Frode Pedersen temperature sensors

Thermocouple for AMK/AKK/AK/BMK/BK

Data sheet 9107

Precious - and non- precious metal

Application

- For installation/exchange in our standard thermocouple assemblies
- For the following complete sensors
  - Data sheet 1101 T/C type AMK
  - Data sheet 1102 T/C type AKK
  - Data sheet 1103 T/C type AK
  - Data sheet 1104 T/C type BMK
  - Data sheet 1105 T/C type BK

Technical features

- Thermocouple type J, K, N, R, or S acc. to IEC 584-1 (EN60584-1)
- Tolerance acc. to IEC 581-1 (EN60584-1)
- Delivered with or without ceramic insulation

Ordering

The requested sensor is selcted from the table below
The colour code means:

Standard: Built of standard modules (short delivery time)

Variant: Modified standard modules

We are specialists in temperature measurement.
Please contact us and we
shall do our utmost to solve your specific measuring tasks

Thermocouple for AMK/AKK/AK

Thermocouple for BMK/BK

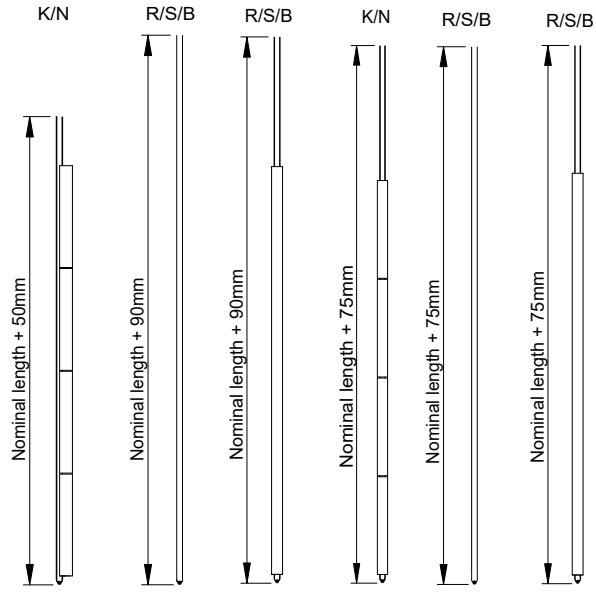


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

Ordering information

Specification number 9107- **Sensor**

Type

Sensor	T/C type	Data sheet	Add length	
BMK	Non-precious	1104	75 mm	0
BK	Non-precious	1105	75 mm	1
BK	Precious	1105	50 mm	2
AMK/AKK/AK	Non-precious	1101/1102/1103	50 mm	3
AMK/AKK/AK	Precious	1101/1102/1103	90 mm	4

Thermocouple type

Type IEC	Material	Diam. mm	Temperature °C Cont.	
J	Fe-CuNi	1.0	800	0 0
J	Fe-CuNi	1.5	800	0 1
K	NiCr-Ni	1.0	800	0 2
K	NiCr-Ni	1.38	900	0 3
K	NiCr-Ni	2.0	1000	0 4
K	NiCr-Ni	3.0	1000	0 5
N	Nicrosil-Nisil	1.5	1050	0 7
N	Nicrosil-Nisil	3.0	1150	0 9
S	Pt10%Rh-Pt	0.3	1300	1 0
S	Pt10%Rh-Pt	0.35	1400	1 1
S	Pt10%Rh-Pt	0.5	1450	1 2
R	Pt13%Rh-Pt	0.3	1300	1 3
R	Pt13%Rh-Pt	0.35	1400	1 4
R	Pt13%Rh-Pt	0.5	1450	1 5

Tolerance acc to IEC 584-1 (EN60584-1)

0	Class 2, for K and N, i.e. ±2.5°C or 0.0075 x t_{actual} (°C) 2)
1	Class 2, for R, and S, i.e. ±1.5°C or 0.0025 x t_{actual} (°C) 2)

Note 2: The highest value apply

Number of thermocouples

0	1
1	2

Nominal length (mm) 1)

0 5 0 0	500
0 7 1 0	710
1 0 0 0	1000
1 4 0 0	1400
2 0 0 0	2000
x x x x	Special

Note 1: Total length is nominal + add length (see 1. digit)

Insulation, ceramic

0	None (Standard for precious T/C). Fig. 2 og 5
1	D=5.5 L=50mm 2-bore insulation tube, KER 610. f/1.5mm wire. Fig 4
2	D=5.5 L=50mm 4-bore insulation tube, KER 610. f/1.0mm wire. Fig 4
3	D=6 L=50mm 1-bore insulation tube, KER 610. f/3mm wire. Fig 1
4	D=8.5 L=50mm 4-bore insulation tube, KER 610. f/2mm wire. Fig 1
5	D=8.5 OD. 2.5mm ID 4-bore insulation rod, KER 710. Fig 3 and 6
6	D=5.5 OD. 1.8mm ID 4-bore insulation rod, KER 710. Fig 3 and 6

SS-FP-9107-UK Version 202401

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AMETEK® SENSORS, TEST & CALIBRATION

Frode Pedersen temperature sensors

Measuring insert T

Inserts for thermocouple assemblies

Data sheet
9108-01

Application

- For installation/exchange in protective tubes and thernowells
- For the following complete sensors
  - Data sheet 1305/1307 Fig. 1 Sensor type BH, DS
  - Data sheet 1304/1306/1308 Fig. 2 Sensor type B, D, AF
  - Data sheet 1301/1304 (15mm) Fig. 3 Sensor type A, B
  - Data sheet 1803 Fig. 4 Sensor type UST 3

Technical features

- Thermocouple type J, K and N acc. to IEC-584-1 (EN60584-1)
- Type TK is a mineral insulated type, vibrationproof
- Type TS85 is specially constructed for exhaust sensor UST 3 (ships)
- Type T80/85 (tube+ceramic powder) is for older protective tubes w/ID 9 mm
- Mounted into the connection head by two spring loaded screws, thus ensuring a good thermal contact to the bottom of the protective tube (response time), and at the same time reducing vibration effects and compensating for expansions

Ordering

Please select the requested sensor from the table below
The colour code means:

Standard: Built of standard modules (short delivery time)

Variant: Modified standard modules

We are specialists in temperature measurement.
Please contact us and we shall
do our utmost to solve your specific measuring tasks

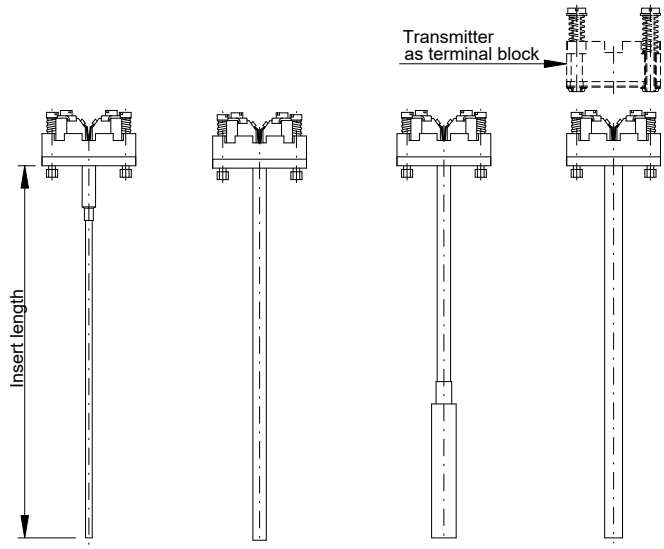


Fig. 1 TK80/115/125 | Fig. 2 TK80/115/125 | Fig. 3 TK80/115/125 | Fig. 4 TS85

Ordering information

Specification number 9108-01- [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ] **Measuring insert** **Transmitter** **4mA: °C 20mA: °C** 4)

