

Quick Start Manual



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

Truflo® — TKP | TK3P Series (V1)

In-Line Paddle Wheel Flow Meter Sensor

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.



Personal Protective Equipment (PPE)

Always utilize the most appropriate PPE during installation and service of Truflo® products.



Note | Technical Notes

Highlights additional information or detailed procedure.



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.



Please ensure that the Instruments are not to be subject to water hammer or pressure spikes! Always Pressure Test System with H₂O Prior to Initial Start-Up

Before installation be certain the appropriate instrument has been selected considering operating pressure, full scale pressure, wetted material requirements, media compatibility, operating temperature, vibration, pulsation, desired accuracy and any other instrument component related to the service application including the potential need for protective attachments and/or special installation requirements. Failure to do so could result in equipment damage, failure and/or personal injury. Ensure only qualified personnel are permitted to install and maintain this instrument.



Pressurize 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.



Please Ensure Full Pipe

TK Series can be installed in a horizontal or vertical direction. Please ensure enough length of straight pipe to avoid intensified turbulent flow that can effect readings.

Min 10x Pipe Diameters Upstream 3x Pipe Diameters Downstream (See Page 11)

A Bag Filter or Y Strainer Filtering Device upstream to Avoid the Paddle Wheel from being damaged by the solids or fibers - max 10% Particle Size - Not to Exceed .5mm Cross Section or Length. Please do not flush the pipe after the Flow Meter is installed with compressed air this may damage the ceramic shaft and will void warranty.

Truflo® — TKP | TK3P Series (V1) In-Line Paddle Wheel Flow Meter Sensor

ICON™ Corrosion-Free
PROCESS CONTROLS Instrumentation Equipment™

Product Description

The TK Series in-line 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.

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 vs Regular Ceramic
- ✓ Integral Rotor Bushings Reduce Wear and Fatigue Stress

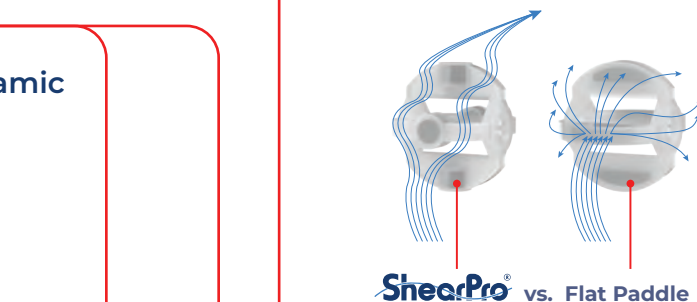
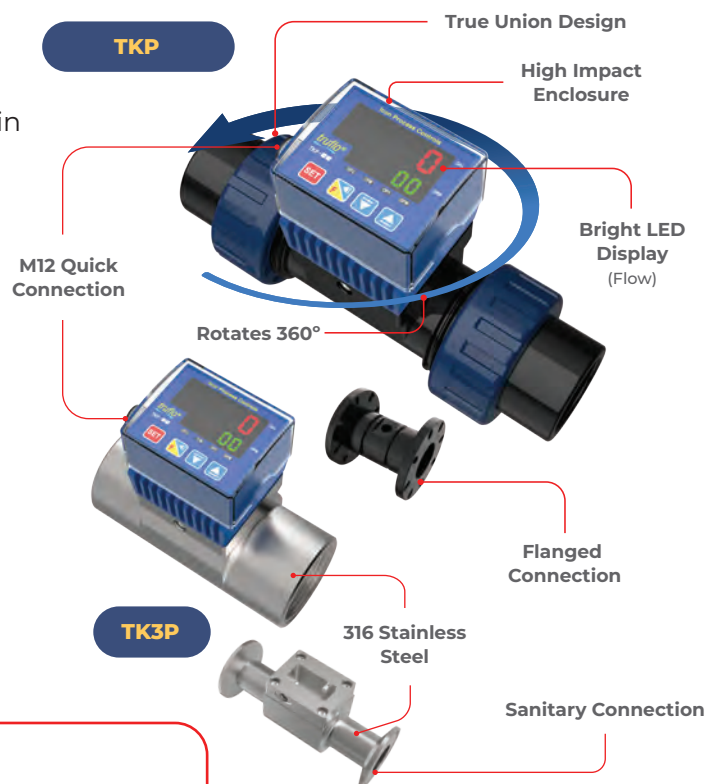
ShearPro® Through-Pin Design

