IB IL 24 DO 32/HD (2MBD)-PAC

**Inline, digital output terminal,
digital outputs: 32, 24 V DC, 500 mA
connection technology: 1-conductor**

Data sheet
6843_en_06

1 Description

The terminal is designed for use within an Inline station.
It is used to output digital signals.

Features

- 32 digital outputs
- Connection of actuators in single-wire technology
- Nominal current per output: 500 mA
- Total current of the terminal: 8 A
- Short-circuit-proof and overload-protected outputs

IB IL 24 DO 32/HD-PAC

WARNING: Explosion hazard when used in potentially explosive areas

When using the terminal in potentially explosive areas, observe the corresponding notes.

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 from the product at phoenixcontact.net/products.

2 Table of contents

3 Ordering data

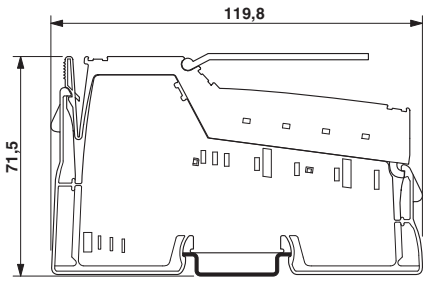
Description	Type	Order No.	Pcs./Pkt.
Inline, Digital output terminal, Digital outputs: 32, 24 V DC, 500 mA, connection method: 1-wire, transmission speed in the local bus 500 kbps, degree of protection IP20, including Inline connectors and marking fields	IB IL 24 DO 32/HD-PAC	2862822	1
Inline, Digital output terminal, Digital outputs: 32, 24 V DC, 500 mA, connection method: 1-wire, transmission speed in the local bus 2 Mbps, degree of protection IP20, including Inline connectors and marking fields	IB IL 24 DO 32/HD-2MBD-PAC	2692898	1

Accessories	Type	Order No.	Pcs./Pkt.
Inline terminal for power distribution (GND), complete with accessories, (connector and labeling field) connections for GND	IB IL PD GND-PAC	2862990	1
Connector set	IB IL DI/DO 8-PLSET	2860950	1
Labeling field, width: 12.2 mm (Marking)	IB IL FIELD 2	2727501	10
Labeling field, width: 48.8 mm (Marking)	IB IL FIELD 8	2727515	10
Insert strip, Sheet, white, unlabeled, can be labeled with: Office printing systems: Laser printer, Mounting type: Insert, Lettering field: 62 x 10 mm (Marking)	ESL 62X10	0809492	1
Insert strip, Sheet, white, unlabeled, can be labeled with: Office printing systems: Laser printer, Mounting type: Insert, Lettering field: 62 x 46 mm (Marking)	ESL 62X46	0809502	5
VARIOFACE front adapter for Inline modules, for transferring 32 (4 x 8) digital signals. (Connector/Adapter)	FLKM 14-PA-INLINE/32	2302777	1

Documentation	Type	Order No.	Pcs./Pkt.
User manual, English, Automation terminals of the Inline product range	IL SYS INST UM E	-	-
Data sheet, English, INTERBUS addressing	DB GB IBS SYS ADDRESS	-	-
Application note, addressing of 16-channel Inline terminals	AH IB IL 24 DI/DO 16 ADDRESS	-	-
Application note, English, Inline terminals for use in zone 2 potentially explosive areas	AH EN IL EX ZONE 2	-	-

4 Technical data

Dimensions (nominal sizes in mm)	



Width	48.8 mm
Height	119.8 mm
Depth	71.5 mm
Note on dimensions	Housing dimensions

General data	
Color	green
Weight	195 g (with connectors)
Operating mode	Process data operation with 2 words
Ambient temperature (operation)	-25 °C ... 55 °C
Ambient temperature (storage/transport)	-25 °C ... 85 °C
Permissible humidity (operation)	10 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	10 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level) 80 kPa ... 106 kPa (up to 3000 m above sea level, in ATEX Zone 2)
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	
Designation	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	
Designation	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 Inline local bus	
Connection method	Inline data jumper

