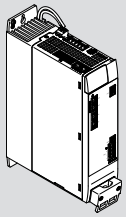
CMMT-AS-C7/12/18/25-11A-P3-...-S1

Servo drive



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Operating instruction | Installation, Safety sub-function

8237334
2025-05g
[8237336]

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Original instructions

1 About this document

1.1 Target group

The document is targeted towards persons who mount and operate the product. It is additionally targeted towards individuals who are entrusted with the planning and application of the product in a safety-related system (safety manual in accordance with EN 61508).

1.2 Applicable documents

All available documents for the product ➔ www.festo.com/sp.

The user documentation for the product also includes the following documents:

Identifier	Content
Operating instructions for the product	Installation, safety sub-function
Manuals for the product	Detailed description for assembly and installation
	Detailed description of safety sub-function
Manual/online help plug-in	Cyber security measures. Plug-in: – Functions and operation of the software – Initial commissioning wizard Firmware functions: – Configuration and parameterisation – Operating modes and operational functions – Diagnostics and optimisation Bus protocol/control: – Device profile – Controller and parameterisation
Festo Automation Suite online help	– Function of the Festo Automation Suite – Management and integration of device-specific plug-ins
Operating instructions CDSB	General functions of the operator unit

Tab. 1: User documentation for the product

1.3 Product version

This documentation refers to the following version of the device:
– Servo drive CMMT-AS-...-S1, revision R01 and higher, see product labelling

1.4 Product labelling

– Observe the specifications on the product.
The product labelling is located on the right side of the device. The product labelling enables identification of the product and shows the following information, for example:

Product labelling (example)	Meaning
CMMT-AS-C7-11A-P3-MP-S1	Order code
8101907 MM-YYYY : J302 Rev 00	Part number, serial number (MM = production month, YYYY = production year, plant number), revision (Rev)
Main input: 3 x 200 V AC - 10% ... 480 V AC + 10% 48 ... 62 Hz 7 A_{RMS}	Technical data on power supply (alternating current supply connection)
Motor out: 3 x 0 ... Input V AC 0 ... 599 Hz 7 A_{RMS} 4 kW	Technical data for the motor output (output voltage, max. output frequency, nominal current, nominal output power)
T_{AMB}: max. 40-50°C	Ambient temperature (T_{AMB})
IP10/20 OVC III PD2	Degree of protection, without mating plug/with mating plug X9A connected; overvoltage category; pollution degree
SCCR: 10 kA	SCCR (short circuit current rating)
R-R-FTO-KC-2018-1054	KC mark certificate (test mark for Korea)
MAC: XX-XX-XX-XX-XX-XX	first MAC address of the device for Ethernet communication
See manual for additional information	Reference to the existing user documentation, which contains information on overload protection and the necessary external circuit breaker.
Data matrix code 123456789AB	Product Key as a data matrix code and an 11-character alphanumeric code
Festo SE & Co. KG	Manufacturer
DE-73734 Esslingen	Manufacturer's address
Made in Germany	Country of origin Germany

Tab. 2: Product labelling (example)

Warning symbols on the front of the product

Warning symbol	Meaning with the CMMT-AS-...
	Attention! Hot surface Metallic housing parts of the device can reach high temperatures during operation. In the event of a fault, internal components may become overloaded. Overloading of components can result in high temperatures and the release of hot gases.
	Attention! General danger point The touch current in the protective earthing conductor can exceed an alternating current of 3.5 mA or a direct current of 10 mA. Always connect both protective earthing connections to the mains-side PE connection, the PE pin of [X9A] and PE earthing screw on the housing. The minimum cross section of the protective earthing conductor must comply with the local safety regulations for protective earthing conductors for equipment with high leakage current.
 5 min	Attention! Dangerous voltage The product is equipped with DC link capacitors, which store dangerous voltage for up to 5 minutes after the power supply is switched off. Do not touch power connections for 5 minutes after the power supply is switched off. After the power supply is switched off, wait at least 5 minutes until the DC link capacitors have discharged.

Tab. 3: Meaning of the warning symbols

Warnings on the product
The following warnings are attached to the right side of the device:

Warnings on the product (en, fr)	Meaning
CAUTION Risk of Electric Shock! Do not touch electrical connectors for 5 minutes after switching power off! Read manual before installing! High leakage current! First connect to earth!	Caution Risk of electric shock! Do not touch electrical connections for 5 minutes after switching power off! Read manual before installing! High leakage current after PE! First connect device to PE!
AVERTISSEMENT Risque du choc électrique! Une tension dangereuse peut être présentée jusqu'à 5 minutes aprés avoir coupé l'alimentation ! Lire le manuel avant installation ! Courant de défaut élevée ! Relier tout d´abord à la terre !	
DANGER Risk of Electric Shock! Disconnect power and wait 5 minutes before servicing.	Danger Risk of electric shock! Disconnect power and wait 5 minutes before servicing.
Risque du choc électrique! Débranchez l'alimentation et attendez 5 min. avant de procéder à l'entretien.	
WARNING Hot surface - Risk of burn!	Warning Hot surface – danger of burns!
ATTENTION Risque de temperature élevée en surface!	

Tab. 4: Warnings on the product

1.5 Specified standards

Version		
EN 61800-5-1:2007+A1:2017		EN 61508 Parts 1-7:2010
EN ISO 13849-1:2015		EN 61800-2:2015
EN 60204-1:2018		EN IEC 61800-3:2018
EN 60529:1991+A1:2000+A2/AC:2019		EN 61800-5-2:2017

Tab. 5: Standards specified in the document

2 Safety

2.1 Safety instructions

General safety instructions
– Assembly and installation are only to be carried out by qualified personnel.
– Only use the product if it is in perfect technical condition.
– Only use the product in its original condition without unauthorised modifications.
– Do not carry out repairs on the product. If defective, replace the product immediately.
– Observe the identifications on the product.
– Take into account the ambient conditions at the location of use.

The safety function might fail and malfunctions might occur if you do not comply with the parameters required for the ambient and connection conditions.
- The product may generate high frequency interference, which may require interference suppression measures in residential areas.
- Wear the prescribed personal protective equipment for transport, assembly and disassembly of product version with a high weight.
- Never remove or insert a plug connector when the power is switched on.
- Do not loosen any screws on the product other than the following:
  - Earthing screw on the cooling element for mounting the PE connection on the mains side
  - Retaining screws of the shield clamp on the housing front
  - For applications in IT networks only: screw for connecting the internal mains filter with PE
- Install the product in a suitable control cabinet. The minimum degree of protection required for the control cabinet is IP54.
- Operate the product only in an installed condition when all required protective measures have been taken (➔ EN 60204-1).
- Fully insulate all conducting lines on the product. We recommend plastic wire end sleeves for wiring power connections. During wiring, please observe the necessary strip lengths.
- Information on strip length ➔ Manual Assembly, Installation.
- Ensure correct protective earthing and shield connection.
- Prior to commissioning, ensure that the resulting movements of the connected actuator technology cannot endanger anyone.
- During commissioning: systematically check all control functions and the communication and signal interface between controller and servo drive.
- The product is equipped with DC link capacitors, which store dangerous voltage for up to 5 minutes after the power supply is switched off. Before working on the product, switch off the power supply via the main switch and secure it against being switched on again unintentionally. Before touching the power connections, wait at least 5 minutes.
- Take the legal regulations for the installation location into account.
- Keep the documentation somewhere safe throughout the entire product lifecycle.

In the event of damage caused by unauthorised manipulation or any use other than that intended, the warranty is invalidated and the manufacturer is not liable for damages.
In the event of damage caused by using unauthorised software or firmware with the device, the warranty will be invalidated, and the manufacturer will not be liable for damages.

Safety instructions for the safety sub-functions
It is only possible to determine whether the product is suitable for specific applications by also assessing further components of the subsystem.
Analyse and validate the safety function of the entire system.
Check the safety functions at adequate intervals for proper functioning. It is the responsibility of the operator to choose the type and frequency of the checks within the specified time period. The manner in which the test is conducted must make it possible to verify that the safety device is functioning perfectly in interaction with all components. Time period for cyclical test ➔ 13.1 Technical data, safety engineering.
Prior to initial commissioning, wire the control inputs of the safety sub-functions STO and SBC. The safety sub-functions STO and SBC are available on the CMMT-AS on delivery without the need for any additional parameterisation.

2.2 Intended use

The servo drive CMMT-AS is intended for supply and control of AC servo motors. The integrated electronics enable regulation of torque (current), rotational speed and position.
Use exclusively:
- in perfect technical condition
- in original condition without unauthorised modifications; only the extensions described in the documentation supplied with the product are permitted
- within the limits of the product defined by the technical data ➔ 13 Technical data
- in an industrial environment

The safety function might fail and malfunctions might occur if you do not comply with the parameters required for the ambient and connection conditions.
The CMMT-AS-...-S1 supports the following safety sub-functions in accordance with EN 61800-5-2:
- Safe torque off (STO/Safe torque off)
- Safe brake control (SBC/Safe brake control)
- Safe stop 1 (SS1), achievable with suitable safety relay unit and appropriate circuitry of the servo drive

The safety sub-function STO is intended to switch off the torque of the connected motor, thereby preventing an unexpected restart of the motor.
The safety sub-function SBC is intended to safely hold the motor and axis in position at standstill.
The safety sub-function SS1 is intended for performing an emergency stop with subsequent torque switch-off.

2.2.1 Application areas

The device is intended for use in an industrial environment and with appropriate measures in commercial, residential and mixed areas.
The device is intended for installation in a control cabinet. The minimum degree of protection required for the control cabinet is IP54.
The device can be operated in TN, TT and IT systems if certain requirements are met.
Information on allowed and prohibited mains types of system earthing and necessary measures for use in IT networks ➔ Manual Assembly, Installation.
Safety sub-functions may only be used for applications for which the stated safety reference values are sufficient ➔ 13.1 Technical data, safety engineering.

2.2.2 Permissible components

The logic power supply must meet the requirements of EN 60204-1 (protective extra-low voltage, PELV).
If holding brakes and clamping units without certification are used, a risk assessment is required to assess their suitability for the related safety-oriented application.
In addition to the requirements of EN 60204-1, the following requirements apply to other components of the drive system from EN 61800-5-2:
- Annex D.3.5 and D.3.6 for motors
- Annex D.3.1 for motor and brake cables
- Annex D.3.4 for mating plugs

Components approved by Festo for the CMMT-AS fulfil these requirements.

2.3 Foreseeable misuse

Foreseeable misuse, general
- Use outside the limits of the product defined in the technical data.
- Cross-wiring of the I/O signals of more than 10 servo drives CMMT-AS.
- Use in IT networks without insulation monitors for detection of earth faults.
  If the device is operated in IT networks, the potential conditions will change in the event of a fault (earth fault on the feeding mains supply). As a result, the rated voltage of 300 V to PE – which has important implications for the design of insulation and network disconnection – will be exceeded. This error must be detected.
- Use of a diagnostic output for connection of a safety function.
  The diagnostic outputs STA and SBA are not part of the safety circuit. The diagnostic outputs are used to improve diagnostic coverage of the related safety sub-function. The diagnostic outputs may only be used in combination with the related safe control signals (AND operation) plus a reliable time monitoring function in the safety relay unit for the purpose of switching additional safety-critical functions.

Foreseeable misuse of the safety sub-function STO
- Use of the STO function without external measures for drive axis influenced by external torques.
  If external torques influence the drive axis, use of the safety sub-function STO on its own is not suitable for stopping the axis safely. Additional measures are required to prevent dangerous movements of the drive axis, such as use of a mechanical brake in combination with the safety sub-function SBC.
- Disconnection of the motor from the power supply.
  The safety sub-function STO does not disconnect the drive from the power supply as defined by electrical safety.

Foreseeable misuse of the safety sub-function SBC
- Use of an unsuitable holding brake or clamping unit, also in view of:
  - Holding or brake torque and emergency brake characteristics, if required.
  - Frequency of actuation
- Use of an unsuitable logic voltage supply

2.4 Training of qualified personnel

The product may be installed and commissioned only by a qualified electrical engineer who is familiar with:
- Installation and operation of electrical control systems
- Applicable regulations for operating safety-related systems

Work on safety engineering systems may only be carried out by qualified personnel trained in safety engineering.

2.5 Product conformity

The product-relevant directives are listed in the declaration of conformity ➔ www.festo.com/sp.

Product conformity	
CE	in accordance with EU EMC Directive in accordance with EU Machinery Directive in accordance with EU RoHS Directive
UKCA	to UK EMC Regulations to UK Supply of Machinery Regulations to UK RoHS Regulations

Tab. 6: Product conformity

The protection objectives of the Low Voltage Directive are fulfilled in accordance with the requirements of the EC Machinery Directive. The requirements of the Low Voltage Directive are based on the product standard EN 61800-5-1. The valid version of the product standard is listed in the declaration of conformity.

2.6 Safety engineering approval

The product is a safety device in accordance with the Machinery Directive. For details of the safety-oriented standards and test values that the product complies with and fulfils, see ➔ 13.1 Technical data, safety engineering.

