

X67DC2322

1 General information

The module is equipped with 2 resolver connections as well as 2 digital inputs and outputs for each. It is possible to evaluate BRX and BRT resolvers using a configurable sine gain of 1 or 0.25.

- 2 resolvers
- BRX/BRT evaluation
- 2 digital inputs and outputs for each

2 Order data


Model number	Short description	Figure
	Multi-function	
X67DC2322	X67 resolver module, 2x 14-bit resolver input BRX/BRT, 2 digital inputs, 24 VDC, sink, 2 digital outputs, 0.5 A, source	

Table 1: X67DC2322 - Order data

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

3 Technical data

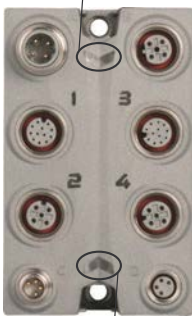
Model number	X67DC2322
Short description	
I/O module	2 resolver inputs, 2 digital inputs, 2 digital outputs
General information	
B&R ID code	0xA5C7
Status indicators	I/O function for each channel, supply voltage, bus function
Diagnostics	
Outputs	Yes, using status LED and software
I/O power supply	Yes, using status LED and software
Connection type	
X2X Link	M12, B-keyed
Inputs/Outputs	M12, A-keyed
Encoder	M12, 12-pin, A-keyed
I/O power supply	M8, 4-pin
Power consumption	
Internal I/O	1 W
X2X Link power supply	0.75 W
Additional power dissipation caused by actuators (resistive) [W]	12.5 W
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
Resolver inputs	
Quantity	2
Reference output	
Output voltage	Typ. 4.4 V _{Eff}
Output current	Max. 50 mA _{Eff}
Frequency	10 kHz
Type	Differential
Angular position resolution	14-bit
Short-circuit protection (reference output)	Yes
Input impedance	10.4 kΩ - j*11.1 kΩ
Resolver type	BRX / BRT
Resolver transformation ratio	
BRX	0.5 (±10%)
BRT	1 (±10%)
I/O power supply	
Nominal voltage	24 VDC
Voltage range	18 to 30 VDC
Digital inputs	
Quantity	2
Nominal voltage	24 VDC
Input current at 24 VDC	Typ. 5 mA
Input filter	
Hardware	≤20 μs
Software	-
Input circuit	Sink
Sensor power supply	0.5 A summation current
Input delay	<1 ms
Switching threshold	
Low	<5 V
High	>15 V
Digital outputs	
Quantity	2
Nominal voltage	24 VDC
Nominal output current	0.5 A
Total nominal current	1 A
Output circuit	Source
Output protection	Thermal cutoff for overcurrent and short circuit, integrated protection for switching inductances, reverse polarity protection for output power supply

Table 2: X67DC2322 - Technical data

Model number	X67DC2322
Switching delay	
0 → 1	Max. 500 µs
1 → 0	Max. 500 µs
Switching frequency	
Resistive load	Max. 100 Hz
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 limitations
>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	200 g
Torque for connections	
M8	Max. 0.4 Nm
M12	Max. 0.6 Nm


