Propeller Flowmeters

SPARLING

Introduction

Quality Policy

Sparling's policy is to supply products and services that meet or exceed the requirements and expectations of our customers. We are committed to the continuous improvement of our people, our products and our processes.

Mission Statement

The Sparling Mission is to serve process measurement markets with flow and level instruments of superior quality. We are customer focused and driven to excellence.

Warranty

Sparling Propeller Meters are warranted to be free from defects in material and workmanship at the time of original shipment and for a period of one year thereafter.

Sparling Propeller Meters

All Sparling MainLine Propeller Meters are engineered for long term reliability and low maintenance. Many Sparling meters have been in service for over 50 years with only minor service!

We have optimized the wear resistance of our design by utilizing full-radius tungsten carbide tips on the propeller and vertical shafts, tungsten carbide disks on the thrust screws and precision ground worm gears heat treated to Rockwell C-60.

Our propellers have the same specific gravity as water and virtually "float", eliminating any side loading of the bearings and resultant wear. A hex insert, molded in place, incorporates machined grooves and a key to ensure a positive drive and prevent slippage.

Features

- Measures accurately over a flow range of 10:1 or greater
- ±2% of rate accuracy, guaranteed by certified wet calibration at three test points in Sparling's National Institute of Standards and Technology (NIST) traceable hydraulic flow lab
- Sturdy cast or fabricated steel construction
- Easily maintained with standard tools
- Registration can be furnished in any standard Engineering Unit

Flow

Your Sparling meter utilizes specially designed propellers and bearings matched to your flow range to insure a long life. Maximum flow ranges can be safely exceeded by 50% when used intermittently. See the Flow Range chart on page 20. **In order to insure proper meter configuration, anticipated flow ranges including minimum and normal flow rates expected, should always be specified on application sheets.**

Applications

Sparling propeller meters have been developed for "clean" water applications where the temperature of the water does not exceed 100° F and suspended solids do not exceed 0.5% of volume.

Sparling propeller meters are not recommended where:

- Suspended solids are over 0.5% of volume
- Operating temperatures are over 100° F (unless higher temperature construction is specified)

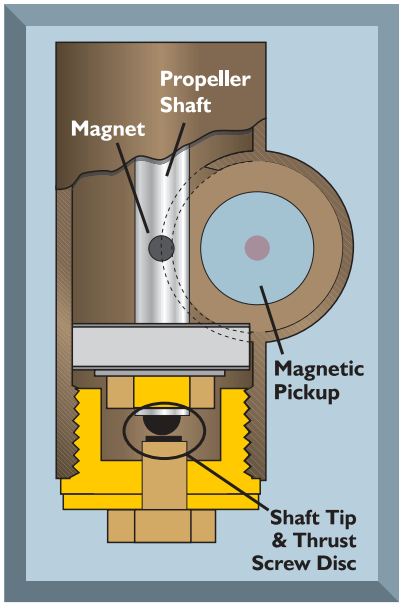
MainLine™

The Model 104/184 electronic propeller meter provides accurate and reliable flow measurement where main line water service is required in municipal and industrial facilities, where isolation of the drive element from the flow stream is desirable or where durable, cost-effective measurement is required.

The Model FM104/184 features the FT194 battery powered electronic rate/totalizer which senses the rotation of the propeller by means of a magnetic pickup sensor located in the gearbox. The rate/totalizer and pickup are completely isolated from the flow stream.

Fewer moving parts combined with a proven Sparling design results in less wear, reduced maintenance costs and longer life. As with all Sparling MainLine propeller meters, the FM104/184 is available with a choice of factory fabricated tubes, saddles and as a meterhead only.

REMOTE OPTION – For remote indication of rate and total the FT194 display/transmitter may be mounted up to 50 ft. from the FM104/184 meterhead. This is ideal for situations where it is inconvenient to have the indicator mounted integrally to the meterhead, such as in a pit or frequently flooded area.



FIELD PROGRAMMABLE – Registration can be changed in the field with the optional Sparling Model 703 programmer.

CHOICE OF OPTIONAL OUTPUTS – The FM104/184 is available with 4-20mA output when the digital rate/totalizer is connected to an outside power source.

Existing Sparling propeller meters can be retrofitted at the factory to accommodate the digital display. Please see FT194 on pages 6-7 for more information.

Installation —

The FM104/184 MainLine Meter must be installed in full flowing suction or discharge lines. Avoid valves, fittings or obstructions immediately upstream of the meter which may cause jetting or non-symmetrical flow profiles. It is recommended that a minimum of five straight pipe diameters be maintained upstream and one diameter downstream of the meter.

Specifications —

Temperature Limits

Operating (Higher Temperature construction is available) ..... 32° F to 100° F
Storage ..... -40° to 175° F

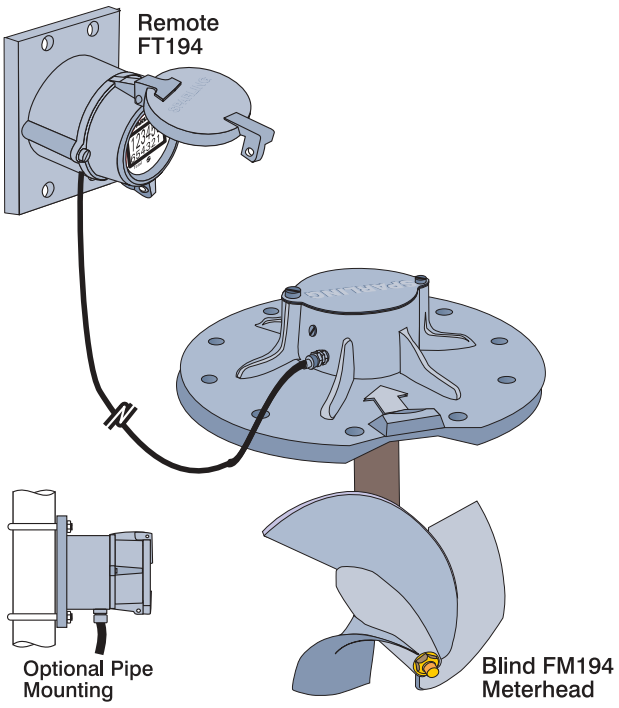
Materials of Construction

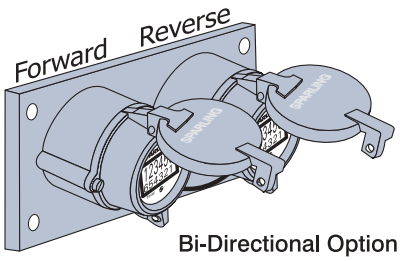
Coverplate ..... Cast Iron (2" – 14") / Fabricated Steel (16" – 72")
Propeller ..... Polyethylene
Gearbox ..... Bronze (2 – 30") / Cast Iron (36" – 72")
Mechanical Parts ..... Stainless Steel
Meter Tubes / Coatings ..... Cast Iron / stainless steel metering section (2"- 3")
Fabricated Steel (4" – 36") / Wetted parts high build epoxy polyamide paint EPA approved for potable water.

Sizes

2" to 14" FM104
16" to 72" FM184

Flow Ranges (Shown on page 20)





Bi-Directional Option

Also Available —

- Indicator/Totalizer/Transmitter options - see pages 6-7
- MA-160 Register Extension - maximum length 5'0"

Model FT194
Digital Indicator/Totalizer

The FT194 is a digital flow rate and totalizer with an easy to read 2-line LCD display which features simultaneous 5-digit rate and 8-digit totalizer indication. The FT194 is standard on the FM104/184.

NON-VOLATILE EEPROM memory chip holds all meter parameters such as full scale, span, calibration factors, engineering units, damping parameters and flow totals, even in the event of a power failure.

A PHOTOELECTRIC CELL ACTIVATES THE DISPLAY when the cover is opened. The display reverts to an energy saving "sleep mode" after a user programmed time interval. Flow totals are continuously updated even when in the "sleep mode". To reactivate the display, simply close and open the cover. The 3.6V lithium battery has an 8 year average life. A low battery indication will display approximately 6 months before the battery requires replacement. Totalization accuracy is not affected when a "low battery" indication is displayed.

Specifications

Accuracy:
- Rate ..... ±0.25% of full scale
- Totalization ..... ±0.1% of rate (in addition to propeller meter accuracy)

Power:
- 3.6V Lithium battery (8 year avg. life)
- 4-20 mA and scaled pulse output with external 24Vdc power source

Operating Temperature ..... -10°F to 158°F (-23°C to 70°C)

Storage Temperature ..... -40°F to 158°F (-40°C to 70°C)

Display ..... 5-digit rate indicator (0.35 inches high)
8 digit totalizer indicator (0.25 inches high). LCD 2 line display with simultaneous rate, total, and low battery indication

Construction ..... Sturdy Die Cast Aluminum bonnet
NEMA-6P & IP67 environmental ratings

Optional Outputs ..... 4-20mA & pulse output, contact on time 100 milliseconds
User can select how many units of measure for every contact closure

Scaling ..... Totalizer Scaler - 0.0001 to 9999.0 / Rate Scaler - 0.0001 to 9999.0
Decimal point can be moved to five positions

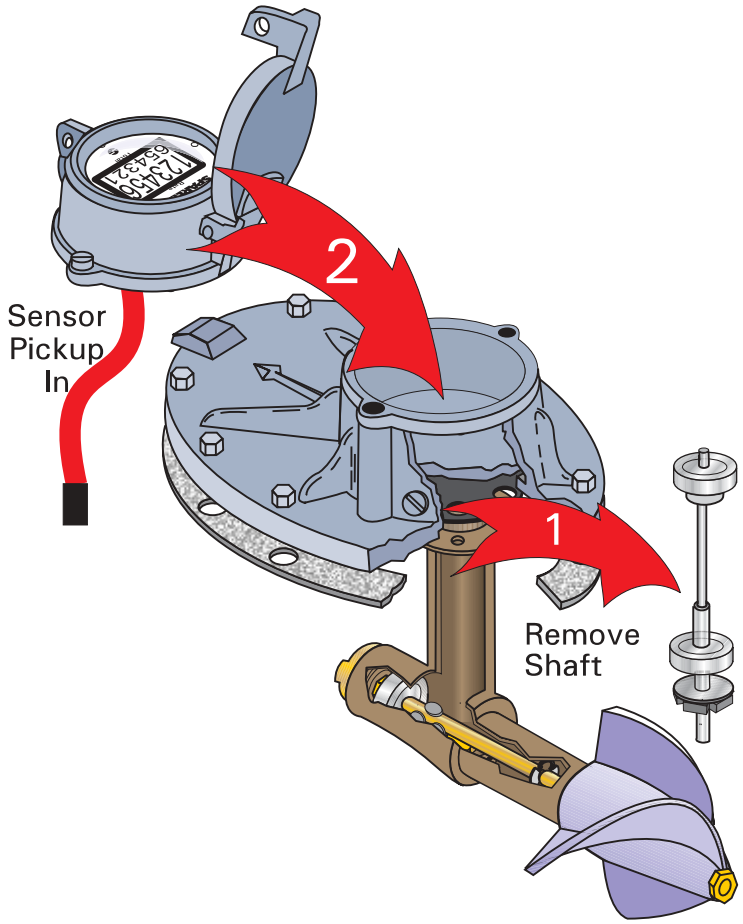
Scaling Units ..... Totalizer - Gallons, Ft^3, Liters, M^3, Acre Feet
Rate - GPM, CFS, MGD, LPS, M^3/Hr

Electrical Rating ..... General Purpose

FT194 Retrofit
Available for your Existing Sparling Meters

Sparling's factory technicians can upgrade your existing Sparling FM102/182 or FM103/183 propeller meters to be compatible with the FT194 digital indicator/totalizer. You'll have all the benefits of the electronic Model FM104/184 propeller meter: fewer moving parts, digital readout and longer life.

Sparling factory technicians remove the vertical shaft and inspect the propeller shaft, bearings and bushings to insure proper operation. The magnetic sensor pickup, which is completely potted and isolated from moisture, is then inserted into the gearbox and the electronic indicator totalizer is mounted to the meter body. Finally, the meter is wet flow calibrated at a minimum of three test points.



MainLine™

Models FM102 & FM182 Direct Drive Propeller Meter

For over 70 years Direct Drive propeller meters have earned a reputation for rugged continuous duty with minimum maintenance.

STAINLESS STEEL WORM GEARS—precision ground and heat treated to Rockwell C-60 prevent the possibility of slippage and low readings. Full-radius tungsten carbide tips on the propeller shafts and tungsten carbide thrust bearings ensure years of trouble-free operation. Propellers have the same specific gravity as water and virtually "float", eliminating any side loading of the bearings and resultant wear. A hex insert molded in place, incorporates machined grooves to prevent movement. A Woodruff key ensures a positive drive.

No special equipment is required for maintenance of Sparling meters - they are easily maintained with standard hand tools. See page 24 for installation considerations.

Specifications —

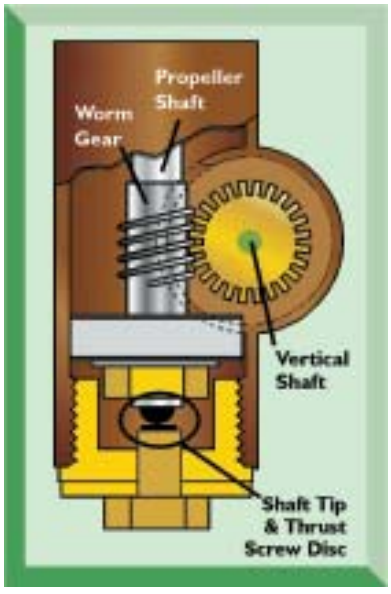
Temperature Limits

Operating ..... 32°F to 100°F*
*Higher Temperature construction is available.

