Passion for Sensors

EN-US

Operating Manual

CC50I.RTD

IO-Link converter

EN-US

1 About this document

1.1 Purpose and scope of application

This document instructs the technical staff of the machine manufacturer or machine operator on the safe use of the described devices.

It does not include instructions on the safe use of the machine in which the devices are integrated. Information on this is found in the operating manual of the machine.

- Read this chapter carefully before you start working with the device.
- Study the documentation carefully before device commissioning.
- Store the manual in a place that is accessible to all users at all times for the entire service life of the device.

Understanding the present manual requires general knowledge about automation technology. In addition, planning and using automation systems requires technical knowledge which is not included in this manual.

1.2 Applicable documents

- Available for download at www.baumer.com:
  - Instruction manual
  - Data sheet
  - Device description file
  - EU Declaration of Conformity
  - Certificates and Approvals
- Attached to product:
  - General information sheet (11042373)

1.3 Labels in this manual

Identifier	Usage	Example
Dialog element	Indicates dialog elements.	Click the *OK* button.
Unique name	Indicates the names of products, files, etc.	*Internet Explorer* is not supported in any version.
`Code`	Indicates entries.	Enter the following IP address: `192.168.0.250`

1.4 Warnings in this manual

Warnings draw attention to potential personal injury or material damage. The warnings in this manual indicate different hazard levels:

Symbol	Warning term	Explanation
	DANGER	Indicates an imminent potential danger with high risk of death or serious personal injury if not being avoided.
	WARNING	Indicates potential danger with medium risk of death or (serious) personal injury if not being avoided.
	CAUTION	Indicates a danger with low risk, which could lead to light or medium injury if not avoided.
	NOTE	Indicates a warning of material damage.
	INFO	Indicates practical information and tips that enable optimal use of the devices.

1.5 Trademarks

The present documentation uses the trademarks of the following companies and institutions:

IO-Link   c/o PROFIBUS User Organisation e.V. (PNO)

2   General information

Intended use

The device has been designed and manufactured for:

- Communication and process control
- General tasks in control and automation
- To be operated in ambient conditions as specified in the data sheet
- For industrial use up to protection IP67/IP69K

Intended use includes EMC-compliant electrical installation.

Commissioning

Assembly, installation, and calibration of this product may only be performed by a specialist.

Installation

Only use the fasteners and fastener accessories intended for this product for installation. Outputs not in use must not be wired. Unused wires of cable outputs must be insulated. Do not go below the permissible cable bending radii. Disconnect the system from power before the product is electrically connected. Use shielded cables to prevent electro-magnetic interference. If the customer assembles plug connections on shielded cables, then EMC-version plug connections should be used and the cable shield must be connected to the plug housing across a large surface area.

Disposal (environmental protection)

Used electrical and electronic devices may not be disposed of in household waste. The product contains valuable raw materials that can be recycled. Therefore dispose of this product at the appropriate collection point. For additional information visit www.baumer.com.

3   Safety

3.1   General safety instructions

⚠️ **DANGER**

High electrical voltage in the machine/system.

Death or severe injuries resulting from electric shock.

   a) While working on the machine/devices, comply with the five safety rules of electrical engineering.

Protection of persons and material assets

- According to DIN VDE 0105-100 - Operation of electrical systems - Part 100: General definitions

The 5 Safety Rules

Protect against *high electrical voltage*

1. Switch off the device.
2. Secure against unwanted switchon.
3. Ensure that each pole is not live respectively under voltage.
4. Grounding and short-circuiting.
5. Cover or block neighboring parts under voltage.

Qualified personnel

The appliance may only be installed, commissioned and operated by qualified personnel who have received safety training.

Qualified means fulfilling the following requirements:

- the personnel underwent suitable training in electrical engineering,
- the personnel is familiar with the safety standards which are common practice in automation engineering,
- the personnel has access to the Operating instructions and the present Instruction Manual,
- are familiar with the safety standards of automation technology,
- the personnel is familiar with the related and applicable basic and technical standards.

Intended use of the device

- During project engineering, installation, commissioning, operation, and testing of the device comply with the existing regulations on accident prevention as well as health and safety at work.
- Check material resistance against aggressive media.

