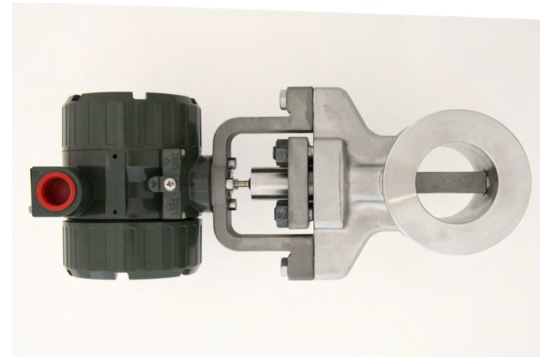


# General Specifications ISTE C 7150

## Vortex Flow Meters Model DY, Model DYA



Model 7150  
Remote Type Detector



Based on the field proven sensor technology of the YEFWLO series vortex flowmeters, DIGITAL YEFWLO features a new amplifier with Yokogawa's proprietary Spectral Signal Processing (SSP) technology to analyze the vortex waveform into its spectral components to filter noise from signal for the most stable measurement possible.

DIGITAL YEFWLO will provide excellent vibration immunity for stable, accurate measurements at low flows without any need for start-up tuning. The user benefits through greater reliability, reduced maintenance and a lower total cost of ownership.

### ■ FEATURES

- SSP (Spectral Signal Processing) technology:  
A unique signal processing technique extends the features of Digital Signal Processing (DSP). Analyzes incoming signals and applies an intelligent amplification circuit based on measured frequency and predicted process conditions.
- No start-up tuning  
Automatically selects the optimum settings – even in noisy environments
- Low flow stability  
Accurately senses vortices at low flow rates for stable, accurate flow measurement
- Backward compatible  
The SSP amplifier can be retrofitted to provide the best vortex flow measurement available today
- Advanced self-diagnostics  
Analysis of the process allows true condition-based maintenance
- Simplified parameter settings  
Frequently used parameters grouped together in a quick-access format decreases commissioning time
- Clear, parallel two line LCD display  
Displays simultaneous flow rate and total along with process diagnostics

- New compact amplifier housing  
Lighter, small and easier to handle design with increased reliability and performance
- Simultaneous analog and pulse outputs
- Status output (flow switch function) or alarm output
- BRAIN and HART communication
- Configurable through local display interface (MMI)
- Wide process temperature range  
High temperature option to 842°F (450°C)
- High accuracy  
±0.75% of reading (liquid)  
±1% of reading (gas, steam)
- 100 ft. (30m) signal cable length for remote amplifier configuration
- Compliance with NACE and NAMUR 43
- Explosion proof and intrinsically safe designs

### ■ MULTI-VARIABLE TYPE (OPTION)

- Integral temperature sensor (Pt1000)
- Calculates mass flow of saturated steam based on steam tables embedded in the software and the mass flow of liquids based on programmed fluid temperature coefficients.
- Provides simultaneous outputs for temperature monitoring and mass flow measurement
- Displays mass flow rate and temperature on two line LCD indicator

### Contents

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Standard Specifications	P. 2
Model & Suffix Codes	P. 4
Option Specifications (Hazardous Area Classifications)	P. 5
Option Specification	P. 6
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## ■ STANDARD SPECIFICATIONS

### Performance Specifications

#### Fluid to be Measured:

Liquid, Gas, Steam (Avoid Multiphase Flow and Sticky Fluids)

#### Measuring Flow Rates:

Refer to Tables 10, 11, and 12, pages 8 and 9

#### Accuracy:

±0.75% of Reading (Liquid)

±1% of Reading (Gas, Steam)

Refer to Table 8, page 8

Refer to Table 3, Page 7 for multi-variable option

#### Repeatability:

± 0.2% of Reading

#### Calibration:

factory-calibrated using water flow.

### Normal Operating Condition

#### Process Temperature Range:

General: -40 to 500°F [-40 to 260°C]

High Process Temperature Version option

-40 to 842°F [-40 to 450°C]

Refer to Figure 1 for integral converter type.

Refer to Page 6 for multi-variable option

#### Process Pressure Limit:

-14.2 PSIA (-1 kg/cm<sup>2</sup>) to flange rating.

#### Ambient Temperature Range:

Remote type detector, Remote type

converter: -40 to 185°F [-40 to 85°C]

Integral type, refer to Figure 1:

-40 to 185°F [-40 to 85°C]

Integral type with Indicator, refer to

Figure 1: -22 to 176°F [-30°C to 80°C]

#### Ambient Humidity:

5 to 100% RH (at 40°C)

(Non Condensing)

#### Power Supply Voltage:

10.5 to 42 V DC

(Refer to Figure 2 ; Relationship Between Power Supply Voltage and Load Resistance)

### Mechanical Specifications

#### Material (General Type):

Refer to Table 1

Body: CF8M casting stainless steel (SUS316)

Shedder bar: Duplex stainless steel (ASTM CD4MCu equivalent to JIS SUS329J1,)

Gasket: JIS SUS316 stainless steel with polytetrafluoroethylene (Teflon) coating.

Converter housing and case, cover:

Aluminum alloy

#### Coating Color:

Converter case, cover: Deep sea moss green

(Munsell 0.6GY 3.1/2.0)

(Polyurethane corrosion-resistant coating)

#### Protection:

IP67 immersion proof and dust proof. (NEMA 4X).

#### Hazardous Area Classifications:

Refer to item "Option Specifications"

#### Electrical Connection:

ANSI 1/2 NPT female

#### Signal Cable:

Model DYC cable, used for remote detector and converter.

Max. length: 98 ft. (30 m.)

Outer Sheath Material:

Heat resistant polyethylene

Temperature Rating :

-40 to 302°F [-40 to 150 °C]

#### Weight:

Refer to Dimensional Drawings.

#### Mounting:

Integral type and Remote type detector :

Flange mounting or wafer mounting

Remote type converter :

2 inch pipe mounting.

### Electrical Specifications

\*Note: Pulse output, alarm output and status output use common terminals, therefore these functions are not used simultaneously.

**Output Signal:** Simultaneous Output (both analog and transistor contact output available). Refer to "Installation" for power supply and pulse output wiring.

**Analog:** 4 to 20 mA DC, 2-wire system.

#### Transistor Contact Output\*:

Open collector, 3-wire system.

Pulse, alarm, status output are selected by parameter setting.

Contact rating: 30 V DC, 120 mA DC

Low level: 0 to 2 V DC. (refer to Figure 3)

### Communication Requirement

#### Communication Signal:

BRAIN or HART communication signal

(superimposed on a 4 to 20 mA DC signal)

#### Conditions of Communication Line:

**Load Resistance:** 250 to 600 Ω (including cable resistance). Refer to Figure 2.

**Supply Voltage:** 16.4 to 42 V DC for digital communications BRAIN and HART protocols. (16.4 to 30 V DC for intrinsically safe type). Refer to Figure 2.

#### Spacing from Power Lines :

6 in. (15cm) or more (Parallel wiring should be avoided.)

### BRAIN

#### Communication Distance:

Up to 1.2 miles (2 km), when polyethylene insulated PVC-sheathed cables (CEV cables) are used. Communication distance varies depending on type of cable used.

#### Load Capacitance:

0.22 μF or less

**Load Inductance:** 3.3 mH or less

**Input Impedance of Receiver Connected to the Receiving Resistance:**

10 kΩ or more at 2.4 kHz.

## HART

### Communication Distance:

Up to .9 miles (1.5km), when using multiple twisted pair cables. Communication distance varies depending on type of cable used.

### Cable Length for Specific Applications:

Use the following formula to determine cable length for specific applications.

$$L = \frac{65 \times 10^6}{(RXC) - (Cf + 10,000)C}$$

where:

L=length in meters.

R=resistance in  $\Omega$  (including barrier resistance)

C=cable capacitance in pF/m.

Cf= maximum shunt capacitance of receiving devices in pF/m.

## Functions

### Damping Time Constant:

0 to 99 Sec (63% response time)

\*Note: Delay time is 0.5 Sec.

Analog output circuit time constant is 0.3 Sec.

### Pulse Output Function\*:

Pulse output is selected from scaled pulse, unscaled pulse, frequency (number of pulses output per second at 100% of output).

Pulse frequency: Max 10 kHz

Duty cycles: Approx. 50% (1:2 to 2:1)

### Self-diagnostics and Alarm Output\*:

In an alarm condition (over range output signal, EEPROM error, vibration noise, abnormal flow such as clogging, bubble) an alarm signal is output and indicated. The alarm signal output goes from close(ON) to open(OFF) during alarm.

### Analog Output Function:

For multi-variable option the analog output corresponds to flow rate or temperature.

### Status Output Function\*

#### Flow Switch:

In case flow rate falls below the flow set value, a status signal is output. The status signal output mode can be reversed (ON/OFF).

#### Data Security During Power Failure:

Data (parameter, totalizer value, etc.) storage by EEPROM. No back-up battery required.

#### Correction

##### Instrument Error Correction:

Vortex flowmeter errors can be corrected by line segment approximations.

##### Reynolds Number Correction:

Output error at Reynolds number 20000 or less is corrected by using five-break-point line-segment approximation.

##### Gas Expansion Correction:

When measuring a compressible gas and steam, this expansion factor is useful to correct the error at velocities above 115 f/s (35m/s or more).

##### Down-scale or Up-scale burn out

In case a CPU or EEPROM failure occurs, the output can be driven up-scale (21.6Ma) or down-scale (3.6Ma). Selection can be made by the end user via a jumper setting.

## Indicator:

Flow rate (% or engineering units) and totalizer can be indicated simultaneously.

Short message for self diagnostics is displayed. Local parameter setting can be accomplished by push buttons.

Rotatable 90° right and left

## EMC Conformity Standards:

EN61326

AS/NZS 2064

Note: For remote converter type, the signal cable should be used with metal conduit.