Storage ..... -40°F to 175°F

Materials of Construction

Coverplate ..... Cast Iron (2-14") / Fabricated Steel (16"- 72")
Propeller ..... Polyethylene
Gearbox ..... Bronze (2"-30") / Cast Iron (36"- 72")
Mechanical Parts ..... Stainless Steel
Bearings ..... Low Range - Stainless Steel
Standard Range - Rubber Front Bearings
Meter Tubes/Coatings .....
Cast Iron / stainless steel metering section (2"- 3")
Fabricated Steel (4"- 36") / Wetted parts high build epoxy polyamide paint approved by the EPA for potable water



Also Available—

- Indicator/Totalizer/Transmitter options - see pages 18, 19
- MA-146 Register Extension - maximum length 10'0"

MainLine™

Models FM103 & FM183 Magnetic Drive Propeller Meter

Sparling's "magnetic worm gear" (2"-14") and "magnetic coupling" (16"-30") eliminate sealing problems and permit complete sealing of the output section from the flow stream.

MAGNETIC WORM GEAR—magnets are embedded in the propeller shaft creating a field which acts on similar magnets in the vertical shaft.

MAGNETICALLY COUPLED—transmits propeller movement through six, pole radial Alnico magnets.

The "magnetic worm gear" rotates at 1/3 the speed of the propeller shaft like a 3:1 worm gear. The "magnetically coupled" meter operates at a 2:1 ratio. With either configuration, the result is the same—as the propeller rotates, so does the vertical shaft. This eliminates the mechanical wear and extra load that a mechanically driven gear imposes on a shaft. Reduced load on the propeller shaft means longer wear for the propeller bearings, and longer intervals between maintenance. Unlike some magnetic propeller meters, Sparling's meter won't jam or "stutter" under rapid acceleration. As with all MainLine™ meters, Sparling magnetic drive meters are built with tungsten carbide thrust bearings *for reduced friction and longer life. See page 24 for installation considerations.*

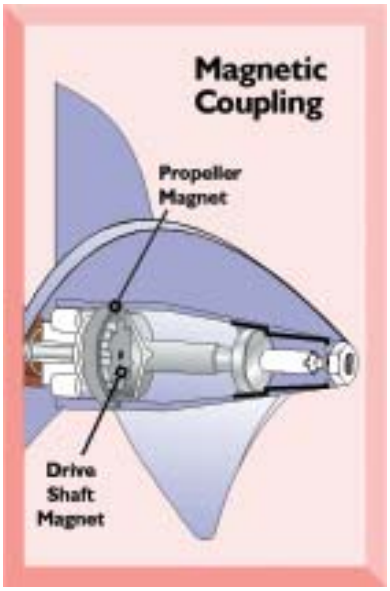
Specifications —

Temperature Limits

Operating ..... 32°F to 100°F
Storage ..... -40°F to 175°F

Materials of Construction

Coverplate ..... Cast Iron (2"- 14") / Fabricated Steel (16"- 30")
Propeller ..... Polyethylene
Gearbox ..... Bronze
Mechanical Parts ..... Stainless Steel
Meter Tubes / Coatings .....
Cast Iron / stainless steel metering section (2"- 3")
Fabricated Steel (4"- 30") / Wetted parts high build epoxy polyamide paint approved by the EPA for potable water



Also Available —

- Indicator/Totalizer/Transmitter options - see pages 18, 19
- MA-147 (FM103) or MA-153 (FM183) Register Extensions - maximum length 5'0"

MainLine™

Tubes, Saddles Straightening Vanes

Sparling MainLine™ direct drive, magnetic drive, or electronic propeller meters may be furnished with a flanged tube or with a saddle for field welding on to the customer's pipe.

Tubes — 2" to 36"

2"- 3" tubes are provided in heavy duty cast iron. 4" and larger tubes are fabricated steel, coated with an epoxy polyamide paint.

6"- 36" tubes are equipped with three integrally mounted straightening vanes. Standard flanges are 150# or 250# with AWWA bolt hole pattern. Meter mounting flanges are Sparlings' standard bolt hole pattern (2"- 14") or AWWA standard (16"- 36"). See page 22.

Saddles — 6" to 72"

Saddles for meterheads from 6"- 14" are provided in heavy duty cast steel with meter mounts in the Sparling standard bolt pattern. Saddles for meterheads from 16"- 72" are fabricated steel and have meter mounts in the AWWA standard bolt hole pattern. See page 23.

Specifications —

Materials of Construction

Tubes

Tube	Cast Iron (2"- 3") / Fabricated Steel (4"- 36")
Flanges	150 or 250# AWWA standard as required
Bolt Pattern (meterhead mounting)	Sparling Standard (2" - 14")
	AWWA flange compliant (16"- 36")
Straightening Vanes*	2"- 4" not required
	6" - 36" integrally welded

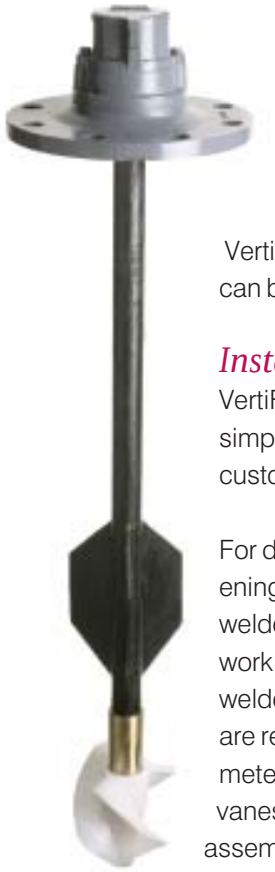
Saddles

Saddle	Cast Steel (6" - 14") / Fabricated Steel (16"- 72")
Bolt Pattern	Sparling Standard (6"- 14")
	AWWA flange compliant (16"- 72")
Straightening Vanes*	Sold Separately

*See chart on page 24 for straightening vane requirements.

VertiFlo™

Model FM132



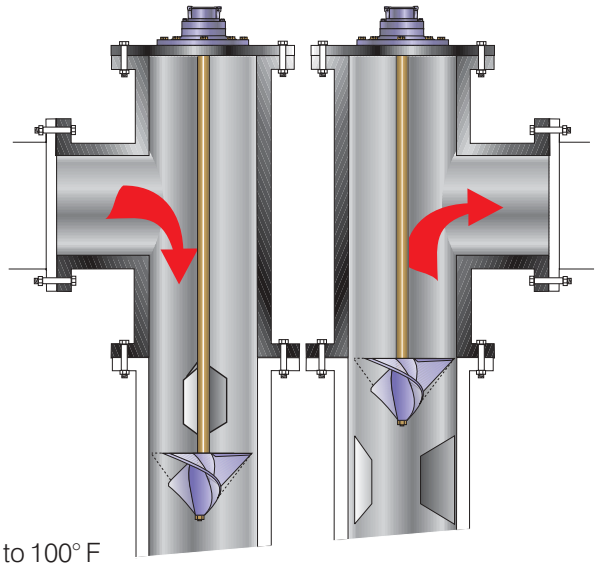
Sparling VertiFlo™ meters are ideal for installations where space limitations or piping configurations preclude the use of Sparling MainLine™ tube or saddle mounted meters. VertiFlo™ meters are used in wells equipped with submersible pumps and installations on the suction side of centrifugal pumps. Standard sizes range from 4" to 14". Flow ranges are shown on page 20.

VertiFlo™ meters are economical - the meter is installed in a standard flanged tee and can be configured for up or down flow conditions.

Installation —

VertiFlo™ meterheads are provided with 150 lb. or 300 lb. flanges as specified, and are simply bolted into position on the flanged tee. The length of the meter drop pipe is per customer requirements. See page 26 for dimensions.

For down-flow installations, the straightening vanes are supplied integrally welded to the drop pipe and no further work is required. For up-flow, three welded or bolted straightening vanes are recommended upstream of the meter. Welding vanes, bolting type vanes and stainless-steel liner and vane assemblies are available from Sparling.



Specifications —

Temperature Limits

Operating	32° F to 100° F
Storage	-40° to 175° F

Materials of Construction

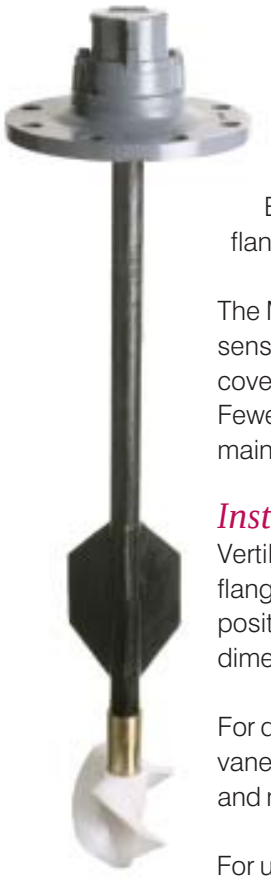
Coverplate	Cast Iron
Propeller	Polyethylene
Gearbox	Bronze
Mechanical Parts	Stainless Steel
Wetted metal parts	Coal Tar Epoxy

Also Available —

- Indicator/Totalizer/Transmitter options - see pages 18, 19

VertiFlo™

Model FM134
Electronic Propeller Meter



Sparling's electronic VertiFlo™ meters are ideal for installations where space limitations or piping configurations preclude the use of Sparling MainLine™ tube or saddle mounted meters. VertiFlo™ electronic meters are used in wells equipped with submersible pumps and installations on the suction side of centrifugal pumps. Standard sizes range from 4" to 14". Flow ranges are shown on page 20.

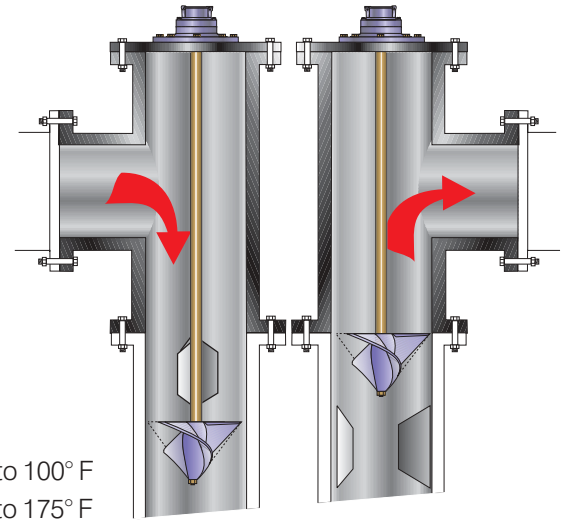
Electronic VertiFlo™ meters are economical - the meter is installed in a standard flanged tee and can be configured for up or down flow conditions.

The Model FM134 interfaces with the FT194 battery powered electronic rate/totalizer which senses the rotation of the propeller by means of a magnetic pickup sensor located in the coverplate. The rate/totalizer and pickup are completely isolated from the flow stream. Fewer moving parts combined with a proven Sparling design results in less wear, reduced maintenance costs and longer life.

Installation —

VertiFlo™ meterheads are drilled in accordance with standard 125 lb. or 250 lb. cast iron flanged tee requirements, as specified on customer order, and are simply bolted into position. The length of the meter drop pipe is manufactured in accordance with overall dimensions as stated in the customers order.

For down-flow installations, the straightening vanes are supplied integral with the meter and no further work is required.



For up-flow, three straightening vanes are recommended to be welded upstream of the meter. Welding vanes, bolting type vanes and stainless-steel liner and vane assemblies are available at extra cost.

Specifications —

Temperature Limits

Operating	32° F to 100° F
Storage	-40° to 175° F

Materials of Construction

Coverplate	Cast Iron
Propeller	Polyethylene
Gearbox	Bronze
Mechanical Parts	Stainless Steel
Wetted metal parts	Coal Tar Epoxy

Also Available —

- Indicator/Totalizer/Transmitter options - see pages 6, 7

Waterworks Intake
Open Channel

Model FM142

Economical and easily installed, the Waterworks Intake meter is designed for large volume flow measurement at the discharge end of a closed conduit, inverted siphon or reservoir. The meter can easily be mounted on existing structures.

The conical shape and flexibility of Sparling's propeller design reduces damage and minimizes maintenance by shedding debris such as algae clumps or rags. The wetted drop pipe and gear box are fabricated from heavy duty materials designed to provide many years of trouble-free service. Materials used are resistant to normal water corrosion.

Flow —

The FM142 utilizes specially designed propellers and bearings matched to your flow range to insure a long life. Maximum flow ranges can be safely exceeded by 50% when used intermittently. See the Flow Range chart on page 20. ***For proper configuration of meter construction, anticipated flow ranges, including minimum and normal flow rates expected should always be specified on application sheets accompanying your order.***

Installation —

The meter propeller is installed fully submerged and facing the center of the flow at the discharge end of a pipe, closed conduit, or inverted siphon. It is suspended from a pipe column attached to a wall or simple support structure. Concrete pipe or a simple culvert structure acts as a meter tube. Gate valves or other obstructions should be at least ten pipe diameters upstream from the meter. Straightening vanes may be furnished as a separate item to insure stable flow conditions and accurate measurement.

