



HENNLICH

MERES

KALORIMETRICKÝ PRŮTOKOMĚR THERMATEL® TA2

DESCRIPTION

The Enhanced Model TA2 Thermal Mass Flow Meter provides reliable mass measurement for air and gas flow applications. The powerful, yet easy to use, electronics are contained in a compact flameproof enclosure. The TA2 is available with both insertion probes as well as flow body design for smaller pipe sizes. The TA2 offers excellent performance at an exceptional value.

FEATURES

- Direct mass flow measurement of air and gases.
- No need for temperature/pressure correction.
- High turndown ratio 100:1.
- Excellent low flow sensitivity.
- Low pressure drop.
- ISO 17025 and NIST traceable calibrations.
- Calibration verification in the field.
- Flow, temperature and totalized flow available over HART®.
- Advanced diagnostics check condition of probe, electronics, and wiring.
- Rotatable plug-in display module provides display of flow rate, temperature, totalized flow, plus diagnostic messages.
- Process temperatures up to +200 °C (+400 °F).
- Pressure rating up to 103 bar (1500 psi) dependent upon process connections.
- Probe can be field replaced.
- Sensor is protected to prevent damage if inserted too far into pipe.
- Optional:
 - retractable probe assembly or valve with compression fitting
 - flow body for 1/2" to 4" pipe sizes
 - flow conditioning plate for flow bodies 1 1/2" up to 4"
 - separate flow conditioning plate for 4" up to 12".
- Accepts both AC and DC power input.
- Optional pulse output plus second mA output which can be used for temperature or different flow range (passive output only).
- 2-line x 16-character backlit display with four pushbuttons for ease of configuration.
- Two calibration curves optional as well as field adjustment for different gases.
- Language selections of English, German, French, Spanish and Russian.
- Rotatable housing.
- Suited for SIL 1 and SIL 2 loops (full FMEDA report available).



For air and gases



APPLICATIONS

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

AGENCY APPROVALS

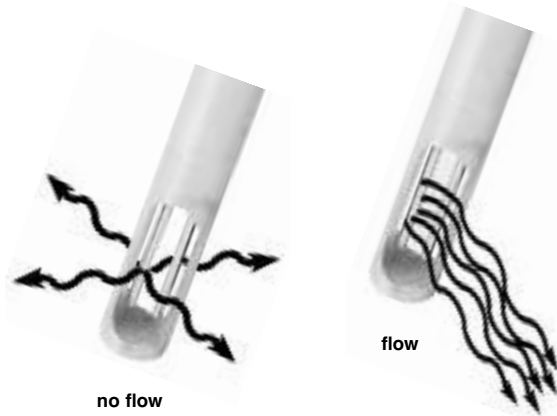
Agency	Approval
ATEX	II 2 G Ex d IIC T6 Gb, flameproof enclosure
cFMus ^①	
IECEX ^①	Ex d IIC T6 Gb, flameproof enclosure
Russian Authorisation Standards ^①	
Other approvals are available, consult factory for more details	

^① Consult factory for proper model numbers and classifications.

TECHNOLOGY

Thermatel Model TA2 flow meter measures mass flow by detecting heat dissipation from a heated surface. The sensor contains two mass balanced elements with precision matched RTD's. The reference sensor measures the process temperature (up to +200 °C [+400 °F]); 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.

For further information on thermal mass flow measurement, request a copy of the MAGNETROL "Thermal Dispersion Mass Flow Measurement Handbook", bulletin 54-621.



ADDITIONAL FEATURES

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.

TOTALIZER

Two 7-digit flow totalizers, one resettable and one non-resettable are provided. Flow units selectable in user's choice of engineering units. Totalizer data is electronically stored eliminating the need for backup batteries and provides maximum safeguard data in the event of a power interruption. The totalizer can be reset using the display module, HART or via PACTware™.

SELECTABLE STP CONDITIONS (Normalised 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 Enhanced TA2 has additional diagnostics to check the operation and performance of the unit. Diagnostics includes probe status, a test of RTD drift with automatic recalibration, and overall performance.

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.

AIR EQUIVALENCY

Using historic air-gas calibration data, an air equivalency calibration can be performed on select gases. Consult your Magnetrol contact for details and flow ranges.

GAS CORRELATION

MAGNETROL calibrates on two gases with known thermal properties and then correlates the data based on the NIST blend properties of the actual gas mix. Typical natural gas error is less than 3 % from the actual gas calibration.

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 1/2" diameter or larger (2"/DN 50 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 25 mm (1.0") lower than the center line of the pipe.

PULSE OUTPUT

The optional pulse output provides a pulse output equivalent to user selected units and multiplier factor. Both active (power from the TA2) or passive (external power supply) connections are provided to match the user's interface. This output can optionally be used as an alarm to indicate that the flow rate is above or below the desired set point.

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.

CALIBRATION VERIFICATION

MAGNETROL has developed a procedure to verify the calibration of the TA2 in the field. Following this procedure, the user can verify that the heat transfer characteristics of the instrument have not changed from first received. While the calibration is a permanent calibration, the user can now check the calibration without having to return the instrument to the manufacturer. When using a HART® handheld or PACTware™, the user is guided through the procedure.

PORTABLE DISPLAY MODULE

A portable display module for configuration and diagnosis of multiple units is available (order code **089-5219-002**). 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 utilised.



Portable display module

HART® COMMUNICATION

Using 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.

NAMUR COMPLIANCE

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

PACTware™ PC SOFTWARE PROGRAM

FDT technology provides an open communication interface between field instruments of various communication protocols and the host/ DCS system. The DTM driver is typical for one type of instrument and delivers the full functionality of the device added with graphical user interface via a laptop or PC. Magnetrol transmitters use the free shareware PACTware™ software to support DTM drivers and the FDT functionality. Via PACTware™ it becomes easy to configure, monitor and diagnose a Magnetrol transmitter from distance or even to call for factory assistance over the internet via the supply of screenshots of echo curves and trending graphs. Magnetrol DTM library HART® has passed the dtmINSPECTOR, the official FDT interoperability test and certification tool. The Magnetrol DTM's are free of charge and can be downloaded from www.magnetrol.com.



Magnetrol recommends the VIATOR® USB HART® Interface from MACTek® Corporation.