Figure 1 Ambient Temperature Limit (Integral Type)

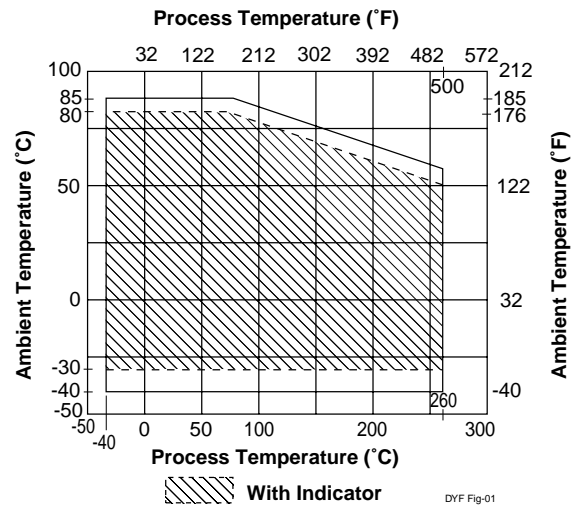


Figure 2 Relationship Between Power Supply and Load Resistance

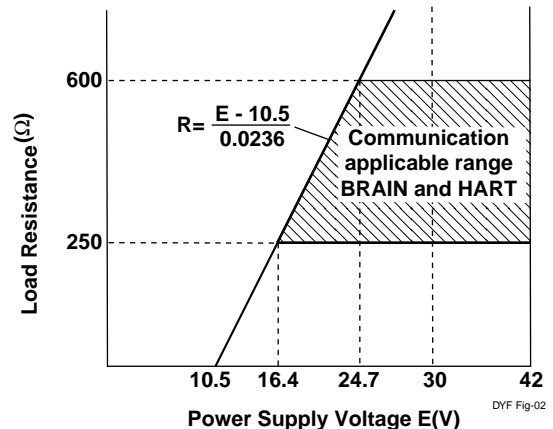
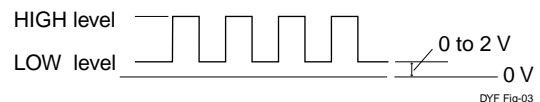


Figure 3 High and Low Level (Pulse Output)



**DY Vortex Flowmeter (Integral Type, Remote type detector)**

Model	Suffix Codes	Description
DY015	.....	Size 15 mm (1/2 inch)
DY025	.....	Size 25 mm (1 inch)
DY040	.....	Size 40 mm (1-1/2 inch)
DY050	.....	Size 50 mm (2 inch)
DY080	.....	Size 80 mm (3 inch)
DY100	.....	Size 100 mm (4 inch)
DY150	.....	Size 150 mm (6 inch)
DY200	.....	Size 200 mm (8 inch)
DY250	.....	Size 250 mm (10 inch)
DY300	.....	Size 300 mm (12 inch)
Output Signal /Communication *1	-D ..... -E ..... -N .....	4 to 20 mA DC, Pulse, BRAIN Communication 4 to 20 mA DC, Pulse, HART Communication Remote type detector
Body Material *2	B ..... X .....	CF8M Others
Shedder bar Material *3	M ..... X ..... L .....	Duplex Stainless Others Duplex Stainless
Process Connection *4	AA1 ..... AA2 ..... AA4 ..... BA1 ..... BA2 ..... BA4 ..... BA5 ..... CA4 ..... CA5 .....	ANSI Class 150 Wafer ANSI Class 300 Wafer ANSI Class 600 Wafer ANSI Class 150 Flange(Raised Face) ANSI Class 300 Flange(Raised Face) ANSI Class 600 Flange(Raised Face) ANSI Class 900 Flange(Raised Face) ANSI Class 600 Flange(Ring Joint) ANSI Class 900 Flange(Ring Joint)
Electrical Connection	-2.....	ANSI 1/2 NPT Female *5
Indicator *6	D ..... N .....	With Indicator No Indicator, Remote type detector
Options	<input type="checkbox"/>	Refer to Option Specifications

DYF Tab-01

**DYA Vortex Flowmeter Converter(Remote Type)**

Model	Suffix Code	Description
DYA	.....	Vortex Flowmeter Converter (Remote Type)
Output Signal /Communication *1	-D ..... -E .....	4 to 20 mA DC, Pulse BRAIN Communication 4 to 20 mA DC, Pulse HART Communication
Electrical Connection	2.....	ANSI 1/2 NPT Female *5
Indicator	D ..... N .....	With Indicator No Indicator
Options	<input type="checkbox"/>	Refer to Option Specifications

**DYC Signal Cable**

Model	Suffix Code	Description
DYC	.....	Signal Cable
Cable End	-1.....	With End finish
Cable Length	-0010F..... -0015F..... -0030F..... -0050F..... -0065F..... -0075F..... -0100F.....	10 ft. 15 ft. 30 ft. 50 ft. 65 ft. 75 ft. 100 ft.
Options	/MV.....	Signal cable for multi-variable type

- \* 1 : Nominal size, Fluid(Liquid, Gas, Steam), Density, Viscosity, Pressure, Temperature, Flow range, Parameters are set at the factory before shipment.
- \* 2 : Refer to Table 1.  
When selecting option /NC or /HX or /HT, select X (others).
- \* 3 : Select M for .5-8in (15-200mm) sizes.  
Select L for 10-12in (250-300mm) sizes.  
When selecting option /NC, /HX, or /HT select X.
- \* 4 : Refer to Table 2.
- \* 5 : In case of /FF1 or /CF1, the screw length is deeper than ANSI standard for 0.5 to 3.5 threads.
- \* 6 : Indicator is not available for remote type detector.

DYF Tab-02

Table 1 Body, Shedder Bar, Gasket Material

Option Item (Note 1)	Option Code (Note 1)	Material			Process Connection	
		Body (Note 2)	Shedder bar (Note 3)	Gasket	Wafer Nominal Size	Flange Nominal Size
General (REFERENCE)	---	CF8M	Duplex Stainless Steel	(Note 4)	.5 to 4 in. (15 to 100mm)	.5 to 12 in. (15 to 300mm)
Compliance with NACE	NC	CF8M	Hastelloy C	(Note 5)	.5 to 4 in. (15 to 100mm)	.5 to 8 in. (15 to 200mm)
Corrosion Resistant Version	HX	Hastelloy C	Hastelloy C	(Note 5)	.5 to 4 in. (15 to 100mm)	.5 to 6 in. (15 to 150mm)
High Process Temperature Version	HT	CF8M	Hastelloy C	316SS stainless steel plated with silver	1 to 4 in. (25 to 100mm)	1 to 8 in. (25 to 200mm)

DYF Tab-03

- (Note 1) Refers to options for Model and Suffix Codes (page 4).
- (Note 2) When selecting /NC or /HX or /HT, select body material code [-X].
- (Note 3) When selecting /NC or /HX or /HT, select shedder bar material code [-X].
- (Note 4) 316SS stainless steel with polytetrafluoroethylene(Teflon) coating
- (Note 5) Hastelloy C with polytetrafluoroethylene (Teflon) coating.

Table 2 Flowmeter Selection Guide

Process Connection	Wafer		Flange(Raised Face)		Flange(Ring Joint)	
	Suffix Code	Nominal Size	Suffix Code	Nominal Size	Suffix Code	Nominal Size
ANSI Class 150	AA1	.5 in up to 4 in (15 mm up to 100 mm)	BA1	.5 in up to 12 in (15 mm up to 300 mm)	—	—
ANSI Class 300	AA2	.5 up to 4 in (15 mm up to 100 mm)	BA2	.5 in up to 12 in (15 mm up to 300 mm)	—	—
ANSI Class 600	AA4	.5 in up to 4 in (15 mm up to 100 mm)	BA4	.5 in up to 8 in (15 mm up to 200 mm)	CA4	.5 in up to 8 in (15 mm up to 200 mm)
ANSI Class 900	—	—	BA5	1 in up to 6 in (25 mm up to 150 mm)	CA5	1 in up to 6 in (25 mm up to 150 mm)

DYF Tab-04

## ■ OPTION SPECIFICATIONS (HAZARDOUS AREA CLASSIFICATIONS)

ITEM	Specifications	Code
Factory Mutual (FM)	<p>FM Explosion proof Approval</p> <p>Explosion proof for Class I, Division 1, Groups A,B,C and D Dust-ignition proof for Class II/III, Division 1, Groups E, F and G Enclosure: NEMA TYPE4X Seal all conduit within 18 inches For Class I, Div. 2 locations "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED." Temperature Code: T6 Amb. Temp: -40 to 140°F (-40 to 60°C) Electrical connection: ANSI 1/2NPT female</p>	FF1
	<p>FM Intrinsically safe Approval (Note 1)</p> <p>Intrinsically safe for Class I,II,III, Division 1, Groups A, B, C, D, E, F and G Nonincendive for Class I,II, Division 2, Groups A, B, C, D, E, F and G, Class III, Division 1 Hazardous locations Enclosure: NEMA 4X Temperature Code: T4 Amb. Temp.(Integral Type and Remote Type Converter ) : -40 to 140°F (-40 to 60°C) Amb. Temp.(Remote Type Detector) : -40 to 185°F (-40 to 85°C) Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=6 nF, Li=0.15 mH Electrical connection: ANSI 1/2NPT female</p>	FS1
	<p>CSA Explosion proof Approval</p> <p>Explosion proof for Class I,Division 1, Groups B,C and D Dust-ignition proof for Class II/III, Division 1, Groups E, F and G For class I, Division 2 locations "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED." Enclosure: "Type 4X" Temperature class : T6...T1 Amb.Temp.: -40 to 140°F (-40 to 60°C) Max. process temp. : T6; 185°F (85°C), T5; 212°F (100°C), T4; 275°F (135°C), T3; 392°F (200°C), T2; 572°F (300°C), T1; 842°F (450°C) Electrical connection : ANSI 1/2 NPT female</p>	CF1
	<p>CSA Intrinsically safe Approval (Note 1)</p> <p>Intrinsically safe for Class I,II,III, Division 1, Groups A, B, C, D, E, F and G Nonincendive for Class I,II, Division 2, Groups A, B, C, D, E, F and G, Class III, Division 1 Enclosure: "Type 4X", Temperature class : T4...T1 Amb. Temp.(Integral Type and Remote Type Converter) : -40 to 140°F (-40 to 60°C) Amb. Temp.(Remote Type Detector): -40 to 185°F (-40 to +85°C) Max. process temp. : T4; 275°F (135 °C), T3; 392°F (200°C), T2; 572°F (300°C), T1; 842°F (450°C) Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=6 nF, Li=0.15 mH Electrical connection : ANSI 1/2 NPT female</p>	CS1
Canadian Standards Association (CSA)		