Table 2: X67DC2322 - Technical data

4 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><th colspan="3">Status indicator for X2X Link</th></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 X2X Link communication not functioning</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 X2X Link communication not functioning	On	On	PREOPERATIONAL: X2X Link supplied, module not initialized			
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	1, 3	<table><tr><th colspan="3">Status indicator for corresponding resolver input (green)</th></tr><tr><th>LED</th><th>Status</th><th>Description</th></tr><tr><td rowspan="3">Green</td><td>Off</td><td>Open circuit or resolver not connected</td></tr><tr><td>On</td><td>Resolver connected, everything OK</td></tr><tr><td>Blinking</td><td>Axis in movement</td></tr></table>	Status indicator for corresponding resolver input (green)			LED	Status	Description	Green	Off	Open circuit or resolver not connected	On	Resolver connected, everything OK	Blinking	Axis in movement								
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2, 4	<table><tr><th colspan="3">Status indicator for corresponding digital input/output</th></tr><tr><th>LED</th><th>Status</th><th>Description</th></tr><tr><td rowspan="2">Green</td><td>Off</td><td>Digital input switched off</td></tr><tr><td>On</td><td>Digital input switched on</td></tr><tr><td rowspan="2">Orange</td><td>Off</td><td>Digital output switched off</td></tr><tr><td>On</td><td>Digital input switched on</td></tr></table>	Status indicator for corresponding digital input/output			LED	Status	Description	Green	Off	Digital input switched off	On	Digital input switched on	Orange	Off	Digital output switched off	On	Digital input switched on						
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LED	Status	Description																					
Green	Off	Digital input switched off																					
	On	Digital input switched on																					
Orange	Off	Digital output switched off																					
	On	Digital input switched on																					
Status indicator 2	<table><tr><th colspan="3">Status indicator for module function</th></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>RESET mode</td></tr><tr><td>Double flash</td><td>BOOT mode (during firmware update)¹⁾</td></tr><tr><td>Blinking</td><td>PREOPERATIONAL mode</td></tr><tr><td>On</td><td>RUN mode</td></tr><tr><td rowspan="2">Red</td><td>Off</td><td>No power to module or everything OK</td></tr><tr><td>On</td><td>Error or reset status</td></tr></table>	Status indicator for module function			LED	Status	Description	Green	Off	No power to module	Single flash	RESET mode	Double flash	BOOT mode (during firmware update) ¹⁾	Blinking	PREOPERATIONAL mode	On	RUN mode	Red	Off	No power to module or everything OK	On	Error or reset status
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	On	RUN mode																					
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1) Depending on the configuration, a firmware update can take up to several minutes.

5 Connection elements



X2X Link
Connector A: Input
Connector B: Output


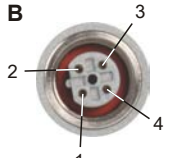
Resolver inputs 1 to 2

Digital inputs/outputs 1 to 2

24 VDC I/O power supply
Connector C: Supply
Connector D: Pass through

6 X2X Link

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

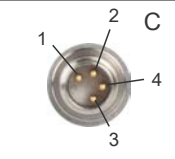
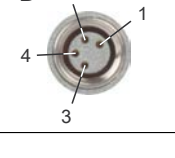
Connection	Pinout	
	Pin	Description
	1	X2X+
	2	X2X
	3	X2X _L
	4	X2X _N
Shield connection made via threaded insert in the module.		
		
