

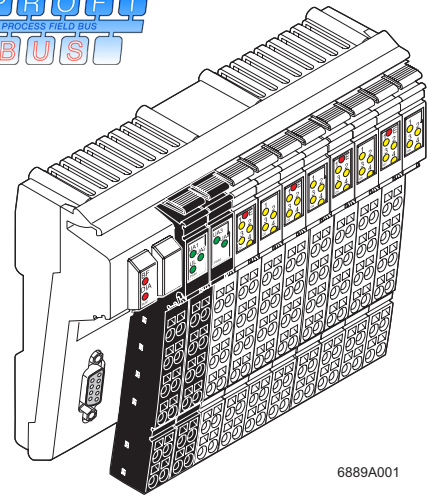
ILB PB 24 DO32

Inline Block IO Module for PROFIBUS With 32 Digital Outputs

AUTOMATIONWORX

Data Sheet
6889_en_04

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6889A001

Description

The ILB PB 24 DO32 module is designed for use within a PROFIBUS network. It is used to output digital signals.

PROFIBUS-DP Features

- Bus connection via D-SUB connectors
- Rotary encoding switches for address setting
- Supported PROFIBUS addresses 1 to 99
- Transmission speed 9.6 kbaud to 12 Mbaud (autobaud)
- Diagnostic and status indicators
- Device description via GSD file

Output Features

- Connections for 32 digital actuators
- Connection of actuators in 2 and 3-wire technology
- Nominal current per output: 0.5 A
- Total current of all outputs: 16 A (4 x 4 A)
- Short-circuit and overload protected outputs
- Diagnostic and status indicators



Please refer to the "Mounting and Removing Inline Block IO Modules" application note (see "Ordering Data" on page 2).



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.

Ordering Data

Product

Description	Type	Order No.	Pcs./Pkt.
Inline Block IO module for PROFIBUS with 32 digital outputs	ILB PB 24 DO32	2862408	1

Accessories: Connector

Description	Type	Order No.	Pcs./Pkt.
9-pos. D-SUB connector for connecting PROFIBUS	SUBCON-PLUS-PROFIB	2744348	1

Accessories: Connectors as Replacement Item

Description	Type	Order No.	Pcs./Pkt.
Connector for the supply (color print)	ILB SCN-12-PWR IN-CP	2863164	10
Connector, with color print, for digital 4-channel or 16-channel Inline output terminals	IB IL SCN-12-OCP	2727624	10

Accessories: Other

Description	Type	Order No.	Pcs./Pkt.
Recommended end clamp; placed both to the right and left of the module to secure it on the DIN rail	CLIPFIX 35-5	3022276	50

Documentation

Description	Type	Order No.	Pcs./Pkt.
"Mounting and Removing Inline Block IO Modules" application note	AH ILB INSTALLATION	9014931	1
"Addressing of 32-Channel ILB Modules" application note	AH ILB 24 DI/DO 32 ADDRESS	9014963	1

Technical Data

General Data

Housing dimensions with connectors (width x height x depth)	156 mm x 55 mm x 141 mm
Weight	510 g (with connectors)
Operating mode	Process data mode with 4 bytes
Transmission speed	9.6 kbaud to 12 Mbaud (autobaud)
Connection method for actuators	2 and 3-wire technology

