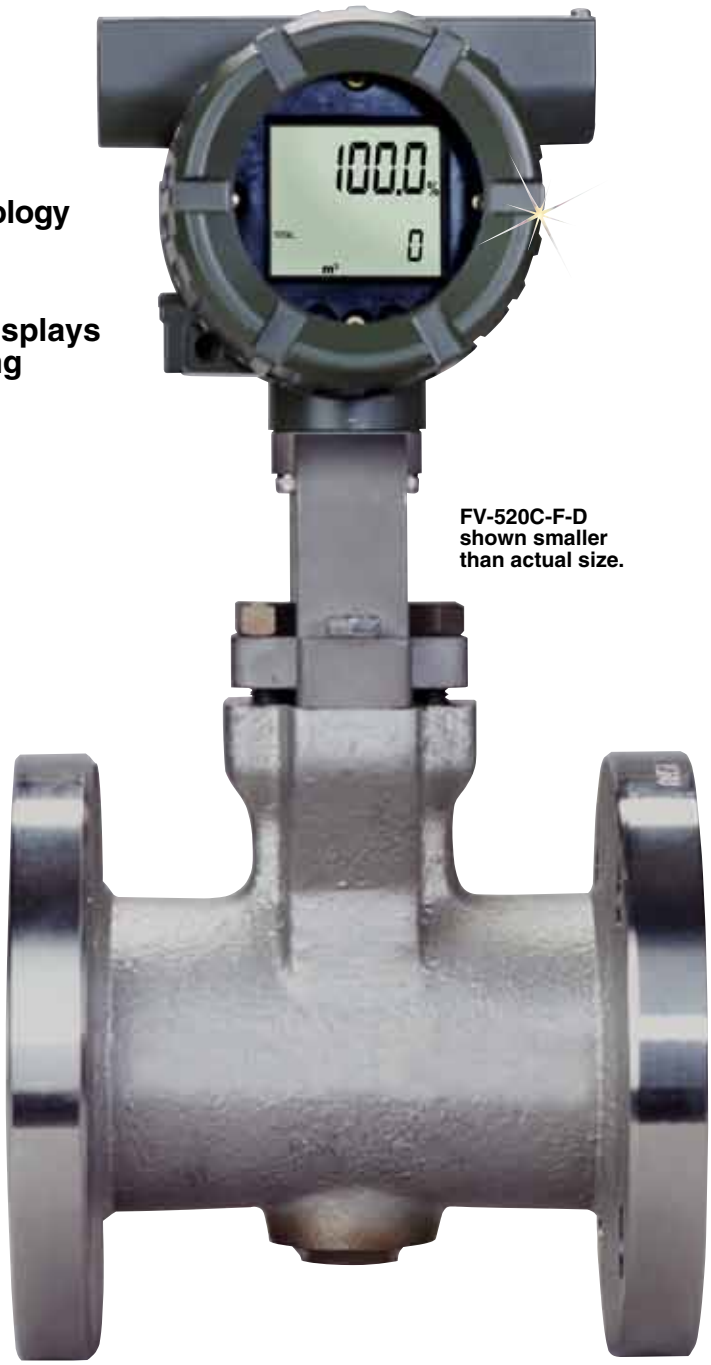
VORTEX FLOWMETERS

FV-505C

2 YEAR WARRANTY

- SSP (Spectral Signal Processing) Technology
- Measures Steam, Gas, and Low Viscosity Liquids
- Clear Parallel Two-Line LCD Display. Displays Simultaneous Flow Rate and Total Along with Process Diagnosis
- New, Compact Amplifier Housing: Lighter, Small and Easier to Handle
- No Start-Up Tuning
- Low Flow Stability
- Advanced Self-Diagnostics
- No Moving Parts
- Simultaneous Analog and Pulse Outputs
- Status Output (Flow Switch Function) or Alarm Output
- Configurable Through Local Display Interface
- High Accuracy: ±0.75% of Reading (Liquid), ±1% of Reading (Gas, Steam)



FV-520C-F-D shown smaller than actual size.

TRODEKS's FV-505C Series vortex flowmeter provides accurate, reliable, low-maintenance flow measurement. Vortices generated by the flowing fluid stress the shedder bar in pulses, and the shedder bar transmits the stress pulses to the encapsulated piezoelectric sensor.

