GF Piping Systems

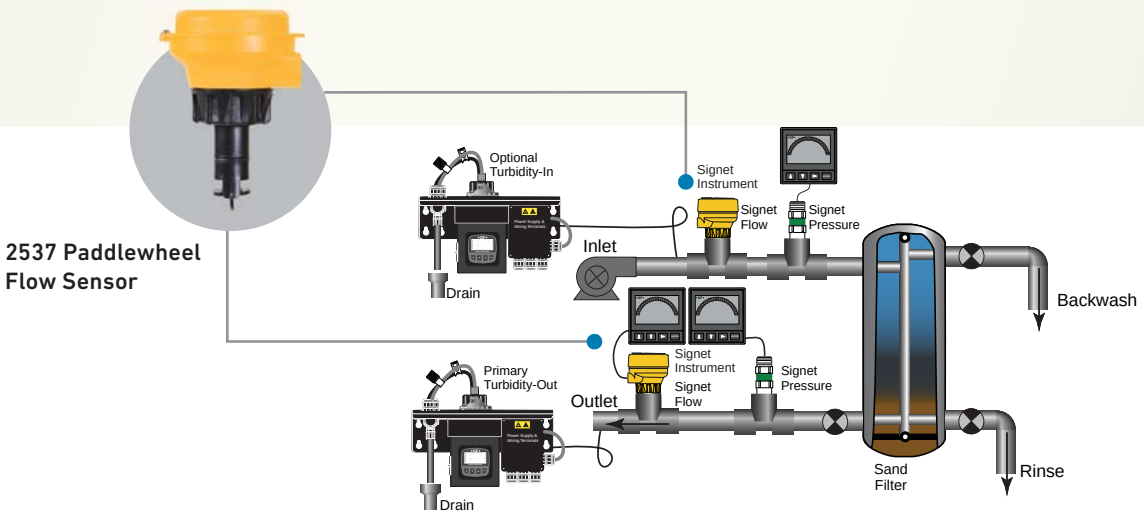
Signet and Ultrasonic Flow Sensors

Paddlewheel, In-line Rotor, Turbine, Magnetic, Ultrasonic

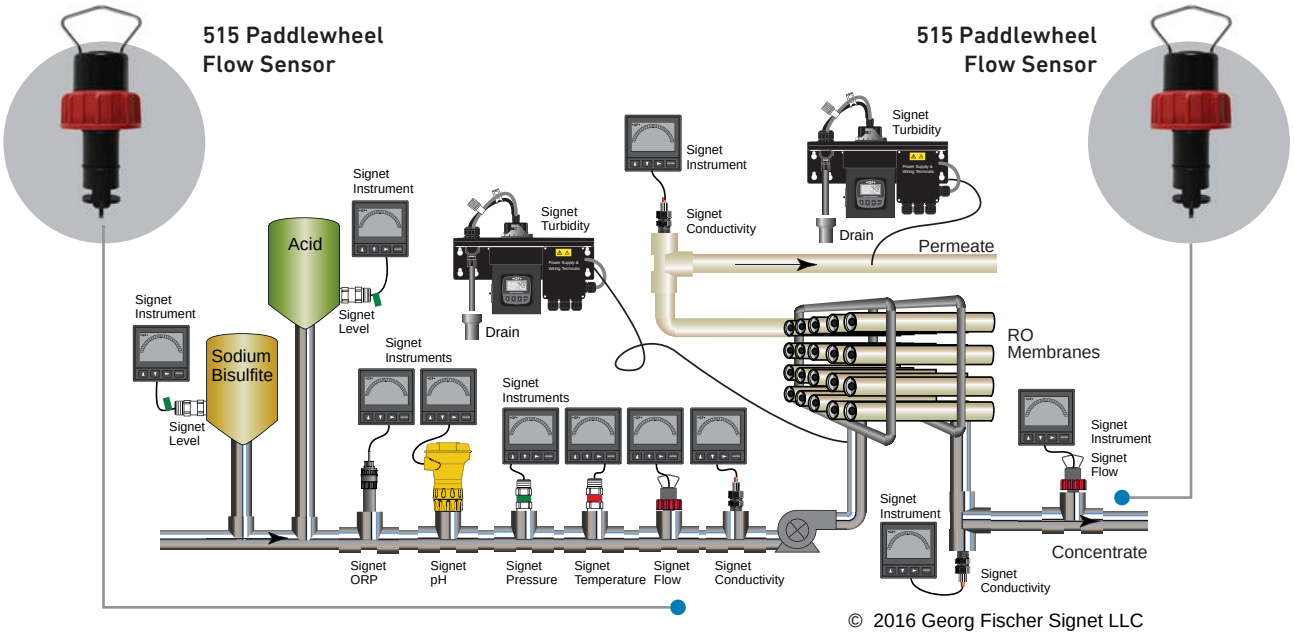
Applications

GF offers the optimal system solution behind the scenes

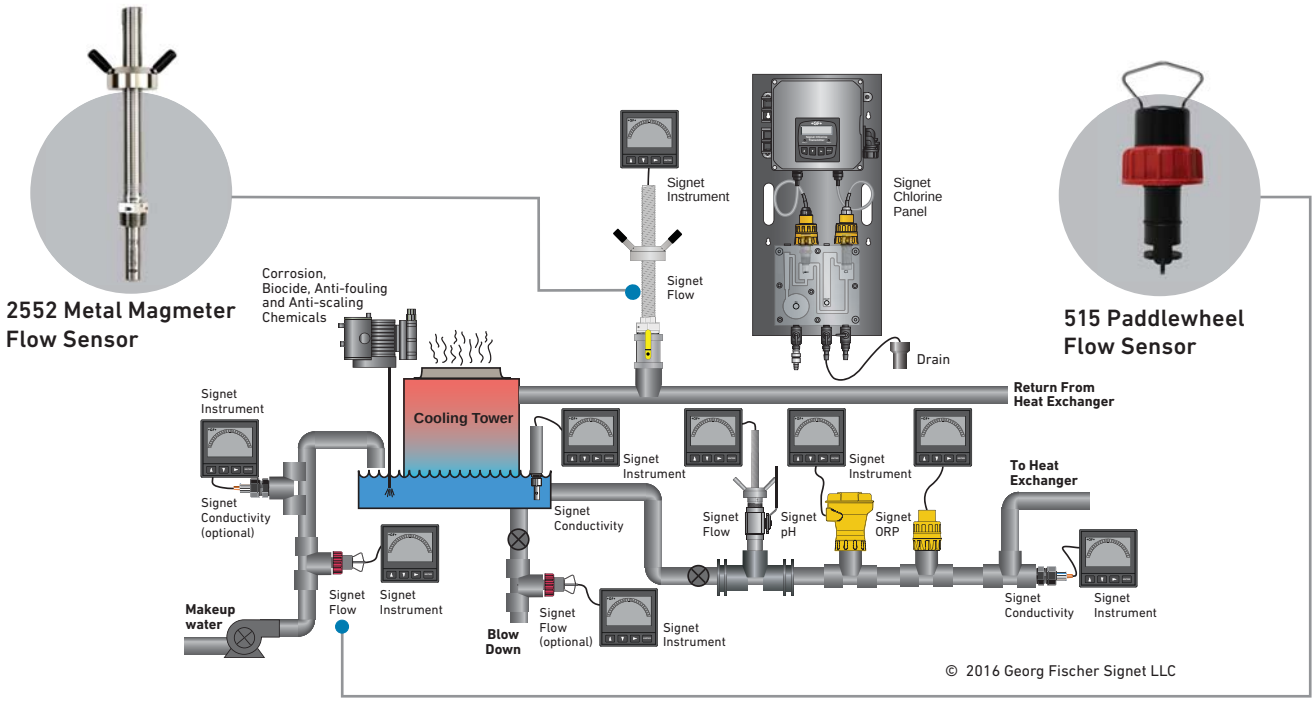
All GF Signet flow sensors comply with the high and specific requirements of the industry.
