Quick Start Manual

truflo®

IO-Link

RoHS Compliant CE

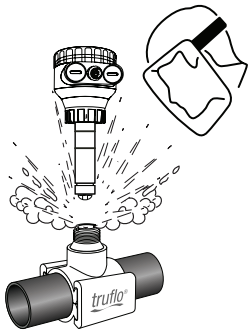
Read the user's manual carefully before starting to use the unit.
Producer reserves the right to implement changes without prior notice.

Safety Information

- De-pressurize and vent system prior to installation or removal
- Confirm chemical compatibility before use
- **DO NOT** exceed maximum temperature or pressure specifications
- **ALWAYS** wear safety goggles or face-shield during installation and/or service
- **DO NOT** alter product construction

Warning | Caution | Danger
Indicates a potential hazard. Failure to follow all warnings may lead to equipment damage, injury, or death.

Note | Technical Notes
Highlights additional information or detailed procedure.



Hand Tighten Only
Over tightening may permanently damage product threads and lead to failure of the retaining nut.

Do Not Use Tools
Use of tool(s) may damage produced beyond repair and potentially void product warranty.

Personal Protective Equipment (PPE)
Always utilize the most appropriate PPE during installation and service of Truflo® products.

Pressurized System Warning
Sensor may be under pressure. Take caution to vent system prior to installation or removal. Failure to do so may result in equipment damage and/or serious injury.

Truflo® — TIR | TI3R Series
Insertion Paddle Wheel Flow Meter Sensor

ICON PROCESS CONTROLS™ Corrosion-Free Instrumentation Equipment™

Product Description

The TI Series insertion plastic paddle wheel flow meter has been engineered to provide long-term accurate flow measurement in tough industrial applications. The paddle wheel assembly consists of a engineered Tefzel® paddle and micro-polished zirconium ceramic rotor pin and bushings. High performance Tefzel® and Zirconium materials have been selected due to their excellent chemical and wear resistant properties.

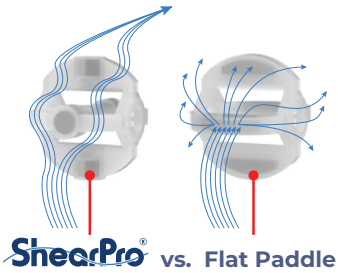
Features

- ½" – 24" Line Sizes
- Flow Rate
- Pulse | 4-20mA | Voltage Outputs (Optional)

New ShearPro® Design

- Contoured Flow Profile
- Reduced Turbulence = Increased Longevity
- 78% Less Drag than Old Flat Paddle Design*

*Ref: NASA "Shape Effects on Drag"



Tefzel® Paddle Wheel

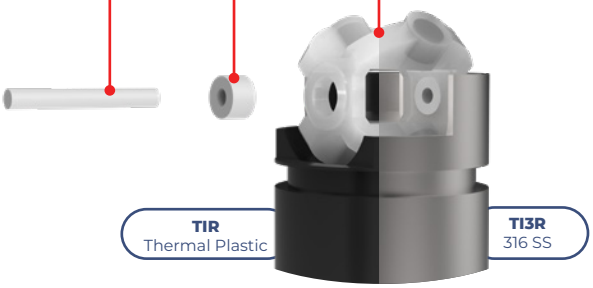
- Superior Chemical And Wear Resistance vs PVDF

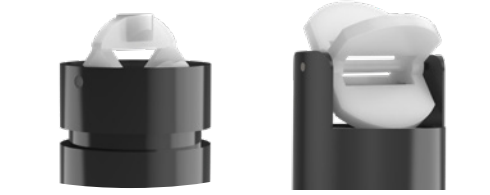
Zirconium Ceramic Rotor | Bushings

- Up to 15x the Wear Resistance
- Integral Rotor Bushings Reduce Wear and Fatigue Stress

360° Shielded Rotor Design

- Eliminates Finger Spread
- No Lost Paddles





ShearPro® vs. Competitor

Technical Specifications

General		
Operating Range	0.3 to 33 ft/s	0.1 to 10 m/s
Pipe Size Range	½ to 24"	DN15 to DN600
Linearity	±0.5% of F.S @ 25°C | 77°F	
Repeatability	±0.5% of F.S @ 25°C | 77°F	
Wetted Materials		
Sensor Body	PVC (Dark) | PP (Pigmented) | PVDF (Natural) | 316SS	
O-Rings	FKM | EPDM* | FFKM*	
Rotor Pin | Bushings	Zirconium Ceramic | ZrO_2	
Paddle | Rotor	ETFE Tefzel®	
Electrical		
Frequency	49 Hz per m/s nominal	15 Hz per ft/s nominal
Supply Voltage	10-30 VDC ±10% regulated	
Supply Current	<1.5 mA @ 3.3 to 6 VDC	<20 mA @ 6 to 24 VDC
Max. Temperature/Pressure Rating – Standard and Integral Sensor | Non-Shock		
PVC	180 Psi @ 68°F | 40 Psi @ 140°F	12.5 Bar @ 20°C | 2.7 Bar @ 60°F
PP	180 Psi @ 68°F | 40 Psi @ 190°F	12.5 Bar @ 20°C | 2.7 Bar @ 88°F
PVDF	200 Psi @ 68°F | 40 Psi @ 240°F	14 Bar @ 20°C | 2.7 Bar @ 115°F
316SS	200 Psi @ 180°F | 40 Psi @ 300°F	14 Bar @ 82°C | 2.7 Bar @ 148°F
Operating Temperature		
PVC	32°F to 140°F	0°C to 60°C
PP	-4°F to 190°F	-20°C to 88°C
PVDF	-40°F to 240°F	-40°C to 115°C
316SS	-40°F to 300°F	-40°C to 148°C
Output		
Pulse | 4-20mA | Voltage (0~5V)*		
Display		
LED | Flow Rate		
Standards and Approvals		
CE | FCC | RoHS Compliant		

