

# BDTG18 – Industrial process temperature gauge, gas filled

## Product description

Badotherm thermometer model BDTG18 is available in 100/160 mm diameter. The design is made in accordance with the international standard EN 13190. The BDTG18 is available with various connections, such as: fixed stem, every angle, capillary, or skin. These gas filled thermometers are suitable for corrosive media and environments in chemical process, petroleum, and food industries. The temperature gauge is completely manufactured in stainless steel.

## Design standard

EN 13190

## Dial sizes, ranges & accuracy

There are 2 dial sizes available for the gas-filled temperature gauge. Both gauges have the same range and accuracy. Accuracy class is based on dry gauges at 23°C +/-10°C ambient temperature.

Dial size	Scale ranges	Accuracy class
100mm	Various ranges between -100 °C and +650 °C *1	Class 1.0
160mm		

1) standard range temperature delta: 60, 80, 100, 120, 140, 160, 200, 250, 300, 400, 500 and 600 °C

## Mounting variation

Not all gauges are suitable for some mounting variations. For the BDT18 series the mounting variations are below.

- **type A** <sup>1)</sup> (01) bottom connection, direct mounting
- **type C** <sup>2)</sup> (10) bottom connection, surface mounting (back)
- **type D** <sup>1)</sup> (03) center back connection, direct mounting
- **type E** <sup>1)2)</sup> (08,12) center back con., panel mounting (front)
- **type H** <sup>2)</sup> bottom connection, console mounting

1) Rigid stem  
2) Capillary type

## Versions of stem mounting

Depending on the process different versions of mounting the stem (bulb) to the case. The versions are:

- **Fixed**; the stem is directly welded to the case
- **Every angle**; the stem is fixed with an adjustable device
- **Remote**; the stem is fixed to the case by a flexible capillary



## Process connection type

The process connection type can be selected freely. There are several options. Threaded option can be selected in multiple thread standards

- **Plain**; stem without thread
- **Fixed** <sup>1)</sup>; Thread fixed to the stem by welding
- **Adjustable**; thread adjustable by compression fitting
- **Rotatable (union) nut**; Female thread on fixed position
- **Rotatable (loose) nut**; Male thread on fixed position

1) only rigid fixed stem

## Stem variation

With rigid stem temperature gauges there are two different types of stem that can be selected.

- **Straight** stem
- **Contact** stem

## Materials of construction

	BDTG18
Case	AISI 304
Bezel	
Connection <sup>1</sup>	AISI 316
Stem <sup>1</sup>	TP316
Movement	Stainless steel
Pointer	
Dial	Aluminium
Window gasket	NBR
Fill plug	NBR (HNBR for filled gauges)
Mounting flanges	AISI 304
Window	Glass
Capillary	AISI 316
Armour	AISI 304

\*1 wetted materials

## Process connection size

Process connections of the BDTG temperature gauges are available in different sizes and types.

ISO 228-1	ISO 7-1	ANSI 1.20.1	DIN 13-1
G 1/4 (A)	R 1/4 (A)	1/4" NPT	M14x1.5
G 3/8 (A)	R 3/8 (A)	3/8" NPT	M18x1.5
G 1/2 (A) ◀	R 1/2 (A)	1/2" NPT	M20x1.5
G 3/4 (A)	R 3/4 (A)	3/4" NPT	M27x2

The small size threads (1/4" and M14) are only possible with 6mm stem. For both female and male there can be restriction per type of process connection.

-> See datasheet "thread information" for specific thread details

## Working range limitations

The gauges are built to withstand harsh environments however the EN 13190 limits the use of a temperature gauge according below table.

Continuous temperature load	Measuring range acc EN 13190
Short time (<24hr)	Scale range acc EN 13190

## Temperature limitations

The gauges can withstand ambient and storage temperature up to a certain limit. The limitations on temperature on the case are:

	Ambient	Storage
Dry case	-40°C ...+60°C	-40°C ...+70°C
Filled case glycerine	-20°C ...+60°C	-20°C ...+70°C
Filled case silicone	-40°C ...+60°C	-40°C ...+70°C

In filled cases situation the above limits for the case temperatures are valid. The case filling does not come in contact with the temperatures at the stem.

