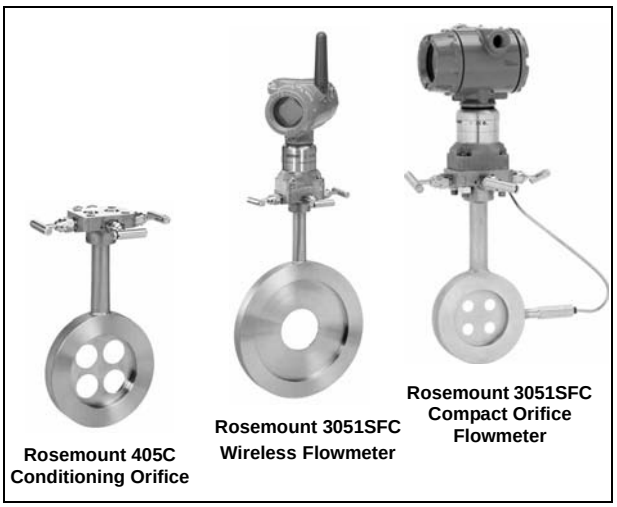
Rosemount Compact Orifice Flowmeter Series

- *Reduce straight pipe requirements to two diameters upstream and downstream from any flow disturbance with Rosemount Conditioning Technology*
- *Reduced installation cost compared to a traditional orifice plate*
- *Accurate and repeatable*
- *Easy-to-install direct mount assembly*
- *Simplify installation with the self-centering ring*
- *Based on ASME/ISO corner tap design*
- *Scalable MultiVariable™ Transmitter enables pressure, temperature, and fully compensated mass and energy flow*
- *WirelessHART™ capabilities extend the full benefits of PlantWeb® to previously inaccessible locations*



Rosemount 405C Conditioning Orifice

Rosemount 3051SFC Wireless Flowmeter

Rosemount 3051SFC Compact Orifice Flowmeter

WirelessHART HART COMMUNICATION PROTOCOL FOUNDATION CE

Content

The Rosemount 405 Compact Orifice Series

Best-in-Class Integrated DP Flowmeters
By integrating Rosemount pressure transmitters with the 405 Compact Orifice Series primary element, Emerson Process Management provides the highest performing DP Flowmeters. This fully integrated flowmeter eliminates the need for fittings, tubing, valves, adapters, manifolds, and mounting brackets, thereby reducing welding and installation time.

Less Expensive than an Orifice Plate Installation
Direct mounting minimizes total installed cost by reducing engineering, procurement, labor, and material expenditures while offering unsurpassed utility.

Direct Mount
A 3-valve isolation manifold and 1-in. (25 mm) thick wafer-style body allows direct mounting while eliminating field connections between the process and the differential pressure-measuring device. The integral configuration results in a robust, inexpensive, and easy-to-install assembly.

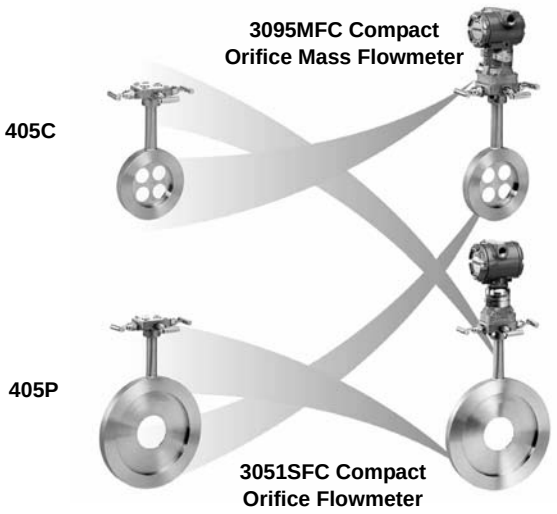
Accurate and Repeatable
The 405C Conditioning Orifice is ideal for limited pipe run measurements in gas, liquid, or steam applications (8-in. (200 mm) nominal diameter and smaller lines). The 405C Conditioning Orifice delivers consistent and accurate measurements one would expect from traditional orifice plate technology.

Centering Mechanism
Improper centering of any orifice type device can cause an error of up to ±5% in small line sizes. A centering mechanism independent of flange rating is standard with the 405 Compact Orifice Series.

Based on ASME/ISO Corner Tap Design

Design features from proven standards are incorporated in a product that performs in a predictable manner and operates on well-known principles.

Rosemount pressure transmitters combined with the Rosemount 405 Compact Orifice create Best-in-Class Flowmeters



Advanced *PlantWeb*® Functionality

Rosemount orifice flowmeters power PlantWeb through a scalable architecture, advanced diagnostics, and MultiVariable capabilities. This reduces operational and maintenance expenditures while improving throughput and utilities management.

Rosemount Pressure Solutions

Rosemount 3051S Series of Instrumentation
Highest performing scalable pressure, flow and level measurement solutions drive better plant efficiency and more productivity. Innovative features include wireless, advanced diagnostics, and multivariable technologies.

Rosemount 3095 Mass Flow Transmitter
Accurately measures differential pressure, static pressure and process temperature to dynamically calculate fully compensated mass flow.

Rosemount 305, 306 and 304 Manifolds
Factory-assembled, calibrated and seal-tested transmitter-to-manifold assemblies reduce installation costs.

Rosemount 1199 Diaphragm Seals
Provides reliable, remote measurements of process pressure and protects the transmitter from hot, corrosive, or viscous fluids.

Orifice Plate Primary Element Systems: Rosemount 1495 and 1595 Orifice Plates, 1496 Flange Unions and 1497 Meter Sections
A comprehensive offering of orifice plates, flange unions and meter sections that are easy to specify and order. The 1595 Conditioning Orifice provides superior performance in tight fit applications.

Rosemount 3051SFA Annubar® Flowmeters, Rosemount 3095MFA Annubar Flowmeters, and Rosemount 485 Annubar Flowmeter Series
The state-of-the-art, fifth generation Rosemount 485 Annubar combined with the Rosemount MultiVariable transmitter technology creates an accurate, repeatable and dependable insertion-type flowmeter.

Rosemount 3051SFC Compact Orifice Flowmeters, Rosemount 3095MFC Compact Orifice Flowmeters, and Rosemount 405 Compact Orifice Flowmeter Series
Compact Orifice Flowmeters can be installed between existing flanges, up to a Class 600 (PN100) rating. A conditioning orifice plate version offers installation in tight fit applications requiring only two diameters of straight run upstream after a flow disturbance.

Rosemount 3051SFP Integral Orifice Flowmeters, Rosemount 3095MFP Integral Orifice Flowmeters, and Rosemount 1195 Integral Orifice Flowmeter Series
These integral orifice flowmeters eliminate the inaccuracies that become more pronounced in small orifice line installations. The completely assembled, ready to install flowmeters reduce cost and simplify installation.

405 Compact Orifice Series Selection Guide

Rosemount 3051SFC Compact Orifice Flowmeter

See ordering information on page 22.

- Combines the Rosemount 3051S scalable pressure transmitter with the 405 Compact Orifice Primary
- Utilize the 3051S MultiVariable pressure transmitter for differential pressure, static pressure and process temperature measurement combinations
- Accuracy up to ±0.75% of mass flow rate
- Provides superior calculations including fully compensated mass, energy, and totalized flow
- Accuracy up to ±0.75% of volumetric rate
- Remote display and interface assembly enables direct mounting with “at-grade” operator interface
- FOUNDATION® fieldbus protocol available

3051SFC Compact Orifice Flowmeter

3095MFC Compact Orifice Flowmeter

Rosemount 3095MFC Compact Orifice Flowmeter

See ordering information on page 36.

- Combines the Rosemount 3095 MultiVariable mass flow transmitter with the 405 Compact Orifice Primary
- Accuracy up to ±0.70% of mass flow rate
- Measures differential pressure, static pressure, and process temperature all-in-one flowmeter assembly
- Dynamically calculates compensated mass flow
- FOUNDATION fieldbus protocol available

Rosemount 405 Compact Orifice Primary

See ordering information on page 45.

- Integral manifold head allows direct mounting of DP transmitters
- Accuracy up to ±0.5% of discharge coefficient uncertainty
- Direct mounting capability to ANSI 600# rating
- Self-centering alignment ring

405C Conditioning Orifice **405P Compact Orifice**

Rosemount 3051SFC Compact Orifice Flowmeter

SPECIFICATIONS

Performance

System Reference Accuracy

Fully-Compensated Mass, Energy, and Actual Volumetric Flow Accuracy

Flow performance specifications assume device is configured for full compensation of static pressure, process temperature, density, viscosity, gas expansion, discharge coefficient, and thermal correction variances over a specified operating range.

Percent (%) of flow rate

TABLE 1. 3051SFC1C - Conditioning Orifice Plate Technology

Beta	Classic MV(1) (8:1 flow turndown)	Ultra for Flow (14:1 flow turndown)
2-in. to 8-in. line size		
0.4 0.65	±1.10% ±1.45%	±0.75% ±1.15%
10-in. to 12-in. line size		
0.4 0.65	±1.35% ±1.70%	±1.00% ±1.40%

(1) For a Range 1 DP sensor, add 0.25% uncertainty.

TABLE 2. 3051SFC1P - Compact Orifice Plate Technology

Beta	Classic MV(1) (8:1 flow turndown)	Ultra for Flow (14:1 flow turndown)
1/2-in. line size		
0.4 0.65	±2.45%	±2.30%
1-in. to 1 1/2-in. line size		
0.4 0.65	±2.00%	±1.85%
2-in. to 8-in. line size		
0.4 0.65	±1.60%	±1.35%
10-in. to 12-in. line size		
0.4 0.65	±1.85%	±1.60%

(1) For a Range 1 DP sensor, add 0.25% uncertainty.

Uncompensated Flow Accuracy

Percent (%) of flow rate

TABLE 3. 3051SFCDC - Conditioning Orifice Plate Technology

Beta	Classic (8:1 flow turndown)	Ultra (8:1 flow turndown)	Ultra for Flow (14:1 flow turndown)
2-in. to 8-in. line size			
0.4 0.65	±1.40% ±1.65%	±0.90% ±1.25%	±0.75% ±1.15%
10-in. to 12-in. line size			
0.4 0.65	±1.65% ±1.90%	±1.15% ±1.50%	±1.00% ±1.40%

TABLE 4. 3051SFCDP - Compact Orifice Plate Technology

Beta	Classic (8:1 flow turndown)	Ultra (8:1 flow turndown)	Ultra for Flow (14:1 flow turndown)
1/2-in. line size			
0.4 0.65(1)	±2.60%	±2.40%	±2.30%
1-in. to 1 1/2-in. line size			
0.4 0.65(1)	±2.20%	±1.90	±1.85%
2-in. to 8-in. line size			
0.4 0.65(1)	±1.80%	±1.45%	±1.35%
10-in. to 12-in. line size			
0.4 0.65(1)	±2.05%	±1.70%	±1.60%

(1) ReD < 10,000 add an additional ±0.5% to the Discharge Coefficient Uncertainty (for all beta and sizes).

Repeatability

±0.1%

Line Sizes

- 1/2-in. (15 mm) – not available for the 3051SFC_C
- 1-in. (25 mm) – not available for the 3051SFC_C
- 1 1/2-in. (40 mm) – not available for the 3051SFC_C
- 2-in. (50 mm)
- 3-in. (80 mm)
- 4-in. (100 mm)
- 6-in. (150 mm)
- 8-in. (200 mm)
- 10-in. (250 mm)
- 12-in. (300 mm)

Performance Statement Assumptions

Measured pipe I.D

Sizing

Contact an Emerson Process Management representative for assistance. A Configuration Data Sheet is required prior to order for application verification.

Functional

Service

- Liquid
- Gas
- Steam

4–20 mA/HART®

Zero and Span Adjustment

Zero and span values can be set anywhere within the range. Span must be greater than or equal to the minimum span.

Output

Two-wire 4–20 mA is user-selectable for linear or square root output. Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

Power Supply

External power supply required.

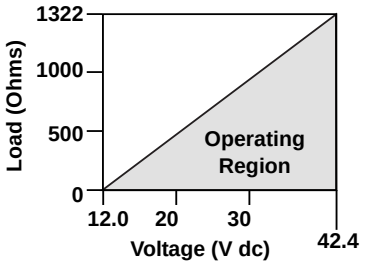
- 3051SFC with Measurement Type D (4–20 mA): 10.5 to 42.4 V dc with no load
- 3051SFC with Measurement Types 1-7: 12 to 42.4 V dc with no load
- 3051SFC HART Diagnostics transmitter: 12 to 42.4 Vdc with no load

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

3051SFC with Measurement Types 1-7
3051S HART Diagnostics Transmitter (option code DA1)

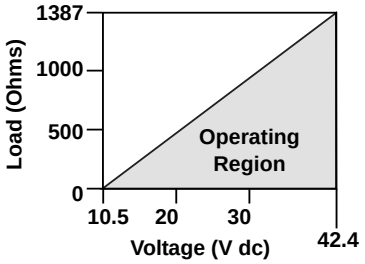
Maximum Loop Resistance = 43.5 * (Power Supply Voltage – 12.0)



The Field Communicator requires a minimum loop resistance of 250Ω for communication.

3051SFC with Measurement Type D

Maximum Loop Resistance = 43.5 * (Power Supply Voltage – 10.5)



The Field Communicator requires a minimum loop resistance of 250Ω for communication.

ASP™ Diagnostics Suite for HART
(3051SFC with Measurement Type D and option DA1)

The 3051S provides Abnormal Situation Prevention indication for a breakthrough in diagnostic capability. The 3051S ASP Diagnostics Suite for HART includes Statistical Process Monitoring (SPM), variable logging with time stamp and advanced process alerts. The enhanced EDDL graphic display provides an intuitive and user-friendly interface to better visualize these diagnostics.

The integral SPM technology calculates the mean and standard deviation of the process variable 22 times per second and makes them available to the user. The 3051S uses these values and highly flexible configuration options for customization to detect many user-defined or application specific abnormal situations (e.g. detecting plugged impulse lines and fluid composition change). Variable logging with time stamp and advanced process alerts capture valuable process and sensor data to enable quick troubleshooting of application and installation issues.

FOUNDATION fieldbus (3051SFC with Measurement Type D)

Power Supply

External power supply required; transmitters operate on 9.0 to 32.0 Vdc transmitter terminal voltage.

Current Draw

17.5 mA for all configurations (including LCD display option)

FOUNDATION fieldbus Parameters

Schedule Entries	14 (max.)
Links	30 (max.)
Virtual Communications Relationships (VCR)	20 (max.)

Standard Function Blocks

Resource Block

- Contains hardware, electronics, and diagnostic information.

Transducer Block

- Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

LCD Block

- Configures the local display.

2 Analog Input Blocks

- Processes the measurements for input into other function blocks. The output value is in engineering or custom units and contains a status indicating measurement quality.

PID Block with Auto-tune

- Contains all logic to perform PID control in the field including cascade and feedforward. Auto-tune capability allows for superior tuning for optimized control performance.

Backup Link Active Scheduler (LAS)

The transmitter can function as a Link Active Scheduler if the current link master device fails or is removed from the segment.

Software Upgrade in the Field

Software for the 3051S with FOUNDATION fieldbus is easy to upgrade in the field using the FOUNDATION fieldbus Common Device Software Download procedure.

PlantWeb Alerts

Enable the full power of the PlantWeb digital architecture by diagnosing instrumentation issues, communicating advisory, maintenance, and failure details, and recommending a solution.

Advanced Control Function Block Suite (Option Code A01)

Input Selector Block

- Selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average, or first "good."

Arithmetic Block

- Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Signal Characterizer Block

- Characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

Integrator Bock

- Compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

Output Splitter Block

- Splits the output of one PID or other control block so that the PID will control two valves or other actuators.

Control Selector Block

- Selects one of up to three inputs (highest, middle, or lowest) that are normally connected to the outputs of PID or other control function blocks.

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	20 milliseconds
PID with Auto-tune	35 milliseconds
Input Selector	20 milliseconds
Arithmetic	20 milliseconds
Signal Characterizer	20 milliseconds
Integrator	20 milliseconds
Output Splitter	20 milliseconds
Control Selector	20 milliseconds

Fully Compensated Mass Flow Block (Option Code H01)

Calculates fully compensated mass flow based on differential pressure with external process pressure and temperature measurements over the fieldbus segment. Configuration for the mass flow calculation is easily accomplished using the Rosemount Engineering Assistant.

ASP Diagnostics Suite for FOUNDATION fieldbus (Option Code D01)

The 3051S ASP Diagnostics Suite for FOUNDATION fieldbus provides Abnormal Situation Prevention indication and enhanced EDDL graphic displays for easy visual analysis.

The integral Statistical Process Monitoring (SPM) technology calculates the mean and standard deviation of the process variable 22 times per second and makes them available to the user. The 3051S uses these values and highly flexible configuration options for customization to detect many user-defined or application specific abnormal situations (e.g. detecting plugged impulse lines and fluid composition change).

Wireless Self-Organizing Networks (3051SFC with Measurement Type D only)

Output

WirelessHART, 2.4 GHz DSSS.
Wireless, 2.4 GHz DSSS or 900 MHz FHSS.

Local Display (WirelessHART only)

The optional five-digit LCD can display user-selectable information such as primary variable in engineering units, percent of range, sensor module temperature, and electronics temperature. Display updates at up to once per minute.

Local Display

The optional five-digit LCD can display primary variable in engineering units. Display updates at update rate up to once per minute.

Update Rate

WirelessHART, user selectable 8 sec. to 60 min.
Wireless, user selectable 15 sec. to 60 min.

Power Module (WirelessHART only)

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with polybutadine terephthalate (PBT) enclosure. Ten-year life at one minute update rate.(1)

(1) Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.
NOTE: Continuous exposure to ambient temperature limits of -40 °F or 185 °F (-40 °C or 85 °C) may reduce specified life by less than 20 percent.

Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with polybutadine terephthalate (PBT) enclosure. Five-year life at one minute update rate, ten-year life at ten minute update rate.(1)

(1) Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.
NOTE: Continuous exposure to ambient temperature limits of -40 °F or 185 °F (-40 °C or 85 °C) may reduce specified life by less than 20 percent.

Differential Pressure Limits

Maximum differential pressure (DP) up to 800 inH_2O.

Pressure Limits(1)

Direct Mount Electronics

- Pressure retention per ANSI B16.5 600# or DIN PN

(1) Static pressure selection may affect pressure limitations.

