



## MEASUREMENT AND INSTRUMENTATION FLS

The FLS Measurement and Instrumentation line consists of a comprehensive range of Flow, pH, ORP, Conductivity Sensors, Monitors and Transmitters.



Enter

# APPLICATIONS TABLE

## PRODUCT SELECTION GUIDE BY LIQUID/OPERATIVE CONDITIONS

FLS Insertion Paddlewheel and Electromagnetic Flow Sensors								
	F3.00	F3.20	F6.30	F3.10	F3.05	F6.60	F111	F6.61
clean liquid	1	1	1	1	1	1	1	1
dirty liquid	3	3	3	3	3	1	3	1
low viscous liquid	2	2	2	3	2	2	2	2
high viscous liquid	3	3	3	3	2	3	3	3
low corrosive liquid	1	1	1	2	1	1	1	1
high corrosive liquid	1	2	1	3	1	2	2	2
fibrous slurry	3	3	3	3	3	1	3	1
abrasive slurry	3	3	3	3	3	1	3	1
no conductive liquid	1	1	1	1	1	3	1	3
pulsating flow	3	3	3	3	3	3	3	3
high temperature	1	1	2	3	1	1	2	2
high pressure	2	1	2	3	2	3	2	2
big pipes	3	3	3	3	3	3	1	1

	FLS In line Ultra low Flow and Oval Gear Sensors		FLS Bulb and Flat pH/ORP Electrodes				FLS Potentiometric and Inductive Conductivity Sensors		
	ULF	F3.80	pH/ORP 200	pH/ORP 400	pH/ORP 600	pH 800	C150-200	C100-300	C6.30
clean liquid	1	1	1	1	1	1	1	1	1
dirty liquid	3	3	2	3	1	1	2	1	1
low viscous liquid	2	1	2	2	2	1	2	1	1
high viscous liquid	3	1	3	3	3	3	3	2	1
low corrosive liquid	1	1	1	1	1	1	3	2	1
high corrosive liquid	1	1	2	2	1	1	3	3	1
fibrous slurry	3	3	2	3	1	1	3	1	1
abrasive slurry	3	3	2	3	2	1	3	2	1
no conductive liquid	1	1	3	1	2	2	3	1	3
pulsating flow	3	2	1	1	1	1	1	1	1
high temperature	2	3	3	1	2	2	3	2	3
high pressure	3	3	2	1	2	2	2	2	3
big pipes	3	3	3	1	1	2	3	3	3

### LEGENDA

- 1 = Generally Suitable
- 2 = Worth Consideration
- 3 = Unsuitable

# PRODUCT SELECTION GUIDE BY PROCESS/MARKET

FLS Insertion Paddlewheel and Electromagnetic Flow Sensors								
	F3.00	F3.20	F6.30	F3.10	F3.05	F6.60	F111	F6.61
fertigation / agriculture	■			■				
swimming pool & SPAs	■		■					
waste water treatment						■		
water and pure water treatment	■	■	■					
food & beverages						■		
water distribution & leak detection							■	■
sewage						■		■
mining slurries						■		■
dosing system								
pump protection					■			
HVAC & Heat exchangers	■	■	■					
detergents/disinfectant production & dosing						■		
metal finishing/ textile process						■		

	FLS In line Ultra low Flow and Oval Gear Sensors		FLS Bulb and Flat pH/ORP Electrodes				FLS Potentiometric and Inductive Conductivity Sensors		
	ULF	F3.80	pH/ORP 200	pH/ORP 400	pH/ORP 600	pH 800	C150-200	C100-300	C6.30
fertigation / agriculture			■					■	
swimming pool & SPAs			■				■		
waste water treatment					■	■		■	
water and pure water treatment				■				■	
food & beverages				■			■		
water distribution & leak detection									
sewage					■	■			■
mining slurries					■	■			■
dosing system	■	■				■			
pump protection									
HVAC & Heat exchangers			■				■		
detergents/disinfectant production & dosing	■	■		■			■		
metal finishing/textile process				■				■	

## LEGENDA

■ = Best cost effective option


# FLS PRODUCTS COMPATIBILITY CHART

**FLS Insertion Paddlewheel and Electromagnetic Flow Sensors compatibility with FLS Instruments**

	M9.02	M9.00	M9.20	M9.50	M9.05	M9.06	M9.03	M9.07	M9.08	M9.10
<b>F3.00</b> Paddlewheel Flow sensor	■	■	■ (only coil version)	■			■	■	■	■
<b>F3.20</b> High pressure Paddlewheel Flow sensor	■	■		■			■	■	■	■
<b>F6.30</b> Paddlewheel Flow Transmitter										■
<b>F3.10</b> Paddlewheel Mini Flow sensor	■	■		■			■	■	■	■
<b>F3.05</b> Paddlewheel Flow switch										
<b>F6.60</b> Magmeter Flow Sensor	■			■			■	■	■	■
<b>F6.61</b> Hot Tap Magmeter Flow Sensor	■			■			■	■	■	■
<b>F111</b> Hot Tap Paddlewheel and Turbine Flow sensor	■	■	■ (only coil version)	■			■	■	■	■

**In Line Ultra Low Flow and Oval Gear Sensors compatibility with FLS Instruments**

	M9.02	M9.00	M9.20	M9.50	M9.05	M9.06	M9.03	M9.07	M9.08	M9.10
<b>ULF</b> Ultra Low Flow sensor	■	■ (only reed version)	■ (only reed version)	■			■	■	■	■
<b>F3.80</b> Oval Gear Flow sensor	■			■			■	■	■	■



INSERTION PADDLEWHEEL,  
TURBINE AND ELECTROMAGNETIC  
FLOW SENSORS  
**INSTALLATION VERSATILITY  
COMBINED TO APPLICATION  
FLEXIBILITY**

# FLS F3.00

## PADDLEWHEEL FLOW SENSOR



The simple and reliable paddlewheel flow sensor type F3.00 is designed for use with every kind of solid-free liquids. The sensor can measure flow from 0.15 m/s (0.5 ft/s) producing a frequency output signal highly repeatable. A rugged construction and a proven technology guarantee exceptional performances with little or no maintenance required.

A dedicated electronic, with a push-pull output, is available for a safe connection to any kind of PLC/Instrument digital input.

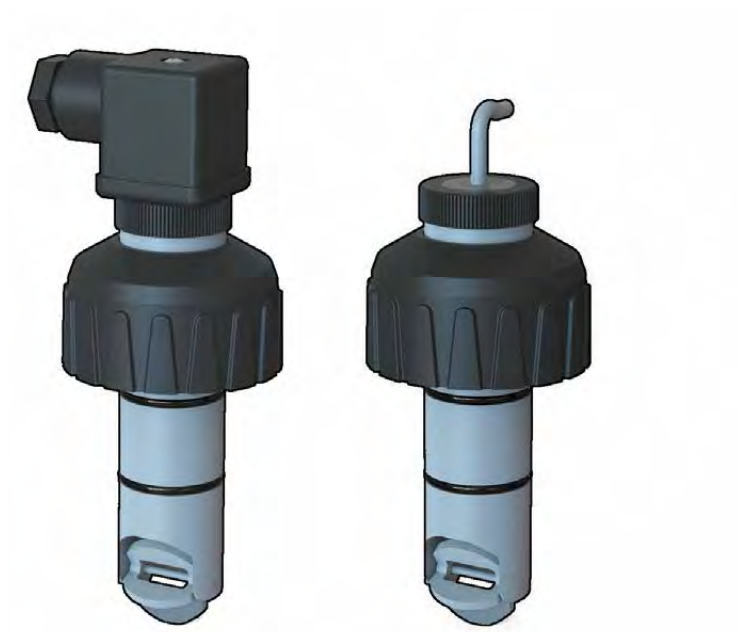
A specially designed family of fittings ensures an easy and quick installation into all pipe materials in sizes from DN15 to DN600 (0.5" to 24").

### APPLICATIONS

- Water treatment and regeneration
- Industrial wastewater treatment and recovery
- Textile finishing
- Water distribution
- Processing and manufacturing industry
- Filtration systems
- Chemical production
- Liquid delivery systems
- Cooling water monitoring
- Heat Exchangers
- Swimming pools
- Pump protection

### MAIN FEATURES

- C-PVC, PVDF or Stainless Steel sensor body
- Two sensor lengths to cover from DN15 up to DN600
- Easy insertion system
- IP65 or IP68 protection class
- Measurement range over 50:1
- High chemical resistance
- Version for battery powered system
- Push-Pull output for universal electrical connection



## TECHNICAL DATA

### General

- Pipe Size Range: DN15 to DN600 (0.5" to 24")  
Please refer to Installation Fittings section for more details
- Flow Rate Range: 0.15 to 8 m/s (0.5 to 25 ft./s)
- Linearity:  $\pm 0.75\%$  of full scale
- Repeatability:  $\pm 0.5\%$  of full scale
- Minimum Reynolds Number Required: 4500
- Enclosure: IP68 or IP65
- Wetted Materials:
  - sensor Body: C-PVC, PVDF or 316L SS
  - o-rings: EPDM or FPM
  - rotor: ECTFE (Halar®)
  - shaft: Ceramic ( $Al_2O_3$ )/316L SS (only for metal sensors)
  - bearings: Ceramic ( $Al_2O_3$ )

### Specific for F3.00.H

- Supply voltage: 5 to 24 VDC  $\pm 10\%$  regulated
- Supply current:  $< 30\text{ mA}$  @ 24 VDC
- Output signal:
  - square wave
  - frequency: 45 Hz per m/s nominal (13.7 Hz per ft/s nominal)
  - type: transistor NPN open collector
  - output current: 10 mA max
- Cable length: 8 m (26.4 ft) standard, 300 m (990 ft) maximum

### Specific for F3.00.C

- Supply voltage: 3 to 5 VDC regulated or 3.6 Volt Lithium battery
- Supply current:  $< 10\ \mu\text{A}$  max

- Output signal:
  - square wave
  - frequency: 45 Hz per m/s nominal (13.7 Hz per ft/s nominal)
  - min. input impedance: 100 K $\Omega$
- Cable length: 8 m (26.4 ft) standard, 16 m (52.8 ft) maximum

### Specific for F3.00.P

- Supply voltage: 12 to 24 VDC  $\pm 10\%$  regulated
- Supply current:  $< 30\text{ mA}$  @ 24 VDC
- Output signal:
  - square wave
  - frequency: 45 Hz per m/s nominal (13.7 Hz per ft/s nominal)
  - type: Push-Pull (for connection to NPN and PNP inputs)
  - output current: 20 mA max
- Cable length: 8 m (26.4 ft) standard, 300 m (990 ft) maximum

### Standards & Approvals

- Manufactured under ISO 9001
- Manufactured under ISO 14001
- CE
- RoHS Compliant
- EAC

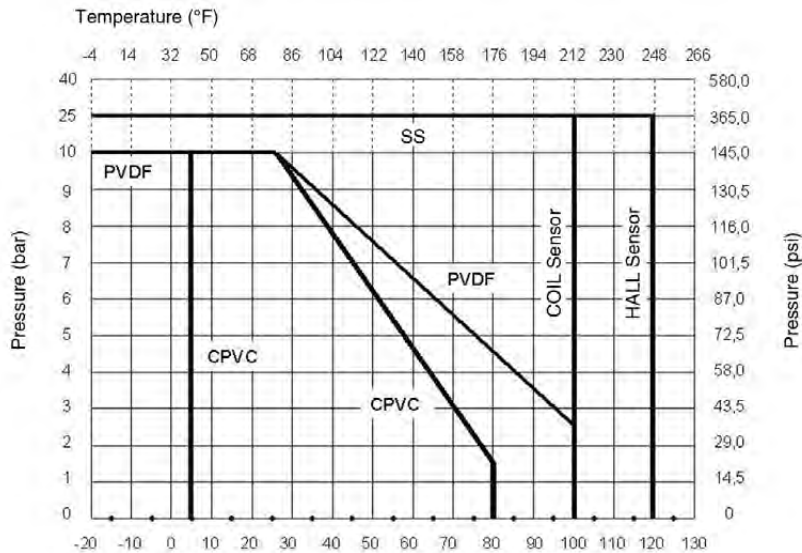
### Maximum Operating Pressure / Temperature (25 years lifetime)

#### F3.00.H or F3.00.P Sensor

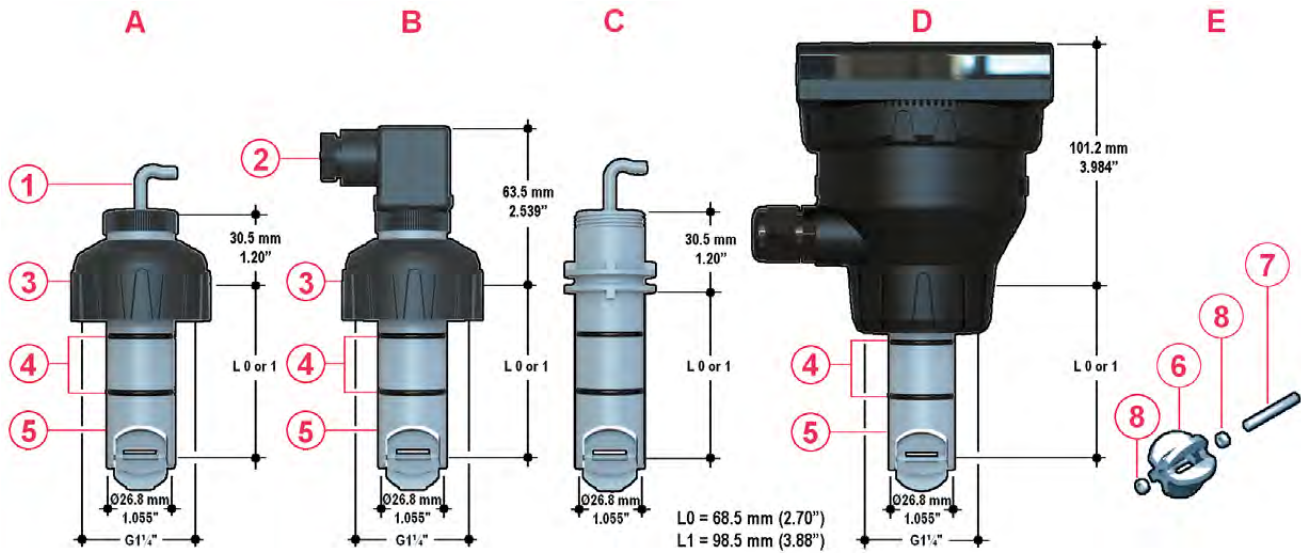
- C-PVC body:
  - 10 bar (145 psi) @ 25°C (77°F)
  - 1,5 bar (22 psi) @ 80° C (176°F)
- PVDF body:
  - 10 bar (145 psi) @ 25°C (77°F)
  - 2,5 bar (36 psi) @ 100°C (212°F)
- SS body:
  - 25 bar (363 psi) @ 120°C (248°F)

#### F3.00.C Sensor

- C-PVC body:
  - 10 bar (145 psi) @ 25°C (77°F)
  - 1,5 bar (22 psi) @ 80° C (176°F)
- PVDF body:
  - 10 bar (145 psi) @ 25°C (77°F)
  - 2,5 bar (36 psi) @ 100°C (212°F)
- SS body:
  - 25 bar (363 psi) @ 100°C (212°F)



# DIMENSIONS



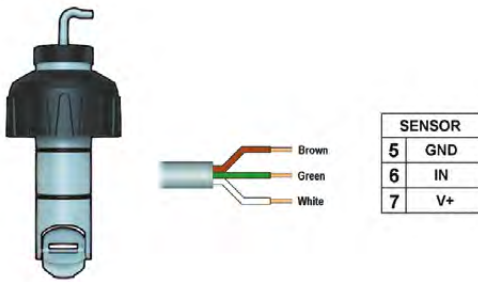
- A F3.00 IP68 Remote Sensor
- B F3.00 IP65 Remote Sensor
- C F3.01 Compact Sensor
- D F3.01 Compact Sensor + Transmitter (sold separately)
- E Paddlewheel system

- 1 Electrical cable: 8 m. (26.4 ft) standard
- 2 4 pole cable plug according to DIN 43650-B/ISO 6952
- 3 UPVC cap for installation into fittings
- 4 O-Ring seals available in EPDM or FPM

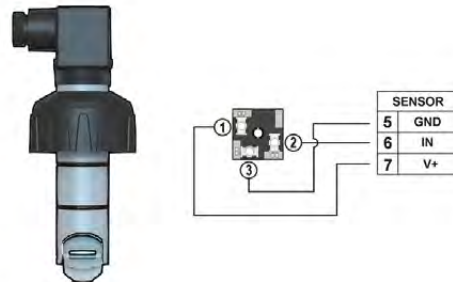
- 5 C-PVC, PVDF or Stainless Steel sensor body
- 6 ECTFE Halar® (registered trademark of Ausimont-Solvay) Open-cell rotor
- 7 Ceramic shaft
- 8 Ceramic bearings

# WIRING CONNECTIONS

F3.00 IP68 Sensor wiring connection



F3.00 IP65 Sensor wiring connection





## ORDERING DATA

F3.00.H.XX Paddlewheel Flow Sensors (Remote version)							
Part No.	Version	Power supply	Length	Main wetted materials	Enclosure	Flow Rate Range	Weight (gr.)
F3.00.H.01	Hall	5 - 24 VDC	L0	C-PVC/ EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.02	Hall	5 - 24 VDC	L0	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.03	Hall	5 - 24 VDC	L1	C-PVC/ EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.04	Hall	5 - 24 VDC	L1	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.05	Hall	5 - 24 VDC	L0	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.06	Hall	5 - 24 VDC	L0	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.07	Hall	5 - 24 VDC	L1	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.08	Hall	5 - 24 VDC	L1	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.09	Hall	5 - 24 VDC	L0	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.H.10	Hall	5 - 24 VDC	L0	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.H.11	Hall	5 - 24 VDC	L1	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.H.12	Hall	5 - 24 VDC	L1	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.H.13	Hall	5 - 24 VDC	L0	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.14	Hall	5 - 24 VDC	L0	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.15	Hall	5 - 24 VDC	L1	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.16	Hall	5 - 24 VDC	L1	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.17	Hall	5 - 24 VDC	L0	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.18	Hall	5 - 24 VDC	L0	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.H.19	Hall	5 - 24 VDC	L1	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.20	Hall	5 - 24 VDC	L1	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.H.21	Hall	5 - 24 VDC	L0	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.H.22	Hall	5 - 24 VDC	L0	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.H.23	Hall	5 - 24 VDC	L1	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.H.24	Hall	5 - 24 VDC	L1	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	650