- ✓ Eliminates Finger Spread
- ✓ No Lost Paddles
- ✓ Increased Temp. Rating
- ✓ 360° Housing Protects Rotor

Finger Spread = LOST
Unprotected Rotor



ShearPro® vs. Competitor 'A'



TKP
Thermal Plastic

TK3P
316 SS

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Technical Specifications

General		
Operating Range	0.3 to 33 ft/s	0.1 to 10 m/s
Pipe Size Range	¼ to 4" **	DN08 to DN100
Linearity	±0.5% of F.S @ 25°C 77°F	
Repeatability	±0.5% of F.S @ 25°C 77°F	
Fluid	Water or Chemical Liquid-Viscosity Range: .5-20 centistokes	
Flow Velocity	10 m/s max.	
Low Cut	0.3 m/s min.	
Operating Pressure	150 Psi (10 Bar) @ Ambient Temp Non-Shock	
Range Ability	10 : 1	
Response Time	Real Time	
Flow Total Meter	Range = 0~999999 ; Unit = Gallon or Liter or Ton (KL) Selectable	
Repeatability	Range = 0.0~999.9 ; Unit = GPM or LPM or CMH Selectable	
Accuracy	± 0.5% of F.S. @ 25°C	
Wetted Materials		
Sensor Body	PVC (Dark) PP (Pigmented) PVDF (Natural) 316 SS	
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	9 to 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°C
PP	180 Psi @ 68°F 40 Psi @ 190°F	12.5 Bar @ 20°C 2.7 Bar @ 88°C
PVDF	200 Psi @ 68°F 40 Psi @ 240°F	14 Bar @ 20°C 2.7 Bar @ 115°C
316 SS	200 Psi @ 180°F 40 Psi @ 300°F	14 Bar @ 82°C 2.7 Bar @ 148°C
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
316 SS	-40°F to 300°F	-40°C to 148°C
Outputs		
NPN Pulse RS485		
Display		
LED Flow Rate + Flow Totalizer		
Standards and Approvals		
UL CE FCC RoHS Compliant		

