



Design Features

- High-quality chemical design
- Case, measuring system and medium-contacting parts from stainless steel
- Temperature detecting element diameter 6, 8 and ≥ 10 mm
- Different connections can be supplied
- Short immersion lengths may be used
- Accuracy class 1 / 2 per DIN 16196 range dependant
- Micro adjusting pointer for indication correction
- Mechanical or inductive contact device per DIN 19234

Application

These thermometers are suitable for use outdoors and in aggressive environments. Because of the robust design, these thermometers have been successfully used in the chemical industry, in petrochemistry, in ocean shipping, and in process engineering. The devices can also be supplied with additional liquid damping for use in extreme conditions. Further information on mounting these devices is to be found in data sheet no. T1-027. Suitable thermowells upon request.

Design and Function

The gas expansion thermometer with electric contact device consists of a temperature detecting element with integrated pressure chamber (active part) and an indicating unit with bourdon tube and contact device tightly fixed onto it. The limit values can be adjusted over the complete scale range with the help of a wrench and are accessible from the front. Ambient temperatures, which influence the indicating unit, are reduced with a compensation.

Technical Data

Case

bayonet-ring case of stainless steel material no. 1.4301, nominal size 100 and 160 mm

Process connection

rigid temperature detecting element, connected via capillary radially protruding at bottom resp. at rear.

Different connections can be supplied, see order details

Case design

degree of protection type IP 66 per EN 60529, alternatively with liquid filling

Case mounting

stand-alone mounting with wall bracket per DIN 16283; alternatively with flange for surface mounting or for flush mounting with DIN mounting flange

Measuring element

bourdon tube dead zone free with noble gas filling

Capillary

stainless steel material no. 1.4571 resp. 1.4404 in different lengths with buckling protection, coated with protective tube upon request, alternatively with sliding screwing

Temperature detecting element

stainless steel material no. 1.4404. Diameter 6, 8 and ≥ 10 mm. See order details for standard lengths and active lengths, other values upon request

Pointer element

stainless steel with compensation

Scale

aluminium, white with black inscription. Alternatively with marking resp. fixed reference pointer

Pointer

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

Window

safety glass, alternatively macrolon with contact lock

Case seal

Buna N

Measuring system damping

liquid filling for damping vibrations

Nominal ranges

per EN 13190, max. -100...700 °C, measuring spans ≥ 60 °C

Accuracy

see under "switch function" and "connection diagram"

Connection plug

waterproof terminal box with conduit thread cable entry and removable test cover, material macrolon

Weights

DN 100, without filling:	approx. 1.1 kg
DN 100, with filling:	approx. 2.0 kg
DN 160, without filling:	approx. 2.0 kg
DN 160, with filling:	approx. 4.3 kg

Special design

- design without screwing (D1001) also available with sliding screwing
- with construction type approval for connection to zone 0 with thermowells per DIN 43772
- with certification on material testing per EN 10204 (DIN 50049)

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. Immersion length
6. Material

A technical test is necessary where required

Information on other models upon request or see order details

Inductive contact devices

Insulating parts

duroplastic with high dielectric strength

Metal parts

corrosion-proof
nickel silver or stainless steel

Bearing

jewel hole, stainless steel axles,
smooth-running

EMC

per EN 60947-5-2, appendix x

initiators ¹	SJ2-N	SJ3.5 N	SJ3.5 SN
case diamter	100	160	160
PTB no.	Ex-83/2022X		
ex group	EEx ib IIC T6 or EEx ia IIC T6		
allowed ambient temperature for device	standard -25...+70 °C		
max. values U _o	in hazardous areas dependant on temperature class, values on request		
I _k	≤ 15.5 V		
P	≤ 50 mA		
	≤ 160 mW		
self-inductance	30 uH	160 uH	160 uH
self-capacitance	20 nF	40 nF	40 nF

¹ other initiators upon request

Touch contacts

Allowed ambient temperature

-25...+70 °C (other values on request)

Metal parts

corrosion-proof
nickel silver or nickel-plated steel

Bearing

jewel hole; stainless steel axles,
smooth-running and wear resisting

Contact material

silver-nickel alloy (AG80Ni20) as standard assembly. For low voltages up to 24 V and currents up to 20 mA, we recommend silver palladium contacts with 10 µm gold plating, which are always delivered with ex-proofed models. Further contact materials upon request.