## Pressure limitations

The gauges can withstand a process static pressure of **25 bar** on the stem. Above these pressure it is advised to use a thermowell from our BDTW series.

## Window

Standard BDTG18 gauges have a glass window with option a laminated safety window.

## Pointer

Standard pointer is an adjustable slotted black painted aluminum pointer. There is a micro adjustable pointer available as option.

## Dial facing

The dial plate is made from aluminum and coated with UV resistant white coating. The black dial markings, scale, numbering, and interval is according the EN 13190. Options like rotated dial, colored dial, customer logo, or colored segments are possible as well. Scale interval and numbering is following the EN 13190.

## Degree of protection

The BDTG18 has a standard degree of protection of IP65. The values are determined according the IEC/EN 60529. Class IP67 is available as option.

## Add-on contacts

The BDTG18 size 100 and 160mm can be supplied with a BDT31-01 add on contact in various contact types such as Inductive, Magnetic, and Electrical. The "BDT31-01 contacts" data sheet will give specific options and limitations on these contacts.

## Case filling

The gauges can be filled with different kind of fill fluids. When selecting the fill fluid the process temperature radiation should be taken into account. The fill fluids available are:

- BPF02 - Silicon
- BPF03 - Fill fluid combined for contacts
- BPF05 - ECTFE inert fluid for oxygen service
- BPF06 - Glycerine 99.5%

## Certification & Declaration

### Calibration

Gauges are full range calibrated as a factory standard. Optionally you can select a 5 points calibration certificate.

### ATEX 114 - 2014/68/EU

ATEX restrictions are explained in the IOM and in the ATEX background datasheet.

### EN 10204 material certificate

A material 3.1 certificate on the wetted parts can be supplied.

## Error limit

The scale range and measuring range are determining the allowed error limit for the temperature gauge. The error limits are according the EN 13190 and in °C. Only class 1 error limits are mentioned as Badotherm do not make class 2 temperature gauges.

Scale Range (°C)	Measuring range (°C)	Class 1 (°C)
-20 + 40	-10 + 30	1
-20 + 50	-10 + 40	
-20 + 60	-10 + 50	
-20 + 80	-10 + 70	
-20 + 100	-10 + 90	2
-20 + 120	-10 + 110	
-20 + 140	-10 + 130	
-25 + 40	-15 + 30	
-30 + 50	-20 + 40	1
-30 + 70	-20 + 60	
-30 + 100	-20 + 90	2
-40 + 60	-30 + 50	1
-40 + 120	-30 + 110	2
-50 + 50	-40 + 40	1
-50 + 550	-40 + 500	10
0 + 60	0 + 50	1
0 + 80	0 + 70	
0 + 100	0 + 90	
0 + 120	20 + 110	
0 + 150	20 + 130	2
0 + 160	20 + 140	
0 + 200	20 + 180	
0 + 250	30 + 220	
0 + 300	30 + 270	2.5
0 + 350	50 + 300	
0 + 400	50 + 350	
0 + 450	50 + 400	
0 + 500	50 + 450	
0 + 550	50 + 500	
0 + 600	100 + 500	
50 + 650	150 + 550	
0 + 650	10 + 550	

## Minimum immersion length (L1)

For accurate measurement it is important to have the full sensing element immersed in the process or thermowell. The minimum immersion length in below table is taking this into account.

