

Rosemount 405 Compact Primary Element



NOTICE

This installation guide provides basic guidelines for Rosemount 405 Primary Element. It does not provide instructions for configuration, diagnostics, maintenance, service, troubleshooting, Explosion-proof, Flameproof, or intrinsically safe (I.S.) installations. Refer to the 405 reference manual (document number 00809-0100-4810) for more instruction. This manual is also available electronically on www.rosemount.com.

If the 405 primary element was ordered assembled to a Rosemount 3051S transmitter, the new assembly is the Rosemount 3051SFC Compact Flowmeter. See the following Quick Start Guide for information on configuration and hazardous locations certifications: Rosemount 3051S Series Pressure Transmitter (document number 00825-0100-4801).

If the 405 primary element was ordered assembled to a Rosemount 3051S MultiVariable™ Transmitter, the new assembly is the Rosemount 3051SFC Compact Flowmeter. See the following Quick Start Guide for information on configuration and hazardous locations certifications: 3051S MultiVariable Transmitter (document number 00825-0100-4803).

WARNING

Process leaks may cause harm or result in death.

To avoid process leaks, only use gaskets designed to seal with the corresponding flange and o-rings to seal process connections.

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Step 1: Primary element location

Install the 405 in the correct location within the piping branch to prevent inaccurate measurement caused by flow disturbances.

Table 1. 405C Straight Pipe Requirements⁽¹⁾

	Beta	0.40	0.50	0.65
Upstream (inlet) side of primary	Reducer	2	2	2
	Single 90° bend or tee	2	2	2
	Two or more 90° bends in the same plane	2	2	2
	Two or more 90° bends in different planes	2	2	2
	Up to 10° of swirl	2	2	2
	Butterfly valve (75% to 100% open)	2	5	5
Downstream (outlet) side of primary		2	2	2

Table 2. 405P Straight Pipe Requirements⁽¹⁾⁽²⁾

	Beta	0.40	0.50	0.65
Upstream (inlet) side of primary	Reducer	5	8	12
	Single 90° bend or tee	16	22	44
	Two or more 90° bends in the same plane	10	18	44
	Two or more 90° bends in different planes	50	75	60
	Expander	12	20	28
	Ball / Gate valve fully open	12	12	18
Downstream (outlet) side of primary		6	6	7

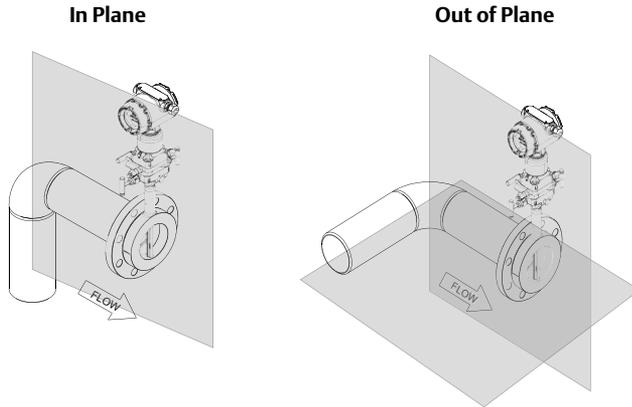
Table 3. 405A Straight Run Requirements⁽¹⁾

		Without straightening vane		With straightening vane ⁽³⁾	
	Annubar™ averaging pitot tube - sensor size 1	In plane ⁽⁴⁾	Out of plane ⁽⁴⁾	From disturbance	From straightening vane
Upstream (inlet) side of primary	Reducer	12	12	8	4
	Expander	18	18	8	4
	Single 90° bend or tee	8	10	8	4
	Two or more 90° bends in the same plane	11	16	8	4
	Two or more 90° bends in different planes	23	28	8	4
	Butterfly Valve (75-100% open)	30	30	8	4
	Ball/Gate Valve fully open	8	10	8	4
Downstream (outlet) side of primary		4	4	4	4

1. Consult an Emerson Process Management representative if a disturbance is not listed.
2. If using flow straighteners, refer to ISO 5167 for recommended links.
3. Use straightening vane to reduce the required straight run length.
4. In Plane means the Annubar is in the same plane as the elbow. Out of Plane means the bar is perpendicular to the plane of the upstream elbow. Refer to Figure 1 on page 4.

