

Thermatel® TG1/TG2 series is a two wire, intrinsically safe switch for gaseous or liquid flow, level or interface detection using the proven thermal dispersion technology.

The unit consists of electronics in a DIN rail housing and a remote sensor with aluminium or stainless steel sensor housing (max 500 m (1650') away from electronics). The TG1/TG2 electronics are compatible with a wide range of sensors designed for specific applications.

The Thermatel® TG1/TG2 series has no moving parts, is easy to install and adjust and provides reliable operation requiring little or no maintenance.

FEATURES

- Easy field calibration – pre-calibration from factory possible.
- Variable flow or Flow/No flow detection of gases and liquids.
- Excellent low flow sensitivity.
- Automatic temperature compensation for repeatable alarm under varying process temperatures.
- Continuous diagnostics (sensor/electronics).
- Continuous monitoring of flow rate versus setpoint via LED.
- mA output provides repeatable indication of flow rate and fault detection.
- Optional retractable fitting for dismantling under process conditions.
- Process conditions up to +450 °C (+850 °F) and 413 bar (6000 psig).
- Suited for SIL1 and SIL2 loops (full FMEDA report available).



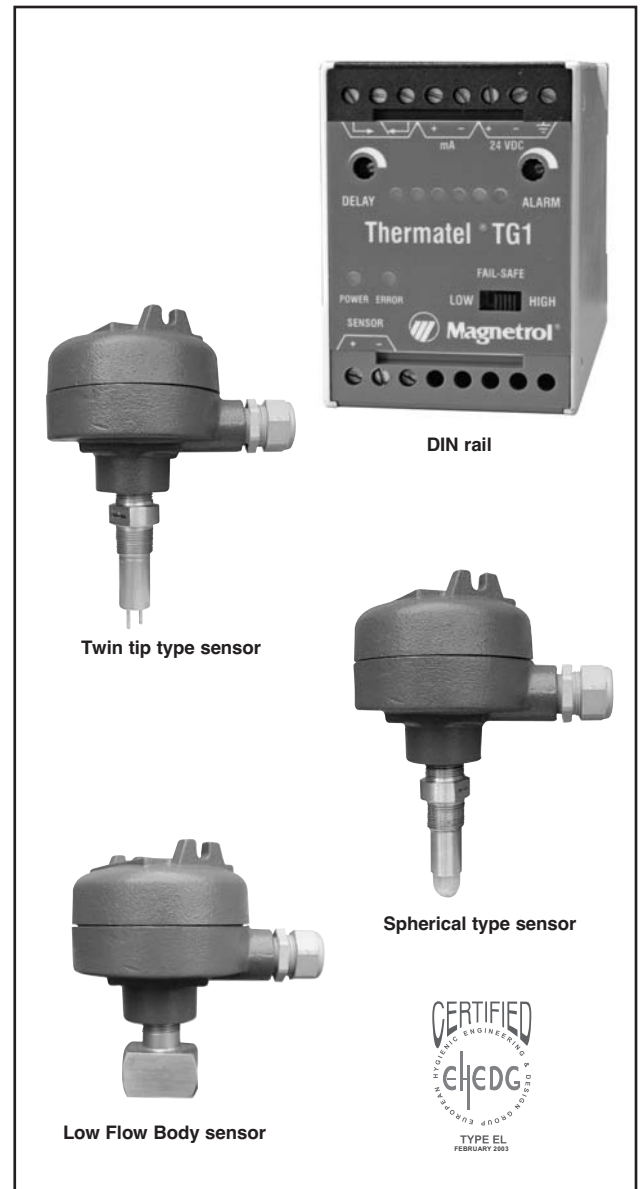
APPLICATIONS

Media: all types of gases and liquids.

Vessels: pipesizes down to 1/4". Max sensor length up to 3,3 m. Can be installed at any angle vertically/horizontally – flanged, threaded or with compression fitting with or without hot or cold tap – ask for bulletin 41-103.

Conditions: Can be used on conductive and non conductive media, very light density to heavy viscous media (up to 10.000 cP). Can be set to ignore foam, aeration, turbulence, and cavitation.

For FLOW/LEVEL/INTERFACE applications



AGENCY APPROVALS

Agency	Approval
ATEX	II 1G EEx ia II B T5

PRINCIPLE OF OPERATION

The Thermatel® switch consists of DIN rail mounted electronics with a remote mounted sensor which may be located up to 500 m (1650 ') away from the electronics.

The sensing assembly contains 2 miniature RTD (Resistance Temperature Detector) tightly encased within a 316L stainless steel, Hastelloy C or Monel tube.

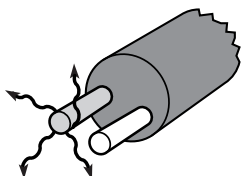
The first RTD (unheated) provides a reference temperature of the process conditions over the entire operating range of -70 °C to +200 °C (-100 °F to +400 °F).

High temperature design is suitable for temperatures ranging from -70 °C to +450 °C (-100 °F to +850 °F).

The second RTD is internally heated to establish a temperature differential above the process temperature. The cooling effect on the heated RTD, caused by the presence of flow or level, decreases the differential temperature between the two RTD's. The change in differential temperature is then converted to a pulse signal that is superimposed on the 2 wires carrying the 24 V DC power to the probe. The compact DIN rail electronics monitor this pulse signal, convert it to a LED indication and non-linear mA output.

Flow

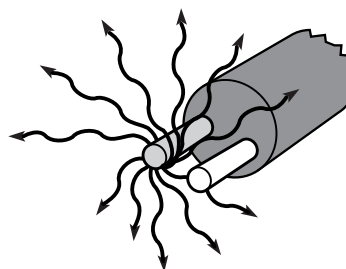
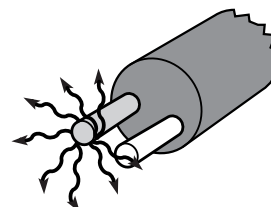
No Flow/Low Flow
In the absence of flow/low flow, the self-heated sensor creates a temperature differential between the two sensors.



