

+GF+ SIGNET 7000/7001 Vortex Flow Sensors



Features

- Six sizes in the range 1/2 to 2 in.
- No moving parts or machined surfaces
- Injection-molded plastic construction
- Excellent surface-finish quality
- +/- 1% of reading accuracy
- End connector options include BCF/IR, Socket Fusion or Solvent Cement Socket
- All HP or high-purity versions are lot-traceable, molded in a dedicated high purity environment, precleaned for ultrapure service, and double-bagged in PA6/PE packaging
- Vibration-noise protection
- Standard sensor output: Frequency or 4 to 20 mA
- Integral transmitters with local displays and many additional features are available as accessories, or select from a wider variety of panel-mount flow instrumentation
- Reverse polarity protected

Description

+GF+ SIGNET Vortex Flow Sensors provide extremely accurate and reliable flow measurement with no moving parts. PVC, PP, PVDF & SYGEF® HP-PVDF material choices accommodate applications ranging from chemical delivery to deionized water distribution. The sensors are injection-molded to achieve a smooth surface finish for cleanliness and better chemical compatibility, that also drastically reduces manufacturing

inconsistencies and in-service particulation associated with machined surfaces. A variety of end connector options simplify installation and allow unparalleled configuration versatility. The sensors feature either frequency output or fixed 4 to 20 mA current output, and can be used with the comprehensive offering of +GF+ SIGNET flow instrumentation to achieve enhanced system functionality.

Application

- Process Flow
- UPW Distribution
- RO/DI Skids
- Process Cooling Water
- Neutralization Systems
- Waste Water Effluent
- Scrubber Control
- Chemical Delivery
- Accurate Batching

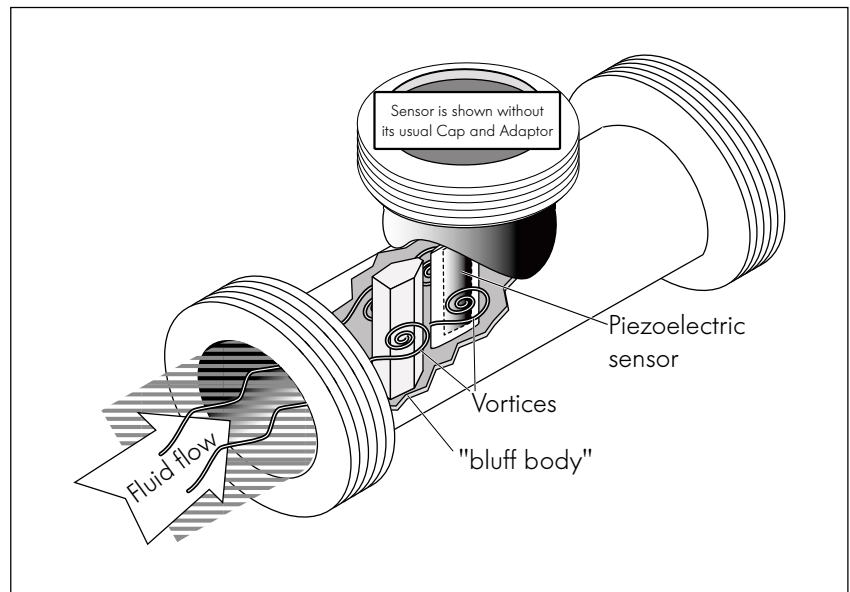
Options

Vortex Sensors	Instrument Options							
	8530	5090	5091	5100	5500	5600	9010	5075
7000 (Freq. Output)	●				●	●	●	●
7001 (4-20mA Out.)			●				●	

Principle of Operation

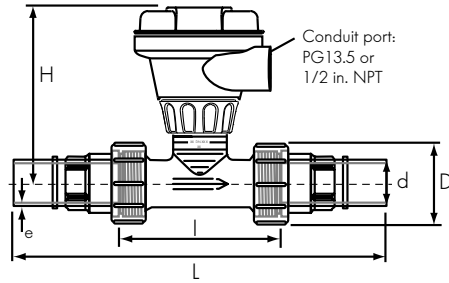
Vortex Flow Sensors 1/2 to 2"

Vortex flow sensors use a naturally occurring phenomenon in which whirling masses of liquid, or vortices, are shed downstream of a stationary object within a flow stream, and at a frequency directly proportional to the velocity of the flow stream. Each vortex causes a local pressure fluctuation that can be detected. +GF+ SIGNET Vortex Flow Sensors, 1/2 to 2", develop vortices around a narrow bluff body and direct them to an encapsulated piezoelectric sensor. The electrical impulse signal from the sensor is amplified and conditioned, producing an extremely accurate and reliable output that is directly proportional to the flow rate.