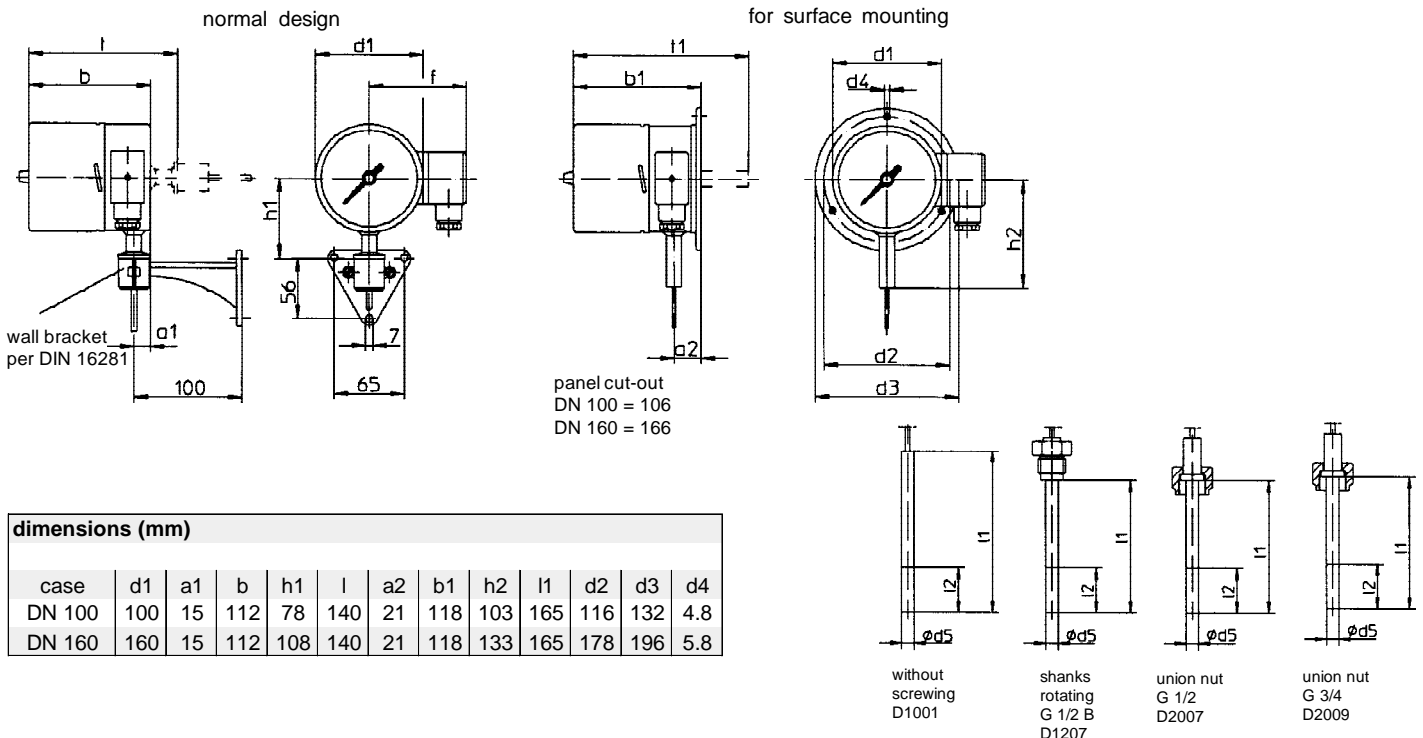
Devices, which switch signals below 24 V and 20 mA, should not be specified with liquid filling, because switching reliability is reduced by liquid films between the contacts. This applies to all contact materials.

