AXL F CNT2 INC2 1F

Axioline F special function module, 2 counter inputs, 2 incremental encoder inputs

Data sheet
7993_en_05

1 Description

Valid for hardware Version 03, firmware Version 1.20 or later.

The module is designed for use within an Axioline F station.

On the one hand, it is used to register fast pulse trains from sensors, and on the other hand to determine positions using incremental encoders.

The module combines two counter inputs for evaluation of fast counting pulses and two incremental encoder inputs for position detection.

General features

- 2 counter inputs
- 2 incremental encoder inputs
- Maximum input frequency: 300 kHz (one channel wired) or 100 kHz (more than one channel wired)
- 32-bit counter (up and down)
- Device type label stored
- Diagnostic and status indicators

Counter features

- The counting (source) is controlled via a control input (gate)
- An output is controlled depending on two limit values
- Single or periodic count

Incremental encoder acquisition features

- Acquiring digital signals from symmetrical and asymmetrical incremental encoders
- An output is controlled depending on two limit values
- Evaluating linear or rotary axes

This data sheet is only valid in association with the UM EN AXL F SYS INST user manual.
For further information on the module, please refer to the corresponding user manual.

Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.net/products.

2 Table of contents

3 Ordering data

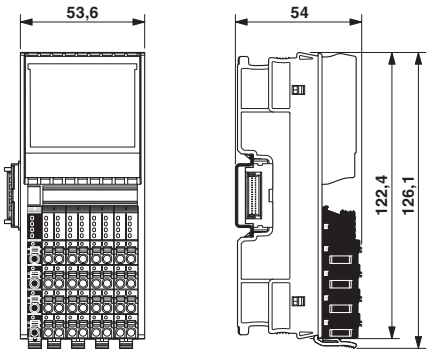
Description	Type	Order No.	Pcs./Pkt.
Axioline F special function module, 2 counter inputs, 2 incremental encoder inputs (including bus base module and connectors)	AXL F CNT2 INC2 1F	2688093	1

Accessories	Type	Order No.	Pcs./Pkt.
Axioline F bus base module for housing type F (Replacement item)	AXL F BS F	2688129	5
Axioline F connector set (for e.g., AXL F DI32/1 1F) (Replacement item)	AXL CNS 4L-O/D/UI/E1	2700982	1
Axioline shield connection set (contains 2 busbar holders and 2 SK 5 shield connection clamps)	AXL SHIELD SET	2700518	1
Zack marker strip for Axioline F (device labeling), in 2 x 20.3 mm pitch, unprinted, 25-section, for individual labeling with B-STIFT 0.8, X-PEN, or CMS-P1-PLOTTER (Marking)	ZB 20,3 AXL UNPRINTED	0829579	25
Zack marker strip, flat, in 10 mm pitch, unprinted, 10-section, for individual labeling with M-PEN 0,8, X-PEN, or CMS-P1-PLOTTER (Marking)	ZBF 10/5,8 AXL UNPRINTED	0829580	50
Insert label, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLL, THERMOMARK ROLL X1, THERMOMARK X, THERMOMARK S1.1, Mounting type: snapped into marker carrier, Lettering field: 35 x 46 mm (Marking)	EMT (35X46)R	0801604	1

Documentation	Type	Order No.	Pcs./Pkt.
User manual, English, Axioline F function module, 2 counter inputs, 2 incremental encoder inputs	UM EN AXL F CNT2 INC2 1F	-	-
User manual, English, Axioline F: System and installation	UM EN AXL F SYS INST	-	-
User manual, English, Axioline F: Diagnostic registers, and error messages	UM EN AXL F SYS DIAG	-	-

4 Technical data

Dimensions (nominal sizes in mm)



Width	53.6 mm
Height	126.1 mm
Depth	54 mm
Note on dimensions	The depth is valid when a TH 35-7.5 DIN rail is used (according to EN 60715).

General data

Color	traffic grey A RAL 7042
Weight	205 g (with connectors and bus base module)
Ambient temperature (operation)	-25 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III, IEC 61140, EN 61140, VDE 0140-1
Mounting position	Any (no temperature derating)

Connection data

Designation	Axioline F connector
Connection method	Push-in connection
Conductor cross section solid / stranded	0.2 mm² ... 1.5 mm² / 0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Please observe the information provided on conductor cross sections in the “Axioline F: system and installation” user manual.

