

AH EN AXL E CABLE / WIRING

Wiring of Axioline E devices

Application note
108441_en_02

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1 Description

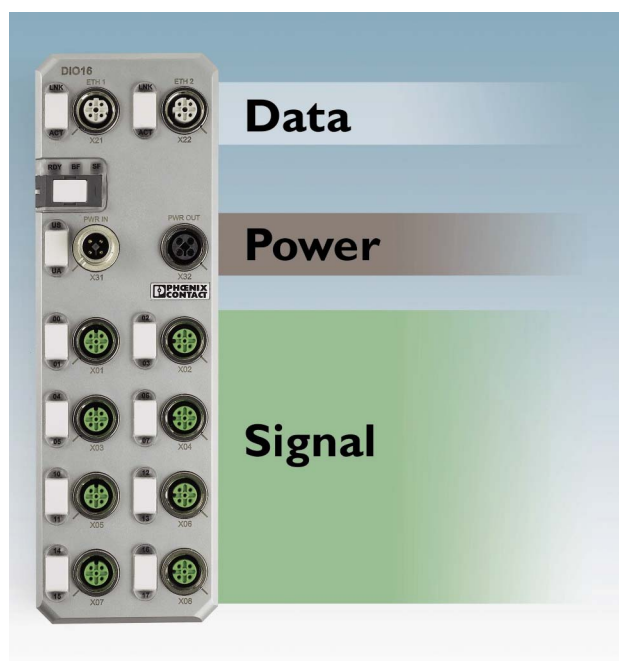
This user guide describes various cable types that you can use with devices of the Axioline E product group.

Cable types are considered for the following interfaces:

- Network
- Power supply
- Periphery
 - IO connections
 - IO-Link ports

You will also find information about the connections on the Axioline E devices and their pin assignments.

In addition, you will find a list of accessories for Axioline E devices.



Phoenix Contact offers the complete range of cables for the Axioline E product group and recommends the use of pre-assembled cables.

Further information on the cables can be found in the Phoenix Contact catalogs.

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2 Network wiring

Phoenix Contact offers the complete range of network cables for the product group Axioline E. The connection of network is carried out via screw-on M12 plug connectors.

The use of Axioline E devices is possible in the following networks:

2.1 Network wiring of the ethernet-based Axioline E devices (PROFINET / EtherCAT® / Ethernet / EtherNet/IP™ / Sercos)

The network connections of the ethernet-based Axioline E devices are identical. Only the Axioline E EtherCAT® devices differ in their **labeling**.

2.1.1 Network connection PROFINET / Ethernet / EtherNet/IP™ / Sercos

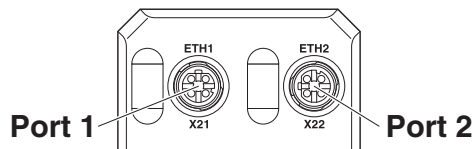


Figure 1 Network connection of the ethernet-based Axioline E devices, D coded

Designation	Meaning
Port 1 (X21)	Ethernet port 1
Port 2 (X22)	Ethernet port 2

2.1.2 Network connection EtherCAT®

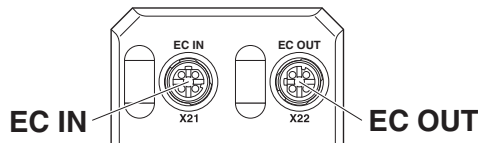


Figure 2 Network connection of the Axioline E EtherCAT® devices, D coded

Designation	Meaning
EC IN (X21)	EtherCAT® IN
EC OUT (X22)	EtherCAT® OUT

2.1.3 Pin assignment of the Network connection of the ethernet-based Axioline E devices

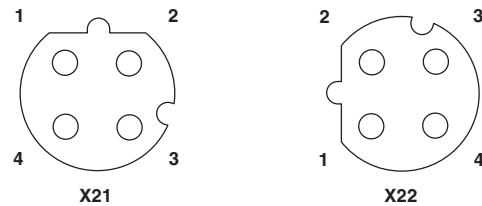


Figure 3 Pin-assignment network connection, D coded

Pin	X21	X22
	Ethernet port 1	Ethernet port 2
	EC IN	EC OUT
1	TX+	TX+
2	RX+	RX+
3	TX-	TX-
4	RX-	RX-

2.1.4 Network cable for PROFINET and EtherCAT®

For PROFINET/EtherCAT® you can order the following cable types.