See Temperature and Pressure Graphs for more information

* Optional

Model Selection

PVC | PP | PVDF		
Size	**Part Number**	**Material**
½" - 4"	TIR-P-S	PVC
6" - 24"	TIR-P-L	PVC
1" - 4"	TIR-PP-S	PP
6" - 24"	TIR-PP-L	PP
1" - 4"	TIR-PF-S	PVDF
6" - 24"	TIR-PF-L	PVDF

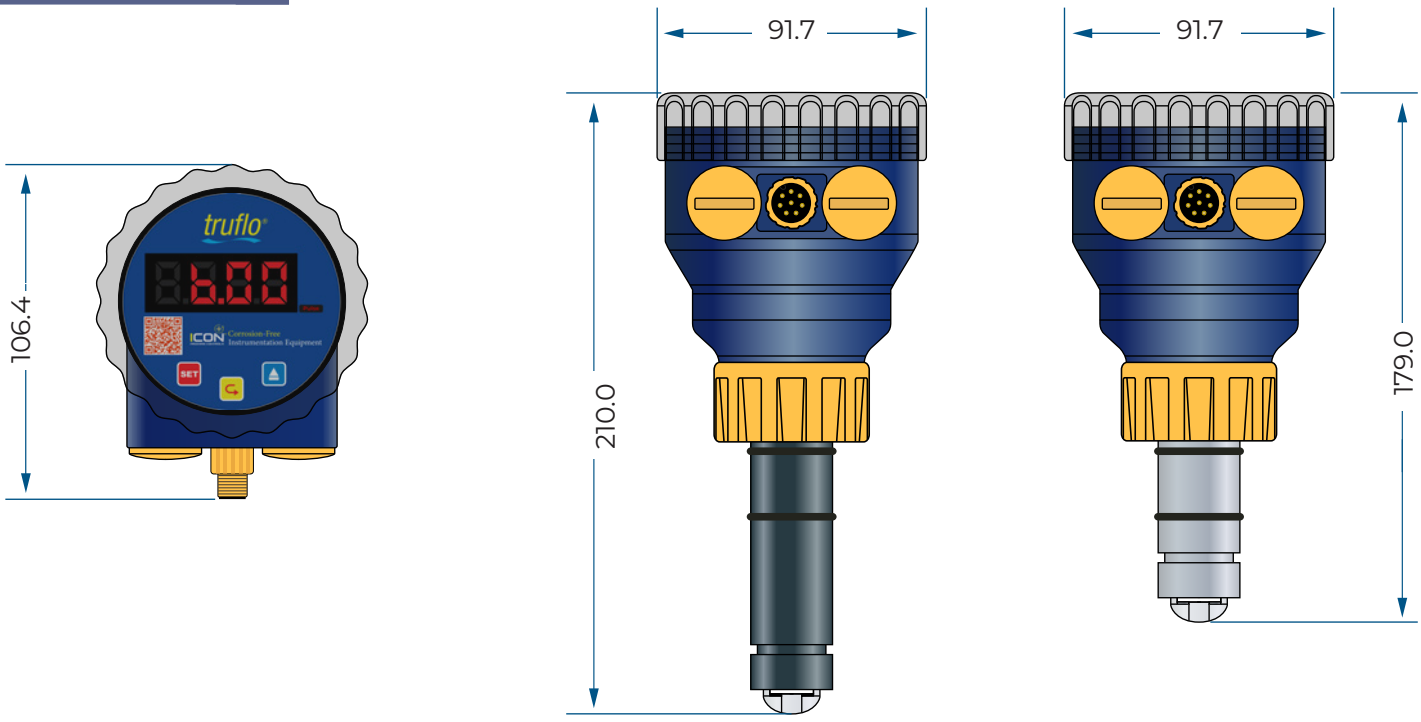
Add Suffix -
'E' - EPDM Seals

316 SS		
Size	**Part Number**	**Material**
½" - 4"	TI3R-SS-S	316 SS
6" - 24"	TI3R-SS-L	316 SS

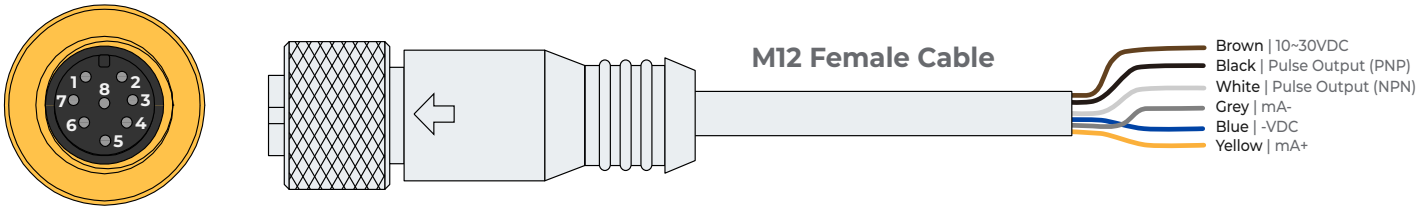
Add Suffix -
'E' - EPDM Seals

Display Characteristics

Dimensions (mm)