	A → B-keyed (male), input B → B-keyed (female), output	

7 24 VDC I/O power supply

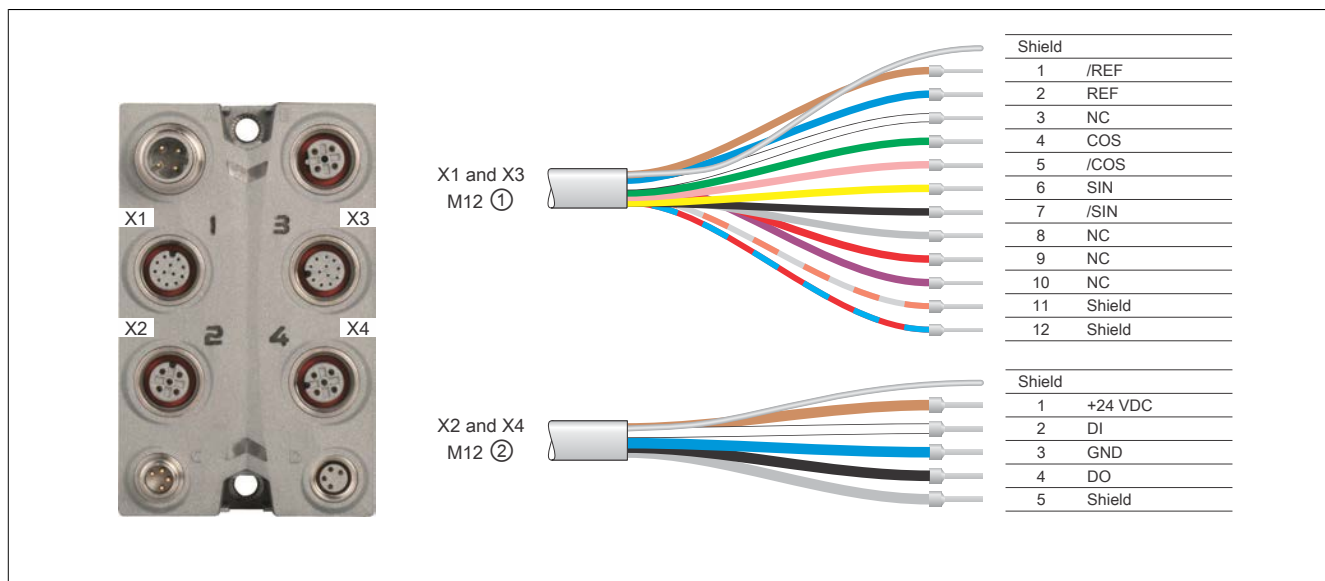
The I/O power supply is connected via M8 connectors C and D. The I/O power supply is connected via connector C (male). Connector D (female) is used to route the I/O power supply to other modules.

Information:

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

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

8 Pinout



- ① X67CA0I41.xxxx: Straight multi-function cable
 X67CA0I51.xxxx: Angled multi-function cable
 ② X67CA0A41.xxxx: M12 straight sensor cable
 X67CA0A51.xxxx: M12 angled sensor cable

8.1 Connection X1 and X3

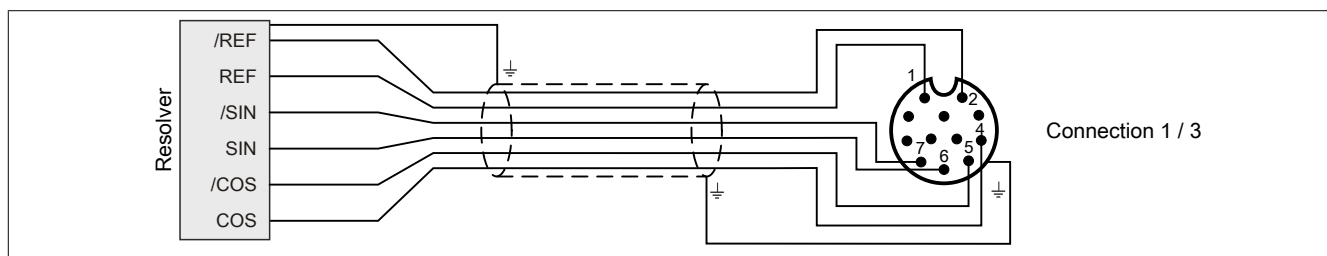
M12, 12-pin		Pinout	
Connection 1		Pin	Name
		1	Ref
		2	/Ref
		3	Not connected
		4	Cos
		5	/Cos
		6	Sin
		7	/Sin
		8 - 10	Not connected
		11 - 12	Shield ¹⁾
		1) Shielding also provided by threaded insert in the module.	
		X1 and X3 → A-keyed (female), input/output	
Connection 3			

