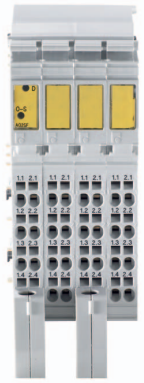
Rexroth Inline Terminal with Two Analog Outputs

R911170520
Edition 03

Data Sheet R-IB IL AO 2/SF(/CN)-PAC



2 analog outputs
2-wire technology
0-20 mA, 4-20 mA
0-10 V

05/2014

1 Description

The terminal is designed for use within an Inline station. It is used to output analog voltage or current signals. The signals are available with a resolution of 16 bits.

Features

- Two analog signal outputs to connect either voltage or current signals
- Connection of actuators in 2-wire technology with shield connection
- Two current ranges, one voltage range:
  0 mA ... 20 mA, 4 mA ... 20 mA
  0 V ... 10 V
- Process data update including conversion time of the digital/analog converter < 1 ms
- 16-bit resolution with high precision (voltage output 0.008%, typical; current output 0.01%, typical)
- High functional safety in the event of an error thanks to real 4 mA ... 20 mA output

This data sheet is only valid in association with the “Automation Terminals of the Rexroth Inline Product Range” application description (DOK-CONTRL-ILSYSINS***-AW..-EN-P, MNR R911317021).

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

2 Table of Contents

3 Ordering Data

Description	Type	MNR	Pcs. / Pkt.
Rexroth Inline terminal with two analog outputs for either voltage or current signals; complete with accessories (connectors and labeling fields); connectors are numbered individually	R-IB IL AO 2/SF-PAC	R911170436	1
Rexroth Inline terminal with two analog outputs for either voltage or current signals; complete with accessories (connectors and labeling fields); connectors are numbered continuously	R-IB IL AO 2/SF/CN-PAC	R911172576	1

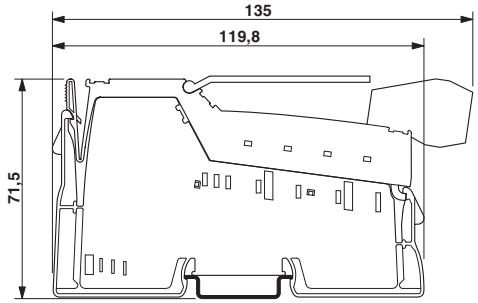
Documentation	Type	MNR	Pcs. / Pkt.
Application description Automation Terminals of the Rexroth Inline Product Range	DOK-CONTRL-ILSYSINS***-AW..-EN-P	R911317021	1

Additional ordering data

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

4 Technical Data

Dimensions (nominal sizes in mm)



Width	48.8 mm
Height	135 mm
Depth	71.5 mm

General data	
Color	Gray
Weight	190 g (with connector)
Operating mode	Process data mode with 2 words
Connection method for actuators	2-wire technology
Ambient temperature (operation)	-25°C ... +55°C
Ambient temperature (storage/transport)	-25°C ... +85°C
Permissible humidity (operation/storage/transport)	10% ... 95%, according to DIN EN 61131-2
Permissible air pressure (operation/storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III, IEC 61140, EN 61140, VDE 0140-1

Connection data	
Designation	Inline connector
Connection method	Spring-cage connection
Conductor cross section (solid/stranded)	0.2 mm² ... 1.5 mm² / 0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16

Inline local bus interface	
Connection method	Inline data jumpers
Transmission speed	500 kbps
Physical transmission method	Copper

Inline potentials/power consumption	
Communications power U_L	7.5 V DC
Current consumption at U_L	36 mA (typical), 45 mA (maximum)
Analog supply voltage U_{ANA}	24 V DC
Current consumption at U_{ANA}	75 mA (typical), 95 mA (maximum)
Total power consumption	2.1 W (typical)

Analog outputs	
Number	2; configured depending on the terminal point used
Signals/resolution in the process data bytes (quantization) for Inline	
Voltage 0 V ... 10 V	0 V ... 10.837 V; 0.333 mV/LSB
Current 0 mA ... 20 mA	0 mA ... 21.6764 mA; 0.667 µA/LSB
4 mA ... 20 mA	4 mA ... 21.3397 mA; 0.533 µA/LSB
Signals/resolution in the process data bytes (quantization) for ST	
Voltage 0 V ... 10 V	0 V ... 9.9975 V; 2.441 mV
Current 0 mA ... 20 mA	0 mA ... 19.9951 mA; 4.8828 µA
4 mA ... 20 mA	4 mA ... 19.9961 mA; 3.906 µA
Basic error limit	±0.003%
Output load	
Voltage output	2 kΩ, minimum
Current output	0 Ω ... 500 Ω
Process data update of the module including conversion time of the digital/analog converter	< 1 ms