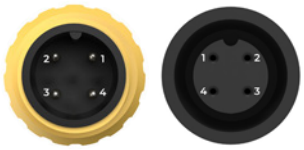
Wiring Diagram



Pin	Description	Color
1	10~30 VDC	Brown
2	Pulse Output NPN	White
3	- VDC	Blue
4	Pulse Output PNP	Black
5	4-20mA + or V*	Yellow
6	4-20mA - or V*	Grey

*Optional

IO-Link



Pin	Description
1	10~30 VDC
2	Factory Specific
3	- VDC
4	IO-Link

Wiring - One Pulse/Gal | Con E

Set "**Con E**" in **Pulse Output Control**

(Refer Pulse Control Programmming, Page 11)

Wire Color	Description
Brown	+ 10~30VDC
White	Pulse Output
Blue	-VDC

Wiring - To Flow Display | Con F

Set "**Con F**" in **Pulse Output Control**

(Refer Pulse Control Programmming, Page 11)

Wire Color	Description
Brown	+ 10~30VDC
White	Paddle Pulse
Blue	-VDC

Wiring - SSR* PNP Pulse | Con A

Set "**Con A**" in **Pulse Output Control**

(Refer Pulse Control Programmming, Page 11)

Wire Color	Description
Brown	+ 10~30VDC
Black	Pulse Output PNP
Blue	-VDC

*SSR – Solid State Relay

Wiring - SSR* NPN Pulse | Con A

Set "**Con A**" in **Pulse Output Control**

(Refer Pulse Control Programmming, Page 11)

Wire Color	Description
Brown	+ 10~30VDC
White	Pulse Output NPN
Blue	-VDC

*SSR – Solid State Relay

Installation

Very Important

- Lubricate O-rings with a viscous lubricant, compatible with the materials of construction.
- Using an alternating | twisting motion, carefully lower the sensor into the fitting. | **Do Not Force** | Fig-3
- Ensure tab | notch are parallel to flow direction | Fig-4

Hand tighten the sensor cap. DO NOT use any tools on the sensor cap or the cap threads or fitting threads may be damaged. | Fig-5

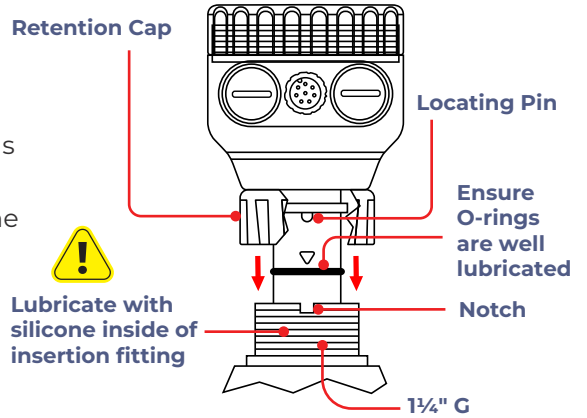


Fig - 3

Fig - 1

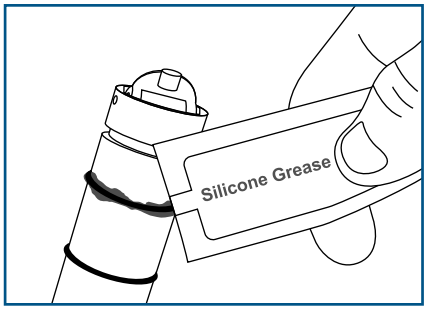
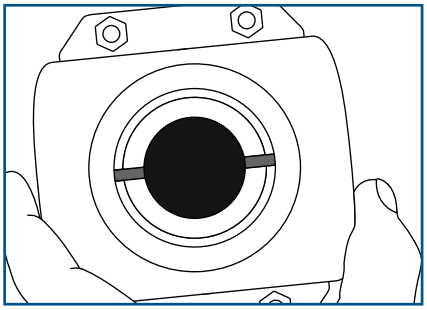


Fig - 2



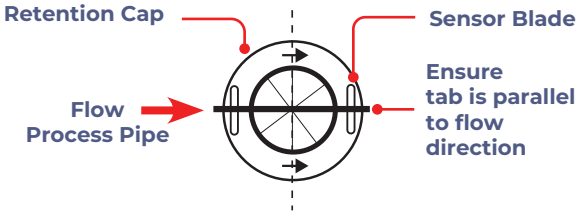


Fig - 4
Top View

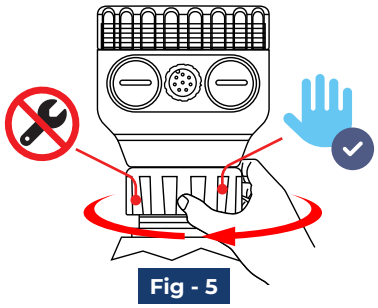
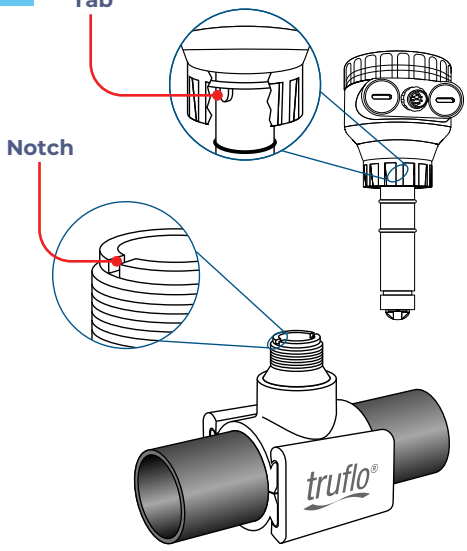


