programmable
flow processor
remote terminal unit

Model FP-93
General Specification

Features

- **Single-board design for low cost and high reliability**
- **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**

EMCO's FP-93 is a microprocessor-based instrument for monitoring a variety of flows in an industrial environment. This programmable flow processor and remote terminal unit accurately calculates volume, mass, and heat flow rates for steam, liquids, and gases and displays these variables in user-selectable, engineering units. Pressure and/or temperature compensation and an 8-point flow calibration curve may be used to enhance performance. Diagnostic routines constantly monitor the FP-93's performance and the detection of a fault is automatically displayed.

The FP-93's backlit display is readable in all lighting conditions. An industrial rated NEMA 4 enclosure is available for protection against harsh environments.

EMCO FLOWMETERS

Engineering Measurements Company
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sales@emcoflow.com

ISO 9001 QUALITY SYSTEM CERTIFIED

Operating Specifications

Fluid types
Steam condensate, water, water energy, liquid, air, natural gas, ideal gas, steam

Storage Temperature
–40 to 140 °F (–x40 to 60 °C)

Operating Temperature
32 to 122 °F (0 to 50 °C)

Relative Humidity
0 to 95% (non-condensing)

Power Requirement
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
VAC Power Size ..2 x 3 x 1.75 in. with 6 ft cords
(5.08 x 7.62 x 4.45 cm with 1.8 m cords)
VAC Power Weight.....1.25 lb (0.57 kg)

Input Signals

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

Note: 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.

Output Signals

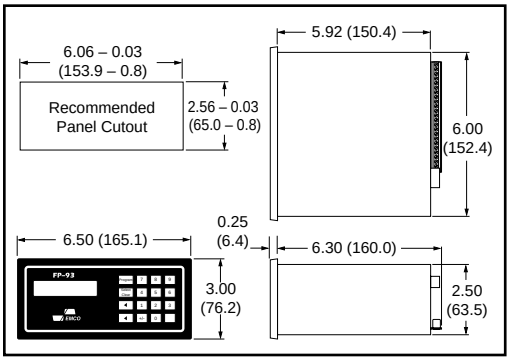
One Isolated 4 to 20 mA Current
Voltage Range.....15 to 40 VDC
Resolution .....6 µA
Accuracy .....± 0.25% of full scale (± 50 µA)

One Isolated Solid-State Relay
1 A maximum up to 60 VDC

Communications
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

Dimensions and Weights

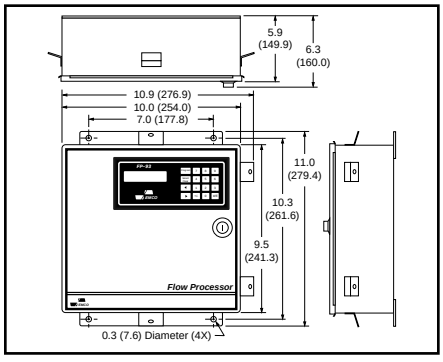
Panel Mount Enclosure



All dimensions are inches (millimeters).

Weight .....1.25 lb (0.57 kg)

NEMA 4 Enclosure



All dimensions are inches (millimeters).

Weight .....15.0 lb (6.75 kg)