8.2 Connection X2 and X4

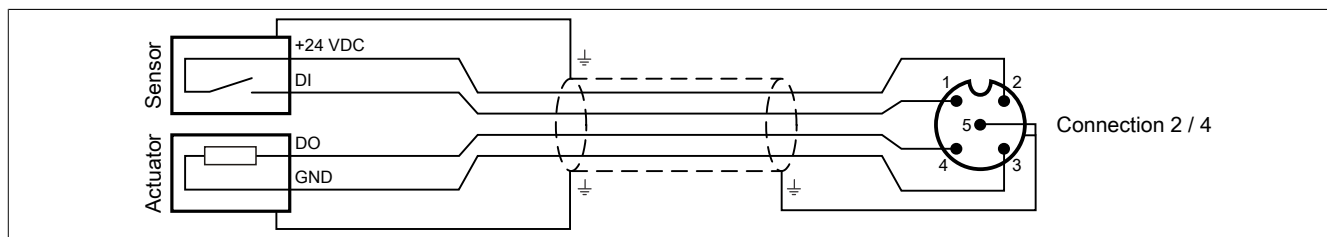
M12 - 5-pin		Pinout	
Connection 2		Pin	Name
		1	24 VDC sensor supply
		2	Digital input
		3	GND
		4	Digital output
		5	Shield ¹⁾
		1) Shielding also provided by threaded insert in the module.	
Connection 4		X2 and X4 → A-keyed (female), input/output	