GF provides reliable quality systems with worldwide support, long service life and cost-efficiency.



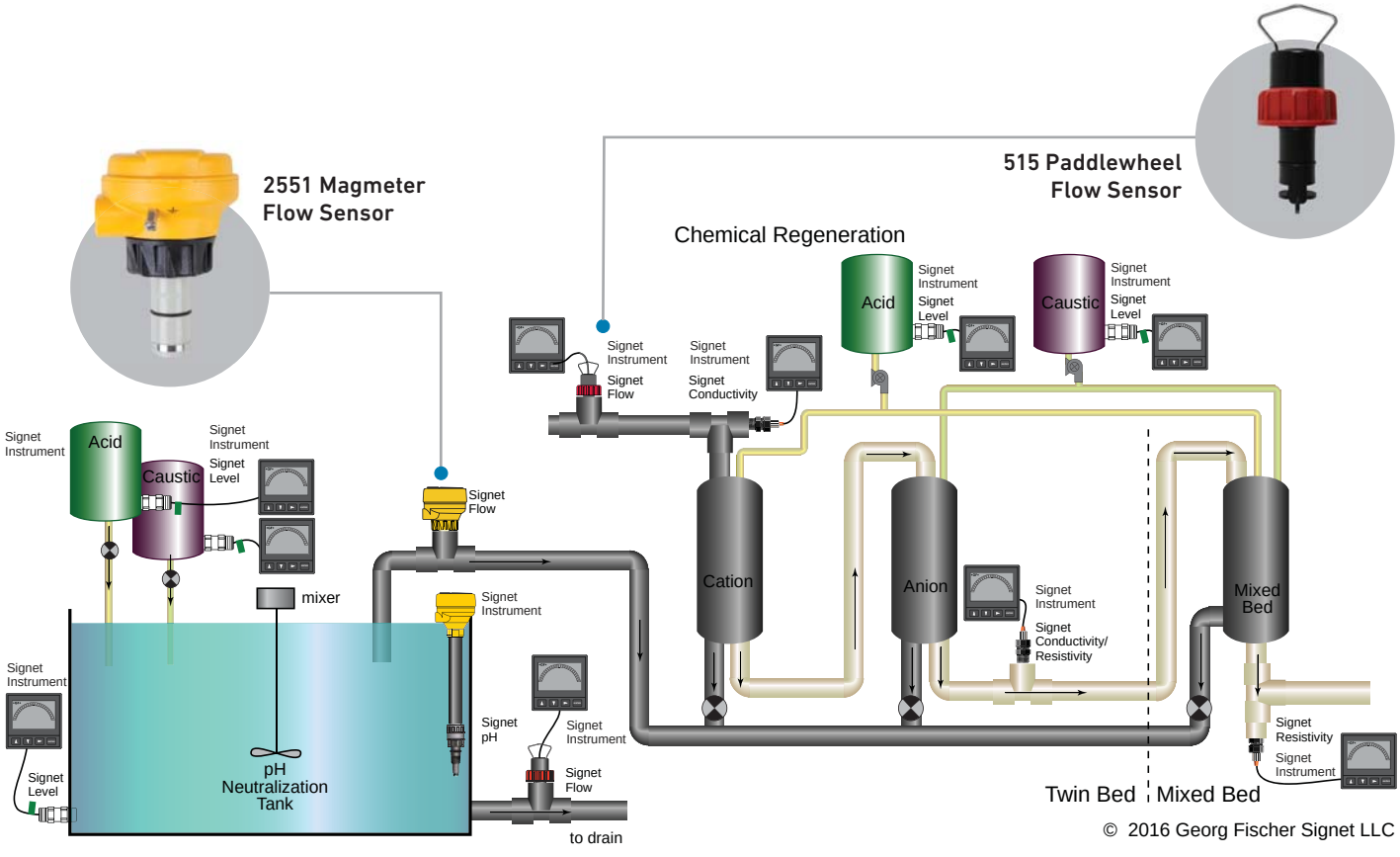
Example Application: Media Filtration



Example Application: Reverse Osmosis



Example Application: Cooling Tower



Example Application: Deionization - Ultra-Pure water

Applications

GF flow sensors can be used in a wide variety of fluid media types.

