

Quick Start Manual

(Industry's Toughest Built Paddle Wheel Flow Meter)

No K-Factor Programming



TK SERIES

- Flow Rate + Flow Totalizer
- 2 Levels of Password Security
- LED Display
- No Tools Required



Read the User's Manual Carefully before Starting to Use the Unit.

All TK Series Flow Meters are Factory Calibrated and do not require K-flow Factor Programming.

Manufacturer reserves the right to implement changes without prior notice.

PRODUCT SELECTION

EXAMPLE

TKP ----- 25 ----- A ----- P
 (1) (2) (3) (4)



1. SERIES

TKS = Paddle Wheel Flow Meter with
Relay Output

TKP = Paddle Wheel Flow Meter - Flow
Rate + Flow Total Pulse Output

TKM = Paddle Wheel Flow Meter- 4-20mA
Output 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

4. COMMUNICATION

RS = TKP Series with RS-485 MODBUS
selectable

5. CONNECTION METHOD

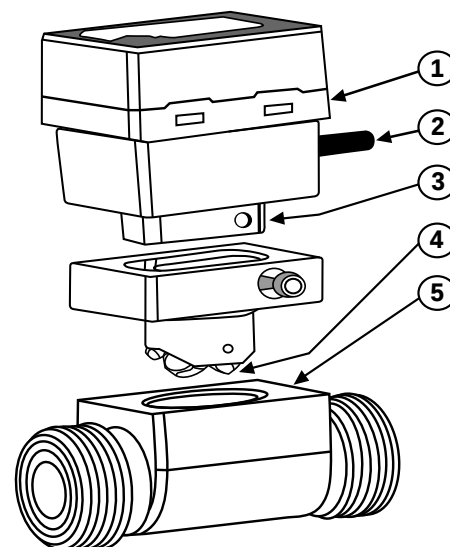
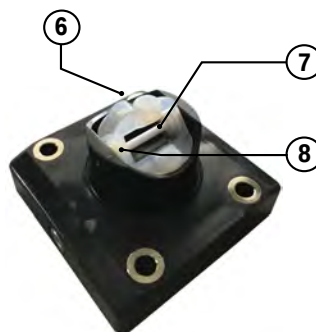
M-M12 Connector - 2Meter - other lengths
available

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



*Zirconium Ceramic Rotor Pin & Bearings...
The Only thing Harder is Diamond*



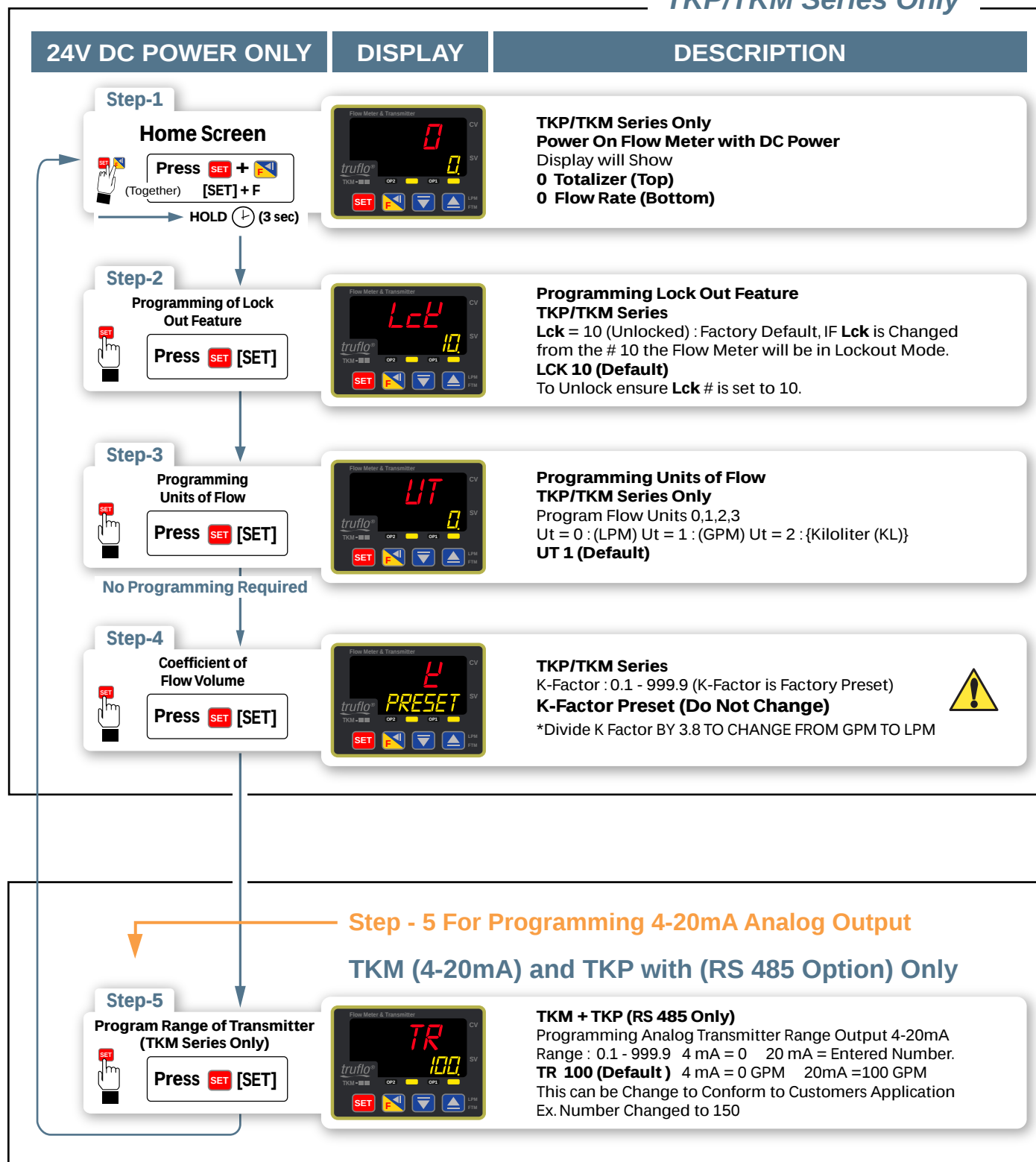
SPECIFICATIONS

Fluid	Water or Chemicals Liquid - Viscosity Range : .5-20 centistokes	
Accuracy	> + 1.0% of F.S. @ 20°C (68°F) - Repeatability + .5% of Full Scale	
Max Flow Velocity	10 m/s max - (32.8 ft/s max)	
Min Flow	0.3 m/s min. - (.98 ft/s min)	
Operating press	150 psi	
Turndown	33:1	
Response time	Real Time	
Material of Construction	Paddle : Tefzel Shaft : Zirconium Ceramic	Body : PVC/PP/316 Seals : EPDM/FPM
Operating Temperature	PVC < 60°C (140°F) PP < 80°C (176°F) 316 SST < 120°C (148°F)	
Electronics	+ 50°C (122°F)	
Protection Class	IP66 NEMA 4X	
Approval	CE Rohs	
Current Draw	60mA Max	
Battery	10-30VDC	

