Data Sheet
10/11-8.64 EN

Field mounted Temperature Transmitter TH202/TH202-Ex

HART programmable,
Pt 100 (RTD), thermocouples,
electrical isolation

- **Input**
  - Resistance thermometer (2, 3, 4 wire circuit)
  - Thermocouples
  - Resistance remote signalling unit (0...5000 Ω)
  - Voltages, mV (–125...+1200 mV)
- **Output**
  - 2 wire technique
  - 4...20 mA, HART signal
- **Electrical isolation (I/O)**
- **Measured error 0.1 K**
- **Customer-specific linearization**
  - 32 tie points
- **Continuous sensor and self-monitoring**
  - Parameter saved permanently in EEPROM
  - Monitoring of data integrety every 10 s
  - Wire break monitoring in acc. with NAMUR NE 89
- **Substitution strategy in case of error (NE 43)**
- **Approvals for explosion protection**
  - Intrinsically safe
    - Ⓔx II 2 (1) G EEx [ia] ib IIC T6, mount in zone 1
    - Ⓔx II 3 G EEx n A II T6, mount in zone 2
  - Pressure-proof
    - Ⓔx II 2 G EEx d IIC T6, mount in zone 1
- **Input functionality (absolute, differential, average value)**
- **EMC acc. to EN 50082-2 and NE 21**
- **Parameterization**
  - Device Management Tool: SV4xx (SMART VISION)
  - Hand held terminals: DHH691 (691 HT), STT04, HC275, FC375
  - CoMeter (HART configurator/LC display)

HART® FIELD COMMUNICATIONS PROTOCOL

Excellent long term stability
Temperature linear output signal
Enhanced self diagnostics

Technical data

Output

Output signal (temperature linear)
4...20 mA

Residual ripple (peak-to-peak)
< 0.3 %

Current consumption
< 3.6 mA

Maximum output current
23.6 mA

Parameterizable current error signal

Underranging/underranging value	3.6...4 mA
Overranging/overranging value	20...23.6 mA
Default value (acc. to NE43)	3.6 or > 21 mA

Damping
t_{63} = 0...30 s

Input

Resistance

Resistance thermometer (IEC 751, JIS, SAMA)
n · Pt 100/Ni 100 to Pt 1000/Ni 1000; Cu
(n = 0.1, 0.2, 0.5, 1, 1.2, 2, 3...10)
Min. measuring span 15 K/50 K

Resistance
0...500 Ω/0...5000 Ω
Min. measuring span 5 Ω/50 Ω

Maximum line resistance (R_w) per core
2, 3, 4 wire 7.5 Ω, 10 Ω, 50 Ω

Measuring current
300 µA

Sensor short-circuit
< 5 Ω (for RTD)

Sensor break (temperature/resistance measurement 2, 3, 4 wire)

Measuring range 0... 500 Ω	> 530 Ω
Measuring range 0...5000 Ω	> 5.3 kΩ

Sensor wire break monitoring in accordance with NAMUR NE 89

Sensor wire break detection	
3 wire resistance measurement	> 35 Ω
4 wire resistance measurement	> 3.7 kΩ

Input filter
50/60 Hz

Thermocouples

Types
B, E, J, K, L, N, R, S, T, U

Voltages
-125 mV...+ 125 mV
-125 mV...+1200 mV

Minimum measuring span
2 mV/50 mV

Sensor wire break monitoring in accordance with NAMUR NE 89
Pulsed with 1 µA outside of the measuring interval
Monitoring disconnectible

Thermocouple measurement	> 5 kΩ
Voltage measurement	> 5 kΩ

Input filter
50/60 Hz

Internal reference junction
Pt 100, via software switchable (no jumper necessary)