Description	Cable length	Order No.	Pcs./Pkt.	Figure
Network cable, M12 male, straight, shielded, free cable end	1 m	1407495	1	
	2 m	1407496	1	
	5 m	1407497	1	
	10 m	1407498	1	
	15 m	1524336	1	
Network cable, M12 socket, straight, shielded, free cable end	1 m	1407528	1	
	2 m	1407529	1	
	5 m	1407530	1	
	10 m	1407531	1	
Network cable, M12 male, straight, shielded, M12 socket, straight, shielded	1 m	1407553	1	
	2 m	1407554	1	
	5 m	1407555	1	
	10 m	1407556	1	
Network cable, M12 male, straight, shielded, M12 male, straight, shielded	0.3 m	1524349	1	
	0.5 m	1524352	1	
	1 m	1407524	1	

2.1.5 Network cable for Ethernet and EtherNet/IP™

For Ethernet and EtherNet/IP™ you can order the following cable types.

Description	Cable length	Order No.	Pcs./Pkt.	Figure
Network cable, M12 male, straight, shielded, free cable end	1 m	1407356	1	
	2 m	1407357	1	
	5 m	1407358	1	
	10 m	1407359	1	
	15 m	1569427	1	
Network cable, M12 socket, straight, shielded, free cable end	1 m	1407380	1	
	2 m	1407381	1	
	5 m	1407382	1	
	10 m	1407383	1	
Network cable, M12 male, straight, shielded, M12 socket, straight, shielded	1 m	1407400	1	
	2 m	1407401	1	
	5 m	1407402	1	
	10 m	1407403	1	
Network cable, M12 male, straight, shielded, M12 male, straight, shielded	0.5 m	1569443	1	
	1 m	1407376	1	
	2 m	1407377	1	
	5 m	1407378	1	
	10 m	1407379	1	

2.1.6 Network cable for Sercos

For Sercos you can order the following cable types.

Description	Cable length	Order No.	Pcs./Pkt.	Figure
Network cable, M12 male, straight, shielded, free cable end	2 m	1419172	1	 
Network cable, M12 male, straight, shielded, on plug straight RJ45	2 m	1419168	1	
Network cable, M12 male, straight, shielded, M12 male, straight, shielded	2 m	1419169	1	

2.2 Network wiring for PROFIBUS

2.2.1 Network connection PROFIBUS

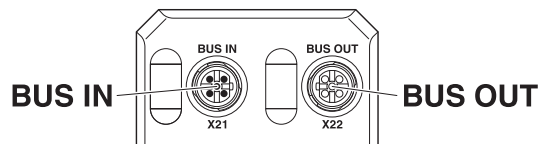


Figure 4 Network connection of the Axiline E PROFIBUS devices

Description	Meaning
BUS IN (X21)	PROFIBUS IN
BUS OUT (X22)	PROFIBUS OUT

2.2.2 PROFIBUS pin assignment

The bus is connected via two B-coded M12 connectors. The incoming bus (IN) is a connector and the outgoing bus (OUT) is a socket.

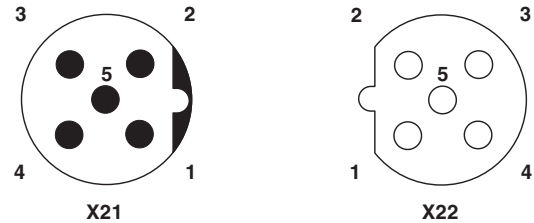


Figure 5 PROFIBUS pin assignment, B-coded

Pin	Signal	Specifikation	Description
1	VP	V	5 V termination resistor
2	RxD / TxD-N (A)	A, RS-485, PD	Inverted bus cable
3	DGND	V	0 V
4	RxD / TxD-P (B)	B, RS-485, PU	Non-inverted bus cable
5	Not connected	-	-

A	=	A line
B	=	B line
RS-485	=	RS-485 level, bidirectional
V	=	Power supply
PU	=	Pullup
PD	=	Pulldown

2.2.3 Network cable for PROFIBUS

For PROFIBUS you can order the following cable types.

Description	Cable length	Order No.	Pcs./Pkt.	Figure
Network cable, M12 male, straight, shielded, free cable end	2 m	1518025	1	 
	5 m	1518038	1	
	10 m	1518041	1	
	15 m	1518054	1	
Network cable, M12 socket, straight, shielded, free cable end	2 m	1518067	1	
	5 m	1518070	1	
	10 m	1518083	1	
	15 m	1518096	1	
Network cable, M12 male, straight, shielded, M12 socket, straight, shielded	0.3 m	1518106	1	
	0.5 m	1518119	1	
	1 m	1518122	1	
	2 m	1518135	1	
	5 m	1518148	1	
	10 m	1518151	1	
	15 m	1518164	1	

2.2.4 Accessories for PROFIBUS

For PROFIBUS the following accessories are offered.

