# General Specifications

EJX930A
Multivariable Transmitter

DPharp EJX™

**GS 01C25R04-01EN**

[Style: S1]

*The high performance EJX930A multivariable transmitter features multi-sensing technology with a single-crystal silicon resonant sensor that outputs the measured differential pressure, static pressure and process temperature, which covers multiple protocols: HART, FOUNDATION fieldbus and RS485 Modbus.*

*Additionally the HART protocol and FOUNDATION fieldbus protocol types are suitable to measure dynamically calculated and fully compensated mass flow for liquid, gas, or steam. 4 to 20 mA DC signal output is available in HART protocol type.*

*A multi-sensing version is also available for users who do not require flow calculation functions. FDT/DTM* standard conforming software is available for transmitter configuration. FSA120 FlowNavigator is used for flow configuration of the HART protocol and FOUNDATION fieldbus protocol types.*

**: FDT (Field Device Tool): Defines the system environment in which the DTM runs.*
*DTM (Device Type Manager): The application which defines the graphical user interface (GUI) specific to the device.*



## Key features:

**[HART protocol type]**
- Saturated Steam Mode for HART Protocol Revision 7 and Device Revision 12 or later
  External temperature can be calculated and output from static pressure by using the built-in steam table (IAPWS-IF97) without external temperature input.
- 1.0% mass flow rate accuracy over 1:10 flow range (In case of uncalibrated differential producer (Orifice))
- HART7: Orifice, Nozzle, Venturi, Multiport Averaging Pitot and Cone meters primary devices are supported
- HART5: Orifice, Nozzle and Venturi primary devices are supported
- Advanced diagnostic function (option)
- Simultaneous dual output of 4 to 20mA and pulse signals.
- HART protocol revision selectable from 5 (HART 5) or 7 (HART 7)
- Long tag supporting up to 32 characters (HART 7)
- Enhanced burst mode and event notification(HART 7)
- SIL2 for safety requirement

  Note: HART 5 stands for HART protocol revision 5
  HART 7 stands for HART protocol revision 7

**[FOUNDATION Fieldbus protocol type]**
- 1.0% mass flow rate accuracy over 1:10 flow range (In case of uncalibrated differential producer (Orifice))
- Orifice, Nozzle and Venturi primary devices are supported
- Advanced diagnostic function (option)
- Various function blocks available; 5 AIs, AR, IT, SC, and IS as standard. PID as an optional feature.
- Cyclically displays up to 10 variables
- Software download function (option)

**[Modbus protocol type]**
- RS485 Modbus protocol type provides easy multi-sensing data transmission to the flow computers.
- The process data status is provided for each measured differential pressure, static pressure and process temperature. It is easy to implement process data diagnosis.
- Cyclically displays up to 16 variables including RTU management data.
- Up to 32 transmitters can be connected by multi-drop communication.
- 32 characters long tag and squawk are supported for easy identification of transmitters.

YOKOGAWA

Yokogawa Electric Corporation
2-9-32, Nakacho, Musashino-shi, Tokyo, 180-8750 Japan
Tel.: 81-422-52-5690 Fax.: 81-422-52-2018

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# ■ STANDARD SPECIFICATIONS

## □ SPAN AND RANGE LIMITS

### Differential Pressure (DP)

| Measurement Span/Range | | kPa | inH2O (/D1) | mbar (/D3) | mmH2O (/D4) |
|---|---|---|---|---|---|
| M | Span | 1 to 100 | 4 to 400 | 10 to 1000 | 100 to 10000 |
| | Range | -100 to 100 | -400 to 400 | -1000 to 1000 | -10000 to 10000 |
| H | Span | 5 to 500 | 20 to 2000 | 50 to 5000 | 0.05 to 5 kgf/cm2 |
| | Range | -500 to 500 | -2000 to 2000 | -5000 to 5000 | -5 to 5 kgf/cm2 |

### Static Pressure (SP)

Absolute Pressure

| Measurement Span/Range | | MPa abs | psia (/D1) | bar abs (/D3) | kgf/cm2 abs (/D4) |
|---|---|---|---|---|---|
| M H | Span | 1 to 32 | 145 to 4500 | 10 to 320 | 10 to 320 |
| | Range | 0 to 32 | 0 to 4500 | 0 to 320 | 0 to 320 |

Gauge Pressure (Sealed gauge)

| Measurement Span/Range | | MPa | psi (/D1) | bar (/D3) | kgf/cm2 (/D4) |
|---|---|---|---|---|---|
| M H | Span | 1 to 32 | 145 to 4500 | 10 to 320 | 10 to 320 |
| | Range | -0.1 to 32 | -14.5 to 4500 | -1 to 320 | -1 to 320 |

* When the saturated steam mode (ET Fixed = Saturated Steam) is set, static pressure range is 70 kPa abs ~ 22.064 MPa abs

### External Temperature (ET) (Pt100 ohm)

| Measurement External Temperature Span/Range | | °C | °F | K |
|---|---|---|---|---|
| M H | Span | 10 to 1050 | 18 to 1890 | 10 to 1050 |
| | Range | -200 to 850 | -328 to 1562 | 73 to 1123 |
| | Fixed Temperature | -273 to 1927 | -459 to 3500 | 0 to 2200 |

* When the saturated steam mode (ET Fixed = Saturated Steam) is set, external temperature value limit is 90 ~ 374°C.

## □ PERFORMANCE SPECIFICATIONS

Zero-based calibrated span output, and silicone oil, unless otherwise mentioned.
For FOUNDATION Fieldbus and Modbus protocol communication types, use calibrated range instead of span in the following specifications.

**Specification Conformance**

EJX series ensures specification conformance to at least ±3σ.

**Mass Flow (For Measurement Function Code B of HART and FOUNDATION Fieldbus protocol types)**

**Mass Flow Reference Accuracy**

±1.0% of Mass Flow Rate over 10:1 flow range (100:1 DP range) for liquids and gases.

**Totalized Mass Flow Reference Accuracy**

1.0% of Total Mass Flow.
Note: Assume 100:1 DP range for liquids and gases.

Conditions for mass flow accuracy
(1)Auto compensation mode.
(2)M and H capsule
(3)Uncalibrated differential producer (Orifice) installed based on the following standards. *1
(4)Uncertainties for discharge coefficient, primary device bore, pipe diameter, and gas expansion factor defined on following standards. *1
(5)Density uncertainty less than 0.1%.

*1: Standards: ISO5167-1 1991, ISO5167-2 2003, ASME, MFC-3M 1989, AGA No.3 1992

**Differential Pressure (DP)**

**Reference Accuracy of Calibrated Span (Includes terminal-based linearity, hysteresis, and repeatability)**

| Measurement span | | H |
|---|---|---|
| Reference accuracy | X ≤ span | ±0.04% of Span |
| | X > span | ±(0.005+0.0049 URL/span)% of Span |
| X | | 70 kPa (280 inH2O) |
| URL (upper range limit) | | 500 kPa (2000 inH2O) |

| Measurement span | | M |
|---|---|---|
| Reference accuracy | X ≤ span | ±0.04% of Span |
| | X > span | ±(0.005+0.0035 URL/span)% of Span |
| X | | 10 kPa (40 inH2O) |
| URL (upper range limit) | | 100 kPa (400 inH2O) |

**Ambient Temperature Effects per 28°C (50°F) Change**

| Capsule | Effect |
|---|---|
| H | ±(0.07% Span + 0.0125% URL) |
| M | ±(0.07% Span + 0.009% URL) |

**Static Pressure Effects per 6.9 MPa (1000 psi) Change**

**Span Effects**

M and H capsules
±0.075% of span

**Effect on Zero**

| Capsule | Effect |
|---|---|
| H | ±0.028% URL |
| M | ±0.02% URL |

**Overpressure Effects**

Overpressure condition: up to maximum working pressure
M and H capsules
±0.03% of URL

**Stability (All normal operating condition, including overpressure effects)**

M and H capsules
±0.1% of URL per 15 years

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### Static Pressure (SP)

#### Reference Accuracy of Calibrated Span for Absolute pressure

#### (Includes terminal-based linearity, hysteresis, and repeatability)

| Capsule | Reference accuracy |
|---|---|
| M, H | ±0.1% of span |

Note: Gauge pressure reference is 1013.25 hPa (1 atm) The gauge pressure variable is based on the above reference accuracy and can be affected by changes in the atmospheric pressure.

#### Ambient Temperature Effects per 28°C (50°F) Change

| Capsule | Effect |
|---|---|
| M, H | ±0.14% Span ± 0.018% URL |

### External temperature (ET)

#### Accuracy (Includes terminal-based linearity, hysteresis, and repeatability)

| Capsule | Accuracy |
|---|---|
| M, H | ±0.5°C (±0.9°F) |

* Specification for External temperature is the transmitter portion only.
Sensor errors caused by the RTD are not included.
The transmitter is compatible with any Pt100 RTD conforming to IEC 751.
Input/output signal is non-isolated.

** When the saturated steam mode (ET Fixed = Saturated Steam) is set, external temperature is calculated from static pressure by using the built-in steam table. The calculation accuracy is ±0.5°C

#### Ambient Temperature Effects per 28°C (50°F ) Change

| Capsule | Effect |
|---|---|
| M, H | ±0.5°C (±0.9°F) |

### Power Supply Effects (HART protocol type)

±0.005 % per Volt (from 21.6 to 32 V DC, 350Ω)

### Vibration Effects

| Signal | Effect |
|---|---|
| Differential Pressure | ±0.1% of URL |
| Static Pressure | ±0.1% of URL |
| External Temperature | ±0.5°C (±0.9°F) |

Amplifier housing code 1:
When tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz, 0.21 mm displacement/60-2000 Hz 3 g)
Amplifier housing code 2:
When tested per the requirements of IEC60770-1 field with general application or pipeline with low vibration level (10-60 Hz 0.15mm displacement /60-500 Hz 2g)

### Mounting Position Effects

Rotation in diaphragm plane has no effect.
Tilting up to 90 degree will cause zero shift up to 0.4 kPa (1.6 in$H_2O$) which can be corrected by the zero adjustment.

### Response Time

| Signal | Capsule | HART | Fieldbus*1 | Modbus |
|---|---|---|---|---|
| Differential Pressure | M, H | 250 ms | 350 ms | 250 ms |
| Static Pressure | M, H | 200 ms | 300 ms | 200 ms |

When amplifier damping is set to zero and including dead time.
*1: Output from transducer block.

## ■ FUNCTIONAL SPECIFICATIONS

### Output specifications for HART Protocol Type

#### Output

Dual output (Both analog and pulse/contact outputs can be obtained simultaneously. See “Wiring Example for Analog Output and Status/Pulse Output”).

#### HART Protocol Revision

HART protocol revision can be selected from 5 or 7 when ordering.
The protocol revision can be changed by user configuration.
The HART protocol revision at the time of shipment is shown by the last number at the serial number column of the name plate.

#### Analog Output

Two wire 4 to 20 mA DC output, user-selectable for Differential Pressure, Static Pressure, External Temperature or Flow Rate signal.
Output range: 3.8 mA to 21.6 mA.
Digital HART FSK protocol are superimposed on the 4 to 20 mA signal.

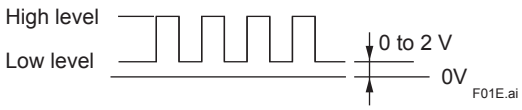
#### Failure Alarm

Analog output status at CPU failure and hardware error;
Up-scale: 110%, 21.6 mA DC or more (standard)
Down-scale: −2.5%, 3.6 mA DC or less
Analog output status at process abnormality (Option code /DG6);
The result of process abnormality detected by the advanced diagnostic function can be reflected to an analog alert status. The following three setting modes are available.

| | | Mode | | |
|---|---|---|---|---|
| | | Burnout | Fall back | Off |
| Standard | | 110%, 21.6mA or more | Holds to a specified value within the output range from 3.8mA to 21.6mA | Normal output |
| Option Code | /C1 | -1.25%, 3.8mA or less | | |
| | /C2 | -1.25%, 3.8mA or less | | |
| | /C3 | 103.1%, 20.5mA or more | | |

#### Pulse/Contact Output

Pulse or status output is selectable by parameter setting.
Transistor contact output (sink type).
Contact rating: 30 V DC, 120 mA DC max.
Low level: 0 to 2 V DC. (See figure below for high and low levels (pulse output).)




