truflo®

TK SERIES MANUAL

- Flow Rate & Totalizer
- Password Security Protected
- Zirconium Ceramic | Rotor | Bearings
- Display Rotates 360 Degrees
- Bright LED Display

ICON™ PROCESS CONTROLS

Corrosion-Free
Instrumentation Equipment

Read carefully the instructions published in this manual before the first use of the sensor. Keep the manual at a safe place. The manufacturer reserves the right to implement changes without prior notice

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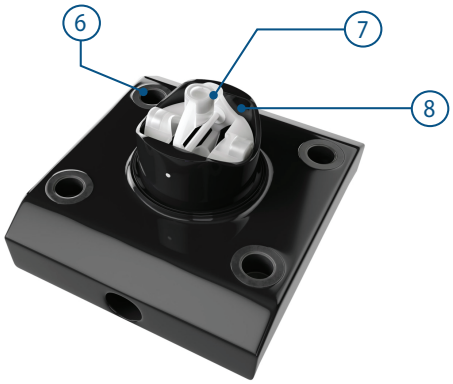
TKS | TKP | TKM ROTATOR SERIES MANUAL

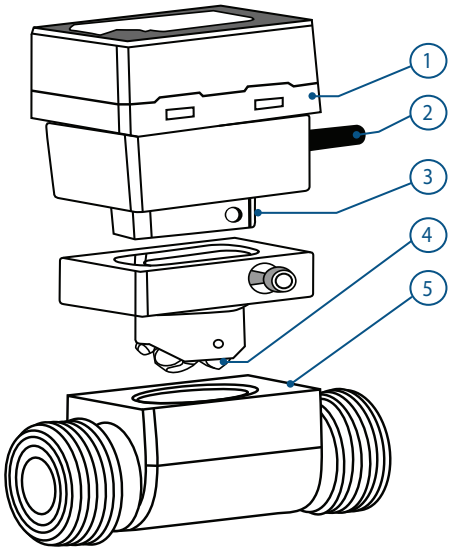
Multi-Function Paddle Wheel Flow Meter

truflo®

2. Parts TK Series

1. Flow Controller
2. Power Supply
3. Hall Sensor
4. Paddle Wheel
5. Body (PVC, PP, PVDF)
6. Tefzel Paddle
7. Rotor Pin
8. Bearing





3. Product Selection

EXAMPLE

TKP ---- 25 ---- P ---- E ---- T ---- RS ---- M

(1) (2) (3) (4) (5) (6) (7)

1. SERIES

a) TKS = Paddle Wheel Flow Meter with Relay + Pulse
b) TKP = Paddle Wheel Flow Meter - (Flow Rate + Flow Total) Pulse Output
c) TKM = Paddle Wheel Flow Meter - 4-20mA + (Flow Rate + Flow Total) Pulse Output

2. PIPE SIZE

15 | (½") | 20 | (¾")
25 | (1") | 40 | (1 ½")
50 | (2") | 80 | (3") | 100 / (4")

3. BODY MATERIAL

P = PVC
PP = Polypropylene
PF = PVDF

* CPVC Socket Unions Available

4. SEALS*

E = EPDM (Optional)
F = FFKM (Optional)

* FPM is Standard

5. END CONNECTIONS

S - Sch 80 Soc
T - NPT
B - SDR11 Butt
D - DIN
F - ANSI 150 lb

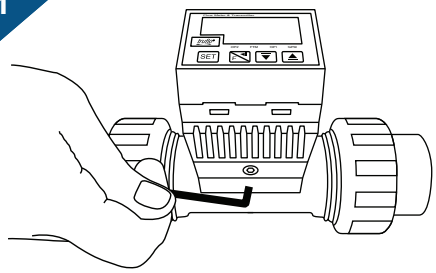
6. RS = TKP Series (Only) with RS-485 MODBUS
7. M = M12 - 2 Meters - Quick Disconnect (Option)

