Rexroth Inline bus coupler for PROFIBUS-DP

R911170618
Edition 01

R-IL PB BK DP/V1-PAC

PROFIBUS-DP controller board
Optional DP/V1 mode
Modular extensions possible using Inline terminals

01/2009

Function description

The Rexroth PROFIBUS DP/V1 bus coupler is the link between PROFIBUS-DP and the Inline installation system.

Inline terminals can be connected in any position to an existing PROFIBUS-DP system using the PROFIBUS DP/V1 bus coupler. In this way, all the advantages of the installation system created using these terminals can also be used on PROFIBUS-DP.

Features

The PROFIBUS DP/V1 bus coupler has the following features:
(*) New functions in the IL PB BK-compatible mode

- A maximum of 63 Inline devices can be connected to PROFIBUS-DP via the bus coupler. The PROFIBUS DP/V1 bus coupler and the Inline terminals create a station.
- The total of all input and output data of the connected terminals must not exceed 176 bytes per station in R-IL PB BK DP/V1 mode (DIP switch 8 = ON).
  (184 bytes in IL PB BK mode, DIP switch 8 = OFF)
- DP/V1 for Class 1 and Class 2 masters
- Acyclic communication with, for example, RS-232 modules also in the process data channel (*)
- I/O terminal parameterization
- Failsafe values
- Various diagnostic formats
- Acknowledgment of I/O errors from the user program (*)
- Adaptation of the high byte/low byte format in 16-channel input and output modules to the control system format (*)
- The bus coupler can be installed with a data transmission speed of 9.6 kbps to 12 Mbps. The bus coupler is automatically set to the speed specified by the PROFIBUS master.
- The operating voltage of the bus coupler is 24 V DC. The operating temperature range is 0°C to +55°C.

- Diagnostics are provided locally by LEDs on the bus coupler and on the Inline terminals. All diagnostic information can be forwarded to the PROFIBUS master via PROFIBUS.

This data sheet is only valid in association with the application descriptions for the Rexroth Inline system (see "Documentation" on page 3).

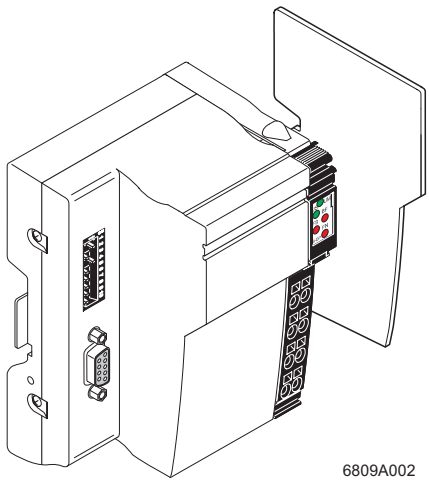
Make sure you always use the latest documentation.
It can be downloaded at www.boschrexroth.com.

The intelligent wiring method used by Inline terminals enables stations to be created quickly and easily, since, for example, time-consuming wiring of the terminal power supply is not required. In the simplest case, it is only necessary for the power supply units integrated into the PROFIBUS DP/V1 bus coupler to be supplied with 24 V DC. They then generate the operating voltage required for the PROFIBUS DP/V1 bus coupler and the connected Inline terminals.

DIP switch 8 is particularly important; see Page 9. By default upon delivery, it is in the "OFF" position. This means that the device can directly replace the previous R-IL PB BK version, although it also offers a few new functions: see above (*). However, these functions can only be used on the new devices. When configuring the device, use the "RX0105BA.GSD" GSD and the "R-IL PB BK DP/V1 (DIP 8 = OFF)" device entry in the hardware list.

In the "ON" position the device offers all the functions mentioned above and has a new PROFIBUS ID number.
Use the "RX0106CC.GSD" GSD and the "R-IL PB BK DP/V1 (DIP8 = ON)" device entry in the hardware list for configuring and parameterizing the device. The stop response, which was specified by this switch in the old device, is then set during parameterization.

The current GSD file is available to download from the Internet at www.boschrexroth.com .



Detail 1 Bus coupler with connector and end plate

The end plate is supplied with the PROFIBUS DP/V1 bus coupler. Place the plate at the end of the Inline station. The end plate has no electrical function. It protects the station from ESD pulses and the user from dangerous contact voltage.

