X67BC6321.L08

Data sheet
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Translation of the original documentation

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Disclaimer

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1 General information

1.1 Other applicable documents

For additional and supplementary information, see the following documents.

Other applicable documents

Document name	Title
MAX67	X67 System user's manual

1.2 Order data

Order number	Short description	Figure
	Bus controller modules	
X67BC6321.L08	X67 bus controller, 1 PROFIBUS DP 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, M8 connectors, high-density module	

Table 1: X67BC6321.L08 - Order data

Required accessories
See "Required cables and connectors" on page 11.
For a general overview, see section "Accessories - General overview" in the X67 System user's manual.

1.3 Module description

The bus controller makes it possible to connect X2X Link I/O nodes to PROFIBUS DP. It supports PROFIBUS DP with all of its options and other additional properties. The configuration of the modular system is optimally supported by PROFIBUS DP.
Up to 63 additional X2X Link-based modules can be connected to the X2X Link bus controller.

The interface is equipped with 2 connections. Both connections are connected to an integrated switch. This makes it easy to implement daisy chain cabling.

Bus controller properties:

- Supported PROFIBUS DP versions: DP-V0
- Maximum baud rate: 12 Mbit/s
- Maximum I/O data size In/Out: 244 bytes / 244 bytes

Functions:

- PROFIBUS DP
- Digital inputs
- Event counter / Gate measurement
- Digital outputs
- Monitoring the operating limits

PROFIBUS DP

PROFIBUS DP is designed for efficient data exchange at the field level. Data exchange with the decentralized devices based on X2X Link is primarily cyclic.

Digital inputs

The digital inputs are equipped with an input filter with a configurable input delay. The input states can also be latched if required.

Event counter / Gate measurement

The module has 2 counter channels that can be used either as event counters or for gate measurement.

Monitoring status of the digital outputs

The output signal of the digital outputs is monitored for short circuit or overload.

Monitoring operating limits

The voltage of the I/O power supply is monitored for voltage overshoot or undershoot.

2 Technical description

2.1 Technical data

Order number	X67BC6321.L08
Short description	
Bus controller	PROFIBUS DP V0
General information	
Inputs/Outputs	16 digital channels, configurable as inputs or outputs using software, inputs with additional functions
Insulation voltage between channel and bus	500 V_{eff}
Nominal voltage	24 VDC
B&R ID code	
Bus controller	0x1AEB
Internal I/O module	0x1A1C
Sensor/Actuator power supply	0.5 A summation current
Status indicators	I/O function per channel, supply voltage, bus function
Diagnostics	
Outputs	Yes, using LED status indicator and software
I/O power supply	Yes, using LED status indicator and software
Connection type	
Fieldbus	M12, B-coded
X2X Link	M12, B-coded
Inputs/Outputs	16x M8, 3-pin
I/O power supply	M8, 4-pin
Power output	15 W X2X Link power supply for I/O modules
Power consumption	
Fieldbus	3.25 W
Internal I/O	2.04 W
X2X Link power supply	23.63 W at maximum power output for connected I/O modules
Certifications	
CE	Yes
UKCA	Yes
ATEX	Zone 2, II 3G Ex nA IIA T5 Gc IP67, Ta = 0 - Max. 60°C TÜV 05 ATEX 7201X
UL	cULus E115267 Industrial control equipment
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5
KC	Yes
Interfaces	
Fieldbus	PROFIBUS DP V0
Variant	2x M12 interface for the Y-connector integrated in the module
Max. distance	1200 m
Transfer rate	Max. 12 Mbit/s
Default transfer rate	Automatic transfer rate detection
Min. cycle time [1]	
Fieldbus	No limitation
X2X Link	400 µs
Synchronization between bus systems possible	No
PROFIBUS DP ID	0xBC60
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 protective function	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 characteristics per EN 61131-2	Type 1

Table 2: X67BC6321.L08 - Technical data

Technical description

Order number	X67BC6321.L08
Input voltage	18 to 30 VDC
Input current at 24 VDC	Typ. 4 mA
Input circuit	Sink
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 resistance	Typ. 6 kΩ
Additional functions	50 kHz event counting, gate measurement
Switching threshold	
Low	<5 VDC
High	>15 VDC
Event counters	
Quantity	2
Signal form	Square wave pulse
Evaluation	Each negative 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 time measurement	
Quantity	1
Signal form	Square wave pulse
Evaluation	Positive edge - Negative 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	Current-sourcing FET
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 shutdown in the event of overcurrent or short circuit, integrated protection for switching inductive loads, reverse polarity protection of the output power supply
Diagnostic status	Output monitoring with 10 ms delay
Leakage current when the output is 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	Channel isolated from PROFIBUS and bus PROFIBUS not isolated from bus and 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

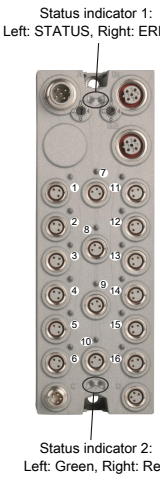
Table 2: X67BC6321.L08 - Technical data

Order number	X67BC6321.L08
Weight	355 g
Torque for connections	
M8	Max. 0.4 Nm
M12	Max. 0.6 Nm

Table 2: X67BC6321.L08 - Technical data

1) The minimum cycle time specifies 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.

