

Temperature Transmitter, head mounted 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: SV401 (SMART VISION)
- Hand held terminals: 691HT, STT04, HHT275
- CoMeter (HART configurator/LC display)

■ 5 years warranty



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 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 · 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 μ A

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

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 μ A 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)
DIN 43710		Thermocouple type N	-200...+1350 °C (-328...+2462 °F)	60 °C (108 °F)
		Thermocouple type L	-200...+ 900 °C (- 76...+ 482 °F)	36 °C (65 °F)
IEC 751; JIS; SAMA ¹⁾		Thermocouple type U	-200...+ 600 °C (-328...+1112 °F)	40 °C (72 °F)
	2, 3 and 4 wire	Resistance thermometer Pt 100	-200...+ 850 °C (-328...+1562 °F)	15 °C (28 °F)
DIN 43760 ²⁾		Resistance thermometer Pt 1000	-200...+ 850 °C (-328...+1562 °F)	50 °C (90 °F)
	2, 3 and 4 wire	Resistance thermometer Ni 100	- 60...+ 250 °C (- 76...+ 482 °F)	8 °C (15 °F)
Resistance		Resistance thermometer Ni 500	- 60...+ 250 °C (- 76...+ 482 °F)	15 °C (28 °F)
		Ω	0...500 Ω /0...5000 Ω	5 Ω /50 Ω
Voltage		mV	-125 mV...+ 125 mV	2 mV
			-125 mV...+1200 mV	50 mV

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

²⁾ Edison Curve No. 7

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

$\leq 1\%$ U_s (< 500 Hz)

Power demand of indicators (only with AGLHD head)
(Power demand of transmitter and indicator have to be added)

Digital indicator

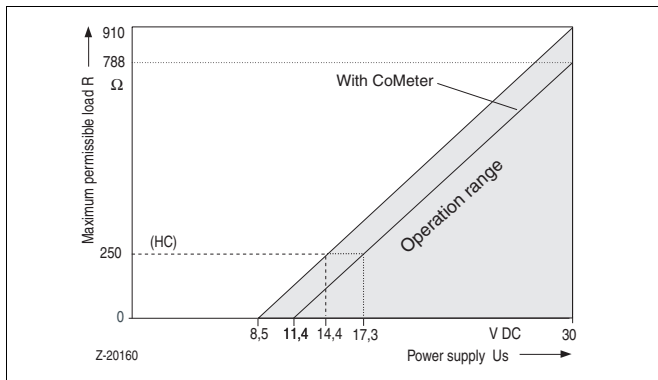
$U_{sd} = 2$ V DC

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 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 stability

$\leq 0.1\%$ p.a.

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 μ V
Linear resistance 500 Ω /5000 Ω ± 40 m Ω /200 m Ω
Linear voltage 120 mV/1200 mV ± 20 μ V/50 μ V

D/A measured error

$\pm 0.05\%$ of measuring span

Additional influence of the internal reference junction

Pt 100 DIN IEC 751 Kl. B

Influences

Influence of ambient temperature

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 Ⓔ 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	$L_i = 220 \text{ } \mu\text{H}$	$L_o = 1 \text{ mH}$
Internal capacitance	$C_i = 15 \text{ nF}$	$C_o = 1.55 \text{ } \mu\text{F}$

Zone 2

Marking Ⓔ 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- oder AGLH-Kopf)

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 wenn eingebaut in BUZH-, AGL- oder AGLH-Kopf)

⁴⁾ See 1. supplement PTB 99 ATEX 2139 X

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 ⁵⁾ Terminals for sensors ⁵⁾	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

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.