Type

Fig.	Diam.	Data sheet	Sensor type	
Fig. 1	3	1305/1307	BH, DS	0
Fig. 2	6	1304/1306/1308	B, D, AF	1
Fig. 3	11	1301/1304	A, B	2
Fig. 4	8	1803	UST 3	3
T80/85	8	Std. tube w/ powder	A,B (old type)	4
TK125S	6	1101/1106	AMK/AKT	5

Length (mm)

Length = Insertion/nominal length + neck length + x mm 1)

175	0 1 7 5
225	0 2 2 5
275	0 2 7 5
290	0 2 9 0
315	0 3 1 5
325	0 3 2 5
375	0 3 7 5
435	0 4 3 5
475	0 4 7 5
525	0 5 2 5
735	0 7 3 5
1025	1 0 2 5
Interim lengths (Min. 100, max. 3025)	x x x x

Note 1: x=25mm for 1301/1304/1305/1308
x=23mm for 1306/1307/1803

Electrical connection

0	Terminalblock with screws
1	Transmitter FPTU galvanic isolated. As terminal block
3	Transmitter FPTU galvanic isolated. EEXiaIICT4/6. As terminal block
a	Transmitter FPTT galvanic isolated. As terminal block
c	Transmitter FPTT galvanic isolated. EEXiaIICT4/6. As terminal block
d	Transmitter FPTH, galvanic isolated. Hart/SIL. As terminal block
e	Transmitter FPTH, galvanic isolated. Hart/SIL.EEXiaIICT4/6.
4	None. Without terminal block. Long flying leads for transmitter
5	None. With terminal block, interchangeable w/transmitter via leads

Note 4: Please specify measuring range in °C

Tolerance acc. to IEC 584-1 (EN60584-1)

0	Class 2, for J, K and N, i.e. ±2.5°C or 0.0075 x t_{actual} (°C) 3)
1	Class 1, for J, K and N, i.e. ±1.5°C or 0.0040 x t_{actual} (°C) 3)

Note 3: The highest value applies

Hot Junction

0	Insulated from outer sheath
1	Grounded (thermocouple bonded to outer sheath)

Number of thermocouples

0	1
1	2 Only type J and K

Measuring insert / Max. temperature 2)

	Model	Thermocouple	Type	Continuously
0	TK80	Fe-CuNi	J	800°C
1	TK115	NiCr-Ni	K	1000°C
2	TK125	NiCrosil-Nisil	N	1000°C
3	TS85	NiCr-Ni	K	800°C
4	T80	Fe-CuNi	J	800°C
5	T85	NiCr-Ni	K	800°C
6	TK125S	NiCrosil-Nisil	N	1200°C

Note 2: The values apply for the thermocouple.

Accessories

Transmitter: See data sheet 9168

AMETEK®
SENSORS, TEST & CALIBRATION

TECHNICAL DATA

All dimensions in mm

Dimensions

Measuring inserts

Fig. 1
TK80/115/125

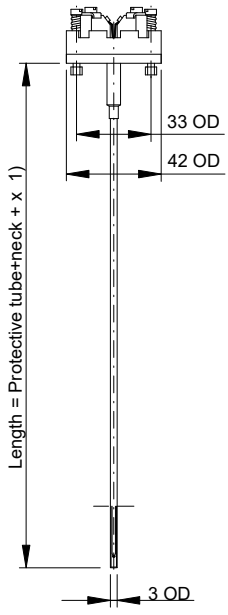


Fig. 2
TK80/115/125

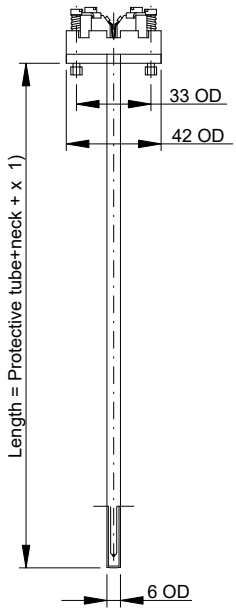


Fig. 3
TK80/115/125

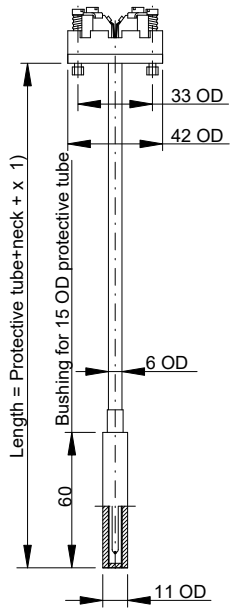
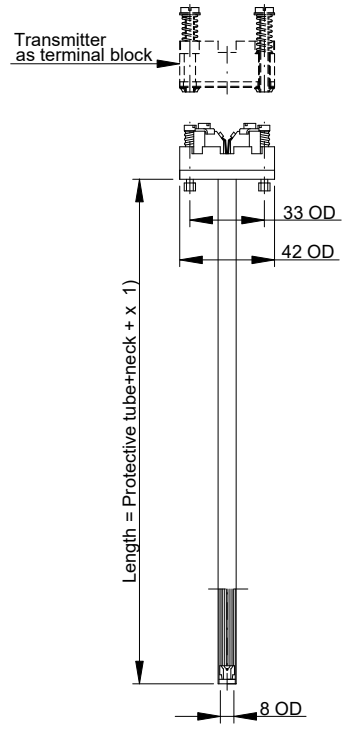


Fig. 4
TS85



Note 1: x=25mm for 1301/1304/1305/1308
x=23mm for 1306/1307/1803

Hot Junction

Thermocouple insulated from sheath

Insulation resistance and test voltage

Depending of temperature and length acc. to IEC 1515 (EN61515)

Thermo-couple	Length	Test temperature	Insulation resistance minimum	
	m	°C	M ohm x m	M ohm
All	≥1	20 ±15	1000	-
	<1	20 ±15	-	1000
J, K, N	All lengths	500 ±15	-	5

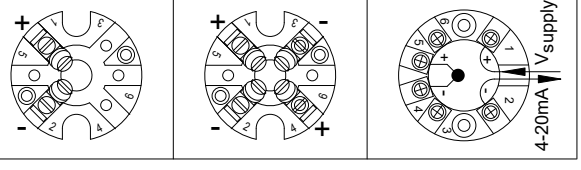
Depending of test voltage, diameter, and number of thermocouple

Diameter	Number of thermocouples			
	1		2	
	U	Rmin	U	Rmin
mm	Volt	M ohm x m	Volt	M ohm x m
3-8	500 ±50	1000	250 ±50	1000

Note:
The insulation resistance depends on the length of the insert. Therefore, it is listed as a length related resistance in Mohm x m for length > 1 meter and Mohm for length < 1 meter