Signal rise times: voltage output 0 V ... 10 V (typical values)	**10% ... 90%**	**0% ... > 99%**
No-load operation	44 µs	72 µs
Ohmic load R_L = 2 kΩ	46 µs	74 µs
Ohmic/capacitive load R_L = 2 kΩ / C_L = 10 nF	47 µs	95 µs
Ohmic/capacitive load R_L = 2 kΩ / C_L = 220 nF	79 µs	350 µs
Ohmic/inductive load R_L = 2 kΩ / L_L = 3.3 mH	48 µs	75 µs

Signal rise times: current output 0 mA ... 20 mA (typical values)	**10% ... 90%**	**0% ... > 99%**
Ohmic load R_L = 500 Ω	126 µs	380 µs
Ohmic/capacitive load R_L = 500 Ω / C_L = 10 nF	140 µs	425 µs
Ohmic/capacitive load R_L = 500 Ω / C_L = 220 nF	350 µs	1200 µs
Ohmic/inductive load R_L = 500 Ω / L_L = 3.3 mH	110 µs	368 µs

Signal rise times: current output 4 mA ... 20 mA (typical values)	**10% ... 90%**	**0% ... > 99%**
Ohmic load R_L = 500 Ω	140 µs	508 µs
Ohmic/capacitive load R_L = 500 Ω / C_L = 10 nF	145 µs	534 µs
Ohmic/capacitive load R_L = 500 Ω / C_L = 220 nF	380 µs	1200 µs
Ohmic/inductive load R_L = 500 Ω / L_L = 3.3 mH	116 µs	410 µs

Tolerance and temperature response of the outputs at T_A = 25°C				
Output range	**Absolute tolerance**		**Relative tolerance**	
	Typical	**Maximum**	**Typical**	**Maximum**
0 V ... 10 V	±0.8 mV	±2.0 mV	±0.008%	±0.02%
0 mA ... 20 mA	±2 µA	±6 µA	±0.01%	±0.03%
4 mA ... 20 mA	±2 µA	±6 µA	±0.01%	±0.03%

Tolerance and temperature response of the outputs at T_A = -25°C ... +55°C		
Output range	**Temperature coefficient**	
	Typical	**Maximum**
0 V ... 10 V	±8 ppm/K	±25 ppm/K
0 mA ... 20 mA	±18 ppm/K	±45 ppm/K
4 mA ... 20 mA	±18 ppm/K	±45 ppm/K

Outside the specified range, tolerances at the analog outputs might increase when gradually switching off the 24 V supply voltage U_{ANA}. They occur below U_{ANA} = +13.5 V. If U_{ANA} continues to fall, an I/O error message is triggered.

Additional tolerances influenced by electromagnetic fields		
Type of electromagnetic interference	**Typical deviation of the output range final value (voltage output)**	**Typical deviation of the output range final value (current output)**
	Relative	**Relative**
Electromagnetic fields; field strength 10 V/m according to EN 61000-4-3/IEC 61000-4-3	< 0.1%	< 0.1%
Conducted interference Class 3 (test voltage 10 V) according to EN 61000-4-6/IEC 61000-4-6	< 0.1%	< 0.3%
Fast transients (burst) 2 kV supply, 1 kV output according to EN 61000-4-4/IEC 61000-4-4	Class A	Class A
Fast transients (burst) 4 kV supply, 2 kV output according to EN 61000-4-4/IEC 61000-4-4	Class B	Class B

Safety equipment

Transient protection for voltage and current outputs

Programming data	
ID code (hex)	5B
ID code (dec)	91
Length code (hex)	02
Length code (dec)	02
Process data channel	32 bits
Input address area	4 bytes
Output address area	4 bytes
Parameter channel (PCP)	0 bytes
Register length (bus)	32 bits

PROFIBUS telegram data	
Required parameter data	6 bytes
Required configuration data	5 bytes

Error messages to the higher-level control or computer system

Failure or insufficient analog supply voltage U_{ANA}	Yes, I/O error message sent to the bus coupler

Electrical isolation/isolation of the voltage areas

Common potentials

24 V I/O 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
7.5 V supply (bus logic), 24 V supply U_{ANA}/I/O	500 V AC, 50 Hz, 1 min.
7.5 V supply (bus logic), 24 V supply U_{ANA}/functional earth ground	500 V AC, 50 Hz, 1 min.
24 V supply (I/O)/functional earth ground	500 V AC, 50 Hz, 1 min.

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).