Transmission speed Inline local bus	
IB IL 24 DO 32/HD-PAC	500 kbps
IB IL 24 DO 32/HD-2MBD-PAC	2 Mbps

Power consumption	
Segment circuit supply U_S	24 V DC (nominal value)
Current consumption from U_S	max. 8 A
Communications power U_L	7.5 V DC
Current consumption from U_L	max. 140 mA
Power consumption	max. 1.05 W (at U_L)

WARNING – Explosion hazard when used in ATEX Zone 2

Make sure that the maximum permissible current of 4 A flowing through potential jumpers U_M and U_S (total current) is not exceeded.

Digital outputs	
Number of outputs	32
Connection method	Spring-cage connection
Connection technology	1-wire
Nominal output voltage	24 V DC
Voltage difference with nominal current	≤ 1 V
Maximum output current per channel	500 mA
Maximum output current per device	8 A
Nominal load, ohmic	12 W (48 Ω)
Nominal load, inductive	12 VA (1.2 H, 50 Ω)
Nominal load, lamp	12 W
Signal delay when switching on an ohmic nominal load	typ. 500 µs
Signal delay when switching on an inductive nominal load	typ. 100 ms (1.2 H, 50 Ω)
Signal delay when switching on a lamp nominal load	typ. 100 ms (for switching frequencies up to 8 Hz, above this frequency, the lamp load behaves like an ohmic load)
Signal delay when switching off an ohmic nominal load	typ. 1 ms
Signal delay when switching off an inductive nominal load	typ. 50 ms (1.2 H, 50 Ω)
Signal delay when switching off a lamp nominal load	typ. 1 ms

Digital outputs	
Maximum operating frequency with ohmic nominal load	max. 300 Hz (this switching frequency is limited by the data rate selected, the number of bus devices, the structure of the bus, the software used and the control or computer system used)
Maximum operating frequency with inductive nominal load	max. 0.5 Hz (1.2 H, 50 Ω)
Maximum operating frequency with lamp nominal load	max. 8 Hz (this switching frequency is limited by the data rate selected, the number of bus devices, the structure of the bus, the software used and the control or computer system used)
Reaction time with short-circuit	ca. 3 s
Reaction time with ohmic overload	ca. 3 s
Behavior at voltage switch-off	The output follows the power supply without delay
Output data validity	typ. 5 ms (after switching the 24 V voltage supply (power up))
One-time unsolicited energy	400 mJ
Limitation of the voltage induced on circuit interruption	-45.8 V ... -15 V
Output voltage when switched off	max. 2 V
Output current when switched off	max. 300 µA
Behavior with overload	Auto restart
Behavior with inductive overload	Output can be destroyed
Restart frequency with ohmic overload	400 Hz
Restart frequency with lamp overload	400 Hz
Reverse voltage resistance to short pulses	Reverse voltage proof
Resistance to permanent reverse voltage	max. 2 A
Overcurrent shut-down	min. 0.7 A
Output current with ground connection interrupt when switched off	max. 25 mA
Switching capacity	typ. 100 mW (in the case of ground connection interrupt, at 1 kΩ load resistance)
Inrush current	max. 1.5 A (at nominal lamp load for 20 ms)
Overload protection, short-circuit protection of outputs	Zener diode in output chip Channels are thermally coupled in groups of four, i.e., an error in one channel can also affect the other channels.

Programming data (INTERBUS, local bus)	
ID code (hex)	BD
ID code (dec.)	189
Length code (hex)	02
Length code (dec.)	02
Process data channel	32 Bit
Input address area	0 Byte
Output address area	4 Byte
Parameter channel (PCP)	0 Byte
Register length (bus)	32 Bit

For the programming data/configuration data of other bus systems, please refer to the corresponding electronic device data sheet (e.g., GSD, EDS).