Connection diagram

Thermocouple		Transmitter FPTU/T
Single TC	Duplex TC	



*) for model FPTH see separate datasheet

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SS-FP-T910601-UK. Version 202401

Frode Pedersen temperature sensors

Measuring insert M

Inserts for resistance thermometers

Data sheet
9108-02

Application

- For installation/exchange in protective tubes and thermowells
- For the following complete sensors
  - Data sheet 1406/1407 Fig. 1 Sensor type DS, BH
  - Data sheet 1403/1405/1810 Fig. 2 Sensor type B, D, BM
  - Data sheet 1401/1403 (15mm) Fig. 3 Sensor type A, B

Technical features

- Pt100 resistance thermometer acc. to IEC 751 (EN60751)
- 3-wire connection is standard
- Type MK60 is a mineral insulated type, vibrationproof
- Type M40 is in a standard steel tube filled with ceramic powder
- Mounted into the connection head by two spring loaded screws, thus ensuring a good thermal contact to the bottom of the protective tube (response time), and at the same time reducing vibration effects and compensating for expansions

Ordering

Please select the requested sensor from the table below
The colour code means:

Standard: Built of standard modules (short delivery time)

Variant: Modified standard modules

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Please contact us and we shall
do our utmost to solve your specific measuring task.

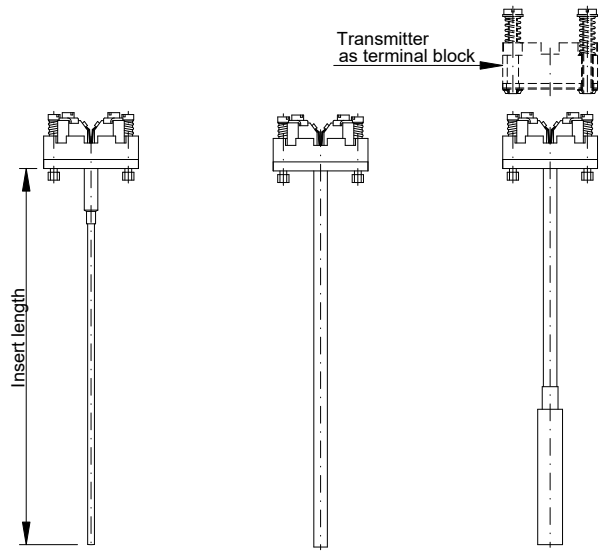


Fig. 1 MK60 | Fig. 2 M40/MK60 | Fig. 3 M40/MK60

Ordering information

Specification number	9108-02-	Measuring insert								Transmitter				
										4mA:	°C	20mA:	°C	3)

Insert type

Type	Fig.	Diam.	Temperature[1]	Data sheet	Sensor type	
MK60	Fig. 1	3	-196 + 600°C	1406/1407	DS, BH	0
M40	Fig. 2	6	-50 +400°C	1403/1405/1810	B, D, BM	1
MK60	Fig. 2	6	--196 +600°C	1403/1405/1810	B, D, BM	2
M40	Fig. 3	6/11	-50 +400°C	1401/1403	A, B	3
MK60	Fig. 3	6/11	-196 +600°C	1401/1403	A, B	4
M40	Fig. 2	8	-50 +400°C	Old type	A,B	5
MK60	Fig. 3	6/8	-196 +600°C	MI type	Old type	8

Note 1:
Total permissible range.
Actual working range: Value listed in section tolerance class

Length (mm)

Length = Insertion/nominal length + neck length + x mm 2)

175	0 1 7 5
225	0 2 2 5
275	0 2 7 5
290	0 2 9 0
315	0 3 1 5
325	0 3 2 5
375	0 3 7 5
435	0 4 3 5
475	0 4 7 5
525	0 5 2 5
735	0 7 3 5
1025	1 0 2 5
Interim lengths (Min. 100, max. 3025)	x x x x

Note 3 x=25mm for 1401/1403/1407/1810
x=23mm for 1405/1406

Electrical connection

0	Terminalblock with screws
1	Transmitter FPTM (Sensor only as 3-wire)
3	Transmitter FPTU galvanic isolated.
4	Transmitter FPTU galvanic isolated. EEXiaIICT4/6
d	Transmitter FPTH, galvanic isolated. Hart/SIL
e	Transmitter FPTH, galvanic isolated. Hart/SIL.EEXiaIICT4/6
5	None. Without terminal block. Long flying leads for transmitter
6	None. With terminal block, interchangeable w/transmitter via leads

Note 3: Please specify measuring range in °C

Connection. Wiring configuration

0	3-wire
1	4-wire
2	2-wire (always for 2xPt100 and OD 3mm)

Tolerance acc to IEC 751 (EN60751)

	Class	Value	Apply in the range for MK60	Apply in the range for M40
0	B	± (0.3°C + 0.005 x t_{actual})°C	-196+600°C	-50+400°C
1	A	± (0.15°C + 0.002 x t_{actual})°C	-100+450°C	-50+400°C
5	Special	± (0.05°C + 0.0013 x t_{actual})°C	-100+200°C	-50+200°C

Resistance value (Ω) acc. to IEC 751 (EN60751)

0	1xPt100
1	2xPt100 (MK60 max 8-wires, M40 max 6-wires)
2	1xPt1000

Accessories

Transmitter: See data sheet 9168

TECHNICAL DATA All dimensions in mm

Dimensions

Measuring inserts

Fig. 1
MK60

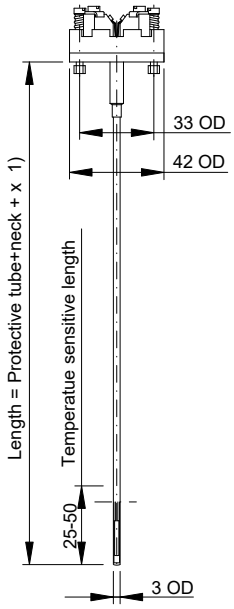


Fig. 2
M40/MK60

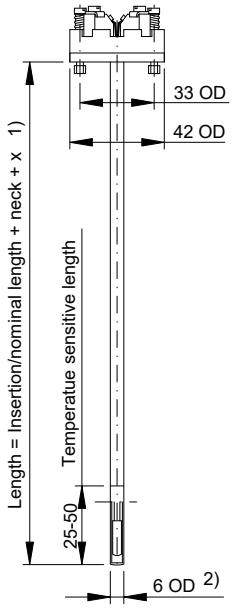
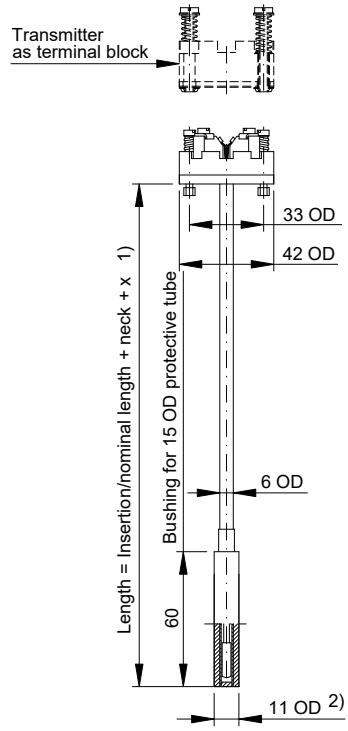