Mechanical tests

Shock test
according to EN 60068-2-27, IEC 60068-2-27

Deviation to DOK-CONTRL-ILSYSINS***-AW-EN-P:
15 g; 11 ms, 25 g; 6 ms, half-sine shock pulse,
three shocks per space direction

Approvals

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

5 Internal Basic Circuit Diagram

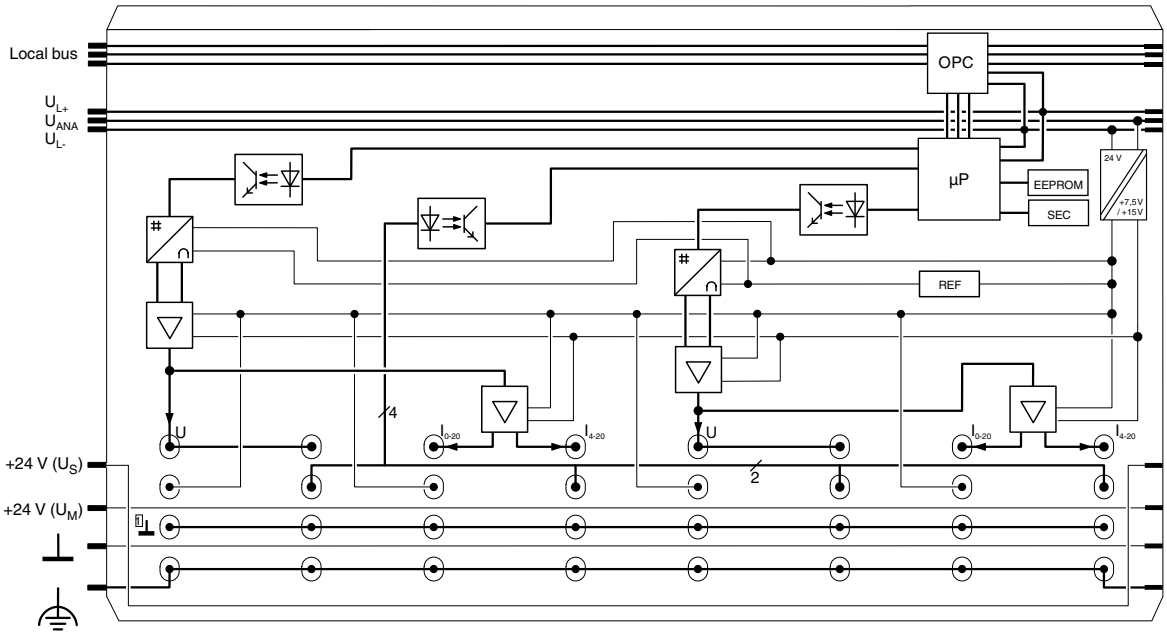


Fig. 1 Internal basic circuit diagram

Key:

OPC	Protocol chip	REF	Reference voltage
	Optocoupler		Amplifier
µP	Microprocessor		Digital/analog converter
SEC	Safety circuit (security)	1	Analog ground, electrically isolated from ground of the potential jumper
EEPROM	Electrically erasable re-programmable read-only memory		
	DC/DC converter with electrical isolation		

For an explanation of the other symbols used, please refer to the “Automation Terminals of the Rexroth Inline Product Range” application description (DOK-CONTRL-ILSYSINS***-AW..-EN-P, MNR R911317021).

