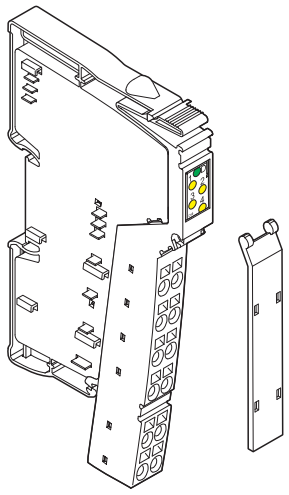
IB IL 24 DI 4 ...

Inline terminal with 4 digital inputs



AUTOMATION

Data Sheet
5550_en_05

1 Description

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

1.1 Features

- Connections for four 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: 1.0 A
- Diagnostic and status indicators
- Approved for the use in potentially explosive areas (observe the notes on page 7)

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.download.phoenixcontact.com.

A conversion table is available on the Internet at www.download.phoenixcontact.com/general/7000_en_00.pdf.

This data sheet is valid for the products listed on the following page:

2 Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Inline terminal with four digital inputs; complete with accessories (connector and labeling field); transmission speed of 500 kbps	IB IL 24 DI 4-PAC	2861234	1
Inline terminal with four digital inputs; without accessories; transmission speed of 500 kbps	IB IL 24 DI 4	2726214	1
Inline terminal with four digital inputs; complete with accessories (connector and labeling field); transmission speed of 2 Mbps	IB IL 24 DI 4-2MBD-PAC	2692306	1
Inline terminal with four digital inputs; without accessories; transmission speed of 2 Mbps	IB IL 24 DI 4-2MBD	2855017	1

One of the connectors listed below is needed for the complete fitting of the IB IL 24 DI 4 and IB IL 24 DI 4-2MBD terminals.

Accessories

Description	Type	Order No.	Pcs./Pkt.
Connector for digital 4-channel or 16-channel Inline terminals, w/o color print	IB IL SCN-12	2726340	1
Connector for digital 4-channel or 16-channel Inline input terminals, with color print	IB IL SCN-12-ICP	2727611	1

Documentation

Description	Type	Order No.	Pcs./Pkt.
"Automation Terminals of the Inline Product Range" user manual	IL SYS INST UM E	2698737	1
"INTERBUS Addressing" data sheet	DB GB IBS SYS ADDRESS	9000990	1
"Inline Terminals for Use in Zone 2 Potentially Explosive Areas" application note	AH EN IL EX ZONE 2	–	–

3 Technical data

General data	
Housing dimensions (width x height x depth)	12.2 mm x 141 mm x 72 mm (with connectors)
Weight	44 g (without connector), 66 g (with connector)
Operating mode	Process data operation with 4 bit (1 nibble)
Connection method for sensors	2 and 3-wire technology
Ambient temperatures (operation)	-25°C to +55°C
Ambient 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
Class of protection	III, IEC 61140
Connection data for Inline connector	
Connection type	Spring-cage terminals
Conductor cross-section	0.2 mm^2 to 1.5 mm^2 (solid or stranded), 24 - 16 AWG

Interface	
Local bus	Through data routing

Transmission speed	
IB IL 24 DI 4, IB IL 24 DI 4-PAC	500 kbps
IB IL 24 DI 4-2MBD, IB IL 24 DI 4-2MBD-PAC	2 Mbps

Power consumption	500 kbps	2 Mbps
Communications power	7.5 V	7.5 V
Current consumption at U_L	40 mA, maximum	51 mA, maximum
Power consumption at U_L	0.3 W, maximum	0.4 W, maximum
Segment supply voltage U_S	24 V DC (nominal value)	24 V DC (nominal value)
Nominal current consumption at U_S	1.0 A, maximum	1.0 A, maximum

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

Digital inputs	
Number	4
Input design	According to EN 61131-2, Type 1
Definition of switching thresholds	
Maximum low-level voltage	$U_{Lmax} < 5$ V
Minimum high-level voltage	$U_{Hmin} > 15$ V
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 for U_{IN}	
At 500 kbps	3 mA, minimum
At 2 Mbps	3 mA, typical
Delay time	None
Permissible cable length to the sensor	30 m (to ensure conformance with EMC Directive)
Use of AC sensors	AC sensors in the voltage range < U_{IN} are limited in application (corresponding to the input design).

Characteristic curve: Current depending on the input voltage and the ambient temperature T_A (at 500 kbps)

Supply voltage	Input current	Input current acc. to 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 (module internal temperature).