Based on the field proven sensor technology of the FV-505C Series vortex flowmeters, FV-505C features a new amplifier with 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.

The FV-505C Series 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.

The programmable display allows access to the full power of TRODEKS's new intelligent amplifier. It permits the user to display flow rate and/or total in engineering units for liquids and gases. Rate and total are displayed simultaneously. If the density or enthalpy of the fluid is constant (i.e. the temperature and pressure do not change), the density value can be entered into the meter to display in kilograms, pounds or metric tons; the enthalpy value can be entered to display in BTUs, kilojoules, etc. Analog output span adjustment and low cutoff are also settable from the display, there is no need to adjust pots. The analog and pulse outputs can also be forced to output from 0 to 100% FS or 0 to 6000 Hz without any flow through the meter as a test of the amplifier. For steam flow measurement, the FV-505C can be used with the TRODEKS® FC-20 mass flow computer. The standard FV-505C is wafer-style to slip between 150# ANSI flanges, and comes supplied with extra long bolts for installation. Units with the suffix "-F" have 150# ANSI flanges.

SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Fluid to be Measured: Liquid, gas, steam (avoid multiphase flow and sticky fluids)

Measuring Flow Rates: Refer to Table 6

Accuracy: ±0.75% of reading (liquid), ±1% of reading (gas, steam). Refer to Table 5

Repeatability: ±0.2% of reading

Calibration: Factory-calibrated using water flow

Normal Operating Condition Process Temperature Range:

General: -40 to 260°C (-40 to 500°F

High Process Temperature Version Option (-HT): -40 to 450°C (-40 to 842°F). Refer to Fig, 1 for integral converter type

Process Pressure Limit: -14.2 PSIA (-1 kg/cm^2) to flange rating

Ambient Temperature Range:

Remote Type Detector, Remote Type Converter: -40 to 85°C (-40 to 185°F)

Integral Type (Refer to Fig. 1): -40 to 85°C (-40 to 185°F)

Integral Type with Indicator (Refer to Fig. 1): -30 to 80°C (-22 to 176°F)

Ambient Humidity: 5 to 100% RH [at 40°C (104°F)] (non-condensing)

Power Supply Voltage: 10.5 to 42 Vdc (refer to Fig. 2, "Relationship Between Power Supply Voltage and Load Resistance.")

MECHANICAL SPECIFICATIONS

Material (General Type):

Body: CF8M casting stainless steel (SUS316)

Shedder Bar: Duplex stainless steel (ASTM CD4MCu equivalent to JIS SUS329J1). -HT option has Hastelloy C

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

Converter Housing and Case, Cover: Aluminum alloy

Coating Color: Converter case and cover are deep sea moss green (Munsell 0.6GY 3.1/2.0) (Polyurethane corrosion-resistance coating)

Protection: NEMA 4X (IP67) immersion proof and dust proof

Electrical Connection: ANSI ½" NPT female

Signal Cable: Cable used for remote detector and converter

Maximum Length: 30 m (98')

Outer Sheath Material: Heat-resistant polyethylene

Temperature Rating: -40 to 150°C (-40 to 302°F)

Weight: Refer to dimensional drawings

Mounting:

Integral Type and Remote Type Detector: Flange mounting or wafer mounting

Remote Type Converter: 2" 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 Vdc, 120 mA DC

Low Level: 0 to 2 Vdc (refer to Fig. 3)

Communication Requirement:

Conditions of Communications Line: 250 to 600 (including cable resistance), refer to Fig. 2

Supply Voltage: 16.4 to 42 Vdc; refer to Fig. 2

Spacing from Power Lines: 15 cm (6") or more (parallel wiring should be avoided)

Display Unit: %, l, t, Nm^3, m^3, kg scf, cf, gal, lb, /h, /m

Cable Length for Specific Applications: Use the following formula to determine cable length for specific applications:

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

where:

L=length in meters

R=resistance in (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: Maximum 10 kHz

Duty Cycles: Approx. 50%

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.

FV-520C-F shown smaller than actual size.

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 for 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: In case a CPU or EEPROM failure occurs, the output can be driven up-scale (21.6 Ma) or down-scale (3.6 Ma). 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-diagnosis is displayed. Local parameter setting can be accomplished by push buttons. Rotatable 90° right and left.