Housing Dimensions

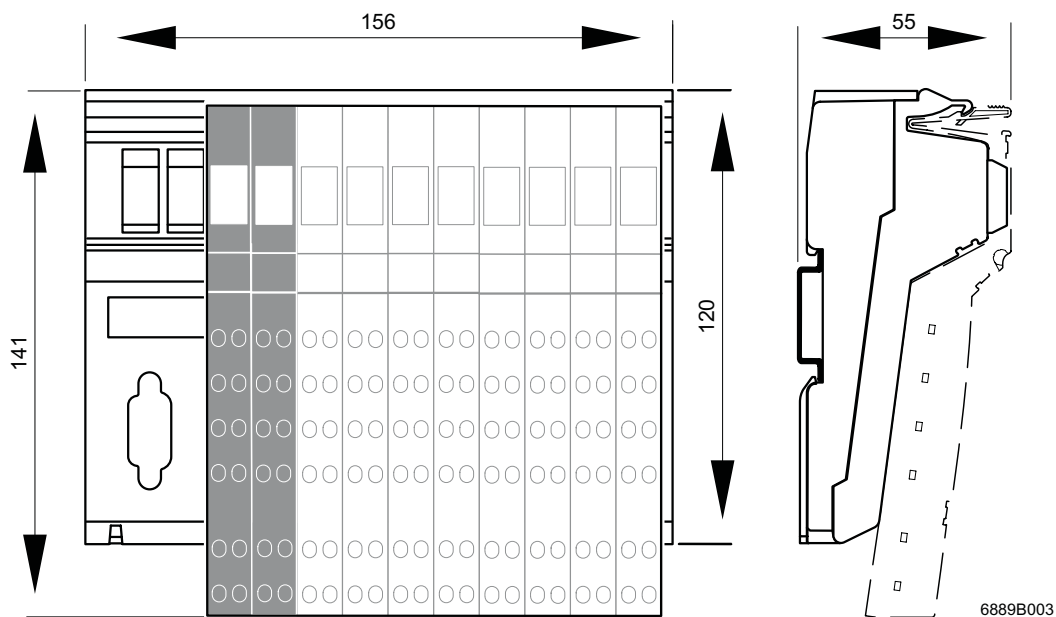


Figure 1 Housing dimensions of the module (dimensions in mm)

Ambient Conditions

Regulations	Developed according to VDE 0160/EN 50178/IEC 62103, UL 508
Ambient temperature (operation)	-25°C to +60°C
Ambient temperature (storage/transport)	-25°C to +85°C
Humidity (operation/storage/transport)	10% to 95% according to EN 61131-2
Air pressure (operation)	80 kPa to 108 kPa (up to 2000 m above sea level)
Air pressure (storage/transport)	66 kPa to 108 kPa (up to 3500 m above sea level)
Degree of protection according to IEC 60529	IP20
Class of protection	Class 3 according to VDE 0106/IEC 60536
Air and creepage distances	According to DIN VDE 0110/IEC 60664, IEC 60664A, DIN VDE 0160/EN 50178/IEC 62103
Housing material	Plastic, PVC-free, PBT, self-extinguishing (V0)
Pollution degree according to EN 60664-1/IEC 60664-1, EN 61131-2/IEC 61131-2	2; condensation not permitted during operation
Surge voltage class	II

Electrical Isolation/Isolation of the Voltage Areas

Test Distance	Test Voltage
PROFIBUS / I/O	500 V AC, 50 Hz, 1 min
PROFIBUS / functional earth ground	500 V AC, 50 Hz, 1 min
I/O / functional earth ground	500 V AC, 50 Hz, 1 min

Mechanical Requirements

Vibration test, sinusoidal vibrations according to EN 60068-2-6/IEC 60068-2-6	5g load, 2.5 hours in each space direction
Shock test according to EN 60068-2-27/IEC 60068-2-27	25g load for 11 ms, half sinusoidal wave, 3 shocks in each space direction and orientation
Broadband noise according to EN 60068-2-64/IEC 60068-2-64	0.78g load, 2.5 hours in each space direction

Conformance With EMC Directive 89/336/EEC**Noise Immunity Test According to 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 strength: 10 V/m
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	Criterion B Remote bus: 2 kV Power supply: 2 kV I/O cables: 2 kV Criterion A All interfaces: 1 kV
Surge voltage	EN 61000-4-5 IEC 61000-4-5	Criterion B DC supply lines: ± 0.5 kV/ ± 1.0 kV (symmetrical/asymmetrical) Signal cables: ± 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 61000-6-4

Noise emission of housing	EN 55011	Class A
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Interface

PROFIBUS interface	Copper cable (RS-485); connected via D-SUB connector; shielding directly connected with functional earth ground
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24 V Module Supply (Communications Power and Actuator Supply; U_L and U_A)

Nominal value	24 V DC
Tolerance	-15%/+20% according to EN 61131-2
Ripple	$\pm 5\%$ according to EN 61131-2
Permissible range	19.2 V DC to 30.0 V DC
Current consumption at U_L	70 mA
Current consumption at U_{A1} and U_{A2}	8 A each
Safety equipment for communications power	Surge protection and protection against polarity reversal
Safety equipment for the actuator supply	Surge protection
Connection	Via power connectors