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**Pulse Output**
Scaled pulse or frequency pulse output is selected by parameter setting.
- **Scaled Pulse Output Function**
  Pulse is output by the unit of the scaled flow rate. Scaled pulse can be totalized.
- **Frequency Output Function**
  Number of pulses output per second at 100% of output.
  Pulse frequency: Max. 10 kHz
  Duty cycles: Approx. 50% (1:2 to 2:1)

**Contact Output Function**
High or low alarm
Status signal output mode can be reversed (ON/OFF).

**Signal Output**

| Output | Flow rate*1 | Differential pressure | Static pressure | External temperature | Total flow*1 |
|---|---|---|---|---|---|
| 4-20mA | ✓*3 | ✓*2 | ✓ | ✓ | |
| Pulse output | ✓ | | | | ✓ |
| High/Low alarm | ✓ | ✓ | ✓ | ✓ | |

*1: When Measurement function code B is specified.
*2: Square root output is not available. Low cut linear mode is not supported.
*3: Reversed output is not available.

**Output specifications for FOUNDATION Fieldbus Protocol Type**

**Output**
Digital communication signal based on the FOUNDATION fieldbus specification.

**Functional Specifications**
Functional specifications for Fieldbus communication conform to the standard specification (H1) of FOUNDATION fieldbus.

**Function Block**

| Block name | Number | Execution time | Note |
|---|---|---|---|
| AI | 5 | 30 ms | For flow, differential pressure, static pressure, external temperature and capsule or amplifier temperature. |
| SC | 1 | 30 ms | An output of Signal characterizer block is a nonlinear function of the respective input. The function is determined by a table. |
| IT | 1 | 30 ms | Integrator block intergrates a variable as a function of the time of accumulates the counts. |
| IS | 1 | 30 ms | Input Selector block provides selection of up to eight inputs and generate an output based on the configured action. |
| AR | 1 | 30 ms | Arithmetic block allows simple use of popular measurement math functions. |
| PID | 1 | 45 ms | Applicable when /LC1 option is specified. |

**LM Function**
LM function is supported.

**Output specifications for Modbus Protocol Type**

| Item | Description |
|---|---|
| Communication protocol | 2-wire half duplex RS-485 Modbus |
| Flow control | None |
| Baud rate | 1200, 4800, 9600*, 19200 |
| Start bit | 1 bit (Fixed) |
| Stop bit | 1 bit*, 2 bits |
| Parity bit | Odd, Even, None* |
| Transfer mode | RTU (Remote Terminal Unit) |
| | Data length: 8 bits |
| | LSB (Least significant bit sent first) |
| Slave address | 1* to 247 |
| Support function | 1: Read Coils |
| | 2: Read Discrete Inputs |
| | 3: Read Holding Registers |
| | 4: Read Input Register |
| | 5: Write Single Coil |
| | 8: Diagnostic (00: Return Query Data) |
| | 16: Write Multiple registers |
| | 43: Read device Identification |
| Bus termination | Standard RS-485 bus termination ON (bus end), OFF* (not bus end) |

*: Factory default setting

**Advanced Diagnostics (option for HART and FOUNDATION Fieldbus protocol types)**
- Impulse line blockage detection
  The impulse line condition can be calculated and detected by extracting the fluctuation component from the differential pressure and static pressure signals. Also EJX930A detects the impulse line abnormality particularly which side of impulse line is plugged.
- Heat trace monitoring
  The change of the flange temperature calculated by using the two temperature sensors built in the EJX930A enables to detect the heat trace breakage or the abnormal temperature due to the failure.

**Saturated Steam Mode for HART Protocol Revision 7 and Device Revision 12 or later**
When the saturated steam mode (ET Fixed = Saturated Steam) is set, external temperature is calculated from static pressure by using the built-in steam table (IAPWS-IF97) and its value limit is 90 to 374°C. The static pressure range corresponding to the external temperature value limit is 70kPa to 22.064 MPa. Errors caused by disconnection of RTD sensor do not occur in the mode.

Note: Setting of the ET fixed mode affects the external temperature range (ET LRV/URV) that can be set (saturated steam mode: 100 to 349°C, others: -210 to 860°C). Set the properly external temperature range when the mode is saturated steam.

Note: External temperature configuration and value is limited when calculating flow value of saturated steam (Following IAPWS-IF97).
1. Output external temperature measured by RTD sensor:
   Configuration: ET Fixed = No
   External temperature value limit: 0 to 374°C (Under saturated steam state)
2. Output external temperature calculated from the static pressure by using the built-in steam table:
   Configuration: ET Fixed = Saturated Steam
   External temperature value limit: 90 to 374°C

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**Damping Time Constant (1st order)**
Amplifier damping time constant is adjustable from 0.00 to 100.00 seconds and added to response time, applicable independently for “DP, SP, ET, and flow” for HART, FOUNDATION fieldbus and “DP, SP, and ET” for Modbus. When the saturated steam mode (ET Fixed = Saturated Steam) is set, the damping setting of the external temperature is disabled, and its time constant value is treated as zero.

**Update Period**

| Signal | HART | Fieldbus | Modbus |
|---|---|---|---|
| Flow rate | 100 ms | 200 ms | — |
| Differential pressure | 100 ms | 200 ms | 100 ms |
| Static pressure | 100 ms | 200 ms | 100 ms |
| External temperature | 400 ms | 800 ms | 400 ms |
| Total flow | 1000 ms | —* | — |

*: Output from IT function block.

**Zero Adjustment Limits**
Zero can be fully elevated or suppressed, within the lower and upper range limits of the capsule, applicable for DP, SP, and ET independently.

**External Zero Adjustment**
External zero for DP is continuously adjustable with 0.01% incremental resolution of span. When the saturated steam mode (ET Fixed = Saturated Steam) is set, zero-point adjustment of the external temperature is disabled, and its trim value (ET LTD) is treated as zero.

**Integral Indicator (LCD)**
5-digit (Flow, DP, SP, and ET) or 6-digit (Total flow) numerical display, 6-digit unit display and bar graph. The indicator is configurable to display one or up to four variables periodically.
For FOUNDATION Fieldbus, the indicator is configurable to display up to 10 function block output values.
For Modbus, the indicator is configurable to display up to 16 output values including RTU output.

**Burst Pressure Limits**
132 MPa (19100 psi)

**Self Diagnostics**
CPU failure, hardware failure, configuration error, process alarm for differential pressure, static pressure and external temperature.

**SIL Certification**
EJX series transmitters except FOUNDATION Fieldbus and Modbus protocol types are certified by TÜV in compliance with the following standards;
IEC 61508: 2010; Part1 to Part 7
Functional Safety of electrical/electronic/programmable electronic safety-related systems; SIL 2 capability for single transmitter use, SIL 3 capability for dual transmitter use.

**Functions Applicable for HART Protocol Revision 7**
- Long tag supporting up to 32 characters
  Long tag secures a better asset management with abundant digits in its software.
- Enhanced burst mode and event notification
  Advanced burst mode includes the variety of transmission setting by specifying burst variables, update period, and message trigger mode, and event notification function gives you alert signal based on the status change in preset values and self-diagnosis.
- Squawk
  Identifying the transmitter by displaying the particular pattern on LCD
- Multidrop communication
  Up to 63 transmitters can be connected. An analog signal output available for one device in a loop.

**Functions Applicable for Modbus Protocol**
- Process data diagnosis
  The process data status is provided for each measured differential pressure, static pressure and process temperature. Also device status parameter is available for detail diagnosis.
- Long tag supporting up to 32 characters
  Long tag secures a better asset management with abundant digits.
- Squawk
  Identifying the transmitter by displaying the particular pattern on LCD.
- Multi-drop communication
  Up to 32 transmitters can be connected.

## ■ Mass Flow Calculation

(For Measurement function code B of HART and FOUNDATION Fieldbus protocol types)

### □ Auto Compensation Mode (FSA120 FlowNavigator is required for configuration)

Configuration of the fluid physical properties and primary element for the EJX900 series can be performed using a dialog window of FSA120.
All flow factors for mass flow calculation are dynamically compensated to an optimum value.
In Auto mode, mass flow can be measured with high accuracy.
The flow factors that are automatically compensated are discharge coefficient, diameter of primary device, upstream internal pipe diameter, gas expansion factor, density, and viscosity.

Supported primary devices are different by output signal type.
HART 7 protocol type: Orifice, Nozzle, Venturi, Multiport Averaging Pitot and Cone meters
HART 5 and FOUNDATION Fieldbus protocol types: Orifice, Nozzle, Venturi

FlowNavigator: FSA120 Flow Configuration Software (refer to GS 01C25R51-01EN). The software package is used to perform mass flow configuration for the EJX930A. These software can also read and write the general parameters of HART communications or FOUNDATION Fieldbus communication. Configuration of the fluid physical properties and the primary element of the EJX900 series can be done by means of a dialog menu.

User Flow Parameters (flow settings information input by FSA120 FlowNavigator) are stored to the transmitter when the device revision is 12 or later.

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### □ Basic Flow Calculation Mode

Flow operation and density compensation are performed conventionally, with the flow factors being input manually.
The operational expression is switched by the fluid type and the unit setting.
Density compensation by phase:
Gas: Compensation as ideal gas by temperature and pressure.
Liquid: Compensation by temperature.
Flow unit categories: See Table 1.

**Table 1. Flow Operational Expression**

| Fluid type | Flow unit Category | Flow equation |
|---|---|---|
| Liquid | Mass Flow | Qm, Qv or Qv_norm = Kfactor × √(ΔP×(1+Temp K1×(T–Tb))) *1 |
| | Normal·Standard Volume Flow | |
| | Volume Flow | |
| Gas | Mass Flow | Qm or Qv_norm = Kfactor × √(ΔP×Tb/T×SP/SPb) *1 |
| | Normal·Standard Volume Flow | |
| | Volume Flow | Qv = Kfactor × √(ΔP×T/Tb×SPb/SP) *1 |

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*1: ═══ : User setting parameter

**Table 2. Symbol**

| Symbol | Description |
|---|---|
| Qm | Mass Flow |
| Qv | Volume Flow |
| Qv_norm | Normal·Standard Volume Flow |
| Kfactor | Basic flow Calculation factor |
| ΔP | Differential Pressure (Transmitter Setting unit) |
| Tb | Reference temperature unit: K |
| T | Temperature unit: K |
| SPb | Reference static pressure unit: kPa abs |
| SP | Static Pressure unit: kPa abs |
| Temp K1 | The density rate of change per temperature 1degC of a density base value (value which set 100% to 1)<br>For Volume Flow: Set 0 |

## ■ NORMAL OPERATING CONDITION

(Optional features or approval codes may affect limits.)

