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Tucor FLEXFlow Meter Installation Manual



Installation, troubleshooting & replacement for Tucor's Low Power 3-Wire Insert Meter & Saddle. This document does not address telemetry.



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Read Before Proceeding!

Usage Requirements

- This meter is for use with water only.
- This meter is not legal for trade applications.
- This meter has a permanent factory setting for measuring water only.

Power Source Requirements

This meter requires DC power from a customer-provided power supply or controller. The power is limited to +3.3VDC +/- 10% and has no protection against accidental connection of reverse polarity. Verify the polarity of the input voltage prior to connecting to the meter and turning on the supply.





1) OVERVIEW SPECIFICATION

FLEXFlow Insert

- **DC power:** provided by customer equipment
- Powered by: 3.0V (dc) min to 3.6V (dc) max
- **OFF State Current:** 50µA (typical)
- Output Frequency: 0 to 100 Hz
- Output Pulse Width: 4mSec (Approx.)
- Output Pulse Type: 3.3V LVTTL Digital Pulse Output

FLEXFlow T & Saddle – Operating Specification

			U	FM-XX-FLEX			UFM-S-XX	-FLEX		
	1"		1.5"	2"	3"	4"	6"	8"	10"	12"
	0.22-33	GPM	0.55-82 GPM	0.92-138	2.06-309	3.58-537	9-1350	15-2300	24-3650	35-5300
	0.83-124	.92	2.08-310.41	GPM	GPM	GPM	GPM	GPM	GPM	GPM
Elaur Bata	L/min	0.1-15	L/min 0.1-15	3.48-522.39	7.80-	13.55-	0.1-15	0.1-15	0.1-15	0.1-15
FIOW Rate	ft/sec		ft/sec	L/min 0.1-15	1169.70	2032.70	ft/sec	ft/sec	ft/sec	ft/sec
				ft/sec	L/min	L/min				
					0.1-15 ft/sec	0.1-15 ft/sec				
Accuracy					+	-/- 2% of Read	ling			
Max.										
Working					150 PSI @ 7	70°F (10.3 bar	@ 60°C)			
Pressure										
Operating										
Temperature				+3	2°F to 140°F	(10.3 bar @ 6	60°C)			
0 4										
Storage										
remperature										
				+32	2°F to 140°F	(10.3 bar @	60°C)			

Each FLEXFlow meter is factory calibrated to output pulses with a frequency equivalent to the velocity of the fluid flowing past the FLEXFlow ultrasonic sensors.

The individual pulses output from the meter are representative of a volume unit of fluid that has passed thru the FLEXFlow meter.

The K-factor (pulses/volume unit) can be found on the subsequent pages for the various line sizes supported by the FLEXFlow T & Saddle. There is 0 Offset.



FLEXFlow T – K Factors

The Following K-Factor values represent what is standard by most irrigation controller applications. For more information regarding FLEXFlow K-Factors, contact Tucor.

	1"	1.5"	UFM-XX-FLEX 2"	3"	4"
Sch. 40	0.5575	0.7923	1.4610	4.2630	8.0881
Sch. 80	0.5354	0.7860	1.4568	4.0850	7.9062