Digital Outputs	
Number	32
Connection method for actuators	2 and 3-wire technology
Nominal output voltage U _{OUT}	24 V DC
Differential voltage at I _{nom}	≤ 1 V
Nominal current I _{nom} per channel	0.5 A
Total current	4 x 4 A
Protection	Short-circuit and overload protection
Nominal load	
Ohmic	48 Ω/12 W
Lamp	12 W
Inductive	12 VA (1.2 H, 50 Ω)
Switching frequency with nominal inductive load	0.5 Hz (1.2 H, 50 Ω), maximum
Overload response	Auto restart
Response with inductive overload	Output may be damaged
Reverse voltage protection against short pulses	Protected against reverse voltages
Resistance to permanently applied reverse voltages	Protected against reverse voltages, permissible current 2 A, maximum
Validity of output data after connecting the 24 V supply voltage (power up)	1 ms, typical
Response upon power down	The output follows the supply voltage without delay.
Limitation of the voltage induced on circuit interruption	-41.0 V
One-time unsolicited energy	1 J, maximum
Protective circuit type	Integrated free running circuit in the output chip
Overcurrent shutdown	0.7 A, minimum
Maximum output current when switched off	10 μA



When not loaded, a voltage can be measured even at an output that is not set.

Typical Power Dissipation With 24 V Supply Voltage

Formula to Calculate the Power Dissipation of the Electronics

$$P_{TOT} = 1.45 W + \sum_{i=1}^n (0.11 W + I_{Li}^2 \times 0.28 \Omega)$$

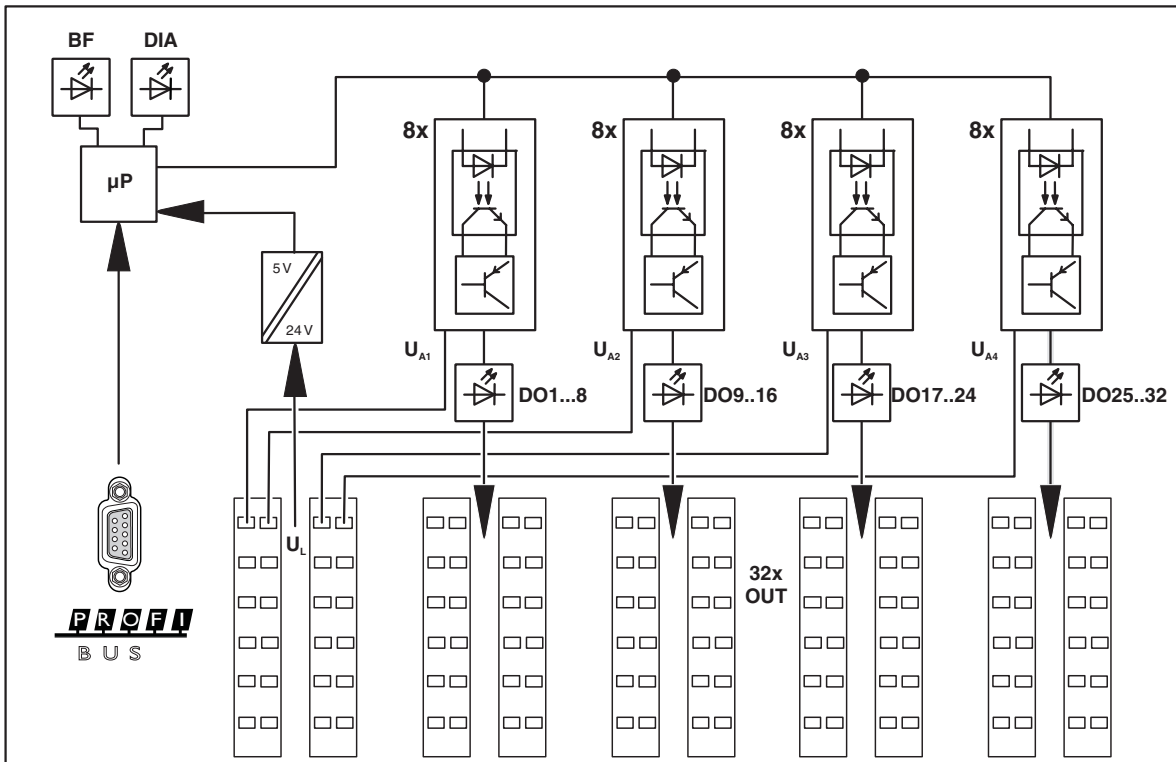
Where
 P_{TOT} Total power dissipation of the module
 i Index
 n Number of set outputs (n = 1 to 32)
 I_{Li} Load current of the output i

