ACOPOSinverter P86

User's manual

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1 Safety information

Read through these instructions carefully and familiarize yourself with the device before installing, operating or servicing it. The warning notices listed below are included in all documentation and on the device itself and indicate potential risks and hazards or specific information that illustrates or simplifies a procedure.

Notes

Danger!

DANGER indicates a direct hazard that will result in death or serious injury if not avoided.

Warning!

WARNING indicates a potential hazard that can result in death, serious injury and/or material damage if not avoided.

Caution!

CAUTION indicates a potential hazard that can result in personal injury and/or material damage if not avoided.

Note:

NOTE without the use of the danger symbol indicates a possible hazard that can result in material damage if not avoided.

The term "inverter" in the context of this manual refers to the control unit of the frequency inverter as defined by the NEC.
Only qualified personnel are permitted to install, operate, service and repair electrical devices. B&R assumes no responsibility for possible consequences resulting from the use of this product.

PLEASE NOTE

Only qualified personnel are permitted to install, operate, control and service electrical devices. B&R is not liable for any damage resulting from the use of this material.
Qualified personnel are employees who have skills and knowledge regarding the design and operation of this electrical equipment and installations and who have completed training to recognize and avoid potential hazards.

Personnel qualifications

Work on and with this product is only permitted to be carried out by appropriately trained and authorized personnel who are familiar with the contents of this manual and all associated product documentation. In addition, such personnel must have participated in safety training to recognize and avoid the hazards associated with the use of this product. Personnel must have sufficient technical training, know-how and experience and be able to foresee and identify potential hazards that may arise from the use of the product, the changing of settings and the mechanical, electrical and electronic equipment of the entire system. All personnel working on and with the product must be familiar with all applicable standards, guidelines and accident prevention regulations.

Intended use

This product is an inverter for three-phase synchronous and induction motors and designed for industrial use according to the specifications and instructions in this manual. When using the product, all relevant safety regulations and guidelines as well as the specified requirements and technical data must be observed. The product must be installed outside the ATEX zone. Before use, a risk assessment must be carried out with regard to the intended application. Based on the results of this analysis, appropriate safety measures must be implemented. Since the product is used as a component of a complete system, personal safety must be ensured by appropriate design of the complete system (for example, appropriate machine design). Any use other than that expressly permitted is prohibited and may present hazards. Only qualified personnel are permitted to install, operate, control and service electrical devices.

Product-related information

Danger!

RISK OF ELECTRIC SHOCK OR ARC AND RISK OF EXPLOSION

- **Work on and with this drive system is only permitted to be carried out by appropriately trained and authorized personnel who are familiar with the contents of this manual and all associated product documentation and who have completed safety training to recognize and avoid the hazards involved. Installation, adjustment, repair and servicing must be carried out by qualified personnel.**
- **The system integrator is responsible for compliance with all relevant local and national electrical engineering requirements and any other applicable regulations regarding the protective grounding of all equipment.**
- **Many components of the product, including the printed circuits, are supplied by the mains voltage.**
- **Only use electrically insulated tools and measuring instruments with the correct rated voltage.**
- **Do not touch any unshielded components or terminals when voltage is applied.**
- **Motors can generate voltage when the shaft is rotated. Before performing any work on the drive system, secure the motor shaft against being driven by an external source.**
- **With AC voltage, voltage can be coupled out to unused conductors in the motor cable. Insulate unused conductors in the motor cable at both ends.**
- **Do not short-circuit the DC bus terminals, the DC bus capacitors or the braking resistor terminals.**
- **Before performing any work on the drive system:**
    - **Disconnect all power supplies, including any external voltage to the control unit. Note that the circuit breaker or main power disconnect switch does not de-energize all circuits.**
    - **Affix a DO NOT SWITCH ON sign to all circuit breakers connected to the inverter system.**
    - **Lock all circuit breakers in the open position.**
    - **Wait 15 minutes to allow the DC bus capacitors to discharge.**
    - **Follow the instructions included in section "Checking for the absence of voltage" in the product installation instructions.**
- **Before switching on the power supply to the inverter system:**
    - **Ensure that work is completed and that there are no hazards resulting from installation.**
    - **If the mains input terminals and motor output terminals are grounded and shorted, remove the grounding and shorts circuits from the main input terminals and motor output terminals.**
    - **Ensure that all devices are properly grounded.**
    - **Ensure that all protective equipment such as covers, doors and screens are installed or closed.**
- **Install and close all covers before switching on the power supply.**

Failure to follow these instructions will result in death or life-threatening injury.

Inverter systems can cause unexpected movements due to incorrect wiring, incorrect settings, incorrect data other errors.

Warning!

UNINTENDED OPERATION OF THE EQUIPMENT

- **All EMC requirements must be strictly observed during wiring.**
- **Operating the product using unknown or unsuitable settings or data is not permitted.**
- **Perform a comprehensive commissioning test.**

Failure to follow these instructions can result in serious bodily injury and even death or damage to the material.

Damaged products and accessories may cause electric shock or unexpected operation of the equipment.

Danger!

ELECTRIC SHOCK OR UNEXPECTED OPERATION OF THE EQUIPMENT

The use of damaged products or accessory products is not permitted.

Failure to follow these instructions will result in death or life-threatening injury.

In the event of damage, contact your local B&R sales representative.

Warning!

LOSS OF CONTROL

- **When developing a control plan, it is necessary to take into account possible error states of the control paths and provide means for certain critical control functions through which a safe state can be achieved after path failure. Examples of critical control functions include emergency switch-off, overrun stop, power failure and restart.**
- **Separate or redundant control paths must be provided for critical control functions.**
- **System control paths can include communication connections. The effects of unforeseen transfer delays or connection disruptions must be taken into account.**
- **All accident prevention regulations and local safety codes[1)] must be followed.**
- **Each implementation of the product must be individually and carefully tested for proper operation before being put into service.**

Failure to follow these instructions can result in serious bodily injury and even death or damage to the material.

Note:

IRREPARABLE DAMAGE DUE TO INCORRECT MAINS VOLTAGE

- **Before switching on and configuring the product, it must be ensured that it is approved for the existing mains voltage.**

Failure to follow these instructions can result in bodily injury or damage to devices.

During operating, the products described in these instructions can reach temperatures above 80°C.

Warning!

HOT SURFACES

- **Avoid all contact with hot surfaces.**
- **Keep flammable or heat-sensitive parts away from the immediate vicinity of hot surfaces.**
- **Before handling the product, ensure that it has cooled down sufficiently.**
- **Ensure that there is sufficient heat dissipation by performing a test run at maximum load.**

Failure to follow these instructions can result in serious bodily injury and even death or damage to the material.

The product is approved for use outside danger zones (explosive atmospheres). Install the device only in areas free of hazardous atmospheres.

1) For the USA: For additional information, see NEMA ICS 1.1 (latest edition), "Safety guidelines for the application, installation and maintenance of solid-state control" and NEMA ICS 7.1 (latest edition), "Safety standards for construction and guide for selection, installation and operation of adjustable-speed drive systems".

Danger!

RISK OF EXPLOSION

Install and use this device only outside danger zones.

Failure to follow these instructions will result in death or serious injury.

Machines, controllers and associated devices are usually integrated into the network. Unauthorized persons and malware can gain access to the machine or other devices on the machine's network/fieldbus and connected networks via insufficiently secured access to software and networks.

Warning!

UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORK

In your hazard and risk analysis, take into account all dangers that may arise by accessing and operating the network/fieldbus and develop a suitable cybersecurity concept.

Ensure that the hardware and software infrastructure into which the machine will be integrated, as well as the organizational policies and guidelines, cover access to this infrastructure by taking into account the results of the hazard and risk analysis, that they are implemented according to best practices and standards and that they address IT and cybersecurity concerns (e.g. ISO/IEC 27000 for common criteria for assessing the security of information technology systems, ISO/IEC 15408, IEC 62351, ISA/IEC 62443, NIST Cybersecurity Framework, Information Security Forum - "Standard of good practice for information security").

Ensure the effectiveness of your IT and cybersecurity system by using appropriate, proven methods.

Failure to follow these instructions can result in death, serious injury or damage to property.

Warning!

LOSS OF CONTROL

Perform a comprehensive commissioning test to ensure that the communication monitoring system properly detects communication interruptions.

Failure to follow these instructions can result in death, serious injury or damage to property.

1.1 Intended use

In all cases, applicable national and international standards, regulations and safety measures must be taken into account and observed!

The B&R products described in this manual are intended for use in industry and industrial applications.
The intended use includes control, operation, monitoring, drive and HMI tasks as part of automation processes in machines and systems.

B&R products are only permitted to be used in their original condition. Modifications and extensions are only permitted if they are described in this manual.

B&R excludes liability for damage of any kind resulting from the use of B&R products in any intended way.

B&R products have not been designed, developed and manufactured for use that involves fatal risks or hazards that could result in death, injury, serious physical harm or other loss without the assurance of exceptionally stringent safety precautions.

B&R products are explicitly not intended for use in the following applications:

- Monitoring and control of thermonuclear processes
- Weapon systems control
- Flight and traffic control systems for passenger and freight transport
- Health monitoring and life support systems

The B&R products described in this manual are designed as "open equipment" (EN 61131-2) and "open type equipment" (UL). They are therefore designated for installation in an enclosed control cabinet.

Servo drives, inverter modules and frequency inverters from B&R are not dual-use goods per Annex I of Council Regulation (EC) No. 428/2009 | 3A225, amended by Commission Delegated Regulation (EU) No. 2015/2420. The electrical output frequency of these modules is monitored; if the limit frequency is exceeded, the current movement is aborted and an error is reported.
Servo drives, inverter modules and frequency inverters with the dual-use option are dual-use goods per Annex I of Council Regulation (EC) No. 428/2009 | 3A225, amended by Commission Delegated Regulation (EU) No. 2015/2420. The electrical output frequency of these modules is not monitored. Modules with the dual-use option are subject to various export restrictions.

2 General information

The products in the ACOPOSinverter family add a cost-optimized drive solution for motors to the B&R portfolio. The drives have been especially designed for use with asynchronous motors in efficiency classes IE2 and IE3, but they can also be used with synchronous motors.

The product family differentiates between mains voltages and motor cable classes. The ACOPOSinverter is supplied with up to 240 V or 500 V and can control motors in the power classes 0.18 kW to 15 kW (IEC) or 0.25 HP to 20 HP (NEMA).

A communication card is required to operate an ACOPOSinverter on a controller. Communication cards of type POWERLINK and X2X have been fully integrated, i.e. special configuration and user interfaces for Automation Studio have been designed to make it easier to commission the drive and to integrate it into B&R in-house development environments mapp Motion and mapp Cockpit. Depending on the requirement specifications, it is possible to choose between two function models. Smaller applications can be implemented with the license-free "Direct control" function model; demanding applications (e.g. with several drives) can be implemented with mapp Motion.

2.1 Device overview

The ACOPOSinverter P86 family of products comprises five inverter sizes (1, 2, 3, 4 and 5) and is ideally suited for integration in compact, powerful inverter solutions with high-performance requirements.

Size 1, 2 and 3 inverters have three expansion slots (marked GP-xx) for the following options:

- GP-SF: Safety module
- GP-ENC: Encoder module
- GP-FB: Fieldbus module (factory-wired)

Size 4 and 5 inverters are equipped as follows: 2 slots for optional modules:

- Slot A: Fieldbus option (factory-wired)
- Slot B: Encoder option
- Slot C: Safety option

Five sizes

For sizes 1 to 3, product identifier 8I86xxxxxxx.0P-100 must be selected in the Automation Studio Hardware Catalog.

Size 1 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000. 8I86T400300.00-000, 8I86T400400.00-000	**Size 2** 8I86T400550.00-000, 8I86T400750.00-000
• 400 V 3-phase from 0.75 kW to 4 kW (1 to 5 HP) 	• 400 V 3-phase from 5.5 kW to 7.5 kW (7 to 10 HP) 
Size 3 8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000	
• 400 V 3-phase from 11 kW to 22 kW (15 to 30 HP) 	

For sizes 4 and 5, product identifier 8I86xxxxxxx.0P-200 must be selected in the Automation Studio Hardware Catalog.

Size 4 8I86T403000.00-000, 8I86T4037000.00-000	**Size 5** 8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000
• 400 V 3-phase from 30 kW to 37 kW (40 to 50 HP) 	• 400 V 3-phase from 45 kW to 75 kW (60 to 100 HP) 

2.2 Order number key

Product area		
8		Motion group
Product family		
I		ACOPOSinverter
Model		
86		ACOPOSinverter P86
Number of phases		
T		3-phase
Voltage range		
4		380 to 480 V
Nominal power		
0-9		W x 10^5
0-9		W x 10^4
0-9		W x 10^3
0-9		W x 10^2
0-9		W x 10
Interface		
.	0-F	Version
.	0P	POWERLINK
Version		
-	1xx	Sizes 1, 2 and 3
-	2xx	Sizes 4 and 5

Examples														
8	I	86	T	4	0	0	3	0	0	.	00	-	100	ACOPOSinverter P86, 3 x 380-500 V, 3 kW, integrated EMC filter and brake chopper
8	I	86	T	4	0	0	3	0	0	.	0P	-	100	ACOPOSinverter P86, 3 x 380-500 V, 3 kW, integrated EMC filter and brake chopper, POWERLINK interface

3 Technical data

3.1 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000

3.1.1 Order data

Order number	Short description	Figure
	ACOPOSinverter P86 - 3-phase 380 to 480 V	
8I86T400075.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 0.75 kW, integrated EMC filter and brake chopper.	
8I86T400150.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 1.5 kW, integrated EMC filter and brake chopper.	
8I86T400220.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 2.2 kW, integrated EMC filter and brake chopper.	
8I86T400300.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 3.0 kW, integrated EMC filter and brake chopper.	
8I86T400400.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 4.0 kW, integrated EMC filter and brake chopper.	
	Optional accessories	
	Additional EMC filters	
8I0FT015.200-1	ACOPOSinverter additional EMC input filter 3-phase 15 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT025.200-1	ACOPOSinverter additional EMC input filter 3-phase 25 A, supply voltage: 380 to 480 V, 50/60 Hz	
	Cable and adapters	
8I0XC001.003-1	USB adapter cable, USB to Modbus, for ACOPOSinverter.	
8I0XC003.400-1	DC bus cable, 0.18 m, 5 pcs., for ACOPOSinverter	
8I0XD304.301-1	RJ45 cable, 1 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.303-1	RJ45 cable, 3 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.305-1	RJ45 cable, 5 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.310-1	RJ45 cable, 10 m, for remote use of the display for the ACOPOSinverter.	
	Fan (replacement parts requirement)	
8I0XF086.401-1	ACOPOSinverter P86 fan kit for size 1, power output class: 0.75 to 4 kW (1 to 5 HP)	
	Graphic display terminal	
8I0FM086.400-1	Female-to-female installation kit for ACOPOSinverter plain text display, IP43 protection	
8I0XD086.400-1	Plain text display for ACOPOSinverter P86, backlight, navigation key, IP43 protection	
	Interface modules	
8I0IFENC.400-1	ACOPOSinverter P86 encoder interface (digital), encoder type / signal: AB, SSI supply voltages: 5, 12, 24 VDC encoder type / signal: ENDAT supply voltages: 5, 12 VDC	
8I0IFENC.401-1	ACOPOSinverter P86 encoder interface (analog), encoder type / signal: SinCos supply voltages: 5, 12, 24 VDC encoder type / signal: HIPERFACE supply voltages: 12 VDC	
8I0IFENC.402-1	ACOPOSinverter P86 encoder interface, encoder type / signal: Resolver	
8I0IFENC.403-1	ACOPOSinverter P86 encoder interface (HTL), encoder type / signal: AB (push-pull) supply voltages: 12, 15, 24 VDC	
	Male connector (replacement parts requirement)	
8I0XS086.401-1	ACOPOSinverter P86 connector set size 1, power output class: 0.75 to 4 kW (1 to 5 HP)	
	Optional EMC kit	
8I0XE086.401-1	EMC installation kit for P86 size 1, power output class: 0.75 to 4 kW (1 to 50 HP)	
	Optional braking resistor	
8I0BR060.002-1	Braking resistor ohmic value: 60 Ω continuous braking power: 0.50 kW degree of protection (IP): IP20	
8I0BR100.001-1	Braking resistor ohmic value: 100 Ω continuous braking power: 0.10 kW degree of protection (IP): IP20	

Table 1: 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000 - Order data

Order number	Short description	Figure
8I0BR100.002-1	Braking resistor ohmic value: 100 Ω continuous braking power: 0.26 kW degree of protection (IP): IP20	
	Optional line chokes	
8I0CT004.000-1	Mains choke 3-phase, 4 A, 50/60 for ACOPOSinverter	
8I0CT010.000-1	Mains choke 3-phase, 10 A, 50/60 Hz for ACOPOSinverter	

Table 1: 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000 - Order data

3.1.2 Technical data

Order number	8I86T400075.00-000	8I86T400150.00-000	8I86T400220.00-000	8I86T400300.00-000	8I86T400400.00-000
General information					
Certifications					
CE	Yes				
UKCA	Yes				
UL	cULus E225616 Power conversion equipment				
Motor power					
Specified on nameplate	0.75 kW (1 HP)	1.5 kW (2 HP)	2.2 kW (3 HP)	3 kW (4 HP)	4 kW (5 HP)
Mains connection					
Mains input voltage	3x 380 VAC -15% to 480 VAC +10%				
Frequency	50 to 60 Hz ±5%				
Apparent power (at 480 VAC)	2.2 kVA	4.1 kVA	5.5 kVA	7.1 kVA	8.8 kVA
Max. assumed short-circuit current (Isc) (short-circuit current at connection point)	5 kA				
Inrush current	Max. 8.7 A			Max. 36.1 A	
Max. mains current with optional mains choke					
At 380 VAC	1.9 A	3.5 A	5.1 A	6.6 A	8.5 A
At 480 VAC	1.6 A	2.8 A	4.1 A	5.3 A	6.8 A
Mains current					
At 380 VAC	3.4 A	6 A	8.4 A	10.7 A	13.4 A
At 480 VAC	2.6 A	4.9 A	6.6 A	8.5 A	10.6 A
Power dissipation					
External cooling	49 W	69 W	90 W	112 W	136 W
Integrated EMC filter	Yes				
Line-conducted and radiated emissions					
With integrated filter					
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	-				
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	20 m				
With add-on filter	8I0FT015.200-1		8I0FT025.200-1		
With add-on filter					
Motor cable length per IEC/EN 61800-3 Cat. C1 environment 1 (public power network)	-				
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	C2 level at 4 kHz with 50 m cable				
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	C3 level at 4 kHz with 100 m cable				
Motor connection					
Nominal output current	2.2 A	4 A	5.6 A	7.2 A	9.3 A
Derating of continuous output current depending on ambient temperature					
At nominal clock frequency (4 kHz or 2.5 kHz with higher inverter power)	No derating (up to 50°C)				
Other clock frequencies	The derating curves are included in the installation instructions, which can be downloaded from www.br-automation.com.				
Derating of continuous output current depending on installation elevation					
Starting at 1000 m above sea level	1%, per 100 m				

Table 2: 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000 - Technical data

Order number	8I86T400075.00-000	8I86T400150.00-000	8I86T400220.00-000	8I86T400300.00-000	8I86T400400.00-000
Max. transient current for 60 s	3.3 A	6 A	8 A	11 A	14 A
Max. transient current for 2 s	4 A	7.2 A	10.1 A	13 A	16.7 A
Output frequency range	0.1 to 599 Hz				
Nominal clock frequency	4 kHz				
Clock frequency 1)					
Min.	2 kHz				
Max.	16 kHz				
Max. motor cable length					
Shielded cable	100 m				
Non-shielded cable	100 m				
Motor control profiles					
Induction motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode 2. Voltage controlled with variable torque → Energy-saving mode, e.g. for fans and pumps Vector control with encoder: 1. Current-controlled with constant torque → Default mode Sensorless slip control: 1. With V/f characteristic curve for constant torque → Default mode 2. With V/f characteristic curve for constant torque (up to 6 f ranges) → Mode for individual special applications 3. With V/f characteristic curve for quadratically increasing torque → Energy-saving mode, e.g. for fans and pumps				
Synchronous motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode Vector control with encoder: 1. Current-controlled with constant torque → Default mode				
Main protective functions of inverter	Thermal protection against power stage overheating Protection against short circuits between motor phases, overcurrent between output phases and ground, overvoltages on the DC bus, exceeding the speed limit. Safety function for: Overvoltage and undervoltage of the mains supply, mains phase failure with 3-phase power supply				
Brake chopper					
Integrated dynamic brake transistors	Yes				
Min. resistance value (external)	78 Ω	52 Ω		31 Ω	
24 VDC power supply					
Input voltage	24 VDC (min. 20.4 VDC, max. 27 VDC)				
Current	Max. 0.8 A				
Available internal power supplies					
Output voltage 24 VDC	24 VDC (min. 20.4 VDC, max. 27 VDC)				
Output voltage 24 VDC					
Max. output current at 24 VDC	Max. 200 mA				
Output voltage 10 VDC	10.5 VDC ±5%				
Output voltage 10 VDC					
Max. output current at 10 VDC	Max. 10 mA				
Interfaces					
POWERLINK					
Type	Type 3 2)				
Digital inputs					
Quantity	5				
Nominal voltage	24 VDC (max. 30 VDC)				
Input circuit	Source or sink				
Switching threshold					
Low	Source: <0.5 V Sink: >16 V				
High	Source: >11 V Sink: <10 V				
Electrical isolation					
Input - ACOPOSinverter	Yes				
Input - Input	No				
Sampling time	2 ms ±0.5 ms				
Input impedance	4.4 kΩ				
Safe input - STO (Safe Torque Off)					
Quantity	2				
Nominal voltage	24 VDC (max. 30 VDC)				
Input impedance	2.2 kΩ				
Switching threshold					
Low	<5 V				
High	>11 V				

Table 2: 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000 - Technical data

Order number	8I86T400075.00-000	8I86T400150.00-000	8I86T400220.00-000	8I86T400300.00-000	8I86T400400.00-000
Electrical isolation					
Input - ACOPOSinverter	Yes				
Input - Input	No				
Input circuit	Source				
Event counters					
Quantity	1				
Nominal voltage	24 VDC (max. 30 VDC)				
Input frequency	0 to 30 kHz				
Input circuit	Source				
Sampling time	5 ms ±1 ms				
Switching threshold					
Low	<0.6 V				
High	>2.5 V				
Analog inputs					
Quantity	2				
Electrical isolation					
Input - Input	No				
Input - ACOPOSinverter	Yes				
Nonlinearity	±0.15%				
Basic accuracy	±0.6% with temperature fluctuation of 60°C				
Input					
Voltage	AI1: 0 to 10 VDC AI2: -10 to 10 VDC				
Current	AI1: 0 to 20 mA				
Resolution	12-bit				
Sampling time	1 ms ±1 ms				
Input impedance					
Voltage	AI1: 31.5 kΩ AI2: 20 kΩ				
Current	250 Ω				
Digital outputs					
Quantity	2				
Nominal voltage	24 VDC -15%/+20%				
Max. voltage	30 VDC				
Output circuit	Source or sink				
Sampling time	2 ms ±0.5 ms				
Max. current	100 mA				
Relay outputs					
Quantity	2				
Nominal voltage	30 VDC / 250 VAC				
Switching current range	Min. switching current: 5 mA at 24 VDC Max. switching current: R1: At cos φ = 1: Max. 3 A / At cos φ = 0.4: Max. 2 A R2: At cos φ = 1: Max. 5 A / At cos φ = 0.4: Max. 2 A				
Variant					
Relay 1	1 changeover contact				
Relay 2	1 normally open contact				
Electrical isolation					
Output - ACOPOSinverter	Yes				
Output - Output	No				
Response time (max.)	5 ms ±0.5 ms				
Analog outputs					
Quantity	1				
Output	0 to 10 VDC or 0 to 20 mA				
Nonlinearity	±0.2%				
Basic accuracy	±1% with temperature fluctuation of 60°C				
Electrical isolation					
Output - ACOPOSinverter	Yes				
Output - Output	No				
Max. load impedance					
Voltage	470 Ω				
Current	500 Ω				
Sampling time	5 ms ±1 ms				
Resolution	10-bit				

Table 2: 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000 - Technical data

Order number	8I86T400075.00-000	8I86T400150.00-000	8I86T400220.00-000	8I86T400300.00-000	8I86T400400.00-000
Electrical properties					
Energy efficiency (IE classification)					
Efficiency data	IE (10, 25): 1.9% (3x 380 VAC), 1.6% (3x 480 VAC) IE (50, 25): 1.8% (3x 380 VAC), 1.6% (3x 480 VAC) IE (10, 50): 2.2% (3x 380 VAC), 1.9% (3x 480 VAC) IE (50, 50): 2.1% (3x 380 VAC), 1.8% (3x 480 VAC) IE (90, 50): 2.1% (3x 380 VAC), 1.9% (3x 480 VAC) IE (10, 100): 2.8% (3x 380 VAC), 2.5% (3x 480 VAC) IE (50, 100): 2.6% (3x 380 VAC), 2.4% (3x 480 VAC) IE (90, 100): 2.9% (3x 380 VAC), 2.6% (3x 480 VAC)	IE (10, 25): 1.3% (3x 380 VAC), 1% (3x 480 VAC) IE (50, 25): 1.2% (3x 380 VAC), 1% (3x 480 VAC) IE (10, 50): 1.5% (3x 380 VAC), 1.2% (3x 480 VAC) IE (50, 50): 1.4% (3x 380 VAC), 1.2% (3x 480 VAC) IE (90, 50): 1.5% (3x 380 VAC), 1.3% (3x 480 VAC) IE (10, 100): 2% (3x 380 VAC), 1.6% (3x 480 VAC) IE (50, 100): 2% (3x 380 VAC), 1.7% (3x 480 VAC) IE (90, 100): 2.4% (3x 380 VAC), 2% (3x 480 VAC)	IE (10, 25): 1.1% (3x 380 VAC), 0.9% (3x 480 VAC) IE (50, 25): 1% (3x 380 VAC), 0.8% (3x 480 VAC) IE (10, 50): 1.3% (3x 380 VAC), 1.1% (3x 480 VAC) IE (50, 50): 1.3% (3x 380 VAC), 1% (3x 480 VAC) IE (90, 50): 1.4% (3x 380 VAC), 1.2% (3x 480 VAC) IE (10, 100): 1.9% (3x 380 VAC), 1.5% (3x 480 VAC) IE (50, 100): 1.8% (3x 380 VAC), 1.5% (3x 480 VAC) IE (90, 100): 2.2% (3x 380 VAC), 1.8% (3x 480 VAC)	IE (10, 25): 1% (3x 380 VAC), 0.8% (3x 480 VAC) IE (50, 25): 0.9% (3x 380 VAC), 0.8% (3x 480 VAC) IE (10, 50): 1.2% (3x 380 VAC), 1% (3x 480 VAC) IE (50, 50): 1.2% (3x 380 VAC), 1% (3x 480 VAC) IE (90, 50): 1.3% (3x 380 VAC), 1.1% (3x 480 VAC) IE (10, 100): 1.8% (3x 380 VAC), 1.4% (3x 480 VAC) IE (50, 100): 1.7% (3x 380 VAC), 1.5% (3x 480 VAC) IE (90, 100): 2.1% (3x 380 VAC), 1.8% (3x 480 VAC)	IE (10, 25): 1% (3x 380 VAC), 0.7% (3x 480 VAC) IE (50, 25): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (10, 50): 1.2% (3x 380 VAC), 0.9% (3x 480 VAC) IE (50, 50): 1.1% (3x 380 VAC), 0.9% (3x 480 VAC) IE (90, 50): 1.2% (3x 380 VAC), 1% (3x 480 VAC) IE (10, 100): 1.8% (3x 380 VAC), 1.3% (3x 480 VAC) IE (50, 100): 1.7% (3x 380 VAC), 1.4% (3x 480 VAC) IE (90, 100): 2% (3x 380 VAC), 1.7% (3x 480 VAC)
Nominal losses in standby mode	15 W (3x 380 VAC), 16 W (3x 480 VAC)				
Operating conditions					
Degree of protection per EN 61800-5-1	IP20				
Degree of protection per EN 60529	IP20				
Max. relative humidity per EN/IEC 60721-3-3 class 3K3	5 to 95%, non-condensing				
Maximum installation elevation	≤1000 m without derating 1000 to 3000 m with Derating				
Max. pollution degree per IEC/EN 61800-5-1	2 (non-conductive pollution)				
Ambient conditions per IEC 60721-3-3	Class 3C3 and 3S3				
Operating position	Vertical mounting orientation ±10°				
Ambient conditions					
Temperature					
Operation	-15 to 50°C without derating 50 to 60°C with derating				
Storage	-40 to 70°C				
Max. vibration resistance	1 g_n 9 to 200 Hz EN/IEC 60721-3-3 class 3M3 1.5 mm peak to peak 2 to 19 Hz EN/IEC 60721-3-3 class 3M3				
Max. shock resistance	15 g_n (duration = 11 ms) per EN/IEC 60721-3-3 class 3M3				
Mechanical properties					
Dimensions					
Width	85 mm				
Height	270 mm				
Depth	232.5 mm				
Weight	1.7 kg		1.8 kg	2.2 kg	2.3 kg

Table 2: 8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000 - Technical data

1) Additional restrictions result from parameter SVL.
2) For additional information, see section "Communication / POWERLINK / General information / Hardware - CN" in Automation Help.

3.2 8I86T400550.00-000, 8I86T400750.00-000

3.2.1 Order data

Order number	Short description	Figure
	ACOPOSinverter P86 - 3-phase 380 to 480 V	
8I86T400550.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 5.5 kW, integrated EMC filter and brake chopper.	
8I86T400750.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 7.5 kW, integrated EMC filter and brake chopper.	
	Optional accessories	
	Additional EMC filters	
8I0FT025.200-1	ACOPOSinverter additional EMC input filter 3-phase 25 A, supply voltage: 380 to 480 V, 50/60 Hz	
	Cable and adapters	
8I0XC001.003-1	USB adapter cable, USB to Modbus, for ACOPOSinverter.	
8I0XC003.400-1	DC bus cable, 0.18 m, 5 pcs., for ACOPOSinverter	
8I0XD304.301-1	RJ45 cable, 1 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.303-1	RJ45 cable, 3 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.305-1	RJ45 cable, 5 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.310-1	RJ45 cable, 10 m, for remote use of the display for the ACOPOSinverter.	
	Fan (replacement parts requirement)	
8I0XF086.402-1	ACOPOSinverter P86 fan kit for size 2, power output class: 5.5 to 7.5 kW (7 to 10 HP)	
	Graphic display terminal	
8I0FM086.400-1	Female-to-female installation kit for ACOPOSinverter plain text display, IP43 protection	
8I0XD086.400-1	Plain text display for ACOPOSinverter P86, backlight, navigation key, IP43 protection	
	Interface modules	
8I0IFENC.400-1	ACOPOSinverter P86 encoder interface (digital), encoder type / signal: AB, SSI supply voltages: 5, 12, 24 VDC encoder type / signal: ENDAT supply voltages: 5, 12 VDC	
8I0IFENC.401-1	ACOPOSinverter P86 encoder interface (analog), encoder type / signal: SinCos supply voltages: 5, 12, 24 VDC encoder type / signal: HIPERFACE supply voltages: 12 VDC	
8I0IFENC.402-1	ACOPOSinverter P86 encoder interface, encoder type / signal: Resolver	
8I0IFENC.403-1	ACOPOSinverter P86 encoder interface (HTL), encoder type / signal: AB (push-pull) supply voltages: 12, 15, 24 VDC	
	Male connector (replacement parts requirement)	
8I0XS086.402-1	ACOPOSinverter P86 connector set for size 2, power output class: 5.5 to 7.5 kW (7 to 10 HP)	
	Optional EMC kit	
8I0XE086.402-1	EMC installation kit for P86 size 2, power output class: 5.5 to 7.5 kW (7.5 to 10 HP)	
	Optional braking resistor	
8I0BR028.001-1	Braking resistor ohmic value: 28 Ω continuous braking power: 1.10 kW degree of protection (IP): IP20	
8I0BR060.002-1	Braking resistor ohmic value: 60 Ω continuous braking power: 0.50 kW degree of protection (IP): IP20	
	Optional line chokes	
8I0CT016.000-1	Mains choke 3-phase, 17 A, 50/60 Hz for ACOPOSinverter	

Table 3: 8I86T400550.00-000, 8I86T400750.00-000 - Order data

3.2.2 Technical data

Order number	8I86T400550.00-000	8I86T400750.00-000
General information		
Certifications		
CE	Yes	
UKCA	Yes	
UL	cULus E225616 Power conversion equipment	
Motor power		
Specified on nameplate	5.5 kW (7 HP)	7.5 kW (10 HP)
Mains connection		
Mains input voltage	3x 380 VAC -15% to 480 VAC +10%	
Frequency	50 to 60 Hz ±5%	
Apparent power (at 480 VAC)	13.3 kVA	17 kVA

Table 4: 8I86T400550.00-000, 8I86T400750.00-000 - Technical data

Order number	8I86T400550.00-000	8I86T400750.00-000
Max. assumed short-circuit current (Isc) (short-circuit current at connection point)	22 kA	
Inrush current	Max. 45.3 A	
Max. mains current with optional mains choke		
At 380 VAC	11.6 A	14.6 A
At 480 VAC	9.4 A	12.1 A
Mains current		
At 380 VAC	20 A	25.6 A
At 480 VAC	16 A	20.4 A
Power dissipation		
External cooling	196 W	256 W
Integrated EMC filter	Yes	
Line-conducted and radiated emissions		
With integrated filter		
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	-	
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	20 m	
With add-on filter	8I0FT025.200-1	
With add-on filter		
Motor cable length per IEC/EN 61800-3 Cat. C1 environment 1 (public power network)	-	
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	C2 level at 4 kHz with 50 m cable	
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	C3 level at 4 kHz with 100 m cable	
Motor connection		
Nominal output current	12.7 A	16.5 A
Derating of continuous output current depending on ambient temperature		
At nominal clock frequency (4 kHz or 2.5 kHz with higher inverter power)	No derating (up to 50°C)	
Other clock frequencies	The derating curves are included in the installation instructions, which can be downloaded from www.br-automation.com.	
Derating of continuous output current depending on installation elevation		
Starting at 1000 m above sea level	1%, per 100 m	
Max. transient current for 60 s	19.1 A	24.8 A
Max. transient current for 2 s	22.9 A	29.7 A
Output frequency range	0.1 to 599 Hz	
Nominal clock frequency	4 kHz	
Clock frequency [1]		
Min.	2 kHz	
Max.	16 kHz	
Max. motor cable length		
Shielded cable	150 m	
Non-shielded cable	300 m	
Motor control profiles		
Induction motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode 2. Voltage controlled with variable torque → Energy-saving mode, e.g. for fans and pumps Vector control with encoder: 1. Current-controlled with constant torque → Default mode Sensorless slip control: 1. With V/f characteristic curve for constant torque → Default mode 2. With V/f characteristic curve for constant torque (up to 6 f ranges) → Mode for individual special applications 3. With V/f characteristic curve for quadratically increasing torque → Energy-saving mode, e.g. for fans and pumps	
Synchronous motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode Vector control with encoder: 1. Current-controlled with constant torque → Default mode	
Main protective functions of inverter	Thermal protection against power stage overheating Protection against short circuits between motor phases, overcurrent between output phases and ground, overvoltages on the DC bus, exceeding the speed limit. Safety function for: Overvoltage and undervoltage of the mains supply, mains phase failure with 3-phase power supply	
Brake chopper		
Integrated dynamic brake transistors	Yes	
Min. resistance value (external)	31 Ω	28 Ω

Table 4: 8I86T400550.00-000, 8I86T400750.00-000 - Technical data

Order number	8I86T400550.00-000	8I86T400750.00-000
24 VDC power supply		
Input voltage	24 VDC (min. 20.4 VDC, max. 27 VDC)	
Current	Max. 0.8 A	
Available internal power supplies		
Output voltage 24 VDC	24 VDC (min. 20.4 VDC, max. 27 VDC)	
Output voltage 24 VDC		
Max. output current at 24 VDC	Max. 200 mA	
Output voltage 10 VDC	10.5 VDC ±5%	
Output voltage 10 VDC		
Max. output current at 10 VDC	Max. 10 mA	
Interfaces		
POWERLINK		
Type	Type 3 [2)]	
Digital inputs		
Quantity	5	
Nominal voltage	24 VDC (max. 30 VDC)	
Input circuit	Source or sink	
Switching threshold		
Low	Source: <0.5 V Sink: >16 V	
High	Source: >11 V Sink: <10 V	
Electrical isolation		
Input - ACOPOSinverter	Yes	
Input - Input	No	
Sampling time	2 ms ±0.5 ms	
Input impedance	4.4 kΩ	
Safe input - STO (Safe Torque Off)		
Quantity	2	
Nominal voltage	24 VDC (max. 30 VDC)	
Input impedance	2.2 kΩ	
Switching threshold		
Low	<5 V	
High	>11 V	
Electrical isolation		
Input - ACOPOSinverter	Yes	
Input - Input	No	
Input circuit	Source	
Event counters		
Quantity	1	
Nominal voltage	24 VDC (max. 30 VDC)	
Input frequency	0 to 30 kHz	
Input circuit	Source	
Sampling time	5 ms ±1 ms	
Switching threshold		
Low	<0.6 V	
High	>2.5 V	
Analog inputs		
Quantity	2	
Electrical isolation		
Input - Input	No	
Input - ACOPOSinverter	Yes	
Nonlinearity	±0.15%	
Basic accuracy	±0.6% with temperature fluctuation of 60°C	
Input		
Voltage	AI1: 0 to 10 VDC AI2: -10 to 10 VDC	
Current	AI1: 0 to 20 mA	
Resolution	12-bit	
Sampling time	1 ms ±1 ms	
Input impedance		
Voltage	AI1: 31.5 kΩ AI2: 20 kΩ	
Current	250 Ω	
Digital outputs		
Quantity	2	
Nominal voltage	24 VDC -15%/+20%	
Max. voltage	30 VDC	
Output circuit	Source or sink	
Sampling time	2 ms ±0.5 ms	
Max. current	100 mA	
Relay outputs		
Quantity	2	

Table 4: 8I86T400550.00-000, 8I86T400750.00-000 - Technical data

Order number	8I86T400550.00-000	8I86T400750.00-000
Nominal voltage	30 VDC / 250 VAC	
Switching current range	Min. switching current: 5 mA at 24 VDC Max. switching current: R1: At cos φ = 1: Max. 3 A / At cos φ = 0.4: Max. 2 A R2: At cos φ = 1: Max. 5 A / At cos φ = 0.4: Max. 2 A	
Variant		
Relay 1	1 changeover contact	
Relay 2	1 normally open contact	
Electrical isolation		
Output - ACOPOSinverter	Yes	
Output - Output	No	
Response time (max.)	5 ms ±0.5 ms	
Analog outputs		
Quantity	1	
Output	0 to 10 VDC or 0 to 20 mA	
Nonlinearity	±0.2%	
Basic accuracy	±1% with temperature fluctuation of 60°C	
Electrical isolation		
Output - ACOPOSinverter	Yes	
Output - Output	No	
Max. load impedance		
Voltage	470 Ω	
Current	500 Ω	
Sampling time	5 ms ±1 ms	
Resolution	10-bit	
Electrical properties		
Energy efficiency (IE classification)		
Efficiency data	IE (10, 25): 0.7% (3x 380 VAC), 0.6% (3x 480 VAC) IE (50, 25): 0.7% (3x 380 VAC), 0.6% (3x 480 VAC) IE (10, 50): 0.9% (3x 380 VAC), 0.8% (3x 480 VAC) IE (50, 50): 0.9% (3x 380 VAC), 0.8% (3x 480 VAC) IE (90, 50): 1% (3x 380 VAC), 0.9% (3x 480 VAC) IE (10, 100): 1.6% (3x 380 VAC), 1.3% (3x 480 VAC) IE (50, 100): 1.6% (3x 380 VAC), 1.4% (3x 480 VAC) IE (90, 100): 2% (3x 380 VAC), 1.7% (3x 480 VAC)	IE (10, 25): 0.7% (3x 380 VAC), 0.5% (3x 480 VAC) IE (50, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (10, 50): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (50, 50): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (90, 50): 1% (3x 380 VAC), 0.9% (3x 480 VAC) IE (10, 100): 1.6% (3x 380 VAC), 1.2% (3x 480 VAC) IE (50, 100): 1.6% (3x 380 VAC), 1.3% (3x 480 VAC) IE (90, 100): 2% (3x 380 VAC), 1.7% (3x 480 VAC)
Nominal losses in standby mode	15 W (3x 380 VAC), 16 W (3x 480 VAC)	
Operating conditions		
Degree of protection per EN 61800-5-1	IP20	
Degree of protection per EN 60529	IP20	
Max. relative humidity per EN/IEC 60721-3-3 class 3K3	5 to 95%, non-condensing	
Maximum installation elevation	≤1000 m without derating 1000 to 3000 m with Derating	
Max. pollution degree per IEC/EN 61800-5-1	2 (non-conductive pollution)	
Ambient conditions per IEC 60721-3-3	Class 3C3 and 3S3	
Operating position	Vertical mounting orientation ±10°	
Ambient conditions		
Temperature		
Operation	-15 to 50°C without derating 50 to 60°C with derating	
Storage	-40 to 70°C	
Max. vibration resistance	1 g_n 9 to 200 Hz EN/IEC 60721-3-3 class 3M3 1.5 mm peak to peak 2 to 19 Hz EN/IEC 60721-3-3 class 3M3	
Max. shock resistance	15 g_n (duration = 11 ms) per EN/IEC 60721-3-3 class 3M3	
Mechanical properties		
Dimensions		
Width	110 mm	
Height	270 mm	
Depth	234 mm	
Weight	2.9 kg	3 kg

Table 4: 8I86T400550.00-000, 8I86T400750.00-000 - Technical data

1) Additional restrictions result from parameter SVL.
2) For additional information, see section "Communication / POWERLINK / General information / Hardware - CN" in Automation Help.

3.3 8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000

3.3.1 Order data

Order number	Short description	Figure
	ACOPOSinverter P86 - 3-phase 380 to 480 V	
8I86T401100.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 11 kW, integrated EMC filter and brake chopper.	
8I86T401500.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 15 kW, integrated EMC filter and brake chopper.	
8I86T401850.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 18.5 kW, integrated EMC filter and brake chopper.	
8I86T402200.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 22 kW, integrated EMC filter and brake chopper.	
	Optional accessories	
	Additional EMC filters	
8I0FT050.200-1	ACOPOSinverter additional EMC input filter 3-phase 50 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT070.200-1	ACOPOSinverter additional EMC input filter 3-phase 70 A, supply voltage: 380 to 480 V, 50/60 Hz	
	Cable and adapters	
8I0XC001.003-1	USB adapter cable, USB to Modbus, for ACOPOSinverter.	
8I0XD304.301-1	RJ45 cable, 1 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.303-1	RJ45 cable, 3 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.305-1	RJ45 cable, 5 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.310-1	RJ45 cable, 10 m, for remote use of the display for the ACOPOSinverter.	
	Fan (replacement parts requirement)	
8I0XF086.403-1	ACOPOSinverter P86 fan kit for size 3, power output class: 11 to 22 kW (15 to 30 HP)	
	Graphic display terminal	
8I0FM086.400-1	Female-to-female installation kit for ACOPOSinverter plain text display, IP43 protection	
8I0XD086.400-1	Plain text display for ACOPOSinverter P86, backlight, navigation key, IP43 protection	
	Interface modules	
8I0IFENC.400-1	ACOPOSinverter P86 encoder interface (digital), encoder type / signal: AB, SSI supply voltages: 5, 12, 24 VDC encoder type / signal: ENDAT supply voltages: 5, 12 VDC	
8I0IFENC.401-1	ACOPOSinverter P86 encoder interface (analog), encoder type / signal: SinCos supply voltages: 5, 12, 24 VDC encoder type / signal: HIPERFACE supply voltages: 12 VDC	
8I0IFENC.402-1	ACOPOSinverter P86 encoder interface, encoder type / signal: Resolver	
8I0IFENC.403-1	ACOPOSinverter P86 encoder interface (HTL), encoder type / signal: AB (push-pull) supply voltages: 12, 15, 24 VDC	
	Male connector (replacement parts requirement)	
8I0XS086.403-1	ACOPOSinverter P86 connector set for size 3, power output class: 11 to 22 kW (15 to 30 HP)	
	Optional EMC kit	
8I0XE086.403-1	EMC installation kit for P86 size 3, power output class: 11 to 22 kW (15 to 30 HP)	
	Optional braking resistor	
8I0BR016.000-1	Braking resistor ohmic value: 16 Ω continuous braking power: 2.20 kW degree of protection (IP): IP20	
8I0BR028.001-1	Braking resistor ohmic value: 28 Ω continuous braking power: 1.10 kW degree of protection (IP): IP20	
	Optional feed-through mounting kit	
8I0PT086.400-1	Pass-through mounting kit for P86 size 3, power output class: 11 to 22 kW (15 to 30 HP)	
	Optional line chokes	
8I0CT030.000-1	Mains choke 3-phase, 30 A, 50/60 Hz for ACOPOSinverter	
8I0CT060.000-1	Mains choke 3-phase, 60 A, 50/60 Hz for ACOPOSinverter	

Table 5: 8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000 - Order data

3.3.2 Technical data

Order number	8I86T401100.00-000	8I86T401500.00-000	8I86T401850.00-000	8I86T402200.00-000
General information				
Certifications				
CE	Yes			
UKCA	Yes			
UL	cULus E225616 Power conversion equipment			
Motor power				
Specified on nameplate	11 kW (15 HP)	15 kW (20 HP)	18.5 kW (25 HP)	22 kW (30 HP)
Mains connection				
Mains input voltage	3x 380 VAC -15% to 480 VAC +10%			
Frequency	50 to 60 Hz ±5%			
Apparent power (at 480 VAC)	23 kVA	29.7 kVA	36.1 kVA	42.1 kVA
Max. assumed short-circuit current (Isc) (short-circuit current at connection point)	22 kA			
Inrush current	Max. 80.8 A		Max. 60.6 A	
Max. mains current with optional mains choke				
At 380 VAC	21.9 A	28.7 A	37.2 A	43.3 A
At 480 VAC	17.7 A	23 A	30.1 A	34.9 A
Mains current				
At 380 VAC	34.7 A	44.9 A	54.7 A	63.5 A
At 480 VAC	27.7 A	35.7 A	43.4 A	50.5 A
Power dissipation				
External cooling	313 W	443 W	559 W	680 W
Natural cooling	50 W	55 W	61 W	66 W
Integrated EMC filter	Yes			
Line-conducted and radiated emissions				
With integrated filter				
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	-			
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	20 m			
With add-on filter	8I0FT050.200-1		8I0FT070.200-1	
With add-on filter				
Motor cable length per IEC/EN 61800-3 Cat. C1 environment 1 (public power network)	-			
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	C2 level at 4 kHz with 50 m cable			
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	C3 level at 4 kHz with 100 m cable			
Motor connection				
Nominal output current	24 A	32 A	39 A	46 A
Derating of continuous output current depending on ambient temperature				
At nominal clock frequency (4 kHz or 2.5 kHz with higher inverter power)	No derating (up to 50°C)			
Other clock frequencies	The derating curves are included in the installation instructions, which can be downloaded from www.br-automation.com.			
Derating of continuous output current depending on installation elevation				
Starting at 1000 m above sea level	1%, per 100 m			
Max. transient current for 60 s	36 A	48 A	59 A	69 A
Max. transient current for 2 s	43 A	58 A	70 A	83 A
Output frequency range	0.1 to 599 Hz			
Nominal clock frequency	4 kHz			
Clock frequency [1)]				
Min.	2 kHz			
Max.	16 kHz			
Max. motor cable length				
Shielded cable	150 m			
Non-shielded cable	300 m			

Table 6: 8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000 - Technical data

Order number	8I86T401100.00-000	8I86T401500.00-000	8I86T401850.00-000	8I86T402200.00-000
Motor control profiles				
Induction motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode 2. Voltage controlled with variable torque → Energy-saving mode, e.g. for fans and pumps Vector control with encoder: 1. Current-controlled with constant torque → Default mode Sensorless slip control: 1. With V/f characteristic curve for constant torque → Default mode 2. With V/f characteristic curve for constant torque (up to 6 f ranges) → Mode for individual special applications 3. With V/f characteristic curve for quadratically increasing torque → Energy-saving mode, e.g. for fans and pumps			
Synchronous motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode Vector control with encoder: 1. Current-controlled with constant torque → Default mode			
Main protective functions of inverter	Thermal protection against power stage overheating Protection against short circuits between motor phases, overcurrent between output phases and ground, overvoltages on the DC bus, exceeding the speed limit. Safety function for: Over-voltage and undervoltage of the mains supply, mains phase failure with 3-phase power supply			
Brake chopper				
Integrated dynamic brake transistors	Yes			
Min. resistance value (external)	16 Ω		13 Ω	10 Ω
24 VDC power supply				
Input voltage	24 VDC (min. 20.4 VDC, max. 27 VDC)			
Current	Max. 0.8 A			
Available internal power supplies				
Output voltage 24 VDC	24 VDC (min. 20.4 VDC, max. 27 VDC)			
Output voltage 24 VDC				
Max. output current at 24 VDC	Max. 200 mA			
Output voltage 10 VDC	10.5 VDC ±5%			
Output voltage 10 VDC				
Max. output current at 10 VDC	Max. 10 mA			
Interfaces				
POWERLINK				
Type	Type 3 [2)]			
Digital inputs				
Quantity	5			
Nominal voltage	24 VDC (max. 30 VDC)			
Input circuit	Source or sink			
Switching threshold				
Low	Source: <0.5 V Sink: >16 V			
High	Source: >11 V Sink: <10 V			
Electrical isolation				
Input - ACOPOSinverter	Yes			
Input - Input	No			
Sampling time	2 ms ±0.5 ms			
Input impedance	4.4 kΩ			
Safe input - STO (Safe Torque Off)				
Quantity	2			
Nominal voltage	24 VDC (max. 30 VDC)			
Input impedance	2.2 kΩ			
Switching threshold				
Low	<5 V			
High	>11 V			
Electrical isolation				
Input - ACOPOSinverter	Yes			
Input - Input	No			
Input circuit	Source			
Event counters				
Quantity	1			
Nominal voltage	24 VDC (max. 30 VDC)			
Input frequency	0 to 30 kHz			
Input circuit	Source			
Sampling time	5 ms ±1 ms			
Switching threshold				
Low	<0.6 V			
High	>2.5 V			

Table 6: 8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000 - Technical data

Order number	8I86T401100.00-000	8I86T401500.00-000	8I86T401850.00-000	8I86T402200.00-000
Analog inputs				
Quantity	2			
Electrical isolation				
Input - Input	No			
Input - ACOPOSinverter	Yes			
Nonlinearity	±0.15%			
Basic accuracy	±0.6% with temperature fluctuation of 60°C			
Input				
Voltage	AI1: 0 to 10 VDC AI2: -10 to 10 VDC			
Current	AI1: 0 to 20 mA			
Resolution	12-bit			
Sampling time	1 ms ±1 ms			
Input impedance				
Voltage	AI1: 31.5 kΩ AI2: 20 kΩ			
Current	250 Ω			
Digital outputs				
Quantity	2			
Nominal voltage	24 VDC -15%/+20%			
Max. voltage	30 VDC			
Output circuit	Source or sink			
Sampling time	2 ms ±0.5 ms			
Max. current	100 mA			
Relay outputs				
Quantity	2			
Nominal voltage	30 VDC / 250 VAC			
Switching current range	Min. switching current: 5 mA at 24 VDC Max. switching current: R1: At cos φ = 1: Max. 3 A / At cos φ = 0.4: Max. 2 A R2: At cos φ = 1: Max. 5 A / At cos φ = 0.4: Max. 2 A			
Variant				
Relay 1	1 changeover contact			
Relay 2	1 normally open contact			
Electrical isolation				
Output - ACOPOSinverter	Yes			
Output - Output	No			
Response time (max.)	5 ms ±0.5 ms			
Analog outputs				
Quantity	1			
Output	0 to 10 VDC or 0 to 20 mA			
Nonlinearity	±0.2%			
Basic accuracy	±1% with temperature fluctuation of 60°C			
Electrical isolation				
Output - ACOPOSinverter	Yes			
Output - Output	No			
Max. load impedance				
Voltage	470 Ω			
Current	500 Ω			
Sampling time	5 ms ±1 ms			2 ms ±0.5 ms
Resolution	10-bit			
Electrical properties				
Energy efficiency (IE classification)				
Efficiency data	IE (10, 25): 0.7% (3x 380 VAC), 0.5% (3x 480 VAC) IE (50, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (10, 50): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (50, 50): 0.8% (3x 380 VAC), 0.7% (3x 480 VAC) IE (90, 50): 1% (3x 380 VAC), 0.9% (3x 480 VAC) IE (10, 100): 1.6% (3x 380 VAC), 1.3% (3x 480 VAC) IE (50, 100): 1.5% (3x 380 VAC), 1.3% (3x 480 VAC) IE (90, 100): 1.9% (3x 380 VAC), 1.7% (3x 480 VAC)	IE (10, 25): 0.7% (3x 380 VAC), 0.5% (3x 480 VAC) IE (50, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (10, 50): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (50, 50): 0.8% (3x 380 VAC), 0.7% (3x 480 VAC) IE (90, 50): 1% (3x 380 VAC), 0.9% (3x 480 VAC) IE (10, 100): 1.6% (3x 380 VAC), 1.2% (3x 480 VAC) IE (50, 100): 1.6% (3x 380 VAC), 1.3% (3x 480 VAC) IE (90, 100): 2% (3x 380 VAC), 1.8% (3x 480 VAC)		IE (10, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (50, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (10, 50): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (50, 50): 0.8% (3x 380 VAC), 0.7% (3x 480 VAC) IE (90, 50): 0.9% (3x 380 VAC), 0.9% (3x 480 VAC) IE (10, 100): 1.6% (3x 380 VAC), 1.3% (3x 480 VAC) IE (50, 100): 1.6% (3x 380 VAC), 1.4% (3x 480 VAC) IE (90, 100): 1.9% (3x 380 VAC), 1.8% (3x 480 VAC)
Nominal losses in standby mode	17 W (3x 380 VAC), 19 W (3x 480 VAC)			
Operating conditions				
Degree of protection per EN 61800-5-1	IP20			
Degree of protection per EN 60529	IP20			
Max. relative humidity per EN/IEC 60721-3-3 class 3K3	5 to 95%, non-condensing			

Table 6: 8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000 - Technical data

Order number	8I86T401100.00-000	8I86T401500.00-000	8I86T401850.00-000	8I86T402200.00-000
Maximum installation elevation	≤1000 m without derating 1000 to 3000 m with Derating			
Max. pollution degree per IEC/EN 61800-5-1	2 (non-conductive pollution)			
Ambient conditions per IEC 60721-3-3	Class 3C3 and 3S3			
Operating position	Vertical mounting orientation ±10°			
Ambient conditions				
Temperature				
Operation	-15 to 50°C without derating 50 to 60°C with derating			
Storage	-40 to 70°C			
Max. vibration resistance	1 g_n 9 to 200 Hz EN/IEC 60721-3-3 class 3M3 1.5 mm peak to peak 2 to 19 Hz EN/IEC 60721-3-3 class 3M3			
Max. shock resistance	15 g_n (duration = 11 ms) per EN/IEC 60721-3-3 class 3M3			
Mechanical properties				
Dimensions				
Width	180 mm			
Height	385 mm			
Depth	249 mm			
Weight	9.5 kg		10.2 kg	

Table 6: 8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000 - Technical data

1) Additional restrictions result from parameter SVL.
2) For additional information, see section "Communication / POWERLINK / General information / Hardware - CN" in Automation Help.

3.4 8I86T403000.00-000, 8I86T403700.00-000

3.4.1 Order data

Order number	Short description	Figure
	ACOPOSinverter P86 - 3-phase 380 to 480 V	
8I86T403000.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 30 kW, integrated EMC filter and brake chopper. Shield plate already integrated in the inverter.	
8I86T403700.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 37 kW, integrated EMC filter and brake chopper. Shield plate already integrated in the inverter.	
	Optional accessories	
	Additional EMC filters	
8I0FT100.200-1	ACOPOSinverter additional EMC input filter 3-phase 100 A, supply voltage: 380 to 480 V, 50/60 Hz	
	Cable and adapters	
8I0XC001.003-1	USB adapter cable, USB to Modbus, for ACOPOSinverter.	
8I0XD304.301-1	RJ45 cable, 1 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.303-1	RJ45 cable, 3 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.305-1	RJ45 cable, 5 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.310-1	RJ45 cable, 10 m, for remote use of the display for the ACOPOSinverter.	
	Fan (replacement parts requirement)	
8I0XF086.404-1	ACOPOSinverter P86 fan kit for size 4, power output class: 30 to 37 kW (40 to 50 HP)	
	Graphic display terminal	
8I0FM086.400-1	Female-to-female installation kit for ACOPOSinverter plain text display, IP43 protection	
8I0XD086.400-1	Plain text display for ACOPOSinverter P86, backlight, navigation key, IP43 protection	
	Interface modules	
8I0IFENC.400-1	ACOPOSinverter P86 encoder interface (digital), encoder type / signal: AB, SSI supply voltages: 5, 12, 24 VDC encoder type / signal: ENDAT supply voltages: 5, 12 VDC	
8I0IFENC.401-1	ACOPOSinverter P86 encoder interface (analog), encoder type / signal: SinCos supply voltages: 5, 12, 24 VDC encoder type / signal: HIPERFACE supply voltages: 12 VDC	
8I0IFENC.402-1	ACOPOSinverter P86 encoder interface, encoder type / signal: Resolver	
8I0IFENC.403-1	ACOPOSinverter P86 encoder interface (HTL), encoder type / signal: AB (push-pull) supply voltages: 12, 15, 24 VDC	
	Optional braking resistor	
8I0BR010.001-1	Braking resistor ohmic value: 10 Ω continuous braking power: 3.40 kW degree of protection (IP): IP20	
	Optional feed-through mounting kit	
8I0PT086.401-1	Pass-through mounting kit for P86 size 4, power output class: 30 to 37 kW (40 to 50 HP)	

Table 7: 8I86T403000.00-000, 8I86T403700.00-000 - Order data

3.4.2 Technical data

Order number	8I86T403000.00-000	8I86T403700.00-000
General information		
Certifications		
CE	Yes	
UKCA	Yes	
UL	cULus E225616 Power conversion equipment	
Motor power		
Specified on nameplate	30 kW (40 HP)	37 kW (50 HP)
Mains connection		
Mains input voltage	3x 380 VAC -15% to 480 VAC +10%	
Frequency	50 to 60 Hz ±5%	
Apparent power (at 480 VAC)	40.2 kVA	49.1 kVA
Max. assumed short-circuit current (Isc) (short-circuit current at connection point)	50 kA	
Inrush current	Max. 92 A	Max. 110 A
Mains current [1]		
At 380 VAC	54.8 A	67.1 A
At 480 VAC	48.3 A	59 A

Table 8: 8I86T403000.00-000, 8I86T403700.00-000 - Technical data

Order number	8I86T403000.00-000	8I86T403700.00-000
Power dissipation		
External cooling	661 W	780 W
Natural cooling	113 W	123 W
Integrated EMC filter	Yes	
Line-conducted and radiated emissions		
With integrated filter		
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	50 m	
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	100 m	
With add-on filter	8I0FT100.200-1	
With add-on filter		
Motor cable length per IEC/EN 61800-3 Cat. C1 environment 1 (public power network)	-	
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	C2 level at 4 kHz with 150 m cable	
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	C3 level at 4 kHz with 300 m cable	
Motor connection		
Nominal output current	61.5 A	74.5 A
Derating of continuous output current depending on ambient temperature		
At nominal clock frequency (4 kHz or 2.5 kHz with higher inverter power)	No derating (up to 50°C)	
Other clock frequencies	The derating curves are included in the installation instructions, which can be downloaded from www.br-automation.com.	
Derating of continuous output current depending on installation elevation		
Starting at 1000 m above sea level	1%, per 100 m	
Max. transient current for 60 s	92.3 A	111.8 A
Max. transient current for 2 s	92.3 A	111.8 A
Output frequency range	0.1 to 500 Hz	
Nominal clock frequency	4 kHz	
Clock frequency		
Min.	2 kHz	
Max.	16 kHz	
Max. motor cable length		
Shielded cable	150 m	
Non-shielded cable	300 m	
Motor control profiles		
Induction motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode 2. Voltage controlled with variable torque → Energy-saving mode, e.g. for fans and pumps Vector control with encoder: 1. Current-controlled with constant torque → Default mode Sensorless slip control: 1. With V/f characteristic curve for constant torque → Default mode 2. With V/f characteristic curve for constant torque (up to 6 f ranges) → Mode for individual special applications 3. With V/f characteristic curve for quadratically increasing torque → Energy-saving mode, e.g. for fans and pumps	
Synchronous motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode Vector control with encoder: 1. Current-controlled with constant torque → Default mode	
Main protective functions of inverter	Thermal protection against power stage overheating Protection against short circuits between motor phases, overcurrent between output phases and ground, overvoltages on the DC bus, exceeding the speed limit. Safety function for: Overvoltage and undervoltage of the mains supply, mains phase failure with 3-phase power supply	
Brake chopper		
Integrated dynamic brake transistors	Yes	
Min. resistance value (external)	10 Ω	
24 VDC power supply		
Input voltage	24 VDC (min. 20.4 VDC, max. 27 VDC)	
Current	Max. 0.8 A	
Available internal power supplies		
Output voltage 24 VDC	24 VDC (min. 20.4 VDC, max. 27 VDC)	
Output voltage 24 VDC		
Max. output current at 24 VDC	Max. 200 mA	
Output voltage 10 VDC	10.5 VDC ±5%	

Table 8: 8I86T403000.00-000, 8I86T403700.00-000 - Technical data

Order number	8I86T403000.00-000	8I86T403700.00-000
Output voltage 10 VDC		
Max. output current at 10 VDC	Max. 10 mA	
Interfaces		
POWERLINK		
Type	Type 3 [2)]	
Digital inputs		
Quantity	8	
Nominal voltage	24 VDC (max. 30 VDC)	
Input circuit	Source or sink	
Switching threshold		
Low	Source: <0.5 V Sink: >16 V	
High	Source: >11 V Sink: <10 V	
Electrical isolation		
Input - ACOPOSinverter	Yes	
Input - Input	No	
Sampling time	2 ms ±0.5 ms	
Input impedance	4.4 kΩ	
Safe input - STO (Safe Torque Off)		
Quantity	2	
Nominal voltage	24 VDC (max. 30 VDC)	
Input impedance	2.2 kΩ	
Switching threshold		
Low	<5 V	
High	>11 V	
Electrical isolation		
Input - ACOPOSinverter	Yes	
Input - Input	No	
Input circuit	Source	
Event counters		
Quantity	2	
Nominal voltage	24 VDC (max. 30 VDC)	
Input frequency	0 to 30 kHz	
Input circuit	Source	
Sampling time	5 ms ±1 ms	
Switching threshold		
Low	<0.6 V	
High	>2.5 V	
Analog inputs		
Quantity	3	
Electrical isolation		
Input - Input	No	
Input - ACOPOSinverter	Yes	
Nonlinearity	±0.15%	
Basic accuracy	±0.6% with temperature fluctuation of 60°C	
Input		
Voltage	0 to 10 VDC	
Current	AI1: 0 to 20 mA	
Resolution	12-bit	
Sampling time	1 ms ±1 ms	
Input impedance		
Voltage	31.5 kΩ	
Current	250 Ω	
Digital outputs		
Quantity	1	
Nominal voltage	24 VDC -15%/+20%	
Max. voltage	30 VDC	
Output circuit	Source or sink	
Max. current	100 mA [3)]	
Relay outputs		
Quantity	3	
Nominal voltage	30 VDC / 250 VAC	
Switching current range	Min. switching current: 5 mA at 24 VDC Max. switching current: R1: At cos φ = 1: Max. 3 A / At cos φ = 0.4: Max. 2 A R2 and R3: At cos φ = 1: Max. 5 A / At cos φ = 0.4: Max. 2 A	
Variant		
Relay 1	1 changeover contact	
Relay 2	1 normally open contact	
Relay 3	1 normally open contact	

Table 8: 8I86T403000.00-000, 8I86T403700.00-000 - Technical data

Order number	8I86T403000.00-000	8I86T403700.00-000
Electrical isolation		
Output - ACOPOSinverter	Yes	
Output - Output	No	
Response time (max.)	5 ms ±0.5 ms	
Analog outputs		
Quantity	2	
Output	0 to 10 VDC or 0 to 20 mA	
Nonlinearity	±0.2%	
Basic accuracy	±1% with temperature fluctuation of 60°C	
Electrical isolation		
Output - ACOPOSinverter	Yes	
Output - Output	No	
Max. load impedance		
Voltage	470 Ω	
Current	500 Ω	
Sampling time	5 ms ±1 ms	
Resolution	10-bit	
Electrical properties		
Energy efficiency (IE classification)		
Efficiency data	IE (10, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (50, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (10, 50): 0.8% (3x 380 VAC), 0.7% (3x 480 VAC) IE (50, 50): 0.8% (3x 380 VAC), 0.7% (3x 480 VAC) IE (90, 50): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (10, 100): 1.5% (3x 380 VAC), 1.3% (3x 480 VAC) IE (50, 100): 1.5% (3x 380 VAC), 1.2% (3x 480 VAC) IE (90, 100): 1.8% (3x 380 VAC), 1.4% (3x 480 VAC)	IE (10, 25): 0.6% (3x 380 VAC), 0.5% (3x 480 VAC) IE (50, 25): 0.5% (3x 380 VAC), 0.4% (3x 480 VAC) IE (10, 50): 0.8% (3x 380 VAC), 0.7% (3x 480 VAC) IE (50, 50): 0.8% (3x 380 VAC), 0.6% (3x 480 VAC) IE (90, 50): 0.9% (3x 380 VAC), 0.7% (3x 480 VAC) IE (10, 100): 1.4% (3x 380 VAC), 1.2% (3x 480 VAC) IE (50, 100): 1.4% (3x 380 VAC), 1.2% (3x 480 VAC) IE (90, 100): 1.7% (3x 380 VAC), 1.4% (3x 480 VAC)
Nominal losses in standby mode	31 W (3x 380 VAC), 33 W (3x 480 VAC)	
Operating conditions		
Degree of protection per EN 61800-5-1	IP20	
Degree of protection per EN 60529	IP20	
Relative humidity per IEC 60068-2-3	5 to 95%, non-condensing	
Maximum installation elevation	≤1000 m without derating 1000 to 4800 m with Derating	
Max. pollution degree per IEC/EN 61800-5-1	2 (non-conductive pollution)	
Ambient conditions per IEC 60721-3-3	Class 3C3 and 3S3	
Operating position	Vertical mounting orientation ±10°	
Ambient conditions		
Temperature		
Operation	-15 to 50°C without derating 50 to 60°C with derating	
Storage	-40 to 70°C	
Max. vibration resistance	1 g_n 13 to 200 Hz EN/IEC 60068-2-6 1.5 mm peak to peak 2 to 13 Hz EN/IEC 60068-2-6	
Max. shock resistance	15 g_n (duration = 11 ms) per EN/IEC 60721-3-3 class 3M3	
Mechanical properties		
Dimensions		
Width	213 mm	
Height	660 mm	
Depth	262 mm	
Weight	27.9 kg	28.4 kg

Table 8: 8I86T403000.00-000, 8I86T403700.00-000 - Technical data

1) Additional restrictions result from parameter SVL.
2) For additional information, see section "Communication / POWERLINK / General information / Hardware - CN" in Automation Help.
3) Programmable as event counter: 20 mA.

3.5 8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000

3.5.1 Order data

Order number	Short description	Figure
	ACOPOSinverter P86 - 3-phase 380 to 480 V	
8I86T404500.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 45 kW, integrated EMC filter and brake chopper. Shield plate already integrated in the inverter.	
8I86T405500.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 55 kW, integrated EMC filter and brake chopper. Shield plate already integrated in the inverter.	
8I86T407500.00-000	Base device for ACOPOSinverter P86, 3x 380 to 480 V, 75 kW, integrated EMC filter and brake chopper. Shield plate already integrated in the inverter.	
	Optional accessories	
	Additional EMC filters	
8I0FT160.200-1	ACOPOSinverter additional EMC input filter 3-phase 160 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT200.200-1	ACOPOSinverter EMC additional EMC input filter 3-phase 200 A, supply voltage: 380 to 480 V, 50/60 Hz	
	Cable and adapters	
8I0XC001.003-1	USB adapter cable, USB to Modbus, for ACOPOSinverter.	
8I0XD304.301-1	RJ45 cable, 1 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.303-1	RJ45 cable, 3 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.305-1	RJ45 cable, 5 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.310-1	RJ45 cable, 10 m, for remote use of the display for the ACOPOSinverter.	
	Fan (replacement parts requirement)	
8I0XF086.405-1	ACOPOSinverter P86 fan kit for size 5, power output class: 45 to 75 kW (60 to 100 HP)	
	Graphic display terminal	
8I0FM086.400-1	Female-to-female installation kit for ACOPOSinverter plain text display, IP43 protection	
8I0XD086.400-1	Plain text display for ACOPOSinverter P86, backlight, navigation key, IP43 protection	
	Interface modules	
8I0IFENC.400-1	ACOPOSinverter P86 encoder interface (digital), encoder type / signal: AB, SSI supply voltages: 5, 12, 24 VDC encoder type / signal: ENDAT supply voltages: 5, 12 VDC	
8I0IFENC.401-1	ACOPOSinverter P86 encoder interface (analog), encoder type / signal: SinCos supply voltages: 5, 12, 24 VDC encoder type / signal: HIPERFACE supply voltages: 12 VDC	
8I0IFENC.402-1	ACOPOSinverter P86 encoder interface, encoder type / signal: Resolver	
8I0IFENC.403-1	ACOPOSinverter P86 encoder interface (HTL), encoder type / signal: AB (push-pull) supply voltages: 12, 15, 24 VDC	
	Optional braking resistor	
8I0BR005.001-1	Braking resistor ohmic value: 5 Ω continuous braking power: 6.90 kW degree of protection (IP): IP23	
8I0BR008.002-1	Braking resistor ohmic value: 8 Ω continuous braking power: 3.80 kW degree of protection (IP): IP20	
	Optional feed-through mounting kit	
8I0PT086.402-1	Pass-through mounting kit for P86 size 5, power output class: 45 to 75 kW (60 to 100 HP)	

Table 9: 8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000 - Order data

3.5.2 Technical data

Order number	8I86T404500.00-000	8I86T405500.00-000	8I86T407500.00-000
General information			
Certifications			
CE	Yes		
UKCA	Yes		
UL	cULus E225616 Power conversion equipment		
Motor power			
Specified on nameplate	45 kW (60 HP)	55 kW (75 HP)	75 kW (100 HP)
Mains connection			
Mains input voltage	3x 380 VAC -15% to 480 VAC +10%		
Frequency	50 to 60 Hz ±5%		
Apparent power (at 480 VAC)	59.7 kVA	72.2 kVA	98.2 kVA

Table 10: 8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000 - Technical data

Order number	8I86T404500.00-000	8I86T405500.00-000	8I86T407500.00-000
Max. assumed short-circuit current (Isc) (short-circuit current at connection point)	50 kA		
Inrush current	Max. 176 A	Max. 187 A	Max. 236 A
Mains current [1]			
At 380 VAC	81.4 A	98.9 A	134.3 A
At 480 VAC	71.8 A	86.9 A	118.1 A
Power dissipation			
External cooling	776 W	987 W	1364 W
Natural cooling	143 W	156 W	185 W
Integrated EMC filter	Yes		
Line-conducted and radiated emissions			
With integrated filter			
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	-		
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	100 m		
With add-on filter	8I0FT160.200-1	8I0FT200.200-1	
With add-on filter			
Motor cable length per IEC/EN 61800-3 Cat. C1 environment 1 (public power network)	-		
Motor cable length per IEC/EN 61800-3 Cat. C2 environment 1 (public power network)	C2 level at 4 kHz with 150 m cable		
Motor cable length per IEC/EN 61800-3 Cat. C3 environment 2 (industrial power system)	C3 level at 4 kHz with 300 m cable		
Motor connection			
Nominal output current	88 A	106 A	145 A
Derating of continuous output current depending on ambient temperature			
At nominal clock frequency (4 kHz or 2.5 kHz with higher inverter power)	No derating		No derating (up to 45°C)
Other clock frequencies	The derating curves are included in the installation instructions, which can be downloaded from www.br-automation.com.		
Derating of continuous output current depending on installation elevation			
Starting at 1000 m above sea level	1%, per 100 m		
Max. transient current for 60 s	132 A	159 A	217.5 A
Max. transient current for 2 s	132 A	-	217.5 A
Output frequency range	0.1 to 500 Hz		
Nominal clock frequency	2.5 kHz		
Clock frequency			
Min.	2 kHz		
Max.	8 kHz		
Max. motor cable length			
Shielded cable	150 m		
Non-shielded cable	300 m		
Motor control profiles			
Induction motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode 2. Voltage controlled with variable torque → Energy-saving mode, e.g. for fans and pumps Vector control with encoder: 1. Current-controlled with constant torque → Default mode Sensorless slip control: 1. With V/f characteristic curve for constant torque → Default mode 2. With V/f characteristic curve for constant torque (up to 6 f ranges) → Mode for individual special applications 3. With V/f characteristic curve for quadratically increasing torque → Energy-saving mode, e.g. for fans and pumps		
Synchronous motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode Vector control with encoder: 1. Current-controlled with constant torque → Default mode		
Main protective functions of inverter	Thermal protection against power stage overheating Protection against short circuits between motor phases, overcurrent between output phases and ground, overvoltages on the DC bus, exceeding the speed limit. Safety function for: Overvoltage and undervoltage of the mains supply, mains phase failure with 3-phase power supply		
Brake chopper			
Integrated dynamic brake transistors	Yes		
Min. resistance value (external)	2.5 Ω		
24 VDC power supply			
Input voltage	24 VDC (min. 20.4 VDC, max. 27 VDC)		
Current	Max. 0.8 A		

Table 10: 8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000 - Technical data

Order number	8I86T404500.00-000	8I86T405500.00-000	8I86T407500.00-000
Available internal power supplies			
Output voltage 24 VDC	24 VDC (min. 20.4 VDC, max. 27 VDC)		
Output voltage 24 VDC			
Max. output current at 24 VDC	Max. 200 mA		
Output voltage 10 VDC	10.5 VDC ±5%		
Output voltage 10 VDC			
Max. output current at 10 VDC	Max. 10 mA		
Interfaces			
POWERLINK			
Type	Type 3 [2)]		
Digital inputs			
Quantity	8		
Nominal voltage	24 VDC (max. 30 VDC)		
Input circuit	Source or sink		
Switching threshold			
Low	Source: <0.5 V Sink: >16 V		
High	Source: >11 V Sink: <10 V		
Electrical isolation			
Input - ACOPOSinverter	Yes		
Input - Input	No		
Sampling time	2 ms ±0.5 ms		
Input impedance	4.4 kΩ		
Safe input - STO (Safe Torque Off)			
Quantity	2		
Nominal voltage	24 VDC (max. 30 VDC)		
Input impedance	2.2 kΩ		
Switching threshold			
Low	<5 V		
High	>11 V		
Electrical isolation			
Input - ACOPOSinverter	Yes		
Input - Input	No		
Input circuit	Source		
Event counters			
Quantity	2		
Nominal voltage	24 VDC (max. 30 VDC)		
Input frequency	0 to 30 kHz		
Input circuit	Source		
Sampling time	5 ms ±1 ms		
Switching threshold			
Low	<0.6 V		
High	>2.5 V		
Analog inputs			
Quantity	3		
Electrical isolation			
Input - Input	No		
Input - ACOPOSinverter	Yes		
Nonlinearity	±0.15%		
Basic accuracy	±0.6% with temperature fluctuation of 60°C		
Input			
Voltage	0 to 10 VDC		
Current	AI1: 0 to 20 mA		
Resolution	12-bit		
Sampling time	1 ms ±1 ms		
Input impedance			
Voltage	31.5 kΩ		
Current	250 Ω		
Digital outputs			
Quantity	1		
Nominal voltage	24 VDC -15%/+20%		
Max. voltage	30 VDC		
Output circuit	Source or sink		
Max. current	100 mA [3)]		
Relay outputs			
Quantity	3		
Nominal voltage	30 VDC / 250 VAC		
Switching current range	Min. switching current: 5 mA at 24 VDC Max. switching current: R1: At cos φ = 1: Max. 3 A / At cos φ = 0.4: Max. 2 A R2 and R3: At cos φ = 1: Max. 5 A / At cos φ = 0.4: Max. 2 A		

Table 10: 8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000 - Technical data

Order number	8I86T404500.00-000	8I86T405500.00-000	8I86T407500.00-000
Variant			
Relay 1	1 changeover contact		
Relay 2	1 normally open contact		
Relay 3	1 normally open contact		
Electrical isolation			
Output - ACOPOSinverter	Yes		
Output - Output	No		
Response time (max.)	5 ms ±0.5 ms		
Analog outputs			
Quantity	2		
Output	0 to 10 VDC or 0 to 20 mA		
Nonlinearity	±0.2%		
Basic accuracy	±1% with temperature fluctuation of 60°C		
Electrical isolation			
Output - ACOPOSinverter	Yes		
Output - Output	No		
Max. load impedance			
Voltage	470 Ω		
Current	500 Ω		
Sampling time	5 ms ±1 ms		
Resolution	10-bit		
Electrical properties			
Energy efficiency (IE classification)			
Efficiency data	IE (10, 25): 0.5% (3x 380 VAC), 0.4% (3x 480 VAC) IE (50, 25): 0.5% (3x 380 VAC), 0.4% (3x 480 VAC) IE (10, 50): 0.7% (3x 380 VAC), 0.6% (3x 480 VAC) IE (50, 50): 0.7% (3x 380 VAC), 0.6% (3x 480 VAC) IE (90, 50): 0.8% (3x 380 VAC), 0.6% (3x 480 VAC) IE (10, 100): 1.3% (3x 380 VAC), 1.1% (3x 480 VAC) IE (50, 100): 1.3% (3x 380 VAC), 1% (3x 480 VAC) IE (90, 100): 1.5% (3x 380 VAC), 1.2% (3x 480 VAC)	IE (10, 25): 0.5% (3x 380 VAC), 0.4% (3x 480 VAC) IE (50, 25): 0.5% (3x 380 VAC), 0.4% (3x 480 VAC) IE (10, 50): 0.7% (3x 380 VAC), 0.6% (3x 480 VAC) IE (50, 50): 0.7% (3x 380 VAC), 0.6% (3x 480 VAC) IE (90, 50): 0.8% (3x 380 VAC), 0.6% (3x 480 VAC) IE (10, 100): 1.4% (3x 380 VAC), 1.1% (3x 480 VAC) IE (50, 100): 1.3% (3x 380 VAC), 1.1% (3x 480 VAC) IE (90, 100): 1.6% (3x 380 VAC), 1.2% (3x 480 VAC)	IE (10, 25): 0.5% (3x 380 VAC), 0.4% (3x 480 VAC) IE (50, 25): 0.4% (3x 380 VAC), 0.4% (3x 480 VAC) IE (10, 50): 0.7% (3x 380 VAC), 0.6% (3x 480 VAC) IE (50, 50): 0.7% (3x 380 VAC), 0.5% (3x 480 VAC) IE (90, 50): 0.8% (3x 380 VAC), 0.6% (3x 480 VAC) IE (10, 100): 1.3% (3x 380 VAC), 1.1% (3x 480 VAC) IE (50, 100): 1.3% (3x 380 VAC), 1.1% (3x 480 VAC) IE (90, 100): 1.6% (3x 380 VAC), 1.2% (3x 480 VAC)
Nominal losses in standby mode	32 W		
Operating conditions			
Degree of protection per EN 61800-5-1	IP20		
Degree of protection per EN 60529	IP20		
Relative humidity per IEC 60068-2-3	5 to 95%, non-condensing		
Maximum installation elevation	≤1000 m without derating 1000 to 4800 m with Derating		
Max. pollution degree per IEC/EN 61800-5-1	2 (non-conductive pollution)		
Ambient conditions per IEC 60721-3-3	Class 3C3 and 3S3		
Operating position	Vertical mounting orientation ±10°		
Ambient conditions			
Temperature			
Operation	-15 to 50°C without derating 50 to 60°C with derating		
Storage	-40 to 70°C		
Max. vibration resistance	1 g_n 13 to 200 Hz EN/IEC 60068-2-6 1.5 mm peak to peak 2 to 13 Hz EN/IEC 60068-2-6		
Max. shock resistance	15 g_n (duration = 11 ms) per EN/IEC 60721-3-3 class 3M3		
Mechanical properties			
Dimensions			
Width	271 mm		
Height	908 mm		
Depth	309 mm		
Weight	56.4 kg	57.9 kg	58.4 kg

Table 10: 8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000 - Technical data

1) Additional restrictions result from parameter SVL.
2) For additional information, see section "Communication / POWERLINK / General information / Hardware - CN" in Automation Help.
3) Programmable as event counter: 20 mA.

4 Installation

4.1 Testing for absence of voltage

The voltage level of the DC bus is calculated by measuring the voltage between DC bus terminals PA/+ and PC/-. The mounting orientation of the DC bus terminals is determined by the inverter model. Use the nameplate to determine your inverter's specific model. For more information, see section "Wiring the power unit" on page 78.

Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

- **Only suitably trained and authorized personnel who are familiar with the content of this manual as well as the overall product documentation are permitted to work with or near this drive system. Such personnel must also have successfully completed safety training on how to identify and prevent the various hazards involved. Installation, setup, repair and servicing must be performed by qualified personnel.**
- **The system integrator is responsible for ensuring compliance with all relevant local and national electrical engineering requirements as well as with any other applicable regulations relating to the protective grounding of all devices.**
- **Many product components, including the printed circuits, are powered via the mains voltage. Do not touch!**
- **Only use electrically insulated tools and ensure that measuring instruments are used with the correct rated voltage.**
- **Once powered on, do not touch any unshielded components or terminals.**
- **Motors can generate voltage when the shaft rotates. Before working on the drive system, make sure that the motor shaft is not driven by an external source.**
- **If there is a change in voltage, the voltage applied to unused conductors in the motor cable may become disconnected. Any motor cable conductors that are not used must be insulated at either end.**
- **Do not short-circuit the DC bus terminals, the DC bus capacitors or the braking resistor terminals.**
- **Before performing any work on the drive system, proceed as follows:**
    - **Disconnect all power supplies, including the external power supply to the control unit, if applicable.**
    - **Affix a "DO NOT SWITCH ON" sign to all circuit breakers connected to the inverter system.**
    - **Lock all circuit breakers in the open position.**
    - **Wait 15 minutes to allow the DC bus capacitors to discharge.**
    - **Follow the instructions under "Testing for absence of voltage".**
- **Before switching on the power supply to the inverter system, proceed as follows:**
    - **Make sure that all work is complete and that no hazards have been created as a result of the installation.**
    - **If the mains input terminals and motor output terminals are grounded and short-circuited, remove the grounding and short circuits from the main input terminals and motor output terminals.**
    - **Make sure that the entire device is grounded correctly.**
    - **Make sure that all protective equipment such as covers, doors and grids are installed and closed.**

Failure to follow these instructions will result in death or serious injury.

Procedure

To test for the absence of voltage, proceed as follows:

1) Measure the voltage on the DC bus between the DC bus terminals (PA/+, PC/-) to ensure that the voltage is less than 42 VDC. You can do this using a voltmeter with the correct rated voltage.
2) If the DC bus capacitors do not discharge correctly, contact your local B&R representative.
   In this case, it is not permitted to repair or start up the product.
3) Make sure that there is no other voltage present in the inverter system.

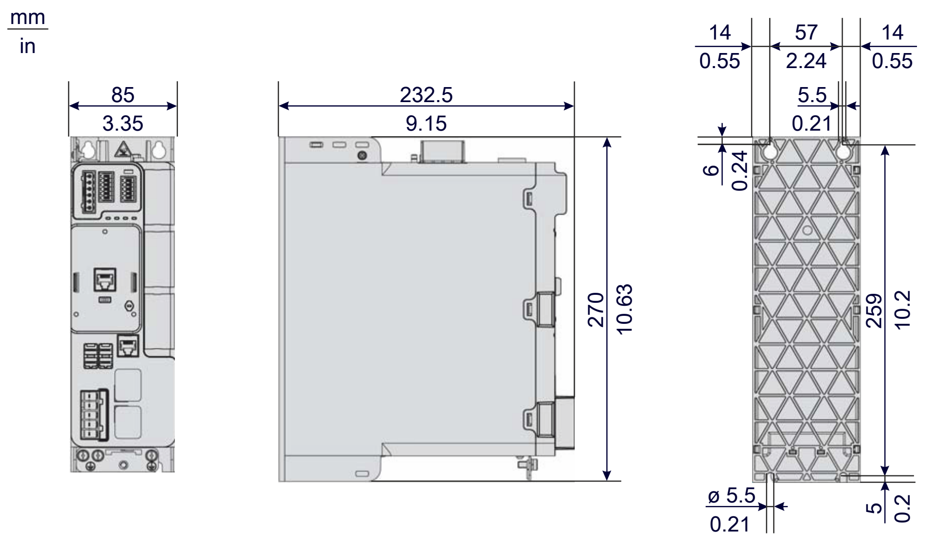
4.2 Mechanical data

Note:

The following dimensions do not include the following:

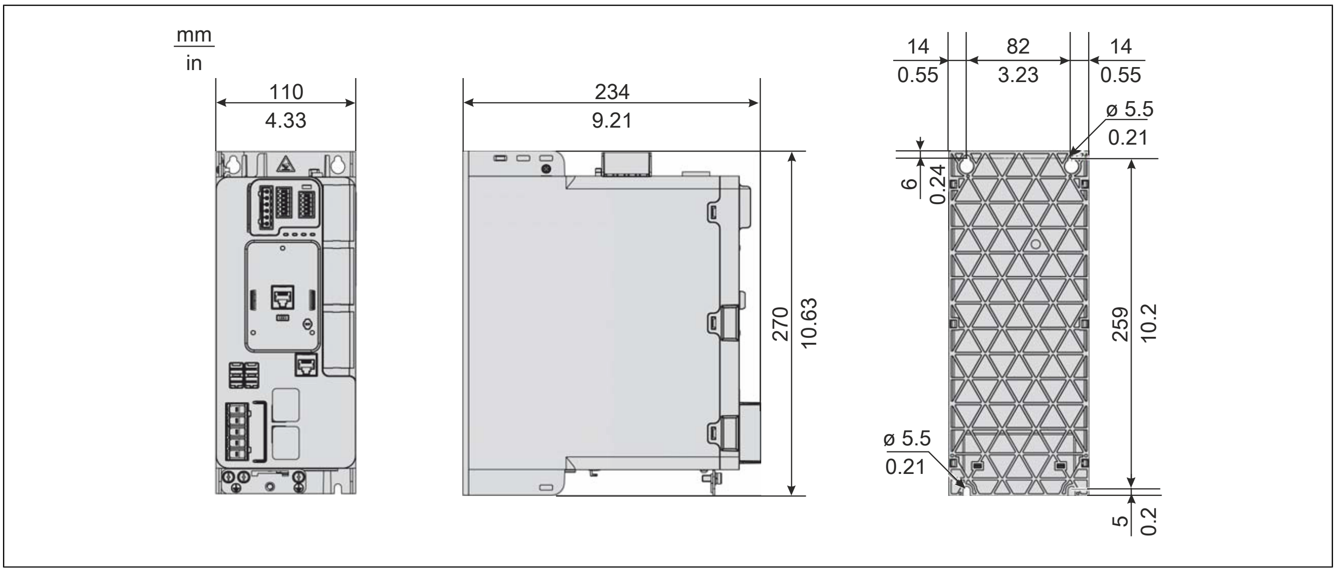
- **An increase in depth when using the optional text terminal.**
- **For sizes 1, 2 and 3: Spacing of 50 mm (2 in.) for proper wiring of the front controller.**
- **For sizes 4 and 5: An increase in depth of 40 mm (1.6 in.) when using the additional slot option. This optional module is placed between the graphics terminal and inverter, which requires increased depth. It makes it possible to connect a safety output module.**

Size 1 - Dimensions and weight



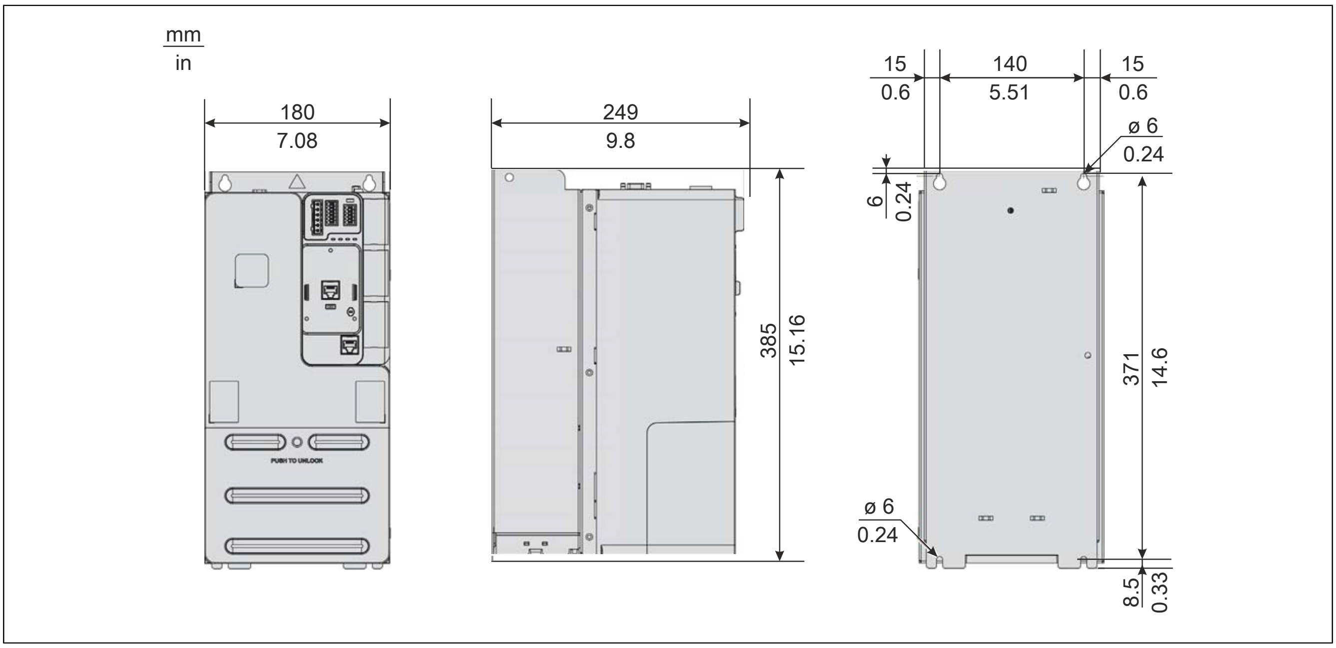
Material number	Weight (kg)	Weight (lb)
8I86T400075.00-000, 8I86T400150.00-000	1.7	3.7
8I86T400220.00-000	1.8	4
8I86T400300.00-000	2.2	4.8
8I86T400400.00-000	2.3	5.1

Size 2 - Dimensions and weight



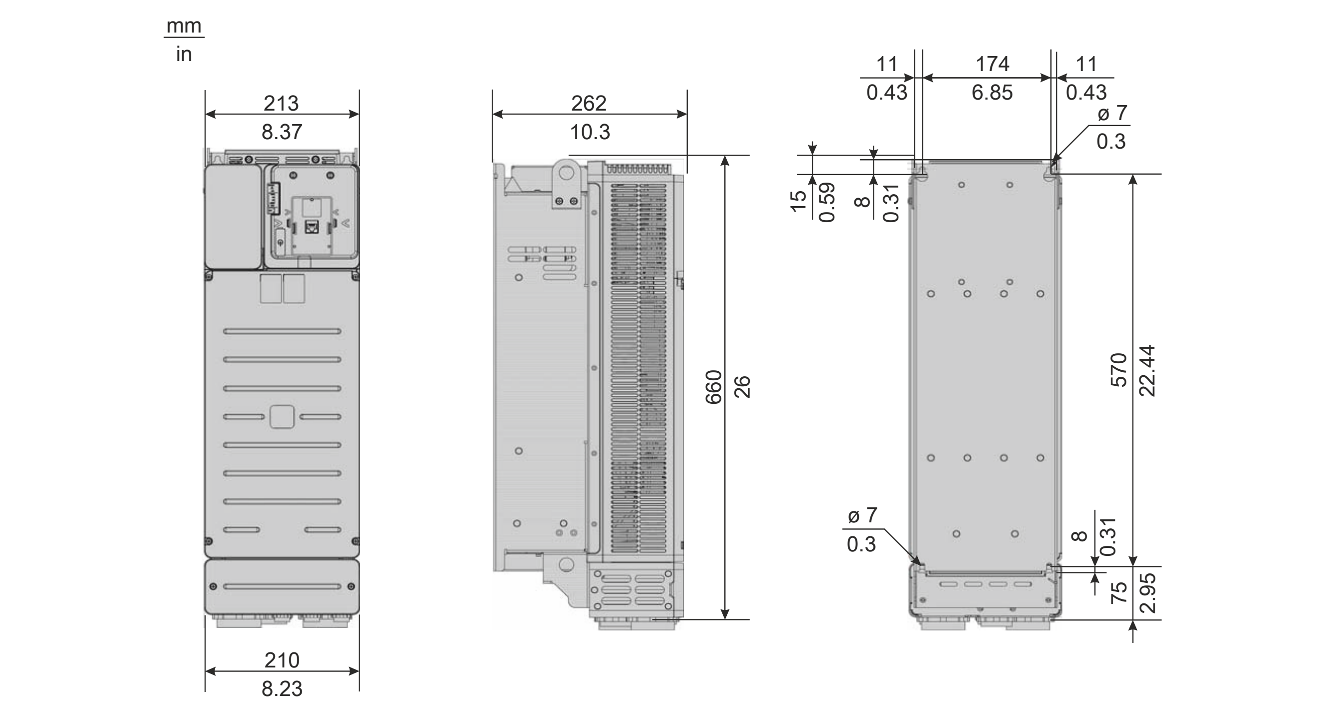
Material number	Weight (kg)	Weight (lb)
8I86T400550.00-000	2.9	6.4
8I86T400750.00-000	3	6.6

Size 3 - Dimensions and weight



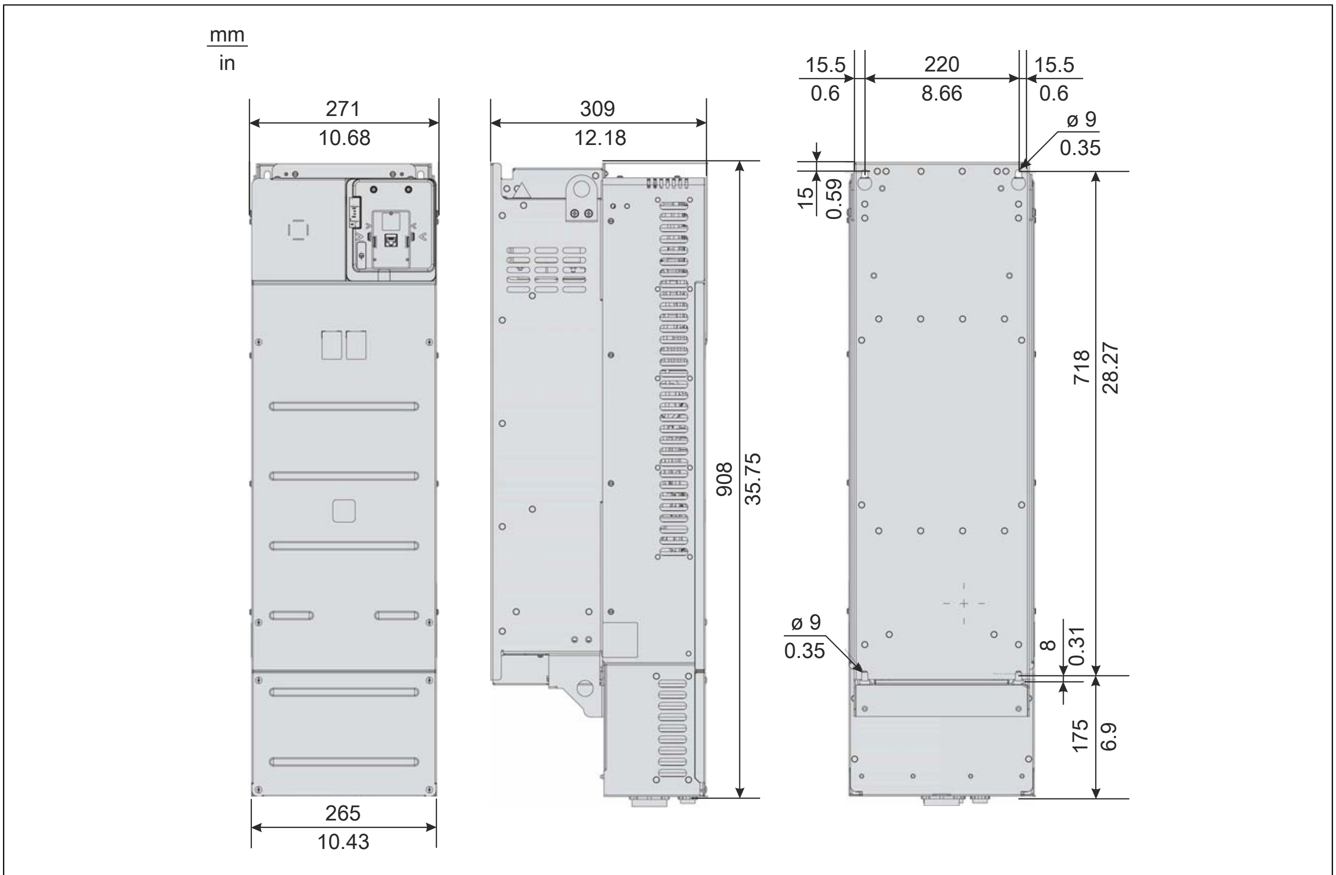
Material number	Weight (kg)	Weight (lb)
8I86T401100.00-000, 8I86T401500.00-000	9.5	20.9
8I86T401850.00-000, 8I86T402200.00-000	10.2	22.5

Size 4 - Dimensions and weight



Material number	Weight (kg)	Weight (lb)
8I86T403000.00-000	27.9	61.5
8I86T403700.00-000	28.4	62.6

Size 5 - Dimensions and weight



Material number	Weight (kg)	Weight (lb)
8I86T404500.00-000	56.4	124.3
8I86T405500.00-000	57.9	127.6
8I86T407500.00-000	58.4	128.7

4.3 Installing the frequency inverter

4.3.1 Procedure for commissioning the inverter

Procedure

1) Take delivery of the inverter and perform an inspection:
   - Make sure that the catalog number indicated on the label matches the model number.
   - Remove the inverter from the packaging and inspect it for damage.
2) Check the mains power supply:
   - Make sure that the mains power supply is compatible with the supply voltage for the inverter power unit.
3) Install the inverter:
   - Install the inverter in accordance with the instructions provided in this document.
   - Mount the inverter(s), and if applicable, all internal and external options.
4) Wire the inverter.
   - Connect the motor and make sure that the connections match the voltage.
   - Make sure that the voltage is switched off, and then connect to the mains power supply.
   - Connect the controller.
5) Programming

Steps 1 to 4 must be carried out with the voltage switched off.

4.3.2 Getting started

Transport and storage

Warning!

HAZARDS DURING TRANSPORTATION

- **The transportation of damaged packaging is not permitted.**
- **The packed product must be transported carefully and the packaging opened carefully.**

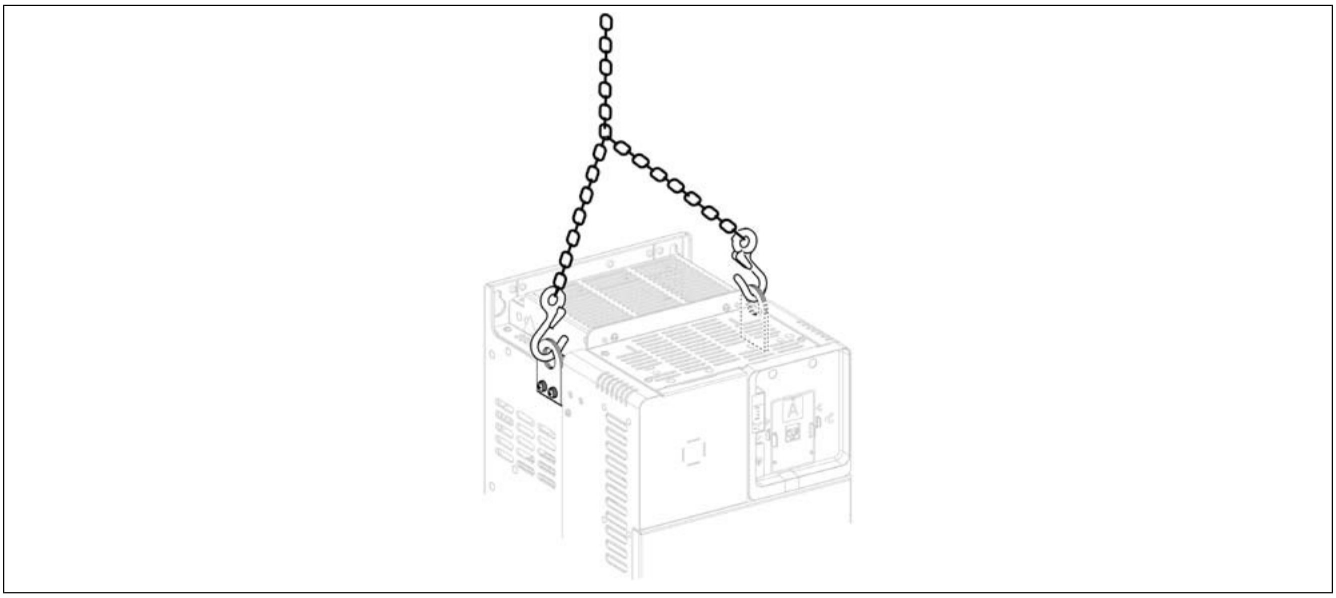
Failure to follow these instructions can result in death, serious injury or damage to property.

To protect the device, make sure that it is transported and stored in its own packaging before installation.
Make sure that environmental conditions are suitable.

Transporting the inverter

Size 1, 2 and 3 inverters can be removed from the packaging and installed without a lifting device.

A lifting device is required for sizes 4 and 5. For this purpose, these inverters are equipped with lifting eyes.



Inspecting the inverter after delivery

Damaged products and accessories can cause electric shocks or the equipment to operate in unexpected ways.

Danger!

ELECTRIC SHOCK OR UNEXPECTED OPERATION OF THE EQUIPMENT

Use of damaged products or accessories is not permitted.

Failure to follow these instructions will result in death or serious injury.

In the event of damage, contact your local B&R sales representative.

1) Remove the inverter from the packaging and inspect it for damage.
2) Make sure that the catalog number on the nameplate matches the model number.

4.3.3 Forming DC bus capacitors

Electrolytic capacitors are installed in B&R servo drives, inverter modules, stepper motor modules and power supplies. In these cases, the oxide layer that acts as a dielectric can become weakened by electrochemical processes when stored for a lengthy period with the power is switched off. In the worst case, this can cause a short circuit and subsequent destruction of the capacitor and irreparable damage to B&R modules.

When stored for periods over 1 year, the electrolytic capacitors may be destroyed during commissioning if not preconditioned. If preconditioning takes place using a forming process defined for B&R modules, then proper operation can be guaranteed. Forming is performed by applying a defined voltage over a defined period of time. This reforms the oxide layer to ensure the functionality of the electrolytic capacitors.

Caution!

DC bus capacitors can become damaged or destroyed when switching on at the nominal voltage after being stored for periods over 1 year.

Forming B&R modules stored over a long period of time before commissioning avoids damage to the capacitors.

4.3.3.1 Forming specifications for DC bus capacitors

Procedure for modules stored for a long period of time

If modules are not supplied with nominal voltage for a longer period of time, the DC bus capacitors must be formed as follows.

The nominal voltage is the voltage permitted at the mains connections on the respective module.

Power is only supplied to the module; the output stage or controller is NOT permitted to be switched on during this!

Storage time up to 1 year: → No action required

Storage time 1 to 2 years: → Supply the module with nominal voltage 1 hour before commissioning.

Storage time 2 to 3 years: Supply the module with an adjustable power supply and increase the voltage in steps. Observe the following sequence:

1. Supply with 25% of the nominal voltage for 30 minutes.
2. Supply with 50% of the nominal voltage for 30 minutes.
3. Supply with 75% of the nominal voltage for 30 minutes.
4. Supply with 100% of the nominal voltage for 30 minutes.

Total forming time: >2 hours
The module is now ready for operation.

Storage time 3 or more years: Supply the module with an adjustable power supply and increase the voltage in steps. Observe the following sequence:

1. Supply with 25% of the nominal voltage for 2 hours.
2. Supply with 50% of the nominal voltage for 2 hours.
3. Supply with 75% of the nominal voltage for 2 hours.
4. Supply with 100% of the nominal voltage for 2 hours.

Total forming time: >8 hours
The module is now ready for operation.

Information:

B&R recommends forming at nominal voltage for 1 hour once a year.

B&R modules that have been stored for more than 5 years without forming should no longer be put into operation.
The storage period is valid from the time of delivery by B&R.

4.3.4 Installation conditions

Preparatory actions

Conductive foreign bodies, dust and faulty parts can cause parasitic voltage.

Danger!

ELECTRIC SHOCK CAUSED BY FOREIGN BODIES OR DAMAGE

- **Use of damaged products is not permitted.**
- **Foreign objects such as small parts, screws or wire ends are not permitted to enter the product.**
- **To prevent sedimentation and the entry of moisture, check that all gaskets and cable grommets are positioned correctly.**

Failure to follow these instructions will result in death or serious injury.

During operating, the products described in these instructions can reach temperatures above 80°C.

Warning!

HOT SURFACES

- **Avoid all contact with hot surfaces.**
- **Keep flammable or heat-sensitive parts away from the immediate vicinity of hot surfaces.**
- **Before handling the product, ensure that it has cooled down sufficiently.**
- **Ensure that there is sufficient heat dissipation by performing a test run at maximum load.**

Failure to follow these instructions can result in serious bodily injury and even death or damage to the material.

Electrical power drives can generate strong local electrical and magnetic fields. This can cause interference for electromagnetically sensitive devices.

Warning!

ELECTROMAGNETIC FIELDS

- **Make sure that anyone with an electronic medical implant, such as a pacemaker, keeps a safe distance from the inverter.**
- **Do not set up any electromagnetically sensitive devices in the vicinity of the inverter.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Affix a label containing safety instructions

The inverter is shipped with a set of labels. As standard, the English label is attached to the inverter.

1) The safety regulations of the destination country must be observed.
2) Select the relevant label for the destination country.
3) Affix the label onto the front of the device in a prominent position. See the example below.

Default web server password

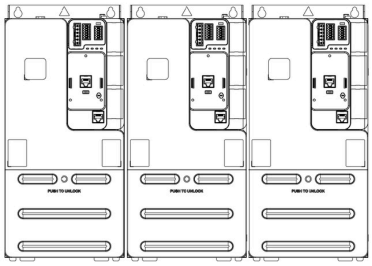
If the nameplate is not visible after the inverter is installed, write down or photograph the default web server password.

4.3.4.1 Mounting types

The following section lists the possible mounting types and resulting degree of protection.

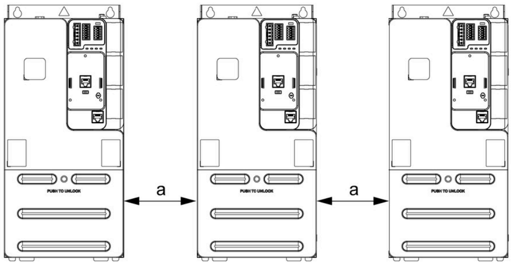
Mounting type 1 - Side by side IP20

Sizes 1 and 2, at ambient temperature ≤50°C (122°F)
Size 3 at ambient temperature ≤40°C (104°F)
Sizes 4 and 5: Only two inverters



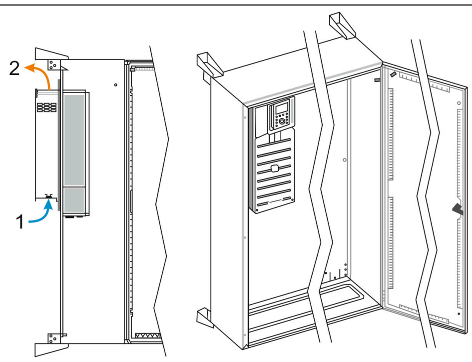
Mounting type 2 - Single installation IP20

Sizes 1 and 2: ≤50°C (122°F): No limitation for spacing a
Sizes 1 and 2: 50 to 60°C (122 to 140°F): a ≥ 50 mm (2 in.)
Size 3: ≤40°C (104°F): No limitation for spacing a
Size 3: 40 to 60°C (104 to 140°F): a ≥ 50 mm (2 in.)
Sizes 4 and 5: a ≥ 110 mm (4.33 in.)

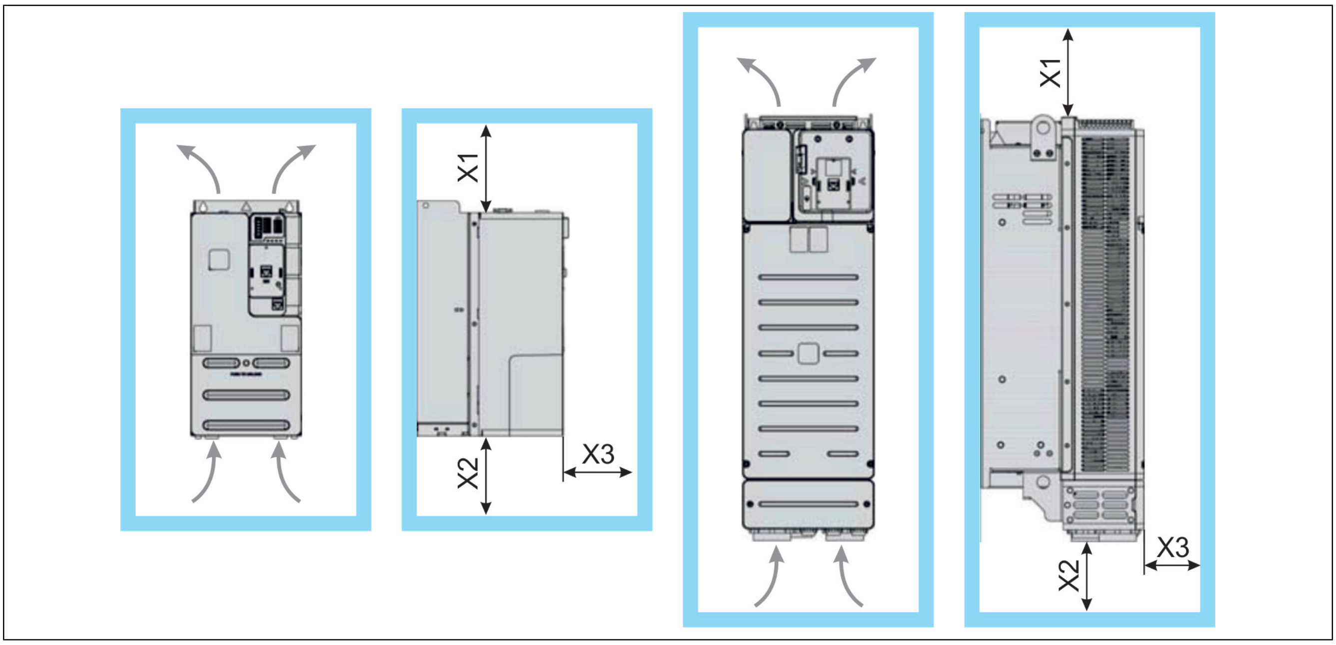


Mounting type 3 - Including kit for flush mounting for sizes 3, 4 and 5

(1) Air inlet
(2) Air outlet
This mounting type requires a special installation kit, which is available at www.br-automation.com.



4.3.4.2 Spacing and installation position in the control cabinet



Size	X1	X2	X3
1, 2 and 3	≥100 mm (4.33 in.)1)	≥100 mm (4.33 in.)1)	≥60 mm (2.4 in.)2)
4 and 5	≥100 mm (4.33 in.)	≥100 mm (4.33 in.)	≥10 mm (0.4 in.)3)

1) Size 1, 2 and 3 inverters can be equipped with optional EMC kits. These kits may require more clearance at or above or below the control cabinet.
2) Size 1, 2 and 3 inverters use front wiring and make it possible to connect a text terminal.
3) Add 33 mm (1.3 in.) when using optional add-on module rack 8I0IFFSM.401-1 for slot C. Add 47 mm (1.85 in.) when using this option with the graphic display terminal.

General installation instructions

- Install the inverter in a control cabinet or plant room. Wall mounting is not possible.
- Install size 1 and 2 inverters on a grounded backplane to improve EMC.
- Install the inverter in a vertical position. This is necessary for cooling the inverter.
- Secure the device to the mounting surface using the screws and swivel disks in accordance with the standards.
- Flat washers should be used for all mounting screws.
- Tighten the mounting screws.
- Do not install the device near heat sources.
- Avoid environmental influences such as high temperatures and high humidity as well as dust, dirt and aggressive gases.
- Comply with the minimum spacing prescribed for the installation to ensure the required cooling.
- Do not install the device on flammable equipment.
- Install the inverter on a solid, vibration-free floor.
- Use backplanes or existing EMC kits for the entire wiring to avoid tensile stress on the connectors.
- For sizes 1, 2 and 3, use only the connectors supplied with the product for wiring. Connector kits are also available at www.br-automation.com.

4.3.4.3 Constant power losses

Note:

If no interface is used, the power losses associated with it are not permitted to be taken into account.

Device	Connection	Power losses in W
Operator terminal	HMI	1.5
Analog inputs and outputs	CN6	1.5
Module slot A/GP-FB	-	3
Module slot B/GP-ENC	-	3
Module slot C/GP-SF	-	1
Digital inputs	CN6	1
200 mA output	CN2	4.8
Sum:		15.8

4.3.5 Derating characteristic curve

Characteristic curves for the nominal current of the inverter (In) as a function of the temperature and switching frequency.

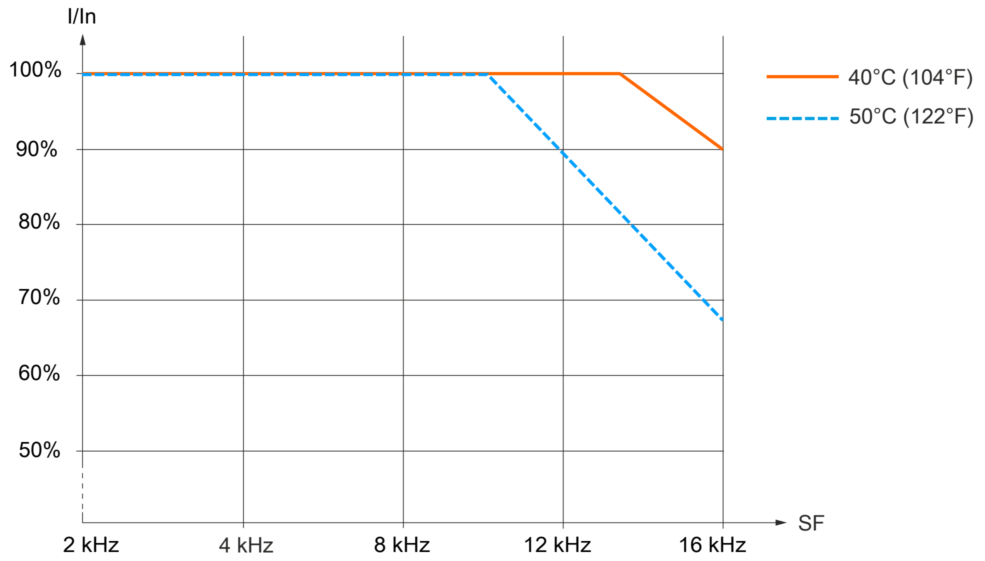
8I86T400075.00-000

No declassification required.

> **Note:**
>
> **For operation at 60°C:**
>
> - **Mounting type 2 required**
> - **No text terminal connected**

8I86T400150.00-000

For mounting type 1:

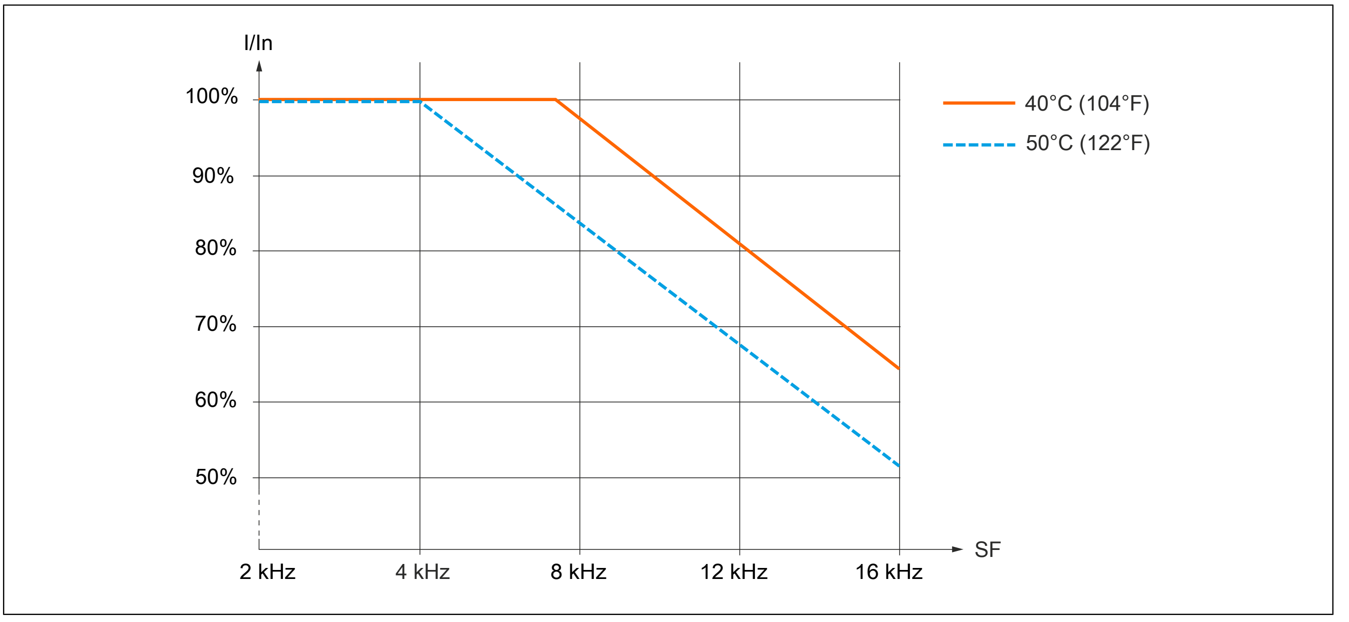


During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

> **Note:**
>
> **For operation at 60°C:**
>
> - **Mounting type 2 required**
> - **No text terminal connected**
> - **No reduction of current required**

8I86T400220.00-000

For mounting type 1:



During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

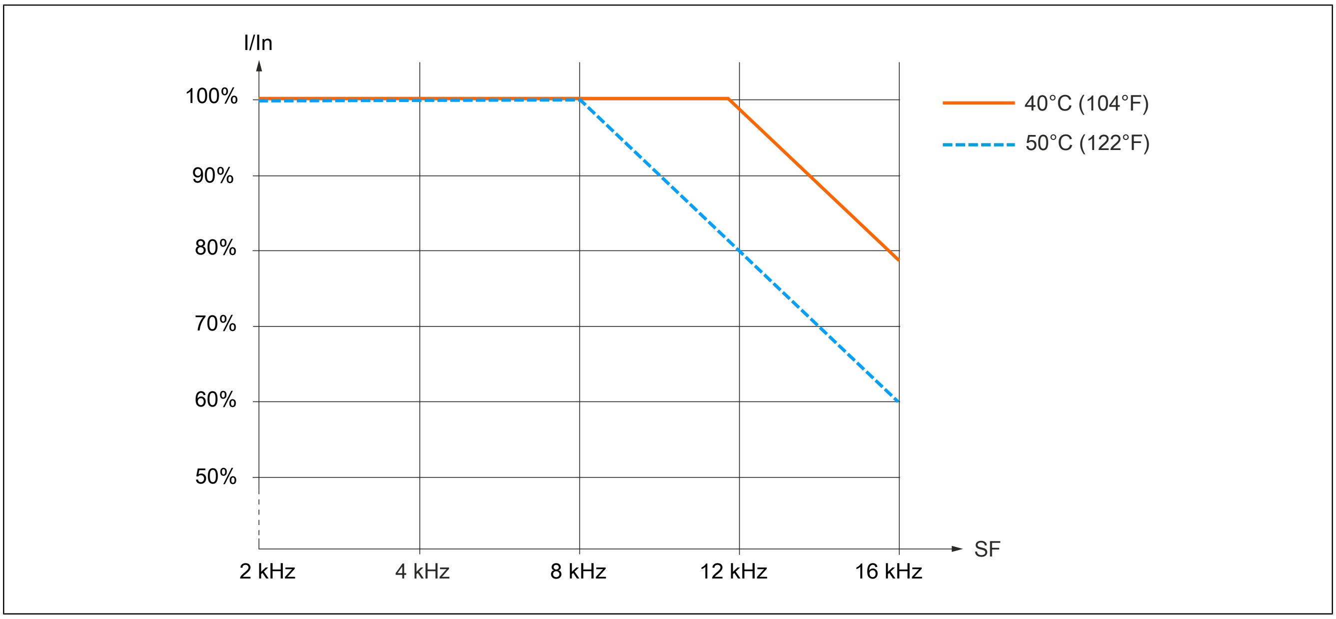
Note:

For operation at 60°C:

- **Mounting type 2 required**
- **No text terminal connected**
- **No reduction of current required**

8I86T400300.00-000

For mounting type 1:



During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

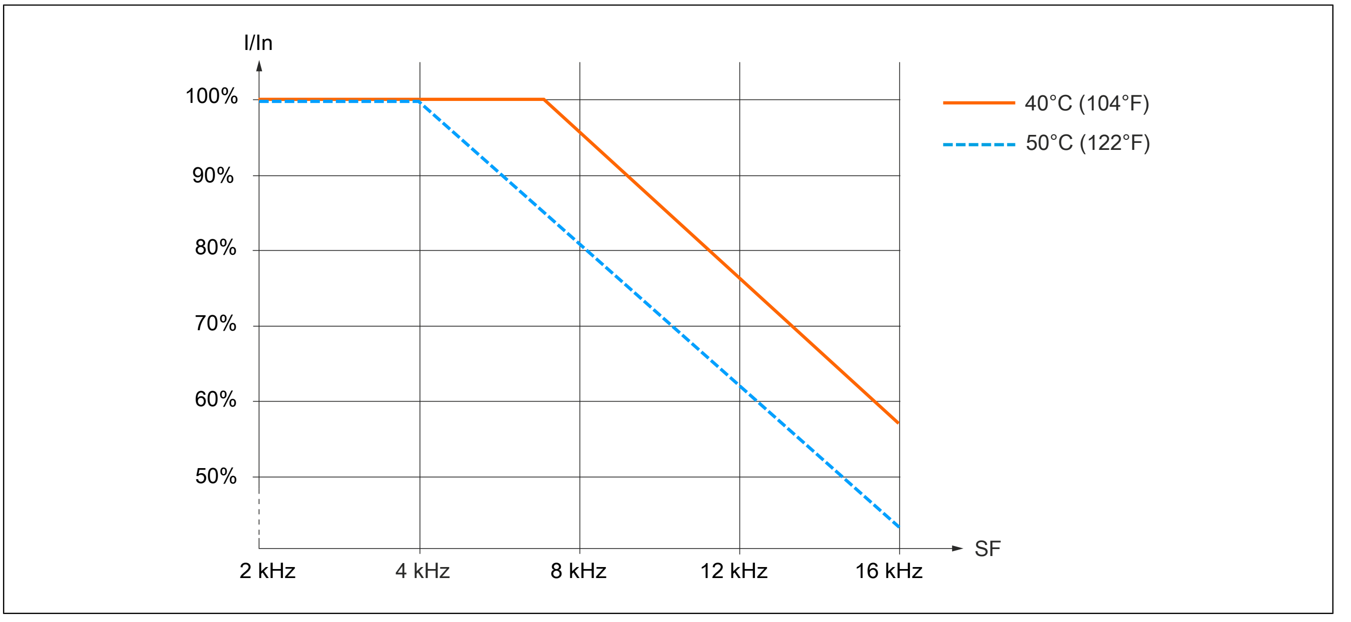
Note:

For operation at 60°C:

- **Mounting type 2 required**
- **No text terminal connected**
- **No reduction of current required**

8I86T400400.00-000

For mounting type 1:



During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

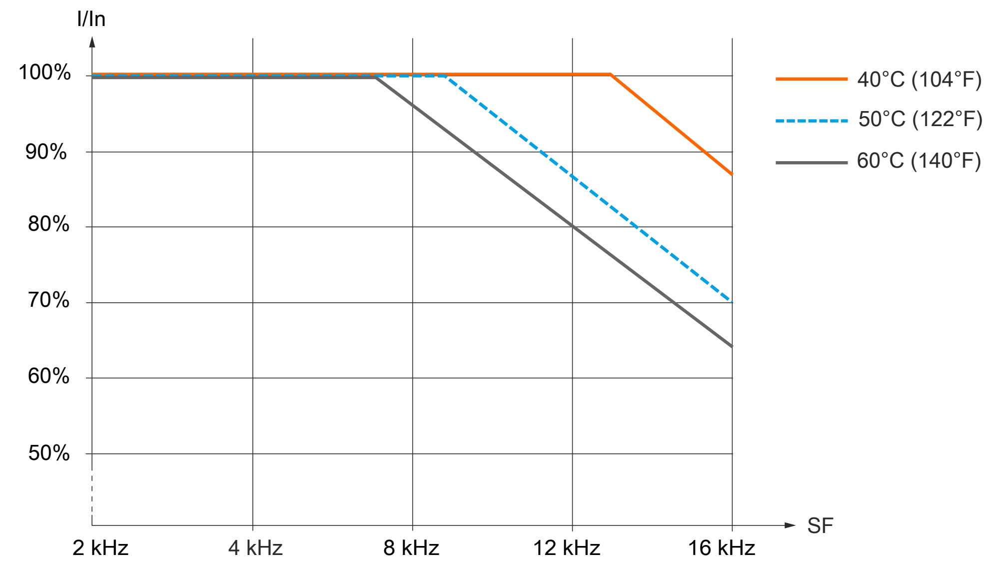
Note:

For operation at 60°C:

- **Mounting type 2 required**
- **No text terminal connected**
- **No reduction of current required**

8I86T400550.00-000

For mounting types 1 and 2: 40°C (104°F) / 50°C (122°F)
For mounting type 2: 60°C (140°F)



During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

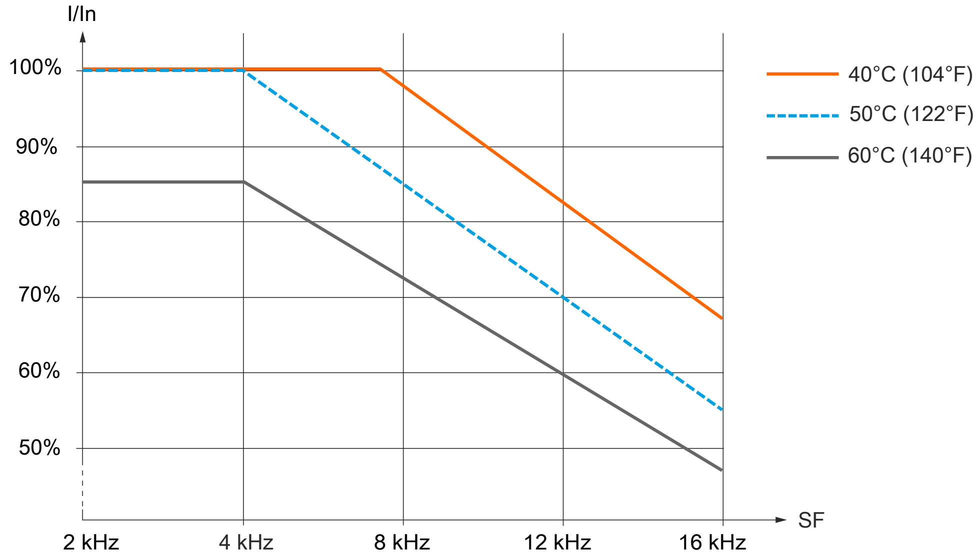
Note:

For operation at 60°C:

- **No side-by-side installation**
- **No text terminal connected**

8I86T400750.00-000

For mounting types 1 and 2: 40°C (104°F) / 50°C (122°F)
For mounting type 2: 60°C (140°F)



During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

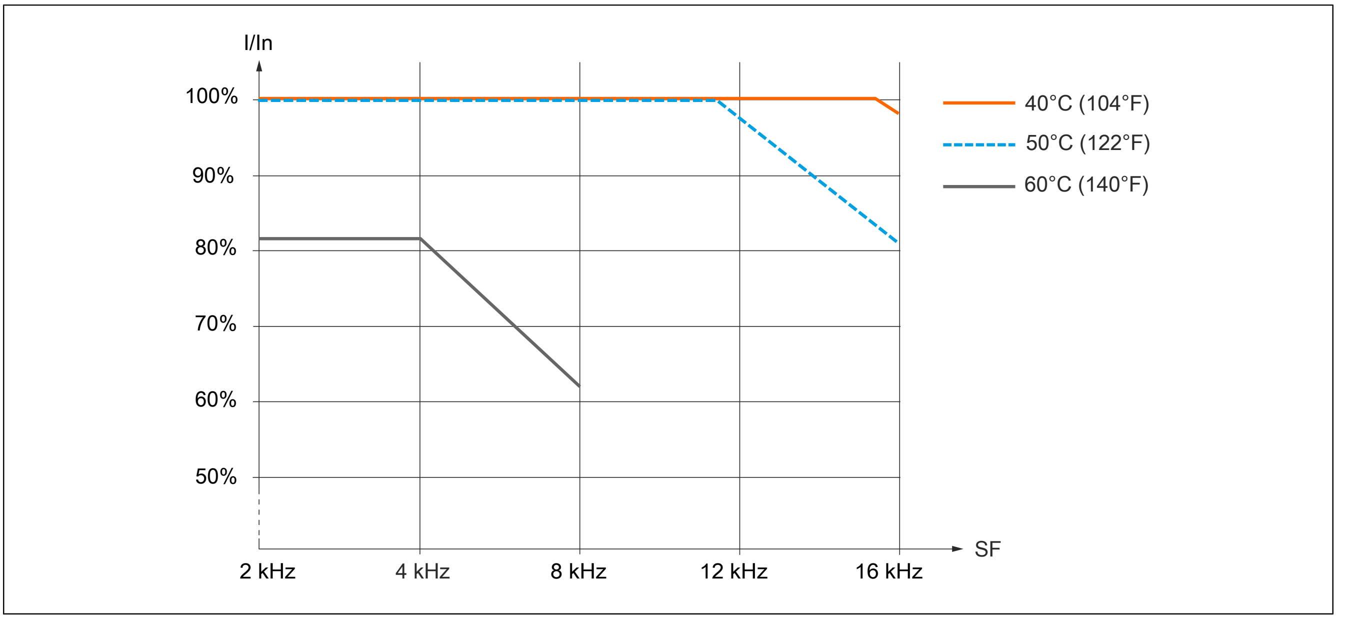
Note:

For operation at 60°C:

- **No side-by-side installation**
- **No text terminal connected**

8I86T401100.00-000

For mounting types 1 and 2: 40°C (104°F)
For mounting types 2: 50°C (122°F) / 60°C (140°F)



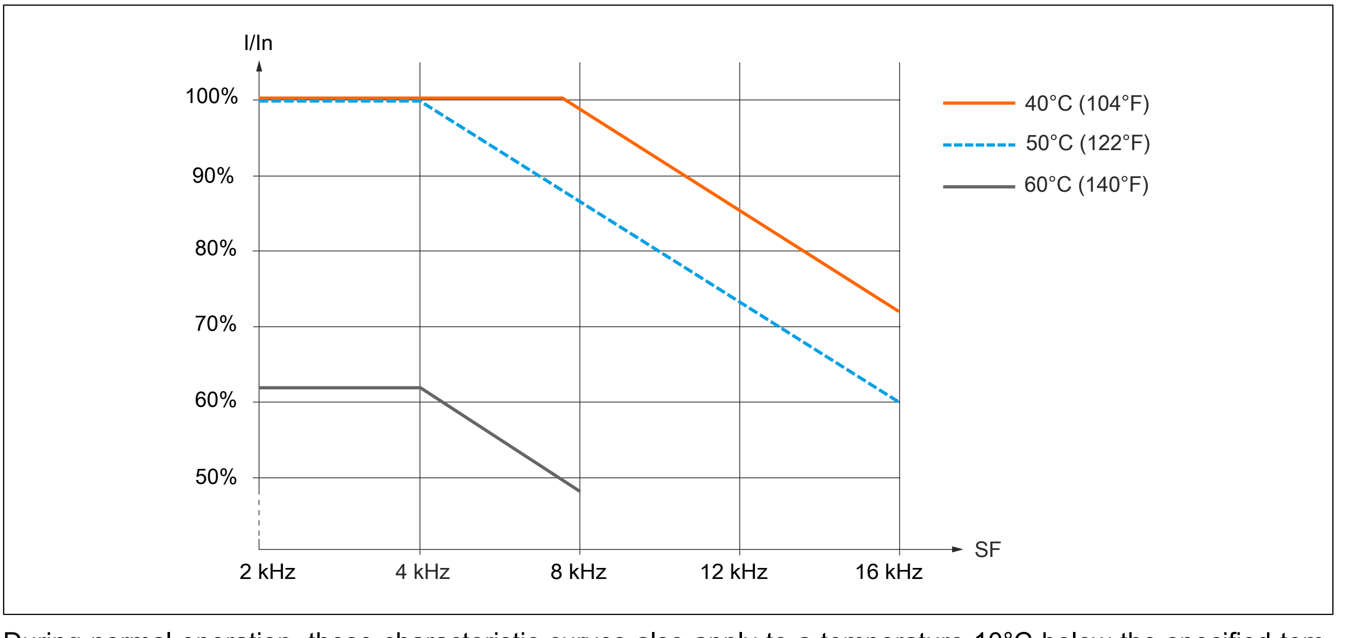
During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

Note:

- **For operation at >40°C: No side-by-side installation**
- **For operation at >50°C: No text terminal connected**

8I86T401500.00-000

For mounting types 1 and 2: 40°C (104°F)
For mounting types 2: 50°C (122°F) / 60°C (140°F)



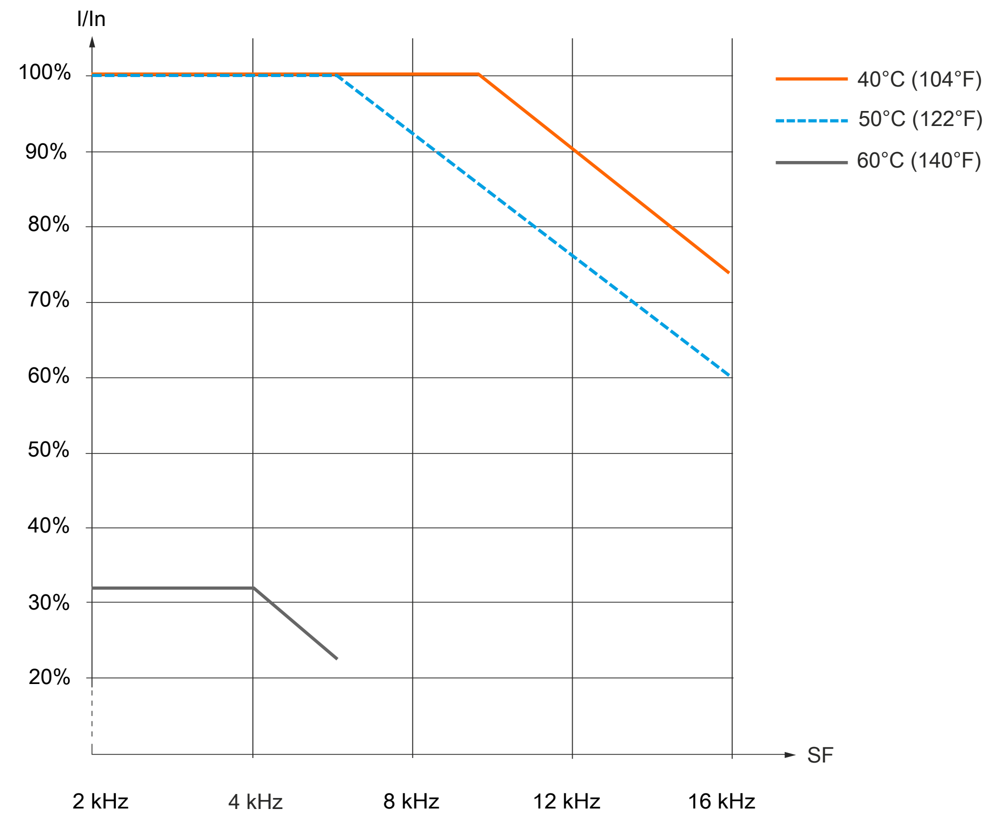
During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

Note:

- **For operation at >40°C: No side-by-side installation**
- **For operation at >50°C: No text terminal connected**

8I86T401850.00-000

For mounting types 1 and 2: 40°C (104°F)
For mounting types 2: 50°C (122°F) / 60°C (140°F)



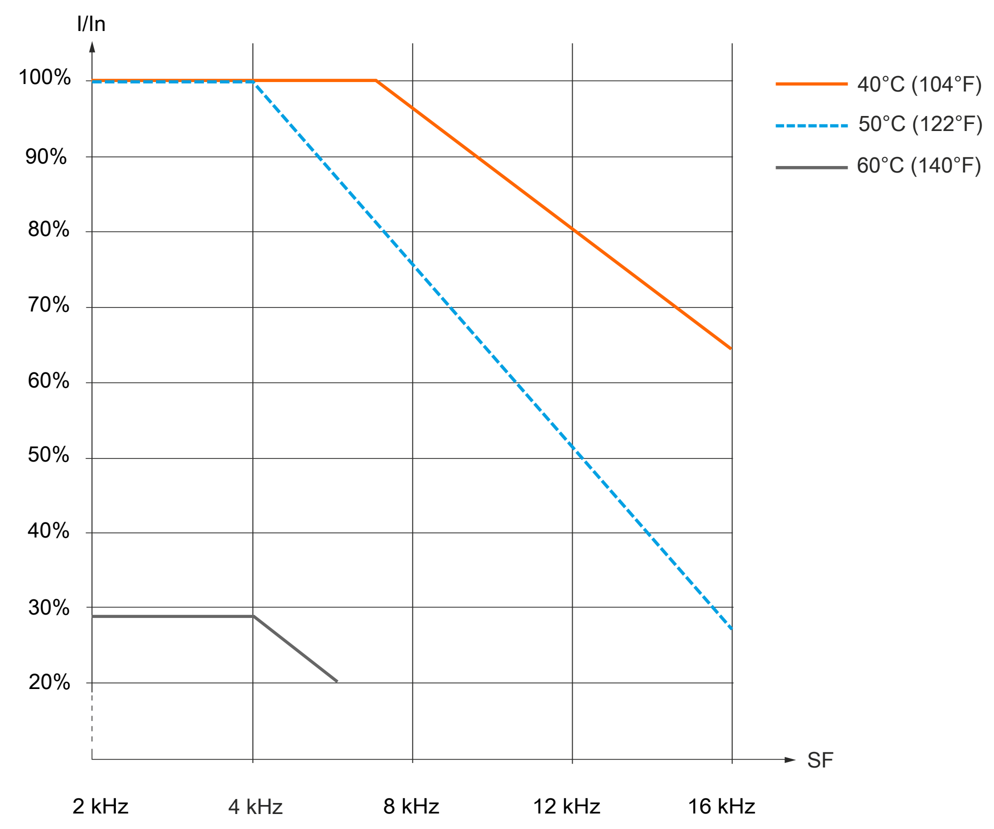
During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

Note:

- **For operation at >40°C: No side-by-side installation**
- **For operation at >50°C: No text terminal connected**

8I86T402200.00-000

For mounting types 1 and 2: 40°C (104°F)
For mounting types 2: 50°C (122°F) / 60°C (140°F)



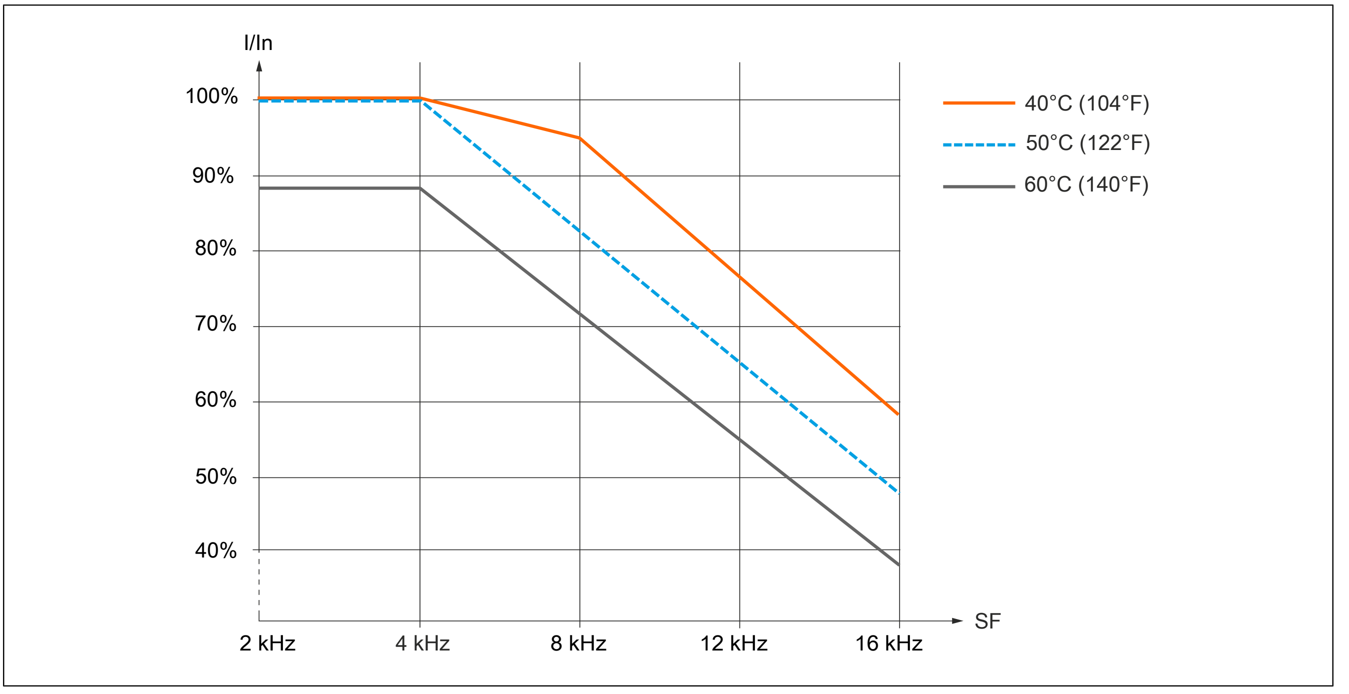
During normal operation, these characteristic curves also apply to a temperature 10°C below the specified temperatures.

Note:

- **For operation at >40°C: No side-by-side installation**
- **For operation at >50°C: No text terminal connected**

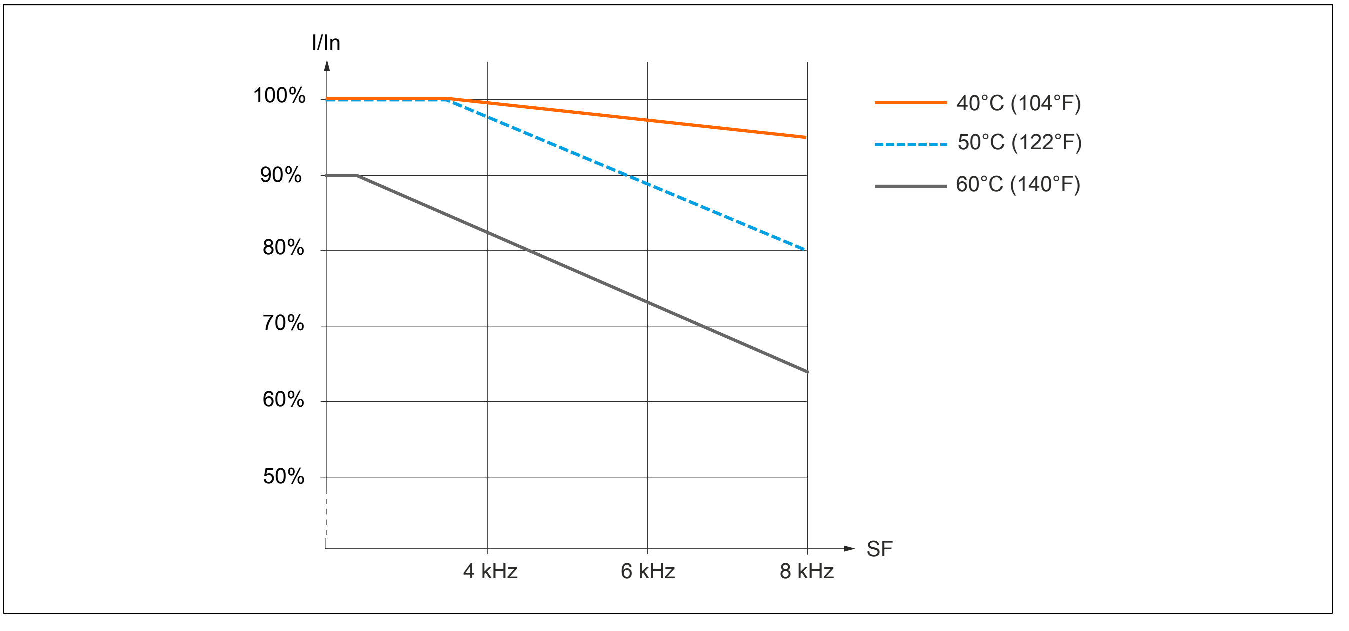
8I86T403000.00-000 and 8I86T403700.00-000

For mounting types 1 and 2: 40°C (104°F) / 50°C (122°F)
For mounting type 2: 60°C (140°F)



8I86T404500.00-000, 8I86T405500.00-000 and 8I86T407500.00-000

For mounting types 1 and 2: 40°C (104°F) / 50°C (122°F)
For mounting type 2: 60°C (140°F)



4.3.6 Installation procedures

Mounting screws

Size	Screw diameter
1	5 mm (0.2 in.)
2	5 mm (0.2 in.)
3	5 mm (0.2 in.)
4	6 mm (0.24 in.)
5	8 mm (0.3 in.)

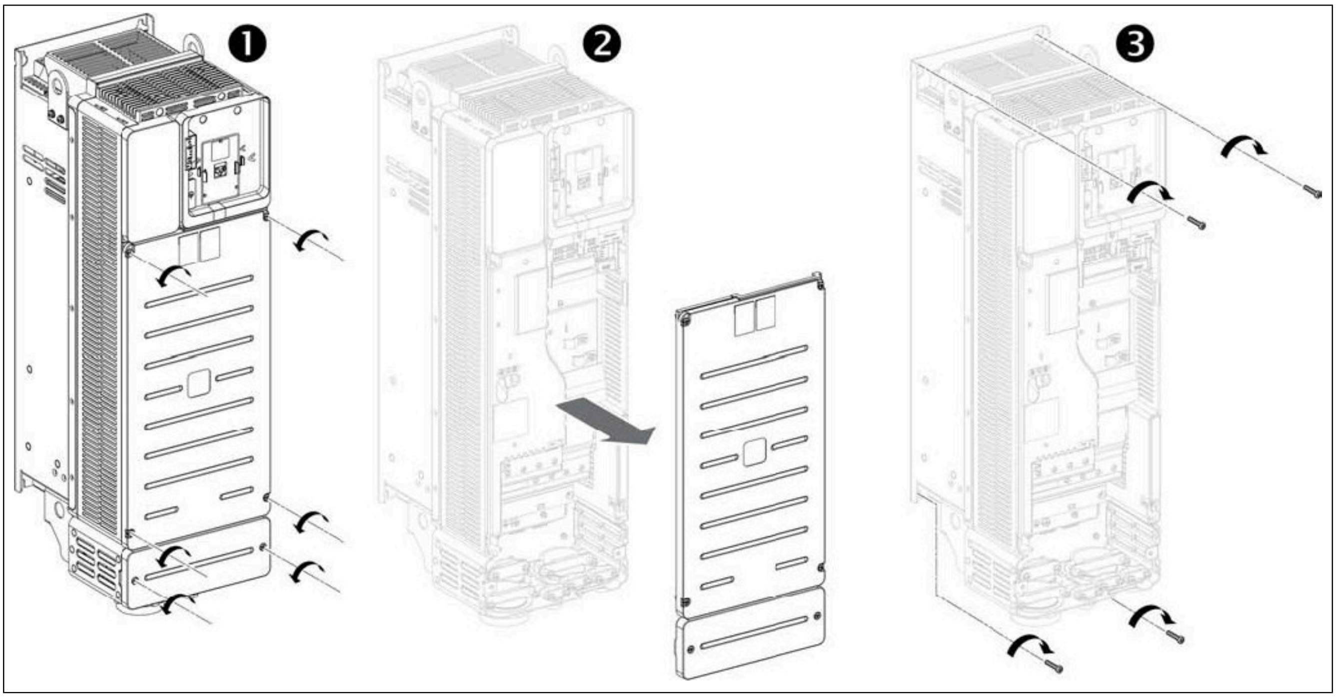
Note:

- **All inverter sizes must be secured using screws.**
- **Screws are not included with the delivered product.**

Installation procedure for sizes 1, 2 and 3

No preparatory disassembly is required to install the inverter. Secure the inverter to the mounting surface using the four screws and swivel disks according to the table above.
Install the inverter on a metal backplane to meet EMC requirements.

Installation procedure for sizes 4 and 5



1) Remove the six screws (size 4) or eight screws (size 5) of the front and lower covers.
2) Remove the covers.
3) Secure the inverter to the mounting surface using the screws and swivel disks according to the table above.

4.4 Wiring the drive

4.4.1 General information about wiring

4.4.1.1 Wiring instructions

General instructions

Voltage is not permitted to be applied during the entire installation procedure.

Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

Before completing any of the procedures described in this section, carefully read through the instructions provided in section "Safety information".

Failure to follow these instructions will result in death or serious injury.

Incorrect settings, invalid data or faulty wiring as well as other types of error can cause unexpected movements.

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

- **When wiring the device, all EMC requirements must be strictly observed.**
- **It is not permitted to operate the product using unspecified or unsuitable settings or data.**
- **Perform a comprehensive commissioning test.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Warning!

UNINTENDED BEHAVIOR OF INPUTS AND OUTPUTS

The function of the inputs and outputs depends on the selected operating mode and settings of the corresponding parameters.

- **Make sure that the wiring has been implemented in accordance with the settings.**
- **Only switch on the system if there are no persons in the danger zone and it is free of obstacles.**
- **During commissioning, carefully check all operating states and potential fault situations.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Danger!

RISK OF ELECTRIC SHOCK

- **Cable cross-sections and tightening torque must comply with the specifications defined in this document.**
- **For voltage above 25 VAC, cables with multiple conductors must only be used with cable lugs.**

Failure to follow these instructions will result in death or serious injury.

This product has a discharge current of more than 3.5 mA. If there are issues with the protective grounding connection, dangerous touch current can occur when contact is made with the product.

Danger!

ELECTRIC SHOCK CAUSED BY HIGH ELECTRICAL DISCHARGE

- **Make sure that all relevant local and national electrical engineering requirements are complied with, as well as any other applicable regulations in relation to the protective grounding of the entire inverter system.**

Failure to follow these instructions will result in death or serious injury.

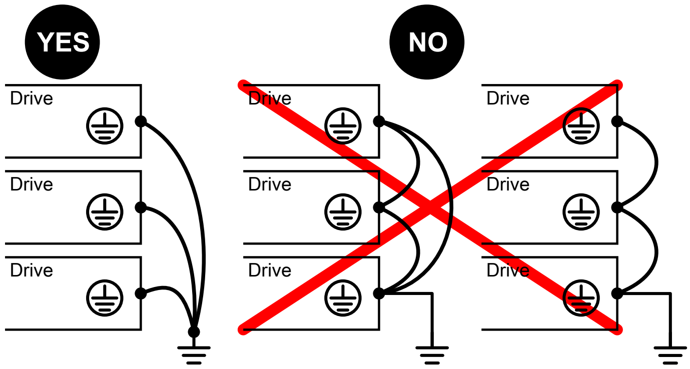
Warning!

INSUFFICIENT PROTECTION AGAINST OVERCURRENT

- **Overcurrent protective devices with the required power rating must be used.**
- **The fuses listed in the appendix for this inverter must be used.**
- **It is not permitted to connect the product to a mains voltage whose short-circuit current rating (SCCR) exceeds the maximum permitted value specified in the appendix.**

Failure to follow these instructions can result in death, serious injury or damage to property.

- Ensure that the ground resistance is <100 mΩ.
- Use wires with the correct cross section for grounding.
- When grounding multiple inverters, each inverter must be directly connected as shown below.
- Do not loop ground cables or connect them in series.



Residual current protective device

Direct current can be introduced into the protective grounding conductor for this inverter If a residual current protective device (RCD/GFCI) or a residual current monitoring device (RCM) is used for additional protection against direct or indirect contact, the following types are to be used.

Warning!

DIRECT CURRENT CAN BE INTRODUCED INTO THE PROTECTIVE GROUNDING CONDUCTOR

- **For one-phase inverters connected to a phase and to the neutral conductor, use a Type A residual current protective device (RCD/GFCI), or a residual current monitoring device (RCM).**
- **For three-phase inverters and one-phase inverters not connected to a phase or to the neutral conductor, use a Type B residual current protective device (RCD/GFCI), or a residual current monitoring device (RCM) that has been approved for use with inverters and is compatible with all types of current.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Additional conditions for using a residual current protective device:

- The drive must have an increased discharge current when the power is switched on. Use a residual current protective device (RCD/GFCI) or a residual current monitoring device (RCM) with a response delay.
- High-frequency currents must be filtered.

Choose a suitable model that incorporates the following functions:

- High frequency current filtering
- A time delay that prevents the upstream device from being triggered due to the load from stray capacitance when switched on. This time delay is not possible for 30 mA devices. In this case, choose devices with immunity against inadvertent triggering.

Due to the high discharge current in standard operation, we recommend choosing at least a 300 mA device.

If the installation requires a residual current protection device with less than 300 mA, an appropriate device can be installed by changing the position of the IT switch (sizes 1, 2 and 3) or removing the screws (sizes 4 and 5). For instructions, see section "Operation in an IT system" on page 75.

If the installation comprises several inverters, provide one residual current protective device for each inverter.

Grounding the device

Note:

IRREPARABLE DAMAGE DUE TO INCORRECT WIRING

- **Before switching on and configuring the product, make sure that it has been wired correctly.**

Failure to follow these instructions can result in damage to property.

Danger!

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

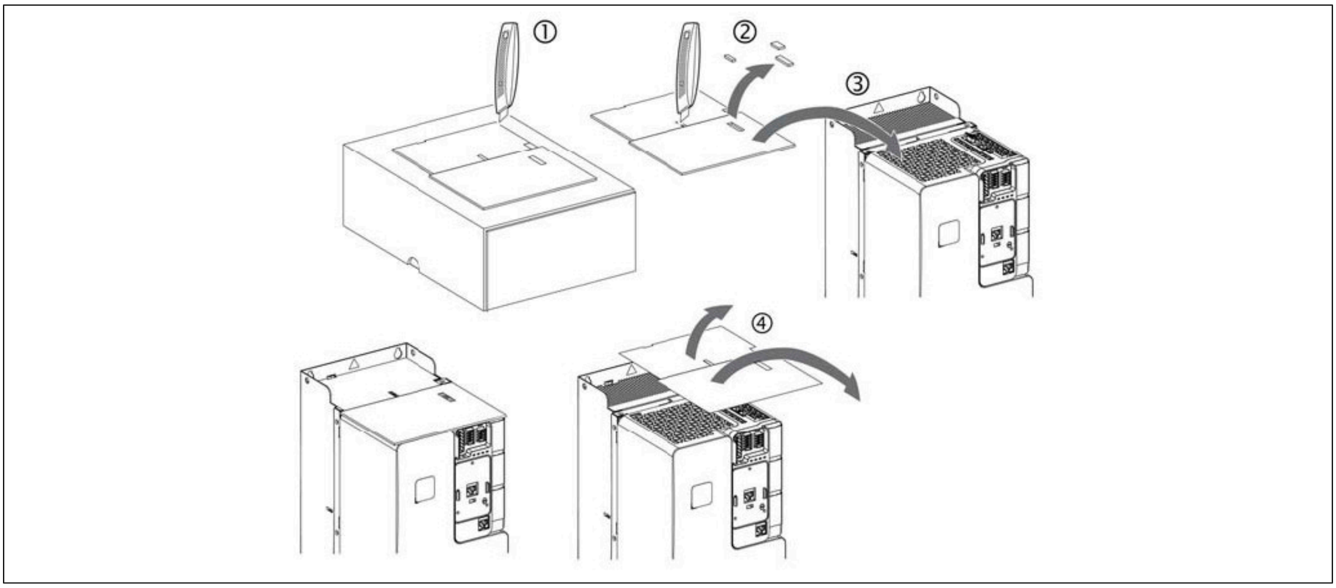
- **Make sure that all relevant local and national electrical engineering requirements are complied with, as well as any other applicable regulations in relation to the protective grounding of the entire inverter system.**
- **Ground the inverter system before applying voltage.**
- **The cross section of the protective grounding conductor must comply with the applicable standards.**
- **Do not use cable ducts as protective grounding conductors; instead, use a protective ground conductor within the cable duct.**
- **It is not permitted to use cable shields as protective grounding conductors.**

Failure to follow these instructions will result in death or serious injury.

Tighten the grounding screws according to the instructions in the section about ground cables (see "Characteristics of the power unit terminals" on page 84).

Before wiring sizes 1, 2 and 3

These inverters are delivered with covers that must be cut out of the packaging and installed on the top of the inverter before wiring. These covers prevent conductive foreign bodies or liquids from entering the inverter. The example shown below applies to size 3.



Follow the instructions below to install the covers:

1) Cut the covers out of the packaging material.
2) Cut out the openings and dispose of them.
3) Attach the covers to the inverter.
4) Remove the inverter.
5) Remove the top covers for normal operation.

Configuration as sink/source

Contrary to the typical definition of sink and source, the following statements apply to this product:

Sink: The inputs and outputs need a voltage sink, i.e. the current flows out of the inputs and outputs.

Source: The inputs and outputs need a voltage source, i.e. the current flows into the inputs and outputs.

4.4.1.2 Instructions for cable lengths

Consequences of using longer cables

When using inverters with motors, fast-switching transistors combined with lengthy motor cables can cause peaks in voltage of over twice the DC connection voltage. These high-voltage peaks can cause the motor winding insulation to wear prematurely.

The function for limiting overvoltage allows the use of longer cables, reducing torque performance in the process.

Length of the motor cables

The spacing between the inverter and the motor(s) is limited by the permitted power failure level, the permitted overvoltage on the motor(s), any stray capacitance current generated and the permitted heat loss.

The maximum spacing is largely dependent on the motors used (insulating material), the type of motor cable used (shielded/unshielded), the cable paths (cable channels, underground cabling) as well as the options used.

Dynamic voltage load of the motor

Overvoltages at the motor terminals result from reflection in the motor cable. If the motor cable length is greater than 10 m, the motors are exposed to significantly higher voltage peaks. The longer the motor cable, the higher the overvoltage value.

The steep edges of the switching impulses at the output side of the inverter place a further load on the motors. The slew rate of the voltage is typically in excess of 5 kV/µs but decreases according to the length of the motor cable.

Use a shielded cable that complies with category C2 or category C3 requirements per IEC 61800-3.

Standard cables with linear capacity can be used for the ACOPOSinverter. Using cables with reduced linear capacity can result in increased cable length performance.

To reduce the voltage load on the motor windings, the overvoltage limitation function **[Motor surge limit.]** (SUL) can be enabled to allow the use of motor cables up to 100 m (328 ft) in length while reducing the torque output.

Overview of workaround solutions

A number of simple measures can be taken to extend the service life of the motor:

- Specification of a motor for inverter applications (IEC 60034-25B or NEMA 400 should be observed)
- Reduce the spacing between the motor and the inverter to a minimum
- Use an unshielded cable
- Reducing the inverter switching frequency (A reduction to 2.5 Hz is recommended.)

4.4.1.3 Electromagnetic compatibility

Limit values

This product complies with the EMC requirements set by IEC 61800-3, provided that the procedures described in this manual are implemented during installation. If the selected configuration (product, line filter, various accessories and measures) does not comply with category C1 requirements, the following applies, as per IEC 61800-3:

Warning!

RADIO INTERFERENCE

In residential areas, this product may trigger radio interference. In this case, additional corrective actions may need to be implemented.

Failure to follow these instructions can result in death, serious injury or damage to property.

EMC requirements for the control cabinet

EMC measures	Objective
Use mounting plates with good conductivity, connect large surfaces of metal parts, remove paint from contact areas.	Good conductivity due to large contact surface area
Ground the control cabinet, control cabinet door and the mounting plate using grounding belts or ground cables. The cable cross section must be at least 10 mm^2 (8 AWG).	Reduction of emissions
Fit switching contactors such as power contactors, relays or solenoids with interference filters or radio interference suppressors (for example, diodes, varistors, RC circuits).	Reduction of mutual interference
Install power components and control components separately.	
Install size 1 and 2 inverters on grounded metal backplane.	Reduction of emissions

Shielded cables

EMC measures	Objective
Connect large surfaces of cable shields, use cable terminals and grounding belts.	Reduction in emissions
Use cable terminals to connect large surfaces of the shielding on all shielded cables to the mounting plate at the control cabinet entry.	
Ground the shielding for digital signal cables at both ends. You can do this by connecting the shielding to large surfaces or via conductive connector housing.	Reduction in signal cable interference, reduction in emissions
Ground the shielding for analog signal cables at the device directly (signal input). Insulate the shielding at the other end of the cable, or use a capacitor for grounding (e.g. 10 nF, 100 V or higher).	Reduction in ground loops caused by low-frequency interference.
Only use shielded motor cables with copper braiding and coverage of at least 85%. Ground large surface areas of the shield on both sides.	Controlled deflection of interference current and reduction in emissions.

Cable installation

EMC measures	Objective
Do not route fieldbus cables and signal cables in a single cable duct together with DC and AC voltage lines of more than 60 V. (Fieldbus cables, signal lines and analog cables can be routed in a single cable duct.) Recommendation: Use separate cable ducts and ensure a minimum distance of 20 cm between each duct.	Reduction in mutual interference.
Keep cables as short as possible. Do not install unnecessary cable loops, and use short cables between the central grounding point in the control cabinet and the external ground connection.	Reduction in capacitive and inductive interference.
Use equipotential bonding lines in the following cases: wide-area installations, different power supplies and cross-building installations.	Reduction in cable shield interference, and reduction in emissions.
Use fine-stranded wires with potential equalization.	Dispersion of high-frequency interference current.
If the motor and machine are not conductively connected by means of an insulated flange or connection without an interface contact, for example, the motor must be grounded using a grounding belt or cable. The wire cross section must be at least 10 mm² (6 AWG).	Reduction in emissions, increased immunity.
Use twisted-pair wires for the DC supply. For digital and analog inputs, use shielded, twisted cables with a pitch of between 25 mm and 50 mm.	Reduction in signal cable interference, reduction in emissions

Power supply

EMC measures	Objective
Operate the product on a mains network with a grounded neutral conductor.	Ensures effectiveness of line filter.
Use overvoltage protection if there is a risk of overvoltage.	Reduction of the risk of damage due to overvoltage.

Additional measures for improving EMC

Depending on the application, the following measures can improve EMC-dependent values:

EMC measures	Objective
Use mains chokes.	Reduction in mains harmonics and extension of product service life.
Use external mains filters.	Improvement in EMC limit values.
Additional EMC measures, such as mounting in a closed control cabinet with 15 dB shielding attenuation of radiated interference, for example.	

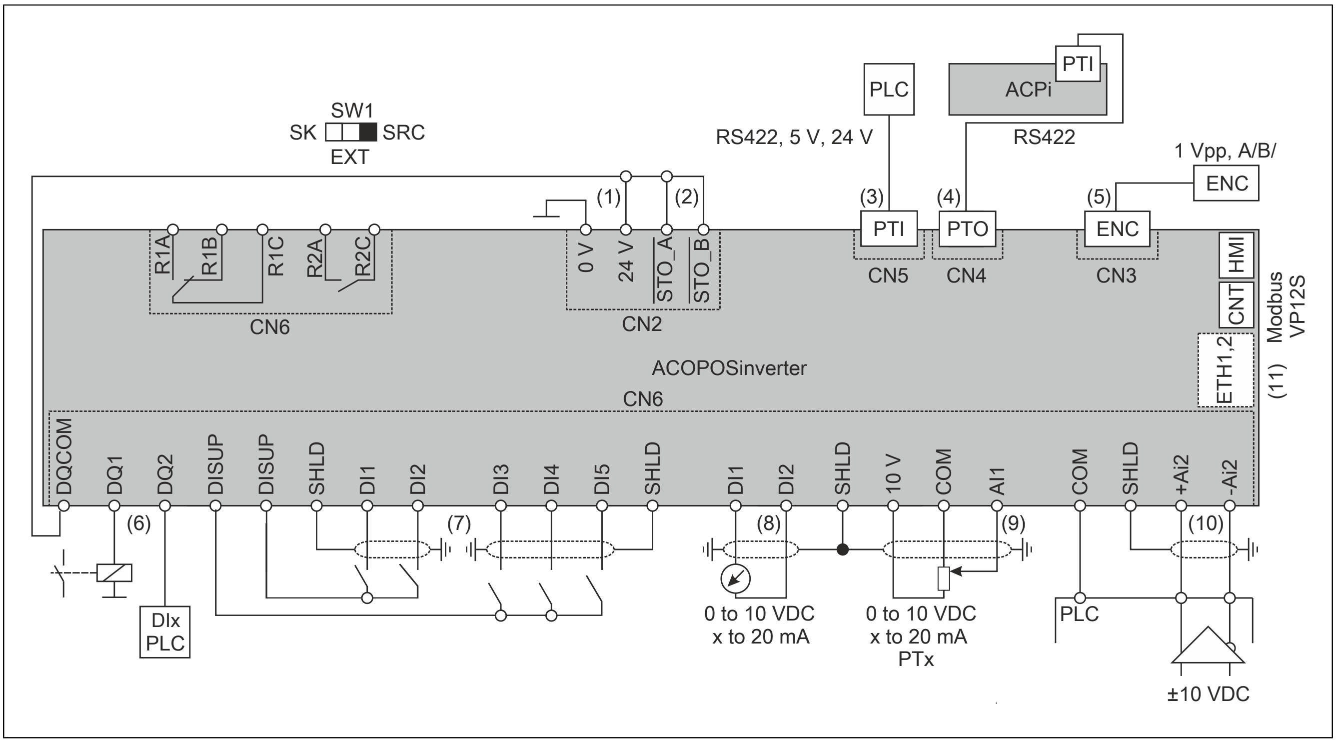
Note:

If an additional input filter is used, it must be installed as close as possible to the inverter and connected directly to the mains via an unshielded cable.

4.4.2 General wiring diagrams

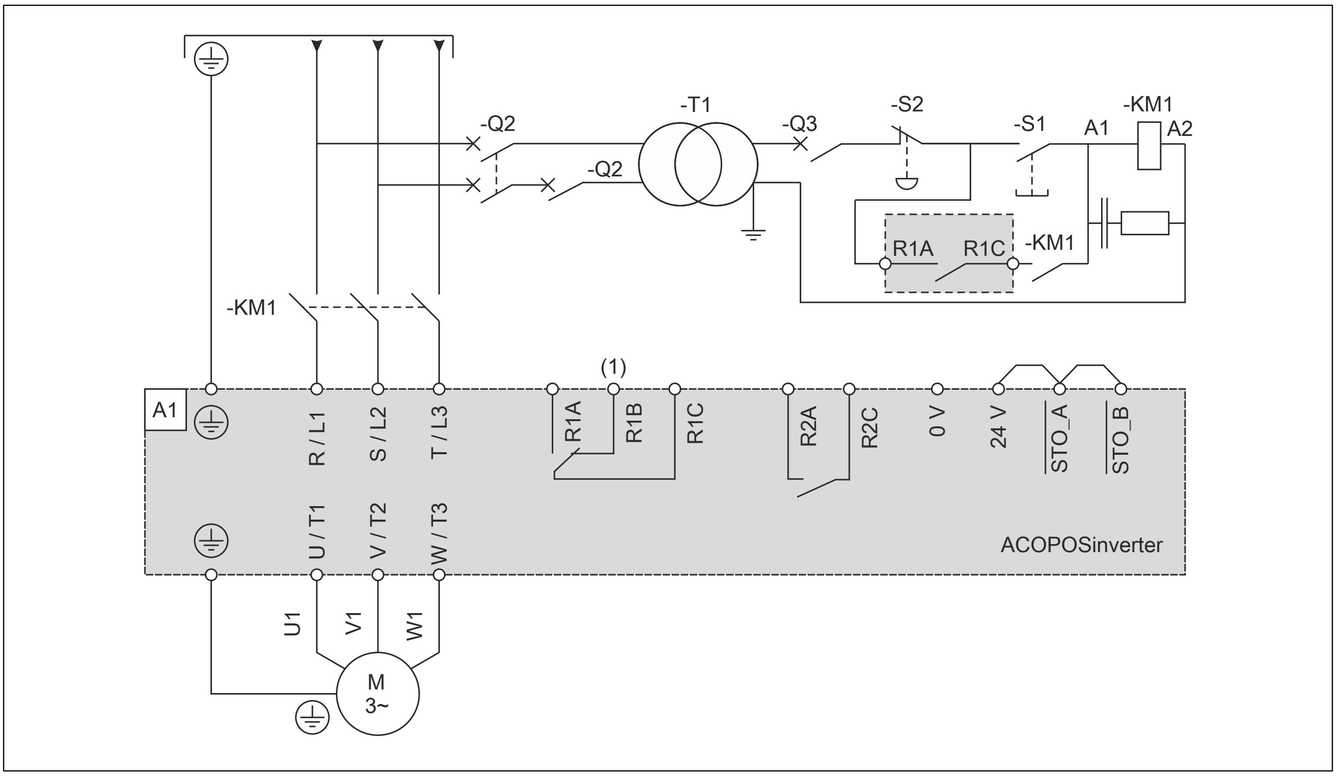
4.4.2.1 Sizes 1, 2 and 3

Control block wiring diagram



(1) 24 V input, output, maximum supply current of 200 mA available
(2) STO - Safe Torque Off
(3) PTI - Pulse train input, pulse from external source (e.g. PLC), connection of direction or A-B signals possible
(4) PTO - Pulse train output, can be used to connect a second ACOPOSinverter P86 PTI
(5) For connecting an encoder for motor speed feedback
(6) Digital output, e.g. for connecting a contactor, can also be used as DI
(7) Digital inputs
(8) Analog output, e.g. for connecting a measuring instrument
(9) Analog input, e.g. from a potentiometer
(10) Analog differential input, e.g. as speed setpoint from external PLC differential, ±10 V
(11) Optional

Three-phase power supply - Connection diagram with line contactor without safety function STO



(1) Use setting "Operating state 'Fault'" of relay output R1 to switch off the product when a fault has been detected.

Three-phase power supply - Wiring diagram with downstream contactor

If a move command is executed, and the downstream contactor between the inverter and the motor is still open, there may still be residual voltage present at the inverter output. This can result in incorrect estimation of the motor speed when the contacts of the downstream contactor are closed. This incorrect estimation of the motor speed can cause unanticipated operation or damage to the equipment.
In addition, there may be overvoltage present at the output of the inverter if the downstream contactor between the inverter and the motor is open while the power stage is still enabled.

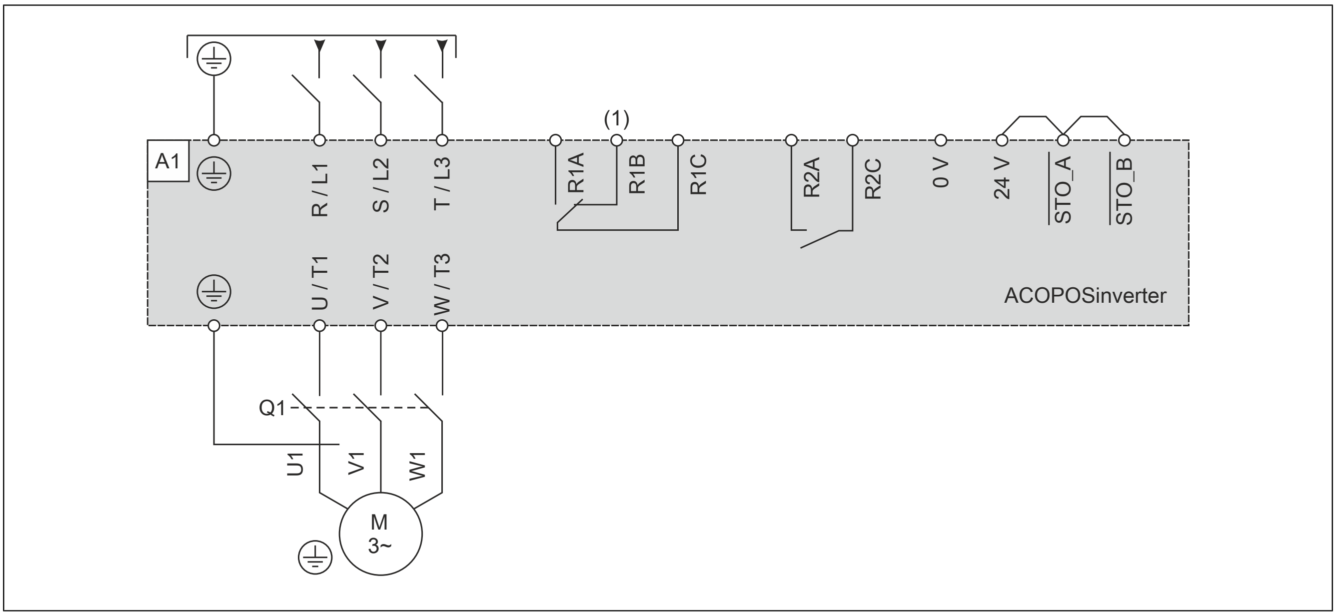
Warning!