4. Specifications

Fluid	Liquid - Viscosity Range <.5-20 centistokes
Accuracy	> .5% of F.S. @ 68°F | 20°C | Repeatability 0.5 of Full Scale
Max Flow Velocity	32.8 ft/s max | 10 m/s max
Min Flow	0.8 ft/s min | 0.3 m/s min
Operating Press	150 psi
Turndown	33:1
Response Time	Real Time
Material of Construction	**Paddle :** Tefzel | Zirconium Ceramic **Body :** PVC | PP | PVDF **Shaft :** Zirconium Ceramic **Seals :** FPM* | EPDM
Operating Temperature	PVC < 140°F | 60°C PP < 176°F | 80°C PVDF < 240°F | 115°C 316 SST< 248°F | 120°C
Electronics	122°F °C
Protection Class	NEMA 4X | IP66
Approval	CE | Rohs
Current Draw	60mA Max
Battery	10-30VDC

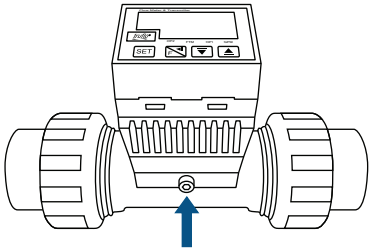
5. Procedure to Rotate Display

1



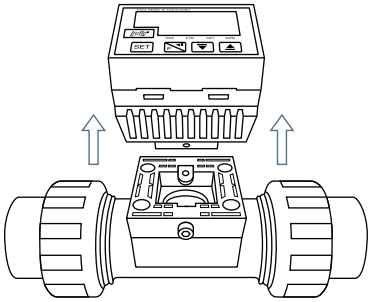
Using an allen key loosen the 2 screws located on either side of the display