Limitation of Simultaneity, Derating		
Ambient Temperature (TA)	Maximum Load Current (I) at 100% Simultaneity	Maximum Load Current (I) at 50% Simultaneity
-25°C to +45°C	32 x 0.5 A	16 x 0.5 A
+46°C to +60°C	32 x 0.4 A	16 x 0.5 A

Approvals

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






Internal Circuit Diagram



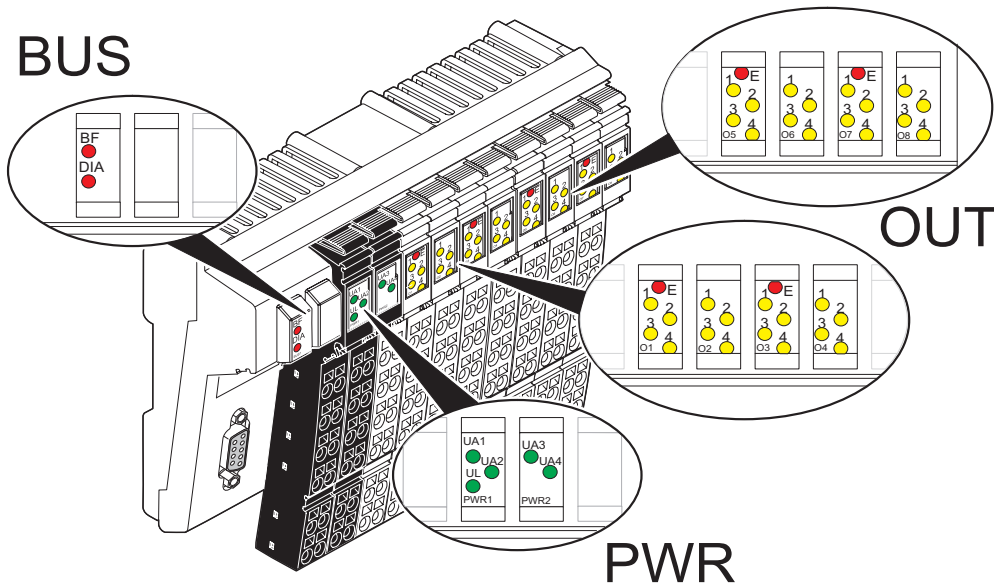
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Figure 2 Internal wiring of the terminal points

Key:

-  LED
-  Protocol chip (bus logic)
-  Power supply unit with electrical isolation
-  Optocoupler
-  Short-circuit-proof output

Local Diagnostic and Status Indicators



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Figure 3 Diagnostic and status indicators of the ILB PB 24 DO32 module

Designation	Color	Meaning
PROFIBUS		
BF	Red	No cyclic data exchange via PROFIBUS, synchronization or parameterization running, timeout elapsed, incorrect setting
	OFF	The module is addressed by PROFIBUS and is in the "cyclic process data exchange" state.
DIA	Red	Module diagnostics
PWR		
UL	Green	Communications power
UA1	Green	Actuator supply 1 (connector 3 and connector 4 for actuators)
UA2	Green	Actuator supply 2 (connector 5 and connector 6 for actuators)
UA3	Green	Actuator supply 3 (connector 7 and connector 8 for actuators)
UA4	Green	Actuator supply 4 (connector 9 and connector 10 for actuators)
OUT		
E	Red	Short circuit or overload of the actuator supply
1 - 4	Yellow	Status indicators of the outputs



If the error LED (E) of a group of eight outputs lights up (e.g., connector 3 and connector 4), this indicates that a short circuit or overload is present at one or more of the outputs in this group.

Address Setting

Addresses are set using two rotary encoding switches. The left switch is used to set the position in tens and the right switch is used to set the position in units. Addresses can be set between 1 and 99. Figure 4 shows how to set the address "74".