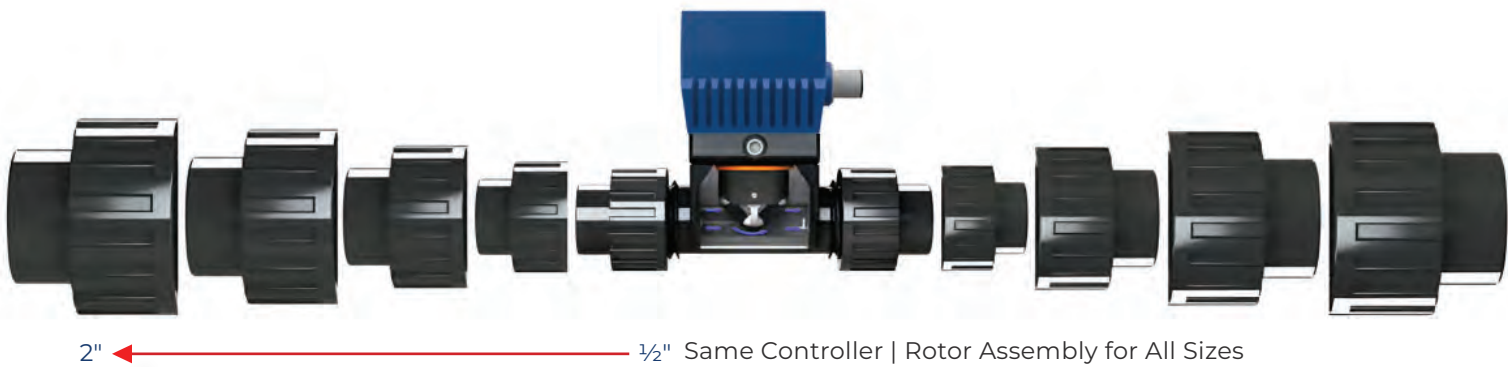
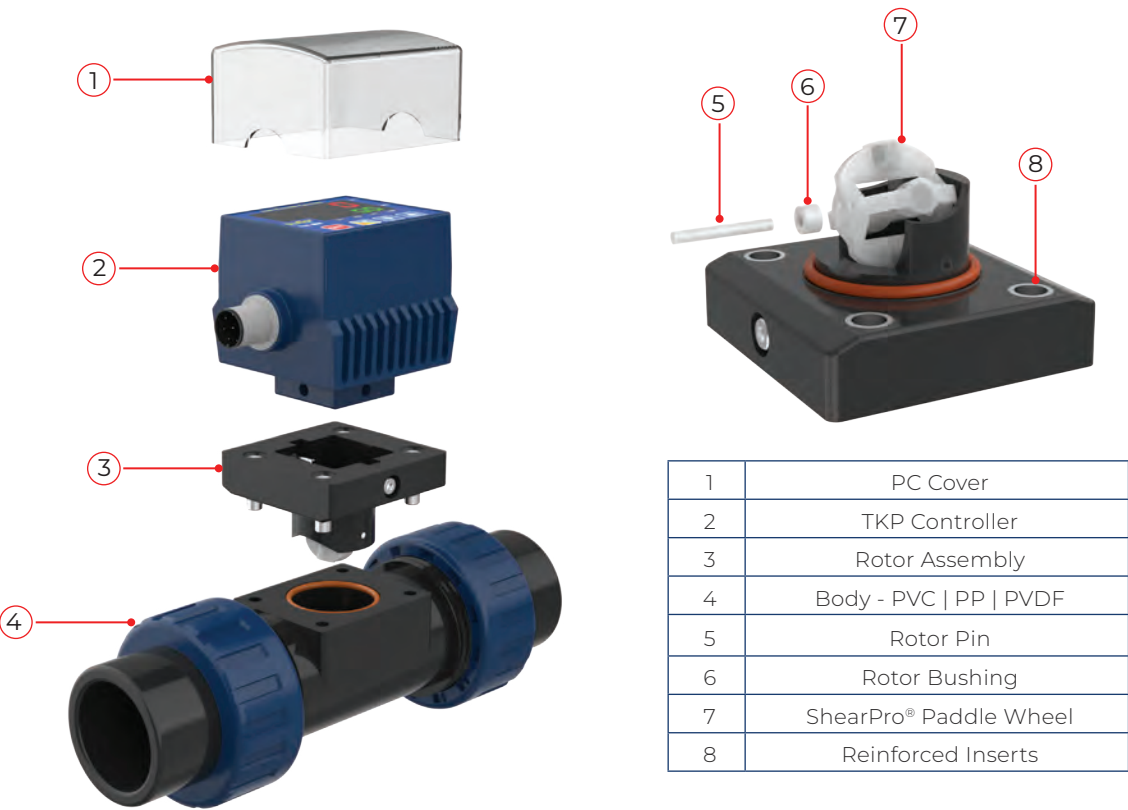
See Temperature and Pressure Graphs for more information

*Optional
** ¼" - ¾" SS Only

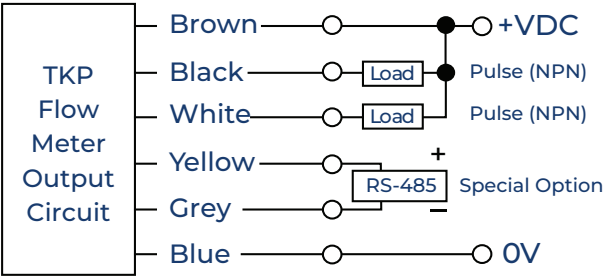
Truflo® — TKP | TK3P Series (V1)