Static Pressure Limit

3051SFC with Measurement Types 3, 4, 7, and D

Operates within specifications between static line pressures of 0.5 psia and 3626 psig;

4500 psig (310,3 bar) for option code P9

6092 psig (420 bar) for option code P0 (Classic only)

Range 1: 0.5 psia to 2000 psig (0,03 to 137,90 bar)

3051SFC with Measurement Types 1, 2, 5, and 6

Operates within 0.5 psia (0,03 bar) and the values in the table below:

Static Pressure	Differential Pressure		
	Range 1	Range 2	Range 3
Range D, J GP/AP	800 psi (57,91 bar)	800 psi (57,91 bar)	800 psi (57,91 bar)
Range E, K GP/AP	2000 psi (137,9 bar)	3626 psi (250 bar)	3626 psi (250 bar)

Burst Pressure Limits

Coplanar or traditional process flange

10000 psig (689,5 bar).

Overpressure Limits

Transmitters withstand the following limits without damage:

3051SFC with Measurement Types 3, 4, 7, and D

Range 1: 2000 psig (137,9 bar)
Ranges 2–3: 3626 psig (250,0 bar)

3051SFC with Measurement Types 1, 2, 5, and 6

Static Pressure	Differential Pressure		
	Range 1	Range 2	Range 3
Range D, J GP/AP	1600 psi (110,3 bar)	1600 psi (110,3 bar)	1600 psi (110,3 bar)
Range E, K GP/AP	2000 psi (137,9 bar)	3626 psi (250 bar)	3626 psi (250 bar)

Flowmeter Overpressure Limits(1)

Standard(1)	Type	Carbon Steel Rating	Stainless Steel Rating
ANSI/ASME	Class 150	285 (20)	275 (19)
ANSI/ASME	Class 300	740 (51)	720 (50)
ANSI/ASME	Class 600	1480 (102)	1440 (99)
At 100 °F (38 °C), the rating decreases with increasing temperature.			
DIN	PN 10/40	580 (40)	580 (40)
DIN	PN 10/16	232 (16)	232 (16)
DIN	PN 25/40	580 (40)	580 (40)
At 248 °F (120 °C), the rating decreases with increasing temperature.			

(1) Carbon Steel and Stainless Steel Ratings are measured in psig (bar).

Process Temperature Limits

Direct Mount Transmitter

- -40 to 450 °F (-40 to 232 °C)
- Up to 400 °F (204 °C) when top mounted in steam service

Remote Mount Transmitter

- -148 to 850 °F (-100 to 454 °C) – Stainless Steel

Transmitter Temperature Limits

Ambient
–40 to 185 °F (–40 to 85 °C)
With LCD display(1): –40 to 175 °F (–40 to 80 °C)
With option code P0: –4 to 185 °F (–20 to 85 °C)
With Inert Fill(2): 0 to 185 °F (-17 to 85 °C)

(1) LCD display may not be readable and LCD updates will be slower at temperatures below -4 °F (-20 °C).

(2) Inert fill temperature limits only apply to 3051SFC with Measurement Types 1, 2, 5, and 6.

Storage
–50 to 230 °F (–46 to 110 °C)
With LCD display: –40 to 185 °F (–40 to 85 °C)
With wireless output (code X): –40 to 185 °F (–40 to 85 °C)
With Inert Fill(1): 0 to 185 °F (-17 to 85 °C)

(1) Inert fill temperature limits only apply to 3051SFC with Measurement Types 1, 2, 5, and 6.

Vibration Limits

Qualified per IEC61298-3 (1998) for field with high vibration level or pipeline with high vibration level (10-60Hz 0.21 mm displacement peak amplitude / 60 - 2000Hz 3g).

The weight and length of the transmitter assembly shall not exceed 5.8 lbs and 7.75-in.

Humidity Limits

- 0–100% relative humidity

Turn-On Time

Performance within specifications less than 5 seconds for 3051SFC with Measurement Types 1-7 and 2 seconds for 3051SFC with Measurement Type D (typical) after power is applied to the transmitter.

Damping

Analog output response to a step change is user-selectable from 0 to 60 seconds for one time constant. For 3051SFC with measurement types 1-7, differential pressure (DP), static pressure (AP/GP), process temperature (PT), Mass Flow, and Energy Flow can be individually adjusted. This software damping is in addition to sensor module response time.

Failure Mode Alarm

HART 4-20mA (output option code A)

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven offscale to alert the user. Rosemount standard (default), NAMUR, and custom alarm levels are available (see Table 5).

High or low alarm signal is software-selectable or hardware-selectable via the optional switch (option D1).

TABLE 5. Alarm Configuration

	High Alarm	Low Alarm
Default	≥ 21.75 mA	≤ 3.75 mA
NAMUR compliant(1)	≥ 22.5 mA	≤ 3.6 mA
Custom levels(2)(3)	20.2 - 23.0 mA	3.6 - 3.8 mA

(1) Analog output levels are compliant with NAMUR recommendation NE 43, see option codes C4 or C5.

(2) Low alarm must be 0.1 mA less than low saturation and high alarm must be 0.1 mA greater than high saturation.

(3) Not available with the SIS Safety Transmitter (option QT).

Safety-Certified Transmitter Failure Values (3051SFC with Measurement Type D Only)

Safety accuracy: 2.0%(1)

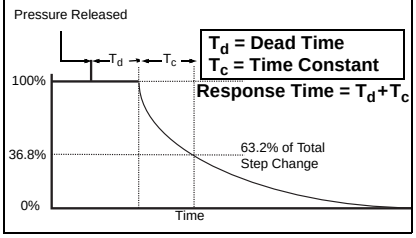
Safety response time: 1.5 seconds

(1) A 2% variation of the transmitter mA output is allowed before a safety trip. Trip values in the DCS or safety logic solver should be derated by 2%.

Dynamic Performance[1]

	4 - 20 mA (HART)[2]	Fieldbus protocol[3][4]	Typical Transmitter Response Time
Total Response Time (Td + Tc)[5]			
3051SFC with Measurement Types 1-7:			
DP Range 1:	310 milliseconds		
DP Range 2:	170 milliseconds		
DP Range 3:	155 milliseconds		
AP & GP:	240 milliseconds		
Type D[6]:			
DP Ranges 2-3:	100 milliseconds	152 milliseconds	
DP Range 1:	255 milliseconds	307 milliseconds	
Dead Time (Td)			
3051SFC with Measurement Types 1-7:			
DP:	100 milliseconds		
AP & GP:	140 milliseconds		
Type D[7]:			
DP:	45 milliseconds (nominal)	97 milliseconds	
Types 1, 3, 5, and 7 only:			
Process Temp RTD Interface:	1 second		
Update Rate			
3051SFC with Measurement Types 1-7:			
DP:	22 times per second		
Type D:			
DP:	22 times per second	22 times per second	
Types 1, 2, 5, and 6 only:			
AP & GP:	11 times per second		
Types 1, 3, 5, and 7 only:			
Process Temp RTD Interface:	1 time per second		
Types 1-4 Calculated Variables:			
Mass or Volumetric Flow Rate:	22 times per second		
Energy Flow Rate:	22 times per second		
Totalized Flow:	1 time per second		

Transmitter Output vs. Time



(1) Does not apply to wireless output code X. See "Wireless Self-Organizing Networks (3051SFC with Measurement Type D only)" on page 6 for wireless transmit rate.

(2) Dead time and update rate apply to all models and ranges; analog output only

(3) Transmitter fieldbus output only, segment macro-cycle not included.

(4) FOUNDATION fieldbus not applicable with 3051SFC with Measurement Types 1-7.

(5) Nominal total response time at 75 °F (24 °C) reference conditions.

(6) For option code DA1, add 45 milliseconds (nominal) to 4-20 mA (HART) total response time values.

(7) For option code DA1, dead time (Td) is 90 milliseconds (nominal).

Physical

Temperature Measurement

Integral RTD

- 100 Ohm platinum RTD temperature sensor assembly (316 SST Mineral Insulated Cable) with 1/4-in. NPT connection to wafer side and 1/2-in. NPT connection to transmitter RTD sensor is separated from process fluid by 1/16-in. and is pressure retaining rated for ANSI 600#. Complies with IEC-751 Class B accuracy. Meets Intrinsic Safety certification, see “Specifications” on page 39.

Remote RTD

- 100 Ohm platinum with 1/2-in. NPT nipple and union (078 series with Rosemount 644 housing)
  Model 0078D21N00A025T32Ex
  Connection Head: 00644-4410-0011
- Standard RTD cable is shielded armored cable, length is 12 feet (3.66 m)

Thermowell with Remote RTD

- 1/2-in. x 1/2-in. NPT, 316 SST

Electronic Connections for Remote Mount

1/2–14 NPT, G1/2, and M20 × 1.5 (CM20) conduit. HART interface connections fixed to terminal block for output code A

Material of Construction

Body/Plate

- 316 SST
- 50 micro-inch Ra surface finish

Manifold Head/Valves

- 316 SST

Flange Studs and Nuts

- Customer supplied
- Available as a spare part

Transmitter Connection Studs and Nuts

- Studs– A193 Grade B8M.
- Nuts– A194 Grade 8M.

Gasket and O-rings

- Gaskets are customer supplied.
- Durlon 8500 fiber gaskets are recommended. Consult an Emerson Process Management representative for use with other gaskets.
- Available as a spare part

NOTE
Gaskets and O-rings must be replaced when the 405 is disassembled.

Process-Wetted Parts

Integral Manifolds / Remote Manifolds

316 SST

Process Isolating Diaphragms

316L SST (UNS S31603)
Alloy C-276 (UNS N10276)

Drain/Vent Valves

316 SST, Alloy C-276, or Alloy 400/K-500 material
(Drain vent seat: Alloy 400, Drain vent stem: Alloy K-500)

Process Flanges and Adapters

Plated carbon steel
SST: CF-8M (Cast 316 SST) per ASTM A743
Cast C-276: CW-12MW per ASTM A494
Cast Alloy 400: M-30C per ASTM A494

Wetted O-rings

Glass-filled PTFE
(Graphite-filled PTFE with Isolating Diaphragm code 6)

Non-Wetted Parts

Electronics Housing

Low-copper aluminum alloy or SST: CF-3M (Cast 316L SST) or CF-8M (Cast 316 SST) NEMA 4X, IP 66,
IP 68 (66 ft (20 m) for 168 hours)
Note: IP 68 not available with Wireless Output

Coplanar Sensor Module Housing

SST: CF-3M (Cast 316L SST)

Sensor Module Fill Fluid

Silicone or inert halocarbon (Inert is not available with 3051S_CA). In-Line series uses Fluorinert® FC-43.

Sensor mounting (including nuts, bolts, and gasket)

SST

Bolts

CS

Paint

Polyurethane

Cover O-rings

Buna-N

Wireless Antenna

PBT/ polycarbonate (PC) integrated omnidirectional antenna

Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with PBT enclosure

Transmitter Connections

Remote Mount

- Available with 1/4-in. (standard) or 1/2-in. (option code E) connections

Orifice Type

- Square edged
- Corner tapped
- Concentric
- Wafer-style

Process Connections

Mounts between the following flange configurations:

ASME B16.5 (ANSI)	DIN	JIS
Class 150	PN16 (option code G)	10k (option code B)
Class 300	PN40 (option code H)	20k (option code R)
Class 600	PN100 (option code H)	40k (option code S)

ANSI alignment ring is included as standard when ordering.

Typical Orifice Hole Sizes (For 3051SFC_C)

Beta is calculated by: (β) = d_C / Pipe ID, where the calculated bore is equal to 2 x typical orifice hole size (d_C = 2d). The table below shows the diameter of each of the four typical orifice holes.

TABLE 6. β = 0.4[(1)(2)]

Line Size	3051SFC_C	3051SFC_P
1/2-in. (15 mm)	Not Available	0.249 (6.325)
1-in. (25 mm)	Not Available	0.420 (10.668)
1 1/2-in. (40 mm)	Not Available	0.644 (16.358)
2-in. (50 mm)	0.413 (10.490)	0.827 (21.006)
3-in. (80 mm)	0.614 (15.596)	1.227 (31.166)
4-in. (100 mm)	0.805 (20.447)	1.610 (40.894)
6-in. (150 mm)	1.213 (30.810)	2.426 (61.620)
8-in. (200 mm)	1.596 (40.538)	3.192 (81.077)
10-in. (250 mm)	2.004 (50.902)	4.008 (101.80)
12-in. (300 mm)	2.400 (60.960)	4.800 (121.92)

(1) Measurement is in inches (millimeters).

(2) Tolerance = ±0.002-in.

TABLE 7. β = 0.65[(1)(2)]

Line Size	3051SFC_C	3051SFC_P
1/2-in. (15 mm)	Not Available	0.404 (10.262)
1-in. (25 mm)	Not Available	0.682 (17.323)
1 1/2-in. (40 mm)	Not Available	1.047 (26.594)
2-in. (50 mm)	0.620 (15.748)[(3)]	1.344 (34.138)
3-in. (80 mm)	0.997 (25.324)	1.994 (50.648)
4-in. (100 mm)	1.308 (33.223)	2.617 (66.472)
6-in. (150 mm)	1.971 (50.063)	3.942 (100.127)
8-in. (200 mm)	2.594 (65.888)	5.188 (131.775)
10-in. (250 mm)	3.257 (82.728)	6.513 (165.43)
12-in. (300 mm)	3.900 (99.060)	7.800 (198.120)

(1) Measurement is in inches (millimeters).

(2) Tolerance = ±0.002-in.

(3) Beta (β) = 0.60-in. (15.24 mm) for 2-in. line size only.

Weight

Line Size	Direct Mount (D3)[(1)]	Remote Mount (R3)[(1)]
1/2-in. (15 mm)	11.20 (5.08)	8.0 (3.63)
1-in. (25 mm)	11.70 (5.31)	8.5 (3.86)
1 1/2-in. (40 mm)	12.45 (5.65)	9.25 (4.20)
2-in. (50 mm)	13.20 (5.99)	10.0 (4.54)
3-in. (80 mm)	13.95 (6.32)	11.75 (5.33)
4-in. (100 mm)	14.95 (6.78)	13.5 (6.12)
6-in. (150 mm)	20.45 (9.28)	17.25 (7.83)
8-in. (200 mm)	24.95 (11.32)	21.75 (9.87)
10-in. (250 mm)	30.70 (13.92)	27.50 (13.58)
12-in. (300 mm)	36.70 (16.64)	33.50 (16.54)

(1) Measurement in lb (kg).

Installation Considerations

Straight Run Requirements

TABLE 8. 3051SFC_C Straight Pipe Requirements[(1)]

	Beta	0.40	0.65
Upstream (inlet) side of primary	Reducer (1 line size)	2	2
	Single 90° bend or tee	2	2
	Two or more 90 ° bends in the same plane	2	2
	Two or more 90° bends in different plane	2	2
	Up to 10° of swirl	2	2
	Butterfly valve (75% to 100% open)	2	N/A
Downstream (outlet) side of primary		2	2

TABLE 9. 3051SFC_P Straight Pipe Requirements[(1)(2)(3)]

	Beta	0.40	0.65
Upstream (inlet) side of primary	Reducer (1 line size)	5	12
	Single 90° bend or tee	16	44
	Two or more 90 ° bends in the same plane	10	44
	Two or more 90° bends in different plane	50	60
	Expander	12	28
	Ball / Gate valve fully open	12	18
Downstream (outlet) side of primary		6	7

(1) Consult an Emerson Process Management representative if disturbance is not listed.

(2) Recommended lengths represented in pipe diameters per ISO 5167.

(3) Refer to ISO 5167 for recommended lengths when using flow straighteners.

Pipe Orientation

Pipe orientation for both 3051SFC_C Compact Conditioning and standard 3051SFC_P Compact Orifice.

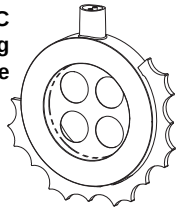
	Process[1]		
Orientation/ Flow Direction	**Gas**	**Liquid**	**Steam**
Horizontal	D/R	D/R	D/R
Vertical Up	R	D/R	R
Vertical Down	D/R	NR	NR

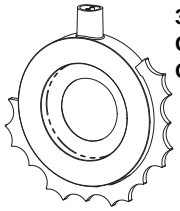
(1) D = Direct mount acceptable (recommended)
R = Remote mount acceptable
NR = Not recommended

Pipe Centering

Improper centering of any orifice type device can cause an error of up to ±5% in small line sizes. A centering mechanism (centering ring) independent of flange rating comes standard with the 405 Compact Orifice Series.

3051SFC_C Conditioning Orifice



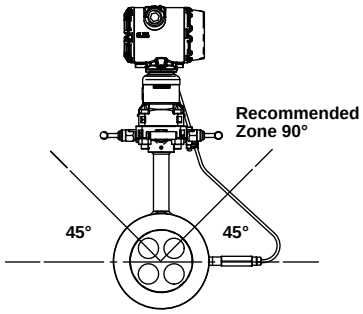


3051SFC_P Compact Orifice

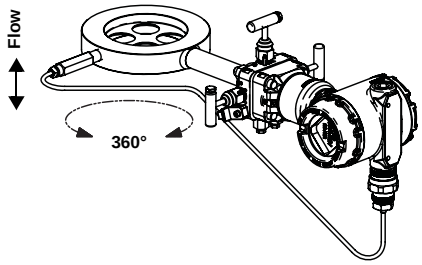
Flowmeter Orientation

Flowmeter orientation for both 3051SFC Conditioning Compact Orifice and Standard Compact Orifice.