2.7 UL/CSA certification

Technical data and environmental conditions may be subject to change in order to comply with Underwriters Laboratories Inc. (UL) certification requirements for the USA and Canada.
Deviating values ➔ 13.4 Technical data of UL/CSA certification.

2.8 Cyber security measures

For information on required measures, see the manual/online help plug-in ➔ 1.2 Applicable documents.

3 Additional information

- Contact the regional Festo contact if you have technical problems ➔ www.festo.com.
- Accessories and spare parts ➔ www.festo.com/catalogue.
- Cyber security information ➔ www.festo.com/psirt.

Firmware, software or configuration files ➔ www.festo.com/sp.

4 Product overview

4.1 Scope of delivery

Components	Number
Servo drive CMMT-AS-...	1
Operating instruction CMMT-AS-...	1
Only for CMMT-AS-...-MP: assortment of plugs NEKM-C6-...	1

Tab. 7: Scope of delivery

4.2 System structure

The servo drive CMMT-AS is a 1-axis servo drive. Depending on the product variant, the following components, which are necessary for standard applications, are integrated into the device or into the cooling profile of the device:
- Mains filter (guarantees immunity to interference and limits conducted emissions)
- Electronics for DC link voltage conditioning
- Power stage (for motor control)
- Braking resistor (integrated into the cooling element)
- Brake chopper (switches the braking resistor in the DC link circuit, if and when required)
- Temperature sensors (for monitoring the temperature of the power module and of the air in the device)
- Fan in the cooling profile

The servo drive features a real-time Ethernet interface for process control. Various bus protocols are supported depending on the product design, e.g. EtherCAT, EtherNet/IP, Modbus TCP or PROFINET.
The device can be parameterised with a PC using either the real-time Ethernet interface or the separate standard Ethernet interface.

Festo recommends use of servo motors, electromechanical drives, lines and accessories from the Festo accessory programme.

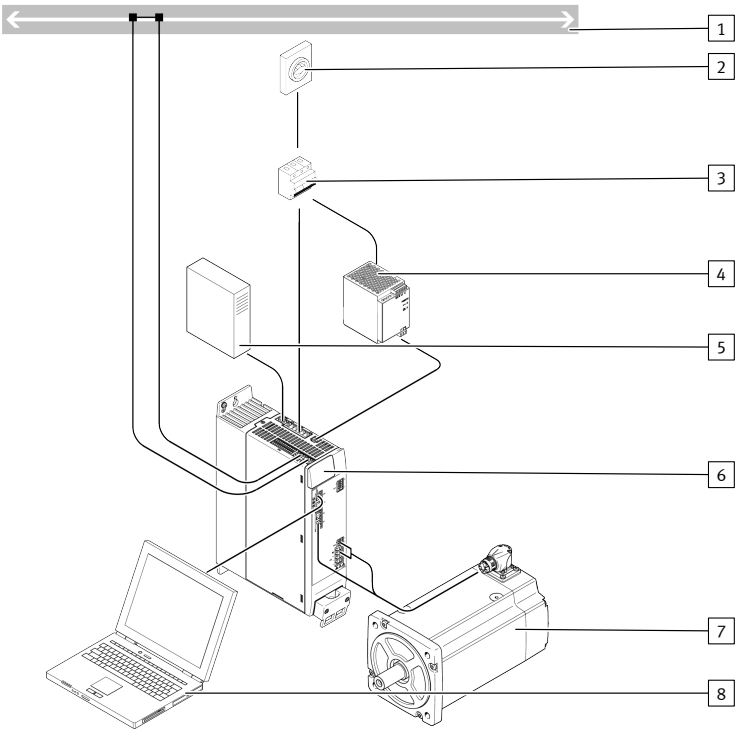


Fig. 1: System structure (example)

1 Bus/network
2 Main switch
3 Automatic circuit breaker/fuses and all-current-sensitive RCD (residual current device) (optional)
4 Fixed power supply for logic voltage supply 24 V DC (PELV)
5 External braking resistor (optional)
6 Servo drive CMMT-AS
7 Servo motor (in this case EMMT-AS-...-RMY)
8 PC with Ethernet connection for parameterisation

4.2.1 Overview of connection technology

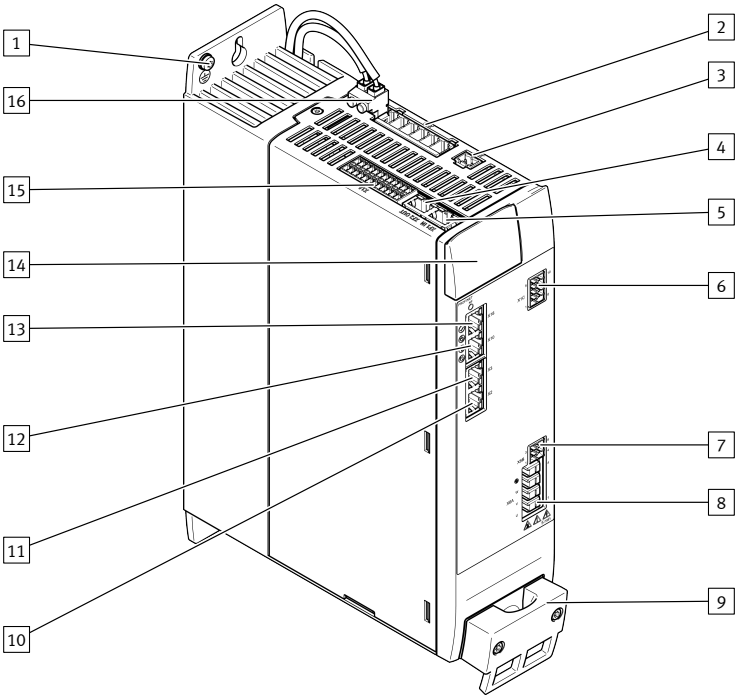
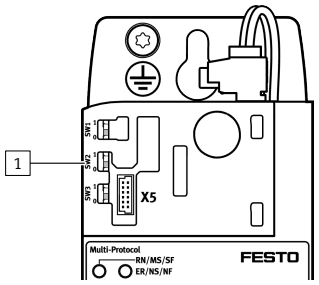


Fig. 2: Connections of the CMMT-AS-C7/C12/C18/C25-11A-P3 (example)

1 PE connection, housing
2 [X9A] Mains and DC link circuit connection
3 [X9C] logic voltage
4 [XF2 OUT] RTE interface port 2
5 [XF1 IN] RTE interface port 1
6 [X1C] inputs/outputs for the axis
7 [X6B] motor auxiliary connection
8 [X6A] motor phase connection
9 Shield clamp of motor cable
10 [X2] encoder connection 1
11 [X3] encoder connection 2
12 [X10] device synchronisation
13 [X18] standard Ethernet
14 [X5] connection for operator unit (behind the blind plate)
15 [X1A] I/O interface
16 [X9B] connection for braking resistor

4.3 Setting bus protocol

The CMMT-AS-...-MP product variant supports several bus protocols.
The following options are available for setting the protocol:
- Configuration in the CMMT-AS plug-in
- Direct setting with DIL switches SW1 to SW3.



1 DIL switches SW1, SW2, SW3

Fig. 3: DIL switches SW1, SW2, SW3 on the CMMT-AS-...-MP

The switches can be adjusted with a small slotted head screwdriver.
The switch position is evaluated once when the device is started. A change in the switch position therefore only takes effect after the device has been restarted.

Protocols supported by the firmware version used ➔ Manual/online help plug-in, software, function, fieldbus, device profile.

Protocol	SW3	SW2	SW1
Parameterisation	0	0	0
PROFINET	0	0	1
EtherCAT	0	1	0
EtherNet/IP, Modbus TCP	0	1	1
Parameterisation	1	1	1

Tab. 8: Bus protocol switch setting

4.4 Safety sub-functions

4.4.1 Function and application

The servo drive CMMT-AS-...-S1 has the following safety-related performance features:
- Safe torque off (STO)
- Safe brake control (SBC)
- Safe stop 1 (SS1) with use of a suitable external safety relay unit and appropriate wiring of the servo drive
- Diagnostic outputs STA and SBA for feedback of the active safety sub-function

4.4.2 Safety sub-function STO

Function and application of STO
The safety sub-function STO switches off the driver supply for the power semiconductor, thus preventing the power output stage from supplying the energy required by the motor. The power supply to the drive is safely disconnected when the safety sub-function STO is active. The drive cannot generate torque and thus cannot perform any dangerous movements. With suspended loads or other external forces, additional measures must be put in place to prevent movements being performed (e.g. mechanical clamping units). The standstill position is not monitored in the STO state.
The machines must be stopped and locked in a safe manner. This especially applies to vertical axes without automatic locking mechanism, clamping unit or counterbalancing.

NOTICE

If there are multiple errors in the servo drive, there is a danger that the drive will move. Failure of the servo drive output stage during the STO status (simultaneous short circuit of 2 power semiconductors in different phases) may result in a limited detent movement of the rotor. The rotation angle/travel corresponds to a pole pitch. Examples:
- Rotating motor, synchronous machine, 8-pin ➔ Movement < 45° at the motor shaft
- Linear motor, pole pitch 20 mm ➔ Movement < 20 mm at the moving part

STO request
The safety sub-function STO is requested on 2 channels by simultaneously switching off the control voltage at both control inputs #STO-A and #STO-B.

STO feedback via STA diagnostic contact
The status of the safety sub-function STO can be reported to the safety relay unit via the STA diagnostic output.
The STA diagnostic output indicates whether the safe status has been reached for the safety sub-function STO. The STA diagnostic output switches to high level only when STO is active on 2 channels via the control inputs #STO-A and #STO-B.

#STO-A	#STO-B	STA
Low level	Low level	High level
Low level	High level	Low level
High level	Low level	Low level
High level	High level	Low level

Tab. 9: Level of STA

If protective functions are triggered on both channels (STO-A and STO-B), e.g. if the voltage at STO-A and STO-B is too high, the internal protective functions switch off and STA also delivers a high level signal.
Recommendation: the safety relay unit should check the status of the diagnostic output whenever there is a request from STO. The level of STA must change according to the logic table. The safety relay unit can cyclically test the signals #STO-A and #STO-B for high level with low test pulses and for low level with high test pulses.

4.4.3 Safety sub-function SBC

Function and application of SBC
The safety sub-function SBC provides safe output signals for the control of brakes (holding brakes or clamping units). The brakes are controlled on 2 channels by switching off the voltage at the following outputs:
- Safe output BR+/BR– [X6B] for the holding brake of the motor
- Safe output BR-EXT/GND [X1C] for the external brake/clamping unit

The holding brake and/or clamping unit engage and slow the motor or axis. The purpose of this is to slow down dangerous movements by mechanical means. The braking time is dependent on how quickly the brake engages and how high the energy level is in the system.
The use of **just one brake** is only possible when performance requirements are low ➔ Tab. 54 Safety reference data for the safety sub-function SBC. To do this, connect the brake either to BR+/BR– **or** to BR-EXT.

NOTICE

If there are suspended loads, they usually drop if SBC is requested simultaneously with STO. This can be traced back to the mechanical inertia of the holding brake or clamping unit and is thus unavoidable. Check whether safety sub-function SS1 is better suited to your application.

SBC may only be used for holding brakes or clamping units which engage in the de-energised state. Ensure the lines are protected when installed.

SBC request
The safety sub-function SBC is requested on 2 channels by simultaneously switching off the control voltage at both control inputs #SBC-A and #SBC-B:
- The #SBC-A request switches off the power to the signals BR+/BR-.
- The #SBC-B request switches off the power to the signal BR-EXT.

In the event of a power failure in the logic voltage supply of the servo drive, power is also cut off to the brake outputs.

SBC feedback via SBA diagnostic contact
The 2-channel switching of the brake is indicated via the SBA output. SBA is used to report the status of the safety sub-function SBC for diagnostic purposes, e.g. by reporting it to an external safety relay unit.
The SBA diagnostic output indicates whether the safe status has been reached for the safety sub-function SBC. It is set if the following two conditions are fulfilled:
- Switching off of both brake outputs is requested (#SBC-A = #SBC-B = low level)
- The internal diagnostic functions have determined that there is no internal error and both brake outputs are de-energised (switched off).

Testing the safety sub-function SBC
Test inputs #SBC-A and #SBC-B separately from each other and together. The diagnostic feedback may only be set to high level when inputs #SBC-A and #SBC-B are both requested. If the signal behaviour does not correspond to expectations, the system must be set to a safe condition within the reaction time. It is essential that time monitoring be provided in the safety relay unit.
The safety sub-function SBC with feedback via SBA must be tested at least 1x within the space of 24 h.
- Test SBA feedback based on the SBC-A and SBC-B level according to the following table.

#SBC-A (BR+)	#SBC-B (BR-Ext)	SBA
Low level	Low level	High level
Low level	High level	Low level
High level	Low level	Low level
High level	High level	Low level

Tab. 10: Testing all SBC levels

While you are testing the safety sub-function SBC, discrepancy error detection may be activated in the CMMT-AS if the test lasts longer than 200 ms. If a corresponding error message is output by the basic unit, you will need to acknowledge it.

Evaluation of SBA
Recommendation: evaluation with every actuation.
- Check SBA feedback whenever there is a request.

