X67BC4321.L12-10

1 General information

CAN (Controller Area Network) systems are widespread in the field of automation technology. CAN topology is based on a line structure and uses twisted wire pairs for data transfer. CANopen is a higher-layer protocol based on CAN. As a standardized protocol, it provides a high degree of flexibility for implementing a wide range of configurations.

The bus controller makes it possible to connect up to 253 X2X Link I/O modules to CANopen. A transition between IP20 and IP67 protection outside of the control cabinet is possible by aligning X20, X67 or XV modules one after the other as needed at distances up to 100m. All CANopen transmission types such as synchronous, event and polling modes are supported together with PDO linking, life/node guarding, emergency objects, and much more.

- Fieldbus: CANopen
- 16 digital channels, configurable as inputs or outputs
- Auto-configuration of I/O modules
- Easy I/O configuration using Automation Studio V4.3 or later
- Constant response times even with large amounts of data (max. 32 Rx and 32 Tx PDOs)
- Configurable I/O cycle (0.5 to 4 ms)
- Possible to configure the transfer rate or have it detected automatically
- Heartbeat consumer and producer, emergency producer
- 2x SDO server, NMT slave
- Simple bootup (autostart)

Information:

Only the standard function model (see the respective module description) is supported when the bus controller is used together with multi-function modules it has automatically configured itself.

Automation Studio V4.3 or later can be used to easily create configuration files (e.g. DCF files). All other function models are also supported by transferring configuration data to the bus controller (e.g. via the master environment with an SDO download).

Automation Studio can be downloaded at no cost from the B&R website www.br-automation.com. The evaluation license is permitted to be used to create complete configurations for fieldbus bus controllers at no cost.

2 Order data

Model number	Short description	Figure
	Bus controller modules	
X67BC4321.L12-10	X67 bus controller, 1 CANopen interface, X2X Link power supply 15 W, 16 digital channels configurable as inputs or outputs, 24 VDC, 0.5 A, configurable input filter, 2 event counters 50 kHz, CAN bus electrically isolated, M12 connectors, high-density module	

Table 1: X67BC4321.L12-10 - Order data

Required accessories
See "Required cables and connectors" on page 8. For a general overview, see section "Accessories - General overview" of the X67 system user's manual.

3 Technical data

Model number	X67BC4321.L12-10
Short description	
Bus controller	CANopen
General information	
Inputs/Outputs	16 digital channels, configurable as inputs or outputs using software, inputs with additional functions
Isolation voltage between channel and bus	500 V_{eff}
Nominal voltage	24 VDC
B&R ID code	
Bus controller	0xB12A
Internal I/O module	0xB52A
Sensor/Actuator power supply	0.5 A summation current
Status indicators	I/O function for each channel, supply voltage, bus function
Diagnostics	
Outputs	Yes, using status LED and software
I/O power supply	Yes, using status LED and software
Connection type	
Fieldbus	M12, A-keyed
X2X Link	M12, B-keyed
Inputs/Outputs	8x M12, A-keyed
I/O power supply	M8, 4-pin
Power output	15 W X2X Link supply for I/O modules
Power consumption	
Fieldbus	2.11 W
Internal I/O	3.71 W
X2X Link power supply	21.59 W at maximum power output for connected I/O modules
Certifications	
CE	Yes
KC	Yes
EAC	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5
ATEX	Zone 2, II 3G Ex nA IIA T5 Gc IP67, Ta = 0 - Max. 60°C TÜV 05 ATEX 7201X
Interfaces	
Fieldbus	CANopen
Variant	2x M12 interface for the Y-connector integrated in the module
Max. distance	1000 m
Transfer rate	Max. 1 Mbit/s
Default transfer rate	Automatic transfer rate detection
Min. cycle time [1]	
Fieldbus	No limitation
X2X Link	500 µs
Synchronization between bus systems possible	No
Terminating resistor	Can be optionally screwed onto the integrated Y-connector
I/O power supply	
Nominal voltage	24 VDC
Voltage range	18 to 30 VDC
Integrated protection	Reverse polarity protection
Power consumption	
Sensor/Actuator power supply	Max. 12 W [2]
Sensor/Actuator power supply	
Voltage	I/O power supply minus voltage drop for short circuit protection
Voltage drop for short-circuit protection at 0.5 A	Max. 2 VDC
Summation current	Max. 0.5 A
Short-circuit proof	Yes
Digital inputs	
Input voltage	18 to 30 VDC
Input current at 24 VDC	Typ. 4 mA
Input characteristics per EN 61131-2	Type 1
Input filter	
Hardware	≤10 µs (channels 1 to 4) / ≤70 µs (channels 5 to 16)
Software	Default 0 ms, configurable between 0 and 25 ms in 0.2 ms intervals
Input circuit	Sink
Additional functions	50 kHz event counting, gate measurement
Input resistance	Typ. 6 kΩ

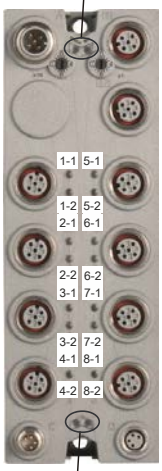
Table 2: X67BC4321.L12-10 - Technical data

