

X67AI4850

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
MAEMV	Installation / EMC guide

1.2 Order data


Order number	Short description	Figure
	Analog input modules	
X67AI4850	X67 analog input module, 4 Inputs, potentiometer displacement gauge 14-bit	

Table 1: X67AI4850 - 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 a 4-channel analog input module. It is used to evaluate potentiometer displacement gauges.

Functions:

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

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.

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	X67AI4850
Short description	
I/O module	4 inputs for potentiometer displacement gauge
General information	
B&R ID code	0x9957
Status indicators	Channel status, operating state, module status
Diagnostics	
Module run/error	Yes, using LED status indicator and software
Input	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	
Bus	0.75 W
Internal I/O	2 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
EAC	Yes
KC	Yes
I/O power supply	
Nominal voltage	24 VDC
Voltage range	18 to 30 VDC
Integrated protection	Reverse polarity protection
Potentiometer power supply	
Short-circuit proof	Yes
Potentiometer supply voltage U_{pot}	4.5 V / Max. 50 mA
Voltage drop for short-circuit protection at 50 mA	Max. 0.13 VDC
Potentiometer, displacement gauge	
Input type	Single-ended input in the range of 0 to U_{pot}
Digital converter resolution	15-bit
Measurement sensor	0.5 to 10 k Ω , potentiometer
Conversion time	<200 μ s for all channels
Output format	INT (16-bit 2s complement)
Short-circuit protection U_{pot}	Yes
Influence of cable length	Twisted and shielded conductors, cable length as short as possible, cable routing separate from load circuits, without intermediate terminal to sensor
Common-mode range	0 to U_{pot}
Insulation voltage between input and bus	500 V _{eff}
Quantization; LSB value (14-bit)	275 μ V
Conversion procedure	Sample & Hold
Output of digital value	
Open circuit on GND	0x7FFF
Open circuit on slider	0x7FFF
Open circuit on U_{pot}	0x0000
Valid range of values	0x0000 - 0x7FFF
Input filter	
Cutoff frequency	10 kHz
Slope	60 dB/Dec.
Electrical properties	
Electrical isolation	Bus isolated from analog input
Operating conditions	
Mounting orientation	
Horizontal	Yes
Vertical	Yes
Installation elevation above sea level	
0 to 2000 m	No limitation
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m
Degree of protection per EN 60529	IP67

Table 2: X67AI4850 - Technical data

Order number	X67AI4850
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	195 g
Torque for connections	
M8	Max. 0.4 Nm
M12	Max. 0.6 Nm

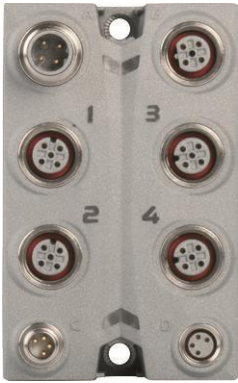
Table 2: X67AI4850 - Technical data

2.2 LED status indicators

Figure	LED	Description																								
 <p>Status indicator 1: Left: Green, Right: Red</p> <p>Status indicator 2: Left: Green, Right: Red</p>	Status indicator 1	<table><tr><td colspan="3">Status indicator for X2X Link</td></tr><tr><th>Green</th><th>Red</th><th>Description</th></tr><tr><td>Off</td><td>Off</td><td>No power supply via X2X Link</td></tr><tr><td>On</td><td>Off</td><td>X2X Link supplied, communication OK</td></tr><tr><td>Off</td><td>On</td><td>X2X Link supplied but no X2X Link communication</td></tr><tr><td>On</td><td>On</td><td>PREOPERATIONAL: X2X Link supplied, module not initialized</td></tr></table>	Status indicator for X2X Link			Green	Red	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						
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Status indicator 2	<table><tr><td colspan="3">Status indicator for module functionality</td></tr><tr><th>LED</th><th>Status</th><th>Description</th></tr><tr><td rowspan="5">Green</td><td>Off</td><td>No power to module</td></tr><tr><td>Single flash</td><td>Mode RESET</td></tr><tr><td>Double flash</td><td>Mode BOOT (during firmware update)¹⁾</td></tr><tr><td>Blinking</td><td>Mode PREOPERATIONAL</td></tr><tr><td>On</td><td>Mode RUN</td></tr><tr><td rowspan="3">Red</td><td>Off</td><td>Module not supplied with power or everything OK</td></tr><tr><td>On</td><td>Error or reset state</td></tr><tr><td>Single flash</td><td>Warning/Error on an I/O channel. Overflow in analog inputs.</td></tr></table>	Status indicator for module functionality			LED	Status	Description	Green	Off	No power to module	Single flash	Mode RESET	Double flash	Mode BOOT (during firmware update) ¹⁾	Blinking	Mode PREOPERATIONAL	On	Mode RUN	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 in analog inputs.	
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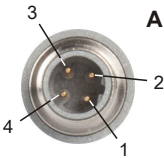
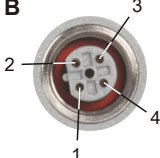
1) Depending on the configuration, a firmware update can take up to several minutes.