Requirements for the brake
Requirements for the brake➔ Manual Safety sub-function

Brake test

- Check whether a brake test is required. The DGUV information sheet “Gravity-loaded axis” provides information on this.

4.4.4 Safety sub-function SS1

Together with a suitable safety relay unit, the following can be achieved:
– Safe stop 1 time controlled (SS1-t/Safe stop 1 time controlled;) triggering of motor deceleration and, after an application-specific time delay, triggering of the safety sub-function STO
Safety sub-function SS1 ➔ 1.2 Applicable documents, Manual Safety sub-function

4.4.5 Fault exclusion

Put suitable measures in place to prevent faulty wiring:
– Exclude wiring faults in accordance with EN 61800-5-2
– Configure the safety relay unit to monitor the outputs of the safety relay unit and wiring up to the servo drive

4.4.6 Safety relay unit

Use suitable safety relay units with the following characteristics:
– 2-channel outputs with
  – Detection of shorts across contacts
  – Required output current (also for STO)
  – Low test pulses up to a maximum length of 1 ms
– Evaluation of the diagnostic outputs of the servo drive
Safety relay units with high test impulses can be used with the following restrictions:
– Test impulses up to 1 ms in length
– Test impulses are not simultaneous/overlapping on #STO-A/B and #SBC-A/B
– The resulting safety-related classification depends on the evaluation of diagnostic feedbacks STA, SBA ➔ 13.1 Technical data, safety engineering, safety reference data STO and SBC.

5 Transport and storage

– Protect the product during transport and storage from excessive stress factors. Excessive stress factors include:
  – mechanical stresses
  – impermissible temperatures
  – moisture
  – aggressive atmospheres
– Store and transport the product in its original packaging. The original packaging offers sufficient protection from typical stresses.

6 Assembly

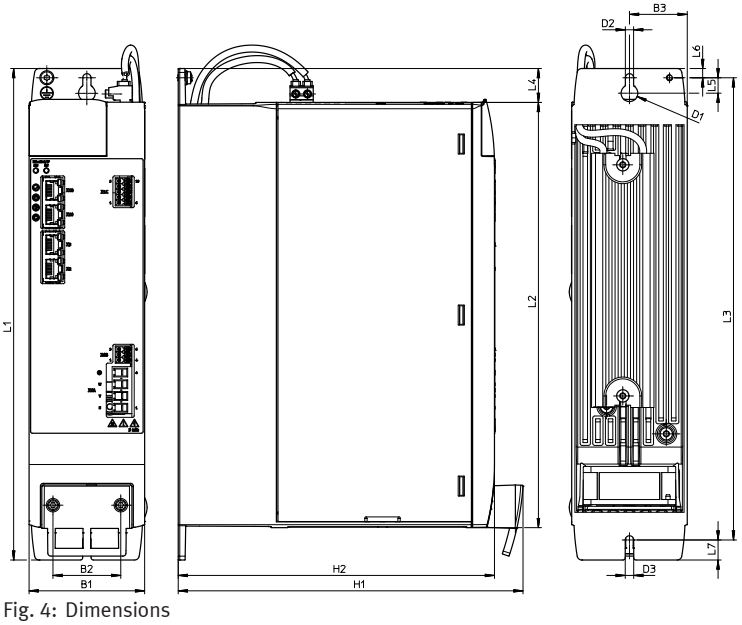


Fig. 4: Dimensions

Dimensions CMMT-AS-C7/C12/C18/C25-11A-P3...								
Dimension	L1	L2	L3	L4	L5	L6	L7	
[mm]	approx. 319	276	300	22	10	6	13	
Dimension	H1	H2	B1	B2	B3	D1	D2	D3
[mm]	approx. 224	approx. 205	approx. 75	44	B1/2	R5.5	5.5	5.5

Tab. 11: Dimensions CMMT-AS-C7/C12/C18/C25-11A-P3...

6.1 Mounting clearances

The servo drives of the CMMT-AS series can be connected in series. When arraying devices, the required minimum distance must be maintained so that the heat generated during operation can be dissipated by allowing sufficient air flow.

Mounting distances CMMT-AS-C7/C12/C18/C25-11A-P3

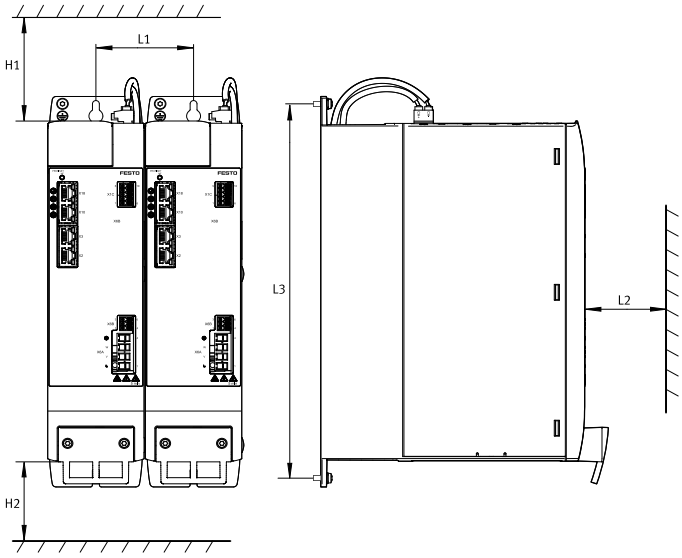


Fig. 5: Mounting distances and installation clearance for CMMT-AS-C7/C12/C18/C25-11A-P3

Servo drive		H1	H2[1)]	L1	L2	L3
CMMT-AS-C7/C12/C18/C25-11A-P3	[mm]	100	70	78	70	300

1) An installation clearance of 150 mm is recommended for compliance with clearance H2 and for optimum routing of the motor and encoder cables on the underside of the housing!

Tab. 12: Mounting distances and installation clearance

This means that a minimum lateral distance of approx. 3 mm (78 mm - 75 mm) must be observed in relation to neighbouring CMMT-AS devices.
For adjacent third-party devices, Festo recommends a distance of at least 10 mm (surface temperature of third-party device max. 40°C). The double mating plug for cross-wiring of the connection [X9A] protrudes by approx. 6 … 7 mm over the right side of the device. However, this is not an obstacle to the addition of additional CMMT-AS.

6.2 Mounting

Assembly instructions

– Use a control cabinet with degree of protection IP54 or higher.
– Always install device vertically in the control cabinet on a closed surface (mains supply lines [X9A] point upwards).
– Screw device flat to a sufficiently stable mounting surface so that good heat transfer from the cooling element to the mounting surface is ensured (e.g. on the rear wall of the control cabinet).
– Maintain minimum distances and installation clearance to guarantee sufficient air flow. The ambient air in the control cabinet must be able to flow through the device from bottom to top without hindrance.
– Take into account the required clearance for the wiring (connecting cables of the device must be routed from above and from the front).
– Do not mount any temperature-sensitive components near the device. The device can become very hot during operation (switch-off temperature of the temperature monitoring function ➔ Technical data).
– When installing several devices in a device compound, observe the general rules for cross-wiring. For DC link coupling, higher-power devices must be placed closer to the mains supply.
– If there is a voltage supply to the device when the control cabinet is open, vertical access to the bottom and top of the device must be prevented.

The cooling element of the servo drive controller has a keyhole-shaped slot at the top and a simple slot at the bottom for mounting with the rear wall of the control cabinet.

Mounting the servo drive

⚠ WARNING

Danger of burns by hot escaping gases and hot surfaces.
In case of faults, incorrect circuitry or incorrect polarity of the connections [X9A], [X9B] and [X6A], internal components can be overloaded. High temperatures can develop and hot gases can be released.

- Have an authorised electrician perform the installation according to the documentation.

⚠ WARNING

Danger of burns from hot housing surfaces.
Metallic housing parts can accept high temperatures in operation. In particular, the braking resistor installed in the profile on the back side can become very hot. Contact with metal housing parts can cause burn injuries.

- Do not touch metallic housing parts.
- After the power supply is switched off, let the device cool off to room temperature.

- Mount the servo drive on the backwall of the control cabinet with suitable screws while complying with the assembly instructions.

- The cooling element can reach temperatures of › 90 °C in the mounting area. The mounting surface must not contain any combustible or heat-sensitive parts.

7 Installation

7.1 Safety

⚠ WARNING

Risk of injury from electric shock.
Contact with live parts at the power connections [X6A], [X9A] and [X9B] can result in severe injuries or death.
- Do not pull out power supply plugs while live.
- Before touching, wait at least 5 minutes after switching off the load voltage to allow the intermediate circuit to discharge.

⚠ WARNING

Risk of injury from electric shock.
The leakage current of the device to earth (PE) is > 3.5 mA AC or 10 mA DC. Touching the device housing if there is a fault can result in serious injuries or death.
Before commissioning, also for brief measuring and test purposes:
- Connect PE connection on the mains side at the following positions:
  - Protective earth connection (earthing screw) of the housing
  - PE pin of the connection [X9A] (power supply)
    The cross section of the PE conductors must be at least equal to the cross section of the mains conductor L at [X9A].
- Connect motor cable to connection [X6A] and the shield of the motor cable on the front side to PE via the shield clamp of the servo drive.
- Observe the regulations of EN 60204-1 for the protective earthing.

⚠ WARNING

Danger of burns by hot escaping gases and hot surfaces.
In case of faults, incorrect circuitry or incorrect polarity of the connections [X9A], [X9B] and [X6A], internal components can be overloaded. High temperatures can develop and hot gases can be released.
- Have an authorised electrician perform the installation according to the documentation.

⚠ WARNING

Risk of injury from electric shock in the event of incomplete insulation at the power connections [X6A], [X9A] and [X9B].
Before operating, plugging in or unplugging the operator unit CDSB or a connector from a hot-plug-capable interface, the following points must be fulfilled:
- The conducting lines at the device are completely insulated.
- The protective earthing (PE) and the shield connection are correctly connected to the device.
- The housing is free of damage.

⚠ WARNING

Risk of injury due to overheating and electric shock with faulty live components
Closing the branch-circuit protective device with faulty live components may cause fire or electric shock.
- The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

Earthing the motor housing

⚠ WARNING

Risk of injury from electric shock.
If the cable shield of the motor cable is not connected to protective earthing by the shield clamp, dangerous voltages on the motor housing may cause serious injury or death.
- Connect the cable shield of the motor cable to the earthed device with the shield clamp.
- In addition, always earth the machine bed close to the motor with electrical continuity to the motor flange.

Information for operation with safety function

NOTICE

Check the safety functions to conclude the installation process and after every modification to the installation.

During installation of safety-related inputs and outputs, also observe the following:
- Comply with all specified requirements, e.g.:
  - Surrounding area (EMC)
  - Logic and load voltage supply
  - Mating plug
  - Connecting cables
  - Cross-wiring
- Additional information ➔ Manual Assembly, Installation.
- The maximum permissible cable length between the safety relay unit and the plug connector of the I/O interface is 3 m.
- Comply with the requirements of EN 60204-1 for the installation. In the event of a fault, the voltage must not exceed 60 V DC. The safety relay unit must switch off its outputs in the event of a fault.
- Wiring between the safety relay unit and the I/O interface of the servo drive must be designed to exclude short circuits between the conductors or to 24 V, in accordance with EN ISO 13849-2, Table D.4. . Otherwise, the safety relay unit must detect a short circuit and, in case of a fault, switch off the control signals on 2 channels.
- Use only suitable mating plugs and connecting cables ➔ Manual Assembly, Installation.
- Prevent conductive contamination between neighbouring plug pins.
- Ensure that no bridges or similar can be used parallel to the safety wiring, e.g. by using the maximum wire cross-section or suitable plastic wire end sleeves.
- Use twin ferrules for cross-wiring of safety-relevant inputs and outputs. A maximum of 10 devices may be cross-wired when cross-wiring inputs and outputs ➔ Manual Assembly, Installation.
- The safety relay unit and its inputs and outputs must comply with the required safety classification of the relevant required safety function.
- Connect each of the control inputs to the safety relay unit on 2 channels using parallel wiring.
- Only use permitted motor cables for the BR+/BR– connection.
- If the diagnostics output of the applicable safety sub-function is evaluated, connect the diagnostics output directly to the safety relay unit. Evaluation of the diagnostic output is either mandatory or optional depending on which safety classification is desired.
- If diagnostic outputs are cross-wired for a device compound: wire diagnostic outputs as a ring. Run the two ends of the ring to the safety relay unit and monitor for discrepancies.

7.2 Residual current device

⚠ WARNING

Risk of injury from electric shock.
This product can cause a DC current in the residual-current conductor in case of error. In cases where a residual current device (RCD) or a residual current monitor (RCM) is used to protect against direct or indirect contact, only the type B kind of RCD or RCM is permitted on the power supply side of this product.

Information on the residual current device ➔ Manual Assembly, Installation.
The touch current in the protective earthing conductor can exceed an alternating current of 3.5 mA or a DC current of 10 mA. Always connect both protective earthing connections to the mains-side PE connection, the PE pin of [X9A] and PE earthing screw on the housing. The minimum cross section of the protective earthing conductor must comply with the local safety regulations for protective earthing conductors for equipment with high leakage current.

