IL PB BK DP/V1-PAC

Inline bus coupler for PROFIBUS DP/V1

Data sheet
6809_en_09

1 Description

The bus coupler is intended for use within a PROFIBUS network and represents the link to the Inline I/O system.
Up to 63 Inline devices can be connected to the bus coupler.
The bus coupler supports a maximum of 16 PCP devices.
A corresponding GSD file is available for integrating the Inline station into the programming system.
This file can be downloaded via the product at phoenixcontact.net/products.
The bus coupler does not support PROFIsafe modules. Use the IL PB BK DI8 DO4/EF-PAC bus coupler for this.This bus coupler does not support intrinsically safe Inline terminals or the corresponding power terminal and disconnect terminal block, i.e., all IB IL EX ... items. Use the IL PB BK DI8 DO4/EF-PAC bus coupler for this.

Features

- PROFIBUS connection via 9-pos. D-SUB socket
- PROFIBUS data transmission speed of 9.6 kbps to 12 Mbps
- Electrical isolation between PROFIBUS interface and logic
- DIP switch to set the PROFIBUS address
- Supported PROFIBUS addresses from 0 to 126
- DP/V1 for class 1 and class 2 masters

This data sheet is only valid in association with the IL SYS INST UM E user manual.

Make sure you always use the latest documentation. It can be downloaded at: phoenixcontact.net/product/2862246 Here you will also find the current GSD file.

2 Table of contents

3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
Inline, Bus coupler, PROFIBUS DP, D-SUB-9 female connector, transmission speed in the local bus: 500 kbps, degree of protection: IP20, including Inline connector and labeling field	IL PB BK DP/V1-PAC	2862246	1

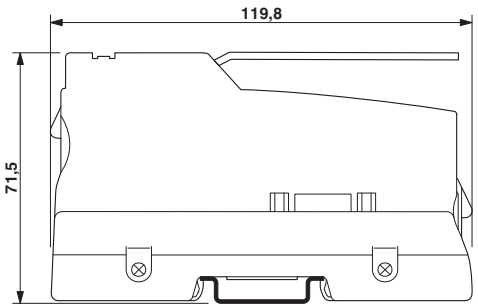
Accessories	Type	Order No.	Pcs./Pkt.
Connector, colored, for Inline power and segment terminal blocks (Connector/Adapter)	IB IL SCN-PWR IN-CP	2727637	10
Labeling field, width: 12.2 mm (Marking)	IB IL FIELD 2	2727501	10
Insert strip, Sheet, white, unlabeled, can be labeled with: Office printing systems: Laser printer, mounting type: insert, lettering field size: 62 x 10 mm (Marking)	ESL 62X10	0809492	1
D-SUB plug, 9-pos., pin, axial version with two cable entries, below 35°, bus system: PROFIBUS DP up to 12 Mbps, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; spring-cage connection terminal blocks (Connector/Adapter)	SUBCON-PLUS-PROFIB	2744348	1
Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray (Mounting)	CLIPFIX 35	3022218	50
D-SUB connector, 9-pos., male connector, cable entry < 35°, bus system: PROFIBUS DP up to 12 Mbps, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; screw connection terminal blocks (Connector/Adapter)	SUBCON-PLUS-PROFIB/SC2	2708232	1
D-SUB connector, 9-pos., male connector, cable entry < 35°, bus system: PROFIBUS DP up to 12 Mbps with PG D-SUB socket for connecting a programming device, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; screw connection terminal blocks (Connector/Adapter)	SUBCON-PLUS-PROFIB/PG/SC2	2708245	1
D-SUB connector, 9-pos., male connector, cable entry < 90°, bus system: PROFIBUS DP up to 12 Mbps, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; IDC terminal block connection (Connector/Adapter)	SUBCON-PLUS-PROFIB/90/IDC	2313672	1
D-SUB connector, 9-pos., male connector, cable entry < 90°, bus system: PROFIBUS DP up to 12 Mbps with PG D-SUB socket for connecting a programming device, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; IDC terminal block connection (Connector/Adapter)	SUBCON-PLUS-PROFIB/90/PG/IDC	2313685	1