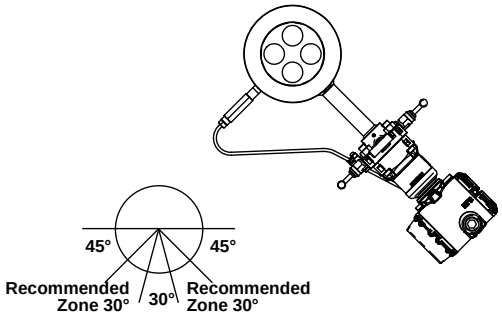
Gas (Horizontal)



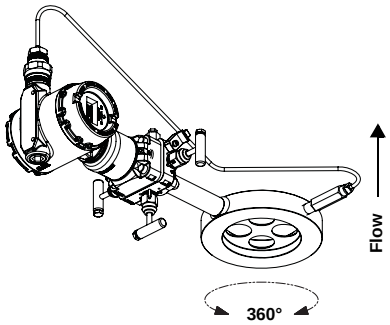
Gas (Vertical)



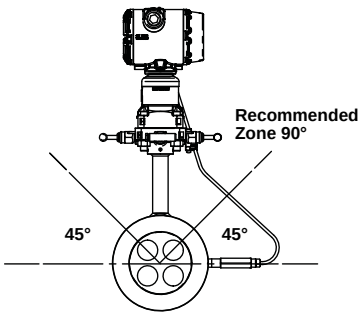
Liquid and Steam (Horizontal)



Steam (Vertical)



Top Mounting for Steam (Horizontal)



Rosemount 3051SFC with Measurement Types 1-7 Certifications

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota USA

Emerson Process Management GmbH & Co. — Wessling, Germany

Emerson Process Management Asia Pacific Private Limited — Singapore

Beijing Rosemount Far East Instrument Co., LTD — Beijing, China

Ordinary Location Certification for FM

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found at www.rosemount.com. A hard copy may be obtained by contacting an Emerson Process Management representative.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

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

Models with Differential Pressure Ranges = 2 to 5 inclusive with Static Pressure = Range 4 only. P9 and P0 options also.
All other Model 3051SMV Pressure Transmitters
— Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold — Sound Engineering Practice

Primary Elements, Flowmeter
— See appropriate Primary Element QIG

Electro Magnetic Compatibility (EMC) (2004/108/EC)

EN 61326-1:2006 and EN 61326-2-3:2006

Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion-proof for Class I, Division 1, Groups B, C, and D; dust-ignition proof for Class II and Class III, Division 1, Groups E, F, and G; hazardous locations; enclosure Type 4X, conduit seal not required.

I5 Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1; Class I, Zone 0 AEx ia IIC when connected in accordance with Rosemount drawing 03151-1206; Non-incendive for Class I, Division 2, Groups A, B, C, and D Enclosure Type 4X
For entity parameters see control drawing 03151-1206.

Canadian Standards Association (CSA)

All CSA hazardous approved transmitters are certified per ANSI/ISA 12.27.01-2003.

E6 Explosion-proof for Class I, Division 1, Groups B, C, and D; Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G; suitable for Class I, Division 2, Groups A, B, C, and D, CSA Enclosure Type 4X; conduit seal not required. Dual Seal.

I6 Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03151-1207; Dual Seal.
For entity parameters see control drawing 03151-1207.

European Certifications

I1 ATEX Intrinsic Safety
Certificate No.: Baseefa 08ATEX0064X ⟨Ex⟩ II 1G
Ex ia IIC T4 (T_a = -60 °C to 70 °C) -HART
CE 1180

Input Parameters

Loop / Power	Groups
U_i = 30 V	HART
I_i = 300 mA	HART
P_i = 1.0 W	HART
C_i = 14.8 nF	HART
L_i = 0	HART

Special conditions for safe use (x)

The apparatus is not capable of withstanding the 500V test as defined in Clause 6.3.12 of EN 60079-11. This must be considered during installation.

N1 ATEX Type n
Certificate No.: Baseefa 08ATEX0065X ⟨Ex⟩ II 3 G
Ex nA nL IIC T4 (T_a = -40 °C TO 70 °C)
Ui = 45 Vdc max
IP66
CE

Special conditions for safe use (x)

The apparatus is not capable of withstanding the 500V insulation test required by Clause 6.8.1 of EN 60079-15. This must be taken into account when installing the apparatus.

ND ATEX Dust
Certificate No.: BAS01ATEX1303X ⟨Ex⟩ II 1 D
Ex tD A20 T105°C (-20 °C ≤ T_{amb} ≤ 85 °C)
V_{max} = 42.4 volts max
A = 24 mA
IP66
CE 1180

Special conditions for safe use (x)

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
3. Cable entries and blanking plugs must be suitable for the ambient range of the apparatus and capable of withstanding a 7J impact test.
4. The 3051SMV must be securely screwed in place to maintain the ingress protection of the enclosure. (The 3051SMV SuperModule must be properly assembled to the 3051SMV housing to maintain ingress protection.)

E1 ATEX Flameproof
Certificate No.: KEMA 00ATEX2143X ⟨Ex⟩ II 1/2 G
Ex d IIC T6 (-50 °C ≤ T_{amb} ≤ 65 °C)
Ex d IIC T5 (-50 °C ≤ T_{amb} ≤ 80 °C)
V_{max} = 42.4V
CE 1180

Special conditions for safe use (x)

1. Appropriate ex d blanking plugs, cable glands, and wiring needs to be suitable for a temperature of 90 °C.
2. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
3. The 3051SMV does not comply with the requirements of IEC 60079-1 Clause 5.2, Table 2 for all joints. Contact Emerson Process Management for information on the dimensions of flameproof joints.

Japanese Certifications

E4 TIIS Flameproof
Consult factory for availability

I4 TIIS Intrinsically Safe
Consult factory for availability

China (NEPSI) Certifications

E3 China Flameproof
Certificate Number: GYJ091001
Ex d IIC T5/T6

I3 China Intrinsic Safety
Certificate Number: GYJ091002X
Ex ia T4

IECEx Certifications

I7 IECEx Intrinsic Safety
Certificate No.: IECExBAS08.0025X
Ex ia IIC T4 (T_a = -60 °C to 70 °C) -HART
IP66

Input Parameters

Loop / Power	Groups
U_i = 30 V	HART
I_i = 300 mA	HART
P_i = 1.0 W	HART
C_i = 14.8 nF	HART
L_i = 0	HART

Special conditions for safe use (x)

The 3051SMV HART 4-20mA is not capable of withstanding the 500V test as defined in clause 6.3.12 of IEC 60079-11. This must be taken into account during installation.

N7 IECEx Type n
Certificate No.: IECExBAS08.0026X
Ex nA nL IIC T4 (Ta = -40 °C to 70 °C)
Ui = 45 Vdc MAX
IP66

Special conditions for safe use (x)

The apparatus is not capable of withstanding the 500 V insulation test required by Clause 6.8.1 of IEC 60079-15.

E7 IECEx Flameproof
Certificate No.: IECExKEM08.0010X
Ex d IIC T6 (-50 °C ≤ T_{amb} ≤ 65 °C)
Ex d IIC T5 (-50 °C ≤ T_{amb} ≤ 80 °C)
V_{max} = 42.4V

Special conditions for safe use (x)

1. Appropriate ex d blanking plugs, cable glands, and wiring needs to be suitable for a temperature of 90 °C.
2. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
3. The 3051SMV does not comply with the requirements of IEC 60079-1 Clause 5.2, Table 2 for all joints. Contact Emerson Process Management for information on the dimensions of flameproof joints.

IECEx Dust Ignition Proof
Certificate No. IECExBAS09.0014X
Ex tD A20 T105°C (-20 °C ≤ T_{amb} ≤ 85 °C)
Vmax = 42.4 V
A=22mA
IP66

Special conditions for safe use (x)

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosures to at least IP66.
3. Cable entries and blanking plugs must be suitable for the ambient temperature range of the apparatus and capable of withstanding a 7J impact test.
4. The 3051S must be securely screwed in place to maintain the ingress protection of the enclosure. (The 3051S SuperModule must be properly assembled to the 3051S housing to maintain ingress protection.)

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

K1 Combination of E1, I1, N1, and ND

K2 Combination of E2 and I2

K4 Combination of E4 and I4

K5 Combination of E5 and I5

K6 Combination of E6 and I6

K7 Combination of E7, I7, and N7

KA Combination of E1, E6, I1, and I6

KB Combination of E5, E6, I5, and I6

KC Combination of E5, E1, I5 and I1

KD Combination of E5, E6, E1, I5, I6, and I1

Rosemount 3051SFC with Measurement Type D Certifications

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota USA

Emerson Process Management GmbH & Co. — Wessling, Germany

Emerson Process Management Asia Pacific Private Limited — Singapore

Beijing Rosemount Far East Instrument Co., LTD — Beijing, China

Emerson Process Management LTDA — Sorocaba, Brazil

Emerson Process Management (India) Pvt. Ltd. — Daman, India

Ordinary Location Certification for FM

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found at www.rosemount.com. A hard copy may be obtained by contacting an Emerson Process Management representative.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

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

Models 3051S_CA4; 3051S_CD2, 3, 4, 5; *(also with P9 option)*
Pressure Transmitters — QS Certificate of Assessment - EC No. PED-H-100, Module H Conformity Assessment

All other Model 3051S Pressure Transmitters — Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold — Sound Engineering Practice

Primary Elements, Flowmeter — See appropriate Primary Element QIG

Electro Magnetic Compatibility (EMC) (2004/108/EC)

EN 61326-1:1997 + A1, A2, and A3 – Industrial

Radio and Telecommunications Terminal Equipment Directive (R&TTE)(1999/5/EC)

Emerson Process Management complies with the R&TTE Directive.

HART & FOUNDATION Fieldbus Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion-proof for Class I, Division 1, Groups B, C, and D; Dust Ignition-proof for Class II and Class III, Division 1, Groups E, F, and G; hazardous locations; enclosure Type 4X, conduit seal not required when installed according to Rosemount drawing 03151-1003.

I5/IE Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1; Class I, Zone 0 AEx ia IIC when connected in accordance with Rosemount drawing 03151-1006;
Non-Incendive for Class I, Division 2, Groups A, B, C, and D
Enclosure Type 4X
For entity parameters see control drawing 03151-1006.

Canadian Standards Association (CSA)

All CSA hazardous approved transmitters are certified per ANSI/ISA 12.27.01-2003.

E6 Explosion-proof for Class I, Division 1, Groups B, C, and D; Dust Ignition-proof for Class II and Class III, Division 1, Groups E, F, and G; suitable for Class I, Division 2, Groups A, B, C, and D, when installed per Rosemount drawing 03151-1013, CSA Enclosure Type 4X; conduit seal not required. Dual Seal.

I6/IF Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03151-1016; Dual Seal.
For entity parameters see control drawing 03151-1016.

European Certifications

I1/IA ATEX Intrinsic Safety
Certificate No.: BAS01ATEX1303X ⟨Ex⟩ II 1G
Ex ia IIC T4 (T_a = -60 °C to 70 °C) -HART/Remote Display/Quick Connect/HART Diagnostics
Ex ia IIC T4 (T_a = -60 °C to 70 °C) -FOUNDATION fieldbus
Ex ia IIC T4 (T_a = -60 °C to 40 °C) -FISCO
CE 1180

Input Parameters

Loop / Power	Groups
U_i = 30 V	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
U_i = 17.5 V	FISCO
I_i = 300 mA	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
I_i = 380 mA	FISCO
P_i = 1.0 W	HART / Remote Display / Quick Connect / HART Diagnostics
P_i = 1.3 W	FOUNDATION fieldbus
P_i = 5.32 W	FISCO
C_i = 30 nF	SuperModule Platform / Quick Connect
C_i = 11.4 nF	HART / HART Diagnostics
C_i = 0	FOUNDATION fieldbus / Remote Display / FISCO
L_i = 0	HART / FOUNDATION fieldbus/ FISCO / Quick Connect / HART Diagnostics
L_i = 60 µH	Remote Display

Special conditions for safe use (x)

1. The apparatus, excluding the Types 3051 S-T and 3051 S-C (In-line and Coplanar SuperModule Platforms respectively), is not capable of withstanding the 500V test as defined in Clause 6.3.12 of EN 6079-11. This must be considered during installation.
2. The terminal pins of the Types 3051 S-T and 3051 S-C must be protected to IP20 minimum.

N1 ATEX Type n
Certificate No.: BAS01ATEX3304X ⟨Ex⟩ II 3 G
Ex nL IIC T5 (T_a = -40 °C TO 70 °C)
Ui = 45 Vdc max
IP66
CE

Special conditions for safe use (x)
The apparatus is not capable of withstanding the 500V insulation test required by Clause 6.8.1 of EN 60079-15. This must be taken into account when installing the apparatus.

ND ATEX Dust
Certificate No.: BAS01ATEX1374X ⟨Ex⟩ II 1 D
Ex tD A20 T105°C (-20 °C ≤ T_{amb} ≤ 85 °C)
V_{max} = 42.4 volts max
A = 22 mA
IP66
CE 1180

Special conditions for safe use (x)

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
3. Cable entries and blanking plugs must be suitable for the ambient range of the apparatus and capable of withstanding a 7J impact test.
4. The 3051S must be securely screwed in place to maintain the ingress protection of the enclosure. (The 3051S SuperModule must be properly assembled to the 3051S housing to maintain ingress protection.)

E1 ATEX Flameproof
Certificate No.: KEMA00ATEX2143X ⟨Ex⟩ II 1/2 G
Ex d IIC T6 (-50 °C ≤ T_{amb} ≤ 65 °C)
Ex d IIC T5 (-50 °C ≤ T_{amb} ≤ 80 °C)
V_{max} = 42.4V
CE 1180

Special conditions for safe use (x)

1. Appropriate ex d blanking plugs, cable glands, and wiring needs to be suitable for a temperature of 90 °C.
2. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
3. The 3051S does not comply with the requirements of EN 60079-1 Clause 5.2, Table 2 for all joints. Contact Emerson Process Management for information on the dimensions of flameproof joints.

Japanese Certifications

E4 TIIS Flameproof
Ex d IIC T6

Certificate	Description
TC15682	Coplanar with Junction Box Housing
TC15683	Coplanar with PlantWeb Housing
TC15684	Coplanar with PlantWeb Housing and LCD Display
TC15685	In-Line SST with Junction Box Housing
TC15686	In-Line Alloy C-276 with Junction Box Housing
TC15687	In-Line SST with PlantWeb Housing
TC15688	In-Line Alloy C-276 with PlantWeb Housing
TC15689	In-Line SST with PlantWeb Housing and LCD Display
TC15690	In-Line Alloy C-276 with PlantWeb Housing and LCD Display
TC17102	Remote Display

China (NEPSI) Certifications

I3 China Intrinsic Safety
Certificate No. (manufactured in Chanhassen, MN): GYJ081078
Certificate No. (manufactured in Singapore): GYJ06367
Ex ia IIC T4

Input Parameters

Loop / Power	Groups
U_i = 30 V	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
U_i = 17.5 V	FISCO
I_i = 300 mA	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
I_i = 380 mA	FISCO
P_i = 1.0 W	HART / Remote Display / Quick Connect / HART Diagnostics
P_i = 1.3 W	FOUNDATION fieldbus
P_i = 5.32 W	FISCO
C_i = 30 nF	SuperModule Platform / Quick Connect
C_i = 11.4 nF	HART / HART Diagnostics
C_i = 0	FOUNDATION fieldbus / Remote Display / FISCO
L_i = 0	HART / FOUNDATION fieldbus/ FISCO / Quick Connect / HART Diagnostics
L_i = 60 µH	Remote Display

E3 China Flameproof
Certificate No. (manufactured in China): GYJ06366
Certificate No. (manufactured in Singapore): GYJ06364
Certificate No. (manufactured in Chanhassen, MN): GYJ091035
Ex d IIB+H_2 T3~T5
DIP A21 Ta T3~T5 IP66

IECEx Certifications

E7 IECEx Flameproof
Certificate No.: IECExKEM08.0010X
Ex d IIC T6 (-50 °C ≤ T_{amb} ≤ 65 °C)
Ex d IIC T5 (-50 °C ≤ T_{amb} ≤ 80 °C)
V_{max} = 42.4V

Special conditions for safe use (x)

1. Appropriate ex d blanking plugs, cable glands, and wiring needs to be suitable for a temperature of 90 °C.
2. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
3. The 3051S does not comply with the requirements of IEC 60079-1 Clause 5.2, Table 2 for all joints. Contact Emerson Process Management for information on the dimensions of flameproof joints.

IEC Ex Dust Ignition Proof
Certificate No. IECExBAS09.0014X
Ex tD A20 T105°C (-20 °C ≤ T_{amb} ≤ 85 °C)
Vmax = 42.4 V
A=22mA
IP66

Special conditions for safe use (x)

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosures to at least IP66.
3. Cable entries and blanking plugs must be suitable for the ambient temperature range of the apparatus and capable of withstanding a 7J impact test.
4. The 3051S must be securely screwed in place to maintain the ingress protection of the enclosure. (The 3051S SuperModule must be properly assembled to the 3051S housing to maintain ingress protection.)

I7/IG IECEx Intrinsic Safety
Certificate No.: IECExBAS04.0017X
Ex ia IIC T4 (T_a = -60 °C to 70 °C) -HART/Remote Display/Quick Connect/HART Diagnostics
Ex ia IIC T4 (T_a = -60 °C to 70 °C) -FOUNDATION fieldbus
Ex ia IIC T4 (T_a = -60 °C to 40 °C) -FISCO
IP66

Input Parameters

Loop / Power	Groups
U_i = 30 V	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
U_i = 17.5 V	FISCO
I_i = 300 mA	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
I_i = 380 mA	FISCO
P_i = 1.0 W	HART / Remote Display / Quick Connect / HART Diagnostics
P_i = 1.3 W	FOUNDATION fieldbus
P_i = 5.32 W	FISCO
C_i = 30 nF	SuperModule Platform / Quick Connect
C_i = 11.4 nF	HART / HART Diagnostics
C_i = 0	FOUNDATION fieldbus / Remote Display / FISCO / Quick Connect / HART Diagnostics
L_i = 0	HART / FOUNDATION fieldbus / FISCO / Quick Connect / HART Diagnostics
L_i = 60 µH	Remote Display

Special conditions for safe use (x)

1. The Models 3051S HART 4-20mA, 3051S fieldbus, 3051S Profibus and 3051S FISCO are not capable of withstanding the 500V test as defined in clause 6.4.12 of IEC 60079-11. This must be taken into account during installation.
2. The terminal pins of the Types 3051S-T and 3051S-C must be protected to IP20 minimum.

N7 IECEx Type n
Certificate No.: IECExBAS04.0018X
Ex nC IIC T4 (T_a = -40 °C to 70 °C)
Ui = 45 Vdc MAX
IP66
Special conditions for safe use (x)
The apparatus is not capable of withstanding the 500 V insulation test required by Clause 8 of IEC 60079-15.

