

X67AI1323

Data sheet
3.20 (November 2025)



Publishing information

B&R Industrial Automation GmbH

B&R Strasse 1

5142 Eggelsberg

Austria

Telephone: +43 7748 6586-0

Fax: +43 7748 6586-26

office@br-automation.com

Disclaimer

All information in this document is current as of its creation. The contents of this document are subject to change without notice. B&R Industrial Automation GmbH assumes unlimited liability in particular for technical or editorial errors in this document only (i) in the event of gross negligence or (ii) for culpably inflicted personal injury. Beyond that, liability is excluded to the extent permitted by law. Liability in cases in which the law stipulates mandatory unlimited liability (such as product liability) remains unaffected. Liability for indirect damage, consequential damage, business interruption, loss of profit or loss of information and data is excluded, in particular for damage that is directly or indirectly attributable to the delivery, performance and use of this material.

B&R Industrial Automation GmbH notes that the software and hardware designations and brand names of the respective companies used in this document are subject to general trademark, brand or patent protection.

Hardware and software from third-party suppliers referenced in this document is subject exclusively to the respective terms of use of these third-party providers. B&R Industrial Automation GmbH assumes no liability in this regard. Any recommendations made by B&R Industrial Automation GmbH are not contractual content, but merely non-binding information for which no liability is assumed. When using hardware and software from third-party suppliers, the relevant user documentation of these third-party suppliers must additionally be consulted and, in particular, the safety guidelines and technical specifications contained therein must be observed. The compatibility of the products from B&R Industrial Automation GmbH described in this document with hardware and software from third-party suppliers is not contractual content unless this has been separately agreed in individual cases; in this respect, warranty for such compatibility is excluded in any case, and it is the sole responsibility of the customer to verify this compatibility in advance.

1248269446548-3.20

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
	Analog input modules	
X67AI1323	X67 analog input module, 4 inputs, 0 to 20 mA or 4 to 20 mA, 12-bit converter resolution, configurable input filter	

Table 1: X67AI1323 - Order data

Required accessories
For a general overview, see section "Accessories - General overview" in the X67 System user's manual.

1.3 Module description

The module is equipped with 4 inputs with 12-bit digital converter resolution. The range of the input signal is either 0 to 20 mA or 4 to 20 mA.

Functions:

- [Input filter](#)
- [Monitoring the input signal](#)
- [Monitoring the operating limits](#)

Analog input filter

The module is equipped with a configurable input filter with input ramp limiting.

Monitoring the input signal

The input signal of the analog inputs is monitored against the upper and lower limit values as well as for open circuit. Other limit values can be defined if necessary.

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	X67AI1323
Short description	
I/O module	4 analog inputs 0 to 20 mA or 4 to 20 mA
General information	
B&R ID code	0x16F2
Status indicators	I/O function per channel, supply voltage, bus function
Diagnostics	
Inputs	Yes, using LED status indicator and software
I/O power supply	Yes, using LED status indicator and software
Connection type	
X2X Link	M12, B-coded
Inputs	4x M12, A-coded
I/O power supply	M8, 4-pin
Power consumption	
Internal I/O	3 W
X2X Link power supply	0.75 W
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
I/O power supply	
Nominal voltage	24 VDC
Voltage range	18 to 30 VDC
Integrated protective function	Reverse polarity protection
Power consumption	
Sensor power supply	Max. 12 W ¹⁾
Analog inputs	
Input	0 to 20 mA or 4 to 20 mA
Input type	Differential input
Digital converter resolution	12-bit
Conversion time	400 µs for all inputs
Output format	INT
Output format	
Current	INT 0x0000 - 0x7FFF / 1 LSB = 0x0008 = 4.883 µA
Load	<300 Ω
Input protection	Protection against wiring with supply voltage
Permissible input signal	Max. ±30 mA
Output of digital value during overload	
Undershoot	0x0000
Overshoot	0x7FFF
Conversion procedure	Successive approximation
Max. error	
Gain	0.1% ²⁾
Offset	0.05% ³⁾
Max. gain drift	0.013 %/°C ²⁾
Max. offset drift	0.02 %/°C ³⁾
Common-mode rejection	
DC	>50 dB
50 Hz	>50 dB
Common-mode range	±11 V
Crosstalk between channels	<-70 dB
Nonlinearity	<0.1% ³⁾
Insulation voltage between input and bus	500 V _{eff}
Voltage drop at 20 mA	Typically 4.5 V


