Rosemount 3095 MultiVariable Mass Flow Transmitter

EQUIPMENT DESCRIPTION

The transmitter shall meet the following technical description:

- Two-wire, multivariable (DP, P, T), capacitance DP, piezoresistive AP/GP, highly functional, high-performance, full dynamically compensated mass flow transmitter with HART or Foundation Fieldbus based digital communication capabilities.
- Small, lightweight Coplanar design.

REFERENCES

Material supplied under this specification shall be in conformance with:

- National Electric Code (NFPA 70) 501-5 by incorporating a two-compartment electronics housing for separation of the process medium and the electrical conduit.
- National Electrical Manufacturer's Association (NEMA) standard number ICS6 "Enclosure for industrial controls and systems," 4X.
- IP65, IP66, or IP68, depending on the installation conditions.
- Factory Mutual (FM) standards for explosion-proof enclosure and intrinsically safe electronic circuitry (HART and Foundation Fieldbus).
- ATEX (HART Only) for intrinsically safe electronic circuitry and flameproof and dust enclosures.
- CE mark per European standards EN 50081-1, EN 50082-2, and EN 61326-1.

Manufacturer must be certified as meeting the requirements of ISO 9001.

ENVIRONMENTAL CONDITIONS

The instrument selected shall be suitable for the following conditions:

- Humidity: 0-100% relative humidity
- Ambient Temperature Limits: -40 to 185 °F (-40 to 85 °C)

The transmitter shall have a dual-compartment housing with a moisture barrier completely isolating the electronic circuitry from the field wiring and calibration terminals.

PROCESS CONDITIONS

The 3095 transmitter shall be suitable for liquid, gas, and steam service.

The process temperature limits at the transmitter isolator flange shall be:

- Silicone fill: -40 to 250 °F (-40 to 121 °C)
- Inert fill: 0 to 185 °F (-18 to 85 °C)

Overpressure Limit: 0 to two times the pressure sensor range with a maximum of 3626 psia (250 bar).

Static Pressure Limit: operates within specifications between static line pressures of 0.5 psia and the URL of the absolute pressure sensor.

ELECTRICAL

The 3095 transmitter shall be certified for use in hazardous areas by a recognized body, such as Factory Mutual.

Electrical connections shall include a choice of the following conduit: 1/2 – 14 NPT, M20 x 1.5 (CM20), or PG13.5.

POWER SUPPLY

The 3095 transmitter shall operate on the following voltage levels with no load:

- 4 – 20 mA with HART: 11 – 55 Vdc
- Foundation Fieldbus: 9 – 32 Vdc

MEASUREMENT RANGES

DP, AP/GP, and temperature ranges shall be available as follows:

	Minimum Span	Maximum Span
Differential	0.5 in. H20 (1,25 mbar)	1000 in. H20 (2,49 bar)
Absolute	8 psia (0,55 bar)	3626 psia (250 bar)
Gage	8 psig (0,55 bar)	3626 psig (250 bar)

The transmitter shall have dynamic temperature compensation over a range of -300 to 1500 °F (-184 to 816 °C).

The transmitter shall measure temperature through an external 3 or 4 wire 100 Ohm platinum RTD.

OUTPUTS

The 3095 transmitter shall be available with the following output protocols:

- Foundation Fieldbus
- 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 analog output shall be adjustable remotely with a field communicator, personal computer with Engineering Assistant software, or a control system.

DATA STORAGE

The transmitter data shall be stored in nonvolatile memory.

The sensor module characterization data shall be an integral part of the sensor module.

Data integrity shall be protected by an 8-bit checksum.

Message integrity shall be verified by vertical and longitudinal parity checks.

SOFTWARE FUNCTIONALITY

The transmitter shall be capable of digital communication without disruption via Foundation Fieldbus protocol or 4-20mA with HART protocol.

The transmitter shall perform continuous diagnostics, capable of self-test functions and be able to provide specific diagnostic information.

Basic configuration capabilities of the transmitter 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 utilize the full DP mass flow equation to calculate the mass flow of gases and liquids as represented by the following equation:

$$Q_m = NC_d E Y_1 d^2 \sqrt{DP\rho}$$

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 Primary Element
ρ = Density
DP= Differential Pressure

The transmitter shall calculate mass flow by dynamically compensating for changes in discharge coefficient of the differential producer, gas expansion factor, velocity of approach factor, density or compressibility, viscosity, Beta ratio, and Reynolds number.