2.3 Connection elements

	X2X Link
	Connector A: Input Connector B: Output
	Connections for channel 1 to 4
	I/O power supply 24 VDC
	Connector C: Supply
	Connector D: Routing

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

2.3.2 Pinout

A close-up photograph of a grey metal M12 connector block. It features four circular ports arranged in a 2x2 grid. The ports are labeled with black numbers: '1' and '3' on the top row, and '2' and '4' on the bottom row. Each port has a red seal and a silver-colored contact area. There are also two smaller, unlabeled ports on the left and right sides of the block.

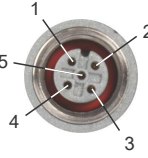
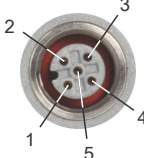
X1 to X4
M12 ①

A diagram of an M12 sensor cable. The cable has a grey braided shield and five internal conductors. The conductors are color-coded: orange, blue, black, black, and grey. The orange conductor is labeled '1', the blue conductor is labeled '2', the first black conductor is labeled '3', the second black conductor is labeled '4', and the grey conductor is labeled '5'. The cable is shown with a grey connector on the left and five individual conductors on the right.

Shield	
1	Potentiometer power supply +
2	AI +
3	GND
4	NC
5	Shield

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

2.3.2.1 Connections X1 to X4

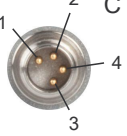
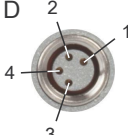
M12, 5-pin	Pinout	
	Pin	Description
	1	Potentiometer power supply +
	2	Slider connection for displacement gauge
	3	Potentiometer power supply GND
	4	NC
	5	Shield ¹⁾
	1) Shielding also provided by threaded insert in the module.	
	X1 to X4 → A-coded (female), input	

2.3.3 I/O power supply 24 VDC

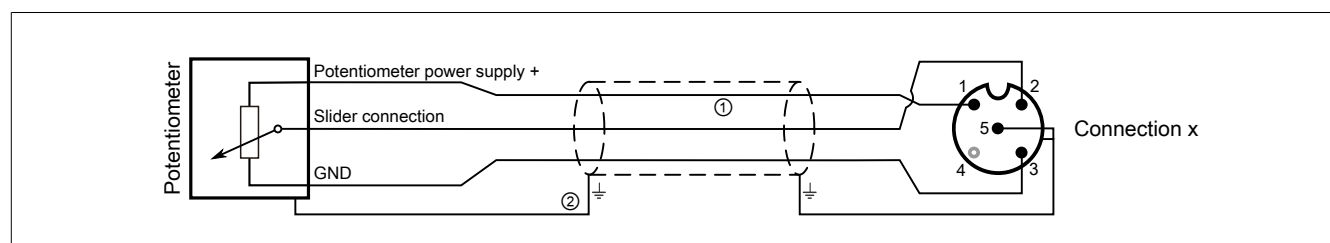
The I/O power supply is connected via M8 connectors C and D. The I/O power supply is connected via connector C (male). Connector D (female) is used to route the I/O power supply to other modules.