UNANTICIPATED OPERATION OF THE EQUIPMENT OR DAMAGE TO THE EQUIPMENT

If a downstream contactor is used between the inverter and the motor, check the following:

- **The contacts between the motor and the inverter must be closed before a move command is executed.**
- **It is not permitted for the power stage to be enabled when the contacts between the motor and the drive are opened.**

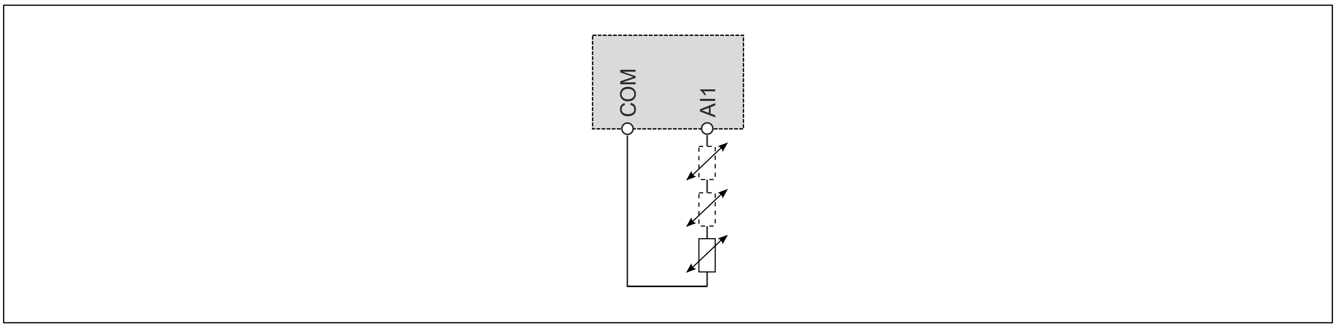
Failure to follow these instructions can result in death, serious injury or damage to property.



(1) Use setting "Operating state 'Fault'" for relay output R1 to switch off the product when a fault has been detected.

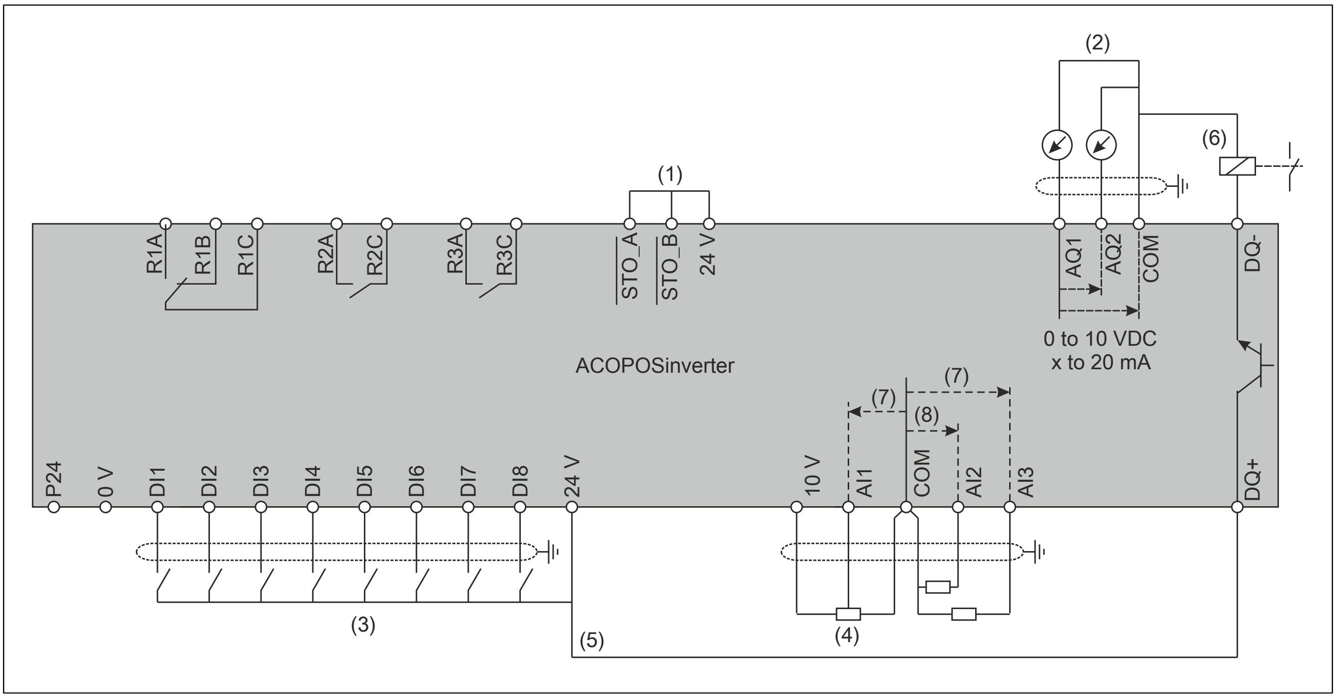
Sensor connection

Up to 3 sensors can be connected to terminal AI1.



4.4.2.2 Sizes 4 and 5

Control block wiring diagram

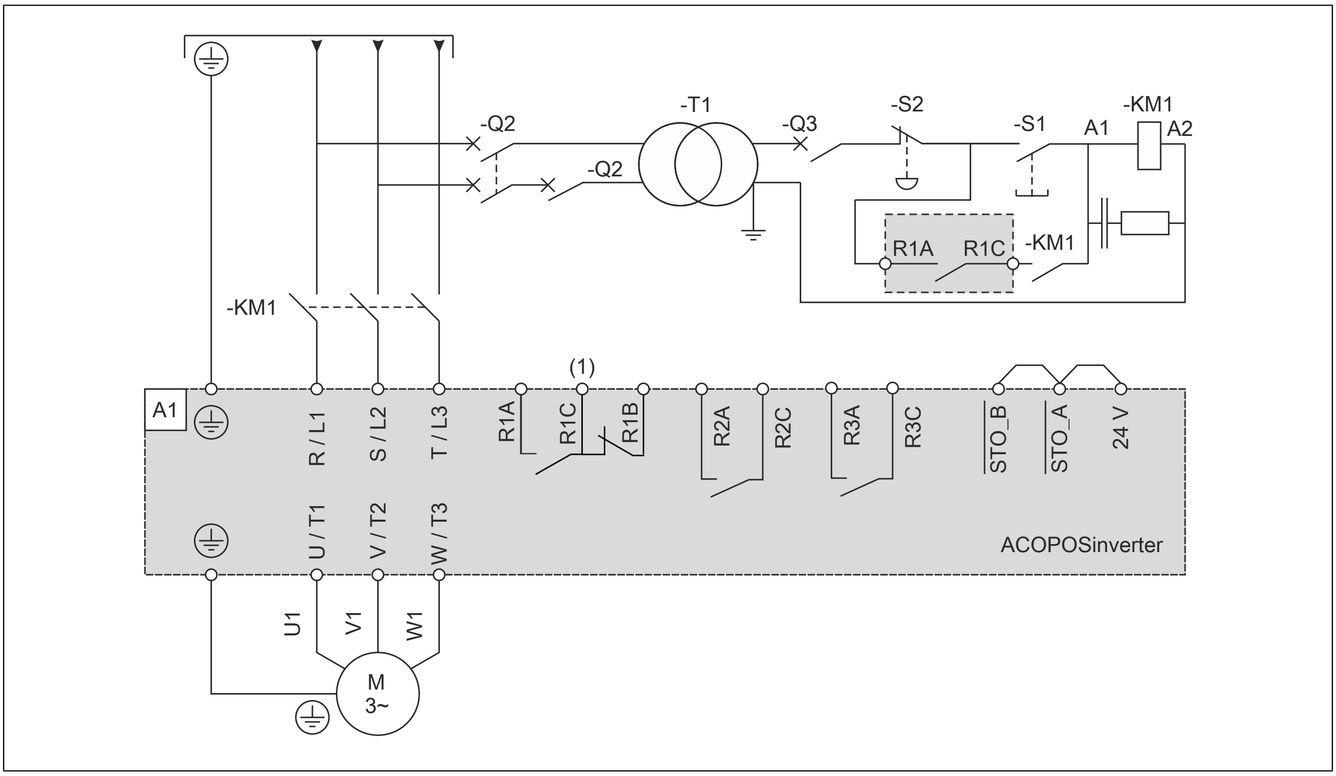


(1) Safe Torque Off (STO)
(2) Analog output
(3) Digital input
(4) Reference potentiometer (e.g. 10 kΩ)
(5) Analog input
(6) Digital output,
(7) 0 to 10 VDC, x to 20 mA
(8) 0 to 10 VDC, -10 to 10 VDC

Note:

The PTI function is not available on size 4 and 5 inverters.

Three-phase power supply - Connection diagram with line contactor without safety function STO



(1) Use setting "Operating state 'Fault'" for relay output R1 to switch off the product when a fault has been detected.

Three-phase power supply - Wiring diagram with downstream contactor

If a move command is executed, and the downstream contactor between the inverter and the motor is still open, there may still be residual voltage present at the inverter output. This can result in incorrect estimation of the motor speed when the contacts of the downstream contactor are closed. This incorrect estimation of the motor speed can cause unanticipated operation or damage to the equipment.
In addition, there may be overvoltage present at the output of the inverter if the downstream contactor between the inverter and the motor is open while the power stage is still enabled.

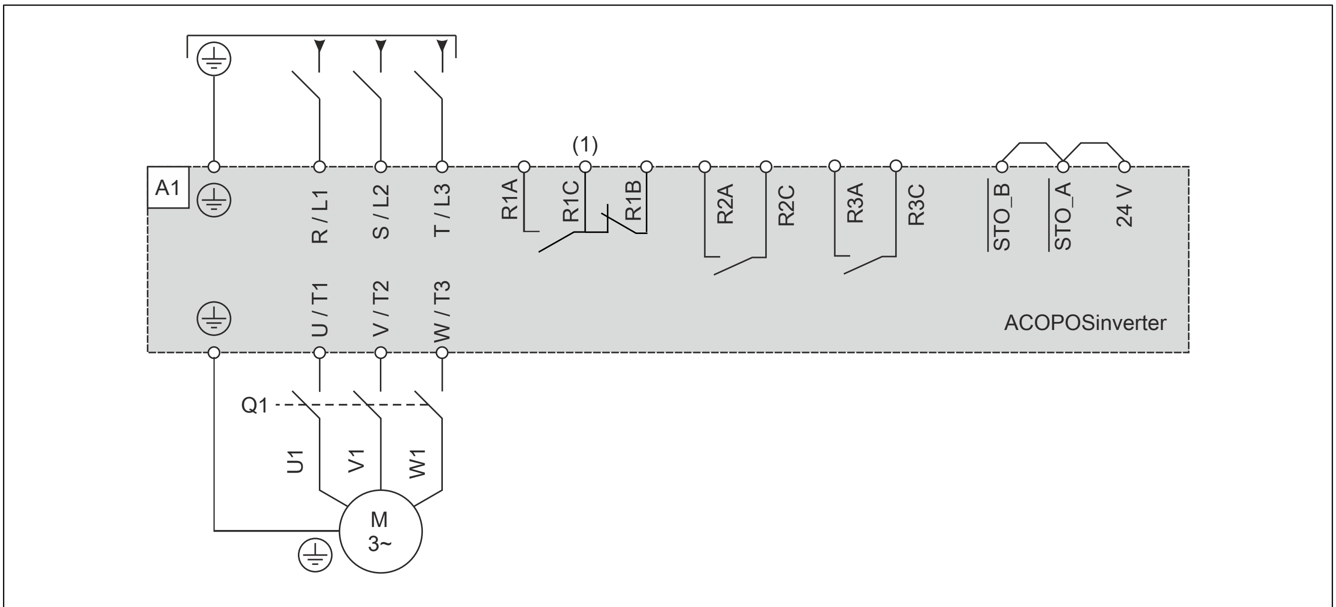
Warning!

UNANTICIPATED OPERATION OF THE EQUIPMENT OR DAMAGE TO THE EQUIPMENT

If a downstream contactor is used between the inverter and the motor, check the following:

- **The contacts between the motor and the inverter must be closed before a move command is executed.**
- **It is not permitted for the power stage to be enabled when the contacts between the motor and the drive are opened.**

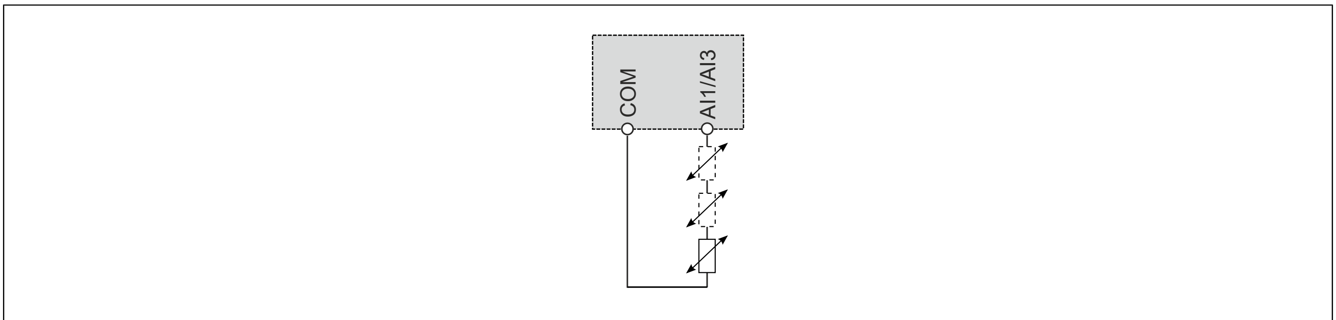
Failure to follow these instructions can result in death, serious injury or damage to property.



(1) Use setting "Operating state 'Fault'" for relay output R1 to switch off the product when a fault has been detected.

Sensor connection

Up to 3 sensors can be connected to terminals AI1/AI3.



4.4.3 Integrated EMC filter

4.4.3.1 Operation in an IT system

Definition

IT system: Insulated or high-impedance grounded neutral conductor. Use a permanent insulation monitoring function that is compatible with non-linear loads (e.g. XM200 or similar).

Corner-grounded system: System with grounded phase

Operation

> ## Note:
>
> **RISK OF DAMAGE TO FREQUENCY INVERTER**
>
> **To operate the inverter with an IT system, the integrated EMC filter must be disconnected as described in these instructions.**
>
> **Failure to follow these instructions can result in damage to property.**

4.4.3.2 Disconnecting the integrated EMC filter

Disconnecting the filter

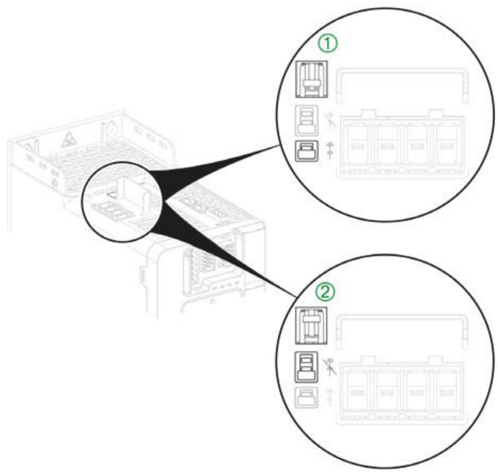
> ## Danger!
>
> **HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH**
>
> **Before completing any of the procedures described in this section, carefully read through the instructions provided in section "Safety information".**
>
> **Failure to follow these instructions will result in death or serious injury.**

The inverter comes with an integrated EMC filter. This means that ground discharge current is generated. If this leakage current creates compatibility issues for your installation (residual current protective device, etc.), you can reduce the leakage current by disabling the Y capacitors as shown below. In this configuration, the product does not comply with EMC requirements as defined by IEC 61800-3.

Setting for sizes 1 and 2

Proceed as follows to disconnect the integrated EMC filter:

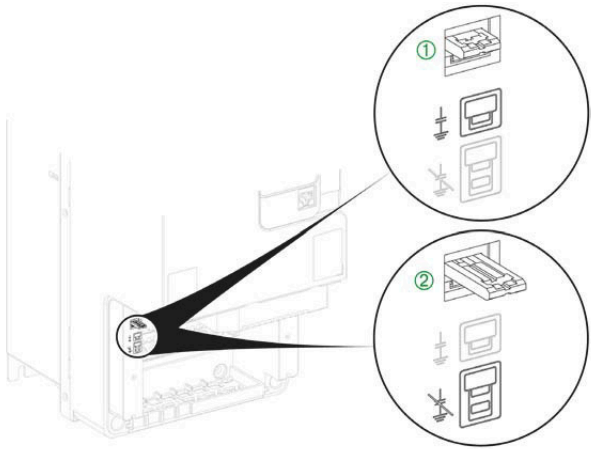
1) The switch is **factory set** to position ⏚, as shown in the detailed view (1).
2) To disconnect the integrated EMC filter ⏚, move the switch to position (2) as per the detailed view.



Setting for size 3

To set the inverter for operation with or without an IT system, follow the instructions below:

1) Remove the front cover.
2) The switch is **factory set** to position ⏚, as shown in the detailed view (1).
3) To disconnect the integrated EMC filter ⏚, move the switch to position (2) as per the detailed view.
4) Replace the front cover.



Setting for sizes 4 and 5

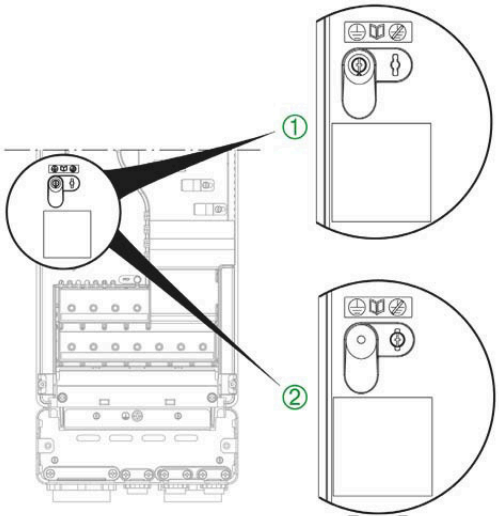
To set the inverter for operation with or without an IT system, follow the instructions below.

1) Remove the front cover.
2) The screw is **factory set** to position ⏚, as shown in the detailed view (1).
3) To disconnect the integrated EMC filter, remove the screw and move it to position ⏚, as shown in the detailed view (2).
4) Replace the front cover.

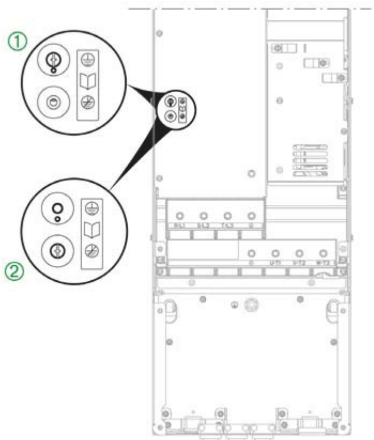
Note:

- **Only use the supplied screws.**
- **Do not start up the inverter if the mounting screws have been removed.**

Setting for size 4 products



Setting for size 5 products



4.4.4 Power unit

4.4.4.1 Wiring the power unit

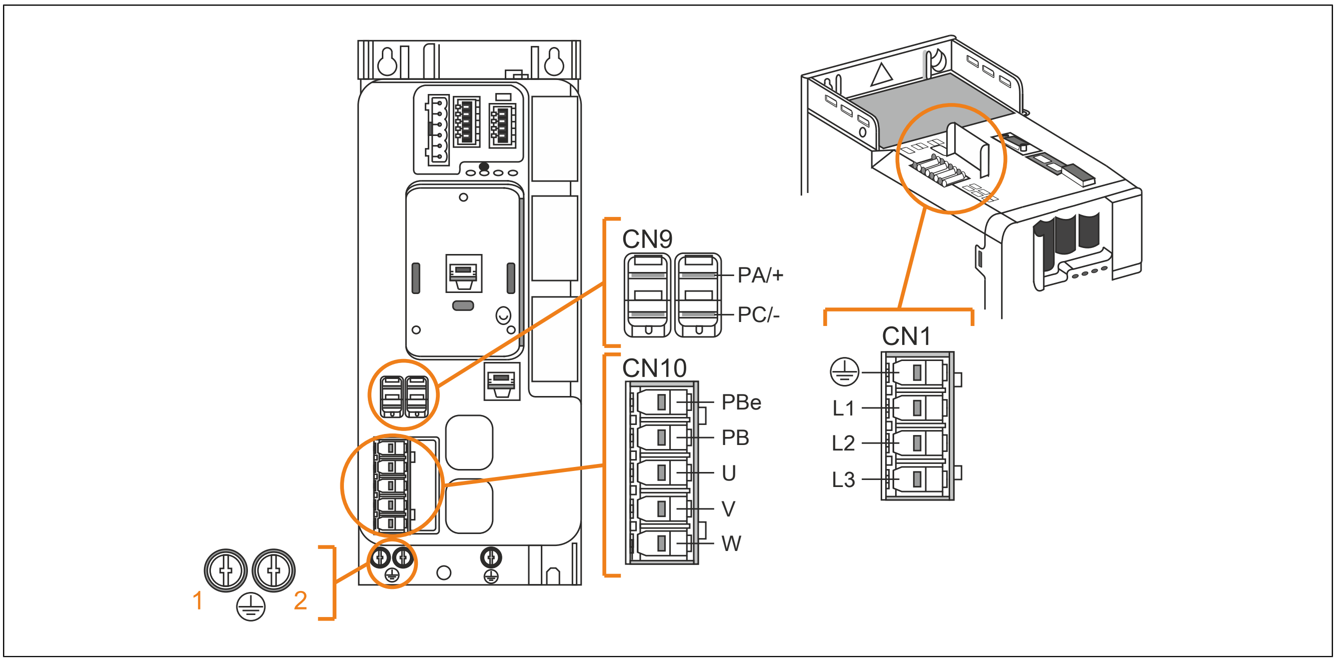
Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

Check that the cable has been installed correctly!

Failure to follow these instructions will result in death or serious injury.

Arrangement of power terminals for sizes 1 and 2



Functions of power terminals for sizes 1 and 2

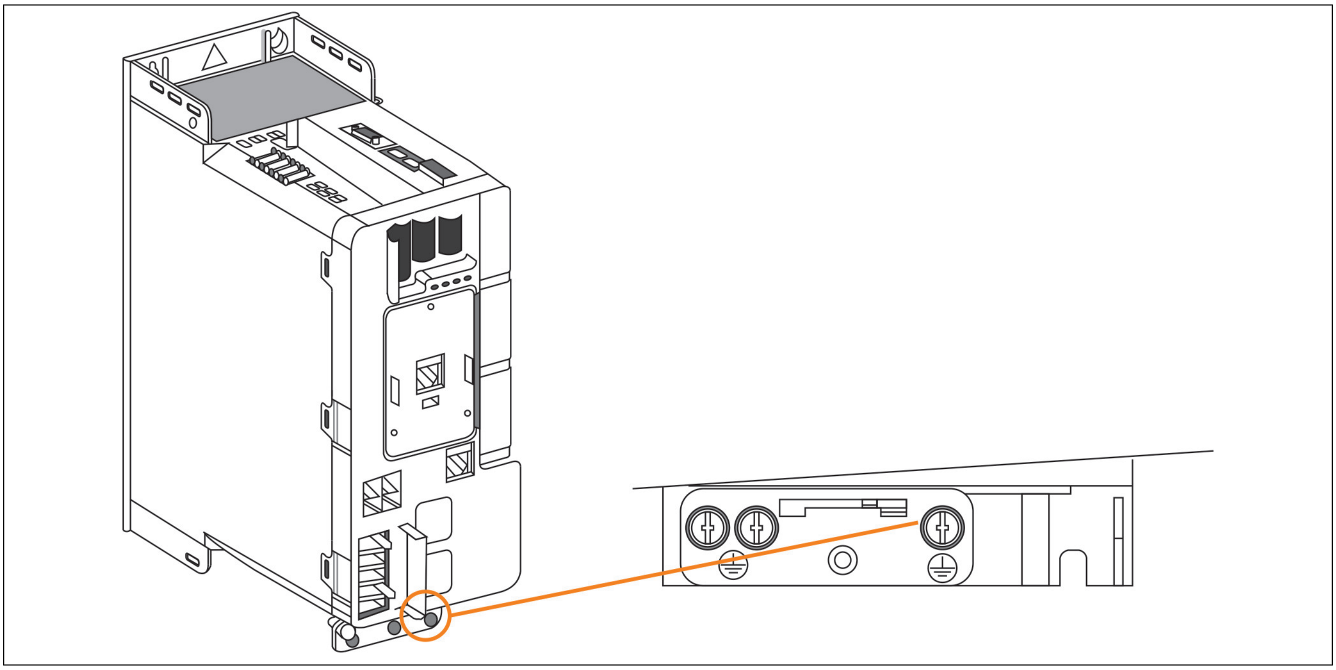
Terminal	Connector	Function
L3/T - L2/S - L1/R - ⏚	CN1	Mains supply and input ground terminal
PA/+	CN9	DC bus polarity +
PC/-	CN9	DC bus polarity
W/T3 - V/T2 - U/T1 - PB - PBe	CN10	Output-side motor connection W/T3 - V/T2 - U/T1, output to the braking resistor PB - PBe[1)]
⏚		Output-side ground terminal (1) and ground terminal of the braking resistor (2).

1) For additional information about the optional braking resistor, see www.br-automation.com.

Connecting the additional protective ground terminal (PE)

Connect the additional protective ground terminal of the device to the central grounding point of the system.

Mounting orientation of the additional protective ground terminal for size 1 and 2 inverters:



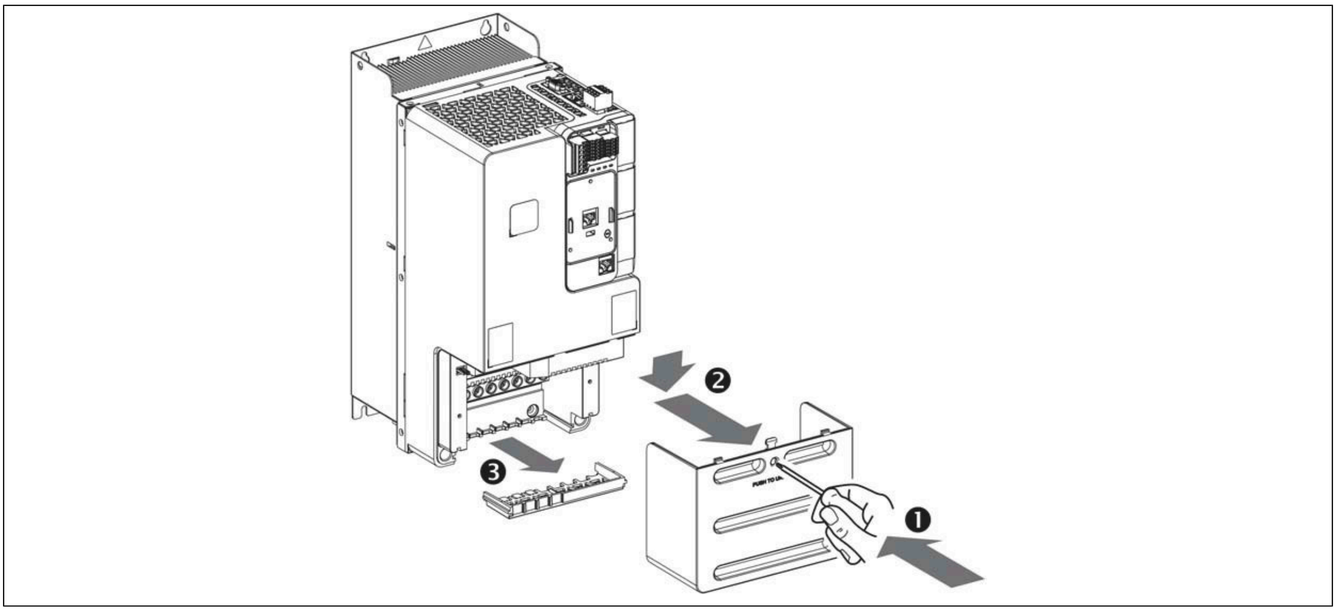
Accessing the terminals for size 3

Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

Before completing any of the procedures described in this section, carefully read through the instructions provided in section "Safety information".

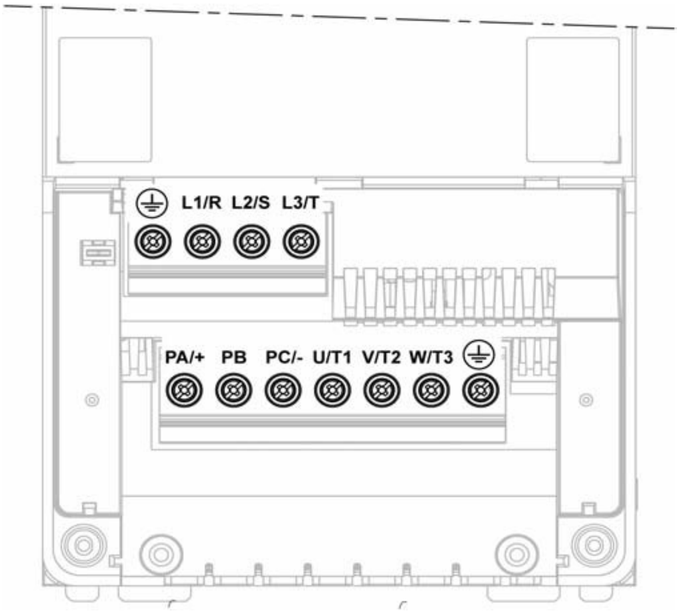
Failure to follow these instructions will result in death or serious injury.



To access the terminals for size 3 inverters, follow the instructions below.

1) Unlatch the cover by pressing with a screwdriver.
2) Remove the front cover.
3) Remove the wire clamp.

Arrangement of power terminals for size 3



Functions of power terminals for size 3

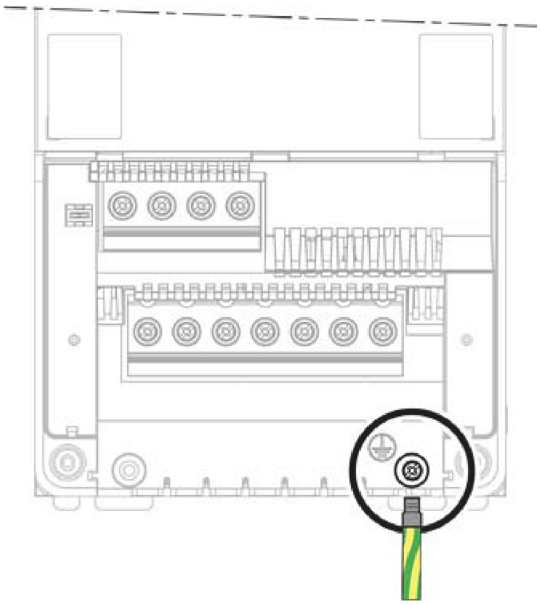
Terminal	Function
L3/T - L2/S - L1/R - ⏚	Mains supply and input ground terminal
PA/+	Output to braking resistor (DC bus + polarity)
PC/-	DC bus (-) polarity
W/T3 - V/T2 - U/T1 - PB	Output-side motor connection W/T3 - V/T2 - U/T1, output to the braking resistor PB [1)]
⏚	Ground terminal

1) For additional information about the optional braking resistor, see www.br-automation.com.

Connecting the additional protective ground terminal (PE)

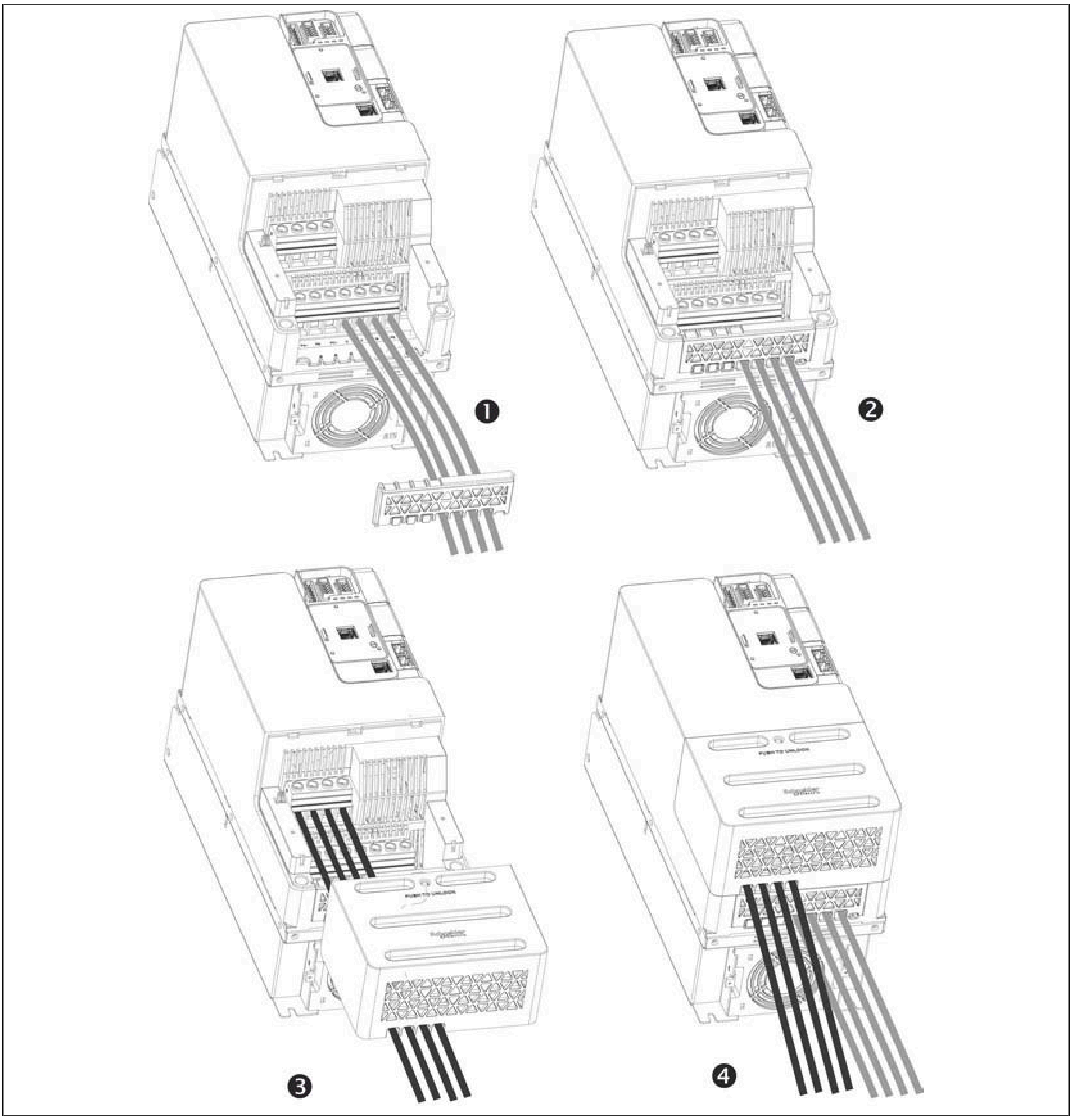
Connect the ground terminal of the device to the central grounding point of the system.

Mounting orientation of the additional protective ground terminal for size 3 inverters:



Use the special ring terminal end.

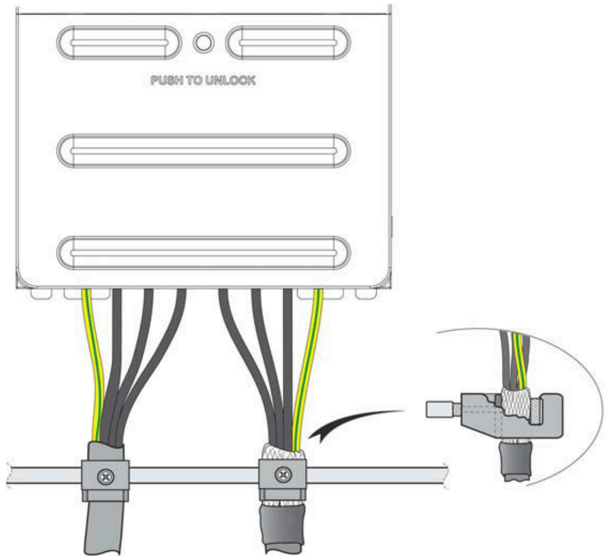
Installing the power cables



Carry out the following instructions:

1) Secure and install the motor cable.
2) Reattach the wire clamp.
3) Secure and install the power cable.
4) Reattach the power cable cover.

Securing the power cables



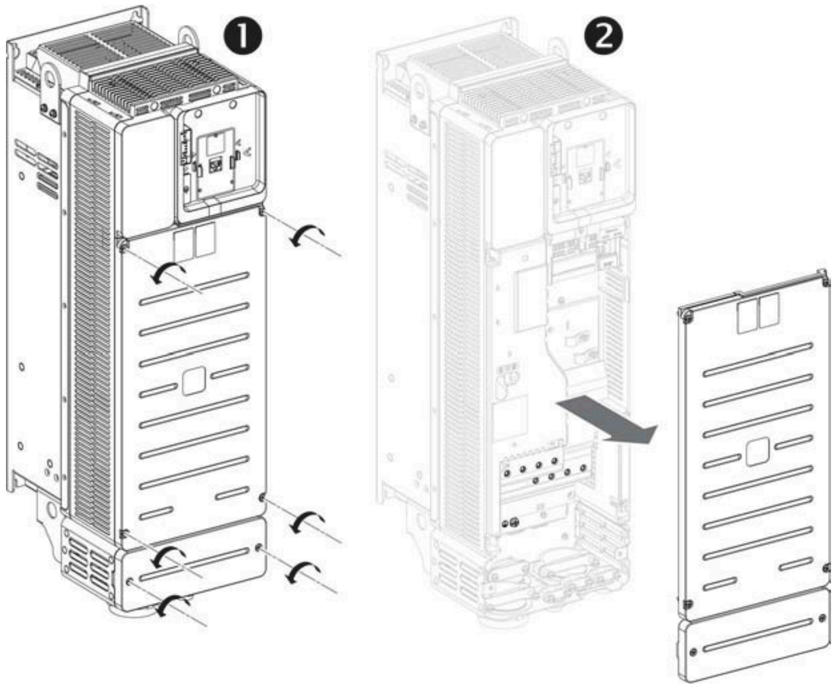
Accessing the terminals for sizes 4 and 5

Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

Before completing any of the procedures described in this section, carefully read through the instructions provided in section "Safety information".

Failure to follow these instructions will result in death or serious injury.



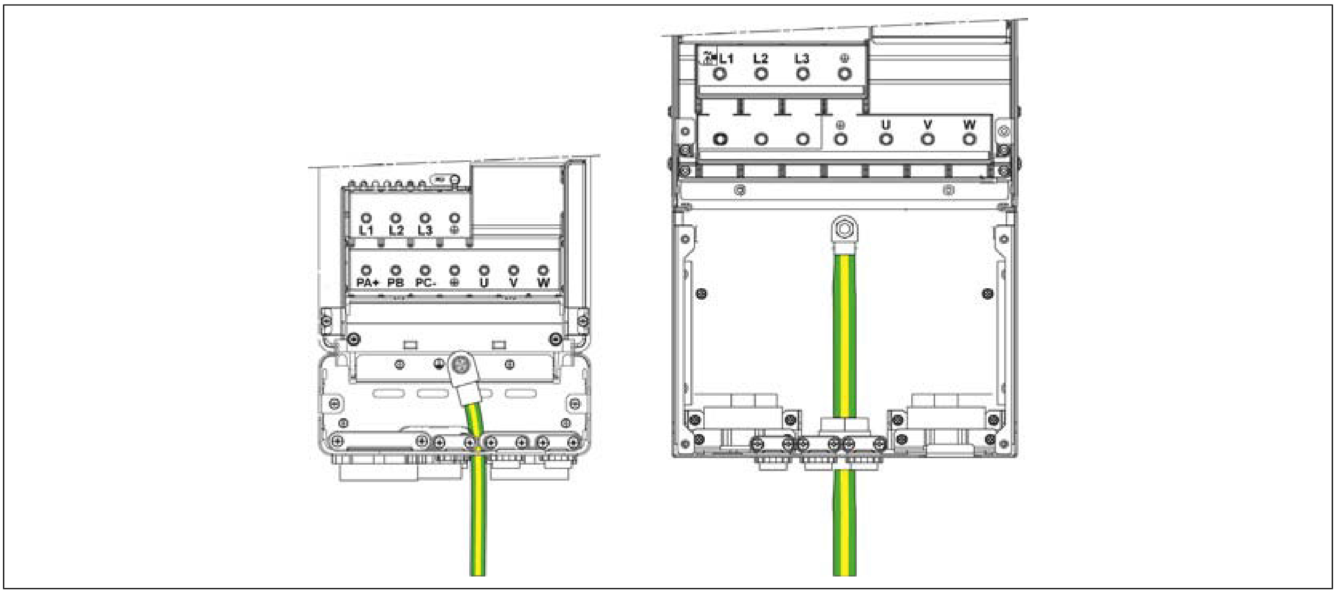
To access the terminals for size 4 and 5 inverters, follow the instructions below.

1) Remove the six screws of the housing fastening.
2) Remove the front covers.

Connecting the additional protective ground terminal (PE)

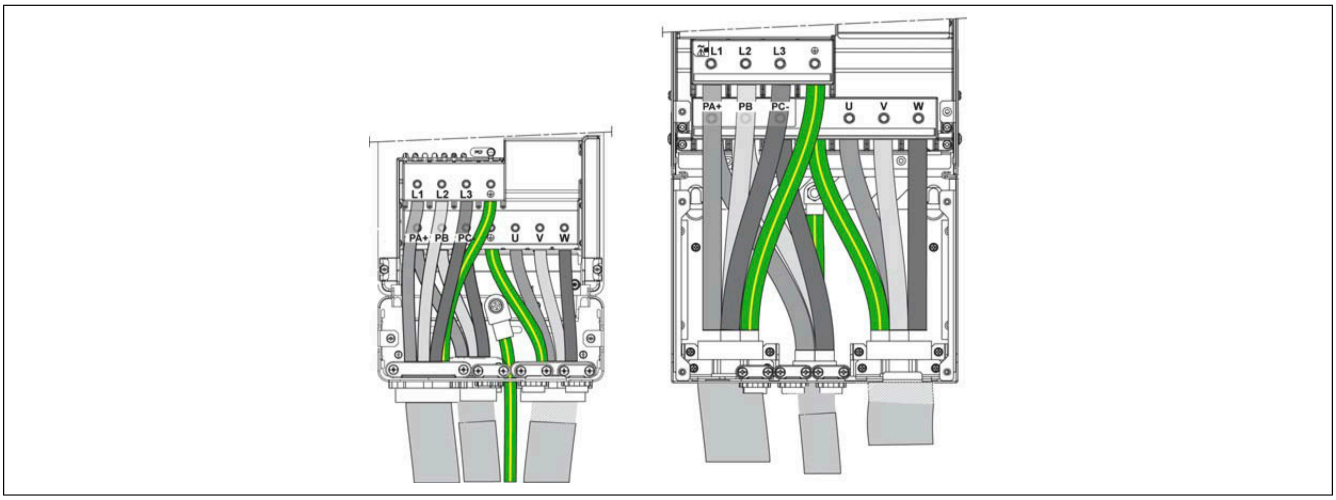
Connect the ground terminal of the device to the central grounding point of the system.

Mounting orientation of the additional protective ground terminal for size 4 and 5 inverters:



Arrangement of power terminals for sizes 4 and 5 and cable routing

Wire the power cables as shown below.



4.4.4.2 Characteristics of the power unit terminals

Additional connection cables for protective ground (PE)

The cross sections of the ground cable at the input and output side correspond to the cross sections of the input and output cable.
The cross section for the protective ground cable must be a minimum of 10 mm² (8 AWG) for copper cables (CU) and 16 mm² (6 AWG) for aluminum cables (AL).
Due to high discharge current, an additional protective ground connection must be wired.

Size 1

Power supply terminals and output terminals

ACOPOSinverter P86	Supply terminals (L1, L2, L3, PE) CN1 connectors			Output terminals (U, V, W, PB, PBe) CN10 connectors		
	Cable cross section		Tightening torque	Cable cross section		Tightening torque
	Min.	Max.[1)]	Nominal value	Min.	Max.[1)]	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000	1.5 (14)	4 (12)	0.69 (6.1)	1.5 (14)	4 (12)	0.69 (6.1)

1) Maximum permissible terminal cross section

DC bus terminals

ACOPOSinverter P86	DC bus terminals (PA/+, PC/-) CN9 connectors	
	Cable cross section	
	Min.	Max.[1)]
	mm² (AWG)	mm² (AWG)
8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000	4 (12)	6 (10)

1) Maximum permissible terminal cross section

Tightening torques of the additional protective ground connection:

- Top ground connection: 2.6 Nm (23.01 lb.in) - CN1 connectors
- Lower ground connection: 0.69 N (6.1 lb.in) - CN10 connectors

Size 2

Power supply terminals and output terminals

ACOPOSinverter P86	Supply terminals (L1, L2, L3, PE) CN1 connectors			Output terminals (U, V, W, PB, PBe) CN10 connectors		
	Cable cross section		Tightening torque	Cable cross section		Tightening torque
	Min.	Max.1)	Nominal value	Min.	Max.1)	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T400550.00-000	1.5 (14)	6 (10)	1.8 (16)	1.5 (14)	6 (10)	1.8 (16)
8I86T400750.00-000	2.5 (12)	6 (10)	1.8 (16)	1.5 (14)	6 (10)	1.8 (16)

1) Maximum permissible terminal cross section

DC bus terminals

ACOPOSinverter P86	DC bus terminals (PA/+, PC/-) CN9 connectors	
	Cable cross section	
	Min.	Max.1)
	mm² (AWG)	mm² (AWG)
8I86T400550.00-000, 8I86T400750.00-000	4 (12)	6 (10)

1) Maximum permissible terminal cross section

Tightening torques of the additional protective ground connection:

- Top ground connection: 2.6 Nm (23.01 lb.in) - CN1 connectors
- Lower ground connection: 0.69 N (6.1 lb.in) - CN10 connectors

Size 3

Power supply terminals and output terminals

ACOPOSinverter P86	Supply terminals (L1, L2, L3, PE) CN1 connectors			Output terminals (U, V, W, PB) CN10 connectors		
	Cable cross section		Tightening torque	Cable cross section		Tightening torque
	Min.	Max.1)	Nominal value	Min.	Max.1)	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T401100.00-000	4 (10)	25 (3)	3.8 (33.6)	2.5 (12)	25 (3)	3.8 (33.6)
8I86T401500.00-000	6 (8)	25 (3)	3.8 (33.6)	4 (10)	25 (3)	3.8 (33.6)
8I86T401850.00-000	10 (8)	25 (3)	3.8 (33.6)	6 (8)	25 (3)	3.8 (33.6)
8I86T402200.00-000	10 (8)	25 (3)	3.8 (33.6)	6 (8)	25 (3)	3.8 (33.6)

1) Maximum permissible terminal cross section

DC bus and braking resistor terminals

ACOPOSinverter P86	DC bus terminals (PA/+, PC/-) - CN9 connectors and PB - CN8 connectors		
	Cable cross section		Tightening torque
	Min.	Max.1)	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T401100.00-000	4 (10)	25 (3)	3.8 (33.6)
8I86T401500.00-000	6 (8)	25 (3)	3.8 (33.6)
8I86T401850.00-000	10 (8)	25 (3)	3.8 (33.6)
8I86T402200.00-000	10 (6)	25 (3)	3.8 (33.6)

1) Maximum permissible terminal cross section

Tightening torques of the additional protective ground connection:

- Top ground connection: 2.6 Nm (23.01 lb.in) - CN1 connectors
- Lower ground connection: 0.69 N (6.1 lb.in) - CN10 connectors

Size 4

Power supply terminals and output terminals

ACOPOSinverter P86	Supply terminals (L1, L2, L3, PE)			Output terminals (U, V, W, PB)		
	Cable cross section		Tightening torque	Cable cross section		Tightening torque
	Min.	Max.[1]	Nominal value	Min.	Max.[1]	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T403000.00-000	35 (3)	50 (1)	10 (88.5)	35 (3)	50 (1)	10 (88.5)
8I86T401370.00-000	35 (2)	50 (1)	10 (88.5)	50 (1)	50 (1)	10 (88.5)

1) Maximum permissible terminal cross section

DC bus and braking resistor terminals

ACOPOSinverter P86	DC bus terminals (PA/+, PB, PC/-)		
	Cable cross section		Tightening torque
	Min.	Max.[1]	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T403000.00-000	25 (4)	50 (1)	10 (88.5)
8I86T403700.00-000	35 (3)	50 (1)	10 (88.5)

1) Maximum permissible terminal cross section

Tightening torques of the additional protective ground connection:

- 5 N (44.2 lb.in)

Size 5

Power supply terminals and output terminals

ACOPOSinverter P86	Supply terminals (L1, L2, L3, PE)			Output terminals (U, V, W, PB)		
	Cable cross section		Tightening torque	Cable cross section		Tightening torque
	Min.	Max.[1]	Nominal value	Min.	Max.[1]	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T404500.00-000	70 (1/0)	120 (250 MCM)	18 (159.3)	70 (1/0)	120 (250 MCM)	18 (159.3)
8I86T401550.00-000	95 (3/0)	120 (250 MCM)	18 (159.3)	95 (3/0)	120 (250 MCM)	18 (159.3)
8I86T401750.00-000	120 (4/0)	120 (250 MCM)	18 (159.3)	120 (250 MCM)	120 (250 MCM)	18 (159.3)

1) Maximum permissible terminal cross section

DC bus and braking resistor terminals

ACOPOSinverter P86	DC bus terminals (PA/+, PB, PC/-)		
	Cable cross section		Tightening torque
	Min.	Max.[1]	Nominal value
	mm² (AWG)	mm² (AWG)	Nm (lb.in)
8I86T404500.00-000, 8I86T405500.00-000	70 (1/0)	120 (250 MCM)	18 (159.3)
8I86T407500.00-000	95 (3/0)	120 (250 MCM)	18 (159.3)

1) Maximum permissible terminal cross section

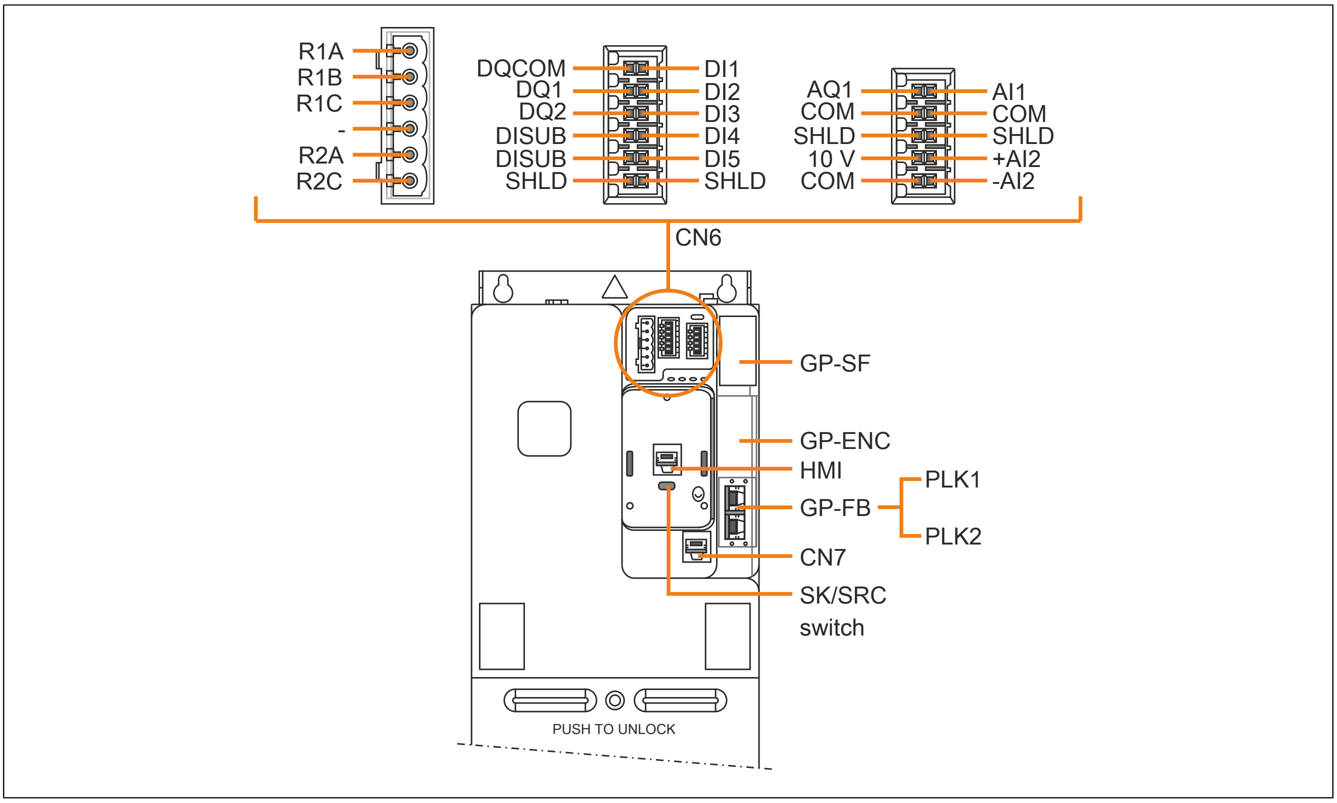
Tightening torques of the additional protective ground connection:

- 10 N (88.5 lb.in)

4.4.5 Control element

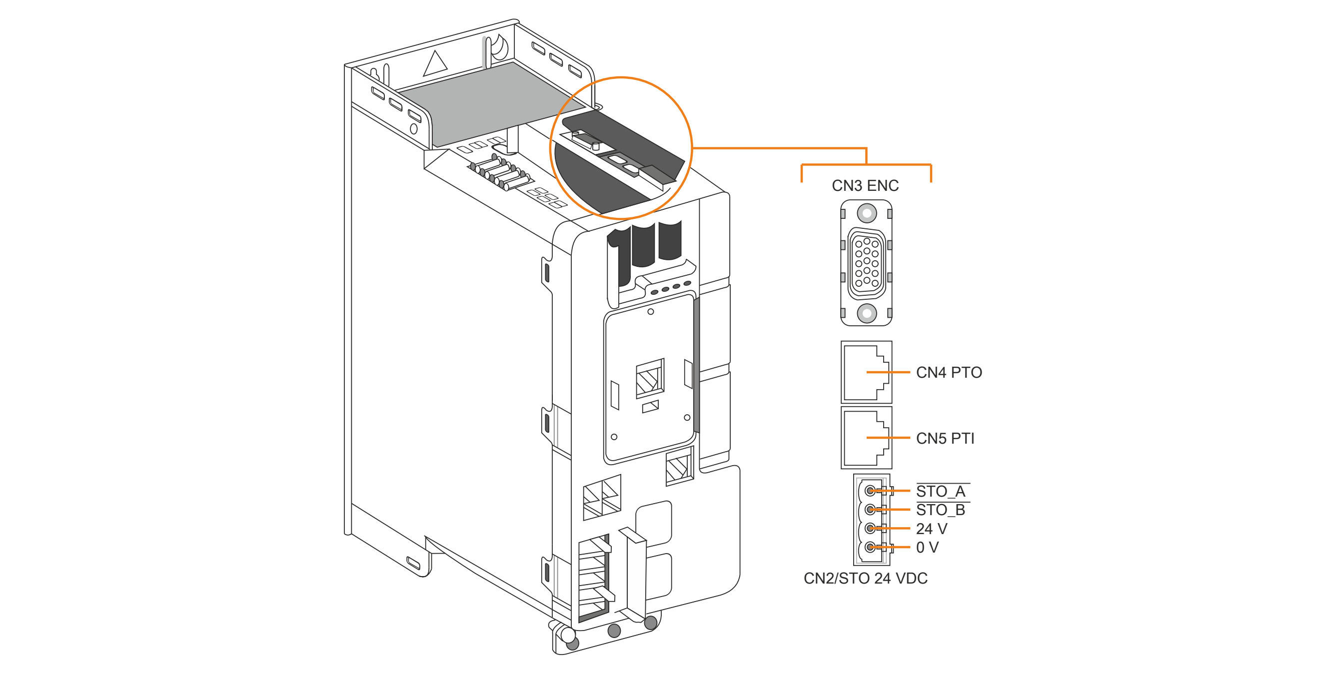
4.4.5.1 Arrangement and characteristics of control block terminals and communication and input/output ports

Size 1, 2 and 3 front control terminals



Connectors/Switches	Description
GP-SF	Slot for safety module
GP-ENC	Slot for encoder module
HMI	RJ45 port for direct connection of a text terminal (8I0XD086.400-1)
GP-FB	Slot for communication module (2x RJ45 for POWERLINK preinstalled)
CN7	Modbus VP12S port for connection to a PC (use with commissioning software ACPi SafeConfigurator via USB adapter cable 8I0XC001.003-1)
SK/EXT/SRC switch	Switch for sink/source (see "Configuration as sink/source" on page 66)
CN6	Analog and digital inputs and outputs, relay outputs, etc.

Top control terminals - Mounting orientation for sizes 1, 2 and 3



Connectors/Switches	Description
CN3 ENC	Integrated encoder
CN4	PTO (pulse train output)
CN5	PTI (pulse train input)
CN2/STO 24 VDC	STO ("Safe Torque Off")

Connection characteristics - Sizes 1, 2 and 3

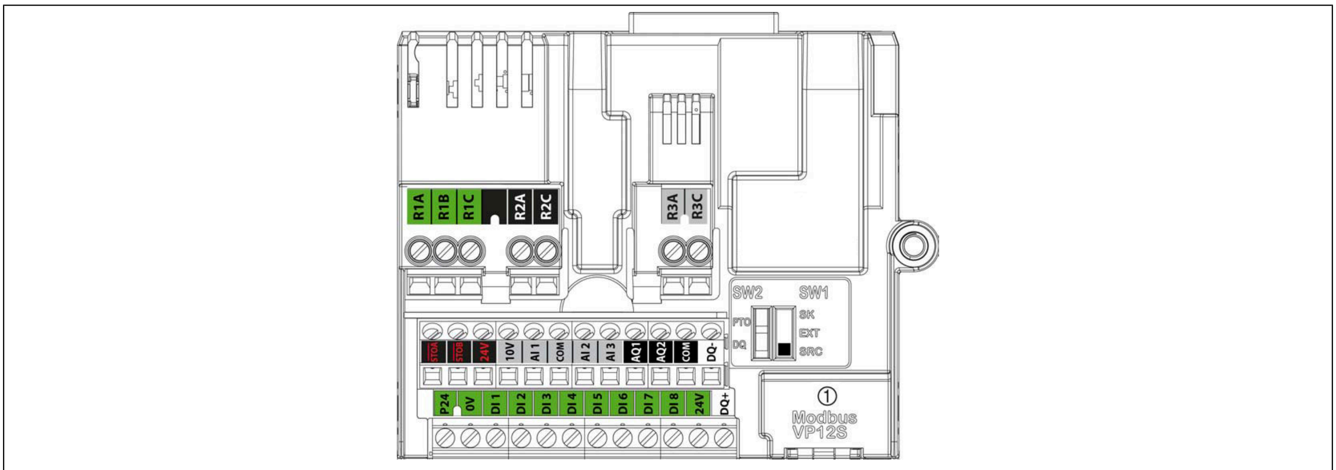
Cable cross sections and tightening torques. The cross section values are specified with wire end sleeve.

Control terminals	Cable cross section for relay output		Cross section for various cables		Tightening torque Rnx
	Min.1)	Max.	Min.1)	Max.	
	mm² (AWG)	mm² (AWG)	mm² (AWG)	mm² (AWG)	Nm (lb.in)
CN6 terminals	0.25 (24)	2.5 (14)	0.25 (24)	1 (16)	0.5 (4.4)

1) The value corresponds to the minimum permitted cross section for the terminal.

Control terminals - Sizes 4 and 5

The control block terminals for sizes 4 and 5 are the same.



(1) Serial Modbus

Note:

Modbus VP12S: This is the marking for the default serial Modbus connection. VPxS indicates a connector with power supply, where 12 stands for 12 VDC supply voltage.

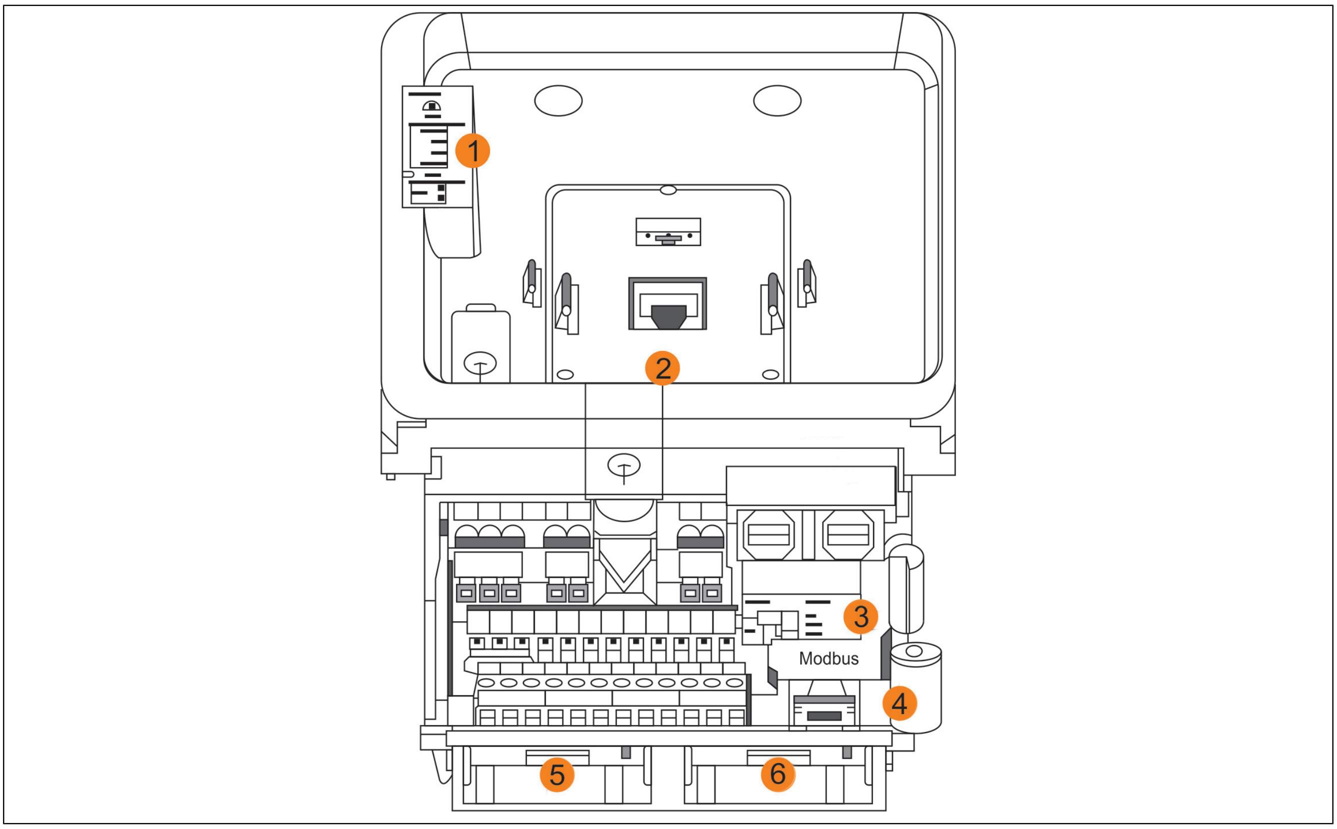
Connection characteristics

Cable cross sections and tightening torque

Control terminals	Cable cross section for relay output		Cross section for various cables		Tightening torque
	Min.[1]	Max.	Min.[1]	Max.	
	mm² (AWG)	mm² (AWG)	mm² (AWG)	mm² (AWG)	Nm (lb.in)
All terminals	0.75 (18)	1.5 (16)	0.5 (2.0)	1.5 (16)	0.5 (4.4)

1) The value corresponds to the minimum permitted cross section for the terminal.

Control block ports



Legend

1) Inverter LED status indicators
2) RJ45 port for direct connection of a text terminal or for connecting a graphic display terminal via cable
3) "SK-EXT-SRC" switch SW1 and "PTO-DQ" switch SW2
4) Modbus VP12S port for connection to a PC (use with commissioning software ACPi SafeConfigurator via USB adapter cable 8I0XC001.003-1)
5) Slot B for encoder module
6) Slot A for communication module (2x RJ45 for POWERLINK preinstalled)

4.4.5.2 Electrical data to the control terminals for sizes 1, 2 and 3

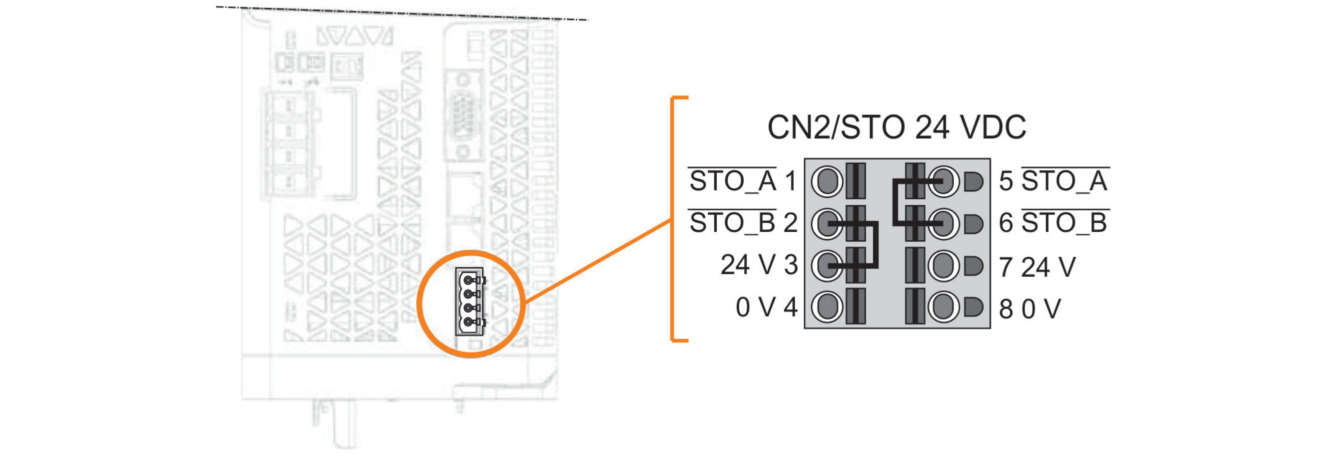
General information

This section contains technical data regarding the control terminals for sizes 1, 2 and 3. The electrical data of the control terminals for sizes 1, 2 and 3 differ from those for sizes 4 and 5.

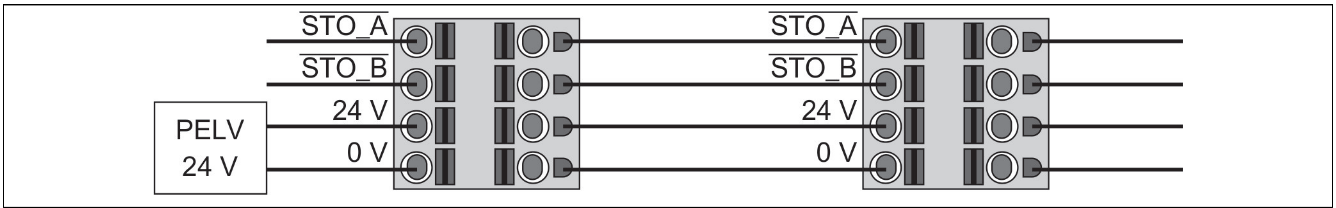
Note:

- **For a description of the terminal arrangement, see the section about the arrangement and characteristics of the control terminals and communication and input/output ports (see "Arrangement and characteristics of control block terminals and communication and input/output ports" on page 87).**
- **For a complete description of the LEDs, see the section about the product LEDs (see "Product LEDs" on page 105) or the programming instructions.**

Upper CN2 connector

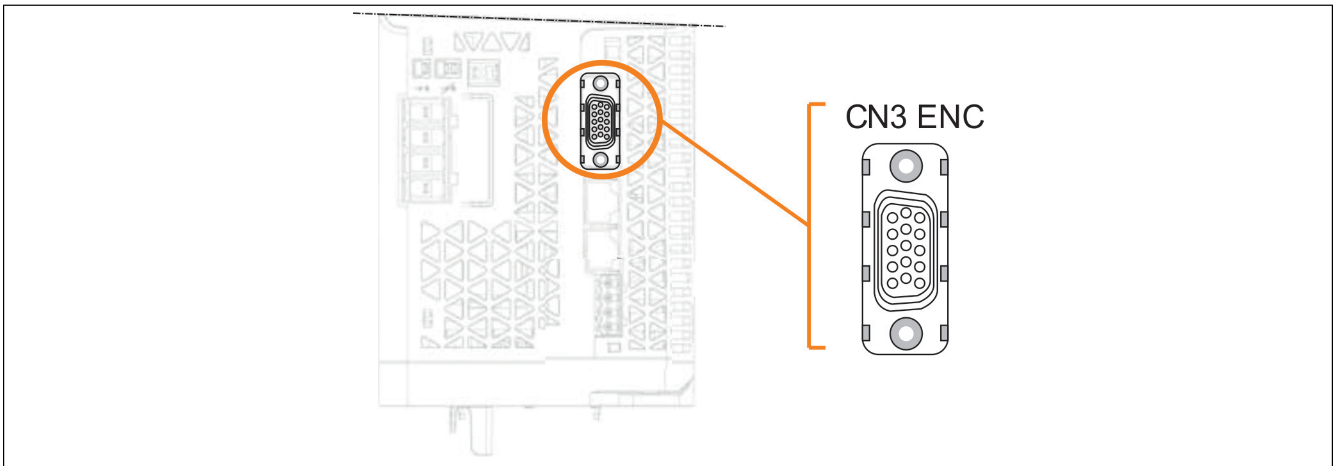


Alternative connection: Wiring from inverter to inverter



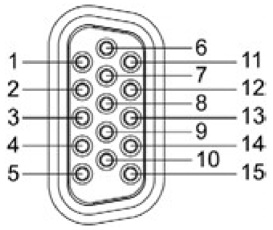
Terminal	Description	Input/Output type	Electrical characteristics
/STO_A, /STO_B	STO inputs, SIL 3	Input	Safety function STO inputs
24 V	Output: Power supply for digital inputs and STO inputs of the safety function Input: External 24 V power supply of the controller	Input/Output	• Maximum input current: 1 A • 24 VDC • Tolerance: Min. 20.4 VDC, max. 27 VDC • Maximum output current: 200 mA • Terminal protected against overload and short circuit • The 24 V output can be set via menu [24 V Supply Output] (S24V) can be disabled to avoid a possible 24 VDC bus power supply of other loads. The 24 VDC power supply is enabled by default. The external 24 VDC power supply of the controller must meet the requirements of IEC 61131-2 (protective extra-low voltage of standard power supply).
0 V	Reference for 24 V power supply		

Upper CN3 connector



Terminal	Description	Input/Output type	Electrical characteristics
ENC	Integrated encoder	Input/Output	SUB-HD-15 internal thread • Digital encoder 5 V RS422 A/B/I • Analog encoder 1 Vpp sin/cos Encoder power supply: • 5 V (max. 10 m (32.8 ft), 250 mA • 12 V, 250 mA • 24 V, 100 mA • Temperature sensor input PTx

Connector type: The encoder interface is designed as a high-density 15-pin female sub-HD connector. Screw locking thread 4-40 UNC



Pin signal - Function and electrical characteristics

Pin	Signal name	Function/Explanation	Electrical characteristics
1	DATA_A+	Data channel A	RS422/RS485, R_{in} 121 Ω, max. 1 Mbit
2	DATA_A-		
3	ENC+24V_OUT	Encoder power supply 24 VDC	24 VDC / 100 mA
4	DATA_I+	Data channel I	RS422/RS485, R_{in} 121 Ω, max. 1 Mbit
5	DATA_I-		
6	SIN	Analog sine input	1 Vpp, max. 100 kHz
7	ENC+12V_OUT	Encoder power supply 12 VDC	12 VDC / 100 mA
8	ENC_0V	Reference potential for encoder power supply or reference for temperature measurement	-
9	TEMP_SENSE	Temperature sensor input	Supported sensors: PTC, Klixon
10	DATA_B+	Data channel B	RS422/RS485, R_{in} 121 Ω, max. 1 Mbit
11	DATA_B-		
12	COS	Cosine analog input	1 Vpp, max. 100 kHz
13	REFCOS	Reference for cosine	1 Vpp, max. 100 kHz
14	REFSIN	Reference for analog sine input	1 Vpp, max. 100 kHz
15	ENC+5V_OUT	Encoder power supply 5 VDC	5 VDC / 250 mA
Shielding		Overall cable shield for signal lines	The shielding is connected in the connector via the housing.

Warning!

There are two ways to connect an AB encoder with a SUB-D 15 type connector to the inverter. However, the pinout of the onboard interface (CN3) differs from optional encoder card see "8I0IFENC.400-1" on page 472. Encoder attachment cables made for an encoder card thus cannot be used on the onboard interface.

There are two ways to connect a SinCos encoder with a SUB-D 15 type connector to the inverter. However, the pinout of the onboard interface (CN3) differs from optional encoder card see "8I0IFENC.401-1" on page 473. Encoder attachment cables made for an encoder card thus cannot be used on the onboard interface.

Pin	Twisted pair digital	Twisted pair analog	ABI	Sin/Cos 1 Vpp	Input/Output
1	1	NC	Required	-	Input/Output
2					
3	4a[1]	4a[1]	-	-	Output
4	3	NC	Required	-	Input
5					
6	NC	2	-	Required	Output
7	4b[1]	4b[1]	-	-	Output
8	4 or 5	4 or 5	Required	Required	-
9	5	5	Optional	Optional	Input
10	2	NC	Required	-	Input
11					
12	NC	3	-	Required	-
13					
14	NC	2	-	Required	Output
15	4c[1]	4c[1]	-	-	Output
Shielding			Required	Required	-

1) Wiring depending on the selected supply voltage

Special features:

- Open-circuit detection on channel DATA_A and DATA_B
- Safety: SIL 1 (SC SIL 2)

Note:

- **The encoder cable connector must be screwed to encoder interface CN3, and the cable must be installed on the control cabinet backplane and on the top of the inverter.**

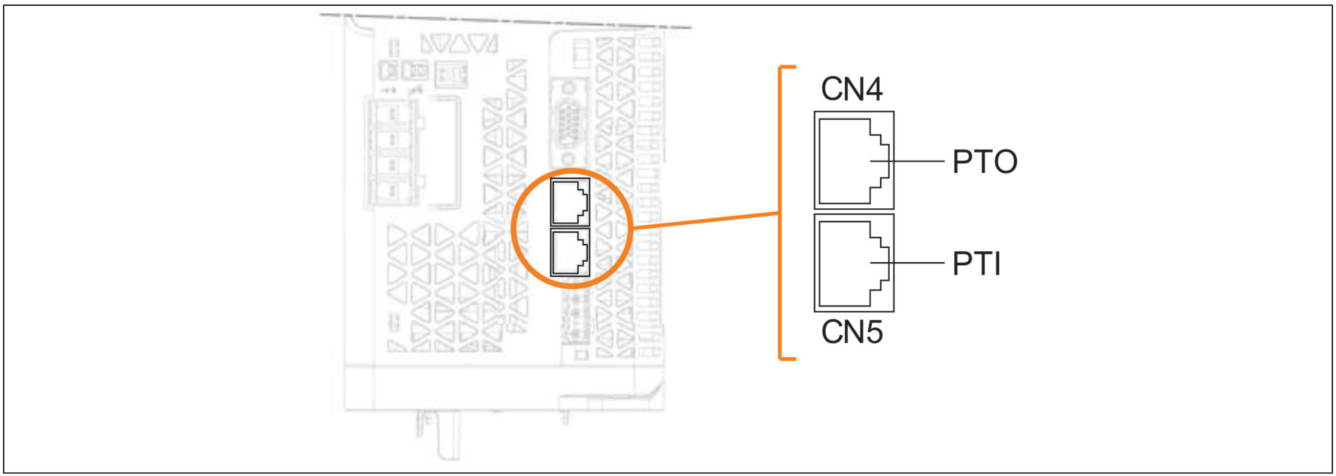
Tips for the cable connection:

- Before connecting the encoder cable, ensure that no signals are short-circuited.
- To enable the 24 V power supply of the encoder, see parameter **[24 V Supply Output]** (S24V).
- EMC performance can be improved by using a UNC screw mounting to properly secure the encoder connector to the CN3 interface. This applies especially if the inverter is frequently exposed to vibrations.
- The encoder cable must be fixed to the top of the inverter (use cable ties on the plastic disc) or to the backplane of the control cabinet to prevent tensile stress.

Maximum cable length according to the encoder power supply:

- 12 VDC / 24 VDC: 100 m (328 ft)
- 5 VDC: 10 m (32.8 ft)

Upper CN4 connector

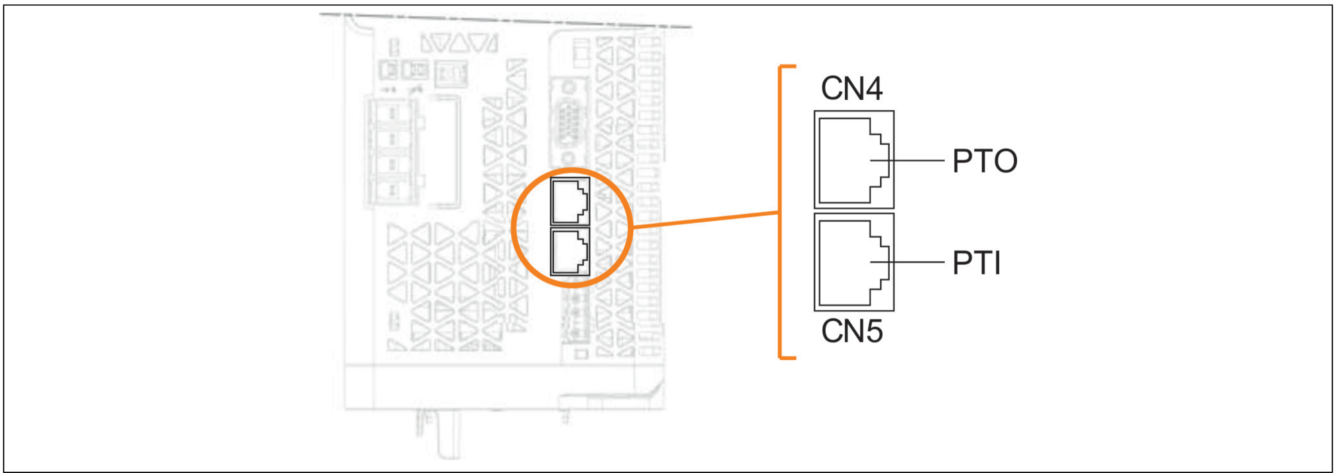


Terminal	Description	Input/Output type	Electrical characteristics
PTO	Pulse train output	Output	5 VDC differential RS422 signals • Logic level per RS422 • Output frequency per signal ≤500 kHz • Motor increments per second ≤1.6 x 106 inc/s

Recommended encoder cable:

- Both ends grounded
- Twisted wire pair
- PELV
- Minimum wire cross section: 0.14 mm² (24 AWG)
- Maximum length: 100 m (328 ft)

Upper CN5 connector



Terminal	Description	Input/Output type	Electrical characteristics
PTI	Pulse train input	Input	5 VDC or 24 VDC signals. The following signals can be connected: • A/B signals • P/D signals (pulse/direction) • CW/CCW signals (clockwise / counterclockwise)

Recommended encoder cable:

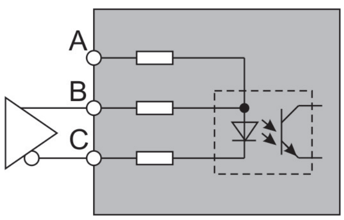
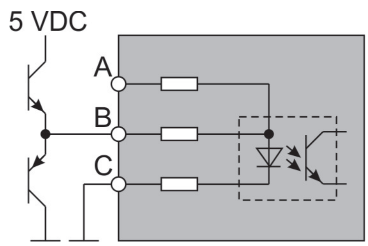
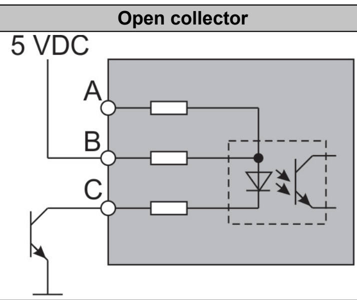
- Both ends grounded
- Twisted wire pair
- PELV
- Minimum wire cross section: 0.14 mm² (24 AWG)

PTI - Input circuit and method selection

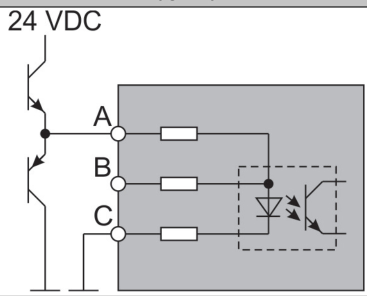
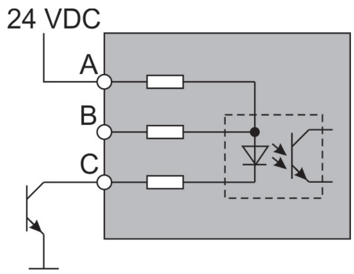
The input circuit and selected method influence the maximum permissible input frequency and maximum permissible cable length:

Input circuit	Unit	RS422	Push-Pull	Open collector
Minimum input frequency with position synchronization method	Hz	0	0	0
Minimum input frequency with speed synchronization method	Hz	100	100	100
Maximum input frequency	MHz	1	0.2	0.01
Maximum cable length	m (ft)	100 (328)	10 (32.8)	1 (3.28)

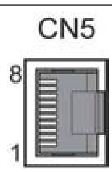
PTI - Signal input circuits 5 VDC

RS422	Push-Pull	Open collector
		

PTI - Signal input circuits 24 VDC

Push-Pull	Open collector
	

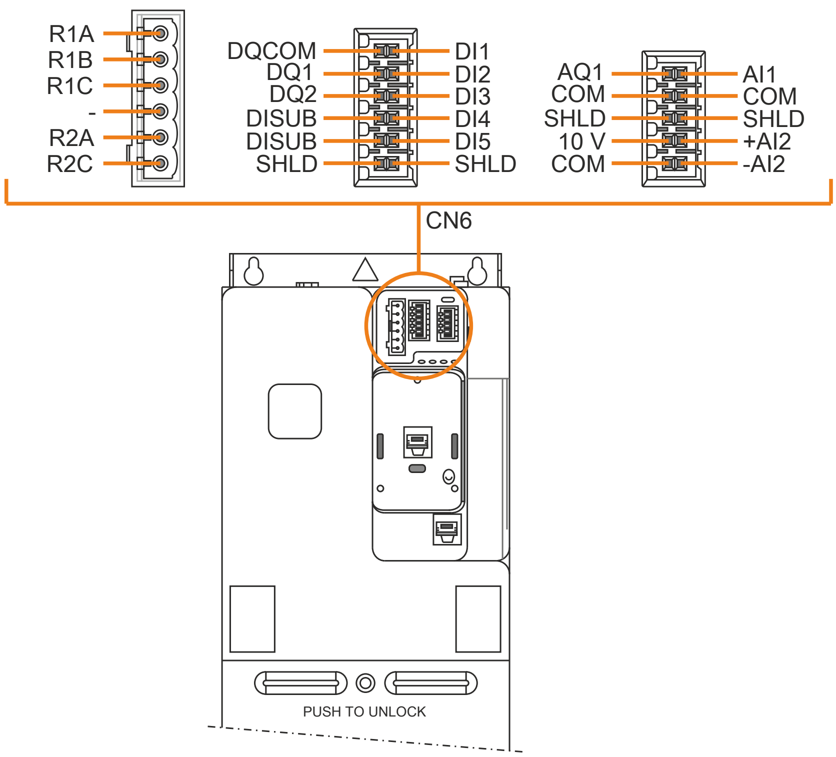
PTI - Detail of connection pins



PTI signal	Pin	RS422 or 5 VDC[1]		24 VDC	
		Twisted wire pair	Function	Twisted wire pair	Function
A/B	1	A	Encoder channel A, 5 VDC	-	-
	2	A	Encoder channel A, inverted	A	Encoder channel A, inverted
	3	-	-	-	-
	4	B	Encoder channel B, 5 VDC	-	-
	5	B	Encoder channel B, inverted	B	Encoder channel B, inverted
	6	-	-	-	-
	7	-	-	A	Encoder channel A, 24 VDC
	8	-	-	B	Encoder channel B, 24 VDC
P/D	1	A	Pulse, 5 VDC	-	-
	2	A	Pulse, inverted	A	Pulse, inverted
	3	-	-	-	-
	4	B	Direction, 5 VDC	-	-
	5	B	Direction, inverted	B	Direction, inverted
	6	-	-	-	-
	7	-	-	A	Pulse, 24 VDC
	8	-	-	B	Direction, 24 VDC
CW/CCW	1	A	Pulse positive, 5 VDC	-	-
	2	A	Pulse positive, inverted	A	Pulse positive, inverted
	3	-	-	-	-
	4	B	Pulse negative, 5 VDC	-	-
	5	B	Pulse negative, inverted	B	Pulse negative, inverted
	6	-	-	-	-
	7	-	-	A	Pulse positive, 24 VDC
	8	-	-	B	Pulse negative, 24 VDC

1) Due to the input current of the optocoupler in the input circuit, connecting a driver output to several devices in parallel is not permitted.

Upper CN6 connector



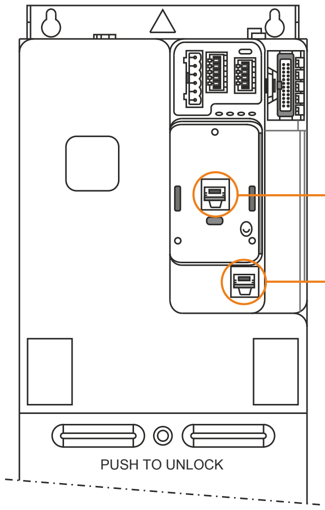
For additional information about sink/source, see "Configuration as sink/source" on page 66.

Terminal	Description	Input/Output type	Electrical characteristics
R1A	Normally open (NO) contact for relay R1	Output	Output relay 1 • Minimum switching capacity: 5 mA for 24 VDC • Maximum switching current for resistive load. (cos ϕ = 1): 3 A for 250 VAC and 30 VDC • Maximum switching current for inductive load: (cos ϕ = 0.4 and L/R = 7 ms): 2 A for 250 VAC and 30 VDC • Update time: 5 ms ±0.5 ms • Service life: 100,000 switching operations at maximum switching current
R1B	Normally closed (NC) contact for relay R1	Output	
R1C	Contact reference point for relay R1	Output	
-	Not wired	NC	Not permitted to be wired in order to help maintain the isolation distance with 230 VAC signals.

Terminal	Description	Input/Output type	Electrical characteristics
R2A	Normally open (NO) contact for relay R2	Output	Output relay 2 • Minimum switching capacity: 5 mA for 24 VDC • Maximum switching current for resistive load. (cos ϕ = 1): 5 A for 250 VAC and 30 VDC • Maximum switching current for inductive load: (cos ϕ = 0.4 and L/R = 7 ms): 2 A for 250 VAC and 30 VDC • Update time: 5 ms ±0.5 ms • Service life: ° 100,000 switching operations at maximum switching capacity ° 500,000 switching operations at 0.5 A for 30 VDC ° 1,000,000 switching operations at 0.5 A for 48 VAC
R2C	Contact reference point for relay R2	Output	
DQCOM	Reference conductor for digital output	Input/Output	Reference conductor for logic output DQx
DQ1	Digital input/output	Input/Output	2 programmable logic inputs/outputs when using configuration menus **[DQ1 Configuration]** (do1) and **[DQ2 Configuration]** (do2) Digital output • Isolated, input impedance 4.4 kΩ • Maximum voltage: 30 VDC • Maximum output current: 100 mA • Frequency range: 0 to 1 kHz • Control of the positive/negative output logic by external user-side wiring. Digital input: Inputs per IEC/EN 61131-2 logic type 1 • Positive logic (source): State 0 at ≤5 VDC or logic input not wired, state 1 at ≥11 VDC • Negative logic (sink): State 0 at ≥16 VDC or logic input not wired, state 1 at ≤10 VDC • Maximum sampling time: 2 ms ±0.5 ms Multiple functions can be configured on one input using multiple assignment.
DQ2			
DISUP	Power supply of the digital inputs	Input/Output	Common power supply for digital inputs on the front potential depending on the position of the switch for sink/source.
SHLD	Input/Output shielding	Input/Output	Shielding for inputs/outputs
DI1 to DI5	Digital inputs	Input	5 programmable logic inputs. 24 VDC input voltage Per IEC/EN 61131-2 logic type 1 • Positive logic (source): State 0 at ≤5 VDC or logic input not wired, state 1 at ≥11 VDC • Negative logic (sink): State 0 at ≥16 VDC or logic input not wired, state 1 at ≤10 VDC • Impedance 4.4 kΩ • Maximum voltage: 30 VDC • Maximum sampling time: 2 ms ±0.5 ms Multiple functions can be configured on one input using multiple assignment. (Example: DI1 assigned to clockwise rotation and preset frequency 2, DI3 assigned to counterclockwise rotation and preset frequency 3.)
AQ1	Analog output	Input	Analog output configurable using software for voltage or current • Analog voltage output min. 0 to 10 VDC. Minimum load impedance 470 Ω • Analog current output X to Y mA by programming X and Y from 0 to 20 mA, maximum load impedance: 500 Ω • Maximum sampling time: 5 ms ±1 ms • Resolution: 10 bits • Accuracy: ±1% with a temperature fluctuation of 60°C • Linearity: ±0.2%

Terminal	Description	Input/Output type	Electrical characteristics
AI1	Analog input and sensor input	Input	V/A configurable using software: Analog voltage or current input • Analog voltage input 0 to 10 VDC, impedance 30 kΩ • Analog current input X to Y mA by programming X and Y from 0 to 20 mA, impedance: 250 Ω • Maximum sampling time: 1 ms ±1 ms • Resolution: 12 bits • Accuracy: ±0.6% with a temperature fluctuation of 60°C # • Linearity: ±0.15% of the maximum value Temperature sensors configurable using software • PT100 ° 1 to 3 temperature sensors in series (configurable using software) ° Sensor current: Maximum 5 mA ° Range -20 to 200°C ° Accuracy ±4°C with a temperature fluctuation of 60°C • PT1000 ° 1 to 3 temperature sensors in series (configurable using software) ° Sensor current: 1 mA ° Range -20 to 200°C ° Accuracy ±4°C with a temperature fluctuation of 60°C • KTY84 ° 1 temperature sensor ° Sensor current: 1 mA ° Range -20 to 200°C ° Accuracy ±4°C with a temperature fluctuation of 60°C • PTC ° Max. 6 sensors, connected in series ° Sensor current: 1 mA ° Nominal value: <1.5 kΩ ° Trigger threshold value for overheating: 2.9 kΩ ±0.2 kΩ ° Reset threshold value for overheating: 1.575 kΩ ±0.75 kΩ ° Threshold value for detecting low impedance: 50 kΩ -10 Ω/+20 Ω ° Low impedance protection <1,000 Ω
COM	Reference wire for analog inputs and outputs	Input/Output	0 V for analog outputs and inputs
SHLD	Shielding for analog inputs and outputs	Input/Output	Shielding for analog inputs/outputs
10 V	Output power supply for analog input / potentiometer reference	Output	Internal power supply for analog inputs • 10.5 VDC • Tolerance ±5% • Current: Maximum 10 mA • Short-circuit protection
AI2+/AI2-	Analog differential input	Input	Analog bipolar voltage input -10 to 10 VDC, impedance 20 kΩ • Maximum sampling time: 1 ms ±1 ms • Resolution: 12 bits • Accuracy: ±0.6% with a temperature fluctuation of 60°C # • Linearity: ±0.15% of the maximum value

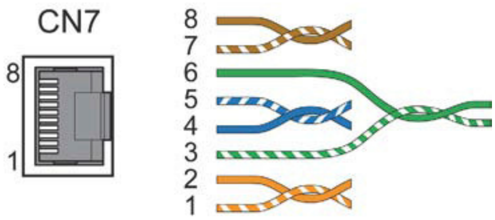
Front connectors



HMI: The purpose is to connect the optional text terminal or graphic display terminal.

Text terminal (8I0XD086.400-1): Can be connected directly to the inverter or installed on an enclosure door using the special kit for door installation (8I0FM086.400-1).

CN7: Modbus VP12S port for connection to a PC (use with commissioning software ACPi SafeConfigurator via USB adapter cable 8I0XC001.003-1)



Detail of connection pins

Pin	Signal	Explanation	Input/Output
1 to 3	-	Reserved	-
4	MOD_D1	Bidirectional transmit/receive signal	RS485 level
5	MOD_D0	Bidirectional transmit/receive signal, inverted	RS485 level
6	-	Reserved	-
7	MOD+10V_OUT	10 V power supply, maximum 100 mA	Output
8	MOD_0V	Reference potential to MOD+10V_OUT	-

4.4.5.3 Electrical data to the control terminals for sizes 4 and 5

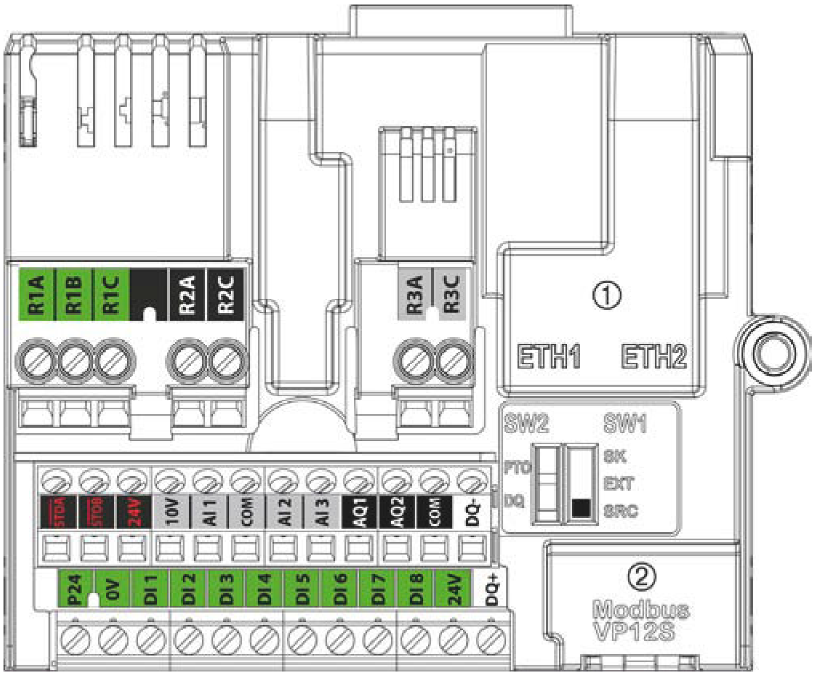
General information

This section contains technical data regarding the control terminals for sizes 4 and 5. The electrical data of the control terminals for sizes 1, 2 and 3 differ from those for sizes 4 and 5.

Note:

- **For a description of the terminal arrangement, see the section about the arrangement and characteristics of the control terminals and communication and input/output ports (see "Arrangement and characteristics of control block terminals and communication and input/output ports" on page 87).**
- **For a complete description of the LEDs, see the section about the product LEDs (see "Product LEDs" on page 105) or the programming instructions.**

Characteristics of control terminals



Note:

- **For a description of the terminal arrangement, see the section about the arrangement and characteristics of the control terminals and communication and input/output ports, Arrangement and characteristics of control block terminals and communication and input/output ports.**

For additional information about sink/source, see "Configuration as sink/source" on page 66.

Terminal	Description	Input/Output type	Electrical characteristics
R1A	Normally open (NO) contact for relay R1	Output	Output relay 1 • Minimum switching capacity: 5 mA for 24 VDC • Maximum switching current for resistive load. (cos ϕ = 1): 3 A for 250 VAC and 30 VDC • Maximum switching current for inductive load: (cos ϕ = 0.4 and L/R = 7 ms): 2 A for 250 VAC and 30 VDC • Update time: 5 ms ±0.5 ms • Service life: 100,000 switching operations at maximum switching current
R1B	Normally closed (NC) contact for relay R1	Output	
R1C	Contact reference point for relay R1	Output	
R2A	Normally open (NO) contact for relay R2	Output	Output relay 2 • Minimum switching capacity: 5 mA for 24 VDC • Maximum switching current for resistive load. (cos ϕ = 1): 5 A for 250 VAC and 30 VDC • Maximum switching current for inductive load: (cos ϕ = 0.4 and L/R = 7 ms): 2 A for 250 VAC and 30 VDC • Update time: 5 ms ±0.5 ms • Service life: ° 100,000 switching operations at maximum switching capacity ° 500,000 switching operations at 0.5 A for 30 VDC ° 1,000,000 switching operations at 0.5 A for 48 VAC
R2C	Contact reference point for relay R2	Output	
R3A	Normally open (NO) contact for relay R3	Output	Output relay 3 • Minimum switching capacity: 5 mA for 24 VDC • Maximum switching current for resistive load. (cos ϕ = 1): 5 A for 250 VAC and 30 VDC • Maximum switching current for inductive load: (cos ϕ = 0.4 and L/R = 7 ms): 2 A for 250 VAC and 30 VDC • Update time: 5 ms ±0.5 ms • Service life: ° 100,000 switching operations at maximum switching capacity ° 500,000 switching operations at 0.5 A for 30 VDC ° 1,000,000 switching operations at 0.5 A for 48 VAC
R3C	Contact reference point for relay R3	Output	
/STOA, /STOB	STO inputs	Input	Safety function STO inputs
24 V	Output power supply for digital inputs and STO inputs of the safety function	Output	• 24 VDC • Tolerance: Min. 20.4 VDC, max. 27 VDC • Current: Max. 200 mA for both 24 VDC terminals • Terminal protected against overload and short circuit • In position "Sink ext.", an external power supply is provided via the PLC.

Terminal	Description	Input/Output type	Electrical characteristics
10 V	Output power supply for analog input	Output	Internal power supply for analog inputs • 10.5 VDC • Tolerance ±5% • Current: Maximum 10 mA • Short-circuit protection
AI1, AI3	Analog input and sensor input	Input	V/A configurable using software: Analog voltage or current input • Analog voltage input 0 to 10 VDC, impedance 31.5 kΩ • Analog current input X to Y mA by programming X and Y from 0 to 20 mA, impedance: 250 Ω • Maximum sampling time: 1 ms ±1 ms • Resolution: 12 bits • Accuracy: ±0.6% with a temperature fluctuation of 60°C • Linearity: ±0.15% of the maximum value Temperature sensors configurable using software • PT100 ° 1 to 3 temperature sensors in series (configurable using software) ° Sensor current: Maximum 5 mA ° Range -20 to 200°C ° Accuracy ±4°C with a temperature fluctuation of 60°C • PT1000 ° 1 to 3 temperature sensors in series (configurable using software) ° Sensor current: 1 mA ° Range -20 to 200°C ° Accuracy ±4°C with a temperature fluctuation of 60°C • KTY84 ° 1 temperature sensor ° Sensor current: 1 mA ° Range -20 to 200°C ° Accuracy ±4°C with a temperature fluctuation of 60°C • PTC ° Max. 6 sensors, connected in series ° Sensor current: 1 mA ° Nominal value: <1.5 kΩ ° Trigger threshold value for overheating: 2.9 kΩ ±0.2 kΩ ° Reset threshold value for overheating: 1.575 kΩ ±0.75 kΩ ° Threshold value for detecting low impedance: 50 kΩ -10 Ω/+20 Ω ° Low impedance protection <1,000 Ω
COM	Reference wire for analog inputs and outputs	Input/Output	0 V for analog inputs/outputs
AI2	Analog input	Input	Analog bipolar voltage input -10 to 10 VDC, impedance 31.5 kΩ • Maximum sampling time: 1 ms ±1 ms • Resolution: 12 bits • Accuracy: ±0.6% with a temperature fluctuation of 60°C • Linearity: ±0.15% of the maximum value
AQ1	Analog output	Output	AQ: Analog output configurable using software for voltage or current • Analog voltage output min. 0 to 10 VDC. Minimum load impedance 470 Ω • Analog current output X to Y mA by programming X and Y from 0 to 20 mA, maximum load impedance: 500 Ω • Maximum sampling time: 5 ms ±1 ms • Resolution: 10 bits • Accuracy: ±1% with a temperature fluctuation of 60°C • Linearity: ±0.2%
AQ2	Analog output	Output	
COM	Reference point for digital and analog outputs	Input/Output	0 V for analog outputs and digital output
DQ-	Digital output	Output	Digital output configurable using switch • Isolated • Maximum voltage: 30 VDC • Maximum current: 100 mA • Frequency range: 0 to 1 kHz • Control of the positive/negative logic by external user-side wiring.
DQ+	Digital output	Output	
DQ+	Pulse output	Output	Pulse train output configurable using switch • Open collector not isolated • Maximum voltage: 30 VDC • Maximum current: 20 mA • Frequency range: 0 to 30 kHz

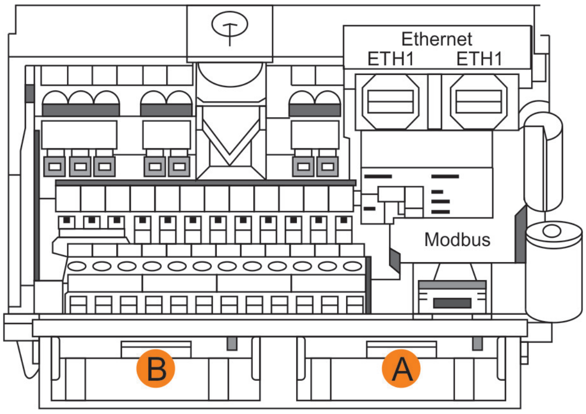
Terminal	Description	Input/Output type	Electrical characteristics
P24	Power supply of external inputs	Input	Power supply of external inputs 24 VDC • Tolerance: Min. 19 VDC, max. 30 VDC • Maximum current: 0.8 A
0 V	0 V	Input/Output	0 V from P24
DI1 to DI8	Digital inputs	Input	8 programmable logic inputs 24 VDC, per IEC/EN 61131-2 logic type 1 • Positive logic (source): State 0 at 5 VDC or logic input not wired, state 1 at 11 VDC • Negative logic (sink): State 0 at 16 VDC or logic input not wired, state 1 at 10 VDC • Impedance 4.4 kΩ • Maximum voltage: 30 VDC • Maximum sampling time: 2 ms ±0.5 ms Multiple functions can be configured on one input using multiple assignment. (Example: DI1 assigned to clockwise rotation and preset frequency 2, DI3 assigned to counterclockwise rotation and preset frequency 3.)
DI7 to DI8	Pulse inputs	Input	Programmable pulse input • Compatible with PLC level 1, standard IEC 65A-68 • State 0 at <0.6 VDC, state 1 at >2.5 VDC • Pulse counter 0 to 30 kHz • Frequency range: Up to 30 kHz • Cyclic ratio: 50% ±10% • Maximum input voltage 30 VDC, <10 mA • Maximum sampling time: 5 ms ±1 ms

4.4.5.4 Routing of the control cable for sizes 4 and 5

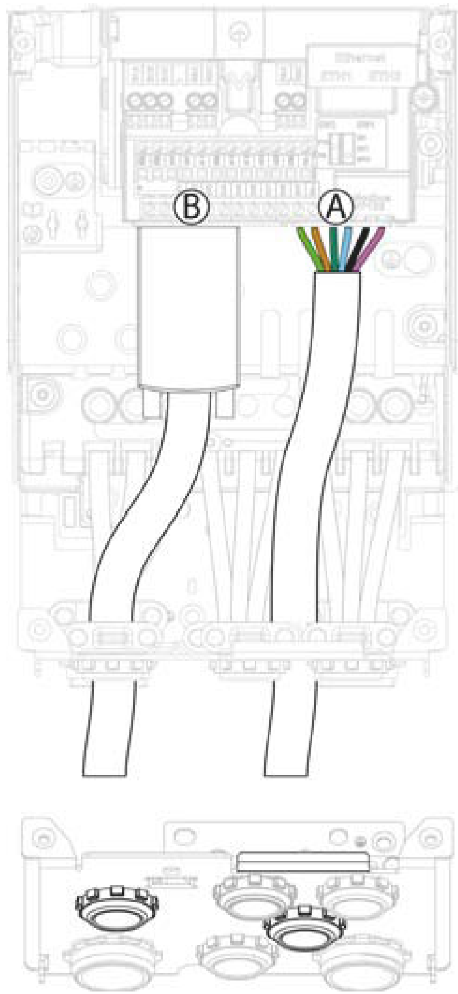
Installing and wiring optional modules

Procedure for installing and wiring a module

1) Insert the module into slot A or B.



2) Insert the cable into the cable connection plate as shown. The break-out recess is used for fieldbus cables.
3) Connect the cable to the module.



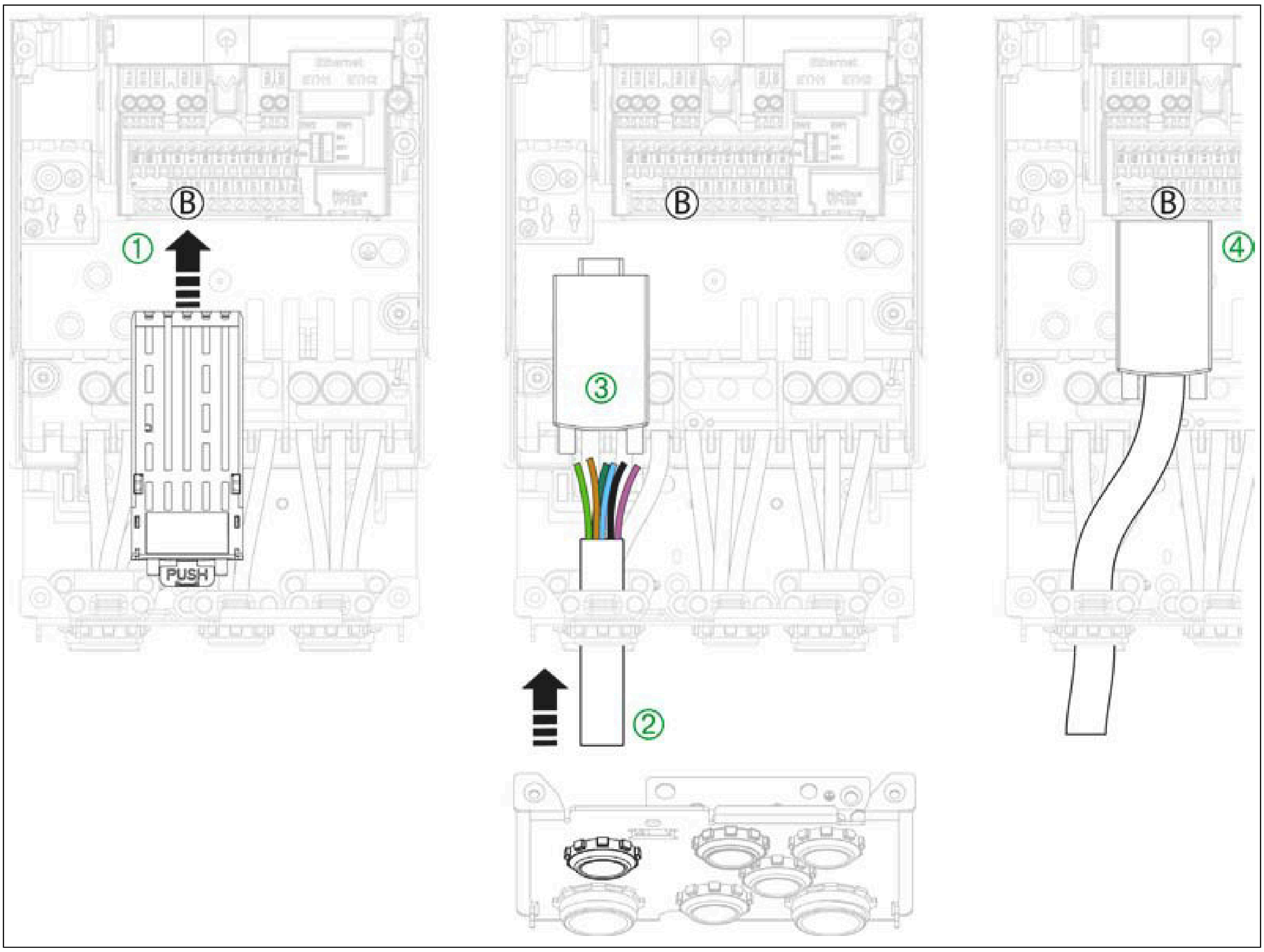
Note:

The cable connection plate shown below applies to size 4. Other cable connection plates differ slightly from this figure.

Installing and wiring the encoder interface module

Procedure for installing the encoder interface module

1) Insert the encoder interface module into slot B and push it further in until an audible click indicates that the final position has been reached.
2) Insert the cable into the cable connection plate as shown.
3) Wire the SUB-D connector.
4) Connect the SUB-D connector to the option module and screw it tight.



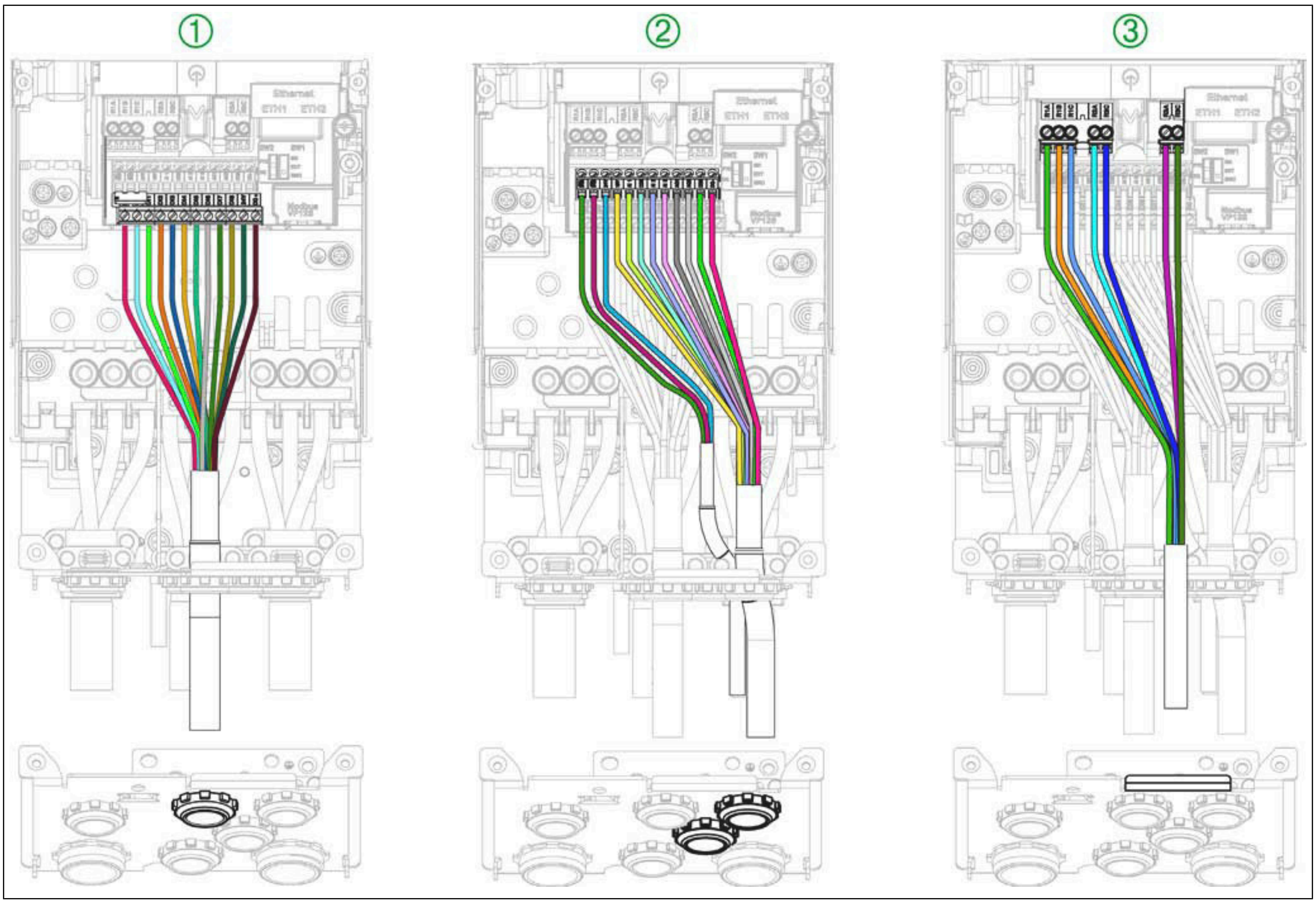
Note:

The cable connection plate shown below applies to size 4. Other cable connection plates differ slightly from this figure.

Wiring the control block

Procedure for wiring the control block terminals

1) Wire P24, 0 V, the digital inputs (DI1 to DI8) and the 24 V and DQ+ terminals.
2) Wire safety outputs STOA and STOB, the 24 V and 10 V connection, the analog inputs (AI1 to AI3), the COM connection, the digital inputs DI1 to DI8, AQ1, AQ2 as well as the COM and DQ terminals.
3) Wire relay outputs R1A, R1B, R1C, R2A, R2C, R3A and R3C.



Note:

The cable connection plate shown below applies to size 4. Other cable connection plates differ slightly from this figure.

4.4.5.5 Product LEDs

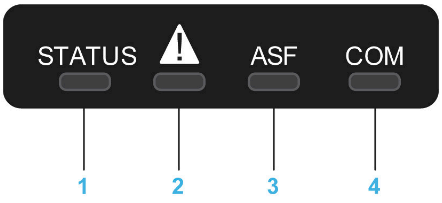
Introduction

The inverter is equipped with LEDs to indicate the respective device status.

The number of available LEDs varies depending on the inverter model.

- Sizes 1, 2 and 3: 4 LEDs

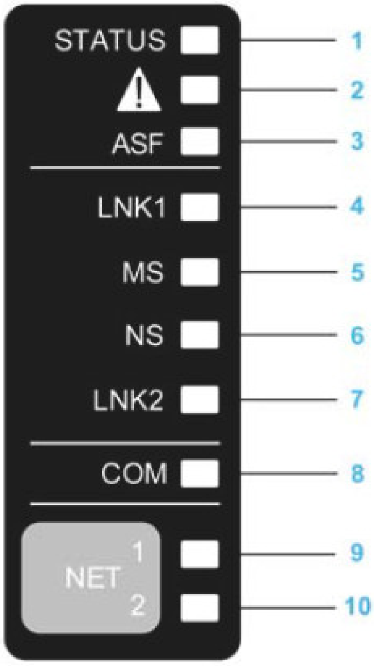
Description of LEDs for sizes 1, 2 and 3



The following table contains details of the inverter's LED status indicators:

No.	LED	Color and status	Description
1	STATUS	OFF	The inverter is switched off.
		Green blinking	The inverter is not in operation but ready to start.
		Rapid green blinking	The inverter is in a transition state (acceleration, braking, etc.).
		Lit solid green	The inverter is in operation.
		Lit solid yellow	Visual device identification when using DTM-based commissioning software
2	Warning/Error	Slow red blinking	The inverter has determined a warning.
		Lit solid red	The inverter has determined a fault.
3	ASF	Lit solid yellow	The safety function has been triggered.
4	COM	Slow yellow blinking	Serial communication activity (commissioning software ACPi SafeConfigurator)

Description of LEDs for sizes 4 and 5



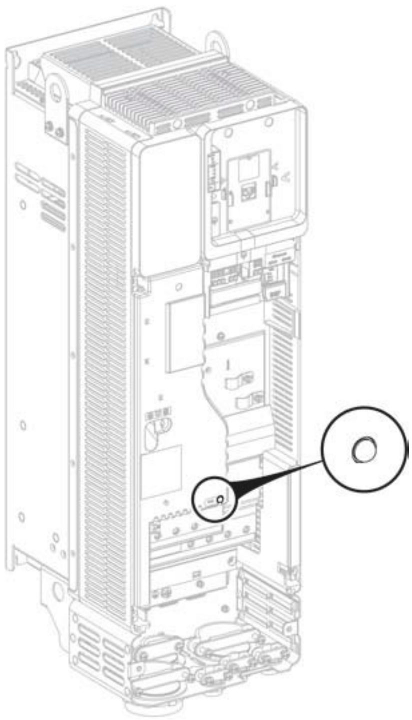
The following table contains details of the inverter's LED status indicators:

No.	LED	Color and status	Description
1	STATUS	OFF	The inverter is switched off.
		Green blinking	The inverter is not in operation but ready to start.
		Rapid green blinking	The inverter is in a transition state (acceleration, braking, etc.).
		Lit solid green	The inverter is in operation.
		Lit solid yellow	Visual device identification when using DTM-based commissioning software
2	Warning/Error	Slow red blinking	The inverter has determined a warning.
		Lit solid red	The inverter has determined a fault.
3	ASF	Lit solid yellow	The safety function has been triggered.
4	COM	Slow yellow blinking	Serial communication activity (commissioning software ACPi SafeConfigurator)

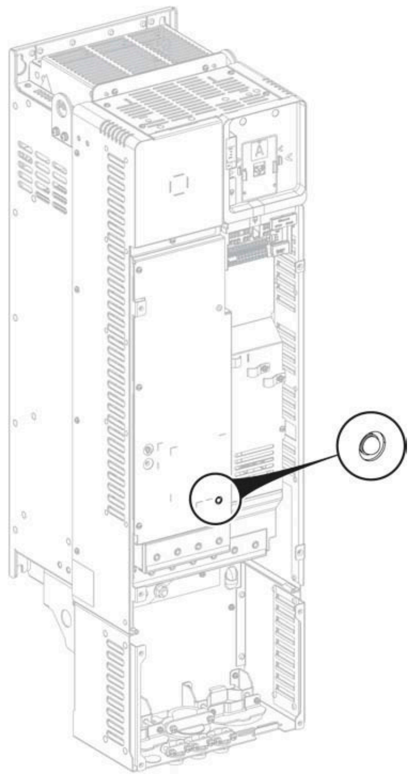
The ACOPOSinverter P86 was developed for use in a POWERLINK network. LEDs that are not described are of no significance for this use case.

DC bus LED for sizes 4 and 5

Size 4



Size 5



4.4.6 Configuring the SK-EXT-SRC switch

Sizes 1, 2 and 3

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

- **If the inverter is set to SK or EXT, the 0 V terminal is not permitted to be connected to ground or protective ground.**
- **It must be ensured that there is no possibility of inadvertent grounding of the digital inputs that have been configured for the sink logic (as a result of damaged signal cables, for example).**
- **To ensure the safe grounding of circuits, all applicable standards and regulations such as NFPA 79 and EN 60204 must be observed.**

Failure to follow these instructions can result in death, serious injury or damage to property.

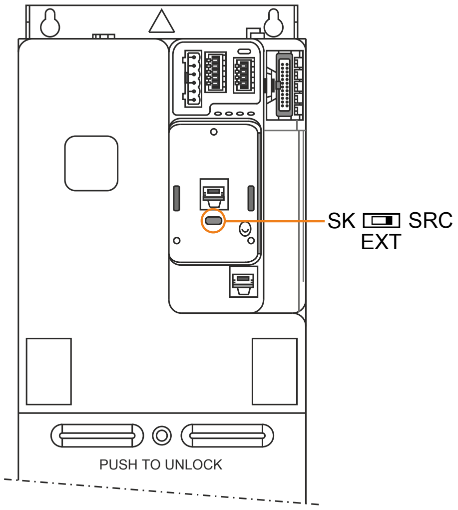
Switch description

Explanation of switch marks:

Marks	Description
SK	Int. sink[1)]
EXT	Ext. sink[1)]
SRC	Source[1)]

1) For additional information about sink/source, see "Configuration as sink/source" on page 66.

The switch is used to adjust the digital input function to the programmable control output technology. The switch is located under the HMI port. It only affects DIx and DQx in digital input mode.



Settings

Switch position		Description	Power supply
SK EXT SRC	Source	Set the switch to "SRC source" (factory setting) if using PLC outputs with PNP transistors. Positive logic PLC. Outputs switch to +24 V if active. Usual for European PLCs.	DISUP: 24 VDC. Can be used for 24 VDC power supply of the switches.
SK EXT SRC	External (sink)	Switch position at EXT (external source) and use of an external power supply	DISUP: For connecting 24 VDC for power supply of all DIx internal logic
SK EXT SRC	Sink	Set the switch to "SK" (internal sink) if using PLC outputs with NPN transistors. N egative logic PLC. Outputs switch to 0 V if active. Usual for Asian PLCs.	DISUP: 0 VDC. Can be used for 0 VDC power supply of the switches.

Sizes 4 and 5

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

- **If the inverter is set to SK or EXT, the 0 V terminal is not permitted to be connected to ground or protective ground.**
- **It must be ensured that there is no possibility of inadvertent grounding of the digital inputs that have been configured for the sink logic (as a result of damaged signal cables, for example).**
- **To ensure the safe grounding of circuits, all applicable standards and regulations such as NFPA 79 and EN 60204 must be observed.**

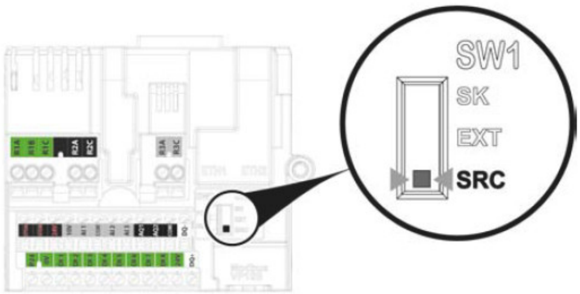
Failure to follow these instructions can result in death, serious injury or damage to property.

Switch description

Explanation of switch marks:

Marks	Description
SK	Internal sink
EXT	External sink
SRC	Source

This switch is used to adapt the functionality of logic inputs to the programmable control output technology. To access the switch, follow the procedure provided for accessing the control terminals. The switch is located to the right of the control terminals. It only affects DIx.



Settings

Switch position	Description	Power supply
Source 	Set the switch to "SRC source" (factory setting) if using PLC outputs with PNP transistors. Positive logic PLC. Outputs switch to +24 V if active. Usual for European PLCs.	Can be used for 24 VDC power supply of the switches.
External (sink) 	Switch position at EXT (external source) and use of an external power supply	24 VDC for power supply of all DIx internal logic
Sink 	Set the switch to "SK" (internal sink) if using PLC outputs with NPN transistors. Negative logic PLC. Outputs switch to 0 V if active. Usual for Asian PLCs.	Can be used for 0 VDC power supply of the switches.

4.4.7 Configuring the PTO-DQ switch

All sizes

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

- **If the inverter is set to SK or EXT, the 0 V terminal is not permitted to be connected to ground or protective ground.**
- **It must be ensured that there is no possibility of inadvertent grounding of the digital inputs that have been configured for the sink logic (as a result of damaged signal cables, for example).**
- **To ensure the safe grounding of circuits, all applicable standards and regulations such as NFPA 79 and EN 60204 must be observed.**

Failure to follow these instructions can result in death, serious injury or damage to property.

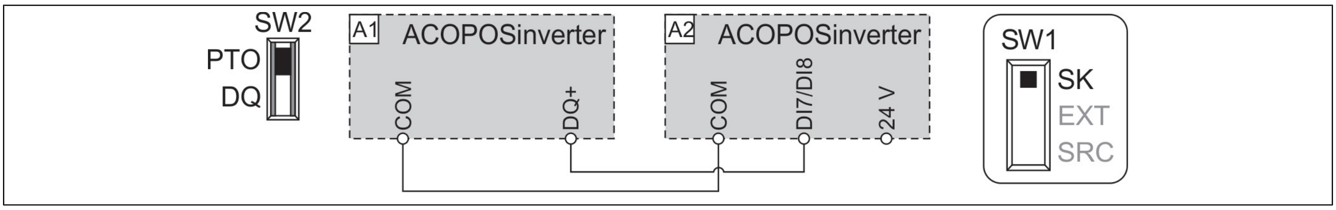
Switch SW2 (PTO/DQ) is used to configure digital output DQ+ or DQ-.

- Set the switch to **PTO (pulse train output)** to configure outputs DQ+ and DQ- as pulse train outputs. This can be used to connect pulse train outputs of another inverter via its DI7 or DI8 pulse input.
- Set the switch to **DQ (digital output)** to configure outputs DQ+ and DQ- as assignable digital outputs.

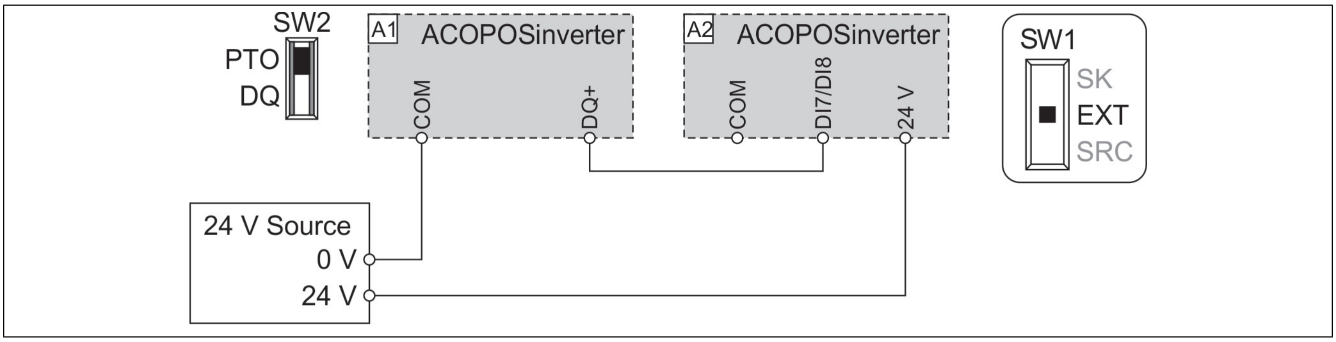
Access

To access the switch, follow the procedure provided for accessing the control terminals (see "Accessing the terminals for sizes 4 and 5" on page 82). The switch is located under the control terminals (Control terminals - Sizes 4 and 5).

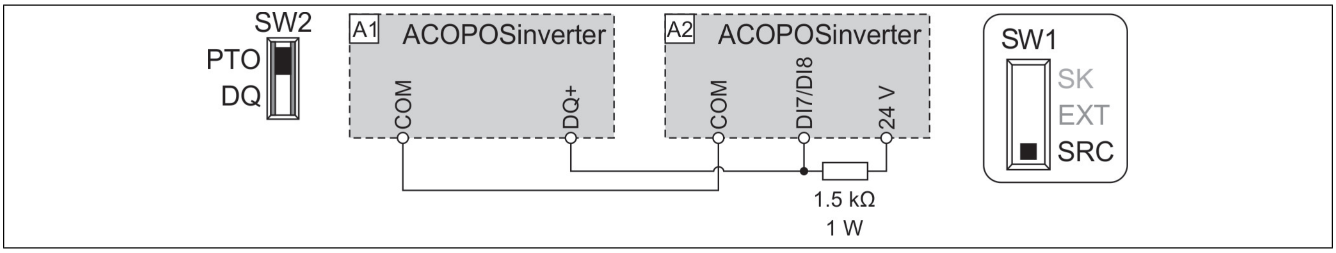
Sizes 1, 2 and 3: Switch SW1 in position SK (mode "Sink")



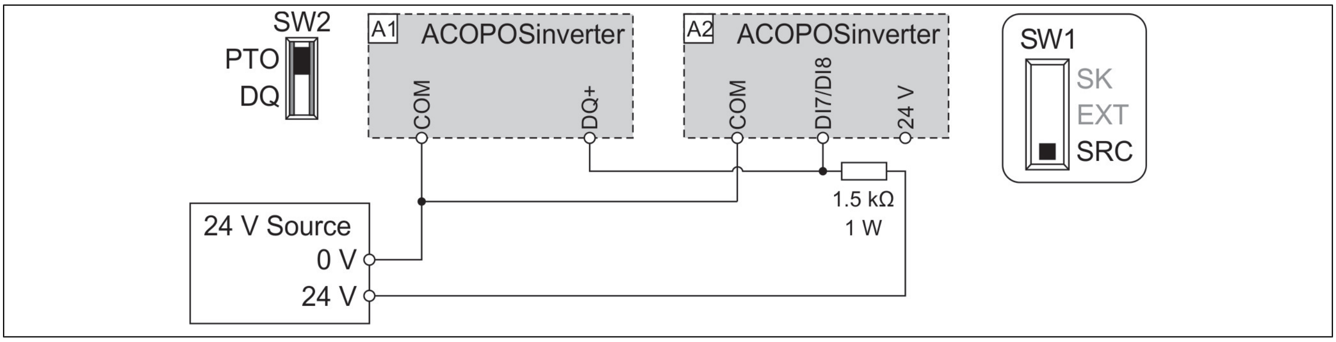
Sizes 1, 2 and 3: Switch SW1 in position EXT (mode "Sink ext.")



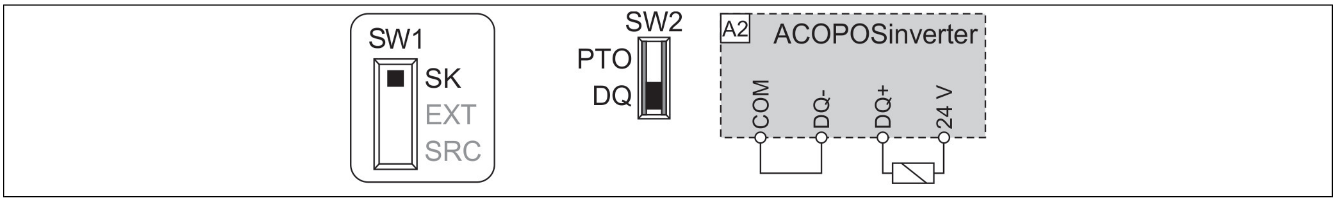
Sizes 1, 2 and 3: Switch SW1 in position SRC (mode "Source")



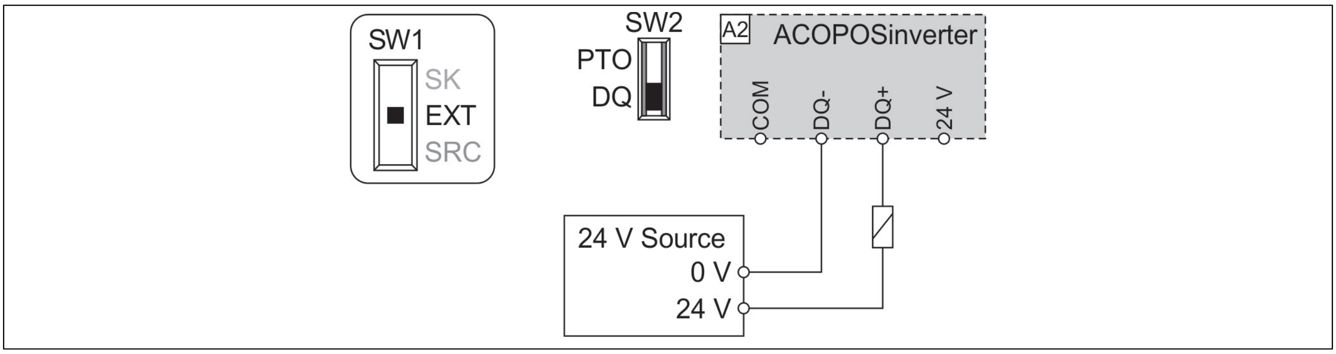
Sizes 1, 2 and 3: Switch SW1 in position SRC (mode "Source ext.")



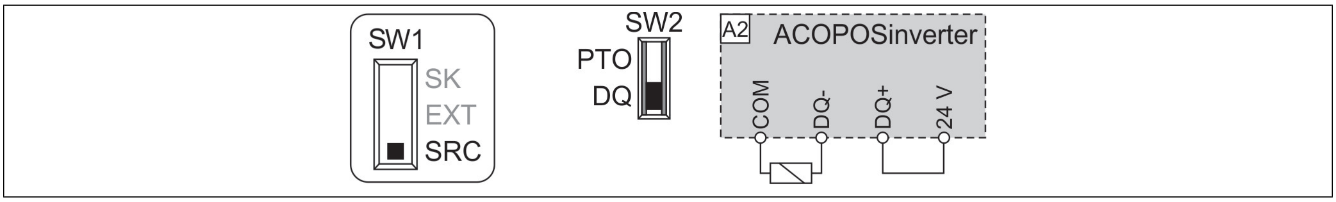
Sizes 4 and 5: Switch SW1 in position SK (mode "Sink")



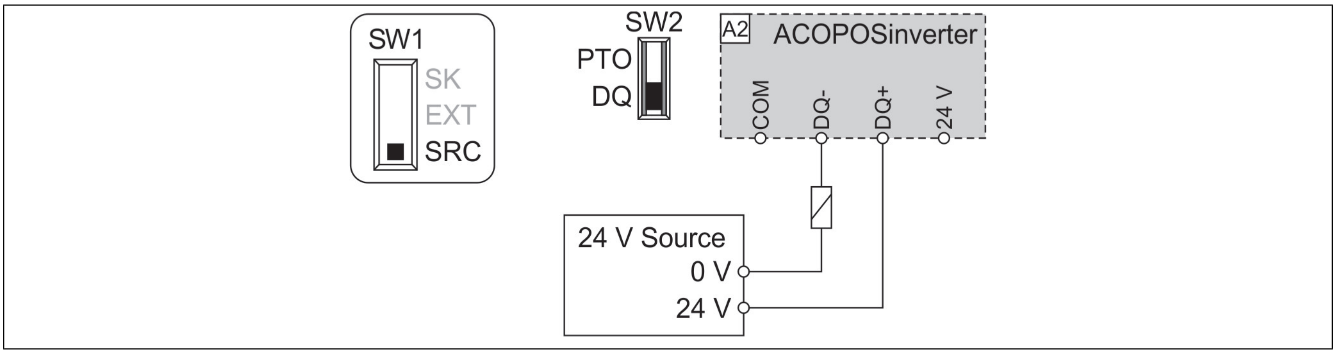
Sizes 4 and 5: Switch SW1 in position EXT (mode "Sink ext.")



Sizes 4 and 5: Switch SW1 in position SRC (mode "Source")

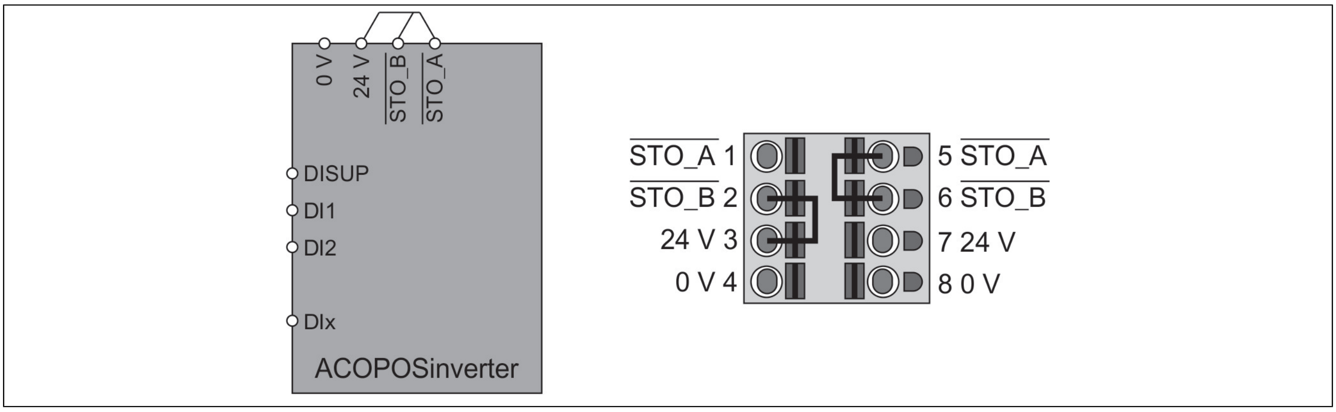


Sizes 4 and 5: Switch SW1 in position SRC (mode "Source ext.")



4.4.8 Function "Safe Torque Off" (STO)

Wiring diagram of safety function STO for sizes 1, 2 and 3



Note:

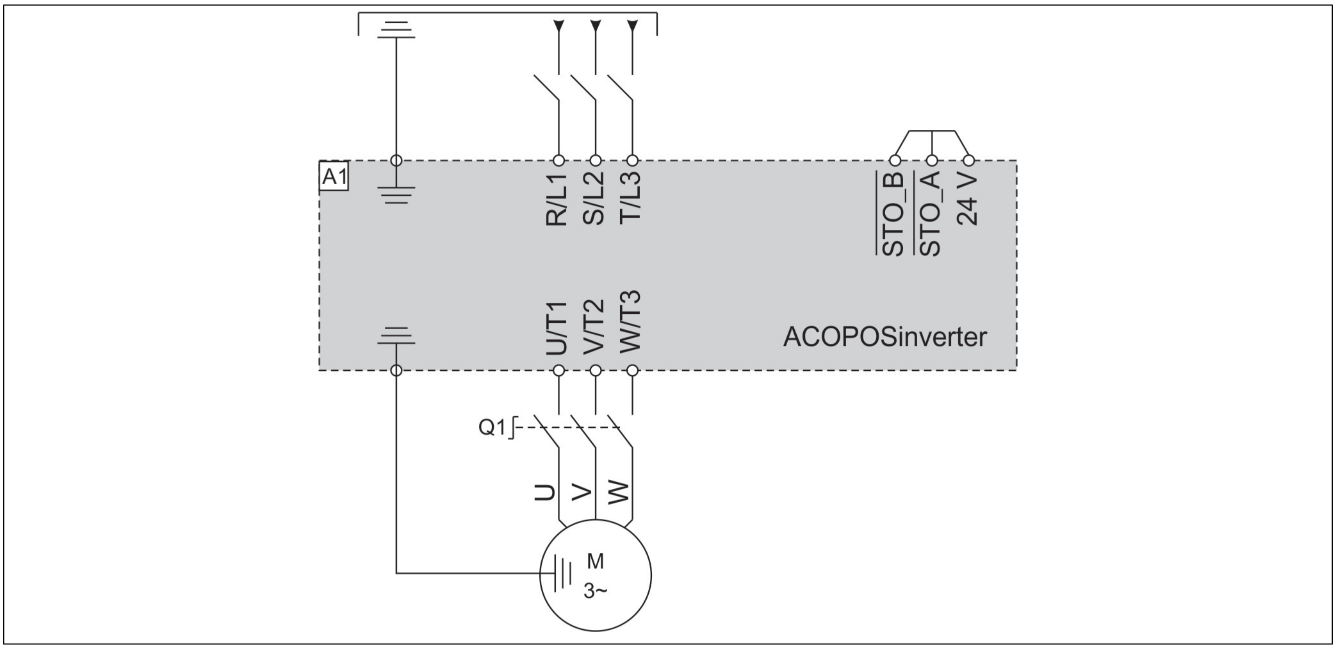
Terminals STO_A and STO_B are not wired at the factory.

If the STO inputs are not used for functional safety, they must be connected to 24 V.

Note:

- **For sizes 1, 2 and 3, the 24 V connection (pin 3) can be disabled via menu [24 V Supply Output] (S24V). If the 24 V power supply output is disabled, the STO signals must be supplied externally.**
- **To prevent the STO function from being triggered when the product is switched on, the external power supply must be switched on first.**

Wiring diagram of safety function STO for sizes 4 and 5



If the STO inputs are not used for functional safety, they must be connected to 24 V.

Note:

- **For sizes 4 and 5, the STO inputs are also connected to a 24 VDC terminal by default. Function STO is triggered if the external power supply is switched off.**
- **To prevent the STO function from being triggered when the product is switched on, the external power supply must be switched on first.**

4.4.9 Wiring the digital inputs

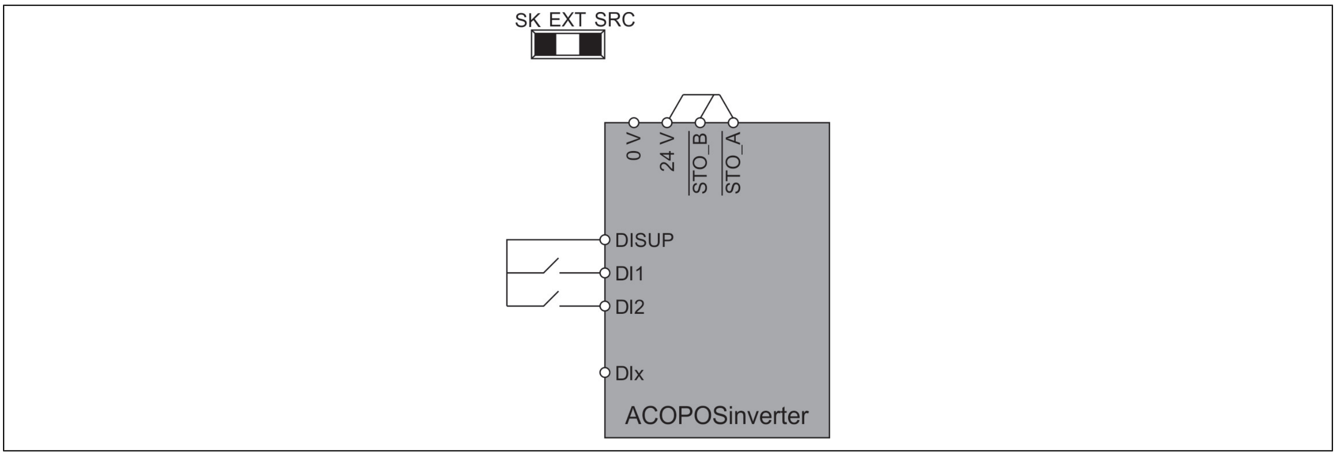
Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

- **If the inverter is set to SK or EXT, the 0 V terminal is not permitted to be connected to ground or protective ground.**
- **It must be ensured that there is no possibility of inadvertent grounding of the digital inputs that have been configured for the sink logic (as a result of damaged signal cables, for example).**
- **To ensure the safe grounding of circuits, all applicable standards and regulations such as NFPA 79 and EN 60204 must be observed.**

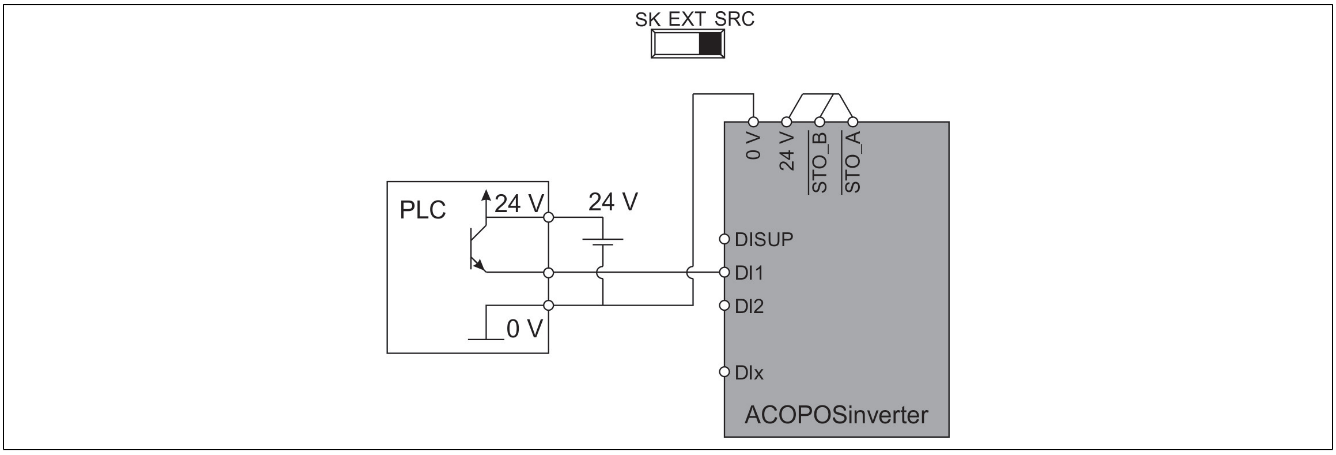
Failure to follow these instructions can result in death, serious injury or damage to property.

Sizes 1, 2 and 3: Internal power supply via DISUP signal



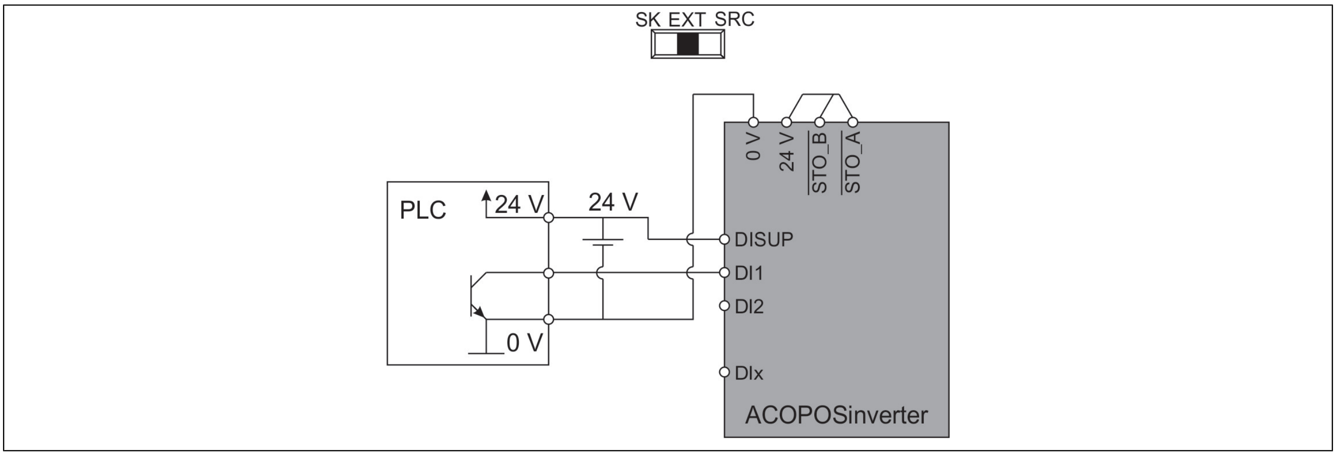
The switch can be set to position SK or SRC. The SRC setting is recommended. DISUP outputs 24 V in the SRC position. DISUP is connected to 0 V in the SK position.

Sizes 1, 2 and 3: Positive logic, source, European style, external power supply



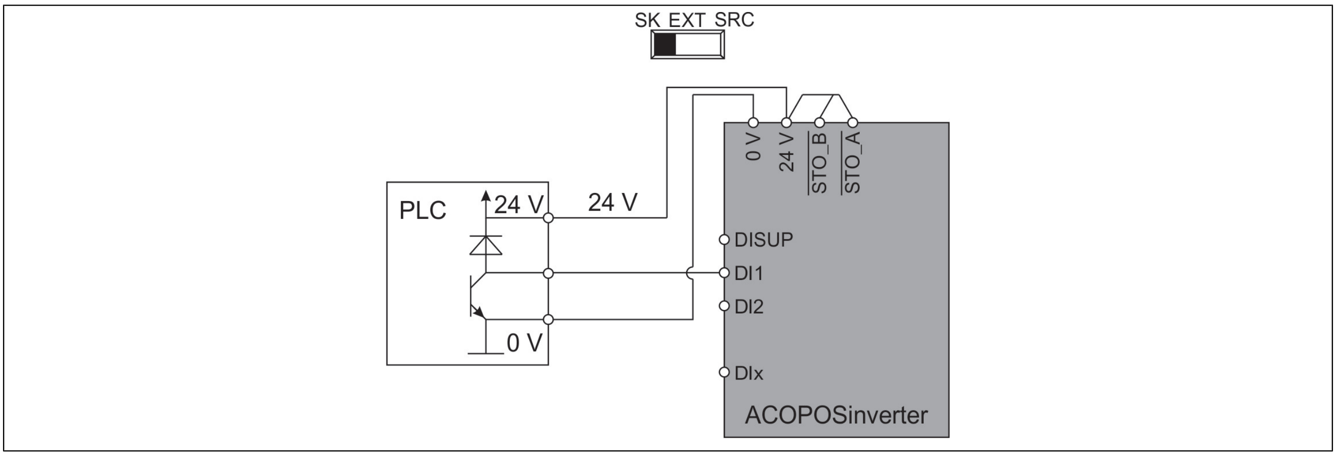
Set the switch to the SRC position.

Sizes 1, 2 and 3: Negative logic, sink, Asian style, external power supply



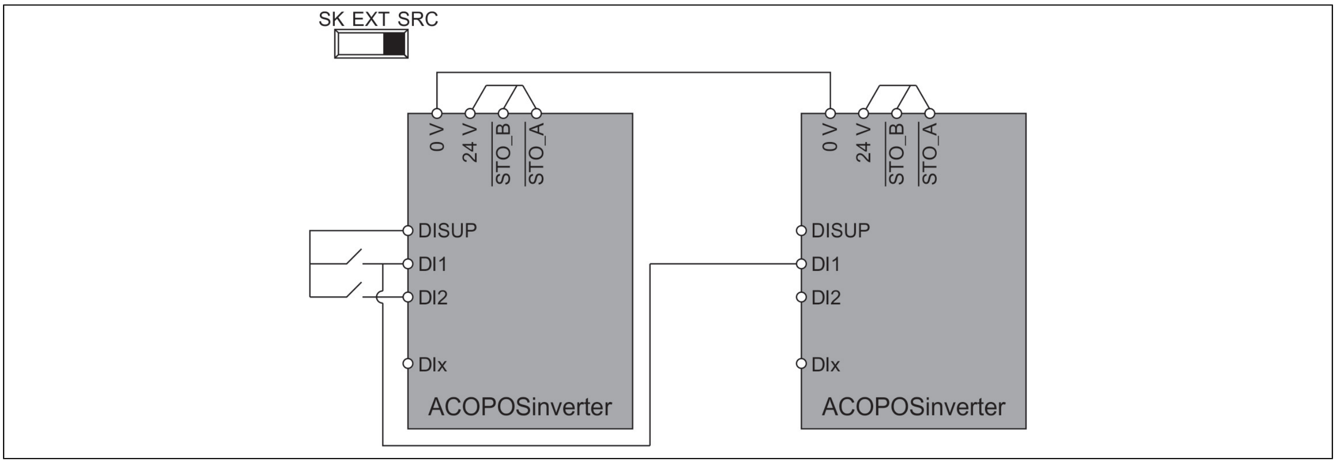
Set the switch to the EXT position.

Sizes 1, 2 and 3: Negative logic, sink, Asian style, internal power supply



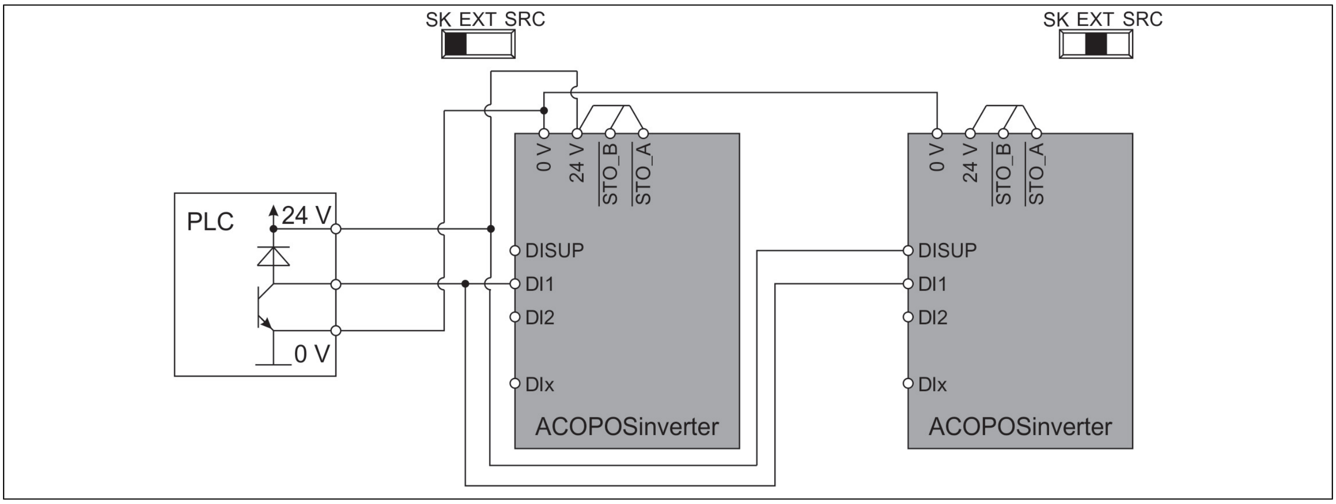
Set the switch to the SK position.

Sizes 1, 2 and 3: Two ACOPOSinverter devices share the same switch.



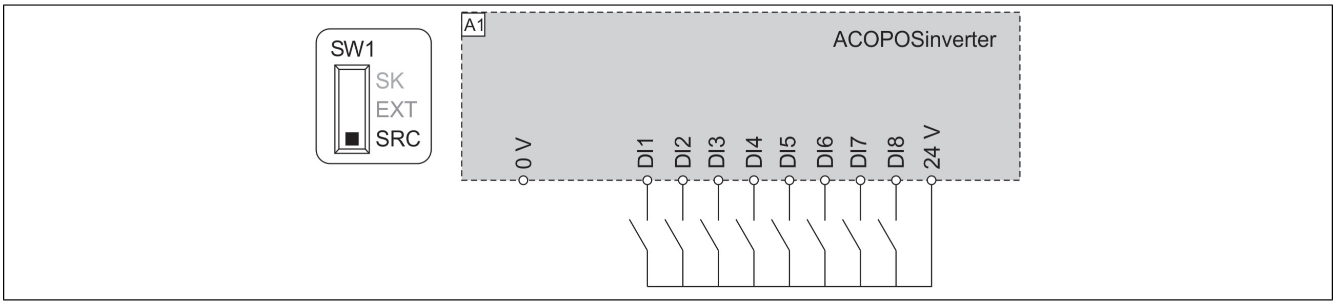
The SRC setting is recommended on both inverters. If the SK setting is selected, an active switch is detected when the second inverter is switched off.

Sizes 1, 2 and 3: Negative logic, sink, Asian style, internal power supply. Two ACOPOSinverter devices share the same switch.

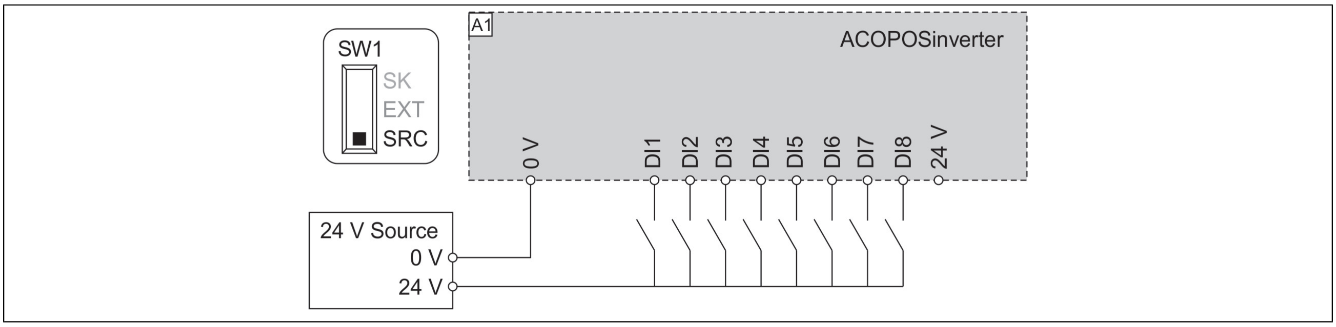


Set the switch on the first inverter to the SK position. Set the switch on the second inverter to the EXT position. Connect DISUP to 24 V. Connect 0 V.

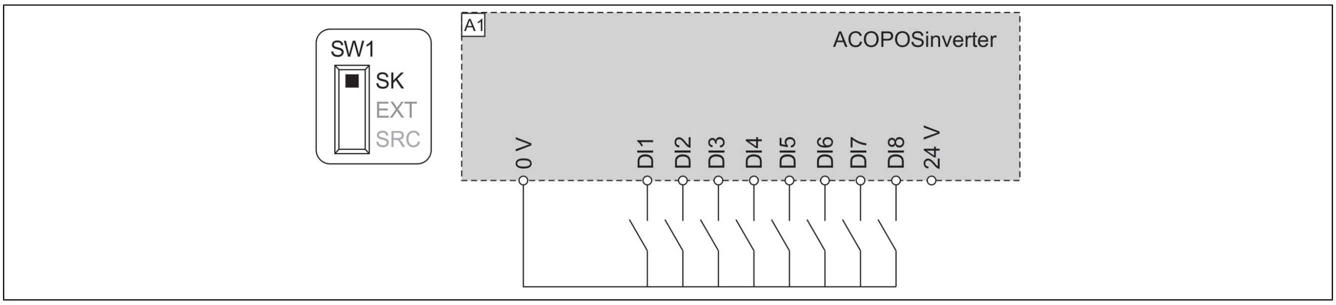
Sizes 4 and 5: Set the switch to position "SRC (source)" if an output power supply is used for the digital inputs.



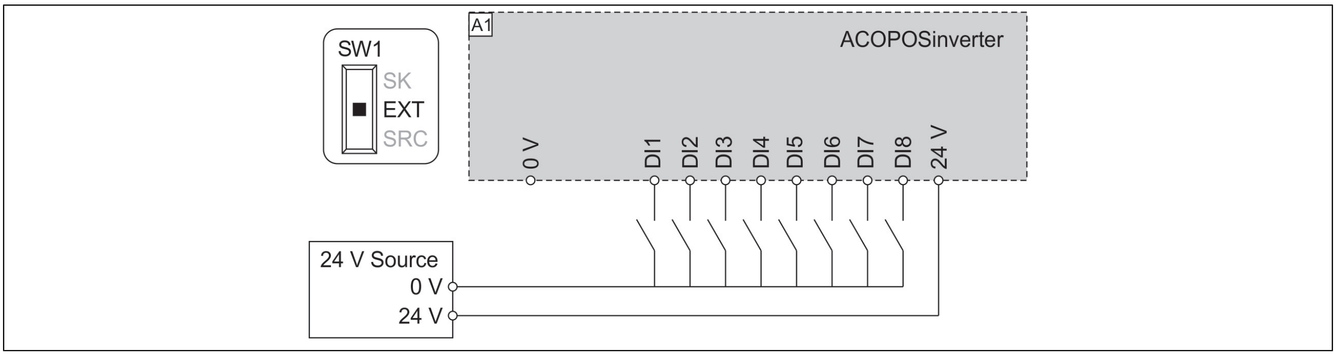
Sizes 4 and 5: Set the switch to position "SRC (source)" if an external power supply is used for the digital inputs.



Sizes 4 and 5: Set the switch to position "SK (sink)" if an output power supply is used for the digital inputs.



Sizes 4 and 5: Set the switch to position "EXT" if an external power supply is used for the digital inputs.

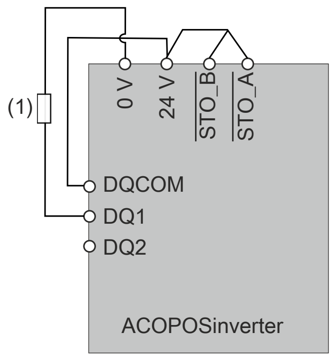


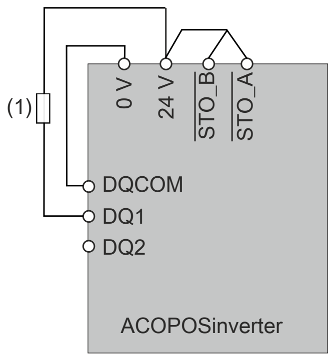
Note:

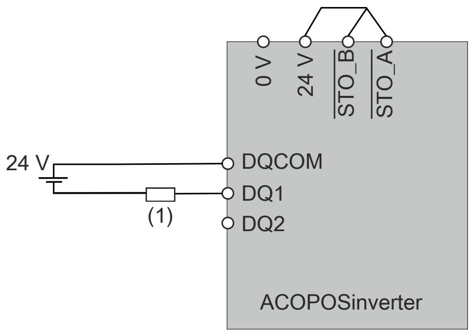
- **STO inputs are also connected to a 24 VDC terminal by default. When the external power supply is switched off, function STO is triggered.**
- **To prevent the STO function from being triggered when the product is switched on, the external power supply must be switched on first.**

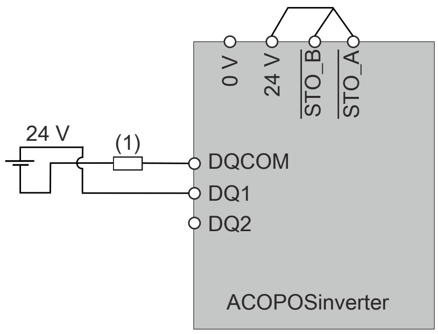
4.4.10 Wiring the digital outputs

Sizes 1, 2 and 3

<table>
<tr><th colspan="2">Digital outputs: Internal power supply</th></tr>
<tr><td>Positive logic, source, European style, DQ switches to 24 V</td><td>Negative logic, sink, Asian style, DQ switches to 0 V</td></tr>
<tr><td>


(1) Relay or valve
</td><td>


(1) Relay or valve
</td></tr>
<tr><th colspan="2">Digital outputs: External power supply</th></tr>
<tr><td>Positive logic, source, European style, DQ switches to 24 V</td><td>Negative logic, sink, Asian style, DQ switches to 0 V</td></tr>
<tr><td>


(1) Relay or valve
</td><td>


(1) Relay or valve
</td></tr>
</table>

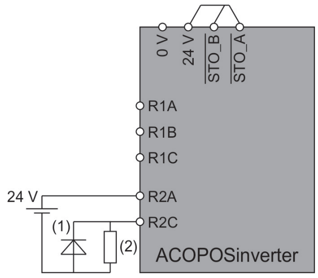
Sizes 4 and 5

Switch SW2 (PTO/DQ) is used to configure digital output DQ+ or DQ- (see "Configuring the PTO-DQ switch" on page 108).

4.4.11 Wiring the relay contacts

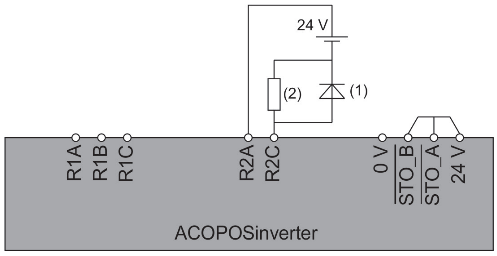
Relay contacts - Connecting the holding brake, brakes with 24 VDC

Sizes 1, 2 and 3



(1) Freewheeling diode
(2) Holding brake

Sizes 4 and 5

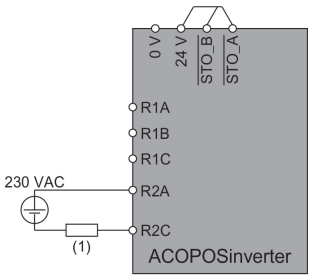


(1) Freewheeling diode
(2) Holding brake

When switching the inductive load with direct current, external overvoltage protection or a freewheeling diode must be installed.

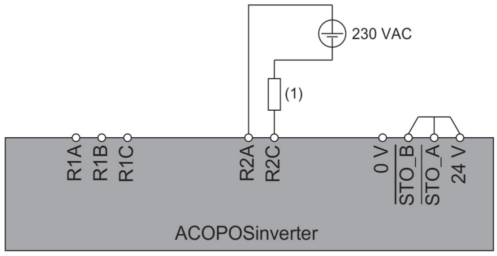
Relay contacts - Connecting the holding brake, brakes with 230 VAC

Sizes 1, 2 and 3



(1) Holding brake

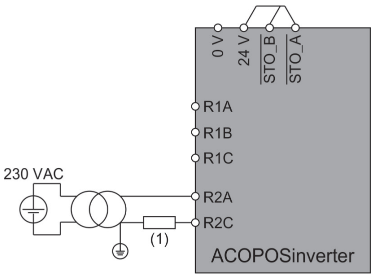
Sizes 4 and 5



(1) Holding brake

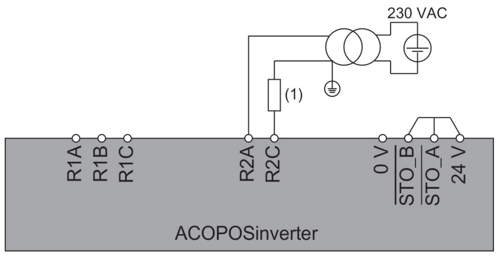
The 230 VAC power supply must meet the requirements of overvoltage category OVC II.

Sizes 1, 2 and 3



(1) Holding brake

Sizes 4 and 5



(1) Holding brake

A transformer can be used to reduce OVC III to OVC II.

4.5 Testing the installation

Before switching on

Safety function STO (Safe Torque Off) does not interrupt the power supply to the DC bus. It only interrupts the power supply to the motor. DC bus voltage and mains voltage are still present in the inverter.

Danger!

RISK OF ELECTRIC SHOCK

- **Use safety function STO for its intended purpose only.**
- **Use a separate switch, outside the circuit for safety function STO, to disconnect the inverter from the mains voltage supply.**

Failure to follow these instructions will result in death or serious injury.

Incorrect settings, invalid data or faulty wiring can cause unexpected movement or signals as well as damage to components and the disabling of monitoring functions.

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

- **Do not switch on the system until you have verified that there is no one in the operating area and that it is free from obstacles.**
- **Make sure that everyone involved in the operation has direct access to a fully functioning emergency switch-off button.**
- **Do not operate the inverter system using unknown settings or data.**
- **Make sure that the wiring has been implemented in accordance with the settings.**
- **Never change a parameter unless you are familiar with the function of the parameter and the consequences of a potential change.**
- **When commissioning, make sure to carefully check all operating states, operating conditions and potential error situations.**
- **Take into account the possibility of movement in the wrong direction or motor vibration.**

Failure to follow these instructions can result in death, serious injury or damage to property.

If a power stage is disabled unintentionally, following a power outage, error or functional failure, for example, the brake function in the motor may no longer operate in a controlled way.

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

Make sure that unbraked movements do not cause injury or damage to the device.

Failure to follow these instructions can result in death, serious injury or damage to property.

Mechanical installation

Check the mechanical installation of the overall inverter system:

1) Have the specified spacing requirements been observed during installation?
2) Have all mounting screws been tightened using the specified tightening torque?

Electrical installation

Check the electrical connections and wiring:

1) Have all protective ground conductors been connected?
2) Have all fuses and circuit breakers been installed with the correct power values? Have the right types of fuse been used?
3) Have all cable ends been connected or insulated?
4) Have all cables and connections been connected and installed correctly?
5) Have the signal cables been connected correctly?
6) Do the required shield connections comply with the EMC requirements?
7) Have all actions been taken to ensure EMC compliance?

Covers and gaskets

To ensure the required protection, make sure that all devices as well as the doors and covers of the control cabinet have been installed correctly.

4.6 Servicing

Serviceable products

Size 1, 2 and 3 inverters are not serviceable products.

For servicing of size 4 and 5 inverters, please contact your local customer service representative.

Service

> **Danger!**
>
> **HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH**
>
> **Before completing any of the procedures described in this section, carefully read through the instructions provided in section "Safety information".**
>
> **Failure to follow these instructions will result in death or serious injury.**

When operating, the products described in these instructions can reach temperatures of over 80°C.

> **Warning!**
>
> **HOT SURFACES**
>
> - **Avoid all contact with hot surfaces.**
> - **Keep flammable or heat-sensitive components away from the immediate vicinity of hot surfaces.**
> - **Before handling the product, wait until it has cooled down sufficiently.**
> - **Make sure that there is adequate heat dissipation by performing a test run on maximum load.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

> **Note:**
>
> **RISK OF DAMAGE TO FREQUENCY INVERTER**
>
> **Perform the procedures listed below.**
>
> **Failure to follow these instructions can result in damage to property.**

Environment	Affected components:	Action	Frequency [1]
Impacts to the product	Housing - Control block (LED display, if used)	Perform a visual inspection of the inverter.	At least once a year
Corrosion	Terminals - Male connectors - Screws - EMC plate	Inspect, and clean if necessary. Connections S1, S2 and S3 can be replaced with the connector kit.	
Dust	Terminals - Fans - Vents - Air inlets and outlets for housing - Cabinet air filters	Inspect, and clean if necessary.	
Temperature	In the vicinity of the product	Inspect, and adjust if necessary.	
Cooling	Fans	Check that the fans are functioning correctly.	At least once a year
		Replace the fans.	After three to five years depending on operating conditions.
Vibration		Check the tightening torque.	At least once a year

1) Starting from the commissioning date. The actual service intervals required are determined by the specific ambient conditions.

It is possible that the fans may continue to function for a certain period after the inverter has been switched off.

Caution!

OPERATING FANS

Before handling the fans, make sure that they have come to a complete stop.

Failure to follow these instructions can result in injury or damage to the equipment.

Replacement parts and repairs

Serviceable product: Please contact your designated customer service representative.

Replacement of fan: It is possible to order a new fan as part of an ACOPOSinverter servicing agreement.

4.7 Leakage current

The leakage current values are specified for a star network (TT/TN) at 3% unbalance between phases at maximum voltage and worst case deviation of internal components; the IT jumper is closed.

In a star network (TT/TN) with the IT jumper fully open or a delta network (IT) that requires all IT jumpers to be open, the leakage current is zero.

Leakage currents are sometimes shared in 2 values with different frequencies. Values cannot be strictly added, but both act together to trigger the residual-current circuit breaker.

Material number	Input frequency (mains frequency) = 50 Hz		Input frequency (mains frequency) = 60 Hz	
	50 Hz	300 Hz	60 Hz	360 Hz
8I86T400075.00-000, 8I86T400150.00-000, 8I86T400220.00-000, 8I86T400300.00-000, 8I86T400400.00-000, 8I86T400550.00-000, 8I86T400750.00-000	0 mA	46.6 mA	0 mA	55.9 mA
8I86T401100.00-000, 8I86T401500.00-000, 8I86T401850.00-000, 8I86T402200.00-000	2.7 mA	0 mA	3.2 mA	0 mA
8I86T403000.00-000, 8I86T403700.00-000	5.8 mA	133 mA	7 mA	159 mA
8I86T404500.00-000, 8I86T405500.00-000, 8I86T407500.00-000	3.9 mA	0 mA	4.7 mA	0 mA

5 The drive

5.1 Introduction

5.1.1 Terminology

Technical terms, terminology and descriptions usually correspond to the terms or definitions in the respective standards.

With regard to inverter systems, this includes the following terms, for example: fault, error messages, failure, malfunctions, fault resets, protection, safe state, safety function, warning, warning message.

This includes the following standards:

- Series IEC 61800: Variable-speed electrical power drives
- Series IEC 61508 Ed.2: Functional safety of electrical / electronic / programmable electronic safety-related systems
- EN 954-1: Safety of machinery - Safety-related parts of control systems
- EN ISO 13849-1/2: Safety of machinery - Safety-related parts of control systems
- Series IEC 61158: Industrial communication networks - Fieldbuses
- Series IEC 61784: Industrial communication networks - Profiles
- IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements

"Area of use" is used in connection with the description of specific dangers and in accordance with the meaning of "danger zone" in the EU Machinery Directive (2006/42/EC) and in directive ISO 12100-1.

5.1.2 Commissioning

5.1.2.1 Getting started

Before switching on the inverter

> ## Warning!
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **Before switching on the device, ensure that no unwanted signals that may cause unexpected movement can be applied to the digital inputs.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

If the inverter has not been switched on for a long time, the capacitors must be fully charged before the motor is started.

> ## Note:
>
> **REDUCED CAPACITOR PERFORMANCE**
>
> - **If the inverter has not been switched on for any of the time frames listed below, leave the inverter connected to the mains voltage for one hour before switching on the motor.**
>   - **12 months when the maximum storage temperature is 50°C**
>   - **24 months when the maximum storage temperature is 45°C (113°F)**
>   - **36 months when the maximum storage temperature is 40°C (104°F)**
> - **Remember that no move commands can be executed until one hour has passed.**
> - **When commissioning the inverter for the first time, check the date of manufacture. If the inverter was manufactured more than 12 months ago, perform the specified procedure.**
>
> **Failure to follow these instructions can result in damage to property.**

If the specified procedure cannot be performed without executing a move command because of the internal mains protection control, perform the procedure during the active power stage. However, the motor must be stopped, in order to prevent noticeable mains current in the capacitors.

Line contactor

> ## Note:
> **RISK OF DAMAGE TO FREQUENCY INVERTER**
>
> **Do not switch the inverter off and on at intervals less than 60 seconds.**
>
> **Failure to observe these instructions can result in damage to the equipment!**

Using a motor with low ratings or dispensing with a motor completely

The factory-set function for detecting output phase loss is active: **[OutPhaseLoss Assign]** (OPL) is set to **[OPF Error Triggered]** (YES). For a commissioning check or maintenance, the inverter can be connected to a low-power motor so that fault **[Output Phase Loss]** (OPF2) or **[Single output phase loss]** (OPF1) is triggered if a move command is output. For this purpose, the function can be disabled by setting **[OutPhaseLossAssign]** (OPL) to **[Function Inactive]** (nO).
Set **[Motor control type]** (Ctt) to **[SVC V]** (VVC) under **[Motor parameters]** (MPA-).

> ## Note:
> **MOTOR OVERHEATING**
>
> **An external protection system for thermal overload is required in the following situations:**
>
> - **If a motor is connected to a nominal current that is less than 20% of the inverter current.**
> - **If the motor shutdown function is used.**
>
> **Failure to observe these instructions can result in damage to the equipment.**

> ## Danger!
> **RISK OF ELECTRIC SHOCK, ARC FLASH OR EXPLOSION**
>
> **If output phase monitoring is disabled, then phase loss and any resulting cable disconnection will not be detected.**
>
> - **Make sure that the parameter settings do not result in unsafe states.**
>
> **Failure to follow these instructions can result in death or serious injury.**

5.1.2.2 Procedure for commissioning the frequency inverter

1) Installation (see "Installation" on page 40)
2) Switch on the inverter without an active move command.
3) Configure the following:
   - The nominal frequency of motor **[Motor Standard]** (bFr) if it is not 50 Hz.
   - The motor parameters including **[Motor Th Current]** (ItH) in menu **[Motor parameters]** (MPA-) only if the factory configuration of the inverter is not suitable.
   - The application functions in the **[Complete settings]** (Cst-) menus only if the factory configuration of the inverter is not suitable.
4) Adjust the following parameters in menu **[Simply start]** (SYS-):
   - **[Acceleration]** (ACC) and **[Deceleration]** (dEC)
   - **[Low Speed]** (LSP) and **[High Speed]** (HSP)
5) Start the inverter.

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

Incorrect settings, invalid data or faulty wiring as well as other types of error can cause unexpected movements.

- **When wiring the device, all EMC requirements must be strictly observed.**
- **It is not permitted to operate the product using unspecified or unsuitable settings or data.**
- **Perform a comprehensive commissioning test.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Tips

Parameter [Config. Source] (FCSI) can be used to restore the factory settings anytime.

Note:

To ensure optimal inverter accuracy and response time, the following steps must be performed:

- **Specify the values indicated on the motor nameplate in menu [Motor parameters] (MPA-).**
- **Perform a motor check using parameter [Autotuning] (tUn) when the motor is cold and connected.**

5.1.3 Overview

5.1.3.1 Factory configuration

Factory setting

The inverter is factory set for common operating conditions:

- Display: Inverter ready for operation [Pre-Ramp Ref Freq] (FRH) when the motor is ready for operation and [Motor Frequency] (RFR) when the motor is running.
- Stop mode during fault detection: Freewheel.