9 Connection examples

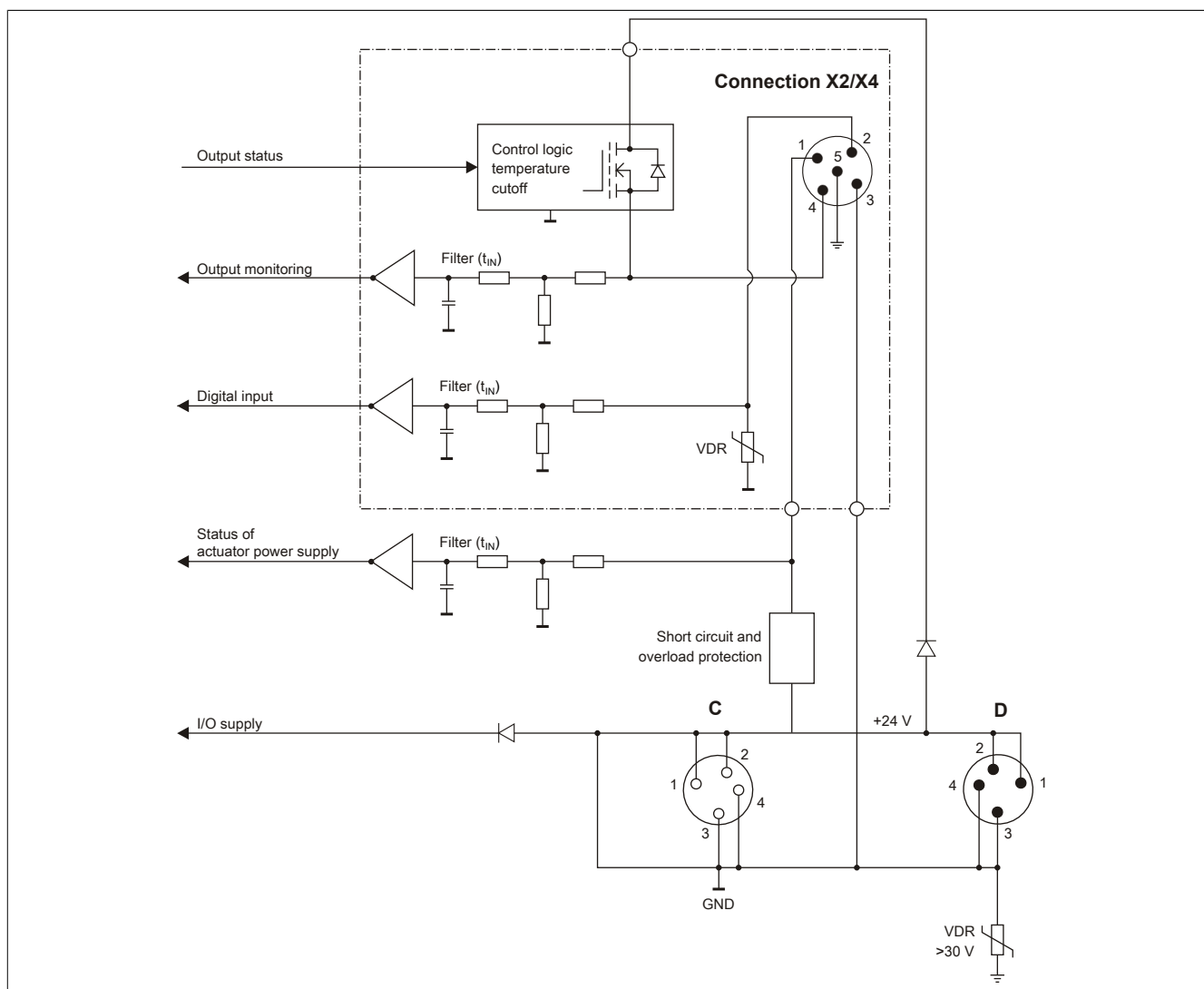
Example X1 and X3



Example X2 and X4



10 Input/Output circuit diagram



11 Note when using long cables

Information:

If the stator winding exhibits high inductance, this can cause problems when using long cables.

In this case, the inductance of the stator winding and capacitance of the cable can result in an oscillating circuit. The oscillating circuit expands the voltage signal beyond the permitted measurement limits. This causes the module to indicate a resolver fault.

12 Register description

12.1 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.

12.2 Function model 0 - Standard

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Configuration						
36	ConfigurationResolver1	UINT				•
44	ConfigurationResolver2	UINT				•
32	ZeroPositionResolver1	DINT				•
40	ZeroPositionResolver2	DINT				•
Communication						
0	Control01	USINT			•	
	EnableTriggerCnt01	Bit 0				
	EnableReferencing01	Bit 1				
	DigitalOutput01	Bit 2				
2	Control02	USINT			•	
	EnableTriggerCnt02	Bit 0				
	EnableReferencing02	Bit 1				
	DigitalOutput02	Bit 2				
6	Status01	USINT	•			
	ResolverError01	Bit 0				
	ErrPosition01	Bit 1				
	DigitalInput01	Bit 4				
	DOReadback01	Bit 5				
14	Status02	USINT	•			
	ResolverError02	Bit 0				
	ErrPosition02	Bit 1				
	DigitalInput02	Bit 4				
	DOReadback02	Bit 5				
0	PosVal01	DINT	•			
8	PosVal02	DINT	•			
4	PosTime01	INT	•			
12	PosTime02	INT	•			
16	TriggerTime01	INT	•			
20	TriggerTime02	INT	•			
18	TriggerCnt01	SINT	•			
22	TriggerCnt02	SINT	•			

12.3 Function model 254 - Bus controller

Register	Offset ¹⁾	Name	Data type	Read		Write	
				Cyclic	Acyclic	Cyclic	Acyclic
Configuration							
36	-	ConfigurationResolver1	UINT				•
44	-	ConfigurationResolver2	UINT				•
32	-	ZeroPositionResolver1	DINT				•
40	-	ZeroPositionResolver2	DINT				•
Communication							
0	0	Control01	USINT			•	
		EnableTriggerCnt01	Bit 0				
		EnableReferencing01	Bit 1				
		DigitalOutput01	Bit 2				
2	2	Control02	USINT			•	
		EnableTriggerCnt02	Bit 0				
		EnableReferencing02	Bit 1				
		DigitalOutput02	Bit 2				
6	6	Status01	USINT	•			
		ResolverError01	Bit 0				
		ErrPosition01	Bit 1				
		DigitalInput01	Bit 4				
		DOReadback01	Bit 5				
14	14	Status02	USINT	•			
		ResolverError02	Bit 0				
		ErrPosition02	Bit 1				
		DigitalInput02	Bit 4				
		DOReadback02	Bit 5				
0	0	PosVal01	DINT	•			
8	8	PosVal02	DINT	•			
4	4	PosTime01	INT	•			
12	12	PosTime02	INT	•			

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

12.3.1 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 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).

