Thermatel®
Thermal Dispersion
Flow and Level Switches

DESCRIPTION

Thermatel has demonstrated reliable performance as a flow or level switch. For use as a flow switch, Thermatel can be used to detect either a high flow or a low flow condition for both gases and liquids. For a level switch, Thermatel can be used to detect difference in thermal conductivity of various media. This includes interface detection between media such as liquid/foam, oil/water and even liquid/solid.

Thermatel probes are available in 316L Stainless Steel, Hastelloy C, or Monel with all welded construction. The technology has no moving parts providing excellent reliability.

Twin Tip

Low Flow Body

Spherical Tip

FEATURES

- Fast response to changes in flow or level
- Detect minimum flow or presence/absence or flow
- Suitable for corrosive and harsh environments with all wetted parts of 316L stainless steel, Hastelloy C or Monel. Titanium construction optionally available
- Excellent low flow sensitivity
- Suitable for high viscosity and aerated fluids
- Hot tap available
- Sanitary design available
- NACE construction available (consult factory)
- Process temperatures from -100° F to +392° F (-73° C to +200° C). High temperature version to +850° F (454° C)
- Monitor liquids and gases with the same sensor
- TS model includes electronic self-test and power on delay

TECHNOLOGY

Thermatel utilizes the proven thermal dispersion technology. There are two elements in the sensor; one heated and one reference. Thermatel detects heat transfer which reduces the temperature difference between the sensors. Changes in temperature difference can be due to either a change in media or a change in flow rate.

The electronics compare the electrical signal from the sensor against the set point and provide a relay actuation.

FEATURES continued

PROBE

Twin Tip

- Corrosive resistant materials
- Pressures to 3000 psig
- Optional ½" process connection fits directly in ½" tee.

Spherical Tip

- General purpose service
- 3-A sanitary design available
- Stainless steel only

Low Flow Body

- Flow rates of 0.08 gph (8 quarts/day) to 30 gph (0.3 to 113.5 liters/hour)
- 1/4" and 1/2" connections
- Suitable for chemical feed pumps

High Temperature

- Temperatures to +850° F (+454° C)
- Pressure to Class 6000 psi
- Includes heat extension

SELF-TEST

Thermatel switches offer a unique method of testing the instrument without removing the switch from the pipe or vessel. The self-test may be configured to simulate either a high or low alarm condition. The on-demand electronic test may be accomplished locally or with a remote contact closure.

FACTORY CALIBRATION

Thermatel Flow Switch may be ordered, factory calibrated to alarm at a specified point. Also, a complete set point curve may be obtained from the factory to permit field modification of alarm point. Contact the factory for details.

HOT TAP

Hot tap retractable probe assemblies for Thermatel probes are available. See bulletin 41-103.

APPLICATIONS

LEVEL SWITCH

Thermatel Series TDL/TSL level/interface switches may be installed in a variety of difficult level applications including:

- High viscosity
- Slurries
- Air/foam
- Foam/liquid interface
- Oil/water interface
- Aerated fluids
- DowTherm®
- Liquid/solids interface

FLOW SWITCH

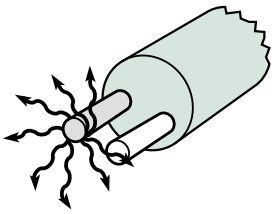
Thermatel Series TDF/TSF flow switches may be installed in a variety of liquid and gas applications including:

- Pump protection
- Relief valve monitoring
- Low/No flow detection
- Seal water
- Cooling water/cooling air
- Exhaust flow
- Progressive cavity pumps
- Chemical feed pumps
- Pump seals

APPLICATIONS

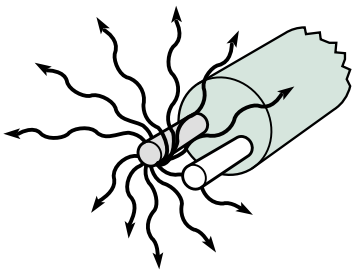
LEVEL SWITCH

Level or Interface can be detected due to differences in thermal conductivity. High or low level alarm applications may be installed either vertically or horizontally.