Fig - 5

Correct Sensor Position

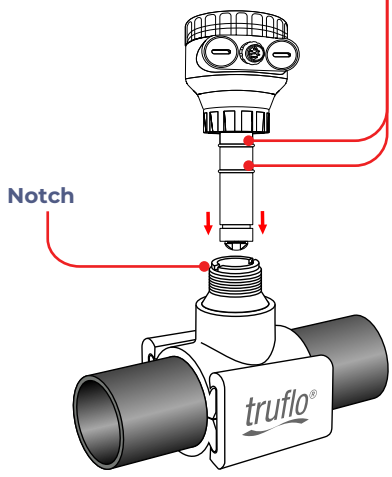
01



Locate the flow meter positioning tab and clamp saddle notch.

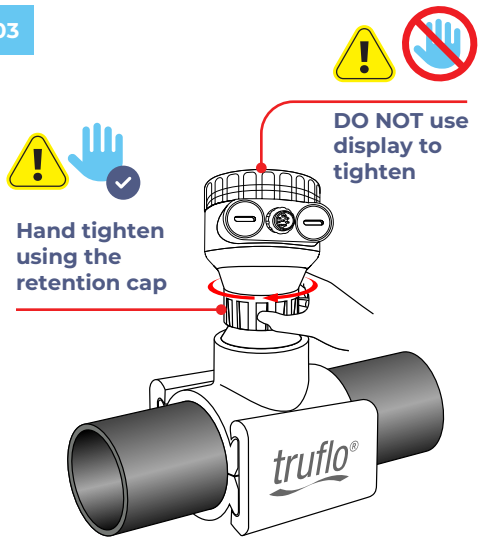
02

VERY IMPORTANT
Lubricate O-rings with a viscous lubricant, compatible with the system



Engage one thread of the sensor cap, then turn the sensor until the alignment tab is seated in the fitting notch. Ensure tab is parallel to flow direction.

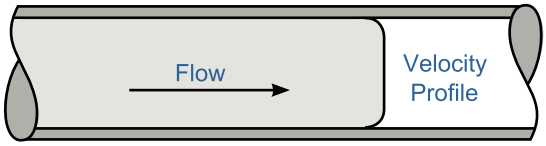
03



- Hand tighten the screw cap
- DO NOT use any tools — threads may be damaged
- Ensure meter is firmly in place

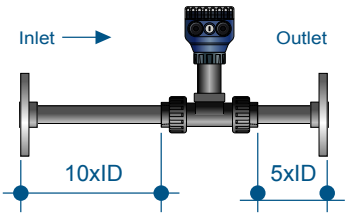
Correct Sensor Position Setup

TI Series flow meters measure liquid media only. There should be no air bubbles and the pipe must always remain full. To ensure accurate flow measurement, the placement of the flow meters needs to adhere to specific parameters. This requires a straight run pipe with a minimum number of pipe diameters distance upstream and downstream of the flow sensor.

