General Specifications

GS 01F06F01-01EN

Model DY
Model DYA
FOUNDATION Fieldbus Communication Type
Vortex Flowmeter

digitalYEWFLO

FOUNDATION

■ General

FOUNDATION Fieldbus is the digital communication line for the field instruments, whose signal is internationally standardized by Fieldbus Foundation.

The Fieldbus bi-directional digital communication performance makes possible for the field instruments and the control devices to be a complete on-line system, superseding the existing analog transmission lines.

Thus, based on FOUNDATION Fieldbus specifications, digitalYEWFLO Fieldbus models offer more flexible instrumentation through a higher level communication capability and propose the cost reduction by multi-drop wirings with less cables.

* FOUNDATION is a registered trademark of Fieldbus FOUNDATION.

Model DYA
Remote Type Converter

Model DY-F
Integral Type Vortex Flowmeter

■ FEATURES

- **Interoperability (ITK 5.0.1)**
  FOUNDATION Fieldbus specifications (ITK 5.0.1) grant the interoperability of the field instruments.
- **Reduction of instrumentation cost**
  The multi-drop wiring on the Fieldbus communication line contributes to the reduction of wiring cost.
- **Mass flow calculation**
  Arithmetic (AR) function block expands the mass flow calculation function for the saturated steam, superheated steam, gases and natural gas by using external pressure/temperature input (/MV:internal temperature input) with a high accuracy.
  Additionally, in combination with DTM* brings to the high accurate mass flow calculation output, ex. natural gas process.
- **User-friendliness**
  The common function block of field devices have the same operability, because of their common specification. The individual device setting (Transducer Block parameter setting) can be done simply by executing METHOD.
- **Independent flow and temperature calculations (multi-variable type: option)**
  The multi-variable type (/MV: option) of digitalYEWFLO separately outputs flowrate output (AI1) and temperature output (AI2) . Two DI function blocks output the limit signal output both flowrate and temperature.
- **Advanced self-diagnostics**
  The digitalYEWFLO has advanced self-diagnostics which can predict and identify anomalies in the process conditions, such as high pipeline vibration and abnormal flow. Also, the Fieldbus type digitalYEWFLO supports various alarm functions, such as high/low-limit alarms and alerts of block errors, based on the FOUNDATION Fieldbus specification.
- **Link Master function : BASIC at factory setting.**
  digitalYEWFLO Fieldbus models support the Link Master function. This function enables backup of network manager and local control only by field devices.
- **PID function block (option)**
  A PID function block (with the I-PD control algorithm) enables the field device to control the process.
- **Software download function (option)**
  Software download function permits to update DY software via a FOUNDATION fieldbus.
  Typical use of this function is to add new features such as function blocks and diagnostics to existing devices.

* DTM (Device Type Manager): the application which defines the Graphical User Interface (GUI) specific to the device.

■ STANDARD SPECIFICATIONS

For items other than those described below, refer to GS 01F06A00-01EN.

Applicable Models:

All the models of DY and DYA with Fieldbus communication functions (Output code: F). These models conform to the following EMC Conformity Standards:
EN61326-1 Class A, Table 2 (For use in industrial locations), EN61326-2-3

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EN55011 Class A Group 1
Caution: This instrument is a Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.
Note: Use the metal conduit for the remote cable.

Normal Operating Condition

Power Supply Voltage:

9 to 32 V DC for general-purpose, flameproof types and Nonincendive type
9 to 24 V DC for intrinsically safe type (Entity model)
9 to 17.5 V DC for intrinsically safe type (FISCO model)

Performance Specifications

Mass Flow Accuracy using Arithmetic (AR) function block:
(when outer temperature sensor and outer pressure sensor are used)
Accuracy +/– %: of Reading

Fluid	Mass Flow Accuracy	Notes		
		Input for Temperature, Pressure	Reference input condition for Mass Flow Accuracy	Flow computing
Saturated steam (Temperature base)	±1.7% (<35m/s) ±2.2% (35m/s–80m/s)	Temperature	Temperature range +100 to +330°C Temperature accuracy ±0.1%	Density computing by temperature using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
Saturated steam (Pressure base)		Pressure	Pressure range 0.1MPa to flange rating Pressure accuracy ±0.2%	Density computing by pressure using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
Superheated steam		Temperature and Pressure	Pressure condition: Pressure range 0.1MPa to flange rating Pressure accuracy ±0.2% Temperature condition: Temperature range +100 to + 450°C Temperature accuracy ±0.1%	Density computing by temperature and pressure using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
General gas	Not fixed	Temperature and Pressure	Accuracy is changed by fluctuating deviation factor K on temperature, pressure condition	Temperature, pressure compensation computing using gas equation (Boyle-Charles's) at fixed deviation factor K.
Liquid	Not fixed	Temperature	Accuracy is changed by setting value for temperature compensation factor	Density computing by temperature using equation API • JIS K2249.
General gas including Natural gas	For Natural gas ±1.1% (<35m/s) ±1.6% (35m/s–80m/s)	Temperature and Pressure	For Natural gas accuracy condition is Pressure condition: Pressure range 0 to 12MPa Pressure signal ±0.2% Temperature condition: Temperature range –10 to + 65°C Temperature signal ±0.1% General gas is computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	For natural gas, AGA No.8 is applied for temperature, pressure compensation computing For general gas and liquid, DIPPR database is applied (AIChE: American Institute of Chemical Engineers) for Mass flow computing. Density parameters are downloaded by FSA120 • FieldMate FlowNavigator
Liquid	Not fixed	Temperature	Computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	