Model number	X67BC4321.L12-10
Switching threshold	
Low	<5 VDC
High	>15 VDC
Event counter	
Quantity	2
Signal form	Square wave pulse
Evaluation	Each falling edge, cyclic counter
Input frequency	Max. 50 kHz
Counter 1	Input 1
Counter 2	Input 3
Counter frequency	Max. 50 kHz
Counter size	16-bit
Gate measurement	
Quantity	1
Signal form	Square wave pulse
Evaluation	Rising edge - Falling edge
Counter frequency	
Internal	48 MHz, 3 MHz, 187.5 kHz
Counter size	16-bit
Length of pause between pulses	≥100 µs
Pulse length	≥20 µs
Supported inputs	Input 2 or input 4
Digital outputs	
Variant	FET positive switching
Switching voltage	I/O power supply minus residual voltage
Nominal output current	0.5 A
Total nominal current	8 A
Output circuit	Source
Output protection	Thermal cutoff on overcurrent or short circuit, integrated protection for switching inductances, reverse polarity protection for output power supply
Diagnostic status	Output monitoring with 10 ms delay
Leakage current when switched off	5 µA
Switching on after overload shutdown	Approx. 10 ms (depends on the module temperature)
Residual voltage	<0.3 V at 0.5 A nominal current
Peak short-circuit current	<12 A
Switching delay	
0 → 1	<400 µs
1 → 0	<400 µs
Switching frequency	
Resistive load	Max. 100 Hz
Inductive load	See section "Switching inductive loads"
Braking voltage when switching off inductive loads	50 VDC
Electrical properties	
Electrical isolation	Bus isolated from CANopen and channel Channel isolated from CANopen Channel not isolated from channel
Operating conditions	
Mounting orientation	
Any	Yes
Installation elevation above sea level	
0 to 2000 m	No limitation
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m
Degree of protection per EN 60529	IP67
Ambient conditions	
Temperature	
Operation	-25 to 60°C
Derating	-
Storage	-40 to 85°C
Transport	-40 to 85°C
Mechanical properties	
Dimensions	
Width	53 mm
Height	155 mm
Depth	42 mm
Weight	300 g
Torque for connections	
M8	Max. 0.4 Nm
M12	Max. 0.6 Nm

Table 2: X67BC4321.L12-10 - Technical data

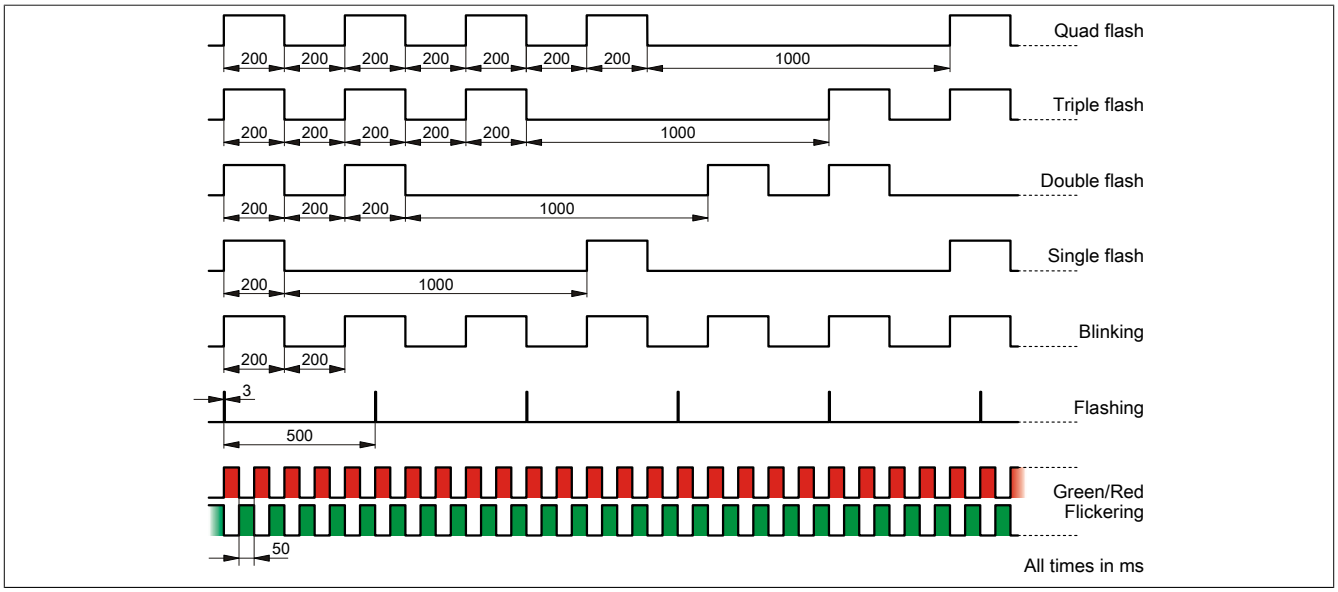
1) The minimum cycle time defines how far the bus cycle can be reduced without communication errors occurring.
2) The power consumption of the sensors and actuators connected to the module is not permitted to exceed 12 W.

4 LED status indicators

Figure	LED	Color	Status	Description
Status indicator 1: Left: Status, Right: MS  Status indicator 2: Left: green, Right: red	**Status indicator 1**			
	STATUS [1]	Status indicator for the CAN STATUS		
		Green	Off	No power supply
			Single flash	STOP mode
			Triple flash	Downloading firmware
			Blinking	PREOPERATIONAL mode
			On	RUN mode
		Green/Red	Flickering	Transfer rate detection in progress
		Red	Off	No power supply or everything OK
			Single flash	CAN warning limit reached
			Double flash	Node guarding / Heartbeat error
			Quad flash	Successfully saved configuration
			Blinking	Invalid node number or configuration
			On	Bus error: Bus off
	MS [2]	Module status indicator		
		Green	Off	No power supply
			Flashing	5 s window for deleting all configuration settings
			On	Boot procedure OK, I/O modules OK
		Red	Double flash	Configuration settings successfully cleared
			Triple flash	Successfully saved transfer rate
			On	I/O modules: Error message or incorrect configuration
	I/O LEDs			
	1-1/2 to 8-1/2	Orange	-	Input/Output status of the corresponding channel
	Status indicator 2: Status indicator for module function			
	Left	Green	Off	No power to module
			Single flash	RESET mode
			Blinking	PREOPERATIONAL mode
			On	RUN mode
	Right	Red	Off	No power supply or everything OK
			On	Error or reset status
			Single flash	Warning/Error on an I/O channel. Level monitoring for digital outputs has been triggered.
			Double flash	Supply voltage not in the valid range

1) The "Status" LED (CAN status) is a green/red dual LED.
2) The "MS" (module status) LED is a green/red dual LED. The LED blinks red several times immediately after startup. This is a boot message, however, and not an error.