MOUNTING CONSIDERATIONS

The flow measurement of the TA2 assumes that the end of the probe is 25 mm (1") past the centreline and the presence of a fully developed flow profile. See figure A.

As gas flows in a pipe or duct, the flow profile will change with obstructions and changes in flow direction. As the gas flows around an elbow, the momentum causes the gas velocity on the outside of the elbow to increase and the velocity on the inside to decrease. See figure B.

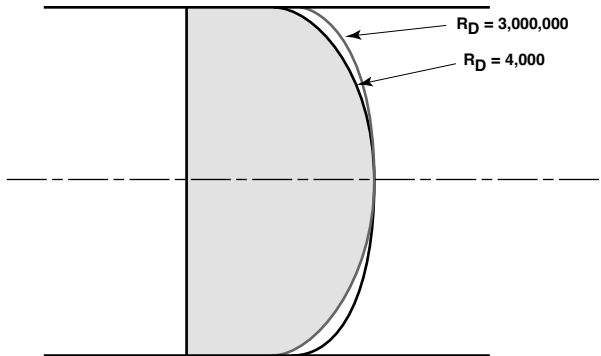


Figure A
Turbulent flow profile

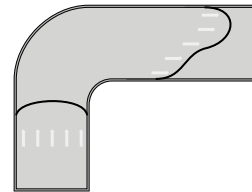


Figure B
Flow profile following single elbow

Figure C indicates the minimum recommended straight run distances required to obtain the desired fully developed flow profile. If these straight-run distances are not available, the overall accuracy of the flow measurement will be affected; however, the repeatability of the measurement will be maintained.

The user has the ability to enter correction factors to compensate for non-ideal flow profile conditions.

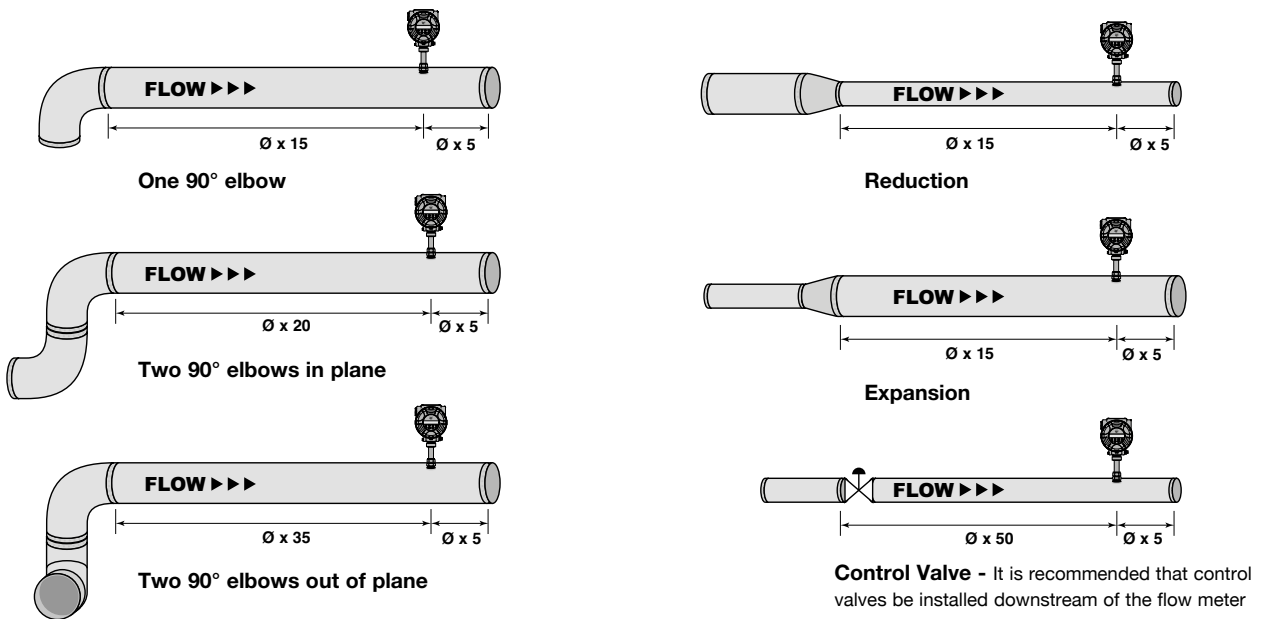


Figure C – Probe Installations

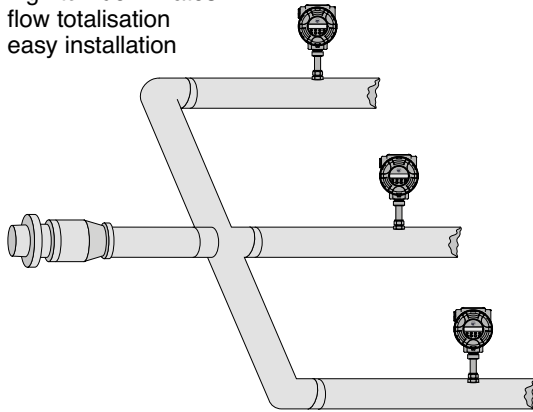
APPLICATIONS

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 totalisation
- easy installation

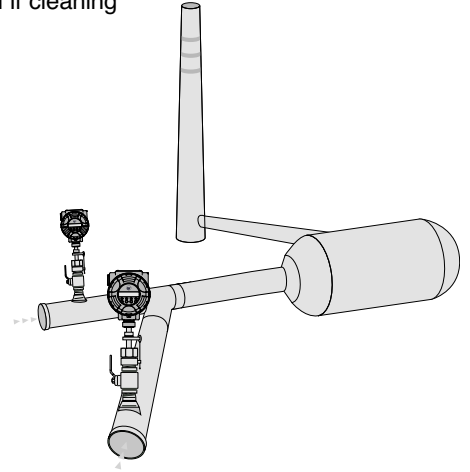


FLARE LINES

Measurement of flow in different sections of flare line.