2



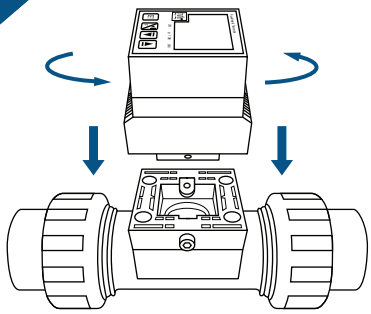
Pull the screws | Do Not Remove

3



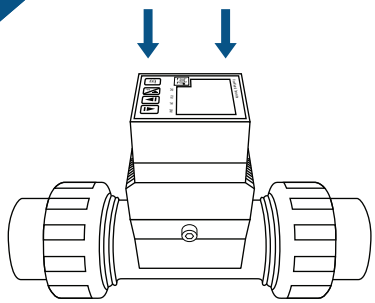
Lift the Display

4



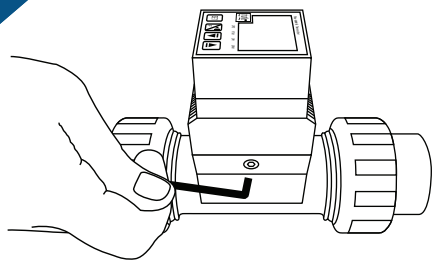
Rotate Display - 90 Degrees

5



Lower Display

6



⚠ Tighten the Allen screws | Snug Tight
Do Not Over-Tighten

6. Programming Models TKP | TKM

STEPS	DISPLAY	OPERATION
Step-1 Home Screen Press SET + F (Together) (HOLD) 3		**TKP | TKM Series Only** **Power On Flow Meter with DC Power** Display will Show **0 Totalizer (Top RED)** **0 Flow Rate (Bottom GREEN)** **24V DC POWER ONLY**
Step-2 Programming of Lock Out Feature Press SET		**Programming Lock Out Feature TKP | TKM Series** Lck = 10 (Unlocked) : Factory Default, IF **Lck** is Changed from the # 10 the Flow Meter will be in Lockout Mode. **LCK 10 (Default)** To Unlock ensure **Lck** # is set to 10.
Step-3 Programming Units of Flow Press SET		**Programming Units of Flow TKP | TKM Series Only** Program Flow Units 0 | 1 | 2 **Ut** = 0 : (LPM) **Ut** = 1 : (GPM) **(Default)** **Ut** = 2 : {Kiloliter (KL)}
No Programming Required **Step-4** Coefficient of Flow Volume Press SET		**TKP | TKM Series Only** K-Factor : 0.1 - 999.9 (K-Factor is Factory Preset) **K-Factor Preset (Do Not Change** *Divide K Factor BY 3.8 TO CHANGE FROM GPM TO LPM ⚠
Step-5 For Programming 4-20mA Analog Output **TKM (4-20mA) and TKP with (RS 485 Option) Only**		
Step-5 Program Range of Transmitter TKM Model Only Press SET		**TKM (4-20mA) and TKP with (RS 485 Option) Only** Programming Analog Transmitter Range Output 4-20mA Range : 0.1 - 999.9 4 mA = 0 20 mA = Entered Number. **TR 100 (Default)** 4 mA = 0 GPM 20mA =100 GPM This can be Change to Conform to Customers Application (Ex. Number Changed to 150)

6.1 Programming NPN Pulse Output
Models TKP | TKM Only

⚠ **Steps Only Necessary If NPN Pulse Output is Required**

STEPS	DISPLAY	OPERATION
Step-1 Home Screen Press SET		**TKP | TKM Series Only** CV Display Reads 0 SV Display Reads 0 0 Totalizer Default 0.0 Flow Rate Default CV = Current Value SV = Programmed Value
Step-2 Programming Flow Rate Pulse Output Press — To Change Value		**1000 Default** **One Pulse Per Gallon Default** **(Flow Rate) Pulse** **CV** Program Value of (Flow Rate) Pulse (NPN) Output Preset Value of Flow Rate Change to a Value that meets your Flow Rate Pulse Output **SV** CV > SV ⟶ Flow Rate Pulse Output ON CV < SV ⟶ Flow Rate Pulse Output OFF
Press SET to Save and Proceed to the Next Screen		
Step-3 Programming Flow Total Pulse Output Press SET		**2000 Factory Default** **One Pulse Per Gallon Default** **CV** Program Value of Flow Totalizer Pulse (NPN) Output SV : Preset value of Flow Total **SV** CV > SV ⟶ Flow Rate output ON **2000 Default** this can be Changed to Desired Value Refer to Next Page Programming OP2 Output for Options for Totalizer **Flow Totalizer Pulse (Step #2-Next)**
Press SET Button to Save and Proceed to Next Screen		
Step-4 Return to Home Screen Press		**Return to Home Screen** 0 Totalizer Default 0.0 Flow Rate Default

- **Op1 & Op2 = 150mA Max Switching Currency Current + Consumption is 60mA Max.**
- **CV = Current Value = Current Flow Rate on Display**
- **SV = Selected Value (Programmed Value Customer Entered)**
- **NPN Pulse is a Transistor**