In-Line Paddle Wheel Flow Meter Sensor

Exploded View – TKP Series



Wiring Diagram



Brown	+10 - 30 VDC	Yellow	RS485A
Blue	-VDC	Grey	RS485B
White	Pulse Output NPN	Black	Pulse Output NPN

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Programming		
<div>SET Select/Save/Continue F Move Selection Left ▲ ▼ Change Digit Value</div>		
STEPS	DISPLAY	OPERATION
1 Home Screen [Hand Icon] SET + F 3 SEC		Home Screen
2 Password [Hand Icon] SET		Factory Default: Lk = 10 Otherwise meter will enter Lockout Mode* Press ▼ / ▲ to change Press SET to save
3 Units of Flow [Hand Icon] SET		Range: 0 ~ 2 Ut.0 = Liter Ut.1 = Gallon (Factory Default) Ut.2 = Kiloliters
4 K Factor [Hand Icon] SET		Enter K Factor Value Refer to Page 9 for K-Factor Values

Totalizer Reset		
STEPS	DISPLAY	OPERATION
1 Home Screen [Hand Icon] SET + ▼ 3 SEC		Home Screen
2 Totalizer Reset [Hand Icon] SET		Totalizer Value will Reset to Zero

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In-Line Paddle Wheel Flow Meter Sensor

Setting Output Limits



Select/Save/Continue



Move Selection Left



Change Digit Value

STEPS	DISPLAY	OPERATION
1 Home Screen 		<p>Home Screen</p> <p>Current Value (CV) Set Value (SV)</p>
2 Flow Rate Pulse Relay Output 		Flow Rate Pulse Relay Output (OP1) Limit CV : Current Flow Rate Value SV : Flow Rate Pulse Relay Output Set Value Note: Refer Relay Mode Selection (Pg 6)
3 Totalizer Pulse Relay Output 		Totalizer Pulse Relay Output (OP2) Limit CV : Current Totalizer Value SV : Totalizer Pulse Relay Output Set Value Note: Refer Pulse Output Control Settings (Pg 8)

* SSR - Solid State Relay

Wiring

Flow Rate Pulse Relay Output

Set "Con F/E/r/c" in **Pulse Output Control***

Wire Color	Description
Brown	+ 10~30VDC
White	Flow Rate Pulse Output (OP1)
Blue	-VDC

Totalizer Pulse Relay Output

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

Wire Color	Description
Brown	+ 10~30VDC
Black	Totalizer Pulse Output (OP2)
Blue	-VDC

Output to Flow Display

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

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

One Pulse/Gallon Output

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

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

One Pulse/Gal + Flow Rate Pulse Relay Output

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

Wire Color	Description
Brown	+ 10~30VDC
Black	Pulse Output (1 Pulse/Gal)
White	SSR (Flow Rate)
Blue	-VDC

* Refer Pulse Control Programming, Page 8

Note: Refer to 'Relay Mode Selection' on Page 8 to configure the relay output as needed.

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In-Line Paddle Wheel Flow Meter Sensor

Pulse Control Programming



Select/Save/Continue



Move Selection Left



Change Digit Value

STEPS	DISPLAY	OPERATION
1 Home Screen SET 3 SEC		Home Screen
2 Pulse Output Control SET		Con = n : OP2 Manual Reset (When Totalizer = Set Value (SV)) Con = c r : OP2 Auto Reset after (t 1) Secs Con = E : One Pulse/Gal (Default) Con = F : Paddle Pulse → Frequency Max 5 KHz (For TVF)
3 OP2 Auto Reset Time Delay SET		Range: 0 ~ 999.99 Secs (Displayed only when Con r Con c is selected)
4 Relay Setting SET		Range: 0 ~ 3 ALt = 0 (Default) Refer to Relay Mode Selection
5 Hysteresis SET		Range: 0.1 ~ 999.9 HyS = 1 (Default) (Hysteresis is a buffer around the Programmed Set Point)
6 OP1 Power On Time Delay SET		Range: 0 ~ 9999 Secs t2 = 20 Sec (Default)
7 MODBUS Configuration SET		Communication Configuration 8n1 : 8 bit Non Parity (Default) 8n2 : 8 bit Non Parity 8o1 : 8 bit Odd Parity 7o1 : 7 bit Odd Parity 8E1 : 8 bit Even Parity 7E1 : 7 bit Even Parity

