

Head mounted Temperature Transmitter TH02/TH02-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 integrity 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
 - ⊕ II 2 (1) G EEx [ia] ib IIC T6, mount in zone 1
 - ⊕ II 3 G EEx n A II T6, mount in zone 2

■ Input functionality

(absolute, differential, average value)

■ EMC acc. to EN 50082-2 and NE 21

■ Parameterization

- Device Management Tool: DSV4xx (SMART VISION)
- Hand held terminals:
 - DHH691 (691 HT), STT04, HC275, FC375
- CoMeter (HART configurator/LC display)



Excellent long term stability
Temperature linear output signal
Enhanced self diagnostics

ABB

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 3.6 mA
Overranging 22 mA
Default value 3.6...23.6 mA

Damping

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

Input

Resistance

Resistance thermometer (IEC 751, JIS, SAMA)

$n \cdot \text{Pt } 100/\text{Ni } 100$ to $\text{Pt } 1000/\text{Ni } 1000$; 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 k Ω

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 k Ω

Input filter

50/60 Hz

Thermocouples/Voltages

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 k Ω
Voltage measurement > 5 k Ω

Input filter

50/60 Hz

Internal reference junction

Pt 100, via software switchable (no jumper necessary)

Standard	Input element		Measuring range	Min. measuring span
		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 (only with AGLHD head) (Power demand of transmitter and indicator have to be added)

Digital indicator

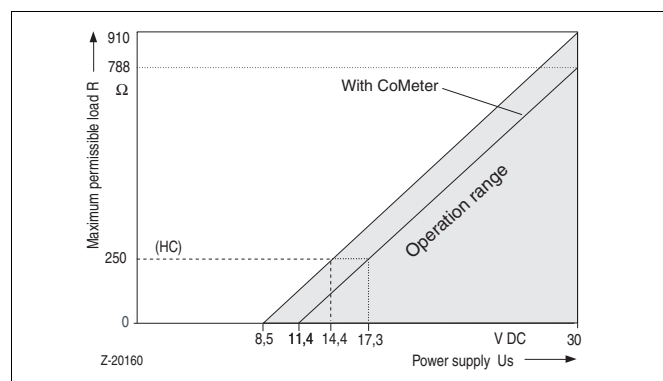
$U_{sd} = 2$ V DC

CoMeter (HART configurator/LC display)

$U_{sd} = 2.9$ V DC

Maximum load

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



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 2 g 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 % (100 % humidity with isolated terminals only)

Condensation: Permitted

Mechanical construction

Dimensions

Confer dimensional drawing

Weight

55 g

Housing material

Polycarbonat
black (Non-Ex-type)
blue (Ex-type)

Electrical connection

Terminals, pluggable

2.5 mm², screw terminals (stainless steel screws)

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 measurement²⁾

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

Thermocouple/mV³⁾

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

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 **Ex** 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	$U_i = 29.4 \text{ V}$	$U_o = 5.6 \text{ V}$
Short-circuit current	$I_i = 130 \text{ mA}$	$I_o = 1.5 \text{ mA}^{(4)}$
Max. power	$P_i = 0.8 \text{ W}$	$P_o = 20 \text{ mW}$
Internal inductance	$L_i = 220 \mu\text{H}$	$L_o = 1 \text{ mH}$
Internal capacitance	$C_i = 15 \text{ nF}$	$C_o = 1.55 \mu\text{F}$

⁴⁾ See 1. supplement PTB 99 ATEX 2139 X

Zone 2

Marking **Ex** 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

Canadian Standards Association and Factory Mutual

Intrinsically Safe

FM Class I, Div. 1, Groups A, B, C, D T6
Class I, Zone 0, Group IIC T6
CSA Class I, Div. 1 and Div. 2, Groups A, B, C, D T6
Class I, Zone 0, Group IIC T6
(Class II Groups E, F, G; Class III if build in BUZH -, AGL- or AGLH head)

Nonincendive

FM Class I, Div. 2, Groups A, B, C, D, T6
CSA Class I, Div. 2, Groups A,B,C,D T6
(Class II, Groups E, F, G; Class III if build in BUZH-, AGL- or AGLH head)