INSERTION FLOW SENSORS

## ORDERING DATA

F3.00.C.XX Paddlewheel Flow Sensors (Remote version)							
Part No.	Version	Power supply	Length	Main wetted materials	Enclosure	Flow Rate Range	Weight (gr.)
F3.00.C.01	Coil	3 - 5 VDC	L0	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.02	Coil	3 - 5 VDC	L0	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.03	Coil	3 - 5 VDC	L1	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.04	Coil	3 - 5 VDC	L1	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.05	Coil	3 - 5 VDC	L0	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.06	Coil	3 - 5 VDC	L0	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.07	Coil	3 - 5 VDC	L1	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.08	Coil	3 - 5 VDC	L1	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.09	Coil	3 - 5 VDC	L0	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.C.10	Coil	3 - 5 VDC	L0	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.C.11	Coil	3 - 5 VDC	L1	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.C.12	Coil	3 - 5 VDC	L1	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.C.13	Coil	3 - 5 VDC	L0	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.14	Coil	3 - 5 VDC	L0	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.15	Coil	3 - 5 VDC	L1	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.16	Coil	3 - 5 VDC	L1	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.17	Coil	3 - 5 VDC	L0	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.18	Coil	3 - 5 VDC	L0	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.C.19	Coil	3 - 5 VDC	L1	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.20	Coil	3 - 5 VDC	L1	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.C.21	Coil	3 - 5 VDC	L0	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.C.22	Coil	3 - 5 VDC	L0	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.C.23	Coil	3 - 5 VDC	L1	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.C.24	Coil	3 - 5 VDC	L1	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	650

## ORDERING DATA

F3.00.P.XX Paddlewheel Flow Sensors (for direct connection to PLC)							
Part No.	Version	Power supply	Length	Main wetted materials	Enclosure	Flow Rate Range	Weight (gr.)
F3.00.P.01	Push-Pull	12 - 24 VDC	L0	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.02	Push-Pull	12 - 24 VDC	L0	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.03	Push-Pull	12 - 24 VDC	L1	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.04	Push-Pull	12 - 24 VDC	L1	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.05	Push-Pull	12 - 24 VDC	L0	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.06	Push-Pull	12 - 24 VDC	L0	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.07	Push-Pull	12 - 24 VDC	L1	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.08	Push-Pull	12 - 24 VDC	L1	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.09	Push-Pull	12 - 24 VDC	L0	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.P.10	Push-Pull	12 - 24 VDC	L0	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.P.11	Push-Pull	12 - 24 VDC	L1	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.P.12	Push-Pull	12 - 24 VDC	L1	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.P.13	Push-Pull	12 - 24 VDC	L0	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.14	Push-Pull	12 - 24 VDC	L0	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.15	Push-Pull	12 - 24 VDC	L1	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.16	Push-Pull	12 - 24 VDC	L1	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.17	Push-Pull	12 - 24 VDC	L0	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.18	Push-Pull	12 - 24 VDC	L0	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.00.P.19	Push-Pull	12 - 24 VDC	L1	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.20	Push-Pull	12 - 24 VDC	L1	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.00.P.21	Push-Pull	12 - 24 VDC	L0	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.P.22	Push-Pull	12 - 24 VDC	L0	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.00.P.23	Push-Pull	12 - 24 VDC	L1	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.00.P.24	Push-Pull	12 - 24 VDC	L1	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	650

INSERTION FLOW SENSORS

## ORDERING DATA

F3.01.X.XX Paddlewheel Flow Sensors (Compact version)							
Part No.	Version	Power supply	Length	Main wetted materials	Enclosure	Flow Rate Range	Weight (gr.)
F3.01.H.01	Hall	5 - 24 VDC	L0	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.H.02	Hall	5 - 24 VDC	L0	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.H.03	Hall	5 - 24 VDC	L1	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.H.04	Hall	5 - 24 VDC	L1	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.H.05	Hall	5 - 24 VDC	L0	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.H.06	Hall	5 - 24 VDC	L0	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.H.07	Hall	5 - 24 VDC	L1	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.H.08	Hall	5 - 24 VDC	L1	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.H.09	Hall	5 - 24 VDC	L0	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.01.H.10	Hall	5 - 24 VDC	L0	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.01.H.11	Hall	5 - 24 VDC	L1	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.01.H.12	Hall	5 - 24 VDC	L1	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.01.C.01	Coil	3 - 5 VDC	L0	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.C.02	Coil	3 - 5 VDC	L0	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.C.03	Coil	3 - 5 VDC	L1	C-PVC/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.C.04	Coil	3 - 5 VDC	L1	C-PVC/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.C.05	Coil	3 - 5 VDC	L0	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.C.06	Coil	3 - 5 VDC	L0	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	250
F3.01.C.07	Coil	3 - 5 VDC	L1	PVDF/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.C.08	Coil	3 - 5 VDC	L1	PVDF/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	300
F3.01.C.09	Coil	3 - 5 VDC	L0	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.01.C.10	Coil	3 - 5 VDC	L0	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	600
F3.01.C.11	Coil	3 - 5 VDC	L1	316SS/EPDM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650
F3.01.C.12	Coil	3 - 5 VDC	L1	316SS/FPM	IP68	0.15 to 8 m/s (0.5 to 25 ft./s.)	650

# FLS F3.20

## HIGH PRESSURE PADDLEWHEEL FLOW SENSOR



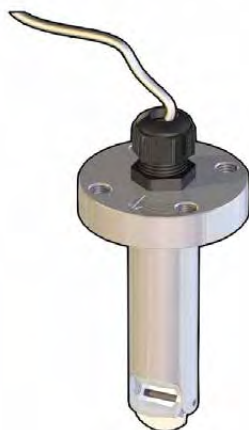
FLS F3.20 is a paddlewheel flow sensor suitable for system at high pressure and at critical temperature. F3.20 is designed for use with every kind of solid-free liquids in compliance with chemical compatibilities of wetted materials. First quality materials used, as SS for body/shaft and Halar® for rotor, grant high mechanical performances and an appreciated reliability. Sensor needs a very limited maintenance and, in those cases, it's easy to perform due to a 4 screws system and to a graphite flat gasket. F3.20 sensor is available for connection to FLS monitors and for PLC connection directly. SS weld on adapter is available for sensor installation on pipe range from 1 ½" to 8" (DN40 to DN200).

### APPLICATIONS

- Heat Exchangers
- Reverse osmosis
- Cooling systems
- HVAC systems (heating, ventilation and air conditioning)
- Boiler feedwater

### MAIN FEATURES

- Working range up to 110 bar (1600 PSI) and up to 248°F (120 °C)
- Wide operating range (from 0,15 to 8 m/s)
- Just one sensor and one fitting for a wide range of pipe dimensions (from 1 ½" to 8")
- High linearity and repeatability
- Limited maintenance need and easy execution
- Available special version for direct connection to PLC



# TECHNICAL DATA

## General

- Pipe Size Range: DN40 to DN200 (0.5 to 8 in). Refer to Installation Fittings section for more details
- Flow Rate Range: 0.15 to 8 m/s (0.5 to 25 ft./s)
- Linearity:  $\pm 0.75\%$  of full scale
- Repeatability:  $\pm 0.5\%$  of full scale
- Pressure: 110 bar (1600 psi)
- Temperature: 120 °C (248 °F)
- Minimum Reynolds Number Required: 4500
- Enclosure: IP68
- Wetted Materials:
  - sensor Body: 316L SS
  - sealing system: graphite flat gasket
  - rotor: ECTFE (Halar®)
  - shaft: AISI316L

## Specific for F3.20.H

- Supply voltage: 5 to 24 VDC regulated
- Supply current:  $< 30$  mA @ 24 VDC
- Output signal:
  - square wave
  - frequency: 45 Hz per m/s nominal (13.7 Hz per ft/s nominal)
  - output type: transistor NPN open collector
  - output current: 10 mA max
- Cable length: 8 m (26.4 ft) standard, 300 m (990 ft) maximum

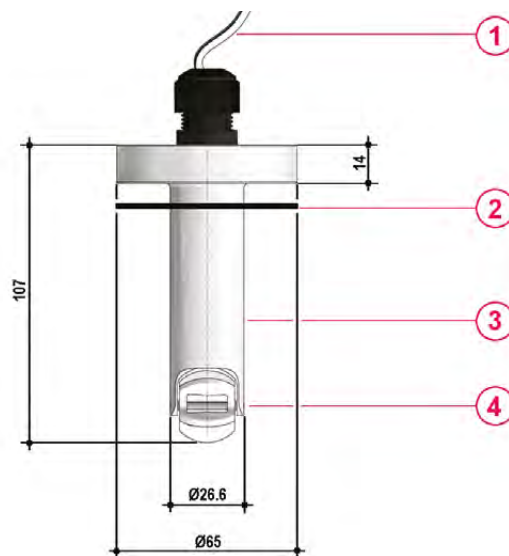
## Specific for F3.20.P

- Supply voltage: 12 to 24 VDC regulated
- Supply current:  $< 30$  mA @ 24 VCC
- Output signal:
  - square wave
  - output frequency: 45 Hz per m/s nominal (13.7 Hz per ft/s nominal)
  - output type: Push - Pull (digital input NPN or PNP)
  - output current: IOut max  $< 20$  mA
- Cable length: 8 m (26.4 ft) standard, 300 m (990 ft) maximum

## Standards & Approvals

- Manufactured under ISO 9001
- Manufactured under ISO 14001
- CE
- RoHS Compliant
- EAC

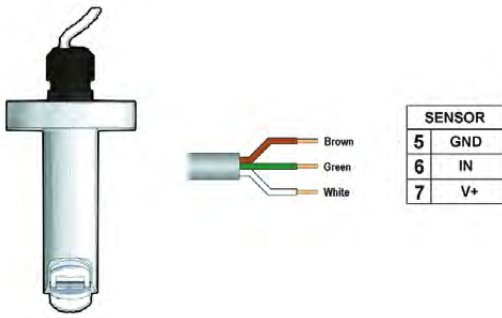
# DIMENSIONS



- 1 Electrical cable: 8 m. (26.4 ft) standard
- 2 Flat gasket
- 3 316L SS sensor body
- 4 ECTFE Halar® Open-cell rotor and Stainless Steel Shaft

# WIRING CONNECTIONS

## F3.20 IP68 Sensor wiring connection



## ORDERING DATA

F3.20.X.01 High Pressure Paddlewheel Flow Sensors							
Part No.	Version	Power supply	Length	Main Wetted Materials	Enclosure	Flow Rate Range	Weight (gr.)
F3.20.H.01	Hall	5- 24 VDC	107 mm	316L SS	IP 68	0.15 to 8 m/s (0.5 to 25 ft./s)	600
F3.20.P.01	Push-Pull	12- 24 VDC	107 mm	316L SS	IP 68	0.15 to 8 m/s (0.5 to 25 ft./s)	600

# FLS F6.30 PADDLEWHEEL FLOW TRANSMITTER



The new FLS F6.30 is a blind transmitter based on paddlewheel. It can be applied for the measurement of every kind of solid-free liquids. The F6.30 can provides different output options using a 4-20 mA and a Solid State Relay. Analog output can be used for long distance transmission and SSR can be set as an alarm or as a volumetric pulse output. F6.30 Paddlewheel Flow Transmitter is provided with an USB interface and a dedicated software (freely downloadable from FLS web site) which allows to easily calibrate instrument and to intuitively set outputs by a PC. The specific design allows an accurate flow measurement over a wide dynamic range in pipe sizes from DN15 (0.5") to DN600 (24").

## APPLICATIONS

- Industrial water and wastewater treatment
- Cooling water systems
- Swimming pools
- Flow control and monitoring
- Water treatment
- Water regeneration plant
- Processing and manufacturing industry
- Water distribution

## MAIN FEATURES

- High chemical resistance
- Pipe size range: from DN15 (0,5") to DN600 (24")
- Low pressure drop
- Friendly calibration procedure
- 4-20 mA, frequency or volumetric pulse output settable by USB
- SSR settable as alarm by PC





## TECHNICAL DATA

### General

- Pipe Size Range: DN15 to DN600 (0.5" to 24")  
Please refer to Installation Fittings section for more details
- Flow Rate Range: 0.15 to 8 m/s (0.5 to 25 ft./s)
- Linearity:  $\pm 0.75\%$  of full scale
- Repeatability:  $\pm 0.5\%$  of full scale
- Minimum Reynolds Number Required: 4500
- Enclosure: IP65
- Wetted Materials:
  - sensor Body: C-PVC, PVDF or 316L SS
  - o-rings: EPDM or FPM
  - rotor: ECTFE (Halar®)
  - shaft: Ceramic ( $Al_2O_3$ )/ 316L SS (only for metal sensors)
  - bearings: Ceramic ( $Al_2O_3$ )

### Electrical

- Power Supply:
  - 12 to 24 VDC  $\pm 10\%$  regulated (reverse polarity and short circuit protected)
  - maximum current: consumption: 150 mA
  - protective earth:  $< 10 \Omega$
- 1 X Current output:
  - 4-20 mA, isolated
  - max. loop impedance:  $800 \Omega @ 24 VDC - 250 \Omega @ 12 VDC$
- 1 X Solid State Relay output:
  - user selectable as MIN alarm, MAX alarm, Volumetric, Pulse Out, Window alarm, Off
  - optically isolated, 50 mA MAX sink, 24 VDC MAX pull-up voltage
  - max pulse/min: 300
  - hysteresis: User selectable

### Environmental

- Storage Temperature:  $-30^\circ C$  to  $+80^\circ C$  ( $-22^\circ F$  to  $176^\circ F$ )
- Ambient Temperature:  $-20^\circ C$  to  $+70^\circ C$  ( $-4^\circ F$  to  $158^\circ F$ )
- Relative Humidity: 0 to 95% (non-condensing)

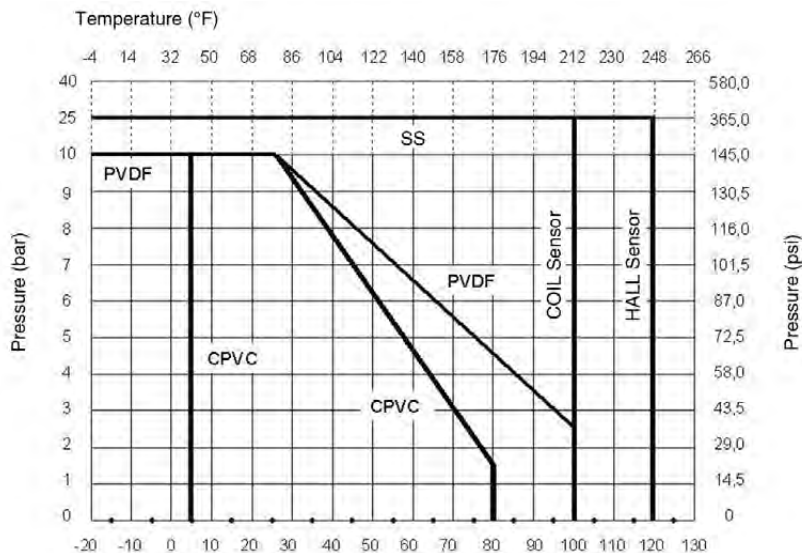
### Standards & Approvals

- Manufactured under ISO 9001
- Manufactured under ISO 14001
- CE
- RoHS Compliant
- EAC

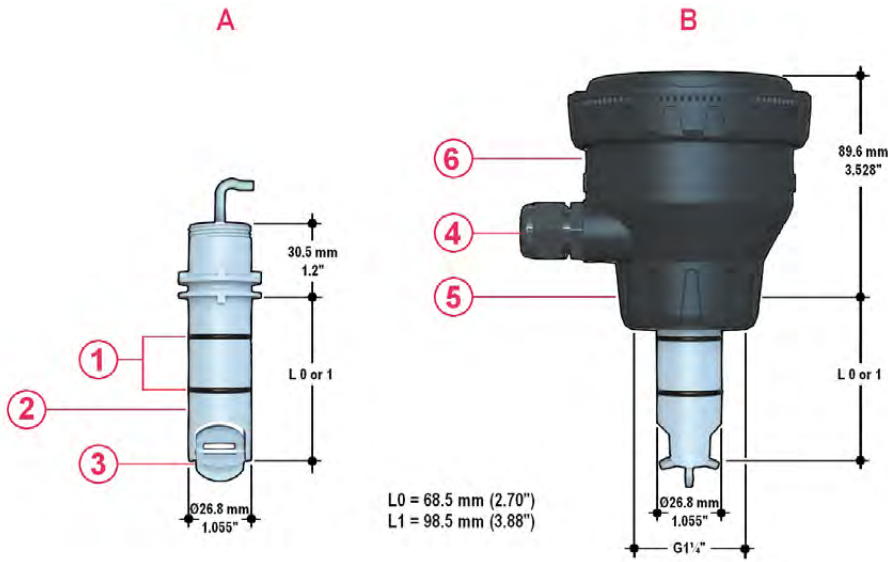
### Maximum Operating Pressure / Temperature (25 years lifetime)

#### F6.30 Transmitter

- C-PVC body:
  - 10 bar (145 psi) @  $25^\circ C$  ( $77^\circ F$ )
  - 1,5 bar (22 psi) @  $80^\circ C$  ( $176^\circ F$ )
- PVDF body:
  - 10 bar (145 psi) @  $25^\circ C$  ( $77^\circ F$ )
  - 2,5 bar (36 psi) @  $100^\circ C$  ( $212^\circ F$ )
- SS body:
  - 25 bar (363 psi) @  $100^\circ C$  ( $212^\circ F$ )



# DIMENSIONS



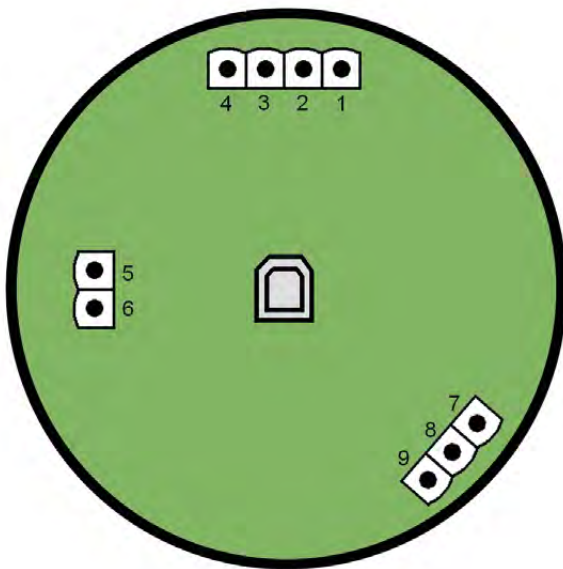
A Sensor body  
 B F6.30 Paddlewheel Flow Transmitter