Dimensions

HP BCF/IR Butt Fusion True Union

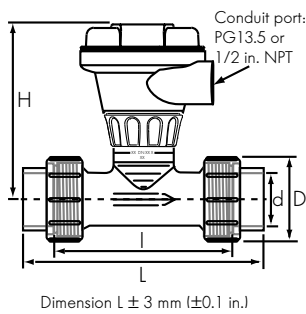


HP BCF/IR True Union

d	Closest	DN	D		L		I		H		e
mm	inch size	mm	mm	inch	mm	inch	mm	inch	mm	inch	mm
20	1/2	15	47	1.85	226	8.90	90	3.54	117	4.61	1.9
25	3/4	20	57	2.24	236	9.29	100	3.94	120	4.72	1.9
32	1	25	64	2.52	248	9.76	110	4.33	123	4.84	2.4
40	1-1/4	32	78	3.07	286	11.26	110	4.33	127	5.00	2.4
50	1-1/2	40	89	3.50	298	11.73	120	4.72	132	5.20	3.0
63	2	50	109	4.29	317	12.48	130	5.12	139	5.47	3.0

- HP BCF/IR True Union supplied with white FPM o-rings.
- All HP Sensors are 100% cleaned, inspected and double-bagged in heat-sealed PA6/PE liners.

HP Socket Fusion True Union PVDF Socket Fusion PP Socket Fusion

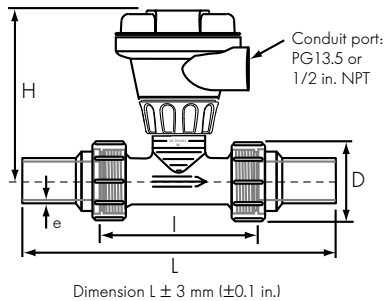


HP Socket Fusion True Union: PVDF and PP, Socket Fusion

d	Closest	DN	D		L		I		H		e
mm	Inch size	mm	mm	inch	mm	inch	mm	inch	mm	inch	mm
20	1/2	15	47	1.85	128	5.04	90	3.54	117	4.61	1.9
25	3/4	20	57	2.24	142	5.59	100	3.94	120	4.72	1.9
32	1	25	64	2.52	156	6.14	110	4.33	123	4.84	2.4
40	1-1/4	32	78	3.07	160	6.30	110	4.33	127	5.00	2.4
50	1-1/2	40	89	3.50	176	6.93	120	4.72	132	5.20	3.0
63	2	50	109	4.29	194	7.64	130	5.12	139	5.47	3.0

- HP Socket Fusion True Union supplied with black FPM O-rings.
- All HP Sensors are 100% cleaned, inspected and double-bagged in heat-sealed PA6/PE liners.

PVDF Butt Fusion/IR PP Butt Fusion/IR

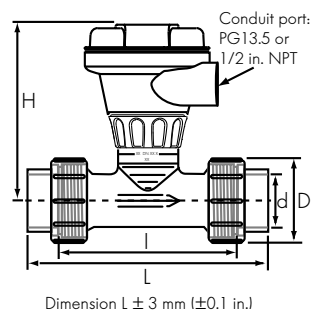


Shown with
Butt Fusion/
IR connectors

PVDF & PP Butt Fusion/IR connectors

d	Closest	DN	D		L		I		H		e
mm	Inch size	mm	mm	inch	mm	inch	mm	inch	mm	inch	mm
20	1/2	15	47	1.85	196	7.72	90	3.54	117	4.61	1.9
25	3/4	20	57	2.24	212	8.35	100	3.94	120	4.72	1.9
32	1	25	64	2.52	228	8.98	110	4.33	123	4.84	2.4
40	1-1/4	32	78	3.07	234	9.21	110	4.33	127	5.00	2.4
50	1-1/2	40	89	3.50	250	9.84	120	4.72	132	5.20	3.0
63	2	50	109	4.29	266	10.47	130	5.12	139	5.47	3.0