Accessories	Type	Order No.	Pcs./Pkt.
D-SUB connector, 9-pos., male connector, cable entry < 90°, bus system: PROFIBUS DP up to 12 Mbps, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; screw connection terminal blocks (Connector/Adapter)	SUBCON-PLUS-PROFIB/90/SC	2313698	1
D-SUB connector, 9-pos., male connector, cable entry < 90°, bus system: PROFIBUS DP up to 12 Mbps with PG D-SUB socket for connecting a programming device, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; screw connection terminal blocks (Connector/Adapter)	SUBCON-PLUS-PROFIB/90/PG/SC	2313708	1
D-SUB connector, 9-pos., male connector, axial version with two cable entries, bus system: PROFIBUS DP up to 12 Mbps, termination resistor can be switched on via slide switch, pin assignment: 3, 5, 6, 8; screw connection terminal blocks (Connector/Adapter)	SUBCON-PLUS-PROFIB/AX/SC	2744380	1
D-SUB plug, 9-pos., pin, assignment: 3, 5, 6, 8; two M12 cable glands (B-coded) under 35°. Bus system: PROFIBUS DP up to 12 Mbps. Termination resistor via separate M12 terminator. (Connector/Adapter)	SUBCON-PLUS-PROFIB/35/M12	2902320	1
D-SUB plug, 9-pos., pin, assignment: 3, 5, 6, 8; two M12 cable glands (B-coded) under 90°. Bus system: PROFIBUS DP up to 12 Mbps. Termination resistor via separate M12 terminator. (Connector/Adapter)	SUBCON-PLUS-PROFIB/90/M12	2902318	1

Documentation	Type	Order No.	Pcs./Pkt.
User manual, English, Automation terminals of the Inline product range	IL SYS INST UM E	-	-
User manual, English, Configuring and installing the PROFIBUS DP/V1 bus coupler for the Inline product range	UM EN IL PB BK DP/V1	-	-
User manual, English, Starting up Inline-PROFIBUS bus couplers with a MELSEC controller from Mitsubishi	UM QS EN IL PB BK + MELSEC	-	-
Application note, German/English, I/O modules at bus couplers	AH IL BK IO LIST	-	-
Application note, English, Parameter data length for devices in a PROFIBUS system	AH EN PROFIBUS PARAMETER DATA	-	-

4 Technical data

Dimensions (nominal sizes in mm)	



Width	85 mm
Height	119.8 mm
Depth	71.5 mm

General data	
Color	green
Weight	240 g (with connectors)
Ambient temperature (operation)	0 °C ... 55 °C
Ambient temperature (storage/transport)	-25 °C ... 85 °C
Permissible humidity (operation)	85 % (non-condensing)
Permissible humidity (storage/transport)	85 % (non-condensing)
Air pressure (operation)	80 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

Connection data: Inline connector	
Connection method	Spring-cage connection
Conductor cross section solid / stranded	0.08 mm² ... 1.5 mm² / 0.08 mm² ... 1.5 mm²
Conductor cross section [AWG]	28 ... 16
Stripping length	8 mm

Connection data for UL approvals: Inline connector	
Connection method	Spring-cage 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

Interface: PROFIBUS DP	
Number	1
Connection method	D-SUB-9 female connector
Number of positions	9
Transmission speed	9.6 kbps ... 12 Mbps

Interface: Inline local bus	
Number	1
Connection method	Inline data jumper
Transmission speed	500 kbps

System limits of the bus coupler	
Amount of process data	max. 176 Byte (per station) max. 176 Byte (Input) max. 176 Byte (Output)
Number of parameter data	max. 168 Byte (DP/V1 mode)
Number of configuration data	max. 168 Byte (DP/V1 mode)
IN and OUT process data for I/O modules that can be aligned	176 Byte
Parameter data for connectable I/O modules	164 Byte
Configuration data for I/O modules that can be aligned	168 Byte
Number of local bus devices that can be connected	max. 63
Number of devices with parameter channel	max. 16

Observe the logic current consumption of each device when configuring an Inline station! It is specified in every terminal-specific data sheet. The current consumption can differ depending on the individual terminal. The permissible number of devices that can be connected therefore depends on the specific station structure.

Further information on on the system limits of both DP/V0 and DP/V1 operating modes can be found in the section “Firmware functions”.

