

Gas expansion thermometer with switch contact

radial bottom or centre back connection, adjustable angle stem

Type series FU



Application area

- General process technology
- Chemical and petrochemical industry
- Plant and mechanical engineering
- Shipping

Features

- High quality case with bajonet ring NS 100/160 degree of protection IP 66
- Case, measuring system and wetted parts of stainless steel
- Various connections can be supplied
- Nominal range -40...600 °C
- Micro adjustment pointer for indication correction
- Accuracy class 1 or 2 per EN 13190, depending on measuring range
- Stem diameter 6, 8 and ≥ 10 mm
- Short immersion lengths of the stem may be used
- Switch contacts (electrical contact devices) per DIN 16085
 - slow acting contact
 - magnetic snap contact
 - inductive contact

Options

- Approvals/Certificates
 - Explosion protection (ATEX/UKEX) for mechanical devices
 - Classification per SIL2
 - Material certificate per EN 10204-3.1
- As per UKCA regulations
- Case with liquid filling
- Connection to zone 0 with thermowells (upon request)

Application

- These thermometers are suitable for use outdoors and in aggressive environments
- The devices can also be supplied with additional liquid damping for use in extreme conditions
- Suitable thermowells see product group T5
- Further information on mounting see operating instructions BA_066

Technical data

Constructional design / case

Design:	High quality case with bajonet ring, stainless steel mat.-no. 1.4301 (304)
Nominal size:	NS 100 or NS 160
Degree of protection:	IP 66 per EN 60529
Case filling:	Labofin Further liquid fillings upon request
Case seal:	sealing ring NBR
Window:	Non-splintering laminated glass. Option: Non-splintering plastic (Macro-lon), with contact lock
Measuring element:	Bourdon tube, dead zone free with inert gas filling.
Movement:	Stainless steel with compensation
Scale:	Pure aluminium, white with black inscription Alternatively with marking
Pointer:	Pure aluminium, black with micro adjustment for zero point correction
Electrical connection:	Connection plug with cable gland M20 x 1.5 and removable test cover, mat. Macro-lon
Weights:	Connection radial bottom or centre back:

NS	without filling	with filling
100	1.1 kg	2.0 kg
160	2.0 kg	4.3 kg

Adjustable angle stem:

NS	without filling	with filling
100	1.2 kg	2.1 kg
160	2.1 kg	4.4 kg

Process connection

Design:	Radial bottom or centre back: Rigid bulb, protruding at bottom or centre back Adjustable angle stem: Rigid bulb, centre back Adjustable angle stem, latching every 22.5°, rotatable through 90° Different connections can be supplied, see order details
---------	---

Temperature detecting element	Stainless steel mat.-no.1.4404 (316L) Diameter 6, 8 and ≥ 10 mm, available in standard lengths Active lengths, depend on temperature detecting element diameter, see order details Further values upon request
-------------------------------	---

Nominal range

Nominal range:	-40...600 °C per EN 13190 Measuring spans ≥ 60 °C, see order details Further nominal ranges upon request
----------------	--

Accuracy

Accuracy class per DIN 16196:

Nominal size NS	Inductive contact	
	single	double
100	class 1	class 1
160	class 2	class 2

Nominal size NS	Touch contact	
	single	double
100	≤ class 2	≤ class 2
160	class 2	-

Specifications apply to all temperature detecting elements with diameter d5 and standard immersion length l1

Temperature ranges

Ambient:	per EN 13190, ambient temperatures that deviate from EN are to be specified
Media:	-30...500 °C
Storage and transport	-20...60 °C
Further designs upon request	

Tests and certificates

- Ex-protection: Magnetic snap contact:
Simple electrical apparatus per EN 60079-11 suitable for intrinsically safe circuits Ex IIC TX.
- Inductive contact:
Contact device suitable for intrinsically safe circuits
⊕ II 2G Ex ia IIC T4/T5/T6 Gb
- ATEX ■ PTB 99 ATEX 2219X
■ PTB 00 ATEX 2049X
- UKEX: ■ CML 21UKEX2893X
■ CML 21UKEX2977X

Ex-protection (ATEX/UKEX) for mechanical devices:

- ⊕ II 2G Ex h IIC T1...T6 Gb X
⊕ II 2D Ex h IIC Txx°C Db X

Further details see operation instruction BA_037 and Ex Instructions XA_005, XA_013 and XA_021.

- SIL2: Functional safety per EN 61508
Classification per SIL2 for gauges with inductive contacts only.