Interface Axioline F local bus

Connection method	Bus base module
Transmission speed	100 MBit/s

Communications power

Communications power U_{Bus}	5 V DC (via bus base module)
Current consumption from U_{Bus}	typ. 100 mA, max. 120 mA
Power consumption at U_{Bus}	typ. 0.5 W, max. 0.6 W

I/O supply

Supply of digital input modules U_I	24 V DC
Maximum permissible voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption from U_I	typ. 50.5 mA (Own current consumption; without wiring of the terminal points), max. 2.5 A (dependent on the encoder or sensor type used and the load on the digital output.)
Power consumption at U_I	typ. 1.2 W, max. 60 W (of which 1.6 W internal losses)
Surge protection of the supply voltage	Electronic (35 V, 0.5 s)
Polarity reversal protection of the supply voltage	Parallel diode; with external 5 A fuse (for startup only)
Protection	max. 8 A (polarity reversal protection up to 5 A)

When using for the first time, protect the module with a 5 A fuse. If all the modules are correctly connected in the system, the 5 A fuse can be replaced by an 8 A fuse. you can now load the module up to 8 A.

NOTE: Damage to the electronics

Provide the module with an external fuse to protect it against polarity reversal. The power supply unit must be able to supply four times the nominal current of the external fuse, to ensure that it trips in the event of an error.

Counter input for 24 V signals	
Number of inputs	2 (S1, S2)
Connection method	Push-in connection
Description of the input	EN 61131-2, type 3
Resolution	32 bit
Input voltage	24 V DC
Nominal input current	2.5 mA (per channel)
Input voltage range "0" signal	-3 V DC ... 5 V DC
Input voltage range "1" signal	11 V DC ... 30 V DC
Permissible cable length	30 m

Incremental encoder inputs	
Number of inputs	2 (A1, /A1, B1, /B1, Z1, /Z1; A2, /A2, B2, /B2, Z2, /Z2)
Connection method	Push-in connection
Encoder signals	Symmetrical and asymmetrical encoders
Cable length	30 m

Encoder types	
Symmetrical incremental encoders	
Number	max. 2 (A, /A, B, /B, (Z, /Z))
Type of connection of signals	Push-in connection
Signal voltage level	Differential signal (signal – inverted signal) ±0.5 V, minimum; ±6 V, maximum
Input frequency	max. 300 kHz (1 channel wired) max. 100 kHz (More than one channel wired or Z signal monitoring via the firmware)
Encoder supply voltage	5 V DC
Common mode voltage range signal - ground	-10 V ... 13.2 V
Asymmetrical incremental encoders	
Number	max. 2 (A, B, (Z))
Type of connection of signals	Push-in connection
Signal voltage level	Low ≤ 2.5 V, high ≥ 3.5 V (up to 27 V, maximum)
Input frequency	max. 300 kHz (1 channel wired) max. 100 kHz (More than one channel wired or Z signal monitoring via the firmware)

Encoder supply	
5 V encoder supply	
Number	2 (U_{E1}, U_{E2})
Nominal output voltage	5 V DC
Voltage range	5 V DC ... 5.5 V DC
Current carrying capacity	max. 250 mA
Short-circuit protection	Electronic
24 V encoder supply	
Number	2 (U_{S1}, U_{S2})
Nominal output voltage	24 V DC
Voltage range	19.2 V DC ... 30 V DC
Current carrying capacity	typ. 500 mA
Short-circuit protection	Electronic

Digital inputs	
Number of inputs	8 (CNT: G1, G2, Dir1, Dir2; INC: Ref1, Ref2, L1, L2)
Connection method	Push-in connection
Connection method	1-wire (optionally 2, 3-wire)
Description of the input	EN 61131-2, type 3
Nominal input voltage	24 V DC
Nominal input current	2.5 mA (per channel)
Max. sensor current per channel	500 mA
Input voltage range "0" signal	-3 V DC ... 5 V DC
Input voltage range "1" signal	11 V DC ... 30 V DC
Permissible conductor length to the sensor	30 m
Short-circuit protection	Electronic for each channel
Overload protection	Electronic for each channel

