

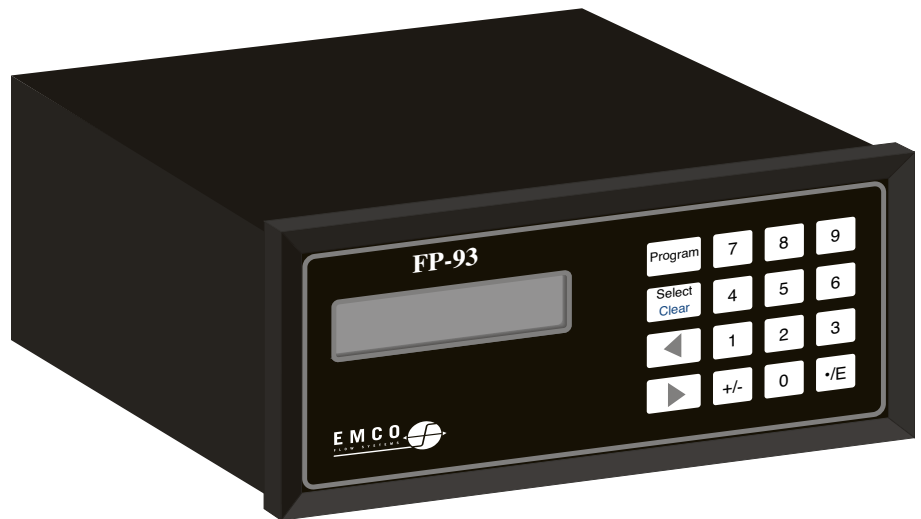
*The microprocessor-based FP-93 monitors a variety of flows in industrial environments. This programmable flow processor and remote terminal unit accurately calculates volume, mass, and heat flow rates for steam, liquids, and gases, displaying these variables in user-selectable engineering units.*

## Benefits

- Calculates volume, mass, and heat flow for steam, liquid, and gas
- Single-board design for low cost and high reliability

## Features

- Displayed values with description and user-selectable, engineering units
- Non-volatile memory for programmed data
- Battery-backed memory for statistical values and totalizers
- Self-diagnostics and operational alarm monitoring
- 16-bit resolution A/D converter for superb analog accuracy
- Isolated outputs for digital and analog control
- Backlit display option for viewing in all lighting conditions
- Light weight and low power consumption
- EIA RS-232C compatible communications interface
- Panel mount unit or optional NEMA 4 enclosure



The EMCO FP-93 is a microprocessor-based instrument that is designed to monitor a variety of flows within industrial environments. The single-board design enables high reliability in a low cost form factor. Pressure and/or temperature compensation and an 8-point flow calibration curve may be used to further enhance performance. Diagnostic routines constantly monitor the FP-93's performance, automatically displaying any detection of a fault. The FP-93 features a backlit display that is readable in all lighting conditions. An industrial rated NEMA 4 enclosure is available for protection against harsh environments.