Advantages:

- good low flow sensitivity
- auto switching capability between multiple calibration curves for highest turndown
- easy removal if cleaning is required

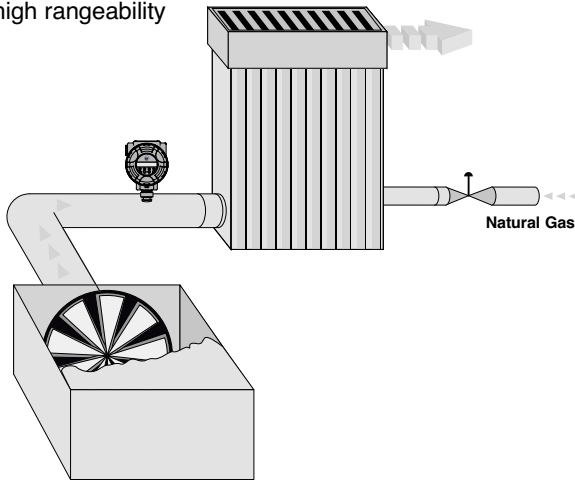


BOILER COMBUSTION

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

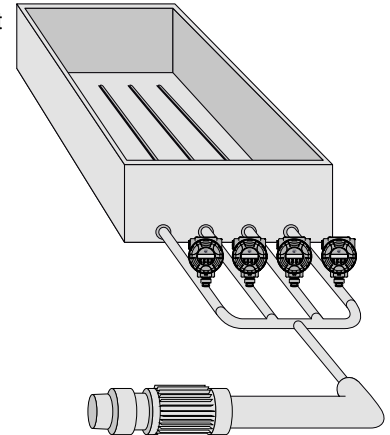


AERATION AIR FLOW

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

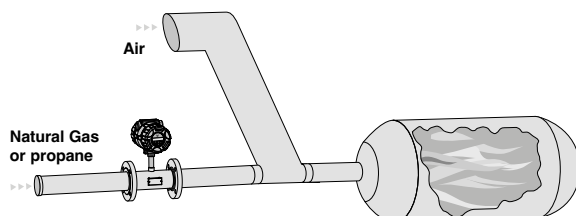


NATURAL GAS FLOW

The Model TA2 efficiently measures the flow and totalised 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 Nm³/h
- built in totalizer
- easy in setup and operation

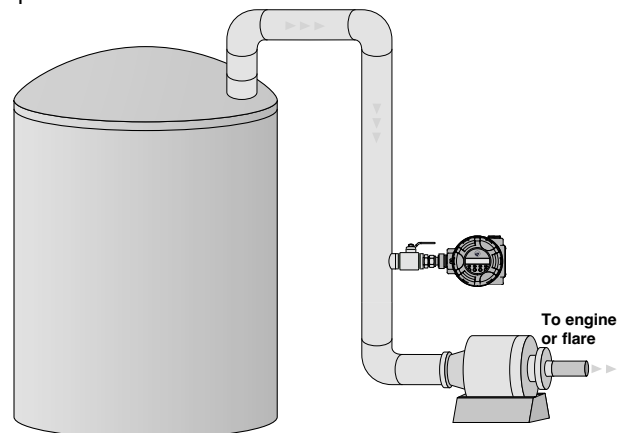


DIGESTER GAS/BIO-GAS

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.

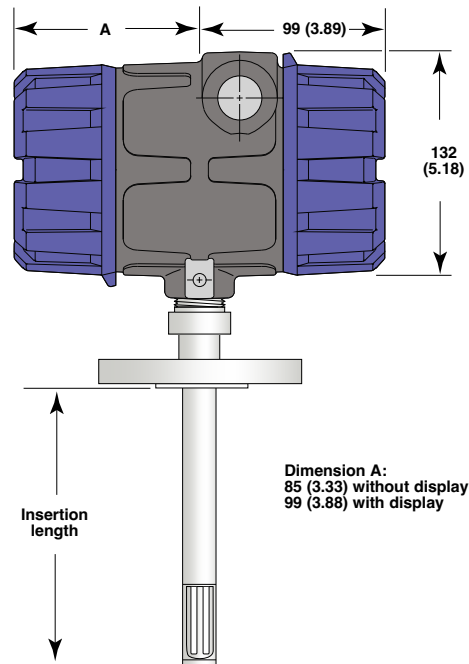
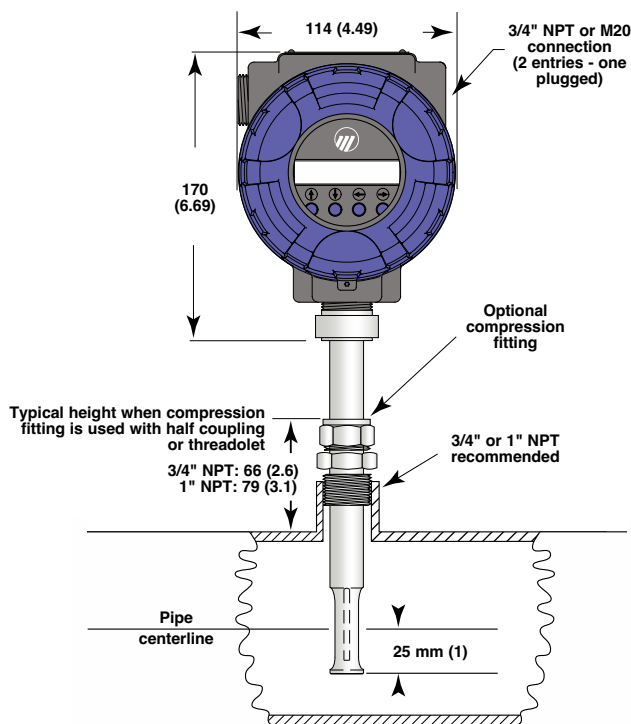
Advantages:

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

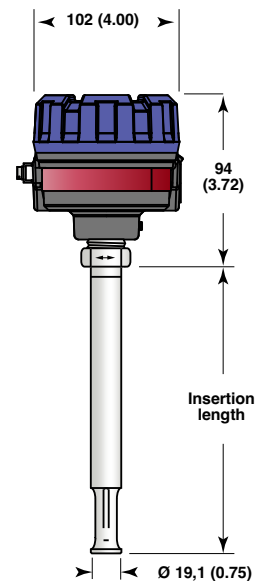
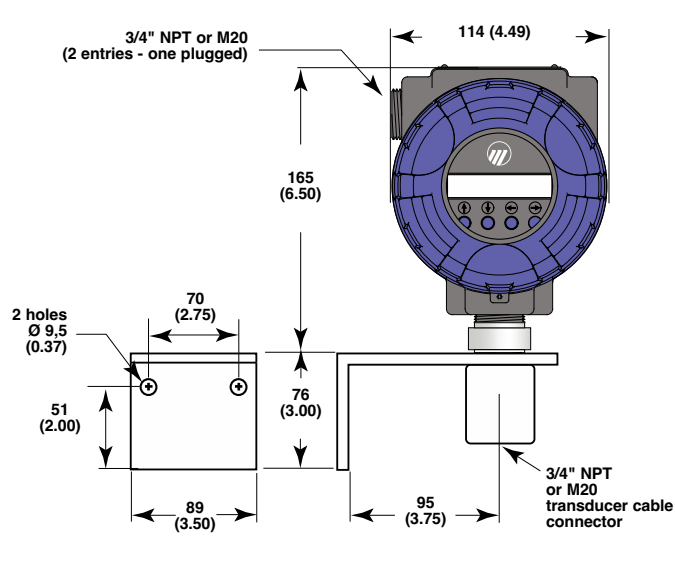


DIMENSIONS IN mm (inches)

Integral Mount TA2



Remote Mount TA2



SELECTION DATA

A complete measuring system consists of:

1. Thermatel® TA2 mass flow electronics.
Thermatel® TA2 mass flow meters require an application report for performing pre-calibration from factory. Ask your Magnetrol® contact for assistance when specifying a device.
2. Thermatel® TA2 mass flow insertion probe or Thermatel® TA2 mass flow sensor with flow body.
3. Connecting cable for remote mount Thermatel® TA2 mass flow meters.
4. Options:
 - MACTek Viator USB HART® interface: order code: **070-3004-002**
 - portable display module – order code: **089-5219-002** (for more details see page 3)
 - flow conditioning plate for use with insertion probes – for order code see page 12
 - retractable probe assembly (RPA) – for order code see page 13
 - valve with compression fitting – order code: **089-5218-001** (for more details see page 14)
5. Free of charge: TA2 DTM (PACTware™) can be downloaded from www.magnetrol.com

SELECTION DATA

1. Order code for Thematel® Enhanced Model TA2 mass flow meter

1 - 4 | BASIC MODEL NUMBER

T	A	2	-	A	Thematel® TA2 mass flow meter
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5 | OUTPUT

1	4-20 mA with HART® communication
4	4-20 mA with HART® communication, Pulse/Alarm, second mA output

6 7 | ACCESSORIES

0 0	Blind transmitter (can receive the plug-in display as future option)
B 0	Plug-in digital display and keypad

8 | CALIBRATION ①

For TA2 with insertion probe

Actual gas calibration	
0	Special ^① . Specify medium separately
1	Air
2	Nitrogen
3	Hydrogen
4	Natural gas
6	Digester gas ^②
7	Propane
8	Oxygen
Air equivalency / Correlation	
5	Gas correlation ^①
9	Air equivalency

For TA2 with sensor with flow body

Actual gas calibration	
A	Special ^① . Specify medium separately
B	Air
C	Nitrogen
D	Hydrogen
E	Natural gas
G	Digester gas ^②
H	Propane
J	Oxygen
Air equivalency / Correlation	
F	Gas correlation ^①
K	Air equivalency

① Consult factory for approval.

② Applies only to digester gas composition of 65 % methane and 35 % CO₂. All other digester gas compositions require Gas Correlation or Air Equivalency calibrations.

9 | MOUNTING/APPROVAL

3	Integral, ATEX II 2 G Ex d IIC T6 Gb, flameproof enclosure
4	Remote ^③ , ATEX II 2 G Ex d IIC T6 Gb, flameproof enclosure

③ Bracket for electronics and probe housing included.

10 | HOUSING / CABLE ENTRY

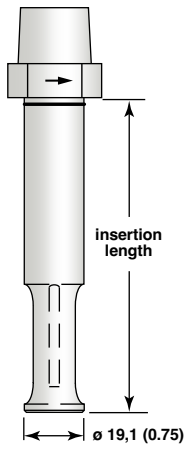
1	IP 66, Cast aluminium, M20 x 1,5 cable entry (2 entries - 1 plugged)
0	IP 66, Cast aluminium, 3/4" NPT cable entry (2 entries - 1 plugged)
2	Stainless Steel, 3/4" NPT
3	Stainless Steel, M20 x 1,5

T	A	2	-	A						
1	2	3	4	5	6	7	8	9	10	

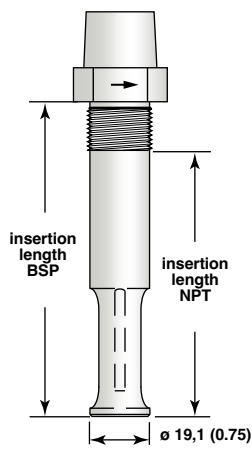
complete order code for Thematel® Enhanced Model TA2 mass flow meter

→ X = product with a specific customer requirement

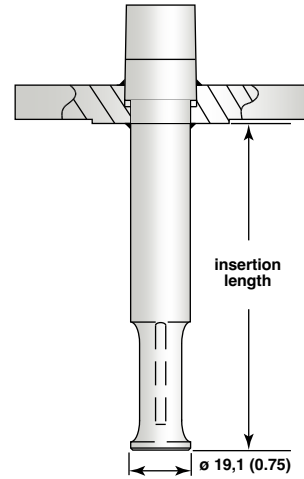
DIMENSIONS IN mm (inches)



TMR for mounting with compression fitting



TMR with threaded connection



TMR with flanged connection

When ordered separately:		
Process Conn. Size	Compression fitting in 316 (1.4401) stainless steel	
	Teflon ferrules Max. 6,89 bar (100 psi)	Stainless steel ferrules Max. 103 bar @ +20 °C (1500 psi @ +70 °F) Max. 94,8 bar @ +200 °C (1375 psi @ +400 °F)
1" NPT	order code: 011-4719-009	order code: 011-4719-007
3/4" NPT	order code: 011-4719-008	order code: 011-4719-006

SELECTION DATA

2. Order code for Thermatel® Enhanced Model TA2 mass flow insertion probe

1 2 3 | BASIC MODEL NUMBER

T M R	Thermatel® TA2 Mass Flow probe - 3/4" diameter
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4 | MATERIALS OF CONSTRUCTION