PVC Sch 80 Solvent Socket PVC Metric Solvent Socket



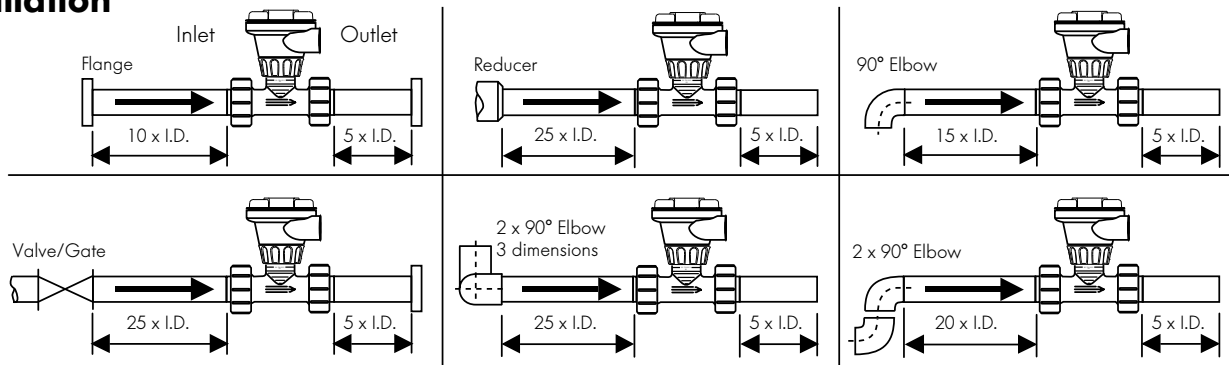
PVC Sch 80 Solvent Socket

Inch size	D		L		I		H	
	mm	inch	mm	inch	mm	inch	mm	inch
1/2	43	1.69	128	5.04	90	3.54	117	4.61
3/4	53	2.09	144	5.67	100	3.94	120	4.72
1	60	2.36	160	6.30	110	4.33	123	4.84
1-1/4	74	2.91	168	6.61	110	4.33	127	5.00
1-1/2	83	3.27	188	7.40	120	4.72	132	5.20
2	103	4.06	212	8.35	130	5.12	139	5.47

PVC Metric Solvent Socket

d	Closest	DN	D		L		I		H		e
mm	Inch size	mm	mm	inch	mm	inch	mm	inch	mm	inch	mm
20	1/2	15	43	1.69	128	5.04	90	3.54	117	4.61	1.9
25	3/4	20	53	2.09	142	5.59	100	3.94	120	4.72	1.9
32	1	25	60	2.36	156	6.14	110	4.33	123	4.84	2.4
40	1-1/4	32	74	2.91	160	6.30	110	4.33	127	5.00	2.4
50	1-1/2	40	83	3.27	176	6.93	120	4.72	132	5.20	3.0
63	2	50	103	4.06	194	7.64	130	5.12	139	5.47	3.0

Installation



- Six common installation configurations are shown as guidelines to help you select the best location in your piping system for a vortex flow sensor. Always maximize distance between sensors and pump sources.
- All mounting angles are acceptable in either horizontal or vertical pipe runs, with upward flow preferred in the case of vertical runs. Install the sensor with the arrow pointing in the direction of the flow. These flow sensors are for uni-directional operation.
- Observe minimum Reynold's Number and back pressure requirements.

Reynold's Number

- A Reynold's Number is a dimensionless number used to determine the effects of viscosity, specific gravity, and velocity on flow sensor performance. To maintain system accuracy, a Reynold's Number greater than 7,500 is required.

Reynold's Number,

$$R_e = 3162.76 \times Q \times S_g / (\mu \times ID)$$

where: Q = Flow rate in GPM

S_g = Specific Gravity

μ = Dynamic Viscosity in Centipoise (cP)

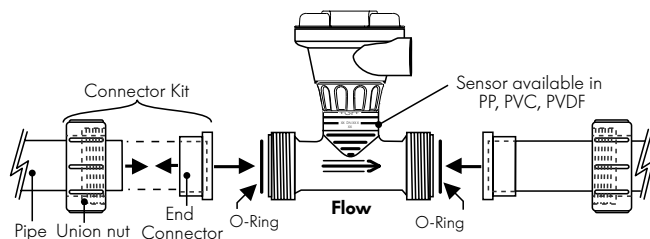
ID = pipe inside diameter in inches

Installation - End Connector Kit Options

Fusion Socket or Solvent Cement Socket

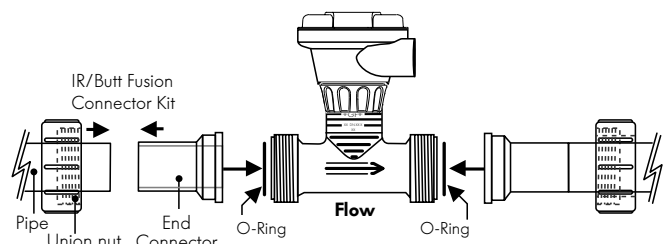
- Fusion socket version: in SYGEF® HP-PVDF, PVDF, or PP. A George Fischer Socket Fusion Joining Machine is required to install the end connectors on the pipeline. Refer to the joining machine manual for installation details.
- Solvent socket version: available in PVC. Follow the PVC cement manufacturer's recommendations for preparation and installation.

NOTE: Except HP, union connections sold separately.



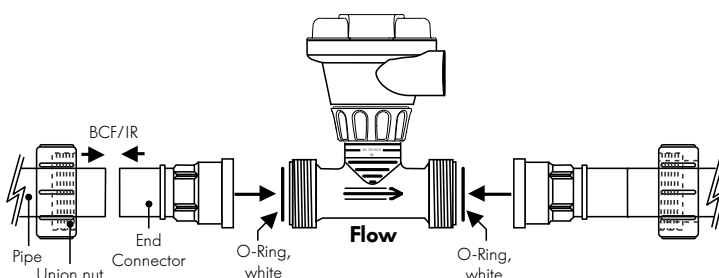
IR/Butt Fusion

- Available in PVDF or PP. A George Fischer IR weld or Butt Fusion Joining Machine is required to install the end connections. Refer to the IR weld or butt fusion joining machine manual for installation details.



