Thermatel®
Model TA1
Mass Flow Transmitter

DESCRIPTION

Thermatel Thermal Mass Flow Transmitter, Model TA1, provides a high level of performance in mass flow measurement of air and gases. Powerful microprocessor-based electronics, combined with a world-class calibration flow bench, provides an instrument that is easy to set up and configure, yet provides the highest level of accuracy, repeatability, and temperature compensation available.

TECHNOLOGY FEATURES

- Direct mass flow measurement
- High turndown ratios
- Excellent low flow sensitivity
- Low pressure drop

ELECTRONICS FEATURES

- Integral key pad and display on the front panel; no need to open enclosure
- NEMA 4X and Class I, Division 2 rating for the main electronics
- Two-line, 16 digits per line alphanumeric display of all parameters
- Two 4–20 mA output signals (one for mass flow rate; one for temperature); each is independently configured
- Each 4–20 mA loop can be set up for active or passive operation
- RS-485/Modbus digital communication
- Advanced diagnostics check the probe and wiring, plus perform routine self-test
- Displays velocity, temperature, flow rate, and totalized flow
- Cable lengths up to 250 feet (76 m)
- Resettable software totalizer

PROBE FEATURES

- All 316L welded stainless steel construction
- Optional Hastelloy C construction
- Selection of process connections, including threads, welded flange construction, and use with compression fitting
- Hot tap optional
- Explosion proof probe and wiring housing
- Process temperatures up to +400° F (+200° C)
- NIST traceable test bench provides accurate calibration

APPLICATIONS

- Combustion air
- Compressed air
- Natural gas
- Aeration lines
- Digester gas
- Vent lines/flare headers
- Hydrogen piping

TECHNOLOGY

Thermatel flow transmitter Model TA1 measures mass flow by detecting heat dissipation from a heated surface. The sensor contains two mass balanced elements with precision matched RTDs. The reference RTD measures the process temperature; the active RTD measures the temperature of the heated element. The temperature difference between the two RTDs is greatest at low flow and decreases in a non-linear relationship as the flow increases. The instrument accurately measures this temperature differential and converts it to a linear flow signal with a 100-to-1 turndown.

The microprocessor-based electronics provide the ability to configure the instrument for your exact process conditions, provide advanced diagnostics, plus advanced temperature compensation program to ensure accurate, repeatable flow measurement over the entire operating range of the instrument.

The basic unit of measurement in the TA1 is the mass velocity measured in SFPM (standard feet per minute) or NMPS (normal meters per second). The mass velocity is the actual velocity corrected to STP conditions. It is easily calculated by dividing the flow rate in SCFM – standard cubic feet per minute by the flow area in square feet.

ADDITIONAL FEATURES

PROBE INSTALLATION

Probes can be provided with a variety of process connections, including threads, flanges, or installation through a compression fitting. The sensor will fit pipe sizes of 1½" diameter or larger (2" minimum with thread connection).

The sensor is protected to prevent damage due to “bottoming-out” if inserted too far into a pipe.

When using an insertion probe with compression fitting, the user can adjust the position of the sensor in the pipe to obtain the optimum location. Typically, this will be with the bottom of the probe 1.0" lower than the center line of the pipe.

TOTALIZER

The software totalizer provides an eight-digit display of the most significant numbers in the user’s choice of engineering units. If the totalized display exceeds eight digits, then the display changes to exponential notation. The use of EEPROM for storage of totalized data eliminates the need for backup batteries and provides maximum safeguard of data in the event of a power interruption. The totalizer can be reset via software.

TURNDOWN

The TA1 offers excellent low flow sensitivity and high turndown ratios. The minimum detectable mass velocity is 25 SFPM. This provides high turndown ratios of over 100 to 1, depending upon the maximum flow rate.

AREA COMPENSATION FOR PIPE SIZE

Insertion of the sensor into a pipe reduces the flow area, thus increasing the velocity for a given flow rate. Magnetrol’s TA1 automatically compensates the flow measurement based on actual area of the pipe. The user simply enters the size or the area of the pipe, and the instrument automatically compensates the flow measurement.

TEMPERATURE COMPENSATION

Thermal flow technology measures the mass flow rate without the need for pressure and temperature correction. However, there is a need to temperature compensate the mass flow measurement for changes in gas properties due to variations in process temperature. By measuring the temperature, Model TA1 provides advanced temperature compensation to correct for changes in properties of the gas. The TA1 provides accurate flow measurement over the entire specified temperature range of the instrument.

NAMUR COMPLIANCE

Magnetrol TA1 output signal meets NAMUR NE43 recommendations for the 4–20 mA signal levels.