Low Level

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



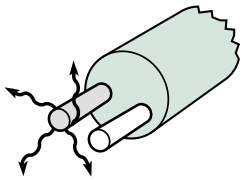
High Level

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

Probes are available in lengths to 130" (330 cm) for a wide variety of applications.

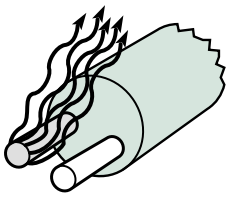
FLOW SWITCH

Flow is detected by an increase in heat transfer that occurs as the flow rate increases. Exceptional low flow sensitivity is obtained with no moving parts. The same unit can be used for both liquid and gas flow indication.



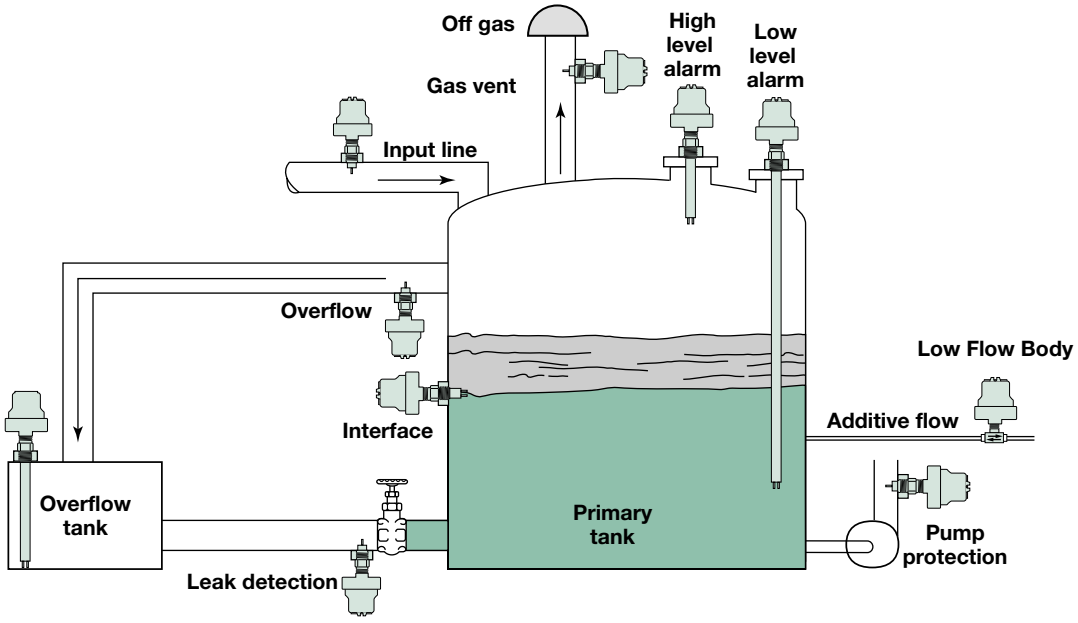
No Flow

In a low flow condition, the self-heated sensor tip creates a temperature differential between the two sensors.



Flow

As flow increases across the sensing assembly, heat is dissipated and temperature differential decreases.