Description	Order No.	Pcs./Pkt.	Figure
T distributor PROFIBUS DP (12 Mbps), 5-positions, shielded, Socket straight M12, B-coded, on connector straight M12, B-coded and connector straight M12, B-coded, Thread M12 connector input not rotatable	1424713	1	
T distributor PROFIBUS DP (12 Mbps), 5-positions, shielded, Socket straight M12, B-coded, on connector straight M12, B-coded and connector straight M12, B-coded,	1424711		
Termination resistor, PROFIBUS M12	1507803	1	
			

3 Power supply (Power cable)

The power supply is connected via screw-on M12 connectors. The connections are identical for all AxioLine E master.

3.1 Power supply connections

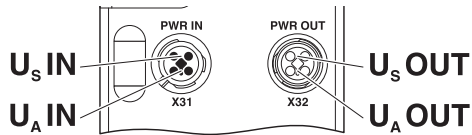


Figure 6 Power supply connections

Description	Meaning
U _S IN (X31)	Power supply IN (logic and sensors)
U _A IN (X31)	Power supply IN (actuators)
U _S OUT (X32)	Power supply OUT for additional devices
U _A OUT (X32)	Power supply OUT for additional devices

3.2 Pin assignment of the power supply U_S/U_A

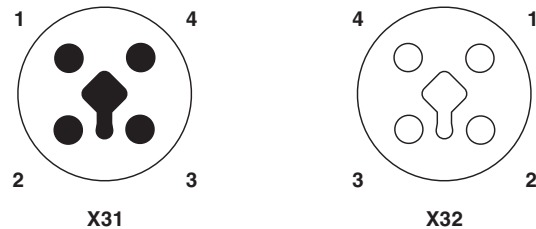


Figure 7 Pin assignment of the power supply, T-coded

Pin	IN	OUT	Conductor colors
1	+24 V DC (U _S)	+24 V DC (U _S)	Brown
2	GND (U _A)	GND (U _A)	White
3	GND (U _S)	GND (U _S)	Blue
4	+24 V DC (U _A)	+24 V DC (U _A)	Black



Make sure that the power supply U_A and the power supply U_S of two independent connected, electrically isolated power supplies takes place.

3.3 M12-SPEEDCON Power cable

To connect the supply voltages, the following cable types can be ordered for the Axioline E devices.

M12-SPEEDCON Power cable
4-positions, T-coded
Cable type: PUR

Free cable end

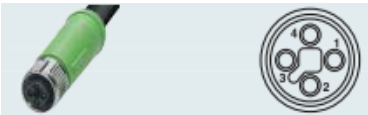


M12 connector, straight



M12 connector, angled



Description	Cable length	Order No.	Cable length	Order No.	Cable length	Order No.
Free cable end 			1 m	1408812	1 m	1408816
			2 m	1408813	2 m	1408819
			5 m	1408814	5 m	1408820
			10 m	1408815	10 m	1408822
M12 socket, straight 	1 m	1408823	1 m	1408808		
	2 m	1408824	2 m	1408809		
	5 m	1408825	5 m	1408810		
	10 m	1408826	10 m	1408811		
M12 socket, angled 	1 m	1408827			1 m	145196
	2 m	1408828			2 m	145197
	5 m	1408829			5 m	145198
	10 m	1408830			10 m	145199

4 Connection of the periphery

The connection of inputs and outputs is executed via M12 screw connectors.

4.1 Digital IO connections

Depending on the device variant, there are 8 sockets for inputs and outputs on the Axioline E devices.

4.1.1 Connection of the inputs and outputs

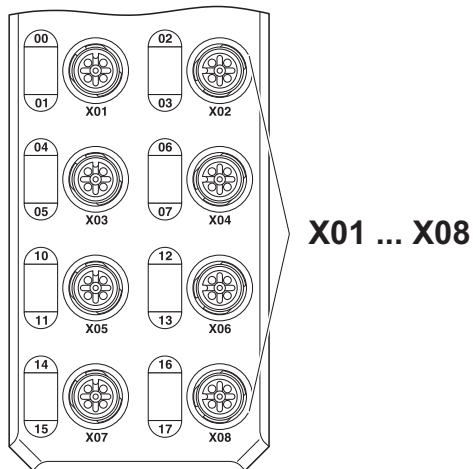


Figure 8 Connections of the inputs and outputs depending on the device variant

Description	Meaning
X01 ... X08	Inputs / outputs

4.1.2 Pin assignment of the inputs and outputs

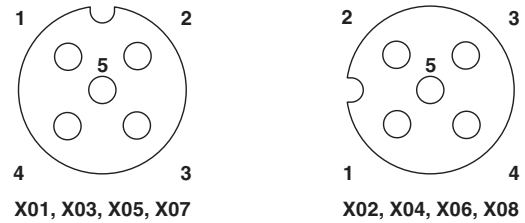


Figure 9 Pin assignment of the inputs and outputs, A-coded

Pin	Socket
1	+24 V DC (U_S)
2	Input / output
3	GND
4	Input / output
5	FE

4.1.3 M12-SAC cable (5-positions with FE)

To connect actuators and sensors, the following cable types can be ordered for the Axioline E devices.