Fig. 3
M40/MK60



Note 1: x=25mm for 1401/1403/1407/1810
x=23mm for 1405/1406

Note 2: 8 OD for older types

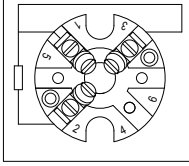
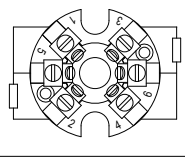
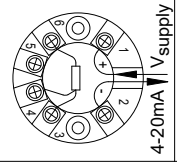
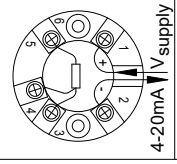
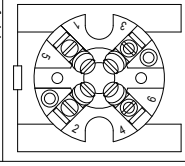
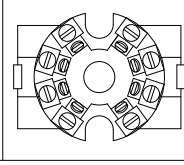
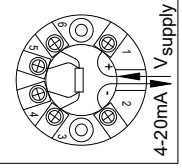
Insulation resistance

Depending of test voltage and diameter

Diameter mm	U Volt	Rmin M ohm x m
3 - 6	250	100

Note:
The insulation resistance depends on the length of the insert. Therefore, it is listed as a length related resistance in Mohm x m for length > 1 meter and Mohm for length < 1 meter

Connection diagram *) for model FPTH see separate datasheet

3-wire configuration				4-wire configuration			
Pt100 resistance		Transmitter FPTU *)	Transmitter FPTM *)	Pt100 resistance		Transmitter FPTU *)	
1xPt100 3-wire	2xPt100 3-wire			1xPt100 4-wire	2xPt100 4-wire		
							

SS-FP-M910802-UK. Version 202401

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Web: www.jofra.com

Frode Pedersen temperature sensors

Protective tubes and thermowells

Data sheet
9111

Application

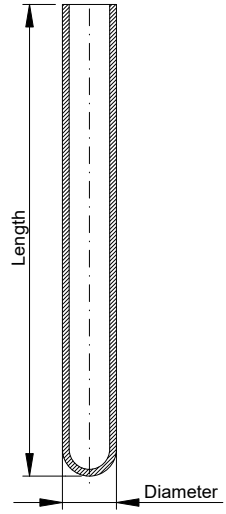
- Protective tube for thermocouple and resistance assemblies

Types

- Protective tubes in cearmic and steel. Thermowells for weld-in (drilled from bar stock) and screw in pockets (fabricated)

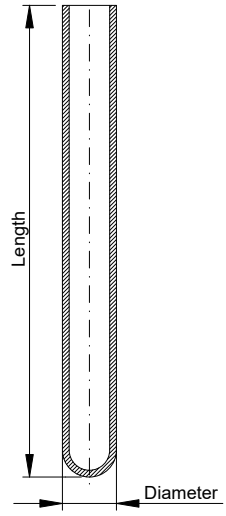
Ordering table for ceramic protective tube KER 610 (C610), max. 1400°C

Protective tube and inner tube for thermocouple assembly	Nominal length (sensor)	Length (tube)	Diameter OD/ID 10/7mm	Diameter OD/ID 15/11mm	Diameter OD/ID 24/19mm
Type	mm	mm	Item no.	Item no.	Item no.
	500	530		120065	On request
AMK data sheet 1101	710	740		120066	On request
AKK data sheet1102	1000	1030		120067	On request
AK data sheet 1103	1400	1430		120068	On request
	2000	2030		120069	On request
	500	520	121745		
BMK data sheet 1104	710	730	121746		
BK data sheet 1105	1000	1020	121747		
	1400	1420	121748		



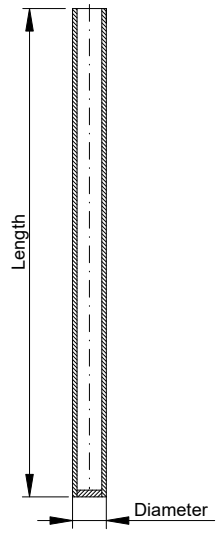
Ordering table for ceramic protective tube KER 710 (C799), max. 1700°C

Protective tube and inner tube for thermocouple assembly	Nominal length (sensor)	Længde (tube)	Diameter OD/ID 10/6mm	Diameter OD/ID 15/11mm	Diameter OD/ID 24/18mm
Type	mm	mm	Item no.	Item no.	Item no.
AMK data sheet 1101	500	530		120026	121509
AKK data sheet 1102	710	740		120027	120032
AK data sheet 1103	1000	1030		120028	120033
AKT data sheet 1106	1400	1430		120030	120035
	2000	2030		120031	120036
	500	520	121753		
BK data sheet 1105	710	730	121754		
	1000	1020	121755		
	1400	1420	121756		



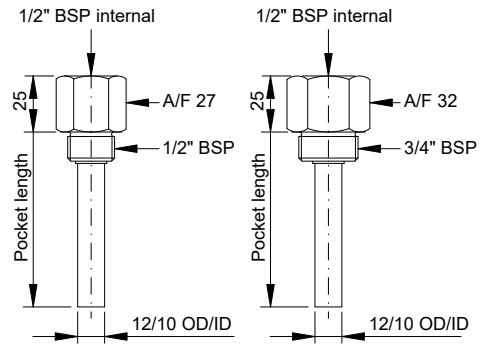
Ordering table for steel protective tube

Protective tube for thermocouple assembly	Nominal length (sensor)	Length (tube)	21.3/16mm OD/ID Heat resistant steel w.no 1.4749	26/18mm OD/ID Heat resistant steel w.no 1.4749	15/12mm OD/ID Heat resistant steel w.no 1.4841
Type	mm	mm	Item no.	Item no.	Item no.
	500	520	121757	121759	
	710	730	120078	120081	
AMK data sheet 1101	1000	1020	120079	121760	
	1400	1420	120080	121761	
	2000	2020	121758	121762	
	500	517			120082
BMK data sheet 1104	710	727			121763
	1000	1017			121764
	1400	1417			121765



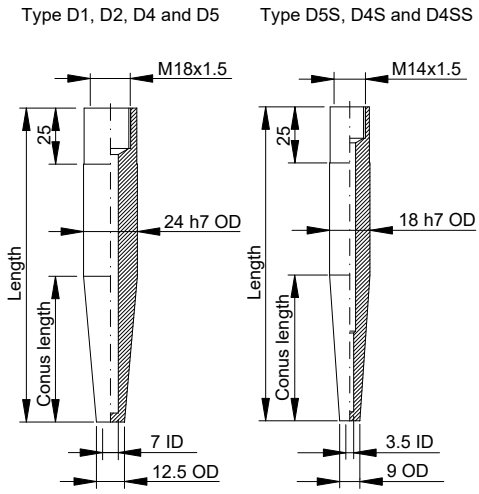
Ordering table for screw- in pocket

Pockets for resistance thermometer	Insertion length (sensor)	Insertion length (pocket)		Thread 1/2" BSP	Thread 3/4" BSP
Type	mm	mm		Item no.	Item no.
BF data sheet 1402	50	28		121716	121721
	100	78		121717	121722
	150	128		120084	121723
	200	178		121718	121724
	250	228		121719	121725
	400	378		121720	121726