2.2 LED status indicators

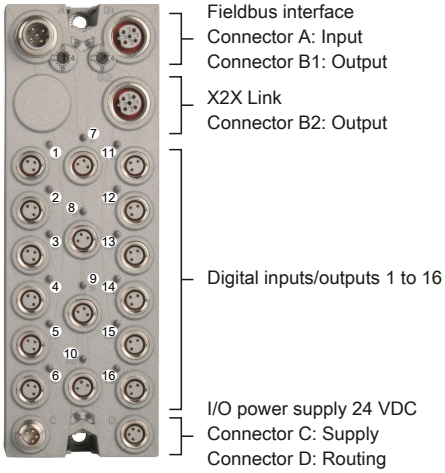
Figure	LED	Color/Status		Description
	**Status indicator 1:** Status indicator for PROFIBUS DP bus controller.			
	Left/Right	**STATUS (green)**	**ERROR (red)**	**Description**
		Off	Off	HARDWARE FAULT / POWER FAILURE
		On	On	BUS OFF
		On	Blinking	WAIT FOR CONFIG
		Blinking	Off	DATA EXCHANGE - DIAGNOSTICS
		On	Off	DATA EXCHANGE - NO ERROR
		Blinking	Blinking	CONFIG ERROR
		Off	Blinking	SERVICE MODE - BOOT
		Single flash	Single flash	HARDWARE FAULT
		For a more detailed description, see section "State diagnostics via the Status/Error LEDs" on page 8.		
	I/O LEDs			
	1 - 16	**Color**	**Status**	**Description**
		Orange	-	Input/Output state of the corresponding channel
	Status indicator 2: Status indicator for module functionality			
	Left	**Color**	**Status**	**Description**
		Green	Off	No power to module
			Single flash	Mode RESET
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	Right	**Color**	**Status**	**Description**
		Red	Off	Module not supplied with power or everything OK
			On	Error or reset state
			Single flash	Warning/Error on an I/O channel. Level monitoring for digital outputs has been triggered.
			Double flash	Supply voltage not within the valid range

2.2.1 State diagnostics via the Status/Error LEDs

Diagnostics about the state of the PROFIBUS DP bus controller is performed with the LEDs "STATUS" and "ERROR".

STATUS (green)	ERROR (red)	Explanation	Workaround
Off	Off	HARDWARE FAULT / POWER FAILURE	• Check the wiring of the supply voltage.
On	On	BUS OFF • Baud rate not detected • No connection to the DP master • DP master not active	• Check the PROFIBUS network. • Check the PROFIBUS master.
On	Blinking	WAIT FOR CONFIG • The baud rate has been detected, but the PROFIBUS master has not yet configured the bus controller.	• Check the node number switch • Check the slave address in the master configuration
Blinking	Off	DATA EXCHANGE - DIAGNOSTICS • The bus controller is still initializing the I/O modules. • The I/O modules configured by the master cannot be found • One or more I/O modules have an error message (short circuit, etc.).	• Initialization can take a few seconds depending on the number of I/O modules connected. • Check the wiring and power supply for the I/O modules • Read the diagnostic messages in the respective PROFIBUS master's engineering tool.
On	Off	DATA EXCHANGE • Cyclic data exchange with the PROFIBUS DP master	
Blinking	Blinking	CONFIG ERROR • One or more I/O modules found do not match with the configuration of the PROFIBUS DP master • The configuration received from the PROFIBUS master is invalid.	• Check the wiring of the X2X Link and the order of I/O modules • Check configuration of the PROFIBUS master • Read the diagnostic messages in the respective PROFIBUS master's engineering tool. • Check the configuration being used; it is possible that the number of configured I/O modules is too high.
Off	Blinking	SERVICE MODE - BOOT • The bus controller's node number has been set to 255 (0xFF) - after 2 s the bus controller starts in service mode	• Set a valid node number
Single flash	Single flash	HARDWARE FAULT	

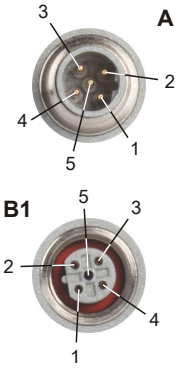
2.3 Operating and connection elements



2.3.1 PROFIBUS DP interface

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

The Y-connector for PROFIBUS DP is already integrated with this module.

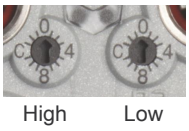
Connection	Pinout			
	**Pin**	**PROFIBUS DP**		
	1	+5 V[1)]	-	-	-
	2	A	RxD/TxD-N	Data\	Green
	3	GND[1)]	-	-	-
	4	B	RxD/TxD-P	Data	Red
	5	Shield[1)]	-	-	-
	1) Shield also provided by threaded insert in module. A → B-coded (male), input B1 → B-coded (female), output				

1) Power supply for terminating resistor (PROFIBUS DP standard) formed internally by the bus controller. These pins are of no importance for the wiring.

2.3.2 PROFIBUS DP node number

The PROFIBUS DP node number is set using the two number switches on the bus controller.

Node number 0xFF enables the service mode. The bus controller starts with PROFIBUS DP address 2. A firmware update is possible in service mode. The I/Os cannot be operated.