Configuration and parameter data in a PROFIBUS system	
Required parameter data	6 Byte
Need for configuration data	4 Byte

Error messages to the higher level control or computer system	
Short-circuit / overload of the digital outputs	Error message in the diagnostic code (bus) and display (2 Hz) via the LED (D) on the module

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

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).

Approvals

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

5 Additional tables

5.1 Output characteristic curve

Output characteristic curve when switched on (typical)	
Output current (A)	**Differential output voltage (V)**
0	0
0.1	0.04
0.2	0.08
0.3	0.12
0.4	0,16
0.5	0,20

5.2 Power dissipation

Formula for calculating the power dissipation of the electronics

$$P_{EL} = 0{,}29\ W + \sum_{i=1}^{n} (0{,}07\ W + I_{Li}^{2} \times 0{,}40\ \Omega)$$

Where:

P_{EL}	Total power dissipation in the terminal
i	Continuous index
n	Number of set outputs (n = 1 ... 32)
I_{Li}	Load current of output i

Power dissipation of the housing

2.8 W, maximum (within the permissible operating temperature)

5.3 Limitation of simultaneity, derating

Limitation of simultaneity, derating		
Ambient temperature T_{amb}	**Maximum load current at 100 % simultaneity**	**Maximum load current at 50 % simultaneity**
-25°C ≤ T_A < +40°C	0.25 A	0.5 A
+40°C ≤ T_A < +45°C	0.21 A	0.45 A
+45°C ≤ T_A < +50°C	0.18 A	0.40 A
+50°C < T_A ≤ +55°C	0.15 A	0.35 A

If all channels are used, the permissible working point must be defined according to the above-stated formula.

An example for calculating the working point can be found in the user manual IL SYS INST UM E.