This table lists the basic inverter parameters and their factory settings:

Code	Name	Factory settings
(bFr)	[Motor Standard]	[50Hz IEC] (50)
(tCC)	[2/3-Wire Control]	[2-Wire Control] (2C): 2-wire control
(Ctt)	[Motor control type]	[SVC V] (VVC): Voltage vector control
(ACC)	[Acceleration]	3 s
(dEC)	[Deceleration]	3 s
(LSP)	[Low Speed]	0 Hz
(HSP)	[High speed]	50 Hz
(ItH)	[Motor Th Current]	Nominal motor current (dependent on inverter size value)
(Frd)	[Forward]	[DI1] (dI1): Digital input DI1
(rrS)	[Reverse]	[DI2] (dI2): Digital input DI2
(Fr1)	[Ref Freq 1 Config]	[AI1] (AI1): Analog input AI1
(r1)	[R1 Assignment]	[Operating State Fault] (FLt): The contact is opened if the inverter has detected an error or is switched off.
(brA)	[Dec.Ramp Adapt]	[Yes] (YES): Function active (deceleration ramp adjusted automatically)
(Atr)	[Auto Fault Reset]	[No] (nO): Function inactive
(Stt)	[Type of stop]	[On Ramp] (rMP): On ramp
(AO1)	[AQ1 assignment]	[Motor Frequency] (Ofr): Motor frequency
(AO2)	[AQ2 assignment]	[Motor Current] (OCr): Motor current
(rSF)	[Fault Reset Assign]	[DI4] (dI4): Digital input DI4

Note:

If the factory presets of the inverter should be restored, [Config. Source] (FCSi) must be set to [Macro Config] (Ini).

High values must be checked for compatibility with the application and changed if necessary.

Differences between inputs and outputs

Depending on the inverter catalog number, many different inputs and outputs may be available for the ACOPOSinverter P86.
The following table specifies the number of inputs and outputs depending on the nominal power of the inverter:

Inputs/Outputs	Quantity
Digital inputs	7
Digital outputs	2[1)]
Relays	2
AI1	10 VDC, 0 to 20 mA, therm.
AI2	±10 VDC
AI3	-
AQ1	10 VDC, 0 to 20 mA
AQ2	-
Pulse input	Dedicated PTI connection
Pulse output	Dedicated PTO connection

1) DI6 is no longer available when using DQ1. DI7 is no longer available when using DQ2.

5.1.3.2 Application functions

Introduction

The following tables show the function assignments for various applications in order to aid selection.
The functions in these tables refer in particular to the following applications:

- Packaging:
  - Palletizers
  - Shrink film packaging machines
  - Carton erectors
- Material handling:
  - Standard cranes
  - Automatic storage systems
  - Grouping belts
- Material processing:
  - Slitting machines
  - Panel-sizing saws
  - Cable twisting

Each application has its own special features, and the combinations listed here are neither mandatory nor exhaustive.
Some functions are designed specifically for a particular application. In such cases, a reference to the application is provided in the form of a tab in the margin of the programming section of the corresponding pages.

Combinations of functions and applications

Function	Packaging	Material handling	Material processing
Braking sequence		✓	
Boost for conical motors		✓	
Limit switch management		✓	
Torque control		✓	✓
Positioning / Auto stop at distance	✓	✓	
Positioning value for PLC	✓	✓	
Load sharing	✓	✓	
Master/Slave management	✓	✓	
Master/Slave on rigid coupling	✓	✓	
Master/Slave on elastic coupling	✓	✓	
High-speed hoisting		✓	
High-speed commutation		✓	✓

Combinations with monitoring functions

Function	Packaging	Material handling	Material processing
External error	✓	✓	✓
Catch on the fly	✓	✓	✓
Motor overspeed	✓	✓	✓
Torque limitation		✓	✓
Encoder test	✓	✓	
Reverse disable	✓		✓
Thermal monitoring of the braking resistor		✓	
Underload detection			✓
Fast stop	✓	✓	✓
Dynamic load detection		✓	
Mechanical avoidance of resonance	✓	✓	✓
Stall monitoring	✓	✓	✓
Load slip detection		✓	
Rope tension and slack rope detection		✓	

Combinations with functions for configuration management

Function	Packaging	Material handling	Material processing
Motor switching	✓		✓
Configuration switching	✓	✓	✓
Parameter switching	✓		✓
Current threshold function		✓	✓
Torque threshold reached	✓	✓	✓
Thermal state reached	✓	✓	✓
Automatic error reset	✓	✓	✓
HSP reached	✓	✓	✓
Surge voltage on the motor		✓	
Parameter adjustment	✓	✓	✓
Pulse input configuration	✓	✓	
Dual rating	✓	✓	✓

5.1.3.3 Display terminal

Introduction

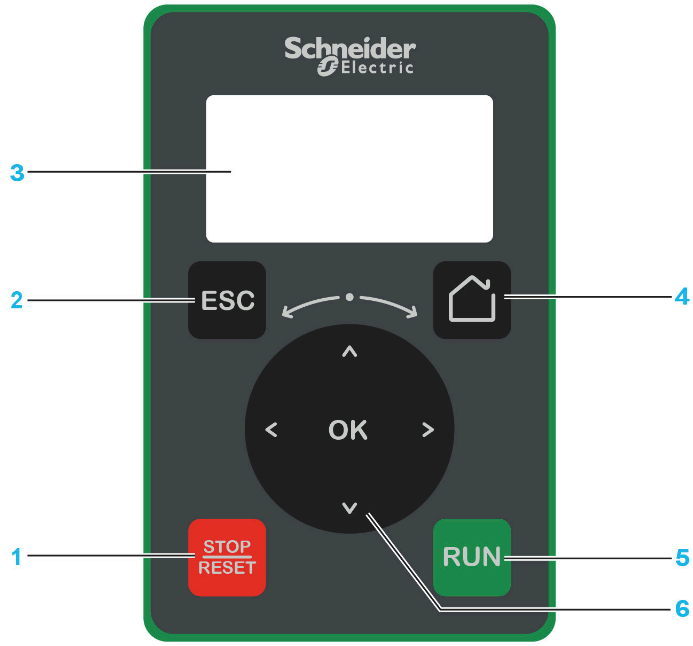
The inverter is compatible with the full-text display terminal (8I0XD086.400-1). These display terminals can be ordered separately.

Note:

In this manual, the term "display terminal" refers to both types of terminals.

Description of the full-text display terminal

The full-text display terminal is a local control device that is either connected to the inverter or installed on the door of a housing via the intended opening installation kit (8I0FM086.400-1).

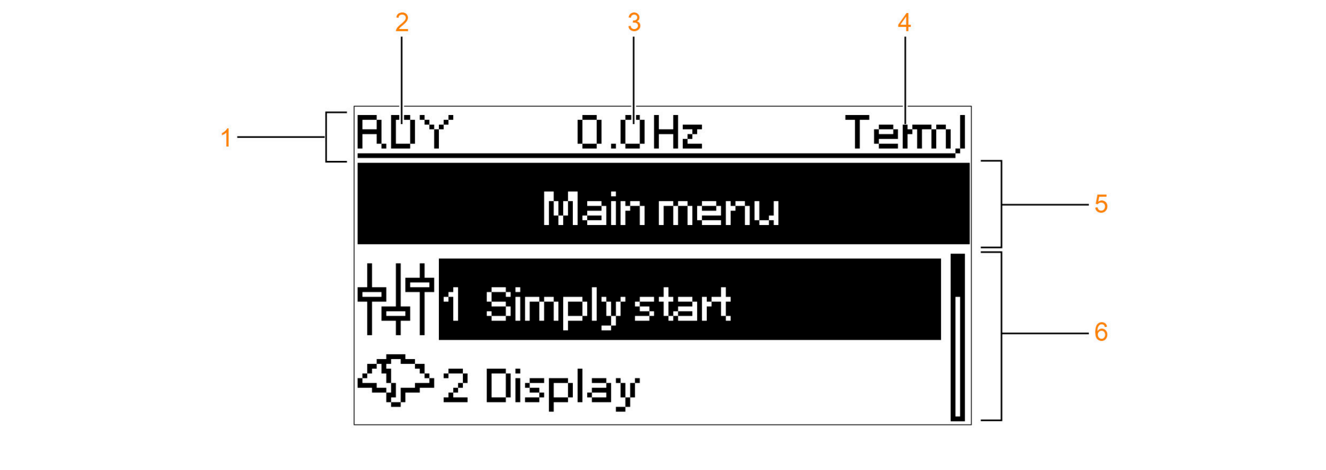


1) **STOP / RESET:** Stop command / Executes a fault reset
2) **ESC:** Exits a menu/parameter or removes the currently displayed value and displays the previously stored value.
3) **Graphic display**
4) **Home:** Provides direct access to the start page
5) **RUN:** Executes the function if it has been configured.
6) **Touch wheel / OK:** Saves the current value or calls the selected menu/parameter. The navigation key is used to quickly navigate through the menus. The up/down arrow keys are used to make selections; the left/right arrow keys are used to select digits when setting a numeric parameter value.

Note:

The inverter can be controlled via keys 1, 5 and 6 if the display terminal is enabled. To enable the keys on the display terminal, [Ref Freq 1 Config] (Fr1) must be set to [Ref.Freq-Rmt.Term] (LCC).

Description of the graphics screen



1) Display bar: The content is configurable.
2) **[Drive state]** (HMIS)
3) User-defined
4) Active control channel
    - TERM: Terminals
    - HMI: Display terminal
    - NET: POWERLINK communication module
    - PWS: DTM-based PC software for commissioning
5) Menu bar: Displays the name of the current menu or submenu.
6) The menus, submenus, parameters, values, bar graphs, etc. are displayed in a drop-down window format with a maximum of two lines. Lines or values selected via the navigation key are displayed inverted.

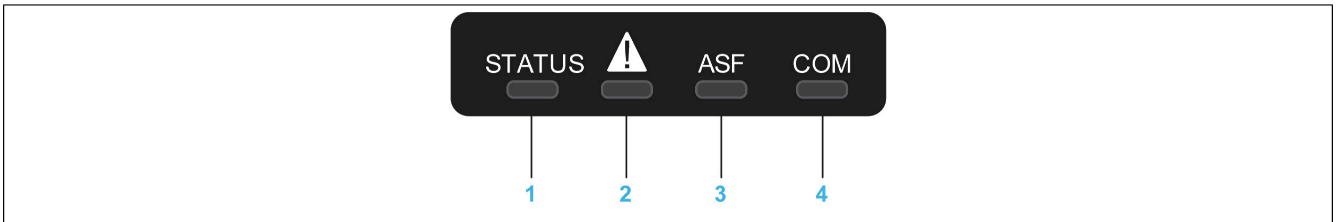
5.1.3.4 Product LEDs

Introduction

The inverter is equipped with LEDs to indicate the respective device status.

The number of available LEDs depends on the nominal power of the inverter. ACOPOSinverter P86 size 1 to 3 is equipped with 4 LEDs. ACOPOSinverter P86 size 4 and 5 is equipped with 10 LEDs.

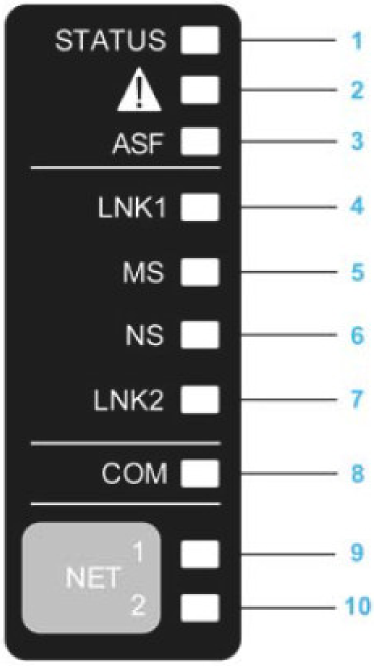
Description of LEDs for sizes 1 to 3



The following table contains details of the inverter's LED status indicators:

No.	LED	Color and status	Description
1	STATUS	OFF	The inverter is switched off.
		Green blinking	The inverter is not in operation but ready to start.
		Rapid green blinking	The inverter is in a transition state (acceleration, braking, etc.).
		Lit solid green	The inverter is in operation.
		Lit solid yellow	Visual device identification when using DTM-based commissioning software
2	Warning/Error	Slow red blinking	The inverter has determined a warning.
		Lit solid red	The inverter has determined a fault.
3	ASF	Lit solid yellow	The safety function has been triggered.
4	COM	Slow yellow blinking	Serial communication activity (commissioning software ACPi SafeConfigurator)

Description of LEDs for sizes 4 and 5



The following table contains details of the inverter's LED status indicators:

No.	LED	Color and status	Description
1	STATUS	OFF	The inverter is switched off.
		Green blinking	The inverter is not in operation but ready to start.
		Rapid green blinking	The inverter is in a transition state (acceleration, braking, etc.).
		Lit solid green	The inverter is in operation.
		Lit solid yellow	Visual device identification when using DTM-based commissioning software
2	Warning/Error	Slow red blinking	The inverter has determined a warning.
		Lit solid red	The inverter has determined a fault.
3	ASF	Lit solid yellow	The safety function has been triggered.
4	COM	Slow yellow blinking	Serial communication activity (commissioning software ACPi SafeConfigurator)

The ACOPOSinverter P86 was developed for use in a POWERLINK network. LEDs that are not described are of no significance for this use case.

5.1.3.5 Structure of the parameter table

General legend

These parameters only appear if the corresponding function has been selected in another menu. If the parameters can also be accessed and modified from within the configuration menu for the corresponding function, these menus will contain a detailed description of the parameters to make programming easier.

These parameters can be changed during operation or when the motor is stopped.

> **Note:**
>
> **To change the parameter assignment, a corresponding validation is required.**

To change the parameter assignment, a corresponding validation is required.

Representation of parameters

The parameters are represented as follows:

[Sample Menu] Code - Menu

Access

The parameters described below are called as follows:

[Path] → [Sub-path]

About this menu

Description of the menu or function

[Parameter 1] Code 1

Description of the parameter

Example of a table with a setting range:

Setting ()	Description
0.0 to 10,000.0	Setting range Factory setting: 50

[Parameter 2] Code 2

Description of the parameter

Example of a table with a selection list:

Setting ()	Code/Value	Description
[50Hz IEC]	50	IEC Factory setting
[60 Hz NEMA]	60	NEMA

5.1.3.6 Searching for a parameter in this document

With the manual

You can use the parameter name or parameter code to search the manual for the page with the details of the selected parameter.

Difference between menu and parameter

A hyphen after menu and submenu codes is used to differentiate between menu commands and parameter codes. Example:

Level	Name	Code
Menu	[Ramp]	(rAMP-)
Parameter	[Acceleration]	(ACC)

5.2 Direct operation

5.2.1 [Simply start] (SYS-)

Menu **[Simply start]** (SYS-) contains three tabs for quick access to the main functions:

- Tab "Quick start" provides quick access to the basic parameters.
- Tab "My menu" is a user-defined menu for quick access to specific parameters.
- Folder "Parameter changes" allows quick access to the 10 most recently changed parameters.

5.2.1.1 [Simply start] (SIM-)

Handheld access

[Simply start] → **[Simply start]**

About this menu

> **Warning!**
>
> **LOSS OF CONTROL**
>
> - **Read the manual of the connected motor thoroughly.**
> - **Check the nameplate and the manual of the connected motor to ensure that all motor parameters are correctly set.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

This menu allows quick access to the basic configurable parameters.

[Motor Standard] (bFr)

Motor standard.

This parameter is accessible if **[Motor control type]** (Ctt) is not set to any of the following values:

- **[Nom SyncMotor]** (SYn)
- **[Sync.CL]** (FSY)
- **[SYN_U VC]** (SYnU)

This parameter is used to change the presets of the following parameters:

- **[High Speed]** (HSP)
- **[Motor Freq Thd]** (Ftd)
- **[Nom Motor Voltage]** (UnS)
- **[Nominal Motor Freq]** (FrS)
- **[Max Frequency]** (tFr)

	Setting	Code/Value	Description
★	[50Hz IEC]	(50)	IEC Factory setting
	[60 Hz NEMA]	(60)	NEMA

[Nominal motor power] (nPr)

Nominal power of the motor.

This parameter is accessible if [Motor param choice] (MPC) is set to [Mot Power] (nPr) and if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Nominal power of the motor specified on the nameplate in kW if [Motor Standard] (bFr) is set to [50Hz IEC] (50) and nominal power in horsepower if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60).

	Setting	Description
	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [0.01 kW]	Max. value [0.01 kW]	Default [0.01 kW]
8I86T400075.00-000	9	220	75
8I86T400150.00-000	9	300	150
8I86T400220.00-000	9	400	220
8I86T400300.00-000	9	550	300
8I86T400400.00-000	55	750	400
8I86T400550.00-000	75	1100	550
8I86T400750.00-000	150	1500	750
8I86T401100.00-000	220	1850	1100
8I86T401500.00-000	300	220	1500

ACOPOSinverter P86	Setting range		
	Min. value [0.1 kW]	Max. value [0.1 kW]	Default [0.1 kW]
8I86T401850.00-000	40	300	185
8I86T402200.00-000	55	370	220
8I86T403000.00-000	75	450	300
8I86T403700.00-000	110	550	370
8I86T404500.00-000	150	750	450
8I86T405500.00-000	185	900	550
8I86T407500.00-000	220	1100	750

[Nom Motor Voltage] (UnS)

Nominal voltage of the motor.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Nominal voltage of the motor specified on the nameplate.

	Setting	Description
	100 to 690 VAC	Setting range Factory setting: Depends on the nominal power of the inverter and [Motor Standard] (bFr).

[Nom Motor Current] (nCr)

Nominal current of the motor given on the nameplate.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
☆	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [0.01 A]	Max. value [0.01 A]	Default [0.01 A]
8I86T400075.00-000	55	396	200
8I86T400150.00-000	100	756	350
8I86T400220.00-000	140	1008	510
8I86T400300.00-000	180	1296	720
8I86T400400.00-000	232	1714	910
8I86T400550.00-000	317	2286	1190
8I86T400750.00-000	412	3240	1520
8I86T401100.00-000	600	4320	2130
8I86T401500.00-000	800	5760	2860

ACOPOSinverter P86	Setting range		
	Min. value [0.1 A]	Max. value [0.1 A]	Default [0.1 A]
8I86T401850.00-000	97	702	351
8I86T402200.00-000	115	830	417
8I86T403000.00-000	153	922	550
8I86T403700.00-000	186	1117	670
8I86T404500.00-000	220	1320	810
8I86T405500.00-000	265	1740	990
8I86T407500.00-000	362	2175	1350

[Nominal Motor Freq] (FrS)

Nominal frequency of the motor.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

The factory setting is 50 Hz or preset 60 Hz if [Motor Standard] (bFr) is set to 60 Hz.

	Setting	Description
☆	10 to 599 Hz	Setting range Factory setting: 50 Hz

[Nominal Motor Speed] (nSP)

Nominal speed of the motor.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

If the synchronous speed and the slip are specified in Hz or as a percentage on the nameplate, use one of the following formulas to calculate the nominal speed:

- $$Nominal\ speed = Synchronous\ speed \times \frac{100 - slip\ as\ a\ \%}{100}$$
- $$Nominal\ speed = Synchronous\ speed \times \frac{60 - slip\ in\ Hz}{60}\ (60\ Hz\ motors)$$
- $$Nominal\ speed = Synchronous\ speed \times \frac{50 - slip\ in\ Hz}{50}\ (50\ Hz\ motors)$$

	Setting	Description
★	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [1 rpm]	Max. value [1 rpm]	Default [1 rpm]
8I86T400075.00-000	0	65535	1400
8I86T400150.00-000			1420
8I86T400220.00-000			1430
8I86T400300.00-000			1420
8I86T400400.00-000			1425
8I86T400550.00-000			1430
8I86T400750.00-000			1450
8I86T401100.00-000			1450
8I86T401500.00-000			1455
8I86T401850.00-000			1455
8I86T402200.00-000			1460
8I86T403000.00-000			1460
8I86T403700.00-000			1475
8I86T404500.00-000			1475
8I86T405500.00-000			1480
8I86T407500.00-000			1480

[Motor 1 Cosinus Phi] (COS)

The nominal cosine phi value of the motor.

This parameter is accessible if [Motor param choice] (MPC) is set to [Mot Cosinus] (COS) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
★	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [0,01]	Max. value [0,01]	Default [0,01]
8I86T400075.00-000	50	100	77
8I86T400150.00-000			79
8I86T400220.00-000			81
8I86T400300.00-000			78
8I86T400400.00-000			79
8I86T400550.00-000			82
8I86T400750.00-000			84
8I86T401100.00-000			85
8I86T401500.00-000			85
8I86T401850.00-000			85
8I86T402200.00-000			85
8I86T403000.00-000			85
8I86T403700.00-000			85
8I86T404500.00-000			85
8I86T405500.00-000			85
8I86T407500.00-000			85

[2/3-Wire Control] (tCC)

2- or 3-wire control.

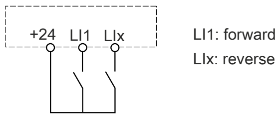
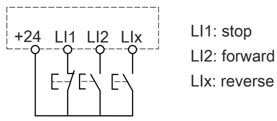
Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

If this parameter is changed, parameters [Reverse Assign] (rrS) and [2-wire type] (tCt) as well as the digital inputs assignments are reset to their factory settings.

Ensure that this change is compatible with the type of wiring used.

Failure to follow these instructions can result in death, serious injury or damage to property.

	Setting	Code/Value	Code/Value
2 s	[2-Wire Control]	2C	**2-wire control (level-controlled):** Switching on or off is controlled by the state (0 or 1) or edge (0 to 1 or 1 to 0) of the input. **Source** wiring example:  **Factory setting**
	[3-Wire Control]	3C	**3-wire control (edge-controlled)** [3 wire]: A **forward** or **reverse** pulse is sufficient to control motor startup. A **stop** pulse is sufficient to control motor stopping. **Source** wiring example: 

[Max Frequency] (tFr)

Maximum output frequency.

The factory setting is 60 Hz or preset 72 Hz if [Motor Standard] (bFr) is set to 60 Hz.

Setting	Description
10 to 599 Hz	Setting range Factory setting: 60 Hz

1) The maximum range is 10 * [Nominal Motor Freq] (FRS) for an induction motor or 10 * [Sync Nominal Freq] (FRSS) for a synchronous motor.

[Autotuning] (tUn)

Warning!

UNEXPECTED MOVEMENT

During autotuning, the motor is moved to adjust the control loops.

- **Only start the system if there are no persons or obstacles in the operating area.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Noise and vibrations of the system are normal during motor measurement.

If [Autotuning Type] (tunt) is set to [Standard] (std), the motor executes small movements during motor measurement.

If [Autotuning Type] (tunt) is set to [Rotation] (rot), the motor runs at half the nominal frequency.

In all cases, the motor must be stopped before a measurement procedure is started. Ensure that the application cannot start the motor during the measurement procedure.

The following are optimized by the measurement procedure:

- The motor power at low speed.
- The estimation of the motor torque.

Autotuning is only performed if no stop command has been issued. If function "Freewheel stop" or "Fast stop" has been assigned to a digital input, this input must be set to 1 (input at 0 active).

Autotuning has priority over any move or premagnetization commands. These will only be taken into account after the autotuning sequence.

If a fault has been detected during motor measurement, the inverter always displays [No action] (nO) and can switch to mode [Autotuning] (tUn) for detected faults depending on the configuration of [Tuning Error Resp] (tnL).

Autotuning can take several seconds. Do not interrupt the process. Wait until the display terminal changes to [No action] (nO).

Note:

The thermal state of the motor greatly affects the measurement result. Always perform motor measurement when the motor is stopped and when it is cold. Ensure that the application cannot start the motor during the measurement procedure.

In order to perform motor measurement again, wait until the motor has stopped and cooled down completely. Set [Autotuning] (tUn) to [Erase Autotuning] (CLr) to perform motor measurement again.

Motor measurement without executing function [Erase Autotuning] (CLr) first is used to estimate the thermal state of the motor.

The cable length also affects the measurement result. If the wiring is changed, the measurement procedure must be repeated.

	Setting	Code/Value	Description
2 s	[No action]	(nO)	Autotuning not active. Factory setting
	[Apply Autotuning]	(YES)	Autotuning is carried out immediately if possible; the parameter then automatically changes to [No action] (nO). If the inverter status does not permit immediate motor measurement, the parameter changes to [No action] (nO) and the operation must be performed again.
	[Erase Autotuning]	(CLr)	The motor parameters acquired by the autotuning function are reset. The standard motor parameter values are used to control the motor. [Autotuning Status] (tUS) is set to [Not done] (tAB).

[Autotuning Status] (tUS)

Status of the autotuning procedure.

(For information only, cannot be modified.)

This parameter is not stored when the inverter is switched off. It shows the autotuning status since the last commissioning.

	Setting	Code/Value	Description
	[Not done]	(tAb)	Autotuning is performed. Factory setting
	[Pending]	(PEnd)	Autotuning has been requested but not yet performed.
	[Active]	(PrOG)	Autotuning active.
	[Error]	(FAIL)	A fault occurred during autotuning.
	[Done]	(dOnE)	The motor parameters calculated by the autotuning function are used to control the motor.

[Tune Selection] (StUn)

Selects tuning.

	Setting	Code/Value	Description
	[Default]	(tAb)	The standard motor parameter values are used to control the motor. Factory setting
	[Measure]	(MEAS)	The values calculated via autotuning are used to control the motor.
	[Customized]	(CUS)	The manually set values are used to control the motor.

[Motor Th Current] (ItH)

Current for thermal monitoring of the motor that must be set according to the rated operating current specified on the nameplate.

	Setting	Description
	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range			
	Min. value [0.01 A]	Max. value [0.01 A]	Default [0.01 A] Asynchronous	Default [0.01 A] Synchronous
8I86T400075.00-000	44	396	200	200
8I86T400150.00-000	80	756	350	370
8I86T400220.00-000	112	1008	510	440
8I86T400300.00-000	144	1296	720	600
8I86T400400.00-000	186	1714	910	700
8I86T400550.00-000	254	2286	1190	900
8I86T400750.00-000	330	3240	1520	1200
8I86T401100.00-000	480	4320	2130	1750
8I86T401500.00-000	640	5760	2860	2300

ACOPOSinverter P86	Setting range			
	Min. value [0.1 A]	Max. value [0.1 A]	Default [0.1 A] Asynchronous	Default [0.1 A] Synchronous
8I86T401850.00-000	78	702	351	290
8I86T402200.00-000	92	830	417	350
8I86T403000.00-000	123	922	550	500
8I86T403700.00-000	149	1117	670	650
8I86T404500.00-000	176	1320	810	820
8I86T405500.00-000	212	1740	990	1000
8I86T407500.00-000	290	2175	1350	1250

[Acceleration] (ACC)

Time to start up from 0 to [Nominal Motor Freq] (FrS). In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

	Setting	Description
	0.0 to 6,000.0 s[1)]	Setting range Factory setting: 3.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

[Deceleration] (dEC)

Time to decelerate from [Nominal Motor Freq] (FrS) to 0. In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

	Setting	Description
	0.0 to 6,000.0 s[1)]	Setting range Factory setting: 3.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

[Low Speed] (LSP)

Low speed.
Motor frequency at minimum setpoint, configurable from 0 to [High Speed] (HSP).

	Setting	Description
	0.0 to [High Speed] (HSP) Hz	Setting range Factory setting: 0.0 Hz

[High Speed] (HSP)

High speed.
Motor frequency at maximum setpoint, configurable from [Low Speed] (LSP) to [Max Frequency] (tFr). The factory setting is changed to 60 Hz if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60).

	Setting	Description
	0.0 to [Max Frequency] (tFr)	Setting range Factory setting: 50.0 Hz

5.2.1.2 [My menu] (MYMn-)

Access

[Simply start] → [My menu]

About this menu

This menu contains the parameters selected from menu [My menu config.] (MyC-).

> **Note:**
>
> **This menu is empty by default.**

5.2.1.3 [Modified parameters] (LMd-)

Access

[Simply start] → [Modified parameters]

About this menu

This menu provides quick access to the 10 last modified parameters.

5.2.2 [Diagnostics] (dIA-)

Menu [Diagnostics] (dIA-) provides inverter and application data that is useful for diagnostic purposes.

5.2.2.1 [Diag. data]

5.2.2.1.1 [Diag. data] (ddt-)

Access

[Diagnostics] → [Diag. data]

About this menu

This menu contains current warnings and detected faults as well as inverter data.

[Last Warning] (LALr)

The last warning that was output.

Setting	Code/Value	Description
[No Warning stored]	(nOA)	No warning stored
[Fallback Frequency]	(FrF)	Response to event / fallback speed
[Speed Maintained]	(rLS)	Response to event / maintained speed
[Type of stop]	(Stt)	Response to event/stop for [Type of stop] (STT) without triggering a fault
[Ref Frequency Warning]	(SrA)	Frequency setpoint reached
[PID error Warning]	(PEE)	Warning for PID fault
[PID Feedback Warn]	(PFA)	Warning for PID actual value
[PID High Fdbck Warn]	(PFAH)	Upper PID threshold value reached
[PID Low Fdbck Warn]	(PFAL)	Lower PID threshold value reached

Setting	Code/Value	Description
[Control Warn]	(PISH)	Warning for PI actual value monitoring triggered
[Limit Switch Reached]	(lsa)	Limit switch reached
[Slack Rope Warning]	(rsda)	Warning for slack rope
[Dynamic Load Warning]	(dlda)	Warning for dynamic load
[AI1 Th Warning]	(tP1A)	Warning for temperature monitoring on AI1
[AI3 Th Warning]	(tP3A)	Warning for temperature monitoring on AI3
[AI1 4-20 Loss Warning]	(AP1)	Warning for loss of 4-20 on AI1
[AI3 4-20 Loss Warning]	(AP3)	Warning for loss of 4-20 on AI3
[IGBT Thermal Warning]	(tJA)	Warning for thermal IGBT state
[Fan Counter Warning]	(FCtA)	Warning for fan tachometer
[Fan Feedback Warning]	(FFdA)	Warning for the actual value of the fan output
[BR Thermal Warning]	(boa)	Temperature warning for braking resistor
[Ext. Error Warning]	(EFA)	Warning for external fault
[Undervoltage Warning]	(USA)	Warning for undervoltage output
[Preventive UnderV Active]	(UPA)	Controlled stop at power loss, threshold value reached
[Mot Freq High Thd]	(FtA)	Threshold value "Motor frequency high 1" reached
[Mot Freq Low Thd]	(FtAL)	Threshold value "Motor frequency low 1" reached
[Pulse Warn Thd Reached]	(FqLA)	Threshold value "Motor frequency high 2" reached
[Mot Freq Low Thd 2]	(F2AL)	Threshold value "Motor frequency low 2" reached
[High Speed Reached]	(FLA)	Result for HSP function reached
[Ref Freq High Thd reached]	(rtAH)	Threshold value "Frequency setpoint high" reached
[Ref Freq Low Thd reached]	(rtAL)	Threshold value "Frequency setpoint low" reached
[2nd Freq Thd Reached]	(F2A)	Frequency level reached (frequency meter)
[Current Thd Reached]	(CtA)	Threshold value "Motor current high" reached
[Low Current Reached]	(CtAL)	Threshold value "Motor current low" reached
[High Torque Warning]	(ttha)	Warning for high torque
[Low Torque Warning]	(ttla)	Warning for low torque
[Process Undld Warning]	(ULA)	Underload detected
[Process Overload Warning]	(OLA)	Overload detected
[Torque Limit Reached]	(SSA)	Timeout for current or torque limit reached
[Torque Control Warning]	(rta)	Warning for torque control
[Drv Therm Thd reached]	(tAd)	Result for function "Thermal threshold value of inverter" reached
[Motor Therm Thd reached]	(tSA)	Thermal threshold value of motor 1 reached
[Mot2 Therm Thd reached]	(ts2)	Thermal threshold value of motor 2 reached
[Mot3 Therm Thd reached]	(ts3)	Thermal threshold value of motor 3 reached
[Mot4 Therm Thd reached]	(ts4)	Thermal threshold value of motor 4 reached
[Power High Threshold]	(PtHA)	Threshold value of power output "High" reached
[Power Low Threshold]	(PtHL)	Threshold value of power output "Low" reached
[Cust Warning 1]	(CAS1)	Customer warning 1 active
[Cust Warning 2]	(CAS2)	Customer warning 2 active
[Cust Warning 3]	(CAS3)	Customer warning 3 active
[Cust Warning 4]	(CAS4)	Customer warning 4 active
[Cust Warning 5]	(CAS5)	Customer warning 5 active
[Auto backp. not Conn.]	(drAP)	Automatic backup not connected with display terminal
[Auto Backup Warning]	(drtF)	Warning for automatic backup transfer
[Slipping warn]	(ana)	Warning for slipping
[Load Mvt Warn]	(bsa)	Warning for load movement
[Brake Cont Warn]	(bca)	Warning for brake contact
[M/S Device Warn]	(msda)	Master/Slave system warning
[Current Reduc Warn]	(tLOW)	Warning for current reduction
[Encoder Thermal Warn]	(tpea)	Thermal warning for encoder
[Backlash Warn]	(bSqA)	Warning for gear backlash

[Last Error] (LFt)

Last fault that occurred.

Setting	Code/Value	Description
[No Error]	(nOF)	No fault detected
[EEPROM Control]	(EEF1)	EEPROM control
[Incorrect Configuration]	(CFF)	Invalid configuration during startup
[Invalid Configuration]	(CFI)	Incorrect parameter configuration
[Modbus Com Interruption]	(SLF1)	Error in local serial Modbus communication
[Internal Link Error]	(ILF)	Error in the internal communication option
[Fieldbus Com Interrupt]	(CnF)	Interrupted communication on fieldbus module
[External Error]	(EPF1)	External fault with LI or local connection
[Overcurrent]	(OCF)	Overcurrent error
[Precharge Capacitor]	(CrF)	Load relay fault
[Encoder Feedback Loss]	(spf)	Loss of encoder signal
[Load slipping]	(anf)	Load slipping
[Input Overheating]	(IHF)	Input overheating fault
[Drive Overheating]	(OHF)	Inverter overtemperature fault
[Motor Overload]	(OLF)	Motor overload fault
[DC Bus Overvoltage]	(ObF)	DC bus overvoltage
[Supply Mains Overvoltage]	(OSF)	Overvoltage fault

Setting	Code/Value	Description
[Single output phase loss]	(OPF1)	Loss of a motor phase
[Input phase loss]	(PHF)	Mains input phase loss
[Supply Mains UnderV]	(USF)	Undervoltage fault
[Motor Short Circuit]	(SCF1)	Motor short circuit fault (hardware detection)
[Motor Overspeed]	(SOF)	Instability or load driving too much
[Autotuning Error]	(tnF)	Tuning fault
[Internal Error 1]	(InF1)	Unknown inverter size
[Internal Error 2]	(InF2)	Unknown or incompatible power card
[Internal Error 3]	(InF3)	Internal communication error
[Internal Error 4]	(InF4)	Internal data inconsistency
[EEPROM Power]	(EEF2)	Internal memory error
[Ground Short Circuit]	(SCF3)	Direct ground fault (hardware detection)
[Output Phase Loss]	(OPF2)	Loss of three motor phases
[CANopen Com Interrupt]	(COF)	CANopen communication error
[Brake Control]	(blf)	Brake controller
[Internal Error 7]	(InF7)	CPLD communication error
[Fieldbus Error]	(EPF2)	External fault for fieldbus module
[Internal Error 8]	(InF8)	Fault for switched-mode power supply
[Brake Feedback]	(brf)	Actual value of brake
[PC Com Interruption]	(SLF2)	Interruption of PC software communication
[Encoder Coupling]	(Ecf)	Encoder coupling
[Torque Limitation Error]	(ssf)	Torque limiting fault
[HMI Com Interruption]	(SLF3)	Communication error for display terminal
[Internal Error 9]	(InF9)	Current measuring circuit fault
[Internal Error 10]	(InFA)	Customer power supply fault
[Internal Error 11]	(InFb)	Temperature sensor fault (OC or SC)
[IGBT Overheating]	(tJF)	IGBT overtemperature fault
[IGBT Short Circuit]	(SCF4)	IGBT short circuit fault (hardware detection)
[Motor Short Circuit]	(SCF5)	Load short circuit during IGON test sequence (hardware detection)
[Torque timeout]	(srf)	Torque timeout
[Internal Error 12]	(infc)	Internal error 12 (internal power supply)
[Encoder]	(enf)	Encoder
[Input Contactor]	(LCF)	Line protection fault
[Internal Error 6]	(InF6)	Unknown or incompatible option module
[Internal Error 14]	(InFE)	CPU fault (RAM, flash memory, task, etc.)
[Brake Resistor ovld]	(bof)	Braking resistor overload
[AI3 4-20mA loss]	(LFF3)	AI3 4-20 mA loss
[Boards Compatibility]	(HCF)	Hardware configuration error
[Dynamic Load Error]	(dlf)	Dynamic load fault detected
[Conf Transfer Error]	(CFI2)	Configuration transmission error
[Channel Switch Error]	(CSF)	Channel switching fault
[Process Underload]	(ULF)	Torque underload fault
[Process Overload]	(OLC)	Torque overload fault
[Angle error]	(ASF)	Angle adjustment fault
[AI1 4-20mA loss]	(LFF1)	AI1 4-20 mA loss
[Safety Function Error]	(SAFF)	Safety function fault
[AI3 Th Level Error]	(tH3F)	Temperature sensor fault on AI3 detected
[AI3 Thermal Sensor Error]	(t3CF)	Temperature sensor fault on AI3
[Program Loading Error]	(PGLF)	Fault "Program loading" detected
[Program Running Error]	(PGrF)	Fault "Program running" detected
[Internal Error 16]	(InFG)	Internal error 16
[Internal Error 17]	(InFH)	Internal error 17
[Internal Error 0]	(InF0)	Internal error 0 (IPC)
[Internal Error 13]	(InFd)	Internal error 13
[Motor Stall Error]	(StF)	Motor stall fault detected
[Internal Error 21]	(InFL)	Internal error 21 (RTC)
[Embd Eth Com Interrupt]	(EtHF)	Embedded Ethernet communication interruption
[Internal Error 15]	(InFF)	Internal error 15 (flash memory)
[Firmware Update Error]	(fwer)	Firmware update error
[Internal Error 22]	(infm)	Internal error 22 (Embedded Ethernet)
[Internal Error 25]	(InFP)	Internal error 25
[Internal Error 20]	(InFK)	Internal error 20
[Internal Error 19]	(infj)	Internal error 19 (encoder module)
[Internal Error 27]	(InFr)	Internal error 27
[DB unit op. circuit]	(bUFO)	Braking module with no load
[Drive Overload]	(tlof)	Frequency inverter overload
[MultiDrive Link Error]	(MdLF)	MultiDrive Link error
[AI1 Th Level Error]	(tH1F)	Temperature sensor fault detected on AI1
[AI1 Thermal Sensor Error]	(t1CF)	Temperature sensor fault on AI1
[Backlash Error]	(bSqF)	Backlash fault
[M/S Device Error]	(msdf)	Master/Slave system error

Setting	Code/Value	Description
[Encoder Th Detected Error]	(tHeF)	Temperature sensor fault detected on encoder module
[Encoder Th Sensor Error]	(teCF)	Temperature sensor fault on the encoder
[Empty Configuration]	(cfi4)	Fault for empty configuration
[FDR 1 Error]	(Fdr1)	Embedded Ethernet: FDR error

[Internal Error 6] (inf6)

This parameter is accessible if **[Last Error]** (lft) is set to **[Internal Error 6]** (inf6).

	Setting	Description
	0 to 12 (value in hex.)	Value = 0x00: No fault detected Value = 0x01: No response of the option module Value = 0x02: Signature reception timeout Value = 0x03: ACK reception timeout Value = 0x04: Signature length Value = 0x05: Checksum Value = 0x06: Unknown state Value = 0x07: UART reception Value = 0x08: Unknown protocol version Value = 0x09: Unknown module type Value = 0x0A: More than 5 unsuccessful attempts Value = 0x0B: Unknown module type Value = 0x0C: Option module not supported by slot Value = 0x0D: Identical option module in more than one slot Value = 0x0E: O1SV not received Value = 0x0F: Software version of option module O1SV not compatible Value = 0x10: Reserved Value = 0x11: Reserved Value = 0x12: Control terminal module not available or not detected Factory setting: -

[Internal Error 19] (infj)

Error code for encoder module.

This parameter is accessible if **[Last Error]** (lft) is set to **[Internal Error 19]** (infj).

	Setting	Description
	0 to 65,535	Setting range Factory setting: -

[Encoder Fdbck Error] (enCE)

This parameter is accessible if **[Last Error]** (lft) is set to **[Encoder Feedback Loss]** (spf).

	Setting	Description
	0 to 65,535	Setting range Fault ID for encoder 1: Overcurrent in encoder power supply 10: AB encoder: A line separated 11: AB encoder: B line separated 12: AB encoder: Detection fault 13: AB encoder: Peak fault 20: Resolver: LOS fault 21: Resolver: DOS fault 22: Resolver: LOT fault 30: SinCos: Signal loss 31: SinCos: Signal loss 32: SinCos: Detection fault 33: SinCos: Peak fault 40: Hiperface: Timeout exceeded while waiting for response and retry 41: Hiperface: Unknown encoder type that cannot be read from encoder EEPROM 42: Hiperface: Hiperface command GetAbsolutePosition failed 43: Hiperface: Checksum error detected and retry exceeded 50: Endat: Communication error 51: Endat: Encoder not connected 52 to 56: Endat: Read error for parameter EnDat21 57: Endat: Encoder does not support EnDat22 58: Endat: Procedure for runtime compensation 59: Endat: Procedure for runtime compensation 60: Endat: Cyclic communication error Factory setting: -

[Nb Of Start] (nSM)

Number of motor starts (can be reset).

Setting	Description
0 to 4,294,967,295	Setting range Factory setting: _

[Motor Run Time] (rtH)

Motor operating hours.

Displays the time that has elapsed (can be reset) in seconds (time the motor has been running).

Setting	Description
0 to 429,496,729.5 h	Setting range Factory setting: _

5.2.2.1.2 [Service message] (SEr-)

Access

[Diagnostics] → **[Diag. data]** → **[Service message]**

About this menu

The service messages are available in this menu.

This is a user-defined service notification that is configured under **[My preferences]** (MYP) → **[Customization]** (CUS) → **[Service message]** (SEr).

5.2.2.1.3 [Other State] (SSt-)

Access

[Diagnostics] → **[Diag. data]** → **[Other State]**

About this menu

List of secondary states.

List

[Set 1 active] (CFP1)

[Set 2 active] (CFP2)

[Set 3 active] (CFP3)

[PID Active] (AUtO)

[DC Bus Charged] (dbL)

[Fast stop Active] (FSt)

[Fallback Frequency] (FrF)

[Speed Maintained] (rLS)

[Type of stop] (Stt)

[Encoder Config] (iCC)

[In braking] (brs)

[Ref Freq Warning] (SrA)

[Forward] (MFrd)

[Reverse] (MrrS)

[In motor fluxing] (FLX)

[Autotuning] (tUn)

5.2.2.1.4 [Diagnostics] (dAU-)

Access

[Diagnostics] → **[Diag. data]** → **[Diagnostics]**

About this menu

This menu enables simple test sequences for diagnostics.

[FAN Diagnostics] (FNT)

Diagnostics of the internal fans.

This function starts a test sequence.

[LED Diagnostics] (HLT)

Diagnostics of the product LED(s).

This function starts a test sequence.

[IGBT Diag w motor] (IWT)

Diagnostics of the product IGBT(s).

This function starts a test sequence with the connected motor (open circuit / short circuit).

[IGBT Diag w/o motor] (IWOT)

Diagnostics of the product IGBT(s).

This function starts a test sequence without the motor (short circuit).

5.2.2.1.5 [Identification] (OId-)

Access

[Diagnostics] → **[Diag. data]** → **[Identification]**

About this menu

This menu is read-only and cannot be configured. The following information can be displayed:

- Setpoint, nominal power and voltage of the inverter
- Software version of the inverter
- Serial number of the inverter
- Available option modules and their software versions
- Type and version of the display terminal

5.2.2.2 [Error history] (pFH)

Access

[Diagnostics] → **[Error history]**

About this menu

In this menu, the 15 most recently detected faults are displayed (dP1) to (dPF).

If you press OK for a selected error code in the error history, the inverter data logged when the fault occurred is displayed.

> **Note:**
>
> **Same content for [Last Error 1] (dP1) to [Last Error F] (dPF).**

[Last Error 1] (dP1)

Last error 1.

Identical to **[Last Error]** (LFt).

[Drive state] (HS1)

State of HMI.

Identical to **[Drive state]** (HMIS).

[Last Error 1 Status] (Ep1)

Status of last error 1.

DRIVECOM status register (identical to [ETA state word] (EtA)).

[ETI state word] (Ip1)

ETI status word

ETI status register

[Cmd word] (CMP1)

Command word. Command register (identical to [Cmd word] (CMd)).

[Motor Current] (LCP1)

Motor current (identical to [Motor Current] (LCr)).

Setting	Description
0 to 2*In	Setting range Factory setting: _

[Output frequency] (rFp1)

Motor frequency (identical to [Output frequency] (rFr)).

Setting	Description
-3,276.7 to 3,276.7 Hz	Setting range Factory setting: _

[Elapsed Time] (rtp1)

Time elapsed.

Setting	Description
0 to 65,535 h	Setting range Factory setting: _

[DC bus voltage] (ULp1)

DC bus voltage (identical to [DC bus voltage] (ULp1)).

Setting	Description
1.0 to 860.0 VAC	Setting range: [No meas. ---- is displayed if no value is measured.] on the display. Factory setting: _

[Motor Therm state] (tHP1)

Thermal state of motor (identical to [Motor Therm state] (tHr)).

Setting	Description
0 to 200%	Setting range Factory setting: _

[Command Channel] (dCC1)

Command channel (identical to [Command channel] (CMdC)).

Setting	Code/Value	Description
[Terminals]	(tErM)	Terminal
[HMI]	(HMi)	Display terminal
[Com. Module]	(nEt)	POWERLINK
[PC tool]	(pws)	DTM-based commissioning software.

[Ref Freq Channel] (drC1)

Channel for the frequency setpoint (identical to [Ref Freq Channel] (rFCC)).

Identical to [Command Channel] (dCC1).

[Motor Torque] (OtP1)

Estimated torque value of the motor (identical to [Motor Torque] (Otr)).

Note:

The value displayed is always positive in motor mode and always negative in generator mode, regardless of the direction.

Setting	Description
-300 to 300%	Setting range Factory setting: _

[Drive Thermal State] (tdP1)

Measured thermal state of the inverter (identical to [Drive Therm State] (tHd)).

Setting	Description
0 to 200%	Setting range Factory setting: _

[IGBT Junction Temp] (tJP1)

Estimated value for the transition temperature.

Setting	Description
0 to 255°C	Setting range Factory setting: _

[Switching Frequency] (SFP1)

Switching frequency used (related to [Switching Frequency] (SFr)).

Setting	Description
0 to 65,535 Hz	Setting range Factory setting: _

[Last Error 2] (dP2) to [Last Error F] (dPF)

Last error 2 to last error F.

Identical to [Last Error 1] (dP1).

5.2.2.3 [Warnings] (ALr-)

5.2.2.3.1 [Actual warnings] ALrd-

Access

[Diagnostics] → [Warnings] → [Actual warnings]

About this menu

List of current warnings.

If there is a warning , ✓ and [!] are displayed on the display terminal.

List of available warnings

Identical to [Last Warning] (LAIR).

5.2.2.3.2 [Warning group 1 definition] (A1C)

Access

[Diagnostics] → [Warnings] → [Warning group 1 definition]

About this menu

In the following submenus, warnings are arranged in one to five groups. The individual groups can be assigned to a relay or a digital output for remote signaling.

If one or more warnings selected in a group occur, the corresponding warning group is enabled.

List of warnings

Identical to [Last Warning] (LALR).

5.2.2.3.3 [Warning group 2 definition] (A2C-)

Access

[Diagnostics] → [Warnings] → [Warning group 2 definition]

About this menu

Identical to [Warning group 1 definition] (A1C).

5.2.2.3.4 [Warning group 3 definition] (A3C-)

Access

[Diagnostics] → [Warnings] → [Warning group 3 definition]

About this menu

Identical to [Warning group 1 definition] (A1C).

5.2.2.3.5 [Warning group 4 definition] (A4C-)

Access

[Diagnostics] → [Warnings] → [Warning group 4 definition]

About this menu

Identical to [Warning group 1 definition] (A1C).

5.2.2.3.6 [Warning group 5 definition] (A5C-)

Access

[Diagnostics] → [Warnings] → [Warning group 5 definition]

About this menu

Identical to [Warning group 1 definition] (A1C).

5.2.2.3.7 [Warnings] (ALr-)

Access

[Diagnostics] → [Warnings]

About this menu

This menu shows the warning history (last 30 warnings).

[Warning History] (ALH)

Identical to [Last Warning] (LALr).

5.2.3 [Display] (MOn-)

Menu [Display] (MOn-) contains monitoring data for the inverter and the application.

It enables application-oriented display of data relating to energy, costs, cycles, efficiency, etc.

The data can be displayed via user-defined units and graphic views.

5.2.3.1 [Display] (MOn-)

5.2.3.1.1 [Elec Ener Input Counter] (ELI)

Access

[Display] → [Energy parameters] → [Elec Ener Input Counter]

About this menu

This menu contains data for the electrical power supply.

[Input Elec. Power] (IPrW)

Calculation of active power consumption.

Setting	Description
Depends on the nominal power of the inverter	Setting range in kW if [Motor Standard] (bFr) is set to [50Hz IEC] (50) and nominal power in horsepower if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60). Factory setting: _

[Input Reac. Power] (IqrW)

Input reactive power.

Setting	Description
Depends on the nominal power of the inverter	Setting range in kW if [Motor Standard] (bFr) is set to [50Hz IEC] (50) and nominal power in horsepower if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60). Factory setting: _

[Real Input Energy] (IE4)

Input power consumption (TWh).

This parameter is accessible if [Real Input Energy] (IE4) is not set to 0.

	Setting	Description
★	-999 to 999 TWh	Setting range Factory setting: _

[Real Input Energy] (IE3)

Input power consumption (GWh).

	Setting	Description
★	-999 to 999 GWh	Setting range Factory setting: _

[Real Input Energy] (IE2)

Input power consumption (MWh).

	Setting	Description
★	-999 to 999 MWh	Setting range Factory setting: _

[Real Input Energy] (IE1)

Input power consumption (kWh).

	Setting	Description
★	-999 to 999 kWh	Setting range Factory setting: _

[Real Input Energy] (IE0)

Input power consumption (Wh).

	Setting	Description
★	-999 to 999 Wh	Setting range Factory setting: _

5.2.3.1.2 [Elec Ener Output Counter] ELO

Access

[Display] → [Energy parameters] → [Elec Ener Output Counter]

About this menu

This menu contains data for electrical energy output.

[Output Elec. Power] (EPrW)

Estimation of the active electrical output power.

Setting	Description
Depends on the nominal power of the inverter	Setting range in kW if [Motor Standard] (bFr) is set to [50Hz IEC] (50) and nominal power in horsepower if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60). Factory setting: _

[Real Consumption] (OE4)

Energy consumption (TWh).

This parameter is accessible if [Real Consumption] (oE4) is not set to 0.

	Setting	Description
★	-999 to 999 TWh	Setting range Factory setting: _

[Real Consumption] (OE3)

Energy consumption (GWh).

Setting	Description
-999 to 999 GWh	Setting range Factory setting: _

[Real Consumption] (OE2)

Energy consumption (MWh).

Setting	Description
-999 to 999 MWh	Setting range Factory setting: _

[Real Consumption] (OE1)

Energy consumption (kWh).

Setting	Description
-999 to 999 kWh	Setting range Factory setting: _

[Real Consumption] (OE0)

Energy absorption (Wh).

Setting	Description
-999 to 999 Wh	Setting range Factory setting: _

[Elc Egy Today] (OCt)

Electrical energy consumed by the motor today (kWh).

Setting	Description
0 to 4,294,967,295 kWh	Setting range Factory setting: _

[Elc Egy Yesterday] (OCY)

Electrical energy consumed by the motor yesterday (kWh).

Setting	Description
0 to 4,294,967,295 kWh	Setting range Factory setting: _

[Over-Consumption Thd] (PCAH)

Threshold value for excess consumption.

Setting	Description
[Under-Consumption Thd] (PCAL) to 200%	Setting range Factory setting: 0.0%

[Under-Consumption Thd] (PCAL)

Threshold value for underconsumption.

Maximum value = (PCAH) if (PCAH) ≤ 100%.

Setting	Description
0.0 to 100.0% or [Over-Consumption Thd] (PCAH) if (PCAH) ≤ 100%	Setting range Factory setting: 0.0%

[Over/Under-Cons Delay] (PCAt)

Detection time for overconsumption/underconsumption

Setting	Description
0 to 60 min	Setting range Factory setting: 1 min

[Peak Output Power] (MOEP)

Peak output power.

Setting	Description
Depends on the nominal power of the inverter.	Setting range Factory setting: _

5.2.3.1.3 [Mechanical energy] MEC

Access

[Display] → [Energy parameters] → [Mechanical energy]

About this menu

This menu contains data for the mechanical energy output.

[Power Estim Value] (OPrW)

Estimation (calculation) of the mechanical motor power.

Setting	Description
Depends on the nominal power of the inverter	Nominal power of the motor specified in kW on the nameplate if [Motor Standard] (bFr) is set to [50Hz IEC] (50) or specified in HP if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60). Factory setting: _

[Motor Consumption] (ME4)

Energy consumption (TWh).

This parameter is accessible if [Motor Consumption] (mE4) is not set to 0.

	Setting	Description
★	0 to 999 TWh	Setting range Factory setting: _

[Motor Consumption] (ME3)

Energy consumption (GWh).

	Setting	Description
★	0 to 999 GWh	Setting range Factory setting: _

[Motor Consumption] (ME2)

Energy consumption (MWh).

	Setting	Description
★	0 to 999 MWh	Setting range Factory setting: _

[Motor Consumption] (ME1)

Energy consumption (kWh).

	Setting	Description
★	0 to 999 kWh	Setting range Factory setting: _

[Motor Consumption] (ME0)

Energy consumption (Wh).

	Setting	Description
	0 to 999 Wh	Setting range Factory setting: _

5.2.3.1.4 [Energy saving] (ESA)

Access

[Display] → [Energy parameters] → [Energy saving]

About this menu

This menu offers a comparison between applications with and without inverters in terms of costs, energy consumption and CO_2 emissions.

[Reference Power] (PrEF)

Setpoint for power output without inverter

Setting	Description
0.00 to 655.35 kW	Nominal power of the motor specified in kW on the nameplate if [Motor Standard] (bFr) is set to [50 Hz IEC] (50) or specified in HP if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60). Factory setting: 0.00 kW

[kWh Cost] (ECSt)

Costs per kWh.

Setting	Description
$0.00 to $655.35	Setting range in € if [Motor Standard] (bFr) is set to [50 Hz IEC] (50), or in $ if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60). Factory setting: _

[CO2 Ratio] (ECO2)

Amount of CO_2 per kWh.

Setting	Description
0.000 to 65.535 kg/kWh	Setting range Factory setting: 0.000 kg/kWh

[Energy saving] (ESAv)

Energy saving due to the inverter solution.

Setting	Description
0 to 4,294,967,295 kWh	Setting range Factory setting: _

[Money Saved] (CASH)

Cost savings due to the inverter solution.

Setting	Description
$0.00 to $42,949.672	Setting range in € if [Motor Standard] (bFr) is set to [50 Hz IEC] (50), or in $ if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60). Factory setting: _

[Co2 Saved] (CO2S)

CO_2 emissions saved due to the inverter solution

Setting	Description
0.0 to 29,496,729.5 t	Setting range Factory setting: _

5.2.3.2 [Application parameters]

[Application parameters] (apr-)

Access

[Display] → [Application parameters]

About this menu

This menu displays application-specific information.

[Application State] (APPS)

Application state.

This parameter specifies the inverter application state.

Setting	Code/Value	Description
[Running]	(rUn)	No application function active; the inverter is in operation.
[Stop]	(StOP)	No application function active; the inverter is not in operation.
[Local Mode Active]	(LOCAL)	Mode "Forced local" enabled
[Channel 2 Active]	(OvEr)	Control mode "Override speed" enabled
[Manual Mode Active]	(MAnU)	Motor running; manual PID mode is active.
[PID Active]	(Auto)	Motor running; automatic PID mode is active.
[Boost In progress]	(booSt)	The boost function is active.
[Sleep Active]	(SLEEP)	The sleep mode is active.
[BL In Progress]	(bQS)	Backlash sequence is active.

5.2.3.3 [Motor parameters]

Access

[Display] → [Motor parameters]

About this menu

This menu displays the motor-specific parameters.

[Motor Speed] (Spd)

Motor speed.

This parameter shows the calculated rotor speed without motor slip.

Setting	Description
0 to 65,535 rpm	Setting range Factory setting: _

[Signed Mech Speed] (Spd1)

Mechanical motor speed with sign.

Setting	Description
-100,000 to 100,000 rpm	Setting range Factory setting: _

[Motor Voltage] (UOP)

Motor voltage.

Setting	Description
0 to 65,535 V	Setting range Factory setting: _

[Motor Power] (OPr)

Motor power.

Output power as a percentage (100% = nominal power of motor).

Setting	Description
-300 to 300%	Setting range Factory setting: _

[Nom Motor Torque] (tqn)

Calculated nominal torque of the motor in Nm (±2% tolerance).

Setting	Description
0.01 to 65,535 Nm	Setting range: Depends on the nominal power of the inverter. Factory setting: _

[Motor Torque] (Otr)

Motor torque.

Output torque (100% = [Nom Motor Torque] (TQN)).

> **Note:**
>
> **The displayed value is always positive in motor mode and always negative in generator mode, regardless of the direction.**

Setting	Description
-300 to 300%	Setting range Factory setting: _

[Motor Torque (Nm)] (Otqn)

Motor torque (Nm).

Output torque.

> **Note:**
>
> **The displayed value is always positive in motor mode and always negative in generator mode, regardless of the direction.**

Setting	Description
-32,767 to 32,767 Nm	Setting range: Depends on the nominal power of the inverter. Factory setting: _

[Motor Current] (LCr)

Motor current.

Setting	Description
0.00 to 65,535 A	Setting range: Depends on the nominal power of the inverter. Factory setting: _

[Motor Therm state] (tHr)

Thermal state of the motor.

The thermal normal state of the motor is 100%; value [Motor Overload] (OLF) is set to 118%.

Setting	Description
0 to 200%	Setting range Factory setting: _

5.2.3.4 [Application parameters]

Access

[Display] → [Application parameters]

About this menu

This menu displays the inverter-specific parameters.

[AIV1 Image input] (AIv1)

AIV1 input image.

This parameter can only be read. It makes it possible to display the speed setpoint created by the motor via the fieldbus channel.

	Setting	Description
	-10.000 to 10.000[1)]	Setting range Factory setting: -

1) Range per [AIV1 Type] (AV1T).

[Pre-Ramp Ref Freq] (FrH)

Frequency setpoint before ramp.

This parameter can only be read. It enables the display of the frequency setpoint applied to the motor, regardless of the selected channel for the setpoint.

Setting	Description
-599.0 to 599.0 Hz	Setting range Factory setting: 0 Hz

[Ref Frequency] (LFr)

Frequency setpoint.

This parameter only appears if the function has been enabled. It is used to change the frequency setpoint using the remote controller. It is not necessary to press the OK button to change the setpoint.

	Setting	Description
	-599.0 to 599.0 Hz	Setting range Factory setting: -

[Torque ref.] (Ltr)

Torque setpoint.

This parameter only appears if the function has been enabled. It is used to change the torque setpoint using the remote controller. It is not necessary to press the OK button to change the setpoint.

This parameter is accessible if **[Trq/spd switching]** (tSS) is not set to **[Not Assigned]** (no) and if **[Torque ref. channel]** (tr1) is set to **[Ref.Freq-Rmt.Term]** (LCC).

	Setting	Description
	-300.0 to 300.0%	Setting range Factory setting: -

[Torque reference] (trr)

Torque setpoint.

This parameter is accessible if **[M/S Device Role]** (MSdt) is set to **[Slave]** (SLAvE) and **[M/S Control Type]** (MSCT) is set to one of the following values:

- **[Torque Direct]** (trqd)
- **[Torque Reverse]** (trqr)
- **[Torque Custom]** (trqC)

	Setting	Description
	-3,276.7 to 3,276.7%	Setting range Factory setting: _

[Motor Frequency] (rFr)

Motor frequency.

This parameter displays the calculated rotor frequency without motor slip.

Setting	Description
-3,276.7 to 3,276.7 Hz	Setting range Factory setting: 0.0 Hz

[Stator Frequency] (sfq)

Stator frequency.

This parameter is accessible if **[Access Level]** (LAC) is set to **[Expert]** (EPr).

	Setting	Description
	[No Freq Applied] (no) up to 599.0 Hz	Setting range Factory setting: -

[Rotor Frequency] (rfq)

Rotor frequency.

This parameter displays the calculated rotor frequency with motor slip.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Description
	[No Freq Applied] (no) up to 599.0 Hz	Setting range Factory setting: -

[Measured output fr.] (mmf)

Measured motor frequency.

This parameter is only accessible if an encoder module is connected or an integrated encoder is used. The available selection options depend on the type of encoder module used.

	Setting	Description
	-3,276.7 to 3,276.7 Hz	Setting range Factory setting: _

[Multiplying Coeff.] (MFr)

Multiplication coefficient.

This parameter is accessible if [Ref Freq - Multiply] (MA2,MA3) has been assigned.

	Setting	Description
	0 to 100%	Setting range Factory setting: -

[Measured Freq] (Fqs)

Measured frequency at pulse input.

This parameter is accessible if [Frequency meter] (fqf) is not set to [Not Configured] (no).

	Setting	Description
	0 to 30 kHz	Setting range Factory setting: -

[Mains Voltage] (uLn)

Mains voltage based on AC bus measurement, motor running or stopped.

Setting	Description
1.0 to 860.0 VAC	Setting range: [No meas. ---- is displayed if no value is measured.] on the display. Factory setting: _

[Mains Voltage phase 1-2] (uL1)

Measurement of mains voltage phase 1-2.

Setting	Description
-3,276.7 to 3,276.7 VAC	Setting range Factory setting: _

[Mains Voltage phase 2-3] (uL2)

Measurement of mains voltage phase 2-3.

Setting	Description
-3,276.7 to 3,276.7 VAC	Setting range Factory setting: _

[Mains Voltage phase 3-1] (uL3)

Measurement of mains voltage phase 3-1.

Setting	Description
-3,276.7 to 3,276.7 VAC	Setting range Factory setting: _

[Mains Frequency] (FAC)

Actual mains frequency.

Setting	Description
0.0 to 999.9 Hz	Setting range Factory setting: _

[DC bus voltage] (vbuS)

DC bus voltage.

Setting	Description
0 to 6,553.5 VDC	Setting range Factory setting: -

[Drive Therm State] (tHd)

Thermal state of the inverter.

The thermal normal state of the inverter is 100%; value [Motor Overload] (OLF) is set to 118%.

Setting	Description
0 to 200%	Setting range Factory setting: _

[Used Param. Set] (CFpS)

Parameter set used.

Configuration parameter status (accessible if parameter switching function has been enabled).

	Setting	Code/Value	Description
★	[None]	(nO)	Not assigned
	[Set N°1]	(CFP1)	Parameter set 1 active
	[Set N°2]	(CFP2)	Parameter set 2 active
	[Set N°3]	(CFP3)	Parameter set 3 active

[Config. active] (Cnfs)

Active configuration.

Setting	Code/Value	Description
[In progress]	(nO)	Transition state
[Config. No.0]	(CnF0)	Configuration 0 active
[Config. No.1]	(CnF1)	Configuration 1 active
[Config. No.2]	(CnF2)	Configuration 2 active
[Config 3 active]	(CnF3)	Configuration 3 active

5.2.3.5 [Thermal Monitoring]

Access

[Display] → [Thermal Monitoring]

About this menu

The contents of this menu are accessible if thermal monitoring is enabled.

[AI1 Th Value] (tH1v)

Temperature value for AI1.

	Setting	Description
★	-15 to 200°C	Setting range Factory setting: -

[AI3 Th Value] (tH3v)

Temperature value for AI3.

Identical to [AI1 Th Value] (tH1v).

[Enc Th Value] (thev)

Temperature sensor value of encoder.

Setting	Description
-15 to 200°C	Setting range Factory setting: -

5.2.3.6 [PID display]

Access

[Display] → [PID display]

About this menu

> **Note:**
>
> **This function cannot be used with certain other functions.**

The following parameters are accessible if **[PID feedback]** (PIF) is not set to **[Not Configured]** (no).

[Internal PID ref] (rPI)

Internal PID setpoint.

	Setting	Description
	0 to 32,767	Setting range Factory setting: 150

[PID Reference] (rPC)

PID setpoint.

	Setting	Description
	0 to 65,535	Setting range Factory setting: 0

[PID feedback] (rPF)

PID actual value.

	Setting	Description
	0 to 65,535	Setting range Factory setting: 0

[PID Error] (rPE)

PID error value.

	Setting	Description
	-32,767 to 32,767	Setting range Factory setting: _

[PID Output] (rPO)

PID output value.

	Setting	Description
	[PID Min Output] (pol) to **[PID Max Output]** (poh)	Setting range Factory setting: -

5.2.3.7 [Counter Management]

Access

[Display] → [Counter Management]

About this menu

This menu is used to display the inverter and motor counters.

[Motor Run Time] (rtHH)

Motor operating hours.

Displays the elapsed time (resettable) in 0.1 hours (time the motor was running).

Setting	Description
0 to 429,496,729.5 h	Setting range Factory setting: _

[Power-on Time] (PtHH)

The counter for switch-on time (resettable) can be reset to 0 via parameter **[Time Counter Reset]** (rPr).

Setting	Description
0 to 429,496,729.5 h	Setting range Factory setting: _

[Fan Operation Time] (FPbt)

Fan operating time

When parameter **[Fan Operation Time]** (FPbt) reaches the predefined value of 45,000 hours, warning **[Fan Counter Warning]** (FCtA) is triggered.

The counter for **[Fan Operation Time]** (FPbt) can be reset to 0 via parameter **[Time Counter Reset]** (rPr).

Setting	Description
0 to 500,000 h	Setting range Factory setting: Read-only

[Nb Of Start] (nSM)

The counter for number of motor starts (resettable) can be reset to 0 via parameter **[Time Counter Reset]** (rPr).

Setting	Description
0 to 4,294,967,295	Setting range Factory setting: _

[Time Counter Reset] (rPr)

Resets the time counter.

	Setting		Description
	[No]	(nO)	No Factory setting
	[Run Time Reset]	(rtH)	Resets the operating time
	[Power ON Time Reset]	(PtH)	Resets the switch-on time
	[Reset Fan Counter]	(FtH)	Resets the fan counter
	[Clear NSM]	(nsm)	Clears the number of motor starts

5.2.3.8 [Other state]

Access

[Display] → **[Other State]**

About this menu

List of secondary states.

List

[Set 1 active] (CFP1)

[Set 2 active] (CFP2)

[Set 3 active] (CFP3)

[Automatic restart] (AUtO)

[DC Bus Charged] (dbL)

[Fast stop Active] (FSt)

[Fallback Frequency] (FrF)

[Speed Maintained] (rLS)

[Type of stop] (Stt)

[Encoder Config] (ICC)

[In braking] (brS)

[Ref Freq Warning] (SrA)

[Forward] (MFrd)

[Reverse] (MrrS)

[In motor fluxing] (FLX)

[Autotuning] (tUn)

5.2.3.9 [I/O map]

5.2.3.9.1 [Digital Input Map] (LIA-)

Access

[Display] → [I/O map] → [Digital Input Map]

About this menu

This menu displays the states and assignments of the digital inputs.

Read-only parameter, not configurable.

If no functions have been assigned [Not Assigned] (nO) is displayed. Use the navigation button to scroll through the functions.

5.2.3.9.2 [AI1] (AI1C-)

Access

[Display] → [I/O map] → [Analog inputs image] → [AI1]

[AI1] (AI1C)

Physical value of AI1.

Customized AI1 map: Value of analog input 1.

Setting	Description
-32,767 to 32,767	Setting range Factory setting: -

Note:

Parameters [AI1 Assignment] (AI1A), [AI1 min value] (UIL1), [AI1 max value] (UIH1) and [AI1 filter] (AI1F) are accessible in the display terminal if you press the OK button for parameter [AI1] (AI1C).

[AI1 Assignment] (AI1A)

Function assignment for analog input AI1.

Read-only parameter, cannot be configured. This parameter displays all functions assigned to the AI1 input. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

Setting	Code/Value	Description
[No]	(nO)	Not assigned
[Torque Ref Offset]	(tqo)	Source of the torque offset
[Torque Ref Ratio]	(tqr)	Source of the torque ratio
[Ref Frequency 1]	(Fr1)	Frequency setpoint for channel 1 Factory setting
[Ref Frequency 2]	(Fr2)	Frequency setpoint for channel 2
[Ref Frequency 2 Summing]	(SA2)	Sum of frequency setpoint 2
[Torque limitation]	(taa)	Torque limitation: Enabled via an analog input
[Torque limitation 2]	(taa2)	Torque limitation: Enabled via an analog input
[Subtract Ref Freq 2]	(dA2)	Subtraction for frequency setpoint 2
[Manual PID Ref.]	(PIM)	Manually set frequency setpoint of the PID controller (automatic/manual mode)
[PID Ref Frequency]	(FPI)	Frequency setpoint for PID
[Ref Frequency 3 Summing]	(SA3)	Sum of frequency setpoint 3
[Ref Frequency 1B]	(Fr1b)	Frequency setpoint for 1B
[Subtract Ref Freq 3]	(dA3)	Subtraction for frequency setpoint 3
[Forced local]	(FLOC)	Setpoint source "Forced local" 1
[Ref Frequency 2 multiplier]	(MA2)	Multiplier for frequency setpoint 2
[Ref Frequency 3 multiplier]	(MA3)	Multiplier for frequency setpoint 3
[Torque reference]	(tr1)	Torque control: Torque setpoint 1
[Torque reference]	(tr2)	Torque control: Torque setpoint 2
[Torque reference 2]	(teff)	External actual value for forward direction
[M/S Speed Ref In]	(mssi)	Master/Slave: Speed input
[M/S Trq Ref In]	(msti)	Master/Slave: Torque input
[Weight input]	(PES)	Sensor input for external weight

[AI1 min value] (UIL1)

Minimum value for AI1.

Voltage scaling parameter for 0% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Voltage] (10U).

	Setting	Description
★	0.0 to 10.0 VDC	Setting range Factory setting: 0.0 VDC

[AI1 max value] (UIH1)

Maximum value for AI1.

Voltage scaling parameter for 100% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Voltage] (10U).

	Setting	Description
★	0.0 to 10.0 VDC	Setting range Factory setting: 10.0 VDC

[AI1 min value] (CrL1)

Minimum value for AI1.

Current scaling parameter for 0% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 0.0 mA

[AI1 max value] (CrH1)

Maximum value for AI1.

Current scaling parameter for 100% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 20.0 mA

[AI1 filter] (AI1F)

AI1 filter.

Interference filter.

	Setting	Description
	0.00 to 10.00 s	Setting range Factory setting: 0.00 s

5.2.3.9.3 [AI2] (AI2C-)

Access

[Display] → [I/O map] → [Analog inputs image] → [AI2]

[AI2] (AI2C)

Physical value for AI2.

Customized AI2 map: Value of analog input 2.

Identical to [AI1] (AI1C).

[AI2 Assignment] (AI2A)

Configures AI2.

Identical to [AI1 Assignment] (AI1A).

[AI2 min value] (UIL2)

Minimum value for AI2.

Voltage scaling parameter for 0% on AI2.

This parameter is accessible if [AI2 Type] (AI2T) is set to [Voltage] (10U).

Identical to [AI1 min value] (UIL1).

[AI2 max value] (UIH2)

Maximum value for AI2.

Voltage scaling parameter for 100% on AI2.

This parameter is accessible if [AI2 Type] (AI2T) is set to [Voltage] (10U).

Identical to [AI1 max value] (UIH1).

[AI2 filter] (AI2F)

AI2 filter.

Interference filter.

Identical to [AI1 filter] (AI1F).

5.2.3.9.4 [AI3] (AI3C-)

Access

[Display] → [I/O map] → [Analog inputs image] → [AI3]

Accessing this menu is possible for inverters with a power output **greater than 22 kW**.

[AI3] (AI3C)

Physical value for AI3.

Customized AI3 map: Value of analog input 3.

Identical to [AI1] (AI1C).

[AI3 Assignment] (AI3A)

Configures AI3.

Identical to [AI1 Assignment] (AI1A).

[AI3 min value] (UIL3)

Voltage scaling parameter for 0% on AI3.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Voltage] (10U).

Identical to [AI1 min value] (UIL1).

[AI3 max value] (UIH3)

Voltage scaling parameter for 100% on AI3.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Voltage] (10U).

Identical to [AI1 max value] (UIH1).

[AI3 min value] (CrL3)

Value for low speed on AI3.

Current scaling parameter for 0% on AI3.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Current] (0A).

Identical to [AI1 min value] (CrL1).

[AI3 max value] (CrH3)

Value for high speed on AI3.

Current scaling parameter for 100% on AI3.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Current] (0A).

Identical to [AI1 max value] (CrH1).

[AI3 Filter] (AI3F)

AI3 filter.

Interference filter.

Identical to [AI1 filter] (AI1F).

5.2.3.9.5 [Analog inputs image] (AiA-)

Access

[Display] → [I/O map] → [Analog inputs image]

[Enc Resistor Value] (tHEr)

Thermal resistance value of the encoder.

This parameter is accessible if an encoder module is connected or an integrated encoder is used and if [Enc Therm Sensor Type] (tHEt) is not set to [None] (nonE).

	Setting	Description
★	-32,767 to 32,767	Setting range Factory setting: _

5.2.3.9.6 [Digital output map] (LOA-)

Access

[Display] → [I/O map] → [Digital output map]

About this menu

DQ assignment for inverters with a power output greater than 22 kW.

DQ1, DQ2 for inverters with a power output less than 30 kW.

Assignment of R1, R2.

R3 assignment for inverters with a power output greater than 22 kW.

Click on the digital output on the display terminal to display the assignment.

Read-only parameter, not configurable.

The function assigned to a digital output is displayed. If no function was assigned, **[Not Assigned]** (nO) is displayed.

This allows the delay, active state and holding time settings for the digital output to be checked. The possible values are identical to those in the configuration menu.

5.2.3.9.7 [AQ1] (AO1C-)

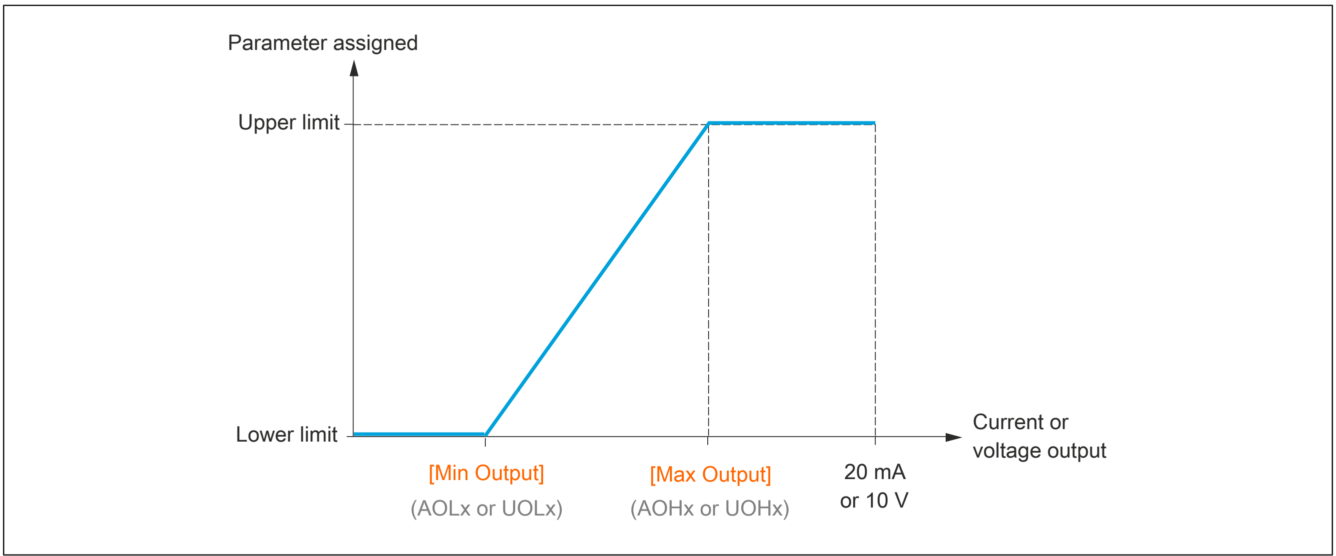
Access

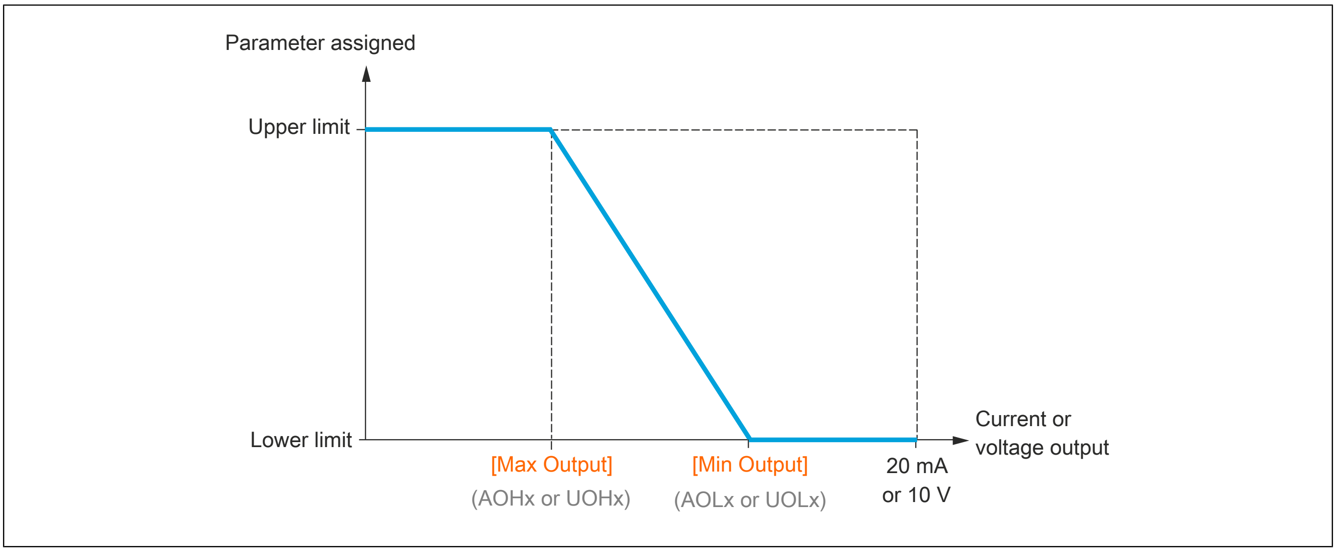
[Display] → [I/O map] → [Analog outputs image] → [AQ1]

Minimum and maximum output values

Legend	Description
PA	Parameter assigned
C/VO	Current or voltage output
UL	Upper limit value
LL	Lower limit value
1	**[Min Output]** (AOLx) or (UOLx)
2	**[Max Output]** (AOHx) or (UOHx)

The minimum output value, in volts, corresponds to the lower limit value of the assigned parameter, and the maximum value corresponds to its upper limit value. The minimum value may be greater than the maximum value.





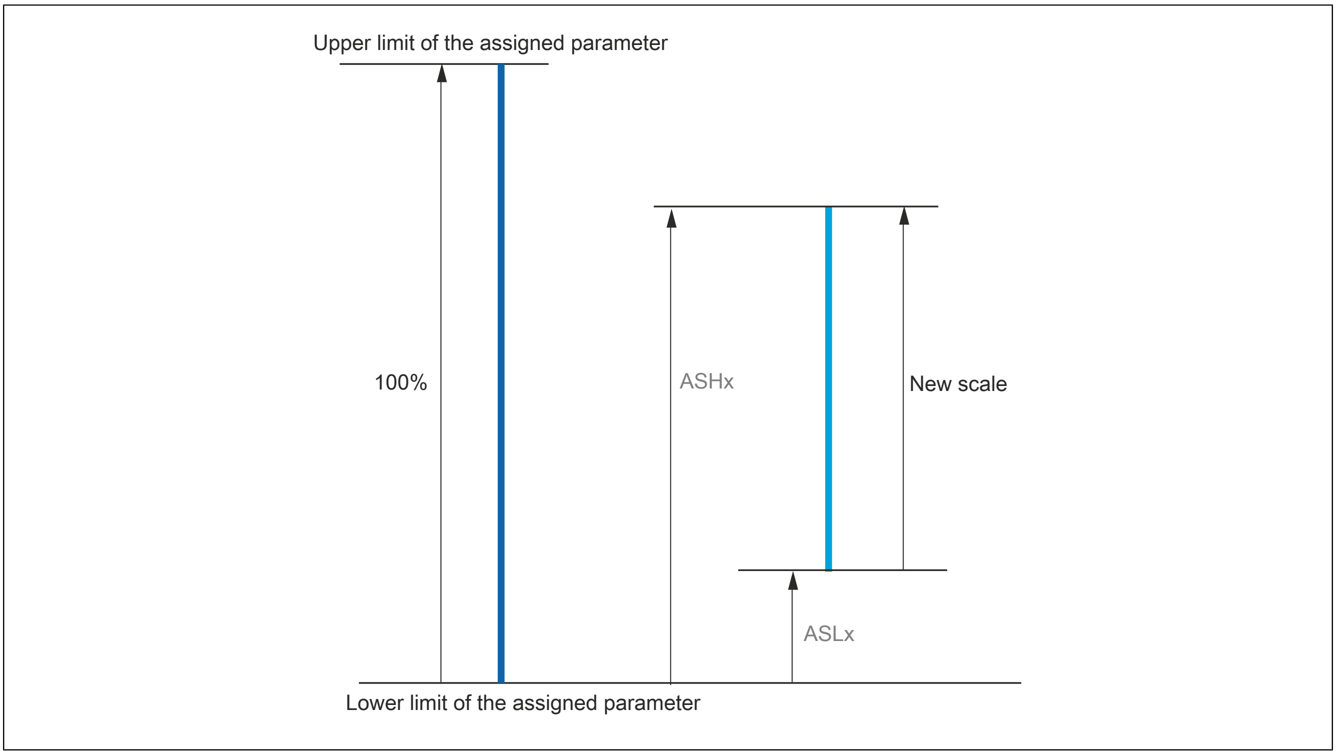
Scaling the assigned parameter

The assigned parameter's scale can be adapted according to requirements. In order to do so, the upper and lower limit values of each analog input are changed via the corresponding parameter.

The parameter values are given as percentages. 100% corresponds to the total variation range of the configured parameter. Accordingly, the following applies: 100% = Upper limit value - Lower limit value.

For example, **[Sign. torque]**(Stq) with the value varying between -3 and +3 times the rated torque. Setting "100%" corresponds to 6 times the rated torque.

- Parameter **[Scaling AQx min]** (ASLx) changes the lower limit value: New value = Lower limit value + (range x (ASLx)). Factory preset value "0%" does not change the lower limit value.
- Parameter **[Scaling AQx max]** (ASHx) changes the upper limit value: New value = Lower limit value + (range x (ASHx)). Factory preset value "100%" does not change the upper limit value.
- **[Scaling AQx min]**(ASLx) must always be lower than **[Scaling AQx max]**(ASHx).



Application example

The value of the motor current on output AQ1 should be transferred with 0-20 mA (range: 2 In motor). In this case, "In motor" is equivalent to 0.8 times the value of "In inverter".

Parameter **[Motor Current]**(OCr) varies between 0 and 2 times the nominal inverter current.

[Scaling AQ1 min] (ASL1) is not permitted to change the lower limit value. The factory setting therefore remains 0%.

[Scaling AQ1 max] (ASH1) must change the upper limit value by 0.5 times the rated motor torque or must change to 100 - 100/5 = 80% (New value = Lower limit value + (range x (ASH1)).

[AQ1] (AO1C)

Customized AQ1 map: Value of analog output 1.

	Setting	Description
	-32,767 to 32,767	Setting range Factory setting: Read-only

[AQ1 assignment] (AO1)

AQ1 assignment.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[Motor Current]	(OCr)	Current in the motor, between 0 and 2 In (In = nominal current of the frequency inverter specified on the inverter nameplate)
[Motor Frequency]	(OFr)	Output frequency, between 0 and [Max Frequency] (tFr) Factory setting
[Ramp out.]	(OrP)	Between 0 and [Max Frequency] (tFr)
[Motor torq.]	(trq)	Motor torque, between 0 and 3 times the rated motor torque
[Sign. torque]	(Stq)	Signed motor torque, between -3 and +3 times the rated motor torque. Sign "+" corresponds to motor operation; sign "-" corresponds to generator operation (braking).
[sign ramp]	(OrS)	Ramp output with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[PID ref.]	(OPS)	PID controller setpoint between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)
[PID feedback]	(OPF)	PID controller actual value between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)
[PID Error]	(OPE)	The PID controller detected a fault between -5% and +5% of values [Max PID feedback] (PIF2) - [Min PID feedback] (PIF1).
[PID output]	(OPI)	PID controller output between [Low Speed] (LSP) and [High speed] (HSP)
[Motor Power]	(OPr)	Motor power, between 0 and 2.5 times [Nominal motor power] (nPr)
[Mot thermal]	(tHr)	Thermal motor state, between 0 and 200% of the thermal rated state
[Drv thermal]	(tHd)	Thermal inverter state, between 0 and 200% of the thermal rated state
[Torque 4Q]	(tr4q)	Signed motor torque, between -3 and +3 times the rated motor torque. Signs "+" and "-" correspond to the physical torque direction regardless of the operating mode (motor or generator).
[Measured Motor Freq]	(ofrr)	Measured motor frequency
[Sig. o/p frq.]	(OFS)	Output frequency with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[Mot therm2]	(tHr2)	Thermal state of motor 2
[Mot therm3]	(tHr3)	Thermal state of motor 3
[Mot therm4]	(tHr4)	Thermal state of motor 4
[Unsigned Trq Ref]	(utr)	Unsigned torque setpoint
[Signed Trq Ref]	(str)	Signed torque setpoint
[Torque lim.]	(tql)	Torque limiting
[Motor Voltage]	(UOP)	Voltage applied to the motor, between 0 and [Nom Motor Voltage] (UnS)
[M/S Out Speed Reference]	(msso)	Master/Slave output speed setpoint
[M/S Out Torque Reference]	(msto)	Master/Slave output torque setpoint

[AQ1 min Output] (UOL1)

Minimum output value for AQ1.

This parameter is accessible if **[AQ1 Type]** (AO1t) is set to **[Voltage]** (10U).

	Setting	Description
☆	0.0 to 10.0 VDC	Setting range Factory setting: 0.0 VDC

[AQ1 max Output] (UOH1)

Maximum output value for AQ1.

This parameter is accessible if **[AQ1 Type]** (AO1t) is set to **[Voltage]** (10U).

	Setting	Description
☆	0.0 to 10.0 VDC	Setting range Factory setting: 10.0 VDC

[AQ1 min Output] (AOL1)

Minimum output value for AQ1.

This parameter is accessible if [AQ1 Type] (AO1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 0.0 mA

[AQ1 max Output] (AOH1)

Maximum output value for AQ1.

This parameter is accessible if [AQ1 Type] (AO1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 20.0 mA

[Scaling AQ1 min] (ASL1)

Scales the lower limit value of the assigned parameter as a percentage of the highest possible fluctuation.

Setting	Description
0.0 to 100.0%	Setting range Factory setting: 0.0%

[Scaling AQ1 max] (ASH1)

Scales the upper limit value of the assigned parameter as a percentage of the highest possible fluctuation.

Setting	Description
0.0 to 100.0%	Setting range Factory setting: 100.0%

[AQ1 Filter] (AO1F)

Interference filter.

Setting	Description
0.00 to 10.00 s	Setting range Factory setting: 0.00 s

5.2.3.9.8 [AQ2] (AO2C-)

Access

[Display] → [I/O map] → [Analog outputs image] → [AQ2]

Accessing this menu is possible for inverters with a power output **greater than 22 kW**.

[AQ2] (AO2C)

Customized AQ2 map: Value of analog output 2.

Identical to [AQ1] (AO1C).

[AQ2 assignment] (AO2)

AQ2 assignment.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[Motor Current]	(OCr)	Current in the motor, between 0 and 2 In (In = nominal current of the frequency inverter specified on the inverter nameplate) Factory setting
[Motor Frequency]	(OFr)	Output frequency, between 0 and [Max Frequency] (tFr)
[Ramp out.]	(OrP)	Between 0 and [Max Frequency] (tFr)
[Motor torq.]	(trq)	Motor torque, between 0 and 3 times the rated motor torque
[Sign. torque]	(Stq)	Signed motor torque, between -3 and +3 times the rated motor torque. Sign "+" corresponds to motor operation; sign "-" corresponds to generator operation (braking).
[sign ramp]	(OrS)	Ramp output with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[PID ref.]	(OPS)	PID controller setpoint between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)
[PID feedback]	(OPF)	Actual value of the PID controller between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)
[PID Error]	(OPE)	The PID controller detected a fault between -5% and +5% of values [Max PID feedback] (PIF2) - [Min PID feedback] (PIF1).
[PID output]	(OPI)	PID controller output between [Low Speed] (LSP) and [High speed] (HSP)
[Motor Power]	(OPr)	Motor power, between 0 and 2.5 times [Nominal motor power] (nPr)

Setting	Code/Value	Description
[Mot thermal]	(tHr)	Thermal motor state, between 0 and 200% of the thermal rated state
[Drv thermal]	(tHd)	Thermal inverter state, between 0 and 200% of the thermal rated state
[Torque 4Q]	(tr4q)	Signed motor torque, between -3 and +3 times the rated motor torque. Signs "+" and "-" correspond to the physical torque direction regardless of the operating mode (motor or generator).
[Measured Motor Freq]	(ofrr)	Measured motor frequency
[Sig. o/p frq.]	(OFS)	Output frequency with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[Mot therm2]	(tHr2)	Thermal state of motor 2
[Mot therm3]	(tHr3)	Thermal state of motor 3
[Mot therm4]	(tHr4)	Thermal state of motor 4
[Unsigned Trq Ref]	(utr)	Unsigned torque setpoint
[Signed Trq Ref]	(str)	Signed torque setpoint
[Torque lim.]	(tql)	Torque limiting
[Motor Voltage]	(UOP)	Voltage applied to the motor, between 0 and [Nom Motor Voltage] (UnS)
[M/S Out Speed Reference]	(msso)	Master/Slave output speed setpoint
[M/S Out Torque Reference]	(msto)	Master/Slave output torque setpoint

[AQ2 Min Output] (UOL2)

Minimum output value for AQ2.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Voltage] (10U).

Identical to [AQ1 min Output] (UOL1).

[AQ2 Max Output] (UOH2)

Maximum output value for AQ2.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Voltage] (10U).

Identical to [AQ1 max Output] (UOH1).

[AQ2 Min Output] (AOL2)

Minimum output value for AQ2.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Current] (0A).

Identical to [AQ1 min Output] (UOL1).

[AQ2 Max Output] (AOH2)

Maximum output value for AQ2.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Current] (0A).

Identical to [AQ1 max Output] (UOH1).

[Scaling AQ2 min] (ASL2)

Scales the lower limit value of the assigned parameter as a percentage of the highest possible fluctuation.

Identical to [Scaling AQ2 min] (ASL1).

[Scaling AQ2 max] (ASH2)

Scales the upper limit value of the assigned parameter as percentage of the highest possible fluctuation.

Identical to [Scaling AQ1 max] (ASH1).

[AQ2 Filter] (AO2F)

Interference filter.

Identical to [AQ1 Filter] (AO1F).

5.2.3.9.9 [PTO Frequency] (PtoC-)

Access

[Display] → [I/O map] → [Analog outputs image] → [PTO Frequency]

Accessing this menu is possible for inverters with a power output **greater than 22 kW**.

[PTO Frequency] (PtoC)

Frequency value of the pulse train output.

Setting	Description
0.00 to 655.35 kHz	Setting range Factory setting: Read-only

[PTO Assign] (Pto)

Assigns the pulse train output.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[Motor Current]	(OCr)	Current in the motor, between 0 and 2 In (In = nominal current of the frequency inverter specified on the inverter nameplate)
[Motor Frequency]	(OFr)	Output frequency, between 0 and [Max Frequency] (tFr) Factory setting
[Ramp out.]	(OrP)	Between 0 and [Max Frequency] (tFr)
[Motor torq.]	(trq)	Motor torque, between 0 and 3 times the rated motor torque
[Sign. torque]	(Stq)	Signed motor torque, between -3 and +3 times the rated motor torque. Sign "+" corresponds to motor operation; sign "-" corresponds to generator operation (braking).
[sign ramp]	(OrS)	Ramp output with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[PID ref.]	(OPS)	PID controller setpoint between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)
[PID feedback]	(OPF)	PID controller actual value between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)
[PID Error]	(OPE)	The PID controller detected a fault between -5% and +5% of values [Max PID feedback] (PIF2) - [Min PID feedback] (PIF1).
[PID output]	(OPI)	PID controller output between [Low Speed] (LSP) and [High speed] (HSP)
[Motor Power]	(OPr)	Motor power, between 0 and 2.5 times [Nominal motor power] (nPr)
[Mot thermal]	(tHr)	Thermal motor state, between 0 and 200% of the thermal rated state
[Drv thermal]	(tHd)	Thermal inverter state, between 0 and 200% of the thermal rated state
[Torque 4Q]	(tr4q)	Signed motor torque, between -3 and +3 times the rated motor torque. Signs "+" and "-" correspond to the physical torque direction regardless of the operating mode (motor or generator).
[Measured Motor Freq]	(ofrr)	Measured motor frequency
[Sig. o/p frq.]	(OFS)	Output frequency with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[Mot therm2]	(tHr2)	Thermal state of motor 2
[Mot therm3]	(tHr3)	Thermal state of motor 3
[Mot therm4]	(tHr4)	Thermal state of motor 4
[Unsigned Trq Ref]	(utr)	Unsigned torque setpoint
[Signed Trq Ref]	(str)	Signed torque setpoint
[Torque lim.]	(tql)	Torque limiting
[Motor Voltage]	(UOP)	Voltage applied to the motor, between 0 and [Nom Motor Voltage] (UnS)
[M/S Out Speed Reference]	(msso)	Master/Slave output speed setpoint
[M/S Out Torque Reference]	(msto)	Master/Slave output torque setpoint

[PTO Max Output Freq] (PtoH)

Maximum output frequency of the pulse train output.

This parameter is accessible if [PTO Assign] (PTO) is not set to [Not Configured] (nO).

	Setting	Description
★	1.00 to 30.00 kHz	Setting range Factory setting: 4.00 kHz

5.2.3.9.10 [DI7 frequency measured] (PFC7-)

Access

[Display] → [I/O map] → [Freq. signal image] → [DI7 frequency measured]

About this menu

The following parameters are accessible on the display terminal by pressing the OK button at parameter [DI7 frequency measured] (PFC7).

Accessing this menu is possible for inverters with a power output **greater than 22 kW**.

[DI7 Frequency Measured] (PFC7)

Filtered, customized frequency setpoint for the pulse input.

Setting	Description
0 to 4,294,967,295	Setting range Factory setting: Read-only

[DI7 Pulse Input Assign] (PI7A)

Assigns pulse input DI7.

All functions assigned to the pulse input are displayed. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

Setting	Code/Value	Description
[No]	(nO)	Not assigned
[Torque Ref Offset]	(tqo)	Source of the torque offset
[Torque Ref Ratio]	(tqr)	Source of the torque ratio
[Ref Frequency 1]	(Fr1)	Frequency setpoint 1
[Ref Frequency 2]	(Fr2)	Frequency setpoint 2
[Ref Frequency 2 Summing]	(SA2)	Sum of frequency setpoint 2
[PID feedback]	(PIF)	Actual value of the PI controller
[Torque limitation]	(taa)	Torque limitation: Enabled via an analog input
[Torque limitation 2]	(taa2)	Torque limitation: Enabled via an analog input
[Subtract Ref Freq 2]	(dA2)	Subtraction for frequency setpoint 2
[Manual PID Ref.]	(PIM)	Manually set frequency setpoint of the PID controller (automatic/manual mode)
[PID Ref Frequency]	(FPI)	Frequency setpoint for PID
[Ref Frequency 3 Summing]	(SA3)	Sum of frequency setpoint 3
[Ref Frequency 1B]	(Fr1b)	Frequency setpoint for 1B
[Subtract Ref Freq 3]	(dA3)	Subtraction for frequency setpoint 3
[Forced local]	(FLOC)	Setpoint source "Forced local" 1
[Ref Frequency 2 multiplier]	(MA2)	Multiplier for frequency setpoint 2
[Ref Frequency 3 multiplier]	(MA3)	Multiplier for frequency setpoint 3
[Torque reference]	(tr1)	Torque control: Torque setpoint 1
[Torque reference]	(tr2)	Torque control: Torque setpoint 2
[Frequency meter]	(fqf)	Enables the frequency meter function
[Torque reference 2]	(teff)	External actual value for forward direction
[M/S Speed Ref In]	(MSSI)	M/S input for the master speed setpoint
[M/S Trq Ref In]	(MSTI)	M/S input for the master torque setpoint
[Weight input]	(PES)	Sensor input for external weight

[DI7 PulseInput Low Freq] (PIL7)

Low frequency for pulse input DI7.

Scales parameters for pulse input: 0% in Hz x 10 [Unit].

Setting	Description
0.00 to 30,000.00 Hz	Setting range Factory setting: 0 Hz

[DI7 PulseInput High Freq] (PIH7)

High frequency for pulse input DI7.

Scales parameters for pulse input: 100% in Hz x 10 [Unit].

Setting	Description
0.00 to 30.00 kHz	Setting range Factory setting: 30.00 kHz

[DI7 Frequency Filter] (PFI7)

Filter time of the low-pass filter for filtering interference (pulse input).

Setting	Description
0 to 1,000 ms	Setting range Factory setting: 0 ms

5.2.3.9.11 [DI8 frequency measured] (PFC8-)

Access

[Display] → [I/O map] → [Freq. signal image] → [DI8 frequency measured]

About this menu

The following parameters are made accessible on the display terminal by pressing the OK key at parameter [DI8 frequency measured] (PFC8).

Accessing this menu is possible for inverters with a power output **greater than 22 kW**.

[DI8 Frequency Measured] (PFC8)

Filtered, customized frequency setpoint for the pulse input.

Identical to **[DI7 frequency measured]** (PFC7).

[DI8 Pulse Input Assign] (PI8A)

Assigns pulse input DI8.

Identical to **[DI7 Pulse Input Assign]** (PI7A).

[DI8 PulseInput Low Freq] (PIL8)

Low frequency for pulse input DI8.

Identical to **[DI7 PulseInput Low Freq]** (PIL7).

[DI8 PulseInput High Freq] (PIH8)

High frequency for pulse input DI8.

Identical to **[DI7 PulseInput High Freq]** (PIH7).

[DI8 Frequency Filter] (PFI8)

Filter time of the low-pass filter for filtering interference (pulse input).

Identical to **[DI7 Frequency Filter]** (PFI7).

5.2.3.9.12 [PTI Freq Measured] (PTIF-)

Access

[Display] → **[I/O map]** → **[Freq. signal image]** → **[PTI Freq Measured]**

About this menu

The following parameters are accessible on the display terminal by pressing the OK button at parameter **[PTI Freq Measured]** (PTIF).

Accessing this menu is possible for inverters with a power output **less than 30 kW**.

[PTI Freq Measured] (PTIF)

Measured PTI frequency.

Setting	Description
-21,474,836.47 to 21,474,836.47 Hz	Setting range Factory setting: Read-only

[RP] (PIA)

Assigns the pulse input.

	Setting	Code/Value	Description
★	[No]	(nO)	Not assigned
	[Torque Ref Offset]	(tqo)	Source of the torque offset
	[Torque Ref Ratio]	(tqr)	Source of the torque ratio
	[Ref Frequency 1]	(Fr1)	Frequency setpoint 1
	[Ref Frequency 2]	(Fr2)	Frequency setpoint 2
	[Ref Frequency 2 Summing]	(SA2)	Sum of frequency setpoint 2
	[PID feedback]	(PIF)	Actual value of the PI controller
	[Torque limitation]	(taa)	Torque limitation: Enabled via an analog input
	[Torque limitation 2]	(taa2)	Torque limitation: Enabled via an analog input
	[Subtract Ref Freq 2]	(dA2)	Subtraction for frequency setpoint 2
	[Manual PID Ref.]	(PIM)	Manually set frequency setpoint of the PID controller (automatic/manual mode)
	[PID Ref Frequency]	(FPI)	Frequency setpoint for PID
	[Ref Frequency 3 Summing]	(SA3)	Sum of frequency setpoint 3
	[Ref Frequency 1B]	(Fr1b)	Frequency setpoint for 1B
	[Subtract Ref Freq 3]	(dA3)	Subtraction for frequency setpoint 3
	[Forced local]	(FLOC)	Setpoint source "Forced local" 1
	[Ref Frequency 2 multiplier]	(MA2)	Multiplier for frequency setpoint 2
	[Ref Frequency 3 multiplier]	(MA3)	Multiplier for frequency setpoint 3
	[Torque reference]	(tr1)	Torque control: Torque setpoint 1
	[Torque reference]	(tr2)	Torque control: Torque setpoint 2
	[Frequency meter]	(fqf)	Enables the frequency meter function
	[Torque reference 2]	(teff)	External actual value for forward direction
	[M/S Speed Ref In]	(MSSI)	M/S input for the master speed setpoint
	[M/S Trq Ref In]	(MSTI)	M/S input for the master torque setpoint

[PTI Low Freq] (PTIL)

Low frequency for pulse train input.

	Setting	Description
★	-1000000.00 to 1000000.00 Hz	Setting range Factory setting: 0 Hz

[PTI High Freq] (PTIH)

High frequency for pulse train input.

	Setting	Description
★	-1000000.00 to 1000000.00 Hz	Setting range Factory setting: 0 Hz

[PTI Filter Time Analog] (PTIT)

Analog PTI filter time.

	Setting	Description
★	0 to 1000 ms	Setting range Factory setting: 0 ms

[PTI Mode] (PTIM)

PTI mode

	Setting	Code/Value	Description
★	[A/B]	(Ab)	A/B input signals Factory setting
	[Pulse/Dir]	(Pd)	Pulse direction for input signals
	[CW/CCW]	(CwCCW)	Input signals clockwise/counterclockwise

[PTI Filter Time Inp] (PTIS)

PTI filter time for input.

	Setting	Description
★	0.00 to 13.00 µs	Setting range Factory setting: 0.25 µs

[PTI Counting Dir Inv] (PTII)

Reverses the PTI direction

	Setting	Code/Value	Description
	[OFF]	(OFF)	No reversal of the counting direction Factory setting
	[ON]	(On)	Reverses the counting direction

5.2.3.9.13 [Freq. signal image] (FSI-)

Access

[Display] → [I/O map] → [Freq. signal image]

[Encoder Pulse Freq] (ECFR)

Pulse frequency of the encoder.

This parameter is accessible if an encoder module is connected and if **[Encoder usage]** (ENU) is set to **[Speed Reference]** (PGR) and if **Reference Type]** (PGA) is set to **[Frequency Generator]** (PTG).

Setting	Description
-21,474,836.47 to 21,474,836.47 kHz	Setting range Factory setting: Read-only

[Encoder Frequency] (EIFC)

Encoder frequency.

This parameter is accessible if an encoder module is connected and if **[Encoder usage]** (ENU) is set to **[Speed Reference]** (PGR) and if **Reference Type]** (PGA) is set to **[Frequency Generator]** (PTG).

Setting	Description
-21,474,836.47 to 21,474,836.47 kHz	Setting range Factory setting: Read-only

5.2.3.10 [Communication map]

5.2.3.10.1 [Communication map] (CMM-)

Access

[Display] → [Communication map]

[Command Channel] (CMdC)

Command channel.

Setting	Code/Value	Description
[Terminals]	(tEr)	Source for the terminal Factory setting
[Ref.Freq-Rmt.Term]	(LCC)	Command via display terminal
[Ref. Freq-Com. Module]	(nEt)	Command via POWERLINK if a module is connected.

[Cmd Register] (CMd)

Command register.

[Ref Freq Channel] (rFCC)

Channel for the frequency setpoint.

Identical to **[Command Channel]** (CMdC).

[Pre-Ramp Ref Freq] (FrH)

Frequency setpoint before ramp.

This parameter can only be read. It enables the display of the frequency setpoint applied to the motor, regardless of the selected channel for the setpoint.

Setting	Description
-599.0 to 599.0 Hz	Setting range Factory setting: 0 Hz

[CIA402 State Reg] (EtA)

CIA402 state register.

Possible values in the CiA402 profile, separate or combined mode:

Note:

Bit combination 0, 1, 2, 4, 5 and 6 defines the state in the DSP 402 status overview.

Bit	Description, value
0	"Ready to be switched on", waiting for mains voltage to be switched on
1	"Switched on", ready
2	"Operation enabled", currently operating
3	Error state detected during operation: 0: Inactive 1: Active
4	"Voltage activated", voltage available in the power supply: 0: Voltage not available in the power supply 1: Voltage available in the power supply **Note:** **If the inverter is supplied with current via the power supply only, this bit is always defined as 1.**
5	Fast stop
6	"Switching on disabled", voltage of the power supply disabled
7	Warning: 0: No warning 1: Warning
8	Reserved (0)
9	Remote: Command or setpoint via the network 0: Command or setpoint via the display terminal 1: Command or setpoint via the network
10	Target setpoint reached: 0: The setpoint was not reached. 1: The setpoint was reached. **Note:** **If the inverter is in speed mode, this corresponds to the speed setpoint.**
11	"Internal limit active", setpoint outside limits: 0: The setpoint is within the limits. 1: The setpoint is not within the limits. **Note:** **If the inverter is in speed mode, the limits are defined using parameters [Low Speed](LSP) and [High Speed] (HSP).**
12	Reserved
13	Reserved
14	"Stop button", STOP via stop button: 0: Stop button not pressed 1: Stop triggered by stop button on display terminal.
15	"Direction of rotation": 0: Forward on the output 1: Reverse on the output

5.2.3.10.2 [Modbus HMI Diag] (MdH-)

Access

[Display] → [Communication map] → [Modbus HMI Diag]

About this menu

Used for the serial Modbus communication port on the front of the control block (used by the display terminal).

[COM LED] (Mdb2)

Displays the LED for Modbus HMI communication.

[Mdb NET frames] (M2Ct)

Modbus channel 2: Number of processed frames.

	Setting	Description
	0 to 65,535	Setting range Factory setting: Read-only

[Mdb NET CRC errors] (M2EC)

Modbus channel 2: Number of CRC errors.

	Setting	Description
	0 to 65,535	Setting range Factory setting: Read-only

5.2.3.10.3 [Powerlink Diag] (PWL-)

Access

[Display] → **[Communication map]** → **[Powerlink Diag]**

[Mac @] (MAC)

MAC address of the POWERLINK module.

The address format is XX-XX-XX-XX-XX-XX

5.2.3.11 [Data logging]

5.2.3.11.1 [Distributed logging] (dLO-)

Access

[Display] → **[Data logging]** → **[Distributed logging]**

About this menu

This menu is used to store data for specific parameters.

The distributed logging function offers the possibility to log up to four parameter distributions simultaneously. Each parameter memory is synchronized with the same sampling time.

The result of this function offers the possibility to extract a bar graph with ten bars (for each 10% of the defined maximum value) to show the distribution of each of the four selected parameters.

> **Note:**
>
> **Any change to the data logging configuration deletes the previously saved data.**

This function is used to extract data samples for storage. If available, these samples can be updated with other tools (ACPi SafeConfigurator). Data logging fulfills the requirement to record and store data.

The inverter can store the following data:

Type of [Data logging]	Description	Stores [Data logging]: Automatically/Manually	Access
Inverter identification	Inverter ID data	Automatic	ACPi SafeConfigurator
Warning event logging	Warning logging	Automatic	ACPi SafeConfigurator
Error event logging	Error logging	Automatic	ACPi SafeConfigurator
Energy logging	1 Energy logging data	Automatic	ACPi SafeConfigurator

Enabling

Enabling function **[Distributed logging]** (dLO-):

- Use **[Log dstrb prm select]** (LdP-) to select 1 to 4 pieces of data that you want to save.
- Set **[Log Distrib State]** (LdEn) to **[Start]** (StArt).

Logging starts as soon as the motor runs.

To stop logging, set **[Log Distrib State]** (LdEn) to **[Stop]** (StOP).

[Log Distrib State] (LdEn)

Distribution logging state.

	Setting	Code/Value	Description
	[Stop]	(StOP)	Distribution logging disabled. Factory setting
	[Start]	(StArt)	Distribution is only logged when the motor is started.
	[Always]	(Always)	Distribution is always logged.
	[Reset]	(Reset)	Distribution logging is reset (configuration, data).
	[Clear]	(Clear)	Distribution data is deleted.
	[Error]	(Error)	An error occurred during distribution logging.

5.2.3.11.2 [Log dstrb prm select] (LdP-)

Access

[Display] → [Data logging] → [Distributed logging] → [Log dstrb prm select]

About this menu

This menu can be used to select up to 4 parameters for data logging. The maximum values for the respective parameters are also stored.

[Log Distrib. Data 1] (Ldd1)

Distribution logging data 1.

	Setting	Code/Value	Description
	[Distrib. Log. Disable]	(nO)	Disables distribution logging Factory setting
	[Motor Frequency]	(rFr)	Motor frequency
	[Motor Current]	(LCr)	Motor current
	[Motor Speed]	(SPd)	Motor speed
	[Motor Voltage]	(UOP)	Motor voltage
	[Motor Mech. Power]	(OPrW)	Mechanical motor power
	[Input Elec. Power]	(IPrW)	Electrical input power
	[Output Elec. Power]	(EPrW)	Electrical output power
	[Motor Torque]	(Otr)	Motor torque
	[Mains Voltage]	(ULn)	Mains voltage
	[DC bus voltage]	(VbUS)	DC bus voltage
	[PID feedback]	(rPF)	PID actual value
	[AI1 Th Value]	(tH1v)	Temperature sensor on AI1
	[AI3 Th Value]	(tH3v)	Temperature sensor on AI3
	[Drive Thermal State]	(tHd)	Thermal state of inverter
	[Motor Therm state]	(tHr)	Thermal state of motor
	[DBR Thermal State]	(tHb)	Thermal state of the braking resistor

[Log Distrib. Data 2] (Ldd2)

Distribution logging data 2.

Identical to [Log Distrib. Data 1] (Ldd1).

[Prot.Verteil. Daten 3] (Ldd3)

Distribution logging data 3.

Identical to [Log Distrib. Data 1] (Ldd1).

[Prot.Verteil. Daten 4] (Ldd4)

Distribution logging data 4.

Identical to [Log Distrib. Data 1] (Ldd1).

5.2.3.11.3 [Distributed logging] (dLO-)

Access

[Display] → [Data logging] → [Distributed logging]

About this menu

> **Note:**
>
> **If the logging data exceeds the user-defined maximum values for distribution logging data, this value is not saved in the distribution logging.**

[Log Distrib Slp Time] (LdSt)

Sampling time for distribution logging.

	Setting	Code/Value	Description
	[200 ms]	(200MS)	200 ms
	[1 second]	(1S)	1 s Factory setting
	[2 second]	(2S)	2 s
	[5 second]	(5S)	5 s

[Dist Max Val 1] (LdM1)

Maximum value of distribution logging data 1.

	Setting	Description
	10 to 65,535	Setting range Factory setting: Read-only

[Dist Max Val 2] (LdM2)

Maximum value of distribution logging data 2.

	Setting	Description
	10 to 65,535	Setting range Factory setting: Read-only

[Dist Max Val 3] (LdM3)

Maximum value of distribution logging data 3.

	Setting	Description
	10 to 65,535	Setting range Factory setting: Read-only

[Dist Max Val 4] (LdM4)

Maximum value of distribution logging data 4.

	Setting	Description
	10 to 65,535	Setting range Factory setting: Read-only

5.2.4 [Complete settings] (CSt-)

Introduction

Menu [Complete settings] (CSt-) contains all settings for inverter functions:

- Motor and inverter configuration
- Application functions
- Monitoring functions

5.2.4.1 [Motor parameters] (MPA-)

5.2.4.1.1 [Motor parameters] (MPA-)

Access

[Complete settings] → [Motor parameters]

About this menu

If a high load is selected, current limiting of the inverter is increased to 1.8 In and the maximum values of the motor parameters connected to the current and/or voltage are reduced. When switching between the selection options, all connected parameters are reset to the factory settings.

The maximum current of the inverter never changes, however. If the inverter is set to a high-load mode, the nominal values for the motor parameters are reduced. This means that an oversized inverter is required for the same motor nameplate in high-load mode.

Motor control types

ACOPOSinverter P84 inverter equipped with 6 motor control types that cover all use cases depending on the application.

The following table shows the selection of the motor control types depending on the requirements of the application:

Motor type	Description
Induction motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode 2. Voltage controlled with variable torque → Energy-saving mode, e.g. for fans and pumps Vector control with encoder: 1. Current-controlled with constant torque → Default mode Sensorless slip control: 1. With V/f characteristic curve for constant torque → Default mode 2. With V/f characteristic curve for constant torque (up to 6 f ranges) → Mode for individual special applications 3. With V/f characteristic curve for quadratically increasing torque → Energy-saving mode, e.g. for fans and pumps
Synchronous motor	Sensorless vector control: 1. Voltage controlled with constant torque → Default mode Vector control with encoder: 1. Current-controlled with constant torque → Default mode

Parameter list for induction motors

The following table shows the minimum parameter list that must be configured for induction motors depending on the selection of **[Motor Control Type]** (CTT):

Note:

After setting these parameters, it is recommended to run [Autotuning] (TUN) to optimize power output.

Parameter	[SVC V] (VVC)	[FVC] (FVC)	[U/F VC 5pts] (UF5)	[Energy Sav.] (NLD)
[Motor Standard] (BFR)	✓	✓	✓	✓
[Nominal motor power] (NPR)	✓	✓	✓	✓
[Nom Motor Voltage] (UNS)	✓	✓	✓	✓
[Nom Motor Current] (NCR)	✓	✓	✓	✓
[Nominal Motor Freq] (FRS)	✓	✓	✓	✓
[Nominal Motor Speed] (NSP)	✓	✓	✓	✓
[Encoder Type] (UECP) or **[Emb Enc Type]** (EECP)		✓ 1)		
[Encoder supply volt.] (UECV) or **[Emb Enc Supply Volt]** (EECV)		✓ 1)		
[Encoder usage] (ENU) or **[Emb Enc Usage]** (EENU)		✓ 1)		

1) The encoder settings depend on the encoder used for the application.

Parameter list for synchronous motors

The following table shows the minimum parameter list that must be configured for synchronous motors depending on the selection of [Motor control type] (CTT):

Note:

After setting these parameters, it is recommended to run [Autotuning] (TUN) to optimize power output.

Parameter	[Nom SyncMotor] (SYN)	[Sync.CL] (FSY)	[SYN_U VC] (SYNU)
[Sync Nominal I] (nCrS)	✓	✓	✓
[Nom SyncMotor] (nSPS)	✓	✓	✓
[Nom Motor Torque] (tqS)	✓	✓	✓
[Pole pairs] (PPnS)	✓	✓	✓
[Angle setting type] (ASt)	✓	✓	✓
[Encoder Type] (UECP) or [Emb Enc Type] (EECP)		✓ 1)	
[Encoder supply volt.] (UECV) or [Emb Enc Supply Volt] (EECV)		✓ 1)	
[Encoder usage] (ENU) or [Emb Enc Usage] (EENU)		✓ 1)	

1) The encoder settings depend on the encoder used for the application.

[Dual Rating] (drt)

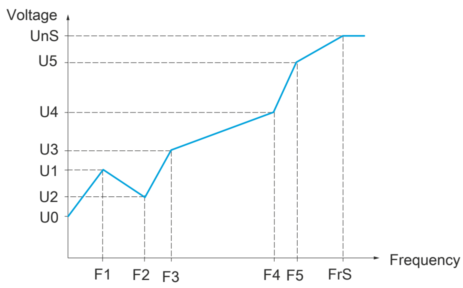
Dual rating state.

Setting	Code/Value	Description
[Normal Duty]	(nOrMAL)	Normal overload, current limiting of the inverter is 1.5 In.
[Heavy Duty]	(HIGH)	High load, current limiting of the inverter is 1.8 In. Factory setting

[Motor control type] (Ctt)

Motor control mode.

> **Note:**
>
> **Select the motor control type before entering parameter values.**

Setting	Code/Value	Description
[SVC V]	(VVC)	Voltage vector control: Voltage-controlled vector control in an open control loop with automatic slip compensation according to the load. This supports operation with several motors in parallel connection on the same inverter (if the motors are identical). Factory setting
[FVC]	(FvC)	Current-controlled vector control in a closed control loop: Current-controlled vector control in a closed control loop with encoder sensor; this option can be selected if an encoder module is connected or an integrated encoder is used. **Note:** **Check the encoder before selecting [FVC] (FvC).**
[U/F VC 5pts]	(UFS)	5-segment U/f profile:  This profile is defined using parameter values UnS, FrS, U1 to U5 and F1 to F5. FrS > F5 > F4 > F3 > F2 > F1 **Note:** **U0 is the result of an internal calculation based on motor parameters and multiplied by (UFr) (%). U0 can be adjusted by changing the (UFr) value.**
[Nom SyncMotor]	(Syn)	Synchronous motors in an open control loop: Special motor control type for permanent magnet synchronous motors.
[Energy Sav.]	(nLd)	Special motor control type, optimized for energy saving. This motor control type reduces the output current of the inverter depending on the motor load. The automatic adjustment of the current level saves energy during periods of minimal load and maintains the optimal power output of the inverter.
[Sync.CL]	(FSy)	Synchronous motor in a closed control loop: For permanent magnet synchronous motors with encoder. This selection is only possible if an encoder module is connected or an integrated encoder is used. **Note:** **Check the encoder before selecting [Sync.CL] (FSY).**
[SYN_U VC]	(SYnU)	Synchronous motor in an open control loop: Special motor control type for permanent magnet synchronous motors. This motor control type is used for applications with variable torque.

5.2.4.1.2 [Data] (Mtd-)

Access

[Complete settings] → [Motor parameters] → [Motor data] → [Data]

About this menu

For synchronous motor parameters. Special parameters are accessible if [Motor control type] (Ctt) is set to one of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Warning!

LOSS OF CONTROL

- **Read the manual of the connected motor thoroughly.**
- **Check the nameplate and the manual of the connected motor to ensure that all motor parameters are correctly set.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Steps for setting and optimizing the motor data:

1) Enter the data of the motor type plate.
2) Perform [Autotuning] (tUn).
3) Adjust parameter [Syn. EMF constant] (PHS) to optimize the behavior:
   - Start the motor at the stable minimum frequency available on the machine (at minimum load).
   - Check and note down the value of [% error EMF sync] (rdAE).
     If the value of [% error EMF sync] (rdAE) is below 0%, then [Syn. EMF constant] (PHS) can be increased.
     If the value of [% error EMF sync] (rdAE) is above 0%, then [Syn. EMF constant] (PHS) can be reduced.
     The value of [% error EMF sync] (rdAE) should be close to 0%.
   - Stop the motor to change [Syn. EMF constant] (PHS) depending on the (previously noted) value for [% error EMF sync] (rdAE).

[Motor Standard] (bFr)

Motor standard.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

This parameter is used to change the presets of the following parameters:

- [High Speed] (HSP)
- [Motor Freq Thd] (Ftd)
- [Nom Motor Voltage] (UnS)
- [Nominal Motor Freq] (FrS)
- [Max Frequency] (tFr)

Note:

The factory-set value for catalog numbers is changed to [60 Hz NEMA] (60).

	Setting	Code/Value	Description
★	[50Hz IEC]	(50)	IEC Factory setting
	[60 Hz NEMA]	(60)	NEMA

[Nominal motor power] (nPr)

Nominal power of the motor.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Nominal power of the motor specified on the nameplate in kW if [Motor Standard] (bFr) is set to [50Hz IEC] (50) and nominal power in horsepower if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60).

	Setting	Description
★	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [0.01 kW]	Max. value [0.01 kW]	Default [0.01 kW]
8I86T400075.00-000	9	220	75
8I86T400150.00-000	9	300	150
8I86T400220.00-000	9	400	220
8I86T400300.00-000	9	550	300
8I86T400400.00-000	55	750	400
8I86T400550.00-000	75	1100	550
8I86T400750.00-000	150	1500	750
8I86T401100.00-000	220	1850	1100
8I86T401500.00-000	300	220	1500

ACOPOSinverter P86	Setting range		
	Min. value [0.1 kW]	Max. value [0.1 kW]	Default [0.1 kW]
8I86T401850.00-000	40	300	185
8I86T402200.00-000	55	370	220
8I86T403000.00-000	75	450	300
8I86T403700.00-000	110	550	370
8I86T404500.00-000	150	750	450
8I86T405500.00-000	185	900	550
8I86T407500.00-000	220	1100	750

[Nom Motor Voltage] (UnS)

Nominal voltage of the motor.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Nominal voltage of the motor specified on the nameplate.

	Setting	Description
★	100 to 690 VAC	Setting range Factory setting: Depends on the nominal power of the inverter and [Motor Standard] (bFr).

[Nom Motor Current] (nCr)

Nominal current of the motor given on the nameplate.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
★	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [0.01 A]	Max. value [0.01 A]	Default [0.01 A]
8I86T400075.00-000	55	396	200
8I86T400150.00-000	100	756	350
8I86T400220.00-000	140	1008	510
8I86T400300.00-000	180	1296	720
8I86T400400.00-000	232	1714	910
8I86T400550.00-000	317	2286	1190
8I86T400750.00-000	412	3240	1520
8I86T401100.00-000	600	4320	2130
8I86T401500.00-000	800	5760	2860

ACOPOSinverter P86	Setting range		
	Min. value [0.1 A]	Max. value [0.1 A]	Default [0.1 A]
8I86T401850.00-000	97	702	351
8I86T402200.00-000	115	830	417
8I86T403000.00-000	153	922	550
8I86T403700.00-000	186	1117	670
8I86T404500.00-000	220	1320	810
8I86T405500.00-000	265	1740	990
8I86T407500.00-000	362	2175	1350

[Nominal Motor Freq] (FrS)

Nominal frequency of the motor.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

The factory setting is 50 Hz or preset 60 Hz if [Motor Standard] (bFr) is set to 60 Hz.

	Setting	Description
★	10.0 to 599.0 Hz	Setting range Factory setting: 50 Hz

[Nominal Motor Speed] (nSP)

Nominal speed of the motor.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

If the synchronous speed and slip are specified in Hz or as a percentage on the nameplate, use one of the following formulas to calculate the nominal speed:

$$\text{Nominal speed} = \text{Synchronous speed} \times \frac{100 - \text{slip in } \%}{100}$$

$$\text{Nominal speed} = \text{Synchronous speed} \times \frac{50 - \text{slip in Hz}}{50} \quad (50-Hz-motors)$$

$$\text{Nominal speed} = \text{Synchronous speed} \times \frac{60 - \text{Slip in Hz}}{60} \quad (60-Hz\text{ motors})$$

	Setting	Description
☆	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [1 rpm]	Max. value [1 rpm]	Default [1 rpm]
8I86T400075.00-000	0	65535	1400
8I86T400150.00-000			1420
8I86T400220.00-000			1430
8I86T400300.00-000			1420
8I86T400400.00-000			1425
8I86T400550.00-000			1430
8I86T400750.00-000			1450
8I86T401100.00-000			1450
8I86T401500.00-000			1455
8I86T401850.00-000			1455
8I86T402200.00-000			1460
8I86T403000.00-000			1460
8I86T403700.00-000			1475
8I86T404500.00-000			1475
8I86T405500.00-000			1480
8I86T407500.00-000			1480

[Motor param choice] (MPC)

Selects the motor parameters.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Code/Value	Description
☆	[Mot Power]	(nPr)	Motor power Factory setting
	[Mot Cosinus]	(COS)	Cosine for motor

[Motor 1 Cosinus Phi] (COS)

The nominal cosine phi value of the motor.

This parameter is accessible if [Motor param choice] (MPC) is set to [Mot Cosinus] (COS) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
☆	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [0,01]	Max. value [0,01]	Default [0,01]
8I86T400075.00-000	50	100	77
8I86T400150.00-000			79
8I86T400220.00-000			81
8I86T400300.00-000			78
8I86T400400.00-000			79
8I86T400550.00-000			82
8I86T400750.00-000			84
8I86T401100.00-000			85
8I86T401500.00-000			85
8I86T401850.00-000			85
8I86T402200.00-000			85
8I86T403000.00-000			85
8I86T403700.00-000			85
8I86T404500.00-000			85
8I86T405500.00-000			85
8I86T407500.00-000			85

[Nominal motor slip] (nSL)

Nominal slip of the motor calculated by the inverter.

This parameter is read-only.

To change the nominal motor slip, change [Rated motor speed] (nSP).

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
☆	0 to 6553.5 Hz	Setting range Factory setting: _

[AsyncMotor R Stator] (rSA)

Stator resistance for induction motor.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

The factory setting is replaced by the result of the autotuning procedure if autotuning was performed.

	Setting	Description
☆	0 to 65,535 mΩ	Setting range Factory setting: 0 mΩ

[Magnetizing Current] (IdA)

Magnetizing current.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
★	0 to 6,553.5 A	Setting range Factory setting: 0 A

[AsyncMotor Lf Induct] (LFA)

Leakage inductance for induction motor.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

The factory setting is replaced by the result of the autotuning procedure if autotuning was performed.

	Setting	Description
★	0 to 655.35 mH	Setting range Factory settings: 0 mH

[Rotor Time Const] (trA)

Time constant for rotor.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
★	0 to 65,535 ms	Setting range Factory setting: 0 ms

[Sync Nominal I] (nCrS)

Nominal current for synchronous motor.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range		
	Min. value [0.01 A]	Max. value [0.01 A]	Default [0.01 A]
8I86T400075.00-000	55	396	200
8I86T400150.00-000	100	756	370
8I86T400220.00-000	140	1008	440
8I86T400300.00-000	180	1296	600
8I86T400400.00-000	232	1714	700
8I86T400550.00-000	317	2286	900
8I86T400750.00-000	412	3240	1200
8I86T401100.00-000	600	4320	1750
8I86T401500.00-000	800	5760	2300

ACOPOSinverter P86	Setting range		
	Min. value [0.1 A]	Max. value [0.1 A]	Default [0.1 A]
8I86T401850.00-000	97	702	290
8I86T402200.00-000	115	830	350
8I86T403000.00-000	153	922	500
8I86T403700.00-000	186	1117	650
8I86T404500.00-000	220	1320	820
8I86T405500.00-000	265	1740	1000
8I86T407500.00-000	362	2175	1250

[Nom SyncMotor Speed] (nSPS)

Nominal speed of synchronous motor.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
	See the following table.	- Factory setting: See the following table.

<table>
<tr><th rowspan="2">ACOPOSinverter P86</th><th colspan="3">Setting range</th></tr>
<tr><th>Min. value [1 rpm]</th><th>Max. value [1 rpm]</th><th>Default [1 rpm]</th></tr>
<tr><td>8I86T400075.00-000</td><td rowspan="16">0</td><td rowspan="7">12000</td><td rowspan="4">3000</td></tr>
<tr><td>8I86T400150.00-000</td></tr>
<tr><td>8I86T400220.00-000</td></tr>
<tr><td>8I86T400300.00-000</td></tr>
<tr><td>8I86T400400.00-000</td><td rowspan="8">2000</td></tr>
<tr><td>8I86T400550.00-000</td></tr>
<tr><td>8I86T400750.00-000</td></tr>
<tr><td>8I86T401100.00-000</td><td rowspan="9">15996</td></tr>
<tr><td>8I86T401500.00-000</td></tr>
<tr><td>8I86T401850.00-000</td></tr>
<tr><td>8I86T402200.00-000</td></tr>
<tr><td>8I86T403000.00-000</td><td rowspan="4">1500</td></tr>
<tr><td>8I86T403700.00-000</td></tr>
<tr><td>8I86T404500.00-000</td></tr>
<tr><td>8I86T405500.00-000</td></tr>
<tr><td>8I86T407500.00-000</td></tr>
</table>

[Nom Motor Torque] (tqS)

Nominal motor torque.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
	See the following table.	- Factory setting: See the following table.

<table>
<tr><th rowspan="2">ACOPOSinverter P86</th><th colspan="3">Setting range</th></tr>
<tr><th>Min. value [0.01 Nm]</th><th>Max. value [0.01 Nm]</th><th>Default [0.01 Nm]</th></tr>
<tr><td>8I86T400075.00-000</td><td rowspan="8">1</td><td rowspan="8">65535</td><td>260</td></tr>
<tr><td>8I86T400150.00-000</td><td>470</td></tr>
<tr><td>8I86T400220.00-000</td><td>680</td></tr>
<tr><td>8I86T400300.00-000</td><td>1050</td></tr>
<tr><td>8I86T400400.00-000</td><td>2050</td></tr>
<tr><td>8I86T400550.00-000</td><td>2670</td></tr>
<tr><td>8I86T400750.00-000</td><td>3500</td></tr>
<tr><td>8I86T401100.00-000</td><td>5000</td></tr>
<tr><td>8I86T401500.00-000</td><td>0</td><td>65540</td><td>7000</td></tr>
</table>

<table>
<tr><th rowspan="2">ACOPOSinverter P86</th><th colspan="3">Setting range</th></tr>
<tr><th>Min. value [0.1 Nm]</th><th>Max. value [0.1 Nm]</th><th>Default [0.1 Nm]</th></tr>
<tr><td>8I86T401850.00-000</td><td rowspan="7">1</td><td rowspan="7">65535</td><td>900</td></tr>
<tr><td>8I86T402200.00-000</td><td>1100</td></tr>
<tr><td>8I86T403000.00-000</td><td>1400</td></tr>
<tr><td>8I86T403700.00-000</td><td>2360</td></tr>
<tr><td>8I86T404500.00-000</td><td>2860</td></tr>
<tr><td>8I86T405500.00-000</td><td>3500</td></tr>
<tr><td>8I86T407500.00-000</td><td>4600</td></tr>
</table>

[Pole pairs] (PPnS)

Pole pair.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
	See the following table.	- Factory setting: See the following table.

<table>
<tr><th rowspan="2">ACOPOSinverter P86</th><th colspan="3">Setting range</th></tr>
<tr><th>Min. value</th><th>Max. value</th><th>Default</th></tr>
<tr><td>8I86T400075.00-000</td><td rowspan="16">1</td><td rowspan="16">50</td><td rowspan="7">4</td></tr>
<tr><td>8I86T400150.00-000</td></tr>
<tr><td>8I86T400220.00-000</td></tr>
<tr><td>8I86T400300.00-000</td></tr>
<tr><td>8I86T400400.00-000</td></tr>
<tr><td>8I86T400550.00-000</td></tr>
<tr><td>8I86T400750.00-000</td></tr>
<tr><td>8I86T401100.00-000</td><td rowspan="9">3</td></tr>
<tr><td>8I86T401500.00-000</td></tr>
<tr><td>8I86T401850.00-000</td></tr>
<tr><td>8I86T402200.00-000</td></tr>
<tr><td>8I86T403000.00-000</td></tr>
<tr><td>8I86T403700.00-000</td></tr>
<tr><td>8I86T404500.00-000</td></tr>
<tr><td>8I86T405500.00-000</td></tr>
<tr><td>8I86T407500.00-000</td></tr>
</table>

[Angle setting type] (ASt)

Automatic type for angle setting.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

[PSI align] (PSI) and [PSIO align] (PSIO) are suitable for all types of synchronous motors. Increasing [SPM align] (SPMA) and [IPM align] (IPMA) increases the power output depending on the type of synchronous motor. Parameter [Rotational Current Injection] (RCI) can be used if [PSI align] (PSI) and [PSIO align] (PSIO) do not deliver the expected power output.

	Setting	Code/Value	Description
	[IPM align]	(IPMA)	Assignment for IPM motor. Assignment mode for internally concealed permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[SPM align]	(SPMA)	Assignment for SPM motor (surface-mounted permanent magnet motor) Assignment mode for surface-mounted permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[PSI align]	(PSI)	Pulse signal supply. Standard assignment mode without rotor movement. The angle is measured by monitoring the response of the stator current to a pulse signal supply over a wide frequency range.
	[PSIO align]	(PSIO)	Pulse signal supply optimized. Assignment mode optimized with rotor movement. The same process as for [PSI align] (PSI) takes place via an optimized frequency range. The measurement time is reduced after the first move command or measurement procedure, even if the inverter has been switched off. Factory setting
	[Rotational Current Injection]	(rCi)	Three-phase current supply. Assignment mode with rotor movement. This assignment mode requires up to 4 s and mechanically aligns the rotor and stator. The motor must be stopped and is not permitted to have a resistive load. **Note:** **This setting is recommended when using a sine wave filter in the application.**
	[No align]	(nO)	No assignment.

[Syn. EMF constant] (PHS)

EMF constant of the synchronous motor.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Setting (PHS) can be used to reduce the current for operation with no load.

	Setting	Description
	0 to 6,553.5 mV/rpm	Setting range Factory setting: 0 mV/rpm

[SyncMotor Stator R] (rSAS)

Calculated stator resistance for synchronous motor.

Cold-state stator resistance (per winding). The factory setting is replaced by the result from motor measurement if motor measurement was performed.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

You can enter the value if you know it.

	Setting	Description
	0 to 65,535 mΩ	Setting range Factory setting: 0 mΩ

[Autotune L d-axis] (LdS)

Autotuning L for the d-axis.

Stator inductance for axis "d" in mH (per phase).

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

For motors with smooth poles: [Autotune L d-axis] (LdS) = [Autotune L q-axis] (LqS) = Stator inductance L.

The factory setting is replaced by the result of the autotuning procedure if autotuning was performed.

	Setting	Description
★	0 to 655.35 mH	Setting range Factory settings: 0 mH

[Autotune L q-axis] (LqS)

Autotuning L for the q-axis.

Stator inductance for axis "q" in mH (per phase).

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

For motors with smooth poles: [Autotune L d-axis] (LdS) = [Autotune L q-axis] (LqS) = Stator inductance L.

The factory setting is replaced by the result of the autotuning procedure if autotuning was performed.

	Setting	Description
★	0 to 655.35 mH	Setting range Factory settings: 0 mH

[Sync Nominal Freq] (FrSS)

Nominal frequency of the synchronous motor.

Nominal motor frequency for synchronous motors in Hz. Automatically updated according to parameter data [Nom SyncMotor Speed] (nSPS) and [Pole pairs] (PPnS).

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
★	10.0 to 599.0 Hz	Setting range Factory setting: (nSPS) x (PPnS) / 60

[PSI Align Curr Max] (MCr)

Maximum current for PSI assignment.

Current level of [Sync Nominal I] (nCrS) for phase shift measurement modes [PSI align] (PSI) and [PSI Oalign] (PSIO) as a percentage. This parameter affects inductance measurement.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

This current must correspond to the maximum current level of the application; otherwise, instability can occur.

If [PSI Align Curr Max] (MCr) is set to [AUTO] (AUtO), [PSI Align Curr Max] (MCr) is adjusted by the inverter according to the motor data settings.

	Setting	Description
★	[AUTO] (AUtO) to 300%	Setting range Factory setting: [AUTO] (AUtO)

Note:

In case of instability, [PSI Align Curr Max] (MCr) can be gradually adjusted upwards to obtain the required power output.

[Current Filter Time] (CrtF)

Filter time for the current.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Description
★	[AUTO] (AUtO) to 100.0 ms	Setting range Factory setting: [AUTO] (AUtO)

[Currents Filter] (CrFA)

Filter time for current values.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Description
★	0.0 to 100.0 ms	Setting range Factory setting: Depends on the nominal power of the inverter.

[% error EMF sync] (rdAE)

Current ratio for the d-axis

This parameter is accessible if [Motor control type] (Ctt) is set to one of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Use [% error EMF sync] (rdAE) to adjust [Syn. EMF constant] (PHS). The value of [% error EMF sync] (rdAE) should be close to 0%.

If the value of [% error EMF sync] (rdAE) is below 0%, then [Syn. EMF constant] (PHS) can be increased.

If the value for [% error EMF sync] (rdAE) is above 0%, then [Syn. EMF constant] (PHS) can be reduced.

	Setting	Description
★	-3276.7 to 3276.7%	Setting range Factory setting: _

5.2.4.1.3 [Angle test setting] (ASA-)

Access

[Complete settings] → [Motor parameters] → [Motor data] → [Angle test setting]

About this menu

For synchronous motor parameters.

This parameter is accessible if **[Motor control type]** (Ctt) is set to the following value:

- **[Sync.CL]** (FSY)

To access the menu, an encoder module must also be connected or an integrated encoder must be used.

[Angle setting type] **(ASt-)**

Automatic type for angle setting.

This parameter is accessible if **[Motor control type]** (Ctt) is set to any of the following values:

- **[Nom SyncMotor]** (SYn)
- **[Sync.CL]** (FSY)
- **[SYN_U VC]** (SYnU)

[PSI align] (PSI) and **[PSIO align]** (PSIO) are suitable for all types of synchronous motors. Increasing **[SPM align]** (SPMA) and **[IPM align]** (IPMA) increases the power output depending on the type of synchronous motor. Parameter **[Rotational Current Injection]** (RCI) can be used if **[PSI align]** (PSI) and **[PSIO align]** (PSIO) do not deliver the expected power output.

	Setting	Code/Value	Description
	[IPM align]	(IPMA)	Assignment for IPM motor. Assignment mode for internally concealed permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[SPM align]	(SPMA)	Assignment for SPM motor (surface-mounted permanent magnet motor) Assignment mode for surface-mounted permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[PSI align]	(PSI)	Pulse signal supply. Standard assignment mode without rotor movement. The angle is measured by monitoring the response of the stator current to a pulse signal supply over a wide frequency range.
★	**[PSIO align]**	(PSIO)	Pulse signal supply optimized. Assignment mode optimized with rotor movement. The same process as for **[PSI align]** (PSI) takes place via an optimized frequency range. The measurement time is reduced after the first move command or measurement procedure, even if the inverter has been switched off. Factory setting
	[Rotational Current Injection]	(rCi)	Three-phase current supply. Assignment mode with rotor movement. This assignment mode requires up to 4 s and mechanically aligns the rotor and stator. The motor must be stopped and is not permitted to have a resistive load. **Note:** **This setting is recommended when using a sine wave filter in the application.**
	[No align]	(nO)	No assignment.

[Angle test setting] **(ASA)**

Angle setting.

Setting	Code/Value	Description
[No]	(no)	No automatic angle setting. Factory setting
[Yes]	(Yes)	Automatic angle setting is requested.
[Done]	(dOne)	Automatic angle setting is performed.

[Angle Test Assign] (ASL)

Enables automatic angle setting via a logic signal.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

Note:

If a line contactor function has been configured, the contactor will close during measurement.

[Angle setting Mode] (ATA)

Enables automatic angle setting.

Setting	Code/Value	Description
[No]	(no)	Automatic angle setting is not enabled.
[Run Command]	(AUto)	Automatic angle setting is performed in response to a move command if the inverter is not in the aligned state. Factory setting

[Angle offset value] (AsV)

Value of automatic angle setting.

Phase shift angle between motor and encoder. 8192 corresponds to 360°.

Setting	Description
[No] until 8192	Value of automatic angle setting. Factory setting [No] (nO)

[Angle setting status] (AStS)

Status of angle measurement.

Setting	Code/Value	Description
[Not done]	(tAb)	Value for angle setting not defined. Factory setting
[Pending]	(Pend)	Angle setting in the waiting state.
[In progress]	(PrOg)	Angle setting function is running.
[Error]	(Fail)	Angle setting function failed.
[Done]	(done)	Angle function is OK.
[Custom Value]	(CUS)	The phase shift angle value has been entered by the user via the display terminal or serial link.

5.2.4.1.4 [Motor tune] (MtU-)

Access

[Complete settings] → [Motor parameters] → [Motor data] → [Motor tune]

[Autotuning] (tUn)

Warning!

UNEXPECTED MOVEMENT

During autotuning, the motor is moved to adjust the control loops.

- **Only start the system if there are no persons or obstacles in the operating area.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Noise and vibrations of the system are normal during motor measurement.

If [Autotuning Type] (tunt) is set to [Standard] (std), the motor executes small movements during motor measurement.

If **[Autotuning Type]** (tunt) is set to **[Rotation]** (rot), the motor runs at half the nominal frequency.

In all cases, the motor must be stopped before a measurement procedure is started. Ensure that the application cannot start the motor during the measurement procedure.

The following are optimized by the measurement procedure:

- The motor power at low speed.
- The estimation of the motor torque.
- The accuracy of the estimation of the process values in sensorless operation and sensorless monitoring.

Autotuning is only performed if no stop command has been issued. If function "Freewheel stop" or "Fast stop" has been assigned to a digital input, this input must be set to 1 (input at 0 active).

Autotuning has priority over any move or premagnetization commands. These will only be taken into account after the autotuning sequence.

If a fault has been detected during motor measurement, the inverter always displays **[No action]** (nO) and can switch to mode **[Autotuning]** (tUn) for detected faults depending on the configuration of **[Tuning Error Resp]** (tnL).

Autotuning can take several seconds. Do not interrupt the process. Wait until the display terminal changes to **[No action]** (nO).

> **Note:**
>
> **The thermal state of the motor greatly affects the measurement result. Always perform motor measurement when the motor is stopped and when it is cold. Ensure that the application cannot start the motor during the measurement procedure.**

In order to perform motor measurement again, wait until the motor has stopped and cooled down completely. Set **[Autotuning]** (tUn) to **[Erase Autotuning]** (CLr) to perform motor measurement again.

Motor measurement without executing function **[Erase Autotuning]** (CLr) first is used to estimate the thermal state of the motor.

The cable length also affects the measurement result. If the wiring is changed, the measurement procedure must be repeated.

	Setting	Code/Value	Description
2 s	[No action]	(nO)	Autotuning not active. Factory setting
	[Apply Autotuning]	(YES)	Autotuning is carried out immediately if possible; the parameter then automatically changes to [No action] (nO). If the inverter status does not permit immediate motor measurement, the parameter changes to [No action] (nO) and the operation must be performed again.
	[Erase Autotuning]	(CLr)	The motor parameters acquired by the autotuning function are reset. The standard motor parameter values are used to control the motor. [Autotuning Status] (tUS) is set to [Not done] (tAB).

[Autotuning Status] (tUS)

Status of the autotuning procedure.

This parameter is not stored when the inverter is switched off. It shows the autotuning status since the last commissioning (for information only, no modification possible).

	Setting	Code/Value	Description
	[Not done]	(tAb)	Autotuning is performed. Factory setting
	[Pending]	(PEnd)	Autotuning has been requested but not yet performed.
	[Active]	(PrOG)	Autotuning active.
	[Error]	(FAIL)	A fault occurred during autotuning.
	[Done]	(dOnE)	The motor parameters calculated by the autotuning function are used to control the motor.

[Auto tuning usage] (tunu)

Autotuning is used.

This parameter indicates the methods that were used to change the motor parameters in accordance with the calculated thermal state of the motor.

This parameter is accessible if **[Access Level]** (LAC) is set to **[Expert]** (EPr).

	Setting	Code/Value	Description
	[No]	(nO)	No calculation of the thermal state. Factory setting
	[Therm Mot]	(tm)	Calculates the thermal stator state based on the nominal current and current consumption of the motor.

[Tuning Error Resp] (tnL)

Response to autotuning fault.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Code/Value	Description
★	[Ignore]	(nO)	Ignores detected faults.
	[Freewheel Stop]	(YES)	Freewheel stop Factory setting

[Autotuning Assign] (tUL)

Assigns autotuning input.

Autotuning is performed when the assigned input or bit changes to 1.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

> **Note:**
>
> **The motor is placed under voltage by the autotuning.**

	Setting	Code/Value	Description
★	[Not Assigned]	(no)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Automatic autotune] (AUt)

Automatic autotuning.

> **Warning!**
>
> **UNEXPECTED MOVEMENT**
>
> **If this function is enabled, autotuning is performed every time the inverter is switched on.**
>
> **Ensure that enabling this function does not result in an unsafe condition.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

The motor must be switched off when the inverter is switched on.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Code/Value	Description
★	[No]	(nO)	Function disabled Factory setting
2 s	[Yes]	(YES)	Tuning is performed automatically on each startup.

[Tune Selection] (StUn)

Selects tuning.

	Setting	Code/Value	Description
★	[Default]	(tAb)	The standard motor parameter values are used to control the motor. Factory setting
	[Measure]	(MEAS)	The values calculated via autotuning are used to control the motor.
	[Customized]	(CUS)	The manually set values are used to control the motor.

[Saliency mot. state] (SMOt)

Information about the saliency of the synchronous motor.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr), [Tune Selection] (Stun) is set to [Measure] (MEAS) and [Motor control type] (Ctt) is set to one of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

This parameter supports the optimization of motor control for synchronous motors.

	Setting	Code/Value	Description
★	[No]	(nO)	Autotuning not performed
	[Low salient]	(LLS)	Low saliency. Recommended configuration: [Angle setting type] (ASt) = [PSI align] (PSI) or [PSIO align] (PSIO) and [HF inj. activation] (HFI) = [No] (nO).
	[Med salient]	(MLS)	Medium saliency. Settings [Angle setting type] (ASt) = [SPM align] (SPMA) and [HF inj. activation] (HFI) = [Yes] (YES) can be used for better performance.
	[High salient]	(HLS)	High saliency. Settings [Angle setting type] (ASt) = [IPM align] (IPMA) and [HF inj. activation] (HFI) = [Yes] (YES) can be used for better power output.

[Autotuning Lvl Of Current] (tCr)

Set the current ratio.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

This parameter displays the current applied to the motor during motor measurement as a percentage of the nominal inverter current.

This parameter affects inductance measurement.

	Setting	Description
★	[AUTO] (AUtO) to 300%	Setting range Factory setting: [AUTO] (AUtO)

[Angle setting type] (ASt)

Automatic type for angle setting.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

[PSI align] (PSI) and [PSIO align] (PSIO) are suitable for all types of synchronous motors. Increasing [SPM align] (SPMA) and [IPM align] (IPMA) increases the power output depending on the type of synchronous motor. Parameter [Rotational Current Injection] (RCI) can be used if [PSI align] (PSI) and [PSIO align] (PSIO) do not deliver the expected power output.

	Setting	Code/Value	Description
★	[IPM align]	(IPMA)	Assignment for IPM motor. Assignment mode for internally concealed permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[SPM align]	(SPMA)	Assignment for SPM motor (surface-mounted permanent magnet motor) Assignment mode for surface-mounted permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[PSI align]	(PSI)	Pulse signal supply. Standard assignment mode without rotor movement. The angle is measured by monitoring the response of the stator current to a pulse signal supply over a wide frequency range.
	[PSIO align]	(PSIO)	Pulse signal supply optimized. Assignment mode optimized with rotor movement. The same process as for [PSI align] (PSI) takes place via an optimized frequency range. The measurement time is reduced after the first move command or measurement procedure, even if the inverter has been switched off. Factory setting
	[Rotational Current Injection]	(rCi)	Three-phase current supply. Assignment mode with rotor movement. This assignment mode requires up to 4 s and mechanically aligns the rotor and stator. The motor must be stopped and is not permitted to have a resistive load. **Note:** **This setting is recommended when using a sine wave filter in the application.**
	[No align]	(nO)	No assignment.

[PSI Align Curr Max] (MCr)

Maximum current for PSI assignment.

Current level of [Sync Nominal I] (nCrS) for phase shift measurement modes [PSI align] (PSI) and [PSI Oalign] (PSIO) as a percentage. This parameter affects inductance measurement.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

This current must correspond to the maximum current level of the application; otherwise, instability can occur.

If [PSI Align Curr Max] (MCr) is set to [AUTO] (AUtO), [PSI Align Curr Max] (MCr) is adjusted by the inverter according to the motor data settings.

	Setting	Description
★	[AUTO] (AUtO) to 300%	Setting range Factory setting: [AUTO] (AUtO)

[Rotational Current Level] (rCL)

Rotating current level.

This parameter is accessible if [Angle setting type] (ast) is set to [Rotational Current Injection] (rCi).

The current level must be set according to the torque required during the alignment procedure.

	Setting	Description
★	10 to 300%	Setting range as a percentage of the nominal motor current Factory setting: 75%

[Rotational Torque Current] (rtC)

Torque current of the rotor.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr), [Angle setting type] (ast) is set to [Rotational Current Injection] (rCi) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
★	0 to 300%	Setting range Factory setting: 0%

[RCI Max Freq] (rCSP)

Maximum output frequency for RCI.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr), [Angle setting type] (ast) is set to [Rotational Current Injection] (rCi) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Description
★	[AUTO] (AUtO) to 599.0 Hz	Setting range Factory setting: [AUTO] (AUtO)

[RCI Round Nb] (rCrP)

Round number for RCI.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr), [Angle setting type] (ast) is set to [Rotational Current Injection] (rCi) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [SYN_U VC] (SYnU)

	Setting	Description
★	[AUTO] (AUtO) to 32767	Setting range Factory setting: [AUTO] (AUtO)

[RCI With Transformer] (rCIr)

RCI alignment with transformer.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Angle setting type] (ast) to [Rotational Current Injection] (rCi) or if [Motor control type] (Ctt) is set to one of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

	Setting	Code/Value	Description
★	[No]	(nO)	Function not active Factory setting
	[Yes]	(YES)	Function active

5.2.4.1.5 [Motor monitoring] (MOP-)

Access

[Complete settings] → [Motor parameters] → [Motor monitoring]

[Motor Th Current] (ItH)

Current for thermal monitoring of the motor that must be set according to the rated operating current specified on the nameplate.

	Setting	Description
★	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range			
	Min. value [0.01 A]	Max. value [0.01 A]	Default [0.01 A] Asynchronous	Default [0.01 A] Synchronous
8I86T400075.00-000	44	396	200	200
8I86T400150.00-000	80	756	350	370
8I86T400220.00-000	112	1008	510	440
8I86T400300.00-000	144	1296	720	600
8I86T400400.00-000	186	1714	910	700
8I86T400550.00-000	254	2286	1190	900
8I86T400750.00-000	330	3240	1520	1200
8I86T401100.00-000	480	4320	2130	1750
8I86T401500.00-000	640	5760	2860	2300

ACOPOSinverter P86	Setting range			
	Min. value [0.1 A]	Max. value [0.1 A]	Default [0.1 A] Asynchronous	Default [0.1 A] Synchronous
8I86T401850.00-000	78	702	351	290
8I86T402200.00-000	92	830	417	350
8I86T403000.00-000	123	922	550	500
8I86T403700.00-000	149	1117	670	650
8I86T404500.00-000	176	1320	810	820
8I86T405500.00-000	212	1740	990	1000
8I86T407500.00-000	290	2175	1350	1250

[Motor Thermal Mode] (tHt)

Thermal monitoring mode for the motor.

> **Note:**
>
> **Detects a fault if the thermal state reaches 118% of the nominal state. Re-enabling takes place when it drops below 100% again.**

Setting	Code/Value	Description
[No]	(nO)	No thermal monitoring
[Self cooled]	(ACL)	Self-cooling motor Factory setting
[Force-cool]	(FCL)	Fan-cooled motor

[MotorTemp ErrorResp] (OLL)

Response to overload fault.

Setting	Code/Value	Description
[Ignore]	(nO)	Ignores detected faults.
[Freewheel Stop]	(YES)	Freewheel Factory setting

5.2.4.1.6 [Thermal Monitoring] (tPP-)

Access

[Complete settings] → [Motor parameters] → [Motor monitoring] → [Thermal Monitoring]

About this menu

The thermal monitoring function protects against overheating by measuring the actual temperatures through the inverter.

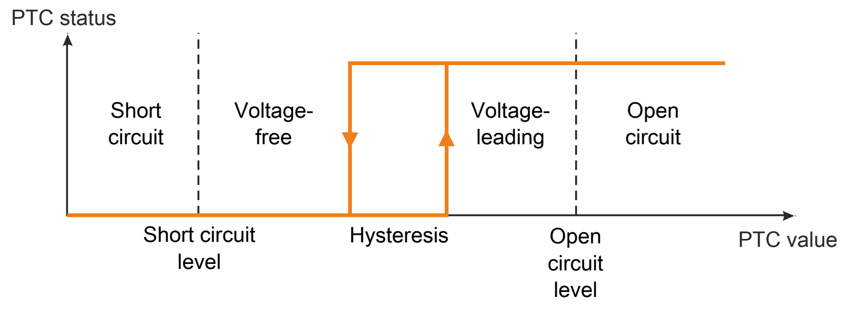
Temperature sensor types PTC, PT100, PT1000 and KTY84 can be used for this function.

The function offers two monitoring levels:

- Warning level: The inverter triggers an event without stopping the application.
- Fault level: The inverter triggers an event and stops the application.

The temperature sensor is monitored to detect the following faults:

- Overtemperature
- Defective sensor (signal loss)
- Sensor short circuit



Enabling

[AIx Th Monitoring] (tHxS) makes it possible to enable thermal monitoring on the corresponding analog input:

- [No] (nO): The function is disabled.
- [Yes] (YES): Thermal monitoring is enabled on the corresponding analog input AIx.

Selecting the heat sensor type

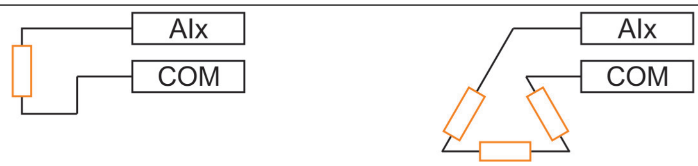
[AIx Type] (AIxt) allows to select the type of heat sensor(s) connected to the corresponding analog input:

- **[No]** (nO): No temperature sensor
- **[PTC Management]** (ptc): 1 to 6 PTC (in series)
- **[KTY]** (KtY): 1 KTY84
- **[PT100]** (1Pt2): 1 PT100 connected with two wires
- **[PT1000]** (1Pt3): 1 PT1000 connected with two wires

2-wire temperature sensors are supported on analog inputs 2 to 5.

Wiring for PT100 and PT1000 sensors

The following wiring is possible for 2-wire sensors:



[AI1 Th Monitoring] (tH1S)

Enables temperature monitoring on AI1.

Setting	Code/Value	Description
[No]	(nO)	No Factory setting
[Yes]	(YES)	Yes

[AI1 Type] (AI1t)

AI1 assignment.

This parameter is accessible if **[AI1 Type]** (tH1S) is not set to **[No]** (no).

	Setting	Code/Value	Description
	[Voltage]	(10U)	0 to 10 VDC Factory setting
	[Current]	(0A)	0 to 20 mA

[AI1 Th Error Resp] (tH1b)

Response of thermal monitoring to fault detection on AI1.

This parameter is accessible if **[AI1 Type]** (Ai1t) is not set to **[Voltage]** (10U) or **[Current]** (0A) or **[Voltage +/-]** (n10u).

	Setting	Code/Value	Description
	[Ignore]	(nO)	Ignores detected faults.
	[Freewheel Stop]	(YES)	Freewheel stop
	[Per STT]	(Stt)	Stops according to parameter **[Type of stop]** (Stt), but without triggering an fault after stopping.
	[Fallback Frequency]	(LFF)	Changes to fallback speed, which is maintained for as long as the detected fault persists and the command has not been canceled.[1]
	[Ramp stop]	(rMP)	Stop via ramp Factory setting

1) Since the detected fault does not trigger a stop in this case, a relay or logic output should be assigned to display the fault.

[AI1 Th Error Level] (tH1F)

Fault detection level for AI1.

This parameter is accessible if **[AI1 Type]** (Ai1t) is not set to **[Voltage]** (10U) or **[Current]** (0A) or **[PTC Management]** (PtC).

	Setting	Description
	-150 to 200.0°C	Setting range Factory setting: 110.0°C

[AI1 Th Warn Level] (tH1A)

Warning level for AI1.

This parameter is accessible if [AI1 Type] (Ai1t) is not set to [Voltage] (10U) or [Current] (0A) or [PTC Management] (PtC).

	Setting	Description
★ ↻	-150 to 200.0°C	Setting range Factory setting: 90.0°C

[AI1 Th Value] (tH1v)

Temperature value for AI1.

This parameter is accessible if [AI1 Type] (Ai1t) is not set to [Voltage] (10U) or [Current] (0A) or [PTC Management] (PtC).

	Setting	Description
★	-150 to 200.0°C	Setting range Factory setting: _

[AI3 Th Monitoring] (tH3S)

Enables temperature monitoring on AI3.

Setting	Code/Value	Description
[No]	(nO)	No Factory setting
[Yes]	(YES)	Yes

[AI3 Type] (AI3t)

AI3 assignment.

This parameter is accessible if [AI3 Type] (tH3S) is not set to [No] (no).

Identical to [AI1 Type] (AI1t) with factory setting [Current] (0A).

[AI3 Th Error Resp] (tH3b)

Response of thermal monitoring to error detection on AI3.

This parameter is accessible if [AI3 Type] (Ai3t) is not set to [Voltage] (10U) or [Current] (0A) or [Voltage +/-] (n10u).

	Setting	Code/Value	Description
★	[Ignore]	(nO)	Ignores detected faults.
	[Freewheel Stop]	(YES)	Freewheel stop
	[Per STT]	(Stt)	Stops according to parameter [Type of stop] (Stt), but without triggering an fault after stopping.
	[Fallback Frequency]	(LFF)	Changes to fallback speed, which is maintained for as long as the detected fault persists and the command has not been canceled.[1)]
	[Ramp stop]	(rMP)	Stop via ramp Factory setting

1) Since the detected fault does not trigger a stop in this case, a relay or logic output should be assigned to display the fault.

[AI3 Th Error Level] (tH3F)

Fault detection level for AI3.

This parameter is accessible if [AI3 Type] (Ai3t) is not set to [Voltage] (10U) or [Current] (0A) or [PTC Management] (PtC).

	Setting	Description
★ ↻	-150 to 200.0°C	Setting range Factory setting: 110.0°C

[AI3 Th Warn Level] (tH3A)

Warning level for AI3.

This parameter is accessible if [AI3 Type] (Ai3t) is not set to [Voltage] (10U) or [Current] (0A) or [PTC Management] (PtC).

	Setting	Description
	-150 to 200.0°C	Setting range Factory setting: 90.0°C

[AI3 Th Value] (tH3v)

Temperature value for AI3.

This parameter is accessible if [AI3 Type] (Ai3t) is not set to [Voltage] (10U) or [Current] (0A) or [PTC Management] (PtC).

	Setting	Description
	-150 to 200.0°C	Setting range Factory setting: _

[Enc Therm Sensor Type] (tHEt)

Temperature sensor type for the encoder.

This parameter is accessible if an encoder module different from the HTL encoder is connected or an integrated encoder is used.

	Setting	Code/Value	Description
	[None]	(nOnE)	None Factory setting
	[PTC]	(PtC)	PTC
	[PT100]	(1Pt2)	PT100
	[PT1000]	(1Pt3)	PT1000
	[KTY]	(ktY)	KTY
	[Klixon]	(kLix)	Klixon

[Enc Th ErrorResp] (tHEb)

Response of thermal monitoring to fault detection on the input of the encoder.

This parameter is accessible if an encoder module is connected or an integrated encoder is used and if [Enc Therm Sensor Type] (tHEt) is not set to [None] (nOnE).

	Setting	Code/Value	Description
	[Ignore]	(nO)	Ignores detection of external faults
	[Freewheel Stop]	(YES)	Freewheel stop
	[Per STT]	(Stt)	Stop that depends on the configuration of [Type of stop] (Stt) without shutdown. In this case, the fault relay does not open; as soon as the detected fault no longer exists, the inverter is ready to restart according to the restart conditions of the active command channel (for example, according to [2/3-Wire Control] (tCC) and [2-wire type] (tCt) when controlled via the terminals). Configuring an alarm for this fault is recommended (assigned to a digital output, for example) in order to indicate the cause of the stop.
	[Fallback Frequency]	(LFF)	Changes to the fallback speed, which is maintained for as long as the detected fault persists and the move command has not been canceled.[1]
	[Speed maintained]	(rLS)	The inverter maintains the frequency that was applied when the fault occurred as long as the fault is active and the move command has not been canceled.[1]
	[Ramp stop]	(rMP)	Stop via ramp Factory setting
	[Fast stop]	(FSt)	Fast stop
	[DC Injection]	(dCI)	Stop by DC injection braking. This function type cannot be used in combination with certain other functions.

1) Since the detected fault does not trigger a stop in this case, the display of this fault must be assigned to a relay or a digital output.

[Enc Th Error Level] (tHEF)

Thermal fault level for the encoder.

This parameter is accessible if an encoder module is connected or an integrated encoder is used and [Enc Therm Sensor Type] (tHEt) is not set to [None] (nOnE) or [PTC] (PtC).

	Setting	Description
	-150 to 200.0°C	Setting range Factory setting: 110.0°C

[Enc Th Warn Level] (tHEA)

Thermal warning level for the encoder.

This parameter is accessible if an encoder module is connected or an integrated encoder is used and [Enc Therm Sensor Type] (tHEt) is not set to [None] (nOnE) or [PTC] (PtC).

	Setting	Description
★	-150 to 200.0°C	Setting range Factory setting: 90.0°C

[Enc Th Value] (tHEV)

Temperature value for the encoder.

This parameter is accessible if an encoder module is connected or an integrated encoder is used and [Enc Therm Sensor Type] (tHEt) is not set to [None] (nOnE) or [PTC] (PtC).

	Setting	Description
★	-150 to 200.0°C	Setting range Factory setting: _

[Fallback Frequency] (LFF)

Fallback speed.

Setting	Description
0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

5.2.4.1.7 [Motor monitoring] (MOP-)

Access

[Complete settings] → [Motor parameters] → [Motor monitoring]

About this menu

The thermal monitoring function protects the motor from overheating by estimating the thermal state of the motor.

[Current Limitation] (CLI)

Internal current limit.

> **Note:**
>
> **OVERHEATING**
>
> **It must be ensured that the motor has the required nominal power for the maximum current applied.**
>
> **Ensure that parameter [Current Limitation] (CLi) is set to a lower or the same value as shown in this table.**
>
> **When determining the current limit value, the duty cycle of the motor and all factors of the respective application including declassification requirements must be taken into account.**
>
> **Failure to follow these instructions can result in damage to property.**

> **Note:**
>
> **If the setting is less than 0.25, the inverter can be locked in state [OutPhaseLoss Assign] (OPL) if this has been enabled. If it is less than the motor no-load current, the motor cannot run.**

	Setting	Description
★ ↻	0 to 1.8 In[1)]	Setting range Factory setting: 1.8 In[1)]

1) Corresponds to the nominal current of the inverter specified on the nameplate.

[Attenuation Time] (SOP)

Damping time.

This parameter is accessible if [Motor surge limit.] (SVL) is not set to [No] (nO).

The value for parameter [Volt surge limit. opt] (SOP) corresponds to the damping time for the cable used. It is used to prevent the superimposition of voltage wave reflections resulting from long cable lengths. It limits overvoltages to twice the DC bus nominal voltage.

Since voltage peaks depend on many parameters, such as cable type, different motor voltages when connected in parallel, different cable lengths when connected in parallel, etc., it is recommended to use an oscilloscope to check the overvoltage values on the motor terminals.

To retain the overall inverter performance, the SOP value is not permitted to be increased unnecessarily.

	Setting		Description
★	[6 µs]	(6)	6 µs
	[8 µs]	(8)	8 µs Factory setting
	[10 µs]	(10)	10 µs

[Sinus Filter Activation] (OFI)

Enables the sine wave filter.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

> **Note:**
>
> **DANGER OF DAMAGE TO THE SINE WAVE FILTER**
>
> **For systems with a sine wave filter, the maximum output frequency [Max Frequency] (tFr) is not permitted to exceed 100 Hz.**
>
> **Failure to follow these instructions can result in damage to property.**

	Setting		Description
★	[No]	(nO)	No sine wave filter Factory setting
	[Yes]	(YES)	Use a sine wave filter to limit motor overvoltages and reduce the detected leakage current to ground or in case of applications with step-up transformer.

[Output Short Circuit Test] (Strt)

Configures the short-circuit test on the output.

The inverter outputs are tested at every start, regardless of the configuration of this parameter. If this parameter is set to [Yes] (YES), the test is also performed each time a move command is output. These tests cause a slight delay (a few ms). In the event of a fault, the inverter will lock.

Fault "Short circuit on inverter output (terminals U-V-W) : SCF" can be detected.

The factory-set value is changed to [Yes] (YES) according to the catalog numbers.

Setting		Description
[No]	(nO)	Does not perform a test during a move command Factory setting
[Yes]	(YES)	Short-circuit test on the output for each move command

[Motor Therm Thd] (ttd)

Enable warning for motor thermal threshold value [Motor Therm Thd] (TSA).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Motor2 therm. level] (ttd2)

Enable warning for thermal level of motor 2 [Motor2 Thermal Thd] (TS2).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Motor3 therm. level] (ttd3)

Enable warning for thermal level of motor 3 [Motor3 Thermal Thd] (TS3).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Motor4 therm. level] (ttd4)

Enable warning for temperature level of motor 4 [Motor4 Thermal Thd] (TS4).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

5.2.4.1.8 [Motor control] (drC-)

Access

[Complete settings] → [Motor parameters] → [Motor control]

About this menu

The parameters linked to motor control are displayed in this menu.

[IR compensation] (UFr)

This parameter is used for torque optimization at low speed or for adjustment in special cases (for example, to reduce [IR compensation] (UFr) for motors connected in parallel). If the torque is not sufficient at low speed, increase [IR compensation] (UFr). If the value is too high, this can result in the motor not starting or a change of the current limiting mode.

	Setting	Description
	0 to 200%	Setting range Factory setting: 100%

[Slip compensation] (SLP)

Slip compensation

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [SVC V] (VVC)
- [U/F VC 5pts] (UF5)
- [Energy Sav.] (NLD)

The speeds given on motor nameplates are not necessarily exact.

If the slip setting is lower than the actual slip, the motor will not rotate at the correct speed in the steady state, but at a lower speed than the setpoint.

If the slip setting is higher than the actual slip, the motor is overcompensated and the speed is not steady.

	Setting	Description
★	0 to 300%	Setting range Factory setting: 100%

[U1] (U1)

Voltage point 1 at 5 V/f points.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0 to 800 VAC	Setting range according to rating. Factory setting: 0 VAC

[U2] (U2)

Voltage point 2 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0 to 800 VAC	Setting range according to rating. Factory setting: 0 VAC

[U3] (U3)

Voltage point 3 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0 to 800 VAC	Setting range according to rating. Factory setting: 0 VAC

[U4] (U4)

Voltage point 4 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0 to 800 VAC	Setting range according to rating. Factory setting: 0 VAC

[U5] (U5)

Voltage point 5 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0 to 800 VAC	Setting range according to rating. Factory setting: 0 VAC

[F1] (F1)

Frequency point 1 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[F2] (F2)

Frequency point 2 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[F3] (F3)

Frequency point 3 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[F4] (F4)

Frequency point 4 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[F5] (F5)

Frequency point 5 at 5 V/f points.

V/f profile setting.

This parameter is accessible if [Motor control type] (Ctt) is set to [V/F 5pts] (UF5).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Output Ph Rotation] (PHr)

Phase rotation of the output.

Changing this parameter causes two of the three motor phases to reverse. This changes the direction of rotation of the motor.

Setting	Code/Value	Description
[ABC]	(AbC)	Standard direction of rotation Factory setting
[ACB]	(ACb)	Opposite direction of rotation

[Inertia Factor] (SPGU)

Factor of inertia

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

	Setting	Description
	0 to 1,000%	Setting range Factory setting: 40%

[Boost Activation] (bOA)

Enables boost.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

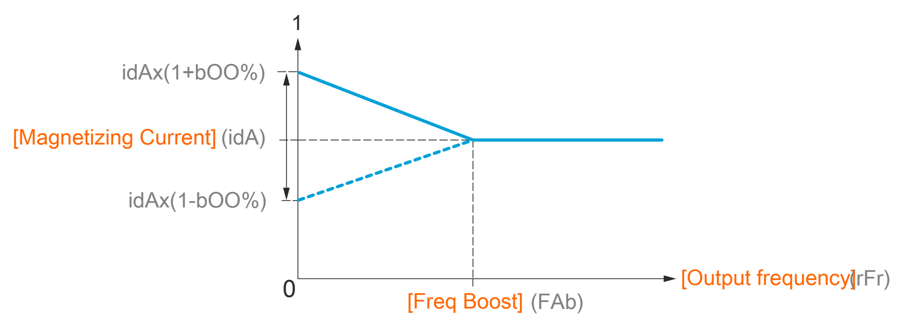
	Setting	Code/Value	Description
☆	[Inactive]	(nO)	No boost
	[Dynamic]	(dYnA)	Dynamic boost. The value of the magnetizing current is modified according to the motor load. Factory setting **Note:** **The inverter controls the value for [Magnetizing Current] (iDA) to optimize the performance.**
	[Static]	(StAt)	Static boost. The value of the magnetizing current follows the profile, regardless of the motor load. **Note:** **With this selection, [Boost] (boo) and [Freq Boost] (FAb) are taken into account.** **Note:** **This selection can be used for a conical motor with a negative value for [Boost] (boo).**
	[Constant]	(CStE)	Constant boost; the magnetizing current is maintained if the direction of motor rotation is changed. An additional parameter is available for the deceleration and stop phase. [Constant] (Cste) is accessible if [Motor control type] (Ctt) is set to [Nom SyncMotor] (Syn), [Sync.CL] (FSY) or [SYN_U VC] (Synu). **Note:** **With this selection, only [Boost] (boo) is taken into account.**
	[Conical Motor]	(CMOT)	Conical boost. This parameter is accessible if [Motor control type] (Ctt) is not set to [Nom SyncMotor] (Syn), [Sync.CL] (FSY) or [SYN_U VC] (Synu). **Note:** **With this selection, [Boost] (boo) can be set for startup and [Boost On Deceleration] (boo2) can be set for deceleration.**

[Boost] (boo)

Value at 0 Hz: Percentage of the nominal magnetizing current (taken into account if not 0).

An excessive value for [Boost] (boo) can result in magnetic saturation of the motor and thus in a reduction in torque.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and if [Boost Activation] (BOA) is not set to [Inactive] (nO).



Note:

For synchronous motors, it is recommended to set this value at low speed to optimize control.

	Setting	Description
☆	-100 to 100%	Setting range Is [Boost Activation] (BOA) set to [Dynamic] (DYNA), [Boost] (boo) is defined at 25%. Factory setting: 0%

[Boost On Deceleration] (bOO2)

Value of the nominal magnetizing current as a percentage (taken into account if not 0).

This parameter is used during the deceleration phase to quickly reduce the magnetizing current in the stop phase.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and if [Boost Activation] (BOA) is set to [Conical Motor] (Cmot).

	Setting	Description
☆	-100 to 0%	Setting range Factory setting: -25%

[Freq Boost] (FAb)

Value at 0 Hz: Speed threshold value to reach the nominal magnetizing current.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and if [Boost Activation] (BOA) is not set to [No] (nO) or [Constant] (CSte).

> **Note:**
>
> **For synchronous motors, it is recommended to set this value to optimize control at low speed.**

	Setting	Description
☆	0.0 to 599.0 Hz	Setting range Is [Boost Activation] (BOA) set to [Dynamic] (DYNA), [Freq Boost] (FAB) is defined at 30.0 Hz. Factory setting: 0.0 Hz

[Braking level] (Vbr)

Braking transistor power-on voltage.

	Setting	Description
	335 to 1130 V	Setting range Factory setting: In accordance with the nominal inverter voltage

ACOPOSinverter P86	[Mains Voltage] (UrES)	Setting range		
		Min. value [VDC]	Max. value [VDC]	Default [VDC]
8I86T4xxxxx.00-000	[380Vac] (380)	698	780	780
	[400Vac] (400)	716		
	[440Vac] (440)	753		
	[460Vac] (460)	772		
	[480Vac] (480)	780		

5.2.4.1.9 [Fluxing by DI] (FLI-)

Access

[Complete settings] → [Motor parameters] → [Motor control] → [Fluxing by DI]

About this menu

This menu is used to configure the magnetic flux via a digital input.

[Motor fluxing] (FLU)

Configures the magnetic flux of the motor.

Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

If parameter [Motor fluxing] (FLU) is set to [Continuous] (Fct), magnetization will always occur, even if the motor is not running.

Ensure that this setting does not result in unsafe states.

Failure to follow these instructions will result in death or serious injury.

Note:

OVERHEATING

It must be ensured that the connected motor has the required nominal power for the applied magnetizing current.

Failure to follow these instructions can result in damage to property.

In order to obtain rapid high torque on startup, magnetic flux needs to already have been established in the motor.

In mode [Continuous] (Fct), the inverter automatically creates the magnetic flux at startup.

In mode [Not continuous] (FnC), magnetization occurs if the motor has been started.

The magnetic current is higher than [Nom Motor Current] (nCr) (configured rated current of the motor) if the magnetic flux is generated and is then adapted to the magnetizing current of the motor.

If [Motor control type] (Ctt) is set to [Sync. mot.] (SYn), parameter [Motor fluxing] (FLU) affects the alignment of the motor but not the magnetic flux.

If [Brake assignment] (bLC) is not set to [No] (nO), parameter [Motor fluxing] (FLU) has no effect.

	Setting		Description
	[Not continuous]	(FnC)	Non-permanent mode
	[Continuous]	(FCt)	Permanent mode This option is not possible if [Auto DC Injection] (AdC) is set to [Yes] (YES), or if [Type of stop] (Stt) is set to [Freewheel] (nSt).
	[No]	(FnO)	Function not active Factory setting

[Fluxing assignment] (FLI)

Assigns the input for the magnetic flux

Note:

OVERHEATING

It must be ensured that the connected motor has the required nominal power for the applied magnetizing current.

Failure to follow these instructions can result in damage to property.

Assignment is only possible if [Motor fluxing] (FLU) is set to [Not continuous] (FnC).

If a DI or a bit is assigned to the control command, motor magnetization is increased in state 1 of the assigned input or bit.

If an DI or a bit has not been assigned, or if the DI or bit is in state 0 during a move command, magnetization occurs when the motor starts.

[Angle setting type] (ASt)

Automatic type for angle setting.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

[PSI align] (PSI) and [PSIO align] (PSIO) are suitable for all types of synchronous motors. Increasing [SPM align] (SPMA) and [IPM align] (IPMA) increases the power output depending on the type of synchronous motor. Parameter [Rotational Current Injection] (RCI) can be used if [PSI align] (PSI) and [PSIO align] (PSIO) do not deliver the expected power output.