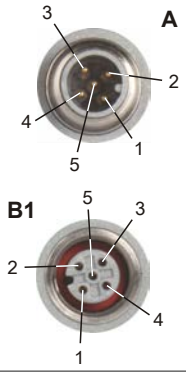
LED status indicators - Blinking patterns



5 Operating and connection elements

6 Fieldbus interface

The bus controller is connected to the fieldbus using pre-assembled cables. The connection is made using M12 circular connectors.

Connection	Pinout	
	**Pin**	**Name**
	1	Shield[1)]
	2	Not used
	3	CAN⊥
	4	CAN_High
	5	CAN_Low
	1) Shield connection also made via threaded insert in the module A → A-keyed (male), input B1 → A-keyed (female), output	

6.1 Node number and transfer rate

The node number and transfer rate are configured using the two number switches on the bus controller.

The transfer rate can be specified in 2 ways:

- Automatic detection by bus controller (see "Automatic transfer rate detection" on page 6)
- Programmed by the user (see "Setting the transfer rate" on page 6)

Switch position	Node number	Transfer rate
0x00	Not permitted	-
0x01 - 0x7F	1 to 127	Automatically set by the bus controller (default) or programmed by the user
0x80 - 0x89	-	Setting the transfer rate
0x8A - 0x8F	Not permitted	-
0x90	Clearing parameters	-
0x91	Not permitted	-
0x92	Save automatic configuration	-
0x93 - 0xFF	Not permitted	-

6.1.1 Automatic transfer rate detection

After booting, the bus controller goes into "Listen only" mode. This means the bus controller behaves passively on the bus and only listens.

The bus controller attempts to receive valid objects. If receive errors occur, the controller switches to the next transfer rate in the lookup table.

If no objects are received, all transfer rates are tested cyclically. This procedure is repeated until valid objects are received.

Lookup table

The controller tests the transfer rate according to this table. Beginning with the starting transfer rate (1000 kbit/s), the controller switches to the next lower transfer rate. At the end of the table, the bus controller restarts the search from the beginning.

Transfer rate
1000 kbit/s
800 kbit/s
500 kbit/s
250 kbit/s
125 kbit/s
100 kbit/s
50 kbit/s
20 kbit/s
10 kbit/s

6.1.2 Setting the transfer rate

The bus controller will detect the transfer rate automatically by default. Switch positions 0x80 to 0x88 can be used to set a fixed transfer rate, or 0x89 can be used to enable automatic transfer rate detection.

Switch position	Transfer rate
0x80	1000 kbit/s
0x81	800 kbit/s
0x82	500 kbit/s
0x83	250 kbit/s
0x84	125 kbit/s
0x85	100 kbit/s
0x86	50 kbit/s
0x87	20 kbit/s
0x88	10 kbit/s
0x89	Automatic transfer rate detection

Programming the transfer rate

1. Switch off the power supply to the bus controller.
2. Define the transfer rate by selecting the switch position (0x80 to 0x89).
3. Switch on the power supply to the bus controller.
4. Wait until LED "MS" blinks with a red triple flash (transfer rate is now programmed).
5. Switch off the power supply to the bus controller.
6. Set the desired node number (0x01 - 0x7F).
7. Switch on the power supply to the bus controller.
8. The bus controller now boots with the set node number and the programmed transfer rate.

6.1.3 Clearing parameters

Various parameters can be stored in the bus controller's flash memory:

- Communication parameters
- Application parameters
- Programmed transfer rate

Clearing the parameters using switch position 0x90 returns the bus controller to its factory settings.

Clearing the parameters listed above

1. Turn off the power supply to the bus controller.
2. Set the node number to 0x90.
3. Turn on the power supply to the bus controller.
4. Wait until the "MS" LED blinks green for 5 s (100 ms on / 200 ms off). The node number switch must be set to 0x00 and then back to 0x90 within this time window.
5. Wait until the "MS" LED blinks with a red double-flash (parameters have been cleared).
6. Turn off the power supply to the bus controller.
7. Set the desired node number (0x01 - 0x7F).
8. Turn on the power supply to the bus controller.
9. The bus controller boots with the set node number and automatic transfer rate detection.

6.1.4 Save automatic configuration

The node number position 0x92 can be used to save automatically generated configurations. This makes it possible to work with a standardized configuration without having to adapt the application to changes associated with service work or different development stages for example.

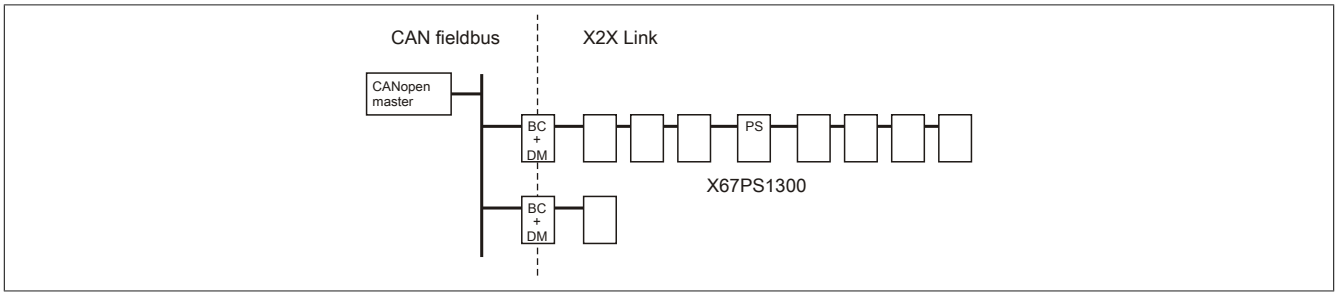
1. Turn off the power supply to the bus controller.
2. Set the node number to 0x90.
3. Turn on the power supply to the bus controller.
4. Wait until the "MS" LED flashes green.
5. The node number switch must be set to 0x00 and then back to 0x90 within this time window of 5 seconds (turn switch "High").
6. Wait until the "MS" LED blinks with a red double-flash (parameters have been cleared).
7. Turn off the power supply to the bus controller.
8. Set the node number to 0x92.
9. Turn on the power supply to the bus controller.
10. Wait until the "MS" LED flashes green.
11. The node number switch must be set to 0x02 and then back to 0x92 within this time window of 5 seconds (turn switch "High").
12. Wait until the "MS" LED blinks with a red quad-flash (parameters have been saved).
13. Turn off the power supply to the bus controller.
14. Set the desired node number (0x01 - 0x7F).
15. Turn on the power supply to the bus controller.
16. The bus controller boots with the set node number and automatic transfer rate detection.