INFO

Any manipulation/modification of hardware and software only qualified *Baumer* personnel, except for firmware updates.

4   Description

IO-Link converter for resistance temperature detectors (RTD)

- Sensor input M12 female connector A-coded
- IO-Link port M12 connector A-coded
- Measuring input galvanically isolated
- Sensors PT100, PT200, PT500, PT1000 (DIN EN60751)
- Resistance measurement 0 Ω ... 3000 Ω
- Interference frequency filter 50/60 Hz
- Diagnostic indicator

5   Technical data

5.1   Electrical Data

Module supply		
Operating voltage IO-Link	Via pin 1	24 V
Operating voltage range US	Via pin 1	18 ... 30 V
Power consumption	Ub = 24 V	≤15 mA

IO-Link port		
IO-Link specification	EN 61131-9	Version 1.1
Communication mode	COM2	38.4 kbit/s
IO-Link transmission protocol		Version 1.1
Cycle time		≥10 ms
Port class		Class A
Data length	Process data resolution	16-bit / 2-byte

Sensor input		
Terminal		M12 female connector A-encoding
Connection technology		2-, 3- and 4-wire
Sensor cable		<30 m
Line resistance		<50 Ω/conductor
Supported sensors (RTD)		PT100, PT200, PT500, PT1000
Resistance measurement		0 Ω … 3 kΩ
Sensor current		approx. 200 µA
Transformation principle	ADC	Sigma-Delta
Resolution	ADC	24 bits
Temperature drift		20 ppm / °K
Sampling rate		≤200 Hz
Filter	Mean value	0 ... 64 measuring operations
Filter	Interference frequency filter	Off, 50 Hz, 60 Hz
Conversion time	Interference frequency filter Off, 50 Hz, 60 Hz	10 ms, 60 ms, 100 ms

5.2 Measuring ranges

PT100, PT200, PT500, PT1000		
Nominal measuring range		-200 °C ... +850 °C
Range of overdrive		-220 °C... +1000 °C
Resolution		0.1 °C
Measuring accuracy	4-wire measurement	<0.1 % (full deflection)
Measuring accuracy	3-wire measurement	<0.2 % (full deflection)
Measuring accuracy	2-wire measurement (lead resistance = 0 Ω)	<0.2 % (full deflection)

PT100 climate		
Nominal measuring range		-120 °C ... +130 °C
Range of overdrive		-145 °C... +155 °C
Resolution		0.01 °C
Measuring accuracy	4-wire measurement	<0.2 % (full deflection)

Ohm 0 Ω ... 3000 Ω		
Nominal measuring range		0 Ω ... 3000 Ω
Range of overdrive		0 Ω ... 3251.1 Ω
Resolution	S7 format	0.1085 Ω
Measuring accuracy	4-wire measurement	<0.05 % (full deflection)
Measuring accuracy	3-wire measurement	<0.1 % (full deflection)
Measuring accuracy	2-wire measurement	<0.1 % (full deflection)

5.3 Ambient conditions

Mechanical		
Oscillation test	EN 60068 Part 2-6	10 ... 58 Hz, vibration amplitude 0.35 mm, 58 ... 150 Hz; 20 g
Shock test	EN 60068 Part 2-27	50 g, duration 11 ms, 3 axes

Climate		
Storage temperature		-40 °C ... +85 °C
Operating temperature		-30 °C ... +70 °C
Ambient temperature	UL 61010	-30 °C ... +70 °C
Climate class	EN 60721	3K3
Installation hight	Above sea level	≤2000 m
Relative humidity		≤85 %

Electrical safety		
Protection	All connections established	IP67
Overvoltage category		II
Level of contamination		3

| EMC emission		
Radio interference emission	EN 61000-6-4	30 ... 230 MHz 40 dBµV/m (@10 m) 230 ... 1000 MHz 47 dBµV/m (@10 m)

