Bimetal thermometer with electrical contact device
radial bottom or centre back connection, Type Series FP . . . .

Features

- Case and wetted parts of stainless steel
- Different connections can be supplied
- Accuracy class 1 / 2 per DIN 16196, depending on range
- Micro adjustment pointer for indication correction
- Electrical contact device per DIN 16196:
  - slow acting contact
  - magnetic snap contact
  - inductive contact devices

Application

These thermometers with integrated contact device are suitable for use outdoors and in aggressive environments. The temperature detecting element is susceptible to bending, therefore, fitting with thermowell is recommended. Further information on mounting is to be found in data sheet no. T1-027. See data sheets T5-... for suitable thermowells per DIN 43772.

Technical Data

Case
high quality bayonet ring case DN 100
material: st. steel mat.-no. 1.4301

Type of protection (EN 60529)
IP 66

Measuring element
helix from thermostatic bimetal per DIN 1715 with good adjusting power and fast acting, thermally aged, base and connection piece laser welded

Temperature detecting element
stainless steel mat. no. 1.4571. Diameter 6 and 8 mm. Can be supplied in standard lengths, see order details; other sizes upon request

Process connection
rigid temperature detecting element, vertical resp. axial protruding at rear.
Different connections available, see order details

Pointer shaft
stainless steel material no. 1.457, with multiple bearings

Scale
pure aluminium, white with black inscription

Pointer
pure aluminium, black with micro adjusting device for zero-point correction

Window
instrument glass, alternatively macrolon with contact lock

Case seal
sealing ring: Perbunan

Nominal ranges
per EN 13190
see order details. Special ranges upon request

Accuracy
see table switch function and connection diagram

Ambient temperature
per EN 13190
ambient temperatures that deviate from EN are to be specified

Storage and transport temperature
per EN 13190
max. -20...+60 °C

Electrical connection
connection plug with cable gland M 20 x 1.5 and removable test cover, mat. Macrolon

Weight
DN 100: approx. 0.6 kg

Special design
- design without screwing (D1001) also available with sliding screwing
- marking on scale
- with construction type approval for connection to zone 0 with protective tubes per E DIN 43772 upon request
- certification of material testing per EN 10204

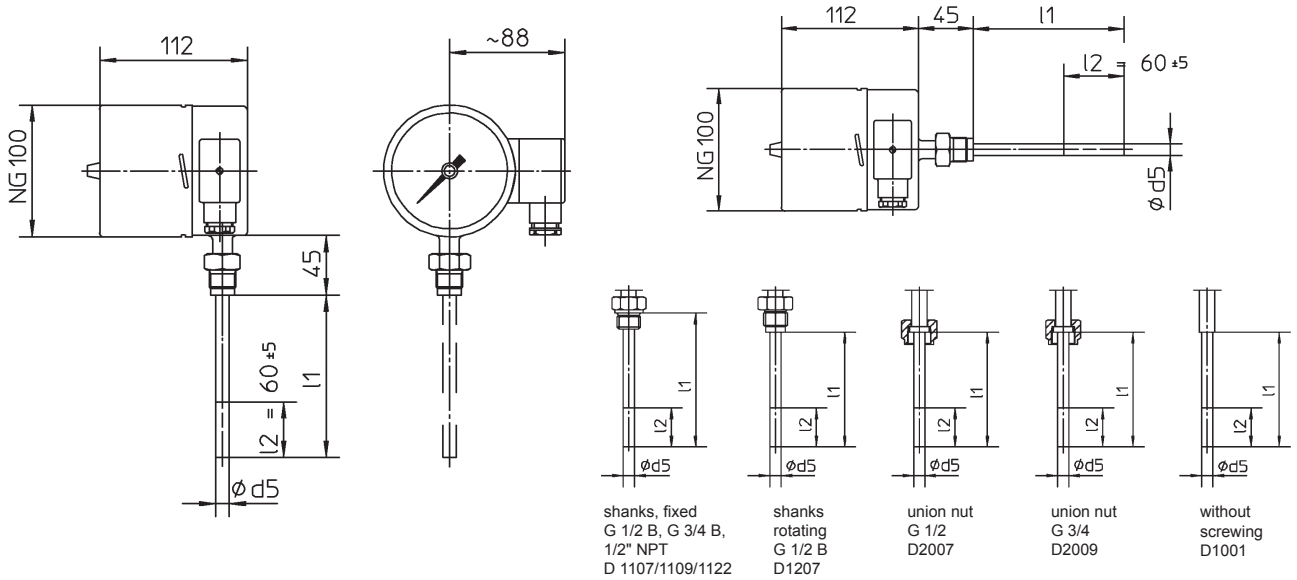
Instructions for use
the loading capacity of the temperature detecting element depends on the following parameters:
1. measured medium
2. measured medium pressure
3. measured medium temperature
4. flow velocity
5. immerison length
6. material

A technical test is necessary where required.