M12 SAC cable
5-positions, A-coded
Cable type: PUR

Free cable end

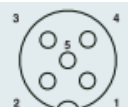


M12 connector straight



M12 connector, angled



Description	Cable length	Order No.	Cable length	Order No.	Cable length	Order No.
Free cable end 			1.5 m	1669767	1.5 m	1669796
			3 m	1669770	3 m	1669806
			5 m	1669783	5 m	1669819
			10 m	1683361	10 m	1694460
			Variable	1697098	Variable	1697108
M12 socket, straight  	1.5 m	1669822	0.3 m	1681583		
	3 m	1669835	0.6 m	1681596		
	5 m	1669848	1.5 m	1681606		
	10 m	1694541	3 m	1681619		
	Variable	1697124	Variable	1697140	Variable	1508734
M12 socket, angled  	1.5 m	1669851	0.3 m	1681622		
	3 m	1669864	0.6 m	1681635		
	5 m	1669877	1.5 m	1681648		
	10 m	1694541	3 m	1681651		
	Variable	1697124	Variable	1697153	Variable	1529506

4.1.4 M12-SAC cable (4-positions without FE)

To connect actuators and sensors, the following cable types can be ordered for the Axioline E devices.

M12-SAC cable
4-positions shielded, A-coded
Cable type: PUR

Free cable end

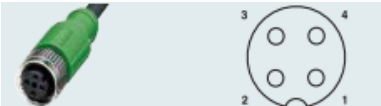


M12 connector, straight
360 °C shielded



M12 connector, angled
360 °C shielded



Description	Cable length	Order No.	Cable length	Order No.	Cable length	Order No.
Free cable end 			1.5 m	1682715	1.5 m	1682870
			3 m	1682618	3 m	1682883
			5 m	1682647	5 m	1682896
			10 m	1694389	10 m	1500703
			Variable	1697467	Variable	1697470
M12 socket, straight, 360 °C shielded 	1.5 m	1682841	0.3 m	1500842		
	3 m	1682854	0.6 m	1500855		
	5 m	1682867	1.5 m	1500868		
	10 m	1500716	3 m	1500871		
	Variable	1697483	Variable	1536081	Variable	1536104
M12 socket, angled, 360 °C shielded 	1.5 m	1682906	0.3 m	1500965		
	3 m	1682919	0.6 m	1500978		
	5 m	1682922	1.5 m	1500981		
	10 m	1500729	3 m	1500994		
	Variable	1697496	Variable	1536094	Variable	1536117

4.1.5 Y cable

If both signals are to run in one cable, use a 5-pin cable.

- Pin 2: straight inputs and outputs
- Pin 4: odd inputs and outputs

Use a Y cable if both signals are to be in separate cables.

Pin assignment of the inputs and outputs

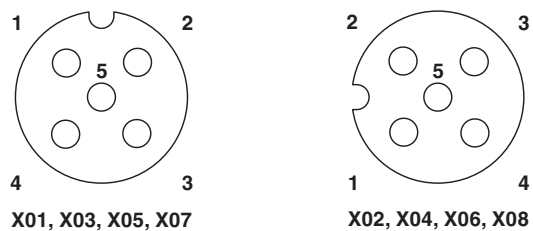


Bild 10 Pin-assignment of the inputs and outputs, A-coded

Pin	Socket
1	+24 V DC (U_S)
2	Input / output
3	GND
4	Input / output
5	FE

Description	Cable length	Order No	Pcs./Pkt.	Figure
Sensor / actuator cable SAC-3P-Y-2XFS SCO/.../... 3-positions, variable cable type, Connector straight M12 SPEEDCON, A-coded, on socket straight M12 SPEEDCON, A-coded and socket straight M12 SPEEDCON	Free input (0.2 m ... 40.0 m)	1542198	1	
Sensor/actuator cable, SAC-3P-Y-2XFS B SCO/.../... 3-position, variable cable type, connector straight M12 SPEEDCON, A-coded, on Socket straight M12 SPEEDCON, A-coded, PIN 2+4 bridged and Socket straight M12 SPEEDCON, PIN 2+4 bridged,	Free input (0.2 m ... 40.0 m)	1542169	1	
Y distributor SAC-3P-Y-2XFS B PE SCO 4-position, connector straight M12 SPEEDCON, A-coded, on Socket straight M12 SPEEDCON, A-coded, PIN 2+4 bridged and Socket straight M12 SPEEDCON, A-coded, PIN 2+4 bridged, Thread M12 socket not rota- table		1523968	5	
Y distributor, SAC-3P-M12Y/2XM12FS PE /.../..., 4-position, unshielded, Plug straight M12, A-coded, on Socket straight M12, A-coded and Socket straight M12, A-coded		1683455	5	
Y distributor, SAC-3P-M12Y/2XM12FS PE S21, 4-position, unshielded, Plug straight M12, A-coded, on Socket straight M12, A-coded and Socket straight M12, A-coded		1511789	5	