Relay Mode Selection

ALt No.	Description
ALt = 0	$CV \geq SV \rightarrow \text{Relay ON} \mid CV < [SV - \text{Hys}] \rightarrow \text{Relay OFF}$
ALt = 1	$CV \leq SV \rightarrow \text{Relay ON} \mid CV > [SV + \text{Hys}] \rightarrow \text{Relay OFF}$
ALt = 2	$[SV + \text{Hys}] \geq CV \geq [SV - \text{Hys}] \rightarrow \text{Relay ON} : CV > [SV + \text{Hys}] \text{ or } CV < [SV - \text{Hys}] \rightarrow \text{Relay OFF}$
ALt = 3	$[SV + \text{Hys}] \geq CV \geq [SV - \text{Hys}] \rightarrow \text{Relay OFF} : CV > [SV + \text{Hys}] \text{ or } CV < [SV - \text{Hys}] \rightarrow \text{Relay ON}$
Hys = Hysteresis — Acts like a buffer ± around (OP1) pulse output	
CV: Current Value (Flow Rate) SV = Set Value	

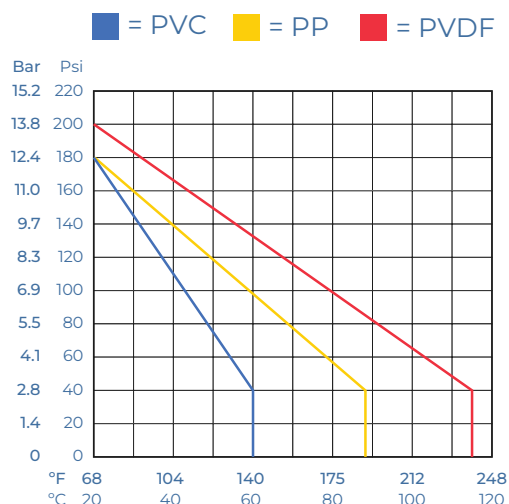
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Temperature | Pressure Graphs | Non-Shock

Note: The Pressure/Temperature graphs are specifically for the Truflo® Flow Meter Sensors.

During system design the specifications of all components must be considered.



K-Factor

Size	LPM	GPM
1/4"	547	2079
3/8"	300	1140
1/2"	127.6	484.9
3/4"	81.8	310.8
1"	55.1	209.4
1 1/2"	18.8	71.4
2"	10.2	38.8
3"	4.7	18
4"	2.1	8

⚠ K-Factor is Pre-Programmed

Min/Max Flow Rates

Pipe Size (O.D.)	LPM GPM		LPM GPM		
	0.3m/s min.		10m/s max.		
DN08 (1¼")	0.6	0.16	12	3	◀ SS Only
DN10 (3⁄8")	1.8	0.48	50	13	◀ SS Only
DN15 (1½")	3.5	1.0	120	32	
DN20 (¾")	5.0	1.5	170	45	
DN25 (1")	9.0	2.5	300	79	
DN40 (1½")	25.0	6.5	850	225	
DN50 (2")	40.0	10.5	1350	357	
DN65 (2½")	60.0	16.0	1850	357	
DN80 (3")	90.0	24.0	2800	739	
DN100 (4")	125.0	33.0	4350	1149	