Level and Flow switch applications

SPECIFICATIONS

Supply Voltage:	120 VAC, +10%, -15% 50-60 Hz
	240 VAC, +10%, -15% 50-60 Hz
	24 VDC, ±20%
Power Consumption:	5 watts maximum
Output Relay TD Electronics:	SPDT with gold flashed contacts, 10 Amp @ 120 VAC, 240 VAC
	8 Amp @ 30 VDC, 0.5 Amp @ 125 VDC
Output Relay TS Electronics:	DPDT with gold flashed contacts, 10 Amp @ 120 VAC, 240 VAC
	10 Amp @ 28 VDC, 0.5 Amp @ 125 VDC
	Hermetically sealed DPDT with gold flashed contacts
	5 Amp @ 120 VAC, 240 VAC
	5 Amp @ 28 VDC
Operating Temperature Electronics:	-40° to +160° F (-40° to +70° C)
Operating Temperature:	
Sensor:	-100° to +392° F (-73° to +200° C) ①
High temperature design:	-100° to +850° F (-73° to +454° C)
Response Time:	1 to 10 seconds (typical liquid)
Set Point Range—Flow:	Water: 0.01 to 5.0 fps (0.003 to 1.5 m/s)
	Air: 0.1 to 500 fps (0.03 to 150 m/s)
Time Delay:	0-100 seconds adjustable
Repeatability:	<1% @ constant temperature
Probe Materials of Construction	
Twin Tip:	All wetted parts of 316L stainless steel, Hastelloy C, or Monel
Spherical Tip:	316L stainless steel
Low Flow Body:	316L stainless steel
Process Connection:	Refer to part number construction chart on pages 8–11
Insertion Length ②③	2 inch (5 centimeter) standard
	Available in lengths from 3 to130 inches in 1 inch increments,
	(7 to 330 centimeters in 1 cm increments)
	½" NPT, 1" (2.5 cm) standard
	Available insertion lengths from 2 to 60 inches (5 to 152 centimeters)
Cable Length	500 feet maximum (152 meters maximum)
Shipping Weight	4.6 lbs. (with 2" probe)

① Operating temperatures greater than 250° F (120° C) require remote electronics

PRESSURE/TEMPERATURE RATING

(DEPENDENT ON PROCESS CONNECTION)

Tip Style	Insertion Length	Pressure/Temperature Rating		
		+100° F (+38° C)	+392° F (+200° C)	+850° F (+450° C)
Twin	2" (5 cm)	3000 psig (206 Bar)	2280 psig (157 Bar)	—
	3-130" (7-330 cm)	1250 psig (86 Bar)	1140 psig (78 Bar)	—
Spherical	2-130" (5-330 cm)	600 psig (41 Bar)	415 psig (28 Bar)	—
Twin with ½" NPT	1" (2.5 cm)	3000 psig (206 Bar)	2280 psig (157 Bar)	—
process connection	2-60" (5-152 cm)	1850 psig (127 Bar)	1680 psig (115 Bar)	—
Low flow body	—	5800 psig (400 Bar)	4100 psig (285 Bar)	—
High temperature	2-36" (5-90 cm)	6000 psig (413 Bar)	4280 psig (295 Bar)	3380 psig (233 Bar)

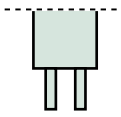
SENSOR TIP DESIGNS

Thermatel offers two sensor tip designs—the original twin tip and the unique spherical tip. Both designs have similar operating ranges.

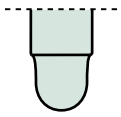
The sensors in the twin tip are mounted at the end of each tip. In the spherical tip, the sensors are bonded directly to the wall of the tip, providing protection of the sensors.

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

Response times for both tips are shown in the chart at right.



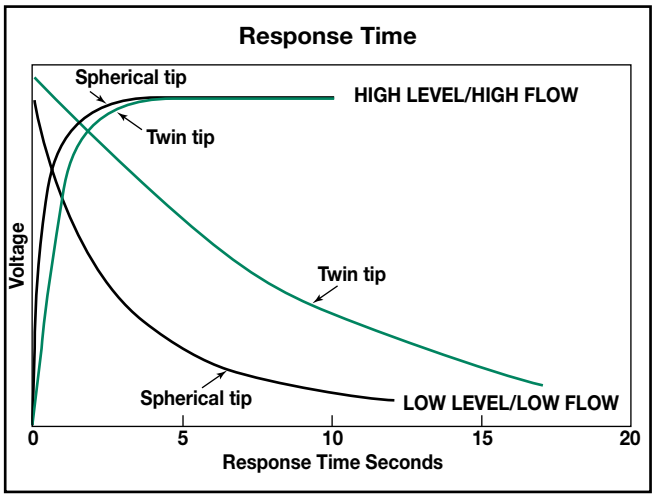
Twin tip



Spherical 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.

