MACX MCR(-EX)-1TS-I-OLP(-SP)

Output loop-powered temperature transducer



Data sheet
109742_en_00

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1 Description

The device is an output loop-powered temperature transducer with HART® communication for the conversion of different input signals into a scalable analog 4 mA ... 20 mA output signal.

The device contains measuring inputs for

- Resistance temperature detector (RTD)
- Thermocouples (TC)
- Resistance (Ω)
- Voltage sensors (mV)

The device can be snapped onto all DIN rails in accordance with EN 60715.

You can universally configure the device via the USB interface of a PC prior to installation or during measurement operation via HART®.

Features

- Safe operation in the Ex area because of international approvals
- Reliable measurement operation because of sensor and device monitoring
- Diagnostic information in accordance with NAMUR NE107
- Different mounting versions and sensor connection combinations

Make sure you always use the latest documentation.
It can be downloaded at phoenixcontact.net/product/1145192.

This document is valid for the products listed in Section “Ordering data” on page 4.

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2 Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Output loop-powered temperature transducer for transmitting RTD and TC sensor signals as well as resistance-type sensor and voltage sensor signals via HART® communication or 4 mA ... 20 mA, freely configurable, screw connection.	MACX MCR-1TS-I-OLP	1145192	1
Output loop-powered temperature transducer for transmitting RTD and TC sensor signals as well as resistance-type sensor and voltage sensor signals via HART® communication or 4 mA ... 20 mA, freely configurable, Push-in connection.	MACX MCR-1TS-I-OLP-SP	1145196	1
Output loop-powered temperature transducer for transmitting RTD and TC sensor signals as well as resistance-type sensor and voltage sensor signals via HART® communication or 4 mA ... 20 mA, freely configurable, intrinsic safety, screw connection.	MACX MCR-EX-1TS-I-OLP	1145365	1
Output loop-powered temperature transducer for transmitting RTD and TC sensor signals as well as resistance-type sensor and voltage sensor signals via HART® communication or 4 mA ... 20 mA, freely configurable, intrinsic safety, Push-in connection.	MACX MCR-EX-1TS-I-OLP-SP	1145207	1

Accessories

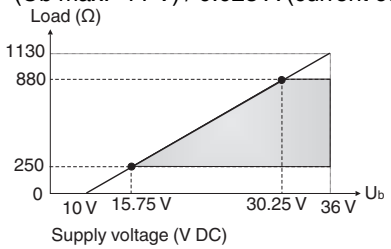
Description	Type	Order No.	Pcs./Pkt.
Programming adapter with USB and T port interface, 2.4 m for programming FA MCR-..., MCR-...-LP-..., and MCR-...-HT-... modules	MCR PAC-T-USB	2309000	1
USB HART modem cable for communication between a PC and HART devices, cable length: 1 m.	GW HART USB MODEM	1003824	1

Documentation

Description	Type	Order No.	Pcs./Pkt.
Packing slip	MACX MCR-1TS-I-OLP(-SP)	1213841	1
Packing slip	MACX MCR-EX-1TS-I-OLP(-SP)	1213877	1

3 Technical data

Input data (see "Input measuring ranges" on page 8)	
Resistance temperature detectors	Pt, Ni, Cu sensors: 2, 3, 4-wire
Thermocouple sensors	A, B, C, D, E, J, K, L, N, R, S, T, U
Linear resistance range	10 Ω ... 2000 Ω
Input voltage range	-20 mV ... 100 mV
Temperature measuring range	
Range depending on the sensor type	-250°C ... 2500°C
Measuring range span	
Resistance temperature detectors	≥10 K
Thermocouples	≥50 K
Resistance	10 Ω
Voltage sensors (mV)	5 mV

Output data	
Output signal	HART® 4 mA ... 20 mA 20 mA ... 4 mA
Current output signal, maximum	23 mA
HART® coding	FSK ±0.5 mA
HART® version	7
Transmission speed	1200 baud
Mains filter	50/60 Hz
Load R_B	(Ub max. -11 V) / 0.023 A (current output) 
Communication resistance	≥250 Ω
Switch-on delay	
HART®	7 s, approximately
Measured value	7 s, approximately
Residual ripple	Permanent residual ripple U_{ss} ≤3 V for U_b ≥13.5 V, $f_{max.}$ = 1 kHz

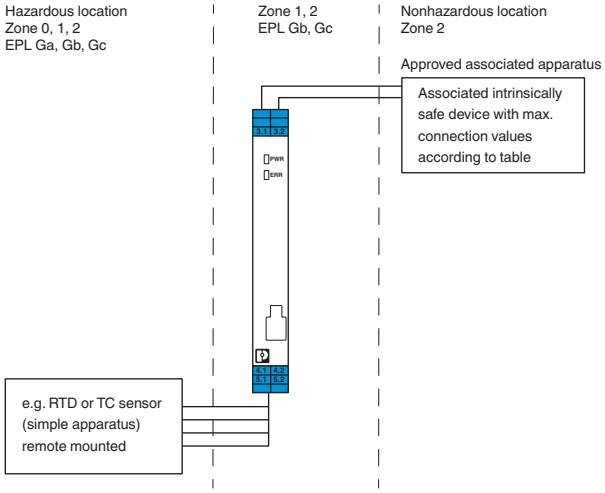
Connection data	Screw connection	Push-in connection
Conductor cross-section, rigid	0.2 mm² ... 2.5 mm²	0.2 mm² ... 1.5 mm²
Conductor cross-section, flexible	0.2 mm² ... 2.5 mm²	0.2 mm² ... 1.5 mm²
Conductor cross-section, AWG	24 ... 14	24 ... 16
Stripping length	7 mm	8 mm
Tightening torque	0.5 Nm ... 0.6 Nm	-

Failure information in accordance with NAMUR NE43	
Failure information is created when the measuring information is invalid or missing. A complete list of all errors occurring in the measuring equipment is issued.	
Measuring value underrange	Linear drop of 4.0 mA ... 3.8 mA
Measuring value overrange	Linear increase from 20.0 mA ... 20.5 mA
Failure, e.g., sensor break, sensor short circuit	≤3.6 mA (“low”) or ≥2 mA (“high”) can be selected The alarm setting “high” can be set between 21.5 mA ... 23 mA, in this way providing the necessary flexibility in order to fulfil the requirements of different control systems.

General data	
Supply voltage range	11 V DC ... 36 V DC
Ex	11 V DC ... 30 V DC
Current consumption, maximum	≤23 mA
Step response (0-99%)	
Thermocouples	1 s
Resistance temperature detectors	1 s
Ambient temperature range	
Operation	-40°C ... 85°C
Storage/transport	-50°C ... 100°C
Humidity, condensation permitted	5% ... 95%
Maximum altitude for use above sea level	≤4000 m
Climatic class	B2
Degree of protection	IP00 when installed in IP66/67, NEMA 4X field housing
Pollution degree	2
Overvoltage category	II
Electrical isolation of input/output	2 kV AC

Conformance/approvals		
CE-compliant		
ATEX	PxCIF20ATEX1145192U	Ⓔx II 3 G Ex ec IIC T6 (1145192 / 1145196)
	EPS 20 ATEX 1 166 X	Ⓔx II 2 (1) G Ex ib [ia Ga] IIC T6...T4 Gb (1145365 / 1145207)
IECEx	IECEx EPS 20.0060X	Ex ib [ia Ga] IIC T6...T4 Gb (1145365/1145207)
CSA		See Control Drawing in the packing slip

3.1 Safety data for MACX MCR-EX-1TS-I-OLP(-SP) (Order No. 1145365/1145207)



Supply		**Terminals 3.1 (+), 3.2 (-)**
U_I	=	≤30 V DC
I_I	=	≤100 mA
P_I	=	700 mW
C_i	=	Negligible
L_i	=	Negligible

Sensor circuit		**Terminals 4.1, 4.2, 5.1, 5.2**
U_O	=	≤4.3 V DC
I_O	=	≤4.8 mA
P_O	=	≤5.2 mW

Sensor circuit		**Maximum connection values**				
Ex ia IIC	C_o	=	3 µF	L_o	=	50 mH
Ex ia IIB	C_o	=	18 µF	L_o	=	100 mH
Ex ia IIA	C_o	=	48 µF	L_o	=	100 mH

Temperature classes		
T6	=	-50°C ... +43°C
T5	=	-50°C ... +58°C
T4	=	-50°C ... +85°C

Electrical connection values		
U_b	=	12 V DC ... 30 V DC
OUT	=	4 mA ... 20 mA
Power consumption	=	≤23 mA

Category	**Type of protection (ATEX)**	**Type of protection (IEC)**
II2(1)G	Ex ib [ia Ga] IIC T6...T4 Gb	Ex ib [ia Ga] IIC T6...T4 Gb

3.2 Input measuring ranges

Table 1 Resistance temperature detectors and resistors

Standard	Designation	Measuring range limits	Measurement deviation (±)		
			Digital [1]		D/A [2]
			Maximum[3]	Related to measured value[4]	
IEC 60751:2008	Pt 100 (1)	-200°C … +850°C (-328°F … +1562°F)	≤0.1°C (0.19°F)	MD = ± (0.05°C (0.09°F) + 0.006% x (MV - MRS))	0.03% (4.8 µA)
	Pt 200 (2)	-200°C … +850°C (-328°F … +1562°F)	≤0.2°C (0.36°F)	MD = ± (0.08°C (0.14°F) + 0.011% x (MV - MRS))	
	Pt 500 (3)	-200°C … +510°C (-328°F … +950°F)	≤0.1°C (0.19°F)	MD = ± (0.035°C (0.063°F) + 0.008% x (MV - MRS))	
	Pt 1000 (4)	-200°C … +250°C (-328°F … +482°F)	≤0.06°C (0.11°F)	MD = ± (0.02°C (0.04°F) + 0.007% x (MV - MRS))	
JIS C1604:1984	Pt 100 (5)	-200°C … +510°C (-328°F … +950°F)	≤0.09°C (0.16°F)	MD = ± (0.05°C (0.09°F) + 0.006% x (MV - MRS))	
GOST 6651-94	Pt 50 (8)	-185°C … +1100°C (-301°F … +2012°F)	≤0.18°C (0.32°F)	MD = ± (0.07°C (0.13°F) + 0.008% x (MV - MRS))	
	Pt 100 (9)	-200°C … +850°C (-328°F … +1562°F)	≤0.11°C (0.2°F)	MD = ± (0.05°C (0.09°F) + 0.006% x (MV - MRS))	
DIN 43760 IPTS-68	Ni 100 (6)	-60°C … +250°C (-76°F … +482°F)	≤0.04°C (0.07°F)	MD = ± (0.04°C (0.07°F) – 0.004% x (MV - MRS))	
	Ni 120 (7)	-60°C … +250°C (-76°F … +482°F)	≤0.04°C (0.07°F)	MD = ± (0.04°C (0.07°F) – 0.004% x (MV - MRS))	
OIML R84: 2003, GOST 6651-2009	Cu 50 (10)	-180°C … +200°C (-292°F … +392°F)	≤0.10°C (0.19°F)	MD = ± (0.08°C (0.14°F) + 0.006% x (MV - MRS))	
	Cu 100 (11)	-180°C … +200°C (-292°F … +392°F)	≤0.06°C (0.11°F)	MD = ± (0.04°C (0.07°F) + 0.003% x (MV - MRS))	
	Ni 100 (12)	-60°C … +180°C (-76°F … +356°F)	≤0.04°C (0.07°F)	MD = ± (0.04°C (0.07 °F) – 0.004% x (MV - MRS))	
	Ni 120 (13)	-60°C … +180°C (-76°F … +356°F)	≤0.04°C (0.07°F)	MD = ± (0.04°C (0.07°F) – 0.004% x (MV - MRS))	
OIML R84: 2003, GOST 6651-94	Cu 50 (14)	-50°C … +200°C (-58°F … +392°F)	≤0.10°C (0.18°F)	MD = ± (0.09°C (0.16°F) + 0.004% x (MV - MRS))	
Resistance-type sensor	Resistance Ω	10 Ω ... 400 Ω	29.5 mΩ	MD = ±17 mΩ + 0.0034% x MV	0.03% (4.8 µA)
		10 Ω ... 2000 Ω	179.4 mΩ	MD = ±60 mΩ + 0.006% x MV	