Programming TKP/TKM Model

Please Follow  Hand To Program

TKP/TKM Series Only



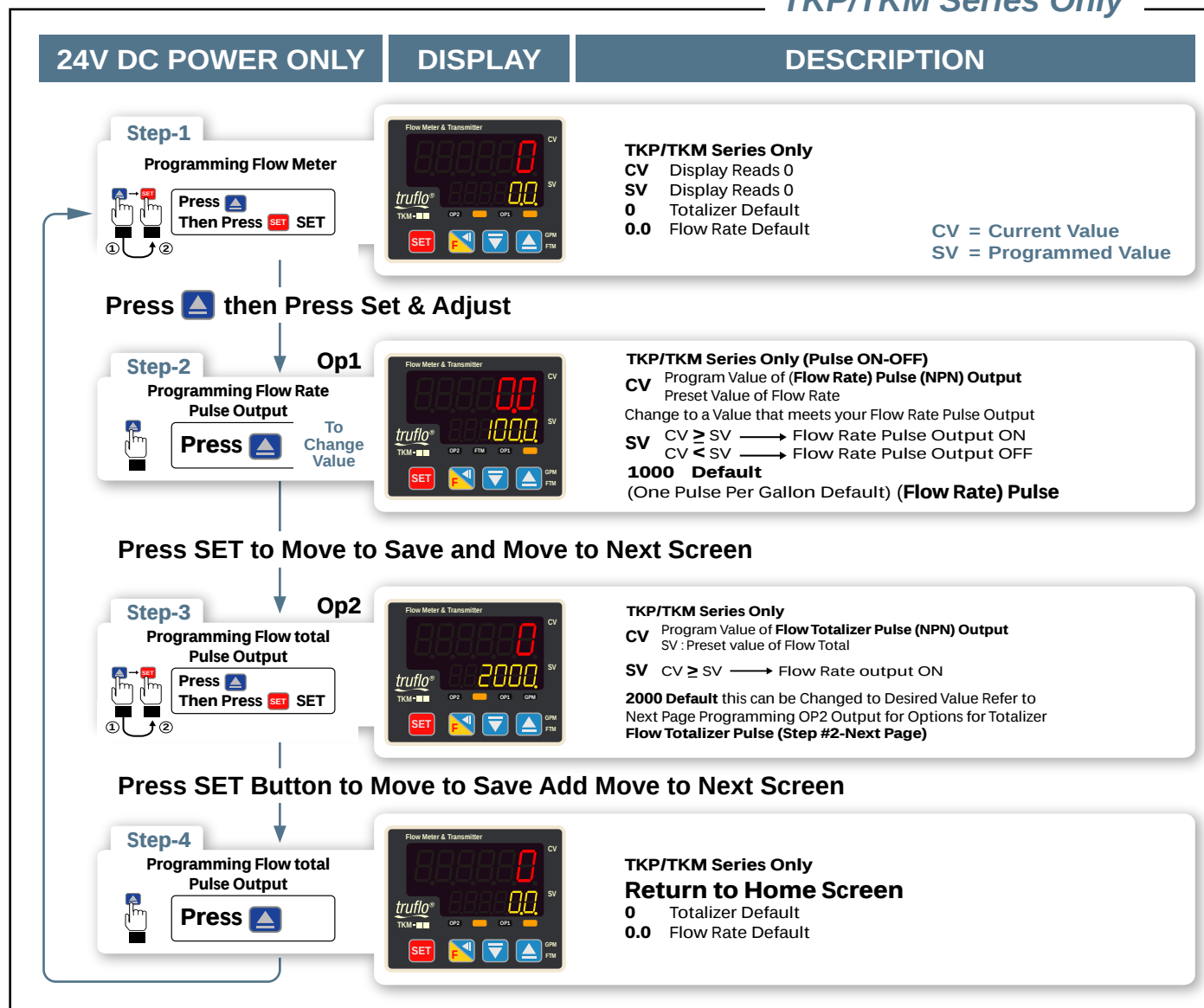
Programming NPN Pulse Output (TKP / TKM Series)

Please Follow  Hand To Program



Steps Only Necessary If NPN Pulse Output is Required

TKP/TKM Series Only



- 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

Programming NPN Pulse Control Function (TKP / TKM Model Only)

Please Follow  Hand To Program

OP1 = NPN Pulse Output (Flow Rate)

OP2 = NPN Pulse Output (Flow Totalizer)

TKP/TKM Series Only



OP1 = NPN Pulse Output (Flow Rate)
 OP2 = NPN Pulse Output (Flow Totalizer)

CV = Current Value

SV = Programmed Value

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 Like Buffer ± Around Pulse Output (Measured in GPM)	

K-Factors for TK Series Flow Meters (All Models)

Size	LPM	GPM
1/2"	124	471
3/4"	72	274
1"	45	171
1 1/2"	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.