A	316/316L (1.4401/14404) stainless steel
B	Hastelloy® C (2.4819) - not available with 316 (1.4401) stainless steel compression fitting
F	Hastelloy® C (2.4819), NACE
N	316/316L SST, NACE

5 6 7 | PROCESS CONNECTION

0 0 A	Designed for use with compression fitting – min. 11 cm insertion length Compression fitting not included
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Threaded with 316 (1.4401) stainless steel compression fitting included

0 3 A	3/4" NPT compression fitting with Teflon ferrules (max. 6,90 bar)
0 4 A	3/4" NPT compression fitting with stainless steel ferrules (max. 103 bar @ +20 °C, max. 94,8 bar @ +200 °C)
0 5 A	1" NPT compression fitting with Teflon ferrules (max. 6,90 bar)
0 6 A	1" NPT compression fitting with stainless steel ferrules (max. 103 bar @ +20 °C, max. 94,8 bar @ +200 °C)

Threaded

1 1 A	3/4" NPT - default selection in combination with a retractable probe assembly (RPA) see page 13
2 1 A	1" NPT
2 2 A	1" BSP (G 1")

ASME flanges

2 3 A	1"	150 lbs ASME RF
2 4 A	1"	300 lbs ASME RF
3 3 A	1 1/2"	150 lbs ASME RF
3 4 A	1 1/2"	300 lbs ASME RF
4 3 A	2"	150 lbs ASME RF
4 4 A	2"	300 lbs ASME RF

EN flanges

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

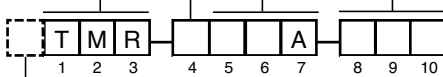
8 9 10 | INSERTION LENGTH - consider process connections

Min probe length

0 0 7	7 cm (2.6") fixed length - for NPT threaded and flanged
0 0 9	9 cm (3.5") fixed length - for BSP threaded

Selectable probe length - specify per cm (0.39") increment

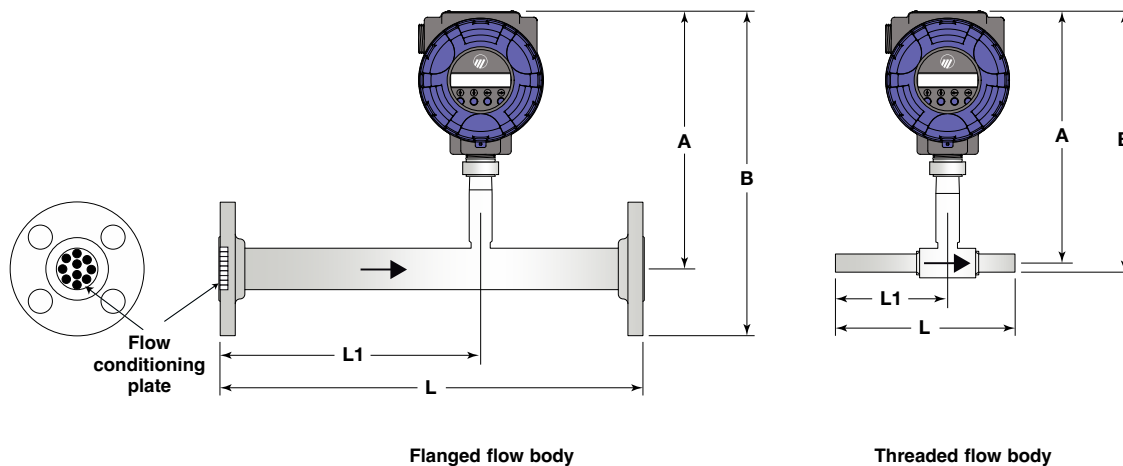
0 0 9	min. 9 cm (3.5")	- for NPT threaded and flanged
0 1 1	min. 11 cm (4.5")	- for BSP threaded and compression fitting
0 2 5	min. 25 cm (10")	- for use with RPA (Retractable Probe Assembly)
2 5 3	max. 253 cm (99.9")	- for all probe connections



complete order code for Thermatel® Enhanced Model TA2 mass flow insertion probe

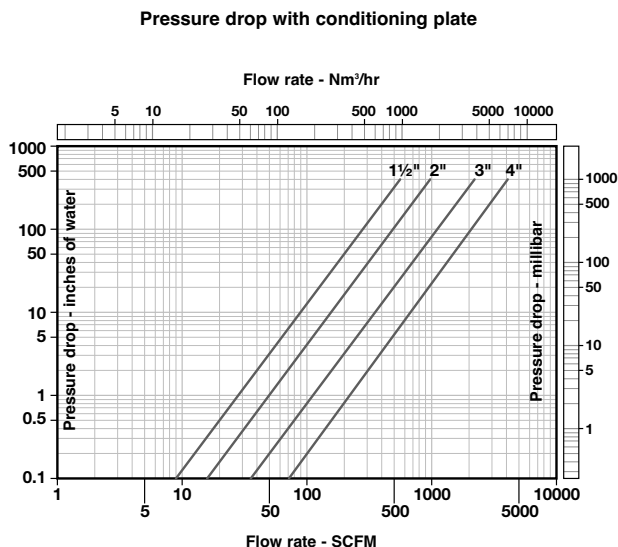
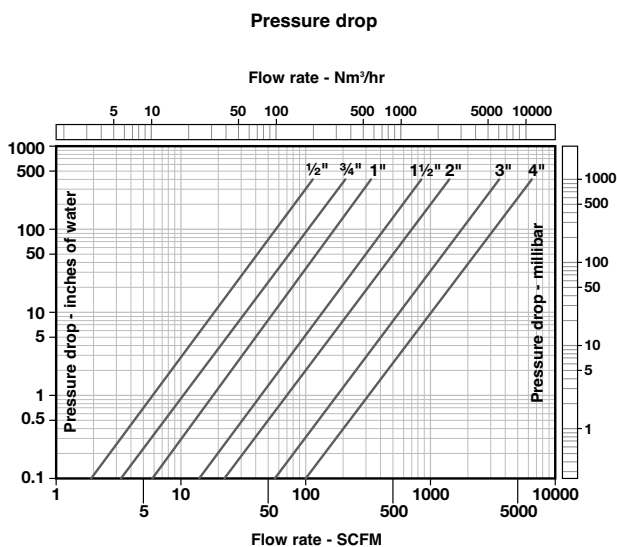
X = product with a specific customer requirement

