TH 02 / TH 02-Ex

Head mounted temperature transmitters, HART programmable, Pt 100 (RTD), thermocouples, electrical isolation

10/11-8.19 EN

- **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
- **Electrcal isolation (I/O))**
- **Measured error 0.1 %**
- **Customer-specific linearization**
  - 32 tie points
- **Continuous sensor and self-monitoring**
  - Parameter saved permanently in EEPROM
  - Monitoring of data integrety every 10 s
- **Substitution strategy in case of error (NE43)**
- **Approvals for explosion protection**
  - intrinsically safe Ex II 2 G EEx [ia] ib IIC T6, mount in zone 1
    Ex 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**
  - PC software application SMART VISION
  - Hand held terminals HC 275, STT 04
  - CoMeter (HART configurator/LC display)
- **5 years warranty**

Technical data

Output

Output signal (temp. linear)	4...20 mA
Residual ripple (peak-to-peak)	< 0.3 %
Current consumption	< 3.6 mA
Max. output current	23.6 mA
Parameterizable current error signal	
Underranging	3.6 mA
Overranging	22 mA
Default value	3.6...22 mA
Damping	t_{63} = 0...30 s

Input

Resistance

Resistance thermometer (IEC 751, JIS, SAMA)	n · Pt100/Ni100 to Pt1000/Ni1000; Cu (n = 0.1; 0.2; 0.5; 1; 1.2; 2; 3...10)
min. span	15 K/50 K
Resistance	0...500 Ω/0...5000 Ω
min. span	5 Ω/50 Ω
Max. 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	
Sensor wire break detection	
3 wire resistance measurem.	> 35 Ω
4 wire resistance measurem.	> 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
Min. span	2 mV/50 mV
Sensor monitoring current	70 nA
Sensor wire break monitoring in accordance with NAMUR	
Thermocouple measurement	> 5 kΩ
Voltage measurement	> 5 kΩ
Input filter	50/60 Hz
Internal reference junction	Pt 100, via software switchable (no jumper necessary)

Power supply (poling protected)

(2 wire methode: power supply wires = signal wires))

Supply voltage	U_s = 8.5...30 V DC
for explosion protection application, max.	U_i = 8.5...29.4 V DC
Influence of supply voltage	< 0.05 %/10 V
max. residual ripple	≤ 1 % U_S (< 500 Hz)

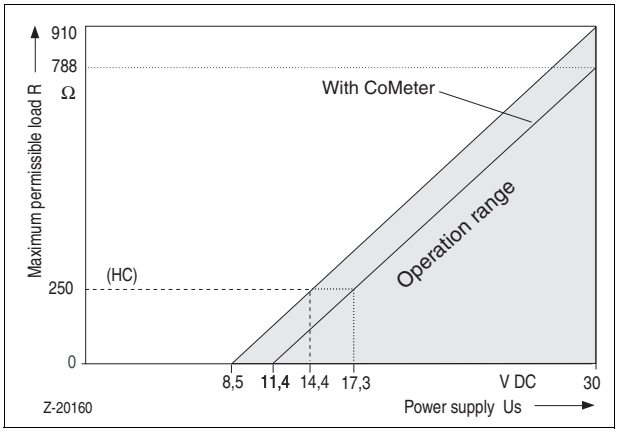
Power demand of indicators (only with AGLHD head)

(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

Maximale Load

$$R(k\Omega) = \frac{(Usmax - Usmin)}{23.6}$$



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] 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	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

Technical data

General characteristics

Output signal refreshment rate	
Pt100	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 68 part.2-6
Resistance to shock	2 g acc. to DIN IEC 68 part.2-27
Electrical isolation (I/O)	1.5 kV AC (60 s)
Long-term stability	≤ 0.1 % p.a.

Environment conditions

Ambient temperature range	–40...85 °C
Transport and storage temperature	–40...100 °C
Relative humidity (100 % humidity with isolated terminals only)	< 100 %
condensation	permitted

Mechanical construction

Dimensions	cf. dimensional drawing
Weight	55 g
Housing material	Polycarbonat
Color (Epoxy)	black (Non-Ex type) blue (Ex-type)
Terminals, pluggable	2.5 mm^2, screw terminals (stainless steel screws)

Characteristics at rated conditions[1)]

(acc. to IEC 770, related to 25 °C)

Deviation from zero / span	< 0.1 % or 0.1 K, whichever value is greater
Characteristic deviation	< 0.1 % or 0.1 K, whichever value is greater
Additional influence of the internal reference junction	Pt 100 DIN IEC 751 cl. B

Influences

Influence effect of temperature

Pt 100/resistance measurement[2)]

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

Thermocouple/mV[3)]

$$< (0.05\ \% + \frac{\text{ME (mV)}}{\text{MS (mV)}} \times 0.01\ \% + \frac{0.014\ \text{K}}{\text{MS (K)}} \times 100\ \%) / 10\ \text{K}$$

