Thermatel®
Model TA2
Mass Flow Transmitter

DESCRIPTION

Thermatel Model TA2 Thermal Mass Flow Transmitter provides reliable mass measurement for air and gas flow applications. The powerful, yet easy to use, electronics are contained in a compact explosion proof enclosure. The TA2 offers excellent performance at exceptional value.

TECHNOLOGY FEATURES

- Direct mass flow measurement of air and gases
- High turndown ratios
- Excellent low flow sensitivity
- Low pressure drop

ELECTRONICS FEATURES

- Compact explosion proof/NEMA 4X enclosure mounted either integrally on the probe or at a remote location
- 4–20 mA output can be set for either active or passive operation
- 24 VDC, 120 VAC, or 240 VAC input
- Advanced diagnostics check condition of probe, electronics, and wiring
- Optional two-line, 16 digits per line alphanumeric display module with four push button keypad for ease of configuration
- Rotatable display module provides display of flow rate, temperature, totalized flow, plus diagnostic messages
- Electronics can be remote mounted for viewing the display
- Optional HART/AMS communications

PROBE FEATURES

- All 316 welded stainless steel construction
- Hastelloy C-276 construction optional
- Selection of process connections, including threads, welded flange construction, and use with compression fitting
- Process temperatures up to +400° F (+200° C)
- Pressure rating to 1000 psig (170 bar) dependent upon process connections
- Probe can be field replaced
- Sensor is protected in a window to prevent damage if inserted too far into pipe
- Optional hot tap retractable probe assembly

APPLICATIONS

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

ADDITIONAL FEATURES

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 using the display module or HART.

TEMPERATURE COMPENSATION

Thermal flow technology measures the mass flow rate without the need for pressure and temperature correction as required with most gas flow instruments that measure the flow rate at actual conditions. However, changing temperature will change the properties of the gas which effect convective heat transfer. The Model TA2 measures the temperature and automatically corrects the mass flow measurement for changes in gas properties over the entire temperature range of the instrument.

SELECTABLE STP CONDITIONS

The TA2 directly measures mass flow of the gas at Standard Temperature and Pressure (STP) conditions. Software permits the user to change STP conditions for their own requirements.

DIAGNOSTICS

Diagnostics is an important aspect of the TA2. The unit has the ability to check the probe status and indicate either normal operation, short or open circuit in the RTDs, or heater circuit.

In order to verify that the calibration and configuration match the original calibration conditions, the user can select a specific signal and compare the TA2 display value against the original calibration certificate.

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. The TA2 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 for the probe blockage.

HART COMMUNICATION

Using the optional HART/AMS communication, the user can configure the instrument from a remote location. HART provides the same functionality as the display module interface including all configuration and diagnostic information.

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 1 ½" diameter or larger (2" minimum size 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 inch (25 mm) lower than the center line of the pipe.

NAMUR COMPLIANCE

Model TA2 output signal meets NAMUR NE43 recommendations for the 4–20 mA signal levels.

PORTABLE DISPLAY MODULE

A portable display module for configuration and diagnosis of multiple units is available (part number 089-5219-001). This portable module plugs into the electronics in the same manner as the normal display and uses the same software menu. This module permits the user to reduce installation cost by having one display module with keypad for multiple TA2 units.

Usage of the display module requires that the housing cover be removed during use and thus may not be useable in hazardous areas. In these cases, the HART option should be utilized.

PROBE SIMULATION MODULE

The Model TA2 has an optional probe simulation module (part number 089-5220-001). Using this module, the user can disconnect the probe from the electronics and verify the operation of the transmitter electronics against a known standard.

FACTORY CALIBRATION AND CONFIGURATION

Each TA2 is calibrated at the factory for the type of gas and the specified flow rate. The instrument is configured for the specific application information. The result is an instrument which can be installed and immediately be placed into operation without field setup.