EMC Conformity Standards: EN61326, AS/NZS 2064 conduit.

Sizing: For typical operating ranges tables and specific operating conditions, please contact TRODEKS's Flow Department.

Figure 1: Ambient Temperature Limit (Integral Type)

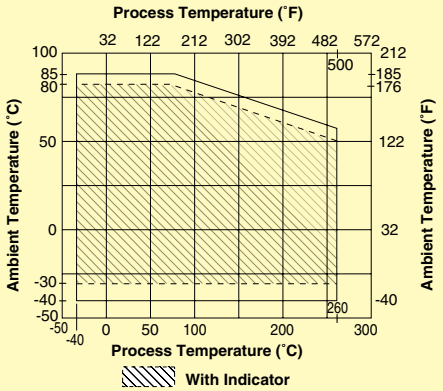


Figure 2: Relationship Between Power Supply and Load Resistance

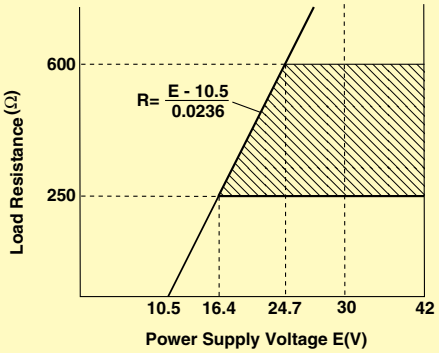


Figure 3: High and Low Level (Pulse Output)

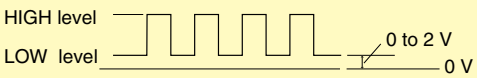


Figure 4: Fluid Temperature Range of High Process Temperature Version

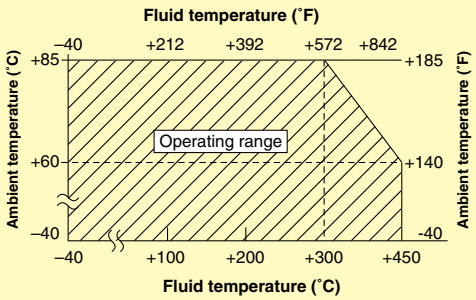


Table 1: Pressure Test Values for Stainless Steel

Flange Rating	Pressure
ANSI Class 150	412 psi (29 kgf/cm²)
ANSI Class 300	1081 psi (76 kgf/cm²)
ANSI Class 600	2161 psi (152 kgf/cm²)
ANSI Class 900	3242 psi (228 kgf/cm²)

Sizing: *The following tables show typical operating ranges. For specific operating conditions, please contact* ***TRODEKS****'s Flow Department*

Tables 2: Minimum Measurable Flow Velocity

Nominal size in in	Liquid		GAS, Steam	
	General Type, Cryogenic Type unit: fps	High Process Temperature Version unit: fps	General Type Cryogenic Type unit:fps(m/s)	High Process Temperature version unit: fps(m/s)
0.5	$\sqrt{168/\rho}$	—	$\sqrt{53.8/\rho}$(9.9)	—
1.0	$\sqrt{82/\rho}$	$\sqrt{329.5/\rho}$	$\sqrt{30.3/\rho}$(6.5)	$\sqrt{84.1/\rho}$(6.5)
1.5	$\sqrt{60/\rho}$	$\sqrt{329.5/\rho}$	$\sqrt{21/\rho}$(6.5)	$\sqrt{84.1/\rho}$(6.5)
2.0	$\sqrt{60/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21/\rho}$(6.5)	$\sqrt{41.2/\rho}$(6.5)
3.0	$\sqrt{60/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21/\rho}$(6.5)	$\sqrt{41.2/\rho}$(6.5)
4.0	$\sqrt{60/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21/\rho}$(6.5)	$\sqrt{41.2/\rho}$(6.5)
6.0	$\sqrt{60/\rho}$	$\sqrt{107.6/\rho}$	$\sqrt{21/\rho}$(6.5)	$\sqrt{41.2/\rho}$(6.5)
8.0	$\sqrt{82/\rho}$	$\sqrt{136.2/\rho}$	$\sqrt{30.3/\rho}$(9.9)	$\sqrt{53.8/\rho}$ (9.9)
10.0	$\sqrt{107.6/\rho}$	—	$\sqrt{41.2/\rho}$(9.9)	—
12.0	$\sqrt{107.6/\rho}$	—	$\sqrt{41.2/\rho}$(9.9)	—

ρ *: Density at operating conditions (lb/cu ft)*
Liquid density is 62.428 lb/cu ft
Gas and steam density is 3.1214 E-2 lb/cu ft or more.