Digital outputs	
Number of outputs	2 (Out1, Out2)
Connection method	Push-in connection
Connection method	1-wire
Nominal output voltage	24 V DC
Maximum output current per channel	500 mA
Nominal load, ohmic	max. 12 W (48 Ω; with nominal voltage)
Nominal load, inductive	max. 12 VA (1.2 H; 48 Ω; with nominal voltage)
Nominal load, lamp	max. 12 W (at nominal voltage)
Short-circuit protection, overload protection of the outputs	Yes

Configuration and parameter data in a PROFIBUS system	
Required parameter data	115 Byte
Need for configuration data	7 Byte

Error messages to the higher level control or computer system	
Short-circuit / overload of the digital outputs	Yes
Error at the symmetrical incremental encoder	Yes

Electrical isolation/isolation of the voltage areas	
Test section	**Test voltage**
5 V communications power (logic), 24 V supply (I/O)	500 V AC, 50 Hz, 1 min.
5 V supply (logic)/functional earth ground	500 V AC, 50 Hz, 1 min.
24 V supply (I/O) / functional earth ground	500 V AC, 50 Hz, 1 min.

Mechanical tests	
Vibration resistance in acc. with EN 60068-2-6/IEC 60068-2-6	5g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	30g
Continuous shock according to EN 60068-2-27/IEC 60068-2-27	10g

Conformance with EMC Directive 2004/108/EC (valid until 19.04.2016) / 2014/30/EU (valid from 20.04.2016)

Noise immunity test in accordance with EN 61000-6-2	
Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2	Criterion B, 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3/IEC 61000-4-3	Criterion A; Field intensity: 10 V/m
Fast transients (burst) EN 61000-4-4/IEC 61000-4-4	Criterion B, 2 kV
Transient overvoltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B, DC supply lines: ±0.5 kV/±0.5 kV (symmetrical/asymmetrical)
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A; Test voltage 10 V
Noise emission test according to EN 61000-6-3	
Radio interference properties EN 55022	Class B

Approvals

For the latest approvals, please visit phoenixcontact.net/products.

Maximum input frequencies depending on the wiring

The maximum input frequency that can be used for operation depends on the wiring of the channels and whether the Z signal, in the case of a linear axis, is to be monitored via the firmware or not.

Condition	Maximum frequency
1 channel wired	300 kHz
More than one channel wired	100 kHz
Z signal monitoring via the firmware	100 kHz

5 Internal circuit diagram

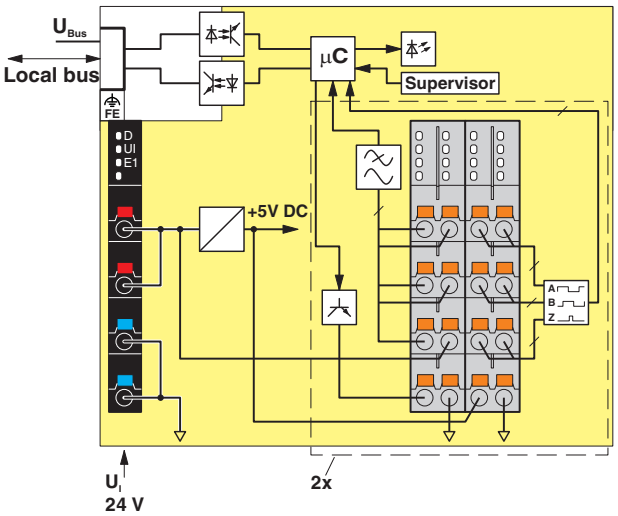


Figure 1 Internal wiring of the terminal points

Key:

Local bus	Axioline F local bus (hereinafter referred to as local bus)
µC	Microcontroller
Supervisor	Hardware monitoring
	Optocoupler
	Power supply unit
	Transistor
	Low pass filter
	LED
	Electrically isolated areas