DIMENSIONS IN mm (inches)



Code	Size	Length (L)		L1		Height to Centerline (A)	Overall Height (B)	
		With Flow Conditioning mm (inches)	Without Flow Conditioning mm (inches)	With Flow Conditioning mm (inches)	Without Flow Conditioning mm (inches)		NPT-M mm (inches)	Flange mm (inches)
0	1/2"	203 (8) ^①	—	127 (5) ^①	—	203 (8.0)	214 (8.4)	248 (9.7)
1	3/4"	286 (11.25) ^①	—	191 (7.5) ^①	—	203 (8.0)	217 (8.5)	251 (9.9)
2	1"	381 (15) ^①	—	254 (10) ^①	—	203 (8.0)	220 (8.7)	257 (10.1)
3	1 1/2"	495 (19.5)	191 (7.5)	305 (12)	95 (3.75)	211 (8.3)	235 (9.3)	274 (10.8)
4	2"	660 (26)	191 (7.5)	406 (16)	95 (3.75)	241 (9.5)	272 (10.7)	318 (12.5)
5	3"	991 (39)	254 (10)	610 (24)	127 (5)	241 (9.5)	N/A	337 (13.3)
6	4"	1321 (52)	305 (12)	914 (36)	152 (6)	241 (9.5)	N/A	356 (14.0)

^① The upstream length in pipe sizes < 1 1/2" dia. is sufficient to create the flow conditioning effect without need for a flow conditioning plate.



Pressure drop is based on air at +20 °C (+70 °F) and 1 atmosphere (density = 1,2 kg/m³ or 0.075 lb/ft³). For other gases, pressure or temperatures, estimate pressure drop by multiplying value from chart by actual density in kg/m³ (at operating conditions) divided by 1,2.

SELECTION DATA

2. Order code for Thermatel® Enhanced Model TA2 sensor with flow body

1 2 3 | BASIC MODEL NUMBER

T	F	T	Thermatel® TA2 sensor with mass flow body
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4 | MATERIALS OF CONSTRUCTION

A	316/316L (1.4401/1.4404) stainless steel body and sensor
1	Carbon steel body / stainless steel sensor

5 6 | THREADED FLOW BODY - ø size and connection

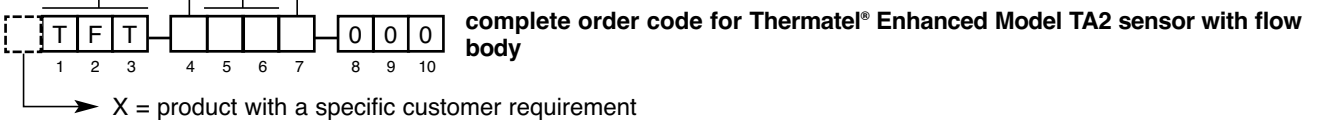
0	1	1/2"	NPT-M
1	1	3/4"	NPT-M
2	1	1"	NPT-M
3	1	1 1/2"	NPT-M
4	1	2"	NPT-M

FLANGED FLOW BODY - ø size and connection

0	3	1/2"	150 lbs ASME RF	ZW	DN15 PN10/40 EN 1092-1 Type B1
1	3	3/4"	150 lbs ASME RF	AW	DN20 PN10/40 EN 1092-1 Type B1
2	3	1"	150 lbs ASME RF	BW	DN25 PN10/40 EN 1092-1 Type B1
3	3	1 1/2"	150 lbs ASME RF	CW	DN40 PN10/40 EN 1092-1 Type B1
4	3	2"	150 lbs ASME RF	DW	DN50 PN10/16 EN 1092-1 Type B1
5	3	3"	150 lbs ASME RF	EW	DN80 PN10/16 EN 1092-1 Type B1
6	3	4"	150 lbs ASME RF	FW	DN100 PN10/16 EN 1092-1 Type B1

7 | FLOW CONDITIONING PLATE

A	None
B	Stainless steel flow conditioning plate - For flow body sizes ≥ 1 1/2"



3. Order code for connecting cable remote mount Thermatel® Enhanced Model TA2 mass flow meter

1 - 7 | BASIC MODEL NUMBER

0	3	7	-	3	3	1	4	Connecting cable for non-hazardous area - 8 wire shielded instrument cable (max 45 m)
0	3	7	-	3	3	2	0	Connecting cable for non-hazardous area - 10 wire shielded instrument cable (max 150 m)
0	0	9	-	8	2	7	0	Connecting cable for ATEX flameproof enclosure - 8 wire shielded instrument cable (max 150 m)

8 9 10 | CABLE LENGTH - specify per m (3.28 ft) increment

0	0	3	min 3 m (9.84 ft) length
0	4	5	max 45 m (148 ft) length (for 037-3314-xxx cable)
1	5	0	max 150 m (492 ft) length (for 037-3320-xxx and 009-8270-xxx cable)