Bus coupler supply U_{BC}; Communications power U_L (7.5 V) and the analog supply U_{ANA} (24 V) are generated from the bus coupler supply.	
Supply voltage	24 V DC (via Inline connector)
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current draw	typ. 100 mA (without connected Inline I/O terminals) max. 1.25 A (with max. number of connected I/O terminal blocks)

Communications power (U_L)	
Supply voltage	7.5 V DC
Power supply unit	max. 2 A DC

Supply of analog modules (U_{ANA})	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Power supply unit	max. 0.5 A DC

Main circuit supply (U_M)	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Power supply unit	max. 8 A DC (sum of $U_M + U_S$)

Segment circuit supply (U_S)	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Power supply unit	max. 8 A DC (sum of $U_M + U_S$)

Protection

NOTE: Electronics may be damaged when overloaded

Provide external protection for the 24 V areas U_{BK}, U_M, and U_S. If you are using an external fuse, the power supply unit must be able to supply four times the nominal current of the fuse. This ensures that it trips in the event of an error.

Protective circuit	
Protection against polarity reversal, surge protection (24-V supply U_{BK} and U_S)	yes

Electrical isolation/isolation of the voltage areas

Test section	Test voltage
PROFIBUS/local bus and supply voltage U_{BK} and U_S	500 V
PROFIBUS / FE	500 V
PROFIBUS / FE D-SUB	500 V
Local bus and supply voltage U_{BK} and U_S / FE	500 V
Local bus and supply voltage U_{BK} and U_S / FE D-SUB	500 V
FE / FE D-SUB	500 V

To achieve electrical isolation between the logic level and the I/O area, supply these areas from separate power supply units. Interconnection of the power supply units in the 24 V area is not permitted (see IL SYS INST UM E user manual).

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	Operation: 25g, 11 ms duration, semi-sinusoidal shock impulse

Conformance with EMC Directive 2014/30/EU	
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 A, all interfaces 1 kV Criterion B, all interfaces 2 kV
Transient overvoltage (surge) EN 61000-4-5/ IEC 61000-4-5	Criterion B, supply lines DC: 0.5 kV/0.5 kV (symmetrical/ asymmetrical), fieldbus cable shield 1 kV
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A; Test voltage 10 V
Noise emission test as per EN 61000-6-4	Class A

Approvals

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

5 Internal circuit diagram

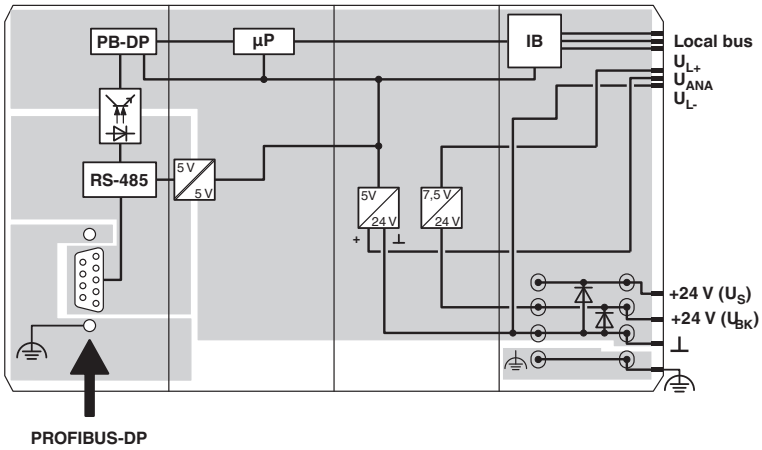


Figure 1 Internal wiring of the terminal points

Key:

PB-DP	Protocol chip
µP	Microprocessor
IB	Protocol chip
	Optocoupler
	Power supply unit with electrical isolation
	Power supply unit without electrical isolation
RS-485	RS-485 interface
	Electrically isolated area

The gray areas in the basic circuit diagram represent the electrically isolated areas:

Functional ground of the PROFIBUS connection (FE D-SUB)

PROFIBUS interface

Local bus and supply voltage U_{BK} and U_S

Functional earth ground

6 Local status and diagnostic indicators

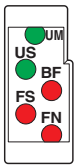


Figure 2 Local diagnostic and status indicators

Designation	Color	Meaning	State	Description
UM	green	**U**Main	on	24 V main circuit supply/internal communications power present
			off	24 V main circuit supply/internal communications power present
US	green	**U**Segment	on	24 V segment circuit supply present
			off	24 V segment circuit supply not present
BF	red	**B**us **F**ault	on	No communication on PROFIBUS
			off	No error
			flashing	PLC in STOP state. Failsafe values are output.
FS	red	**F**ailure **S**elect	on	If FS is on, FN indicates the error type
			off	If FS is not on, FN indicates the error number
FN	red	**F**ailure **N**umber	flashing	The number of flashing pulses indicates the error type or the error number, depending on whether FS is on or not
			off	No error

7 Connection of PROFIBUS and power supply

7.1 Connecting PROFIBUS

Connect PROFIBUS to the bus coupler using a 9-pos. D-SUB connector (see Ordering data). For the pin assignment, please refer to the figure and the table.