Programming TKS Model Only

Please Follow  Hand To Program

TKS Series Only

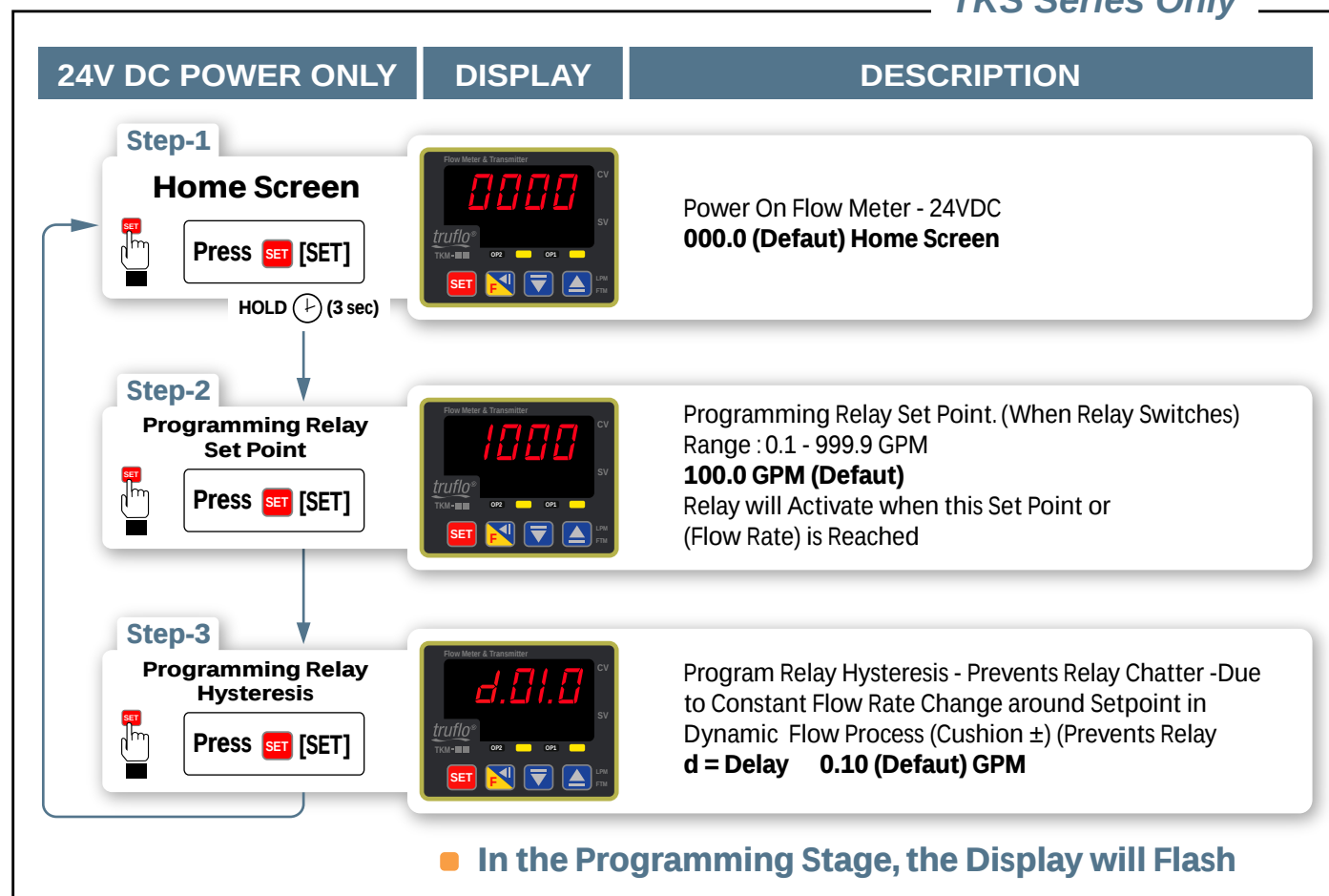


Programming TKS Model Only

Program Relay Set Point And Relay Delay (Prevents Relay Chatter)

Please Follow  Hand To Program

TKS Series Only



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)	

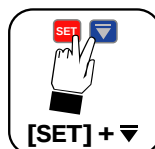
General Terms

- 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
- 5) **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

Important



Totalizer Reset TKP/TKM
To Reset the Flow Totalizer to Zero Press



for  (3 sec)
Important

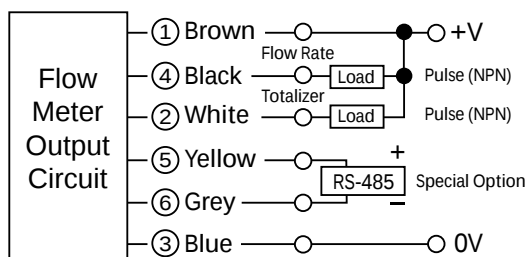
Standard Pipe Size

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 (1/2")	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 1/2")	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 1/2	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

Pressure vs. Temperature (psi, water, non-shock)

NOMINAL SIZE		PVC				PP				PVDF				
		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
INCHES	mm													
1/2-2	15-50	150	120	100	30	150	110	90	55	150	125	100	85	55
2-1/2	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

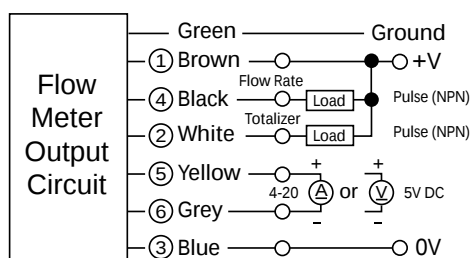
MODEL TKP FLOW RATE + FLOW TOTALIZER + NPN PULSE



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

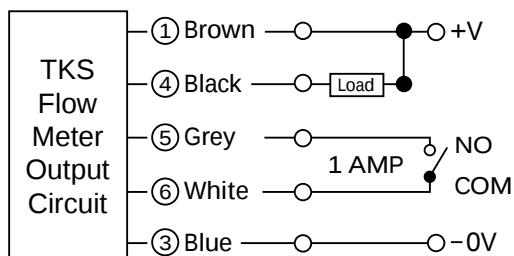
MODEL TKM (4-20mA Or 0-5V DC + NPN Pulse) FLOW RATE + FLOW TOTALIZER + PULSE



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

MODEL TKS NPN (FLOW RATE - RELAY + PULSE)



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) : 120Ω max.

Voltage output (0 - 5V) : 10KΩ min.

DC Power Only

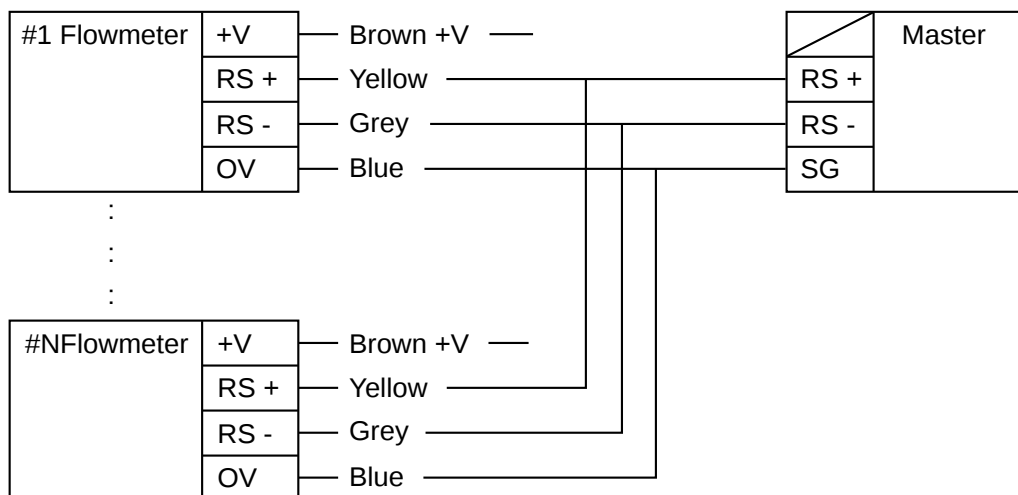
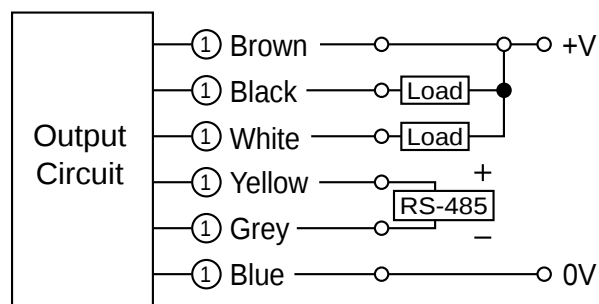
TKM Series (0-5VDC) Optional 4-20mA is Standard