## Operating Specifications

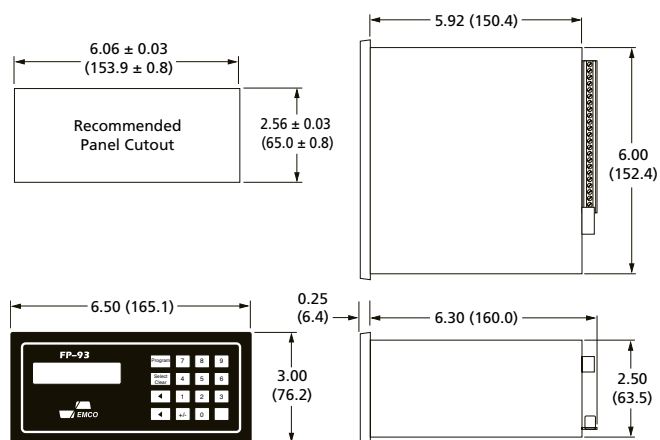
<b>Fluid Types</b>	Steam condensate, water, water energy, liquid, air, natural gas, ideal gas, and steam	
<b>Storage Temperature</b>	-40 to 140°F (-40 to 60°C)	
<b>Operating Temperature</b>	32 to 122°F (0 to 50°C)	
<b>Relative Humidity</b>	0 to 95% (non-condensing)	
<b>Power Requirement</b>	The FP-93 power supply, 24 VDC ±5% at 150 mA, is used for powering external transmitters.	
Standard	10.5 to 36 VDC, 100 mA maximum	
Option 1	115 VAC ±15% @ 50/60 Hz	
Option 2	230 VAC ±15% @ 50/60 Hz	
	2 x 3 x 1.75" with 6' cords (5.08 x 7.62 x 4.45 cm with 1.8 m cords)	
	VAC Power Weight—1.25 lb (0.57 kg)	
<b>Input Signals</b>		
One Frequency	Range 0 to 10 kHz	
	Accuracy ±(0.01% of reading + 1 count)	
	Impedance 50 kΩ minimum	
	Transition Level +3 volts nominal	
	Hysteresis 0.25 volts	
	Signal Amplitude 4 to 36 VDC	
One Direction	Impedance 50 kΩ minimum	
	Transition Level +3 volts nominal	
	Hysteresis 0.25 volts	
	Signal Amplitude ±36 volts maximum	
	One 4-Wire RTD Resistance	Range 10 to 4000 Ω
		Resolution—the greater of 0.05% of reading or 0.1 Ω
	Accuracy	10 to 100 Ω ±0.15 Ω
	100 to 2000 Ω ±0.15% of reading	
	100 to 4000 Ω ±0.2% of reading (extended range)	
Two Analog (4 to 20 mA) Current	Resolution 0.4 μA	
	Accuracy ±0.15% of full scale (±30 μA)	
	Impedance 100 Ω	
	Alarm Limits	Overrange 21.6 mA
	Underrange 2.4 mA	
<b>Output Signals</b>		
One Isolated 4 to 20 mA Current	Voltage Range 15 to 40 VDC	
	Resolution 6 μA	
	Accuracy ±0.25% of full scale (±50 μA)	
One Isolated Solid-State Relay	A maximum up to 60 VDC	
<b>Communications</b>		
Compatibility	EIA RS-232C	
Multi-Drop Capability	Up to 10 units on a single RS-232C port (RS423 compatible)	
Programmable Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19200, or 38400 baud	
Data Bits	7 or 8	
Parity	Even, odd, or none	
Stop Bits	1 or 2	
Connector	Chassis mounted 9-pin D-subminiature	

The analog input can be configured for flow input in all applications except BTU measurements with two RTD temperature inputs. For BTU measurements, select frequency input for flow.

## Dimensions and Weights

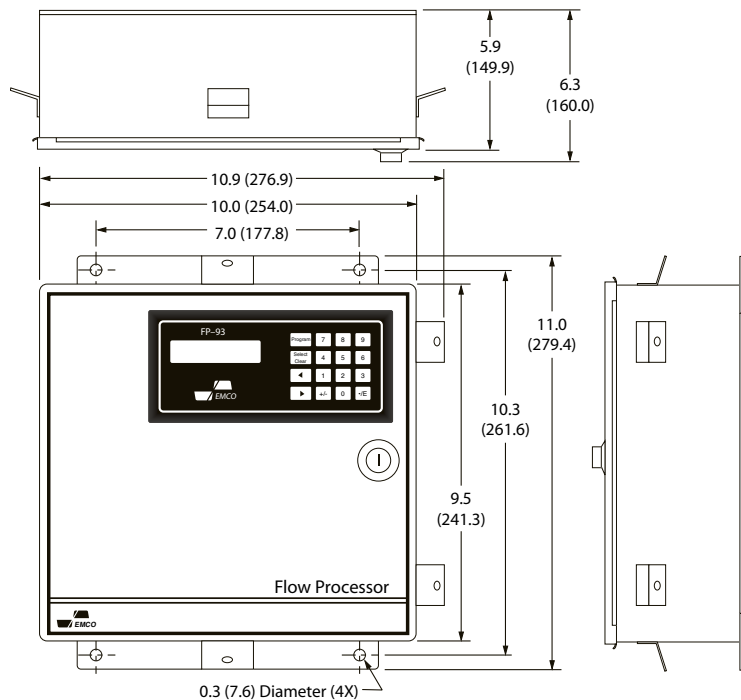
*Dimensions are in inches (millimeters).*

### Panel Mount Enclosure



Weight 1.25 lb (0.57 kg)

### NEMA 4 Enclosure



Weight 15.0 lb (6.75 kg)

