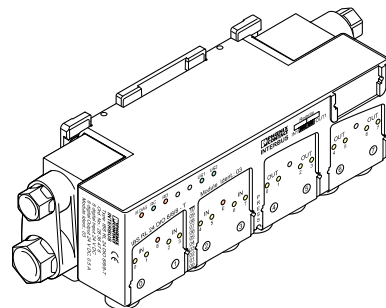


# IBS RL 24 DIO 8/8/8-T

## Digital Input/Output Module With Eight Inputs and Eight Outputs



Data Sheet 5632B

04/2000

### Product Description

The module is designed for use in systems engineering. With IP 67 protection, it is suitable for use without a control cabinet in harsh industrial conditions. It can, for example, be used on the tool platforms, directly on welding robots, or in conveying systems.

Depending on the application area, this module allows you to connect the bus and the power supply to the module from two sides.

QUICKON bus connectors are used to feed the module with the power supply for the bus logic/sensors (24 V DC) and actuators (24 V DC).

### Features

- INTERBUS protocol (EN 50254)
- IP 67 protection
- Bus connection using copper cables
- QUICKON connectors for the supply voltage
- Sensors and actuators are connected using 5-pos. M12 female connectors
- Installation options:
  - directly to the welding robot
  - on aluminum mounting channels
  - two-position attachment
  - direct mounting

### Note



This data sheet is intended to be used in conjunction with the Rugged Line I/O Systems Manual IBS RL SYS PRO UM E.



Note that the bus connectors and the mounting plate are not supplied as standard (see Ordering Data page 14).



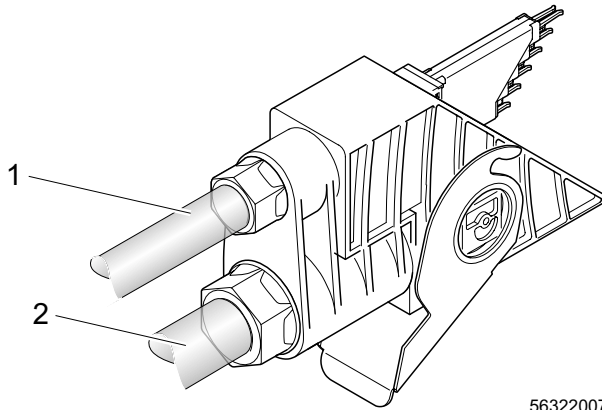
Only connect and remove the bus connector when power has been disconnected. (Connection according to DIN EN 60204-1:1993-06.)



To ensure IP 67 protection you must note the following points:

- The bus connectors must be connected.
- You must not pierce the grommet of unused bus connectors. (You will, for example, have unused connections if the module is the last device in the bus system.)
- Cover unused M12 female connectors with protective caps.

## Connector Pin Assignment



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Figure 1 Connector pin assignment of the incoming or outgoing bus

- 1 INTERBUS remote bus
- 2  $U_{S1}/U_{S2}$  power supply  
 $U_{S1}$  = bus/sensor supply  
 $U_{S2}$  = actuator supply



All  $U_{S1}$  and  $U_{S2}$  contacts are rated 16 Amps.

### INTERBUS Remote Bus

Position in Figure 1	Signal	Connection Method	Wire Color	Designation
1	/DO	1	Green	GN
	DO	2	Yellow	YE
	/DI	3	Pink	PK
	DI	4	Gray	GY
	GND	5	Brown	BN

### $U_{S1}/U_{S2}$ Power Supply

Position in Figure 1	Signal	Connection Method	Wire Color	Des.
2	+24 V $U_{S1}$	1	Black	1
	GND $U_{S1}$	2	Black	2
	+24 V $U_{S2}$	3	Black	3
	GND $U_{S2}$	4	Black	4
	Functional earth ground	5	Yellow	5

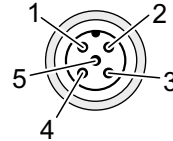
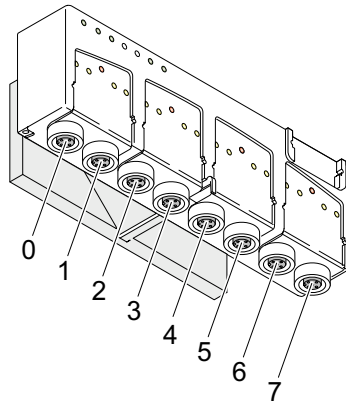
## Connection of Inputs and Outputs



Two inputs are assigned to each of the sockets 0 to 3; two outputs are assigned to sockets 4 to 7.