7.3 Mains fuse

The CMMT-AS does not have an integrated fuse at the mains input or in the DC link circuit. An external fuse is required at the power connection of the device. A device compound coupled in the DC link circuit must be protected by a common mains fuse.
- Use only circuit breakers and fuses that have the relevant approval and meet the specifications and protection requirements stated below.

Requirements for circuit breakers (automatic circuit breakers)		
Type of fuse		Circuit breaker
max. permissible rated current	[A]	40
		Restrictions concerning line protection ➔ Tab. 14 Line protection requirements
Short circuit current rating SCCR of mains fuse	[kA]	min. 10
Approvals		IEC 60947-2
Rated voltage	[V AC]	min. 400
Overvoltage category		III
Pollution degree		2
Characteristic		C

Tab. 13: Requirements for circuit breakers and fuses

The circuit breaker is used for line protection. The rated current of the circuit breaker must be less than or equal to the approved current rating of the selected conductor cross section. The circuit breaker must also take into account the overload case and must not trip (overload case: a 3-fold increase in the input current for 2 s).

Line protection requirements					
Description	Cable cross section at [X9A] in [mm²]	Mains fuse [A][1]			
CMMT-AS-		C7-11A-P3	C12-11A-P3	C18-11A-P3	C25-11A-P3
Minimum fuse protection	1.5[2]	10	16	–	–
	4	–	–	25	32
Maximum fuse protection of an individual device or a device compound					
without heat-resistant cable	4	25			
	6	32			
with heat-resistant cable[3]	4	32			
	6	40			

1) Specifications according to DIN VDE 0298-4:2013, permissible currents according to EN 60204-1 may differ (depending on installation type and temperature)
2) depending on the type of installation of the cables, wiring with min. 2.5 mm² may be required for the CMMT-AS-C12-11A-P3.
3) no derating up to an ambient temperature of 50 °C and a cable temperature higher than 70 °C (max. cable temperature 90 °C)

Tab. 14: Line protection requirements

Fuse protection when load circuit is supplied with DC power

The CMMT-AS allows the load circuit to be supplied with DC power. With DC power, external fuse protection is once again required in the form of short circuit protection and line protection. The fuse that is used must be capable of reliably disconnecting the maximum DC supply voltage that could occur and the potential short circuit current ($SCCR_{DC}$).
Maximum fuse protection: 40 A

If fuse protection is to be avoided on the DC side, check whether the fuse protection could alternatively be installed on the AC side upstream of the DC fixed power supply.

7.4 Permissible and impermissible mains types of system earthing

Information on allowed and prohibited mains types of system earthing and necessary measures for use in IT networks ➔ Manual Assembly, Installation.

Leakage currents in IT systems

High-frequency leakage currents to protective earthing (PE) may be encountered even in IT systems (IT = Isolé Terre) during operation of the servo drive. The leakage currents flow to the PE through the coupling capacitances of the motor cable and the motor and back to the servo drive through the coupling capacitance of the isolating transformer via the load supply. The coupling capacitances can be minimised by selection of a suitable isolating transformer and keeping the motor cable as short as possible.

⚠ WARNING

Risk of injury from electric shock.

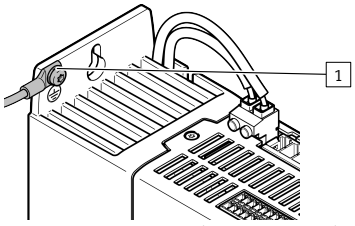
The servo drive generates high-frequency leakage currents, which can lead to dangerous contact currents on the external conductors and the neutral conductor of the IT system. Touching the mains conductor or the neutral conductor can result in serious injuries or death.

- Before working on the IT systems, disconnect the servo drive from the mains.

7.5 Connection of the mains side PE conductor

For safety reasons all PE conductors must always be connected prior to commissioning. Observe the regulations of EN 60204-1 when implementing protective earthing.
Always connect PE connection on the mains side (PE rail in the control cabinet) at the following positions:
– PE pin of the connection [X9A]
– PE connection (earthing screw) next to the upper slot of the cooling element
The cross section of the PE conductors must be at least equal to the cross section of the mains conductors L at [X9A]. Wire individually wired devices in a star shape. Observe the requirements for cross-wiring for cross-wired devices. Recommendation: use copper earthing strap (advantageous for EMC).

1. Fit a suitable cable lug to the PE conductors for the earthing screw.
2. Tighten earthing screw with a size T20 TORX screwdriver (tightening torque 1.8 Nm ± 15 %).



1 PE connection (earthing screw)

Fig. 6: PE connection (earthing screw)

7.6 Information on EMC-compliant installation

A mains filter is integrated into the device. The mains filter fulfils the following tasks:
– Guarantees the device's immunity to interference
– Limits the conducted emissions of the device

The device fulfils the requirements of the relevant product standard EN 61800-3 with suitable installation and wiring of all connecting cables.
The category that the device fulfils is dependent on the filter measures used and the motor cable length. The integrated mains filter is designed so that the device fulfils the following categories when operated as an individual device:

CMMT-AS...	PWM [kHz]	Required measures	Max. permissible motor cable length [m]
Category C2: operation in the first environment (residential area)			
-C7-11A-P3 -C12-11A-P3	8	– (none)	10
-C18-11A-P3 -C25-11A-P3	8	External mains filter and line choke	10
Category C3: operation in the second environment (industrial area)			
-C7-11A-P3 -C12-11A-P3	8	– (none)	25
		External mains filter	100
-C18-11A-P3 -C25-11A-P3	8	– (none)	50
		External mains filter	100

Tab. 15: Category according to the pulse-width modulation frequency and the cable length

Required measures

Measures	Description
Line choke	With the products CMMT-AS-C18/C25-... install a suitable line choke with three partial windings for mains supply lines L1, L2, and L3 for compliance with the mains harmonics in accordance with EN 61800-3-12 - see the following information.
Snap ferrite	With the products CMMT-AS-C18/C25-... suitable snap ferrites for category C2 must be installed on the line to [X18], e.g. Würth snap ferrite 74272211 or compatible. Run the line 4x through the snap ferrite.
External mains filter	Install a suitable external mains filter – accessories.

Tab. 16: Installation measures for operation in the area of the specified category

To install a line choke ➔ 7.7 Connection examples.
– If set-up and commissioning are performed by a professional with the necessary experience in configuring and commissioning drive systems, including their EMC aspects, category C2 devices can be used (first environment, residential area).
– Limit values for the harmonic currents in the mains supply (EN 61000-3-2 or EN 61000-3-12) will apply for operation of category C2 devices, based on the connected load of the machine. Please check whether this is the case for your facility/system.
  As a rule, compliance with the limit values for harmonic currents requires the use of external filter measures, e.g. installation of a line choke.
  More information about the required actions ➔ Manual Assembly, Installation.
– Category C3 devices are intended for use in the second environment only (industrial environment). Use in the first environment is not permitted.

This product can generate high-frequency malfunctions, which may require interference suppression measures in residential areas.
In practice, the combination of the installed components and their characteristics will influence the achievable length of the motor cable ➔ Manual Assembly, Installation.

7.7 Connection examples

Connection plan, 3-phase mains connection

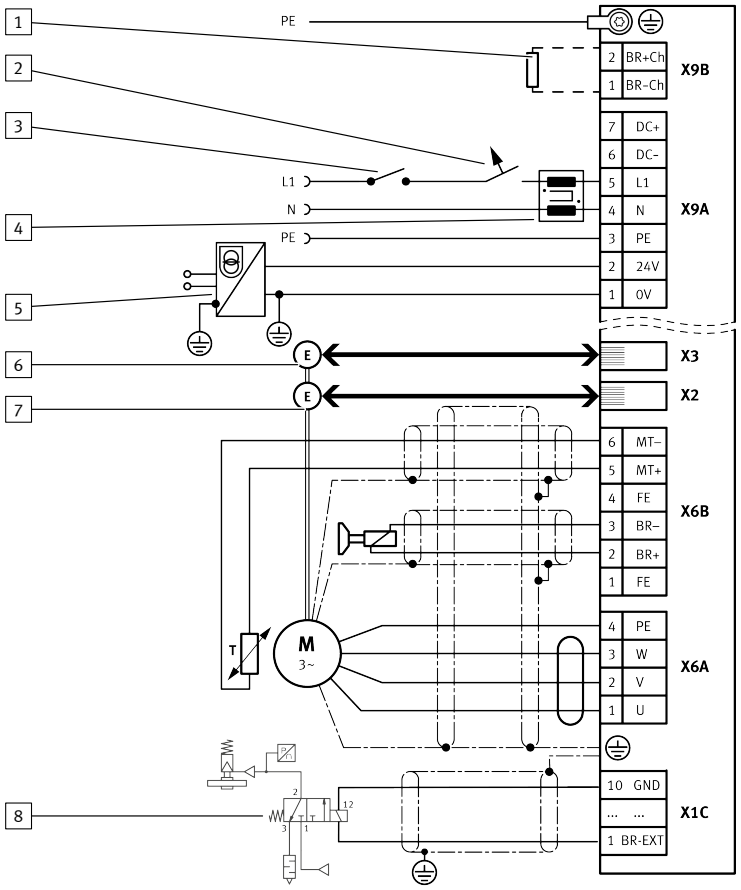


Fig. 7: Connection example

1 Braking resistor
2 Circuit breaker or 3 x fuses
3 Main switch/main contactor
4 Line choke if required (for category C2)
5 PELV fixed power supply for 24 V supply
6 Encoder 2 (optional)
7 Encoder 1
8 Example of external brake

STO connection example

The safety sub-function STO (safe torque off) is triggered by an input device that makes the safety request (e.g. light curtain).

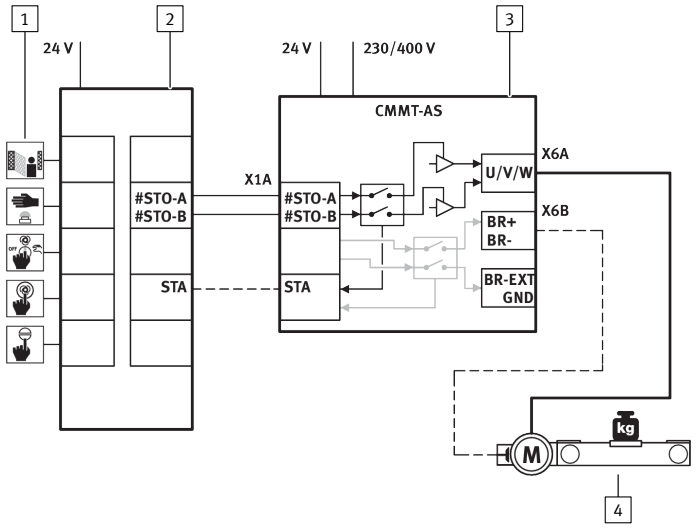


Fig. 8: STO sample circuit

1 Input device for safety request, e.g. light curtain
2 Safety relay unit
3 Servo drive CMMT-AS
4 Drive axis

Information on the sample circuit

The safety request is passed on to the servo drive on 2 channels via the #STO-A and #STO-B inputs at the connection [X1A]. This safety request results in the 2-channel switch-off of the driver power supply to the servo drive's power output stage. The safety relay unit can use the STA diagnostic output to monitor whether the safe status has been reached for the safety sub-function STO.

SBC connection example

The safety sub-function SBC (safe brake control) is triggered by an input device that makes the safety request.

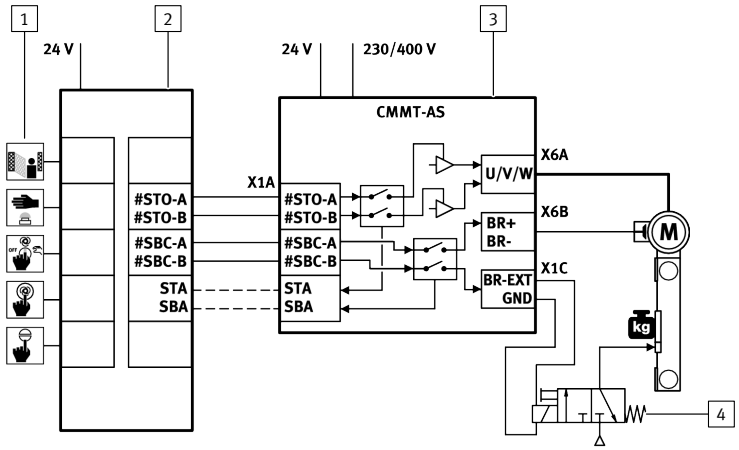


Fig. 9: SBC sample circuit

1 Input device for safety request, e.g. light curtain
2 Safety relay unit
3 Servo drive CMMT-AS
4 Control (in this example: solenoid valve) of the clamping unit

Information on the sample circuit

The safety request is passed on to the servo drive on 2 channels via the inputs #SBC-A and #SBC-B at the connection [X1A].