2.3.2.1 Automatic transfer rate detection

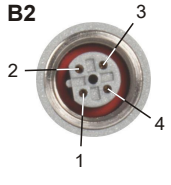
After startup or after a communication timeout, the bus controller enters state "Baud search". This means that the bus controller behaves passively with respect to the bus.

The bus controller always starts the search for the set transfer rate with the highest transfer rate. If no telegram has been received completely and without errors during the monitoring time, the search is continued with the next lower transfer rate.

Transfer rate
12 Mbit/s
6 Mbit/s
3 Mbit/s
1.5 Mbit/s
500 kbit/s
187.5 kbit/s
93.75 kbit/s
45.45 kbit/s
19.2 kbit/s
9.6 kbit/s

2.3.3 X2X Link

Additional modules are connected to the bus controller via X2X Link using pre-assembled cables. The connection is made using M12 circular connectors.

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

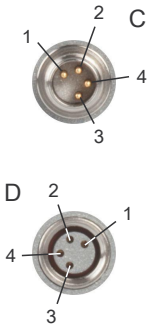
2.3.4 I/O power supply 24 VDC

The I/O power supply is connected via M8 connectors C and D. The power supply is fed via connector C (male). Connector D (female) is used to route the 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 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, supply for I/O power supply D → Connector (female) in module, routing of I/O power supply		

Information:

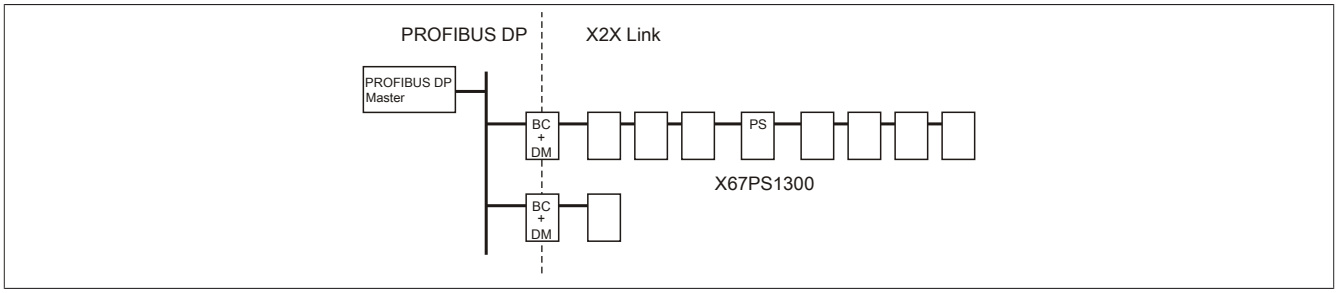
If the summation current of the outputs is >4 A, current must also be supplied via connector D, pin 2.

2.4 System configuration

The possible maximum number of I/O modules that can be connected to the PROFIBUS DP bus controller can be determined with the design tool.

This tool and the associated device description file (GSD file) are available in the Downloads section of the B&R website (www.br-automation.com).

A digital mixed module is already integrated in the bus controller.

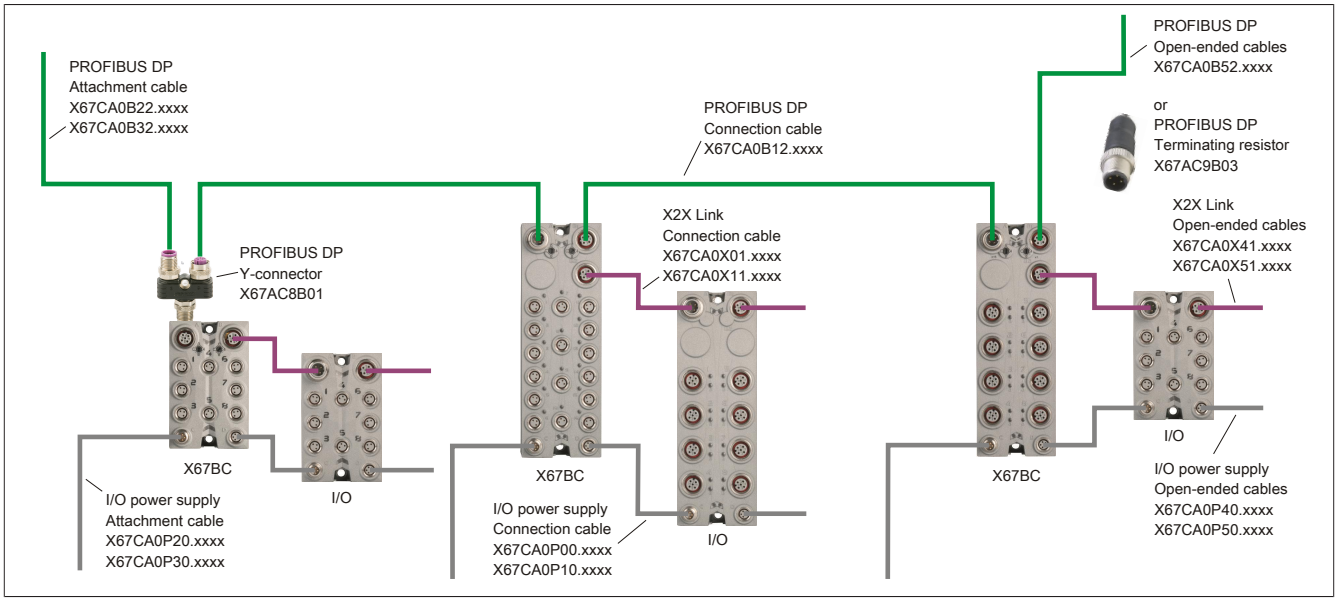


Information:

15 W are made available from the bus controller for additional X67 modules or other modules based on X2X Link.

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

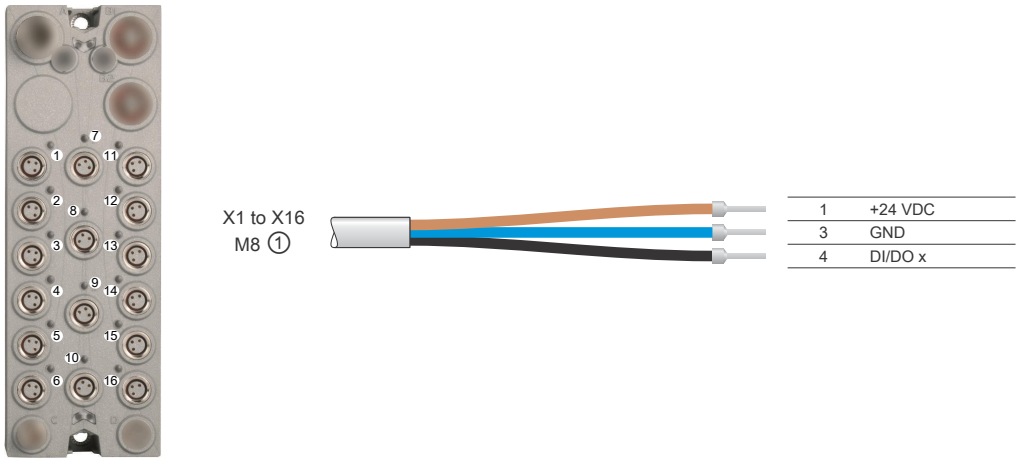
2.5 Required cables and connectors



3 Integrated digital mixed module

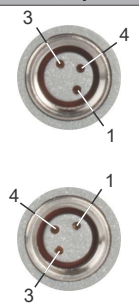
1 additional mixed module can be saved by the digital mixed module integrated in the bus controller.

3.1 Pinout

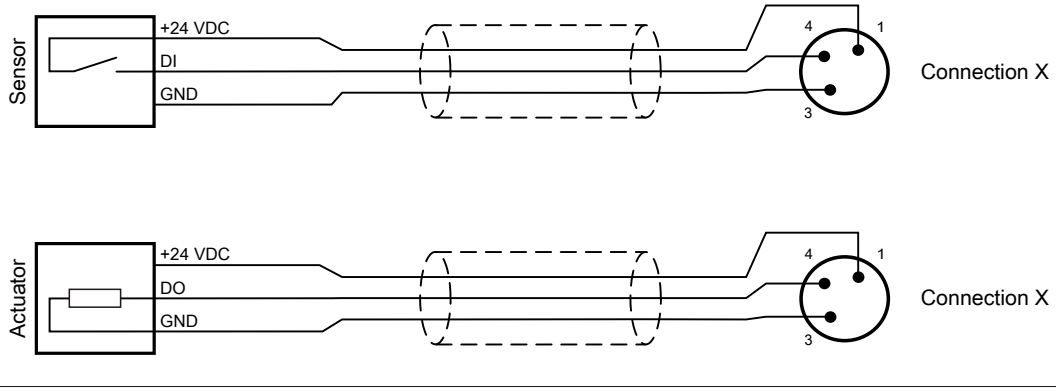


① X67CA0D40.xxxx: M8 sensor cable, straight
X67CA0D50.xxxx: M8 sensor cable, angled