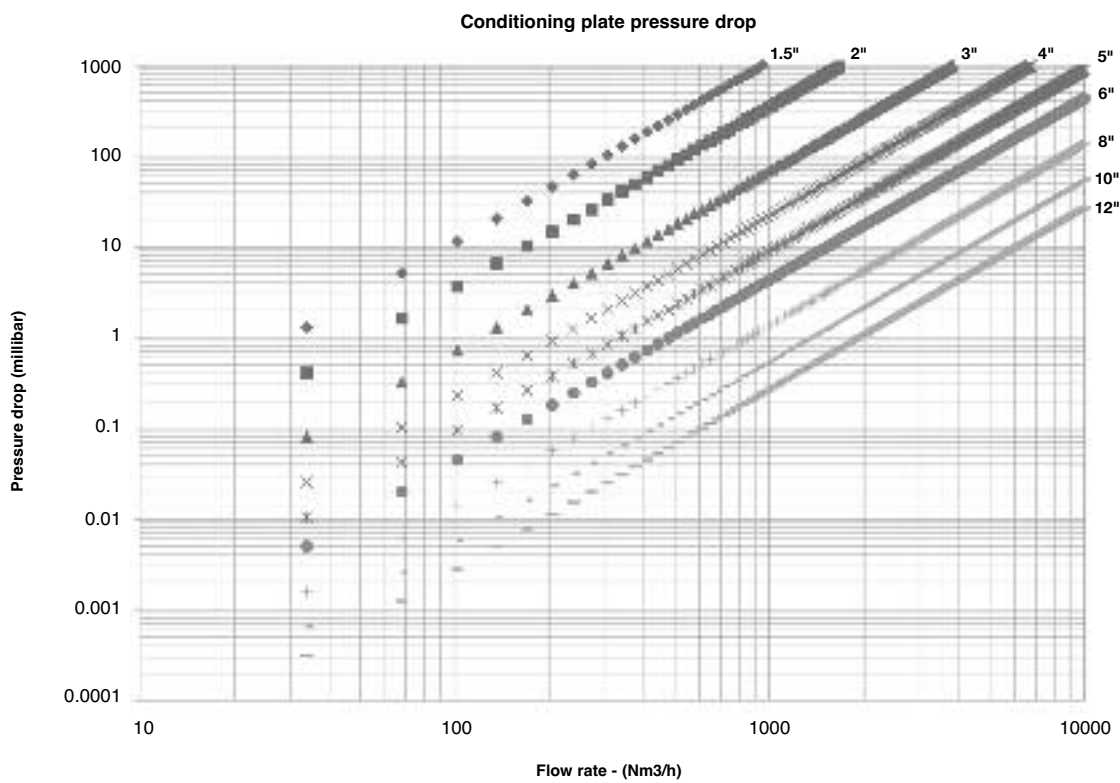


SELECTION DATA

4. Order code for flow conditioning plate for use with insertion probes

Part Number	Description
004-8986-001	4" 316 stainless steel
004-8986-002	4" carbon steel
004-8986-003	4" PVC
004-8986-004	5" 316 stainless steel
004-8986-005	5" carbon steel
004-8986-006	5" PVC
004-8986-007	6" 316 stainless steel
004-8986-008	6" carbon steel
004-8986-009	6" PVC

Part Number	Description
004-8986-010	8" 316 stainless steel
004-8986-011	8" carbon steel
004-8986-012	8" PVC
004-8986-013	10" 316 stainless steel
004-8986-014	10" carbon steel
004-8986-015	10" PVC
004-8986-016	12" 316 stainless steel
004-8986-017	12" carbon steel
004-8986-018	12" PVC



SELECTION DATA

5. Order code for retractable probe assembly

1 2 3 | BASIC MODEL NUMBER

R	P	A	Retractable probe assembly
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4 | DESIGN TYPE

E	Low pressure - up to 5,5 bar (80 psi)
F	High pressure - up to 300 lbs service

5 | MATERIALS OF CONSTRUCTION

1	Carbon steel with 316 SST (1.4401) seal gland
4	316 SST (1.4401)

6 | PROCESS CONNECTION

0	1 1/2" NPT	– not available for RPA-E1
1	1 1/2" - 150 lbs RF flange	
2	1 1/2" - 300 lbs RF flange	

7 | BALL VALVE

0	No ball valve supplied	
1	Carbon steel ball valve	– select material code 1
2	Stainless steel ball valve	– select material code 4

8 9 10 | PROBE LENGTH

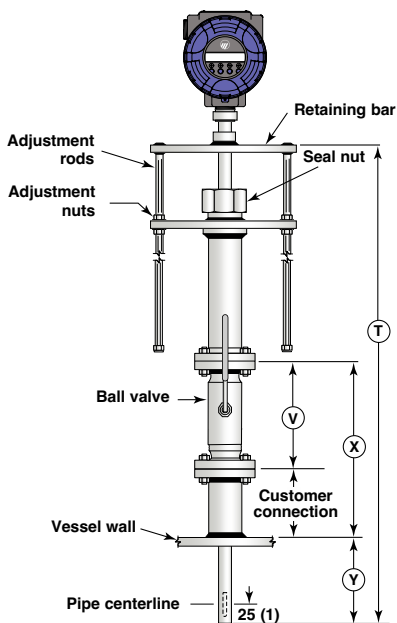
0 2 5	min 25 cm (9.84")
1 8 0	max 180 cm (70.87")



complete order code for retractable probe assembly

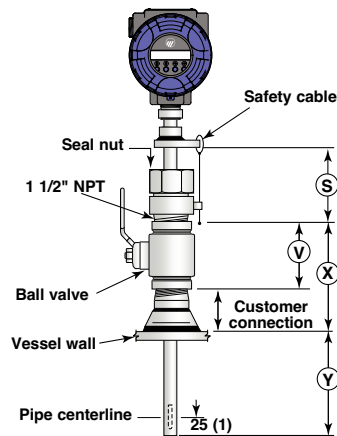
X = product with a specific customer requirement

DIMENSIONS IN mm (inches)



Model RPA-F412-XXX

minimum probe length: $T = 2(X + Y)$



Model RPA-E402-XXX

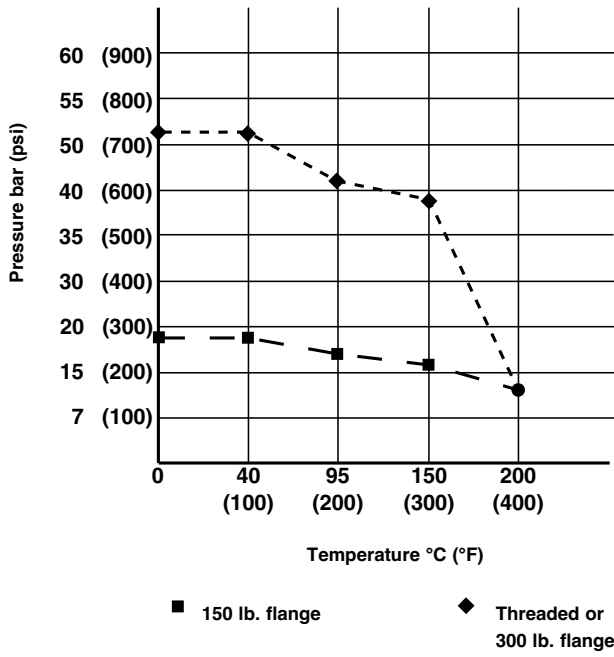
minimum probe length: $S + X + Y$

S Dimension	
Threaded connection	102 (4.00)
Flanged connection	127 (5.00)

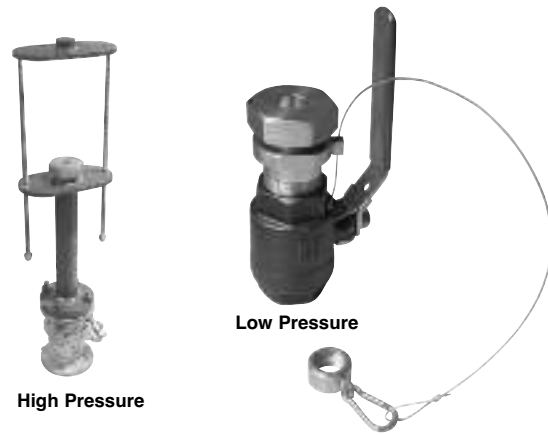
Ball Valve Dimensions*	
Size	V
1 1/2" NPT	112 (4.4)
1 1/2" 150# flange	165 (6.5)
1 1/2" 300# flange	191 (7.5)

*Dimension of ball valve if supplied by the factory.