Instruction Manual / RS-485

RS-485 Modbus Protocol -IV

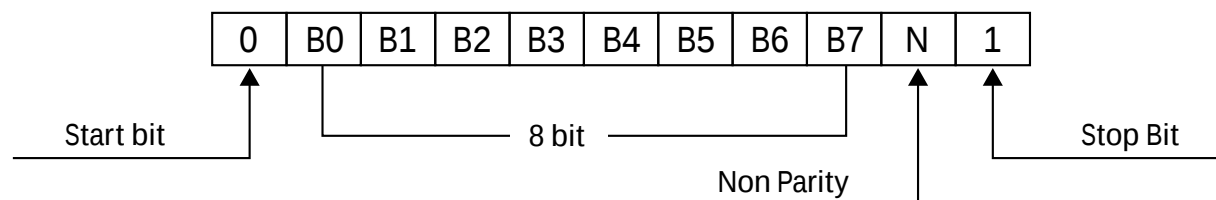
Thank you very much for using Truflo TK series flow meter Please read this instruction manual before operating it to avoid from the malfunction.

Connection Diagram



Communication Standard	EIA-RS 485	Communication Speed	9600 or 19200 or 38400 bps
Communication Mode	RS=0 :「MODBUS- RTU mode」 RS=1 :「MODBUS-ASCII mode」	Communication Station No.	ID No. = 01 ~ 99 (01H ~ 63H)

Configuration of Communication (8N1)



RS-485 communication

Address of parameter register

Address No.	Parameter	Description	Read Write	Decimal point	Range of Data
00H 01H	Lck	Lock setting	R / W	0	0 ~ 9999
00H 01H	Ut	Unit selecting	R / W	0	0 ~ 3
00H 01H	k	K value setting	R / W	1	0.1 ~ 999.9
00H 01H	t r (iLo word)	Transmitter range	R / W	1	0.1 ~ 9999.9
00H 01H	t r (iHi word)				
00H 01H	SPn	Transmitter span	R / W	3	0.000 ~ 9.999
00H 01H	OSt (iLo word)	Transmitter offset	R / W	3	0.000 ~ 999.999
00H 01H	OSt (iHi word)				
00H 01H	Con*	Control mode	R / W	0	0 ~ 3
00H 01H	t 1	Reset time	R / W	2	0.1 ~ 999.9
00H 01H	ALt	Output status (LPM Op 1)	R / W	0	0 ~ 3
00H 01H	HYS	Hysteresis (LPM)	R / W	1	0.1 ~ 999.9
00H 01H	t 2	Delay time (OP1)	R / W	0	0 ~ 99
00H 01H	r S*	RS-485 mode	R / W	0	0 ~ 1
00H 01H	bPS*	Baud rate	R / W	0	0 ~ 2
00H 01H	l d	Station No.	R	0	0 ~ 99
00H 01H	SV1 (Lo word)	Flow rate setting	R / W	1	0.0 ~ 99999.9
00H 01H	SV1 (Hi word)				
00H 01H	SV2 (Lo word)	Flow volume setting	R / W	0	0 ~ 999999
00H 01H	SV2 (Hi word)				
00H 01H	PV (Lo word)	Flow rate value	R	1	0.0 ~ 99999.9
00H 01H	PV (Hi word)				
00H 01H	CV (Lo word)	Flow volume value	R / W	0	0 ~ 999999
00H 01H	CV (Hi word)				
00H 01H	Output status*	Out1 & Out2 output status	R	0	0 ~ 3

Decimal point FALL value of the parameter is processed to integer, Ex. 「123.4」 「1234」

「Con*」: 「0」= 「n」, 「1」= 「r」, 「2」= 「c」, 「3」= 「E」

「r S*」: 「0」= 「Modbus - RTU mode」, 「1」= 「Modbus - ASCII mode」

「bPS*」: 「0」= 「9600」, 「1」= 「19200」, 「2」= 「38400」

Output Status****

Data	Out1	Out2	Data	Out1	Out2	Data	Out1	Out2	Data	Out1	Out2
00H 00H	Off	Off	00H 01H	On	Off	00H 02H	Off	On	00H 03H	On	On

Remarks

Symbol	ASCII code	Description	Symbol	ASCII Code	Description	Symbol	ASCII Code	Description
@	40	Start code	C	43	Hex	4	34	Hex / BCD
R	52	Read	D	44	Hex	5	35	Hex / BCD
W	57	Write	E	45	Hex	6	36	Hex / BCD
CR	0D	Stop code	F	46	Hex	7	37	Hex / BCD
-	2D	Minus	1	31	Hex / BCD	8	38	Hex / BCD
A	41	Hex	2	32	Hex / BCD	9	39	Hex / BCD
B	42	Hex	3	33	Hex / BCD	:	3A	Hex

Message format

MODBUS RTU	Read command :	Station No.	Function code	Address	Batches of Data	CRC	
	Read response :	Station No.	Function code	Data byte counts	Data	CRC	
MODBUS ASCII	Read command :	Start code	Station No.	Function code	Address	Data	LRC Stop code
	Read response :	Start code	Station No.	Function code	Address	Data	LRC Stop code

Function code

Function code	Function	Description
03H	Read	To read the data on register
06H	Write (Single word)	To write the preset value on register
10H	Write (Double word)	To write the preset value on register
08H	Diagnose	To diagnose the error of message format

Ex : 「Read the CV value (flow volume) of No.01 flow meter ; CV=123456 (01E240H) (Liters)」 and
「Write the K value (K factor) of No.01 flow meter ; K=123.4 (04D2H)」
「Write the SV1 value (Flow rate setting) of No.01 flow meter; SV1=12345.6 (01E240H)」
(Station No= 01H,CV address = 22H/23H,CV = 123456 (01E240H) , K address = 03H,K=123.4 (04D2H)
(SV1 address = 14H/15H, SV1 = 123456 (01E240H))

Communication mode : 「RS = 0 : MODBUS . RTU code」

Read command	Station No.	Function code	Address	Batches of data	CRC
	01H	03H	00H 22H	00H 02H	64H 01H
Read response	Station No.	Function code	Data byte counts	Data	CRC
	01H	03H	04H	E2H 40H 00H 01H	E2H A3H
Write command	Station No.	Function code	Address	Data	CRC
	01H	06H	00H 03H	04H D2H	FBH 57H
Write response	Station No.	Function code	Address	Data	CRC
	01H	06H	00H 03H	04H D2H	FBH 57H
Write command	Station No.	Function code	Address	Data	CRC
	01H	10H	00H 14H	E2H 40H 00H 01H	56H 69H
Write response	Station No.	Function code	Address	Data	CRC
	01H	10H	00H 14H	E2H 40H 00H 01H	56H 69H