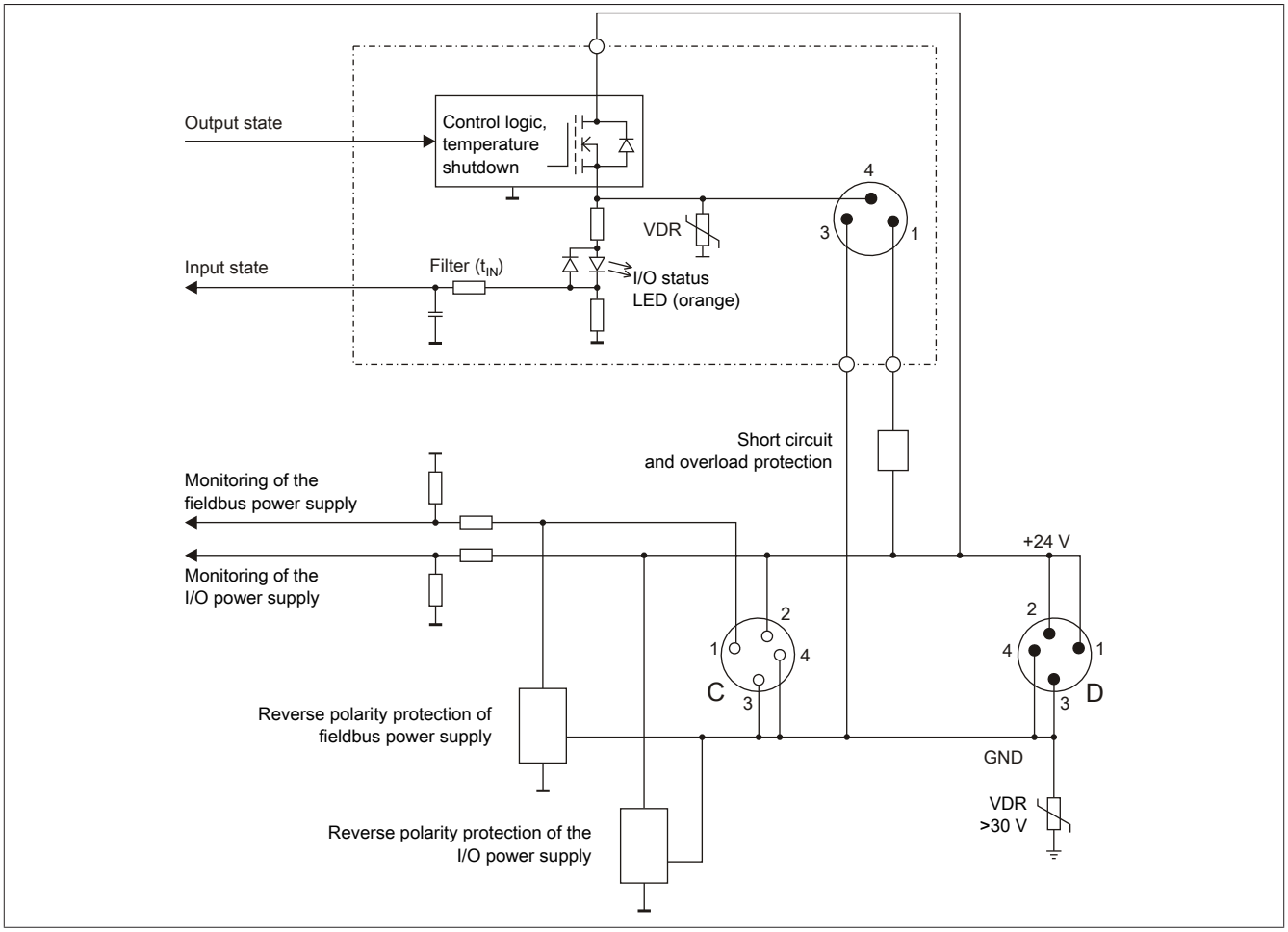
3.2 Connections X1 to X16

M8, 3-pin	Pinout	
	**Pin**	**Name**
	1	24 VDC sensor/actuator power supply[1)]
	3	GND
	4	Input/Output
	1) The sensor/actuator power supply is not permitted to be external.	
	Connections (female), input/output	