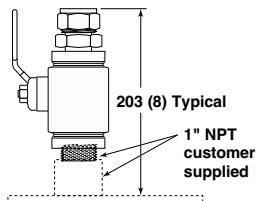
High Pressure RPA



Retractable probe assembly



6. Order code for valve with compression fitting



1" NPT ball valve in 316 SST with compression fitting (TFE ferrules)
 order code: **089-5218-001**

TRANSMITTER SPECIFICATIONS

ELECTRONICS SPECIFICATIONS

Description		Specification
Power supply		15 – 30 V DC 100 – 264 V AC, 50-60 Hz
Power consumption		DC = 9 W max - AC = 20 VA max
Output		4-20 mA with HART®
Analog Output	Active	4-20 mA isolated (3,8 – 20,5 mA useable as per NAMUR NE 43) - max 1000 Ω loop resistance
	Passive	4-20 mA isolated (3,8 – 20,5 mA useable as per NAMUR NE 43) - max loop resistance depending power supply
Resolution	Analog	0,01 mA
	Display	0,01 Nm/s
Calibration		Pre-calibrated from factory - ISO 17025 and NIST traceable
Damping		Adjustable 0-15 s time constant
Diagnostic Alarm		Adjustable 3,6 mA, 22 mA or Hold last output
User Interface		HART® communicator, AMS® or PACT ^{ware} ™, 4-button keypad
Pulse Output		Active connection – 24 V DC Power, 150 mA Passive connection – 2,5 to 60 V DC Power, 1,5 A
Alarm Output		Active connection – 24 V DC Power, 100 mA Passive connection – 2,5 to 60 V DC Power, 1 A
Display		2-line x 16-character backlit LCD
Displayed values		Flow (eg. Nm ³ /h, NI/h) and/or mass flow (eg. kg/h) and/or temperature (°C/°F) and/or loop current (mA) and/or totalized flow (eg. Nm ³ /h, NI/h)
Menu Language		English, French, German, Spanish, Russian
Housing Material		IP 66, Aluminium A 356 (< 0,2 % copper) dual compartment, 316 stainless steel
Approvals		ATEX II 2 G Ex d IIC T6 Gb, flameproof enclosure IEC Ex d IIC T6 Gb, flameproof enclosure Temperature class decreases for process temperatures above +55 °C (+130 °F) Other approvals are available, consult factory for more details
SIL (Safety Integrity Level)		Functional safety to SIL1 as 1oo1 / SIL2 as 1oo2 in accordance to IEC 61508 – SFF: 88,3 % Full FMEDA report and declaration sheets available at request
Shock/Vibration Class		ANSI/ISA-S71.03 Class SA1 (Shock), ANSI/ISA-S71.03 Class VC2 (Vibration)
Net weight		3,3 kg (7.3 lbs) – electronics with 25 cm threaded probe

PERFORMANCE

Description		Specification
Turn down ratio		100:1 typical (depending upon calibration)
Flow range	Max	0,05 - 275 Nm/s (10 - 54,000 SFPM) reference of air at STP conditions
	Min	0,05 - 2,5 Nm/s (10 - 500 SFPM) reference of air at STP conditions
Linearity		Included in flow accuracy
Accuracy	Flow	± 1 % of reading + 0,5 % of calibrated full scale
	Temperature	± 1 °C (2 °F)
Repeatability		± 0,5 % of reading
Response time		Time constant of 1 to 3 s
Remote electronics		Max 45 m or 150 m, depending on cable used
Ambient temperature		-40 °C to +80 °C (-40 °F to +176 °F) (ATEX up to +55 °C (+130 °F), IEC up to +70 °C (+160 °F)) Display: -30 °C to +80 °C (-22 °F to +176 °F)
Operating temperature effect		± 0,04 % of reading per °C
Humidity		0-99 %, non-condensing
Electromagnetic Compatibility		Meets CE requirements (EN 61326)

PROBE SPECIFICATIONS

Description	Insertion probe	Sensor with flow body
Materials – wetted parts	316/316L (1.4401/1.4404) or Hastelloy® C (2.4819)	Sensor: 316/316L (1.4401/1.4404) Flow body: stainless steel or carbon steel
Mounting	Threaded, compression fitting, ASME-EN flanged or with Retractable probe assembly	Threaded or flanged
Probe length	From 7 cm up to 253 cm (2.6" up to 99.9")	Flow body sizes from 1/2" up to 4"
Max process temperature	Integral electronics: -45 °C up to +120 °C (-50 °F up to +250 °F) -45 °C up to +200 °C (-50 °F up to +400 °F) with 100 mm (4") longer probe serving as heat extension between the electronics and the compression fitting Remote electronics: -45 °C up to +200 °C (-50 °F up to +400 °F)	
Max pressure rating	103 bar @ +20 °C (1500 psi @ +70 °F) 94,8 bar @ +200 °C (1375 psi @ +400 °F) – direct insertion 75,9 bar @ +200 °C (1100 psi @ +400 °F) – with flow body	



QUALITY ASSURANCE - ISO 9001

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** AND OUR TOTAL COMPANY IS COMMITTED TO PROVIDING FULL CUSTOMER SATISFACTION BOTH IN QUALITY PRODUCTS AND QUALITY SERVICE.

PRODUCT WARRANTY

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UNDER RESERVE OF MODIFICATIONS

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SENSORS, TEST & CALIBRATION