Switch contacts

- Slow acting contact: Type L2
- max. 2 touch contacts
 - Contact load: 10 W / 18 VA
 - Switching up to 230 V DC
 - Available with separate circuit (Type M2)
- Magnetic snap contact: Type L4
- max. 2 touch contacts
 - Contact load: 30 W / 50 VA
 - Switching up to 230 V DC
 - Available with separate circuit (Type M4)

- Inductive contact: Type N4
(standard)
- Initiator
 - max. 2 contacts
 - Control unit required

- Inductive contact: Type N1
(SN)
- Safety initiator
 - max. 2 contacts, contactless
 - Control unit required

- Inductive contact inverse: Type N2
(S1N)
- Safety initiator, inverse switching
 - max. 2 contacts, contactless
 - Control unit required

- Inductive contact with integrated amplifier: Type N6
- max. 2 contacts, contactless
 - 100 mA
 - 3-wire technology, suitable for direct activation at a PLC

Further information see operating instruction BA_066 and Technical Information TA_039.

Instructions for use

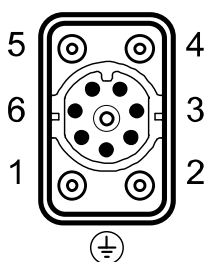
The loading capacity of the temperature detecting element depends on the following parameters:

- Media
- Media pressure
- Media temperature
- Flow velocity
- Insertion length
- Material

A technical examination might be necessary as well as the use of a separate thermowell (Product group D5).

Connection diagram

Terminal box

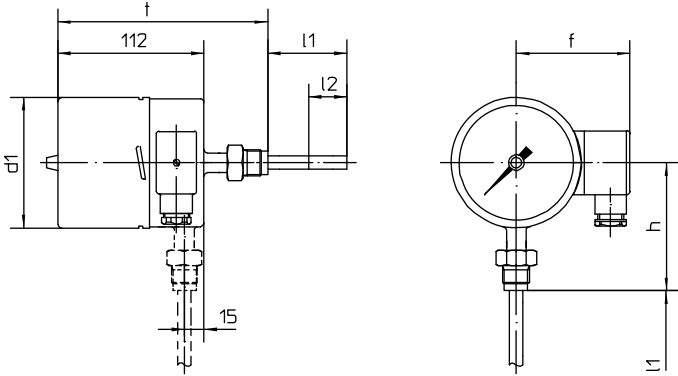


Pin assignment for switch contacts see TA_039.

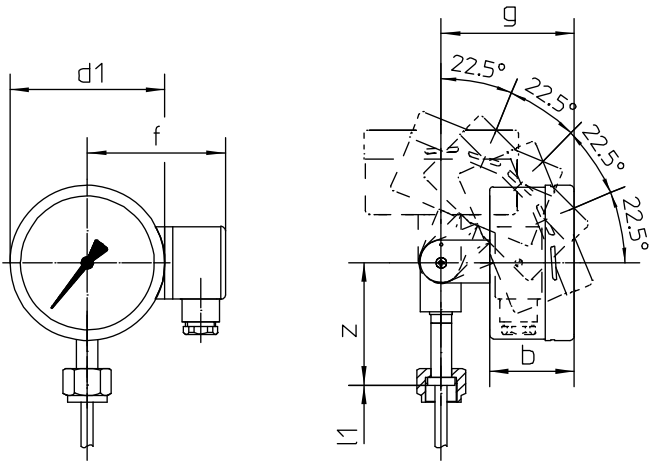
Dimensions

Case and process connections

Case with bottom and centre back connection:



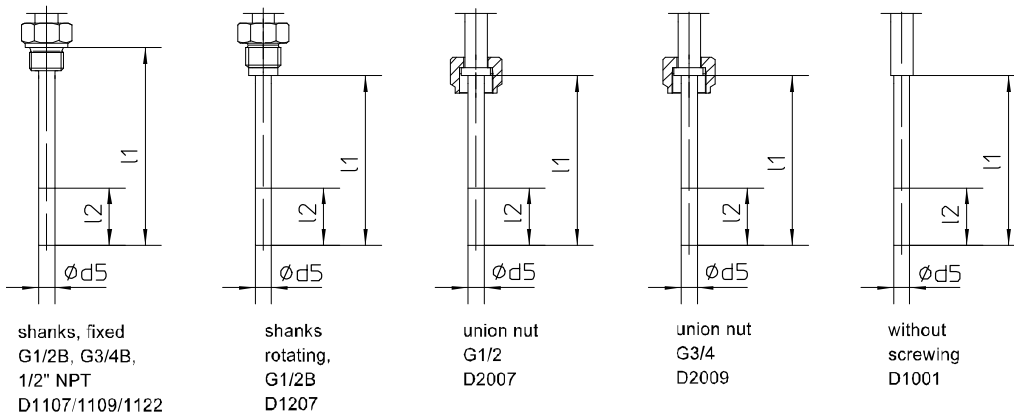
Adjustable angle stem:



Temperature detecting element diameter d_5 , insertion length l_1 and active length l_2 see order details.