FLEXFlow Saddle – Factors by Pipe Material UFM-S-6-FLEX

				OUTSIDE				Refer	ence	Typical	
NOMINAL	MATERIAL	CLASSIFICATION	PRESSURE	DIA.	WALL THICKNESS	INSIDE DIA.	CIRCUMFERENCE .	K-fac	ctor	Irrigation	Rainmaster
SIZE			psi	inches	inches	inches	inches	pulses/Gal	pulses/litre	K-Value	Value
6"	HDPE	GEOTHERMAL (SDR 9)		6.625	0.736	5.153	20.813	4.420	1.168	13.575	3702
6"	TUBE (STEEL)	7 GA		6.000	0.188	5.624	18.850	3.850	1.017	15.585	4251
6"	TUBE (STEEL)	10 GA		6.000	0.135	5.730	18.850	3.722	0.983	16.122	4397
.9	TUBE (STEEL)	11 GA		6.000	0.125	5.750	18.850	3.698	0.977	16.225	4425
6"	PIPE (ALUM)	SCH80		6.625	0.432	5.761	20.813	3.684	0.973	16.287	4442
6"	PVC	SCH80	167	6.625	0.432	5.761	20.813	3.684	0.973	16.287	4442
9	125# PVC	PIP (SDR 32.5)	125	6.140	0.189	5.762	19.289	3.683	0.973	16.292	4443
6"	TUBE (STEEL)	12 GA		6.000	0.105	5.790	18.850	3.649	0.964	16.443	4485
6"	TUBE (ALUM)	IRRIGATION PIPE		6.000	0.083	5.834	18.850	3.596	0.950	16.687	4551
6"	TUBE (STEEL)	14 GA		6.000	0.083	5.834	18.850	3.596	0.950	16.687	4551
6"	100# PVC	PIP (SDR 41)	100	6.140	0.150	5.840	19.289	3.588	0.948	16.721	4560
6"	TUBE (ALUM)	IRRIGATION PIPE		6.000	0.058	5.884	18.850	3.535	0.934	16.973	4629
6"	TUBE (ALUM)	IRRIGATION PIPE		6.000	0.051	5.898	18.850	3.518	0.929	17.054	4651
6"	80# PVC	PIP (SDR 51)	80	6.140	0.121	5.898	19.289	3.518	0.929	17.054	4651
6"	50# PVC	PIP (SDR 81)	50	6.140	0.076	5.988	19.289	3.409	0.901	17.599	4800
.9	200# PVC	IPS CL 200	200	6.625	0.316	5.993	20.813	3.403	0.899	17.631	4808
6"	LH PVC	PIP (SDR 91)	91	6.140	0.070	6.000	19.289	3.395	0.897	17.675	4820
6"	PIPE (ALUM)	SCH40		6.625	0.280	6.065	20.813	3.316	0.876	18.094	4935
6"	PVC	SCH40	106	6.625	0.280	6.065	20.813	3.316	0.876	18.094	4935
6"	160# PVC	IPS CL 160	160	6.625	0.255	6.115	20.813	3.255	0.860	18.430	5027
6"	125# PVC	IPS CL 125	125	6.625	0.204	6.217	20.813	3.132	0.827	19.157	5225
6"	PIPE (STEEL)	7 GA		6.625	0.188	6.249	20.813	3.093	0.817	19.397	5290
6"	100# PVC	IPS CL 100	100	6.625	0.162	6.301	20.813	3.030	0.801	19.800	5400
6"	PIPE (STEEL)	10 GA		6.625	0.135	6.355	20.813	2.965	0.783	20.236	5519
6"	PIPE (ALUM)	SCH10		6.625	0.134	6.357	20.813	2.963	0.783	20.253	5524
6"	PIPE (STEEL)	12 GA		6.625	0.105	6.415	20.813	2.892	0.764	20.744	5658
6"	63# PVC	IPS CL 63	63	6.625	0.104	6.417	20.813	2.890	0.763	20.762	5662