EMC-immunity		
Electromagnetic HF fields	EN 61000-4-3	80 ... 1000 MHz,10 V/m 1,4 ... 2 GHz, 3 V/m 2 ... 2,7 GHz, 1 V/m
Fast transients (burst)	EN 61000-4-4	±1 kV, 5 kHz Measuring precision 5 % FS without filter 0.2 % FS with max. filter
Conducted HF interference	EN 61000-4-6	0.15 ... 80 MHz 10 V, 80 % AM; 1 kHz
Electrostatic discharge (ESD)	EN 61000-4-2	Contact ±4 kV Air: ±8 kV

5.4 Protection

Device protection		
Reverse polarity protection IO-Link port		Yes
Short-circuit protection sensor input		Yes

5.5 Mechanical data

Material data		
Housing		Plastic PC + PBT
M12 female / mating connector Knurled nut / knurled screw		Zinc casting with Cu/Ni finish
FE connection sleeve		Brass with Cu/Ni finish
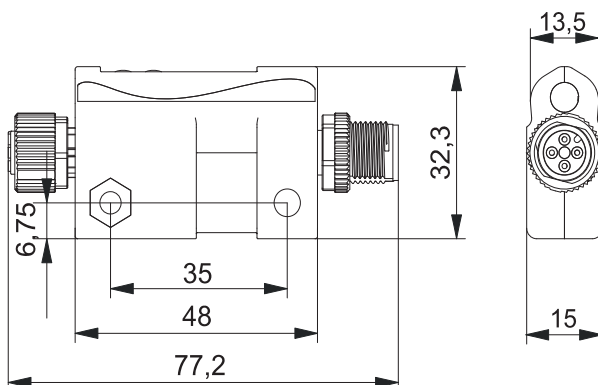
5.6   Product reliability

Product reliability		
MTTF	SN 29500 and rated data (40 °C)	298 years

5.7   Conformity, Approvals

Conformity, Approvals		
Product standard	EN 61131-2, EN 61131-9 Programmable logic controllers	
CE	2014/30/EU 2011/65/EU	
UKCA		
ULus	UL 61010-2-201, UL 61010-1	E201820
cUL	CSA 22.2 No. 61010-2-201, 61010-1	E201820
REACH	(EC) No 1272/2008	SVHC List
WEEE	2012/19/EU	Category 5
China RoHS	GB/T 26572	25 EPUP

Hazardous substance (有害物質)						
Part Name 零件名稱	Lead (Pb) 铅	Mercury (Hg) 汞	Cadmium (Cd) 镉	Hexavalent Chromium (Cr (VI)) 六价铬	Polybrominated biphenyls (PBB) 多溴联苯	Polybrominated diphenyl ethers (PBDE) 多溴联苯醚
Component part PCB [1] [2] 组件部分 印刷电路板	X	O	O	O	O	O
Connection Terminal / Screws / Housing[3] 接线端子 /拧/ 外殻	X	O	O	O	O	O
O : Indicates that the content of the harmful substance in all homogeneous materials of the component part is below the limit defined in GB/T 26572. O: 表明該有害物質在組成部分的所有均質材料的含量低於按GB/ T26572定義的限制。 X: Indicates that the content of the harmful substance in at least one homogeneous material of the component part exceeds the limit defined in GB/T 26572. X: 表示該有害物質在組成部分中的至少一個均質材料的含量超過按GB / T26572定義的限制。						

[1] EU RoHS Directive 2011/65/EU, Annex III: Exemption 7(a) Lead in high melting temperature type solders (i.e., lead-based alloys containing 85 % by weight or more lead)

[2] EU RoHS Directive 2011/65/EU, Annex III: Exemption 7(c)-I Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g., piezoelectronic devices, or in a glass or ceramic matrix compound.

[3] EU RoHS Directive 2011/65/EU, Annex III: Exemption 6(c) Copper alloy containing up to 4 % lead by weight.

6   Installation

6.1   Requirements

Installation requirements:

- Mounting point in immediate vicinity of sensor/actuator.
- Even mounting surface to avoid mechanical tension.
- Earthed mounting surface for earthing of ring terminal.
- Short cable distance to all components.
- Sufficient space to ease replacement and plug-in connections.
- Suitable installation site in terms of vibration and shock load, temperature and humidity (see Technical data).
- Protected site to prevent connection cables from being torn off accidentally.
- Diagnostic LEDs visible in operation.