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

K1 Combination of E1, I1, N1, and ND
K2 Combination of E2 and I2
K5 Combination of E5 and I5
K6 Combination of E6 and I6
K7 Combination of E7, I7, and N7
KA Combination of E1, I1, E6, and I6
KB Combination of E5, I5, I6 and E6
KC Combination of E5, E1, I5 and I1
KD Combination of E5, I5, E6, I6, E1, and I1

Rosemount 3051SFC Wireless Certifications

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota USA
Emerson Process Management GmbH & Co. — Wessling, Germany
Emerson Process Management Asia Pacific Private Limited — Singapore
Beijing Rosemount Far East Instrument Co., LTD — Beijing, China
Emerson Process Management LTDA — Sorocaba, Brazil
Emerson Process Management (India) Pvt. Ltd. — Daman, India

Telecommunication Compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

FCC and IC Approvals

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference this device and must accept any interference received, including interference that may cause undesired operation.

This device must be installed to ensure a minimum antenna separation distance of 20cm from all persons.

Ordinary Location Certification for FM

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found at www.rosemount.com. A hard copy may be obtained by contacting an Emerson Process Management representative.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

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

Models 3051S_CA4; 3051S_CD2, 3, 4, 5; *(also with P9 option)*
Pressure Transmitters — QS Certificate of Assessment - EC No. PED-H-100, Module H Conformity Assessment

All other Model 3051S Pressure Transmitters — Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold — Sound Engineering Practice

Primary Elements, Flowmeter — See appropriate Primary Element QIG

Electro Magnetic Compatibility (EMC) (2004/108/EC)

EN 61326-1:1997 A1, A2, A3(1)
EN 61326-1:2006
EN 61326-2-3:2006

(1) Only applies to "Operating Frequency and Protocol" option code 1.

Radio and Telecommunications Terminal Equipment Directive (R&TTE)(1999/5/EC)

Emerson Process Management complies with the R&TTE Directive.

Hazardous Locations Certifications

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsically Safe, Non-Incendive, and Dust Ignition-proof.
Intrinsically Safe for Class I/II/III, Division 1, Groups A, B, C, D, E, F, and G.
Zone Marking: Class I, Zone 0, AEx ia IIC
Temperature Codes T4 (T_{amb} = -50 to 70° C)
Non-Incendive for Class I, Division 2, Groups A, B, C, and D.
Dust Ignition-proof for Class II/III, Division 1, Groups E, F, and G.
Ambient temperature limits: -50 to 85° C
For use with Rosemount SmartPower options 00753-9220-0001 only.
Enclosure Type 4X / IP66

CSA - Canadian Standards Association

All CSA hazardous approved transmitters are certified per ANSI/ISA 12.27.01-2003.

I6 CSA Intrinsically Safe
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D.
Temp Code T3C
Enclosure Type 4X / IP66
For use with Rosemount SmartPower options 00753-9220-0001 only.

European Certifications

I1 ATEX Intrinsic Safety
Certificate No.: BAS01ATEX1303X ⟨Ex⟩ II 1G
Ex ia IIC T4 (T_a = -60 °C to 70 °C)
IP66
For use with Rosemount SmartPower options 00753-9220-0001 only.
CE 1180

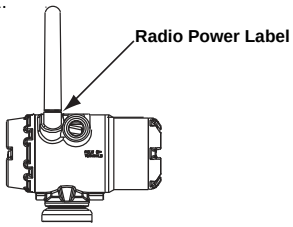
CE ①

Country[1]	Restriction
Bulgaria	General authorization required for outdoor use and public service
France	Outdoor use limited to 10mW e.i.r.p.
Italy	If used outside of own premises, general authorization is required.
Norway	May be restricted in the geographical area within a radius of 20 km from the center of Ny-Alesund.
Romania	Use on a secondary basis. Individual license required.

(1) Only applies to "Operating Frequency and Protocol" option code 1.

Radio Power Label (See Figure 1) indicates output power configuration of the radio. Devices with this label are configured for output power less than 10 mW e.i.r.p. At time of purchase the customer must specify ultimate country of installation and operation.

Figure 1.



IECEx Certifications

I7 IECEx Intrinsic Safety
Certificate No.: IECEx BAS 04.0017X
Ex ia IIC T4 (Ta = -60 °C to 70 °C)
For use with Rosemount SmartPower options 00753-9220-0001 only.
IP66

DIMENSIONAL DRAWINGS

Rosemount 3051SFC Compact Orifice Flowmeter

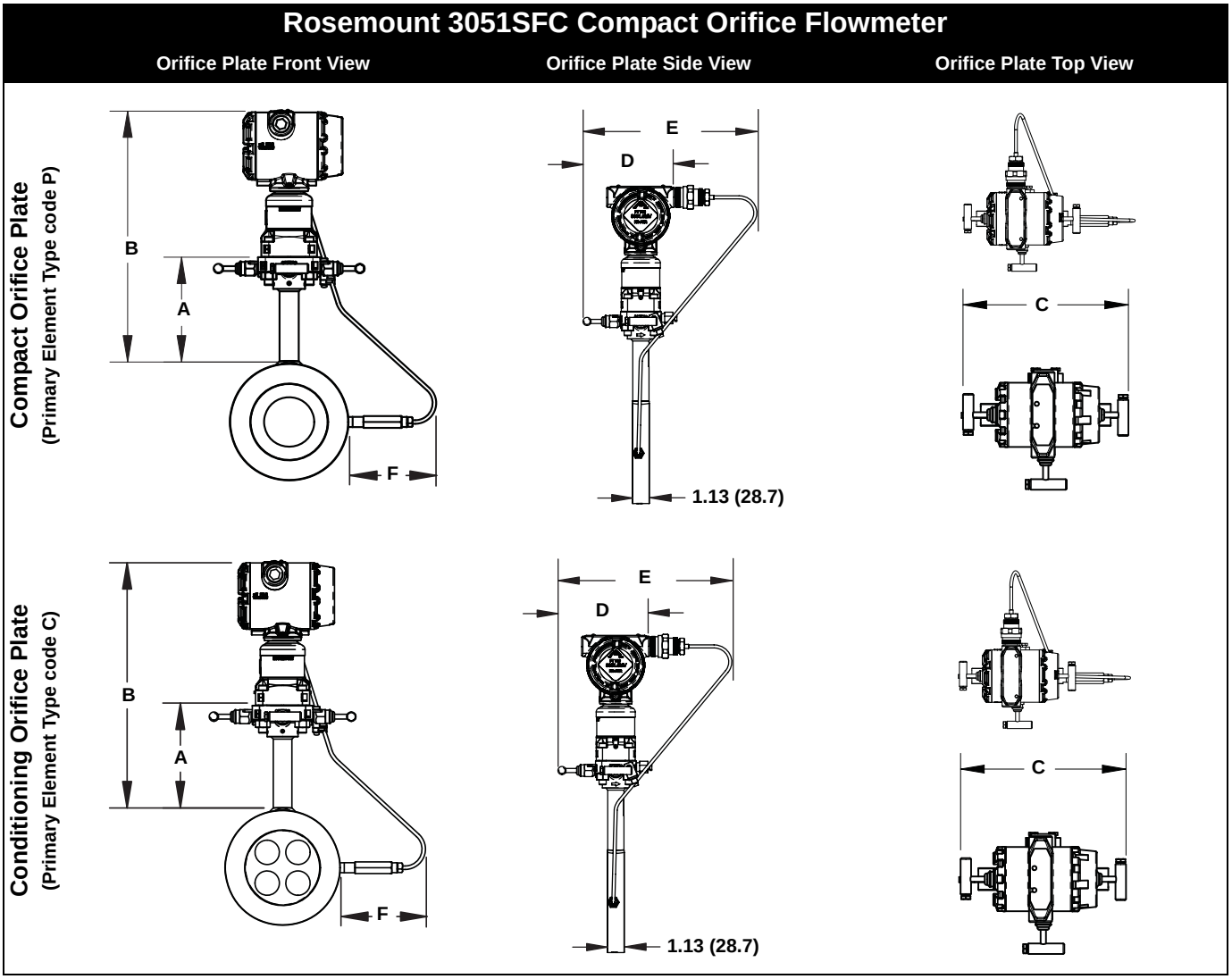


TABLE 10. Dimensional Drawings[(1)]

Primary Element Type	A	B	Transmitter Height	C	D	E	F
Type P and C	5.50 (140)	Transmitter Height + A	7.75 (197)	7.75 (197) - closed 8.25 (210) - open	6.00 (152) - closed 6.25 (159) - open	Max of 8.9 (226)	Max of 7.2 (183)

(1) Measurement in inches (millimeters).

ORDERING INFORMATION

Rosemount 3051SFC Compact Orifice Flowmeter Ordering Information

Model	Product Description
3051SFC	Compact Orifice Flowmeter
Code	**Transmitter Feature Board Measurement Type**
1	MultiVariable (Fully Compensated Mass and Energy Flow) – Differential and Static Pressures with Temperature
2	MultiVariable (Compensated Flow) – Differential and Static Pressures
3	MultiVariable (Compensated Flow) – Differential Pressure and Temperature
4	MultiVariable (Compensated Flow) – Differential Pressure
5	MultiVariable (Direct Measurement) – Differential and Static Pressures with Temperature
6	MultiVariable (Direct Measurement) – Differential and Static Pressures
7	MultiVariable (Direct Measurement) – Differential Pressure and Temperature
D	Differential Pressure
Code	**Primary Element Type**
C	Conditioning Orifice Plate
P	Orifice Plate
Code	**Material Type**
S	316 SST
Code	**Line Size**
005(1)	1/2-in. (15 mm)
010(1)	1-in. (25 mm)
015(1)	1 1/2-in. (40 mm)
020	2-in. (50 mm)
030	3-in. (80 mm)
040	4-in. (100 mm)
060	6-in. (150 mm)
080	8-in. (200 mm)
100	10-in. (250 mm)
120	12-in. (300 mm)
Code	**Primary Element Style**
N	Square Edged
Code	**Beta Ratio**
040	0.40 Beta Ratio (β)
065(2)	0.65 Beta Ratio (β)
Code	**Temperature Measurement**
R(3)	Remote Thermowell and RTD
T(3)	Integral RTD
0(4)	No Temperature Sensor
Code	**Transmitter Connection Platform**
3	Direct-mount, 3-valve Integral Manifold, SST
7	Remote-mount, 1/4-in. NPT Connections
Code	**Differential Pressure Range**
1	0 to 25 inH_2O (0 to 62,2 mbar)
2	0 to 250 inH_2O (0 to 623 mbar)
3	0 to 1000 inH_2O (0 to 2,5 bar)
Code	**Static Pressure Range**
A(5)	None
D	Absolute 0.5 to 800 psia (0,033 to 55,2 bar)
E(6)	Absolute 0.5 to 3626 psia (0,033 to 250 bar)
J	Gage -14.2 to 800 psig (-0,979 to 55,2 bar)
K(6)	Gage -14.2 to 3626 psig (-0,979 to 250 bar)

Rosemount 3051SFC Compact Orifice Flowmeter Ordering Information

Code	Output Protocol		
A	4–20 mA with digital signal based on HART protocol		
F[7][8]	FOUNDATION fieldbus protocol: AI block, Link Master, Input Selector Block (Requires PlantWeb housing)		
X[8][9]	Wireless (Requires wireless options and wireless housing 5A)		
Code	**Transmitter Housing Style**	**Material[10]**	**Conduit Entry Size**
00	None (Customer-supplied electrical connection)		
01[8][11]	Assemble to Rosemount 753R Web-based Monitoring Indicator		
1A	PlantWeb Housing	Aluminum	1/2-14 NPT
1B	PlantWeb Housing	Aluminum	M20 x 1.5 (CM20)
1C	PlantWeb Housing	Aluminum	G1/2
1J	PlantWeb Housing	SST	1/2-14 NPT
1K	PlantWeb Housing	SST	M20 x 1.5 (CM20)
1L	PlantWeb Housing	SST	G1/2
2A[8]	Junction Box Housing	Aluminum	1/2-14 NPT
2B[8]	Junction Box Housing	Aluminum	M20 x 1.5 (CM20)
2C[8]	Junction Box Housing	Aluminum	G1/2
2E[8]	Junction Box housing with output for remote display and interface	Aluminum	1/2-14 NPT
2F[8]	Junction Box housing with output for remote display and interface	Aluminum	M20 x 1.5 (CM20)
2G[8]	Junction Box housing with output for remote display and interface	Aluminum	G1/2
2J[8]	Junction Box Housing	SST	1/2-14 NPT
2M[8]	Junction Box housing with output for remote display and interface	SST	1/2-14 NPT
5A[8]	Wireless PlantWeb housing	Aluminum	M20 x 1.5 (CM20)
7J[8][12]	Quick Connect (A size Mini, 4-pin male termination)		
Code	**Transmitter Performance Class**		
3051S MultiVariable SuperModule, Measurement Types 1, 2, 5, and 6			
3	Ultra for Flow: 0.75% flow rate accuracy, 14:1 flow turndown, 10-yr stability, limited 12-yr warranty		
5	Classic MV: 1.10% flow rate accuracy, 8:1 flow turndown, 5-yr stability		
3051S Single Variable SuperModule, Measurement Types 3, 4, 7, and D			
1[13]	Ultra: 0.90% flow rate accuracy, 8:1 flow turndown, 10-yr stability, limited 12-yr warranty		
2	Classic: 1.40% flow rate accuracy, 8:1 flow turndown, 5-yr stability		
3[14]	Ultra for Flow: 0.75% flow rate accuracy, 14:1 flow turndown, 10-yr stability, limited 12-yr warranty		
Code	**Options**		
Installation Accessories			
A	ANSI Alignment Ring (150#)		
C	ANSI Alignment Ring (300#)		
D	ANSI Alignment Ring (600#)		
G	DIN Alignment Ring (PN 16)		
H	DIN Alignment Ring (PN 40)		
J	DIN Alignment Ring (PN 100)		
B	JIS Alignment Ring (10K)		
R	JIS Alignment Ring (20K)		
S	JIS Alignment Ring (40K)		
Remote Adapters			
E	Flange adapters 316 SST (1/2-in. NPT)		
High Temperature Applications			
T	Graphite Valve Packing (T_{max} = 850 °F)		
Flow Calibration			
WC[15]	Discharge Coefficient Verification (3 point)		
WD[15]	Discharge Coefficient Verification (10 point)		
Pressure Testing			
P1	Hydrostatic Testing		

Rosemount 3051SFC Compact Orifice Flowmeter Ordering Information

Special Cleaning	
P2	Cleaning for special processes
PA	Cleaning per ASTM G93 Level D (section 11.4)
Special Inspection	
QC1	Visual and Dimensional Inspection with Certificate
QC7	Inspection and Performance Certificate
Transmitter Calibration Certification	
Q4	Calibration Data Certificate for Transmitter
QP	Calibration Data Certificate and Tamper Evident Seal
Safety Certification	
QS[16][17]	Certificate of FMEDA data
QT[8][18]	Safety Certified to IEC 61508 with certificate of FMEDA data
Material Traceability Certifications	
Q8[19]	Material Traceability Certification per EN 10204:2004 3.1
Code Conformance	
J2	ANSI B31.1
J3	ANSI B31.3
J4	ANSI B31.8
Material Conformance	
J5[20]	NACE MR-0175-91 / ISO 15156
Country Certification	
J1	Canadian Registration
Product Certifications	
E1	ATEX Flameproof
I1	ATEX Intrinsic Safety
IA[8]	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only
N1	ATEX Type n
ND	ATEX Dust
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)
E4	TIIS Flameproof
I4[21]	TIIS Intrinsic Safety
K4[21]	TIIS Flameproof, Intrinsic Safety (combination of E4 and I4)
E5	FM Explosion-proof, Dust Ignition-proof
I5	FM Intrinsically Safe, Division 2
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2
I6	CSA Intrinsically Safe
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)
E7	IECEx Flameproof, Dust Ignition-proof
I7	IECEx Intrinsic Safety
N7	IECEx Type n
K7	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)
E3[1]	China Flameproof
I3[1]	China Intrinsic Safety
KA[22]	ATEX and CSA Flameproof, Intrinsically Safe, Division 2 (combination of E1, I1, E6, and I6) *Note: Only available on Housing Style codes 1A, 1J, 2A, 2J, 2E, or 2M.*
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6) *Note: Only available on Housing Style codes 1A, 1J, 2A, 2J, 2E, or 2M.*
KC[22]	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2 (combination of E5, E1, I5, and I1) *Note: Only available on Housing Style codes 1A, 1J, 2A, 2J, 2E, or 2M.*
KD[22]	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, I5, E6, I6, E1, and I1) *Note: Only available on Housing Style codes 1A, 1J, 2A, 2J, 2E, or 2M.*

Rosemount 3051SFC Compact Orifice Flowmeter Ordering Information

Alternative Transmitter Material of Construction	
L1	Inert Sensor Fill Fluid (not available with Differential Pressure range code 1A)
L2	Graphite-filled (PTFE) o-ring
LA	Inert sensor fill fluid and graphite-filled (PTFE) o-ring
Digital Display(23)	
M5	PlantWeb LCD display
M7(17)(24)	Remote mount LCD display and interface, PlantWeb housing, no cable, SST bracket
M8(17)(24)(25)	Remote mount LCD display and interface, PlantWeb housing, 50 foot cable, SST bracket
M9(17)(24)(25)	Remote mount LCD display and interface, PlantWeb housing, 100 foot cable, SST bracket
Terminal Blocks	
T1(26)	Transient terminal block
T2(8)(27)	Terminal block with WAGO® spring clamp terminals
T3(8)(27)	Transient terminal block with WAGO spring clamp terminals
Manifold for Remote Mount Option	
F2	3-Valve Manifold, SST
F6	5-Valve Manifold, SST
PlantWeb Control Functionality	
A01(8)(28)	FOUNDATION fieldbus Advanced Control Function Block Suite
PlantWeb Diagnostic Functionality	
D01(8)(28)	FOUNDATION fieldbus Diagnostics Suite
DA1(8)(29)	HART Diagnostic Suite
PlantWeb Enhanced Measurement Functionality	
H01(8)(28)(30)	Fully Compensated Mass Flow Block
Code	**Wireless Options - Select code from each wireless category (example: WA2WK1)**
Wireless Transmitter Rate	
WA	User Configurable Burst Rate
Operating Frequency and Protocol	
3	2.4 GHz DSSS, WirelessHART™
Omnidirectional Wireless Antenna	
WK	Long Range, Integral Antenna
SmartPower™	
1	Long-life Power Module Adapter, Intrinsically Safe NOTE: Long-life Power Module must be shipped separately, order Part No. 00753-9220-0001.
Code	**Options**
Cold Temperature	
BRR(21)	-60 °F (-51 °C) Cold Temperature Start-up
Special Configuration (Software)	
C4(16)(31)	NAMUR alarm and saturation signal levels, high alarm
C5(16)(31)	NAMUR alarm and saturation signal levels, low alarm
C6(16)(31)	Custom alarm and saturation signal levels, high alarm *Note: Requires option code C1, custom software configuration. A Configuration Data Sheet must be completed, see document number 00806-0100-4810.*
C7(16)(31)	Custom alarm and saturation signal levels, low alarm *Note: Requires option code C1, custom software configuration. A Configuration Data Sheet must be completed, see document number 00806-0100-4810.*
C8(16)(31)	Low alarm (standard Rosemount alarm and saturation signal levels)
Special Configuration (Hardware)	
D1(16)(17)	Hardware Adjustment (zero, span, security).
D4	External ground screw
DA(16)(17)	Hardware adjustment (zero, span, security) and external ground screw
Conduit Electrical Connector	
ZE(32)	M12, 4-pin, Male Connector (eurofast)
ZM(32)	A size Mini, 4-pin, Male Connector (minifast)

(1) Not available for Primary Element Type code C.