	Setting	Code/Value	Description
★	[IPM align]	(IPMA)	Assignment for IPM motor. Assignment mode for internally concealed permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[SPM align]	(SPMA)	Assignment for SPM motor (surface-mounted permanent magnet motor) Assignment mode for surface-mounted permanent magnet motor. It uses a high-frequency application that produces much less noise then standard assignment mode.
	[PSI align]	(PSI)	Pulse signal supply. Standard assignment mode without rotor movement. The angle is measured by monitoring the response of the stator current to a pulse signal supply over a wide frequency range.
	[PSIO align]	(PSIO)	Pulse signal supply optimized. Assignment mode optimized with rotor movement. The same process as for [PSI align] (PSI) takes place via an optimized frequency range. The measurement time is reduced after the first move command or measurement procedure, even if the inverter has been switched off. Factory setting
	[Rotational Current Injection]	(rCi)	Three-phase current supply. Assignment mode with rotor movement. This assignment mode requires up to 4 s and mechanically aligns the rotor and stator. The motor must be stopped and is not permitted to have a resistive load. **Note:** **This setting is recommended when using a sine wave filter in the application.**
	[No align]	(nO)	No assignment.

5.2.4.1.10 [Spd Loop Optimization] (MCL-)

Access

[Complete settings] → [Motor parameters] → [Motor control] → [Spd Loop Optimization]

About this menu

This procedure is possible if [Motor control type] (CTT) is not set to [U/F VC 5pts] (UF5) or [SYN_U VC] (SYNU).

Recommended procedure for setting the high-performance speed controller

1) Enter the motor parameters. If you change one of these parameters at a later point, you must repeat the entire procedure.
2) The inertia of the driven load must be entered in parameter [Application Inertia] (JAPL).

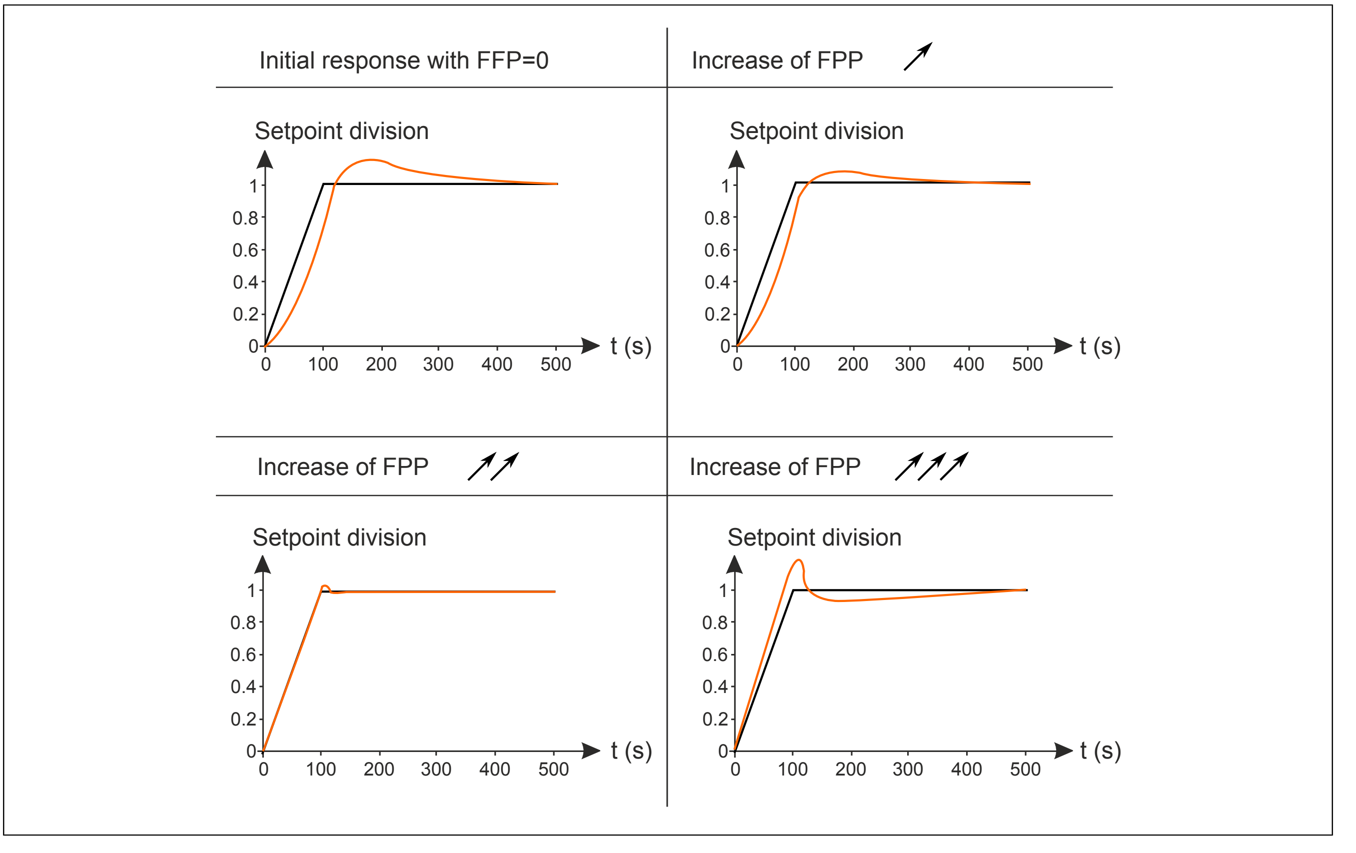
> **Note:**
>
> **When a motor parameter is changed, the estimated inertia is recalculated and updated (parameter [Estim. app. inertia] (JESt) and [Inertia Mult. Coef.] (JMUL). The value of [Application Inertia] (JAPL) is reset to the default value according to the new value of [Estim. app. inertia] (JESt).**

3) Check the response of the speed controller by setting [Feed forward] (FFP) to 0 (see diagrams on the next page).
4) If necessary, adjust the bandwidth and damping (stability) via parameters [FreqLoop Stab] (STA) and [FreqLoopGain] (FLG).
5) To optimize ramp tracking, increase parameter [Feed forward] (FFP) as described on the following page until the best possible result is achieved.
6) If necessary, the feed-forward bandwidth can be adjusted (as shown on the next page) to further improve ramp tracking or filter noise at the speed setpoint.

High-performance speed controller - Setting parameter [Feed forward] (FFP)

This parameter is used to set the dynamic feed-forward torque that is required for the acceleration or deceleration of the inertia. The effect of this parameter on ramp tracking is illustrated below. If the value of [Feed forward] (FFP) is increased, the ramp can be tracked more precisely. If the value is too high, however, overspeed will occur. The optimal setting is reached when the speed precisely follows the ramp; this depends on the accuracy of parameter [Application Inertia] (JAPL) and the setting of parameter [Encoder filter value] (FFr).

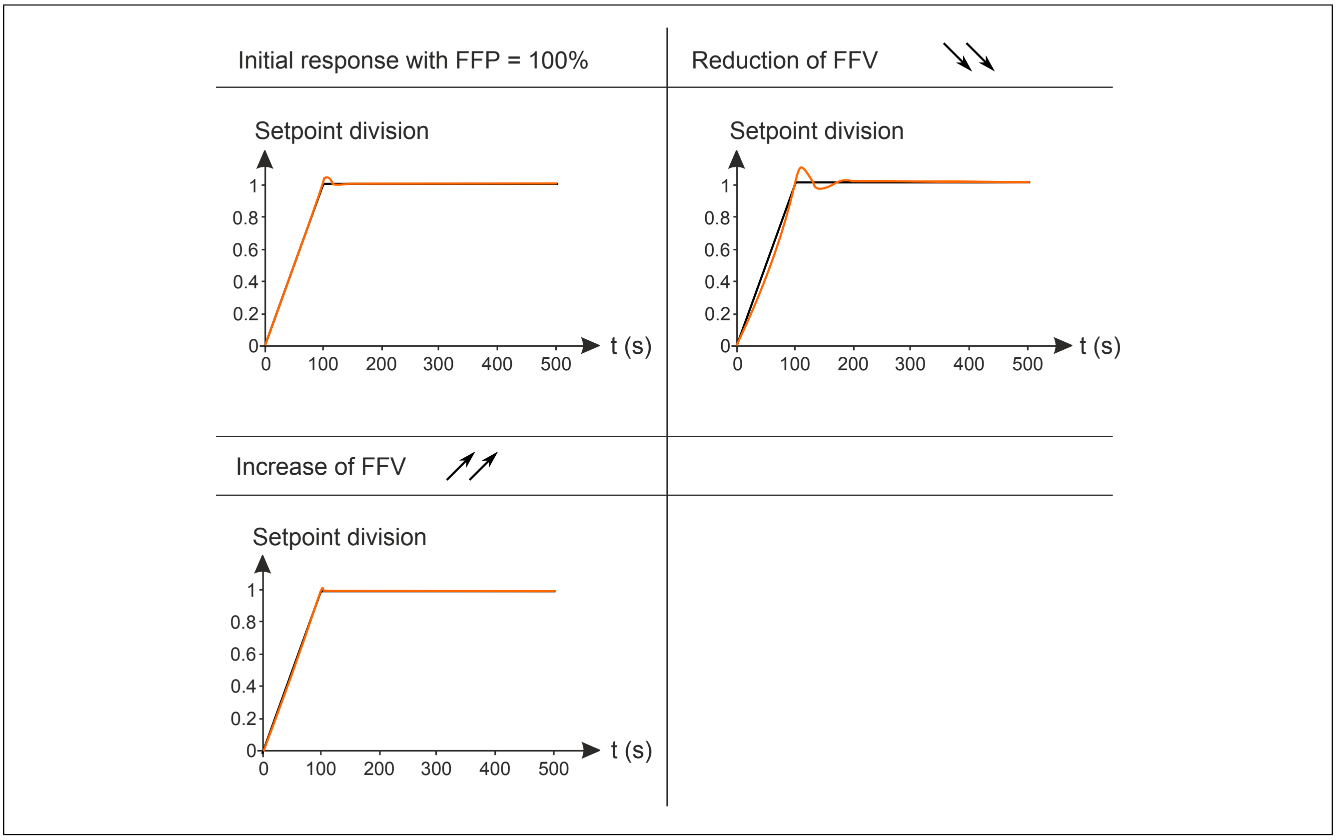
Settings of [Feed forward] (FFP)



High-performance speed controller - Setting parameter [FeedFwd Bandwidth] (FFV)

This parameter is used to set the bandwidth of the dynamic feed-forward torque. The effect of this parameter on ramp tracking is illustrated below. A decrease in the value of [FeedFwd Bandwidth] (FFV) dampens the effects of noise to the speed setpoint (torque ripple). However, too much reduction relative to the ramp settings (for short ramps) causes deceleration and affects ramp tracking. If the value of [FeedFwd Bandwidth] (FFV), the ramp can be tracked more precisely, but the sensitivity to noise is also increased. The optimal setting is reached when the best possible compromise between ramp tracking and sensitivity to interference is achieved.

Settings of [FeedFwd Bandwidth] (FFV)



[Speed loop type] (SSL)

Type of speed controller.

This parameter is accessible if [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

	Setting	Code/Value	Description
★	[Standard]	(Std)	Standard speed controller Factory setting
	[High Perf]	(HPF)	High-performance speed controller. We recommend disabling [Dec.Ramp Adapt] (brA) = [No] (nO)

[Speed prop. gain] (SPG)

Proportional gain for speed control

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (Std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

	Setting	Description
★	0 to 1000%	Setting range Factory setting: 40%

[Speed time integral] (SIt)

Integral time constant for speed control

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (Std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

	Setting	Description
	0 to 65,535 ms	Setting range Factory setting: Depends on the nominal power of the inverter.

[K speed loop filter] (SFC)

Speed filter coefficient (0 (IP) to 1 (PI)).

	Setting	Description
	0 to 100	Setting range Factory setting: 65

[Spd est. filter time] (FFH)

Filter time of the calculated speed.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Description
	0.0 to 100.0 ms	Setting range Factory setting: Depends on the nominal power of the inverter.

[FreqLoop Stab] (STA)

Stability of the speed controller (damping factor).

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

Stability: This parameter is used to return to steady state after a speed transient according to the dynamics of the machine. Gradually increase the stability to increase the damping of the control loop and reduce possible overspeed.

	Setting	Description
	0 to 100%	Setting range Factory setting: 20%

[FreqLoopGain] (FLG)

P component of the speed controller (bandwidth).

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

This parameter is used to adjust the response to speed transients of the machine depending on the dynamics. For machines with high resistive load, high inertia or fast cycles, the gain must be increased gradually.

	Setting	Description
	0 to 100%	Setting range Factory setting: 20%

[Feed forward] (FFP)

Enables and sets feed-forward control.

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

Percentage of high-performance controller for feed-forward control. 100% correspond to the value calculated using the value of [Application Inertia] (JAPL).

	Setting	Description
★ ⟲	0 to 200%	Setting range Factory setting: 0%

[FeedFwd Bandwidth] (FFV)

Bandwidth of the feed-forward filter.

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

Bandwidth of the feed-forward filter of the high-performance speed controller as a percentage of the predefined value.

	Setting	Description
★ ⟲	20 to 500%	Setting range Factory setting: 100%

[External FeedFwd Assign] (tEff)

External feed-forward mode.

	Setting	Code/Value	Description
★	[No]	(nO)	Analog input is not assigned. Factory setting
	[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3 **Note:** **Accessing selection AI3 is possible for inverters with a power output greater than 22 kW.**
	[Ref.Freq-Rmt.Term]	(LCC)	Frequency setpoint via remote operator terminal.
	[Ref. Freq-Com. Module]	(nEt)	Frequency setpoint via POWERLINK if a module is connected.
	[DI7 PulseInput] to [DI8 PulseInput]	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input. **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
	[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Inertia Mult. Coef.] (JMUL)

Scaling factor for the display of inertia values.

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

Increment for parameters [Application Inertia] (JAPL) and [Estim. app. inertia] (JESt) calculated by the inverter in read-only mode: 0.1 gm², 1 gm², 10 gm², 100 gm² or 1,000 gm².

	Setting	Description
★	0.0 to 6553.5 gm²	Setting range Factory setting: 0.0 gm²

[Estim. app. inertia] (JEST)

Calculated inertia for the application.

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

The inertia of the driven load is calculated by the inverter using the motor parameters in read-only mode. Based on this inertia value, the inverter determines the default settings of the speed controller.

Via [Inertia Mult. Coef.] (JMUL): - 0.1 gm², 1 gm², 10 gm², 100 gm² or 1,000 gm².

	Setting	Description
★	1 to 9,999 kg/m²	Setting range Factory setting: _

[App. Inertia Coef.] (JACo)

Configurable inertia ratio for the application.

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

This coefficient defines the relationship between parameters [Estim. app. inertia] (JESt) and [Application Inertia] (JAPL).

[Application Inertia] (JAPL) = [Estim. app. inertia] (JESt) x [App. Inertia Coef.] (JACO)

	Setting	Description
★	0.10 to 100.00	Setting range Factory setting: 1

[Application Inertia] (JAPL)

Configurable inertia of the application.

This parameter is accessible if [Speed loop type] (SSL) is set to [Standard] (std) and [Motor control type] (Ctt) is not set to any of the following values:

- [U/F VC 5pts] (UF5)
- [SYN_U VC] (SYnU)

Configurable application inertia used by the inverter to optimize the speed controller settings.

Via [Inertia Mult. Coef.] (JMUL): 0.1 gm², 1 gm², 10 gm², 100 gm² or 1,000 gm².

> **Note:**
>
> **When a motor parameter is changed, the estimated inertia is recalculated and updated (parameter [Estim. app. inertia] (JEST) and [Inertia Mult. Coef.] (JMUL). The value of [Application Inertia] (JAPL) is reset to the default value according to the new value of [Estim. app. inertia] (JEST).**

	Setting	Description
☆	0.00 to 655.35 kgm²	Setting range Factory setting: _

[Encoder filter activ.] (FFA)

Enables the actual value filter of the encoder.

This parameter is accessible if an encoder module is connected or an integrated encoder is used.

This parameter is accessible if [Encoder usage] (Enu) or [Emb Enc Usage] (EEnu) is not set to [No] (nO):

	Setting	Code/Value	Description
☆	[No]	(nO)	Filter disabled. Factory setting: _
	[Yes]	(YES)	Filter enabled.

[Encoder filter value] (FFr)

Value of the actual value filter of the encoder.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and if [Encoder filter activ.] (FFA) is set to [Yes] (YES).

	Setting	Description
☆	0.0 to 40.0 ms	Setting range Factory setting: Depends on the nominal power of the encoder.

[Notch Filter Activation] (NFA)

Enables the notch filter.

This parameter enables the notch filter function. Two independent notch filters can be configured.

The central frequency of the notch filter should be set to the value of the mechanical resonance frequency or to a slightly higher value. The main function determines the resonance frequency as precisely as possible.

> **Note:**
>
> **At frequencies above the mechanical resonance frequency, vibrations can occur depending on the setting of the speed controller and motor parameters. It is therefore important to identify the actual mechanical resonance frequency.**

Perform the following actions for commissioning:

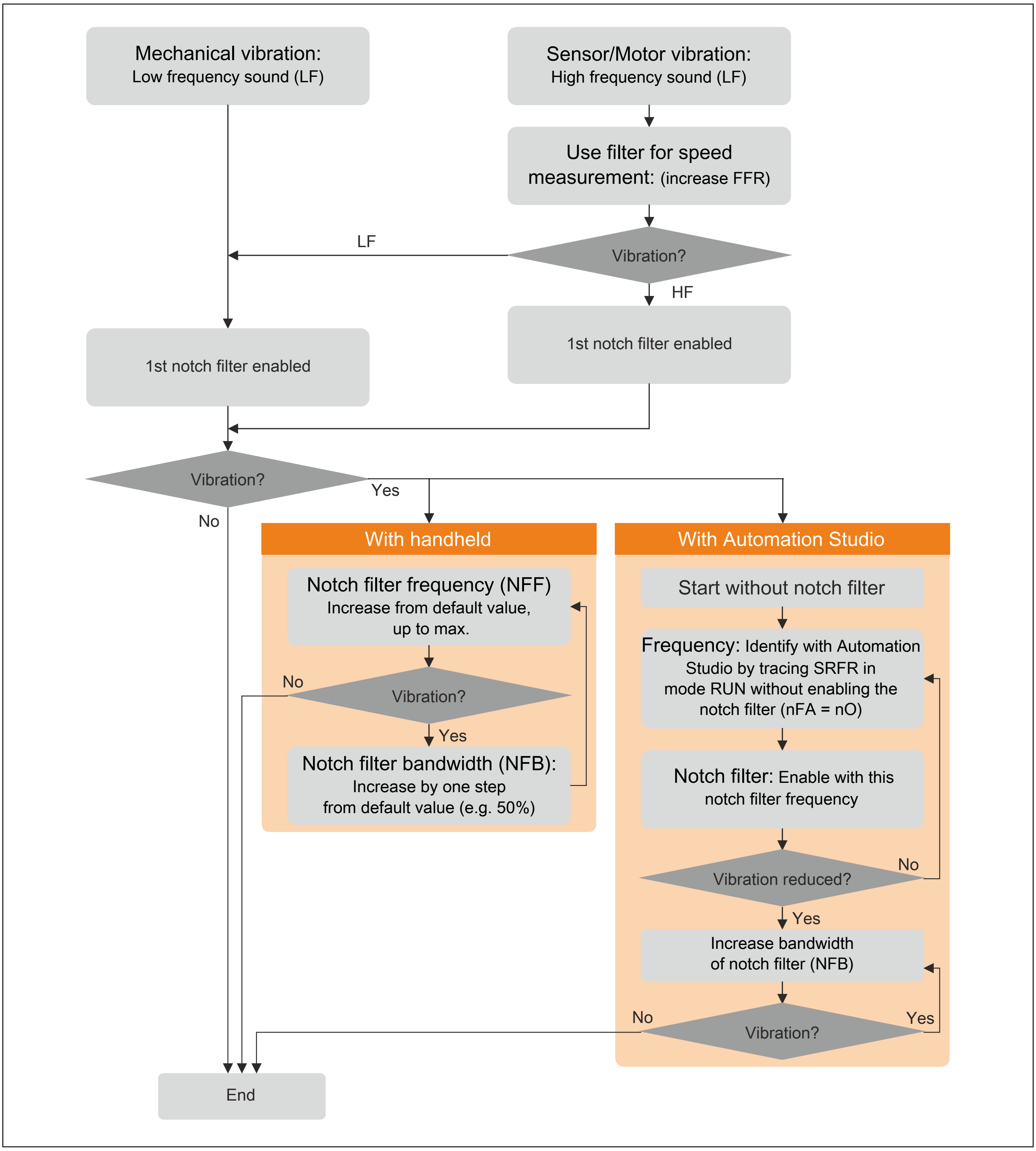
1) Set the motor data.
2) Set the application data.
3) Define the speed controller settings.
4) In case of vibrations, select the notch filter settings as described below.
5) If the power output is not OK, repeat the procedure from step 3.

This parameter is accessible if an encoder module is connected or an integrated encoder is used.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and if [Speed loop type] (SSL) is set to [High Perf] (HPF).

	Setting	Code/Value	Description
	[First]	(1ST)	Notch filter 1 enabled
	[2nd]	(2nd)	Notch filter 2 enabled
	[All]	(ALL)	Notch filter 1 and 2 enabled
	[No]	(nO)	No notch filter enabled Factory setting

Notch filter settings



[Notch Filter Freq 1] (NFf1)

Central frequency of notch filter 1.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Speed loop type] (SSL) to [High Perf] (HPF) and [Notch Filter Activation] (nFA) is set to one of the following values:

- [First] (1sT)
- [All] (ALL)

	Setting	Description
★	10.0 to 150.0 Hz	Setting range Factory setting: 15.0 Hz

[Notch Filter Bdw 1] (NFB1)

Bandwidth of notch filter 1.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Speed loop type] (SSL) to [High Perf] (HPF) and [Notch Filter Activation] (nFA) is set to one of the following values:

- [First] (1sT)
- [All] (ALL)

This parameter defines the bandwidth of notch filter 1. A filter with a higher bandwidth offers a wider range of stability if the resonant frequency of the load changes (depending on the position of the transport cart or the load acting on it).

> **Note:**
>
> **Increasing the bandwidth can affect the expected inverter dynamics (reduction of the speed controller dynamics).**

	Setting	Description
★	10 to 400%	Setting range Factory setting: 100%

[Notch Filter Depth 1] (NFD1)

Depth of notch filter 1.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Speed loop type] (SSL) to [High Perf] (HPF) and [Notch Filter Activation] (nFA) is set to one of the following values:

- [First] (1sT)
- [All] (ALL)

This parameter defines the gain of notch filter 1 on the central frequency. No filter is applied with (NFD1) = 100%.

	Setting	Description
★	0 to 99%	Setting range Factory setting: 10%

[Notch Filter Freq 2] (NFF2)

Central frequency of notch filter 2.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Speed loop type] (SSL) to [High Perf] (HPF) and [Notch Filter Activation] (nFA) is set to one of the following values:

- [Second] (2nd)
- [All] (ALL)

	Setting	Description
★	10.0 to 150.0 Hz	Setting range Factory setting: 85.0 Hz

[Notch Filter Bdw 2] (NFB2)

Bandwidth of notch filter 2.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Speed loop type] (SSL) to [High Perf] (HPF) and [Notch Filter Activation] (nFA) is set to one of the following values:

- [Second] (2nd)
- [All] (ALL)

This parameter defines the bandwidth of notch filter 2. A filter with a higher bandwidth offers a wider range of stability if the resonant frequency of the load changes (depending on the position of the transport cart or the load acting on it).

> **Note:**
>
> **Increasing the bandwidth can affect the expected inverter dynamics (reduction of the speed controller dynamics).**

	Setting	Description
☆	10 to 400%	Setting range Factory setting: 100%

[Notch Filter Depth 2] (NFD2)

Depth of notch filter 2.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Speed loop type] (SSL) to [High Perf] (HPF) and [Notch Filter Activation] (nFA) is set to one of the following values:

- [Second] (2nd)
- [All] (ALL)

This parameter defines the gain of notch filter 2 on the central frequency. No filter is applied with (NFD2) = 100%.

	Setting	Description
☆	0 to 99%	Setting range Factory setting: 25%

5.2.4.1.11 [Motor control] (drC-)

Access

[Complete settings] → [Motor parameters] → [Motor control]

About this menu

The parameters linked to motor control are displayed in this menu.

[HF inj. activation] (HFI)

Enables HF injection.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Motor control type] (Ctt) is not set to any of the following values:

- [Nom SyncMotor] (SYn)
- [Sync.CL] (FSY)
- [SYN_U VC] (SYnU)

Setting	Code/Value	Description
[No]	(nO)	HF injection inactive. Factory setting
[Yes]	(YES)	HF injection active.

[HF injection freq.] (FrI)

Frequency of the HF injection signal.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [HF inj. activation] (HFi) is set to [Yes] (YES).

Setting	Description
250 to 1000 Hz	Setting range Factory setting: 500 Hz

[HF pll bandwidth] (SPb)

Bandwidth of the HF PLL.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [HF inj. activation] (HFi) is set to [Yes] (YES).

Setting	Description
0 to 400%	Setting range Factory setting: 100%

[Current Level Align] (ILr)

Threshold value for HF injection.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [HF inj. activation] (HFi) is set to [Yes] (YES).

Setting	Description
0 to 200%	Setting range Factory setting: 50%

[Boost level align.] (SIr)

Boost level assignment for IPMA.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

Setting	Description
0 to 200%	Setting range Factory setting: 100%

[Angle error Comp.] (PEC)

Compensates the magnet wheel angle fault.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [HF inj. activation] (HFi) is set to [Yes] (YES).

Setting	Description
0 to 500%	Setting range Factory setting: 0%

Handling output voltage and overmodulation

[Overmodul. Activation] (OVMA)

Enables overmodulation.

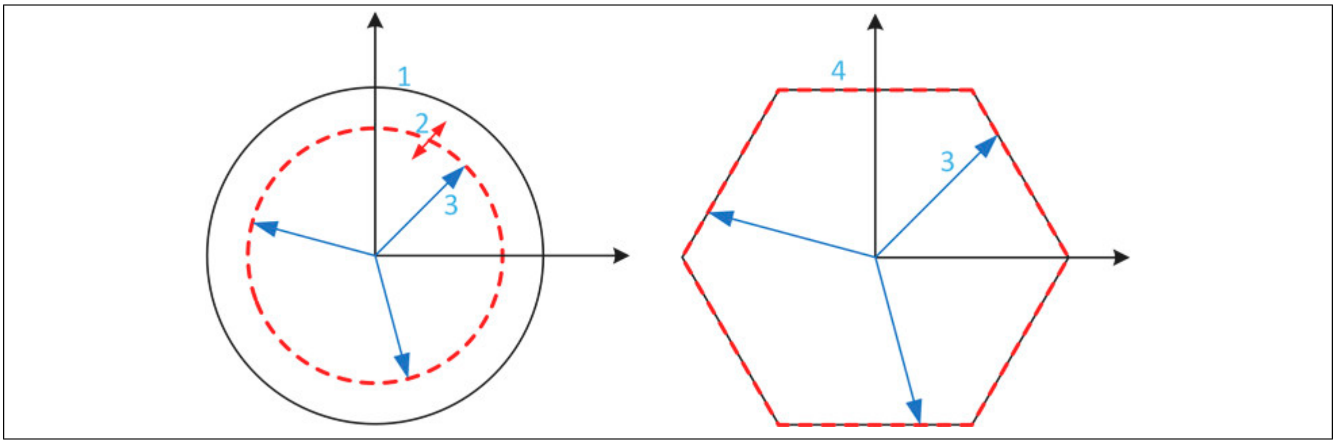
This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

Overmodulation serves the following purposes:

- It compensates the output voltage loss caused by the load of the inverter.
- It increases the maximum possible voltage to reduce current consumption at a high motor voltage and limits the thermal effect on the motor.

The factory settings for the motor supplied via the intermediate drive of the inverter include the following:

- A normal output voltage mode that is not zero, depending on the DC bus power supply.
- No overmodulation ([Overmodul. Activation] (OVMA) is set to [No] (nO)): Sinusoidal line-to-line voltage.
- Output voltage limited to the maximum possible value depending on the DC bus supply, which depends on the main power supply.



1) Maximum possible value of output voltage limiting (default value)
2) VLim with a numerical value below the maximum limit
3) Output voltage
4) Output voltage limiting with complete overmodulation (hexagonal)

Setting	Code/Value	Description
[Default]	(DEFAULT)	Overload modulation is not configured. By default, output voltage limiting is represented by a circle with a maximum radius that depends on the DC bus voltage. The radius can be reduced to a smaller value by setting a numerical value for [Output voltage limitation] (Vlim). Factory setting
[All]	(FULL)	Overmodulation is active and complete. Output voltage limiting is represented by a regular hexagon depending on the DC bus voltage. The line-to-line voltages are not sinusoidal.

[Output voltage limitation] (VLIM)

Output voltage limiting.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

This parameter is used to change output voltage limiting to a lower value than the maximum default value.

The unit of the numerical value of this parameter is expressed as the effective voltage of the line-to-line voltage.

This parameter cannot be set to a numeric value if [Overmodul. Activation] (OVMA) is set to [All] (FULL).

Setting	Code/Value	Description
[Default]	(DEFAULT)	Default value of output voltage limiting. Output voltage limiting is at the maximum capacity of the DC bus voltage depending on setting [Overmodul. Activation] (OVMA). Factory setting
0 to 999 V		Setting range of output voltage limiting. Set a value that is lower than the corresponding value [Standard] (Default) to reduce maximum output voltage limiting. If the numerical value is higher than the corresponding default value [Standard] (Default), the corresponding default value is used.

5.2.4.1.12 [Switching Frequency] (SWF-)

Access

[Complete settings] → [Motor parameters] → [Switching Frequency]

[Switching Frequency] (SFr)

Switching frequency of the inverter.

Setting range: The maximum value is limited to 4 kHz if parameter **[Motor surge limit.]** (SVL) has been configured.

If **[Sinus Filter Activation]** (OFI) is set to **[Yes]** (YES), the minimum value is 2 kHz and the maximum value is limited to 6 kHz or 8 kHz according to the inverter rating.

> **Note:**
>
> **In the event of excessive temperature increase, the inverter will automatically reduce the switching frequency and then reset it again as soon as the temperature has reverted to within the normal range.**

For high-speed motors, it is recommended to increase PWM frequency **[Switching Frequency]** (SFr) to 8, 12 or 16 kHz.

	Setting	Description
	2 to 8 or 16 kHz according to the rating of the inverter	Setting range Factory setting: 4.0 kHz or 2.5 kHz according to the rating of the inverter

[Noise Reduction] (nrd)

Reduces motor noise.

Random frequency modulation prevents any resonance that may occur at a fixed frequency.

Setting	Code/Value	Description
[No]	(nO)	Fixed frequency Factory setting
[Yes]	(YES)	Frequency with random modulation

[Switch Freq Type] (SFt)

Switching frequency type.

This parameter is accessible if **[Access Level]** (LAC) is set to **[Expert]** (EPr).

The motor switching frequency is always changed (reduced) if the internal temperature of the inverter is too high.

	Setting	Code/Value	Description
	[SFR type 1]	(HF1)	Optimizes thermal loss. Enables the system to adapt the switching frequency to the motor frequency. This setting is used to optimize thermal loss of the inverter to improve its efficiency. Factory setting
	[SFR type 2]	(HF2)	Enables the system to keep a constant selected switching frequency **[Switching frequency]** (SFr), regardless of motor frequency **[Output frequency]** (rFr). This setting is used to reduce motor noise to a minimum by a high switching frequency. In the event of overheating, the inverter automatically reduces the switching frequency. When the temperature returns to the normal value, the frequency is also increased back to its original value.

[Motor surge limit.] (SVL)

Voltage peak limiting.

This function limits motor overvoltage and can be used for the following types of application:

- NEMA motors
- Old or low-grade motors
- Spindle motors
- Rewound motors

This parameter can remain set to **[No]** (nO) for 230/400 VAC motors that are operated at 230 V and for cases in which the cable between the inverter and the motor does not exceed the following lengths:

- 4 m for unshielded cables
- 10 m for shielded cables

Note:

If [Motor surge limit.] (SVL) is set to [YES] (YES), the maximum switching frequency [Switching Frequency] (SFr) is changed.

Setting	Code/Value	Description
[No]	(nO)	Function inactive Factory setting
[Yes]	(YES)	Function active

[Attenuation Time] (SOP)

Damping time.

This parameter is accessible if **[Motor surge limit.]** (SVL) is not set to **[No]** (nO). The value for parameter **[Attenuation Time]** (SOP) corresponds to the damping time for the cable used. It is used to prevent superimposition of voltage wave reflections resulting from long cable lengths. It limits overvoltages to twice the DC bus nominal voltage. Since voltage peaks depend on many parameters, such as cable type, different motor voltages when connected in parallel, different cable lengths when connected in parallel, etc., it is recommended to use an oscilloscope to check the overvoltage values on the motor terminals. If the higher value of **[Attenuation Time]** (SOP) is not sufficient for the cable lengths, an output filter or dV/dt filter must be used.

To retain overall inverter performance, value **[Attenuation Time]** (SOP) is not permitted to be increased unnecessarily.

	Setting	Code/Value	Description
☆	[6 µs]	(6)	6 µs
	[8 µs]	(8)	8 µs Factory setting
	[10 µs]	(10)	10 µs

5.2.4.2 [Define system units] (SUC-)

Access

[Complete settings] → **[Define system units]**

About this menu

To ensure easy configuration, commissioning, operation and maintenance, the inverter uses the application units.

The physical values described by application units include the following:

- Temperature values
- Currency values

Note:

Some additional standard system units are automatically derived from configurable system units or from other parameters.

Be default, system units refer to all communication parameters and HMI (display terminal, web server, DTM-based software).

If a system unit is changed, the values are not scaled again. Numerical values are retained, but the meaning of these values changes:

- After a change, the behavior of the product does not change (the numerical system state remains the same).
- Writing new values to a new unit by communication functions or via HMI affects the behavior. In this case, all parameters must be reconfigured according to the newly selected unit.
- To avoid problems resulting from a change in system parameter units, system units should only be changed during product installation and before functions are put into operation.

The precision of the physical values is determined together with the unit.

Values have a sign by default.

Values have the following default ranges:

16-bit values	32-bit values
-32,768 to 32,767	-2,147,483,648 to 2,147,483,648

[Temperature unit] (SUtp)

Unit of the standard system application for temperature.

Available temperature units:

Unit	Symbol	Conversion
Degrees Celsius	°C	–
Degrees Fahrenheit	°F	TF = 9/5*Tc+32

Setting	Code/Value	Description
[0.1°C]	(01C)	0.1°C Factory setting
[0.1°F]	(01F)	0.1°F

[Currency unit list] (SUCU)

Unit of the standard system application for the currency.

Setting	Code/Value	Description
[EURO]	(EUrO)	Euro Factory setting
[$]	(dollar)	Dollar
[£]	(pound)	Pound
[Krone]	(Kr)	Krone
[Renminbi]	(rMb)	Renminbi
[Other]	(OtHEr)	Other

5.2.4.3 [Command and Reference] (CrP-)

Access

[Complete settings] → [Command and Reference]

Channel parameters "Command and setpoint" are accessible.

Move commands (forward, reverse, stop, etc.) and setpoints can be transferred using the following channels:

Command	Setpoint
Clamps: DI digital inputs	Clamps: AI analog inputs, pulse input
Display terminal	Display terminal
Fieldbus module	POWERLINK communication module
–	±Speed via display terminal

Note:

The stop buttons on the display terminal can be programmed as buttons without priority. A stop button can only have priority if parameter [Stop Key Enable] (PSt) is set to [Yes] (YES) or [All] (All).

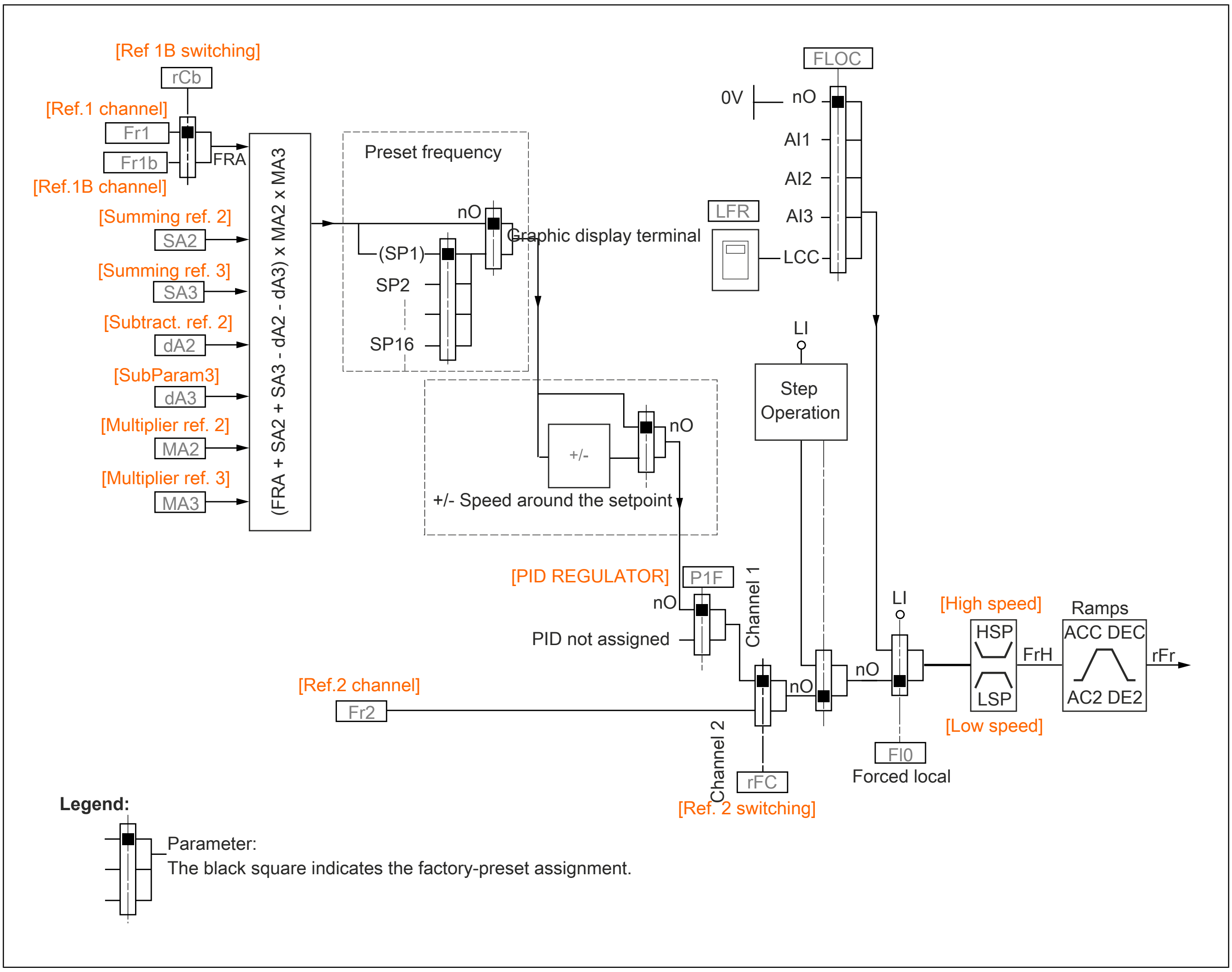
The inverter's behavior can be adjusted to requirements:

- [Not separ.] (SIM): Command and setpoint are transferred via the same channel.
- [Separate] (SEP): Command and setpoint are transferred via different channels. In these configurations, control is via the communication bus in accordance with the DRIVECOM standard.

Note:

Stop commands from the display terminal remain active even if the terminals are not the active command channel.

Setpoint channel for [Not separ.] (SIM) and [Separate] (SEP) configurations, PID not configured.



(Fr1): Terminals, display terminal, POWERLINK communication module, pulse input DI7, pulse input DI8.

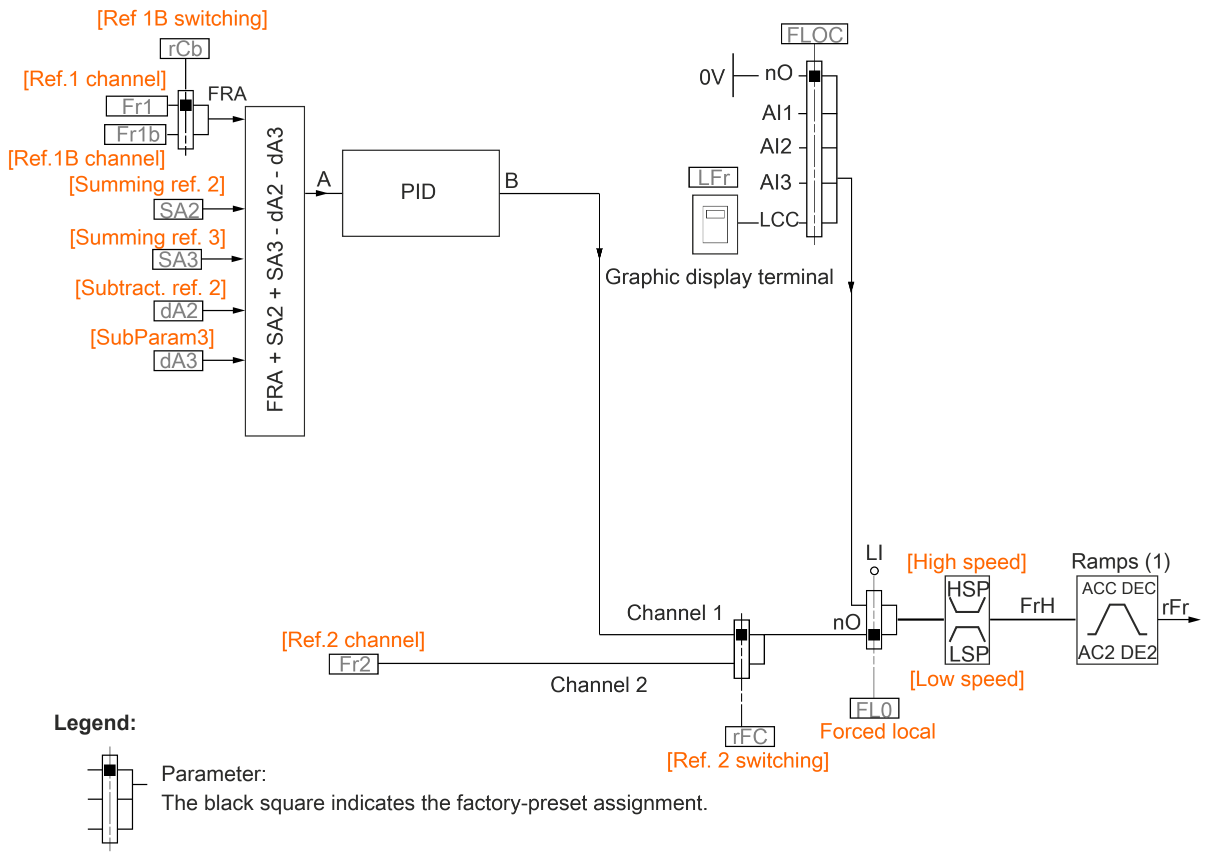
(Fr1b) for (SEP) and (IO): Terminals, display terminal, POWERLINK communication module, pulse input DI7, pulse input DI8.

(Fr1b) for (SIM): Terminals, pulse input DI7, pulse input DI8.

(SA2), (SA3), (dA2), (dA3), (MA2), (MA3): Terminals, display terminal, POWERLINK communication module, pulse input DI7, pulse input DI8 and AI virtual 1.

(Fr2): Terminals, display terminal, POWERLINK communication module and frequency setpoint via DI.

Setpoint channel for [Not separ.] (SIM) and [Separate] (SEP) configurations, PID configured with PID set-points on terminals



(1) The ramps are not active if the PID function is active in automatic mode.

(Fr1): Terminals, display terminal, POWERLINK communication module, pulse input DI7, pulse input DI8.

(Fr1b) for (SEP) and (IO): Terminals, display terminal, POWERLINK communication module, pulse input DI7, pulse input DI8.

(Fr1b) for (SIM): Terminals, pulse input DI7, pulse input DI8.

(SA2), (SA3), (dA2), (dA3): Terminals, display terminal, POWERLINK communication module, pulse input DI7, pulse input DI8.

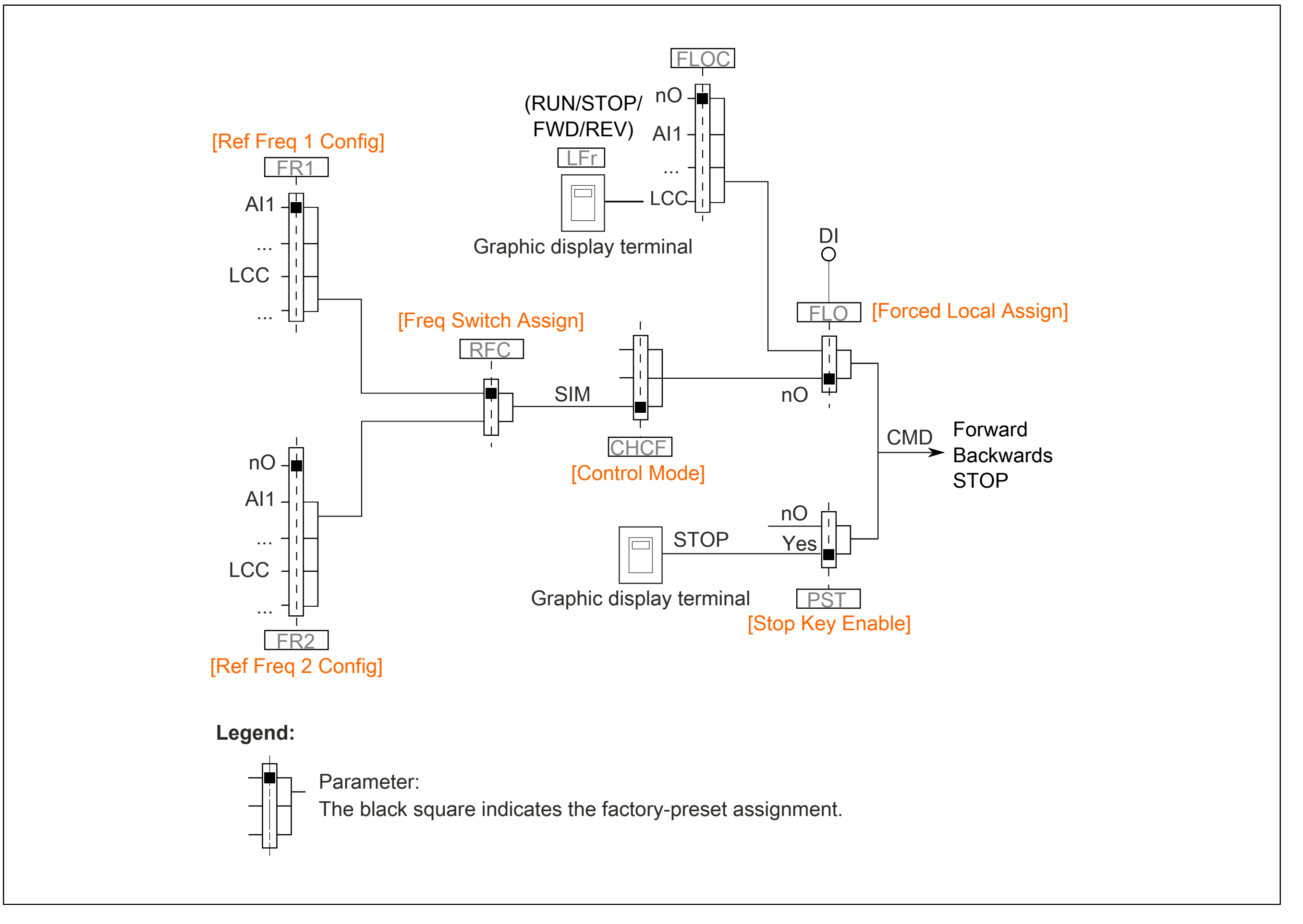
(Fr2): Terminals, display terminal, POWERLINK communication module and frequency setpoint via DI.

Command channel for configuration [Not separ.] (SIM)

Setpoint and command, together.

The command channel is dependent on the setpoint channel. Parameters (Fr1), (Fr2), (RFC), (FLO) and (FLOC) apply for the setpoint and command.

Example: If the setpoint is (Fr1) = (AI1) (analog input on the terminals), control is done via DI (digital input on the terminals).



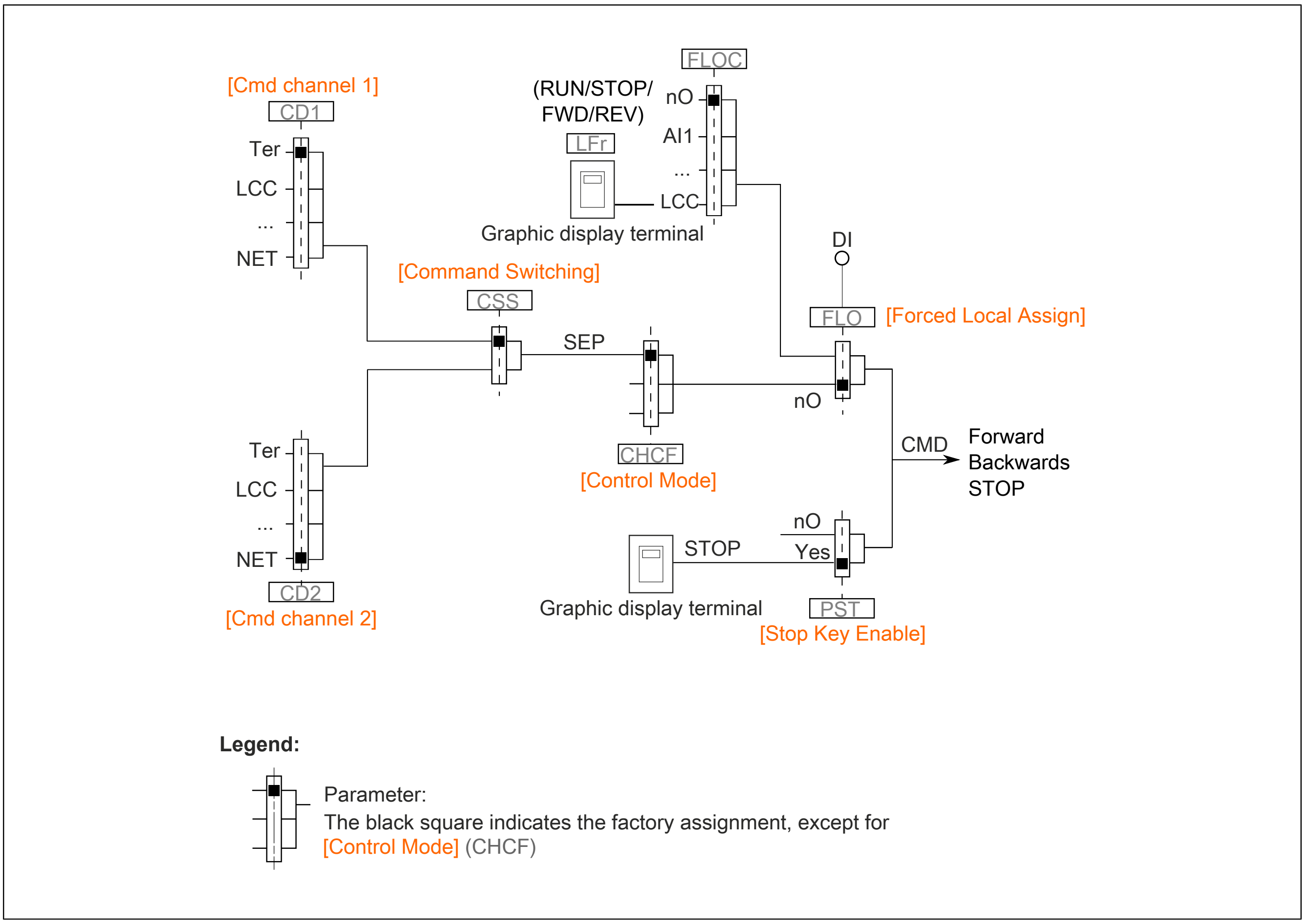
Command channel for configuration [Separate] (SEP)

Setpoint and command are separate.

Parameters (FLO) and (FLOC) apply for setpoint and command.

Example: If the setpoint is in mode "Forced local" mode via AI1 (analog input on the terminals), the command in mode "Forced local" is executed via the DI (digital input on the terminals).

Command channels (CD1) and (CD2) are independent of setpoint channels (FR1), (FR1B) and (FR2).



[Cmd channel 1] (Cd1) and [Cmd channel 2] (Cd2): Terminals, graphic display terminal, HMI panel, POWERLINK communication module

[Ref Freq 1 Config] (Fr1)

Configures frequency setpoint 1.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[AI1]	(AI1)	Analog input AI1 Factory setting
[AI2] to [AI3]	(AI2) to (AI3)	Analog inputs AI2 to AI3 **Note:** **Accessing selection AI3 is possible for inverters with a power output greater than 22 kW.**
[AI Virtual 1]	(AIv1)	Virtual analog input 1
[Ref Frequency via DI]	(UPdt)	Assigns the up/down function via DIx.
[Ref.Freq-Rmt.Term]	(LCC)	Frequency setpoint via remote operator terminal.
[Ref. Freq-Com. Module]	(nEt)	Frequency setpoint via POWERLINK
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Ref.1B channel] (Fr1b)

Configures frequency setpoint 1B.

Identical to [Ref Freq 1 Config] (Fr1) (see above) with factory setting [Not Configured] (nO)

[Ref 1B switching] (rCb)

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

This parameter can cause unexpected movements such as reversing the direction of rotation of the motor, sudden acceleration or a sudden stop.

- **It is important to ensure that setting this parameter does not cause unexpected movements.**
- **It is important to ensure that setting this parameter does not result in unsafe states.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Selects a switchover (1 to 1B).

- [Ref Freq 1 Config] (Fr1) is active in state 0 of the assigned input or bit.
- [Ref.1B channel] (Fr1b) is active in state 1 of the assigned input or bit.

For [Ref 1B switching] (rCb), [Ref Frequency 1] (Fr1) is forced if [Control Mode] (CHCF) is set to [Not separ.] (SIM) and [Ref Freq 1 Config] (Fr1) is assigned via the terminals (analog inputs, pulse input).

Note:

If this function is enabled from another active command channel, monitoring for this new channel is also enabled.

Setting	Code/Value	Description
[Ref Frequency 1]	(Fr1)	Set point channel = Channel 1 (for RFC)
[Ref.1B channel]	(Fr1b)	Setpoint channel = Channel 1b (for RFC)
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Reverse Disable] (rIn)

Disables reverse direction.

Blocking movement in reverse direction does not apply to direction requests transmitted by digital inputs.

Reverse direction requests transmitted by digital inputs are taken into account.

Reverse direction requests transmitted from the display terminal or cable are not taken into account.

Any speed setpoint for reverse rotation originating from the PID, summation input, etc. will be interpreted as null frequency (0 Hz).

Setting	Code/Value	Description
[No]	(nO)	No Factory setting
[Yes]	(YES)	Yes

[Control Mode] (CHCF)

Configuration for mixed mode.

	Setting	Code/Value	Description
2 s	[Not separ.]	(SIM)	Setpoint and command, together Factory setting
	[Separate]	(SEP)	Setpoint and command are separate.

[Command Switching] (CCS)

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

This parameter can cause unexpected movements such as reversing the direction of rotation of the motor, sudden acceleration or a sudden stop.

- **It is important to ensure that setting this parameter does not cause unexpected movements.**
- **It is important to ensure that setting this parameter does not result in unsafe states.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Switches the command channel.

This parameter is accessible if [Control Mode] (CHCF) is set to [Separate] (SEP).

In state 0 of the assigned input or bit, [Cmd channel 1] (Cd1) is active. In state 1 of the assigned input or bit, [Cmd channel 2] (Cd2) is active.

Note:

If this function is enabled from another active command channel, monitoring for this new channel is also enabled.

	Setting	Code/Value	Description
★	[Cmd channel 1]	(Cd1)	Command channel = Channel 1 (for CCS) Factory setting
	[Cmd channel 2]	(Cd2)	Command channel = Channel 2 (for CCS)
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**

[Cmd channel 1] (Cd1)

Assigns command channel 1.

This parameter is accessible if [Control Mode] (CHCF) is set to [Separate] (SEP).

	Setting	Code/Value	Description
★	[Terminals]	(tEr)	Source for the terminal Factory setting
	[Ref.Freq-Rmt.Term]	(LCC)	Command via display terminal
	[Ref. Freq-Com. Module]	(nEt)	Command via POWERLINK if a module is connected.

[Cmd channel 2] (Cd2)

Assigns command channel 2.

This parameter is accessible if [Control Mode] (CHCF) is set to [Separate] (SEP).

[Freq Switch Assign] (rFC)

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

This parameter can cause unexpected movements such as reversing the direction of rotation of the motor, sudden acceleration or a sudden stop.

- **It is important to ensure that setting this parameter does not cause unexpected movements.**
- **It is important to ensure that setting this parameter does not result in unsafe states.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Assigns the switchover frequency.

In state 0 of the assigned input or bit, [Ref Frequency 1] (FR1) is active.

In state 1 of the assigned input or bit, [Ref Frequency 2] (FR2) is active.

Note:

If this function is enabled from another active command channel, monitoring for this new channel is also enabled.

Setting	Code/Value	Description
[Ref Frequency 1]	(Fr1)	Set point channel = Channel 1 (for RFC)
[Ref.1B channel]	(Fr1b)	Setpoint channel = Channel 1b (for RFC)
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Ref Freq 2 Config] (Fr2)

Configures frequency setpoint 2.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned. If [Control Mode] (CHCF) is set to [Not separ.] (SIM), the command is applied to the terminals with setpoint 0. If [Control Mode] (CHCF) is set to [Separate] (SEP), the setpoint is 0. Factory setting
[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3 **Note:** **Accessing selection AI3 is possible for inverters with a power output greater than 22 kW.**
[AI Virtual 1]	(AIv1)	Virtual analog input 1
[Ref Frequency via DI]	(UPdt)	Command ±speed DIx assigned
[Ref.Freq-Rmt.Term]	(LCC)	Frequency setpoint via graphic display terminal.
[Ref. Freq-Com. Module]	(nEt)	Frequency setpoint via POWERLINK if a module is connected.
[DI7 PulseInput] to [DI8 PulseInput]	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input. **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Copy Ch1-Ch2] (COP)

Copies the frequency setpoint from channel 1 to channel 2.

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **This parameter can cause unexpected movements such as reversing the direction of rotation of the motor, sudden acceleration or a sudden stop.**
>
> - **It is important to ensure that setting this parameter does not cause unexpected movements.**
> - **It is important to ensure that setting this parameter does not result in unsafe states.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

Enables copying of the current setpoint and/or command with switchover (to avoid fluctuations in speed, for example).

If **[Control Mode]** (CHCF) is set to **[Not separ.]** (SIM) or **[Separate]** (SEP), copying is only possible from channel 1 to channel 2.

	Setting	Code/Value	Description
2 s	[No]	(nO)	No copy Factory setting
	[Ref Frequency]	(SP)	Copy of the setpoint
	[Command]	(Cd)	Copy command
	[Cmd + Ref Frequency]	(ALL)	Copy of setpoint and command

Since the display terminal can be selected as the command and/or setpoint channel, its action modes can be configured.

Comments:

- The display terminal command/setpoint is only active if the command and/or setpoint channel of the terminal is active, except (BMP) with the button for local/remote (command via display terminal), which has priority over these channels. Press the local/remote button again to switch the control back to the selected channel.
- Command and setpoint via the display terminal are not possible if the latter is connected to more than one inverter.
- The functions for the predefined PID setpoint are only accessible if **[Control Mode]** (CHCF) is set to **[Not separ.]** (SIM) or **[Separate]** (SEP).
- The command via the display terminal is accessible independent of the selected **[Control Mode]** (CHCF).

[Forced Local Freq] (FLOC)

"Forced local" setpoint source assignment.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned (control via terminals with setpoint of zero) Factory setting
[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3 **Note:** **Accessing selection AI3 is possible for inverters with a power output greater than 22 kW.**
[Ref.Freq-Rmt.Term]	(LCC)	Graphic display terminal
[DI7 PulseInput] to [DI8 PulseInput]	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input. **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Time-out Forc. Local] (FLOt)

Time for channel confirmation after "local" is forced.

This parameter is accessible if [Forced Local Assign] (FLO) is not set to [No] (nO).

	Setting	Description
	0.1 to 30.0 s	Setting range Factory setting: 10.0 s

[Forced Local Assign] (FLO)

Local forced assignment.

Mode "Forced local" is active if the input state is 1.

For [Forced Local Assign] (FLO), [No] (nO) is forced if [Control Mode] (CHCF) is set to [I/O profile] (IO).

Setting	Code/Value	Description
[Not Assigned]	(nO)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**

[Reverse Assign] (rrS)

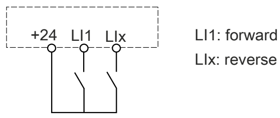
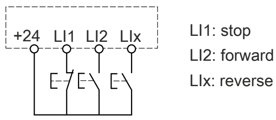
Assigns reverse.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[2/3-Wire Control] (tCC)

2- or 3-wire control.

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **If this parameter is changed, parameters [Reverse Assign] (rrS) and [2-wire type] (tCt) as well as the digital inputs assignments are reset to their factory settings.**
>
> **Ensure that this change is compatible with the type of wiring used.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

	Setting	Code/Value	Description
2 s	[2-Wire Control]	(2C)	2-wire control (level-controlled): This is the input state (0 or 1) or edge (0 to 1 or 1 to 0) that controls running or stopping. Factory setting Example of source wiring: 
	[3-Wire Control]	(3C)	3-wire control (edge-controlled) [3 wire]: A forward or reverse pulse is sufficient for motor startup. A stop pulse is sufficient to stop the motor. Example of source wiring: 

[2-wire type] (tCt)

2-wire control type.

This parameter is accessible if [2/3-wire control] (tCC) is set to [2-Wire Control] (2C).

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **Ensure that the parameter setting is compatible with the type of wiring used.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

	Setting	Code/Value	Description
2 s	[Level]	(LEL)	State 0 or 1 determines whether operation (1) or a stop (0) takes place.
	[Transition]	(trn)	A state change (edge or transition) is required to initiate operation and to prevent an inadvertent restart after mains supply failure. Factory setting
	[Level With Fwd Priority]	(PFO)	State 0 or 1 is taken into account for operation or stopping, but input signal "Forward" takes priority over input signal "Reverse".

[Stop Key Enable] (PSt)

Button "STOP/RESET" is enabled.

If this function is set to **[No]** (nO), button "STOP" is disabled on the display terminal when parameter **[Command Channel]** (CMdC) is not set to **[Ref.Freq-Rmt.Term]** (LCC).

> **Warning!**
>
> **LOSS OF CONTROL**
>
> **This parameter is only permitted to be set to [No] (nO) if appropriate alternative stop functions have been implemented.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

If 2-wire control by level is used, (parameter **[2/3-Wire Control]** (tCC) set to **[2-Wire Control]** (2C) and parameter **[2-wire type]** (TCT) set to **[Level]** (LEL) or **[Level With Fwd Priority]** (PFO)) and parameter **[Stop Key Enable]** (PSt), which is set to **[Stop Key Priority All]** (ALL) is set to **[Stop Key Priority All]** (ALL), the motor will start if key "STOP/RESET" on the display terminal is pressed while movement is active.

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **Only set parameter [Stop Key Enable] (PSt) for 2-wire control by level to [Stop Key Priority All] (ALL) after you have verified that this setting cannot result in unsafe states.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

The following table shows the behavior of the function if the graphic display terminal is not the active command channel:

	Setting	Code/Value	Description
2 s	[Stop Key No Priority]	(nO)	Disables key "STOP/RESET" on the display terminal.
	[Stop Key Priority]	(YES)	Gives priority to key "STOP/RESET" on the display terminal. Only the stop function is enabled. The stop is performed in freewheel mode. Factory setting
	[Stop Key Priority All]	(All)	Gives priority to key "STOP/RESET" on the graphic display terminal. The fault reset function and stop function are enabled. The stop is performed according to set value [Type of stop] (STT).

[HMI cmd.] (bMP)

HMI command.

Setting	Code/Value	Description
[Stop]	(StOP)	Stops the inverter (copy of the controlled direction of rotation and setpoint of the previous channel to be taken into account for the next move command).
[Bumpless]	(bUMP)	Does not stop the inverter (copy of the controlled direction of rotation and setpoint of the previous channel).
[Disabled]	(dIS)	Disabled Factory setting

5.2.4.4 [Hoisting Functions]

5.2.4.4.1 [Brake logic control] (BLC-)

Access

[Complete settings] → **[Hoisting Functions]** → **[Brake logic control]**

About this menu

Note:

This function cannot be used with certain other functions.

This function is used to control an electromagnetic brake via the inverter for horizontal and vertical hoisting applications as well as machines with imbalance.

Principle of hoisting applications:

- Vertical hoisting movement: Maintains the motor torque in the driving load holding direction during brake engage and release phases for holding the load and enables a smooth start when the brake is released and a smooth stop when the brake is engaged.
- Horizontal hoisting movement: Synchronizes brake engage by increasing the torque and engaging the brake at speed zero at standstill in order to prevent jolting.

Information about setting the brake logic with a vertical hoisting application

Warning!

ACCIDENTAL OPERATION OF DEVICE

- **Perform a risk assessment per EN ISO 12100 and all other standards valid for your application.**
- **Use redundant components and/or control paths for all critical control functions identified during risk assessment.**
- **If transporting loads can cause hazards, such as loads slipping or falling in hoisting applications, operate the inverter in a closed control loop.**
- **Perform extensive commissioning tests for all potential fault situations to check the effectiveness of the implemented monitoring functions, for example speed monitoring via the encoder and short-circuit monitoring for all connected devices.**
- **Perform extensive commissioning tests for all potential fault situations to verify that the values of all parameters are appropriate for safely bringing the load to a stop.**

Failure to follow these instructions can result in death, serious injury or damage to property.

The line contactor and the braking contactor must be disconnected from the power supply if the inverter changes to operating state "Fault".

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

- **Assign [Operating state fault] (FLT) to output relay R1.**
- **Connect the coil of the line contactor to output relay R1.**
- **Connect the braking contactor downstream to the line contactor.**

Failure to follow these instructions can result in death, serious injury or damage to property.

1) **[Brake Release Pulse]** (bIP): YES. Ensure that the forward direction of operation corresponds to hoisting the load.
For applications in which the lowered load differs considerably from the raised load, **[Brake Release Pulse]** (bIP) must be set to **[2 IBR]** (2Ibr).
(Example: Always hoist with a load and lower when load is empty.)
2) Brake engage current **[Brk Release Current]** (Ibr) and **[Brake release I Rev]** (Ird) if **[Brake Release Pulse]** (bIP) = **[2 IBR]** (2Ibr): Set the brake engage current to the nominal current according to the motor nameplate. When testing, adjust the brake engage current to achieve slip-free holding of the load.
3) Acceleration time: For hoisting applications, it is advisable to set the acceleration ramps to at least 0.5 seconds. Ensure that the inverter does not exceed current limiting. The same recommendation also applies to deceleration.
Please note: For a hoisting movement, a braking resistor must be used.
4) **[Brake Release time]** (brt): Must be set according to the brake type. This is the time required for the mechanical brake to release.
5) **[Brake release freq]** (bIr) only in open control loop: Leave in mode **[Auto]** (Auto) and adjust if necessary.
6) **[Brake engage freq]** (bEn): Leave in mode **[Auto]** (Auto) and adjust if necessary.
7) **[Brake engage time]** (bEt): Must be set according to the brake type. It is the time required for the mechanical brake to engage.

Information about setting the brake logic with a horizontal hoisting application

Warning!

ACCIDENTAL OPERATION OF DEVICE

- **Perform a risk assessment per EN ISO 12100 and all other standards valid for your application.**
- **Use redundant components and/or control paths for all critical control functions identified during risk assessment.**
- **If transporting loads can cause hazards, such as loads slipping or falling in hoisting applications, operate the inverter in a closed control loop.**
- **Perform extensive commissioning tests for all potential fault situations to check the effectiveness of the implemented monitoring functions, for example speed monitoring via the encoder and short-circuit monitoring for all connected devices.**
- **Perform extensive commissioning tests for all potential fault situations to verify that the values of all parameters are appropriate for safely bringing the load to a stop.**

Failure to follow these instructions can result in death, serious injury or damage to property.

The line contactor and the braking contactor must be disconnected from the power supply if the inverter changes to operating state "Fault".

Warning!

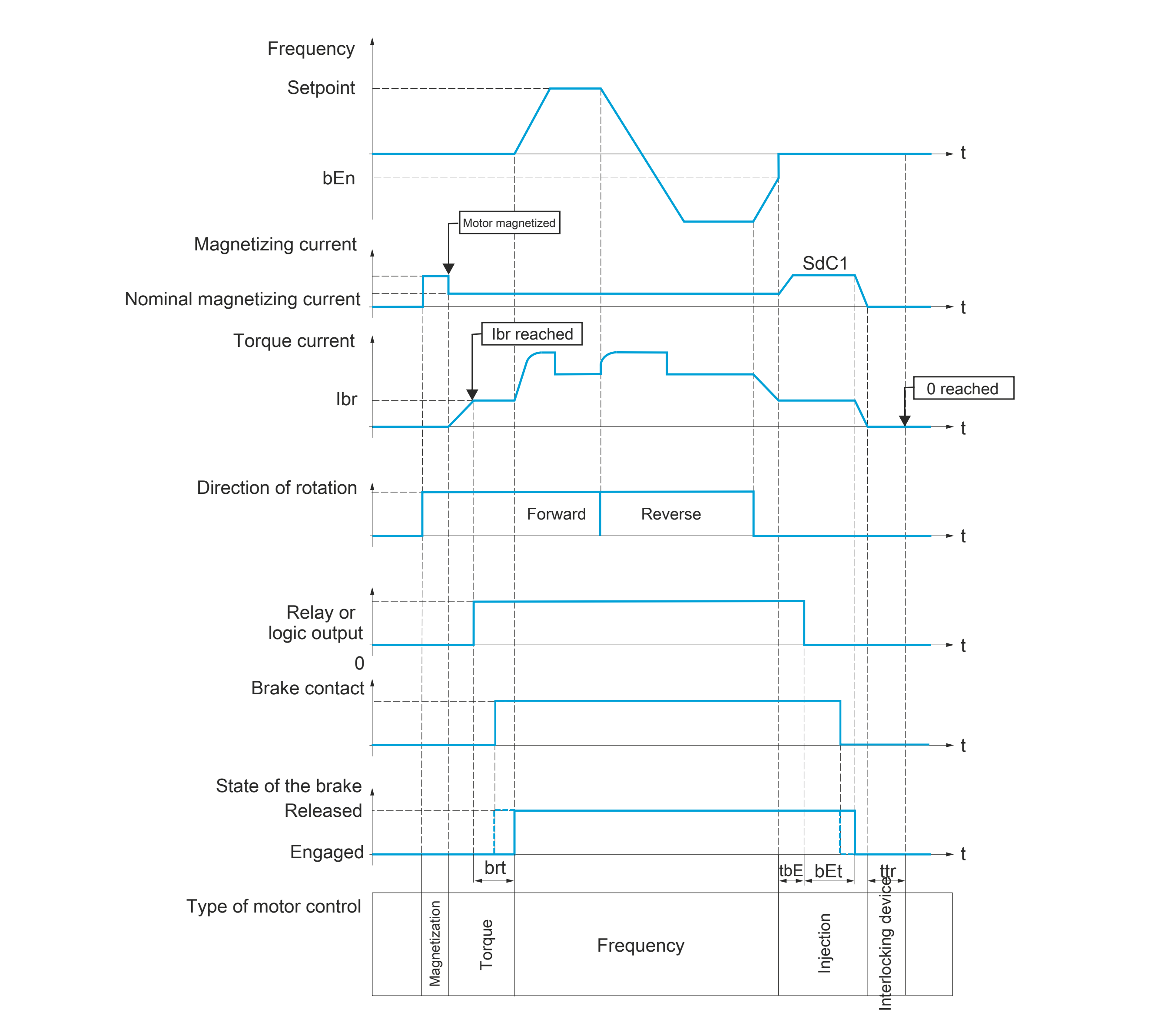
UNEXPECTED OPERATION OF THE EQUIPMENT

- **Assign [Operating state fault] (FLT) to output relay R1.**
- **Connect the coil of the line contactor to output relay R1.**
- **Connect the braking contactor downstream to the line contactor.**

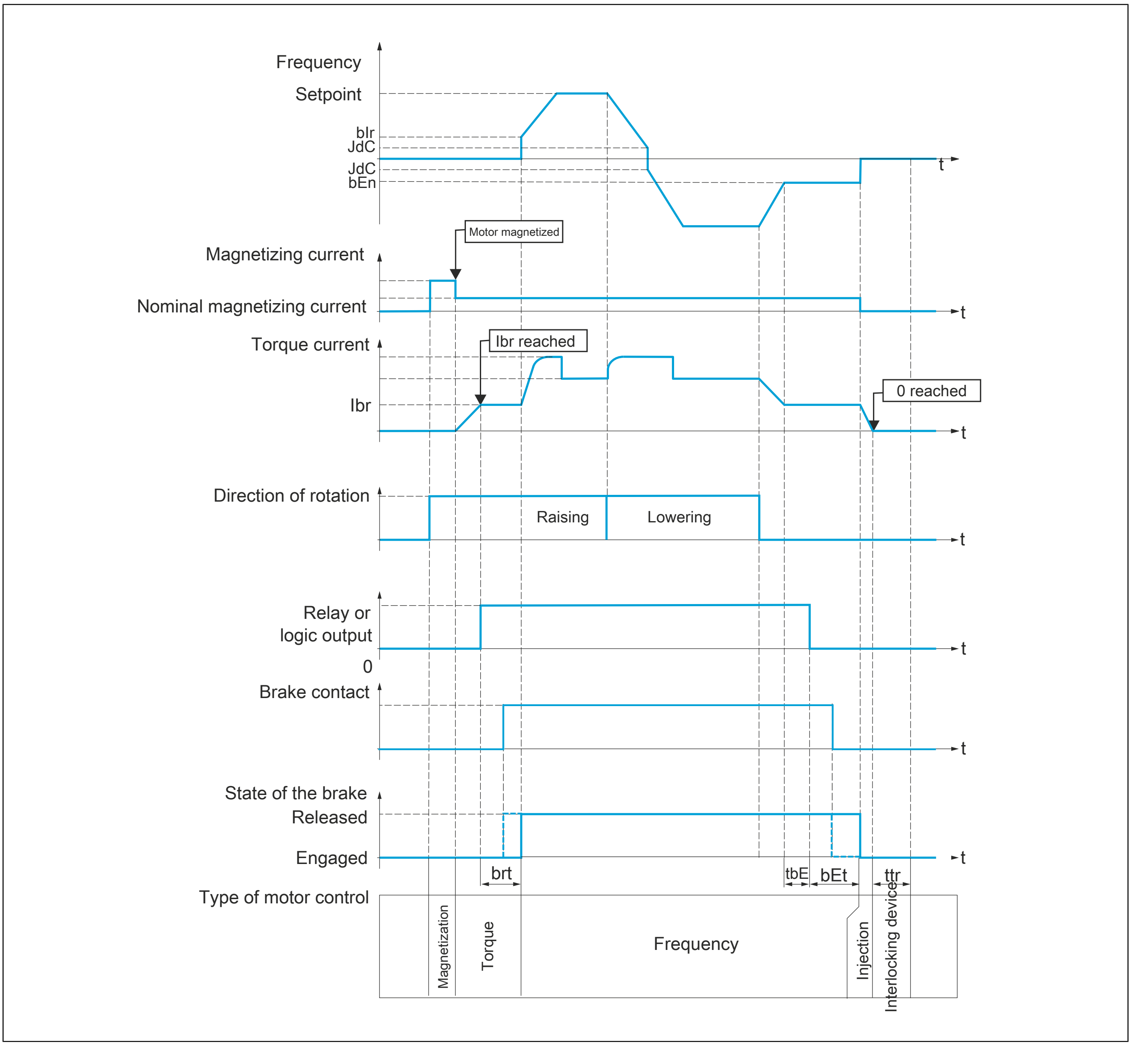
Failure to follow these instructions can result in death, serious injury or damage to property.

1) **[Brake Release Pulse]** (bIP): No.
2) **[Brk Release Current]** (Ibr): Set to 0.
3) **[Brake Release time]** (brt): Must be set according to the brake type. This is the time required for the mechanical brake to release.
4) **[Brake engage freq]** (bEn) only in open control loop: Leave in mode **[Auto]** (Auto) and adjust if necessary.
5) **[Brake engage time]** (bEt): Must be set according to the brake type. It is the time required for the mechanical brake to engage.

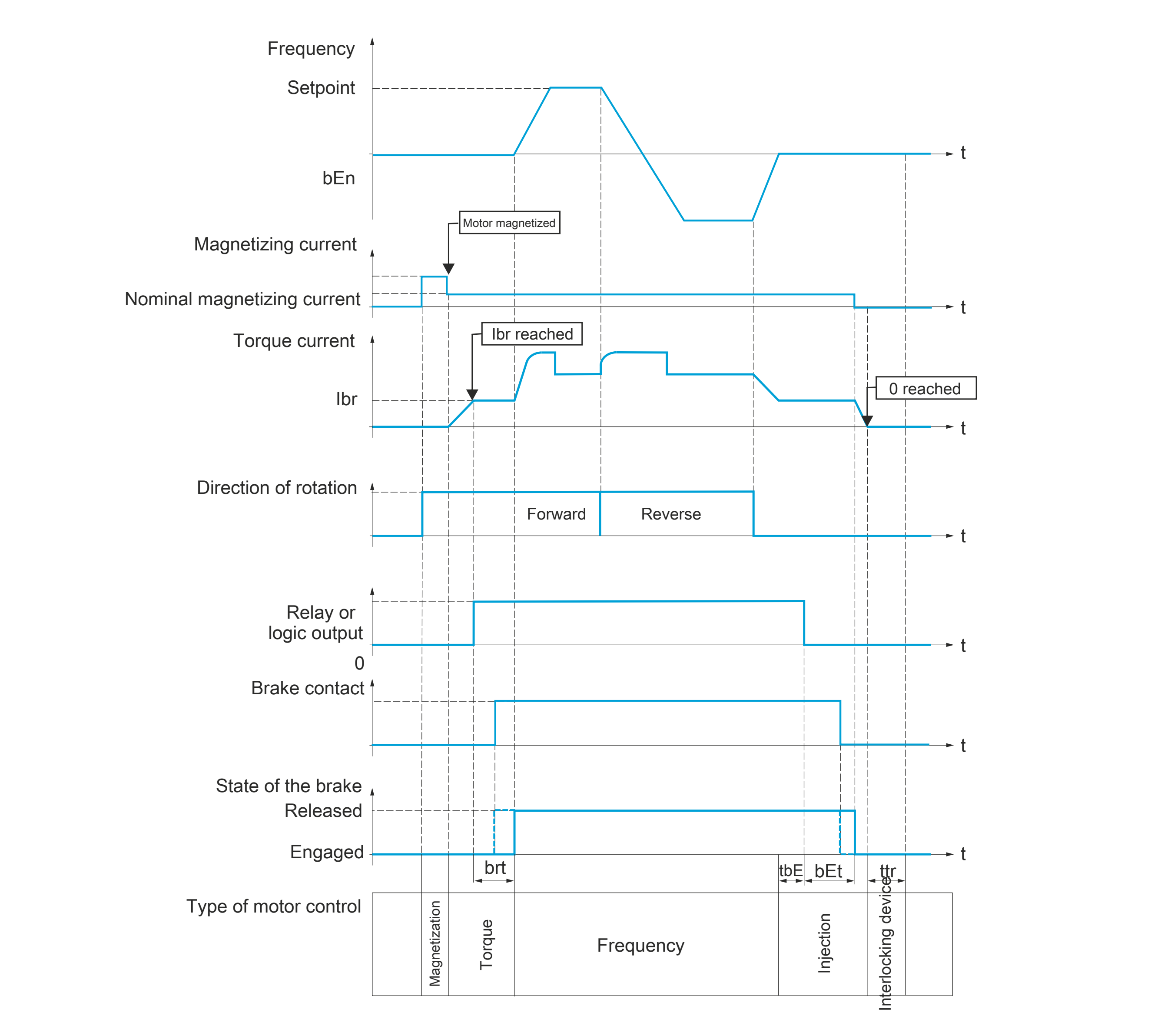
Horizontal movement in an open control loop



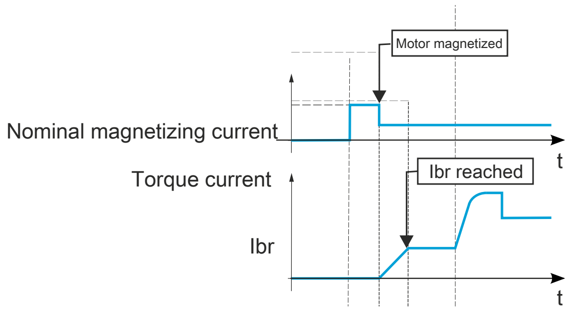
Vertical movement in an open control loop



Vertical or horizontal movement in a closed control loop



Behavior during move command



When the move command is output, the inverter overmagnetizes the motor for a short time to achieve a torque that is high enough for the motor. The torque value is defined via parameter **[Brk Release Current]** (Ibr). This torque is required to maintain the load when the brake is released and before speed control is started. Motor rotor time parameter **[Rotor Time Const]** (trA) is the time required for the magnetization of the motor. The inverter calculates this parameter using the values of **[Nom Motor Current]** (nCr), **[Motor 1 Cosinus Phi]** (COS), **[Nom Motor Voltage]** (UnS) and **[Nominal Motor Speed]** (nSP), which must be defined to appropriate values for the motor specifications.

Before releasing the brake, the inverter checks the following 2 conditions using relay output R2, which is set via parameter **[Brake assignment]** (bLC):

- The magnetizing current must be stable.
- The torque setpoint is reached.

If one of these conditions is not met, the inverter does not release the brake and triggers error code **[Brake Control]** (bLF).

This error code is triggered if a motor phase is not properly connected to the motor output of the inverter.

[Brake assignment] (bLC)

Assigns the brake function.

[Brake assignment] (bLC) is forced to **[No]** (nO) if **[Motor control type]** (Ctt) is set to **[U/F VC 5pts]** (UF5), **[SYN_U VC]** (SYnU) or **[Nom SyncMotor]** (SYn) and **[OutPhaseLoss Assign]** (OPL) to **[No Error Triggered]** (OAC) and **[DC Injection Assign]** (dCI), **[Catch on the fly]** (FLr), **[Jog Assign]** (JOG), **[PID feedback]** (PIF) and **[BL mode]** (BQM) is not set to **[No]** (nO).

Setting	Code/Value	Description
[No]	(nO)	Not assigned. Factory setting
[R2] to **[R3]**	(r2) to (r3)	Relay outputs R2 to R3 **Note:** **Accessing selection R3 is possible for inverters with a power output greater than 22 kW.**
[DQ1 Digital Output] to **[DQ2 Digital Output]**	(dO1) to (dO2)	Digital outputs DQ1 to DQ2 **Note:** **Accessing selection DQ2 is possible for inverters with a power output less than 30 kW.**

[Movement type] (bSt)

Type of braking sequence.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

For this parameter, [Hoisting] (VER) is forced if [Weight sensor Assign] (PES) is assigned.

	Setting	Code/Value	Description
★	[Traveling]	(HOr)	Resistive-load movement (e.g. translational movement of overhead crane).
	[Hoisting]	(vEr)	Driving-load movement (e.g. hoisting winch). Factory setting

[Brake contact] (BCI)

Brake feedback (brake contact input).

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

If the brake has a monitoring contact (closed for released brake).

	Setting	Code/Value	Description
★	[Not Assigned]	(nO)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Brake Fdbk Filter] (FbCI)

Actual value filter of the brake.

This parameter is accessible if [Brake contact] (bCI) is not set to [No] (nO).

	Setting	Description
★	0 to 5000 ms	Setting range Factory setting: 100 ms

[Brake Relay Fdbk] (BRI)

Input of the actual value of the brake relay.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

Identical to [Brake contact] (BCI).

[Brake Rly Fdbk Filter] (FBRI)

Filter for the actual value of the brake relay.

This parameter is accessible if [Brake Relay Fdbk] (BRI) is not defined as [No] (nO).

	Setting	Description
	0 to 1000 ms	Setting range Factory setting: 100 ms

[Brake Release Pulse] (bIP)

Start pulse of the brake.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no) and if [Weight sensor Assign] (PES) is set to [Not Configured] (no).

	Setting	Code/Value	Description
★	[No]	(nO)	The motor torque is specified in the required direction with current [Brk Release Current] (Ibr). Factory setting: If [Movement type] (BST) = [Traveling] (HOr).
	[Yes]	(YES)	The motor torque is always in clockwise rotation (ensure that this direction of rotation corresponds to the hoisting operation) with current [Brk Release Current] (Ibr). Factory setting: If [Movement type] (BST) = [Hoisting] (vEr).
	[2 IBR]	(2ibr)	The torque has the required direction of rotation with current [Brk Release Current] (Ibr) for clockwise rotation and [Brake release I Rev] (Ird) for counterclockwise rotation; for certain specific applications.

[Brk Release Current] (Ibr)

Current threshold value for brake release.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no) and if [Weight sensor Assign] (PES) is set to [Not Configured] (no).

	Setting	Description
★ ↻	0 to 1.1 In[1)]	Setting range Factory setting: [Nom Motor Current] (nCr)

1) "In" corresponds to the nominal current of the inverter specified on the nameplate.

[Brake release I Rev] (ird)

Current threshold value for brake release for lowering operation.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no) and if [Brake Release Pulse] (bIP) is set to [2 IBR] (2IBR) and if [Weight sensor Assign] (PES) is set to [Not Configured] (no).

	Setting	Description
↻	0 to 1.1 In[1)]	Setting range Factory setting: 0

1) "In" corresponds to the nominal current of the inverter specified on the nameplate.

[Brake Release time] (brt)

Brake release time.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

	Setting	Description
★ ↻	0.0 to 5.00 s	Setting range Factory setting: 0.50 s

> **Note:**
>
> **The minimum value considered by the inverter is the maximum value for [Brake Fdbk Filter] (FBCI) and [Brake Rly Fdbk Filter] (FBRI).**

[Brake release freq] (blr)

Brake release frequency.

This parameter is accessible if [Motor control type] (Ctt) is not set to [FVC] (fvC) or [Sync.CL] (FSY) and if [Movement type] (BST) is set to [Hoisting] (ver).

	Setting	Code/Value	Description
★ ↻	[Auto]	(Auto)	The inverter is assigned a value equal to the nominal slip of the motor that was calculated via the inverter parameters.
	0.0 to 10.0 Hz		Manual setting Factory setting: • 0 if [Movement type] (BST) is set to [Traveling] (HOr) or [Hoisting] (ver) and an open control loop is available. • [Auto] (Auto) if [Movement type] (BST) is set to [Hoisting] (ver) and an open control loop is available.

[Brake engage frequency] (bEn)

Threshold value for the braking engage frequency.

This parameter is accessible if [Motor control type] (Ctt) is not set to [FVC] (fvC) or [Sync.CL] (FSY) and if [Brake assignment] (BLC) is not set to [No] (nO).

	Setting	Code/Value	Description
★ ↻	[Auto]	(Auto)	The inverter is assigned a value equal to the nominal slip of the motor that was calculated via the inverter parameters.
	0.0 to 10.0 Hz		Manual setting Factory setting: • 0 at closed control loop. • [Auto] (Auto) in open control loop

[Brake engage at 0] (bECd)

Brake engage delay at speed 0 is achieved with a frequency setpoint = 0 Hz.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

- [FVC] (FVC)
- [Sync.CL] (FSY)

This parameter is used to set the brake engage delay when the speed reaches zero.

	Setting	Code/Value	Description
★	[No]	(nO)	Brake does not engage if the speed stays at 0. Factory setting
	0.0 to 30.0 s		Brake release deceleration when the speed reaches 0. **Note:** **The brake engage type depends on set value [BRH b6] (BRH6).**

[Brake engage delay] (tbE)

Decelerates the brake response frequency.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

Delay before the brake engage request. Used for a brake response delay in case the brake should be engaged when the inverter comes to a complete standstill.

	Setting	Description
★	0.00 to 5.00 s	Setting range Factory setting: 0.00 s

[Brake engage time] (bET)

Brake response time.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

> **Note:**
>
> **The minimum value considered by the inverter is the maximum value for [Brake Fdbk Filter] (FBCI) and [Brake Rly Fdbk Filter] (FBRI).**

	Setting	Description
★	0.00 to 5.00 s	Setting range Factory setting: 0.50 s

[Auto DC inj Level 1] (SdC1)

Automatic DC injection braking level 1.

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

This parameter is accessible if [Movement Type] (BST) is set to [Traveling] (HOR) or if [Motor control type] (CTT) is not set to [FVC] (FVC) or [Sync.CL] (FSY).

	Setting	Description
★	0 to 1.1 In[1]	Setting range Factory setting: 0.7 In[1]

1) "In" corresponds to the nominal current of the inverter specified on the nameplate.

[Engage at reversal] (bEd)

Engages the brake when the direction of rotation is reversed.

This parameter can be used to define whether or not the brake engages on transition to speed zero when the direction of rotation is reversed.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

	Setting	Code/Value	Description
	[No]	(nO)	The brake does not engage. Factory setting
	[Yes]	(YES)	The brake engages.

[Jump at reversal] (JdC)

Brake: Frequency jump when the direction of rotation is reversed.

This parameter is accessible if [Movement type] (BST) is set to [Hoisting] (ver) and if [Motor control type] (Ctt) is not set to any of the following values:

- [FVC] (FVC)
- [Sync.CL] (FSY)

When the setpoint direction is reversed, this parameter can be used to avoid loss of torque (and consequential release of load) on transition to speed zero. The parameter is irrelevant if [Engage at reversal] (bEd) is set to [Yes] (YES).

	Setting	Code/Value	Description
	[Auto]	(Auto)	The inverter is assigned a value equal to the nominal slip of the motor that was calculated via the inverter parameters.
	0.0 to 10.0 Hz		Manual setting Factory setting: • 0 if [Movement type] (BST) is set to [Traveling] (HOr) or [Hoisting] (ver) and an open control loop is available. • [Auto] (Auto) if [Movement type] (BST) is set to [Hoisting] (ver) and an open control loop is available.

[Time to restart] (ttr)

Braking time until restart.

Time between the end of a brake engage sequence and the start of the next brake release sequence.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

	Setting	Description
	0.00 to 15.00 s	Setting range Factory setting: 0.00 s

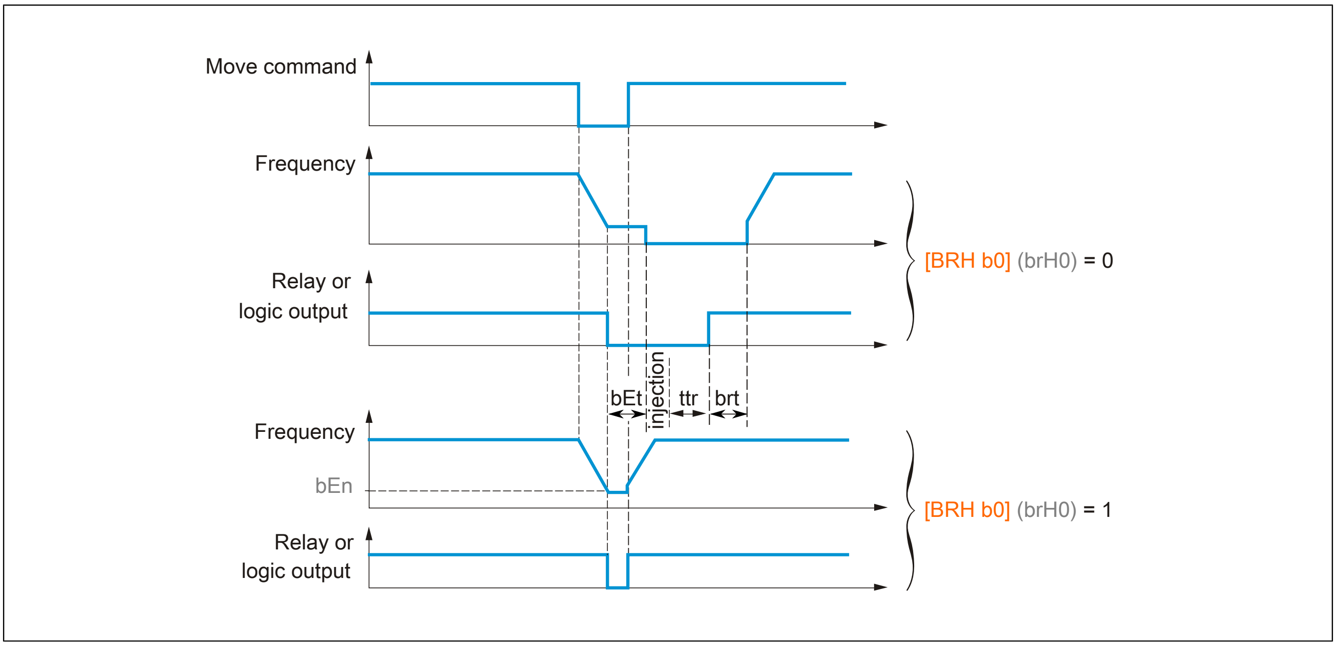
[BRH b0] (BRH0)

Selects the brake restart sequence if a move command is repeated while the brake is engaged.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (nO) and if [Access Level] (LAC) is set to [Expert] (EPr).

Used in open and closed control loop.

A move command can be requested during the brake response phase. Whether the sequence for the new brake release is performed or not depends on the setting of [BRH b0] (BRH0).



> **Note:**
>
> **If a move command is requested during phase [Time to restart] (ttr), the full brake controller sequence is initialized.**
>
> **If a move command is initialized when option [Engage at reversal] (bEd) is requested, the complete brake controller sequence is initialized.**

	Setting	Code/Value	Description
	[0]	(0)	The engage/release sequence is fully executed. Factory setting
★	[1]	(1)	If the move command is requested during the brake response phase: • Before the end of [Brake engage delay] (TBE), the move command is executed immediately. • During phase [Brake engage delay] (BET), the move command is executed using time [Brake Release time] (BRT) before the restart. • After phase [Brake engage time] (BET), the brake logic sequence is fully completed.

[BRH b2] (BRH2)

Disables the brake contact fault in the steady state.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (nO) and if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Code/Value	Description
★	[0]	(0)	Fault "Brake actual value" is active in the steady state (error state if the contact is open during operation). Fault [Brake Feedback] (brF) is monitored during all operating phases. Factory setting
	[1]	(1)	Fault "Brake actual value" is not active in the steady state. Fault [Brake Feedback] (brF) is only monitored during brake engage phases and brake release phases.

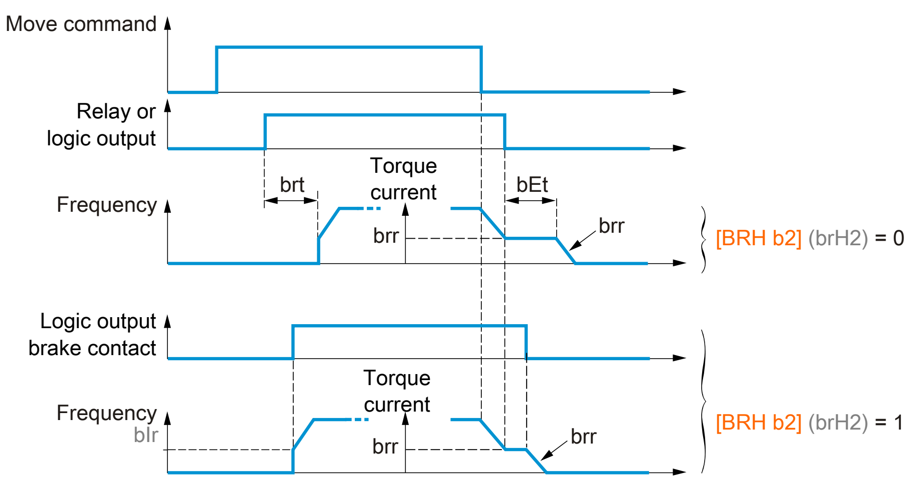
[BRH b2] (BRH2)

Takes into account brake feedback for the brake controller sequence.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (nO) and if [Access Level] (LAC) is set to [Expert] (EPr).

If a digital input is assigned to "Brake actual value":

- [BRH b2] (BRH2) = [0] (0): During the brake release sequence, the setpoint is enabled after time [Brake Release time] (brt) has elapsed. During the brake engage sequence, the current switches to [0] (0) according to ramp [Current ramp time] (brr) after time [Brake engage time] (bEt) has elapsed.
- [BRH b2] (BRH2) = [1] (1): The setpoint is enabled when releasing if digital input [Brake contact] (BCI) changes to [1] (1). When closing, the current changes to [0] (0) according to ramp [Current ramp time] (brr) if digital input [Brake contact] (BCI) changes to [0] (0).



	Setting	Code/Value	Description
★	[0]	(0)	The engage/release sequence is fully executed. Factory setting
	[1]	(1)	The brake is immediately released again.

[BRH b3] (brH3)

Only in the closed control loop. Manages unresponsive [Brake contact] (BCI) and/or responsive [Brake Relay Fdbk] (BRI) if assigned.

Warning!

DESCENDING LOAD

Set [BRH b3] (brH3) only to [1] (1) if your application displays associated warning [Brake Cont Warn] (bCA), for example by assigning warning [Brake Cont Warn] (bCA) to an output.

If warning [Brake Cont Warn] (bCA) is triggered, the user must perform the following action.

- **Move the load to a safe position.**
- **Switch off the inverter.**
- **Determine the cause of the warning and eliminate it.**
- **Before resuming regular operation, all electrical and mechanical components of the brake must be checked for proper operation.**

Failure to follow these instructions can result in death, serious injury or damage to property.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (nO) and if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Code/Value	Description
★	[0]	(0)	During the brake engage sequence, the brake contact and the actual value of the brake relay must be open before time [Brake engage time] (bEt) has elapsed; otherwise, the inverter will be blocked by brake contact fault [Brake Feedback] (brF). Factory setting
	[1]	(1)	During the brake release sequence, the brake contact and actual value of the brake relay must be open before time [Brake engage time] (bEt) has elapsed; otherwise, alarm [Brake Cont Warn] (bCA) is triggered and speed zero is retained.

[BRH b4] (brH4)

Only in the closed control loop. Depending on the set value, a fault is triggered or the speed control loop is enabled at zero if a movement is performed without a move command (measurement of a speed above a minimum threshold value defined by [BRH_b4_freq] (BFDT)).

Warning!

DESCENDING LOAD

Only define parameter [BRH_b4] (brH4) to [1] (1) if your application displays associated warning [Load Mvt Warn] (bSA), for example by assigning warning [Load Mvt Warn] (bSA) to an output.

If warning [Load Mvt Warn] (bSA) is triggered, the user must perform the following action.

- **Move the load to a safe position.**
- **Switch off the inverter.**
- **Determine the cause of the warning and eliminate it.**
- **Before resuming regular operation, all electrical and mechanical components of the brake must be checked for proper operation.**

Failure to follow these instructions can result in death, serious injury or damage to property.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Code/Value	Description
☆	[0]	(0)	For movements for which no command was output, fault [Load Mvt Error] (MDCF) is triggered. Factory setting
	[1]	(1)	If a movement occurs without a move command, the inverter switches to zero speed control without a brake release command and alarm [Load Mvt Warn] (bSA) is triggered.

Note:

If a fault is triggered, the load is not retained due to function [BRH b4] (brH4).

Note:

If the product is controlled with profile Cia402, function [BRH b4] (brH4) is only enabled in operating state "Operation enabled" (operation, stop, etc.).

[BRH b6] (brH6)

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

The brake engage type is selected if [Brake engage at 0] (BECD) is set to a numerical value.

	Setting	Code/Value	Description
☆	[0]	(0)	The brake is engaged (including the handling of [Brake engage time] (BET)) and zero speed is retained. Then: • If a frequency setpoint other than zero is required, the command to release the brake after applying the torque is transmitted via [Brake Release time] (BRT). • If a stop command (outside the inverter) is requested, the brake engage sequence is completed. Factory setting **Note:** **The brake command is only taken into account after [Brake engage time] (BET).**
	[1]	(1)	A stop command is executed by the inverter and the brake engage sequence is fully completed after the delay defined with [Brake engage at 0] (BECD).

[Current ramp time] (brr)

Time of the current ramp of the brake.

This parameter is accessible if [Brake assignment] (bLC) is not set to [No] (no).

Time of the torque current ramp (increase and decrease) for a change in current corresponding to the value of the holding current (parameter [Brk Release Current] (ibr), [Brake release I Rev] (ird) or [Point 1Y] (CP1), [Point 2Y] (CP2)).

	Setting	Description
☆	0.00 to 5.00 s	Setting range Factory setting: 0.00 s

[BRH_b4_freq] (bFtd)

Frequency threshold value for BRH_b4 detected.

This parameter represents the detection threshold value for **[BRH b4]** (brH4). The required value depends on the response of the mechanical installation.

If the value of parameter **[BRH_b4_freq]** (bFtd) is too low, this can trigger undesired load movement monitoring.

If the value of parameter **[BRH_b4_freq]** (bFtd) is too high, load movement monitoring may not be triggered, even if necessary.

> ## Warning!
>
> **LOSS OF CONTROL**
>
> **Use comprehensive commissioning tests for all load conditions and all potential fault conditions to ensure that the setting for this parameter is suitable for the application.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

If **[BRH_b4_freq]** (bFtd) is defined as **[No]** (nO), load movement monitoring is disabled. Unintended movements and descending loads are not detected with this setting.

> ## Warning!
>
> **DESCENDING LOAD**
>
> **It is important to ensure that setting this parameter does not result in unsafe states.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

This parameter is accessible if **[Motor control type]** (Ctt) is set to **[FVC]** (fvC) or if **[Sync.CL]** (FSY) and **[Brake assignment]** (BLC) are not set to **[No]** (nO).

	Setting	Code/Value	Description
☆	**[No]**	(nO)	Movement monitoring is disabled.
	0.1 to 10 Hz		Setting range Factory setting: 10% of **[Nominal Motor Freq]** (FRS) or **[Sync Nominal Freq]** (FRSS) depending on **[Motor control type]** (Ctt).

5.2.4.4.2 [High speed hoisting] (HSH-)

Access

[Complete settings] → **[Hoisting Functions]** → **[High speed hoisting]**

About this menu

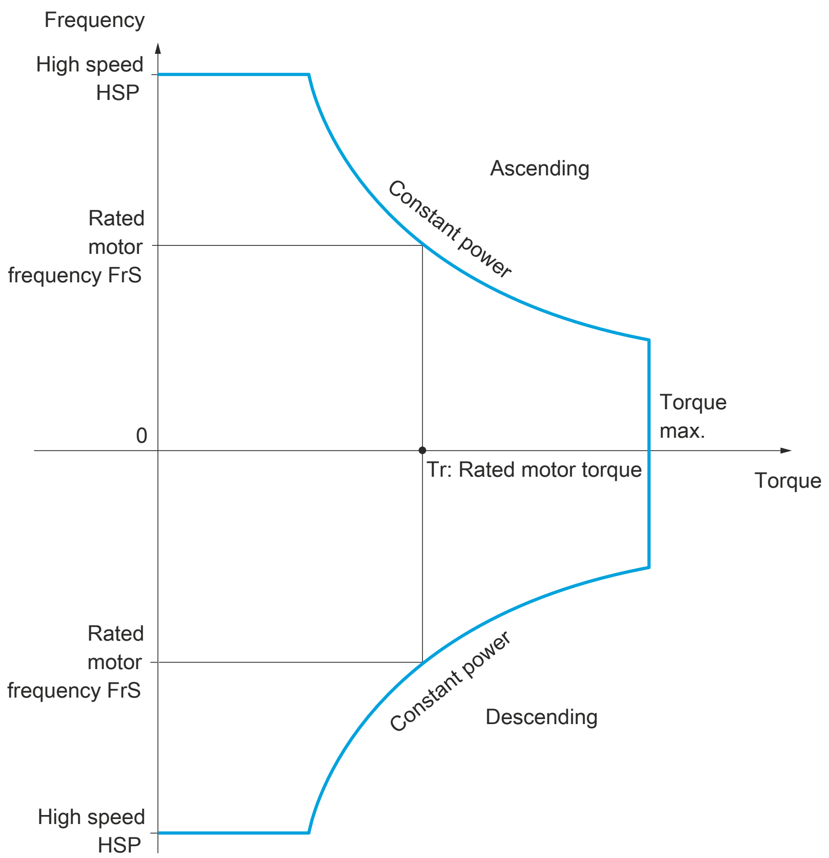
> ## Note:
>
> **This function cannot be used with certain other functions.**

This function can be used to optimize the cycle time for hoisting movements for zero or lightweight loads. It allows operation at "constant power output" in order to reach a speed greater than the nominal speed without exceeding the nominal motor current.

The speed stays limited by parameter **[High Speed]** (HSP).

The function affects speed setpoint limiting but not the setpoint itself.

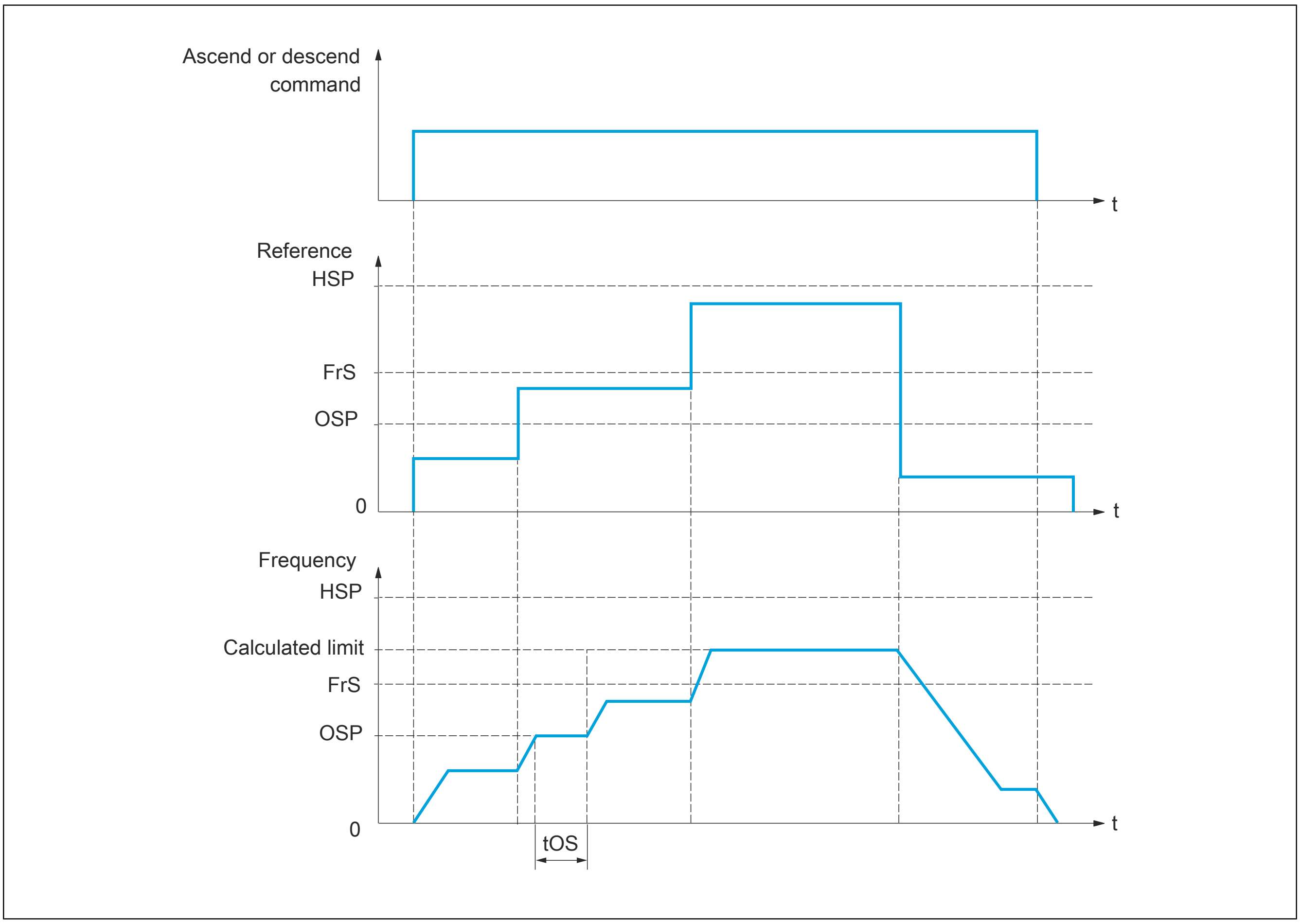
Principle



There are 2 possible operating modes:

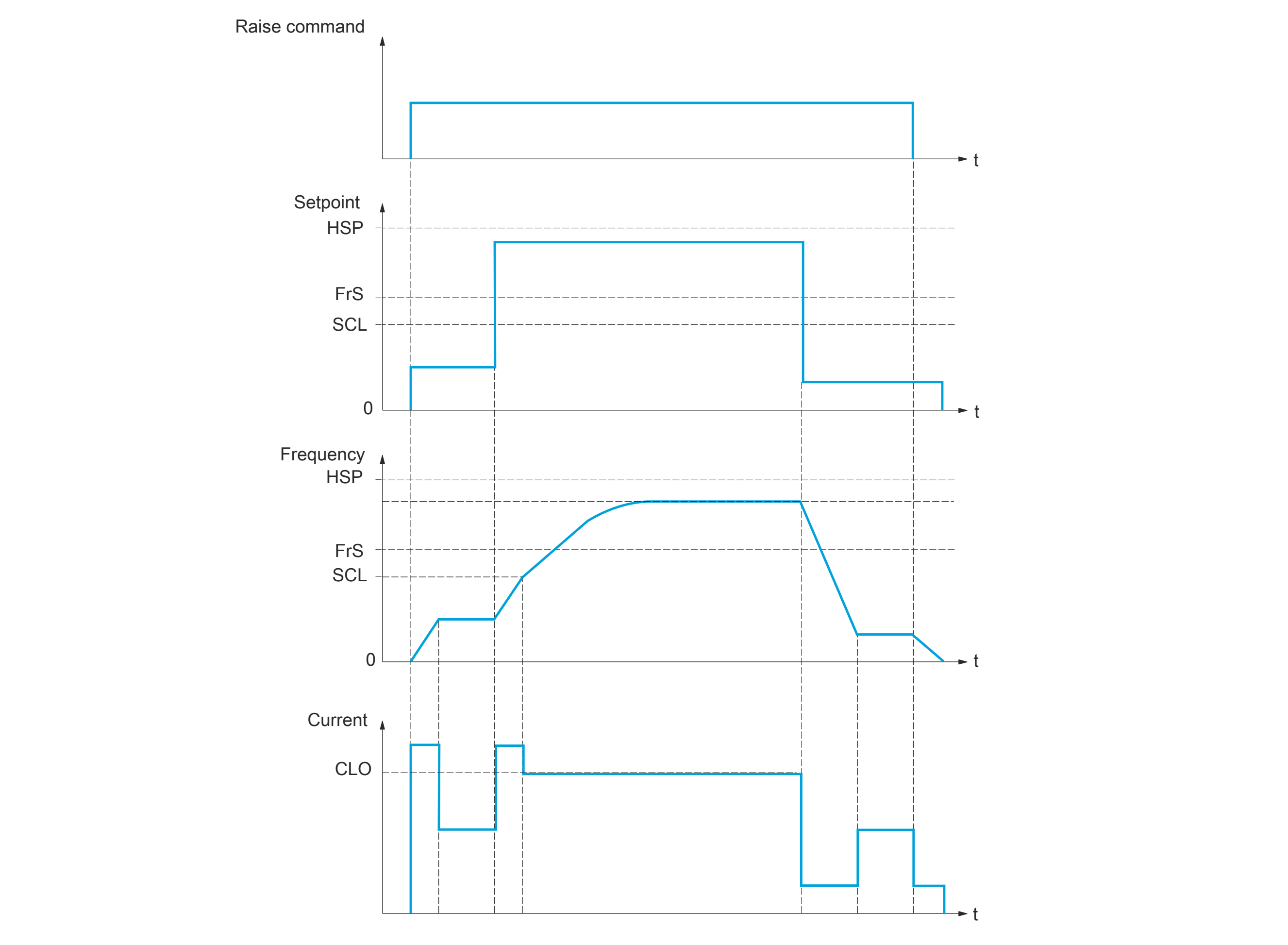
- Mode "Speed control": The maximum permissible speed is calculated by the inverter during a frequency step that is set so that the inverter can measure the load.
- Mode "Current limiting": The maximum permissible frequency is the frequency that supports current limiting during motor operation (in the "hoisting" direction only). For direction "Lowering", operation always corresponds to mode "Frequency setpoint".

Mode "Speed control":



Two parameters are used to reduce the frequency calculated by the inverter for the hoisting and lowering direction.

Mode "Current limiting"



SCL: Configurable frequency threshold value, above which current limiting is active.

CLO: Current limiting for HSP function, large frequency.

Note:

The speed reached for a specific current will be lower in case of network undervoltage in comparison with nominal network voltage.

Operation at constant torque up to 87 Hz

Depending on the insulation class of the motor, it is possible to supply the motor with a higher voltage than the one indicated on its coupling.

For example, a 230/400 VAC motor wired and coupled for operation at 230 VAC / 50 Hz (in delta) can be supplied with 400 V if it is operated continuously at a torque of up to 87 Hz.

For some motors, operation at 400 VAC / 87 Hz is specified on the nameplate.

To use function **[High speed hoisting]** (HSH-) for operation at 87 Hz, the following parameters must be configured as follows:

1) Configure **[Max Frequency]** (TFR) to 87 Hz.
2) Configure **[High Speed]** (HSP) to 87 Hz.
3) Configure **[Nom Motor Current]** (NCR) with the nominal current for delta coupling specified on the motor nameplate.
4) Configure **[Nominal Motor Freq]** (FRS) to 87 Hz.
5) Configure **[Nom Motor Voltage]** (UNS) with the result of the following formula:

$$UNS_{87Hz} = UNS_{50Hz} \times \frac{FRS_{87Hz}}{FRS_{50Hz}}$$

6) Configure **[Nominal Motor Speed]** (NSP) with the result of the following formula:

$$NSP_{87Hz} = \frac{60}{\eta_P} \times 87 - \left(\frac{60}{\eta_P} \times 50 - NSP_{50Hz}\right)$$

> **Note:**
>
> **With nominal power:** $\eta_P = \frac{FRS_{50Hz} \times 60}{NSP_{50Hz}}$ **with** $\eta_P \in \mathbb{N}$

7) **[Nominal motor power]** (NPR) with the result of the following formula:

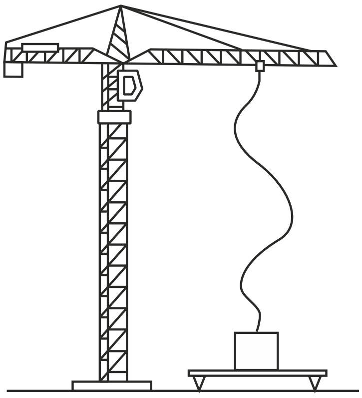
$$NPR_{87Hz} = NPR_{50Hz} \times \frac{\eta_P\ NSP_{87Hz} + 30FRS_{87Hz}}{\eta_P\ NSP_{50Hz} + 30FRS_{50Hz}}$$

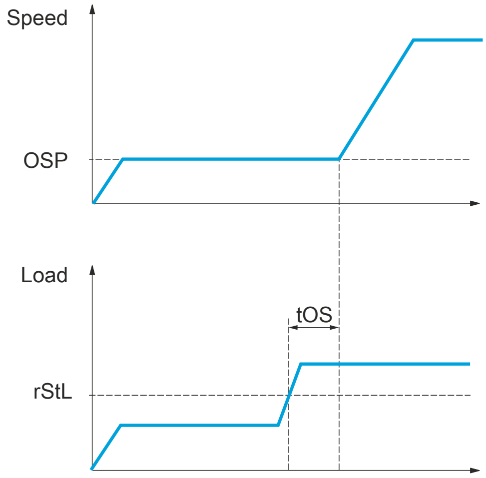
> **Note:**
>
> **With nominal power:** $\eta_P = \frac{FRS_{50Hz} \times 60}{NSP_{50Hz}}$ **with** $\eta_P \in \mathbb{N}$

8) Perform autotuning for the motor by setting **[Autotuning]** (TUN) to value **[Yes]** (YES).

Rope slack

Function "Rope slack" can be used to prevent starting up at high speed when a load has been set down ready for hoisting but the cable is still slack as shown in the figure below.





The frequency step (parameter OSP) is used for measuring the load. As long as the frequency level has not reached configurable threshold value **[Rope slack trq level]** (rStL), which corresponds to the weight of the load hook, the effective measuring cycle will not be triggered.

Menu **[Input/Output]** (I_O-) can be used to assign the display of state "Slack rope" to a logic output or relay.

Note:

The speed reached for a specific current will be lower in case of network undervoltage in comparison with nominal network voltage.

[High speed hoisting] (HSO)

Enables the function for HSP optimization

Setting	Code/Value	Description
[No]	(nO)	Function inactive Factory setting
[Ref Frequency]	(SSO)	Mode "Frequency setpoint":
[Current Limitation]	(CSO)	Mode "Current limiting"

[Motor speed coeff.] (COF)

Coefficient for optimization in the hoisting direction (motor quadrant).

This parameter can be accessed if **[High speed hoisting]** (HSO) is set to **[Speed ref]** (SSO).

	Setting	Description
	0 to 100%	Setting range Factory setting: 100%

[Gen. speed coeff] (COr)

Coefficient for optimization in the lowering direction (generator quadrant).

This parameter is accessible if **[High speed hoisting]** (HSO) is not set to **[No]** (nO).

	Setting	Description
	0 to 100%	Setting range Factory setting: 50%

[Load measuring tm.] (tOS)

Time for torque measurement.

This parameter is accessible if [High speed hoisting] (HSO) is not set to [No] (nO).

	Setting	Description
	0.10 to 65.00 s	Setting range Factory setting: 0.50 s

[Measurement spd] (OSp)

Optimizes the speed.

This parameter is accessible if [High speed hoisting] (HSO) is not set to [No] (nO).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 40 Hz

[High speed I Limit] (CLO)

Optimizes current limiting.

This parameter can be accessed if [High speed hoisting] (HSO) is set to [I Limit] (CSO).

> **Note:**
>
> **If the setting is less than 0.25 In, the inverter can be locked in state [Output Phase Loss] (OPL) if this has been enabled.**

	Setting	Description
	0 to 1.1 In[1)]	Setting range Factory setting: In[1)]

1) "In" corresponds to the nominal current of the inverter specified on the nameplate.

[I Limit. frequency] (SCL)

Configurable frequency threshold value above which current limiting is active at a high frequency.

This parameter can be accessed if [High speed hoisting] (HSO) is set to [I Limit] (CSO).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 40 Hz

[Rope slack config.] (rSd)

Actual value of load measurement.

This parameter is accessible if [High speed hoisting] (HSO) is not set to [No] (nO).

	Setting	Code/Value	Description
	[No]	(nO)	Function inactive Factory setting
	[Weight Estimation]	(drl)	Load measurement by estimating the inverter torque.
	[Ext Weight Sensor]	(PES)	Measures the load with a weight sensor. Assignment is only possible if [Ext Weight Sensor] (PES) is not set to [Not Configured] (nO).

[Rope slack trq level] (rStL)

Threshold value for the setting, which corresponds to a load that is slightly less than the weight of the empty load hook as a percentage of the rated load.

The parameter is accessible if [Rope slack config.] (rSd) was assigned.

	Setting	Description
	0 to 100%	Setting range Factory setting: 0%

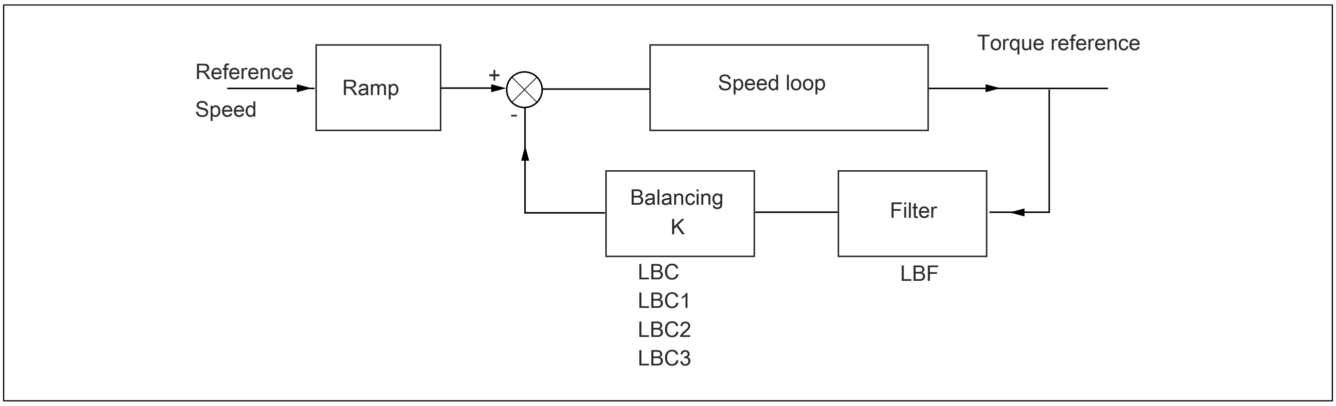
5.2.4.4.3 [Load Sharing] (Lds-)

Access

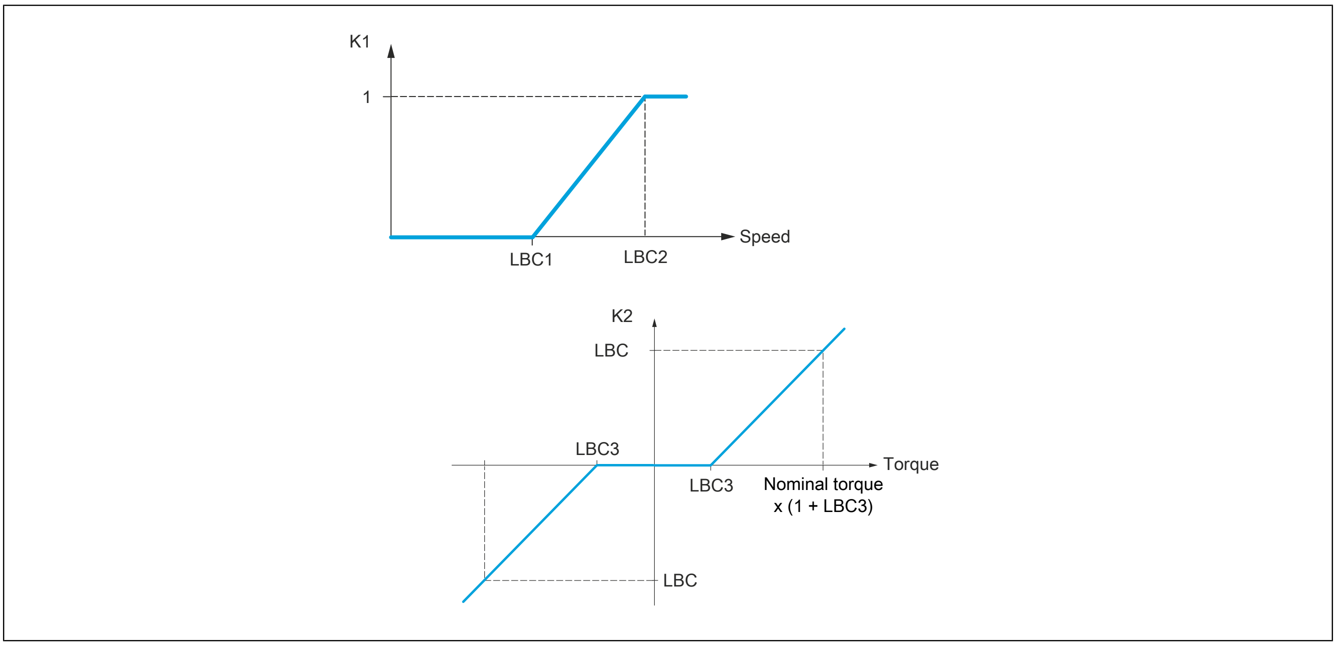
[Complete settings] → [Hoisting Functions] → [Load Sharing]

About this menu

Principle:



Load sharing factor K is determined by the torque and speed with the two factors K1 and K2 (K = K1 x K2).



[Load Sharing] (LBA)

Configures load sharing.

If two motors are mechanically connected and therefore run at identical speed and each of the motors is controlled by an inverter, this function can be used to optimize torque distribution between the two motors. For this, the function changes the speed depending on the torque.

This parameter is accessible if [Motor control type] (Ctt) is set to any of the following values:

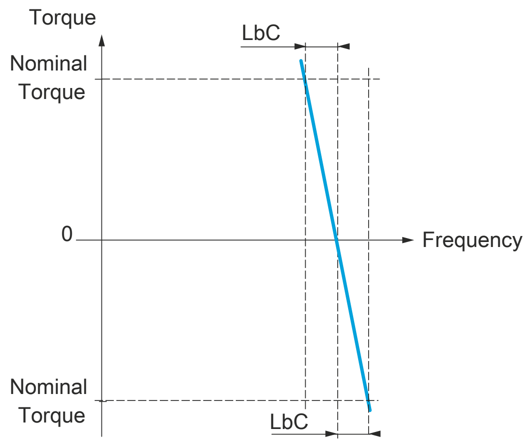
- [SVC V] (VVC)
- [FVC] (FVC)
- [Nom SyncMotor] (SYN)
- [Sync.CL] (FSY)

Setting	Code/Value	Description
[No]	(nO)	Function inactive Factory setting
[Yes]	(YES)	Function active

[Load correction] (LbC)

Corrects load sharing at nominal speed.

This parameter is only accessible if [Load Sharing] (LbA) is set to [Yes] (YES).



Setting	Description
0 to 1000.0 Hz	Setting range Factory setting: 0.0 Hz

[Correction min spd] (LbC1)

Lower limit for the speed setpoint of the torque reduction function.

Minimum speed for load sharing in Hz. Below this threshold value, no correction is made. Prevents correction at very low speed if this would affect the rotation of the motor.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and if [Load Sharing] (LbA) is set to [Yes] (YES).

Setting	Description
0 to 999.9 Hz	Setting range Factory setting: 0.0 Hz

[Correction max spd] (LbC2)

Upper limit for the speed setpoint of the torque reduction function.

Speed setpoint in Hz, above which the maximum load is corrected.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and if [Load Sharing] (LbA) is set to [Yes] (YES).

Setting	Description
[Correction min spd] (LbC1) Hz at 1000.0 Hz	Setting range Factory setting: 0 Hz

[Torque offset] (LbC3)

Torque offset for torque correction.

Minimum torque for load sharing as a percentage of the nominal torque. Below this threshold value, no correction is made. Serves to avoid torque instability when the torque direction is not constant.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr) and [Load Sharing] (LbA) to [Yes] (YES).

Setting	Description
0 to 300%	Setting range Factory setting: 0%

[Sharing filter] (LbF)

Filter of the time constant.

This parameter is accessible if **[Access Level]** (LAC) is set to **[Expert]** (EPr) and **[Load Sharing]** (LbA) to **[Yes]** (YES).

Used with flexible mechanical clutches to avoid instability.

Setting	Description
100 to 20,000 ms	Setting range Factory setting: 100 ms

5.2.4.4.4 [Rope Slack Handling] (Sdr-)

Access

[Complete settings] → **[Hoisting Functions]** → **[Rope Slack Handling]**

About this menu

This parameter is accessible if **[High speed hoisting]** (HSO) is not set to **[No]** (nO).

[Rope slack config.] (rSd)

Actual value of load measurement.

	Setting	Code/Value	Description
★	[No]	(nO)	Function inactive Factory setting
	[Weight Estimation]	(drI)	Load measurement by estimating the inverter torque.
	[Ext Weight Sensor]	(PES)	Measures the load with a weight sensor. Assignment is only possible if [Ext Weight Sensor] (PES) is not set to [Not Configured] (nO).

[Rope slack trq level] (rStL)

Torque limit for slack rope detection.

This parameter is accessible if **[Rope slack config.]** (rSd) is not set to **[No]** (nO).

	Setting	Description
★	0 to 100%	Setting range Factory setting: 0%

5.2.4.5 [Hoisting monitoring]

[Dynamic load detect.] (dLd-)

Access

[Complete settings] → **[Hoisting Functions]** → **[Dynamic load detect.]**

About this menu

This detection is only possible with function "High-speed hoisting". This function is used to detect whether an obstacle has occurred that triggers a sudden increase (when hoisting) or a sudden decrease (when lowering) in load.

Detection of load deviation will result in a fault: **[Dynamic Load Error]** (dLF). The response of the inverter to this fault can be configured via parameter **[Dyn. load Mgt.]** (dLb).

Load variation detection can also be assigned to a relay or digital output.

Based on the configuration of high-speed hoisting, two detection modes are possible:

- Mode "Scaling freq HMI"
  [High speed hoisting] (HSO) is set to **[Speed ref]** (SSO).
  Torque variation detection.
  During high-speed operation, the load is compared to the load measured during the frequency step. The permissible load variation and duration can be configured. If exceeded, a fault is triggered.
- Mode "Current limiting"
  [High speed hoisting] (HSO) is set to **[Current Limitation]** (CSO). When hoisting at high speed, a load increase results in speed reduction. Even if high-speed operation is enabled, a fault is triggered if the motor frequency falls below threshold value **[I Limit. frequency]** (SCL). The function only detects a load increase in the high-speed range (up to **[I Limit. frequency]** (SCL)). When lowering, operation continues in accordance with mode "Speed control".

[Dynamic load time] (tLd)

Enables load variation detection and the delay setting for taking into account the detected fault **[Dynamic Load Error]** (dLF).

Setting	Code/Value	Description
[No]	(nO)	No detection of load variation Factory setting
0.00 to 10.00 s		Setting of the delay for taking into account the detected fault.

[Dyn. load threshold] (dLd)

Sets the trigger value for load variation detection as a percentage of the load measured during the frequency step.

	Setting	Description
	1 to 100%	Setting range Factory setting: 100%

[Dyn. load Mgt.] (dLb)

Response of the inverter to a detected load variation.

Setting	Code/Value	Description
[Ignore]	(nO)	Ignores detected faults.
[Freewheel Stop]	(YES)	Freewheel stop Factory setting
[Per STT]	(Stt)	Stops according to parameter [Type of stop] (Stt), but without causing a fault after stopping
[Fallback Frequency]	(LFF)	Changes to the fallback speed, which is maintained for as long as the detected fault persists and the move command has not been canceled.[1)]
[Spd maintained]	(rLS)	Speed that is maintained as long as the detected fault persists and the move command is not canceled.[1)]
[Ramp stop]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop

1) Since the detected fault does not trigger a stop in this case, a relay or logic output should be assigned to display the fault.

5.2.4.6 [Generic functions] – [Speed limits] (SLM-)

Access

[Complete settings] → **[Generic functions]** → **[Speed limits]**

[Low Speed] (LSP)

Motor frequency at low speed.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[High Speed] (HSP)

Motor frequency at high speed.

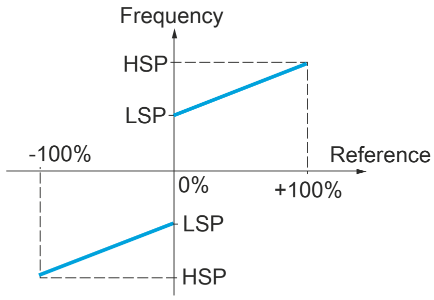
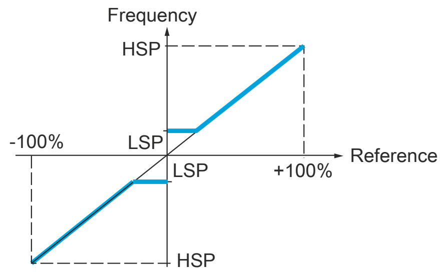
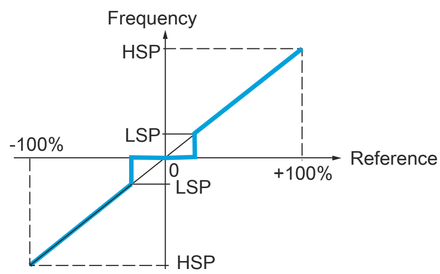
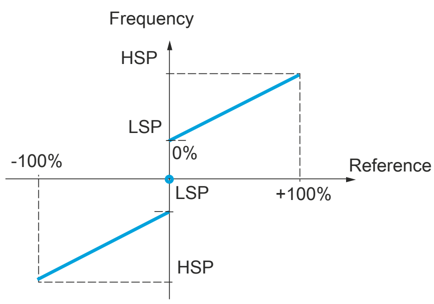
	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 50.0 Hz

[Ref Freq Template] (bSP)

Manages low speed (template).

This parameter defines how the speed setpoint is taken into account (for analog inputs and pulse input only). For the PID controller, this is the PID output setpoint.

The limit values are defined by parameters [Low Speed] (LSP) and [High Speed] (HSP).

	Setting	Code/Value	Description
	[Standard]	(bSd)	 When setpoint = 0, the frequency = [Low Speed] (LSP). Factory setting
	[Pedestal]	(bLS)	 When setpoint = 0 to [Low Speed] (LSP), the frequency = [Low Speed] (LSP).
	[Deadband]	(bnS)	 When setpoint = 0 to [Low Speed] (LSP), the frequency = 0.
	[Deadband at 0%]	(bnS0)	 This procedure corresponds to [Standard] (bSd). In the following cases, the frequency = 0 at setpoint 0: The signal is lower than [Min value], which is greater than 0 (example: 1 VDC for a 2 to 10 VDC input). The signal is greater than [Min value], which is greater than [Max value] (example: 11 VDC for a 10 to 0 VDC input). If "bidirectional" was defined for the input range, the procedure is identical to [Standard] (bSd).

5.2.4.7 [Generic functions] - [Ramp] (rAMP-)

Access

[Complete settings] → [Generic functions] → [Ramp]

[Ramp Type] (rPt)

Ramp type.

Setting	Code/Value	Description
[Linear]	(LIn)	Linear ramp Factory setting
[S-Ramp]	(S)	S ramp
[U-Ramp]	(U)	U ramp
[Customized]	(CUS)	Customized ramp

[Ramp increment] (Inr)

This parameter applies to [Acceleration] (ACC), [Deceleration] (dEC), [Acceleration 2] (AC2) and [Deceleration 2] (dE2).

	Setting	Code/Value	Description
	[0,01]	(0.01)	Ramp up to 99.99 seconds
	[0.1]	(0.1)	Ramp up to 999.9 seconds Factory setting
	[1]	(1)	Ramp up to 6,000 seconds

[Acceleration] (ACC)

Time to start up from 0 to [Nominal Motor Freq] (FrS).

In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

	Setting	Description
	0.0 to 6,000.0 s[1)]	Setting range Factory setting: 3.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

[Deceleration] (dEC)

Time to decelerate from [Nominal Motor Freq] (FrS) to 0.

In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

	Setting	Description
	0.0 to 6,000.0 s[1)]	Setting range Factory setting: 3.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

[Begin Acc round] (tA1)

Rounding of the acceleration ramp start as a percentage of ramp time [Acceleration] (ACC) or [Acceleration 2] (AC2).

Can be set between 0 and 100%.

This parameter is accessible if [Ramp Type] (rPt) is set to [Customized] (CUS).

	Setting	Description
	0 to 100%	Setting range Factory setting: 10%

[End Acc round] (tA2)

Rounding of the acceleration ramp end as a percentage of [Acceleration] (ACC) or [Acceleration 2] (AC2).

Can be set from 0 to (100% - [Begin Acc round] (tA1)).

This parameter is accessible if [Ramp Type] (rPt) is set to [Customized] (CUS).

	Setting	Description
★ ⟲	0 to 100%	Setting range Factory setting: 10%

[Begin Dec round] (tA3)

Rounding of the deceleration ramp start as a percentage of ramp time [Deceleration] (dEC) or [Deceleration 2] (dE2).

Can be set between 0 and 100%.

This parameter is accessible if [Ramp Type] (rPt) is set to [Customized] (CUS).

	Setting	Description
★ ⟲	0 to 100%	Setting range Factory setting: 10%

[End Dec round] (tA4)

Rounding of the deceleration ramp end as a percentage of ramp time [Deceleration] (dEC) or [Deceleration 2] (dE2).

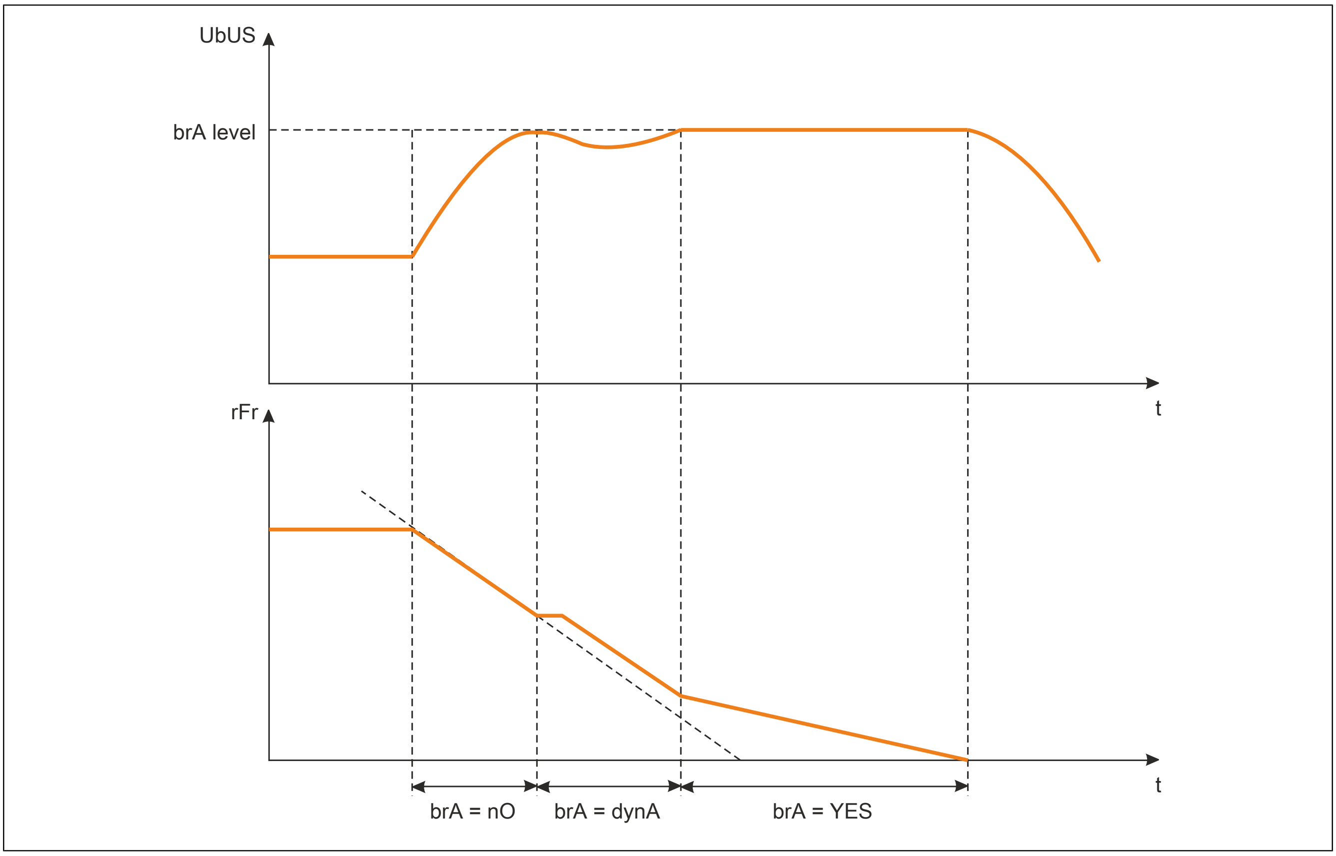
Can be set from 0 to (100% - [Begin Dec round] (tA3)).

This parameter is accessible if [Ramp Type] (rPt) is set to [Customized] (CUS).

	Setting	Description
★ ⟲	0 to 100%	Setting range Factory setting: 10%

[Dec.Ramp Adapt] (brA)

Adjusts the deceleration ramp.



Enabling this function automatically adjusts the deceleration ramp if it has been set at a value too low with respect to the inertia of the load, which can cause an overvoltage fault.

The function is incompatible with applications requiring:
Positioning on a ramp

Setting	Code/Value	Description
[No]	(nO)	Function inactive. **Note:** **[Dec.Ramp Adapt] (brA) is forced to [No] (nO) if [Brake assignment] (BLC) is configured or [Braking power control] (BBA) is set to [Yes] (YES) and [Dec.Ramp Adapt] (brA) to [High Torque] (DYNA).**
[Yes]	(YES)	Function active for applications that do not require high deceleration time. Factory setting
[High Torque]	(dYnA)	Adds a constant current flow component. Selection [High Torque] (dYnA) is displayed depending on the inverter rating and parameter [Motor control type] (Ctt). It allows lower deceleration than parameter [Yes] (YES). The selection must be defined by comparative tests. If value [High Torque] (dYnA) is configured for [Dec.Ramp Adapt] (brA), dynamic braking performance is improved by an additional current flow component. The aim is to increase the iron loss and magnetic energy stored in the motor.

[Braking balance] (BBA)

Controls the braking power

This parameter is used to control the braking power between inverters that are connected via the DC bus.

	Setting	Code/Value	Description
	[No]	(nO)	Function inactive. Factory setting
	[Yes]	(YES)	Function active.

[Braking Resistor] (BrC)

Connects the braking resistor.

> **Note:**
>
> **The factory-set value of the parameter is set to [Yes] (YES) if [Brake assignment] (BLC) is configured.**

Setting	Code/Value	Description
[No]	(nO)	Function not active Factory setting **Note:** **This selection cannot be used to enable fault [DB unit op. circuit] (BUFO).**
[Yes]	(YES)	Function active **Note:** **For this parameter, [Yes] (YES) is forced if [Dec.Ramp Adapt] (brA) is defined as [No] (nO) on an inverter with a power output greater than 22 kW.**

5.2.4.8 [Generic functions] - [Ramp switching] (rPt-)

Access

[Complete settings] → [Generic functions] → [Ramp switching]

[Ramp 2 Thd] (Frt)

Frequency threshold value for ramp 2

The second ramp is switched if the value of [Ramp 2 Thd] (Frt) is not 0 (0 disables the function) and if the output frequency is greater than [Ramp 2 Thd] (Frt).

Ramp switching via threshold value can be combined with [Ramp Switch Assign] (rPS) as follows:

DI or bit	Frequency	Ramp
0	<(Frt)	(ACC), (dEC)
0	>(Frt)	(AC2), (dE2)
1	<(Frt)	(AC2), (dE2)
1	>(Frt)	(AC2), (dE2)

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Ramp Switch Assign] (rPS)

Switches the ramp.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Acceleration 2] (AC2)

Startup time 2.

Time to start up from 0 to [Nominal Motor Freq] (FrS). In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

This parameter is accessible if [Ramp 2 Thd] (Frt) is greater than 0 or if [Ramp Switch Assign] (rPS) is assigned.

	Setting	Description
	0.0 to 6,000.0 s[1]	Setting range Factory setting: 5.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

[Deceleration 2] (dE2)

Deceleration 2.

Time to decelerate from [Nominal Motor Freq] (FrS) to 0. In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

This parameter is accessible if [Ramp 2 Thd] (Frt) is greater than 0 or if [Ramp Switch Assign] (rPS) is assigned.

	Setting	Description
	0.0 to 6,000.0 s[1]	Setting range Factory setting: 5.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

5.2.4.9 [Generic functions] – [Stop configuration] (Stt-)

Access

[Complete settings] → [Generic functions] → [Stop configuration]

About this menu

> **Note:**
>
> **This function cannot be used with certain other functions.**

[Type of stop] (Stt)

Normal stop mode.

Stop mode when resetting the move command or when setting a stop command.

Setting	Code/Value	Description
[On Ramp]	(rMP)	Stops via the ramp; if [Brake assignment] (bLC) or [Low speed time out] (tLS) are configured, or if [Motor fluxing] (FLU) is set to [Continuous] (FCt), then only [On Ramp] (rMP) is possible. Factory setting
[Fast stop]	(FSt)	Fast stop
[Freewheel]	(nSt)	Freewheel stop
[DC Injection]	(dCI)	Stop by DC injection braking. Available if [Motor control type] (Ctt) is not set to any of the following values: • [Nom SyncMotor] (SYn) • [Sync.CL] (FSY) • [SYN_U VC] (SYnU)

[Freewheel stop ass.] (nSt)

Freewheel stop.

This stop is enabled if the input or bit changes to 0. If the input changes back to state 1 and the command is still active, the motor is only restarted if [2/3-Wire Control] (tCC) is set to [2-Wire Control] (2C) and if [2-wire type] (tCt) is set to [Level] (LEL) or [Fwd priority] (PFO). Otherwise, a new move command is required.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**
[DI1 (Low level)] to [DI8 (Low level)]	(L1L) to (L8L)	Digital inputs DI1 to DI8 used for low level. **Note:** **Accessing selection DI8 with a low level is possible for inverters with a power output greater than 22 kW.**

[Freewheel stop Thd] (FFt)

Threshold value for freewheel stop.

Threshold value for speed below which the motor switches to stop mode "Freewheel".

This parameter can be used to set a threshold value below [Low speed] (LSP) to change to free deceleration in a defined way during a ramp stop or fast stop.

This parameter is accessible if [Type of stop] (Stt) is set to [Fast stop] (FSt) or [On Ramp] (rMP) and neither [Brake assignment] (bLC) or [Auto DC Injection] (AdC) are still configured.

	Setting	Description
☆	0.2 to 599.0 Hz	Setting range Factory setting: 0.2 Hz

[Fast stop Assign] (FSt)

Fast stop.

This stop is enabled when the input changes to 0 or the bit changes to 1.

If the input changes back to state 1 and the command is still active, the motor is only restarted if [2/3-Wire Control] (tCC) is set to [2-Wire Control] (2C) and if [2-wire type] (tCt) is set to [Level] (LEL) or [Fwd priority] (PFO). Otherwise, a new move command is required.

Note:

This function cannot be used with certain other functions.

[Ramp Divider] (dCF)

Deceleration ramp reduction coefficient for fast stops.

Enabled ramp ([Deceleration] (dEC) or [Deceleration 2] (dE2)) is divided by this coefficient when transmitting stop commands.

Value 0 corresponds to a minimum ramp time.

	Setting	Description
☆	0 to 10	Setting range Factory setting: 4

[DC Injection Assign] (dCI)

Assigns DC injection braking.

> **Warning!**
>
> **UNINTENTIONAL MOVEMENT**
>
> **DC injection braking is not permitted to be used for generating a holding torque if the motor is at a standstill.**
>
> **To keep the motor at a standstill, a holding brake must be used.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

DC injection braking is initiated when the assigned input or bit changes to state 1.

If the input changes back to state 0 and the command is still active, the motor is only restarted if [2/3-Wire Control] (tCC) is set to [2-Wire Control] (2C) and if [2-wire type] (tCt) is set to [Level] (LEL) or [Fwd priority] (PFO). Otherwise, a new move command is required.

> **Note:**
>
> **This function cannot be used with certain other functions.**

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[DC inject. level 1] (IdC)

Stop by DC injection braking.

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

Strength of braking current during DC injection braking, enabled via digital input or selected as stop mode.

This parameter is accessible if [Type of stop] (Stt) is set to [DC Injection] (dCI) or [DC injection] (dCI) is not set to [No] (nO).

	Setting	Description
	0.1 to 1.41 In[1]	Setting range This setting is independent of function [Auto DC Injection] (AdC-). Factory setting: 0.7 In[1]

1) Corresponds to the nominal current of the inverter specified on the nameplate.

[DC injection time 1] (tdI)

Time for DC injection braking 1

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

Maximum DC connection time [DC inject. level 1] (IdC). After this time has elapsed, the DC connection changes to [DC inject. level 2] (IdC2).

This parameter is accessible if [Type of stop] (Stt) is set to [DC Injection] (dCI) or [DC injection] (dCI) is not set to [No] (nO).

	Setting	Description
	0.1 to 30 s	Setting range This setting is independent of function [Auto DC Injection] (AdC-). Factory setting: 0.5 s

[DC inject. level 2] (IdC2)

DC injection braking current 2.

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

DC injection braking connection that is enabled by a digital input or as stop mode after time [DC injection time 1] (tdI) has elapsed.

This parameter is accessible if [Type of stop] (Stt) is set to [DC Injection] (dCI) or [DC injection] (dCI) is not set to [No] (nO).

	Setting	Description
	0.1 In[1)] to [DC inject. level 1] (IdC)	Setting range This setting is independent of function [Auto DC Injection] (AdC-). Factory setting: 0.5 In[1)].

1) Corresponds to the nominal current of the inverter specified on the nameplate.

[DC Inj Time 2] (tdC)

DC injection braking time 2.

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

Maximum DC connection time [DC inject. level 2] (IdC2), only selected as stop mode.

This parameter is accessible if [Type of stop] (Stt) is not set to [Not Configured] (dCI).

	Setting	Description
	0.1 to 30 s	Setting range This setting is independent of function [Auto DC Injection] (AdC-). Factory setting: 0.5 s

[SwitchOnDisable Stp] (dOtd)

Disables stop mode.

Setting	Code/Value	Description
[Freewheel Stop]	(nSt)	Disables the inverter function
[Ramp stop]	(rMP)	Stops the ramp and disables the inverter function. Factory setting

5.2.4.10 [Generic functions] – [Auto DC Injection] (AdC-)

Access

[Complete settings] → [Generic functions] → [Auto DC Injection]

About this menu

This menu enables automatic DC connection. This stops the rotor at the end of the deceleration ramp.

[Auto DC Injection] (AdC)

Automatic DC injection braking.

> ## Danger!
>
> **HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH**
>
> **If parameter [Auto DC injection] (AdC) is set to [Continuous] (Ct), DC injection braking is always active, even if the motor is not running.**
>
> **Ensure that this setting does not result in unsafe states.**
>
> **Failure to follow these instructions will result in death or serious injury.**

> ## Warning!
>
> **UNINTENTIONAL MOVEMENT**
>
> **DC injection braking is not permitted to be used for generating a holding torque if the motor is at a standstill.**
>
> **To keep the motor at a standstill, a holding brake must be used.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

Automatic DC injection braking at standstill (at the end of the ramp).

> ## Note:
>
> **This function blocks function [Motor fluxing] (FLU). If [Motor fluxing] (FLU) is set to [Continuous] (FCt), [Auto DC Injection] (AdC) must be [No] (nO) .**

[No] (nO) is forced for [Auto DC Injection] (AdC) if [Brake assignment] (bLC) is not set to [No] (nO). This parameter increases the power supply current, even without a move command.

	Setting	Code/Value	Description
2 s	[No]	(nO)	No supply Factory setting
	[Yes]	(YES)	Supply with configurable duration
	[Continuous]	(Ct)	Continuous power supply at standstill

[Auto DC inj Level 1] (SdC1)

Automatic DC injection braking level 1

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

Level of DC connection at standstill.

This parameter is accessible if **[Auto DC Injection]** (AdC) is not set to **[No]** (nO) and if **[Motor control type]** (Ctt) is not set to **[FVC]** (FVC) or **[Sync.CL]** (FSY).

	Setting	Description
	0 to 1.1 In[1)]	Setting range Factory setting: 0.7 In[1)]

1) "In" corresponds to the nominal current of the inverter specified on the nameplate.

[Auto DC Inj Time 1] (tdC1)

Automatic DC injection braking time 1.

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

This parameter is accessible if **[Auto DC Injection]** (AdC) is not set to **[No]** (nO).

This time corresponds to the holding time at speed zero if **[Motor control type]** (Ctt) is set to one of the following values:

- **[Nom SyncMotor]** (SYn)
- **[Sync.CL]** (FSY)
- **[SYN_U VC]** (SYnU)

	Setting	Description
	0.1 to 30.0 s	Setting range Factory setting: 0.5 s

[Auto DC inj Level 2] (SdC2)

Automatic DC injection braking level 2

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

Second level of DC connection at standstill.

This parameter is accessible if **[Auto DC Injection]** (AdC) is not set to **[No]** (nO) and if **[Motor control type]** (Ctt) is not set to **[FVC]** (FVC) or **[Sync.CL]** (FSY).

	Setting	Description
	0 to 1.1 In[1)]	Setting range Factory setting: 0.5 In[1)]

1) "In" corresponds to the nominal current of the inverter specified on the nameplate.

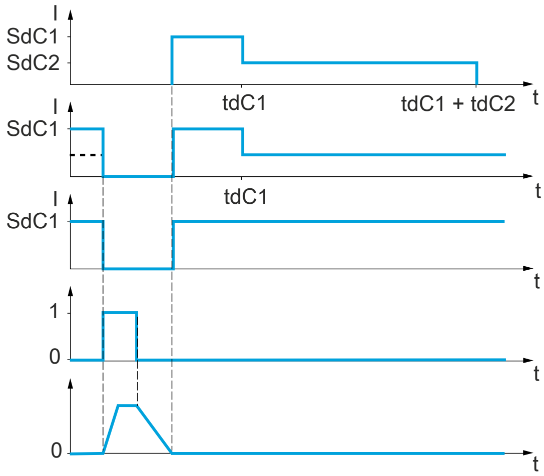
[Auto DC Inj Time 2] (tdC2)

Automatic DC injection braking time 2.

> **Note:**
>
> **MOTOR OVERHEATING AND DAMAGE**
>
> **It must be ensured that the connected motor has the nominal power required for the applied DC injection braking current in terms of size and time to prevent the motor from overheating and damage.**
>
> **Failure to follow these instructions can result in damage to property.**

Second connection time at standstill.

This parameter is accessible if [Auto DC Injection] (AdC) is not set to [Yes] (YES) and if [Motor control type] (Ctt) is not set to [FVC] (FVC) or [Sync.CL] (FSY).

AdC	SdC2	Operation
YES	x	
Ct	≠ 0	
Ct	= 0	
Move command		
Speed		

	Setting	Description
	0.0 to 30.0 s	Setting range Factory setting: 0.0 s

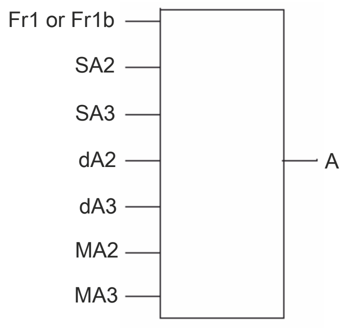
5.2.4.11 [Generic functions] - [Ref. operations] (OAI-)

Access

[Complete settings] → [Generic functions] → [Ref. operations]

About this menu

Input addition/ Input subtraction / Multiplier



A: (Fr1 or Fr1b + SA2 + SA3 - dA2 - dA3) x MA2 x MA3

Note:

- **If SA2, SA3, dA2, dA3 are not assigned, they are set to 0.**
- **If MA2, MA3 are not assigned, they are set to 1.**
- **A is limited by parameter LSP for minimum speed and HSP for maximum speed.**
- **For multiplication, the signal is interpreted as a percentage on MA2 or MA3. 100% corresponds to the maximum value of the corresponding input. If MA2 or MA3 is transmitted via the communication bus or display terminal, multiplication variable MFr must be transmitted via the bus or display terminal.**
- **The inversion of the direction of rotation in case of a negative result can be locked (see [Reverse Disable] (rIn)).**

[Summing Input 2] (SA2)

Sum of input 2.

Selects a setpoint that should be added to [Ref Freq 1 Config] (Fr1) or [Ref.1B channel] (Fr1b).

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[AI1]	(AI1)	Analog input AI1 Factory setting
[AI2] to [AI3]	(AI2) to (AI3)	Analog inputs AI2 to AI3
[Ref Frequency via DI]	(UPdt)	Assigns the up/down function by DIx
[Ref.Freq-Rmt.Term]	(LCC)	Frequency setpoint via remote operator terminal
[Ref. Freq-Com. Module]	(nEt)	Frequency setpoint via POWERLINK if a module is connected.
[AI Virtual 1]	(AIv1)	Virtual analog input 1
[DI7 PulseInput] to [DI8 PulseInput]	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse inputs **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Summing Input 3] (SA3)

Sum of input 3.

Selects a setpoint that should be added to [Ref Freq 1 Config] (Fr1) or [Ref.1B channel] (Fr1b).

Identical to [Summing Input 2] (SA2).

[Subtract Ref Freq 2] (dA2)

Subtracts frequency setpoint 2.

Selects a setpoint that should be subtracted from [Ref Freq 1 Config] (Fr1) or [Ref.1B channel] (Fr1b).

Identical to [Summing Input 2] (SA2).

[Subtract Ref Freq 3] (dA3)

Subtracts frequency setpoint 3.

Selects a setpoint that should be subtracted from [Ref Freq 1 Config] (Fr1) or [Ref.1B channel] (Fr1b).

Identical to [Summing Input 2] (SA2).

[Ref Freq 2 Multiply] (MA2)

Multiplier for frequency setpoint 2 (as a percentage of the source range).

Selects multiplier setpoint [Ref Freq 1 Config] (Fr1) or [Ref.1B channel] (Fr1b).

Identical to [Summing Input 2] (SA2).

[Ref Freq 3 Multiply] (MA3)

Multiplier for frequency setpoint 3 (as a percentage of the source range).

Selects multiplier setpoint [Ref Freq 1 Config] (Fr1) or [Ref.1B channel] (Fr1b).

Identical to [Summing Input 2] (SA2).

5.2.4.12 [Generic functions] - [Preset speeds] (PSS-)

Access

[Complete settings] → [Generic functions] → [Preset speeds]

About this menu

> **Note:**
>
> **This function cannot be used with certain other functions.**

Combination table for inputs for preset speeds

2, 4, 8 or 16 speeds can be preselected, in which case 1, 2, 3 or 4 digital inputs are required.

The following must be configured:

- 2 and 4 speeds to obtain 4 speeds.
- 2, 4 and 8 speeds to obtain 8 speeds.
- 2, 4, 8 and 16 speeds to obtain 16 speeds.

16 preset freq. (PS16)	8 preset freq. (PS8)	4 preset freq. (PS4)	2 preset freq. (PS2)	Speed setpoint
0	0	0	0	Setpoint 1 1)
0	0	0	1	SP2
0	0	1	0	SP3
0	0	1	1	SP4
0	1	0	0	SP5
0	1	0	1	SP6
0	1	1	0	SP7
0	1	1	1	SP8
1	0	0	0	SP9
1	0	0	1	SP10
1	0	1	0	SP11
1	0	1	1	SP12
1	1	0	0	SP13
1	1	0	1	SP14
1	1	1	0	SP15
1	1	1	1	SP16

1) Setpoint 1 = (SP1)

[2 Preset Freq] (PS2)

2 presets for frequency assignment.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[4 Preset Freq] (PS4)

4 presets for frequency assignment.

Identical to [2 Preset Freq] (PS2).

In order to obtain 4 speeds, 2 speeds must also be configured.

[8 Preset Freq] (PS8)

8 presets for frequency assignment.

Identical to [2 Preset Freq] (PS2).

In order to obtain 8 speeds, 2 and 4 speeds must also be configured.

[16 Preset Freq] (PS16)

16 presets for frequency assignment.

Identical to [2 Preset Freq] (PS2).

In order to obtain 16 speeds, 2, 4 and 8 speeds must also be configured.

[Preset speed 2] (SP2)

Preset for speed 2. See the input combination table on the previous page for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 10.0 Hz

[Preset speed 3] (SP3)

Preset for speed 3. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 15.0 Hz

[Preset speed 4] (SP4)

Preset for speed 4. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 20.0 Hz

[Preset speed 5] (SP5)

Preset for speed 5. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 25.0 Hz

[Preset speed 6] (SP6)

Preset for speed 6. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 30.0 Hz

[Preset speed 7] (SP7)

Preset for speed 7. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 35.0 Hz

[Preset speed 8] (SP8)

Preset for speed 8. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 40.0 Hz

[Preset speed 9] (SP9)

Preset for speed 9. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 45.0 Hz

[Preset speed 10] (SP10)

Preset for speed 10. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 50.0 Hz

[Preset speed 11] (SP11)

Preset for speed 11. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 55.0 Hz

[Preset speed 12] (SP12)

Preset for speed 12. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 60.0 Hz

[Preset speed 13] (SP13)

Preset for speed 13. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 70.0 Hz

[Preset speed 14] (SP14)

Preset for speed 14. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 80.0 Hz

[Preset speed 15] (SP15)

Preset for speed 15. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 90.0 Hz

[Preset speed 16] (SP16)

Preset for speed 16. See the input combination table for preset speeds.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 100.0 Hz

5.2.4.13 [Generic functions] – [+/- speed] (Upd-)

Access

[Complete settings] → [Generic functions] → [+/- speed]

About this menu

This function is accessible if setpoint channel [Ref Freq Channel 2] (Fr2) is set to [Ref Frequency via DI] (UPdt).

> **Note:**
>
> **This function cannot be used with certain other functions.**

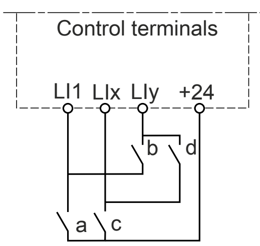
Two operating modes are available:

- **Use of single-action buttons:** 2 digital inputs are required in addition to the directions of rotation. The input set to "+ speed" increases the speed, and the input set to "- speed" reduces the speed.
- **Use of double-action buttons:** Only one logic input, which is assigned "+ speed", is required.

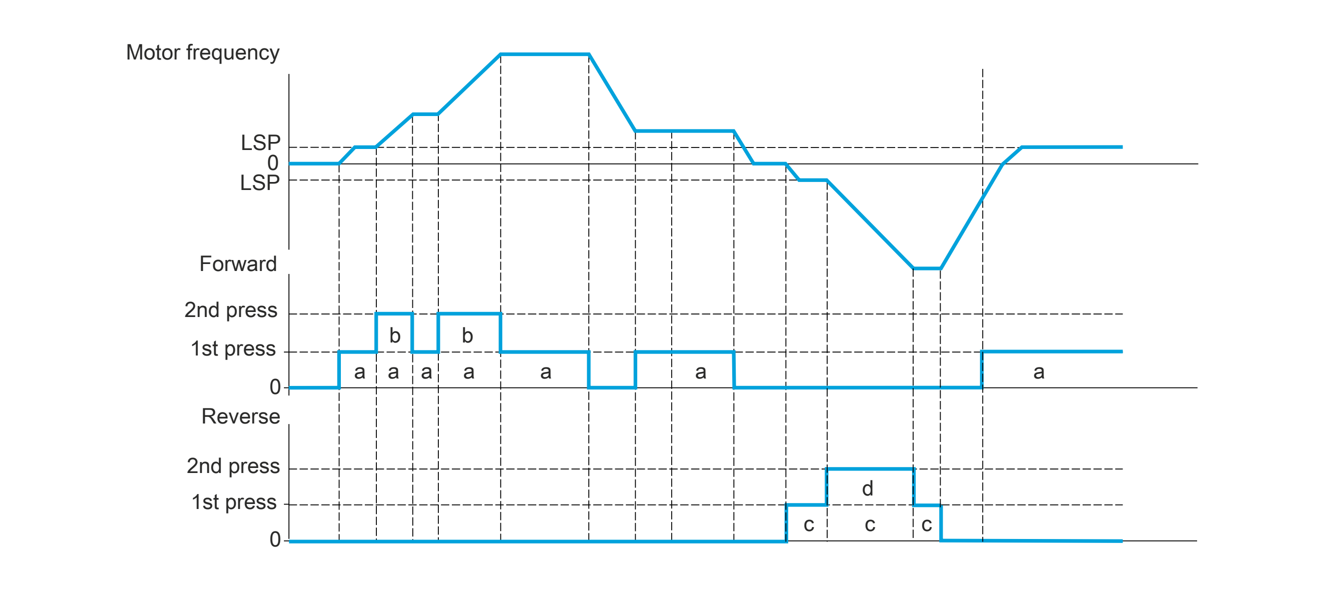
+/- speed with double-action buttons:

Description: 1 button that can be pressed twice (2-step) for each direction of rotation. A contact closes each time the button is pressed.

Setting	Released (- speed)	1. Push (Speed maintained)	2. Push (+ speed)
Button "Forward"	-	a	a and b
Reverse button	-	c	c and d



LI1: Forward
LIx: Reverse
LIy: + speed



This version of "+/-speed" must not be used with 3-wire control.

For both operating modes, the maximum speed is defined by **[High Speed]** (HSP).

> **Note:**
>
> **If the setpoint is switched via [Freq Switch Assign] (rFC) from any setpoint channel to another setpoint channel with "+/- speed", the value of setpoint [Motor Frequency] (rFr) (after ramp) can be applied according to channel [Copy Ch1-Ch2] (COP).**
>
> **This prevents the speed being incorrectly reset to zero when switching takes place.**

[+ Speed Assign] (USP)

Increases the assignment of the speed input.

The function is active if the assigned input or bit is at 1.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to **[DI8]**	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to **[CD15]**	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[- Speed Assign] (dSP)

Reduces the assignment of the speed input. See parameter table of **[+ Speed Assign]** (USP).

Parameter settings identical to **[+ Speed Assign]** (USP.).

The function is active if the assigned input or bit is at 1.

[Ref Frequency Save] (Str)

Saves the frequency setpoint.

This parameter is accessible if **[+ Speed Assign]** (USP) is not set to **[Not Assigned]** (nO) or if **[- Speed Assign]** (dSP) is not set to **[Not Assigned]** (nO).

This parameter, which is assigned to function "+/- speed", can be used to save the setpoint in the following cases:

- If the move commands disappear (saved to RAM).
- If the line supply is isolated or the move commands disappear (saved to EEPROM).

The next time the frequency inverter starts up, the speed setpoint is therefore the last setpoint that was saved.

	Setting	Code/Value	Description
★	[No save]	(nO)	Not saved Factory setting
	[Save to RAM]	(rAM)	+/- speed including saving the frequency setpoint to RAM.
	[Save to EEprom]	(EEP)	+/- speed including saving the frequency setpoint to EEPROM.

5.2.4.14 [Generic functions] – [+/- speed around ref] (SrE)

Access

[Complete settings] → [Generic functions] → [+/- speed around ref]

About this menu

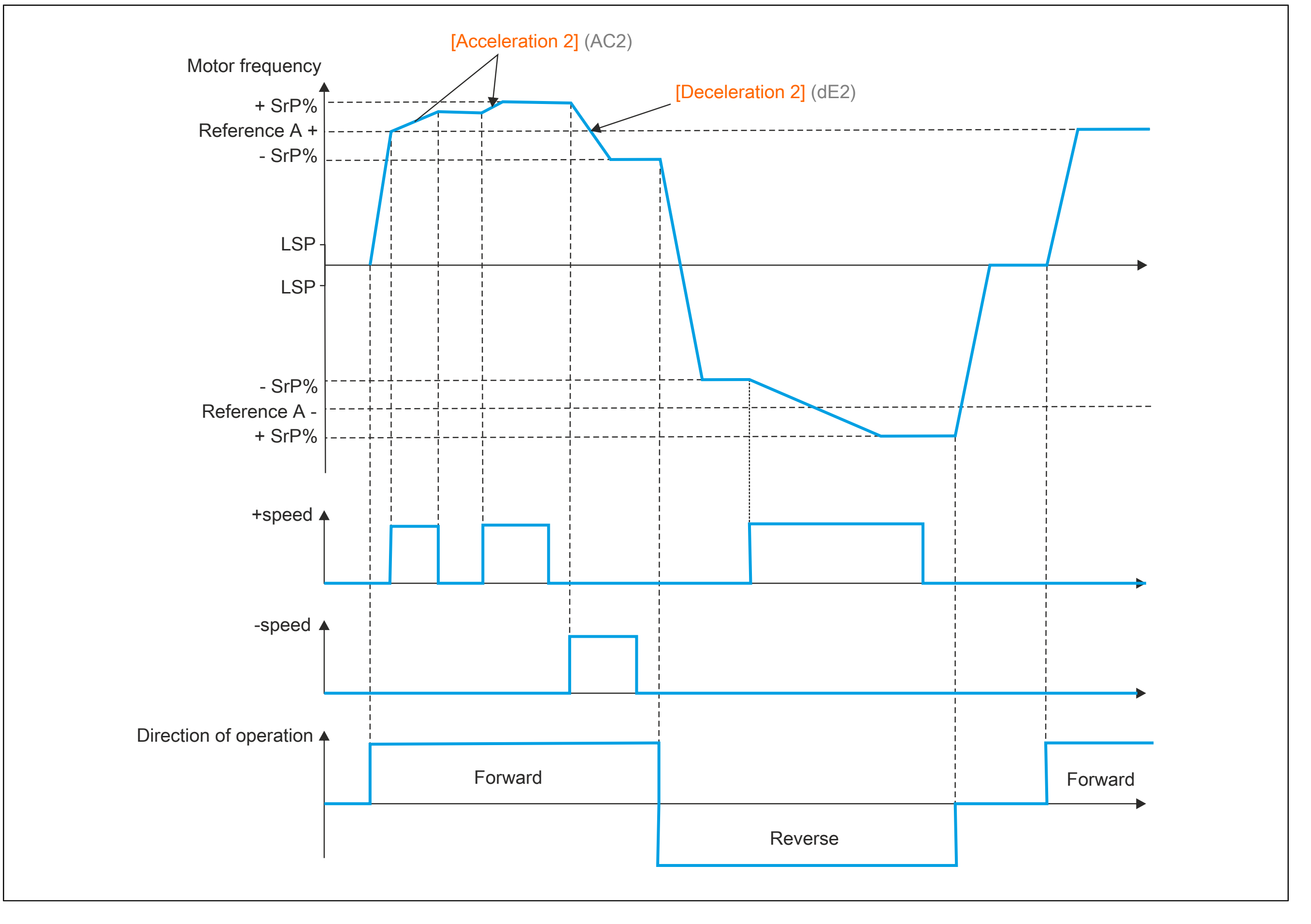
This function is accessible for setpoint channel **[Ref Freq 1 Config]** (Fr1).

> **Note:**
>
> **This function cannot be used with certain other functions.**

The setpoint is given by **[Ref Freq 1 Config]** (Fr1) or **[Ref.1B channel]** (Fr1b) with addition/subtraction/multiplication functions and preselected speeds if relevant (see diagram below).

For clarity, this setpoint is referred to as A. The effect of buttons "+ speed" and "- speed" can be set in a percentage of setpoint A. When stopping, the setpoint (A +/- speed) is not saved, i.e. the inverter only restarts with setpoint A.

The maximum total setpoint is limited by **[High Speed]** (HSP) and the minimum setpoint is limited by **[Low Speed]** (LSP).



[+ Speed Assign] (USI)

Assigns the speed increase.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[- Speed Assign] (dSI)

Assigns the speed reduction. See parameter table of [+ Speed Assign] (USP).

The function is active if the assigned input or bit is at 1.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[+/-Speed limitation] (SrP)

Limits the speed increase/reduction.

This parameter limits the deviation range with +/- speed as a percentage of the setpoint. The ramps used with this function are [Acceleration 2] (AC2) and [Deceleration 2] (dE2).

This parameter is accessible if [+ Speed Assign] (USI) or [- Speed Assign] (dSI) is not set to [No] (nO).

	Setting	Description
★ ↻	0 to 50%	Setting range Factory setting: 10%

[Acceleration 2] (AC2)

Startup time 2.

Time to start up from 0 to [Nominal Motor Freq] (FrS). In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

This parameter is accessible if [+ Speed Assign] (USI) or [- Speed Assign] (dSI) is not set to [No] (nO).

	Setting	Description
★ ↻	0.0 to 6,000.0 s[1)]	Setting range Factory setting: 5.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

[Deceleration 2] (dE2)

Deceleration 2.

Time to decelerate from [Nominal Motor Freq] (FrS) to 0. In order to ensure ramp repeatability, the value of this parameter must be defined in accordance with the relevant application options.

This parameter is accessible if [+ Speed Assign] (USI) or [- Speed Assign] (dSI) is not set to [No] (nO).

	Setting	Description
★ ↻	0.0 to 6,000.0 s[1)]	Setting range Factory setting: 5.0 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

5.2.4.15 [Generic functions] - [Jump frequency] (JUF-)

Access

[Complete settings] → [Generic functions] → [Jump frequency]

About this menu

This function prevents prolonged operation within a configurable range around the regulated frequency.

This function can be used to prevent a critical speed that would cause resonance. Setting the value to 0 makes the function inactive.

[Jump frequency] (JPF)

Jump frequency.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Skip Frequency 2] (JF2)

Jump frequency 2.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[3rd Skip Frequency] (JF3)

Jump frequency 3.

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Skip.Freq.Hysteresis] (JFH)

Bandwidth for jump frequency.

This parameter is accessible if at least one jump frequency JPF, JF2 or JF3 is not equal to 0.

Example range for the jump frequency: Between JPF - JFH and JPF + JFH.

This setting applies to all 3 frequencies JPF, JF2, JF3.

	Setting	Description
	0.1 to 10.0 Hz	Setting range Factory setting: 1.0 Hz

5.2.4.16 [Generic functions] - [PID controller]

5.2.4.16.1 [PID controller] (PId-)

Access

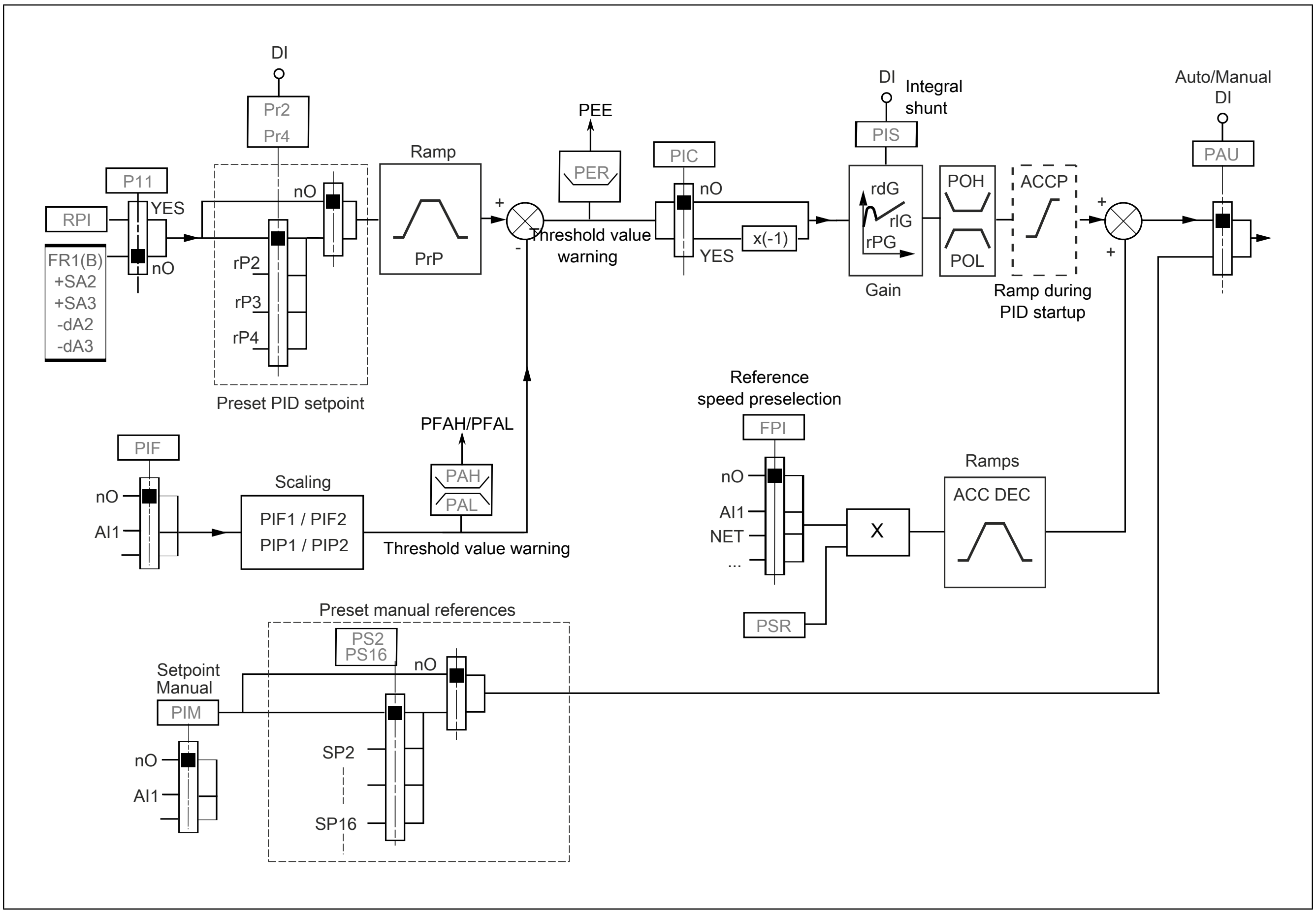
[Complete settings] → [Generic functions] → [PID controller]

About this menu

> **Note:**
>
> **This function cannot be used with certain other functions.**

Overview

The function is enabled if the PID actual value (measurement) is assigned to an analog input.