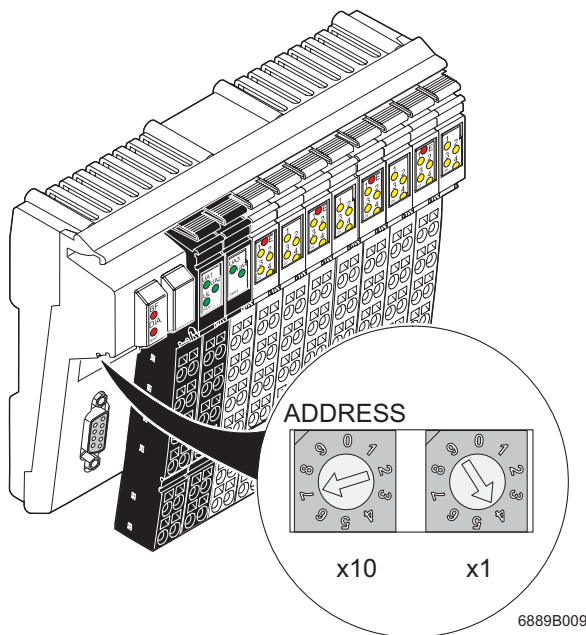


Figure 4 PROFIBUS rotary encoding switches



Any change to an address setting is only accepted after a voltage reset.

Connecting PROFIBUS, the Supply, and Actuators

Connecting PROFIBUS

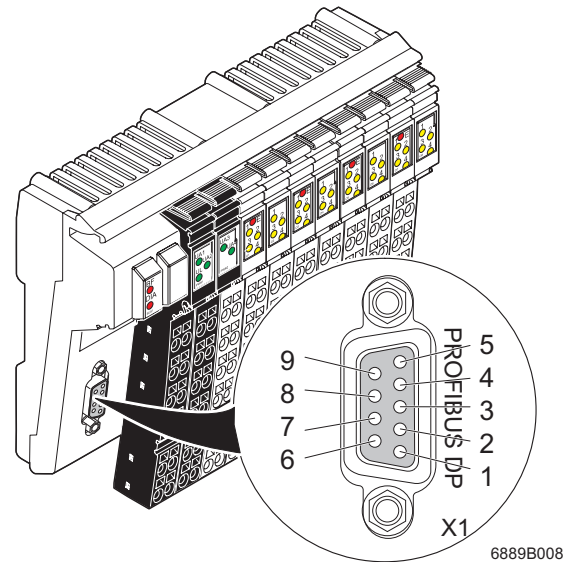
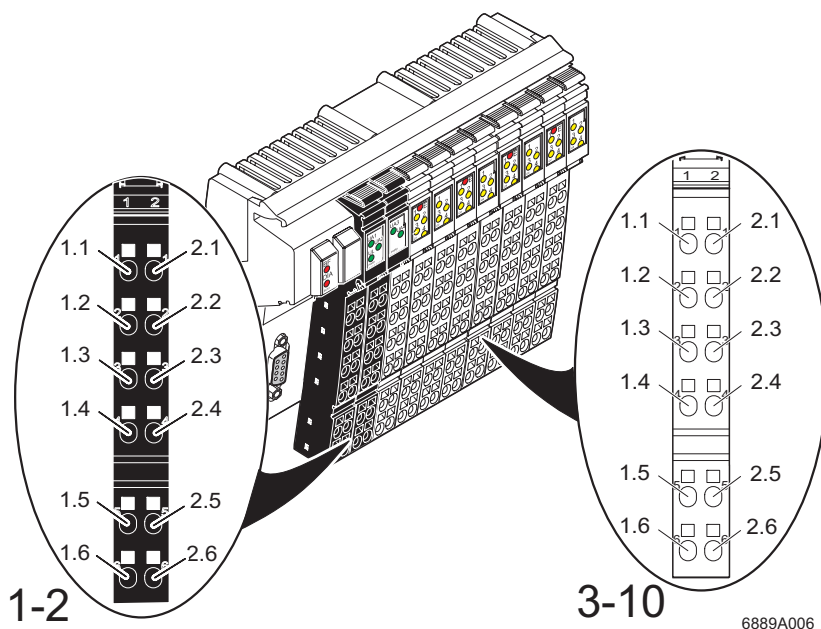


Figure 5 Pin assignment of the 9-pos. D-SUB female connector

Connect PROFIBUS to the module using a 9-pos. D-SUB connector (e.g., SUBCON-PLUS-PROFIB). For the pin assignment, please refer to the following table:

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 (supply voltage +5 V for termination resistors)
7	Reserved
8	RxD/TxD-N (receive/transmit data -), cable A
9	Reserved

Connecting the Supply and Actuators



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Figure 6 Terminal point assignment of Inline connectors

Terminal Point Assignment of Power Connectors (Connectors 1 and 2 in Figure 6)

