IB IL 24 DI 16 ...

Inline terminal with 16 digital inputs

Data sheet
5553_en_05

1 Description

This terminal is designed for use within an Inline station. It is used to acquire digital signals.

Features

- Connections for 16 digital sensors
- Connection of sensors in 2 and 3-wire technology
- Maximum permissible load current per sensor: 250 mA
- Maximum permissible load current from the terminal: 4.0 A
- Diagnostics and status indicators
- **IB IL 24 DI 16 and IB IL 24 DI 16-PAC**: Approved for the use in potentially explosive areas (observe the notes on page 7)

	Please note that the numbering of the terminal points differs for the various connector versions (see Figure 2 on page 6).
	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 www.phoenixcontact.net/catalog.
	This data sheet is valid for all products listed on the following page:

2 Ordering data

Products

Description	Type	Order No.	Pcs. / Pkt.
Terminal with 16 digital inputs; complete with accessories (connectors consecutively numbered and labeling fields); transmission speed of 500 kbps	IB IL 24 DI 16-PAC	2861250	1
Terminal with 16 digital inputs; complete with accessories (connectors not consecutively numbered and labeling fields); transmission speed of 500 kbps	IB IL 24 DI 16-PAC/SN	2862958	1
Terminal with 16 digital inputs; without accessories; transmission speed of 500 kbps	IB IL 24 DI 16	2726230	1
Terminal with 16 digital inputs; complete with accessories (connectors consecutively numbered and labeling fields); transmission speed of 2 Mbps	IB IL 24 DI 16-2MBD-PAC	2861959	1
Terminal with 16 digital inputs; complete with accessories (connectors not consecutively numbered and labeling fields); transmission speed of 2 Mbps	IB IL 24 DI 16-2MBD-PAC/SN	2878120	1
Terminal with 16 digital inputs; without accessories; transmission speed of 2 Mbps	IB IL 24 DI 16-2MBD	2855114	1

Four of the listed connectors or one connector set are needed for the complete fitting of the IB IL 24 DI 16 and IB IL 24 DI 16-2MBD.

Accessories

Description	Type	Order No.	Pcs. / Pkt.
Connector with twelve spring-cage connections (green, without color print)	IB IL SCN-12	2726340	10
Connector with twelve spring-cage connections (green, with color print)	IB IL SCN-12-ICP	2727611	10
Connector set with 48 spring-cage connections (green, without color print)	IB IL DI/DO 16-PLSET	2860976	1
Connector set with 48 spring-cage connections numbered consecutively (green, with color print)	IB IL DI 16-PLSET/ICP	2860989	1

Documentation

Description	Type	Order No.	Pcs. / Pkt.
"Automation terminals of the Inline product range" user manual	IL SYS INST UM E	–	1
“Configuring and installing the INTERBUS Inline product range” user manual	IB IL SYS PRO UM E	–	1
"INTERBUS addressing" data sheet	DB GB IBS SYS ADDRESS	–	1
"Inline terminals for use in zone 2 potentially explosive areas" application note	AH EN IL EX ZONE 2	–	1
"Addressing of 16-channel Inline terminals" application note	AH IB IL 24 DI/DO 16 ADDRESS	–	1

3 Technical data

General data	
Housing dimensions (width x height x depth)	48.8 mm x 140.5 mm x 71.5 mm
Weight	122 g (without connectors), 210 g (with connectors)
Operating mode	Process data mode with 1 word
Connection method for sensors	2 and 3-wire technology
Permissible temperature (operation)	-25°C to +55°C
Permissible temperature (storage/transport)	-25°C to +85°C
Permissible humidity (operation/storage/transport)	10% to 95%, according to DIN EN 61131-2
Permissible air pressure (operation/storage/transport)	70 kPa to 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20 according to IEC 60529
Protection class	III, IEC 61140, EN 61140, VDE 0140-1
Connection data for connectors	
Connection method	Spring-cage terminals
Conductor cross-section	0.08 mm^2 to 1.5 mm^2 (solid or stranded), 28 - 16 AWG