Power dissipation

Formula to calculate the power dissipation of the electronics

$$P_{TOT} = 0.24\ W + \sum_{i=1}^{n} [\ U_{INi} \times 0.003\ A\ ]$$

,

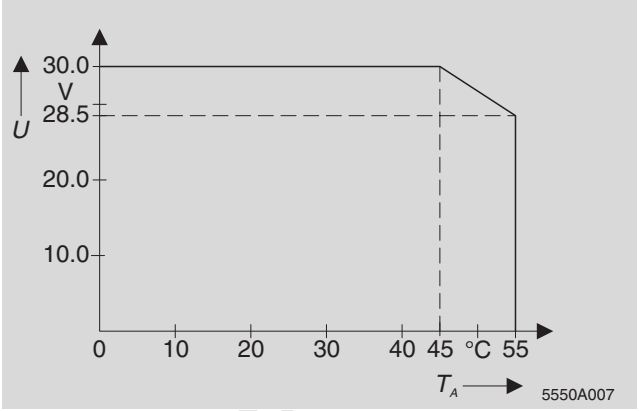
Where

P_{TOT}	Total power dissipation in the terminal
n	Number of set inputs (n = 1 to 4)
U_{INi}	Input voltage of input i
i	Index

Power dissipation of the housing P_{HOU}

0.6 W, maximum (within the permissible operating temperature)

Limitation of simultaneity, derating

IB IL 24 DI 4, IB IL 24 DI 4-PAC (500 kbps)	No limitation of simultaneity, no derating
IB IL 24 DI 4-2MBD, IB IL 24 DI 4-2MBD-PAC (2 Mbps)	

Safety equipment

Overload in segment circuit	No
Surge voltage	Protective elements in the power terminal
Polarity reversal	Protective elements in the power terminal

Electrical isolation

To provide electrical isolation between the logic level and the I/O area it is necessary to supply the station bus coupler and the digital input terminal described here via the bus coupler or a power terminal from separate power supply units. Interconnection of the power supply units in the 24 V area is not permitted. (See also IL SYS INST UM E user manual.)

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 coupler/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

Error messages to the higher-level control or computer system

None

Approvals

For the latest approvals, please visit www.download.phoenixcontact.com or www.eshop.phoenixcontact.com.

4 Internal circuit diagram

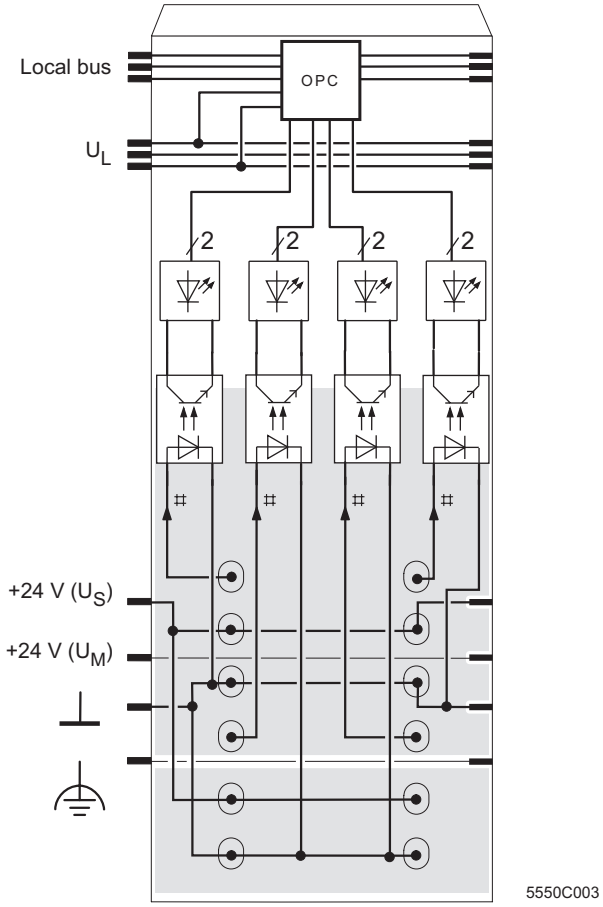


Figure 1 Internal wiring of the terminal points

Key:

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

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

5 Local diagnostic/status indicators and terminal point assignment

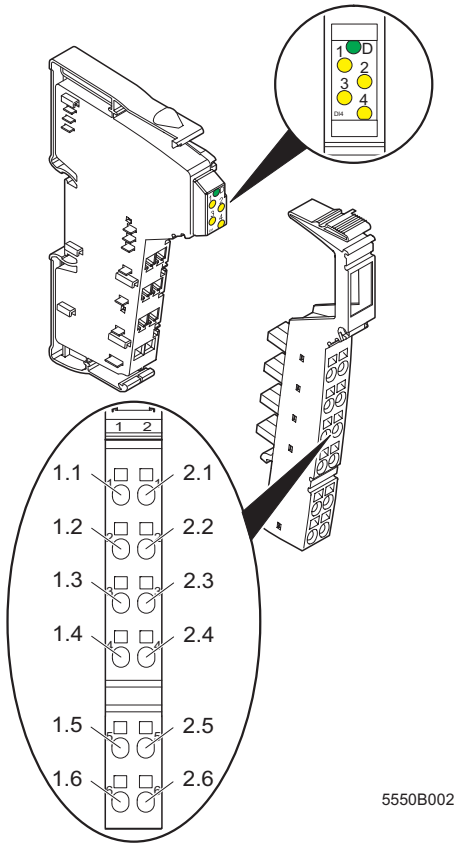


Figure 2 Terminal with appropriate connector

5.1 Local diagnostic and status indicators

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

5.2 Function identification

Light blue

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

5.3 Terminal point assignment

Terminal point	Assignment
1.1	Signal input 1 (IN 1)
2.1	Signal input 2 (IN 2)
1.2, 2.2	Segment voltage U_S for 2 and 3-wire termination
1.3, 2.3	Ground contact (GND) for 3-wire termination
1.4	Signal input 3 (IN 3)
2.4	Signal input 4 (IN 4)
1.5, 2.5	Segment voltage U_S for 2 and 3-wire termination
1.6, 2.6	Ground contact (GND) for 3-wire termination

6 Connection example

When connecting the sensors observe the assignment of the terminal points to the process data (see page 8).

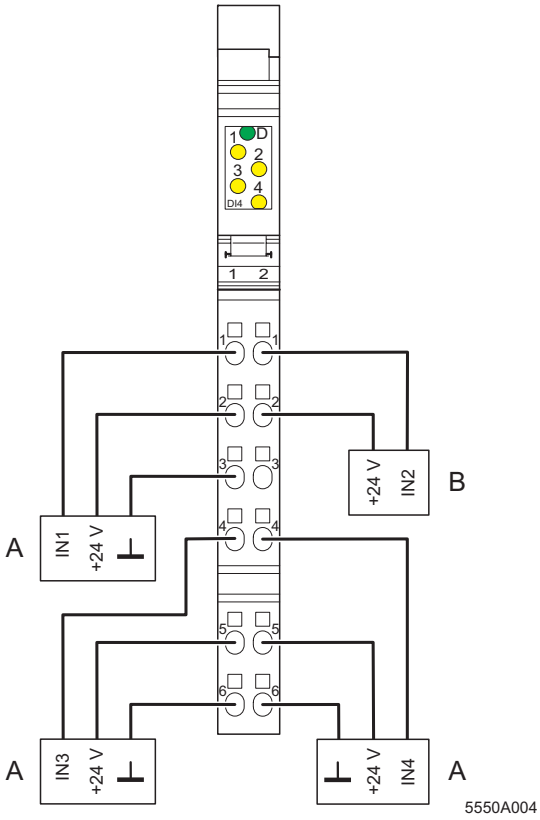


Figure 3 Typical sensor connections

A 3-wire termination
B 2-wire termination

7 Notes on using the terminal in potentially explosive areas for the IB IL 24 DI 4 and IB IL 24 DI 4-PAC terminals

Approval according to EC Directive EG-RL 94/9 (ATEX)

II 3G EEx nAC IIC T4 U

This Inline terminal conforms to standard EN 50021 and can be installed in a zone 2 potentially explosive area. This Inline terminal is a category 3 item of equipment.

UL approval

This Inline terminal of the indicated hardware version or later is suitable for use in Class I, Division 2, Groups A, B, C, D.

WARNING: Explosion hazard
Only use Inline terminals that are approved for use in potentially explosive areas.

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

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

Check the labeling on the Inline terminal and the packaging (see Figure 4).

Figure 4 Typical labeling of terminals for use in potentially explosive areas

WARNING: Explosion hazard

Before startup, ensure that the following points and instructions are observed.

1. When working on the Inline terminal, always disconnect 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.

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).

WARNING: Explosion hazard, Restrictions regarding the Inline system

Please 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 Inline terminals in potentially explosive areas.

8 Programming data/ configuration data

8.1 Local bus (INTERBUS)

ID code	BE_{hex} (190_{dec})
Length code	41_{hex}
Input address area	4 bits
Output address area	0 bits
Parameter channel (PCP)	0 bits
Register length (bus)	4 bits

8.2 Other bus systems

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

9 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.

9.1 Assignment of the terminal points to the IN process data

(Byte.bit) view	Byte.Bit	0.3	0.2	0.1	0.0
Module	Terminal point (signal)	2.4	1.4	2.1	1.1
	Terminal point (+24 V)	2.5	1.5	2.2	1.2
	Terminal point (GND)	2.6	1.6	2.3	1.3
Status indicator	LED	4	3	2	1