Terminal Point	Assignment
Connector 1 (PWR 1)	
1.1, 2.1	24 V actuator supply
1.1	U_{A1}
2.1	U_{A2}
1.2, 2.2	24 V communications power U_L
1.3, 2.3	GND
1.4, 2.4	FE
1.5, 2.5	24 V communications power U_L
1.6, 2.6	GND
Connector 2 (PWR 2)	
1.1, 2.1	24 V actuator supply
1.1	U_{A3}
1.2	U_{A4}
1.2, 2.2	24 V communications power U_L
1.3, 2.3	GND
1.4, 2.4	FE
1.5, 2.5	24 V communications power U_L
1.6, 2.6	GND



The terminal points can have a total current of 8 A per terminal point. The maximum current carrying capacity of 8 A must not be exceeded. If the total output current in your application is > 8 A, supply the module via a minimum of two terminal points connected in parallel.



The supply points have the same ground potential. All ground supplies on a module are electrically connected with one another. The communications power is also electrically connected via all contacts. In this way, it can supply all potentials with just one supply without the need for additional terminals, see "Connection example" on page 11.

Terminal Point Assignment of Output Connectors (Connectors 3 to 10 in Figure 6 on page 9)

Terminal Point				Assignment
Connector 3 (O1)	Connector 4 (O2)	Connector 5 (O3)	Connector 6 (O4)	
1.1, 2.1	1.1, 2.1	1.1, 2.1	1.1, 2.1	Signal output (OUT)
1.2, 2.2	1.2, 2.2	1.2, 2.2	1.2, 2.2	Ground contact (GND) for 2 and 3-wire termination
1.3, 2.3	1.3, 2.3	1.3, 2.3	1.3, 2.3	FE connection for 3-wire termination
1.4, 2.4	1.4, 2.4	1.4, 2.4	1.4, 2.4	Signal output (OUT)
1.5, 2.5	1.5, 2.5	1.5, 2.5	1.5, 2.5	Ground contact (GND) for 2 and 3-wire termination
1.6, 2.6	1.6, 2.6	1.6, 2.6	1.6, 2.6	FE connection for 3-wire termination
Connector 7 (O5)	Connector 8 (O6)	Connector 9 (O7)	Connector 10 (O8)	
1.1, 2.1	1.1, 2.1	1.1, 2.1	1.1, 2.1	Signal output (OUT)
1.2, 2.2	1.2, 2.2	1.2, 2.2	1.2, 2.2	Ground contact (GND) for 2 and 3-wire termination
1.3, 2.3	1.3, 2.3	1.3, 2.3	1.3, 2.3	FE connection for 3-wire termination
1.4, 2.4	1.4, 2.4	1.4, 2.4	1.4, 2.4	Signal output (OUT)
1.5, 2.5	1.5, 2.5	1.5, 2.5	1.5, 2.5	Ground contact (GND) for 2 and 3-wire termination
1.6, 2.6	1.6, 2.6	1.6, 2.6	1.6, 2.6	FE connection for 3-wire termination