Nominal size in mm	Liquid		GAS, Steam	
	General Type, Cryogenic Type (unit: m/s)	High Process Temperature Version (unit: m/s)	General Type, Cryogenic 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/m3)*
Liquid density is 400 up to 2000kg/m3
Gas and steam density is 0.5kg/m3 or more.

Tables 2: *Relationship between minimum velocity and density (use the larger of the two values)*

FV-500C-RMK-D shown smaller than actual size.

Table 3: Range of Measurable Flow Velocity

Fluid	Nominal Size	Minimum flow velocity	Maximum flow velocity
Liquid	15 to 300 mm 0.5 to 12 in.	"flow velocity obtained from Table 5" or "flow velocity at Reynolds number of 5000", whichever is greater. For liquid Reynolds number of 5000 : Use Figure.6	33 fps (10 m/s)
Gas, Steam	15 to 300 mm 0.5 to 12 in.	"flow velocity obtained from Table 5" or "flow velocity at Reynolds number of 5000", whichever is greater. For Gas and steam Reynolds number of 5000 : Use of a calculation formula on the following page.	262 fps (80 m/s)

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

Table 4: Range of Guaranteed Accuracy at Minimum Flow Velocity

Fluid	Nominal Size	Minimum flow velocity	Maximum flow velocity
Liquid	0.5 to 4" (15 to 100 mm)	"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" (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	0.5 to 4" (15 to 100 mm)	"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" (150 to 300 mm)	"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	

Calculation Formula

How to calculate volume flow rate at operating conditions:

$$Qf = \frac{\upsilon \times D^2}{354} \text{ or } Qf = 3600 \times \upsilon \times S$$

How to calculate the velocity of a Reynolds Number:

$\upsilon = 5 \times \nu/D$
(Reynolds number of 5000)

$\upsilon = 20 \times \nu/D$
(Reynolds number of 20000)

$\upsilon = 40 \times \nu/D$
(Reynolds number of 40000)

however

$$Re = \frac{354 \times 10^3 \times Qf^2}{\nu \times D} \quad (1)$$

$$\nu = \frac{\mu}{\rho f} \times 10_3 \quad (2)$$

Qf = Volume flow rate at operating conditions (m^3/h)
D = Inner diameter of FV-500C (mm)
S = Sectional area of FV-500C (m^2)
υ = Flow velocity (m/s)
Re = Reynolds number (none unit)
pf = Density at operating conditions (kg/m)
m = Viscosity at operating conditions (cP)
ν = Kinematic viscosity at operating conditions (cSt)

Pressure Loss

At velocity of 10 m/s by water, P=108 kPa. At velocity of 80 m/s by atmospheric air, P= 9 kPa obtained from the following equations:

$$P = 108 \times 10^5 \cdot \rho f \cdot \upsilon 2 \quad (1)$$

or

$$P = 135 \times pf \cdot \frac{Qf^2}{D^4} \quad (2)$$

where:
P = Pressure loss (kPa)
ρf = Density at operating condition (kg/m^3)
υ = Flow velocity(m/s)
Qf = Actual flow rate (m^3/h)
D = Internal diameter (mm)

Figure 7 shows the pressure loss versus actual flow rate. When nominal size 15 to 50 mm 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 (176°F) is 30 m^3/h.

Table 5: Detailed Accuracy (for Range of Guaranteed Accuracy)

Fluid	Nominal Size	Accuracy
Liquid	0.5" (15 mm)	1.0% of Reading (20000 ≦ Re)
	1 to 4" (25 to 100 mm)	1.0% of Reading (20000 ≦ Re < D ¥ 10^3)
		0.75% of Reading (D ¥ 10^3 ≦ Re)
	6 to 12" (150 to 300 mm)	1.0% of Reading (40000 ≦ Re)
Gas, Steam	0.5 to 12" (15 to 300 mm)	1.0% of Reading {Velocity 115fps (35m/s) or less}
		1.5% of Reading {Velocity 115fps (35m/s) up to 262fps (80m/s)}