Input element		Measuring range	Min. measuring span
Standard	**Sensor**		
IEC 584-1	Thermocouple type B	250...+1820 °C (+482...+3308 °F)	235 °C (423 °F)
	Thermocouple type E	–250...+1000 °C (–418...+1832 °F)	30 °C (54 °F)
	Thermocouple type J	–210...+1200 °C (–346...+2192 °F)	37 °C (67 °F)
	Thermocouple type K	–250...+1372 °C (–418...+2502 °F)	54 °C (98 °F)
	Thermocouple type R	– 50...+1768 °C (– 58...+3215 °F)	171 °C (308 °F)
	Thermocouple type S	– 50...+1768 °C (– 58...+3215 °F)	193 °C (348 °F)
	Thermocouple type T	–200...+ 400 °C (–328...+ 752 °F)	50 °C (90 °F)
	Thermocouple type N	–200...+1350 °C (–328...+2462 °F)	60 °C (108 °F)
DIN 43710	Thermocouple type L	–200...+ 900 °C (– 76...+ 482 °F)	36 °C (65 °F)
	Thermocouple type U	–200...+ 600 °C (–328...+1112 °F)	40 °C (72 °F)
IEC 751; JIS; SAMA[1)] 2, 3 and 4 wire	Resistance thermometer Pt 100	–200...+ 850 °C (–328...+1562 °F)	15 °C (28 °F)
	Resistance thermometer Pt 1000	–200...+ 850 °C (–328...+1562 °F)	50 °C (90 °F)
DIN 43760 2, 3 and 4 wire	Resistance thermometer Ni 100	– 60...+ 250 °C (– 76...+ 482 °F)	8 °C (15 °F)
	Resistance thermometer Ni 500	– 60...+ 250 °C (– 76...+ 482 °F)	15 °C (28 °F)
Resistance	Ω	0...500 Ω/0...5000 Ω	5 Ω/50 Ω
Voltage	mV	–125 mV...+ 125 mV –125 mV...+1200 mV	2 mV 50 mV

[1)] IEC 751 a = 0.00385, JIS a = 0.003916, SAMA a = 0.003902

Power supply (poling protected)

Supply voltage

Non-Ex-application	U_s = 8.5...30 V DC
For Ex-Application, max.	U_i = 8.5...29.4 V DC

2 wire methode: power supply wires = signal wires

Influence of supply voltage

< 0.05 %/10 V

maximum residual ripple

≤ 1 % U_S (< 500 Hz)

Power demand of indicators

(Power demand of transmitter and indicator have to be added)

Digital indicator

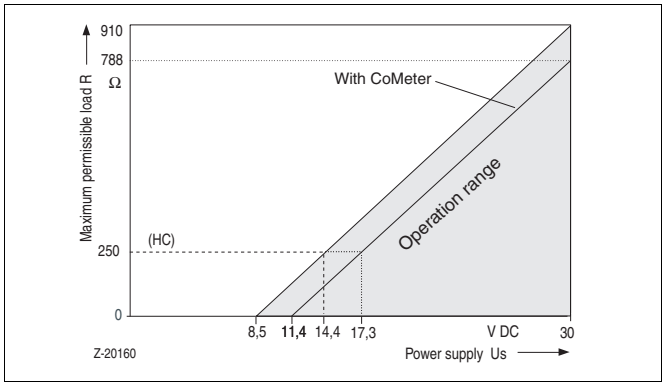
U_{sd} = 2 V DC

CoMeter (HART configutor/LC display)

U_{sd} = 2.9 V DC

Maximum load

$$R(\mathrm{k}\Omega) = \frac{(U_{smax} - U_{smin})}{23.6}$$



General characteristics

Output signal refreshment rate

Pt 100	0.4 s (Input signal change < 0.25 K/s)
Thermocouples	0.2 s (Input signal change < 2.5 K/s)

Vibration resistance

Vibration in operation	2g acc. to DIN IEC 68T.2-6
Resistance to shock	acc. to DIN IEC 68T.2-27

Electrical isolation (I/O)

1.5 kV AC (60 s)

Long-term drift

≤ 0.02 % per annum (ambient temperature < 60 °C)
≤ 0.05 % per annum (ambient temperature < 85 °C)