1 Measured value transmitted with HART®

2 Percent values with regard to the configured measuring range of the analog output signal

3 Maximum measurement deviation from the specified measuring range

4 Deviation from maximum measurement deviation possible due to rounding

- Connection method: 2, 3, or 4-wire connection, sensor current: ≤0.3 mA
- Compensation of the cable resistance (0 Ω … 30 Ω) possible for 2-wire circuit
- Sensor cable resistance up to 50 Ω, maximum, per cable for 3 and 4-wire connection

Table 2 Thermocouples and voltage sensors

Standard	Designation	Measuring range	Measurement deviation (±)		
			Digital [1]		D/A [2]
			Maximum[3]	Related to measured value[4]	
IEC 60584-1	Type A (30)	0°C … +2500°C (+32°F … +4532°F)	≤1.65°C (2.79°F)	MD = ± (1.0°C (1.8°F) + 0.018% x (MV - MRS))	0.03% (4.8 µA)
	Type B (31)	+500°C … +1820°C (+932°F … +3308°F)	≤2.1°C (3.8°F)	MD = ± (2.1°C (3.8°F) – 0.055% x (MV - MRS))	
IEC 60584-1; ASTM E988-96	Type C (32)	0°C … +2000°C (+32°F … +3632°F)	≤0.86°C (1.55°F)	MD = ± (0.75°C (1.35°F) + 0.0055% x (MV - MRS))	
ASTM E988-96	Type D (33)	0°C … +2000°C (+32°F … +3632°F)	≤1.1°C (1.98°F)	MD = ± (1.1°C (1.98°F) + 0.008% x (MV - MRS))	
IEC 60584-1	Type E (34)	-150°C … +1000°C (-238°F … +1832°F)	≤0.3°C (0.54°F)	MD = ± (0.3°C (0.54°F) – 0.006% x (MV - MRS))	
	Type J (35)	-150°C … +1200°C (-238°F … +2192°F)	≤0.36°C (0.65°F)	MD = ± (0.36°C (0.65°F) – 0.005% x (MV - MRS))	
	Type K (36)	-150°C … +1200°C (-238°F … +2192°F)	≤0.5°C (0.9°F)	MD = ± (0.5°C (0.9°F) – 0.005% x (MV - MRS))	
	Type N (37)	-150°C … +1300°C (-238°F … +2372°F)	≤0.7°C (1.26°F)	MD = ± (0.7°C (1.26°F) – 0.014% x (MV - MRS))	
	Type R (38)	+50°C … +1768°C (+122°F … +3214°F)	≤1.6°C (2.88°F)	MD = ± (1.6°C (2.88°F) – 0.026% x (MV - MRS))	
	Type S (39)	+50°C … +1768°C (+122°F … +3214°F)	≤1.6°C (2.88°F)	MD = ± (1.6°C (2.88°F) – 0.022% x (MV - MRS))	
	Type T (40)	-150°C … +400°C (-238°F … +752°F)	≤0.5°C (0.9°F)	MD = ± (0.5°C (0.9°F) – 0.04% x (MV - MRS))	
DIN 43710	Type L (41)	-150°C … +900°C (-238°F … +1652°F)	≤0.39°C (0.7°F)	MD = ± (0.39°C (0.7°F) – 0.008% x (MV - MRS))	
	Type U (42)	-150°C … +600°C (-238°F … +1112°F)	≤0.45°C (0.81°F)	MD = ± (0.45°C (0.81°F) – 0.025% x (MV - MRS))	
GOST R8.8585-2001	Type L (43)	-200°C … +800°C (-328°F … +1472°F)	≤2.30°C (4014°F)	MD = ± (2.3°C (4.14°F) – 0.015% x (MV - MRS))	
Voltage sensor (mV)		-20 mV … +100 mV	10 µV	MD = ± (10 µV + 0.0018% x (MV - MRS))	4.8 µA

[1] Measured value transmitted with HART®

[2] Percent values with regard to the configured measuring range of the analog output signal

[3] Maximum measurement deviation from the specified measuring range

[4] Deviation from maximum measurement deviation possible due to rounding

MV = Measured value

MRS = Measuring range start value of the relevant sensor

When using an external 2-wire RTD for cold junction measurement, the measurement deviation caused by the transmitter is <0.5°C (0.9°F). Measurement deviation of the sensor element must be added.

- Internal cold junction (Pt 100)
- Cold junction external: adjustable value -40°C ... +85°C (-40°F ... +185°F)
- Maximum sensor cable resistance: 10 kΩ

If the sensor cable resistance is greater than 10 kΩ, an error message in accordance with NAMUR NE89 is output.

Sample calculation with Pt 100, 0°C … +200°C (+32°F … +392°F) measuring range, 25°C (77°F) ambient temperature, 24 V supply voltage

Measurement deviation, digital = 0.05°C + 0.006% x (200°C - (-200°C))	0.07°C (0.126°F)
Measurement deviation, D/A = 0.003% of 200 C (360°F)	0.06°C (0.108°F)
Measurement deviation of digital value (HART®)	0.07°C (0.126°F)
Measurement deviation of analog value (current output) √(Measurement deviation digital^2 + Measurement deviation D/A^2)	0.10°C (0.18°F)

Operational influence

The information on the measurement deviation corresponds to an extended measuring insecurity of ±2 s (Gaussian normal distribution). Information under reference conditions. Total measurement deviation of the temperature transducer at the current output = √(Measurement deviation digital² + Measurement deviation D/A²).

Operational influence taken into account:

– Long-term drift
– Influence of the ambient temperature
– Influence of the supply voltage

Table 3 Resistance temperature detectors and resistors

Standard	Designation	Ambient temperature: effect (±) per 1°C (1.8°F) change			Supply voltage: effect (±) per V change		
		Digital [1]		D/A [2]	Digital [1]		D/A [2]
		Maximum	Related to measured value		Maximum	Related to measured value	
IEC 60751:2008	Pt 100 (1)	≤0.013°C (0.023°F)	0.0013% x (MV -MRS), 0.003°C (0.005°F), minimum	0.003%	≤0.007°C (0.013°F)	0.007% x (MV -MRS), 0.003°C (0.005°F), minimum	0.003%
	Pt 200 (2)	≤0.017°C (0.031°F)	-		≤0.009°C (0.016°F)	-	
	Pt 500 (3)	≤0.008°C (0.014°F)	0.013% x (MV -MRS), 0.006°C (0.011°F), minimum		≤0.004°C (0.007°F)	0.007% x (MV -MRS), 0.006°C (0.011°F), minimum	
	Pt 1000 (4)	≤0.005°C (0.009°F)	-		≤0.003°C (0.005°F)	-	
JIS C1604:1984	Pt 100 (5)	≤0.009°C (0.016°F)	0.013% x (MV -MRS), 0.003°C (0.005°F), minimum		≤0.004°C (0.007°F)	0.007% x (MV -MRS), 0.003°C (0.005°F), minimum	
GOST 6651-94	Pt 50 (8)	≤0.017°C (0.031°F)	0.015% x (MV -MRS), 0.01°C (0.018°F), minimum		≤0.009°C (0.016°F)	0.007% x (MV -MRS), 0.01°C (0.018°F), minimum	
	Pt 100 (9)	≤0.013°C (0.023°F)	0.013% x (MV -MRS), 0.003°C (0.005°F), minimum		≤0.007°C (0.013°F)	0.007% x (MV -MRS), 0.003°C (0.005°F), minimum	
DIN 43760 IPTS-68	Ni 100 (6)	≤0.003°C (0.005°F)	-		≤0.001°C (0.002°F)	-	
	Ni 120 (7)		-			-	
OIML R84: 2003, GOST 6651-2009	Cu 50 (10)	≤0.005°C (0.009°F)	-		≤0.005°C (0.009°F)	-	
	Cu 100 (11)	≤0.004°C (0.007°F)	-		≤0.004°C (0.007°F)	-	
	Ni 100 (12)	≤0.003°C (0.005°F)	-		≤0.003°C (0.005°F)	-	
	Ni 120 (13)		-			-	
OIML R84: 2003, GOST 6651-94	Cu 50 (14)	≤0.005°C (0.009°F)	-		≤0.005°C (0.009°F)	-	
Resistance-type sensors							
10 Ω ... 400 Ω		≤4 mΩ	0.001% x MV, 1 mΩ, minimum	0.003%	≤2 mΩ	0.0005% x MV, 1 mΩ, minimum	0.003%
10 Ω ... 2000 Ω		≤20 mΩ	0.001% x MV, 10 mΩ, minimum		≤10 mΩ	0.0005% x MV, 5 mΩ, minimum	

[1] Measured value transmitted with HART®

[2] Percent values with regard to the configured measuring range of the analog output signal

Table 4 Thermocouples and voltage sensors

Standard	Designation	Ambient temperature: effect (±) per 1°C (1.8°F) change			Supply voltage: effect (±) per V change		
		Digital [1]		D/A [2]	Digital [1]		D/A [2]
		Maximum	Related to measured value		Maximum	Related to measured value	
IEC 60584-1	Type A (30)	≤0.07°C (0.126°F)	0.003% x (MV -MRS), 0.01°C (0.018°F), minimum	0.003%	≤0.03°C (0.054°F)	0.0012% x (MV - MRS), 0.013°C (0.023°F), minimum	0.003%
	Type B (31)	≤0.04°C (0.072°F)	-		≤0.02°C (0.036°F)	-	
IEC 60584-1; ASTM E988-96	Type C (32)	≤0.04°C (0.072°F)	0.0021% x (MV - MRS), 0.01°C (0.018°F), minimum		≤0.02°C (0.036°F)	0.0012% x (MV - MRS), 0.013°C (0.023°F), minimum	
ASTM E988-96	Type D (33)	≤0.04°C (0.072°F)	0.0019% x (MV - MRS), 0.01°C (0.018°F), minimum		≤0.02°C (0.036°F)	0.0011% x (MV - MRS), 0.0°C (0.0°F), minimum	
IEC 60584-1	Type E (34)	≤0.02°C (0.036°F)	0.0014% x (MV - MRS), 0.0°C (0.0°F), minimum		≤0.01°C (0.018°F)	0.0008% x (MV - MRS), 0.0°C (0.0°F), minimum	
	Type J (35)	≤0.02°C (0.036°F)	0.0014% x (MV - MRS), 0.0°C (0.0°F), minimum		≤0.01°C (0.018°F)	0.0008% x MV, 0.0°C (0.0°F), minimum	
	Type K (36)	≤0.02°C (0.036°F)	0.0015% x (MV - MRS), 0.0°C (0.0°F), minimum		≤0.01°C (0.018°F)	0.0009% x (MV - MRS), 0.0°C (0.0°F), minimum	
	Type N (37)	≤0.02°C (0.036°F)	0.0014% x (MV - MRS), 0.0°C (0.0°F), minimum		≤0.01°C (0.018°F)	0.0008% x MV, 0.0°C (0.0°F), minimum	
	Type R (38)	≤0.03°C (0.054°F)	-		≤0.02°C (0.036°F)	-	
	Type S (39)	≤0.03°C (0.054°F)	-		≤0.02°C (0.036°F)	-	
	Type T (40)	≤0.01°C (0.018°F)	-		≤0.0°C (0.0°F)	-	
DIN 43710	Type L (41)	≤0.01°C (0.018°F)	-		≤0.01°C (0.018°F)	-	
	Type U (42)	≤0.01°C (0.018°F)	-		≤0.0°C (0.0°F)	-	
GOST R8.8585-20 01	Type L (43)	≤0.01°C (0.018°F)	-		≤0.01°C (0.018°F)	-	
Voltage sensor (mV)							
-20 mV ... 100 mV-		≤1.5 µV	0.0015% x MV	0.003%	≤0.8 µV	0.0008% x MV	0.003%

[1] Measured value transmitted with HART®

[2] Percent values with regard to the configured measuring range of the analog output signal

MV = Measured value

MRS = Measuring range start value of the relevant sensor

Total measurement deviation of the transmitter at the current output = √(Measurement deviation digital^2 + Measurement deviation D/A^2).