BCF/IR Fusion

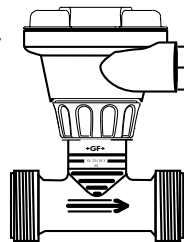
- A George Fischer SYGEF HP BCF/IR Fusion Joining Machine is required to install the end connections. Refer to the SYGEF BCF/IR fusion joining machine manual for installation details.



Wiring

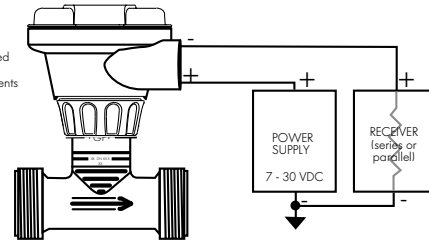
Frequency Output Models

- DC sensor power supplied by +GF+ SIGNET instrument
- Use the 2535/2536 input card setting when wiring to the +GF+ SIGNET 9010 Intelk-Pro™ Flow Controller



10KΩ pull-up resistor required for non-Signet brand instruments

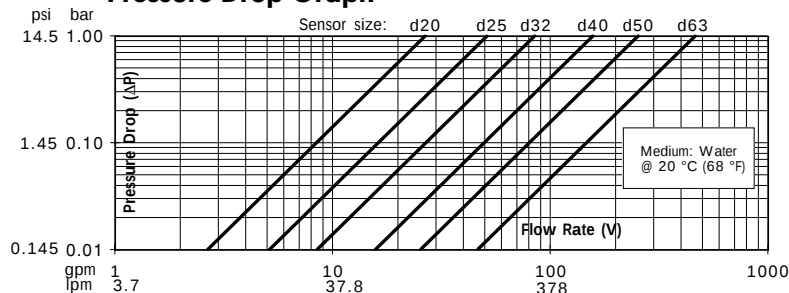
4 to 20mA Current Output Models



Back Pressure Calculation

- Minimum downstream pipe backpressure levels (full pipes) are required to prevent cavitation within the sensor. The minimum back pressure is calculated by the following formula: $2.7 \times \Delta P + 1.3 \times P_v$ (ΔP = Pressure drop across sensor. P_v = Liquid vapor pressure at operating temperature.)
- Using Pressure Drop Graph, find ΔP by locating your maximum flow rate on specific sensor size line.
- Using the Liquid Vapor Pressures Chart, find P_v at operating temperature.
- Calculate minimum back pressure needed using formula.

Pressure Drop Graph



Liquid Vapor Pressures at Operation Temperatures

°C	-20	-10	0	10	20	25	30	40	50	65
°F	-4	14	32	50	68	77	86	104	122	149
P_v (bar)	0.001	0.003	0.006	0.012	0.023	0.32	0.042	0.074	0.123	0.25
P_v (psi)	0.014	0.038	0.088	0.178	0.338	0.458	0.614	1.067	1.784	3.626

Technical Data

Wetted materials:

Sensor: PVC, PP, PVDF, or SYGEF® HP PVDF
 Union O-Rings: FPM or EPDM

Pipe size range:

Metric PP/PVDF: d20 to 63 mm, DN15 to 50 mm
 PVC, Sch80: 1/2 to 2 in.

Linear Flow range:

d20 to d25 (0.5 to 0.75 in.) sensors: 0.5 to 4 m/s (1.6 to 13 ft/s)
 d32 to d40 (1.0 to 1.25 in.) sensors: 0.4 to 4 m/s (1.3 to 13 ft/s)
 d50 to d63 (1.5 to 2.0 in.) sensors: 0.3 to 4 m/s (1.0 to 13 ft/s)

NOTE: Below these velocity ranges, Vortex output is non-linear.

Enclosure:

Rating: NEMA 4X/IP65
 Material: PC/PBT blend of resins
 Seals (2): Buna-N (NBR)

Electrical:

Linearity: $\pm 1\%$ of reading @ 25 °C
 Repeatability: $\pm 0.5\%$ of reading @ 25 °C
 Reverse polarity protection

Electrical - Frequency Output Model

Power: 3.5 to 24 VDC, regulated, 1.5 mA max
 Output type: Open-collector NPN transistor, 10 mA max sink,
 24 VDC max pull-up voltage, 0 to 300 Hz (size dependent),
 50% duty cycle, non-isolated

Electrical - Current Output Model

Power: 7 to 30 VDC, regulated, 20 mA max

Current loop (2-wire):

Loop impedance: 1 Ω maximum at 7 VDC
 300 Ω maximum at 12 VDC
 800 Ω maximum at 24 VDC