Environment conditions

Ambient temperature range

-40...85 °C

Transport and storage temperature

-40...100 °C

Relative humidity

< 100 %

Condensation: Permitted

Mechanical construction

Dimensions

Confer dimensional drawing

Weight

1.25 kg (without accesories)

Housing material

Aluminium	epoxy color (RAL 9002)
stainless steel	

Type of protection

IP 67

Electrical connection

Thread (alternatively)

2 x M20 x 1.5, 2 x 1/2“ GK, 2 x 1/2“ NPT, 2 x 3/4“ NPT

or with cable screw connections

2 x M20 x 1.5 (metal)

Ground screw external/internal

6 mm^2 M5 / 2.5 mm^2 M4

Terminals, pluggable

2.5 mm^2, screw terminals

Characteristics at rated conditions

According to IEC 770 (related to 25 °C)[1)]

Digital measured error

Pt 100	± 0.1 K
Thermocouples	± 20 µV
Linear resistance 500 Ω/5000 Ω	± 40 mΩ/200 mΩ
Linear voltage 120 mV/1200 mV	± 20 µV/50 µV

D/A measured error

± 0.05 % of measuring span

Additional influence of the internal reference junction

Pt 100 DIN IEC 751 Kl. B

Influences

Influence of ambient temperature acc. to IEC 68-2-2

Pt 100/resistance measurement[2)]

$$< (0.05\ \% + \frac{\mathrm{ME}\ (\Omega)}{\mathrm{MS}\ (\Omega)} \times 0.008\ \%) / 10\ \mathrm{K}$$

Thermocouple/mV[3)]

$$< (0.05\ \% + \frac{\mathrm{ME}\ (\mathrm{mV})}{\mathrm{MS}\ (\mathrm{mV})} \times 0.01\ \% + \frac{0.14\ \mathrm{K}}{\mathrm{MS}\ (\mathrm{K})} \times 100\ \%) / 10\ \mathrm{K}$$

Percentage related to measuring span MS = ME – MA
MA = lower range value, ME = upper range value

[1)] Percentage related to set measuring span
Specified values corresponds to 3 σ (Gaussian normal distribution)
[2)] Pt 100 (0...400 °C): Influence of ambient temperature
< (0.05 % + 0.013 %)/10 K = 0.063 %/10 K
[3)] Type K (0...1000 °C): Influence of ambient temperature
< (0.05 % + 0.01 % + 0.014 %)/10 K = 0.074 %/10 K

Explosion protection

Intrinsically safe

Zone 1

Marking	Ⓔx II 2 (1) G EEx [ia] ib IIC T6
EC-Type-Examination certificate	PTB 99 ATEX 2139 X
Temperature class T6/T5/T4	50 °C/65 °C/85 °C

Supply circuit	Output [ib]	Input [ia]
Max. voltage	U_i = 29.4 V	U_o = 5.6 V
Short-circuit current	I_i = 130 mA	I_o = 1.5 mA[1)]
Max. power	P_i = 0.8 W	P_o = 20 mW
Internal inductance	L_i = 220 µH	L_o = 1 mH
Internal capacitance	C_i = 15 nF	C_o = 1.55 µF

1) See 1. supplement PTB 99 ATEX 2139 X

Zone 2

Marking	Ⓔx II 3 G EEx n A II T6
Conformity statement	PTB 99 ATEX 2216 X
Temperature class T6/T5/T4	50 °C/65 °C/85 °C

Dust-explosionproof

Zone 20: intrinsically safe type

Marking	Ⓔx II 1 D IP 65 T 135 °C and Ⓔx II 2(1) G EEx ia IIC T6
EC-Type-Examination certificate	DMT 02 ATEX E 248

Zone 20: Non intrinsically safe type

Marking	Ⓔx II 1 D IP 65 T 135 °C[2)]
EC-Type-Examination certificate	DMT 02 ATEX E 248