Specifications —

Materials of Construction

Drop Pipe	Brass (10" - 30") / Fabricated Steel (36" - 72")
Propeller	Polyethylene
Gearbox	Bronze (10" - 30") / Cast Iron (36" - 72")
Mechanical Parts	Stainless Steel
Coatings	Not required (10" - 30") / Galvanized (36" - 72")

Also Available —

- Indicator/Totalizer/Transmitter options - see pages 18, 19
- Revolving mounting bracket and dimensions - see page 27

Waterworks Intake Open Channel

Model FM144 Electronic Propeller Meter

Economical and easily installed, the Waterworks Intake meter is designed for large volume flow measurement at the discharge end of a closed conduit, inverted siphon or reservoir. The meter can easily be mounted on existing structures.

The conical shape and flexibility of Sparling's propeller design reduces damage and minimizes maintenance by shedding debris such as algae clumps or rags. The wetted drop pipe and gear box are fabricated from heavy duty materials designed to provide many years of trouble-free service. Materials used are resistant to normal water corrosion.

The Model FM144 interfaces with the FT194 battery powered electronic rate/totalizer which senses the rotation of the propeller by means of a magnetic pickup sensor located in the gearbox. The rate/totalizer and pickup are completely isolated from the flow stream. Fewer moving parts combined with a proven Sparling design results in less wear, reduced maintenance costs and longer life.

Flow —

The FM144 utilizes specially designed propellers and bearings matched to your flow range to insure a long life. Maximum flow ranges can be safely exceeded by 50% when used intermittently. See the Flow Range chart on page 20. ***For proper configuration of meter construction, anticipated flow ranges, including minimum and normal flow rates expected should always be specified on application sheets accompanying your order.***

Installation —

The meter propeller is installed fully submerged and facing the center of the flow at the discharge end of a pipe, closed conduit, or inverted siphon. It is suspended from a pipe column attached to a wall or simple support structure. Concrete pipe or a simple culvert structure acts as a meter tube. Gate valves or other obstructions should be at least ten pipe diameters upstream from the meter. Straightening vanes may be furnished as a separate item to insure stable flow conditions and accurate measurement.

Specifications —

Materials of Construction

Drop Pipe	Brass (10" - 30") / Fabricated Steel (36" - 72")
Propeller	Polyethylene
Gearbox	Bronze (10" - 30") / Cast Iron (36" - 72")
Mechanical Parts	Stainless Steel
Coatings	Not required (10" - 30") / Galvanized (36" - 72")

Also Available —

- Indicator/Totalizer/Transmitter options - see pages 6, 7
- Revolving mounting bracket and dimensions - see page 27

Fire Hydrant Meter

Model FM162

Sparling's Fire Hydrant Meter is fitted for fire hydrant hose connection and is designed to measure flows from 35 GPM. The pressure drop through the meter is approximately 1 psi at 200 gallons per minute.

Weighing only twenty pounds, it is convenient to carry and attach. Hydrant and hose connections can be made in a few minutes.

The connections are 2-1/2 inch National Fire Hose, 7-1/2 thread coupling and spigot. 3" Standard National Pipe Thread tapped at both ends may be supplied if preferred. See page 28 for dimensions.

Specifications —

Materials of Construction

Body
Cast Aluminum
Liner
Stainless Steel

Propeller	Polyethylene
Mechanical Parts	Bronze or Stainless Steel
Weight	20 lbs.
Coatings	Standard Sparling coating
Connections	2-1/2 National Fire Hose Fitting or 3" National Pipe Thread
Totalizer	FT191 (see page 6, 7, 18)

Irrigation
Low Pressure Meters

Model FM312

Sparling began supplying meters for irrigation applications in the early 1900's. They provided a low cost, reliable flow measurement device that was easy to install.

Irrigation meters are factory calibrated and ready to mount to existing pipe or on plain end steel tubes. See page 28 for dimensions.

Installation —

This meter may be installed at any convenient angle in a full flowing suction or discharge line. Avoid any valve, fitting or obstruction directly upstream from the meter propeller. At least five diameters of straight pipe upstream and one diameter downstream from the meter are recommended.

Specifications — (Flow ranges shown on page 20)

Temperature Limits

Operating	32°F to 100°F
Storage	-40°F to 175°F

Materials of Construction

Saddle	Cast Iron (4" - 12") / Cast Aluminum (14")
Gear Box	Cast Bronze
Propeller	Polyethylene
Mechanical Parts	Stainless Steel
Coatings	Grey water base paint

Mounting Options

Plain end steel tube	4"
Plain end steel tube w/straightening vanes	6" - 14"
Meterhead only with stainless steel straps	4" - 14"
Meterhead only with U-bolts	4" - 8", 14"
Meterhead only with anchor bars	10" - 12"

Also Available —

- Indicator/Totalizer/Transmitter options - see pages 18, 19
- Dummy covers

Model FM314
Electronic Propeller Meter

Metering of irrigation water was pioneered by Sparling more than 75 years ago in the era when water was less expensive and plentiful and irrigation was limited to a few farming areas. As specialists in the design, engineering and servicing of irrigation meters, Sparling occupies an enviable position having acquired the "know how" that only long experience can validate.

The Model 314 interfaces with the FT194 battery powered electronic rate/totalizer which senses the rotation of the propeller by means of a magnetic pickup sensor located in the gearbox. The rate/totalizer and pickup are completely isolated from the flow stream. Fewer moving parts combined with a proven Sparling design results in less wear, reduced maintenance costs and longer life.

Irrigation meters are factory calibrated and ready to mount to existing pipe or on plain end steel tubes. See page 28 for dimensions.

Installation —

This meter may be installed at any convenient angle in a full flowing suction or discharge line. Avoid any valve, fitting or obstruction directly upstream from the meter propeller. At least five diameters of straight pipe upstream and one diameter downstream from the meter are recommended.

Specifications — (Flow ranges shown on page 20)

Temperature Limits

Operating	32°F to 100°F
Storage	-40°F to 175°F

Materials of Construction

Saddle	Cast Iron (4" - 12") / Cast Aluminum (14")
Gear Box	Cast Bronze
Propeller	Polyethylene
Mechanical Parts	Stainless Steel
Coatings	Grey water base paint

Mounting Options

Plain end steel tube	4"
Plain end steel tube w/straightening vanes	6" - 14"
Meterhead only with stainless steel straps	4" - 14"
Meterhead only with U-bolts	4" - 8", 14"
Meterhead only with anchor bars	10" - 12"

Also Available —

- Indicator/Totalizer/Transmitter options - see pages 6, 7
- Dummy covers

Indicators/Totalizers — *FT190 / FT191*

Sparling provides four Indicator/Totalizer/Transmitter packages as optional equipment. The FT190, FT191, FT193 and the electronic FT194. Integrally mounted to the meterhead, these housings are made of die cast aluminum and have a locking hasp for security. See page 25 for dimensions.

FT190 —

Mechanical Flow Totalizer and Indicator
Compatible with all Sparling propeller flowmeters, ***except Model 162***
Enclosure: NEMA 3R
Accuracy: Visual Indicator ±5% full scale,
Totalizer ±2% of rate
Available with optional P, B, & E switches

FT191 —

Mechanical Flow Totalizer
Compatible with all Sparling propeller flowmeters
Accuracy ±2% of rate
4-20mA output accuracy ±0.5% of full scale
Available with optional P, B & E switches
Enclosure: NEMA 3R

FT190/FT191 Output Specifications (optional)

P Switch - for meterheads up to 30" (ambient temperature limits 30° F to 130° F (-1°C to 55°C)

Pulse output - three-wire solid state switch using external power supply

- External power supply ..... 11 to 20 Vdc, 60 mA max.
- Pulse output load ..... 1500 ohms (min.)
- Output pulse rate ..... 0-20 Hz
- Duty cycle ..... 50/50 + 20%

Isolated Switching Output ..... Two-wire isolated solid state switch (optocoupled)

- External Power ..... 10-30 Vdc & 100mA (functional only when pulse output is powered)
- Switching output rate ..... 0-20 Hz
- Duty cycle ..... 50/50 + 20%

B Switch

- 3-wire, single pole, double throw, break-before-make contact closure
- Contact rating ..... 115 VAC ±10%, 1 amp max. non-inductive
- Contact rate ..... 30 full cycles/minute
- Contact duration ..... Variable with flow rate
- ON Time ..... 450 ms (min.) / Continuous (max.)
- Accuracy ..... ±2% of actual flow over rated meterhead range

E Switch

- Single pole, single throw, 2-wire, contact closure
- Contact rating ..... 115 Vac ±10%, 1 amp max. non-inductive
- Contact rate ..... Scalable 0-1 pulse/minute to 0-150 pulses/minute
- Contact duration ..... 100 ms (min.) / Continuous (max.)
- Accuracy ..... ±2% of actual flow over rated meterhead range

FT193 —

Mechanical Flow Totalizer with 4-20 mA and scaled pulse output
Accuracy: Totalizer ±2% of rate, 4-20 mA output ±0.5% full scale
Ambient temperature limits: +30° F (-1° C) to +130° F (+55° C)
Compatible with Sparling Models 102, 103, 132, 182, 183, 142
Construction: Die Cast Aluminum standard Sparling coating
Enclosure: NEMA 3R
Electrical Rating: General Purpose

Output Specifications —

All output connections - pigtail leads through 1/2" NPT grommeted or potted sealed conduit connection

4-20 mA Output

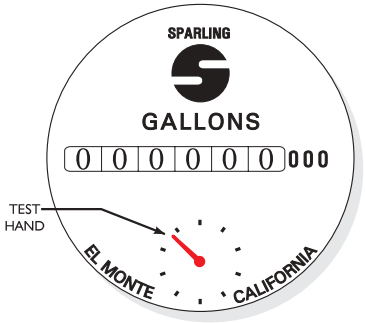
True two-wire requiring external power supply

- External power supply ..... 18 - 30 Vdc
- Output load capability ..... See power supply vs. output load curve
- Reverse polarity protection ..... 35 Vdc (max.)
- Accuracy ..... ±0.5% of full scale (over and above flow meter accuracy)

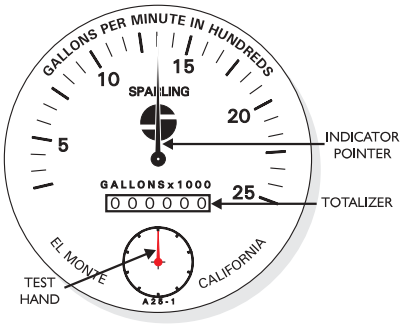
Scaled Electronic Pulse Rate

Two-wire isolated solid state switch (optocoupled)

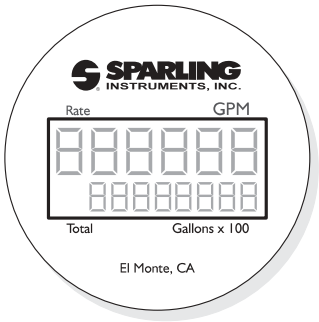
- External power supply ..... 10 Vdc to 30 Vdc
- Pulse amplitude ..... 0 Vdc (off) to external supply voltage minus 3 Vdc (on)
- Output load ..... 4 Watts max.
- Pulse on time ..... 100 ms
- Pulse output registration ..... Equal to mechanical totalizer least significant digit
- Accuracy ..... ±2% Actual flow over rated meterhead range