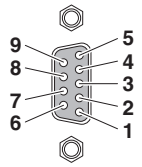


Figure 3 Pin assignment of the 9-pos. D-SUB female connector

Pin	Assignment
1	Reserved
2	Reserved
3	RxD/TxD-P (receive/transmit data +), cable B
4	CNTR-P (control signal for repeater), direction control
5	DGND (reference potential to 5 V)
6	VP (+5 V supply voltage for termination resistors)
7	Reserved
8	RxD/TxD-N (receive/transmit data –), cable A
9	Reserved

7.2 Mains termination resistors

Since PROFIBUS DP is a serial bus system in a line or tree structure, the individual branches must be terminated using a termination resistor. The bus coupler does not have a resistor of this type. For further information, please refer to your PROFIBUS documentation. Phoenix Contact recommends the use of the SUBCON-PLUS-PROFIB connector, Order No. 2744348. This connector has a termination resistor that can be connected.

7.3 Terminal point assignment of the power plug

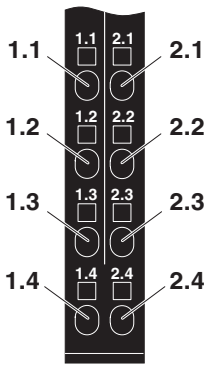


Figure 4 Terminal point assignment

Terminal point	Assignment	Meaning
1.1, 2.1	U_S	Segment supply (+24 V DC)
1.2, 2.2	U_{BK}	Main, bus coupler, logic and interface supply (+24 V DC)
1.3, 2.3	GND U_{BK}, U_S	Reference potential for U_{BK} and U_S
1.4, 2.4	FE	Functional earth ground

8 Connection example

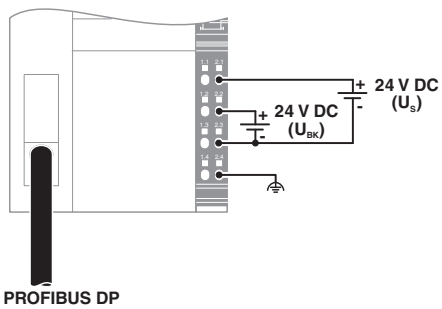


Figure 5 Connection example

9 Parameterization of the hardware

Parameterize the bus coupler with the help of the 10-fold DIP switch.

Set the PROFIBUS address and the behavior of the bus coupler via the DIP switches.

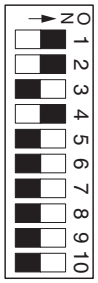


Figure 6 DIP switches

The meanings of the switch settings can be found in the following table:

DIP switch		Meaning
1 ... 7		PROFIBUS address
	1	Least significant bit (LSB)
	7	Most significant bit (MSB)
8		Operating mode
	ON	New mode with DP/V1 support, safety values and parameterization
	OFF	Compatible with IL PB BK (default)
9 ... 10	OFF / OFF	Reserved. Set both switches to OFF.

DIP switch 8

Switch 8 is set to the OFF position by default. Therefore the device can directly replace the previous IL PB BK (Order No. 2740054) version and also offers the new functions listed below. However, these functions can only be used on the new devices.
To configure the bus coupler, use the GSD "PXC_00F0.GSD" and the "IL PB BK DP/V1 (DIP 8 = OFF)" device entry in the hardware list.

In the ON position, the bus coupler provides all the functions described in the document and has a new PROFIBUS identification number.
To configure the bus coupler, use the GSD "PXC_06CC.GSD" and the "IL PB BK DP/V1 (DIP8 = ON)" device entry in the hardware list.
The stop behavior that was specified in the old device by this switch can then be set in the parameterization.