6.2 Programming NPN Pulse Control Function
Models TKP | TKM Only

STEPS	DISPLAY	OPERATION
Step-1 Home Screen Press SET — (HOLD) 3		**Power On Flow Meter With 10-30 V DC** **0 Flow Totalizer** **0.0 Flow Rate**
Step-2 Programming OP2 Output Pulse Control (Totalizer) Press SET (HOLD) 3		**Program (NPN) Pulse Output (OP2) Totalizer** Range E.n.r.c. Con = n : Manual Reset; Con = c : time (1=10 Secs) Auto Reset Using Timer Con = c : time (secs) Auto Reset Using Timer i.e 5 =Pulse On (5 secs) Con = r : Auto Reset when Total Volume Value = Selct Value (SV) Con = E : Pulse Output of Unit volume (Default) = One Gal/Pulse Con = F ⟶ Paddle Pulse ⟶ Frequency Max 5 KHZ **Con = E (Default)**
Step-3 Programming OP1 Output Pulse Option (Flow Rate) Press SET (HOLD) 3		**Program Flow Rate Pulse (NPN) Output (OP1) Range: 0 - 3** CV > SV ⟶ Pulse (NPN) ON CV < SV - HYS ⟶ Pulse (NPN) OFF CV > SV ⟶ Pulse (NPN) ON CV > SV + HYS ⟶ Pulse (NPN) OFF **ALT 0 (Default) Most Common** CV = C urrent Value SV = P rogrammed Value Hys = See below
Step-4 Programming Hysteresis of Output Flow Rate Pulse Press SET (HOLD) 3		Program Hysteresis of NPN Output Pulse Range 0.1-999.99 (GAL) Hysteresis **HYS ± 1.0 GPM (Default)** Hys - Hysteresis is a buffer around the Programmed Set Point Example (Example) Liquid Caused by Pump Stopping or Valve Closing i.e.-sloshing
Step-5 Programming OP1 Power On Delay Time For Initial Start UP (Sec) Press SET		**Flow Rate** Program Time Delay for NPN Pulse (OP1) on Initial Start Up Range : 0-9999 (Secs) Time Delay of Pulse Output (Flow Rate) **T2 = 20 (Secs) (Default) Flow Rate**

6.3 Mode of NPN Pulse Output TKP | TKM Models

ALT NO.	DESCRIPTION
ALt = 0	CV > SV ⟶ ON: CV < SV - HyS ⟶ OFF
ALt = 1	CV < SV ⟶ ON: CV > SV + HyS ⟶ OFF
ALt = 2	SV + HyS > CV > SV - HyS ⟶ ON: CV > SV + HyS or CV < SV - HyS ⟶ OFF
ALt = 3	SV + HyS > CV > SV - HyS ⟶ OFF: CV > SV + HyS or CV < SV - HyS ⟶ ON
Current Value = Flow Rate	SV = Selected Value = Programmed Value (Customer)
Hys = Hysteresis ACTS Lika Buffer ± Around Pulse Output (Measured in GPM)	

6.4 K-Factors for TK

Size	LPM	GPM
½"	124	471
¾"	72	274
1"	54	171
1 ½"	19	72
2"	10.3	39
3"	4.7	18
4"	2.1	8

⚠ **Required when Programming Remote Display or Controller.**
K-Factor Pre Programmed by Factory - No Flow Meter Programming of a K-Factor is required.

6.5 Programming TKS Model Only

STEPS	DISPLAY	OPERATION
Step-1 Home Screen Press SET + F (Together) (HOLD) 3		**TKS Series Only** Power Up Flow Meter with DC Power **000.0** **24V DC POWER ONLY**
Step-2 Programming Lock Output Press SET		Programming Lock - Out Secure Feature Lk = 10 (Unlocked Status) - **(Default)** Changing Number will Lock Flow Meter **LK.10 (Default)** **10 = Unlocked** If any other Number is entered the Programming will be restricted
Step-3 No Programming Required K Value Press SET		K-Factor Range : 0.1-999.9 (Depends on Meter Size - Factory Pre- Programmed) K Value Preset (Do Not Change) ⚠
Step-4 Programming Units of Flow Press SET		Program Flow Units 0,1,2 Ut = 0 : (LPM) Ut = 1 : (GPM) **(Default)** Ut = 2 : {Kiloliter (KL)}
Step-5 Programming Communication Output Type Press SET		Programming NPN Pulse Output con.E - Output = 1 Pulse / Gal con.F - Paddle Pulse Output 5KHZ MAX-Remote Display **con.E (Default)**
Step-6 Programming of Relay Set Point Press SET		Programming Relay Setpoint ON - OFF Options Select - ALt.0, ALt.1, ALt.2, ALt.3, **ALt.0 (Default)** **See Next Page for Relay Alarm Options-**
Step-7 Programming Relay Time Delay Press SET		Programming Initial Start-Up Relay Time Delay Range : 0-99 sec Delay Time to Power on Alarm Output Relay **t.20 (Default)** (20 Seconds) Initial Start up of Flow Meter or Process (Allows for System Steady State before Relay Switch becomes Active).