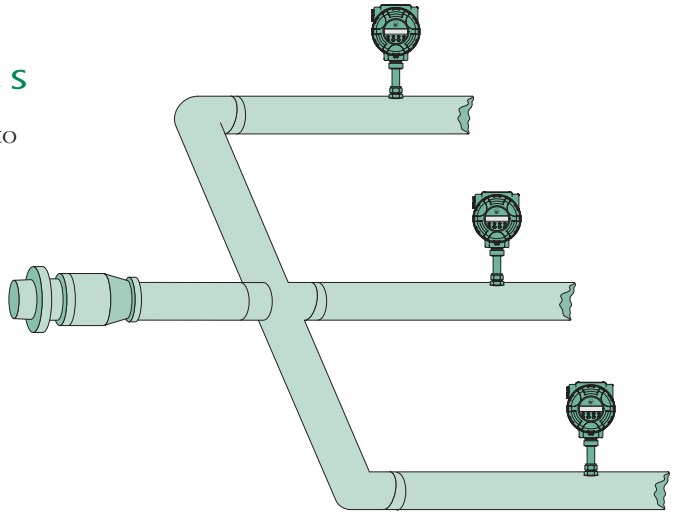
Portable Display Module

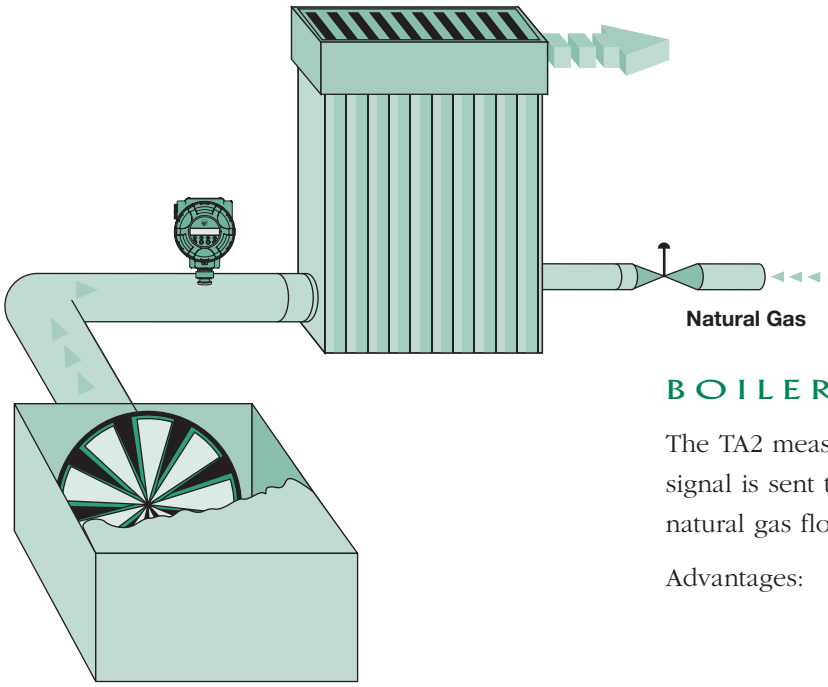
COMPRESSED AIR/GASES

Measurement of mass flow in different gas lines to determine in plant usage for internal allocation.

Advantages:

- direct mass flow
- high turndown rates
- flow totalization
- easy installation





BOILER COMBUSTION

The TA2 measures the inlet air flow to the boiler. This signal is sent to the DCS where it is used to trim the natural gas flow.

Advantages:

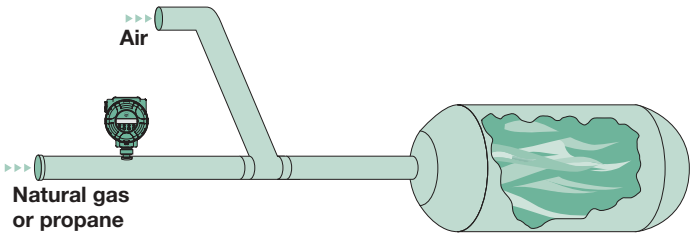
- mass flow measurement
- repeatable flow signal
- high rangeability

NATURAL GAS FLOW

The Model TA2 efficiently measures the flow and totalized flow of fuel to furnaces, heaters, or boilers. This data may be used for internal allocation or to report emission rates.