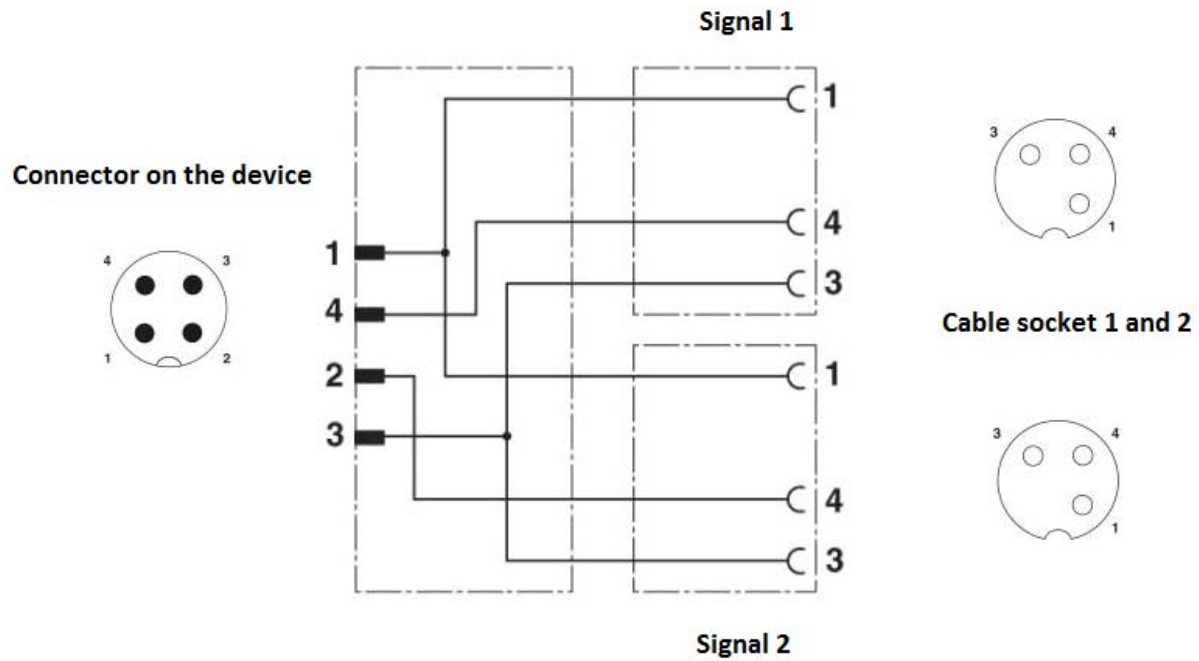


Figure 11 Circuit diagram for Sensor / actuator cable, SAC-3P-Y-2XFS SCO/.../...

4.2 IO-Link ports

The Axioline E-IO-Link master has 8 IO-Link ports. It enables the operation of up to eight IO-Link sensors/actuators and is also used to acquire digital signals.

4.2.1 Connecting IO Link ports and inputs

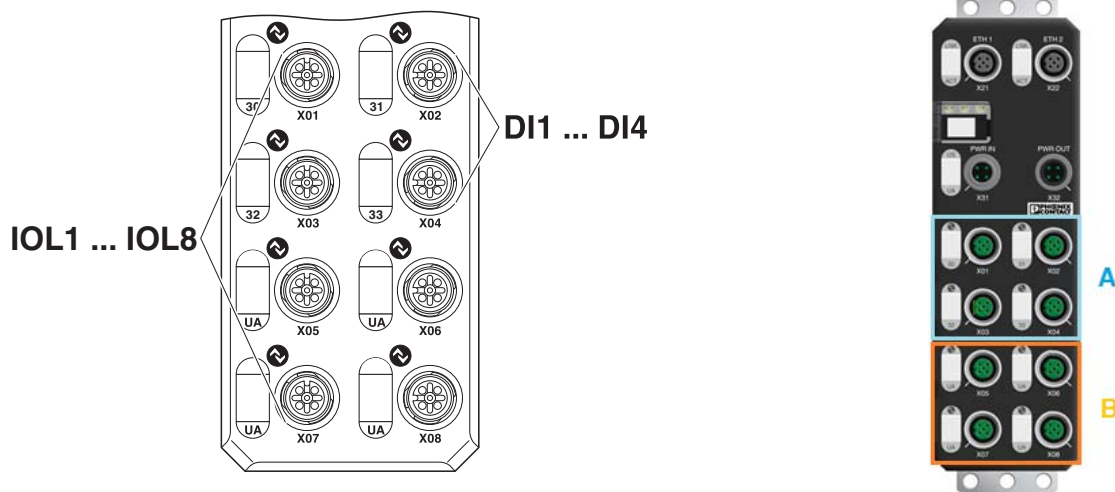
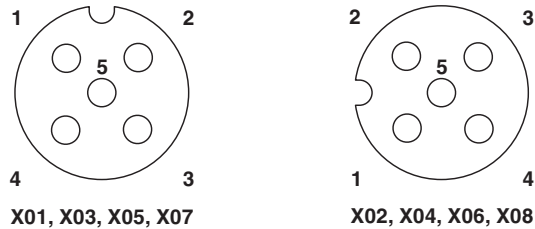