12.3.2 CAN I/O bus controller

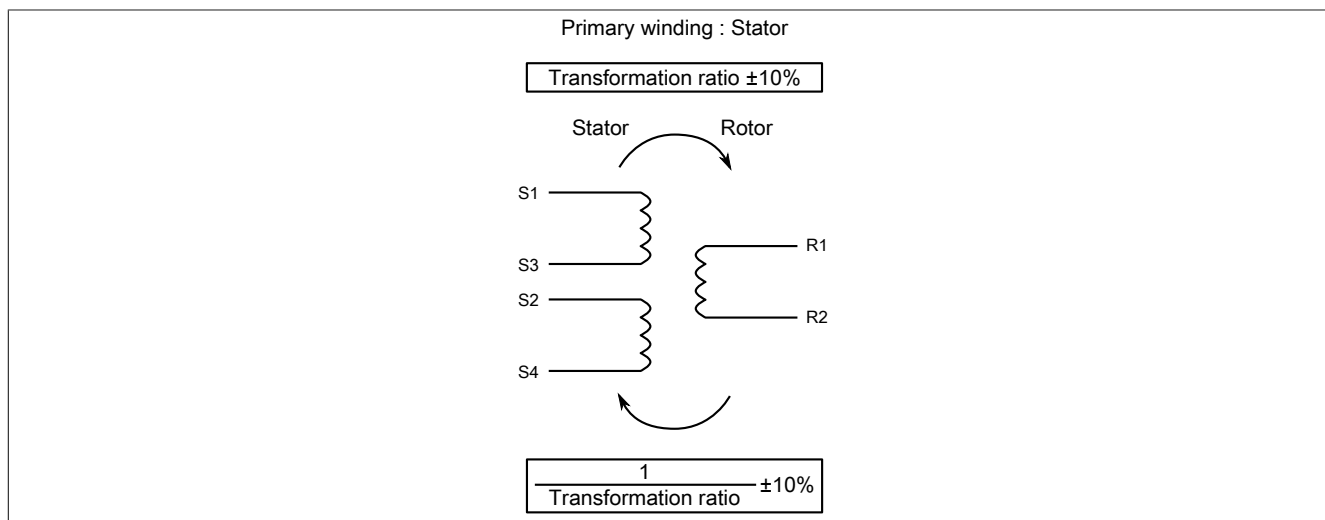
The module occupies 2 analog logical slots on CAN I/O.

12.4 Configuration

12.4.1 BRT resolver transformation ratio

A BRT resolver is usually supplied with 2 sine signals. The signal on the output of the rotor is measured to calculate the angle of rotation of the axis (primary winding = stator).

In order to use a BRT resolver with this module that only provides 1 sine signal, the resolver must be inverted. The sine signal is fed into the rotor winding (R1 and R2), and the 2 stator signals are measured in order to calculate the angle of rotation of the axis. In this case, the transformation ratio is also inverted.



The module works with resolvers that have a transformation ratio of 1.

$$\frac{1}{1 \pm 10\%} = \pm 10\%$$

With inversion, it is also possible to use resolvers with the primary stator winding and a transformation ratio of 2 ±10%. In this case, a transformation ratio of 0.5 must be configured in the BRX configuration.

$$\frac{1}{2 \pm 10\%} = 0.5 \pm 10\%$$

Primary winding	Transformation ratio according to data sheet	Configuration in Automation Studio
Rotor	0.5 ±10%	BRX
Rotor	1.0 ±10%	BRT
Stator	1.0 ±10%	BRT
Stator	2.0 ±10%	BRX

12.4.2 Resolver configuration

Name:

ConfigurationResolver01 to ConfigurationResolver02

The resolvers can be configured in these registers.