Table 5 Long-term drift of resistance temperature detectors (RTD) and resistance-type sensors

Standard	Designation	Long-term drift (±) [1]				
		After 1 month	After 6 months	After 1 year	After 3 years	After 5 years
		Related to measured value				
IEC 60751:2008	Pt 100 (1)	≤0.039% x (MV - MRS) or 0.01°C (0.02°F)	≤0.061% x (MV - MRS) or 0.02°C (0.04°F)	≤0.007% x (MV - MRS) or 0.02°C (0.04°F)	≤0.0093% x (MV - MRS) or 0.03°C (0.05°F)	≤0.0102% x (MV - MRS) or 0.03°C (0.05°F)
	Pt 200 (2)	0.05°C (0.09°F)	0.05°C (0.09°F)	0.09°C (0.17°F)	0.12°C (0.27°F)	0.13°C (0.24°F)
	Pt 500 (3)	≤0.048% x (MV - MRS) or 0.01°C (0.02°F)	≤0.0075% x (MV - MRS) or 0.02°C (0.04°F)	≤0.068% x (MV - MRS) or 0.03°C (0.06°F)	≤0.011% x (MV - MRS) or 0.03°C (0.05°F)	≤0.012% x (MV - MRS) or 0.04°C (0.07°F)
	Pt 1000 (4)	≤0.048% x (MV - MRS) or 0.01°C (0.02°F)	≤0.0077% x (MV - MRS) or 0.02°C (0.04°F)	≤0.0088% x (MV - MRS) or 0.02°C (0.04°F)	≤0.0114% x (MV - MRS) or 0.03°C (0.05°F)	≤0.013% x (MV - MRS) or 0.03°C (0.05°F)
JIS C1604:1984	Pt 100 (5)	≤0.039% x (MV - MRS) or 0.01°C (0.02°F)	≤0.0061% x (MV - MRS) or 0.02°C (0.04°F)	≤0.007% x (MV - MRS) or 0.02°C (0.04°F)	≤0.0093% x (MV - MRS) or 0.03°C (0.05°F)	≤0.00102% x (MV - MRS) or 0.03°C (0.05°F)
GOST 6651-94	Pt 50 (8)	≤0.042% x (MV - MRS) or 0.02°C (0.04°F)	≤0.0068% x (MV - MRS) or 0.04°C (0.07°F)	≤0.0076% x (MV - MRS) or 0.04°C (0.08°F)	≤0.01% x (MV - MRS) or 0.06°C (0.11°F)	≤0.011% x (MV - MRS) or 0.07°C (0.12°F)
	Pt 100 (9)	≤0.016% x (MV - MRS) or 0.04°C (0.07°F)	≤0.0061% x (MV - MRS) or 0.02°C (0.04°F)	≤0.007% x (MV - MRS) or 0.02°C (0.04°F)	≤0.0093% x (MV - MRS) or 0.03°C (0.05°F)	≤0.0102% x (MV - MRS) or 0.03°C (0.05°F)
DIN 43760 IPTS-68	Ni 100 (6)	0.01°C (0.02°F)	0.01°C (0.02°F)	0.02°C (0.04°F)	0.02°C (0.04°F)	0.02°C (0.04°F)
	Ni 120 (7)					
OIML R84: 2003, GOST 6651-2009	Cu 50 (10)	0.02°C (0.04°F)	0.03°C (0.05°F)	0.04°C (0.07°F)	0.05°C (0.09°F)	0.05°C (0.09°F)
	Cu 100 (11)	0.01°C (0.02°F)	0.02°C (0.04°F)	0.02°C (0.04°F)	0.03°C (0.05°F)	0.04°C (0.07°F)
	Ni 100 (12)		0.01°C (0.02°F)	0.02°C (0.04°F)	0.02°C (0.04°F)	0.02°C (0.04°F)
	Ni 120 (13)					
OIML R84: 2003, GOST 6651-94	Cu 50 (14)	0.02°C (0.04°F)	0.03°C (0.05°F)	0.04°C (0.07°F)	0.05°C (0.09°F)	0.05°C (0.09°F)
Resistance-type sensors						
10 Ω ... 400 Ω		≤0.003% x MV or 4 mΩ	≤0.0048% x MV or 6 mΩ	≤0.0055% x MV or 7 mΩ	≤0.0073% x MV or 10 mΩ	≤0.008% x MV or 11 mΩ
10 Ω ... 2000 Ω		≤0.0038% x MV or 25 mΩ	≤0.006% x MV or 40 mΩ	≤0.007% x (MV - MRS) or 47 mΩ	≤0.009% x (MV - MRS) or 60 mΩ	≤0.0067% x (MV - MRS) or 67 mΩ

[1] The higher value is valid.

Table 6 Long-term drift of thermocouples (TC) and voltage sensors

Standard	Designation	Long-term drift (±) [1]				
		After 1 month	After 6 months	After 1 year	After 3 years	After 5 years
		Related to measured value				
IEC 60584-1	Type A (30)	≤0.021% x (MV - MRS) or 0.34°C (0.61°F)	≤0.037% x (MV - MRS) or 0.59°C (1.06°F)	≤0.044% x (MV - MRS) or 0.70°C (1.26°F)	≤0.058% x (MV - MRS) or 0.93°C (1.67°F)	≤0.063% x (MV - MRS) or 1.01°C (1.82°F)
	Type B (31)	0.80°C (1.44°F)	1.40°C (2.52°F)	1.66°C (2.99°F)	2.19°C (3.94°F)	2.39°C (4.30°F)
IEC 60584-1; ASTM E988-96	Type C (32)	0.34°C (0.61°F)	0.58°C (1.04°F)	0.70°C (1.26°F)	0.92°C (1.66°F)	1.00°C (1.80°F)
ASTM E988-96	Type D (33)	0.42°C (0.76°F)	0.73°C (1.31°F)	0.87°C (1.57°F)	1.15°C (2.07°F)	1.26°C (2.27°F)
IEC 60584-1	Type E (34)	0.13°C (0.23°F)	0.22°C (0.40°F)	0.26°C (0.47°F)	0.34°C (0.61°F)	0.37°C (0.67°F)
	Type J (35)	0.15°C (0.27°F)	0.26°C (0.47°F)	0.31°C (0.56°F)	0.41°C (0.74°F)	0.44°C (0.79°F)
	Type K (36)	0.17°C (0.31°F)	0.30°C (0.54°F)	0.36°C (0.65°F)	0.47°C (0.85°F)	0.51°C (0.92°F)
	Type N (37)	0.25°C (0.45°F)	0.44°C (0.79°F)	0.52°C (0.94°F)	0.69°C (1.24°F)	0.75°C (1.35°F)
	Type R (38)	0.62°C (1.12°F)	1.08°C (1.94°F)	1.28°C (2.30°F)	1.69°C (3.04°F)	1.85°C (3.33°F)
	Type S (39)			1.29°C (2.32°F)	1.70°C (3.06°F)	
	Type T (40)	0.18°C (0.32°F)	0.32°C (0.58°F)	0.38°C (0.68°F)	0.50°C (0.90°F)	0.54°C (0.97°F)
DIN 43710	Type L (41)	0.12°C (0.22°F)	0.21°C (0.38°F)	0.25°C (0.45°F)	0.33°C (0.59°F)	0.36°C (0.65°F)
	Type U (42)	0.18°C (0.32°F)	0.31°C (0.56°F)	0.37°C (0.67°F)	0.49°C (0.88°F)	0.53°C (0.95°F)
GOST R8.8585-20 01	Type L (43)	0.15°C (0.27°F)	0.26°C (0.47°F)	0.31°C (0.56°F)	0.41°C (0.74°F)	0.44°C (0.79°F)
Voltage sensor (mV)						
-20 mV ... 100 mV		≤0.012% x MV or 4 µV	≤0.021% x MV or 7 µV	≤0.025% x MV or 8 µV	≤0.033% x MV or 11 µV	≤0.036% x MV or 12 µV

[1] The higher value is valid.

Table 7 Long-term drift of analog output

Long-term drift D/A [1]				
After 1 month	After 6 months	After 1 year	After 3 years	After 5 years
0.018%	0.026%	0.030%	0.036%	0.038%

[1] Percent values with regard to the configured measuring range of the analog output signal

Sample calculation with Pt 100, 0°C … +200°C (+32°F … +392°F) measuring range, 35°C (95°F) ambient temperature, 30 V supply voltage

Measurement deviation, digital = 0.04°C + 0.006% x (200°C - (-200°C))	0.07°C (0.126°F)
Measurement deviation, D/A = 0.03% of 200 C (360°F)	0.06°C (0.108°F)
Influence of the ambient temperature (digital) = (35 - 25) x (0.0013% x 200°C - (-200°C)), 0.003°C, minimum	0.05°C (0.09°F)
Influence of the ambient temperature (D/A) = (35 - 25) x (0.003% x 200°C)	0.06°C (0.108°F)
Influence of the supply voltage (digital) = (30 - 24) x (0.0007% x 200°C - (-200°C)), 0.005°C, minimum	0.048°C (0.086°F)
Influence of the supply voltage (D/A) = (30 - 24) x (0.003% x 200°C)	0.04°C (0.072°F)
Measurement deviation of digital value (HART®): √(Measurement deviation digital^2 + Influence of ambient temperature (digital)^2 + Influence of supply voltage (digital)^2)	0.10°C (0.18°F)
Measurement deviation of analog value (current output): √(Measurement deviation digital^2 + Measurement deviation D/A^2 + Influence of ambient temperature (digital)^2 + Influence of ambient temperature (D/A)^2 + Influence of supply voltage (digital)^2 + Influence of supply voltage (D/A)^2)	0.13°C (0.23°F)

The information on the measurement deviation corresponds to 2 σ (Gaussian normal distribution).

Physical input measuring range of the sensors	
10 Ω ... 400 Ω	Cu 50, Cu 100, polynomial RTD, Pt 50, Pt 100, Ni 100, Ni 120
10 Ω ... 2000 Ω	Pt 200, Pt 500, Pt 1000
-20 mV ... 100 mV	Type A, B, C, D, E, J, K, L, N, R, S, T, U thermocouples

4 Safety notes

4.1 MACX MCR-1TS-I-OLP (Order No. 1145192/ 1145196)

4.1.1 Installation notes

- The device is an item of equipment (category 3) with “non-sparking equipment” type of protection and may be installed in zones up to zone 2. It satisfies the requirements of the following standards. You will find detailed information in the EU declaration of conformity, which is enclosed and is also available on our website in the latest version:

  IEC/EN 60079-0, IEC/EN 60079-15
- Only qualified specialist personnel may install, start up, and operate the device.
- Follow the installation instructions as described.
- Install the device in accordance with the manufacturer’s information and the valid standards and regulations (e.g., IEC/EN 60079-14).
- When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as general technical regulations must be observed. The technical data is provided in the packing slip and on the certificates (conformity assessment, additional approvals where applicable).
- Do not open or make changes to the device.
- The IP20 degree of protection (IEC/EN 60529) of the device is intended for use in a clean and dry environment. Do not subject the device to mechanical and/or thermal stress that exceeds the specified limits.
- Do not repair the device yourself but replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from non-compliance.
- The device complies with the EMC regulations for industrial areas (EMC class B). When used in residential areas, the device may cause radio interference.
- Operate the device only under the approved ambient conditions.
- Only operate the device when it has no errors and is in an operationally safe condition.
- If you install the device in a housing suitable for category 3, you must comply with the IP54 housing degree of protection in accordance with IEC/EN 60529.