6 Electrical isolation

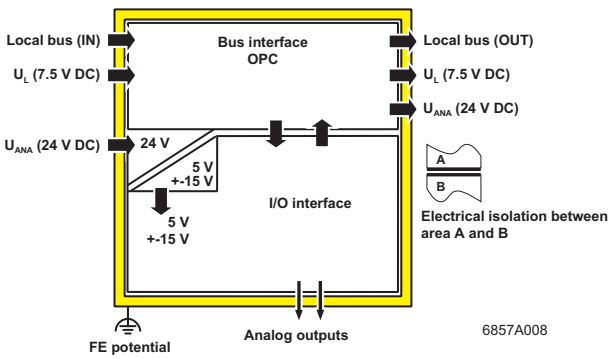


Fig. 2 Electrical isolation of the individual function areas

7 Terminal Point Assignment

R-IB IL AO 2/SF-PAC

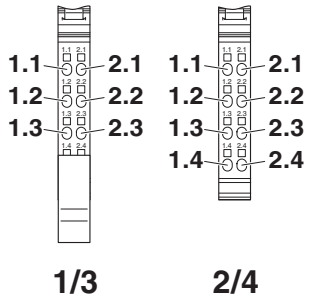


Fig. 3 Terminal point assignment

R-IB IL AO 2/SF/CN-PAC

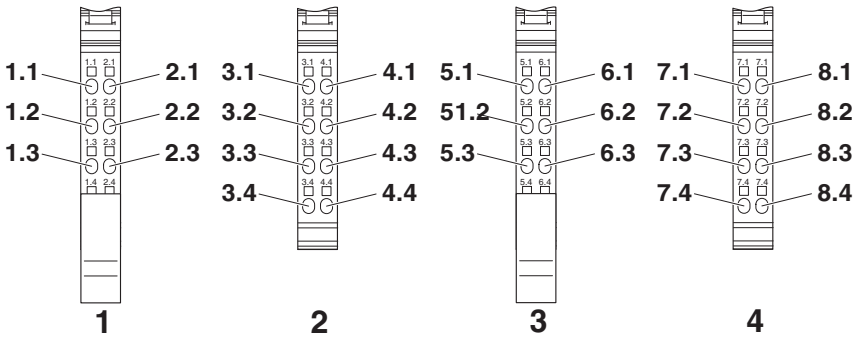


Fig. 4 Terminal point assignment

Connector	Terminal point		Signal	Assignment
	R-IB IL AO 2/SF-PAC	R-IB IL AO 2/SF/CN-PAC		
1	**1.1, 2.1**	**1.1, 2.1**	**+U**	Voltage output of channel 1
	1.2, 2.2	**1.2, 2.2**	**B1**	Jumper 1
	1.3, 2.3	**1.3, 2.3**	**AGND**	Analog ground
	1.4, 2.4	**1.4, 2.4**	**Shield**	Shield connection
2	**1.1**	**3.1**	**+I_{0-20}**	Current output of channel 1: 0 mA ... 20 mA
	2.1	**4.1**	**+I_{4-20}**	Current output of channel 1: 4 mA ... 20 mA
	1.2, 2.2	**3.2, 4.2**	**B2**	Jumper 2
	1.3, 2.3	**3.3, 4.3**	**AGND**	Analog ground
	1.4, 2.4	**3.4, 4.4**	**Shield**	Shield connection
3	**1.1, 2.1**	**5.1, 6.1**	**+U**	Voltage output of channel 2
	1.2, 2.2	**5.2, 6.2**	**B1**	Jumper 1
	1.3, 2.3	**5.3,6.3**	**AGND**	Analog ground
	1.4, 2.4	**5.4, 6.4**	**Shield**	Shield connection
4	**1.1**	**7.1**	**+I_{0-20}**	Current output of channel 2: 0 mA ... 20 mA
	2.1	**8.1**	**+I_{4-20}**	Current output of channel 2: 4 mA ... 20 mA
	1.2, 2.2	**7.2, 8.2**	**B2**	Jumper 2
	1.3, 2.3	**7.3, 8.3**	**AGND**	Analog ground
	1.4, 2.4	**7.4, 8.4**	**Shield**	Shield connection

8 Installation Note

Installing jumpers may influence the accuracy of the channels independently of each other. Without using jumpers the voltage channels have a high level of accuracy and the current channels have a low level of accuracy. Installing a jumper for a channel increases the accuracy of a current output. This also reduces the accuracy of the voltage output. Only install the jumper when using a current channel. Installing a jumper when using a voltage channel will not be indicated as an error. Changing the jumper will only take effect upon power up.

Coding table

Representation in Fig. 5	Connector	Jumper	State	Meaning
A	X*	B1	Not installed	High level of accuracy 0 V ... +10 V
	Y*	B2	Not installed	
B	X*	B1	Installed	High level of accuracy 0 mA ... +20 mA
	Y*	B2	Not installed	
C	X*	B1	Not installed	High level of accuracy 4 mA ... +20 mA
	Y*	B2	Installed	
X*Y* represent connectors 1 and 2 (channel 1) or connectors 3 and 4 (channel 2).				

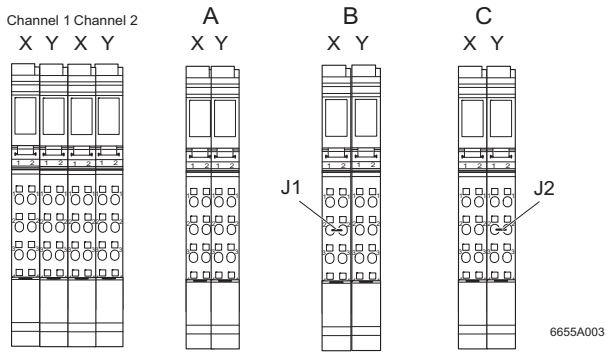


Fig. 5 Figure for the coding table

9 Connection Examples

Use connectors with shield connection when installing the actuators. Fig. 6 and Fig. 7 show the connection schematically (without shield connector).