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)	8 kV	no influence	1000-4-2
Terminals for supply ¹⁾	6 kV	no influence	
Terminals for sensors ¹⁾	4 kV	no influence	
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
Surge:			
asymmetrisch	1 kV	< 1 %	1000-4-5
symmetrisch	0.5 kV	< 1 %	

⁵⁾ 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 configurator and LC display

Device Management Tool

DSV4xx (SMART VISION)

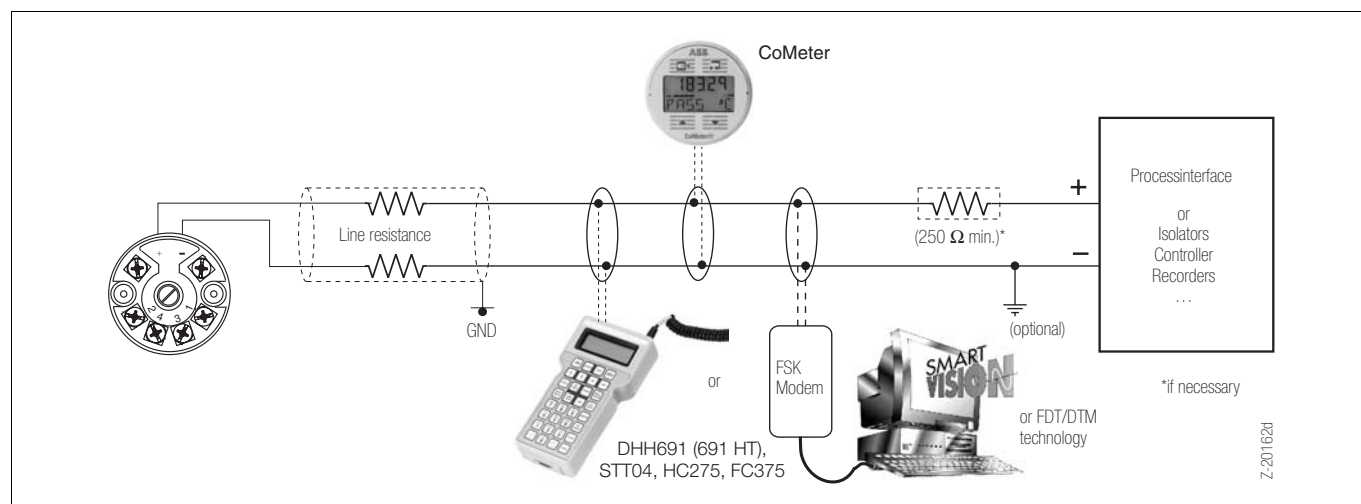
FDT/DTM technology

Software connection

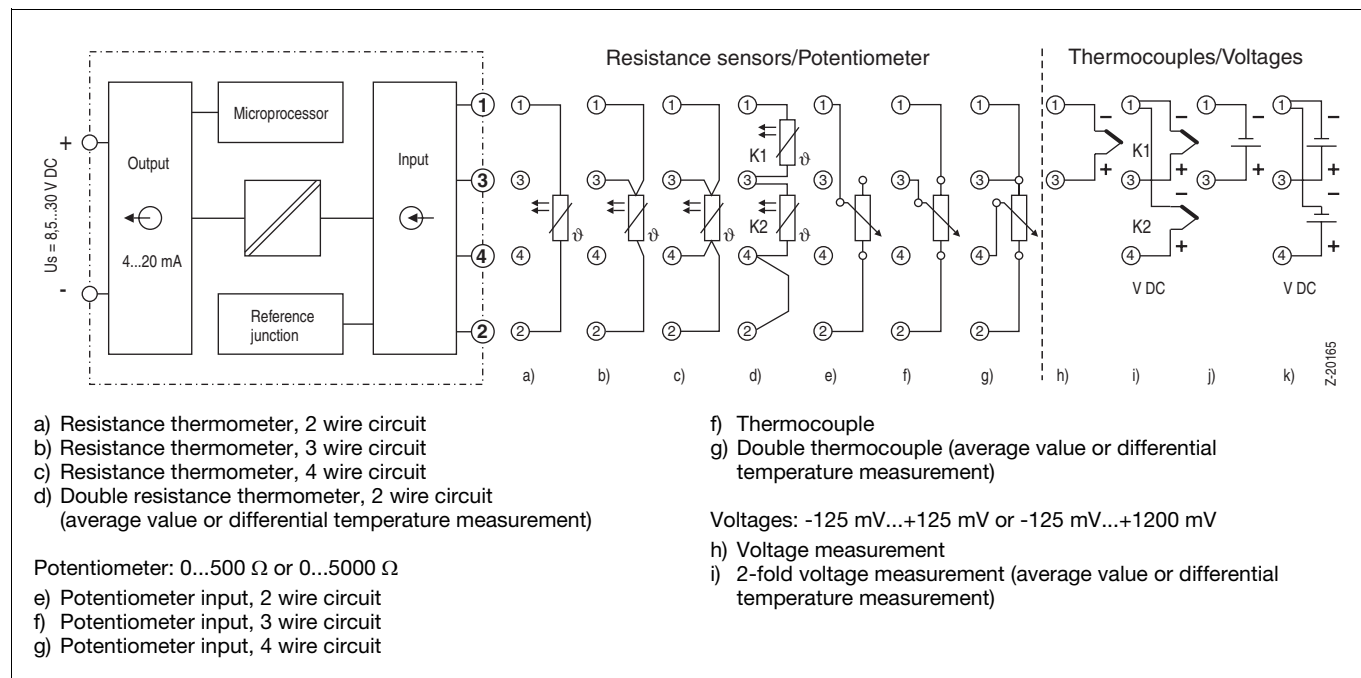
AMS (from version 5 without additional drivers)