D: *Inner diameter of FV-500C (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.*

Figure 7: Pressure Loss

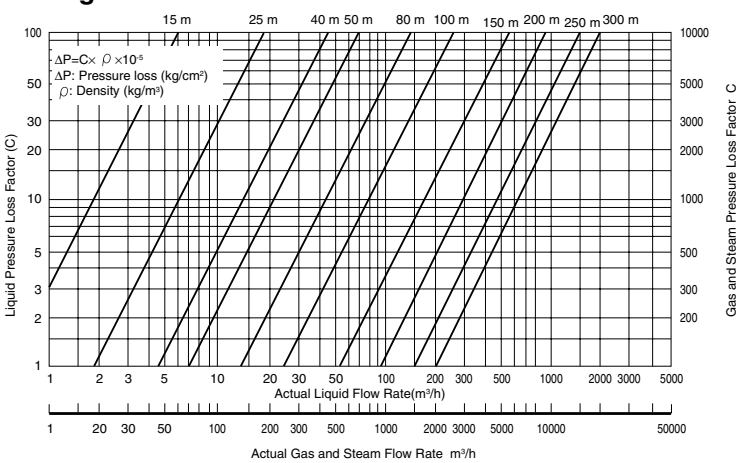
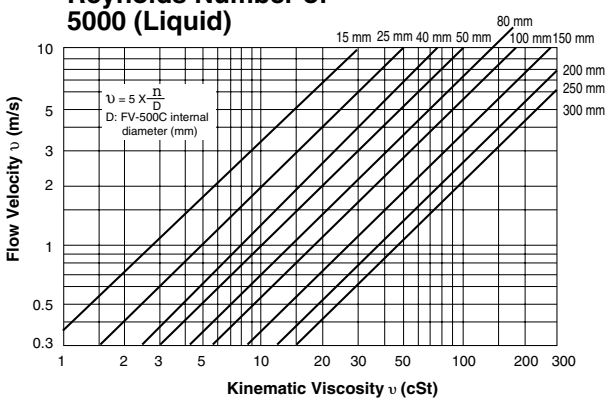


Figure 6: Flow Velocity at Reynolds Number of 5000 (Liquid)



Kinematic viscosity. Use of equation (2). When the nominal size is 50 mm (2") and the kinematic viscosity is 10cST, the flow velocity at Reynold's number of 5000 is 1 m/s using Fig.6.

Table 6: Inner Diameter and Nominal Value

Nominal Size		Inner Diameter mm (inch)	Nominal K-Factor Pulse /G (/L)	Nominal Pulse Rate	
mm	inch			Hz/ft/s (Hz/m/s)	Hz/ft/m (Hz/m^3/h)
15	0.5	14.6 (0.57)	1423.3 (376)	19.11 (62.7)	23.6 (104)
25	1	25.7 (1.0)	247.9 (65.6)	10.82 (35.5)	4.3 (19.1)
40	1.5	39.7 (1.56)	70.7 (18.7)	7.04 (23.1)	1.2 (5.19)
50	2	51.1 (2.01)	33.9 (8.95)	5.57 (18.3)	0.57 (2.49)
80	3	71.0 (2.79)	12.6 (3.33)	4.02 (13.2)	0.21 (0.925)
100	4	93.8 (3.69)	5.41 (1.43)	3.01 (9.88)	0.09 (0.397)
150	6	138.8 (5.43)	1.66 (0.441)	2.03 (6.67)	0.03 (0.123)
200	8	185.6 (7.30)	0.700 (0.185)	1.52 (5.00)	0.01 (0.0514)
250	10	230.8 (9.08)	0.365 (0.0966)	1.23 (4.04)	0.006 (0.0268)
300	12	276.2 (10.87)	0.213 (0.0563)	1.03 (3.37)	0.004 (0.0156)

1. Since the density of water at 80°C (176°F) is 972kg/m³, substitute this value in equation (2):

$$P = 135 \times 972 \times \frac{30}{51.1^4}$$

$$= 17.3 \text{ kPa}$$

2. Obtain the pressure loss using equation (1).
The flow velocity when the flow rate is 30 m³/h is given by:

$$\upsilon = \frac{354 \times Qf}{D^2} = \frac{354 \times 30}{51.1^2} = 4.07 \text{m/s}$$

Therefore, substitute this value in equation (1):

$$P = 108 \times 10^{-5} \times 972 \times 4.07^2$$

$$= 17.3 \text{ kPa}$$

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

$$P = 98.1 \times 18.5 \times 972 \times 10^{-5}$$

$$= 17.6 \text{ kPa}$$

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:

$P - 2.7 \cdot \Delta P + 1.3 \cdot Po$ (3)

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 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 m³/h. It is only necessary to confirm the pressure at the maximum flow rate, therefore, the saturated steam pressure of water at 80°C (176°F) is as follows from the table of saturated steam pressures:

Po = 47.4 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.