Communication mode : 「RS = 1 FMODBUS . ASCII code」

Read command	Start code	Station No.	Function code	Address	Batches of data*	LRC	Stop code
	3AH	30H 31H	30H 33H	30H 30H 32H 32H	30H30H 30H32H	42H 36H	0DH 0AH
Read response	Start code	Station No.	Function code	Data byte counts**	Data	LRC	Stop code
	3AH	30H 31H	30H 33H	30H 34H	*1	33H 43H	0DH 0AH
Write command	Start code	Station No.	Function code	Address	Data	LRC	Stop code
	3AH	30H 31H	30H 33H	30H 30H 30H 33H	*2	39H 43H	0DH 0AH
Write response	Start code	Station No.	Function code	Address	Data	LRC	Stop code
	3AH	30H 31H	30H 33H	30H 30H 30H 33H	*2	39H 43H	0DH 0AH

Data byte counts** : 2 ASCII code byte = 1 data byte

*1 : 45H 32H 34H 30H 30H 30H 30H 31H (4 data bytes)

*2 : 30H 34H 44H 32H (2 data bytes)

Calculation of 「FCS」

(RS = 0 FMODBUS . RTU code) : FCS = CRC .16 (Cyclic redundancy check)

Procedure of CRC-16 calculation

1. To load FFH FFH to the 16 bit CRC register
2. To exclusive OR (*) the first byte of the message format with the low order byte of the 16 bit CRC register, then put the result in the 16 bit CRC register.
3. To shift the CRC register one bit to right (toward the LSB) and fill the MSB with zero.
4. To repeat the step 3 If the carry flag is 0 (LSB is 0), Exclusive OR the CRC register with A001H which is the value of polynomial if the carry flag is 1 (LSB is 1), then put the result in the 16 bit CRC register.
5. To repeat the step3 and 4 until the 16 bit CRC register is shifted 8 times
6. To repeat from step 2 to step 5 for the next byte of the message format until final byte of message is completed. (Except the CRC bytes)
7. To get the CRC value by changing the high order and low order byte of the final CRC register.

(RS = 1 FMODBUS . ASCII code) FFCS = LRC

Procedure of LRC calculation

1. To add all bytes in the message format, excluding the start code 「F」 and ending code (0DH 0AH), then put this value in an 8-bit field.
2. To get a Two's complement from this 8-bit field. it is named 「Y」 (8-bit field also)
3. To get the LRC value by changing the Hex code to ASCII code from the 「Y」.

Error response code

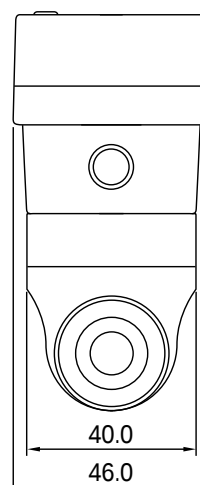
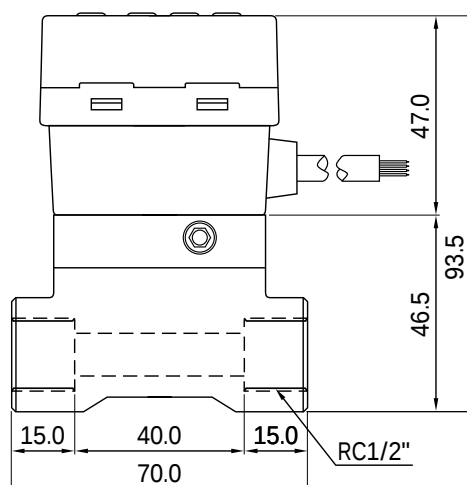
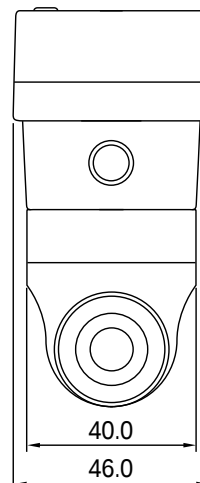
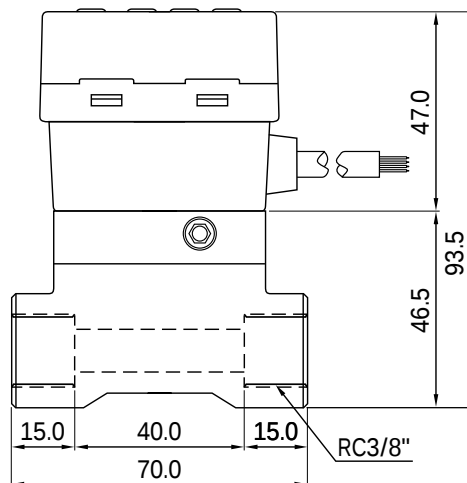
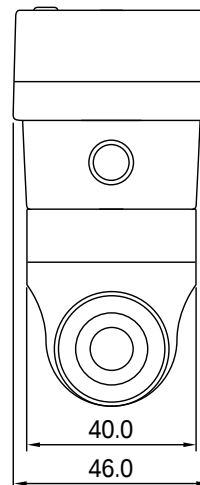
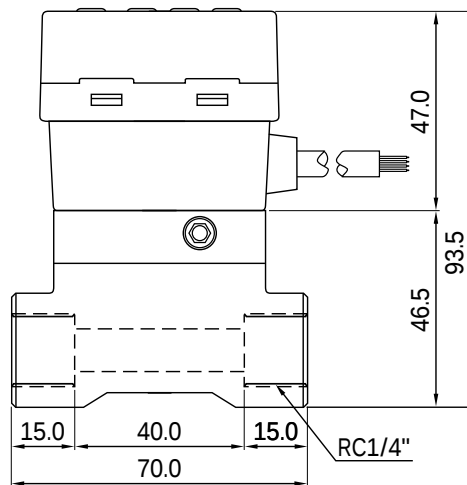
Message format

RS = 0 FMODBUS . RTU code				
Function	Station No.	Function code	Error code	FCS
Read	<u>01H</u> ~ <u>63H</u>	<u>83H</u>	<u>01H</u> ~ <u>05H</u>	CRC-16
Write	<u>01H</u> ~ <u>63H</u>	<u>86H</u>	<u>01H</u> ~ <u>05H</u>	CRC-16