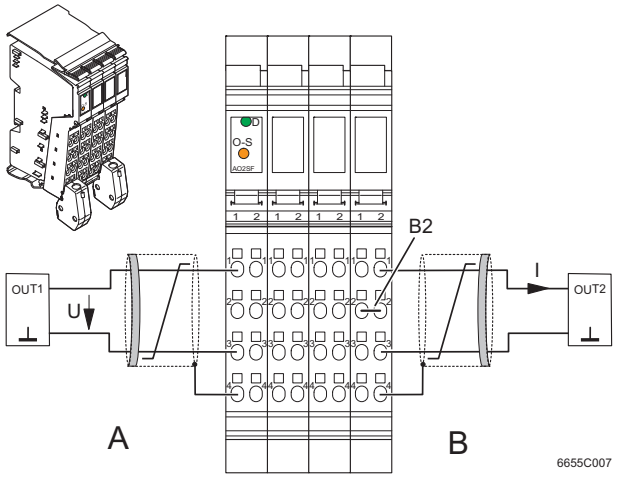


Fig. 6 Actuator connection to the voltage and current outputs using 2-wire technology with shield connection

A: Channel 1, signals for an actuator at the voltage output 0 V ... 10 V

B: Channel 2, signals for an actuator at the current output 4 mA ... 20 mA with a high level of accuracy

B2: External jumper

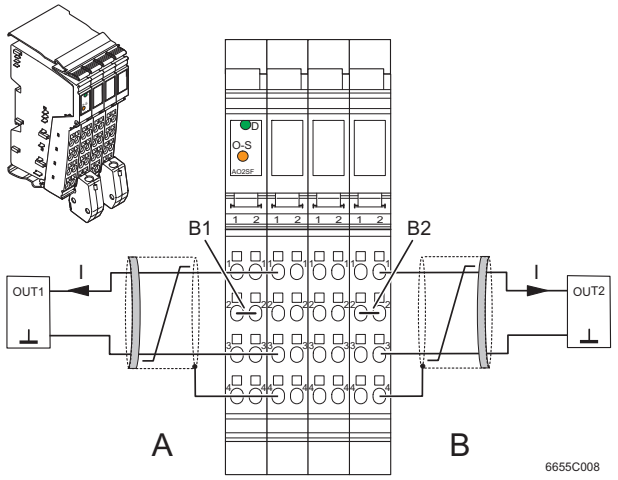


Fig. 7 Actuator connection to the current outputs using 2-wire technology with shield connection

A: Channel 1, signals for an actuator at the current output 0 mA ... 20 mA with a high level of accuracy

B: Channel 2, signals for an actuator at the current output 4 mA ... 20 mA with a high level of accuracy

J1, J2: External jumpers

10 Connection Notes

Always connect the analog actuators using shielded twisted pair cables.

At the terminal, connect one end of the shielding to PE. At the module, fold the outer cable sheath back and connect the shield to the terminal via the shield connection clamp. The clamp connects the shield directly to FE on the module side.

When using cables longer than 10 m in environments prone to interference, we recommend connecting the shield on the actuator to the FE potential via an RC element. The capacitor C should typically have values of 1 nF to 15 nF. The resistor R should have a resistance of at least 10 MΩ.

Use an I/O connector with shield connection when installing the actuator. On the base side that is not used to connect an actuator, you may use the connector without shield connection.

11 Installation Instructions

High current flowing through potential jumpers U_M and U_S leads to a temperature rise in the potential jumpers and inside the terminal. To keep the current flowing through the potential jumpers of the analog terminals as low as possible, always place the analog terminals after all the other terminals at the end of the main circuit (for the sequence of the Inline terminals: see also “Automation Terminals of the Rexroth Inline Product Range” application description (DOK-CONTRL-ILSYSINS***-AW..-EN-P, MNR R911317021).

12 Local Diagnostics and Status Indicators

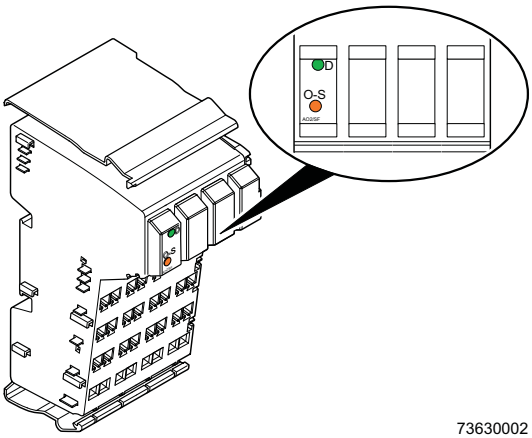


Fig. 8 Local diagnostics and status indicators

Des.	Color	Meaning
D	Green	Diagnostics
O-S	Orange	Original default state parameterized

Function identification

Yellow

13 Process Data

In the following tables, the terminal points for the R-IB IL AO 2/SF-PAC terminal are given first, then followed by the terminal points for the R-IB IL AO 2/SF/CN-PAC terminal that are specified in brackets.