6 Terminal point assignment

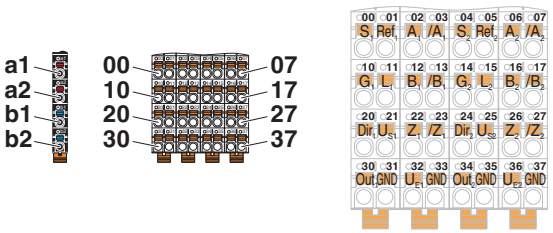


Figure 2 Terminal point assignment

Terminal point	Color	Assignment	
Supply voltage input			
a1, a2	Red	24 V DC (U_I)	Sensor/encoder supply (internally jumpered)
b1, b2	Blue	GND	Reference potential of the supply voltage (internally jumpered)
Connector 2 (counter 1) / connector 4 (counter 2)			
00/04	Orange	S1/S2	Source 1/2, counter input for counter 1/2
10/14	Orange	G1/G2	Gate 1/2, control input for counter 1/2 (default)
20/24	Orange	Dir1/ Dir2	Direction 1/2, counting direction default for counter 1/2 (optional: stop input for counter 1/2)
30/34	Orange	Out1/ Out2	Output for counter 1/2 (default) or incremental encoder 1/2
01/05	Orange	Ref1/ Ref2	Reference 1/2, reference switch input for incremental encoder 1/2
11/15	Orange	L1/L2	Latch input for incremental encoder 1/2
21/25	Orange	U_{S1}/ U_{S2}	Sensor voltage +24 V DC; to supply the counting sensor; can also be used to supply the incremental encoder
31/35	Orange	GND	Reference potential of the I/O supply

Terminal point	Color	Assignment	
Connector 3 (incremental encoder 1) / connector 5 (incremental encoder 2)			
02/06	Orange	A1/A2	Track A, incremental encoder 1/2
12/16	Orange	B1/B2	Track B, incremental encoder 1/2
22/26	Orange	Z1/Z2	Track Z, incremental encoder 1/2
32/36	Orange	U_{E1}/ U_{E2}	Encoder supply +5 V DC for incremental encoder 1/2
03/07	Orange	/A1 / / A2	Track A inverted, incremental encoder 1/2
13/17	Orange	/B1 / / B2	Track B inverted, incremental encoder 1/2
23/27	Orange	/Z1 / /Z2	Track Z inverted, incremental encoder 1/2
33/37	Orange	GND	Reference potential of the I/O supply

7 Connection examples

Counter

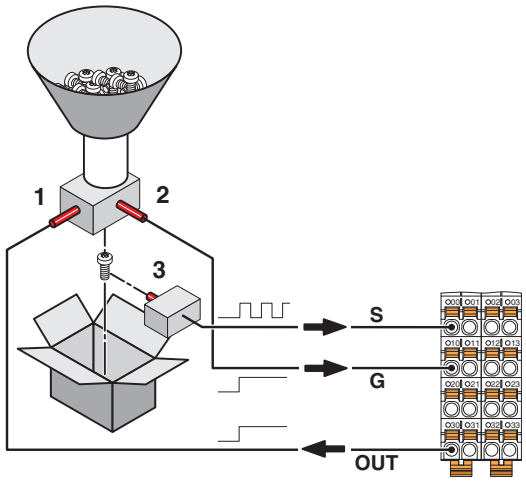


Figure 3 Counter connections for counting piece goods

The example shows a typical wiring of the terminal for counting screws.

Use shielded cables and connect the grounding rail with PE to ensure error-free counting.

Incremental encoder

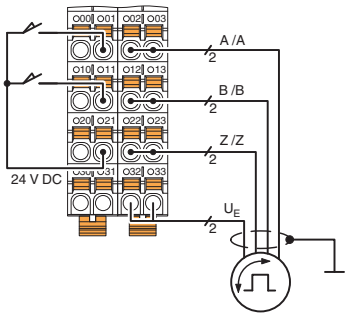


Figure 4 Quadrature encoder with 5 V supply

The example shows a typical wiring of the terminal with a symmetrical 5 V encoder and the two latch and reference input signals.

Use a shielded cable and connect it to ground potential when you connect the quadrature encoder.

Unused terminal points can be used as an option.

Terminal points S, G and Dir can be used for counter functions only.