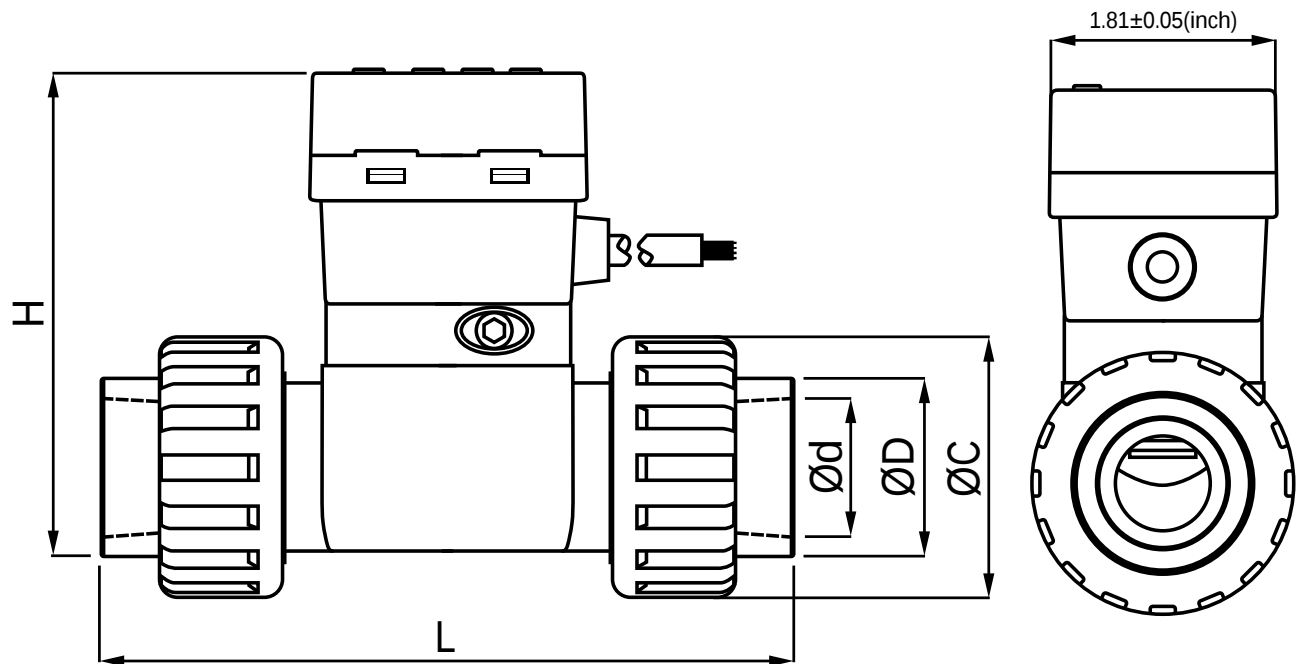
RS = 1 FMODBUS . ASCII code						
Function	Start code	Station No.	Function code	Error code	FCS	Stop code
Read	<u>3AH</u>	<u>30H</u> <u>31H</u> ~ <u>36H</u> <u>33H</u>	<u>38H</u> <u>33H</u>	<u>30H</u> <u>31H</u> ~ <u>30H</u> <u>35H</u>	LRC	<u>0DH</u> <u>0AH</u>
Write	<u>3AH</u>	<u>30H</u> <u>31H</u> ~ <u>36H</u> <u>33H</u>	<u>38H</u> <u>36H</u>	<u>30H</u> <u>31H</u> ~ <u>30H</u> <u>35H</u>	LRC	<u>0DH</u> <u>0AH</u>

Error code					
Code		Description	Code		Description
MODBUS – RTU	<u>01H</u>	Command error	MODBUS – RTU	<u>03H</u>	Data overflow error
MODBUS – ASCII	<u>03H</u> <u>31H</u>		MODBUS – ASCII	<u>30H</u> <u>33H</u>	
MODBUS – RTU	<u>02H</u>	Address overflow error	MODBUS – RTU	<u>04H</u>	Data error
MODBUS – ASCII	<u>30H</u> <u>32H</u>		MODBUS – ASCII	<u>30H</u> <u>34H</u>	
MODBUS – RTU	<u>05H</u>	CRC or LRC error			
MODBUS – ASCII	<u>30H</u> <u>35H</u>				

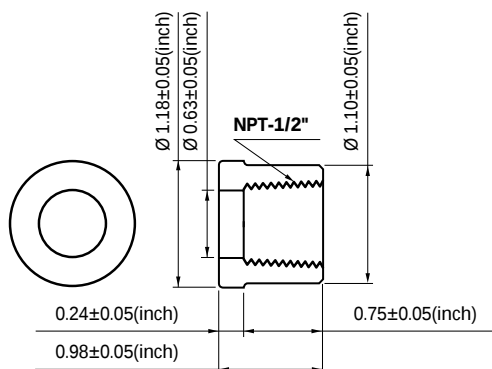
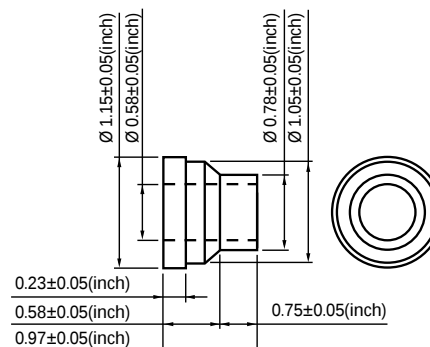
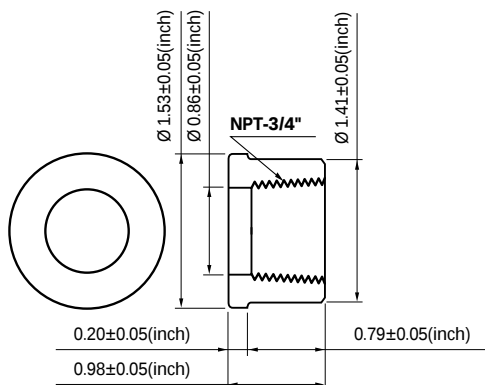
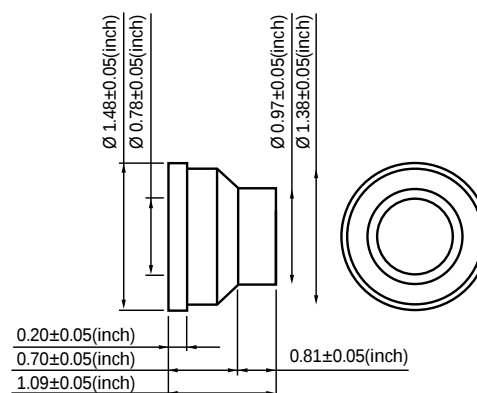
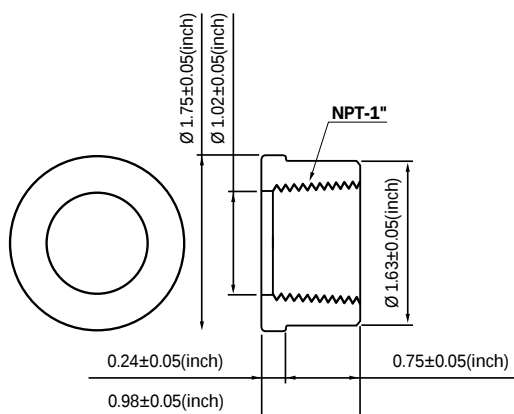
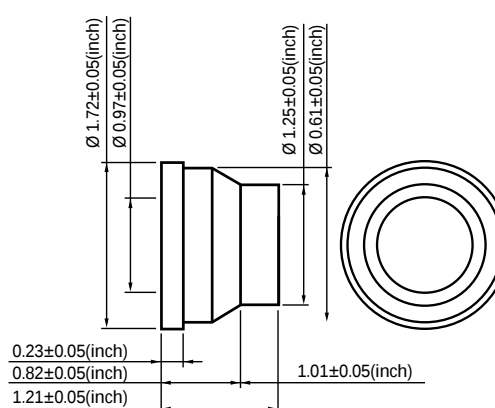
Dimensions- TK3 Series