Ordering table for weld- in thermowell DIN 43772 form 4

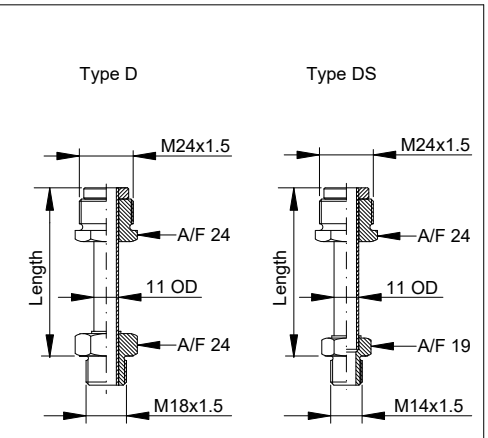
weld-in thermo well for thermocouple and resistance assemblies Type D and DS	Length	Conus-length	Steel W.no. 1.5415 16Mo3 Certificate 1) EN10204-3.1	Steel W.no. 1.7335 13CrMo4-5 Certificate 1) EN10204-3.1	Steel W.no. 1.7380 Certificate 1)	Steel W.no. 1.4404 AiSi 316L Certificate 1) EN10204-3.1
Well	mm	mm	Item no.	Item no.	Item no.	Item no.
D1	140	65	121727	120111	On request	121472
D2	200	125	121728	120113	On request	120115
D4	200	65	120119	120116	On request	120118
D5	260	125	120122	120120	On request	120121
D5S	115	40	121729	120128	On request	121671
D4S	140	65	121730	121307	On request	120124
D4SS	200	65	120127	120125	On request	121713



Note 1: Material certificates to be ordered separately
Certifikat EN10204-3.1 (3.1 B), item no. 121127

Ordering table for extension tube

Extension tube for thermocouple and resistance assemblies	Extension length	Length		
Type	mm	mm		Item no.
D data sheet 1306, 1405	52	68		121738
	102	118		121739
	152	168		120444
	202	218		121740
DS data sheet 1307, 1406	52	68		121741
	102	118		121742
	152	168		120443
	202	218		121743



OBS: Above items are standard length and diameters. Vi also offer special versions.
Please contact us and we will do our best to solve to solve your specific measuring task

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AMETEK®
SENSORS, TEST & CALIBRATION

SS-FP-9111-UK. Version 202401

Frode Pedersen temperature sensors

Process connection

Adjustable compression fittings and flanges

Data sheet
9113

Application

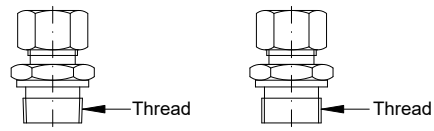
- For connecting sensors with adjustable attachment to the process

Types

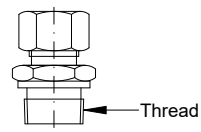
- Compression fittings with steel ferrule or teflon olive
- Compression fittings with ceramic sealing
- Flange +counter flange in cast iron with ceramic sealing
- Flange in stainless steel

Ordering table for compression fittings

Material: Stainless steel AiSi 316		With steel ferrule	With teflon olive	
For tube with diam. mm	Thread	max. 400°C, max. 40 bar Item no.	max. 100°C, max. 10 bar Item no.	British pipe thread
3	1/4"BSPT	121782	121806	BSPT tapered / BSPP parallel
4	1/4"BSPT	NA	121807	
4.5	3/8"BSPT	NA	121808	
4.5	1/2"BSPT	NA	121809	
6	1/4"BSPT	121786	121810	
6	3/8"BSPT	121787	121811	
6	1/2"BSPT	121788	121812	
8	3/8"BSPP	NA	121813	
8	1/2"BSPP	121790	NA	
15	3/4"BSPP	121791	NA	



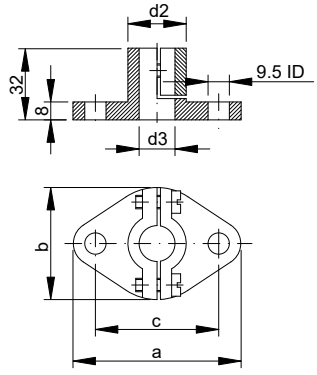
Material: Stainless steel AiSi 316		With steel ferrule	With teflon olive	
For tube with diam. mm	Thread NPT	max. 400°C, max. 40 bar Item no.	max. 100°C, max. 10 bar Item no.	American pipe thread
ø1,5	1/8" NPT	121792	121816	NPT tapered
ø3	1/8" NPT	NA	121817	
ø3	1/4" NPT	121794	NA	
ø6	1/4" NPT	NA	121819	
ø6	1/2" NPT	NA	121821	
ø15	3/4" NPT	121800	121824	



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Ordering table for connection flange DIN 43734

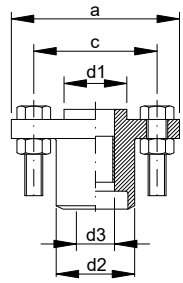
Material: Steel, W.no. 1.0401						
For tube with diam.	Dimensions mm					
mm	a	b	c	d2	d3	Item no.
15	76	50	55	26	16	120198
21.3/22	90	65	70	33	23	120199
26	90	65	70	35	29	121769
32	90	65	70	43	33	NA



Ordering table for counterflange DIN 43734

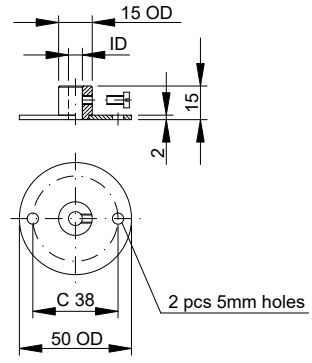
Material: Steel, W.no. 1.0401 Max. 1 bar, ceramic sealing						
For tube with diam.	Dimensions mm					
mm	a	c	d1	d2	d3	Item no.
15 (ceramic)	90	70	39	43	17	NA
15 (steel)	75	55	28	35	17	121831 [1)]
21.3/22 (steel)	90	70	39	43	24	120200 [1)]
24 (ceramic)	90	70	39	43	26	121772
26 (steel)	90	70	39	43	28	NA

Note 1: Inclusive connection flange



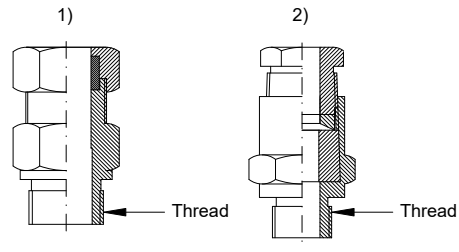
Ordering table for adjustable flange

Material: Steel, AISI 316		
For tube with diam.		
mm		Item no
6		120191
8		120993



Ordering table for compression fitting with ceramic sealing

Material: Steel, W.no. 1.0718		Max. 1 bar, ceramic sealing	
For tube with diam		Thread	
mm		BSPT	Item no.
15	2)	3/4"	121505
21.3/22	1)	1"	120368
26	2)	1 1/4"	121774
32	2)	1 1/4"	121704

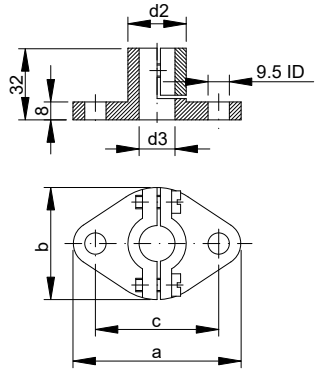


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Ordering table for connection flange DIN 43734