The PROFIBUS DP/V1 bus coupler has been extended to include dynamic configuration in firmware B or later. This includes the specification and configuration for a maximum configuration. Any subgroup of this maximum configuration may be operated. In addition to the dynamic configuration, empty spaces may be reserved for future extensions.

Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Rexroth Inline bus coupler for PROFIBUS-DP, complete with accessories (connector and labeling field)	R-IL PB BK DP/V1-PAC	R911170971	1

Documentation

Description	Type	Order No.	Pcs./Pkt.
Application description: "Automation terminals of the Rexroth Inline product range"	DOK-CONTRL-ILSYSINS***-AW..-EN-P	R911317021	1
Application description: "Configuring and installing the Rexroth product range Inline for INTERBUS"	DOK-CONTRL-ILSYSPRO***-AW..-EN-P	R911317023	1
Application description: "Rexroth Inline bus coupler for PROFIBUS-DP R-IL PB BK DP/V1-PAC"	DOK-CONTRL-ILPBDPV1***-AW01-EN-P	R911326030	1

For additional ordering data (accessories), please refer to the product catalog at www.boschrexroth.com.

Technical data

General data	
Housing dimensions (width x height x depth)	85 mm x 120 mm x 72 mm
Weight	297 g (with connector)
Ambient temperature (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 3,000 m above sea level)
Degree of protection	IP20 according to IEC 60529
Class of protection	Class 3 according to EN 61131-2, IEC 61131-2
Connection data for Inline connectors	
Connection method	Spring-cage terminal blocks
Conductor cross-section	0.08 mm^2 to 1.5 mm^2 (solid or stranded), 28-16 AWG

System data	
Number of devices per station	63, maximum
Total amount of I/O data per station	184 bytes, maximum in IL PB BK mode 176 bytes, maximum in IL PB BK DP/V1 mode
Maximum bus coupler current for supplying the I/O terminals with communications power	2 A at U_L
Maximum current for supplying the analog terminals	0.5 A at U_{ANA}

PROFIBUS-DP interface

Copper cable (RS-485), connected via D-SUB shield connector; electrically isolated supply; shielding directly connected to functional earth ground.

24 V main supply U_M (main supply, bus coupler supply, communications power, and interface supply)	
Connection method	Spring-cage terminal blocks
Recommended cable lengths	30 m, maximum; routing cables through outdoor areas is not admissible
Continuation	Via potential routing
Nominal value	24 V DC
Tolerance	-15% / +20% (according to EN 61 13 1-2)
Ripple	±5%

24 V main supply U_M (main supply, bus coupler supply, communications power, and interface supply)	
Permissible range	19.2 V to 30 V (ripple included)
Minimum current consumption at nominal voltage	0.1 A DC (no-load operation, i.e., incoming PROFIBUS plugged in, no Inline devices connected)
Maximum current consumption at nominal voltage	1.25 A DC, consisting of: 0.75 A DC for communications power 0.5 A DC for analog power supply
Safety measures	
Surge voltage	Yes
Polarity reversal	Yes

CAUTION

Provide external fuses for the 24 V area.
This 24 V area must have an external fuse. The power supply unit must be able to supply four times the nominal current of the external fuse in order to ensure that it trips in the event of an error.

24 V segment supply U_S	
Connection method	Spring-cage terminal blocks
Recommended cable lengths	30 m, maximum; routing cables through outdoor areas is not admissible
Continuation	Via potential routing
Nominal value	24 V DC
Tolerance	-15% / +20% (according to EN 61 13 1-2)
Ripple	±5%
Permissible range	19.2 V to 30 V (ripple included)
Current carrying capacity	8 A, maximum
Safety measures	
Surge voltage	Yes
Polarity reversal	Yes

CAUTION

Provide external fuses for the 24 V area.
This 24 V area must have an external fuse. The power supply unit must be able to supply four times the nominal current of the external fuse in order to ensure that it trips in the event of an error.