The PID value must be assigned to an analog input (AIx, pulse input).

The PID setpoint must be assigned to the following parameters:

- Preselected setpoints via digital inputs (**[Ref PID Preset 2]** (rP2), **[Ref PID Preset 3]** (rP3), **[Ref PID Preset 4]** (rP4)).
- According to the configuration of **[Intern PID Ref]** (PII):
    - **[Internal PID ref]** (rPI)
    - Setpoint A: **[Ref Freq 1 Config]** (Fr1) or **[Ref.1B channel]** (Fr1b)

Combination table for preset PID setpoints

LI (Pr4)	LI (Pr2)	Pr2 = nO	Reference
			rPI or A
0	0		rPI or A
0	1		rP2
1	0		rP3
1	1		rP4

A specified speed setpoint can be used to initialize the speed on restarting the process.

Scaling of feedback and setpoints:

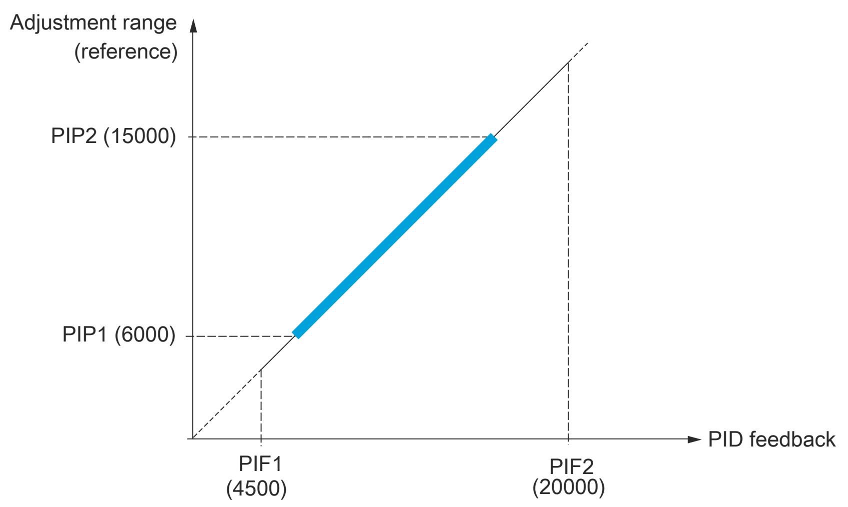
- For the scaling of the PID actual value (sensor range), parameters **[Min PID feedback]** (PIF1), **[Max PID feedback]** (PIF2) can be used. **This scaling absolutely must be retained for all further parameters.**
- For scaling the control range (e.g. the setpoint), parameters **[Min PID Process]** (PIP1), **[Max PID Process]** (PIP2) can be used. **The control range must be within the sensor range.**

The maximum value of the scaling parameters is 32,767. To facilitate installation, we recommend using values as close as possible to this maximum value scaled in powers of ten. Scaling is performed without a unit if **[Type of control]** (tOCt) is set to **[NA]** (nA) or as a percentage if the parameter is set to **[OTHER]** (OtHEr).

Example

Controlling the volume contained in a tank between 6 and 15 m³.

- Used sensor 4 to 20 mA, 4.5 m³ for 4 mA and 20 m³ for 20 mA, with the result that (PIF1) = 4,500 and (PIF2) = 20,000.
- Control range 6 to 15 m³, with the result that (PIP1) = 6,000 (Min. setpoint) and (PIP2) = 15,000 (Max. actual value).
- Example setpoints:
  - (rP1) (internal setpoint) = 9,500
  - (rP2) (preselected setpoint) = 6,500
  - (rP3) (preselected setpoint) = 8,000
  - (rP4) (preselected setpoint) = 11,200



Additional parameters:

- Reversing the correction direction **[PID Inversion]** (PIC). If **[PID Inversion]** (PIC) is set to **[No]** (nO), the motor speed increases when a positive deviation is detected (for example, pressure control with a compressor). If **[PID Inversion]** (PIC) is set to **[Yes]** (YES), the motor speed is reduced when a positive deviation is detected (for example, temperature control with a fan).
- The integral gain (I component) can be short-circuited via a digital input.
- A warning for **[PID feedback]** (PiF) can be configured.
- A warning for **[PID Error]** (rPE) can be configured.

Manual/Automatic operation with PID

This function includes the PID controller, the preset speeds and a manual setpoint. Depending on the state of the digital input, the frequency setpoint is given by the preset speeds or by a manual setpoint input via the PID function.

Manual PID setpoint **[Manual PID reference]** (PIM):

- Analog inputs AI1 to AI3
- Pulse inputs

Reference for preselected speed **[Predictive Speed Ref]** (FPI):

- **[AI1]** (AI1): Analog input
- **[AI2]** (AI2): Analog input
- **[AI3]** (AI3): Analog input
- **[Ref.Freq-Rmt.Term]** (LCC): Display terminal

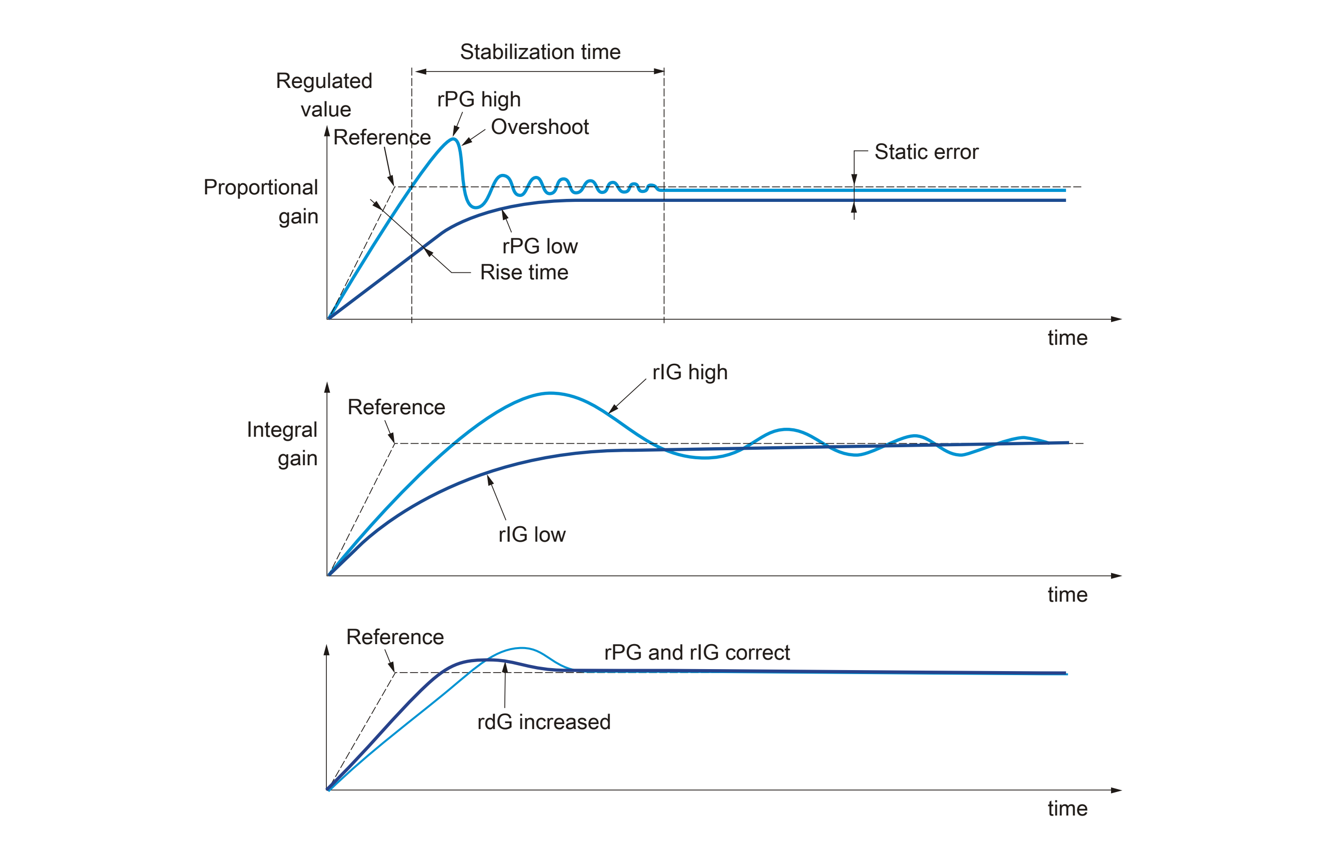
Commissioning the PID controller

1) Configuration in PID mode:
   Overview see "[PID controller] (PId-)" on page 279.
2) Perform a test using the factory settings:
   To optimize the inverter, control **[PID Prop.Gain]** (rPG) or **[PID Intgl.Gain]** (rIG) gradually and independently and observe the effect on the PID actual value in relation to the setpoint.
3) If the factory settings are unstable or the setpoint is not met:

   a) Test the frequency range of the system under load with a frequency setpoint in manual operation (without PID controllers):

      - The speed must remain stable in the steady state and correspond to the setpoint; the PID actual value must remain stable.
      - In temporary operation, the speed must follow the ramp and stabilize quickly; the PID actual value must follow the speed. Perform other tests to check inverter settings and/or sensor signals and wiring.

   b) Switch to PID mode
   c) Set **[PID ramp]** (PrP) to the lowest value permitted by the mechanics without triggering **[DC Bus Overvoltage]** (ObF).
   d) Set integral gain **[PID Intgl.Gain]** (rIG) to the minimum value.
   e) Leave derivative gain **[PID derivative gain]** (rdG) at 0.
   f) Observe the PID actual value and the setpoint.
   g) Perform a number of startup/stop operations or fast load or setpoint changes.
   h) Set proportional gain **[PID Prop.Gain]** (rPG) in such a way that allows for the best compromise between response time and stability during temporary phases (slight overshoot and 1 or 2 vibrations prior to stability).
   i) If the setpoint deviates from the preset speed value in the steady state, gradually increase integral gain **[PID Intgl.Gain]** (rIG), reduce proportional gain **[PID Prop.Gain]** (rPG) in case of instability (pump applications) and find a compromise between response time and static stability (see diagram).
   j) Finally, with the D component (derivative gain), overshoot can be reduced and response time improved via a stability compromise as compensation, which is not easy to achieve because it depends on three gain factors.
   k) Test the entire setpoint range.



The oscillation frequency depends on the system kinematics:

Parameter	Rise time	Overshoot	Stabilizing time	Static error
rPG +	- -	+	=	-
rIG +	-	+ +	+	- -
rdG +	=	-	-	=

5.2.4.16.2 [Feedback] (Fdb-)

Access

[Complete settings] → [Generic functions] → [PID controller] → [Feedback]

About this menu

> **Note:**
>
> **This function cannot be used with certain other functions.**

[Type of control] (tOCt)

PID control type = Selection of unit.

Setting	Code/Value	Description
[nA]	(nA)	Nothing special Factory setting
[Other]	(Other)	Other control and unit

[PID feedback] (PIF)

Actual value of PID controller.

Setting	Code/Value	Description
[No]	(nO)	Not assigned Factory setting
[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3
[AI Virtual 1]	(AIv1)	Virtual analog input 1
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[AI1 Type] (AI1t)

Configures analog input AI1.

This parameter is accessible if [PID feedback] (PIF) is set to [AI1] (AI1).

	Setting	Code/Value	Description
★	[Voltage]	(10U)	0 to 10 VDC Factory setting
	[Current]	(0A)	0 to 20 mA

[AI1 min value] (UIL1)

Voltage scaling parameter for 0% on AI1.

This parameter is accessible if [PID feedback] (PIF) is set to [AI1] (AI1) and if [AI1 Type] (AI1t) is set to [Voltage] (10U).

	Setting	Description
★	0.0 to 10.0 VDC	Setting range Factory setting: 0.0 VDC

[AI1 max value] (UIH1)

Voltage scaling parameter for 100% on AI1.

This parameter is accessible if [PID feedback] (PIF) is set to [AI1] (AI1) and if [AI1 Type] (AI1t) is set to [Voltage] (10U).

	Setting	Description
★	0.0 to 10.0 VDC	Setting range Factory setting: 10.0 VDC

[AI1 min value] (CRL1)

Current scaling parameter for 0% on AI1.

This parameter is accessible if [PID feedback] (PIF) is set to [AI1] (AI1) and if [AI1 Type] (AI1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 0.0 mA

[AI1 min value] (CRH1)

Current scaling parameter for 100% on AI1.

This parameter is accessible if [PID feedback] (PIF) is set to [AI1] (AI1) and if [AI1 Type] (AI1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 20.0 mA

[AI1 range] (AI1L)

AI1 scaling selection.

This parameter is accessible if [PID feedback] (PIF) is set to [AI1] (AI1) and if [AI1 Type] (AI1t) is set to [Current] (0A).

This parameter is forced to [0-100%] (POS) if [AI1 Type] (AI1T) is not set to [Current] (0A) or if [AI1 min value] (CRL1) is lower than 3 mA.

	Setting	Code/Value	Description
★	[0-100%]	(PoS)	Unidirectional: AI1 current scaling is 0 to 100%. Factory setting
	[-/+100%]	(PoSnEG)	Bidirectional: Current scaling for AI1 is -100 to 100%. [AI1 min. value] (CRL1) corresponds to -100%. [AI1 max value] (CRH1) corresponds to 100%.

[AI2 Type] (AI2t)

Configures analog input AI2.

This parameter is accessible if [PID feedback] (PIF) is set to [AI2] (AI2).

	Setting	Code/Value	Description
★	[Voltage]	(10U)	0 to 10 VDC
	[Voltage +/-]	(n10U)	±10 V Factory setting

[AI2 min value] (UIL2)

Voltage scaling parameter for 0% on AI2.

This parameter is accessible if [PID feedback] (PIF) is set to [AI2] (AI2) and if [AI1 Type] (AI2t) is set to [Voltage] (10U).

Identical to [AI1 min value] (UIL1).

[AI2 max value] (UIH2)

Voltage scaling parameter for 0% on AI2.

This parameter is accessible if [PID feedback] (PIF) is set to [AI2] (AI2) and if [AI1 Type] (AI2t) is set to [Voltage] (10U).

Identical to [AI1 max value] (UIH1).

[AI3 Type] (AI3t)

Configures analog input AI3.

This parameter is accessible if [PID feedback] (PIF) is set to [AI3] (AI3).

Identical to [AI2 Type] (AI2t).

[AI3 min value] (UIL3)

Voltage scaling parameter for 0% on AI3.

This parameter is accessible if [PID feedback] (PIF) is set to [AI3] (AI3) and if [AI3 Type] (AI3t) is set to [Voltage] (10U).

Identical to [AI1 min value] (UIL1).

[AI3 max value] (UIH3)

Voltage scaling parameter for 100% on AI3.

This parameter is accessible if [PID feedback] (PIF) is set to [AI3] (AI3) and if [AI3 Type] (AI3t) is set to [Voltage] (10U).

Identical to [AI1 max value] (UIH1).

[AI3 min value] (CrL3)

Current scaling parameter for 0% on AI3.

This parameter is accessible if [PID feedback] (PIF) is set to [AI3] (AI3) and if [AI3 Type] (AI3t) is set to [Current] (0A).

Identical to [AI1 min value] (CrL1).

[AI3 max value] (CrH3)

Current scaling parameter for 100% on AI3.

This parameter is accessible if [PID feedback] (PIF) is set to [AI3] (AI3) and if [AI3 Type] (AI3t) is set to [Current] (0A).

Identical to [AI1 max value] (CrH1).

[AI3 range] (AI3L)

AI3 scaling selection.

This parameter is accessible if [PID feedback] (PIF) is set to [AI3] (AI3) and if [AI3 Type] (AI3t) is set to [Current] (0A).

Identical to [AI1 range] (AI1L).

[Min PID feedback] (PIF1)

Minimum PID actual value.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Description
	0 to [Max PID feedback] (PIF2)	Setting range Factory setting: 100

[Max PID feedback] (PIF2)

Maximum PID actual value.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Description
	[Max PID feedback] (PIF2) to 32,767	Setting range Factory setting: 1,000

[PID feedback] (rPF)

Value for PID actual value, display only.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Description
	0 to 65,535	Setting range Factory setting: 0

[Min Fbk Warning] (PAL)

Warning for the minimum actual value.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Description
	0 to 65,535	Setting range Factory setting: 100

[Max Fbk Warning] (PAH)

Warning for the maximum actual value.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Description
	0 to 65,535	Setting range Factory setting: 1,000

5.2.4.16.3 [PID Reference] (rF-)

Access

[Complete settings] → [Generic functions] → [PID controller]→ [PID Reference]

About this menu

> **Note:**
>
> **This function cannot be used with certain other functions.**

[Intern PID Ref] (PII)

Internal PID setpoint.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Code/Value	Description
★	[No]	(nO)	The PID controller setpoint is determined by [Ref Freq 1 Config] (Fr1) or [Ref.1B channel] (Fr1b) using addition/subtraction/multiplication functions. See overview. Factory setting
	[Yes]	(YES)	The PID controller setpoint is internally determined by [Internal PID ref] (rPI).

[Ref Freq 1 Config] (Fr1)

Configures frequency setpoint 1.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO) and if [Intern PID Ref] (PII) is set to [No] (nO).

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[AI1]	(AI1)	Analog input AI1 Factory setting
[AI2] to [AI3]	(AI2) to (AI3)	Analog inputs AI2 to AI3 **Note:** **Accessing selection AI3 is possible for inverters with a power output greater than 22 kW.**
[AI Virtual 1]	(AIv1)	Virtual analog input 1
[Ref Frequency via DI]	(UPdt)	Assigns the up/down function via DIx.
[Ref.Freq-Rmt.Term]	(LCC)	Frequency setpoint via remote operator terminal.
[Ref. Freq-Com. Module]	(nEt)	Frequency setpoint via POWERLINK
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Min PID reference] (PIP1)

Minimum PID setpoint.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Description
★ ⟳	[Min PID feedback] (PIF1) to [Max PID reference] (PIP2)	Setting range Factory setting: 150

[Max PID reference] (PIP2)

Maximum PID setpoint.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Description
★ ⟳	[Min PID reference] (PIP1) to [Max PID feedback] (PIF2)	Setting range Factory setting: 900

[Internal PID ref] (rPI)

Internal PID setpoint.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO) and if [Intern PID Ref] (PII) is set to [Yes] (YES).

	Setting	Description
★ ⟳	[Min PID reference] (PIP1) to [Max PID reference] (PIP2)	Setting range Factory setting: 150

[Auto/Manual assign.] (PAU)

Selects auto/manual for the input.

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

	Setting	Code/Value	Description
★	[Not Assigned]	(nO)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Manual PID Reference] (PIM)

Manual PID setpoint. Setpoint input in manual mode.

This parameter is accessible if [PID feedback] (PIF) is not set to [Configured] (nO) and if [Auto/Manual assign.] (PAU) is not set to [No] (nO).

The preset speeds are active on a manual setpoint if they are configured.

	Setting	Code/Value	Description
★	[No]	(nO)	Not assigned Factory setting
	[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3
	[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

5.2.4.16.4 [PID preset references] (PrI)

Access

[Complete settings] → [Generic functions] → [PID controller] → [Ref Frequency] → [PID preset references]

About this menu

The function is accessible if [PID feedback Assign] (PIF).

[2 PID Preset Assign] (Pr2)

Assigns 2 preset PID values.

If the assigned input or bit is at state 0, the function is inactive.

If the assigned input or bit is at state 1, the function is active.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[4 PID Preset Assign] (Pr4)

Assigns 4 preset PID values.

Identical to [2 PID Preset Assign] (Pr2).

Before assigning this function, ensure that [2 PID Preset Assign] (Pr2) has been assigned.

[Ref PID Preset 2] (rP2)

Second preset PID setpoint.

This parameter is only accessible if [2 PID Preset Assign] (Pr2) has been assigned.

	Setting	Description
	[Min PID reference] (PIP1) to [Max PID reference] (PIP2)	Setting range Factory setting: 300

[Ref PID Preset 3] (rP3)

Third preset PID setpoint.

This parameter is only accessible if [4 PID Preset Assign] (Pr4) has been assigned.

	Setting	Description
	[Min PID reference] (PIP1) to [Max PID reference] (PIP2)	Setting range Factory setting: 600

[Ref PID Preset 4] (rP4)

Fourth preset PID setpoint.

This parameter is only accessible if [4 PID Preset Assign] (Pr4) and [2 PID Preset Assign] (Pr2) are assigned.

	Setting	Description
	[Min PID reference] (PIP1) to [Max PID reference] (PIP2)	Setting range Factory setting: 900

5.2.4.16.5 [PID Reference] (rF)

Access

[Complete settings] → [Generic functions] → [PID controller] → [PID Reference]

[Predictive Speed Ref] (FPI)

Reference for preselected speed

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Code/Value	Description
	[No]	(nO)	Not assigned Factory setting
	[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3
	[Ref.Freq-Rmt.Term]	(LCC)	Frequency setpoint via remote operator terminal.
	[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Speed Input %] (PSr)

Setpoint for PID input speed as a percentage.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Description
	1 to 100%	Setting range Factory setting: 100%

5.2.4.16.6 [Settings] (St-)

Access

[Complete settings] → [Generic functions] → [PID controller] → [Settings]

About this menu

This parameter is accessible if [PID feedback] (PIF) is not set to [Not Configured] (nO).

> **Note:**
>
> **This function cannot be used with certain other functions.**

[PID Prop.Gain] (rPG)

Proportional gain for PID.

	Setting	Description
★ ⟲	0.01 to 100	Setting range Factory setting: 1

[PID Intgl.Gain] (rIG)

Integral gain.

	Setting	Description
★ ⟲	0.01 to 100	Setting range Factory setting: 1

[PID derivative gain] (rdG)

Derivative gain.

	Setting	Description
★ ⟲	0 to 100	Setting range Factory setting: 0

[PID ramp] (PrP)

PID acceleration/deceleration ramp, defined by [Min PID reference] (PIP1) to [Max PID reference] (PIP2) and vice versa.

	Setting	Description
★ ⟲	0 to 99.9 s	Setting range Factory setting: 0 s

[PID Inversion] (PIC)

PID inversion.

	Setting	Code/Value	Description
★	[No]	(nO)	No Factory setting
	[Yes]	(YES)	Yes

[PID Min Output] (POL)

Minimum value of the PID output in Hz.

	Setting	Description
★ ⟲	-599.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[PID Max Output] (POH)

Maximum value of the PID output in Hz.

	Setting	Description
★	-599.0 to 599.0 Hz	Setting range Factory setting: 60.0 Hz

[PID error Warning] (PEr)

Maximum actual value warning for gain.

	Setting	Description
★	0 to 65,535	Setting range Factory setting: 100

[PID Integral OFF] (PIS)

Integral shunt.

If the assigned input or bit is in state 0, the function is inactive (I component of the PID is valid).

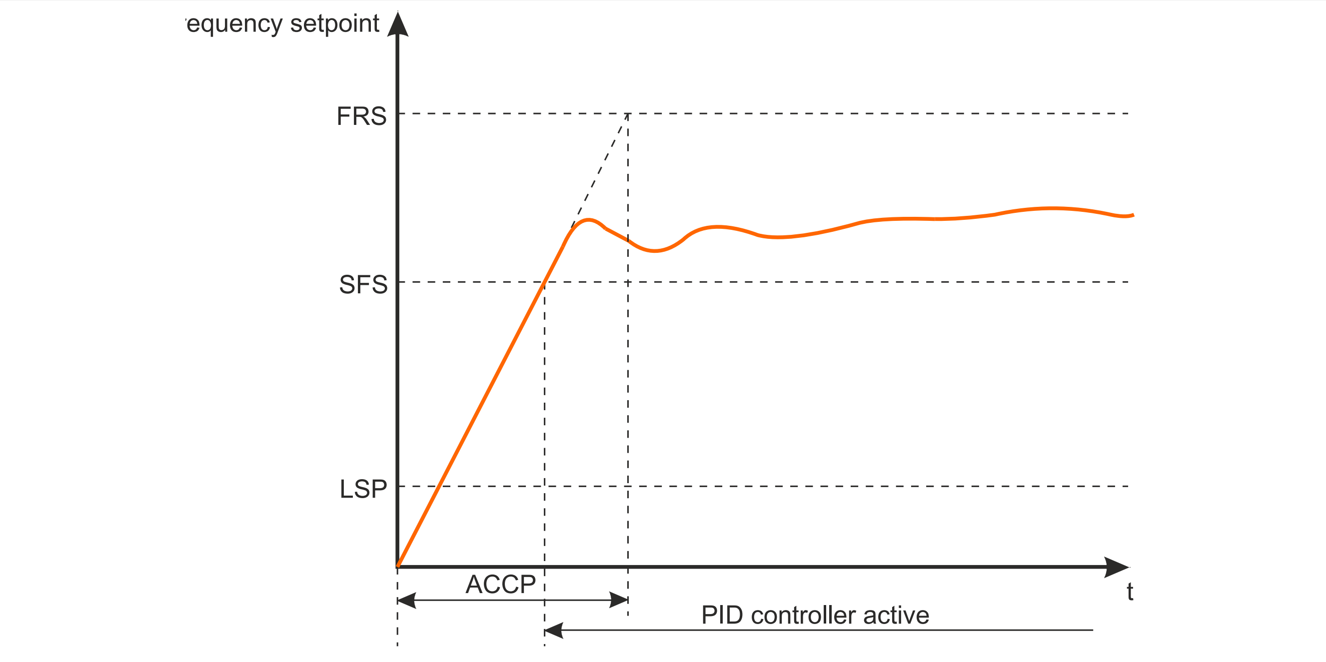
If the assigned input or bit is in state 1, the function is active (I component of the PID is locked).

	Setting	Code/Value	Description
★	[Not Assigned]	(no)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[PID acceleration time] (ACCP)

PID: Acceleration time when switching on.

The PID start ramp can be applied before the PID controller is started to quickly reach the PID setpoint without increasing the PID gain.



	Setting	Description
	0.01 to 99.99 s[1)]	Setting range Factory setting: 5.00 s

1) Range 0.01 to 99.99 s, 0.1 to 999.9 s or 1 to 6,000 s according to [Ramp increment] (Inr).

[PID Start Ref Freq] (SFS)

Frequency setpoint for PID startup

	Setting	Description
	0.0 to 599.0 Hz	Setting range If [PID Start Ref Freq] (SFS) is lower than [Low Speed] (LSP), this function has no effect. Factory setting: 0.0 Hz

5.2.4.17 [Generic functions] - [Threshold reached]

[Threshold reached] (tHrE-)

Access

[Complete settings] → [Generic functions] → [Threshold reached]

[Low I Threshold] (CtdL)

Lower current threshold value (for warning [Low Current Reached] (CTAL)).

	Setting	Description
	0 to 65.35 A	Setting range Factory setting: 0 A

[High Current Thd] (Ctd)

Upper current threshold value (for warning [Current Thd Reached] (CTA)).

	Setting	Description
	0 to 65.35 A	Setting range Factory setting: Nominal current inverter

[Low Freq. Threshold] (FtdL)

Low threshold value of the motor frequency (for warning [Mot Freq Low Thd] (FTAL)).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Motor Freq Thd] (Ftd)

Motor frequency threshold (for warning [Mot Freq High Thd] (FTA)).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 50.0 Hz

[2 Freq. Threshold] (F2dL)

Low threshold value 2 of the motor frequency (for warning [Mot Freq Low Thd 2] (F2AL)).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Freq. threshold 2] (F2d)

Threshold value 2 of the motor frequency (for warning [Mot Freq High Thd 2] (F2A)).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 50.0 Hz

[Motor Therm Thd] (ttd)

Threshold value of the thermal motor state (for warning [Motor Therm Thd reached] (TSA)).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Motor2 therm. level] (ttd2)

Threshold value of thermal state motor 2 (for warning [Mot2 Therm Thd reached] (TS2)).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Motor3 therm. level] (ttd3)

Threshold value of thermal state motor 3 (for warning [Mot3 Therm Thd reached] (TS3)).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Motor4 therm. level] (ttd4)

Threshold value of thermal state motor 4 (for warning [Mot4 Therm Thd reached] (TS4)).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Reference high Thd] (rtd)

Threshold value of frequency setpoint "High" (for warning [Ref Freq High Thd reached] (RTAH)).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Reference low Thd] (rtdL)

Threshold value of frequency setpoint "Low" (for warning [Ref Freq Low Thd reached] (RTAL)).

	Setting	Description
	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[High torque thd.] (ttH)

Warning for high torque (for warning **[High Torque Warning]** (TTHA)).

	Setting	Description
	-300 to 300%	Setting range Factory setting: 100%

[Low torque thd.] (ttL)

Warning for low torque (for warning **[Low Torque Warning]** (TTLA)).

	Setting	Description
	-300 to 300%	Setting range Factory setting: 50%

5.2.4.18 [Generic functions] – [Mains contactor command]

[Mains contactor command] (LLC-)

Access

[Complete settings] → **[Generic functions]** → **[Mains contactor command]**

About this menu

The line contactor closes each time a move command (forward or reverse direction) is transmitted and opens after each stop as soon as the inverter is locked. The contactor opens when the motor reaches zero speed in stop mode "Stop at ramp", for example.

Note:

The inverter control power supply must be provided by an external 24 VDC source.

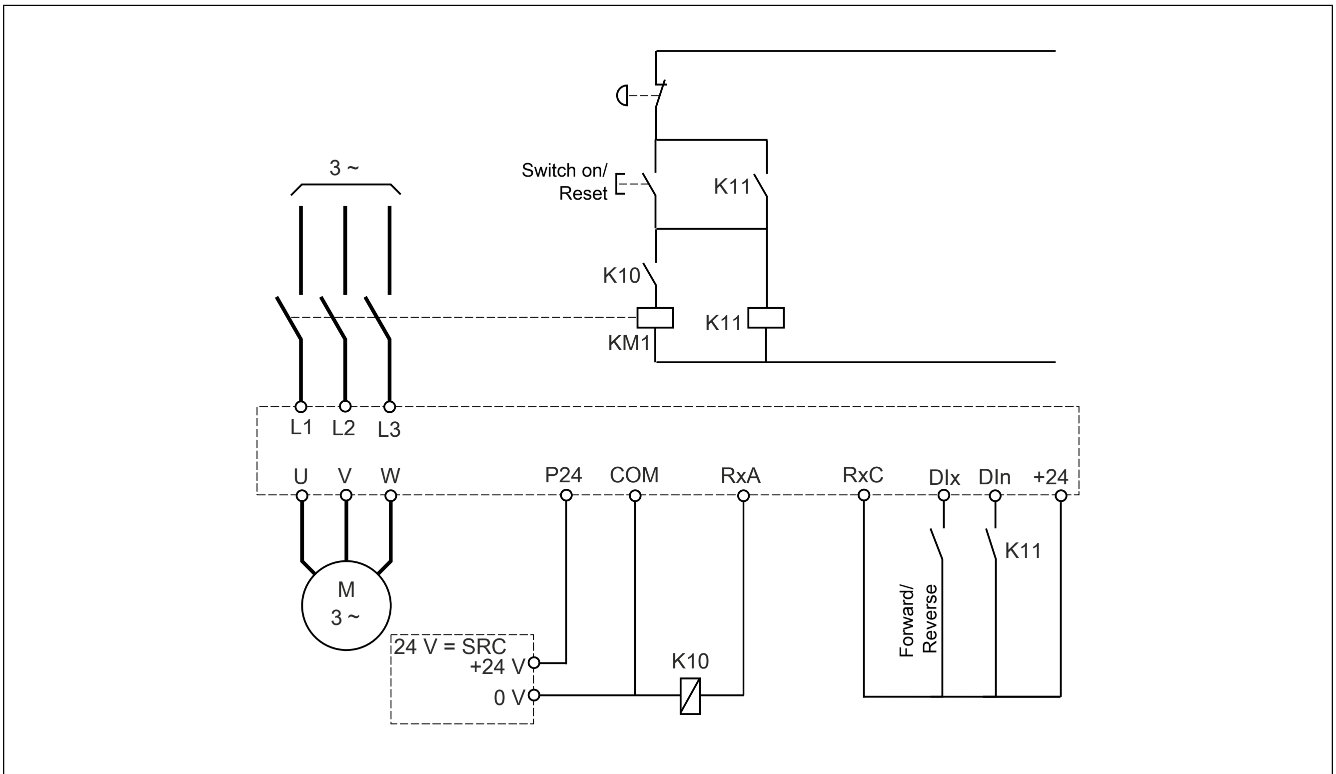
Note:

INVERTER DAMAGE

Do not use this function at intervals less than 60 seconds.

Failure to follow these instructions can result in damage to property.

Example circuit (24 VDC power supply):



DIx = Move command **[Forward]** (Frd) or **[Reverse]** (rrS)

RxA/RxC = [Mains Contactor] (LLC)

DIn = [Drive Lock] (LES)

> **Note:**
>
> **After releasing the emergency switching-off device, button "Run/Reset" must be pressed.**

[Mains Contactor] (LLC)

Line contactor control.

Setting	Code/Value	Description
[No]	(nO)	Not assigned. Factory setting
[R2] to [R3]	(r2) to (r3)	Relay outputs R2 to R3 **Note:** **Accessing selection R3 is possible for inverters with a power output greater than 22 kW.**
[DQ1 Digital Output] to [DQ2 Digital Output]	(dO1) to (dO2)	Digital outputs DQ1 to DQ2 **Note:** **Accessing selection DQ2 is possible for inverters with a power output less than 30 kW.**

[Drive Lock] (LES)

Assigns inverter locking

This parameter is accessible if [Mains Contactor] (LLC) is not set to [No] (nO).

The inverter is locked if the assigned input or bit changes to 0.

	Setting	Code/Value	Description
	[Not Assigned]	(no)	Not assigned Factory setting
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**
★	[DI1 (Low level)] to [DI8 (Low level)]	(L1L) to (L8L)	Digital inputs DI1 to DI8 used for low level **Note:** **Accessing selection DI8 with a low level is possible for inverters with a power output greater than 22 kW.**

[Mains V. time out] (LCt)

Monitoring time for closing the mains contactor.

Setting	Description
1 to 999 s	Setting range Factory setting: 5 s

5.2.4.19 [Generic functions] – [Output contactor cmd]

[Output contactor cmd] (OCC-)

Access

[Complete settings] → [Generic functions] → [Output contactor cmd]

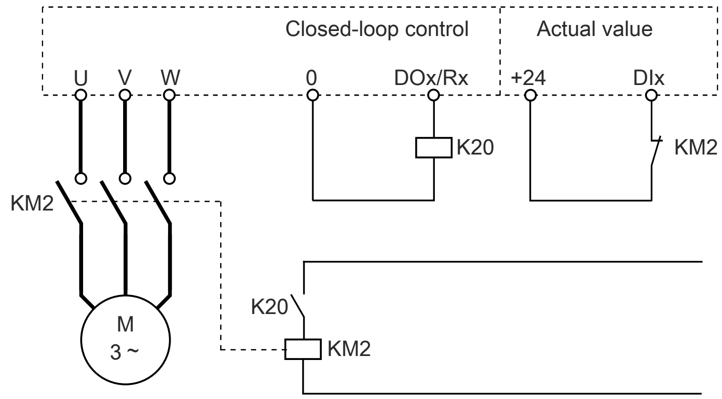
About this menu

This function enables the inverter to control and/or monitor a contactor installed between the inverter and the motor.

Control of the output contactor by the inverter is enabled by assigning [Out. contactor Assign] (OCC). When a move command is enabled, a request to close the contactor is output. If no current is applied to the motor, a request to open the contactor is output.

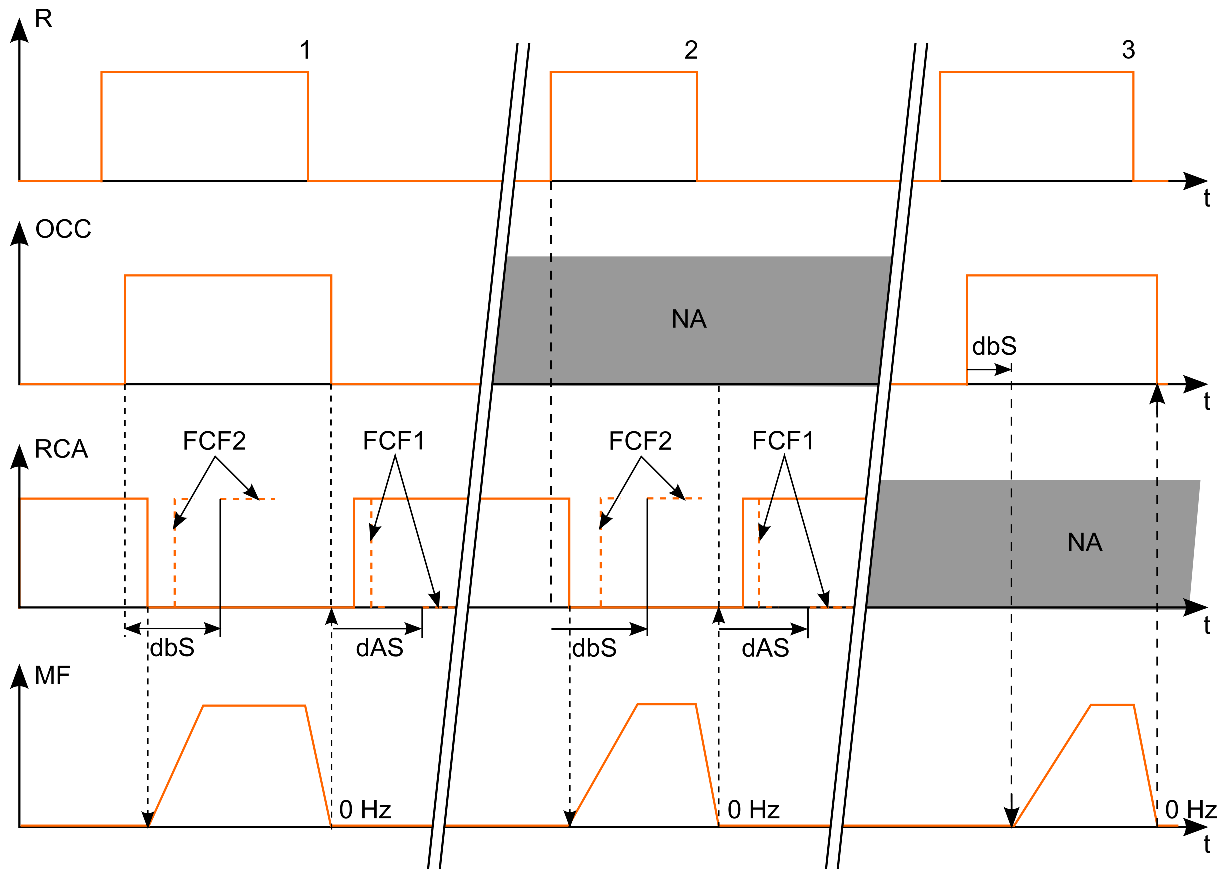
Output contactor monitoring by the inverter is enabled by assigning the actual value to [Output contact. Fdbk] (RCA). In case of contradictions, the inverter triggers the following:

- Fault **[Out Contact Opened Error]** (FCF2) if **[Output contact. Fdbk]** (RCA) is not closed before **[Delay to motor run]** (DBS) has elapsed or **[Output contact. Fdbk]** (RCA) opens while the motor is running.
- Fault **[Out Contact Closed Error]** (FCF1) if **[Output contact. Fdbk]** (RCA) is not opened before **[Delay to open con.]** (DAS) has elapsed or **[Output contact. Fdbk]** (RCA) closes when the motor stops.



Note:

- **Fault [Out Contact Opened Error] (FCF2) can be deleted by changing the move command from 1 to 0.**
- **[Output contact. Fdbk] (OCC) and [Output contact. Fdbk] (RCA) can be used individually.**
- **When using the DC injection braking function, the output contactor does not close as long as DC braking is active.**



1	OCC and RCA assigned
2	RCA assigned
3	OCC assigned
t	Time
R	Move command

OCC	Output contactor
RCA	Actual value for output contactor
NA	Not assigned
MF	Motor frequency

[Out. contactor Assign] (oCC)

Line contactor control.

Setting	Code/Value	Description
[No]	(nO)	Not assigned. Factory setting
[R2] to [R3]	(r2) to (r3)	Relay outputs R2 to R3 **Note:** **Accessing selection R3 is possible for inverters with a power output greater than 22 kW.**
[DQ1 Digital Output] to [DQ2 Digital Output]	(dO1) to (dO2)	Digital outputs DQ1 to DQ2 **Note:** **Accessing selection DQ2 is possible for inverters with a power output less than 30 kW.**

[Output contact. Fdbk] (rCA)

Actual value for output contactor

The motor starts running if the assigned digital input or bit changes to 0.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1 (Low level)] to [DI8 (Low level)]	(L1L) to (L8L)	Digital inputs DI1 to DI8 used for low level **Note:** **Accessing selection DI8 with a low level is possible for inverters with a power output greater than 22 kW.**

[Delay to motor run] (dbS)

Delay when closing the open contactor

This parameter delays:

- Motor control after a move command has been output if the inverter only monitors the output contactor.
- Error monitoring [Out Contact Opened Error] (FCF2) if [Output contact. Fdbk] (RCA) is assigned.

The delay must be greater than the closing time of the output contactor.

The parameter is accessible if [Out. contactor Assign] (OCC) or [Output contact. Fdbk] (RCA) is assigned.

Setting	Description
0.05 to 60.00 s	Setting range Factory setting: 0.15 s

[Delay to open con.] (dAS)

Delay when opening the contactor

The delay must be greater than the opening time for the output contactor.

If the value of the digital input, which is assigned to [Output contact. Fdbk] (RCA), is not 0 at the end of this delay, fault [Out Contact Closed Error] (FCF1) is triggered. If this parameter is defined as 0, fault [Out Contact Closed Error] (FCF1) is not monitored.

The parameter is accessible if [Output contact. Fdbk] (RCA) is assigned.

Setting	Description
0.00 to 5.00 s	Setting range Factory setting: 0.10 s

5.2.4.20 [Generic functions] - [Reverse Disable]

[Reverse Disable] (rEIn-)

Access

[Complete settings] → [Generic functions] → [Reverse Disable]

[Reverse Disable] (rIn)

Disables reverse direction.

Reverse direction requests transmitted by digital inputs are taken into account.

Reverse direction requests transmitted from the display terminal or cable are not taken into account.

Any speed setpoint for reverse rotation originating from the PID, summation input, etc. will be interpreted as null frequency (0 Hz).

Setting	Code/Value	Description
[No]	(nO)	No Factory setting
[Yes]	(YES)	Yes

5.2.4.21 [Generic functions] - [Torque limitation]

[Torque limitation] (tOL-)

Access

[Complete settings] → [Generic functions] → [Torque limitation]

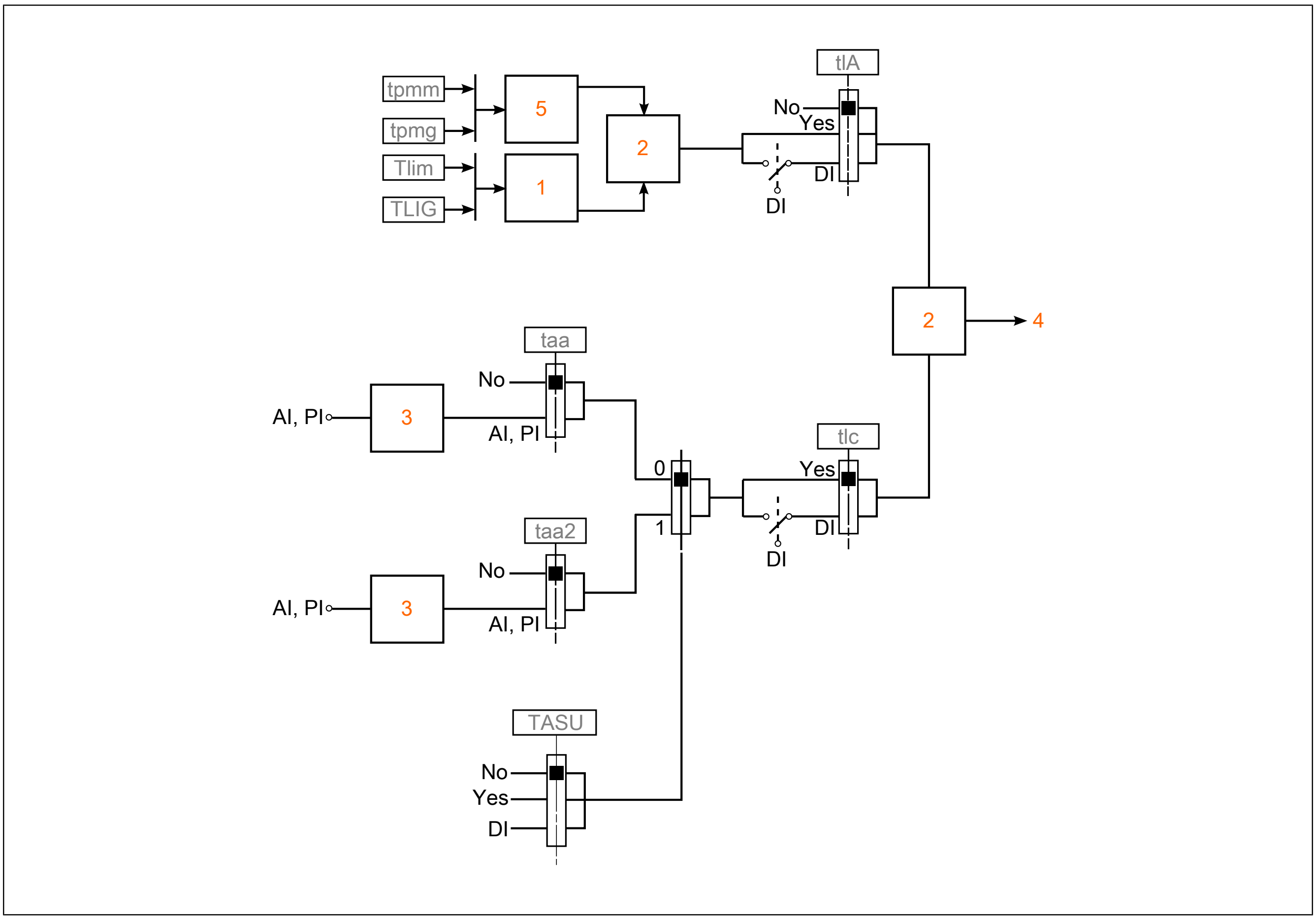
About this menu

Two types of torque limiting are possible:

- With a value that is defined by a parameter (torque or power output)
- With a value that is specified by an analog input (AI or pulse input)

If both types are enabled, the lowest value is taken into account.

Both types can be configured or switched remotely using a digital input or via the communication bus.



1 Torque limiting via parameter
2 Lowest value taken into account
3 Torque limiting via analog input, RP
4 Limit value
5 Torque limiting via parameter at power output

[Torque limit activ.] (tLA)

Enables permanent torque limiting.

If the assigned input or bit is at state 0, the function is inactive.

If the assigned input or bit is at state 1, the function is active.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[Yes]	(YES)	Yes
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Pmax Motor] (tPMM)

Maximum acceptable power output in motor mode.

This parameter is accessible if [Torque limit activ.] (tLA) is not set to [Not Assigned] (nO).

	Setting	Description
	10 to 300%	Setting range Factory setting: 300%

[Pmax Generator] (tPMG)

Maximum acceptable power output in generator mode.

This parameter is accessible if [Torque limit activ.] (tLA) is not set to [Not Assigned] (nO).

	Setting	Description
	10 to 300%	Setting range Factory setting: 300%

[Torque increment] (IntP)

Increases torque limiting

This parameter is accessible if [Torque limit activ.] (tLA) is not set to [Not Assigned] (nO).

Selects the units for parameters [Motoring torque lim] (tLIM)[Gen. torque limit] (tLIG).

	Setting	Code/Value	Description
	0.1%	0.1	Unit 0.1%
	1%	1	Unit 1% Factory setting

[Motoring torque lim] (tLIM)

Torque limiting for the motor

This parameter is accessible if [Torque limit activ.] (tLA) is not set to [Not Assigned] (nO).

Torque limiting in motor operation as a percentage or in 0.1% steps of the nominal torque according to the parameter for [Torque increment] (IntP).

	Setting	Description
	0 to 300%	Setting range Factory setting: 100%

[Gen. torque limit] (tLIG)

Torque limiting for the generator

This parameter is accessible if [Torque limit activ.] (tLA) is not set to [Not Assigned] (nO).

Torque limiting in generator operation as a percentage or in 0.1% steps of the nominal torque according to the parameter for [Torque increment] (IntP).

	Setting	Description
★ ↻	0 to 300%	Setting range Factory setting: 100%

[Analog limit activ.] (tLC)

Enabled (analog input) via a digital input.

This parameter is accessible if [Ref Torque Assign] (TAA) or [Ref Torque 2 Assign] (TAA2) is configured.

Identical to [Torque limit activ.] (tLA).

If the assigned input or bit is at 0:

- The limit is determined by parameters [Motoring torque lim] (tLIM) and [Gen. torque limit] (tLIG) if [Torque limit activ.] (tLA) is not set to [No] (nO).
- No limit if [Torque limit activ.] (tLA) is set to [No] (nO).

If the assigned input or bit is at 1: The limit depends on the input that has been assigned by [Ref Torque Assign] (tAA) or [Ref Torque 2 Assign] (tAA2).

> **Note:**
>
> **If both limits are enabled simultaneously (by the assigned input and parameter), the lowest value is taken into account.**

[Ref Torque Assign] (tAA)

Enabled via an analog value

If the function is assigned, the limit varies between 0 and 300% of the nominal torque, based on the 0 to 100% signal at the assigned input.

Examples: 12 mA on a 4-20 mA input results in a limit to 150% of the nominal torque. 2.5 V direct current on a 10 V direct current input results in 75% of the nominal torque.

Setting	Code/Value	Description
[No]	(nO)	Analog input is not assigned. Factory setting
[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3
[AI Virtual 1]	(AIv1)	Virtual analog input 1
[DI7 PulseInput] to [DI8 PulseInput]	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input. **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Ref Torque Switch Assign] (tASU)

Assigns the switch for the setpoint torque.

This parameter is accessible if [Ref Torque Assign] (TAA) or [Ref Torque 2 Assign] (TAA2) is not set to [No] (no).

Identical to [Torque limit activ.] (tLA).

[Ref Torque 2 Assign] (tAA2)

Enabled via another analog value.

Identical to [Ref Torque Assign] (tAA).

[Trq/I limit. stop] (SSb)

Torque current limiting: Behavior configuration.

Setting	Code/Value	Description
[Ignore]	(nO)	Ignores detected faults. Factory setting
[Freewheel Stop]	(YES)	Freewheel stop
[Per STT]	(Stt)	Stops according to parameter [Type of stop] (Stt), but without causing a fault after stopping
[Fallback Frequency]	(LFF)	Changes to the fallback speed, which is maintained for as long as the detected fault persists and the move command has not been canceled.[1]
[Spd maintained]	(rLS)	Speed that is maintained as long as the detected fault persists and the move command is not canceled.[1]
[Ramp stop]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop
[DC Injection]	(dCI)	DC injection braking

1) Since the detected fault does not trigger a stop in this case, a relay or logic output should be assigned to display the fault.

[Trq/I limit. time out] (StO)

Torque current limiting: Fault delay [Torque Limitation Error] (SSF) and warning delay [Torque Limit Reached] (SSA).

	Setting	Description
	0 to 9,999 ms	Setting range Factory setting: 1,000 ms

5.2.4.22 [Generic functions] - [2nd current limit.]

[2nd current limit.] (CLI-)

Access

[Complete settings] → [Generic functions] → [2nd current limit.]

[Current Limitation2] (LC2)

Assigns current limiting.

If the assigned input or bit is in state 0, the first current limiting is active.

If the assigned input or bit is at state 1, the second current limiting is active.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Current Limit2 Value] (CL2)

Value for current limiting 2.

This parameter is accessible if [Current Limitation2] (LC2) is not set to [No] (nO).

> **Note:**
>
> **OVERHEATING**
>
> **It must be ensured that the motor has the required nominal power for the maximum current applied.**
>
> **Ensure that parameter [Current Limitation] (CLi) is set to a lower or the same value as shown in this table.**
>
> **When determining the current limit value, the duty cycle of the motor and all factors of the respective application including declassification requirements must be taken into account.**
>
> **Failure to follow these instructions can result in damage to property.**

The setting range is limited to 1.8 In.

> **Note:**
>
> **If the setting is less than 0.25, the inverter can be locked in state [OutPhaseLoss Assign] (OPL) if this has been enabled. If it is less than the motor no-load current, the motor cannot run.**

	Setting	Description
	0 to 1.8 In[1]	Setting range Factory setting: 1.8 In[1]

1) Corresponds to the nominal current of the inverter specified on the nameplate.

[Current Limitation] (CLI)

First current limiting value.

> **Note:**
>
> **OVERHEATING**
>
> **It must be ensured that the motor has the required nominal power for the maximum current applied.**
>
> **Ensure that parameter [Current Limitation] (CLi) is set to a lower or the same value as shown in this table.**
>
> **When determining the current limit value, the duty cycle of the motor and all factors of the respective application including declassification requirements must be taken into account.**
>
> **Failure to follow these instructions can result in damage to property.**

The setting range is limited to 1.8 In.

> **Note:**
>
> **If the setting is less than 0.25, the inverter can be locked in state [OutPhaseLoss Assign] (OPL) if this has been enabled. If it is less than the motor no-load current, the motor cannot run.**

	Setting	Description
	0 to 1.8 In[1]	Setting range Factory setting: 1.8 In[1]

1) Corresponds to the nominal current of the inverter specified on the nameplate.

5.2.4.23 [Generic functions] - [Jog]

[Jog] (jOG)

Access

[Complete settings] → [Generic functions] → [Jog]

[Jog Assign] (Jog)

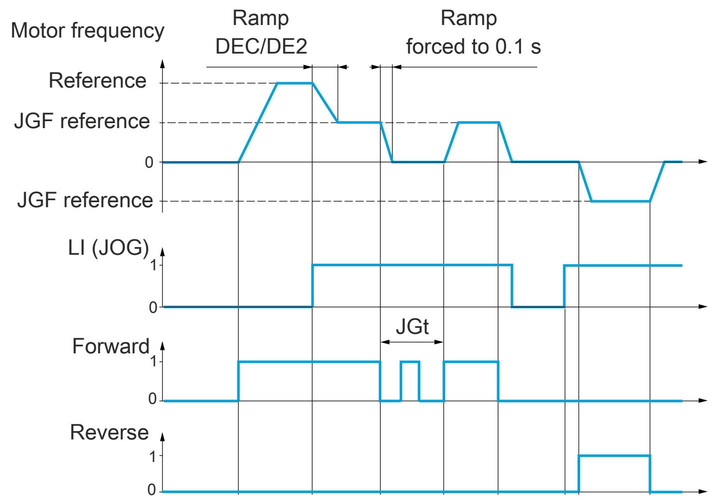
Jog (step) operation.

Function JOG is only active if the command channel and setpoint channel are on the terminals.

This function can be used if [PID feedback] (PiF), [Brake logic control] (bLC), [High speed hoisting] (HSO), [+ Speed Assign] (USI) and [- Speed Assign] (DSI) is set to [No] (nO) and if [Ref Freq 2 Config] (FR2) is set to [Ref Frequency via DI] (UPDT).

The function is active if the assigned input or bit is set to 1.

Example: Operation via 2-wire control ([2/3-Wire Control] (tCC) = [2-Wire Control] (2C))



Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Jog frequency] (JGF)

This parameter is accessible if [Jog Assign] (JOG) is not set to [No] (nO).

	Setting	Description
	0.0 to 10.0 Hz	Setting range Factory setting: 10.0 Hz

[Jog Delay] (JGt)

This parameter is accessible if [Jog Assign] (JOG) is not set to [No] (nO).

	Setting	Description
	0.0 to 2.0 s	Setting range Factory setting: 0.5 s

5.2.4.24 [Generic functions] - [High Speed Switching]

[High Speed Switching] (CHS)

Access

[Complete settings] → [Generic functions] → [High Speed Switching]

[2 High speed] (SH2)

Assigns 2 HSP values

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[Mot Freq High Thd]	(FtA)	Threshold value for high motor frequency reached
[2nd Freq Thd Reached]	(F2A)	2. Frequency threshold value reached
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[4 High speed] (SH4)

Assigns 4 HSP values

> **Note:**
>
> **In order to obtain 4 HSP values, [2 High speed] (SH2) must also be configured. Identical to [2 High speed] (SH2).**

[High speed] (HSP)

Motor frequency at maximum setpoint, configurable from [Low Speed] (LSP) to [Max Frequency] (tFr).

The factory setting is changed to 60 Hz if [Motor Standard] (bFr) is set to [60 Hz NEMA] (60).

	Setting	Description
	0 to 599 Hz	Setting range Factory setting: 50 Hz

[High speed 2] (HSP2)

Visible if [2 High speed] (SH2) is not set to [No] (nO).

Identical to [High speed] (HSP).

[High speed 3] (HSP3)

Visible if [4 High speed] (SH4) is not set to [No] (nO).

Identical to [High speed] (HSP).

[High speed 4] (HSP4)

Visible if [4 High speed] (SH4) is not set to [No] (nO).

Identical to [High speed] (HSP).

5.2.4.25 [Generic functions] - [Memo reference frequency]

[Memo reference frequency] (SPM)

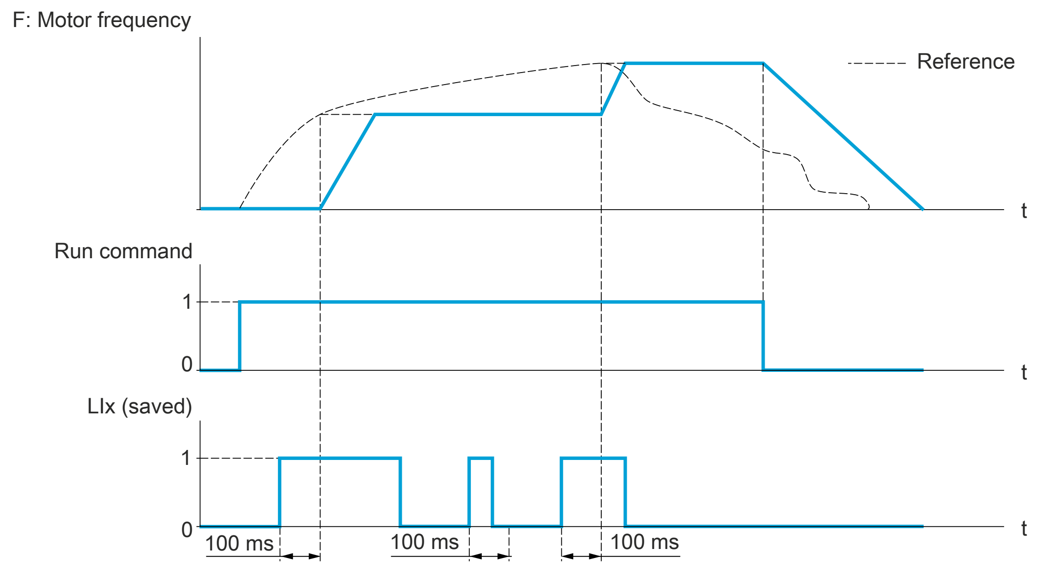
Access

[Complete settings] → [Generic functions] → [Memo reference frequency]

About this menu

Stores a speed setpoint using a digital input command with a duration greater than 0.1 s.

- This function is used to alternately control the speed of several inverters via a single analog setpoint and a digital input for each inverter.
- It is also used to confirm a network setpoint (communication bus or network) on several inverters via a digital input. This enables the synchronization of movements by eliminating deviations when setting the setpoint.
- The setpoint is detected 100 ms after the rising edge of the request. A new setpoint will only be detected upon a new request.



[Ref Freq Memo assign] (SPM)

Memory allocation for the frequency setpoint

The function is active if the assigned input is in an active state.

Setting	Code/Value	Description
[Not Assigned]	(nO)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**

5.2.4.26 [Generic functions] - [Brake logic control]

[Brake logic control] (BLC)

Access

[Complete settings] → [Generic functions] → [Brake logic control]

About this menu

Identical to menu [Brake logic control] (BLC-) (see "[Brake logic control] (BLC-)" on page 232).

5.2.4.27 [Generic functions] - [Limit switches]

[Limit switches] (LSt-)

Access

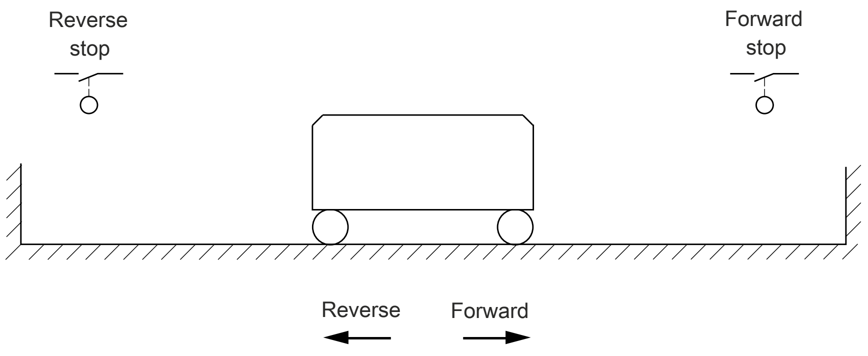
[Complete settings] → [Generic functions] → [Limit switches]

About this menu

This function can be used for setting travel path limits using limit switches.

The stop mode is configurable. If the stop contact is enabled, the start in the other direction is authorized.

Example:



The stop is enabled if the input is set to 0 (open contact).

[Stop FW assign] (LAF)

Assigns the limit value for stopping in the forward direction.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**
[DI1 (Low level)] to [DI8 (Low level)]	(L1L) to (L8L)	Digital inputs DI1 to DI8 used for low level. **Note:** **Accessing selection DI8 with a low level is possible for inverters with a power output greater than 22 kW.**

[Stop RV assign] (LAr)

Assigns the limit value for stopping in the reverse direction.

Identical to [Stop FW assign] (LAF).

[Stop type] (LAS)

Stop mode on the limit switch.

This parameter is accessible if [Stop FW assign] (LAF) or [Stop RV assign] (LAr) is assigned.

If the assigned input changes to 0, the stop is controlled according to the selected mode. A restart is only authorized for the other direction of rotation after the motor has stopped. If the two inputs are assigned to [Stop FW assign] (LAF) and [Stop RV assign] (LAr) and have the state 0, a restart is not possible.

Setting	Code/Value	Description
[On Ramp]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop
[Freewheel Stop]	(nSt)	Freewheel stop Factory setting

5.2.4.28 [Generic functions] - [Positioning by sensors]

[Positioning by sensors] (LPO)

Access

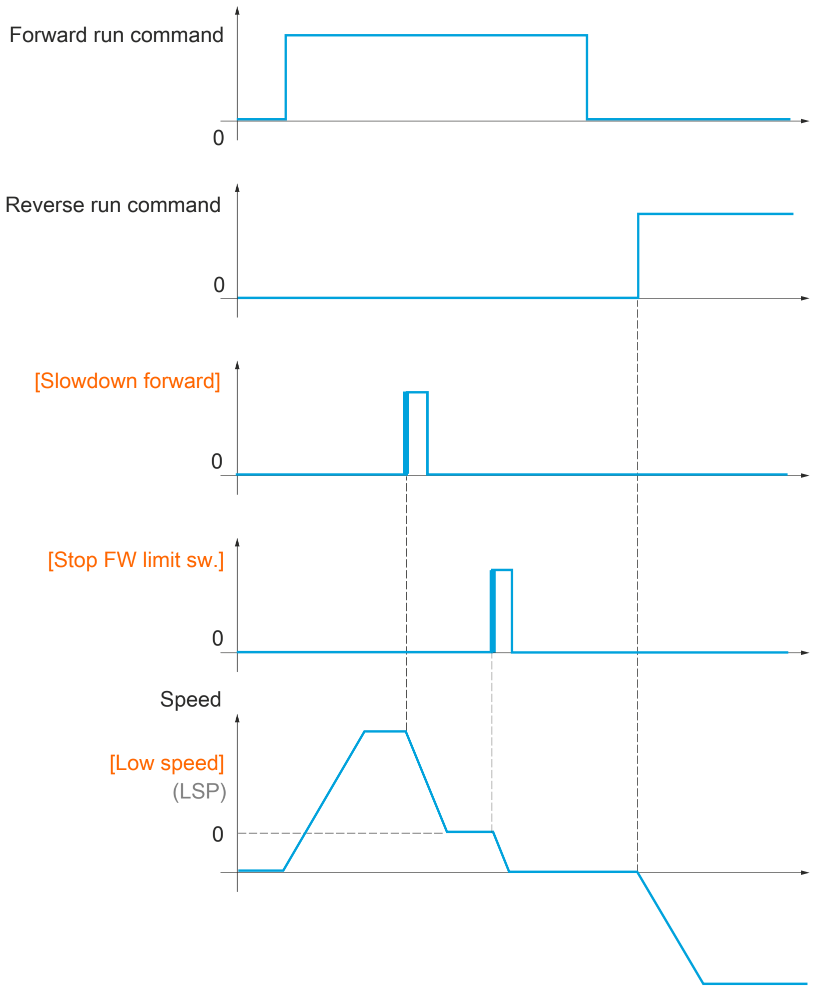
[Complete settings] → [Generic functions] → [Positioning by sensors]

About this menu

This function is used for managing positioning using position sensors or limit switches linked to logic inputs or using control word bits:

- Braking
- Stop

The action logic for the inputs and bits can be configured on a rising edge (change from 0 to 1) or a falling edge (change from 1 to 0). The example below has been configured on a rising edge:



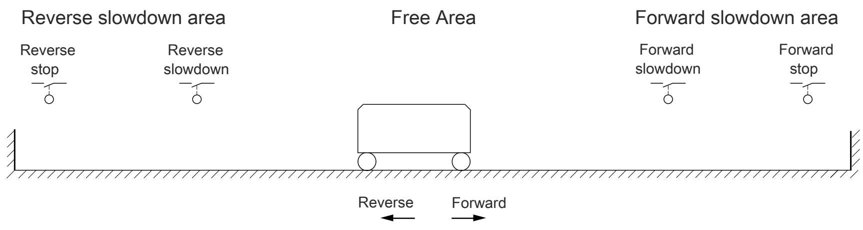
The slowdown mode and stop mode can be configured.

The operation is identical for both directions of operation. Slowdown and stopping operate according to the same logic, specified below.

Example: Forward slowdown on rising edge

- Forward slowdown takes place on a rising edge (change from 0 to 1) of the input or bit assigned to forward slowdown if this rising edge occurs in forward operation. The slowdown command is then memorized, even in the event of a power outage. Operation in the opposite direction is authorized at high frequency. The slowdown command is deleted on a falling edge (change from 1 to 0) of the input or bit assigned to forward slowdown if this falling edge occurs in reverse operation.
- A bit or a logic input can be assigned to disable this function.
- Although forward slowdown is disabled while the disable input or bit is at 1, sensor changes continue to be monitored and saved.

Example: Positioning of limit switch on rising edge



Warning!

LOSS OF CONTROL

- **Make sure to connect the limit switches correctly.**
- **Make sure to install the limit switches correctly. The limit switches must be installed at a sufficient distance from the mechanical end stop in order to ensure an appropriate stop distance.**
- **In order for them to be operational, the limit switches must be reset.**
- **Make sure the limit switches function correctly.**

Failure to follow these instructions can result in serious injury or death as well as damage to the equipment.

Operation with short cams:

Warning!

LOSS OF CONTROL

Before commissioning the motor for the first time or after having reset the configuration to factory settings, the motor must always be started up outside of the slowdown and stop ranges.

Failure to follow these instructions can result in serious injury or death as well as damage to the equipment.

Warning!

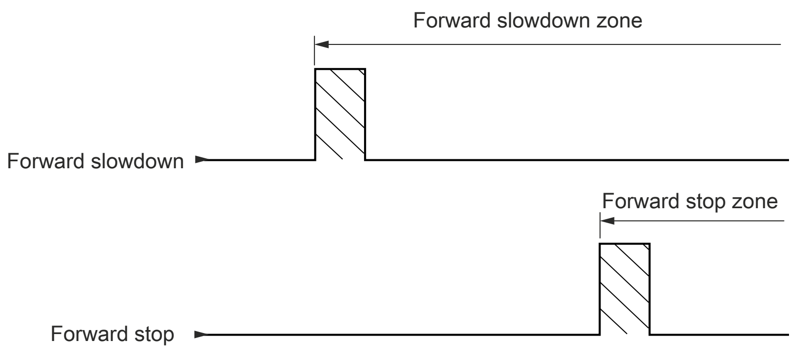
LOSS OF CONTROL

If the inverter is switched off, the current range will be stored.

If the system has been moved manually while the inverter was switched off, you need to restore the original position before switching the inverter back on.

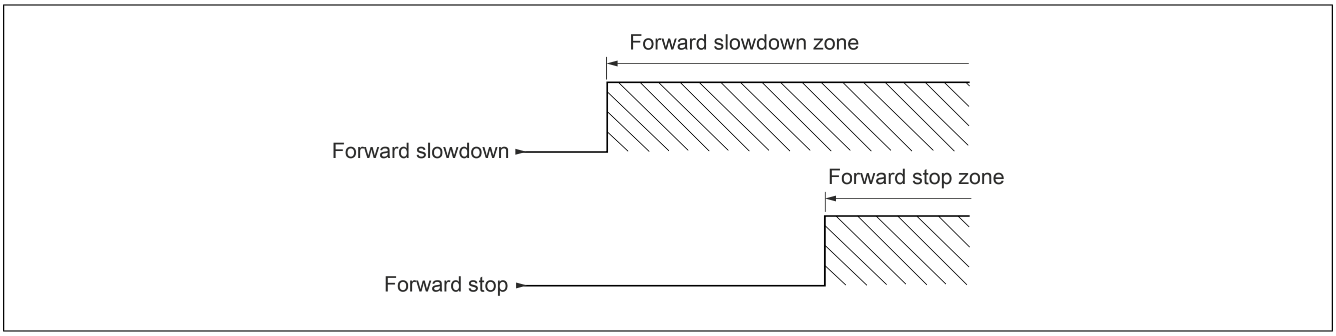
Failure to follow these instructions can result in serious injury or death as well as damage to the equipment.

In this instance, when operating for the first time or after restoring the factory settings, the inverter must initially be started outside the slowdown and stop zones in order to initialize the function.



Operation with long cams:

In this instance, there is no limitation, which means the function can be initialized across the entire system to be controlled.



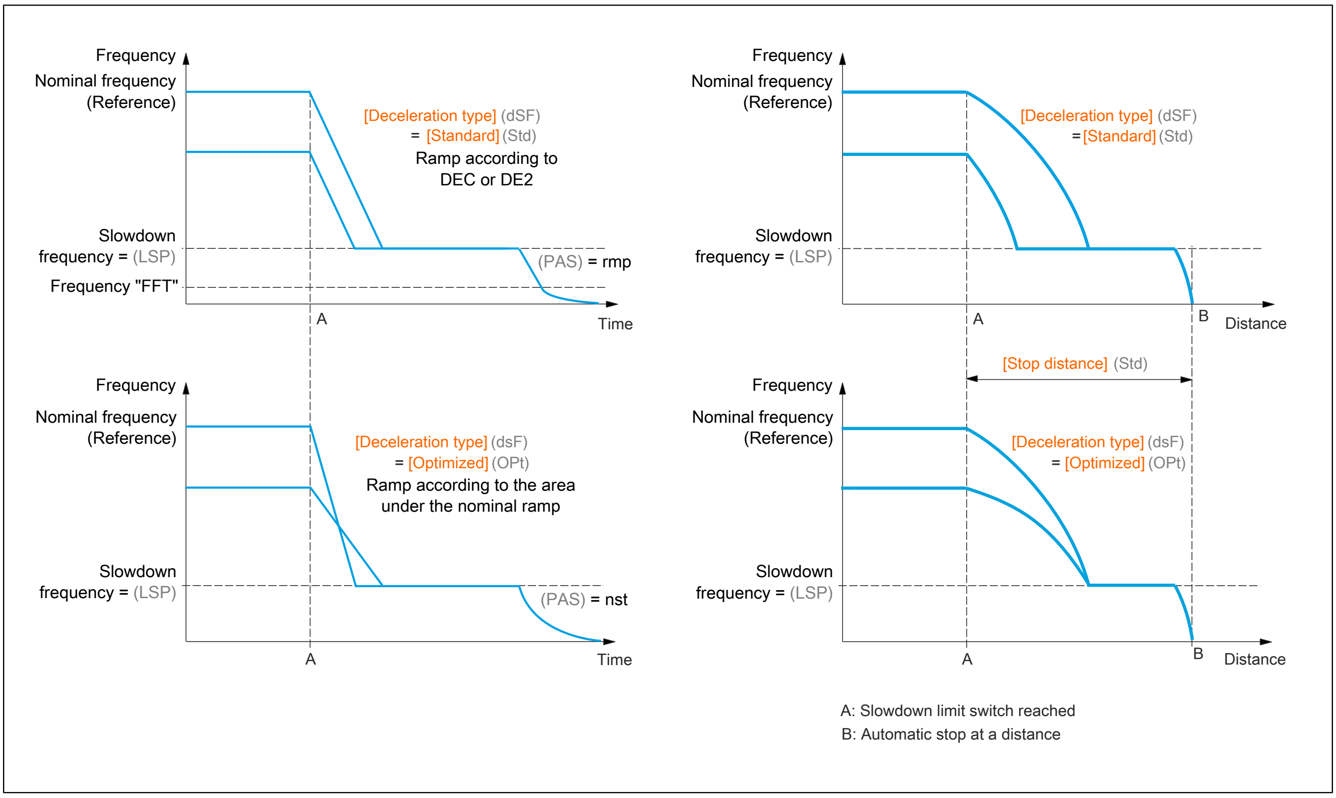
Calculated stopping distance (remote stop) after deceleration limit switch

This function can be used to control the stopping of the moving part automatically once a preset distance has been traveled after the slowdown limit switch.

On the basis of the rated linear speed and the speed estimated by the inverter when the slowdown limit switch is tripped, the inverter will induce the stop at the configured distance.

This function is useful in applications where one shared limit switch (for violations) with manual restart is shared for both directions. It will then only respond to ensure safety if the distance is exceeded. The stop limit switch retains priority in respect of the function.

Depending on parameter **[Deceleration type]** (dSF), one of the following four modes of operation is achieved:



Note:

- **If the deceleration ramp is modified while stopping at a distance is in progress, this distance will not be observed.**
- **If the direction is modified while stopping at a distance is in progress, this distance will not be observed.**

Warning!

LOSS OF CONTROL

Make sure that the configured distance is actually possible.

This function does not replace the limit switch.

Failure to follow these instructions can result in serious injury or death as well as damage to the equipment.

[Stop FW limit sw.] (SAF)

Stop switch for clockwise rotation.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Stop RV limit sw.] (SAr)

Stop switch for counterclockwise rotation.

Identical to [Stop FW limit sw.] (SAF).

[Forward Slowdown] (dAF)

Slowdown achieved on clockwise rotation.

Identical to [Stop FW limit sw.] (SAF).

[Reverse Slowdown] (dAr)

Slowdown achieved on counterclockwise rotation.

Identical to [Stop FW limit sw.] (SAF).

[Disable limit sw.] (CLS)

Deletes the limit switches.

> **Warning!**
>
> **LOSS OF CONTROL**
>
> **If [Disable limit sw.] (CLS) is set to an input and enabled, limit switch control is disabled.**
>
> **Ensure that enabling this function does not result in an unsafe condition.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

If the assigned bit or input is in state 1, the action of the limit switch is disabled. If the inverter was slowed down or stopped by the limit switch in that moment, it will start up until it reaches its speed setpoint.

This parameter can be accessed if at least one limit switch or one sensor has been assigned.

	Setting	Code/Value	Description
★	[Not Assigned]	(no)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Stop type] (PAS)

Stop mode when enabling the limit switch.

This parameter can be accessed if at least one limit switch or one sensor has been assigned.

	Setting	Code/Value	Description
★	[On Ramp]	(rMP)	Via ramp Factory setting
	[Fast stop]	(FSt)	Fast stop (ramp is reduced by [Ramp Divider] (dCF))
	[Freewheel Stop]	(nSt)	Freewheel stop

[Deceleration type] (dSF)

Adjusts the limit switch deceleration.

This parameter can be accessed if at least one limit switch or one sensor has been assigned.

	Setting	Code/Value	Description
★	[Standard]	(Std)	Uses ramp [Deceleration] (dEC) or [Deceleration 2] (dE2) (depending on which has been enabled). Factory setting
	[Optimized]	(OPt)	The ramp time is calculated on the basis of the actual speed if the slowdown contact switches in order to limit the operating time at low speed (cycle time optimization: The braking time is constant, regardless of the output speed).

[Stop distance] (Std)

Stopping distance.

This parameter can be accessed if at least one limit switch or one sensor has been assigned. Enables and adjusts function "Stopping distance calculated after the slowdown limit switch".

	Setting	Code/Value	Description
★	[No]	(nO)	Function inactive Factory setting
	[0.01...10.00]	(0.01...10.00)	Sets the stopping distance in meters

[Nom linear speed] (nLS)

Nominal linear speed.

The parameter can be accessed if at least one limit switch or one sensor has been assigned and [Stop distance] (Std) is not set to [No] (nO).

	Setting	Description
★	0.20 to 5.00 m/s	Factory setting: 1.00 m/s

[Stop corrector] (SFd)

Scaling factor applied to the stopping distance to compensate a nonlinear ramp, for example.

The parameter can be accessed if at least one limit switch or one sensor has been assigned and [Stop distance] (Std) is not set to [No] (nO).

	Setting	Description
☆	50 to 200%	Factory setting: 100%

[Memo Stop] (MStP)

Stores the stop switch.

This parameter can be accessed if at least one limit switch or one sensor has been assigned.

	Setting	Code/Value	Description
☆	[No]	(nO)	Does not store the limit switch
	[Yes]	(YES)	Saves the limit switch Factory setting

[Priority restart] (PrSt)

The startup has priority, even if the stop switch is enabled.

This parameter can be accessed if at least one limit switch or one sensor has been assigned.

	Setting	Code/Value	Description
☆	[No]	(nO)	No priority for restart if stop switch has been enabled Factory setting
	[Yes]	(YES)	Priority for restart even if stop switch has been enabled

5.2.4.29 [Generic functions] – [Torque control]

[Torque control] (tOr-)

Access

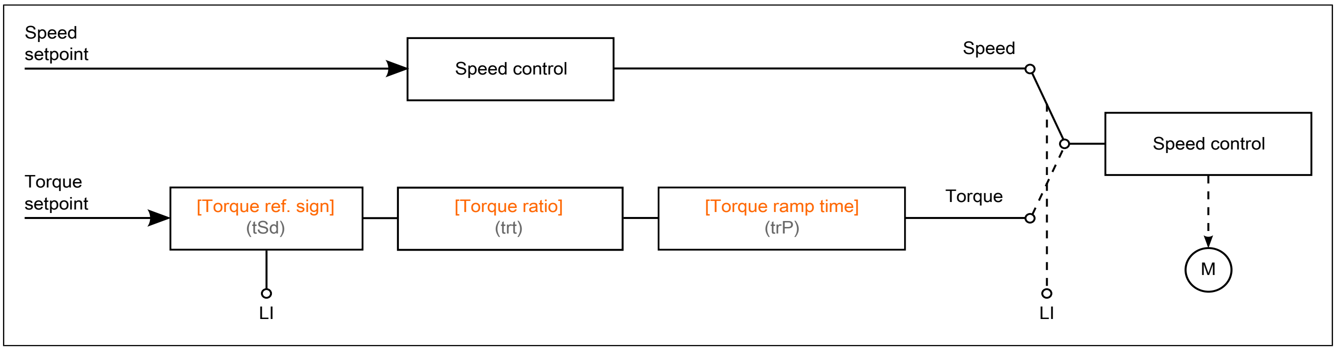
[Complete settings] → [Generic functions] → [Torque control]

About this menu

This function can be used if [Motor control type] (CTT) is set to [SVCV] (SVC) or [FVC] (FVC) or [Sync. mot.] (SYn) or [Sync.CL] (FSY).

> **Note:**
>
> **This function cannot be used with certain other functions.**

> **Note:**
>
> **This function is not compatible with the handling of fault [Load slipping] (AnF).**



This function allows switching between operating modes "Speed control" and "Torque control".

In operating mode "Torque control", the speed can fluctuate within a configurable deadband. The inverter automatically switches to speed control and remains at this speed limit if the speed reaches the upper or lower limit value. The controlled torque is therefore no longer maintained and two cases can occur:

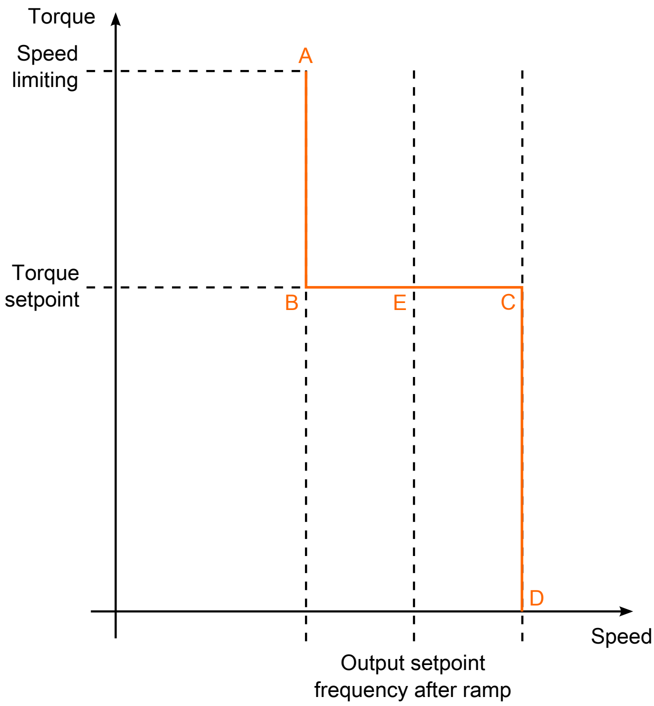
- If the torque changes to the required value, the inverter returns to torque control.
- If the torque does not return to the required value after the configured time, the inverter switches to **[Torque Control Warning]** (rtA) or **[Torque timeout]** (SrF.).

Warning!

UNEXPECTED OPERATION OF THE EQUIPMENT

Ensure that enabling this function does not result in an unsafe condition.

Failure to follow these instructions can result in death, serious injury or damage to property.



AB, CD	Fallback to speed control
BC	Torque control range
E	Ideal operating point

The sign and the value of the torque can be transferred via a logic output and an analog output.

[Trq/spd switching] (tSS)

Switches between torque/speed control via a logic input.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[Yes]	(YES)	Yes
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Torque ref. channel] (tr1)

Channel for torque setpoint.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

> **Note:**
> **[Torque ref.] (LTR) is accessible via menu [Display], submenu [Application parameters].**

	Setting	Code/Value	Description
★	[Not Configured]	(nO)	Not assigned Factory setting
	[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3
	[Ref.Freq-Rmt.Term]	(LCC)	Frequency setpoint via remote operator terminal
	[Ref. Freq-Com. Module]	(nEt)	Frequency setpoint via POWERLINK interface
	[Embedded Ethernet]	(EtH)	Integrated Ethernet **Note:** **Accessing this selection is possible when used as a direct control.**
	[DI7 PulseInput] to [DI8 PulseInput]	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input. **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
	[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Torque Ref Assign] (tri)

Assigns the channel for the torque setpoint.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Setting	Code/Value	Description
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[Torque ref. channel]	(tr1)	Channel for torque setpoint 1
[Torque ref. 2 channel]	(tr2)	Channel for torque setpoint 2

[Torque ref. 2 channel] (tr2)

Channel for torque setpoint 2.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Identical to [Torque ref. channel] (tr1).

[Torque ref. sign] (tSd)

Assignment for the sign reversal of the setpoint for the torque control function.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Identical to [Trq/spd switching] (tSS).

[Torque ratio] (trt)

Torque control: Torque coefficient.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

	Setting	Description
★ ↻	0.0 to 1000.0%	Coefficient applied to [Torque ref. channel] (tr1) or [Torque ref. 2 channel] (tr2). Factory setting: 100.0%

[Torque Ratio Assign] (tqr)

Torque control: Selection of the torque ratio.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

	Setting	Code/Value	Description
★	[No]	(nO)	Analog input is not assigned. Factory setting
	[AI1] to [AI3]	(AI1) to (AI3)	Analog inputs AI1 to AI3
	[AI Virtual 1]	(AIv1)	Virtual analog input 1
	[DI7 PulseInput] to [DI8 PulseInput]	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input. **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
	[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Torque Ref Offset] (tqop)

Setpoint for the torque offset.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

	Setting	Description
★	-1000.0 to 1000.0%	Setting range Factory setting: 0.0%

[Torque Offset Assign] (tqo)

Torque control: Selection of the value for the torque offset.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Identical to [Torque Ratio Assign] (tqr).

[Low Torque] (Ltq)

Low threshold value for torque.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

This parameter cannot be set higher than [High Torque] (HTQ).

	Setting	Description
★	-300.0 to [High Torque] (HTQ)	Setting range Factory setting: -300.0%

[High Torque] (Htq)

High threshold value for torque.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

This parameter cannot be set lower than [Low Torque] (Ltq).

	Setting	Description
★	[Low Torque] (Ltq) to 300.0%	Setting range Factory setting: 300.0%

[Torque ramp time] (trP)

Time for torque ramp.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

	Setting	Description
★	0.0 to 99.99 s	Time of increase and decrease of nominal torque for a setpoint change of 100%. Factory setting: 3.00 s

[Torque Filter] (trf)

Enables the torque filter.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

	Setting	Code/Value	Description
★	[No]	(nO)	No Factory setting
	[Yes]	(YES)	Yes

[Torque Filter Bandwidth] (trw)

Bandwidth of torque filter.

This parameter is only accessible if [Torque Filter] (trf) is set to [Yes] (YES).

	Setting	Description
★	1 to 1000 Hz	Setting range Factory setting: 20 Hz

[Torque control stop] (tSt)

Torque control: Type of stop command.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

	Setting	Code/Value	Description
★	[Speed]	(SPd)	Stops at speed control according to the configuration of [Type of stop] (STT).
	[Freewheel Stop]	(nSt)	Freewheel stop Factory setting
	[Spin]	(SPn)	Stops at a torque of 0 but maintains the motor magnetization (only in closed control loop).

[Spin time] (SPt)

Torque control: Holding time of the motor magnetization.

Holding time of motor magnetization after a stop to permit a quick restart.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO) and if [Torque control stop] (tSt) is set to [Spin] (SPn).

	Setting	Description
★	0.0 to 3600.0 s	Setting range Factory setting: 1.0 s

[Positive deadband] (dbp)

Speed regulation for positive deadband.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Value that is algebraically added to the speed reference.

Example for [Positive deadband] (dbP) = 10:

- If setpoint = +50 Hz: +50 + 10 = 60 Hz
- If setpoint = -50 Hz: -50 + 10 = -40 Hz

	Setting	Description
★	0.0 to 2 x [Max Frequency] (tFr)	Setting range Factory setting: 10.0 Hz

[Negative deadband] (dbn)

Speed regulation for negative deadband.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Value that is algebraically subtracted from the speed setpoint.

Example for [Negative deadband] (dbn) = 10:

- If setpoint = +50 Hz: + 50 - 10 = 40 Hz
- If setpoint = -50 Hz: -50 - 10 = -60 Hz

	Setting	Description
☆	0.0 to 2 x [Max Frequency] (tFr)	Setting range Factory setting: 10.0 Hz

[Torque ctrl time out] (rtO)

Timeout for torque control.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Time for a fault or alarm after automatically leaving torque control mode.

	Setting	Description
☆	0.0 to 999.9 s	Setting range Factory setting: 60 s

[Torque Ctrl ErrorResp] (tOb)

Response to torque control faults.

This parameter is accessible if [Trq/spd switching] (tSS) is not set to [No] (nO).

Response of the inverter after time [Torque ctrl time out] (rtO) has elapsed.

	Setting	Code/Value	Description
☆	[Warning]	(ALrM)	Triggers a warning on timeout. Factory setting
	[Error]	(FLt)	Triggers a fault with freewheel stop

5.2.4.30 [Generic functions] - [Parameter switching]

[Parameters switching] (MLP-)

Access

[Complete settings] → [Generic functions] → [Parameters switching]

About this menu

1 to 15 parameters from list [Parameter Selection] (SPS) can be selected and 2 or 3 different values assigned. The 2 or 3 value groups can be switched by 1 or 2 digital inputs or control word bits. Switching can be performed during operation (motor running). Switching can also be controlled based on one or two frequency threshold values, with each threshold value functioning as a digital input (0 = threshold value not reached, 1 = threshold value reached).

	Values 1	Values 2	Values 3
Parameter 1 to parameter 15	Parameter 1 to parameter 15	Parameter 1 to parameter 15	Parameter 1 to parameter 15
Input DI or bit or values of frequency threshold value 2	0	1	0 or 1
Input DI or bit or values of frequency threshold value 3	0	0	1

Note:

Do not change the values in [Parameter Selection] (PLC), since all changes made in this menu are lost the next time the device is switched on. The parameters can be changed in the active configuration via menu [Parameters switching] (MLP-) during operation.

[2 Parameter sets] (CHA1)

Switches parameter assignment 1.

Switching 2 parameter sets.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[Mot Freq High Thd]	(FtA)	Threshold value for high motor frequency reached
[2nd Freq Thd Reached]	(F2A)	2. Frequency threshold value reached
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[3 Parameter sets] (CHA2)

Switches parameter assignment 2.

Switching 3 parameter sets.

Identical to [2 Parameter sets] (CHA1).

Note:

To obtain 3 parameter sets, the configuration of [2 Parameter sets] (CHA1) is required first.

[Parameter Selection] (SPS)

This parameter is accessible if [2 Parameter sets] (CHA1) is not set to [No] (nO).

Making an entry in this parameter opens a window containing all the adjustment parameters that can be accessed. Use the OK button to select 1 to 15 parameters. The OK button can also be used to cancel the selection of parameters.

The following parameters are available for the parameter switching function:

Parameter	Code
[Ramp increment]	(Inr)
[Acceleration]	(ACC)
[Deceleration]	(dEC)
[Acceleration 2]	(AC2)
[Deceleration 2]	(dE2)
[Begin Acc round]	(tA1)
[End Acc round]	(tA2)
[Begin Dec round]	(tA3)
[End Dec round]	(tA4)
[Low Speed]	(LSP)
[High speed]	(HSP)
[High Speed 2]	(HSP2)
[High Speed 3]	(HSP3)
[High Speed 4]	(HSP3)
[Motor Th Current]	(ItH)
[IR compensation]	(UFr)
[Slip compensation]	(SLP)
[K speed loop filter]	(SFC)
[Speed time integral]	(SIt)
[Speed prop. gain]	(SPG)
[Inertia Factor]	(SPGU)
[Ramp Divider]	(dCF)
[DC Inj Level 1]	(IdC)
[DC injection time 1]	(tdI)
[DC Inj Level 2]	(IdC2)
[DC Inj Time 2]	(tdC)
[Auto DC inj Level 1]	(SdC1)
[Auto DC Inj Time 1]	(tdC1)
[Auto DC inj Level 2]	(SdC2)
[Auto DC Inj Time 2]	(tdC2)

Parameter	Code
[Switching Frequency]	(SFr)
[Current Limitation]	(CLI)
[Current Limit2 Value]	(CL2)
[Motor fluxing]	(FLU)
[Low Speed Timeout]	(tLS)
[Sleep Offset Thres.]	(SLE)
[Jog frequency]	(JGf)
[Jog Delay]	(JGt)
[Preset speed 2] to [Preset speed 16]	(SP2) to (SP16)
[+/-Speed limitation]	(srp)
[Multiplying Coeff.]	(MFr)
[Brk Release Current]	(ibr)
[Brake release I Rev]	(ird)
[Brake Release time]	(brt)
[Brake release freq]	(bir)
[Brake engage freq]	(ben)
[Brake engage delay]	(tbe)
[Brake engage time]	(bet)
[Jump at reversal]	(jdC)
[Time to restart]	(ttr)
[BRH b4 freq]	(bFtd)
[Motoring torque lim]	(tlim)
[Gen. torque limit]	(tlig)
[Torque ratio]	(trt)
[Low Torque]	(ltq)
[High Torque]	(Htq)
[PID Prop.Gain]	(rPG)
[PID Intgl.Gain]	(rIG)
[PID derivative gain]	(rdG)
[PID ramp]	(PrP)
[PID Min Output]	(POL)
[PID Max Output]	(POH)
[PID Start Ref Freq]	(SFS)
[PID acceleration time]	(ACCP)
[Min Fbk Warning]	(PAL)
[Max Fbk Warning]	(PAH)
[PID error Warning]	(PEr)
[Speed Input %]	(PSr)
[Ref PID Preset 2]	(rP2)
[Ref PID Preset 3]	(rP3)
[Ref PID Preset 4]	(rP4)
[PID Fdbk Range]	(PFMr)
[PID Fdbk Error Delay]	(PFMd)
[High Current Thd]	(Ctd)
[Low I Threshold]	(CtdL)
[High torque thd.]	(ttH)
[Low torque thd.]	(ttl)
[Motor Freq Thd]	(Ftd)
[Low Freq.Threshold]	(FtdL)
[Freq. threshold 2]	(F2d)
[2 Freq. Threshold]	(F2dL)
[Freewheel stop Thd]	(FFt)
[Motor Therm Thd]	(ttd)
[Reference high Thd]	(rtd)
[Reference low Thd]	(rtdL)
[Jump frequency]	(JPF)
[Skip Frequency 2]	(JF2)
[3rd Skip Frequency]	(JF3)
[Skip Freq.Hysteresis]	(JFH)
[Unld.Thr.Nom.Speed]	(LUn)
[Unld.Thr.0.Speed]	(LUL)
[Unld. FreqThr. Det.]	(rMUd)
[Hysteresis Freq]	(Srb)
[Underload T.B.Rest.]	(FtU)
[Ovld Detection Thr.]	(LOC)
[Overload T.B.Rest.]	(FtO)
[Fan Mode]	(FFM)
[Pmax Motor]	(tPMMO)
[Pmax Generator]	(tPMG)
[Stall Max Time]	(StP1)
[Stall Current]	(StP2)
[Stall Frequency]	(StP3)
[AI1 Th Warn Level]	(tH1A)

Parameter	Code
[AI3 Th Warn Level]	(tH3A)
[AI1 Th Error Level]	(tH1F)
[AI3 Th Error Level]	(tH3F)
[Load correction]	(lbC)

[Set 1] (PS1-)

Access

[Complete settings] → [Generic functions] → [Parameters switching] → [Set 1]

About this menu

Making an entry in this menu opens a settings window containing the selected parameters in the order in which they were selected.

[Set 2] (PS2-)

Access

[Complete settings] → [Generic functions] → [Parameters switching] → [Set 2]

About this menu

Identical to [Set 1] (PS1-).

[Set 3] (PS3-)

Access

[Complete settings] → [Generic functions] → [Parameters switching] → [Set 3]

About this menu

Identical to [Set 1] (PS1-).

5.2.4.31 [Generic functions] – [Stop after speed timeout]

[Stop after speed timeout] (PrSP-)

Access

[Complete settings] → [Generic functions] → [Stop after speed timeout]

Idling/Restarting in speed control mode

The inverter is in speed control mode if PID is not active – typically in the following cases:

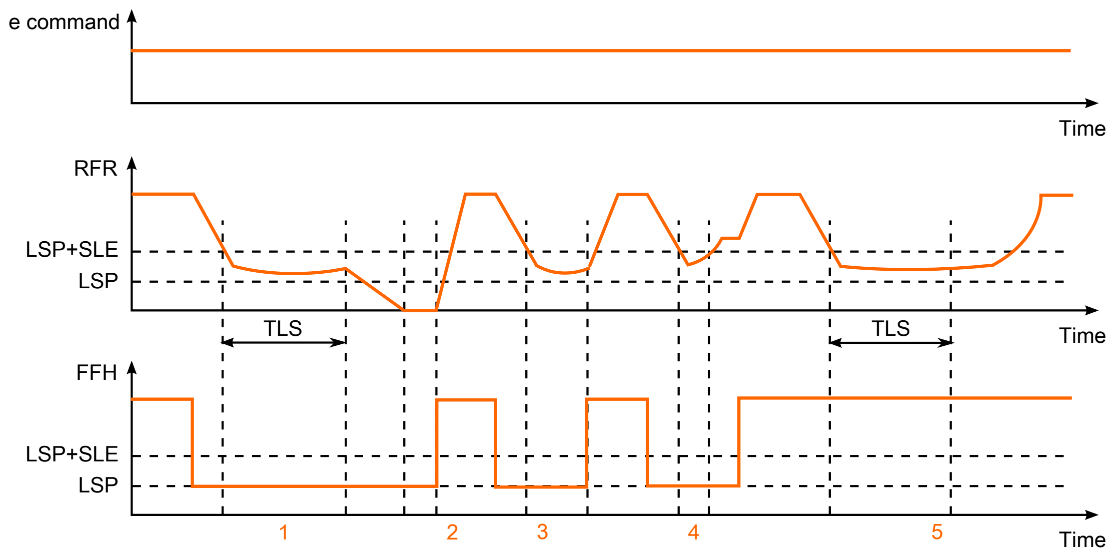
- PID is not configured (e.g. the setpoint for the motor speed is controlled by an external PLC).
- PID is in manual mode (e.g. manual application mode).
- PID is not active because channel 1 is not selected (e.g. mode "Forced local" is enabled).

If the inverter is in speed control mode (PID is not used or not active), a speed condition is used to put the application into the idle state. With the inverter in the idle state, the motor is restarted when the idle condition no longer exists.

This function is used to avoid prolonged operation at low speeds if this is not practical and does not correspond to the system characteristics. If the motor is operated at low speed for a longer period of time, the motor is stopped. The corresponding time period and speed are configurable.

In speed control mode, the following rules apply to rest/restart:

- The motor is stopped if **[Pre-Ramp Ref Freq]** (FrH) and **[Output frequency]** (rFr) fall to a value less than **[Low Speed]** (LSP) + **[Sleep Offset Thres.]** (SLE) and do not rise above that for a period of **[Low Speed Timeout]** (tLS).
- The motor is restarted if **[Pre-Ramp Ref Freq]** (FrH) > **[Low Speed]** (LSP) + **[Sleep Offset Thres.]** (SLE).



1) Desired function for **[Low Speed Timeout]** (tLS): After **[Low Speed Timeout]** (tLS), the motor is stopped according to the current deceleration ramp.
2) **[Pre-Ramp Ref Freq]** (FrH) becomes greater than **[Low Speed]** (LSP) + **[Sleep Offset Thres.]** (SLE) and function **[Low Speed Timeout]** (tLS) is disabled if the move command is not canceled.
3) Function **[Low Speed Timeout]** (tLS) is not disabled because **[Pre-Ramp Ref Freq]** (FrH) becomes greater than **[Low Speed]** (LSP) + **[Sleep Offset Thres.]** (SLE) before time **[Low Speed Timeout]** (tLS) has elapsed.
4) Function **[Low Speed Timeout]** (tLS) is not disabled because **[Output frequency]** (rFr) becomes greater than **[Low Speed]** (LSP) + **[Sleep Offset Thres.]** (SLE) before time **[Low Speed Timeout]** (tLS) has elapsed.
5) Function **[Low Speed Timeout]** (tLS) is not disabled because **[Pre-Ramp Ref Freq]** (FrH) remains greater than **[Low Speed]** (LSP) + **[Sleep Offset Thres.]** (SLE).

[Low speed time out] (tLS)

Timeout for low speed.

	Setting	Description
↻	0.0 to 999.9 s	Setting range Factory setting: 0.0 s

[Sleep Offset Thres.] (SLE)

Offset threshold value for sleep mode

This parameter is accessible if **[Low speed time out]** (tLS) is not set to 0.

Configurable threshold value for restart (offset) after longer operation at **[Low Speed]** (LSP) + **[Sleep Offset Thres.]** (SLE) in Hz. The motor restarts when the setpoint (LSP + SLE) is exceeded and a move command still persists.

	Setting	Description
	1.0 to **[Max Frequency]** (tFr)	Setting range Factory setting: 1.0 Hz

5.2.4.32 [Generic functions] - [DC bus supply]

[DC bus supply] (dCO-)

Access

[Complete settings] → **[Generic functions]** → **[DC bus supply]**

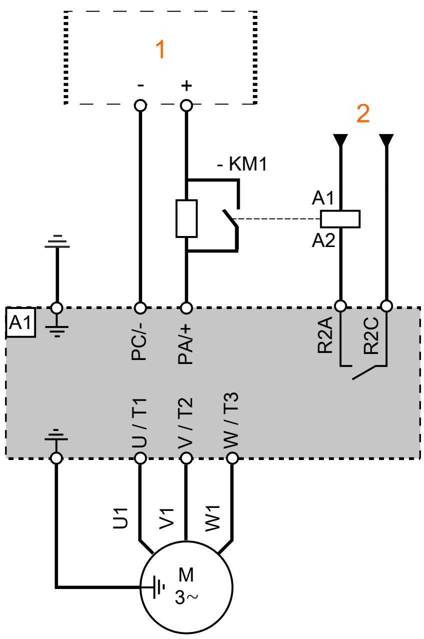
About this menu

This menu is accessible for 480 V inverters with a power output **greater than 22 kW**.

The menu offers the possibility to switch on/off inverters supplied by a common DC bus without having to switch off the supply unit. Direct power supply via the DC bus requires a protected DC power source with suitable power output and voltage as well as a resistor and a precharging contactor for the capacitors with a suitable design. Contact B&R customer service for the rating of these components.

The precharging contactor can be controlled via a relay or a logic output of the inverter using function "**Direct power supply by DC bus**".

Wiring example using relay R2:



1	DC power supply
2	24 VDC

[DC Charging Assign] (dCO)

Assigns the load of the DC bus.

	Setting	Code/Value	Description
★	[No]	(nO)	Not assigned. Factory setting
	[R2] to [R3]	(r2) to (r3)	Relay outputs R2 to R3 **Note:** **Accessing selection R3 is possible for inverters with a power output greater than 22 kW.**
	[DQ1 Digital Output] to [DQ2 Digital Output]	(dO1) to (dO2)	Digital outputs DQ1 to DQ2 **Note:** **Accessing selection DQ2 is possible for inverters with a power output less than 30 kW.**

[DC Bus Charge Time] (DCT)

Loading time of the DC bus option.

This parameter is accessible if [DC Charging Assign] (dCO) is not set to [No] (nO).

	Setting	Description
★	0.00 to 10.00 s	Setting range Factory setting: 0.00 s

5.2.4.33 [Generic functions] - [Multimotors config]

[Multimotors config] (MMC-)

Access

[Complete settings] → [Generic functions] → [Multimotors config]

Switching motors or configurations

The inverter can contain up to 4 configurations, which can be stored via parameter [Save Configuration] (SCSi).

Each of these configurations can be remotely enabled in order to adapt to the following conditions:

- 2 to 4 different motors or mechanisms (multi-motor mode).
- 2 to 4 different configurations for a single motor (multi-configuration mode).

The two switching modes cannot be combined.

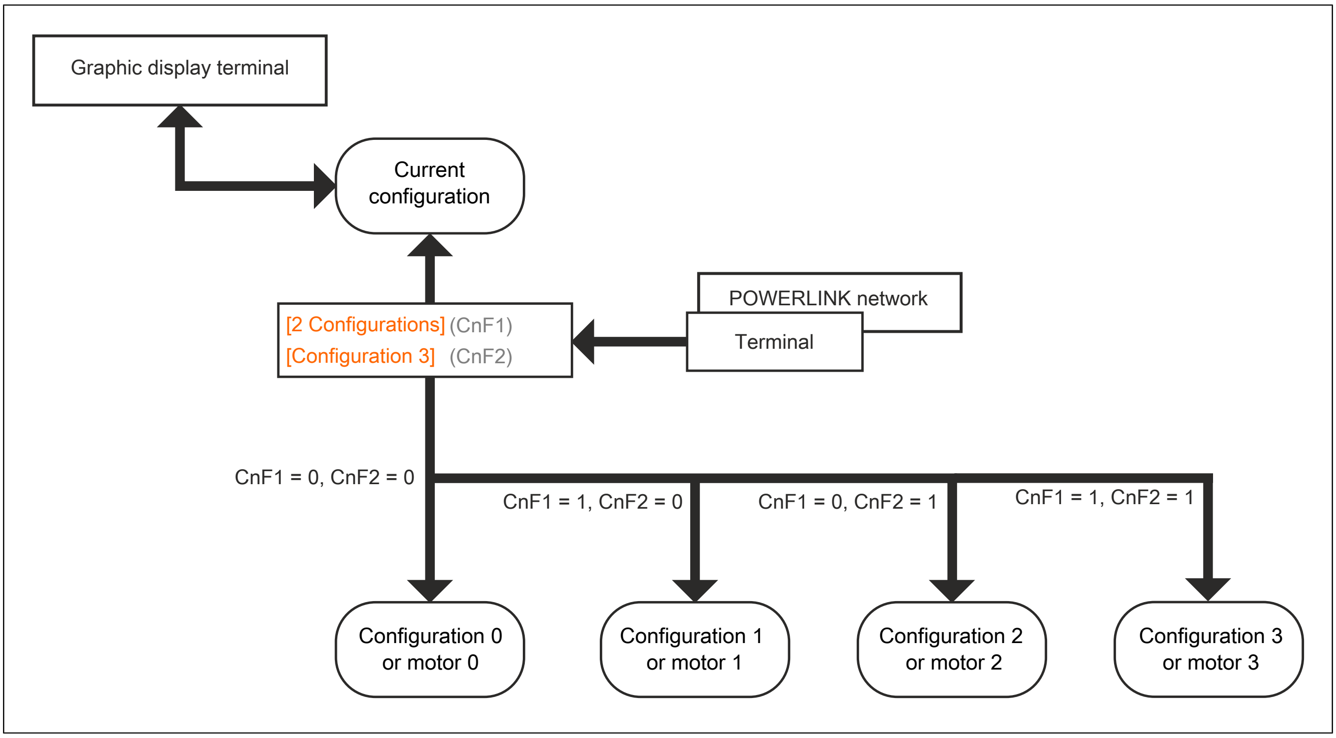
> **Note:**
>
> **Note the following conditions:**
>
> - **Switching can take place when stopping (inverter locked). If a switching request is transmitted during operation, it will be executed at the next stop.**
> - **When switching between motors, the affected power and control terminals must be switched accordingly.**
> - **All configurations must use the same hardware configurations; otherwise, the inverter will be locked in state [Incorrect Configuration] (CFF).**
> - **When switching over to a non-existent configuration, the inverter locks in state [Empty Configuration] (CFI4).**

Menus and parameters switched in multi-motor mode

Communication parameters are not switched in multi-configuration mode.

- Menu [Motor parameters] (MPA-)
- Menu [Input/Output] (IO-)
- Menu [Generic functions] (CSGF-) with the exception of function [Multimotors config] (MMC-) (one-time configuration only)
- Menu [Generic monitoring] (GPR-)
- Menu [My menu] (MyMn-)

Transferring an inverter configuration to another device via the display terminal if the inverter uses function [Multimotors config] (MMC-)

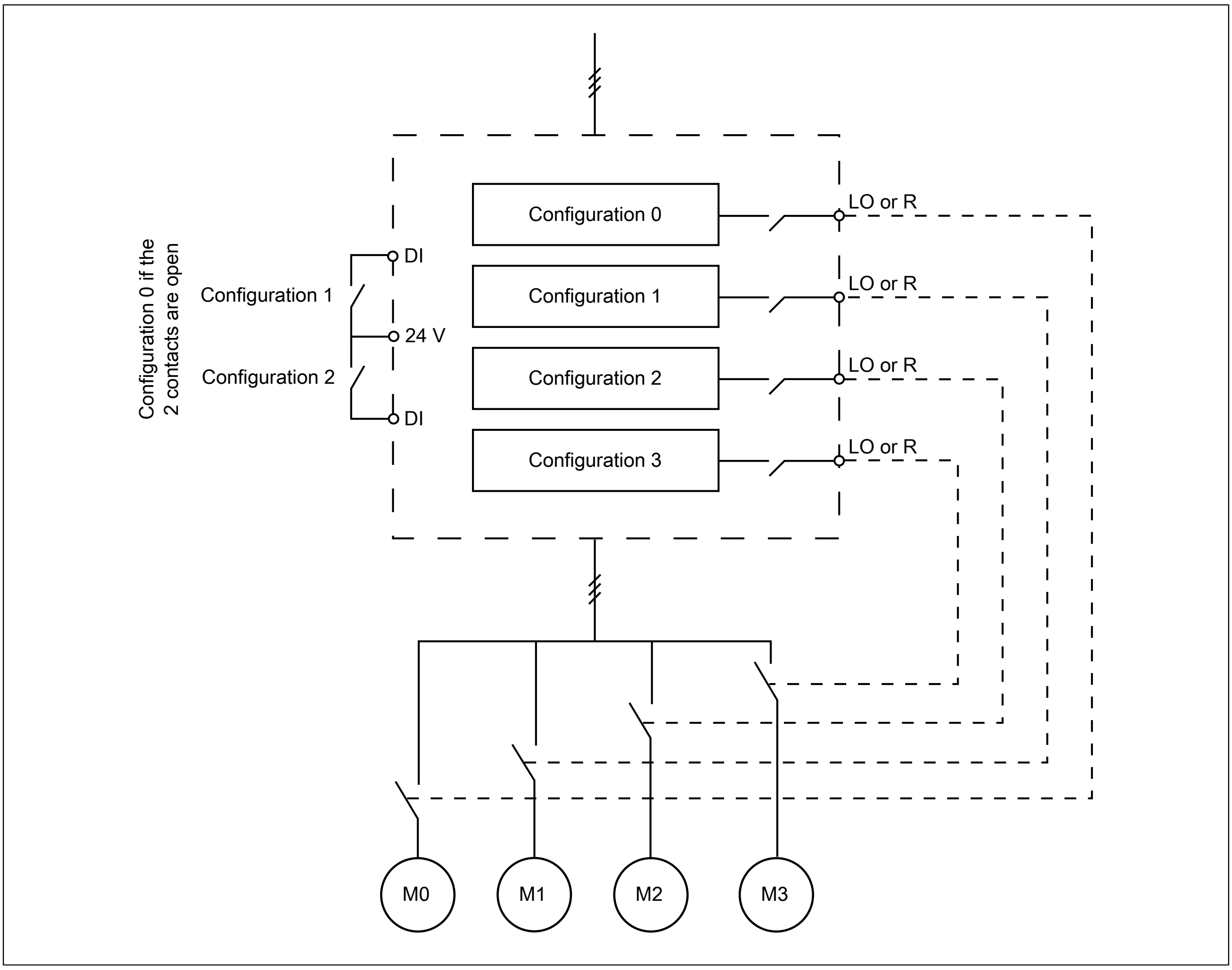


Switchover command

Depending on the number of motors or selected configurations (2 to 4), the switchover command is transmitted via one or two digital inputs. The table below lists the possible combinations.

DI (CnF1) 2 motors or configurations	DI (CnF2) 3 motors or configurations	Number of configurations or active motors
0	0	0
1	0	1
0	1	2
1	1	3

Circuit diagram for multi-motor mode



Motor measurement in multi-motor mode

This motor measurement can be performed as follows:

- Manually using a digital input when switching the motor.
- Automatically when enabling the motor for the first time after the inverter has been switched on if parameter **[Automatic autotune]** (AUt) is set to **[YES]** (YES).

Thermal motor states in multi-motor mode:
The inverter supports the individual protection of the three motors. Each thermal state takes into account all stopping times if the power supply to the inverter is not switched off.

Note:

MOTOR OVERHEATING

The individual thermal motor states are not stored when the inverter is switched off. When the inverter is switched back on, it does not know the thermal state of the connected motors.

In order to ensure correct temperature monitoring of the motors, an external temperature sensor must be installed for each motor.

Failure to follow these instructions can result in damage to property.

Configuring the information output

In menu [Input/Output] (IO-), a digital output can be assigned to each configuration or motor (2 or 4) for the remote transmission of information.

> **Note:**
>
> **When switching menu [Input/Output] (IO-), these outputs must be assigned in all configurations where information is required.**

[Multimotors] (CHM)

Selects multi-motor operation.

Setting	Code/Value	Description
[No]	(nO)	Multiple configurations possible Factory setting
[Yes]	(YES)	Multiple motors possible

[2 Configurations] (CnF1)

Switching between two motors or two configurations.

[3 Configurations] (CnF2)

Switching between three motors or three configurations.

> **Note:**
>
> **To obtain 4 motors or 4 configurations, [2 Configurations] (CnF1) must also be configured.**

Identical to [2 Configurations] (CnF1).

5.2.4.34 [Generic functions] - [24V Supply Output]

[24V Supply Output] (S24V)

Access

[Complete settings] → [Generic functions] → [24V Supply Output]

Accessing this menu is possible for inverters with a power output **less than 30 kW**.

[24V Supply Output] (S24V)

24 V supply output.

Setting	Code/Value	Description
[No]	(nO)	The 24 V pin is used for input supply.
[Yes]	(YES)	The 24 V pin is used for output supply. Factory setting

5.2.4.35 [Generic functions] - [External Weight Measurement]

[External weight meas.] (ELM-)

Access

[Complete settings] → [Generic functions] → [External weight meas.]

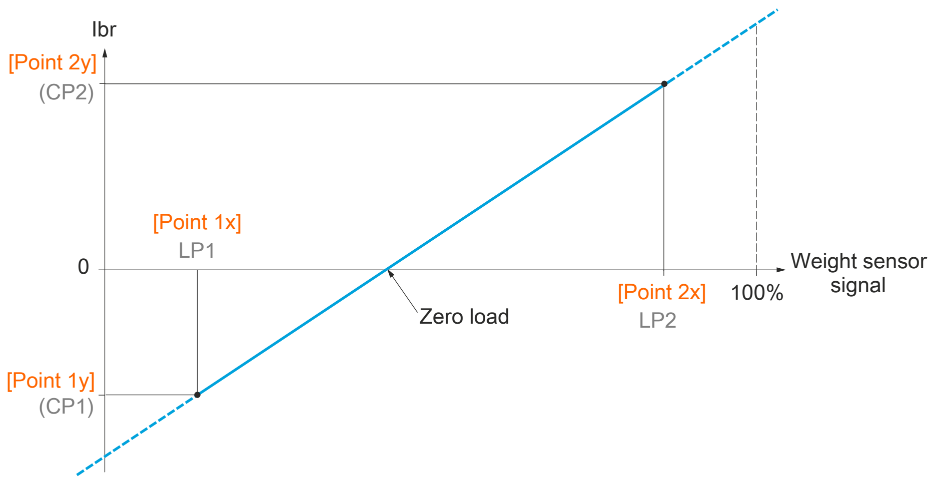
About this menu

> **Warning!**
>
> **LOSS OF CONTROL**
>
> **Perform a comprehensive commissioning test to check the weight sensor for proper operation under all operating and fault conditions.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

This function uses the information transmitted by a weight sensor to adjust **[Brk Release Current]** (Ibr) (the torque current) of function **[Brake logic control]** (BLC-). The brake release current can be positive or negative depending on the settings. Depending on the sensor type, the signal of the weight sensor can be assigned to an analog input (usually a signal with 4 to 20 mA), the pulse input or the encoder input.

The weight sensor can measure the total weight of a hoisting winch and its load, for example.

The brake release current is adjusted according to the curve shown below.



This curve can represent a weight sensor where a motor load of zero occurs if the load is not zero.

[Weight sensor Assign] (PES)

Assigns the weight sensor.

If **[Brake assignment]** (bLC) is not configured, **[No]** (no) is forced for this parameter.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not configured. Factory setting
[AI1] to **[AI3]**	(AI1) to (AI3)	Analog inputs AI1 to AI3 **Note:** **Accessing selection AI3 is possible for inverters with a power output greater than 22 kW.**
[AI Virtual 1]	(AIv1)	Virtual analog input 1
[DI7 PulseInput] to **[DI8 PulseInput]**	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input. **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Point 1 X] (LP1)

External weight point 1 X.

The parameter is accessible if **[Weight sensor Assign]** (PES) is assigned.

Setting	Description
0.0 to 99.99%	Setting range This parameter is not permitted to be equal to or greater than **[Point 2 X]** (LP2). Factory setting: 0.00%

[Point 1Y] (CP1)

External weight point 1Y.

The parameter is accessible if [Weight sensor Assign] (PES) is assigned.

Setting	Description
-1.1 to 1.1 In[1)]	Setting range in A Factory setting: 0.7 * [Nom Motor Current] (NCR)

1) In corresponds to the nominal current of the inverter specified in the installation manual and on the nameplate.

[Point 2 X] (LP2)

External weight point 2 X.

The parameter is accessible if [Weight sensor Assign] (PES) is assigned.

Setting	Description
0.01 to 100.00%	Setting range in A This parameter is not permitted to be equal to or greater than [Point 1 X] (LP1). Factory setting: 50.00%

[Point 2Y] (CP2)

External weight point 2Y.

The parameter is accessible if [Weight sensor Assign] (PES) is assigned.

Setting	Description
-1.1 to 1.1 In[1)]	Setting range in A Factory setting: [Nom Motor Current] (NCR)

1) In corresponds to the nominal current of the inverter specified in the installation manual and on the nameplate.

[Ibr 4-20 mA loss] (IBRA)

Brake release current when weight sensor information is lost.

This parameter is accessible if the weight sensor is assigned to an analog current input (PES = AIx) and the monitoring function for a loss of 4 to 20 mA is disabled (LFLx = No).

[AIx min. value] (CrLx) must be equal to or greater than 4 mA and [Ibr 4-20 mA loss] (IBRA) must be defined as a value suitable for the application.

For hoisting applications, setting [Nom Motor Current] (NCR) is recommended.

Setting	Description
0 to 1.1 In[1)]	Setting range in A Factory setting: 0 A

1) In corresponds to the nominal current of the inverter specified in the installation manual and on the nameplate.

5.2.4.36 [Generic monitoring]

[Process Underload] (ULd-)

Access

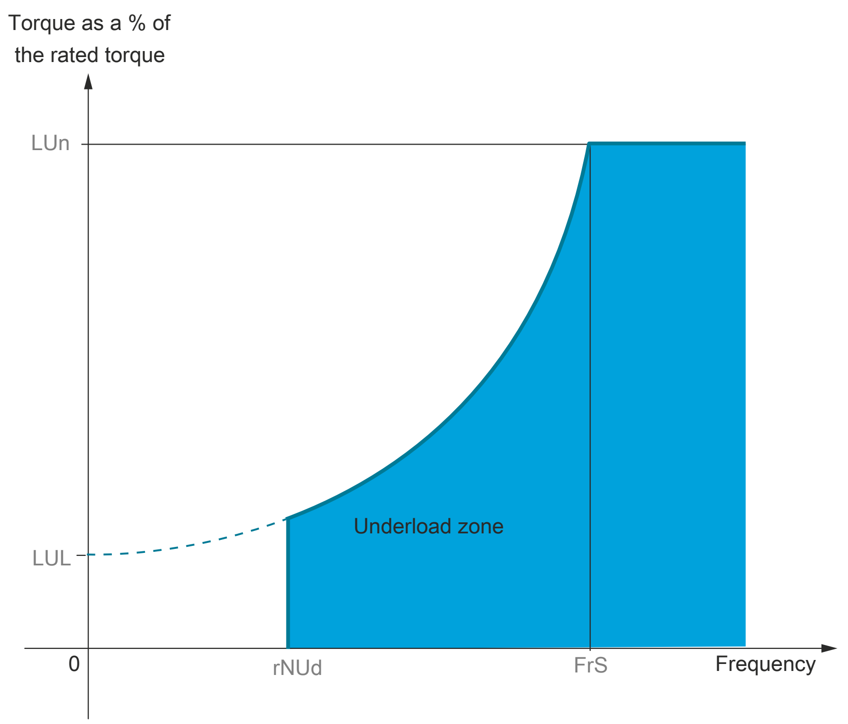
[Complete settings] → [Generic monitoring] → [Process Underload]

Underload process fault

A process underload is detected when the next event occurs and remains unresolved for at least the configurable time set in [Unld T. Del. Detect](ULt):

- The motor is in the steady state and the torque is below the underload limit value of parameters ([Unld.Thr.0.Speed](LUL), [Unld.Thr.Nom.Speed](LUn) and [Unld. FreqThr. Det.](rMUd)).
- The motor is in the steady state if the difference between the frequency setpoint and motor frequency falls below configurable threshold value [Hysteresis Freq](Srb).

Between frequency 0 and nominal frequency, the characteristic curve produces the following equation: The underload function for frequencies under



A relay or a digital output can be assigned to the signal of this fault in menus **[Input/Output]** (IO-), **[I/O assignment]** (IOAS-).

[Unld T. Del. Detect] (ULt)

Delay for underload detection.

If the value is 0, the function is disabled and the other parameters are not available.

Setting	Description
0 to 100 s	Setting range Factory setting: 0 s

[Unld.Thr.Nom.Speed] (LUn)

Underload threshold value at nominal motor speed **[Nominal Motor Freq]** (FrS) as a percentage of the nominal torque.

The parameter is accessible if **[Unld T. Del. Detect]** (ULt) is not set to 0.

	Setting	Description
★ ⟳	20 to 100%	Setting range Factory setting: 60%

[Unld.Thr.0.Speed] (LUL)

Threshold value for underload at a frequency of zero, as a percentage of the nominal torque.

The parameter is accessible if **[Unld T. Del. Detect]** (ULt) is not set to 0.

	Setting	Description
★ ⟳	0 to **[Unld.Thr.Nom.Speed]** (LUn)	Setting range Factory setting: 0%

[Unld. FreqThr. Det.] (rMUd)

Minimum frequency threshold value for underload detection.

The parameter is accessible if **[Unld T. Del. Detect]** (ULt) is not set to 0.

	Setting	Description
★ ⟳	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

[Hysteresis Freq] (Srb)

Maximum deviation between frequency setpoint and motor frequency that defines the steady state.

The parameter is accessible if [Unld T. Del. Detect] (ULt) or [Ovld Time Detect.] (TOL) is not set to 0.

	Setting	Description
★ ↻	0.3 to 599.0 Hz	Setting range Factory setting: 0.3 Hz

[Underload Mangmt.] (UdL)

Underload management. Behavior when switching to underload detection.

The parameter is accessible if [Unld T. Del. Detect] (ULt) is not set to 0.

	Setting	Code/Value	Description
★	[Ignore]	(nO)	Ignores detected faults.
	[Freewheel Stop]	(YES)	Freewheel stop Factory setting
	[Ramp stop]	(rMP)	Stop via ramp
	[Fast stop]	(FST)	Fast stop

[Underload T.B.Rest.] (FtU)

Permissible minimum time frame between underload detection and automatic restart.

To enable an automatic restart, the value for [Fault Reset Time] (tAr) must be at least 1 minute greater than this parameter.

The parameter is accessible if [Underload Mangmt.] (UdL) is not set to [Ignore] (nO).

	Setting	Description
★ ↻	0 to 6 minutes	Setting range Factory setting: 0 Min.

[Process Overload] (OLd-)

Access

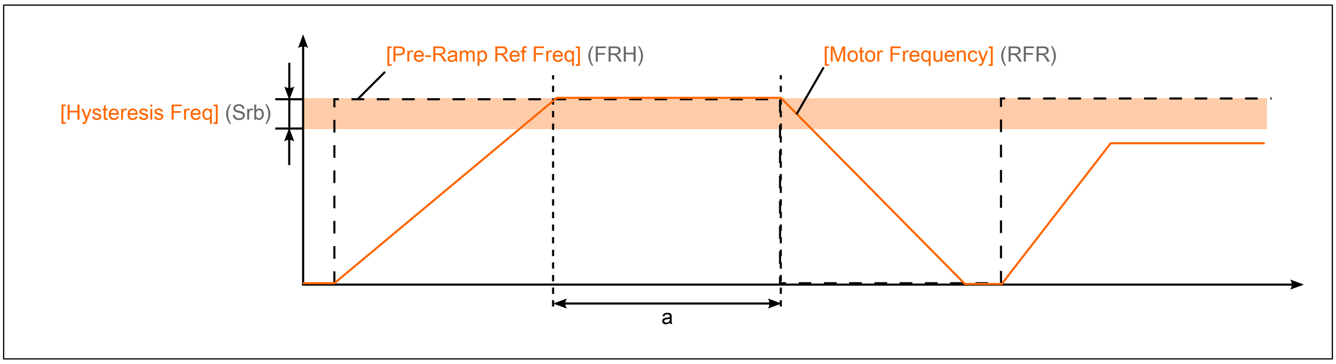
[Complete settings] → [Generic monitoring] → [Process Overload]

About this menu

A process overload is detected when the next event occurs and persists at least for configurable time **[Ovld Time Detect.]** (tOL):

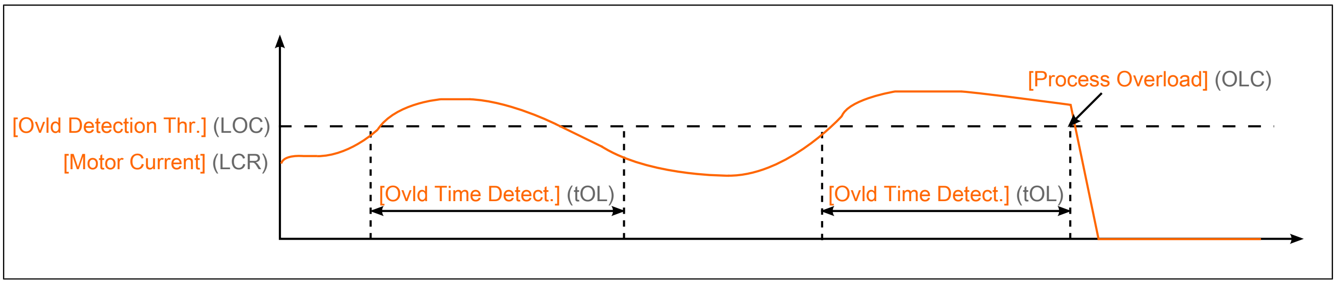
- During acceleration/deceleration, the inverter is in mode **[Current Limitation]** (CLI)
- The motor is in the steady state and **[Motor Current]** (LCR) is above defined overload threshold value **[OvLd Detection Thr.]** (LOC)

The motor is in the steady state when the difference between **[Pre-Ramp Ref Freq]** (FRH) and **[Motor Frequency]** (RFR) is below configurable threshold value **[Hysteresis Freq]** (Srb).



Note:

Monitoring for process overload is active at all times in state [Current Limitation] (CLI).



[Ovld Time Detect.] (tOL)

Overload response time.

If the value is 0, the function is disabled and the other parameters are not available.

Setting	Description
0 to 100 s	Setting range Factory setting: 0 s

[Ovld Detection Thr.] (LOC)

Overload threshold value.

Overload detection threshold value, as a percentage of the nominal motor current **[Nom Motor Current]** (nCr). For the function to be executed, this value must be lower than the threshold current.

This parameter is accessible if **[Ovld Time Detect.]** (tOL) is not set to 0.

	Setting	Description
	70 to 150%	Setting range Factory setting: 110%

[Hysteresis Freq] (Srb)

Hysteresis for the steady state.

Maximum deviation between frequency setpoint and motor frequency that defines the steady state.

The parameter is accessible if [Ovld Time Detect.] (tOL) or [Unld T. Del. Detect] (ULT) is not set to 0.

	Setting	Description
	0.3 to 599.0 Hz	Setting range Factory setting: 0.3 Hz

[Ovld.Proces.Mngmt] (OdL)

Behavior when switching to overload detection.

The parameter is accessible if [Ovld Time Detect.] (tOL) is not set to 0.

	Setting	Code/Value	Description
	[Ignore]	(nO)	Ignores detected faults.
	[Freewheel Stop]	(YES)	Freewheel stop Factory setting
	[Ramp stop]	(rMP)	Stop via ramp
	[Fast stop]	(FST)	Fast stop

[Overload T.B.Rest.] (FtO)

Permissible minimum time frame between overload detection and automatic restart.

To enable an automatic restart, the value for [Fault Reset Time] (tAr) must be at least 1 minute greater than this parameter.

The parameter is accessible if [Ovld Time Detect.] (tOL) or [Ovld.Proces.Mngmt] (odL) is not set to 0.

	Setting	Description
	0 to 6 minutes	Setting range Factory setting: 0 Min.

[Stall monitoring] (StPr-)

Access

[Complete settings] → [Generic monitoring] → [Stall monitoring]

About this menu

This function prevents motor overload by monitoring the motor current and speed rise time.

A stall monitoring condition exists in the following cases:

- An output frequency is lower than stall frequency [Stall Frequency] (StP3)
- And an output current is higher than stall current [Stall Current] (StP2)
- This is the case over a longer period of time than stall time [Stall Max Time] (StP1)

If a stall condition occurs, fault [Motor Stall Error] (StF) is triggered.

[Stall monitoring] (StPC)

Enables stall monitoring.

Setting	Code/Value	Description
[No]	(nO)	Function disabled Factory setting
[Yes]	(YES)	Function enabled

[Stall Max Time] (StP1)

Max. stall time for the motor

This parameter is accessible if [Stall monitoring] (StPC) is not set to [No] (nO).

	Setting	Description
	0.0 to 200 s	Setting range Factory setting: 60.0 s

[Stall Current] (StP2)

Current level for stall monitoring, as a percentage of nominal motor current [Nom Motor Current] (NCR).

This parameter is accessible if [Stall monitoring] (StPC) is not set to [No] (nO).

The factory setting is changed to 150.0% if [Dual Rating] (DRT) is set to [Heavy Duty] (High).

	Setting	Description
	0.0 to 150.0%	Setting range Factory setting: 150.0%

[Stall Frequency] (StP3)

Frequency level for stall monitoring.

This parameter is accessible if [Stall monitoring] (StPC) is not set to [No] (nO).

	Setting	Description
	0.0 to [Max Frequency] (tfr)	Setting range Factory setting: 2.0 Hz

[Thermal monitoring] (tPP-)

Access

[Complete settings] → [Generic monitoring] → [Thermal Monitoring]

About this menu

Identical to menu 5.2.4.1.6 "[Thermal Monitoring] (tPP-)" on page 195.

[Frequency meter] (FqF-)

Access

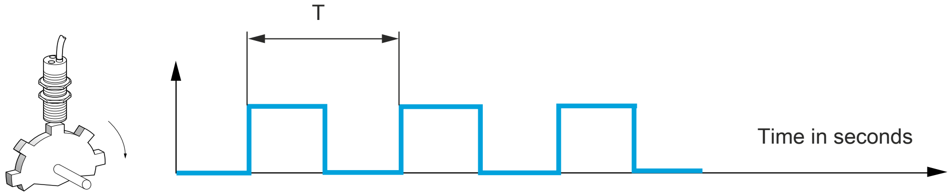
[Complete settings] → [Generic monitoring] → [Frequency meter]

About this menu

This function uses the pulse input and can only be used if the pulse input is not used for another function.

Application example

A notched disk driven by a motor that is connected to a proximity switch can generate a frequency signal proportional to the motor speed.



When applied to the pulse input, this signal provides the following options:

- Measurement and display of the motor speed: Signal frequency = 1/T. This frequency is displayed with parameter **[Measured Freq]** (FqS).
- Detection of overspeed (if the measured speed exceeds a predefined threshold value, the inverter will trigger an fault).
- Detection of a defective brake if the brake logic is configured: If the speed is not increased fast enough after a brake engage command, the inverter will trigger an fault. This function enables detection of wear and tear on the brake linings.
- Detection of a speed threshold value, which can be set using **[Pulse warning thd.]** (FqL) and assigned to a relay or digital output.

[Frequency meter] (FqF)

Enables the frequency meter function.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned Factory setting
[DI7 PulseInput] to **[DI8 PulseInput]**	(PI7) to (PI8)	Digital inputs DI7 to DI8 used as pulse input **Note:** **Accessing this selection is possible for inverters with a power output greater than 22 kW.**
[RP]	(PI)	Pulse input **Note:** **Accessing this selection is possible for inverters with a power output less than 30 kW.**

[Pulse scal. divider] (FqC)

Measurement coefficient.

The measured frequency is displayed with parameter **[Measured Freq]** (FqS).

	Setting	Description
	1.0 to 100.0	Setting range Factory setting: 1.0

[Overspd. pulse thd.] (FqA)

Maximum permissible frequency.

Enables and sets overspeed monitoring: **[Motor Overspeed]** (SOF)

Setting	Code/Value	Description
[No]	(nO)	No monitoring of the motor overspeed Factory setting
0 to 30 kHz		Adjusts the threshold value for triggering the frequency at the pulse input divided by **[Pulse scal. divider]** (FqC).

[Pulse overspd delay] (tdS)

Time before an overspeed fault is triggered.

Setting	Description
0.0 to 10.0 s	Setting range Factory setting: 0.0 s

[Level fr. pulse ctrl] (Fdt)

Threshold value for actual value detection.

Enables and adjusts pulse input monitoring (speed feedback) [Encoder Feedback Loss] (SPF)

Setting	Code/Value	Description
[No]	(nO)	No monitoring of the speed feedback Factory setting
0 to 599 Hz		Sets the frequency threshold value of the motor for triggering the speed feedback fault (deviation between the calculated frequency and measured speed).

[Pulse thd. wo Run] (Fqt)

Frequency threshold value for brake wear.

Enables and adjusts monitoring of the actual value of the brake [Brake Feedback] (brF). If brake logic control [Brake assignment] (bLC) is not configured, this parameter is forced to [No] (nO).

Setting	Code/Value	Description
[No]	(nO)	No brake monitoring Factory setting
1 to 1,000 Hz		Sets the frequency threshold value of the motor for triggering fault [Brake Feedback] (brF) (detection of a speed unequal to zero).

[Pulse wo Run delay] (tqb)

Time before fault "Brake wear" is triggered.

Setting	Description
0.0 to 10.0 s	Setting range Factory setting: 0.0 s

[Pulse warning thd.] (FqL)

Frequency level.

This parameter is accessible if [Frequency meter] (FqF) is not set to [No] (nO).

Setting	Description
0 to 30,000 Hz	Setting range Factory setting: 0 Hz

5.2.4.37 [Input/Output] - [I/O assignment]

[DI1 assignment] (L1A)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI1 assignment]

[DI1 Low Assignment] (L1L)

Low DI1 assignment.

Read-only parameter, cannot be configured. This parameter displays all functions assigned to digital input DI1. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

[DI1 Low Assignment] (L1L)

High DI1 assignment.

Read-only parameter, cannot be configured. This parameter displays all functions assigned to digital input DI1. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

[DI2 assignment] (L2A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI2 assignment]

About this menu

Identical to [DI1 assignment] (L1A).

[DI2 Low Assignment] (L2L)

Low DI2 assignment.

[DI2 High Assignment] (L2H)

High DI2 assignment.

[DI3 assignment] (L3A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI3 assignment]

About this menu

Identical to [DI1 assignment] (L1A).

[DI3 Low Assignment] (L3L)

Low DI3 assignment.

[DI3 High Assignment] (L3H)

High DI3 assignment.

[DI4 assignment] (L4A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI4 assignment]

About this menu

Identical to [DI1 assignment] (L1A).

[DI4 Low Assignment] (L4L)

Low DI4 assignment.

[DI4 High Assignment] (L4H)

High DI4 assignment.

[DI5 assignment] (L5A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI5 assignment]

About this menu

Identical to [DI1 assignment] (L1A).

[DI5 Low Assignment] (L5L)

Low DI5 assignment.

[DI5 High Assignment] (L5H)

High DI5 assignment.

[DI6 assignment] (L6A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI6 assignment]

About this menu

Identical to **[DI1 assignment]** (L1A).

[DI6 Low Assignment] (L6L)

Low DI6 assignment.

[DI6 High Assignment] (L6H)

High DI6 assignment.

[DI7 assignment] (L7A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI7 assignment]

About this menu

Identical to **[DI1 assignment]** (L1A).

[DI7 Low Assignment] (L7L)

Low DI7 assignment.

[DI7 High Assignment] (L7H)

High DI7 assignment.

[DI8 assignment] (L8A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI8 assignment]

About this menu

Accessing this menu is possible for inverters with a power output greater than 22 kW.

Identical to **[DI1 assignment]** (L1A).

[DI8 Low Assignment] (L8L)

Low DI8 assignment.

[DI8 High Assignment] (L8H)

High DI8 assignment.

[DI7 Pulse Input Assign] (PI7A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI7 Pulse Input Assign]

About this menu

The following parameters are accessible on the display terminal by pressing the OK button on parameter [DI7 frequency measured] (PFC7).

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[DI7 Pulse Input Assign] (PI7A)

Assigns pulse input DI7

All functions assigned to the pulse input are displayed. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

Setting	Code/Value	Description
[No]	(nO)	Not assigned Factory setting
[Torque Ref Offset]	(tqo)	Source of the torque offset
[Torque Ref Ratio]	(tqr)	Source of the torque ratio
[Ref Frequency 1]	(Fr1)	Frequency setpoint 1
[Ref Frequency 2]	(Fr2)	Frequency setpoint 2
[Ref Frequency 2 Summing]	(SA2)	Sum of frequency setpoint 2
[Torque limitation]	(taa)	Torque limitation: Enabled via an analog input
[Torque limitation 2]	(taa2)	Torque limitation: Enabled via an analog input
[Subtract Ref Freq 2]	(dA2)	Subtraction for frequency setpoint 2
[Forced local]	(FLOC)	Setpoint source "Forced local" 1
[Ref Frequency 2 multiplier]	(MA2)	Multiplier for frequency setpoint 2
[Ref Frequency 3 multiplier]	(MA3)	Multiplier for frequency setpoint 3
[Torque reference]	(tr1)	Torque control: Torque setpoint 1
[Torque reference]	(tr2)	Torque control: Torque setpoint 2
[Frequency meter]	(fqf)	Enables the frequency meter function
[Torque reference 2]	(teff)	External actual value for forward direction

[DI8 Pulse Input Assign] (PI8A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [DI8 Pulse Input Assign]

About this menu

Identical to [DI7 Pulse Input Assign] (PI7A-).

The following parameters are accessible on the display terminal by pressing the OK button on parameter [DI8 frequency measured] (PFC8).

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[DI8 Pulse Input Assign] (PI8A)

Assigns pulse input DI8.

Identical to [DI7 Pulse Input Assign] (PI7A).

[Encoder Pulse Assign] (PTGA)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [Encoder Pulse Assign]

About this menu

Accessing this parameter is possible for sizes 4 and 5 if an encoder module is connected.

[Encoder Pulse Assign] (PTGA)

Encoder pulse assignment.

All functions assigned to the pulse input are displayed. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

Displayed identically to [DI7 Pulse Input Assign] (PI7A).

[RP] (PIA)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [RP assignment]

About this menu

Accessing this menu is possible for inverters with a power output less than 30 kW.

[RP assignment] (PiA)

Assigns the pulse input.

Displayed identically to [Pulse Input DI7 Assign] (PI7A).

[AI1 Assignment] (AI1A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [AI1 Assignment]

[AI1 Assignment] (AI1A)

Function assignment for analog input AI1.

Read-only parameter, cannot be configured. This parameter displays all functions assigned to the AI1 input. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

[AI2 Assignment] (AI2A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [AI2 Assignment]

About this menu

Displayed identically to [AI1 Assignment] (AI1A).

[AI2 Assignment] (AI2A)

AI2 assignment.

[AI3 Assignment] (AI3A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [Assignment AI3]

About this menu

Displayed identically to [AI1 Assignment] (AI1A).

[AI3 Assignment] (AI3A)

AI3 assignment.

Accessing this parameter is possible for inverters with a power output greater than 22 kW.

[AIV1 assignment] (Av1A-)

Access

[Complete settings] → [Input/Output] → [I/O assignment] → [AIV1 assignment]

[AIV1 assignment] (Av1A)

Function assignment for virtual analog input 1.

Read-only parameter, cannot be configured. All functions assigned to virtual analog input 1 are displayed. This allows compatibility problems to be checked, for example. If no functions have been assigned, **[No]** (nO) is displayed.

5.2.4.38 [Input/Output] - [DI/DQ]

5.2.4.38.1 [Input/Output] - [DI/DQ] - [DIxx Configuration]

[DI1 Configuration] (di1-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DI1 Configuration]

[DI1 Low Assignment] (L1L)

Low DI1 assignment.

Read-only parameter, cannot be configured. This parameter displays all functions assigned to digital input DI1. This allows compatibility problems to be checked, for example.

If no functions have been assigned, **[No]** (nO) is displayed.

[DI1 High Assignment] (L1H)

High DI1 assignment.

Read-only parameter, cannot be configured. This parameter displays all functions assigned to digital input DI1. This allows compatibility problems to be checked, for example.

If no functions have been assigned, **[No]** (nO) is displayed.

[DI1 Delay] (L1d)

Delay for DI1.

> **Note:**
>
> **Commands received on this digital input are processed as soon as the delay set by this parameter has expired.**

Setting	Description
0 to 200 ms	Setting range Factory setting: 2 ms

[DI2 Configuration] (di2-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DI2 Configuration]

About this menu

Identical to [DI1 Configuration] (di1-).

[DI2 Low Assignment] (L2L)

Low DI2 assignment.

[DI2 High Assignment] (L2H)

High DI2 assignment.

[DI2 Delay] (L2d)

Delay for DI2.

[DI3 Configuration] (di3-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DI3 Configuration]

About this menu

Identical to [DI1 Configuration] (di1-).

[DI3 Low Assignment] (L3L)

Low DI3 assignment.

[DI3 High Assignment] (L3H)

High DI3 assignment.

[DI3 Delay] (L3d)

Delay for DI3.

[DI4 Configuration] (di4-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DI4 Configuration]

About this menu

Identical to [DI1 Configuration] (di1-).

[DI4 Low Assignment] (L4L)

Low DI4 assignment.

[DI4 High Assignment] (L4H)

High DI4 assignment.

[DI4 Delay] (L4d)

Delay for DI4.

[DI5 Configuration] (di5-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DI5 Configuration]

About this menu

Identical to **[DI1 Configuration]** (di1-).

[DI5 Low Assignment] (L5L)

Low DI5 assignment.

[DI5 High Assignment] (L5H)

High DI5 assignment.

[DI5 Delay] (L5d)

Delay for DI5.

[DI6 Configuration] (di6-)

Access

[Complete settings] → **[Input/Output]** → **[DI/DQ]** → **[DI6 Configuration]**

About this menu

Identical to **[DI1 Configuration]** (di1-).

[DI6 Low Assignment] (L6L)

Low DI6 assignment.

[DI6 High Assignment] (L6H)

High DI6 assignment.

[DI6 Delay] (L6d)

Delay for DI6.

[DI7 Configuration] (di7-)

Access

[Complete settings] → **[Input/Output]** → **[DI/DQ]** → **[DI7 Configuration]**

About this menu

Identical to **[DI1 Configuration]** (di1-).

[DI7 Low Assignment] (L7L)

Low DI7 assignment.

[DI7 High Assignment] (L7H)

High DI7 assignment.

[DI7 Delay] (L7d)

Delay for DI7.

[DI8 Configuration] (di8-)

Access

[Complete settings] → **[Input/Output]** → **[DI/DQ]** → **[DI8 Configuration]**

About this menu

Accessing this menu is possible for inverters with a power output greater than 22 kW.

Identical to [DI1 Configuration] (di1-).

[DI8 Low Assignment] (L8L)

Low DI8 assignment.

[DI8 High Assignment] (L8H)

High DI8 assignment.

[DI8 Delay] (L8d)

Delay for DI8.

5.2.4.38.2 [Input/Output] - [DI/DQ] - [DIx Pulse Config]

[DI7 Pulse Config] (PAI7-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DI7 Pulse Config]

About this menu

The following parameters are accessible on the display terminal by pressing the OK button on parameter [DI7 frequency measured] (PFC7).

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[DI7 Pulse Input Assign] (PI7A)

Assigns pulse input DI7

All functions assigned to the pulse input are displayed. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

Setting	Code/Value	Description
[No]	(nO)	Not assigned Factory setting
[Torque Ref Offset]	(tqo)	Source of the torque offset
[Torque Ref Ratio]	(tqr)	Source of the torque ratio
[Ref Frequency 1]	(Fr1)	Frequency setpoint 1
[Ref Frequency 2]	(Fr2)	Frequency setpoint 2
[Ref Frequency 2 Summing]	(SA2)	Sum of frequency setpoint 2
[PID feedback]	(PIF)	Actual value of the PI controller
[Torque limitation]	(taa)	Torque limitation: Enabled via an analog input
[Torque limitation 2]	(taa2)	Torque limitation: Enabled via an analog input
[Subtract Ref Freq 2]	(dA2)	Subtraction for frequency setpoint 2
[Manual PID Ref.]	(PIM)	Manually set frequency setpoint of the PID controller (automatic/manual mode)
[PID Ref Frequency]	(FPI)	Frequency setpoint for PID
[Ref Frequency 3 Summing]	(SA3)	Sum of frequency setpoint 3
[Ref Frequency 1B]	(Fr1b)	Frequency setpoint for 1B
[Subtract Ref Freq 3]	(dA3)	Subtraction for frequency setpoint 3
[Forced local]	(FLOC)	Setpoint source "Forced local" 1
[Ref Frequency 2 multiplier]	(MA2)	Multiplier for frequency setpoint 2
[Ref Frequency 3 multiplier]	(MA3)	Multiplier for frequency setpoint 3
[Torque reference]	(tr1)	Torque control: Torque setpoint 1
[Torque reference]	(tr2)	Torque control: Torque setpoint 2
[Frequency meter]	(fqf)	Enables the frequency meter function
[Torque reference 2]	(teff)	External actual value for forward direction

[DI7 PulseInput Low Freq] (PIL7)

Low frequency for pulse input DI7.

Scales parameters for pulse input: 0% in Hz x 10 [Unit].

Setting	Description
0.00 to 30,000.00 Hz	Setting range Factory setting: 0 Hz

[DI7 PulseInput High Freq] (PIH7)

High frequency for pulse input DI7.

Scales parameters for pulse input: 100% in Hz x 10 [Unit].

Setting	Description
0.00 to 30.00 kHz	Setting range Factory setting: 30.00 kHz

[DI7 Frequency Filter] (PFI7)

Filter time of the low-pass filter for filtering interference (pulse input).

Setting	Description
0 to 1,000 ms	Setting range Factory setting: 0 ms

[DI8 Pulse Config] (PAI8-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DI8 Pulse Config]

About this menu

The following parameters are accessible on the display terminal by pressing the OK button on parameter [DI8 frequency measured] (PFC8).

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[DI8 Pulse Input Assign] (PI8A)

Assigns pulse input DI8.

Identical to [DI7 Pulse Input Assign] (PI7A).

[DI8 PulseInput Low Freq] (PIL8)

Low frequency for pulse input DI8.

Identical to [DI7 PulseInput Low Freq] (PIL7).

[DI8 PulseInput High Freq] (PIH8)

High frequency for pulse input DI8.

Identical to [DI7 PulseInput High Freq] (PIH7).

[DI8 Frequency Filter] (PFI8)

Filter time of the low-pass filter for filtering interference (pulse input).

Identical to [DI7 Frequency Filter] (PFI7).

5.2.4.38.3 [Input/Output] – [DI/DQ] - [Pulse Input]

[Pulse Input] (PTI)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [Pulse Input]

About this menu

Accessing this menu is possible for inverters with a power output less than 30 kW.

[RP assignment] (PiA)

PTI assignment.

	Setting	Code/Value	Description
	[No]	(nO)	Not assigned Factory setting
	[Torque Ref Offset]	(tqo)	Source of the torque offset
	[Torque Ref Ratio]	(tqr)	Source of the torque ratio
	[Ref Frequency 1]	(Fr1)	Frequency setpoint 1
	[Ref Frequency 2]	(Fr2)	Frequency setpoint 2
	[Ref Frequen-cy 2 Summing]	(SA2)	Sum of frequency setpoint 2
	[PID feedback]	(PIF)	Actual value of the PI controller
	[Torque limitation]	(taa)	Torque limitation: Enabled via an analog input
	[Torque limitation 2]	(taa2)	Torque limitation: Enabled via an analog input
	[Subtract Ref Freq 2]	(dA2)	Subtraction for frequency setpoint 2
	[Manual PID Ref.]	(PIM)	Manually set frequency setpoint of the PID controller (automatic/manual mode)
	[PID Ref Frequency]	(FPI)	Frequency setpoint for PID
	[Ref Frequen-cy 3 Summing]	(SA3)	Sum of frequency setpoint 3
	[Ref Frequency 1B]	(Fr1b)	Frequency setpoint for 1B
	[Subtract Ref Freq 3]	(dA3)	Subtraction for frequency setpoint 3
	[Forced local]	(FLOC)	Setpoint source "Forced local" 1
	[Ref Frequen-cy 2 multiplier]	(MA2)	Multiplier for frequency setpoint 2
	[Ref Frequen-cy 3 multiplier]	(MA3)	Multiplier for frequency setpoint 3
	[Torque reference]	(tr1)	Torque control: Torque setpoint 1
	[Torque reference]	(tr2)	Torque control: Torque setpoint 2
	[Frequency meter]	(fqf)	Enables the frequency meter function
	[Torque reference 2]	(teff)	External actual value for forward direction

[PTI Low Freq] (PTIL)

Low frequency for pulse train input.

	Setting	Description
	-1000000.00 to 1000000.00 Hz	Setting range Factory setting: 0 Hz

[PTI High Freq] (PTIH)

High frequency for pulse train input.

	Setting	Description
	-1000000.00 to 1000000.00 Hz	Setting range Factory setting: 0 Hz

[PTI Filter Time Analog] (PTIT)

Analog PTI filter time.

	Setting	Description
	0 to 1000 ms	Setting range Factory setting: 0 ms

[PTI Mode] (PTIM)

PTI mode

	Setting	Code/Value	Description
	[A/B]	(Ab)	A/B input signals Factory setting
	[Pulse/Dir]	(Pd)	Pulse direction for input signals
	[CW/CCW]	(CwCCW)	Input signals clockwise/counterclockwise

[PTI Filter Time Inp] (PTIS)

PTI filter time for input.

	Setting	Description
	0.00 to 13.00 µs	Setting range Factory setting: 0.25 µs

[PTI Counting Dir Inv] (PTII)

Reverses the PTI direction

	Setting	Code/Value	Description
★	[OFF]	(OFF)	No reversal of the counting direction Factory setting
	[ON]	(On)	Reverses the counting direction

5.2.4.38.4 [Input/Output] - [DI/DQ] - [PTO configuration]

[PTO configuration] (Pto-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [PTO Configuration]

About this menu

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[PTO Assign] (PtO)

Assigns the pulse train output.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[Motor Current]	(OCr)	Current in the motor, between 0 and 2 In (In = nominal current of the frequency inverter specified on the inverter nameplate) Factory setting
[Motor Frequency]	(OFr)	Output frequency, between 0 and [Max Frequency] (tFr)
[Ramp out.]	(OrP)	Between 0 and [Max Frequency] (tFr)
[Motor torq.]	(trq)	Motor torque, between 0 and 3 times the rated motor torque
[Sign. torque]	(Stq)	Signed motor torque, between -3 and +3 times the rated motor torque. Sign "+" corresponds to motor operation; sign "-" corresponds to generator operation (braking).
[sign ramp]	(OrS)	Ramp output with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[PID ref.]	(OPS)	PID controller setpoint between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)
[PID feedback]	(OPF)	PID controller actual value between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)
[PID Error]	(OPE)	The PID controller detected a fault between -5% and +5% of values [Max PID feedback] (PIF2) - [Min PID feedback] (PIF1).
[PID output]	(OPI)	PID controller output between [Low Speed] (LSP) and [High Speed] (HSP)
[Motor Power]	(OPr)	Motor power, between 0 and 2.5 times [Nominal motor power] (nPr)
[Mot thermal]	(tHr)	Thermal motor state, between 0 and 200% of the thermal rated state
[Drv thermal]	(tHd)	Thermal inverter state, between 0 and 200% of the thermal rated state
[Measured Motor Freq]	(ofrr)	Measured motor frequency
[Sig. o/p frq.]	(OFS)	Output frequency with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[Mot therm2]	(tHr2)	Thermal state of motor 2
[Mot therm3]	(tHr3)	Thermal state of motor 3
[Mot therm4]	(tHr4)	Thermal state of motor 4
[Unsigned Trq Ref]	(utr)	Unsigned torque setpoint
[Signed Trq Ref]	(str)	Signed torque setpoint
[Torque lim.]	(tql)	Torque limiting
[Motor Voltage]	(UOP)	Voltage applied to the motor, between 0 and [Nom Motor Voltage] (UnS)
[DC Bus voltage]	(VbUS)	DC bus voltage
[Copy PI8]	(COPY)	Copy pulse input

[PTO Max Output Freq] (PtOH)

Maximum output frequency of the pulse train output.

This parameter is accessible if [PTO Assign] (PTO) is not set to [Not Configured] (nO).

	Setting	Description
★	1.00 to 30.00 kHz	Setting range Factory setting: 4.00 kHz

[PTO Min Output Freq] (PtOL)

Minimum output frequency of the pulse train output.

This parameter is accessible if [PTO Assign] (PTO) is not set to [Not Configured] (nO).

	Setting	Description
★	1.00 to 30.00 kHz	Setting range Factory setting: 1.00 kHz

[PTO configuration] (Ptoo-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [PTO Configuration]

About this menu

Accessing this menu is possible for inverters with a power output less than 30 kW.

[PTO Mode Selection] (PtOM)

Assigns the pulse train output.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned Factory setting
[PTI Signal]	(PTI)	PTI signal.
[PTO Assigned Param]	(CONS)	Parameter assigned to PTO.

[PTO Assign] (PtOE)

PTO assignment.

This parameter is accessible if [PTO Mode Selection] (PTOM) is not set to [PTO Assigned Param] (ConS).

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[Motor Current]	(OCr)	Current in the motor, between 0 and 2 In (In = nominal current of the frequency inverter specified on the inverter nameplate) Factory setting
[Motor Frequency]	(OFr)	Output frequency, between 0 and [Max Frequency] (tFr)
[Ramp out.]	(OrP)	Between 0 and [Max Frequency] (tFr)
[Motor torq.]	(trq)	Motor torque, between 0 and 3 times the rated motor torque
[Sign. torque]	(Stq)	Signed motor torque, between -3 and +3 times the rated motor torque. Sign "+" corresponds to motor operation; sign "-" corresponds to generator operation (braking).
[sign ramp]	(OrS)	Ramp output with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[PID ref.]	(OPS)	PID controller setpoint between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)
[PID feedback]	(OPF)	PID controller actual value between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)
[PID Error]	(OPE)	The PID controller detected a fault between -5% and +5% of values [Max PID feedback] (PIF2) - [Min PID feedback] (PIF1).
[PID output]	(OPI)	PID controller output between [Low Speed] (LSP) and [High Speed] (HSP)
[Motor Power]	(OPr)	Motor power, between 0 and 2.5 times [Nominal motor power] (nPr)
[Mot thermal]	(tHr)	Thermal motor state, between 0 and 200% of the thermal rated state
[Drv thermal]	(tHd)	Thermal inverter state, between 0 and 200% of the thermal rated state
[Measured Motor Freq]	(ofrr)	Measured motor frequency
[Sig. o/p frq.]	(OFS)	Output frequency with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[Mot therm2]	(tHr2)	Thermal state of motor 2
[Mot therm3]	(tHr3)	Thermal state of motor 3
[Mot therm4]	(tHr4)	Thermal state of motor 4
[Unsigned Trq Ref]	(utr)	Unsigned torque setpoint
[Signed Trq Ref]	(str)	Signed torque setpoint
[Torque lim.]	(tql)	Torque limiting
[Motor Voltage]	(UOP)	Voltage applied to the motor, between 0 and [Nom Motor Voltage] (UnS)
[DC Bus voltage]	(VbUS)	DC bus voltage
[Copy PI8]	(COPY)	Copy pulse input

[PTO High Freq] (PtOu)

High frequency for PTO.

This parameter is accessible if [PTO Mode Selection] (PTOM) is not set to [PTO Assigned Param] (ConS).

	Setting	Description
★	-1,000,000.00 to 1,000,000.00 Hz	Setting range Factory setting: 1,000,000.00 Hz

[PTO Low Freq] (PtOb)

Low frequency for PTO.

This parameter is accessible if [PTO Mode Selection] (PTOM) is not set to [PTO Assigned Param] (ConS).

	Setting	Description
★	-1,000,000.00 to 1,000,000.00 Hz	Setting range Factory setting: 0.00 Hz

[PTO Freq Value] (PtOF)

PTO frequency value.

This parameter is accessible if [PTO Mode Selection] (PTOM) is not set to [PTO Assigned Param] (ConS).

	Setting	Description
☆	-1,000,000.00 to 1,000,000.00 Hz	Setting range Factory setting: -

5.2.4.38.5 [Input/Output] - [DI/DQ] - [DQ1x Configuration]

[DQ1 Configuration] (dO1-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DQ1 Configuration]

[DQ1 Assignment] (dO1)

Assigns digital output 1.

Identical to [R2 Assignment] (r2).

[DQ1 Delay time] (DO1D)

Enables delay time for DQ1.

	Setting	Description
☆	0 to 60,000 ms	Setting range 0 to 9,999 ms, then 10.00 to 60.00 s on the display terminal. Factory setting: 0 ms

[DQ1 Active at] (DO1S)

State of DQ1 (current output level).

	Setting	Code/Value	Description
☆	[1]	(POS)	State 1 if the information is true Factory setting
	[0]	(nEG)	State 0 if the information is true

[DQ1 Holding time] (dO1H)

Holding delay time for DQ1.

	Setting	Description
☆	0 to 9,999 ms	Setting range Factory setting: 0 ms

[DQ2 Configuration] (dO2-)

Access

[Complete settings] → [Input/Output] → [DI/DQ] → [DQ2 Configuration]

About this menu

Accessing this menu is possible for inverters with a power output less than 30 kW.

[DQ2 Assignment] (dO2)

Assigns digital output 2.

Identical to [DQ1 Assignment] (do1).

[DQ2 Delay time] (DO2D)

Enables delay time for DQ2.

Identical to [DQ1 Delay time] (do1D).

[DQ2 Active at] (DO2S)

State of DQ2 (current output level).

Identical to [DQ1 Active at] (do1S).

[DQ2 Holding time] (dO2H)

Holding delay time for DQ2.

Identical to [DQ1 Holding time] (do1H).

5.2.4.39 [Input/Output] - [Analog I/O]

5.2.4.39.1 [Input/Output] - [Analog I/O] - [AI1 Configuration]

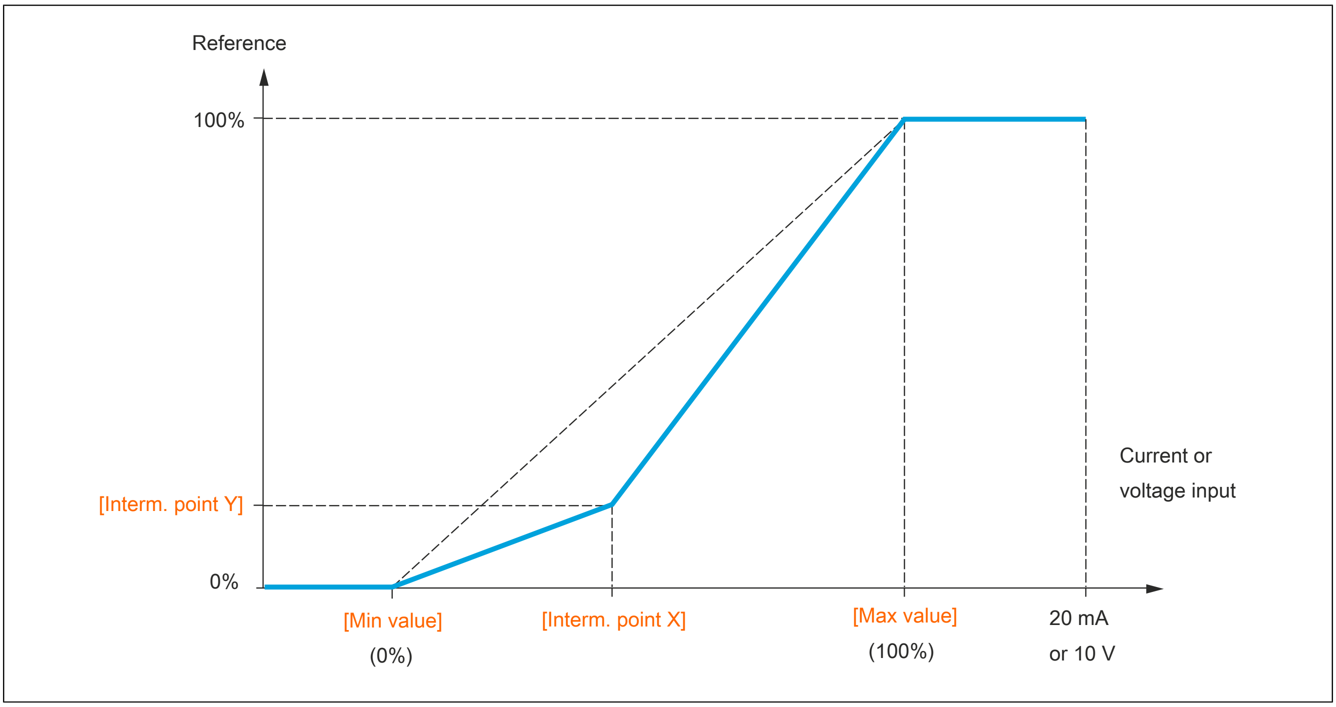
[AI1 configuration] (AI1-)

Access

[Complete settings] → [Input/Output] → [AI/AQ] → [AI1 configuration]

About this menu

The input can be delinearized by configuring an intermediate point on the input/output curve of this input:



Note:

For [AI1 Interm. point] 0% corresponds to the [Min value] and 100% to the [Max value].

[AI1 Assignment] (AI1A)

Function assignment for analog input AI1.

Read-only parameter, cannot be configured. This parameter displays all functions assigned to the AI1 input. This allows compatibility problems to be checked, for example.

If no functions have been assigned, [No] (nO) is displayed.

[AI1 Type] (AI1t)

Configures analog input AI1.

Setting	Code/Value	Description
[Voltage]	(10U)	0 to 10 VDC Factory setting
[Current]	(0A)	0 to 20 mA

[AI1 min value] (UIL1)

Minimum value for AI1.

Voltage scaling parameter for 0% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Voltage] (10U).

	Setting	Description
★	0.0 to 10.0 VDC	Setting range Factory setting: 0.0 VDC

[AI1 max value] (UIH1)

Maximum value for AI1.

Voltage scaling parameter for 100% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Voltage] (10U).

	Setting	Description
★	0.0 to 10.0 VDC	Setting range Factory setting: 10.0 VDC

[AI1 min value] (CrL1)

Minimum value for AI1.

Current scaling parameter for 0% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 0.0 mA

[AI1 max value] (CrH1)

Maximum value for AI1.

Current scaling parameter for 100% on AI1.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 20.0 mA

[AI1 filter] (AI1F)

Switch-off time for low-pass filter AI1.

	Setting	Description
	0.00 to 10.00 s	Setting range Factory setting: 0.00 s

[AI1 Interm. point X] (AI1E)

Coordinate of the delinearization point at the input. Percentage of the physical input signal.

0% corresponds to [AI1 min value] (U1LI).

100% corresponds to [AI1 max value] (U1HI).

	Setting	Description
	0 to 100%	Setting range Factory setting: 0%

[AI1 Interm. point Y] (AI1S)

Coordinate for input delinearization (frequency setpoint).

The percentage of the internal frequency setpoint corresponds to the percentage of physical input signal [AI1 Interm. point X] (AI1E).

	Setting	Description
	0 to 100%	Setting range Factory setting: 0%

[AI1 range] (AI1L)

AI1 scaling selection.

This parameter is accessible if [AI1 Type] (AI1t) is set to [Current] (0A).

This parameter is forced to [0-100%] (POS) if [AI1 Type] (AI1T) is not set to [Current] (0A) or if [AI1 min value] (CRL1) is lower than 3 mA.

	Setting	Code/Value	Description
★	[0-100%]	(PoS)	Unidirectional: AI1 current scaling is 0 to 100%. Factory setting
	[-/+100%]	(PoSnEG)	Bidirectional: Current scaling for AI1 is -100 to 100%. [AI1 min. value] (CRL1) corresponds to -100%. [AI1 max value] (CRH1) corresponds to 100%.

[AI2 configuration] (AI2-)

Access

[Complete settings] → [Input/Output] → [AI/AQ] → [AI2 configuration]

[AI2 Assignment] (AI2A)

Function assignment for AI2.

Identical to [AI1 Assignment] (AI1A).

[AI2 Type] (AI2t)

Configures analog input AI2.

Setting	Code/Value	Description
[Voltage]	(10U)	0 to 10 VDC
[Voltage +/-]	(n10U)	±10 VDC Factory setting

[AI2 min value] (UIL2)

Minimum value for AI2.

Voltage scaling parameter for 0% on AI2.

This parameter is accessible if [AI2 Type] (AI2T) is set to [Voltage] (10U).

Identical to [AI1 min value] (UIL1).

[AI2 max value] (UIH2)

Maximum value for AI2.

Voltage scaling parameter for 100% on AI2.

This parameter is accessible if [AI2 Type] (AI2T) is set to [Voltage] (10U).

Identical to [AI1 max value] (UIH1).

[AI2 filter] (AI2F)

AI2 filter.

Interference filter.

Identical to [AI1 filter] (AI1F).

[AI2 Interm. point X] (AI2E)

Input level for delinearization on AI2

Identical to [AI1 Interm. point X] (AI1E).

[AI2 Interm. point Y] (AI2S)

Output level for delinearization on AI2.

Identical to [AI1 Interm. point Y] (AI1S).

[AI3 configuration] (AI3-)

Access

[Complete settings] → [Input/Output] → [AI/AQ] → [AI3 configuration]

About this menu

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[AI3 Assignment] (AI3A)

Function assignment for AI3.

Identical to [AI1 Assignment] (AI1A).

[AI3 Type] (AI3t)

Configures analog input AI3.

Identical to [AI2 Type] (AI2t) with factory setting: [Current] (0A).

[AI3 min value] (UIL3)

Parameter value for voltage scaling AI3 = 0%.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Voltage] (10U).

Identical to [AI1 min value] (UIL1).

[AI3 max value] (UIH3)

Parameter value for voltage scaling AI3 = 100%.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Voltage] (10U).

Identical to [AI1 max value] (UIH1).

[AI3 min value] (CrL3)

Current scaling parameter for 0% on AI3.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Current] (0A).

Identical to [AI1 min value] (CrL1).

[AI3 max value] (CrH3)

Current scaling parameter for 100% on AI3.

This parameter is accessible if [AI3 Type] (AI3T) is set to [Current] (0A).

Identical to [AI1 max value] (CrH1).

[AI3 Filter] (AI3F)

Switch-off time for low-pass filter AI3.

Identical to [AI1 filter] (AI1F).

[AI3 X Interm. point] (AI3E)

Input level for delinearization on AI3

Identical to [AI1 Interm. point X] (AI1E).

[AI3 Y Interm. point] (AI3S)

Output level for delinearization on AI3.

Identical to [AI1 Interm. point Y] (AI1S).

[AI3 range] (AI3L)

AI3 scaling selection.

This parameter is accessible if **[AI3 Type]** (AI3T) is set to **[Current]** (0A).

Identical to **[AI1 Type]** (AI1T).

5.2.4.39.2 [Input/Output] - [Analog I/O] - [AQ1 configuration]

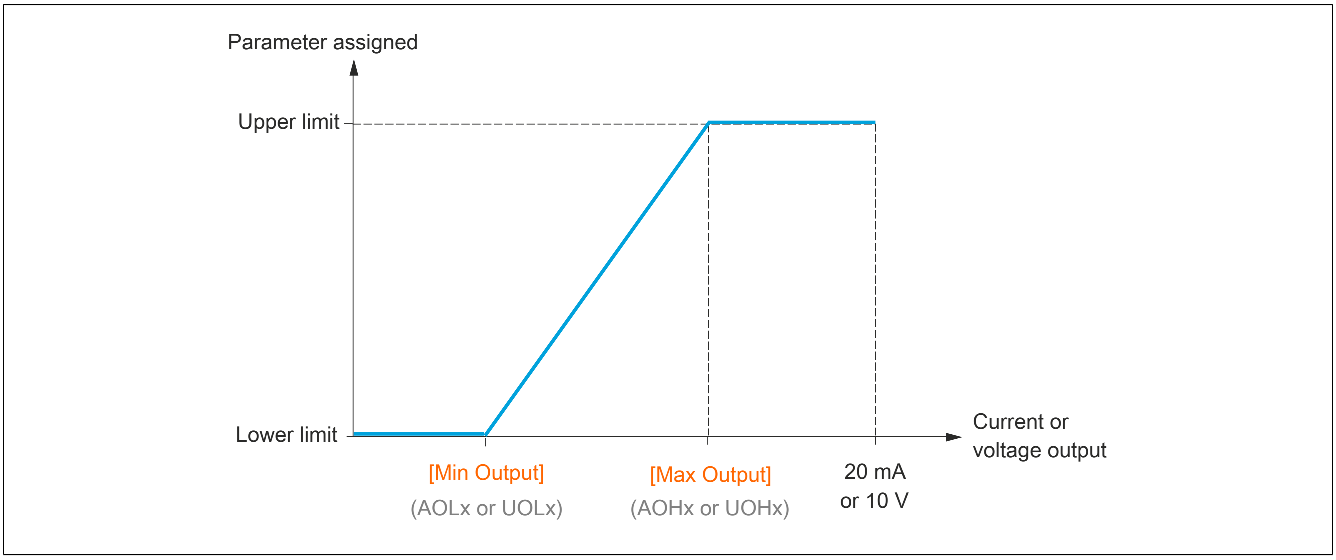
[AQ1 configuration] (AO1-)

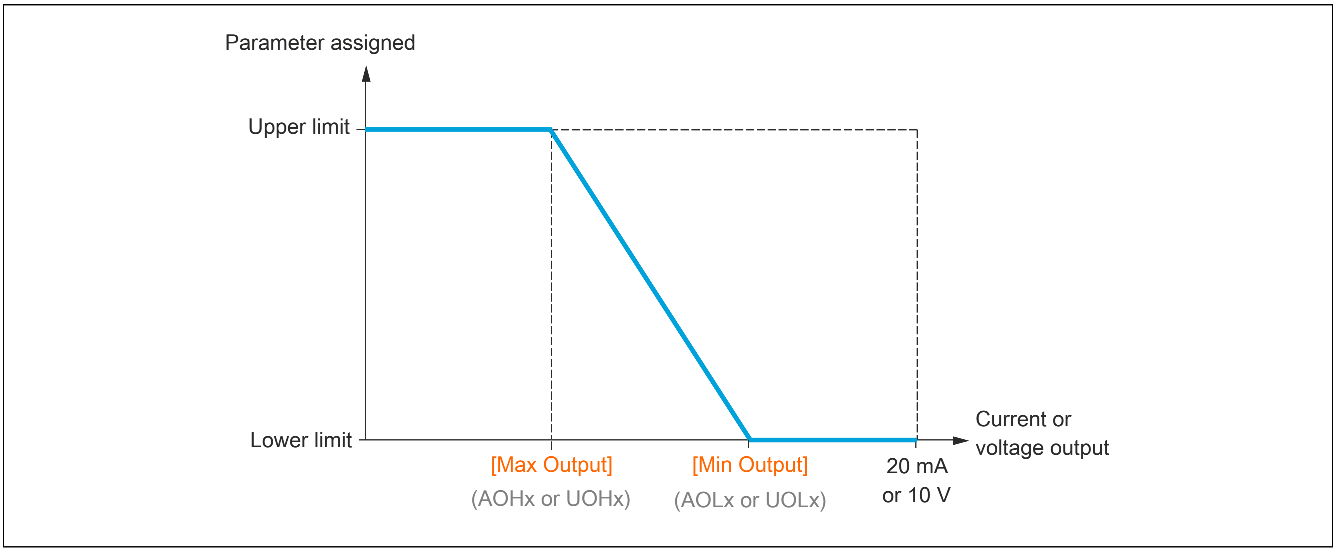
Access

[Complete settings] → **[Input/Output]** → **[AI/AQ]** → **[AQ1 configuration]**

Minimum and maximum output values

The minimum output value, in volts, corresponds to the lower limit value of the assigned parameter, and the maximum value corresponds to its upper limit value. The minimum value may be greater than the maximum value.





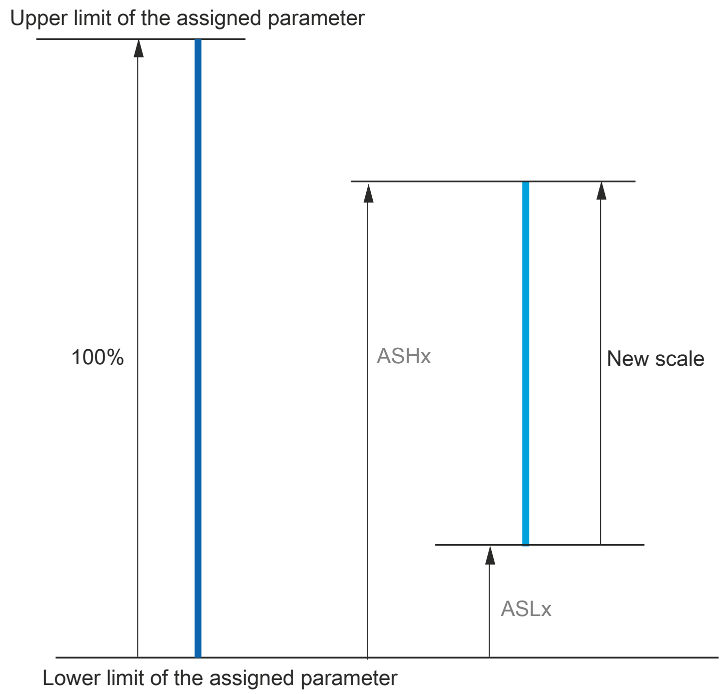
Scaling the assigned parameter

The assigned parameter's scale can be adapted according to requirements. In order to do so, the upper and lower limit values of each analog input are changed via the corresponding parameter.