Advantages:

- direct mass flow in SCFM
- built in totalizer
- ease in setup and operation

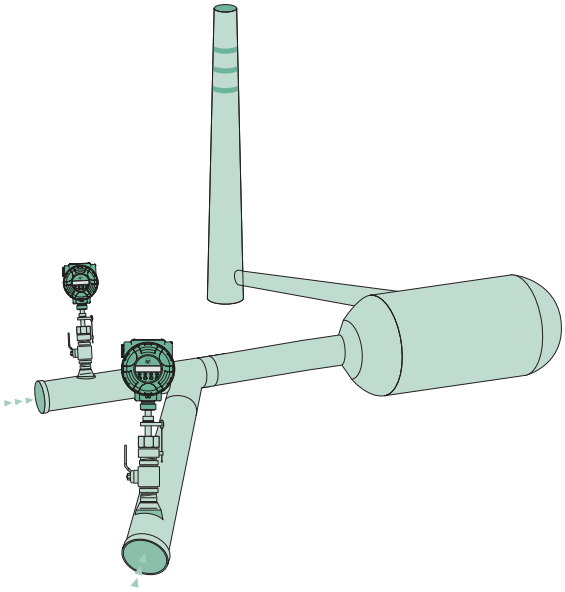


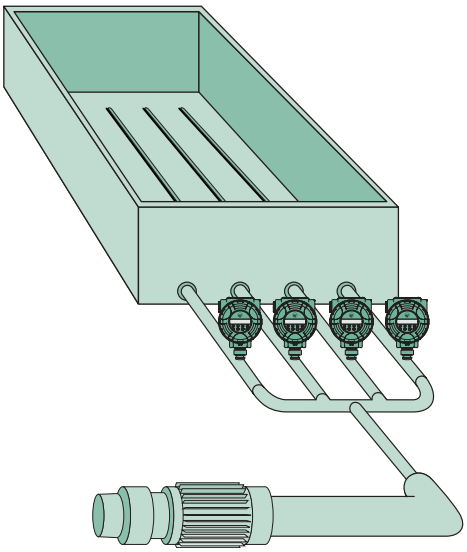
FLARE LINES

Measurement of flow in different sections of flare line.

Advantages:

- good low flow sensitivity
- high turndown
- easy removal if cleaning is required





AERATION AIR FLOW

Measurement and balance of the flow to each section of the aeration basin in waste water treatment plants.

Advantages:

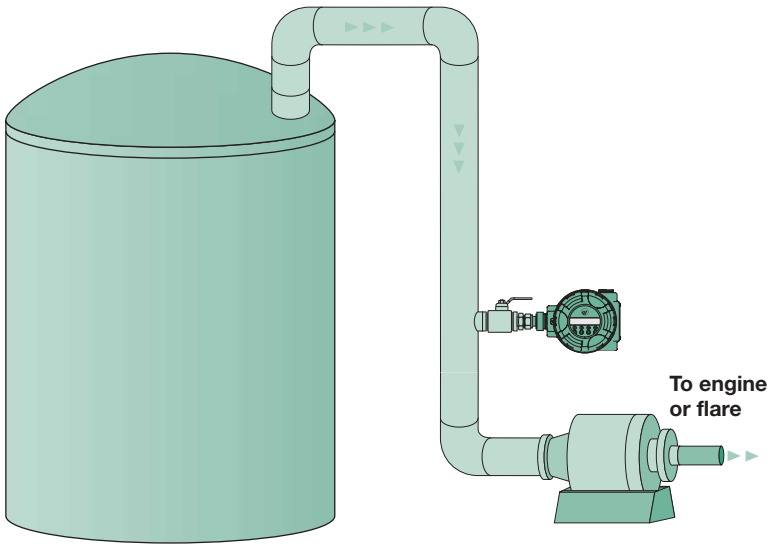
- low installation cost
- direct mass flow
- high reliability

DIGESTER GAS/BIO-GAS

The off gas from a digester contains a mixture of methane and carbon dioxide saturated with moisture. This is a difficult flow measurement due to low flow rate and low pressures.

Advantages:

- excellent low flow sensitivity
- high turndown rates
- provides measurement of flow and totalized flow



TECHNOLOGY

Thermatel Model TA2 flow transmitter measures mass flow by detecting heat dissipation from a heated surface. The sensor contains two mass balanced elements with precision matched RTDs. The reference sensor measures the process temperature (up to 400° F [200° C]); the second RTD measures the temperature of the heated sensor. The power to the heater is varied to maintain a constant temperature difference above the reference temperature.