Transmitter configurable software shall allow the user to configure the transmitter with data from the AIChE fluid properties database and allow for user-defined fluid properties.

Process variable (Flow, DP, P, and T) information shall be available digitally.

Transmitter software security shall be user-selectable.

Upscale/Downscale failure mode shall be user-selectable.

PERFORMANCE

The transmitter shall meet the following performance criteria as a minimum:

Specification Conformance

All transmitter performance specifications shall conform to a minimum of ±3 sigma standard.

Mass Flow

- Accuracy
  - Ultra for Flow: ±1.0% of mass flow rate over 10:1 flow range (100:1 DP range for liquids and gases)
  - Standard: ±1.0% of mass flow rate over 8:1 flow range (64:1 DP range for liquids and gases)
- Totalized Mass Flow: ±1.0% of total mass flow

Differential Pressure

Range 2 & 3
Reference Accuracy:

- Ultra for Flow
  - ±0.05% of DP reading for rangedown from 1:1 to 3:1 of URL
  - ±[0.05% + 0.0145(URL/Reading)]% of reading for rangedowns greater than 3:1 of URL
- Standard
  - ±0.075% of span for spans from 1:1 to 10:1 of URL
  - ±[0.025 + 0.005(URL/Span)]% of span for spans greater than 10:1 of URL

Static Pressure Effects per 1000 psi (6.9MPa)

- Zero: ±0.05% of URL
- Span: ±0.20% of reading

Stability:

- ±0.25% of URL for 10 years (Ultra for Flow)
- ±0.125% of URL for 5 years (Standard)

Range 1
Reference Accuracy:

- ±0.10% of Span for rangedowns from 1:1 to 15:1
- ±[0.025 + 0.005(URL/Span)]% of Span for rangedowns greater than 15:1 of URL.

Static Pressure Effects per 800 psi (5.5 MPa)

- Zero: ±0.05% of URL
- Span: ±0.40% or reading

Stability

- ±0.2% of URL for 1 year

Total Ambient Temperature Effects per 50 °F (28 °C)

Range 1

- ±(0.20% of URL + 0.25% of span) for spans from 1:1 to 30:1
- ±(0.24% of URL + 0.15% of span) for spans from 30:1 to 50:1

Range 2-3

- ±(0.025% of URL + 0.125% of span) for spans from 1:1 to 30:1
- ±(0.035% of URL - 0.175% of span) for spans from 30:1 to 100:1

Range 2-3 Ultra for Flow (Option U3)(1)

- ±0.130% reading for rangedown from 1:1 to 3:1 of URL
- ±[0.05 + 0.0345 (URL/Reading)]% Reading > 3:1 to 100:1 of URL

Absolute/Gage Pressure

Reference Accuracy:

- ±0.075% of span for spans from 1:1 to 10:1 of URL
- [0.03 + 0.0075(URL/Span)]% of span for spans greater than 10:1 of URL

Stability:

- ±0.125% of URL for 5 years

Total Ambient Effects per 50 °F (28 °C):

- ±(0.050% of URL + 0.125% of span) spans from 1:1 to 30:1
- ±(0.060% of URL – 0.175% of span) for spans form 30:1 to 100:1

(1) Ultra for Flow (Option U3) applicable for DP ranges 2 and 3 with SST isolator material and silicone fill fluid only.

Temperature

12 & 24 ft. Cables

Reference Accuracy:

- ±1.0 °F (0.56 °C) for process temperature from -150 to 1200 °F (-101 to 649 °C)
- For above 1200 °F (649 °C), add ±1.0 °F (0.56 °C) per 100 °F (0.38 °C)

Stability:

- ±1.0 °F (0.56 °C) for 12 months

75 ft. Cables

Reference Accuracy:

- ±2.0 °F (1.12 °C) for process temperatures from -150 to 1200 °F (-101 to 649 °C)
- For above 1200 °F (649 °C), add ±1.0 °F (0.56 °C) per 100 °F (38 °C)

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