max. contact load under resistive and inductive load and operation in air								
voltage per DIN IEC 38		slow acting contact			magnetic snap contact			
DC voltage	AC voltage	DC voltage	AC voltage	inductive load AC voltage cos φ > 0.7	DC voltage	AC voltage	DC voltage	AC voltage
V	V	mA	mA	mA	mA	mA	mA	mA
220	230	40	45	25	100	120	65	65
110	110	80	90	45	200	240	130	130
48	48	120	170	70	300	450	200	200
24	24	200	350	100	400	600	250	250

limit values for the contact load under resistive load and operation in air (per DIN VDE 0660, section 100 and section 200)		
	slow acting contact	magnetic snap contact
rated insulation voltage U	61 - 300 V	61 - 300 V
rated voltage U _{eff} max.	250 V	250 V
rated current:		
making current	0.7 A	1.0 A
cutoff current	0.7 A	1.0 A
constant current	0.6 A	0.6 A
switching capacity	10 W 18 VA	30 W 50 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.

Dimensions



Switch function and connection diagram

Switch function, terminal connections and directions of effect are realized according to the DIN 16196. With regard to switches, it should be noted that a contact which closes with increasing temperature corresponds to a contact which opens with falling temperature. However, because of the switching hysteresis, they are adjusted differently.

Switch function and direction of effect

switching element	code number (order code)	direction of action	switch function	
			slow acting contact magnetic snap contact	inductive contact device
makers	1	increasing temperature	makes contact	makes contact; control current on
	4	decreasing temperature		
breakers	2	increasing temperature	breaks contact	breaks contact; control current off
	5	decreasing temperature		
change over elements ¹	3	increasing temperature	switches the contact	not applicable
	6	decreasing temperature		

¹ Unless otherwise specified, the contacts are not adjusted overlapping. Handle change over contact as double contact.

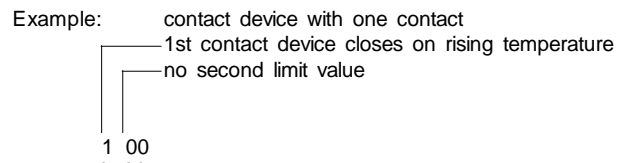
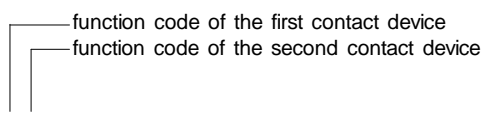
Connection diagram

contact device	switch function	assignment of connection terminals				
		slow acting and magnetic snap contact		inductive contact device		
		common supply	separate supply		polarity	
1st contact	makers	1	1	1	-	
		4	2	2	+	
	breakers	1	1	1	-	
		4	2	2	+	
	change over elements	makers	1	-	-	-
		breakers	4	-	-	-
2nd contact	makers	2	3	3	-	
		4	4	4	+	
	breakers	2	3	3	-	
		4	4	4	+	

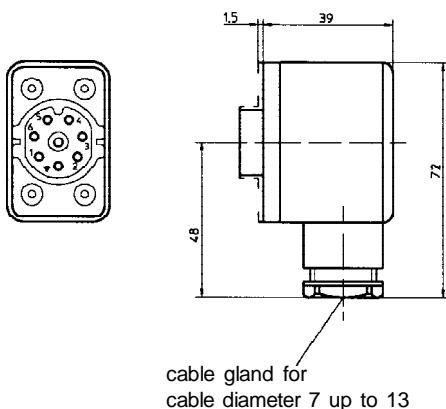
Identification of the switch functions

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.