Pressure-proof enclosure

Marking	Ⓔx II 2 G EEx d IIC T6
EC-Type-Examination certificate	PTB ATEX 1144 X
Temperature class T6/T5/T4	50 °C/65 °C/85 °C

Canadian Standards Association and Factory Mutual

Intrinsically Safe

FM/CSA	Class I, Div. 1/Div. 2, Groups A, B, C, D Class II, Div. 1/Div. 2, Groups E, F, G Class III Class I, Zone 1, AEx [ia] ib IIC T6 Class I, Zone 1, Ex [ia] ib IIC T6

Nonincendive

FM	Class I, Div. 2, Groups A, B, C, D, T6 Class II, Div. 1/Div. 2, Groups F, G, T6 Class III T6

Explosionsproof

FM/CSA	Class I, Div. 1/Div. 2, Groups A, B, C, D, T6 Class II, Div. 1/Div. 2, Groups E, F, G, T6 Class III T6

2) With this marking, a 63 mA fuse must be inserted in the 4...20 mA circuit before the transmitter

Electromagnetic compatibility (EMC)

Pt 100: measuring range 0...100 °C, span 100 K

Type of test	Degree	Influence	IEC
Burst to signal/ data lines	3 kV	< 0.1 %	1000-4-4
Static discharge Contact plate (indirect) Terminals for supply[3)] Terminals for sensors[3)]	 8 kV 6 kV 4 kV	 no influence no influence no influence	1000-4-2
Radiated field 80 MHz...1 GHz	 10 V/m	 < 1.0 %	1000-4-3
Coupling 150 kHz - 80 MHz	 10 V	 < 1.0 %	1000-4-6

3) Air discharge (at 1 mm distance)

According to NAMUR NE 21 recommendation.

In case of an input signal change > 0.25 K/s for Pt100 or > 2.5 K/s for thermocouples a measured value plausibility check is performed.

Communication/parameterization

Hand held terminal HHT
DHH691 (691 HT), STT04, HC275, FC375

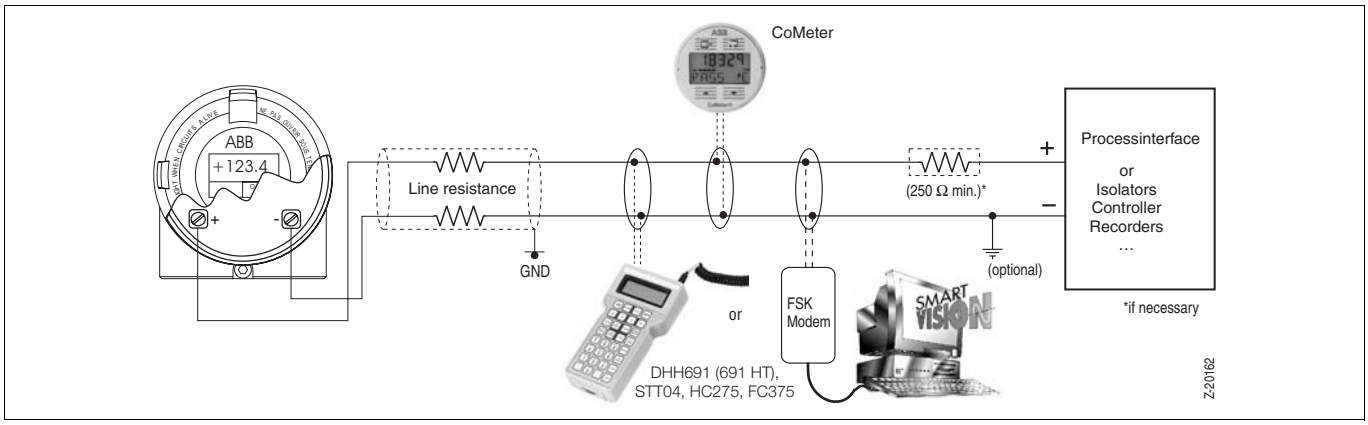
CoMeter
Hart conigurator and LC display

Device Management Tool
DSV4xx (SMART VISION)