**Ambient Temperature Limits**
–40 to 85°C (–40 to 185°F)
–30 to 80°C (–22 to 176°F) with LCD display

**Process Temperature Limits**
–40 to 120°C (–40 to 248°F)

**Ambient Humidity Limits**
0 to 100% RH

**Working Pressure Limits (Silicone oil)**
Maximum Pressure Limits

| | |
|---|---|
| M and H Capsule | 32 MPa (4500 psi) |

**Minimum Pressure Limit**
See figure below.

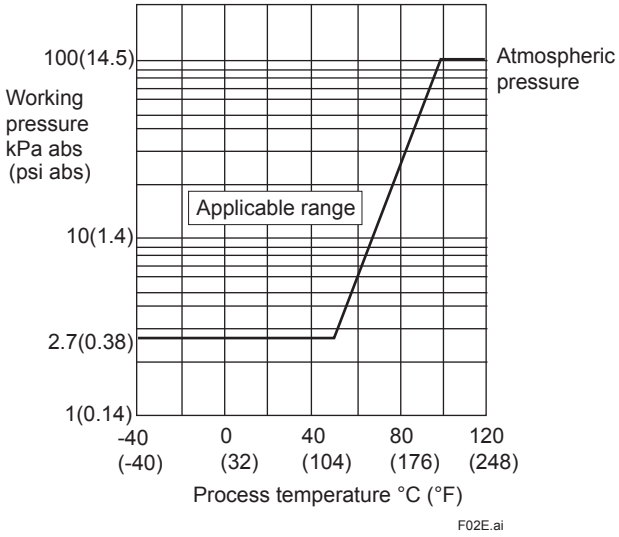



**Figure 1. Working Pressure and Process Temperature**

**Supply & Load Requirements (for HART protocol type)**
(Optional features or safety approvals may affect electrical requirements.)
With 24 V DC supply, up to a 570Ω load can be used. See figure below.

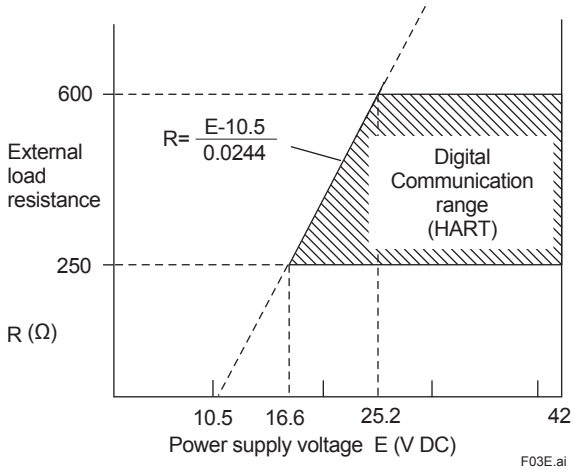



**Figure 2. Relationship Between Power Supply Voltage and External Load Resistance**

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**Supply Voltage**
[for HART]
10.5 to 42 V DC for general use and flameproof type.
10.5 to 32 V DC for lightning protector (Option code / A).
10.5 to 30 V DC for intrinsically safe, type n or nonincendive.
Minimum voltage limited at 16.6 V DC for HART communication.
[for FOUNDATION fieldbus]
9 to 32 V DC for general use, flameproof type, Type n or nonincendive.
[for Modbus]
9 to 30 V DC 250 mW for general use and flameproof type, quiescent supply current 10 mA typical

**Load (for HART protocol type)**
0 to 1335Ω for operation
250 to 600Ω for digital communication

**FOUNDATION Fieldbus Communication Requirements**
Supply Voltage: 9 to 32 V DC
Current draw :
Steady state 15 mA (max)
Software download state 24 mA (max)

**EMC Conformity Standards**
EN61326-1 Class A, Table2
EN61326-2-3
EN61326-2-5 (for fieldbus)

**European Pressure Equipment Directive 2014/68/EU**
Sound Engineering Practice (for all capsules)

With option code /PE3 (for M and H capsules)

Category III, Module H, Type of Equipment : Pressure Accessory-Vessel, type of Fluid: Liquid and Gas, Group of fluid: 1and 2

**EU RoHS Directive**
EN IEC 63000

**Safety Requirement Standards**
EN61010-1, EN IEC 61010-2-030
C22.2 No.61010-1, C22.2 No.61010-2-030
- Installation category: 1 (Anticipated transient overvoltage 330 V)
- Pollution degree: 2
- Indoor/Outdoor use

## ■ PHYSICAL SPECIFICATIONS

**Wetted Parts Materials**

**Diaphragm, cover flange, process connector, capsule gasket, and vent/drain plug**
See “MODEL AND SUFFIX CODES.”

**Process connector gasket**
PTFE Teflon
Fluorinated rubber for option code N2 and N3

**Non-wetted Parts Materials**

**Bolts**
B7 carbon steel, 316L SST or 660 SST

**Housing**
- Low copper cast aluminum alloy
- ASTM CF-8M Stainless steel (optional)

**Coating of housing**
[for aluminum housing]
Polyester resin powder coating
Mint-green paint (Munsell 5.6BG 3.3/2.9 or its equivalent)
[for option code /P□ or /X2]
Epoxy and polyurethane resin solvent coating

**Degrees of protection**
IP66/IP67, Type 4X

**Cover O-rings**
Buna-N, fluoro-rubber (optional)

**Name plate and tag**
316 SST

**Fill fluid**
Silicone oil, fluorinated oil (optional)

**Cable for RTD**
External Temperature Input Code -1, -2, -3, -4
Oil-proof and a heat-resistant cable with a shield
Outside diameter: 8.5 mm (0.335 inch),
Voltage rating: 300V
Temperature rating: –40 to 105°C (–40 to 221°F)
Frame resistance: UL (CSA) VW-1
Adaptation standard: UL (CSA) AWM STYLE 2517

External Temperature Input Code -B,-C,-D
A heat-resistant FEP cable with a shield
Outside diameter: 4.3mm (0.168 inch)
Voltage rating: 300V
Temperature rating: –80 to 200°C (–112 to 392°F)
Flame resistance: NEC Article 800-CMP
Adaptation standard: NEC Article 725-PLTC

Note for using an extension cable:
When extending a temperature cable with using an extension cable and a junction box, total cable length including the original external temperature cable must be less than 25 m. Use PE or XLPE insulated cable for extension.

**Cable gland:**
Nickel plating brass

**Weight**
6.8 kg (14.3 lb) without integral indicator, mounting bracket, process connector and RTD cable.
Add 1.5 kg (3.3 lb) for Amplifier housing code 2.

**Connections**
See “MODEL AND SUFFIX CODES.”
Process connection of cover flange: IEC61518

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## ■ MODEL AND SUFFIX CODES

| Model | Suffix Codes | Description |
|---|---|---|
| **EJX930A** | . . . . . | Multivariable transmitter |
| Output signal | **-E** . . . . . | 4 to 20 mA DC with digital communication (HART protocol)*8 |
| | **-J** . . . . . | 4 to 20 mA DC with digital communication (HART 5/HART 7 protocol)*9 |
| | **-F** . . . . . | Digital communication (FOUNDATION fieldbus protocol) |
| | **-M** . . . . . | Digital communication (RS485 Modbus protocol)<br>When Output signal code -M is selected, option code A must also be selected. |
| Measurement span (capsule) | **M** . . . . . | 1 to 100 kPa (4 to 400 in$H_2O$) |
| | **H** . . . . . | 5 to 500 kPa (20 to 2000 in$H_2O$) |
| Wetted parts material *1 | **S** . . . . . | See Table 5. |
| Process connections | **3** . . . . . | with 1/4 NPT female process connector *10 |
| | **4** . . . . . | with 1/2 NPT female process connector *10 |
| | ► **5** . . . . . | without process connector (1/4 NPT female on the cover flanges) |
| Bolts and nuts material | **J** . . . . . | B7 carbon steel |
| | **G** . . . . . | F316L SST |
| | **C** . . . . . | 660 SST |
| Installation | **-7** . . . . . | Vertical piping, left side high pressure, and process connection downside |
| | **-8** . . . . . | Horizontal piping and right side high pressure |
| | ► **-9** . . . . . | Horizontal piping and left side high pressure |
| Amplifier housing | **1** . . . . . | Cast aluminum alloy |
| | **2** . . . . . | ASTM CF-8M stainless steel |
| Electrical connection | **F** . . . . . | G 1/2 female, two electrical connections (One connection for RTD) |
| | **2** . . . . . | 1/2NPT female, two electrical connections (One connection for RTD) |
| | **4** . . . . . | M20 female, two electrical connections (One connection for RTD) |
| | **5** . . . . . | G 1/2 female, two electrical connections and blind plug *2*6*7 |
| | **7** . . . . . | 1/2NPT female, two electrical connections and a blind plug *2*6*7 |
| | **9** . . . . . | M20 female, two electrical connections and a blind plug *2*6*7 |
| | **A** . . . . . | G 1/2 female, two electrical connections and a 316 SST blind plug *2 |
| | **C** . . . . . | 1/2 NPT female, two electrical connections and a 316 SST blind plug *2 |
| | **D** . . . . . | M20 female, two electrical connections and a 316 SST blind plug *2 |
| Integral indicator | **D** . . . . . | Digital indicator |
| | ► **N** . . . . . | None |
| Mounting bracket | **B** . . . . . | 304 SST 2-inch pipe mounting, flat type (for horizontal piping) |
| | **D** . . . . . | 304 SST 2-inch pipe mounting, L type (for vertical piping) |
| | **J** . . . . . | 316 SST 2-inch pipe mounting, flat type (for horizontal piping) |
| | **K** . . . . . | 316 SST 2-inch pipe mounting, L type (for vertical piping) |
| | **P** . . . . . | 316 SST 2-inch pipe mounting, position adjustable L type (for vertical piping) *14 |
| | ► **N** . . . . . | None |
| External temperature input*3 | **-0** . . . . | Fixed temperature (without cable) *5*12 |
| | **-1** . . . . | RTD input with 0.5 m (1.64 ft) of shielded cable and two cable glands*7*11 |
| | **-2** . . . . | RTD input with 4 m (13.1 ft) of shielded cable and two cable glands*7*11 |
| | **-3** . . . . | RTD input with 7.5 m (24.6 ft) of shielded cable and two cable glands*7*11 |
| | **-4** . . . . | RTD input with 25 m (81 ft) of shielded cable and two cable glands*7*11 |
| | **-B** . . . . | RTD input with 4 m (13.1 ft) of shielded cable without cable gland *4 |
| | **-C** . . . . | RTD input with 7.5 m (24.6 ft) of shielded cable without cable gland *4 |
| | **-D** . . . . | RTD input with 25 m (81 ft) of shielded cable without cable gland *4 |
| Measurement function | **A** . . . | Multi Sensing (DP, P and T) *13 |
| | ► **B** . . . | Mass Flow Measurement (Flow, DP, P and T) (Applicable for Output signal codes -E, -J, and -F). |
| Option codes | | /☐ Optional specification |

The "►" marks indicate the most typical selection for each specification.

*1: ⚠ Users must consider the characteristics of selected wetted parts material and the influence of process fluids. The use of inappropriate materials can result in the leakage of corrosive process fluids and cause injury to personnel and/or damage to plant facilities. It is also possible that the diaphragm itself can be damaged and that material from the broken diaphragm and the fill fluid can contaminate the user's process fluids.
Be very careful with highly corrosive process fluids such as hydrochloric acid, sulfuric acid, hydrogen sulfide, sodium hypochlorite, and high-temperature steam (150°C [302°F] or above). Contact Yokogawa for detailed information of the wetted parts material.

*2: For External temperature input code 0 (Fixed temperature) .

*3: Recommended External Temperature Input Cable is as shown in Table 4. RTD is not provided.

*4: Specify when using conduit for RTD connection.

*5: Preset external temperature value is used for density compensation.

*6: Material of a blind plug is aluminum alloy or 304 SST.

*7: Not applicable for Amplifier housing code 2.

*8: Output signal code E: HART 5.

*9: Output signal code J: HART 5 or HART 7 selectable. Specify HART 5 or HART 7 when ordering. (Output signal code J is recommended for HART communication.)

*10: Lower limit of ambient and process temperature is –15°C.