- 1 O-Ring (EPDM or FPM)
- 2 Sensor body PVCC, PVDF, 316L SS
- 3 Halar Rotor, Ceramic shaft & bearings
- 4 Cable Gland

- 5 ABS cap for installation into fittings
- 6 Electronic box

# WIRING CONNECTIONS

Rear Terminal View



1	+VDC	Power Supply
2	+LOOP	
3	-LOOP	
4	-VDC	
5	NO	SSR
6	COM	
7	GND	Flow Sensor
8	FREQ IN	
9	+V	

## ORDERING DATA

FLS F6.30.XX Paddlewheel Flow Transmitters							
Part No.	Version	Power supply	Length	Main wetted materials	Enclosure	Flow Rate Range	Weight (gr.)
F6.30.01	Hall	12 - 24 VDC	L0	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	750
F6.30.02	Hall	12 - 24 VDC	L0	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	750
F6.30.03	Hall	12 - 24 VDC	L1	C-PVC/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	800
F6.30.04	Hall	12 - 24 VDC	L1	C-PVC/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	800
F6.30.05	Hall	12 - 24 VDC	L0	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	750
F6.30.06	Hall	12 - 24 VDC	L0	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	750
F6.30.07	Hall	12 - 24 VDC	L1	PVDF/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	800
F6.30.08	Hall	12 - 24 VDC	L1	PVDF/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	800
F6.30.09	Hall	12 - 24 VDC	L0	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	950
F6.30.10	Hall	12 - 24 VDC	L0	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	950
F6.30.11	Hall	12 - 24 VDC	L1	316SS/EPDM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	1000
F6.30.12	Hall	12 - 24 VDC	L1	316SS/FPM	IP65	0.15 to 8 m/s (0.5 to 25 ft./s.)	1000

INSERTION FLOW SENSORS

# FLS F3.10

## PADDLEWHEEL MINI FLOW SENSOR



The simple and reliable paddlewheel technology has been moved into this MINIFLOW sensor type FLS F3.10, designed for use with every kind of solid-free liquids. The sensor can measure flow from 0.25 m/s (0.8 ft/s) producing a frequency output signal highly repeatable. A rugged construction and a proven technology guarantee exceptional performances with little or no maintenance required. The very small dimension and a special design make it suitable for installation on FIP standard Tee-fittings from DN15 to DN40 (0.5 to 1.5 in.).

### APPLICATIONS

- Water treatment
- Filtration systems
- Pure water production
- Water monitoring
- Fertigation

### MAIN FEATURES

- IP68 enclosure
- ABS body with EPDM or FPM seal
- ABS 4-blade paddlewheel (no bearings)
- Mono-directional design
- Installation on standard FIP tees
- PVDF body version on request



## TECHNICAL DATA

### General

- Pipe Size Range: DN15 to DN40 (0.5 to 1 1/2")
- Please refer to Installation Fittings section for more details
- Flow Rate Range: 0.25 to 4 m/s (0.8 to 12,5 ft./s)
- Linearity:  $\pm 1\%$  of full scale
- Repeatability:  $\pm 0.5\%$  of full scale. Minimum Reynolds Number Required: 4500
- Enclosure: IP68
- Operating Pressure:
  - max 10 bar (145 psi) @ 20 °C (68°F)
  - max 2 bar (30 psi) @ 70 °C (158°F)
- Operating Temperature: -20°C to 70°C (-4°F to 158°F).
- Wetted Materials:
  - sensor Body: ABS (PVDF for special version)
  - o-rings: EPDM or FPM
  - rotor: ABS (PVDF for special version)
  - shaft: 316L SS
  - magnets: SmCo<sub>5</sub>

### Electrical

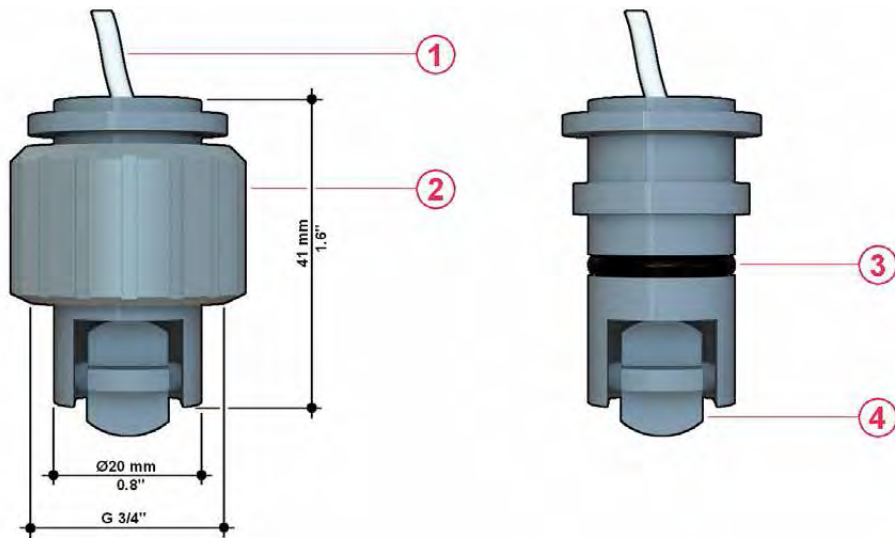
- Supply current: < 30 mA @ 24 VDC
- Output signal:
  - square wave
  - output frequency: 15 Hz per m/s nominal (4,6 Hz per ft/s nominal)
  - output type: transistor NPN open collector
  - output current: 10 mA max
- Cable length: 2 m (6,5 ft) standard, 300 m (990 ft)

maximum

### Standards & Approvals

- Manufactured under ISO 9001
- Manufactured under ISO 14001
- CE
- RoHS Compliant
- EAC

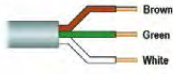
## DIMENSIONS



- 1 Electrical cable: 8 m. (26.4 ft) standard
- 2 UPVC cap for installation into fittings
- 3 O-Ring seals available in EPDM or FPM
- 4 ABS 4-blade rotor and SS shaft

# WIRING CONNECTIONS

## F3.10 IP68 Sensor wiring connection



SENSOR	
5	GND
6	IN
7	V+

## ORDERING DATA

F3.10.H.XX Paddlewheel Miniflow Sensors							
Part No.	Version	Power supply	Length	Main wetted materials	Enclosure	Flow Rate Range	Weight (gr.)
F3.10.H.01	Hall	5 - 24 VDC	41 mm	ABS/EPDM	IP68	0.25 to 4 m/s (0.8 to 12,5 ft./s)	100
F3.10.H.02	Hall	5 - 24 VDC	41 mm	ABS/FPM	IP68	0.25 to 4 m/s (0.8 to 12,5 ft./s)	100

# FLS F3.05

## PADDLEWHEEL FLOW SWITCH



The simple insertion paddlewheel flow switch type F3.05 is designed to protect a pump from running dry or pumping against a closed valve. It is equipped with a mechanical SPST contact activated when the flow velocity drops below the factory preset value of 0.15 m/s (0.5 ft/s). The F3.05 features a LED which shows the flow status locally.

A specially designed family of fitting ensures an easy and quick installation into all pipe materials in sizes from DN15 to DN600 (0.5" to 24").

### APPLICATIONS

- Pump protection
- Filtration systems
- Cooling water systems

### MAIN FEATURES

- C-PVC, PVDF, Stainless Steel body
- Easy insertion system
- High chemical resistance
- No-Flow alarm relay output
- Highly visible Local Bicolour Status Indicator
- Maintenance free
- Very low pressure drop



# TECHNICAL DATA

## General

- Pipe Size Range: DN15 to DN600 (0.5 to 24 in.)  
Please refer to Installation Fittings section for more details
- Supply voltage: 12 to 24 VDC  $\pm$  10% regulated
- Supply current: < 50 mA
- Relay Output: mechanical SPDT contact, 1A @ 24 VDC, 0.1A @ 230 VAC
- Local Status Indicator:
  - GREEN Led = Flow
  - RED Led = No Flow
- No-Flow Rate Point: 0.15 m/s (0.5 ft./s)
- Enclosure: IP65
- Wetted Materials:
  - sensor Body: C-PVC or PVDF or 316L SS
  - o-rings: EPDM or FPM
  - rotor: ECTFE (Halar®)
  - shaft: Ceramic ( $Al_2O_3$ )
  - bearings: Ceramic ( $Al_2O_3$ )

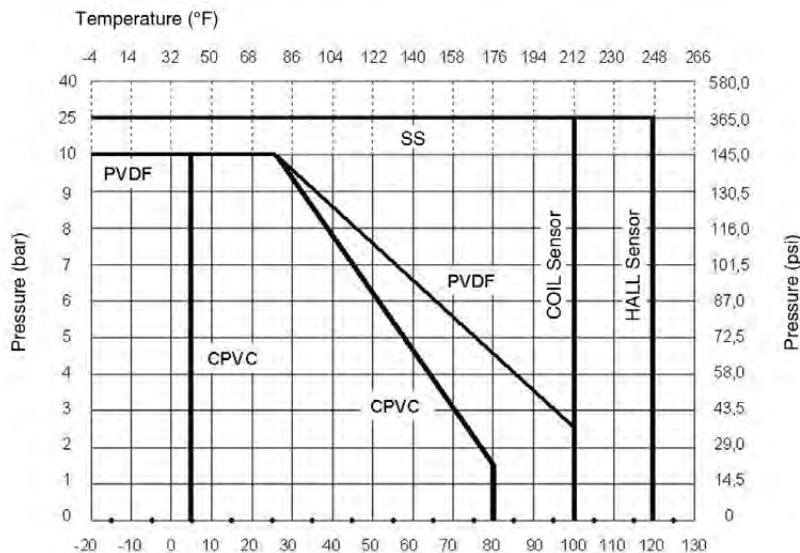
## Standards & Approvals

- Manufactured under ISO 9001
- Manufactured under ISO 14001
- CE
- RoHS Compliant
- EAC

## Maximum Operating Pressure / Temperature (25 years lifetime)

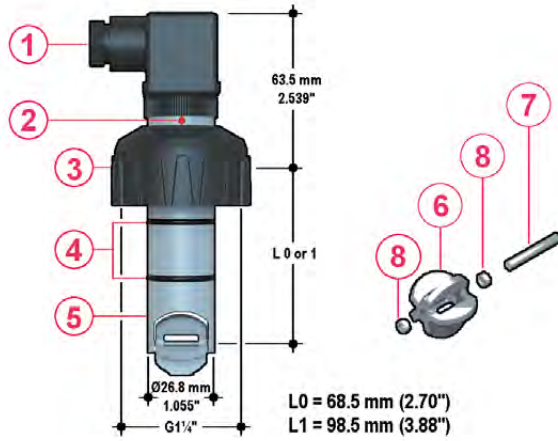
### F3.05 Sensor

- C-PVC body:
  - 10 bar (145 psi) @ 25°C (77°F)
  - 1,5 bar (22 psi) @ 80° C (176°F)
- PVDF body:
  - 10 bar (145 psi) @ 25°C (77°F)
  - 2,5 bar (36 psi) @ 100°C (212°F)
- SS body:
  - 25 bar (363 psi) @ 120°C (248°F)





## DIMENSIONS

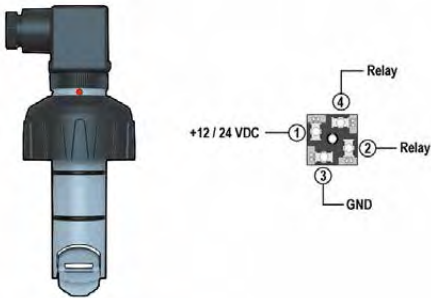


- 1 4 pole cable plug according to DIN 43650-B/ISO 6952
- 2 Local Bicolour Status LED
- 3 UPVC cap for installation into fittings
- 4 O-Ring seals available in EPDM or FPM

- 5 C-PVC, PVDF or Stainless Steel sensor body
- 6 ECTFE (Halar®) Open-cell rotor,
- 7 Ceramic shaft
- 8 Ceramic bearings

## WIRING CONNECTIONS

### F3.05 sensor wiring connection



## ORDERING DATA

F3.05.XX Paddlewheel Flow Switches							
Part No.	Version	Power supply	Length	Main wetted materials	Enclosure	Flow Rate Range	Weight (gr.)
F3.05.01	Hall	12 to 24 VDC	L0	C-PVC/EPDM	IP65	-	250
F3.05.02	Hall	12 to 24 VDC	L0	C-PVC/FPM	IP65	-	250
F3.05.03	Hall	12 to 24 VDC	L1	C-PVC/EPDM	IP65	-	300
F3.05.04	Hall	12 to 24 VDC	L1	C-PVC/FPM	IP65	-	300
F3.05.05	Hall	12 to 24 VDC	L0	PVDF/EPDM	IP65	-	250
F3.05.06	Hall	12 to 24 VDC	L0	PVDF/FPM	IP65	-	250
F3.05.07	Hall	12 to 24 VDC	L1	PVDF/EPDM	IP65	-	300
F3.05.08	Hall	12 to 24 VDC	L1	PVDF/FPM	IP65	-	300
F3.05.09	Hall	12 to 24 VDC	L0	316L SS/EPDM	IP65	-	600
F3.05.10	Hall	12 to 24 VDC	L0	316L SS/FPM	IP65	-	600
F3.05.11	Hall	12 to 24 VDC	L1	316L SS/EPDM	IP65	-	650
F3.05.12	Hall	12 to 24 VDC	L1	316L SS/FPM	IP65	-	650



INSTALLATION  
& OPERATING GUIDELINES  
**FOR INSERTION FLOW SENSORS**

## INSTALLATION GUIDELINES

### Insertion Technology Main Features

- All the insertion technology flow sensors are velocity-based flow measurement devices;
- The installation typically requires only a small hole in the pipe for sensor perpendicular mounting;
- Sensors dimension are not pipe size specific: almost independent from pipe cross section.

### Flow Sensor Installation

The placement of a flow meter is critical to get an accurate and reliable reading. For a flow meter proper performance it is necessary to check:

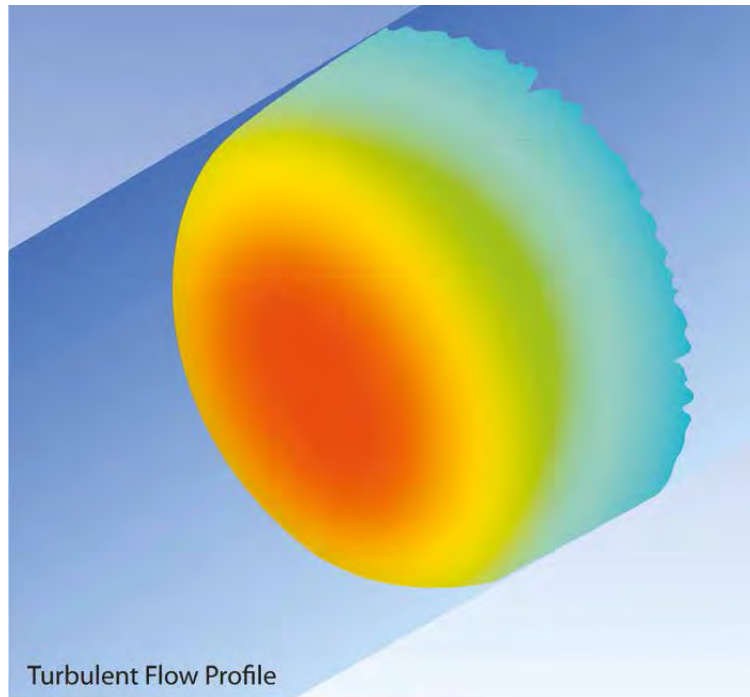
- Full pipe at every time;
- Uniform flow velocity into the pipe.

### Full Pipe Condition

If the pipe is not full the flow meter will give inaccurate reading even if the sensor is always completely submerged. Sensor will make the flow rate calculation on the assumption that the pipe is full, leading to overestimation of the flow. A pump intake or an outlet on the bottom of a tank does not necessary ensure the pipe always running full; air can be sucked by pumps or it could remain entrapped when the pipe was empty. Anyway the flowmeter should be always situated in the lowest point of the pipe and there should be downstream the flowmeter a part of the pipe placed 1 x ID higher than where the flow meter is located.

### Uniform Flow Velocity

Insertion flow meters measure the velocity of the liquid. It is important the velocity is uniform across the entire cross section of the pipe in the location of the sensor. Flow patterns are distorted both downstream and upstream of any disturbance. In a pipe, liquid at the edge of the pipe moves slower than towards the center because of friction along the walls. In a straight run of pipe, area with similar velocities can be depicted as concentric rings.



## Pipe Location

- The six most common installation configurations shown in fig. 1 help in selecting the best location in the pipeline for paddlewheel flow sensor as well for magmeter flow sensor.
- The three configurations in fig. 2 ensure that the pipe is always full: for a correct measurement the sensor can NOT be exposed to air bubbles at any time.
- The three installations in Fig. 3 should be avoided unless you are absolutely sure the sensor is not exposed to air bubbles.
- In gravity-flow systems the connection to the tank must be designed so the level does not drop below the outlet: this to avoid pipe to draw air from the tank causing a inaccurate measurement of sensor (see Fig. 4).
- For more information, please refer to EN ISO 5167-1.
- Always maximize distance between flow sensors and pumps.