6.6 Programming TKS Model Only
Program Relay Set Point and Relay Delay (Prevents Relay Chatter)

STEPS	DISPLAY	OPERATION
Step-1 Home Screen Press SET (HOLD) 3		Power On Flow Meter - 24VDC Home Screen 000.0 **(Defaut)** **24V DC POWER ONLY**
Step-2 Programming Relay Set Point Press SET		Programming Relay Set Point. (When Relay Switches) Range : 0.1 - 999.9 GPM 100.0 GPM **(Defaut)** Relay will Activate when this Set Point or (Flow Rate) is Reached
Step-3 Programming Relay Hysteresis Press SET		Program Relay Hysteresis - Prevents Relay Chatter - Due to Constant Flow Rate Change around Setpoint in Dynamic Flow Process (Cushion ±) Prevents Relay d = Delay 0.10 GPM d.0.10 **(Defaut)** ■ **In the Programming Stage, the Display will Flash**

6.7 Relay ON - OFF Options For TKS Series Only

(Not for TKP | TKM Series)

ALT NO.	DESCRIPTION
ALt = 0	CV > SV ⟶ Relay ON : CV < SV - d ⟶ Relay OFF
ALt = 1	CV < SV ⟶ Relay ON : CV > SV + d ⟶ Relay OFF
ALt = 2	SV + d > CV > SV - d ⟶ Relay ON: CV > SV + d or CV < SV - d ⟶ Relay OFF
ALt = 3	SV + d > CV > SV - d ⟶ Relay OFF: CV > SV + d or CV < SV - d ⟶ Relay ON
CV = Current Display Value = Flow Rate	SV = Selected Value = Programmed Value
d = (GPM) Hysteresis Measured around Relay Set Point (± Measured in Gallons)	

6.8 General Terms

1) **K** : Coefficient of Flow Volume, **Note : Factory Set Do Not Change**

2) **tr** : TKM Range of Transmitter - Flow Rate 4-20 mA (4mA = 0) (20mA = Max Range)
TKP - RS 485 Option

3) **NPN** : Transistor Relay - No Moving Parts

4) **Con** : Output Control of Flow Total OP2,
Con = n ⟶ Manual Reset,
Con = c ⟶ Time Reset (1=10 Secs) ⟶ Auto Reset,
Con = r ⟶ Auto Reset, Based on Volume (GPM)
Con = E ⟶ Pulse Output of Unit Volume,
Con = F ⟶ Pulse Output of Paddle = 5 KHZ Max

Totalizer Reset TKP | TKM Series
To Reset the Flow Totalizer to Zero Press SET + ▼ **Key Hold** 3 sec


(PressTogether)

7. Standard Pipe Size

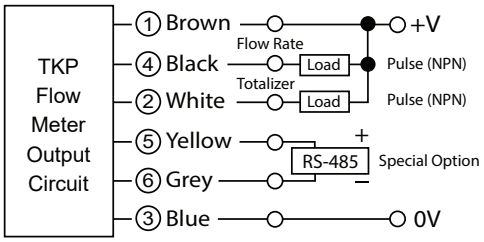
Pipe Size (O.D.)	ANSI (ID) (Inches)		DIN (ID) (mm)	Flow Rate (LPM) / USGPM	
	Sch (40)	Sch (80)		0.3m/s min.	10m/s max.
DN15 (½")	0.62	0.55	Ø20	3.5 | 1.0	120 | 32
DN20 (3/4")	0.82	0.74	Ø25	5.0 | 1.5	170 | 45
DN25 (1")	1.00	0.96	Ø32	9.0 | 2.5	300 | 79
DN40 (1 ½")	1.40	1.50	Ø50	25.0 | 6.5	850 | 225
DN50 (2")	2.00	1.90	Ø63	40.0 | 10.5	1350 | 357
2 ½	2.50	2.30	Ø75	60.0 | 16	1850 | 357
DN80 (3")	3.10	2.90	Ø78	90.0 | 24	2800 | 739
DN100 (4")	4.00	3.80	Ø96.50	125.0 | 33	4350 | 1149