(2) For 2-in. (50.8 mm) line sizes the Beta Ratio is 0.6 for Primary Element Type code C.

(3) Only available with Transmitter Feature Board Measurement Type: 1, 3, 5, 7.

(4) Required for Measurement Type codes 2, 4, 6, and D.

(5) Required for Measurement Type codes 3, 4, 7, and D.

(6) For Measurement Type 1, 2, 5, and 6 with DP range 1, absolute limits are 0.5 to 2000 psi (0,03 to 137,9 bar) and gage limits are -14.2 to 2000 psig (-0,98 to 137,9 bar).

(7) Requires PlantWeb housing.

(8) Only available with Measurement Type D.

(9) Available approvals are FM Intrinsically Safe, Division 2 (option code I5), CSA Intrinsically Safe (option code I6), ATEX Intrinsic Safety (option code I1; only available with 2.4 GHz), and IECEx Intrinsic Safety (option code I7; only available with 2.4 GHz).

(10) Material specified is cast as follows: CF-8M is the cast version of 316 SST, CF-3M is the cast version of 316L SST. For housing, material is aluminum with polyurethane paint.

(11) Available with output code A only. Not available with approvals. See Rosemount 753R Product Data Sheet, 00813-0100-4379, to specify Web-Based Monitoring Indicator. Does not integrate into plant host systems.

(12) Available with output code A only. Available approvals are FM Intrinsically Safe, Division 2 (option code I5), ATEX Intrinsic Safety (option code I1), or IECEx Intrinsic Safety (option code I7). Contact an Emerson Process Management representative for additional information.

(13) Not available with Wireless Operating Frequency and Protocol option codes 1 or 2.

(14) Not available with Wireless Operating Frequency and Protocol option codes 1 or 2 or Housing code 01. This option is only available with differential pressure ranges 2 and 3, and silicone fill fluid.

(15) Not available with Primary Element Type code P.

(16) Not available with Output Protocol code F or Housing code 01.

(17) Only available with Measurement Type D. Not available with output code X.

(18) Not available with output code F or X. Not available with housing code 01 or 7J.

(19) Instrument valves not included in Traceability Certification.

(20) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(21) Only available with Measurement Types 1-7.

(22) Not available with Temperature Measurement code R.

(23) Not available with Housing code 01 or 7J.

(24) Not available with output code F, Housing code 01, option code DA1, or option code QT.

(25) Cable supplied is Belden 3084A, rated for ambient temperatures up to 167°F (75°C).

(26) Not available with Housing code 00, 01, 5A, or 7J.

(27) Available with Output Protocol code A and Plantweb housing only.

(28) Requires PlantWeb housing and output code F.

(29) Requires PlantWeb housing and output code A. Includes Hardware Adjustments as standard. Not available with option code QT.

(30) Requires Rosemount Engineering Assistant version 5.5.1 to configure.

(31) Not available with output code X.

(32) Not available with Housing code 00, 01, 5A, or 7J. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Division 2 (option code I5) or FM FISCO Intrinsically Safe (option code IE), install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA 4X and IP66).

Rosemount 3095MFC Compact Orifice Mass Flowmeter

SPECIFICATIONS

Performance

System Reference Accuracy

Percent (%) of mass flow rate

TABLE 11. 3095MFCC - Conditioning Orifice Plate Technology

Beta	3095MFCC (8:1 flow turndown)	3095MFCC with Ultra for Flow (14:1 flow turndown)
2-in. to 8-in. line size		
0.4	±2.50%	±0.90%
0.65	±2.65%	±1.25%
10-in. to 12-in. line size		
0.4	±2.75%	±1.15%
0.65	±2.90%	±1.50%

TABLE 12. 3095MFCP - Compact Orifice Plate Technology

Beta	3095MFCP (8:1 flow turndown)	3095MFCP with Ultra for Flow (14:1 flow turndown)
1/2-in. line size		
0.4 0.65	±3.35%	±2.35%
1-in. to 1 1/2-in. line size		
0.4 0.65	±3.00%	±1.90%
2-in. to 8-in. line size		
0.4 0.65	±2.75%	±1.45%
10-in. to 12-in. line size		
0.4 0.65	±3.00%	±1.70%

Repeatability

±0.1%

Line Sizes

- 1/2-in. (15 mm) – not available for the 3095MFCC
- 1-in. (25 mm) – not available for the 3095MFCC
- 1 1/2-in. (40 mm) – not available for the 3095MFCC
- 2-in. (50 mm)
- 3-in. (80 mm)
- 4-in. (100 mm)
- 6-in. (150 mm)
- 8-in. (200 mm)
- 10-in. (250 mm)
- 12-in. (300 mm)

Output

Two-wire 4–20 mA, user-selectable for DP, AP, GP, PT, mass flow, or totalized flow. Digital HART protocol superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

Performance Statement Assumptions

- Measured pipe I.D
- Electronics are trimmed for optimum flow accuracy

Sizing

Contact an Emerson Process Management representative for assistance. A Configuration Data Sheet is required prior to order for application verification.

Functional

Service

- Liquid
- Gas
- Steam

Power Supply

4–20 mA option

- External power supply required. Standard transmitter (4–20 mA) operates on 11 to 55 v dc with no load

Process Temperature Limits

Direct Mount Transmitter

- 450 °F (232 °C)
- 400 °F (204 °C) when top mounted in steam service

Remote Mount Transmitter

- 850 °F (454 °C) – Stainless Steel

Transmitter Temperature Limits

Ambient

- -40 to 185 °F (-40 to 85 °C)
- with integral display: -4 to 175 °F (-20 to 80 °C)

Storage

- -50 to 230 °F (-46 to 110 °C)
- with integral display: -40 to 185 °F (-40 to 85 °C)

Differential Pressure Limits

Maximum differential pressure (DP) up to 800 inH_2O.

Pressure Limits(1)

Direct Mount Transmitter

- Pressure retention per ANSI B16.5 600# or DIN PN 100

Overpressure Limits

0 to 2 times the absolute pressure range with a maximum of 3626 psia (250 bar).

Static Pressure Limits

Operates within specification between static pressures of 0.5 psia (0.03 bar-A) and the URL of the static pressure sensor.

(1) Static pressure selection may effect pressure limitations.

Vibration Limits

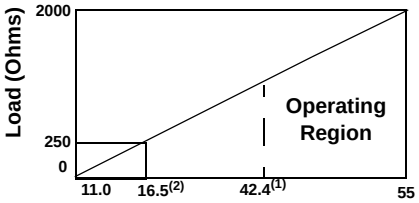
Qualified per IEC61298-3 (1998) for field with high vibration level or pipeline with high vibration level (10-60Hz 0.21mm displacement peak amplitude / 60 - 2000Hz 3g).

The weight and length of the transmitter assembly shall not exceed 5.8 lbs and 7.75-in.

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

$$\text{Maximum Loop Resistance} = \frac{\text{Power Supply} - 11.0}{0.022}$$



(1) For CSA approval, power supply must not exceed 42.4 Vdc.

(2) HART protocol communication requires a loop resistance value between 250-1100 ohms, inclusive.

FOUNDATION fieldbus (output option code V)

Power Supply

External power supply required; transmitters operate on 9.0 to 32.0 V dc transmitter terminal voltage.

Current Draw

17.5 mA for all configurations (including LCD display option)

Humidity Limits

- 0–100% relative humidity

Turn-On Time

Digital and analog measured variables will be within specification 7 – 10 seconds after power is applied to the transmitter.

Digital and analog flow output will be within specifications 10 – 14 seconds after power is applied to the transmitter.

Damping

Analog output response to a step input change is user-selectable from 0 to 29 seconds for one time constant. This software damping is in addition to sensor module response time

Failure Mode Alarm

Output Code A

If self-diagnostics detect a non-recoverable transmitter failure, the analog signal will be driven either below 3.75 mA or above 21.75 mA to alert the user. High or low alarm signal is user-selectable by internal jumper pins.

Output Code V

If self-diagnostics detect a gross transmitter failure, that information gets passed as a status along with the process variable(s).

Configuration

Field Communicator (Model 375 or 475)

- Performs traditional transmitter maintenance functions

3095 MultiVariable Engineering Assistant (EA) software package

- Contains built-in physical property database
- Enables mass flow configuration, maintenance, and diagnostic functions via HART modem (output option code A)

  Enables mass flow configuration via PCMCIA Interface for FOUNDATION fieldbus (output option code V)

Physical Properties Database

- Maintained in Engineering Assistant Software Configurator
- Physical properties for over 110 fluids
- Natural gas per AGA
- Steam and water per ASME
- Other database fluids per American Institute of Chemical Engineers (AIChE)
- Optional custom entry

FOUNDATION fieldbus Function Blocks

Standard Function Blocks

Resource Block

- Contains hardware, electronics, and diagnostic information.

Transducer Block

- Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

LCD Block

- Configures the local display.

5 Analog Input Blocks

- Processes the measurements for input into other function blocks. The output value is in engineering or custom units and contains a status indicating measurement quality.

PID Block with Auto-tune

- Contains all logic to perform PID control in the field including cascade and feedforward. Auto-tune capability allows for superior tuning for optimized control performance.

Advanced Control Function Block Suite (Option Code A01)

Input Selector Block

- Selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average, or first “good.”

Arithmetic Block

- Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Signal Characterizer Block

- Characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

Integrator Bock

- Compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

Output Splitter Block

- Splits the output of one PID or other control block so that the PID will control two valves or other actuators.

Control Selector Block

- Selects one of up to three inputs (highest, middle, or lowest) that are normally connected to the outputs of PID or other control function blocks.

Physical

Temperature Measurement

Integral RTD

- 100 Ohm platinum RTD temperature sensor assembly (316 SST Mineral Insulated Cable) with 1/4-in. NPT connection to wafer side and 1/2-in. NPT connection to transmitter RTD sensor is separated from process fluid by 1/16-in. and is pressure retaining rated for ANSI 600#. Complies with IEC-751 Class B accuracy. Meets Intrinsic Safety certification, see “Specifications” on page 39.

Remote RTD

- 100 Ohm platinum with 1/2-in. NPT nipple and union (078 series with Rosemount 644 housing)
  Model 0078D21N00A025T32Ex
  Connection Head: 00644-4410-0011
- Standard RTD cable is shielded armored cable, length is 12-ft. (3.66 m)
- Remote RTD material is SST

Thermowell

- 1/2-in. x 1/2-in. NPT, 316 SST

Electronic Connections for Remote Mount

- 1/2–14 NPT, G1/2, and M20 × 1.5 (CM20) conduit. HART interface connections fixed to terminal block for output code A

Process-Wetted Parts

Integral Manifolds

- 316 SST
- Alloy C-276

Remote Manifolds

- 316 SST
- Alloy C-276

Transmitter Vent Valves and Process Flanges

- 316 SST
- Alloy C-276
- Glass-filled PTFE O-rings

Process Isolating Diaphragms

- 316L SST
- Alloy C-276

Integral Manifold O-Rings

- PTFE/Graphite

Non-Wetted Parts

Sensor Module Fill Fluid

- Silicone oil
- Inert Fill optional

Cover O-rings

- Buna-N

Remote Mounting Brackets

- SST

Electronic Housing

- Low copper aluminum, NEMA 4x, IP65
- SST (optional)

Paint

- Polyurethane

Bolts

- CS

Material of Construction

Body/Plate

- 316 SST
- 50 micro-inch Ra surface finish

Manifold Head/Valves

- 316 SST

Flange Studs and Nuts

- Customer supplied
- Available as a spare part

Transmitter Connection Studs and Nuts

- Studs– A193 Grade B8M.
- Nuts– A194 Grade 8M.

Gasket and O-rings

- Gaskets are customer supplied.
- Durlon 8500 fiber gaskets are recommended. Consult an Emerson Process Management representative for use with other gaskets.
- Available as a spare part

NOTE
Gaskets and O-rings should be replaced when the 405 is disassembled.

Transmitter Connections

Remote Mount

- Available with 1/4-in. (standard) or 1/2-in. (option code E) connections

Orifice Type

- Square edged, Wafer style

Orifice Pressure Taps

- Corner

Process Connections

Mounts between the following flange configurations

ASME B16.5 (ANSI)	DIN	JIS
Class 150	PN16 (option code G)	10k (option code B)
Class 300	PN40 (option code H)	20k (option code R)
Class 600	PN100 (option code H)	40k (option code S)

ANSI alignment ring is included as standard when ordering

Typical Orifice Hole Sizes (For 3095MFCC)

Beta is calculated by: (β) = d_C / Pipe ID, where the calculated bore is equal to 2 x typical orifice hole size (d_C = 2d). The table below shows the diameter of each of the four typical orifice holes.

TABLE 13. β = 0.4(1)(2)

Line Size	3095MFCC	3095MFCP
1/2-in. (15 mm)	Not Available	0.249 (6.325)
1-in. (25 mm)	Not Available	0.420 (10.668)
1 1/2-in. (40 mm)	Not Available	0.644 (16.358)
2-in. (50 mm)	0.413 (10.490)	0.827 (21.006)
3-in. (80 mm)	0.614 (15.596)	1.227 (31.166)
4-in. (100 mm)	0.805 (20.447)	1.610 (40.894)
6-in. (150 mm)	1.213 (30.810)	2.426 (61.620)
8-in. (200 mm)	1.596 (40.538)	3.192 (81.077)
10-in. (250 mm)	2.004 (50.902)	4.008 (101.80)
12-in. (300 mm)	2.400 (60.960)	4.800 (121.92)

(1) Measurement is in inches (millimeters)

(2) Tolerance = ±0.002-in.

TABLE 14. β = 0.65(1)(2)

Line Size	3095MFCC	3095MFCP
1/2-in. (15 mm)	Not Available	0.404 (10.262)
1-in. (25 mm)	Not Available	0.682 (17.323)
1 1/2-in. (40 mm)	Not Available	1.047 (26.594)
2-in. (50 mm)	0.620 (15.748)(3)	1.344 (34.138)
3-in. (80 mm)	0.997 (25.324)	1.994 (50.648)
4-in. (100 mm)	1.308 (33.223)	2.617 (66.472)
6-in. (150 mm)	1.971 (50.063)	3.942 (100.127)
8-in. (200 mm)	2.594 (65.888)	5.188 (131.775)
10-in. (250 mm)	3.257 (82.728)	6.513 (165.43)
12-in. (300 mm)	3.900 (99.060)	7.800 (198.120)

(1) Measurement is in inches (millimeters)

(2) Tolerance = ±0.002-in.

(3) Beta (β) = 0.60-in. (15.24 mm) for 2-in. line size only.

3095MFC Weight

Line Size	Direct Mount (D3)(1)(2)	Remote Mount (R3)(1)
1/2-in. (15 mm)	9.50 (4.69)	6.3 (3.11)
1-in. (25 mm)	10.25 (5.06)	7.05 (3.48)
1 1/2-in. (40 mm)	10.75 (5.31)	7.55 (3.73)
2-in. (50 mm)	11.00 (5.43)	7.80 (3.85)
3-in. (80 mm)	13.00 (6.42)	9.80 (4.84)
4-in. (100 mm)	15.50 (7.65)	12.30 (6.07)
6-in. (150 mm)	20.45 (9.28)	17.25 (7.83)
8-in. (200 mm)	24.95 (11.32)	21.75 (9.87)
10-in. (250 mm)	30.70 (13.92)	27.50 (13.58)
12-in. (300 mm)	36.70 (16.64)	33.50 (16.54)

(1) Measurement in lb (kg).

(2) Includes 3095 MultiVariable transmitter.

Installation Considerations

Straight Run Requirements

TABLE 15. 3095MFCC Straight Pipe Requirements(1)

	Beta	0.40	0.65
Upstream (inlet) side of primary	Reducer (1 line size)	2	2
	Single 90° bend or tee	2	2
	Two or more 90 ° bends in the same plane	2	2
	Two or more 90° bends in different plane	2	2
	Up to 10° of swirl	2	2
	Butterfly valve (75% to 100% open)	2	N/A
Downstream (outlet) side of primary		2	2

TABLE 16. 3095MFCP Straight Pipe Requirements(1)(2)(3)

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

(1) Consult an Emerson Process Management representative if disturbance is not listed.

(2) Recommended lengths represented in pipe diameters per ISO 5167.

(3) Refer to ISO 5167 for recommended lengths when using flow straighteners.

Pipe Orientation

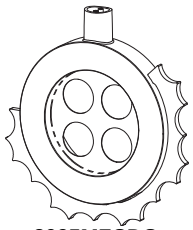
Pipe orientation for both 3095MFCC Compact Conditioning Mass Orifice and standard 3095MFCP Compact Mass Orifice.

	Process[1]		
Orientation/ Flow Direction	**Gas**	**Liquid**	**Steam**
Horizontal	D/R	D/R	D/R
Vertical Up	R	D/R	R
Vertical Down	D/R	NR	NR

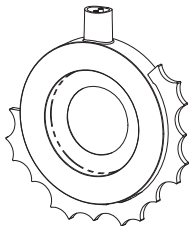
(1) D = Direct mount acceptable (recommended)
R = Remote mount acceptable
NR = Not recommended

Pipe Centering

Improper centering of any orifice type device can cause an error of up to ±5% in small line sizes. A centering mechanism (centering ring) independent of flange rating comes standard with the 405 Compact Orifice Series.