Table 2: X67AI1323 - Technical data

Order number	X67AI1323
Input filter	
Cutoff frequency	1 kHz
Slope	40 dB
Sensor power supply	
Voltage	I/O power supply minus voltage drop for short-circuit protection
Voltage drop for short-circuit protection at 500 mA	Max. 2 VDC
Summation current	Max. 0.5 A
Short-circuit proof	Yes
Electrical properties	
Electrical isolation	Channel isolated from bus 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	85 mm
Depth	42 mm
Weight	190 g
Torque for connections	
M8	Max. 0.4 Nm
M12	Max. 0.6 Nm

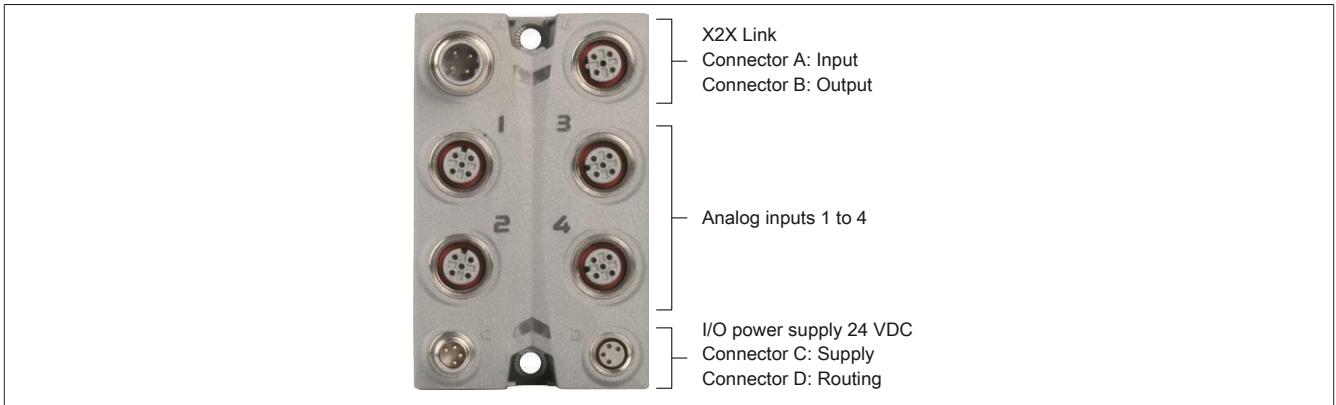
Table 2: X67AI1323 - Technical data

- 1) The power consumption of the sensors connected to the module is not permitted to exceed 12 W.
- 2) Based on the current measured value.
- 3) Based on the entire measurement range.

2.2 LED status indicators

Figure	LED	Color/Status	Description	
 <p>Status indicator 1: Left: Green, Right: Red</p> <p>Status indicator 2: Left: Green, Right: Red</p>	Status indicator 1: Status indicator for X2X Link			
	Left/Right	Green (left)	Red (right)	Description
		Off	Off	No power supply via X2X Link
		On	Off	X2X Link supplied, communication OK
		Off	On	X2X Link supplied but no X2X Link communication
		On	On	PREOPERATIONAL: X2X Link supplied, module not initialized
	I/O LEDs: Status indicator for the corresponding analog input			
	1 - 4	Color	Status	Description
		Green	On	The A/D converter is running.
			Blinking	Input signal overflow or underflow
			Off	Module not in mode RUN
	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. Overflow or underflow of the analog inputs.	
		Double flash	Supply voltage not within the valid range	