Bild 12 Connecting IO-Link ports and the digital inputs, A = A ports, B = B ports

Description	Meaning
IO-Link 1 ... 8 (X01 ... X08)	IO-Link ports 1 ... 8 (A ports + B ports)
DI1 ... DI4 (X01 ... X04)	Inputs 1 ... 4

4.3 IO-Link A ports

4.3.1 Pin assignment of the IO-Link A ports



Nominal current at L+/L-

Pin 1 and pin 3 provide a nominal current of 200 mA, maximum. Higher currents are briefly permitted during startup. The current is then limited electronically.

Bild 13 Pin assignment IO-Link A ports, A-coded

Pin	IO-Link A ports (X01 ... X04)	Conductor colors
1	24 V DC (L+)	Brown
2	DI	White
3	GND (L-)	Blue
4	C/Q, I/O link data transmission cable	Black
5	Not connected	-



IO-Link A port

The IO-Link A port is assigned an additional hardwired DI (digital input) at pin 2.

Operating modes

The C/Q cable (pin 4) can be configured independently of the other pins. The IO-Link ports can be operated in the following operating modes:

- DI (behaves like a digital input)
- DO (behaves like a digital output)
- DI with IO-Link
- IO-Link



NOTE: Sensor damage

When connecting an IO-type A sensor to an IO-Link B port that avoltage is applied to pin 2 and pin 5. Do not connect it to the sensor. Use a three-conductor cable between port and sensor, e.g., cable type SAC-3P-M12MS/ .../... Order No. 1696662

4.3.2 Cable for IO-Link A ports

To connect actuators and sensors to IO-Link A ports, you can order the following 4-pin cable types.

Description	Cable length	Order No.	Pcs./Pkt.	Figure
Sensor / actuator cable, 4-positions, PE-X/PE-X halogen-free, black-gray RAL 7021, shielded, Connector straight M12, A-coded, on socket straight M12, A-coded, for outdoor applications, with high-grade steel knurl	5 m	1454192	1	
Sensor / actuator cable, 4-positions variable cable type, Connector straight M12, A-coded, on free cable end	0.2 m ... 40 m	1696947	1	
Sensor / actuator cable, 4-positions, PVC, black RAL 9005, Connector straight M12, A-coded, on socket angled M12, A-coded	0.3 m	1415617	1	
	0.6 m	1454817	1	
	1.5 m	1415618	1	
	3 m	1415619	1	
Sensor / actuator cable, 4-positions, PVC, black RAL 9005, Connector straight M12, A-coded, on socket straight M12, A-coded	0.3 m	1415611	1	
	0.6 m	1415612	1	
	1.5 m	1415613	1	
	3 m	1415614	1	

4.4 IO-Link B ports

4.4.1 Pin assignment of the IO-Link B ports

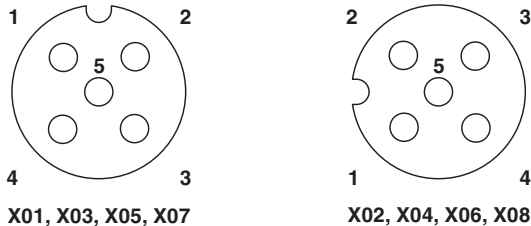


Bild 14 Pin assignment IO-Link B ports, A-coded



Nominal current at L+/L-

Pin 1 and pin 3 provide a nominal current of 200 mA, maximum. Higher currents are briefly permitted during startup. The current is then limited electronically.

4.4.2 Cable for IO-Link B ports

Use 5-pin cables to connect IO-Link B ports, as shown in the table "M12-SAC cable (5-positions with FE)" on page 12.