3095MFCDC
Conditioning Orifice

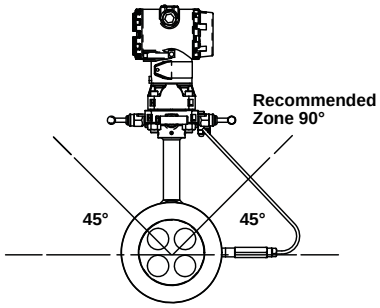


3095MFCDP
Compact Orifice

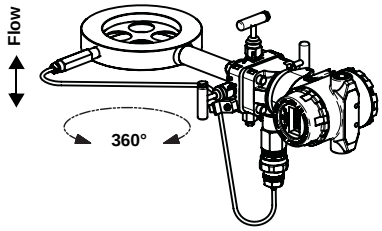
Flowmeter Orientation

Flowmeter orientation for both 3095MFC Conditioning Compact Orifice and standard Compact Orifice.

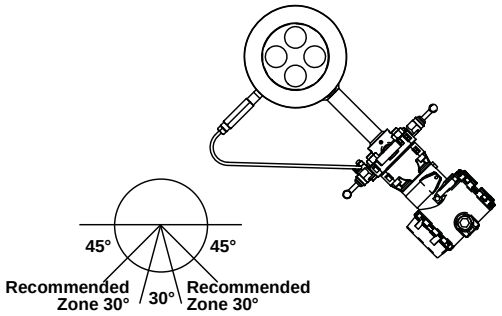
Gas (Horizontal)



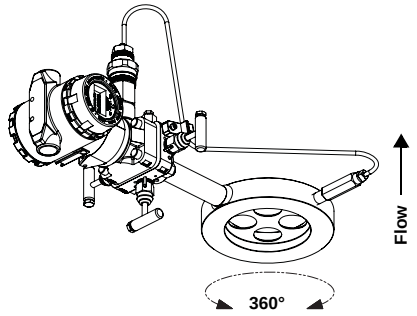
Gas (Vertical)



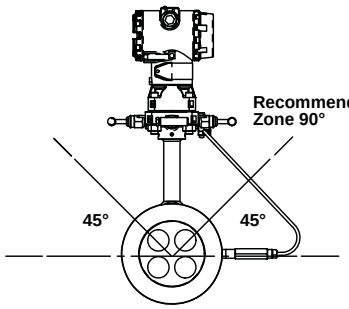
Liquid and Steam (Horizontal)



Steam (Vertical)



Top Mounting for Steam (Horizontal)



PRODUCT CERTIFICATIONS

Rosemount 3095 with HART

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.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

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

3095M_2/3,4/D Flow Transmitters — QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

All other 3095_ Transmitters/Level Controller — Sound Engineering Practice

Transmitter Attachments: Process Flange - Manifold — Sound Engineering Practice

Electro Magnetic Compatibility (EMC) (89/336/EEC)

3095MV Flow Transmitters

— EN 50081-1: 1992; EN 50082-2:1995; EN61326-1:2006; EN61326-2-3:2006

Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/Class III, Division 1, Groups E, F, and G. Enclosure type NEMA 4X. Factory Sealed. Provides nonincendive RTD connections for Class I, Division 2, Groups A, B, C, and D.

I5 Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G hazardous outdoor locations and Zone 0 Exia IIC T4.
Non-incendive for Class I, Division 2, Groups A, B, C, and D. Temperature Code T4. Factory Sealed.
For input parameters and installation see control drawing 03095-1020.

Canadian Standards Association (CSA)

E6 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/Class III, Division 1, Groups E, F, and G. CSA enclosure Type 4X suitable for indoor and outdoor hazardous locations. Provides nonincendive RTD connection for Class I, Division 2, Groups A, B, C, and D.Factory Sealed. Install in accordance with Rosemount Drawing 03095-1024. Approved for Class I, Division 2, Groups A, B, C, and D.

I6 Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D. when installed in accordance with Rosemount drawing 03095-1021. Temperature Code T3C.

For input parameters and installation see control drawing 03095-1021.

European Certifications

I1 ATEX Intrinsic Safety
Certificate Number: BAS98ATEX1359X ⟨Ex⟩ II 1 G
Ex ia IIC T5 (T_{amb} = –45 °C to 40 °C)
Ex ia IIC T4 (T_{amb} = –45 °C to 70 °C)
CE 1180

TABLE 17. Connection Parameters (Power/Signal Terminals)

U_i = 30V
I_i = 200 mA
P_i = 1.0 W
C_i = 0.012 µF
L_i = 0

TABLE 18. Temperature Sensor Connection Parameters

U_o = 30V
I_o = 19 mA
P_o = 140 mW
C_i = 0.002 µF
L_i = 0

TABLE 19. Temp Sensor Terminals Connection Parameters

C_o = 0.066 µF	Gas Group IIC
C_o = 0.560 µF	Gas Group IIB
C_o = 1.82 µF	Gas Group IIA
L_o = 96 mH	Gas Group IIC
L_o = 365 mH	Gas Group IIB
L_o = 696 mH	Gas Group IIA
L_o/R_o = 247 µH/ohm	Gas Group IIC
L_o/R_o = 633 µH/ohm	Gas Group IIB
L_o/R_o= 633 µH/ohm	Gas Group IIA

Special Conditions for Safe Use

The 3095, when fitted with the transient terminal block (order code B), are not capable of withstanding the 500 volts insulation test required by EN60079-11, Clause 6.3.12 (1994). This condition must be accounted for during installation.

N1 ATEX Type N

Certificate Number: BAS98ATEX3360X ⟨Ex⟩ II 3 G

Ex nL IIC T5 (T_{amb} = –45 °C to 40 °C)
Ex nL IIC T4 (T_{amb} = –45 °C to 70 °C)

U_i = 55V

CE

The apparatus is designed for connection to a remote temperature sensor such as a resistance temperature detection (RTD)

Special Conditions for Safe Use

The 3095, when fitted with the transient terminal block (order code B), are not capable of withstanding the 500 volts insulation test required by EN60079-15, Clause 6.8.1. This condition must be accounted for during installation.

E1 ATEX Flameproof
Certificate Number: KEMA02ATEX2320X ⟨Ex⟩ II 1/2 G
EEx d IIC T5 (-50°C ≤ T_{amb} ≤ 80°C)
T6 (-50°C ≤ T_{amb} ≤ 65°C)
CE 1180

Special Conditions for Safe Use (x):

The device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

ND ATEX Dust
Certificate Number: KEMA02ATEX2321 ⟨Ex⟩ II 1 D
V = 55 Vdc MAX
I = 23 mA MAX
IP66
CE 1180

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

K5 E5 and I5 combination

K6 E6 and I6 combination

K1 I1, N1, E1, and ND combination

Rosemount 3095 with Fieldbus

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.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

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

3095F_2/3,4/D and 3095M_2/3,4/D Flow Transmitters

— QS Certificate of Assessment - EC No. PED-H-20 Module H Conformity Assessment

All other 3095_ Transmitters/Level Controller

— Sound Engineering Practice

Transmitter Attachments: Process Flange - Manifold

— Sound Engineering Practice

Primary Elements, Flowmeter

— See appropriate Primary Element QIG

Electro Magnetic Compatibility (EMC) (89/336/EEC)

3095 Flow Transmitters

— EN 50081-1: 1992; EN 50082-2:1995; EN61326-1:2006; EN61326-2-3:2006

Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Rosemount 3095 Fieldbus Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/Class III, Division 1, Groups E, F, and G. Enclosure type NEMA 4X. Factory Sealed. Provides nonincendive RTD connections for Class I, Division 2, Groups A, B, C, and D.

I5 Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G hazardous outdoor locations. Non-incendive for Class I, Division 2, Groups A, B, C, and D. Temperature Code T4. Factory Sealed.

For input parameters and installation see control drawing 03095-1020.

IE FISCO for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G hazardous outdoor locations. Temperature Code T4. Factory Sealed.

For input parameters and installation see control drawing 03095-1020.

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

K5 E5 and I5 combination

Canadian Standards Association (CSA)

IF CSA FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only

European Certifications

IA ATEX FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only

Australian Certifications

IG IECEx FISCO Intrinsic Safety

DIMENSIONAL DRAWINGS

Rosemount 3095MFC Compact Orifice Mass Flowmeter

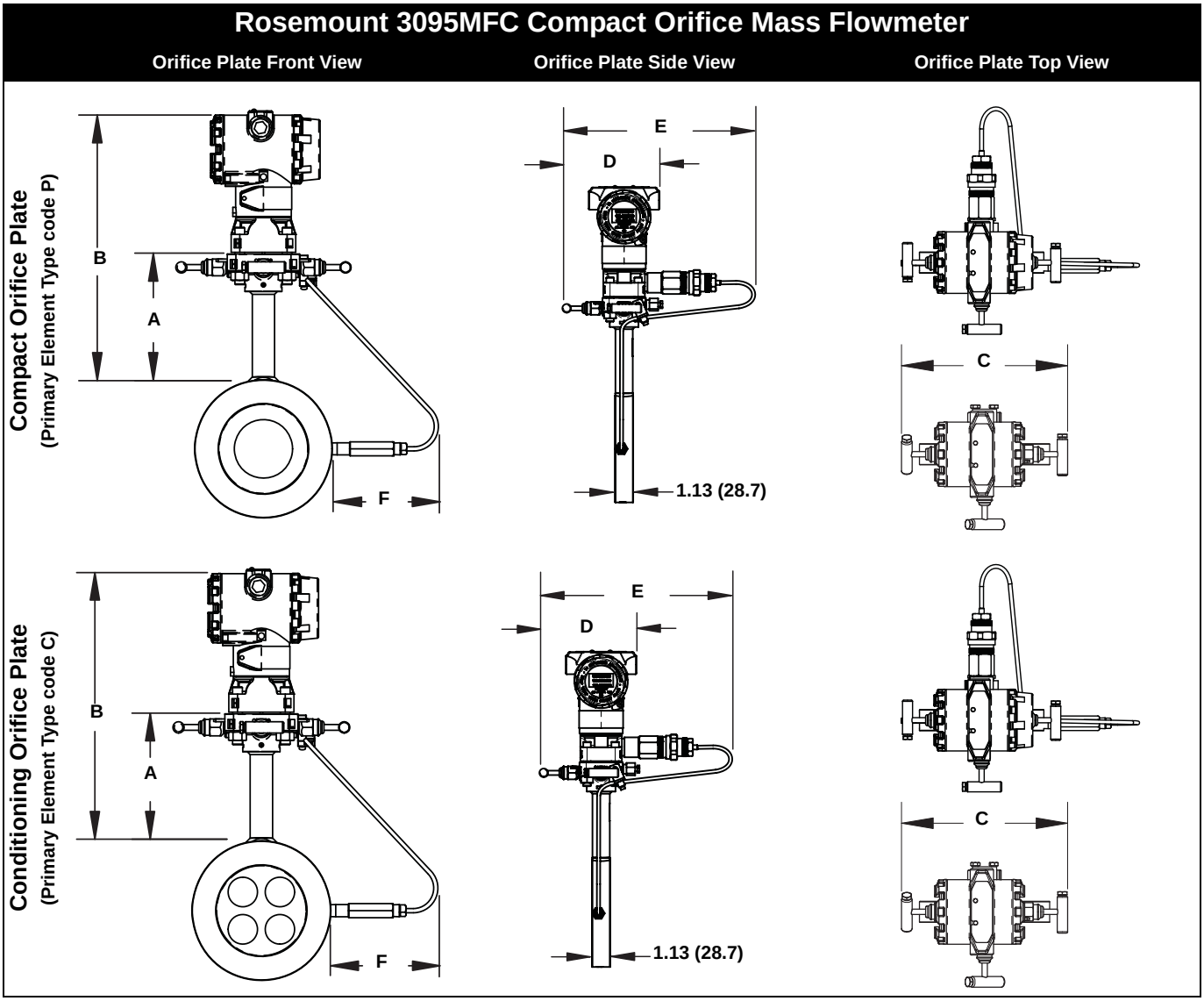


TABLE 20. Dimensional Drawings[1]

Plate Type	A	B	Transmitter Height	C	D	E	F
Type P & C	5.50 (140)	Transmitter Height + A	6.25 (159)	7.75 (197) - closed 8.25 (210) - open	6.0 (152) - closed 6.25 (159) - open	Max of 11.9 (302)	Max of 7.2 (183)

(1) Measurement is in inches (millimeters).

ORDERING INFORMATION

Rosemount 3095MFC Compact Orifice Mass Flowmeter Ordering Information

Model	Product Description	
3095MFC	Compact Orifice Mass Flowmeter	
Code	**Primary Element Type**	
C	Conditioning Orifice Plate	
P	Orifice Plate	
Code	**Material Type**	
S	316 Stainless Steel (SST)	
Code	**Line Size**	
005(1)	1/2-in. (15 mm)	
010(1)	1-in. (25 mm)	
015(1)	1 1/2-in. (40 mm)	
020	2-in. (50 mm)	
030	3-in. (80 mm)	
040	4-in. (100 mm)	
060	6-in. (150 mm)	
080	8-in. (200 mm)	
100	10-in. (250 mm)	
120	12-in. (300 mm)	
Code	**Primary Element Style**	
N	Square Edged	
Code	**Beta Ratio**	
040	0.40 Beta Ratio (β)	
065(2)	0.65 Beta Ratio (β)	
Code	**Temperature Measurement**	
R	Remote Thermowell and RTD	
T	Integral RTD	
0	No Temperature Sensor	
Code	**Transmitter Connection Platform**	
3	Direct-mount, 3-valve Integral Manifold, SST	
7	Remote-mount, 1/4-in. NPT connections	
Code	**Differential Pressure Range**	
1	0 to 25 in H_2O (0 to 62,3 mbar)	
2	0 to 250 in H_2O (0 to 623 mbar)	
3	0 to 1000 in H_2O (0 to 2,5 bar)	
Code	**Static Pressure Range**	
B	0 – 8 to 0 – 800 psia (0 –55,16 to 0 – 5515,8 kPa)	
C	0 – 8 to 0 – 800 psig (0 –55,16 to 0 – 5515,8 kPa)	
D	0 – 36.2 to 0 – 3626 psia (0 –250 to 0 – 25000 kPa)	
E	0 – 36.2 to 0 – 3626 psig (0 –250 to 0 – 25000 kPa)	
Code	**Output Protocol**	
A	4–20 mA with digital signal based on HART protocol	
V	FOUNDATION fieldbus protocol	
Code	**Transmitter Housing Material**	**Conduit Entry Size**
1A	Polyurethane-covered aluminum	1/2-14 NPT
1B	Polyurethane-covered aluminum	M20 x 1.5 (CM20)
1C	Polyurethane-covered aluminum	G1/2
1J	SST	1/2-14 NPT
1K	SST	M20 x 1.5 (CM20)
1L	SST	G1/2
Code	**Options**	
Performance Class		
U3(3)	Ultra for Flow: up to ±0.90% mass flow rate accuracy, up to 10:1 turndown, 10-year stability, limited 12-year warranty	

Rosemount 3095MFC Compact Orifice Mass Flowmeter Ordering Information

PlantWeb Control Functionality	
A01[4]	Advanced Control Suite: PID, arith, signal char, integ, etc.
Installation Accessories	
A	ANSI Alignment Ring (150#)
C	ANSI Alignment Ring (300#)
D	ANSI Alignment Ring (600#)
G	DIN Alignment Ring (PN 16)
H	DIN Alignment Ring (PN 40)
J	DIN Alignment Ring (PN 100)
B	JIS Alignment Ring (10K)
R	JIS Alignment Ring (20K)
S	JIS Alignment Ring (40K)
Remote Adapters	
E	Flange adapters 316 SST ($^1/_2$-in. NPT)
High Temperature Applications	
T	Graphite Valve Packing (T_{max} = 850 °F)
Flow Calibration	
WC[5]	Discharge Coefficient Verification (3 point)
WD[5]	Discharge Coefficient Verification (10 point)
Pressure Testing	
P1	Hydrostatic Testing
Special Cleaning	
P2	Cleaning for special processes
PA	Cleaning per ASTM G93 Level D (section 11.4)
Special Inspection	
QC1	Visual and dimensional inspection with certificate
QC7	Inspection and performance certificate
Transmitter Calibration Certification	
Q4	Calibration data certificate for transmitter
Material Traceability Certification	
Q8[6]	Material Traceability Certification per EN 10204:2004 3.1
Code Conformance	
J2	ANSI B31.1
J3	ANSI B31.3
J4	ANSI B31.8
Materials Conformance	
J5[7][8]	NACE MR-0175 / ISO 15156
Country Certification	
J1	Canadian Registration
Product Certifications	
E5	FM Explosion-proof, Dust Ignition-proof
I5	FM Intrinsically Safe, Division 2
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2
I6	CSA Intrinsically Safe, Division 2
I1	ATEX Intrinsic Safety
E1	ATEX Flameproof
N1	ATEX Type n
ND	ATEX Dust
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)
K6	CSA Explosion-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)
I7	IECEx Intrinsic Safety
E4	TIIS Flameproof
Alternative Transmitter Material of Construction	
L1[8]	Inert Sensor Fill Fluid

Rosemount 3095MFC Compact Orifice Mass Flowmeter Ordering Information

Display	
M5	Integral mount LCD display
Terminal Blocks	
T1	Transient Protection
Manifold for Remote Mount Option	
F2	3-Valve Manifold, SST
F6	5-Valve Manifold, SST

Typical Model Number: 3095MFC C S 040 N 040 0 3 B A 1A

(1) Not available for Primary Element Type code C.

(2) For 2-in. (50.8 mm) line sizes the Beta Ratio is 0.6 for Primary Element Type code C.

(3) Ultra for Flow applicable for HART protocol, DP ranges 2 and 3 with SST isolator material and silicone fill fluid options only.

(4) Function Blocks include: Arithmetic, Integrator, Analog Output, Signal Characterizer, Control Selector, and Output Selector.

(5) Not available with Primary Element Type code P.

(6) Instrument valves not included in Traceability Certification.

(7) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(8) Not available with DP range 1.