Note

Recommended lengths represented in pipe diameters. If longer lengths of straight run are available, position the 405 so 80% of the pipe run is upstream and 20% is downstream. Flow conditioners may be used to reduce the required straight run length, improving performance.

Figure 1. Compact Annubar Flowmeter In plane and Out of plane**Note**

The above figure depicts in plane and out of plane orientations only. Refer to [Table 3 on page 3](#) for recommended straight run requirements.

Vibration limits for Rosemount 405 products

Qualified per IEC61298-3 (2008) for field with general application or pipeline with low vibration level (10-1000 Hz test frequency range, 0.15 mm displacement peak amplitude, 20 m/s² acceleration amplitude)⁽¹⁾.

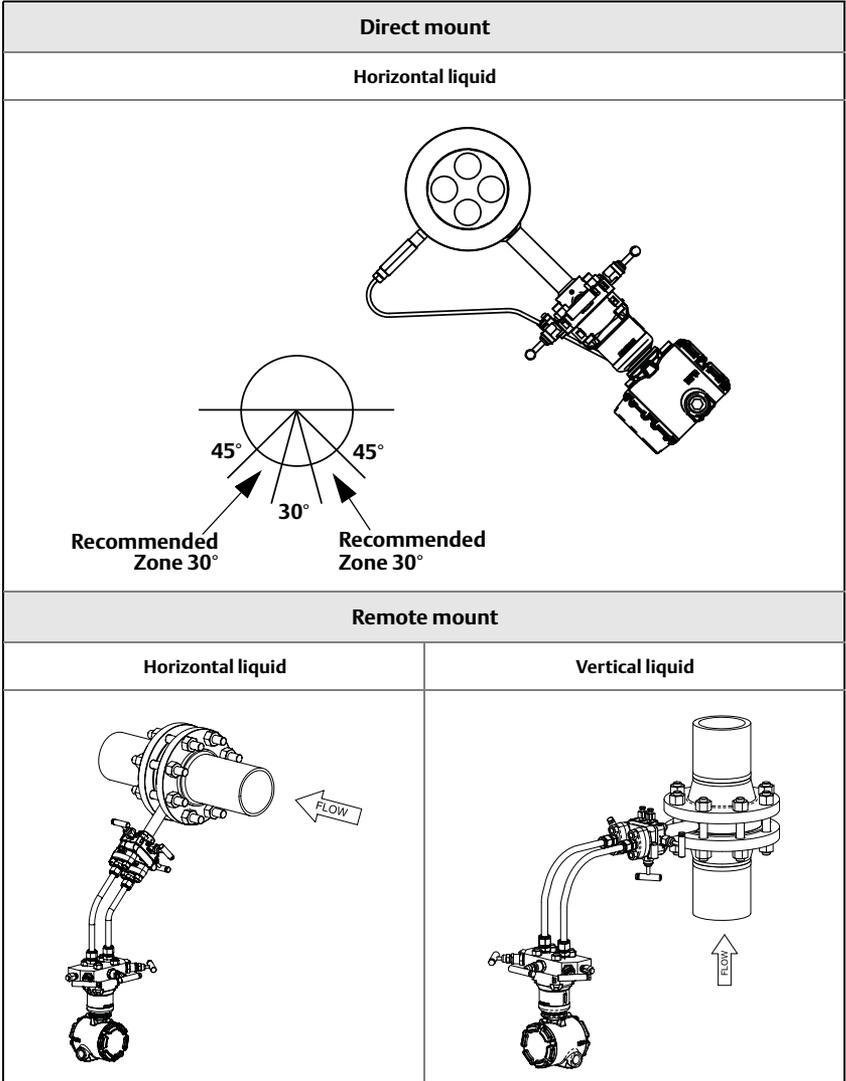
The weight and length of the transmitter assembly shall not exceed 9.8 lbs (4.45 kg) and 8.60-in. (218.44 mm).