6 Internal circuit diagram

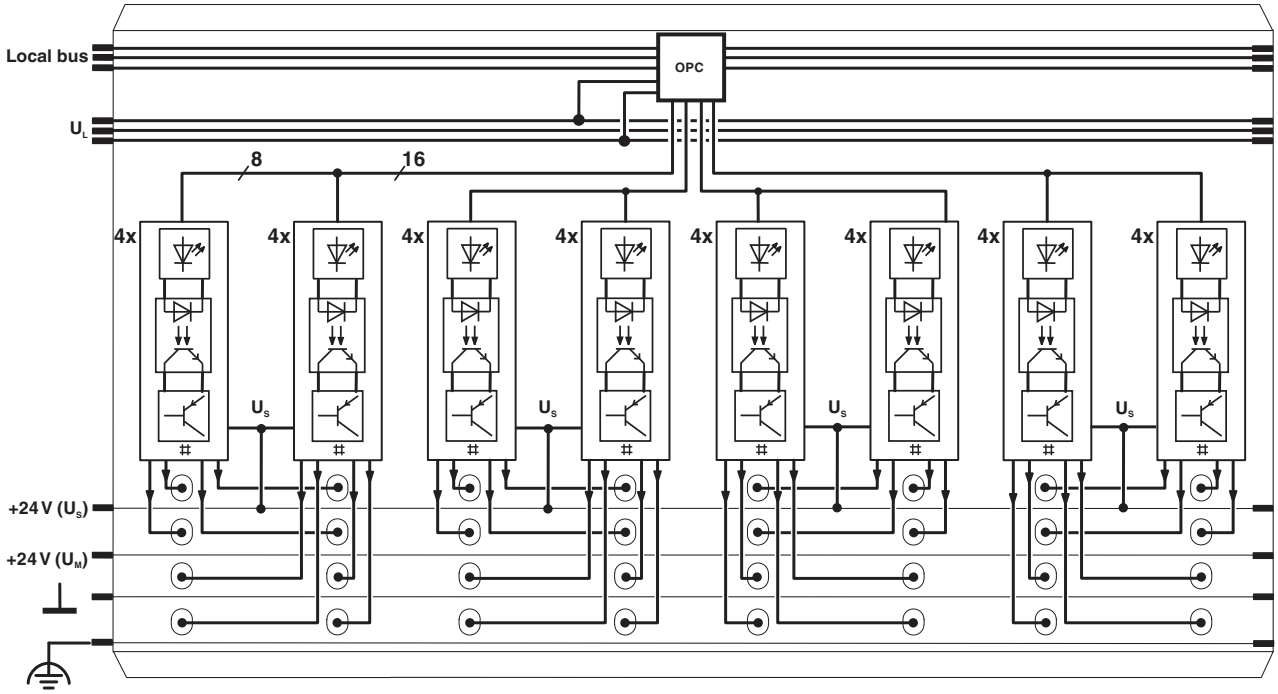


Figure 1 Internal wiring of the terminal points

Key:

OPC — Protocol chip (Bus logic including voltage conditioning)

LED (status indicator)

Optocoupler

Transistor

Digital output

Explanation for other used symbols has been provided in the IL SYS INST UM E user manual.

7 Notes on using the terminal block in potentially explosive areas

Valid for: **IB IL 24 DI 32/HD-PAC**

WARNING: Explosion hazard

Please make sure that the following notes and instructions are observed.

Approval according to ATEX Directive 2014/34/EU

Ⓔx II 3 G Ex nA IIC T4 Gc X

Installation notes

T_{amb} = -25 °C ... +55 °C

The category 3 device is designed for installation in zone 2 potentially explosive areas.

The device meets the requirements of EN 60079–0:2012 + A11:2013 and EN 60079–15:2010.

- Observe the specified conditions for use in potentially explosive areas! Also observe the requirements of EN 60079-14.
- Install the device in a suitable approved housing (with at least IP54 protection) that meets the requirements of EN 60079-15.
- Only assemble, disassemble as well as connect and disconnect cables when the power is disconnected.
- Only devices that are designed for operation in Ex Zone 2 and the conditions at the installation location may be connected to the circuits in Zone 2.
- For safe operation, lockable plug connections must have a functional interlock (e. g. locking clip, screw connection etc.). Insert the interlock. Repair any damaged connectors immediately.
- Only connect one cable per terminal point. If you want to connect two flexible cables per terminal point, then use a TWIN ferrule.
- Use transient protection so that short-term surge voltages do not exceed 119 V.
- The air pressure during operation must not exceed 106 kPa.
- Perform a dielectric test after installing the device in the housing.
- For all supply and signal lines connected to the station, make sure that there is a connection to ground potential.
- Make sure that the maximum permissible current of 4 A flowing through potential jumpers U_M and U_S (total current) is not exceeded.
- When using the device in potentially explosive areas, observe the specifications in the application note AH DE IL EX ZONE 2 (German) / AH EN IL EX ZONE 2 (English).

8 Terminal point assignment

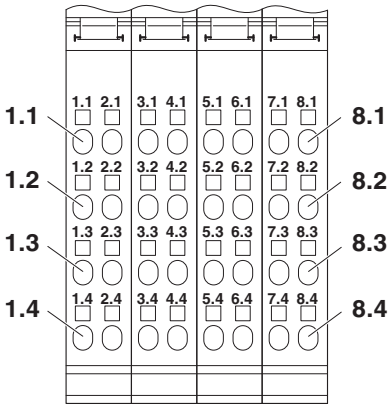


Figure 2 Terminal point assignment

Terminal point	Assignment
1.1 / 2.1	Signal output (OUT01 / OUT02)
1.2 / 2.2	Signal output (OUT03 / OUT04)
1.3 / 2.3	Signal output (OUT05 / OUT06)
1.4 / 2.4	Signal output (OUT07 / OUT08)
3.1 / 4.1	Signal output (OUT09 / OUT10)
3.2 / 4.2	Signal output (OUT11 / OUT12)
3.3 / 4.3	Signal output (OUT13 / OUT14)
3.4 / 4.4	Signal output (OUT15 / OUT16)
5.1 / 6.1	Signal output (OUT17 / OUT18)
5.2 / 6.2	Signal output (OUT19 / OUT20)
5.3 / 6.3	Signal output (OUT21 / OUT22)
5.4 / 6.4	Signal output (OUT23 / OUT24)
7.1 / 8.1	Signal output (OUT25 / OUT26)
7.2 / 8.2	Signal output (OUT27 / OUT28)
7.3 / 8.3	Signal output (OUT29 / OUT30)
7.4 / 8.4	Signal output (OUT31 / OUT32)

9 Connection notes and examples

When connecting the actuators, observe the assignment of the terminal points to the process data.