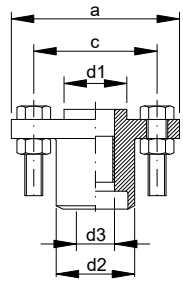
Material: Steel, W.no. 1.0401						
For tube with diam.	Dimensions mm					
mm	a	b	c	d2	d3	Item no.
15	76	50	55	26	16	120198
21.3/22	90	65	70	33	23	120199
26	90	65	70	35	29	121769
32	90	65	70	43	33	NA



Ordering table for counterflange DIN 43734

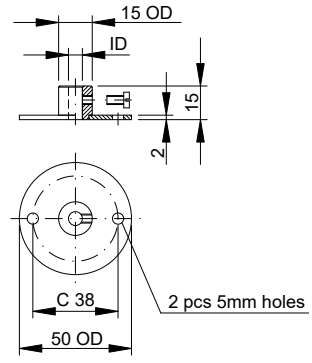
Material: Steel, W.no. 1.0401 Max. 1 bar, ceramic sealing						
For tube with diam.	Dimensions mm					
mm	a	c	d1	d2	d3	Item no.
15 (ceramic)	90	70	39	43	17	NA
15 (steel)	75	55	28	35	17	121831 [1)]
21.3/22 (steel)	90	70	39	43	24	120200 [1)]
24 (ceramic)	90	70	39	43	26	121772
26 (steel)	90	70	39	43	28	NA

Note 1: Inclusive connection flange



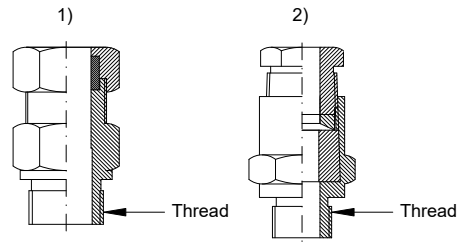
Ordering table for adjustable flange

Material: Steel, AISI 316		
For tube with diam.		
mm		Item no
6		120191
8		120993



Ordering table for compression fitting with ceramic sealing

Material: Steel, W.no. 1.0718		Max. 1 bar, ceramic sealing	
For tube with diam		Thread	
mm		BSPT	Item no.
15	2)	3/4"	121505
21.3/22	1)	1"	120368
26	2)	1 1/4"	121774
32	2)	1 1/4"	121704



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SS-FP-9113-UK. Version 202401

Frode Pedersen temperature sensors

Thermocouple wire

Insulated and bare wires

Data sheet
9152

Application

- Thermocouple wires are used to manufacture thermocouples according to all standard combinations in IEC 584-1 (EN60584-1)

Types

- Bare thermocouple wire
  The maximum temperatures stated depends on many factors such as ambient atmosphere, type of installation and diameter etc. The limits are for mechanically unloaded thermocouple wires under continious use in air not contaminated by noxious gasses
- Insulated thermocouple wire
  The temperature limits indicated apply to the insulation materals

Features

- The thermocouple voltage and tolerance are in accordance with IEC 584-1 (EN60584-1)
- Insulated non - precious metal thermocouple are delivered on spools with 100 or 500meter. For bare wires each leg on individually spools (paired)
- For precious metal thermocouple each leg are delivered on individually spools (paired)

Ordering

The requested type is selected from the table below

Ordering table for thermocouple wires

For thermocouple		Insulation		Conductors			Overall size	Weight	Designation	Item no.
Designation	Type	Single wire/ Outer sheath	Temperature °C	No. of cores	Core diameter mm	Resistance (f/a pair) ohm/m at 20°C	app. mm	g/m	PVC : P Silicone : S Fibreglass : GL	
Cu-CuNi	T	PVC/PVC	-10 +105	2	0.5	2.59	2.2x3.4 oval	12	PP	120763
Cu-CuNi		Fibreglass/ Fibreglass	-25 +400	2	0.5	2.59	1.1x1.9 oval	6	GLGL	120766
Fe-CuNi	J	PVC/PVC	-10 +105	2	0.5	3.11	2.2x3.4 oval	12	PP	120767
Fe-CuNi		Fibreglass/ Fibreglass	-25 +400	2	0.5	3.11	1.1x1.9 oval	6	GLGL	120769
NiCr-Ni	K	PVC/PVC	-10 +105	2	0.5	5.05	2.2x3.4 oval	12	PP	120770
NiCr-Ni		Fibreglass/ Fibreglass	-25 +400	2	0.2	31.49	0.6x1.0 oval	1.5	GLGL	120774
NiCr-Ni		Fibreglass/ Fibreglass	-25 +400	2	0.5	5.05	1.1x1.9 oval	6	GLGL	120775
NiCr-Ni	K	Bare	cont. 800 shortly 1000	2	1.0	1.26		13.5		120783
NiCr-Ni		Bare	cont. 900 shortly 1100	2	1.38	0.56		30		120781
NiCr-Ni		Bare	cont. 1000 shortly 1200	2	3.0	0.14		60		120787
NiCrosil-Nisil	N	Bare	cont. 1100 shortly 1200	2	1.5	0.56		30		120788
NiCrosil-Nisil		Bare	cont. 1150 shortly 1250	2	3.0	0.14		60		120789
Pt10Rh	S	Bare	cont. 1300 shortly 1600	2	0.3	4.22		2.92		120791
Pt10Rh		Bare	cont. 1400 shortly 1600	2	0.35	3.20		3.98		120790
Pt10Rh		Bare	cont. 1450 shortly 1600	2	0.50	1.56		8.12		120792
Pt13Rh	R	Bare	cont. 1300 shortly 1600	2	0.3	4.31		2.89		121674
Pt13Rh		Bare	cont. 1400 shortly 1600	2	0.35	3.16		3.94		120793
Pt13Rh		Bare	cont. 1450 shortly 1600	2	0.50	1.55		8.04		120794

TECHNICAL DATA

Tolerances and temperature ranges

Type	Tolerance Class 1	Working temperature range °C 1)	Tolerance Class 2	Working temperature range °C 1)	Tolerance Class 3	Working temperature range °C 1)
T	±0.5°C or 0.004 x t_{actual} (°C)	-40 +350	±1.0°C or 0.0075 x t_{actual} (°C)	-40 +350	±1.0°C or ±0.0015 x t_{actual} (°C)	-40 +350
J	±1.5°C or 0.0040 x t_{actual} (°C)	-40 +1000	±2.5°C or 0.0075 x t_{actual} (°C)	-40 +750		
K	±1.5°C or 0.0040 x t_{actual} (°C)	-40 +350	±2.5°C or 0.0075 x t_{actual} (°C)	-40 +1200	±1.0°C or ±0.0015 x t_{actual} (°C)	-200 +40
N	±1.5°C or 0.0040 x t_{actual} (°C)	-40 +1000	±2.5°C or 0.0075 x t_{actual} (°C)	-40 +1200	±2.5°C or ±0.0015 x t_{actual} (°C)	-200 +40
S	±1.0°C	0 +1100	±1.5°C or 0.0025 x t_{actual} (°C)	0 +1600		
S	±(1.0°C+0.003 (t_{actual} -1100))°C	+1100 +1600				
R	±1.0°C	0 +1100	±1.5°C or 0.0025 x t_{actual} (°C)	0 +1600		
R	±(1.0°C+0.003 (t_{actual} -1100))°C	+1100 +1600				
B			±1.5°C or 0.0025 x t_{actual} (°C)	+600 +1700	±4°C or ±0.005 x t_{actual} (°C)	+600 +1700

Note 1: The values apply for the T/C only and are not related to diam., insulation etc.