⁵⁾ Air discharge (at 1 mm distance)

Displays (option in conjunction with AGLHD head)

Digital display

- Process value, sensor value or loop current value indicator
- Fed through current loop
- LC display:
3½ digits (± 1999), digit height 10 mm, 7 segments
- Standard scaling 0...100 %
Linear scaling for measuring ranges and units possible
Description of the physical unit (labels)

CoMeter (HART configurator and LC display)

- 4 function keys for request and programming (Code protection)
- Fed through current loop
- LC display:
5 digits (± 1999), digit height 7,6 mm, 7 segments
- Sign and floating point
- 10 segment bargraph (heading of measuring range)
- 7 digits alphanumeric characters 6 mm, 14 segments

Dual function

- HART transmitter programming unit (all HART functions except for freely configurable characteristic curve and TAG Number)
- Process value, sensor value or loop current value indicator

Request function

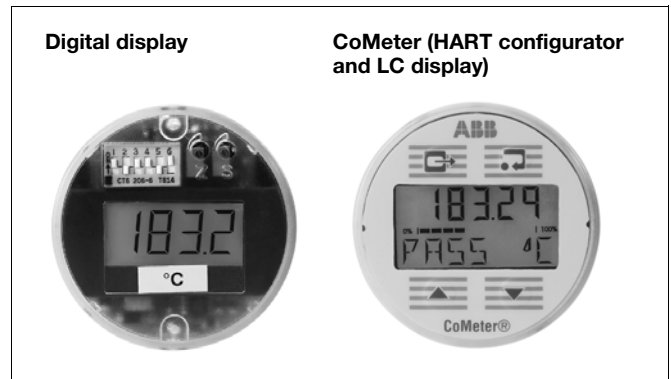
Process variable, analog and display value, description of measuring point, serial number, error behaviour, lower/upper measuring range limit

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	Digital display	CoMeter
Response time	0.5 s	1.3 s
Measuring error	± 0.1 %	± 0.15 %
Overtoltage or maximum current	150 % of input range	215 mA
EMC	EN 50082-2	
Temperature	-20...+70 °C	
Humidity	0...100 %, condensating permitted	

Mind limits of application

Communication/parameterization

Hand held terminal HHT

691HT, STT04, HHT275

CoMeter

Hart configurator and LC display

Device Management Tool

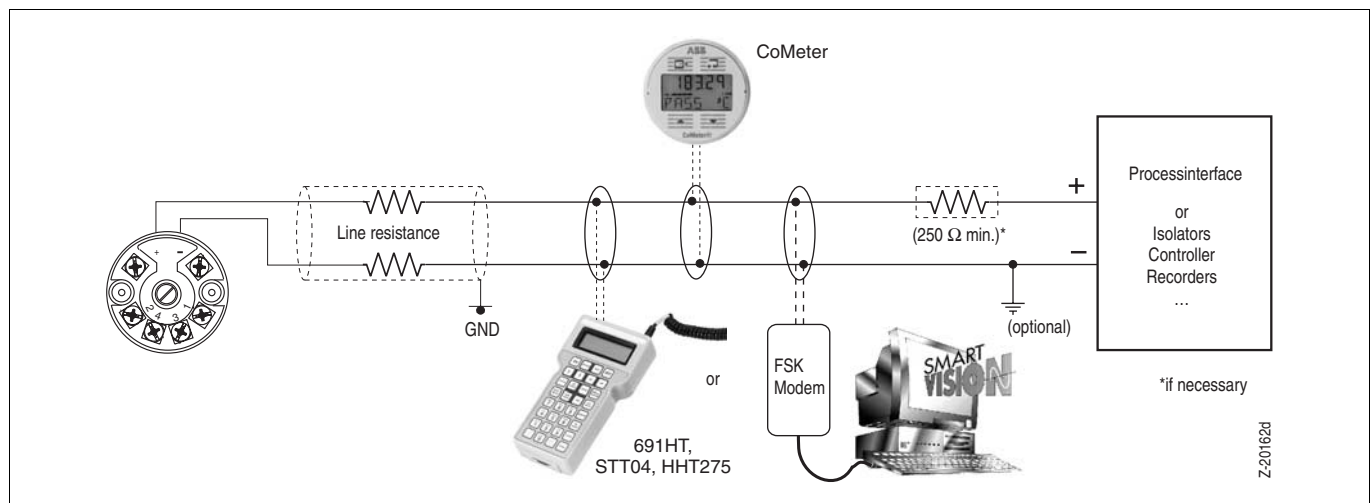
SV401 (SMART VISION)