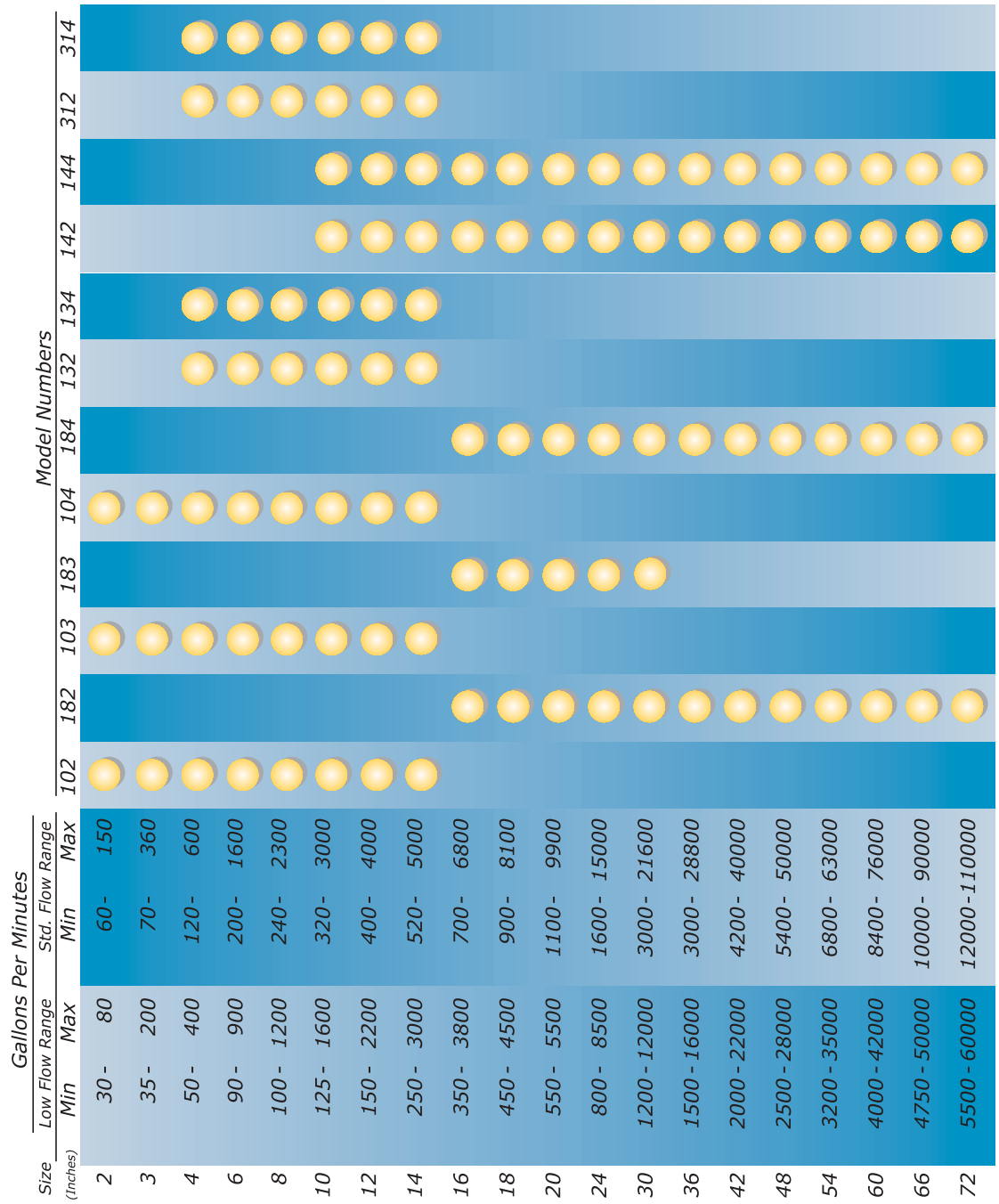
FT191 & FT193 Mechanical



FT190 Mechanical



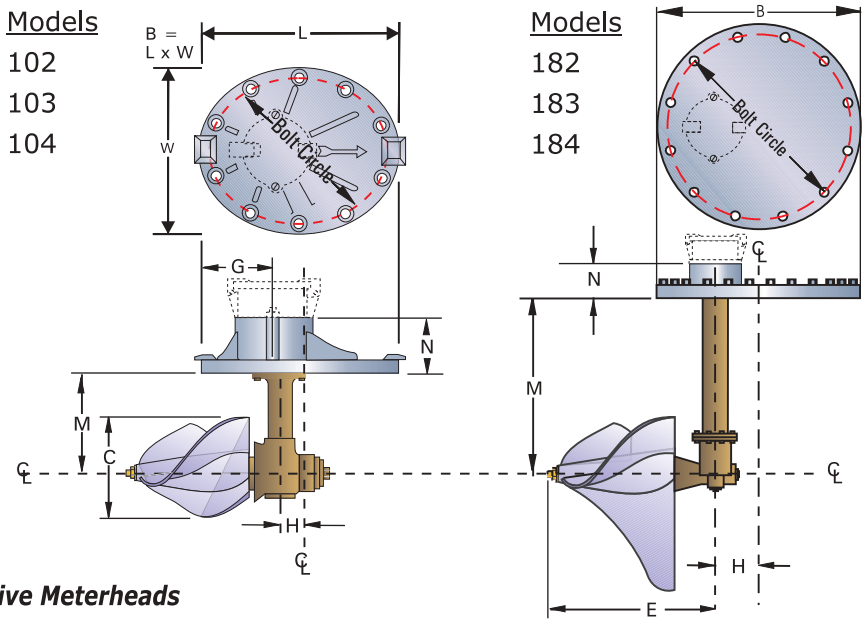
FT194 Digital



Size (Inches)	Gallons Per Minutes Low Flow Range Min	Low Flow Range Max	Std. Flow Range Min	Std. Flow Range Max
2	30 -	80	60 -	150
3	35 -	200	70 -	360
4	50 -	400	120 -	600
6	90 -	900	200 -	1600
8	100 -	1200	240 -	2300
10	125 -	1600	320 -	3000
12	150 -	2200	400 -	4000
14	250 -	3000	520 -	5000
16	350 -	3800	700 -	6800
18	450 -	4500	900 -	8100
20	550 -	5500	1100 -	9900
24	800 -	8500	1600 -	15000
30	1200 -	12000	3000 -	21600
36	1500 -	16000	3000 -	28800
42	2000 -	22000	4200 -	40000
48	2500 -	28000	5400 -	50000
54	3200 -	35000	6800 -	63000
60	4000 -	42000	8400 -	76000
66	4750 -	50000	10000 -	90000
72	5500 -	60000	12000 -	110000

Maximum flow ranges can be safely exceeded by 50% when use is intermittent (10-15% of the time). See the Flow Range chart above. The Sparling meter utilizes specially designed propellers and bearings matched to your flow range to insure reliability and long life. **For proper configuration of meter construction, anticipated flow ranges including minimum and normal flow rates expected, should always be specified on application sheets accompanying your order.**

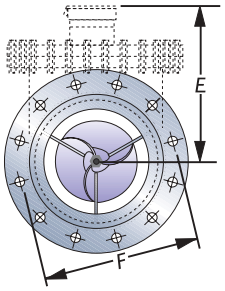
Meterhead Dimensions

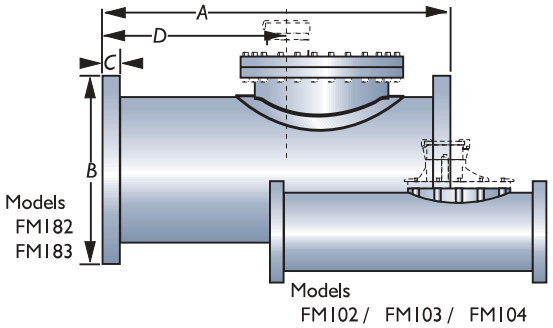


Direct and Magnetic Drive Meterheads

SIZE			WT (lbs.) Fabr. Steel	WT (lbs.) Cast Iron	Dimensions (inches) B 150 lbs.	B 250 lbs.	C	E	G	H	M 150 lbs	M 250 lbs	N
2	Electronic Drive		–	20	8.13 x 5.13	8.13 x 5.13	2.38	4.00	3.13	0.50	1.75	1.75	2.56
3	Electronic Drive		–	20	8.25 x 6.25	8.25 x 6.25	2.75	4.00	3.18	0.63	2.75	2.75	2.56
4	Electronic Drive		20	–	9.50 x 6.75	9.50 x 6.75	3.50	6.94	4.13	0.63	3.44	3.44	2.56
6	Electronic Drive		25	–	10.38 x 7.31	10.38 x 7.31	4.75	6.31	3.69	0.94	4.25	4.25	2.93
8	Electronic Drive		29	–	11.00 x 10.63	11.00 x 10.63	7.00	6.31	5.81	-0.32	5.31	5.31	2.81
10	Electronic Drive		34	–	11.00 x 10.63	11.00 x 10.63	8.00	6.31	5.81	-0.32	6.31	6.31	2.81
12	Electronic Drive		36	–	11.00 x 10.63	11.00 x 10.63	10.00	6.31	5.81	-0.32	7.31	7.31	2.81
14	Electronic Drive		37	–	11.00 x 10.63	11.00 x 10.63	11.00	6.31	5.81	-0.32	8.00	8.00	2.81
16	Electronic Drive		210	–	23.50 dia.	25.50 dia.	13.00	12.00	4.56	4.25	12.25	12.25	2.88
18	Electronic Drive		210	–	23.50 dia.	25.50 dia.	16.00	12.00	4.56	4.25	13.25	13.50	2.88
20	Electronic Drive		215	–	23.50 dia.	25.50 dia.	16.00	12.00	4.56	4.25	14.25	14.50	2.88
24	Electronic Drive		215	–	23.50 dia.	25.50 dia.	16.00	12.00	4.56	4.25	16.25	16.50	2.88
30	Electronic Drive		220	–	23.50 dia.	25.50 dia.	16.00	12.00	4.56	4.25	19.25	19.50	2.88
36	Electronic Drive	Direct Drive	825	–	32.00 dia.	36.00 dia.	25.25	18.75	6.81	6.50	23.00	24.00	3.13
42	Electronic Drive	Direct Drive	835	–	32.00 dia.	36.00 dia.	25.25	18.75	6.81	6.50	26.00	27.00	3.13
48	Electronic Drive	Direct Drive	1350	–	38.75 dia.	43.00 dia.	38.38	20.00	9.81	9.50	29.50	30.50	3.25
54	Electronic Drive	Direct Drive	1360	–	38.75 dia.	43.00 dia.	38.38	20.00	9.81	9.50	32.50	33.50	3.25
60	Electronic Drive	Direct Drive	1370	–	38.75 dia.	43.00 dia.	38.38	20.00	9.81	9.50	35.50	36.50	3.25
66	Electronic Drive	Direct Drive	1380	–	38.75 dia.	43.00 dia.	38.38	20.00	9.81	9.50	38.50	39.50	3.25
72	Electronic Drive	Direct Drive	1390	–	38.75 dia.	43.00 dia.	38.38	20.00	9.81	9.20	41.50	42.50	3.25

Basic Meter Tube Dimensions





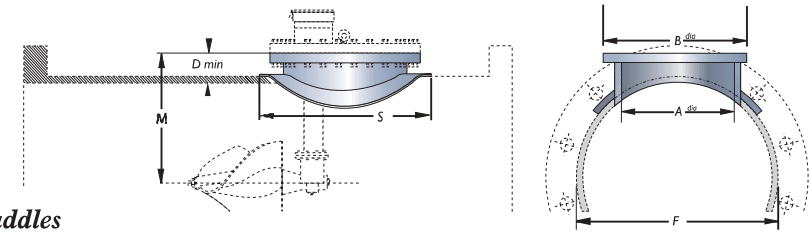
150 PSI Flanged Tubes, Flat Faced

Size	Wt. (lbs.) Fabr. Steel	Wt. (lbs.) Cast Iron	Dimensions (inches) A	B	C	D	E	F	Bolt Size	# of Bolts
2	–	20	13-1/4	6	5/8	6-1/8	6-1/2	4-3/4	5/8	4
3	–	25	12-3/4	7-1/2	3/4	5-7/16	7-7/16	6	5/8	4
4	40	–	18	9	15/16	10-3/16	8-1/8	7-1/2	5/8	8
6	95	–	22	11	11/16	12	9-1/4	9-1/2	3/4	8
8	155	–	24	13-1/2	11/16	14-1/2	10-5/16	11-3/4	3/4	8
10	260	–	26	16	11/16	15-1/2	11-5/16	14-1/4	7/8	12
12	310	–	28	19	13/16	17-1/4	12-5/16	17	7/8	12
14	325	–	32	21	15/16	21-1/4	12-5/16	18-3/4	1	12
16	410	–	46	23-1/2	1	25-7/16	17-3/4	21-1/4	1	16
18	480	–	48	25	1-1/16	26-15/16	18-3/4	22-3/4	1-1/8	16
20	540	–	50	27-1/2	1-1/8	28-7/16	19-3/4	25	1-1/8	20
24	695	–	54	32	1-1/4	31-15/16	21-3/4	29-1/2	1-1/4	20
30	860	–	60	38-3/4	1-3/8	36-15/16	24-3/4	36	1-1/4	28
36	1180	–	80	46	1-5/8	49-11/16	28-7/8	42-3/4	1-1/2	32

250 PSI Flanged Tubes, Flat Faced

Size	Wt. (lbs.) Fabr. Steel	Wt. (lbs.) Cast Iron	Dimensions (inches) A	B	C	D	E	F	Bolt Size	# of Bolts
2	–	35	13-1/4	6-1/2	7/8	6-1/8	6-1/2	5	5/8	8
3	–	40	12-3/4	8-1/4	1-1/8	5-7/16	7-7/16	6-5/8	3/4	8
4	60	–	20-5/8	10	1-1/4	13-1/8	8-1/4	7-7/8	3/4	8
6	130	–	22	12-1/2	1-7/16	12	9-1/4	10-5/8	3/4	12
8	285	–	24	15	1-5/8	14-1/2	10-5/16	13	7/8	12
10	290	–	26	17-1/2	1-7/8	15-1/2	11-5/16	15-1/4	1	16
12	360	–	28	20-1/2	2	17-1/4	12-5/16	17-3/4	1-1/8	16
14	420	–	32	23	2-1/8	21-1/4	12-15/16	20-1/4	1-1/8	20
16	530	–	46	25-1/2	2-1/4	25-7/16	18-9/16	22-1/2	1-1/4	20
18	600	–	48	28	2-3/8	26-15/16	19-9/16	24-3/4	1-1/4	24
20	680	–	50	30-1/2	2-1/2	28-7/16	20-9/16	27	1-1/4	24
24	825	–	54	36	2-3/4	31-15/16	22-9/16	32	1-1/2	24
30	990	–	60	43	2-15/16	36-15/16	25-9/16	39-1/4	1-3/4	28
36	1480	–	80	50	3-3/16	49-11/16	29-3/4	46	2	32