8 Local status and diagnostic indicators

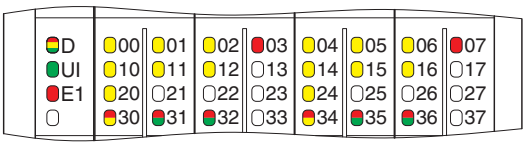


Figure 5 Local status and diagnostic indicators

Designation	Color	Meaning	State	Description
D	Red/ yellow/ green	Diagnostics of local bus communication		
		Run	Green ON	The device is ready for operation, communication within the station is OK. All data is valid. There are no faults.
		Active	Green flashing	The device is ready for operation, communication within the station is OK. The data is **not** valid. Valid data from the controller/higher-level network not available. There is no fault in the module.
		Device application not active	Flashing green/yellow	The device is ready for operation, communication within the station is OK. Output data **cannot** be outputted and/or input data **cannot** be read. There is a fault on the periphery side of the module..
		Ready	Yellow ON	The device is ready for operation but did not detect a valid cycle after power-on.
		Connected	Yellow flashing	The device is not (yet) part of the active configuration.
		Reset	Red ON	The device is ready for operation but has lost the connection to the bus head.
		Not connected	Flashing red	The device is ready for operation but there is no connection to the previously existing device.
		Power down	OFF	Device in (power) reset.
UI	Green	U_{Input}	ON	Sensor/encoder supply present
			OFF	Sensor/encoder supply not present
E1	Red	Peripheral fault	ON	I/O error present.
			OFF	No I/O error.

Designation	Color	Meaning	State	Description
Connector 2 (counter 1) / connector 4 (counter 2)				
00/04	Yellow	Status of counter input 1/2 (S1/S2, source 1/2)	ON	Input is set.
			OFF	Input is not set.
10/14	Yellow	Status of counter input 1/2 (G1/G2, gate 1/2)	ON	Input is set.
			OFF	Input is not set.
20/24	Yellow	Status of counting direction input 1/2 (Dir1/Dir2, direction 1/2)	ON	Input is set.
			OFF	Input is not set.
30/34	Red/ yellow	Status of output 1/2	Yellow ON	Output is set.
			Red ON	Short-circuit/overload of the output.
			OFF	Output is not set.
01/05	Yellow	Status of reference switch input 1/2 (Ref1/Ref2, reference 1/2)	ON	Input is set.
			OFF	Input is not set.
11/15	Yellow	Status of latch input 1/2 (L1/L2, latch 1/2)	ON	Input is set.
			OFF	Input is not set.
31/35	Red/ green	Status of sensor supply 1/2 (U_{S1}/U_{S2})	Green ON	Sensor supply is OK.
			Red ON	Short circuit/overload of the sensor supply.
			OFF	Sensor supply not present.
Connector 3 (incremental encoder 1) /connector 5 (incremental encoder 2)				
02/06	Yellow	Positive direction of rotation (UP)	ON	Module counting upwards.
			OFF and 12/16 OFF	Standstill or the corresponding INC channel is not parameterized.
12/16	Yellow	Negative direction of rotation (DN)	ON	Module counting downwards.
			OFF and 02/06 OFF	Standstill or the corresponding INC channel is not parameterized.
32/36	Red/ green	Status of the 5 V sensor supply (U_{E1}/U_{E2})	Green ON	Encoder supply is OK.
			Red ON	Short-circuit/overload of the encoder supply.
			OFF	Encoder supply not present.
03/07	Red	Encoder error	ON	An encoder error has occurred.
			OFF	No encoder error has occurred.

9 Process data

The module uses 14 words of IN process data and 14 words of OUT process data.

You can control the application via the OUT process data (e. g., start counter, reference encoder, set outputs).

Input process data contains general states of the module, states of the channels, and the corresponding counter and latch values.

For the assignment of the process data words, please refer to the user manual of the module.

10 Parameter, diagnostics and information (PDI)

Parameter and diagnostic data as well as other information is transmitted via the PDI channel of the Axioline F station.

For detailed information on PDI and the objects, please refer to the
UM EN AXL F SYS INST user manual.