Scale Range (°C)	Measuring range (°C)	6mm	8mm	12mm
-20 + 40	-10 + 30	60	55	50
-20 + 50	-10 + 40			
-20 + 60	-10 + 50			
-20 + 80	-10 + 70			
-20 + 100	-10 + 90	80	80	60
-20 + 120	-10 + 110			
-20 + 140	-10 + 130			
-25 + 40	-15 + 30			
-30 + 50	-20 + 40	60	55	50
-30 + 70	-20 + 60			
-30 + 100	-20 + 90	80	80	60
-40 + 60	-30 + 50	60	55	50
-40 + 120	-30 + 110	80	80	60
-50 + 50	-40 + 40	80	80	60
-50 + 550	-40 + 500	160	100	100
0 + 60	0 + 50	60	55	50
0 + 80	0 + 70			
0 + 100	0 + 90			
0 + 120	20 + 110			
0 + 150	20 + 130	80	80	60
0 + 160	20 + 140			
0 + 200	20 + 180			
0 + 250	30 + 220			
0 + 300	30 + 270	100	80	80
0 + 350	50 + 300			
0 + 400	50 + 350			
0 + 450	50 + 400			
0 + 500	50 + 450			
0 + 550	50 + 500			
0 + 600	100 + 500			
50 + 650	150 + 550			
0 + 650	100 + 550			

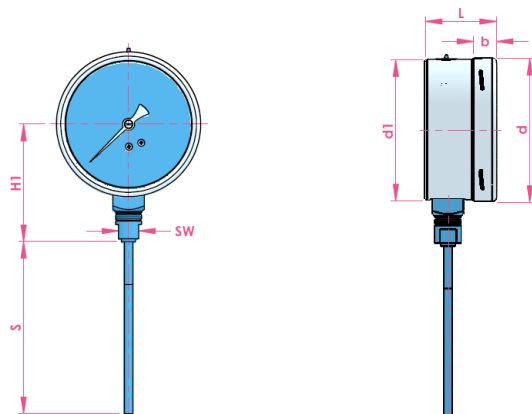
## Stem diameters (d)

Metric sizes
6mm
8mm
10mm
12mm

Imperial sizes
¼" (6.35)
3/8" (9.53)
½" (12.7)

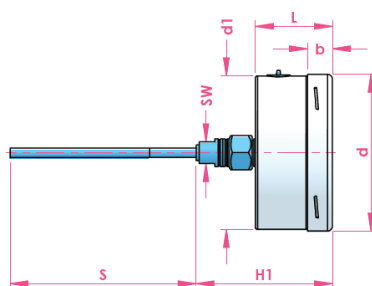
## Dimensions table

### Type A ; Fixed



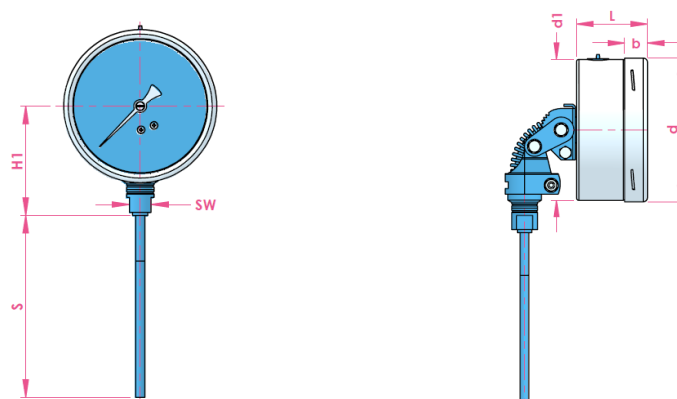
Dial size	d	d1	b	L	SW	H1	S	weight
100	101.0	99.0	16.0	49.7	14	81.8	variable	0.5 kg
160	161.0	158.5	17.5	51.0		111.6		0.8 kg