Information on other models upon request or see order details

Dimensions

process connection axial at rear



shanks, fixed G 1/2 B, G 3/4 B, 1/2" NPT D 1107/1109/1122

shanks rotating G 1/2 B D1207

union nut G 1/2 D2007

union nut G 3/4 D2009

without screwing D1001

Switch function and terminal connection

Switch function, terminal connections and directions of effect are realized according to DIN 16196.

Switch function and direction of effect

switchwing element	switch function: slow acting contact magnetic snap contact	switch function: inductive contact device	direction of effect	function code
makers	makes contact	makes contact; control current on	increasing temperature	1
			decreasing temperature	4
breakers	breaks contact	breaks contact; control current off	increasing temperature	2
			decreasing temperature	5

Accuracy

nominal size	temperature detecting element	type of contact: touch contacts, slow acting contact, single	touch contacts, slow acting contact, double	touch contacts, magnetic snap contact, single	touch contacts, magnetic snap contact, double	inductive contacts, single	inductive contacts, double
DN 100	Ø 8	class 1	class 2	class 2	class 2*	class 1	class 2
	Ø 6	class 2	class 2	class 2	> class 2	class 2	class 2

* pls indicate switch point, falls keine Schaltpunkte angegeben werden, werden werkseitig 30 % bzw. 70 % vom Messbereich eingestellt.

Identification of the switch functions

The switch functions are clearly identified by a three-digit number key. The key must be specified in the order details.
The free positions in the number code for the single and double contact devices are each to be assigned a zero.

Example: Double contact device inductive contact (SJ2 - N)

- 1st contact device closes on rising temperature
- 2nd contact device opens on rising temperatre
- 3rd ./.

1 2 0

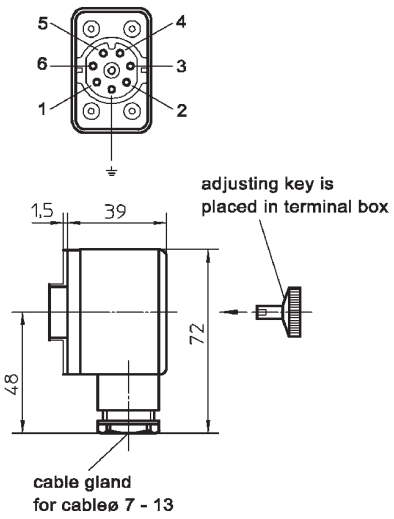
order code option:	N 4 1 2 0
switch function per DIN 16196 and details on type plate:	1 2

Connections plug / terminal connection

The assignment of terminal connections is realized according to DIN 16196.

Pin connection for contact devices

contact device / contact function	switch function	slow acting and magnetic snap contact: standard	slow acting and magnetic snap contact: separate supply		inductive contact device	polarity
single	makers or breakers	1 + 4	--		1 / 2	- / +
double	1st contact 2nd contact	1 + 4 2 + 4	1 + 2 3 + 4		1 / 2 3 / 4	- / + - / +



Touch contacts

Connection characteristic data for touch contacts

hysteresis error: 2 up to 5% of meas. span (hysteresis) according to DIN 16196
switching accuracy: 1.5 of accuracy class (setting accuracy per DIN 16196)
contact setting range: can be adjusted across the entire scale range (adjustment made with contact lock)
ambient temperatur: -25 up to +70°C
contact material: silver-nickel 10 µ gold plating, standard

Recommended contact load under resistive and inductive load and operation in air

voltage per DIN IEC 28		slow acting contact			magnetic snap contact		
		resistive load		inductive load	resistive load		inductive load
DC	AC	DC	AC	cos φ > 0,7	DC	AC	cos φ > 0.7
220 V	230 V	40 mA	45 mA	25 mA	100 mA	120 mA	65 mA
110 V	110 V	80 mA	90 mA	45 mA	200 mA	240 mA	130 mA
48 V	48 V	120 mA	170 mA	70 mA	300 mA	450 mA	200 mA
24 V	24 V	200 mA	350 mA	100 mA	400 mA	600 mA	250 mA

The switching current should not be lower than 20 mA for 24 V DC.