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*11: Refer to table 6 whether the cable glands are attached or not.
*12: If you use the saturated steam mode (external temperature is calculated from static pressure), set ET fixed parameter to Saturated Steam after shipping.
*13: No flow calculation function. When using the flow calculation function, specify code B.
*14: For position adjustable bracket, refer to SD 01C25B14-01EN.

### ☐Selection guide for HART 5 and HART 7

Select HART 5 or HART 7 as follow.

| Output signal code | Specified item when ordering "HART protocol revision" | HART protocol revision | Selection guide | | Note |
|---|---|---|---|---|---|
| | | | Requirement for HART 7 function | Other conditions | |
| -E | Not Available | HART 5 | NO | Not available to switch to HART 7 protocol after delivery. | * |
| -J | Specify '5' | | | Available to switch to HART 7 protocol after delivery by user-configuration. | ** |
| | Specify '7' | HART 7 | YES<br>In this case, be sure to confirm that HART configuration tool supports HART 7 by Table 3. | Available to switch to HART 5 protocol after delivery by user-configuration. | |

*: This code will be unified to the new code "-J". Therefore the code "-J" is recommended for HART communication type.
**: In case of selecting HART 7 without conforming to Table 3, communication will not be available.

### ☐HART protocol revision and communication

Protocol revision supported by HART configuration tool must be the same or higher than that of the EJX multivariable transmitter.

**Table 3. HART protocol revision and communication**

| | | Protocol revision supported by HART configuration tool | |
|---|---|---|---|
| | | HART 5 | HART 7 |
| Protocol revision of EJX multivariable transmitter | HART 5 | Communication Available | Communication Available |
| | HART 7 | Communication Not Available | Communication Available |

### ☐Applicable External Temperature Cable

**Table 4.**

| External Temperature Input Code | | -1, -2, -3, -4 | -B, -C, -D |
|---|---|---|---|
| General Application | | ✓ | ✓ |
| Factory Mutual (FM) | Explosionproof Approval | | ✓ |
| | Intrinsically Safe Approval Nonincendive | | ✓ |
| ATEX | Flameproof Approval | ✓ | |
| | Intrinsically Safe Approval | ✓ | |
| Canadian Standards Association (CSA) | Explosionproof Approval | | ✓ |
| IECEx Scheme | Flameproof Approval | ✓ | ✓ |

### ☐Wetted Parts Materials

**Table 5.**

| Wetted parts material code | Cover flange | Process connector | Capsule | Capsule gasket | Vent/Drain plug |
|---|---|---|---|---|---|
| S # | F316 SST *3 | ASTM CF-8M *1*3 | Hastelloy C-276 *2 (Diaphragm)<br>F316L SST, 316L SST (Others) | Teflon-coated 316L SST | 316 SST |

*1: Cast version of 316 SST. Equivalent to SCS14A.
*2: Hastelloy C-276 or ASTM N10276.
*3: Intergranular corrosion test passed according to ASTM A262 Practice E.
The '#'marks indicate the construction materials conform to NACE material recommendations per MR0175/ISO 15156.
Please refer to the latest standards for details. Selected materials also conform to NACE MR0103.

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**☐Attached Cable glands for EJX910A and EJX930A**

**Table 6.**

| | | Flameproof approval | | | | Intrinsically safe approval | | | General Application |
|---|---|---|---|---|---|---|---|---|---|
| | | FM CSA | ATEX | IECEx Scheme | NEPSI KOSHA INMETRO EAC | FM | ATEX | NEPSI KOSHA INMETRO EAC | |
| External Temperature Input | -0 | No | No | No | No | No | No | N/A | No |
| | -1, -2, -3, -4 | N/A | Yes | Yes | No | N/A | Yes | | Yes |
| | -B, -C, -D | No | N/A | No | No | No | N/A | | No |

Yes: Attached No: Not attached N/A: Not applicable

## ■ OPTIONAL SPECIFICATIONS (For Explosion Protected)

Please select appropriate equipment in accordance with the laws and regulations of the relevant country/region, when it is used in a location where explosive atmospheres may be present.

| Item | Description | Code |
|---|---|---|
| Factory Mutual (FM) | FM Explosionproof Approval *4<br>Applicable Standard: FM3600:2018, FM3615:2018, FM3810:2018, NEMA 250:2003, ANSI/UL 61010-1:2012, ANSI/UL 61010-2-30:2012<br>Explosionproof for Class I, Division 1, Groups B, C and D, Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G, in Hazardous locations, indoors and outdoors (Enclosure: Type 4X)<br>"FACTORY SEALED, CONDUIT SEAL NOT REQUIRED."<br>Temperature class: T6, Amb. Temp.: –40 to 60°C (–40 to 140°F) | **FF1** |
| | FM Intrinsically Safe and Nonincendive Approval *1 *3 *4<br>Applicable Standard: FM 3600:2011, FM 3610:2010, FM 3611:2004, FM 3810:2005, ANSI/ISA-60079-0-2009, ANSI/ISA-60079-11-2009, ANSI/ISA-60079-27-2006, ANSI/ISA-61010-1-2004, NEMA 250:1991<br>Intrinsically Safe for Class I,II, & III, Division 1, Groups A,B,C,D,F & G, Entity, FISCO.<br>Class I, Zone 0, AEx ia IIC,<br>Enclosure: Type 4X, Temp. Class: T4, Amb. Temp.: –40 to 60°C (–40 to 140°F).<br>Intrinsically Apparatus Parameters:<br>[FISCO (IIC)] Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=3.52 nF, Li=0 µH<br>[FISCO (IIB)] Ui=17.5 V, Ii=460 mA, Pi=5.32 W, Ci=3.52 nF, Li=0 µH<br>[Entity] Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=3.52 nF, Li=0 µH<br>Sensor Circuit: Uo=6.51 V, Io=4 mA, Po=6 mW, Co=34 µF, Lo=500 mH<br>Nonincendive for Class I, Division 2, Groups A, B, C and D, NIFW, FNICO<br>Class I, Zone 2, Group IIC, NIFW, FNICO<br>Class II, Division 2, Groups F&G, and Class III, Division 1<br>Enclosure: Type 4X, Temp. Class: T4, Amb. Temp.: –40 to 60°C (–40 to 140°F)<br>Nonincendive Apparatus Parameters: Vmax.=32 V, Ci=1.76 nF, Li=0 µH | **FS15** |
| ATEX | ATEX Flameproof Approval *4<br>Applicable Standard: EN IEC 60079-0, EN 60079-1, EN 60079-31<br>Certificate: KEMA 07ATEX0109 X<br>II 2G Ex db IIC T6...T4 Gb, II 2D Ex tb IIIC T85°C Db<br>Degree of protection: IP66/IP67<br>Amb. Temp. (Tamb) for gas-proof :<br>T4; –50 to 75°C (–58 to 167°F), T5; –50 to 80°C (–58 to 176°F), T6; –50 to 75°C (–58 to 167°F)<br>Process Temp. for gas-proof (Tp):<br>T4; –50 to 120°C (–58 to 248°F), T5; –50 to 100°C (–58 to 212°F), T6; –50 to 85°C (–58 to 185°F)<br>Max. surface Temp. for dust-proof: T85°C (Tamb: –30 to 75°C, Tp: –30 to 85°C) *5 | **KF22** |
| | ATEX Intrinsically Safe Approval *1 *3 *4<br>Applicable Standards: EN IEC 60079-0, EN 60079-11<br>Certificate: KEMA 06ATEX0278X<br>II 1 G Ex ia IIC/IIB T4 Ga, II 2 D Ex ia IIIC T85°C T100°C T120°C Db Type of protection: IP66/IP67<br>Amb. Temp. for EPL Ga: –40 to 60°C (–40 to 140°F)<br>Amb. Temp. for EPL Db: –30 to 60°C *5<br>Max. Process Temp. (Tp): 120°C (248°F)<br>Max. Surface Temp. for EPL Db. T85°C (Tp:80°C), T100°C (Tp:100°C), T120°C (Tp:120°C)<br>Ambient Humidity: 0 to 100% (No condensation)<br>Electrical data:<br>Supply/Output circuit (terminals + and –)<br>[FISCO (IIC)] Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=3.52 nF, Li=0 µH<br>[FISCO (IIB)] Ui=17.5 V, Ii=460 mA, Pi=5.32 W, Ci=3.52 nF, Li=0 µH<br>[Entity] Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=3.52 nF, Li=0 µH<br>External Temperature Input circuit (connector)<br>Uo=7.63 V, Io=3.85 mA, Po=0.008 W, Co=4.8 µF, Lo=100 mH | **KS26** |

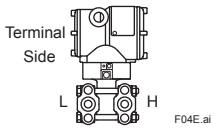
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| Item | Description | Code |
|---|---|---|
| Canadian Standards Association (CSA) | CSA Explosionproof Approval *4<br>Certificate: 2014354<br>Applicable Standard: C22.2 No.0, C22.2 No.0.4, C22.2 No.0.5, C22.2 No.25, C22.2 No.30, C22.2 No.94, C22.2 No.60079-0, C22.2 No.60079-1, C22.2 No.61010-1, C22.2 No.61010-2-030<br>Explosion-proof for Class I, Groups B, C and D.<br>Dustignition-proof for Class II/III, Groups E, F and G.<br>When installed in Division 2, “SEAL NOT REQUIRED” Enclosure: Type 4X, Temp. Code: T6...T4<br>Ex d IIC T6...T4 Enclosure: IP66 and IP67<br>Max.Process Temp.: T4;120°C (248°F), T5;100°C (212 °F), T6; 85°C (185°F)<br>Amb.Temp.: –50 to 75°C (–58 to 167°F) for T4, –50 to 80°C (–58 to 176°F) for T5, –50 to 75°C (–58 to 167°F) for T6 *5<br>Process Sealing Certification<br>Dual Seal Certified by CSA to the requirement of ANSI/ISA 12.27.01<br>No additional sealing required<br>Primary seal failure annunciation: at the zero adjustment screw | **CF1** |
| IECEx Scheme | IECEx Flameproof Approval *4<br>Applicable Standard: IEC 60079-0, IEC 60079-1, IEC 60079-31<br>Certificate: IECEx DEK 14.0046X<br>Enclosure: IP66/IP67<br>Ex db IIC T6...T4 Gb, Ex tb IIIC T85°C Db<br>Amb. Temp. (Tamb) for gas-proof :<br>T4; –50 to 75°C (–58 to 167°F), T5; –50 to 80°C (–58 to 176°F), T6; –50 to 75°C (–58 to 167°F)<br>Process Temp. for gas-proof (Tp):<br>T4; –50 to 120°C (–58 to 248°F), T5; –50 to 100°C (–58 to 212°F),<br>T6; –50 to 85°C (–58 to 185°F)<br>Max. surface Temp. for dust-proof: T85°C (Tamb: –30 to 75°C, Tp: –30 to 85°C) *5 | **SF22** |

Contact Yokogawa representative for the codes indicated as ‘—’
*1: Not Applicable for Output signal codes -E and -J.
*2: Not Applicable for Output signal code -F.
*3: Not Applicable for Output signal code -M.
*4: Applicable for Electrical connection codes 2, 4, 7, 9, C, and D.
*5: Lower limit of ambient temperature is –15°C (5°F) when option code HE is specified.