2.3 Connection elements

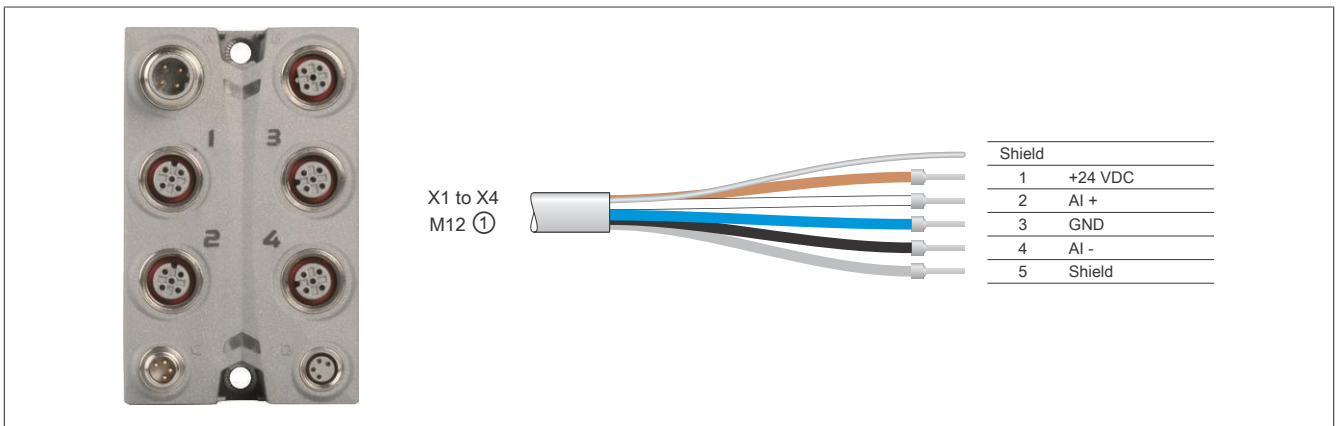


2.3.1 X2X Link

The module is connected to the X2X Link network using pre-assembled cables. The connection is made using M12 circular connectors.

Connection	Pin	Pinout
	1	X2X+
	2	X2X
	3	X2XL
	4	X2X\
	Shield connection made via threaded insert in the module.	
	A → B-coded (male), input B → B-coded (female), output	

2.3.2 Pinout



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

2.3.2.1 Connections X1 to X4

M12, 5-pin	Pinout	
	Pin	Name
	1	Sensor power supply 24 VDC
	2	Input +
	3	GND
	4	Input -
	5	Shield ¹⁾
	1) Shielding also provided by threaded insert in the module.	
	X1 to X4 → A-coded (female), input	

2.3.3 I/O power supply 24 VDC

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.

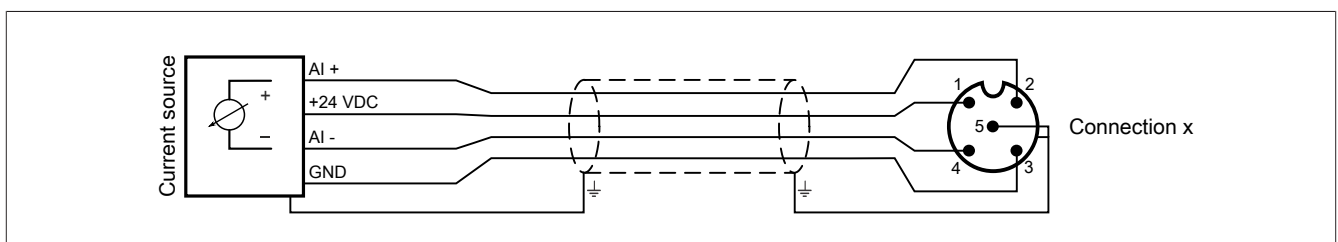


Information:

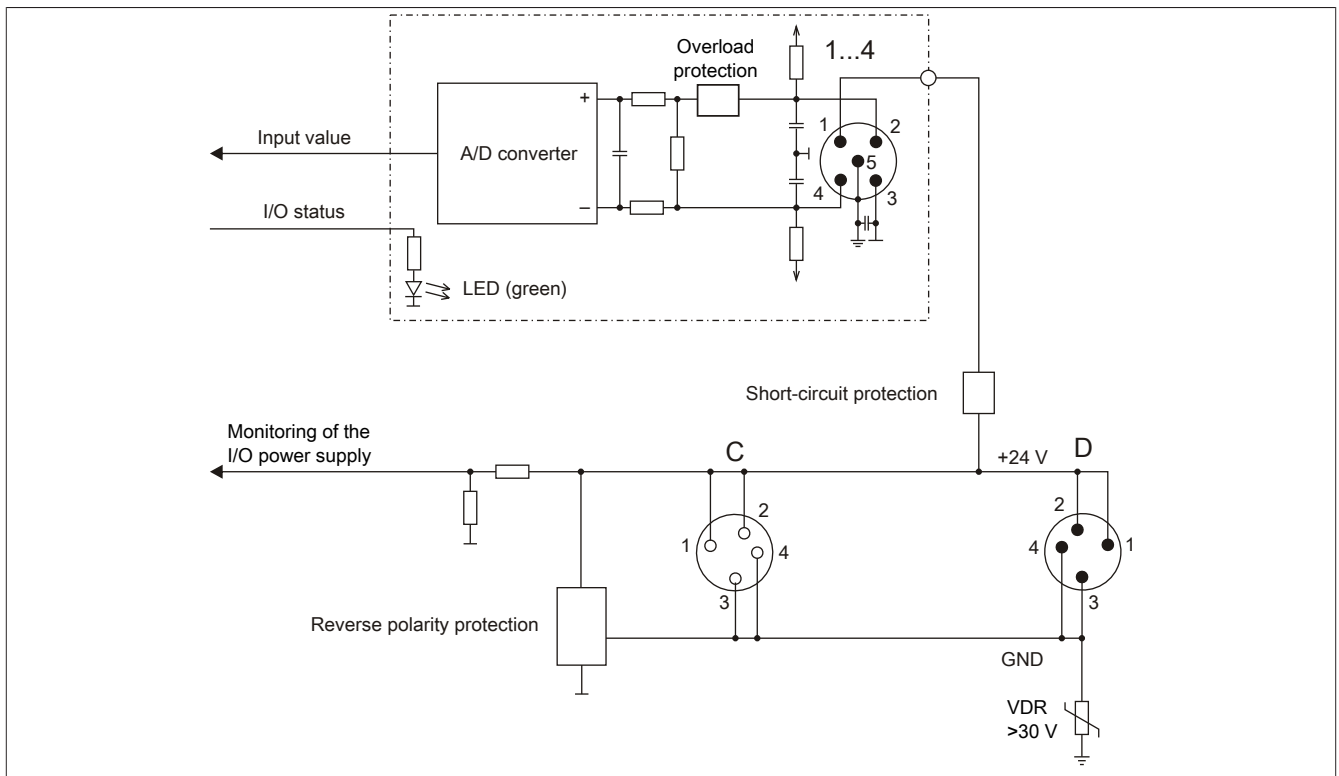
The maximum permissible current for the I/O power supply is 8 A (4 A per connection pin)!

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

2.4 Connection example



2.5 Input circuit diagram



3 Function description

3.1 Input filter

The module is equipped with a configurable input filter. The minimum cycle time must be $>500 \mu\text{s}$. The filter function is disabled for shorter cycle times.

When the input filter is activated, the channels are sampled at millisecond intervals. The time offset between the channels is $200 \mu\text{s}$. The conversion takes place asynchronously to the network cycle.



Information:

The register is described in "[Configuring the input filter](#)" on page 16.

3.1.1 Input ramp limiting

Input ramp limiting can only be performed in conjunction with filtering. Input ramp limiting is performed before filtering.

The difference of the input value change is checked for exceeding the specified limit. In the event of overshoot, the tracked input value is equal to the old value \pm the limit value.

Configurable limit values:

Value	Limit value
0	The input value is used without limitation.
1	0x3FFF = 16383
2	0x1FFF = 8191
3	0x0FFF = 4095
4	0x07FF = 2047
5	0x03FF = 1023
6	0x01FF = 511
7	0x00FF = 255

Function description

Input ramp limiting is well suited for suppressing disturbances (spikes). The following examples show the functionality of input ramp limiting based on an input step and a disturbance.

Example 1

The input value jumps from 8000 to 17000. The diagram shows the tracked input value with the following settings:

Input ramp limiting = 4 = 0x07FF = 2047

Filter level = 2

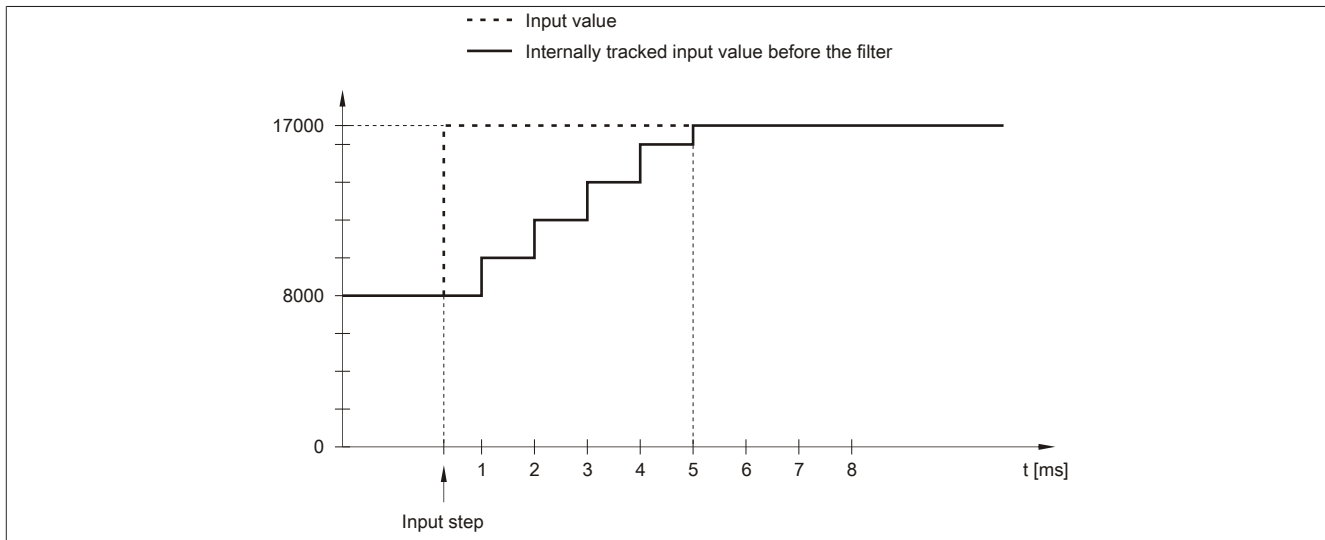


Figure 1: Tracked input value for input step

Example 2

A disturbance interferes with the input value. The diagram shows the tracked input value with the following settings:

Input ramp limiting = 4 = 0x07FF = 2047

Filter level = 2

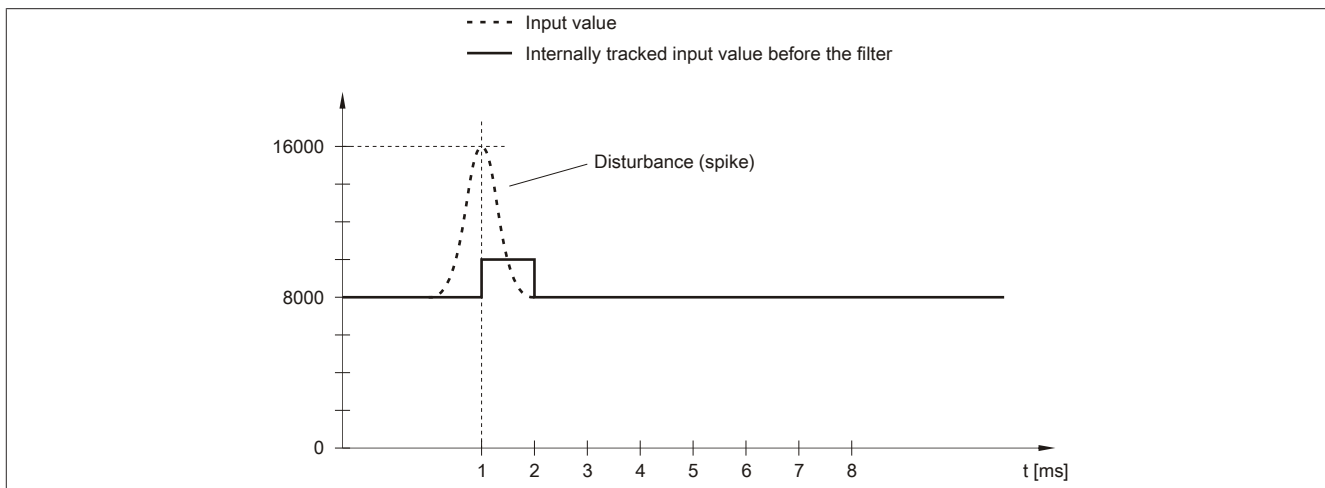


Figure 2: Tracked input value for disturbance

3.1.2 Filter level

A filter can be defined to prevent large input steps. This filter is used to bring the input value closer to the actual analog value over a period of several bus cycles.

Filtering takes place after any input ramp limiting has been carried out.

Formula for calculating the input value:

$$\text{Value}_{\text{New}} = \text{Value}_{\text{Old}} - \frac{\text{Value}_{\text{Old}}}{\text{Filter level}} + \frac{\text{Input value}}{\text{Filter level}}$$

Adjustable filter levels:

Value	Filter level
0	Filter switched off
1	Filter level 2
2	Filter level 4
3	Filter level 8
4	Filter level 16
5	Filter level 32
6	Filter level 64
7	Filter level 128

The following examples show the functionality of the filter based on an input step and a disturbance.