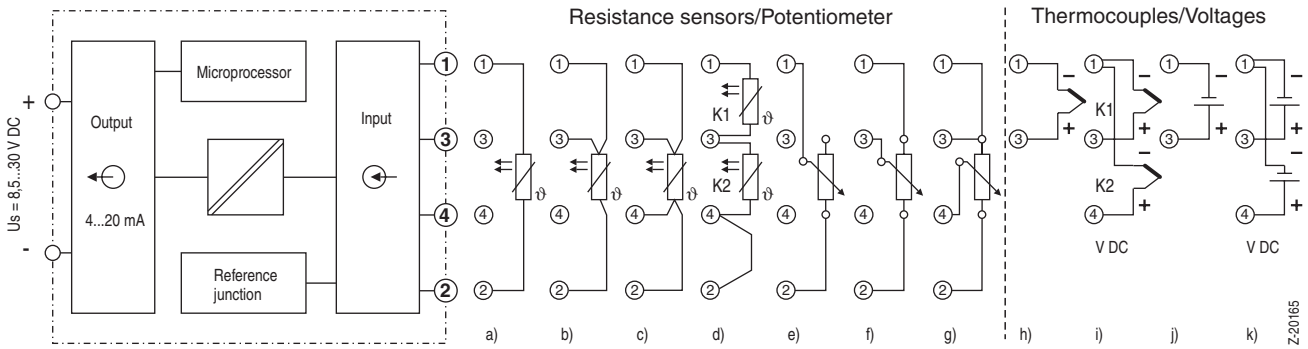
FDT/DTM technology

Software connection
AMS (from version 5 without additional drivers)

Parameter
Sensor type, error signalling, measuring range, general characteristics (i. e. TAG number), damping, signal simulation of output



Connection diagram



a) Resistance thermometer, 2 wire circuit
b) Resistance thermometer, 3 wire circuit
c) Resistance thermometer, 4 wire circuit
d) Double resistance thermometer, 2 wire circuit
(average value or differential temperature measurement)

Potentiometer: 0...500 Ω or 0...5000 Ω

e) Potentiometer input, 2 wire circuit
f) Potentiometer input, 3 wire circuit
g) Potentiometer input, 4 wire circuit

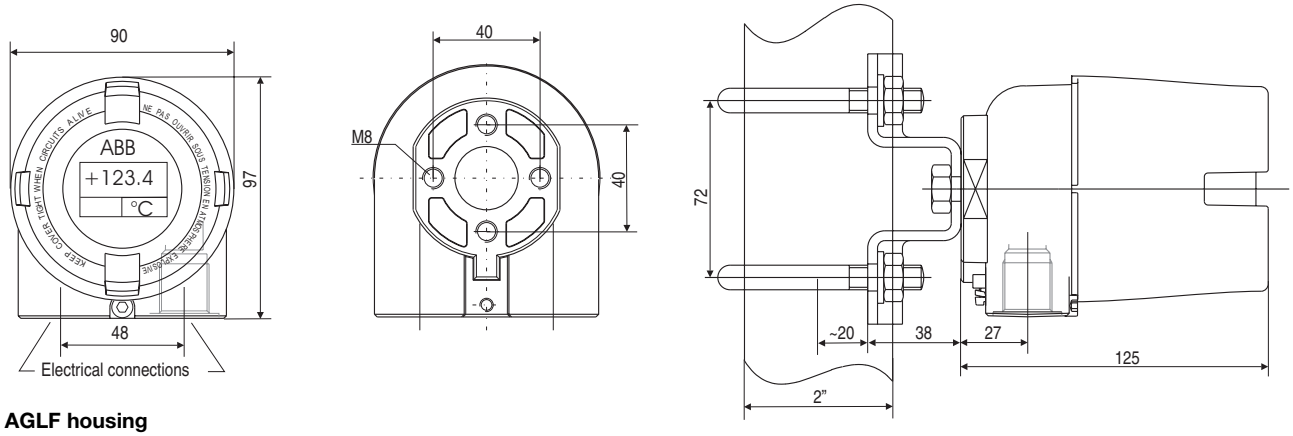
f) Thermocouple
g) Double thermocouple (average value or differential temperature measurement)