1. Stainless steel temperature housing is not recommended with primary element technology A in applications with mechanical vibration.

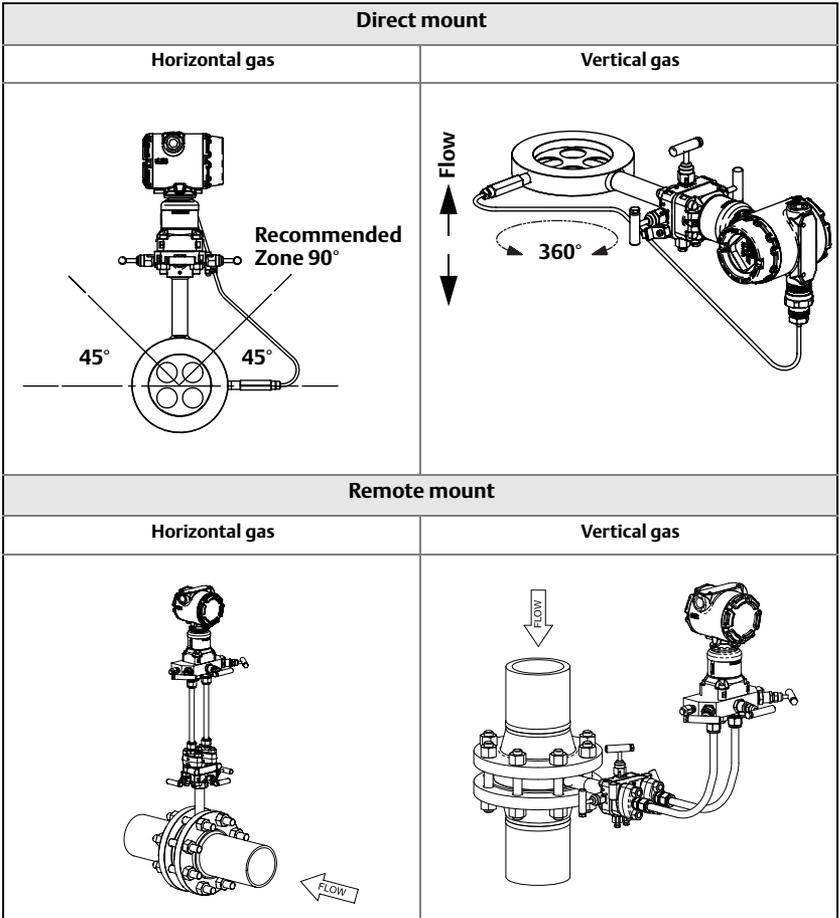
Step 2: Primary element orientation

The primary element can be installed in any position around the circumference of the pipe, provided the vents are positioned properly for bleeding or venting. Optimal results for liquid or steam in a vertical line are obtained when flow is up.