Connection plug / Connection diagram



Accuracy ¹

nominal size	contact device	type of contact	
		inductive	touch contact
100	single	class 1	≤ class 2
	double	class 1	≤ class 2
160	single	class 2	class 2
	double	class 2	-

¹ specifications per EN 13190 / DIN 16196 for all temperature detecting element diameters and standard immersion lengths l1

Order Details - please give additional specifications for models not listed -

Gas expansion thermometer with capillary and electric contact device 1, high quality chemical design										standard measuring and nominal ranges °C per EN 13190, class 1			
case	· DN 100				FU2					nominal range °C	meas. range °C	order code	
	· DN 160				FU3					-20...+40	-10...+30	340	
case design	· IP 66 process connection bottom				43					-20...+60	-10...+50	346	
	· IP 66 process connection at rear				33					-30...+50	-20...+40	322	
	· IP 66 process connection bottom with filling				63					-40...+40	-30...+30	220	
	· IP 66 process connection at rear with filling				53					-40...+60	-30...+50	222	
design	· standard				0					0...60	10...50	520	
	· ex-protection				1					0...80	10...70	522	
measuring range	· per table				A2... ←					0...100	10...90	524	
process connection	· without screwing				D1001					0...120	20...100	540	
	· shanks, rotating G 1/2 B				D1207					0...160	20...140	544	
	· shanks, rotating G 3/4 B				D1209					0...200	20...180	548	
	· union nut G 1/2				D2007					0...250	30...220	560	
	· union nut G 3/4				D2009					0...300	30...270	565	
temperature detecting element Ø d5	· 6 mm (l2 ≥ 180 mm) 5				F6					0...400	50...350	627	
	· 8 mm (l2 ≥ 80 mm) 5				F8					0...500	50...450	630	
	· 10 mm (l2 ≥ 50 mm) 5				F10					0...600	100...500	640	
immersion length l1 (mm) 6	D1001	D1207	D2007	D2009									
	without screwing	shanks rotating G 1/2 B	union nut G 1/2	union nut G 3/4									
	100	080	089	093							...		
	160	140	126	130							...		
	250	230	186	190							...		
	400	380	276	280							...		
deviating length: pls specify												999	
mounting	· with wall bracket, aluminium, standard				G4								
	· prepared for wall bracket				G1								
	· for surface mounting				G2								
	· for flush mounting				G3								
	· with wall bracket, st. steel				G5								
capillary	· st. steel, length acc. to specification per m				K39								
	· st. steel with protective tube, acc. to specification				K49								
contact	touch contact												
	· combination contact with magnet 2									L4		increasing temperature makes contact	1
	· combination contact with magnet, gold-plated									L1		increasing temperature breaks contact	2
	· slow acting contact 2/3									L2		decreasing temperature makes contact	4
	· sep. circuit combination contact with magnet 2									M4		decreasing temperature breaks contact	5
	· sep. circuit combination contact with magnet, gold-plated									M1		change-over elements increasing temperature switches °	3
	inductive contact											change-over elements decreasing temperature switches 8	6
	· initiator (N)									N4			
	· safety initiator (SN)									N1			
	· contact with integrated switching amplifier in 3-wire circuitry PNP 7									N6			
switch function 4	· single contact (1st figur per table)									.00			
	· double contact (1st and 2nd figure per table)									..0			
additional features (to be indicated in case of need, only)													
window	· macrolon									R11			
marking	· on scale (pls specify)									T2			
sliding screwing on capillary 9	· G 1/2 B									V10			
	· G 3/4 B									V11			
	· 1/2" NPT									V20			
Order code (example):				FU2430	A2520	D1209	F8100	G1	K38	N4200			

1 gas expansion thermometer with pneumatic contact device upon request
 2 not with ex-protection
 3 not for gauges with case filling
 4 regarding accuracy pls see "switch function" and "connection diagram"
 5 the active length l2 must completely reach the process temperature that is to be measured. The depth of immersion should be increased accordingly.

6 standard immersion length to be specified in order code, e.g. l1 100 mm: order code 100
 7 further designs see data-sheet D6-039
 8 only 1 change-over element possible; pls indicate switch point
 9 operating temperature max. 250 °C, but not with coated capillary