1) Mass Flow Accuracy for Steam and Natural gas is computed adding by Temperature and Pressure compensation based on Volumetric Flow Accuracy.
2) Mass Flow Accuracy for AI output is the same as Smart type (BRAIN, HARTprotocol). Refer to GS 01F06A00-01EN.

Mass Flow or Volumetric Flow at Norminal/Standard condition Accuracy using Arithmetic (AR) function block: (when Multi-bariable type (/MV) and outer pressure sensor are used)

Accuracy +/– %: of Reading

Fluid	Mass Flow Accuracy	Notes		
		Input for Temperature, Pressure	Reference condition for Mass Flow Accuracy	Flow computing
Saturated steam (Temperature base)	±2.0% (<35m/s) ±2.5% (35m/s–80m/s)	Temperature	Temperature range +100 to +250°C	Density computing by temperature using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
Saturated steam (Pressure base)		Pressure	Pressure range 0.1MPa to flange rating Pressure accuracy ±0.2%	Density computing by pressure using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
Superheated steam		Temperature and Pressure	Pressure condition: Pressure range 0.1MPa to flange rating Pressure accuracy ±0.2% Temperature condition: Temperature range +100 to + 250°C	Density computing by temperature and pressure using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
General gas	Not fixed	Temperature and Pressure	Accuracy is changed by fluctuating deviation factor K on temperature, pressure condition	Temperature, pressure compensation computing using gas equation (Boyle-Charles's) at fixed deviation factor K.
Liquid	Not fixed	Temperature	Accuracy is changed by setting value for temperature compensation factor	Density computing by temperature using equation API • JIS K2249.
General gas including Natural gas	For Natural gas ±2.0% (<35m/s) ±2.5% (35m/s–80m/s)	Temperature and Pressure	For Natural gas accuracy condition is Pressure condition: Pressure range 0 to 12MPa Pressure signal ±0.2% Temperature condition: Temperature range –10 to + 65°C General gas is computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	For natural gas, AGA No.8 is applied for temperature, pressure compensation computing For general gas and liquid, DIPPR database is applied (AIChE: American Institute of Chemical Engineers) for Mass flow computing. Density parameters are downloaded by FSA120 • FieldMate FlowNavigator
Liquid	Not fixed	Temperature	Computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	

1) Mass Flow Accuracy for Steam and Natural gas is computed adding by Temperature and Pressure compensation based on Volumetric Flow Accuracy.
2) Refer to GS 01F06A00-01EN about mass and volumetric flow accuracy of AI1 output and temperature accuracy of AI2 output.

Electrical Specifications

Output Signals:
Digital communication signal compliant with the FOUNDATION Fieldbus protocol

Communication Requirement

Condition of Communication Line:
Supply voltage: 9 to 32 V DC
Supply current: 15 mA maximum
24 mA maximum for the software download

Functional Specifications:
Functional specifications for Fieldbus communication conform to the standard specifications (H1) of FOUNDATION fieldbus.
Function blocks

Block name	Number	Execution time	Note
AI	3	29 ms	AI1: Monitors the fow rate and totalized flow rate;, AI2: Monitors the temperature for a model with the multi-variable type option; AI3: volumetric flow input for mass flowrate calculation of AR.
DI	2	25 ms	Flow and temperature limit switches
AR	1	40 ms	Mass flow calculation
IT	1	40 ms	Integrator block integrates a variable as a function of the time or accumulates the counts
PID	1	40 ms	Applicable when LC1 option is specified

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Link master function (BASIC of factory setting)

■ MODEL AND SUFFIX CODES

DY□□□-F□□□□□-□□/□
DYA-F□□/□

"F" following the first dash indicates that the output is digital communication compliant with the FOUNDATION Fieldbus protocol.

■ OPTIONAL SPECIFICATIONS

For options other than below, see GS 01F06A00-01E.

(Note1) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).