Parameter

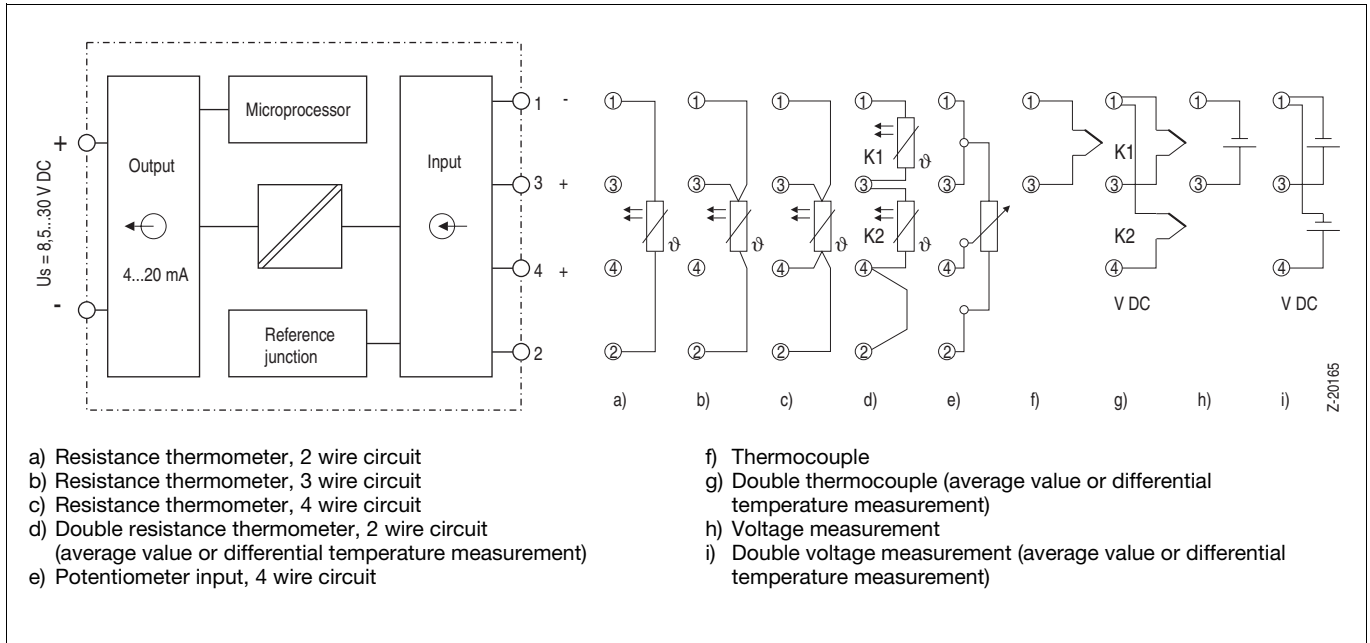
Sensor type, error signalling, measuring range, general characteristics (i. e. TAG number), damping, signal simulation of output