(Note 1) : For intrinsically safe approval, use a certified barrier

DYF Tab-0506

## ■ OPTION SPECIFICATIONS

Item	Specification	Applicable Model	Code
Multi-Variable Type (Note 3)	Integral temperature sensor (Pt 1000)	DY/DYA	MV
Stainless Steel Tag Plate (Note 1)	SUS304 tag plate, wire tied to converter case.	DY/DYA	SCT
Stainless Steel Bolt & Nut Assembly	SUS304 bolt/nut assembly. Used when a wafer type is installed.	DY Wafer Type	BL
Epoxy Coating	Epoxy coating for meter cover and case.	DY / DYA	X1
High Process Temperature Version	Process temperature range -40 to 842°F (-40 to +450°C) Refer to Table 1 , Figure 4. Refer to Table 5 for minimum velocity. For other sizes, please contact YOKOGAWA.	DY***-N	HT
Lightning Protector	Lightning arrester in power supply line. Maximum power supply voltage : 30VDC	DY***-D,E / DYA	A
Compliance with NACE	Compliance with NACE. Refer to Table 1.	DY	NC
Corrosion Resistant Version	Corrosion Resistant Verion. Refer to Table 1.	DY	HX
180° Rotation of Converter Housing	180° rotation of housing (flow right to left).	DY	CRC
Down-scale burn-out in event of CPU or EEPROM failure /NAMUR compliance(Note 2)	Set output to 3.6mA or less when burn-out occurs.	DY***-D,E / DYA	NM

- (Note 1) When /SCT is not chosen, the specified Tag Number is printed on a paper tag.  
 (Note 2) The output is set 3.6mA or less (General type is set 21.6mA or more at shipping).  
 (Note 3) Refer to Table 9 (built in temperature sensor) type (/MV)

DYF Tab-07

## ■ OPTION SPECIFICATIONS (MULTI-VARIABLE TYPE)/(MV)(\*1)

		Multi-Variable Type			
Size	Wafer	1in to 4in (25mm to 100mm)			
	Flange	1in to 8in (25mm to 200mm)			
Function		Mass Flow calculation			
Fluid		Saturated Steam	Superheat Steam	Gas	Liquid
Compensation Temperature		100 to 260°C	100 to 260°C	-29 to 260°C	-29 to 260°C
Accuracy (*2)	Mass Flow	Table 3	Table 3	Table 3	Table 3
Accuracy (*2)	Temperature	±0.5% of Reading	±1% of Reading	±1% (less than 100°C) ±1% of Reading (100°C or more)	±0.5% (less than 100°C) ±1% of Reading (100°C or more)
Mass Flow Calculation Method		Density Calculation (*3)	Density Calculation (constant pressure is assumed) (*4)	Temp-Pressure Correction (constant pressure is assumed) (*5)	Density Change Calculation (*6)
Output	Analog Output	Flow Rate or Temperature (*7)			
	Pulse Output	Only for Flow Rate			
	Alarm Output	Standard Alarms and Temperature Alarms			
	Status Output	Only for Flow Switch			
Temperature Response (50% response)		60 seconds			
Display	Upper	Select from Flow Rate (% , Engineering Unit) or Temperature % (*8)			
	Lower	Select from Total or Temperature (C, F) (*9)			
Remote Type		Flow Converter: Select DYA-□□□/MV Signal Cable: Select DYC-□□□/MV (*10)			

- \*1 Option /HT is not available when /MV is selected.  
 \*2 For use in steam or superheated steam, insulation or a steam jacket is required for proper operation of the temperature compensation function.  
 \*3 Temperature compensated steam mass flow is calculated using density data from standard saturated steam tables.  
 \*4 For superheated steam measurements a constant pressure is required or separate pressure compensation is required.  
 \*5 For gas measurement pressure at normal operating conditions must be advised. Pressure must be held constant or separate pressure compensation is required.  
 \*6 For liquid mass flow measurement density at normal operating conditions is used. Temperature compensation uses a quadratic equation with a customer supplied temperature coefficient.  
 \*7 The default setting is flow rate. This can be changed to temperature via a parameter change in the software.  
 \*8 When indicating temperature %, a T will also appear in that line indicating % of temperature range.  
 \*9 The default is temperature. When total rate is selected total is displayed.  
 \*10 For remote meters the cable length must be advised at time of order placement when the "/MV" option is selected.

**Table 3 Detailed Accuracy for /MV Option**

Fluid	Nominal Size	Accuracy
Liquid	1 to 4 in	± 2.0% of Reading (20000 ≤ Re < D × 10 <sup>3</sup> )
	25 to 100 mm	± 1.5% of Reading (D × 10 <sup>3</sup> ≤ Re)
	6 to 8 in 150 to 200 mm	± 2.0% of Reading (40000 ≤ Re)
Gas, Steam	1 to 8 in	± 2.0% of Reading (Velocity 35 m/s or less)
	25 to 200 mm	± 2.5% of Reading (Velocity 35 m/s up to 80 m/s)

T09-2.EPS

D: Inner diameter of YEWFLOW (mm)

Re: Reynolds number (non unit)

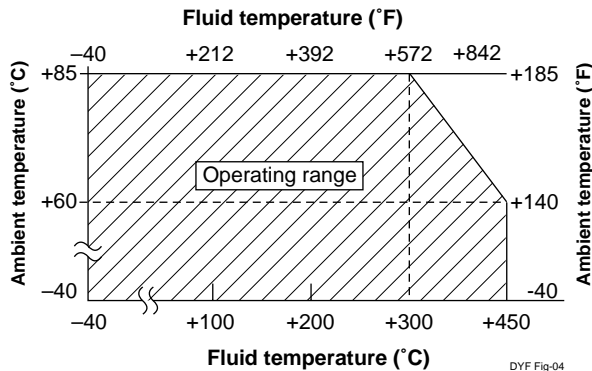
Note: In case of analog output, add ± 0.1% of full scale to the values mentioned above.

**Table 4 Pressure Test Values for Stainless Steel**

Flange Rating	Pressure
ANSI Class 150	412 psi (29 kgf/cm <sup>2</sup> )
ANSI Class 300	1081 psi (76 kgf/cm <sup>2</sup> )
ANSI Class 600	2161 psi (152 kgf/cm <sup>2</sup> )
ANSI Class 900	3242 psi (228 kgf/cm <sup>2</sup> )

DYF Tab-09

**Figure 4 Fluid Temperature Range of High Process Temperature Version**



DYF Fig-04

**Minimum measurable flow velocity**

The following tables show typical operating ranges. For specific operating conditions please run the flow meter sizing program. Available from Yokogawa.

**Table 5 Relationship between Minimum Velocity and Density (Use the Larger of the Two Values)**

Nominal size in in.	Liquid		GAS, Steam	
	General Type (unit: fps)	High Process Temperature Version (unit: fps)	General Type (unit: fps)	High Process Temperature version (unit: fps)
.5	$\sqrt{168.125/\rho}$	—	$\sqrt{53.8/\rho}$ or 9.95	—
1	$\sqrt{82.3/\rho}$	$\sqrt{329.5/\rho}$	$\sqrt{30.3/\rho}$ or 6.5	$\sqrt{84/\rho}$ or 6.5
1.5	$\sqrt{60.5/\rho}$	$\sqrt{329.5/\rho}$	$\sqrt{21.0/\rho}$ or 6.5	$\sqrt{84/\rho}$ or 6.5
2	$\sqrt{60.5/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21.0/\rho}$ or 6.5	$\sqrt{41.2/\rho}$ or 6.5
3	$\sqrt{60.5/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21.0/\rho}$ or 6.5	$\sqrt{41.2/\rho}$ or 6.5
4	$\sqrt{60.5/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21.0/\rho}$ or 6.5	$\sqrt{41.2/\rho}$ or 6.5
6	$\sqrt{60.5/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21.0/\rho}$ or 9.9	$\sqrt{41.2/\rho}$ or 6.5
8	$\sqrt{82.5/\rho}$	$\sqrt{136.2/\rho}$	$\sqrt{30.3/\rho}$ or 9.9	$\sqrt{55.8/\rho}$ or 9.9
10	$\sqrt{107.6/\rho}$	—	$\sqrt{41.22/\rho}$ or 9.9	—
12	$\sqrt{107.6/\rho}$	—	$\sqrt{41.22/\rho}$ or 9.9	—

ρ : Density at operating conditions (lb/cubic ft)

Liquid density is 25-125 lb/cubic ft

Gas and steam density is 3.1214 lb/cubic ft or more.

DYF Tab-10-8

Nominal size in mm	Liquid		GAS, Steam	
	General Type (unit: m/s)	High Process Temperature Version (unit: m/s)	General Type (unit: m/s)	High Process Temperature version (unit: m/s)
15	$\sqrt{250/\rho}$	—	$\sqrt{80/\rho}$ or 3	—
25	$\sqrt{122.5/\rho}$	$\sqrt{490/\rho}$	$\sqrt{45/\rho}$ or 2	$\sqrt{125/\rho}$ or 2
40	$\sqrt{90/\rho}$	$\sqrt{490/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{125/\rho}$ or 2
50	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
80	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
100	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
150	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 3	$\sqrt{61.3/\rho}$ or 3
200	$\sqrt{122.5/\rho}$	$\sqrt{202.5/\rho}$	$\sqrt{45/\rho}$ or 3	$\sqrt{80/\rho}$ or 3
250	$\sqrt{160/\rho}$	—	$\sqrt{61.3/\rho}$ or 3	—
300	$\sqrt{160/\rho}$	—	$\sqrt{61.3/\rho}$ or 3	—

ρ : Density at operating conditions (kg/m<sup>3</sup>)

Liquid density is 400-2000kg/m<sup>3</sup>

Gas and steam density is 0.5kg/m<sup>3</sup> or more.

**Table 6 Range of Measurable Flow Velocity**

Fluid	Nominal Size	Minimum flow velocity	Maximum flow velocity
Liquid	15 to 300 mm	"flow velocity obtained from Table.5" or "flow velocity at Reynolds number of 5000", whichever is greater.	33 fps
	.5 to 12 in.	For liquid Reynolds number of 5000 : Use Figure.6	(10 m/s)
Gas, Steam	15 to 300 mm	"flow velocity obtained from Table.5" or "flow velocity at Reynolds number of 5000", whichever is greater.	262 fps
	.5 to 12 in.	For Gas and steam Reynolds number of 5000 : Use of a calculation formula on the following page.	(80 m/s)

When the flow velocity is lower than minimum, both the analog output and the pulse output is displayed as zero "0".