4.1.2 Installation in potentially explosive areas (zone 2)

- Observe the specified conditions for use in potentially explosive areas. For installation in zone 2, the devices must be installed in a suitable housing that satisfies the demands of IEC/EN 60079-15 (at least IP54) or a different type of protection in accordance with IEC/ EN 60079-0, Section 1.
- Only devices which are designed for operation in Ex zone 2 and are suitable for the conditions at the installation location may be connected to the circuits in zone 2.
- In potentially explosive areas, only connect and disconnect cables when the power is disconnected.
- The device must be stopped and immediately removed from the Ex area if it is damaged, was subjected to an impermissible load, stored incorrectly, or if it malfunctions.
- Use suitable cables for the operation of the temperature transducer at an ambient temperature below -20°C and cable entries approved for this application.
- During installation ensure that the housings and cable glands used meet the requirements of IEC/EN 60079-0 for category 3 or group III housings.
- At ambient temperatures above +70°C, use suitable heat-resistant cables, cable entries, and seals whose operating temperature is Ta +5 K above the ambient temperature.
- Set up the device such that electrostatic charge is not possible, for example by installing it in a grounded housing.
- Do not use the programming interface for configuration in potentially explosive areas.

4.2 MACX MCR-EX-1TS-I-OLP(-SP) (Order No. 114365/1145207)

4.2.1 Installation notes

- The device is an item of equipment (category 2) with “intrinsic safety” type of protection, and may be installed in zones up to zone 1. It satisfies the requirements of the following standards. You will find detailed information in the EU declaration of conformity, which is enclosed and is also available on our website in the latest version:

  IEC/EN 60079-0, IEC/EN 60079-11
- Only qualified specialist personnel may install, start up, and operate the device.
- Follow the installation instructions as described.
- Install the device in accordance with the manufacturer’s information and the valid standards and regulations (e.g., IEC/EN 60079-14).
- When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as general technical regulations must be observed. The technical data is provided in the packing slip and on the certificates (conformity assessment, additional approvals where applicable).
- Do not open or make changes to the device.
- The IP20 degree of protection (IEC/EN 60529) of the device is intended for use in a clean and dry environment. Do not subject the device to mechanical and/or thermal stress that exceeds the specified limits.
- Do not repair the device yourself but replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from non-compliance.
- The device complies with the EMC regulations for industrial areas (EMC class B). When used in residential areas, the device may cause radio interference.
- Operate the device only under the approved ambient conditions.
- The device is intended for installation in a control cabinet.

4.2.2 Installation in potentially explosive areas

- The device must be stopped and immediately removed from the Ex area if it is damaged, was subjected to an impermissible load, stored incorrectly, or if it malfunctions.
- During installation make sure that the safety distance between the intrinsically safe circuits and the non-intrinsically safe circuits is 50 mm.
- When interconnecting the measuring device with certified intrinsically safe circuits of category “ib” with explosion protection group IIC or IIB, the type of protection changes: Ex ib IIC or Ex ib IIB.
- Do not use the programming interface for configuration in potentially explosive areas.
- The device is approved for intrinsically safe (Ex i) circuits up to zone 0 (gas) of the Ex area. The safety values of the intrinsically safe equipment and of the connecting cables must be observed during connection (IEC/EN 60079-14) and must comply with the values specified in these installation notes or the EU examination certificate.
- During measurements on the intrinsically safe side, the relevant regulations with regard to the connection of intrinsically safe equipment must be observed. Only use measuring devices approved for intrinsically safe circuits.
- If the device has been used in non-intrinsically safe circuits, it must not be used again in intrinsically safe circuits. The module must be clearly marked as non-intrinsically safe.
- This device may be used in zone 1 (category 2) or zone 2 (category 3) in accordance with the manufacturer’s information.
- The safe sensor circuit may be inserted into zone 0 (category 1).

4.3 Occupational safety

When working on and with the device, wear the required personal safety equipment as stipulated by national regulations.

4.4 Operational safety

Risk of injury

– Only operate the device when it has no errors and is in an operationally safe condition.
– The operator is responsible for error-free operation of the device.

4.5 Product safety

This measuring device has been built and tested for operational safety in line with the latest technology and good engineering practice. The device left the factory in a safe and error-free condition.

The device fulfils general safety and legal requirements.

The device complies with the EC directives that are listed in the device-specific EC declaration of conformity. By affixing the CE mark, Phoenix Contact confirms this situation.

5 Scope of supply

The scope of supply of the device consists of:

– Temperature transmitter
– Packing slip with installation and safety notes, and initial startup

6 Installation

6.1 Transport and storage

Please note the following points:

- Pack the device for storage and transport so that it is protected against shock. The original packaging provides optimum protection for this.
- The permissible storage temperature is -50°C … +100°C (-58°F … +212°F).

6.2 Installation conditions

Operating temperature range:

– -40°C ... +85°C (-40°F ... 185°F)

6.3 Installation dimensions

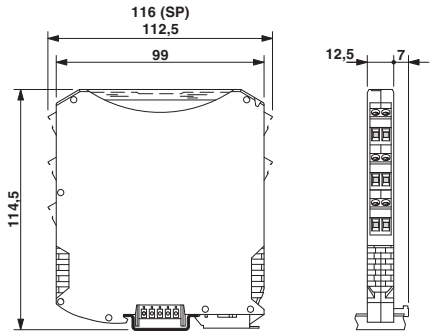


Figure 1 Dimensions

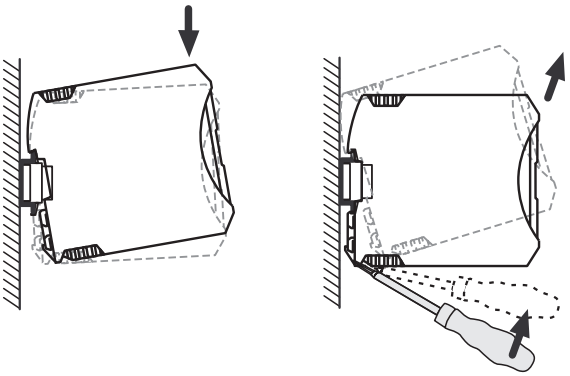
6.4 Mounting location

The device can be snapped onto all 35 mm DIN rails in accordance with EN 60715.

6.5 Mounting

NOTE: Electrostatic discharge

Take protective measures against electrostatic discharge before opening the front cover.



An ME 6,2 TBUS-2 DIN rail connector (Order No. 2869728) is used to supply active devices. A DIN rail connector is not required to operate this passive device.

This device can be snapped onto a DIN rail connector – an electrically conductive connection is not established. This means that there is no need to disconnect an existing DIN rail connector element connection.

6.6 Installation check

- Is the device undamaged (visual inspection)?
- Do the ambient conditions correspond to the device specifications?

6.7 Electrical connection

WARNING: Risk of electric shock

Keep the device disconnected from the power supply when making electrical connections.

NOTE: Damage to the electronics

Use the programming interface only for the programming adapter.

Violation can lead to the destruction of the electronics.

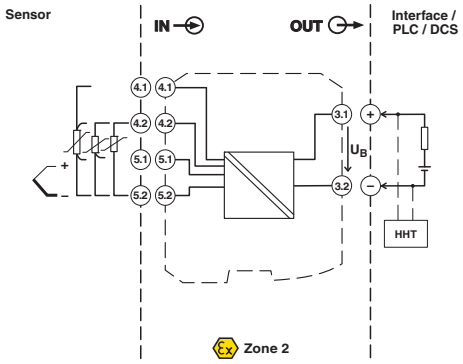


Figure 2 Terminal connection assignment for MACX MCR-1TS-I-OLP(-SP) (Order No. 1145192/ 1145196)

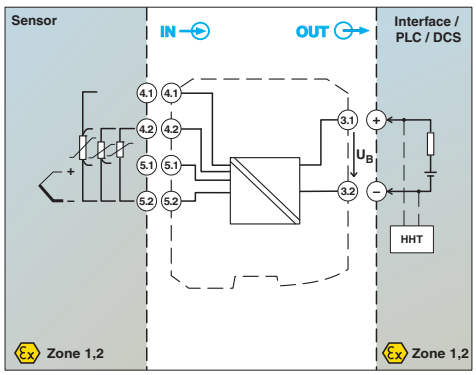


Figure 3 Terminal connection assignment for MACX MCR-EX-1TS-I-OLP(-SP) (Order No. 1145192/1145196)

A minimum load of 250 Ω is required in the signal circuit for device operation via the HART® protocol (terminals 3.1 and 3.2).

NOTE: Damage to the device by high-energy transients

Provide suitable upstream surge protection.

6.7.1 Connecting the cables

Screw connection

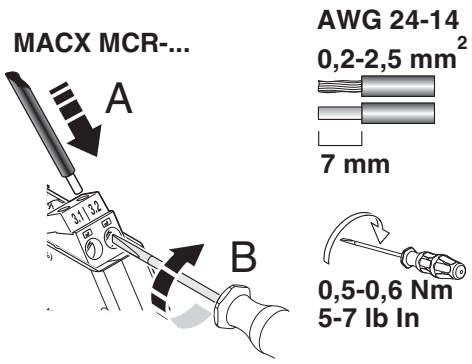


Figure 4 Screw connection

- Strip the conductor by 7 mm and crimp with ferrules.
- Insert the conductor into the corresponding connection terminal block.
- Use a screwdriver to tighten the screw in the opening above the connection terminal block.
- Tightening torque: 0.6 Nm

Push-in connection

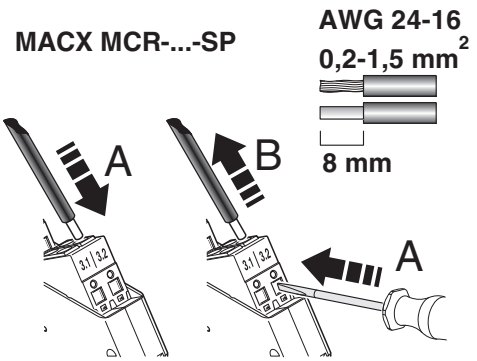


Figure 5 Push-in connection

- Strip the conductor by 7 mm and crimp with ferrules.
- Insert the conductor into the corresponding connection terminal block.
- To release, press the pushbutton using a screwdriver.

6.7.2 Connecting the signal line (supply)

Without HART® communication, a normal installation cable is sufficient.

With HART® communication, we recommend a shielded cable.

The signal line connections (3.1 + and 3.2 -) are protected against polarity reversal.

6.7.3 Connection check

- Is there any damage to the devices or cables?
- Does the supply voltage comply with the specifications on the rating plate?
- Is strain relief provided for the cables?
- Are the auxiliary energy and signal cables connected correctly?
- Are all the screw terminal blocks securely tightened and the connections of the spring clamps checked?
- Are all the cable entries mounted, securely tightened and sealed?
- Are all the housing covers mounted and securely closed?

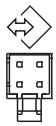
7 Configuration

7.1 Standard configuration

The device is supplied with the following standard configuration:

Sensor input 1 active, Pt 100 (IEC 60751), -200°C ... 850°C

PC configuration interface



Connect the device to your PC to configure the device using the software solution. This requires the MCR-PAC-T-USB programming adapter (Order No. 2309000) and the FDT/DTM software packages, which already contain the driver for the programming adapter.

The software solution can be downloaded free of charge from the following address: phoenixcontact.net/products. Make sure to download and install both the FDT framework application and the DTM package.