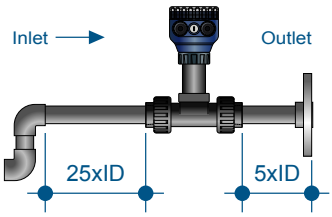


Developed Turbulent Flow

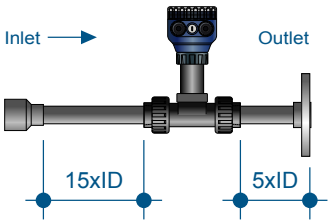
Flange



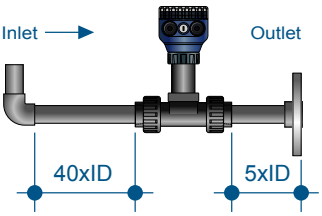
2x 90° Elbow



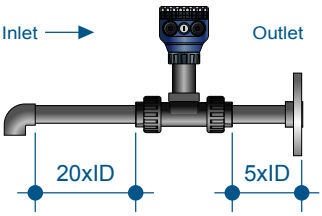
Reducer



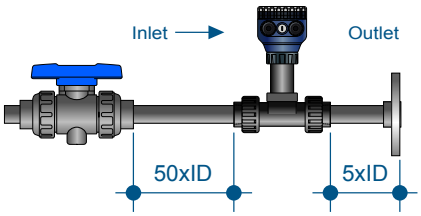
90° Downward Flow



90° Elbow Downward Flow Upward

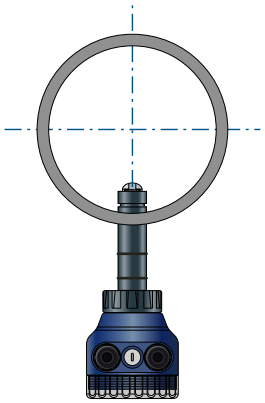


Ball Valve



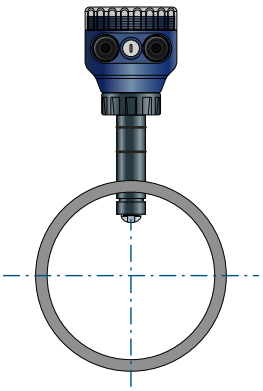
Installation Positions

Figure - 1



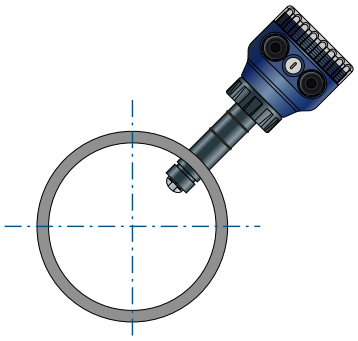
Good if NO SEDIMENT present

Figure - 2



Good if NO AIR BUBBLES present

Figure - 3



Preferred installation if SEDIMENT* or AIR BUBBLES may be present

*Maximum % of solids: 10% with particle size not exceeding 0.5mm cross section or length

Fittings and K-Factor

TEE FITTINGS

Tee Fitting		K-Factor		Sensor Length
IN	DN	LPM	GPM	
½" (V1)	15	156.1	593.0	S
½" (V2)	15	267.6	1013.0	S
¾"	20	160.0	604.0	S
1"	25	108.0	408.0	S
1½"	40	37.0	140.0	S
2"	50	21.6	81.7	S
2½"	65	14.4	54.4	S
3"	80	9.3	35.0	S
4"	100	5.2	19.8	S

TEE FITTINGS (V2)

Size	K-Factor
½"	282.0
¾"	196.0
1"	136.0
1½"	43.2
2"	23.2

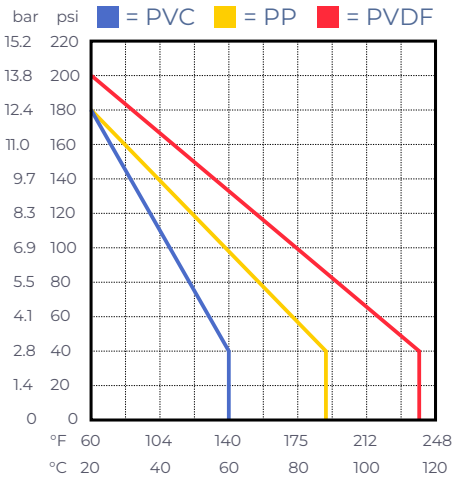
CLAMP-ON SADDLES

Clamp Saddles		K-Factor		Sensor Length
IN	DN	LPM	GPM	
2"	50	21.6	81.7	S
3"	80	9.3	35.0	S
4"	100	5.2	19.8	S
6"	150	2.4	9.2	L
8"	200	1.4	5.2	L

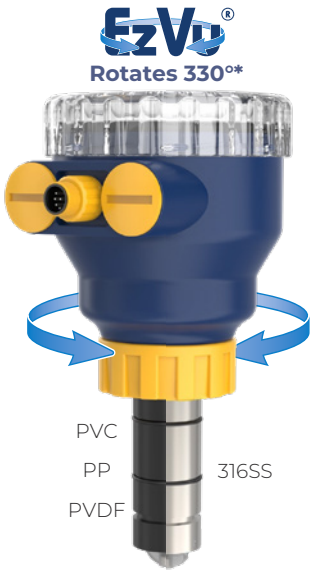
CPVC SOCKET WELD-ON ADAPTERS

Weld On Adapter		K-Factor		Sensor Length
IN	DN	LPM	GPM	
2"	50	14.4	54.4	S
2½"	65	9.3	35.5	S
3"	80	9.3	35.0	S
4"	100	5.2	19.8	S
6"	150	2.4	9.2	L
8"	200	1.4	5.2	L
10"	250	0.91	3.4	L
12"	300	0.65	2.5	L
14"	400	0.5	1.8	L
16"	500	0.4	1.4	L
18"	600	0.3	1.1	L
20"	800	0.23	0.9	L
24"	1000	0.16	0.6	L

Pressure vs. Temperature



Note: During system design the specifications of all components must be considered. | Non-Shock



* Optional

Min/Max Flow Rates

Pipe Size (O.D.)	LPM | GPM	LPM | GPM
	0.3m/s min.	10m/s max
½" | DN15	3.5 | 1.0	120.0 | 32.0
¾" | DN20	5.0 | 1.5	170.0 | 45.0
1" | DN25	9.0 | 2.5	300.0 | 79.0
1 ½" | DN40	25.0 | 6.5	850.0 | 225.0
2" | DN50	40.0 | 10.5	1350.0 | 357.0
2 ½" | DN60	60.0 | 16.0	1850.0 | 357.0
3" | DN80	90.0 | 24.0	2800.0 | 739.0
4" | DN100	125.0 | 33.0	4350.0 | 1149.0
6" | DN150	230.0 | 60.0	7590.0 | 1997.0
8" | DN200	315.0 | 82.0	10395.0 | 2735.0