### Type D ; Fixed



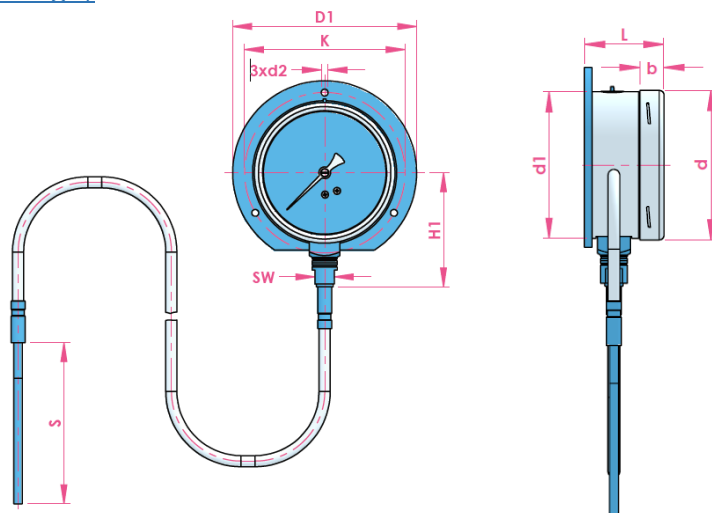
Size	d	d1	b	L	SW	H1	SW	S	weight
100	101.0	99.0	16.0	49.7	14	87.9	14	variable	0.6 kg
160	161.0	158.5	17.5	51.0		87.4			0.8 kg

### Type DA ; Every angle



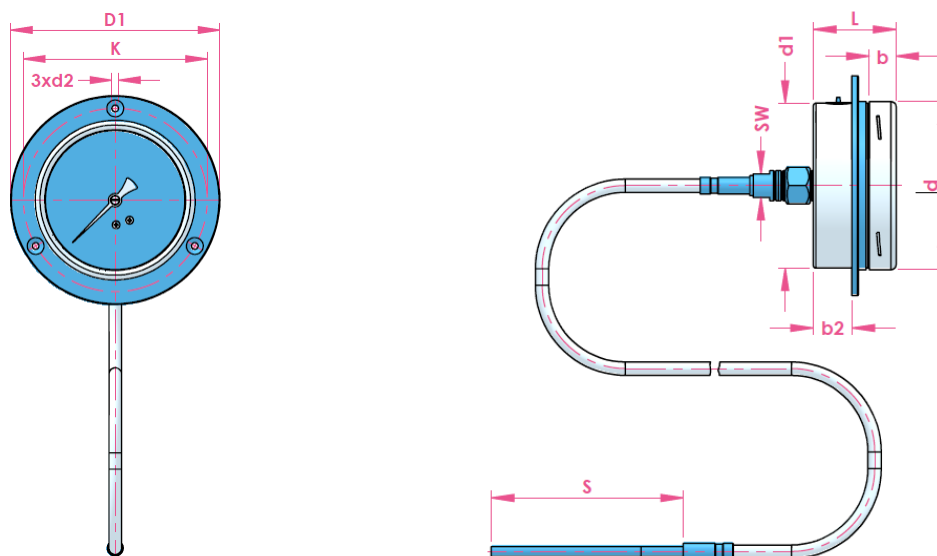
Dial size	d	d1	b	L	SW	H1	SW	S	weight
100/100	101.0	99.0	16.0	49.7	14	72.2	14	variable	0.5 kg
160/160	161.0	158.5	17.5	51.0					0.8 kg

### Type C ; Remote (back-flange)



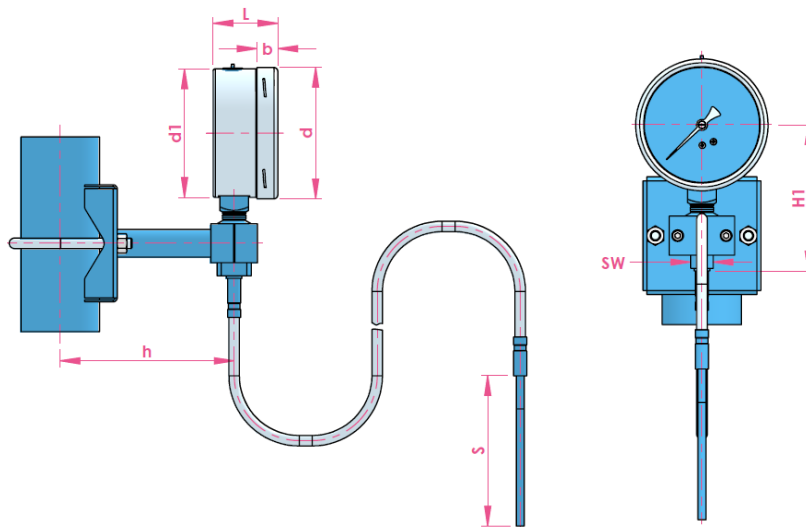
Size	d	d1	b	L	K	D1	SW	H1	S	weight
100	101.0	99.0	16.0	53.0	115	132.0	14	81.8	variable	0.6 kg
160	161.0	158.5	17.5	54.0	179.4	195.5		111.6		0.8 kg