Information:

A mapping tool for decoding the saved PDO mapping is available in the Download section of the B&R website (www.br-automation.com).

6.2 System configuration

A digital mixed module is already integrated in the bus controller. Up to 252 additionalI/O modules can be connected to the bus controller.



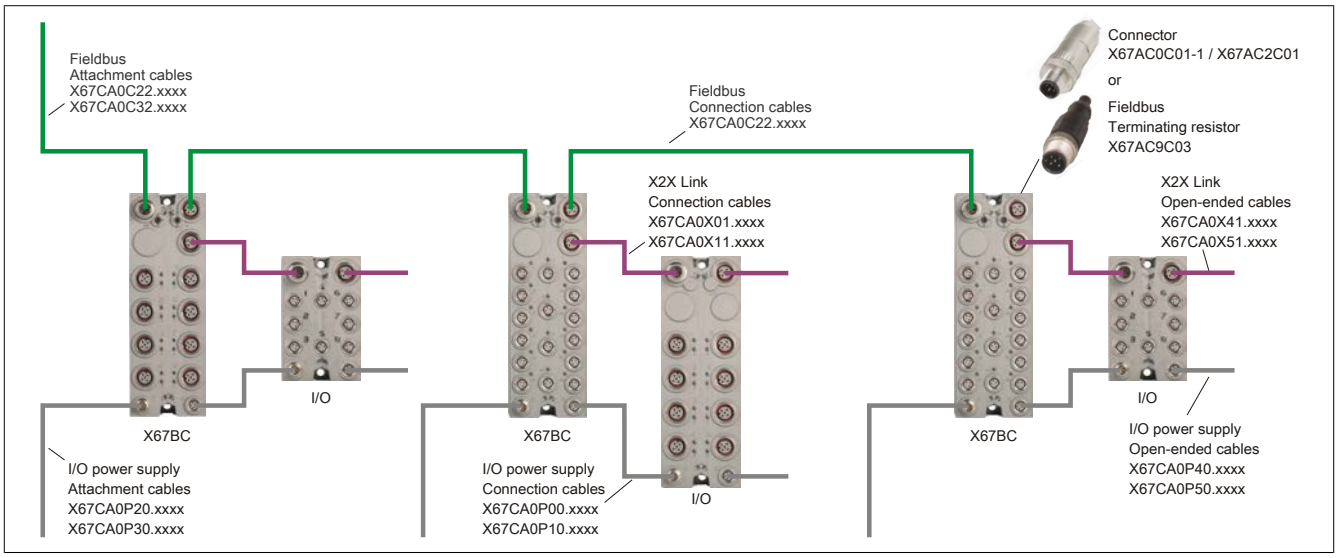
Information:

15 W are provided by the bus controller for additional X67 modules or other X2X Link-based modules.

System supply module X67PS1300 is needed for additional power. This system supply module provides 15 W for additional modules. Each one should be mounted in the middle of the modules that are to be supplied with power.

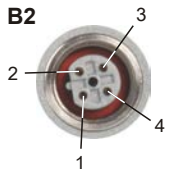
6.3 Required cables and connectors

The bus terminating resistor is housed in a male connector and screwed into the B1 connector when needed.



7 X2X Link

Additional modules can be connected to the bus controller via X2X Link using pre-assembled cables. The connection is made using an M12 circular connector.

Connection	Pinout	
	**Pin**	**Name**
	1	X2X+
	2	X2X
	3	X2X⊥
	4	X2X\
	Shield connection made via threaded insert in the module	
	B2 → B-keyed (female), output	

8 24 VDC I/O power supply

The I/O power supply is connected via M8 connectors C and D. The I/O power supply is connected via connector C (male). Connector D (female) is used to route the I/O power supply to other modules.

The fieldbus / X2X Link power supply and I/O power supply are supplied separately via pins 1 and 2.

Information:

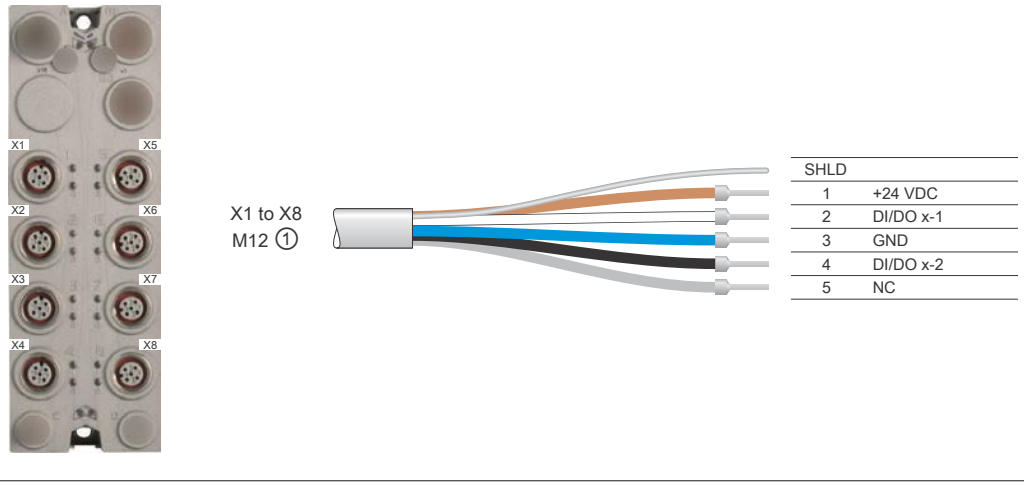
The maximum permissible current for the I/O power supply is 8 A (4 A per connection pin)!