Parameter

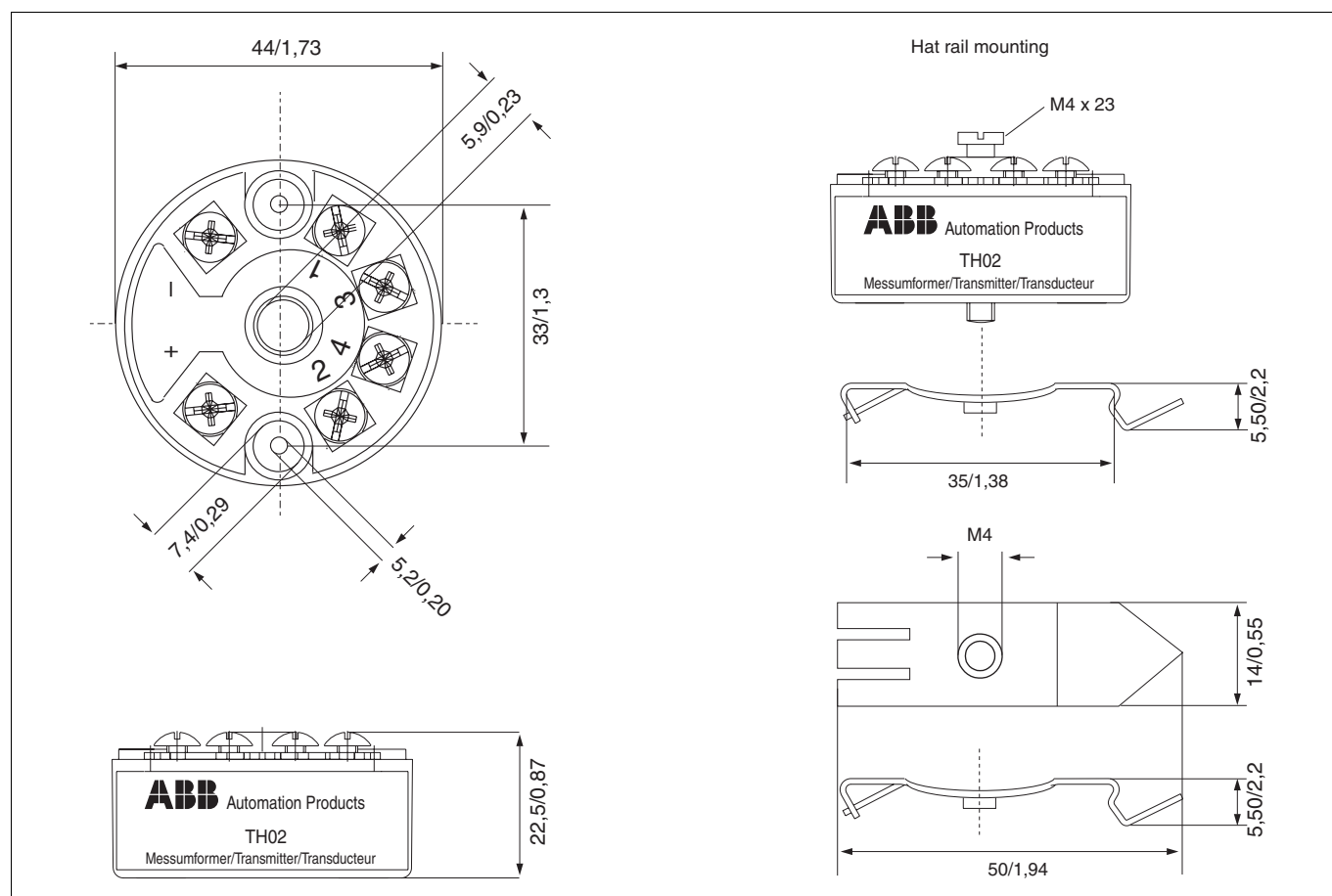
Sensor type, error signalling, measuring range, general characteristics (i. e. TAG number), damping, signal simulation of output