### Type E ; Remote (front-flange)



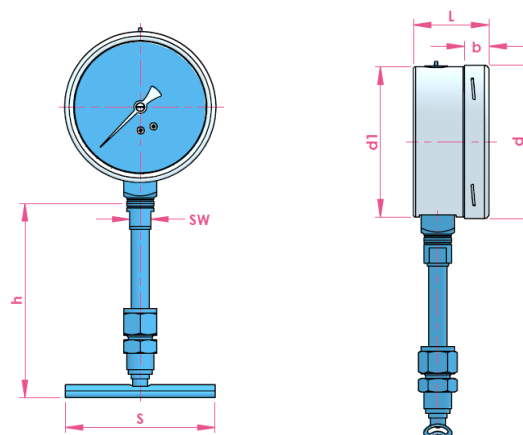
Size	d	d1	b	L	b2	k	D1	SW	S	weight
100	101.0	99.0	16.0	49.7	23.2	116.0	132	14	variable	0.6 kg
160	161.0	158.5	17.5	51.0	19.7	179.2	196			0.8 kg

### Type H ; Distance



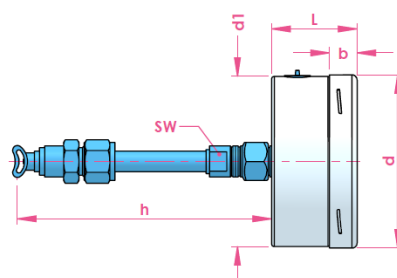
Size	d	d1	b	L	h	H1	SW	S	weight
100	101.0	99.0	16.0	49.7	133.8	111.8	17	variable	0.6 kg
160	161.0	158.5	17.5	51.0		141.6			0.8 kg

### Type A ; Contact stem



Size	d	d1	b	L	h	SW	S	weight
100	101.0	99.0	16.0	49.7	129.8	14	100.0	0.6 kg
160	161.0	158.5	17.5	51.0				0.8 kg

### Type D ; Contact stem

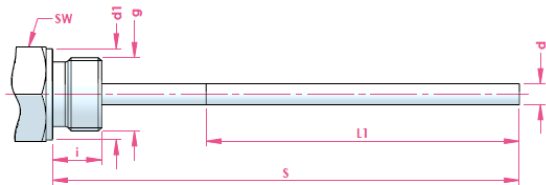


Size	d	d1	b	L	h	SW	S	weight
100	101.0	99.0	16.0	49.7	148	14	100	0.6 kg
160	161.0	158.5	17.5	51.0				0.8 kg

## Connection details

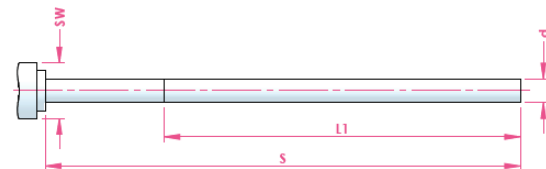
Size S is a free choice with respect to the minimum insert length L1. This dimensions can be found in the table "minimum insert length". The stem diameters can be found in the table "Stem diameters".