Flow rate measurements can be conducted in media ranging from highly pure to highly contaminated, and allows a tailor made solution for almost any application in accordance with the application requirements. Refer to the charts for sensor recommendations.

Paddlewheel Flow

- 515
- 525
- 2536
- 2537
- 2540

Rotor/Turbine Flow

- 2000
- 2507
- 2100

Magmeter Flow

- 2551
- 2552

Ultrasonic Flow

- U1000
- U3000/4000
- 220/330

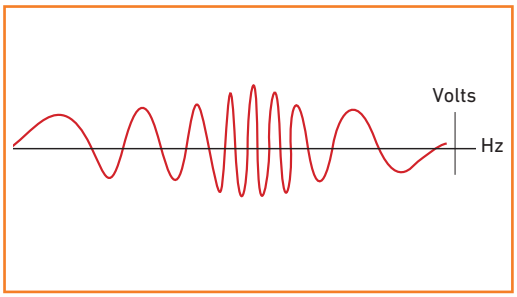
	Paddlewheel	Ultrasonic	Turbine	Magmeter
Industrial				
Ultra-Pure		x		
DI Water	x	x	x	
Tap Water	x	x	x	x
Brackish Water	x		x	x
Sea Water	x			x
Brine Water	x			x
Conductive	x	x		x
Chemical Contaminants				
Organics	x	x	x	x
Corrosives	x			x
Chemical Transport	x	x	x	x
Batch/Mix	x	x	x	
Waste Water				
Particles	x			x
Fibers				x
Municipal				
Drinking	x	x	x	x
Wastewater	x			x

	515	525	2536	2537	2540	2000	2507	2100	2551	2552	U1000	U3000 U4000	PF220 PF330
Batch Process	x		x			x	x		x				
Boiler Feedwater Monitoring	x	x	x										
Chemical Dosing						x	x	x					
Chemical Processing									x	x		x	x
Chemical Production	x		x	x								x	x
Chemical Transport		x							x				
Chilled Water Metering					x				x	x	x	x	
Clarified Effluent					x								
Commercial Pools, Spas and Aquariums	x		x		x				x			x	
Cooling Systems		x			x				x	x		x	x
Demineralized Water			x	x							x	x	x
Fertigation								x					
Filtration Systems	x		x	x									
Fluid Dispensing							x	x					
Gravity Feed Lines			x	x	x								
Ground Water Remediation					x					x			
Heat Exchangers		x									x		
High-Purity Chemical Dispensing								x					
HVAC Systems		x			x				x	x		x	
Hydraulic Systems												x	x
Industrial Water Distribution									x	x			x
Irrigation									x	x			
Laboratory and Clinical Wet Benches							x						
Leak Detection					x					x		x	x
Liquid Delivery Systems	x		x	x									
Metal Recovery and Landfill Leachate									x				
Mining Applications										x			
Municipal Water Distribution										x			
Neutralization Systems	x		x						x				
Potable Water													x
Process and Coolant Flow						x				x		x	x
Process Control											x	x	x
Process Water Metering	x		x	x					x		x	x	
Pump Protection	x		x	x				x			x	x	
Pure Water Production											x	x	x
Reverse Osmosis	x		x	x					x				
River Water													x
Scrubber Systems	x		x	x					x	x			
Textile Dyeing								x				x	x
Turf Irrigation					x								
Ultra-Pure Water measurement											x	x	x
Wastewater Treatment										x			
Water Dilution	x		x					x	x				
Water and Wastewater Monitoring	x		x	x					x				
Water Distribution										x			
Water Process Flow	x		x	x	x				x	x			
Water/Glycol Solutions												x	x

Measuring Principals

GF flow sensors have a variety of measurement types to fit your needs

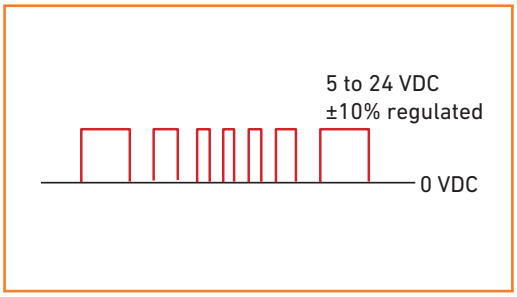
All GF flow sensors belong to the broad category of velocity-based flow measurement devices. Here is a general overview. Principles of operation vary considerably. Choose the appropriate sensor for optimal flow measurement results.



+ Sine Wave Frequency output measurements

- 515
- 525

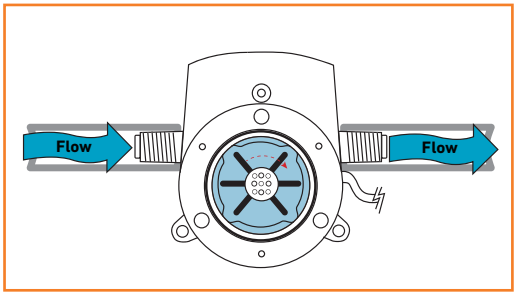
Sinusoidal sensors produce a signal typical of self generating, non-powered paddlewheel sensors. The frequency and amplitude (voltage) both vary directly with flow rate.