Rainmaster Value 6542 7063 8115 8188 8347 8420 8485 8520 8555 8589 8603 8642 8680 8744 8895 8903 8903 8955 9577 9959 0044 8117 8117 8387 9261 Typical Irrigation 25.897 29.754 29.762 29.762 30.022 30.606 30.753 30.873 31.111 31.240 31.369 31.491 31.544 31.685 31.828 32.062 32.616 32.644 32.644 32.833 33.956 35.114 36.517 36.826 K-Value 23.988 pulses/litre 0.515 0.612 0.533 0.533 0.533 0.528 0.518 0.513 0.509 0.507 0.505 0.503 0.502 0.500 0.498 0.494 0.486 0.486 0.486 0.483 0.467 0.451 0.434 0.430 0.661 Reference K-factor pulses/Gal 2.016 2.317 2.017 2.016 1.999 1.960 1.943 L.929 1.921 1.913 1.905 1.902 1.894 1.885 l.840 L.838 1.838 1.767 L.709 L.643 1.629 2.501 1.951 CIRCUMFERENCE 27.096 27.096 25.133 27.096 27.096 25.635 25.133 25.133 25.635 25.133 27.096 25.133 25.133 25.635 25.133 25.133 25.133 25.635 27.096 27.096 27.096 27.096 27.096 27.096 27.096 inches INSIDE DIA. 6.709 7.625 7.625 7.658 7.730 7.805 7.820 7.840 7.856 7.898 7.958 8.095 8.329 8.355 inches 7.057 7.624 7.750 7.762 7.790 7.834 7.872 7.961 7.961 7.981 8.205 WALL THICKNESS 0.958 0.188 0.500 0.500 0.135 0.125 0.199 0.105 0.410 0.090 0.083 0.160 0.072 0.332 0.210 0.148 inches 0.784 0.064 0.051 0.101 0.332 0.322 0.265 0.251 DUTSIDE inches 8.160 8.000 8.000 8.160 8.000 8.000 8.625 8.625 8.625 8.000 8.625 8.625 8.160 8.000 8.000 8.000 8.625 8.000 8.160 8.625 8.625 8.625 8.625 8.625 8.625 DIA. PRESSURE 148 psi 00 200 80 50 60 93 125 00 63 GEOTHERMAL (SDR 11) GEOTHERMAL (SDR 9) CLASSIFICATION IRRIGATION PIPE IRRIGATION PIPE IRRIGATION PIPE IRRIGATION PIPE PIP (SDR 32.5) PIP (SDR 41) PIP (SDR 51) PIP (SDR 81) PS CL 200 PS CL 160 IPS CL 125 PS CL 100 PS CL 63 SCH40 SCH80 SCH10 SCH80 10 GA 11 GA 12 GA 14 GA SCH40 7 GA MATERIAL TUBE (ALUM) TUBE (STEEL) TUBE (ALUM) TUBE (ALUM) TUBE (ALUM) TUBE (STEEL) TUBE (STEEL) TUBE (STEEL) TUBE (STEEL) 160# PVC 200# PVC 125# PVC 100# PVC 125# PVC 100# PVC 50# PVC 63# PVC 80# PVC HDPE HDPE PIPE PIPE PIPE PVC PVC NOMINAL . 00 ÷ ω. ÷ ÷ ÷ ā ÷. ÷. -00 ÷. ÷ ÷. . 00 ÷00 ÷. ÷ ÷ ÷00 ÷00 ÷. ÷. ō ÷ ÷

Tucor FLEXFlow Meter User Guide

UFM-S-8-FLEX



Tucor FLEXFlow Meter User Guide

UFM-S-10-FLEX

			Por conor	OUTSIDE	COLUMN T			Refer	ence	Typical	
NOMINAL	MATERIAL	CLASSIFICATION	FRESSURE	DIA.	WALL I FICKIVESS	INSIDE DIA.	CIRCUMITERENCE	K-fa	ctor	Irrigation	Rainmaster
			psi	inches	inches	inches	inches	pulses/Gal	pulses/litre	K-Value	Value
10"	HDPE	GEOTHERMAL (SDR 9)		10.750	1.194	8.362	33.772	1.747	0.461	34.348	9368
10"	HDPE	GEOTHERMAL (SDR 11)		10.750	0.977	8.796	33.772	1.556	0.411	38.572	10520
10"	PIPE	SCH80		10.750	0.593	9.564	33.772	1.217	0.321	49.302	13446
10"	PVC	SCH80	140	10.750	0.593	9.564	33.772	1.217	0.321	49.302	13446
10"	125# PVC	PIP (SDR 32.5)	125	10.200	0.314	9.572	32.044	1.213	0.321	49.445	13485
10"	TUBE (STEEL)	7 GA		10.000	0.188	9.624	31.416	1.191	0.315	50.397	13745
10"	100# PVC	PIP (SDR 41)	100	10.200	0.249	9.702	32.044	1.156	0.305	51.896	14153
10"	TUBE (STEEL)	10 GA		10.000	0.135	9.730	31.416	1.144	0.302	52.455	14306
10"	TUBE (STEEL)	11 GA		10.000	0.125	9.750	31.416	1.135	0.300	52.863	14417
10"	200# PVC	IPS CL 200	200	10.750	0.500	9.750	33.772	1.135	0.300	52.863	14417
10"	TUBE (STEEL)	12 GA		10.000	0.105	9.790	31.416	1.117	0.295	53.697	14645
10"	80# PVC	PIP (SDR 51)	80	10.200	0.200	9.800	32.044	1.113	0.294	53.910	14703
10"	TUBE (ALUM)	IRRIGATION PIPE		10.000	0.094	9.812	31.416	1.108	0.293	54.167	14773
10"	TUBE (ALUM)	IRRIGATION PIPE		10.000	0.064	9.872	31.416	1.081	0.286	55.492	15134
10"	TUBE (ALUM)	IRRIGATION PIPE		10.000	0.051	9.898	31.416	1.070	0.283	56.087	15297
10"	160# PVC	IPS CL 160	160	10.750	0.413	9.924	33.772	1.058	0.280	56.694	15462
10"	50# PVC	PIP (SDR 81)	50	10.200	0.126	9.948	32.044	1.048	0.277	57.267	15618
10"	PVC	SCH40	84	10.750	0.365	10.020	33.772	1.016	0.268	59.055	16106
10"	PIPE	SCH40		10.750	0.365	10.020	33.772	1.016	0.268	59.055	16106
10"	125# PVC	IPS CL 125	125	10.750	0.331	10.088	33.772	0.986	0.260	60.851	16596
10"	100# PVC	IPS CL 100	100	10.750	0.262	10.226	33.772	0.925	0.244	64.852	17687
10"	63# PVC	IPS CL 63	63	10.750	0.168	10.414	33.772	0.842	0.223	71.232	19427
10"	PIPE	SCH10		10.750	0.165	10.420	33.772	0.840	0.222	71.456	19488