### Fixed - male threaded connection *not for capillary*



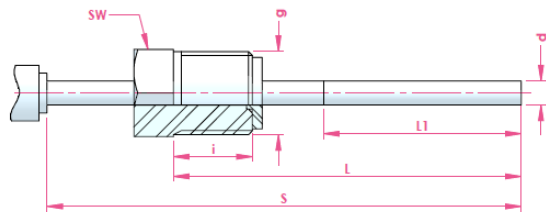
g	SW	i	d1
G 1/2 A	27	14	26
G 3/4 A	32	16	32
1/2" NPT	22	19	NA
3/4" NPT	30	20	NA

### Plain - stem without thread



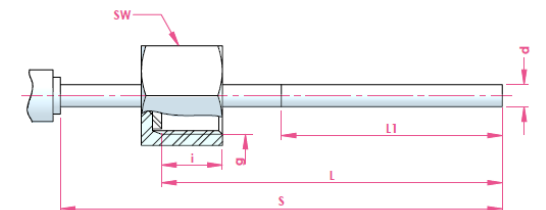
SW
22

### Male Nut – Rotatable loose nut



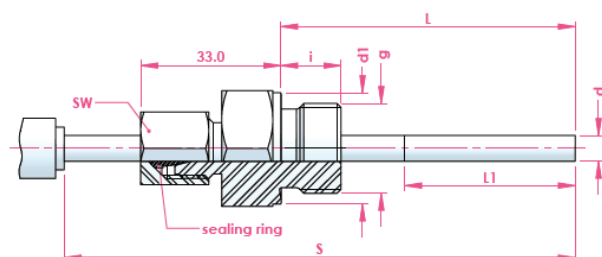
g	SW	i
G 1/2 A	27	20
M20x1.5	22	15

### Female nut – rotatable swivel nut



Size	G	SW	i
100, 160	G1/2B	27	8.5
	G3/4B	32	10.5
	M24x1.5	32	13.5

### Compression fitting – fitting on plain stem



g	SW	i	d1
G 1/2 A	27	14	26
G 3/4 A	32	16	32
M18x1.5	24	12	23
1/2"NPT	22	19	NA
3/4"NPT	30	20	NA

## Product code 100, 160mm

Example code:		<b>BDTG18</b>	160	A	1	F	S	D08	L100	G12M	316	A	0	L	C33	1	
<b>TYPE</b>																	
100 mm ◀																	100
160 mm ◀																	160
<b>MOUNTING</b>																	
Bottom connection - direct mounting (01) ◀																	A
Bottom connection - surface mounting (10)																	C
Center back connection. - direct mounting (03)																	D
Center back connection. - panel mount (08,12)																	E
Bottom connection - console mounting (10)																	H
<b>STEM MOUNTING</b>																	
Fixed stem to the case																	1
Every Angle device to the case																	2
Remote from the case with armoured capillary																	3
<b>CONNECTION TYPE</b>																	
Plain stem without thread																	P
Fixed thread on the stem																	F
Adjustable by compression fitting on stem																	A
Adjustable by compression fitting on capillary																	C
Rotatable male or female nut																	R
<b>STEM VARIATION</b>																	
Straight stem																	S
Contact mounting stem																	C
<b>STEM DIAMETER</b>																	
6mm																	M06
1/4"																	I14
8mm																	M08
3/8"																	I38
10mm																	M10
12mm																	M12
1/2"																	I12
<b>STEM LENGTH</b>																	
L followed by length (eg "L100" for 100mm)																	L100
<b>CONNECTION (SEE TABLE 5 FOR OTHER OPTIONS)</b>																	
G 3/8" B																	G38M
G1/2 A ◀																	G12M
1/2" NPT																	N12M
R 1/2																	R12M
M20x1.5																	M20M
<b>CASE/BEZEL MATERIAL</b>																	
AISI 304 ◀																	4
AISI 316																	6
<b>POINTER</b>																	
Adjustable slotted pointer ◀																	A
Micro adjustable pointer																	M
Add-on contact device (see table 4)																	A__
<b>LIQUID FILLING</b>																	
Dry ◀																	0
BPF 06 - Glycerine filled 1,26 (99,5%)																	6
BPF 02 - Silicone filled																	2
BPF 03 - Contact use																	3
BPF 05 - Oxygen service																	5
<b>WINDOW</b>																	
Laminated glass (S1)																	L
Glass ◀																	G
<b>RANGE</b>																	
See table 1 and table 2																	....
<b>ACCURACY</b>																	
Class 1																	1