Colour code

	Type of thermocouple	Insulation sheath	Insulation positive	Insulation negative
IEC 584-4	Type T, Cu-CuNi	Brown	Brown	White
	Type J, Fe-CuNi	Black	Black	White
	Type K, NiCr-Ni	Green	Green	White
	Type R/S, PtRh-Pt	Orange	Orange	White
	Type B, PtRh-Pt	Grey	Grey	White
	Type N, NiCrosil-Nisil	Pink	Pink	White

Features

Bare thermocouple wire. Non- precious

Cu-conductor	Positive leg in T/C type Cu-CuNi (T). It consist of pure cupper free of oxygen.
Fe-conductor	Positive leg in T/C type Fe-CuNi (J). It consist of pure iron with max few hundredts of common inclusions.
CuNi-conductor	Negative leg in T/C type Cu-CuNi (T) and Fe-CuNi (J). It consist of 45% Ni and 55% Cu and a small content of Mn and Si.
NiCr-conductor	Positive leg in T/C type NiCr-Ni (K). It consist of Ni with app. 10% Cr. and added app. with 2% aluminium and other materials.
Ni-conductor	Negative leg in T/C type NiCr-Ni (K) It consist of Ni with app. 3% Mn and 2% Al. NiCr-Ni is also designated as Chromel-Alumel. The thermoelectrical properties are identical.
Nicrosil-conductor	Positive leg in T/C type Nicrosil-Nisil (N). It consist of Ni with 14% Cr and 1.5% Si.
Nisil-conductor	Negative leg in T/C type Nicrosil-Nisil (N). It consist of Ni with app. 4.5% Si and 0.1 Mg.

Bare thermocouple wire. Precious

Pt10Rh-conductor	Positive leg in T/C type Pt10%Rh-Pt (S). It consist of an alloy of pure Pt and 10% Rh
Pt13Rh-conductor	Positive leg in T/C type Pt13%Rh-Pt (R). It consist of an alloy of pure Pt and 13% Rh.
Pt-conductor	Negative leg in T/C type Pt10%Rh-Pt (S) and Pt13%Rh-Pt (R). It consist of an alloy of pure Pt
Pt30Rh-conductor	Positive leg in T/C type Pt30%Rh-Pt6%Rh (B). It consist of an alloy of pure Pt and 30% Rh.
Pt6Rh-conductor	Negative leg in T/C type Pt30%Rh-Pt6%Rh (B). It consist of an alloy of pure Pt and 6% Rh.

SS-FP-9152-UK. Version 202401

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Frode Pedersen temperature sensors

FPTU-FPTT-FPTM-FPTH transmitter

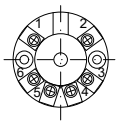
headmounted

Data Sheet 9168

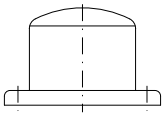
Application

- Conversion and linearization of thermocouples and Pt100 resistance thermometers signals into a temperature proprotional 4 -20mA standard current signal

As terminal block



In high cap



Technical features

- 2-wire transmitter
  Input for TC, Pt100, ohm or mV
  (FPTU, universal, FPTT only for thermocouple, FPTM only for Pt100, FHTH, universal and SIL, Hart)
- Programmable by means of a standard PC using an interface module
- For mounting in the sensor connection head as a terminal block or in a high cap
- Supplied in version with galvanic isolation and EEx/ATEX approved
- Version with EEx/ATEX approval acc. to EEXiaIICT1-T6 and SIL approval
- Programmable sensor error value acc. to Namur NE 43

Order information for FPTU

Specification number 9168- | | |

Type

FPTU galvanic isolated. In high cap (B-head)	2
FPTU galvanic isolated. EEXiaIICT4/T6. In high cap (B)	4
FPTU galvanic isolated. As terminal block	6
FPTU galvanic isolated. EEXiaIICT4/6. As terminal block	8

Configuration

Input type	Total range	Min. range		
Without configuration			0	0
Type B Pt30%Rh-Pt6%Rh	+400 +1820°C	200°C	0	1
Type E NiCr-CuNi	-100 +1000°C	50°C	0	2
Type J Fe-CuNi	-100 +1200°C	50°C	0	3
Type K NiCr-Ni	-180 +1372°C	50°C	0	4
Type N NiCrosil-Nisil	-180 +1300°C	50°C	0	5
Type R Pt13%Rh-Pt	-50 +1760°C	200°C	0	6
Type S Pt10%Rh-Pt	-50 +1760°C	200°C	0	7
Type T Cu-CuNi	-200 + 400°C	50°C	0	8
Type U Cu-CuNi (DIN)	-200 + 600°C	50°C	0	9
Type L Fe-CuNi (DIN)	-100 + 900°C	50°C	1	0
Pt100 2-wire	-200 + 850°C	25°C	1	2
Pt100 3-wire	-200 + 850°C	25°C	1	3
Pt100 4-wire	-200 + 850°C	25°C	1	4

Order information for FPTM

Specifications number 9168- | | |

Type

FPTM standard version. In high cap (B-head)	1
FPTM EEXiaIICT4/T6. In high cap (B-head)	3
FPTM standard version. As terminal block	5
FPTM EEXiaIICT4/T6. As terminal block	7

Configuration

Input type	Total range	Min. range		
Without configuration			9	0
Pt100 3-wire	-200 +850°C	25°C	3	3

Measuring range

Please specify measuring range in °C 4mA: °C. 20mA: °C

Accessories for FPTU - FPTT-FPTM-FPTH

Description	Catalogue no.
Silumin box (RM2) IP 54	120181
Looplink configuration software	121280
DIN-Rail clips	122634

Order information for FPTT

Specification number 9168- | | |

Type

FPTT galvanic isolated. In high cap (B-head)	2
FPTT galvanic isolated. EEXiaIICT4/T6. In high cap (B)	4
FPTT galvanic isolated. As terminal block	6
FPTT galvanic isolated. EEXiaIICT4/T6. As terminal block	8

Configuration

Input type	Total range	Min. range		
Without configuration			4	0
Type B Pt30%Rh-Pt6%Rh	+400 +1820°C	200°C	4	1
Type E NiCr-CuNi	-100 +1000°C	50°C	4	2
Type J Fe-CuNi	-100 +1200°C	50°C	4	3
Type K NiCr-Ni	-180 +1372°C	50°C	4	4
Type N NiCrosil-Nisil	-180 +1300°C	50°C	4	5
Type R Pt13%Rh-Pt	-50 +1760°C	200°C	4	6
Type S Pt10%Rh-Pt	-50 +1760°C	200°C	4	7
Type T Cu-CuNi	-200 + 400°C	50°C	4	8
Type U Cu-CuNi (DIN)	-200 + 600°C	50°C	4	9
Type L Fe-CuNi (DIN)	-100 + 900°C	50°C	5	0