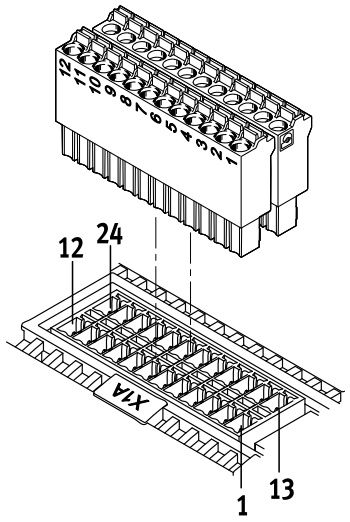
- The request via the input #SBC-A switches off power to the signals BR+ and BR- at the connection [X6B]. This de-energises and closes the holding brake.
- The request via the input #SBC-B switches off power to the signal BR-EXT at the connection [X1C]. This shuts off power to the control of the external clamping unit. The clamping unit closes.
- The safety relay unit monitors the SBA diagnostic output and checks whether the safe status has been reached for the safety sub-function SBC.

7.8 Interfaces

Observe the requirements for mating plugs ➔ Manual Assembly, Installation.

7.8.1 [X1A], inputs and outputs for the higher-order PLC

The I/O interface [X1A] is located on the top of the device.
The inputs and outputs of this I/O interface are used for coupling to a higher-order PLC. The safety-related inputs and outputs are connected to a safety relay unit.

[X1A]	Pin	Function	Description
	24	RDY-C1	Normally open contact: ready for operation message (Ready)
	23	RDY-C2	
	22	STA	Diagnostic output Safe torque off acknowledge
	21	SBA	Diagnostic output Safe brake control acknowledge
	20	–	reserved, do not connect
	19	–	
	18	SIN4	Release brake request
	17	GND	Reference potential
	16	TRG0	fast output for triggering external components, channel 0
	15	TRG1	like TRG0, but channel 1
	14	CAP0	fast input for position detection, channel 0
	13	CAP1	like CAP0, but channel 1
	12	#STO-A	Safe torque off control input, channel A
	11	#STO-B	Safe torque off control input, channel B
	10	#SBC-A	Safe brake control control input, channel A
	9	#SBC-B	Safe brake control control input, channel B
	8	–	reserved, do not connect
	7		
	6		
	5		
	4	ERR-RST	Error acknowledgement
	3	CTRL-EN	Power stage enable
	2	AIN0	Differential analogue input
	1	#AIN0	

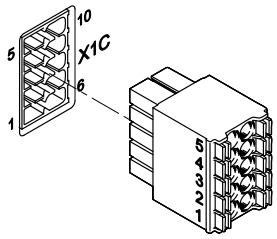
Tab. 17: Inputs and outputs for the higher-order PLC with the CMMT-AS-...-S1

Requirements for the connecting cable	Single device	Device compound
Shielding	unshielded	
Min. conductor cross-section incl. plastic wire ferrule	0.25 mm²	–
Max. conductor cross-section including plastic wire ferrule	0.75 mm²	–
Min. conductor cross-section including double plastic wire ferrule	–	0.25 mm²
Max. conductor cross-section including double plastic wire ferrule	–	0.5 mm²
Max. length	3 m	0.5 m

Tab. 18: Requirements for the connecting cable

7.8.2 [X1C], inputs and outputs for the axis

The I/O interface [X1C] is located on the front of the device. This interface makes functional and safety-related inputs and outputs available for components on the axis. Output BR-EXT is used in conjunction with the safety sub-function Safe brake control ➔ Manual Safety sub-function.

[X1C]	Pin	Function	Description
	10	GND	Reference potential
	9	24V	Power supply output for sensors
	8	GND	Reference potential
	7	LIM1	Digital input for limit switch 1 (PNP logic, 24 V DC)
	6	LIM0	Digital input for limit switch 0 (PNP logic, 24 V DC)
	5	GND	Reference potential
	4	24 V	Power supply output for sensors
	3	–	reserved, do not connect
	2	REF-A	Digital input for reference switch (PNP logic, 24 V DC)
	1	BR-EXT	Output for connecting an external clamping unit (high-side switch, low test pulses on #SBC-B are transmitted to BR-EXT)

Tab. 19: Inputs and outputs for the axis

Cable requirements	
Shielding	Unshielded/shielded[1)]
Min. conductor cross-section including plastic wire end sleeve	0.25 mm²
Max. conductor cross-section including plastic wire end sleeve	0.75 mm²
Max. length	100 m

1) For safety-related applications, use a shielded cable outside the control cabinet. Otherwise, a shield is not absolutely essential, but is recommended.

Tab. 20: Cable requirements

Requirements for the shield support

Connecting the shield

1. On the device side, connect the cable shield to the shield clamp for the motor cable.
2. On the machine side, connect the cable shield to an earthed machine part.

7.8.3 [X2], encoder interface 1

The encoder interface [X2] is located on the front panel of the device. The encoder interface [X2] is primarily designed for connecting the position encoder integrated into the motor.

Supported standards/protocols	Supported encoders
Hiperface	SEK/SEL 37 SKS/SKM 36
EnDat 2.2	ECI 1118/EBI 1135 ECI 1119/EQI 1131 ECN 1113/EQN 1125 ECN 1123/EQN 1135
EnDat 2.1	Only in combination with Festo EMMS-AS series motors that have an integrated encoder with EnDat 2.1 protocol
Only for CMMT-AS -...- MP: BiSS-C	Absolute encoders with BiSS interface that support the BiSS-C protocol
Digital incremental encoders with square-wave signals and with RS422-compatible signal output (differential A, B, N signals)	ROD 426 or compatible
Analogue SIN/COS incremental encoders with differential analogue signals with 1 V_{ss}	HEIDENHAIN LS 187/LS 487 (20 µm signal period) or compatible
Encoders with asynchronous two-wire communication interface (RS485)	Nikon MAR-M50A or compatible (18 bit data frames)

Tab. 21: Standards and protocols supported by the encoder interface [X2]

NOTICE

Damage to the sensor when sensor type is changed.

The servo drive can provide 5 V or 10 V sensor supply. Through configuration of the sensor, the supply voltage is established for the sensor. The sensor can be damaged if the configuration is not adjusted before connection of another sensor type.

- When changing the sensor type: Comply with specified steps.

Change of encoder type

1. Disconnect encoder from the device.
2. Set up and configure new encoder type in the CMMT-AS.
3. Save settings in the CMMT-AS.
4. Switch off CMMT-AS.
5. Connect new encoder type.
6. Switch CMMT-AS back on.

Requirements for the connecting cable	
Characteristics	– Encoder cable for servo drives, shielded – Optical shield cover > 85% – Separately twisted signal pairs – Recommended design: (4 x (2 x 0.25 mm²))[1)]
Max. cable length	100 m[1)]

1) In the case of encoders with no compensation for voltage drops or in the case of very long cables, thicker supply cables may be required.

Tab. 22: Requirements for the connecting cable

Requirements for the shield support

Connecting the encoder cable shield

1. On the device side, connect the encoder cable shield to the plug housing.
2. On the motor side, connect the encoder cable shield to the encoder or encoder plug.

7.8.4 [X3], encoder interface 2

The encoder interface [X3] is located on the front panel of the device. The encoder interface [X3] primarily serves to connect a second position encoder to the axis (e.g. to enable precise positioning control for the axis or as a redundant measuring system for safe motion monitoring).

Supported standards/protocols	Supported encoders
Only for CMMT-AS-...-MP: Hiperface	➔ 7.8.3 [X2], encoder interface 1
Only for CMMT-AS-...-MP: EnDat 2.2	
Only for CMMT-AS-...-MP: EnDat 2.1	
Digital incremental encoders	
Analogue SIN/COS incremental encoders	

Tab. 23: Standards and protocols supported by the encoder interface [X3]

[X3] is designed to be electrically compatible with [X2] but does not support all encoders and functions like [X2].

7.8.5 [X10], SYNC IN/OUT

The interface [X10] is located on the front panel of the device. The interface [X10] permits master-slave coupling. In the master-slave coupling, the axes of several devices (slave axes) are synchronised via a device (master axis). The SYNC interface can be configured for different functions and can be used as follows:

Possible functions	Description
Incremental encoder output	Output of a master axis that emulates encoder signals (encoder emulation)
Incremental encoder input	Input of a slave axis for receiving the encoder signals of a master axis

Tab. 24: Possible functions of the connection [X10]

Requirements for the connecting cable	
Characteristics	– Encoder cable for servo drives, shielded – Optical shield cover > 85% – Separately twisted signal pairs – recommended design: (4 x (2 x 0.25 mm²))
Max. cable length	3 m

Tab. 25: Requirements for the connecting cable

Requirements for the shield support

Connect the connecting cable shield to the plug housings on both sides.

Possible connections

Connection possibilities	Description
Direct connection of 2 devices	Two devices can be connected directly with a patch cable (point-to-point connection). Recommendation: use patch cable of category Cat 5e; maximum length: 25 cm
Connection of multiple devices via RJ45 T adapter and patch cables	A maximum of 16 devices may be connected. Recommendation: use T adapter and patch cables of category Cat 5e; maximum length per cable: 25 cm
Connection of multiple devices via patch cables and a connector box (accessories ➔ www.festo.com/catalogue)	A maximum of 16 devices may be connected. Recommendation: use patch cables of category Cat 5e; maximum length per cable: 100 cm

Tab. 26: Connection possibilities

7.8.6 [X18], standard Ethernet

The interface [X18] is located on the front panel of the device. The following can be performed via the interface [X18] using the commissioning software:
- Diagnostics
- Parameterisation
- Controller
- Firmware updates

The interface is designed to conform to the standard IEEE 802.3. The interface is electrically isolated and intended for use with limited cable lengths ➔ Tab. 27 Requirements for the connecting cable. For this reason, the insulation coordination approach differs from IEEE 802.3 and must conform instead to the applicable product standard IEC 61800-5-1.

Requirements for the connecting cable	
Characteristics	CAT 5, patch cable, double shielded
Max. cable length	30 m

Tab. 27: Requirements for the connecting cable

The following connections are possible via the Ethernet interface:

Connections	Description
Point-to-point connection	The device is connected directly to the PC via an Ethernet cable.
Network connection	The device is connected to an Ethernet network.

Tab. 28: Options for connection

The device supports the following methods of IP configuration (based on IPv4):

Methods	Description
Obtain IP address automatically (DHCP client)	The device obtains its IP configuration from a DHCP server in the network. This method is suitable for networks with a DHCP server installed.
Fixed IP configuration	The device uses a fixed IP configuration. The IP configuration of the device can be permanently assigned manually. However, the device can only be addressed if the assigned IP configuration matches the IP configuration of the PC. Factory setting: 192.168.0.1

Tab. 29: Options for IP configuration

7.8.7 [X19], Real-time Ethernet (RTE) port 1 and port 2

The interface [X19] is located on the top of the device. The interface [X19] permits RTE communication. The following protocols are supported by the interface [X19]:

Product variant	Supported protocol
CMMT-AS-...-MP	EtherCAT, EtherNet/IP, Modbus TCP, PROFINET ➔ 4.3 Setting bus protocol
CMMT-AS-...-EC	EtherCAT
CMMT-AS-...-EP	EtherNet/IP, Modbus TCP
CMMT-AS-...-PN	PROFINET

Tab. 30: Supported protocols

The physical level of the interface fulfils the requirements according to IEEE 802.3. The interface is electrically isolated and intended for use with limited cable lengths ➔ Tab. 31 Requirements for the connecting cable.
The interface [X19] offers 2 ports.
- Port 1, labelled on the device with [X19, XF1 IN]
- Port 2, labelled on the device with [X19, XF2 OUT]

2 LEDs are integrated into each of the two RJ45 bushings. The behaviour of the LEDs depends on the bus protocol. Both LEDs are not always used.

Requirements for the connecting cable	
Characteristics	CAT 5, patch cable, double shielded
Max. cable length	30 m

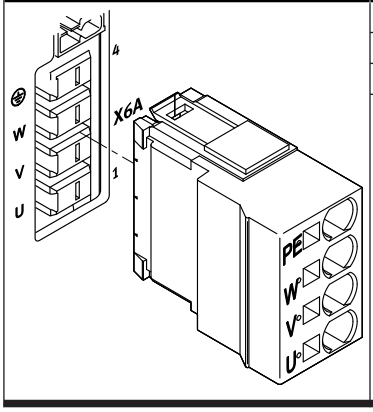
Tab. 31: Requirements for the connecting cable

7.9 Motor connection

7.9.1 [X6A], motor phase connection

The connection [X6A] is located on the front of the device. The following connections to the motor are established via the connection [X6A]:
- Motor phases U, V, W
- PE connection

Incorrect circuitry of PE and motor phases results in a device defect, jerking or uncontrolled start-up of the motor when the power supply is switched on.

[X6A]	Pin	Function	Description
	4	PE	Protective earthing, motor
	3	W	third motor phase
	2	V	second motor phase
	1	U	first motor phase

Tab. 32: Motor phase connection

The cable shield of the motor cable must be placed on the support surface on the bottom front of the housing and the motor cable fastened with the shield clamp.