Tucor FLEXFlow Meter User Guide

UFM-S-12-FLEX

			101100100	OUTSIDE	33111 THICKNESS	VIU EUISINI		Refer	rence	Typical	
SIZE	MATERIAL	CLASSIFICATION	r RESSURE	DIA.	WALL I FICKINESS	INSIDE DIA.	CIRCUMITERENCE	K-fa	ctor	Irrigation	Rainmaster
			psi	inches	inches	inches	inches	pulses/Gal	pulses/litre	K-Value	Value
12"	HDPE	GEOTHERMAL (SDR 9)		12.750	1.417	9.916	40.055	1.371	0.362	43.765	11936
12"	HDPE	GEOTHERMAL (SDR 11)		12.750	1.159	10.432	40.055	1.215	0.321	49.390	13470
12"	PIPE	SCH80		12.750	0.687	11.376	40.055	0.929	0.245	64.574	17611
12"	PVC	SCH80	137	12.750	0.687	11.376	40.055	0.929	0.245	64.574	17611
12"	125# PVC	PIP (SDR 32.5)	125	12.240	0.377	11.486	38.453	0.896	0.237	66.973	18265
12"	200# PVC	IPS CL 200	200	12.750	0.606	11.538	40.055	0.880	0.233	68.170	18592
12"	100# PVC	PIP (SDR 41)	100	12.240	0.299	11.642	38.453	0.849	0.224	70.698	19281
12"	TUBE (STEEL)	10 GA		12.000	0.135	11.730	37.699	0.822	0.217	72.988	19906
12"	TUBE (STEEL)	11 GA		12.000	0.125	11.750	37.699	0.816	0.216	73.529	20054
12"	80# PVC	PIP (SDR 51)	80	12.240	0.240	11.760	38.453	0.813	0.215	73.803	20128
12"	160# PVC	IPS CL 160	160	12.750	0.490	11.770	40.055	0.810	0.214	74.079	20204
12"	TUBE (STEEL)	12 GA		12.000	0.105	11.790	37.699	0.804	0.212	74.637	20356
12"	TUBE (ALUM)	IRRIGATION PIPE		12.000	0.094	11.812	37.699	0.797	0.211	75.260	20526
12"	TUBE (ALUM)	IRRIGATION PIPE		12.000	0.064	11.872	37.699	0.779	0.206	77.014	21004
12"	PVC	SCH40	79	12.750	0.408	11.934	40.055	0.760	0.201	78.914	21522
12"	PIPE	SCH40		12.750	0.408	11.934	40.055	0.760	0.201	78.914	21522
12"	50# PVC	PIP (SDR 81)	50	12.240	0.151	11.938	38.453	0.759	0.201	79.040	21557
12"	125# PVC	IPS CL 125	125	12.750	0.392	11.966	40.055	0.751	0.198	79.932	21800
12"	100# PVC	IPS CL 100	100	12.750	0.311	12.128	40.055	0.702	0.185	85.517	23323
12"	63# PVC	IPS CL 63	63	12.750	0.199	12.352	40.055	0.634	0.167	94.662	25817
12"	PIPE	SCH10		12.750	0.180	12.390	40.055	0.622	0.164	96.411	26294





2) INSTALLATION

Wiring – Insert

It is recommended to connect the pulse output to a high impedance input on external equipment to maintain low current consumption.