Flow
As media flows increases across the sensing assembly, heat is dissipated and temperature differential decreases .

Level

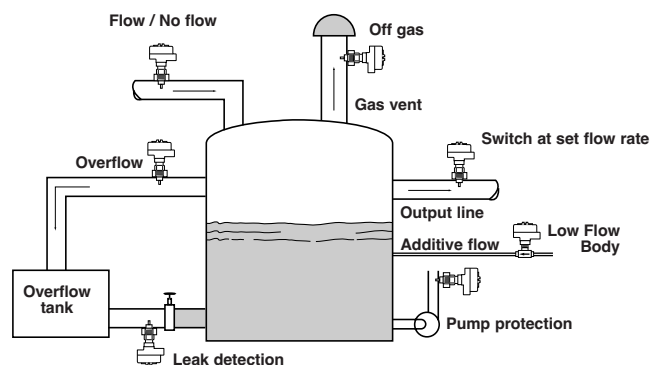
Low Level
In the absence of media, the self-heated sensor tip creates a temperature differential between the two sensors.



High Level
As media contacts the sensing assembly, heat is absorbed by the fluid, decreasing the temperature differential.

APPLICATIONS FLOW

Thermatel® TG1/TG2 switches may be installed in a variety of flow applications as shown in the illustration below. Flow/No Flow can be detected in an input line to a primary tank, or in an output line. They may be installed for overflow detection in a pipe connected to an overflow tank or installed in a drain line for Wet/Dry indication. In addition, due to the capability to detect liquids or gases, the Thermatel® flow switch may be installed in a gas vent to detect off-gas from the primary tank.

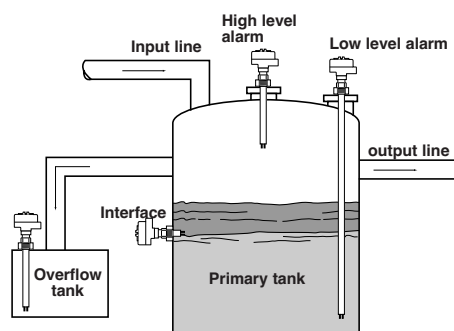


- Liquid or Gas flow detection
- Maintain a minimum flow rate
 - Pump protection
 - Cooling air/water
- Detect presence of flow
 - Relief valves
 - Flare lines

APPLICATIONS LEVEL SWITCH

Thermatel® series TG1/TG2 switches can be installed in a variety of level applications as shown in the illustration below. High or low level alarm applications can be installed in either vertical or horizontal mountings.

Sensors are available in lengths from 50 to 3300 mm (2" to 130") for a wide variety of applications.



- High level
- Low level
- Interface between different medias
 - Oil/water
 - Liquid/solids
- Suitable for any liquid level detection including:
 - High viscosity
 - High solids content
 - Aeration
 - Foam
- Insensitive to dielectric, specific gravity, viscosity
- Sanitary applications

EXPEDITE SHIP PLAN (ESP)

Several Thermatel switches are available for quick shipment, within max. 3 weeks after factory receipt of purchase order, through the Expedite Ship Plan (ESP).

Models covered by ESP service are conveniently colour coded in the selection data charts.

To take advantage of ESP, simply match the colour coded model number codes (standard dimensions apply).

ESP service may not apply to orders of ten units or more. Contact your local representative for lead times on larger volume orders, as well as other products and options.

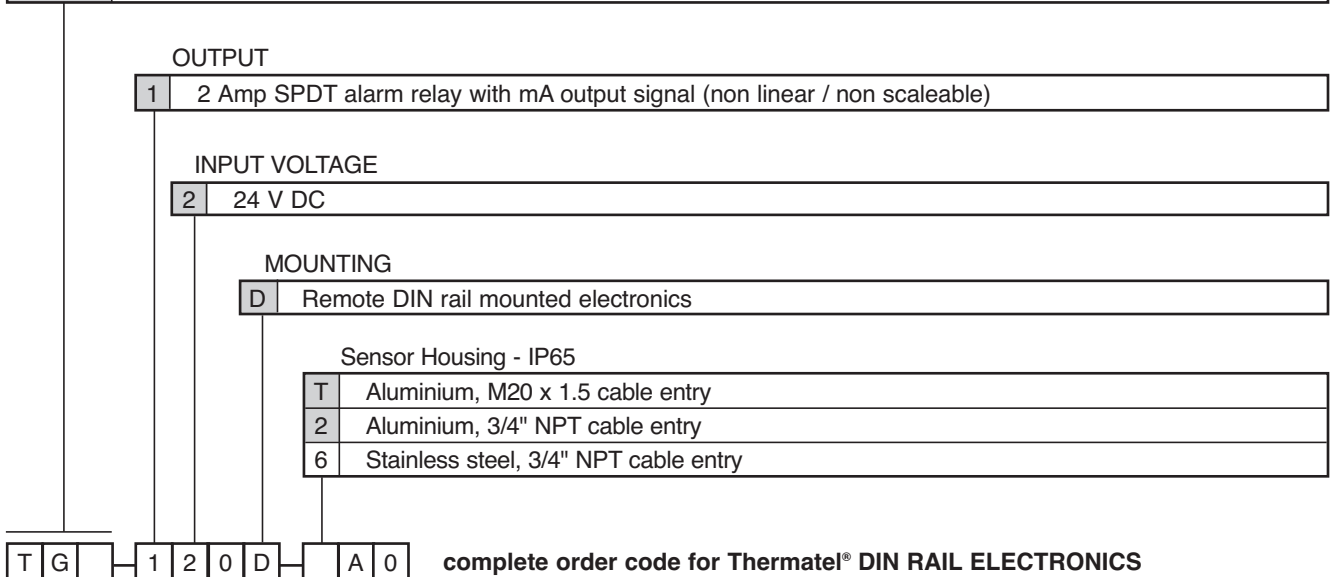
SELECTION DATA

A complete Thermatel® system consists of:

1. THERMATEL® DIN RAIL electronics
2. Connecting cable
3. THERMATEL® sensor, incl. sensor housing (see pages 5, 6 and 7)
4. Optional: Mounting flanges (compatible with 3/4" threaded sensors)
5. Optional: hot tap process connection, consult factory for details

1. Order code for Thermatel® DIN RAIL ELECTRONICS

T	G	1	Intrinsically safe Thermatel electronics with standard LED flow indication
T	G	2	Intrinsically safe Thermatel electronics with LED flow indication per NAMUR NE 44



2. Order code for connecting cable (standard shielded instrument cable – 0,50 mm²)

0 0 1 - 5 0 0	From 1 m (3.28') min. to 500 m (1650') max. Specify in increments of 1 m (3.28') consult factory for longer distances
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Use	Spherical Tip	Twin Tip	High Temperature	Low Flow Body	Mini Sensor
For	General purpose High viscosity	General purpose Corrosive material	High temperatures High pressures	Low flow detection	Flow detection
Medium adhesivity	Coating	Mild coating	Mild coating	Mild coating	Mild coating
Process connection: Thread	3/4" NPT, 1" BSP/NPT	3/4" NPT, 1" BSP/NPT	3/4" NPT, 1" BSP/NPT	1/4", 1/2" NPT 1/4", 1/2" BSP	1/2" NPT, 3/4" NPT, 1" NPT fits directly in "T" piece
Flange	ANSI, EN/DIN, sanitary	ANSI, EN/DIN, sanitary	ANSI, EN/DIN		
Maximum temperature	+200 °C (+400 °F)	+200 °C (+400 °F)	+450 °C (+850 °F)	+120 °C (+250 °F)	+120 °C (+250 °F)
Maximum pressure	41 bar (600 psi)	207 bar (3000 psi) ^①	413 bar (6000 psi)	400 bar (5800 psi)	207 bar (3000 psi) ^①
Probe length	5 to 330 cm	5 to 330 cm	5 to 90 cm	Not applicable	3 to 330 cm

^① Max 127 bar (1850 psig) for sensors > min. length

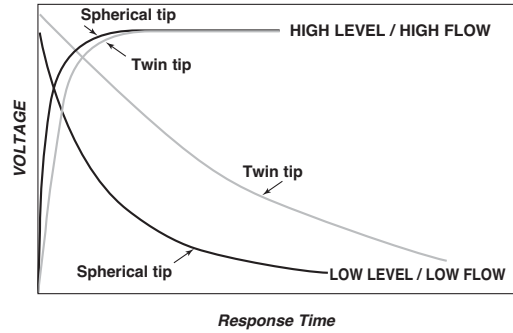
TWO SENSOR TIP DESIGNS

Thermatel offers two sensor tip designs: the sensor twin tip and the unique spherical tip. Both designs have similar operating ranges. Response time to a change in flow is depicted for both tips in the chart at right.



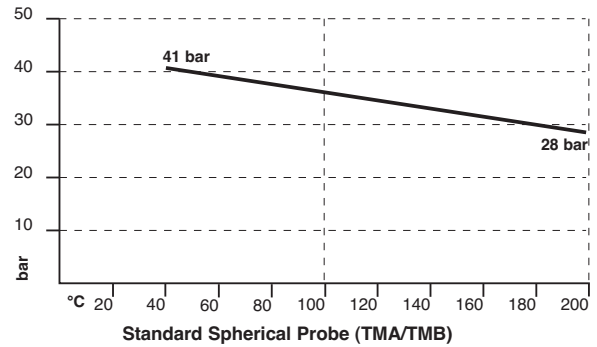
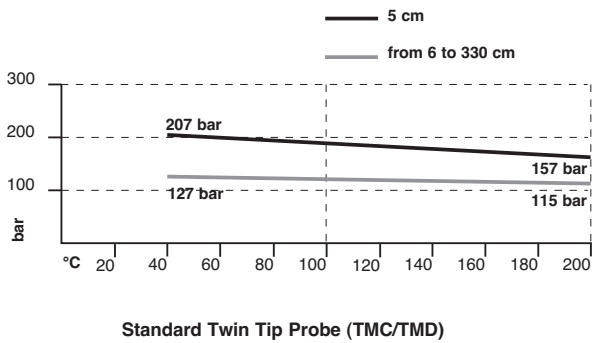
The spherical tip is recommended for all types of applications: general purpose, high viscosity and applications where buildup can occur.

RESPONSE TIME/ SPHERICAL TIP VERSUS TWIN TIP

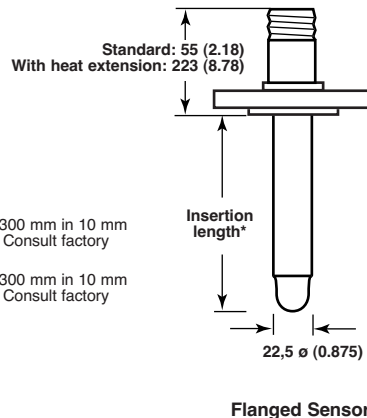
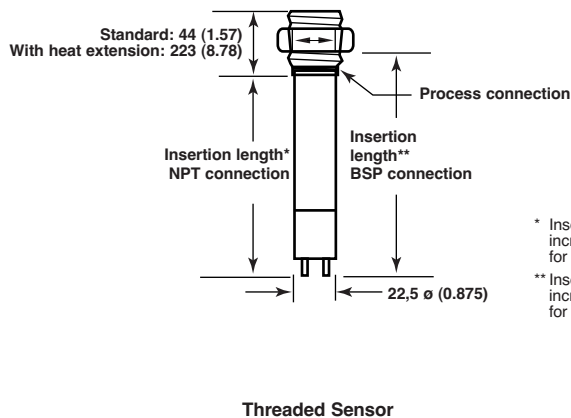


Both sensors detect flow or level at approximately the same rate. However, the spherical tip responds faster to a loss of flow or a dry condition.