The actual response time depends upon variables including set point adjustment rate of change in flow, and application specific parameters.



Response time: Spherical tip vs. Twin tip

AGENCY APPROVALS

AGENCY	MODEL APPROVED	PROTEC TION METHOD	AREA CLASSIFICATION
FM ①	TXX-XXX0-E00 TXX-XXX0-Y00	Explosion Proof	Class I, Div 1; Groups C, D Class II & III, Div 1; Groups E, F, G NEMA Type 4X and IP65
	TXX-XX00-J00 TXX-XXX0-R00	Explosion Proof	Class I, Div 1; Groups B, C, D Class II & III, Div 1; Groups E, F, G NEMA Type 4X and IP 65
	TXX-XXX0-E00 TXX-XXX0-R00 TXX-XXX0-J00 TXX-XXX0-Y00	Non-Incendive	Class I, Div 2; Groups A, B, C, D Class II & III, Div 2; Groups E, F, G T4A NEMA Type 4X and IP 65
	Probe Model ② XTX-XXXX-XXX XT9-XXXX-X00	Explosion Proof	Class I, Div 1; Groups B, C, D Class II & III, Div 1; Groups E, F, G ② NEMA Type 4X and IP 65
CSA ①	TXX-XXX0-E00 TXX-XXX0-Y00	Explosion Proof	Class I, Div 1; Groups C, D Class II & III, Div 1; Groups E, F, G T4A Type 4X
	TXX-XX00-J00 TXX-XX00-R00	Explosion Proof	Class I, Div 1; Groups B, C, D ③ Class II & III, Div 1; Groups E, F, G T4A Type 4X
	TXX-XXX0-E00 TXX-XXX0-R00 TXX-XXX0-J00 TXX-XXX0-Y00	Suitable for	Class I, Div 2; Groups A, B, C, D Class II & III, Div 2; Groups E, F, G T4A Type 4X
	Probe Model ② XTX-XXXX-XXX XT9-XXXX-X00	Explosion Proof	Class I, Div 1; Groups B, C, D ② Class II & III, Div 1; Groups E, F, G Type 4X
CENELEC ④	TXX-XXX0-U00 TXX-XXX0-V00 TXX-XXX0-W00	Explosion Proof	EEx d II C T5 (-20° to +90° C) T4 (-40° to +55° C)
SAA	TDF-1100-E00 TDF-1120-E00	Explosion Proof	Ex d IIC (Hydrogen Only) T6 IP65

① FM/CSA approved based on a maximum temperature rise of sensor of 180° F (100° C) above the process temperature.

② Probe type XT1-XXX0-XXX limited to Class I locations only. Class II, Groups E, F & G approval only with spherical tip (XT2-XXX0-XXX).

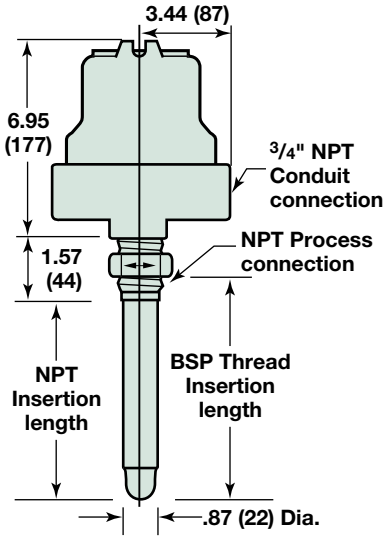
③ CSA approval for Group B with integral electronics only.

④ Other CENELEC approved model available.