Welding Saddle Dimensions



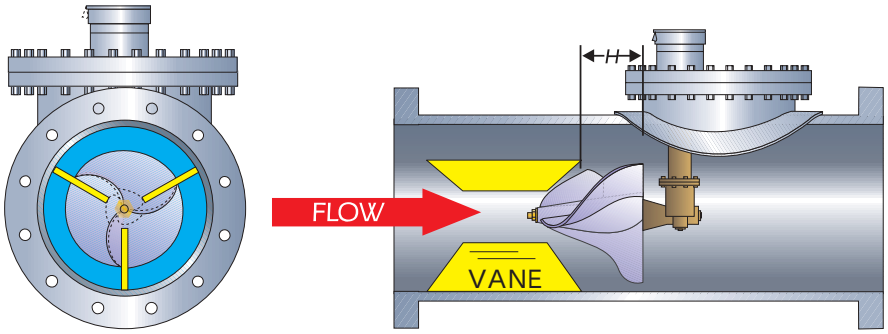
150 PSI Welding Saddles

Size	Wt. (lbs.) Fabr. Steel	Dimensions (inches) A	B	D	F*	M	S	Bolt Circle	Bolt Size	# of Bolts
6	20	7-5/8	9-1/4	N/A	6-5/8	4-1/4	9-1/4	N/A	7/16	10
8	30	8-1/4	11-3/4	N/A	8-5/8	5-5/16	11-3/4	N/A	7/16	10
10	35	8-1/4	11-3/4	N/A	10-3/4	6-5/16	11-3/4	N/A	7/16	10
12	55	8-1/4	11-3/4	N/A	12-3/4	7-5/16	11-3/4	N/A	7/16	10
14	70	8-1/4	11-3/4	N/A	14	8	11-3/4	N/A	7/16	10
16	145	16	23-1/2	4	16	12-1/4	N/A	21-1/4	1	16
18	150	16	23-1/2	4	18	13-1/2	26	21-1/4	1	16
20	155	16	23-1/2	4	20	14-1/2	26	21-1/4	1	16
24	165	16	23-1/2	4-1/2	24	16-1/4	26	21-1/4	1	16
30	185	16	23-1/2	4-1/2	30	19-1/4	26	21-1/4	1	16
36	275	24	32	5	36	23	36-1/2	29-1/2	1-1/4	20
42	295	24	32	5	42	26	36-1/2	29-1/2	1-1/4	20
48	550	30	38-3/4	5-1/2	48	49-1/2	46-3/4	36	1-1/4	28
54	560	30	38-3/4	5-1/2	54	32-1/2	46-3/4	36	1-1/4	28
60	580	30	38-3/4	5-1/2	60	35-1/2	46-3/4	36	1-1/4	28
66	600	30	38-3/4	5-1/2	66	38-1/2	46-3/4	36	1-1/4	28
72	625	30	38-3/4	5-1/2	72	41	46-3/4	36	1-1/4	28

250 PSI Welding Saddles

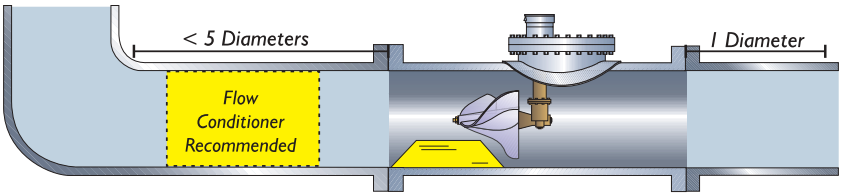
Size	Wt. (lbs.) Fabr. Steel	Dimensions (inches) A	B	D	F*	M	S	Bolt Circle	Bolt Size	# of Bolts
6	20	7-5/8	9-1/4	N/A	6-5/8	4-1/4	9-1/4	N/A	7/16	10
8	30	8-1/4	11-3/4	N/A	8-5/8	5-5/16	11-3/4	N/A	7/16	10
10	35	8-1/4	11-3/4	N/A	10-3/4	6-5/16	11-3/4	N/A	7/16	10
12	55	8-1/4	11-3/4	N/A	12-3/4	7-5/16	11-3/4	N/A	7/16	10
14	70	8-1/4	11-3/4	N/A	14	8	11-3/4	N/A	7/16	10
16	145	16	25-1/2	4-1/4	16	12-1/4	N/A	22-1/2	1-1/4	20
18	150	16	25-1/2	4-1/4	18	13-1/2	26	22-1/2	1-1/4	20
20	155	16	25-1/2	4-1/4	20	14-1/2	26	22-1/2	1-1/4	20
24	165	16	25-1/2	4-1/4	24	16-1/4	26	22-1/2	1-1/4	20
30	185	16	25-1/2	4-1/4	30	19-1/4	26	22-1/2	1-1/4	20
36	275	24	36	5	36	23	36-1/2	32	1-1/2	24
42	295	24	36	5	42	26	36-1/2	32	1-1/2	24
48	550	30	43	5-1/2	48	29-1/2	46-3/4	39-1/4	1-3/4	28
54	560	30	43	5-1/2	54	32-1/2	46-3/4	39-1/4	1-3/4	28
60	580	30	43	5-1/2	60	35-1/2	46-3/4	39-1/4	1-3/4	28
66	600	30	43	5-1/2	66	38-1/2	46-3/4	39-1/4	1-3/4	28
72	625	30	43	5-1/2	72	41-1/2	46-3/4	39-1/4	1-3/4	28

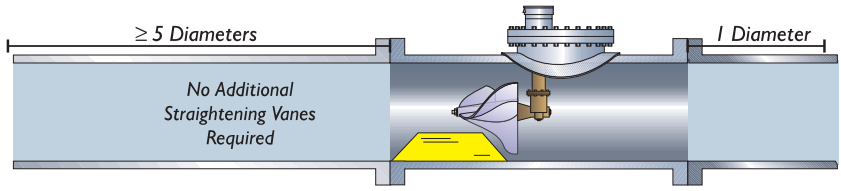
Straightening Vanes

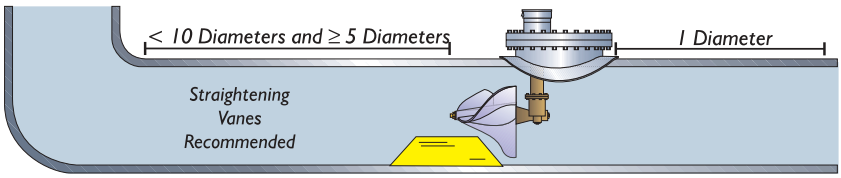


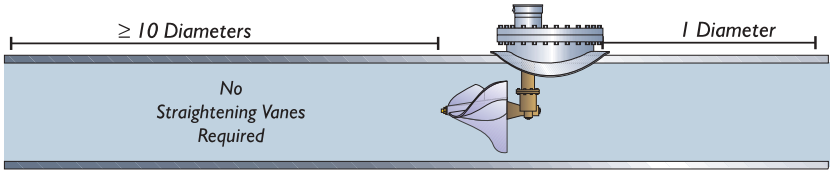
Pipe Dia. (inches)	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	66	72
H	4	4	4	4	4	8	8	8	8	8	12	12	15	15	15	15	15

H = Straightening vane mounting distance from pipe opening.



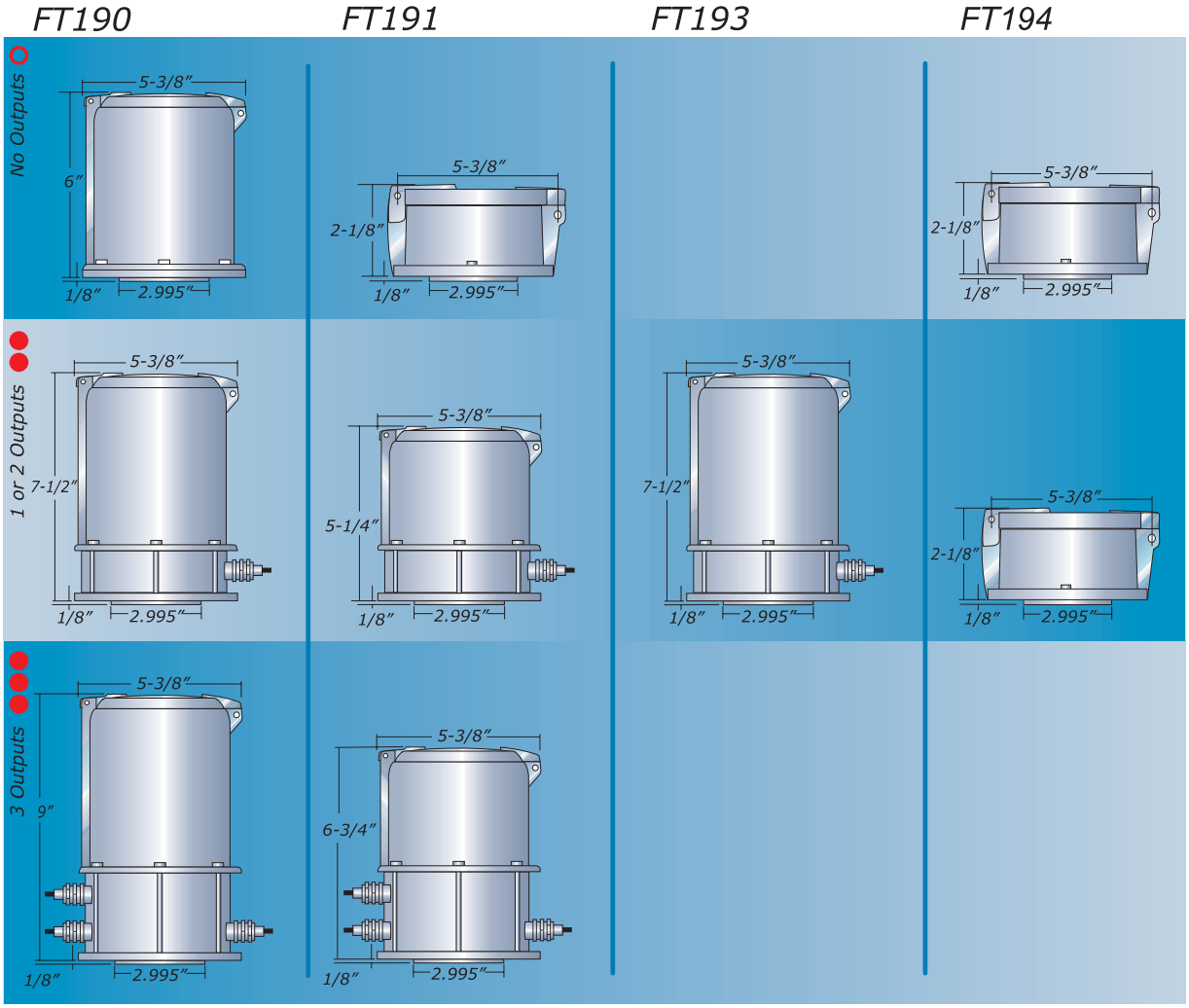






Installation —

Meters must be installed in full flowing suction or discharge lines. Avoid valves, fittings or obstructions immediately upstream of the meter which may cause jetting or uneven flow profiles. It is recommended that a minimum of five straight pipe diameters be maintained upstream and one diameter downstream of the meter.

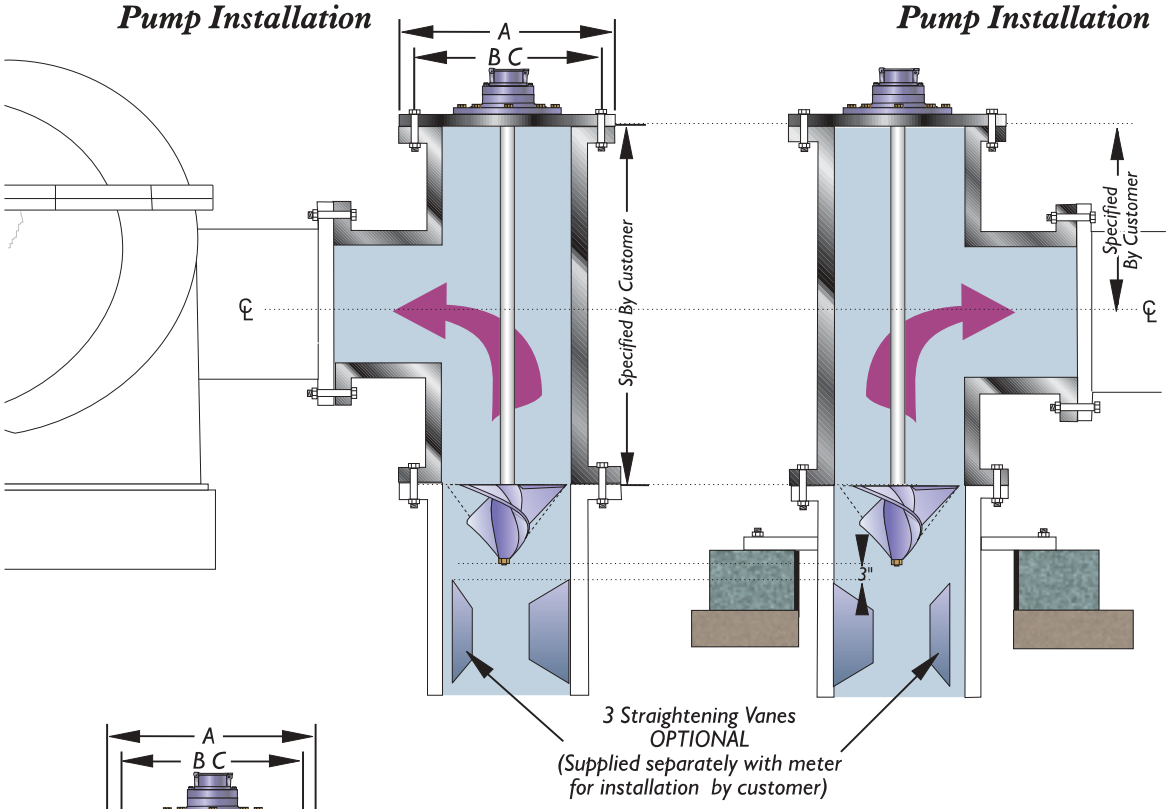


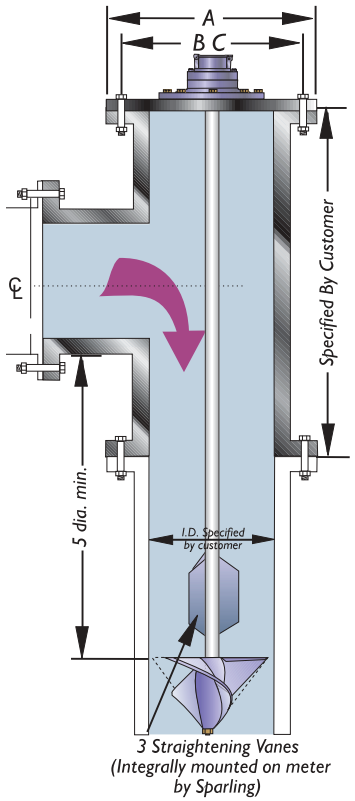
Indicator/Totalizer Compatibility

Model	102	182	103	183	104	184	132	134	142	144	162	312	314
FT190	●	●	●	●			●		●				
FT191	●	●	●	●			●		●		●	●	
FT193	●	●	●	●			●		●				
FT194					●	●		●		●			●