New functions in the "compatible to IL PB BK" mode:

– For example, acyclic communication with RS-232 modules also in the process data channel
– Acknowledgement of periphery errors from the application program
– Adjustment of the high-byte/low-byte format with 16-channel input and output modules to the controller format

10 Parameter data

During configuration, please note that connected digital I/O terminals also use parameter data in PROFIBUS. Please refer to the GSD file, application note
AH EN PROFIBUS PARAMETER DATA or the terminal-specific data sheets for the parameter data length.

11 Firmware functions

Function	IL PB BK DI8 DO4/EF-PAC	IL PB BK DI8 DO4-PAC	IL PB BK DP/V1-PAC	
			DP/V0 mode	DP/V1 mode
Process and parameter data				
Total amount of process data				
- IN and OUT	488 bytes, maximum	488 bytes, maximum	184 bytes, maximum	176 bytes, maximum
- IN	244 bytes, maximum	244 bytes, maximum	184 bytes, maximum	176 bytes, maximum
- OUT	244 bytes, maximum	244 bytes, maximum	184 bytes, maximum	176 bytes, maximum
Amount of process data for alignable I/O terminals				
- IN and OUT	486 bytes, maximum	486 bytes, maximum	184 bytes, maximum	176 bytes, maximum
- IN	243 bytes, maximum	243 bytes, maximum	184 bytes, maximum	176 bytes, maximum
- OUT	243 bytes, maximum	243 bytes, maximum	184 bytes, maximum	176 bytes, maximum
Amount of parameter data				
- Total	244 bytes, maximum	244 bytes, maximum	8 bytes, maximum	168 bytes, maximum
- For alignable I/O terminals	230 bytes, maximum	230 bytes, maximum	0 bytes	160 bytes, maximum
Amount of configuration data				
- Total	244 bytes, maximum	244 bytes, maximum	168 bytes, maximum	168 bytes, maximum
- For alignable I/O terminals	239 bytes, maximum	239 bytes, maximum	168 bytes, maximum	168 bytes, maximum
Other				
Number of PCP devices	max. 16	max. 16	8, maximum	8, maximum
Can be replaced by IL PB BK-PAC	No	No	Yes	No
Supports DP/V1 read and write (acyclic communication), Class 1 and Class 2 master	Yes	Yes	No	Yes
Communication with PCP modules via "normal" process data (DP/V0)	Yes	Yes	Yes	Yes
Transmission invoke ID	Yes	Yes	Yes	Yes
Parameterization of several I/Os via dialog boxes in the configuration tool	Yes	Yes	No	Yes
Dynamic configuration (reserving I/Os in the PLC)	Yes	Yes	No	Yes
Specification of fail-safe values via the configuration tool	Yes	Yes	No	Yes
Byte rotation for the IB IL 24 DI 16-PAC and IB IL 24 DO 16-PAC	Yes	Yes	Yes	Yes
Byte rotation for the IB IL 24 DI 32-PAC and IB IL 24 DO 32-PAC	Yes	Yes	Yes	Yes
Operation in the event of terminal failure on the local bus	Yes	Yes	No	No
Acknowledgment of local bus stops via the application program	Yes	Yes	Yes	Yes

Function	IL PB BK DI8 DO4/EF-PAC	IL PB BK DI8 DO4-PAC	IL PB BK DP/V1-PAC	
			DP/V0 mode	DP/V1 mode
Acknowledging bus stops either automatically or via the application program	Yes	Yes	Yes	Yes
Diagnostics in IL PB BK format	Yes	Yes	Yes	Yes
Channel-specific diagnostics	Yes	Yes	No	No
Diagnostics in identification format	Yes	Yes	No	Yes
Diagnostics as status PDU	Yes	Yes	No	Yes
Stop behavior can be set via parameter telegram	Yes	Yes	Yes	Yes
I&M functions	Yes	Yes	No	No
PROFIsafe support	Yes	No	No	No
Support for intrinsically safe Inline terminals (IB IL EX ...)	Yes	No	No	No
IO-Link call	Yes (FW 2.0 or later)	No	No	No
Selection of the diagnostic format in the configuration tool	Yes	No	No	No

For more detailed information about the functions described, please refer to the user manuals (see Ordering data).