PRESSURE/TEMPERATURE RATING



DIMENSIONS IN MM (INCHES)



* Insertion length: 50 to 3300 mm in 10 mm increments (2" to 130"). Consult factory for longer lengths.
 ** Insertion length: 80 to 3300 mm in 10 mm increments (3" to 130"). Consult factory for longer lengths.

SELECTION DATA (CONT.)

3. Order code for TG1/TG2 Thermatel® STANDARD SENSOR FOR FLOW/LEVEL INTERFACE

BASIC MODEL NUMBER – SENSOR

T M A	Standard spherical tip	max 120 °C (250 °F) / max 41 bar (600 psi)
T M B	Standard spherical tip - with heat extension	max 200 °C (400 °F) / max 41 bar (600 psi)
T M C	Standard twin tip	max 120 °C (250 °F) / max 207 bar (3000 psi) ^①
T M D	Standard twin tip - with heat extension	max 200 °C (400 °F) / max 207 bar (3000 psi) ^①

^① Max 127 bar (1850 psig) for sensors ≥ 6 cm (3")

MATERIAL OF CONSTRUCTION FOR SENSOR AND PROCESS CONNECTION

A	316/316 L (1.4401/1.4404) stainless steel
B	Hastelloy C (2.4819) - only available for twin tip sensors (TMC/TMD)
C	Monel (2.4360) - only available for twin tip sensors (TMC/TMD)

PROCESS CONNECTION SIZE

1	1	Threaded 3/4" NPT
2	1	Threaded 1" NPT
2	2	Threaded G1 (1" BSP)
2	P	Threaded G1 A (BSP) – compatible with sanitary weld flange

ANSI FLANGED

2	3	1"	150 lbs ANSI RF flange
2	4	1"	300 lbs ANSI RF flange
2	5	1"	600 lbs ANSI RF flange
3	3	1 1/2"	150 lbs ANSI RF flange
3	4	1 1/2"	300 lbs ANSI RF flange
3	5	1 1/2"	600 lbs ANSI RF flange
4	3	2"	150 lbs ANSI RF flange
4	4	2"	300 lbs ANSI RF flange
4	5	2"	600 lbs ANSI RF flange

EN/DIN FLANGED

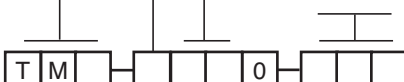
B	B	DN 25	PN 16/25/40	EN 1092-1 Type A
B	C	DN 25	PN 63/100	EN 1092-1 Type B2
C	B	DN 40	PN 16/25/40	EN 1092-1 Type A
C	C	DN 40	PN 63/100	EN 1092-1 Type B2
D	A	DN 50	PN 16	EN 1092-1 Type A
D	B	DN 50	PN 25/40	EN 1092-1 Type A
D	D	DN 50	PN 63	EN 1092-1 Type B2
D	E	DN 50	PN 100	EN 1092-1 Type B2

SANITARY FLANGED – AVAILABLE FOR TMA/TMB SENSORS IN 316/316L (1.4401/1.4404)

3	T	1" and 1 1/2"	3A compatible	V	V	Varivent	DN 65
4	T	2"	3A compatible	B	N	NEUMO Bio Control®	D 25
B	S	DIN 11.851	DN 25	D	N	NEUMO Bio Control®	D 50
C	S	DIN 11.851	DN 40	V	N	NEUMO Bio Control®	D 65
D	S	DIN 11.851	DN 50				

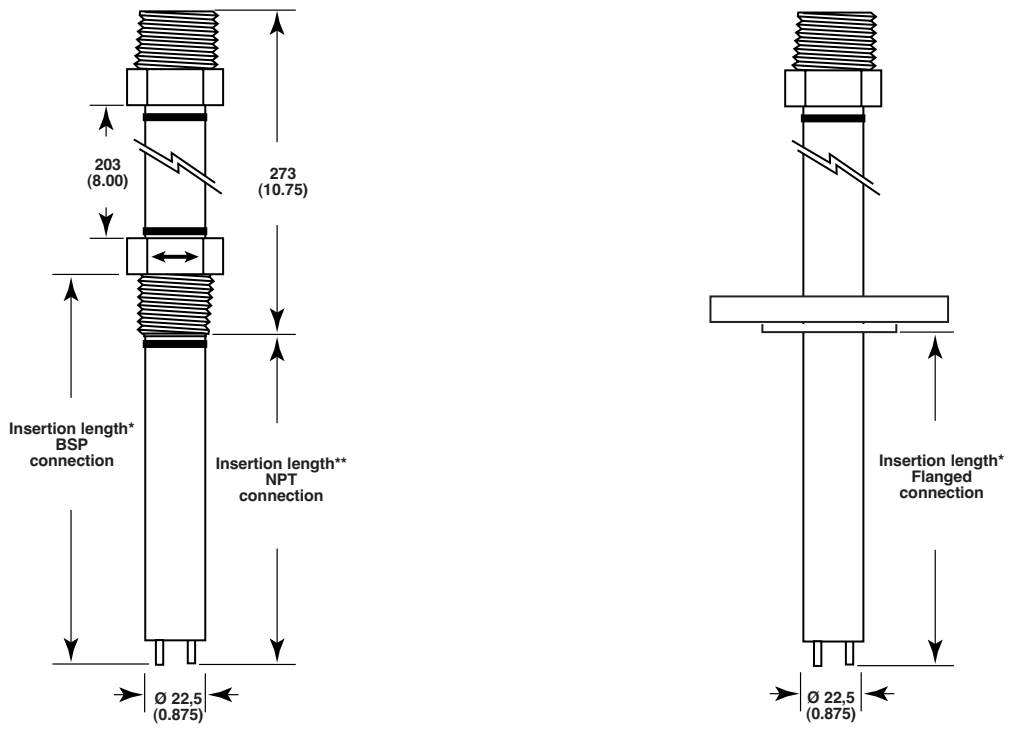
INSERTION LENGTH – SPECIFY FOR INCREMENTS OF 10 mm (0.39")