NOTE: Malfunction

GND of the actuators and GND of the supply voltage U_S, which supply the actuators, must have the same potential.

The easiest way to meet this requirement is to use the IB IL PD GND (-PAC) terminal (four terminals for 32 actuators). Wire the GND connections for the actuators to these terminals. In this way, they are connected to potential jumper GND of the Inline station.

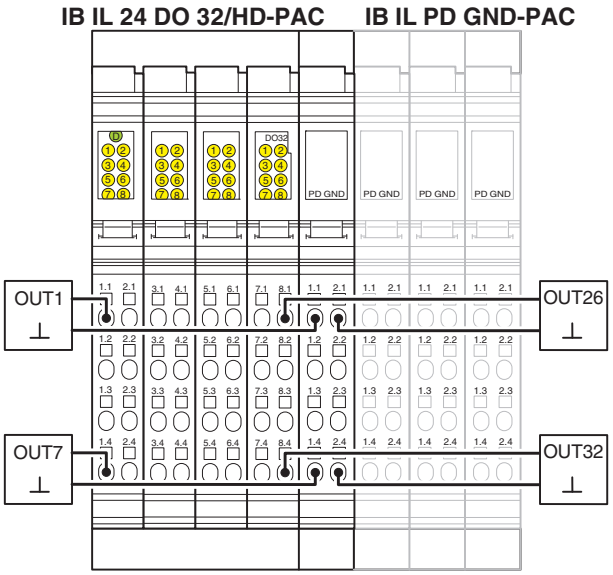


Figure 3 Typical connection of actuators when using the IB IL PD GND-PAC terminal

The slot numbering corresponds to the marking of the original connectors of the PAC version or the connector marking of the recommended connector set IB IL DI/DO 8-PLSET.

The actuators can also be connected via external busbars. Ensure that GND of the actuators and GND for U_S have the same potential.