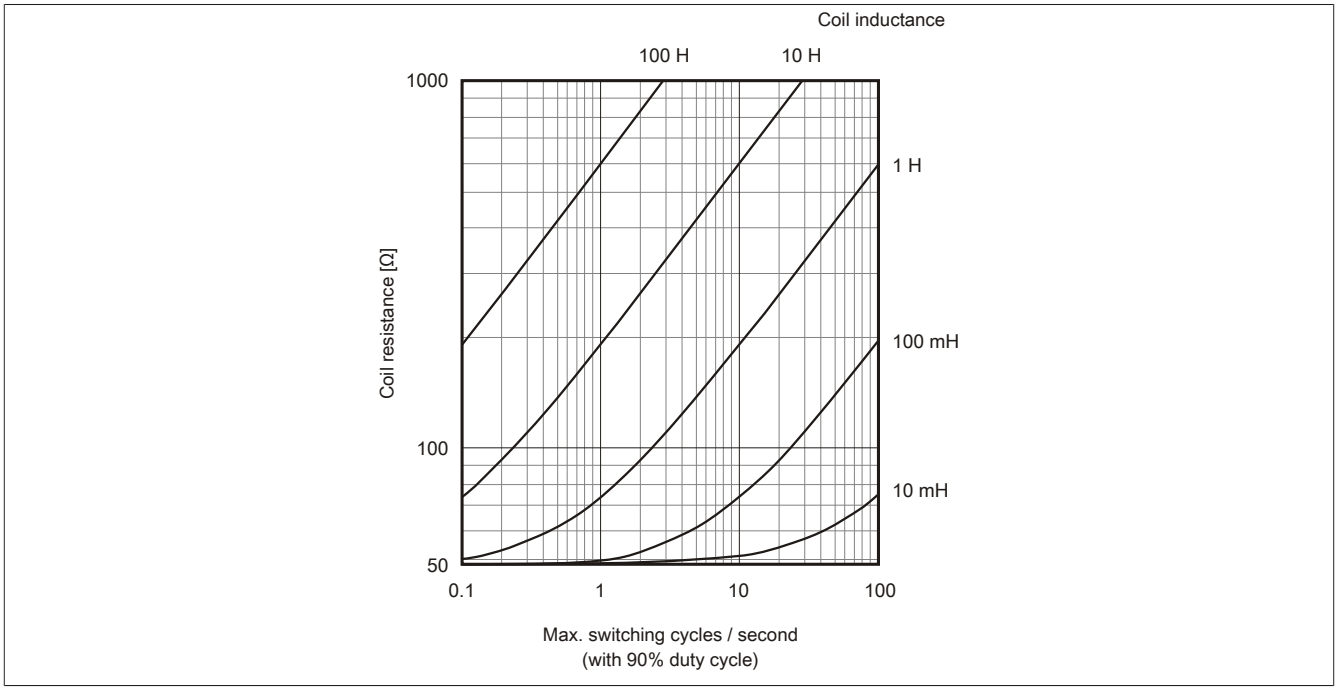
3.3 Connection examples



3.4 Input/Output circuit diagram



3.5 Switching inductive loads



4 Function description

4.1 PROFIBUS DP

PROFIBUS DP is designed for efficient data exchange at the field level. Data exchange with the decentralized devices based on X2X Link is primarily cyclic. The communication functions required for this are defined by the DP basic functions. Beyond these basic functions, DP also offers acyclic communication services.

PROFIBUS DP is based on the physics of the RS485 interface. Data transfer is controlled using a hybrid bus access procedure: Active stations receive communication rights via a token passing procedure and can then access all stations on the network according to the master-slave principle. The maximum time of circulation for a token can be configured, which results in a defined cycle time.

Access represents various services for the user for both cyclic and for acyclic data transfer.

In addition to the device, module and channel diagnostics provided in the PROFIBUS standard, there are other possibilities such as switching to the slot diagnostics option in S7 format.

For additional information, see the PROFIBUS bus controller user's manual.

4.2 Digital inputs

The module is equipped with 16 digital channels that can be configured as digital inputs.

Information:

The registers are described in "I/O masks 1 to 8" on page 21 and "I/O masks 9 to 16" on page 21.

4.2.1 Recording the input state

Unfiltered

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

Filtered

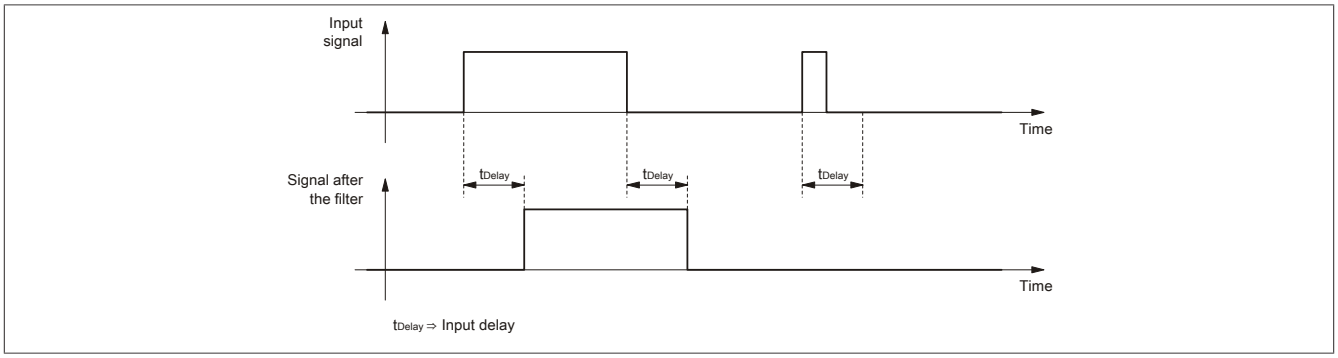
The filtered state is collected with a fixed offset to the network cycle and transferred in the same cycle. Filtering takes place asynchronously to the network in multiples of 200 µs with a network-related jitter of up to 50 µs.

Information:

The registers are described in "Input state of digital inputs 1 to 8" on page 23 and "Input state of digital inputs 9 to 16" on page 23.

4.2.2 Input filter

An input filter is available for each input. Disturbance pulses that are shorter than the input delay are suppressed by the input filter.



The input delay can be set in steps of 100 µs. It makes sense, however, to enter values in steps of 2 since the input signals are sampled in an interval of 200 µs.

Values	Filter
0	No software filter
2	0.2 ms
...	...
250	25 ms - Higher values are limited to this value.

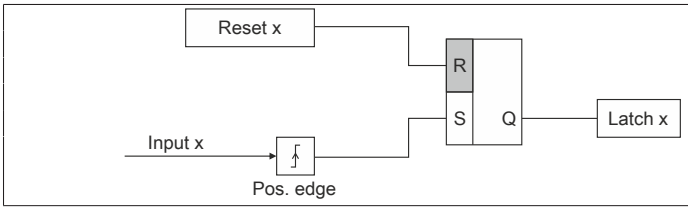
Information:

The register is described in "Digital input filter" on page 22.

4.2.3 Input latch

The positive edges of the input signals can be latched with a resolution of 200 µs.

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

Information:

The register is described in "Input latch" on page 25.

4.3 Event counter / Gate measurement

The module has 2 counter channels that can be used either as event counters or for gate measurement.

Event counter operation

The falling edges are registered on the counter input.

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

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 greater than 100 µs.