The parameter values are given as percentages. 100% corresponds to the total variation range of the configured parameter. Accordingly, the following applies: 100% = Upper limit value - Lower limit value.

For example, **[Sign. torque]**(Stq) with the value varying between -3 and +3 times the rated torque. Setting "100%" corresponds to 6 times the rated torque.

- Parameter **[Scaling AQx min]** (ASLx) changes the lower limit value: New value = Lower limit value + (range x (ASLx)). Factory preset value "0%" does not change the lower limit value.
- Parameter **[Scaling AQx max]** (ASHx) changes the upper limit value: New value = Lower limit value + (range x (ASHx)). Factory preset value "100%" does not change the upper limit value.
- **[Scaling AQx min]**(ASLx) must always be lower than **[Scaling AQx max]**(ASHx).



Application example

The motor current value at output AO1 should be transferred with 0-20 mA (range: 2 In motor). In this case, In motor is equivalent to 0.8 times the value of In inverter.

Parameter **[I motor]**(OCr) varies between 0 and 2 times the rated inverter current or in the range of 2.5 times the inverter rated current.

Parameter **[AO1 max scal]**(ASL1) does not change the lower limit value. Consequently, this value remains at the factory setting of 0%.

Parameter **[AO1 min scal]**(ASH1) changes the upper limit value by 0.5 times the nominal motor torque, i.e. 100 - 100/5 = 80% (New value = Lower limit value + (range x ASH1)).

[AQ1 assignment](AO1)

AQ1 assignment.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[Motor Current]	(OCr)	Current in the motor, between 0 and 2 In (In = nominal current of the frequency inverter specified on the inverter nameplate)
[Motor Frequency]	(OFr)	Output frequency, between 0 and [Max Frequency] (tFr) Factory setting
[Ramp out.]	(OrP)	Between 0 and [Max Frequency] (tFr)
[Motor torq.]	(trq)	Motor torque, between 0 and 3 times the rated motor torque
[Sign. torque]	(Stq)	Signed motor torque, between -3 and +3 times the rated motor torque. Sign "+" corresponds to motor operation; sign "-" corresponds to generator operation (braking).
[sign ramp]	(OrS)	Ramp output with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[PID ref.]	(OPS)	PID controller setpoint between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)
[PID feedback]	(OPF)	PID controller actual value between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)
[PID Error]	(OPE)	The PID controller detected a fault between -5% and +5% of values [Max PID feedback] (PIF2) - [Min PID feedback] (PIF1).
[PID output]	(OPI)	PID controller output between [Low Speed] (LSP) and [High speed] (HSP)
[Motor Power]	(OPr)	Motor power, between 0 and 2.5 times [Nominal motor power] (nPr)
[Mot thermal]	(tHr)	Thermal motor state, between 0 and 200% of the thermal rated state
[Drv thermal]	(tHd)	Thermal inverter state, between 0 and 200% of the thermal rated state
[Torque 4Q]	(tr4q)	Signed motor torque, between -3 and +3 times the rated motor torque. Signs "+" and "-" correspond to the physical torque direction regardless of the operating mode (motor or generator).
[Measured Motor Freq]	(ofrr)	Measured motor frequency
[Sig. o/p frq.]	(OFS)	Output frequency with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[Mot therm2]	(tHr2)	Thermal state of motor 2
[Mot therm3]	(tHr3)	Thermal state of motor 3
[Mot therm4]	(tHr4)	Thermal state of motor 4
[Unsigned Trq Ref]	(utr)	Unsigned torque setpoint
[Signed Trq Ref]	(str)	Signed torque setpoint
[Torque lim.]	(tql)	Torque limiting
[Motor Voltage]	(UOP)	Voltage applied to the motor, between 0 and [Nom Motor Voltage] (UnS)
[M/S Out Speed Reference]	(msso)	Master/Slave output speed setpoint
[M/S Out Torque Reference]	(msto)	Master/Slave output torque setpoint

[AQ1 Type](AO1t)

Type AO1.

Setting	Code/Value	Description
[Voltage]	(10U)	0 to 10 VDC
[Current]	(0A)	0 to 20 mA Factory setting

[AQ1 min Output](AOL1)

Current scaling parameter for 0% on AO1.

This parameter is accessible if [AQ1 Type] (AO1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 0.0 mA

[AQ1 max Output](AOH1)

Current scaling parameter for 100% on AO1.

This parameter is accessible if [AQ1 Type] (AO1t) is set to [Current] (0A).

	Setting	Description
★	0.0 to 20.0 mA	Setting range Factory setting: 20.0 mA

[AQ1 min Output](UOL1)

Parameter value for voltage scaling AO1 = 0%.

This parameter is accessible if [AQ1 Type] (AO1t) is set to [Voltage] (10U).

	Setting	Description
★	0.0 to 10.0 VDC	Setting range Factory setting: 0.0 VDC

[AQ1 max Output](UOH1)

Parameter value for voltage scaling AO1 = 100%.

This parameter is accessible if [AQ1 Type] (AO1t) is set to [Voltage] (10U).

	Setting	Description
	0.0 to 10.0 VDC	Setting range Factory setting: 10.0 VDC

[Scaling AQ1 min](ASL1)

Parameter value for scaling of AQ1 = 0%.

Scales the lower limit value of the assigned parameter as a percentage of the highest possible fluctuation.

Setting	Description
0.0 to 100.0%	Setting range Factory setting: 0.0%

[Scaling AQ1 max](ASH1)

Parameter value for scaling of AQ1 = 100%.

Scales the upper limit value of the assigned parameter as a percentage of the highest possible fluctuation.

Setting	Description
0.0 to 100.0%	Setting range Factory setting: 100.0%

[AQ1 Filter](AO1F)

Cutoff time for low-pass filter of AQ1.

Setting	Description
0.00 to 10.00 s	Setting range Factory setting: 0.00 s

[AQ2 configuration] (AO2-)

Access

[Complete settings] → [Input/Output] → [AI/AQ] → [AQ2 configuration]

About this menu

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[AQ2 assignment](AO2)

AQ2 assignment.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned
[Motor Current]	(OCr)	Current in the motor, between 0 and 2 In (In = nominal current of the frequency inverter specified on the inverter nameplate) Factory setting
[Motor Frequency]	(OFr)	Output frequency, between 0 and [Max Frequency] (tFr)
[Ramp out.]	(OrP)	Between 0 and [Max Frequency] (tFr)
[Motor torq.]	(trq)	Motor torque, between 0 and 3 times the rated motor torque
[Sign. torque]	(Stq)	Signed motor torque, between -3 and +3 times the rated motor torque. Sign "+" corresponds to motor operation; sign "-" corresponds to generator operation (braking).
[sign ramp]	(OrS)	Ramp output with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[PID ref.]	(OPS)	PID controller setpoint between [Min PID reference] (PIP1) and [Max PID reference] (PIP2)
[PID feedback]	(OPF)	Actual value of the PID controller between [Min PID feedback] (PIF1) and [Max PID feedback] (PIF2)
[PID Error]	(OPE)	The PID controller detected a fault between -5% and +5% of values [Max PID feedback] (PIF2) - [Min PID feedback] (PIF1).
[PID output]	(OPI)	PID controller output between [Low Speed] (LSP) and [High speed] (HSP)
[Motor Power]	(OPr)	Motor power, between 0 and 2.5 times [Nominal motor power] (nPr)
[Mot thermal]	(tHr)	Thermal motor state, between 0 and 200% of the thermal rated state
[Drv thermal]	(tHd)	Thermal inverter state, between 0 and 200% of the thermal rated state
[Torque 4Q]	(tr4q)	Signed motor torque, between -3 and +3 times the rated motor torque. Signs "+" and "-" correspond to the physical torque direction regardless of the operating mode (motor or generator).
[Measured Motor Freq]	(ofrr)	Measured motor frequency
[Sig. o/p frq.]	(OFS)	Output frequency with sign, between -[Max Frequency] (tFr) and +[Max Frequency] (tFr)
[Mot therm2]	(tHr2)	Thermal state of motor 2
[Mot therm3]	(tHr3)	Thermal state of motor 3
[Mot therm4]	(tHr4)	Thermal state of motor 4
[Unsigned Trq Ref]	(utr)	Unsigned torque setpoint
[Signed Trq Ref]	(str)	Signed torque setpoint
[Torque lim.]	(tql)	Torque limiting
[Motor Voltage]	(UOP)	Voltage applied to the motor, between 0 and [Nom Motor Voltage] (UnS)

[AQ2 Type](AO2t)

Type AQ2.

Setting	Code/Value	Description
[Voltage]	(10U)	0 to 10 VDC
[Current]	(0A)	0 to 20 mA Factory setting

[AQ2 Min Output](AOL2)

Current scaling parameter for 0% on AO2.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Current] (0A).

Identical to [AQ1 min Output] (AOL1).

[AQ2 Max Output](AOH2)

Current scaling parameter for 100% on AO2.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Current] (0A).

Identical to [AQ1 max Output] (AOH1).

[AQ2 Min Output](UOL2)

Parameter value for voltage scaling AO2 = 0%.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Voltage] (10U).

Identical to [AQ1 min Output] (UOL1).

[AQ2 Max Output](UOH2)

Parameter value for voltage scaling AO2 = 100%.

This parameter is accessible if [AQ2 Type] (AO2t) is set to [Voltage] (10U).

Identical to [AQ1 max Output] (UOH1).

[Scaling AQ2 min](ASL2)

Parameter value for AQ2 scaling = 0%.

Identical to **[Scaling AQ1 min]** (ASL1).

[Scaling AQ2 max](ASH2)

Parameter value for AQ2 scaling = 100%.

Identical to **[Scaling AQ1 max]** (ASH1).

[AQ2 Filter](AO2F)

Cutoff time for low-pass filter AQ2.

Identical to **[AQ1 Filter]** (AO1F).

5.2.4.39.3 [Input/Output] - [Analog I/O] - [Virtual AI1]

[Virtual AI1] (AV1-)

Access

[Complete settings] → **[Input/Output]** → **[AI/AQ]** → **[Virtual AI1]**

[AIV1 assignment](Av1A)

Function assignment for virtual AI1

Setting	Code/Value	Description
[No]	(nO)	Not assigned
[Torque Ref Offset]	(tqo)	Source of the torque offset
[Torque Ref Ratio]	(tqr)	Source of the torque ratio
[Ref Frequency 2 Summing]	(SA2)	Sum of frequency setpoint 2
[Torque limitation]	(taa)	Torque limitation: Enabled via an analog input
[Torque limitation 2]	(taa2)	Torque limitation: Enabled via an analog input
[Subtract Ref Freq 2]	(dA2)	Subtraction for frequency setpoint 2
[Ref Frequency 3 Summing]	(SA3)	Sum of frequency setpoint 3
[Subtract Ref Freq 3]	(dA3)	Subtraction for frequency setpoint 3
[Ref Frequency 2 multiplier]	(MA2)	Multiplier for frequency setpoint 2
[Ref Frequency 3 multiplier]	(MA3)	Multiplier for frequency setpoint 3

[AIV1 Channel Assignment](AIC1)

Channel assignment of virtual analog input AIV1.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not assigned Factory setting
[Ref. Freq-Com. Module]	(nEt)	Frequency setpoint via POWERLINK

[AIV1 Type](AV1T)

Configures virtual analog input AIV1.

Setting	Code/Value	Description
[+/-8192]	(inEG)	±8192 Factory setting
[+/-100 %]	(PnEG)	±100.00%

5.2.4.40 [Input/Output] - [Relay]

[R1 configuration] (r1-)

Access

[Complete settings] → **[Input/Output]** → **[Relay]** → **[R1 configuration]**

[R1 Assignment](r1)

R1 assignment.

Setting	Code/Value	Description
[No]	(nO)	Not assigned
[Operating State Fault]	(FLt)	Operating state fault Factory setting
[Drive Running]	(rUn)	The inverter is running.
[Mot Freq High Thd]	(FtA)	Motor frequency threshold value [Motor Freq Thd] (FTD) reached
[High Speed Reached]	(FLA)	HSP reached
[Current Thd Reached]	(CtA)	Threshold value for motor current [High Current Thd] (CTD) reached
[Ref Freq Reached]	(SrA)	Frequency setpoint reached
[Motor Therm Thd reached]	(tSA)	Thermal motor threshold value [Motor Therm Thd] (TTD) reached
[PID error Warning]	(PEE)	Warning for PID fault
[PID Feedback Warning]	(PFA)	Warning for actual value of PID
[Mot Freq High Thd 2]	(F2A)	Second frequency threshold value [Freq. threshold 2] (F2D) reached
[Drv Therm Thd reached]	(tAd)	Thermal threshold value for inverter reached
[Ref Freq High Thd reached]	(rtAH)	Threshold value for frequency setpoint "High" reached
[Ref Freq Low Thd Reached]	(rtAL)	Threshold value for frequency setpoint "Low" reached
[Mot Freq Low Thd]	(FtAL)	Threshold value for low frequency [Low Freq.Threshold] (FTDL) reached
[Mot Freq Low Thd 2]	(F2AL)	Second threshold value for low frequency [2 Freq. Threshold] (F2DL) reached
[Low Current Reached]	(CtAL)	Threshold value for low current [Low I Threshold] (CTDL) reached
[Process Undld Warning]	(ULA)	Warning for underload
[Process Overload Warning]	(OLA)	Warning for overload
[Forced Run]	(ern)	Emergency operation
[Slack Rope Warning]	(rsda)	Rope slack
[High Torque Warning]	(ttHa)	Threshold value for high torque
[Forward]	(MFrd)	Forward
[Reverse]	(MrrS)	Reverse
[HMI cmd.]	(BMP)	Control via the graphic display terminal is active (only active with key for local/remote).
[Ramp switching]	(rp2)	Status of ramp switching
[Mot2 Therm Thd reached]	(ts2)	Thermal threshold value "Motor 2" (TTD2) reached
[Mot3 Therm Thd reached]	(ts3)	Thermal threshold value "Motor 3" (TTD3) reached
[Mot4 Therm Thd reached]	(ts4)	Thermal threshold value "Motor 4" (TTD4) reached
[Neg Torque]	(AtS)	Current torque sign
[Cnfg.0 act.]	(CnF0)	Configuration 0 active
[Cnfg.1 act.]	(CnF1)	Configuration 1 active
[Cnfg.2 act.]	(CnF2)	Configuration 2 active
[Configuration 3 Active]	(CnF3)	Configuration 3 active
[Set 1 active]	(CFP1)	Parameter set 1 active
[Set 2 active]	(CFP2)	Parameter set 2 active
[Set 3 active]	(CFP3)	Parameter set 3 active
[DC Bus Charged]	(dbL)	DC bus charged
[In braking]	(BRS)	Braking active
[Power removal state]	(PrM)	State of STO. The information cannot be transmitted without power supply. An external power supply is not permitted with this set value.
[Pulse Warn Thd Reached]	(fqla)	Threshold value for impulse warning reached
[I present]	(MCP)	Motor current exists.
[Limit Switch Reached]	(lsa)	Enables the limit switch function
[Dynamic Load Warning]	(dlda)	Detects dynamic loads
[Warning Grp 1]	(AG1)	Warning for group 1
[Warning Grp 2]	(AG2)	Warning for group 2
[Warning Grp 3]	(AG3)	Warning for group 3
[Warning Grp 4]	(AG4)	Warning for group 4
[Warning Grp 5]	(AG5)	Warning for group 5
[External Error Warning]	(EFA)	Warning for external fault
[Undervoltage Warning]	(USA)	Warning for undervoltage
[Preventive UnderV Active]	(UPA)	Warning for undervoltage prevention
[Slipping warn]	(ana)	Warning for slipping
[Drive Thermal Warning]	(tHA)	Warning for thermal state of the inverter
[Load Mvt Warn]	(bsa)	Warning for braking speed
[Brake Cont Warn]	(bCa)	Warning for brake contact
[Lim T/I Reached]	(ssa)	Torque limiting - Alarm
[Trq ctrl Warning]	(rta)	Warning for timeout for torque control
[IGBT Thermal Warning]	(tJA)	Overtemperature warning
[BR Thermal Warning]	(boa)	Temperature warning for braking resistor
[DBR Active]	(brAS)	Braking resistor active
[AI3 4-20 Loss Warning]	(AP3)	Warning for loss of 4-20 mA on AI3
[Ready]	(rdY)	Ready to start
[AI1 4-20 Loss Warning]	(AP1)	Warning for loss of 4-20 mA on AI1
[AI1 Th Warning]	(tp1a)	Thermal warning 1
[Fallback Frequency]	(frf)	Response to event / fallback speed
[Speed Maintained]	(rls)	Response to event / maintained speed
[Per Type of Stop]	(stt)	Responses to event/stop on STT without a fault triggered after stop
[AI3 Th Warning]	(tp3a)	Thermal warning 3
[Pos. Target Reached]	(PPWS)	Position specification reached
[Temp Sens AI2 Warn]	(TS1A)	Warning for temperature sensor on AI1 (open circuit)
[Temp Sens AI3 Warn]	(TS3A)	Warning for temperature sensor on AI3 (open circuit)

[R1 Delay time] (r1d)

Enables delay time for R1.

The state change takes place after the defined time elapses if the information becomes true.

The delay cannot be set for assignment [Operating State Fault] (FLt) and remains at 0.

Setting	Description
0 to 60,000 ms	Setting range Factory setting: 0 ms

[R1 Active at] (r1S)

Status R1 (current level output).

Configuration [1] (POS) cannot be changed for assignment [Operating State "Fault"] (FLt).

Setting	Code/Value	Description
[1]	(POS)	State 1 if the information is true Factory setting
[2]	(nEG)	State 0 if the information is true

[R1 Holding time] (r1H)

Holding delay time for R1.

The state change takes place after the defined time elapses if the information becomes false.

The holding time cannot be set for the assignment [Operating State "Fault"] (FLt) and remains at 0.

Setting	Description
0 to 9,999 ms	Setting range Factory setting: 0 ms

[R2 configuration] (r2-)

Access

[Complete settings] → [Input/Output] → [Relay] → [R2 configuration]

About this menu

Identical to menu [R1 configuration] (r1-).

[R2 Assignment] (r2)

R2 assignment

Identical to [R1 Assignment] (r1).

Setting	Code/Value	Description
[No]	(NO)	Not assigned Factory setting
[Brake Sequence]	(BLC)	Braking sequence
[Mains Contactor]	(LLC)	Controls the line contactor
[DC charging]	(DCO)	DC charging
[Output cont]	(OCC)	Controls the output contactor

[R2 Delay time] (r2d)

Enables delay time for R2.

[R2 Active at] (r2S)

Status R2 (current level output).

[R2 Holding time] (r2H)

Holding delay time for R2.

[R3 configuration] (r3-)

Access

[Complete settings] → **[Input/Output]** → **[Relay]** → **[R3 configuration]**

About this menu

Identical to menu **[R1 configuration]** (r1-).

Accessing this menu is possible for inverters with a power output greater than 22 kW.

[R3 Assignment] (r3)

R3 assignment.

Identical to **[R2 Assignment]** (r2).

[R3 Delay time] (r3d)

Enables delay time for R3.

[R3 Active at] (r3S)

Status R3 (current level output).

[R3 Holding time] (r3H)

Holding delay time for R3.

5.2.4.41 [Input/Output]

[Input/Output] (io-)

Access

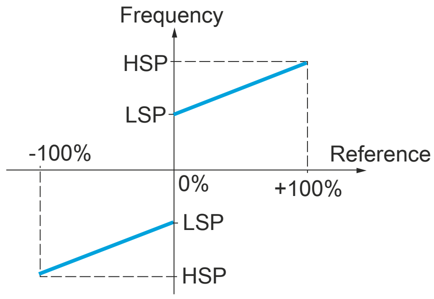
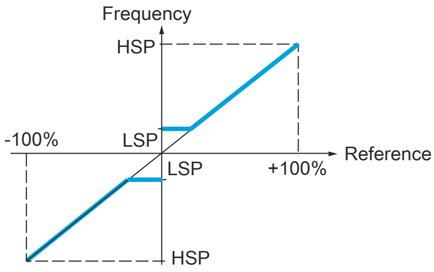
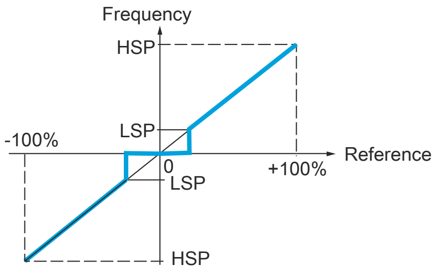
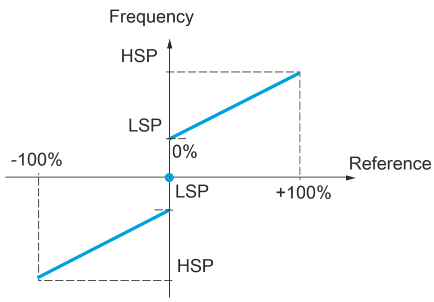
[Complete settings] → **[Input/Output]**

[Ref Freq Template] (bSP)

Selects the template for the frequency setpoint.

This parameter defines how the speed setpoint is taken into account (for analog inputs and pulse input only). For the PID controller, this is the PID output setpoint.

The limit values are defined by parameters **[Low Speed]** (LSP) and **[High Speed]** (HSP).

	Setting	Code/Value	Description
	[Standard]	(bSd)	 When setpoint = 0, the frequency = [Low Speed] (LSP). Factory setting
	[Pedestal]	(bLS)	 When setpoint = 0 to [Low Speed] (LSP), the frequency = [Low Speed] (LSP).
	[Deadband]	(bnS)	 When setpoint = 0 to [Low Speed] (LSP), the frequency = 0.
	[Deadband at 0%]	(bnS0)	 This procedure corresponds to [Standard] (bSd). In the following cases, the frequency = 0 at setpoint 0: The signal is lower than [Min value], which is greater than 0 (example: 1 VDC for a 2 to 10 VDC input). The signal is greater than [Min value], which is greater than [Max value] (example: 11 VDC for a 10 to 0 VDC input). If "bidirectional" was defined for the input range, the procedure is identical to [Standard] (bSd).

5.2.4.42 [Encoder configuration]

[Encoder configuration] (IEN-)

Access

[Complete settings] → [Encoder configuration]

About this menu

This menu is accessible if an encoder module (8I0IFENC.400-1, 8I0IFENC.401-1, 8I0IFENC.402-1 or 8I0IFENC.403-1) is connected. The available menu areas depend on the type of encoder used.

Procedure for testing the encoder

This process applies to all types of encoders.

1) Configure the parameters of the encoder used.
2) Set **[Motor control type]** (Ctt) to a value other than **[FVC]** (FvC) even if it corresponds to the required configuration. Example: Use **[SVC V]** (vvC) for an induction motor and **[Sync.mot.]** (SYn) for a synchronous motor.
3) Configure the motor parameters according to the specifications on the nameplate.
   - Induction motor **[Nominal motor power]** (nPr), **[Nom Motor Voltage]** (UnS), **[Nom Motor Current]** (nCr), **[Nominal Motor Freq]** (FrS), **[Nominal Motor Speed]** (nSP)
   - Synchronous motor **[Sync Nominal I]** (nCrS), **[Nom SyncMotor Speed]** (nSPS), **[Pole pairs]** (PPnS), **[Syn. EMF constant]** (PHS), **[Autotune L d-axis]** (LdS), **[Autotune L q-axis]** (LqS), **[SyncMotor Stator R]** (rSAS)
4) Set **[Encoder usage]** (EnU) to **[No]** (nO).
5) Perform motor measurement (autotuning).
6) Set **[Encoder check]** (EnC) to **[Yes]** (YES).
7) Set the motor rotation to a stabilized speed in the range of 15% for at least three seconds and monitor the encoder behavior via menu **[Display]** (mon) using parameter **[Measured output fr.]** (MMF).
8) If a fault of **[Encoder]** (EnF) is detected, **[Encoder check]** (EnC) returns to value **[No]** (nO).
   - Check the parameter settings (see steps 1 to 5 below).
   - Check the operation of the mechanical and electrical components, the power supply and all encoder connections.
   - Reverse the motor direction of rotation (parameter **[Output Ph Rotation]** (PHr)) or the encoder signals.
9) Repeat the process starting at step 6 until the value for **[Encoder check]** (EnC) changes to **[Done]** (dOnE).
10) If necessary, **[Motor control type]** (Ctt) is set to **[FVC]** (FvC) or **[Sync.CL]** (FSY).

> **Note:**
>
> **In this case, [Encoder usage] (EnU) is automatically set to [Speed Regulation] (REG).**

[Encoder Type] (UeCP)

Type of encoder.

This parameter is accessible if 8I0IFENC.400-1, 8I0IFENC.401-1, 8I0IFENC.402-1 or 8I0IFENC.403-1 is connected.

The content of the selection list depends on the inserted encoder module.

Setting	Code/Value	Description
[Undefined]	(und)	Unknown/No encoder type selected Factory setting
[Hiperface]	(SCHP)	SinCos HIPERFACE encoder
[SinCos]	(SC)	SinCos encoder
[SSI]	(SSI)	SSI encoder
[RS422]	(Ab)	AB encoder
[Resolver]	(rES)	Resolver encoder
[EnDat 2.2]	(En22)	EnDat 2.2 encoder
[HTL]	(HTL)	HTL encoder

[AB Encoder Type] (ENS)

Configures encoder type AB.

This parameter is accessible if [Encoder Type] (UECP) is set to [RS422] (AB) or [HTL] (HTL).

Note:

For this parameter, [AABB] (AAbb) is forced if the encoder module differs from the HTL encoder.

Warning!

LOSS OF CONTROL

If you use an HTL encoder module (8I0IFENC.403-1) and set [Encoder usage] (Enu) to [Speed Regulation] (rEG), you must set parameter [AB Encoder Type] (ENS) to [AABB] (AAbb).

Failure to follow these instructions can result in death, serious injury or damage to property.

Setting	Code/Value	Description
[AABB]	(AAbb)	Signals A, /A, B, /B Factory setting
[AB]	(Ab)	Signals A, B
[A]	(A)	Signal A **Note:** **The encoder usage cannot be set to [A] (A) when [Encoder usage] (Enu) is set to [Speed Regulation] (rEG) for an HTL encoder module.**

[Encoder supply volt.] (UeCv)

Supply voltage for the encoder.

Nominal voltage of the encoder used. The content of the selection list depends on the inserted encoder module.

This parameter is accessible if [Encoder Type] (UECP) is not set to [Undefined] (Und) or [Resolver] (rES).

	Setting	Code/Value	Description
★	[Undefined]	(und)	Undefined Factory setting
	[5 Vdc]	(5v)	5 volts
	[12 Vdc]	(12v)	12 volts
	[15 Vdc]	(15v)	15 volts
	[24 Vdc]	(24v)	24 volts

[Number of pulses] (PGI)

Number of pulses per encoder revolution.

The parameter is accessible when an encoder module of type 8I0IFENC.400-1 is inserted and [Encoder Type] (UECP) is set to [RS422] (Ab) or if an encoder module of type 8I0IFENC.403-1 is inserted and [Encoder Type] (UECP) is set to [HTL] (HTL).

	Setting	Description
★	100 to 10,000	Factory setting: 1024

[Encoder check] (ENC)

Enables the encoder test.

Setting	Code/Value	Description
[Not done]	(nO)	Test not performed. Factory setting
[Yes]	(YES)	Enables encoder monitoring.
[Done]	(dOne)	Test performed successfully. The test procedure checks the following: • Direction of rotation of the encoder/motor • Existing signals (continuity of wiring) • Number of pulses/revolutions. In the event of a fault, the inverter triggers fault [Encoder] (EnF).

[Encoder usage] (ENu)

Setting	Code/Value	Description
[No]	(nO)	Function not active Factory setting
[Speed Monitoring]	(SEC)	The encoder is only used as speed feedback for monitoring.
[Speed Regulation]	(rEG)	The encoder is used as speed feedback for closed-loop control and monitoring. This configuration is automatic if the inverter is configured operation in a closed control loop ([Motor control type] (Ctt) = [FVC] (FvC) or [Sync.CL] (FSY)). If [Motor control type] (Ctt) = [SVC V] (vvC), then the encoder acts as speed feedback and allows the static correction of the speed. For other values of [Motor control type] (Ctt) , this configuration cannot be accessed. **Note:** **The encoder usage cannot be set to [Speed Regulation] (rEG) if [AB Encoder Type] (ENS) is set to [A] (A) for an HTL encoder module.**
[Speed Reference]	(PGR)	The encoder provides a speed setpoint. This can only be selected for a forward-counting encoder module.

[Encoder rotation inv.] (Enri)

Reverses the rotation direction of the encoder.

Setting	Code/Value	Description
[No]	(nO)	Disables reversal of the rotation direction of the encoder. Factory setting
[Yes]	(YES)	Enables reversal of the rotation direction of the encoder.

[Resolver Exct. Freq.] (rEFq)

Phase angle control of the resolver.

This parameter is accessible if [Encoder Type] (UECP) is set to [Resolver] (RES).

	Setting	Code/Value	Description
	[3 kHz]	(3K)	3 kHz
	[4 kHz]	(4K)	4 kHz
	[5 kHz]	(5K)	5 kHz
	[6 kHz]	(6K)	6 kHz
	[7 kHz]	(7K)	7 kHz
	[8 kHz]	(8K)	8 kHz Factory setting
	[9 kHz]	(9K)	9 kHz
	[10 kHz]	(10K)	10 kHz
	[11 kHz]	(11K)	11 kHz
	[12 kHz]	(12K)	12 kHz

[Transformation ratio] (trES)

Transmission ratio of the resolver.

This parameter is accessible if [Encoder Type] (UECP) is set to [Resolver] (RES).

	Setting	Code/Value	Description
	[0.3]	(03)	0.3
	[0.5]	(05)	0.5 Factory setting
	[0.8]	(08)	0.8
	[1]	(10)	1.0

[Resolver poles nbr] (rPPn)

Number of pole pairs of the resolver.

This parameter is accessible if [Encoder Type] (UECP) is set to [Resolver] (RES).

	Setting	Code/Value	Description
	[2 poles]	(2P)	2 poles Factory setting
	[4 poles]	(4P)	4 poles
	[6 poles]	(6P)	6 poles
	[8 poles]	(8P)	8 poles

[Sincos lines count] (uELC)

SinCos counter.

This parameter is accessible if [Encoder Type] (UECP) is set to [SinCos] (SC).

	Setting	Code/Value	Description
★	[Undefined]	(und)	Undefined Factory setting
	[1...10000]		Setting range

[SSI parity] (SSCP)

SSI parity.

This parameter is accessible if [Encoder Type] (UECP) is set to [SSI] (SSI).

	Setting	Code/Value	Description
★	[Undefined]	(Und)	Undefined Factory setting
	[No parity]	(nO)	No parity
	[Even parity]	(EVEn)	Even parity

[SSI frame size] (SSFS)

SSI frame size (number of bits).

This parameter is accessible if [Encoder Type] (UECP) is set to [SSI] (SSI).

	Setting	Description
★	[Auto] (AUtO) to 31	Setting range Factory setting: [Auto] (AUtO)

[Nbr of revolutions] (EnMr)

Number of revolutions.

Format of the number of revolutions (number of bits).

This parameter is accessible if [Encoder Type] (UECP) is set to [SSI] (SSI).

	Setting	Description
★	[Undefined] (Und) to 25	Setting range Factory setting: [Undefined] (und)

[Turn bit resolution] (Entr)

Resolution of the rotation in bits.

Resolution per revolution (number of bits).

This parameter is accessible if [Encoder Type] (UECP) is set to [SSI] (SSI).

	Setting	Description
★	[Undefined] (Und) to 25	Setting range Factory setting: [Undefined] (und)

[SSI code type] (SSCD)

Type of SSI code.

This parameter is accessible if [Encoder Type] (UECP) is set to [SSI] (SSI).

	Setting	Code/Value	Description
★	[Undefined]	(Und)	Undefined Factory setting
	[Binary code]	(bIn)	Binary code
	[Gray code]	(GrAY)	Gray code

[Clock frequency] (EnSP)

Clock frequency.

This parameter is accessible if [Encoder Type] (UECP) is set to [SSI] (SSI).

	Setting	Code/Value	Description
★	[200 kHz]	(200K)	200 kHz Factory setting
	[1 Mhz]	(1M)	1 MHz

[AB Encoder Max Freq] (AbMF)

Maximum frequency of the AB encoder.

This parameter is accessible if [Encoder Type] (UECP) is set to [RS422] (Ab) or [HTL] (HTL) and [Access Level] (LAC) is set to [Expert] (Epr).

This parameter can be used to adjust the encoder filter in case of EMC-related interferences.

	Setting	Code/Value	Description
★	[150 kHz]	(150K)	150 kHz
	[300 kHz]	(300K)	300 kHz Factory setting
	[500 kHz]	(500K)	500 kHz
	[1000 kHz]	(1M)	1000 kHz

[Encoder filter activ.] (FFA)

Enables the actual value filter of the encoder.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (Epr) and [Encoder usage] (Enu) or [Emb Enc Usage] (EENu) is not set to [No] (nO).

	Setting	Code/Value	Description
★	[No]	(nO)	Filter disabled. Factory setting
	[Yes]	(YES)	Filter enabled.

[Encoder filter value] (FFr)

Value of the actual value filter of the encoder.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (Epr) and [Encoder filter activ.] (FFA) to [Yes] (YES).

	Setting	Description
★	0.0 to 40.0 ms	Setting range Factory setting: Depends on the nominal power of the encoder.

[Stop on top Z] (toSt)

Stops at the next z-detection.

This parameter can be used for homing. If the approach speed is set too high, fault [DC Bus Overvoltage] (ObF) is triggered.

This parameter is accessible if a digital encoder module of type 8I0IFENC.400-1 has been inserted and [Encoder Type] (ueCp) is set to [RS422] (Ab).

	Setting	Code/Value	Description
★	[Not Assigned]	(no)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Reset Position Assign] (rPoS)

Resets the position assignment.

This parameter resets the value of parameters [PLC Encoder Pulse] (PUC) and [Enc pulse count] (PUCD).

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

Identical to [Stop on top Z] (toSt).

5.2.4.43 [Embedded Encoder]

[Embedded Encoder] (IEE)

Access

[Complete settings] → [Embedded Encoder]

About this menu

This menu is accessible on inverters with a power output up to 22 kW if no encoder module (8I0IFENC.400-1, 8I0IFENC.401-1, 8I0IFENC.402-1 or 8I0IFENC.403-1) is connected.

[Emb Enc Type] (EECP)

Type of encoder.

The content of the selection list depends on the inserted encoder module.

Setting	Code/Value	Description
[None]	(nOnE)	No encoder connected. Factory setting
[AB]	(Ab)	AB encoder
[SinCos]	(SC)	SinCos encoder

[Emb Enc Supply Volt] (EECv)

Supply voltage of the integrated encoder.

Setting	Code/Value	Description
[5 Vdc]	(5v)	5 volts
[12 Vdc]	(12v)	12 volts Factory setting
[24 Vdc]	(24v)	24 volts

[Emb Enc Pulses Nb] (EPGI)

Number of pulses per encoder revolution.

This parameter is accessible if **[Emb Encoder Type]** (EECP) is set to **[RS422]** (Ab).

	Setting	Description
★	100 to 10,000	Factory setting: 1024

[Encoder check] (ENC)

Enables the encoder test.

Setting	Code/Value	Description
[Not done]	(nO)	Test not performed. Factory setting
[Yes]	(YES)	Enables encoder monitoring.
[Done]	(dOne)	Test performed successfully. The test procedure checks the following: • Direction of rotation of the encoder/motor • Existing signals (continuity of wiring) • Number of pulses/revolutions. In the event of a fault, the inverter triggers fault [Encoder] (EnF).

[Emb Enc Usage] (EENu)

Setting	Code/Value	Description
[No]	(nO)	Function not active Factory setting
[Speed Monitoring]	(SEC)	The encoder is only used as speed feedback for monitoring.
[Speed Regulation]	(rEG)	The encoder is used as speed feedback for closed-loop control and monitoring. This configuration is automatic if the inverter is configured operation in a closed control loop ([Motor control type] (Ctt) = [FVC] (FvC) or [Sync.CL] (FSY)). If [Motor control type] (Ctt) = [SVC V] (vvC), then the encoder acts as speed feedback and allows the static correction of the speed. For other values of [Motor control type] (Ctt) , this configuration cannot be accessed.
[Speed Reference]	(PGR)	The encoder provides a speed setpoint. This can only be selected for a forward-counting encoder module.

[Emb Enc Rotation Inv] (EEri)

Reverses the rotation direction of the encoder.

Setting	Code/Value	Description
[No]	(nO)	Disables reversal of the rotation direction of the encoder. Factory setting
[Yes]	(YES)	Enables reversal of the rotation direction of the encoder.

[Emb Enc Sincos lines] (EELC)

SinCos counter.

This parameter is accessible if [Emb Encoder Type] (EECP) is set to [SinCos] (SC).

	Setting	Code/Value	Description
★	[Undefined]	(und)	Undefined Factory setting
	[1...10000]		Setting range

[Encoder filter activ.] (FFA)

Enables the actual value filter of the encoder.

This parameter is accessible if [Encoder usage] (enu) or [Emb Enc Usage] (EENu) are not set to [No] (nO).

	Setting	Code/Value	Description
★	[No]	(nO)	Filter disabled. Factory setting
	[Yes]	(YES)	Filter enabled.

[Encoder filter value] (FFr)

Value of the actual value filter of the encoder.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (Epr) and [Encoder filter activ.] (FFA) to [Yes] (YES).

	Setting	Description
★	0.0 to 40.0 ms	Setting range Factory setting: Depends on the nominal power of the encoder.

[Stop on top Z] (toSt)

Stops at the next z-detection.

This parameter can be used for homing. If the approach speed is set too high, fault [DC Bus Overvoltage] (ObF) is triggered.

This parameter is accessible if [Emb Encoder Type] (EECP) is set to [RS422] (Ab).

	Setting	Code/Value	Description
★	[Not Assigned]	(no)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Reset Position Assign] (rPoS)

Resets the position assignment.

This parameter resets the value of parameters [PLC Encoder Pulse] (PUC) and [Enc pulse count] (PUCD).

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

Identical to [Stop on top Z] (toSt).

5.2.4.44 [Error/Warning handling]

5.2.4.44.1 [Auto fault reset]

[Auto fault reset] (Atr-)

Access

[Complete settings] → [Error/Warning handling] → [Auto fault reset]

[Auto fault reset] (Atr-)

Automatic fault reset.

This function can be used to automatically reset single or multiple faults. If the cause of the error that triggered the transition to error state is resolved while this function is active, the inverter reverts to normal operation. For the duration that automatic fault reset attempts are performed, output signal [Operating State Fault] (FLt) will not be available. If these fault reset attempts are unsuccessful, the inverter remains in operating state "Fault" and output signal [Operating State Fault] (FLt) is enabled.

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **Ensure that enabling this function does not result in an unsafe condition.**
>
> **Ensure that pending output signal "Operating state 'Fault'" does not result in unsafe conditions when this function is enabled.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

The inverter's failure notification relay remains enabled for as long as the function is active. The frequency reference and the direction of operation must be maintained.

2-wire control is recommended ([2/3-wire control] (tCC) is set to [2-Wire Control] (2C) and [2-wire type] (tCt) to [Level] (LEL) set).

If the restart has not yet taken place after the configurable time has elapsed [Fault Reset Time] (tAr), the inverter will abort and remain locked until it is switched off and then on again.

The error codes that enable this function are listed in this manual under section "Diagnostics".

	Setting	Code/Value	Description
2 s	[No]	(nO)	Function inactive Factory setting
	[Yes]	(YES)	Automatic restart after locking due to an fault if the fault has been corrected and the other operating conditions permit restart. Restarting takes place by means of a series of automatic attempts in increasing intervals of time: 1 s, 5 s, 10 s and then 1 minute for all subsequent attempts.

[Fault Reset Time] (tAr)

Maximum time for automatic restart.

This parameter appears if [Auto fault reset] (Atr) is set to [Yes] (YES). It makes it possible to limit the number of successive restarts in the event of a recurring fault.

	Setting	Code/Value	Description
	[5 minutes]	(5)	5 minutes Factory setting
	[10 minutes]	(10)	10 minutes
	[30 minutes]	(30)	30 minutes
	[1 hour]	(1h)	1 hour
	[2 hours]	(2h)	2 hours
	[3 hours]	(3h)	3 hours
	[Unlimited]	(Ct)	Permanent

5.2.4.44.2 [Fault reset]

[Fault reset] (rSt-)

Access

[Complete settings] → [Error/Warning handling] → [Fault reset]

[Fault Reset Assign] (rSF)

Assigns the input for fault reset

Detected faults are cleared manually if the assigned input or bit changes to 1, provided the cause of the fault has been resolved.

The STOP/RESET button on the display terminal performs the same function.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI6]	(LI1) to (LI6)	Digital inputs DI1 to DI6 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**

[Product Restart] (rP)

The restart function performs a fault reset and then restarts the inverter. During this restart, the inverter runs through the same steps as if it were switched off and then switched on again. Depending on the wiring and configuration of the inverter, this can result in sudden, unexpected operation.

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **Ensure that enabling this function does not result in an unsafe condition.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

Restart of the product.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

It allows all faults to be reset without disconnecting the inverter from the power supply.

	Setting	Code/Value	Description
★	[No]	(nO)	Function not active Factory setting
	[Yes]	(YES)	Reinitializes. Press and hold the OK button for 2 seconds. The parameter automatically changes back to [No] (nO) as soon as the process is finished. The inverter can only be reinitialized if it is locked.

[Prod Restart Assign] (rPA)

Assigns a product restart.

The restart function performs a fault reset and then restarts the inverter. During this restart, the inverter runs through the same steps as if it were switched off and then switched on again. Depending on the wiring and configuration of the inverter, this can result in sudden, unexpected operation.

The restart function can be assigned to a digital input.

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **The restart function executes a fault reset and restarts the inverter.**
>
> **Ensure that enabling this function does not result in an unsafe condition.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

	Setting	Code/Value	Description
★ ⌛ 2 s	[Not Assigned]	(nO)	Not assigned Factory setting
	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**

5.2.4.44.3 [Catch On Fly]

[Catch On Fly] (FLr-)

Access

[Complete settings] → [Error/Warning handling] → [Catch On Fly]

[Catch On Fly] (FLr)

Catch on the fly.

Enables a jerk-free restart if the start command remains after the following events:

- Power failure or disconnection.
- Current detected fault cleared or automatic restart.
- Freewheel stop.

The speed specified by the inverter is based on the calculated or measured speed of the motor at restart and then follows the ramp up to the setpoint speed.

2-wire level control is required for this function.

If this function is active, it intervenes each time a move command is executed; this results in a slight current delay (max. 0.5 s).

[Catch On Fly] (FLr) is forced to **[No]** (nO) if one of the following settings is configured:

- **[Motor control type]** (Ctt) is set to **[FVC]** (FVC) or **[Sync.CL]** (FSY)
- **[Auto DC Injection]** (AdC) is set to **[Continuous]** (Ct)
- **[Brake assignment]** (bLC) or **[BL mode]** (bqM) is not set to **[No]** (nO)

Setting	Code/Value	Description
[Not Configured]	(nO)	Function inactive. Factory setting
[Yes On Freewheel]	(YES)	Function active only after freewheel stop.
[Yes Always]	(ALL)	Function active after all stop modes.

[Catch on Fly Sensitivity] (VCb)

Catch on the fly sensitivity.

This parameter is accessible if **[Access Level]** (LAC) is set to **[Expert]** (EPr).

Setting parameter **[Catch on Fly Sensitivity]** (VCb) too low can result in an incorrect calculation of the motor speed.

Warning!

LOSS OF CONTROL

Gradually reduce the value of parameter [Catch on Fly Sensitivity] (VCb).

During commissioning, it is important to ensure that the inverter and system function as intended. Tests and simulations must therefore be carried out in a controlled environment under controlled conditions.

Failure to follow these instructions can result in death, serious injury or damage to property.

	Setting	Description
★	0.10 to 100.00 V	Setting range Factory setting: 0.20 V

[Catch On Fly Mode] (Cofm)

Method for determining the speed for function "Catch on the fly".

For synchronous motors, **[Catch On Fly Mode]** (Cofm) is forced to **[Measured]** (HwCof).

Setting	Code/Value	Description
[Measured]	(HwCof)	Catch on the fly - Hardware The motor voltage signal must be greater than [Catch on Fly Sensitivity] (VCb) so that the speed can be calculated. Factory setting
[Computed]	(swCof)	Catch on the fly - Software. A signal is fed in order to calculate the speed and position of the rotor. Method [Computed] (swCof) is not effective for a motor speed range above -HSP or +HSP.

5.2.4.44.4 [Error detection disable]

[Error detection disable] (InH)

Access

[Complete settings] → [Error/Warning handling] → [Error detection disable]

[ErrorDetect Disabled] (InH)

Disables fault detection

In rare cases, the monitoring functions of the inverter are not desired as they hamper the application. A typical example would be a smoke extraction fan that is used as part of a fire safety system. For example, in the event of a fire, the fan in a smoke extractor needs to work for as long as possible, even if the permissible ambient temperature of the inverter has been exceeded. With such applications, damage or destruction of the device is acceptable as collateral damage because it prevents other higher-risk damage.

For theses types of applications, a parameter is available to disable specific monitoring functions so that automatic error detection and automatic error response are no longer active for the device. For disabled monitoring functions, alternative functions must be implemented so that users and/or superordinate control systems can respond appropriately to detected fault conditions. If the overheating monitoring function of an inverter that is used in a smoke extraction fan is disabled, the inverter itself can trigger a fire if faults are not detected. For example, an overheating condition can be displayed on a control panel, without the inverter having to be automatically stopped immediately by the integrated monitoring functions.

Danger!

MONITORING FUNCTIONS DISABLED, NO FAULT DETECTION

- **This parameter is only permitted to be used after a comprehensive risk assessment in accordance with all regulations and standards that apply to the device and the application.**
- **Implement alternative functions that do not trigger automatic fault responses from the inverter for monitoring functions that are disabled. However, appropriate and equivalent responses must be implemented by other measures that meet the requirements of all applicable regulations and standards and take into account the results of the risk assessment.**
- **The system must be started up and tested with the monitoring function enabled.**
- **During commissioning, it is important to ensure that the inverter and system function as intended. Tests and simulations must therefore be carried out in a controlled environment under controlled conditions.**

Failure to follow these instructions will result in death or serious injury.

This parameter is accessible if [Access Level] (LAC) is set to [Expert] (EPr).

Fault detection is enabled with bit status 0. Fault detection is disabled with bit status 1.

Current faults are cleared on a rising edge (change from 0 to 1) of the assigned input or bit.

The detection of the following faults can be enabled: AnF, bOF, CnF, COF, dLF, EnF, EPF1, EPF2, FCF2, ETHF, InFA, InFB, InFV, LFF1, LFF3, ObF, OHF, OLC, OLF, OPF1, OPF2, OSF, PHF, SLF1, SLF2, SLF3, SOF, SPF, SSF, TFd, TJF, TnF, ULF, USF.

	Setting	Code/Value	Description
	[Not Assigned]	(no)	Not assigned Factory setting
★	[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
	[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

5.2.4.44.5 [External Error]

[External Error] (EtF)

Access

[Complete settings] → [Error/Warning handling] → [External Error]

[Ext Error Assign] (EtF)

Assignment for external fault.

There is no external fault for bit status 0. There is no external fault for bit status 1.

Setting	Code/Value	Description
[Not Assigned]	(no)	Not assigned Factory setting
[DI1] to [DI8]	(LI1) to (LI8)	Digital inputs DI1 to DI8 **Note:** **Accessing selection DI8 is possible for inverters with a power output greater than 22 kW.**
[CD11] to [CD15]	(Cd11) to (Cd15)	Virtual digital inputs CMD.11 to CMD.15, regardless of the configuration. **Note:** **Accessing this selection is possible when used as a direct control.**

[Ext Error Resp] (EPL)

Response of the inverter to an external fault.

Type of stop when an external fault is detected.

Setting	Code/Value	Description
[Ignore]	(nO)	Ignores detection of external faults
[Freewheel Stop]	(YES)	Freewheel stop Factory setting
[Per STT]	(Stt)	Stop that depends on the configuration of [Type of stop] (Stt) without shutdown. In this case, the fault relay does not open; as soon as the detected fault no longer exists, the inverter is ready to restart according to the restart conditions of the active command channel (for example, according to [2/3-Wire Control] (tCC) and [2-wire type] (tCt) when controlled via the terminals). Configuring an alarm for this fault is recommended (assigned to a digital output, for example) in order to indicate the cause of the stop.
[Fallback Frequency]	(LFF)	Changes to the fallback speed, which is maintained for as long as the detected fault persists and the move command has not been canceled.[1]
[Speed maintained]	(rLS)	The inverter maintains the frequency that was applied when the fault occurred as long as the fault is active and the move command has not been canceled.[1]
[Ramp stop]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop
[DC Injection]	(dCI)	Stop by DC injection braking. This function type cannot be used in combination with certain other functions.

1) Since the detected fault does not trigger a stop in this case, the display of this fault must be assigned to a relay or a digital output.

[Fallback Frequency] (LFF)

Fallback speed.

This parameter is accessible if the parameter for error response is set to [Fallback Frequency] (LFF).

	Setting	Description
★	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

5.2.4.44.6 [Output phase loss]

[Output phase loss] (OPL)

Access

[Complete settings] → [Error/Warning handling] → [Output phase loss]

[OutPhaseLoss Assign] (OPL)

Assignment for loss of output phase.

> **Danger!**
>
> **RISK OF ELECTRIC SHOCK, ARC FLASH OR EXPLOSION**
>
> **If output phase monitoring is disabled, then phase loss and any resulting cable disconnection will not be detected.**
>
> - **Make sure that the parameter settings do not result in unsafe states.**
>
> **Failure to follow these instructions can result in death or serious injury.**

> **Note:**
>
> **[OutPhaseLoss Assign] (OPL) is set to [Function Inactive] (nO) if [Motor control type] (Ctt) is set to [SYN_U VC] (SYn), [Sync.CL] (FSY) or [SYN_U VC] (SYnU). In addition, if [HF inj. activation] (HFI) is set to [No] (nO), [OutPhaseLoss Assign] (OPL) is forced to [Function Inactive] (nO).**

	Setting	Code/Value	Description
2 s	[Function Inactive]	(nO)	Function not active
	[OPF Error Triggered]	(YES)	Switch off at [OutPhaseLoss Assign] (OPL) with stop mode "Freewheel" Factory setting
	[No Error Triggered]	(OAC)	No fault triggered but control of the output voltage in order to prevent overcurrent when the connection to the motor is restored and "catch on the fly" (even if this function has not been configured). After [Output cut] (SOC) expires, the inverter switches to status [Output cut] (Odt). "Catch on the fly" is possible as soon as the inverter is in state standby output shutdown [Output cut] (SOC).

[OutPhaseLoss Delay] (Odt)

Detection time of the output (motor) phase loss.

Detection time for fault [OutPhaseLoss Assign] (OPL).

	Setting	Description
	0.5 to 10 s	Setting range Factory setting: 0.5 s

5.2.4.44.7 [Input phase loss]

[Input phase loss] (IPL)

Access

[Complete settings] → [Error/Warning handling] → [Input phase loss]

[InPhaseLoss Assign] (IPL)

Response to loss of input phase fault.

If a network phase is missing and this results in power loss, fault [Input phase loss] (PHF) is triggered.

If 2 or 3 network phases are missing, the inverter will operate until fault [Supply Mains UnderV] (USF) is triggered.

	Setting	Code/Value	Description
★	[Ignore]	(nO)	The monitoring function for input phase loss is disabled if the inverter is supplied via a single-phase power network or DC bus.
2 s	[Freewheel]	(YES)	The inverter stops in freewheel mode if a phase failure is detected in the supply system.

5.2.4.44.8 [4-20mA loss]

[4-20mA loss] (LFL)

Access

[Complete settings] → [Error/Warning handling] → [4-20mA loss]

[4-20mA loss] (LFL1)

Response to loss of 4 to 20 mA on AI1.

Behavior of the inverter when a 4-20 event occurs on AI1.

Setting	Code/Value	Description
[Ignore]	(nO)	Fault detection ignored. This is the only possible configuration if [AI1 min value] (CrL1) is less than 3 mA. Factory setting
[Freewheel Stop]	(YES)	Freewheel stop
[Per STT]	(Stt)	Stop depending on the configuration of [Type of stop] (Stt), without shutdown. In this case, the fault relay does not open and, after the detected fault no longer exists, the inverter is ready to restart according to the restart conditions of the active command channel (for example, according to [2/3-Wire Control] (tCC) and [2-wire type] (tCt) when controlled via the terminals). Configuring an alarm for this fault is recommended (assigned to a digital output, for example) in order to indicate the cause of the stop.
[Fallback Frequency]	(LFF)	Changes to the fallback speed, which is maintained for as long as the detected fault persists and the move command has not been canceled.[1)]
[Spd maint.]	(rLS)	The inverter maintains the frequency that was applied when the fault occurred as long as the fault is active and the move command has not been canceled.[1)]
[Ramp stop]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop
[DC Injection]	(dCI)	Stop by DC injection braking. This function type cannot be used in combination with certain other functions.

1) Since the detected fault does not trigger a stop in this case, the display of this fault must be assigned to a relay or a digital output.

[AI3 4-20mA loss] (LFL3)

Response to loss of 4-20 mA on AI3.

Behavior of the inverter when a 4-20 event occurs on AI3.

Identical to [AI1 4-20mA Loss] (LFL1).

[Fallback Frequency] (LFF)

Fallback speed.

	Setting	Description
★	0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

5.2.4.44.9 [Fallback Frequency]

[Fallback Frequency] (LFF)

Access

[Complete settings] → [Error/Warning handling] → [Fallback speed]

[Fallback Frequency] (LFF)

Fallback speed.

Setting	Description
0.0 to 599.0 Hz	Setting range Factory setting: 0.0 Hz

5.2.4.44.10 [Communication module]

[Communication module] (COMO)

Access

[Complete settings] → [Error/Warning handling] → [Communication module]

[Fieldbus Interrupt Resp] (CLL)

Warning!

LOSS OF CONTROL

If this parameter is set to [No] (nO), monitoring of fieldbus communication is disabled.

- **This setting is only permitted to be used after a comprehensive risk assessment in accordance with all regulations and standards that apply to the device and the application.**
- **This setting is only permitted to be used for tests during commissioning.**
- **It must be ensured that communication monitoring has been reactivated before the commissioning procedure and final commissioning test are performed.**

Failure to follow these instructions can result in death, serious injury or damage to property.

Response to a communication interruption of the POWERLINK communication module.

Setting	Code/Value	Description
[Ignore]	(nO)	Ignores detected faults
[Freewheel Stop]	(YES)	Freewheel stop Factory setting
[Per STT]	(Stt)	Stop depending on the configuration of [Type of stop] (Stt), without shutdown. In this case, the fault relay does not open and, after the detected fault no longer exists, the inverter is ready to restart according to the restart conditions of the active command channel (for example, according to [2/3-Wire Control] (tCC) and [2-wire type] (tCt) when controlled via the terminals).1)
[Spd maint.]	(rLS)	The inverter maintains the frequency that was applied when the fault occurred as long as the fault is active and the move command has not been canceled.1)
[Ramp stop]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop
[DC Injection]	(dCI)	Stop by DC injection braking. This function type cannot be used in combination with certain other functions.

1) Since the detected fault does not trigger a stop in this case, the display of this fault must be assigned to a relay or a digital output.

5.2.4.44.11 [Undervoltage handling]

[Undervoltage handling] (USb)

Access

[Complete settings] → [Error/Warning handling] → [Undervoltage handling]

[Undervoltage Resp] (USb)

Response to undervoltage.

Setting	Code/Value	Description
[Error Triggered]	(0)	The inverter triggers a fault (the fault relay assigned to [Operating State Fault] (FLt) opens). Factory setting
[Error Triggered w/o Relay]	(1)	The inverter triggers a fault (the fault relay assigned to [Operating State Fault] (FLt) remains closed).
[Warning Triggered]	(2)	The warning and fault relays remain closed. The warning can be assigned to a digital output or a relay.

[Mains Voltage] (UrES)

Nominal voltage of the mains supply in VAC.

The factory default value for this parameter depends on the nominal power of the inverter.

Setting	Code/Value	Description
[380 Vac]	(380)	380 VAC
[400 Vac]	(400)	400 VAC
[415 Vac]	(415)	415 VAC
[440 Vac]	(440)	440 VAC
[460 Vac]	(460)	460 VAC
[480 Vac]	(480)	480 VAC Factory setting

[Undervoltage Level] (USL)

Undervoltage level

The factory setting depends on the nominal voltage of the inverter.

Setting	Description
100 to 354 VAC	Setting range: Depends on the nominal power of the inverter. Factory setting: Depends on the nominal power of the inverter.

ACOPOSinverter P86	[Mains Voltage] (UrES)	Setting range		
		Min. value [VDC]	Max. value [VDC]	Default [VDC]
8I86T4xxxxx.00-000	[380Vac] (380)	190	255	255
	[400Vac] (400)	202		
	[440Vac] (440)	228		
	[460Vac] (460)	242		
	[480Vac] (480)	255		

[UnderVolt Timeout] (USt)

Timeout undervoltage.

Setting	Description
0.2 to 999.9 s	Setting range Factory setting: 0.2 s

[Stop Type PLoss] (StP)

Controlled stop in case of voltage loss.

Behavior on reaching the prevention level for undervoltage.

Setting	Code/Value	Description
[No]	(nO)	No action Factory setting
[DC Maintain]	(MMS)	This stop mode uses the inertia of the application to keep the control block powered and thus keep the I/O and the fieldbus connection in an operational state as long as possible.
[Ramp stop]	(rMP)	Stop after a configurable deceleration ramp [Max stop time] (StM) to avoid an uncontrolled stop of the application.
[Freewheel Stop]	(LnF)	Interlocking device (Freewheel Stop) without triggering a fault

[UnderV. Restart Tm] (tSM)

Time for restart after undervoltage.

This parameter is accessible if [CtrlStopPLoss] (StP) is set to [Ramp stop] (rMP).

The delay before restart authorization after a complete stop with [CtrlStopPLoss] (StP) is set to [Ramp stop] (rMP) if the voltage reaches a normal value again.

	Setting	Description
	1.0 to 999.9 s	Setting range Factory setting: 1.0 s

[Prevention Level] (UPL)

Undervoltage prevention level.

This parameter is accessible if [CtrlStopPLoss] (StP) is set to [No] (nO).

The adjustment range and the factory setting are dependent on the nominal voltage of the inverter as well as on the value of [Mains Voltage] (UrES).

	Setting	Description
	141 to 414 V	Setting range Factory setting: Depends on the nominal power of the inverter.

ACOPOSinverter P86	[Mains Voltage] (UrES)	Setting range		
		Min. value [VDC]	Max. value [VDC]	Default [VDC]
8I86T4xxxxx.00-000	[380Vac] (380)	255	297	297
	[400Vac] (400)			
	[440Vac] (440)			
	[460Vac] (460)			
	[480Vac] (480)			

[Max stop time] (StM)

Maximum stop time.

This parameter is accessible if **[CtrlStopPLoss]** (StP) is set to **[Ramp stop]** (rMP).

This parameter defines the time of the deceleration ramp in case of a power failure. During this controlled stop, the inverter is powered by the inertia of the application; the motor runs in generator mode. It is recommended to check whether the set delay is compatible with the application inertia.

	Setting	Description
	0.01 to 60.00 s	Setting range Factory setting: 1.00 s

[DC Bus Maintain Time] (tbS)

Holding time of the DC bus.

This parameter is accessible if **[CtrlStopPLoss]** (StP) is set to **[DC Maintain]** (MMS).

	Setting	Description
	1 to 9999 s	Setting range Factory setting: 9999 s

5.2.4.44.12 [Ground Fault]

[Ground Fault] (GrFL)

Access

[Complete settings] → **[Error/Warning handling]** → **[Ground Fault]**

About this menu

This parameter is accessible if **[Access Level]** (LAC) is set to **[Expert]** (EPr).

If the internal ground fault detection **[Ground Fault]** (GrFL) causes undesirable results in your application, it is possible to replace the internal ground fault detection with an appropriate external ground fault monitoring system. If parameter **[Ground Fault]** (GrFL) is set to **[ErrorDetect Disabled]** (INH) or to a percentage of the nominal inverter current, the inverter's internal ground fault detection is disabled or its effectiveness is reduced. You must therefore install an external ground fault detection system that is capable of reliably detecting ground faults.

Danger!

MONITORING OF GROUND FAULTS DISABLED

- **Only set parameter [Ground Fault] (GrFL) to [ErrorDetect Disabled] (INH) or to a percentage of the nominal inverter current after a comprehensive risk assessment has been carried out in accordance with all regulations and standards applicable to the device and application.**
- **Implement an alternative, external ground fault monitoring function that provides appropriate and equivalent responses to an inverter ground fault, while meeting the requirements of all applicable regulations and standards and taking into account the results of the risk assessment.**
- **The system must be started up and tested with all monitoring functions enabled.**
- **During commissioning, it must be ensured that the alternative, external ground fault detection system correctly detects all types of ground faults. Tests and simulations must therefore be carried out in a controlled environment under controlled conditions.**

Failure to follow these instructions will result in death or serious injury.

[Ground Fault Activation] (GrFL)

Response to ground fault error.

Note:

The setting of this parameter is taken into account after a product restart.

Setting	Code/Value	Description
[ErrorDetect Disabled]	(InH)	Disables fault detection
[Yes]	(YES)	Uses internal product value. Around 25% of the nominal inverter current is possible for inverters with a power output greater than 11 kW. Around 50% of the nominal inverter current is possible for inverters with a power output less than or equal to 11 kW. Factory setting
0.0 to 100.0%		Setting range of the nominal inverter current as a percentage

5.2.4.44.13 [Motor thermal monit]

[Motor thermal monit] (tHt)

Access

[Complete settings] → [Error/Warning handling] → [Motor thermal monit]

About this menu

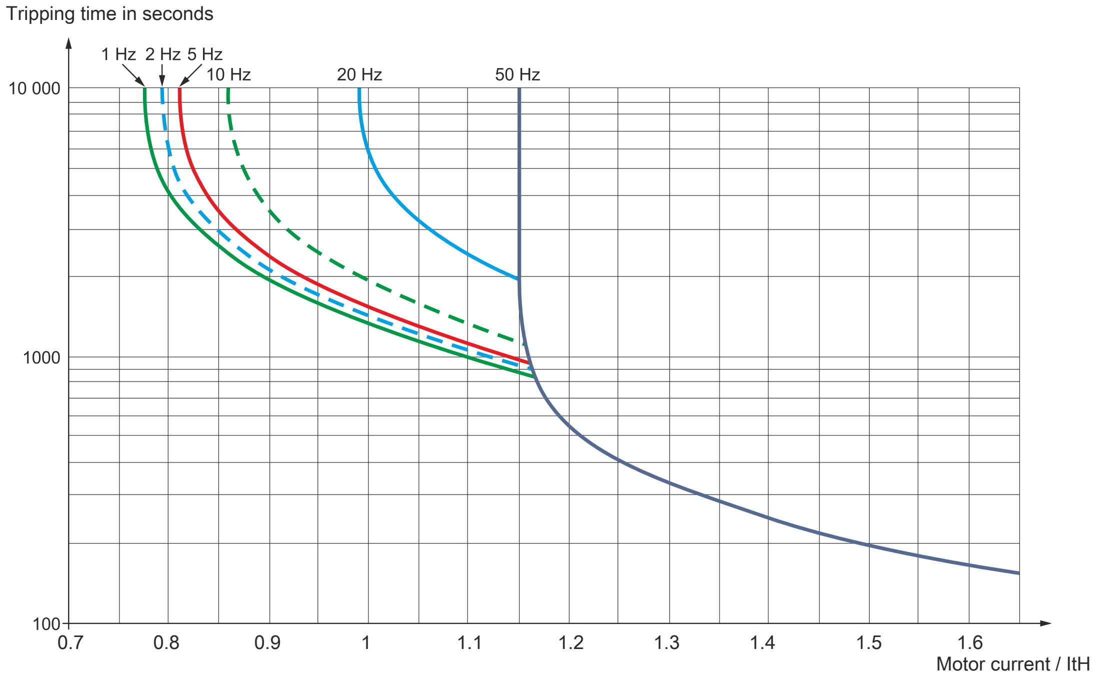
Thermal protection of the motor through calculation of I^2t.

Note:

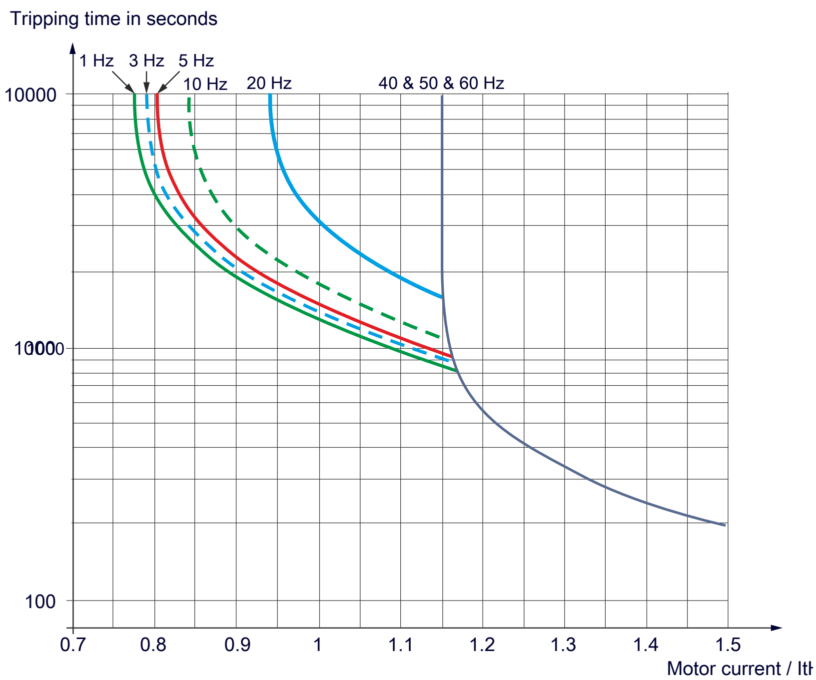
The thermal state of the motor is stored when the inverter is switched off. The switch-off time is used to calculate the thermal motor state when switched on again.

- Self-cooling motors: The trip curves depend on the motor frequency.
- External cooling motors: Only the 50 Hz trip curve must be taken into account, regardless of the motor frequency.

Under a curve for a 50 Hz motor.



Under a curve for a 60 Hz motor.



[Motor Th Current] (ItH)

Current for thermal monitoring of the motor that must be set according to the rated operating current specified on the nameplate.

	Setting	Description
★	See the following table.	- Factory setting: See the following table.

ACOPOSinverter P86	Setting range			
	Min. value [0.01 A]	Max. value [0.01 A]	Default [0.01 A] Asynchronous	Default [0.01 A] Synchronous
8I86T400075.00-000	44	396	200	200
8I86T400150.00-000	80	756	350	370
8I86T400220.00-000	112	1008	510	440
8I86T400300.00-000	144	1296	720	600
8I86T400400.00-000	186	1714	910	700
8I86T400550.00-000	254	2286	1190	900
8I86T400750.00-000	330	3240	1520	1200
8I86T401100.00-000	480	4320	2130	1750
8I86T401500.00-000	640	5760	2860	2300

ACOPOSinverter P86	Setting range			
	Min. value [0.1 A]	Max. value [0.1 A]	Default [0.1 A] Asynchronous	Default [0.1 A] Synchronous
8I86T401850.00-000	78	702	351	290
8I86T402200.00-000	92	830	417	350
8I86T403000.00-000	123	922	550	500
8I86T403700.00-000	149	1117	670	650
8I86T404500.00-000	176	1320	810	820
8I86T405500.00-000	212	1740	990	1000
8I86T407500.00-000	290	2175	1350	1250

[Motor Thermal Mode] (tHt)

Thermal monitoring mode for the motor.

> **Note:**
>
> **Detects a fault if the thermal state reaches 118% of the nominal state. Re-enabling takes place when it drops below 100% again.**

Setting	Code/Value	Description
[No]	(nO)	No thermal monitoring
[Self cooled]	(ACL)	Self-cooling motor Factory setting
[Force-cool]	(FCL)	Fan-cooled motor

5.2.4.44.14 [Encoder-Überwachung]

[Encoder-Überwachung] (Sdd)

Access

[Complete settings] → [Error/Warning handling] → [Encoder-Überwachung]

[Load slip detection] (Sdd)

Load slip detection function.

Setting	Code/Value	Description
[No]	(nO)	No fault triggered. The warning can be assigned to a digital output or a relay. Factory setting
[Yes]	(YES)	Fault triggered. [Load slip detection] (Sdd) is set to [Yes] (YES) if [Motor control type] (Ctt) is set to [FVC] (fvC) or [Sync.CL] (FSY). Fault [Load slipping] (anf) is triggered by comparing the ramp output and the speed feedback; it is effective for speeds greater than 10% of the [Nominal Motor Freq] (frs). If a fault is triggered, the inverter stops in freewheel mode, and if the control function of the brake logic has been configured, the brake command is set to 0.

[Encoder Coupling Monit] (eCC)

Encoder coupling monitoring.

This parameter is accessible if [Encoder usage] (enu) is not set to [No] (nO).

Setting	Code/Value	Description
[No]	(nO)	Fault not monitored Factory setting
[Yes]	(YES)	Fault monitored. If the brake logic control function has been configured, the factory settings are set to [Yes] (YES). [Encoder Coupling Monit] (eCC) can only be set to [Yes] (YES) if [Load slip detection] (Sdd) is set to [Yes] (YES) and [Encoder usage] (ENu) or [Brake assignment] (blC) are not set to [No] (nO). The monitored fault is an interruption in the mechanical coupling of the encoder. In the event of a fault, the inverter switches to mode "Freewheel stop", and if the control function of the brake logic has been configured, the braking command is enabled.

[Encoder check time] (eCt)

Encoder check time.

This parameter is accessible if [Encoder usage] (ENu) and [Encoder Coupling Monit] (eCC) are not set to [No] (nO).

	Setting	Description
★ ↻	2.0 to 10.0 s	Setting range Factory setting: 2.0 s

5.2.4.44.15 [Braking Resistor monit]

[Braking Resistor monit] (brP)

Access

[Complete settings] → [Error/Warning handling] → [Braking Resistor monit]

About this menu

This function is used to monitor the thermal state of the braking resistors.

The calculation used for monitoring estimates the total thermal state of all braking resistors. The braking resistor monitoring function does not replace the thermal contact monitoring of each managed brake resistor. This function does not monitor the IGBT, short circuits and the presence of the braking resistors. The internal calculation uses the properties of the equivalent braking resistor such as the time constant, the equivalent power and the nominal value of the resistor.

Depending on the setting of [Braking Resistor Monit] (bro), when [DBR Thermal State] (tHb) reaches 100%, the error [Brake Resistor ovld] (boF) or warning [BR Thermal Warning] (boA) is triggered.

[Braking Resistor Monit] (bro)

Display for braking resistor.

Setting	Code/Value	Description
[Ignore]	(nO)	No monitoring of the braking resistor (thus blocking access to the other parameters of this function). Factory setting
[Warning]	(YES)	The warning can be assigned to a logic output or a relay.
[Error]	(flt)	Triggers error [Brake Resistor ovld] (bof) with locking of the inverter (freewheel stop).

[Braking Resistor Power] (brp)

Nominal power of the resistance used.

Input of the total power of all installed braking resistors.

This parameter is accessible if [Braking Resistor Monit] (bro) is not set to [No] (nO).

	Setting	Description
★ ↻	0.1 to 3,000.0 kW	Setting range Factory setting: 0.1 kW

[Braking Resistor Value] (brV)

Nominal value of the braking resistor in Ω.

This parameter is accessible if [Braking Resistor Monit] (bro) is not set to [No] (nO).

	Setting	Description
	0.1 to 200.0	Setting range Factory setting: 0.1 Ω

[Braking Resist T Constant] (brtC)

Time constant braking resistor.

This parameter is accessible if [Braking Resistor Monit] (bro) is not set to [No] (nO).

	Setting	Description
	0 to 200 s	Setting range Factory setting: 45 s

Material number	Time constant [s]
8I0BR100.001-1	23
8I0BR100.002-1	39
8I0BR060.002-1	50
8I0BR028.001-1	161
8I0BR016.000-1	140
8I0BR010.001-1	131
8I0BR008.002-1	167
8I0BR005.001-1	200

[DBR Thermal State] (tHb)

Thermal state of the braking resistor.

Read-only parameter.

When switching on, the value is updated corresponding to the time the inverter was switched off.

This parameter is specified in % of the nominal power ([Braking Resistor Power] (brp)).

Setting	Description
0 to 118%	Setting range Factory setting: _

5.2.4.44.16 [Torque or i lim. detect]

[Torque or i lim. detect] (tld)

Access

[Complete settings] → [Error/Warning handling] → [Torque or i lim. detect]

[Trq/I limit. stop] (SSb)

Torque current limiting: Behavior configuration.

Setting	Code/Value	Description
[Ignore]	(nO)	Ignores detected faults. Factory setting
[Freewheel Stop]	(YES)	Freewheel stop
[Per STT]	(Stt)	Stops according to parameter [Type of stop] (Stt), but without causing a fault after stopping
[Fallback Frequency]	(LFF)	Changes to the fallback speed, which is maintained for as long as the detected fault persists and the move command has not been canceled.[1]
[Spd maintained]	(rLS)	Speed that is maintained as long as the detected fault persists and the move command is not canceled.[1]
[Ramp stop]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop
[DC Injection]	(dCI)	DC injection braking

1) Since the detected fault does not trigger a stop in this case, a relay or logic output should be assigned to display the fault.

[Trq/I limit. time out] (StO)

Torque current limiting: Fault delay [Torque Limitation Error] (SSF) and warning delay [Torque Limit Reached] (SSA).

	Setting	Description
	0 to 9,999 ms	Setting range Factory setting: 1,000 ms

5.2.4.44.17 [Drive overload monit]

[Drive overload monit] (obr)

Access

[Complete settings] → [Error/Warning handling] → [Drive overload monit]

Monitoring for inverter overload

If [Drive overload monit] (tlol) is set to [I2t Current Reduction] (I2T), the inverter automatically adjusts its overload capability.

Current limiting is automatically adjusted depending on the machine cycles.

If [Dual Rating] (DRT) is set to [Normal rating] (NORMAL), the maximum values for overload capability are as follows:

- 110% of the nominal inverter current over 60 seconds.
- 135% of the nominal inverter current over 2 seconds.

If [Dual Rating] (DRT) is set to [Heavy Duty] (HIGH), the maximum values for overload capability are as follows:

- 150% of the nominal inverter current over 60 seconds.
- 180% of the nominal inverter current over 2 seconds.

If the inverter current exceeds the above maximum values for 2 or 60 seconds, current limiting is reduced and warning [Current Reduction] (TLOW) is enabled.

Current limiting can be reduced to the nominal current of the inverter.

> **Note:**
>
> **When the product is switched off, the overload state is stored. The next time the inverter is switched on, its response will depend on the value of [I2t Actual Load Value] (TLOA).**

[DriveTemp ErrorResp] (oHI)

Response to overtemperature fault of the inverter.

Setting	Code/Value	Description
[Ignore]	(nO)	Ignores detected faults.
[Freewheel Stop]	(YES)	Freewheel stop Factory setting
[Per STT]	(Stt)	Stops according to parameter [Type of stop] (Stt), but without causing a fault after stopping
[Fallback Frequency]	(LFF)	Changes to the fallback speed, which is maintained for as long as the detected fault persists and the move command has not been canceled.[1)]
[Spd maintained]	(rLS)	Speed that is maintained as long as the detected fault persists and the move command is not canceled.[1)]
[Ramp stop]	(rMP)	Stop via ramp
[Fast stop]	(FSt)	Fast stop

1) Since the detected fault does not trigger a stop in this case, a relay or logic output should be assigned to display the fault.

[Drv Thermal Warning] (tHa)

Warning for thermal state of the inverter (for warning [Drv Therm Thd reached] (TAD)).

	Setting	Description
	0 to 118%	Setting range Factory setting: 100%

[Drive overload monit] (tlol)

Enables overload monitoring of the frequency inverter.

> **Note:**
>
> **INVERTER OVERHEATING AND DAMAGE**
>
> **If [Drive overload monit] (tlol) is set to [Disabled] (diS), monitoring for overheating on the inverter is disabled.**
>
> **It is important that the setting for this parameter does not result in damage to the equipment.**
>
> **Failure to follow these instructions can result in damage to property.**

The factory setting is [I2t Current Reduction] (I2T) for inverters with a power output up to 22 kW and [Disabled] (diS) for inverters with a power output over 22 kW.

Setting	Code/Value	Description
[Disabled]	(dis)	Disabled Factory setting
[I2t Current Reduction]	(I2t)	I2t current reduction
[Error Triggered]	(trip)	Triggers error
[Reduce to I Nom Drive]	(lim)	The motor current is reduced to the nominal current of the inverter.

[I2t Actual Load Value] (TLOA)

I^2t integral actual value of the load.

If the value of this parameter exceeds 100%, current limiting is automatically reduced.

- This value is only increased if the actual current exceeds the nominal current of the inverter.
- This value is automatically reduced depending on internal calculations.

	Setting	Description
	-3276.7 to 3276.7%	Setting range Factory setting: -

[I2t Mean Load Value] (TLOM)

I^2t average load value.

This parameter specifies the average load value of the inverter.

	Setting	Description
	-3276.7 to 3276.7%	Setting range Factory setting: -

5.2.4.44.18 [Warn grp definition]

[Warn grp 1 definition] (A1C)

Access

[Complete settings] → [Error/Warning handling] → [Warning groups config] → [Warn grp 1 definition]

About this menu

In the following submenus, warnings are arranged in one to five groups. The individual groups can be assigned to the remote signaling of a relay or a digital output.

If one or more warnings selected in a group occur, the corresponding warning group is enabled.

List of warnings

Setting	Code	Description
[No Warning stored]	(NOA)	No warning stored
[Fallback Frequency]	(FRF)	Response to event: Fallback frequency
[Speed Maintained]	(RLS)	Response to event: Speed maintained
[Type of stop]	(STT)	Response to event: Stop after [Type of stop] (STT) without triggering a fault
[Ref Frequency Warning]	(SRA)	Frequency setpoint reached
[PID error Warning]	(PEE)	Warning for PID fault
[PID Feedback Warning]	(PFA)	Warning for actual value of PID
[PID High Fdbck Warn]	(PFAH)	Upper PID threshold reached
[PID Low Fdbck Warn]	(PFAL)	Lower PID threshold reached
[Limit Switch Reached]	(LSA)	Limit switch reached
[Slack Rope Warning]	(RSDA)	Warning for slack rope

Setting	Code	Description
[Dynamic Load Warning]	(DLDA)	Warning for dynamic load
[AI3 Th Warning]	(TP3A)	Thermal warning on AI3
[AI1 4-20 Loss Warning]	(AP1)	Warning for loss of 4-20 mA on AI1
[AI3 4-20 Loss Warning]	(AP3)	Warning for loss of 4-20 mA on AI3
[Drive Thermal Warning]	(THA)	Warning for overheating on inverter
[IGBT Thermal Warning]	(TJA)	Warning for thermal state of IGBT
[Fan Counter Warning]	(FCTA)	Warning for fan tachometer
[Fan Feedback Warning]	(FFDA)	Warning for actual value of the fan
[BR Thermal Warning]	(BOA)	Thermal warning for braking resistor
[Ext. Error Warning]	(EFA)	Warning for external fault
[Undervoltage Warning]	(USA)	Warning for undervoltage
[Preventive UnderV Active]	(UPA)	Controlled stop threshold reached
[Mot Freq High Thd]	(FTA)	Threshold value "Motor frequency high 1" reached
[Mot Freq Low Thd]	(FTAL)	Threshold value "Motor frequency low 1" reached
[Pulse Warn Thd Reached]	(FQLA)	Threshold value for impulse warning reached
[Mot Freq Low Thd 2]	(F2AL)	Threshold value "Motor frequency low 2" reached
[High Speed Reached]	(FLA)	Warning "High speed" reached
[Ref Freq High Thd reached]	(RTAH)	Threshold value for frequency setpoint "High" reached
[Ref Freq Low Thd reached]	(RTAL)	Threshold value for frequency setpoint "Low" reached
[2nd Freq Thd Reached]	(F2A)	Threshold value "Motor frequency high 2" reached
[Current Thd Reached]	(CTA)	Threshold value "Motor current high" reached
[Low Current Reached]	(CTAL)	Threshold value "Motor current low" reached
[High Torque Warning]	(TTHA)	Threshold value "Torque high" reached
[Low Torque Warning]	(TTLA)	Threshold value for low torque
[Process Undld Warning]	(ULA)	Warning for underload
[Process Overload Warning]	(OLA)	Warning for overload
[Torque Limit Reached]	(SSA)	Torque limit reached
[Torque Control Warning]	(RTA)	Torque control warning
[Drv Therm Thd reached]	(TAD)	Thermal threshold value for inverter reached
[Motor Therm Thd reached]	(TSA)	Thermal motor threshold value reached
[Mot2 Therm Thd reached]	(TS2)	Thermal threshold value "Motor 2" reached
[Mot3 Therm Thd reached]	(TS3)	Thermal threshold value "Motor 3" reached
[Mot4 Therm Thd reached]	(TS4)	Thermal threshold value "Motor 4" reached
[Power High Threshold]	(PTHA)	Threshold value for power output "High" reached
[Power Low Threshold]	(PTHL)	Threshold value for power output "Low" reached
[Cust Warning 1]	(CAS1)	Customer warning 1 active
[Cust Warning 2]	(CAS2)	Customer warning 2 active
[Cust Warning 3]	(CAS3)	Customer warning 3 active
[Cust Warning 4]	(CAS4)	Customer warning 4 active
[Cust Warning 5]	(CAS5)	Customer warning 5 active
[Power Cons Warning]	(POWD)	Warning for power consumption
[Slipping warn]	(ANA)	Warning for slipping
[Load Mvt Warn]	(BSA)	Warning for load movement
[Brake Cont Warn]	(BCA)	Warning for brake contact
[AI1 Th Warning]	(TP1A)	Thermal warning on AI1
[Current Reduc Warn]	(TLOW)	Warning for current reduction
[M/S Device Warn]	(MSDA)	Master/Slave system warning
[Backlash Warn]	(BSQA)	Warning for gear backlash
[Encoder Thermal Warn]	(TPEA)	Thermal warning for encoder module
[Pos. Following Warn]	(PFES)	Position after warning
[Temp Sens AI1 Warn]	(TS1A)	Warning for temperature sensor on AI1 (open circuit)
[Temp Sens AI3 Warn]	(TS3A)	Warning for temperature sensor on AI3 (open circuit)

[Warn grp 2 definition] (A2C)

Access

[Complete settings] → [Error/Warning handling] → [Warning groups config] → [Warn grp 2 definition]

About this menu

Identical to [Warn grp 1 definition] (A1C).

[Warn grp 3 definition] (A3C)

Access

[Complete settings] → [Error/Warning handling] → [Warning groups config] → [Warn grp 3 definition]

About this menu

Identical to [Warn grp 1 definition] (A1C).

[Warn grp 4 definition] (A4C)

Access

[Complete settings] → [Error/Warning handling] → [Warning groups config] → [Warn grp 4 definition]

About this menu

Identical to [Warn grp 1 definition] (A1C).

[Warn grp 5 definition] (A5C)

Access

[Complete settings] → [Error/Warning handling] → [Warning groups config] → [Warn grp 5 definition]

About this menu

Identical to [Warn grp 1 definition] (A1C).

5.2.4.45 [Maintenance]

5.2.4.45.1 [Diagnostics]

[Diagnostics] (dAU)

Access

[Complete settings] → [Maintenance] → [Diagnostics]

About this menu

This menu enables simple test sequences for diagnostics.

[FAN Diagnostics] (FNT)

Diagnostics of the internal fans.

This function starts a test sequence.

[LED Diagnostics] (HLT)

Diagnostics of the product LED(s).

This function starts a test sequence.

[IGBT Diag w motor] (IWT)

Diagnostics of the internal fans.

This function starts a test sequence with the motor (open circuit/short circuit).

[IGBT Diag w/o motor] (IWOT)

Diagnostics of the product IGBT(s).

This function starts a test sequence without the motor (short circuit).

5.2.4.45.2 [Customer event]

[Customer event 1] (CE1)

Access

[Complete settings] → [Maintenance] → [Customer events] → [Customer event 1]

About this menu

With this menu, individually set customer events can be set on a time-based basis.

[Config Warning 1] (CCA1)

Configures customer warning 1.

Setting	Code/Value	Description
[Not Configured]	(nO)	Not configured Factory setting
[Counter]	(CPt)	Counters
[Date And Time]	(dt)	Date and time

[Counter Limit 1] (CCL1)

Configures counter limit 1.

Setting	Description
0 to 4,294,967,295 s	Setting range Factory setting: 0 s

[Counter Source 1] (CCS1)

Configures counter source 1.

Setting	Code/Value	Description
[Mains/Control ON]	(0)	Power supply from power network or controller on
[Mains Supply ON]	(1)	Mains supply on
[Drive Running]	(2)	Inverter in operating state Factory setting

[Current Counter 1] (CC1)

Current counter 1.

Setting	Description
0 to 4,294,967,295 s	Setting range Factory setting: 0 s

[Date Time Warn 1] (Cdt1)

Date and time warning 1.

Accessing this menu is only possible via the display terminal.

	Setting	Description
	hh:mm DD/MM/YYYY	Setting range Factory setting: 00:00 01/01/2000

[Customer event 2] (CE2)

Access

[Complete settings] → [Maintenance] → [Customer events] → [Customer event 2]

About this menu

Identical to [Customer event 1] (CE1).

[Config Warning 2] (CCA2)

Configures customer warning 2.

[Counter Limit 2] (CCL2)

Configures counter limit 2.

[Counter Source 2] (CCS2)

Configures counter source 2.

[Current Counter 2] (CC2)

Current counter 2.

[Date Time Warn 2] (Cdt2)

Date and time warning 2.

Accessing this menu is only possible via the display terminal.

[Customer event 3] (CE3)

Access

[Complete settings] → [Maintenance] → [Customer events] → [Customer event 3]

About this menu

Identical to [Customer event 1] (CE1).

[Config Warning 3] (CCA3)

Configures customer warning 3.

[Counter Limit 3] (CCL3)

Configures counter limit 3.

[Counter Source 3] (CCS3)

Configures counter source 3.

[Current Counter 3] (CC3)

Current counter 3.

[Date Time Warn 3] (Cdt3)

Date and time warning 3.

Accessing this menu is only possible via the display terminal.

[Customer event 4] (CE4)

Access

[Complete settings] → [Maintenance] → [Customer events] → [Customer event 4]

About this menu

Identical to [Customer event 1] (CE1).

[Config Warning 4] (CCA4)

Configures customer warning 4.

[Counter Limit 4] (CCL4)

Configures counter limit 4.

[Counter Source 4] (CCS4)

Configures counter source 4.

[Current Counter 4] (CC4)

Current counter 4.

[Date Time Warn 4] (Cdt4)

Date and time warning 4.

Accessing this menu is only possible via the display terminal.

[Customer event 5] (CE5)

Access

[Complete settings] → [Maintenance] → [Customer events] → [Customer event 5]

About this menu

Identical to [Customer event 1] (CE1).

[Config Warning 5] (CCA5)

Configures customer warning 5.

[Counter Limit 5] (CCL5)

Configures counter limit 5.

[Counter Source 5] (CCS5)

Configures counter source 5.

[Current Counter 5] (CC5)

Electricity meter 5.

[Date Time Warn 5] (Cdt5)

Date and time warning 5.

Accessing this menu is only possible via the display terminal.

5.2.4.45.3 [Customer events]

[Customer events] (CUEv)

Access

[Complete settings] → [Maintenance] → [Customer events]

[Warning Clearing] (CAr)

Deletes customer warning

	Setting	Code/Value	Description
	[No Warning Clearing]	(nO)	Does not delete warning Factory setting
	[Clear Event 1 Warning]	(rA1)	Clears warning for event 1
	[Clear Event 2 Warning]	(rA2)	Clears warning for event 2
	[Clear Event 3 Warning]	(rA3)	Clears warning for event 3
	[Clear Event 4 Warning]	(rA4)	Clears warning for event 4
	[Clear Event 5 Warning]	(rA5)	Clears warning for event 5

5.2.4.45.4 [Fan management]

[Fan management] (FAMA)

Access

[Complete settings] → [Maintenance] → [Fan management]

About this menu

The values for fan speed and [Fan Operation Time] (FPbt) are monitored.

At unusually low speed, the fan outputs warning [Fan Feedback Warning] (FFdA). As soon as parameter [Fan Operation Time] (FPbt) reaches the predefined value of 45,000 hours, warning [Fan Counter Warning] (FCtA) is triggered.

The counter for [Fan Operation Time] (FPbt) can be reset to 0 via parameter [Counter Reset] (rPr).

[Fan Mode] (FFM)

Fan activation mode.

	Setting	Code/Value	Description
	[Standard]	(Std)	Fan operation is enabled when the motor is running. Depending on the size of the inverter, this may be the only available setting. Factory setting
	[Always]	(rUn)	The fan is always enabled.
	[Never]	(stp)	Fan operation is enabled when the motor is running.
	[Economy]	(eco)	Only activates the fan if the internal thermal state of the inverter requires it.

> **Note:**
>
> **OVERHEATING**
>
> **Ensure that the ambient temperature does not exceed 40°C when the fan is switched off.**
>
> **Failure to follow these instructions can result in damage to property.**

5.2.4.45.5 [Maintenance]

[Maintenance] (CSMA)

Access

[Complete settings] → [Maintenance]

[Time Counter Reset] (rPr)

Resets the time counter.

> **Note:**
>
> **The list of possible values depends on the product size.**

	Setting	Code/Value	Description
	[No]	(nO)	No Factory setting
	[Run Time Reset]	(rtH)	Resets the operating time
	[Power ON Time Reset]	(PtH)	Resets the switch-on time
	[Reset Fan Counter]	(FtH)	Resets the fan counter
	[Clear NSM]	(nsm)	Clears the number of motor starts

5.2.5 [Communication] (COM-)

Menu [Communication] (COM-) contains the fieldbus submenu.

5.2.5.1 [Modbus HMI]

[Modbus HMI] (Md2-)

Access

[Communication] → [Comm parameters] → [Modbus SL] → [Modbus HMI]

About this menu

This menu refers to the serial Modbus communication port on the front of the control block. It is used by default for the display terminal. The display terminal is only compatible with the following settings: **[HMI Baud Rate]** (tbr2) equals **[19200 bps]** (19k2), **[Term 2 word order]** (tWO2) equals **[HIGH]** (On) and **[HMI Format]** (tFO2) equals **[8-E-1]** (8E1).

[HMI Baud Rate] (tbr2)

Modbus baud rate.

Setting	Code/Value	Description
[4800 bps]	(4k8)	4800 baud
[9600 bps]	(9k6)	9,600 baud
[19200 bps]	(19k2)	19,200 baud Factory setting
[38,4 kbit/s]	(38k4)	38,400 baud

[Term 2 word order] (tWO2)

Modbus channel 2: Word order.

This parameter is accessible if **[Access Level]** (LAC) is set to **[Expert]** (EPr).

	Setting	Code/Value	Description
	[OFF]	(oFF)	Low-order word first
	[ON]	(oN)	High-order word first Factory setting

[HMI Format] (tFO2)

HMI format.

Setting	Code/Value	Description
[8-O-1]	(8o1)	8 bits, odd parity, 1 stop bit
[8-E-1]	(8E1)	8 bits, even parity, 1 stop bit Factory setting
[8-N-1]	(8n1)	8 bits, no parity, 1 stop bit
[8-N-2]	(8n2)	8 bits, no parity, 2 stop bits

[Mdb com start] (COM2)

Modbus communication status.

Setting	Code/Value	Description
[r0t0]	(r0t0)	Modbus: No reception, no transmission
[r0t1]	(r0t1)	Modbus: No reception, transmission
[r1t0]	(r1t0)	Modbus: Reception, no transmission
[r1t1]	(r1t1)	Modbus: Reception and transmission

5.2.5.2 [Powerlink]

[Powerlink] (EPL)

Access

[Communication] → **[Comm parameters]** → **[Powerlink]**

5.2.6 [File management] (FMt-)

5.2.6.1 [Transfer config file]

[Transfer config file] (tCF-)

Access

[File management] → **[File management]**

[Copy to the drive] (OPF)

This allows a previously stored configuration of an inverter to be selected from the display terminal memory and transferred to the inverters.

After a configuration file transfer, the inverter must be restarted.

[Copy from the drive] (SAF)

This allows the current configuration of the inverters to be stored in the display terminal memory.

> **Note:**
> **The graphic display terminal can store up to 16 configuration files.**

5.2.6.2 [Factory settings]

[Factory settings] (FCS-)

Access

[File management] → [Factory settings]

About this menu

This parameter is used to select the configuration to be restored after operation with the factory settings.

[Config. Source] (FCSI)

	Setting	Code/Value	Description
★	[Macro-Conf]	(InI)	Factory parameter set Factory setting
	[Config 1]	(CFG1)	Customer parameter set 1
	[Config 2]	(CFG2)	Customer parameter set 2
	[Config 3]	(CFG3)	Customer parameter set 3

5.2.6.3 [Parameter group list]

[Parameter group list] (FrY-)

Access

[File management] → [Factory settings] → [Parameter group list]

About this menu

List of menus to be loaded

> **Note:**
> **In the factory configuration and after returning to the "Factory setting", [Parameter group list] (FrY-) is empty.**

[All] (ALL)

All parameters in all menus.

[Drive Configuration] (drM)

Load menu **[Complete settings]** (CSt-).

[Motor parameters] (MOt)

Load menu **[Motor parameters]** (MPA-).

[Comm. Menu] (COM)

Load menu **[Communication]** (COM-).

This parameter is accessible if **[Config. Source]** (FCSI) is not set to **[Macro-Conf]** (ini).

[Display Config.] (dIS)

Load menu **[Display screen type]** (MSC-).

This parameter is accessible if **[Config. Source]** (FCSI) is not set to **[Macro-Conf]** (ini).

5.2.6.4 [Factory settings]

[Factory settings] (FCS-)

Access

[File management] → [Factory settings]

[Go to Factory settings] (GFS)

> **Warning!**
>
> **UNEXPECTED OPERATION OF THE EQUIPMENT**
>
> **It is important to ensure that a factory setting restoration is compatible with the wiring used.**
>
> **Failure to follow these instructions can result in death, serious injury or damage to property.**

It is only possible to revert to the factory settings if at least one group of parameters has previously been selected.

[Save Configuration] (SCSI)

Stores a configuration. The active configuration to be stored is not part of the selection.

If this involves [Config 0] (Str0), for example, only [Config 1] (Str1), [Config 2] (Str2) and [Config 3] (Str3) appear. The parameter changes back to [No] (nO) when the process is completed.

	Setting	Code/Value	Description
★	[No]	(nO)	No Factory setting
	[Config 0]	(Str0)	Stores customer parameter set 0
	[Config 1]	(Str1)	Stores customer parameter set 1
	[Config 2]	(Str2)	Stores customer parameter set 2
	[Config 3]	(Str3)	Stores customer parameter set 3

5.2.6.5 [Firmware update diag]

[Firmware update diag] (FWUD-)

Access

[File management] → [Firmware update] → [Firmware update diag]

About this menu

This menu can be accessed in expert mode and the graphic display terminal must be used to complete the firmware update.

[Firmware Update Status] (FWSt)

Setting	Code/Value	Description
[Inactive]	(CHECK)	Firmware update inactive
[PwrUpd in progress]	(POWER)	Power update in progress
[PwrUpd Pending]	(PEND)	Power update pending
[Ready]	(RDY)	Firmware update ready
[Inactive]	(nO)	Firmware update inactive
[Succeeded]	(SUCCD)	Firmware update successful
[Update Error]	(FAILED)	Update error
[In progress]	(PROG)	Firmware update in progress
[Requested]	(RQSTD)	Firmware update requested
[Transfer In Progress]	(TRLD)	Transfer in progress
[Transfer Done]	(TROK)	Transfer completed
[Package cleared]	(CLEAR)	Package cleared
[Warning]	(SUCWR)	Firmware update successful with warnings
[Drive State Error]	(FLSTA)	Inverter state error
[Package Error]	(FLPKG)	Package error
[Saving conf]	(SAvE)	The firmware update stores the current configuration.
[Post Script]	(POSt)	Firmware update takes care of the post-FWUPD.

[Firmware Update Error] (FWEr)

Setting	Code/Value	Description
[No Error]	(nO)	No error
[Lock Error]	(LOCK)	Lock error
[Package Error]	(MD5)	Package error
[Package Error]	(COMP)	Package error
[Ask error]	(ASK)	Query error
[Reset Drive Error]	(RESET)	Error during inverter reset
[Conf Saving Warning]	(SAVE)	Warning for storing the configuration
[Conf Loading Warning]	(LOAD)	Warning for loading configuration
[Post Script Warning]	(SCP)	Post script warning
[Package Description Error]	(DES)	Package description error
[Package not found]	(PKG)	Package not found
[Power Supply error]	(SPWr)	Power supply error
[Boot M3 error]	(BTM3)	Boot M3 error
[Boot C28 error]	(BTC28)	Boot C28 error
[M3 Error]	(M3)	M3 error
[C28 error]	(C28)	C28 error
[CPLD error]	(CPLD)	CPLD error
[Boot Power Error]	(PWR)	Boot power error
[Emb. Eth Boot Error]	(EMBT)	Boot embedded Ethernet error
[Emb. Eth Error]	(EMIL)	Embedded Ethernet error
[Emb. Eth Web Error]	(EMWB)	Embedded Ethernet web server error
[Module Eth Boot Error]	(OPTBT)	Boot Ethernet module error
[Module Eth Error]	(OPTIL)	Ethernet module error
[Module Eth Web Error]	(OPTWB)	Ethernet web module error
[Password enabled]	(PSWD)	Password enabled
[Flash Error]	(MEM)	Flash memory error
[Package Error]	(IFO)	Package information error

5.2.6.6 [Identification]

[Identification] (OId-)

Access

[File management] → [Firmware update] → [Identification]

About this menu

This menu is read-only and cannot be configured. The following information can be displayed:

- Setpoint, nominal power and voltage of the inverter
- Software version of the inverter
- Serial number of the inverter
- Available option modules and their software versions
- Type and version of the display terminal

5.2.6.7 [Package version]

[Package version] (PFV)

Access

[File management] → [Firmware update] → [Package version]

About this menu

This menu can be accessed in expert mode.

[Package Type] (PKtp)

Type of the firmware update packet.

Setting	Code/Value	Description
[Product]	(Prd)	Firmware update for product package Factory setting
[Module]	(OPt)	Firmware update for option package
[Spare part]	(SPr)	Firmware update for replacement parts package
[Customized]	(CUS)	Customized firmware update package.
[Indus]	(Ind)	Firmware update for industrialization package.

[Package version] (PKVS)

Version of the firmware update packet.

	Setting	Description
	0 to 65,535	Setting range Factory setting: _

5.2.6.8 [Firmware update]

[Firmware update] (FWUP)

Access

[File management] → [Firmware update]

About this menu

This menu can be accessed in expert mode.

[Firmware update] (FWAP)

Firmware update application.

	Setting	Code/Value	Description
	[No]	(nO)	No Factory setting
	[Yes]	(YES)	Yes

[Abort Firmware Update] (FWCL)

Deletes firmware update.

	Setting	Code/Value	Description
	[No]	(nO)	No Factory setting
	[Yes]	(YES)	Yes

5.2.7 [My preferences] (MYP-)

Menu **[My preferences]** (MYP-) contains the settings for the user-defined HMI and access to parameters.

5.2.7.1 [Language]

[Language] (LnG-)

Access

[My preferences] → [Language]

About this menu

The display terminal language can be selected via this menu.

5.2.7.2 [Password]

[Password] (COd-)

Access

[My preferences] → [Password]

About this menu

Enables the configuration to be protected with an access code or a password to be entered in order to access a protected configuration.

- The inverter is unlocked when the password is set to [No password defined] (nO) or if the correct password has been entered. All menus are accessible.
- Before protecting the configuration with a password, the following is required:
  - Define the [Upload rights] (ULr) and [Download rights] (dLr).
  - Make a careful note of the password and keep it in a safe place where you will always be able to find it.

Menu access is altered if the inverter is locked. If the password is locked:

- Menu [My menu] (MYMN-) (in menu [Simply start] (SYS-)) is displayed unless it is empty.
- Menus [Diagnostics] (DIA-) and [Display] (MON-) are displayed with read-only parameters. Submenus with configurable parameters are not displayed.
- Menus [Complete settings] (CST-) and [Communication] (COM-) are not displayed.
- Menu [Transfer config file] (TCF-) (in menu [File management] (FMT-)) is still displayed.
- Menu [My preferences] (MYP-) displays the following:
  - [Language] (LNG)
  - Menu [Password] (COD-)
  - Menu [Display screen type] (MSC-) (in menu [Customization] (CUS-))
  - [Date & Time settings] (RTC)
  - [Access Level] (LAC)
  - Menu [LCD settings] (CNL-)

[Password status] (PSSt)

Password status. Read-only parameter.

Setting	Code/Value	Description
[No password defined]	(nO)	No password defined Factory setting
[Password is unlocked]	(UL)	Password unlocked
[Password is locked]	(LOC)	Password locked

[Password] (PWd)

Password composed of 6 characters. Define and enter a password to lock the inverter. The value for [Password status] (PSSt) switches to [Password is locked] (LOC).

To unlock the inverter, the password must be entered. After the code has been entered correctly, the inverter is unlocked and the value for [Password status] (PSSt) switches to [Password is unlocked] (UL). The next time the inverter is switched on, access is blocked again.

To change the password, unlock the inverter and then enter the new password. Entering a new password locks the inverter.

To remove the password, unlock the inverter and enter the password 000000. The value for [Password status] (PSSt) switches to [No password defined] (nO). The next time the inverter is switched on, it is not locked.

[Upload rights] (ULr)

Upload rights.

	Setting	Code/Value	Description
	[Permitted]	(ULr0)	The entire configuration (password, monitoring, configuration) can be stored with commissioning tools or the display terminal. Factory setting
	[Not allowed]	(ULr1)	The commissioning tools and display terminal cannot store the configuration even if the inverter is not protected by a password or the correct password has been entered.

[Download rights] (DLr)

Download rights.

	Setting	Code/Value	Description
	[Locked drv]	(DLr0)	Inverter disabled: The configuration can only be downloaded to the inverter if the inverter is protected by a password that matches the password of the configuration to be downloaded.
	[Unlock. drv]	(DLr1)	Inverter unlocked: The configuration can be downloaded to the inverter or a configuration can be changed if the inverter is unlocked or not protected by a password. Factory setting
	[Not allowed]	(DLr2)	The configuration cannot be downloaded.
	[Lock/unlock]	(DLr3)	Combination of [Locked drv] (DLr0) and [Unlock. drv] (DLr1).

5.2.7.3 [Parameter access]

[Restricted channels] (PCd-)

Access

[My preferences] → [Parameter access] → [Restricted access] → [Restricted channels]

About this menu

The following channels can be selected to limit access to the corresponding parameters.

[HMI] (COn)

Display terminal.

[PC tool] (PWS)

DTM-based commissioning software.

[Restricted param] (PPA-)

Access

[My preferences] → [Parameter access] → [Restricted access] → [Restricted param]

About this menu

On these screens, all parameters in menu [Complete settings] (CSt-) can be protected and are displayed for selection except for the expert parameters.

To select all parameters, press button **All**. To deselect all parameters, press button **All** again.

Content of menu [Complete settings] (CSt-). If no parameters are available, no selections can be made on these screens.

[Visibility] (VIS-)

Access

[My preferences] → [Parameter access] → [Visibility]

About this menu

Selects the display of all parameters or only the active parameters.

[Parameters] (PVIS)

The parameters.

	Setting	Code/Value	Description
	[Active]	(ACt)	Only active parameters are accessible. Factory setting
	[All]	(ALL)	All parameters are accessible.

5.2.7.4 [Customization]

[My menu config.] (MYC-)

Access

[My preferences] → [Customization] → [My menu config.]

About this menu

Menu [My menu] (MYMn-) can be configured via this menu.

[Parameter Selection] (UMP)

Content of menu [Complete settings] (CSt-).

If no parameters are available, a selection cannot be made on this screen.

[Selected List] (UML)

The selected parameters can be sorted using this menu.

[My menu] (MYMn)

Used to define the name of the individually configured menu.

[Display screen type] (MSC-)

Access

[My preferences] → [Customization] → [Display screen type]

About this menu

This parameter can be used to select the display type for the standard screen.

[Display value type] (Mdt)

Screen display type.

	Setting	Code/Value	Description
	[Digital]	(dEC)	Digital values Factory setting
	[Bar graph]	(bAr)	Bar display
	[List]	(LISt)	List with values
	[Vu Meter]	(vUMEt)	Vu measuring instrument

[Parameter Selection] (MPC)

Adapts the selection. This parameter can be used to select the display type for the standard screen.

[Param. Bar Select] (PbS-)

Access

[My preferences] → [Customization] → [Param. Bar Select]

About this menu

This view allows selection of the parameters to be displayed in the top bar of the display terminal screen.

[Customer parameters] (CYP-)

Access

[My preferences] → [Customization] → [Customer parameters]

About this menu

Up to 15 parameters can be renamed via this menu.

[Parameter Selection] (SCP)

Selects the parameter. Up to 15 parameters can be selected via this menu.

[Custom Selection] (CPM)

Adapts the selection. This view is used to define the following settings for the respective selected parameter:

- Name
- Unit if relevant (user-defined unit available)
- Multiplier (1 to 1000) if relevant
- Divisor (1 to 1000) if relevant
- Offset (-99.00 to 99.00) if relevant

[Service message] (SEr-)

Access

[My preferences] → [Customization] → [Service message]

About this menu

With this menu, a user-defined service notification (5 lines with 23 characters each) can be defined.

This message can be displayed in menus **[Diagnostics]** (dIA-) and **[Diag. data]** (ddt-), and in the submenu of **[Service message]** (SEr-).

[LINE 1] (SML01)

Line 1.

[LINE 2] (SML02)

Line 2.

[LINE 3] (SML03)

Line 3.

[LINE 4] (SML04)

Line 4.

[LINE 5] (SML05)

Line 5.

5.2.7.5 [Date & Time settings]

[Factory settings] (RTC-)

Access

[My preferences] → [Date/time settings]

About this menu

This view is used to set the date and time. This information is used to apply timestamps to all logged data.

Information regarding date and time should be available when the inverters are started up (time server available and configured or display terminal connected) so that the logged data can be provided with time stamps.

When these settings are changed, the previously logged data value is changed in the case of time-based average data.

5.2.7.6 [Access Level]

[Access Level] (LAC)

Access

[My preferences] → [Access Level]

[Access Level] (LAC)

Access control level.

	Setting	Code/Value	Description
	[Basic]	(bAS)	Access to menus [Simply start] (SYS-), [Diagnostics] (dIA-), [File management] (FMT-) and [My preferences] (MYP-) only.
	[Standard]	(Std)	Accesses all menus. Factory setting
	[Expert]	(EPr)	Access to all menus and additional parameters.

5.2.7.7 [LCD settings]

[LCD settings] (CnL-)

Access

[My preferences] → [LCD settings]

About this menu

This menu can be used to set the parameters linked to the display terminal.

[Screen Contrast] (CSt)

Screen contrast setting.

Setting	Description
0 to 100%	Setting range Factory setting: 50%

[Standby] (SbY)

Standby delay.

> **Note:**
>
> **Disabling the automatic standby function for the backlight of the display terminal shortens its service life.**

Setting	Description
[No] (nO) to 10 minutes.	Time for automatically switching off the backlight Factory setting: 10 min.

[Display Terminal locked] (KLCK)

Display terminal key locked. Press the ESC and Home keys to lock and unlock the display terminal buttons. The stop button remains active when the display terminal is locked.

Setting	Description
[No] (nO) to 10 minutes.	Setting range Factory setting: 5 min.

5.2.7.8 [Pairing password]

[Pairing password] (PPi)

Access

[My preferences] → [Pairing password]

About this menu

This function is only accessible in expert mode. This function is used to detect that an option module has been modified or that the software has been modified in any way. When a pairing password is entered, the parameters of the cards currently inserted are stored. At each subsequent start, the parameters are checked and if a deviation exists, the inverter locks **[Boards Compatibility]** (HCF). For a restart, the initial situation must be restored or the pairing password must be entered again.

The following parameters are checked:

- Option module type.
- Software version of the inverter and option module.
- Serial number of the control block cards.

[Pairing password] (PPI)

Function as a pairing code.

Setting	Description
[OFF] (oFF) to 9,999	Setting range Factory setting: **[OFF]** (oFF)

[OFF] (oFF) means that the pairing password is inactive.

[ON] (oN) means that the function of the pairing password is active and in the case of a detected **[Boards Compatibility]** (HCF) fault, a code is required to start the inverter. As soon as the code has been entered, the inverter is unlocked and the value changes to **[ON]** (oN).

5.3 Maintenance and diagnostics

5.3.1 Servicing

Limitation of warranty

The warranty does not apply if the product has been opened by anyone other than B&R service administrators.

Service

Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

Before completing any of the procedures described in this section, carefully read through the instructions provided in section "Safety information".

Failure to follow these instructions will result in death or serious injury.

During operating, the products described in these instructions can reach temperatures above 80°C.

Warning!

HOT SURFACES

- **Avoid all contact with hot surfaces.**
- **Keep flammable or heat-sensitive parts away from the immediate vicinity of hot surfaces.**
- **Before handling the product, ensure that it has cooled down sufficiently.**
- **Ensure that there is sufficient heat dissipation by performing a test run at maximum load.**

Failure to follow these instructions can result in serious bodily injury and even death or damage to the material.

Warning!

INSUFFICIENT MAINTENANCE

It is important to ensure that maintenance work is carried out at the specified intervals as described below.

Failure to follow these instructions can result in death, serious injury or damage to property.

If the inverter is in operation, the ambient conditions must be maintained. It is also important to ensure that this is checked during maintenance and, if necessary, that all factors influencing the ambient conditions are corrected.

	Affected components:	Activity	Interval[1)]
General state	All parts such as housing, HMI, control blocks, connectors, etc.	Perform a visual inspection.	At least once a year.
Corrosion	Terminals, connectors, screws, EMC plate	Inspect and clean if necessary.	
Dust	Terminals - Fans - Air inlets and outlets for housing - Cabinet air filters	Inspect and clean if necessary.	
	Filter mats (floor-mounted inverters)	Check.	
		Replace.	At least every four years.
Cooling	Fans (wall-mounted inverters)	Check that the fans are functioning correctly.	At least once a year.
		Replace the fans.	After three to five years depending on operating conditions.
	Mounting	All screws for electrical and mechanical connections	Check the tightening torque.

1) Maximum service intervals starting at commissioning date. Reduce the service intervals to adapt maintenance work to the ambient conditions, operating conditions of the inverter and other factors that can affect the operation and/or maintenance requirements of the inverter.

Replacement parts and repairs

Maintainable product. Please contact your designated customer service representative.

Fan replacement

A new fan can be ordered within the scope of an inverter maintenance agreement.

5.3.2 Diagnostics and fault correction

Overview

This chapter contains descriptions of the different types of diagnostics and troubleshooting tips.

Danger!

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

Before completing any of the procedures described in this section, carefully read through the instructions provided in section "Safety information".

Failure to follow these instructions will result in death or serious injury.

5.3.2.1 Warning codes

List of available warning messages

Setting	Code	Description
[No Warning stored]	(NOA)	No warning stored
[Fallback Frequency]	(FRF)	Response to event: Fallback frequency
[Speed Maintained]	(RLS)	Response to event: Speed maintained
[Type of stop]	(STT)	Response to event: Stop after [Type of stop] (STT) without triggering a fault
[Ref Frequency Warning]	(SRA)	Frequency setpoint reached
[PID error Warning]	(PEE)	Warning for PID fault
[PID Feedback Warning]	(PFA)	Warning for actual value of PID
[PID High Fdbck Warn]	(PFAH)	Upper PID threshold reached
[PID Low Fdbck Warn]	(PFAL)	Lower PID threshold reached
[Limit Switch Reached]	(LSA)	Limit switch reached
[Slack Rope Warning]	(RSDA)	Warning for slack rope
[Dynamic Load Warning]	(DLDA)	Warning for dynamic load
[AI3 Th Warning]	(TP3A)	Thermal warning on AI3
[AI1 4-20 Loss Warning]	(AP1)	Warning for loss of 4-20 mA on AI1
[AI3 4-20 Loss Warning]	(AP3)	Warning for loss of 4-20 mA on AI3
[Drive Thermal Warning]	(THA)	Warning for overheating on inverter
[IGBT Thermal Warning]	(TJA)	Warning for thermal state of IGBT
[Fan Counter Warning]	(FCTA)	Warning for fan tachometer
[Fan Feedback Warning]	(FFDA)	Warning for actual value of the fan
[BR Thermal Warning]	(BOA)	Thermal warning for braking resistor
[Ext. Error Warning]	(EFA)	Warning for external fault
[Undervoltage Warning]	(USA)	Warning for undervoltage
[Preventive UnderV Active]	(UPA)	Controlled stop threshold reached
[Mot Freq High Thd]	(FTA)	Threshold value "Motor frequency high 1" reached
[Mot Freq Low Thd]	(FTAL)	Threshold value "Motor frequency low 1" reached
[Pulse Warn Thd Reached]	(FQLA)	Threshold value for impulse warning reached
[Mot Freq Low Thd 2]	(F2AL)	Threshold value "Motor frequency low 2" reached
[High Speed Reached]	(FLA)	Warning "High speed" reached
[Ref Freq High Thd reached]	(RTAH)	Threshold value for frequency setpoint "High" reached
[Ref Freq Low Thd reached]	(RTAL)	Threshold value for frequency setpoint "Low" reached

Setting	Code	Description
[2nd Freq Thd Reached]	(F2A)	Threshold value "Motor frequency high 2" reached
[Current Thd Reached]	(CTA)	Threshold value "Motor current high" reached
[Low Current Reached]	(CTAL)	Threshold value "Motor current low" reached
[High Torque Warning]	(TTHA)	Threshold value "Torque high" reached
[Low Torque Warning]	(TTLA)	Threshold value for low torque
[Process Undld Warning]	(ULA)	Warning for underload
[Process Overload Warning]	(OLA)	Warning for overload
[Torque Limit Reached]	(SSA)	Torque limit reached
[Torque Control Warning]	(RTA)	Torque control warning
[Drv Therm Thd reached]	(TAD)	Thermal threshold value for inverter reached
[Motor Therm Thd reached]	(TSA)	Thermal motor threshold value reached
[Mot2 Therm Thd reached]	(TS2)	Thermal threshold value "Motor 2" reached
[Mot3 Therm Thd reached]	(TS3)	Thermal threshold value "Motor 3" reached
[Mot4 Therm Thd reached]	(TS4)	Thermal threshold value "Motor 4" reached
[Power High Threshold]	(PTHA)	Threshold value for power output "High" reached
[Power Low Threshold]	(PTHL)	Threshold value for power output "Low" reached
[Cust Warning 1]	(CAS1)	Customer warning 1 active
[Cust Warning 2]	(CAS2)	Customer warning 2 active
[Cust Warning 3]	(CAS3)	Customer warning 3 active
[Cust Warning 4]	(CAS4)	Customer warning 4 active
[Cust Warning 5]	(CAS5)	Customer warning 5 active
[Power Cons Warning]	(POWD)	Warning for power consumption
[Slipping warn]	(ANA)	Warning for slipping
[Load Mvt Warn]	(BSA)	Warning for load movement
[Brake Cont Warn]	(BCA)	Warning for brake contact
[AI1 Th Warning]	(TP1A)	Thermal warning on AI1
[Current Reduc Warn]	(TLOW)	Warning for current reduction
[M/S Device Warn]	(MSDA)	Master/Slave system warning
[Backlash Warn]	(BSQA)	Warning for gear backlash
[Encoder Thermal Warn]	(TPEA)	Thermal warning for encoder module
[Pos. Following Warn]	(PFES)	Position after warning
[Temp Sens AI1 Warn]	(TS1A)	Warning for temperature sensor on AI1 (open circuit)
[Temp Sens AI3 Warn]	(TS3A)	Warning for temperature sensor on AI3 (open circuit)

5.3.2.2 Error codes

5.3.2.2.1 Error codes - Overview

Clearing the detected fault

Steps to be completed if the inverter system requires intervention:

1) Disconnect all power supplies, including the external power supply to the control unit if applicable.
2) Lock all circuit breakers in open position.
3) Wait 15 minutes to allow the DC bus capacitors to discharge. The evaluation of the control LED is not sufficient to ensure that the DC bus is fully discharged.
4) Measure the voltage of the DC bus between the PA/+ and PC/- terminals to ensure that the voltage is less than 42 V.
5) If the DC bus capacitors do not discharge completely, contact your local representative at B&R. The frequency inverter is not permitted to be repaired or put into operation in this case.
6) Find and correct the cause of the detected fault.
7) Reinstate the power supply of the inverter to check whether the fault has been resolved.

After the cause has been corrected, the detected fault can be cleared as follows:

- Switch off the inverters.
- Use parameter [Product Restart] (rP).
- Use function [Auto Fault Reset] (Atr-).
- Set a digital input or control bit for function [Fault reset] (rSt-).
- Press the STOP/RESET button on the display terminal when the active command channel is set to [Ref.Freq-Rmt.Term] (LCC).

5.3.2.2.2 Error codes - A to E

[Load slipping] (AnF)

Probable cause:
The difference between the output frequency and the actual speed value is not correct.

Error correction:

- Confirm the drive power of the application (motor, load, etc.) accordingly.
- Check the motor, amplification and stability parameters.
- Add a braking resistor.
- Check the mechanical coupling and the wiring of the encoder.
- If the function is used for torque control and the assignment of the encoder is set to the actual speed value:
  - Set **[Load slip detection]** (Sdd) to **[No]** (nO).
  - Set **[Positive deadband]** (dbP) and **[Negative deadband]** (dbn) to a value less than 10% of the rated motor frequency.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Angle error] (ASF)

Probable cause:
For synchronous motors, the speed control setting is not correct if the setpoint runs through 0.

Error correction:

- Check the speed control parameters.
- Check the motor phases and the maximum permissible current for the inverter.

Clearing the error code:
This detected fault can be manually reset using parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Brake Control] (bLF)

Probable cause:

- Brake-releasing current not reached.
- The torque setpoint is not reached.
- Magnetizing current not stable.

Error correction:

- Check frequency inverter / motor connection.
- Check motor windings.
- Check settings **[Brk Release Current]** (Ibr) and **[Brake release I Rev]** (Ird).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Brake Resistor ovld] (bOF)

Probable cause:
The braking resistor is overloaded.

Error correction:

- Wait until the braking resistor has cooled down.
- Check the nominal power of the braking resistor.
- Check parameters **[Braking Resistor Power]** (brP) and **[Braking Resistor Value]** (brv).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Brake Feedback] (brF)

Probable cause:

- The status of the actual value contact of the brake or of the brake relay actual value is not correct compared to the logic control of the brake.
- The brake does not stop the motor fast enough (detection via speed measurement on input "Pulse input").

Error correction:

- Check the setpoint circuit of the brake.
- Check the logic control circuit of the brake.
- Check the braking behavior.
- Take into account the setting for brake response times **[Brake Release time]** (BRT) and **[Brake Engage Time]** (BET), **[Brake Fdbk Filter]** (FbCI) and **[Brake Rly Fdbk Filter]** (FBRI).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Backlash Error] (BSqF)

Probable cause:
The torque setpoint used for the gear backlash function cannot be reached after **[BL Monit Delay]** (bqt) expires.

Error correction:

- Check the settings.
- Check the coupling.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[DB unit sh. circuit] (bUF)

Probable cause:

Error correction:

- Check the wiring of the brake module.
- Check whether the value of the brake module is too low.

Clearing the error code:
This detected fault requires a voltage reset.

[DB unit op. circuit] (bUFO)

Probable cause:

- Open circuit of the brake circuit.
- Braking resistor not connected.

Error correction:

- Check the wiring of the braking resistor.
- Check by measuring whether the braking resistor resistance is low enough.
- Check parameter **[Brake Relay Fdbk]** (brI).

Clearing the error code:
This detected fault requires a voltage reset.

[Circuit Breaker Error] (CbF)

Probable cause:
The voltage level of the DC bus is incorrect compared to the control of the circuit breaker (start or stop pulse) after configured timeout **[Mains V. time out]** (LCt).

Error correction:

- Check the logic controller of the circuit breaker (pulse time for start and stop).
- Check the mechanical condition of the circuit breaker.

Clearing the error code:
This detected fault requires a voltage reset.

[Incorrect Configuration] (CFF)

Probable cause:

- Option module changed or removed.
- The control block was replaced by a control block that was configured on an inverter with different rating data.
- The active configuration is inconsistent.

Error correction:

- Ensure that no fault has been detected in the option module.
- In the event of the control block being changed deliberately, see the recommendations specified below.
- Restore the factory settings or the backup configuration if valid.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Invalid Configuration] (CFI)

Probable cause:
Invalid configuration. The configuration loaded in the inverter via the commissioning tool or fieldbus is inconsistent.

Error correction:

- Check the previously loaded configuration.
- Load a compatible configuration.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Conf Transfer Error] (CFI2)

Probable cause:

- The configuration was not transferred correctly.
- The loaded configuration is not compatible with the inverter.

Error correction:

- Check the last loaded configuration.
- Load a compatible configuration.
- Use the PC software commissioning tool to transfer a compatible configuration.
- Reset to the factory settings.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Pre-settings Transfer Error] (CFI3)

Probable cause:
The existing configuration was not transferred correctly.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Empty Configuration] (CFI4)

Probable cause:
The selected configuration for function **[Multimotors config]** (MMC-) was not created in advance.

Error correction:

- Check the stored configurations.
- Switch to a compatible configuration.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Fieldbus Com Interrupt] (CnF)

Probable cause:
Communication interruption on field bus module. This fault is triggered when communication between the fieldbus module and master (PLC) is interrupted.

Error correction:

- Check the environment (electromagnetic compatibility).
- Check the wiring.
- Check the timeout.
- Replace option module.
- Contact your local B&R representative.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[CANopen Com Interrupt] (COF)

Probable cause:
Communication interruption on the CANopen® fieldbus

Error correction:

- Check the communication field bus.
- Check the timeout.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Precharge Capacitor] (CrF)

Probable cause:
Control error on charging circuit or charging resistor damaged.

Error correction:

- Turn inverter off and then on again.
- Check internal connections.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Channel Switch Error] (CSF)

Probable cause:
Switching to an invalid channel

Error correction:
Check the function parameters.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Dynamic Load Error] (dLF)

Probable cause:
Load variation outside of range.

Error correction:
Check whether the instability of the load is due to a mechanical cause.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Encoder Coupling] (ECF)

Probable cause:
The mechanical coupling of the encoder is defective. Detection is active if parameter **[Encoder Coupling Monit]** (ECC) is set to **[Yes]** (YES).
This fault is triggered if the actual speed value is 0 and the inverter is in the torque limiting or current limiting state.
The limit values for the actual speed value are as follows:

- 5 Hz for the minimum value
- 10% of **[Nominal Motor Freq]** (FrS) for the maximum value
- Check the setting of parameter **[Encoder Coupling Monit]** (ECC).
- Check the setting of parameter **[Encoder check time]** (ECt).

The monitoring is not compatible with the functions for torque or current limiting.

Error correction:
Check the mechanical coupling of the encoder.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[EEPROM Control] (EEF1)

Probable cause:
A fault was detected in the internal memory of the control block.

Error correction:

- Check the environment (electromagnetic compatibility).
- Switch off the product.
- Restore the factory settings.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[EEPROM Power] (EEF2)

Probable cause:
A fault was detected in the internal memory of the power card.

Error correction:

- Check the environment (electromagnetic compatibility).
- Switch off the product.
- Restore the factory settings.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Encoder] (EnF)

Probable cause:
Actual value of fault encoder.
The difference between the measured and calculated value is greater than 4% of **[Nominal Motor Freq]** (FrS) or **[Sync Nominal Freq]** (FrSS).

Error correction:

- Check the configuration parameters for the encoder used.
- Check the operation of the mechanical and electrical components of the encoder.
- Check the consistency between the encoder signals and the direction of the motor rotation.
- If necessary, reverse the direction of the motor rotation (parameter **[Output Ph Rotation]** (PHr)) or the encoder signals.
- Check the encoder module.
- Check the encoder type and supply voltage.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[External Error] (EPF1)

Probable cause:

- Event triggered by an external device, depending on the user.
- An external fault was triggered via Embedded Ethernet.

Error correction:
Remove the cause of the external fault.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Fieldbus Error] (EPF2)

Probable cause:
An external fault was triggered via the fieldbus

Error correction:
Remove the cause of the external fault.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Embd Eth Com Interrupt] (EtHF)

Probable cause:
Communication interruption on the Ethernet IP Modbus TCP bus.

Error correction:
Check communication bus.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

5.3.2.2.3 Error codes - F to I

[Out Contact Closed Error] (FCF1)

Probable cause:
The output contactor remains closed even though the opening conditions have been met.

Error correction:

- Check the output contactor and its wiring.
- Check the wiring of the output contactor feedback.

Clearing the error code:
This detected fault requires a voltage reset.

[Out Contact Opened Error] (FCF2)

Probable cause:
The output contactor remains open even though the closing conditions have been fulfilled.

Error correction:
Check the output contactor and its wiring. Check the wiring of the output contactor feedback.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[FDR 1 Error] (FDR1)

Probable cause:

- Interruption of communication between inverter and PLC
- Incompatible, empty or invalid configuration file
- Inverter nominal power not consistent with configuration file

Error correction:

- Check the inverter and PLC connections.
- Check communication load.
- Restart the transfer of the configuration file from the inverter to the PLC.

Clearing the error code:
This detected fault requires a voltage reset.

[Firmware Update Error] (FWEr)

Probable cause:
The firmware update function has detected a fault.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Boards Compatibility] (HCF)

Probable cause:
Parameter **[Pairing password]** (PPI) was enabled and an option module was changed.

Error correction:

- Use the original option module.
- Confirm the configuration by entering the **[Pairing password]** (PPI) if the module has been changed intentionally.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Input Overheating] (iHF)

Probable cause:
The temperature of the AFE module is too high.

Error correction:
Check the ventilation and the ambient temperature of the inverters. Allow the inverter to cool before switching it on again.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Internal Link Error] (ILF)

Probable cause:
Interruption of communication between option module and inverter.

Error correction:

- Check the environment (electromagnetic compatibility).
- Check the connections.
- Replace option module.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 0] (InF0)

Probable cause:
Interruption of communication between microprocessors on the control board.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 1] (InF1)

Probable cause:
The nominal power of the power card is not valid.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 2] (InF2)

Probable cause:
The power card is not compatible with the control block software.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 3] (InF3)

Probable cause:
Internal communication error detected.

Error correction:

- Check the wiring on the control terminals of the inverter (internal 10 V power supply for overload of the analog inputs).
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 4] (InF4)

Probable cause:
Inconsistent internal data.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 6] (InF6)

Probable cause:

- The option module installed in the inverter is not recognized.
- The removable control terminal modules (if present) are not present or not recognized.
- The integrated Ethernet adapter is not recognized.

Error correction:

- Check the order number and compatibility of the option module.
- Reinsert the removable control terminal modules after the inverters have been switched off.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 7] (InF7)

Probable cause:
Communication interruption on the CPLD component of the control board.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 8] (InF8)

Probable cause:
The internal switched-mode power supply is not working correctly.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 9] (InF9)

Probable cause:
A fault was detected during current measurement.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 10] (InFA)

Probable cause:
The input stage is not working correctly.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 11] (InFb)

Probable cause:
The inverter's internal temperature sensor is not operating correctly.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Internal Error 12] (InFC)

Probable cause:
Fault in the internal power supply.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 13] (InFd)

Probable cause:
Deviation from differential current.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 14] (InFE)

Probable cause:
Internal fault detected on the microprocessor.

Error correction:

- Attempt to delete the error code.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 15] (InFF)

Probable cause:
Flash format serial memory.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 16] (InFG)

Probable cause:
Communication interruption with output relay module expansion module or internal fault of output relay module expansion module

Error correction:

- Ensure that the option module is correctly connected to the slot.
- Replace option module.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 17] (InFH)

Probable cause:
Communication interruption on the extension module of the digital and analog inputs and outputs or internal fault on the extension module of the digital and analog inputs and outputs.

Error correction:

- Ensure that the option module is correctly connected to the slot.
- Replace option module.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 18] (InFi)

Probable cause:
Communication interruption on the safety function module or internal fault of the safety function module.

Error correction:

- Ensure that the option module is correctly connected to the slot.
- Replace option module.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 19] (InFJ)

Probable cause:
A fault was detected on the encoder module.

Error correction:

- Check the encoder's compatibility.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 20] (InFK)

Probable cause:
Fault on the interface of the option module.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 21] (InFL)

Probable cause:
Fault on the internal real-time clock. There may be a communication fault between the keypad and the inverter or a startup fault on the clock oscillator.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 22] (InFM)

Probable cause:
An fault was detected on the Embedded Ethernet adapter.

Error correction:
Check the connection to the Ethernet port. Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 25] (InFP)

Probable cause:
Hardware version and firmware version of the control board are not compatible.

Error correction:

- Update the firmware package.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Internal Error 27] (InFr)

Probable cause:
The DPLD diagnostics detected a fault.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

5.3.2.2.4 Error codes - L to R

[Input Contactor] (LCF)

Probable cause:
The inverter is not switched on even though the timeout **[Mains V. time out]** (LCt) has expired.

Error correction:

- Check the input contactor and its wiring.
- Check timeout **[Mains V. time out]** (LCt).
- Check the wiring between the power supply system / contactor / inverter.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[AI1 4-20mA Loss] (LFF1)

Probable cause:
4-20 mA loss on analog input AI1. This fault is triggered if the measured current is less than 2 mA.

Error correction:

- Check the connection on the analog inputs.
- Check the setting for parameter **[AI1 4-20mA Loss]** (LFL1).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[AI3 4-20mA loss] (LFF3)

Probable cause:
4-20 mA loss on analog input AI3. This fault is triggered if the measured current is less than 2 mA.

Error correction:

- Check the connection on the analog inputs.
- Check the setting for parameter **[AI3 4-20mA loss]** (LFL3).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Load Mvt Error] (MdCF)

Probable cause:
Load movement for which no command was output.

Error correction:
Check the command circuit of the brake. Check the brake.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[M/S Device Error] (MSdF)

Probable cause:

- One or more slaves of a master are not available or not ready.
- The master of a slave is not available.

Error correction:

- Check the inverter status.
- Check the settings of the master-slave architecture.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[DC Bus Overvoltage] (ObF)

Probable cause:

- Deceleration time too short or driving load.
- Mains supply too high.

Error correction:

- Increase deceleration.
- Configure function **[Dec.Ramp Adapt]** (brA) if compatible with the application.
- Check the mains supply.
- Check the performance of the braking circuit if present.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Overcurrent] (OCF)

Probable cause:

- The parameters in menu **[Motor data]** (MOA-) are incorrect.
- Inertia or load too high.
- Mechanical blockade.

Error correction:

- Check the motor parameters.
- Check the dimensioning of the inverter/load.
- Check the state of the mechanism.
- Reduce **[Current Limitation]** (CLI).
- Increase the switching frequency.

Clearing the error code:
This detected fault requires a voltage reset.

[Drive Overheating] (OHF)

Probable cause:
The temperature of the inverter is too high.

Error correction:
Check the motor load, inverter ventilation and ambient temperature. Allow the inverter to cool before switching it on again.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Process Overload] (OLC)

Probable cause:
Process overload.

Error correction:

- Determine and eliminate the cause of the overload.
- Check the parameters of function **[Process Overload]** (OLd-).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Motor Overload] (OLF)

Probable cause:
Triggered by excessive motor current.

Error correction:

- Check the thermal monitoring setting of the motor.
- Check the motor load. Allow the motor to cool before switching it on again.
- Check the settings of the following parameters:
  - **[Motor Th Current]** (ITH)
  - **[Motor Thermal Mode]** (THT)
  - **[Motor Therm Thd]** (TTD)
  - **[MotorTemp ErrorResp]** (OLL)

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Single Output Phase Loss] (OPF1)

Probable cause:
Loss of one phase at inverter output.

Error correction:
Check the wiring between the inverter and motor.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Output Phase Loss] (OPF2)

Probable cause:

- Motor not connected or motor power too low.
- Output contactor open
- Instantaneous instability in the motor current

Error correction:

- Check the wiring between the inverter and motor.
- When using an output contactor, set parameter **[OutPhaseLoss Assign]** (OPL) to **[No Error Triggered]** (OAC).
- If the inverter is connected to a low-power motor or no motor at all: In factory settings mode, motor phase loss detection is active **[Output Phase Loss]** (OPL) = **[OPF Error Triggered]** (YES). Disable motor phase loss detection **[Output Phase Loss]** (OPL) = **[Function Inactive]** (nO).
- Check and optimize the following parameters:
  - **[IR compensation]** (UFr)
  - **[Nom Motor Voltage]** (UnS)
  - **[Rated mot. current]** (nCr)
  - Perform **[Autotuning]** (tUn)

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Supply Mains Overvoltage] (OSF)

Probable cause:

- Mains supply too high.
- Disturbances in the mains supply.

Error correction:
Check the mains supply.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Program Loading Error] (PGLF)

Probable cause:
Attempt to delete the error code.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Program Running Error] (PGrF)

Probable cause:
Attempt to delete the error code.

Error correction:
Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Input phase loss] (PHF)

Probable cause:

- Inverter incorrectly supplied or fuse tripped.
- A phase is not available.
- 3-phase inverter used on a single-phase line supply.
- Unbalanced load.

Error correction:

- Check the power connection and fuses.
- Use a three-phase power supply.
- Disable the detector fault with setting **[Input phase loss]** (IPL) = **[No]** (nO) if a single-phase power supply or DC bus power supply is used.

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

[Rotation Angle Monit] (RAdF)

Probable cause:
Angle of rotation monitoring detected a deviation that was too high.

Error correction:

- Check the system for mechanical problems.
- Check the monitoring function settings.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

5.3.2.2.5 Error codes - S to U

[Safety Function Error] (SAFF)

Probable cause:

- Debounce time exceeded
- Internal hardware fault
- STOA and STOB have a different status (high/low) for more than 1 second.

Error correction:

- Check the wiring of digital inputs STOA and STOB.
- Contact your local B&R representative.

Clearing the error code:
This detected fault requires a voltage reset.

[Motor Short Circuit] (SCF1)

Probable cause:
Short circuit or grounding at the inverter output.

Error correction:

- Check the attachment cables from the inverter to the motor and the motor insulation.
- Adjust the switching frequency.
- Connect chokes to the motor in series.
- Check speed control and brake setting.
- Increase **[Time to restart]** (ttr).

Clearing the error code:
This detected fault requires a voltage reset.

[Ground Short Circuit] (SCF3)

Probable cause:
Significant leakage current if several motors are connected in parallel.

Error correction:

- Check the attachment cables from the inverter to the motor and the motor insulation.
- Adjust the switching frequency.
- Connect chokes to the motor in series.
- Check speed control and brake setting.
- Increase **[Time to restart]** (ttr).

Clearing the error code:
This detected fault requires a voltage reset.

[IGBT Short Circuit] (SCF4)

Probable cause:
Fault detected on power unit. When the product is switched on, the IGBTs are tested for a short circuit. A fault (short circuit or interruption) is detected on at least one IGBT. The time for testing the individual transistors is between 1 and 10 µs.

Error correction:
Check the setting of parameter **[Output Short Circuit Test]** (Strt). Contact your local B&R representative.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Motor Short Circuit] (SCF5)

Probable cause:
Short circuit at inverter output.

Error correction:
Check the attachment cables from the inverter to the motor and the motor insulation. Contact your local B&R representative.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Modbus Com Interruption] (SLF1)

Probable cause:
Communication interruption on the Modbus port.

Error correction:

- Check communication bus.
- Check the timeout.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[PC Com Interruption] (SLF2)

Probable cause:
Communication with commissioning software interrupted.

Error correction:

- Check the commissioning software's attachment cable.
- Check the timeout.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[HMI Com Interruption] (SLF3)

Probable cause:
Communication with the graphic display terminal interrupted. This fault is triggered if the command or reference value is specified from the graphic display terminal and communication is interrupted for more than 2 seconds.

Error correction:

- Check communication on the graphic display terminal.
- Check the timeout.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Motor Overspeed] (SOF)

Probable cause:

- Instability or drive load too high.
- If a downstream contactor is used, the contacts between the motor and inverter were not closed before a move command was executed.

Error correction:

- Check the motor's parameter settings.
- Check the dimensioning of the motor/inverter/load.
- Before executing a move command, check the contacts between the motor and inverter.

Clearing the error code:
This detected fault requires a voltage reset.

[Encoder Feedback Loss] (SPF)

Probable cause:

- Encoder actual value signal is missing.
- No top z signal after two completed revolutions.
- No signal at pulse input when using the input for speed measurement.

Error correction:

- Check error code value **[Encoder Fdbck Error]** (EnCE).
- Check the wiring between the encoder and the frequency inverter.
- Check the encoder.
- Check the encoder settings.
- Check the wiring of the pulse input and the sensor used.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Torque timeout] (SrF)

Probable cause:
The torque control function cannot regulate the torque within the configured bandwidth. The inverter switched to speed control for longer than **[Torque ctrl time out]** (rtO).

Error correction:

- Check the settings of function **[Torque control]** (tOr-).
- Check whether there are any mechanical limitations.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Torque Limitation Error] (SSF)

Probable cause:
The frequency inverter was in state "Torque limitation" or "Current limiting" during [Trq/I Limit Timeout] (StO).

Error correction:

- Check the settings of function [Torque control] (tOr-).
- Check whether there are any mechanical limitations.

Clearing the error code:
This detected fault can be reset using function [Auto Fault Reset] (Atr) or manually via parameter [Fault Reset Assign] (rSF) after the cause has been eliminated.

[Motor Stall Error] (StF)

Probable cause:
Motor stall monitoring detected a fault. [Motor Stall Error] (STF) is triggered under the following conditions:

- The output frequency is lower than stall frequency [Stall Frequency] (STP3).
- The output current is higher than stall current [Stall Current] (STP2).
- This is the case over a period of time longer than stall time [Stall Max Time] (STP1.).

Error correction:

- Look for a mechanical stall of the motor.
- Look for a possible cause of the motor overload.
- Check the monitoring function settings.

Clearing the error code:
This detected fault can be reset using function [Auto Fault Reset] (Atr) or manually via parameter [Fault Reset Assign] (rSF) after the cause has been eliminated.

[AI1 Thermal Sensor Error] (t1CF)

Probable cause:
The monitoring function of the temperature sensor has detected a fault on analog input AI1:

- Open circuit, or
- Short circuit

Error correction:

- Check the sensor and wiring.
- Replace the sensor.

Clearing the error code:
This detected fault can be reset using function [Auto Fault Reset] (Atr) or manually via parameter [Fault Reset Assign] (rSF) after the cause has been eliminated.

[AI3 Thermal Sensor Error] (t3CF)

Probable cause:
The monitoring function of the temperature sensor has detected a fault on analog input AI3:

- Open circuit, or
- Short circuit

Error correction:

- Check the sensor and wiring.
- Replace the sensor.
- Check the setting of parameter [AI3 Type] (AI3T)

Clearing the error code:
This detected fault can be reset using function [Auto Fault Reset] (Atr) or manually via parameter [Fault Reset Assign] (rSF) after the cause has been eliminated.

[Encoder Th Sensor Error] (tECF)

Probable cause:
The monitoring function of the temperature sensor has detected a fault on the analog input of the encoder module:

- Open circuit, or
- Short circuit

Error correction:

- Check the sensor and wiring.
- Replace the sensor.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[AI1 Th Error Level] (tH1F)

Probable cause:
The monitoring function of the temperature sensor has detected a temperature that is too high on analog input AI1.

Error correction:

- Look for a possible cause of overheating.
- Check the monitoring function settings.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[AI3 Th Error Level] (tH3F)

Probable cause:
Temperature sensor monitoring has detected a high temperature fault on analog input AI3.

Error correction:

- Look for a possible cause of overheating.
- Check the monitoring function settings.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Encoder Th Detected Error] (tHEF)

Probable cause:
The monitoring function of the temperature sensor has detected excessively high temperature on the analog input of the encoder module.

Error correction:

- Look for a possible cause of overheating.
- Check the monitoring function settings.

Clearing the error code:
This detected fault requires a voltage reset.

[IGBT Overheating] (tJF)

Probable cause:
Overheating of the inverter power stage.

Error correction:

- Check the dimensioning of load/motor/inverter in relation to the ambient conditions.
- Reduce the switching frequency.
- Increase the ramp time.
- Reduce current limiting.

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Drive Overload] (tLOF)

Probable cause:
Function **[Drive overload monit]** (Obr-) has detected a fault.

Error correction:

- Check the dimensioning of load/motor/inverter in relation to the ambient conditions.
- Check the settings of parameter **[Drive overload monit]** (tLOL).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Autotuning Error] (tnF)

Probable cause:

- Special motor or motor whose power output is not suitable for the inverter.
- Motor not connected to the inverter.
- Motor not stopped.

Error correction:

- Check that the motor and inverter are compatible.
- Ensure that the motor is connected to the inverter during autotuning.
- When using an output motor contactor, ensure that it is closed during autotuning.
- Ensure that the motor is connected and in stop mode during motor measurement (autotuning).

Clearing the error code:
This detected fault can be manually reset using parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Process Underload] (ULF)

Probable cause:
Process underload

Error correction:

- Check and eliminate the cause of the underload.
- Check the parameters of function **[Process Underload]** (Uld-).

Clearing the error code:
This detected fault can be reset using function **[Auto Fault Reset]** (Atr) or manually via parameter **[Fault Reset Assign]** (rSF) after the cause has been eliminated.

[Supply Mains UnderV] (USF)

Probable cause:

- Power supply network too low.
- Transient voltage drop.

Error correction:
Check the voltage and parameters for **[Undervoltage handling]** (USb).

Clearing the error code:
This detected fault is deleted as soon as the cause has been eliminated.

5.3.2.3 Frequently asked questions (FAQ)

Introduction

If the display does not light up, check the power supply to the inverter.

The assignment of functions "Fast stop" or "Freewheel" will prevent the inverter from starting if the corresponding digital inputs are not switched on. The inverter then displays **[Freewheel]** (nSt) in freewheel stop mode and **[Quick stop]** (FSt) in fast stop mode. This is normal since these functions are active at zero and the inverter is stopped in the event of an open circuit.

Ensure that the input for move commands is enabled according to the selected control type (parameter **[2/3 wire control]** (tCC) and **[2-wire type]** (tCt)).

If the setpoint or command channel is assigned to a fieldbus, the inverter displays the following message when power supply **[Freewheel]** (nSt) is connected. It remains in stop mode until the fieldbus outputs a command.

Inverter in stalled state

The inverter is in a stalled state and displays **[Freewheel Stop]** (nSt) if a move command such as "Forward", "Reverse" or "DC injection stop" is still active during the following:

- A reset to the factory settings is taking place.
- A manual fault reset is being performed with **[Fault Reset Assign]** (RsF).
- A manual fault reset is being performed by switching the product off and on.
- A stop command is being output from a channel that is not the active channel command (e.g. the stop button on the display terminal in 2/3-wire control).

Before authorizing a new move command, all active move commands must first be disabled.

Option module replaced or removed

If an option module is removed or changed, the inverter is locked when switched on in fault mode **[Incorrect Configuration]** (CFF). If the option module was intentionally replaced or removed, the fault can be cleared by pressing OK twice. This causes the factory settings for the module-specific parameter groups to be restored.

Changing the control block

After replacing a control block with a control block configured for a different inverter type, the inverter is locked when switched on in fault mode **[Incorrect Configuration]** (CFF). If the control block was intentionally replaced, this fault can be cleared by pressing OK twice, which results in the restoration of all factory settings.

6 The drive in Automation Studio

Each ACOPOSinverter consists of a frequency inverter equipped with a communication card. Depending on the type of network, a hardware upgrade is available that contains information about the respective network type as well as the data of all available drives. The desired power output class of the drive can be selected in the module configuration so that only compatible values for the motor parameters can be preset in Automation Studio.

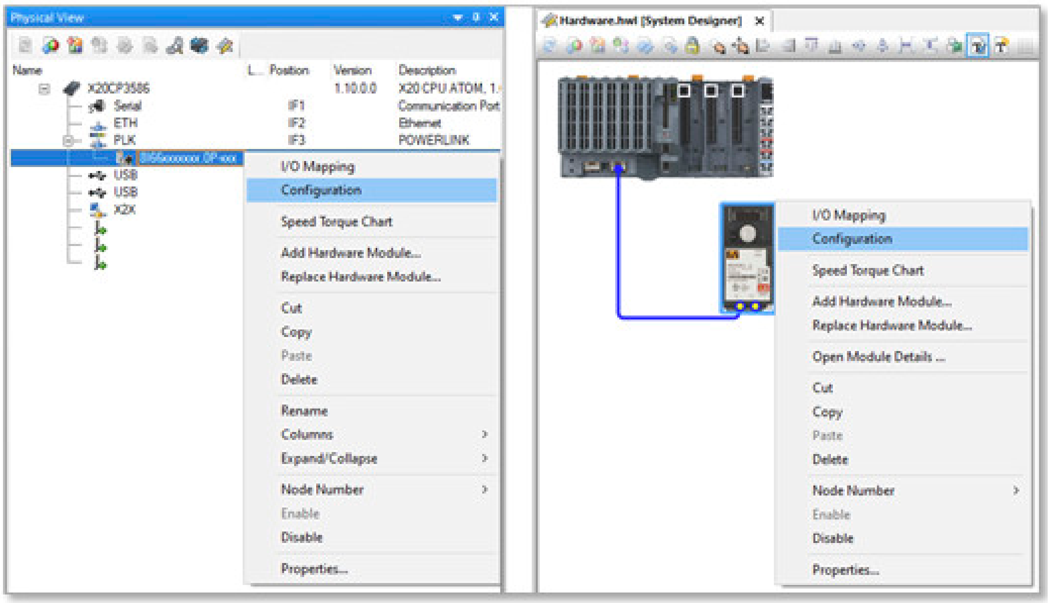
6.1 The module configuration

The configuration parameters have been restructured for the "Px6" generation of ACOPOSinverter devices. This allowed related functions to be arranged in the same way for all representatives of this product group. Access to different drives has been standardized and switching between different devices has been made easier.

Information:

The frequency inverter validates the currently configured parameter set at startup. To ensure that the project download is error-free, the module configuration of the Automation Studio project must meet the requirements of the internal consistency check. In the newly structured module configuration for the Px6 product generation, all known dependencies between the configuration parameters are taken into account, making it much easier to handle the devices.

The module configuration can be used to set all parameters that are relevant for use on the PLC. Right-clicking on the device in Physical View or System Designer brings up a selection window that can be used to open the module configuration.



The module configuration of the ACOPOSinverter is structured logically. The following overview shows excerpts of the most important parts of the user interface:

- Configuration of the POWERLINK properties
    - ...
    - Multiplexed station
    - Dynamic node allocation
- **Function model of the ACOPOSinverter (selection mandatory)**
    - Optional monitoring data points
    - **Hardware installer (selection mandatory)**
        - Local process logic
            - Configuring local I/Os
            - Alarms or alarm groups
            - Analog value monitoring
        - **Power unit (selection obligatory)**
            - **Motor data (entry mandatory)**
            - Temperature monitoring
            - Current/speed limiting
        - Drive
            - Motor management
            - Axis management
            - Load management

6.1.1 The communication interface

The settings for the communication card are arranged in the first section of the module configuration. If the ACOPOSinverter is used in a POWERLINK network, the following standard functions are often enabled:

1. Dynamic node allocation (in short: "DNA")
   The DNA function can be used to automatically assign the POWERLINK node number, which normally must be entered manually on the drive in advance.
2. Multiplexed station (in short: "Multiplexing")
   The multiplexing function can be used to reduce the bus load on POWERLINK without affecting the control of the motor.

6.1.2 Function models of the drive

The second section of the module configuration contains the settings for the frequency inverter. Two function models have been implemented for the ACOPOSinverter:

1. "Motion configuration"
   Function model "Motion configuration" is used to integrate the ACOPOSinverter into a mapp Motion project.
2. "Direct control"
   Function model "Direct control" is used for direct control of the ACOPOSinverter via the I/O mapping.

6.2 Commissioning

The following step sequence describes the recommended procedure for commissioning an ACOPOSinverter. This procedure is not mandatory. Experienced users often omit individual steps or use alternative ways to put the drive into operation. The use of Automation Studio library "AsEpl" or "AsIoAcc" is still permissible, but is not considered in detail in this description.

For each step listed, a corresponding subchapter has been written that explains the procedure in more detail. Step 1 is explained in subchapter 1, step 2 in subchapter 2, etc.

Recommended step sequence:

1. Configure your PLC and drive in the System Designer/Physical View of Automation Studio.
   Check the Automation Studio project that has been created.

2. Change to the module configuration of the drive.
   Make a preliminary selection for the function model and enter the current motor type (IM or SYN without additional function) under "Hardware installer".
3. Enter the nominal values of the motor in the module configuration of the drive.
   Check the drive data entered.
4. Carry out the "Tuning".
   Check the behavior of the drive. It is recommended to read out the results of the measurement and transfer them to the module configuration of the drive.
5. Finally, adjust the settings for configuration items "Function model" and "Hardware installer".
   Make sure that the motor data entered previously has been retained in the module configuration of the drive.

6.2.1 Selection of the correct hardware upgrade

Create an Automation Studio project with your PLC and the desired drive in the System Designer/Physical View. The following table assigns the required hardware upgrade to all drives in the "ACOPOSinverter Px6" product family.

Type of ACOPOSinverter	Name of the required hardware upgrade
ACOPOSinverter P86 (sizes 1, 2 and 3)	8I86xxxxxxx.0P-1xx
ACOPOSinverter P86 (sizes 4 and 5)	8I86xxxxxxx.0P-2xx

If you are using a POWERLINK communication card, make sure that the configured node number matches the node number set on the drive.

- The default settings in Automation Studio require that node numbers of POWERLINK-CNs are configured manually in advance. For the ACOPOSinverter P86, which are used in POWERLINK networks, the optional additional display is required for the manual assignment of node numbers.
  Path: **[6. Communication]** → **[6.1 Communication parameters]** → **[Powerlink]** → **[Address]**
  The new value must be confirmed with "OK" to store it in the memory. The ACOPOSinverter must then be restarted. To do so, the device can be switched off and on again.
- The default settings on the device specify that the node number "0" is set for ACOPOSinverter devices in POWERLINK networks. This configuration can be retained if the POWERLINK standard function "Dynamic node allocation" (DNA for short) is enabled in the module configuration in Automation Studio.
  Path: POWERLINK properties → Dynamic node allocation

Then transfer the compiled project to the PLC and wait for the connection to be established again. Change to the "I/O mapping" of the drive and switch on "Monitor mode".

If "ModuleOk" is reported back as "TRUE", continue with the next step of the step sequence. If "ModuleOk" remains FALSE, perform the countermeasures listed below.

Countermeasures:

Make sure that the network settings of the master are compatible with the drive. The set bus cycle of the master interface should not undershoot 400 µs.

6.2.2 Function model and hardware installer

Make a preliminary selection for the function model. This document describes the procedures for both function models.

> **Note:**
>
> **Function model "Direct control" has proven to be more convenient for the subsequent measurement procedure. It is still possible to change to function model "Motion configuration" at a later time.**

Choose the current motor type (induction motor "IM", synchronous motor "SYN") without any accessories (holding brake "BRK", encoder "ENC") as the hardware installer.

6.2.3 Entering the nominal values of the motor (motor nameplate)

To be able to control a motor, the nominal values of the connected motor (motor nameplate) must be communicated to the ACOPOSinverter. To do this, change to the module configuration of the drive and proceed as follows:

1. Enter your power unit.
   Choose the purchase order number of your drive.
2. Enter the nominal data of your motor.
   Nominal current, nominal voltage, nominal speed, etc.

Depending on the motor type, the following parameters must be entered in the module configuration:

Induction motor (IM)		**Synchronous motor (SYN)**	
FRS	Frequency	TQS	Torque
NSP	Speed	PPNS	Number of pole pairs
UNS	Voltage	NSPS	Speed
NCR	Current	NCRS	Current
COS	Cosine(φ)		
NPR	Power		

Information:

When using induction motors of lower efficiency (e.g. motors of efficiency class IE 1 or motors running out of round), it is recommended to enter the motor power (NPR) and define the value of the Cosine(φ) parameter to 100.

Then transfer the compiled project to the PLC and wait for the connection to be established again. Change to the "I/O mapping" of the drive and switch on "Monitor mode".

If "ModuleOk" is reported back as "TRUE", continue with the next step of the step sequence. If "ModuleOk" remains FALSE, perform the countermeasures listed below.

Countermeasures

- Make sure that the nominal power specifications of the motor and drive are approximately the same.
- Make sure that the decimal place was correctly observed when entering the motor data (pay attention to the specifications in the "Unit" column in the module configuration).

6.2.4 "Tuning"

The ACOPOSinverter uses an internal calculation model to control the connected motor. This model uses the characteristic values of the motor nameplate. To realistically represent the complete system comprising the drive, motor cable and motor, other influencing factors must be taken into account. Therefore, a measurement procedure must be gone through before actual use. Automation Studio offers the possibility of saving the measurement results in the project.

With the default settings, a new measurement is requested each time the drive parameters are downloaded. The measurement is executed the next time the status transitions to "Operation enabled". This setting allows the drive to be commissioned quickly and conveniently. However, it results in the axis behavior being adjusted after each restart. To specify the axis behavior uniquely, the result parameters must be read out after the measurement and then entered directly into the module configuration.

Information:

To obtain adequate values during the measurement, the characteristic values of the motor nameplate must have been entered in the ACOPOSinverter beforehand.

6.2.4.1 Procedure with default settings in function model "Direct control"

The I/O mapping can be used to change to state "Operation enabled" when using function model "Direct control" and thus initiate the measurement procedure. To do so, proceed as follows:

Checking the current configuration in advance

- Make sure that function model "Direct control" is selected.
- Make sure that the nominal values of the motor (motor nameplate) are entered correctly.
- Make sure that the "Tuning" settings have not been adjusted.

If individual configuration items do not meet the requirements, adjust them and transfer the Automation Studio project again.

Triggering the measurement procedure

Supply the DC bus of the ACOPOSinverter, change to the "I/O mapping" of the drive and switch on "Monitor mode".

- Make sure that bit 4 of the DS402 status word reports TRUE (DC bus supplied).
- Force the output data point (0x6042) for the DS402 setpoint to value 0.

Trigger the measurement using the DS402 command word.

- To do so, force the corresponding data point (0x6040) in the output direction to the following values in succession: 6, 7, 127.
- Make sure that the DS402 status word is correctly reported back after submitting each command. In addition, check whether you have come closer to state "Operations enabled" (see overview of the DS402 state machine).

Information:

There is a distinctive noise during the measurement. This is correct.

Continue by reading out the measurement results from the drive memory (see chapter "Reading out the measurement results" on page 434).

6.2.4.2 Procedure with default settings in function model "Motion configuration"

When using function model "Motion configuration", mapp Cockpit can be used to change to state "Operation enabled" and thus initiate the measurement procedure. Alternatively, the function blocks of the mapp Motion library can be used.

Checking the current configuration in advance

- Make sure that function model "Motion configuration" is selected.
- Make sure that the nominal values of the motor (motor nameplate) are entered correctly.
- Make sure that the "Tuning" settings have not been adjusted.
- Make sure that an axis object (gAxis_x) has been created and entered as "Axis reference" in the module configuration of the drive.
  For a step-by-step instruction guide on creating an axis object for mapp Motion or mapp Cockpit see the corresponding "Getting started" tutorial.

Change to dialog box "Change runtime".

Path (en): Project → Change runtime versions

All selected components of the Automation Runtime are displayed in tab "Runtime versions".

- Make sure that a version is defined for mapp Motion.
- Make sure that a version is defined for mapp Cockpit.
- Make sure that a version is defined for McDS402Ax.
  The version for McDS402Ax is displayed as setting "Advanced" in mapp Motion. These can be shown or hidden via a checkbox in the lower right area.

If individual configuration items do not meet the requirements, adjust them and transfer the Automation Studio project again.

Triggering the measurement procedure

Supply the DC bus of the ACOPOSinverter and open the web interface for mapp Cockpit.

Path (en): Tools → mapp Cockpit

Or open it in the browser via http://[IP address of the controller]:8084/mappCockpit/index.html?clear

- Choose the axis that was entered in the configuration of the inverter and check whether "Communication ready" is "true" in mapp Cockpit.
- Start the measurement by clicking the green PowerOn button.

Information:

There is a distinctive noise during the measurement. This is correct.

An error message may appear in the mapp Cockpit Logger during the measurement. This only occurs during measurement and can therefore be ignored.

Continue by reading out the measurement results from the drive memory.

6.2.4.3 Reading out the measurement results

Depending on the motor type, values are determined for the following drive parameters:

Induction motor (IM)		Synchronous motor (SYN)	
RSA	Stator resistance	RSAS	Stator resistance
LFA	Leakage inductance	LDS	Leakage inductance d part
IDA	Magnetizing current	LQS	Leakage inductance q part
TRA	Rotor time const.	PHS	Permanent magnet flux
		SMOT	Saliency motor state

The use of the optional display is recommended to read out the measurement results. If the display is not available, Automation Studio library "AsEpl"/"AsIoAcc" can also be used.

Reading back the measurement results using the additional display:

If you have an adequate additional display at hand, you can read out the results of the last measurement as follows:

Path:

[Complete settings] → **[Motor parameters]** → **[Motor data]** → **[Data]**

Reading back the measurement results using Automation Studio libraries:

Alternatively, you can also read out the results of the last measurement using function Read of the corresponding library via Automation Studio. In X2X networks, this requires Automation Studio library "AsIoAcc" and in POWERLINK networks Automation Studio library "AsEpl".

Induction motor (IM)			Synchronous motor (SYN)		
X2X	POWERLINK		X2X	POWERLINK	
Channel name	Index	Subindex	Channel name	Index	Subindex
RSA_Input	0x2042	0x2B	RSAS_Input	0x2042	0x53
LFA_Input	0x2042	0x3F	LDS_Input	0x2042	0x4B
IDA_Input	0x2042	0x35	LQS_Input	0x2042	0x4C
TRA_Input	0x2042	0x44	PHS_Input	0x2042	0x4A
			SMOT_Input	0x2042	0x2E

6.2.4.4 Evaluating measurement results and storing them in the project

The measurement of the additional parameters is influenced by various environmental factors. Each measurement gives individual results. To determine the additional parameters, it is recommended to perform the measurement several times (5 to 10 times) and to calculate average values in each case.

Different measuring methods are offered in the module configuration of the drive. If you vary the measuring methods for the repeat measurements, the value ranges of the individual parameters can be better estimated.

> **Notice!**
>
> **Observe the detailed description of the individual configuration parameters.**
>
> **Individual methods can cause the motor to rotate during the measurement process. If such a measuring method is selected, the axis may have to be isolated from the rest of the application.**
>
> **To carry out the measurement with motors that have an integrated holding brake, it must be ensured that the brake has been released before the measurement. If the application conditions do not permit the brake to be released permanently, only measuring methods that are not expected to rotate the motor may be used.**

Change to the module configuration of the drive.

Change the "Tuning" settings from measured to predefined values and enter the determined characteristic values.

Correlation between configuration parameter "AST" and measurement result "SMOT"

If the measurement procedure for synchronous motors is used, the value for configuration parameter "AST" can be determined using the measurement result for "SMOT".

"SMOT"	Saliency motor state		"AST"	Angle setting type
1 "LLS"	Low salient	→	5 "PSI" 6 "PSIO"	PSI align PSIO align
2 "MLS"	Medium salient	→	4 "SPMA"	SPM align
3 "HLS"	High salient	→	3 "IPMA"	IPM align

6.2.5 Function model and hardware installer II

Finally, define the required values for the configuration items "Function model" and "Hardware installer".

6.2.5.1 Function model

Two function models have been implemented for the ACOPOSinverter.

Motion configuration

In function model "Motion configuration", the ACOPOSinverter is used as a mapp object of axis type "mappAxis", i.e. the frequency inverter is managed from mapp Motion. The data required to control the motor (DS402 control word and speed setpoint) are generated by the PLC and transmitted directly to the drive. The user has no possibility to access these output data points directly.

Function model "Motion configuration" and the use of mapp Motion offers the following:

- Uniform setting of the velocity profile for all manufacturers (e.g. defining min/max speed, acceleration/braking behavior)
- Uniform operation for all manufacturers (e.g. switching the drive on/off, specifying the speed setpoint) with PLCopen function blocks
- It enables PLC-based interaction with other drives in the Automation Studio project.

By cleverly integrating the frequency inverter into a mapp Motion project, the transition from programming to configuration can be made successfully. I/O mapping plays a subordinate role in function model "Motion configuration". It offers, for example, the possibility of monitoring the frequency inverter beyond the typical mapp Motion functions. In addition to the standardized DS402 input data points (error code, status word and actual speed value), manufacturer-specific information can also be retrieved to analyze the current situation on the drive in even greater detail.

Direct control

In function model "Direct control", the ACOPOSinverter is managed via the module configuration and the I/O mapping. The required settings (including DS402 velocity profile) can be entered via the module configuration. Then the I/O mapping is used to interact with the frequency inverter; i.e. the DS402 input data (error code, status word and actual speed value) can be received and the DS402 output data (control word and speed setpoint) can be sent.

Function model "Direct control":

- It does not require a license for the mapp Motion development environment.
- The model assumes that the user can program a PLC task that manages the required command interface.
- It is only recommended if the frequency inverter should interact little with other devices in the Automation Studio project.

When using function model "Direct control", the control of the motor must be programmed in Automation Studio. The DS402 state machine must be taken into account (see chapter "The DS402 state machine" on page 442).

6.2.5.2 Hardware installer

The drive provides different hardware installers. Choose the one that suits your situation. Make sure that the previously selected motor type (induction motor "IM", synchronous motor "SYN") is not modified.

> **Notice!**
>
> **Since different parameters are used to describe induction motors "IM" and synchronous motors "SYN", the motor data (motor nameplate and result parameters of the measurement procedure) must be entered again after switching the motor type.**

Holding brake

If you are putting a motor into service with an integrated holding brake, make sure that the function for controlling the brake is linked to the required logic output.

Path: Hardware installer → Local process logic → Configuration of local I/Os

> **Notice!**
>
> **Multiple linkages are not supported by the drive. Make sure that only one logic output (relay, digital output) is linked to the function for controlling the holding brake.**

Then adjust the operation of the brake function.

Path: Hardware installer → Power unit → Motor data

Encoder

Some drives offer hardware installers with encoder. If the drive is equipped with an encoder card, the drive can process the corresponding signal. The actual speed value determined in this way can then be used for speed control.

To do so, choose the corresponding hardware installer and change to section "Feedback logic". Enter the purchase order number of the installed encoder card and set the required configuration parameters.

6.3 I/Os of the ACOPOSinverter

In addition to the high-voltage motor output, the drive provides a number of other inputs and outputs that can be used to interact with the device. For the configuration parameters available for this purpose, see section "Local process logic" .

Inputs

The inputs can be used to receive appropriate signals from the field. Additional input data points can be used to report the results to the application via I/O mapping.

Outputs

The outputs can be linked to corresponding drive parameters. A corresponding signal is then generated depending on the state of the parameter.

In addition, ACOPOSinverter devices offer the possibility of controlling the outputs via the I/O mapping.

Alarm groups

The drive generates various alarms internally. These can be combined into alarm groups and reported to the application via the I/O mapping.

6.3.1 Additional data points in the I/O mapping

Additional data points can be registered in the I/O mapping of the ACOPOSinverter. This option enables cyclic transfer of device-specific information that is not described in the DS402 standard.

Additional input data points

Device-specific input data points that should be read out cyclically can be chosen in the section "Optional monitoring data points". They can be used, for example, to provide detailed diagnostics for the drive.

Additional output data points

The module configuration allows access to various device-specific special functions of the drive. In some cases, an additional dynamic default value is required for this. Depending on the execution of the device-specific function, such a default value must be specified via the I/Os of the "local process logic" or can be linked to a cyclic output data point in the I/O mapping.

Another example of additional output data points is the direct setpoint specification for the relays, digital or analog outputs. The method of operation of each output can be set correspondingly in section "Local process logic".

> **Information:**
>
> **The module configuration must be saved for the I/O mapping to display additionally enabled data points.**

6.4 Control behavior

The control behavior of the drive can be adjusted to the requirements of the respective application. For the configuration parameters available for this purpose, see sections "Motor management" and "Axis management".

6.4.1 Motor management

The motor management ensures that the kinetic setpoint is converted into an electrical setpoint. The default settings specify that the difference between the setpoint and actual speed is formed and converted into a setpoint for torque with the aid of a PI controller.

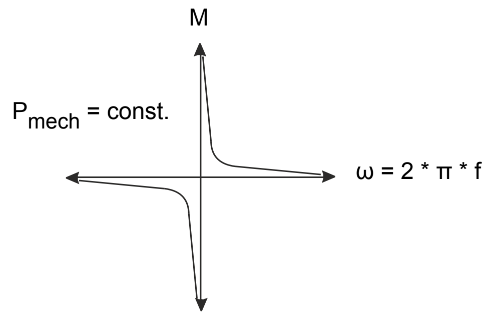
Motor management - Part 2

Power is the most important variable for describing a system comprising a drive and motor. For normal operation or motor operation, electrical power (P_{el}) is converted to mechanical power (P_{mech}) and for generator operation, mechanical power (P_{mech}) is converted to electrical power (P_{el}).

Information:

- $P_{el, 3ph} = \sqrt{(3)} * U * I * \cos(\varphi)$
- $P_{mech} = M * 2 * \pi * f = M * \omega$

On closer inspection of mechanical power (P_{mech}), the particular interaction between torque (M) and angular velocity (ω) at constant power yields a hyperbolic distribution between these sizes.



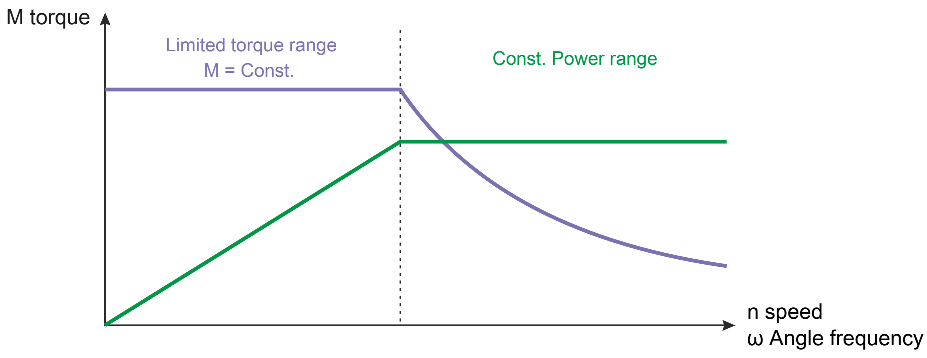
The speed/torque diagram is a general specification that can be created for any motor. In electric motors, speed is directly dependent on AC voltage frequency; the y-axis is therefore often displayed as a frequency axis and divided into two sections. Frequencies greater than nominal frequency are subjected to what is known as field suppression, i.e. in this frequency range it may happen that the maximum power of the motor is output and the specified nominal torque can no longer be fully established.

Torque is normally limited to nominal torque in the frequency range between 0 Hz and nominal frequency, so the maximum possible power does not need to be fully output.

The various types of ACOPOSinverter motor management relate to the frequency range between 0 Hz and nominal frequency. According to how electrical power behaves in relation to frequency (speed), either the full torque is available or energy consumption is reduced.

n/M diagram: M const., P~f

The idealized speed/torque diagram with high torque at low speed corresponds to the following:



6.4.1.1 PARK transformation

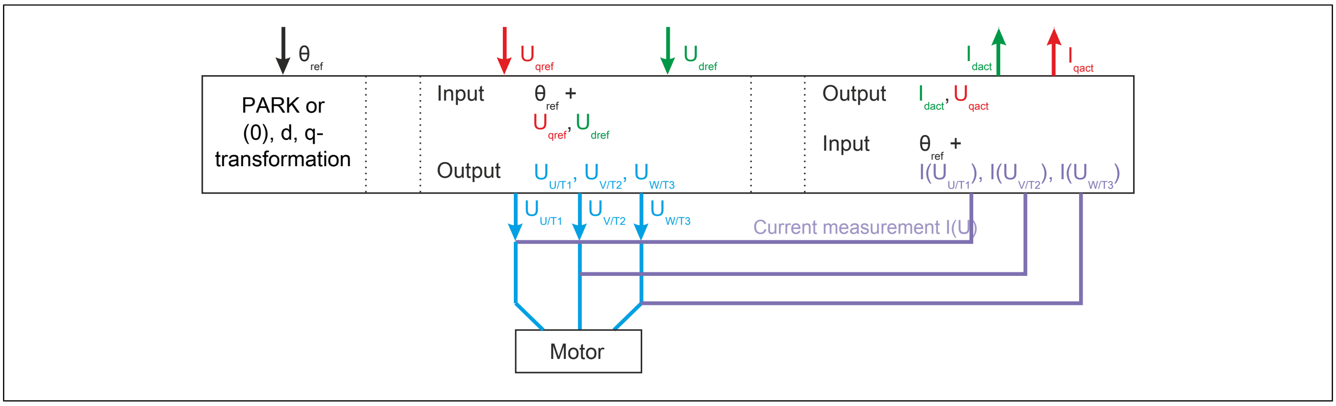
Motor management - Part 1

The essential component of motor management is based on the mathematical information of the Park transform (also known as the dq0 transformation). This enables an electrical rotating field size to be represented as a vector in a two-dimensional coordinate system that circles a single point; which means that by using an angle θ that describes the current position of the vector, sinusoidal voltages can be expressed as a pair of limbs comprising a "d-ratio" and a "q-ratio", for example:

$U_{U/T1}$, $U_{V/T2}$ or $U_{W/T3}$	< θ (angle) >	U_d, U_q

The mathematical transformation is reversible and can be applied to other sizes in the rotating field, for example:

$U_{U/T1}$, $U_{V/T2}$ or $U_{W/T3}$ < θ (angle) > U_d, U_q



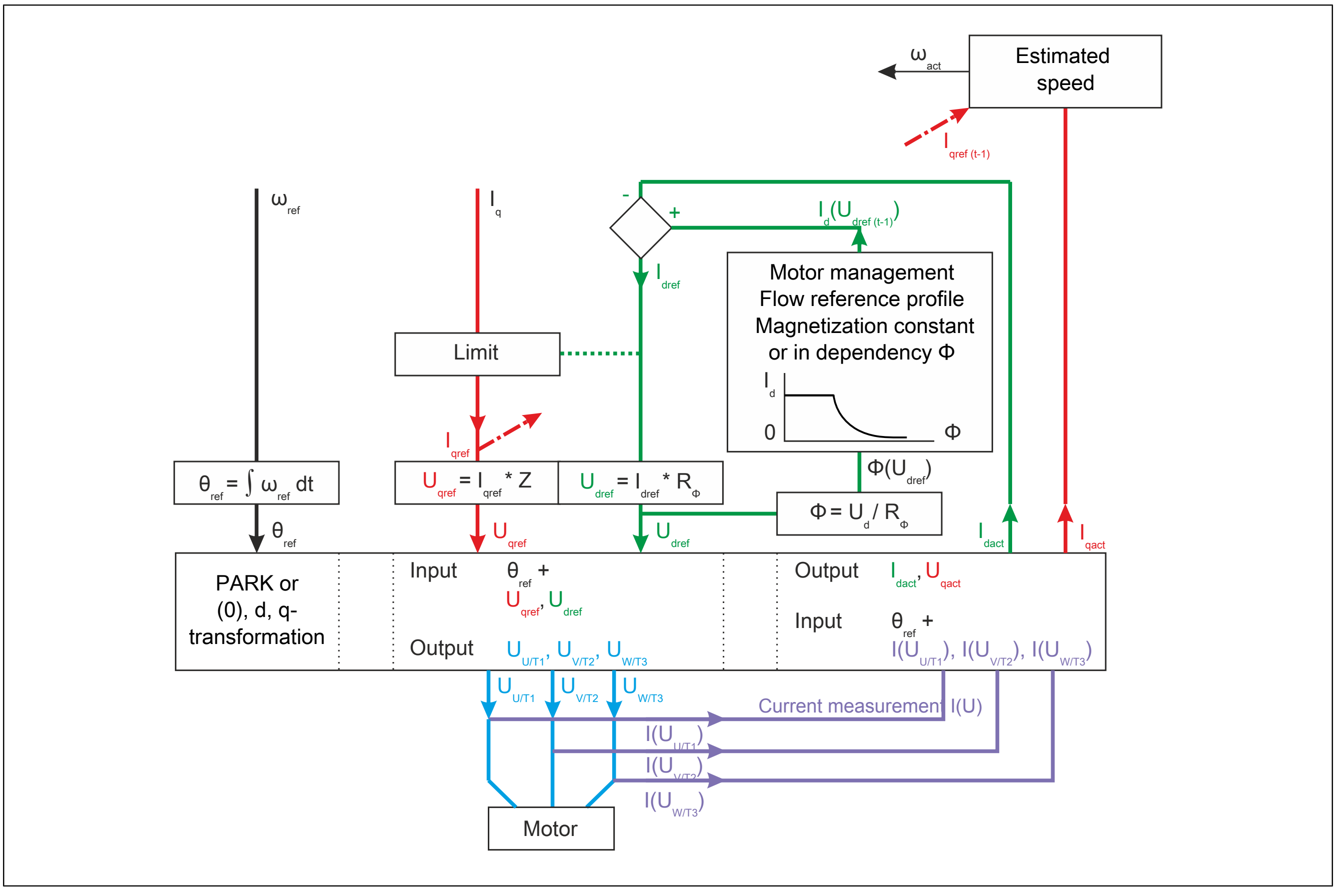
Three controlled variables are necessary for controlling PWM output on ACOPOSinverter:

- θ_{ref}: Reference angle of vectors
- U_d: d-ratio of the output voltage (magnetization)
- U_q: q-ratio of the output voltage (field strength)

To calculate voltage values for all three phases of output PWM from this data, the reference angle for $U_{V/T2}$ will be subjected to an offset of 120° and $U_{W/T3}$ to an offset of 240°.

If a three-phase motor is attached to PWN output of ACOPOSinverter, the corresponding currents will flow during output control. These are measured, averaged and then expressed in accordance with Park transform principles as vectors with d-ratio and q-ratio within the frequency inverter.