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FP-93 Programmed Constants

Column #1 Application	Column #2 Flow Input	Column #3 Analog inputs	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 *Steam/cond* *Water* *Water energy* *Liquid* *Air* *Natural gas* *Ideal gas* *Steam*	Flow *Frequency* *4-20 mA* *Substitute* Flowmeter *Linear* *Non-linear* *Insertion* *Small turbine* *Large turbine* Interpolation *Linear* *Cubic Spline* Bidirectional *On/Off* Substitute freq Pipe diameter Obscuration Profile factor K-factor Full scale vel Full scale freq Diff press cal Frequency #1 Velocity #1 *thru* Frequency #8 Velocity #8	Temp input *None* *RTD* *4-20 mA* *Substitute* Sub temp #1 RTD #1 cal A RTD #1 cal B RTD #1 cal R Zero scale Full scale Temp Input #2 *None* *RTD* *4-20 mA* *Substitute* Sub temp #2 RTD #2 cal A RTD #2 cal B RTD #2 cal R Zero scale Full scale Pressure input *None* *4-20 mA* *Substitute* Sub pressure Zero scale Full scale Atm pressure	Density from *Temp. input #1* *Temp. input #2* Ref. density Specific gravity Mole frac CO_2 Mole frac N_2 Supercomp Viscosity Temperature #1 Density #1 *thru* Temperature #8 Density #8	Total #1 *None* *Volume flow* *Comp flow* *Mass flow* *Energy flow* Scale factor Total #1 *None* *Volume flow* *Comp flow* *Mass flow* *Energy flow* Scale factor #2	Analog output *None* *Temperature* *Temp #2* *Diff Temp* *Pressure* *Density* *Velocity* *Volume flow* *Comp flow* *Mass flow* *Energy flow* Zero scale Full scale	Relay output *None* *Temp alarm* *Temp #2 alarm* *Diff Temp alarm* *Pressure alarm* *Density alarm* *Velocity alarm* *Vol flow alarm* *Comp flow alarm* *Mass flow alarm* *Energy alarm* *Total #1* *Total #2* Alarm limit *Low* *High* Setpoint Hysteresis	Bar graph *Off/On* Density *Off/On* Temperature *Off/On* Temp Stats *Off/On* Pressure *Off/On* Pressure stats *Off/On* Line velocity *Off/On* Volume flow *Off/On* Vol flow stats *Off/On* Comp vol flow *Off/On* Comp vol stats *Off/On* Mass flow *Off/On* Mass flow stats *Off/On* Energy flow *Off/On* Energy stats *Off/On* Analog output *Off/On* Relay output *Off/On* Total #1 *Off/On* Total #2 *Off/On* Clock/Calendar *Off/On* Verification *Off/On*	Velocity units *ft/sec* *cm/sec* *m/sec* Volume units *cubic feet* *cubic inches* *gallons* *barrels* *cubic cm* *liters* *cubic meters* *quarts* Mass units *pounds* *tons* *grams* *kilograms* *metric tons* *Energy units* *Btu* *kJ* *cal* *kcal* *Mcal* *ton* *kW* *MW* *GW* Flow time base */second* */minute* */hour* */day* Temp units *°F/°R/°C/K* Pressure units *psi* *atm* *bar* *kg/cm²* *mm Hg* Pressure display *absolute* *gauge* Density units *lb/ft³* *g/cc* *kg/m³*	Unit number Baud rate *38400* *19200* *9600* *4800* *2400* *1200* *600* *300* Data format *7 Even* *7 Odd* *8 None* Stop bits *1/2* Comm handshake *None* *Hardware (CTS)* *XON/XOFF* *Both* Modem Comm *Off/On* Password Display scan Sync calc *Off/On* Temperature TC Pressure TC Flow TC A/D reference A/D int count D/A zero count D/A span count

Model and Suffix Codes

CATEGORY	DESCRIPTION	SUFFIX CODES					
Model	Microprocessor-based flow processor	FP-93	. . .	. . .	. . .	. . .	. . .
Enclosure	Panel mount unit NEMA 4 rated enclosure	. . . . . .	P N	. . . . . .	. . . . . .	. . . . . .	. . . . . .
Power Supply	10.5 to 36 VDC 115 VAC, 50/60 Hz[1] 2305 VAC, 50/60 Hz[1]	. . . .	. . . .	0 1 2	. . . .	. . . .	. . . .
Relay Output	DC Option	. . .	. . .	. . .	D	. . .	. . .
Display	Standard display Display with backlighting	. . . . . .	. . . . . .	. . . . . .	. . . . . .	S B	. . . . . .
Flow Input	Frequency Analog 4 to 20 mA	. . . . . .	. . . . . .	. . . . . .	. . . . . .	. . . . . .	F A

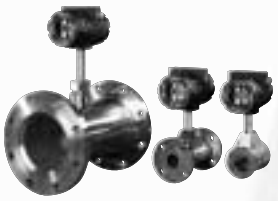
Example → **FP-93-P-0-D-S-F**

1. Not available with European CE Mark.

Providing innovative flowmeter products and services for over three decades . . .

Engineering Measurements Company (EMCO) is a long established manufacturer of precision flowmeters for liquid, gas, and steam applications for commerce and industry. Manufactured under an ISO 9001 certified quality system, which includes extensive flow calibration capability, engineering, applications, and service, underpining a world-wide sales and service organization totally focused on providing the best flowmeters and customer service in the industry.

- Manufacturing is housed in a modern plant located in Longmont, Colorado
- Modern clean-room, mechanized assembly equipment, and computer based testing ensure the highest quality product
- Trained professional flow specialists and technicians offer timely customer assistance
- Factory trained and certified field technicians provide product support services



Vortex PhD™ Inline Vortex

V-Bar™ Insertion Vortex

Turbo-Bar™ Insertion Turbine

MAGFLO® Electromagnetic

PDH Helix

PDP Piston

Sono-Trak™

EMCO FLOWMETERS

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P/N 990109 Rev. I
Specifications subject to change without notice

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