Limit values for the contact load under resistive load and operation in air

		slow acting contact	magnetic snap contact
rated insulation voltage U_i		60 < U_i ≤ 250 V	60 < U_i ≤ 250 V
rated operation voltage U_{eff} max.		250 V	250 V
rated current:	- make rating	0.7 A	1.0 A
	- break reating	0.7 A	1.0 A
	- continous load	0.6 A	0.6 A
switching capacity		10 W 18 VA	30 V 50 VA

Limit values for current, voltage and output should not be exceeded.

Minimum values for the contact load under resistive load in air

	slow acting contact		magnet snap contact	
rated operatio voltage U_{eff} min.	24 V		24 V	
switching capacity (DC AC)	0.4 W	0.4 VA	0.4 W	0.4 VA

The use of contact protection relays is recommended in order to provide the greatest switching reliability possible, to prevent contact interruptions and to increase the breaking capacity. The service life of the contacts is considerably increased, because 99% of the time the contacts are opened and closed in a voltage-free state. This switching amplifier should definitely be used in measuring devices with liquid filling.

Limit values for the contact load under resistive and inductive load and operation in liquid filling (oil)

	slow acting contact	magnetic snap contact		
rated operation voltage U_{eff} max.	slow acting contacts are generally unsuitable for devices with liquid filling	(AC) 230 V ~	(AC) 110 V ~	(AC) 48 V ~
rated current:		90 mA	90 mA	90 mA
switching capacity (AC):		20 VA	10 VA	4.3 VA

Maximum values for current (90 mA) and output (20 VA) should also not be exceeded with low operating voltages. This means that 24 V AC operating voltage is too low to assure secure switching in liquid filling. We recommend the use of contact protection relays for DC voltages.

Connection characteristic data for Explosion protection

Switching of intrinsically safe circuits with magnetic snap contacts, only and with following max. values:
U ≤ 24 V DC I ≤ 30 mA P ≤ 0,7 W Regulations of VDE 0165 should be observed!

Inductive contact devices

Connection characteristic data for initiators per DIN EN 60947-5-6 (NAMUR):

nominal voltage: 8 V= (Ri ≈ 1KΩ)
operating voltage: 5 - 25 V
current consumption: > 3 mA (active face uncovered)
switching accuracy: approx. 0.5% of full scale value
contact setting range: can be adjusted across the entire scale range (adjustment made with contact lock)
ambient temperature: -20 up to +70°C

Connection characteristic data and limit values for Explosion protection

standard specification on type plate

Initiators: SJ 2 - N (DN 100)			SJ 3.5 - N (DN 160)					type of connected circuit as per type examination certif.
PTB 99 ATEX 2219 X			Ex-values for initiator					
connection to intrinsically safe circuits EEx ia IIC/IIB or EEx ib IIC/IIB with:			C_i	L_i	Tu at T4	Tu at T5	Tu at T6	
U_i = 16 V	I_i = 25 mA	P_i = 34 mW	50nF	250µH	100 °C	88 °C	73 °C	1
U_i = 16 V	I_i = 25 mA	P_i = 64 mW	50nF	250µH	100 °C	81 °C	66 °C	2
U_i = 16 V	I_i = 52 mA	P_i = 169 mW	50nF	250µH	89 °C	60 °C	45 °C	3
U_i = 16 V	I_i = 76 mA	P_i = 242 mW	50nF	250µH	74 °C	45 °C	30 °C	4

Initiators: SJ2 - SN, SJ2 - S1N (DN 100)			SJ 3.5 - SN , SJ 3.5 - S1N (DN 160)					type of connected circuit as per type examination certif.
PTB 00 ATEX 2049 X			Ex-values for initiator					
connection to intrinsically safe circuits EEx ia IIC/IIB or EEx ib IIC/IIB with:			C_i	L_i	Tu at T4	Tu at T5	Tu at T6	
U_i = 16 V	I_i = 25 mA	P_i = 34 mW	30nF	100µH	100 °C	88 °C	73 °C	1
U_i = 16 V	I_i = 25 mA	P_i = 64 mW	30nF	100µH	100 °C	81 °C	66 °C	2
U_i = 16 V	I_i = 52 mA	P_i = 169 mW	30nF	100µH	89 °C	60 °C	45 °C	3
U_i = 16 V	I_i = 76 mA	P_i = 242 mW	30nF	100µH	74 °C	45 °C	30 °C	4

The allowed electrical connection data and allowed ambient temperatures (Tu) for ex-operation should not be exceeded. Please refer to product category M7 for suitable switching amplifiers and isolation switch amplifiers for ex-areas.

