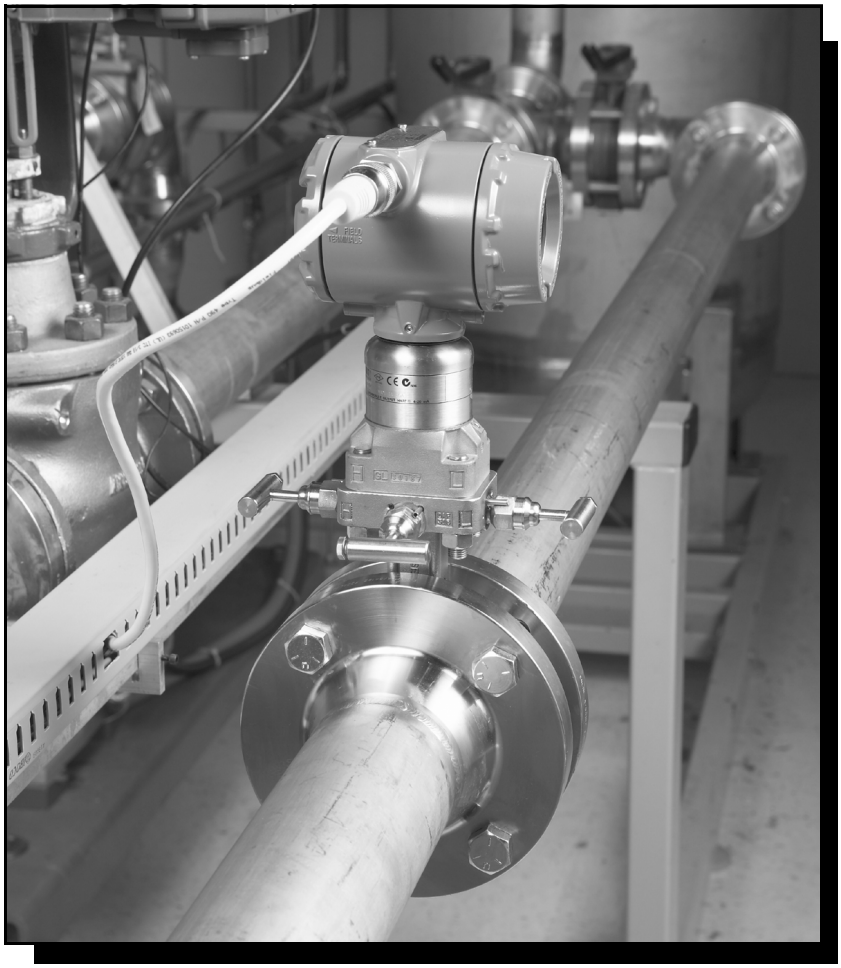
Product Specification Sheet
00815-0100-4810, Rev AA
June 2005

Conditioning Orifice Plate Specification Guide



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Overview

This Product Specification sheet defines the requirements for the Conditioning Orifice Plate (COP). This Specification is also included for Electronic Pressure Instruments when integrated with the Conditioning Orifice Plate (COP) primary to form complete flowmeters.

Vendor Requirements

The manufacturer of the COP shall be certified to the international standard ISO 9001.

The vendor shall have the ability to pre-assemble the COP primary with a pressure instrument (transmitter), perform a leak-test and calibrate the unit before shipping.

The vendor shall have the ability to provide technical support for the COP primary element and the pressure instrument.

When a pressure instrument is supplied with the COP, each pressure instrument shall be individually tested for accuracy using calibration equipment traceable to NIST or an equivalent internationally recognized authority.

Instrument Specifications

The COP shall perform within ± 0.5% to ± 0.75% of discharge coefficient (dependant on conditioning orifice beta size) and the vendor shall make independent testing documentation available demonstrating this performance.

The COP shall have the ability to accommodate isolation valves and connections that are suitable for connecting a pressure instrument.

All line sizes serviced by the COP shall be able to accommodate a remote RTD.

Conditioning Orifice Plate

The COP shall consist of four symmetrical orifice holes to allow flow separation independent of flow rate, pressure or temperature. As a result, a flow coefficient (Cd) shall be maintained over a wide range of Reynolds numbers.

These products shall deliver accurate and repeatable results when installed downstream of a variety of flow disturbances, that normally cause measurement errors in the flow process.

Materials

The primary element shall be available in 316 Stainless Steel, 304L Stainless Steel, Monel® and Hastelloy® 276 material types.

The COP shall be available for use with industry standard flanges:

- ANSI B16.5 (FF, RF, RTJ)
- ANSI B16.36 Orifice Flange Unions (FF, RF, RTJ)
- DIN EN.1092 (FF, RF)
- DIN 19214 Orifice Flange Unions (FF, RF)

The COP material will be the same or equivalent to that of the Flange Unions.

Conditioning Orifice Type

The COP will be configured as either a Compact Orifice Plate design or as an Orifice Plate design. Both designs will have four symmetrical orifice holes with a specific beta size depending on the process application.