Requirements for the connecting cable	
Wires and shielding	– 4 power wires, shielded – Extra optional wires, e.g. for the holding brake (shielded separately) and the motor temperature sensor (shielded separately)
Design	Only use cables that ensure reinforced isolation between the motor phases and the shielded signals of the holding brake and motor temperature sensor in accordance with IEC 61800-5-1. ➔ 7.9.4 Shield support of the motor cable
Max. cable length	➔ 7.6 Information on EMC-compliant installation
Max. capacitance	< 250 pF/m
Nominal cross section of power wires[1]	
CMMT-AS-C7/C12-11A-P3[2)3)]	0.75 mm² ... 2.5 mm²
CMMT-AS-C18/C25-11A-P3	2.5 mm² ... 6 mm²
Cable diameter of the stripped cable or shield sleeve (clamping range of the shield clamp)	
CMMT-AS-C7/C12-11A-P3	12 mm ... 17 mm
CMMT-AS-C18/C25-11A-P3	14 mm ... 19 mm
The only motor cables permitted are those that fulfil the requirements of EN 61800-5-2, Annex D.3.1 and the requirements of EN 60204-1.	

1) Shield clamp and mating plug also allow larger cross sections.
2) at 0.75 mm², check whether the shield diameter is sufficient for a clean clamping
3) 2.5 mm² recommended for cable lengths of 50 m and over to limit the voltage drop of the available output voltage.

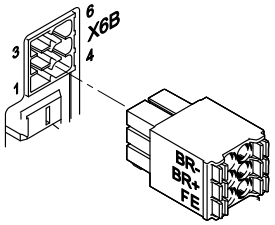
Tab. 33: Requirements for the connecting cable

Festo offers prefabricated motor cables as accessories ➔ 3 Additional information.
- Only use motor cables that have been approved for operation with the Festo servo drive. Motor cables of other manufacturers are permitted if they meet the specified requirements.

7.9.2 [X6B], motor auxiliary connection

The connection [X6B] is located on the front of the device. The holding brake of the motor and the motor temperature sensor can be connected to the connection [X6B]. The output for the holding brake is controlled both functionally and by the safety part for the Safe brake control safety sub-function. The safety part has priority in the event of a request (switching off the output) ➔ Manual Safety sub-function.
To allow motor temperature monitoring, the following are supported:
- N/C and N/O contacts
- KTY 81 ... 84 (silicon temperature sensors)
- PTC (PTC resistor, positive temperature coefficient)
- NTC (NTC resistor, negative temperature coefficient)
- Pt1000 (platinum measuring resistor)

The servo drive monitors whether the motor temperature violates an upper or lower limit. With switching sensors, only the upper limit value can be monitored (e.g. with a normally closed contact). The limit values and the error response can be parameterised.

[X6B]	Pin	Function	Description
	6	MT–	Motor temperature (negative potential)
	5	MT+	Motor temperature (positive potential)
	4	FE	Functional earth connected to protective earth
	3	BR–	Holding brake (negative potential)
	2	BR+	Holding brake (positive potential)
	1	FE	Functional earth connected to protective earth

Tab. 34: Motor auxiliary connection

Requirements for the connecting cable	
Design	– 2 wires for the line to the holding brake, twisted in pairs, separately shielded – 2 wires for the line to the temperature sensor, twisted in pairs, separately shielded
Min. conductor cross-section including plastic wire end sleeve	0.25 mm²
Max. conductor cross-section including plastic wire end sleeve	0.75 mm²
Max. length	100 m[1)]

1) With cable lengths > 25 m, take account of the voltage drop on the cables by selecting appropriate wire cross sections.

Tab. 35: Requirements for the connecting cable

Requirement for the temperature sensor in the motor
– electrically reinforced isolation from the motor phases in accordance with IEC 61800-5-1, voltage class C, overvoltage category III.

Requirements for the shield support
– Connect the cable shield on both sides.
– Make unshielded cable ends as short as possible (recommended 150 mm, max. 200 mm).

7.9.3 Electronic overload and over temperature protection for the motor

The CMMT-AS allows the motor to be electronically protected against overload and provides over temperature protection with the following protective functions:

Protective functions	Description	Measures required during installation and commissioning
Temperature monitoring of the motor	The motor temperature is monitored for an upper and lower limit value, including hysteresis. The limit values can be parameterised.	– Connect the temperature sensor to connection [X6B] (both switching and analogue temperature sensors are supported) – Parameterise the temperature limit values in accordance with the type of motor used, e.g. using the device-specific plug-in. Comply with the permissible limit values of the motor.
Electronic current limiting and I²t monitoring of the motor current	The motor current is monitored electronically and limited in accordance with the limit values specified in the standard ➔ EN 61800-5-1, Tab. 29. Motor currents and I²t time constant can be parameterised.	– Parameterise the nominal current, maximum current and I²t time constant of the motor, e.g. using the device-specific plug-in.
Thermal memory in the event of motor switch-off	Supported, not parameterizable	– None
Thermal memory in the event of a power supply failure		
Speed-sensitive overload protection	Parameterisable	– Parameterise I²t monitoring with speed-dependent scaling, e.g. with the device-specific plug-in. Such as for: – Synchronous servo motors (lower permissible current at high rotational speed) – Fan motors (lower permissible current at low rotational speed)

Tab. 36: Protective functions for the motor

The specified parameters are preset for Festo motors. The parameters can be adapted in the plug-in.

7.9.4 Shield support of the motor cable

Requirements for the motor cable shield support on the device side
The type of shield support depends on the design of the motor cable. If, for example, a hybrid cable is used to connect the motor, holding brake and temperature sensor, the following options are available for connecting the shield on the device side:
Option 1: all motor cable shields are jointly connected over a wide surface area using a shield sleeve at the cable end and are connected below the shield clamp on the front of the CMMT-AS.

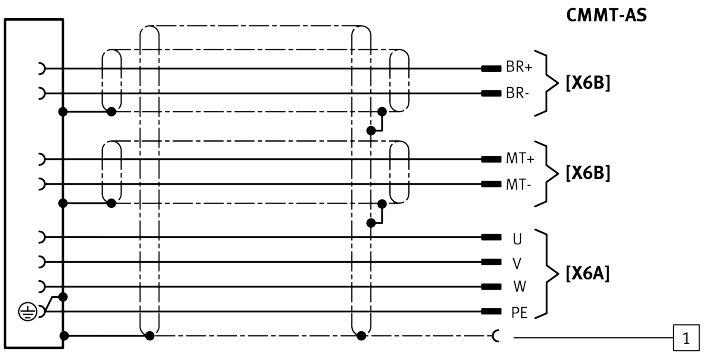


Fig. 10: Joint shield support for all cable shields, example

1 Shield sleeve

Option 2: the outside shield of the motor cable is connected separately over a wide surface area below the shield clamp on the front of the CMMT-AS. The inside shields are connected separately to the designated FE pin of the connection [X6B].
• Make unshielded cable ends as short as possible.

Mounting the shield clamp
The lower section on the front of the housing is used as a shield support surface. The shield support surface, together with the shield clamp, allows the motor cable shield to be connected over a wide surface area ➔ Fig. 11.

1. Using the shield clamp, press the motor cable shield or the conductive shield end sleeve of the motor cable onto the shield support surface of the housing.
2. Using a size T20 TORX screwdriver, tighten the retaining screws (2x) of the shield clamp. Pay attention to the clamping range and observe the tightening torque specified below.

Property	Value	Comment
Clamping range CMMT-AS-...-C7/C12-11A-P3	12 mm ... 17 mm	Diameter of the stripped cable or shield sleeve
Clamping range CMMT-AS-...-C18/C25-11A-P3	14 mm ... 19 mm	
Tightening torque for the retaining screws in the case of block mounting	1.8 Nm ± 15%	In the case of block mounting, the shield clamp makes full contact with the base of the housing (cable diameter 12 mm)
Minimum tightening torque with larger cable diameter (> 12 mm ... 23 mm)	0.5 Nm ± 15%	Make sure that a higher tightening torque does not crush the connecting cable in the clamping area by excessive pressure.

Tab. 37: Tightening torque and clamping range CMMT-AS-C7/C12-11A-P3

Longer screws M4 x 30 - 8.8 screws are required for the hybrid cable from Festo with a nominal cross section of the power cores of 6 mm². The screws are included with the Festo hybrid cable.

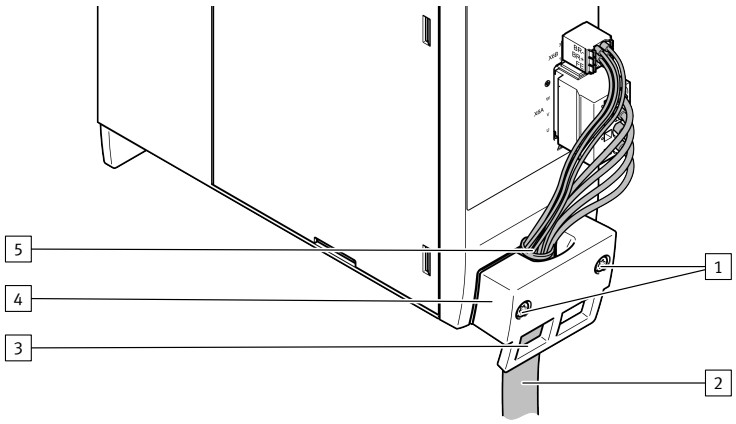


Fig. 11: Shield clamp of the motor cable

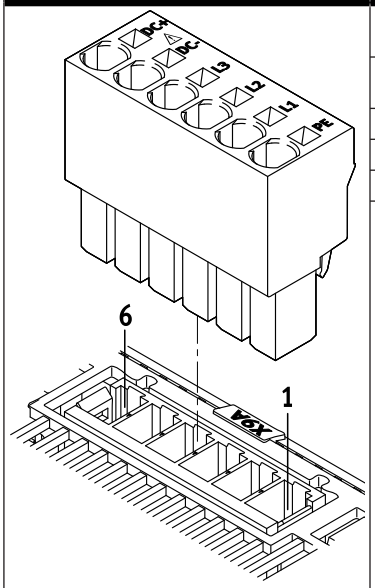
1 Retaining screws of the shield clamp (2x)
2 Motor cable
3 Cut-out for mounting cable binders (2x)
4 Shield clamp
5 Motor cable shield connected over a large surface area below the shield clamp

Motor cable shield support on the motor side
Detailed information on the motor-side connection with Festo motor cables ➔ Assembly instructions for the motor cable ➔ www.festo.com/sp.
• Connect all shields to the PE over a wide surface area on the motor side, e.g. via the shield connection provided on the motor connector or the shield support surface in the motor junction box.

7.10 Power and logic voltage supply

7.10.1 [X9A], power supply and DC link circuit connection

The connections for the power voltage supply and the DC link circuit are not protected against wiring errors. The reversal of the connections results in a device defect during switch-on.
With cross-wiring, observe the polarity of the DC link connection on all devices.

[X9A]	Pin	Function	Description
	6	DC+	DC link circuit positive potential
	5	DC-	DC link circuit negative potential
	4	L3	Mains supply phase L3
	3	L2	Mains supply phase L2
	2	L1	Mains supply phase L1
	1	PE	Protective earthing

Tab. 38: Power supply and DC link circuit

Requirements for the connecting cable	Single device	Device compound
Number of insulated wires and shielding	4 insulated wires, unshielded	without DC link coupling: 4 wires, unshielded with DC link coupling: 6 wires, unshielded
Min. conductor cross-section including plastic wire end sleeve	0.5 mm²	1.5 mm²
Max. conductor cross-section including plastic wire end sleeve	4 mm²	4 mm²
Max. conductor cross section including wire end sleeve without plastic sleeve	6 mm²	6 mm²
Max. length	2 m	≤ 0.5 m

Tab. 39: Requirements for the connecting cable

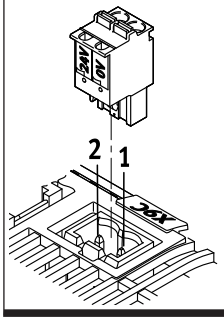
7.10.2 [X9C], logic voltage supply

⚠ WARNING

Risk of injury due to electric shock.

- For the electrical power supply with extra-low voltages, use only PELV circuits that guarantee a reinforced isolation from the mains network.
- Observe IEC 60204-1/EN 60204-1.

- Only connect PELV circuits with an output current of max. 25 A. Otherwise, use a separate external fuse: 25 A.

[X9C]	Pin	Function	Description
	2	24 V DC	positive potential of logic voltage supply
	1	0 V	Reference potential for logic voltage supply

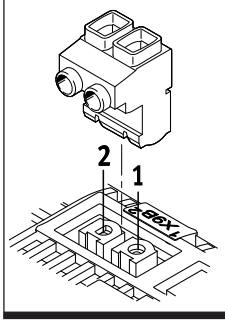
Tab. 40: Logic voltage supply

Requirements for the connecting cable	Single device	Device compound
Number of insulated wires and shielding	2 insulated wires, unshielded	2 insulated wires, unshielded
Min. conductor cross section incl. wire end sleeve with plastic sleeve	0.5 mm²	0.5 mm²
Max. conductor cross section incl. plastic wire end sleeve	2.5 mm²	2.5 mm²
Max. length	2 m	0.5 m

Tab. 41: Requirements for the connecting cable

7.10.3 [X9B], connection for braking resistor

The connection [X9B] is located on the top of the device. The internal braking resistor or a suitable external braking resistor is attached to the connection [X9B].