Pin	IO-Link B ports (X05 ... X08)	Conductor colours
1	24 V DC (L+)	Brown
2	24 V DC (U _A)	White
3	GND (L-)	Blue
4	C/Q, I/O link data transmission cable	Black
5	GND (U _A)	Green/yellow



IO-Link B port

The IO-Link B port has an additional supply voltage via pin 2 and pin 5. This port is suitable for connecting devices that have a higher current consumption. There are max. 2 A nominal current provided.

Operating modes

The C/Q cable (pin 4) can be configured independently of the other pins. The IO-Link ports can be operated in the following operating modes:

- DI (behaves like a digital input)
- DO (behaves like a digital output)
- DI with IO-Link
- IO-Link



NOTE: Sensor damage

When connecting an IO-type A sensor to an IO-Link B port that a voltage is applied to pin 2 and pin 5. Do not connect it to the sensor. Use a three-conductor cable between port and sensor, e.g., cable type SAC-3P-M12MS/ .../... Order No. 1696662

4.5 Connection of AXL E IO-Link devices to an AXL E IO-Link master

4.5.1 Connecting the Axioline E digital input device via an IO-Link A port

The Axioline E digital input device is connected to an IO-Link master via an IO-Link A port.

Connection example

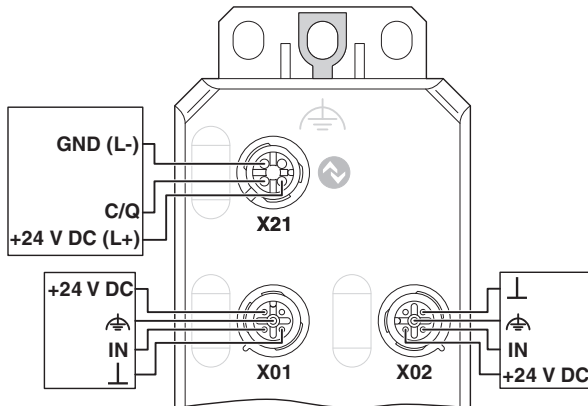


Figure 15 Example connection of connector X21 (IO-Link A port) and sockets X01 (input 1) and X02 (input 2)

Pin assignment of the connector X21: IO-Link A port

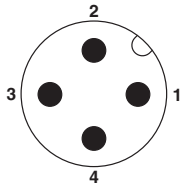


Figure 16 Pin assignment of connector X21

Pin	Connector X21: IO-Link A port
1	+24 V DC (L+)
2	Not used
3	GND (L-)
4	C/Q, IO-Link data transmission channel

Cable for IO-Link A ports

Use 4-pin cables to connect IO-Link A ports, as shown in the table "Cable for IO-Link A ports" on page 19.



To simplify your storage, you can also use 5-pin cables, which can be found in the table "M12-SAC cable (5-positions with FE)" on page 12.

4.5.2 Connecting the Axioline E digital output device via an IO-Link B port

The Axioline E digital output device is connected to an IO-Link master via an IO-Link B port.

Connection example

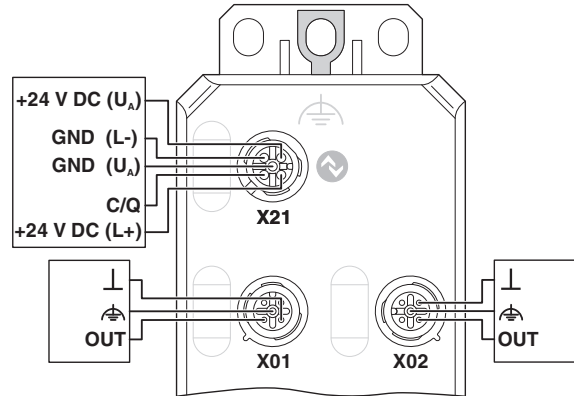


Bild 17 Example connection of connector X21 (IO-Link B port) and sockets X01 (output 1) and X02 (output 2)

Pin assignment of the connector X21: IO-Link B port

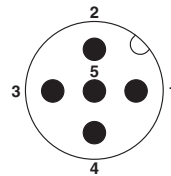


Bild 18 Pin assignment of connector X21

Pin	Connector X21: IO-Link B port
1	+24 V DC (L+)
2	+24 V DC (U _A)
3	GND (L-)
4	C/Q, IO-Link data transmission channel
5	GND (U _A)

Cable for IO-Link B ports

Use 5-pin cables to connect IO-Link B ports, as shown in the table "M12-SAC cable (5-positions with FE)" on page 12.

5 Accessories

The following table lists accessories for Axioline E devices.