Connection diagram



Dimensional diagram (dimensions in mm)



Displays (option in conjunction with AGLHD head)

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

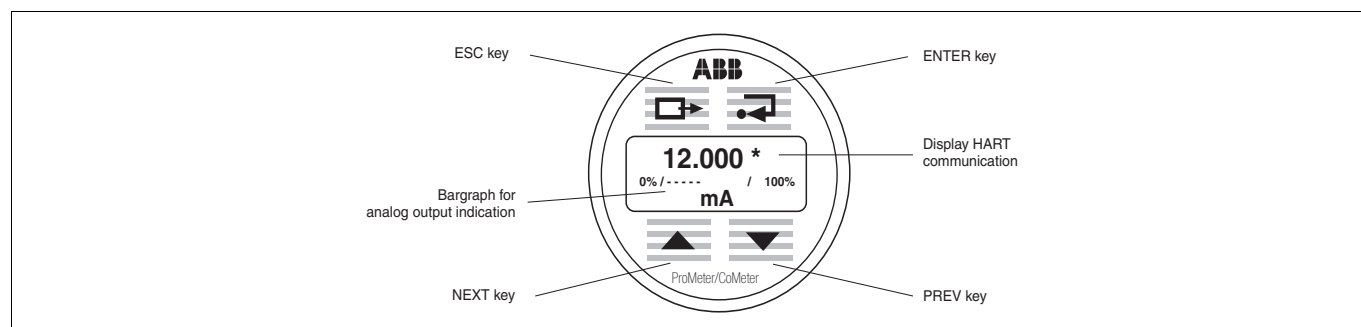
- Dual function (HART configurator and programmable LC display)
- Programmable LC indicator as ProMeter

HART configurator

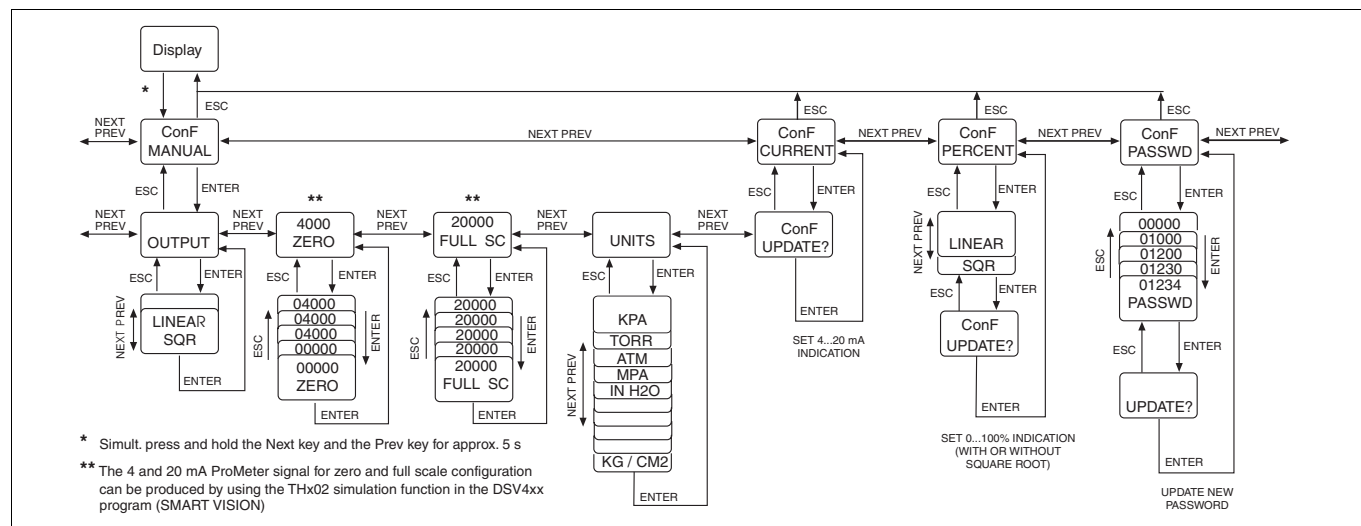
- HART transmitter programming unit (all HART functions except for freely configurable characteristic curve and TAG Number)