Example 1

The input value jumps from 8000 to 16000. The diagram shows the calculated value with the following settings:

Input ramp limiting = 0

Filter level = 2 or 4

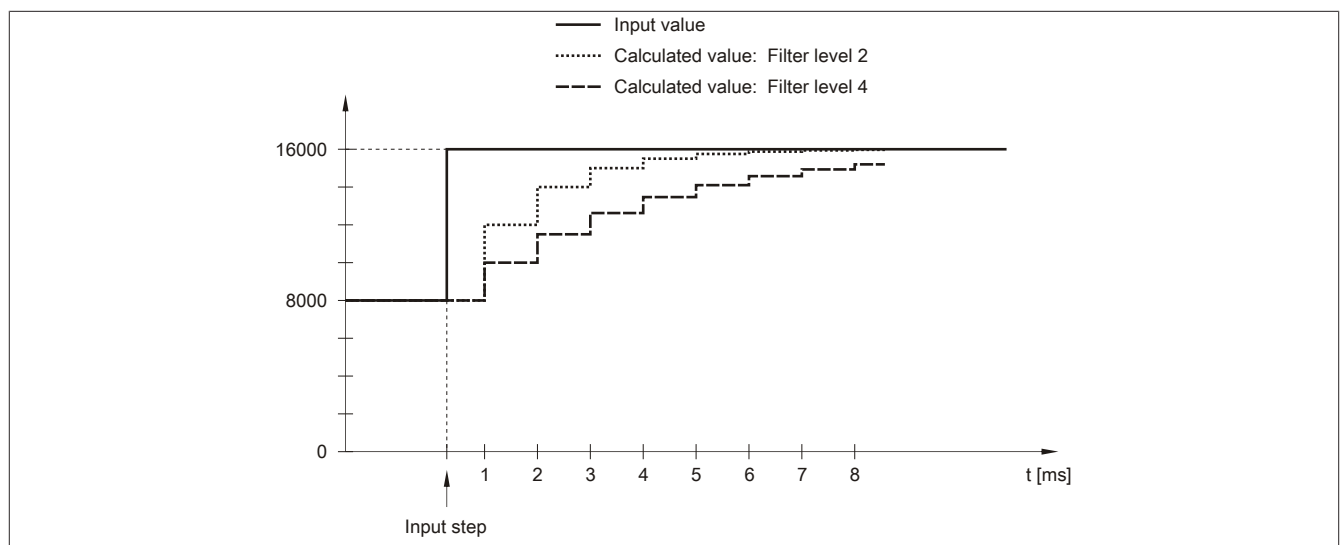


Figure 3: Calculated value during input step

Function description

Example 2

A disturbance interferes with the input value. The diagram shows the calculated value with the following settings:

Input ramp limiting = 0

Filter level = 2 or 4

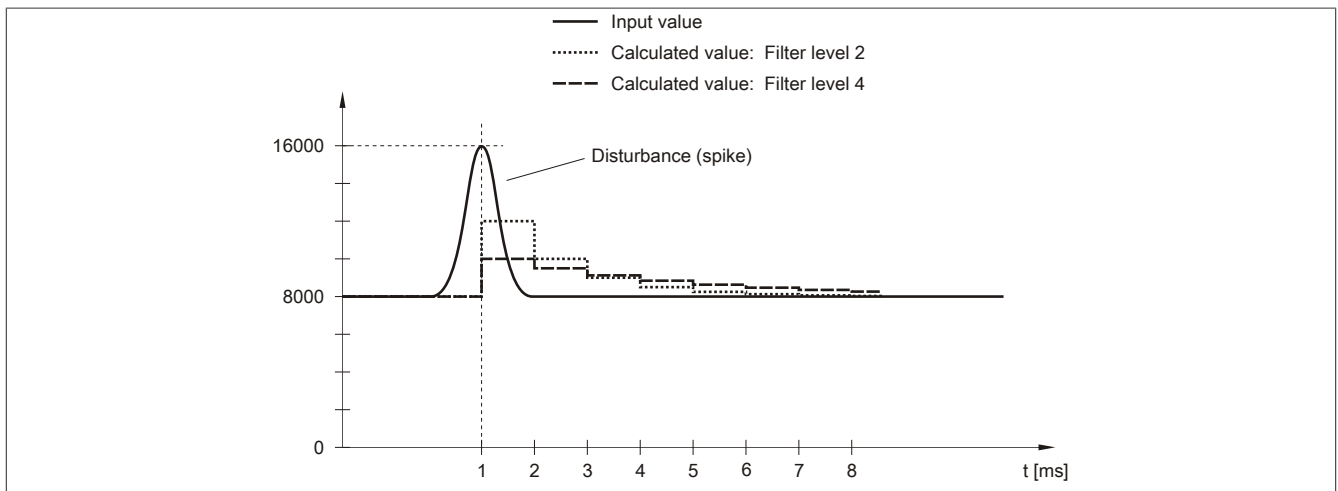


Figure 4: Calculated value during disturbance

3.2 Monitoring the input signal

The input signal is monitored against the upper and lower limit values. These must be defined according to the operating mode:

Limit value (default)	Current signal 0 to 20 mA		Current signal 4 to 20 mA	
Upper maximum limit value	20 mA	+32767 (0x7FFF)	20 mA	+32767 (0x7FFF)
Lower minimum limit value	0 mA	0 (0x0000) ¹⁾	4 mA	0 (0x0000) ²⁾

- 1) The analog value is limited down to 0.
- 2) The analog value is limited down to 0 at currents <4 mA. The status bit for the lower limit is set.

Other limit values can be defined if necessary. The limit values apply to all channels. These are enabled automatically by writing to the limit value registers. From this point on, the analog values will be monitored and limited according to the new limits. The results of monitoring are displayed in the status register.

Examples of limit value settings

Use case	Limit value settings
Current signal: 4 to 20 mA	If values <4 mA should be measured for a current signal with 4 to 20 mA, a negative limit value must be set: 0 mA corresponds to value -8192 (0xE000). When modifying limit values, it is important to ensure that the set limit values apply to all channels in mixed mode.

Limiting the analog value

In addition to the status information, the analog value is fixed to the values listed below by default in an error state. The analog value is limited to the new values if the limit values were changed.

Error state	Digital value on error (default values)
Upper limit value overshoot	+32767 (0x7FFF)
Lower limit value undershoot	-32767 (0x8001)



Information:

The register is described in "[Status of the inputs](#)" on page 18.

3.3 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 18.

4 Commissioning

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).

4.1.1 CAN I/O bus controller

The module occupies 1 analog logical slot on CAN I/O.

5 Register description

5.1 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.

5.2 Function model 0 - Standard

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Configuration						
16	ConfigOutput01 (input filter)	USINT				•
18	ConfigOutput02 (channel type)	USINT				•
20	ConfigOutput03 (lower limit value)	INT				•
22	ConfigOutput04 (upper limit value)	INT				•
Communication						
0	AnalogInput01	INT	•			
2	AnalogInput02	INT	•			
4	AnalogInput03	INT	•			
6	AnalogInput04	INT	•			
30	Status of the inputs	USINT	•			
	UnderflowAnalogInput01	Bit 0				
	OverflowAnalogInput01	Bit 1				
				
	UnderflowAnalogInput04	Bit 6				
	OverflowAnalogInput04	Bit 7				
8192	asy_ModulID	UINT		•		
8196	asy_SupplyStatus	USINT		•		
8208	asy_SupplyInput	USINT		•		

5.3 Function model 254 - Bus controller

Register	Offset ¹⁾	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
16	-	ConfigOutput01 (input filter)	USINT				•
18	-	ConfigOutput02 (channel type)	USINT				•
20	-	ConfigOutput03 (lower limit value)	INT				•
22	-	ConfigOutput04 (upper limit value)	INT				•
Communication							
0	0	AnalogInput01	INT	•			
2	2	AnalogInput02	INT	•			
4	4	AnalogInput03	INT	•			
6	6	AnalogInput04	INT	•			
30	-	Status of the inputs	USINT		•		
		UnderflowAnalogInput01	Bit 1				
		OverflowAnalogInput01	Bit 2				
					
		UnderflowAnalogInput04	Bit 6				
		OverflowAnalogInput04	Bit 7				
8192	-	asy_ModulID	UINT		•		
8196	-	asy_SupplyStatus	USINT		•		
8208	-	asy_SupplyInput	USINT		•		

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

5.4 Analog signal - Configuration

5.4.1 Configuring the input filter

Name:

ConfigOutput01

The filter level and input ramp limiting of the input filter are set in this register.