Accessories	Order No.	Pcs./Pkt.	Figure
An M12 screw plug for the unoccupied M12 sockets of the sensor/actuator cable, boxes and flush-type connectors (Protection and sealing elements)	1680539	5	
Snap-in markers, Sheet, white, unlabeled, can be labeled with: THERMOMARK PRIME, THERMOMARK CARD, BLUEMARK CLED, BLUEMARK LED, TOPMARK LASER, mounting type: snapped into marker carrier, I lettering field size: 7 x 10 mm (Marking)	0830765	10	
Nut for assembling sensor/actuator cables with M12 connector and M12 connectors for assembly, with a knurl diameter of 15 mm, for 4 mm hexagonal drive	1208432	1	
Nut for assembling M12 connectors for assembly with a knurl diameter of 20 mm, for 4 mm hexagonal drive	1208445	1	
Torque screwdriver, with preset torque of 0.4 Nm and 4 mm hexagonal drive for M12 connectors	1208429	1	
Mounting plate for Axioline E metal devices	2701761	1	

Cable configurator for single and Y cables

The cable configurator will help you find the right cable for your application. The cable configurator can be found at:

phoenixcontact.com/online/portal/gb?1dmy&urle=wcm%3apath%3a/gben/web/main/products/product_configurator/application_pages/assembled_cables_p_18_01/sac



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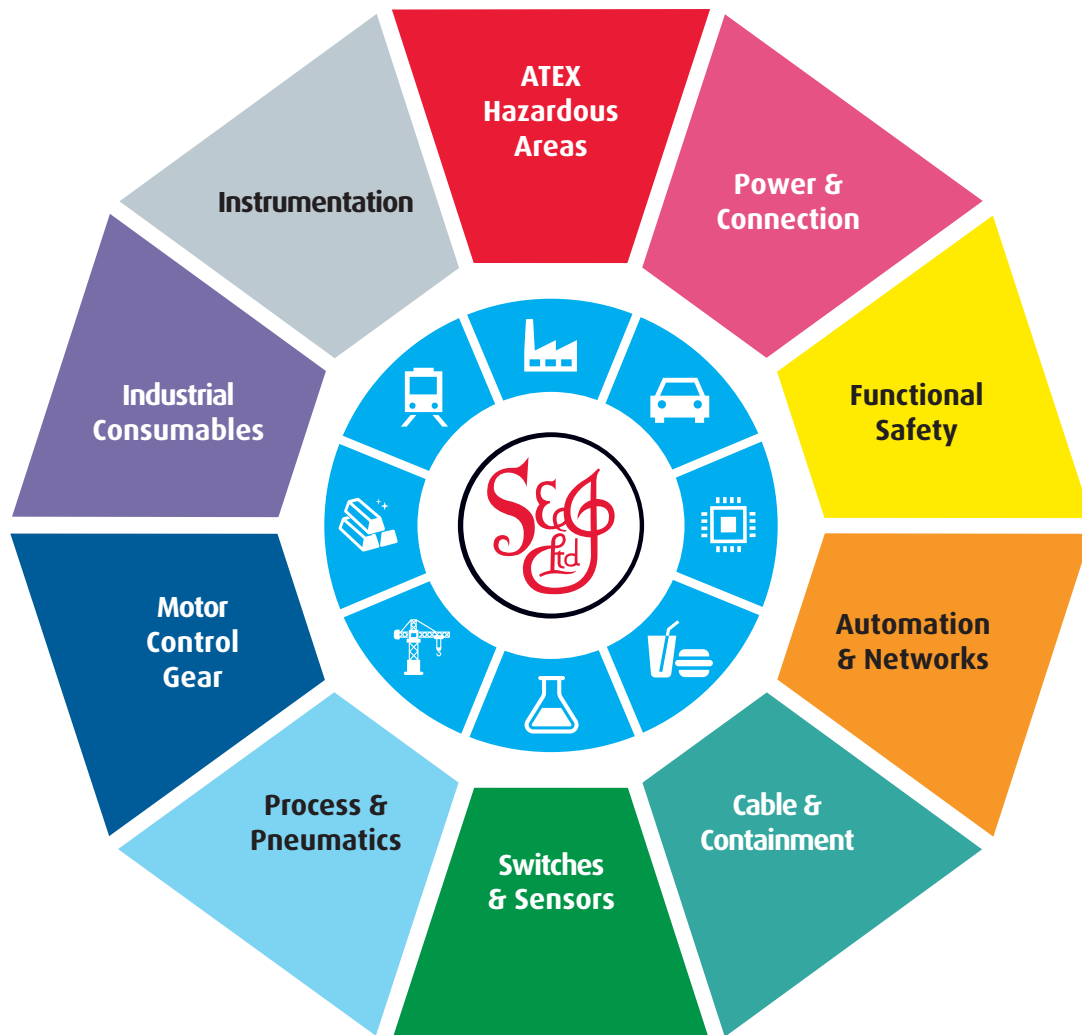
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