Dimensions (mm)					* z					* z for nominal ranges > 160 °C dimensions increases by 36 mm
Case	d1	b	g	f	D1001	D1107/1109/1122	D1207	D2007	D2009	
NS 100	100	60	92	90	83	83	83	83	83	
NS 160	160	60	92	120	83	68	83	83	83	

Process connections for bottom connection, centre back connection and adjustable angle stem:



Order details

Gas expansion thermometer with switch contact

Type series FU

Order code FU....						
FU240 .	case design degree of protection IP 66	process connection bottom	NS 100		without liquid filling	
FU340 .			NS 160			
FU260 .			NS 100		with liquid filling	
FU360 .			NS 160			
FU230 .		process connection centre back	NS 100		without liquid filling	
FU330 .			NS 160			
FU250 .			NS 100		with liquid filling	
FU350 .			NS 160			
FU231 .		adjustable angle stem	NS 100		without liquid filling	
FU331 .			NS 160			
FU251 .			NS 100		with liquid filling	
FU351 .			NS 160			
0	design	standard				
1		ex-protection				
		nominal range [°C]	measuring range [°C]			
A2340	standard ranges °C, accuracy class 1 per EN 13190	-20...40	-10...30			
A2346		-20...60	-10...50			
A2322		-30...50	-20...40			
A2220		-40...40	-30...30			
A2222		-40...60	-30...50			
A2520		0...60	10...50			
A2522		0...80	10...70			
A2524		0...100	10...90			
A2540		0...120	20...100			
A2544		0...160	20...140			
A2548		0...200	20...180			
A2560		0...250	30...220			
A2565		0...300	30...270			
A2627		0...400	50...350			
A2630		0...500	50...450			
A2640		0...600	100...500			
D1107	process connection	shanks fixed	G1/2 B			
D1109			G3/4 B			
D1122			1/2 NPT			
D1207		shanks rotating	G1/2 B			
D2007		union nut	G1/2			
D2009			G3/4			
D1001		without screwing				
F6		temperature detecting element Ø d5	6 mm (l2 ≥ 180 mm) ¹			
F8	8 mm (l2 ≥ 80 mm) ¹					
F10	10 mm (l2 ≥ 50 mm) ¹					
	immersion length l1 (mm) ²	D11.. shanks fixed	D1207 shanks rotating G1/2 B	D2007 union nut G1/2	D2009 union nut G3/4	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	-
999	deviating length: pls specify					

	switch contact	type of contact	number
L4 . 00	touch contact	magnetic snap contact	single contact
L4 . . 0			double contact
L2 . 00		slow acting contact ³	single contact
L2 . . 0			double contact
M4 . . 0		magnetic snap contact separated circuits	double contact
M2 . . 0		slow acting contact ³ separated circuits	double contact
N4 . 00	inductive contact	initiator (N)	single contact
N4 . . 0			double contact ⁵
N1 . 00		safety initiator (SN)	single contact
N1 . . 0			double contact ⁵
N2 . 00		safety initiator invers (S1N) ⁴	single contact
N2 . . 0			double contact ⁵
N6 . 00		inductive contact with integrated switching amplifier, 3-wire technology PNP ³	single contact
N6 . . 0			double contact ⁵
. . .	switch function - per contact, replace point with number		
1	switch	rising measured value closes contact	
2		rising measured value opens contact	
4		falling measured value closes contact	
5		falling measured value opens contact	
3	change-over element ⁶	rising measured value switches	
6		falling measured value switches	

Example of order code switch contacts N4120:

Double inductive contact with initiator → type of contact = N4

1. Inductive contact closes on rising measured value → code number 1
2. Inductive contact opens on rising measured value → code number 2
3. Inductive contact not be used → code number 0

Additional features (to be indicated if required)		
R11	window	macrolon
T2	marking	on scale (pls. specify)
W2605	functional safety per EN 61508, classification per SIL2 ⁷	
W2660	as per UKCA regulations ⁸	

Order code (example): FU2400 - A2548 - D1109 - F8100 - L4100 - ...

¹ 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

² standard immersion length to be specified in order code, e.g. l1 100 mm: order code 100

³ not with ex-protection

⁴ with NS 100: one contact device, only

⁵ for NS 100, type SJ2-S1N: For safe use observe TA_044

⁶ possible with touch contacts only (slow acting contact or magnetic snap contact)

⁷ for devices with inductive contact only

⁸ not possible with thermowell systems with inside pipe diameter > 25 mm