Fig.1

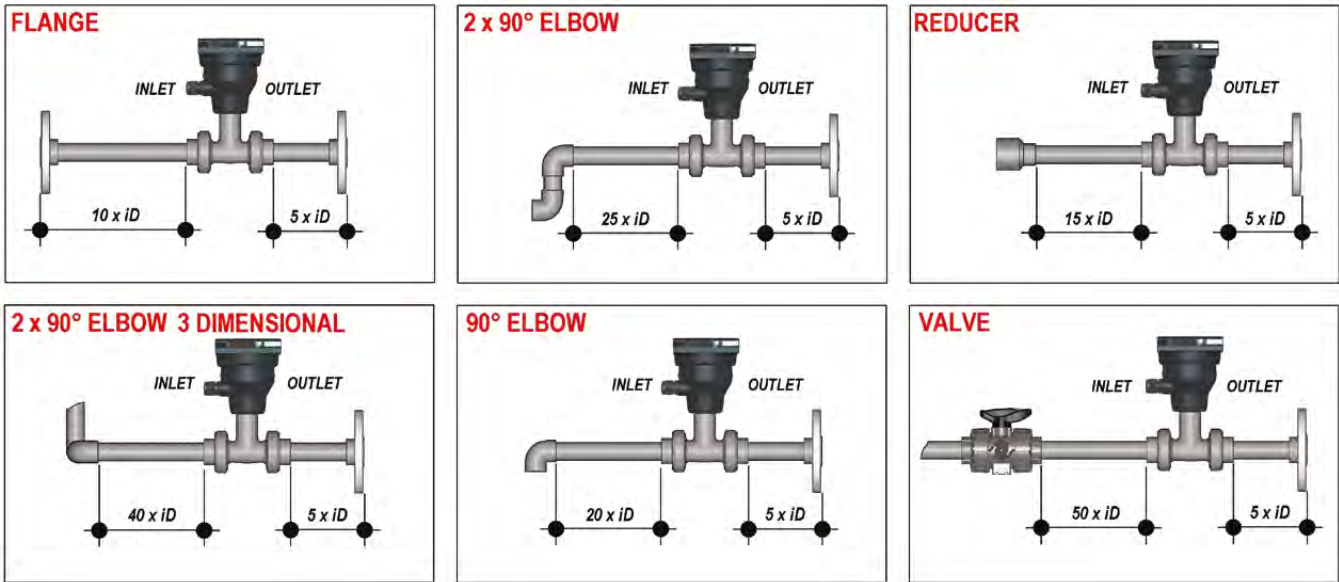


Fig.2

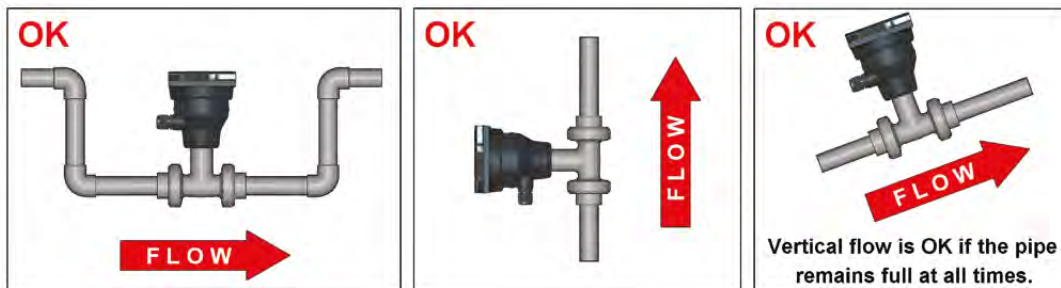


Fig.3

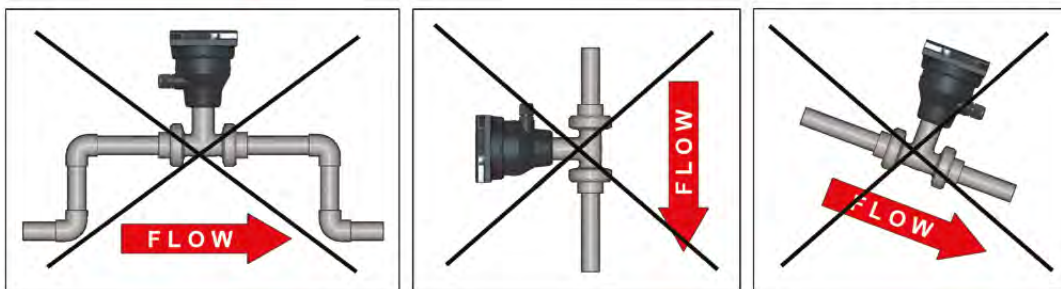
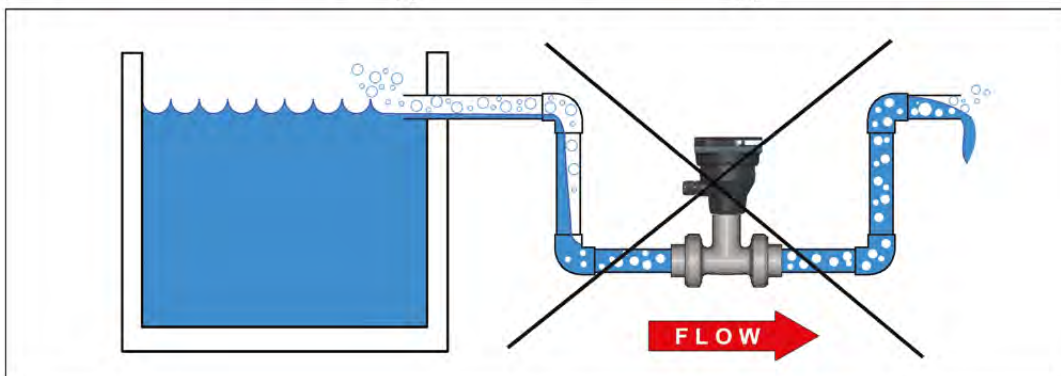


Fig.4



**Mounting Positions**

Measuring part of sensor (rotor for paddlewheel and pins for magmeter) should be positioned at 12% of ID where, basing on insertion theory, average velocity can be measured.

The reading accuracy of insertion flow sensors can be affected by:

- air bubbles;
- sediments;
- friction between shaft and bearings (only for paddlewheel).

In a horizontal pipe runs, the mounting position to get the best performances is at a 45° angle (Fig. 3) to avoid air bubbles as well sediments. Vertical position (Fig. 2) can be chosen in case air bubbles are not present. Do not mount the sensor on the bottom of the pipe (Fig. 1) if sediments are likely. Do not mount paddlewheel at 90° otherwise friction can affect measurement. Except last consideration about 90° installation, all previous evaluations are valid for magmeter sensor also. Installation in a vertical pipe runs can be done fixing any orientation. Upward flow is preferred to ensure full pipe.

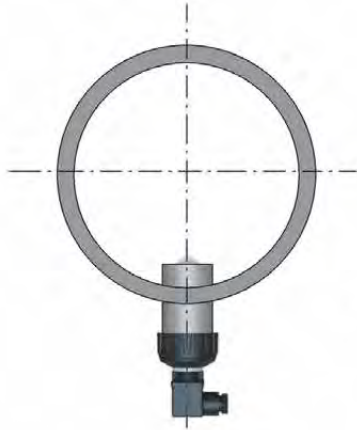


Fig. 1

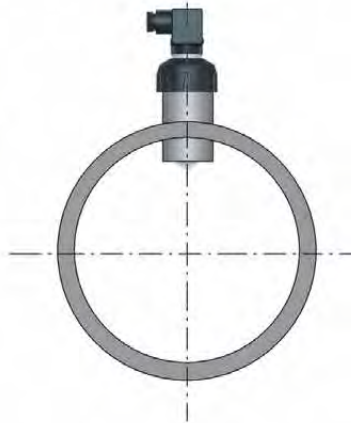


Fig. 2

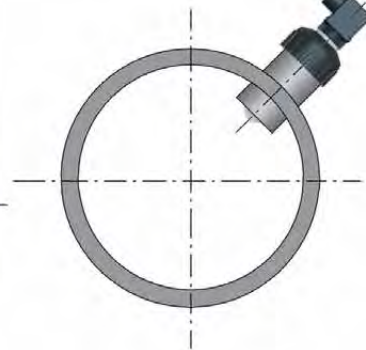


Fig. 3

**K-Factor**

K factor is a conversion value which has to be fixed in order to convert sensor output (frequency) to a flow rate.

K factor depends on ID of pipe where sensor has been installed and, as each pipe has a specific wall thickness, in general it's necessary to know pipe size (external diameter), pipe material and all info which can determine internal diameter.

Provided k- factors are referred to water so in case sensors are applied to measure a different liquid (with a different viscosity and/or density) a recalibration on-site can be needed using a secondary standard.

**Maximize sensor performances**

In order to get the maximum accuracy, a recalibration using a reference value of flow rate could help to evaluate a fine tuning of k-factor in according with specifications of installation site. This procedure is strongly suggested when sensors are applied to measure a different liquid than water and in case distances reported into EN ISO 5167-1 can't be respected in the installation.

## OPERATING GUIDELINES

### Paddlewheel Flow Sensors

Rotor and shaft are in direct contact with the fluid. Since the paddle will spin at a velocity that is directly proportional to the rate of flow, these components will wear over time. Rotors which have operated at high velocity will tend to wear more than units operated at low velocities. Because every fluid has different characteristics, it is difficult to estimate the life expectancy of these components. The chemical compatibilities of each wetted component to the chemical being measured should be considered to choose the best material option. Axles and paddles can be easily replaceable in order to maintain better performances. Avoid using paddlewheel flowmeters for measuring very dirty fluid, or liquids with rocks or pebbles that could break or damage the rotor or the axle. Solids could affect sensor response also modifying friction of shaft. Don't use paddlewheel in case liquid contains fibers. A neglected paddlewheel will in time have degraded accuracy. Even if in case liquid contains solids we suggest to apply a magmeter, you can use a paddlewheel but in such case it's strongly suggested to plan a cleaning procedure of wetted parts periodically. For cleaning procedure use detergent or chemicals compatible with wetted materials.

### Magmeter Flow Sensor

In general magmeter flow sensor doesn't need a specific maintenance. In case magmeter is used to measure a very dirty liquid it can be suggested to clean periodically the device with a cloth slightly dampened with water or a liquid compatible with the materials of the device and cloth. Dirty electrodes may cause measurement inaccuracy. Do not use abrasive materials to take maintenance.

### Hot tap Insertion Flowmeters

The use of hot tap instrumentation is suggested for installation in pressurized pipes and when it is impossible to stop the flow rate into the pipeline. Hot tap version is available for magmeter, paddlewheel and turbine sensors. Previous advices are valid for these versions also. The sensors designed for hot tap installation are suitable also for pipes with a diameter larger than the maximum covered by traditional sensors (typically DN600/24"). Hot tap sensors have to be combined with hot tap fitting only.



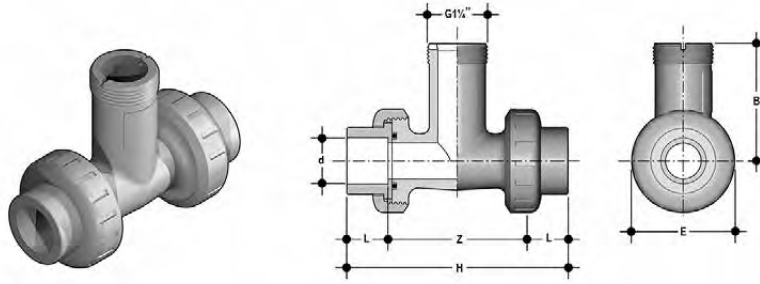
INSTALLATION FITTINGS  
**FOR FLOW SENSORS  
AND ANALYTICAL ELECTRODES**





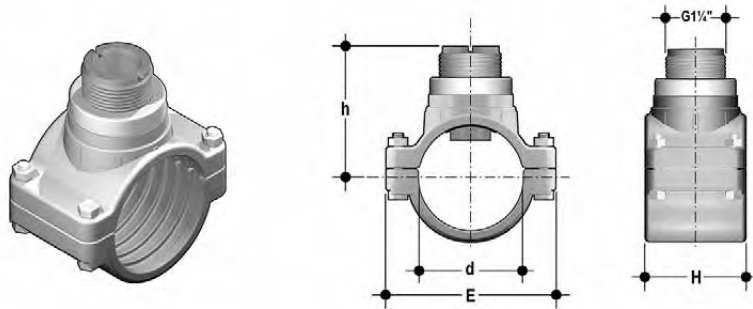
# **STANDARD INSERTION INSTALLATION**

## INSTALLATION ON PVC PIPES



ISO Metric PVC Tee Fittings (female ends for solvent welding)

Part No.	DN/Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFIV20B	15	20	EPDM	UPVC	113	81	16	73	53	L0	F & A
TFIV25B	20	25	EPDM	UPVC	126	88	19	8	62	L0	F & A
TFIV32B	25	32	EPDM	UPVC	139.5	95.5	22	81	71	L0	F & A
TFIV40B	32	40	EPDM	UPVC	170	118	26	84	84	L0	F & A
TFIV50B	40	50	EPDM	UPVC	199	137	31	82.5	98	L0	F & A
TFIV20D	15	20	FPM	UPVC	113	81	16	73	53	L0	F & A
TFIV25D	20	25	FPM	UPVC	126	88	19	8	62	L0	F & A
TFIV32D	25	32	FPM	UPVC	139.5	95.5	22	81	71	L0	F & A
TFIV40D	32	40	FPM	UPVC	170	118	26	84	84	L0	F & A
TFIV50D	40	50	FPM	UPVC	199	137	31	82.5	98	L0	F & A



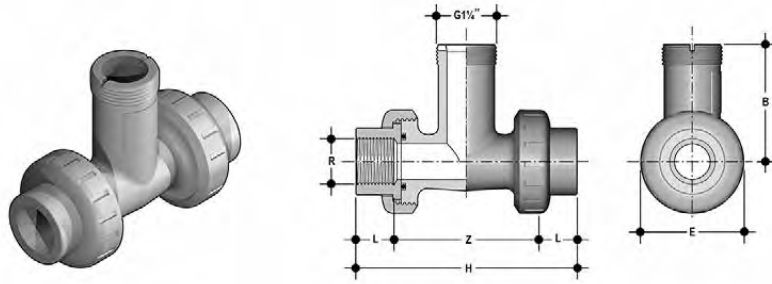
ISO Metric Clamp Saddles

Part No.	DN/Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SVIC063BVC	50	63	EPDM	UPVC	C-PVC	105	116	86.7	35	L0	F & A
SVIC075BVC	65	75	EPDM	UPVC	C-PVC	105	134	90.8	35	L0	F & A
SVIC090BVC	80	90	EPDM	UPVC	C-PVC	105	152	95.9	40	L0	F & A
SVIC110BVC	100	110	EPDM	UPVC	C-PVC	105	176	102.8	40	L0	F & A
SVIC125BVC	110	125	EPDM	UPVC	C-PVC	112	190	137.9	40	L1	F
SVIC140BVC	125	140	EPDM	UPVC	C-PVC	114	214	143.1	40	L1	F
SVIC160BVC	150	160	EPDM	UPVC	C-PVC	120	238	149.9	40	L1	F
SVIC200BVC	180	200	EPDM	UPVC	C-PVC	133	300	163.7	40	L1	F
SVIC225BVC	200	225	EPDM	UPVC	C-PVC	125	333	172.3	40	L1	F
SVIC063DVC	50	63	FPM	UPVC	C-PVC	105	116	86.7	35	L0	F & A
SVIC075DVC	65	75	FPM	UPVC	C-PVC	105	134	90.8	35	L0	F & A
SVIC090DVC	80	90	FPM	UPVC	C-PVC	105	152	95.9	40	L0	F & A
SVIC110DVC	100	110	FPM	UPVC	C-PVC	105	176	102.8	40	L0	F & A
SVIC125DVC	110	125	FPM	UPVC	C-PVC	112	190	137.9	40	L1	F
SVIC140DVC	125	140	FPM	UPVC	C-PVC	114	214	143.1	40	L1	F
SVIC160DVC	150	160	FPM	UPVC	C-PVC	120	238	149.9	40	L1	F
SVIC200DVC	180	200	FPM	UPVC	C-PVC	133	300	163.7	40	L1	F
SVIC225DVC	200	225	FPM	UPVC	C-PVC	125	333	172.3	40	L1	F
SMIC250IVC*	225	250	NBR	PP	C-PVC	79	324	203.5	40	L0	F
SMIC280IVC*	250	280	NBR	PP	C-PVC	88	385	212.2	40	L1	F
SMIC315IVC*	280	315	NBR	PP	C-PVC	88	385	220.1	40	L1	F

\* For IP68 sensors or compact monitors only

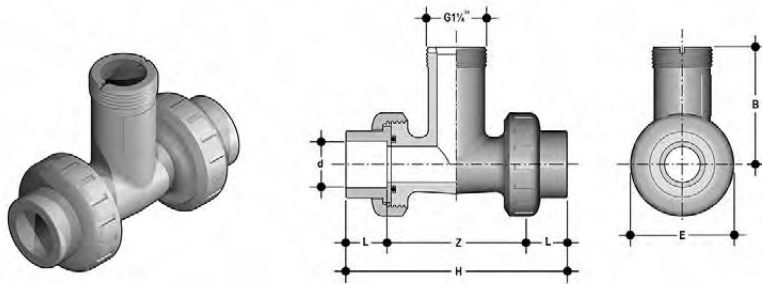
(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

# INSTALLATION ON PVC PIPES



**BSP Female Threaded PVC Tee Fittings (parallel threaded female ends)**

Part No.	DN/Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFFV20B	15	1/2"	EPDM	UPVC	118.5	88.5	15	73	53	L0	F & A
TFFV25B	20	3/4"	EPDM	UPVC	127.5	94.9	16.3	80	62	L0	F & A
TFFV32B	25	1"	EPDM	UPVC	146	107.8	19.1	81	71	L0	F & A
TFFV40B	32	1 1/4"	EPDM	UPVC	177	134.2	21.4	84	84	L0	F & A
TFFV50B	40	1 1/2"	EPDM	UPVC	191	148.2	21.4	82.5	98	L0	F & A
TFFV20D	15	1/2"	FPM	UPVC	118.5	88.5	15	73	53	L0	F & A
TFFV25D	20	3/4"	FPM	UPVC	127.5	94.9	16.3	80	62	L0	F & A
TFFV32D	25	1"	FPM	UPVC	146	107.8	19.1	81	71	L0	F & A
TFFV40D	32	1 1/4"	FPM	UPVC	177	134.2	21.4	84	84	L0	F & A
TFFV50D	40	1 1/2"	FPM	UPVC	191	148.2	21.4	82.5	98	L0	F & A