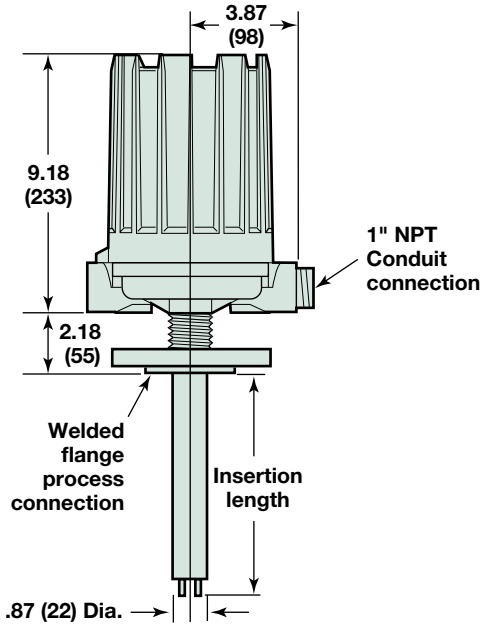
CE These units have been tested to EN 50081-2 and EN 50082-2 and are in compliance with the EMC Directive 89/336/EEC.

DIMENSIONAL SPECIFICATIONS

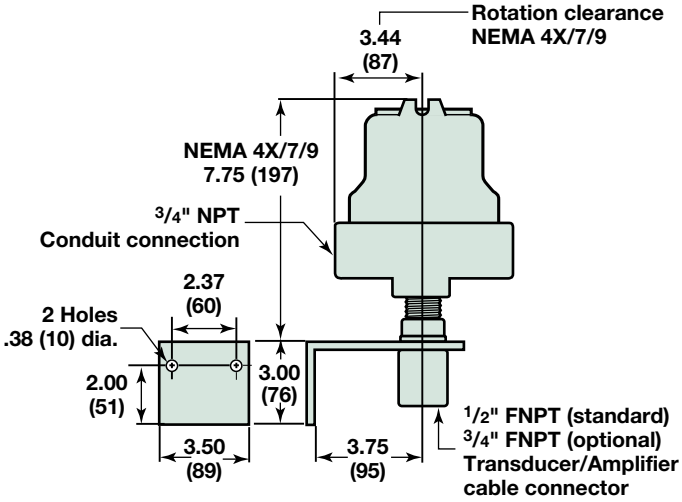
INCHES (MM)



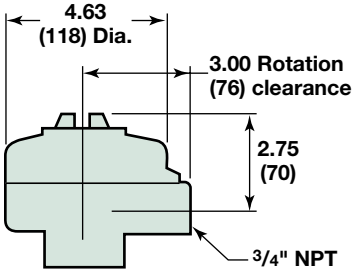
NEMA 4X/7/9 Housing, Group C, D, E, F, & G (Code E) shown with 3/4" NPT Spherical Tip probe



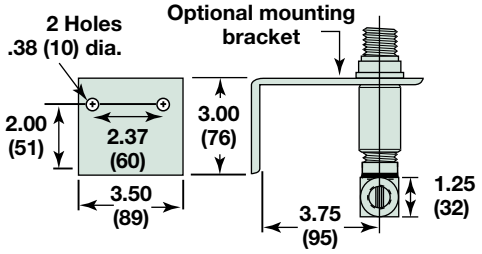
NEMA 4X/7/9, Group B Aluminum Housing (Code R) shown with flanged Twin Tip probe



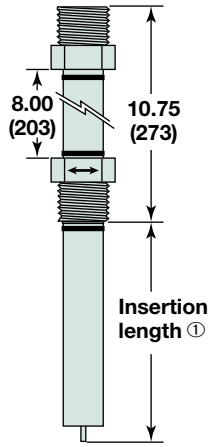
Remote Electronics Housing (Code E)



Remote Sensor Housing

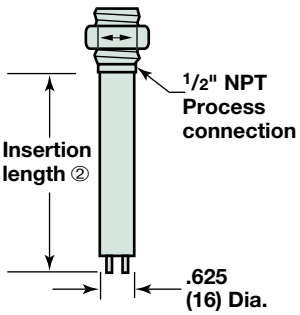


Low Flow Body (end view)



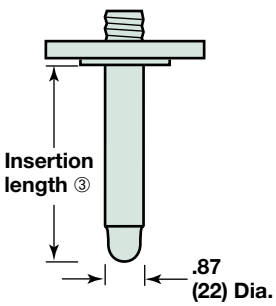
High Temperature Probe with 8" heat extension

① Insertion length:
2" to 36" (5 to 91 cm)



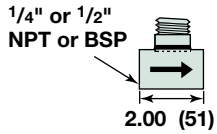
½" Twin Tip Probe

② Insertion length:
1" (2.5 cm) minimum. 2" to 60" (5 to 152 cm) available.