Interface	
Local bus	Through data routing

Transmission speed	
IB IL 24 DI 16-PAC	500 kbps
IB IL 24 DI 16-PAC/SN	500 kbps
IB IL 24 DI 16	500 kbps
IB IL 24 DI 16-2MBD-PAC	2 Mbps
IB IL 24 DI 16-2MBD-PAC/SN	2 Mbps
IB IL 24 DI 16-2MBD	2 Mbps

Supply of the module electronics and I/O through the bus terminal/power terminal	
Connection method	Through potential routing

Power consumption	500 kbps	2 Mbps
Communications power	7.5 V	7.5 V
Current consumption from the local bus	60 mA, maximum	80 mA, maximum
Power consumption from the local bus	0.45 W, maximum	0.6 W, maximum
Segment supply voltage U_S	24 V DC (nominal value)	24 V DC (nominal value)
Nominal current consumption at U_S	4 A, maximum	4 A, maximum

Digital inputs	
Number	16
Connection method	Spring-cage connection
Connection method	2, 3-wire
Description of the input	EN 61131-2 Type 1
Input voltage range “0” signal	-3 V DC ... +5 V DC
Input voltage range “1” signal	+15 V DC ... 30 V DC
Common potentials	Segment supply, ground
Nominal input voltage U_{IN}	24 V DC
Permissible range	-30 V < U_{IN} < +30 V DC
Nominal input current at U_{IN}	3 mA, minimum
Delay time	None
Permissible cable length to sensor	30 m
Use of AC sensors	AC sensors in the voltage range < U_{IN} are limited in application (according to the input design)

Characteristic curve: Current depending on the input voltage and the ambient temperature T_A			
Supply voltage	**Input current**	**Input current for t >= 20 s**	
		For T_A = 25°C	**For T_A = 55°C**
18 V	3.0 mA	2.9 mA	2.5 mA
24 V	3.9 mA	3.8 mA	3.5 mA
30 V	4.5 mA	4.2 mA	3.0 mA
The current is reduced depending on the ambient temperature T_A and the number of inputs that are switched on (internal module temperature).			

Power dissipation

Formula for calculating the power dissipation of the electronics

500 kbps	2 Mbps
$P_{EL} = 0.525\ W + \sum_{n=1}^{16} [\ U_{INn} \times 0.003\ A\ ]$	$P_{EL} = 0.6\ W + \sum_{n=1}^{16} [\ U_{INn} \times 0.003\ A\ ]$

Where:

P_{EL}	Total power dissipation in the terminal
n	Index of the number of set inputs n = 1 to 16
U_{INn}	Input voltage of input n

Power dissipation of the housing P_{HOU}	2.8 W, maximum (within the permissible operating temperature)

Limitation of simultaneity, derating

Derating	No limitation of simultaneity, no derating

Safety equipment

Overload in segment circuit	No
Surge voltage	Protective elements of the power terminal
Reverse polarity	Protective elements of the power terminal

Programming data

ID code (hex)	BE
ID code (dec)	190
Length code (hex)	01
Length code (dec)	01
Process data channel	16 bits
Input address area	1 word
Output address area	0 words
Parameter channel (PCP)	0 words
Register length (bus)	1 word

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

PROFIBUS telegram data

Required parameter data	1 byte
Required configuration data	4 bytes

Error messages to the higher-level control or computer system

None

Electrical isolation/isolation of the voltage areas

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 also application description).

Common potentials

The 24 V main voltage, 24 V segment voltage, and GND have the same potential. FE is a separate potential area.

Separate potentials in the system consisting of bus terminal/power terminal and I/O terminal

- Test distance	- Test voltage
5 V supply incoming remote bus/7.5 V supply (bus logic)	500 V AC, 50 Hz, 1 min.
5 V supply outgoing remote bus/7.5 V supply (bus logic)	500 V AC, 50 Hz, 1 min.
7.5 V supply (bus logic)/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.

Approvals

For the latest approvals, please visit www.phoenixcontact.net/catalog.