Conformity with EMC Directive 89/336/EEC and 2004/108/EC

Noise immunity test according to EN 61000-6-2

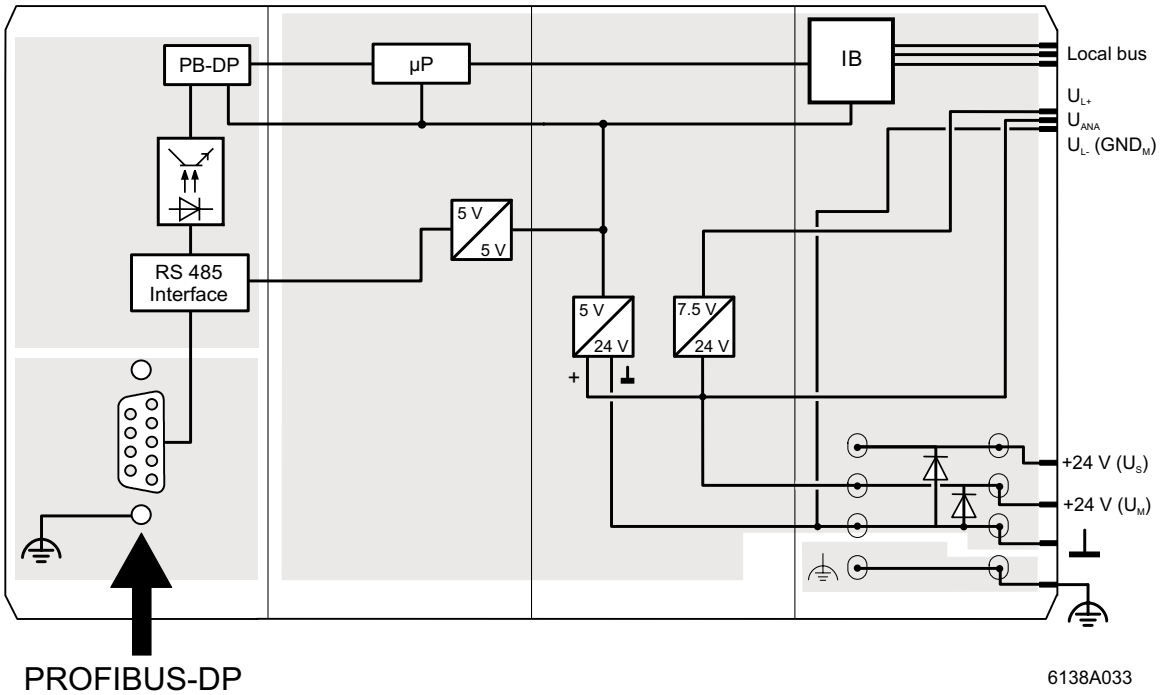
Electrostatic discharge (ESD)	EN 61000-4-2/ IEC 61000-4-2	Criterion B 6 kV contact discharge 8 kV air discharge
Electromagnetic fields	EN 61000-4-3 IEC 61000-4-3	Criterion A Field strength: 10 V/m
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	Criterion A All interfaces: 1 kV Criterion B All interfaces: 2 kV
Surge voltage	EN 61000-4-5/ IEC 61000-4-5	Criterion B DC supply lines: 0.5 kV/1 kV (symmetrical/ asymmetrical) Fieldbus cable shielding 1 kV

Conformity with EMC Directive 89/336/EEC and 2004/108/EC (continued)		
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

Approvals

For the latest approvals, please visit www.boschrexroth.com.

Basic circuit diagram



Detail 2 *Basic circuit diagram of the PROFIBUS DP/V1 bus coupler*

Key:

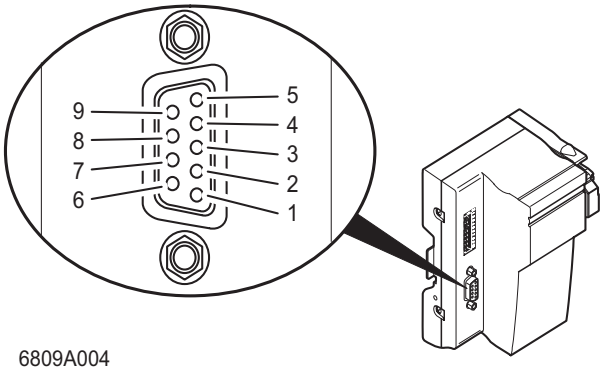
PB-DP	Protocol chip
µP	Microprocessor
IB	Protocol chip
	Optocoupler
	Power supply unit with electrical isolation
RS 485 Interface	RS-485 interface

Other symbols used are explained in the application descriptions for the Rexroth Inline system (see "Documentation" on page 3) or the application description for your bus system.