Rosemount 405 Compact Orifice Primary Element

SPECIFICATIONS

Performance

Discharge Coefficient Uncertainty

TABLE 21. 405C Conditioning Orifice Technology

Beta	Discharge Coefficient Uncertainty
2-in. to 12-in. line size	
0.4 0.65	±0.50% ±1.00%

TABLE 22. 405P Compact Orifice Technology

Beta	Discharge Coefficient Uncertainty
1/2-in. line size	
0.4 0.65	±2.25%
1-in. to 1 1/2-in. line size	
0.4 0.65	±1.75%
2-in. to 12-in. line size	
0.4 0.65	±1.25%

Line Sizes

- 1/2-in. (15 mm) – not available for the 405C
- 1-in. (25 mm) – not available for the 405C
- 1 1/2-in. (40 mm) – not available for the 405C
- 2-in. (50 mm)
- 3-in. (80 mm)
- 4-in. (100 mm)
- 6-in. (150 mm)
- 8-in. (200 mm)
- 10-in. (250 mm)
- 12-in. (300 mm)

Sizing

Contact an Emerson Process Management sales representative assistance. A “Configuration Data Sheet” is required prior to order for application verification.

Functional

Service

- Liquid
- Gas
- Vapor

Process Temperature Limits

Direct Mount Transmitter

- -40 to 450 °F (-40 to 232 °C)
- Up to 400 °F (204 °C) when top mounted in steam service

Remote Mount Transmitter

- -148 to 850 °F (-100 to 454 °C) – Stainless Steel

Differential Pressure Limits

Maximum differential pressure (DP) up to 800 inH_2O.

Maximum Working Pressure

- Pressure retention per ANSI B16.5 600# or DIN PN100

Vibration Limits

Qualified per IEC61298-3 (1998) for field with high vibration level or pipeline with high vibration level (10-60Hz 0.21mm displacement peak amplitude / 60 - 2000Hz 3g).

The weight and length of the transmitter assembly shall not exceed 5.8 lbs and 7.75-in.

Assembly to a transmitter

Select option code C11 for the Rosemount 3051S transmitter (or option code S3 for the Rosemount 3051C or 3095MV transmitters) to factory assemble the Rosemount 405 to a Rosemount pressure transmitter. If the 405 and transmitter are not factory assembled, they may be shipped separately. For a consolidated shipment, inform the Emerson Process Management representative when placing the order.

Physical

Temperature Measurement

Integral RTD

- 100 Ohm platinum RTD temperature sensor assembly (316 SST Mineral Insulated Cable) with 1/4-in. NPT connection to wafer side and 1/2-in. NPT connection to transmitter RTD sensor is separated from process fluid by 1/16-in. and is pressure retaining rated for ANSI 600#. Complies with IEC-751 Class B accuracy. Meets Intrinsic Safety certification, see “Specifications” on page 39.

Remote RTD

- 100 Ohm platinum with 1/2-in. NPT nipple and union (078 series with Rosemount 644 housing) Model 0078D21N00A025T32Ex Connection Head: 00644-4410-0011
- Standard RTD cable is shielded armored cable, length is 12 ft. (3,66 m)
- Remote RTD material is SST Thermowell
- 1/2-in. x 1/2-in. NPT, 316 SST

Material of Construction

Body/Plate

- 316 SST
- 50 micro-inch Ra surface finish

Manifold Head/Valves

- 316 SST

Flange Studs and Nuts

- Customer supplied
- Available as a spare part

Transmitter Connection Studs and Nuts

- Studs– A193 Grade B8M.
- Nuts– A194 Grade 8M.

Gasket and O-rings

- Gaskets are customer supplied.
- Durlon 8500 fiber gaskets are recommended. Consult an Emerson Process Management representative for use with other gaskets.
- Available as a spare part

NOTE
Gaskets and O-rings should be replaced when the 405 is disassembled.

Transmitter Connections

Direct Mount

- Integrally mount to 3051 and 3095 transmitters, range 1, 2, and 3.

Remote Mount

- Available with 1/4-in. (standard) or 1/2-in. (option code E) connections

Orifice Type

- Square edged, Wafer style

Orifice Pressure Taps

- Corner

Process Connections

Mounts between the following flange configurations:

ASME B16.5 (ANSI)	DIN	JIS
Class 150	PN16 (option code G)	10k (option code B)
Class 300	PN40 (option code H)	20k (option code R)
Class 600	PN100 (option code H)	40k (option code S)

ANSI alignment ring is included as standard when ordering.

Typical Orifice Hole Sizes (For 405C)

Beta is calculated by: (β) = d_C / Pipe ID, where the calculated bore is equal to 2 x typical orifice hole size (d_C = 2d). The table below shows the diameter of each of the four typical orifice holes.

TABLE 23. β = 0.4(1)(2)

Line Size	405C	405P
1/2-in. (15 mm)	Not Available	0.249 (6.325)
1-in. (25 mm)	Not Available	0.420 (10.668)
1 1/2-in. (40 mm)	Not Available	0.644 (16.358)
2-in. (50 mm)	0.413 (10.490)	0.827 (21.006)
3-in. (80 mm)	0.614 (15.596)	1.227 (31.166)
4-in. (100 mm)	0.805 (20.447)	1.610 (40.894)
6-in. (150 mm)	1.213 (30.810)	2.426 (61.620)
8-in. (200 mm)	1.596 (40.538)	3.192 (81.077)
10-in. (250 mm)	2.004 (50.902)	4.008 (101.80)
12-in. (300 mm)	2.400 (60.960)	4.800 (121.92)

(1) Measurement is in inches (millimeters)

(2) Tolerance = ±0.002-in.

TABLE 24. β = 0.65(1)(2)

Line Size	405C	405P
1/2-in. (15 mm)	Not Available	0.404 (10.262)
1-in. (25 mm)	Not Available	0.682 (17.323)
1 1/2-in. (40 mm)	Not Available	1.047 (26.594)
2-in. (50 mm)	0.620 (15.748)(3)	1.344 (34.138)
3-in. (80 mm)	0.997 (25.324)	1.994 (50.648)
4-in. (100 mm)	1.308 (33.223)	2.617 (66.472)
6-in. (150 mm)	1.971 (50.063)	3.942 (100.127)
8-in. (200 mm)	2.594 (65.888)	5.188 (131.775)
10-in. (250 mm)	3.257 (82.728)	6.513 (165.43)
12-in. (300 mm)	3.900 (99.060)	7.800 (198.120)

(1) Measurement is in inches (millimeters)

(2) Tolerance = ±0.002-in.

(3) Beta (β) = 0.60-in. (15.24 mm) for 2-in. line size only.

405 Weight

Line Size	Direct Mount (D3)(1)(2)	Remote Mount (R3)(1)
1/2-in. (15 mm)	3.50 (1.73)	7.5 (3.70)
1-in. (25 mm)	4.25 (2.10)	8.25 (4.07)
1 1/2-in. (40 mm)	4.75 (2.34)	8.75 (4.32)
2-in. (50 mm)	5.00 (2.47)	9.00 (4.44)
3-in. (80 mm)	7.00 (3.45)	11.00 (5.43)
4-in. (100 mm)	9.50 (4.69)	13.50 (6.67)
6-in. (150 mm)	13.00 (6.41)	17.00 (8.40)
8-in. (200 mm)	18.25 (9.00)	22.25 (10.99)
10-in. (250 mm)	23.50 (11.59)	27.50 (13.58)
12-in. (300 mm)	29.50 (14.55)	33.50 (16.54)

(1) Measurement in lb (kg).

(2) Includes 405 Direct Mount option D3.

Installation Consideration

Straight Pipe Requirement

Use the appropriate lengths of straight pipe upstream and downstream of the 405 to minimize the effects of moderate flow disturbances in the pipe. Table 25 and Table 26 lists recommended lengths of straight pipe per ISO 5167.

TABLE 25. 405C Straight Pipe Requirements(1)

	Beta	0.40	0.65
Upstream (inlet) side of primary	Reducer (1 line size)	2	2
	Single 90° bend or tee	2	2
	Two or more 90 ° bends in the same plane	2	2
	Two or more 90° bends in different plane	2	2
	Up to 10° of swirl	2	2
	Butterfly valve (75% to 100% open)	2	N/A
Downstream (outlet) side of primary		2	2

TABLE 26. 405P Straight Pipe Requirements(1)(2)(3)

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

(1) Consult an Emerson Process Management representative if disturbance is not listed.

(2) Recommended lengths represented in pipe diameters per ISO 5167.

(3) Refer to ISO 5167 for recommended lengths when using flow straighteners.

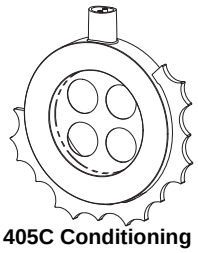
Pipe Orientation

Orientation/ Flow Direction	Process(1) Gas	Liquid	Steam
Horizontal	D/R	D/R	D/R
Vertical Up	R	D/R	R
Vertical Down	D/R	NR	NR

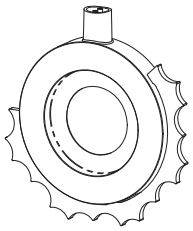
(1) D = Direct mount acceptable (recommended)
R = Remote mount acceptable
NR = Not recommended

Pipe Centering

Improper centering of any orifice type device can cause an error of up to ±5% in small line sizes. A centering mechanism (centering ring) independent of flange rating comes standard with the 405 Compact Orifice Series.



405C Conditioning Orifice



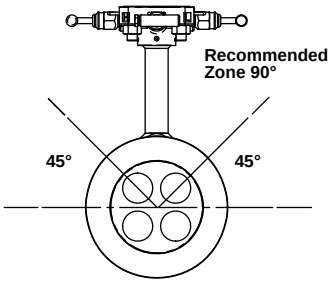
405P Compact Orifice

Flowmeter Orientation

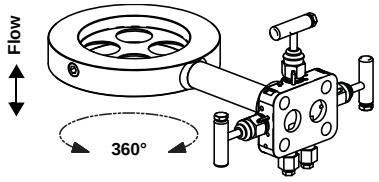
Flowmeter orientation for the Conditioning Compact Orifice and standard Compact Orifice.

Flowmeter Orientation (Recommended)

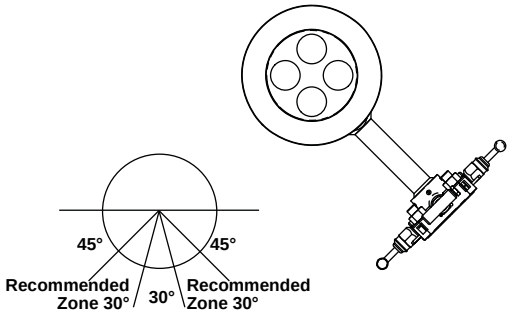
Gas (Horizontal)



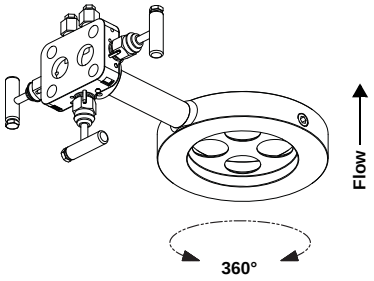
Gas (Vertical)



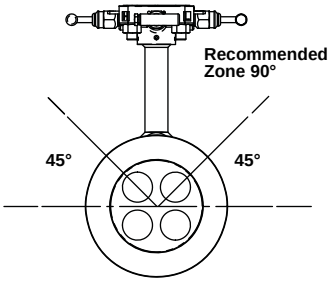
Liquid and Steam (Horizontal)



Steam (Vertical)



Top Mounting for Steam (Horizontal)

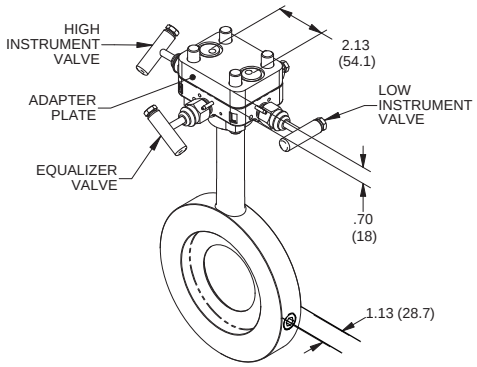


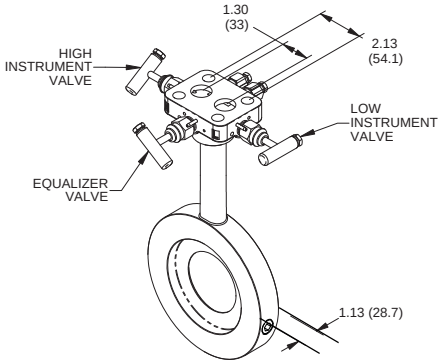
DIMENSIONAL DRAWINGS

Rosemount 405 Compact Orifice Plate (Direct Mount)

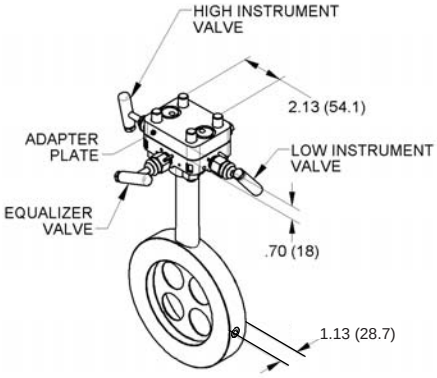
Front View (transmitter connection A3) | **Front View (transmitter connection D3)**

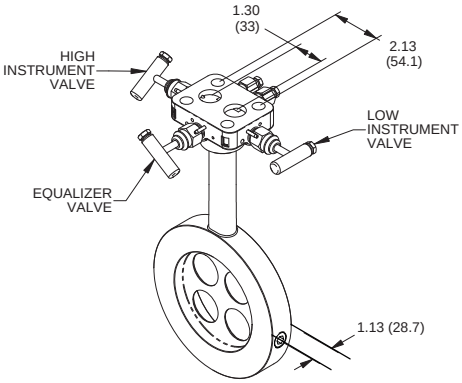
Compact Orifice Plate
(Primary Element Type code P)





Conditioning Orifice Plate
(Primary Element Type code C)



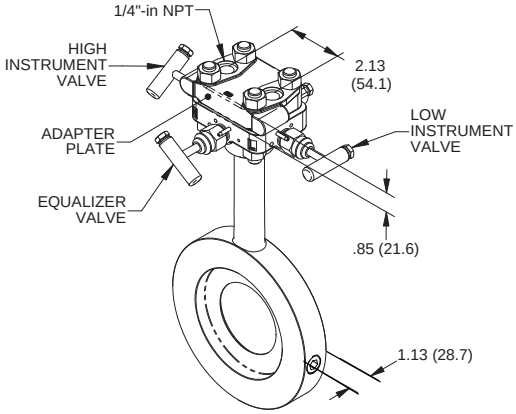


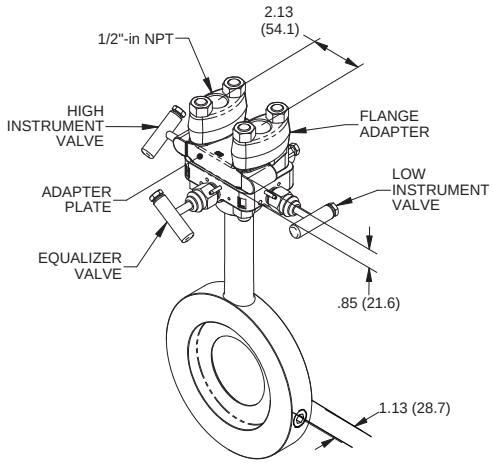
NOTE
Transmitter connection code A3 is to be used with a traditional style transmitter. This is a stainless steel adapter plate for allowing the direct mount of traditional style transmitters.

Rosemount 405 Compact Orifice Plate (Remote Mount Transmitter)

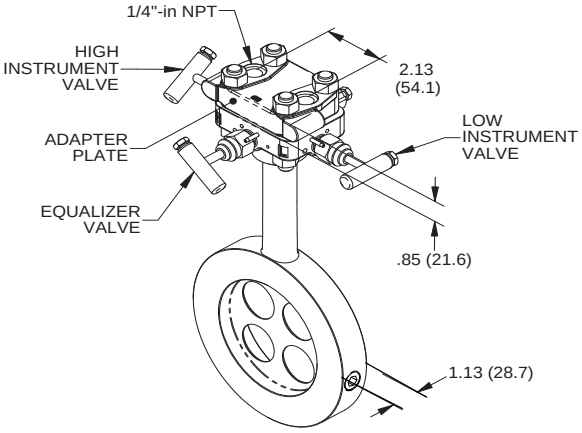
Adapter Plate (R3) | **Flange Adapter (R3 with option E)**

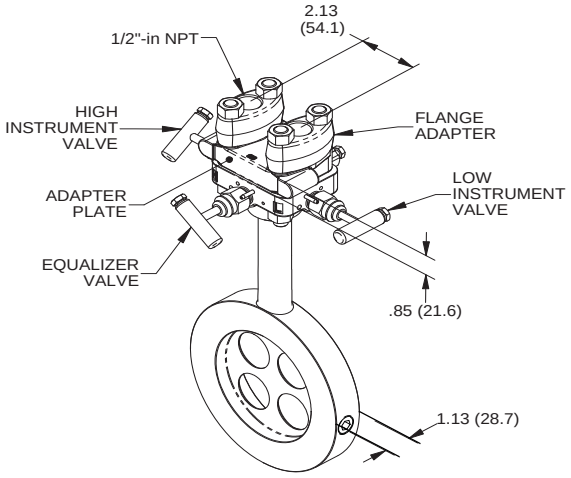
Compact Orifice Plate
(Primary Element Type code P)





Conditioning Orifice Plate
(Primary Element Type code C)





ORDERING INFORMATION

Rosemount 405 Compact Orifice Primary Element Ordering Information

Model	Product Description
405	Compact Primary Element
Code	**Primary Element Type**
C	Conditioning Orifice Plate
P	Orifice Plate
Code	**Material Type**
S	316 Stainless Steel (SST)
Code	**Line Size**
005(1)	1/2-in. (15 mm)
010(1)	1-in. (25 mm)
015(1)	1 1/2-in. (40 mm)
020	2-in. (50 mm)
030	3-in. (80 mm)
040	4-in. (100 mm)
060	6-in. (150 mm)
080	8-in. (200 mm)
100	10-in. (250 mm)
120	12-in. (300 mm)
Code	**Temperature Measurement**
N	No Temperature Measurement
Code	**Beta Ratio**
040	0.40 Beta Ratio (β)
065(2)	0.65 Beta Ratio (β)
Code	**Transmitter Connection**
D3	Coplanar, Direct mount, 3-valve Integral Manifold, SST
R3	Remote-mount, 1/4-in. NPT connections
A3	Traditional, Direct mount, 3-valve Integral Manifold with adapter plate, SST
Code	**Options**
Installation Accessories	
A	ANSI Alignment Ring (150#)
C	ANSI Alignment Ring (300#)
D	ANSI Alignment Ring (600#)
G	DIN Alignment Ring (PN 16)
H	DIN Alignment Ring (PN 40)
J	DIN Alignment Ring (PN 100)
B	JIS Alignment Ring (10K)
R	JIS Alignment Ring (20K)
S	JIS Alignment Ring (40K)
Remote Adapters	
E	Flange adapters 316 SST (1/2-in. NPT)
High Temperature Applications	
T	Graphite valve packing (T_{max} = 850 °F)
Flow Calibration	
WC(3)	Discharge Coefficient Verification (3 point)
WD(3)	Discharge Coefficient Verification (10 point)
Pressure Testing	
P1	Hydrostatic testing
Special Cleaning	
P2	Cleaning for special processes
PA	Cleaning per ASTM G93 Level D (section 11.4)

Rosemount 405 Compact Orifice Primary Element Ordering Information

Special Inspection	
QC1	Visual and Dimensional Inspection with certificate
QC7	Inspection and performance certificate
Material Traceability Certification	
Q8[4]	Material Traceability Certification per En 10204:2004 3.1
Code Conformance	
J2	ANSI B31.1
J3	ANSI B31.3
J4	ANSI B31.8
Materials Conformance	
J5[5]	NACE MR-0175-91
Country Certification	
J1	Canadian Registration
Typical Model Number: 405 C S 040 N 040 D3	

(1) Not available for Primary Element Type code C.