Order information for FPTH (Hart protocol 5/7+SIL app)

Specification number 9168- | | |

Type

FPTH Hart/SIL In high cap (B-head)	2
FPTH Hart/SIL, EEXiaIICT4/T6. In high cap (B)	4
FPTH Hart/SIL. As terminal block	6
FPTH Hart/SIL EEXiaIICT4/6. As terminal block	8

Configuration

Input type	Total range	Min. range		
Without configuration			6	0
Type B Pt30%Rh-Pt6%Rh	+400 +1820°C	200°C	6	1
Type E NiCr-CuNi	-100 +1000°C	50°C	6	2
Type J Fe-CuNi	-100 +1200°C	50°C	6	3
Type K NiCr-Ni	-180 +1372°C	50°C	6	4
Type N NiCrosil-Nisil	-180 +1300°C	50°C	6	5
Type R Pt13%Rh-Pt	-50 +1760°C	200°C	6	6
Type S Pt10%Rh-Pt	-50 +1760°C	200°C	6	7
Type T Cu-CuNi	-200 + 400°C	50°C	6	8
Type U Cu-CuNi (DIN)	-200 + 600°C	50°C	6	9
Type L Fe-CuNi (DIN)	-100 + 900°C	50°C	7	0
Pt100 2-wire	-200 + 850°C	25°C	7	2
Pt100 3-wire	-200 + 850°C	25°C	7	3
Pt100 4-wire	-200 + 850°C	25°C	7	4

TECHNICAL DATA All dimensions in mm

Common specifications

- Supply voltage U_S
  - Standard version ..... FPTU 7.0-35VDC
    FPTT 7.0-35VDC
    FPTM 8.0-35VDC
  - EEX version ..... FPTU 7.0-28VDC
    FPTT 7.0-28VDC
    FPTM 8.0-28VDC
- Consumption ..... 25 mW - 0,8 W
- Isolation voltage (FPTU isolated and FPTT) 1500VAC in 60 sec.
- Warm up time ..... 5 min.
- Signal-/noise ratio ..... min. 60 dB
- Response time (programmable) ..... 1-60 sec.
- Updating time ..... 440 msec.
- Ambient temperature
  Standard version ..... -40+85°C
- Linearity ..... < ± 0.01% FS
- Effect of supply variations ..... < 0.005% FS / VDC
- EMC-data, emission EN50 081
- EMC-data, immunity EN50 082
- EMC-data, immunity influence ..... < ± 0.5% FS
- Vibration ..... IEC 68-2-6 Test FC
- Lloyd's specification no. 1 ..... 4g / 2 - 100 Hz
- Max. wire size ..... 1 x 1.5 mm ^{2}
- Humidity ..... 0 - 90% RH
- Dimensions ..... dia. 44 x 20.2 mm
- Degree of protection (enclosure/terminal) ..... IP 68 / IP00
- Weight ..... 50 g
- Mounting ..... Connection head type
  B/BHS- or separate box

Thermocouple input (only FPTU and FPTT)

- Range ..... See page 1
- Max. offset ..... 50% of selected max. value
- T/C input type ..... E, J, K, L, T, U, B, R and S
- Accuracy ..... Better than 0.005%
  of selected max. range
- Cold junction compensation (CJC) ..... < ± 1.0°C
- Temperature coefficient
  Type E, J, K, L, N, T, U range < 500°C ..... <± 0.05°C / °C $_{amb}$
  Type E, J, K, L, N, T, U range > 500°C ..... <± 0.01% FS / °C $_{amb}$
  Type B, R, S ..... <± 0.2°C / °C $_{amb}$
- Sensor error detection ..... yes

Pt100 and resistance input

- Type and range ..... See front page
- Max. offset ..... 50% of selected max. value
  Cable resistance per wire (max.) ..... 5 ohm
  Sensor current ..... nom. 0,2 mA
- Basic accuracy ..... FPTU ± 0.2°C
  FPTM ± 0.3°C
- Temperature coefficient for
  range < 100°C ..... <± 0.01°C / °C $_{amb}$
  range > 100°C ..... <± 0.01% FS / °C $_{amb}$
- Effect of sensor cable resistance (3/4-wire) ..... < 0.002 ohm / ohm
- Sensor error detection ..... yes

Output

- Signal range ..... 4 - 20 mA
- Min. signal range ..... 16 mA
- Load resistance ..... FPTU (U_S-7)/0.023 ohm
  FPTT (U_S-7)/0.023 ohm
  FPTM (U_S -8)/0.023 ohm
- Load stability ..... < ± 0.01% FS / 100 ohm

Sensor error detection:

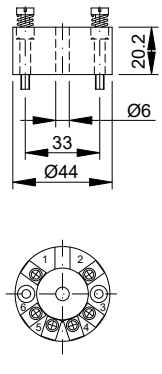
- Programmable ..... 3.5 - 4 mA
  20 - 23 mA
- Namur NE43 Upscale ..... 23 mA
- Namur NE43 Downscale ..... 3.5 mA
- To max. ..... > 23 mA
- To min. ..... < 3,8 mA
- No function ..... Not defined

Ex-data

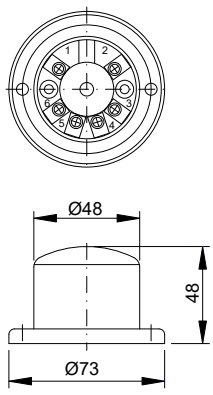
- $U_{Smax.}$ ..... 28.0 VDC
- $I_{max. in}$ ..... 120 mADC
- $P_{max.}$ ..... 0.84 W
- L_{eq} ..... <=10 mH
- C_{eq} ..... <=1nF
- Approvals EEXiaIICT1-T6
  ATEX 0539 Ex II 1 G
- Applicable in zone ..... 0,1 or 2
- Max ambient temperature ..... T1-T4 -40+85°C
  T5-T6 -40+60°C

FS=Full span

As terminal block



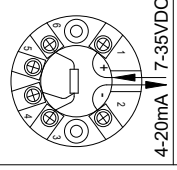
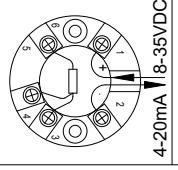
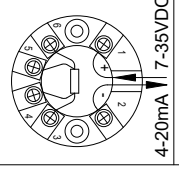
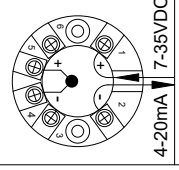
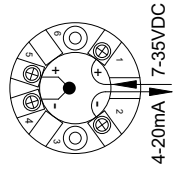
In high cap BHX



Transmitter FPTH

PR model 5437
See data-sheet from PR Electronics

Connection diagram

Pt100 resistance thermometer			Thermocouple		Transmitter FPTH PR model 5437
3-wire		4-wire			
Transmitter FPTU	Transmitter FPTM	Transmitter FPTU	Transmitter FPTU	Transmitter FPTT	See data-sheet from PR Electronics
 4-20mA 7-35VDC	 4-20mA 8-35VDC	 4-20mA 7-35VDC	 4-20mA 7-35VDC	 4-20mA 7-35VDC	 4-20mA

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