8. Pressure vs. Temperature (Psi, water, non-shock)

NOMINAL SIZE		PVC				PP				PVDF				
INCHES	mm	30° F 70° F	71° F 105° F	106° F 120° F	121° F 140° F	- 5° F 85° F	86° F 120° F	121° F 140° F	141° F 175° F	- 5° F 70° F	71° F 105° F	106° F 140° F	141° F 175° F	176° F 210° F
½-2	15-50	150	120	100	30	150	110	90	55	150	125	100	85	55
2-½	65	150	120	100	NA	150	95	70	40	150	125	100	85	55
3	80	150	120	100	NA	150	95	70	40	150	125	100	85	60
4	100	150	120	100	NA	150	95	70	40	150	125	100	85	60

9. Wiring Diagram

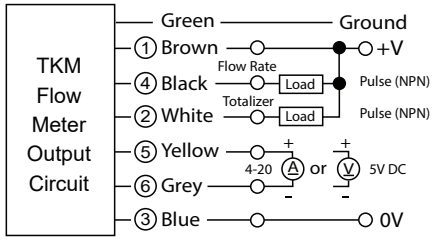
9.1 TKP - Flow Rate + Flow Totalizer + NPN Pulse Diagram



Brown	10 - 30 VDC (+)	Yellow	(+) RS-485 (OPT)
Blue	0V (-)	Grey	(-) RS-485 1 OPT RS485 is a Special Order Item
White	Totalizer Pulse Output NPN	Black	Flow Rate Pulse Output (NPN)

Yellow & Grey with RS485 (Only) Black Wire can be Changed for Flow Total Limit Output or Unit Volume Pulse Output

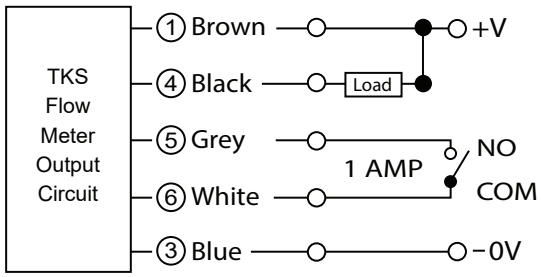
9.2 TKM - (4-20mA or 0-5V DC + NPN Pulse) Flow Rate + Flow Totalizer + Pulse Diagram



Brown	10 - 30 VDC (+)	Yellow	+ (4-20mA) or (0-5V)
Blue	0V (-)	Grey	Totalizer Output NPN (4-20mA or 0 - 5V DC) (4-20mA Default -0-5VDC Option-Special Order)
White	Totalizer Pulse Output NPN	Black	Flow Rate Pulse Output NPN

Black Wire can be Changed for Flow Total Limit Output or Unit Volume Pulse Output