- 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	$\pm 0.15 \%$	
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.						
TH02/TH02-Ex		V11518-						
TH02	(without Ex)		1					
Type of protection: intrinsically safe								
TH02-Ex	ATEX Zone 1: II 2 (1) G EEx [ia]ib IIC T6		5					
TH02-Ex N	ATEX Zone 2: II 3 G EEx n A II T6		N					
TH02-Ex	FM IS Class I, Div. 1, Groups A, B, C, D T6 Class I, Zone 0, Group IIC T6		7					
TH02-Ex	CSA IS Class I, Div.1 and Div. 2, Groups A, B, C, D T6 (Class II Groups E, F, G; Class III If build in BUZH head, AGL head or AGLH head) Nonincendive. Class I, Div. 2, Groups A, B, C, D T6, (Class II, Groups E, F, G; Class III if built in BUZH head, AGL head or AGLH head)		9					
TH02-Ex N	FM nonincendive. Class I, Div. 2, Groups A, B, C, D T6		M					
Construction / display								
Module (h = 22.5 mm)			3					
Module (h = 22.5 mm) with sensor connecting line			1					
Module (h = 22.5 mm) with snap-on fixing			4					
Module (h = 27.5 mm) for mounting on measuring module			Z					
Module built into connection head or cover with sensor connecting line								
BUZH head			R					
BUSH head			P					
BUKH-Ex head			N					
Raised B-head cover			L					
B head (complete head with raised cover)			K					
AUZH head			V					
AUSH head			U					
AGL head without display		1)	X					
AGLHD head with digital display (ProMeter)		1)	D					
AGLHD head with digital display/HART configurator (CoMeter)		1)	C					
Attention: The sensor connecting lines correspond to the order for the type of sensor or its type of circuitry								
Module built into field housing:								
Aluminum field housing 80 x 75 x 57 mm, IP 65; 2 x M16 x 1.5			A					
Polyester field housing 75 x 80 x 55 mm, IP 65; 2 x M16 x 1.5			9					
Aluminum field housing 80x175x57 mm, IP 65; 1 x M16 x 1.5; 1 x M20 x 1.5, with separate terminal block			F					
Polyester field housing 75x190x55 mm, IP 65; 1 x M16 x 1.5; 1 x M20 x 1.5, with separate terminal block			E					
Note: Other field housings with several transmitters or especially for pipe mounting on request								
Programming								
Factory standard parameter			0					
Pt 100, 0...100 °C, 4 wire circuit, damping off, direct action characteristic overranging at sensor or device error (22 mA)								
Customer specific parameter settings			1					

Continued on next page

- 1) Standard: Aluminum, metal-cable-screw-connection M20 x 1.5 EEx e;
protective pipe connection M24 x 1.5 (optional M20 x 1.5; 1/2" NPT; 3/4" NPT);
(do not use for EEx d applications, see data sheet 10/10-3.28 EN for EEx d details)

Ordering information (continued)

					Catalog No.			
TH02/TH02-Ex					V11518-			
Calibration certificates								
without						0		
2 point						1		
9 point						2		
Certificates								
without						0		
SIL2 - Declaration of conformity						2		
Accessories								
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			

Note:

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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