Voltages: -125 mV...+125 mV or -125 mV...+1200 mV

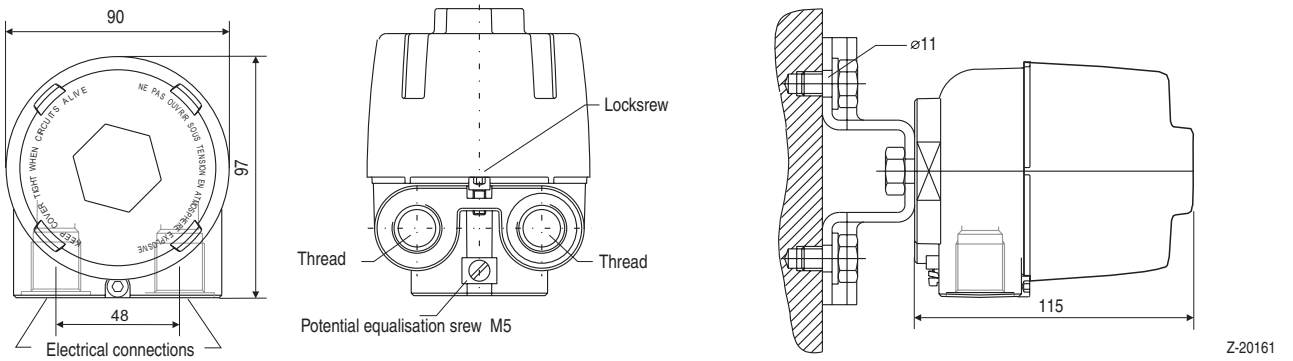
h) Voltage measurement
i) 2-fold voltage measurement (average value or differential temperature measurement)

Dimensional diagram (Dimensions in mm)

AGLFD housing



AGLF housing



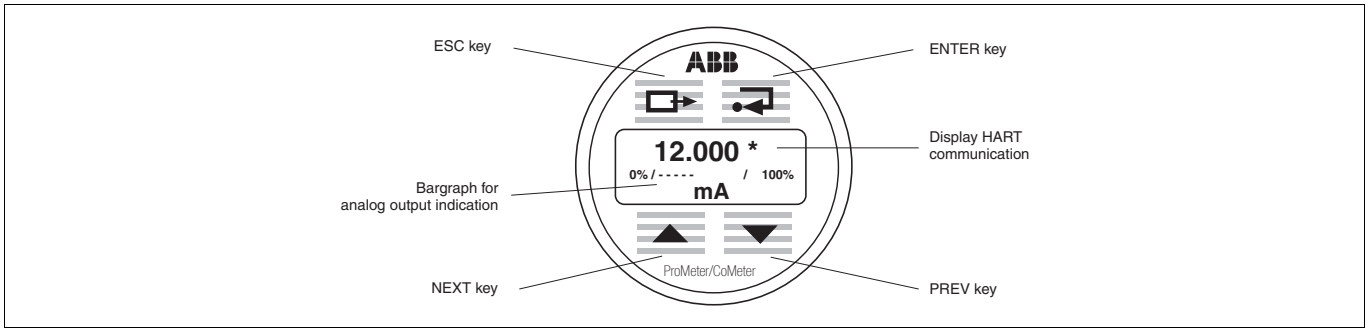
Displays (option)