Spherical Tip Probe with flange

③ Insertion length:
2" to 130" (5 to 330 cm).



Low Flow Body (front view)

MODEL NUMBER

Models available for quick shipment, usually within one week after factory receipt of a purchase order, through the Expedite Ship Plan (ESP)

MODEL

D	Standard (TD) SPDT Relay
S	On-demand electronic self-test (TS) DPDT relay

APPLICATION

F	Flow
L	Level

OUTPUT

1	10 Amp SPDT relay with gold flashed contacts (Model TD)
2	10 Amp DPDT relay with gold flashed contacts (Model TS)
4	5 Amp hermetically sealed DPDT relay with gold flashed contacts (Model TS)

INPUT VOLTAGE

0	120 VAC
1	240 VAC
2	24 VDC

MOUNTING

0	Integral
2	Remote (includes electronics housing bracket and remote sensor housing)

HOUSING

E	NEMA 4X/7/9	Polymer coated aluminum dual conduit connection, ¾" NPT
J	NEMA 4X/7/9 Group B	Polymer coated cast iron (integral only) Single conduit connection, 1" NPT
R	NEMA 4X/7/9 Group B	Polymer coated die-cast aluminum dual conduit connection, 1" NPT
U	CENELEC*	Polymer coated aluminum dual cable entry, PG 13.5
V	CENELEC*	Polymer coated aluminum dual cable entry, ¾" NPT
Y	NEMA 4X/7/9	316 stainless steel, single conduit connection, ¾" NPT
W	CENELEC*	Polymer coated aluminum, dual cable entry, M 20 × 1.5

*additional CENELEC approved housings available; consult factory.

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PROBE

MODEL NUMBER

PROBE DESIGN

4	Probe length in inches
6	Probe length in centimeters

TIP STYLE

1	Twin tip
2	Spherical tip – available in 316L stainless steel only (code 22)

PROCESS CONNECTION

1	¾" NPT
2	1" NPT
3	1½" sanitary flange, 16 AMP - 3A
4	2" sanitary flange, 16 AMP - 3A
A	½" NPT – available with twin tip (code 1) and in 316L stainless steel only (code 22)
B	1" 150#, raised faced flange socket welded to probe
C	1½" 150#, raised faced flange socket welded to probe
D	2" 150#, raised faced flange socket welded to probe
E	1" 300#, raised faced flange socket welded to probe
F	1½" 300#, raised faced flange socket welded to probe
G	2" 300#, raised faced flange socket welded to probe
H	1" 600#, raised faced flange socket welded to probe
J	1½" 600#, raised faced flange socket welded to probe
K	2" 600#, raised faced flange socket welded to probe

DIN flange process connections available – consult factory

MATERIAL

22	316L stainless steel
HC	Hastelloy C-276
MM	Monel

Construction to meet NACE MR0175 standard available.
Titanium construction available; consult factory.

INSERTION LENGTH with PROBE DESIGN code 4

001	1" minimum (½" NPT connection only)
002	2" minimum (ESP with ¾" NPT connection only)
*	3" to 130" maximum in 1" increments

* Example: 4 inches = Code 004.
For lengths over 130 inches, consult factory.

INSERTION LENGTH with PROBE DESIGN code 6

003	2.5 cm minimum (½" NPT connection only)
005	5 cm minimum (ESP with ¾" NPT connection only)
*	6 to 330 cm maximum in 1 cm increments

* Example: 25 cm = Code 025.
For lengths over 330 cm, consult factory.