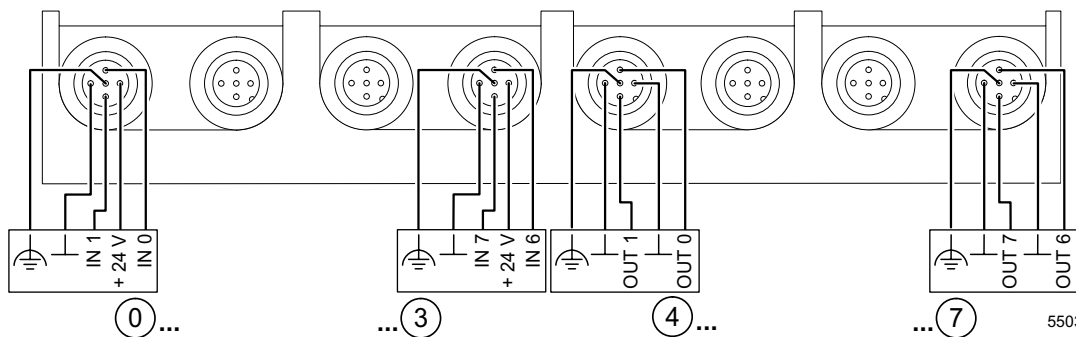
A concurrent channel derating of 50% applies to the outputs. This means only four outputs are allowed to carry the nominal current at the same time.



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Figure 2 Pin assignment of 5-pos. M12 sockets (1)

Pin	Socket 0	Socket 1	Socket 2	Socket 3	Socket 4	Socket 5	Socket 6	Socket 7
1	U <sub>S1</sub> -1 V (sensor supply)				Ground U <sub>S2</sub>			
2	IN 1	IN 3	IN 5	IN 7	OUT 1	OUT 3	OUT 5	OUT 7
3	Ground U <sub>S1</sub>				Ground U <sub>S2</sub>			
4	IN 0	IN 2	IN 4	IN 6	OUT 0	OUT 2	OUT 4	OUT 6
5	Functional earth ground							



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Figure 3 Pin assignment of 5-pos. M12 sockets (2)

## Electrical Isolation

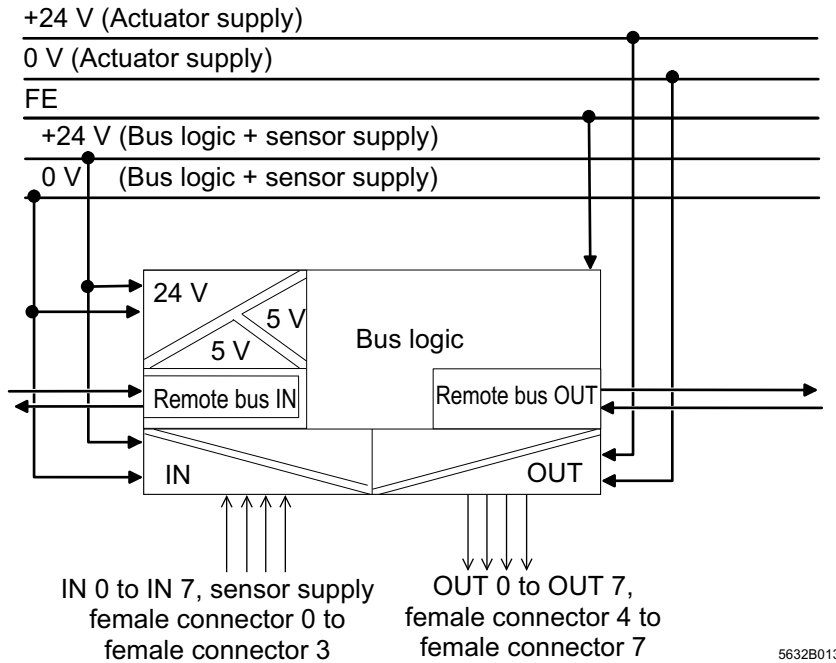


Figure 4 Block diagram

## Programming Data

ID code	03 <sub>hex</sub> (03 <sub>dec</sub> )
Length code	81 <sub>hex</sub> (129 <sub>dec</sub> )
Input address area	1 bytes
Output address area	1 bytes
Parameter channel (PCP)	Not present
Register length (bus)	1 bytes