7.2 Configuration via software

CAUTION: Undefined behavior of the output during configuration possible

Do not configure the device while a process is running.

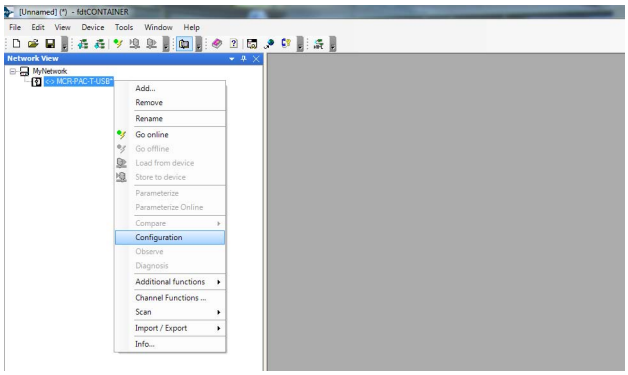
For device connection, use the MCR-PAC-T-USB programming adapter (Order No. 2309000) or one of the possibilities from Section “Overview of operating possibilities” on page 24.

Setting the programming interface

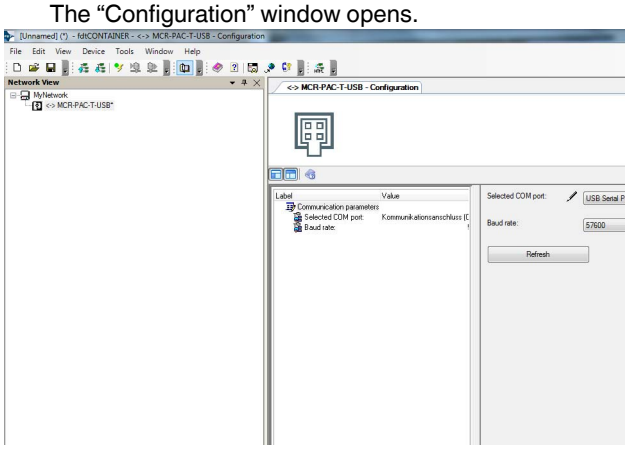
When you create a new project in your FDT/DTM program, you have to select the programming interface in the configuration window once.

Proceed as follows:

- Load the DTM for the MCR-PAC-T-USB programming adapter to your project.
- Right-click on the MCR-PAC-T-USB. Select “Configuration”.



The “Configuration” window opens.



- In the “Selected COM port” field, select the “USB Serial Port (COM xxx)” entry.
- Confirm your selection with <Enter>.
- Load the DTM of the temperature transducer to your project.

  Communication is established.

7.3 HART® communication interface

HART® functions as well as device-specific parameters are configured via HART® communication or the programming interface of the device. For this, special configuration tools from different manufacturers are available. For further information, contact your Phoenix Contact sales employee.

7.4 Device status display

The device has the following operating and indication elements.

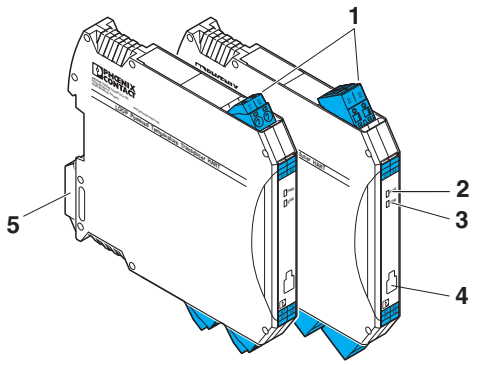


Figure 6 Operating and indication elements

1 Plug-in screw terminal block or Push-in connection terminal block
2 Programming interface
3 Green “PWR” LED for power supply
4 Red “ERR” LED for error display
5 Snap-on foot for DIN rail mounting

LED	Color/status	Description
PWR	Green	Supply voltage
	On	Supply voltage is present
ERR	Red	Diagnostics
	Flashing	Diagnostic message, category C, S or M
	On	Diagnostic message, category F

Table 1 Status signals

Symbol	Event category	Meaning
F	Operational error	An operational error has occurred. The measured value is no longer valid.
C	Service mode	The device is in service mode (e.g., during a simulation).
S	Out of specification	The device is being operated outside its technical specifications (e.g., during startup or cleaning).
M	Maintenance required	Maintenance is required. The measured value is still valid.

Table 2 Diagnostic behavior

Alarm	Measurement is interrupted. The signal outputs take on the defined alarm status. A diagnostic message is generated (status message F).
Warning	The device continues measuring. A diagnostic message is generated (status signal M, C, or S).

8 Startup

8.1 Installation check and switching on the device

Perform all final checks before starting up the device.

– Checklist “Installation check” on page 20
– Checklist “Connection check” on page 21

During initial startup of the device, program the setup according to the descriptions in the following sections.

8.2 General information on device configuration

You can start up and parameterize your device as follows:

– Using the HART® protocol
– Using the MCR PAC-T-USB adapter via PC

8.3 Overview of operating possibilities

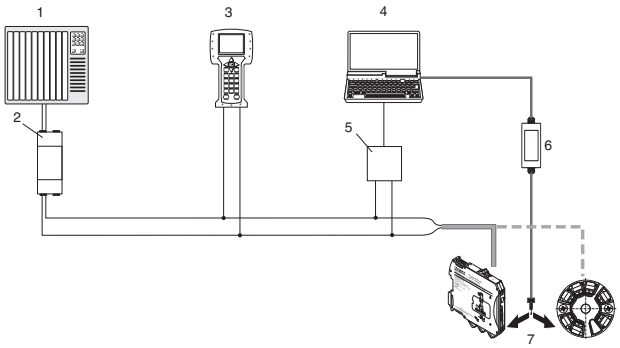


Figure 7 Overview of operating possibilities

1 PLC (programmable logic controller)
2 Measuring transducer supply device, e.g., MACX MCR-EX-SL-RPSSI-I-SP (Order No. 2924016) (with communication resistance)
3 Hand-held device, e.g., from Fisher Rosemount
4 PC with operating tool (e.g., M&M Container or IFS-CONF)
5 HART® modem
6 MCR-PAC-T-USB programming adapter (Order No. 2309000)
7 Temperature transmitter

8.4 Integrating the transmitter via HART® protocol

For HART® communication, measured values are transmitted from the transmitter via the HART® protocol to a connected control system where they are further processed.

Table 1 Version data of the device

Firmware version	01.01.zz	On rating plate *Firmware version* parameter Diagnostics, device information, firmware version
Manufacturer ID	0xB0	*Manufacturer ID* parameter Diagnostics, device information, manufacturer ID
Device type ID	MACX MCR-(EX)-1TS-I-OLP	*Device type* parameter Diagnostics, device information, device type
HART® protocol revision	7.0	---
Device revision	1	*Device revision* parameter Diagnostics, device information, device revision

8.4.1 HART® device variables and measured values

The device variables are assigned the following measured values by default:

Device variable	Measured value
PV	Sensor
SV	Device temperature
TV	Sensor
QV	Sensor

Assignment of the device variables to the process variable can be changed in the following menu:
Application, HART configuration

8.4.2 Device variables and measured values

The individual device variables are assigned the following measured values:

Device variable	Measured value
0	Sensor 1
2	Device temperature

The device variables can be retrieved from a HART® master via HART® command 9 or 33.

8.4.3 Supported HART® commands

The HART® protocol enables transmission of measured and device data between the HART® master and the corresponding field device for configuration and diagnostic purposes. HART® masters, such as the hand-held operator panel or PC-based operating programs (e.g., M&M Container), require device description files (DD = Device Descriptions, DTM) that allow for access to all information in a HART® device. This type of information is only transmitted via “commands”.

Universal commands:

Universal commands are supported and used by all HART® devices.

Connected functions include the following:

– Detection of HART® devices
– Reading digital measured values

Common practice commands:

The common practice commands provide functions that can be supported or executed by many but not by all field devices.

Device-specific commands:

These commands allow for access to device-specific functions that are not standardized for HART®. These commands access individual field device information, for example.

Command no.	Designation
Universal commands	
0, Cmd0	Read unique identifier
1, Cmd001	Read primary variable
2, Cmd002	Read loop current and percent of range
3, Cmd003	Read dynamic variables and loop current
6, Cmd006	Write polling address
7, Cmd007	Read loop configuration
8, Cmd008	Read dynamic variable classifications
9, Cmd009	Read device variables with status
11, Cmd011	Read unique identifier associated with TAG
12, Cmd012	Read message
13, Cmd013	Read TAG, descriptor, date
14, Cmd014	Read primary variable transducer information
15, Cmd015	Read device information
16, Cmd016	Read final assembly number
17, Cmd017	Write message
18, Cmd018	Write TAG, descriptor, date
19, Cmd019	Write final assembly number
20, Cmd020	Read long TAG (32-byte TAG)
21, Cmd021	Read unique identifier associated with long TAG
22, Cmd022	Write long TAG (32-byte TAG)
38, Cmd038	Reset configuration changed flag
48, Cmd048	Read additional device status
Common practice commands	
33, Cmd033	Read device variables
34, Cmd034	Write primary variable damping value
35, Cmd035	Write primary variable range values
40, Cmd040	Enter/Exit fixed current mode
42, Cmd042	Perform device reset
44, Cmd044	Write primary variable units
45, Cmd045	Trim loop current zero
46, Cmd046	Trim loop current gain
50, Cmd050	Read dynamic variable assignments
54, Cmd054	Read device variable information
59, Cmd059	Write number of response preambles
72, Cmd072	Squawk

Command no.	Designation
95, Cmd095	Read device communication statistics
100, Cmd100	Write primary alarm code
516, Cmd516	Read device location
517, Cmd517	Write device location
518, Cmd518	Read location description
519, Cmd519	Write location description
520, Cmd520	Read process unit tag
521, Cmd521	Write process unit tag
523, Cmd523	Read condensed status mapping array
524, Cmd524	Write condensed status mapping array
525, Cmd525	Reset condensed status mapping array
526, Cmd526	Write simulation mode
527, Cmd527	Simulate status bit

8.5 Operating menu and parameter description

The following tables list all the parameters included in the “Guidance”, “Diagnostics”, “Application” and “System” operating menus. The page numbers refer to the description of the associated parameter.

Not all submenus and parameters are available on every device, depending on the parameterization. Details are given in the description of the parameters under the “Requirements” category.