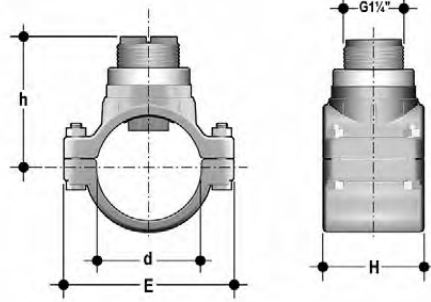


**BS Solvent Welding PVC Tee Fittings (female ends for solvent welding)**

Part No.	DN/Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFLV20B	15	1/2"	EPDM	UPVC	113	8	16.5	73	53	L0	F & A
TFLV25B	20	3/4"	EPDM	UPVC	126	88	19	80	62	L0	F & A
TFLV32B	25	1"	EPDM	UPVC	139.5	94.5	22.5	81	71	L0	F & A
TFLV40B	32	1 1/4"	EPDM	UPVC	17	118	26	84	84	L0	F & A
TFLV50B	40	1 1/2"	EPDM	UPVC	199	139	30	82.5	98	L0	F & A
TFLV20D	15	1/2"	FPM	UPVC	113	8	16.5	73	53	L0	F & A
TFLV25D	20	3/4"	FPM	UPVC	126	88	19	80	62	L0	F & A
TFLV32D	25	1"	FPM	UPVC	139.5	94.5	22.5	81	71	L0	F & A
TFLV40D	32	1 1/4"	FPM	UPVC	17	118	26	84	84	L0	F & A
TFLV50D	40	1 1/2"	FPM	UPVC	199	139	30	82.5	98	L0	F & A

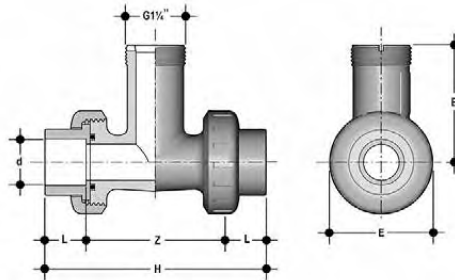
(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PVC PIPES



**BS Clamp Saddles**

Part No.	DN/ Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SVLC2.0BVM	50	2"	EPDM	UPVC	C-PVC	105	116	85.3	35	L0	F & A
SVLC3.0BVM	80	3"	EPDM	UPVC	C-PVC	105	152	95.0	40	L0	F & A
SVLC4.0BVM	100	4"	EPDM	UPVC	C-PVC	105	176	103.5	40	L0	F & A
SVLC6.0BVM	150	6"	EPDM	UPVC	C-PVC	120	238	151.7	40	L1	F
SVLC8.0BVM	200	8"	EPDM	UPVC	C-PVC	125	333	169.8	40	L1	F
SVLC2.0DVM	50	2"	FPM	UPVC	C-PVC	105	116	85.3	35	L0	F & A
SVLC3.0DVM	80	3"	FPM	UPVC	C-PVC	105	152	95.0	40	L0	F & A
SVLC4.0DVM	100	4"	FPM	UPVC	C-PVC	105	176	103.5	40	L0	F & A
SVLC6.0DVM	150	6"	FPM	UPVC	C-PVC	120	238	151.7	40	L1	F
SVLC8.0DVM	200	8"	FPM	UPVC	C-PVC	125	333	169.8	40	L1	F

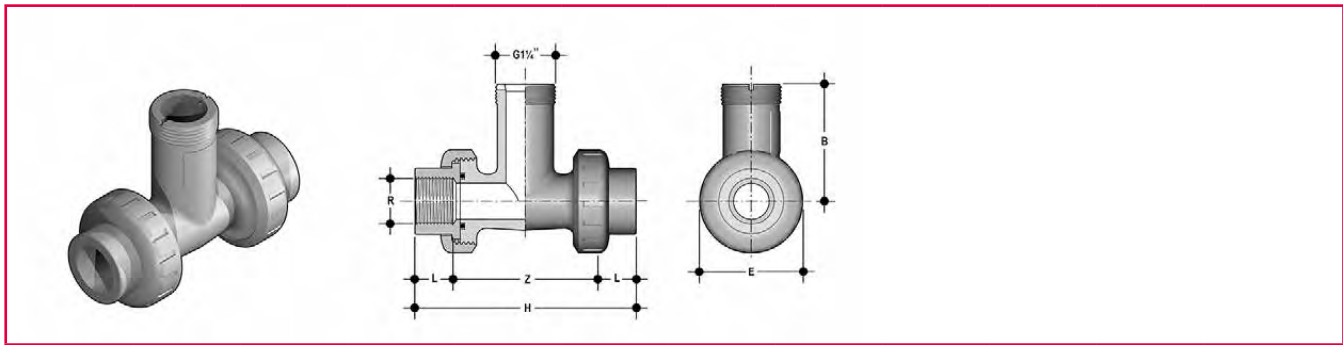


**ASTM SCH. 80 PVC Tee Fittings (female ends for solvent welding)**

Part No.	DN/ Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFAV20B	15	1/2"	EPDM	UPVC	4.92"	3.15"	0.89"	2.87"	2.09"	L0	F & A
TFAV25B	20	3/4"	EPDM	UPVC	5.51"	3.50"	1.00"	3.15"	2.44"	L0	F & A
TFAV32B	25	1"	EPDM	UPVC	6.04"	3.78"	1.13"	3.19"	2.80"	L0	F & A
TFAV40B	32	1 1/4"	EPDM	UPVC	7.34"	4.80"	1.26"	3.31"	3.31"	L0	F & A
TFAV50B	40	1 1/2"	EPDM	UPVC	8.15"	5.39"	1.38"	3.25"	3.86"	L0	F & A
TFAV20D	15	1/2"	FPM	UPVC	4.92"	3.15"	0.89"	2.87"	2.09"	L0	F & A
TFAV25D	20	3/4"	FPM	UPVC	5.51"	3.50"	1.00"	3.15"	2.44"	L0	F & A
TFAV32D	25	1"	FPM	UPVC	6.04"	3.78"	1.13"	3.19"	2.80"	L0	F & A
TFAV40D	32	1 1/4"	FPM	UPVC	7.34"	4.80"	1.26"	3.31"	3.31"	L0	F & A
TFAV50D	40	1 1/2"	FPM	UPVC	8.15"	5.39"	1.38"	3.25"	3.86"	L0	F & A

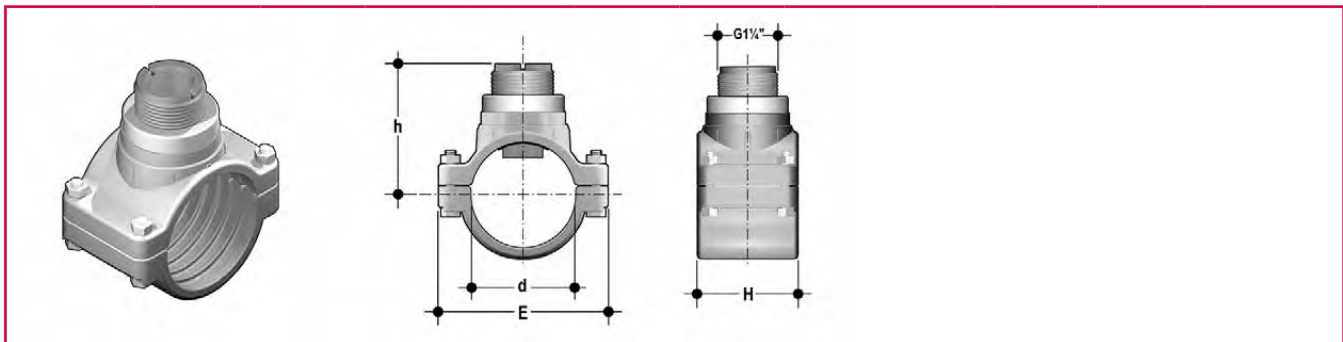
(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PVC PIPES



**NPT Female Threaded PVC Tee Fittings (NPT threaded female ends)**

Part No.	DN/Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFNV20B	15	1/2"	EPDM	UPVC	4.67"	3.26"	0.70"	2.87"	2.09"	L0	F & A
TFNV25B	20	3/4"	EPDM	UPVC	5.02"	3.60"	0.71"	3.15"	2.44"	L0	F & A
TFNV32B	25	1"	EPDM	UPVC	5.75"	3.97"	0.89"	3.19"	2.80"	L0	F & A
TFNV40B	32	1 1/4"	EPDM	UPVC	6.97"	5.12"	0.93"	3.31"	3.31"	L0	F & A
TFNV50B	40	1 1/2"	EPDM	UPVC	7.52"	5.28"	1.12"	3.25"	3.86"	L0	F & A
TFNV20D	15	1/2"	FPM	UPVC	4.67"	3.26"	0.70"	2.87"	2.09"	L0	F & A
TFNV25D	20	3/4"	FPM	UPVC	5.02"	3.60"	0.71"	3.15"	2.44"	L0	F & A
TFNV32D	25	1"	FPM	UPVC	5.75"	3.97"	0.89"	3.19"	2.80"	L0	F & A
TFNV40D	32	1 1/4"	FPM	UPVC	6.97"	5.12"	0.93"	3.31"	3.31"	L0	F & A
TFNV50D	40	1 1/2"	FPM	UPVC	7.52"	5.28"	1.12"	3.25"	3.86"	L0	F & A

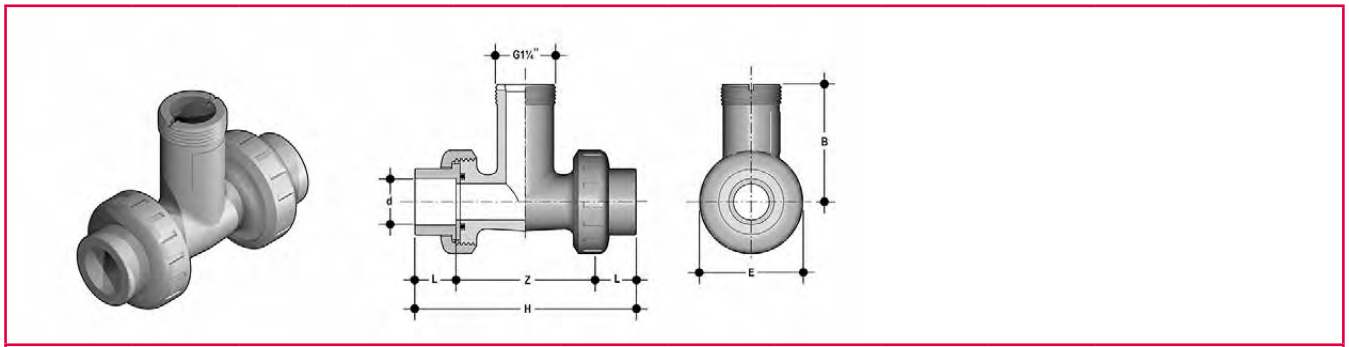


**ASTM Clamp Saddles**

Part No.	DN/Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SVAC2.0BVM	50	2"	EPDM	UPVC	C-PVC	4.13"	4.57"	3.3"	1.38"	L0	F & A
SVAC2.5BVM	65	2 1/2"	EPDM	UPVC	C-PVC	4.13"	5.28"	3.4"	1.38"	L0	F & A
SVAC3.0BVM	80	3"	EPDM	UPVC	C-PVC	4.13"	5.98"	3.6"	1.57"	L0	F & A
SVAC4.0BVM	100	4"	EPDM	UPVC	C-PVC	4.13"	6.93"	4.0"	1.57"	L0	F & A
SVAC5.0BVM	125	5"	EPDM	UPVC	C-PVC	4.49"	8.43"	5.6"	1.57"	L1	F
SVAC6.0BVM	150	6"	EPDM	UPVC	C-PVC	4.72"	9.37"	5.9"	1.57"	L1	F
SVAC8.0BVM	200	8"	EPDM	UPVC	C-PVC	4.92"	13.11"	6.6"	1.57"	L1	F
SVAC2.0DVM	50	2"	FPM	UPVC	C-PVC	4.13"	4.57"	3.3"	1.38"	L0	F & A
SVAC2.5DVM	65	2 1/2"	FPM	UPVC	C-PVC	4.13"	5.28"	3.4"	1.38"	L0	F & A
SVAC3.0DVM	80	3"	FPM	UPVC	C-PVC	4.13"	5.98"	3.6"	1.57"	L0	F & A
SVAC4.0DVM	100	4"	FPM	UPVC	C-PVC	4.13"	6.93"	4.0"	1.57"	L0	F & A
SVAC5.0DVM	125	5"	FPM	UPVC	C-PVC	4.49"	8.43"	5.6"	1.57"	L1	F
SVAC6.0DVM	150	6"	FPM	UPVC	C-PVC	4.72"	9.37"	5.9"	1.57"	L1	F
SVAC8.0DVM	200	8"	FPM	UPVC	C-PVC	4.92"	13.11"	6.6"	1.57"	L1	F

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PVCC PIPES

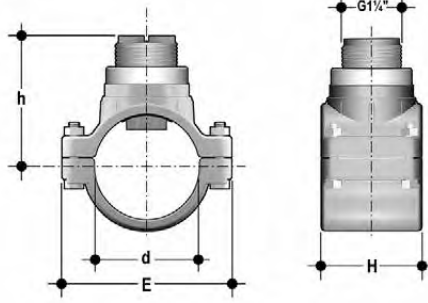


ISO Metric C-PVC Tee Fittings (female ends for solvent welding)

Part No.	DN/ Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFIC20B	15	20	EPDM	C-PVC	113	81	16	73	53	L0	F & A
TFIC25B	20	25	EPDM	C-PVC	126	88	19	80	62	L0	F & A
TFIC32B	25	32	EPDM	C-PVC	139.5	95.5	22	81	71	L0	F & A
TFIC40B	32	40	EPDM	C-PVC	170	118	26	84	84	L0	F & A
TFIC50B	40	50	EPDM	C-PVC	199	137	31	82.5	98	L0	F & A
TFIC20D	15	20	FPM	C-PVC	113	81	16	73	53	L0	F & A
TFIC25D	20	25	FPM	C-PVC	126	88	19	80	62	L0	F & A
TFIC32D	25	32	FPM	C-PVC	139.5	95.5	22	81	71	L0	F & A
TFIC40D	32	40	FPM	C-PVC	170	118	26	84	84	L0	F & A
TFIC50D	40	50	FPM	C-PVC	199	137	31	82.5	98	L0	F & A

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PVCC PIPES



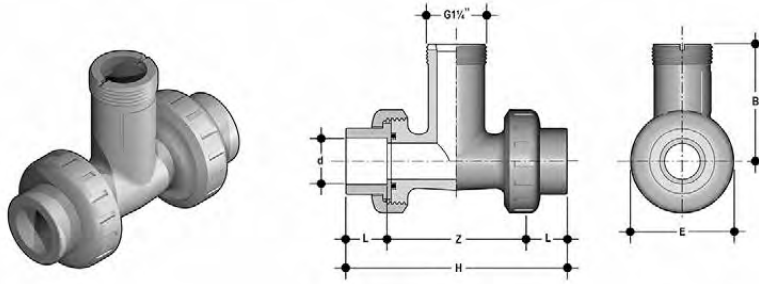
ISO Metric Clamp Saddles

Part No.	DN/ Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Lenght	Suitable for (*)
SVIC063BVC	50	63	EPDM	UPVC	C-PVC	105	116	86.7	35	L0	F & A
SVIC075BVC	65	75	EPDM	UPVC	C-PVC	105	134	90.8	35	L0	F & A
SVIC090BVC	80	90	EPDM	UPVC	C-PVC	105	152	95.9	40	L0	F & A
SVIC110BVC	100	110	EPDM	UPVC	C-PVC	105	176	102.8	40	L0	F & A
SVIC125BVC	110	125	EPDM	UPVC	C-PVC	112	190	137.9	40	L1	F
SVIC140BVC	125	140	EPDM	UPVC	C-PVC	114	214	143.1	40	L1	F
SVIC160BVC	150	160	EPDM	UPVC	C-PVC	120	238	149.9	40	L1	F
SVIC200BVC	180	200	EPDM	UPVC	C-PVC	133	300	163.7	40	L1	F
SVIC225BVC	200	225	EPDM	UPVC	C-PVC	125	333	172.3	40	L1	F
SVIC063DVC	50	63	FPM	UPVC	C-PVC	105	116	86.7	35	L0	F & A
SVIC075DVC	65	75	FPM	UPVC	C-PVC	105	134	90.8	35	L0	F & A
SVIC090DVC	80	90	FPM	UPVC	C-PVC	105	152	95.9	40	L0	F & A
SVIC110DVC	100	110	FPM	UPVC	C-PVC	105	176	102.8	40	L0	F & A
SVIC125DVC	110	125	FPM	UPVC	C-PVC	112	190	137.9	40	L1	F
SVIC140DVC	125	140	FPM	UPVC	C-PVC	114	214	143.1	40	L1	F
SVIC160DVC	150	160	FPM	UPVC	C-PVC	120	238	149.9	40	L1	F
SVIC200DVC	180	200	FPM	UPVC	C-PVC	133	300	163.7	40	L1	F
SVIC225DVC	200	225	FPM	UPVC	C-PVC	125	333	172.3	40	L1	F
SMIC250IVC*	225	250	NBR	PP	C-PVC	79	324	203.5	40	L0	F
SMIC280IVC*	250	280	NBR	PP	C-PVC	88	385	212.2	40	L1	F
SMIC315IVC*	280	315	NBR	PP	C-PVC	88	385	220.1	40	L1	F

\* For IP68 sensors or compact monitors only

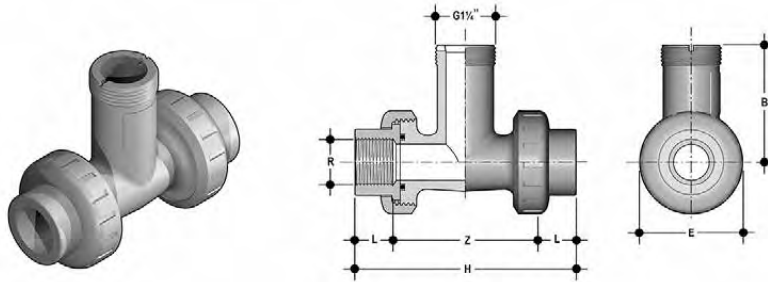
(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PP PIPES



ISO Metric PP Tee Fittings (female ends for socket welding)