◀: is the sign for the standard temperature gauge



**Tabel 1: Temperature Range code**

°C		°F	
Code	Range	Code	Range
C01	-200 ... +50	F03	-320 ... +200
C02	-200 ... +100	F08	-100 ... +100
C04	-100 ... +50	F15	-40 ... +180
C05	-100 ... +60	F27	0 ... +200
C06	-100 ... +100	F28	0 ... +250
C07	-100 ... +500	F29	+20 ... +240
C09	-50 ... +50	F43	+50 ... +400
C10	-50 ... +70	F44	+50 ... +550
C11	-50 ... +100	F45	+50 ... +750
C12	-50 ... +200	F49	+200 ... +1000
C13	-40 ... +40	F52	+400 ... +1200
C14	-40 ... +60		
C16	-30 ... +30		
C17	-30 ... +50		
C18	-30 ... +70		
C19	-30 ... +100		
C20	-20 ... +40		
C21	-20 ... +50		
C22	-20 ... +60		
C23	-20 ... +80		
C24	-20 ... +100		
C25	-20 ... +110		
C26	-20 ... +120		
C30	0 ... +60		
C31	0 ... +80		
C32	0 ... +100		
C33	0 ... +120		
C34	0 ... +150		
C35	0 ... +160		
C36	0 ... +200		
C37	0 ... +250		
C38	0 ... +300		
C39	0 ... +400		
C40	0 ... +500		
C41	0 ... +600		
C42	0 ... +650		
C46	+50 ... +300		
C47	+50 ... +400		
C48	+50 ... +650		
C50	+100 ... +500		
C51	+100 ... +700		
...	On request		

**Table 2: Secondary scale**

Dual scale option	code
°C red	#CR
°C black	#CB
°C blue	#CBL
°F red	#FR
°F black	#FB
°F blue	#FBL
°R red	#RR
°R black	#RB
°R blue	#RBL

Add the code behind the temperature code (eg C35#FR for 0...160 °C /°F with red scale)

**Table 3: General option code**

Option (start options with X_)	code
IP 66 class	_IP66
IP 67 Class	_IP67
Drag pointer*1	_SP
Index pointer*1	_IP
Calibrated at 0°	C0
Calibrated at 180°	_C180
NACE ISO 15156 (MR 01 75) (alloy 400)	_N75
ATEX II2GDc-IM2c	_ATEX
3.1 material certificate	_IC31
Calibration certificate 5 points	_CC5
Calibration certificate 10 points	_CC10

\*1 only with glass window

**Table 4: Contact option code**

Option (start options with X_)	code	
Snap-action magnetic contact	M1 (make contact)	_AM1
	M2 (break contact)	_AM2
	M11 (make - make contact)	_AM11
	M12 (make - break contact)	_AM12
	M21 (break - make contact)	_AM21
Inductive contact	I1 (make contact)	_AI1
	I2 (break contact)	_AI2
	I11 (make - make contact)	_AI11
	I12 (make - break contact)	_AI12
	I21 (break - make contact)	_AI21

**Table 5: thread options**

Thread standard	Thread sie	code
ISO 228-1	G 1/4 (A)	G14M
	G 3/8 (A)	G38M
	G 1/2(A) ◀	G12M
	G 3/4 (A)	G34M
ISO 7-1	R 1/4 (A)	R14M
	R 3/8 (A)	R38M
	R 1/2 (A)	R12M
ANSI 1.20.1	R 3/4 (A)	R34M
	1/4" NPT	N14M
	3/8" NPT	N38M
	1/2" NPT ◀	N12M
DIN 13-1	3/4" NPT	N34M
	M14x1.5	M14M
	M18x1.5	M18M
	M20x1.5	M20M
	M27x2	M27M

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## Change log

Date	Change

Holland – Romania – India – Thailand – Dubai – USA

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TG 7001  
15<sup>th</sup> of March 2022