Guidance,	Commissioning,		Start the commissioning wizard

Guidance,	Create documentation	Page 31
	Save / Restore	Page 31
	Compare	Page 31

Diagnostics,	Actual diagnostics,	Actual diagnostics 1	Page 31
		Operating time	Page 31

Diagnostics,	Diagnostic list,	Actual diagnostics 1, 2, 3	Page 31
		Actual diag channel 1, 2, 3	Page 31
		Time stamp 1, 2, 3	Page 31

Diagnostics,	Event logbook,	Previous diagnostics n	Page 32
		Previous diag n channel	Page 32
		Time stamp n	Page 32

Diagnostics,	Simulation,	Diagnostic event simulation	Page 32
		Current output simulation	Page 32
		Value current output	Page 32
		Sensor simulation	Page 33
		Sensor simulation value	Page 33

Diagnostics,	Diagnostic settings,	Properties,	Alarm delay	Page 33
			Limit corrosion detection	Page 33
			Sensor line resistance	Page 33
			Thermocouple diagnostics	Page 34
		Diagnostic behavior,	Sensor, electronics, process, configuration	Page 34
		Status signal,	Sensor, electronics, process, configuration	Page 34

Diagnostics,	Min/max values,	Sensor min value	Page 34
		Sensor max value	Page 34
		Reset sensor min/max values	Page 34
		Device temperature min.	Page 35
		Device temperature max.	Page 35
		Reset device temp. min/max values	Page 35

Application,	Measured values,	Sensor value	Page 35
		Sensor raw value	Page 35
		Output current	Page 35
		Percent of range	Page 35
		Device temperature	Page 35
		PV	Page 35
		SV	Page 35
		TV	Page 35
		QV	Page 35

Application,	Sensor,	Unit	Page 36
		Sensor type	Page 36
		Connection type	Page 36
		2-wire compensation	Page 36
		Reference junction	Page 36
		RJ preset value	Page 36
		Sensor offset	Page 37

Application,	Sensor,	Linearization,	Call/v. Dusen coeff. R0	Page 37
			Call/v. Dusen coeff. R0 A, B,C	Page 37
			Polynomial coeff. R0	Page 37
			Polynomial coeff. R0 A, B	Page 37
			Sensor lower limit	Page 37
			Sensor upper limit	Page 37

Application,	Current output,	4 mA value	Page 38
		20 mA value	Page 38
		Failure mode	Page 38
		Failure current	Page 38
		Current trimming 4 mA	Page 38
		Current trimming 20 mA	Page 38
		Damping	Page 39

Application,	HART configuration,	Assign current output (PV)	Page 39
		Assign SV	Page 39
		Assign TV	Page 39
		Assign QV	Page 39
		HART address	Page 40
		No. of preambles	Page 40

System,	Device management,	HART short tag	Page 40
		Device tag	Page 40
		Mains filter	Page 40
		Locking status	Page 40
		Device reset	Page 40
		Configuration counter	Page 41
		Configuration changed	Page 41

System,	User management,	Define password,	New password	Page 41
			Confirm new password	Page 41
			Status password entry	Page 42
		Change user role	Password	Page 42
			Status password entry	Page 42
		Recover password	Recover password	Page 42
			Status password entry	Page 42
		Change password	Old password	Page 43
			New password	Page 41
			Confirm new password	Page 41
			Status password entry	Page 43
		Delete password	Delete password	Page 43

System,	Information,	Device,	Squawk	Page 43
			Serial number	Page 43
			Order code	Page 44
			Firmware version	Page 44
			Hardware revision	Page 44
			Extended order code (n)	Page 44
			Device name	Page 44
			Manufacturer	Page 44

System,	Information,	Device location,	Latitude	Page 45
			Longitude	Page 45
			Altitude	Page 45
			Location method	Page 45
			Location description	Page 45
			Process unit TAG	Page 45

System,	Information,	HART info,	Device type	Page 45
			Device revision	Page 45
			HART revision	Page 46
			HART descriptor	Page 46
			HART message	Page 46
			Hardware revision	Page 46
			Software revision	Page 46
			HART date code	Page 46
			Manufacturer ID	Page 46
			Device ID	Page 46

8.5.1 “Guidance” menu

All parameters used for basic device settings are available here.

Create documentation	
Navigation	Guidance, Create documentation
Description	Creates parameterization documentation for the device.

Save / Restore	
Navigation	Guidance, Save / Restore
Description	Provides the option to save a device parameterization, and to load a device parameterization from a file.

Compare	
Navigation	Guidance, Compare
Description	Provides the option to compare two existing device parameterizations.

8.5.2 “Diagnostics” menu

“Actual diagnostics” submenu

Actual diagnostics 1	
Navigation	Diagnostics, Actual diagnostics, Actual diagnostics 1
Description	Displays the currently pending diagnostic message. If multiple messages occur simultaneously, the message with the highest priority will be displayed.
Additional information	Example of display format: F041: sensor break

Operating time	
Navigation	Diagnostics, Actual diagnostics, Operating time
Description	Displays the time that the device is operating up to the present time.
Display	Hours (h)

“Diagnostic list” submenu

n = Number of diagnostic messages (n = 1 ... 3)

Actual diagnostics n	
Navigation	Diagnostics, Diagnostic list, Actual diagnostics
Description	Displays the currently pending diagnostic message. If multiple messages occur simultaneously, the message with the highest priority will be displayed.
Additional information	Example of display format: F041: sensor break

Actual diag channel n	
Navigation	Diagnostics, Diagnostic list, Actual diag channel n
Description	Displays the function module that the diagnostic message refers to.
Display	– Device – Sensor – Device temperature – Current output – Sensor RJ

Time stamp n	
Navigation	Diagnostics, Diagnostic list, Time stamp n
Description	Displays the time stamp of the current diagnostic message related to the operating time.
Display	Hours (h)

“Event logbook” submenu

n = Number of diagnostic messages (n =1 ... 10). The last 10 messages are listed chronologically.

Previous diagnostics n	
Navigation	Diagnostics, Event logbook, Previous diagnostics n
Description	Displays the diagnostic messages that have occurred in the past. The last 10 messages are listed chronologically.
Display	Symbol for event behavior and diagnostic event
Additional information	Example of display format: F201: electronics

Previous diag n channel	
Navigation	Diagnostics, Event logbook, Previous diag n channel
Description	Displays the function module that the diagnostic message refers to.
Display	– Device – Sensor – Device temperature – Current output – Sensor RJ

Time stamp n	
Navigation	Diagnostics, Event logbook, Time stamp n
Description	Displays the time stamp of the last diagnostic message related to the operating time.
Display	Hours (h)

“Simulation” submenu

Diagnostic event simulation	
Navigation	Diagnostics, Simulation, Diagnostic event simulation
Description	Switches diagnostic simulation on and off.
Selection	Enter one of the diagnostic events using the drop-down menu (“Overview of diagnostic events” on page 48). In simulation mode, the assigned status signals and the diagnostic behavior are used. To exit simulation: select “Off”.
Additional information	Example: x043: short circuit
Default settings	Off

Current output simulation	
Navigation	Diagnostics, Simulation, Current output simulation
Description	Switches simulation of the current output on and off. The status signal indicates a category “Function control” (C) diagnostic message while simulation is running.
Selection	– Off – On
Default settings	Off

Value current output	
Navigation	Diagnostics, Simulation, Value current output
Description	Sets a current value for simulation. In this way, correct adjustment of the current output and correct function of downstream evaluation devices can be checked.
Input	3.58 mA ... 23 mA
Default settings	3.58 mA

Sensor simulation	
Navigation	Diagnostics, Simulation, Sensor simulation
Description	Selection to enable simulation for the process variable. The simulation value for the process variable is determined in the “Sensor simulation value” parameter.
Selection	– Off – On
Default settings	Off

Sensor simulation value	
Navigation	Diagnostics, Simulation, Sensor simulation value
Description	Enter a simulation value for the process variable. Downstream measured value processing and the signal output will follow this value. In this way, correct parameterization of the measuring device can be checked.
Selection	-1.0×10^{20}°C ... $+1.0 \times 10^{20}$°C
Default settings	0.00°C

“Diagnostic settings, Properties” submenu

Alarm delay	
Navigation	Diagnostics, Diagnostic settings, Properties, Alarm delay
Description	Sets the delay by which a diagnostic signal is suppressed before it is output.
Input	0 s ... 5 s
Default settings	2 s

Limit corrosion detection	
Navigation	Diagnostics, Diagnostic settings, Properties, Limit corrosion detection
Requirements	A 4-wire RTD or TC must be selected as the sensor type or connection method.
Description	Enter the limit value for corrosion detection. If this value is exceeded, the device behaves as specified in the diagnostic settings.
Input	5 Ω ... 10000 Ω
Default settings	– 50 Ω with 4-wire RTD connection method – 5000 Ω with TC connection method

Sensor line resistance	
Navigation	Diagnostics, Diagnostic settings, Properties, Sensor line resistance
Requirements	A 4-wire RTD or TC must be selected as the sensor type or connection method.
Description	Displays the highest resistance value measured in the sensor cables.
Display	-1.0×10^{20} Ω ... $+1.0 \times 10^{20}$ Ω

Thermocouple diagnostics	
Navigation	Diagnostics, Diagnostic settings, Thermocouple diagnostics
Description	Selection for deactivating the “Sensor corrosion” and “Sensor break” diagnostic functions during thermocouple measurement. This may be necessary to enable connection of electronic simulators (e.g., calibrators) during thermocouple measurement. The measuring accuracy of the temperature transducer is not affected, neither when thermocouple diagnostics are enabled nor when they are disabled.
Selection	– On – Off
Default settings	On

“Diagnostic settings, Diagnostic behavior” submenu

Diagnostic behavior	
Navigation	Diagnostics, Diagnostic settings, Diagnostic behavior
Description	Each diagnostic event is assigned to a specific diagnostic behavior. This assignment can be changed for particular diagnostic events.
Selection	– Alarm – Warning – Disabled
Default settings	See list for diagnostic events, Page 48

“Diagnostic settings, Status signal” submenu

Status signal	
Navigation	Diagnostics, Diagnostic settings, Status signal
Description	Each diagnostic event is assigned to a specific status signal by default. [1] This assignment can be changed for particular diagnostic events.
Selection	– Failure (F) – Function check (C) – Out of specification (S) – Maintenance required (M) – No effect (N)
Default settings	See list for diagnostic events, Page 48

[1] Digital information available via HART® communication

“Min/max values” submenu

Sensor min value	
Navigation	Diagnostics, Min/max values, Sensor min value
Description	Displays the minimum temperature measured in the past at the sensor input (drag pointer).

Sensor max value	
Navigation	Diagnostics, Min/max values, Sensor max value
Description	Displays the maximum temperature measured in the past at the sensor input (drag pointer).

Reset sensor min/max values	
Navigation	Diagnostics, Min/max values, Reset sensor min/max values
Description	Resets the min/max values of the sensor to the default values.
Input	Clicking the “Reset sensor min/max values” button enables the reset function. The min/max values of the sensor then only indicate the temporary values that have been reset.

Device temperature min.	
Navigation	Diagnostics, Min/max values, Device temperature min.
Description	Displays the minimum electronics temperature measured in the past (drag pointer).

Device temperature max.	
Navigation	Diagnostics, Min/max values, Device temperature max.
Description	Displays the maximum electronics temperature measured in the past (drag pointer).

Reset device temp. min/max values	
Navigation	Diagnostics, Min/max values, Reset device temp. min/max values
Description	Resets the drag pointers of the measured minimum and maximum electronics temperatures.
Input	Clicking the “Reset device temperature min/max” button enables the reset function. The min/max values for the device temperature then only indicate the temporary values that have been reset.

8.5.3 “Application” menu

“Measured values” submenu

Sensor value	
Navigation	Application, Measured values, Sensor value
Description	Displays the current measured value at the sensor input.

Sensor raw value	
Navigation	Application, Measured values, Sensor raw value
Description	Displays the non-linearized mV/ohm value at the respective sensor input.

Output current	
Navigation	Application, Measured values, Output current
Description	Displays the calculated output current in mA.

Percent of range	
Navigation	Application, Measured values, Percent of range
Description	Displays the measured value in percent of the measuring range

Device temperature	
Navigation	Application, Measured values, Device temperature
Description	Displays the current electronics temperature.

PV	
Navigation	Application, Measured values, PV
Description	Displays the first device variable.

SV	
Navigation	Application, Measured values, SV
Description	Displays the second device variable.

TV	
Navigation	Application, Measured values, TV
Description	Displays the third device variable.

QV	
Navigation	Application, Measured values, QV
Description	Displays the fourth device variable.

“Sensor” submenu

Unit	
Navigation	Application, Sensor, Unit
Description	Selects the measuring unit for all measured values.
Selection	– °C – °F – K – Ω – mV
Default settings	°C
Additional information	If you select a different unit than the default setting (°C), all the temperature values set will be converted to comply with the temperature unit set. Example: 150°C are set as the final value. After selecting °F as the unit, the new (converted) final value = 302°F.