ProMeter
- Programmable LC indicator
- loop-powered (4...20 mA)
- LC display: 5 digits (± 1999), digit height 7,6 mm, 7 segments
- sign and variable decimal place
- 10 segment bargraph (heading of measuring range)
- 7 digits alphanumeric characters 6 mm, 14 segments
- Programmable display variables: process value, sensor value, loop current, percentage
- Password-protected programming acces

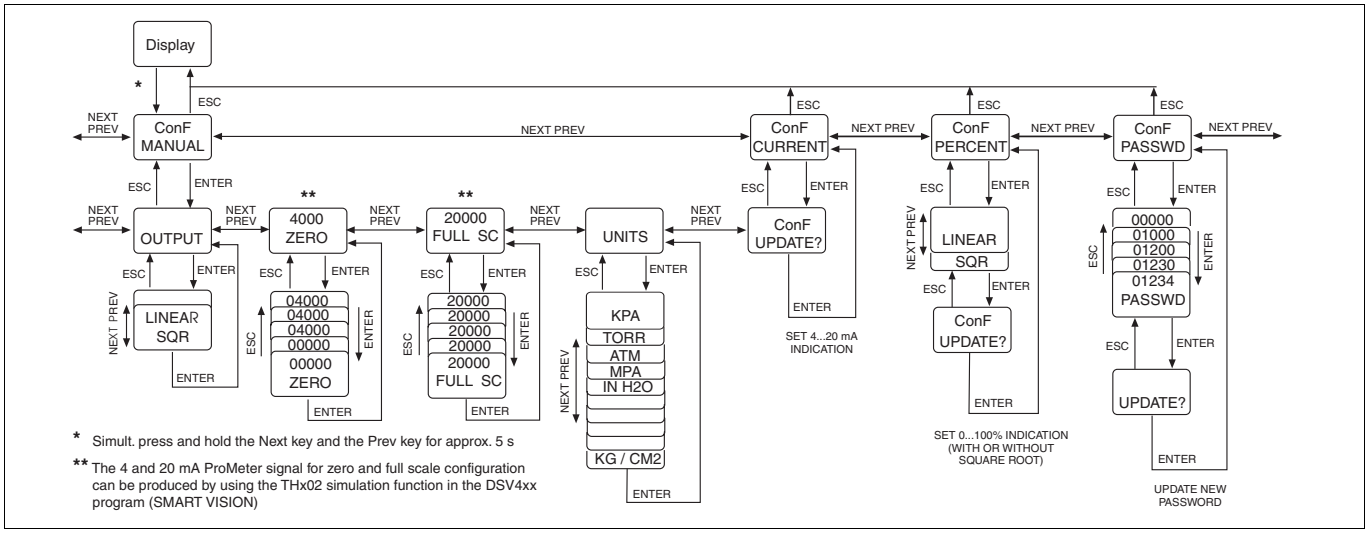
CoMeter
- Dual function (HART configurator and programmable LC display)
- Programmable LC indicator as ProMeter

HART configurator
- HART transmitter programming unit (all HART functions except for freely configurable characteristic curve and TAG Number)
- Request function
  Process variable, analog and display value, description of measuring point, serial number, error behaviour, lower/upper measuring range limit
- Change function
  Sensor type, sensor circuit, measuring range, damping, mains filter, error signalling
- Special function
  Zero point adjustment, simulation of output signal, adjustment of output signal, wet calibration

Display	ProMeter	CoMeter
Response time	1.3 s	
Measuring error	± 0.15 %	
Maximum current	130 mA	215 mA
EMC	EN 50082-2	
Temperature operating range	-20...+70 °C (-40...-20 °C without function)	
Humidity	0...100 %, condensating permitted	



ProMeter configuration menu



Note:
1. When using the ProMeter for process value or sensor value indication, its zero and full scale configuration must be in accordance with the transmitter temperature range or sensor range.