⚠ DANGER

High electrical voltage in the machine/system.

Death or severe injuries resulting from electric shock.

a) While working on the machine/devices, comply with the five safety rules of electrical engineering.

☼ INFO

Only use a power unit capable of limiting voltage to max. 60 VDC resp. 25 AC at the occurrence of error. Power supply must comply with SELV or PELV.
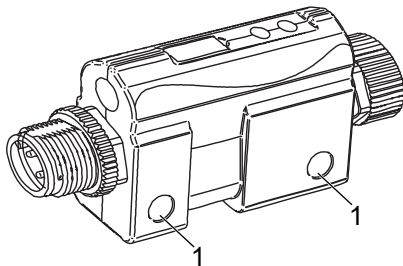

6.2   Sensor attachment

⚠ WARNING

Material damage due to incorrect installation.

Use fastening screws that are appropriate for the mounting surface.

a) Fastening screws and tightening torques depend on mounting surface.

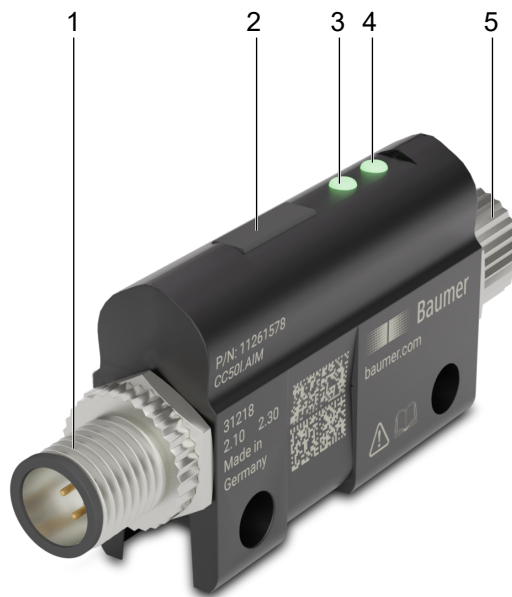b) Ttighten the screws carefully. Observe the specified tightening torques.

Ill. 1: Sensor attachment

1	M5 mounting hole Ø 5.2 mm

7 Installation

7.1 Connection

Ill. 2: Device structure

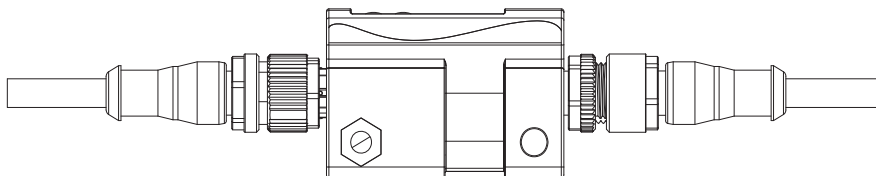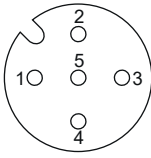|			
1	IO-Link port 4-pin M12 connector A-coded	2	Product label, can be exchanged
3	LED 1 Device status / diagnostics	4	LED 2 IO-Link status
5	Sensor input M12 female connector 5-pin A-coded		

7.2 Connection lines

⚠ **CAUTION**

Hot surface.

Minor personal injuries and damage to the device when contacting hot surfaces.

a) Wear suitable isolating gloves.