For flow applications, probe length should extend at least 10% into pipe.

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HIGH TEMPERATURE PROBE

MODEL NUMBER

High temperature probe includes 8" (20 cm) heat extension between process connection and electronics.

PROBE DESIGN

4	Probe length in inches
6	Probe length in centimeters

PROCESS CONNECTION*

11	¾" NPT
21	1" NPT
23	1" 150#, raised faced flange socket welded to probe
24	1" 300#, raised faced flange socket welded to probe
25	1" 600#, raised faced flange socket welded to probe
26	1" 1500#, raised faced flange socket welded to probe
33	1½" 150#, raised faced flange socket welded to probe
34	1½" 300#, raised faced flange socket welded to probe
35	1½" 600#, raised faced flange socket welded to probe
36	1½" 1500#, raised faced flange socket welded to probe
37	1½" 2500#, raised faced flange socket welded to probe
43	2" 150#, raised faced flange socket welded to probe
44	2" 300#, raised faced flange socket welded to probe
45	2" 600#, raised faced flange socket welded to probe
46	2" 1500#, raised faced flange socket welded to probe
47	2" 2500#, raised faced flange socket welded to probe

* DIN flange process connections available – consult factory

MATERIAL

S	316L stainless steel
H	Hastelloy C-276

INSERTION LENGTH with PROBE DESIGN code 4

2" to 36" maximum in 1" increments Example: 4 inches = Code 004
Minimum lengths: 2.0" (002) with threaded process connection
3.0" (003) with flanged process connection

INSERTION LENGTH with PROBE DESIGN code 6

5 cm to 91 cm maximum in 1 cm increments Example: 8 cm = Code 008
Minimum lengths: 5 cm (005) with threaded process connection
7 cm (007) with flanged process connection

	T	H	—				0	—		

For flow applications, probe length should extend at least 10% into pipe.

LOW FLOW BODY

MODEL NUMBER

Flow rate gallons per hour
.1 1.0 10.0
Flow GPH

FLOW BODY CODE

C	¼"
D	½"

PROCESS CONNECTION

1	NPT
2	BSP

¼" connection for flow rates of 0.08 to 10 gallons per hour (0.3 to 38 liters per hour); ½" connection for flow rates of 1.0 to 30 gallons per hour (3.8 to 113.5 liters per hour).

Gas flow rate

Minimum detectable flow rate:

¼" connection 200 SCCM (0.42 SCFH);
½" connection 1000 SCCM (2.1 SCFH).

MOUNTING BRACELET

0	None
1	Provided

4	T	9	—		2	2		—		0	0

CONNECTING CABLE

MODEL NUMBER

CONNECTING CABLE IN FEET

Cable length in feet; 10 feet minimum, 500 feet maximum length
Example: 12 feet = Code 012

0	3	7	—	3	1	8	6	—			

CONNECTING CABLE IN METERS

3 meters minimum, 152 meters maximum length
Example: 3 meters = Code 003

0	3	7	—	3	1	9	8	—			

QUALITY

MAGNETROL
REGISTERED TO
ISO 9001
Your Assurance of
Quality and Service

The quality assurance system in place at Magnetrol guarantees the highest level of quality throughout the company. Magnetrol is committed to providing full customer satisfaction both in quality products and quality service.

Magnetrol's quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

ESP

Expedite
Ship
Plan

Several Thermatel flow and level switches are available for quick shipment, usually within one week after factory receipt of a purchase order, through the Expedite Ship Plan (ESP).

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

To take advantage of ESP, simply match the color 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.

WARRANTY

All Magnetrol electronic level and flow controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol products.

For additional information, see Instruction Manual 54-601.

Magnetrol

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Heikensstraat 6 • B 9240 Zele, Belgium • 052 45.11.11 • Fax 052 45.09.93
Regent Business Ctr., Jubilee Rd. • Burgess Hill, Sussex RH15 9TL U.K. • 01444-871313 • Fax 01444-871317

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