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## ■ OPTIONAL SPECIFICATIONS

| Item | | Description | | Code |
|---|---|---|---|---|
| Painting | Color change | Amplifier cover only | | P□ |
| | | Amplifier cover and terminal cover, Munsell 7.5 R4/14 | | PR |
| | Coating change | Anti-corrosion coating*1 | | X2 |
| 316 SST exterior parts | | 316 SST zero-adjustment screw and setscrews*15 | | HC |
| Fluoro-rubber O-ring | | All O-rings of amplifier housing. Lower limit of ambient temperature: –15°C (5°F) | | HE |
| Lightning protector | | HART protocol type:<br>Transmitter power supply voltage: 10.5 to 32 V DC<br>Allowable current: Max. 6000 A (1×40 µs), Repeating 1000 A (1×40 µs) 100 times<br>Applicable Standards: IEC 61000-4-4, IEC 61000-4-5<br>FOUNDATION fieldbus protocol type:<br>Allowable current: Max. 6000 A (1×40 µs), Repeating 1000 A (1×40 µs) 100 times<br>Applicable Standards: IEC 61000-4-4, IEC 61000-4-5<br>Modbus protocol type:<br>Applicable Standards: IEC 61000-4-5<br>This option (option code A) must be selected when Modbus protocol type (Output signal code -M) is selected. | | A |
| Oil-prohibited use*2 | | Degrease cleansing treatment | | K1 |
| | | Degrease cleansing treatment and fluorinated oilfilled capsule.<br>Operating temperature −20 to 80°C (−4 to 176°F) | | K2 |
| | | Degrease cleansing treatment | With certificates | K41 |
| | | Degrease cleansing treatment and fluorinated oilfilled capsule.<br>Operating temperature −20 to 80°C (−4 to 176°F) | With certificates | K42 |
| Oil-prohibited use with dehydrating treatment*2 | | Degrease cleansing and dehydrating treatment | | K5 |
| | | Degrease cleansing and dehydrating treatment with fluorinated oilfilled capsule.<br>Operating temperature −20 to 80°C (−4 to 176°F) | | K6 |
| | | Degrease cleansing and dehydrating treatment | With certificates | K45 |
| | | Degrease cleansing and dehydrating treatment with fluorinated oilfilled capsule.<br>Operating temperature −20 to 80°C (−4 to 176°F) | With certificates | K46 |
| Capsule fill fluid | | Fluorinated oil filled in capsule<br>Operating temperature −20 to 80°C (−4 to 176°F) | | K3 |
| Calibration units*3 | | P calibration (psi unit) | (See Table for Span and Range Limits.) | D1 |
| | | bar calibration (bar unit) | (See Table for Span and Range Limits.) | D3 |
| | | M calibration (kgf/cm$^2$ unit) | (See Table for Span and Range Limits.) | D4 |
| Plug option*20 | | Long vent *4 Total length: 119 mm (standard: 34 mm); Total length when combining with option code K1,K2, K5, and K6: 130 mm. Material: 316 SST | | U1 |
| | | Without vent and drain plugs | | UN |
| Gold-plated *2 | | Surface of isolating diaphragms are gold plated, effective for hydrogen permeation. | | A1 |
| Output limits and failure operation *5<br>(for HART protocol type) | | Failure alarm down-scale: Output status at CPU failure and hardware error is −2.5%, 3.6 mA DC or less. | | C1 |
| | | NAMUR NE43 Compliant Output signal limits:<br>3.8 mA to 20.5 mA | Failure alarm down-scale: Output status at CPU failure and hardware error is −2.5%, 3.6 mA DC or less. | C2 |
| | | | Failure alarm up-scale: Output status at CPU failure and hardware error is 110%, 21.6 mA or more. | C3 |
| Body option*6<br> | | Right side high pressure, without drain and vent plugs | | N1 |
| | | N1 and Process connection, based on IEC61518 with female thread on both sides of cover flange, with blind kidney flanges on back. | | N2 |
| | | N2, and Material certificate for cover flange, diaphragm, capsule body, and blind kidney flange | | N3 |
| Wired tag plate | | 316 SST tag plate wired onto transmitter (Tag No.: Maximum. 16 characters.) | | N4 |
| Data configuration at factory*7 | | Data configuration for HART communication type | Software damping, Descriptor, Message | CA |
| | | Data configuration for Fieldbus communication type | Software damping | CC |
| | | Data configuration for Modbus communication type | Software damping, Descriptor, Message | CE |
| PID function *13 | | (For FOUNDATION Fieldbus protocol type)<br>PID control function | | LC1 |
| Software downloading function *13 | | (For FOUNDATION Fieldbus protocol type)<br>Based on FOUNDATION Fieldbus Specification(FF-883) Download class: Class1 | | EE |

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| Item | Description | | Code |
|---|---|---|---|
| Advanced diagnostics (For HART or FOUNDATION Fieldbus protocol type) | Multi-sensing process monitoring<br>• Impulse line blockage detection *16<br>• Heat trace monitoring | HART protocol type | **DG6** |
| | | FOUNDATION Fieldbus protocol type *17 | **DG1** |
| European Pressure Equipment Directive*14 | PED 2014/68/EU<br>Category III, Module H, type of equipment: Pressure accessory-vessel,<br>Tupe of fluid: Liquid and Gas, Group of fluid: 1 and 2 | | **PE3** |
| Material certificate*8 | Cover flange *9 | | **M01** |
| | Cover flange, Process connector *10 | | **M11** |
| | Cover flange, Diaphragm, Capsule body*9*20 | | **MA1** |
| | Cover flange, Process connector, Diaphragm, Capsule body *10*20 | | **MC1** |
| | Cover flange, Bolt and Nut for cover flange, Diaphragm, Capsule body, Vent and Drain plug, Vent screw, Capsule gasket*9*18*19 | | **MG1** |
| | Cover flange, Process connector, Bolt and nut for cover flange, Bolt for process connector, Diaphragm, Capsule body, Vent and Drain plug, Vent screw, Capsule gasket*10*18*19 | | **MH1** |
| Pressure test/ Leak test certificate | Test Pressure: 32 MPa (4500 psi) | Nitrogen(N2) Gas or Water*12<br>Retention time: one minute | **T09** |
| Calibration certificate | Text, Traceability | | **L4** |
| | Text, Traceability, Primary standards list | | **L5** |
| | Text, Traceability, Primary standards list, Calibration equipment list | | **L6** |
| | Text, Traceability, Primary standards list, Calibration equipment list, Calibration equipment certificate | | **L9** |
| Additional blind plug*21*22 | Additional blind plug is attached to the conduit connection on both sides for storing transmitter | | **PP** |

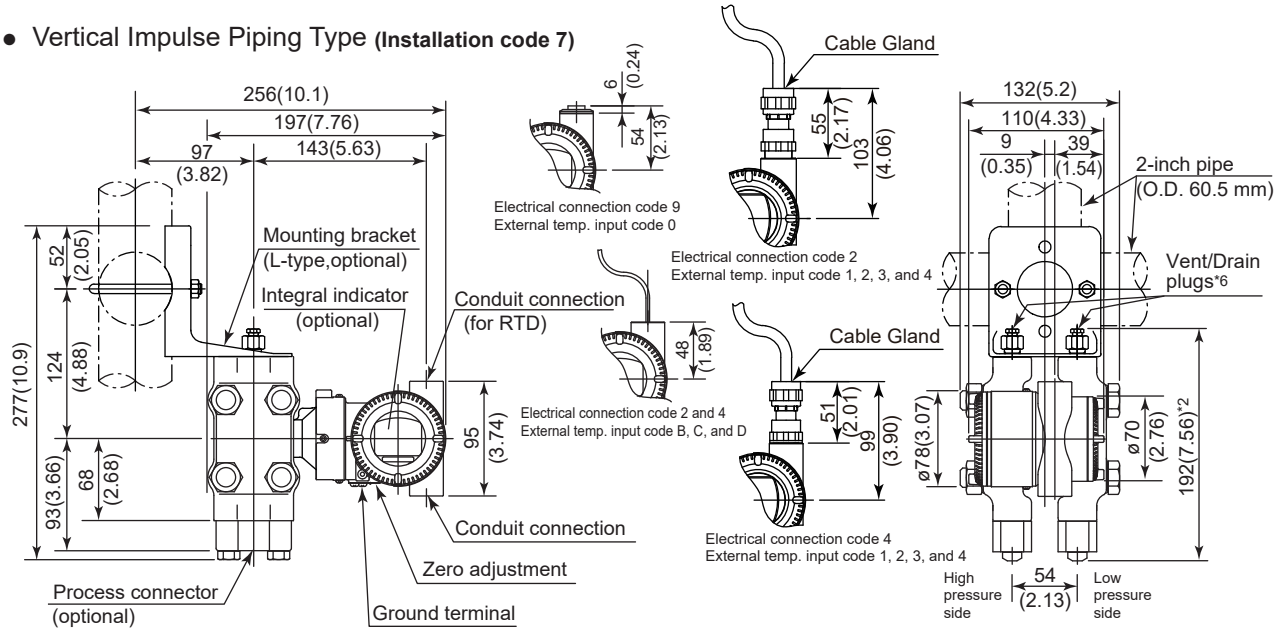
*1: Not applicable with color or coating change option.
*2: Applicable for Wetted parts material code S.
*3: The unit of MWP (Max. working pressure) on the name plate of a housing is the same unit as specified by option codes D1, D3, and D4.
*4: Applicable for vertical impulse piping type (Installation code 7) and Wetted parts material code S.
*5: Applicable for Output signal codes -E and -J. The hardware error indicates faulty amplifier or capsule.
*6: Applicable for Wetted parts material code S; Process connection codes 3, 4, and 5; Installation code 9; and Mounting bracket code N. Process connection faces on the other side of zero adjustment screw.
*7: Also see 'Ordering Information'.
*8: Material traceability certification, per EN 10204 3.1B.
*9: Applicable for Process connections code 5.
*10: Applicable for Process connections codes 3 and 4.
*11: The unit on the certificate is always Pa unit regardless of selection of option code D1, D3 or D4.
*12: Dry nitrogen gas or pure water is used for oil-prohibited use (option codes K1, K2, K5, K6, K41, K42, K45, and K46).
*13: Applicable for Output signal code -F.
*14: Applicable for Measurement span codes M and H. If compliance with category III is needed, specify this code.
*15: 316 or 316L SST. The specification is included in Amplifier code 2.
*16: The change of pressure fluctuation is monitored and then detects the impulse line blockage. Refer to TI 01C25A31-01E for detailed technical information required for using this function.
*17: This option code must be specified with option code EE.
*18: Not applicable with plug option code UN.
*19: Not applicable with option code N1, N2 and N3.
*20: Applicable for option code UN and N1.
*21: Not applicable for electrical connection codes 0, 2, and 4.
*22: When combined with electrical connection code 7 or C and explosion protection options (FF1, FU1, FU14, KF22, KU22, KU24, CF1, CU1, SF22, SU22, SU34, V1U1, NF21, PF23, UF1, GF12, GU12, GU14, BF21, BU21), the blind plug is shipped as an accessory.