Environmental

Maximum media press./temp.:

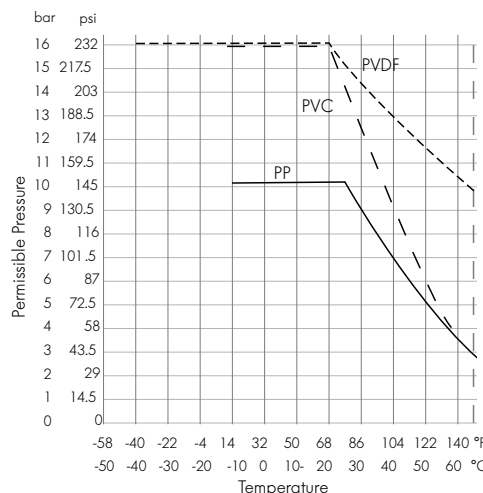
PVDF: 16 bar @ 0 °C, 9.8 bar @ 65 °C
 (232 psi @ 32 °F, 144 psi @ 149 °F)
 PP: 10 bar @ 0 °C, 2.9 bar @ 65 °C
 (145 psi @ 32 °F, 42 psi @ 149 °F)
 PVC: 16 bar @ 0 °C, 3.7 bar @ 60 °C
 (232 psi @ 32 °F, 54 psi @ 140 °F)

Operating temp.: 0 to 65°C (32 to 149°F)

Storage temp.: -15 to 80 °C (5 to 176 °F)

Relative humidity: 0 to 95%, non-condensing

Max. vibration: 1mm or 1g double amplitude @ 500 Hz



Standards and Approvals

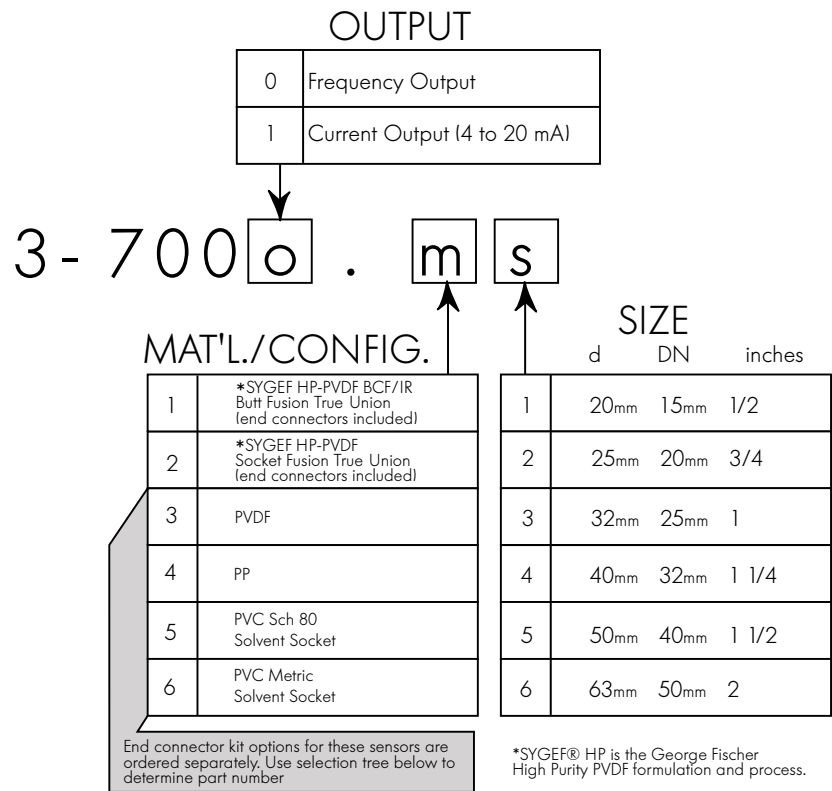
- Manufactured under ISO 9001 and ISO 14001
- CE
- Immunity: EN50082-2
- Emissions: EN55011

Ordering Information

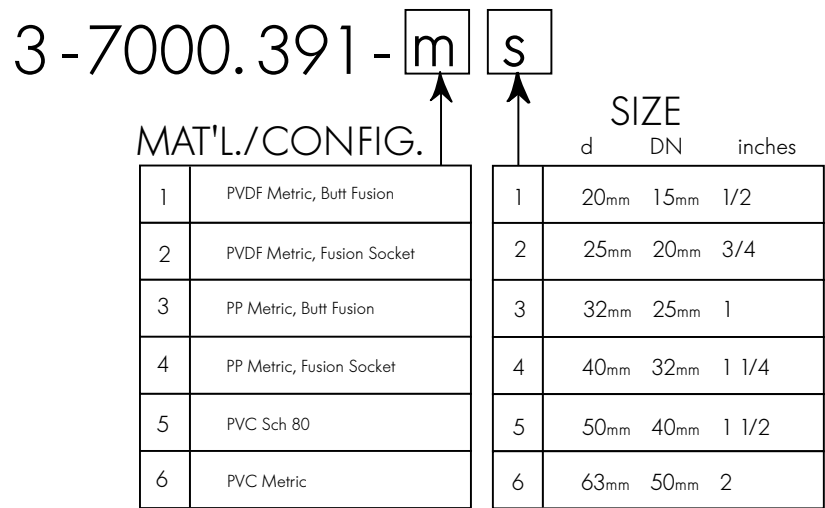
Ordering Notes:

- +GF+ SIGNET Vortex Flow Sensors and End Connector Kits are ordered separately, except the high purity versions in SYGEF® HP-PVDF, which are sold fully assembled with end connectors, cleaned and double bagged.
- All PP and PVDF Vortex Flow Sensors are shipped with FPM O-rings, and PVC Vortex Flow Sensors are shipped with EPDM O-rings. O-ring kits of 2 each are available in both materials.

Sensor Ordering Tree



Connector Kit Ordering Tree



Ordering Information (continued)

Vortex Flow Sensors Frequency Output

Mfr. Part No.	Code	Description
3-7000-11	159 000 106	HP-Butt DN15, 0.5"
3-7000-12	159 000 107	HP-Butt DN20, 0.75"
3-7000-13	159 000 108	HP-Butt DN25, 1.0"
3-7000-14	159 000 109	HP-Butt DN32, 1.25"
3-7000-15	159 000 110	HP-Butt DN40, 1.5"
3-7000-16	159 000 111	HP-Butt DN50, 2.0"

3-7000-21	159 000 112	HP SKT DN15, 0.5"
3-7000-22	159 000 113	HP SKT DN20, 0.75"
3-7000-23	159 000 114	HP SKT DN25, 1.0"
3-7000-24	159 000 115	HP SKT DN32, 1.25"
3-7000-25	159 000 116	HP SKT DN40, 1.5"
3-7000-26	159 000 117	HP SKT DN50, 2.0"

3-7000-31	159 000 118	PVDF DN15, 0.5"
3-7000-32	159 000 119	PVDF DN20, 0.75"
3-7000-33	159 000 120	PVDF DN25, 1.0"
3-7000-34	159 000 121	PVDF DN32, 1.25"
3-7000-35	159 000 122	PVDF DN40, 1.5"
3-7000-36	159 000 123	PVDF DN50, 2.0"

3-7000-41	159 000 124	PP DN15, 0.5"
3-7000-42	159 000 125	PP DN20, 0.75"
3-7000-43	159 000 126	PP DN25, 1.0"
3-7000-44	159 000 127	PP DN32, 1.25"
3-7000-45	159 000 128	PP DN40, 1.5"
3-7000-46	159 000 129	PP DN50, 2.0"

3-7000-51	159 000 130	Sch80 PVC 0.5"
3-7000-52	159 000 131	Sch80 PVC 0.75"
3-7000-53	159 000 132	Sch80 PVC 1.0"
3-7000-54	159 000 133	Sch80 PVC 1.25"
3-7000-55	159 000 134	Sch80 PVC 1.5"
3-7000-56	159 000 135	Sch80 PVC 2.0"

3-7000-61	159 000 136	MetricPVC DN15
3-7000-62	159 000 137	MetricPVC DN20
3-7000-63	159 000 138	MetricPVC DN25
3-7000-64	159 000 139	MetricPVC DN32
3-7000-65	159 000 140	MetricPVC DN40
3-7000-66	159 000 141	MetricPVC DN50

End Connector Kits

Mfr. Part No.	Code	Description
3-7000.391-11	159 000 611	PVDF Butt DN15, 0.5"
3-7000.391-12	159 000 612	PVDF Butt DN20, 0.75"
3-7000.391-13	159 000 613	PVDF Butt DN25, 1.0"
3-7000.391-14	159 000 614	PVDF Butt DN32, 1.25"
3-7000.391-15	159 000 615	PVDF Butt DN40, 1.5"
3-7000.391-16	159 000 616	PVDF Butt DN50, 2.0"

3-7000.391-21	159 000 605	PVDF SKT DN15, 0.5"
3-7000.391-22	159 000 606	PVDF SKT DN20, 0.75"
3-7000.391-23	159 000 607	PVDF SKT DN25, 1.0"
3-7000.391-24	159 000 608	PVDF SKT DN32, 1.25"
3-7000.391-25	159 000 609	PVDF SKT DN40, 1.5"
3-7000.391-26	159 000 610	PVDF SKT DN50, 2.0"