4 Local diagnostic and status indicators and terminal point assignment

4.1 Local diagnostics and status indicators

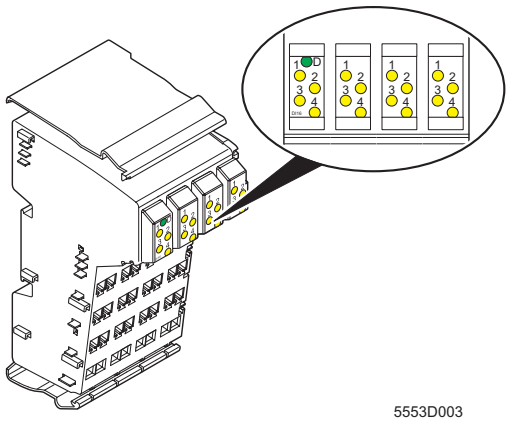

Figure 1 Local diagnostic and status indicators

Des.	Color	Meaning
D	Green	Diagnostics
For each connector		
1, 2, 3, 4	Yellow	Status indicators for the inputs

4.2 Function identification

Light blue

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

4.3 Terminal point assignment for each connector

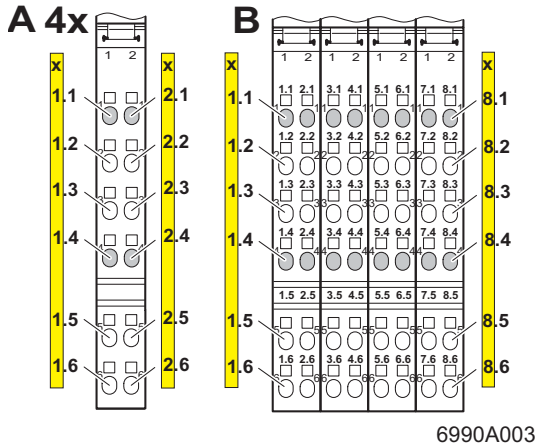

Figure 2 Terminal point numbering: individual connectors (**A**) and connector sets (**B**)

A – Using the IB IL 24 DI 16-PAC/SN and IB IL 24 DI 16-2MBD-PAC/SN with the connectors provided

– Using individual connectors (IB IL SCN-12 or IB IL SCN-12-ICP)

B – Using the IB IL 24 DI 16-PAC and IB IL 24 DI 16-2MBD-PAC with the original connector set

– Using the IB IL 24 DI 16-PLSET/ICP or IB IL DI/DO 16-PLSET connector sets

Terminal point	Assignment
x.1	Signal input (IN)
x.2	Segment voltage U_S for 2 and 3-wire termination
x.3	Ground contact (GND) for 3-wire termination
x.4	Signal input (IN)
x.5	Segment voltage U_S for 2 and 3-wire termination
x.6	Ground contact (GND) for 3-wire termination

5 Notes on using the terminal in potentially explosive areas for the IB IL 24 DI 16 and IB IL 24 DI 16-PAC terminals

5.1 Approval according to EC directive 94/9 (ATEX) II 3G Ex nAC IIC T4 X

This Inline terminal conforms to the requirements of protection type "n" and can be installed in a zone 2 potentially explosive area. This Inline terminal is a category 3G item of electrical equipment.

WARNING: Explosion hazard
Only Inline terminals that are approved for use in potentially explosive areas may be snapped next to this Inline terminal.

Before using an Inline terminal in a zone 2 potentially explosive area, first check whether the terminal has been approved for installation in this area.

For a list of terminals that are approved for the potentially explosive areas of zone 2, please refer to the AH EN IL EX ZONE 2 application note.

Check the labeling on the Inline terminal and on the packaging (see Figure 3).

Figure 3 Typical labeling of terminals for use in potentially explosive areas

WARNING: Explosion hazard

Prior to startup, make sure that the following points and instructions are observed.

1. When working on the Inline terminal, always switch off the supply voltage.
2. The Inline terminal must only be installed, started up, and maintained by qualified specialist personnel.
3. Install the Inline terminals in a control cabinet or metal housing. The minimum requirement for both items is IP54 protection according to EN 60529.
4. The Inline terminal must not be subject to mechanical strain and thermal loads, which exceed the limits specified in the product documentation.
5. The Inline terminal must not be repaired by the user. Repairs may only be carried out by the manufacturer. The Inline terminal is to be replaced by an approved terminal of the same type.
6. Only category 3G equipment may be connected to Inline terminals in zone 2.
7. Observe all applicable standards and national safety and accident prevention regulations for installing and operating equipment.