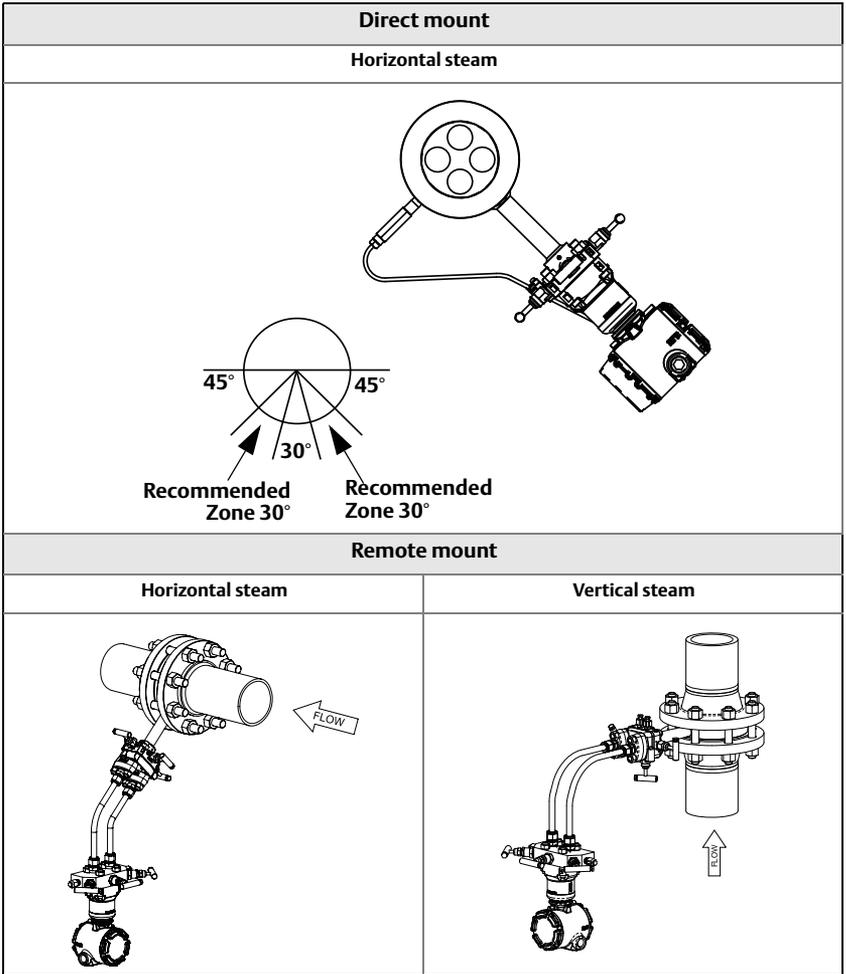
Liquid - 405C, 405P, and 405A



Gas - 405C, 405P, and 405A



Steam - 405C, 405P, and 405A

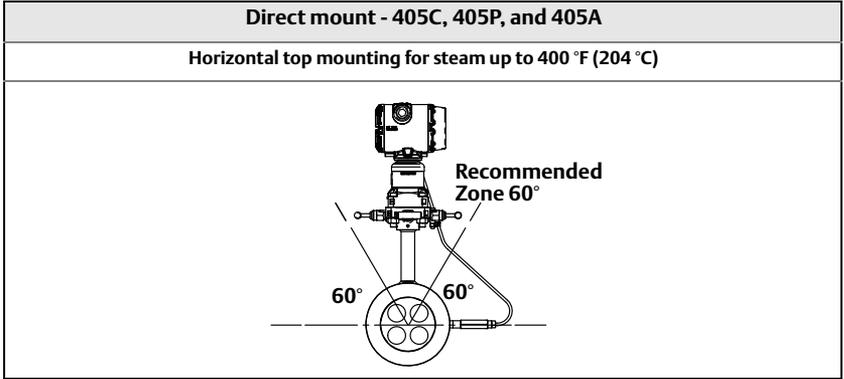


Note

For the 405A in steam applications, with DP readings in a low flow condition as low as 0.75 inH₂O in horizontal pipes consider installing the primary element/flowmeter in the top mounting for steam configuration.