[X9B]	Pin	Function	Description
	2	BR+Ch	Braking resistor positive connection
	1	BR-Ch	Braking resistor negative connection

Tab. 42: Connection for the braking resistor

Requirements for the connecting cables of external braking resistors	
Number of insulated wires and shielding	2 wires, shielded
Min. conductor cross section incl. wire end sleeve with plastic sleeve	0.25 mm²
Max. conductor cross section incl. plastic wire end sleeve	2.5 mm²
Max. cable length	2 m
Wiring	inside the control cabinet, shield connected to PE
Tightening torque of the screw terminals on the mating plug GIC 2.5 HCV/2-ST-7.62	0.5 … 0.6 Nm[1)]

1) Specification of the manufacturer at the time the documentation was approved

Tab. 43: Requirements for the connecting cable

Selection of suitable braking resistors
Information on selecting suitable braking resistors ➔ Manual Assembly, Installation.

7.11 Cross-wiring

Cross-wiring makes it possible to set up a device compound consisting of up to 10 servo drives CMMT-AS. The different cross-wiring options are as follows:
– Cross-wiring of I/O signals at the connection [X1A]
– Cross-wiring of the mains and logic voltage supply without DC link coupling
– Cross-wiring of the mains and logic voltage supply with DC link coupling
Information on cross-wiring ➔ Manual Assembly, Installation and Manual Safety sub-function.

7.12 STO installation

Inputs and outputs for the safety sub-function STO
The 2-channel request for the safety sub-function is made via the digital inputs #STO-A and #STO-B. The STA diagnostic output indicates whether the safe status has been reached for the safety sub-function STO.

Connection	Pin	Type	Identifier	Function
[X1A]	X1A.11	DIN	#STO-B	Safe torque off, channel B
	X1A.12		#STO-A	Safe torque off, channel A
	X1A.22	DOUT	STA	Safe torque off acknowledge

Tab. 44: Inputs and outputs for the safety sub-function STO

7.13 SBC installation

Inputs and outputs for the safety sub-function SBC
The 2-channel request for the safety sub-function is made via the digital inputs #SBC-A and #SBC-B at the connection [X1A]. The SBA diagnostic output indicates whether the safe status has been reached for the safety sub-function SBC. The holding brake is connected via the connection [X6B]. The external clamping unit is connected via the connection [X1C].

Connection	Pin	Type	Identifier	Function
[X1A]	X1A.9	DIN	#SBC-B	Safe brake control, channel B
	X1A.10		#SBC-A	Safe brake control, channel A
	X1A.21	DOUT	SBA	Safe brake control acknowledge
[X1C]	X1C.1	DOUT	BR-EXT	Output for connection of an external clamping unit (High-Side-Switch)
	X1C.5		GND	Reference potential
[X6B]	X6B.1	–	FE	Functional earth connected to protective earth

Connection	Pin	Type	Identifier	Function
[X6B]	X6B.2	OUT	BR+	Holding brake (positive potential)
	X6B.3		BR–	Holding brake (negative potential)

Tab. 45: Inputs and outputs for the SBC safety sub-function

7.14 SS1 installation

Inputs and outputs for the safety sub-function SS1

The safety sub-function SS1 is wired like the safety sub-function STO but is supplemented by the functional input CTRL-EN so that the braking ramp can be activated by the safety relay unit.

7.15 Installation for operation without safety sub-function

Minimum wiring for operation without safety sub-function

For operation without the safety sub-function, wire inputs X1A.9 to X1A.12 as follows:

Connection	Pin	Type	Identifier	Function
[X1A]	X1A.9	DIN	#SBC-B	Supplies each one with 24 V
	X1A.10		#SBC-A	
	X1A.11		#STO-B	
	X1A.12		#STO-A	
	X1A.21	DOUT	SBA	Do not connect
	X1A.22		STA	

Tab. 46: Wiring of inputs and outputs without safety sub-function

8 Commissioning

8.1 Safety

⚠ WARNING

Risk of injury from electric shock in the event of incomplete insulation at the power connections [X6A], [X9A] and [X9B].

Before operating, plugging in or unplugging the operator unit CDSB or a connector from a hot-plug-capable interface, the following points must be fulfilled:

- The conducting lines at the device are completely insulated.
- The protective earthing (PE) and the shield connection are correctly connected to the device.
- The housing is free of damage.

⚠ WARNING

Severe, irreversible injuries from accidental movements of the connected actuator technology.

Unintentional movements of the connected actuator technology can result from exchanging the connecting cables of a servo drive or between servo drives.

- Before commissioning: all cables must be correctly assigned and connected.

⚠ WARNING

Risk of injury from electric shock.

Contact with live parts at the power connections [X6A], [X9A] and [X9B] can result in severe injuries or death.

- Do not pull out power supply plugs while live.
- Before touching, wait at least 5 minutes after switching off the load voltage to allow the intermediate circuit to discharge.

NOTICE

During commissioning: Keep the range of movement of the connected actuators clear, so that no persons are endangered.

NOTICE

Unauthorised Access to the Device Can Cause Damage or Malfunction.

- When connecting the device to a network, protect the network from unauthorised access.
  Standards for security in information technology can be used for network protection measures, e.g. IEC 62443, ISO/IEC 27001.

Use of the safety functions

NOTICE

The safety sub-functions STO and SBC are already available on the CMMT-AS on delivery without the need for any additional parameterisation. Prior to initial commissioning, you must – as a minimum – wire safety sub-functions STO and SBC.

1. Make sure that each safety function of the system is analysed and validated. It is the responsibility of the operator to determine and verify the required safety classification (safety integrity level, performance level and category) of the system.
2. Put the servo drive into operation and validate its behaviour in a test run.

Observe measures during integration of the PDS in accordance with EN ISO 13849-1:

– Functional test
– Project management
– Documentation
– Performance of a black-box test

8.2 Preparation for commissioning

For initial commissioning, you will need to have the Festo Automation Suite software installed along with the CMMT-AS plug-in ➔ www.festo.com/sp.

Prepare for commissioning as follows:

1. Check the wiring of the CMMT-AS.
   With the CMMT-AS-...-MP, check the switch setting for the selection of the bus protocol ➔ 4.3 Setting bus protocol.
2. Install the Festo Automation Suite plus CMMT-AS plug-in on the PC.
3. Create a project and add CMMT-AS device.
4. Establish the connection to the CMMT-AS and set network configuration.
5. Identify the technical data of the components that is required for configuration.

8.3 Commissioning steps

NOTICE

Unwanted drive movements or damage to components.

Incorrect parameterisation may result in unwanted drive movements or overload when the closed-loop controller is enabled or may lead to connected components becoming overloaded or damaged.

- Do not enable the closed-loop controller until the configured components (servo drive, motor, axis, etc.) match those that are connected exactly.

During initial commissioning with the Festo Automation Suite with the CMMT-AS plug-in installed, the following steps must be performed, for example:

1. Perform configuration and parameterisation with the CMMT-AS plug-in (hardware configuration, critical limits and parameters).
2. When using safety functions, test the functions of the safety functions ➔ Manual Safety sub-function.
3. Check signal behaviour of the digital inputs/outputs (e.g. limit/reference switch).
4. Provide required control signals.
5. Check direction of rotation/direction of travel of the electromechanical drive (e.g. in jog operation).
6. Carry out homing.
7. Test positioning behaviour (test mode, ➔ help for the CMMT-AS plug-in).
8. If necessary, optimise controller setting (optional, ➔ help for the CMMT-AS plug-in).
9. Perform fieldbus configuration and test control profile (➔ description of the device profile used).
10. Complete commissioning (e.g. save project with Festo Automation Suite and archive project).

9 Operation

Check the safety functions at adequate intervals for proper functioning. It is the responsibility of the operator to choose the type and frequency of the checks within the specified time period. The manner in which the test is conducted must make it possible to verify that the safety device is functioning perfectly in interaction with all components. Time period for cyclical test ➔ 13.1 Technical data, safety engineering.

The CMMT-AS is maintenance-free during its period of use and specified service life. The test interval varies from one safety sub-function to another:

– STO: no test has to be carried out during the period of use, but we recommend evaluating STA whenever the sub-function is requested to ensure maximum diagnostic coverage and the highest safety-related classification.
– SBC: cyclical test required at least once every 24 h and SBA evaluation recommended whenever the sub-function SBC is requested to ensure maximum diagnostic coverage and the highest safety-related classification.

10 Maintenance and care

If used as intended, the product is maintenance-free.

10.1 Cleaning

⚠ WARNING

Risk of injury from electric shock.

Contact with live parts at the power connections [X6A], [X9A] and [X9B] can result in severe injuries or death.

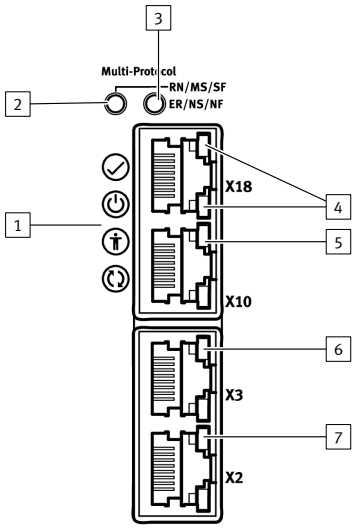
- Do not pull out power supply plugs while live.
- Before touching, wait at least 5 minutes after switching off the load voltage to allow the intermediate circuit to discharge.

- Clean the outside of the product with a soft cloth.

11 Malfunctions

11.1 Diagnostics via LED

LEDs for indicating status information are on the front and top of the device. The number of LEDs depends on the product design. There are up to 11 LEDs on the front of the device. There are up to 4 LEDs on the top of the device at connections [X19], XF1 IN and XF2 OUT.



1 Device status (4 LEDs)
2 RN/MS/SF (example CMMT-AS-...-MP)
3 ER/NS/NF (example CMMT-AS-...-MP)
4 Ethernet interface activated and communication activity [X18]
5 Sync interface activated [X10]
6 Encoder status, encoder interface [X3]
7 Encoder status, encoder interface [X2]

Fig. 12: LEDs on the front

11.1.1 Device status displays

LED	Designation	Brief description
✓	Status LED	Indicates the general device status
⏻	Power LED	Indicates the status of the power supply
🧍	Safety LED	Indicates the status of the safety equipment
🔄	Application status LED	Indicates the identification sequence and is reserved for future extensions

Tab. 47: Device status LEDs (status, power, safety and application status LEDs)

✓ Status LED, display of the device status

LED	Meaning
fast red flashing	Unexpected exception error. – Restart device – Service case
flashing red	An error is pending.
Flashing orange	The servo drive is currently performing a firmware update.
flashing yellow	A warning is pending.
yellow light	The servo drive is in the initialisation phase.
flashing green	The servo drive is ready, and the power stage is switched off (Ready).
green light	The power stage and the closed-loop controller are enabled.

Tab. 48: Status LED

⏻ Power LED, status of the power supply

LED	Meaning
flashing yellow	The logic voltage and AC supply are present. The intermediate circuit is being charged.
yellow light	The logic voltage supply is present, but the AC supply is lacking.
green light	The logic voltage supply is present, and the intermediate circuit is charged.

Tab. 49: Power LED

🧍 Safety LED, status of the safety engineering

Malfunctions of the safety sub-functions are detected and displayed in the functional device. The following are detected:
- Safety sub-functions requested via 1 channel (discrepancy monitoring)
- Internal device errors that lead to pulse monitoring not being switched off or only switched off on one channel
- Errors in the brake outputs or the external wiring that result in voltage being present on the brake output even though the safety sub-function SBC has been requested

Malfunctions are externally reported by the functional part, including via the additional communication interfaces (bus, commissioning software).

LED	Meaning
flashing red	Error in the safety part or a safety condition has been violated.
flashing yellow	The safety sub-function has been requested but is not yet active.
yellow light	The safety sub-function has been requested and is active.
green light	Ready, a safety sub-function has not been requested.

Tab. 50: Safety LED

11.2 Repair

Repair or maintenance of the product is not permissible. If necessary, replace the complete product.
1. If there is an internal defect: Always replace the product.
2. Send the defective product unchanged, together with a description of the error and application, back to Festo.
3. Check with your regional Festo contact person to clarify the conditions for the return shipment.

12 Disassembly

Disassemble in reverse order of mounting.

Before disassembly
1. Switch off the power supply at the main switch.
2. Secure the system against accidental reactivation.
3. Wait at least 5 minutes until the intermediate circuit has discharged.
4. Let the device cool down to room temperature.
5. Before touching the power connections [X6A], [X9A], [X9B], check to ensure they are free of voltage.
6. Disconnect all electrical cables.

For disassembly of the device
- Loosen retaining screws (2x) and remove the device from the mounting surface.

