

General Specifications

digitalYEWFLO Series
Vortex Flowmeter
FOUNDATION Fieldbus Communication Type

digitalYEWFLO

GS 01F06F01-01EN



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.

FEATURES

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

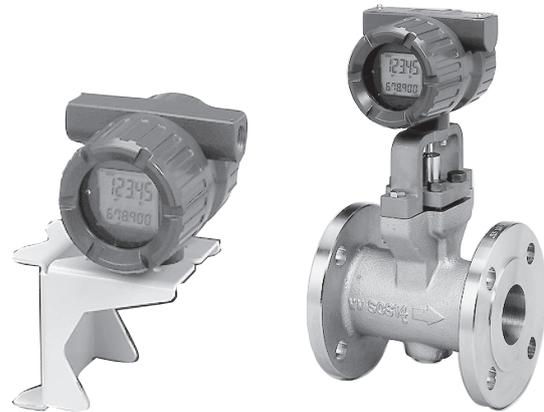
The common function block of field devices have the same operability, because of their common specification. The individual device setting (Transducer Block parameter setting) can be done simply by executing METHOD.

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.



Vortex Flow Converter (Remote Type Converter) Vortex Flowmeter (Integral Type)

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.

EMC Conformity Standards:

EN 61326-1 Class A, Table 2 (For use in industrial locations), EN 61326-2-3, EN61326-2-5

Note1: 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.

Note2: Use the metal conduit for the remote cable.

● 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 (Note 1, Note 2)	Notes		
		Input for Temperature, Pressure	Reference input condition for Mass Flow Accuracy	Flow computing
Saturated steam (Temperature base)	±1.7% (Flow velocity 35m/s or less) ±2.2% (Flow velocity 35m/s to 80m/s)	Temperature	Temperature range +100 to +330°C Temperature accuracy ±0.1%	Density computing by temperature using standard steam table (IAPWS-IF97: International Association 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 Association 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 Association 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 K 2249.
General gas including Natural gas	±1.1% (Flow velocity 35m/s or less) ±1.6% (Flow velocity 35m/s to 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 calculation parameters are downloaded by FSA120 • FieldMate FlowNavigator (Note 3)
Liquid	Not fixed	Temperature	Computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	

- Note 1) Mass Flow Accuracy for Steam and Natural gas is computed adding by Temperature and Pressure compensation based on Volumetric Flow Accuracy.
 Note 2) Refer to GS 01F06A00-01EN about mass and volumetric flow accuracy of AI1 output.
 Note 3) Refer to GS 01C25R51-01EN.

Mass Flow or Volumetric Flow at Normal/Standard condition Accuracy using Arithmetic (AR) function block:
(when Multi-Variable Type (option code: /MV), High Process Temperature Version Multi-Variable Type (combination of option code /HT and /MV) and outer pressure sensor are used)
 Accuracy ± %: of Reading

Fluid	Mass Flow Accuracy (Note 1, Note 2)	Notes		
		Input for Temperature, Pressure	Reference condition for Mass Flow Accuracy	Flow computing
Saturated steam (Temperature base)	±2.0% (Flow velocity 35m/s or less) ±2.5% (Flow velocity 35m/s to 80m/s)	Temperature	Temperature range +100 to +250°C (/MV) +100 to +330°C (/HT/MV)	Density computing by temperature using standard steam table (IAPWS-IF97: International Association 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 Association 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 (/MV) +100 to +400°C (/HT/MV)	Density computing by temperature and pressure using standard steam table (IAPWS-IF97: International Association 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 K 2249.
General gas including Natural gas	±2.0% (Flow velocity 35m/s or less) ±2.5% (Flow velocity 35m/s to 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 calculation parameters are downloaded by FSA120 • FieldMate FlowNavigator (Note 3)
Liquid	Not fixed	Temperature	Computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	

Note 1) Mass Flow Accuracy for Steam and Natural gas is computed adding by Temperature and Pressure compensation based on Volumetric Flow Accuracy.

Note 2) Refer to GS 01F06A00-01EN about mass and volumetric flow accuracy of AI1 output and temperature accuracy of AI2 output.

Note 3) Refer to GS 01C25R51-01EN.

● **Electrical Specifications**

Power Supply Voltage:

9 to 32 V DC for general-purpose, flameproof, ATEX intrinsically safe Ex ic (Entity model) and Nonincendive

9 to 24 V DC for intrinsically safe (Entity model)

9 to 17.5 V DC for intrinsically safe and ATEX intrinsically safe Ex ic (FISCO model)

Output Signals:

Digital communication signal compliant with the FOUNDATION Fieldbus protocol

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. FOUNDATION Fieldbus specifications (ITK 5.0.1) grant the interoperability of the field instruments. Function blocks:

Block name	Number	Execution time	Note
AI	3	29 ms	AI1: Monitors the flow 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

MODEL AND SUFFIX CODES

DY□□□^F_N □□□□□-□□/□

DYA-F□□□/□

F: digital communication (FOUNDATION Fieldbus protocol)

N: Remote type detector

OPTIONAL SPECIFICATIONS

[IMPORTANT] In case of the remote type, select the same specification (code) for both detector and converter.

For options other than below, refer to GS 01F06A00-01EN.