Sensor type	
Navigation	Application, Sensor, Sensor type
Description	Selects the sensor type for the sensor input. Observe the terminal assignment when connecting the individual sensors (“Installation conditions” on page 19).
Selection	You can find a list of all suitable sensor types in Section “Input measuring ranges” on page 8.
Default settings	Sensor type 1: Pt 100 IEC 751

Connection type	
Navigation	Application, Sensor, Connection type
Requirements	An RTD sensor must be specified as the sensor type.
Description	Selects the connection method of the sensor.
Selection	– 2-wire – 3-wire – 4-wire
Default settings	3-wire

2-wire compensation	
Navigation	Application, Sensor, 2-wire compensation
Requirements	An RTD sensor with 2-wire connection method must be specified as the sensor type.
Description	Determines the resistance value for 2-wire compensation for RTDs.
Input	0 Ω ... 30 Ω
Default settings	0 Ω

Reference junction	
Navigation	Application, Sensor, Reference junction
Requirements	A thermocouple (TC) sensor must be selected as the sensor type.
Description	Selects cold junction measurement for temperature compensation of thermocouples (TC). When preset value is selected, the compensation value is specified via the “RJ preset value” parameter.
Selection	– Internal measurement: Internal cold junction temperature is used. – Preset value: Fixed preset value is used. – Measured value of external sensor: Measured value of the connected sensor is used.
Default settings	Internal measurement

isRJ preset value	
Navigation	Application, Sensor, RJ preset value
Requirements	The preset value parameter must be set when the cold junction is selected.
Description	Determines the fixed preset value for temperature compensation.
Input	-58 ... +360
Default settings	0.00

Sensor offset	
Navigation	Application, Sensor, Sensor offset
Description	Sets zero point correction (offset) for the sensor measured value. The specified value is added to the measured value.
Input	-18.0 ... +18.0
Default settings	0.0

“Sensor, Linearization” submenu

Call./v. Dusen coeff. R0	
Navigation	Application, Sensor, Linearization, Call./v. Dusen coeff. R0
Requirements	The RTD platinum selection (Callendar/Van Dusen) is enabled in the “Sensor type” parameter.
Description	Sets the R0 value for linearization with the Callendar/Van Dusen polynomial.
Input	1 ... 2000
Default settings	100,000 Ω

Call./v. Dusen coeff. A, B, and C	
Navigation	Application, Sensor, Linearization, Call./v. Dusen coeff. A, B, and C
Requirements	The RTD platinum selection (Callendar/Van Dusen) is enabled in the “Sensor type” parameter.
Description	Sets the coefficients for sensor linearization according to the Callendar/Van Dusen method.
Default settings	– A: 3.90830e-003 – B: -5.77500e-007 – C: -4.18300e-012

Polynomial coeff. R0	
Navigation	Application, Sensor, Linearization, Polynomial coeff. R0
Requirements	The RTD poly nickel or RTD polynomial copper option is enabled in the “Sensor type” parameter.
Description	Sets the R0 value for linearization for nickel/copper sensors.
Input	1 Ω ... 20,000 Ω
Default settings	100.00 Ω

Polynomial coeff. A, B	
Navigation	Application, Sensor, Linearization, Polynomial coeff. A, B
Requirements	The RTD poly nickel or RTD polynomial copper option is enabled in the “Sensor type” parameter.
Description	Sets the coefficients for sensor linearization for copper/nickel RTDs.
Default settings	– Polynomial coeff. A: 5.49630e-003 – Polynomial coeff. B: 6.75560e-006

Sensor lower limit	
Navigation	Application, Sensor, Linearization, Sensor lower limit
Requirements	In the “Sensor type” parameter, RTD platinum, RTD poly nickel, or RTD polynomial copper is enabled.
Description	Sets the lower calculation limit for the special sensor linearization.
Input	Depends on the selected sensor type
Default settings	Depends on the selected sensor type

Sensor upper limit	
Navigation	Application, Sensor, Linearization, Sensor upper limit
Requirements	In the “Sensor type” parameter, RTD platinum, RTD poly nickel, or RTD polynomial copper is enabled.
Description	Sets the upper calculation limit for the special sensor linearization.
Input	Depends on the selected sensor type
Default settings	Depends on the selected sensor type

"Current output" submenu

4 mA value	
Navigation	Application, Current output, 4 mA value
Description	Assigns a measured value to the 4 mA current value.
Default settings	0°C

20 mA value	
Navigation	Application, Current output, 20 mA value
Description	Assigns a measured value to the 20 mA current value.
Default settings	100°C

Failure mode	
Navigation	Application, Current output, Failure mode
Description	Selects the failure signal level that the current output issues in the case of an error.
Selection	– High alarm – Low alarm
Default settings	Low alarm

Failure current	
Navigation	Application, Current output, Failure current
Requirements	The high alarm option is enabled in the "Failure mode" parameter.
Description	Sets the current value that the current output issues in the event of a malfunction.
Input	21.5 mA ... 23 mA
Default settings	22.5 mA

Adjustment of the analog output (4 mA and 20 mA voltage trimming)

Voltage trimming is used for the compensation of the analog output (D/A conversion). The output current of the transmitter can be adapted to match the expected value at the higher-level system.

Voltage trimming does not affect the digital HART® value. This can cause the displayed measured value on the locally installed display to differ from the displayed value in the higher-level system.

1. Install a precise ampere meter (higher precision than the transmitter) in the current loop.
2. Switch on simulation of the current output and set the simulation value to 4 mA.
3. Measure the loop current using the ampere meter and take a note of it.
4. Set the simulation value to 20 mA.
5. Measure the loop current using the ampere meter and take a note of it.
6. Enter the determined current values as the adjustment values in the 4 mA or 20 mA voltage trimming parameter.

Current trimming 4 mA	
Navigation	Application, Current output, Current trimming 4 mA
Description	Sets the correction value for the current output at measuring range start at 4 mA.
Input	3.5 mA ... 4.25 mA
Default settings	4 mA
Additional information	Trimming only affects the current loop values between 3.8 mA ... 20.5 mA. Failure mode with low alarm and high alarm current values is not subject to trimming.

Current trimming 20 mA	
Navigation	Application, Current output, Current trimming 20 mA
Description	Sets the correction value for the current output at measuring range end at 20 mA.
Input	19.5 mA ... 20.5 mA
Default settings	20 mA
Additional information	Trimming only affects the current loop values between 3.8 mA ... 20.5 mA. Failure mode with low alarm and high alarm current values is not subject to trimming.

Damping	
Navigation	Application, Current output, Damping
Description	Sets the time constants for damping the current output.
Input	0 s ... 120 s
Default settings	0 s
Additional information	The current output responses to fluctuations of the measured value with exponential delay. This parameter determines the time constant of this delay. If a lower time constant is entered, the current output responses quickly to the measured value. If a higher time constant is entered, the response of the current output is delayed.

"HART configuration" submenu

Assign current output (PV)	
Navigation	Application, HART configuration, Assign current output (PV)
Description	Assigns the measured variable to the primary HART® value (PV).
Display	Sensor
Default settings	Sensor (fixed assignment)

Assign SV	
Navigation	Application, HART configuration, Assign SV
Description	Assigns the measured variable to the second HART® value (SV).
Display	Device temperature (permanently assigned)
Default settings	Device temperature (permanently assigned)

Assign TV	
Navigation	Application, HART configuration, Assign TV
Description	Assigns the measured variable to the third HART® value (TV).
Display	Sensor (fixed assignment)
Default settings	Sensor (fixed assignment)

Assign QV	
Navigation	Application, HART configuration, Assign QV
Description	Assigns the measured variable to the fourth HART® value (QV).
Display	Sensor (fixed assignment)
Default settings	Sensor (fixed assignment)

HART address	
Navigation	Application, HART configuration, HART address
Description	Defines the HART® address of the device.
Display	0 ... 63
Default settings	0
Additional information	Measured value transfer via the current value is only possible for address “0”. For all other addresses, the current is fixed to 4 mA (multidrop mode).

No. of preambles	
Navigation	Application, HART configuration, No. of preambles
Description	Specifies the number of preambles in the HART® telegram.
Display	5 ... 20
Default settings	5

8.5.4 “System” menu

“Device management” submenu

HART short tag	
Navigation	System, Device management, HART short tag
Description	Defines a short description for the measuring point.
Input	Up to eight alphanumeric characters (letters, numbers, special characters)
Default settings	8 x “?”

Device tag	
Navigation	System, Device management, Device tag
Description	Enter a clear designation for the measuring point to be able to quickly identify it within the system.
Input	Maximum of 32 characters such as letters, numerals, or special characters (e.g., @, %, /)
Default settings	Depending on product root and serial number

Mains filter	
Navigation	System, Device management, Mains filter
Description	Selects the mains filter for A/D conversion.
Selection	– 50 Hz – 60 Hz
Default settings	50 Hz

Locking status	
Navigation	System, Device management, Locking status
Description	Displays the status of device locking. If write protection is active, write access to the parameters is blocked.
Display	Activated or deactivated check box: locked by hardware

Device reset	
Navigation	System, Device management, Device reset
Description	Resets the entire device configuration or parts of the configuration to a defined state.
Selection	– Not active The parameter is exited without action. – To default settings All parameters are reset to the default settings. – To delivery state All parameters are reset to the delivery state. The delivery state can differ from the default settings if customer-specific parameter values were specified when ordering. – Restart the device. The device restarts with an unchanged device configuration.
Default settings	Not active

Configuration counter	
Navigation	System, Device management, Configuration counter
Description	Displays the counter value for changes of device parameters. Static parameters of which the values change during optimization or configuration cause this parameter to increment by 1. This supports parameter version management. The counter may display a higher value if several parameters are changed, e.g., by loading parameters etc. to the device. The counter can never be reset, and even after a device reset it is not reset to a default value. If the counter overruns (16 bits), it begins again at 1.

Configuration changed	
Navigation	System, Device management, Configuration changed
Description	Displays if the configuration of the device was changed by a master (primary or secondary).

“User management” submenu

The following operating elements support navigation through the submenu:

– Back

  Return to previous page

– Cancel

  When using the cancel function, the state that was present before starting the submenu is restored.

“User management, Define password” submenu (Maintenance)

Define password	
Navigation	System, User management, Define password
Description	Starts the password definition.
Input	Activate the button.

New password	
Navigation	System, User management, Define password, New password
Description	Enter a password for the “Maintenance” user role to access the relevant functions.
Additional information	If the default settings have not been changed, the device is in the “Maintenance” user role. The device configuration data is not write-protected and can always be changed. After defining a password, devices can be switched to the “Maintenance” user role, provided that the correct password is entered in the password parameter. A new password becomes valid once it has been verified by entering it in the “Confirm new password” parameter. The password must be between 4 (minimum) and 16 (maximum) characters long and can contain letters and numbers. Leading blanks or blanks at the end are not used as part of the password. In case you lose your password, please contact your Phoenix Contact sales department.
Input	. . . . . . (Enter the corresponding password)

Confirm new password	
Navigation	System, User management, Define password, Confirm new password
Description	Confirms the newly defined password.
Additional information	A new password becomes valid once it has been verified by entering it in the “Confirm new password” parameter. The password must be between 4 (minimum) and 16 (maximum) characters long and can contain letters and numbers. In case you lose your password, please contact your Phoenix Contact sales department.
Input	. . . . . . (Enter the corresponding password)

Status password entry	
Navigation	System, User management, Define password, Status password entry
Description	Displays the verification status of the password – Password accepted – Incorrect password – Password rules not fulfilled – Access denied – Incorrect entry order – Invalid user role – Password confirmation faulty – Password reset successful

“User management, Enter password” submenu (Operator)

Enter password	
Navigation	System, User management, Enter password
Requirements	The “Operator” user role is active and a password has been defined.
Description	Enter a password for the selected user role to access the functions associated with this user role.
Input	Enter a defined password.

