Temperature Transmitter
ETS 4100 Ex applications

Integrated temperature probe | **Accuracy 0.4 %**

Intrinsically Safe, Dustproof enclosure
Non-Sparking,
ATEX, IECEx, double approval
HART interface
Optional pressure measurement

Description:

The ETS 4100 with HART interface is an intrinsically safe electronic temperature transmitter for monitoring of temperature in hydraulic systems.

The double approval in accordance with ATEX and IECEx enables universal, almost worldwide utilisation of the devices in potentially explosive atmospheres.

Based on a silicon semiconductor device and corresponding evaluation electronics, the temperature sensor is designed to measure temperatures within a range of -25 °C .. +100 °C.

In addition to the analogue 4 .. 20 mA output of the measured value, digital communication is possible by means of the HART protocol.

The instrument provides the option of a pressure sensor. The pressure signal is given out as a digital signal via the HART protocol and the temperature signal is still available as an analogue signal (4 .. 20 mA).

The main fields of application are in the oil & gas industry, gas turbines. The device is also used in mining applications as well as in locations with high dust contamination.

Protection types and applications:

ATEX

I M1	Ex ia	I	Ma
II 1G	Ex ia	IIC	T6,T5 Ga
II 1/2G	Ex ia	IIC	T6,T5 Ga/Gb
II 2G	Ex ia	IIC	T6,T5 Gb
II 1D	Ex ia	IIIC	T85 °C/T95 °C Da
II 1D	Ex ta	IIIC	T80/90/100 °C T_{500}90/ T_{500}100/ T_{500}110 °C Da
II 2D	Ex tb	IIIC	T80/T90/T100 °C Db
II 3G	Ex nA	IIC	T6, T5, T4 Gc
II 3G	Ex ic	IIC	T6, T5, T4 Gc
II 3D	Ex tc	IIIC	T80/T90/T100 °C Dc
II 3D	Ex ic	IIIC	T80/T90/T100 °C Dc

IECEx

Ex ia	I	Ma
Ex ia	IIC	T6,T5 Ga
Ex ia	IIC	T6,T5 Ga/Gb
Ex ia	IIC	T6,T5 Gb
Ex ia	IIIC	T85/T95 °C Da
Ex ta	IIIC	T80/T90/T100 °C Da T_{500}90/T_{500}100/T_{500}110 °C Da
Ex tb	IIIC	T80/T90/T100 °C Db
Ex nA	IIC	T6,T5,T4 Gc
Ex ic	IIC	T6,T5,T4 Gc
Ex tc	IIIC	T80/T90/T100 °C Dc
Ex ic	IIIC	T80/T90/T100 °C Dc

Technical data:

Input data		
Measuring range	-25 .. +100 °C	
Probe lengths	10.7; 50; 100; 250; 350 mm	
Probe diameter	8 mm	
Pressure resistance	600 bar (probe length 10.7 mm) 125 bar (probe length ≥ 50 mm)	
Mechanical connection	G1/4 A ISO 1179-2	
Tightening torque, recommended	20 Nm	
Parts in contact with fluid	Stainless steel: 1.4571; 1.4301 Seal: FKM	
Output data		
Output signal, permitted load resistance	4 .. 20 mA, 2-conductor, with HART protocol $R_{Lmax.}=(U_B - 12\ V) / 20\ mA\ [k\Omega]$ for HART communication min. 250 Ω	
HART Communication	Acc. to HART 7 specifications	
HART Common Practice Commands i.e.	Altering of measuring range limits (see table)	
Accuracy (at room temperature)	≤ ± 0.4 % FS typ. ≤ ± 0.8 % FS max.	
Temperature drift (environment)	≤ ± 0.01 % FS / °C	
Response time acc. to DIN EN 60751	t_{50}: ~ 10 s t_{90}: ~ 15 s	
Environmental conditions		
Operating/ambient/ fluid temperature range [1) 2)]	T6, T80/T85 °C, T_{500}90 °C T5, T90/T95 °C, T_{500}100 °C T100, T_{500}110 °C T4	Ta = -40 .. +60 °C / -20 .. +60 °C Ta = -40 .. +70 °C / -20 .. +70 °C Ta = -40 .. +80 °C / -20 .. +80 °C Ta = -40 .. +85 °C / -20 .. +85 °C
Storage temperature range	-40 °C .. +100 °C	
CE mark	EN 61000-6-1 / 2 / 3 / 4; EN 60079-0 / 11 / 15 / 26 / 31; EN 50303	
Vibration resistance acc. to DIN EN 60068-2-6 at 10 .. 500 Hz	≤ 20 g	
Protection class acc. to DIN EN 60529 [3)]	IP 67	
Relevant data for Ex applications	**EX ia, ic**	**Ex nA, ta, tb,tc**
Supply voltage	12 .. 28 V DC	12 .. 28 V DC
Max. input current	Ii = 100 mA	
Max. input power	Pi = 0.7 W	Max. power consumption ≤ 1W
Connection capacitance of the sensor	Ci = ≤ 22 nF	
Inductance of the sensor	Li = 0 mH	
Insulation voltage	50 V AC, with integrated overvoltage protection acc. to EN 61000-6-2	
Other data		
Residual ripple of supply voltage	Acc. to FSK Physical Layer Specification (HCF_SPEC_054)	
Current consumption	≤ 25 mA	
Weight	~ 280 g (probe length 010) ~ 315 g (probe length 050,100) ~ 350 g (probe length 250) ~ 385 g (probe length 350)	