316SS PC PVC PP PVDF RoHS Compliant CE

Programming

SET Select/Save/Continue | Move Selection Left | Change Digit Value

STEPS	DISPLAY	OPERATION
1 Home Screen SET 3 SEC		Home Screen
2 K Factor SET		**K Factor (K1 | K2)** **K1** — Pipe Size: ¾" - 24" GPM | ½" - 8" LPM **K2** — Pipe Size: 10" - 24" LPM
3 Enter K Factor Value SET		**K Factor Value** Enter K Factor value depending on pipe size. Refer to Page 9 for K-Factor Values
4 Transmitter Range SET		**Transmitter Range | 20mA** Note: 4mA = 0 (Factory Default)
5 Enter 20mA Value SET		**Enter 20mA Value** 20mA = Max Flow Rate
6 SSR* Alarm Set Point SET		**SSR* Alarm Set Point** *SSR – Solid State Relay Note: See Page No. 6 for Wiring
7 Enter Alarm Set Point Value SET		**Enter Alarm Set Point** Factory Default: 100 Range: 0 ~ 999.9
8 Alarm Hysteresis SET		**Alarm Hysterisis**
9 Enter Hysteresis Value SET		**Enter Hysterisis Value** Factory Default: 0.0 Range: 0 ~ 999.9

Additional Programming

SET Select/Save/Continue | Move Selection Left | Change Digit Value

STEPS	DISPLAY	OPERATION
1 Home Screen ▸ 		**Home Screen**
2 Lock Settings ▸ 		**Lock Settings** Factory Default: Lk = 10 Otherwise meter will enter **Lockout Mode***
3 Filter Damping ▸ 		**Filter Damping** Factory Default: F = 10 Range: 00 ~ 99 Sec
4 Decimal Point ▸ 		**Decimal Point** Factory Default: dP = 1 Range: 0 ~ 1
5 Flow Unit ▸ 		**Flow Unit** Ut.G = Gallons (Factory Default) Ut.L = Liters | Ut.KL = Kiloliters
6 Pulse Output Control ▸ 		**Pulse Output Control** Con.E = One Pulse/Gal (Factory Default) Con.F = Paddle Pulse ▸ Frequency Max 5 KHZ | Con.A = SSR*
7 Alarm Mode Setting ▸ 		**Alarm Mode Setting** Factory Default: ALT = 0 Range: 0~4 | Refer to Alarm Mode Selection (See below)
8 Alarm Output Delay ▸ 		**Alarm Output Delay** Factory Default: t = 00 Range: 01 ~ 09 Secs

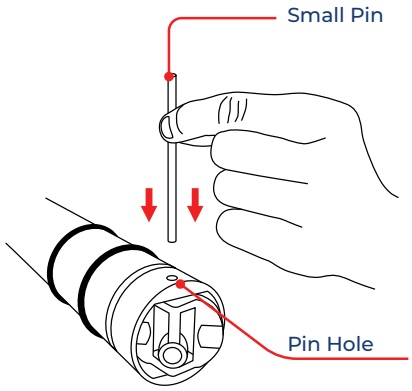
***SSR** = Solid State Relay

Alarm Mode Selection

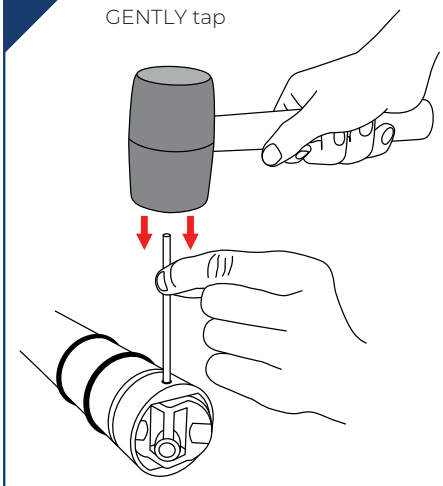
ALt No.	Description
ALt = 0	CV ≥ SV ⟶ Relay ON | CV < [SV - Hys] ⟶ Relay OFF
ALt = 1	CV ≤ SV ⟶ Relay ON | CV > [SV + Hys] ⟶ Relay OFF
ALt = 2	[SV + Hys] ≥ CV ≥ [SV - Hys] ⟶ Relay ON : CV > [SV + Hys] or CV < [SV - HyS] ⟶ Relay OFF
ALt = 3	[SV + Hys] ≥ CV ≥ [SV - Hys] ⟶ Relay OFF: CV > [SV + Hys] or CV < [SV - HyS] ⟶ Relay ON
Hys = Hysteresis — Acts like a buffer ± around Alarm Set Point	
CV: Current Value (Flow Rate) | SV = Set Value	