0	0	5	Minimum length 50 mm (2")
0	0	8	Minimum length 80 mm (3") – sensors with BSP (G1) connection
3	3	0	Maximum length 3300 mm (130")



complete order code for TG1/TG2 Thermatel® STANDARD SENSOR

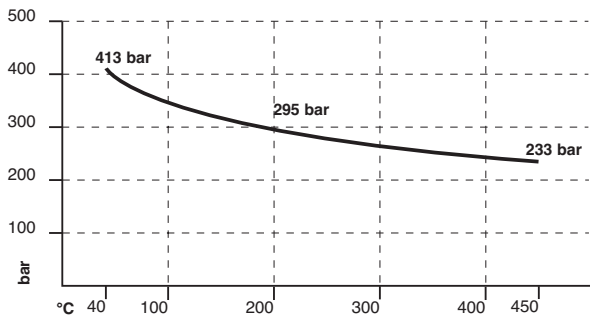
DIMENSIONS IN MM (INCHES)



* Insertion length: 50 to 900 mm in 10 mm increments (2" to 35.4").
 **Insertion length: 80 to 900 mm in 10 mm increments (3" to 35.4").

High Temperature Sensor (TMH)

PRESSURE/TEMPERATURE RATING



SELECTION DATA (CONT.)

3. Order code for TG1/TG2 Thermatel® HIGH TEMPERATURE / HIGH PRESSURE SENSOR FOR FLOW/LEVEL/INTERFACE

T M H	High temperature / high pressure twin tip – max 450 °C (850 °F) / max 413 bar (6000 psi)
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MATERIAL OF CONSTRUCTION FOR SENSOR AND PROCESS CONNECTION

A	316/316 L (1.4401/1.4404) stainless steel
B	Hastelloy C (2.4819)

PROCESS CONNECTION SIZE

1	1	Threaded 3/4" NPT
2	1	Threaded 1" NPT
2	2	Threaded G1 (1" BSP)

ANSI FLANGED

2	3	1"	150 lbs ANSI RF flange
2	4	1"	300 lbs ANSI RF flange
2	5	1"	600 lbs ANSI RF flange
2	7	1"	900/1500 lbs ANSI RF flange
3	3	1 1/2"	150 lbs ANSI RF flange
3	4	1 1/2"	300 lbs ANSI RF flange
3	5	1 1/2"	600 lbs ANSI RF flange
3	7	1 1/2"	900/1500 lbs ANSI RF flange
3	8	1 1/2"	2500 lbs ANSI RF flange
4	3	2"	150 lbs ANSI RF flange
4	4	2"	300 lbs ANSI RF flange
4	5	2"	600 lbs ANSI RF flange
4	7	2"	900/1500 lbs ANSI RF flange
4	8	2"	2500 lbs ANSI RF flange

END/DIN FLANGED

B	B	DN 25	PN 16/25/40	EN 1092-1 Type A
B	C	DN 25	PN 63/100	EN 1092-1 Type B2
B	G	DN 25	PN 250	EN 1092-1 Type B2
C	B	DN 40	PN 16/25/40	EN 1092-1 Type A
C	C	DN 40	PN 63/100	EN 1092-1 Type B2
C	G	DN 40	PN 250	EN 1092-1 Type B2
C	J	DN 40	PN 400	EN 1092-1 Type B2
D	A	DN 50	PN 16	EN 1092-1 Type A
D	B	DN 50	PN 25/40	EN 1092-1 Type A
D	D	DN 50	PN 63	EN 1092-1 Type B2
D	E	DN 50	PN 100	EN 1092-1 Type B2
D	G	DN 50	PN 250	EN 1092-1 Type B2
D	J	DN 50	PN 400	EN 1092-1 Type B2

INSERTION LENGTH – SPECIFY FOR INCREMENTS OF 10 mm (0.39")

0 0 5	Minimum length 50 mm (2")
0 0 8	Minimum length 80 mm (3") – sensors with BSP (G1) connection
0 9 0	Maximum length 900 mm (35.4")



complete order code for TG1/TG2 Thermatel®
HIGH TEMPERATURE /HIGH PRESSURE SENSOR

SELECTION DATA (CONT.)

3. Order code for TG1/TG2 Thematel® MINI SENSOR FOR FLOW/LEVEL INTERFACE - 1/2" NPT process connection

T M M	Mini twin tip (16 mm diam.) – max 120 °C (250 °F) / max 207 bar (3000 psi) for standard sensor length max 120 °C (250 °F) / max 127 bar (1850 psi) for sensors ≥ 50 mm
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MATERIAL OF CONSTRUCTION FOR SENSOR AND PROCESS CONNECTION

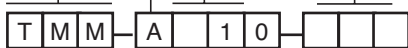
A	316/316 L (1.4401/1.4404) stainless steel
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PROCESS CONNECTION SIZE