FP-93 Programmed Constants									
Column #1	Column #2	Column #3	Column #4 Fluid Parameters	Column #5 Totalizer	Column #6 Analog Output	Column #7 Relay Output	Column #8 Displayed Values	Column #9 Display Units	Column #10 System
Fluid	Flow	Temp input	Density from	Total #1	Analog out- put	Relay output	Bar graph	Velocity units	Unit number
Steam/cond	Frequency	None	Temp. input	None	None	None	Off/On	ft/sec	Baud rate
Water	4 to 20 mA	RTD	#1	Volume flow	None	Temp alarm	Density	cm/sec	38400
Water energy	Substitute	4 to 20 mA	Temp. input	Comp flow	Temperature	Temp #2	Off/On	m/sec	19200
Liquid	Flowmeter	Substitute	#2	Mass flow	Temp #2	alarm	Temperature	Volume units	9600
Air	Linear	Sub temp #1	Ref. density	Energy flow	Diff Temp	Diff Temp	Off/On	cubic feet	4800
Natural gas	Non-linear	RTD #1 cal A	Specific grav- ity	Scale factor	Pressure	alarm	Temp Stats	cubic inches	2400
Ideal gas	Insertion	RTD #1 cal B	Mole frac CO <sub>2</sub>	Total #1	Density	Pressure	Off/On	gallons	1200
Steam	Small turbine	RTD #1 cal R	Mole frac N <sub>2</sub>	None	Velocity	alarm	Pressure	barrels	600
	Large turbine	Zero scale	Supercomp	Volume flow	Volume flow	Density alarm	Off/On	cubic cm	300
	Interpolation	Full scale	Viscosity	Comp flow	Comp flow	Velocity alarm	Pressure stats	liters	Data format
	Linear	Temp Input	Temperature	Mass flow	Mass flow	Vol flow	Off/On	cubic meters	7 Even
	Cubic Spline	#2	#1	Energy flow	Energy flow	alarm	Line velocity	quarts	7 Odd
	Bidirectional	None	Density #1	Scale fac- tor #2	Zero scale	Comp flow	Off/On	Mass units	8 None
	On/Off	RTD	thru		Full scale	alarm	Volume flow	pounds	Stop bits
	Substitute	4 to 20 mA	Temperature			alarm	Off/On	tons	1/2
	freq	Substitute	#8			Energy alarm	Vol flow stats	grams	Comm hand- shake
	Pipe diameter	Sub temp #2	Density #8			Total #1	Off/On	kilograms	None
	Obscuration	RTD #2 cal A				Total #2	Comp vol	metric tons	Hardware
	Profile factor	RTD #2 cal B				Alarm limit	flow	Energy units	(CTS)
	K-factor	RTD #2 cal R				Low	Off/On	Btu	XON/XOFF
	Full scale vel	Zero scale				High	Comp vol	kJ	Both
	Full scale freq	Full scale				Setpoint	stats	cal	Modem
	Diff press cal	Pressure input				Hysteresis	Off/On	kcal	Comm
	Frequency #1	None					Mass flow	Mcal	Off/On
	Velocity #1	4 to 20 mA					Off/On	ton	Password
	thru	Substitute					Mass flow	kW	Display scan
	Frequency #8	Sub pressure					stats	MW	Sync calc
	Velocity #8	Zero scale					Off/On	GW	Off/On
		Full scale					Energy flow	Flow time	Temperature
		Atm pressure					Off/On	base	TC
							Energy stats	/second	Pressure TC
							Off/On	/minute	Flow TC
							Analog out- put	/hour	A/D reference
							Off/On	/day	A/D int count
							Relay output	Temp units	D/A zero
							Off/On	"F"/"R"/"C"/"K	count
							Total #1	Pressure units	D/A span
							Off/On	psi	count
							Total #2	atm	
							Off/On	bar	
							Clock/ Calendar	kg/cm <sup>2</sup>	
							Off/On	mm Hg	
							Verification	Pressure dis- play	
							Off/On	absolute	
								gauge	
								Density units	
								lb/ft <sup>3</sup>	
								g/cc	
								kg/m <sup>3</sup>	

## Model and Suffix Codes

Category	Suffix Codes					
<b>Model</b>						
Microprocessor-Based Flow Processor	FP-93					
<b>Enclosure</b>						
Panel Mount Unit		P				
NEMA 4 Rated Enclosure		N				
<b>Power Supply</b>						
10.5 to 36 VDC			0			
115 VAC, 50/60 Hz <sup>1</sup>			1			
2305 VAC, 50/60 Hz <sup>1</sup>			2			
<b>Relay Output</b>						
DC Option				D		
<b>Display</b>						
Standard Display					S	
Display with Backlighting					B	
<b>Flow Input</b>						
Frequency						F
Analog 4 to 20 mA						A
<b>Example</b>	<b>FP-93-</b>	<b>P-</b>	<b>0-</b>	<b>D-</b>	<b>S-</b>	<b>F</b>
FP-93-P-0-D-S-F represents a panel mount unit, 10.5 to 36 VDC power supply, DC option relay output, standard display, with frequency flow input.						

1 Not available with European CE Mark.



**For information on EMCO industrial flow products, contact:**

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