12 Standard diagnostics and device-specific diagnostics via PROFIBUS

Error type	Meaning
1	Parameter error on PROFIBUS (SET_PRM telegram)
2	Configuration error on PROFIBUS (CHK_CFG Telegram)
	Detailed information on PROFIBUS configuration errors is given in 14 different error numbers.
3	Configuration error in the Inline station
	Detailed information on configuration errors in the Inline station is given in eight different error numbers.
4	Local bus error within the station
	Detailed information on local bus errors inside the station is given in six different error numbers.
5	Module error
6	Parameter error on the local bus
7	EEPROM error

Detailed information on error causes and remedies can be found in the user manual of the bus coupler.

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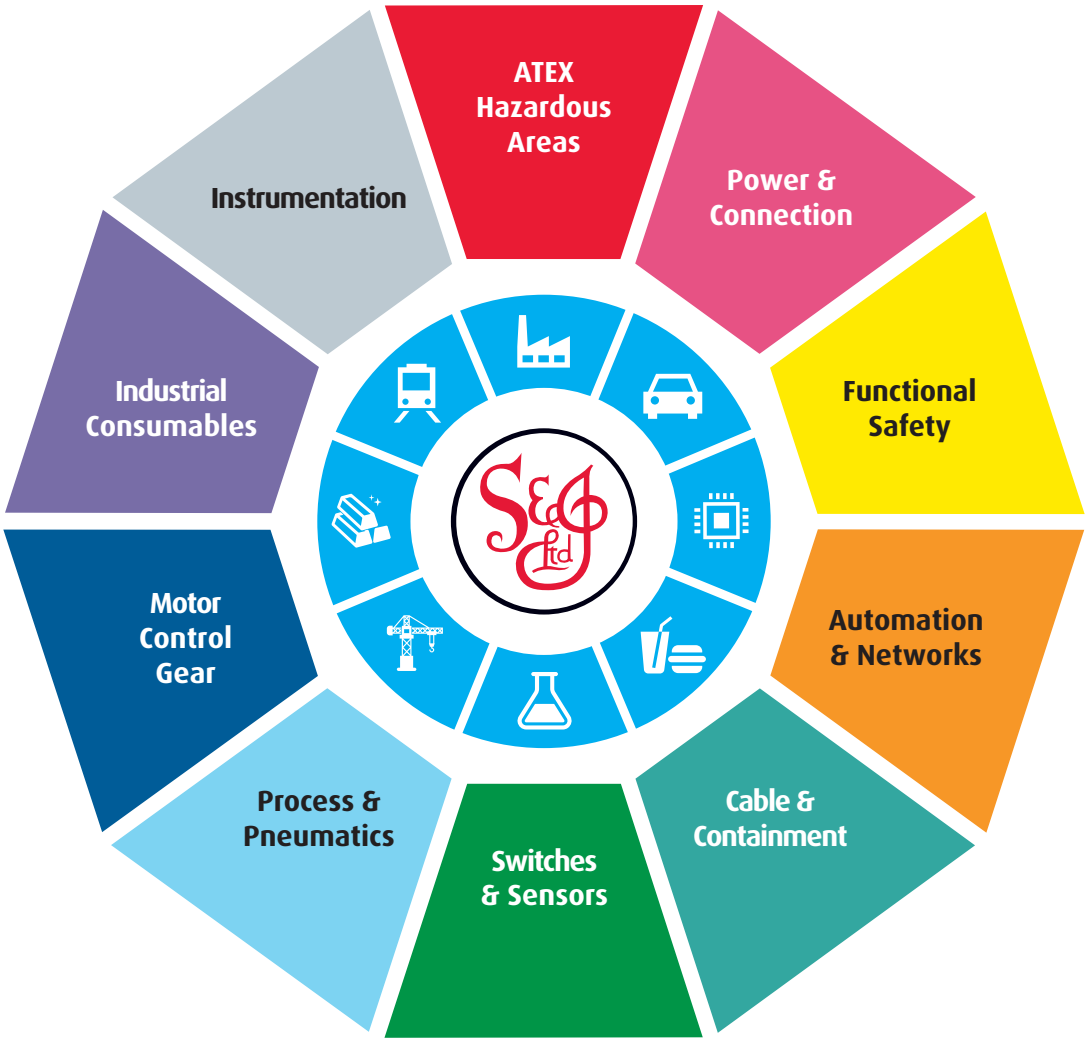

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