Software interface

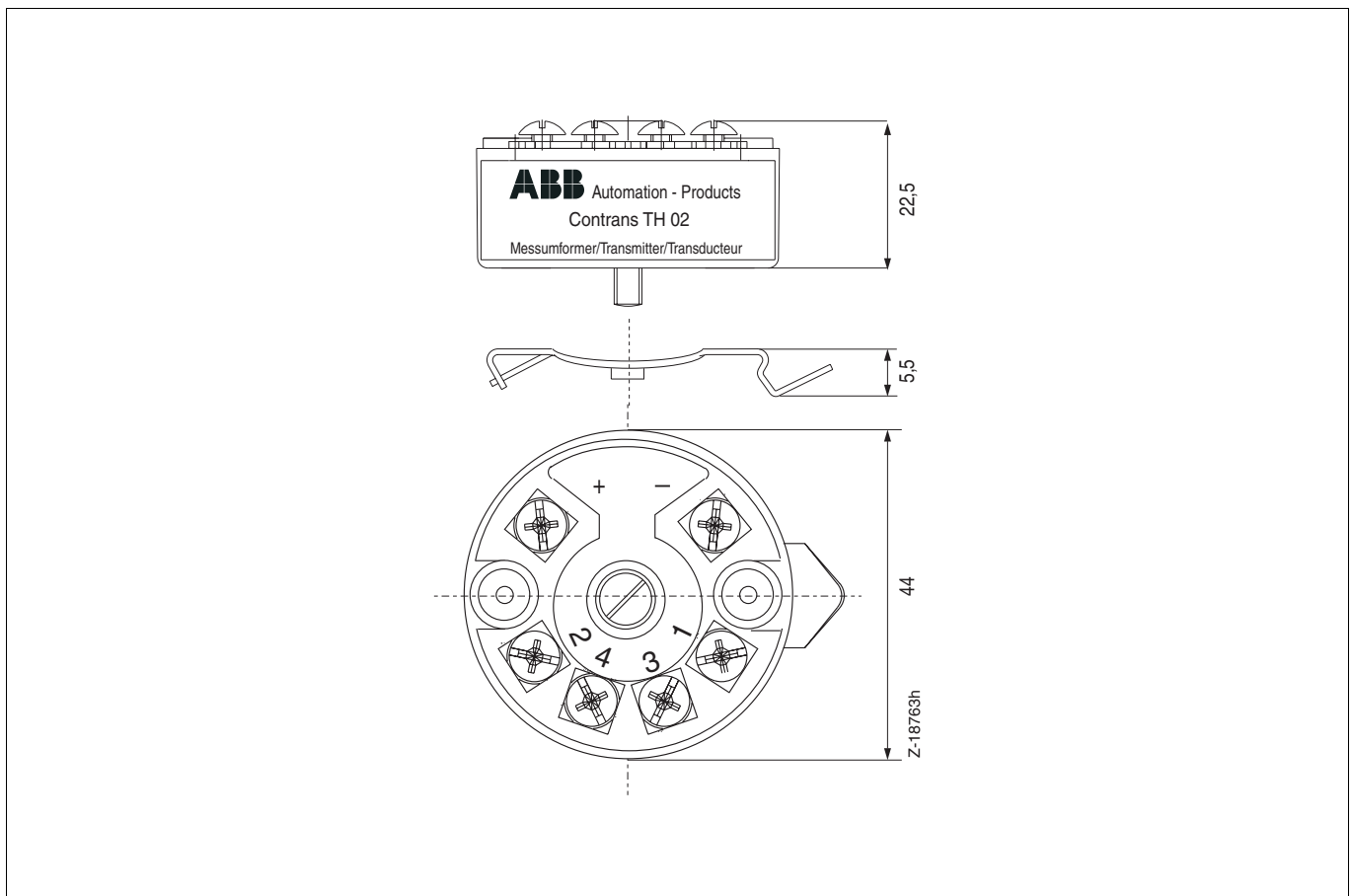
AMS, Cornerstone



Connection diagram



Dimensional diagram (dimensions in mm)



Ordering information

		Catalog No.			
TH02/TH 02-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 (completely head with raised cover)			K		
AUZH head			V		
AUSH head			U		
AGL head ¹⁾ without display			X		
AGLHD head ¹⁾ with digital display			D		
AGLHD head ¹⁾ with cometer			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:					
Aluminium 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		
Aluminium field housing 80 x 175 x 57 mm, IP 65; 1 x M16 x 1.5; 1 x M20 x 1.5 with separate terminal block			F		
Polyester field housing 75 x 190 x 55 mm, IP 65; 1 x M16 x 1.5; 1 x M20 x 1.5 with separate terminal block			E		
Notice: Other field housings with several transmitters or specially for pipe mounting on request.					
Programming					
Factory standard parameter Pt 100, 0...100 °C, 4 wire circuit, damping off, direct action characteristic overranging at sensor or device error (22 mA)			0		
Customer-specific parameter setting (questionnaire)			1		
Calibration certificates					
without			0		
2 point			1		
9 point			2		
Accessories					
		Catalog No.			
ABB FSK modem [EEx ib] IIC (parameter setting in the installation)		see Data Sheet 10/63-6.71 EN			
Device Management Tool SV401 (SMART VISION)		see Data Sheet 10/63-1.20 EN			
TH02 /-102 /-202 driver for AMS software 1.4 (Rosemount) ²⁾		7957771			

¹⁾ Standard: Aluminium, 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)

²⁾ already integrated in AMS software version 5.0 or higher

Notice: For a lokal programming on the desk can used as Hardware the universal FSK-Programming-Set (without Parasoft) (see Data Sheet 10/63-6.71 EN: ordering information) .

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