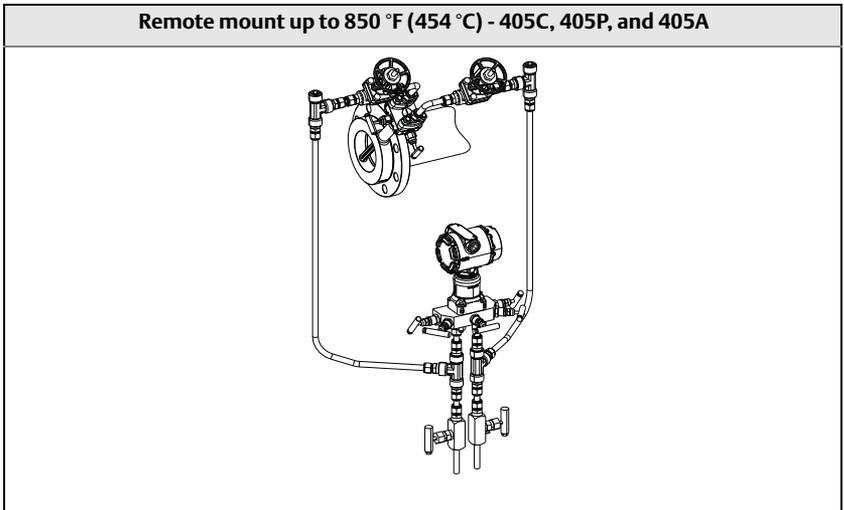
Top mounting for steam

Top mounting in steam is an alternative mounting method for steam installations that can be used if there are space restrictions or other concerns. This installation method is intended for applications that run with limited interruptions or shutdowns. Also, for outdoor applications, top mounting can eliminate the need for heat tracing, if steam is flowing.



Note

For the 405A in wet steam applications, do not mount the flowmeter at the direct vertical position. Mounting at an angle will avoid measurement inaccuracy due to water running along the bottom of the pipe.



Note

When top mounting with a remote mount transmitter, use enough impulse piping to dissipate the process heat to avoid damaging the transmitter.

Suggested top mounting orientations: For steam up to 400 °F (204 °C) use direct mount orientation and for steam up to 850 °F (454 °C) use remote mount orientation. For direct mounting, ambient temperature should be less than 100 °F (38 °C). For remote mount installations, the impulse piping should slope up slightly from the instrument connections on the 405A Compact Annubar primary element to the cross fittings, allowing condensate to drain back into the pipe. From the cross fittings, the impulse piping should be routed downward to the transmitter and the drain legs. The transmitter should be located below the instrument connections of the 405A Compact Annubar primary element.

For technologies C, P, and A, depending on the environmental conditions, it may be necessary to insulate the mounting hardware.

Step 3: Primary element installation

1. Orient the assembly according to the guidelines provided in “Primary element orientation” on page 5. Ensure the flow arrow stamped on the 405 Primary Element is pointing in the same direction as the process flow.

Note

ANSI 150 - 600# alignment ring is included as standard when ordering for up to 8-in. line sizes. For the 10-in. and 12-in. line size, the alignment ring must be ordered (Installation Accessories). If a DIN or JIS alignment ring is required, it must be ordered as an option. Contact an Emerson Process Management sales representative for additional information.

Note

For ease of installation, the gasket may be secured to the flange face with small pieces of tape. Be sure the gasket or tape does not protrude into the pipe.

2. If using an alignment ring with through holes, proceed to [Step 9](#).
3. Insert two studs through the flange holes located opposite the head of the 405.
4. Place the alignment ring on the 405 body (see [Figure 2](#)).
5. Insert gaskets.
6. Insert the 405 between the flanges so that the indentations on the alignment ring contact the installed studs. The studs must contact the alignment ring in the indentation marked with the appropriate flange rating to ensure proper alignment.
7. Install remaining studs and nuts (hand tight). Ensure that three of the studs are in contact with the alignment ring.
8. Lubricate studs and tighten nuts in a cross pattern to the appropriate torque per local standards.

Steps 9-12 are for use with alignment rings that have through holes.