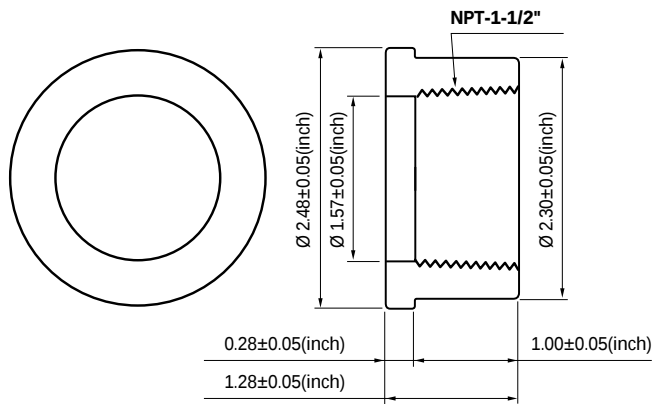
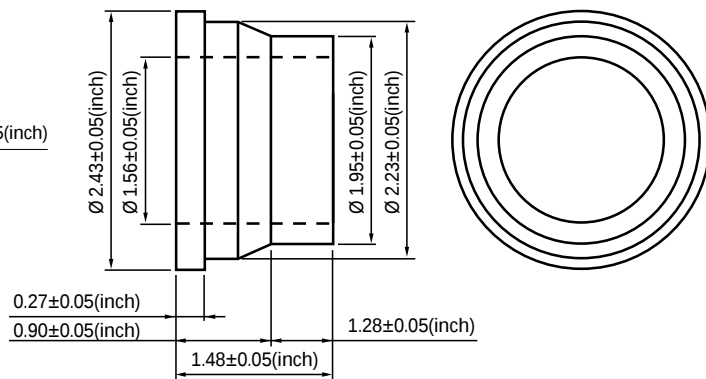
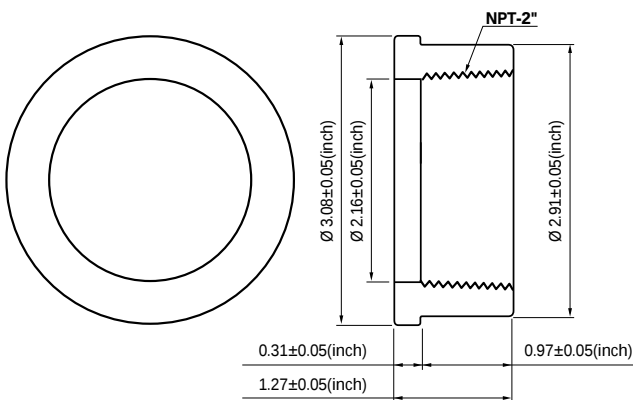
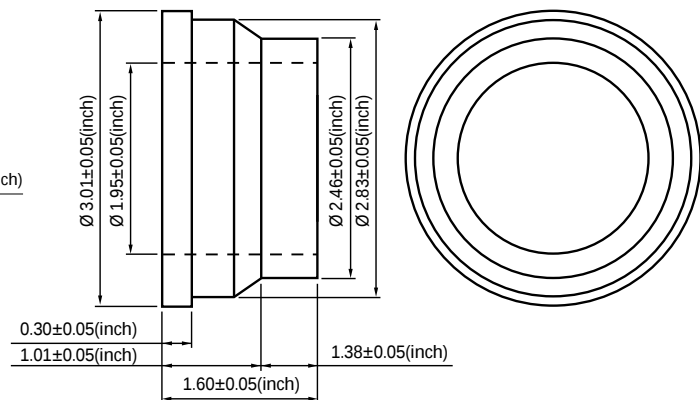


Dimensions- TKS/TKP/TKM Series

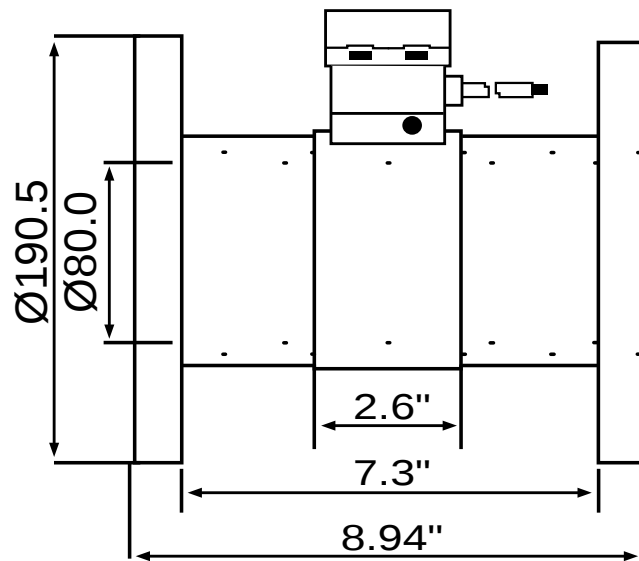
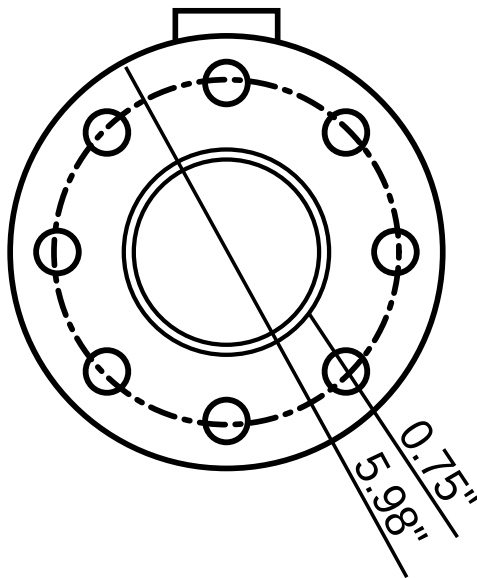


Pipe Size	H (inch)	L (inch)	Ød (inch)	ØD (inch)	ØC (inch)
(1/2") DN (15)	4.09±0.05	5.48±0.05	0.84±0.05	1.07±0.05	1.61±0.05
(3/4") DN (20)	4.17±0.05	6.12±0.05	1.05±0.05	1.36±0.05	2.08±0.05
(1") DN (25)	4.30±0.05	6.76±0.05	1.32±0.05	1.68±0.05	2.36±0.05
(1-1/2") DN (40)	5.02±0.05	7.66±0.05	1.91±0.05	2.33±0.05	3.26±0.05
(2") DN (50)	5.56±0.05	8.39±0.05	2.38±0.05	2.86±0.05	4.33±0.05