Vortex Flow Sensor 4 to 20 mA Current Output

Mfr. Part No.	Code	Description
3-7001-11	159 000 148	HP-Butt DN15, 0.5"
3-7001-12	159 000 149	HP-Butt DN20, 0.75"
3-7001-13	159 000 150	HP-Butt DN25, 1.0"
3-7001-14	159 000 151	HP-Butt DN32, 1.25"
3-7001-15	159 000 152	HP-Butt DN40, 1.5"
3-7001-16	159 000 153	HP-Butt DN50, 2.0"

3-7001-21	159 000 154	HP SKT DN15, 0.5"
3-7001-22	159 000 155	HP SKT DN20, 0.75"
3-7001-23	159 000 156	HP SKT DN25, 1.0"
3-7001-24	159 000 157	HP SKT DN32, 1.25"
3-7001-25	159 000 158	HP SKT DN40, 1.5"
3-7001-26	159 000 159	HP SKT DN50, 2.0"

3-7001-31	159 000 160	PVDF DN15, 0.5"
3-7001-32	159 000 161	PVDF DN20, 0.75"
3-7001-33	159 000 162	PVDF DN25, 1.0"
3-7001-34	159 000 163	PVDF DN32, 1.25"
3-7001-35	159 000 164	PVDF DN40, 1.5"
3-7001-36	159 000 165	PVDF DN50, 2.0"

3-7001-41	159 000 166	PP DN15, 0.5"
3-7001-42	159 000 167	PP DN20, 0.75"
3-7001-43	159 000 168	PP DN25, 1.0"
3-7001-44	159 000 169	PP DN32, 1.25"
3-7001-45	159 000 170	PP DN40, 1.5"
3-7001-46	159 000 171	PP DN50, 2.0"

3-7001-51	159 000 172	Sch80 PVC 0.5"
3-7001-52	159 000 173	Sch80 PVC 0.75"
3-7001-53	159 000 174	Sch80 PVC 1.0"
3-7001-54	159 000 175	Sch80 PVC 1.25"
3-7001-55	159 000 176	Sch80 PVC 1.5"
3-7001-56	159 000 177	Sch80 PVC 2.0"

3-7001-61	159 000 178	MetricPVC DN15
3-7001-62	159 000 179	MetricPVC DN20
3-7001-63	159 000 180	MetricPVC DN25
3-7001-64	159 000 181	MetricPVC DN32
3-7001-65	159 000 182	MetricPVC DN40
3-7001-66	159 000 183	MetricPVC DN50

O-Ring Kits

Mfr. Part No.	Code	Description
3-7000.390-01	159 000 563	O-ring, DN15, 0.5", EPDM
3-7000.390-02	159 000 564	O-ring, DN20, 0.75", EPDM
3-7000.390-03	159 000 565	O-ring, DN25, 1.0", EPDM
3-7000.390-04	159 000 566	O-ring, DN32, 1.25", EPDM
3-7000.390-05	159 000 567	O-ring, DN40, 1.5", EPDM
3-7000.390-06	159 000 568	O-ring, DN50, 2.0", EPDM

3-7000.390-07	159 000 569	O-ring, DN15, 0.5", FPM
3-7000.390-08	159 000 570	O-ring, DN20, 0.75", FPM
3-7000.390-09	159 000 571	O-ring, DN25, 1.0", FPM
3-7000.390-10	159 000 572	O-ring, DN32, 1.25", FPM
3-7000.390-11	159 000 573	O-ring, DN40, 1.5", FPM
3-7000.390-12	159 000 574	O-ring, DN50, 2.0", FPM

Ordering Information (continued)

End Connector Kits (continued)

Mfr. Part No.	Code	Description
3-7000.391-31	159 000 599	PP Butt DN15, 0.5"
3-7000.391-32	159 000 600	PP Butt DN20, 0.75"
3-7000.391-33	159 000 601	PP Butt DN25, 1.0"
3-7000.391-34	159 000 602	PP Butt DN32, 1.25"
3-7000.391-35	159 000 603	PP Butt DN40, 1.5"
3-7000.391-36	159 000 604	PP Butt DN50, 2.0"
3-7000.391-41	159 000 593	PP SKT DN15, 0.5"
3-7000.391-42	159 000 594	PP SKT DN20, 0.75"
3-7000.391-43	159 000 595	PP SKT DN25, 1.0"
3-7000.391-44	159 000 596	PP SKT DN32, 1.25"
3-7000.391-45	159 000 597	PP SKT DN40, 1.5"
3-7000.391-46	159 000 598	PP SKT DN50, 2.0"
3-7000.391-51	159 000 581	Sch80 PVC SKT 0.5"
3-7000.391-52	159 000 582	Sch80 PVC SKT 0.75"
3-7000.391-53	159 000 583	Sch80 PVC SKT 1.0"
3-7000.391-54	159 000 584	Sch80 PVC SKT 1.25"
3-7000.391-55	159 000 585	Sch80 PVC SKT 1.5"
3-7000.391-56	159 000 586	Sch80 PVC SKT 2.0"
3-7000.391-61	159 000 587	MetricPVC SKT DN15
3-7000.391-62	159 000 588	MetricPVC SKT DN20
3-7000.391-63	159 000 589	MetricPVC SKT DN25
3-7000.391-64	159 000 590	MetricPVC SKT DN32
3-7000.391-65	159 000 591	MetricPVC SKT DN40
3-7000.391-66	159 000 592	MetricPVC SKT DN50