Typical Centrifugal Pump Installation

Typical Submersible Pump Installation



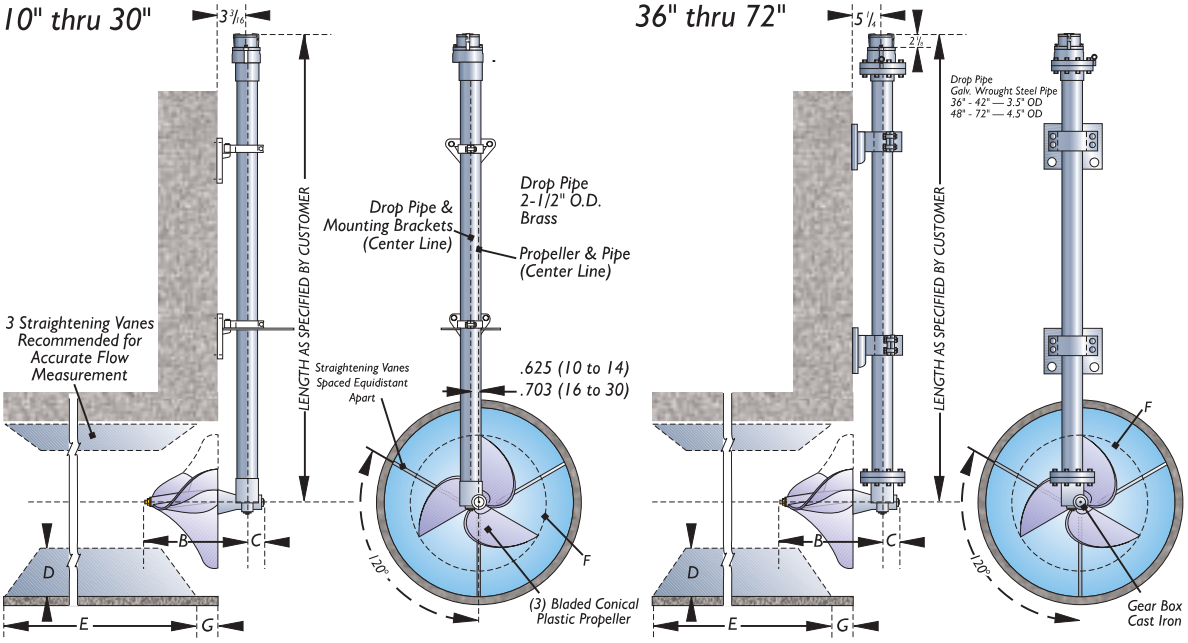


150 PSI

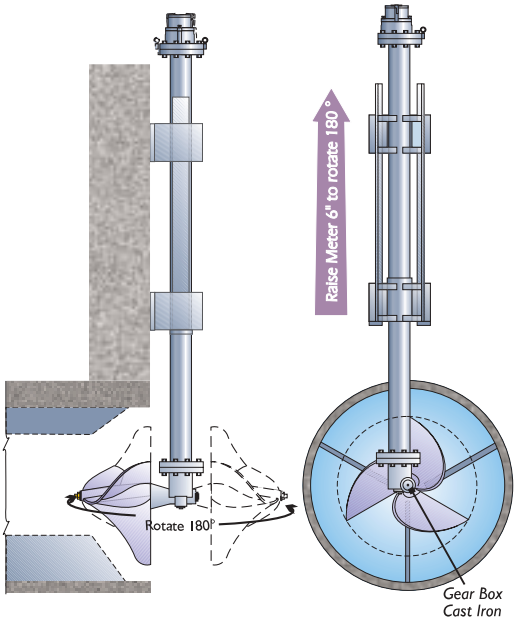
Size	Wt. (lbs.)	A	BC	Bolt Size	# of Bolts	Drop Pipe Length (in.) Up-Flow	Dn-Flow
4	75	9	7-1/2	5/8	8	18	28.5
6	105	11	9-1/2	3/4	8	21	41
8	155	13-1/2	11-3/4	3/4	8	23	53
10	165	16	14-1/4	7/8	12	27	66
12	180	19	17	7/8	12	29	78
14	225	21	18-3/4	1	12	34	91

250 PSI

Size	Wt. (lbs.)	A	BC	Bolt Size	# of Bolts	Drop Pipe Length (in.) Up-Flow	Dn-Flow
4	80	10	7-7/8	3/4	8	18	28.5
6	135	12-1/2	10-5/8	3/4	12	21	41
8	200	15	13	7/8	12	23	53
10	240	17-1/2	15-1/4	1	16	27	66
12	280	20-1/2	17-3/4	1-1/8	16	29	78
14	450	23	20-1/4	1-1/2	20	34	91



Optional Revolving Type Bracket Mounting

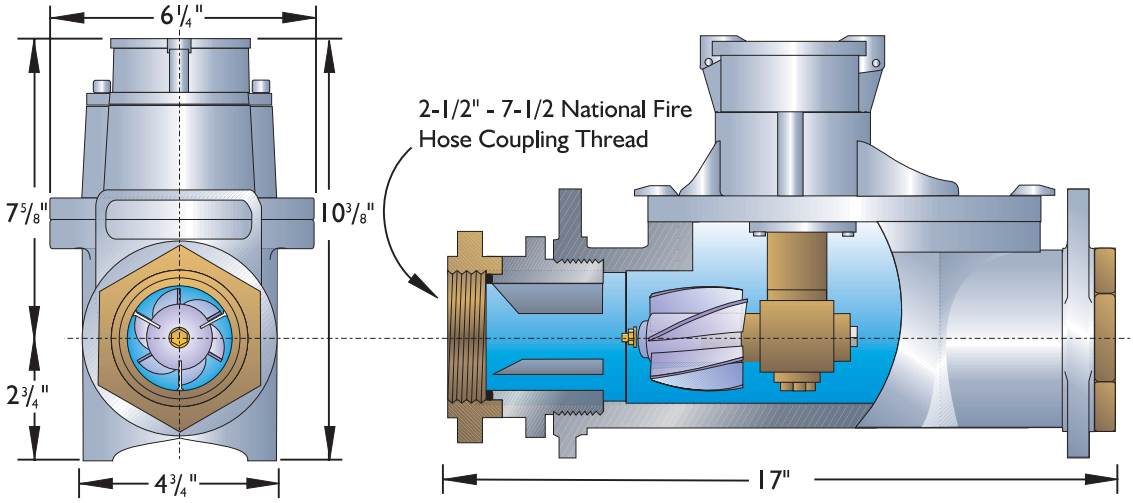


Size	Wt. (lbs.)*	Dimensions (inches) B	C	E	H	G
10	90	9-1/2	2-1/8	16-1/2	8	4
12	90	9-1/2	2-1/8	16-1/2	10	3
14	90	9-1/2	2-1/8	28	11	2
16	105	12	2-5/8	28	13	5
18	105	12	2-5/8	30	16	3
20	105	12	2-5/8	33	16	2
24	105	12	2-5/8	36	16	1
30	115	12	2-5/8	45	16	1
36	350	18-1/8	4-3/8	54	25-1/4	4
42	350	18-1/8	4-3/8	60	25-1/4	4
48	580	20	4-1/2	72	38-3/8	4
54	580	20	4-1/2	80	38-3/8	4
60	580	20	4-1/2	90	38-3/8	4
66	580	20	4-1/2	96	38-3/8	4
72	580	20	4-1/2	108	38-3/8	4

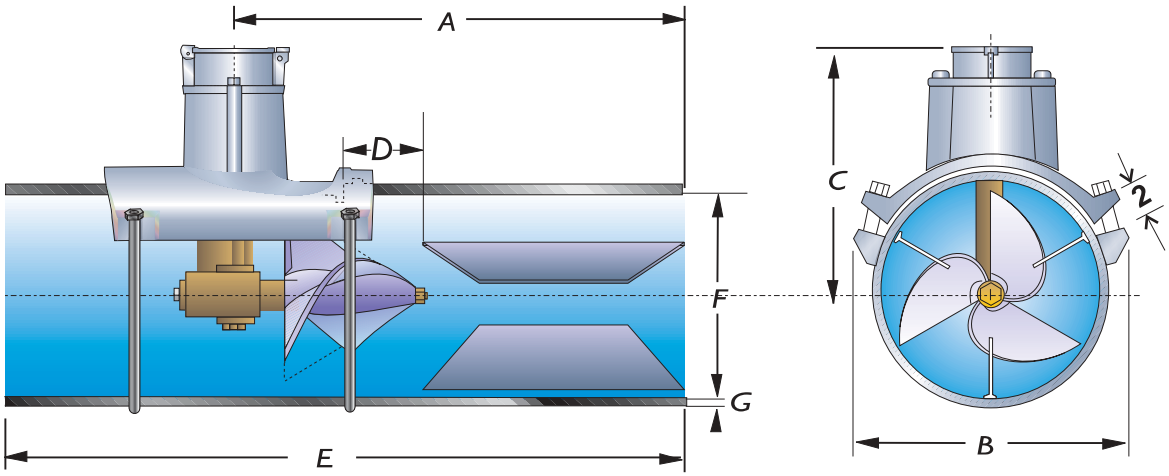
*Weights are for 5-foot drop pipe.

Dimensions

Fire Hydrant Model FM 162



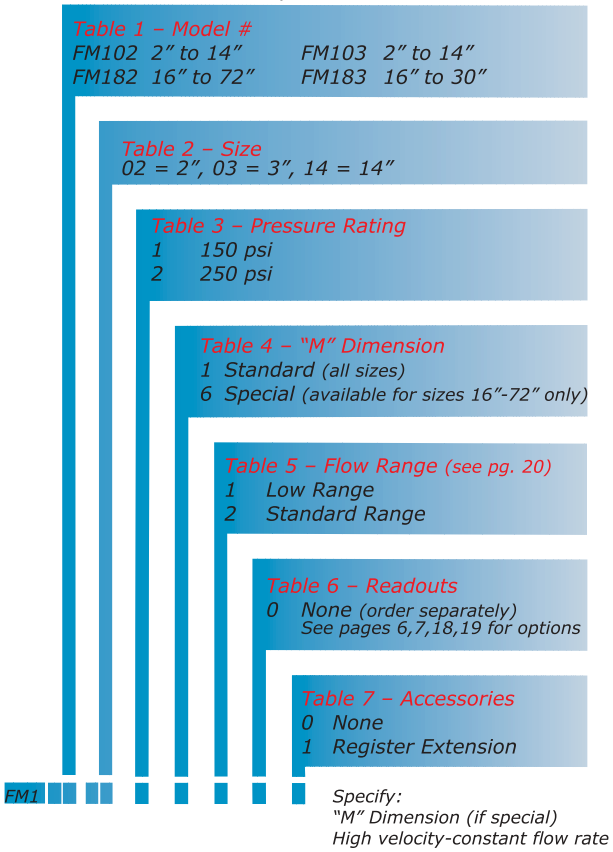
Low Pressure Irrigation Meter Models 312/314