There is an inherent non-linear relationship between power and mass flow. The microprocessor in the TA2 compares the power against the calibration curve and converts the power requirements to the mass flow rate. Temperature is also measured to provide temperature compensation of the mass flow over the operating range of the instrument.

AGENCY APPROVALS

AGENCY	APPROVED MODEL	PROTECTION METHOD	AREA CLASSIFICATION
FM FM APPROVED	TA2-XXXX-XX0 with TXR-XXX0-XXX (probe)	Explosion proof	Class I, Div 1, Groups B, C, & D Class II, Div 1, Groups E, F, & G Class III, T6 Ta = 160° F NEMA 4X, IP 66
		Non-Incendive	Class I, Div 2, Groups A, B, C, & D Class II, Div 2, Groups F & G Class III, T4 Ta = 160° F NEMA 4X, IP 66
CSA	TA2-XXXX-XX0 with TXR-XXX0-XXX (probe)	Explosion proof	Class I, Div 1, Groups B, C, & D Class II, Div 1, Groups E, F, & G Class III, T6 Ta = 160° F Type 4X
		Suitable for:	Class I, Div 2, Groups A, B, C, & D Class II, Div 2, Groups E, F, & G Class III, T4 Ta = 160° F Type 4X
ATEX	TA2-XXXX-XXX with TXR-XXX0-XXX (probe)	Explosion proof	Ex II 2 G EEx d IIC T6

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.

SPECIFICATIONS

PERFORMANCE

Flow range maximum		25–40,000 SFPM (0.13–200 Nm/s) air reference to standard conditions
		Higher ranges and other gases available; contact factory.
Flow range minimum		25–500 SFPM (0.13–2.5 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		±0.04% per ° C
Turn down		100:1 typical (depending on calibrated flow range)
Calibration		NIST traceable
Ambient temperature		-40° F to +160° F (-40° C to +70° C); display not readable below -4° F (-20° C) ①
Storage temperature		-60° F to +160° F (-50° C to +70° C) blind units only
Display		Two-line alphanumeric LCD, 16-characters per line
Keypad		Four pushbutton
Humidity		99% Non-condensing
Supply voltage		120 VAC, 50-60 Hz, +10%/-15%
		240 VAC, 50-60 Hz, +10%/-15%
		24 VDC ±20%
Power consumption		6 watts, 9 VA
Analog output signal		
	Active	4–20 mA (isolated) maximum 1000 Ω loop resistance
	Passive	4–20 mA (isolated) loop resistance dependent on power supply
HART		Optional
Response time		1 to 2 second time constant typical
Cable length		50 feet maximum

① For operating temperatures between +250° F and +400° F (+120° C and +200° C), either use remote electronics or a longer length insertion probe to provide an additional four inches (100 mm) between the electronics and the compression fitting.

PROBE

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

MODEL NUMBER

TRANSMITTER

INPUT VOLTAGE

0	120 VAC
1	240 VAC
2	24 VDC

SIGNAL OUTPUT

0	4-20 mA
1	4-20 mA with HART

DISPLAY

0	None
B	Plug in display with keypad (with window)

LANGUAGE

1	English
4	German

CALIBRATION

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

HOUSING LOCATION / AGENCY APPROVAL

3	Integral, general purpose, non-incendive, & explosion proof FM/CSA (Groups B, C, & D)
4	Remote, general purpose, non-incendive, & explosion proof FM/CSA (Groups B, C, & D)
C	Integral, general purpose, Ex d ATEX
D	Remote, general purpose, Ex d ATEX

ENCLOSURE TYPE

0	Aluminum, ¾" NPT
1	Aluminum, M20

T	A	2	—					—			

ESP

Model TA2-01B1-130 with 8" probe Model TER-A000-080 is available for quick shipment, usually within one week after factory receipt of a purchase order, through the Expedite Ship Plan (ESP). Applies to units calibrated on air with velocities up to 10,000 SFPM.

MODEL NUMBER

PROBE

UNIT OF MEASUREMENT

TER	Probe length in tenths of inches
TMR	Probe length in centimeters

MATERIALS OF CONSTRUCTION

A	316/316L stainless steel
B	Hastelloy C

PROCESS CONNECTION

00	Compression fitting utilized①②	43	2" 150# ANSI raised face flange
11	¾" NPT	44	2" 300# ANSI raised face flange
21	1" NPT	BA	DN25 PN 16, DIN 2527, Form B
22	1" BSP	BB	DN25 PN 25/40, 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 25/40, 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 p10)

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, 50 feet maximum length
Example: 50 feet = 050

Longer cable lengths possible.
Consult Magnetrol with application details.