Information:

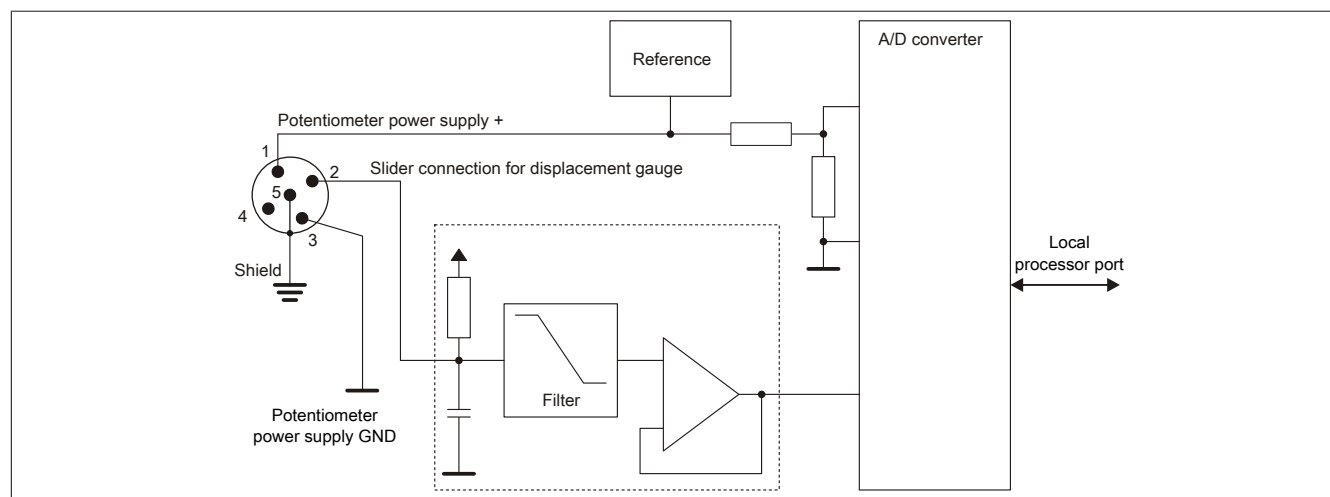
The maximum permissible current for the I/O power supply is 8 A (4 A per connection pin)!

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 Monitoring the input signal

The input signal is monitored against the upper and lower limit values as well as for open circuit.

Limit value (default)	Potentiometer	
Upper maximum limit value	100%	+32767 (0x7FFF)
Lower minimum limit value	0%	0 (0x0)

Information:

The register is described in "[Status of the inputs](#)" on page 8.

3.2 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 limits](#)" on page 8.

4 Register description

4.1 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.

4.2 Function model 0 - Standard

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Communication						
0	AnalogInput01	INT	●			
2	AnalogInput02	INT	●			
4	AnalogInput03	INT	●			
6	AnalogInput04	INT	●			
30	StatusInput01	USINT	●			
8196	ModuleState	USINT		●		

4.3 Function model 254 - Bus controller

Register	Offset ¹⁾	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Communication							
0	0	AnalogInput01	INT	●			
2	2	AnalogInput02	INT	●			
4	4	AnalogInput03	INT	●			
6	6	AnalogInput04	INT	●			
30	-	StatusInput01	USINT		●		
8196	-	ModuleState	USINT		●		

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

4.3.1 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).

4.3.2 CAN I/O bus controller

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

4.4 Analog signal - Communication

4.4.1 Input values of analog inputs

Name:

AnalogInput01 to AnalogInput04

This register contains the analog input value of the potentiometer.

Data type	Values	Input signal:
INT	0 to 32767	0 to 100% of the potentiometer

4.4.2 Status of the inputs

Name:
StatusInput01

The module inputs are monitored in this register. A change in the monitoring status is actively transmitted as an error message. The following states are monitored depending on the settings:

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Description	Value	Information
0 - 1	Channel 1	00	No error
		01	Lower limit value undershot
		10	Upper limit value overshoot
		11	Open circuit
...		...	
6 - 7	Channel 4	00	No error
		01	Lower limit value undershot
		10	Upper limit value overshoot
		11	Open circuit

4.5 Operating limits

Name:
ModuleState

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	

4.6 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
250 µs

4.7 Minimum cycle time

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

Minimum cycle time
250 µs