13.1 Assignment of Terminal Points to the OUT Process Data

(Word.bit) view	Word	Word 0															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Assignment	IB IL format	SB	Output value of channel 1														
Assignment	IB ST format	SB	Output value of channel 1												0	0	0
Terminal points Slot 1	Signal	Terminal point 1.1: voltage output															
	AGND	Terminal point 1.3, 2.3															
	Shielding (FE)	Terminal point 1.4, 2.4															
Terminal points Slot 2	Signal	Terminal point 1.1 (3.1): current output 0 mA ... 20 mA Terminal point 2.1 (4.1): current output 4 mA ... 20 mA															
	AGND	Terminal point 1.3, 2.3 (3.3, 4.3)															
	Shielding (FE)	Terminal point 1.4, 2.4 (3.4, 4.4)															

(Word.bit) view	Word	Word 1															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Assignment	IB IL format	SB	Output value of channel 2														
Assignment	IB ST format	SB	Output value of channel 2												0	0	0
Terminal points Slot 3	Signal	Terminal point 1.1 (5.1): voltage output															
	AGND	Terminal point 1.3, 2.3 (5.3, 6.3)															
	Shielding (FE)	Terminal point 1.4, 2.4 (5.4, 6.4)															
Terminal points Slot 4	Signal	Terminal point 1.1 (7.1): current output 0 mA ... 20 mA Terminal point 2.1 (8.1): current output 4 mA ... 20 mA															
	AGND	Terminal point 1.3, 2.3 (7.3, 8.3)															
	Shielding (FE)	Terminal point 1.4, 2.4 (7.4, 8.4)															

SB Sign bit

0 In “IB ST” format bits 2 to 0 are irrelevant. Set these bits to “0”.

13.2 Assignment of IN Process Data

(Word.bit) view	Byte	Word 0															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Assignment		SB	Mirrored output value of channel 1												F	0	H

(Word.bit) view	Byte	Word 1															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Assignment		SB	Mirrored output value of channel 2												F	0	H

SB Sign bit
F Format of output data
H HOLD/RESET

13.3 OUT Process Data

The OUT process data specifies the output values in each cycle.

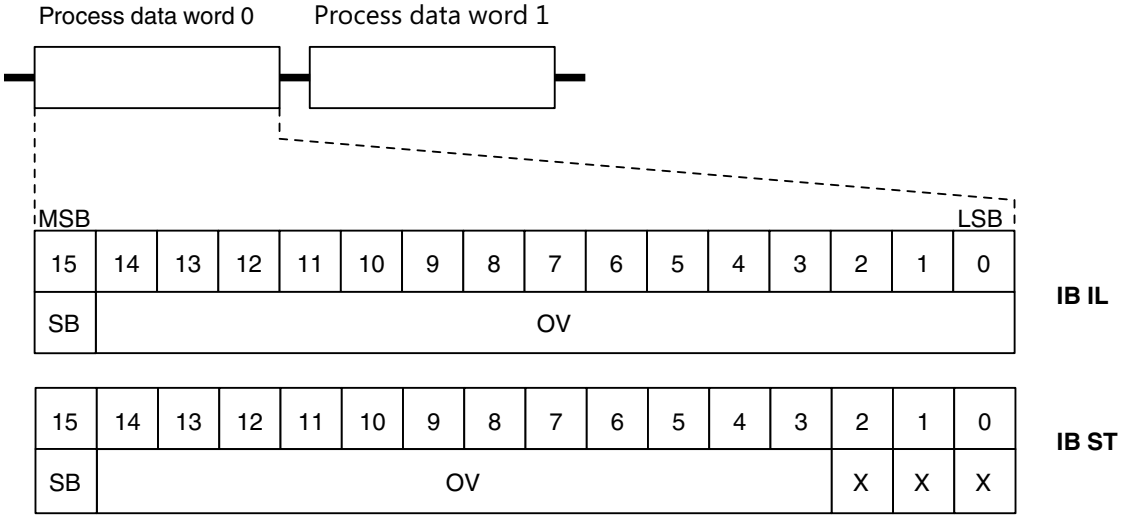


Fig. 9 OUT process data words in IB IL and IB ST formats

SB Sign bit
OV Output value
X Irrelevant bit
MSB Most significant bit
LSB Least significant bit

Set the irrelevant bits to 0.

13.4 IN Process Data

Bits 15 to 3 of the process data output values are mirrored in the IN process data. Bit 15 is the sign bit. Bits 2 to 0 are available as status bits. They contain information about the parameterized behavior of the terminal.