### Error Messages

- The breakdown of the sensor supply for a group of four inputs is indicated to the control or computer system (through the bus). The breakdown is stored in the module.
- The bus delivers a short-circuit or overload message to the control or computer system. These messages are stored in the module.
- The bus indicates to the control or computer system that the supply voltage  $U_{S1}$  has dropped below the permissible range.
- Upon delivery the module is set up so that errors concerning the supply voltage  $U_{S1}$ , the sensor supply or the outputs are indicated via the bus.  
If the supply voltage  $U_{S2}$  is not present or is below the permissible voltage range this is not indicated but only displayed by the US2 LED.
- The error messages are reset through acknowledgment in the control or computer system.
- The configuration data and the error messages (except for undervoltage diagnostics) are only stored in the volatile memory of the module. Configuration data and error messages are deleted when the power is reset.

**Assignment to the INTERBUS Input Data Word**

(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
Terminal	Slot	3	3	2	2	1	1	0	0	Not used							
	Input	7	6	5	4	3	2	1	0								
		Status input 0 to 7															

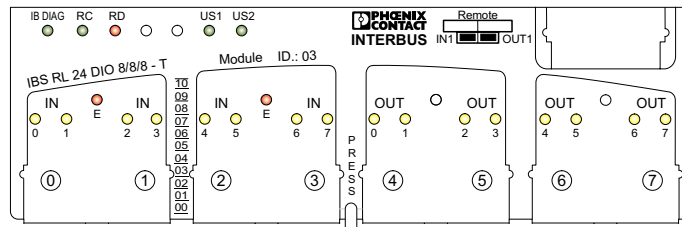
**Assignment of the Bits to the INTERBUS Output Data Word**

(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
Terminal	Slot	7	7	6	6	5	5	4	4	Not used							
	Output	7	6	5	4	3	2	1	0								
		Status output 0 to 7															



For the assignment of the illustrated (Byte.Bit) view for your control or computer system, please refer to data sheet DB GB IBS SYS ADDRESS, Part No. 90 00 99 0.

## Status and Diagnostic Indicators



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Figure 5 Position of the status and diagnostic indicators

<b>IB DIAG</b>	Green LED	INTERBUS diagnostics
	OFF:	Supply voltage not present
	Flashing at 0.5 Hz:	Supply voltage present, bus not active
	Flashing at 2 Hz:	Supply voltage present, I/O error
	ON:	Supply voltage present, bus active, no I/O error
<b>RC</b>	Green LED	Remote bus cable check
	ON:	Incoming remote bus connection established
	OFF:	Incoming remote bus connection defective
<b>RD</b>	Red LED	Remote bus status (Remote Bus Disabled)
	ON:	Outgoing remote bus switched off
<b>US1</b>	Green LED	Monitoring the supply voltage $U_{S1}$
	OFF:	$U_{S1}$ not present
	Flashing:	$U_{S1}$ below the permissible voltage range
	ON:	$U_{S1}$ present
<b>US2</b>	Green LED	Monitoring the supply voltage $U_{S2}$
	Flashing:	$U_{S2}$ below the permissible voltage range / not present
	ON:	$U_{S2}$ present
<b>E</b>	Red LED	Error message
	ON:	Short-circuit of the sensor supply for a group of four inputs. (This error message is stored temporarily on the module. It is stored in volatile memory and will be lost after power is reset.)

- |                  |                                           |                                                                                                                                                                                                                                         |
|------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IN 0 -7</b>   | Yellow LED<br>ON:<br>OFF:                 | Status per input<br>Input at logic 1<br>Input at logic 0                                                                                                                                                                                |
| <b>OUT 0 - 7</b> | Yellow/red LED<br>Yellow:<br>OFF:<br>Red: | Status per output<br>Output at logic 1<br>Output at logic 0<br>Short-circuit/overload of an output.<br>(This error message is stored temporarily on the module. It is stored in volatile memory and will be lost after power is reset.) |