CE marking

The CE marking on the instruments certifies compliance with valid EU directives for bringing products to market within the European Union. The following directives are met: ATEX 94/9 EG, EMV 89/336/EG
ATEX 94/9 EG: Electrical equipment in hazardous areas should only be installed and commissioned by competent personnel. Modifications to devices and connections destroy the operating safety, the ex-proofing and the guarantee.
EMC 89/336/EG: The instrument can only be protected against electromagnetic interference (EMC) when the conditions for screening, earthing, wiring and potential isolation are met during installation.

Order Details

- please give additional specifications for models not listed -

Bimetall thermometer with electrical contact device radial bottom or centre back connection

case design	DN 100 IP 66	· process connection axial	**FP230 .**
		· process connection vertical	**FP240 .**
design	· standard		**0**
	· ex-protection		**1**
nominal range	· see table		**A2...**
process connection	· shanks fixed	· G 1/2 B	**D1107**
		· G 3/4 B	**D1109**
		· 1/2" NPT	**D1122**
	· shanks rotating	· G 1/2 B	**D1207**
	· union nut	· G 1/2	**D2007**
		· G 3/4	**D2009**
	· without screwing	· OV	**D1001**
temperature detecting element Ø d5	· 6 mm (l2 ~ 60 mm) ³		**F6 . . .**
	· 8 mm (l2 ~ 60 mm) ³		**F8 . . .**

immersion length l1 (mm) ⁴	D 11.. shanks fixed	D1207 shanks rotating G 1/2 B	D2007 union nut G 1/2	D2009 union nut 3/4	D1001 without screwing	
	100	080	089	093	100	. . .
	160	140	126	130	160	. . .
	250	230	186	190	250	. . .
	400	380	276	280	400	. . .
	--	--	426	430	--	. . .
	deviating length: pls specify					**999**

contact	*touch contact*	
	· slow acting contact	**L2 . . .**
	· magnetic snap contact	**L4 . . .**
	· slow acting contact, separated circuits	**M2 . . .**
	· magnetic snap contact, separated circuits	**M4 . . .**
	inductive contact device	
	· standard initiator	**N4 . . .**
	· safety initiator SJ2 - SN / SJ3.5 - SN	**N1 . . .**
	· safet initiator invers SJ2 - S1N / SJ 3.5 - S1N ²	**N2 . . .**
	· with integrated switching amplifier ¹	**N6 . . .**
switch function	· single contact (1st figure per table)	**.00**
	· double contact (1st + 2nd figure per table)	**. .0**

additional features (to be indicated in case of need, only):

window	· macrolon	**R11**
marking	· on scale (pls. specify)	**T2**

Order code (example):						
	FP2400	**A2540**	**D1109**	**F8100**	**N4100**	

standard measuring and nominal ranges °C per EN 13190

nominal range °C	meas. range °C	order code
-20...+40	-10...+30	**340**
-20...+60	-10...+50	**346**
-30...+50	-20...+40	**322**
-40...+40	-30...+30	**220**
-40...+60	-30...+50	**222**
0...60	10...50	**520**
0...80	10...70	**522**
0...100	10...90	**524**
0...120	20...100	**540**
0...160	20...140	**544**
0...200	20...180	**548**
0...250	30...220	**560**
0...300	30...270	**565**
0...400	50...350	**627**
0...500	50...450	**630**
0...600	100...500	**640**

switch function	fig.
· increasing temperature makes contact	**1**
· increasing temperature breaks contact	**2**
· decreasing temperature makes contact	**4**
· decreasing temperature breaks contact	**5**

¹ not with ex-protection
² with DN 100: one contact device, only
³ the active length l2 must completely reach the process temperature that is to be measured. The depth of immersion length l1 should be increased accordingly.
⁴ standard immersion length to be specified in order code, e.g. l1 100 mm: order code 100