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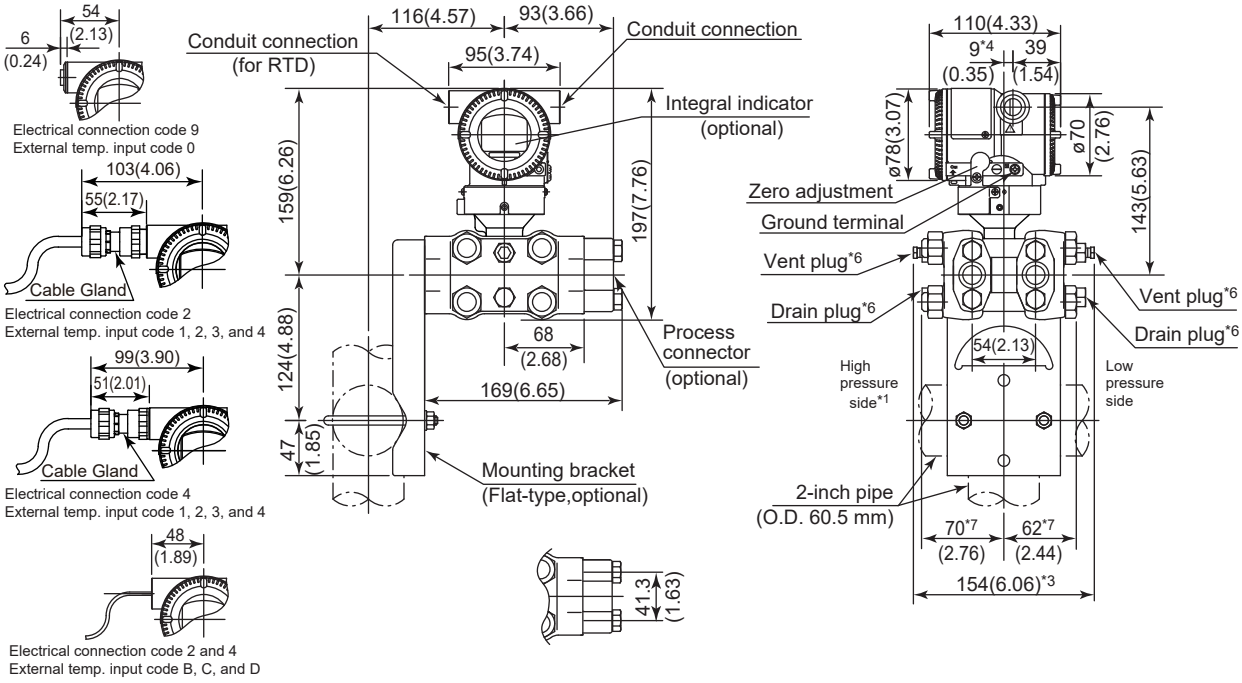
## ■ DIMENSIONS

Unit: mm (approx.inch)

● Vertical Impulse Piping Type **(Installation code 7)**




● Horizontal Impulse Piping Type **(Installation code 9)**

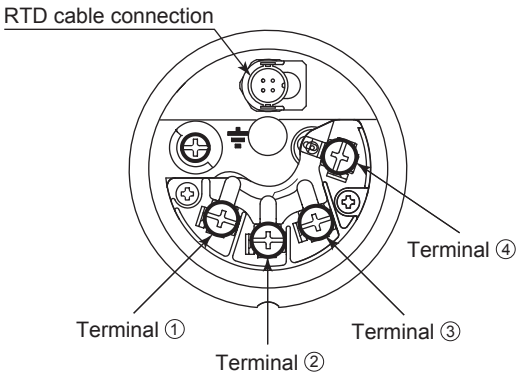



*1: When Installation code 8 is selected, high and low pressure side on above figure are reversed.
(i.e. High pressure side is on the right side.)
*2: When Option code K1, K2, K5, K6, K41, K42, K45, or K46 is selected, add 15 mm(0.59 inch) to the value in the figure.
*3: When Option code K1, K2, K5, K6, K41, K42, K45, or K46 is selected, add 30 mm(1.18 inch) to the value in the figure.
*4: 15 mm(0.59 inch) for right side high pressure.
*5: When electrical connection code 7 or C is selected, a blind plug is protruded up to 8 mm(0.31 inch) from the conduit connection.
*6: When option code UN is specified, Vent/Drain holes and plugs are not applicable.
*7: Those two values are swapped for right side high pressure.

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## ● Terminal Configuration




## ● Terminal Wiring (HART and FOUNDATION Fieldbus protocol types)

| | | | |
|---|---|---|---|
| SUPPLY | + / − | ①<br>② | Power supply and output terminals |
| CHECK | + / − | ③<br>② | External indicator (ammeter) terminals *1*2 |
| PULSE | + / − | ④<br>② | Pulse or status contact output terminals *2 |
| ⏚ Ground terminal | | | |

*1: When using an external indicator or check meter, the internal resistance must be 10Ω or less.
*2: Not available for FOUNDATION Fieldbus communication type.

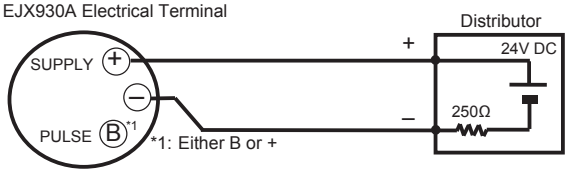
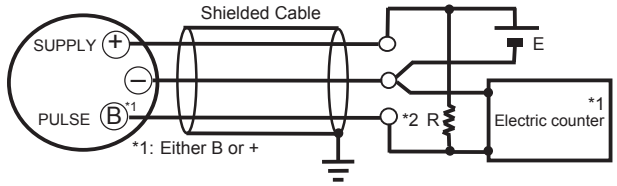
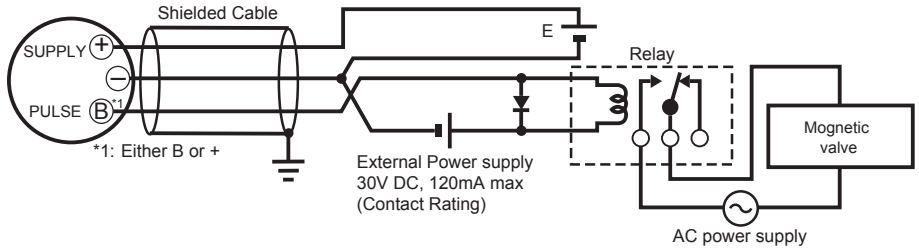
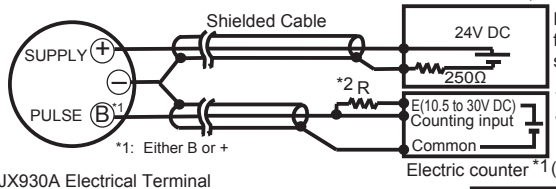
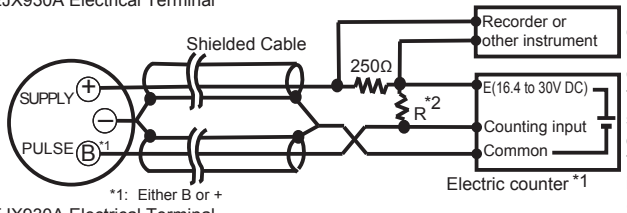
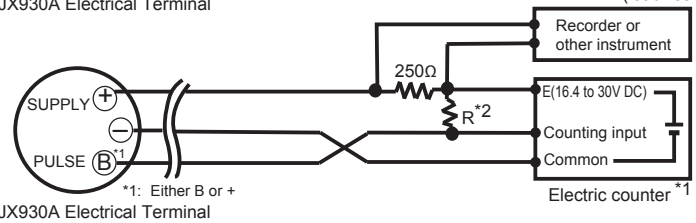
## ● Terminal Wiring (Modbus protocol type)

| | | | |
|---|---|---|---|
| SUPPLY | + / − | ①<br>② | Power supply terminals |
| MODBUS | A / B | ③<br>④ | Modbus communication (RS-485) terminals |
| ⏚ Ground terminal | | | |

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## ● Wiring Example for Analog Output and Status/Pulse Output (for HART Protocol type)

| Connection | Description |
|---|---|
| **Analog Output**<br>In this case, Communication is possible (up to a distance of 2km when a CEV cable is used.) | EJX930A Electrical Terminal<br> |
| **Pulse Output**<br>In this case, No communication is possible. | EJX930A Electrical Terminal<br>Use the Three-wire shielded cable.<br> |
| **Status Output**<br>In this case, No communication is possible. | EJX930A Electrical Terminal<br>Use the Three-wire shielded cable.<br> |
| **Simultaneous Analog -Pulse Output** *3<br>Example 1<br>In this case, Communica -tion is possible(up to a distance of 2km when a CEV cable is used).<br>Example 2<br>In this case, Communica -tion is possible (up to a distance of 200m when a CEV cable is used) and R = 1kΩ).<br>Example 3<br>In this case, No communi -cation is possible (when shielded cable is not used). | When analog and pulse output are used, the length of communication line is subjected to wiring conditions. Refer to example 1 to 3.<br>Distributor (or communication medium : ex. EP card)<br><br>For the shielded cables in this example of flowmeter installation, use two-wire separately shielded cables.<br>This supply voltage requires a power sourse with a maximum output current of no less than E/R.<br>Electric counter *1 (or communication medium : ex. EP card)<br>EJX930A Electrical Terminal<br><br>Electric counter *1<br>For the shielded cables in this example of flowmeter installation, use two-wire separately shielded cables.<br>This supply voltage requires a power sourse with a maximum output current of no less than E/R+25mA.<br>The supply voltage requires output impedance no more than 1/1000 of R (load resistance).<br>EJX930A Electrical Terminal<br><br>Electric counter *1<br>This supply voltage requires a power sourse with a maximum output current of no less than E/R+25mA.<br>EJX930A Electrical Terminal |
| **The range of load resistance R for the pulse output.** | The load resistance of pulse output should be used to 1kΩ, 2W.<br>If no translation of the pulse output possible by the cable length or the frequency of the pluse output, the load resistance should be selected by calculation as shown below.<br>$\frac{E\ (V)}{120} \leq R\ (k\Omega) \leq \frac{0.1}{C\ (\mu F) \times f\ (kHz)}$<br>Example of CEV cable capacitance ≒ 0.1μF/km<br>$P\ (mW) = \frac{E^2\ (V)}{R\ (k\Omega)}$<br>Where<br>E = Supply voltage (V)<br>f = Frequency of pulse output (kHz)<br>R = Value of load resistance (kΩ)<br>C = Cable capacitance (μF)<br>P = Power ratio of the load resistance (mW) |

*1: To avoid the influence of external noise, use an electric counter which fits to the pulse frequency.
*2: Resistor is not necessary in case of an electric counter which can receive contact pulse signal directly.
*3: When using analog and pulse output simultaneously, the HART communication may be influenced by noise comparing analog output only. Take countermeasure for noise shown above, e.g. use shield cable etc.

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**< Ordering Information for HART protocol type >**
Specify the following when ordering.

1. Model, suffix codes, and option codes
2. Calibration range and units
   1) Calibration range can be specified with range value specifications up to 5 digits (excluding any decimal point) for low or high range limits within the range of –32000 to 32000.
      When reverse range is designated, specify Lower Range Value (LRV) as greater than Upper Range Value (URV).
   2) Specify unit from the tables “Calibration Units for HART protocol type”
3. Static pressure is selected from gauge pressure or absolute pressure.
4. TAG NO (if required)
   Specified characters (up to 22 characters, or 16 characters when /N4 is specified) are engraved on the stainless steel tag plate fixed on the terminal box.
5. SOFTWARE TAG (if required)
   Specified characters*1 are set as “Tag” (the first 8 characters) and “Long tag”*2 (32 characters) in the amplifier memory.
   When the “SOFTWARE TAG” is not specified, specified “TAG NO” is set as “Tag” (the first 8 characters) and “Long tag”*2 (22 characters) in the amplifier memory.
   *1: Output signal code “E” (HART 5): up to 8 characters are specified
   Output signal code “J” (HART 5/HART 7): up to 32 characters are specified
   *2: Applicable only for HART 7
6. Other factory configurations (if required)
   Specifying option code CA will allow further configuration at factory.
   Following are configurable items and setting range.
   1) Descriptor (up to 16 characters)
   2) Message (up to 30 characters)
   3) Software damping in second (0.00 to 100.00)
7. When the output signal code is “J”, specify the HART protocol revision “5” or “7”.