Cable Signals

- Red Wire +3.3VDC Power Supply
- Black Wire Ground from Power Supply
- White Wire LVTTL Digital Pulse Output**



FlexFlow Meter



Wiring Connections

When using 18 AWG cable, cut off the unused wires so that they are even with the sheath of the cable.

NOTE: For 18 AWG connections, remember the color of the twisted pair of wires you use so that you can make an identical connection with the same wires later.

Strip insulation 3/4 in. (19 mm)



With wire ends even, insert wires into the connector and tighten until secure.

Insert the connector all the way into the tube until the connector rests on the bottom of the tube.

Fold the wires into the channels.

Close the cap.



NOTE: If having difficulty getting the twist-on connector down into the tube when using small gauge wires, use a thin, non-conductive object to push the connector to the bottom of the tube. Upon removal of the object, ensure that no voids or water paths remain in the grease.

Installing the FLEXFlow Saddle

Step 1 – Drilling hole:

It is recommended that the saddle/sensor not be located on the very top or very bottom of the pipe. Ideal performance can be achieved with the saddle mounted at 2 to 4 o'clock or 8 to 10 o'clock. Hole should also be drilled perpendicular to the pipe centerline and tangent to the curvature.

Step 2 – Mounting the saddle:

The saddle will need to be preassembled to insure the fit is proper. Assemble the hardware as shown in Figure 1. Tighten only the bottom nuts that hold the threaded studs to the saddle.



Place gasket over hole in pipe, place pre-assembled saddle from above over gasket. Be sure saddle engages hole properly and saddle contour matches pipe's outside diameter. Attach 2 each band clamps as shown in Figure 2 and tighten with 7/16 inch wrench. Recommended Torque is 75 IN-LB.

NOTE: Clamps can loosen when mounted to plastic pipe, due to thermal contraction.





Step 3 – Mounting the sleeve:

Remove the top two nuts and pull sleeve from saddle. Using a tape measure, measure the distance from the lip of the inside of pipe to the top of the saddle.







Transpose this measurement onto the sleeve as shown in Figure 4 and mark with a permanent marker.



Figure 4

Place the marked sleeve back into saddle, engaging the threaded studs to the depth marked. Twist the bottom nuts upward to bottom of sleeve flange, replace the two nuts removed earlier and tighten all nuts with 7/16 wrench. See Figure 5.







<u>Step 4 – Mounting the sensor:</u>

Note the flow arrows on the side of the sensor; these must point downstream. Insert sensor into sleeve, press down until hole in sensor matches hole in sleeve. Insert retention pin. Final sensor depth should match that shown in Figure 6.





Installing the FLEXFlow T

NOTE: Provide a straight pipe run of at least 10Xs the pipe's diameter upstream of the meter, and at least 5Xs the pipe's diameter downstream of the meter. The arrow embossed on the insert body denotes the flow direction.



Install Meter Onto the Pipe

The Tee is bi-directional; the insert is not. The insert operates correctly as long as the insert arrow is pointed in the direction of flow. The insert can be rotated 180 degrees, so its arrow can always be pointed in the direction of flow regardless of Tee installation. If space allows, install Tee / insert at an angle rather than pointing up (see Figure 3).

<u>Step 1</u>

Remove all burrs from the pipe ends I.D. and O.D. edges and the Tee sockets I.D. edges.



Step 2

Clean and apply primer to the pipe ends and Tee sockets.

Step 3

Apply PVC cement to pipe ends and Tee sockets and quickly assemble the parts while the cement is fluid. Follow the cement manufacturer's instructions.

Step 4

Hold the cemented parts together for at least 30 seconds.



NOTE: There is no need to remove the insert to install the meter. The meter must be installed with the arrow on the insert pointing in the flow direction.

If the meter is accidentally installed backwards, simply remove the insert, rotate 180 degrees so the arrow points in the flow direction, and reinstall the insert.

NOTE: For 1 inch pipe installations, this angle is especially important and should be set at 45 degrees for most accurate meter operation

For additional support, please contact Tucor directly: 1-800-272-7472 <u>www.tucor.co</u>m