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■ **Flow velocity at minimum flow velocity**

**Table 7 Range of Guaranteed Accuracy Flow Velocity**

Fluid	Nominal Size	Minimum flow velocity	Maximum flow velocity
Liquid	.5 to 4 in (15 to 100mm)	"flow velocity obtained from Table.5" or "flow velocity at Reynolds number of 20000", whichever is greater. For liquid Reynolds number of 20000 : The value is four times velocity value in Figure.6	33fps  (10 m/s)
	6 to 12 in (150 to 300 mm)	"flow velocity obtained from Table.5" or "flow velocity at Reynolds number of 40000", whichever is greater. For liquid Reynolds number of 40000 : The value is eight times velocity value in Figure.6	
Gas, Steam	.5 to 4 in (15 to 100mm)	"flow velocity obtained from Table.5" or "flow velocity at Reynolds number of 20000", whichever is greater. For gas and steam Reynolds number of 20000 : Use of a calculation formula	262fps  (80 m/s)
	6 to 12 in (150 to 300mm)	"flow velocity obtained from Table.5" or "flow velocity at Reynolds number of 40000", whichever is greater. For gas and steam Reynolds number of 40000 : Use of a calculation formula	

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**Table 8 Detailed Accuracy**

Fluid	Nominal Size	Accuracy
Liquid	.5 in (15mm)	± 1.0% of Reading (20000 ≤ Re)
	1 to 4 in (25 to 100 mm)	± 1.0% of Reading (20000 ≤ Re < D × 10 <sup>3</sup> ) ± 0.75% of Reading (D × 10 <sup>3</sup> ≤ Re )
	6 to 12 in (150 to 300 mm)	± 1.0% of Reading (40000 ≤ Re)
Gas, Steam	.5 to 12 in	± 1.0% of Reading (Velocity 115fps (35m/s) or less)
	(15 to 300 mm)	± 1.5% of Reading (Velocity 115fps (35m/s) up to 262fps (80m/s))

DYF Tab-13

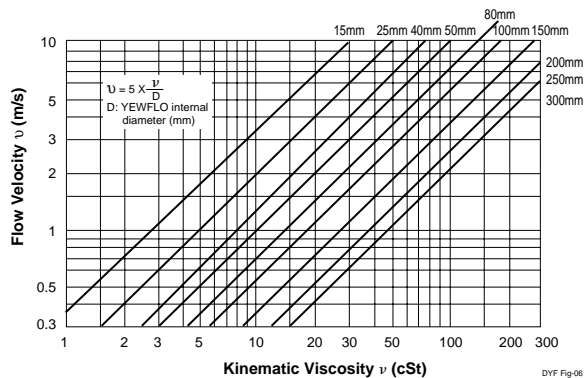
D : Inner diameter of YEWFLO (mm)

Re: Reynolds number

Note: This table shows the accuracy of pulse output. In case of analog output, add ± 0.1% of full scale to the values mentioned above.

■ **Flow velocity at Reynolds Number of 5000 (Liquid)**

**Figure 6 Flow Velocity at Reynolds Number of 5000 (Liquid)**



DYF Fig-06

■ **How to calculate volume flow rate at operating conditions.**

$$Q_f = \frac{v \times D^2}{354} \quad \text{or} \quad Q_f = 3600 \times v \times S$$

■ **How to calculate the velocity of a Reynolds number.**

- $v = 5.3 \nu / D$  (Reynolds number of 5000)
- $v = 20.3 \nu / D$  (Reynolds number of 20000)
- $v = 40.3 \nu / D$  (Reynolds number of 40000)

however

$$Re = \frac{354 \times 10^3 \times Q_f}{\nu \times D} \quad \dots\dots\dots(1)$$

$$\nu = \frac{\mu}{\rho f} \times 10^3 \quad \dots\dots\dots(2)$$

Qf : Volume flow rate at operating conditions (m<sup>3</sup>/h)

D : Inner diameter of YEWFLO (mm)

S : Sectional area of YEWFLO(m<sup>2</sup>)

v : Flow velocity (m/s)

Re : Reynolds number (none unit)

pf : Density at operating conditions (kg/m<sup>3</sup>)

μ : Viscosity at operating conditions (cP)

ν : Kinematic viscosity at operating conditions (cSt)

**Table 9 Inner Diameter and Nominal Value**

Nominal Size		Inner Diameter in. (mm)	Nominal K-Factor Pulse /G (L)	Nominal Pulse Rate	
mm	inch			Hz/ft/s (Hz/m/s)	Hz/ft/m (Hz/m <sup>3</sup> /h)
15	.5	.57 (14.6)	1423.3 (376)	19.11 (62.7)	23.6 (104)
25	1	1.0 (25.7)	247.9 (65.6)	10.82 (35.5)	4.3 (19.1)
40	1.5	1.56 (39.7)	70.7 (18.7)	7.04 (23.1)	1.2 (5.19)
50	2	2.01 (51.1)	33.9 (8.95)	5.57 (18.3)	.57 (2.49)
80	3	2.79 (71.0)	12.6 (3.33)	4.02 (13.2)	.21 (0.925)
100	4	3.69 (93.8)	5.41 (1.43)	3.01 (9.88)	.09 (0.397)
150	6	5.43 (138.8)	1.66 (0.441)	2.03 (6.67)	.03 (0.123)
200	8	7.30 (185.6)	.700 (0.185)	1.52 (5.00)	.01 (0.0514)
250	10	9.08 (230.8)	.365 (0.0966)	1.23 (4.04)	.006 (0.0268)
300	12	10.87 (276.2)	.213 (0.0563)	1.03 (3.37)	.004 (0.0156)

■ **Typical fluid example**

**Table 10 Range of Measurable Water Flow Rate (at standard condition of 59°F, p=62.428 lb/cubic ft.)**

Nominal Size		Measurable Flow Rate in GPM (m <sup>3</sup> /h)	Range of Guaranteed Accuracy Flow Rate in GPM (m <sup>3</sup> /h)
mm	inch		
15	.5	1.3 to 26 (0.30 to 6)	4.13 to 26 (0.94 to 6)
25	1	2.9 to 79.3 (0.65 to 18)	7.5 to 79.3 (1.7 to 18)
40	1.5	5.7 to 193(1.3 to 44)	11.4 to 193 (2.6 to 44)
50	2	9.6 to 321 (2.2 to 73)	14.5 to 321 (3.3 to 73)
80	3	18.9 to 625(4.3 to 142)	20.2 625 (4.6 to 142)
100	4	33.0 to 1091(7.5 to 248)	33 to 1091 (7.5 to 248)
150	6	74.8 to 239.5(17 to 544)	79.2 to 2395 (18 to 544)
200	8	149 to 4284(34 to 973)	150 to 4284 (34 to 973)
250	10	264 to 6630 (60 to 1506)	265 to 6630 (60 to 1506)
300	12	379 to 9492 (86 to 2156)	379 to 9492 (86 to 215)

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**Table 11 Range of Measurable Air Flow Rate at Selected Process Pressures**

Nominal Size	Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in SCFM (Nm <sup>3</sup> /h at MPa in parenthesis)									
		0 PSI(0)	15 PSI(0.1)	25 PSI(0.2)	50 PSI(0.4)	75 PSI(0.6)	100 PSI(0.8)	150 PSI(1.0)	250 PSI(1.5)	300 PSI(2.0)	350 PSI(2.5)
0.5 in (15mm)	min.	4.05(4.3)	5.76(6.7)	6.66(8.2)	8.51(10.5)	10.0(12.5)	11.34(16.1)	13.6(19.7)	19.3(28.6)	23(37.5)	26.7(46.4)
	max.	28.35(48.2)	57.32(95.8)	76.64(143)	125(239)	173.4(334)	221.9(429)	319.1(524)	514.3(762)	612.2(1000)	710.2(1238)
1.0 in (25mm)	min.	9.38(11.0)	13.34(15.5)	15.43(19.0)	19.7(24.5)	23.2(29.0)	26.3(33.3)	31.5(40.6)	40(59.0)	47.3(77.5)	54.9(95.9)
	max.	87.48(149)	176.9(297)	236.5(444)	385.7(739)	535.1(1034)	684.8(1329)	984.7(1624)	1586(2361)	1889(3098)	2191(3836)
1.5 in (40mm)	min.	18.67(30.0)	26.54(30.8)	30.69(37.8)	39.2(48.7)	46.17(61.6)	52.2(79.2)	62.6(97)	94.8(149)	112.9(184)	130.9(229)
	max.	208.7(356)	421.9(708)	564.2(1060)	920.0(1764)	1276(2468)	1633(3171)	2349(3875)	3785(5634)	4506(7394)	5228(9153)
2.0 in (50mm)	min.	30.99(36.2)	44.0(51)	50.9(62.4)	65.1(80.5)	76.7(102)	86.7(131)	104(161)	157.4(233)	187.4(306)	217.4(379)
	max.	346.5(591)	700.4(1174)	936.6(1757)	1527(2922)	2119(4088)	2712(5254)	3899(6420)	6285(9335)	7481(12249)	8679(15164)
3.0 in (80mm)	min.	60.14(70.1)	85.5(98.4)	98.9(120)	126.3(155)	148.7(197)	168.3(254)	201.8(310)	305.3(451)	363.6(591)	421.8(732)
	max.	672.4(1140)	1359(2266)	1817(3391)	2964(5642)	4113(7892)	5263(10143)	7568(12394)	121986(18021)	14518(23648)	16842(29274)
4.0 in (100mm)	min.	104.4(122)	148.5(172)	171.7(211)	219.3(272)	258.3(334)	292.2(442)	350.4(540)	530.5(786)	631.5(1031)	732.6(1277)
	max.	1167(1990)	2360(3954)	3156(5919)	5148(9847)	7143(13775)	9140(17703)	13143(21632)	21182(31453)	25214(41274)	29251(51095)
6.0 in (150mm)	min.	228.7(268)	325.1(377)	376.0(485)	480.2(808)	587.5(1131)	751.8(1453)	1081(1776)	1742(2583)	2073(3389)	2405(4196)
	max.	2556(4358)	5168(8659)	6911(12960)	11272(21559)	15639(30163)	20012(38765)	28777(47365)	46377(68867)	55205(90373)	64044(111875)
8.0 in (200mm)	min.	496(575)	706.5(809)	817.0(990)	1043(1445)	1229(2202)	1390(2599)	1937(3175)	3122(4617)	3717(6059)	4312(7501)
	max.	4582(7792)	9264(15482)	12387(23172)	20204(38549)	28033(53933)	35872(69313)	51582(84693)	83129(123138)	98952(161591)	114796(200046)
10 in (250mm)	min.	885(1037)	1259(1461)	1456(1788)	1859(2306)	2190(3127)	2478(4019)	2992(4911)	6911(7140)	9739(9370)	6658(11600)
	max.	7075(12049)	14304(23939)	19127(35833)	31196(59611)	43283(83400)	55387(107181)	79644(130968)	128353(190418)	152784(249881)	177246(309334)
12 in (300mm)	min.	1269(1485)	1805(2093)	2087(2561)	2665(3303)	3139(4479)	3551(5756)	4288(7033)	6911(10226)	8226(13419)	9543(16612)
	max.	10142(17256)	20503(34286)	27415(51317)	44715(85370)	62039(119441)	79388(153499)	114157(187556)	183972(272699)	218890(357856)	254053(443017)

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- (1) At standard conditions STP 59°F, 14.7 PSIA (0°C, 1 atm).
- (2) Pressure listed is at process temperature of 59°F (0°C).
- (3) Maximum flow rate is at 262 f/s (80m/s)
- (4) Minimum values are determined from Table 5.