9. Place the alignment ring on the 405 body (see “Horizontal gas” on page 6).
10. Insert the 405 between the flanges.
 - a. Starting on the side opposite the 405 head, rotate the alignment ring such that the radius corresponding to the alignment ring marking matches that of the application flange rating.
 - b. Insert one stud through both the upstream and downstream flanges and allow the ring to rest on the bolt. This will ensure proper alignment.
11. Repeat step 10 for the installation of the remaining bolts that will contact the alignment ring.
12. Insert gaskets.
13. Install remaining studs and nuts (hand tight). Ensure three of the studs are in contact with the alignment ring.
14. Lubricate studs and tighten nuts in a cross pattern to the appropriate torque per local standards.

Note

Standard $\frac{1}{16}$ -in. gaskets are recommended for use with the 405. Using other gaskets could potentially cause a bias shift in the measurement.

Recommended insulation guidelines

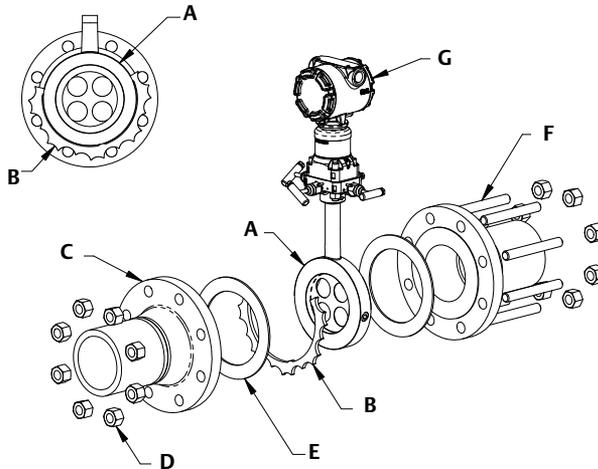
For flowmeters with integral temperature assembly:

It is recommended the meter to be insulated when the process ambient temperature is greater than 30 °F (-1 °C).

1. For line sizes 1/2-in. (15 mm) to 4-in. (100 mm), it is recommended to have 4-in. (100 mm) of insulation of at least a 4.35 R-factor.
2. For line sizes 6-in. (150 mm) to 12-in. (300 mm), it is recommended to have 5-in. (125 mm) of insulation of at least a 4.35 R-factor.

The full thickness stated above may not be necessary for the entire flowmeter, but is required for the temperature sensor area at a minimum. Insulation is needed to ensure meeting our specified temperature measurement accuracy. Insulation should only be placed up to the neck and not cover the transmitter.

Figure 2. Rosemount 405 Installation



- | | |
|--|-------------------------------------|
| A. Rosemount 405⁽¹⁾ | E. Gasket |
| B. Alignment Ring | F. Stud |
| C. Existing Pipe Assembly with Flange | G. Transmitter⁽²⁾ |
| D. Nut | |

1. This installation drawing applies to the 405C, 405P, and 405A.

2. The installation drawing applies when using the Rosemount 3051S, Rosemount 3051S MultiVariable, Rosemount 3051, and Rosemount 2051 transmitter. See the following documents for quick installation instruction of the transmitters.

Rosemount 3051S MultiVariable Transmitter: document number 00825-0100-4803

Rosemount 3051S: document number 00825-0100-4801

Rosemount 3051: document number 00825-0100-4001

Rosemount 2051: document number 00825-0100-4101

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. – Chanhassen, Minnesota USA
Rosemount DP Flow Design and Operations – Boulder, Colorado USA
Emerson Process Management GmbH & Co. OHG – Wessling, Germany
Emerson Process Management Asia Pacific Private Limited – Singapore
Emerson Beijing Instrument Co., Ltd – Beijing, China

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

European Pressure Equipment Directive (PED) (97/23/EC)

405 Compact Primary Element
— Sound Engineering Practice (SEP)
Pressure Transmitter
— See appropriate Pressure Transmitter QIG

Hazardous Locations Certifications

For information regarding the electronics product certification, see the appropriate transmitter QIG:

- Rosemount 3051SMV: (document number 00825-0100-4803)
- Rosemount 3051S: (document number 00825-0100-4801)
- Rosemount 3051: (document number 00825-0100-4001)
- Rosemount 2051: (document number 00825-0100-4101)