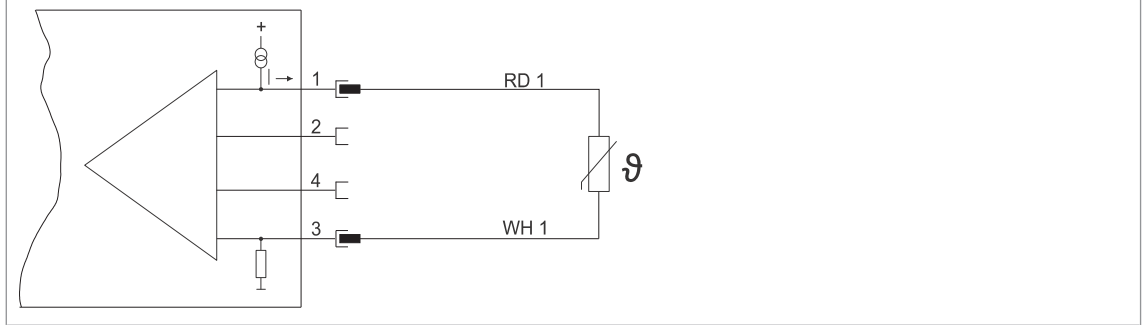b) Only use connection cables that meet thermal requirements.
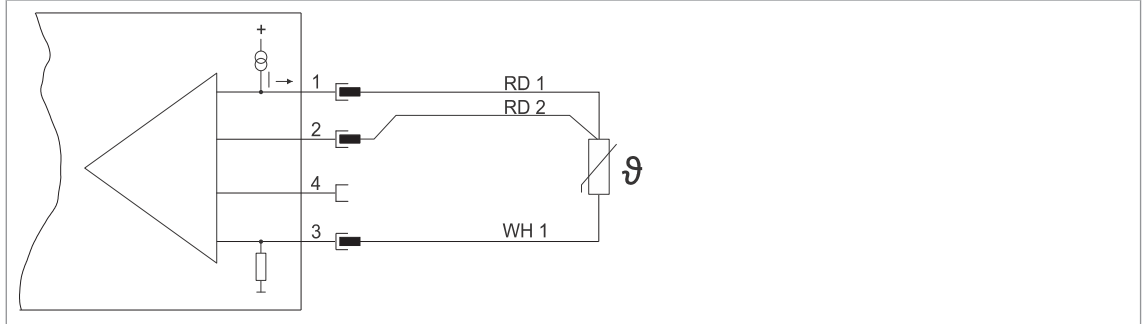

M12	0.6 Nm		Art.-No. 11238694

7.3   Sensor input

Assignment		
	Pin 1	RD 1
	Pin 2	RD 2
	Pin 3	WH 1
	Pin 4	WH 3
	Pin 5	n.c.

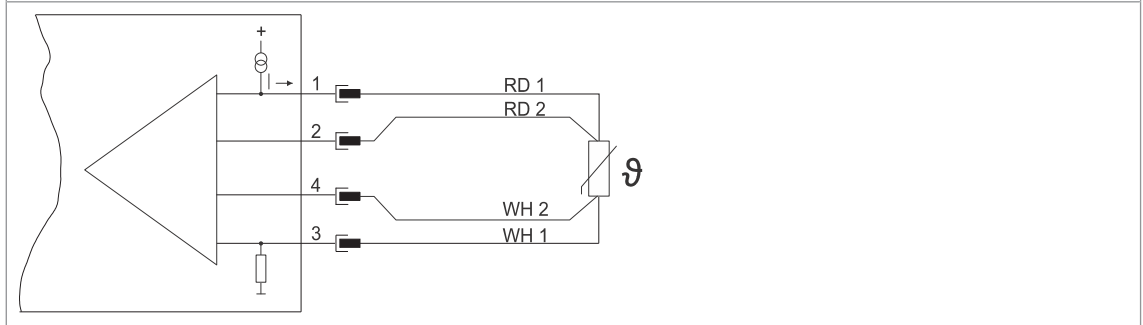**2-wire connection**

3-wire connection

4-wire connection

7.4   IO-Link interface port

Sensors with current output (0/4 ... 20 mA)