SELECTABLE STP CONDITIONS

The TA1 directly measures mass flow of the gas at standard pressure and temperature (STP) conditions. Software permits the user to change STP conditions for their own requirements.

SPECIFICATIONS

PERFORMANCE

Description	Specification
Flow range maximum	25–35,000 SFPM (0.15-175 Nm/s) air reference to standard conditions.
	Higher ranges and other gases available; contact factory.
Flow range minimum	25–500 SFPM (0.15–2.5 Nm/s) air reference to standard conditions.
Accuracy flow	±1% of reading +0.5% of calibrated full scale
Accuracy temperature	±2° F (1° C)
Repeatability	±0.5% of reading
Linearity	Included in flow accuracy
Temperature effect	±0.05%/° C
Turn down	100:1 typical (depending on calibrated flow range)
Calibration	NIST traceable
Ambient temperature	
Electronics	Without heater and thermostat: -4° to +160° F (-20° to +70° C)
	With heater and thermostat: -40° to +160° F (-40° to +70° C)
Display	Two-line alphanumeric, LCD 16-characters per line
Keypad	16-button integral to front panel
Humidity (electronics)	99% Non-condensing
Cable length	250 feet (76 m) (consult factory for longer lengths)
Supply voltage	120 VAC, 50–60 Hz, +10%/-15%
	240 VAC, 50–60 Hz, +10%/-15%
	24 VDC ±20%
Power consumption	12 watts maximum/15 VA maximum
with heater option	62 watts maximum/65 VA maximum
Analog output signal	
Active	4–20 mA flow (isolated) maximum 1000 Ω loop resistance
	4–20 mA temperature (isolated) maximum 1000 Ω loop resistance
Passive	4–20 mA flow (isolated) loop resistance dependent on power supply
	4–20 mA temperature (isolated) loop resistant dependent on power supply
Digital output	RS-485/Modbus, RTU mode
Relays (optional)	0, 2, or 4 10-amp SPDT resistive with gold flash contacts
Fail-safe	Software selectable

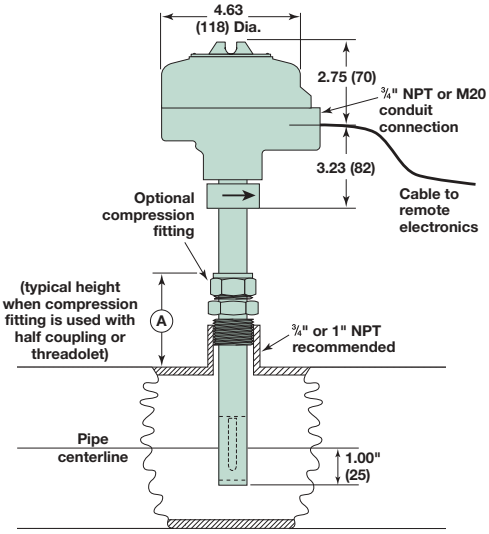
SPECIFICATIONS

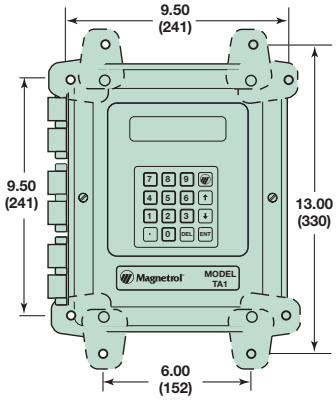
PROBE

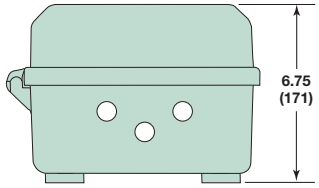
Description	Specification
Materials	316L stainless steel all welded, Hastelloy C-276 optional
Process connections	Refer to model number
Pressure rating	1000 psig (170 bar) dependent upon process connections
Temperature rating	-50° to +400° F (-45° to +200° C)

DIMENSIONAL SPECIFICATIONS

INCHES (mm)

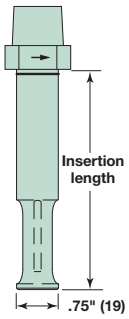




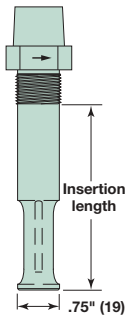


Remote electronics

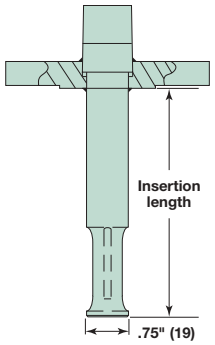
Process Connection size	Height A	Compression fitting	
		Teflon ferrules	Stainless steel ferrules
1" NPT	3.1 (79)	011-4719-009 (100 psi maximum)	011-4719-007 (1000 psi maximum)
¾" NPT	2.6 (66)	011-4719-008 (100 psi maximum)	011-4719-006 (100 psi maximum)