5.2 Restrictions

WARNING: Explosion hazard

When using terminals in potentially explosive areas, observe the technical data and limit values specified in the corresponding documentation (user manual, data sheet, package slip).

DANGER: Explosion hazard;
Restrictions regarding the Inline system

The **maximum permissible current** flowing through the potential jumpers U_M and U_S (total current) is limited to **4 A** when using the Inline terminal in potentially explosive areas.

6 Internal circuit diagram

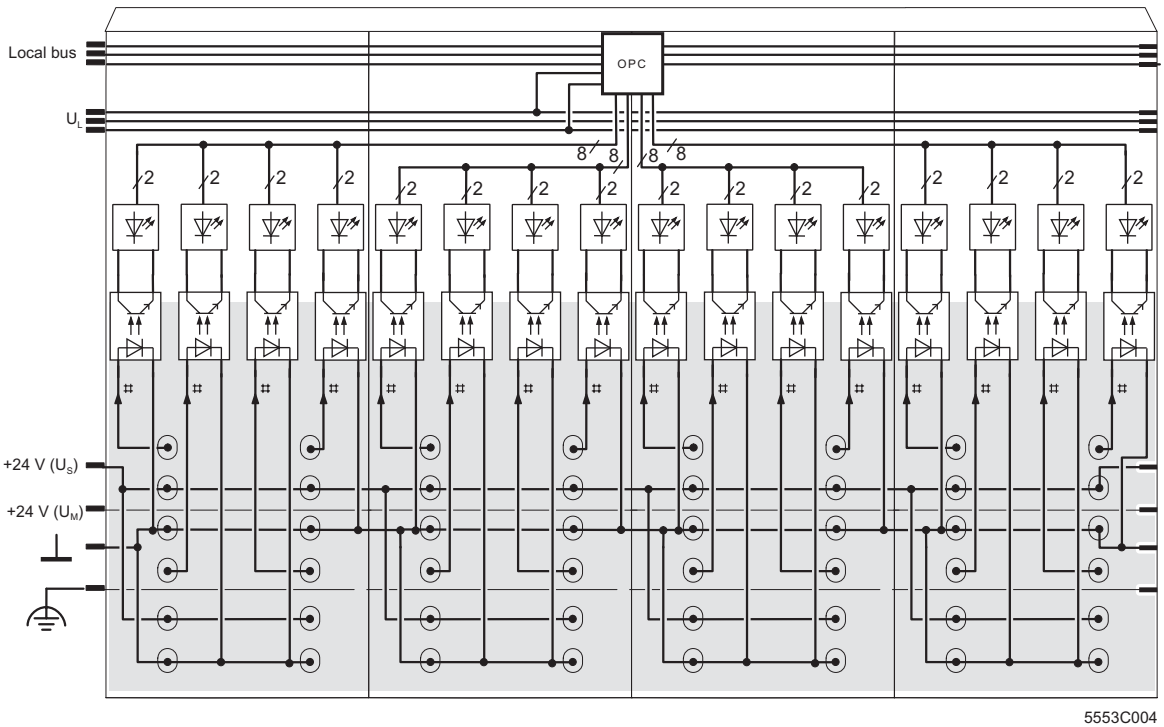

Figure 4 Internal wiring of the terminal points

Key:

OPC	Protocol chip (bus logic including voltage conditioning)
	LED
	Optocoupler
	Digital input
	Electrically isolated area

Other symbols used are explained in the IL SYS INST UM E user manual.

7 Connection notes and connection example

NOTE: Malfunction

The terminal must be provided with supply voltage U_S, as it is used internally as the auxiliary supply.

When connecting the sensors observe the assignment of the terminal points to the process data, see page 10.