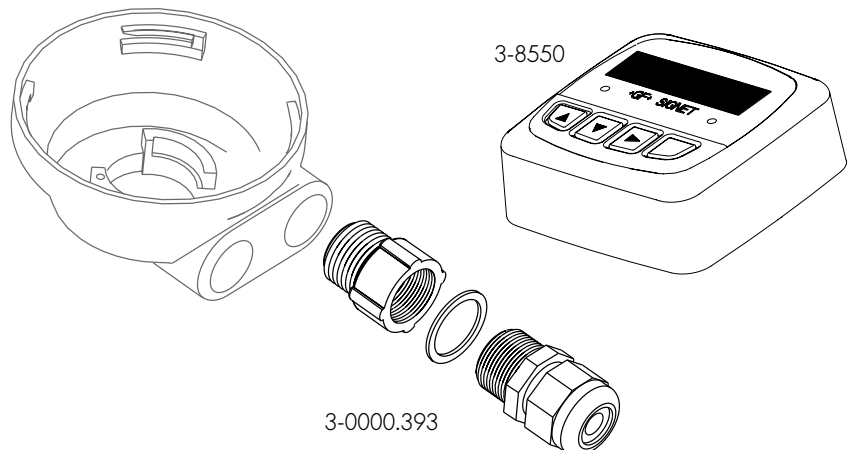
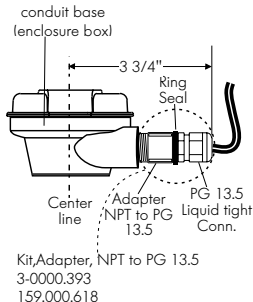
O-Ring Kits (continued)

Mfr. Part No.	Code	Description
3-7000.390-13	159 000 575	O-ring, DN15, 0.5", FPM-HP
3-7000.390-14	159 000 576	O-ring, DN20, 0.75", FPM-HP
3-7000.390-15	159 000 577	O-ring, DN25, 1.0", FPM-HP
3-7000.390-16	159 000 578	O-ring, DN32, 1.25", FPM-HP
3-7000.390-17	159 000 579	O-ring, DN40, 1.5", FPM-HP
3-7000.390-18	159 000 580	O-ring, DN50, 2.0", FPM-HP

Accessories

Mfr. Part No.	Code	Description
3-8550-1	159 000 047	Flow Transmitter for Field/Integral Mount
3-8550-2	159 000 049	Flow Transmitter w/ 2 Relays for Field/Integral Mount
3-8550-3	159 000 051	2-Channel Flow Transmitter for Field/Integral Mount
3-8050	159 000 184	Universal Adapter Kit
3-0000.393	159 000 618	Liquid Tight Connector Kit with PG 13.5 to NPT Adapter
3-8055	159 000 629	HPV/IVS Retro Kit
1203-1121	198 864 920	Base Seal
1223-0151	159 000 236	Cap O-ring

Dimensions of Adapter & Liquid Tight Connector as Mounted



Engineering Specifications

- The flow sensor shall use an encapsulated, non-moving piezoelectric sensor to detect the flow rate.
- The sensor shall be available in models usable in pipe sizes from outside diameter d20 to 63 mm, inside diameter DN 15 to 50 mm.
PVC units shall also be available in Schedule 80, 0.5 to 2 inches.
- The sensor output shall be a current loop with impedance not to exceed 800Ω with a 24 VDC supply, or an open-collector non-isolated NPN transistor with 10 mA maximum sink with a 24 VDC maximum pull-up voltage at 50% duty cycle.
- Measurement accuracy shall be $\pm 1\%$ of reading @ 25°C (77°F).
- Measurement repeatability shall be $\pm 0.5\%$ of reading @ 25°C (77°F).
- The operating range of the sensor shall accommodate nominal flow rates from 0.3 to 4 m/s (1 to 13 ft/s) depending on size.
- The sensor body shall be made of injection-molded PVDF, PP or PVC.
- The sensor shall attach to a pipe via true-union couplings. End connector options for pipe connection shall include infrared (IR) or socket fusion for PVDF or PP construction, or solvent cement sockets for PVC construction.
- The system shall be manufactured under ISO 9001 and ISO 14001 certified processes, and shall meet appropriate CE standards, including EN50082-2 for EMI immunity and EN55011 for EMI emissions. System housings shall be sealed to IP65/NEMA 4X rating.
- The flow sensor shall be +GF+ SIGNET Vortex 7000/7001 Flow Sensor.