Item	Description	Code
PID Function	Provides a PID control function block.	LC1
Multi-variable Type	Provides a temperature sensor (Pt 1000) built into the vortex shedder bar, enabling the AI2 function block to output the process fluid temperature, and mass flow rates to be calculated. (For details, see GS 01F06A00-01EN.)	MV
Software download function	Based on FOUNDATION Fieldbus Specification (FF-883) Download class: Class 1	EE
Factory Mutual (FM)	FM explosion-proof Approval Applicable Standard: FM3600, FM3611, FM3615, FM3810, Including Supplement 1 ANSI/NEMA 250 Type of Protection: explosion-proof for Class I, Division 1, Groups A, B, C, and D; Dust-ignitionproof Class II/III, Division 1, Groups E, F, and G. "SEAL ALL CONDUITS WITHIN 18 INCHES." "WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED." Enclousure Rating: NEMA TYPE 4X Temperature Code: T6 Ambient Temperature: –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Ambient Humidity: 0 to 100%RH Maximum Working Pressure: 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating. Electrical Connection: ANSI 1/2NPT female	FF1
	FM Intrinsically Safe Approval (Note 1) , Nonincendive Applicable Standard: FM3600, FM3610, FM3611, FM3810, NEMA-250, ANSI/ISA-60079-0, ANSI/ISA-60079-11, ISA60079-27 Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G, T4, and Class I, Zone 0, AEx ia IIB/IIC T4, Entity, FISCO Nonincendive for Class I, II, Div.2, Groups A, B, C, D, F and G, Class III, DIV.1, Class I, Zone 2, Group IIC, FNICO Ambient Temperature : –29 to +60°C (Integral Type Vortex Flowmeter) –29 to +80°C (Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Ambient Humidity : 0 to 100% RH (No condensation) Indoors and Outdoors : TYPE 4X Electrical Parameters : Intrinsically Safe [Entity] Vmax=24V, Imax=250mA, Pi=1.2W, Ci=1.76nF, Li=0 [FISCO (IIC)] Vmax=17.5V, Imax=380mA, Pi=5.32W, Ci=1.76nF, Li=0 [FISCO (IIB)] Vmax=17.5V, Imax=460mA, Pi=5.32W, Ci=1.76nF, Li=0 Nonincendive Vmax=32V, Ci=1.76nF, Li=0 Electrical Connection : ANSI 1/2NPT female	FS16

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Item	Description	Code
ATEX	ATEX Flameproof Approval Applicable Standard: EN60079-0, EN60079-1 Type of Protection: II 2 G Ex d IIC T6...T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) II 2 G Ex d IIC T6 Gb (Remote Type Vortex Flow Converter) Group : II, Category : 2G Temperature Class : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Process Temp. : T6(–29 to 80°C), T5(–29 to 100°C), T4(–29 to 135°C), T3(–29 to 200°C), T2(–29 to 300°C), T1(–29 to 450°C) (Use /HT version above 250°C) Ambient Temperature: –29 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to 60°C (Remote Type Vortex Flow Converter without indicator) –30 to 60°C (Remote Type Vortex Flow Converter with indicator) Ambient Humidity: 0 to 100% RH Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	KF2
	ATEX Intrinsically Safe Approval (Note 1) Applicable Standard : EN50014, EN50020, EN60079-27, EN50284 Type of Protection: EEx ia IIB/IIC T4...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) EEx ia IIB/IIC T4 (Remote Type Vortex Flow Converter) Groups: II Category: 1G Maximum Working Pressure: 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Tamb. (Integral Type Vortex Flowmeter): –29 to +60°C Tamb. (Remote Type Vortex Flow Detector): –29 to +80°C Tamb. (Remote Type Vortex Flow Converter): –40 to +60°C Ambient Humidity: 0 to 100%RH (No condensation) Process Temp.: T4; 135°C, T3; 200°C, T2; 300°C, T1;450°C (Use /HT version above 250°C) For connection to certified Intrinsically Safe circuit with Supply circuit of Integral Type Flowmeter and Remote Type Converter: [Entity] Vmax=24V, Imax=250mA, Pi=1.2W, Ci=1.76nF, Li=0 [FISCO (IIC)] Vmax=17.5V, Imax=380mA, Pi=5.32W, Ci=1.76nF [FISCO (IIB)] Vmax=17.5V, Imax=460mA, Pi=5.32W, Ci=1.76nF, Li=0 Connect sensor circuit of DYA and DY-N (/HT) Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	KS26
	ATEX Type n Approval Applicable Standards: EN 60079-15, EN 60079-0 Type of protection: Ex nL IIC T4...T1Gc (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Ex nL IIC T4Gc (Remote Type Vortex Flow Converter) Groups: II Category: 3G Ambient Temperature: –29 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to 60°C (Remote Type Vortex Flow Converter without indicator) –30 to 60°C (Remote Type Vortex Flow Converter with indicator) Ambient Humidity: 0 to 100%RH (No Condensation) Process Temperature: T4 (–29 to 135°C), T3 (–29 to 200°C) T2 (–29 to 300°C), T1 (–29 to 450°C) (Use /HT version above 250°C) Degree of Protection of Enclosure: IP66/IP67 Electrical Connection : ANSI 1/2NPT female, ISO M20 × 1.5 female	KN26
Canadian Standards Association (CSA)	CSA explosion-proof Approval Applicable Standard: C22.1-98, 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.142, C22.2, No.61010-1, ANSI/ISA-12.27.01 Type of Protection: explosion-proof for Class I, Groups B, C and D; Class II, Groups E, F and G; Class III. For Class I, Division 2 locations- "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED." Enclosure: Type 4X Temperature Class: T6...T1(Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Amb. Temp.: –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Process Temp. : T6;85°C, T5;100°C, T4;135°C, T3;200°C, T2;300°C, T1;450°C Enclosure : Type 4X Maximum Working Pressure: 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating. Electrical Connection: ANSI 1/2 female	CF1
	Process Sealing Certification Dual Seal Certified by CSA to the requirement of ANSI/ISA 12.27.01 No additional sealing required	CF11
IECEx	IECEx Flameproof Approval Applicable Standard: IEC60079-0, IEC60079-1 Type of Protection: Ex d IIC T6...T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Ex d IIC T6 Gb (Remote Type Vortex Flow Converter) Temperature Class : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Process Temp. : T6(–40 to 80°C), T5(–40 to 100°C), T4(–40 to 135°C), T3(–40 to 200°C), T2(–40 to 300°C), T1(–40 to 450°C) (Use /HT version above 250°C) Ambient Temperature: –29 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to 60°C (Remote Type Vortex Flow Converter without indicator) –30 to 60°C (Remote Type Vortex Flow Converter with indicator) Ambient Humidity: 0 to 100% RH Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	SF2
Technology Institution of Industrial Safety (TIIS), Japan	TIIS explosion-proof ExdIICT6 approval Amb. temp.: –20 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Electrical connection: JIS G1/2 female	JF3