9.3 TKS - NPN (Flow Rate + Relay + Pulse) Diagram

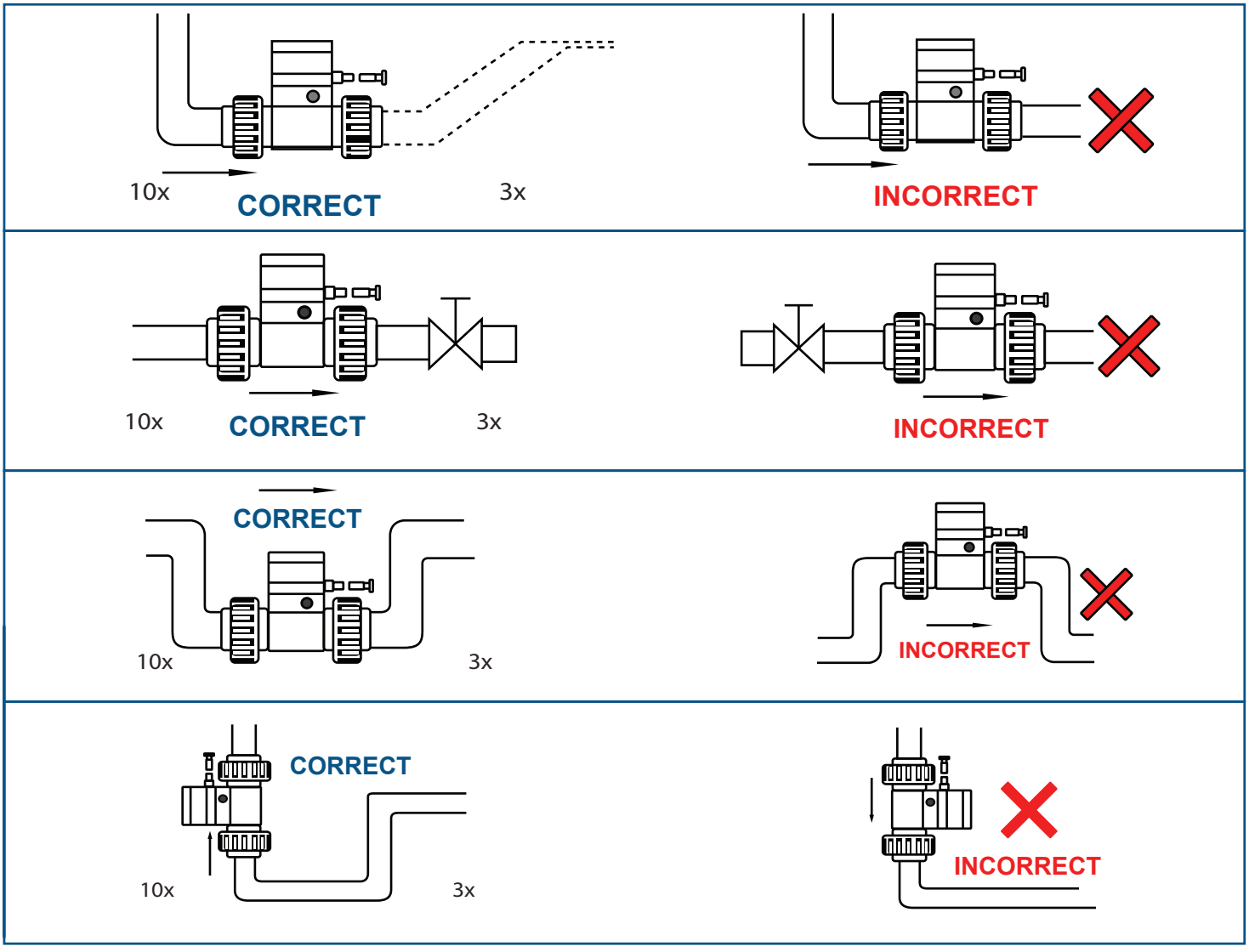


Brown	10 - 30 VDC (+)	White	COM
Blue	0V (-)	Grey	NO
Black	Flow Rate Pulse Output (NPN)		1 Amp

Black Wire is a Unit Volume NPN Pulse Output-1 Pulse for every Gallon

TKP - Yellow & Grey wires with RS - 485 Option Only
Current output (4 - 20mA) : 120 Ω max.
Voltage output (0 - 5V) : 10K Ω min.
TKM Series (0-5VDC) Optional 4-20mA is Standard

10. Installation Positions



Please make sure the pipe is filled with the fluid under normal operation.
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

11. 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 years 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.

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** 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; or 2) 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.