Overview of firmware functions

PROFIBUS	R-IL PB BK	R-IL PB BK DP/V1-PAC	
		DP/V0 mode DIP8 = OFF	DP/V1 mode DIP8 = ON
Can be replaced with IL PB BK	x	x	–
DP/V0 supported (cyclic communication)	Maximum of 184 bytes of process data	Maximum of 184 bytes of process data	Maximum of 176 bytes of process data
PCP module operation	–	x	x
Supports DP/V1 read and DP/V1 write (acyclic communication), Class 1 and Class 2 master	–	–	x
Communication with PCP modules via "normal" process data (DP/V0)	–	x	x
Parameterization of several I/Os via dialog boxes in the configuration tool	–	–	x
Specification of substitute values using the configuration tool	–	–	x
Byte rotation for R-IB IL 24 DI 16-PAC and R-IB IL 24 DO 16-PAC for adaptation to the control system format	–	x	x
Byte rotation for R-IB IL 24 DI 32 and R-IB IL 24 DO 32-PAC	–	New for firmware B or later	New for firmware B or later
Acknowledgment of bus stop, either automatically or via the application program	–	x	x
Acknowledgement of I/O errors, either automatically or via the application program	–	x	x
Diagnostics in IL PB BK format	x	x	x
Diagnostics in identification format	–	–	x
Diagnostics as status PDU	–	–	x
Stop response can be set using DIP switch	x	–	–
Stop response can be set using parameter telegram	–	x	x
Invoke ID transmission	–	New for firmware B or later	New for firmware B or later
Dynamic configuration (Reservation of I/Os in the PLC, e.g., for easy expandability)	–	–	New for firmware B or later
Freely assignable station ID (2 bytes) for improved identification in the network	–	–	New for firmware B or later
Specification of failsafe values using the configuration tool	–	–	x
Failsafe values even without connection to the PLC	–	–	New for firmware B or later
Improved I/O diagnostics during startup	–	–	New for firmware B or later
Configuration can be stored (additional verification using the most recent valid configuration)	–	–	New for firmware B or later

Connecting PROFIBUS



Detail 3 Pin assignment of the 9-pos. D-SUB socket

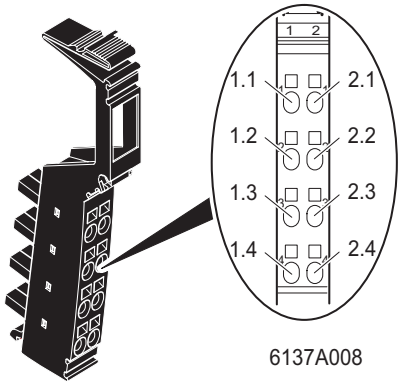
Connect PROFIBUS to the PROFIBUS DP/V1 bus coupler via a 9-pos. D-SUB connector according to the PROFIBUS standard. For the pin assignment, please refer to the following table:

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

Mains termination resistors

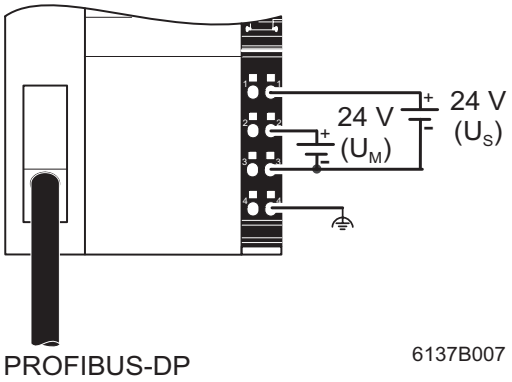
Since PROFIBUS-DP is a serial bus system in a line or tree structure, the individual branches must be terminated using a termination resistor. The PROFIBUS DP/V1 bus coupler does not have a resistor of this type. For additional information, please refer to the PROFIBUS documentation. Suitable PROFIBUS connectors with a connectable termination resistor can be found at www.boschrexroth.com.