+ Open Collector frequency output measurements

- 2536
- 2540
- 2000
- 2100
- 2507
- 2537

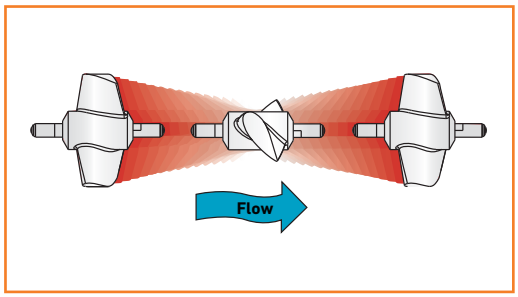
Open Collector sensors produce a transistor-type square wave typical of powered flow sensors with frequency output.



+ In-Line Rotor flow rate measurements

- 2000
- 2507

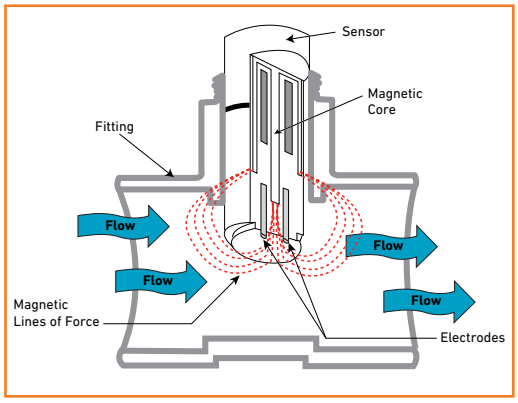
In-line rotor type sensors produce a transistor-type square wave output signal. Positioned in the flow cell, they are able to measure lower flow rates.



Turbine flow rate measurements

- 2100

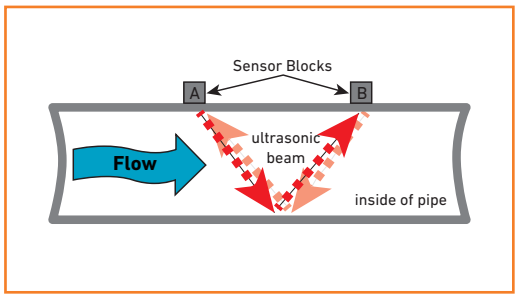
Turbine flow sensors are full-bore devices designed for low flow measurements. Similar to paddlewheels, they rely on the energy in the flow stream to spin a rotor (turbine). The difference is the shaft is in the center of, and parallel to, the flow stream. The velocity of the liquid spins the turbine for detection by external electronic circuitry, producing a transistor-type square wave with a frequency directly proportional to the flow rate.



Magnetic inductive flow rate measurements

- 2551
- 2552

Electromagnetic flow sensors operate on Faraday's principal of electromagnetic induction, and have no moving parts. As a conductive fluid (>20µS) moves through the magnetic field produced at the sensor tip, a voltage occurs that is directly proportional to the fluid velocity. Internal electronics then convert this voltage to a frequency and/or 4 to 20 mA output.



Ultrasonic clamp-on flow rate measurements

- U1000
- U3000
- U4000
- PF220
- PF330

Ultrasonic flow meters work on the basis of the Transit Time principle of ultrasonic sound in liquid media. Two transducers send and receive ultrasonic bursts into the pipe up and down stream the of flow. Depending on the flow velocity there is a noticeable time difference between the up and down stream signal. The difference is proportional to the actual flow rate.

Performance Data

515 Paddlewheel Flow Sensor

Sensor type	515 insertion paddlewheel	
Operating range m/s	0.3 - 6 m/s	
Accuracy	n/a	
Repeatability	± 0.5% of max. range	
Linearity	± 1% of max. range	
Frequency	19.7 Hz per m/s nominal	
Pipe size range	0.5 in. - 36 in.	
Supply voltage	None	
Source impedance	8 KΩ	
Sensor body	PP, PVDF	
Rotor	PVDF, ETFE	
Rotor pin	Titanium, Hastelloy-C, Natural PVDF, Ceramic, Stainless Steel, Tantalum	
O-ring	FPM, EPDM, FFPM	
Operating temperature	PP: -18 °C - 90 °C	
	PVDF: -18 °C - 100 °C	
Operating pressure	PP: 12.5 bar @ 20 °C	PVDF: 14 bar @ 20 °C
	PP: 1.7 bar @ 90 °C	PVDF: 1.4 bar @ 100 °C
Output	AC frequency	
Approvals	RoHS compliant, China RoHS, Lloyd's Register, NSF (-PX version only)	

525 Paddlewheel Flow Sensor

Specifications	
Sensor type	525 insertion paddlewheel
Operating range m/s	0.5 - 6 m/s
Accuracy	n/a
Repeatability	± 0.5% of max range
Linearity	± 1% of max range
Frequency	39 Hz per m/s nominal
Pipe size range	0.5 in. - 12 in.
Supply voltage	None
Source impedance	11.6 KΩ
Sensor body	SS 316
Rotor	17-4PH-1 Stainless Steel
Rotor pin	Tungsten Carbide, Stainless Steel 316
Operating temperature	-18 °C - 149 °C
Operating pressure	103 bar @ 149 °C
Approvals	RoHS compliant, China RoHS

2536 Paddlewheel Flow Sensor

Specifications	
Sensor type	2536 insertion paddlewheel
Operating range m/s	0.1 - 6 m/s
Accuracy	n/a
Repeatability	± 0.5% of max. range
Linearity	± 1% of max. range
Frequency	49 Hz per m/s nominal
Pipe size range	0.5 in. - 36 in.
Supply voltage	5 - 24 VDC
Sensor body	PP, PVDF, PVC
Rotor	PVDF, ETFE, PVC
Rotor pin	Titanium, Hastelloy-C, Natural PVDF, Ceramic, Stainless Steel, Tantalum
O-ring	FPM, EPDM, FFPM
Operating temperature	PP: -18 °C - 85 °C
	PVC: 0 °C - 60 °C
	PVDF: -18 °C - 85 °C
Operating pressure	PP: 12.5 bar @ 20 °C
	PP: 1.7 bar @ 85 °C
	PVC: 12.5 bar @ 20 °C
	PVC: 6.9 bar @ 60 °C
	PVDF: 14 bar @ 20 °C
	PVDF: 1.7 bar @ 85 °C
Approvals	CE, FCC, NSF (3-2536-PX only)