Part No.	DN/ Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFIM20B	15	20	EPDM	PP	111	73	14.5	73	53	L0	F & A
TFIM25B	20	25	EPDM	PP	120.5	80	16	80	62	L0	F & A
TFIM32B	25	32	EPDM	PP	133.5	81	18	81	71	L0	F & A
TFIM40B	32	40	EPDM	PP	163.5	84	20.5	84	84	L0	F & A
TFIM50B	40	50	EPDM	PP	195	82.5	23.5	82.5	98	L0	F & A
TFIM20D	15	20	FPM	PP	111	73	14.5	73	53	L0	F & A
TFIM25D	20	25	FPM	PP	120.5	80	16	80	62	L0	F & A
TFIM32D	25	32	FPM	PP	133.5	81	18	81	71	L0	F & A
TFIM40D	32	40	FPM	PP	163.5	84	20.5	84	84	L0	F & A
TFIM50D	40	50	FPM	PP	195	82.5	23.5	82.5	98	L0	F & A



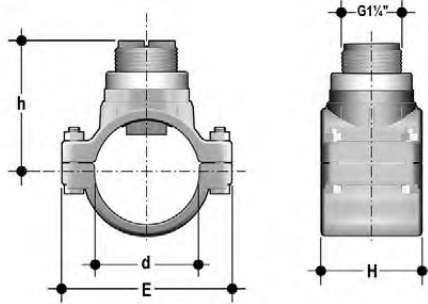
BSP Female Threaded PP Tee Fittings (parallel threaded female ends)

Part No.	DN/ Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFFM20B	15	1/2"	EPDM	PP	113	83	15	73	53	L0	F & A
TFFM25B	20	3/4"	EPDM	PP	126	93.4	16.3	80	62	L0	F & A
TFFM32B	25	1"	EPDM	PP	139.5	101.3	19.1	81	71	L0	F & A
TFFM40B	32	1 1/4"	EPDM	PP	17	127.2	21.4	84	84	L0	F & A
TFFM50B	40	1 1/2"	EPDM	PP	199	156.2	21.4	82.5	98	L0	F & A
TFFM20D	15	1/2"	FPM	PP	113	83	15	73	53	L0	F & A
TFFM25D	20	3/4"	FPM	PP	126	93.4	16.3	80	62	L0	F & A
TFFM32D	25	1"	FPM	PP	139.5	101.3	19.1	81	71	L0	F & A
TFFM40D	32	1 1/4"	FPM	PP	17	127.2	21.4	84	84	L0	F & A
TFFM50D	40	1 1/2"	FPM	PP	199	156.2	21.4	82.5	98	L0	F & A

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes



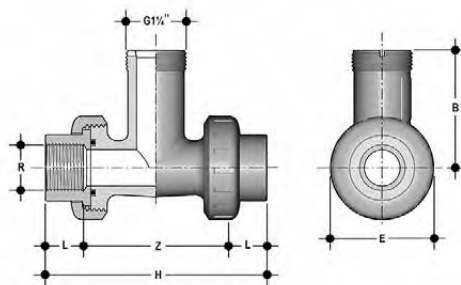
## INSTALLATION ON PP PIPES



ISO metric Clamp Saddles

Part No.	DN/ Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SVIC063BME	50	63	EPDM	UPVC	C-PVC **	105	116	84.3	35	L0	F & A
SVIC075BME	65	75	EPDM	UPVC	C-PVC **	105	134	88.	35	L0	F & A
SVIC090BME	80	90	EPDM	UPVC	C-PVC **	105	152	92.6	4	L0	F & A
SVIC110BME	100	110	EPDM	UPVC	C-PVC **	105	176	98.8	40	L0	F & A
SVIC125BME	110	125	EPDM	UPVC	C-PVC **	112	190	133.3	40	L1	F
SVIC140BME	125	140	EPDM	UPVC	C-PVC **	114	214	138.0	40	L1	F
SVIC160BME	150	160	EPDM	UPVC	C-PVC **	120	238	144.1	40	L1	F
SVIC200BME	180	200	EPDM	UPVC	C-PVC **	133	300	156.4	40	L1	F
SVIC225BME	200	225	EPDM	UPVC	C-PVC **	125	333	164.1	40	L1	F
SVIC063DME	50	63	FPM	UPVC	C-PVC **	105	116	84.3	35	L0	F & A
SVIC075DME	65	75	FPM	UPVC	C-PVC **	105	134	88.	35	L0	F & A
SVIC090DME	80	90	FPM	UPVC	C-PVC **	105	152	92.6	4	L0	F & A
SVIC110DME	100	110	FPM	UPVC	C-PVC **	105	176	98.8	40	L0	F & A
SVIC125DME	110	125	FPM	UPVC	C-PVC **	112	190	133.3	40	L1	F
SVIC140DME	125	140	FPM	UPVC	C-PVC **	114	214	138.0	40	L1	F
SVIC160DME	150	160	FPM	UPVC	C-PVC **	120	238	144.1	40	L1	F
SVIC200DME	180	200	FPM	UPVC	C-PVC **	133	300	156.4	40	L1	F
SVIC225DME	200	225	FPM	UPVC	C-PVC **	125	333	164.1	40	L1	F
SMIC250IME*	225	250	NBR	PP	C-PVC **	79	324	189.9	40	L0	F
SMIC280IME*	250	280	NBR	PP	C-PVC **	88	385	200.2	40	L1	F
SMIC315IME*	300	315	NBR	PP	C-PVC **	88	385	209.3	40	L1	F

\* For IP68 sensors or compact monitors only \*\* PVDF insert available on request

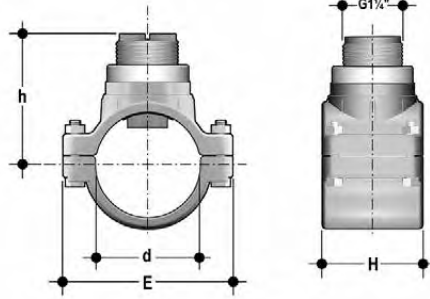


NPT Female Threaded PP Tee Fittings (NPT threaded female ends)

Part No.	DN/ Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFNM20B	15	1/2"	EPDM	PP	4.45"	3.05"	0.70"	2.87"	2.09"	L0	F & A
TFNM25B	20	3/4"	EPDM	PP	4.96"	3.54"	0.71"	3.15"	2.44"	L0	F & A
TFNM32B	25	1"	EPDM	PP	5.49"	3.71"	0.89"	3.19"	2.80"	L0	F & A
TFNM40B	32	1 1/4"	EPDM	PP	6.69"	4.84"	0.93"	3.31"	3.31"	L0	F & A
TFNM50B	40	1 1/2"	EPDM	PP	7.83"	5.59"	1.12"	3.25"	3.86"	L0	F & A
TFNM20D	15	1/2"	FPM	PP	4.45"	3.05"	0.70"	2.87"	2.09"	L0	F & A
TFNM25D	20	3/4"	FPM	PP	4.96"	3.54"	0.71"	3.15"	2.44"	L0	F & A
TFNM32D	25	1"	FPM	PP	5.49"	3.71"	0.89"	3.19"	2.80"	L0	F & A
TFNM40D	32	1 1/4"	FPM	PP	6.69"	4.84"	0.93"	3.31"	3.31"	L0	F & A
TFNM50D	40	1 1/2"	FPM	PP	7.83"	5.59"	1.12"	3.25"	3.86"	L0	F & A

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PP PIPES



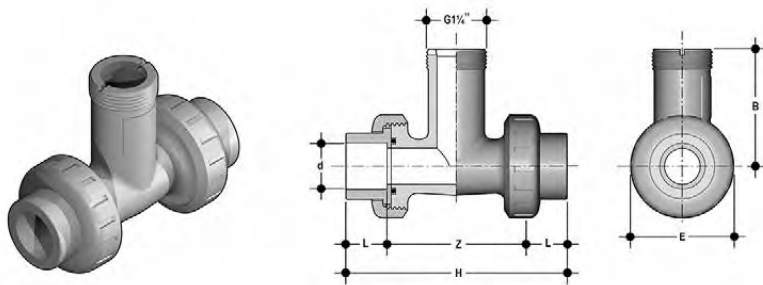
ASTM Clamp Saddles

Part No.	DN/Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SVAC2.0BVM	50	2"	EPDM	UPVC	C-PVC**	4.13"	4.57"	3.29"	1.38"	L0	F & A
SVAC2.5BVM	65	2 1/2"	EPDM	UPVC	C-PVC**	4.13"	5.28"	3.43"	1.38"	L0	F & A
SVAC3.0BVM	80	3"	EPDM	UPVC	C-PVC**	4.13"	5.98"	3.65"	1.57"	L0	F & A
SVAC4.0BVM	100	4"	EPDM	UPVC	C-PVC**	4.13"	6.93"	4.00"	1.57"	L0	F & A
SVAC5.0BVM	125	5"	EPDM	UPVC	C-PVC**	4.49"	8.43"	5.55"	1.57"	L1	F
SVAC6.0BVM	150	6"	EPDM	UPVC	C-PVC**	4.72"	9.37"	5.91"	1.57"	L1	F
SVAC8.0BVM	200	8"	EPDM	UPVC	C-PVC**	4.92"	13.11"	6.61"	1.57"	L1	F
SVAC2.0DVM	50	2"	FPM	UPVC	C-PVC**	4.13"	4.57"	3.29"	1.38"	L0	F & A
SVAC2.5DVM	65	2 1/2"	FPM	UPVC	C-PVC**	4.13"	5.28"	3.43"	1.38"	L0	F & A
SVAC3.0DVM	80	3"	FPM	UPVC	C-PVC**	4.13"	5.98"	3.65"	1.57"	L0	F & A
SVAC4.0DVM	100	4"	FPM	UPVC	C-PVC**	4.13"	6.93"	4.00"	1.57"	L0	F & A
SVAC5.0DVM	125	5"	FPM	UPVC	C-PVC**	4.49"	8.43"	5.55"	1.57"	L1	F
SVAC6.0DVM	150	6"	FPM	UPVC	C-PVC**	4.72"	9.37"	5.91"	1.57"	L1	F
SVAC8.0DVM	200	8"	FPM	UPVC	C-PVC**	4.92"	13.11"	6.61"	1.57"	L1	F

\*\* PVDF insert available on request

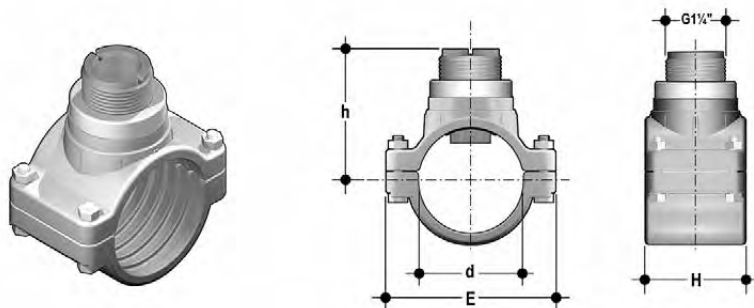
(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PVDF PIPES



ISO Metric PVDF Tee Fittings (female ends for socket welding)

Part No.	DN/Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFIF20B	15	20	EPDM	PVDF	111	82	14.5	73	53	L0	F & A
TFIF25B	20	25	EPDM	PVDF	120.5	88.5	16	80	62	L0	F & A
TFIF32B	25	32	EPDM	PVDF	133.5	97	18	81	71	L0	F & A
TFIF40B	32	40	EPDM	PVDF	161.5	120.5	20.5	84	84	L0	F & A
TFIF50B	40	50	EPDM	PVDF	193.5	146.5	23.5	82.5	98	L0	F & A
TFIF20D	15	20	FPM	PVDF	111	82	14.5	73	53	L0	F & A
TFIF25D	20	25	FPM	PVDF	120.5	88.5	16	80	62	L0	F & A
TFIF32D	25	32	FPM	PVDF	133.5	97	18	81	71	L0	F & A
TFIF40D	32	40	FPM	PVDF	161.5	120.5	20.5	84	84	L0	F & A
TFIF50D	40	50	FPM	PVDF	193.5	146.5	23.5	82.5	98	L0	F & A

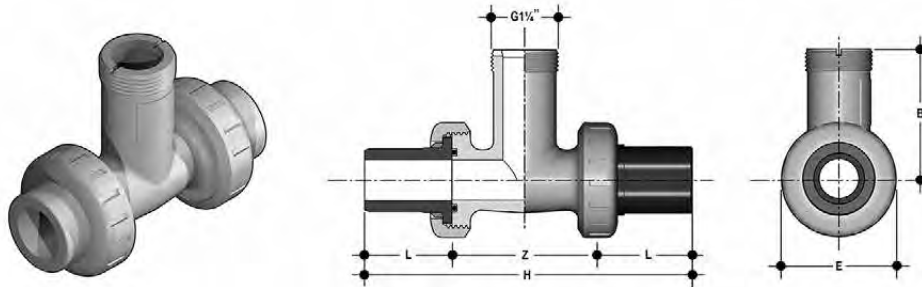


ISO Metric Clamp Saddles

Part No.	DN/Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SVIF063BF	50	63	EPDM	UPVC	PVDF	105	116	87.2	35	L0	F & A
SVIF075BF	65	75	EPDM	UPVC	PVDF	105	134	91.5	35	L0	F & A
SVIF090BF	80	90	EPDM	UPVC	PVDF	105	152	96.8	40	L0	F & A
SVIF110BF	100	110	EPDM	UPVC	PVDF	105	176	104.0	40	L0	F & A
SVIF125BF	110	125	EPDM	UPVC	PVDF	112	190	139.3	40	L1	F
SVIF140BF	125	140	EPDM	UPVC	PVDF	114	214	144.6	40	L1	F
SVIF160BF	150	160	EPDM	UPVC	PVDF	120	238	151.8	40	L1	F
SVIF200BF	180	200	EPDM	UPVC	PVDF	133	300	165.9	40	L1	F
SVIF225BF	200	225	EPDM	UPVC	PVDF	125	333	174.9	40	L1	F
SVIF063DF	50	63	FPM	UPVC	PVDF	105	116	87.2	35	L0	F & A
SVIF075DF	65	75	FPM	UPVC	PVDF	105	134	91.5	35	L0	F & A
SVIF090DF	80	90	FPM	UPVC	PVDF	105	152	96.8	40	L0	F & A
SVIF110DF	100	110	FPM	UPVC	PVDF	105	176	104.0	40	L0	F & A
SVIF125DF	110	125	FPM	UPVC	PVDF	112	190	139.3	40	L1	F
SVIF140DF	125	140	FPM	UPVC	PVDF	114	214	144.6	40	L1	F
SVIF160DF	150	160	FPM	UPVC	PVDF	120	238	151.8	40	L1	F
SVIF200DF	180	200	FPM	UPVC	PVDF	133	300	165.9	40	L1	F
SVIF225DF	200	225	FPM	UPVC	PVDF	125	333	174.9	40	L1	F

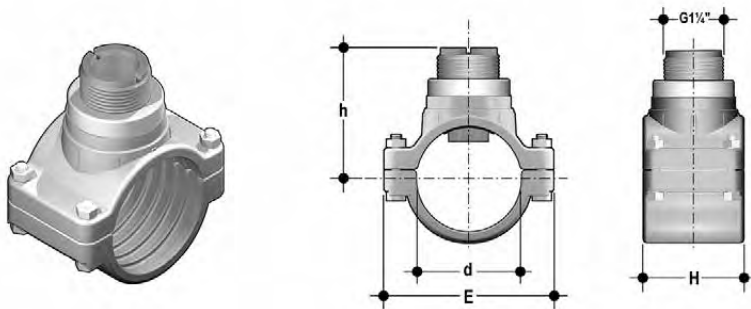
(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON PE PIPES



ISO Metric PVC Tee Fittings (PE end connectors for electrotusion or butt welding)

Part No.	DN/Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFIV20BE	15	20	EPDM	UPVC	183	73	55	73	53	L0	F & A
TFIV25BE	20	25	EPDM	UPVC	223	83	70	80	62	L0	F & A
TFIV32BE	25	32	EPDM	UPVC	237	89	74	81	71	L0	F & A
TFIV40BE	32	40	EPDM	UPVC	266	110	78	84	84	L0	F & A
TFIV50BE	40	50	EPDM	UPVC	295	127	84	82.5	98	L0	F & A
TFIV20DE	15	20	FPM	UPVC	183	73	55	73	53	L0	F & A
TFIV25DE	20	25	FPM	UPVC	223	83	70	80	62	L0	F & A
TFIV32DE	25	32	FPM	UPVC	237	89	74	81	71	L0	F & A
TFIV40DE	32	40	FPM	UPVC	266	110	78	84	84	L0	F & A
TFIV50DE	40	50	FPM	UPVC	295	127	84	82.5	98	L0	F & A