**Table 12 Range of Measurable Saturated Steam Flow Rate at Selected Process Pressures**

Nominal Size	Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in lb/hr (kg/hr at MPa in parenthesis)									
		15 PSI (0.1)	25 PSI (0.2)	50 PSI (0.4)	75 PSI (0.6)	100 PSI (0.8)	150 PSI (1)	250 PSI (1.5)	300 PSI (2)	350 PSI (2.5)	425 PSI (3)
0.5 in. (15mm)	min.	18.1(5.8)	20.7(7.0)	26.0(8.8)	30.4(10.4)	34.1(11.6)	40.8(12.8)	51(15.3)	55.5(19.1)	63.6(23.6)	70.9(28.1)
	max.	122.6(55.8)	160.8(80)	254.4(129)	346.2(177)	437(225)	616.9(272)	975.1(390)	1155(508)	1518(628)	1888(748)
1.0 in. (25mm)	min.	41.8(13.4)	47.9(16.2)	60.3(20.5)	70.3(24.1)	79(27.1)	93.8(30)	117.9(36)	128.4(41)	147.2(49)	164.1(58)
	max.	378.1(169.7)	496.3(247.7)	785.1(400)	1068(548)	1348(696)	1903(843)	3008(1209)	3563(1575)	4684(1945)	5825(2318)
1.5 in. (40mm)	min.	83.2(26.5)	119.9(32)	119.9(40.6)	139.8(47.7)	157.1(53.8)	186.6(59)	234.7(72)	255.4(93)	292.8(116)	348(138)
	max.	902.1(405)	1184(591)	1873(954)	2548(1310)	3216(1662)	4540(2012)	7177(2884)	8501(3759)	11175(4640)	13896(5532)
2.0 in. (50mm)	min.	138.1(44.0)	158.2(53)	199(67.3)	232.1(79)	260.8(89)	309.9(98)	389.6(119)	424(156)	486.1(192)	577.8(229)
	max.	1497(671)	1965(979)	3109(1580)	4231(2170)	5340(2753)	7538(3333)	11916(4778)	14113(6228)	18552(7688)	23070(9166)
3.0 in. (80mm)	min.	268(84.9)	307(103)	386.2(130)	450.5(152)	506.1(171)	601.3(189)	756(231)	822.8(300)	943.3(371)	1121(442)
	max.	2906(1295)	3814(1891)	6034(3050)	8210(4188)	10363(5314)	14628(6435)	23124(9224)	27389(12024)	36003(14842)	44771(17694)
4.0 in. (100mm)	min.	465(148)	533(179)	670.7(227)	782.4(267)	878.9(300)	1044(330)	1313(402)	1428(524)	1638(647)	1947(772)
	max.	5047(2261)	6624(3300)	10479(5326)	14259(7310)	17997(9276)	25406(11232)	40160(16102)	47567(20986)	62527(25907)	77754(30883)
6.0 in. (150mm)	min.	1019(324)	1167(392)	1468(498)	1712(600)	1924(761)	2286(922)	3303(1322)	3912(1723)	5142(2127)	6395(2536)
	max.	11051(4950)	14504(7226)	22944(11661)	31221(16010)	39404(20315)	55625(24595)	87929(35258)	104146(45953)	136900(56729)	170239(67624)
8.0 in. (200mm)	min.	2214(697)	2537(841)	3190(1068)	3722(1252)	4181(1410)	4968(1649)	6246(2364)	7012(3081)	9218(3803)	11463(4534)
	max.	19808(8851)	25997(12918)	41126(20850)	55962(28627)	70631(36325)	99706(43976)	157608(63043)	186678(82165)	245387(101433)	305147(120913)
10.0 in. (250mm)	min.	3947(1256)	4521(1518)	5687(1929)	6634(2260)	7453(2546)	11133(2801)	11133(3655)	12117(4764)	14233(5882)	17694(7011)
	max.	30585(13687)	40140(19977)	63500(32243)	86407(44268)	109055(56172)	153947(68005)	243350(97489)	288234(127058)	378881(156854)	471152(186978)
12.0 in. (300mm)	min.	5657(1799)	6481(2174)	8152(2762)	9509(3236)	10683(3646)	12692(4012)	15958(5235)	17367(6823)	20400(8423)	25369(10041)
	max.	46838(19602)	57535(28609)	91017(46175)	123850(63397)	156313(80445)	220658(97390)	348802(139614)	413135(181960)	543063(224633)	675317(267772)

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- (1) Maximum flow rate is at 262 f/s (80m/s).
- (3) Minimum values are determined from Table 5.

**Pressure Loss**

At velocity of 10 m/s by water, ΔP = 108 kPa

At velocity of 80 m/s by atmospheric air,

$$\Delta P = 9 \text{ kPa}$$

obtained from the following equations.

$$\Delta P = 108 \times 10^{-5} \cdot \rho f \cdot v^2 \dots\dots\dots(1)$$

or

$$\Delta P = 135 \times \rho f \cdot \frac{Q_f^2}{D^4} \dots\dots\dots(2)$$

where,

ΔP : Pressure loss (kPa)

ρf : Density at operating condition (kg/m<sup>3</sup>)

v : Flow velocity (m/s)

Qf : Actual flow rate (m<sup>3</sup>/h)

D : Internal Diameter (mm)

Figure 7 shows pressure loss versus actual flow rate. When nominal size 15 to 50mm and adjacent pipeline is Sch 40, and nominal size 80 to 300 mm and adjacent pipeline is Sch 80, the pressure loss will be approximately 10% smaller than calculated value.

**(Example) Calculation of pressure loss**

Calculate the pressure loss when the nominal size is 50 mm and the flow rate of water at operating temperature 80°C is 30m<sup>3</sup>/h.

- Since the density of water at 80°C is 972kg/m<sup>3</sup>, substitute this value in equation (2):

$$\Delta P = 135 \times 972 \times \frac{30^2}{51.14} = 17.3\text{kPa}$$

- Obtain the pressure loss using equation (1). The flow velocity when the flow rate is 30m<sup>3</sup>/h is given by:

$$v = \frac{354 \times Q_f}{D^2} = \frac{354 \times 30}{51.12} = 4.07\text{m/s}$$

Therefore, substitute this value in equation (1):

$$\Delta P = 108 \times 10^{-5} \times 972 \times 4.07^2 = 17.3\text{kPa}$$

- Obtain the pressure loss using Figure 7. Since the liquid pressure loss factor can be read as 18.5, then:

$$\Delta P = 98.1 \times 18.5 \times 972 \times 10^{-5} = 17.6\text{kPa}$$

**■ Cavitation**

**(Minimum back pressure, liquid service only):**

Cavitation occurs when the flow line pressure is low and flow velocity is high during fluid measurement, preventing correct measurement of flow rate. The optimum line pressure can be obtained from the following equation.

$$P = 2.7 \cdot \Delta P + 1.3 \cdot P_o$$

where,

P : Line pressure, 2 to 7 times as large as internal diameter on downstream of flowmeter body surface. (kPa absolute).

ΔP : Pressure loss (kPa).

Refer to the item above.

Po : Saturation liquid vapor pressure at operating temperature (kPa absolute).

**(Example) Confirmation of presence of cavitation**

Suppose that the line pressure is 120 kPa abs and the flow rate scale is 0 to 30 m<sup>3</sup>/h. It is only necessary to confirm the pressure at the maximum flow rate ; therefore, the saturated steam pressure of water at 80°C is as follows from the table of saturated steam pressures:

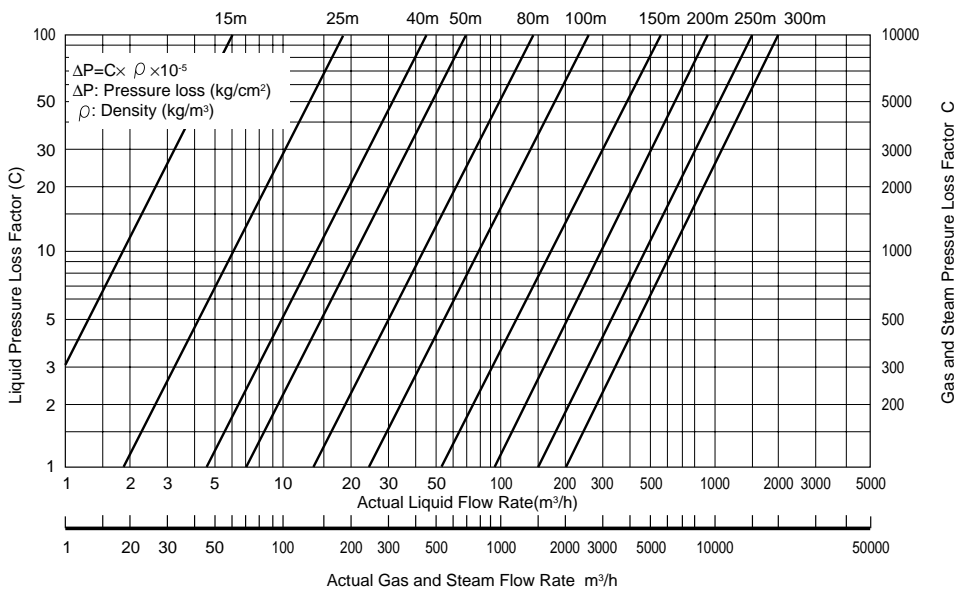
$$P_o = 47.4 \text{ kPa abs}$$

Therefore, substitute this value in equation (3):

$$P = 2.7 \times 17.3 + 1.3 \times 47.4 = 108.3 \text{ kPa abs}$$

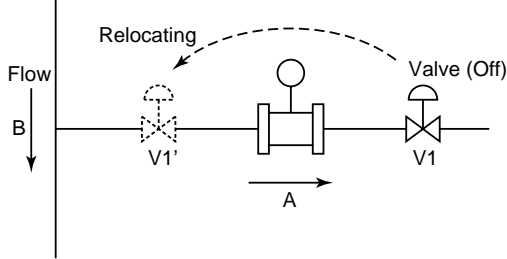
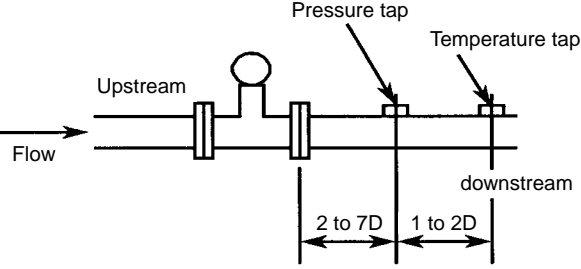
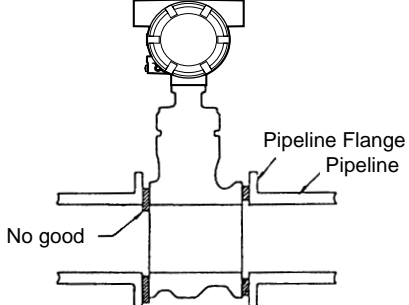
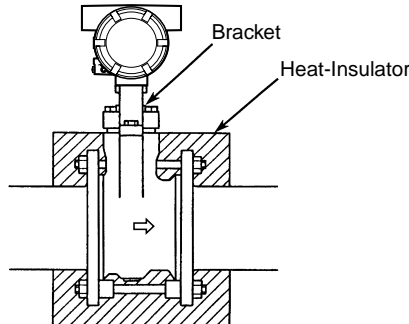
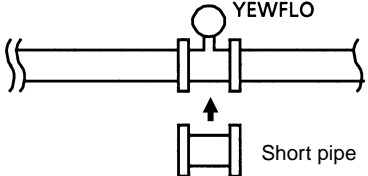
Since the operating pressure of 120 kPa abs is higher than 108.3 kPa abs, no cavitation occurs.

**Figure 7 Pressure Loss**

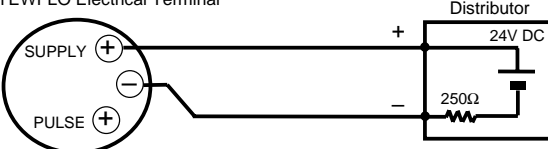
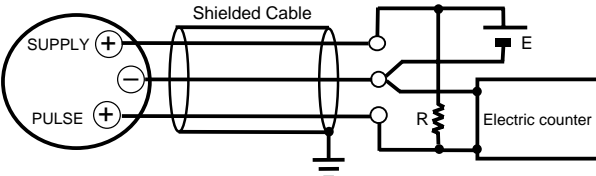
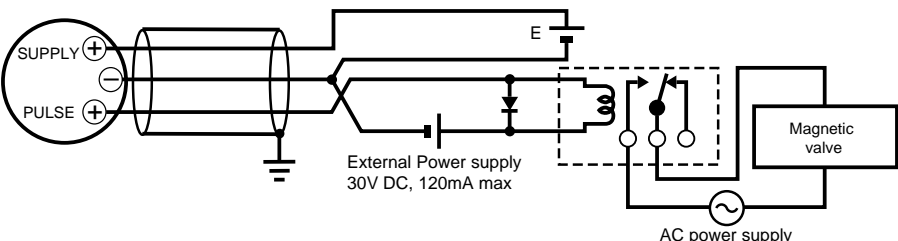
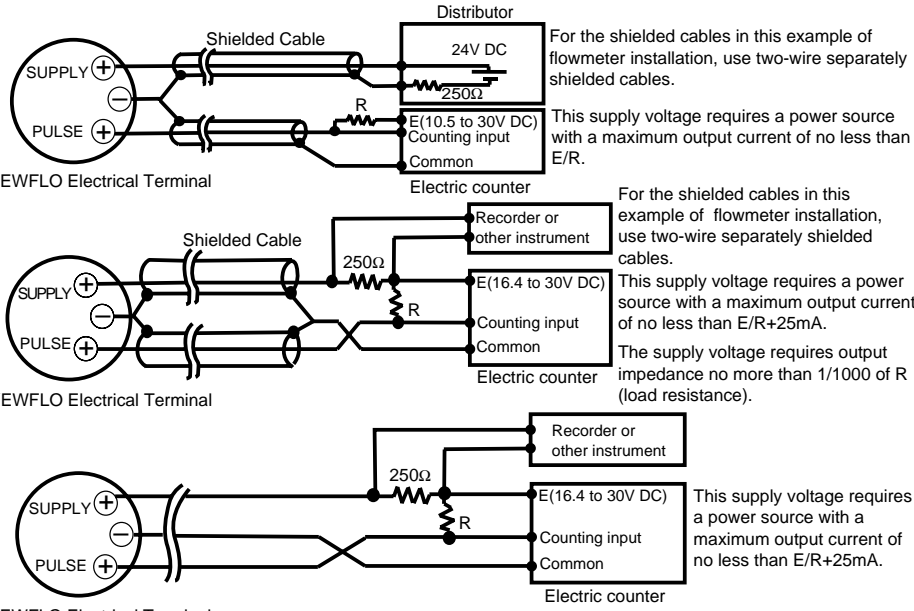


\*Refer to Yokogawa Flowmeter Sizing Program available at [www.yca.com/technical-information/swdownloads.htm](http://www.yca.com/technical-information/swdownloads.htm)

Description	Figure
<p><b>Piping support:</b>                      Typical vibration immunity level is 1G for normal piping condition.                      Piping support should be fixed in case of vibration greater than 1G.</p>	
<p><b>Installation direction:</b>                      If a pipe is always filled with liquids, the pipe can be installed vertically or at inclined angle.</p>	
<p><b>Adjacent pipes:</b>                      The process pipeline inner diameter should be larger than the YEWFLO inner diameter.                      Use the following adjacent pipe.                      Nominal size .5 to 2 in. (15 to 50mm) : Sch 40 or less.                      Nominal size 3 to 12 in. (80 to 300mm) : Sch 80 or less.</p>	
<p><b>Reducer pipe:</b>                      Ensure the upstream straight pipe length is 10D or more, and the downstream straight pipe length is 5D or more for reducer pipe. (D: nominal YEWFLO diameter)</p>	
<p><b>Expander pipe:</b>                      Ensure the upstream straight pipe length is 10D or more, and the downstream straight pipe length is 5D or more for expander pipe.</p>	
<p><b>Bent pipe and straight pipe length:</b>                      Ensure the upstream straight pipe length is 10D or more, and the downstream straight pipe length is 5D or more for bent pipe.</p>	
<p><b>Valve position and straight pipe length:</b></p> <ul style="list-style-type: none"> <li>■ Upstream straight run requirement is dependent upon configuration, such as upstream valves, expansions, elbows, etc. 5D or more for downstream pipe runs.</li> <li>■ In case the valve has to be installed upstream of the flowmeter, ensure the upstream straight pipe length is 20D or more, and the downstream straight pipe length is 5D or more.</li> </ul>	
<p><b>Fluid pulsation:</b>                      For a gas line which uses a position-type or roots-type blower compressor or a high-pressure liquid line (about 1MPa or more) which uses piston-type or plunger-type pump, fluid pulsations may be produced.                      In these case, install valve on the upstream side of YEWFLO.                      For fluid vibration, put a vibration damping device such as throttling plate or expansion section on the upstream side of YEWFLO.</p>	
<p><b>Piston-type or plunger pump:</b>                      Install the accumulator on the upstream side of YEWFLO to reduce fluid vibrations.</p>	

Description	Figure
<p><b>Valve position (T-type piping exist):</b> If pulsating flow results from a Tee installation, install the valve upstream of the flowmeter.</p>	
<p><b>Pressure and Temperature Taps:</b> Pressure tap outlet: install this tap between 2D and 7D on the downstream side of a flowmeter. Temperature tap outlet: install this on the downstream side 1D to 2D away from a pressure tap.</p>	
<p><b>Mounting Gasket:</b> Avoid mounting gaskets which protrude into the pipe line. This may cause inaccurate readings. Use the gaskets with bolt holes, even if YEWFLOW is the wafer type. When using a spiral gasket (without bolt holes), confirm the size with the gasket - manufacturer, as standard items may not be used for certain flange ratings.</p>	
<p><b>Heat-Insulation:</b> When an integral-type flowmeter or a remote type detector is installed and the pipe carrying high-temperature fluids is heat-insulated, do not wrap adiabatic materials around the installation bracket of the converter.</p>	
<p><b>Flushing of the pipe line:</b> Flush and clean scale, encrustation and sludge on the inside of pipe for newly installed pipe line and repaired pipe line before the operation. For flushing, the flow should flow through bypass-piping to avoid damaging the flowmeter. If there is no bypass-piping, install short pipe instead of the flowmeter.</p>	