Connection	Pinout		
	**Pin**	**Connector C (male)**	**Connector D (female)**
	1	24 VDC fieldbus / X2X Link	24 VDC I/O
	2	24 VDC I/O	24 VDC I/O
	3	GND	GND
	4	GND	GND
	C → Connector (male) in module, feed for I/O power supply C → Connector (female) in module, routing of I/O power supply		

9 Integrated digital mixed module

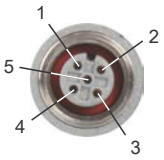
1 additional mixed module can be saved by the digital mixed module integrated in the bus controller.

9.1 Pinout

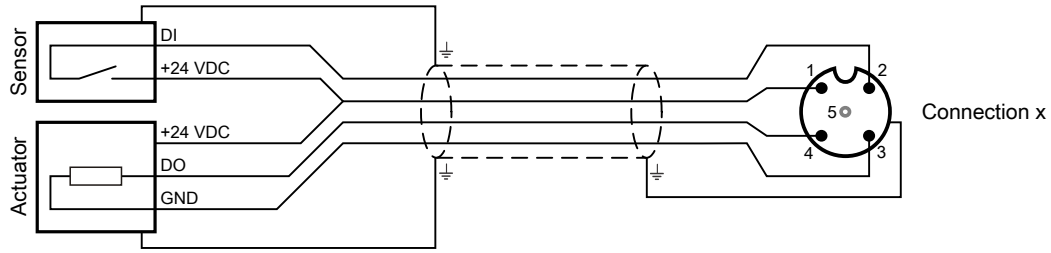


① X67CA0A41.xxxx: M12 sensor cable, straight
X67CA0A51.xxxx: M12 sensor cable, angled

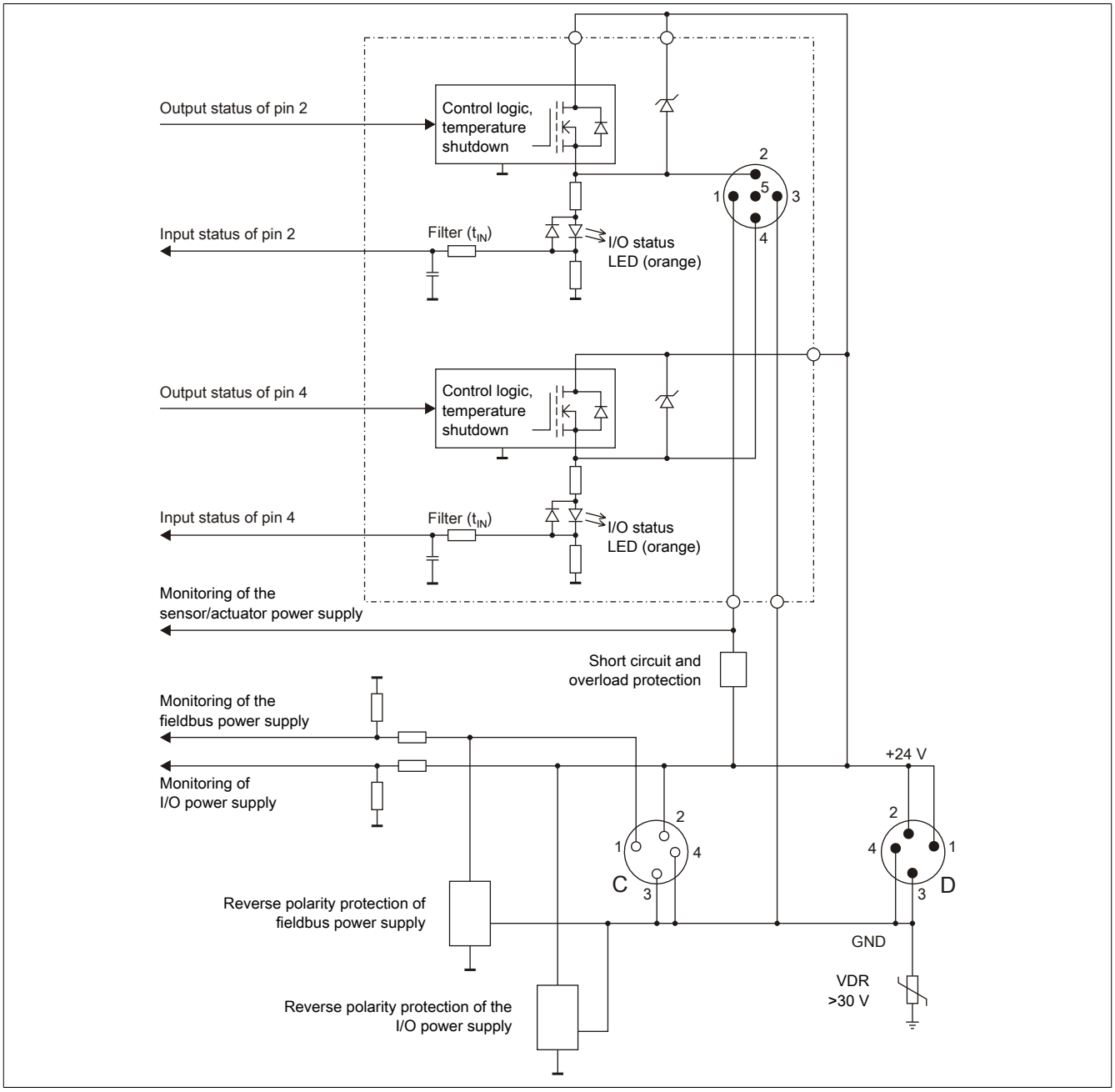
9.2 Connection X1 to X8

M12, 5-pin	Pinout	
Connection 1 to 4	**Pin**	**Name**
	1	24 VDC sensor/actuator power supply[1)]
	2	Input/Output x-1
	3	GND
	4	Input/Output x-2
	5	NC
	Shield connection made via threaded insert in the module. 1) Sensors/Actuators are not permitted to be supplied externally. X1 to X8 → A-keyed (female), input/output	
Connection 5 to 8		