Assignment		
	Pin 1	L+(+24 V)
	Pin 2	n.c.
	Pin 3	GND, L-
	Pin 4	IO-Link Datenleitung, C/Q
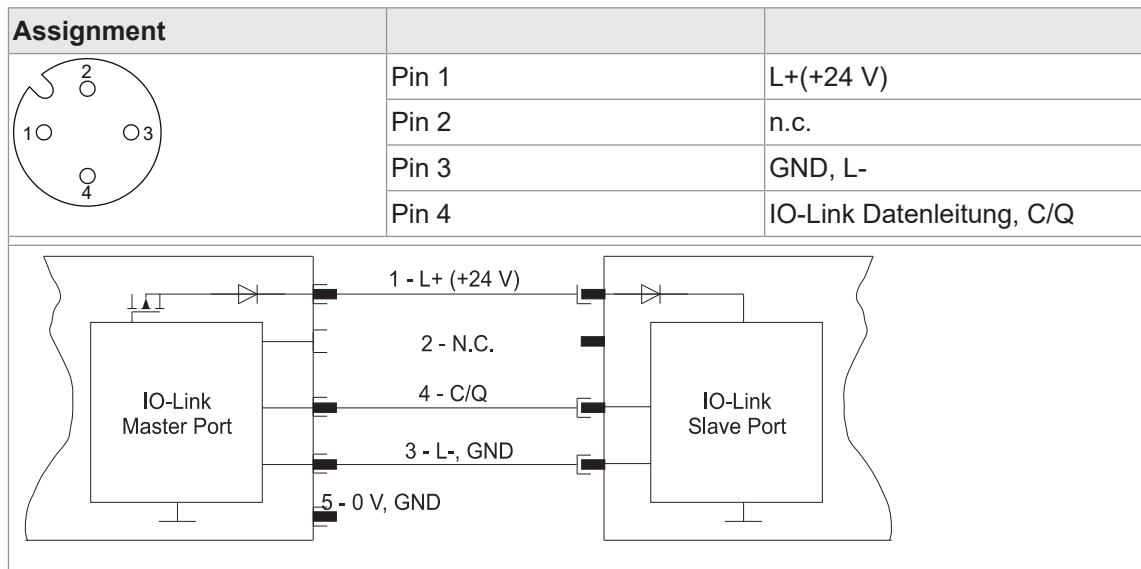
8   Operation

8.1   LED indicator

LED indicators

The IO-Link converter features 2 LEDs for status indication.

| 1 | LED 1 bicolor red/green | 2 | LED 2 monocolor green |

LED 1 Device status

Bicolor red/green:

- Provides device and function-related status information.
- Green indicates the overall device status.
- Red indicates the analog channel status.

INFO
Red and green being on at the same time, LED1 may look amber.

8.1.1   LED 1

LED green

Indicates the overall device status.

Indicator	Status	Description
Green	On continuous	Device power on, status ok.
Green	Flashing at 1 Hz	Device supply undervoltage (Ub <18 V)
Green	Flashing irregularly (4 Hz/1 Hz)	Device supply Overvoltage (Ub >30 V)
	Off	No power supply present.

Tab. 1: Device status

8.1.2   **LED 1 red**

INFO

Indicates the analog channel status

Several diagnostics occurring all at once, the LED indicator will priorize the status according to the order in the related table. Top entry has highest priority.

Indicator	Status	Description
Red	Flashing at 1 Hz	Sensor data beyond range
Red	Flashing at 2 Hz	Converter excess temperature
Red	Flashing irregularly 1 Hz 250 ms On/750 ms Off	Sensor cable break
	Off	OK

Tab. 2: LED 1 red, device status

8.1.3   **LED 2**

IO-Link status

LED monocolor green

- Provides the IO-Link communication status.

Indicator	Status	Description
Green	On continuous	No IO-Link process data communication (pre-operate mode)
Green	Flashing irregularly 1 Hz 250 ms On/750 ms Off	IO-Link process data communication (operate mode)
	Off	No IO-Link communication

Tab. 3: LED indicator IO-Link on green

8.2 Process data

8.2.1 IO-Link object directory
Identification

ISDU Index	ISDU Subindex	Object name	Access	Length in bytes	Meaning/default value	
0x00	0x08	VendorID	R	2	0x012F	
	0x09					
	0x0A	DeviceID	R	3	0x040001	
	0x0B					
	0x0C					
0x10	0x00	VendorName	R	20	Baumer	
0x11	0x00	VendorText	R	40	www.baumer.com	
0x12	0x00	ProductName	R	40	CC50I.RTD	
0x13	0x00	ProductID	R	20	11261577	
0x14	0x00	ProductText	R	64	IOL/Analog Converter, AI Multi U/I	
0x15	0x00	SerialNumber	R	16	Consecutive serial number, set by default	
0x16	0x00	HardwareRevision	R	5	e.g. "01.00"	
0x17	0x00	FirmwareRevision	R	10	e.g. "01.00.01-T"	
0x18	0x00	ApplicationSpecificTag	R	Max. 32	User-specific name, e.g. "System 3 / Port 4"	
0x24		DeviceStatus	R	1	**Value**	**Definition**
					0	Device is working properly
					1	Maintenance required
					2	Outside specification
					3	Functional test
					4	Error
					5-255	Reserved
0x25		DetailedDeviceStatus	R	18	Currently present events	
0x28		ProcessDataInput	R	2	Recently valid process data	