## Housing Dimensions

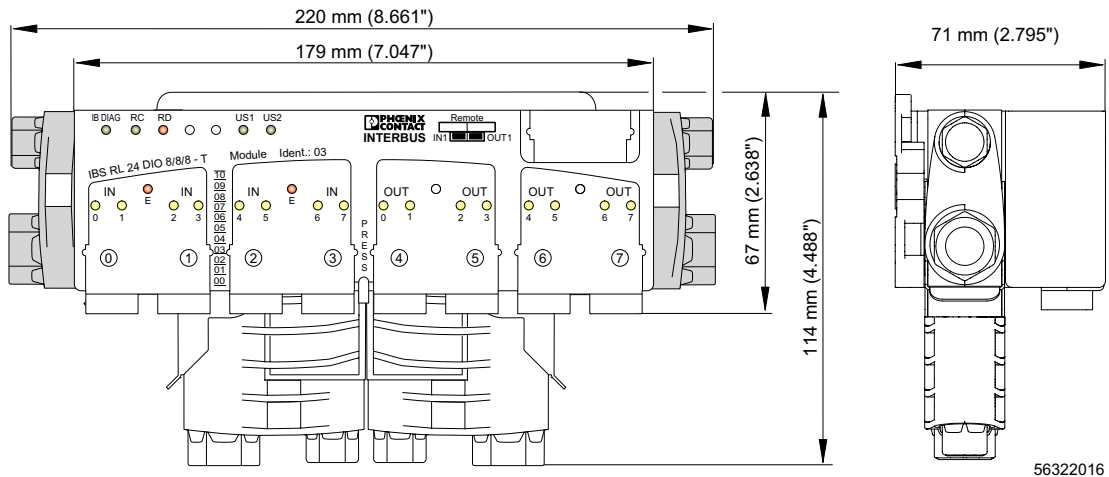




Figure 6 Housing dimensions






## Technical Data

General Data	
Ambient temperature	Operation: 0°C to +55°C (32°F to 131°F) Storage/transport: -25°C to +70°C (-13°F to 158°F)
Humidity	Operation: 100% Storage/transport: 95%, no condensation
Air pressure	Operation: 860 hPa to 1080 hPa (up to 1500 m [4921.260 ft.] above sea level) Storage/transport: 660 hPa to 1080 hPa (up to 3500 m [11,482.940 ft.] above sea level)
Degree of protection	IP 67 (when installed) Seal unused slots/connections to ensure IP 67 protection.
Material	Zinc die-cast Copper and nickel-plated surface
Electrical isolation between bus logic and I/O devices between bus logic and outputs	Test voltage 500 V AC, 50 Hz, 1 min Test voltage 500 V AC, 50 Hz, 1 min
Housing dimensions (width x height x depth)	220 mm x 114 mm x 71 mm (8.661 in. x 4.488 in. x 2.795 in.) (with bus connector and mounting plate)
Weight	Approximately 720 g (without connector and mounting plate)

Supply Voltage $U_{S1}$ (Bus Logic)	
Nominal voltage	24 V DC
Permissible range	18.5 V DC to 32 V DC (ripple included)
Ripple	3.6 V <sub>pp</sub>
Current consumption	120 mA, typical, plus supply current for the sensors
Overvoltage protection	35 V (0.5 s)
Protection against polarity reversal	Yes (diode connected in parallel) 20 A, 500 ms, typical

Supply Voltage $U_{S1}$ (Bus Logic) (Continued)	
External fuse	5 A slow-blow, maximum
 Protection against polarity reversal is only effective if the module is externally protected. The power supply unit must be able to supply at least four times the rating of the external fuse.	
 The voltage $U_{S1}$ is looped through and can be tapped off at the connector for the outgoing remote bus. The maximum continuous current must not exceed 16 A.	

Supply Voltage $U_{S1}$ (Sensor Voltage)	
 The sensors are supplied in groups of four via a short-circuit-proof sensor supply.	
Nominal voltage	$U_{S1}$ minus 1 V
Current consumption	400 mA total current for all inputs (50 mA per input)
Protection	Electronic overload/short-circuit protection per group

Actuator Voltage $U_{S2}$	
Nominal voltage	24 V DC
Permissible voltage range	18.5 V DC to 32 V DC (ripple included)
Ripple	3.6 V <sub>pp</sub>
Current consumption	2 A, maximum, note concurrent channel derating
Concurrent channel derating	50%
Overvoltage protection	35 V (0.5 s)
Protection against polarity reversal	Yes (diode connected in parallel) 20 A, 500 ms, typical
External fuse	5 A slow-blow, maximum
 Protection against polarity reversal is only effective if the module is externally protected. The power supply unit must be able to supply at least four times the rating of the external fuse.	
 The voltage $U_{S2}$ is looped through and can be tapped off at the connector for the outgoing remote bus. The maximum continuous current must not exceed 16 A.	