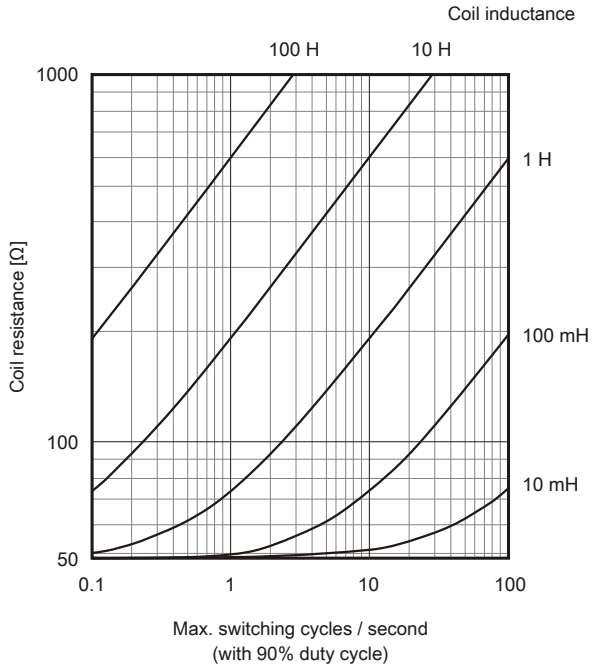
9.3 Connection example



9.4 Input/Output circuit diagram



9.5 Switching inductive loads



10 Additional documentation and import files (EDS)

Additional documentation about bus controller functions as well as the necessary import files for the master engineering tool are available for download from the Downloads section of the B&R website (www.br-automation.com).

11 Register description

11.1 General data points

In addition to the registers listed in the register description, the module also has other more general data points. These registers are not specific to the module but contain general information such as serial number and hardware version.

These general data points are listed in section "Additional information - General data points" of the X67 system user's manual.

11.2 Function model 2 - Standard

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Configuration						
16	ConfigIOMask01	USINT				•
17	ConfigIOMask02	USINT				•
18	ConfigOutput03 (input filter)	USINT				•
Communication						
0	Input state of digital inputs 1 to 16	UINT	•			
	DigitalInput01	Bit 0				
	...	...				
	DigitalInput16	Bit 15				
2	Switching state of digital outputs 1 to 16	UINT			•	
	DigitalOutput01	Bit 0				
	...	...				
	DigitalOutput16	Bit 15				
30	Status of digital outputs 1 to 16	UINT	•			
	StatusDigitalOutput01	Bit 0				
	...	...				
	StatusDigitalOutput16	Bit 15				
26	Input latch - Rising edges 1 to 8	USINT	•			
	InputLatch01	Bit 0				
	...	...				
	InputLatch08	Bit 7				
27	Input latch - Rising edges 9 to 16	USINT	•			
	InputLatch09	Bit 0				
	...	...				
	InputLatch16	Bit 7				
28	Acknowledgment - Input latch 1 to 8	USINT			•	
	QuitInputLatch01	Bit 0				
	...	...				
	QuitInputLatch08	Bit 7				
29	Acknowledgment - Input latch 9 to 16	USINT			•	
	QuitInputLatch09	Bit 0				
	...	...				
	QuitInputLatch16	Bit 7				
8192	asy_ModulID	UINT		•		
8196	asy_SupplyStatus	USINT		•		
8208	asy_SupplyInput	USINT		•		
8210	asy_SupplyOutput	USINT		•		

11.3 Function model 1 - Counter

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Configuration						
16	ConfigIOMask01	USINT				•
17	ConfigIOMask02	USINT				•
20	ConfigOutput01 (counter channel 1)	USINT				•
22	ConfigOutput02 (counter channel 2)	USINT				•
18	ConfigOutput03 (input filter)	USINT				•
Communication						
0	Input state of digital inputs 1 to 16	UINT	•			
	DigitalInput01	Bit 0				
	...	...				
	DigitalInput16	Bit 15				
2	Switching state of digital outputs 1 to 16	UINT			•	
	DigitalOutput01	Bit 0				
	...	...				
	DigitalOutput16	Bit 15				
30	Status of digital outputs 1 to 16	UINT	•			
	StatusDigitalOutput01	Bit 0				
	...	...				
	StatusDigitalOutput16	Bit 15				
26	Input latch - Rising edges 1 to 8	USINT	•			
	InputLatch01	Bit 0				
	...	...				
	InputLatch08	Bit 7				
27	Input latch - Rising edges 9 to 16	USINT	•			
	InputLatch09	Bit 0				
	...	...				
	InputLatch16	Bit 7				
28	Acknowledgment - Input latch 1 to 8	USINT			•	
	QuitInputLatch01	Bit 0				
	...	...				
	QuitInputLatch08	Bit 7				
29	Acknowledgment - Input latch 9 to 16	USINT			•	
	QuitInputLatch09	Bit 0				
	...	...				
	QuitInputLatch16	Bit 7				
4	Counter01	UINT	•			
6	Counter02	UINT	•			
20	Reset counter 1	USINT			•	
	ResetCounter01	Bit 5				
22	Reset counter 2	USINT			•	
	ResetCounter02	Bit 5				
8192	asy_ModulID	UINT		•		
8196	asy_SupplyStatus	USINT		•		
8208	asy_SupplyInput	USINT		•		
8210	asy_SupplyOutput	USINT		•		