Note: Reverse polarity protection of the supply voltage, overvoltage, override and short circuit protection are provided.
FS (**F**ull **S**cale) = relative to complete measuring range
B.F.S.L. = **B**est **F**it **S**traight **L**ine

1) -20 °C with FKM seal, -40 °C on request
2) With M12x1 male connector, only up to -25 °C
3) With mounted mating connector in corresponding protection class

Measuring range limits:

By means of HART Common Practice Commands, you have the opportunity to adjust the following measuring range limits:
Measuring range limits of the primary variable, temperature:

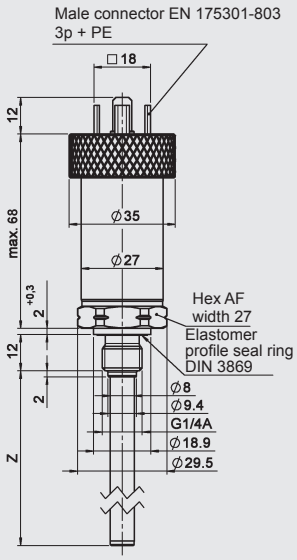
Lower measuring range limit		Upper measuring range limit		Measuring span	
min	max	min	max	min	max
-25 °C	75 °C	0 °C	100 °C	25 °C	125 °C

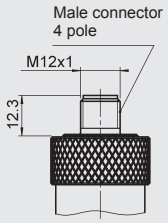
Fields of application:

Code no. for use in model code	1			9	A	C
ATEX DEKRA 13ATEX0031X DEKRA 13ATEX0032	I M1 Ex ia I Ma	II 1G Ex ia IIC T6,T5 Ga II 1/2G Ex ia IIC T6,T5 Ga/Gb II 1D Ex ia IIIC T85/T95 °C Da	II 2G Ex ia IIC T6,T5 Gb	II 3G Ex nA IIC T6,T5 Gc	II 1D Ex ta IIIC T80/T90 °C T_{500}90/T_{500}100 °C Da II 2D Ex tb IIIC T80/T90 °C Db	II 3G Ex ic IIC T6,T5 Gc II 3D Ex ic IIIC T80/T90 °C Dc
IECEx DEK 14.0011X	Ex ia I Ma	Ex ia IIC T6,T5 Ga Ex ia IIC T6,T5 Ga/Gb Ex ia IIIC T85/T95 °C Da	Ex ia IIC T6,T5 Gb	Ex nA IIC T6,T5 Gc	Ex ta IIIC T80/T90 °C T_{500}90/T_{500}100 °C Da Ex tb IIIC T80/T90 °C Db	Ex ic IIC T6,T5 Gc Ex ic IIIC T80/T90 °C Dc
Application fields	Mining Protection type: intrinsically safe ia with barrier	Gases/conductive dust Protection type: intrinsically safe ia with barrier	Gases Protection type: intrinsically safe ia with barrier	Gases Protection type: non-sparking nA	Conductive dust Protection type: dustproof enclosure	Gases/conductive dust Protection type: Intrinsically safe ic with barrier
Electrical connection (see model code)	5, 6	5, 6	5, 6	6	6	5, 6

Instruments for other protection types and zones (see cover) are available upon request.