(2) For 2-in. (50,8 mm) line sizes the Beta Ratio is 0.6 for Primary Element Type code C.

(3) Not available with Primary Element Type code P.

(4) Instrument valves not included in Traceability Certification.

(5) Materials of Construction comply with metallurgical requirements within NACE MR0175/ISO for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

DP Flow Configuration Data Sheet

All sections are required on this form.
★ = Default Value

◯ Select only one of the items provided
☐ One or more of the listed items can be selected

Customer Information

Customer: _____ Contact Name: _____

P.O./Reference No: _____ Fax No./Email: _____

Phone No.:_____ P.O. Line Item: _____

Model No._____

Customer Signoff: _____

Tagging

Hardware Tag: _____

Service:_____

Instrument Selection

Select DP Instrument and complete appropriate additional information.

Annubar®:
3051SFA
- ◯ Fully Compensated
- ◯ Pressure Compensated
- ◯ Temperature Compensated
- ◯ DP Compensated(1)
- ◯ DP Only

◯ 3095MFA
◯ 485
◯ 285

Additional Information

Connection Type:
For 3051SFA, 3095MFA, 485
◯ Pak-Lok
◯ Flange w/ Opposite Side Support
Flange Rating:_____
◯ Flange-Lok
Flange Rating:_____
Gear Drive Flo-Tap:
- ◯ Threaded
- ◯ Flanged

Flange Rating:_____
Manual Drive Flo-Tap:
- ◯ Threaded
- ◯ Flanged

Flange Rating:_____

For 285
◯ Pak-Lok
◯ Duct Mount Plate
◯ Duct Mount Plate + compression fitting

Compact Orifice:
3051SFC
- ◯ Fully Compensated
- ◯ Pressure Compensated
- ◯ Temperature Compensated
- ◯ DP Compensated(1)
- ◯ DP Only

◯ 3095MFC
◯ 405

Additional Information

Orifice Type:
◯ Conditioning
◯ Standard

Integral Orifice:
3051SFP
- ◯ Fully Compensated
- ◯ Pressure Compensated
- ◯ Temperature Compensated
- ◯ DP Compensated(1)
- ◯ DP Only

◯ 3095MFP
◯ 1195

Additional Information

Connection Type:
Pipe Ends
◯ Flanged
Flange Rating:_____
◯ Beveled
◯ Threaded

Body Only
◯ Threaded
◯ Socket-Weld

Orifice Plates:
◯ 1595 Conditioning Plate
1495 Standard Plate
Concentric Square Edged★
- ◯ ISO 5167-2 2003★
- ◯ AGA Report #3 2003
- ◯ ASME MFC 3M 2004
- ◯ Drain/Vent (ISO TR 15377)

◯ Restriction Orifice
◯ Alt. Bore
Type:_____

Additional Information

Plate Type:
◯ Paddle★
◯ Paddle – Spiral Wound
◯ Universal for RTJ Type Flange
☐ With Plate Holder

Tap Type:
◯ Flange
◯ Corner
◯ Pipe – D & D/2

Flange Rating:_____

◯ Non-Rosemount Primary Element: _____

Note: Please submit Primary Element Manufacturer's Calculation Data Sheet.

(1) Compensates for varying discharge coefficient and gas expansion factor based on Reynold's Number, assuming a fixed pressure and temperature.

Fluid Selection			
Steam:	◯ Superheated	◯ Saturated - Pressure Based	◯ Saturated - Temperature Based
Liquid:	◯ Water	◯ Methanol	◯ Ethanol
	◯ Ammonia	◯ Other Database Liquid _____ (see page 3)	
Gas:	◯ Air	◯ Nitrogen	◯ Hydrogen
	◯ Oxygen	◯ Other Database Gas _____ (see page 3)	
Natural Gas:	◯ Please complete Natural Gas Data Sheet (document number 00806-0300-4803) or submit gas analysis report.		
Custom(1):	Name_____		
	Specific Gravity / Molecular Weight _____		Viscosity _____
◯ Gas	Density / Compressibility @ Flowing Conditions _____		@ Base Conditions _____
	Isentropic exponent _____		
◯ Liquid	Density @ Flowing Conditions _____		@ Base Conditions _____
	Vapor Pressure _____		

(1) Please provide data at normal flowing conditions. For MultiVariable flowmeter configuration, a Custom Gas Data Sheet (document number 00806-0200-4716) or a Custom Liquid Data Sheet (document number 00806-0300-4716) is required.

Application Data

Line Size: _____ ◯ in.★ ◯ mm

Sch: _____

OR

Pipe I.D. _____◯ in.★ ◯ mm

Wall Thickness _____◯ in.★ ◯ mm

Primary Element Material:_____ (316 SST★)

Pipe Material:_____ (CS★)

Pipe Orientation: ◯ Horizontal★ ◯ Vertical - Flow Up ◯ Vertical - Flow Down

Process Information (Gray boxes are required values)

	Units	Minimum	Normal	Maximum	Full Scale / Design
Flow Rate:					
Pressure:					
Process Temp:					

Atmospheric Pressure: _____ (14.696 psia★) (used to convert gage pressure to absolute pressure or absolute pressure to gage pressure)

Base Conditions (Required only if base volumetric flow rate units are used)

◯ Standard★	◯ Normal (ISO Standard)	◯ Standard - Natural Gas (AGA)	◯ User Defined
P = 14.696 psia/ 101.325 kPaa	P = 14.696 psia/ 101.325 kPaa	P = 14.73 psia/ 101.53 kPaa	P = _____
T = 60 °F/ 15.56 °C	T = 32 °F/ 0 °C	T = 60 °F/ 15.56 °C	T = _____◯ °F ◯ °C

MultiVariable Flowmeter Calibration

For MultiVariable flowmeters, please specify each sensor's Lower Trim Value (LTV) and Upper Trim Value (UTV).(1)

Differential Pressure:	LTV=_____	UTV=_____	Units=_____
Static Pressure:	LTV=_____	UTV=_____	Units=_____
Process Temperature:	LTV=_____	UTV=_____	Units=_____

(1) If left blank, trim values will be determined from process conditions entered on page 2.

Flowmeter Configuration Defaults[1]			
Flowmeter Models: 3051SFA / 3051SFP / 3051SFC			3095MFA / 3095MFP / 3095MFC
3051S MultiVariable		3051S Single Variable	3095 All Configurations
Compensated Mass and Energy Flow (Measurement Type: 1-4)	Direct Process Variable (Measurement Type: 5-7)	Differential Pressure (Measurement Type: D)	Compensated Mass Flow
4 mA = 0, 20 mA = Full Scale Flow	4 mA = 0, 20 mA = URL InH_2O	4 mA = 0, 20 mA = Full Scale Flow	4 mA = 0, 20 mA = Full Scale Flow
Process Variable Assignment PV: Mass Flow 2V: Differential Pressure 3V: Static Pressure (if available) 4V: Process Temp. (if available)	Process Variable Assignment PV: Square Root of DP 2V: Static Pressure (if available) 3V: Process Temp. (if available) 4V: Module Temp.	Process Variable Assignment PV: Scaled Variable 2V: Differential Pressure 3V: Module Temp.	Process Variable Assignment PV: Mass Flow 2V: Differential Pressure 3V: Static Pressure 4V: Process Temp.
Protocol: HART Burst Mode: Off Write Protect: Off Alarm: High LCD: Flow, DP, P, T	Protocol: HART Burst Mode: Off Write Protect: Off Alarm: High LCD: DP, P, T	Protocol: HART Burst Mode: Off Write Protect: Off Alarm: High LCD: Flow	Protocol: HART Burst Mode: Off Write Protect: Off Alarm: High LCD: Flow

(1) If device settings other than default are required, please complete the appropriate Configuration Data Sheet: 00806-0100-4803 for 3051SMV, 00806-0100-4801 for 3051S, 00806-0100-4716 for 3095.

Fluid Database List

◯ 1~1~2~2-TETRAFLUORO-ETHANE	◯ 2-METHYL-1-PENTENE	◯ ETHANE	◯ METHYL ETHYL KETONE	◯ PROPANE
◯ 1~1~2-TRICHLOROETHANE	◯ ACETIC ACID	◯ ETHANOL	◯ N-BUTYRALDEHYDE	◯ PROPYLENE
◯ 1~2~4-TRICHLOROBENZENE	◯ ACETONE	◯ ETHYLAMINE	◯ METHYL VINYL ETHER	◯ PYRENE
◯ 1~2-BUTADIENE	◯ ACETONITRILE	◯ ETHYLBENZENE	◯ N-BUTANE	◯ STYRENE
◯ 1~3~5-TRICHLOROBENZENE	◯ ACETYLENE	◯ ETHYLENE	◯ N-BUTANOL	◯ SULFUR DIOXIDE
◯ 1~3-BUTADIENE	◯ ACRYLONITRILE	◯ ETHYLENE GLYCOL	◯ N-BUTYRONITRILE	◯ TOLUENE
◯ 1~4-DIOXANE	◯ AIR	◯ ETHYLENE OXIDE	◯ N-DECANE	◯ TRICHLOROETHYLENE
◯ 1~4-HEXADIENE	◯ ALLYL ALCOHOL	◯ FLUORENE	◯ N-DODECANE	◯ VINYL ACETATE
◯ 1-BUTENE	◯ AMMONIA	◯ FURAN	◯ NEON	◯ VINYL CHLORIDE
◯ 1-DECANAL	◯ ARGON	◯ HELIUM-4	◯ NEOPENTANE	◯ VINYLCYCLOHEXENE
◯ 1-DECANOL	◯ BENZALDEHYDE	◯ HYDRAZINE	◯ N-HEPTADECANE	◯ WATER
◯ 1-DECENE	◯ BENZENE	◯ HYDROGEN	◯ N-HEPTANE	
◯ 1-DODECANOL	◯ BENZYL ALCOHOL	◯ HYDROGEN CHLORIDE	◯ N-HEXANE	
◯ 1-DODECENE	◯ BIPHENYL	◯ HYDROGEN CYANIDE	◯ NITRIC ACID	
◯ 1-HEPTANOL	◯ CARBON DIOXIDE	◯ HYDROGEN PEROXIDE	◯ NITRIC OXIDE	
◯ 1-HEPTENE	◯ CARBON MONOXIDE	◯ HYDROGEN SULFIDE	◯ NITROBENZENE	
◯ 1-HEXADECANOL	◯ CARBON TETRACHLORIDE	◯ ISOBUTANE	◯ NITROETHANE	
◯ 1-HEXENE	◯ CHLORINE	◯ ISOBUTENE	◯ NITROGEN	
◯ 1-NONANAL	◯ CHLOROPRENE	◯ ISOBUTYLBENZENE	◯ NITROMETHANE	
◯ 1-NONANOL	◯ CHLOROTRIFLUORO-ETHYLENE	◯ ISOPENTANE	◯ NITROUS OXIDE	
◯ 1-OCTANOL	◯ CARBON DIOXIDE	◯ ISOPRENE	◯ N-NONANE	
◯ 1-OCTENE	◯ CYCLOHEPTANE	◯ ISOPROPANOL	◯ N-OCTANE	
◯ 1-PENTADECANOL	◯ CYCLOHEXANE	◯ M-CHLORONITRO-BENZENE	◯ N-PENTANE	
◯ 1-PENTANOL	◯ CYCLOPENTANE	◯ M-DICHLORO-BENZENE	◯ OXYGEN	
◯ 1-PENTENE	◯ CYCLOPENTENE	◯ METHANE	◯ PENTAFLUOROETHANE	
◯ 1-UNDECANOL	◯ CYCLOPROPANE	◯ METHANOL	◯ PHENOL	
◯ 2~2-DIMETHYLBUTANE	◯ DIVINYL ETHER	◯ METHYL ACRYLATE	◯ PROPADIENE	

Fluid Data Sheet (FDS)

For custom fluid not in the Rosemount Fluid Database

For technical assistance in filling out this CDS, call an Emerson Process Management representative. Complete this form to define a custom fluid. The H symbol identifies the default value.

NOTE
This form is not required if using the Rosemount Fluid Database.

* = Required Item
★ = Default

Customer Information	
Customer:	Contact Name:
Customer Phone:	Customer Fax:
	Customer PO:

Fluid Properties	
❑ Custom Liquid– Complete Table	❑ Liquid
❑ Custom Gas– Complete Table	❑ Gas
❑ Custom Natural Gas– Complete Table	❑ Natural Gas

For Rosemount Use Only	
S.O.:	LI
CHAMP:	DATE:
	ADMIN:

TABLE 27. Custom Liquid Worksheet

* = Required Item

★ = Default

Mass Liquid Density and Viscosity Information

1. Fill in the following operating temperatures

   a) _____ min

   b) _____ [1/3 (max - min))] + min

   c) _____ [2/3 (max - min))] + min

   d) _____ max

2. **Transfer the values from the above section to the numbered lines below.**
3. Check one Density box, then enter the values for each temperature and the standard density.
4. Check one Viscosity box, then enter values for each temperature. (At least one viscosity value is required).

Density	Viscosity
❑ Density in lbs/CuFt	❑ Viscosity in centipoise
❑ Density in kg/CuM	❑ Viscosity in lbs/ft sec
	❑ Viscosity in pascal sec
Temperature	Temperature
a) _____ min	a) _____ min.
b) _____ [1/3 (max - min))] + min	b) _____ [1/3 (max - min))] + min
c) _____ [2/3 (max - min))] + min	c) _____ [2/3 (max - min))] + min
d) _____ max	d) _____ max

Base density: _____
(at base reference conditions specified)

Volumetric Liquid Density and Viscosity Information

* Density at Flow: _____ Units: ❑ lb/ft^3 ❑ Kg/m^3 ❑ Other:

OR

Specific Gravity at Flow: _____

* Viscosity at Flow: _____ Units: ❑ Centipoise ❑ Other:

TABLE 28. Custom Gas Worksheet

* = Required Item

★ = Default

Mass Gas Compressibility and Viscosity Information

1. Fill in the following operating pressures and operating temperatures

Operating Pressures	Operating Temperatures
1) _____ min	5) _____ min
2) _____ [1/3 (max - min))] + min	6) _____ [1/2 (max - min))] + min
3) _____ [2/3 (max - min))] + min	7) _____ max
4) _____ max	8) _____ [1/3 (max - min))] + min
	9) _____ [2/3 (max - min))] + min

2. **Transfer the values from the above section to the numbered lines below**
3. Check one Density/Compressibility box, then enter the 12 values for each pressure/temperature range.
4. Check one Viscosity box, then enter values for each temperature. (At least one viscosity value is required).
5. Enter values for molecular weight, isentropic exponent, and standard density (or standard compressibility).

Density
- ❑ Density in lbs/CuFt
- ❑ Density in kg/CuM
- ❑ Compressibility

Viscosity
- ❑ Viscosity in centipoise
- ❑ Viscosity in lbs/ft sec
- ❑ Viscosity in pascal sec

Pressure	Temperature	Temperature
1) _____	5) _____	5) _____
2) _____	5) _____	8) _____
3) _____	5) _____	9) _____
4) _____	5) _____	7) _____
1) _____	6) _____	
2) _____	6) _____	Molecular Weight: _____
3) _____	6) _____	Isentropic Exponent: _____ 1.4 ★
4) _____	6) _____	
1) _____	7) _____	
2) _____	7) _____	
3) _____	7) _____	
4) _____	7) _____	

Standard density/compressibility: _____

Volumetric Gas Compressibility and Viscosity Information

* Density at Flow: _____ Units: ❑ lb/ft^3 ❑ Kg/m^3 ❑ Other:

OR

M.W. / Specific Gravity at Flow: _____

Compressibility at Flow: _____

Compressibility at Base: _____

* Viscosity at Flow: _____ Units: ❑ Centipoise ❑ Other: Isentropic Exponent (K):_____ 1.4 ★

Rosemount Compact Orifice Flowmeter Series

Product Data Sheet
00813-0100-4810, Rev KA
November 2009

Emerson Process Management
Rosemount Measurement
8200 Market Boulevard
Chanhassen MN 55317 USA
Tel (USA) 1 800 999 9307
Tel (International) +1 952 906 8888
Fax +1 952 949 7001

Emerson Process Management
Blegistrasse 23
P.O. Box 1046
CH 6341 Baar
Switzerland
Tel +41 (0) 41 768 6111
Fax +41 (0) 41 768 6300

Emerson FZE
P.O. Box 17033
Jebel Ali Free Zone
Dubai UAE
Tel +971 4 811 8100
Fax +971 4 886 5465

Emerson Process Management Asia Pacific Pte Ltd
1 Pandan Crescent
Singapore 128461
Tel +65 6777 8211
Fax +65 6777 0947
Service Support Hotline : +65 6770 8711
Email : Enquiries@AP.EmersonProcess.com

00813-0100-4810 Rev KA, 11/09

EMERSON™
Process Management