Compact Conditioning Orifice Plate

- Shall be of all-welded design
- Shall be capable of withstanding 1440 psig at 100°F (99 bar at 38°C)
- Shall be capable of installing between ANSI Flange Unions
- Shall have a centering mechanism for installation in center of pipe
- Shall be capable of direct mounting to the pressure instrument

Conditioning Orifice Plate

- Shall be of Paddle type or Universal Type
- Shall be capable of withstanding 6000 psig at 100°F (408 bar at 38°C)
- Shall be capable of installing between Orifice Flange Unions

Flowmeter Specifications

The vendor shall be able to supply the COP primary integrated with the pressure instrument to create a complete flowmeter.

- The vendor shall have the ability to provide a flowmeter for both volumetric and mass flow output.

Functional Specifications

- The pressure instrument shall have the capability to be supplied as mounted directly on the COP primary when the process temperature is less than 450°F (232°C).
- Differential pressure instruments shall be capacitance technology-based.
- The pressure instrument sensor shall be hermetically sealed from the external environment.
- The pressure instrument shall have built-in transient protection.

Communication Specifications

- Communication with the flowmeter can occur via a hand-held device.
- Digital communication with the flowmeter shall be via open protocols (e.g. HART, FOUNDATION™ Fieldbus). Proprietary protocols are not permitted.
- The flowmeter shall allow field upgrading of communication protocols and the addition of advanced instrument software functions without changing the pressure sensor.

Software Specifications

- The flowmeter shall contain user definable low flow cut-off functionality.
- The pressure instrument shall be able to fully communicate with a Microsoft® Windows® based instrument management software via an open communication protocol.
- It shall be possible to store last calibration date and next calibration due date in the pressure instrument memory using a hand held configurator. This information should be available on Windows-based instrument management software.
- All instruments shall retain original factory calibration settings in a permanent memory. It shall be possible to recall this calibration using a hand-held communicator.

LCD Specifications

- The instrument indicator shall be LCD type. It shall display the numeric value and also have a 0-100% scale bar graph corresponding to the analog output. It shall be possible to configure the indicator to display more than one parameter (pressure, scaled output); in this case the display will toggle / scroll to show all selected parameters. The indicator will display all alarms and alerts.

Volumetric Output Flowmeters

A volumetric measurement is ideal for liquid fluid types.

When the COP is integrated with a differential pressure instrument for volumetric output, the flowmeter shall perform as follows:

- Within ± 0.75% to ± 0.95% of flow rate, dependant on beta size.
- The vendor shall make independent testing documentation available demonstrating this performance.

Functional Specifications

- Pressure instrument hardware / software failure alarm shall be selectable as high, low, or any user-defined value.
- The flowmeter shall have the ability to detect impulse line plugging or should allow field upgrading to include this by the addition of an electronics card.

Software Specifications

- The flowmeter shall allow the digital output of the pressure instrument to be scaled to any user-defined unit (e.g 0-200 m^3/hr, 0-9000 gallons/min).
- The flowmeter shall allow custom user-entered digital alerts for both high and low values for the pressure reading. This digital alert will not affect the analog output.
- Flowmeters for custody transfer will have hardware and software write protect security. Hardware security will override software.

LCD Specifications

- It shall be possible to remote mount electronics with a display up to 100 ft (30 m) from the pressure sensor. These electronics will allow full configuration of the instrument via a hand-held communicator.

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Mass Flow Flowmeters

For compressible fluid applications (i.e. steam and gases), multivariable differential pressure flowmeters are ideal. These flowmeters shall perform real-time calculations by compensating for changes in the COP flow coefficient (Cd) factor, gas expansion factor, velocity of approach factor, density or compressibility, viscosity, and Reynolds Number.

When a multivariable transmitter is integrated with the COP, the flowmeter shall perform within ±0.7% to ±0.9% of mass flow rate in gas and steam. The vendor shall make independent testing documentation available demonstrating this performance.

Functional Specifications

- The flowmeter shall provide a fully compensated mass flow output.
- The flowmeter shall have the capability of either a Gage Pressure (GP) sensor or an Absolute Pressure (AP) sensor.
- The pressure instrument shall be two-wire, multivariable (differential pressure, pressure, and temperature).

Software Specifications

- Pressure Instrument outputs shall be a 4-20 mA analog signal, user-selectable to represent mass flow, differential pressure, static pressure, or temperature, with a superimposed digital signal, using HART® protocol.
- The pressure instrument shall perform continuous diagnostics, capable of self-test functions and be able to provide specific diagnostic information.
- Basic configuration capabilities of the pressure instrument shall allow the user the ability to input and store information including the range, engineering units, damping, drain / vent valves, flange, and O-ring materials, date, message, descriptor, tag number, and serial number.
- Mass flow configuration shall allow the user to input and store information including the fluid name, fluid density, fluid viscosity and the COP primary element calibration factor.

To calculate mass flow, the transmitter shall utilize the full DP mass flow equation:

$$Q_m = NC_d EY_1 d_2 \{DP(\rho)\}^{\frac{1}{2}}$$

Where,

Q_m = Mass Flow

N = Units Conversion Factor

C_d = Discharge Coefficient

Y_1 = Gas Expansion Factor

E = Velocity of Approach Factor

d_2 = Bore of the Differential Producer

ρ=Density

DP = Differential Pressure

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