0	1	Threaded 1/2" NPT
1	1	Threaded 3/4" NPT
2	1	Threaded 1" NPT

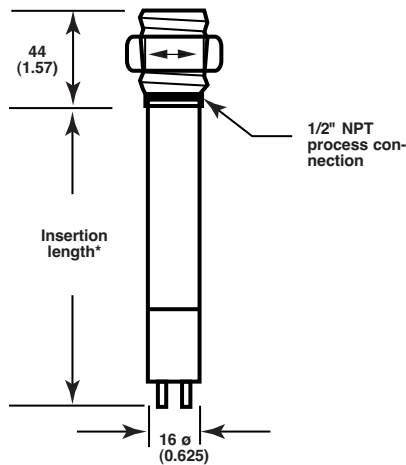
INSERTION LENGTH – SPECIFY FOR INCREMENTS OF 10 mm (0.39")

0	0	3	Standard length 25 mm (1")
0	0	5	Minimum selectable length 50 mm (2")
3	3	0	Maximum selectable length 3300 mm (130")



complete order code TG1/TG2 Thematel® MINI SENSOR

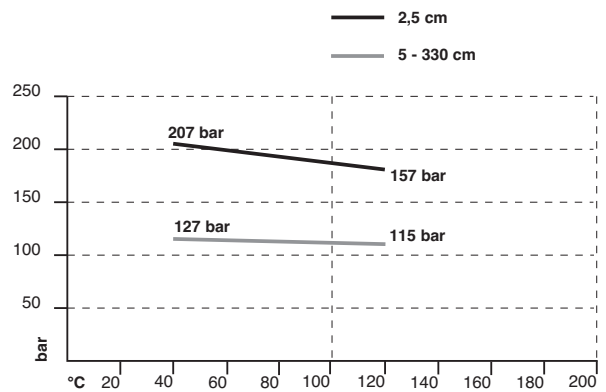
DIMENSIONS IN mm (inches)



* Insertion length:
25 mm (1") minimum.
50 to 3300 mm (2" to 130") available

Mini Sensor (TMM)

PRESSURE/TEMPERATURE RATING



RECOMMENDED FLOW RANGES

Size	Water	Air
1/2" "T"	0,75 to 680 l/h (0.2 GPH to 180 GPH)	0,85 to 120 Nm ³ /h (0.5 to 70 SCFM)
3/4" "T"	2 to 900 l/h (0.5 GPH to 240 GPH)	2,5 to 170 Nm ³ /h (1.5 to 100 SCFM)
1" "T"	3,8 to 1600 l/h (1 GPH to 420 GPH)	5 to 290 Nm ³ /h (3 to 170 SCFM)

SELECTION DATA (CONT.)

3. Order code for TG1/TG2 ThermoTel® LOW FLOW BODY SENSOR

T M L	Low flow body – max 120 °C (250 °F) / max 400 bar (5800 psi)
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MATERIAL OF CONSTRUCTION FOR SENSOR AND PROCESS CONNECTION

A	316/316 L (1.4401/1.4404) stainless steel
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PROCESS CONNECTION SIZE

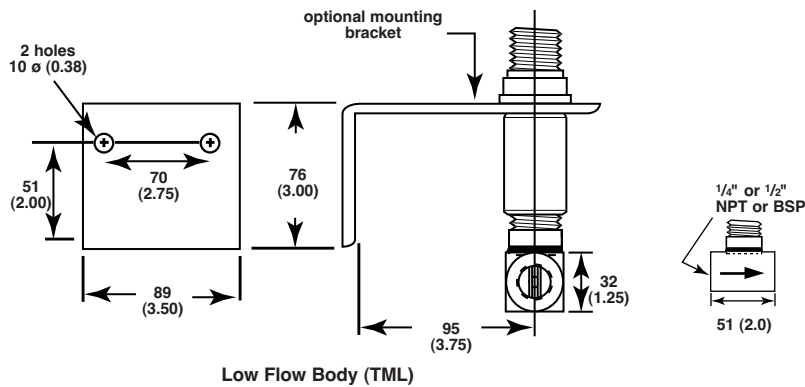
T 1	Threaded 1/4" NPT
V 1	Threaded 1/2" NPT
T 0	Threaded G 1/4 (1/4" BSP)
V 0	Threaded G 1/2 (1/2" BSP)

MOUNTING BRACKET

0 0 0	None
1 0 0	With mounting bracket in carbon steel

T M L A 0 complete order code for TG1/TG2 ThermoTel® LOW FLOW BODY SENSOR

DIMENSIONS IN mm (INCHES)



PRESSION/TEMPERATURE

Max 285 bar (4100 psi) @ max +120 °C (+250 °F) with integral electronics / +200 °C (+400 °F) with remote electronics.
 Max 400 bar (5800 psi) @ +40 °C (100 °F).

RECOMMENDED FLOW RANGES

Size	Water	Air
1/4" flow body	0,02 to 5,7 l/h (0.0055 GPH to 1.5 GPH)	0,006 Nm ³ /h to 5,75 Nm ³ /h (100 sccm to 200 SCFH)
1/2" flow body	0,04 to 11,5 l/h (0.01 GPH to 3 GPH)	0,015 Nm ³ /h to 11,5 Nm ³ /h (250 sccm to 400 SCFH)