Parameterization

ISDU Index	ISDU Subindex	Object name	Access	Length in bytes	Meaning/default value	
0x40	0x00	ParamDiagnosisSetup	RW	2	Bit 0	Reserved
					Bit 1	Minimum alert threshold
					Bit 2	Maximum user-defined alert threshold
					Bit 3	Converter overtemperature >85 °C
					Bit 4	Overvoltage supply >30 V
					Bit 5	Undervoltage supply <18 V
					Bit 6	Reserved
					Bit 7	Reserved
					Bit 8	Reserved
					Bit 9	Reserved
					Bit 10	Sensor cable break
					Bit 11	Reserved
					Bit 12	Reserved
					Bit 13	Reserved
					Bit 14	Below nominal measuring range
					Bit 15	Nominal measuring range exceeded
					Default	0xC43E = 1100 0100 0011 1110 (Entire diagnostics active)
0x41	0x00	ParamLowerLimit	RW	2	Minimum alert threshold 0x8000 (-32768) (Default)	
0x42	0x00	ParamUpperLimit	RW	2	Maximum user-defined alert threshold 0x7FFF (32767) (Default)	
0x43	0x00	ParamFilterTime	RW	1	Averaging filter total of measuring operations 0x00 ... 0x40 Default: 0x00	

ISDU Index	ISDU Subindex	Object name	Access	Length in bytes	Meaning/default value
0x44	0x00	ParamDeviceFunction	RW	1	RTD sensor & measuring range | Value	Definition
---	---
0x13	PT-100-Klima
0x14	PT-100 (Default)
0x15	PT-200
0x16	PT-500
0x17	PT-1000
0x18	0 ... 3000 Ohm	
0x45	0x00	Diagnosis-State	R	4	Currently present diagnostics and device status. Significance of bits 0 ... 15 corresponds to the meaning of bits 0 ... 15 in ISDU IDX 0x40. Bits 16 ... 31 are reserved and have no meaning to users.
0x48	0x00	ParamWire-Mode	RW	1	Connection technology ■ 0x00 2-wire (default) ■ 0x01 3-wire ■ 0x02 4-wire
0x48	0x00	Param-NotchFilter	RW	1	Interference frequency filter [conversion time] ■ 0x00: Off [10 ms] ■ 0x01: 50 Hz [60 ms] (Default) ■ 0x02: 60 Hz [100 ms]
0x97	0x00	Processor Temperature	R	1	Processor temperature Dies

8.3 Diagnostic tools

8.3.1 IO-Link events

Event code	Description	Device status (ISDU IDX 0x24)	Event type	Qualifier	Note
General events					
0x0000	No malfunction	0	Notification		
0x4210	Device excess temperature	2	Warning	appearing disappearing	corresponds to bit 3 in ISDU Idx 0x40
0x5110	Primary device supply overvoltage - check tolerance	2	Warning	appearing disappearing	Ub >30 V corresponds to bit 4 in ISDU Idx 0x40
0x5111	Primary device supply undervoltage - check tolerance	2	Warning	appearing disappearing	Ub <18 V corresponds to bit 5 in ISDU Idx 0x40

Event code	Description	Device status (ISDU IDX 0x24)	Event type	Qualifier	Note
General events					
0x6320	Parameter error - check data sheet and/or parameters	4	Error	appearing disappearing	Invalid parameter value (to be avoided)
0x7700	Cable break at connected device - check wiring	4	Error	appearing disappearing	corresponds to bit 10 in ISDU Idx 0x40 Only AO I 0/4 ... 20 mA

As there is no PNIO integration for IO-Link mapping the predefined event codes of IO-Link Spec. 1.1 correctly to PNIO diagnostics, the ISDU index 0x45 must be read out as well.