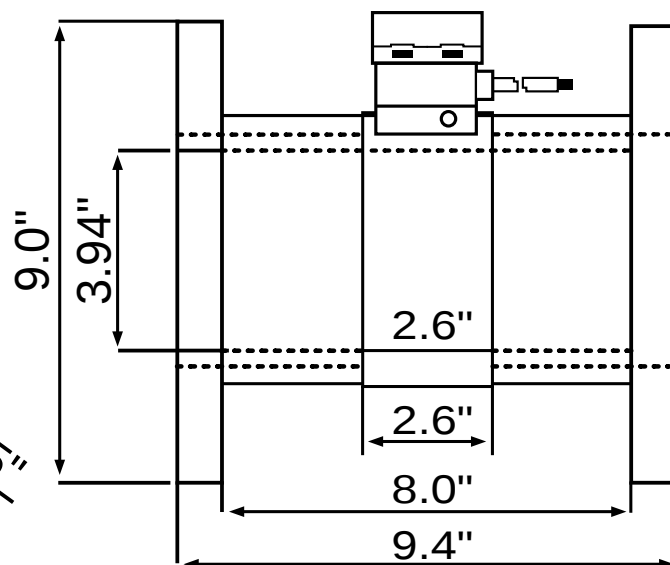
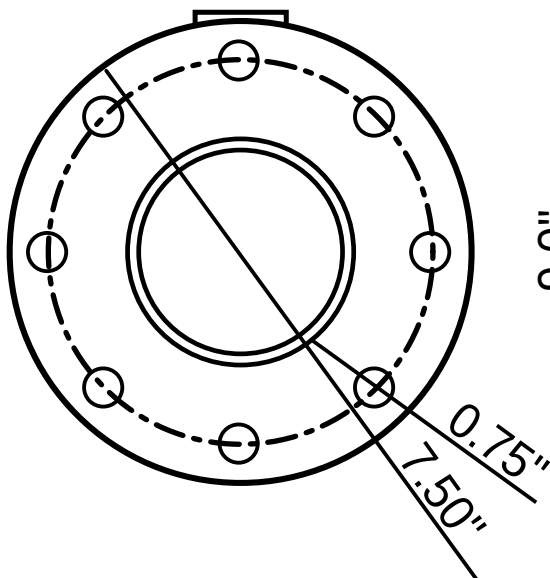
½" DN15-UNION-NPT-PP**½" DN15-UNION-PP SDR 11 IR FUSION****¾" DN20-UNION-NPT****¾" DN20-UNION-PP SDR 11 IR FUSION****1" DN25-UNION-NPT****1" DN25-UNION-PP SDR 11 IR FUSION**

1½" DN40-UNION-NPT-PVC- PP, PVDF**1½" DN40-UNION-PP PVDF
SDR 11 IR FUSION****2" DN50-UNION-NPT-PVC-PP, PVDF****2" DN50-UNION-PP, PVDF
SDR 11 IR FUSION**

3" ANSI JIS

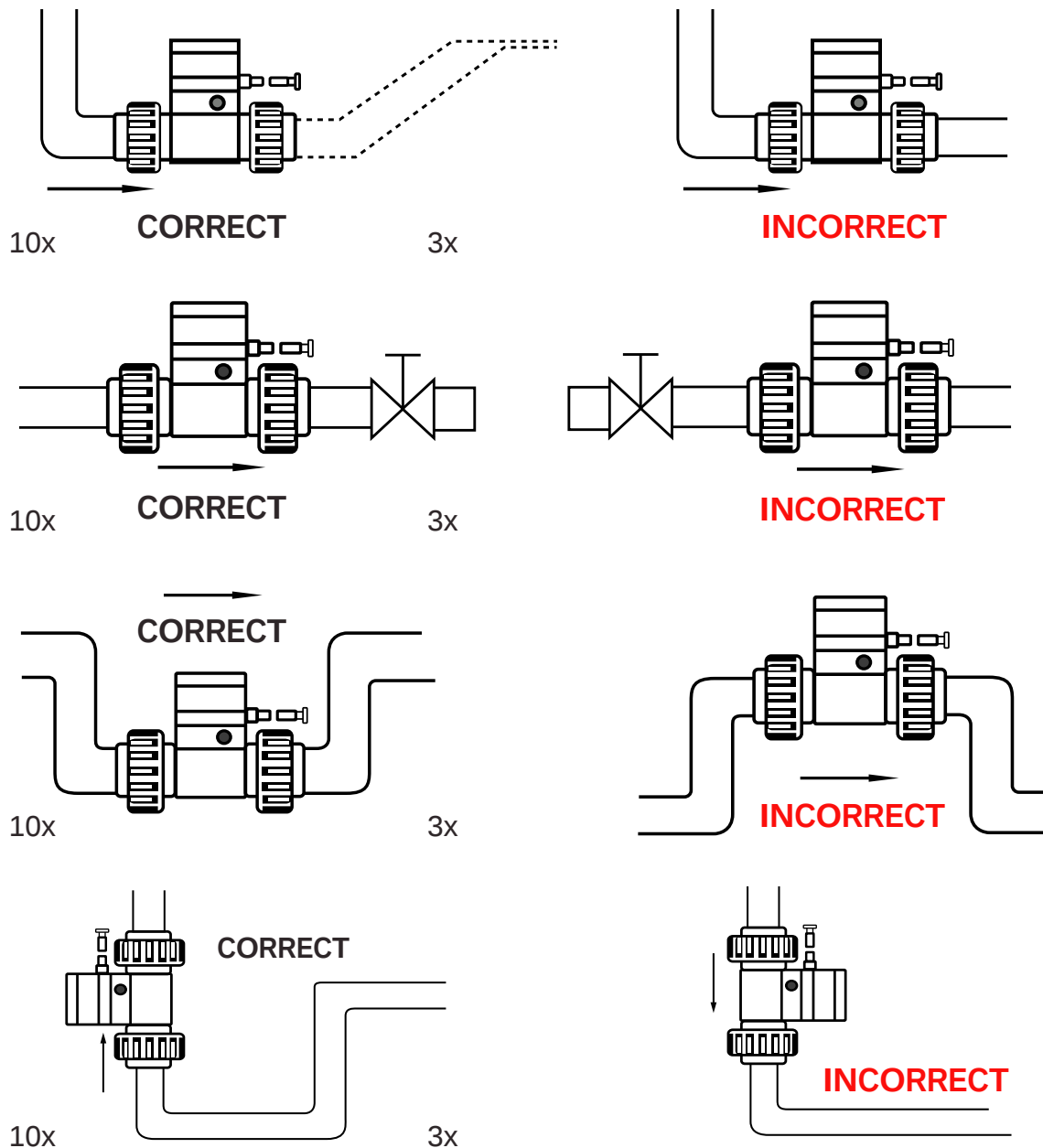


PVC 4" ANSI JIS



Remarks : Different Options Are Available

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