ELECTRONICS SPECIFICATIONS

Description		Specifications
Power at terminals		24 V DC ($\pm 20\%$)
Power consumption		5 W max.
Flow range		Standard sensors: 0,003 to 1,5 m/s (0.01 to 5.0 FPS) – water 0,03 to 150 m/s (0.1 to 500 FPS) – air HTHP, Hastelloy C / Monel: 0,003 to 0,3 m/s (0.01 to 1.0 FPS) – water (1 mm wall sensors) 0,03 to 150 m/s (0.1 to 500 FPS) – air 1/4" Low flow body: 0,02 to 5,7 l/h – water and min 0,006 Nm ³ /h – air/gases 1/2" Low flow body: 0,04 to 11,5 l/h – water and min 0,015 Nm ³ /h – air/gases
Signal output	Alarm	2 Amp SPDT relay
	Continuous	mA output (non linear, non scaleable)
	Error	22 mA in "HIGH" Fail-safe mode / 3,6 mA in "LOW" Fail-safe mode (as per NAMUR NE 43)
User interface	Set point	Adjustable via potentiometer located on DIN Rail housing
	Range selection	Selectable in probe electronics
LED indication	Power	LED's for Power/Alarm status
	Error	Red LED blinks in case of error
	Alarm	4 x green LED's – for safe/ (normal) condition 1 x yellow LED – indicates when flow or level is approaching the alarm set point 1 x red LED – indicates an alarm condition (TG1) all LED's OFF – indicates an alarm condition (TG2)
Approvals		ATEX II 1 G EEx ia II B T5
SIL (Safety Integrity Level)		Functional safety to SIL1/SIL2 in accordance to IEC 61508 – SFF of 79,4 % – full FMEDA reports and declaration sheets available
Housing materials		DIN Rail: IP 20, polycarbonate / Sensor housing: IP 65, Aluminium or Stainless Steel
Net and gross weight		2 kg. (4.6 lbs.) with 50 mm (2") sensor

PERFORMANCE

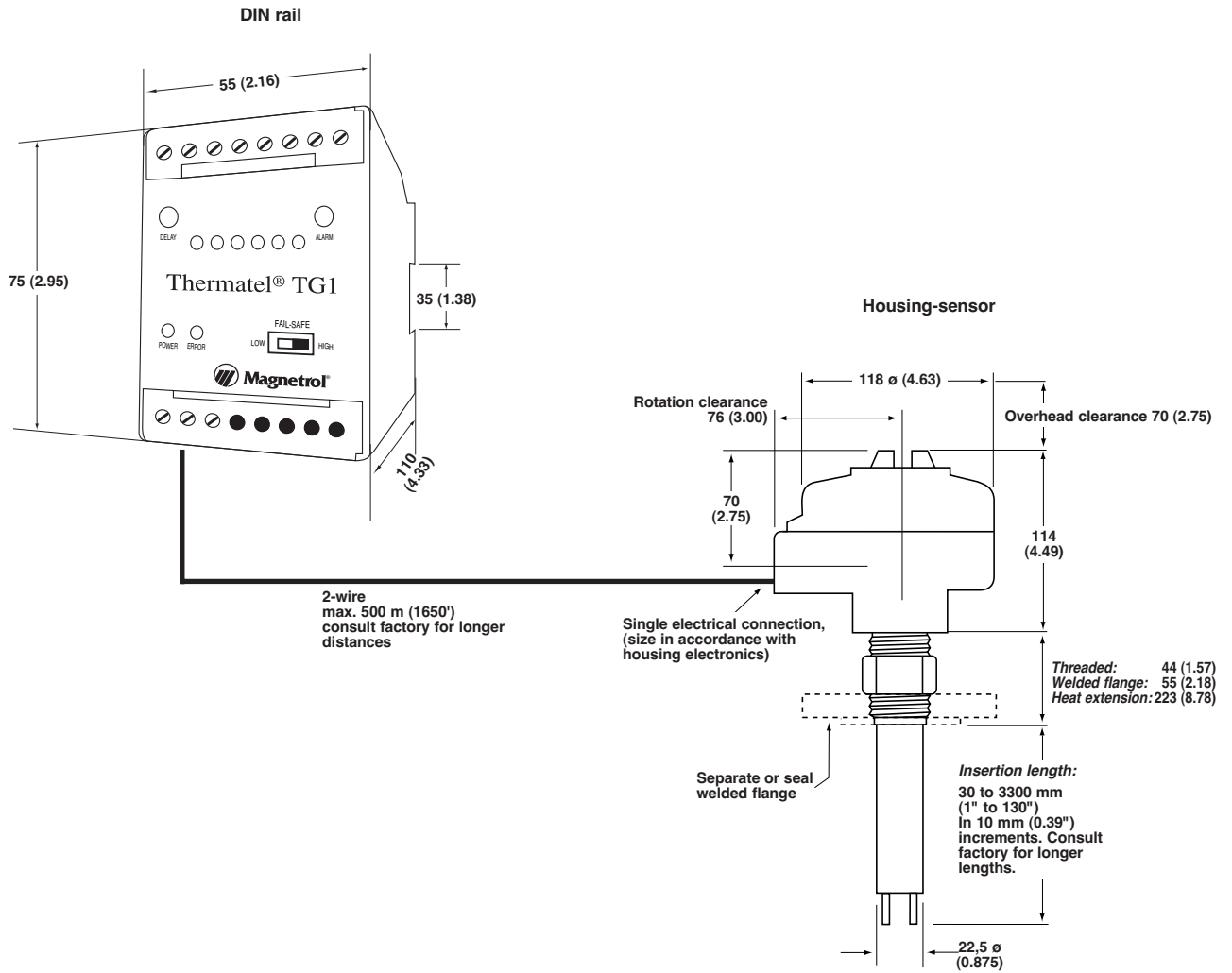
Description	Specification
Response time	1-10 s typical (dependant on sensor type, application and set point)
Repeatability	< 1 % @ constant °C
Ambient temperature	-40 to +70 °C (-40 to +158 °F) – operational -50 to +76 °C (-58 to +170 °F) – storage
Humidity	0-99 % non condensing
Electromagnetic compatibility	Meets CE requirements (EN 61326: 1997 + A1 + A2) and Namur NE 21