**Table 11. Factory Setting for HART protocol type**

| Parameter | Default value | Description |
|---|---|---|
| Tag number | — | As specified in order |
| Flow unit | kg/h | Valid when Measurement Function Code B is specified.<br>Standard flow configuration<br>Fluid: N2<br>Primary element type: ISO5167-1 1991 Orifice Corner Taps<br>Upstream internal pipe diameter = 0.0527 m (Carbon Steel)<br>Diameter of primary device = 0.03162 m (SUS304)<br>Operating Pressure range = 0.1 to 1 MPa abs<br>Operating Temperature range = 0 to 50°C |
| Flow LRV | 0 | |
| Flow URV | 1000 | |
| Flow Damping *1 | 0.00 s | |
| DP unit | kPa | Selectable from Table 13. Pressure Unit |
| DP LRV | 0 | As specified in order |
| DP URV | Max.span | |
| DP Damping *1 | 2.00 s | As specified in order |
| SP A/G Selection | Absolute | As specified in order |
| SP unit | MPa | Selectable from Table 14. Static Pressure Unit |
| SP LRV | 0 | As specified in order |
| SP URV | 32 | |
| SP Damping *1 | 1.00 s | As specified in order |
| ET unit | °C | Selectable from Table 15. Temperature Unit |
| ET LRV | –200 | As specified in order |
| ET URV | 850 | |
| ET Damping *1 | 1.00 s | As specified in order |
| Fixed Temperature | 20°C (68°F) | When External Temperature Input Code 0 is specified. |
| Output signal | DP | When Measurement Function Code A is specified. |
| | Flow | When Measurement Function Code B is specified. |
| Display setting | DP and unit | When Measurement Function Code A is specified. |
| | Flow and unit | When Measurement Function Code B is specified. |

*1: To specify these items at factory, option code CA is required.

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## Calibration Units fot HART protocol type

### Table 12-1. Mass Flow Unit

| Unit | LCD | Communication |
|---|---|---|
| grams per second | g/s | ← |
| grams per minute | g/m | g/min |
| grams per hour | g/h | ← |
| kilograms per second | kg/s | ← |
| kilograms per minute | kg/m | kg/min |
| kilograms per hour | kg/h | ← |
| kilograms per day | kg/d | ← |
| metric tons per minute | t/m | t/min |
| metric tons per hour | t/h | ← |
| metric tons per day | t/d | ← |
| pounds per second | lb/s | ← |
| pounds per minute | lb/m | lb/min |
| pounds per hour | lb/h | ← |
| pounds per day | lb/d | ← |
| short tons per minute | STon/m | STon/min |
| short tons per hour | STon/h | ← |
| short tons per day | STon/d | ← |
| long tons per hour | LTon/h | ← |
| long tons per day | LTon/d | ← |

### Table 12-2. Normal•Standard Volume Flow Unit

| Unit | LCD | Communication |
|---|---|---|
| normal cubic meter per hour | Nm3/h | ← |
| normal liter per hour | NL/h | ← |
| standard cubic feet per minute | SCFM | ← |
| standard liter per hour | SL/h | ← |
| standard liter per minute | SL/m | SL/min |
| standard liter per second | SL/s | ← |
| normal cubic meter per day | Nm3/d | ← |
| standard cubic feet per day | SCFD | ← |
| standard cubic feet per hour | SCFH | ← |
| standard cubic feet per second | SCFS | ← |
| standard cubic meter per day | Sm3/d | ← |
| standard cubic meter per hour | Sm3/h | ← |
| thousand standard cubic feet per day | MSCFD | ← |
| million standard cubic feet per day | MMSCFD | ← |

### Table 12-3. Volume Flow Unit

| Unit | LCD | Communication |
|---|---|---|
| cubic feet per minute | CFM | ← |
| gallons per minute | GPM | ← |
| liters per minute | L/m | L/min |
| imperial gallons per minute | IGal/m | Impgal/min |
| cubic meter per hour | M3/h | ← |
| gallons per second | gal/s | ← |
| million gallons per day | Mgal/d | ← |
| liters per second | L/s | ← |
| million liters per day | ML/d | ← |
| cubic feet per second | CFS | ← |
| cubic feet per day | ft3/d | ← |
| cubic meters per second | M3/s | ← |
| cubic meters per day | M3/d | ← |
| imperial gallons per hour | IGal/h | Impgal/h |
| imperial gallons per day | IGal/d | Impgal/d |
| cubic feet per hour | CFH | ← |
| cubic meters per minute | m3/m | m3/min |
| barrels per second | bbl/s | ← |
| barrels per minute | bbl/m | bbl/min |
| barrels per hour | bbl/h | ← |
| barrels per day | bbl/d | ← |
| gallons per hour | gal/h | ← |
| imperial gallons per second | IGal/s | Impgal/s |
| liters per hour | L/h | ← |
| gallons per day | gal/d | ← |

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**Table 13. Pressure Unit**

| Unit | LCD | Communication |
|---|---|---|
| mmH2O@4C | mmH2O | ← |
| mmH2O@68F | mmH2O | ← |
| mmHg | mmHg | ← |
| Torr | Torr | ← |
| MPa | MPa | ← |
| kPa | kPa | ← |
| Pa | Pa | ← |
| mbar | mbar | ← |
| bar | bar | ← |
| gf/cm2 | gf/cm2 | ← |
| kgf/cm2 | kgf/cm2 | ← |
| inH2O@4C | inH2O | ← |
| inH2O@68F | inH2O | ← |
| inHg | inHg | ← |
| ftH2O@4C | ftH2O | ← |
| psi | psi | ← |
| atm | atm | ← |
| ftH2O@68F | ftH2O | ← |
| hPa | hPa | ← |

**Table 14. Static Pressure Unit**

| Unit | LCD/ Communication | When abs is selected | |
|---|---|---|---|
| | | LCD | Communication |
| mmH2O@4C | mmH2O | mmH2OA | mmH2O |
| mmH2O@68F | mmH2O | mmH2OA | mmH2O |
| mmHg@0C | mmHg | mmHgA | mmHg |
| Torr | Torr | TorrA | Torr |
| MPa | MPa | MPaA | MPa |
| kPa | kPa | kPaA | kPa |
| Pa | Pa | PaA | Pa |
| mbar | mbar | mbarA | mbar |
| bar | bar | barA | bar |
| gf/cm2 | gf/cm2 | g/cm2A | g/cm2 |
| kgf/cm2 | kgf/cm2 | kg/cm2A | kg/cm2 |
| inH2O@4C | inH2O | inH2OA | inH2O |
| inH2O@68F | inH2O | inH2OA | inH2O |
| inHg@0C | inHg | inHgA | inHg |
| ftH2O@4C | ftH2O | ftH2OA | ftH2O |
| psi | psi | psiA | psi |
| atm | atm | atmA | atm |
| ftH2O@68F | ftH2O | ftH2OA | ftH2O |
| hPa | hPa | hPaA | hPa |

**Table 15. Temperature Unit**

| Unit | LCD/Communication |
|---|---|
| °C | deg C |
| °F | deg F |
| K | K |

**Table 16. Total Flow Unit**

| Unit | LCD/Communication |
|---|---|
| grams | g |
| kilograms | kg |
| metric tons | t |
| pounds | lb |
| short tons | STon |
| long tons | LTon |
| ounce | oz |
| gallons | gal |
| liters | L |
| imperial gallons | Impgal |
| cubic meters | m3 |
| barrels | bbl |
| cubic yards | yd3 |
| cubic feet | ft3 |
| cubic inches | in3 |
| normal cubic meter | Nm3 |
| normal liter | NL |
| standard cubic feet | SCF |

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**< Ordering Information for FOUNDATION Fieldbus protocol type >**
Specify the following when ordering.

1. Model, suffix codes, and option codes
2. Calibration range and units for Differential pressure, Static pressure and external temperature
   1) Calibration range can be specified with range value specifications up to 5 digits (excluding any decimal point) for low or high range limits within the range of –32000 to 32000. When reverse range is designated, specify Lower Range Value (LRV) as greater than Upper Range Value (URV).
   2) Specify unit. See Table 17 for settable unit at factory.
3. Static pressure is selected from gauge pressure or absolute pressure.
4. Tag Number (if required)
   Specify software tag (PD_TAG) up to 32 characters to be written on the amplifier memory and Tag number up to 22 characters (or 16 characters when /N4 is specified) to be engraved on the tag plate separately.
5. Output mode (AI1 L_TYPE) ;
   Select one from 'Direct', 'indirect Linear' or 'indirect SQRT' for output mode of AI1(Differential pressure).
6. Output scale and unit (AI1 OUT_SCALE);
   This setting is used for Indicator and output of AI1 block for Differential pressure. The scale range can be specified with range limit specifications up to 5 digit (excluding any decimal point) for low and high range limits within the range of –32000 to 32000. When AI1 L_TYPE is Direct, these setting does not affect the output of AI1 block.
7. Specify Node address in hexadecimal.
8. Select 'BASIC' or 'LINK MASTER' for Operation Functional Class.
9. Other factory configurations (if required)
   Specifying option code CC will allow further configuration at factory.
   Following is configurable item and setting range:
   Software damping in second (0.00 to 100.00)

**Table 17. Factory Setting for FOUNDATION Fieldbus protocol type**

| Parameter | Default value | Description |
|---|---|---|
| Tag number | — | As specified in order |
| Software Tag (PD_TAG) | FT1001 | As specified in order |
| Flow unit (XD_SCALE of AI4) | kg/h | Valid when Measurement Function Code B is specified.<br>Standard flow configuration<br>Fluid: N2<br>Primary element type: ISO5167-1 1991 Orifice Corner Taps<br>Upstream internal pipe diameter = 0.0527 m (Carbon Steel)<br>Diameter of primary device = 0.03162 m (SUS304)<br>Operating Pressure range = 0.1 to 1 MPa abs<br>Operating Temperature range = 0 to 50°C |
| Flow LRV (XD_SCALE of AI4) | 0 | |
| Flow URV (XD_SCALE of AI4) | 1000 | |
| Flow Damping *1 | 0.00 s | |
| DP unit (XD_SCALE of AI1) | kPa | Selectable from kPa, MPa, Pa, hPa, mbar, bar, gf/cm$^2$, kgf/cm$^2$, mm$H_2O$, mm$H_2O$(68°F), in$H_2O$, in$H_2O$(68°F), ft$H_2O$, ft$H_2O$(68°F), mmAq, mmWG, mmHg or psi. |
| DP LRV (XD_SCALE of AI1) | 0 | As specified in order |
| DP URV (XD_SCALE of AI1) | Max.span | |
| DP Damping *1 | 2.00 s | As specified in order |
| SP A/G selection | Absolute | Absolute or gauge, as specified in order |
| SP unit (XD_SCALE of AI2) | MPa | See Description for 'DP unit (XD_SCALE of AI1).' |
| SP LRV (XD_SCALE of AI2) | 0 | As specified in order |
| SP URV (XD_SCALE of AI2) | 32 | |
| SP Damping *1 | 1.00 s | As specified in order |
| ET unit (XD_SCALE of AI3) | °C | Selectable from °C, °F or K |
| ET LRV (XD_SCALE of AI3) | –200 | As specified in order |
| ET URV (XD_SCALE of AI3) | 850 | |
| ET Damping *1 | 1.00 s | As specified in order |
| Fixed Temperature | 20°C (68°F) | When External Temperature Input Code 0 is specified. |
| Output signal | DP, SP, ET | When Measurement Function Code A is specified. |
| | Flow, DP, SP, ET | When Measurement Function Code B is specified. |
| Display setting | DP and unit | When Measurement Function Code A is specified. |
| | Flow and unit | When Measurement Function Code B is specified. |
| Node Address | '0xF5' | As specified in order |
| Operation Functional Class | 'BASIC' | As specified in order |

*1: To specify these items at factory, option code CC is required.