Connection Example

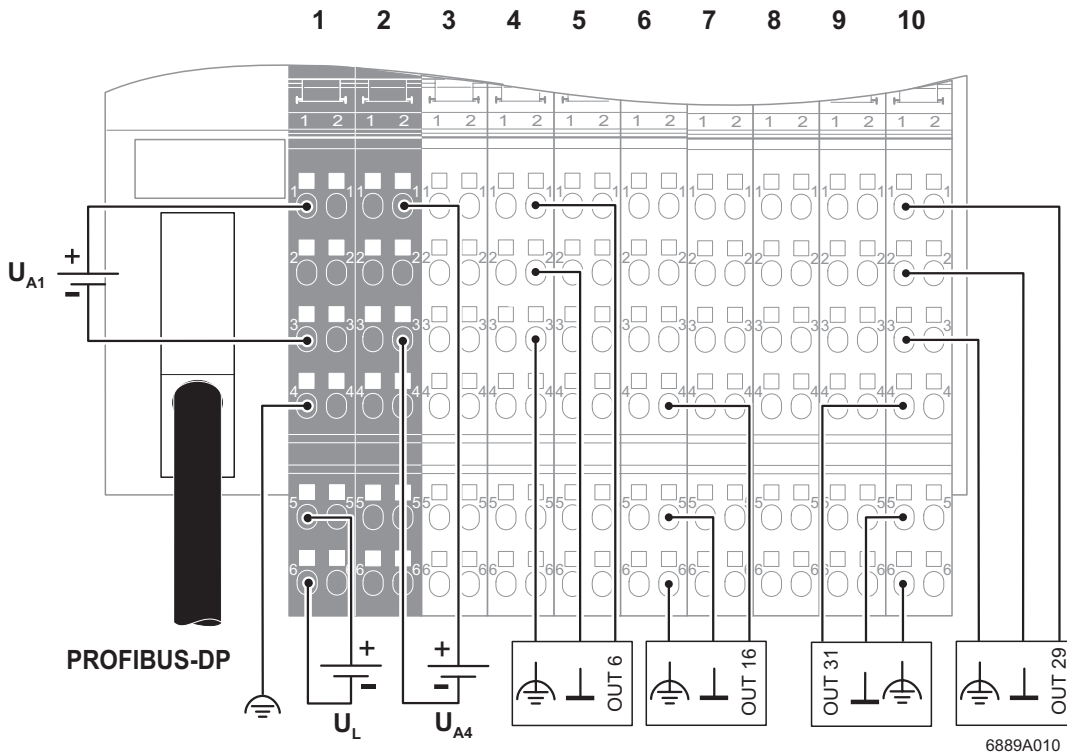


Figure 7 Connection example



The numbers above the module illustration identify the connector slots.



When connecting the actuators, observe the assignment of the terminal points to the process data (see "Process Data" on page 12).



The module has an FE spring (metal clip) on the bottom of the electronics base. This spring creates an electrical connection to the DIN rail. Use grounding terminals to connect the DIN rail to protective earth ground. The module is grounded when it is snapped onto the DIN rail.
 To ensure reliable functional earth grounding of the module even when the DIN rail is dirty or the metal clip is damaged, Phoenix Contact also recommends grounding the module via one of the FE terminal points.

Device Data

ID number	06BD
Output address area	4 bytes

Process Data



Please refer to the application note for addressing 32-channel ILB modules.
Documentation and the current GSD file can be downloaded at www.download.phoenixcontact.com.

Assignment of Terminal Points to the OUT Process Data Word (Slots 3 to 6)

(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 (O2)				3 (O1)				6 (O4)				5 (O3)			
	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 (ground)	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 (FE)	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 indicator	Slot	4 (O2)				3 (O1)				6 (O4)				5 (O3)			
	LED	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

Assignment of Terminal Points to the OUT Process Data Word (Slots 7 to 10)

(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
Module	Slot	8 (O6)				7 (O5)				10 (O8)				9 (O7)			
	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 (ground)	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 (FE)	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 indicator	Slot	8 (O6)				7 (O5)				10 (O8)				9 (O7)			
	LED	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

Diagnostic Data

Mapping of Diagnostic Data in PROFIBUS

Diagnostic Data	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Remark
Byte 0	X	X	X	X	X	X	X	X	Station status 1
Byte 1	X	X	X	X	X	X	X	X	Station status 2
Byte 2	X	X	X	X	X	X	X	X	Station status 3
Byte 3	X	X	X	X	X	X	X	X	Master address diagnostics
Byte 4	0	0	0	0	0	1	1	0	High ID number
Byte 5	1	0	1	1	1	1	0	1	Low ID number
Byte 6	0	0	0	0	0	1	1	1	Diagnostic header
Byte 7	M.7	M.6	M.5	M.4	M.3	M.2	M.1	M.0	Device diagnostics
Byte 8	0	0	0	0	0	0	0	0	Reserved
Byte 9	0	0	0	0	0	0	0	0	Reserved
Byte 10	0	0	0	0	0	0	0	0	Reserved
Byte 11	0	0	0	0	0	0	0	0	Reserved
Byte 12	X	X	0	0	0	0	0	0	Reserved



Bytes 0 to 6 are PROFIBUS standard. Bytes 7 to 12 are device-specific.

Diagnostic Data for Device Diagnostics

Bit	Remark	Assignment
M.0	Short-circuit/overload status of at least one output	1, if output is overloaded/short circuited
M.1- M.7	Reserved	0



If a diagnostic event occurs, the diagnostic data is always sent to the master by means of a diagnostic telegram generated once by the device.

The current status of the diagnostic data can be read by the device at any time.

Error Table With Diagnostic Data and Status Indicators

Error Type	Diagnostic Data	Status Indicators
Actuator supply UA1 to UA4 too low	No response	UA1 to UA4 LEDs are off
Short circuit of a digital output	Diagnostic register bit 0 is set to "1"	E LED of the affected output group is red DIA LED is red

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9