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

Bit structure:

Bit	Description	Value	Information
0 - 1	Trigger mode ¹⁾	00	No trigger (bus controller default setting)
		01	On rising edge of digital input
		10	On falling edge of digital input
		11	On rising and falling edge of digital input
2 - 3	Homing mode Set null position of register PosVal0x	00	No homing (bus controller default setting)
		01	On rising edge
		10	On falling edge
		11	Immediately if EnableReferencing0x = 1
4	Resolver type	0	BRX (bus controller default setting)
		1	BRT
5 - 15	Reserved	0	

1) The trigger mode must be 0 in function model "254 - Bus controller".

12.4.3 Defining the zero position

Name:

ZeroPositionResolver1 to ZeroPositionResolver2

The zero position of the resolver can be defined in this register. There are two possibilities for this:

- Edge event on the digital input. See register "[ConfigurationResolver0x](#)" on page 10.
- Setting the zero position directly. See bit 1 of register "[Control0x](#)" on page 11.

Data type	Values	Information
DINT	-2,147,483,648 to 2,147,483,647	Bus controller default setting: 0

12.5 Communication

12.5.1 Status of the resolver and digital inputs/outputs

Name:

Status01 to Status02

ResolverError01 to ResolverError02

ErrPosition01 to ErrPosition02

DigitalInput01 to DigitalInput02

DORedback01 to DORedback02

The status of the resolvers and digital inputs/outputs can be read out in this register.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Description	Value	Information
0	ResolverError0x	0	No error
		1	Open circuit or resolver not connected ¹⁾
1	ErrPosition0x	0	No error
		1	Resolver not yet initialized ¹⁾
2 - 3	Reserved	0	
4	DigitalInput0x	0	Input not set
		1	Input set
5	DORedback0x	0	Output not set
		1	Output set
6 - 7	Reserved	0	

1) No update of registers "[Trigger counter](#)" on page 12 and "[Trigger time](#)" on page 12

12.5.2 Setting the resolver/trigger configuration and digital outputs

Name:

Control01 to Control02

EnableTriggerCnt01 to EnableTriggerCnt02

EnableReferencing01 to EnableReferencing02

DigitalOutput01 to DigitalOutput02

The digital outputs, resolver homing and the mode of the trigger counter can be set in this register.

Data type	Values
USINT	See the bit structure.

Bit structure:

Bit	Description	Value	Information
0	EnableTriggerCnt0x ¹⁾	0	" Trigger counter " on page 12 and " Trigger time " on page 12 are set to 0.
		1	Trigger mode corresponds to bits 0 to 1 of register " Resolver configuration " on page 10.
1	EnableReferencing0x	0	Disabled
		1	Sets the zero position
2	DigitalOutput0x	0	Digital output not set
		1	Digital output set
3 - 7	Reserved	0	

1) In function model "254 - Bus controller", the value must be equal to 0.

12.5.3 Resolver timestamp

Name:

PosTime01 to PosTime02

The timestamp (X2X system time) of the last measurement of the resolver position is indicated in this register.

This register can be hidden in the Automation Studio I/O mapping in order to reduce the X2X Link load.

Data type	Values
INT	-32768 to 32767

12.5.4 Resolver position

Name:

PosVal01 to PosVal02

The current position of the resolver is indicated in this register.

- The high word contains the number of revolutions.
- The low word contains the position within a revolution.

Datentyp	Werte
DINT	-2.147.483.648 bis 2.147.483.647

12.5.5 Trigger counter

Name:

TriggerCnt01 to TriggerCnt02

The counter in this register is increased on every occurrence of a trigger event.

Data type	Values
SINT	-128 to 127

12.5.6 Trigger time

Name:

TriggerTime01 to TriggerTime02

The system time of the last trigger event is indicated in this register.

Data type	Values
INT	-32768 to 32767

12.6 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
250 µs