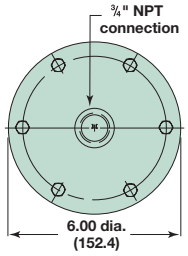
Insertion probe



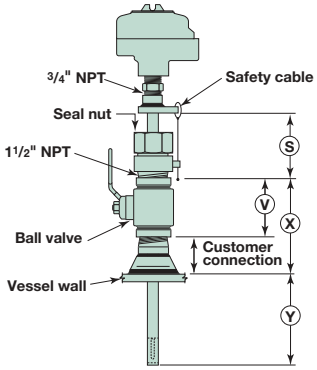
Probe w/NPT threads



Flanged probe



Duct mounting bracket with ¾" NPT
Part Number 089-7247-001 or
089-7247-002 (includes hardware)



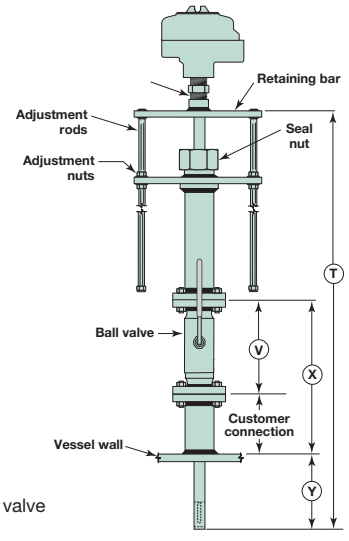
Low Pressure Hot Tap
minimum probe length
= S + X + Y

S Dimension	
Threaded connection	4.0
Flanged connection	5.0

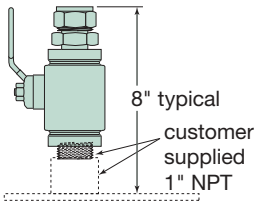
Ball Valve Dimensions*	
Size	V
1½" NPT	4.4
1½" 150# flange	6.5
1½" 300# flange	7.5

*Dimension of ball valve if supplied by Magnetrol.

V Ball valve dimension (see chart)
X Dimension from wall to top of ball valve
Y Insertion length into pipe



High Pressure Hot Tap
minimum probe length
T = 2(X + Y)



Part Number
089-5218-001

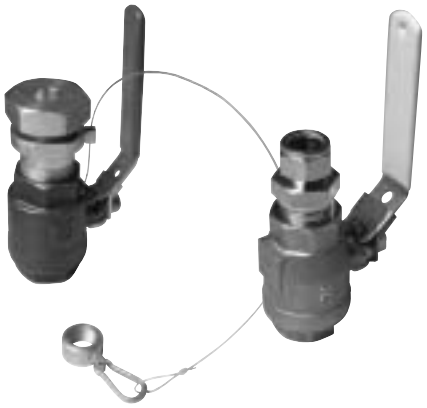
RETRACTABLE PROBE ASSEMBLY

HOT TAP

Magnetrol offers two methods of removing the probe from the pipe without having to shut down the process. The Hot Tap Retractable Probe Assembly is designed to meet API (American Petroleum Institute) standards. The less demanding valve with compression fitting (part 089-5218-001) will have some minor leakage when the probe is removed or re-inserted and does not have the safety cable to prevent "blow out" of the probe when removed under pressure. RPA requires a probe with ¾" NPT process connection.

The valve with compression fitting uses a 1" NPT connection while the RPA uses a 1½" NPT connection.

High Pressure



Low Pressure

089-5218-001

BASIC MODEL NUMBER

RPA	RPA (Retractable Probe Assembly)

DESIGN TYPE

5	Low pressure (up to 50 psi), length in tenths of an inch
6	High pressure (up to 300# class service), length in tenths of an inch
E	Low pressure (up to 50 psi), length in centimeters
F	High pressure (up to 300# class service), length in centimeters

MATERIALS OF CONSTRUCTION

1	Carbon steel (high pressure design only, seal gland is 316 stainless steel)
4	316 stainless steel

PROCESS CONNECTION

0	1½" NPT
1	1½" 150 lb. flange
2	1½" 300 lb. flange

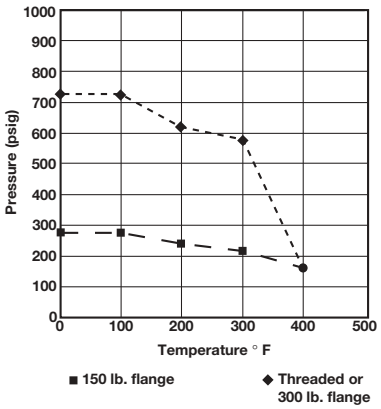
BALL VALVE

0	No ball valve supplied
1	Carbon steel
2	Stainless steel

PROBE LENGTH

10 to 99.9 inches (example: 8.5" = 085)
7 to 253 centimeters (example: 18 cm = 018)