Dimensions:

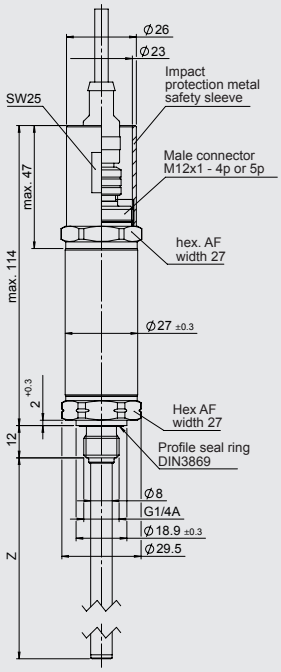




Probe length (Z)
10.7 mm
50 mm
100 mm
250 mm
350 mm

With impact protection metal safety sleeve:

Protection types and applications (code): 9,A
The impact protection metal safety sleeve is included. A straight mating connector is required for electrical connection. E.g. mating connector M12x1, 4 pole, straight, with 3 m shielded cable: ZBE 06S-03, part no. 6098243



Model code:

ETS 4 1 X X – F21 – XXX – E N X – 000

Mechanical connection
4 = G1/4 A ISO 1179-2

Electrical connection
5 = male, EN 175301-803, 3 pole+PE (IP 67 mating connector supplied)
6 = male M12x1, 4 pole

Output signal
F21 = 4 .. 20 mA, 2-conductor, with HART protocol

Probe lengths
010 = 10.7 mm
050 = 50 mm
100 = 100 mm
250 = 250 mm
350 = 350 mm

Approval
E = **ATEX; IECEx**

Insulation voltage:
N = 50 V AC to housing

Protection types and applications (code)

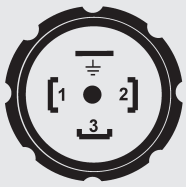
	ATEX				IECEx		
1 =	I M1	Ex ia	I	Ma	Ex ia	I	Ma
	II 1G	Ex ia	IIC	T6,T5 Ga	Ex ia	IIC	T6,T5 Ga
	II 1/2 G	Ex ia	IIC	T6,T5 Ga/Gb	Ex ia	IIC	T6,T5 Ga/Gb
	II 2 G	Ex ia	IIC	T6,T5 Gb	Ex ia	IIC	T6,T5 Gb
	II 1D	Ex ia	IIIC	T85 °C/T95 °C Da	Ex ia	IIIC	T85 °C/T95 °C Da
9 =	II 3G	Ex nA	IIC	T6, T5 Gc	Ex nA	IIC	T6, T5 Gc
	Only in conjunction with electrical connection "6" and the impact protection metal safety sleeve (see dimensions)						
A =	II 1D	Ex ta	IIIC	T80/T90 °C T_{500}90/ T_{500}100 Da	Ex ta	IIIC	T80/T90 °C Da T_{500}90/ T_{500}100 °C Da
	II 2D	Ex tb	IIIC	T80/T90 °C Db	Ex tb	IIIC	T80/T90 °C Db
	Only in conjunction with electrical connection "6" and the impact protection metal safety sleeve (see dimensions)						
C =	II 3G	Ex ic	IIC	T6, T5 Gc	Ex ic	IIC	T6, T5 Gc
	II 3D	Ex ic	IIIC	T80/T90 °C Dc	Ex ic	IIIC	T80/T90 °C Dc

Modification number
000 = standard

Accessories:
Appropriate accessories, such as mating connectors, can be found in the Accessories brochure.

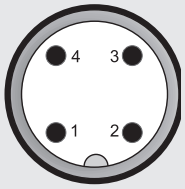
Pin connections:

EN 175301-803



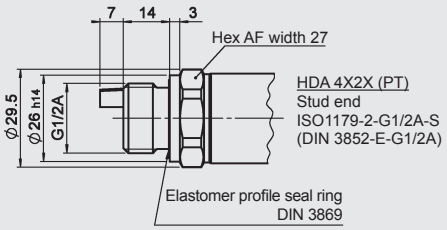
Pin	ETS 4xx5-F21
1	Signal +
2	Signal -
3	n.c.
⊥	PE

M12x1



Pin	ETS 4xx6-21
1	Signal +
2	n.c.
3	Signal -
4	n.c.