Typical Fluid Example

Table 7: Range of Measurable Water Flow Rate (At Standard Condition of 15°C (59°F), P=62.428 lb/cubic ft)

Nominal Size		Measurable Flow Rate in GPM (m³/h)	Range of Guarranted Accuracy Flow Rate in GPM (m³/h)
mm	inch		
15	0.5	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)

Typical Range of Measurable Air Flow Rate at Selected Process Pressures

Nominal Size	Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in SCFM (Nm³/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	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)
(15 mm)	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	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)
(25 mm)	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	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)
(40 mm)	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	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)
(50 mm)	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	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)
(80 mm)	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	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)
(100 mm)	max.	1167 (1990)	2360 (3954)	3156 (5919)	5148 (9847)	7143 (13775	9140 (17703)	13143 (21632)	21182 (31453)	25214 (41274)	29251 (51095)
6.0 in	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)
(150 mm)	max.	2556 (4358)	5168 (8659)	6911 (12960)	11272 (21559	15639 (30163	20012 (38765)	28777 (47365)	46377 (68867)	55205 (90373)	64044 (111875)
8.0 in	min.	496 (575)	706.5 (809)	817.0 (990)	1043 (1445)	1229 (2202)	1390 (2599)	1937 (3175)	3122 (4617)	3717 (6059)	4312 (7501)
(200 mm)	max.	4582 (7792)	9264 (15482)	12387 (23172	20204 (38549	28033 (53933	35872 (69313)	51582 (84693)	83129 (123138)	98952 (161591)	114796(200046)
10 in	min.	885 (1037)	1259 (1461)	1456 (1788)	1859 (2306)	2190 (3127)	2478 (4019)	2992 (4911)	6911 (7140)	5739 (9370)	6658 (11600)
(250 mm)	max.	7075 (12049)	14304 (23939	19127 (35833	31196 (59611	43283 (83400	55387 (107181)	79644 (130968)	128353 (190418)	152784 (249881)	177246 (309334)
12 in	min.	1269 (1485)	1805 (2093)	2087 (2561)	2665 (3303)	3139 (4479)	3551 (5756)	4288 (7033)	6911 (10226)	8226 (13419)	9543 (16612)
(300 mm)	max.	10142 (17256)	20503 (34286)	27415 (51317)	44715 (85370)	62039 (119441)	79388 (153499)	114157 (187556)	183972 (272699)	218890 (357856)	254053 (443017)

(1) At standard conditions STP 15C (59˚F), 14.7 PSIA (0C, 1 atm).
(2) Pressure listed is at process temperature of 15C (59˚F).
(3) Maximum flow rate is at 262 f/s (80m/s)
(4) Minimum values are determined from Table 5.

Table 9: Range of Measurable Saturated Steam Flow Rate at Selected Process Pressures