SENSOR SPECIFICATIONS

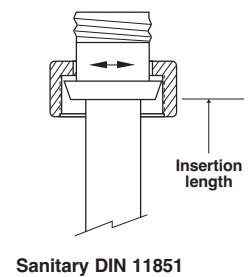
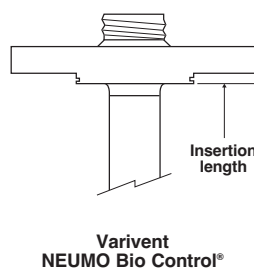
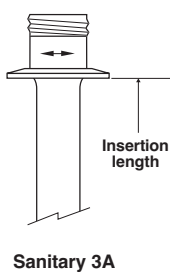
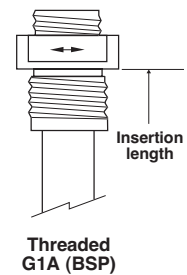
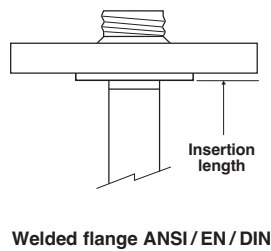
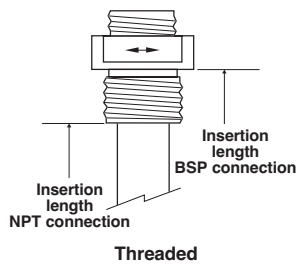
Description	Twin tip - spherical sensors TMM - TMA/TMB - TMC/TMD	HTHP sensor TMH	Low flow body TML
Materials	316/316L (1.4401/1.4404) Hastelloy C (2.4819) – TMC/TMD Monel (2.4360) – TMM	316/316L (1.4401/1.4404) Hastelloy C (2.4819)	316/316L (1.4401/1.4404)
Sanitary finish	0.82 μ m (RA 32) – consult factory for electropolishing – only for TMA/TMB		
Sensor / pipe diameter	22,5 mm (0.875") – except TMM 16 mm (0.63") – TMM	22,5 mm (0.875")	1/4" or 1/2"
Process connection	Threaded: 1/2" NPT (TMM), 3/4" NPT, 1" NPT, G1 (1" BSP) Flanged: ANSI, EN/DIN or sanitary		F- 1/4" or 1/2" NPT or BSP
Probe length	5 - 330 cm (2" - 130") 2,5 - 150 cm (1" - 60") – TMM	5 to 90 cm (2-36")	Not applicable
Max process temperature	TMA/TMC/TMM: -70 to +120 °C (-100 to 250 °F) TMB/TMD: -70 to +200 °C (-100 to 400 °F)	-70 °C to +450 °C (-100 °F to +850 °F)	-70 °C to +120 °C (-100 °F to +250 °F)
Max process pressure	TMA/TMB: 41 bar (600 psi) TMC/TMD: 207 bar (3000 psi) ^① TMM: 207 bar (3000 psi) ^①	413 bar (6000 psi)	400 bar (5800 psi)
Recommended for	TMA: best sensitivity for liquid flows / suitable for gas flow – resists heavy coating TMB: same as TMA but can be used with integral electronics up to +200 °C (+400 °F) TMC: best sensitivity for air/gas flows – resists light coating TMD: same as TMC but can be used with integral electronics up to 200 °C (+400 °F) TMM: for direct mounting in "T" pieces on small pipe sizes – light coating TMH: high temperature and pressure conditions – light coating TML: for the detection, control of extreme low flows, resists light coating		

^① Max 127 bar (1850 psig) for sensors > min. length.

DIMENSIONS IN mm



CONNECTIONS



OPTIONAL SENSOR MOUNTING FLANGES

Raised face mounting flanges are available in the sizes and materials shown at right. Thread on mounting flanges can only be used in combination with 3/4" NPT-M process connection transducer. Specify the part number as an additional line item when placing an order. Consult factory (C/F) for additional flange sizes and materials such as Hastelloy B, Monel, etc...

ANSI B16.5 flanges	Part No.		
	Carbon steel	316/316L SST (1.4401/1.4404)	Hastelloy C (2.4819)
1" 150 lbs RF	004-5867-041	004-5867-043	004-5867-052
1 1/2" 150 lbs RF	004-5867-021	004-5867-001	004-5867-031
2" 150 lbs RF	004-5867-022	004-5867-002	004-5867-032
3" 150 lbs RF	004-5867-023	004-5867-003	004-5867-033
4" 150 lbs RF	004-5867-024	004-5867-004	004-5867-034
6" 150 lbs RF	004-5867-025	004-5867-005	004-5867-035
1" 300 lbs RF	004-5867-042	004-5867-044	004-5867-053
1 1/2" 150 lbs RF	004-5867-026	004-5867-006	004-5867-036
2" 150 lbs RF	004-5867-027	004-5867-007	004-5867-037
3" 150 lbs RF	004-5867-028	004-5867-008	004-5867-038
4" 150 lbs RF	004-5867-029	004-5867-009	004-5867-039
6" 150 lbs RF	004-5867-030	004-5867-010	004-5867-040
1" 600 lbs RF	004-5867-051	004-5867-050	consult factory
1 1/2" 600 lbs RF	004-5867-046	004-5867-045	consult factory
2" 600 lbs RF	004-5867-049	004-5867-048	consult factory

QUALITY ASSURANCE - ISO 9001:2000



THE QUALITY ASSURANCE SYSTEM IN PLACE AT MAGNETROL GUARANTEES THE HIGHEST LEVEL OF QUALITY DURING THE DESIGN, THE CONSTRUCTION AND THE SERVICE OF CONTROLS. OUR QUALITY ASSURANCE SYSTEM IS APPROVED AND CERTIFIED TO ISO 9001:2000 AND OUR TOTAL COMPANY IS COMMITTED TO PROVIDING FULL CUSTOMER SATISFACTION BOTH IN QUALITY PRODUCTS AND QUALITY SERVICE.

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BULLETIN N°: BE 54-105.4
EFFECTIVE: MARCH 2008
SUPERSEDES: May 2007

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