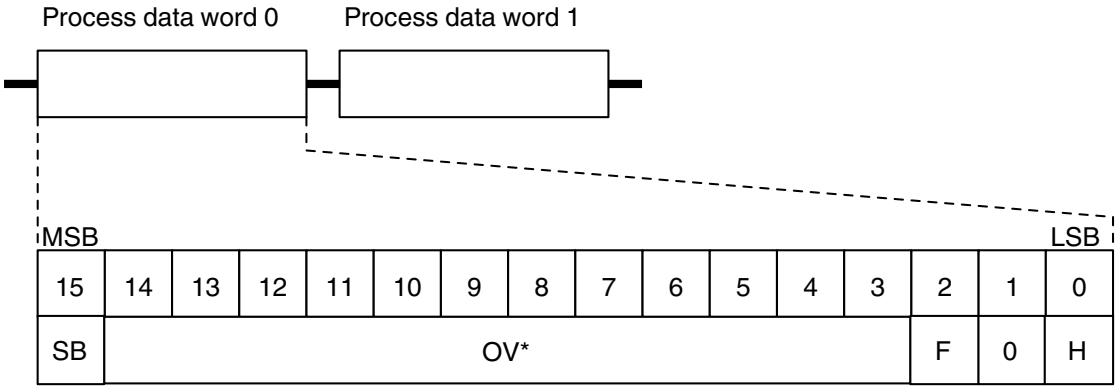


Fig. 10 IN process data words

SB	Sign bit
OV*	Mirrored output value
F	Format of output data
H	HOLD/RESET
MSB	Most significant bit
LSB	Least significant bit

Bits 2 to 0 have the following meaning:

Bit	Designation	Meaning	Bit x = 0	Bit x = 1
2	F	Format of output data	IL	ST
1		Reserved		
0	H	HOLD/RESET see page 15	HOLD	RESET

14 Formats for Representing the Output Values

"IB IL" is the default format on the terminal. To ensure that the terminal can be operated in ST data format, the output value representation can be switched to "IB ST" format.

14.1 "IB IL" Format

The output value is represented in bits 14 to 0. An additional bit (bit 15) is available as a sign bit. The sign bit is 0 for the output value 0 V ... 10 V. If the sign bit is 1, which corresponds to a negative value, the value 0 V (or 0 mA/4 mA) is output.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SB	OV														

SB = Sign bit
OV = Output value

Bits 2 to 0 are not mirrored in the input data.

Significant output values in "IB IL" format

The terminal has two analog output channels, which are able to output voltages in the range from 0 V ... +10 V or currents in the range from 0 mA ... 20 mA and 4 mA ... 20 mA with a resolution of 15 bits plus the sign bit.

Range	Output data word (two's complement)		Output range		
			0 V ... +10 V U_{Output}	0 mA ... +20 mA I_{Output}	+4 mA ... +20 mA I_{Output}
	hex	dec	V	mA	mA
Overflow	7FFF	32767	+10.8373	+21.6764	+21.3397
	7F01	32513	+10.8373	+21.6764	+21.3397
Overload capability range	7F00	32512	+10.8373	+21.6764	+21.3397
	7531	30001	+10.0003	+20.0007	+20.0005
Nominal range	7530	30000	+10.0000	+20.0000	+20.0000
	3A98	15000	5.0000	+10.0000	+12.0000
	0001	1	+0.000333	+0.000667	+4.000533
	0000	0	0	0	+4.000
Underflow	< 0000	< 0	0	0	+4.000

14.2 "IB ST" Format

The output value is represented in bits 14 to 3. Bit 15 is available as a sign bit. Bits 2 to 0 are irrelevant.

This format corresponds to the data format used on INTERBUS ST modules.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SB	OV												x	x	x

SB Sign bit
OV Output value
X Irrelevant bit (set this bit to 0)

Bits 2 to 0 are not mirrored in the input data.

Significant output values in "IB ST" format

Value range 0 V ... 10 V and 0 mA ... 20 mA

Output data word (two's complement)	0 V ... +10 V U_{Output}	0 mA ... +20 mA I_{Output}
hex	V	mA
> 7FF8	9.9975	19.9951
7FF8	9.9975	19.9951
4000	5.0000	10.0000
0008	0.0024	0.0048
≤ 0000	0	0

Value range 4 mA ... 20 mA

Output data word (two's complement)	4 mA ... +20 mA I_{Output}
hex	mA
> 7FFC	19.9961
7FFC	19.9961
4000	12.0000
000C	4.003906
≤ 0004	4.0000

All three ranges are available in parallel for this terminal. Therefore, bit 2, which is designed to distinguish the measuring ranges 0 mA ... 20 mA/4 mA ... 20 mA in the ST format, is irrelevant.

15 Output Behavior

15.1 Output Behavior during Error-Free Operation (Normal Operation)

On power up during normal operation, the parameterized output range and the data format of the terminal are read retentively.

In the event of an error, volatile parameterization is also possible for these settings as well as for the behavior of the terminal. This parameterization can be carried out during runtime by a process data sequence.

15.2 Output Behavior in the Event of an Error

In the event of an error, the output behavior depends on the non-volatile settings or the subsequent volatile parameterization. That means the outputs hold the last value (HOLD, default setting) or they return to zero (RESET, can be parameterized).

Take the output behavior (in the event of an error) into account when configuring your system.