<b>INTERBUS Interface</b>	
Interface type	2-wire installation remote bus Differential signal lines, twisted in pairs
Connection method	IP 67 connector



<b>Digital Inputs</b>	
Number of inputs	8
Electrical isolation between I/O devices and bus logic to the digital outputs	Test voltage 500 V AC, 50 Hz, 1 min Test voltage 500 V AC, 50 Hz, 1 min
Input voltage	According to DIN EN 61131-2 Permissible range 0 signal: 0 V to +5 V Permissible range 1 signal: 11 V to 30 V
Input current	3 mA, typical
Permissible residual current, "0" signal	1.5 mA, typical
Delay time 0 → 1	3 ms, typical
Delay time 1 → 0	3 ms, typical

<b>Characteristic of the Inputs</b>	
<b>Input Voltage (V)</b>	<b>Input Current (mA), Typical</b>
$0 < U_{IN} < 0.7$	0
3	0.23
6	0.51
9	0.92
12	1.37
15	1.80
18	2.25
21	2.68
24	3.13
27	3.57
30	4.01

Switching Threshold of the Inputs, Typical		
Signal Transition	Input Voltage (V)	Input current (mA), Typical
0 → 1	7.52	0.72
1 → 0	7.49	0.72

Digital Outputs	
Number	8
Nominal output voltage $U_{OUT}$	24 V DC
Differential voltage for $I_{nom}$	$\leq 1$ V
Concurrent channel derating of the outputs	50%
Nominal current $I_{nom}$ per channel with derating and 50% coincidence	0.5 A
Tolerance of the nominal current	+10%
Total current	2 A
Contactors (four channels are thermally coupled, i.e., an error in one channel can affect the other channels of the group).	Short-circuit; overload
Nominal load	
Ohmic	48 $\Omega$ / 12 W
Lamp	12 W
Inductive	12 VA (1.2 H, 48 $\Omega$ )
Signal delay upon power up of	
- Ohmic nominal load	20 $\mu$ s, typical
- Lamp nominal load	20 $\mu$ s, typical
- Inductive nominal load	20 $\mu$ s (1.2 H, 48 $\Omega$ ), typical
Signal delay: ON to OFF	
- Ohmic nominal load	300 $\mu$ s, typical
- Lamp nominal load	300 $\mu$ s, typical
- Inductive nominal load	300 $\mu$ s, typical (1.2 H, 48 $\Omega$ )

**Digital Outputs (Continued)**

Switching frequency	
- Ohmic nominal load	300 Hz, maximum
 This switching frequency is limited by the selected data rate, the number of bus devices, the bus structure, the software and the control or computer system used.	
- Lamp nominal load	300 Hz, maximum
 This switching frequency is limited by the selected data rate, the number of bus devices, the bus structure, the software and the control or computer system used.	
- Inductive nominal load	0.5 Hz (1.2 H; 48 Ω), maximum
Overload response	Auto restart
Response time with ohmic overload (12 Ω, 25°C [77°F])	Approximately 3 s
Response after inductive overload	Output can be destroyed
Reverse voltage endurance against short pulses	Protection up to 2 A DC
Strength against permanently applied surge voltage	No
Limitation of the demagnetization voltage induced on circuit interruption	$U(\text{demag}) \leq -8 \text{ V}$
Overvoltage disconnection	At 0.7 A, minimum
Output current when switched off	100 μA, maximum
Output voltage when switched off	1 V, maximum
Output current with ground connection interrupted	25 mA, maximum
Switching power with ground connection interrupted	100 mW at 1 kΩ load resistance, typical

**Output Characteristic 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

**Ordering Data**

Description	Order Designation	Order No.
Digital input/output module	IBS RL 24 DIO 8/8/8-T	28 36 47 6
Bus connector (2 pcs. needed)	IBS RL PLUG-T	27 31 89 8
Mounting plate	IBS RL AP	27 31 12 8
Labeling fields (set of 50 pcs.)	IBS RL MARKER-SET	27 32 72 9
Protective caps (5 pcs.) for unused M12 connectors	IBS IP PROT IO	27 59 91 9
Rugged Line I/O Systems Manual	IBS RL SYS PRO UM E	27 43 78 9
4-pos. sensor connector with QUICKON connection for M12 female sockets	SACC-M12MS-4QLCON	16 40 22 3
Remote bus cable for very flexible applications, welding-splash-resistant in standard applications	IBS RBC METER/F-T	27 23 12 3
Supply cable, 5 x 1.5 mm <sup>2</sup> (16 AWG), gray, very flexible, welding-splash-resistant in standard applications	IBS PWR/5 HD/F	28 36 15 9
Supply cable, 5 x 1.5 mm <sup>2</sup> (16 AWG)	IBS PWR/5	28 20 00 0
Fiber cutter	IBS RL FOC	27 25 14 7

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