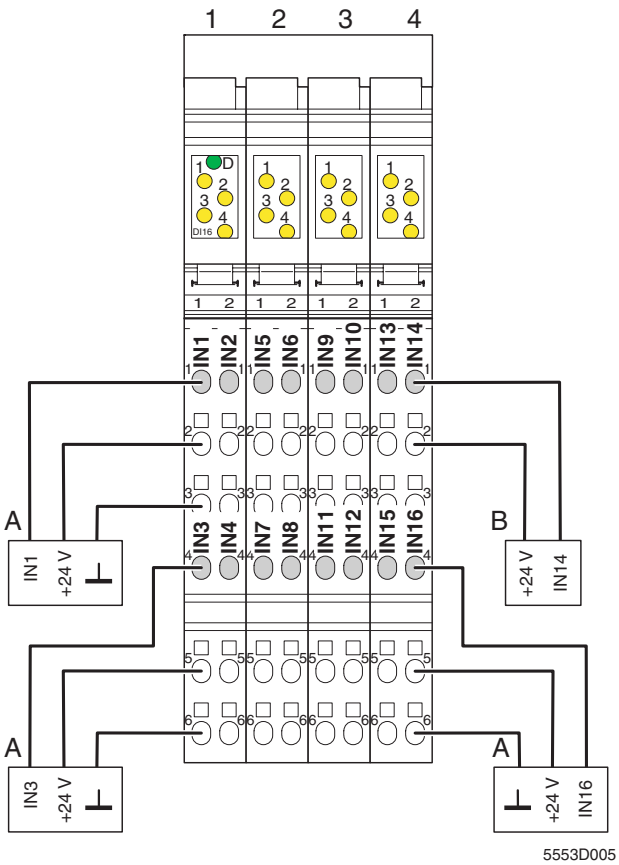

Figure 5 Typical connection of sensors

A 3-wire termination

B 2-wire termination

The numbers shown above the module indicate the connector slots.

8 Process data

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 control systems of **other bus systems**, please refer to the AH IB IL 24 DI/DO ADDRESS document.

Assignment of the terminal points to IN process data

The following table applies to the IB IL 24 DI 16-PAC and IB IL 24 DI 16-2MBD-PAC with the original connector set and when using the IB IL DI/DO 16-PLSET or IB IL DI 16-PLSET/ICP connector sets (see also Figure 2 on page 6, detail B).

(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
Module	Slot	4				3				2				1			
	Terminal point (signal)	**8.4**	**7.4**	**8.1**	**7.1**	**6.4**	**5.4**	**6.1**	**5.1**	**4.4**	**3.4**	**4.1**	**3.1**	**2.4**	**1.4**	**2.1**	**1.1**
	Terminal point (+24 V)	8.5	7.5	8.2	7.2	6.5	5.5	6.2	5.2	4.5	3.5	4.2	3.2	2.5	1.5	2.2	1.2
	Terminal point (GND)	8.6	7.6	8.3	7.3	6.6	5.6	6.3	5.3	4.6	3.6	4.3	3.3	2.6	1.6	2.3	1.3
Status indication	Slot	4				3				2				1			
	LED	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

The following table applies to the IB IL 24 DI 16-PAC/SN and IB IL 24 DI 16-2MBD-PAC/SN with the original connector set and when using the IB IL SCN-12 or IB IL SCN-12-ICP connectors (see also Figure 2 on page 6, detail A).

(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
Module	Slot	4				3				2				1			
	Terminal point (signal)	**2.4**	**1.4**	**2.1**	**1.1**	**2.4**	**1.4**	**2.1**	**1.1**	**2.4**	**1.4**	**2.1**	**1.1**	**2.4**	**1.4**	**2.1**	**1.1**
	Terminal point (+24 V)	2.5	1.5	2.2	1.2	2.5	1.5	2.2	1.2	2.5	1.5	2.2	1.2	2.5	1.5	2.2	1.2
	Terminal point (GND)	2.6	1.6	2.3	1.3	2.6	1.6	2.3	1.3	2.6	1.6	2.3	1.3	2.6	1.6	2.3	1.3
Status indication	Slot	4				3				2				1			
	LED	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1