Supplying operating voltages



Detail 4 Terminal assignment of the PROFIBUS DP/V1 bus coupler power connector

Terminal points	Remark
1.1, 2.1	Segment supply (+24 V DC)
1.2, 2.2	Main supply, bus coupler supply, communications power, and interface supply (+24 V DC)
1.3, 2.3	Reference potential GND
1.4, 2.4	Functional earth ground (FE)

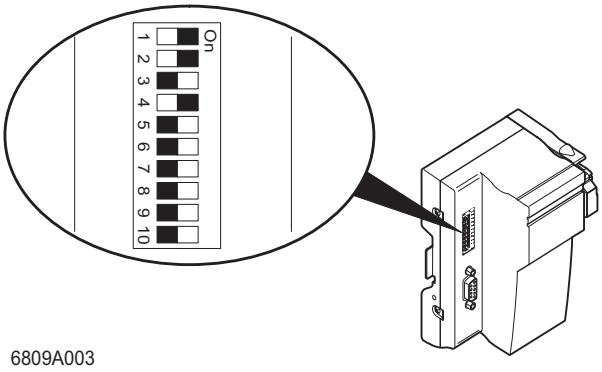


Detail 5 Circuit diagram for the PROFIBUS DP/V1 bus coupler

Connect the PROFIBUS DP/V1 bus coupler according to Detail 5.

Hardware configuration

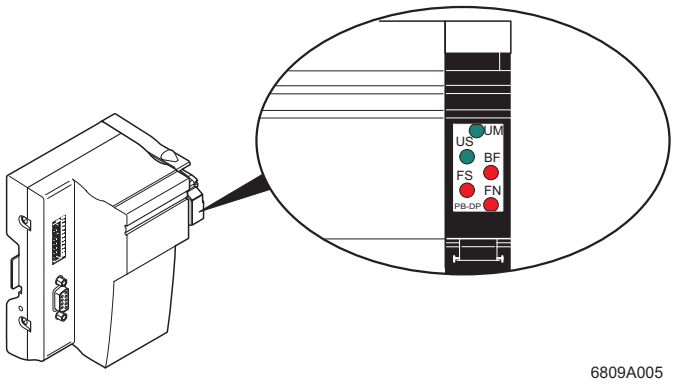
Configure the hardware on the PROFIBUS DP/V1 bus coupler using the 10-pos. DIP switch. The PROFIBUS address and other PROFIBUS DP/V1 bus couplersettings can be set using this switch. The meaning of the switches is given in the following table.



Detail 6 PROFIBUS DP/V1 bus coupler DIP switches

DIP switches	Meaning
1 to 7	PROFIBUS address in binary format (0 to 127 in decimal format). Switch 1 defines the least significant bit (2^0), Switch 7 defines the most significant bit (2^6).
8	Operating mode of Inline station: ON = DP/V1 mode with acyclic communication, parameterization, fail-safe values, etc. OFF = Can directly replace the previous version R-IL PB BK.
9 to 10	Reserved; both switches **must** be in the "OFF" position.

Local diagnostic indicators



Detail 7 Indicators on the PROFIBUS DP/V1 bus coupler

LED	Color	Meaning	State	Description of the LED states
UM	Green	**U**Main	On	24 V main circuit supply present.
			Off	Main circuit supply not present.
US	Green	**U**Segment	On	24 V segment circuit supply present.
			Off	Segment circuit supply not present.
BF	Red	**B**us **F**ault	On	No communication on PROFIBUS
			Off	No error
			Flashing	PLC in STOP state. Failsafe values are output.
FS	Red	**F**ailure **S**elect	On	If FS is on, FN indicates the error type.
			Off	If FS is not on, FN indicates the error number.
FN	Red	**F**ailure **N**umber	Flashing	The number of flashing pulses indicates the error type or the error number, depending on whether FS is on or not
			Off	No error

Standard and device-related diagnostics for PROFIBUS

Error type	Meaning
1	**Parameter error on PROFIBUS (SET_PRM telegram)**
2	**Configuration error on PROFIBUS (CHK_CFG telegram)**
	Detailed information about the PROFIBUS configuration error is represented by 14 different error numbers.
3	**Configuration error in the Inline station**
	Detailed information about the Inline station configuration error is represented by eight different error numbers.
4	**INTERBUS error within the station**
	Detailed information about the INTERBUS error within the station is represented by six different error numbers.
5	**Module error**
6	**Parameter error on the local bus**
7	**EEPROM error**
More detailed information about error causes and remedies can be found in the user manual; see "Ordering data" on page 3.	

Notes

DOK-CONTRL-ILPBDPV1***-KB01-EN-P

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