15.3 Output Behavior of the Voltage and Current Outputs

Switching operation/state of the supply voltage	**Marginal condition**	**OUT process data word (hex)**	**Behavior/status of the analog output**		
			0 V ... 10 V	**0 mA ... 20 mA**	**4 mA ... 20 mA**
U_{ANA} from 0 V ... 24 V	U_L = 0 V	xxxx	0 V	0 mA	4 mA
U_{ANA} from 24 V ... 0 V	U_L = 7.5 V	xxxx	0 V	0 mA	0 mA
Bus in stop state	U_{ANA} = 0 V	xxxx	0 V	0 mA	0 mA
Bus in stop state	U_{ANA} = 24 V	xxxx	Hold last value		
Bus reset (e.g., remote bus cable break)		xxxx	Can be parameterized: Hold last value (default setting) or		
			0 V	0 mA	4 mA

U_{ANA} Analog supply voltage of the terminal

U_L Supply voltage for module electronics (communications power)

xxxx Any value in the range from 0000_{hex} to $FFFF_{hex}$.

15.4 Response of the Voltage or Current Outputs to a Control Command of the Controller Board

Command	**State after switching operation**			
	OUT process data word (hexadecimal)	**Analog output**		
		0 V ... 10 V	**0 mA ... 20 mA**	**4 mA ... 20 mA**
STOP	xxxx	Hold last value		
ALARM STOP (reset)	xxxx	Can be parameterized: Hold last value (default setting) or		
		0 V	0 mA	4 mA

16 Input Behavior

With regard to the input behavior, a distinction is made between normal operation and parameterization mode. Input behavior in parameterization mode is described in “Parameterization” on page 18.

During **error-free normal operation** the output data is mirrored in the input words as “acknowledgment” in bits 15 to 3 as soon as it has been transmitted to the DAC.

Bits 2 to 0 are available as status bits and are used to display and read the set behavior of the terminal.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SB	OV*												F	0	H

SB Sign bit

OV* Mirrored output value

F Data format 0: IB IL 1: IB ST

H Hold/reset 0: Hold 1: Reset

If an **error** is detected by the terminal, it is indicated by means of an error code in the first or second IN process data word depending on the error type. Possible error codes are given in the following table.

Error codes:

Output data word (two’s complement) hex	Cause	Remedy
8010	The jumpers for selecting the “high accuracy” range are contradictory (e.g., 0 mA ... 20 mA and simultaneously 4 mA ... 20 mA). The error message is indicated on the corresponding channel only.	Connect the jumpers correctly.
	The user parameterization cannot be stored. The error message is indicated on both channels.	Carry out a power up.
8020	Error in the I/O voltage supply.	Check the voltage supply on the bus coupler. Check that the potential jumpers are connecting safely.Replace the terminal.
8040	Terminal is defective.	Replace the terminal.

An I/O error is triggered with codes 8020_{hex} and 8040_{hex}.

The error codes overwrite the status bits (bits 2 to 0) with “0”.

17 Parameterization

By default upon delivery, the terminal parameters are set as follows:

Data format:	IB IL
Behavior of the outputs in the event of an error:	Outputs hold the last value (Hold)

The following terminal parameters can be configured according to your conditions using the process data:

Data format:	IB ST
Behavior of the outputs in the event of an error:	Outputs are set to 0 (Reset)

In order to parameterize the terminal, you must change to parameterization mode.

Steps to be taken to parameterize the terminal:

Step 1:	**Transmission of code 8030_{hex} in the first OUT process data word.** In bits 15 to 3 of the first IN process data word this code is acknowledged as a normal process data item.
Step 2:	**Transmission of the parameterization code: 1000 0000 0101 $p_3p_20p_{1bin}$ in the second OUT process data word.** Where p_x are the terminal parameters: p_3: volatile or non-volatile (0: volatile; 1: non-volatile) p_2: data format (0: IB IL; 1: IB ST) p_1: reset behavior (0: Hold; 1: Reset) Both output data words must be written with a maximum time of 10 s between each other. This makes data consistency over two words unnecessary. The writing sequence is not important. If the time has elapsed, something else, differing from the parameter value, must be written in the two words. The parameter words must be kept for 2 s until the parameterization is accepted.
Step 3:	Acceptance of the value is confirmed in bits 15 to 3 of the first input word by mirroring the code. No timer is required in the application as monitoring the input data is sufficient. When mirroring, note that bits 2 to 0 still indicate the current terminal parameterization in each word. As soon as the new parameterization is valid, the corresponding parameter bit is set in the input data.
Step 4:	The terminal is in normal process data mode again. Prior to a new parameterization, the data on both output words must have changed.

The orange “O-S” LED on the terminal indicates whether the original configuration is present or whether the active configuration differs from the default configuration of the terminal upon delivery. The LED is on if the default state has been parameterized.

DOK-CONTRL-ILAO2/
SF***-KB03-EN-P

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