Model Selection

PVC		
Size	End Connections	Part Number
1/2"	Sch 80 Soc	TKP-15-P
3/4"	Sch 80 Soc	TKP-20-P
1"	Sch 80 Soc	TKP-25-P
1 1/2"	Sch 80 Soc	TKP-40-P
2"	Sch 80 Soc	TKP-50-P
3"	Flanged	TKP-80-P
4"	Flanged	TKP-100-P

PVDF		
Size	End Connections	Part Number
1/2"	NPT	TKP-15-PF
3/4"	NPT	TKP-20-PF
1"	NPT	TKP-25-PF
1 1/2"	NPT	TKP-40-PF
2"	NPT	TKP-50-PF

Note: PVC Socket Ends (Std)
PP/PVDF NPT Ends (Std)

Add 2nd Suffix (seals):

FKM (std, no suffix required)

-E ▶ EPDM Seals

-K ▶ FFKM | Kalrez® Seals

Add 1st Suffix (end connection):

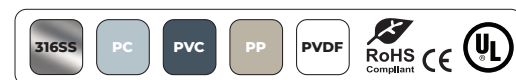
-T ▶ NPT End Connectors (on PVC)

-B ▶ Butt Fusion End Connections for PP or PVDF

-F ▶ Flange ANSI 150lb - Consult Factory

PP		
Size	End Connections	Part Number
1/2"	NPT	TKP-15-PP
3/4"	NPT	TKP-20-PP
1"	NPT	TKP-25-PP
1 1/2"	NPT	TKP-40-PP
2"	NPT	TKP-50-PP
3"	Flanged	TKP-80-PP
4"	Flanged	TKP-100-PP

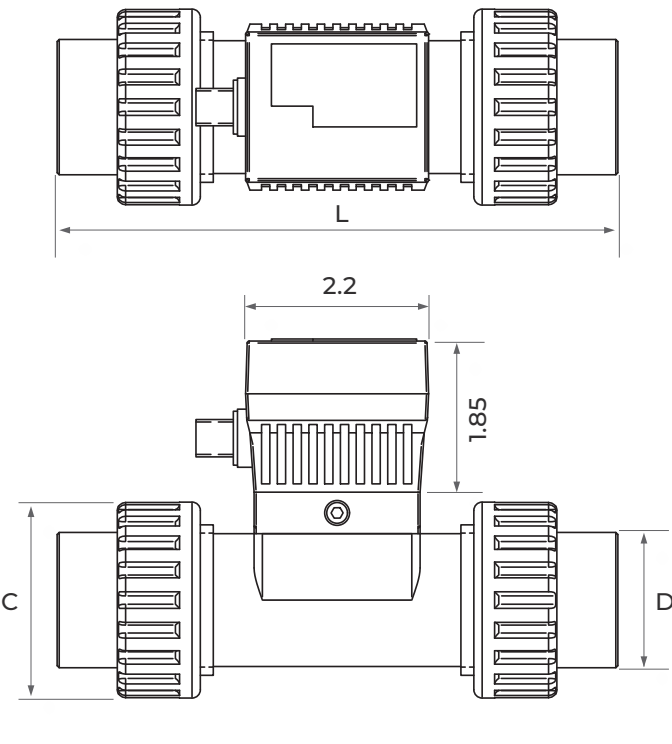
316 SS		
Size	End Connections	Part Number
1/4"	NPT	TK3P-08-SS
3/8"	NPT	TK3P-10-SS
1/2"	NPT	TK3P-15-SS
3/4"	NPT	TK3P-20-SS
1"	NPT	TK3P-25-SS
1 1/2"	NPT	TK3P-40-SS
2"	NPT	TK3P-50-SS
3"	NPT	TK3P-80-SS
4"	NPT	TK3P-100-SS



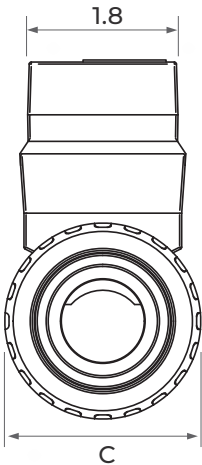
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Dimensions