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## Calibration Units for FOUNDATION Fieldbus protocol type

**Table 18. Temperature Unit**

| INDEX | UNIT | LCD |
|---|---|---|
| 1000 | K | Kelvin |
| 1001 | °C | deg C |
| 1002 | °F | deg F |

**Table 19-1. Pressure unit (1)**

| INDEX | UNIT | LCD |
|---|---|---|
| 1130 | Pa | Pa |
| 1131 | GPa | GPa |
| 1132 | MPa | MPa |
| 1133 | kPa | kPa |
| 1134 | mPa | mPa |
| 1135 | µPa | uPa |
| 1136 | hPa | hPa |
| 1137 | bar | bar |
| 1138 | mbar | mbar |
| 1139 | torr | torr |
| 1140 | atm | atm |
| 1141 | psi | psi |
| 1142 | psia | psia |
| 1143 | psig | psig |
| 1144 | g/cm2 | g/cm2 |
| 1145 | kg/cm2 | kg/cm2 |
| 1146 | inH2O | inH2O |
| 1147 | inH2O(4°C) | inH2O |
| 1148 | inH2O(68°F) | inH2O |
| 1149 | mmH2O | mmH2O |
| 1150 | mmH2O(4°C) | mmH2O |
| 1151 | mmH2O(68°F) | mmH2O |
| 1152 | ftH2O | ftH2O |
| 1153 | ftH2O(4°C) | ftH2O |
| 1154 | ftH2O(68°F) | ftH2O |
| 1155 | inHg | inHg |
| 1156 | inHg(0°C) | inHg |
| 1157 | mmHg | mmHg |
| 1158 | mmHg(0°C) | mmHg |

**Table 19-2. Pressure unit (2)**

| INDEX | UNIT | LCD |
|---|---|---|
| 1541 | Paa | Paa |
| 1542 | Pag | Pag |
| 1543 | GPaa | GPaa |
| 1544 | GPag | GPag |
| 1545 | MPaa | MPaa |
| 1546 | MPag | MPag |
| 1547 | kPaa | kPaa |
| 1548 | kPag | kPag |
| 1549 | mPaa | mPaa |
| 1550 | mPag | mPag |
| 1551 | µPaa | uPaa |
| 1552 | µPag | uPag |
| 1553 | hPaa | hPaa |
| 1554 | hPag | hPag |
| 1555 | g/cm2a | g/cm2a |
| 1556 | g/cm2g | g/cm2g |
| 1557 | kg/cm2a | kg/cm2a |
| 1558 | kg/cm2g | kg/cm2g |
| 1559 | inH2Oa | inH2Oa |
| 1560 | inH2Og | inH2Og |
| 1561 | inH2Oa(4°C) | inH2Oa |
| 1562 | inH2Og(4°C) | inH2Og |
| 1563 | inH2Oa(68°F) | inH2Oa |
| 1564 | inH2Og(68°F) | inH2Og |
| 1565 | mmH2Oa | mmH2Oa |
| 1566 | mmH2Og | mmH2Og |
| 1567 | mmH2Oa(4°C) | mmH2Oa |
| 1568 | mmH2Og(4°C) | mmH2Og |
| 1569 | mmH2Oa(68°F) | mmH2Oa |
| 1570 | mmH2Og(68°F) | mmH2Og |
| 1571 | ftH2Oa | ftH2Oa |
| 1572 | ftH2Og | ftH2Og |
| 1573 | ftH2Oa(4°C) | ftH2Oa |
| 1574 | ftH2Og(4°C) | ftH2Og |
| 1575 | ftH2Oa(68°F) | ftH2Oa |
| 1576 | ftH2Og(68°F) | ftH2Og |
| 1577 | inHga | inHga |
| 1578 | inHgg | inHgg |
| 1579 | inHga(0°C) | inHga |
| 1580 | inHgg(0°C) | inHgg |
| 1581 | mmHga | mmHga |
| 1582 | mmHgg | mmHgg |
| 1583 | mmHga(0°C) | mmHga |
| 1584 | mmHgg(0°C) | mmHgg |
| 1590 | Barg | Barg |
| 1591 | mBarg | mBarg |
| 1597 | Bara | Bara |

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**Table 20-1. Mass Flow Unit**

| INDEX | UNIT | LCD |
|---|---|---|
| 1318 | g/s | g/s |
| 1319 | g/min | g/m |
| 1320 | g/h | g/h |
| 1322 | kg/s | kg/s |
| 1323 | kg/min | kg/m |
| 1324 | kg/h | kg/h |
| 1325 | kg/d | kg/d |
| 1327 | t/min | t/m |
| 1328 | t/h | t/h |
| 1329 | t/d | t/d |
| 1330 | lb/s | lb/s |
| 1331 | lb/min | lb/m |
| 1332 | lb/h | lb/h |
| 1333 | lb/d | lb/d |
| 1335 | STon/min | STon/m |
| 1336 | STon/h | STon/h |
| 1337 | STon/d | STon/d |
| 1340 | LTon/h | LTon/h |
| 1341 | LTon/d | LTon/d |

**Table 20-2. Normal•Standard Volume Flow Unit**

| INDEX | UNIT | LCD |
|---|---|---|
| 1360 | SCFM | SCFM |
| 1361 | SCFH | SCFH |
| 1524 | Nm3/h | Nm3/h |
| 1525 | Nm3/d | Nm3/d |
| 1529 | Sm3h | Sm3/h |
| 1530 | Sm3/d | Sm3/d |
| 1534 | NL/h | NL/h |
| 1537 | SL/s | SL/s |
| 1538 | SL/h | SL/h |
| 1539 | SL/m | SL/m |
| 1598 | MSCFD | MSCFD |
| 1599 | MMSCFD | MMSCFD |
| 65520 | SCFS | SCFS |
| 65521 | SCFD | SCFD |

**Table 20-3. Volume Flow Unit**

| INDEX | UNIT | LCD |
|---|---|---|
| 1347 | m3/s | m3/s |
| 1348 | m3/min | m3/m |
| 1349 | m3/h | m3/h |
| 1350 | m3/d | m3/d |
| 1351 | L/s | L/s |
| 1352 | L/min | L/m |
| 1353 | L/h | L/h |
| 1355 | ML/d | ML/d |
| 1356 | CFS | CFS |
| 1357 | CFM | CFM |
| 1358 | CFH | CFH |
| 1359 | ft3/d | ft3/d |
| 1362 | gal/s | gal/s |
| 1363 | GPM | GPM |
| 1364 | gal/h | gal/h |
| 1365 | gal/d | gal/d |
| 1366 | Mgal/d | Mgal/d |
| 1367 | ImpGal/s | IGal/s |
| 1368 | ImpGal/min | IGal/m |
| 1369 | ImpGal/h | IGal/h |
| 1370 | ImpGal/d | IGal/d |
| 1371 | bbl/s | bbl/s |
| 1372 | bbl/min | bbl/m |
| 1373 | bbl/h | bbl/h |
| 1374 | bbl/d | bbl/d |

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**< Ordering Information for Modbus protocol type >**
Specify the following when ordering.

1. Model, suffix codes, and option codes
2. Calibration range and units
   1) Calibration range can be specified with range value specifications up to 5 digits (excluding any decimal point) for low or high range limits within the range of –32000 to 32000.
      When reverse range is designated, specify Lower Range Value (LRV) as greater than Upper Range Value (URV).
   2) Specify unit from the tables “Calibration Units for Modbus protocol type”
3. Static pressure is selected from gauge pressure or absolute pressure.
4. TAG NO (if required)
   Specified characters (up to 22 characters, or 16 characters when /N4 is specified) are engraved on the stainless steel tag plate fixed on the terminal box.
5. SOFTWARE TAG (if required)
   Specified characters (up to 32 characters) are set as “Tag” (the first 8 characters) and “Long tag” (32 characters) in the amplifier memory.
   When the “SOFTWARE TAG” is not specified, specified “TAG NO” is set as “Tag” (the first 8 characters) and “Long tag” (22 characters) in the amplifier memory.
6. Other factory configurations (if required)
   Specifying option code CE will allow further configuration at factory.
   Following are configurable items and setting range.
   1) Descriptor (up to 16 characters)
   2) Message (up to 30 characters)
   3) Software damping in second (0.00 to 100.00)

**Table 21. Factory Setting for Modbus protocol type**

| Parameter | Default value | Description |
|---|---|---|
| Tag number | — | As specified in order |
| DP unit | kPa | Selectable from Table 22. Pressure Unit |
| DP LRV | 0 | As specified in order |
| DP URV | Max.span | |
| DP Damping *1 | 2.00 s | As specified in order |
| SP A/G Selection | Absolute | As specified in order |
| SP unit | MPa | Selectable from Table 23. Static Pressure Unit |
| SP LRV | 0 | As specified in order |
| SP URV | 32 | |
| SP Damping *1 | 1.00 s | As specified in order |
| ET unit | °C | Selectable from Table 24. Temperature Unit |
| ET LRV | –200 | As specified in order |
| ET URV | 850 | |
| ET Damping *1 | 1.00 s | As specified in order |
| Fixed Temperature | 20°C (68°F) | When External Temperature Input Code 0 is specified. |
| Display setting | DP and unit | |

*1: To specify these items at factory, option code CE is required.

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### Calibration Units for Modbus protocol type

**Table 22. Pressure Unit**

| Unit | LCD | Communication |
|---|---|---|
| mmH2O@4C | mmH2O | ← |
| mmH2O@68F | mmH2O | ← |
| mmHg | mmHg | ← |
| Torr | Torr | ← |
| MPa | MPa | ← |
| kPa | kPa | ← |
| Pa | Pa | ← |
| mbar | mbar | ← |
| bar | bar | ← |
| gf/cm2 | gf/cm2 | ← |
| kgf/cm2 | kgf/cm2 | ← |
| inH2O@4C | inH2O | ← |
| inH2O@68F | inH2O | ← |
| inHg | inHg | ← |
| ftH2O@4C | ftH2O | ← |
| psi | psi | ← |
| atm | atm | ← |
| ftH2O@68F | ftH2O | ← |
| hPa | hPa | ← |

**Table 23. Static Pressure Unit**

| Unit | LCD/ Communication | When abs is selected | |
|---|---|---|---|
| | | LCD | Communication |
| mmH2O@4C | mmH2O | mmH2OA | mmH2O |
| mmH2O@68F | mmH2O | mmH2OA | mmH2O |
| mmHg@0C | mmHg | mmHgA | mmHg |
| Torr | Torr | TorrA | Torr |
| MPa | MPa | MPaA | MPa |
| kPa | kPa | kPaA | kPa |
| Pa | Pa | PaA | Pa |
| mbar | mbar | mbarA | mbar |
| bar | bar | barA | bar |
| gf/cm2 | gf/cm2 | g/cm2A | g/cm2 |
| kgf/cm2 | kgf/cm2 | kg/cm2A | kg/cm2 |
| inH2O@4C | inH2O | inH2OA | inH2O |
| inH2O@68F | inH2O | inH2OA | inH2O |
| inHg@0C | inHg | inHgA | inHg |
| ftH2O@4C | ftH2O | ftH2OA | ftH2O |
| psi | psi | psiA | psi |
| atm | atm | atmA | atm |
| ftH2O@68F | ftH2O | ftH2OA | ftH2O |
| hPa | hPa | hPaA | hPa |

**Table 24. Temperature Unit**

| Unit | LCD/Communication |
|---|---|
| °C | deg C |
| °F | deg F |
| K | K |

### < Material Cross Reference >

| ASTM | JIS |
|---|---|
| 316 | SUS316 |
| F316 | SUSF316 |
| 316L | SUS316L |
| F316L | SUSF316L |
| 304 | SUS304 |
| F304 | SUSF304 |
| 660 | SUH660 |
| B7 | SNB7 |
| CF-8M | SCS14A |

### < Related Instruments>

FSA120 Flow Configuration Software (FlowNavigator): Refer to GS 01C25R51-01EN
Power Distributor: Refer to GS 01B04T01-02E or GS 01B04T02-02E

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This instrument is intended to be sold and used only as a part of equipment which is excluded from WEEE Directive, such as large-scale stationary industrial tools, a large-scale fixed installation and so on, and, therefore, subjected to the exclusion from the scope of the WEEE Directive. The instrument should be disposed of in accordance with local and national legislation/regulations.

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