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): Effect of temperature influence
< (0.05 % + 0.013 %)/10 K = 0.063 %/10 K
3) Type K (0...1000 °C): Effect of temperature influence
< (0.05 % + 0.01 % + 0.014 %)/10 K = 0.074 %/10 K

Explosion protection

Intrinsically safe

Zone 1	⟨Ex⟩ II 2 G EEx [ia] ib IIC T6
EC certificate	PTB99 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 = 145 mA[4)]
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

Zone 2	⟨Ex⟩ II 3 G EEx n A II T6
Conformity declaration	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, Group A, B, C, D T6
Class I, Zone 0, Group IIC T6
CSA Class I, Div.1 and Div.2, Group A, B, C, D T6
Class I, Zone 0, Group IIC T6
(Class II Group E,F,G; Class III if build in BUZH head, AGL head or AGLH head)

Nonincendive
FM Class I, Div.2, Group A, B, C, D, T6
CSA Class I, Div.2, Group A, B, C, D, T6
(Class II, Group E, F, G; Class III if build in BUZH head, AGL head 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:			1000-4-2
contact plate (indirect)	8 kV	no influence	
terminals for supply[5)]	6 kV	no influence	
terminals for sensors[5)]	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

Acc. 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.

4) Load current for connected primary element [ia] < 1.5 mA
5) Air discharge (at 1 mm distance)

Displays (Option) only 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)
- 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

Digital display

CoMeter (HART configurator) and LC display

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 %
Overvoltage or maximum current	150 % of input range	215 mA
EMC	EN 50082-2	
Temperature	-20...+70 °C	
Humidity	0...100 %, condensation permitted	

Mind limits of application.