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

Information:

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

Information:

Registers are described in "Configuring counter channels 1 and 2" on page 22 and "Event counter / Gate measurement" on page 26.

4.4 Digital outputs

The module is equipped with 16 digital channels that can be configured as digital outputs.

Information:

The registers are described in "I/O masks 1 to 8" on page 21 and "I/O masks 9 to 16" on page 21.

4.4.1 Monitoring status of the 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 out. A change in the monitoring status is actively transmitted as an error message.

Supervision status	Description
0	Digital output channel: No error
1	Digital output channel: Short circuit or overload

Information:

The register is described in "Monitoring status of the digital outputs" on page 24.

4.5 Monitoring the operating limits

The status of the I/O power supply can be read out.

Bit	Description
0	I/O power supply within the warning limits (18 to 30 V)
1	I/O power supply outside the warning limits (<18 V or >30 V)

Information:

The register is described in "Operating limit status registers" on page 26.

5 Commissioning

5.1 Import files (GSD) and other documentation

The necessary import files for the master engineering tool and additional documentation about the functions of the PROFIBUS DP are available for download on the B&R website (www.br-automation.com).

Information:

With multifunction modules, the bus controller supports only the default function model in the event of automatic configuration by the bus controller (see the respective module description).

6 Register description

6.1 General data points

In addition to the registers described in the register description, the module has additional general data points. These are not module-specific but contain general information such as serial number and hardware variant.

General data points are described in section "Additional information - General data points" in the X67 System user's manual.

6.2 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				
0	Input state of digital inputs 1 to 8	USINT	•			
	DigitalInput01	Bit 0				
	...	...				
	DigitalInput08	Bit 7				
1	Input state of digital inputs 9 to 16	USINT	•			
	DigitalInput09	Bit 0				
	...	...				
	DigitalInput16	Bit 7				
2	Switching state of digital outputs 1 to 16	UINT			•	
	DigitalOutput01	Bit 0				
	...	...				
	DigitalOutput16	Bit 15				
2	Switching state of digital outputs 1 to 8	USINT			•	
	DigitalOutput01	Bit 0				
	...	...				
	DigitalOutput08	Bit 7				
3	Switching state of digital outputs 9 to 16	USINT			•	
	DigitalOutput09	Bit 0				
	...	...				
	DigitalOutput16	Bit 7				
30	Status of digital outputs 1 to 16	UINT	•			
	StatusDigitalOutput01	Bit 0				
	...	...				
	StatusDigitalOutput16	Bit 15				
30	Status of digital outputs 1 to 8	USINT	•			
	StatusDigitalOutput01	Bit 0				
	...	...				
	StatusDigitalOutput08	Bit 7				
31	Status of digital outputs 9 to 16	USINT	•			
	StatusDigitalOutput09	Bit 0				
	...	...				
	StatusDigitalOutput16	Bit 7				
26	Input latch - Positive edges 1 to 8	USINT	•			
	InputLatch01	Bit 0				
	...	...				
	InputLatch08	Bit 7				
27	Input latch - Positive edges 9 to 16	USINT	•			
	InputLatch09	Bit 0				
	...	...				
	InputLatch16	Bit 7				

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
28	Acknowledgment - Input latches 1 to 8	USINT			•	
	QuitInputLatch01	Bit 0				
	...	...				
	QuitInputLatch08	Bit 7				
29	Acknowledgment - Input latches 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		•		

6.3 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				
0	Input state of digital inputs 1 to 8	USINT	•			
	DigitalInput01	Bit 0				
	...	...				
	DigitalInput08	Bit 7				
1	Input state of digital inputs 9 to 16	USINT	•			
	DigitalInput09	Bit 0				
	...	...				
	DigitalInput16	Bit 7				
2	Switching state of digital outputs 1 to 16	UINT			•	
	DigitalOutput01	Bit 0				
	...	...				
	DigitalOutput16	Bit 15				
2	Switching state of digital outputs 1 to 8	USINT			•	
	DigitalOutput01	Bit 0				
	...	...				
	DigitalOutput08	Bit 7				
3	Switching state of digital outputs 9 to 16	USINT			•	
	DigitalOutput09	Bit 0				
	...	...				
	DigitalOutput16	Bit 7				
30	Status of digital outputs 1 to 16	UINT	•			
	StatusDigitalOutput01	Bit 0				
	...	...				
	StatusDigitalOutput16	Bit 15				
30	Status of digital outputs 1 to 8	USINT	•			
	StatusDigitalOutput01	Bit 0				
	...	...				
	StatusDigitalOutput08	Bit 7				
31	Status of digital outputs 9 to 16	USINT	•			
	StatusDigitalOutput09	Bit 0				
	...	...				
	StatusDigitalOutput16	Bit 7				
26	Input latch - Positive edges 1 to 8	USINT	•			
	InputLatch01	Bit 0				
	...	...				
	InputLatch08	Bit 7				
27	Input latch - Positive edges 9 to 16	USINT	•			
	InputLatch09	Bit 0				
	...	...				
	InputLatch16	Bit 7				
28	Acknowledgment - Input latches 1 to 8	USINT			•	
	QuitInputLatch01	Bit 0				
	...	...				
	QuitInputLatch08	Bit 7				

Register description

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
29	Acknowledgment - Input latches 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		•		

6.4 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 - Positive edges 1 to 8	USINT	•			
		InputLatch01	Bit 0				
		...	...				
		InputLatch08	Bit 7				
27	-	Input latch - Positive edges 9 to 16	USINT	•			
		InputLatch09	Bit 0				
		...	...				
		InputLatch16	Bit 7				
28	-	Acknowledgment - Input latches 1 to 8	USINT			•	
		QuitInputLatch01	Bit 0				
		...	...				
		QuitInputLatch08	Bit 7				
29	-	Acknowledgment - Input latches 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.