2537 Paddlewheel Flow Sensor

Specifications	
Sensor type	2537 insertion paddlewheel
Operating range m/s	0.1 - 6 m/s
Accuracy	n/a
Repeatability	± 0.5% of max. range
Linearity	± 1% of max. range
Frequency	n/a
Pipe size range	0.5 in. - 8 in.
Supply voltage	5 - 24 VDC
Sensor body	PP, PVDF
Rotor	PVDF, ETFE
Rotor pin	Titanium, Hastelloy-C, Natural PVDF, Ceramic, Stainless Steel, Tantalum
O-ring	FPM, EPDM, FFPM
Other	n/a
Operating temperature	PP: -18 °C - 90 °C
	PVDF: -18 °C - 100 °C
Operating pressure	PP: 12.5 bar @ 20 °C
	PP: 1.7 bar @ 90 °C
	PVDF: 14 bar @ 20 °C
	PVDF: 1.4 bar @ 100 °C
Output	Open collector, 4-20 mA, Digital (S3L), DCR relay, SSR relay
Approvals	CE, FCC, UL, NSF (3-2537-XC-PX version only)

2540 Paddlewheel Flow Sensor

Specifications	
Sensor type	2540 (insertion paddlewheel)
Operating range m/s	0.1 - 6 m/s
Accuracy	n/a
Repeatability	± 0.5% of max. range
Linearity	± 1% of max. range
Frequency	49 Hz per m/s nominal
Pipe size range	1.5 in. - 36 in.
Supply voltage	5 - 24 VDC
Sensor body	SS 316
Rotor	17-4PH-1 Stainless Steel
Rotor pin	Tungsten Carbide, Stainless Steel 316
O-ring	FPM, EPDM
Other	Carbon fiber reinforced PTFE bearing
Operating temperature	-18 °C - 100 °C
Operating pressure	17 bar @ 100 °C
Output	Open collector
Approvals	CE, FCC, RoHS compliant, China RoHS

2551 Magmeter

Additional features:

- Empty pipe detection
- Bi-directional
- Relay
- Multi-language display version
- Min. conductivity 20 uS/cm

Specifications	
Sensor type	2551 Insertion magmeter
Operating range m/s	0.05 - 10 m/s
Accuracy	n/a
Repeatability	± 0.5% of reading
Linearity	± 1% of reading
Pipe size range	0.5 in. - 36 in.
Supply voltage	5 - 24 VDC
Sensor body	PP, PVDF
Other	SS 316L, Hastelloy-C, Titanium
Operating temperature	Ambient -10 °C - 70 °C
	Media 0 °C - 85 °C
Operating pressure	10.3 bar @ 25 °C
	1.4 bar @ 85 °C
Output	Frequency, S^3L, 4 to 20 mA
Approvals	CE, UL, CUL, RoHS compliant

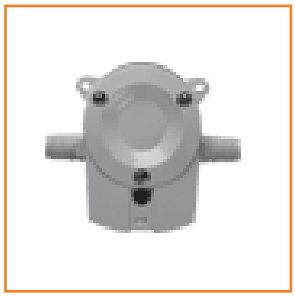
2552 Metal Magmeter

Additional features:

- Empty pipe detection
- Bi-directional
- Min. conductivity 20 uS/cm

Specifications	
Sensor type	2552 Insertion magmeter
Operating range m/s	0.05 - 10 m/s
Accuracy	± 2% of measured value
Repeatability	± 0.5% of reading
Linearity	± 1% of reading
Frequency	5 to 6.5 VDC 15 mA maximum
Pipe size range	2 in. - 102 in.
Supply voltage	5 - 24 VDC
Sensor body	SS 316L
Other	PVDF
Operating temperature	Ambient -15 °C - 70 °C
	Media -15 °C - 85 °C
Operating pressure	20.7 bar @ 25 °C
Output	Frequency, S^3L, 4-20 mA
Approvals	CE, RoHS compliant

2000 Micro Flow Sensor



Additional features:

- Lowest flow range 110 mL/min.
- PPS body for tough service
- Good chemical resistance

Specifications	
Sensor type	2000 In-line rotor
Operating range m/s	0.11 to 12.11 l/m
Accuracy	n/a
Pipe size range	¼ in. tubing
Supply voltage	5 - 24 VDC
Sensor body	PPS
Rotor	PEEK™
O-ring	FPM
Operating temperature	0 °C to 80 °C
Operating pressure	80 psi
Output	Open collector

2507 Micro Flow Sensor

Additional features:

- Detachable signal connector
- Replacement inserts for different flow ranges
- Good chemical resistance

Specifications	
Sensor type	2507 In-line rotor
Operating range m/s	0.4 to 12.0 l/m
Accuracy	± 2.0% of reading
Repeatability	± 0.25% of full range
Pipe size range	¼ in. tubing
Supply voltage	5 - 24 VDC
Sensor body	PVDF
Rotor	PVDF
O-ring	FPM
Operating temperature	-30 °C to 120 °C
Operating pressure	80 psi
Output	Open collector
Approvals	CE, FCC, RoHS compliant, China RoHS

2100 Turbine Flow Sensor

Specifications	
Sensor type	2100 In-line turbine
Operating range m/s	0.38 to 38.0 l/m
Accuracy	± 3% of reading
Repeatability	± 0.5% of reading
Pipe size range	¼", ⅜", ½" (tubing), ½" (piping)
Supply voltage	5 ~ 24 VDC
Sensor body	PVDF
Rotor	PVDF
O-ring	FPM, EPDM
Other	Ceramic bearing
Operating temperature	-20 °C to 70 °C
Operating pressure	130 psi
Output	Open collector
Approvals	CE, FCC, RoHS compliant, China RoHS