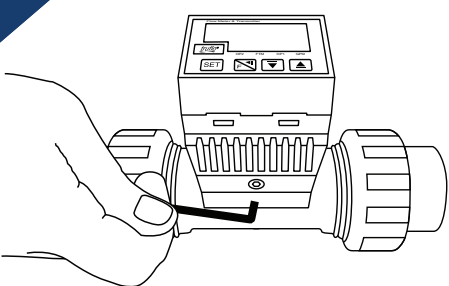


Pipe Size	L (inch)	D (inch)	C (inch)
½" DN (15)	5.48	1.07	1.61
¾" DN (20)	6.12	1.36	2.08
1" DN (25)	6.76	1.68	2.36
1½" DN (40)	7.66	2.33	3.26
2" DN (50)	8.40	2.86	4.33



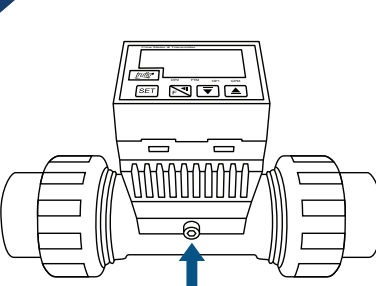
Procedure to Rotate Display

1



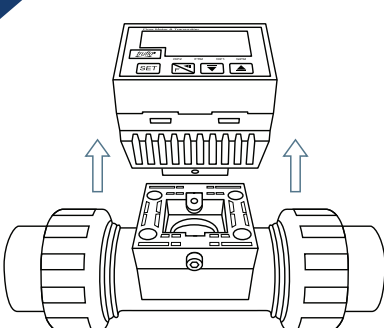
Using an allen key loosen the 2 screws located on either side of the display.

2



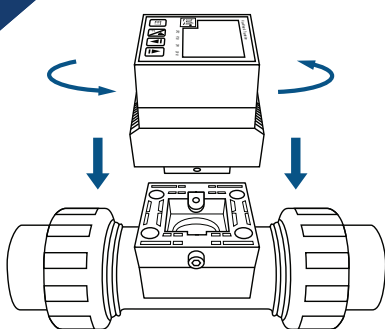
Pull the Screws | Do Not Remove!

3



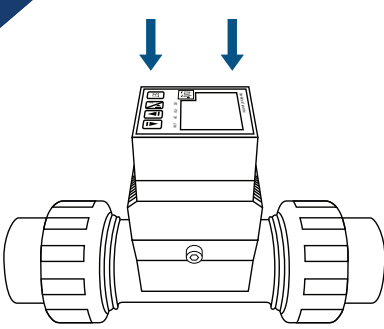
Lift the Display.

4



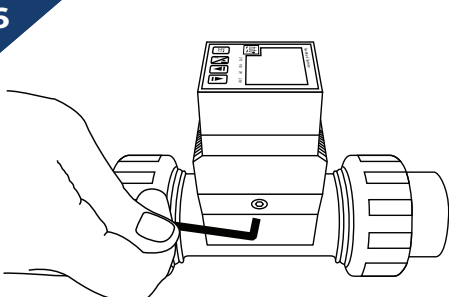
Rotate Display 90°.

5



Lower Display.