R	P	A	—					—			



AGENCY APPROVALS

AGENCY	APPROVED MODEL	PROTECTION METHOD	AREA CLASSIFICATION
FM	TA1-X2XX-1XX	Hazardous environments	Class I, Div 2, Groups A, B, C & D, T4A Class II, Div 2, Groups F & G Class III
		Indoors and outdoors	NEMA 4X and IP 65
	TXR-XXX0-XXX (probe)	Hazardous environments	Class I, Div 1, Groups B, C & D Class II, Div 1, Groups E, F & G Class III (Maximum surface temperature of probe is 73° C above process temperature)
		Indoors and outdoors	NEMA 4X and IP 65
CSA	TA1-X2XX-11X	Suitable for:	Class I, Div 2, Groups A, B, C & D, T4A Class II, Div 2, Groups E, F & G Class III
		Indoors and outdoors	Type 4X
	TXR-XXX0-XXX (probe)	Hazardous environments	Class I, Div 1, Groups C & D Class II, Div 1, Groups E, F & G Class III (Maximum surface temperature of probe is 73° C above process temperature)
		Indoors and outdoors	Type 4X

ATEX approved units available.
Contact Magnetrol for selection.

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

MODEL NUMBER

REMOTE TRANSMITTER

INPUT VOLTAGE

0	120 VAC
1	240 VAC
2	24 VDC
3	120 VAC with heater
4	240 VAC with heater

NUMBER OF RELAYS

0	None
2	Two
4	Four

CALIBRATION

0	Special calibration (consult factory for all gases other than air)
1	Air standard calibration

PROBE HOUSING

1	FM/CSA approved
D	ATEX approved

CONDUIT CONNECTION

0	¾" NPT
1	M20

T	A	1	—		2			—	1		

MODEL NUMBER

PROBE

UNIT OF MEASUREMENT

TER	Probe length in tenths of an inch
TMR	Probe length in centimeters

MATERIALS OF CONSTRUCTION

A	316/316L stainless steel
B	Hastelloy C-276

PROCESS CONNECTION

00	Compression fitting utilized①②	43	2" 150# ANSI raised face flange
11	¼" NPT threaded	44	2" 300# ANSI raised face flange
21	1" NPT	BA	DN25 PN 16, DIN 2527, Form B
22	1" BSP	BB	DN25 PN 25/4, DIN 2527, Form B
23	1" 150# ANSI raised face flange	CA	DN40 PN 16, DIN 2527, Form B
24	1" 300# ANSI raised face flange	CB	DN40 PN 25/4, DIN 2527, Form B
33	1½" 150# ANSI raised face flange	DA	DN50 PN 16, DIN 2527, Form B
34	1½" 300# ANSI raised face flange	DB	DN50 PN 25/40, DIN 2527, Form B

① Not available with Hastelloy C construction

② Customer supplied or purchased separately (see page 4)

PROBE LENGTH

2.6 to 99.9 inches (example: 8.5" = 085)
Minimum lengths: 2.6" (026) with threaded process connection
2.8" (028) with flanged process connection
4.5" (045) with compression fitting process connection

7 to 253 centimeters (example: 18 cm = 018)
Minimum lengths: 7 cm (007) with threaded or flanged process connection
11 cm (011) with compression fitting process connection

T		R	—				0	—			

MODEL NUMBER

CONNECTING CABLE

CABLE LENGTH IN FEET

10 feet minimum, 250 feet maximum length
Example: 50 feet = 050

0	3	7	—	3	3	1	3	—			

CABLE LENGTH IN METERS

3 meters minimum, 75 meters maximum length
Example: 8 meters = 008

0	3	7	—	3	3	1	4	—			

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.

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.

Additional information

The following additional Thermatel literature is available from your local representative:

54-620	Thermatel Model TA1Mass Flow Transmitter Instruction Manual and Parts List
54-100	Thermatel technology brochure
54-101	Thermatel Thermal Dispersion Flow and Level Switch sales literature
54-105	TG1/TG2 Thermal Dispersion Switch sales literature
54-130	TA2 Mass Flow Transmitter sales literature
54-131	TA1/TA2 Probe Location Brochure
54-621	Thermal Dispersion Mass Flow Measurement Handbook

Magnetrol

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