11.4 Function model 254 - Bus controller

Register	Offset[1)]	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
16	-	ConfigIOMask01	USINT				•
17	-	ConfigIOMask02	USINT				•
20	-	ConfigOutput01 (counter channel 1)	USINT				•
22	-	ConfigOutput02 (counter channel 2)	USINT				•
18	-	ConfigOutput03 (input filter)	USINT				•
Communication							
0	0	Input state of digital inputs 1 to 16	UINT	•			
		DigitalInput01	Bit 0				
		...	...				
		DigitalInput16	Bit 15				
2	2	Switching state of digital outputs 1 to 16	UINT			•	
		DigitalOutput01	Bit 0				
		...	...				
		DigitalOutput16	Bit 15				
30	-	Status of digital outputs 1 to 16	UINT	•			
		StatusDigitalOutput01	Bit 0				
		...	...				
		StatusDigitalOutput16	Bit 15				
26	-	Input latch - Rising edges 1 to 8	USINT	•			
		InputLatch01	Bit 0				
		...	...				
		InputLatch08	Bit 7				
27	-	Input latch - Rising edges 9 to 16	USINT	•			
		InputLatch09	Bit 0				
		...	...				
		InputLatch16	Bit 7				
28	-	Acknowledgment - Input latch 1 to 8	USINT			•	
		QuitInputLatch01	Bit 0				
		...	...				
		QuitInputLatch08	Bit 7				
29	-	Acknowledgment - Input latch 9 to 16	USINT			•	
		QuitInputLatch09	Bit 0				
		...	...				
		QuitInputLatch16	Bit 7				
4	-	Counter01	UINT		•		
6	-	Counter02	UINT		•		
20	-	Reset counter 1	USINT			•	
		ResetCounter01	Bit 5				
22	-	Reset counter 2	USINT			•	
		ResetCounter02	Bit 5				
8192	-	asy_ModulID	UINT		•		
8196	-	asy_SupplyStatus	USINT		•		
8208	-	asy_SupplyInput	USINT		•		
8210	-	asy_SupplyOutput	USINT		•		

1) The offset specifies the position of the register within the CAN object.

11.4.1 Using the module on the bus controller

Function model 254 "Bus controller" is used by default only by non-configurable bus controllers. All other bus controllers can use additional registers and functions depending on the fieldbus used.

For detailed information, see section "Additional information - Using I/O modules on the bus controller" of the X67 user's manual (version 3.30 or later).

11.4.2 CAN I/O bus controller

The module occupies 2 digital logical slots on CAN I/O.

11.5 Configuration

11.5.1 I/O mask 1 to 8

Name:
ConfigIOMask01

Channels are configured as inputs/outputs in this register. It also determines whether output monitoring or filtering is applied to the channels. Outputs are monitored but not filtered.

> **Information:**
>
> **In counter operation, channels 1 to 4 can only be configured as inputs.**

Data type	Values	Bus controller default setting
USINT	See bit structure.	0

Bit structure:

Bit	Description	Value	Information
0	Channel 1 configured as input/output	0	Configured as input (bus controller default setting)
		1	Configured as output
...		...	
7	Channel 8 configured as input/output	0	Configured as input (bus controller default setting)
		1	Configured as output

11.5.2 I/O mask 9 to 16

Name:
ConfigIOMask02

Channels are configured as inputs/outputs in this register. It also determines whether output monitoring or filtering is applied to the channels. Outputs are monitored but not filtered.

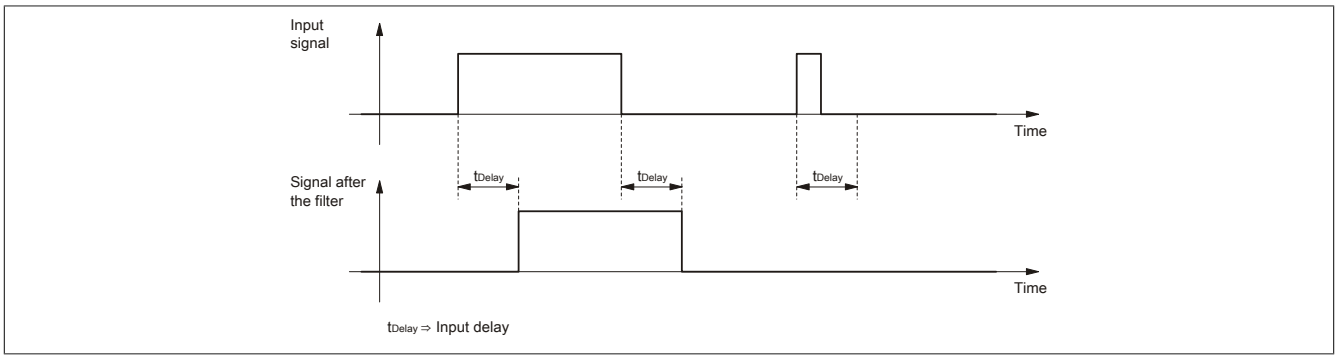
Data type	Values	Bus controller default setting
USINT	See bit structure.	0

Bit structure:

Bit	Description	Value	Information
0	Channel 9 configured as input/output	0	Configured as input (bus controller default setting)
		1	Configured as output
...		...	
7	Channel 16 configured as input/output	0	Configured as input (bus controller default setting)
		1	Configured as output

11.5.3 Input filter

An input filter is available for each input. The input delay can be set using register "ConfigOutput03" on page 17. Disturbance pulses which are shorter than the input delay are suppressed by the input filter.



11.5.3.1 Digital input filter

Name:
ConfigOutput03

This register can be used to specify the filter value for all digital inputs.

The filter value can be configured in steps of 100 µs. It makes sense to enter values in steps of 2, however, since the input signals are sampled every 200 µs.

Data type	Value	Filter
USINT	0	No software filter (bus controller default setting)
	2	0.2 ms
	...	...
	250	25 ms - Higher values are limited to this value

11.5.4 Configuration of Counter Channels 1 and 2

Name:
ConfigOutput01 to ConfigOutput02
ResetCounter01 to ResetCounter02

Counter channels 1 and 2 are configured in this register.

Data type	Values	Bus controller default setting
USINT	See bit structure.	0

Bit structure:

Bit	Description	Value	Information
0 - 2	Configuration of the counter frequency (only with gate measurement)	000	Counter frequency = 48 MHz (bus controller default setting)
		001	Counter frequency = 3 MHz
		010	Counter frequency = 187.5 kHz
		011 to 111	Reserved
3 - 4	Reserved	0	
5	ResetCounter0x	0	No affect on counter (bus controller default setting)
		1	Delete counter
6 - 7	Configuration of the operating mode	0	Event counter operation (Bus controller default setting)
		1	Gate measurement

Event counter operation

The falling edges are registered on the counter input.

The counter status is collected with a fixed offset to the network cycle and transferred in the same cycle.