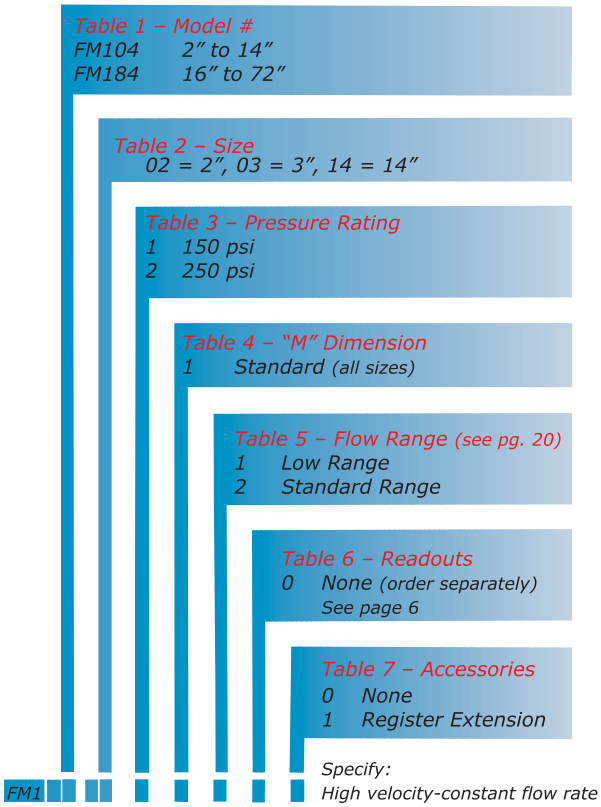
Size	Wt. (lbs.) Meterhead	Wt. (lbs.) w/Tube	Dimensions (inches) A	B	C	D	E	F	G	Mounting: U-bolts	SS Straps	Anchor Bars	Plain End Steel Tube
4	20	40	9.19	8.00	7.63	N/A	16.0	4.03	.24	●	●		●
6	25	45	14.44	9.00	7.88	2.75	22.0	6.36	.13	●	●		●
8	30	65	15.94	10.50	9.44	3.00	24.0	8.36	.13	●	●		●
10	35	80	19.94	11.50	9.56	3.25	30.0	10.38	.19		●	●	●
12	40	125	23.94	12.38	11.50	3.25	36.0	12.38	.19		●	●	●
14	30	140	28.00	17.63	11.13	4.88	42.0	13.63	.19	●	●		●

How to Order

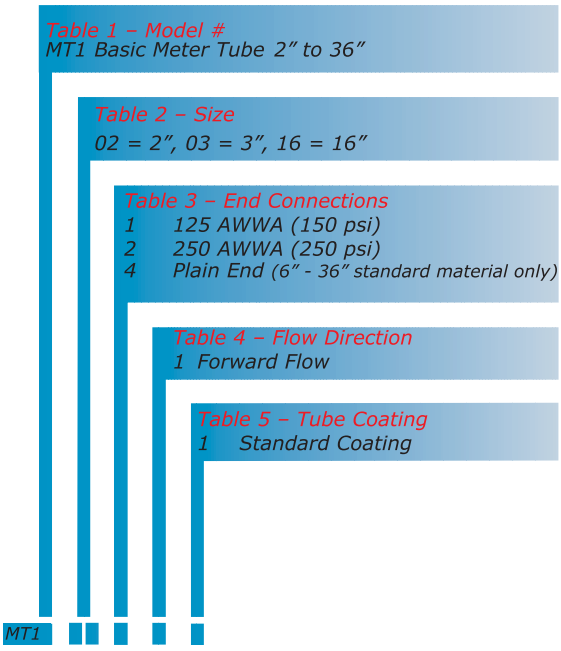
Models 102/182, 103/183



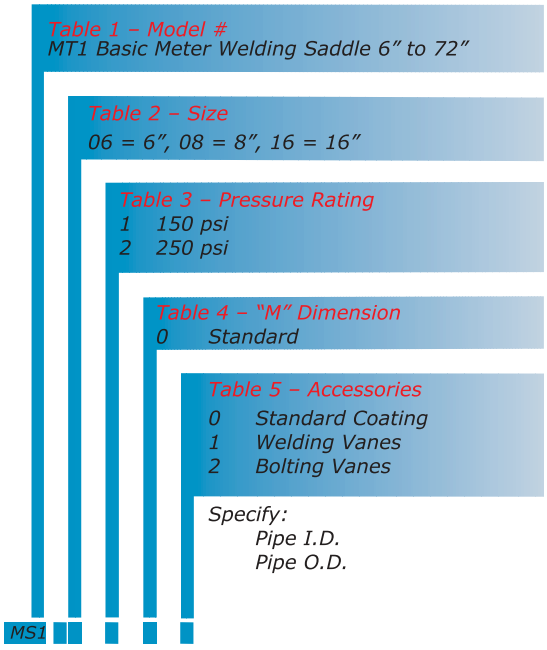
Model 104/184



Mainline Meter Tubes



Mainline Meter Saddles



How to Order

VertiFlo Models 132/134

Table 1 – Model #
FM132 4" to 14" (Direct)
FM134 4" to 14" (Electronic)

Table 2 – Size
04 = 4", 06 = 6", 14 = 14"

Table 3 – Head Connections
1 125 lbs. AWWA Flange (150 psi)
2 250 lbs. AWWA Flange (300 psi)

Table 4 – Construction
4 Up-flow (vanes not included)
5 Down-flow (vanes included)

Table 5 – Flow Range (see pg. 20)
1 Low Range
2 Standard Range

Table 6 – Readouts
0 None (order separately)
See pgs. 6, 7, 18, 19 for options

Table 7 – Accessories
0 None
1 Welding Vanes
2 Bolting Vanes
5 Additional Drop Pipe
6 1 & 5 above
7 2 & 5 above

Waterworks Intake Meters Models 142/144

Table 1 – Model #
FM142 10" to 72" (Direct)
FM144 10" to 72" (Electronic)

Table 2 – Size
10 = 10", 16 = 16", 72 = 72"

Table 3 – Mounting
6 Standard Wall Brackets
7 Guide rail & revolving bracket (36" - 72")

Table 4 – Construction
1 Standard

Table 5 – Flow Range (see pg. 20)
1 Low Range
2 Standard Range

Table 6 – Readouts
0 None (order separately)
See pgs. 6, 7, 18, 19 for options

Table 7 – Accessories
0 None
1 Welding Vanes
2 Bolting Vanes
5 Additional Drop Pipe
6 1 & 5 above
7 2 & 5 above

Fire Hydrant Meters Model 162

Table 1 – Model #
FM162 3" Fire Hydrant Meter w/tube & register

Table 2 – Size
03 = 3"

Table 3 – End Connections
5 National Pipe Thread (3" less couplings)
7 2½–7½ Thread–National Fire Hose

Table 4 – Construction
1 Standard

Table 5 – Flow Range
1 Low Range 35-200 gpm
2 Std. Range 100-400 gpm

Table 6 – Readouts
1 Standard Registration

Table 6 – Accessories
0 None
1 Strainer

Irrigation Meters Models 312/314

Table 1 – Model #
FM312 Low Pressure Irrigation Meter 4"-14"
FM314 w/mounting hardware & gasket

Table 2 – Size
04 = 4", 14 = 14"

Table 3 – Configuration
0 Meterhead only w/U-Bolts (4", 6", 8"& 14")
1 Meterhead only w/SS straps (4" - 14")
2 Meterhead only w/Anchor Bars (10" & 12")
3 With Plain End Steel Tube

Table 4 – Readout
0 None
1 Standard Register (FT191)
2 Rate Indicator Totalizer (FT190)
4 Rate Indicator (FT194 for FM314)

Table 5 – Flow Range (See pg.20)
1 Low Range
2 Standard Range

Table 6 – Accessories
0 None
1 Bolting Vanes

Indicators/Totalizers/Transmitters Series 190

Table 1 – Model #

FT190 Mechanical Flow Totalizer & Indicator
FT191 Mechanical Flow Totalizer
FT193 Mechanical Flow Totalizer with 4-20mA and Scaled Pulse Output

Table 2 – Outputs

000 No Outputs (FT190 & FT191 only
B00 One "B" switch (190/191)
BB0 Two "B" switches (190/191)
E00 One "E" switch (190/191)
EE0 Two "E" switches (190/191)
EEE Three "E" switches (190/191)
BE0 One "B" and one "E" switch (190/191)
BEE One "B" and two "E" switches (190/191)
P00 One "P" switch (190/191)
PB0 One "P" and one "B" switch (190/191)
PE0 One "P" and one "E" switch (190/191)
111 4-20 mA and Scaled Pulse Rate (FT193 only)

Table 3 – Mounting

2 For mounting on meterhead on same order
3 Replacement for existing meterheads

Specify:
FT191– Registration from page 32)
FT190– Registration & Full Scale Indication From pages 33 & 34)
FT193– Customers' Full Scale Registration from page 32)

Digital Indicator/Totalizer FT 194

Table 1 – Model #

FT194 Digital Rate/Flow Totalizer

Table 2 – Outputs

0 Display only, no Outputs
1 4-20mA & Pulse Output

Table 3 – Mounting

1 Integral
2 Remote - Wall or Pipe Mount

Specify:
•Registration (from page 32)
•Full Scale

Options for FT194
•Calibrator
•Programmer
•Mounting Hardware (pipe)

Standard Registration for FT191, FT193 & FT194

Nom. Size	Cubic Feet	U.S. Gallons	Imperial Gallons	Acre Feet	Cubic Meters	Liters	Acre Inches
2	1.0	10.0	10.0	0.00001	0.01	10.0	0.001
3	1.0	10.0	10.0	0.0001	0.1	100.0	0.001
4	10.0	100.0	100.0	0.0001	0.1	100.0	0.001
5	10.0	100.0	100.0	0.0001	0.1	100.0	0.001
6	10.0	100.0	100.0	0.001	1.0	100.0	0.001
8	10.0	100.0	100.0	0.001	1.0	1000.0	0.01
10	100.0	100.0	100.0	0.001	1.0	1000.0	0.01
12	100.0	1000.0	1000.0	0.001	1.0	1000.0	0.01
14	100.0	1000.0	1000.0	0.001	1.0	1000.0	0.01
16	100.0	1000.0	1000.0	0.01	10.0	10000.0	0.1
18	100.0	1000.0	1000.0	0.01	10.0	10000.0	0.1
20	100.0	1000.0	1000.0	0.01	10.0	10000.0	0.1
24	100.0	1000.0	1000.0	0.01	10.0	10000.0	0.1
30	100.0	1000.0	1000.0	0.01	10.0	10000.0	0.1
36	1000.0	10000.0	10000.0	0.01	10.0	10000.0	0.1
42	1000.0	10000.0	10000.0	0.01	10.0	10000.0	0.1
48	1000.0	10000.0	10000.0	0.1	100.0	100000.0	0.1
54	1000.0	10000.0	10000.0	0.1	100.0	100000.0	0.1
60	1000.0	10000.0	10000.0	0.1	100.0	100000.0	0.1
66	1000.0	10000.0	10000.0	0.1	100.0	100000.0	0.1
72	1000.0	10000.0	10000.0	0.1	100.0	100000.0	0.1

Standard Indicator Scale and Registration for FT190

Size	Full Scale Indication	Registration
2"	100 GPM	10 GALLONS
	100 IGPM	10 IMP. GAL.
	100 GPM	10 CF
	200 GPM	100 GALLONS
	200 IGPM	10 IMP. GAL
	300 GPM	10 CF
	0.25 CFS	10 CF
	0.5 CFS	10 CF
	6 LPS	100 LITERS
	12.5 LPS	0.1 CU. MTRS.
3"	200 GPM	10 GALLONS
	200 IGPM	10 IMP. GAL.
	300 GPM	10 GALLONS
	300 IGPM	10 IMP. GAL
	300 GPM	UNIT CF
	300 GPM	10 CF
	300 GPM	.0001 AF
	500 GPM	100 GALLONS
	500 IGPM	100 IMP. GAL.
	500 GPM	10 CF
	500 GPM	.001 AF
	0.5 CFS	10 CF
	1.0 CFS	10 CF
	0.5 MGD	100 GALLONS
	12.5 LPS	0.1 CU. MTRS.
	25 LPS	1000 LITERS
	30 LPS	1000 LITERS
	100 M3/HR	UNIT CU. MTRS.
4"	500 GPM	100 GALLONS
	500 IGPM	100 IMP. GAL.
	500 GPM	10 CF
	500 GPM	.001 AF
	1000 GPM	10 CF
	1.0 CFS	10 CF
	1.0 CFS	100 CF
	1.0 CFS	.001 AF
	30 LPS	1000 LITERS
	50 LPS	UNIT CU. MTRS.
	100 M3/HR	UNIT CU. MTRS
5"	750 GPM	100 GALLONS
	750 GPM	1000 GALLONS
	750 IGPM	1000 IMP. GAL.
	1000 GPM	100 GALLONS
	1000 GPM	1000 GALLONS
	1000 IGPM	1000 IMP. GAL.
	1000 GPM	10 CF
	1000 GPM	100 CF
	1000 GPM	.001 AF
	2.0 CFS	10 CF