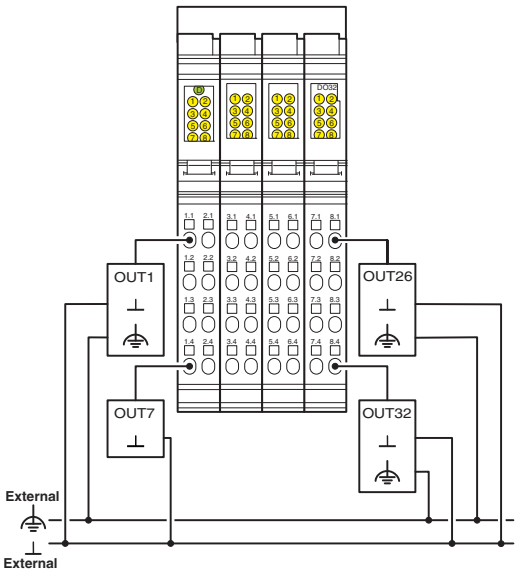


Figure 4 Typical connection of actuators when using external busbars

10 Application examples

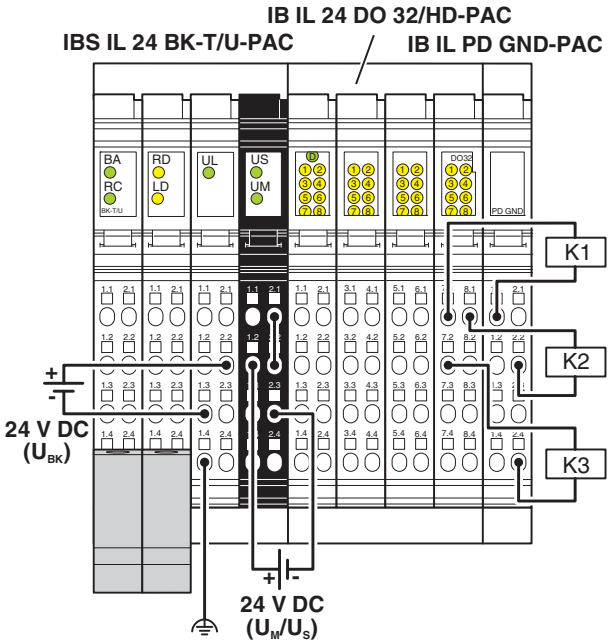


Figure 5 Connection of contactors when using the IB IL PD GND-PAC terminal

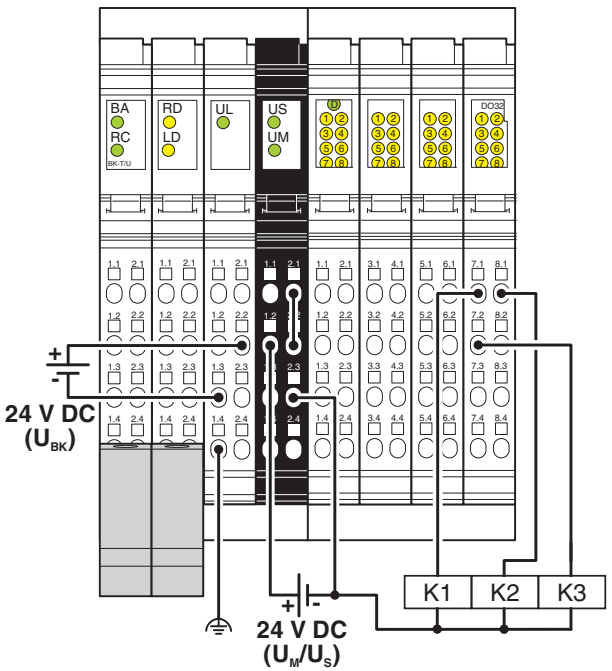


Figure 6 Connection of contactors when using external busbars

11 Local diagnostic and status indicators

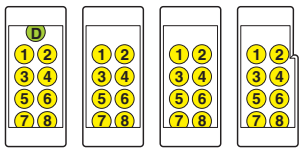


Figure 7 Local diagnostic and status indicators

Designation	Color	Meaning
D	Green	Diagnostics (bus and logic voltage)
For each connector		
1 ... 8	Yellow	Status of the outputs

Function identification

Pink

2 Mbps: White stripe in the vicinity of the D LED

12 Process data

Assignment of the terminal points to the output process data

(Word.bit) view	Word	Word 0															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
(Byte.Bit) view	Byte	Byte 0								Byte 1							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Assignment	Slot	4								3							
	Signal	OUT 32	OUT 31	OUT 30	OUT 29	OUT 28	OUT 27	OUT 26	OUT 25	OUT 24	OUT 23	OUT 22	OUT 21	OUT 20	OUT 19	OUT 18	OUT 17
	Terminal point (signal)	8.4	7.4	8.3	7.3	8.2	7.2	8.1	7.1	6.4	5.4	6.3	5.3	6.2	5.2	6.1	5.1
Status indicator	LED	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1

(Word.bit) view	Word	Word 1															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
(Byte.Bit) view	Byte	Byte 2								Byte 3							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Assignment	Slot	2								1							
	Signal	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10	OUT 09	OUT 08	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01
	Terminal point (signal)	4.4	3.4	4.3	3.3	4.2	3.2	4.1	3.1	2.4	1.4	2.3	1.3	2.2	1.2	2.1	1.1
Status indicator	LED	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1

For the assignment of the illustrated (byte.bit) view to your INTERBUS control or computer system, please refer to the DB GB IBS SYS ADDRESS data sheet.