Dimensions with pressure measurement option:



Additional technical data with pressure measurement option:

Input data								
Measuring ranges	bar	16	40	60	100	250	400	600
Overload pressures	bar	32	80	120	200	500	800	1000
Burst pressure	bar	200	200	300	500	1000	2000	2000
Mechanical connection		G1/2 A ISO 1179-2 with probe						
Tightening torque, recommended		45 Nm						
Probe length		7 mm						
Output data								
Output signal Temperature		4 .. 20 mA with HART Protocol						
Output signal Pressure		available via HART protocol as a digital signal						
Accuracy acc. to DIN 16086, terminal based		≤ ± 0.25 % FS typ. ≤ ± 0.5 % FS max.						
Accuracy, B.F.S.L.		≤ ± 0.15 % FS typ. ≤ ± 0.25 % FS max.						
Temperature compensation Zero point		≤ ± 0.008 % / °C typ. ≤ ± 0.015 % / °C max.						
Temperature compensation Span		≤ ± 0.008 % / °C typ. ≤ ± 0.015 % / °C max.						
Non-linearity acc. to DIN 16086, terminal based		≤ ± 0.3 % FS max.						
Hysteresis		≤ ± 0.1 % FS max.						
Repeatability		≤ ± 0.05 % FS						
Long-term drift		≤ ± 0.1 % FS typ. / year						
Environmental conditions								
Compensated temperature range		-25 .. +85 °C						

Measuring range limits:

Additional measuring range limits of the secondary variable, pressure:

Lower measuring range limit		Upper measuring range limit		Measuring span	
min	max	min	max	min	max
0 % FS	112.5 % FS	37.5 % FS	150 % FS	37.5 % FS	150 % FS

Model code with temperature measurement option:

ETS 4 1 2 X – F21 – 007 – P – XXXX – E N X – XXX

Mechanical connection
2 = G1/2 A ISO 1179-2

Electrical connection
5 = male EN 175301-803, 3 pole+PE,
6 = male M12x1, 4 pole

Output signal
F21 = 4 .. 20 mA, 2-conductor, with HART protocol

Probe length
007 = 7 mm

With pressure measurement

Measuring ranges in bar
0016; 0040; 0060; 0100; 0250; 0400; 0600

Approval
E = **ATEX**
IECEx

Insulation voltage
N = 50 V AC to housing

Protection types and applications (code)

	ATEX				IECEx		
1 =	I M1	Ex ia	I	Ma	Ex ia	I	Ma
	II 1G	Ex ia	IIC	T6,T5 Ga	Ex ia	IIC	T6,T5 Ga
	II 1/2 G	Ex ia	IIC	T6,T5 Ga/Gb	Ex ia	IIC	T6,T5 Ga/Gb
	II 2 G	Ex ia	IIC	T6,T5 Gb	Ex ia	IIC	T6,T5 Gb
	II 1D	Ex ia	IIIC	T85 °C/T95 °C Da	Ex ia	IIIC	T85 °C/T95 °C Da
9 =	II 3G	Ex nA	IIC	T6, T5 Gc	Ex nA	IIC	T6, T5 Gc
	Only in conjunction with electrical connection "6" and the impact protection metal safety sleeve (see dimensions)						
A =	II 1D	Ex ta	IIIC	T80/T90 °C Da T_{500}90/ T_{500}100 °C Da	Ex ta	IIIC	T80/T90 °C Da T_{500}90/ T_{500}100 °C Da
	II 2D	Ex tb	IIIC	T80/T90 °C Db	Ex tb	IIIC	T80/T90 °C Db
	Only in conjunction with electrical connection "6" and the impact protection metal safety sleeve (see dimensions)						
C =	II 3G	Ex ic	IIC	T6, T5 Gc	Ex ic	IIC	T6, T5 Gc
	II 3D	Ex ic	IIIC	T80/T90 °C Dc	Ex ic	IIIC	T80/T90 °C Dc

Modification number:
000 = standard

Note:

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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