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<Factory setting>

Item	AI1 for Flow Rate Signal (Standard)	AI2 for Temperature Signal (with MV Option)
Tag number (PD_TAG)	Set to “FT1003” by default unless otherwise specified when ordered.	
Output mode (L_TYPE)	“Direct”	
Upper and lower calculation range limits and unit (XD_SCALE)	The upper range limit will be set to the maximum flow rate range specified in the registered sizing data, or to the 0 to 10 m^3/h range in case of UNCALIBRATION.	–40 to 250°C or –40 to 482°F
Upper and lower output range limits and unit (OUT_SCALE)		
Node address	Set to 0xF2 unless otherwise specified when ordered.	

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Explanation of parameters:

(1) XD_SCALE: Defines the input values from the transducer block (input range of the sensor) corresponding to 0% and 100% values in the calculation inside the AI function block. For a digitalYEWFLO, the values set as the flow span or temperature range (optional) are stored in this parameter.

(2) OUT_SCALE: Output scaling parameter. Defines the output values corresponding to 0% and 100% values in the calculation inside the AI function block.

(3) L_TYPE: Determines whether the values passed from the transducer block (sensor) should be output without processing (“Direct”) or through scaling conversion based on OUT_SCALE (“Indirect”).

■ TERMINAL CONNECTION

Terminal Symbols	Description
SUPPLY ⊕ SUPPLY ⊖	Fieldbus communication signal
⏚	Internal Ground Terminal

⏚ External Ground Terminal

T03.EPS

Ordering Instructions

Specify the following when ordering:

a) Model and suffix codes.
b) Sizing data: Mandatory for ordering. (*)
Create the sizing data by using the latest digitalYEWFLO Sizing Program.
(*): digitalYEWFLO Sizing Program is necessary to generate the sizing data for order.
XD_SCALE and OUT_SCALE are set the maximum flowrate in the sizinf data for order.
c) Selection of UPPER DISP. FLOWRATE
Except: the Remote Type Detector (-N)
d) Multi-Variable Type Selection
e) Tag Number (PD_TAG): Specify software tag (up to 32 letters) to be written on the amplifier memory.
f) Node address
g) Operation Functional Class: Select ‘BASIC’ or ‘LINK MASTER’.
h) Final destination selection

Related Instruments

Maintenance tools for field devices, bus terminators, fieldbus power supply, and other fieldbus components need to be prepared by the customer.

=== RELATED MATERIAL ===

Model DY, Model DYA Vortex Flowmeter...GS 01F06A00-01EN.

FSA120 Flow Configuration Software...GS 01C25R51-01E