13 Technical data

13.1 Technical data, safety engineering

Approval information, safety engineering	
CE	
Type-examination	The functional safety engineering of the product has been certified by an independent testing body, see EC-type examination certificate ➔ www.festo.com/sp
Certificate issuing authority	TÜV Rheinland, Certification Body of Machinery, NB 0035
Certificate no.	01/205/5640.01/23
UKCA	
Type-examination	The functional safety engineering of the product has been certified by an independent body, see UK-type examination certificate ➔ www.festo.com/sp
Certificate issuing authority	TUV Rheinland UK Ltd, Approved Body for Machinery, No. 2571
Certificate no.	01/205U/5640.01/23

Tab. 51: Approval information, safety engineering

General safety reference data		
Request rate in accordance with EN 61508		High request rate
Reaction time when the safety sub-function is requested	[ms]	< 10 (applies to STO and SBC)
Error reaction time (how long it takes for the diagnostic output status to become correct once the safety sub-function has been requested)	[ms]	< 20 (applies for STA and SBA)

Tab. 52: Safety reference data and safety specifications

Safety reference data for the safety sub-function STO			
Circuitry	without high-test pulses, without or with STA evaluation	with hightest pulses and with STA evaluation[1)]	with hightest pulses and without STA evaluation
Safety sub-function in accordance with EN 61800-5-2	Safe torque off (STO)		
Safety integrity level in accordance with EN 61508	SIL 3	SIL 3	SIL 2
Category in accordance with EN ISO 13849-1	Cat. 4	Cat. 4	Cat. 3
Performance level in accordance with EN ISO 13849-1	PL e	PL e	PL d
Probability of dangerous failure per hour in accordance with EN 61508, PFH [1/h]	3.70×10^{-11}	9.40×10^{-11}	5.90×10^{-10}

Safety reference data for the safety sub-function STO				
Circuitry		without high-test pulses, without or with STA evaluation	with hightest pulses and with STA evaluation[1]	with hightest pulses and without STA evaluation
Mean time to dangerous failure in accordance with EN ISO 13849-1, $MTTF_d$	[a]	2400	1960	1960
Average diagnostic coverage in accordance with EN ISO 13849-1, DC_{AVG}	[%]	97	95	75
Operating life (mission time) in accordance with EN ISO 13849-1, T_M	[a]	20		
Safe failure fraction SFF in accordance with EN 61508	[%]	99	99	99
Hardware fault tolerance in accordance with EN 61508, HFT		1		
Common cause factor for dangerous undetected failures β in accordance with EN 61508	[%]	5		
Classification in accordance with EN 61508		Type A		

1) Safety sub-function STO tested and STA diagnostic output monitored by the safety controller at least once every 24 h.

Tab. 53: Safety reference data for the safety sub-function STO

Safety reference data for the safety sub-function SBC			
Circuitry		2 brakes[1] with SBA evaluation[2]	1 brake[3] without SBA evaluation
Safety sub-function in accordance with EN 61800-5-2		Safe brake control (SBC)	
Safety integrity level in accordance with EN 61508		SIL 3	SIL 1
Category in accordance with EN ISO 13849-1		Cat. 3	Cat. 1
Performance level in accordance with EN ISO 13849-1		PL e	PL c
Probability of dangerous failure per hour in accordance with EN 61508, PFH	[1/h]	3.00×10^{-10}	9.00×10^{-8}
Mean time to dangerous failure in accordance with EN ISO 13849-1, $MTTF_d$	[a]	1400	950
Average diagnostic coverage in accordance with EN ISO 13849-1, DC_{AVG}	[%]	93	–
Operating life (mission time) in accordance with EN ISO 13849-1, T_M	[a]	20	
Safe failure fraction SFF in accordance with EN 61508	[%]	99	87
Hardware fault tolerance in accordance with EN 61508, HFT		1	0
Common cause factor for dangerous undetected failures β in accordance with EN 61508	[%]	5	
Classification in accordance with EN 61508		Type A	

1) Connection of a brake to BR+/BR– and a second brake to BR-EXT; 2-channel wiring and request via #SBC-A and #SBC-B.
2) Monitoring of the safety sub-function via the SBA diagnostic output by the safety controller at least once every 24 hours.
3) Brake connected either to BR+/BR– or to BR-EXT; single-channel request via the safety controller using #SBC-A and #SBC-B; both inputs must be bridged externally.

Tab. 54: Safety reference data for the safety sub-function SBC

The technical data for the safety sub-function SS1 must be calculated individually according to the application. Use the specified safety reference data for STO and SBC for the calculation.

13.2 General technical data

General technical data		
Declaration of conformity		➔ www.festo.com/sp
Type ID code		CMMT-AS
Type of mounting		Mounting plate, attached with screws
Mounting position		Vertical, mounted on closed surface, free convection with unhindered air flow from bottom to top
Product weight	[kg]	CMMT-AS-C7-11A-P3: 4.1 CMMT-AS-C12-11A-P3: 4.1 CMMT-AS-C18-11A-P3: 4.3 CMMT-AS-C25-11A-P3: 4.3

Tab. 55: General technical data

Ambient conditions, transport		
Transport temperature	[°C]	–25 … +70
Relative humidity	[%]	5 … 95 (non-condensing)
Max. transportation duration	[d]	30
Permissible altitude	[m]	12000 (above sea level) for 12 h
Vibration resistant		Vibration test and free fall in packaging in accordance with EN 61800-2

Tab. 56: Ambient conditions, transport

Ambient conditions, storage		
Storage temperature	[°C]	–25 … +55
Relative humidity	[%]	5 … 95 (non-condensing)
Permissible altitude	[m]	3000 (above sea level)

Tab. 57: Ambient conditions, storage

Ambient conditions, operation		
Ambient temperature at nominal power	[°C]	0 … +40
Ambient temperature with derating (–3%/°C at 40°C … 50°C)	[°C]	0 … +50
Cooling		Via ambient air in the control cabinet and additionally via forced ventilation through an integrated fan
Temperature monitoring		Monitoring of: – Cooling element (power module) – Air in the device Switch-off if temperature is too high or too low
Relative humidity	[%]	5 … 90 (non-condensing), no corrosive media permitted near the device
Permissible setup altitude above sea level at nominal power	[m]	0 … 1000
Permissible setup altitude above sea level with derating (–10%/1000 m at 1000 m … 2000 m)	[m]	0 … 2000 Operation above 2000 m is not permitted!
Degree of protection in accordance with EN 60529		IP20 (with attached mating plug X9A and with intended mounting on closed backwall, otherwise IP10) :
Requirements for installation space		Install in a control cabinet with at least IP54, design as “closed electrical operating area” in accordance with IEC 61800-5-1, Chap. 3.5 :
Protection class		I
Overvoltage category		III
Contamination level		2 (or better)
Vibration resistance in accordance with		IEC 61800-5-1 and EN 61800-2
Shock resistance in accordance with		EN 61800-2

Tab. 58: Ambient conditions, operation

Service life		
Service life of the device with rated load in S1 operation[1] and 40°C ambient temperature	[h]	25000
Service life of the device at < 50 % rated load in S1 operation[1] and 40 °C ambient temperature	[h]	50000

1) Continuous operation with constant load

Tab. 59: Service life

13.3 Technical data, electrical

13.3.1 Load voltage supply [X9A]

Electrical data, load voltage supply [X9A]

Number of phases		3			
Voltage range	[V AC]	200 – 10 % ... 480 + 10 %			
Voltage range with derating (–1.5 %/10 V AC)	[V AC]	400 ... 530			
Nominal operating voltage	[V AC]	400			
System voltage in accordance with IEC 61800-5-1	[V AC]	300			
Mains frequency	[Hz]	48 … 62			
Network connection/allowed mains types of system earthing[1)]		L1 ➔ L2 ➔ L3: TT, TN, IT			
Required quality of the mains supply		Corresponds to the requirements of EN 61800-3 if not specified otherwise			
Alternative DC supply feed[2)]	[V DC]	80 … 700			
CMMT-AS-		C7-11A-P3	C12-11A-P3	C18-11A-P3	C25-11A-P3
Mains current consumption at nominal power approx.	[A_{RMS}]	9	15	22	29
Short circuit current rating (SCCR)	[kA]	10			

1) in accordance with IEC 60364-1
2) Parameterisation required ➔ Manual/online help plug-in, software, function, fieldbus, device profile

Tab. 60: Load voltage supply

13.3.2 Logic voltage supply [X9C]

Electrical data, logic voltage supply

Logic voltage range	[V DC]	24 ± 20 %			
Nominal voltage	[V DC]	24			
Starting current (with 28.8V)	[A]	Typically 5 (with primary-side connection of the 24 V logic supply) Maximum 50 (with hard switching to the previously switched-on logic supply)			
Protective functions		– Polarity reversal – Short circuit to 0 V (24 V outputs)			
CMMT-AS-		C7-11A-P3	C12-11A-P3	C18-11A-P3	C25-11A-P3
Current consumption (without holding brake, CDSB, digital I/Os and auxiliary supply output unloaded), [1)]	[A]	0.5	0.5	0.7	0.7
Current consumption (with safe inputs at 24 V, with holding brake), [2)]	[A]	2.0	2.0	3.0	3.0
Current consumption (with holding brake, with CDSB, digital I/Os and auxiliary supply outputs with load and with fan)[1)]	[A]	2.5	2.5	3.5	3.5

1) including current for the safe inputs
2) including current consumption for power stage ON and for the safe inputs

Tab. 61: Logic voltage supply

13.3.3 Motor connection power specifications [X6A]

Internal protective functions detect short circuits between 2 motor phases and short circuits of a motor phase to PE. If a short circuit is detected, the pulse-width modulation signals are switched off.

Parameters for the power specifications

Nominal voltage of mains connection	[V AC]	400
Ambient temperature (air)	[°C]	≤ 40
Setup altitude	[m]	≤ 1000

Tab. 62: Parameters

Power specifications during operation with the given parameters [X6A]

CMMT-AS-		C7-11A-P3	C12-11A-P3	C18-11A-P3	C25-11A-P3
Pulse-width modulation frequency	[kHz]	8	8	8	8
Current regulator cycle time	[µs]	62.5	62.5	62.5	62.5
Nominal output power (S1 operation; cos(phi) > 0.8)	[W]	4000	6000	9000	12000
Nominal current (S1 operation)	[A_{RMS}]	7	12	18	25
Max. output power (S2 operation; cos(phi) > 0.8)	[W]	10 000	17 000	27 000	36 000
Maximum current	[A_{RMS}]	21	36	54	75

Power specifications during operation with the given parameters [X6A]

CMMT-AS-		...-11A-P3			
Output voltage range	[V_{RMS}]	3 x 0 ... input			
Output voltage with feed of nominal voltage and nominal power	[V_{RMS}]	380			
Output frequency	[Hz]	0 ... 599			
CMMT-AS-		C7-11A-P3	C12-11A-P3	C18-11A-P3	C25-11A-P3
Duration for maximum current (f_s > 5 Hz)	[s]	2			
Duration for maximum current at standstill ($f_s \leq 5$ Hz); minimum cycle time 1 s!	[s]	0.1		0.2	

Tab. 63: Motor connection power specifications [X6A]

13.4 Technical data of UL/CSA certification

In combination with the UL inspection mark on the product, the information in this section must also be observed in order to comply with the certification conditions of Underwriters Laboratories Inc. (UL) for USA and Canada.

UL/CSA certification information

Product category code	NMMS / NMMS7 (Power Conversion Equipment)
File number	E331130_Vol-1_Sec-3
Considered standards	UL61800-5-1 Adjustable Speed Electrical Power Drive Systems CSA C22.2 No. 274-17 – Adjustable Speed Drive
UL mark	c UL us LISTED
UL control number	4PU8

Tab. 64: UL/CSA certification information

- Use in an environment with pollution degree 2 (or better).
- Use only Cu cables that have a permissible constant insulation temperature of at least 75 °C at the following connections:
  - [X6A], motor connection
  - [X9A], power supply and DC link circuit connection
  - [X9B], connection for braking resistor
  - [X9C], logic voltage supply
- Operate the CMMT-AS-C25-11A-P3 with a maximum nominal motor current of 24 A_{RMS}.
- The CMMT-AS-C7/C12/C18/C25-11A-P3 is suitable for the following power supply networks:
  - Type WYE 480 V/277 V with a short circuit current rating of SCCR 10 kA

  For operation in type WYE 480 V/277 V power supply networks with SCCR › 10 kA ➔ Manual assembly, installation.
- Permissible and impermissible mains types of system earthing:
  - According to the UL standard, the TT system with separate neutral conductor and PE conductor is not permitted in the overall system.
- UL: The integrated semiconductor short-circuit protection does not protect the downstream power circuit. The power circuit must be protected in conformity with the National Electrical Code and all other local regulations.
  CSA: The integrated semiconductor short-circuit protection does not protect the downstream power circuit. The power circuit must be protected in conformity with the Canadian Electrical Code, part I.

Requirements for circuit breakers (automatic circuit breakers) and fuses

Overcurrent protective device		Circuit breaker
Max. approved rated current	[A]	30
Short circuit current rating SCCR of mains fuse	[kA]	min. 10
Rated voltage	[V AC]	480

Tab. 65: Requirements for circuit breakers and fuses

13.5 Additional technical data

Additional technical data on the product and detailed descriptions of all interfaces ➔ 1.2 Applicable documents, Manual Assembly, Installation.