Rotor Pin | Paddle Replacement

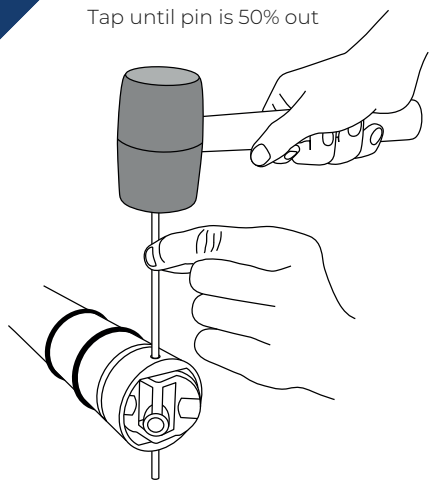
1 Line up pin with hole



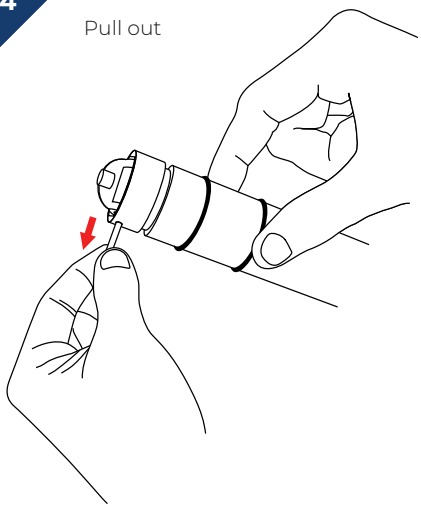
2 GENTLY tap



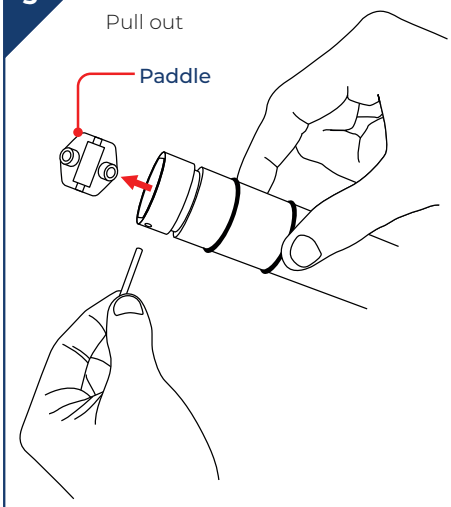
3 Tap until pin is 50% out



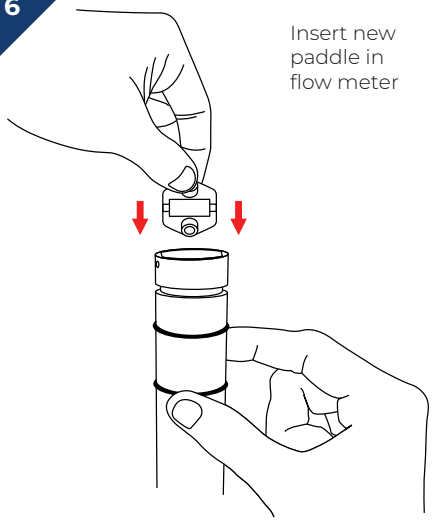
4 Pull out



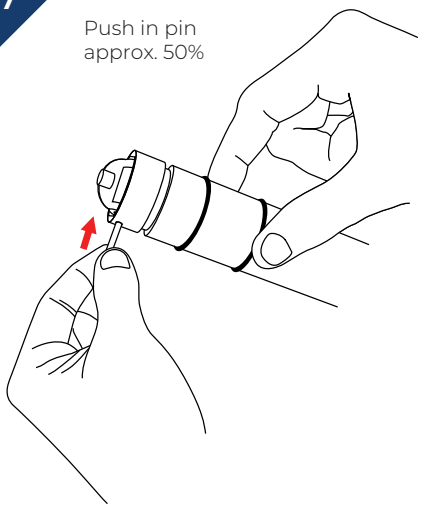
5 Pull out



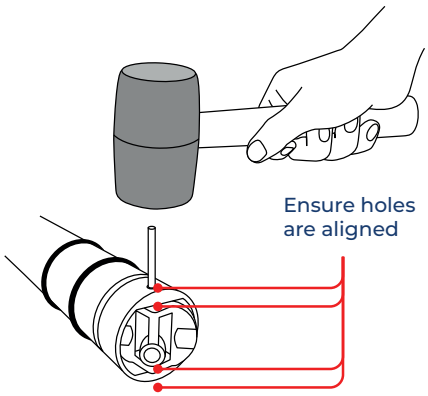
6 Insert new paddle in flow meter



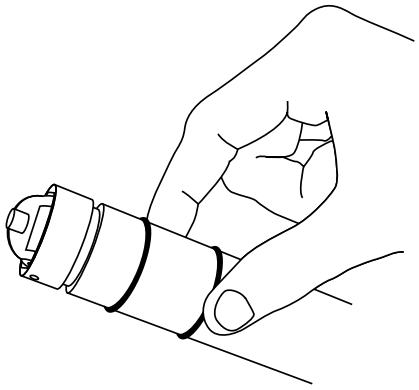
7 Push in pin approx. 50%



8 GENTLY tap



9 Congratulations! Replacement procedure is complete!



Installation Fittings

SA
Clamp-On Saddle Fittings

- PVC Material
- Viton® O-Rings
- Available in Metric DIN
- Will Accept Signet® Type Flow Meter

PVC	
Size	Part Number
2"	SA020
3"	SA030
4"	SA040
6"	SA060
8"	SA080

PT | PPT | PFT
Installation Fittings

- PVC | PP | PVDF
- Socket End Connections
- Will Accept Signet® Type Flow Meter
- True-Union Design

	PVDF	PVC	PP
Size	Part Number	Part Number	Part Number
½"	PFT005	PT005	PPT005
¾"	PFT007	PT007	PPT007
1"	PFT010	PT010	PPT010
1½"	PFT015	PT015	PPT015
2"	PFT020	PT020	PPT020

Add Suffix -
'E' - EPDM Seals
'T' - NPT End Connectors
'B' - Butt Fused End Connections for PP or PVDF

SAR
Clamp-On Saddle Fittings (SDR Pipe)

- PVC Material
- Viton® O-Rings
- Available in Metric DIN
- Will Accept Signet® Type Flow Meter

PVC	
Size	Part Number
2"	SAR020
3"	SAR030
4"	SAR040
6"	SAR060
8"	SAR080
10"	SAR100
12"	SAR120
14"	SAR140
16"	SAR160