U1000 Ultraflow Ultrasonic Flow Sensor

Additional features:

- Bi-directional

Specifications	
Sensor type	U1000 Ultrasonic Clamp-on
Operating range m/s	0.1 ~ 10 m/s
Accuracy	±3 % of flow reading
Repeatability	±5 % of measured flow
Pipe size range	1 in. - 4.5 in.
Supply voltage	12 to 24 VAC or DC
Enclosure material	Polycarbonate
Keypad	4 key tactile feedback membrane keypad
Operating temperature	0 °C to 85 °C
Operating humidity	Max. 90% relative humidity @ 50 °C
Output	Analog, Pulse output
Approvals	CE

U3000/U4000 Ultraflow Ultrasonic Flow Sensor

Additional features:

- Datalogger 198K data points

Specifications	
Sensor type	U3000-4000 Ultrasonic Clamp-on
Operating range m/s	0.1 ~ 20 m/s
Accuracy	±0.5% to ±3% of flow reading for Pipe ID >75 mm ±3% of flow reading Pipe ID 13 mm - 75 mm
Repeatability	±0.5% of measured value or ±0.2 m/s whichever is greater
Pipe size range	0.5 in. - 78 in.
Supply voltage	12 - 24 VAC or DC; 86 - 264 VAC
Operating temperature	-20 °C to 50 °C
Pipe wall temperature	-20 °C to 135 °C
Operating humidity	Max. 90% relative humidity @ 50 °C
Output	4 to 20 mA, 0 to 20 mA, 0 to 16 mA, Pulse output, 2 Alarm outputs
Approvals	CE

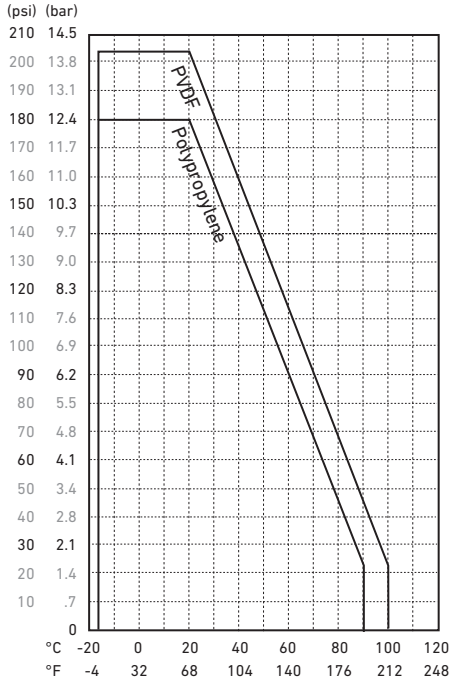
220/330 Portaflow Portable Ultrasonic Flow Sensor

Specifications	
Sensor type	220/330 Ultrasonic Clamp-on
Operating range m/s	0.1 ~ 20 m/s
Accuracy	±0.5% to ±3% of flow reading for Pipe ID >75 mm ±3% of flow reading Pipe ID 13 mm - 75 mm
Repeatability	±0.5% of measured value or ±0.2 m/s whichever is greater
Pipe size range	13 mm to 2000 mm OD
Supply voltage	Battery power
Enclosure material	ABS and aluminium
Operating temperature	-20 °C to 50 °C
Pipe wall temperature	-20 °C to 135 °C
Output	Analog, Pulse output, USB, RS232
Approvals - Electrical	UL, CUL, TUV, CB, CE
Approvals - Data logger	CE, RoHS compliant

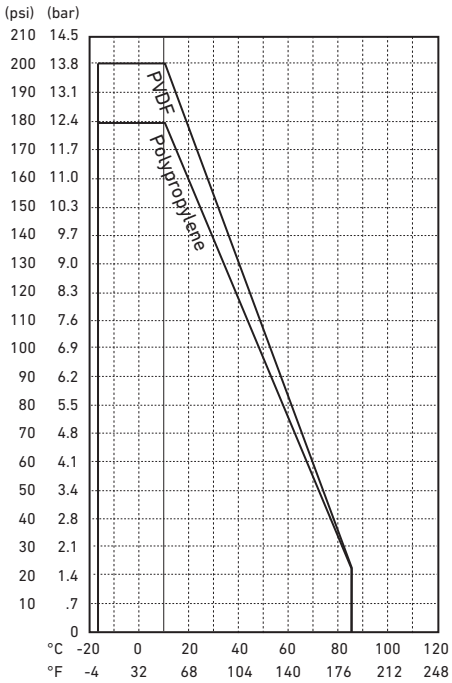
Temperature/ Pressure Graphs

Note:
The pressure/temperature graphs are specifically for the Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.