Size	Full Scale Indication	Registration
5" Cnt.	3.0 CFS	10 CF
	3.0 CFS	100 CF
	3.0 CFS	.001 AF
	1.0 MGD	100 GALLONS
	1.5 MGD	1000 GALLONS
	50 LPS	UNIT CU. MTERS.
	60 LPS	1000 LITERS
	60 LPS	UNIT CU. MTRS.
	75 LPS	UNIT CU. MTRS.
6"	1000 GPM	100 GALLONS
	1000 GPM	1000 GALLONS
	1000 IGPM	1000 IMP. GAL.
	1000 GPM	10 CF
	1000 GPM	100 CF
	1000 GPM	.001 AF
	2.0 CFS	10 CF
	3.0 CFS	10 CF
	3.0 CFS	100 CF
	3.0 CFS	.001 AF
	1.5 MGD	1000 GALLONS
	60 LPS	1000 LITERS
	60 LPS	UNIT CU. MTRS.
	75 LPS	UNIT CU. MTRS.
	1400 GPM	1000 GALLONS
	1400 IGPM	1000 IMP. GAL.
	1400 GPM	100 CF
	1400 GPM	.001 AF
	1400 GPM	UNIT CU. MTRS.
	1400 GPM	.01 ACRE IN.
	2.0 MGD	1000 GALLONS
	1700 GPM	1000 GALLONS
	1700 IGPM	1000 IMP. GAL.
	1700 GPM	100 CF
	1700 GPM	.01 AF
	4.0 CFS	100 CF
	4.0 CFS	.001 AF
	5.5 CFS	.001 AF
	2.5 MGD	1000 GALLONS
	100 LPS	1000 LITERS
	100 LPS	UNIT CU. MTRS.
	125 LPS	1000 LITERS
8"	1400 GPM	1000 GALLONS
	1400 IGPM	1000 IMP. GAL.
	1400 GPM	100 CF
	1400 GPM	.001 CF
	1400 GPM	UNIT CU. MTRS.
	1400 GPM	.01 ACRE IN.
	3.0 CFS	10 CF
	3.0 CFS	100 CF

Size	Full Scale Indication	Registration
8" Cnt.	3.0 CFS	.001 AF
	2.0 MGD	1000 GALLONS
	75 LPS	UNIT CU. MTRS.
	100 LPS	1000 LITERS
	100 LPS	UNIT CU. MTRS.
	1700 GPM	1000 GALLONS
	1700 IGPM	1000 IMP. GAL.
	1700 GPM	100 CF
	1700 GPM	.01 AF
	4.0 CFS	100 CF
	4.0 CFS	.001 AF
	5.5 CFS	.001 AF
	2.5 MGD	1000 GALLONS
	125 LPS	1000 LITERS
	2500 GPM	1000 GALLONS
	2500 IGPM	1000 IMP. GAL.
	2500 GPM	100 CF
	2500 GPM	.01 AF
	2500 GPM	.1 ACRE IN.
	6.0 CFS	100 CF
	6.0 CFS	0.02 AF
	4.0 MGD	1000 GALLONS
	200 LPS	10 CU. MTRS.
	200 LPS	.01 MEGA LTRS.
10"	1700 GPM	1000 GALLONS
	1700 IGPM	1000 IMP. GAL.
	1700 GPM	100 CF
	1700 GPM	.01 AG
	4.0 CFS	100 CF
	4.0 CFS	.001 AF
	5.5 CFS	.001 AF
	2.5 MGD	1000 GALLONS
	100 LPS	1000 LITERS
	100 LPS	UNIT CU. MTRS.
	125 LPS	1000 LITERS
	2500 GPM	1000 GALLONS
	2500 IGPM	1000 IMP. GAL.
	2500 GPM	100 CF
	2500 GPM	.01 AF
	2500 GPM	.1 ACRE IN.
	6.0 CFS	100 CF
	6.0 CFS	.01 AF
	4.0 MGD	1000 GAL
	200 LPS	10 CU. MTRS.

Size	Full Scale Indication	Registration
10" Cnt.	200 LPS	.01 MEGA LTR.
	3000 GPM	1000 GALLLONS
	3000 IGPM	1000 IMP. GAL.
	7.5 CFS	.001 AF
	8.0 CFS	100 CF
	8.0 CFS	.01 AF
	5.0 MGD	1000 GALLONS
	3500 GPM	1000 GALLONS
	3500 IGPM	1000 IMP. GAL.
	3500 GPM	100 CF
	3500 GPM	1000 CF
	3500 GPM	.01 AF
12"	2500 GPM	1000 GALLONS
	2500 IGPM	1000 IMP. GAL.
	2500 GPM	100 CF
	2500 GPM	.01 AF
	2500 GPM	.1 ACRE IN.
	6.0 CFS	100 CF
	6.0 CFS	.01 AF
	4.0 MGD	1000 GALLONS
	200 LPS	10 CU. MTRS.
	200 LPS	.01 MEGA LTR.
	3000 GPM	1000 GALLONS
	3000 IGPM	1000 IMP. GAL.
	7.5 CFS	.001 AF
	8.0 CFS	100 CF
	8.0 CFS	.01 AF
	5.0 MGD	1000 GALLONS
	3500 GPM	1000 GALLONS
	3500 IGPM	1000 IMP. GAL.
	3500 GPM	100 CF
	3500 GPM	1000 CF
	3500 GPM	.01 AF
	4500 GPM	1000 GALLONS
	4500 IGPM	1000 IMP. GAL.
	4500 GPM	.01 AF
	4500 GPM	100 CF
	10.0 CFS	100 CF
	10.0 CFS	.01 AF
	7.5 MGD	1000 GALLONS
	250 LPS	10000 LITERS
	250 LPS	10 CU. MTRS.
14"	3000 GPM	1000 GALLONS
	3000 IGPM	1000 IMP. GAL.
	7.5 CFS	.001 AF
	8.0 CFS	100 CF
	8.0 CFS	.01 AF
	5.0 MGD	1000 GALLONS

Standard Indicator Scale and Registration for FT190

Size	Full Scale Indication	Registration
14"	200 LPS	10 CU. MTRS.
	200 LPS	.01 MEGA LTR.
	3500 GPM	1000 GALLONS
	3500 IGPM	1000 IMP. GAL.
	3500 GPM	100 CF
	3500 GPM	1000 CF
	3500 GPM	.01 AF
	4500 GPM	1000 GALLONS
	4500 IGPM	1000 IMP. GAL.
	4500 GPM	.01 AF
	4500 GPM	100 CF
	10.0 CFS	100 CF
	10.0 CFS	.01 AF
	7.5 MGD	1000 GALLONS
	250 LPS	10000 LITERS
	250 LPS	10 CU. MTRS.
	5000 GPM	1000 GALLONS
	5000 IGPM	1000 IMP. GAL.
	5000 GPM	100 CF
	14.0 CFS	100 CF
	300 LPS	10 CU. MTRS.
16"	4500 GPM	1000 GALLONS
	4500 IGPM	1000 IMP. GAL.
	4500 GPM	.01 AF
	10.0 CFS	100 CF
	10.0 CFS	.01 AF
	7.5 MGD	1000 GALLONS
	250 LPS	10000 LITERS
	250 LPS	10 CU. MTRS.
	5000 GPM	1000 GALLONS
	5000 IGPM	1000 IMP. GAL.
	5000 GPM	100 CF
	14.0 CFS	100 CF
	300 LPS	10 CU. MTRS.
	6000 GPM	1000 GALLONS
	6000 IGPM	1000 IMP. GAL.
	6000 GPM	10000 GALLONS
	6000 GPM	100 CF
	7500 GPM	10000 GALLONS
	15.0 CFS	100 CF
	15.0 CFS	.01 AF
	10.0 MGD	1000 GALLONS
	10.0 MGD	10000 GALLONS
	350 LPS	10 CU. MTRS.
	400 LPS	10 KILOLTRS.

Size	Full Scale Indication	Registration
18"	5000 GPM	1000 GALLONS
	5000 IGPM	1000 IMP. GAL.
	5000 GPM	100 CF
	6000 GPM	100 CF
	14.0 CFS	1000 CF
	7.5 MGD	1000 GALLONS
	300 LPS	10 CU. MTRS.
	10000 GPM	10000 GALLONS
	10000 IGPM	10000 IMP. GAL.
	10000 GPM	.01 AF
	10000 GPM	100 CF
	18.0 CFS	100 CF
	18.0 CFS	1000 CF
	18.0 CFS	.01 AF
	20.0 CFS	1000 CF
	20.0 CFS	.01 AF
	25.0 CFS	1000 CF
	25.0 CFS	.01 AF
	15.0 MGD	1000 GALLONS
	15.0 MGD	10000 GALLONS
	750 LPS	10 CU. MTRS.
20"	6000 GPM	1000 GALLONS
	6000 IGPM	1000 IMP. GAL.
	6000 GPM	10000 GALLONS
	7500 GPM	10000 GALLONS
	10000 GPM	10000 GALLONS
	10000 IGPM	10000 GALLONS
	10000 GPM	.01 AF
	10000 GPM	100 CF
	15.0 CFS	100 F
	15.0 CFS	.01 AF
	18.0 CFS	100 CF
	18.0 CFS	1000 CF
	18.0 CFS	.01 AF
	20.0 CFS	1000 CF
	20.0 CFS	.01 AF
	25.0 CFS	1000 CF
	25.0 CFS	.01 AF
	10.0 MGD	1000 GALLONS
	10.0 MGD	10000 GALLONS
	15.0 MGD	1000 GALLONS
	15.0 MGD	10000 GALLONS
	350 LPS	10 CU. MTRS.
	400 LPS	10 KILOLTRS
	750 LPS	10 CU. MTRS
24"	10000 GPM	10000 GALLONS
	10000 IGPM	10000 IMP. GAL.
	10000 GPM	.01 AF
	10000 GPM	100 CF
	15000 GPM	10000 GAL
	15000 IGPM	10000 IMP. GAL.

Size	Full Scale Indication	Registration
24" Cnt.	17000 GPM	10000 GALLONS
	17000 IGPM	10000 IMP. GAL.
	18.0 CFS	100 CF
	18.0 CFS	1000 CF
	18.0 CFS	.01 AF
	20.0 CFS	1000 CF
	20.0 CFS	.01 AF
	25.0 CFS	1000 CF
	25.0 CFS	.01 AF
	30.0 CFS	1000 CF
	34.0 CFS	.01 AF
	15.0 MGD	1000 GALLONS
	15.0 MGD	10000 GALLONS
	20.0 MGD	10000 GALLONS
	30.0 MGD	10000 GALLONS
	750 LPS	10 CU. MTRS.
	1000 LPS	100 CU. MTRS.
	1500 LPS	100 KILOLTRS.
30"	15000 GPM	10000 GALLONS
	15000 IGPM	10000 IMP. GAL.
	17000 GPM	10000 GALLONS
	17000 IGPM	10000 IMP. GAL.
	25000 GPM	10000 GALLONS
	15000 IGPM	10000 IMP. GAL.
	30.0 CFS	1000 CF
	34.0 CFS	.01 AF
	50.0 CFS	1000 CF
	50.0 CFS	.01 AF
	20.0 MGD	10000 GALLONS
	30.0 MGD	10000 GALLONS
	40.0 MGD	10000 GALLONS
	1000 LPS	100 CU. MTRS.
	1500 LPS	100 KILOLTRS.
	2000 LPS	100 CU. MTRS.
36"	17000 GPM	10000 GALLONS
	17000 IGPM	10000 IMP. GAL.
	25000 GPM	10000 GALLONS
	25000 IGPM	10000 IMP. GAL.
	35000 GPM	10000 GALLONS
	3500 IGPM	10000 IMP. GAL.
	50.0 CFS	1000 CF
	50.0 CFS	.01 AF
	75.0 CFS	.01 AF
	30.0 MGD	10000 GALLONS
	40.0 MGD	10000 GALLONS
	60.0 MGD	10000 GALLONS
	1500 LPS	100 KILOLTRS.
	2000 LPS	100 CU. MTRS.
42"	25000 GPM	10000 GALLONS

Size	Full Scale Indication	Registration
42"	25000 IGPM	10000 IMP. GAL.
Cnt.	35000 GPM	10000 GALLONS
	35000 IGPM	10000 IMP. GAL.
	45000 GPM	10000 GALLONS
	45000 IGPM	10000 IMP. GAL.
	50.0 CFS	1000 CF
	50.0 CFS	.01 AF
	75.0 CFS	0.1 AF
	100 CFS	1000 CF
	40.0 MGD	10000 GALLONS
	60.0 MGD	10000 GALLONS
	75.0 MGD	10000 GALLONS
	2000 LPS	100 CU. MTRS.
	5000 LPS	100 CU. MTRS.
48"	35000 GPM	10000 GALLONS
	35000 IGPM	10000 IMP. GAL.
	45000 GPM	10000 GALLONS
	45000 IGPM	10000 IMP. GAL.
	75.0 CFS	0.1 AF
	100 CFS	1000 CF
	60.0 MGD	10000 GALLONS
	75.0 MGD	10000 GALLONS
	2000 LPS	100 CU. MTRS.
	5000 LPS	100 CU. MTRS.
54"	40000 GPM	10000 GALLONS
	40000 IGPM	10000 GALLONS
	75 CFS	1000 CF
	75 CFS	0.1 AF
	75 MGD	10000 GALLONS
	3000 LPS	100 CU. MTRS.
60"	45000 GPM	10000 GALLONS
	45000 IGPM	10000 IMP. GAL.
	60000 GPM	10000 GALLONS
	60000 IGPM	10000 IMP. GAL.
	75000 GPM	10000 GALLONS
	75000 IGPM	10000 IMP. GAL.
	100 CFS	1000 CF
	150 CFS	10000 CF
	150 CFS	.01 AF
	75.0 MGD	10000 GALLONS
	100 MGD	10000 GALLONS
	5000 LPS	100 CU. MTRS.
66" & 72"	60000 GPM	10000 GALLONS
	60000 IGPM	10000 IMP. GAL.
	75000 GPM	10000 GALLONS
	75000 IGPM	10000 IMP. GAL.

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#1343 04/02