Gate measurement

> **Information:**
>
> **Only one of the counter channels at a time can be used for gate measurement.**

The time of rising to falling edges for the gate input is registered using an internal frequency. The result is checked for overflow (0xFFFF).

The recovery time between measurements must be >100 µs.

The measurement result is transferred with the falling edge to the result memory.

11.6 Communication

11.6.1 Digital inputs

Unfiltered

The input state is collected with a fixed offset to the network cycle and transferred in the same cycle.

Filtered

The filtered status is collected with a fixed offset to the network cycle and transferred in the same cycle. Filtering takes place asynchronously to the network in multiples of 200 µs with a network-related jitter of up to 50 µs.

11.6.1.1 Input state of digital inputs 1 to 16

Name:
DigitalInput01 to DigitalInput16

This register indicates the input state of digital inputs 1 to 16.

Data type	Values
UINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	DigitalInput01	0 or 1	Input state - Digital input 1
...		...	
15	DigitalInput16	0 or 1	Input state - Digital input 16

11.6.2 Digital outputs

The output status is transferred to the output channels with a fixed offset in relation to the network cycle (SyncOut).

11.6.2.1 Switching state of digital outputs 1 to 16

Name:
DigitalOutput01 to DigitalOutput16

This register is used to store the switching state of digital outputs 1 to 16.

Data type	Values
UINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	DigitalOutput01	0	Digital output 01 reset
		1	Digital output 01 set
...		...	
15	DigitalOutput16	0	Digital output 16 reset
		1	Digital output 16 set

11.6.3 Monitoring status of the digital outputs

On the module, the output states of the outputs are compared to the target states. The control of the output driver is used for the target state.

A change in the output state resets monitoring for that output. The status of each individual channel can be read. A change in the monitoring status generates an error message.

11.6.3.1 Status of digital outputs 1 to 16

Name:
StatusDigitalOutput01 to StatusDigitalOutput16

This register is used to indicate the status of digital outputs 1 to 16.

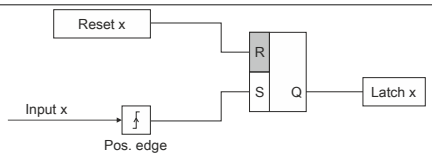
Data type	Values
UINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	StatusDigitalOutput01	0	Channel 01: No error
		1	Channel 01: Short circuit or overload
...		...	
15	StatusDigitalOutput16	0	Channel 16: No error
		1	Channel 16: Short circuit or overload

11.6.4 Input latch

It works in the same way as a dominant reset RS flip-flop.



R	S	Q	State
0	0	x	Do not change
0	1	1	Set
1	0	0	Reset
1	1	0	Reset

11.6.4.1 Input latch - Rising edges 1 to 8

Name:
InputLatch01 to InputLatch08

The rising edges of the input signal can be latched with a resolution of 200 µs in this register. The input latch is either reset or prevented from latching with register "QuitInputLatch0x" on page 20.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	InputLatch01	0	Do not latch input 1
		1	Latch input 1
...		...	
7	InputLatch08	0	Do not latch input 8
		1	Latch input 8

11.6.4.2 Input latch - Rising edges 9 to 16

Name:
InputLatch09 to InputLatch16

The rising edges of the input signal can be latched with a resolution of 200 µs in this register. The input latch is either reset or prevented from latching with register "QuitInputLatchxx" on page 20.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	InputLatch09	0	Do not latch input 9
		1	Latch input 9
...		...	
7	InputLatch16	0	Do not latch input 16
		1	Latch input 16

11.6.4.3 Acknowledgment - Input latch 1 to 8

Name:
QuitInputLatch01 to QuitInputLatch08

This register is used to reset the input latch by channel.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	QuitInputLatch01	0	Do not reset input 1
		1	Reset input 1
...		...	
7	QuitInputLatch08	0	Do not reset input 8
		1	Reset input 8

11.6.4.4 Acknowledgment - Input latch 9 to 16

Name:
QuitInputLatch09 to QuitInputLatch16

This register is used to reset the input latch by channel.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	QuitInputLatch09	0	Do not reset input 9
		1	Reset input 9
...		...	
7	QuitInputLatch16	0	Do not reset input 16
		1	Reset input 16

11.6.5 Event counter / Gate measurement

Name:
Counter01 and Counter02

Depending on the mode, this register contains the counter value or gate time of channel 1 and channel 2.

Data type	Values
UINT	0 to 65535

11.6.6 Reading the module ID

Name:
asy_ModulID

This register offers the possibility to read the module ID.

Data type	Values
UINT	Module ID

11.6.7 Operating limit status registers

Name:
asy_SupplyStatus

This register can be used to read the status of the operating limits.

Data type	Value
USINT	See bit structure.

Bit structure:

Bit	Description	Value	Information
0	Input supply within / outside of the warning limits	0	Within the warning limits (18 to 30 V)
		1	Outside of the warning limits (<18 V or >30 V)
1	Reserved	0	
2	Output supply within / outside of the warning limits	0	Within the warning limits (18 to 30 V)
		1	Outside of the warning limits (<18 V or >30 V)
3 - 7	Reserved	0	

11.6.8 I/O supply voltage

Name:
asy_SupplyInput

This register contains the I/O supply voltage measured by the module.

Data type	Values	Information
USINT	0 to 255	Resolution 1 V

11.6.9 Output supply voltage

Name:
asy_SupplyOutput

This register contains the output supply voltage measured by the module.

Data type	Values	Information
USINT	0 to 255	Resolution 1 V

11.7 Minimum I/O update time

The minimum I/O update time defines how far the bus cycle can be reduced while still allowing an I/O update to take place in each cycle.

	Minimum I/O update time
Without filtering	150 µs
With filtering	200 µs
Counter operation	250 µs

11.8 Minimum cycle time

The minimum cycle time specifies the time up to which the bus cycle can be reduced without communication errors occurring. It is important to note that very fast cycles reduce the idle time available for handling monitoring, diagnostics and acyclic commands.

	Minimum cycle time
Without filtering	150 µs
With filtering	200 µs
Counter operation	250 µs