515 Paddlewheel Flow Sensor

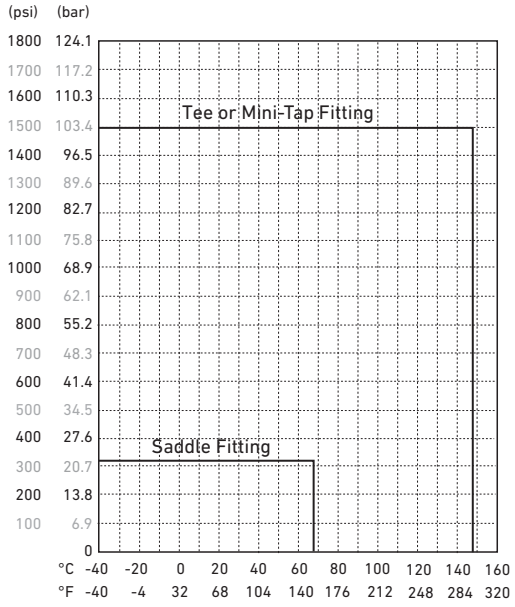


2536 & 2537 Paddlewheel Flow Sensor

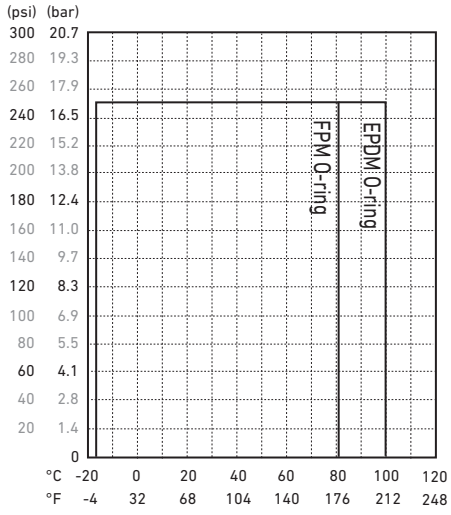


*2537 Only: Graph applies to wetted materials (sensor) only. Maximum ambient temperature is 65°C.

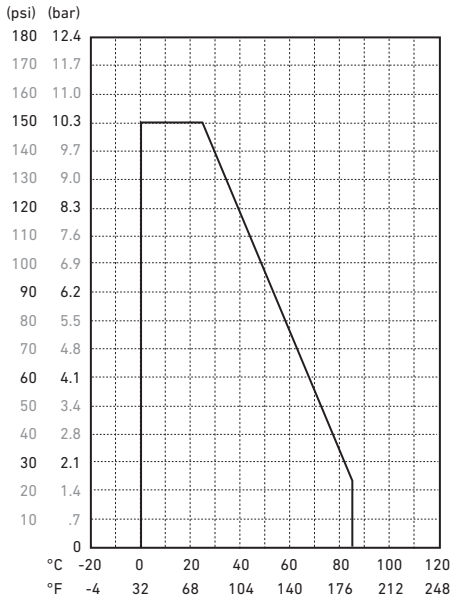
525 Paddlewheel Flow Sensor



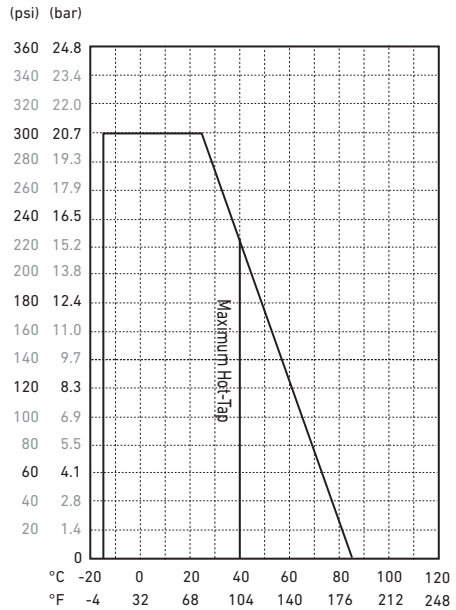
2540 Paddlewheel Flow Sensor



2551 Magmeter

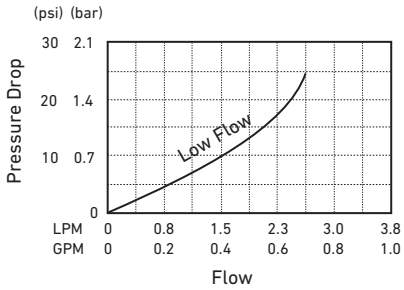


2552 Metal Magmeter

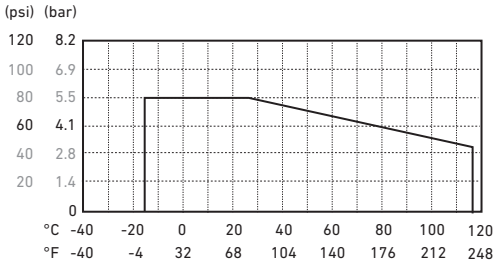


2000 Micro Flow Sensor

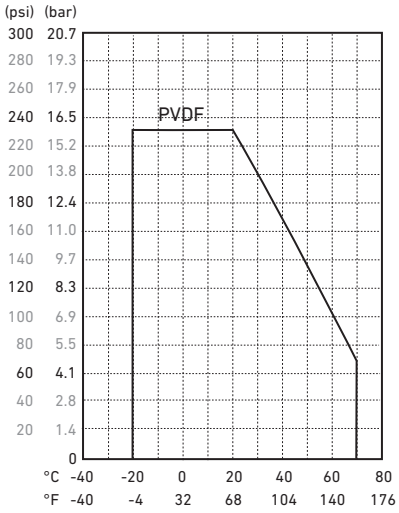
Pressure Drop - Low Flow



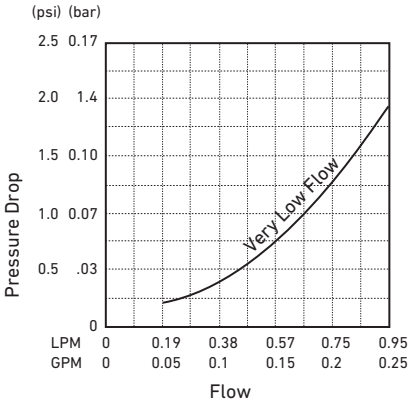
2507 Micro Flow Sensor



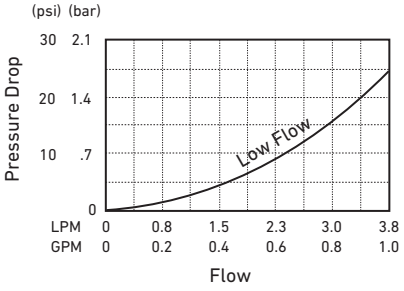
2100 Turbine Flow Sensor



Pressure Drop - Very Low Flow



Pressure Drop - Low Flow



Flow Range Charts

Paddlewheel and Electromagnetic Sensors -GPM

Signet Models 515, 525, 2536, 2537, 2540, 2551, 2552
GPM Flow Rates for DN15 to DN450 (½ in. to 18 in.) pipe sizes