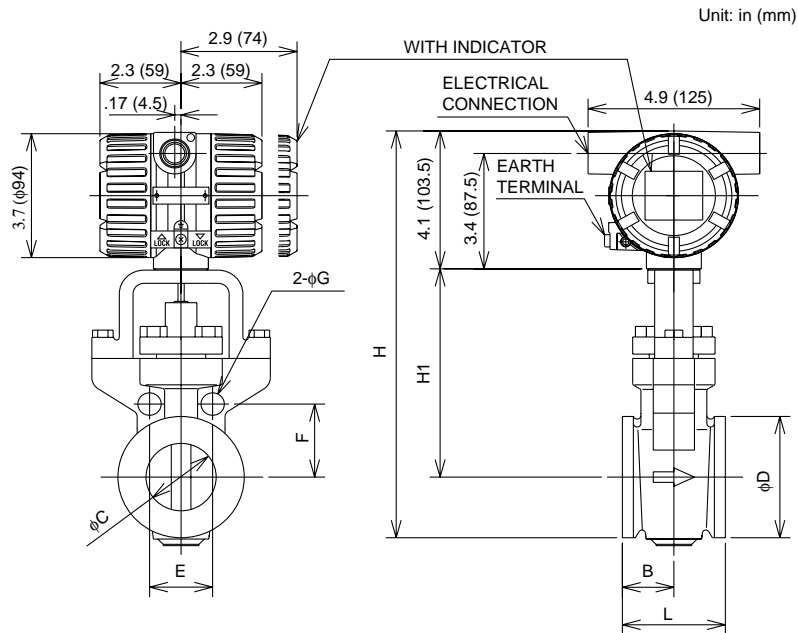
# Wiring example for simultaneous analog and pulse output

Connection	Description
<p>Analog Output</p>	<p>YEWFO Electrical Terminal</p> 
<p>Pulse Output</p>	<p>YEWFO Electrical Terminal</p> <p>Use three-wire shielded cable.</p> 
<p>Status Output Alarm Output</p>	<p>YEWFO Electrical Terminal</p>  <p>External Power supply 30V DC, 120mA max</p> <p>AC power supply</p> <p>Magnetic valve</p>
<p>Simultaneous Analog -Pulse Output</p> <p>Example 1 In this case, Communication is possible (up to a distance of 2km when a CEV cable is used).</p> <p>Example 2 In this case, Communication is possible (up to a distance of 200m when a CEV cable is used and R = 1kΩ).</p> <p>Example 3 In this case, No communication is possible (when shielded cable is not used).</p>	<p>When analog and pulse output are used, the length of communication line is subject to wiring conditions. Refer to example 1 to 3. If the communication carries out from amplifier, no need to consider wiring conditions.</p>  <p>For the shielded cables in this example of flowmeter installation, use two-wire separately shielded cables.</p> <p>This supply voltage requires a power source with a maximum output current of no less than E/R.</p> <p>For the shielded cables in this example of flowmeter installation, use two-wire separately shielded cables.</p> <p>This supply voltage requires a power source with a maximum output current of no less than E/R+25mA.</p> <p>The supply voltage requires output impedance no more than 1/1000 of R (load resistance).</p> <p>This supply voltage requires a power source with a maximum output current of no less than E/R+25mA.</p>
<p>The range of load resistance R for the pulse output.</p>	<p>The load resistance of pulse output should be used to 1kΩ, 2W. If no pulse output is detected, the load resistance should be determined by the calculation below.</p> $\frac{E (V)}{120} \leq R (k\Omega) \leq \frac{0.1}{C (\mu F) \times f (kHz)}$ <p>Example of CEV cable capacitance ≈ 0.1μF/km</p> $P (mW) = \frac{E^2 (V^2)}{R (k\Omega)}$ <p>Where E = Supply voltage (V) f = Frequency of pulse output (kHz) R = Value of load resistance (kΩ)</p> <p>C = Cable capacitance (μF) P = Power ratio of the load resistance (mW)</p>

## EXTERNAL DIMENSIONS

■ Wafer type .5 to 4 in (15mm up to 100mm)

■ Note: All dimensions are nominal and for reference only. Dimensions are guaranteed through certified prints.



TYPE CODE	INTEGRAL/REMOTE											
	DY015 (7150 - 050) [.5 in (15mm)]						DY025 (7150 - 100) [1 in (25mm)]					
PROCESS CONNECTION	inches			millimeters			inches			millimeters		
	AA1	AA2	AA4	AA1	AA2	AA4	AA1	AA2	AA4	AA1	AA2	AA4
L	2.8 in			70 mm			2.8 in			70 mm		
B	1.4 in			35 mm			1.4 in			35 mm		
C	.6 in			14.6 mm			1.0 in			25.7 mm		
D	1.4 in			35.1 mm			2.0 in			50.8 mm		
H	9.8 in			248 mm			10.2 in			258 mm		
H1	5 in			127 mm			5.1 in			129 mm		
E	1.7	1.9	1.9	42.7	47.1	47.1	2.2	2.5	2.5	56	62.9	62.9
F	.8	.9	.9	21.4	23.5	23.5	1.1	1.2	1.2	28	31.4	31.4
G	.6	.6	.6	14	14	14	.6	.7	.7	14	17	17
WEIGHT	6 lb			2.8 kg			8 lb			3.7 kg		

TYPE CODE	INTEGRAL/REMOTE											
	DY040 (7150 - 150) [1.5 in (40mm)]						DY050 (7150 - 200) [2 in (50mm)]					
PROCESS CONNECTION	inches			millimeters			inches			millimeters		
	AA1	AA2	AA4	AA1	AA2	AA4	AA1	AA2	AA4	AA1	AA2	AA4
L	2.8 in			70 mm			3.0 in			75 mm		
B	1.4 in			35 mm			1.5 in			37.5 mm		
C	1.6 in			39.7 mm			2.0 in			51.1 mm		
D	2.9 in			73 mm			3.6 in			92 mm		
H	10.9 in			276 mm			12.2 in			307.5 mm		
H1	5.4 in			136 mm			6.2 in			158 mm		
E	2.8	3.2	3.2	69.7	80.8	80.8	(Note 3)	1.9	1.9	(Note 3)	48.6	48.6
F	1.4	1.6	1.6	34.8	40.4	40.4	(Note 3)	2.3	2.3	(Note 3)	58.7	58.7
G	.6	.8	.8	14	20	20	(Note 3)	.6	.6	(Note 3)	17	17
WEIGHT	9.5 lb			4.3 kg			14 lb			6.0 kg		

TYPE CODE	INTEGRAL/REMOTE											
	DY080 (7150 - 300) [3 in (80mm)]						DY100 (7150 - 400) [4 in (100mm)]					
PROCESS CONNECTION	inches			millimeters			inches			millimeters		
	AA1	AA2	AA4	AA1	AA2	AA4	AA1	AA2	AA4	AA1	AA2	AA4
L	3.9 in			100 mm			4.7 in			120 mm		
B	1.5 in			40 mm			1.9 in			50 mm		
C	2.8 in			71 mm			3.7 in			93.8 mm		
D	5.0 in			127 mm			6.2 in			157.2 mm		
H	13.5 in.			342 mm			14.6 in.			372 mm		
H1	6.9 in			175 mm			7.5 in			190 mm		
E	(Note 3)	2.5	2.5	(Note 3)	64.4	64.4	2.9	3.0	3.3	72.9	76.6	82.6
F	(Note 3)	3.1	3.1	(Note 3)	77.7	77.7	3.5	3.6	3.9	88	92.5	99.7
G	(Note 3)	.8	.8	(Note 3)	20	20	.7	.8	.9	17	20	23
WEIGHT	21 lb			9.4 kg			28 lb			12.8 kg		

(Note 1) Integral weight is the same as Remote.

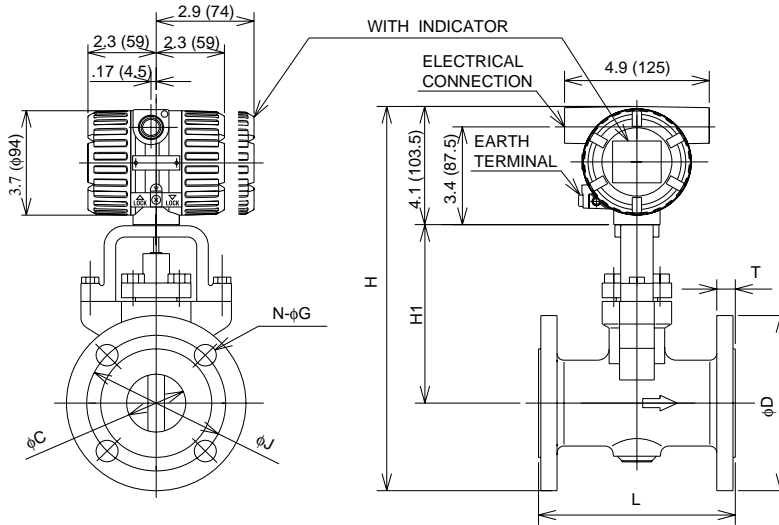
(Note 2) Add .5lb for display.

(Note 3) The hole is not provided.

■ Flange type .5 to 4 in (15mm up to 100mm)

■ Note: All dimensions are nominal and for reference only. Dimensions are guaranteed through certified prints.