ROSEMOUNT



EC Declaration of Conformity

No: DSI 1000 Rev. I

We,

**Emerson Process Management
Heath Place - Bognor Regis
West Sussex PO22 9SH
England**

declare under our sole responsibility that the products,

Primary Element Models 405 / 1195 / 1595 & Annubar® Models 485 / 585

manufactured by,

**Rosemount / Dieterich Standard, Inc.
5601 North 71st Street
Boulder, CO 80301
USA**

to which this declaration relates, is in conformity with the provisions of the European Community Directives as shown in the attached schedule.

Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Community notified body certification, as shown in the attached schedule.

As permitted by 97/23/EC, Annex 7, the authorized signatory for the legally binding declaration of conformity for Rosemount/Dieterich Standard, Inc. is Vice President of Quality, Timothy J. Layer.

(signature)

Timothy J. Layer

Vice President, Quality

20-Oct-2011

(date of issue)





Schedule
EC Declaration of Conformity DSI 1000 Rev. I

Summary of Classifications		
Model/Range	PED Category	
	Group 1 Fluid	Group 2 Fluid
585M - 2500# All Lines	N/A	SEP
585S - 1500# & 2500# All Lines	III	SEP
MSL46 - 2500# All Lines	N/A	SEP
MSR: 1500# & 2500# All Lines	III	SEP
1195, 3051SFP, 3095MFP: 150# 1-1/2"	I	SEP
1195, 3051SFP, 3095MFP: 300# & 600# 1-1/2"	II	I
1195, 3051SFP, 3095MFP: 1-1/2" Threaded & Welded	II	I
DNF - 150# 1-1/4", 1-1/2" & 2"	I	SEP
DNF - 300# 1-1/4", 1-1/2" & 2"	II	I
DNF, DNT, & DNW: 600# 1-1/4", 1-1/2" & 2"	II	I
Elanged - 485/3051SFA/3095MFA: 1500# & 2500# All Lines	II	SEP
FloTap - 485/3051SFA/3095MFA: Sensor Size 2 150# 6" to 24" Line	I	SEP
FloTap - 485/3051SFA/3095MFA: Sensor Size 2 300# 6" to 24" Line	II	I
FloTap - 485/3051SFA/3095MFA: Sensor Size 2 600# 6" to 16" Line	II	I
FloTap - 485/3051SFA/3095MFA: Sensor Size 2 600# 18" to 24" Line	III	II
FloTap - 485/3051SFA/3095MFA: Sensor Size 3 150# 12" to 44" Line	II	I
FloTap - 485/3051SFA/3095MFA: Sensor Size 3 150# 46" to 72" Line	III	II
FloTap - 485/3051SFA/3095MFA: Sensor Size 3 300# 12" to 72" Line	III	II
FloTap - 485/3051SFA/3095MFA: Sensor Size 3 600# 12" to 48" Line	III	II
FloTap - 485/3051SFA/3095MFA: Sensor Size 3 600# 60" to 72" Line	IV*	III

PED Directive (97/23/EC)

Models: 405 / 485 / 585/ 1195 / 1595

QS Certificate of Assessment – CE-0041-H-RMT-001-10-USA

IV Flo Tap - 485/3051SFA/3095MFA: Sensor Size 3 600# 60" to 72" Line (Category IV Flo Tap will require a B1 Certificate for design examination and H1 Certificate for special surveillance)*

All other models:

Sound Engineering Practice



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Schedule
EC Declaration of Conformity DSI 1000 Rev. 1

Pressure Equipment Directive (93/27/EC) Notified Body:

Bureau Veritas UK Limited [Notified Body Number: 0041]
Parklands, Wilmslow Road, Didsbury
Manchester M20 2RE
United Kingdom





Quick Start Guide
00825-0100-4810, Rev FE
July 2014

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00825-0100-4810, Rev FE, 07/14

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