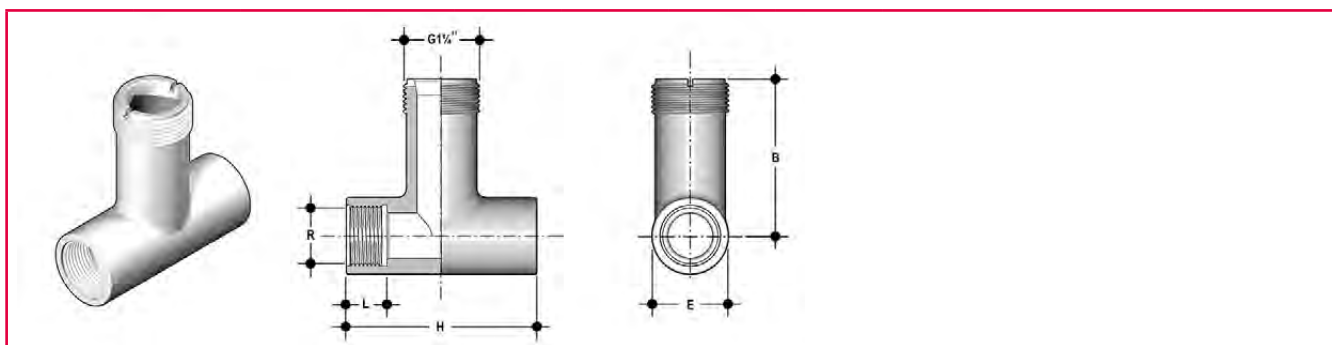
ISO Metric Clamp Saddles

Part No.	DN/Size	d/R	O-ring	Body	Insert	H	E	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SVIC063BME	50	63	EPDM	UPVC	C-PVC	105	116	84.3	35	L0	F & A
SVIC075BME	65	75	EPDM	UPVC	C-PVC	105	134	88.	35	L0	F & A
SVIC090BME	80	90	EPDM	UPVC	C-PVC	105	152	92.6	4	L0	F & A
SVIC110BME	100	110	EPDM	UPVC	C-PVC	105	176	98.8	40	L0	F & A
SVIC125BME	110	125	EPDM	UPVC	C-PVC	112	190	133.3	40	L1	F
SVIC140BME	125	140	EPDM	UPVC	C-PVC	114	214	138.0	40	L1	F
SVIC160BME	150	160	EPDM	UPVC	C-PVC	120	238	144.1	40	L1	F
SVIC200BME	180	200	EPDM	UPVC	C-PVC	133	300	156.4	40	L1	F
SVIC225BME	200	225	EPDM	UPVC	C-PVC	125	333	164.1	40	L1	F
SVIC063DME	50	63	FPM	UPVC	C-PVC	105	116	84.3	35	L0	F & A
SVIC075DME	65	75	FPM	UPVC	C-PVC	105	134	88.	35	L0	F & A
SVIC090DME	80	90	FPM	UPVC	C-PVC	105	152	92.6	4	L0	F & A
SVIC110DME	100	110	FPM	UPVC	C-PVC	105	176	98.8	40	L0	F & A
SVIC125DME	110	125	FPM	UPVC	C-PVC	112	190	133.3	40	L1	F
SVIC140DME	125	140	FPM	UPVC	C-PVC	114	214	138.0	40	L1	F
SVIC160DME	150	160	FPM	UPVC	C-PVC	120	238	144.1	40	L1	F
SVIC200DME	180	200	FPM	UPVC	C-PVC	133	300	156.4	40	L1	F
SVIC225DME	200	225	FPM	UPVC	C-PVC	125	333	164.1	40	L1	F
SMIC250IME*	225	250	NBR	PP	C-PVC	79	324	189.9	40	L0	F
SMIC280IME*	250	280	NBR	PP	C-PVC	88	385	200.2	40	L1	F
SMIC315IME*	300	315	NBR	PP	C-PVC	88	385	209.3	40	L1	F

\* For IP68 sensors or compact monitors only

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION ON METAL PIPES



**BSP Female Threaded 316 SS Tee Fittings**

Part No.	DN/Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TFFX20	15	1/2"	-	316 SS	85	-	16	73	42	L0	F & A
TFFX25	20	3/4"	-	316 SS	95	-	20	81.2	42	L0	F & A
TFFX32	25	1"	-	316 SS	105	-	22.5	81.2	42	L0	F & A
TFFX40	32	1 1/4"	-	316 SS	12	-	20.5	83.8	54	L0	F & A



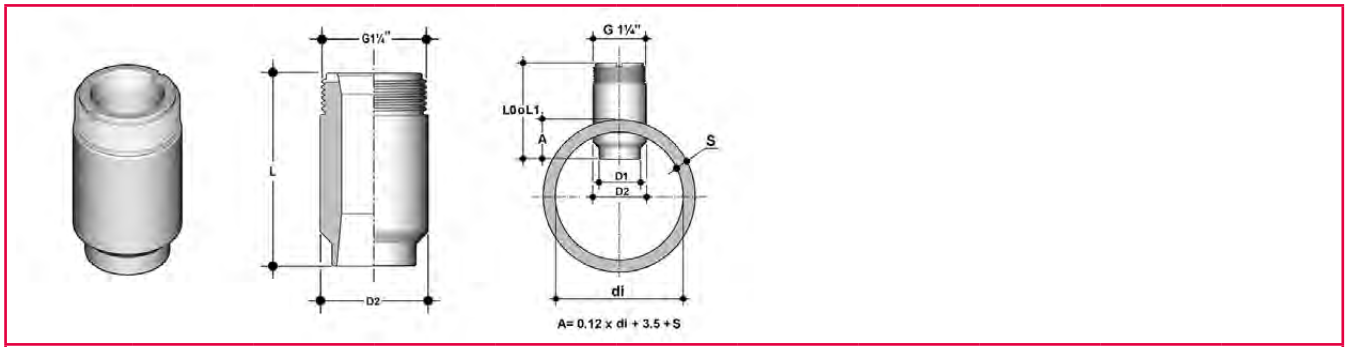
**Strap-on Saddles**

Part No.	DN/Size	O.D. min.	O.D. max	Parallel Thread (GAS)	O-ring	Body	Insert	h	Drilling Hole	Flow Sensor Length	Suitable for (*)
SZIC080I*	80	88	104	1 1/4"	EPDM	Cast iron + SS	C-PVC	153	40	L0	F
SZIC100I*	100	112	126	1 1/4"	EPDM	Cast iron + SS	C-PVC	160	40	L0	F
SZIC125I*	125	140	154	1 1/4"	EPDM	Cast iron + SS	C-PVC	170	40	L0	F
SZIC150I*	150	168	184	1 1/4"	EPDM	Cast iron + SS	C-PVC	180	40	L0	F
SZIC200I*	200	218	234	1 1/4"	EPDM	Cast iron + SS	C-PVC	228	40	L1	F
SZIC250I*	250	272	286	1 1/4"	EPDM	Cast iron + SS	C-PVC	247	40	L1	F
SZIC300I*	300	322	344	1 1/4"	EPDM	Cast iron + SS	C-PVC	266	40	L1	F
SZIC350I*	350	356	384	1 1/4"	EPDM	Cast iron + SS	C-PVC	305	40	L1	F
SZIC400I*	400	425	458	1 1/4"	EPDM	Cast iron + SS	C-PVC	324	40	L1	F
SZIC450I*	450	475	516	1 1/4"	EPDM	Cast iron + SS	C-PVC	343	40	L1	F

(\*) For IP68 sensors or compact monitors only

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

# INSTALLATION ON METAL PIPES

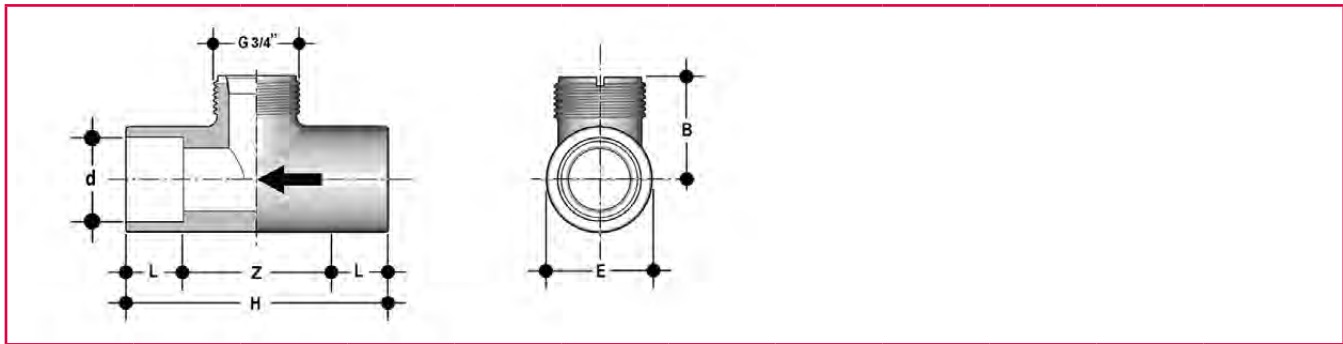


**316L SS Weld on Adapters**

Part No.	DN/Size	d/R	Parallel Thread (GAS)	Body	L	D1	D2	Drilling Hole	Flow Sensor Length	Suitable for (*)
WAIXL0	40	-	1 1/4"	316L SS	68.5	33,9	34	34	L0	F & A
WAIXL0	50	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F & A
WAIXL0	60	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F & A
WAIXL0	65	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F & A
WAIXL0	80	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F & A
WAIXL0	100	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F & A
WAIXL0	110	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F & A
WAIXL0	125	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F
WAIXL0	150	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F
WAIXL0	175	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F
WAIXL0	200	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F
WAIXL0	225	-	1 1/4"	316L SS	68.5	33,9	44	44	L0	F
WAIXL1	250	-	1 1/4"	316L SS	98.5	33,9	44	44	L1	F
WAIXL1	300	-	1 1/4"	316L SS	98.5	33,9	44	44	L1	F
WAIXL1	350	-	1 1/4"	316L SS	98.5	33,9	44	44	L1	F
WAIXL1	400	-	1 1/4"	316L SS	98.5	33,9	44	44	L1	F
WAIXL1	450	-	1 1/4"	316L SS	98.5	33,9	44	44	L1	F
WAIXL1	500	-	1 1/4"	316L SS	98.5	33,9	44	44	L1	F
WAIXL1	600	-	1 1/4"	316L SS	98.5	33,9	44	44	L1	F

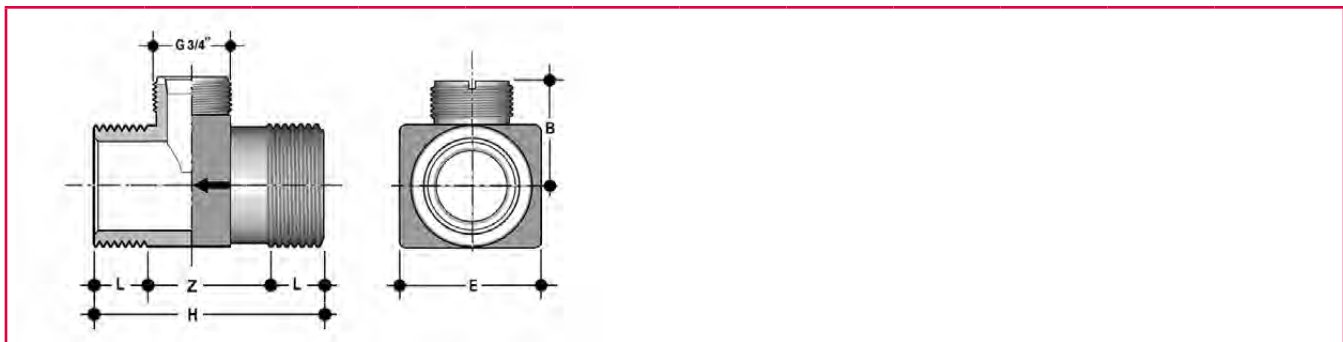
(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION FITTINGS FOR FLS F3.10



**ISO Metric PVC Tee Fittings (female ends for solvent welding)**

Part No.	DN/ Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TMIV20MF	15	20	-	UPVC	43	11	16	27	27	-	F
TMIV25MF	20	25	-	UPVC	52	14	19	30	33	-	F
TMIV32MF	25	32	-	UPVC	61,5	17,5	22	33,5	41	-	F
TMIV40MF	32	40	-	UPVC	74	22	26	38	50	-	F
TMIV50MF	40	50	-	UPVC	89	27	31	43	61	-	F

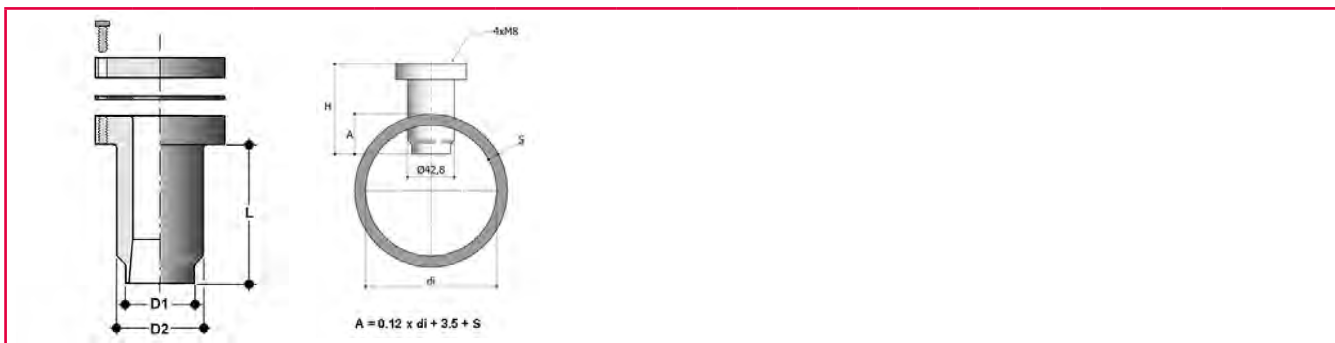


**ISO Metric BRASS Tee Fitting (1 1/4" male threaded ends)**

Part No.	DN/ Size	d/R	O-ring	Body	H	Z	L	B	E	Flow Sensor Length	Suitable for (*)
TMFODN23	23	1 1/4"	-	BRASS	74,2	46,2	14	28	50	-	F

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes

## INSTALLATION FITTINGS FOR FLS F3.20



### 316L SS Weld-on Adapters

Part No.	DN/Size	d/R	Parallel Thread (GAS)	Body	L	D1	D2	Drilling Hole	Flow Sensor Length	Suitable for (*)
WAIXHP	40	-	1 1/4"	316L SS	68,5	34	42,8	34	L0	F
WAIXHP	50	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	60	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	65	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	80	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	100	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	110	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	125	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	150	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	175	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F
WAIXHP	200	-	1 1/4"	316L SS	68,5	34	42,8	43	L0	F

(\*) Suitable for: F= Flow sensors; A= Analytical electrodes





SPARE PARTS AND ACCESSORIES  
**FOR MONITORS, FLOW SENSORS  
AND ANALYTICAL ELECTRODES**



TECHNICAL INFORMATION  
**ABOUT FLOW AND ANALYTICAL  
MEASUREMENT**



# **FLOW MEASUREMENT**

# FLOW MEASUREMENT

Insertion technology is based on fluid speed meters, properly installed in a cylindrical straight pipe, and used to measure the local flow velocity  $V_m$  to calculate the average velocity  $V_a$  and the volumetric flow rate  $Q_v$ . These flow sensors are theoretically supported by fluid-dynamic laws applicable to any circular cross section pipe when some physical conditions (fully developed turbulent flow) are respected.

Those laws state the relationship between the measured local flow velocity and the average flow velocity (UNI 10727; ISO 7145).

The relationship between average velocity  $V_a$  and measured velocity is usually expressed through the "Profile Factor":

$$F_p = V_a / V_m$$

Using the above mentioned factor:

$$Q_v = V_a * ID^2 / 4 = F_p * V_m * ID^2 / 4$$

ID = pipe inside diameter

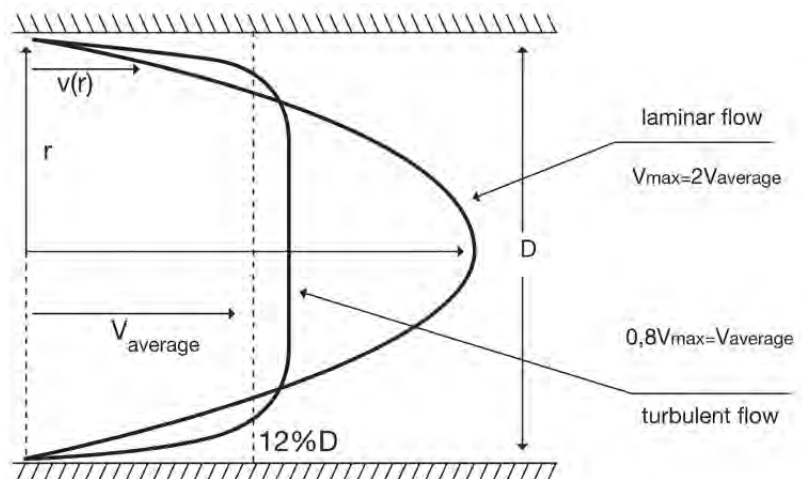
Two different positions are suitable for the flow velocity measuring point:

1. Critical position: the velocity sensor is inserted in a peculiar point where the local velocity correspond to the average velocity (12% of Internal Diameter):

$$V_a = V_m \ggg F_p = 1.$$

2. Central position: the velocity sensor is placed exactly in the centre of the pipe cross section. The local velocity correspond to the maximum velocity:

$$V_m = V_{max} \ggg F_p < 1.$$



## Fully Developed Turbulent Flow

All velocity based flow sensors provide an accurate and reliable indication only when they are measuring a fully developed turbulent flow. Fully developed turbulent flow occurs in every Newtonian fluid when the Reynolds Number is greater than 4500. Fully developed turbulent flow can be more difficult to achieve with high viscosity liquids, low flow rates or large pipes. Quite often a reduction of the pipe size to increase the local flow velocity is enough to produce a proper Reynolds Number:

$$\text{Re} = V \times \text{ID} \times \text{Sg} / \mu$$

where:

**V** = flow velocity in m/s

**ID** = pipe inside diameter in meter

**Sg** = Specific Gravity in Kg/m<sup>3</sup>

**μ** = Dynamic Viscosity in Pa\*s  
(1 Pa\*s = 10<sup>3</sup> cP)

or, converting flow velocity in flow rate:

$$\text{Re} = 1.2732 \times \text{Qv} \times \text{Sg} / \mu \times \text{ID}$$

where:

**Qv** = flow rate in l/s

**Sg** = Specific Gravity in Kg/m<sup>3</sup>

**μ** = Dynamic Viscosity in Pa\*s  
(1 Pa\*s = 10<sup>3</sup> cP)

**ID** = pipe inside diameter in meter

$$\text{Re} = 3162.76 \times \text{Qv} \times \text{Sg} / \mu \times \text{ID}$$

where:

**Qv** = flow rate in gpm

**Sg** = Specific Gravity in Kg/m<sup>3</sup>

**μ** = Dynamic Viscosity in centipoises  
(1 Pa\*s = 10<sup>3</sup> cP)

**ID** = pipe inside diameter in inches

# FLOW SENSORS OPERATING PRINCIPLE

## Insertion flow sensor

### Paddlewheel sensor

This flow sensor consists of a transducer (hall effect for powered system and coil for battery powered system) and a ECTFE five-blade (four blades for F3.10, F3.20 and SS version of F3.00) open cell paddlewheel fixed on a ceramic shaft (SS in case of F3.10, F3.20 and SS version of F3.00). Shaft is orthogonal to the flow direction. The paddlewheel is equipped with a permanent magnet integrated into each blade. As the magnet passes close to the transducer a pulse is generated. When liquid flows into the pipe, the paddlewheel is set in rotation producing a square wave output signal. The frequency is proportional to the flow velocity. The sensor is installed into the pipe using a wide range of insertion type fittings supplied by FLS.