CT
CPVC Tee Installation Fitting

- 1"-4" Pipe Sizes
- Easy to Install
- Will Accept Signet® Flow Meter

CPVC	
Size	Part Number
1"	CT010
1 ½"	CT015
2"	CT020
3"	CT030
4"	CT040

Add Suffix -
'E' - EPDM Seals
'T' - NPT End Connectors
'B' - Butt Fused End Connections for PP or PVDF

PG
Glue-On Adapter

- 2"-24" Pipe Sizes
- Easy to Install
- Will Accept Signet® Flow Meter

Glue-On Adapter – CPVC	
Size	Part Number
2"- 4"	PG4
6"- 24"	PG24

SWOL
Weld-On Adapter

- 2”-12” Pipe Sizes
- 316SS Weld-o-let with PVDF insert
- Easy to Install
- Will Accept Signet® Flow Meter

Weld-On Adapter - 316 SS	
Size	Part Number
3”	SWOL3
4”	SWOL4
6”	SWOL6
8”	SWOL8
10”	SWOL10
12”	SWOL12

SST
316SS TI3 Series
NPT Tee Fittings

- Will Accept Signet® Type Flow Meter

Threaded Tee Fitting - 316 SS	
Size	Part Number
½"	SST005
¾"	SST007
1"	SST010
1 ½"	SST015
2"	SST020
3"	SST030
4"	SST040

SSS
316SS TI3 Series
Sanitary Tee Fittings

- Will Accept Signet® Type Flow Meter

Sanitary Tee Fitting - 316 SS	
Size	Part Number
½"	SSS005
¾"	SSS007
1"	SSS010
1 ½"	SSS015
2"	SSS020
3"	SSS030
4"	SSS040

SSF
316SS TI3 Series
Flanged Tee Fittings

- Will Accept Signet® Type Flow Meter

Flanged Tee Fitting - 316 SS	
Size	Part Number
½"	SSF005
¾"	SSF007
1"	SSF010
1 ½"	SSF015
2"	SSF020
3"	SSF030
4"	SSF040

Warranty, Returns and Limitations

Warranty

Icon Process Controls Ltd warrants to the original purchaser of its products that such products will be free from defects in material and workmanship under normal use and service in accordance with instructions furnished by Icon Process Controls Ltd for a period of one year from the date of sale of such products. Icon Process Controls Ltd obligation under this warranty is solely and exclusively limited to the repair or replacement, at Icon Process Controls Ltd option, of the products or components, which Icon Process Controls Ltd examination determines to its satisfaction to be defective in material or workmanship within the warranty period. Icon Process Controls Ltd must be notified pursuant to the instructions below of any claim under this warranty within thirty (30) days of any claimed lack of conformity of the product. Any product repaired under this warranty will be warranted only for the remainder of the original warranty period. Any product provided as a replacement under this warranty will be warranted for the one year from the date of replacement.

Returns

Products cannot be returned to Icon Process Controls Ltd without prior authorization. To return a product that is thought to be defective, go to www.iconprocon.com, and submit a customer return (MRA) request form and follow the instructions therein. All warranty and non-warranty product returns to Icon Process Controls Ltd must be shipped prepaid and insured. Icon Process Controls Ltd will not be responsible for any products lost or damaged in shipment.

Limitations

This warranty does not apply to products which:

1. are beyond the warranty period or are products for which the original purchaser does not follow the warranty procedures outlined above;
2. have been subjected to electrical, mechanical or chemical damage due to improper, accidental or negligent use;
3. have been modified or altered;
4. anyone other than service personnel authorized by Icon Process Controls Ltd have attempted to repair;
5. have been involved in accidents or natural disasters; or
6. are damaged during return shipment to Icon Process Controls Ltd

Icon Process Controls Ltd reserves the right to unilaterally waive this warranty and dispose of any product returned to Icon Process Controls Ltd where:

1. there is evidence of a potentially hazardous material present with the product;
2. or the product has remained unclaimed at Icon Process Controls Ltd for more than 30 days after Icon Process Controls Ltd has dutifully requested disposition.

This warranty contains the sole express warranty made by Icon Process Controls Ltd in connection with its products. ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED. The remedies of repair or replacement as stated above are the exclusive remedies for the breach of this warranty. IN NO EVENT SHALL Icon Process Controls Ltd BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND INCLUDING PERSONAL OR REAL PROPERTY OR FOR INJURY TO ANY PERSON. THIS WARRANTY CONSTITUTES THE FINAL, COMPLETE AND EXCLUSIVE STATEMENT OF WARRANTY TERMS AND NO PERSON IS AUTHORIZED TO MAKE ANY OTHER WARRANTIES OR REPRESENTATIONS ON BEHALF OF Icon Process Controls Ltd. This warranty will be interpreted pursuant to the laws of the province of Ontario, Canada.

If any portion of this warranty is held to be invalid or unenforceable for any reason, such finding will not invalidate any other provision of this warranty.

For additional product documentation and technical support visit:

www.iconprocon.com | e-mail: sales@iconprocon.com or support@iconprocon.com | Ph: 905.469.9283

truflo® by ICON PROCESS CONTROLS Corrosion-Free Instrumentation Equipment

Phone: 905.469.9283 · **Sales:** sales@iconprocon.com · **Support:** support@iconprocon.com