0	3	7	—	3	3	1	3	—			

CABLE LENGTH IN METERS

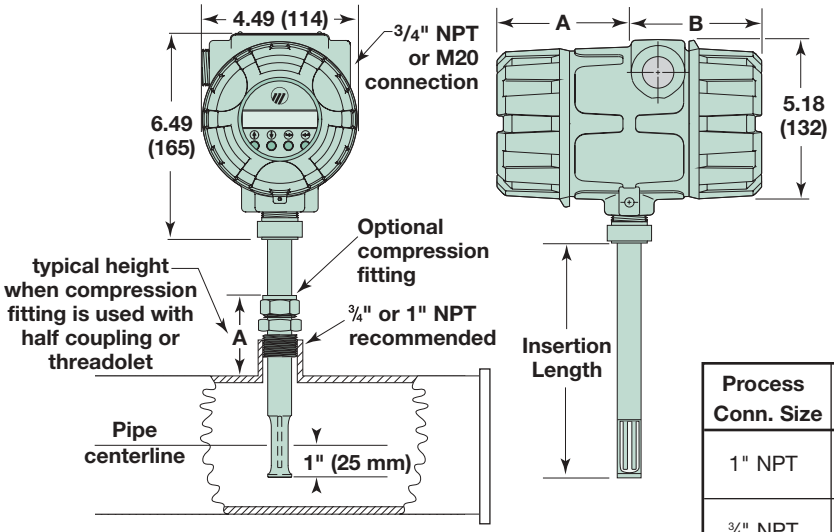
3 meters minimum, 15 meters maximum length
Example: 8 meters = 008

Longer cable lengths possible.
Consult Magnetrol with application details.

0	3	7	—	3	3	1	4	—			

DIMENSIONAL SPECIFICATIONS

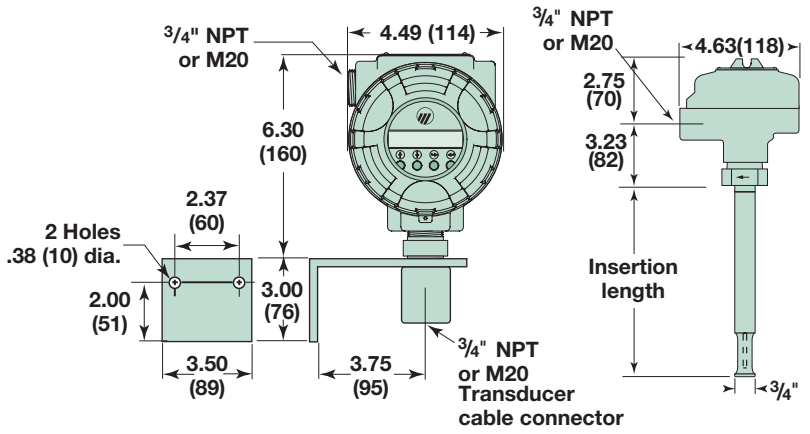
INCHES (mm)



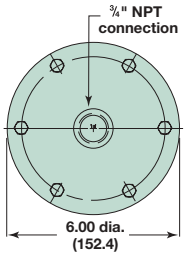
Integral Mount Model TA2
Front and Side Views

Dimension A:
3.33 (85) without display
3.88 (89) with display
Dimension B:
3.88 (89)

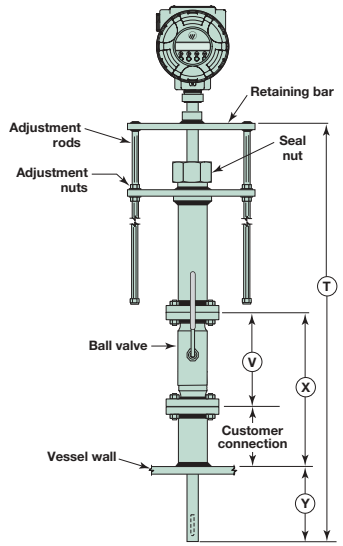
Process Conn. Size	Height A	Compression fitting	
		Teflon ferrules	Stainless steel ferrules
1" NPT	3.1 (79)	011-4719-009 (100 psi maximum)	011-4719-007 (1000 psi maximum)
¾" NPT	2.6 (66)	011-4719-008 (100 psi maximum)	011-4719-006 (1000 psi maximum)