The d-ratio represents the intensity of the magnetic flow and is regulated using cascades. The outer control loop is based on the current measurement at the output. The inner control loop is represented using a reference profile, which is selected during motor management selection.



Current angular velocity (ω_{act}) is calculated using the current actual value and the previously requested setpoint for I_q. The application also supplies the requested value for speed (LFRD) and electrical frequency (LFR). The setpoint for the angular velocity (ω_{set}) corresponds to the formula:

- ω_{set} = 2 π f = 2 π LFR
- ω_{set} = 2 π (n_{mech} * Pole pairs / 60) = 2 π (LFRD * Pole pairs / 60)

To extrapolate from a value for angular velocity ω to angle θ, a derivative with respect to time occurs at the end of control of angle θ.

The q-ratio is an expression of field strength and therefore torque. The reference value for I_q can be limited. This limitation results from application specifications (e.g. CLI, TAA) and is influenced by the current reference value for ID.

The way in which the information for I_{qact}, ω_{act} and ω_{set} is used for calculating angle θ and for controlling U_q is determined by the slip control or torque control.

6.4.1.2 Torque control

The torque control of the ACOPOSinverter is based on direct field-oriented vector control (in short: "direct FOC").

Setpoint processing during torque control

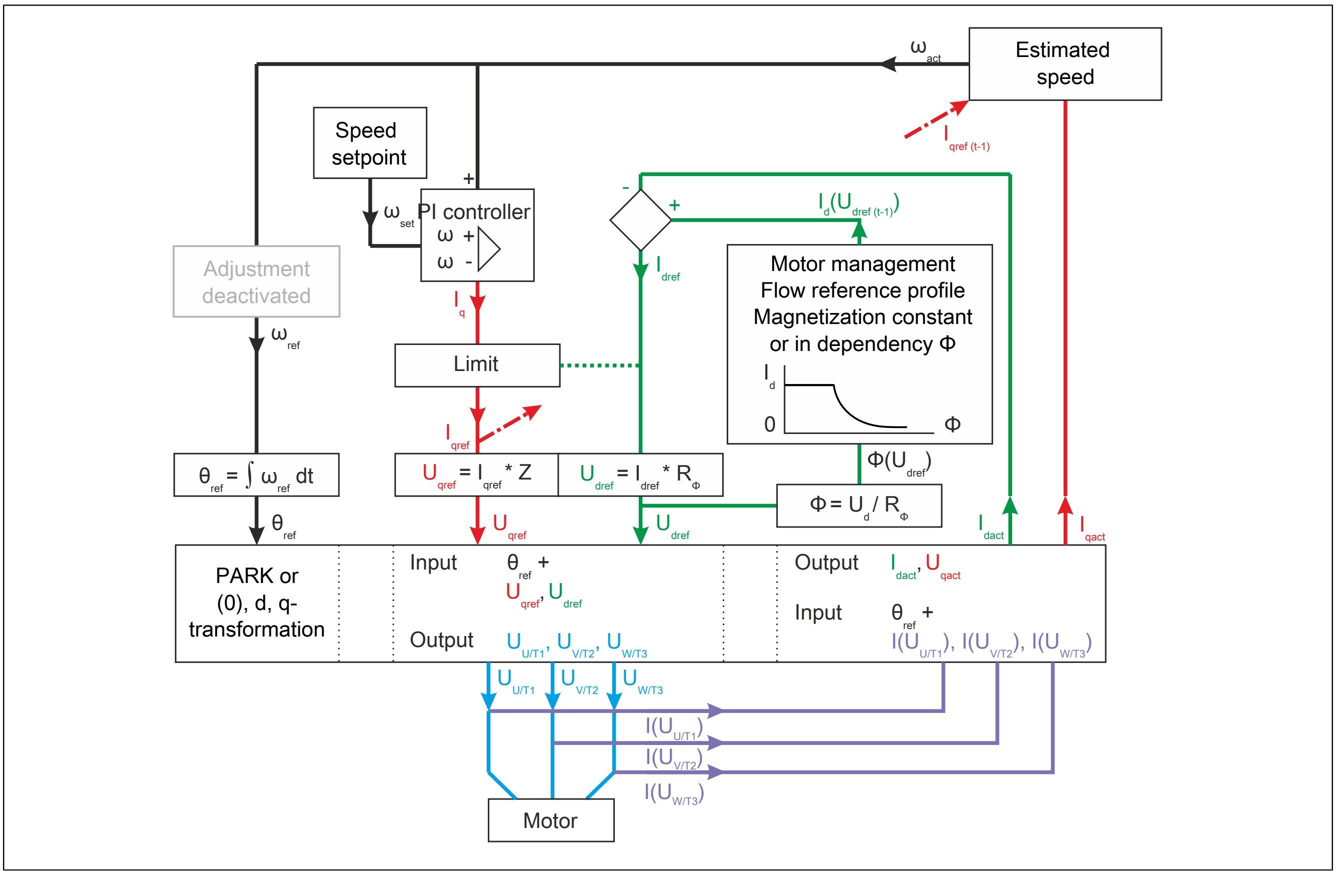
During torque control, the value ω_{act} is used as a basis for calculating the reference angle θ. The q-portion is calculated using a PI controller. The next (unlimited) reference value for I_q is calculated from the difference in speed between ω_{act} and ω_{set}.

Due to PI control, this procedure for calculating the necessary reference values achieves a very high dynamic, meaning that new reference values for speed can be implemented quicker and can be used with both induction motors and synchronous motors.

Since this procedure is based on projections, it requires reliable values for the tuning parameters, however.

Information:

Slip control is not recommended for using ACOPOSinverter with a controller.



6.4.1.3 Slip control

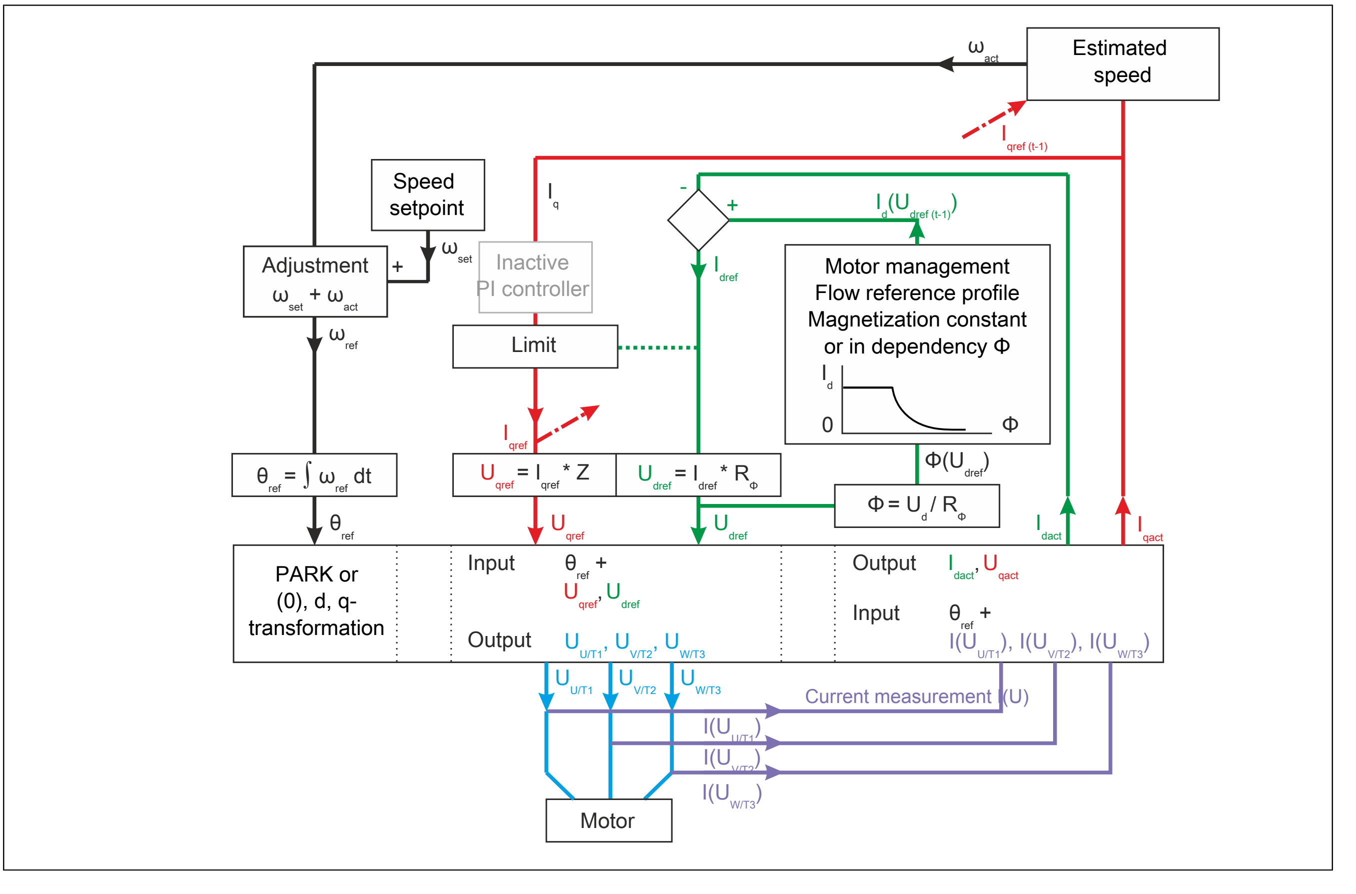
The slip control of the ACOPOSinverter is based on indirect field-oriented vector control (in short "indirect FOC"). It is only available in function model "Direct control" because the results are too inaccurate for control via mapp Motion.

Setpoint processing during slip control

Values for ω_{act} and ω_{set} are added together during slip control. This "adjusted" angular velocity is then used for calculating reference angle θ. The q-portion is calculated as a single control loop based on the current measurement on output PWM. This relatively simple procedure for calculating necessary reference values suffices for some simple applications using induction motors. It is based on a unique mathematical correlation and is error-tolerant, i.e. can be used even if the tuning parameter has been calculated inaccurately. Slip control is unsuitable for use with higher dynamics since the system is relatively slow, i.e. it requires a relatively long time to achieve a steady state.

Information:

Torque control is not recommended for using ACOPOSinverter with a controller.



6.4.2 Axis management

Axis management: Speed/frequency data

Mechanical parameters for the rotating axis have been implemented in ACOPOSinverter in a way that corresponds to standard "DS402".

The speed data relates to a rotating axis that is not provided by the frequency inverter itself. Output PWM (U/T1, V/T2, W/T3) only outputs AC voltage with regulated frequency. Since these electrical sizes are designated for controlling a three-phase motor, a calculation model has been implemented into the drive to describe the effect of the output AC voltage on the connected motor. Viewing the rotating axis functions in this way as a high-level abstraction layer, which enables easier management of the entire system of frequency inverter and motor system. The frequency inverter internally converts the speed data [rpm] to elevated frequency [Hz]. The number of pole pairs of the motor must be taken into account for this. The following applies:

$n_{mech.}$ [rpm] * Pole pairs = $f_{el.}$ [Hz] * 60

> **Information:**
>
> **Since the frequency inverter primarily controls the electrical frequency of the output AC voltage, it displays the currently generated electrical frequency by default in state 5 "Running". If necessary, a conversion factor can be applied to this value using parameter SDS.**

6.5 The drive as a mapp object of type "axis"

For information about commissioning as an object of type "mappAxis axis", see the general mapp Motion description in the respective "Getting started" tutorial chapters "Axis" and "mapp Cockpit".

The following chapters describe the most important device-specific configuration options. Some of these functions are only available in function model "Direct control" because they are either managed internally via mapp Motion or are not compatible.

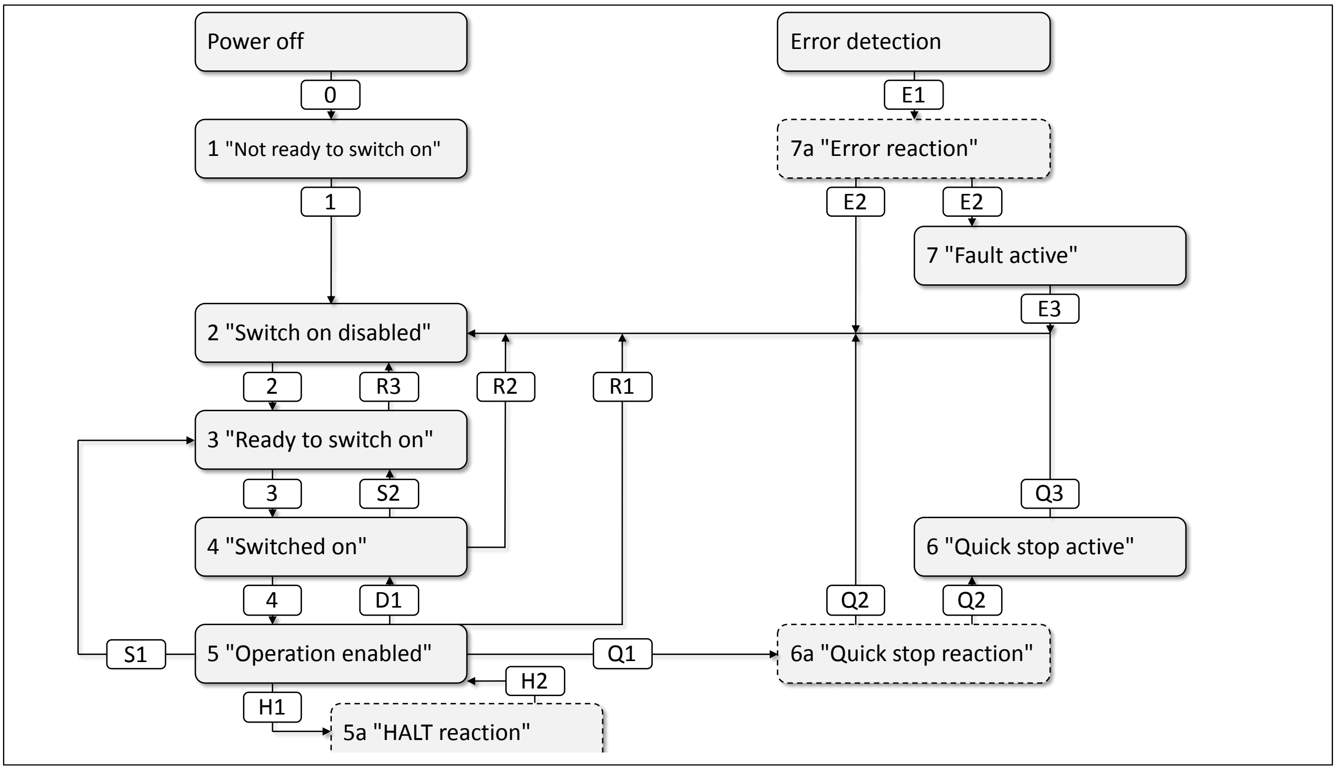
6.6 The drive as a standard module

To implement the drive as a standard module, a task for managing the drive must be written in the Automation Studio project. To write this task, the programmer must take into account the specifications of standard DS402.

6.6.1 The DS402 state machine

The following overview shows the underlying state machine of standard DS402. DS402 is a device profile that is used to control electrical drives. It can be used in connection with POWERLINK and other communication networks.

The overview shows the DS402 interface, which basically consists of a status word and a command word. The DS402 status word can be used to determine which state the frequency inverter is currently in. An appropriate DS402 command can then be issued or an adequate setpoint specified to interact with the drive.



6.6.1.1 Determining the DS402 state

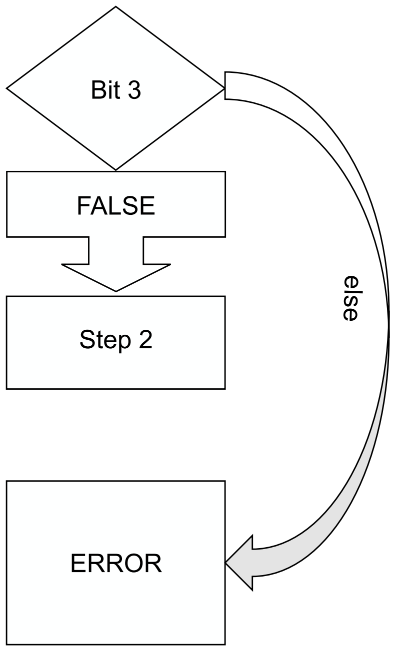
If the ACOPOSinverter is used in function model "Direct control", the PLC task should check the current value of status word 0x6041 at the beginning of each task cycle to find out which DS402 state the drive is currently in.

Check routine (recommended sequence)

The lower half word can be used to determine which DS402 state the ACOPOSinverter is currently in.

1. Bit 3 (status word & 0x08)

   If FALSE is reported on bit 3, the current DS402 state has not yet been clearly determined. Proceed to the next step of the test routine.
   If TRUE is displayed on bit 3, the ACOPOSinverter is in an error state. In this case, register 0x603F "ErrorCode_I603F" must be evaluated. In addition, the corresponding device-specific register can be used to perform detailed diagnostics.
   In the event of an error, the ACOPOSinverter first changes to state 7a "Error reaction" and performs a previously determined action. It then changes to state 7 "Fault active".
   Bits 0, 1 and 2 can be evaluated to distinguish between the two states. If all bits return FALSE, the error response is complete, i.e. the drive is in state 7 "Fault active" and is waiting for an acknowledge command.

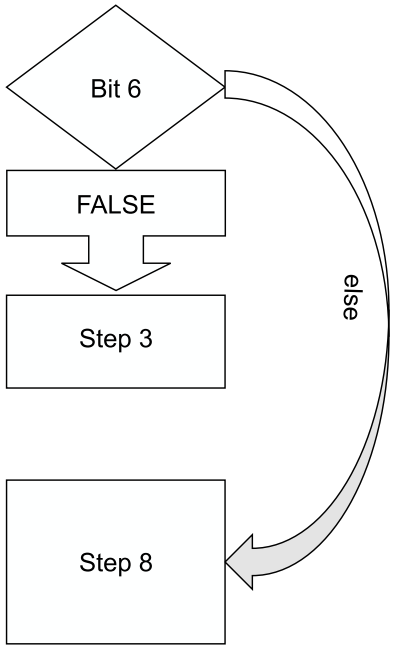


Information:

To issue acknowledge command "Acknowledge", a positive edge must be transferred to bit 7 of command word 0x6040. Acknowledge commands are assessed as invalid if the cause of error has not been eliminated.

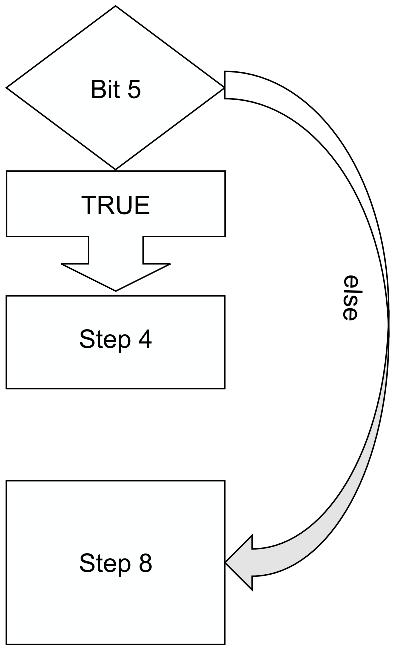
2. Bit 6 (status word & 0x40)

   If FALSE is reported on bit 6, the current DS402 state has not yet been clearly determined.
   Proceed to the next step of the test routine.
   If TRUE is displayed on bit 6, the ACOPOSinverter is in state 2 "Switch on disabled".
   To assess the current situation at the device in detail, it is recommended to continue the test routine with the final step 8 "Checking bit 7".



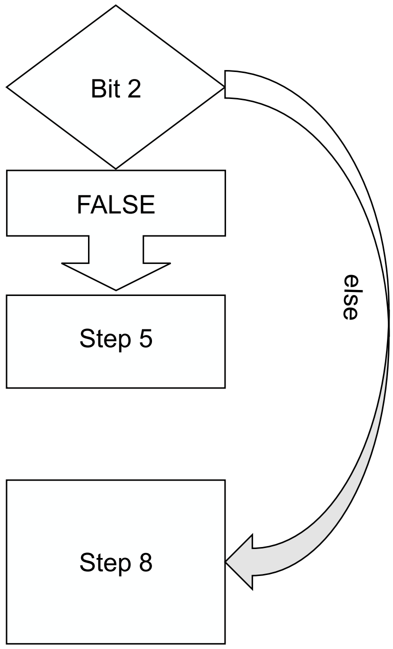
3. Bit 5 (status word & 0x20)
   NOTICE: Negative logic

   If TRUE is reported on bit 5, the current DS402 state has not yet been clearly determined.
   Proceed to the next step of the test routine.
   If FALSE is displayed on bit 5, the ACOPOSinverter is in state 1 "Not ready to switch on" or is currently executing a quick stop.
   To distinguish between the two states, bits 0, 1, 2 and 3 of the status word must be checked. If all four bits return the value FALSE, the drive is not yet in state 1 "Not ready to switch on".
   The quick stop function can be used, for example, to implement an emergency stop. After completion of a quick stop, an acknowledge command may be required to return to state 1 "Not ready to switch on".
   To assess the current situation at the device in detail during a quick stop, it is recommended to continue the test routine with the final step 8 "Checking bit 7".



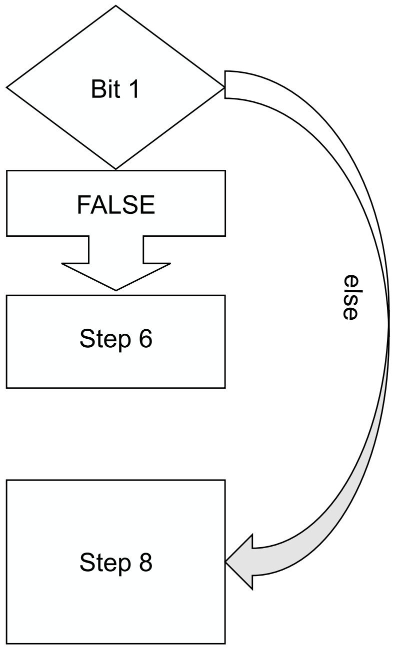
4. Bit 2 (status word & 0x04)

   If FALSE is reported on bit 2, the current DS402 state has not yet been clearly determined.
   Proceed to the next step of the test routine.
   If TRUE is displayed on bit 2, the ACOPOSinverter is in state 5 "Operation enabled".
   In this state, the ACOPOSinverter processes the setpoint from the PLC and controls the motor.
   To assess the current situation at the device in detail, it is recommended to continue the test routine with the final step 8 "Checking bit 7".



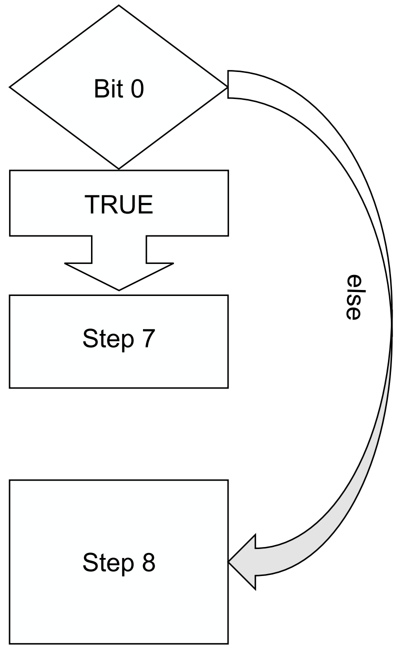
5. Bit 1 (status word & 0x02)

   If FALSE is reported on bit 1, the current DS402 state has not yet been clearly determined.
   Proceed to the next step of the test routine.
   If TRUE is displayed on bit 1, the ACOPOSinverter is in state 4 "Switched on".
   To assess the current situation at the device in detail, it is recommended to continue the test routine with the final step 8 "Checking bit 7".



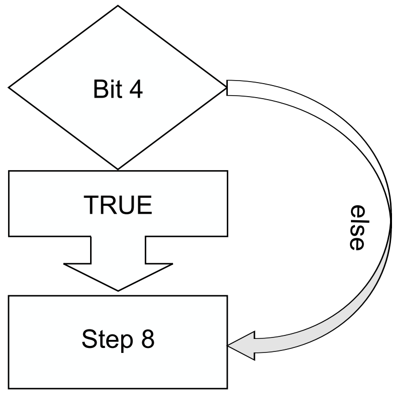
6. Bit 0 (status word & 0x01)

   If bit 0 reports FALSE, the ACOPOSinverter is in state 1 "Not ready to switch on".
   To assess the current situation at the device in detail, it is recommended to continue the test routine with the final step 8 "Checking bit 7".
   If TRUE is displayed on bit 0, the ACOPOSinverter is in state 3 "Ready to switch on".
   If the drive is additionally supplied with 24 VDC from an external source, it is not yet ensured that the DC bus is sufficiently supplied. To check the voltage level of the DC bus, continue with step 7 "Checking bit 4".



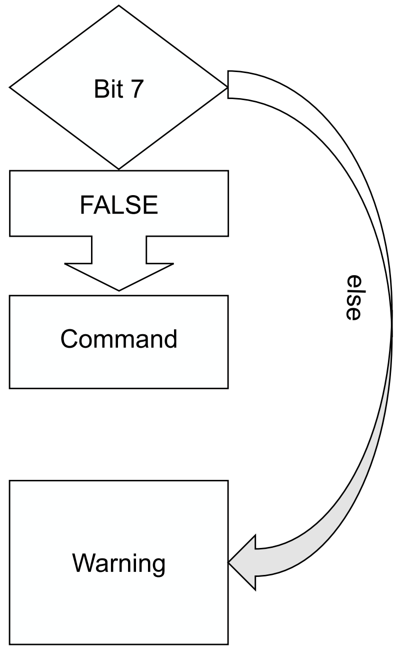
7. Bit 4 (status word & 0x10)

   If bit 4 TRUE is displayed, the DC bus is sufficiently supplied with voltage.
   If bit 4 FALSE is displayed, the DC bus of the drive is not sufficiently supplied.
   In both cases, it is recommended to continue the test routine with the final step 8 "Checking bit 7".



8. Bit 7 (STS & 0x80)

   If FALSE is reported on bit 7, there is no current message.
   If TRUE is displayed on bit 7, the drive is reporting a warning. In this case, register 0x603F "ErrorCode_I603F" and the corresponding device-specific register should be evaluated.



6.6.1.2 Permissible actions

The DS402 status word has been used to determine which DS402 state the drive is in. The permissible transitions or possible commands for the command word are derived depending on the current DS402 state.

State 1 "Not ready to switch on"

This state is reported during the boot operation of the ACOPOSinverter. After switching on, the components of the drive are initialized, e.g. the power unit, the I/O circuit board and the communication card. If the evaluation of the status word shows that the drive is in state 1 "Not ready to switch on", the drive is not yet ready for operation.

Transition 0:
If the boot operation is completed successfully, the drive changes to state 2 "Switch on disabled".

If an error occurs during the boot operation, the drive automatically changes to state 7a "Fault reaction". This ensures that the drive leaves this state automatically and that a renewed check of the DS402 status word at a later time results in a different result.

State 2 "Switch on disabled"

This state is reported when the logic of the ACOPOSinverter is ready for operation. The DS402 interface is in standby and waits for the initial command from the application.

Transition 2:
If command 0x06 is issued via the DS402 command word, the drive changes to state 3 "Ready to switch on".

State 3 "Ready to switch on"

This state can be used to ensure that the mains connections (L1, L2, L3) correspond to expectations.

Transition 3:
If command 0x07 is issued via the DS402 command word, the drive changes to state 4 "Switched on". This transition can be refused by the drive if the DC bus is insufficiently supplied with voltage or the line contactor function has been enabled and a required feedback is missing.

Transition R3:
If the DS402 command word is reset or the command 0x00 is issued, the drive changes back to state 2 "Switch on disabled".

Transition 34 (special case):
If command 0x0F is issued via the DS402 command word, the drive also changes from state 3 "Ready to switch on" to state 5 "Operation enabled".

Notice!

This transition is not explicitly mentioned in the DS402 standard. It is a device-specific special case that is only supported by individual inverter types. B&R recommends not using this transition.

State 4 "Switched on"

This state can be used to ensure that the motor connections (T1, T2, T3) correspond to expectations.

Transition 4:
If command 0x0F is issued via the DS402 command word, the drive changes to state 5 "Operation enabled".
This transition can be refused by the drive if the motor contactor function has been enabled and a required feedback is missing.

Transition S2:
If command 0x06 is issued via the DS402 command word, the drive changes back to state 3 "Ready to switch on".

Transition R2:
If the DS402 command word is reset or the command 0x00 is issued, the drive changes back to state 2 "Switch on disabled".

State 5 "Operation enabled" and state 5a "HALT reaction"

In state 5 "Operation enabled", the velocity setpoint is processed.

Warning!

Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.

Transition Q1:
If command 0x02 is issued via the DS402 command word, the drive changes to state 6a "Quick stop reaction".

> **Information:**
>
> **The "Quick stop option code" defines how the motor should be stopped when transition Q1 has been requested.**
>
> **In addition, the "Quick stop option code" defines which variant of the subsequent transition Q2 is executed.**

Transition S1:
If command 0x06 is issued via the DS402 command word, the drive changes back to state 3 "Ready to switch on".

> **Information:**
>
> **The "Shutdown option code" defines how the motor should be stopped when transition S1 has been requested.**

Transition D1:
If command 0x07 is issued via the DS402 command word, the drive changes to state 4 "Switched on".

> **Information:**
>
> **The "Disable option code" defines how the motor should be stopped when transition D1 has been requested.**

Transitions H1 and H2:
If bit 8 of the DS402 command word is set, the drive changes to state 5a "HALT reaction". As soon as the bit is reset, the drive changes back to state 5 "Operation enabled".

> **Information:**
>
> **The "HALT option code" defines how the motor should be stopped when transition H1 has been requested.**

Transition R1:
If the DS402 command word is reset or the command 0x00 is issued, the drive changes back to state 2 "Switch on disabled".

State 6 "Quick stop active" and state 6a "Quick stop reaction"

If a valid "Quick stop" command has been issued, the drive changes to state 6a "Quick stop reaction". The behavior of the drive in this case is determined by the quick stop option code.

> **Information:**
>
> **The "Quick stop option code" defines how the motor should be stopped when transition Q1 has been requested.**
>
> **In addition, the "Quick stop option code" defines which variant of the subsequent transition Q2 is executed.**

Transition Q2:
If the quick stop option code is configured to value 1, 2, 3 or 4, the drive changes to state 2 "Switch on disabled" after the axis has been stopped.

Transition Q3:
If the quick stop option code is configured to value 5, 6, 7 or 8, the drive changes to state 6 "Quick stop active" after the axis has been stopped.
To exit state 6 "Quick stop active" and change to state 2 "Switch on disabled", the DS402 command word must be reset or the command 0x00 issued.

State 7 "Fault active" and state 7a "Fault reaction"

The ACOPOSinverter monitors itself during operation. This self-diagnostics serves to protect the device and cannot be disabled by the user. If the drive diagnoses an error, it changes to state 7a "Error reaction" within the DS402 state machine and generates an error message. The behavior of the drive in this case is determined by the "fault reaction option code" (or "abort connection option code").

Information:

The "fault reaction option code" (or the "abort connection option code") defines how the motor should be stopped when the drive detects an error.

Transition E2:
Depending on the severity of the error, the drive automatically changes to either state 2 "Switch on disabled" or state 7 "Fault active" after the axis is stopped.

Transition E3:
To exit state 7 "Fault active" and change to state 2 "Switch on disabled", the reported cause of error must be eliminated and acknowledge command 0x80 or the DS402 command word must be issued.

6.6.2 DS402-Drive modes

The ACOPOSinverter is designed to use VL mode. VL mode enables the processing of a velocity setpoint.

6.6.2.1 Register description (drive modes)

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
0x6502	SupportedDriveModes_I6502	UDINT		●		
0x6060	ModesOfOperation_I6060Out	SINT				●
	ModesOfOperation_I6060In	SINT		●		
0x6061	ModesOfOperationDisplay_I6061	SINT		●		

6.6.2.2 Supported DS402 modes of operation

Name:
SupportedDriveModes_I6502

DS402 profile register 0x6502 provides information about the modes of operation supported by the POWER-LINK-CN.

Data type	Default	Range of values
UDINT	2	See the bit structure.

Bit	Name	Value	Information
...		...	
1	VL mode "Velocity mode"	0	Mode is not supported.
		1	Mode is supported.
...		...	

Information:

The DS402 standard describes further drive modes that are not listed here.

6.6.2.3 Requesting DS402 mode of operation

Name:
ModesOfOperation_I6060Out
ModesOfOperation_I6060In

DS402 profile register 0x6060 enables switching between supported modes of operation. The register can be written and read. When reading out the register, it must be noted that the mode of operation reported back was only requested. The currently active mode of operation is prepared in register 0x6061 "ModesOfOperationDisplay_I6061".

Data type	Range of values	
SINT	2	Switching to VL mode requested

Information:

Since the drive only supports one DS402 mode of operation, only one permissible value is defined.

6.6.2.4 Current DS402 mode of operation

Name:
ModesOfOperationDisplay_I6061

DS402 profile register 0x6061 displays the active mode of operation.

Data type	Range of values	
SINT	2	Switching to VL mode requested

Information:

Since the drive only supports one DS402 mode of operation, only one permissible value is defined.

7 Interfaces

7.1 POWERLINK

7.1.1 General information

8I0IF108.400-4

POWERLINK interface 8I0IF108.400-4 is used for size 1 to 3 ACOPOSinverter devices.

- POWERLINK V2 for real-time Ethernet communication
- Firmware update via fieldbus
- Integrated hub for efficient cabling
- PollResponse Chaining
- Dynamic node allocation (DNA)

8I0IF108.400-5

POWERLINK interface 8I0IF108.400-5 is used for size 4 and 5 ACOPOSinverter devices.

- POWERLINK V2 for real-time Ethernet communication
- Firmware update via fieldbus
- Integrated hub for efficient cabling
- PollResponse Chaining
- Dynamic node allocation (DNA)

7.1.2 Order data

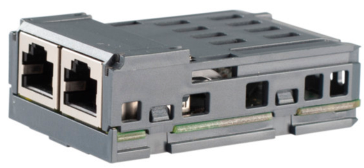
Order number	Short description	Figure
	Interface modules	
8I0IF108.400-4	2x POWERLINK interface, POWERLINK V2, interface module for ACOPOSinverter P86 (sizes 1-3)	
8I0IF108.400-5	2x POWERLINK interface, POWERLINK V2, interface module for ACOPOSinverter P86 (sizes 4-5)	

Table 11: 8I0IF108.400-4, 8I0IF108.400-5 - Order data

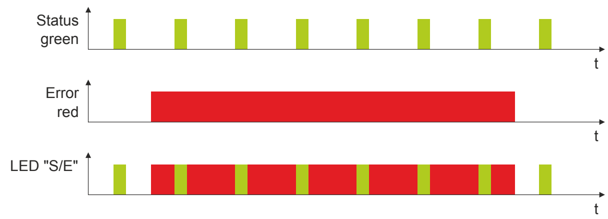
7.1.3 Technical data

Order number	8I0IF108.400-4	8I0IF108.400-5
Short description		
Communication module	POWERLINK V2 controlled node	
General information		
B&R ID code	0xFC0E	0xA72E
Status indicators	Module status, bus function	
Diagnostics		
Module status	Yes, using LED status indicator and software	
Bus function	Yes, using LED status indicator and software	
Certifications		
CE	Yes	
Interfaces		
Fieldbus	POWERLINK V2 controlled node	
Type	Type 2 1)	
Variant	2x shielded RJ45 (hub)	
Cable length	Max. 100 m between 2 stations (segment length)	
Transfer rate	100 Mbit/s	
Transfer		
Physical layer	100BASE-TX	
Half-duplex	Yes	
Full-duplex	No	
Autonegotiation	Yes	
Auto-MDI/MDIX	Yes	
Hub propagation delay	0.96 to 1 µs	
Operating conditions		
Mounting orientation		
Horizontal	Yes	
Vertical	Yes	
Installation elevation above sea level		
0 to 2000 m	No limitation	
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m	
Degree of protection per EN 60529	IP20	
Ambient conditions		
Temperature		
Operation		
Horizontal mounting orientation	-10 to 50°C	
Vertical mounting orientation	-20 to 60°C	
Derating	-	
Storage	-25 to 70°C	
Relative humidity		
Operation	5 to 95%, non-condensing	
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	

Table 12: 8I0IF108.400-4, 8I0IF108.400-5 - Technical data

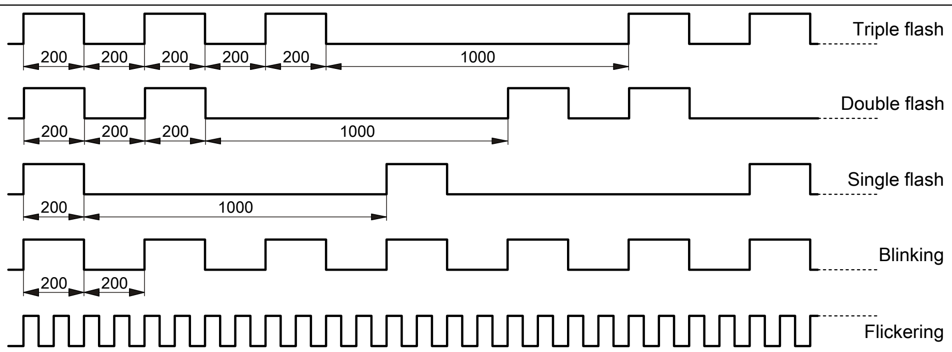
1) See Automation Help under "Communication / POWERLINK / General information / Hardware - IF/LS" for more information.

7.1.4 LED status indicators

Figure	LED	Color	Status	Description
	S/E[1]	Green	Off	No power supply or mode NOT_ACTIVE. The controlled node (CN) is either not supplied with power or it is in state NOT_ACTIVE. The CN waits in this state for about 5 s after a restart. Communication is not possible with the CN. If no POWERLINK communication is detected during these 5 s, the CN changes to state BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the CN immediately changes to state PRE_OPERATIONAL_1.
			Flickering	Mode BASIC_ETHERNET. The CN has not detected any POWERLINK communication. In this state, it is possible to communicate directly with the CN (e.g. with UDP, IP). If POWERLINK communication is detected in this state, the CN changes to state PRE_OPERATIONAL_1.
			Single flash	Mode PRE_OPERATIONAL_1. When operating on a POWERLINK V1 manager, the CN immediately changes to state PRE_OPERATIONAL_2. When operating on a POWERLINK V2 manager, the CN waits until an SoC frame is received and then changes to state PRE_OPERATIONAL_2.
			Double flash	Mode PRE_OPERATIONAL_2. The CN is normally configured by the manager in this state. It is then switched to state READY_TO_OPERATE by command (POWERLINK V2) or by setting flag "Data valid" in the output data (POWERLINK V1).
			Triple flash	Mode READY_TO_OPERATE. In a POWERLINK V1 network, the CN switches to state OPERATIONAL automatically as soon as input data is present. In a POWERLINK V2 network, the manager switches to state OPERATIONAL by command.
			On	Mode OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
			Blinking	Mode STOPPED. Output data is not being output, and no input data is being provided. It is only possible to switch to or leave this state after the manager has given the appropriate command.
		Red	On	The controlled node (CN) is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE  Note: • Several red blinking signals are displayed immediately after the device is switched on. This is not an error, however. • The LED lights up red for CNs with set physical node number 0 that have not yet been assigned a node number via dynamic node allocation (DNA).
	L/A IFx	Green	On	The link to the remote station is established.
			Blinking	The link to the remote station is established, and Ethernet activity is taking place on the bus.
	E	Red	On	Fault of a critical module (RAM, flash memory, hardware or internal communication error) occurred.

1) The Status/Error LED "S/E" is a green/red dual LED.

LED status indicators - Blink times



7.1.4.1 System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

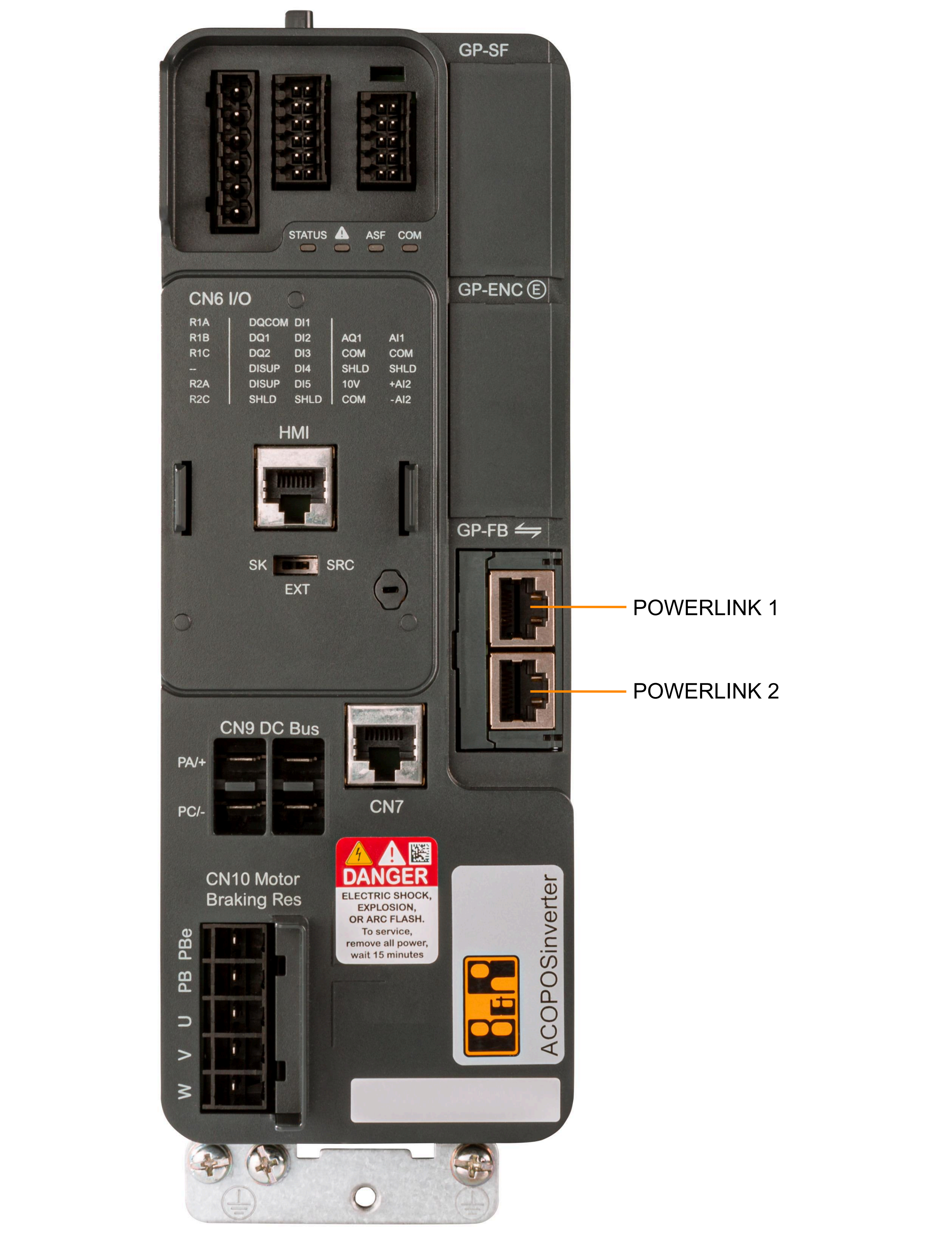
The error code is indicated by LED "S/E" blinking red. The blinking signal of the error code consists of 4 switch-on phases with short (150 ms) or long (600 ms) duration. The error code is repeated every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The module is defective and must be replaced.	●	●	●	-	Pause	●	●	●	-	Pause
Bus error: The module or a system component is defective and must be replaced. **Information:** **The module does not support hot plugging.**	-	●	●	●	Pause	-	●	●	●	Pause

Table 13: Status/Error ("S/E") LED - System stop error codes

7.1.5 Operating and connection elements

On the ACOPOSinverter P86, the POWERLINK communication card comes is delivered preinstalled in the drive.


GP-SF
STATUS
ASF
COM
GP-ENC
CN6 I/O
R1A
R1B
R1C
--
R2A
R2C
DQCOM
DQ1
DQ2
DISUP
DISUP
SHLD
DI1
DI2
DI3
DI4
DI5
SHLD
AQ1
COM
SHLD
10V
COM
AI1
COM
SHLD
+AI2
-AI2
HMI
GP-FB
SK
SRC
EXT
POWERLINK 1
POWERLINK 2
CN9 DC Bus
PA/+
PC/-
CN7
CN10 Motor
Braking Res
PBe
PB
U
V
W
DANGER
ELECTRIC SHOCK,
EXPLOSION,
OR ARC FLASH.
To service,
remove all power,
wait 15 minutes
ACOPOSinverter

7.1.6 POWERLINK node number

Node numbers between 0x00 (0) and 0xEF (239) are permitted.

The POWERLINK node number is configured using the integrated operator terminal or handwheel.

Parameters are called as follows:

[DRIVE MENU](DRI),

[CONFIGURATION](CONF-),

[FULL](FULL-),

[COMMUNICATION](COM-),

[COMMUNICATION CARD](Cbd-):

Code	Name/Description	Setting range	Factory settings
(ADRC)	**[Address]**	0 to 239	0

7.1.7 Dynamic node allocation (DNA)

Bus controller POWERLINK offers the option of receiving dynamically assigned node numbers.

This has the following advantages:

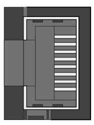
- No setting of the node number switch
- Easier installation
- Reduced error sources

For information regarding configuration as well as an example, see Automation Help → Communication → POWERLINK → General information → Dynamic node allocation (DNA).

Information:

Interface IF1 must always be used as the input from the preceding node.

7.1.8 Ethernet interface

Interface	Pinout		
	Pin	Ethernet	
 1 Shielded RJ45	1	RXD	Receive data
	2	RXD\	Receive data\
	3	TXD	Transmit data
	4	Termination	
	5	Termination	
	6	TXD\	Transmit data\
	7	Termination	
	8	Termination	

7.1.9 SG4

The communication module comes with preinstalled firmware. The firmware is also part of the hardware upgrade.

If the hardware upgrade currently used in Automation Studio contains a different firmware version, this will be loaded to the communication module during project download.

7.1.10 Register description

7.1.10.1 System requirements

The following minimum versions are recommended in order to use the functions:

- Automation Studio 4.3.5
- Automation Runtime N4.34

7.1.10.2 Base values of drive

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
Predefined values									
3009	0x2000	0x0A	PRT_Input		UINT		•		
3011	0x2000	0x0C	NCV_Input		UINT		•		

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
3012	0x2000	0x0D	VCAL_Input		UINT		●		
3013	0x2000	0x0E	NCVI_Input		UINT		●		
3016	0x2000	0x11	IMAX_Input		UINT		●		
3017	0x2000	0x12	INV_Input		UINT		●		
3018	0x2000	0x13	VMAX_Input		UINT		●		

7.1.10.3 Inputs/Outputs

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
5232	0x2016	0x21	AI1R_Input		(U)INT	●	●		
13249	0x2066	0x32	TH1V_Input		INT	●	●		
5233	0x2016	0x22	AI2R_Input		(U)INT	●	●		
5234	0x2016	0x23	AI3R_Input		(U)INT	●	●		
13251	0x2066	0x34	TH3V_Input		INT	●	●		
5202	0x2016	0x03	IL1R_Input		UINT	●	●		
5202	0x2016	0x03	Status response of the digital inputs		UINT	●			
			IL1R_Input_DI1		Bit 0				
			IL1R_Input_DI2		Bit 1				
			IL1R_Input_DI3		Bit 2				
			IL1R_Input_DI4		Bit 3				
			IL1R_Input_DI5		Bit 4				
			IL1R_Input_DI6		Bit 5				
			IL1R_Input_DI7		Bit 6				
			IL1R_Input_DI8		Bit 7				
13366	0x2067	0x43	PRA7_Input		UINT	●	●		
13386	0x2067	0x57	PRA8_Input		UINT	●	●		
17022	0x208C	0x17	PTIA_Input		INT	●	●		
14603	0x2074	0x04	FQS_Input		UINT	●	●		
5261	0x2016	0x3E		AO1R_Output	UINT			●	
5262	0x2016	0x3F		AO2R_Output	UINT			●	
5251	0x2016	0x34	AO1I_Input		UINT	●	●		
5652	0x201A	0x35	AO2I_Input		UINT	●	●		
5212	0x2016	0x0D	Control of digital outputs		UINT			●	
				OL1R_Output_R1	Bit 0				
				OL1R_Output_R2	Bit 1				
				OL1R_Output_R3	Bit 2				
				OL1R_Output_DQ1	Bit 8				
				OL1R_Output_DQ2	Bit 9				
5211	0x2016	0x0C	OL1I_Input		UINT	●	●		
5211	0x2016	0x0C	Status response of the digital outputs		UINT	●			
			OL1I_Input_R1		Bit 0				
			OL1I_Input_R2		Bit 1				
			OL1I_Input_R3		Bit 2				
			OL1I_Input_DQ1		Bit 8				
			OL1I_Input_DQ2		Bit 9				
5289	0x2016	0x5A		PTOC_Output	UINT			●	

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
Configuration of the analog inputs									
4402	0x200E	0x03	AI1T_Input	AI1T_Output	UINT		●		●
4403	0x200E	0x04	AI2T_Input	AI2T_Output	UINT		●		●
4404	0x200E	0x05	AI3T_Input	AI3T_Output	UINT		●		●
4412	0x200E	0x0D	UIL1_Input	UIL1_Output	UINT		●		●
4413	0x200E	0x0E	UIL2_Input	UIL2_Output	UINT		●		●
4414	0x200E	0x0F	UIL3_Input	UIL3_Output	UINT		●		●
4422	0x200E	0x17	UIH1_Input	UIH1_Output	UINT		●		●
4423	0x200E	0x18	UIH2_Input	UIH2_Output	UINT		●		●
4424	0x200E	0x19	UIH3_Input	UIH3_Output	UINT		●		●
4432	0x200E	0x21	CRL1_Input	CRL1_Output	UINT		●		●
4434	0x200E	0x23	CRL3_Input	CRL3_Output	UINT		●		●
4442	0x200E	0x2B	CRH1_Input	CRH1_Output	UINT		●		●
4444	0x200E	0x2D	CRH3_Input	CRH3_Output	UINT		●		●
4452	0x200E	0x35	AI1F_Input	AI1F_Output	UINT		●		●
4453	0x200E	0x36	AI2F_Input	AI2F_Output	UINT		●		●
4454	0x200E	0x37	AI3F_Input	AI3F_Output	UINT		●		●
4462	0x200E	0x3F	AI1E_Input	AI1E_Output	UINT		●		●
4463	0x200E	0x40	AI2E_Input	AI2E_Output	UINT		●		●
4464	0x200E	0x41	AI3E_Input	AI3E_Output	UINT		●		●
4472	0x200E	0x49	AI1S_Input	AI1S_Output	UINT		●		●
4473	0x200E	0x4A	AI2S_Input	AI2S_Output	UINT		●		●

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
4474	0x200E	0x4B	AI3S_Input	AI3S_Output	UINT		●		●
4482	0x200E	0x53	AI1L_Input	AI1L_Output	UINT		●		●
4484	0x200E	0x55	AI3L_Input	AI3L_Output	UINT		●		●
13209	0x2066	0x0A	TH1S_Input	TH1S_Output	UINT		●		●
13211	0x2066	0x0C	TH3S_Input	TH3S_Output	UINT		●		●
13219	0x2066	0x14	TH1A_Input	TH1A_Output	UINT		●		●
13221	0x2066	0x16	TH3A_Input	TH3A_Output	UINT		●		●
13229	0x2066	0x1E	TH1F_Input	TH1F_Output	INT		●		●
13231	0x2066	0x20	TH3F_Input	TH3F_Output	INT		●		●
5282	0x2016	0x53	AIC1_Input	AIC1_Output	UINT		●		●
5287	0x2016	0x58	AV1T_Input	AV1T_Output	UINT		●		●
Configuration of analog outputs									
4601	0x2010	0x02	AO1T_Input	AO1T_Output	UINT		●		●
4602	0x2010	0x03	AO2T_Input	AO2T_Output	UINT		●		●
4611	0x2010	0x0C	AO1F_Input	AO1F_Output	UINT		●		●
4612	0x2010	0x0D	AO2F_Input	AO2F_Output	UINT		●		●
4621	0x2010	0x16	UOL1_Input	UOL1_Output	UINT		●		●
4622	0x2010	0x17	UOL2_Input	UOL2_Output	UINT		●		●
4631	0x2010	0x20	UOH1_Input	UOH1_Output	UINT		●		●
4632	0x2010	0x21	UOH2_Input	UOH2_Output	UINT		●		●
4641	0x2010	0x2A	AOL1_Input	AOL1_Output	UINT		●		●
4642	0x2010	0x2B	AOL2_Input	AOL2_Output	UINT		●		●
4651	0x2010	0x34	AOH1_Input	AOH1_Output	UINT		●		●
4652	0x2010	0x35	AOH2_Input	AOH2_Output	UINT		●		●
4661	0x2010	0x3E	ASL1_Input	ASL1_Output	UINT		●		●
4662	0x2010	0x3F	ASL2_Input	ASL2_Output	UINT		●		●
4671	0x2010	0x48	ASH1_Input	ASH1_Output	UINT		●		●
4672	0x2010	0x49	ASH2_Input	ASH2_Output	UINT		●		●
4293	0x200C	0x5E	AOF1_Input	AOF1_Output	UINT		●		●
4691	0x2010	0x5C	AOF2_Input	AOF2_Output	UINT		●		●
5021	0x2014	0x16	AO1_Input	AO1_Output	UINT		●		●
5022	0x2014	0x17	AO2_Input	AO2_Output	UINT		●		●
Configuration of digital inputs									
4001	0x200A	0x02	L1D_Input	L1D_Output	UINT		●		●
4002	0x200A	0x03	L2D_Input	L2D_Output	UINT		●		●
4003	0x200A	0x04	L3D_Input	L3D_Output	UINT		●		●
4004	0x200A	0x05	L4D_Input	L4D_Output	UINT		●		●
4005	0x200A	0x06	L5D_Input	L5D_Output	UINT		●		●
4006	0x200A	0x07	L6D_Input	L6D_Output	UINT		●		●
4007	0x200A	0x08	L7D_Input	L7D_Output	UINT		●		●
4008	0x200A	0x09	L8D_Input	L8D_Output	UINT		●		●
Configuration of digital outputs									
4201	0x200C	0x02	R1S_Input	R1S_Output	UINT		●		●
4202	0x200C	0x03	R2S_Input	R2S_Output	UINT		●		●
4203	0x200C	0x04	R3S_Input	R3S_Output	UINT		●		●
4221	0x200C	0x16	R1H_Input	R1H_Output	UINT		●		●
4222	0x200C	0x17	R2H_Input	R2H_Output	UINT		●		●
4223	0x200C	0x18	R3H_Input	R3H_Output	UINT		●		●
4241	0x200C	0x2A	R1D_Input	R1D_Output	UINT		●		●
4242	0x200C	0x2B	R2D_Input	R2D_Output	UINT		●		●
4243	0x200C	0x2C	R3D_Input	R3D_Output	UINT		●		●
4290	0x200C	0x5B	R1F_Input	R1F_Output	UINT		●		●
4291	0x200C	0x5C	R2F_Input	R2F_Output	UINT		●		●
17600	0x2092	0x01	R3F_Input	R3F_Output	UINT		●		●
4261	0x200C	0x3E	DO1S_Input	DO1S_Output	UINT		●		●
4262	0x200C	0x3F	DO2S_Input	DO2S_Output	UINT		●		●
4271	0x200C	0x48	DO1H_Input	DO1H_Output	UINT		●		●
4272	0x200C	0x49	DO2H_Input	DO2H_Output	UINT		●		●
4281	0x200C	0x52	DO1D_Input	DO1D_Output	UINT		●		●
4282	0x200C	0x53	DO2D_Input	DO2D_Output	UINT		●		●
4292	0x200C	0x5D	LO1F_Input	LO1F_Output	UINT		●		●
17604	0x2092	0x05	LO2F_Input	LO2F_Output	UINT		●		●
5001	0x2014	0x02	R1_Input	R1_Output	UINT		●		●
5002	0x2014	0x03	R2_Input	R2_Output	UINT		●		●
5003	0x2014	0x04	R3_Input	R3_Output	UINT		●		●
5031	0x2014	0x20	DO1_Input	DO1_Output	UINT		●		●
5032	0x2014	0x21	DO2_Input	DO2_Output	UINT		●		●
Configuration of the PTI interface and other signals									
17000	0x208C	0x01	PTIM_Input	PTIM_Output	UINT		●		●
17001	0x208C	0x02	PTII_Input	PTII_Output	UINT		●		●
17002	0x208C	0x03	PTIS_Input	PTIS_Output	UINT		●		●
17004	0x208C	0x05	PTIL_Input	PTIL_Output	DINT		●		●
17006	0x208C	0x07	PTIH_Input	PTIH_Output	DINT		●		●

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
17008	0x208C	0x09	PTIT_Input	PTIT_Output	UINT		●		●
13360	0x2067	0x3D	PIL7_Input	PIL7_Output	UDINT		●		●
13362	0x2067	0x3F	PIH7_Input	PIH7_Output	UINT		●		●
13364	0x2067	0x41	PFI7_Input	PFI7_Output	UINT		●		●
13382	0x2067	0x53	PIH8_Input	PIH8_Output	UINT		●		●
13384	0x2067	0x55	PFI8_Input	PFI8_Output	UINT		●		●
14601	0x2074	0x02	FQF_Input	FQF_Output	UINT		●		●
14602	0x2074	0x03	FQC_Input	FQC_Output	UINT		●		●
14604	0x2074	0x05	FQA_Input	FQA_Output	UINT		●		●
14605	0x2074	0x06	TDS_Input	TDS_Output	UINT		●		●
14606	0x2074	0x07	FDT_Input	FDT_Output	UINT		●		●
14607	0x2074	0x08	FQT_Input	FQT_Output	UINT		●		●
14608	0x2074	0x09	TQB_Input	TQB_Output	UINT		●		●
14609	0x2074	0x0A	FQL_Input	FQL_Output	UINT		●		●
Configuration of the PTO interface									
17050	0x208C	0x33	PTOM_Input	PTOM_Output	UINT		●		●
17054	0x208C	0x37	PTOB_Input	PTOB_Output	DINT		●		●
17056	0x208C	0x39	PTOU_Input	PTOU_Output	DINT		●		●
4688	0x2010	0x59	PTOL_Input	PTOL_Output	UINT		●		●
4689	0x2010	0x5A	PTOH_Input	PTOH_Output	UINT		●		●
17051	0x208C	0x34	POFE_Input	POFE_Output	UINT		●		●
5050	0x2014	0x33	PTO_Input	PTO_Output	UINT		●		●
5052	0x2014	0x35	PTOE_Input	PTOE_Output	UINT		●		●

7.1.10.4 Communication (with setpoint in rpm)

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
Optional status responses									
3240	0x2002	0x29	HMIS_Input		UINT	●	●		
7121	0x2029	0x16	LFT_Input		UINT	●	●		
3206	0x2002	0x07	ETI_Input		UINT	●	●		
9630	0x2042	0x1F	THR_Input		UINT	●	●		
3209	0x2002	0x0A	THD_Input		UINT	●	●		
7035	0x2028	0x24	TLOM_Input		UINT	●	●		
14114	0x206F	0x0F	THB_Input		UINT	●	●		
12870	0x2062	0x47	AGS_Input		UINT	●	●		
15322	0x207B	0x17	STOS_Input		UINT	●	●		
State and command register (default)									
8606	0x2038	0x07	ERRD_Input		UINT	●			
3201	0x2002	0x02	ETAD_Input		UINT	●			
3201	0x2002	0x02	Status response of the DS402 state machine		UINT	●			
			ETAD_Input_rtso		Bit 0				
			ETAD_Input_so		Bit 1				
			ETAD_Input_oe		Bit 2				
			ETAD_Input_f		Bit 3				
			ETAD_Input_ve		Bit 4				
			ETAD_Input_qs		Bit 5				
			ETAD_Input_sod		Bit 6				
			ETAD_Input_w		Bit 7				
			ETAD_Input_rm		Bit 9				
			ETAD_Input_tr		Bit 10				
			ETAD_Input_ila		Bit 11				
8501	0x2037	0x02	CMDD_Intput	CMDD_Output	UINT		●	●	
8602	0x2038	0x03	LFRD_Input	LFRD_Output	INT		●	●	
8641	0x2038	0x2A	FROD_Input		INT	●	●		
8604	0x2038	0x05	RFRD_Input		INT	●	●		
Optional responses and additional setpoints									
8505	0x2037	0x06	LTR_Input	LTR_Output	INT		●	●	
9231	0x203E	0x20	TRR_Input		INT	●			
9232	0x203E	0x21	TRO_Input		INT	●			
3205	0x2002	0x06	OTR_Input		INT	●	●		
8605	0x2038	0x06	FRHD_Input		INT	●	●		
3203	0x2002	0x04	FRH_Input		INT	●	●		
9021	0x203C	0x16	FRO_Input		INT	●	●		
3202	0x2002	0x03	RFR_Input		INT	●	●		
12011	0x205A	0x0C	SPDM_Input		UINT	●	●		
5611	0x201A	0x0C	PUC_Input		INT	●	●		
5668	0x201A	0x45	PUCD_Input		DINT		●		
3216	0x2002	0x11	OTRN_Input		INT	●	●		
5281	0x2016	0x52	AIV1_Input	AIV1_Output	UINT		●	●	
9131	0x203D	0x20	TFF_Input	TFF_Output	UINT		●	●	
9137	0x203D	0x26	TFFA_Input		UINT	●	●		

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
3208	0x2002	0x09	UOP_Input		UINT	●	●		
3204	0x2002	0x05	LCR_Input		UINT	●	●		
3211	0x2002	0x0C	OPR_Input		INT	●	●		
3243	0x2002	0x2C	VBUS_Input		UINT	●	●		
3207	0x2002	0x08	ULN_Input		UINT	●	●		
3225	0x2002	0x1A	SRFR_Input		INT	●	●		
3226	0x2002	0x1B	SOTR_Input		INT	●	●		
3224	0x2002	0x19	SLCR_Input		UINT	●	●		
3290	0x2002	0x5B	SOPR_Input		INT	●	●		
3229	0x2002	0x1E	SULN_Input		UINT	●	●		
Error history									
7393	0x202B	0x5E	FNB_Input		UINT		●		
Index + 7200	0x202A	Index + 0x01	LFT: DP0_Input DP[0…9]_Input		UINT		●		
Index + 7590	0x202E	Index - 0x09	LFT: DPA_Input DP[A…F]_Input		UINT		●		
Index + 7210	0x202A	Index + 0x0B	ETAD: EP0_Input EP[0…9]_Input		UINT		●		
Index + 7600	0x202E	Index + 0x01	ETAD: EPA_Input EP[A…F]_Input		UINT		●		
Index + 7220	0x202A	Index + 0x15	ETI: IP0_Input IP[0…9]_Input		UINT		●		
Index + 7610	0x202E	Index + 0x0B	ETI: IPA_Input IP[A…F]_Input		UINT		●		
Index + 7230	0x202A	Index + 0x1F	CMDD: CMP0_Input CMP[0…9]_Input		UINT		●		
Index + 7620	0x202E	Index + 0x15	CMDD: CMPA_Input CMP[A…F]_Input		UINT		●		
Index + 7240	0x202A	Index + 0x29	LCR: LCP0_Input LCP[0…9]_Input		INT		●		
Index + 7630	0x202E	Index + 0x1F	LCR: LCPA_Input LCP[A…F]_Input		INT		●		
Index + 7250	0x202A	Index + 0x33	RFR: RFP0_Input RFP[0…9]_Input		INT		●		
Index + 7640	0x202E	Index + 0x29	RFR: RFPA_Input RFP[A…F]_Input		INT		●		
Index + 7260	0x202A	Index + 0x3D	RTHI: RTP0_Input RTP[0…9]_Input		UINT		●		
Index + 7650	0x202E	Index + 0x33	RTHI: RTPA_Input RTP[A…F]_Input		UINT		●		
Index + 7270	0x202A	Index + 0x47	ULN: ULP0_Input ULP[0…9]_Input		UINT		●		
Index + 7660	0x202E	Index + 0x3D	ULN: ULPA_Input ULP[A…F]_Input		UINT		●		
Index + 7280	0x202A	Index + 0x51	THR: THP0_Input THP[0…9]_Input		UINT		●		
Index + 7670	0x202E	Index + 0x47	THR: THP0_Input THP[A…F]_Input		UINT		●		
Index + 7320	0x202B	Index + 0x15	HMIS: HS0_Input HS[0…9]_Input		UINT		●		
Index + 7710	0x202F	Index + 0x0B	HMIS: HS0_Input HS[A…F]_Input		UINT		●		
Index + 7330	0x202B	Index + 0x1F	OTR: OTP0_Input OTP[0…9]_Input		INT		●		
Index + 7720	0x202F	Index + 0x15	OTR: OTPA_Input OTP[A…F]_Input		INT		●		
Index + 7340	0x202B	Index + 0x29	THD: TDP0_Input TDP[0…9]_Input		UINT		●		
Index + 7730	0x202F	Index + 0x1F	THD: TDPA_Input TDP[A…F]_Input		UINT		●		

7.1.10.5 Communication (with setpoint in Hz)

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
Optional status responses									
3240	0x2002	0x29	HMIS_Input		UINT	●	●		
7121	0x2029	0x16	LFT_Input		UINT	●	●		
3206	0x2002	0x07	ETI_Input		UINT	●	●		
9630	0x2042	0x1F	THR_Input		UINT	●	●		
3209	0x2002	0x0A	THD_Input		UINT	●	●		
7035	0x2028	0x24	TLOM_Input		UINT	●	●		
14114	0x206F	0x0F	THB_Input		UINT	●	●		
12870	0x2062	0x47	AGS_Input		UINT	●	●		
15322	0x207B	0x17	STOS_Input		UINT	●	●		
State and command register (default)									
8606	0x2038	0x07	ERRD_Input		UINT	●			

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
3201	0x2002	0x02	ETAD_Input		UINT	●			
3201	0x2002	0x02	Status response of the DS402 state machine		UINT	●			
			ETAD_Input_rtso		Bit 0				
			ETAD_Input_so		Bit 1				
			ETAD_Input_oe		Bit 2				
			ETAD_Input_f		Bit 3				
			ETAD_Input_ve		Bit 4				
			ETAD_Input_qs		Bit 5				
			ETAD_Input_sod		Bit 6				
			ETAD_Input_w		Bit 7				
			ETAD_Input_rm		Bit 9				
			ETAD_Input_tr		Bit 10				
			ETAD_Input_ila		Bit 11				
8501	0x2037	0x02	CMDD_Intput	CMDD_Output	UINT		●	●	
8502	0x2037	0x03	LFR_Input	LFR_Output	INT		●	●	
9021	0x203C	0x16	FRO_Input		INT	●	●		
3202	0x2002	0x03	RFR_Input		INT	●	●		
Optional responses and additional setpoints									
8505	0x2037	0x06	LTR_Input	LTR_Output	INT		●	●	
9231	0x203E	0x20	TRR_Input		INT	●			
9232	0x203E	0x21	TRO_Input		INT	●			
3203	0x2002	0x04	FRH_Input		INT	●	●		
8605	0x2038	0x06	FRHD_Input		INT	●	●		
8641	0x2038	0x2A	FROD_Input		INT	●	●		
8604	0x2038	0x05	RFRD_Input		INT	●	●		
3205	0x2002	0x06	OTR_Input		INT	●	●		
12011	0x205A	0x0C	SPDM_Input		UINT	●	●		
5611	0x201A	0x0C	PUC_Input		INT	●	●		
5668	0x201A	0x45	PUCD_Input		DINT		●		
3216	0x2002	0x11	OTRN_Input		INT	●	●		
5281	0x2016	0x52	AIV1_Input	AIV1_Output	UINT		●	●	
9131	0x203D	0x20	TFF_Input	TFF_Output	UINT		●	●	
9137	0x203D	0x26	TFFA_Input		UINT	●	●		
3208	0x2002	0x09	UOP_Input		UINT	●	●		
3204	0x2002	0x05	LCR_Input		UINT	●	●		
3211	0x2002	0x0C	OPR_Input		INT	●	●		
3243	0x2002	0x2C	VBUS_Input		UINT	●	●		
3207	0x2002	0x08	ULN_Input		UINT	●	●		
3225	0x2002	0x1A	SRFR_Input		INT	●	●		
3226	0x2002	0x1B	SOTR_Input		INT	●	●		
3224	0x2002	0x19	SLCR_Input		UINT	●	●		
3290	0x2002	0x5B	SOPR_Input		INT	●	●		
3229	0x2002	0x1E	SULN_Input		UINT	●	●		
Error history									
7393	0x202B	0x5E	FNB_Input		UINT		●		
Index + 7200	0x202A	Index + 0x01	LFT: DP0_Input DP[0…9]_Input		UINT		●		
Index + 7590	0x202E	Index - 0x09	LFT: DPA_Input DP[A…F]_Input		UINT		●		
Index + 7210	0x202A	Index + 0x0B	ETAD: EP0_Input EP[0…9]_Input		UINT		●		
Index + 7600	0x202E	Index + 0x01	ETAD: EPA_Input EP[A…F]_Input		UINT		●		
Index + 7220	0x202A	Index + 0x15	ETI: IP0_Input IP[0…9]_Input		UINT		●		
Index + 7610	0x202E	Index + 0x0B	ETI: IPA_Input IP[A…F]_Input		UINT		●		
Index + 7230	0x202A	Index + 0x1F	CMDD: CMP0_Input CMP[0…9]_Input		UINT		●		
Index + 7620	0x202E	Index + 0x15	CMDD: CMPA_Input CMP[A…F]_Input		UINT		●		
Index + 7240	0x202A	Index + 0x29	LCR: LCP0_Input LCP[0…9]_Input		INT		●		
Index + 7630	0x202E	Index + 0x1F	LCR: LCPA_Input LCP[A…F]_Input		INT		●		
Index + 7250	0x202A	Index + 0x33	RFR: RFP0_Input RFP[0…9]_Input		INT		●		
Index + 7640	0x202E	Index + 0x29	RFR: RFPA_Input RFP[A…F]_Input		INT		●		
Index + 7260	0x202A	Index + 0x3D	RTHI: RTP0_Input RTP[0…9]_Input		UINT		●		
Index + 7650	0x202E	Index + 0x33	RTHI: RTPA_Input RTP[A…F]_Input		UINT		●		
Index + 7270	0x202A	Index + 0x47	ULN: ULP0_Input ULP[0…9]_Input		UINT		●		

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As output	As input		Cyclic	Acyclic	Cyclic	Acyclic
Index + 7660	0x202E	Index + 0x3D	ULN: ULPA_Input ULP[A…F]_Input		UINT		•		
Index + 7280	0x202A	Index + 0x51	THR: THP0_Input THP[0…9]_Input		UINT		•		
Index + 7670	0x202E	Index + 0x47	THR: THP0_Input THP[A…F]_Input		UINT		•		
Index + 7320	0x202B	Index + 0x15	HMIS: HS0_Input HS[0…9]_Input		UINT		•		
Index + 7710	0x202F	Index + 0x0B	HMIS: HS0_Input HS[A…F]_Input		UINT		•		
Index + 7330	0x202B	Index + 0x1F	OTR: OTP0_Input OTP[0…9]_Input		INT		•		
Index + 7720	0x202F	Index + 0x15	OTR: OTPA_Input OTP[A…F]_Input		INT		•		
Index + 7340	0x202B	Index + 0x29	THD: TDP0_Input TDP[0…9]_Input		UINT		•		
Index + 7730	0x202F	Index + 0x1F	THD: TDPA_Input TDP[A…F]_Input		UINT		•		

7.1.10.6 Configuration

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
General									
3015	0x2000	0x10	BFR_Input	BFR_Output	UINT		•		•
3022	0x2000	0x17	FRY_Input	FRY_Output	UINT		•		•
3006	0x2000	0x07	LAC_Input	LAC_Output	UINT		•		•
4275	0x200C	0x4C	S24V_Input	S24V_Output	UINT		•		•
Nameplate (induction motor)									
9601	0x2042	0x02	UNS_Input	UNS_Output	UINT		•		•
9602	0x2042	0x03	FRS_Input	FRS_Output	UINT		•		•
9603	0x2042	0x04	NCR_Input	NCR_Output	UINT		•		•
9604	0x2042	0x05	NSP_Input	NSP_Output	UINT		•		•
9606	0x2042	0x07	COS_Input	COS_Output	UINT		•		•
9614	0x2042	0x0F	MPC_Input	MPC_Output	UINT		•		•
9613	0x2042	0x0E	NPR_Input	NPR_Output	UINT		•		•
9605	0x2042	0x06	NSL_Input		UINT		•		
9618	0x2042	0x13	PPN_Input		UINT		•		
9669	0x2042	0x46	TQN_Input		UINT		•		
9699	0x2042	0x64	FMX_Input		UINT		•		
Nameplate (synchronous motor)									
9670	0x2042	0x47	NCRS_Input	NCRS_Output	UINT		•		•
9671	0x2042	0x48	NSPS_Input	NSPS_Output	UINT		•		•
9672	0x2042	0x49	PPNS_Input	PPNS_Output	UINT		•		•
9684	0x2042	0x55	TQS_Input	TQS_Output	UINT		•		•
9679	0x2042	0x50	FRSS_Input		UINT		•		
9699	0x2042	0x64	FMX_Input		UINT		•		
Tuning settings									
9609	0x2042	0x0A	TUS_Input		UINT		•		
9617	0x2042	0x12	STUN_Input		UINT		•		
9608	0x2042	0x09	TUN_Input	TUN_Output	UINT		•		•
9610	0x2042	0x0B	TUL_Input	TUL_Output	UINT		•		•
9615	0x2042	0x10	AUT_Input	AUT_Output	UINT		•		•
9619	0x2042	0x14	TUNU_Input	TUNU_Output	UINT		•		•
9626	0x2042	0x1B	TUNT_Input	TUNT_Output	UINT		•		•
9627	0x2042	0x1C	TCR_Input	TCR_Output	UINT		•		•
User-defined tuning parameters (induction motor)									
9642	0x2042	0x2B	RSA_Input	RSA_Output	UINT		•		•
9652	0x2042	0x35	IDA_Input	IDA_Output	UINT		•		•
9662	0x2042	0x3F	LFA_Input	LFA_Output	UINT		•		•
9667	0x2042	0x44	TRA_Input	TRA_Output	UINT		•		•
User-defined tuning parameters (synchronous motor)									
9682	0x2042	0x53	RSAS_Input	RSAS_Output	UINT		•		•
9673	0x2042	0x4A	PHS_Input	PHS_Output	UINT		•		•
9674	0x2042	0x4B	LDS_Input	LDS_Output	UINT		•		•
9675	0x2042	0x4C	LQS_Input	LQS_Output	UINT		•		•
Tuning results (induction motor)									
9643	0x2042	0x2C	RSAI_Input		UINT		•		
9653	0x2042	0x36	IDAI_Input		UINT		•		
9663	0x2042	0x40	LFAI_Input		UINT		•		
9668	0x2042	0x45	TRAI_Input		UINT		•		
Tuning results (synchronous motor)									
9683	0x2042	0x54	RASI_Input		UINT		•		
9685	0x2042	0x56	PHSI_Input		UINT		•		
9692	0x2042	0x5D	LDSI_Input		UINT		•		

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
9696	0x2042	0x61	LQSI_Input		UINT		●		
Temperature model (motor)									
9612	0x2042	0x0D	THT_Input	THT_Output	UINT		●		●
9622	0x2042	0x17	ITH_Input	ITH_Output	UINT		●		●
Temperature model (drive)									
7031	0x2028	0x20	TLOL_Input	TLOL_Output	UINT		●		●
7032	0x2028	0x21	TLOH_Input	TLOH_Output	UINT		●		●
7033	0x2028	0x22	TLON_Input	TLON_Output	UINT		●		●
7034	0x2028	0x23	TLOA_Input		UINT		●		
Other output limitations									
9201	0x203E	0x02	CLI_Input	CLI_Output	UINT		●		●
9202	0x203E	0x03	LC2_Input	LC2_Output	UINT		●		●
9203	0x203E	0x04	CL2_Input	CL2_Output	UINT		●		●
9208	0x203E	0x09	TASU_Input	TASU_Output	UINT		●		●
9209	0x203E	0x0A	TAA2_Input	TAA2_Output	UINT		●		●
9210	0x203E	0x0B	TLA_Input	TLA_Output	UINT		●		●
9213	0x203E	0x0E	TLC_Input	TLC_Output	UINT		●		●
9214	0x203E	0x0F	TAA_Input	TAA_Output	UINT		●		●
9215	0x203E	0x10	INTP_Input	INTP_Output	UINT		●		●
9211	0x203E	0x0C	TLIM_Input	TLIM_Output	UINT		●		●
9212	0x203E	0x0D	TLIG_Input	TLIG_Output	UINT		●		●
9216	0x203E	0x11	TPMM_Input	TPMM_Output	UINT		●		●
9217	0x203E	0x12	TPMG_Input	TPMG_Output	UINT		●		●
9246	0x203E	0x2F	TLMS_Input		UINT		●		
9247	0x203E	0x30	TLGS_Input		UINT		●		
9248	0x203E	0x31	TPMS_Input		UINT		●		
9249	0x203E	0x32	TPGS_Input		UINT		●		
9240	0x203E	0x29	SSB_Input	SSB_Output	UINT		●		●
9241	0x203E	0x2A	STO_Input	STO_Output	UINT		●		●
9260	0x203E	0x3D	INT_Input	INT_Output	UINT		●		●
9261	0x203E	0x3E	LTCR_Input	LTCR_Output	UINT		●		●
9270	0x203E	0x47	STPC_Input	STPC_Output	UINT		●		●
9271	0x203E	0x48	STP1_Input	STP1_Output	UINT		●		●
9272	0x203E	0x49	STP2_Input	STP2_Output	UINT		●		●
9273	0x203E	0x4A	STP3_Input	STP3_Output	UINT		●		●
Brake controller (BLC)									
10001	0x2046	0x02	BLC_Input	BLC_Output	UINT		●		●
10003	0x2046	0x04	BEN_Input	BEN_Output	INT		●		●
10004	0x2046	0x05	BRT_Input	BRT_Output	UINT		●		●
10005	0x2046	0x06	BET_Input	BET_Output	UINT		●		●
10006	0x2046	0x07	IBR_Input	IBR_Output	UINT		●		●
10007	0x2046	0x08	BIP_Input	BIP_Output	UINT		●		●
10008	0x2046	0x09	BST_Input	BST_Output	UINT		●		●
10009	0x2046	0x0A	BCI_Input	BCI_Output	UINT		●		●
10010	0x2046	0x0B	TBE_Input	TBE_Output	UINT		●		●
10011	0x2046	0x0C	IRD_Input	IRD_Output	UINT		●		●
10012	0x2046	0x0D	BIR_Input	BIR_Output	INT		●		●
10013	0x2046	0x0E	JDC_Input	JDC_Output	INT		●		●
10014	0x2046	0x0F	BECD_Input	BECD_Output	INT		●		●
10015	0x2046	0x10	BRR_Input	BRR_Output	UINT		●		●
10020	0x2046	0x15	BED_Input	BED_Output	UINT		●		●
10022	0x2046	0x17	TTR_Input	TTR_Output	UINT		●		●
10025	0x2046	0x1A	FBCI_Input	FBCI_Output	UINT		●		●
10050	0x2046	0x33	BRH_Input	BRH_Output	UINT		●		●
10051	0x2046	0x34	BFTD_Input	BFTD_Output	UINT		●		●
10052	0x2046	0x35	BRI_Input	BRI_Output	UINT		●		●
10053	0x2046	0x36	FBRI_Input	FBRI_Output	UINT		●		●
10054	0x2046	0x37	MDFT_Input	MDFT_Output	UINT		●		●
10055	0x2046	0x38	MTBF_Input		UINT		●		
10070	0x2046	0x47	PES_Input	PES_Output	UINT		●		●
10071	0x2046	0x48	LP1_Input	LP1_Output	UINT		●		●
10072	0x2046	0x49	CP1_Input	CP1_Output	INT		●		●
10073	0x2046	0x4A	LP2_Input	LP2_Output	UINT		●		●
10074	0x2046	0x4B	CP2_Input	CP2_Output	INT		●		●
10075	0x2046	0x4C	IBRA_Input	IBRA_Output	UINT		●		●
12301	0x205D	0x02	HSO_Input	HSO_Output	UINT		●		●
12302	0x205D	0x03	CLO_Input	CLO_Output	UINT		●		●
12303	0x205D	0x04	COF_Input	COF_Output	UINT		●		●
12304	0x205D	0x05	COR_Input	COR_Output	UINT		●		●
12305	0x205D	0x06	OSP_Input	OSP_Output	UINT		●		●
12306	0x205D	0x07	SCL_Input	SCL_Output	UINT		●		●
12307	0x205D	0x08	TOS_Input	TOS_Output	UINT		●		●
12311	0x205D	0x0C	DLD_Input	DLD_Output	UINT		●		●

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
12312	0x205D	0x0D	TLD_Input	TLD_Output	INT		●		●
12313	0x205D	0x0E	DLB_Input	DLB_Output	UINT		●		●
12321	0x205D	0x16	RSD_Input	RSD_Output	UINT		●		●
12322	0x205D	0x17	RSTL_Input	RSTL_Output	UINT		●		●
Encoder									
5604	0x201A	0x05	PGI_Input	PGI_Output	UINT		●		●
5605	0x201A	0x06	ENC_Input	ENC_Output	UINT		●		●
5606	0x201A	0x07	ENU_Input	ENU_Output	UINT		●		●
5607	0x201A	0x08	ECC_Input	ECC_Output	UINT		●		●
5608	0x201A	0x09	ENS_Input	ENS_Output	UINT		●		●
5609	0x201A	0x0A	ECT_Input	ECT_Output	UINT		●		●
5610	0x201A	0x0B	PDI_Input	PDI_Output	UINT		●		●
5612	0x201A	0x0D	ENF_Input		UINT		●		
5613	0x201A	0x0E	RPPN_Input	RPPN_Output	UINT		●		●
5615	0x201A	0x10	UECP_Input	UECP_Output	UINT		●		●
5616	0x201A	0x11	UECV_Input	UECV_Output	UINT		●		●
5617	0x201A	0x12	UELC_Input	UELC_Output	UINT		●		●
5618	0x201A	0x13	ENRI_Input	ENRI_Output	UINT		●		●
5619	0x201A	0x14	TRES_Input	TRES_Output	UINT		●		●
5620	0x201A	0x15	SSCD_Input	SSCD_Output	UINT		●		●
5621	0x201A	0x16	SSCP_Input	SSCP_Output	UINT		●		●
5622	0x201A	0x17	SSFS_Input	SSFS_Output	INT		●		●
5623	0x201A	0x18	ENMR_Input	ENMR_Output	INT		●		●
5624	0x201A	0x19	ENTR_Input	ENTR_Output	INT		●		●
5627	0x201A	0x1C	ENSP_Input	ENSP_Output	UINT		●		●
5628	0x201A	0x1D	RPOS_Input	RPOS_Output	UINT		●		●
5629	0x201A	0x1E	REFQ_Input	REFQ_Output	UINT		●		●
5630	0x201A	0x1F	FFA_Input	FFA_Output	UINT		●		●
5631	0x201A	0x20	FFR_Input	FFR_Output	UINT		●		●
5632	0x201A	0x21	ABMF_Input	ABMF_Output	UINT		●		●
5670	0x201A	0x47	EECP_Input	EECP_Output	UINT		●		●
5671	0x201A	0x48	EPGI_Input	EPGI_Output	UINT		●		●
5672	0x201A	0x49	EELC_Input	EELC_Output	UINT		●		●
5677	0x201A	0x4E	EENU_Input	EENU_Output	UINT		●		●
5678	0x201A	0x4F	EERI_Input	EERI_Output	UINT		●		●
5679	0x201A	0x50	EECV_Input	EECV_Output	UINT		●		●
5698	0x201A	0x63	ENCR_Input		UINT		●		
5699	0x201A	0x64	ENCE_Input		UINT		●		
5662	0x201A	0x3F	THER_Input		INT		●		
5663	0x201A	0x40	THEV_Input		INT	●	●		
5661	0x201A	0x3E	THET_Input	THET_Output	UINT		●		●
5664	0x201A	0x41	THEA_Input	THEA_Output	INT		●		●
5665	0x201A	0x42	THEF_Input	THEF_Output	INT		●		●
11240	0x2052	0x29	TOST_Input	TOST_Output	UINT		●		●
Access									
7122	0x2029	0x17	ATR_Input	ATR_Output	UINT		●		●
7123	0x2029	0x18	TAR_Input	TAR_Output	UINT		●		●
7124	0x2029	0x19	RSF_Input	RSF_Output	UINT		●		●
7125	0x2029	0x1A	INH_Input	INH_Output	UINT		●		●
7128	0x2029	0x1D	RP_Input	RP_Output	UINT		●		●
7129	0x2029	0x1E	RPA_Input	RPA_Output	UINT		●		●
8401	0x2036	0x02	CHCF_Input	CHCF_Output	UINT		●		●
8402	0x2036	0x03	COP_Input	COP_Output	UINT		●		●
13529	0x2069	0x1E	BMP_Input	BMP_Output	UINT		●		●
8403	0x2036	0x04	CSB_Input	CSB_Output	UINT		●		●
8411	0x2036	0x0C	RFC_Input	RFC_Output	UINT		●		●
8412	0x2036	0x0D	RCB_Input	RCB_Output	UINT		●		●
8413	0x2036	0x0E	FR1_Input	FR1_Output	UINT		●		●
8414	0x2036	0x0F	FR2_Input	FR2_Output	UINT		●		●
8415	0x2036	0x10	FR1B_Input	FR1B_Output	UINT		●		●
8421	0x2036	0x16	CCS_Input	CCS_Output	UINT		●		●
8423	0x2036	0x18	CD1_Input	CD1_Output	UINT		●		●
8424	0x2036	0x19	CD2_Input	CD2_Output	UINT		●		●
9238	0x203E	0x27	TRI_Input	TRI_Output	UINT		●		●
9221	0x203E	0x16	TR1_Input	TR1_Output	UINT		●		●
9239	0x203E	0x28	TR2_Input	TR2_Output	UINT		●		●
8441	0x2036	0x2A	CRC_Input		UINT		●		
8442	0x2036	0x2B	CCC_Input		UINT		●		
8491	0x2036	0x5C	SPM_Input	SPM_Output	UINT		●		●
11101	0x2051	0x02	TCC_Input	TCC_Output	UINT		●		●
11102	0x2051	0x03	TCT_Input	TCT_Output	UINT		●		●
11103	0x2051	0x04	RUN_Input	RUN_Output	UINT		●		●
11104	0x2051	0x05	FRD_Input	FRD_Output	UINT		●		●

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
11105	0x2051	0x06	RRS_Input	RRS_Output	UINT		●		●
11110	0x2051	0x0B	JOG_Input	JOG_Output	UINT		●		●
11111	0x2051	0x0C	JGF_Input	JGF_Output	UINT		●		●
11112	0x2051	0x0D	JGT_Input	JGT_Output	UINT		●		●
Power unit									
13801	0x206C	0x02	URES_Input	URES_Output	UINT		●		●
13802	0x206C	0x03	USL_Input	USL_Output	UINT		●		●
13803	0x206C	0x04	USB_Input	USB_Output	UINT		●		●
13804	0x206C	0x05	UST_Input	UST_Output	UINT		●		●
13811	0x206C	0x0C	UPL_Input	UPL_Output	UINT		●		●
13812	0x206C	0x0D	TBS_Input	TBS_Output	UINT		●		●
13813	0x206C	0x0E	TSM_Input	TSM_Output	UINT		●		●
13814	0x206C	0x0F	STM_Input	STM_Output	UINT		●		●
14101	0x206F	0x02	VBR_Input	VBR_Output	UINT		●		●
14102	0x206F	0x03	BBA_Input	BBA_Output	UINT		●		●
14111	0x206F	0x0C	BRO_Input	BRO_Output	UINT		●		●
14112	0x206F	0x0D	BRP_Input	BRP_Output	UINT		●		●
14113	0x206F	0x0E	BRV_Input	BRV_Output	UINT		●		●
14115	0x206F	0x10	BRTC_Input	BRTC_Output	UINT		●		●
14117	0x206F	0x12	BRC_Input	BRC_Output	UINT		●		●
3102	0x2001	0x03	SFR_Input	SFR_Output	UINT		●		●
3101	0x2001	0x02	SFT_Input	SFT_Output	UINT		●		●
3109	0x2001	0x0A	OFI_Input	OFI_Output	UINT		●		●
3107	0x2001	0x08	NRD_Input	NRD_Output	UINT		●		●
12601	0x2060	0x02	SVL_Input	SVL_Output	UINT		●		●
12602	0x2060	0x03	SOP_Input	SOP_Output	UINT		●		●
Motor management									
9607	0x2042	0x08	CTT_Input	CTT_Output	UINT		●		●
13401	0x2068	0x02	PHR_Input	PHR_Output	UINT		●		●
9629	0x2042	0x1E	SPGU_Input	SPGU_Output	UINT		●		●
12403	0x205E	0x04	U1_Input	U1_Output	UINT		●		●
12404	0x205E	0x05	F1_Input	F1_Output	UINT		●		●
12405	0x205E	0x06	U2_Input	U2_Output	UINT		●		●
12406	0x205E	0x07	F2_Input	F2_Output	UINT		●		●
12407	0x205E	0x08	U3_Input	U3_Output	UINT		●		●
12408	0x205E	0x09	F3_Input	F3_Output	UINT		●		●
12409	0x205E	0x0A	U4_Input	U4_Output	UINT		●		●
12410	0x205E	0x0B	F4_Input	F4_Output	UINT		●		●
12411	0x205E	0x0C	U5_Input	U5_Output	UINT		●		●
12412	0x205E	0x0D	F5_Input	F5_Output	UINT		●		●
9106	0x203D	0x07	SSL_Input	SSL_Output	UINT		●		●
9103	0x203D	0x04	SPG_Input	SPG_Output	UINT		●		●
9104	0x203D	0x05	SIT_Input	SIT_Output	UINT		●		●
9105	0x203D	0x06	SFC_Input	SFC_Output	UINT		●		●
9620	0x2042	0x15	FLG_Input	FLG_Output	UINT		●		●
9621	0x2042	0x16	STA_Input	STA_Output	UINT		●		●
9625	0x2042	0x1A	SLP_Input	SLP_Output	UINT		●		●
9623	0x2042	0x18	UFR_Input	UFR_Output	UINT		●		●
13901	0x206D	0x02	FLI_Input	FLI_Output	UINT		●		●
13902	0x206D	0x03	FLU_Input	FLU_Output	UINT		●		●
13910	0x206D	0x0B	BOA_Input	BOA_Output	UINT		●		●
13911	0x206D	0x0C	FAB_Input	FAB_Output	UINT		●		●
13912	0x206D	0x0D	BOO_Input	BOO_Output	INT		●		●
13913	0x206D	0x0E	BOO2_Input	BOO2_Output	INT		●		●
9107	0x203D	0x08	JEST_Input		UINT		●		
9108	0x203D	0x09	JAPL_Input	JAPL_Output	UINT		●		●
9109	0x203D	0x0A	JMUL_Input		UINT		●		
9110	0x203D	0x0B	FFP_Input	FFP_Output	UINT		●		●
9111	0x203D	0x0C	FFV_Input	FFV_Output	UINT		●		●
9112	0x203D	0x0D	JACO_Input	JACO_Output	UINT		●		●
9115	0x203D	0x10	FFH_Input	FFH_Output	UINT		●		●
9116	0x203D	0x11	CRTF_Input	CRTF_Output	UINT		●		●
9118	0x203D	0x13	CRFA_Input	CRFA_Output	UINT		●		●
9120	0x203D	0x15	NFA_Input	NFA_Output	UINT		●		●
9121	0x203D	0x16	NFF1_Input	NFF1_Output	UINT		●		●
9122	0x203D	0x17	NFB1_Input	NFB1_Output	UINT		●		●
9123	0x203D	0x18	NFD1_Input	NFD1_Output	UINT		●		●
9124	0x203D	0x19	NFF2_Input	NFF2_Output	UINT		●		●
9125	0x203D	0x1A	NFB2_Input	NFB2_Output	UINT		●		●
9126	0x203D	0x1B	NFD2_Input	NFD2_Output	UINT		●		●
9130	0x203D	0x1F	TEFF_Input	TEFF_Output	UINT		●		●
9220	0x203E	0x15	TSS_Input	TSS_Output	UINT		●		●
9222	0x203E	0x17	TSD_Input	TSD_Output	UINT		●		●

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
9242	0x203E	0x2B	HTQ_Input	HTQ_Output	UINT		●		●
9243	0x203E	0x2C	LTQ_Input	LTQ_Output	UINT		●		●
9226	0x203E	0x1B	TRP_Input	TRP_Output	UINT		●		●
9223	0x203E	0x18	DBN_Input	DBN_Output	UINT		●		●
9224	0x203E	0x19	DBP_Input	DBP_Output	UINT		●		●
9225	0x203E	0x1A	TRT_Input	TRT_Output	UINT		●		●
9227	0x203E	0x1C	TST_Input	TST_Output	UINT		●		●
9228	0x203E	0x1D	TOB_Input	TOB_Output	UINT		●		●
9229	0x203E	0x1E	RTO_Input	RTO_Output	UINT		●		●
9230	0x203E	0x1F	SPT_Input	SPT_Output	UINT		●		●
9233	0x203E	0x22	TQR_Input	TQR_Output	UINT		●		●
9234	0x203E	0x23	TQOP_Input	TQOP_Output	UINT		●		●
9235	0x203E	0x24	TQO_Input	TQO_Output	UINT		●		●
9236	0x203E	0x25	TRF_Input	TRF_Output	UINT		●		●
9237	0x203E	0x26	TRW_Input	TRW_Output	UINT		●		●
13925	0x206D	0x1A	AST_Input	AST_Output	UINT		●		●
13927	0x206D	0x1C	ASOD_Input		UINT		●		
9645	0x2042	0x2E	SMOT_Input		UINT		●		
9676	0x2042	0x4D	RDAE_Input		INT		●		
Axis management									
3112	0x2001	0x0D	STRT_Input	STRT_Output	UINT		●		●
3108	0x2001	0x09	RIN_Input	RIN_Output	UINT		●		●
3103	0x2001	0x04	TFR_Input	TFR_Output	UINT		●		●
3104	0x2001	0x05	HSP_Input	HSP_Output	UINT		●		●
15101	0x2079	0x02	SH2_Input	SH2_Output	UINT		●		●
15102	0x2079	0x03	SH4_Input	SH4_Output	UINT		●		●
15109	0x2079	0x0A	HSU_Input		UINT		●		
15110	0x2079	0x0B	HSP2_Input	HSP2_Output	UINT		●		●
15111	0x2079	0x0C	HSP3_Input	HSP3_Output	UINT		●		●
15112	0x2079	0x0D	HSP4_Input	HSP4_Output	UINT		●		●
3105	0x2001	0x06	LSP_Input	LSP_Output	UINT		●		●
3106	0x2001	0x07	BSP_Input	BSP_Output	UINT		●		●
11701	0x2057	0x02	TLS_Input	TLS_Output	UINT		●		●
11702	0x2057	0x03	SLE_Input	SLE_Output	UINT		●		●
9001	0x203C	0x02	ACC_Input	ACC_Output	UINT		●		●
9002	0x203C	0x03	DEC_Input	DEC_Output	UINT		●		●
9003	0x203C	0x04	BRA_Input	BRA_Output	UINT		●		●
9004	0x203C	0x05	RPT_Input	RPT_Output	UINT		●		●
9005	0x203C	0x06	TA1_Input	TA1_Output	UINT		●		●
9006	0x203C	0x07	TA2_Input	TA2_Output	UINT		●		●
9007	0x203C	0x08	TA3_Input	TA3_Output	UINT		●		●
9008	0x203C	0x09	TA4_Input	TA4_Output	UINT		●		●
9010	0x203C	0x0B	RPS_Input	RPS_Output	UINT		●		●
9011	0x203C	0x0C	FRT_Input	FRT_Output	UINT		●		●
9012	0x203C	0x0D	AC2_Input	AC2_Output	UINT		●		●
9013	0x203C	0x0E	DE2_Input	DE2_Output	UINT		●		●
9020	0x203C	0x15	INR_Input	INR_Output	UINT		●		●
11201	0x2052	0x02	STT_Input	STT_Output	UINT		●		●
11202	0x2052	0x03	NST_Input	NST_Output	UINT		●		●
11203	0x2052	0x04	DCI_Input	DCI_Output	UINT		●		●
11204	0x2052	0x05	FST_Input	FST_Output	UINT		●		●
11210	0x2052	0x0B	IDC_Input	IDC_Output	UINT		●		●
11211	0x2052	0x0C	TDC_Input	TDC_Output	UINT		●		●
11212	0x2052	0x0D	IDC2_Input	IDC2_Output	UINT		●		●
11213	0x2052	0x0E	TDI_Input	TDI_Output	UINT		●		●
11220	0x2052	0x15	FFT_Input	FFT_Output	UINT		●		●
11230	0x2052	0x1F	DCF_Input	DCF_Output	UINT		●		●
10401	0x204A	0x02	ADC_Input	ADC_Output	UINT		●		●
10402	0x204A	0x03	TDC1_Input	TDC1_Output	UINT		●		●
10403	0x204A	0x04	SDC1_Input	SDC1_Output	UINT		●		●
10404	0x204A	0x05	TDC2_Input	TDC2_Output	UINT		●		●
10405	0x204A	0x06	SDC2_Input	SDC2_Output	UINT		●		●
10499	0x204A	0x64	TAFI_Input	TAFI_Output	UINT		●		●
3110	0x2001	0x0B	FLR_Input	FLR_Output	UINT		●		●
3111	0x2001	0x0C	VCB_Input	VCB_Output	UINT		●		●
3113	0x2001	0x0E	COFM_Input	COFM_Output	UINT		●		●
3114	0x2001	0x0F	SF2P_Input	SF2P_Output	UINT		●		●
3115	0x2001	0x10	SF3P_Input	SF3P_Output	UINT		●		●
3130	0x2001	0x1F	FFM_Input	FFM_Output	UINT		●		●
11301	0x2053	0x02	JPF_Input	JPF_Output	UINT		●		●
11302	0x2053	0x03	JF2_Input	JF2_Output	UINT		●		●
11303	0x2053	0x04	JF3_Input	JF3_Output	UINT		●		●
Load management									

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
14401	0x2072	0x02	SRB_Input	SRB_Output	UINT		●		●
14411	0x2072	0x0C	ULT_Input	ULT_Output	UINT		●		●
14412	0x2072	0x0D	UDL_Input	UDL_Output	UINT		●		●
14413	0x2072	0x0E	FTU_Input	FTU_Output	UINT		●		●
14414	0x2072	0x0F	RMUD_Input	RMUD_Output	UINT		●		●
14415	0x2072	0x10	LUL_Input	LUL_Output	UINT		●		●
14416	0x2072	0x11	LUN_Input	LUN_Output	UINT		●		●
14421	0x2072	0x16	TOL_Input	TOL_Output	UINT		●		●
14422	0x2072	0x17	ODL_Input	ODL_Output	UINT		●		●
14423	0x2072	0x18	FTO_Input	FTO_Output	UINT		●		●
14425	0x2072	0x1A	LOC_Input	LOC_Output	UINT		●		●
Fault behavior									
7002	0x2028	0x03	IPL_Input	IPL_Output	UINT		●		●
9611	0x2042	0x0C	OPL_Input	OPL_Output	UINT		●		●
7004	0x2028	0x05	STP_Input	STP_Output	UINT		●		●
7005	0x2028	0x06	SDD_Input	SDD_Output	UINT		●		●
7006	0x2028	0x07	EPL_Input	EPL_Output	UINT		●		●
7008	0x2028	0x09	OHL_Input	OHL_Output	UINT		●		●
7009	0x2028	0x0A	OLL_Input	OLL_Output	UINT		●		●
7010	0x2028	0x0B	SLL_Input	SLL_Output	UINT		●		●
7011	0x2028	0x0C	COL_Input	COL_Output	UINT		●		●
7012	0x2028	0x0D	TNL_Input	TNL_Output	UINT		●		●
7017	0x2028	0x12	LFL1_Input	LFL1_Output	UINT		●		●
7013	0x2028	0x0E	LFL3_Input	LFL3_Output	UINT		●		●
7015	0x2028	0x10	CLL_Input	CLL_Output	UINT		●		●
7020	0x2028	0x15	DCFF_Input	DCFF_Output	UINT		●		●
7021	0x2028	0x16	ETHL_Input	ETHL_Output	UINT		●		●
7030	0x2028	0x1F	GRFL_Input	GRFL_Output	UINT		●		●
7080	0x2028	0x51	LFF_Input	LFF_Output	UINT		●		●
7081	0x2028	0x52	ODT_Input	ODT_Output	UINT		●		●
13239	0x2066	0x28	TH1B_Input	TH1B_Output	UINT		●		●
13241	0x2066	0x2A	TH3B_Input	TH3B_Output	UINT		●		●
5666	0x201A	0x43	THEB_Input	THEB_Output	UINT		●		●
7131	0x2029	0x20	ETF_Input	ETF_Output	UINT		●		●
7132	0x2029	0x21	CNF_Input		UINT		●		
7134	0x2029	0x23	ILF1_Input		UINT		●		
7136	0x2029	0x25	ETHF_Input		UINT		●		
7137	0x2029	0x26	INF6_Input		UINT		●		
7138	0x2029	0x27	INFG_Input		UINT		●		
7139	0x2029	0x28	INFH_Input		UINT		●		
7142	0x2029	0x2B	INFJ_Input		UINT		●		
User-defined threshold values									
11001	0x2050	0x02	CTD_Input	CTD_Output	UINT		●		●
11002	0x2050	0x03	TTD_Input	TTD_Output	UINT		●		●
11003	0x2050	0x04	FTD_Input	FTD_Output	UINT		●		●
11004	0x2050	0x05	F2D_Input	F2D_Output	UINT		●		●
11006	0x2050	0x07	TTD2_Input	TTD2_Output	UINT		●		●
11007	0x2050	0x08	TTD3_Input	TTD3_Output	UINT		●		●
11008	0x2050	0x09	TTD4_Input	TTD4_Output	UINT		●		●
11009	0x2050	0x0A	THA_Input	THA_Output	UINT		●		●
11010	0x2050	0x0B	CTDL_Input	CTDL_Output	UINT		●		●
11011	0x2050	0x0C	FTDL_Input	FTDL_Output	UINT		●		●
11012	0x2050	0x0D	F2DL_Input	F2DL_Output	UINT		●		●
11013	0x2050	0x0E	RTD_Input	RTD_Output	UINT		●		●
11014	0x2050	0x0F	RTDL_Input	RTDL_Output	UINT		●		●
11015	0x2050	0x10	TTL_Input	TTL_Output	INT		●		●
11016	0x2050	0x11	TTH_Input	TTH_Output	INT		●		●
User-defined alarm groups									
12821	0x2062	0x16	AG11_Input	AG11_Output	UINT		●		●
12822	0x2062	0x17	AG21_Input	AG21_Output	UINT		●		●
12823	0x2062	0x18	AG31_Input	AG31_Output	UINT		●		●
12824	0x2062	0x19	AG41_Input	AG41_Output	UINT		●		●
12825	0x2062	0x1A	AG51_Input	AG51_Output	UINT		●		●
12826	0x2062	0x1B	AG12_Input	AG12_Output	UINT		●		●
12827	0x2062	0x1C	AG22_Input	AG22_Output	UINT		●		●
12828	0x2062	0x1D	AG32_Input	AG32_Output	UINT		●		●
12829	0x2062	0x1E	AG42_Input	AG42_Output	UINT		●		●
12830	0x2062	0x1F	AG52_Input	AG52_Output	UINT		●		●
12831	0x2062	0x20	AG13_Input	AG13_Output	UINT		●		●
12832	0x2062	0x21	AG23_Input	AG23_Output	UINT		●		●
12833	0x2062	0x22	AG33_Input	AG33_Output	UINT		●		●
12834	0x2062	0x23	AG43_Input	AG43_Output	UINT		●		●
12835	0x2062	0x24	AG53_Input	AG53_Output	UINT		●		●

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
12836	0x2062	0x25	AG14_Input	AG14_Output	UINT		●		●
12837	0x2062	0x26	AG24_Input	AG24_Output	UINT		●		●
12838	0x2062	0x27	AG34_Input	AG34_Output	UINT		●		●
12839	0x2062	0x28	AG44_Input	AG44_Output	UINT		●		●
12840	0x2062	0x29	AG54_Input	AG54_Output	UINT		●		●
12841	0x2062	0x2A	AG15_Input	AG15_Output	UINT		●		●
12842	0x2062	0x2B	AG25_Input	AG25_Output	UINT		●		●
12843	0x2062	0x2C	AG35_Input	AG35_Output	UINT		●		●
12844	0x2062	0x2D	AG45_Input	AG45_Output	UINT		●		●
12845	0x2062	0x2E	AG55_Input	AG55_Output	UINT		●		●
12846	0x2062	0x2F	AG16_Input	AG16_Output	UINT		●		●
12847	0x2062	0x30	AG26_Input	AG26_Output	UINT		●		●
12848	0x2062	0x31	AG36_Input	AG36_Output	UINT		●		●
12849	0x2062	0x32	AG46_Input	AG46_Output	UINT		●		●
12850	0x2062	0x33	AG56_Input	AG56_Output	UINT		●		●
12860	0x2062	0x3D	ALR1_Input		UINT		●		
12861	0x2062	0x3E	ALR2_Input		UINT		●		
12862	0x2062	0x3F	ALR3_Input		UINT		●		
12863	0x2062	0x40	ALR4_Input		UINT		●		
12864	0x2062	0x41	ALR5_Input		UINT		●		
12865	0x2062	0x42	ALR6_Input		UINT		●		
12867	0x2062	0x44	ALR8_Input		UINT		●		
12868	0x2062	0x45	ALR9_Input		UINT		●		
12871	0x2062	0x48	AG18_Input	AG18_Output	UINT		●		●
12872	0x2062	0x49	AG28_Input	AG28_Output	UINT		●		●
12873	0x2062	0x4A	AG38_Input	AG38_Output	UINT		●		●
12874	0x2062	0x4B	AG48_Input	AG48_Output	UINT		●		●
12875	0x2062	0x4C	AG58_Input	AG58_Output	UINT		●		●
12879	0x2062	0x50	ALCT_Input		UINT		●		
12881	0x2062	0x52	AG19_Input	AG19_Output	UINT		●		●
12882	0x2062	0x53	AG29_Input	AG29_Output	UINT		●		●
12883	0x2062	0x54	AG39_Input	AG39_Output	UINT		●		●
12884	0x2062	0x55	AG49_Input	AG49_Output	UINT		●		●
12885	0x2062	0x56	AG59_Input	AG59_Output	UINT		●		●
12890	0x2062	0x5B	LALR_Input		UINT		●		
12891	0x2062	0x5C	LAMD_Input		UINT		●		
12892	0x2062	0x5D	LADM_Input		UINT		●		
12895	0x2062	0x60	AALI_Input		UINT		●		
12896	0x2062	0x61	AALR_Input		UINT		●		
12897	0x2062	0x62	AAMD_Input		UINT		●		
12898	0x2062	0x63	AADM_Input		UINT		●		
Handheld settings									
64002	0x2262	0x03	PST_Input	PST_Output	UINT		●		●
64035	0x2262	0x24	PVIS_Input	PVIS_Output	UINT		●		●
13501	0x2069	0x02	FN1_Input	FN1_Output	UINT		●		●
13502	0x2069	0x03	FN2_Input	FN2_Output	UINT		●		●
13503	0x2069	0x04	FN3_Input	FN3_Output	UINT		●		●
13585	0x2069	0x56	FN4_Input	FN4_Output	UINT		●		●
13521	0x2069	0x16	FJOG_Input	FJOG_Output	UINT		●		●
13522	0x2069	0x17	FPS1_Input	FPS1_Output	UINT		●		●
13523	0x2069	0x18	FPS2_Input	FPS2_Output	UINT		●		●
13524	0x2069	0x19	FPR1_Input	FPR1_Output	UINT		●		●
13525	0x2069	0x1A	FPR2_Input	FPR2_Output	UINT		●		●
13526	0x2069	0x1B	FUSP_Input	FUSP_Output	UINT		●		●
13527	0x2069	0x1C	FDSP_Input	FDSP_Output	UINT		●		●
Special function: "High frequency injection"(synchronous motors)									
15600	0x207E	0x01	HFI_Input	HFI_Output	UINT		●		●
15601	0x207E	0x02	FRI_Input	FRI_Output	UINT		●		●
15603	0x207E	0x04	SPB_Input	SPB_Output	UINT		●		●
15605	0x207E	0x06	ILR_Input	ILR_Output	UINT		●		●
15606	0x207E	0x07	SIR_Input	SIR_Output	UINT		●		●
15607	0x207E	0x08	MCR_Input	MCR_Output	UINT		●		●
15608	0x207E	0x09	PEC_Input	PEC_Output	UINT		●		●
15699	0x207E	0x64	APPT_Input	APPT_Output	UINT		●		●
Special function: "Controlling the motor contactor"									
13101	0x2065	0x02	DBS_Input	DBS_Output	UINT		●		●
13102	0x2065	0x03	DAS_Input	DAS_Output	UINT		●		●
13103	0x2065	0x04	RCA_Input	RCA_Output	UINT		●		●
13104	0x2065	0x05	OCC_Input	OCC_Output	UINT		●		●
Special function: "Controlling the line contactor"									
13601	0x206A	0x02	LES_Input	LES_Output	UINT		●		●
13602	0x206A	0x03	LLC_Input	LLC_Output	UINT		●		●
13603	0x206A	0x04	LCT_Input	LCT_Output	UINT		●		●

Modbus	POWERLINK		Name		Data type	Read		Write	
"ADL"	"Index"	"Subindex"	As input	As output		Cyclic	Acyclic	Cyclic	Acyclic
Special function: "Limit switch"									
11601	0x2056	0x02	LAF_Input	LAF_Output	UINT		●		●
11602	0x2056	0x03	LAR_Input	LAR_Output	UINT		●		●
12501	0x205F	0x02	SAF_Input	SAF_Output	UINT		●		●
12502	0x205F	0x03	SAR_Input	SAR_Output	UINT		●		●
12503	0x205F	0x04	DAF_Input	DAF_Output	UINT		●		●
12504	0x205F	0x05	DAR_Input	DAR_Output	UINT		●		●
12505	0x205F	0x06	DSF_Input	DSF_Output	UINT		●		●
11603	0x2056	0x04	LAS_Input	LAS_Output	UINT		●		●
12506	0x205F	0x07	PAS_Input	PAS_Output	UINT		●		●
12507	0x205F	0x08	CLS_Input	CLS_Output	UINT		●		●
12511	0x205F	0x0C	NLS_Input	NLS_Output	UINT		●		●
12521	0x205F	0x16	STD_Input	STD_Output	UINT		●		●
12522	0x205F	0x17	SFD_Input	SFD_Output	UINT		●		●
12523	0x205F	0x18	MSTP_Input	MSTP_Output	UINT		●		●
12524	0x205F	0x19	PRST_Input	PRST_Output	UINT		●		●
Special function: "Load distribution"									
14301	0x2071	0x02	LBA_Input	LBA_Output	UINT		●		●
14302	0x2071	0x03	LBC_Input	LBC_Output	UINT		●		●
14303	0x2071	0x04	LBC1_Input	LBC1_Output	UINT		●		●
14304	0x2071	0x05	LBC2_Input	LBC2_Output	UINT		●		●
14305	0x2071	0x06	LBC3_Input	LBC3_Output	UINT		●		●
14306	0x2071	0x07	LBF_Input	LBF_Output	UINT		●		●
Special function: "PID control"									
8503	0x2037	0x04	PISP_Input		UINT		●		
11901	0x2059	0x02	PIF_Input	PIF_Output	UINT		●		●
11904	0x2059	0x05	PIF1_Input	PIF1_Output	UINT		●		●
11905	0x2059	0x06	PIF2_Input	PIF2_Output	UINT		●		●
11906	0x2059	0x07	PIP1_Input	PIP1_Output	UINT		●		●
11907	0x2059	0x08	PIP2_Input	PIP2_Output	UINT		●		●
11908	0x2059	0x09	PII_Input	PII_Output	UINT		●		●
11909	0x2059	0x0A	PR2_Input	PR2_Output	UINT		●		●
11910	0x2059	0x0B	PR4_Input	PR4_Output	UINT		●		●
11919	0x2059	0x14	TOCT_Input	TOCT_Output	UINT		●		●
11920	0x2059	0x15	RPI_Input	RPI_Output	UINT		●		●
11921	0x2059	0x16	RP2_Input	RP2_Output	UINT		●		●
11922	0x2059	0x17	RP3_Input	RP3_Output	UINT		●		●
11923	0x2059	0x18	RP4_Input	RP4_Output	UINT		●		●
11940	0x2059	0x29	PIC_Input	PIC_Output	UINT		●		●
11941	0x2059	0x2A	RPG_Input	RPG_Output	UINT		●		●
11942	0x2059	0x2B	RIG_Input	RIG_Output	UINT		●		●
11943	0x2059	0x2C	RDG_Input	RDG_Output	UINT		●		●
11944	0x2059	0x2D	PIS_Input	PIS_Output	UINT		●		●
11950	0x2059	0x33	FPI_Input	FPI_Output	UINT		●		●
11951	0x2059	0x34	PSR_Input	PSR_Output	UINT		●		●
11952	0x2059	0x35	POL_Input	POL_Output	INT		●		●
11953	0x2059	0x36	POH_Input	POH_Output	INT		●		●
11954	0x2059	0x37	PIM_Input	PIM_Output	UINT		●		●
11955	0x2059	0x38	SFS_Input	SFS_Output	UINT		●		●
11961	0x2059	0x3E	PAL_Input	PAL_Output	UINT		●		●
11962	0x2059	0x3F	PAH_Input	PAH_Output	UINT		●		●
11963	0x2059	0x40	PER_Input	PER_Output	UINT		●		●
11970	0x2059	0x47	PAU_Input	PAU_Output	UINT		●		●
11980	0x2059	0x51	RPE_Input		INT		●		
11981	0x2059	0x52	RPF_Input		UINT		●		
11982	0x2059	0x53	RPC_Input		UINT		●		
11983	0x2059	0x54	RPO_Input		INT		●		
11984	0x2059	0x55	PRP_Input	PRP_Output	UINT		●		●

7.1.10.7 Minimum cycle time

The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring. It is important to note that very fast cycles reduce the idle time available for handling monitoring, diagnostics and acyclic commands.

Minimum cycle time
400 µs

8 Accessories

8.1 Overview

Material number	Description	Page
Encoder modules		
8I0IFENC.400-1	ACOPOSinverter P86 encoder interface (digital), encoder type / signal: AB, SSI supply voltages: 5, 12, 24 VDC encoder type / signal: ENDAT supply voltages: 5, 12 VDC	471
8I0IFENC.401-1	ACOPOSinverter P86 encoder interface (analog), encoder type / signal: SinCos supply voltages: 5, 12, 24 VDC encoder type / signal: HIPERFACE supply voltages: 12 VDC	
8I0IFENC.402-1	ACOPOSinverter P86 encoder interface, encoder type / signal: Resolver	
8I0IFENC.403-1	ACOPOSinverter P86 encoder interface (HTL), encoder type / signal: AB (push-pull) supply voltages: 12, 15, 24 VDC	
Plain text display		
8I0FM086.400-1	Female-to-female installation kit for ACOPOSinverter plain text display, IP43 protection	480
8I0XD086.400-1	Plain text display for ACOPOSinverter P86, backlight, navigation key, IP43 protection	
Cables and adapters		
8I0XC003.400-1	DC bus cable, 0.18 m, 5 pcs., for ACOPOSinverter	482
8I0XD304.301-1	RJ45 cable, 1 m, for remote use of the display for the ACOPOSinverter	
8I0XD304.303-1	RJ45 cable, 3 m, for remote use of the display for the ACOPOSinverter	
8I0XD304.305-1	RJ45 cable, 5 m, for remote use of the display for the ACOPOSinverter	
8I0XD304.310-1	RJ45 cable, 10 m, for remote use of the display for the ACOPOSinverter	
Optional braking resistors		
8I0BR005.001-1	Braking resistor ohmic value: 5 Ω continuous braking power: 6.90 kW degree of protection (IP): IP23	483
8I0BR008.002-1	Braking resistor ohmic value: 8 Ω continuous braking power: 3.80 kW degree of protection (IP): IP20	
8I0BR010.001-1	Braking resistor ohmic value: 10 Ω continuous braking power: 3.40 kW degree of protection (IP): IP20	
8I0BR016.000-1	Braking resistor ohmic value: 16 Ω continuous braking power: 2.20 kW degree of protection (IP): IP20	
8I0BR028.001-1	Braking resistor ohmic value: 28 Ω continuous braking power: 1.10 kW degree of protection (IP): IP20	
8I0BR060.002-1	Braking resistor ohmic value: 60 Ω continuous braking power: 0.50 kW degree of protection (IP): IP20	
8I0BR100.001-1	Braking resistor ohmic value: 100 Ω continuous braking power: 0.10 kW degree of protection (IP): IP20	
8I0BR100.002-1	Braking resistor ohmic value: 100 Ω continuous braking power: 0.26 kW degree of protection (IP): IP20	
Optional EMC filters		
8I0FT015.200-1	ACOPOSinverter additional EMC input filter 3-phase 15 A, supply voltage: 380 to 480 V, 50/60 Hz	488
8I0FT025.200-1	ACOPOSinverter additional EMC input filter 3-phase 25 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT050.200-1	ACOPOSinverter additional EMC input filter 3-phase 50 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT070.200-1	ACOPOSinverter additional EMC input filter 3-phase 70 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT100.200-1	ACOPOSinverter additional EMC input filter 3-phase 100 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT160.200-1	ACOPOSinverter additional EMC input filter 3-phase 160 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT200.200-1	ACOPOSinverter EMC additional EMC input filter 3-phase 200 A, supply voltage: 380 to 480 V, 50/60 Hz	
Optional EMC kit		
8I0XE086.401-1	EMC installation kit for P86 size 1, power output class: 0.75 to 4 kW (1 to 5 HP)	492
8I0XE086.402-1	EMC installation kit for P86 size 2, power output class: 5.5 to 7.5 kW (7.5 to 10 HP)	
8I0XE086.403-1	EMC installation kit for P86 size 3, power output class: 11 to 22 kW (15 to 30 HP)	
Optional pass-through mounting kit		
8I0PT086.400-1	Pass-through mounting kit for P86 size 3, power output class: 11 to 22 kW (15 to 30 HP)	500
8I0PT086.401-1	Pass-through mounting kit for P86 size 4, power output class: 30 to 37 kW (40 to 50 HP)	
8I0PT086.402-1	Pass-through mounting kit for P86 size 5, power output class: 45 to 75 kW (60 to 100 HP)	
Optional mains choke		
8I0CT004.000-1	ACOPOSinverter mains choke 3-phase, 4 A, 50/60 Hz	515
8I0CT010.000-1	ACOPOSinverter mains choke 3-phase, 10 A, 50/60 Hz	
8I0CT016.000-1	ACOPOSinverter mains choke 3-phase, 17 A, 50/60 Hz	
8I0CT030.000-1	ACOPOSinverter mains choke 3-phase, 30 A, 50/60 Hz	
8I0CT060.000-1	ACOPOSinverter mains choke 3-phase, 60 A, 50/60 Hz	
Fan (replacement parts requirement)		
8I0XF086.401-1	ACOPOSinverter P86 fan kit for size 1, power output class: 0.75 to 4 kW (1 to 5 HP)	518
8I0XF086.402-1	ACOPOSinverter P86 fan kit for size 2, power output class: 5.5 to 7.5 kW (7 to 10 HP)	
8I0XF086.403-1	ACOPOSinverter P86 fan kit for size 3, power output class: 11 to 22 kW (15 to 30 HP)	
8I0XF086.404-1	ACOPOSinverter P86 fan kit for size 4, power output class: 30 to 37 kW (40 to 50 HP)	
8I0XF086.405-1	ACOPOSinverter P86 fan kit for size 5, power output class: 45 to 75 kW (60 to 100 HP)	
Male connector (replacement parts requirement)		
8I0XS086.401-1	ACOPOSinverter P86 connector set size 1, power output class: 0.75 to 4 kW (1 to 5 HP)	524
8I0XS086.402-1	ACOPOSinverter P86 connector set for size 2, power output class: 5.5 to 7.5 kW (7 to 10 HP)	
8I0XS086.403-1	ACOPOSinverter P86 connector set for size 3, power output class: 11 to 22 kW (15 to 30 HP)	

8.2 Encoder modules

8.2.1 Order data

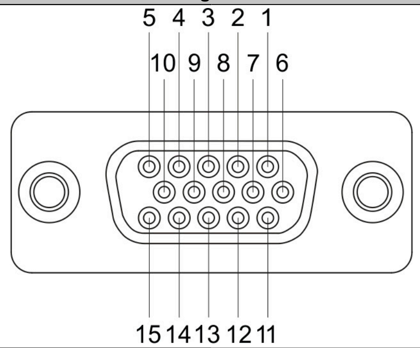
Order number	Short description	Figure
	Interface modules	
8I0IFENC.400-1	ACOPOSinverter P86 encoder interface (digital), encoder type / signal: AB, SSI supply voltages: 5, 12, 24 VDC encoder type / signal: ENDAT supply voltages: 5, 12 VDC	
8I0IFENC.401-1	ACOPOSinverter P86 encoder interface (analog), encoder type / signal: SinCos supply voltages: 5, 12, 24 VDC encoder type / signal: HIPERFACE supply voltages: 12 VDC	
8I0IFENC.402-1	ACOPOSinverter P86 encoder interface, encoder type / signal: Resolver	
8I0IFENC.403-1	ACOPOSinverter P86 encoder interface (HTL), encoder type / signal: AB (push-pull) supply voltages: 12, 15, 24 VDC	

Table 14: 8I0IFENC.400-1, 8I0IFENC.401-1, 8I0IFENC.402-1, 8I0IFENC.403-1 - Order data

8.2.2 Pinout

8.2.2.1 8I0IFENC.400-1

Figure



Pin	Signal	Function	Description
1	DATA_A+	Data channel A	RS422/RS485, R_{in} 121 Ω, max. 12 Mbit/s
2	DATA_A-		
3	ENC+24V_OUT	24 VDC power supply	24 VDC / 100 mA
4	DATA_I+	Data channel I	RS422/RS485, R_{in} 121 Ω, max. 12 Mbit/s
5	DATA_I-		
6	CLK+	Clock signal	
7	ENC+12V_OUT	12 VDC power supply	12 VDC / 100 mA
8	ENC_0V	Reference potential for power supply	-
9	N.C.	-	-
10	DATA_B+	Data channel B	RS422/RS485, R_{in} 121 Ω, max. 12 Mbit/s
11	DATA_B-		
12	TEMP_SENSE+	Temperature sensor +	PTC, PT100, PT1000, KTY84, Klixon
13	TEMP_SENSE-	Temperature sensor -	
14	CLK-	Clock signal	RS422/RS485, R_{in} 121 Ω, max. 12 Mbit/s
15	ENC+5V_OUT	5 VDC power supply	5 VDC / 250 mA
Shield		Total cable shielding for signal lines	The shield is connected via the metal housing in the connector.

Warning!

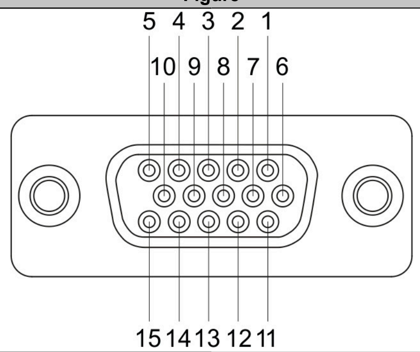
There are two ways to connect an AB encoder with a SUB-D 15 type connector to the inverter. However, the pinout of the optional encoder card (8I0IFENC.400-1) differs from the see "onboard interface (CN3)" on page 90. Encoder attachment cables made for the onboard interface thus cannot be used on the encoder card.

Pin	Twisted wire pair	ABI	SSI	EnDat 2.2	Inputs/Outputs
1	1	Required	Required	Required	Input[2]
2					
3	5[1]	-	-	-	Output
4	3	Optional	-	-	Input
5					
6	4	-	Required	Required	Output
7	5[1]	-	-	-	Output
8	5	Required	Required	Required	-
9	-	-	-	-	-
10	2	Required	-	-	Input
11					
12	6	Optional	Optional	Optional	Input
13					
14	4	-	Required	Required	Output
15	5[1]	-	-	-	Output
Shield		Required	Required	Required	-

1) Wired according to the selected supply voltage.
2) Input/Output for EnDat 2.2

8.2.2.2 8I0IFENC.401-1

Figure



Pin	Signal	Function	Description
1	DATA+	Data channel	RS422/RS485, R_{in} 121 Ω, max. 12 Mbit/s
2	DATA-		
3	N.C.	-	-
4	SIN	Analog sine input	1 Vpp, max. 100 kHz
5	REFSIN	Sine reference	
6	N.C.	-	-
7	ENC+12V_OUT	12 VDC power supply	12 VDC / 100 mA
8	GND	Reference potential for power supply	-
9	COS	Analog cosine input	1 Vpp, max. 100 kHz
10	REFCOS	Cosine reference	
11	N.C.	-	-
12	TEMP_SENSE+	Temperature sensor +	PTC, PT100, PT1000, KTY84, Klixon
13	TEMP_SENSE-	Temperature sensor -	
14	ENC+24V_OUT	24 VDC power supply	24 VDC / 100 mA
15	ENC+5V_OUT	5 VDC power supply	5 VDC / 250 mA
Shield		Total cable shielding for signal lines	The shield is connected via the metal housing in the connector.

Warning!

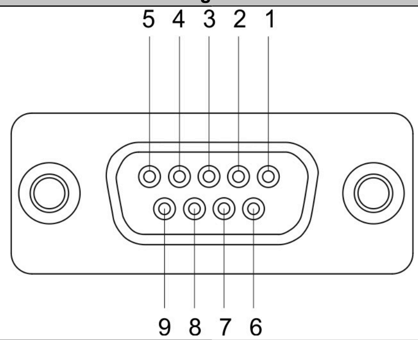
There are two ways to connect a SinCos encoder with a SUB-D 15 type connector to the inverter. However, the pinout of the optional encoder card (8I0IFENC.401-1) differs from the see "onboard interface (CN3)" on page 90. Encoder attachment cables made for the onboard interface thus cannot be used on the encoder card.

Pin	Twisted wire pair	Sine cosine	HIPERFACE	Inputs/Outputs
1	1	-	Required	Input/Output
2				
3	-	-	-	-
4	2	Required	Required	Input
5				
6	-	-	-	-
7	4a 1)	-	-	Output
8	4	-	-	-
9	3	Required	Required	Input
10				
11	-	-	-	-
12	5	Optional	Optional	Input
13				
14	4c 1)	-	-	Output
15	4b 1)	-	-	Output
Shield		Required	Required	-

1) Wired according to the selected supply voltage.

8.2.2.3 8I0IFENC.402-1

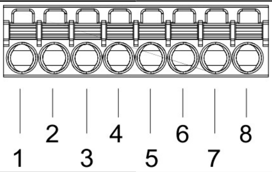
Figure



Pin	Signal	Function	Description
1	N.C.	-	-
2	TEMP+	Temperature sensor +	PTC, PT100, PT1000, KTY84, Klixon
3	COS-	Cosine signal -	-
4	SIN+	Sinus signal +	-
5	REF+	Reference signal +	Excitation, carrier 3 to 12 kHz, 1 kHz steps, 2.4 to 7.7 V_{eff}, protected against overload and short circuit
6	TEMP-	Temperature sensor -	PTC, Pt100, Pt1000, KTY84, Klixon
7	COS+	Cosine signal +	-
8	SIN-	Sinus signal-	-
9	REF-	Reference signal -	Excitation, carrier 3 to 12 kHz, 1 kHz steps, 2.4 to 7.7 V_{eff}, protected against overload and short circuit
Shield		Total cable shielding for signal lines	The shield is connected via the metal housing in the connector.

Pin	Twisted wire pair	Resolver standard signal abbreviation	Direction
1	-	-	-
2	4	-	Input
3	3	S4	Input
4	2	S1	Input
5	1	R2	Output
6	4	-	Input
7	3	S2	Input
8	2	S3	Input
9	1	R1	Output
Shield		-	-

8.2.2.4 8I0IFENC.403-1

Figure			
			
Pin	**Signal**	**Function**	**Description**
1	A+	Channel A	Incremental signal: 12 / 15 / 24 VDC Input impedance: 2 kΩ Maximum frequency: 300 kHz Low level: ≤2 VDC High level: ≥9 VDC
2	A-	/Channel A	
3	B+	Channel B	
4	B-	/Channel B	
5	V+	Software-configurable supply voltage	12 VDC / 200 mA, or 15 VDC / 175 mA, or 24 VDC / 100 mA
6	V+		
7	0 V	Reference potential for power supply	-
8	0 V		
Shield		Total cable shielding for signal lines	The shield is connected via the metal housing in the connector.

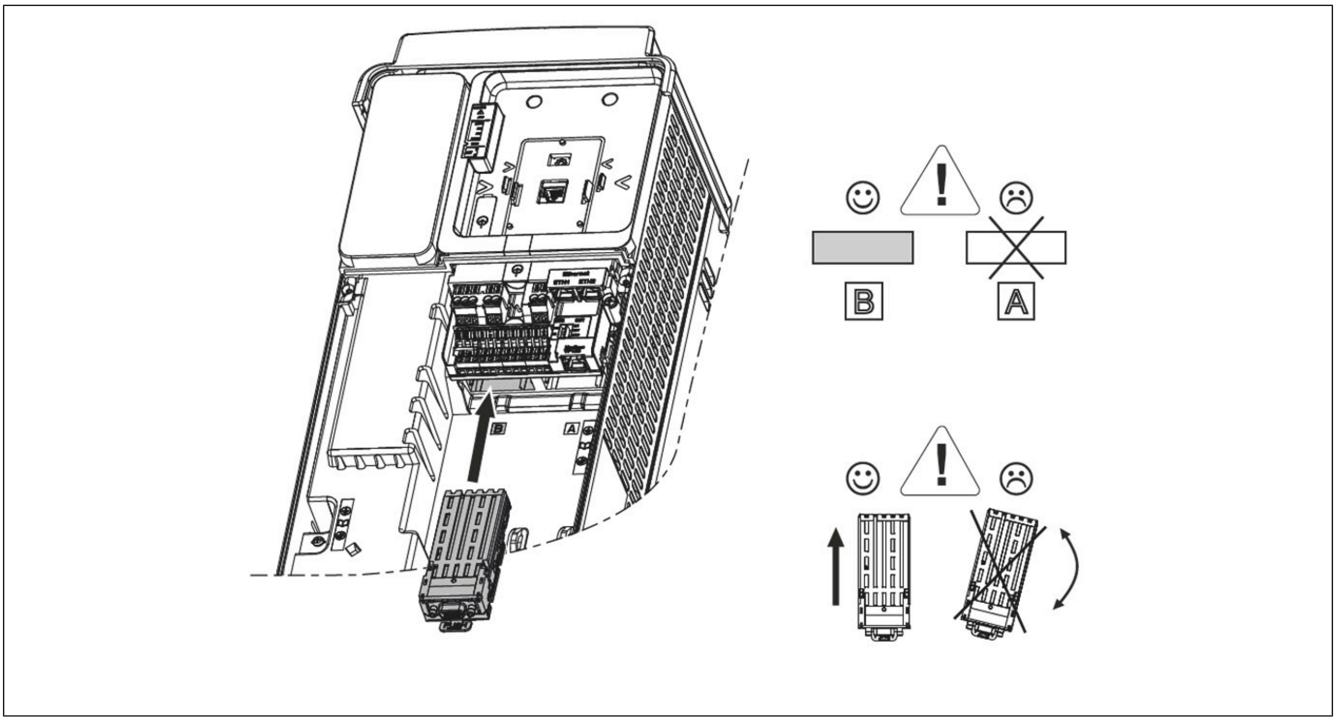
Pin	Twisted wire pair	Push/Pull			Open collector					Input/Output
		A/AB/B diff.	AB single end	A single end	A/AB/B diff.	AB PNP	AB NPN	A PNP	A NPN	
1	1	Required	Required	Required	Required	Required	Required[2]	Required	Required[2]	Input
2		Required	Required[1]	Required[1]	Required	Required[1]	Required	Required[1]	Required	Input
3	2	Required	Required	-	Required	Required	Required[2]	-	-	Input
4		Required	Required[1]	-	Required	Required[1]	Required	-	-	Input
5	3	Required	Required	Required	Required	Required	Required	Required	Required	Output
6	Optional	-	-	-	-	-	Required[2]	-	Required[2]	Output
7	3	Required	Required	Required	Required	Required	Required	Required	Required	Output
8	Optional	-	Required[1]	Required[1]	-	Required[1]	-	Required[1]	-	Output
Shield		Required	Required	Required	Required	Required	Required	Required	Required	-

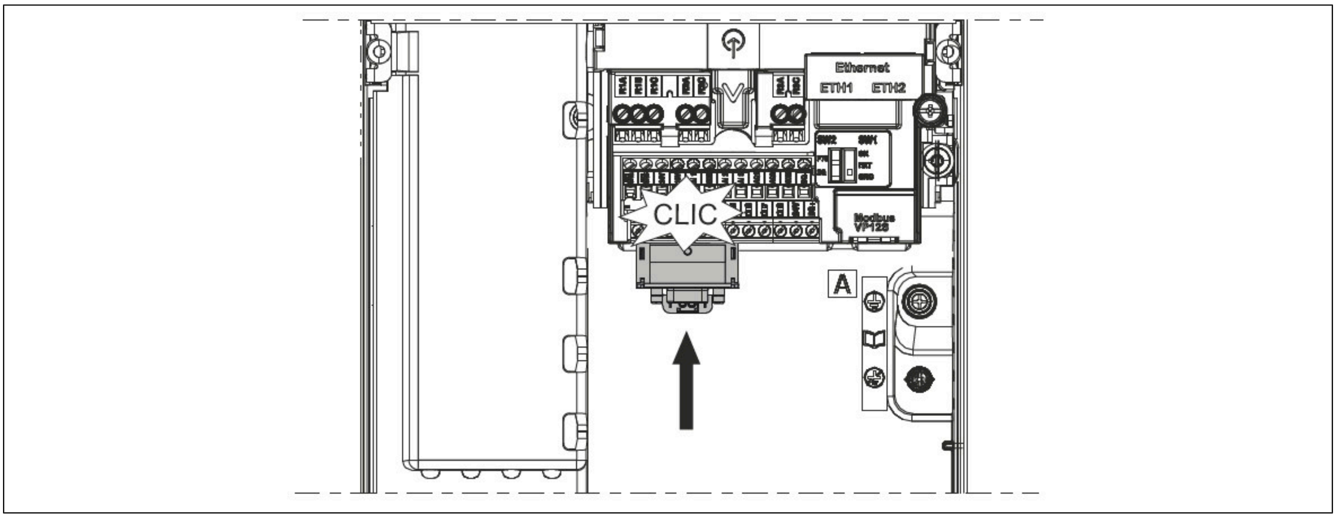
1) The inputs must be wired to the 0 V pins.
2) The inputs must be wired to the V+ pins.

Max. encoder cable length				
Encoder power supply	**Min. cable cross section**	**Total consumption of the encoder**		
		100 mA	**175 mA**	**200 mA**
12 VDC	0.2 mm² (24 AWG)	100 m	50 m	50 m
	0.5 mm² (20 AWG)	250 m	150 m	100 m
	0.75 mm² (18 AWG)	400 m	250 m	200 m
	1 mm² (AWG17)	500 m	300 m	250 m
	1.5 mm² (AWG15)	500 m	500 m	400 m
15 VDC	0.2 mm² (24 AWG)	250 m	150 m	-
	0.5 mm² (20 AWG)	500 m	400 m	-
	0.75 mm² (18 AWG)	500 m	500 m	-
24 VDC	0.2 mm² (24 AWG)	500 m	-	-

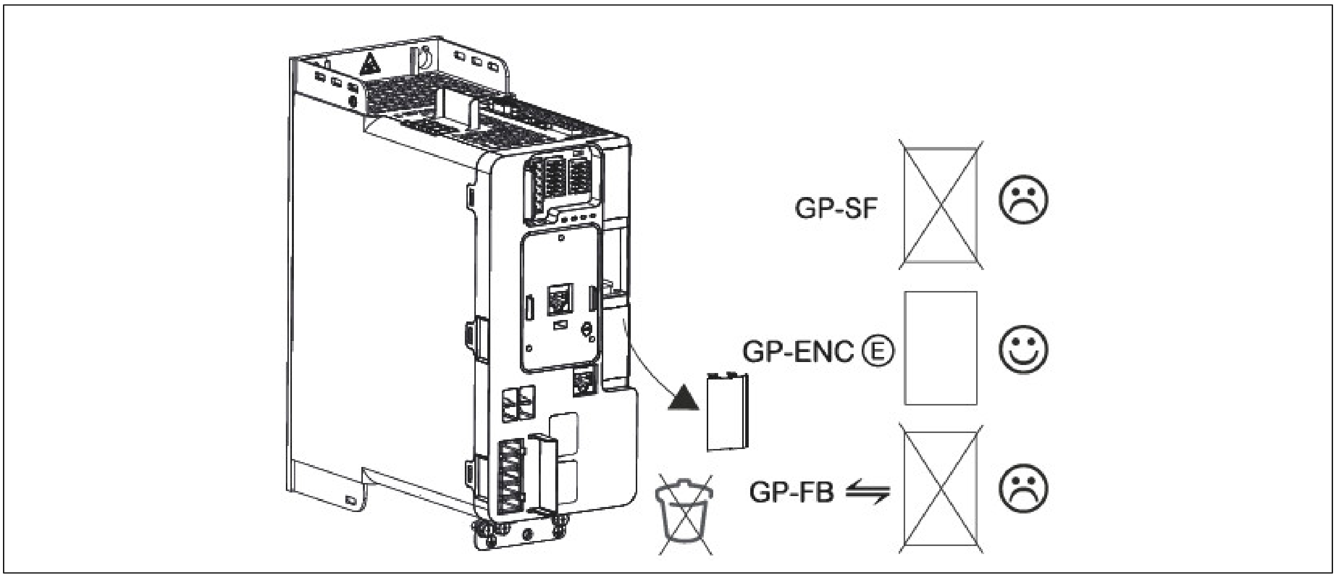
8.2.3 Installation

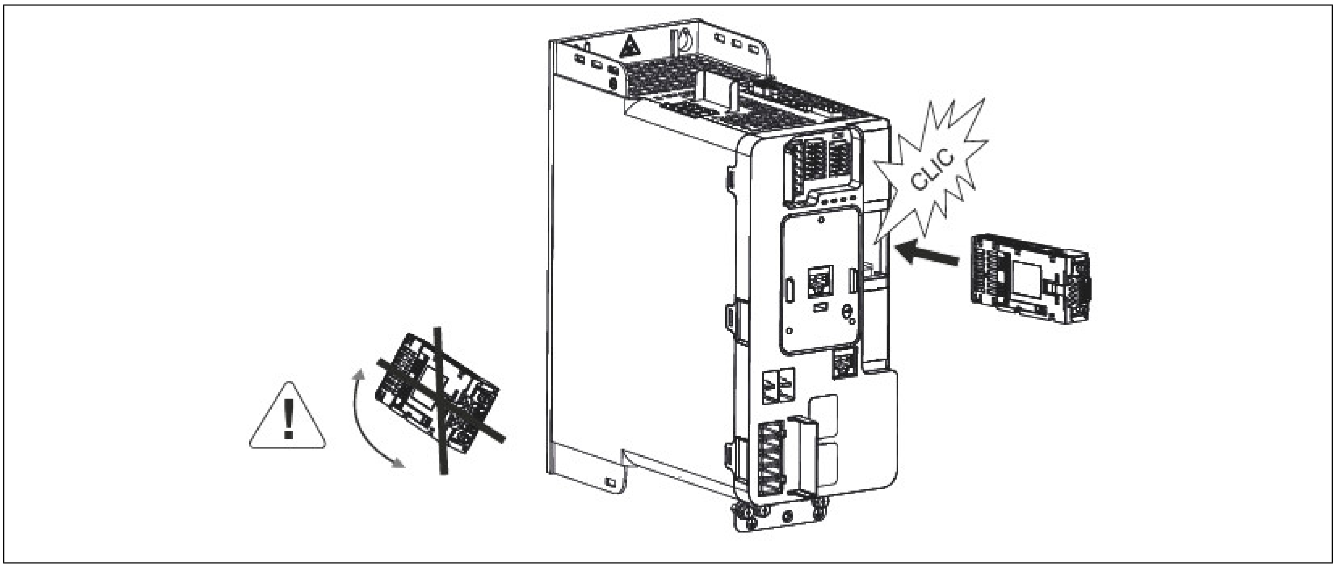
Installation

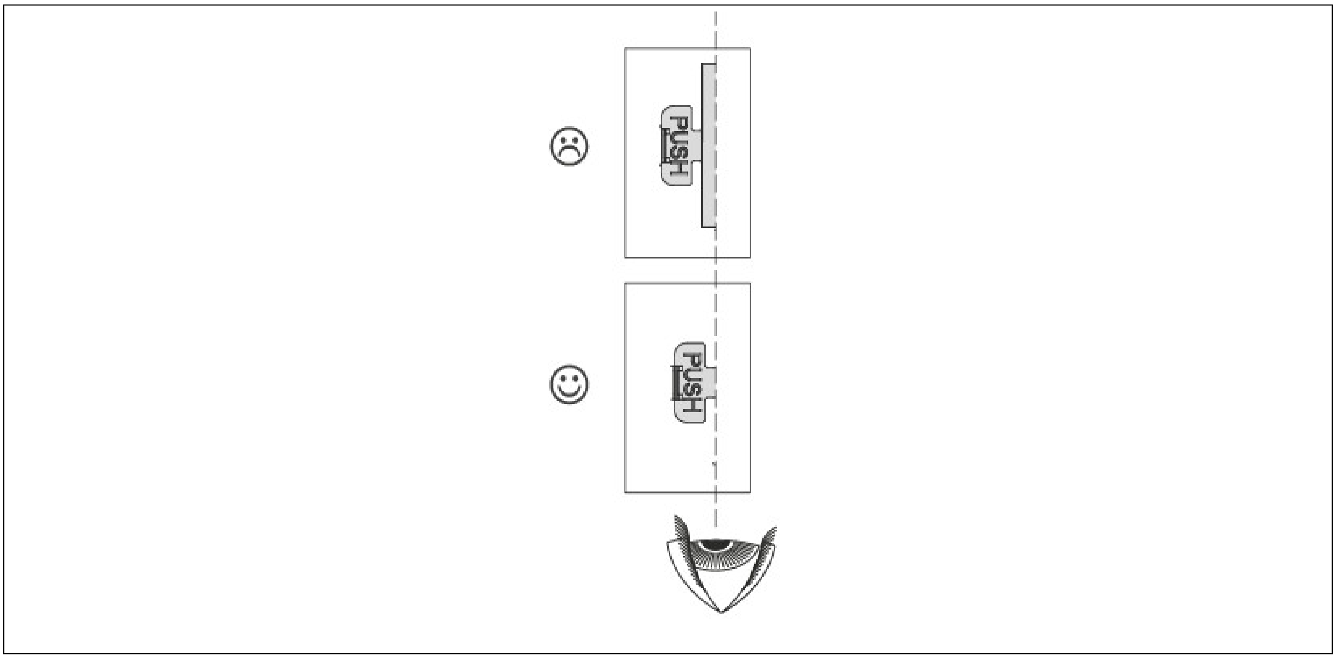




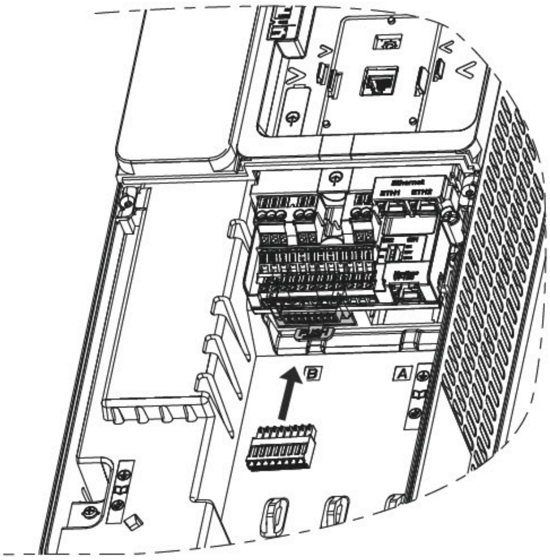
Valid for 8I0IFENC.400-1, 8I0IFENC.401-1 and 8I0IFENC.402-1:





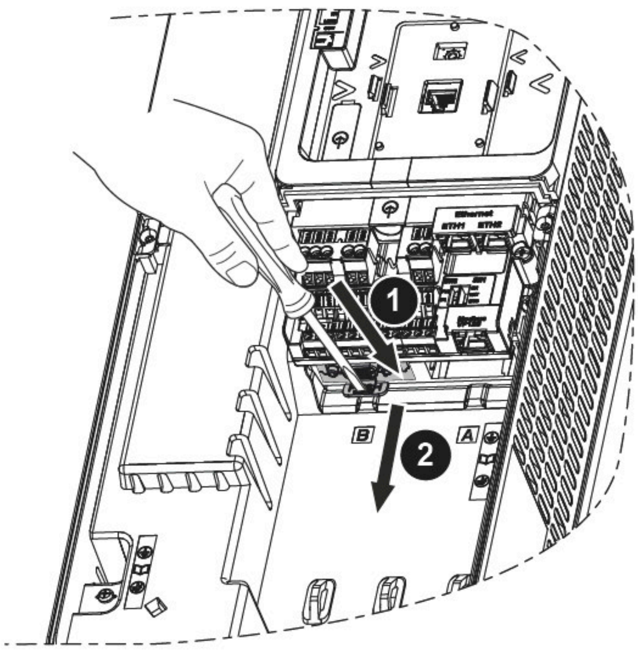


Valid for 8I0IFENC.403-1:

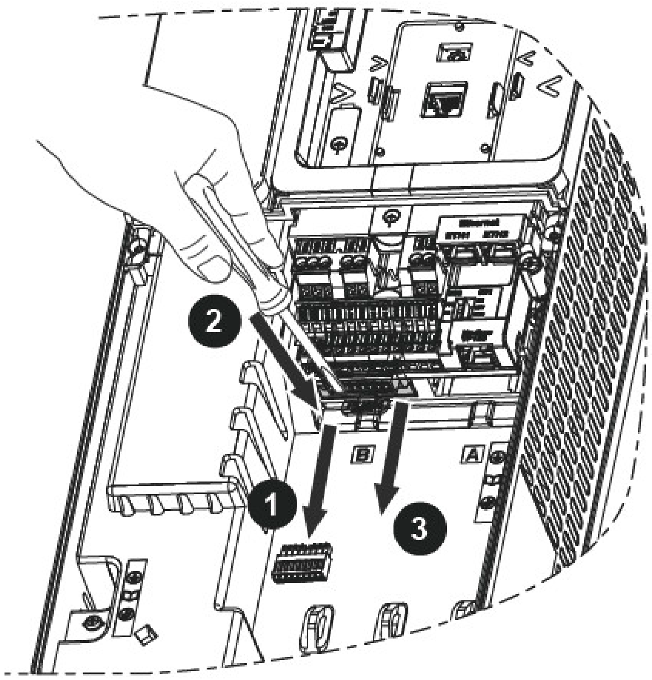


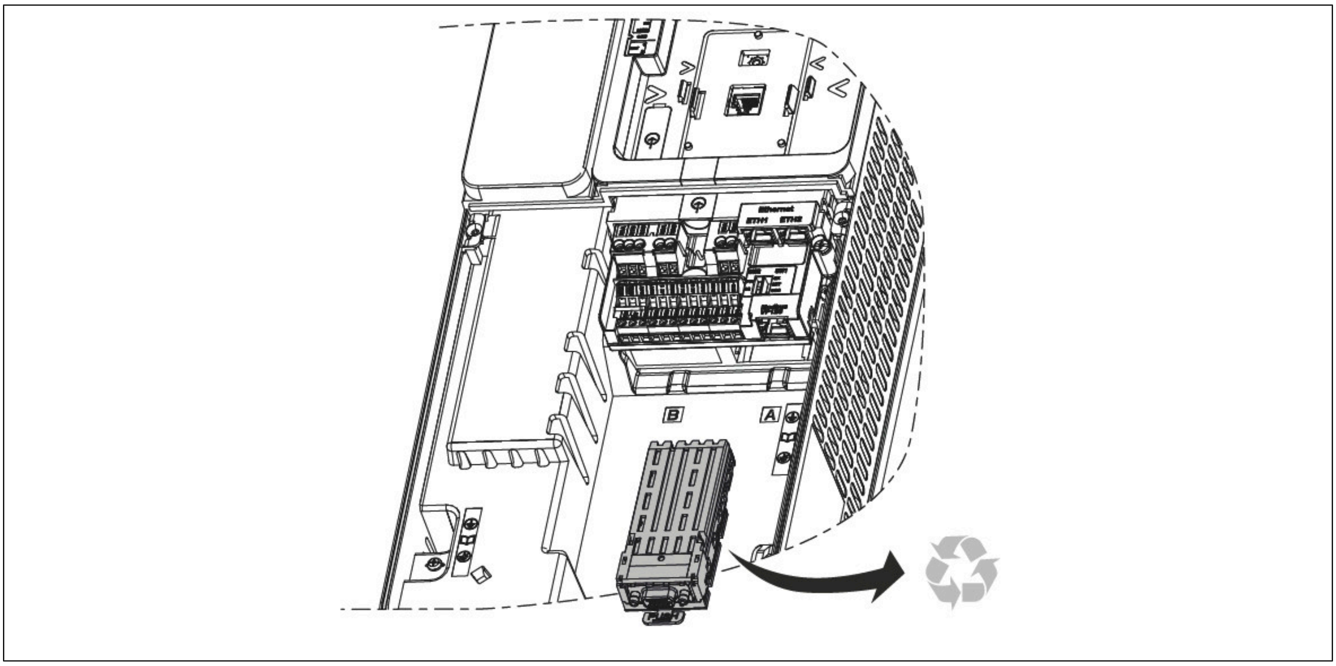
Removal

Valid for 8I0IFENC.400-1, 8I0IFENC.401-1 and 8I0IFENC.402-1:

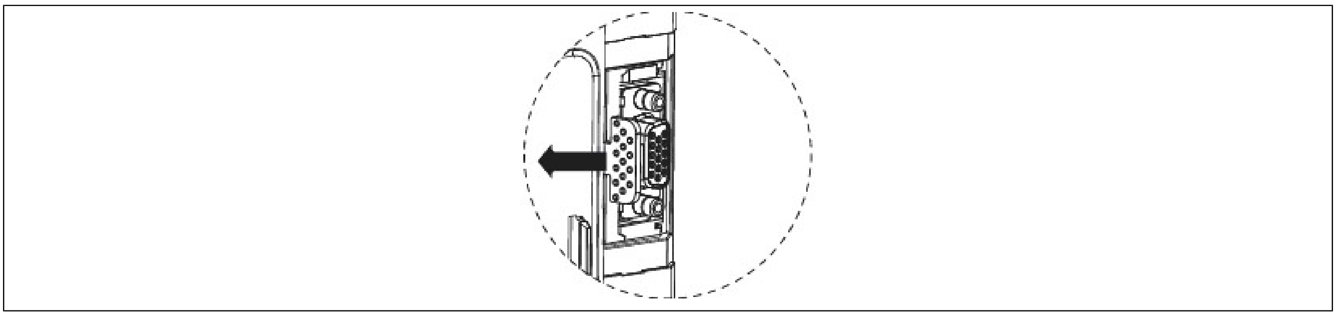


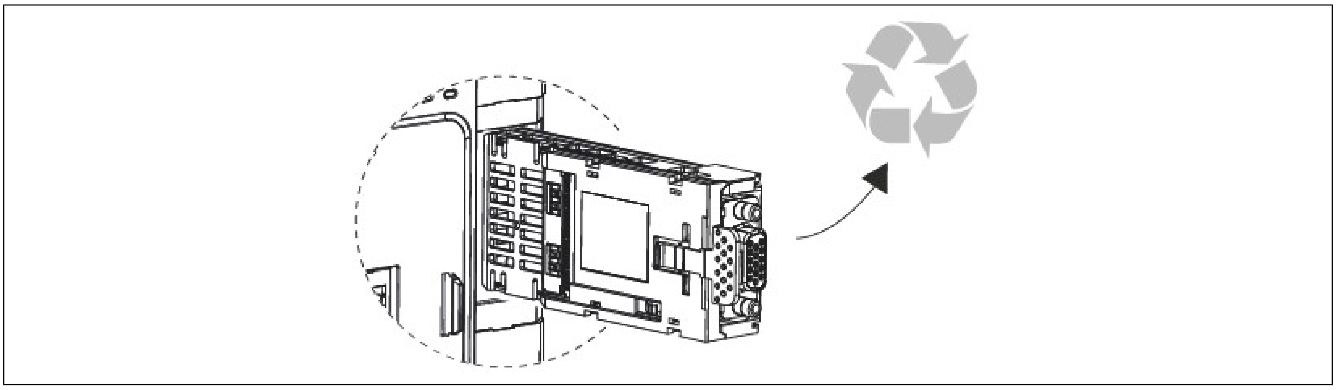
Valid for 8I0IFENC.403-1:





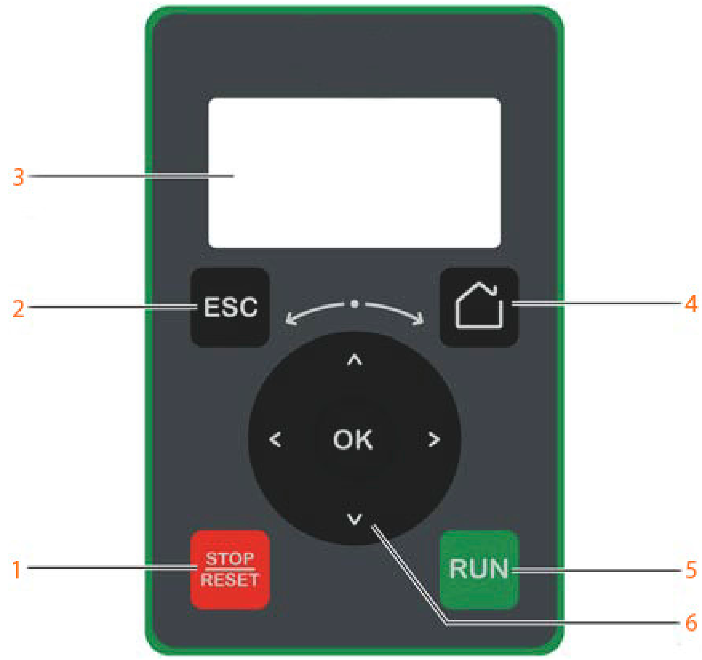
Valid for 8I0IFENC.400-1, 8I0IFENC.401-1 and 8I0IFENC.402-1:





8.3 Plain text display

The plain text display is a local control unit that can be connected directly to the inverter or installed on an enclosure door using the special kit for door installation (8I0FM086.400-1).



1) **STOP/RESET:** Stop command / Applies an error reset
2) **ESC:** Used to exit a menu/parameter or to remove the currently displayed value and return to the value previously stored in memory.
3) **Display**
4) **Home:** Provides direct access to the home page.
5) **RUN:** Executes the function assuming that it has been configured.
6) **Touch wheel / OK:** Used to store the current value or access the selected menu/parameters. The touch wheel is used to quickly scroll through the menus. The up/down arrows are used for a concrete selection. The right/left arrows are used to select digits when setting the numerical value for a parameter.

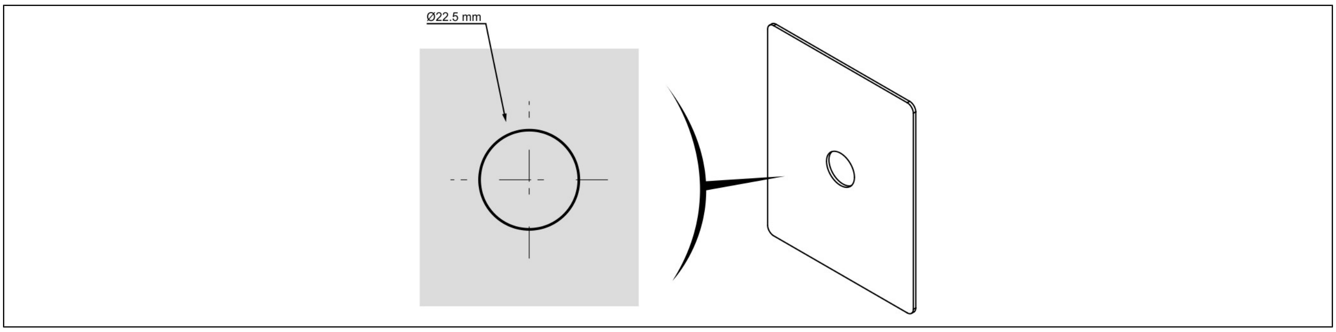
8.3.1 Order data

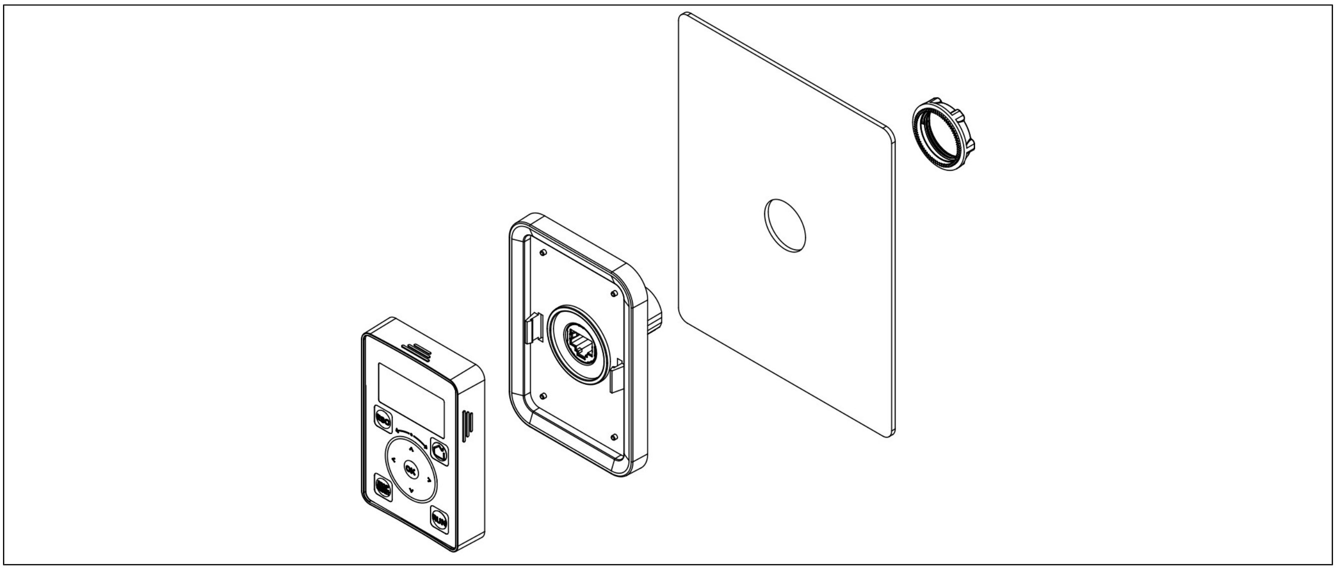
Order number	Short description	Figure
	Graphic display terminal	
8I0XD086.400-1	Plain text display for ACOPOSinverter P86, backlight, navigation key, IP43 protection	
8I0FM086.400-1	Female-to-female installation kit for ACOPOSinverter plain text display, IP43 protection	

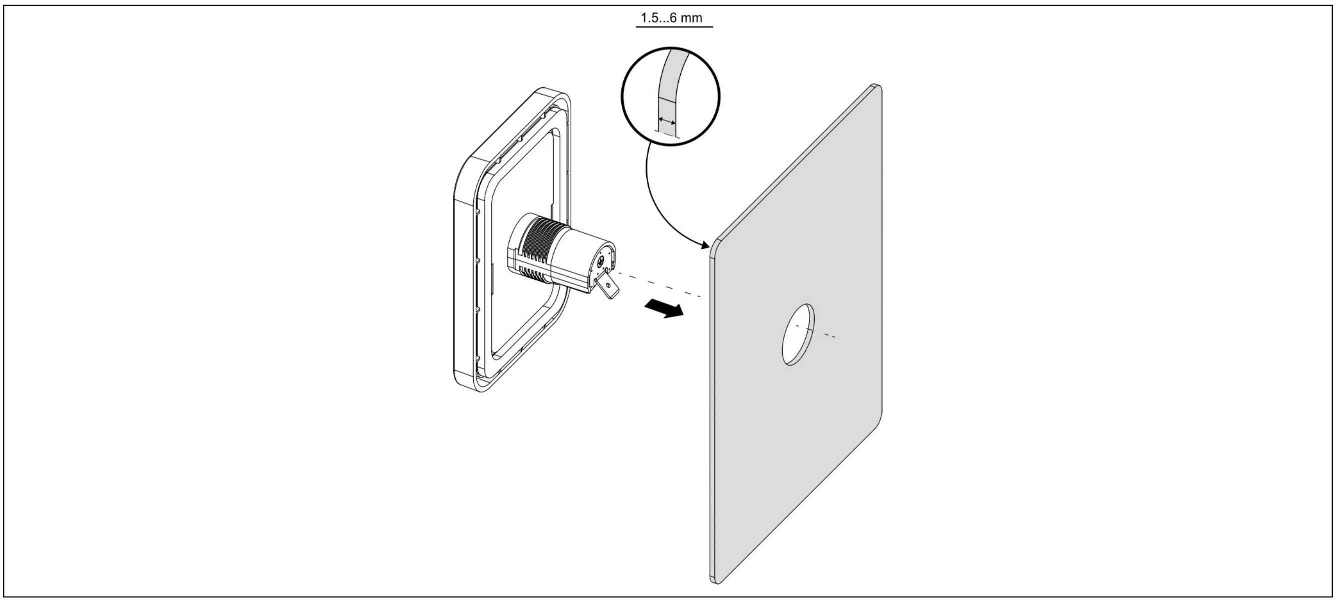
Table 15: 8I0XD086.400-1, 8I0FM086.400-1 - Order data

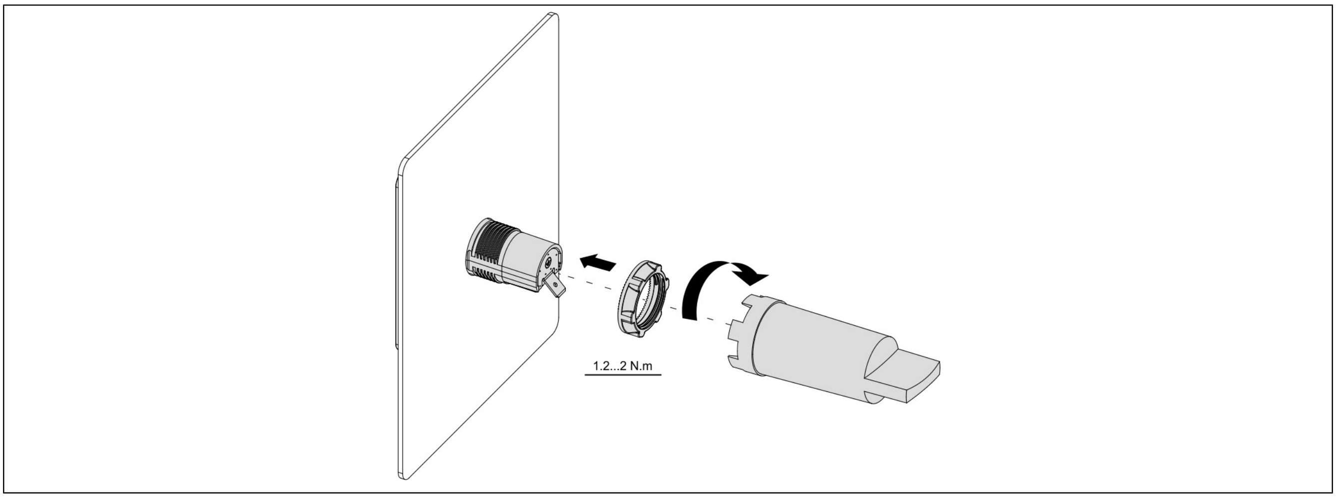
8.3.2 Installation

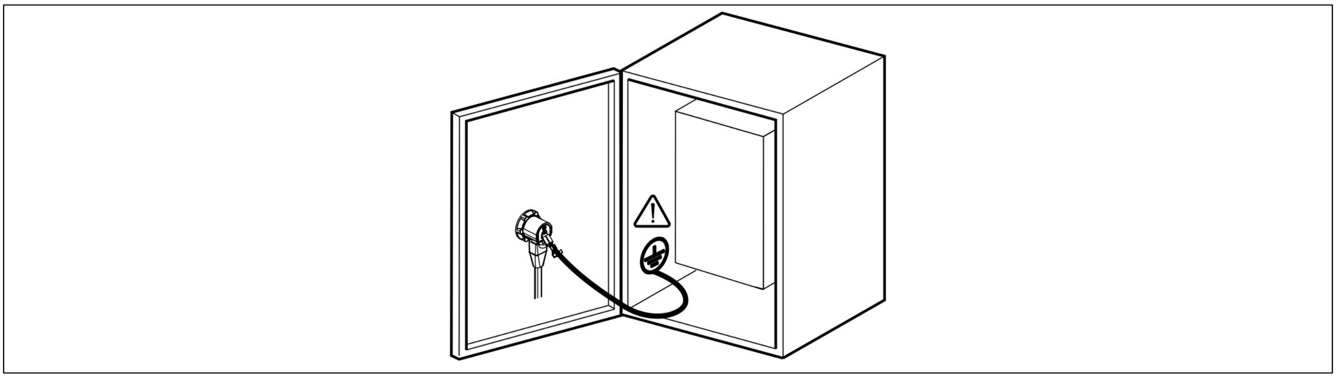
8I0FM086.400-1

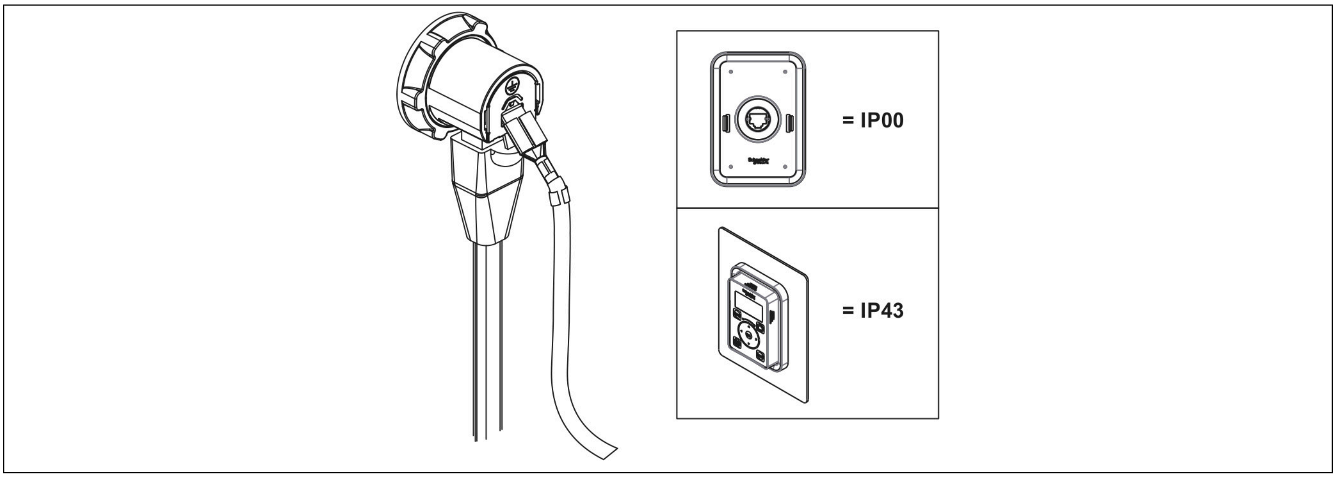












8.4 Cables and adapters

8.4.1 Order data

Order number	Short description	Figure
	Cable and adapters	
8I0XC003.400-1	DC bus cable, 0.18 m, 5 pcs., for ACOPOSinverter.	
8I0XD304.301-1	RJ45 cable, 1 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.303-1	RJ45 cable, 3 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.305-1	RJ45 cable, 5 m, for remote use of the display for the ACOPOSinverter.	
8I0XD304.310-1	RJ45 cable, 10 m, for remote use of the display for the ACOPOSinverter.	

Table 16: 8I0XC003.400-1, 8I0XD304.301-1, 8I0XD304.303-1, 8I0XD304.305-1, 8I0XD304.310-1 - Order data

8.4.2 DC bus cable

8.4.2.1 Technical data

Order number	**8I0XC003.400-1**
Short description	
Accessories	ACPi P66/P74/P76/P86 DC bus cables
Mechanical properties	
Dimensions	
Length	0.18 m
Brief overview	
Content of delivery	5 pcs.

Table 17: 8I0XC003.400-1 - Technical data

8.5 Optional braking resistors

The braking resistor allows the inverter to continue running when braking to a stop or decelerating by branching off the brake energy. It permits a maximum short-term braking torque.

The resistors are intended for installation on the outside of the housing are not permitted to interfere with natural cooling. Incoming and outgoing air is not permitted to be blocked. The air must be free of dust, condensation and corrosive gases.