6



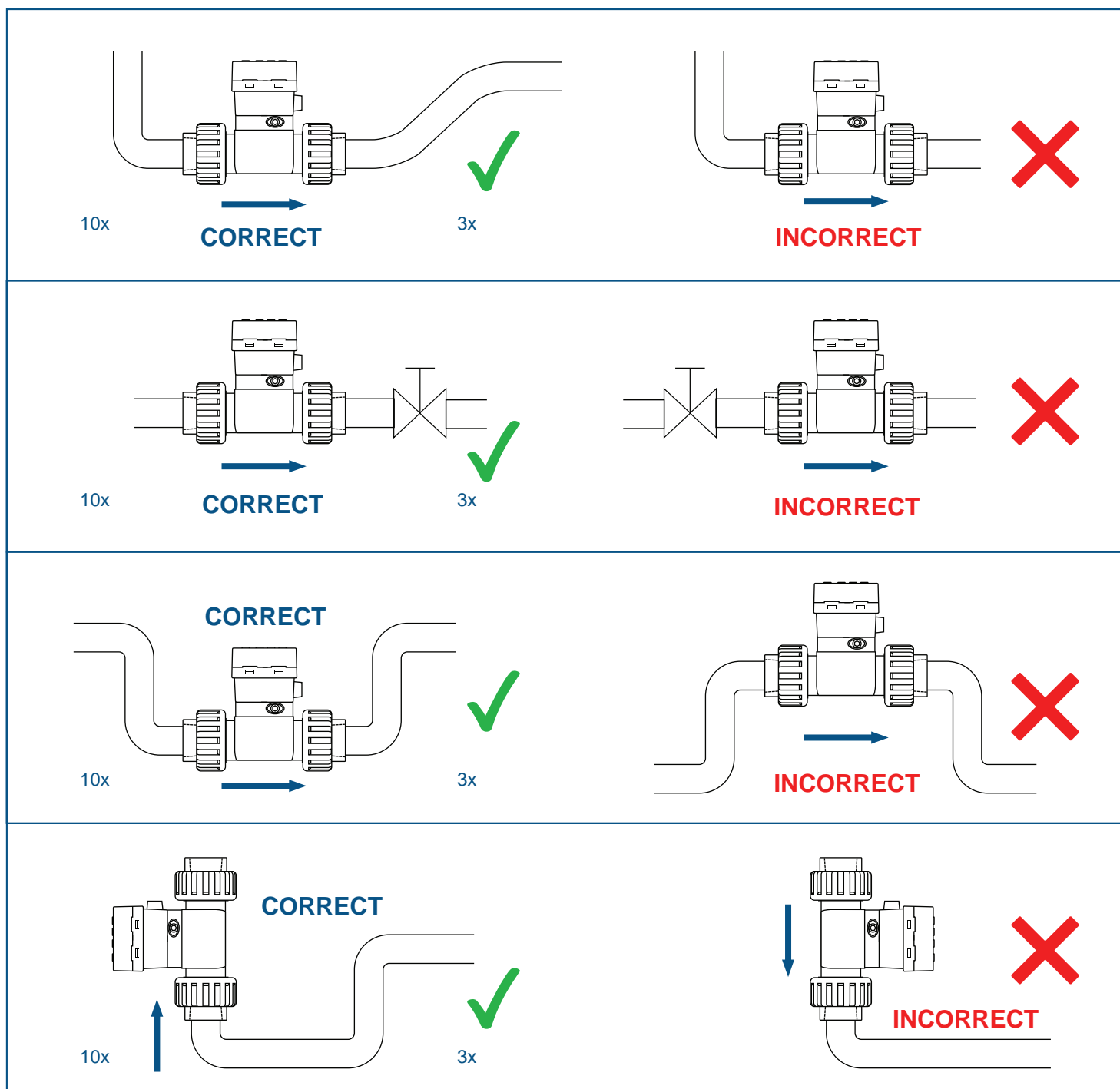
⚠ Tighten Allen Screws | Snug Tight Do Not Over-Tighten!

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Installation Position



Please Ensure Full Pipe

TK Series can be installed in a horizontal or vertical direction.

Please ensure enough length of straight pipe to avoid turbulence that can effect readings.

Note: Min 10x Pipe Diameters Upstream 3x Pipe Diameters Downstream.

A Plastic Basket Strainer, Bag Filter or Y Strainer Filtering Device upstream to Avoid the Paddle Wheel from being damaged by the solids or fibers - max 10% Particle Size - Not to Exceed .5mm Cross Section or Length.

Please do not flush the pipe after the Flow Meter is installed with Compressed Air this may damage the ceramic shaft and will Void Warranty.

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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 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.