Nominal Size	Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in lb/h (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.	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)
(15 mm)	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.	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)
(25 mm)	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.	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)
(40 mm)	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.	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)
(50 mm)	max.	1497 (671)	1965 (979)	3109 (1580)	4231 (2170)	5340 (2753)	7538 (3333)	11916 (4778)	14113 (6228)	18552 (7688)	23070 (9166)
3.0 in.	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)
(80 mm)	max.	2906 (1295)	3814 (1891)	6034 (3050)	8210 (4188)	10363 (5314)	14628 (6435)	23124 (9224)	27389 (12024)	36003 (14842)	44771 (17694)
4.0 in.	min.	465 (148)	533 (179)	670.7 (227)	782.4 (267)	878.9 (300)	1044 (330)	1313 (402)	1428 (524)	1638 (647)	1947 (772)
(100 mm)	max.	5047 (2261)	6624 (3300)	10479 (5326)	14259 (7310)	17997 (9276)	25406 (11232)	40160 (16102)	47567 (20986)	62527 (25907)	77754 (30883)
6.0 in.	min.	1019 (324)	1167 (392)	1468 (498)	1712 (600)	1924 (761)	2286 (922)	3303 (1322)	3912 (1723)	5142 (2127)	6395 (2536)
(150 mm)	max.	11051 (4950)	14504 (7226)	22944 (11661)	31221 (16010)	39404 (20315)	55625 (24595)	87929 (35258)	104146 (45953)	136900 (56729)	170239 (67624)
8.0 in.	min.	2214 (697)	2537 (841)	3190 (1068)	3722 (1252)	4181 (1410)	4968 (1649)	6246 (2364)	7012 (3081)	9218 (3803)	11463 (4534)
(200 mm)	max.	19808 (8851)	25997 (12918)	41126 (20850)	55962 (28627)	70631 (36325)	99706 (43976)	157608 (63043)	186678 (82165)	245387 (101433)	305147 (120913)
10.0 in.	min.	3947 (1256)	4521 (1518)	5687 (1929)	6634 (2260)	7453 (2546)	11133 (2801)	11133 (3655)	12117 (4764)	14233 (5882)	17694 (7011)
(250 mm)	max.	30585 (13687)	40140 (19977)	63500 (32243)	86407 (44268)	109055 (56172)	153947 (68005)	243350 (97489)	288234 (127058)	378881 (156854)	471152 (186978)
12.0 in.	min.	5657 (1799)	6481 (2174)	8152 (2762)	9509 (3236)	10683 (3646)	12692 (4012)	15958 (5235)	17367 (6823)	20400 (8423)	25369 (10041)
(30 mm)	max.	46838 (19602))	57535 (28609))	91017 (46175))	123850 (63397)	156313 (80445)	220658 (97390)	348802 (139614)	413135 (181960)	543063 (224633)	675317 (267772)

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

To Order

Model No. (Without Display Module)	Description	Lay Length mm (inch)	Weight kg (lb)
FV-505C	½" wafer mount	70 (2.8)	2.8 (6)
FV-505C-F	½" flange mount	70 (2.8)	2.8 (6)
FV-510C	1" wafer mount	70 (2.8)	3.7 (8)
FV-510C-F	1" flange mount	70 (2.8)	3.7 (8)
FV-515C	1½" wafer mount	70 (2.8)	4.3 (9.5)
FV-515C-F	1½" flange mount	70 (2.8)	4.3 (9.5)
FV-520C	2" wafer mount	75 (3.0)	6 (14)
FV-520C-F	2" flange mount	75 (3.0)	6 (14)
FV-530C	3" wafer mount	100 (3.9)	9.4 (21)
FV-530C-F	3" flange mount	100 (3.9)	9.4 (21)
FV-540C	4" wafer mount	120 (4.7)	12.8 (28)
FV-540C-F	4" flange mount	120 (4.7)	12.8 (28)
FV-560C-F	6" flange mount	270 (10.6)	36.4 (80)
FV-580C-F	8" flange mount	310 (12.2)	55.4 (122)
FV-591C-F	10" flange mount	370 (14.6)	90 (199)
FV-592C-F	12" flange mount	400 (15.7)	140 (308)