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

(Note2) In case of /KN26, the screw length of Electrical Connection is deeper than ANSI standard for 0.5 to 2 threads.

Item	Description	Code
Multi-variable Type	Provides a temperature sensor (Pt 1000) built-in the vortex shedder bar, enabling the AI2 function block to output the process fluid temperature, and mass flow rates to be calculated. (For details, refer to GS 01F06A00-01EN.)	MV
PID Function	Provides a PID control function block.	LC1
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: Explosionproof 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." Enclosure Rating: 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 (No condensation) Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating. Electrical Connection: ANSI 1/2NPT female	FF1
	FM Intrinsically Safe Approval, Nonincendive (Note1) 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=3.52nF, Li=0 [FISCO (IIC)] Vmax=17.5V, Imax=380mA, Pi=5.32W, Ci=3.52nF, Li=0 [FISCO (IIB)] Vmax=17.5V, Imax=460mA, Pi=5.32W, Ci=3.52nF, Li=0 Nonincendive Vmax=32V, Ci=3.52nF, Li=0 Electrical Connection : ANSI 1/2NPT female	FS16

Item	Description	Code
ATEX	<p>ATEX Flameproof Approval Applicable Standard: EN 60079-0, EN 60079-1 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 : 2 G Temperature Class : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Process Temperature : 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 (No condensation) Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female</p>	KF2
	<p>ATEX Intrinsically Safe Approval Ex ia (Note1) Applicable Standard : EN 50014, EN 50020, EN 60079-27, EN 50284 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: 1 G Ambient Temperature (Integral Type Vortex Flowmeter): -29 to +60°C Ambient Temperature (Remote Type Vortex Flow Detector): -29 to +80°C Ambient Temperature (Remote Type Vortex Flow Converter): -40 to +60°C Ambient Humidity: 0 to 100%RH (No condensation) Process Temperature : 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</p>	KS26
	<p>ATEX Intrinsically Safe Ex ic (Note1, 2) Applicable Standard: EN 60079-0, EN 60079-11 Type of Protection: Ex ic IIC T4...T1 Gc (Integral Type Vortex Flowmeter) Ex ic IIC T6...T1 Gc (Remote Type Vortex Flow Detector) Ex ic IIC T5...T4 Gc (Remote Type Vortex Flow Converter) Groups/Category: II 3 G Temperature Class: T4...T1 (Integral Type Vortex Flowmeter) T6...T1 (Remote Type Vortex Flow Detector) T5...T4 (Remote Type Vortex Flow Converter) Ambient Temperature: -29 to +60°C (Integral Type Vortex Flowmeter) -40 to +80 [79]°C (Remote Type Vortex Flow Detector) (Option /LT below -29°C, [] for Option /MV at T6) -40 to +80°C (Remote Type Vortex Flow Converter without indicator): -30 to +80°C (Remote Type Vortex Flow Converter with indicator): Ambient Humidity: 5 to 100%RH (No condensation) Process Temperature: T6: -196 to 84 [79]°C, T5: -196 to 100°C, T4: -196 to 135°C, T3: -196 to 199°C, T2: -196 to 299 [289]°C, T1: -196 to 449 [439]°C (Option /HT above 250°C and Option /LT below -29°C, [] : Option /MV) Signal/Supply (Terminals SUPPLY + and -) Circuit: FISCO field device Ui = 32 V, Ci = 3.52 nF, Li = 0 mH Electrical Connection: ANSI 1/2 NPT female, ISO M20 × 1.5 female</p>	KN26

Item	Description	Code
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) 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) Process Temperature : T6;85°C, T5;100°C, T4;135°C, T3;200°C, T2;300°C, T1;450°C Enclosure : Type 4X 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 Temperature : 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 (No condensation) Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	SF2
Technology Institution of Industrial Safety (TIIS), Japan	TIIS explosion-proof Ex d IIC T6 approval Ambient Temperature: -20 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Electrical connection: JIS G1/2 female	JF3

<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 +260°C or -40 to +500°F
Upper and lower output range limits and unit (OUT_SCALE)_		
Node address	Set to 0xF2 unless otherwise specified when ordered.	

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 (option) 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 Terminals Grounding Terminal

Ordering Instructions

Specify the following when ordering:

- 1) Model and suffix codes.
- 2) 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 sizing data for order.
- 3) Selection of UPPER DISP. FLOWRATE
Except: the Remote Type Detector (-N)
- 4) Multi-Variable Type Selection
- 5) Tag Number (PD_TAG): Specify software tag (up to 32 characters) to be written on the amplifier memory.
- 6) Node address
- 7) Operation Functional Class: Select 'BASIC' or 'LINK MASTER'.
- 8) Final destination selection
(for detail, refer to GS 01F06A00-01EN)

Related Material

- digitalYEWFLO Series Vortex Flowmeter
GS 01F06A00-01EN
- FSA120 Flow Configuration Software
GS 01C25R51-01EN

Reference

'digitalYEWFLO', 'DY', 'DYA', and 'DYC' are registered trademarks of Yokogawa Electric Corporation.
Product names and company names in this document are trademarks or registered trademarks of the respective companies.

In this document, trademarks or registered trademarks are not marked with "TM" or "®".

Related Instruments

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