Comprehensive information on all objects created on the module can be obtained from the user manual for the module.

The module is delivered with a default configuration, which allows you to start it up without parameterization. The incremental encoder interfaces are disabled in this default configuration.

11 Device descriptions

The device is described in the device description files.
The device descriptions for controllers from Phoenix Contact are included in PC Worx and the corresponding service packs.
The device description files for other systems are available for download at phoenixcontact.net/products in the download area of the bus coupler used.

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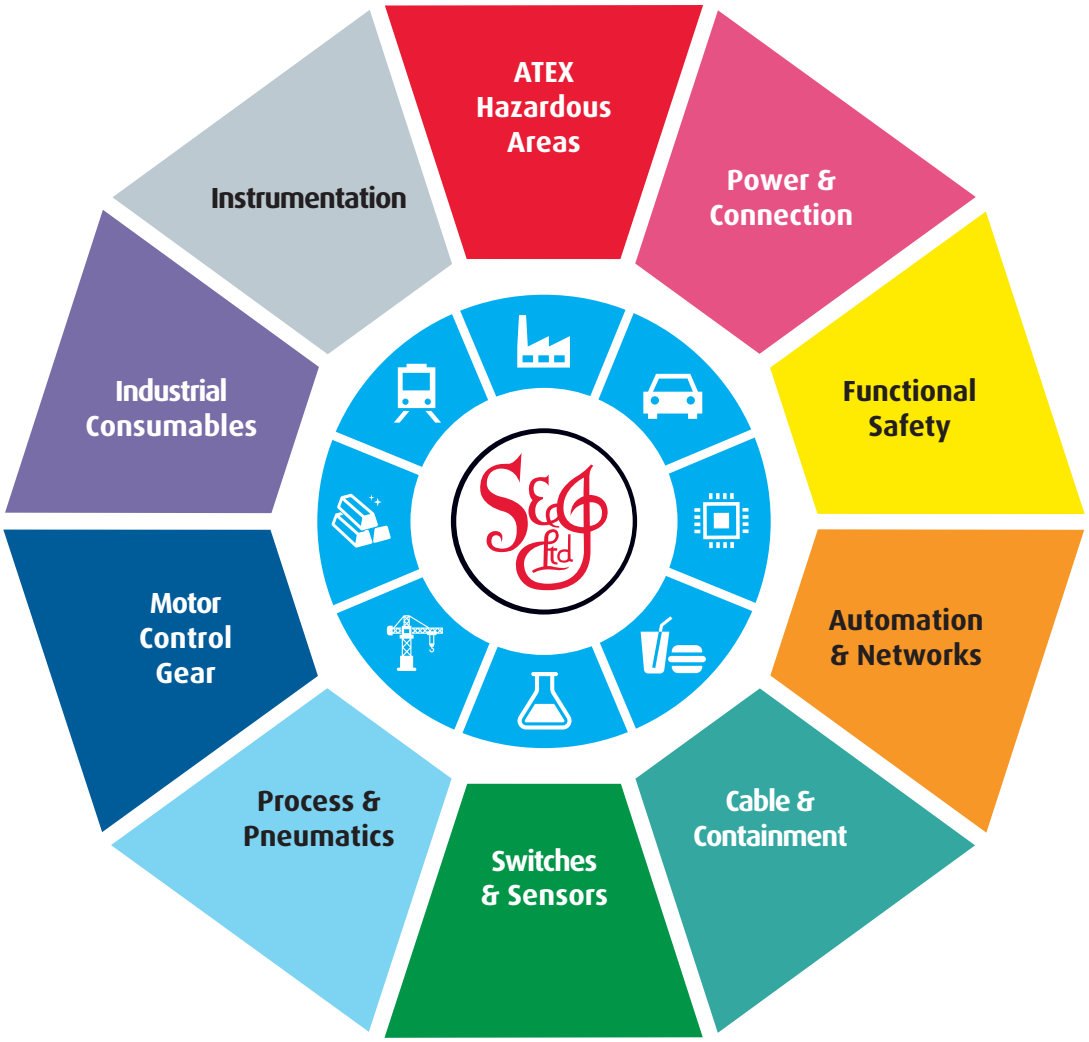

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