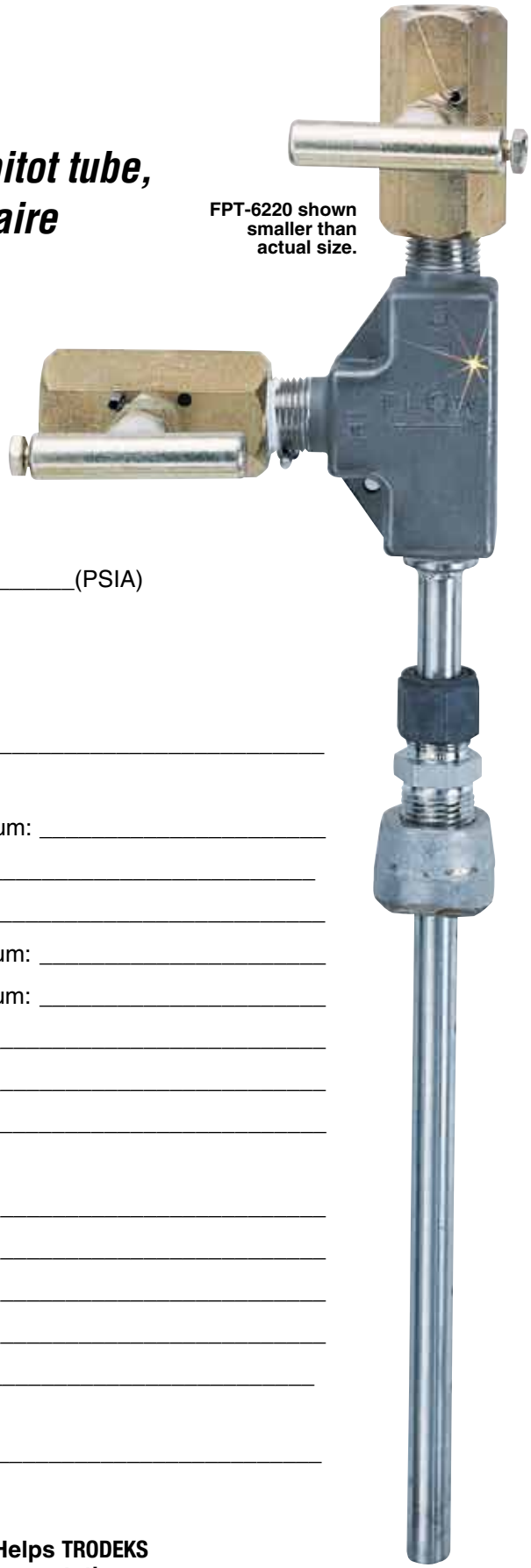
Comes with complete operators manual.
***Note:** Units with "**-F**" suffix have 150 class flange connections.*
*For units with a display, add "**-D**" to the model number for additional cost.*
*For units with remote electronics, add "**-R**" to the model number, to order the mounting kit and cable in the accessories table.*
*For units designed for high temperature use, add "**-HT**" to the model number and consult engineering for cost.*
*For NIST calibration add "**–NIST**" to model for additional cost.*
***Ordering Example: FV-505C-D**, ½" wafer mount vortex flowmeter with integral display, Consult engineering for cost.*

***Note:** To confirm that the vortex meter will work for your requirements, contact the Flow Department. When ordering units without a display, the vortex meter will be programmed at our factory for your application, contact the Flow Department for details.*

Accessories

Model No.	Description
FV-500C-RMK	Remote mounting kit
FV-500C-RMK-D	Remote mounting kit with display
FV-500CABLE-10F	3 m (10') cable for remote mounting
FV-500CABLE-30F	9 m (30') cable for remote mounting
FV-500CABLE-50F	15 m (50') cable for remote mounting
FV-500CABLE-75F	23 m (75') cable for remote mounting
FV-500CABLE-100F	30 m (100') cable for remote mounting

To enter an order for a vortex meter or pitot tube, we request that the following questionnaire be submitted with your order:



FPT-6220 shown smaller than actual size.

1) What is the fluid being measured?_____

*****FOR LIQUIDS OTHER THAN WATER:*****

Max Liquid Vapor Pressure at Operating Temperature:_____(PSIA)

*****FOR GASES OTHER THAN AIR:*****

Compressibility Factor (Z): _____

2) Pressure: Maximum: _____ Minimum: _____

Units (circle one): PSI/KPa/inH_2O/kg cm^2/bar/other (specify):_____

Absolute or Gage?_____

3) Flowrate: Maximum: _____ Minimum: _____

4) Fluid Temperature: Maximum: _____ Minimum: _____

5) Fluid Density Range (liquids only): _____

6) Fluid Viscosity Range (liquids only): _____

7) Pipe Size:_____

Maximum Acceptable Pressure Drop: _____

Pipe Schedule or Wall Thickness: _____

Pipe Material: _____

Metering Run: Upstream Straight Pipe Run Length: _____

Downstream Straight Pipe Run Length: _____

Nearest Upstream Obstruction (Reducer, Elbow, Globe, Valve, Ball Valve, Expansion, etc.): _____

Providing This Information Helps TRODEKS Assure You The Best Instrumentation To Fit Your Application. Thanks For Your Cooperation!