2. CoMeter configuration menu see 3KDE115040R4501

Ordering information

			Catalog No.									
TH202/TH202-Ex			**V11523-**									
TH202	(without expolsion protection)			1								
With explosion protection:												
Type of protection: intrinsically safe												
TH202-Ex	PTB/ATEX	II 2 (1) G EEx [ia] ib IIC T6 (Zone 1)		5								
TH202-Ex	FM/CSA	Class I, Div. 1/Div. 2, Groups A, B, C, D		7								
		Class II, Div. 1/ Div. 2, Groups E, F, G										
		Class III										
		Class I, Zone 1, AEx [ia] ib IIC T6										
		Class I, Zone 1, Ex [ia] ib IIC T6										
TH202-Ex N	PTB/ATEX	II 3 G EEx n A II T6 (Zone 2)		N								
TH202-Ex N	FM/CSA	Class I, Div. 2, Groups A, B, C, D T6 nonincendive		M								
		Class II, Div. 2, Groups F, G T6										
		Class III T6										
Type of protection: Dust-explosionproof		(Zone 20)										
TH202-Ex	DMT/ATEX	II 1 D IP 65 T 135 °C and		S								
		II 2 (1) G EEx ia IIC T6 (intrinsically safe type)										
TH202-Ex D	DMT/ATEX	II 1 D IP 65 T 135 °C (Non intrinsically safe type)		G								
Type of protection: Pressure-proof enclosure / explosionproof												
TH202-Ex d	PTB/ATEX	II 2 G EEx d IIC T6		D								
TH202-Ex d	FM	Class I, Div. 1/Div. 2, Groups A, B, C, D T6		E								
		Class II, Div. 1/Div. 2, Groups E, F, G T6										
		Class III T6										
Display / construction												
AGLF/AGSF housing without display					N							
AGLFD/AGSFD housing with digital indicator (ProMeter)					D							
AGLFD/AGSFD housing with digital display/HART configurator (CoMeter)					C							
Material												
Aluminum						A						
Stainless steel						E						
Connections												
with cable screw connection		2 pieces M20 x 1.5 cable screw connection 1)					M					
		2 pieces pressure proof cable screw connection 1)					D					
Thread		M20 x 1.5					1					
(without cable screw connection)		1/2" NPT					2					
		3/4" NPT					3					
		1/2" GK					4					
Mounting field housing												
without								1				
Wall mounting (carbon steel)								2				
Wall mounting (stainless steel)								3				
2" Pipe mounting (carbon steel)								4				
2" Pipe mounting (stainless steel)								5				
Programming												
Factory standard parameter:									S			
Pt 100, 4 wire circuit, damping off, direct action characteristic												
overranging at sensor or device error (22 mA)												
Customer specific parameter definition									K			

Continued on next page

1) Metal screw connection EEx e or EEx d (cable-diameter 3.5…8.7 mm)

Ordering information (continued)

	Catalog No.			
TH202/TH202-Ex	**V11523-**			
Calibration certificates				
without	0			
2 point calibration certificate	1			
9 point calibration certificate	2			
Certificates				
without		0		
SIL2 - Declaration of conformity		2		

Accessories

	Catalog No.		
Surge/Lightning prot. for M20 x 1.5 cable-entry-glands, Non Ex-Version Type DPI MD 24 M 2 S	7964116		
Surge/Lightning protection for M20 x 1.5 cable-entry-glands, Ex-Version Type DPI MD EX 24 M 2	7964115		
ABB FSK modem [EEx ib] IIC (parameter setting in the installation)	see Data Sheet 10/63-6.71 EN		
Device Management Tool DSV4xx (SMART VISION)	see Data Sheet 10/63-1.20 EN		

Notes:
Surge/lightning protection is permitted only for ATEX intrinsically safe devices which will be installed in zone 1 or 2. Measuring circuit of these devices with surge/lightning protection can also be used for zone 0 if allowed in the ATEX approval of this device type

For a local programming on the desk the universal FSK programming set can be used as Hardware
(see Data Sheet 10/63-6.71 EN: ordering information)

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Printed in the Fed. Rep. of Germany (03.05)

10/11-8.64 EN Rev. B

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