Communication/parameterization

Hand held terminal HHT

HC 275, STT 04

Cometer

HART configurator and LC display

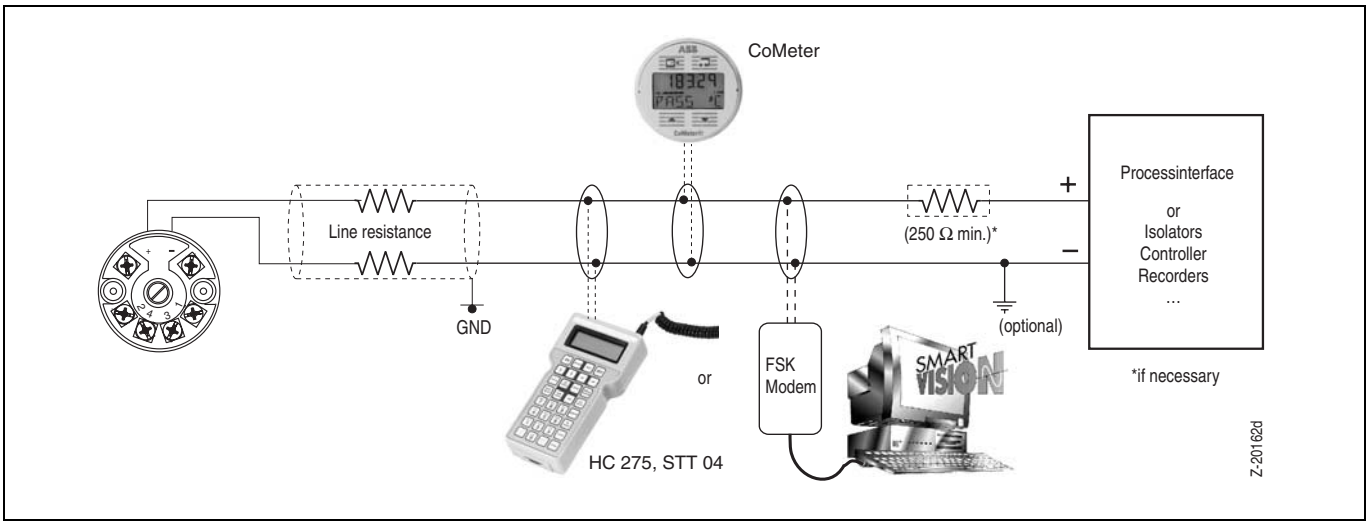
Software-Tool

SMART VISION

Parameter

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

Software interface AMS, Cornerstone



Ordering information

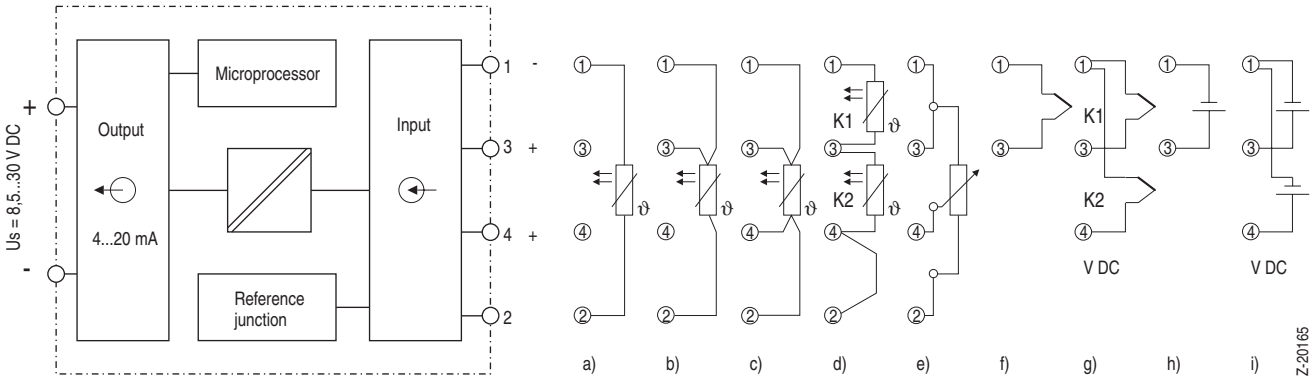
			Catalog No.					
TH 02 / TH 02-Ex			**V11518-**					
TH 02	(without Ex)		1					
Type of protection: intrinsically safe								
TH 02-Ex	ATEX	**Zone 1:** II 2 G EEx [ia]ib IIC T6	5					
TH 02-Ex N	ATEX	**Zone 2:** II 3 G EEx n A II T6	N					
TH 02-Ex	FM	**IS** Class I, Div. 1, Group A, B, C, D T6 altenatively Class I, Zone 0, Group IIC T6	7					
TH 02-Ex	CSA	**IS** Class I, Div.1 and Div.2, Group A, B, C, D T6 altenatively Class I, Zone 0, Group IIC T6 (Class II Group E,F,G; Class III If build in BUZH head, AGL head or AGLH head) **Nonincendive**, Class I, Div. 2, Group A,B,C,D, T6 (Class II, Group E,F,G; Class III if built in BUZH head, AGL head or AGLH head)	9					
TH 02-Ex N	FM	**nonincendive**, Class I, Div. 2, Group A,B,C,D, T6	M					
Construction								
Module (h=22,5mm)				3				
Module (h=22,5 mm) with sensor connecting line				1				
Module (h=22,5 mm) with snap-on fixing				4				
Module (h=27,5mm) for mounting on measuring module				Z				
Module built into connection head or cover with sensor connecting line								
BUZH head				R				
BUSH head				P				
BUKH head				M				
BUKH Ex-head				N				
Raised B-head cover				L				
B head (completely head with raised cover)				K				
BBKH head				S				
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 PG 11				A				
Polyester field housing 75 x 80 x 55 mm, IP 65; 2 x PG 11				9				
Aluminium field housing 80 x 175 x 57 mm, IP 65; 1 x PG 11; 1 x PG 13,5 with separate terminal block				F				
Polyester field housing 75 x 190 x 55 mm, IP 65; 1 x PG 11; 1 x PG 13,5 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 circut, damping off, direct action characteristic overranging at sensor or device error (22 mA)			0			
Customer-specific parameter setting (questionnaire)					1			
Calibration certificates		without				0		
		two-point				1		
		nine-point				2		

Accessories	Catalog No		
H&B FSK modem [EEx ib] IIC (parameter setting in the installation)	see Data Sheet 10/63-6.71 EN		
SMART VISION Software	see Data Sheet 10/63-1.20 EN		
TH 02 / -102 / -202 driver for AMS software 1.4 (Rosemount)	7957771		

[1] Standard: Aluminium; metal-cable-srew-connection M20x1,5 EEx e or EEx d;
protecive pipe connection M24x1,5 (optional M20x1,5; 1/2" NPT; 3/4" NPT, stainless steel)

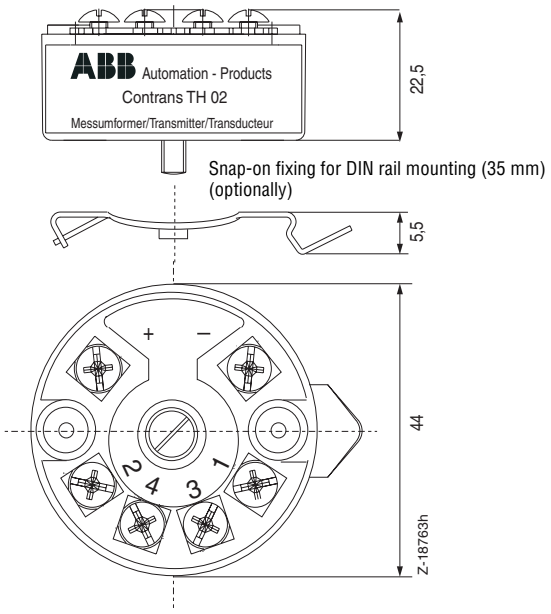
Notice:
For a lokal programming on the desk can used <u>as Hardware</u> the universal FSK-Programming-Set (without Parasoft).
(see Data Sheet 10/63-6.71 EN: ordering information)

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
e) Potentiometer input (4 wire circuit)
f) Thermocouple
g) Double thermocouple
h) Voltage measurement
i) Double voltage measurement

Dimensional diagramm (dimension in mm)



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