8.5.1 Order data

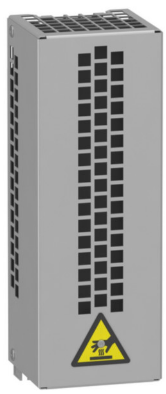
Order number	**Short description**	**Figure**
	Optional braking resistor	
8I0BR100.001-1	Braking resistor ohmic value: 100 Ω continuous braking power: 0.10 kW degree of protection (IP): IP20	
8I0BR100.002-1	Braking resistor ohmic value: 100 Ω continuous braking power: 0.26 kW degree of protection (IP): IP20	
8I0BR060.002-1	Braking resistor ohmic value: 60 Ω continuous braking power: 0.50 kW degree of protection (IP): IP20	
8I0BR028.001-1	Braking resistor ohmic value: 28 Ω continuous braking power: 1.10 kW degree of protection (IP): IP20	
8I0BR016.000-1	Braking resistor ohmic value: 16 Ω continuous braking power: 2.20 kW degree of protection (IP): IP20	
8I0BR010.001-1	Braking resistor ohmic value: 10 Ω continuous braking power: 3.40 kW degree of protection (IP): IP20	
8I0BR008.002-1	Braking resistor ohmic value: 8 Ω continuous braking power: 3.80 kW degree of protection (IP): IP20	
8I0BR005.001-1	Braking resistor ohmic value: 5 Ω continuous braking power: 6.90 kW degree of protection (IP): IP23	

Table 18: 8I0BR100.001-1, 8I0BR100.002-1, 8I0BR060.002-1, 8I0BR028.001-1, 8I0BR016.000-1, 8I0BR010.001-1, 8I0BR008.002-1, 8I0BR005.001-1 - Order data

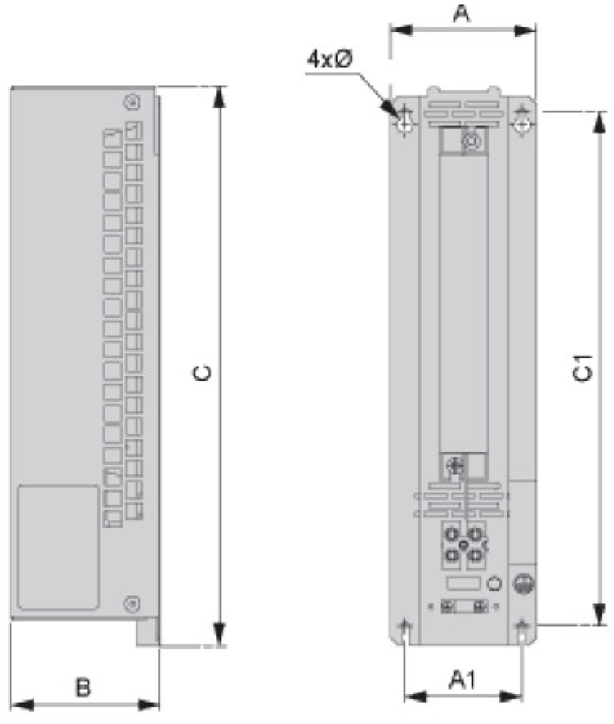
8.5.2 Technical data

Order number	8I0BR100.001-1	8I0BR100.002-1	8I0BR060.002-1	8I0BR028.001-1	8I0BR016.000-1	8I0BR010.001-1	8I0BR008.002-1	8I0BR005.001-1
General information								
Certifications								
CE	Yes							
UKCA	Yes							
Operating conditions								
Rated protection of housing	IP20						IP23	
Ambient conditions								
Temperature								
Operation	0 to 50°C							
Storage	-25 to 70°C							
Mechanical properties								
Dimensions								
Width	105 mm		175 mm	190 mm	290 mm	390 mm	540 mm	
Height	295 mm	465 mm		570 mm		640 mm	485 mm	
Depth	100 mm			180 mm			650 mm	
Weight	1.5 kg	2.5 kg	3.8 kg	4.2 kg	6.4 kg	9 kg	25.5 kg	30.5 kg
Properties								
Resistance value at 20°C	100 Ω		60 Ω	28 Ω	16 Ω	10 Ω	8 Ω	5 Ω
Average available power at 50°C	0.1 kW	0.26 kW	0.5 kW	0.96 kW (nominal power 1.1 kW)	1.9 kW (nominal power 2.2 kW)	2.9 kW (nominal power 3.4 kW)	3.8 kW	6.9 kW
Thermal protection	Via drive			Via drive or thermal switch at 120°C				

Table 19: 8I0BR100.001-1, 8I0BR100.002-1, 8I0BR060.002-1, 8I0BR028.001-1, 8I0BR016.000-1, 8I0BR010.001-1, 8I0BR008.002-1, 8I0BR005.001-1 - Technical data

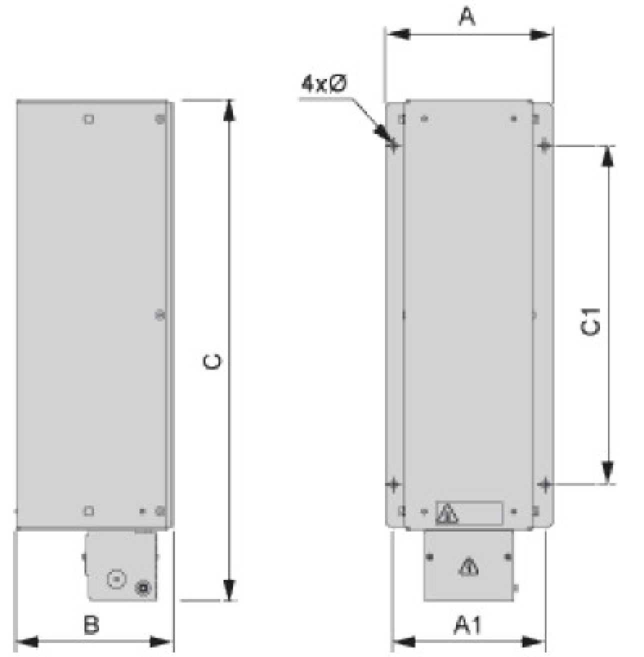
8.5.3 Dimension

8I0BR100.001-1, 8I0BR100.002-1, 8I0BR060.002-1



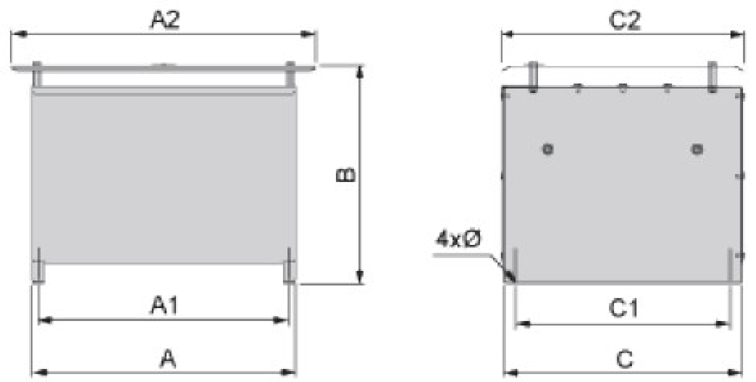
Material number	A mm / in.	B mm / in.	C mm / in.	A1 mm / in.	C1 mm / in.	Ø mm / in.
8I0BR100.001-1	105 / 4.13	100 / 3.94	295 / 11.61	72 / 2.83	266 / 10.47	4.5 / 0.18
8I0BR100.002-1	105 / 4.13	100 / 3.94	465 / 18.31	72 / 2.83	436 / 17.16	4.5 / 0.18
8I0BR060.002-1	175 / 6.89	100 / 3.94	465 / 18.31	142 / 5.59	436 / 17.16	4.5 / 0.18

8I0BR028.001-1, 8I0BR016.000-1, 8I0BR010.001-1



Material number	A mm / in.	B mm / in.	C mm / in.	A1 mm / in.	C1 mm / in.	Ø mm / in.
8I0BR028.001-1	190 / 7.48	180 / 7.09	570 / 22.44	170 / 6.69	380 / 14.96	6.6 x 9 / 0.26 x 0.35
8I0BR016.000-1	290 / 11.42	180 / 7.09	570 / 22.44	270 / 10.63	380 / 14.96	6.6 x 9 / 0.26 x 0.35
8I0BR010.001-1	390 / 15.35	180 / 7.09	640 / 25.20	370 / 14.57	380 / 14.96	6.6 x 9 / 0.26 x 0.35

8I0BR008.002-1, 8I0BR005.001-1



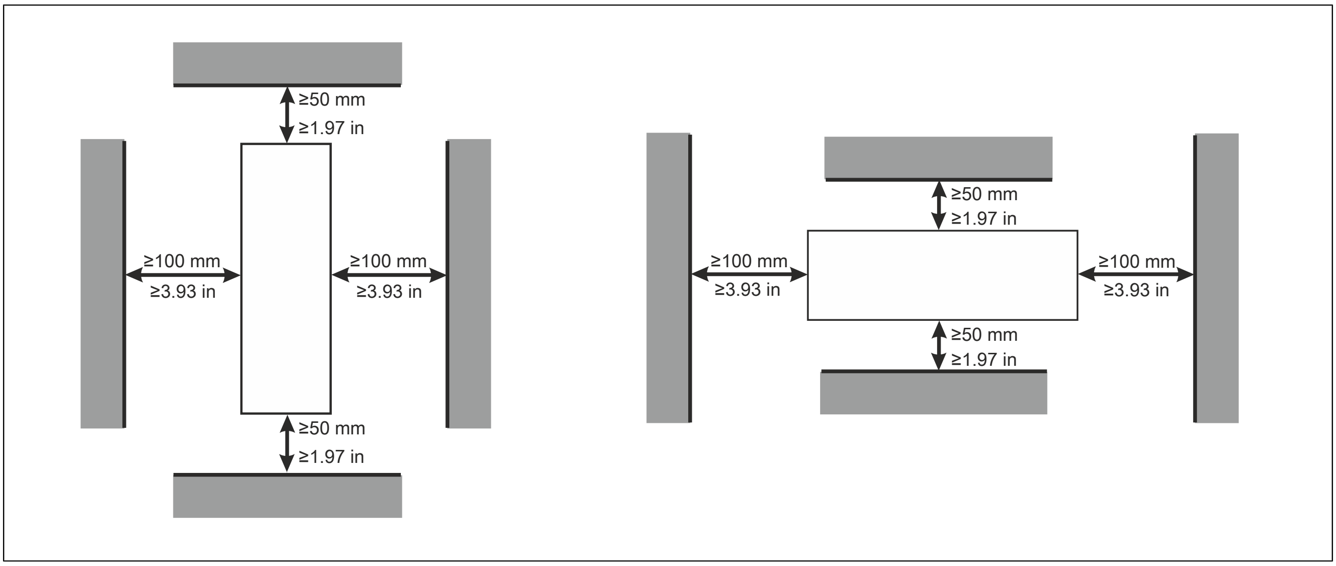
Material number	A mm / in.	B mm / in.	C mm / in.	A1 mm / in.	C1 mm / in.	A2 mm / in.	C2 mm / in.	Ø mm / in.
8I0BR008.002-1	530 / 20.87	485 / 19.09	485 / 19.09	510 / 20.08	380 / 14.96	650 / 25.59	540 / 21.26	9 x 12 / 0.35 x 0.47
8I0BR005.001-1	530 / 20.87	485 / 19.09	485 / 19.09	510 / 20.08	380 / 14.96	650 / 25.59	540 / 21.26	9 x 12 / 0.35 x 0.47

8.5.4 Installation

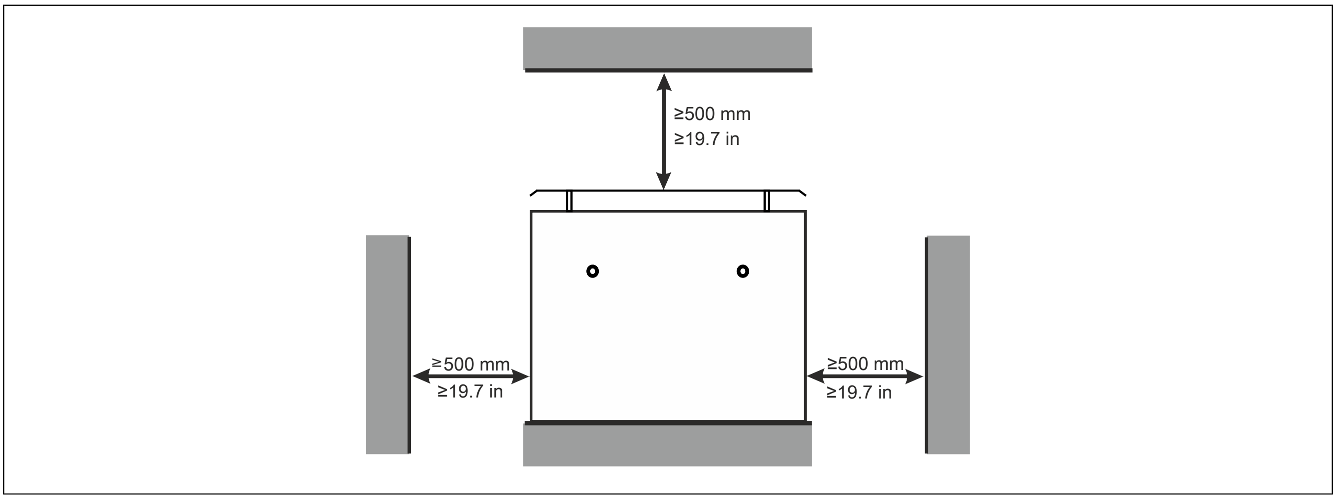
Installation

> **Information:**
>
> **Braking resistors must be arranged outside the control cabinet and are not permitted to be placed below other drives.**

8I0BR100.001-1, 8I0BR100.002-1, 8I0BR060.002-1, 8I0BR028.001-1, 8I0BR016.000-1, 8I0BR010.001-1 - Distances

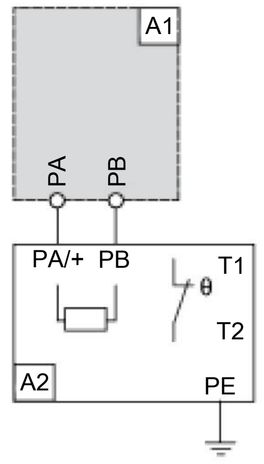


8I0BR008.002-1, 8I0BR005.001-1 - Distances



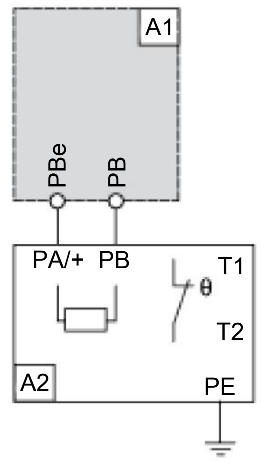
8.5.5 Connection example

Connection example 1



A1: Drive or external brake unit
A2: Braking resistor
PA, PB: Bus DC
T1, T2: Temperature control switch

Connection example 2



A1: Drive or external brake unit
A2: Braking resistor
PA, PBe: Bus DC
T1, T2: Temperature control switch

8.6 Optional EMC filters

8.6.1 Order data

Order number	Short description	Figure
	Additional EMC filters	
8I0FT015.200-1	ACOPOSinverter additional EMC input filter 3-phase 15 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT025.200-1	ACOPOSinverter additional EMC input filter 3-phase 25 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT050.200-1	ACOPOSinverter additional EMC input filter 3-phase 50 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT070.200-1	ACOPOSinverter additional EMC input filter 3-phase 70 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT100.200-1	ACOPOSinverter additional EMC input filter 3-phase 100 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT160.200-1	ACOPOSinverter additional EMC input filter 3-phase 160 A, supply voltage: 380 to 480 V, 50/60 Hz	
8I0FT200.200-1	ACOPOSinverter EMC additional EMC input filter 3-phase 200 A, supply voltage: 380 to 480 V, 50/60 Hz	

Table 20: 8I0FT015.200-1, 8I0FT025.200-1, 8I0FT050.200-1, 8I0FT070.200-1, 8I0FT100.200-1, 8I0FT160.200-1, 8I0FT200.200-1 - Order data

8.6.2 Technical data

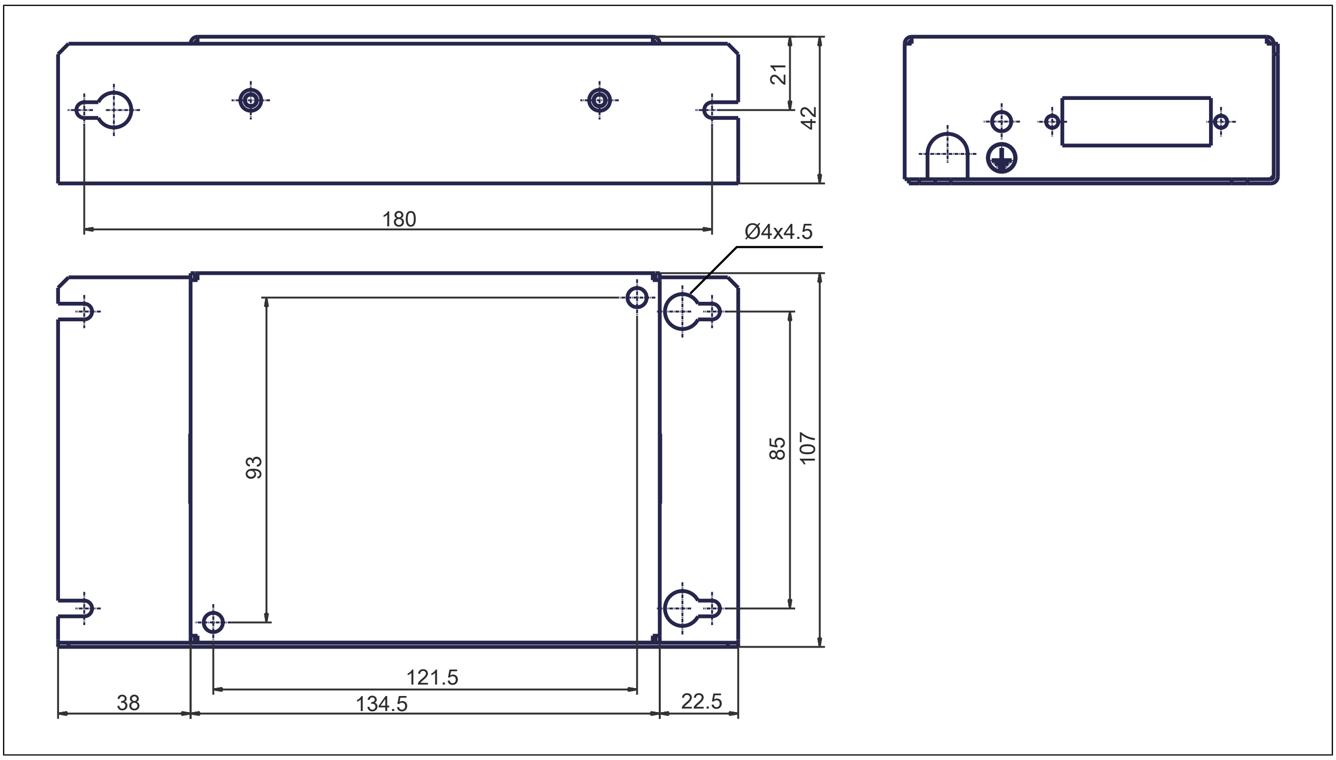
Order number	8I0FT015.200-1	8I0FT025.200-1	8I0FT050.200-1	8I0FT070.200-1	8I0FT100.200-1	8I0FT160.200-1	8I0FT200.200-1
General information							
Certifications							
CE	-		Yes				
KC	Yes		-				
Mains connection							
Power dissipation	9.9 W	15.8 W	8 W	10 W	12.4 W	25 W	32.5 W
Max. nominal voltage	3x 500 VAC +10%		3x 480 VAC +10%				
Nominal filter current	15 A	25 A	50 A	70 A	100 A	160 A	200 A
Max. fault current	15 mA	35 mA	7.6 mA	3.98 mA	13.9 mA		
Operating conditions							
Installation elevation above sea level	0 to 1000 m [1]		0 to 1000 m [2]				
Degree of protection per EN 60529	IP21 and IP41 on the upper part		IP20				
Max. relative humidity per IEC 60068-2-3	95%, non-condensing No dripping water		5 to 95%, non-condensing				
Ambient conditions							
Temperature							
Operation	-10 to 60°C		-10 to 50°C [3]				
Storage	-25 to 70°C		-40 to 70°C				
Mechanical properties							
Dimensions							
Width	107 mm	140 mm	90 mm	100 mm	120 mm	130 mm	200 mm
Height	195 mm	235 mm	285 mm	330 mm	340 mm	395 mm	445 mm
Depth	42 mm	50 mm	170 mm	180 mm		240 mm	320 mm
Weight	0.9 kg	1.35 kg	5.2 kg	6.1 kg	6.5 kg	8.5 kg	9.5 kg

Table 21: 8I0FT015.200-1, 8I0FT025.200-1, 8I0FT050.200-1, 8I0FT070.200-1, 8I0FT100.200-1, 8I0FT160.200-1, 8I0FT200.200-1 - Technical data

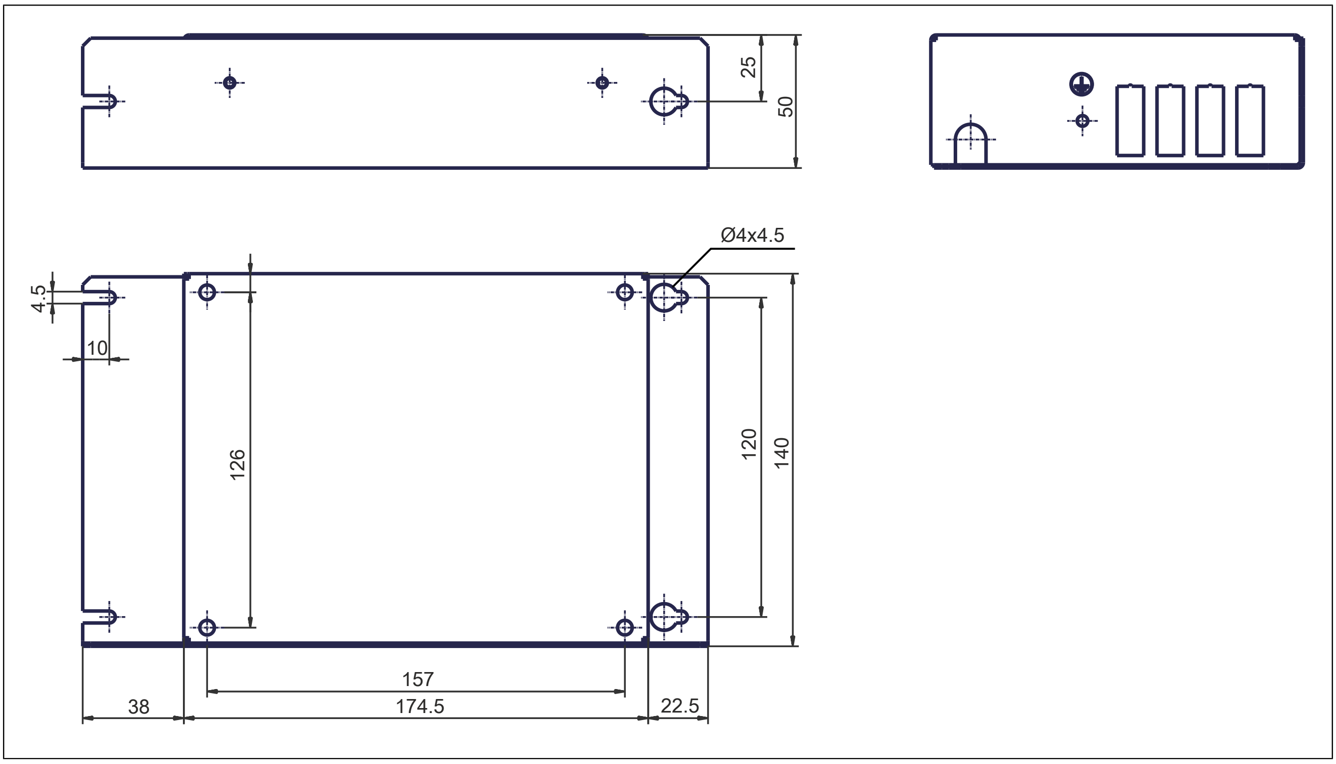
1) Over 1000 m, current reduced by 1% per 100 m
2) From 1000 to 4000 m, current reduced by 1% per 100 m.
3) 50 to 60°C with current drop of 1.5% per 1°C.

8.6.3 Dimensions

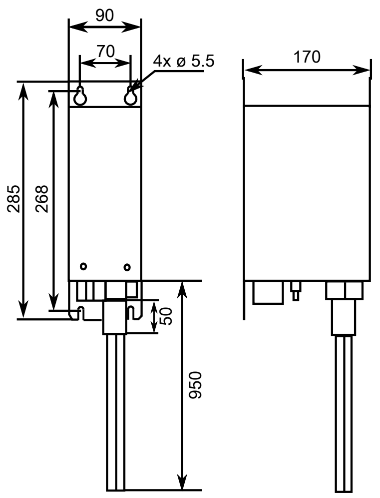
8I0FT015.200-1



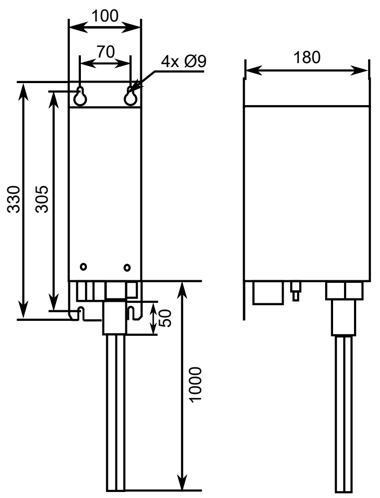
8I0FT025.200-1



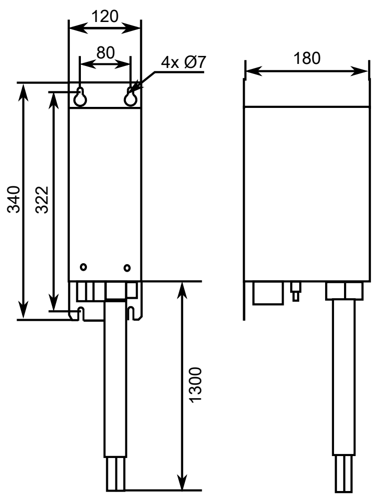
8I0FT050.200-1



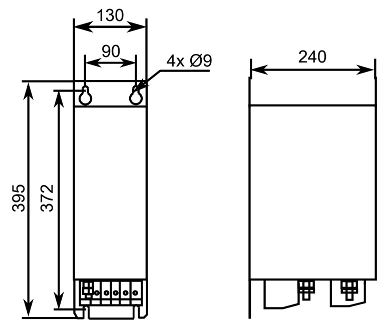
8I0FT070.200-1



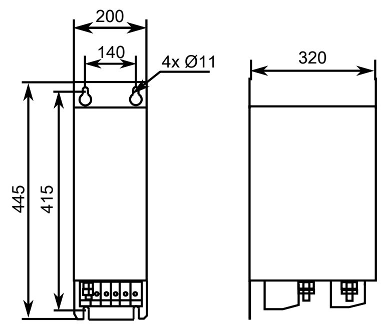
8I0FT100.200-1



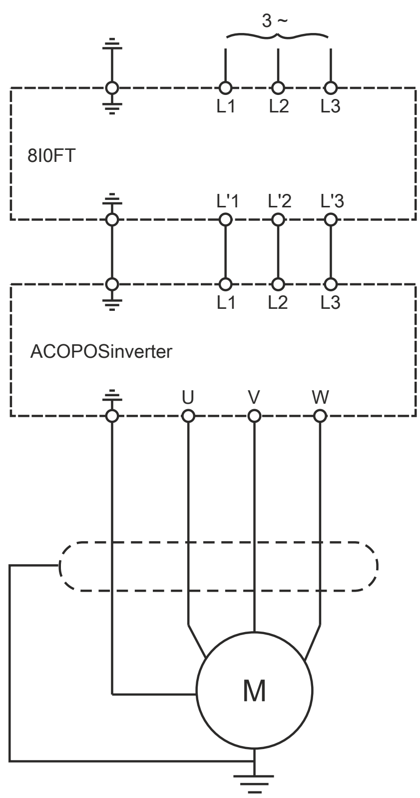
8I0FT160.200-1



8I0FT200.200-1



8.6.4 Installation



8.7 Optional EMC kit

8.7.1 Order data

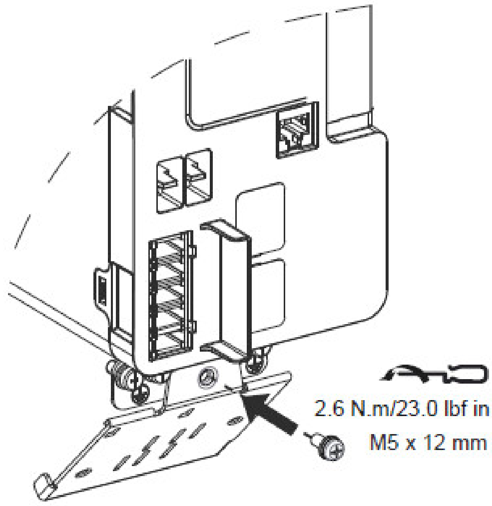
Order number	Short description	Figure
	Optional EMC kit	
8I0XE086.401-1	EMC installation kit for P86 size 1, power output class: 0.75 to 4 kW (1 to 50 HP)	
8I0XE086.402-1	EMC installation kit for P86 size 2, power output class: 5.5 to 7.5 kW (7.5 to 10 HP)	
8I0XE086.403-1	EMC installation kit for P86 size 3, power output class: 11 to 22 kW (15 to 30 HP)	

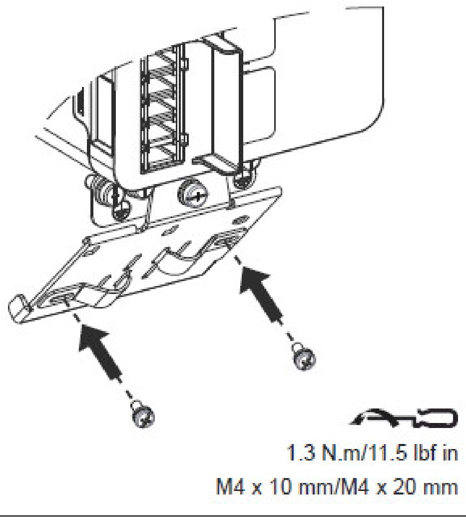
Table 22: 8I0XE086.401-1, 8I0XE086.402-1, 8I0XE086.403-1 - Order data

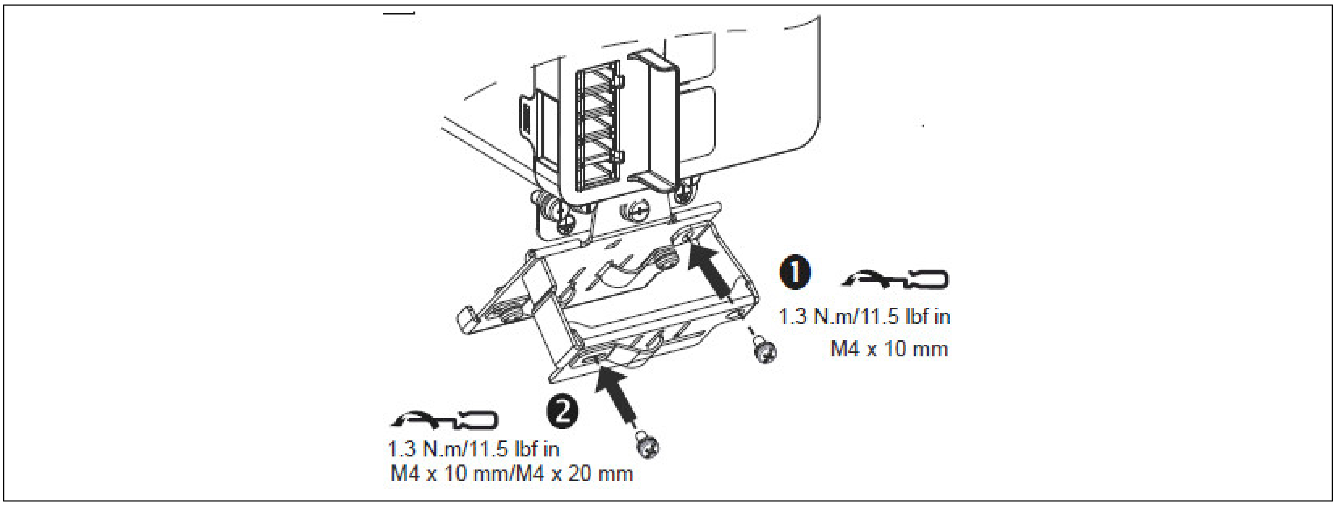
8.7.2 Installation

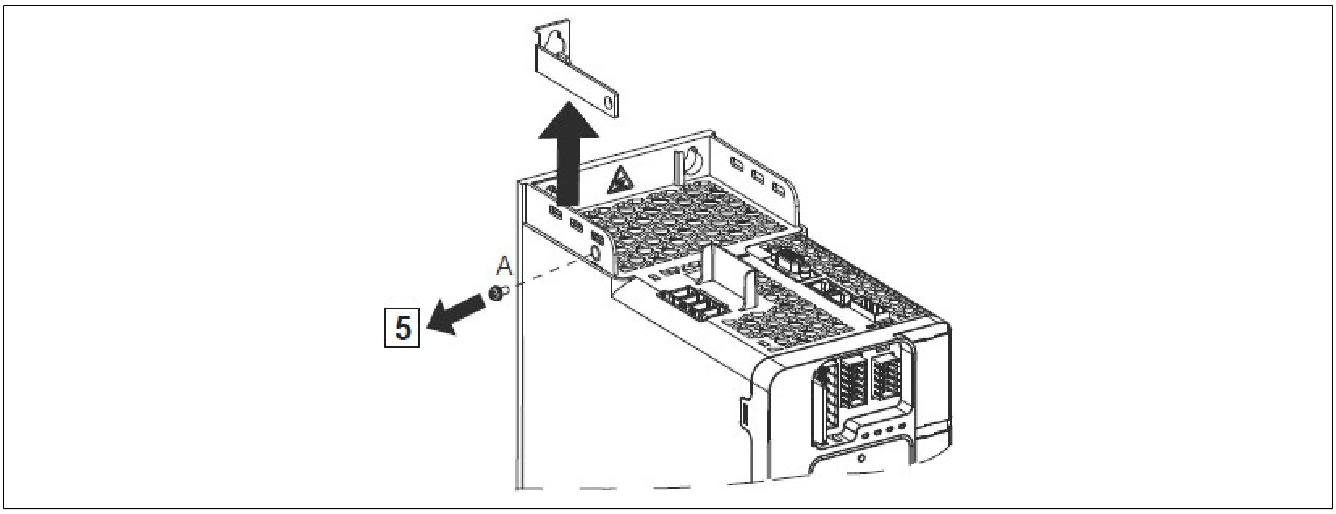
8.7.2.1 8I0XE086.401-1 and 8I0XE086.402-1

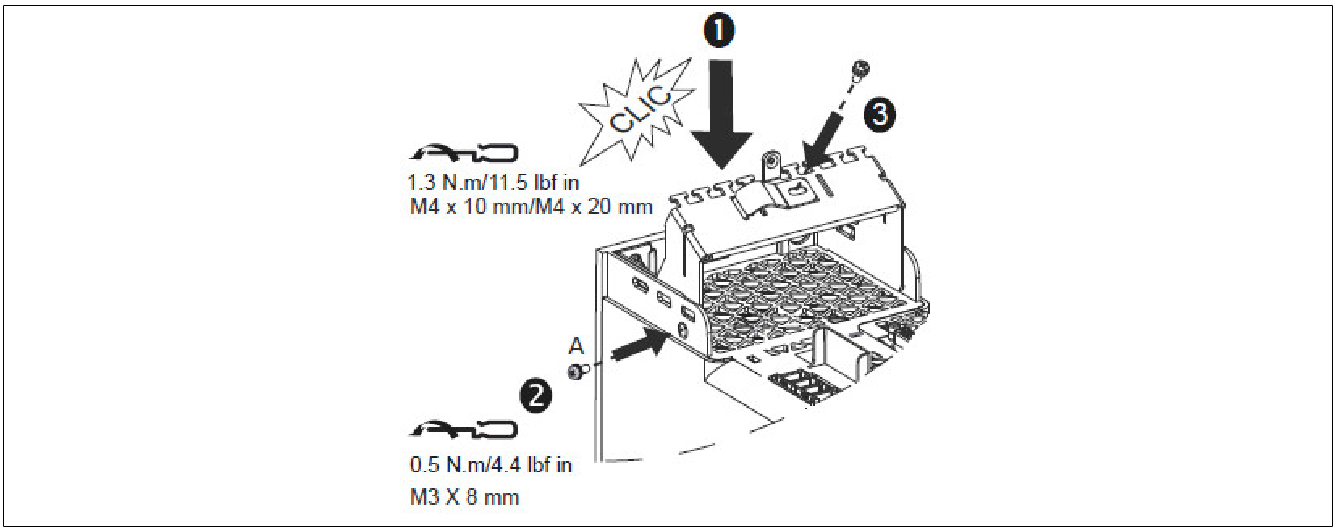
8I0XE086.401-1 size 1 and 8I0XE086.402-1 size 2

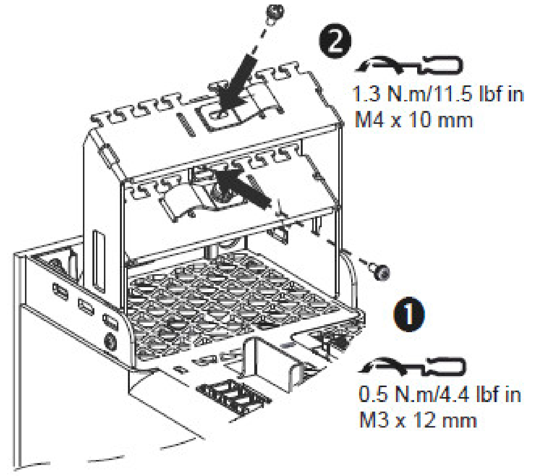





1.3 N.m/11.5 lbf in
M4 x 10 mm
1.3 N.m/11.5 lbf in
M4 x 10 mm/M4 x 20 mm

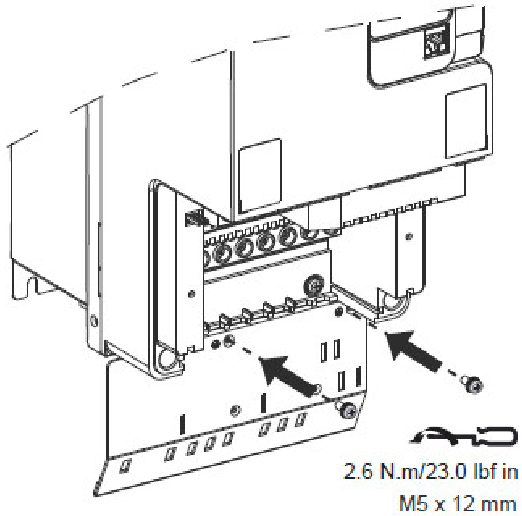

A
5

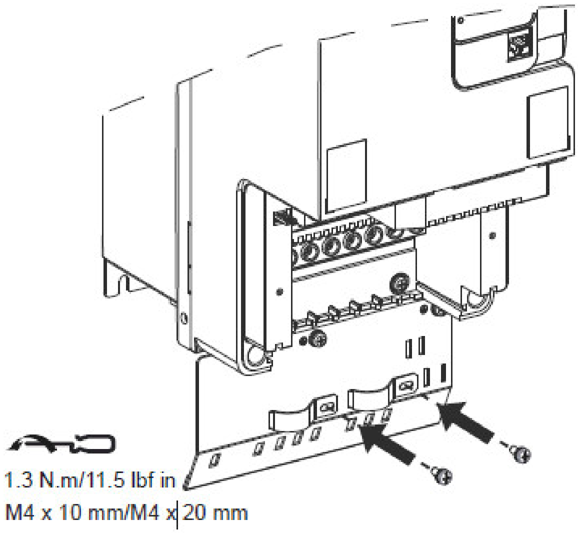

CLIC
1.3 N.m/11.5 lbf in
M4 x 10 mm/M4 x 20 mm
A
0.5 N.m/4.4 lbf in
M3 X 8 mm

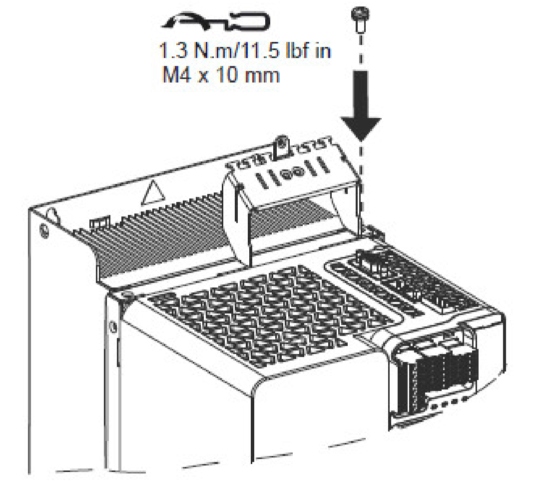


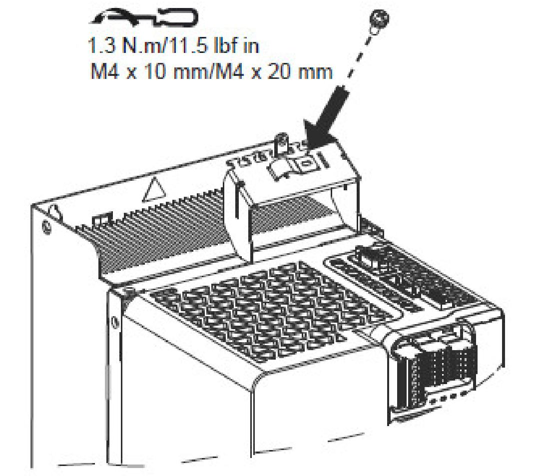
8.7.2.2 8I0XE086.403-1

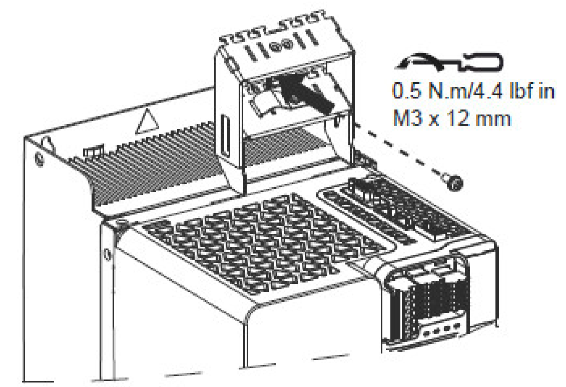
Size 3

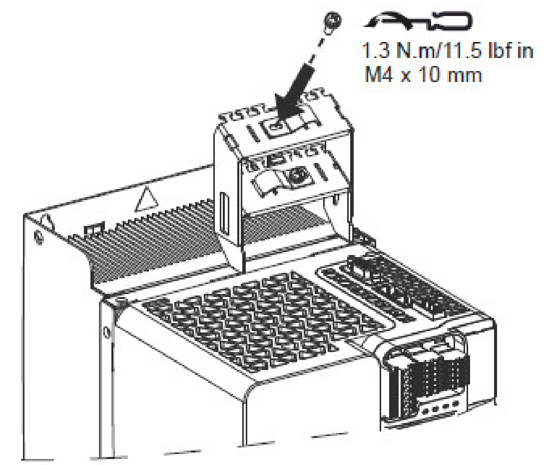





1.3 N.m/11.5 lbf in
M4 x 10 mm


1.3 N.m/11.5 lbf in
M4 x 10 mm/M4 x 20 mm

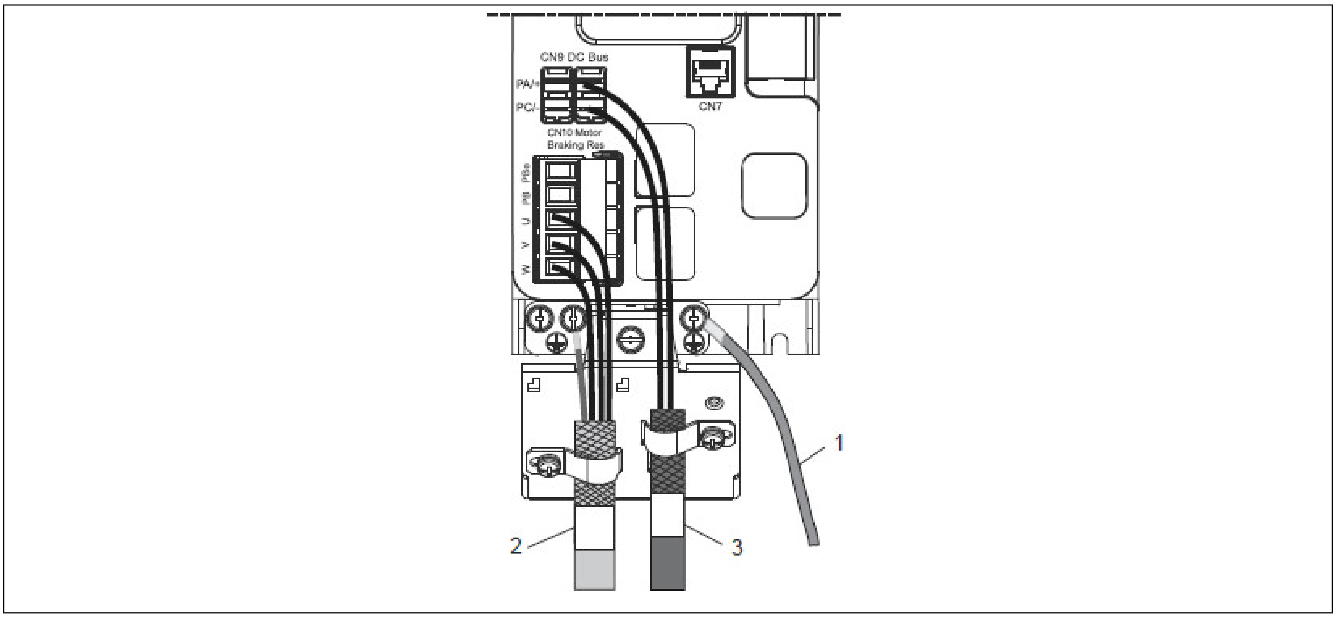

0.5 N.m/4.4 lbf in
M3 x 12 mm


1.3 N.m/11.5 lbf in
M4 x 10 mm

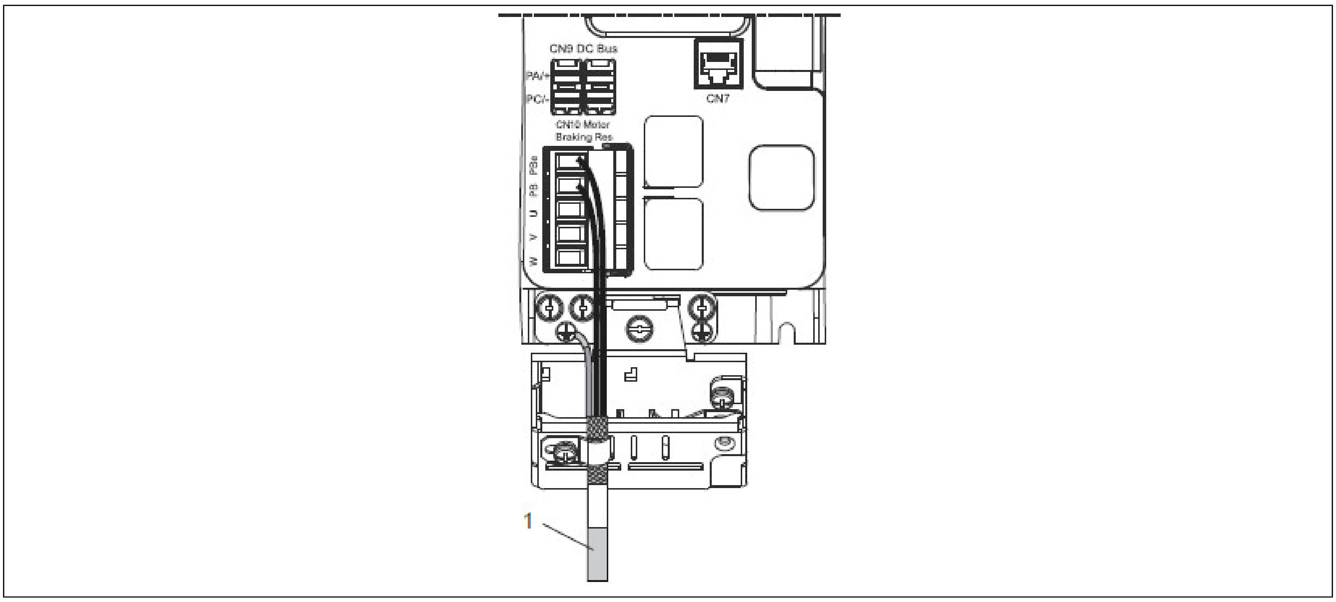
8.7.3 Wiring

8.7.3.1 8I0XE086.401-1 and 8I0XE086.402-1

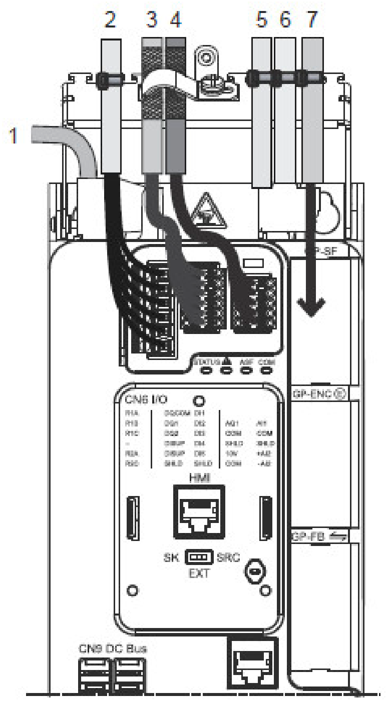
8I0XE086.401-1 size 1 and 8I0XE086.402-1 size 2



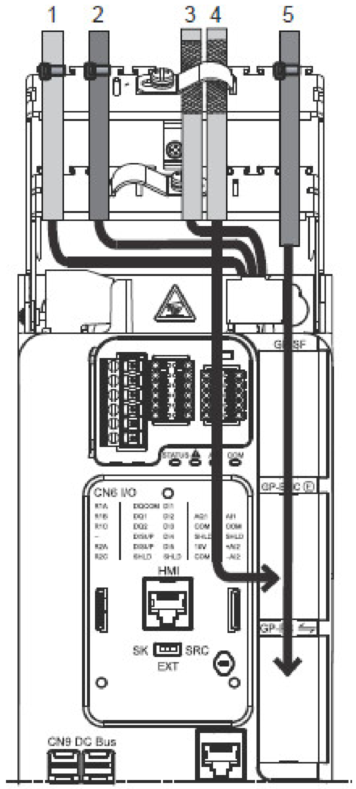
1) GND
2) CN10: U, V, W, GND
3) CN9: PA/+, PC/-



1) CN10: GND, PB, PBe



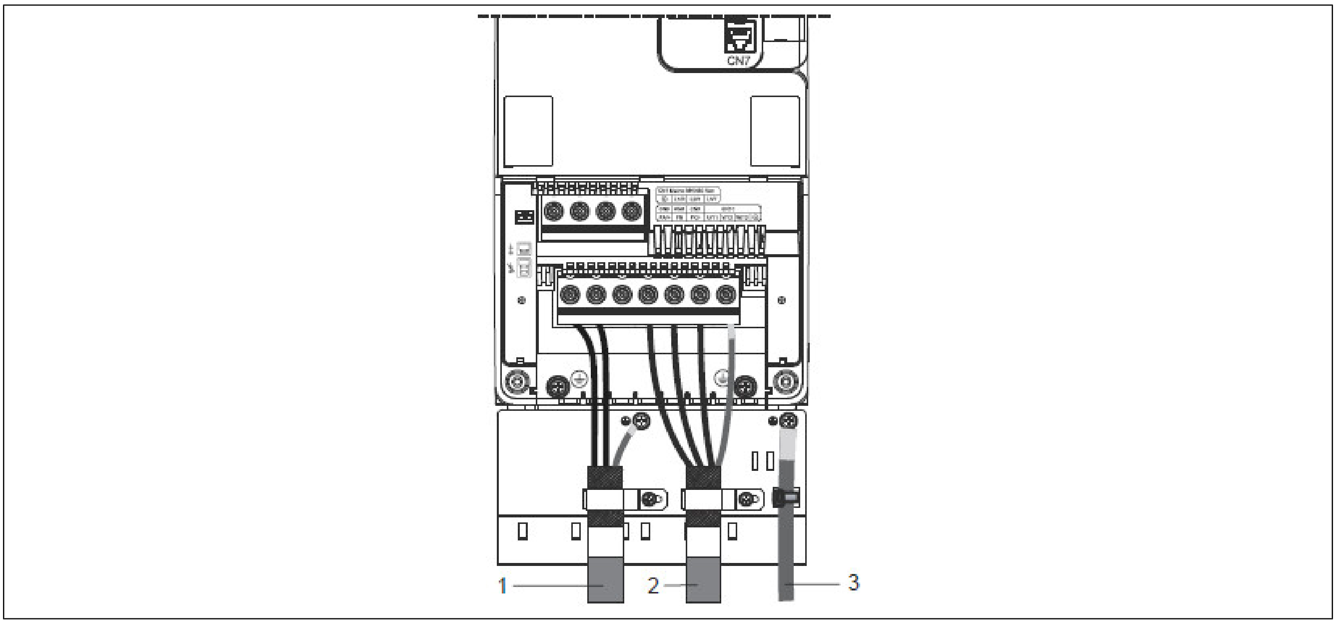
1) CN1: MAINS 400 VAC, GND, L1, L2, L3
2) CN6: R1A, R1B, R1C, R2A, R2C
3) CN6: DQCOM, DQ1, DQ2, DISUP to DI5, SHLD ...
4) CN6: AQ1, AI1, COM, SHLD, +AI2, -AI2...
5) CN5: PTI
6) CN4: PTO
7) GP-SF



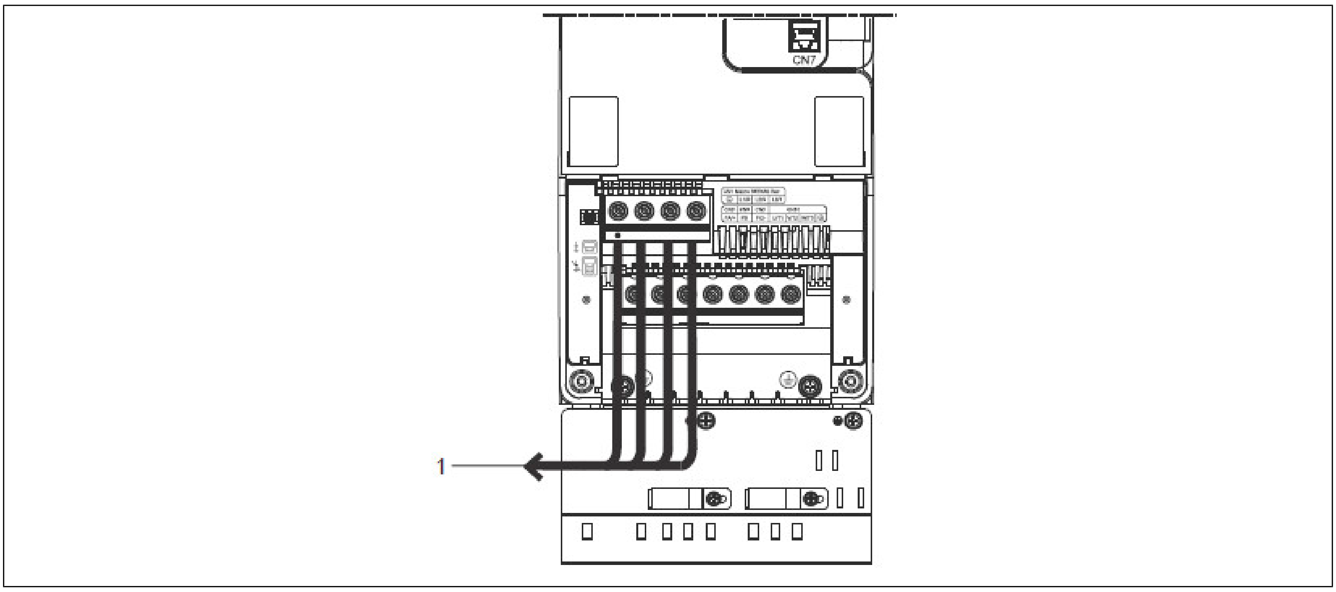
1) CN3: ENC
2) CN2: 24 V, 0 V
3) CN2: STO_A, STO_B
4) GP-ENC
5) GP-FB

8.7.3.2 8I0XE086.403-1

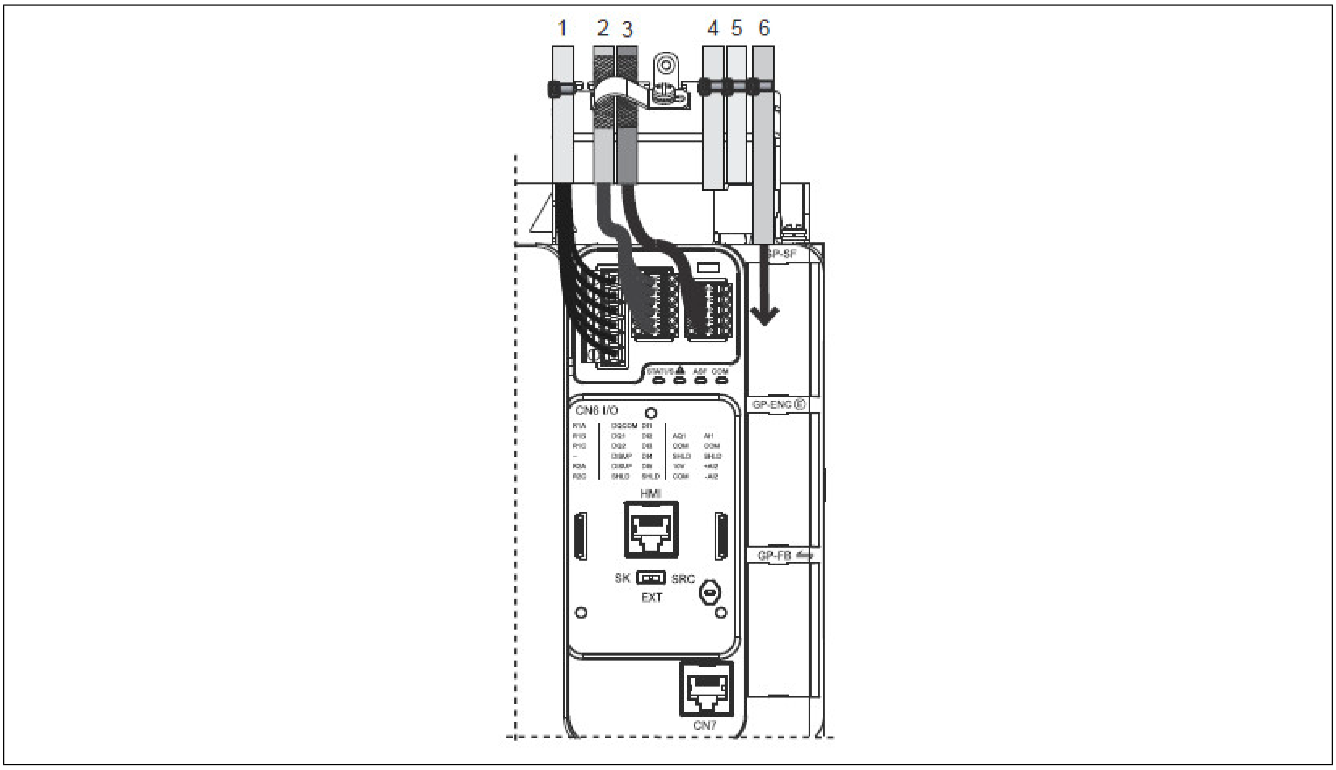
Size 3



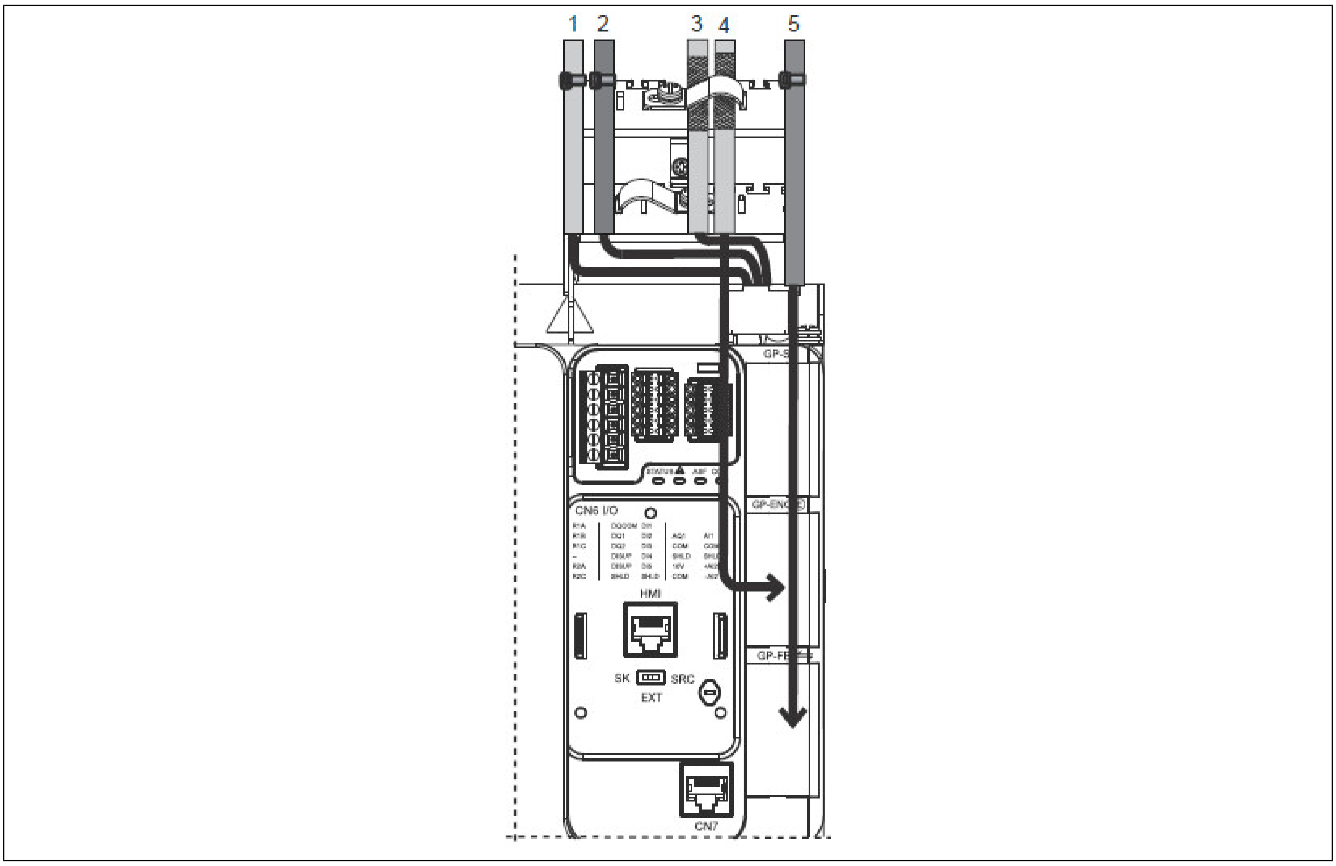
1) PA/+, PB, PC/-, GND
2) U/T1, V/T2, W/T3, GND
3) GND



1) L1/R, L2/S, L3/T, GND



1) CN6: R1A, R1B, R1C, R2A, R2C
2) CN6: DQCOM, DQ1, DQ2, DISUP to DI5, SHLD...
3) CN6: AQ1, AI1, COM, SHLD, +AI2, -AI2...
4) CN5: PTI
5) CN4: PTO
6) GP-SF



1) CN3: ENC
2) CN2: 24 V, 0 V
3) CN2: STO_A, STO_B
4) GP-ENC
5) GP-FB

8.8 Optional pass-through mounting kit

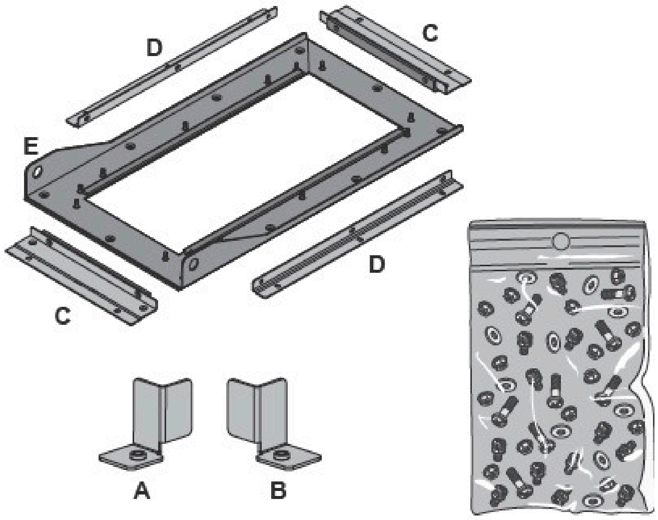
8.8.1 Order data

Order number	Short description	Figure
	Optional feed-through mounting kit	
8I0PT086.400-1	Feed-through installation kit for P86 size 3, power output class: 11 to 22 kW (15 to 30 HP)	
8I0PT086.401-1	Feed-through installation kit for P86 size 4, power output class: 30 to 37 kW (40 to 50 HP)	
8I0PT086.402-1	Feed-through installation kit for P86 size 5, power output class: 45 to 75 kW (60 to 100 HP)	

Table 23: 8I0PT086.400-1, 8I0PT086.401-1, 8I0PT086.402-1 - Order data

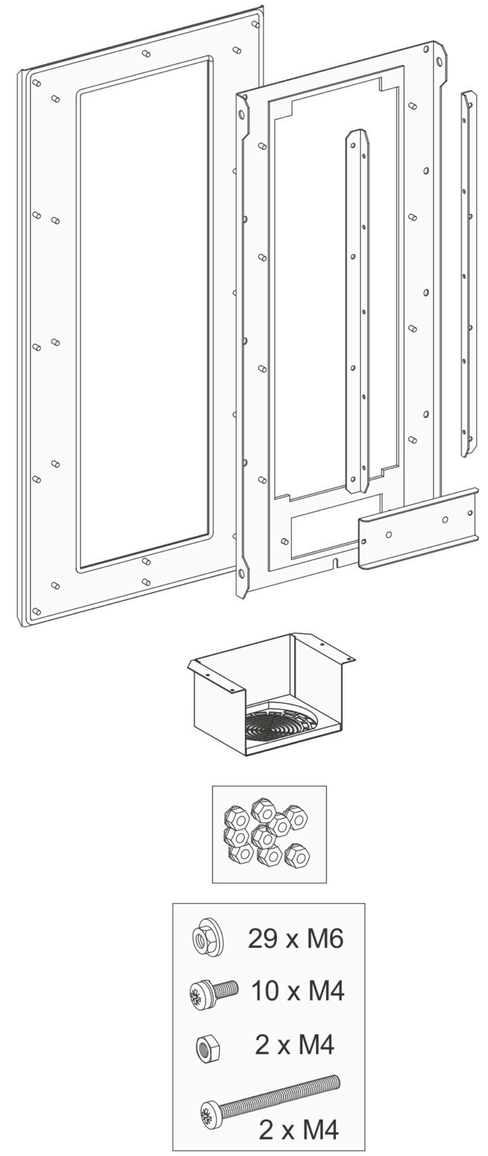
8.8.2 Content of delivery

8I0PT086.400-1

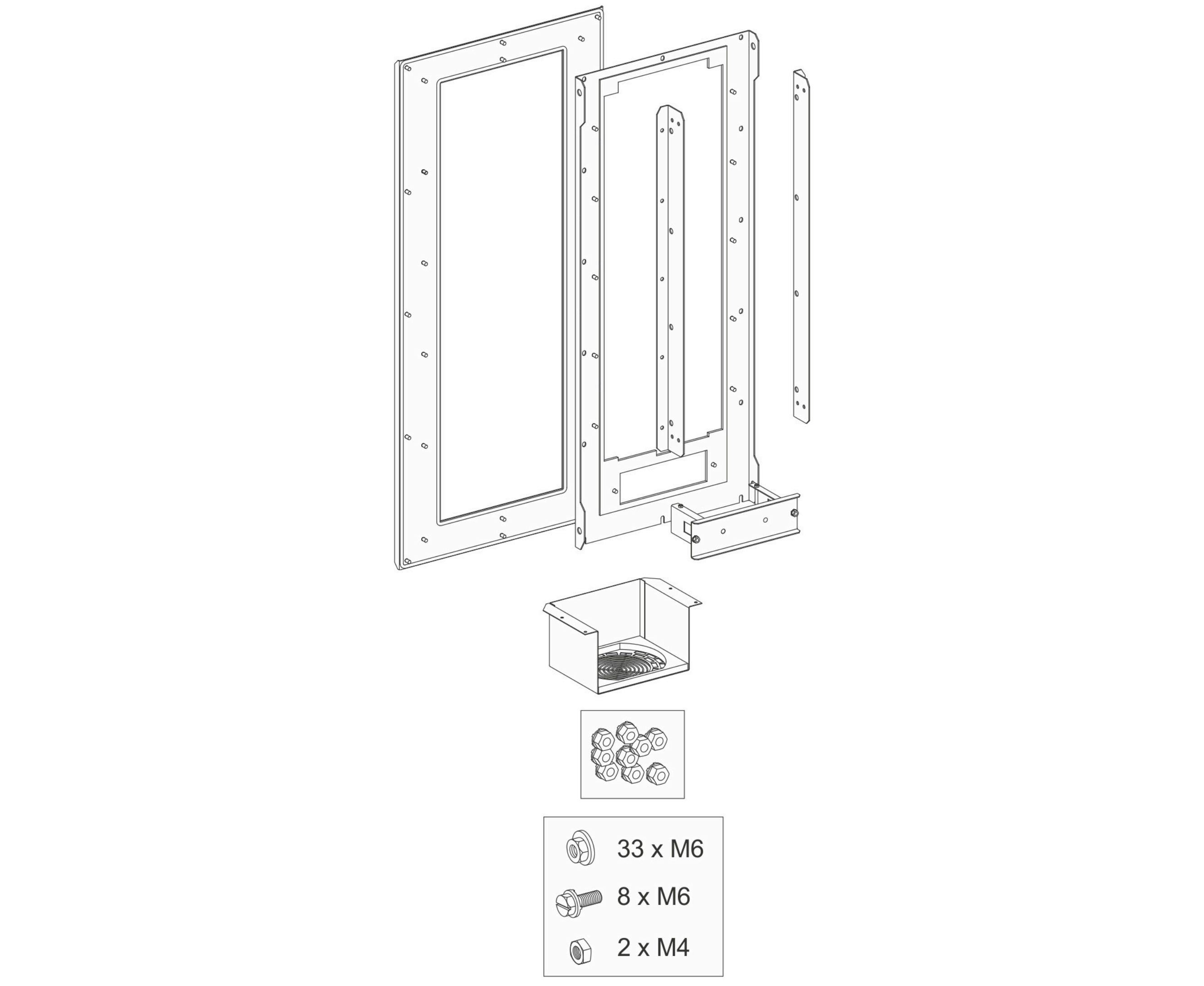


1		2 x	M5 x 12
2		10 x	M4 x 10
3		14 x	M4
4		10 x	Ø 5.3 mm (*0.21 in*)
5		10 x	M5 x 20

8I0PT086.401-1

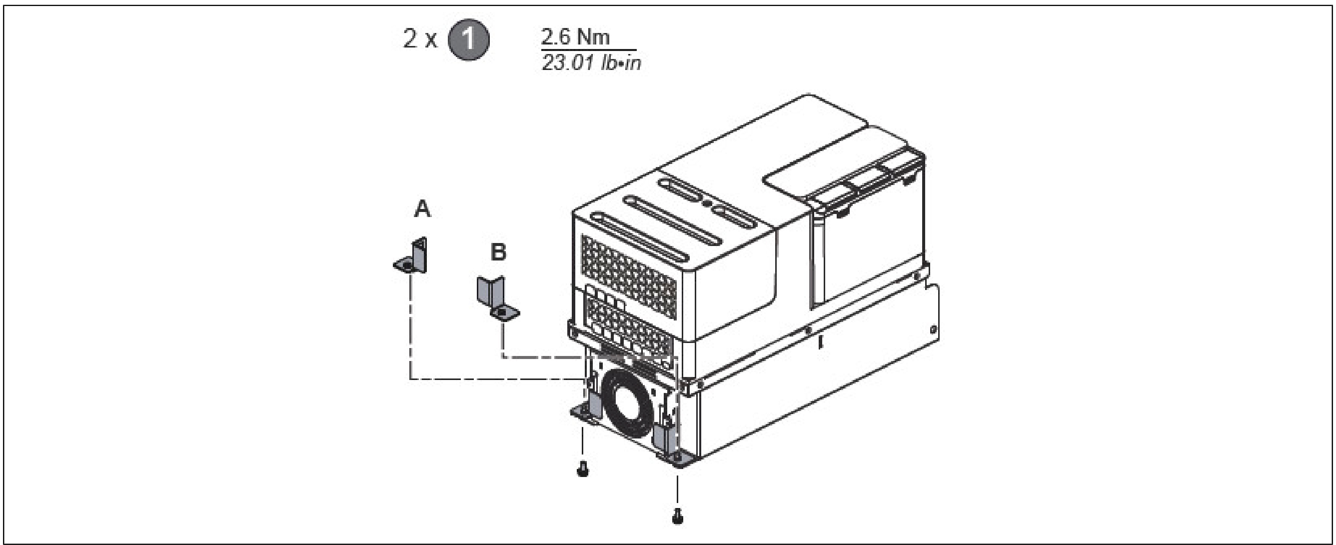


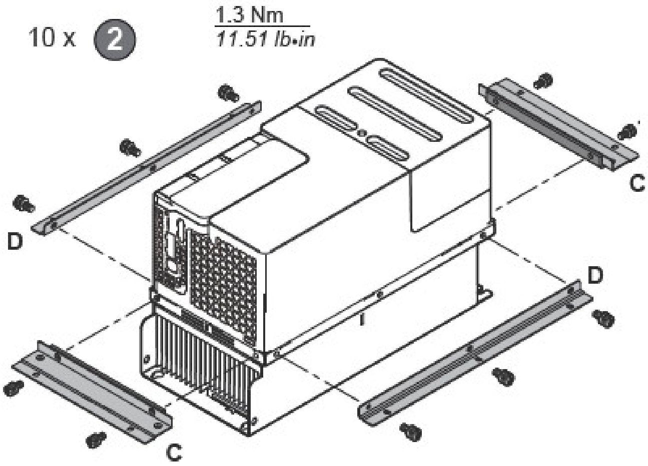
8I0PT086.402-1

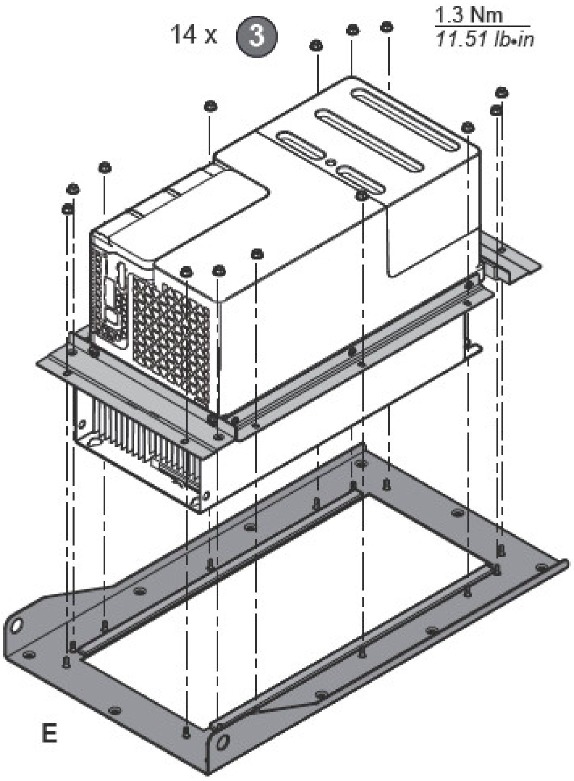


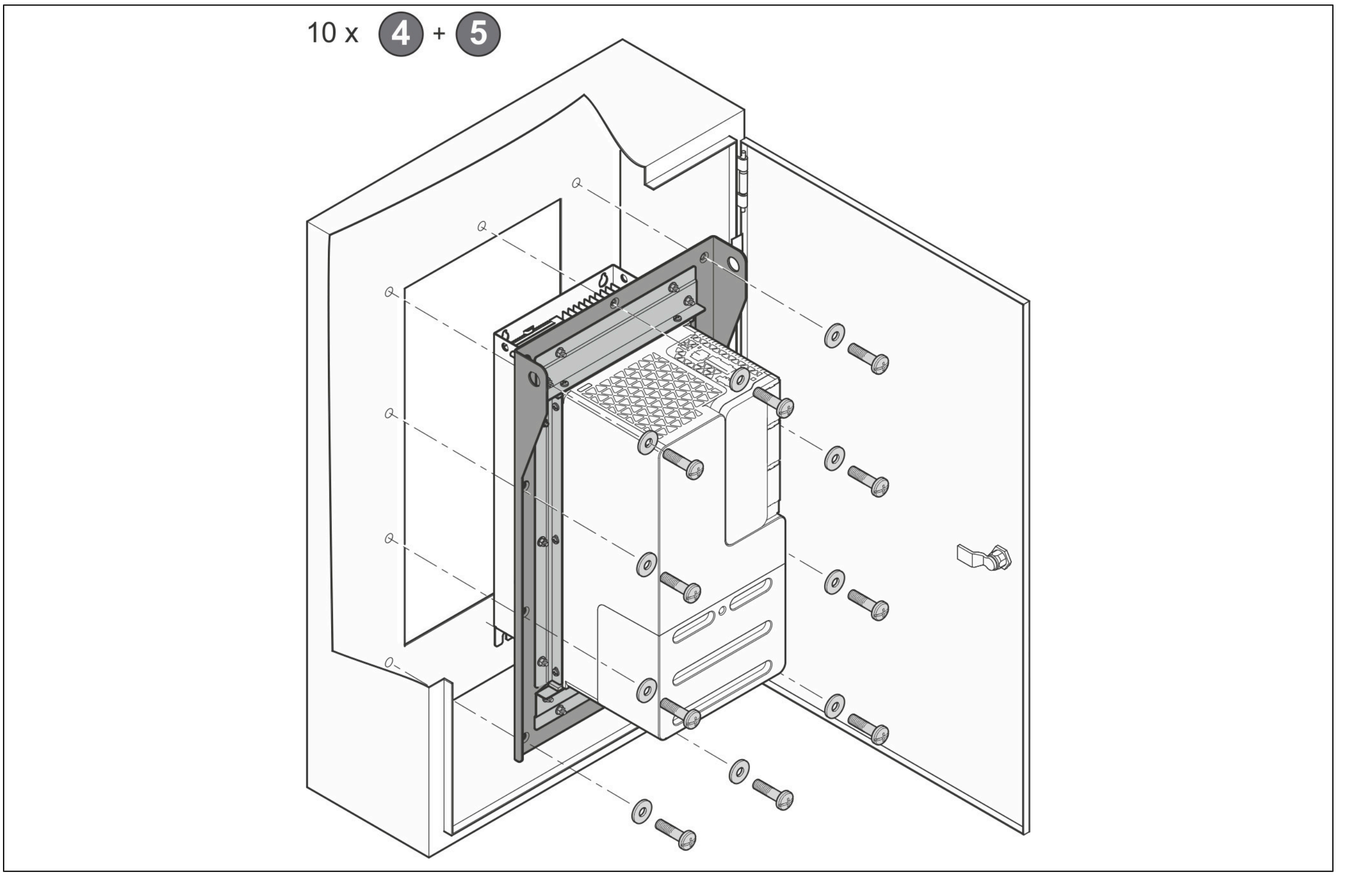
8.8.3 Installation

8.8.3.1 8I0PT086.400-1



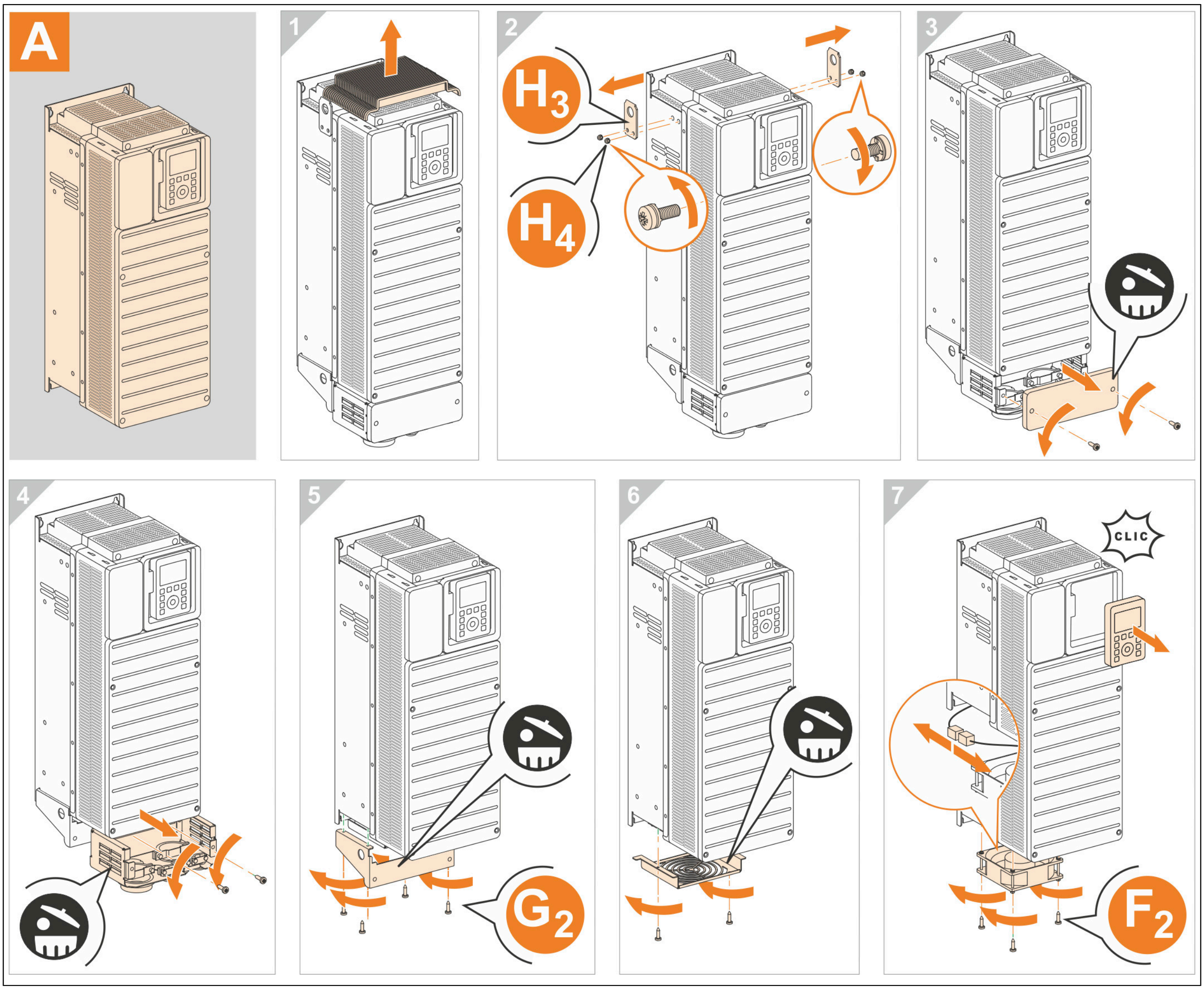

10 x 2
1.3 Nm
11.51 lb•in
C
D
D
C


14 x 3
1.3 Nm
11.51 lb•in
E

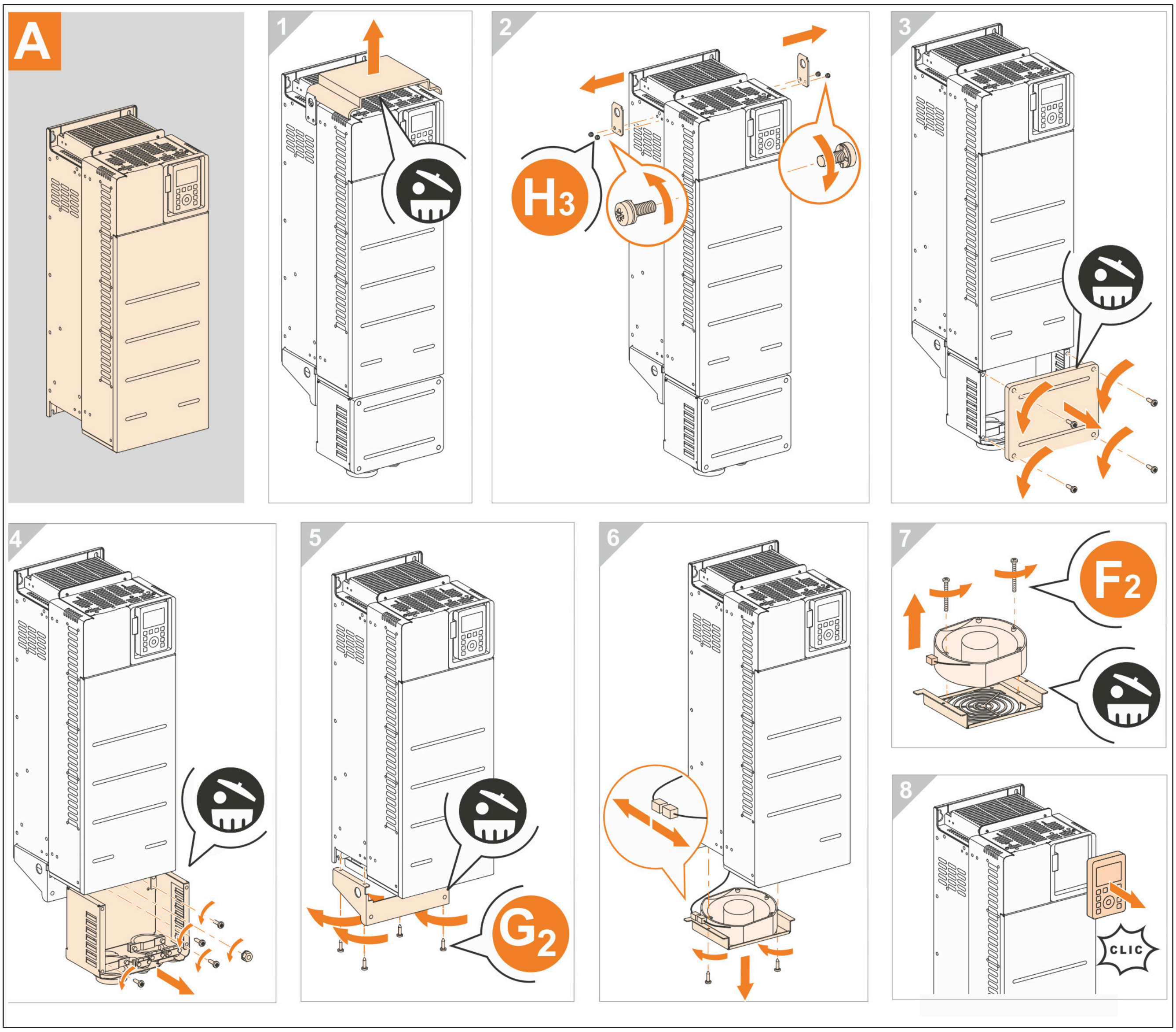

10 x 4 + 5

8.8.3.2 8I0PT086.401-1 and 8I0PT086.402-1

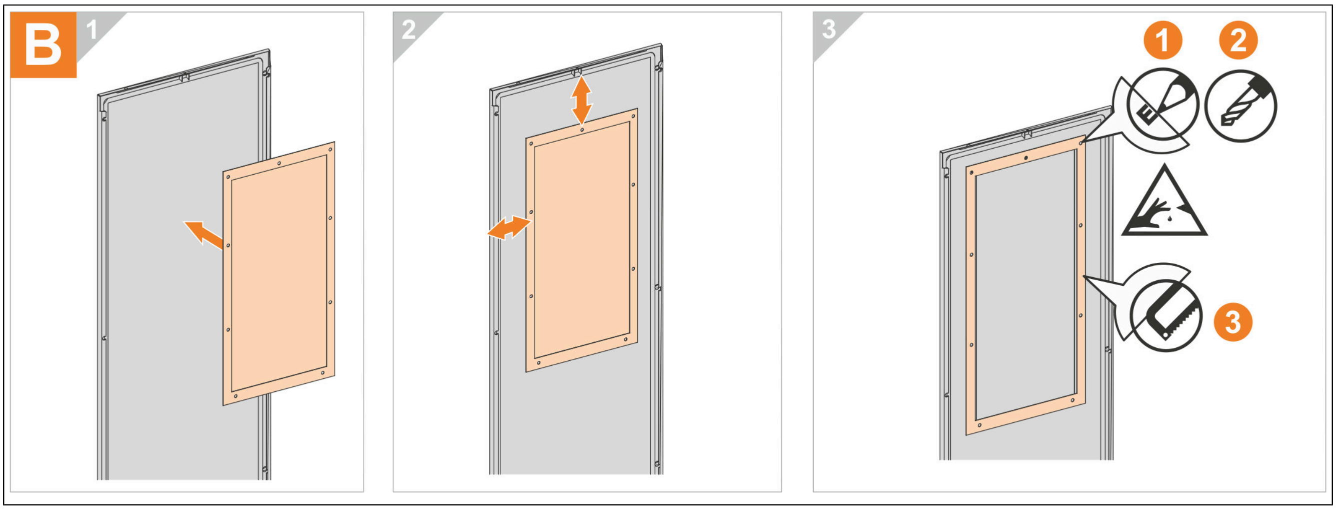
Step A: 8I0PT086.401-1



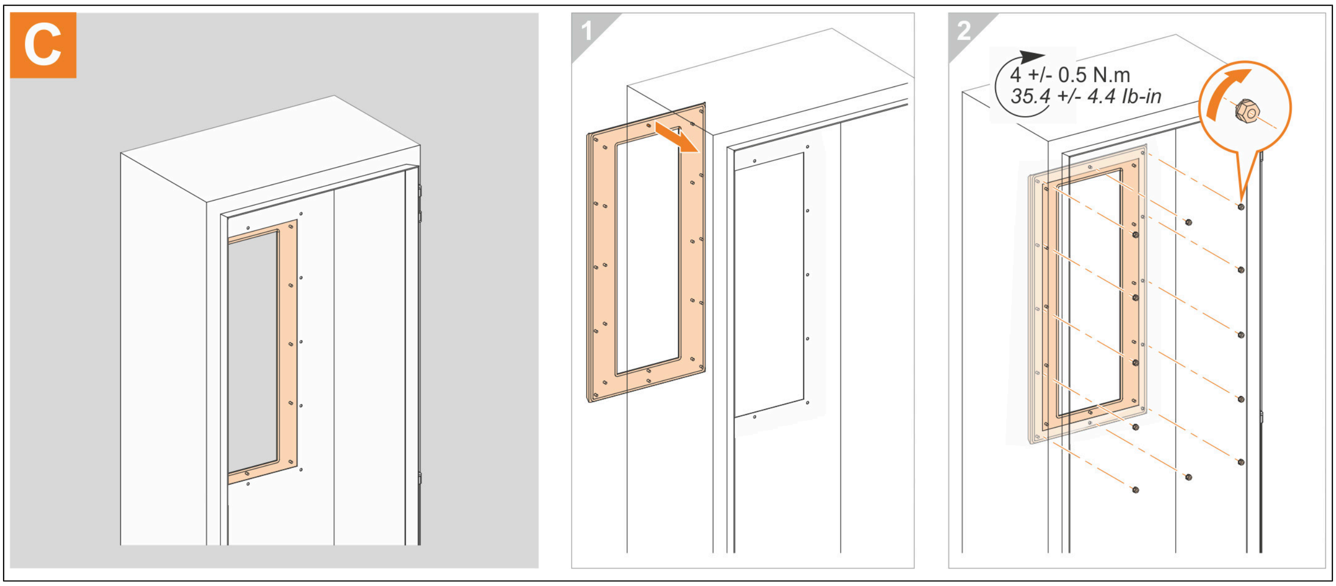
Step A: 8I0PT086.402-1



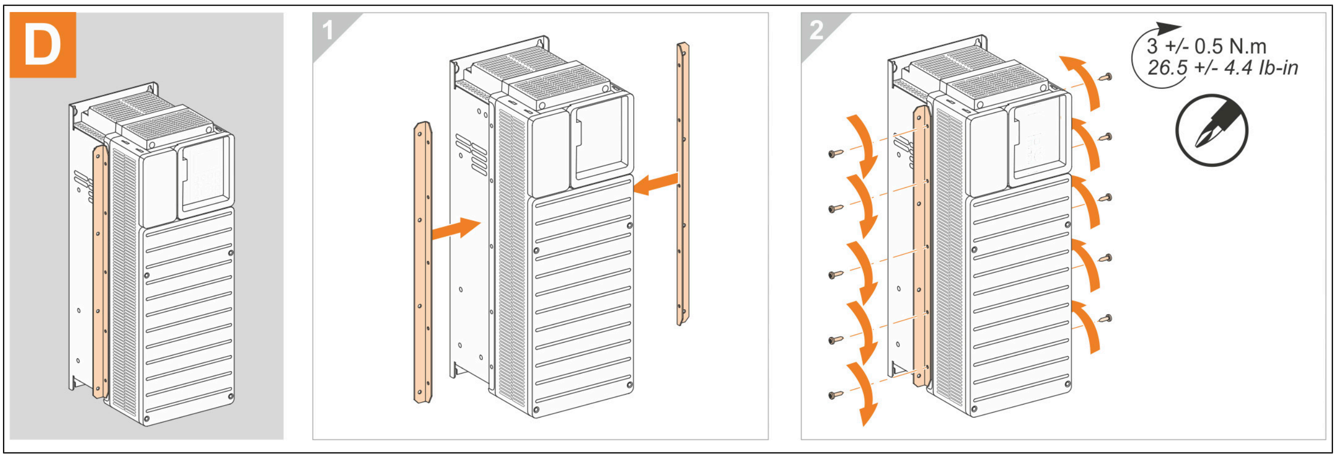
Step B



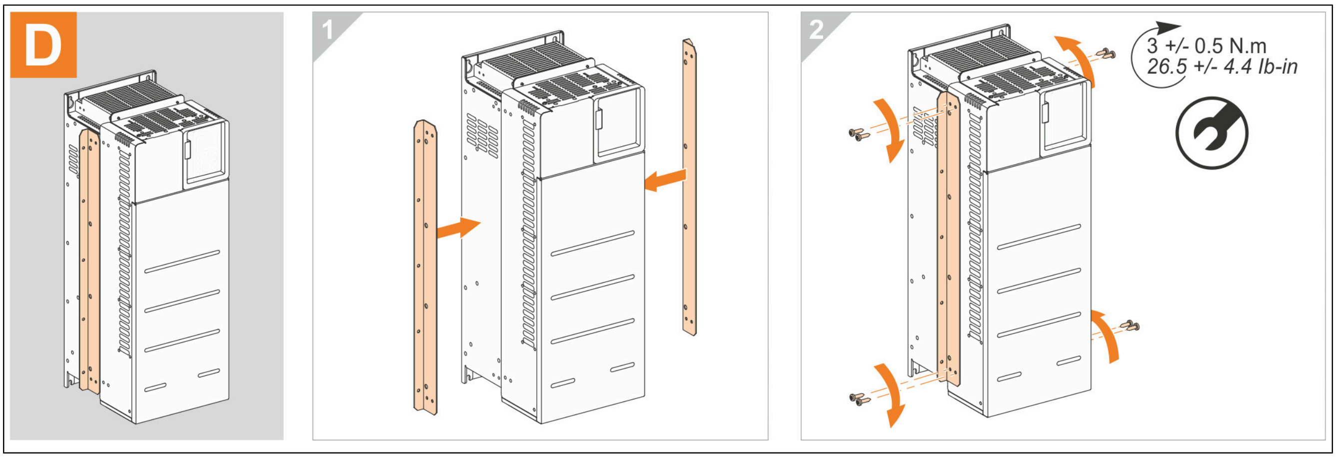
Step C



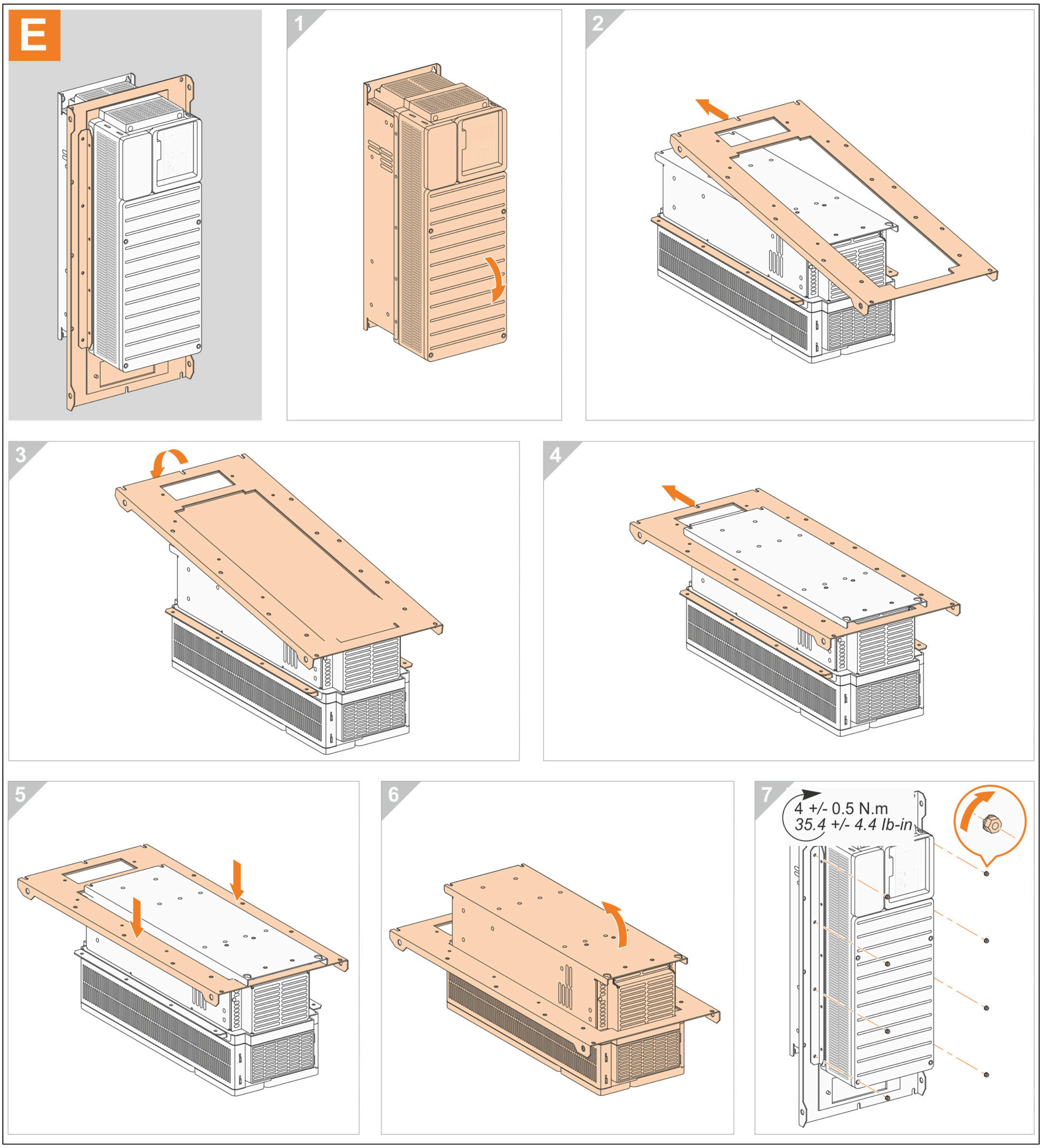
Step D: 8I0PT086.401-1



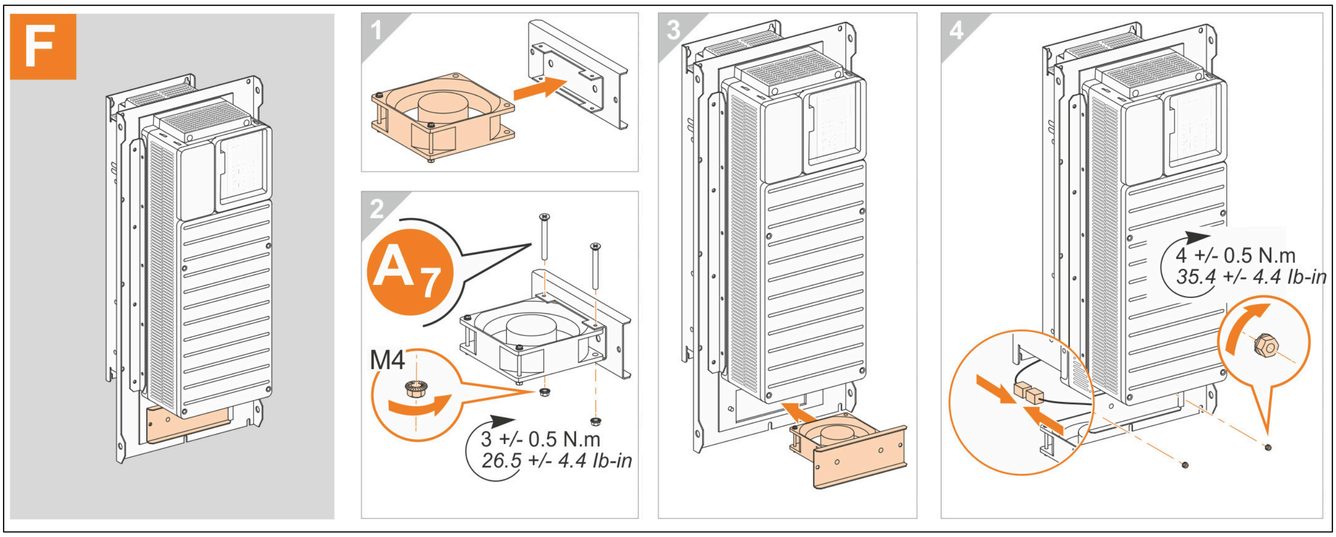
Step D: 8I0PT086.402-1



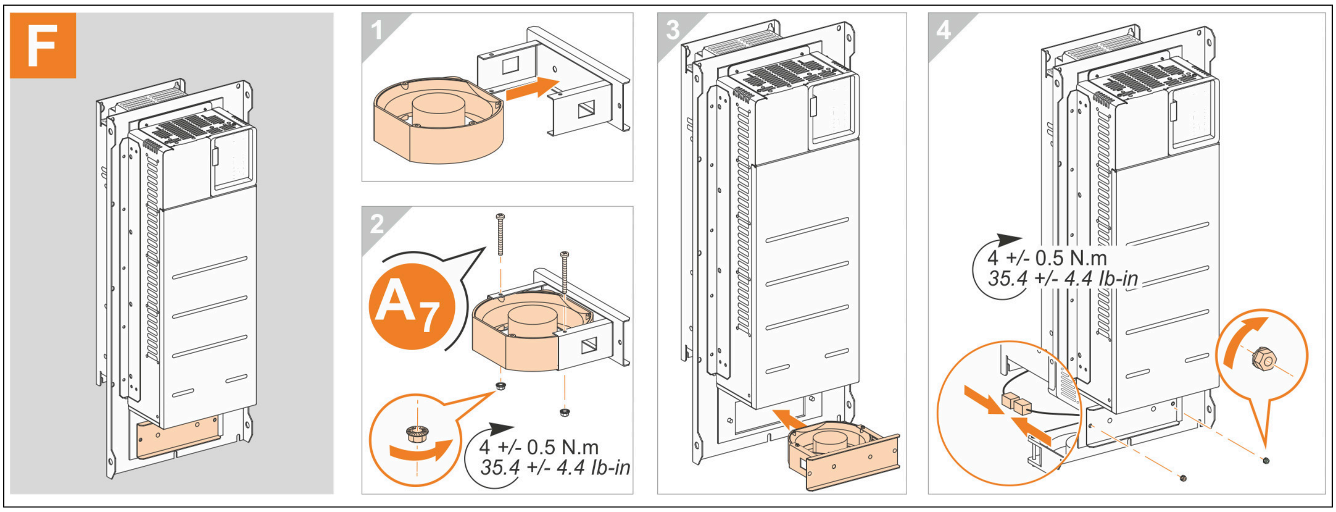
Step E



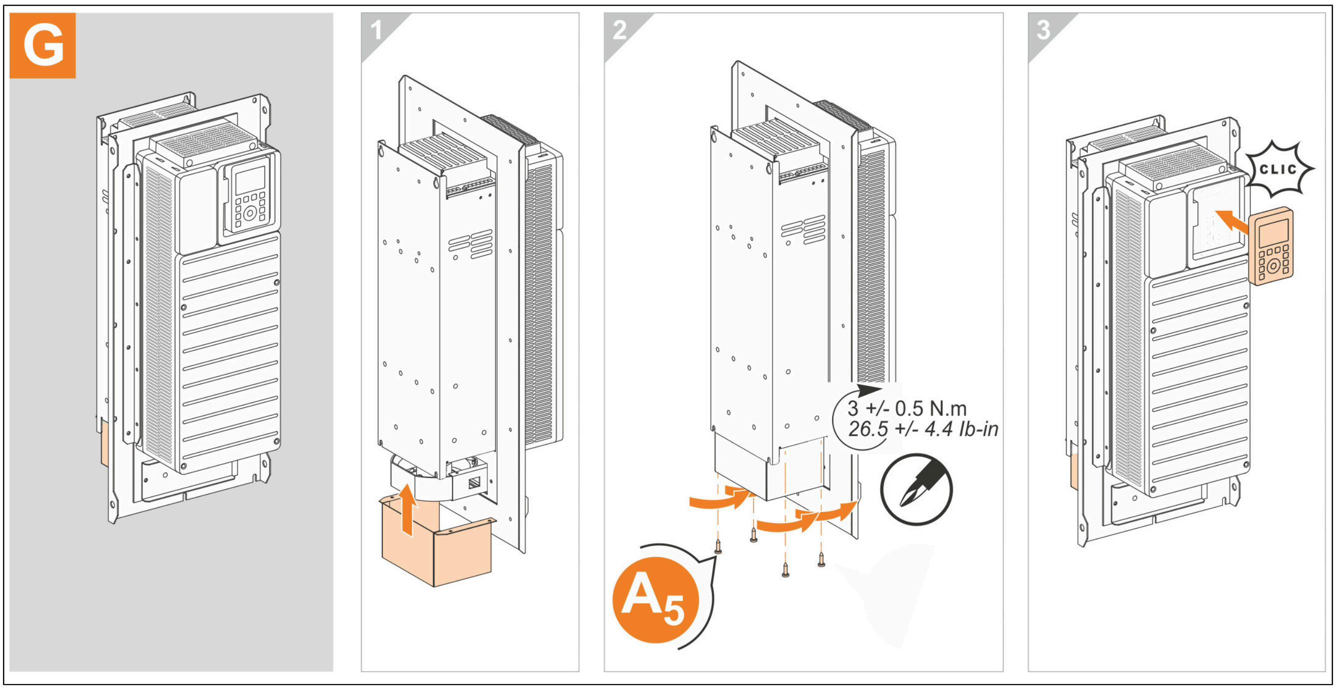
Step F: 8I0PT086.401-1



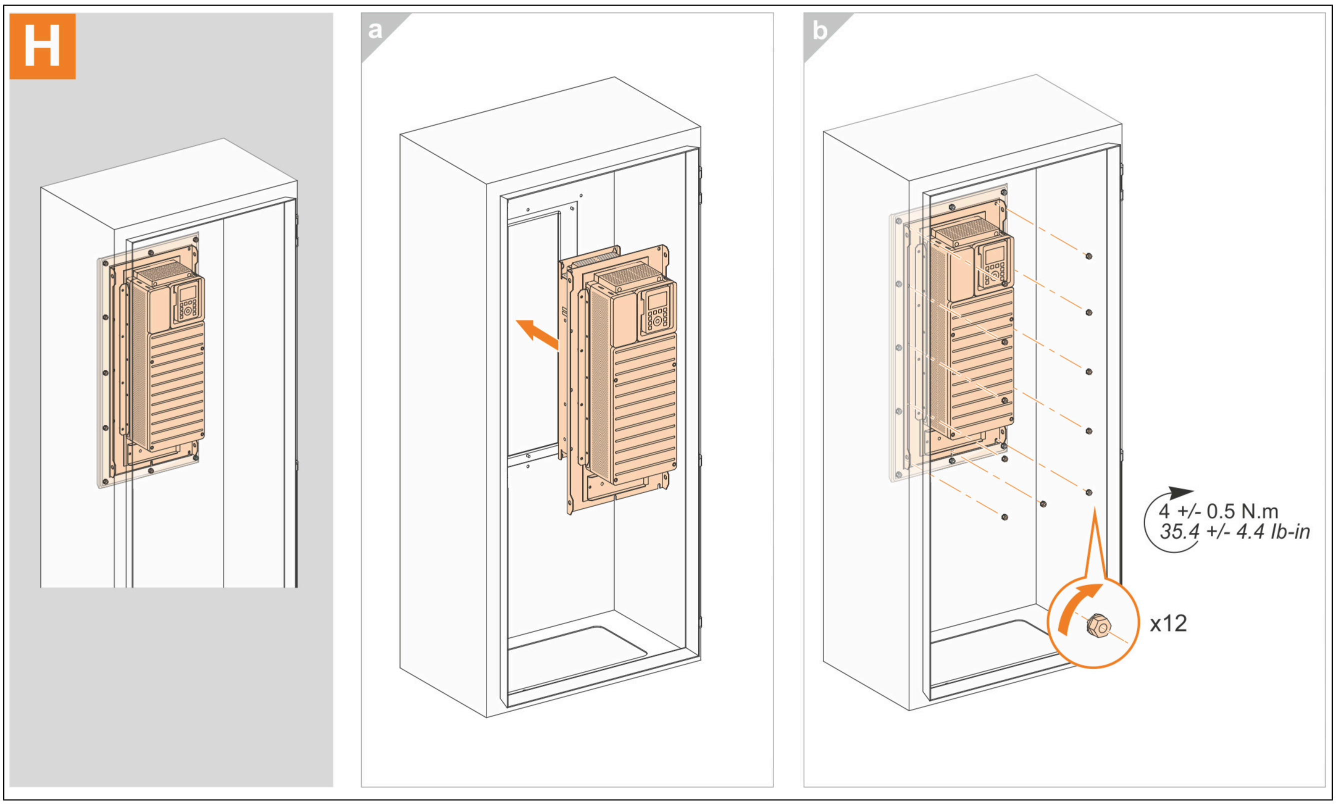
Step F: 8I0PT086.402-1

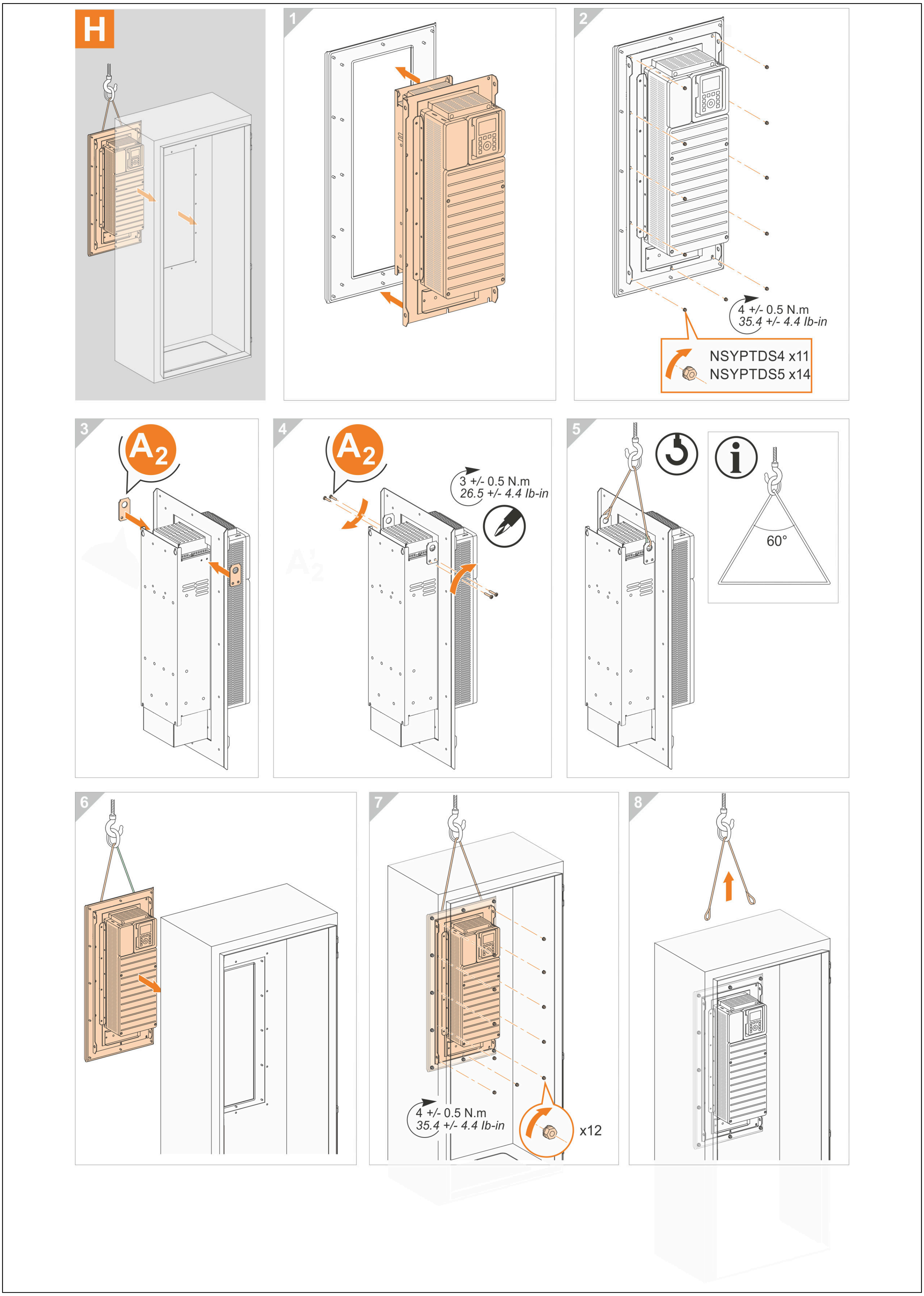


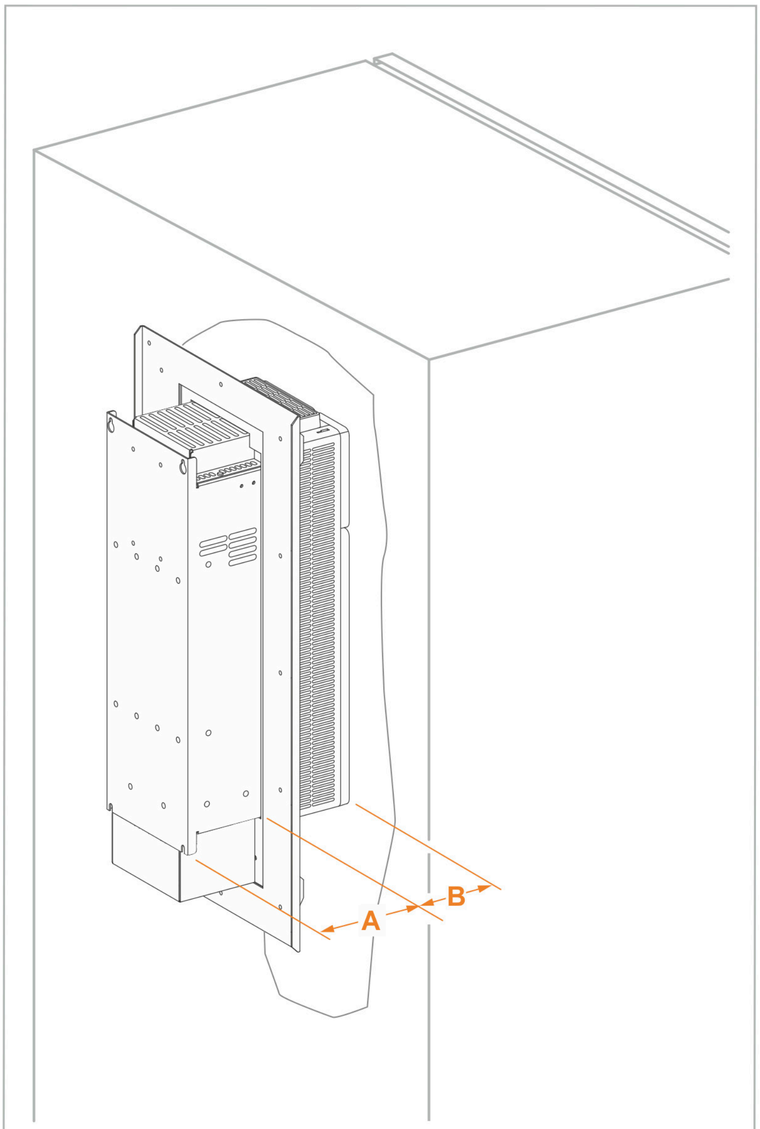
Step G

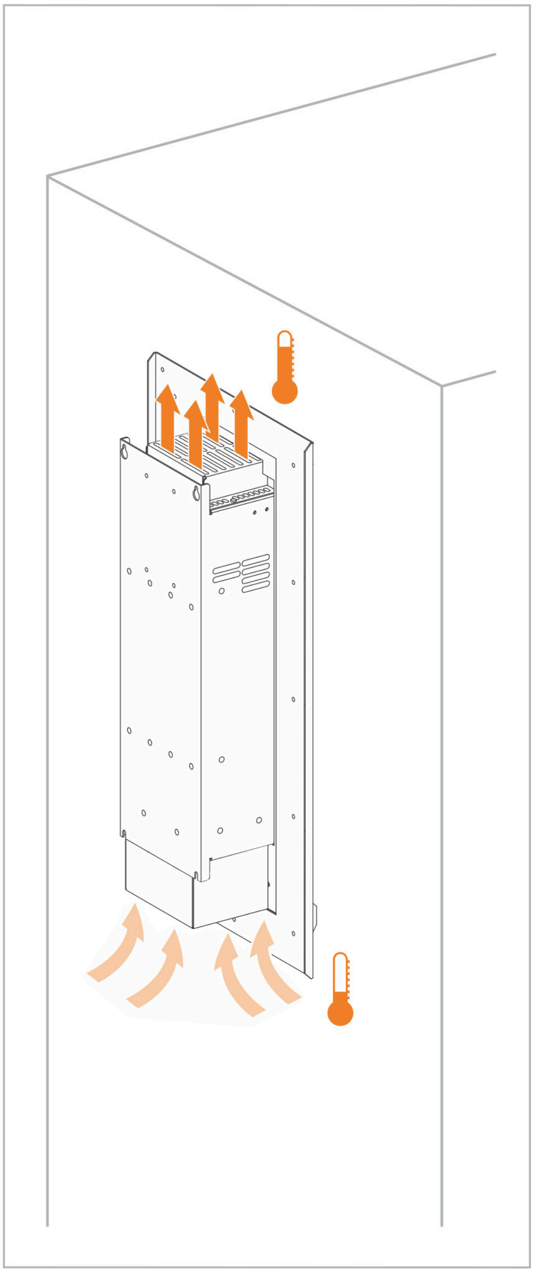


Step H




H
1
2
4 +/- 0.5 N.m
35.4 +/- 4.4 lb-in
NSYPTDS4 x11
NSYPTDS5 x14
3
4
3 +/- 0.5 N.m
26.5 +/- 4.4 lb-in
5
60°
6
7
4 +/- 0.5 N.m
35.4 +/- 4.4 lb-in
x12
8

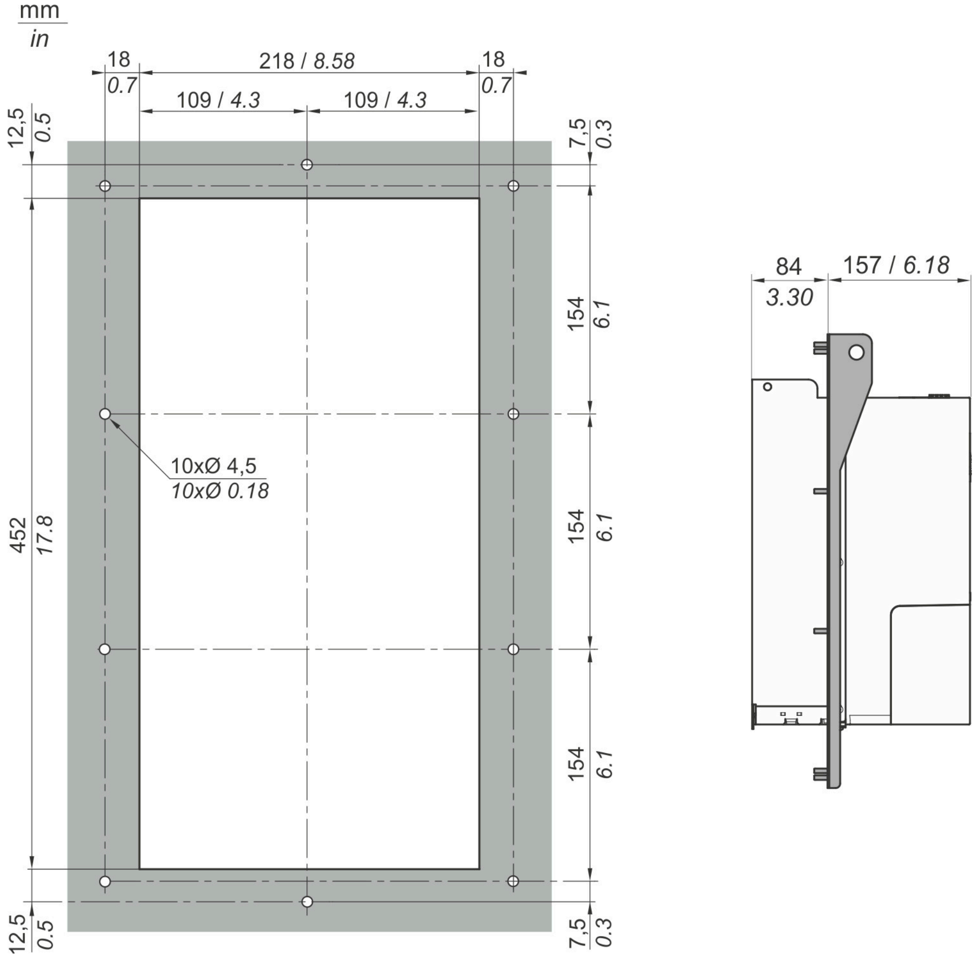




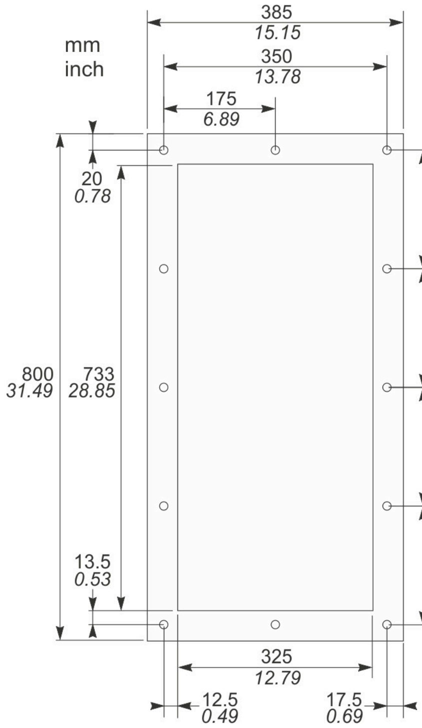
	A	B
8I0PT086.401-1	130 mm 5.12 in	140 mm 5.51 in
8I0PT086.402-1	160 mm 6.3 in	155 mm 6.1 in

8.8.4 Dimension

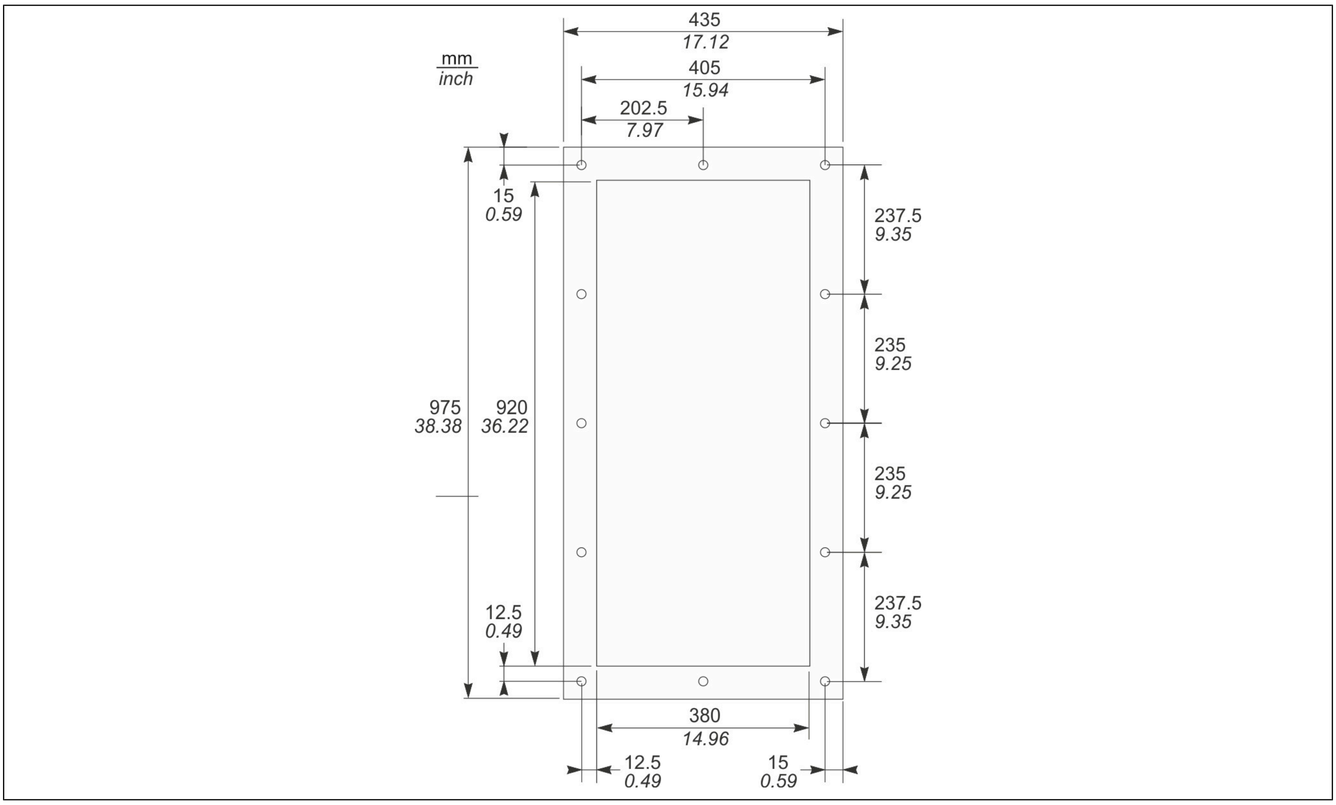
8I0PT086.400-1



8I0PT086.401-1



8I0PT086.402-1



8.9 Optional mains choke

8.9.1 Order data

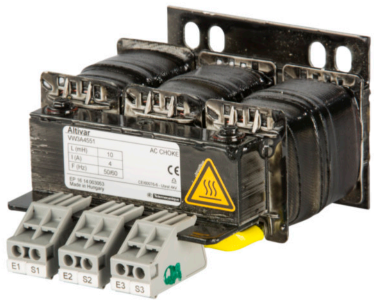
Order number	Short description	Figure
	Optional line chokes	
8I0CT004.000-1	ACOPOSinverter mains choke 3-phase, 4 A, 50/60 Hz	
8I0CT010.000-1	ACOPOSinverter mains choke 3-phase, 10 A, 50/60 Hz	
8I0CT016.000-1	ACOPOSinverter mains choke 3-phase, 17 A, 50/60 Hz	
8I0CT030.000-1	ACOPOSinverter mains choke 3-phase, 30 A, 50/60 Hz	
8I0CT060.000-1	ACOPOSinverter mains choke 3-phase, 60 A, 50/60 Hz	

Table 24: 8I0CT004.000-1, 8I0CT010.000-1, 8I0CT016.000-1, 8I0CT030.000-1, 8I0CT060.000-1 - Order data

8.9.2 Technical data

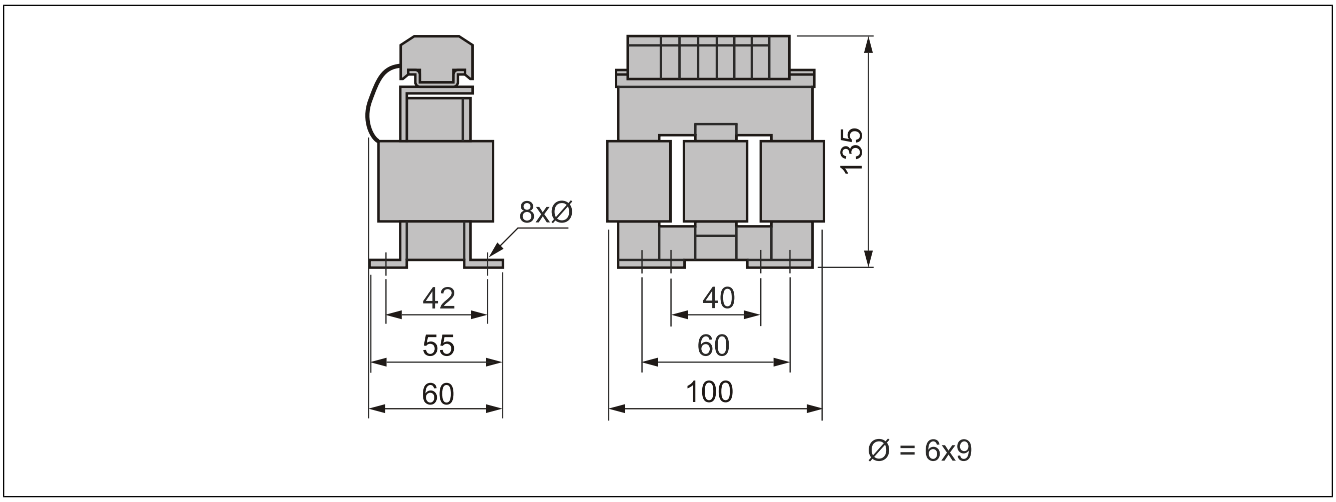
Order number	8I0CT004.000-1	8I0CT010.000-1	8I0CT016.000-1	8I0CT030.000-1	8I0CT060.000-1
General information					
Certifications					
CE	Yes				
UKCA	Yes				
KC	Yes				
Mains connection					
Power dissipation	45 W	65 W	75 W	90 W	94 W
Inductance	10 mH	4 mH	2 mH	1 mH	0.5 mH
Nominal current	4 A [1]	10 A [1]	17 A [1]	30 A [1]	60 A [1]
Voltage drop	Up to 5% of the nominal mains voltage. Higher values result in torque loss.				
Saturation current	-				
Operating conditions					
Installation elevation above sea level	0 to 1000 m				
Degree of protection					
Choke	IP00				
Terminals	IP20			IP10	
Max. relative humidity	95%, non-condensing No dripping water				
Ambient temperature	0 to 45°C				
Max. ambient temperature	Up to 55°C [2]				
Maximum installation elevation	3000 m [3]				1000 m
Ambient conditions					
Temperature					
Storage	-25 to 70°C				
Mechanical properties					
Weight	1.5 kg	3.0 kg	3.5 kg	6.0 kg	11.0 kg
General information					
Conformity to standard	IEC 61800-5-1 (protection level 1 against overvoltages in the mains supply per VDE 0160)				

Table 25: 8I0CT004.000-1, 8I0CT010.000-1, 8I0CT016.000-1, 8I0CT030.000-1, 8I0CT060.000-1 - Technical data

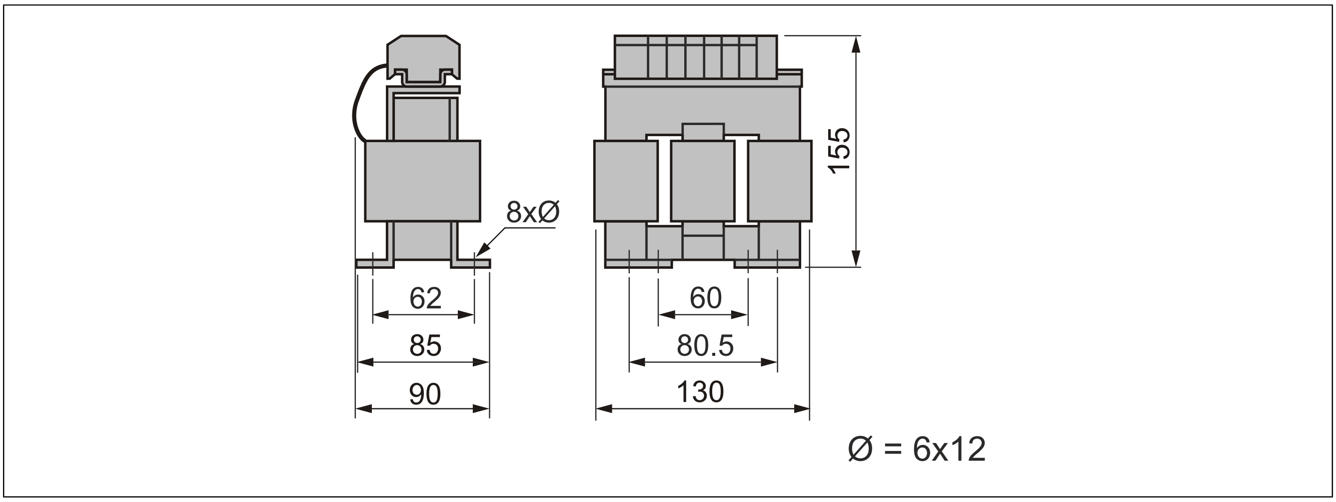
1) Max. current = 1.65 x Nominal current for 60 seconds
2) With current reduction of 2% per °C above 45°C.
3) From 1000 to 3000 m, current reduced by 1% per 100 m

8.9.3 Dimension

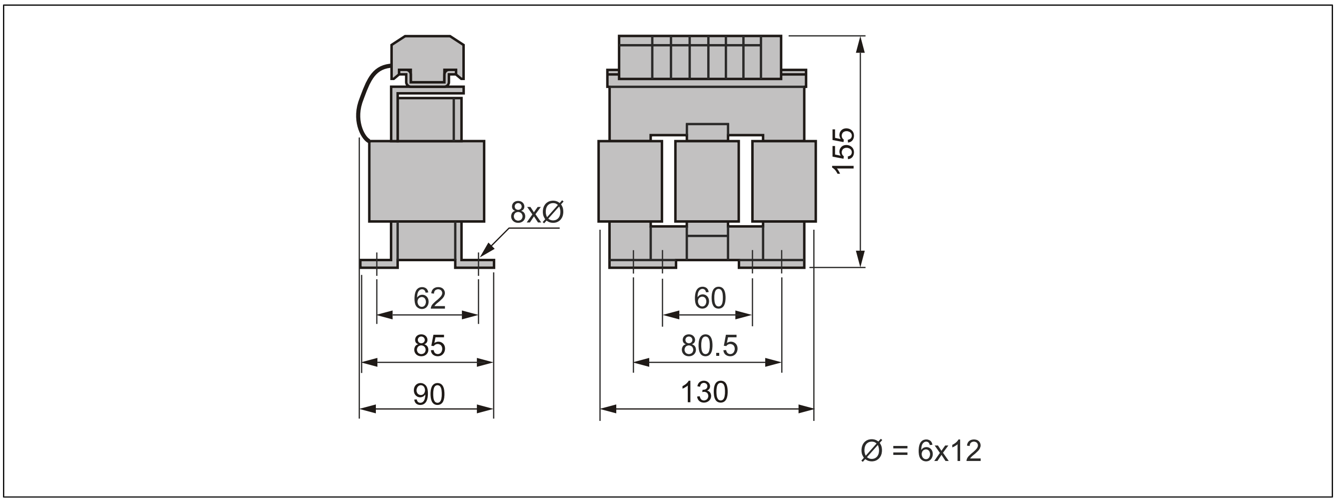
8I0CT004.000-1



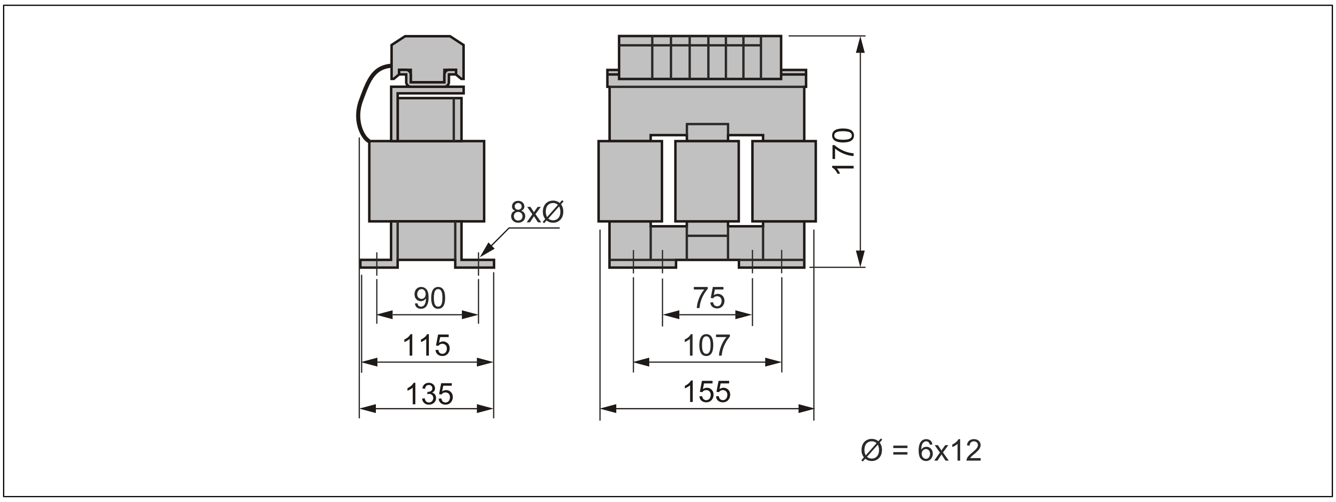
8I0CT010.000-1



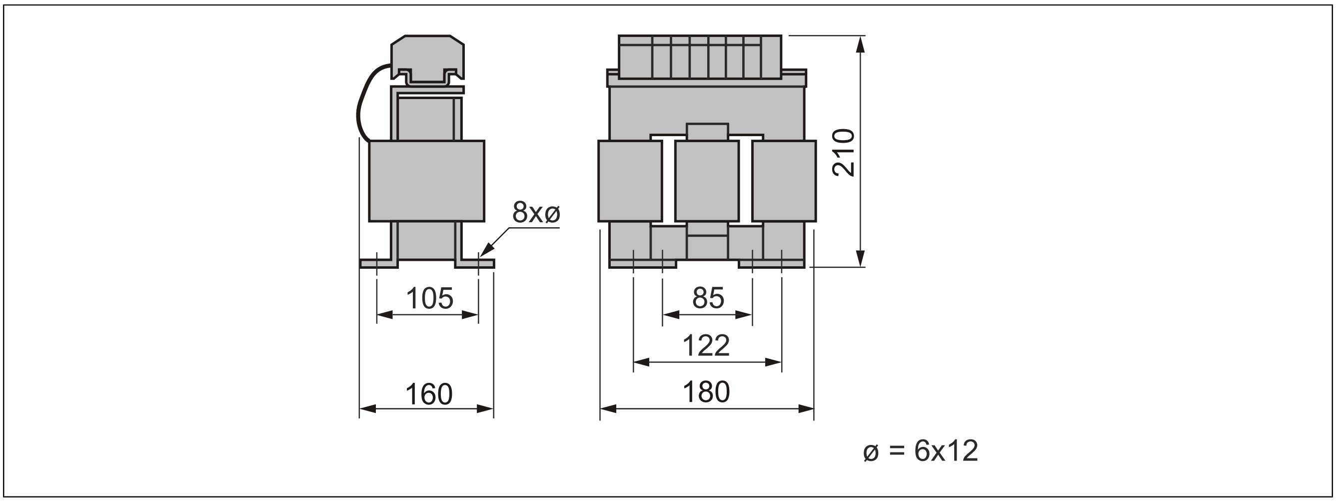
8I0CT016.000-1



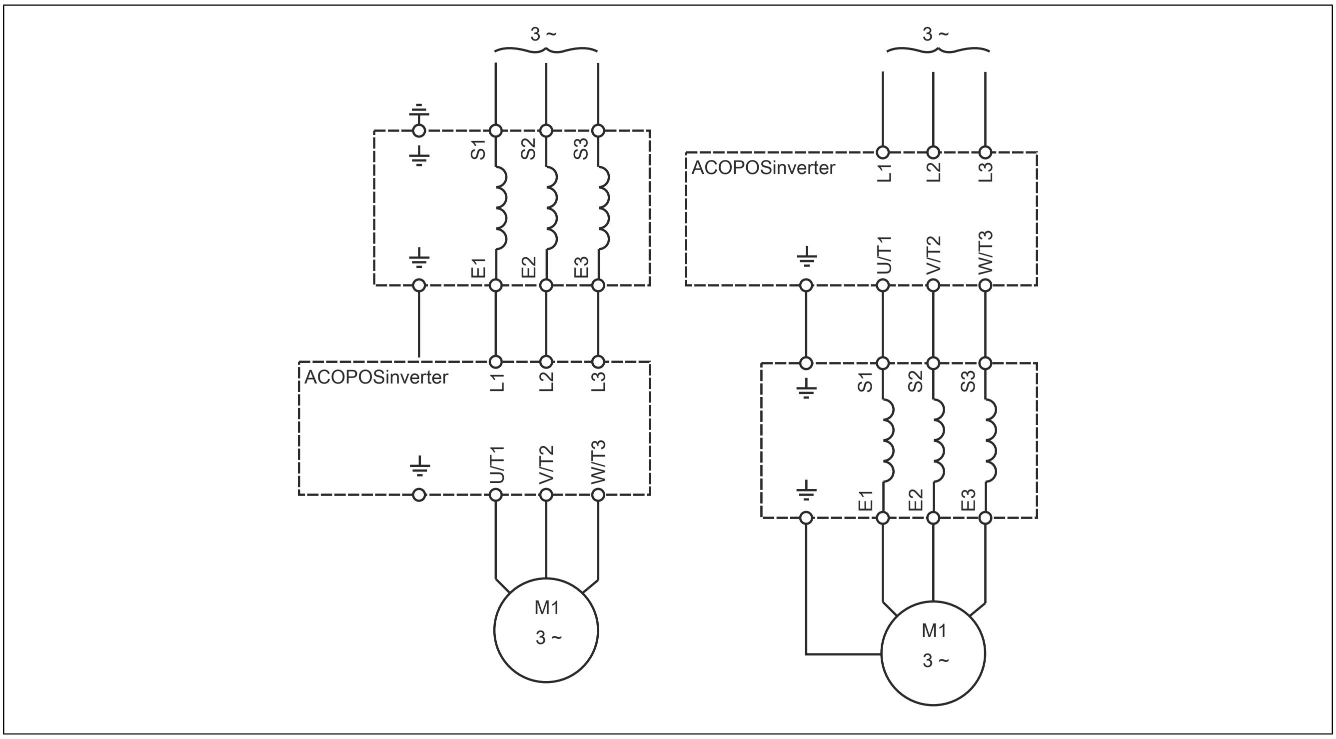
8I0CT030.000-1

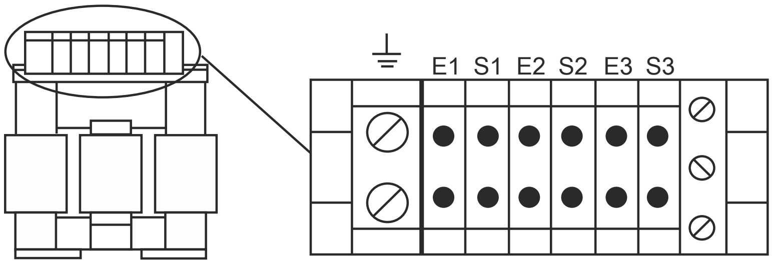


8I0CT060.000-1



8.9.4 Installation





8.10 Fan (replacement parts requirement)

8.10.1 Order data

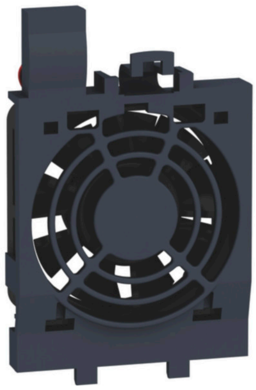
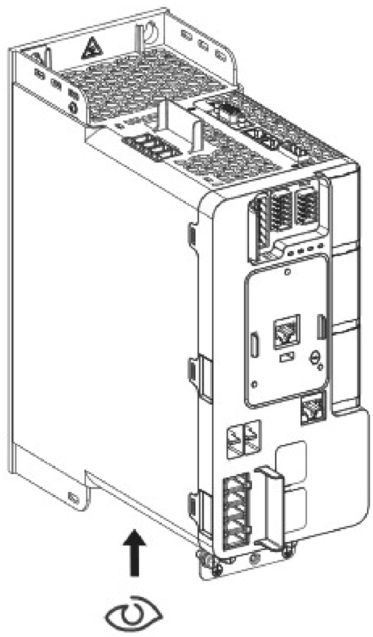
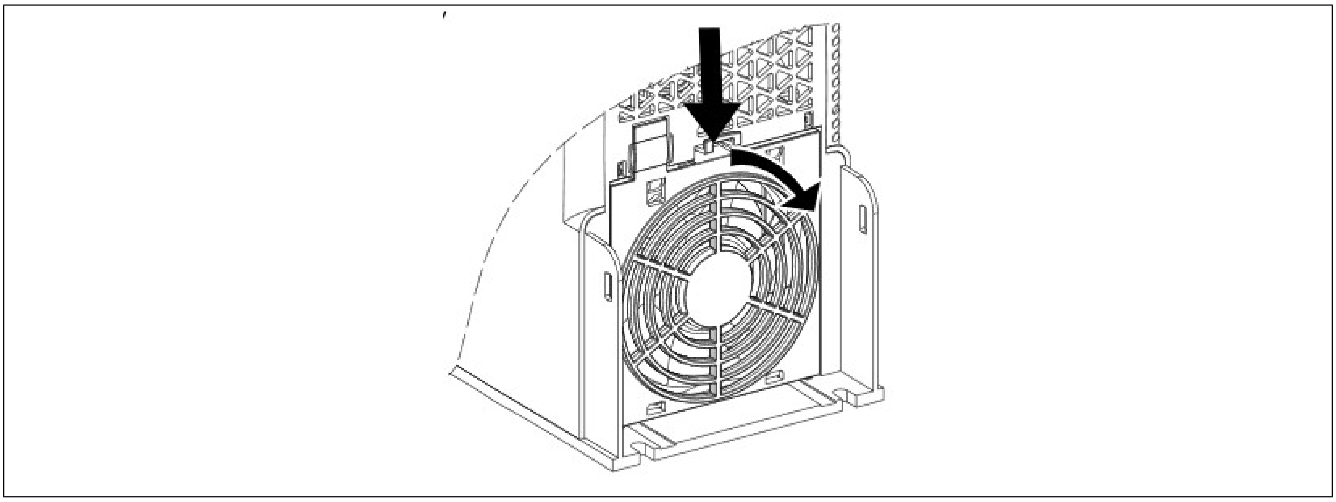
Order number	Short description	Figure
	Fan (replacement parts requirement)	
8I0XF086.401-1	ACOPOSinverter P86 fan kit for size 1, power output class: 0.75 to 4 kW (1 to 5 HP)	
8I0XF086.402-1	ACOPOSinverter P86 fan kit for size 2, power output class: 5.5 to 7.5 kW (7 to 10 HP)	
8I0XF086.403-1	ACOPOSinverter P86 fan kit for size 3, power output class: 11 to 22 kW (15 to 30 HP)	
8I0XF086.404-1	ACOPOSinverter P86 fan kit for size 4, power output class: 30 to 37 kW (40 to 50 HP)	
8I0XF086.405-1	ACOPOSinverter P86 fan kit for size 5, power output class: 45 to 75 kW (60 to 100 HP)	

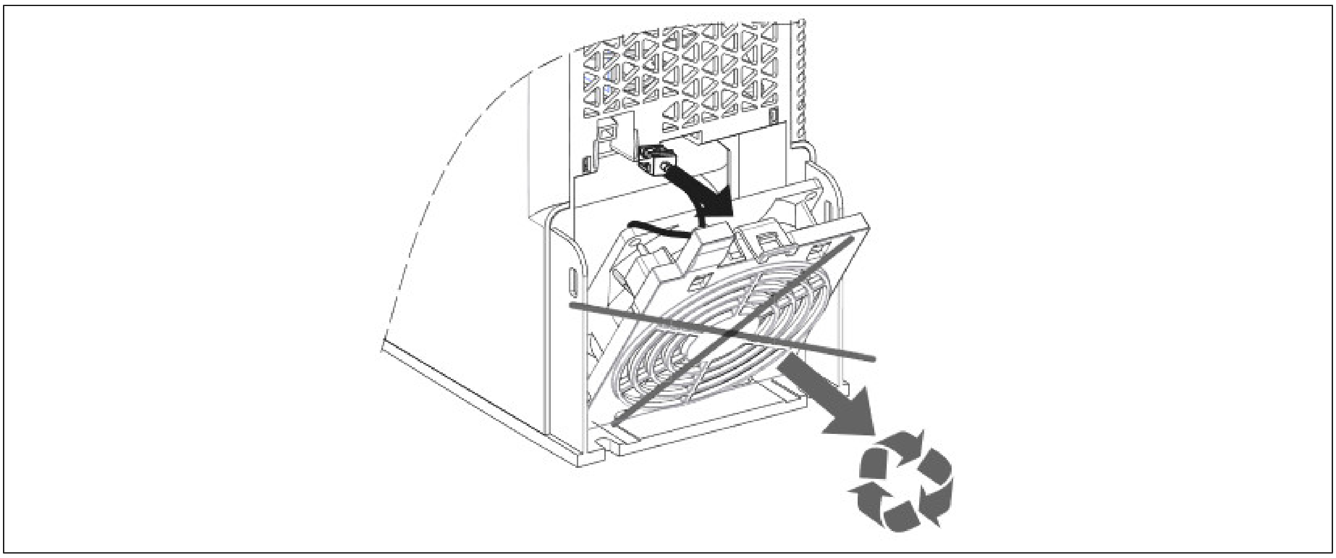
Table 26: 8I0XF086.401-1, 8I0XF086.402-1, 8I0XF086.403-1, 8I0XF086.404-1, 8I0XF086.405-1 - Order data

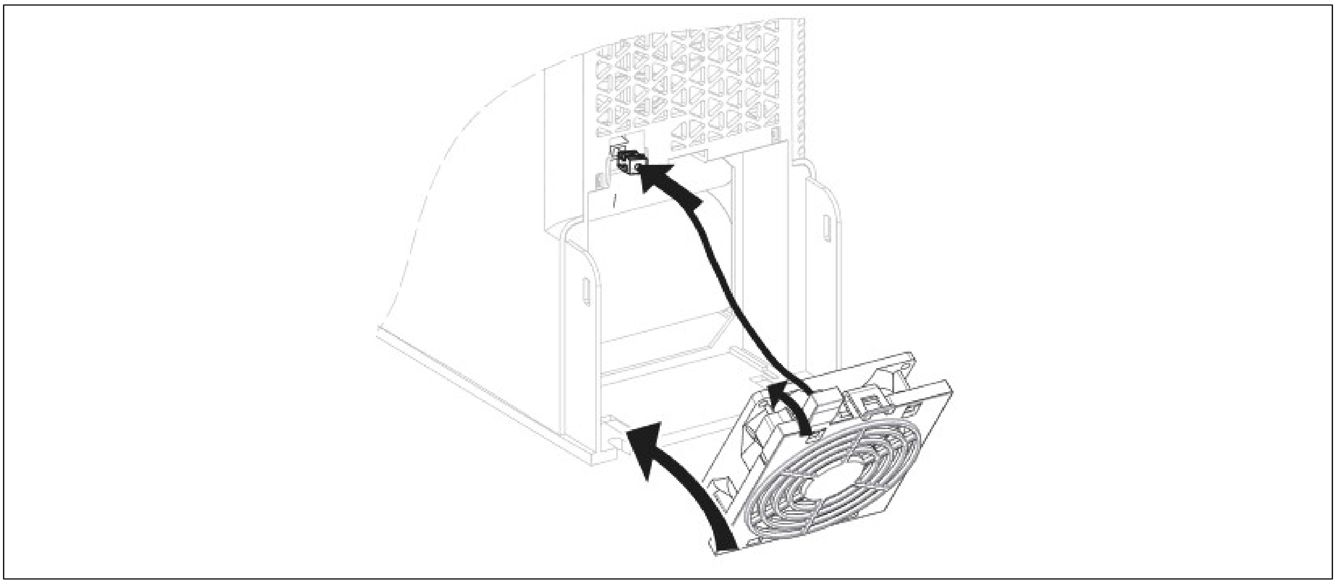
8.10.2 Installation

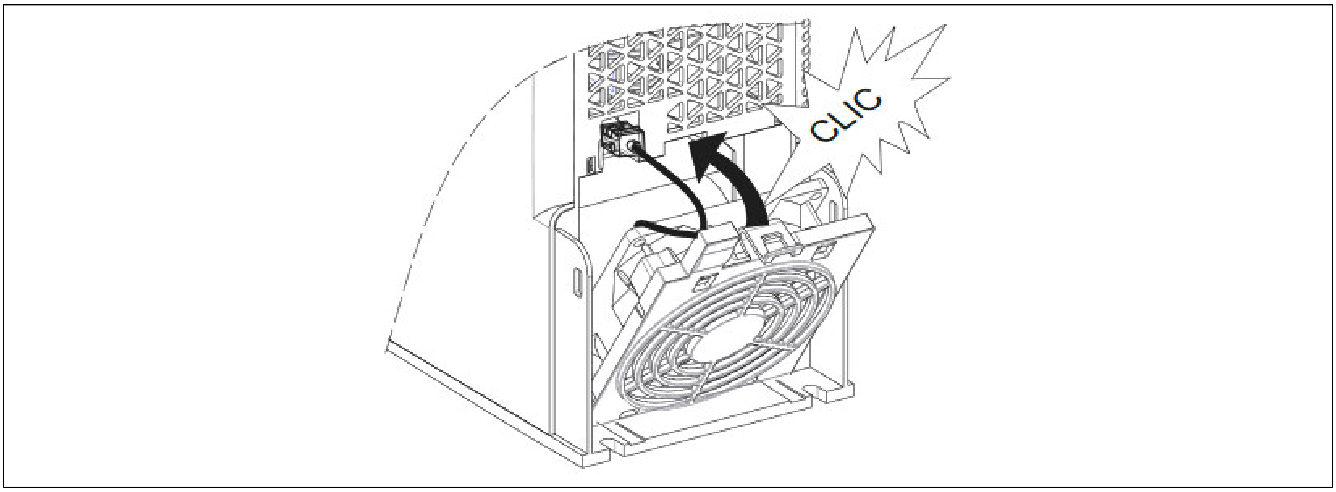
8.10.2.1 8I0XF086.401-1 and 8I0XF086.402-1

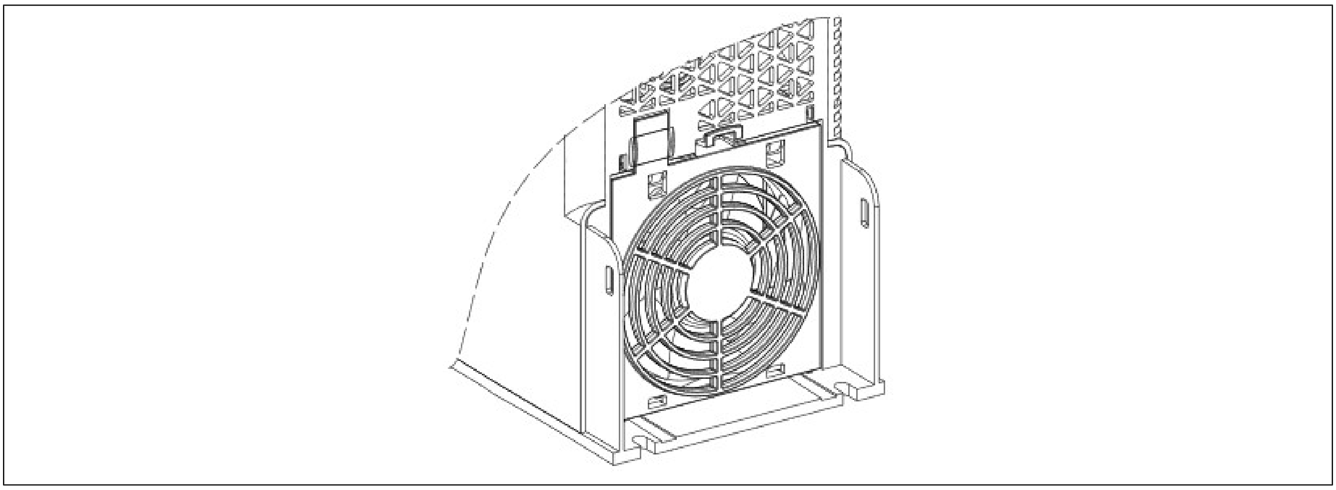




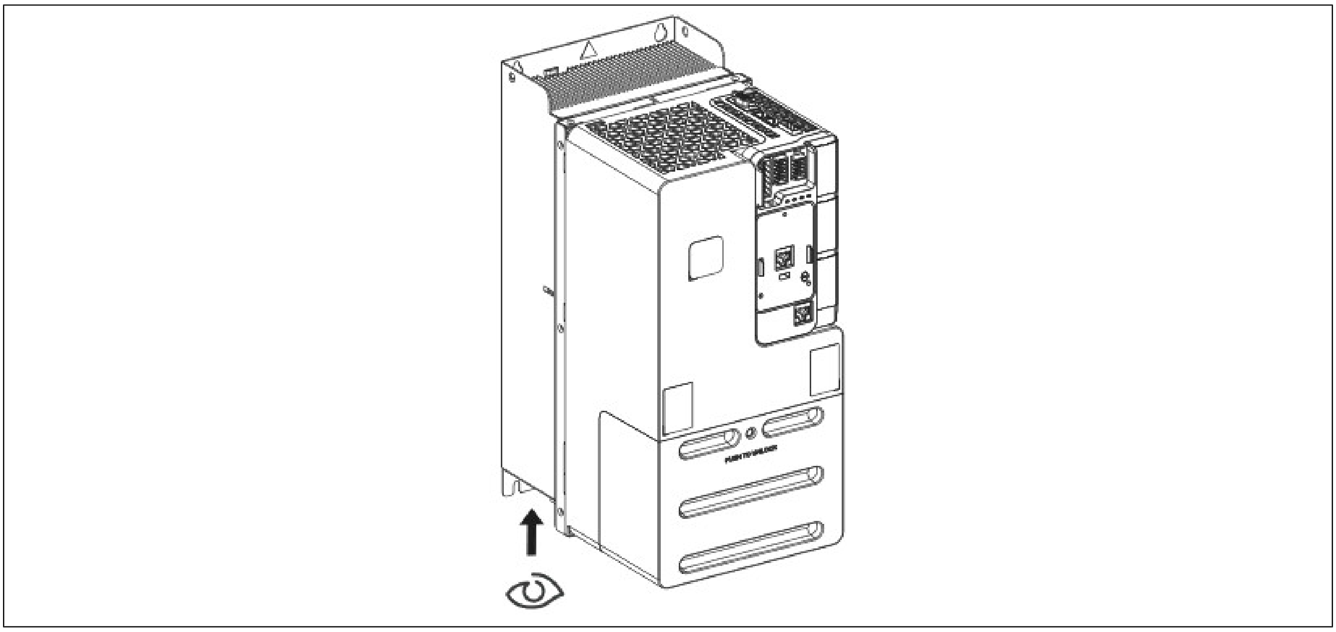


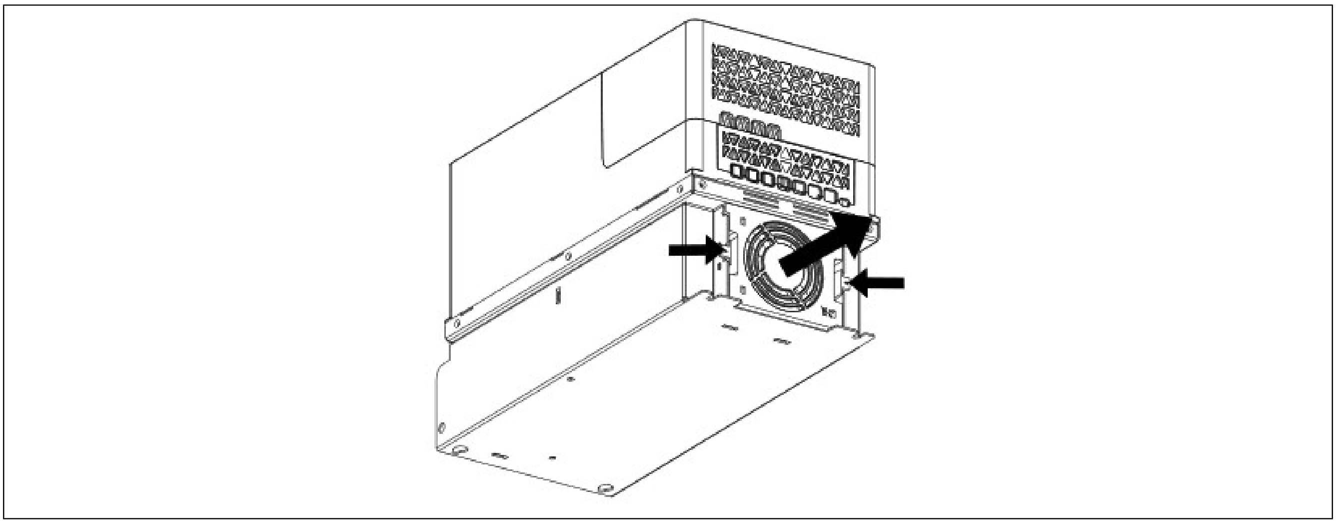


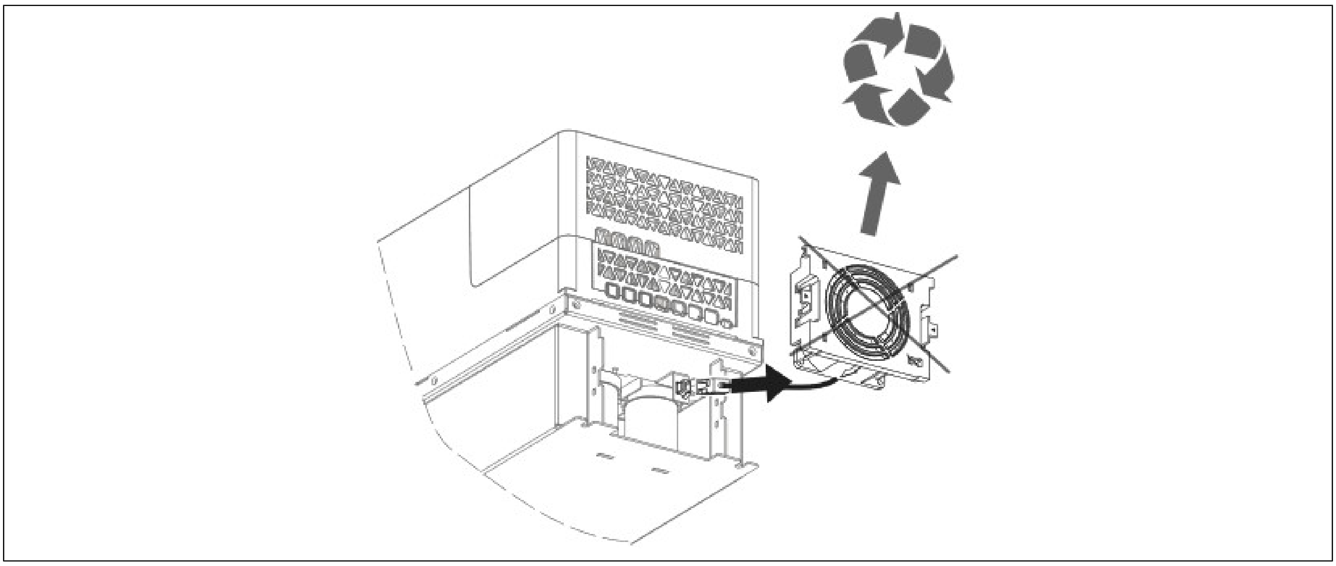


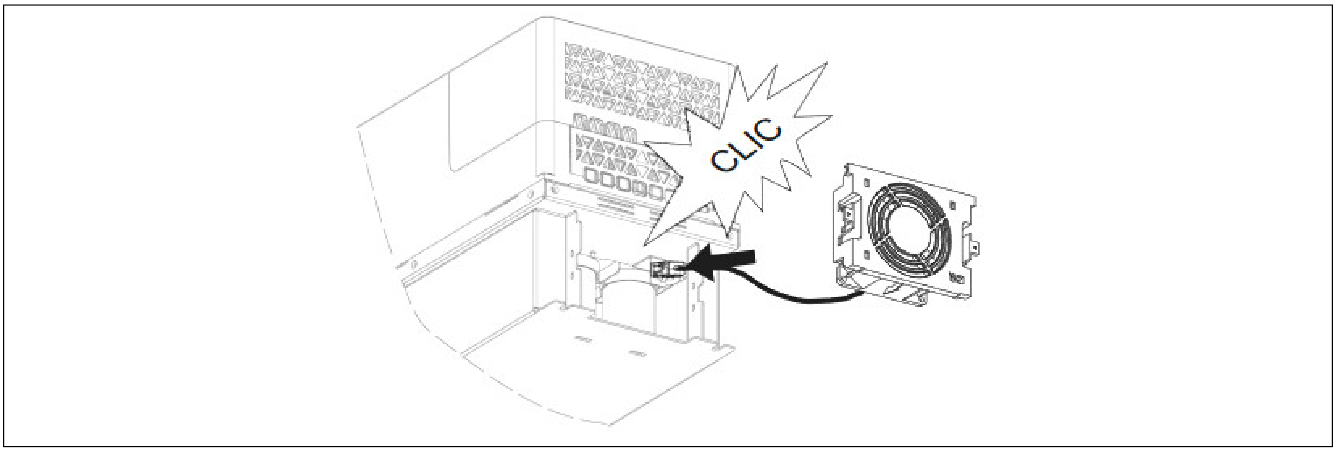


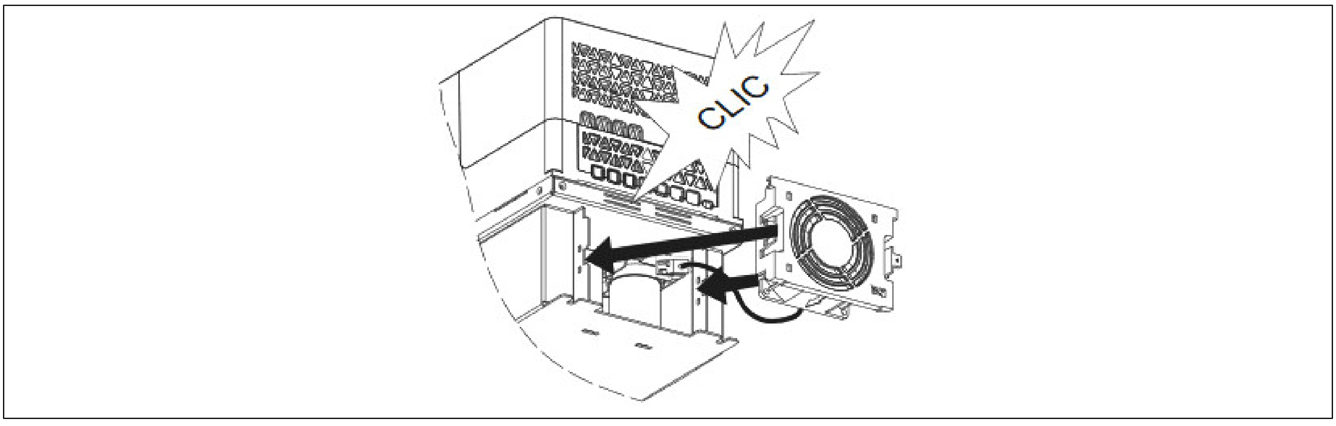
8.10.2.2 8I0XF086.403-1

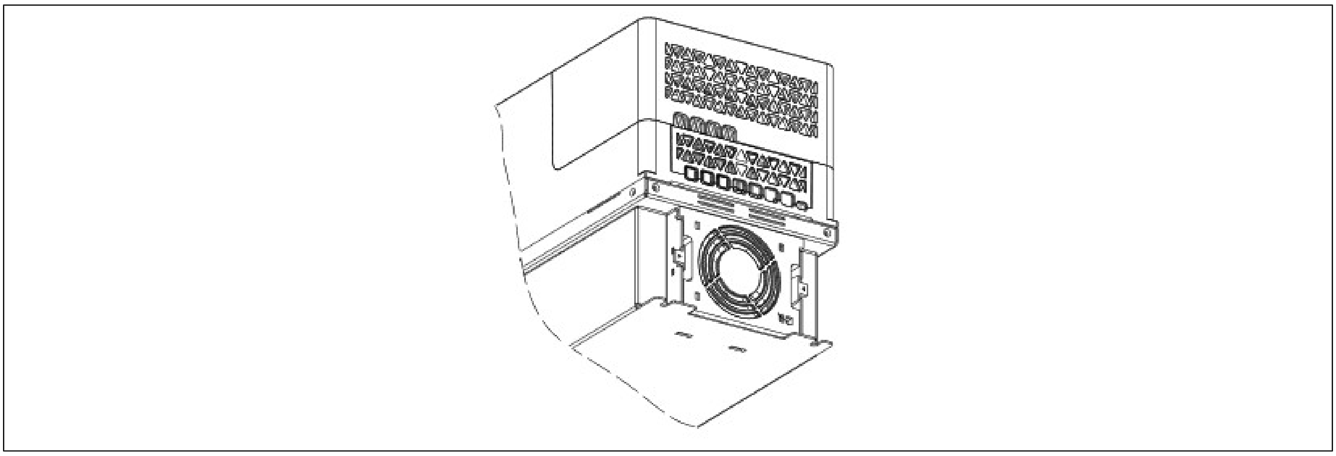




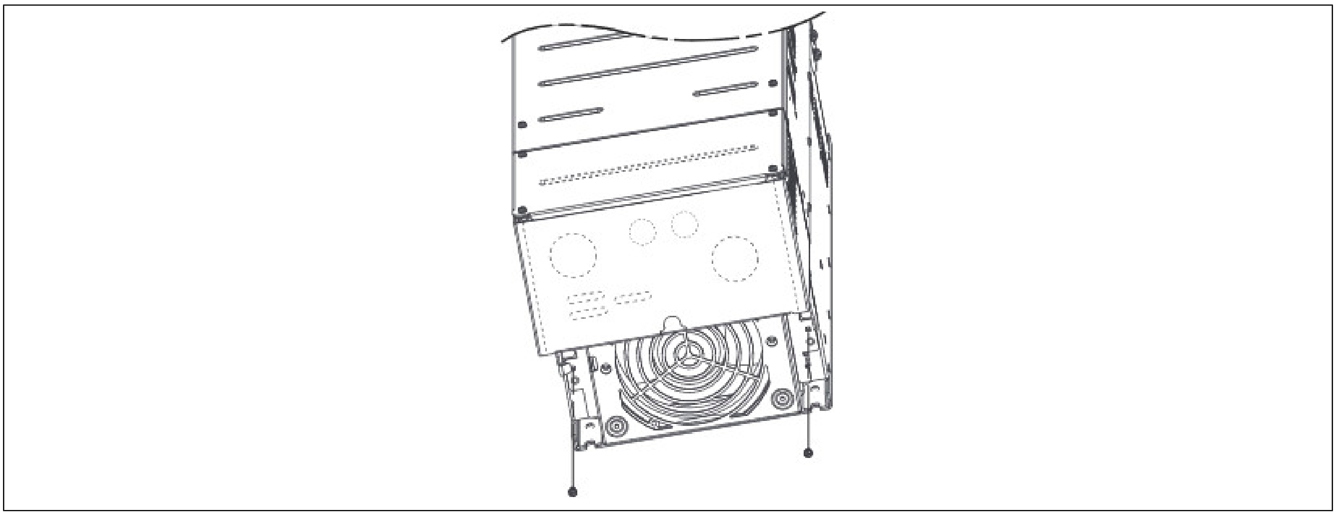


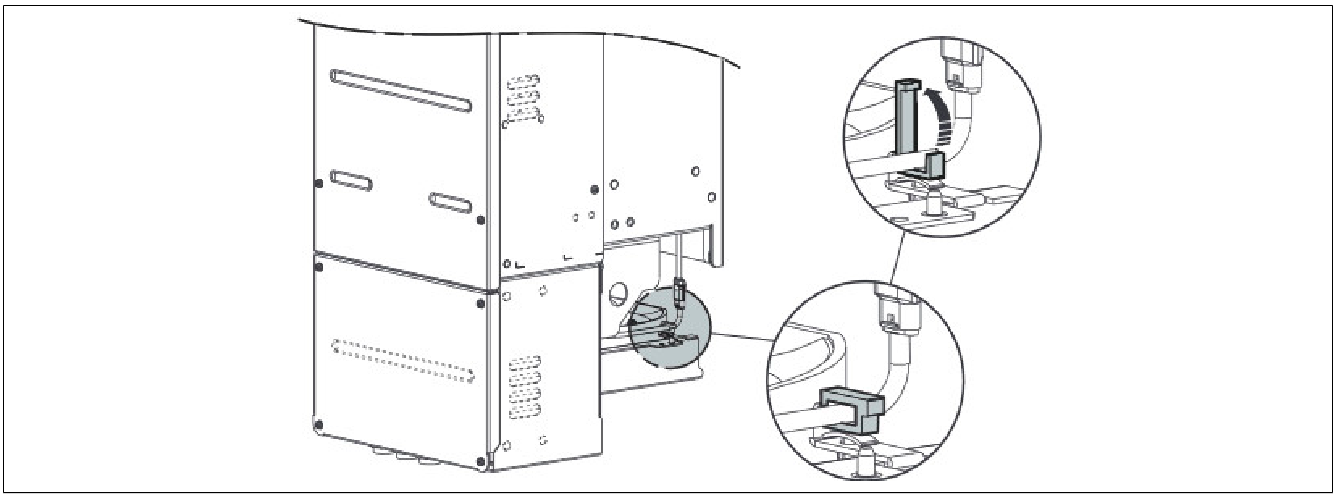

CLIC

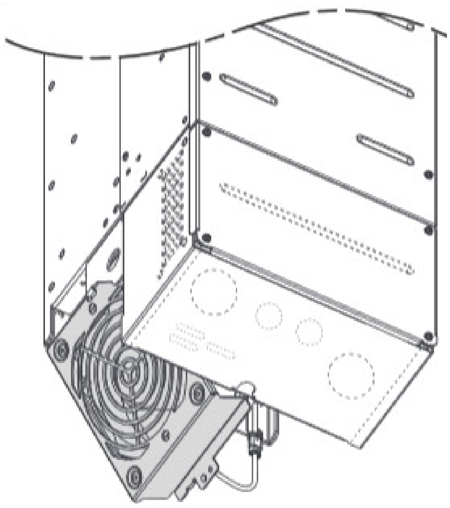

CLIC

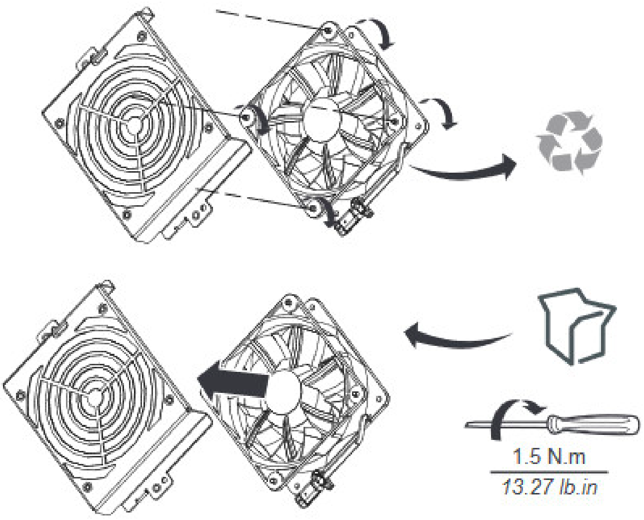


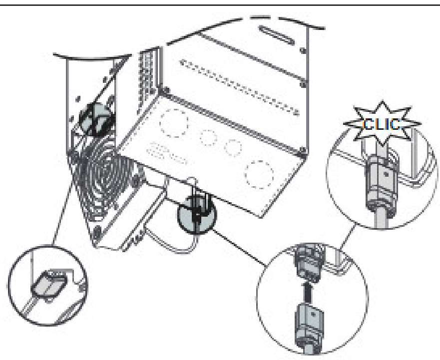
8.10.2.3 8I0XF086.404-1 and 8I0XF086.405-1

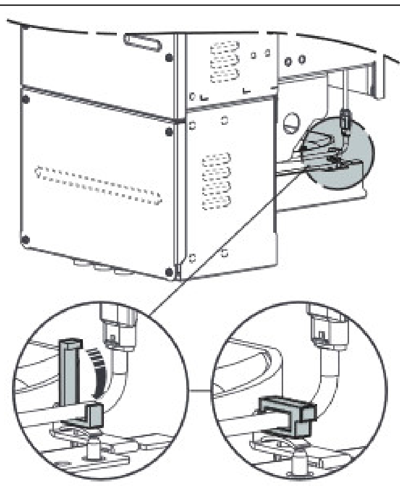


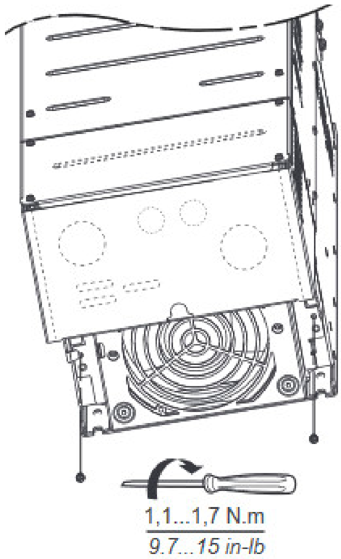





1.5 N.m
13.27 lb.in


CLIC





8.11 Male connector (replacement parts requirement)

8.11.1 Order data

Order number	Short description	Figure
	Male connector (replacement parts requirement)	
8I0XS086.401-1	ACOPOSinverter P86 connector set size 1, power output class: 0.75 to 4 kW (1 to 5 HP)	
8I0XS086.402-1	ACOPOSinverter P86 connector set for size 2, power output class: 5.5 to 7.5 kW (7 to 10 HP)	
8I0XS086.403-1	ACOPOSinverter P86 connector set for size 3, power output class: 11 to 22 kW (15 to 30 HP)	

Table 27: 8I0XS086.401-1, 8I0XS086.402-1, 8I0XS086.403-1 - Order data

9 EC declaration of conformity

This document was originally written in the English language. The English edition therefore represents the original instruction manual in accordance with the 2006/42/EC machinery directive. Documents in other languages are to be viewed as translations of the original instruction manual.

Product manufacturer

B&R Industrial Automation GmbH

B&R Strasse 1

5142 Eggelsberg

AUSTRIA

The EC declarations of conformity can be downloaded from the B&R website (www.br-automation.com).