Unit: in (mm)



TYPE	INTEGRAL/REMOTE															
	DY015 (7150 - 050) [.5 in (15mm)]								DY025 (7150 - 100) [1 in (25mm)]							
	inches				millimeters				inches				millimeters			
PROCESS CONNECTION	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5
L	5.1 in				6.3				130 mm				160			
C	.57 in								14.6 mm							
D	3.5	3.8	3.8	4.8	88.9	95.3	95.3	120.7	4.3	4.8	4.8	5.9	108	124	124	149.4
H	10.8	10.8	10.8	11.5	275	278	278	291	11.3	11.6	11.6	12.1	286.5	294.5	294.5	307
H1	5 in								127 mm							
T	.4	.6	.8	1.1	11.2	14.2	21	28.8	.6	.7	.9	1.4	14.2	17.5	24	34.9
J	2.4	2.6	2.6	3.3	60.5	66.5	66.5	82.6	3.1	3.5	3.5	4.0	79.2	89	89	101.6
N	4								4							
G	.6	.6	.6	.9	15.7	15.7	15.7	22.4	.6	.75	.75	1.0	15.7	19	19	25.4
WEIGHT	9 lb	10 lb	10 lb	15 lb	4.1 kg	4.3 kg	4.6 kg	6.7 kg	15 lb	16 lb	17 lb	24 lb	6.6 kg	7.2 kg	7.7 kg	11.1 kg

TYPE	INTEGRAL/REMOTE															
	DY040 (7150 - 150) [1.5 in (40mm)]								DY050 (7150 - 200) [2 in (50mm)]							
	inches				millimeters				inches				millimeters			
PROCESS CONNECTION	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5
L	5.9 in				7.9				150 mm				200			
C	1.6 in								1.6							
D	5.0	6.1	6.1	7.0	127	155.4	155.4	177.8	6.0	6.5	6.5	8.5	152.4	165.1	165.1	215.9
H	11.9	12.5	12.5	12.9	303	317	317	328.5	13.3	13.3	13.5	14.6	337.5	344	344	369.5
H1	5.4 in								136 mm							
T	.7	.8	1.1	1.5	17.5	20.6	28.8	38.2	.8	.9	1.3	1.8	19.1	22.4	31.8	44.5
J	3.8	4.5	4.5	4.9	98.6	114.3	114.3	124	4.7	4.7	5.1	6.5	120.7	127	127	165.1
N	4								4							
G	.6	.9	.9	1.1	15.7	22.4	22.4	28.4	.8	.8	.8	1	19	19	19	25.4
WEIGHT	18 lb	21 lb	25 lb	36 lb	8.1 kg	9.3 kg	11.3 kg	16.2 kg	26 lb	29 lb	33 lb	59 lb	11.7 kg	13.2 kg	14.8 kg	26.5 kg

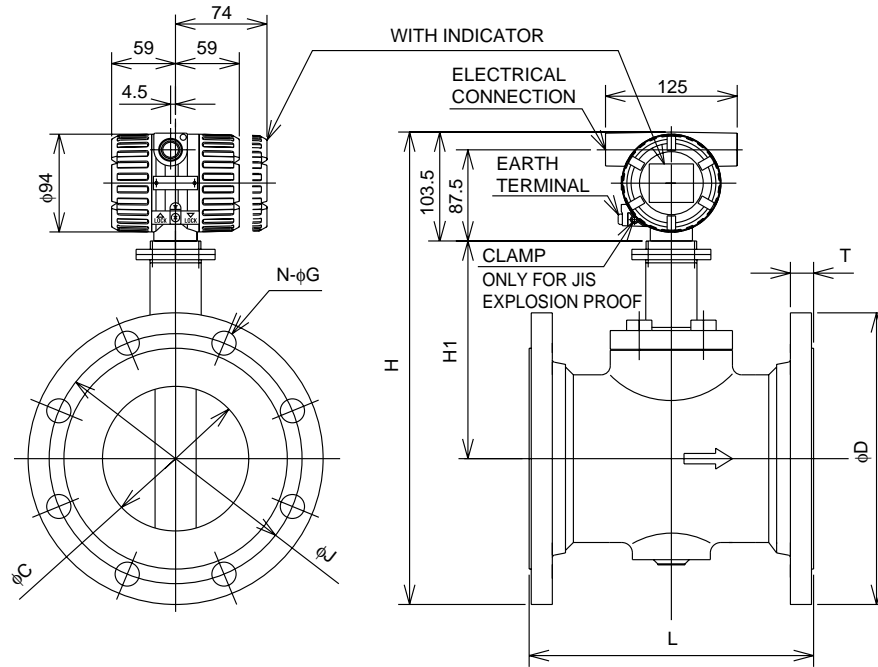
TYPE	INTEGRAL/REMOTE															
	DY080 (7150 - 300) [3 in (80mm)]								DY100 (7150 - 400) [4 in (100mm)]							
	inches				millimeters				inches				millimeters			
PROCESS CONNECTION	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5
L	7.9 in				9.7				200 mm				245			
C	2.8 in								.71 mm							
D	7.5	8.3	8.3	9.5	190.5	209.6	209.6	241.3	9.0	10	10.7	11.5	228.6	254	273	292.1
H	14.7	15.1	15.1	15.7	374	383.5	383.5	399	16.1	16.6	16.9	17.3	409	420.5	430	439.5
H1	6.9 in								175 mm							
T	.9	1.1	32	1.8	23.9	28.4	38.2	44.5	.9	1.3	1.8	2.0	23.9	31.8	44.5	50.9
J	6	6.6	170	7.5	152.4	168.2	168	190.5	7.5	7.9	8.5	9.3	190.5	200.2	216	235
N	4	8	8	8	4	8	8	8	8	8	8	8	8	8	8	8
G	.8	.9	23	1.0	19	22.4	22.4	25.4	.8	.9	1.0	1.3	19	22.4	25.4	31.8
WEIGHT	44 lb	53 lb	56 lb	79 lb	20 kg	23.8 kg	25.4 kg	35.7 kg	61 lb	79 lb	112 lb	124 lb	27.4 kg	35.9 kg	50.8 kg	55.9 kg

(Note 1) Integral weight is the same as Remote  
 (Note 2) Add .5lb for display.

■ Flange type 6 to 12 in (150mm up to 300mm)

■ Note: All dimensions are nominal and for reference only. Dimensions are guaranteed through certified prints.

Unit: mm



TYPE	INTEGRAL/REMOTE															
CODE	DY150 (7150 - 600) [6 in (150mm)]								DY200 (7150 - 800) [8 in (200mm)]							
PROCESS CONNECTION	inches				millimeters				inches				millimeters			
	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5	BA1	BA2	BA4	BA5
L	10.6 in	12.2	13.2		270 mm	310	336		12.2 in	14.5	15.2		310 mm	370	386	
C	5.5 in				138.8 mm				7.3 in				185.6 mm			
D	11	12.5	14	15	279.4	317.5	356	381	13.5	15	16.5	18.5	342.9	381	419.1	469.9
H	17.8	18.5	19.3	19.8	452	471	491	503	20.3	21.1	21.8	22.8	516	535	554	579
H1	8.2 in				209 mm				9.5 in				241 mm			
T	1	1.4	2.1	2.4	25.4	36.6	54.4	62	1.1	1.6	2.4	2.8	28.4	41.1	62	69.9
J	9.5	10.6	11.5	12.5	241.3	269.7	292	317.5	11.8	13	13.7	15.5	298.5	330.2	349.3	393.7
N	8	12	12	12	8	12	12	12	8	12	12	12	8	12	12	12
G	.9	.9	1.1	1.3	22.4	22.4	28.4	31.8	.9	1	1.25	1.5	22.4	25.4	31.8	38.1
WEIGHT	80 lb	120 lb	186 lb	234 lb	36.4 kg	54.4 kg	84.4 kg	106 kg	122 lb	177 lb	300 lb	401 lb	55.4 kg	80.4 kg	136 kg	182 kg

TYPE	INTEGRAL/REMOTE							
CODE	DY250 [10 in (250mm)]				DY300 [12 in (300mm)]			
PROCESS CONNECTION	inches		millimeters		inches		millimeters	
	BA1	BA2	BA1	BA2	BA1	BA2	BA1	BA2
L	14.6 in		370 mm		15.7 in		400 mm	
C	9.1 in		230.8 mm		10.9 in		276.2 mm	
D	16	17.5	406.4	444.5	19	20.5	482.6	520.7
H	23	23.7	584	603	25.7	26.4	652	671
H1	10.9 in		277 mm		12.1 in		307 mm	
T	1.2	1.9	31.2	48.8	1.3	2.0	32.8	51.8
J	14.3	15.2	362	387.4	17	17.8	431.8	450.9
N	12	16	12	16	12	16	12	16
G	1.0	1.1	25.4	28.5	1.0	1.3	25.4	31.8
WEIGHT	199 lb	75 lb	90 kg	125 kg	308 lb	392 lb	140 kg	178 kg

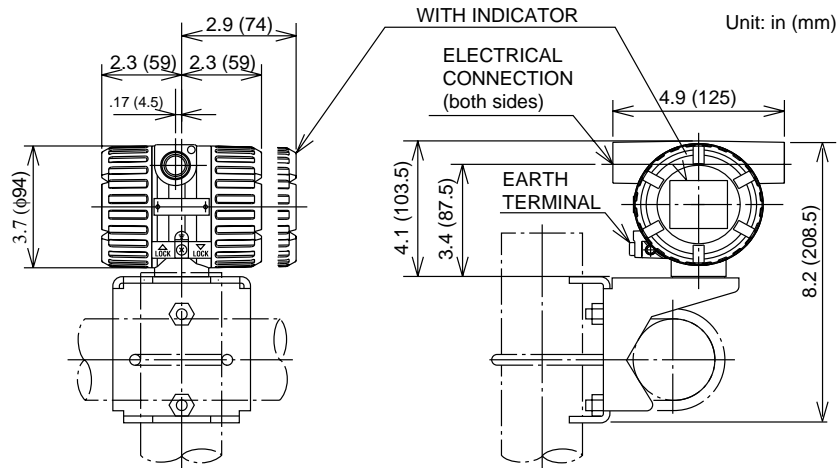
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(Note 1) Integral weight is the same as Remote  
 (Note 2) In case of with indicator, add 0.2kg



■ Remote Type Converter

■ Note: All dimensions are nominal and for reference only. Dimensions are guaranteed through certified prints.

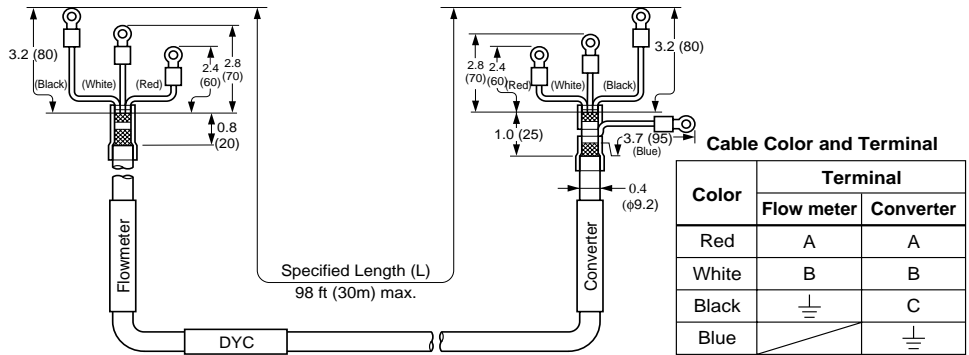


Weight: 4.2lbs (1.9 kg)  
 Note: For flowmeters with indicator, add .4lbs (0.2 kg).

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■ Signal Cable for Remote Type

■ Note: All dimensions are nominal and for reference only. Dimensions are guaranteed through certified prints.



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