For the assignment of the illustrated (byte.bit) view to controllers for other bus systems, please refer to document AH IB IL 24 DI/DO 32 ADDRESS.

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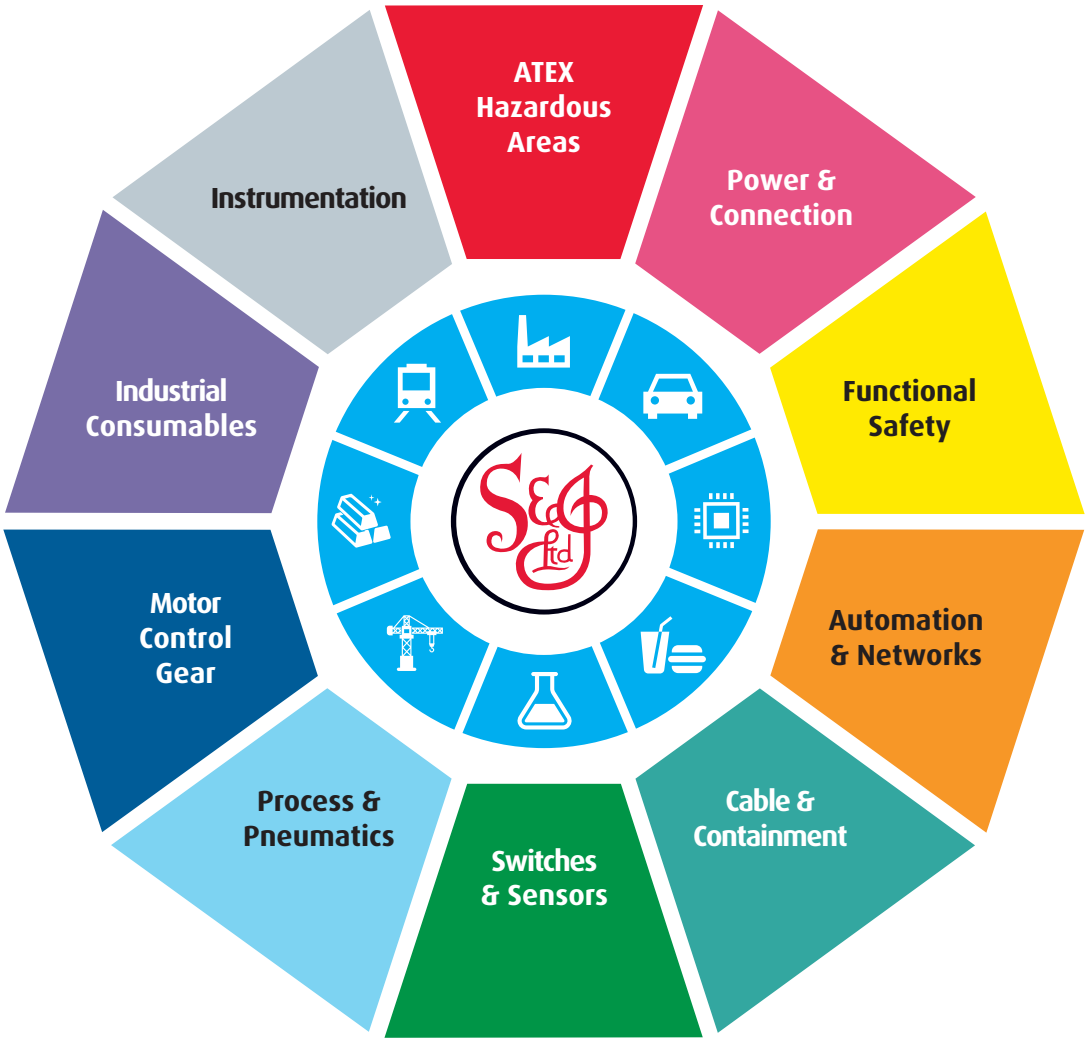

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