In conjunction with a master supporting the Baumer IO-Link extended integration, ISDU index 0x45 readout is not required.

Event code	Description	Device status (ISDU IDX 0x24)	Event type	Qualifier	Note
Manufacturer-specific events					
0x1800	Production data range contains invalid data	4	Error	appearing disappearing	No masking by event parameterization in ISDU Idx 0x40
0x1801	Parameter data range contains invalid data	4	Error	appearing disappearing	No masking by event parameterization in ISDU Idx 0x40
0x1802	Minimum alert threshold	2	Warning	appearing disappearing	corresponds to bit 1 in ISDU Idx 0x40
0x1803	Maximum user-defined alert threshold	2	Warning	appearing disappearing	corresponds to bit 2 in ISDU Idx 0x40
0x1805	Nominal measuring range exceeded - Check sensor signal	2	Warning	appearing disappearing	corresponds to bit 15 in ISDU Idx 0x40
0x1806	below nominal measuring range - Check sensor signal	2	Warning	appearing disappearing	corresponds to bit 14 in ISDU Idx 0x40

8.3.2   Process data

Temperature measuring ranges: PT100, PT200, PT500, PT1000

Values		Measured value	
Dec.	Hex.	Temperature in °C	Area
32767	7FFF	>1000.0	Overflow
10000	2710	1000.0	Range of overdrive
8500	2135	850.1	
8500	2134	850.0	Nominal range
1	0001	0.1	
0	0000	0	
-2000	F830	-200.0	
-2001	F82F	-200.1	Range of underdrive
-2200	F768	-220.0	
-32768	8000	<-220.0	Underflow

Temperature measuring ranges: PT100 Climate

Values		Measured value	
Dec.	Hex.	Temperature in °C	Area
32767	7FFF	>155.00	Overflow
15500	3C8C	155.00	Range of overdrive
13001	32C9	130.01	
1300	32C8	130.00	Nominal range
1	0001	0.01	
0	0000	0	
-12000	D120	-120.00	
-12001	D11F	-120.01	Range of underdrive
-14500	C75C	-145.00	
-32768	8000	<-145.00	Underflow

Measuring ranges Resistance

Values		Measured value	
Dec.	Hex.	R in Ohm	Area
32767	7FFF	>3527.7	Overflow
32511	7EFF	3527.7	Range of overdrive
27649	6C01	3000.1	
27648	6C00	3000	Nominal range
1	0001	0.1085	
0	0000	0.0	

9   Maintenance

Bus nodes and device modules are free from maintenance. No inspection nor maintenance intervals required.

Instruction:

- ◆ Replace defective bus nodes and/or modules.

10   Annex

10.1   Accessories

10.1.1   Tools

Designation	Art. no.
M12 installation wrench set SW 13	11238694
M12 mounting wrench bit SW 17	11238695

Ill. 3: Assembly wrench

INFO

PRODUCTS AND ACCESSORIES

You can find a large selection of products at: https://www.baumer.com

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10.2   Glossary

Term	Significance
AI	Analog Input (Analog input)
Bit	Binary digit
Byte	Term from IEC 61158. Corresponds to 1 byte or 8 bits.
DC	Diagnostic Coverage (Degree of detection of errors)
DIN	German Institute for Standardization
EMV	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharges
FE	Functional earth
IO-Link	Standardized communication system for connecting intelligent sensors and actuators to an automation system
IP67	Ingress protection (Protection class according to DIN EN 60529) 6: Dust-tight, protected against unauthorized access by wire 7: Protection against short-term submersion
ISDU (IO-Link)	Indexed Service Data Unit
LED	Light Emitting Diode
MTTFd	Mean Time To (dangerous) Failure (Average operating time to (dangerous) failure)
n.c.	Not connected (not used)
PELV	Protective Extra Low Voltage (safety extra-low voltage)
RTD	Resistive Temperature Detector (resistance thermometer)
SELV	Safety Extra Low Voltage (safety extra-low voltage)
TH	T/C Thermocouple (thermocouple)

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Passion for Sensors