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

Bit structure:

Bit	Description	Value	Information
0 - 2	Defines the filter level	000	Filter disabled (bus controller default setting)
		001	Filter level 2
		010	Filter level 4
		011	Filter level 8
		100	Filter level 16
		101	Filter level 32
		110	Filter level 64
		111	Filter level 128
3	Reserved	0	
4 - 6	Defines input ramp limiting	000	The input value is applied without limitation (bus controller default setting)
		001	Limit value = 0x3FFF (16383)
		010	Limit value = 0x1FFF (8191)
		011	Limit value = 0x0FFF (4095)
		100	Limit value = 0x07FF (2047)
		101	Limit value = 0x03FF (1023)
		110	Limit value = 0x01FF (511)
		111	Limit value = 0x00FF (255)
7	Reserved	0	

5.4.2 Channel type

Name:

ConfigOutput02

This register is used to define the measurement range of the analog input.

The measurement range 4 to 20 mA is determined by converting the value from the range 0 to 20 mA. 4 mA corresponds to digital value 0x0000; 20 mA corresponds to value 0x7FFF. Due to the conversion (higher range of values), certain digital values never occur.

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

Bit structure:

Bit	Description	Value	Information
0	Channel 1	0	0 to 20 mA (bus controller default setting)
		1	4 to 20 mA
...		...	
3	Channel 4	0	0 to 20 mA (bus controller default setting)
		1	4 to 20 mA
4 - 7	Reserved	0	

5.4.3 Limit values

The input signal is monitored against the upper and lower limit values. These must be defined according to the operating mode.

5.4.3.1 Lower limit value

Name:
ConfigOutput03

The lower limit value for analog values can be set in this register. If the analog value undershoots the limit value, it is frozen at this value and the corresponding error state bit is set.

Data type	Values	Information
INT	-32768 to 32767	Bus controller default setting: -32767



Information:

- For a 0 to 20 mA configuration, this value should be set to 0.
- For a 4 to 20 mA configuration, this value can be set to -8192 (corresponds to 0 mA) in order to display values <4 mA.



Information:

It is important to note that this setting applies to all channels!

5.4.3.2 Upper limit value

Name:
ConfigOutput04

The upper limit value for analog values can be set in this register. If the analog value overshoots the limit value, it is frozen at this value and the corresponding error state bit is set.

Data type	Values	Information
INT	-32768 to 32767	Bus controller default setting: 32767



Information:

Default value 32767 corresponds to the maximum default value at 20 mA.



Information:

It is important to note that this setting applies to all channels!

5.5 Analog signal - Communication

5.5.1 Analog inputs

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

5.5.1.1 Input values of analog inputs

Name:

AnalogInput01 to AnalogInput04

This register contains the analog input value depending on the configured operating mode.

Data type	Values	Input signal:
INT	-8192 to 32767	Current signal 4 to 20 mA
	0 to 32767	Current signal 0 to 20 mA

5.5.1.2 Status of the inputs

Name:

UnderflowAnalogInput01 to UnderflowAnalogInput04

OverflowAnalogInput01 to OverflowAnalogInput04

StatusAnalogInput01 to StatusAnalogInput04

The module inputs are monitored in this register. A change in the monitoring status is actively issued as an error message and, in the event of an error, the analog value is fixed at defined values. For details, see ["Monitoring the input signal" on page 12](#).

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Description	Value	Information
0	UnderflowAnalogInput01	0	No error
		1	Lower limit value undershot
1	OverflowAnalogInput01 StatusAnalogInput01	0	No error
		1	Upper limit value overshoot
...
6	UnderflowAnalogInput04	0	No error
		1	Lower limit value undershot
7	OverflowAnalogInput04 StatusAnalogInput04	0	No error
		1	Upper limit value overshoot

5.5.2 Reading out the module ID

Name:

asy_ModulID

This register offers the possibility to read the module ID.

Data type	Values
UINT	Module ID

5.5.3 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	I/O power supply within/outside warning limits	0	Within the warning limits (18 to 30 V)
		1	Outside the warning limits (<18 V or >30 V)
1 - 7	Reserved	0	

5.5.4 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

5.6 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	
Inputs without filtering	250 μ s
Inputs with filtering	>500 μ s

5.7 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	
Inputs without filtering:	
All channels per bus cycle	400 μ s
2 channels per bus cycle	300 μ s
1 channel per bus cycle	300 μ s
Inputs with filtering	1 ms