6.4.1 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 other registers and functions depending on the fieldbus used.

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

6.4.2 CAN I/O bus controller

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

6.5 Configuration

6.5.1 I/O masks 1 to 8

Name:
ConfigIOMask01

Channels can be 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 the 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

6.5.2 I/O masks 9 to 16

Name:
ConfigIOMask02

Channels can be 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 the 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

6.5.3 Digital input filter

Name:
ConfigOutput03

The filter value for all digital inputs can be configured in this register.

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

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

6.5.4 Configuring 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 the 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 effect on counter (bus controller default setting)
		1	Clears the counter
6 - 7	Configuration of the operating mode	0	Event counter operation (bus controller default setting)
		1	Gate measurement

6.6 Communication

6.6.1 Digital inputs

6.6.1.1 Input state of digital inputs 1 to 16

Name:
DigitalInput01 to DigitalInput16

This register contains 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

6.6.1.2 Input state of digital inputs 1 to 8

Name:
DigitalInput01 to DigitalInput08

This register contains the input state of digital inputs 1 to 8.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	DigitalInput01	0 or 1	Input state - Digital input 1
...		...	
7	DigitalInput08	0 or 1	Input state - Digital input 8

6.6.1.3 Input state of digital inputs 9 to 16

Name:
DigitalInput09 to DigitalInput16

This register contains the input state of digital inputs 9 to 16.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	DigitalInput09	0 or 1	Input state - Digital input 9
...		...	
7	DigitalInput16	0 or 1	Input state - Digital input 16

6.6.2 Digital outputs

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

6.6.2.1 Switching state of digital outputs 1 to 16

Name:
DigitalOutput01 to DigitalOutput16

This register stores 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

6.6.2.2 Switching state of digital outputs 1 to 8

Name:
DigitalOutput01 to DigitalOutput08

This register stores the switching state of digital outputs 1 to 8.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	DigitalOutput01	0	Digital output 01 reset
		1	Digital output 01 set
...		...	
7	DigitalOutput08	0	Digital output 08 reset
		1	Digital output 08 set

6.6.2.3 Switching state of digital outputs 9 to 16

Name:
DigitalOutput09 to DigitalOutput16

This register stores the switching state of digital outputs 9 to 16.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	DigitalOutput09	0	Digital output 09 reset
		1	Digital output 09 set
...		...	
7	DigitalOutput16	0	Digital output 16 reset
		1	Digital output 16 set

6.6.3 Monitoring status of the digital outputs

On the module, the output states of the outputs are compared to the target states.

6.6.3.1 Status of digital outputs 1 to 16

Name:
StatusDigitalOutput01 to StatusDigitalOutput16

This register contains the state 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

6.6.3.2 Status of digital outputs 1 to 8

Name:
StatusDigitalOutput01 to StatusDigitalOutput08

This register contains the state of digital outputs 1 to 8.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	StatusDigitalOutput01	0	Channel 01: No error
		1	Channel 01: Short circuit or overload
...		...	
7	StatusDigitalOutput08	0	Channel 08: No error
		1	Channel 08: Short circuit or overload

6.6.3.3 Status of digital outputs 9 to 16

Name:
StatusDigitalOutput09 to StatusDigitalOutput16

This register contains the state of digital outputs 9 to 16.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Name	Value	Information
0	StatusDigitalOutput09	0	Channel 09: No error
		1	Channel 09: Short circuit or overload
...		...	
7	StatusDigitalOutput16	0	Channel 16: No error
		1	Channel 16: Short circuit or overload

6.6.4 Input latch

6.6.4.1 Input latch - Positive edges 1 to 8

Name:
InputLatch01 to InputLatch08

The positive 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 26.

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

6.6.4.2 Input latch - Positive edges 9 to 16

Name:
InputLatch09 to InputLatch16

The positive edges of the input signal can be latched with a resolution of 200 µs in this register. The input latch is reset again or latching is prevented with register "QuitInputLatch0x" on page 26.

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

6.6.4.3 Acknowledgment - Input latches 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

6.6.4.4 Acknowledgment - Input latches 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

6.6.5 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

6.6.6 Reading out the module ID

Name:
asy_ModulID

This register offers the possibility to read the module ID.

Data type	Values
UINT	Module ID

6.6.7 Operating limit status registers

Name:
asy_SupplyStatus

The status of the operating limits can be read out in this register.

Data type	Values
USINT	See the bit structure.

Bit structure:

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

6.6.8 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

6.6.9 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

6.7 Minimum I/O update time

The minimum I/O update time specifies how far the bus cycle can be reduced so that an I/O update is performed in each cycle.

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

6.8 Minimum cycle time

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

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