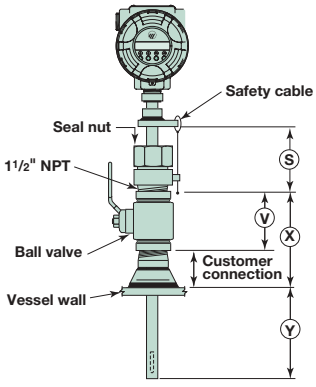
Remote Mount Model TA2



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



Hot Tap
Model RPA-6X12-XXX
minimum probe length:
T = 2(X+Y)



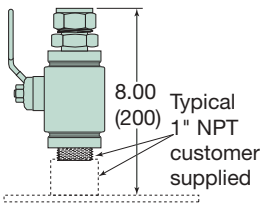
Hot Tap
Model RPA-5402-XXX
minimum probe length
= S+X+Y

S Dimension	
Threaded conn.	4.00
Flanged conn.	5.00

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 the factory.

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



Valve with
Compression Fitting
(089-5218-001)

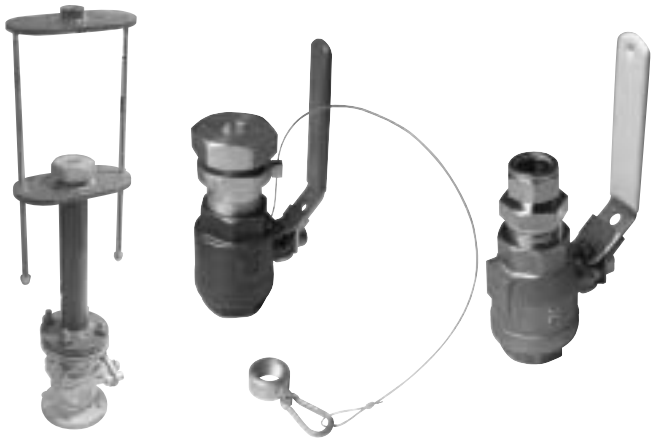
RETRACTABLE PROBE ASSEMBLY

HOT TAP

Two methods are offered of removing the probe from the pipe without having to shut down the process. The Hot Tap Retractable Probe Assembly (RPA) is designed to meet API (American Petroleum Institute) standards. The less demanding valve and compression fitting (part number 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 (code 11).

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	Retractable probe assembly

DESIGN TYPE

5	Low pressure (up to 80 psi, 5.5 bar), length in tenth of an inch
6	High pressure (up to 300# class service), length in tenth of an inch
E	Low pressure (up to 80 psi, 5.5 bar), 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# flange
2	1½" 300# flange

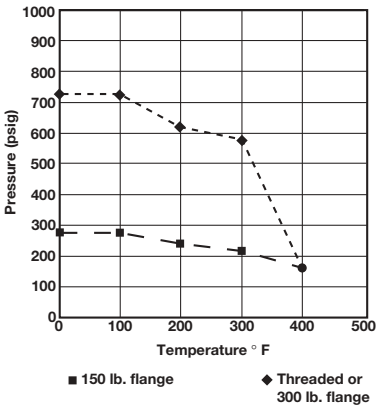
BALL VALVE

0	No ball valve supplied
1	Carbon steel
2	Stainless steel

PROBE LENGTH

10 to 99.9 inches (example: 12" = 120)
25 to 253 centimeters (example: 30 cm = 030)

R	P	A	—					—			



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

Model TA2-01B1-130 with 8" probe Model TER-A000-080 is available for quick shipment, usually within one week after factory receipt of a purchase order, through the Expedite Ship Plan (ESP).

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.

Additional information

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

54-630	Thermatel Model TA2 Mass 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	Thermatel TG1 Flow and Level Switch sales literature
54-120	Thermatel Model TA1 Mass Flow Transmitter sales literature
54-131	Thermatel Model TA1/TA2 Probe location literature
54-621	Thermal Dispersion Mass Flow Measurement Handbook

Magnetrol

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