Status password entry	
Navigation	System, User management, Enter password, Status password entry
Description	Displays the verification status of the password – Password accepted – Incorrect password – Password rules not fulfilled – Access denied – Incorrect entry order – Invalid user role – Password confirmation faulty – Password reset successful

“User management, Recover password” submenu (Operator)

Recover password	
Navigation	System, User management, Recover password
Requirements	The “Operator” user role is active and a password has been defined.
Description	Enter the reset code to reset the current password. **CAUTION:** Loss of the current password Use the reset code only in case you lose the current password. Contact the Phoenix Contact sales department.
Input	Activate the button and enter the reset code.

Status password entry	
Navigation	System, User management, Recover password, Status password entry
Description	Displays the verification status of the password – Password accepted – Incorrect password – Password rules not fulfilled – Access denied – Incorrect entry order – Invalid user role – Password confirmation faulty – Password reset successful

“User management, Logout” submenu (Maintenance)

Logout	
Navigation	System, User management, Logout
Requirements	The “Maintenance” user role must be active.
Description	The “Maintenance” user role is exited and the system changes to the “Operator” user role.
Input	Activate the button.

“User management, Change password” submenu (Maintenance)

Change password	
Navigation	System, User management, Change password
Requirements	The “Maintenance” user role must be active.
Description	– Old password: Enter the current password, then change the existing password. – New password:Page 41 – Confirm new password: Page 41
Input	– . . . . . (Enter the old password) – . . . . . (Enter the new password) – . . . . . (Confirm the new password)

Status password entry	
Navigation	System, User management, Change password, Status password entry
Description	Displays the verification status of the password – Password accepted – Incorrect password – Password rules not fulfilled – Access denied – Incorrect entry order – Invalid user role – Password confirmation faulty – Password reset successful

“User management, Delete password” submenu (Maintenance)

Delete password	
Navigation	System, User management, Delete password
Requirements	The “Maintenance” user role must be active.
Description	The currently valid password will be deleted. The “Define password” button appears.
Input	Activate the “Delete password” button.

“Information, Device” submenu

Squawk	
Navigation	System, Information, Device, Squawk
Description	This function can be used for easy identification of the device locally in the field. After activating the Squawk function, all the segments on the display are flashing.
Selection	– Squawk once The display flashes for 60 s and then returns to normal mode. – Squawk on The display flashes permanently. – Squawk off The function is disabled and the display works in normal mode again.
Input	Activate the corresponding button.

Serial number	
Navigation	System, Information, Device, Serial number
Description	Displays the serial number of the device. The serial number can be found on the rating plate.
Display	11-digit string, maximum, of letters and numbers

Order code	
Navigation	System, Information, Device, Order code
Description	Displays the order code of the device. It can also be found on the rating plate. The code is generated from a reversible transformation of the extended order code that specifies the characteristics of all device features of the product structure. In contrast to the extended order code, the device features cannot be directly read from the order code. Useful application for the order code: – To order a replacement device of the same design – To quickly and clearly identify the measuring device, e.g., when contacting Phoenix Contact

Firmware version	
Navigation	System, Information, Device, Firmware version
Description	Displays the installed device firmware version.
Display	6-digit string, maximum, in xx.yy.zz format

Hardware revision	
Navigation	System, Information, Device, Hardware revision
Description	Displays the installed hardware version.
Display	6-digit string, maximum, in xx.yy.zz format

Extended order code (n)	
n = Number of parts of the extended order code (n = 1 ... 3)	
Navigation	System, Information, Device, Extended order code n
Description	Displays the first, second, and/or third part of the extended order code. Because of the character length it is divided into three parameters, maximum. The extended order code specifies the characteristics of all the device features of the product structure, and in this way clearly characterizes the device. It can also be found on the rating plate. Useful application for the extended order code: – To order a replacement device of the same design – To verify the ordered device features using the delivery note.
Display	7-digit number

Device name	
Navigation	System, Information, Device, Device name
Description	Displays the device name. It can also be found on the rating plate.

Manufacturer	
Navigation	System, Information, Device, Manufacturer
Description	Displays the name of the manufacturer.

“Information, Device location” submenu

Latitude	
Navigation	System, Information, Device location, Latitude
Description	Enter the coordinates for the latitude that describe the device location.
Input	-90.000° ... +90.000°
Default settings	0

Longitude	
Navigation	System, Information, Device location, Longitude
Description	Enter the coordinates for the longitude that describe the device location.
Input	-180.000° ... +180.000°
Default settings	0

Altitude	
Navigation	System, Information, Device location, Altitude
Description	Enter the information for the altitude that describes the device location.
Input	-1.0 x 10^{+20} m ... +1.0 x 10^{+20} m
Default settings	0 m

Location method	
Navigation	System, Information, Device location, Location method
Description	Selects the data format for determining the geographic position. The codes for determining the position are based on US National Marine Electronics Association (NMEA) Standard NMEA 0183.
Input	– No fix – GPS or Standard Positioning Service (SPS) fix – Differential PGS fix – Precise positioning service (PPS) – Real Time Kinetic (RTK) fixed solution – Real Time Kinetic (RTK) float solution – Estimated dead reckoning – Manual input mode – Simulation mode
Default settings	Manual input mode

Location description	
Navigation	System, Information, Device location, Location description
Description	Enter the location description to find the device within the system.
Input	Up to 32 alphanumeric characters (letters, numbers, special characters)
Default settings	32 x “?”

Process unit tag	
Navigation	System, Information, Device location, Location description
Description	Enter the process unit in which the device is installed.
Input	Up to 32 alphanumeric characters (letters, numbers, special characters)
Default settings	32 x “?”

“Information, HART info” submenu

Device type	
Navigation	System, Information, HART info, Device type
Description	Displays the device type with which the device is registered in the HART® FieldComm Group. The device type is specified by the manufacturer. It is required to assign the matching device description file (DD) to the device.
Display	4-digit hexadecimal number
Default settings	0x11D0

Device revision	
Navigation	System, Information, HART info, Device revision
Description	Displays the device revision with which the device is registered in the HART® FieldComm Group. It is required to assign the matching device description file (DD) to the device.
Display	Revision in hexadecimal format
Default settings	0x01

HART revision	
Navigation	System, Information, HART info, HART revision
Description	Displays the HART revision of the device.

HART descriptor	
Navigation	System, Information, HART info, HART descriptor
Description	Defines a description for the measuring point.
Input	Up to 16 alphanumeric characters (capital letters, numbers, different special characters)
Default settings	16 x “?”

HART message	
Navigation	System, Information, HART info, HART message
Description	Defines a HART message that the master sends on request via the HART® protocol.
Input	Up to 32 alphanumeric characters (capital letters, numbers, different special characters)
Default settings	32 x “?”

Hardware revision	
Navigation	System, Information, HART info, Hardware revision
Description	See Page 44
Display	

Software revision	
Navigation	System, Information, HART info, Software revision
Description	Displays the software revision of the device.

HART date code	
Navigation	System, Information, HART info, HART date code
Description	Defines date information for individual use.
Input	Date in format: year-month-day (YYYY-MM-DD)
Default settings	2010-01-01[1]

[1] Also 01.01.2010, depending on the operating tool.

Manufacturer ID	
Navigation	System, Information, HART info, Manufacturer ID
Description	Displays the manufacturer ID with which the device is registered in the HART® FieldComm Group.
Display	4-digit hexadecimal number
Default settings	0x0011

Device ID	
Navigation	System, Information, HART info, Device ID
Description	The device ID stores a unique HART ID that the control systems use to identify the device. The device ID is also transmitted in command 0. The device ID is clearly determined from the serial number of the device.
Display	ID generated based on the serial number

9 Maintenance

The device does not require special service or maintenance.

10 Troubleshooting

10.1 Indication of diagnostic events

Table 2 Status signals

Symbol	Event category	Meaning
F	Operational error	An operational error has occurred.
C	Service mode	The device is in service mode (e.g., during a simulation).
S	Out of specification	The device is being operated outside its technical specifications (e.g., during startup or cleaning).
M	Maintenance required	Maintenance is required.
N	Not categorized	

Table 3 Diagnostic behavior

Alarm	Measurement is interrupted. The signal outputs take on the defined alarm status. A diagnostic message is generated (status signal F).
Warning	The device continues measuring. A diagnostic message is generated.
Disabled	The diagnostic behavior is disabled completely, even if the device does not acquire a measured value.

Diagnostic event and event text

The malfunction can be identified using the diagnostic event. The event text helps by supplying information on the malfunction.

	Diagnostic event		
	Status signal	Event number	Event text
	↓	↓	↓
Example	F	042	Sensor corrosion
		3-digit number	

If multiple diagnostic events occur simultaneously, only the diagnostic message with the highest priority will be displayed. Further pending diagnostic messages are displayed in the “Diagnostic list” submenu (see Page 31).

Past diagnostic messages that are no longer pending are displayed in the “Event logbook” submenu (Page 32).

10.2 Overview of diagnostic events

Each diagnostic event is assigned to a specific event behavior by default. The users can change this assignment for particular diagnostic events.

Diagnostic number	Short text	Remedy measure	Default status signal Can be changed to	Can be set[1] ✓ Cannot be set ✕	Default diagnostic behavior	Can be set[2] ✓ Cannot be set ✕
Diagnostics for sensor						
041	Sensor interrupted	1. Check the electronic wiring. 2. Replace the sensor. 3. Check the configuration of the connection method.	F	✓	Alarm	✓
042	Sensor corroded	1. Check the sensor. 2. Replace the sensor.	M	✓	Warning	✓
043	Short circuit	1. Check the electrical wiring. 2. Check the sensor. 3. Replace the sensor or cable.	F	✓	Alarm	✓
047	Sensor limit reached sensor n	1. Check the sensors. 2. Check the process conditions.	S	✓	Warning	✓
145	Compensation reference point	1. Check the terminal temperature. 2. Check the external reference measuring point.	F	✓	Alarm	✓
Diagnostics for electronics						
201	Electronics faulty	1. Restart the device. 2. Replace the electronics.	F	✕	Alarm	✕
221	Reference sensor defective	Replace the device.	M	✓	Alarm	✕
Diagnostics for configuration						
401	Factory reset active	Factory reset active, please wait.	C	✕	Warning	✕
402	Initialization active	Initialization active, please wait.	C	✕	Warning	✕
410	Data transfer failed	1. Check the connection. 2. Repeat the data transmission.	F	✕	Alarm	✕
411	Up/download active	Upload/download active, please wait.	C	✕	Warning	✕
435	Linearization faulty	Check the linearization.	F	✕	Alarm	✕
485	Process variable simulation active	Switch off simulation.	C	✕	Warning	✕
491	Current output simulation	Switch off simulation.	C	✓	Warning	✓

Diagnostic number	Short text	Remedy measure	Default status signal Can be changed to	Can be set[1] ✓ Cannot be set ✕	Default diagnostic behavior	Can be set[2] ✓ Cannot be set ✕
495	Diagnostic event simulation active	Switch off simulation.	C	✓	Warning	✓
531	Factory adjustment missing	1. Contact the service department. 2. Replace the device.	F	✕	Alarm	✕
537	Configuration	1. Check the device parameterization. 2. Upload and download the new configuration. (For current output: check the parameterization of the analog output.)	F	✕	Alarm	✕
582	Sensor diagnostics TC disabled	Enable diagnostics for thermocouple measurement.	C	✕	Warning	✕
Diagnostics for process						
801	Supply voltage too low[3]	Increase the supply voltage.	S	✓	Alarm	✕
825	Operating temperature	1. Check the ambient temperature. 2. Check the process temperature.	S	✓	Warning	✓
844	Process value outside specification	1. Check the process value. 2. Check the application. 3. Check the sensor.	S	✓	Warning	✓

[1] Can be set to F, C, S, M, N

[2] To “Alarm”, “Warning”, and “Disabled”

[3] With this diagnostic event, the device always outputs the “low” alarm state (output current ≤3.6 mA).

11 Disposal

The device contains electronic components. It must therefore be disposed of as electronic waste. Observe local disposal regulations.