### Turbine sensor

This flow sensor consists of a transducer and a ECTFE eight-blade turbine on a ceramic shaft. Shaft is parallel to the flow direction and sensor is able to recognize both flow directions. The propeller is equipped with a permanent magnet integrated into each blade. As the magnet passes close to the transducer a pulse is generated. When liquid flows into the pipe, the turbine is set in rotation producing a square wave output signal. The frequency is proportional to the flow velocity. The sensor is installed into the pipe using a wide range of insertion type fittings supplied by FLS.

### F3.05 Flow Switch

F3.05 is a flow switch based on a paddlewheel sensor from mechanical point of view.

This means that a transducer is present as well as a five-blade open cell paddlewheel. Also in this case, rotor is equipped with a permanent magnet integrated into each blade. As the magnet passes close to the transducer an output pulse is generated. That pulse is monitored by a missing signal circuit that trips an internal relay when the pulse frequency drops below the factory preset frequency of 0.15 m/s (0.5 ft/s). The switch is installed into the pipe using a wide range of insertion type fittings supplied by FLS.

### Magmeter sensor

Magmeter sensor is based on Faraday's law since a voltage is induced in an electrical conductor when it moves in a magnetic field. A coil mounted into sensor body generates a magnetic field perpendicular to the flow direction. The magnetic field and the flow velocity induce a voltage between the electrodes. The voltage is directly proportional to the flow velocity.

The voltage is converted into a flow proportional 4-20mA output signal or frequency output signal.

## In-line flow sensor

### ULF sensor

This in-line flow sensor consists of a transducer and a five-blade paddlewheel (four-blade paddlewheel for ULF0X.X.0). The paddlewheel is equipped with a permanent magnet integrated into each blade. As the magnet passes close to the transducer a pulse is generated. When liquid flows into the sensor body, the paddlewheel is set in rotation producing a square wave output signal. The generated frequency is proportional to the flow velocity.

### F3.80 Oval Gear sensor

This in-line sensor body contains two oval gears set into rotation by a flowing fluid. The two gears are meshed at 90° to define a fixed fluid volume pumped out every rotation.

Two permanent magnets are positioned into each gear and a hall effect sensor detects the magnetic field generating a square wave signal output with frequency proportional to the number of fluid volumes pumped out.

## VELOCITY/FLOW RATE CONVERSION TABLES

<b>Velocity [m/s] = (Flow Rate [l/s] x 1273.2) / ID<sup>2</sup></b>		<b>Flow Rate [l/s] = (Velocity [m/s] x ID<sup>2</sup>) / 1273.2</b>														
		<b>Velocity</b>														
		ft/sec	0,16	0,33	0,5	0,7	1,6	2,6	3,3	6,6	9,8	13,1	16,4	20	23	26,2
		m/s	0,05	0,1	0,15	0,2	0,5	0,8	1	2	3	4	5	6	7	8
<b>D [mm]</b>	<b>DN [mm]</b>	<b>Flow Rate l/s</b>														
20	15	0,01	0,02	0,03	0,04	0,09	0,14	0,18	0,35	0,53	0,71	0,88	1,06	1,24	1,41	
25	20	0,02	0,03	0,05	0,06	0,16	0,25	0,31	0,63	0,94	1,26	1,57	1,89	2,20	2,51	
32	25	0,02	0,05	0,07	0,10	0,25	0,39	0,49	0,98	1,47	1,96	2,45	2,95	3,44	3,93	
40	32	0,04	0,08	0,12	0,16	0,40	0,64	0,80	1,61	2,41	3,22	4,02	4,83	5,63	6,43	
50	40	0,06	0,13	0,19	0,25	0,63	1,01	1,26	2,51	3,77	5,03	6,28	7,54	8,80	10,05	
63	50	0,10	0,20	0,29	0,39	0,98	1,57	1,96	3,93	5,89	7,85	9,82	11,78	13,74	15,71	
75	65	0,17	0,33	0,50	0,66	1,66	2,65	3,32	6,64	9,96	13,27	16,59	19,91	23,23	26,55	
90	80	0,25	0,50	0,75	1,01	2,51	4,02	5,03	10,05	15,08	20,11	25,13	30,16	35,19	40,21	
110	100	0,39	0,79	1,18	1,57	3,93	6,28	7,85	15,71	23,56	31,42	39,27	47,13	54,98	62,83	
125	110	0,48	0,95	1,43	1,90	4,75	7,60	9,50	19,01	28,51	38,01	47,52	57,02	66,53	76,03	
140	125	0,61	1,23	1,84	2,45	6,14	9,82	12,27	25,54	36,82	49,09	61,36	73,63	85,91	98,18	
160	150	0,88	1,77	2,65	3,53	8,84	14,14	17,67	35,34	53,02	70,69	88,36	106,03	123,70	141,38	
200	180	1,27	2,54	3,82	5,09	12,72	20,36	25,45	50,90	76,34	101,79	127,24	152,69	178,13	203,58	
225	200	1,57	3,14	4,71	6,28	15,71	25,13	31,42	62,83	94,25	125,67	157,08	188,50	219,92	251,34	
250	225	1,99	3,98	5,96	7,95	19,88	31,81	39,76	79,52	119,29	159,05	198,81	238,57	278,33	318,10	
280	250	2,45	4,91	7,36	9,82	25,54	39,27	49,09	98,18	147,27	196,36	245,44	294,53	343,62	392,71	
315	280	3,08	6,16	9,24	12,32	30,79	49,26	61,58	123,15	184,73	246,31	307,89	369,46	431,04	492,62	

<b>Velocity [m/s] = (Flow Rate [l/min] x 21.16) / ID<sup>2</sup></b>		<b>Flow Rate [l/min] = (Velocity [m/s] x ID<sup>2</sup>) / 21.16</b>														
		<b>Velocity</b>														
		ft/sec	0,16	0,33	0,5	0,7	1,6	2,6	3,3	6,6	9,8	13,1	16,4	20	23	26,2
		m/s	0,05	0,1	0,15	0,2	0,5	0,8	1	2	3	4	5	6	7	8
<b>D [mm]</b>	<b>DN [mm]</b>	<b>Flow Rate l/min</b>														
20	15	0,5	1,1	1,6	2,1	5,3	8,5	10,6	21,3	31,9	42,5	53,2	63,8	74,4	85,1	
25	20	0,9	1,9	2,8	3,8	9,5	15,1	18,9	37,8	56,7	75,6	94,5	113,4	132,3	151,2	
32	25	1,5	3,0	4,4	5,9	14,8	23,6	29,5	59,1	88,6	118,1	147,7	177,2	206,8	236,3	
40	32	2,4	4,8	7,3	9,7	24,2	38,7	48,4	96,8	145,2	193,6	242,0	290,4	338,8	387,1	
50	40	3,8	7,6	11,3	15,1	37,8	60,5	75,6	151,2	226,8	302,5	378,1	453,7	529,3	604,9	
63	50	5,9	11,8	17,7	23,6	59,1	94,5	118,1	236,3	354,4	472,6	590,7	708,9	827,0	945,2	
75	65	10,0	20,0	30,0	39,9	99,8	159,7	199,7	399,3	599,0	798,7	998,3	1198,0	1397,7	1597,4	
90	80	15,1	30,2	45,4	60,5	151,2	242,0	302,5	604,9	907,4	1209,8	1512,3	1814,7	2117,2	2419,7	
110	100	23,6	47,3	70,9	94,5	236,3	378,1	472,6	945,2	1417,8	1890,4	2362,9	2835,5	3308,1	3780,7	
125	110	28,6	57,2	85,8	114,4	285,9	457,5	571,8	1143,7	1715,5	2287,3	2859,2	3431,0	4002,8	4574,7	
140	125	36,9	73,8	110,8	147,7	369,2	590,7	738,4	1476,8	2215,3	2953,7	3692,1	4430,5	5169,0	5907,4	
160	150	53,2	106,3	159,5	212,7	531,7	850,7	1063,3	2126,7	3190,0	4253,3	5316,6	6380,0	7443,3	8506,6	
200	180	76,6	153,1	229,7	306,2	765,6	1225,0	1531,2	3062,4	4593,6	6124,8	7656,0	9187,1	10718,3	12249,5	
225	200	94,5	189,0	283,6	378,1	945,2	1512,3	1890,4	3780,7	5671,1	7561,4	9451,8	11342,2	13232,5	15122,9	
250	225	119,6	239,2	358,9	478,5	1196,2	1914,0	2392,5	4785,0	7177,5	9569,9	11962,4	14354,9	16747,4	19139,9	
280	250	147,7	295,4	443,1	590,7	1476,8	2362,9	2953,7	5907,4	8861,1	11814,7	14768,4	17722,1	20675,8	23629,5	
315	280	185,3	370,5	555,8	741,0	1852,6	2964,1	3705,1	7410,2	11115,3	14820,4	18525,5	22230,6	25935,7	29640,8	

# VELOCITY/FLOW RATE CONVERSION TABLES

Velocity [m/s] = (Flow Rate [l/h] x 0.35344) / ID <sup>2</sup>		Flow Rate [l/h] = (Velocity [m/s] x ID <sup>2</sup> ) / 0.35344													
		Velocity													
		ft/sec	0,16	0,33	0,5	0,7	1,6	3,3	6,6	9,8	13,1	16,4	20	23	26,2
		m/s	0,05	0,1	0,15	0,2	0,5	1	2	3	4	5	6	7	8
D [mm]	DN [mm]	Flow Rate l/h													
20	15	32	64	95	127	318	637	1273	1910	2546	3183	3820	4456	5093	
25	20	57	113	170	226	566	1132	2263	3395	4527	5659	6790	7922	9054	
32	25	88	177	265	354	884	1768	3537	5305	7073	8842	10610	12378	14147	
40	32	145	290	435	579	1449	2897	5794	8692	11589	14486	17383	20281	23178	
50	40	226	453	679	905	2263	4527	9054	13581	18108	22635	27162	31689	36215	
63	50	354	707	1061	1415	3537	7073	14147	21220	28293	35367	42440	49513	56587	
75	65	598	1195	1793	2391	5977	11954	23908	35862	47816	59770	71724	83678	95632	
90	80	905	1811	2716	3622	9054	18108	36215	54323	72431	90539	108646	126754	144862	
110	100	1415	2829	4244	5659	14147	28293	56587	84880	113173	141467	169760	198053	226347	
125	110	1712	3423	5135	6847	17117	34235	68470	102705	136940	171175	205410	239645	273880	
140	125	2210	4421	6631	8842	22104	44208	88417	132625	176833	221042	265250	309458	353667	
160	150	3183	6366	9549	12732	31830	63660	127320	190980	254640	318300	381960	445620	509280	
200	180	4584	9167	13751	18334	45835	91670	183341	275011	366682	458352	550023	641693	733364	
225	200	2659	11317	16976	22635	56587	113173	226347	339520	452694	565867	679040	792214	905387	
250	225	7162	14324	21485	28647	71618	143235	286470	429705	572940	716175	859410	1002645	1145880	
280	250	8842	17683	26525	35367	88417	176833	353667	530500	707334	884167	1061000	1237834	1414667	
315	280	11091	22182	33273	44364	110910	221820	443640	665459	887279	1109099	1330919	1552739	1774559	

Velocity [m/s] = (Flow Rate [l/h] x 0.35344) / ID <sup>2</sup>		Flow Rate [l/h] = (Velocity [m/s] x ID <sup>2</sup> ) / 0.35344														
		Velocity														
		ft/sec	0,16	0,33	0,5	0,7	1,6	2,6	3,3	6,6	9,8	13,1	16,4	20	23	26,2
		m/s	0,05	0,1	0,15	0,2	0,5	0,8	1	2	3	4	5	6	7	8
D [mm]	DN [mm]	Flow Rate m <sup>3</sup> /h														
20	15	0,03	0,06	0,10	0,13	0,32	0,51	0,64	1,27	1,91	2,55	3,18	3,82	4,46	5,09	
25	20	0,06	0,11	0,17	0,23	0,57	0,91	1,13	2,26	3,40	4,53	5,66	6,79	7,92	9,05	
32	25	0,09	0,18	0,27	0,35	0,88	1,41	1,77	3,54	5,31	7,07	8,84	10,61	12,38	14,15	
40	32	0,14	0,29	0,43	0,58	1,45	2,32	2,90	5,79	8,69	11,59	14,49	17,38	20,28	23,18	
50	40	0,23	0,45	0,68	0,91	2,26	3,62	4,53	9,05	13,58	18,11	22,63	27,16	31,69	36,22	
63	50	0,35	0,71	1,06	1,41	3,54	5,66	7,07	14,15	21,22	28,29	35,57	42,44	49,51	56,59	
75	65	0,60	1,20	1,79	2,39	5,98	9,56	11,95	23,91	35,86	47,82	59,77	71,72	83,68	95,63	
90	80	0,91	1,81	2,72	3,62	9,05	14,49	18,11	36,22	54,32	72,43	90,54	108,65	126,75	144,86	
110	100	1,41	2,83	4,24	5,66	14,15	22,63	28,29	56,59	84,88	113,17	141,47	169,76	198,05	226,35	
125	110	1,71	3,42	5,14	6,85	17,12	27,39	34,23	68,47	102,70	136,94	171,17	205,41	239,64	273,88	
140	125	2,21	4,42	6,63	8,84	22,10	35,37	44,21	88,42	132,63	176,83	221,04	265,25	309,46	353,67	
160	150	3,18	6,37	9,55	12,73	31,83	50,93	63,66	127,32	190,98	254,64	318,30	381,96	445,62	509,28	
200	180	4,58	9,17	13,75	18,33	45,84	73,34	91,67	183,34	275,01	366,68	458,35	550,02	641,69	733,36	
225	200	5,66	11,32	16,98	22,63	56,59	90,54	113,17	226,35	339,52	452,69	565,87	679,04	792,21	905,39	
250	225	7,16	14,32	21,49	28,65	71,62	114,59	143,24	286,47	429,71	572,94	716,18	859,41	1002,65	1145,88	
280	250	8,84	17,68	26,53	35,37	88,42	141,47	176,83	353,67	530,50	707,33	884,17	1061,00	1237,83	1414,67	
315	280	11,09	22,18	33,27	44,36	110,91	177,46	221,82	443,64	665,46	887,28	1109,10	1330,92	1552,74	1774,56	



## VELOCITY/FLOW RATE CONVERSION TABLES

Velocity [f/s] = (Flow Rate [gpm] x 0.4085) / ID <sup>2</sup>								Flow Rate [gpm] = (Velocity [f/s] x ID <sup>2</sup> ) / 0.4085								
		Velocity														
		ft/sec	0,16	0,33	0,5	0,7	1,6	2,6	3,3	6,6	9,8	13,1	16,4	20	23	26,2
		m/s	0,05	0,1	0,15	0,2	0,5	0,8	1	2	3	4	5	6	7	8
D [inch]	DN [mm]	Flow Rate US-gpm														
1/2	15	0,14	0,28	0,42	0,56	1,40	2,25	2,81	5,62	8,43	11,24	14,05	16,85	19,66	22,47	
3/4	20	0,25	0,50	0,75	1,00	2,50	4,00	4,99	9,99	14,98	19,98	24,97	29,96	34,96	39,95	
1	25	0,39	0,78	1,17	1,56	3,90	6,24	7,80	15,61	23,41	31,21	39,01	46,82	54,62	62,42	
1 1/4	32	0,64	1,28	1,92	2,56	6,39	10,23	12,78	25,57	38,35	51,14	63,92	76,70	89,49	102,27	
1 1/2	40	1,00	2,00	3,00	4,00	9,99	15,98	19,98	39,95	59,93	79,90	99,88	119,85	139,83	159,80	
2	50	1,56	3,12	4,68	6,24	15,61	24,97	31,21	64,42	93,63	124,85	156,06	187,27	218,48	249,69	
2 1/2	65	2,64	5,27	7,91	10,55	26,37	42,20	52,75	105,49	158,24	210,99	263,74	316,48	369,23	421,98	
3	80	4,00	7,99	11,99	15,98	39,95	63,92	79,90	159,80	239,70	319,60	399,50	479,41	559,31	639,21	
4	100	6,24	12,48	18,73	24,97	62,42	99,88	124,85	249,69	374,54	499,38	624,23	749,07	873,92	998,76	
5	125	9,75	19,51	29,26	39,01	97,54	156,06	195,07	390,14	585,21	780,28	975,35	1170,42	1365,49	1560,56	
6	150	14,05	28,09	42,14	56,18	140,45	224,72	280,90	561,80	842,70	1123,61	1404,51	1685,41	1966,31	2247,21	
8	200	24,97	49,94	74,91	99,88	249,69	399,50	499,38	998,76	1498,14	1997,52	2496,90	2996,28	3495,66	3995,04	
10	225	31,60	63,20	94,80	126,41	316,01	505,62	632,03	1264,06	1896,08	2528,11	3160,14	3792,17	4424,20	5056,23	
12	300	48,94	97,88	146,82	195,76	489,39	783,03	978,79	1957,57	2936,36	3915,14	4893,93	5872,71	6851,50	7830,28	

## VELOCITY/FLOW RATE CONVERSION TABLES

To convert		Into	Multiply by
VOLUME	US Gallon	fl. oz. (U.S.)	128
		cubic inch	231
		cubic ft.	134
		liter	3.785
		cubic meter	000.379
		Imp. gallon	833
	Imperial Gallon	U.S. gallon	12
		Cubic Foot	U.S. gallon
	Liter	Cubic meter	00.283
		Cubic meter	U.S. gallon
cubic ft.			35.314
LENGTH	Inch	centimeter	25.400
		meter	3.048
	Foot	meter	9.144
		kilometer	16.093
WEIGHT	Ounce	gram	283.495
	Pound	gram	45.359
FLOW RATE	US gallon per minute (gpm)	liter per second	0.063
	US gallon per minute (gpm)	cubic meter per hr.	227
	UK gallon per minute (gpm)	cubic meter per hr.	273
PRESSURE	Atmosphere	bar	10.133
	Psi [lb/inch <sup>2</sup> ]	bar	00.689
	Pascal [Newton/m <sup>2</sup> ]	bar	10-5
	MegaPascal	bar	10
TEMPERATURE	Kelvin [°K]	celsius [°C]	°C = °K - 273
	Fahrenheit [°F]	celsius [°C]	°C = (°F - 32) x 5/9