Nominal Pipe Size		2551/2552		2536/8512/2537/2540		515 and 8510		525	
Inch	Metric DN (mm)	Min	Max	Min	Max	Min	Max	Min	Max
		0.15 ft/s	33 ft/s	0.3 ft/s	20 ft/s	1 ft/s	20 ft/s	1.6 ft/s	20 ft/s
0.5	15	0.14	31.25	0.28	18.94	0.95	18.94	1.52	18.94
0.75	20	0.25	54.85	0.50	33.24	1.66	33.24	2.66	33.24
1	25	0.40	88.89	0.81	53.88	2.69	53.88	4.31	53.88
1.25	32	0.70	153.84	1.40	93.24	4.66	93.24	7.46	93.24
1.5	40	0.95	209.40	1.90	126.91	6.35	126.91	10.15	126.91
2	50	1.57	345.15	3.14	209.18	10.46	209.18	16.73	209.18
2.5	65	2.24	492.45	4.48	298.46	14.92	298.46	23.88	298.46
3	80	3.46	760.39	6.91	460.84	23.04	460.84	36.87	460.84
4	100	5.95	1309.40	11.90	793.57	39.68	793.57	63.49	793.57
5	125	9.35	2057.74	18.71	1247.12	62.36	1247.12	99.77	1247.12
6	150	13.51	2971.57	27.01	1800.95	90.05	1800.95	144.08	1800.95
8	200	23.39	5145.63	46.78	3118.57	155.93	3118.57	249.49	3118.57
10	250	36.87	8110.73	73.73	4915.59	245.78	4915.59	393.25	4915.59
12	300	52.33	11512.97	104.66	6977.56	348.88	6977.56	558.20	6977.56
14	350	-	-	126.49	8432.82	421.64	8432.82	-	-
16	400	-	-	165.24	11015.97	550.80	11015.97	-	-
18	450	-	-	209.16	13943.74	697.19	13943.74	-	-

Paddlewheel and Electromagnetic Sensors - LPM

Signet Models 515, 525, 2536, 2537, 2540, 2551, 2552
LPM Flow Rates for DN15 to DN450 (½ in. to 18 in.) pipe sizes

Nominal Pipe Size		2551/2552		2536/8512/2537/2540		515 and 8510		525	
Inch	Metric DN (mm)	Min	Max	Min	Max	Min	Max	Min	Max
		0.05 m/s	10 m/s	0.1 m/s	6 m/s	0.3 m/s	6 m/s	0.5 m/s	6 m/s
0.5	15	0.6	117.6	1.2	70.6	3.5	70.6	5.9	70.6
0.75	20	1.0	206.4	2.1	123.9	6.2	123.9	10.3	123.9
1	25	1.7	334.5	3.3	200.7	10.0	200.7	16.7	200.7
1.25	32	2.9	579.0	5.8	347.4	17.4	347.4	28.9	347.4
1.5	40	3.9	788.1	7.9	472.8	23.6	472.8	39.4	472.8
2	50	6.5	1298.9	13.0	779.4	39.0	779.4	64.9	779.4
2.5	65	9.3	1853.3	18.5	1112.0	55.6	1112.0	92.7	1112.0
3	80	14.3	2861.7	28.6	1717.0	85.9	1717.0	143.1	1717.0
4	100	24.6	4927.8	49.3	2956.7	147.8	2956.7	246.4	2956.7
5	125	38.7	7744.2	77.4	4646.5	232.3	4646.5	387.2	4646.5
6	150	55.9	11183.3	111.8	6710.0	335.5	6710.0	559.2	6710.0
8	200	96.8	19365.3	193.7	11619.2	581.0	11619.2	968.3	11619.2
10	250	152.6	30524.2	305.2	18314.5	915.7	18314.5	1526.2	18314.5
12	300	216.6	43328.4	433.3	25997.0	1299.9	25997.0	2166.4	25997.0
14	350	-	-	523.7	31419.1	1571.0	31419.1	-	-
16	400	-	-	684.1	41043.4	2052.2	41043.4	-	-
18	450	-	-	865.9	51951.7	2597.6	51951.7	-	-

In-line Rotor and Turbine Sensors - GPM/LPM

Signet Models 2000, 2100, and 2507
GPM and LPM Flow Rates

		GPM		LPM	
Model and Size	Description	Min	Max	Min	Max
3-2000-1X	Micro Flow - Low	0.030	0.700	0.110	2.600
3-2000-2X	Micro Flow - High	0.300	3.200	1.130	12.110
3-2100-XL and -31 Kits	Turbine Low - 1/2" Tubing	0.100	1.000	0.380	3.800
3-2100-XL and -32 Kits	Turbine Low - 3/8" Tubing	0.100	1.000	0.380	3.800
3-2100-XL and -33 Kits	Turbine Low - 1/4" Tubing	0.100	1.000	0.380	3.800
3-2100-XL and -34 thru -38 Kits	Turbine Low - 1/2" Pipe	0.100	1.000	0.380	3.800
3-2100-XH and -31 kits	Turbine High - 1/2" Tubing	0.800	10.000	3.000	38.000
3-2100-XH and -34 thru -38 Kits	Turbine High - 1/2" Pipe	0.800	10.000	3.000	38.000
3-2507.100-2V	Mini Flow - 2 mm Insert	0.106	0.740	0.500	2.800
3-2507.100-3V	Mini Flow - 3 mm Insert	0.198	1.123	0.750	4.250
3-2507.100-4V	Mini Flow - 4 mm Insert	0.330	1.585	1.250	6.000
3-2507.100-6V	Mini Flow - 6 mm Insert	0.792	3.170	3.000	12.000