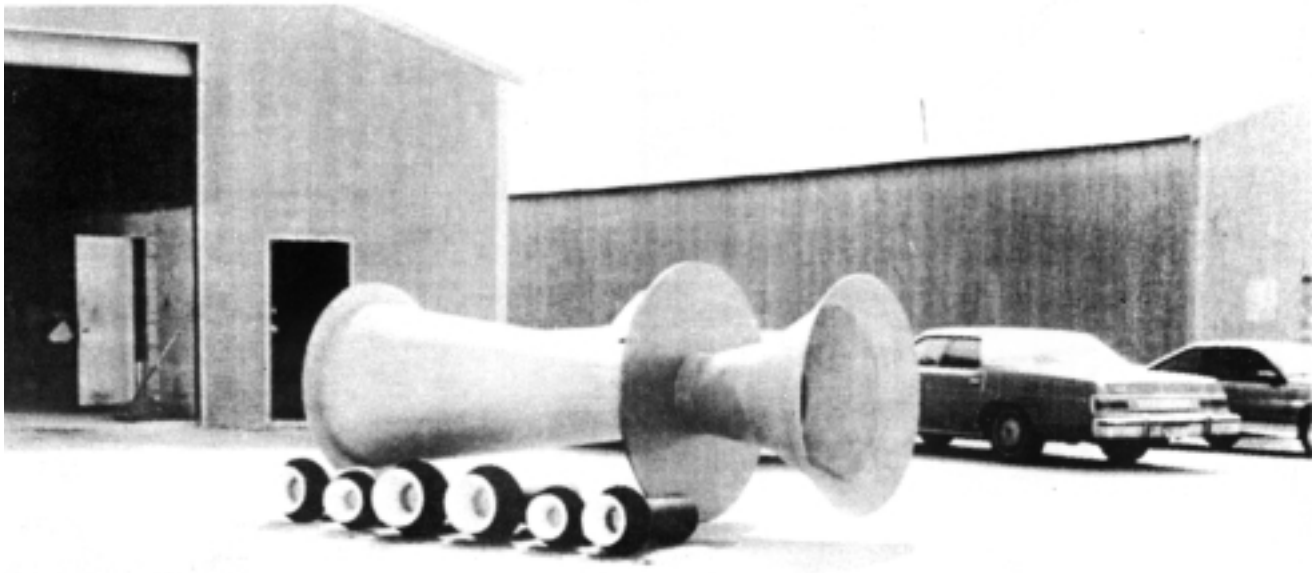
TRI-FLO INC.

P.O. BOX 121254
ARLINGTON, TX 76012 U.S.A.
WEBSITE: www.quikpage.com/T/triflo

TEL: (817) 483-0001
FAX: (817) 483-1959
E. MAIL: triflo@flash.net



2% HEAD LOSS AND LOW LOSS

FLOW TUBES

After studying the Flow Industry for a number of years, concentrating on waste water treatment design, we recognize that there are major issues concerning Flow Tubes. Efficiency, cost, energy consumption, performance, location and accuracy are some of these concerns.

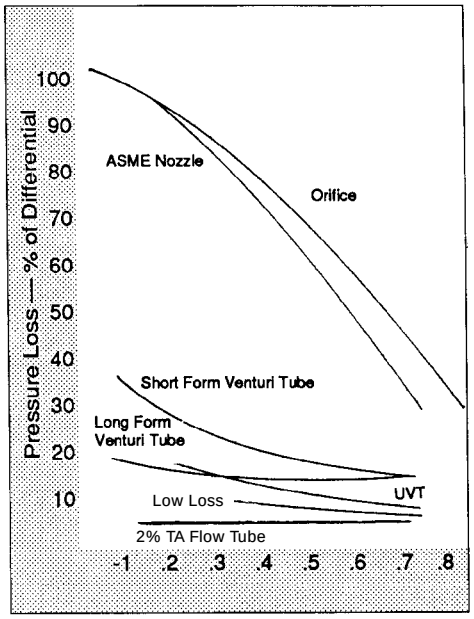
Our dedication to Quality and the Flow Industry have driven us to new patented designs. Our TA-2% Head Loss Tube showed a 98% recovery on Beta Ratio of 0.30. Yes, maximum performance with minimum operating costs are available in a single primary element.

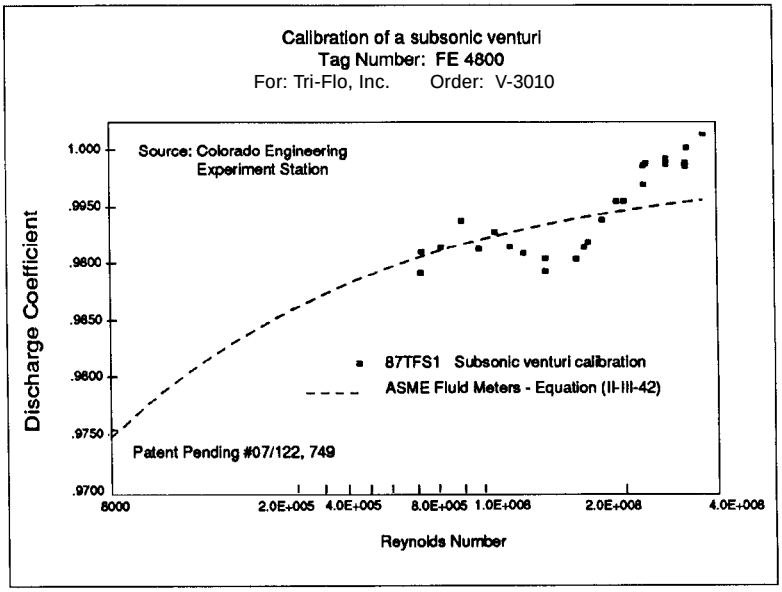
GENERAL DESIGN AND DESCRIPTION:

The Tri-Flo LOW LOSS and 2% HEAD LOSS FLOW TUBES are differential pressure primary Flow Elements designed for extremely low pressure loss, rangeability and accuracy.

CUSTOM CRAFTED FLOW ELEMENTS

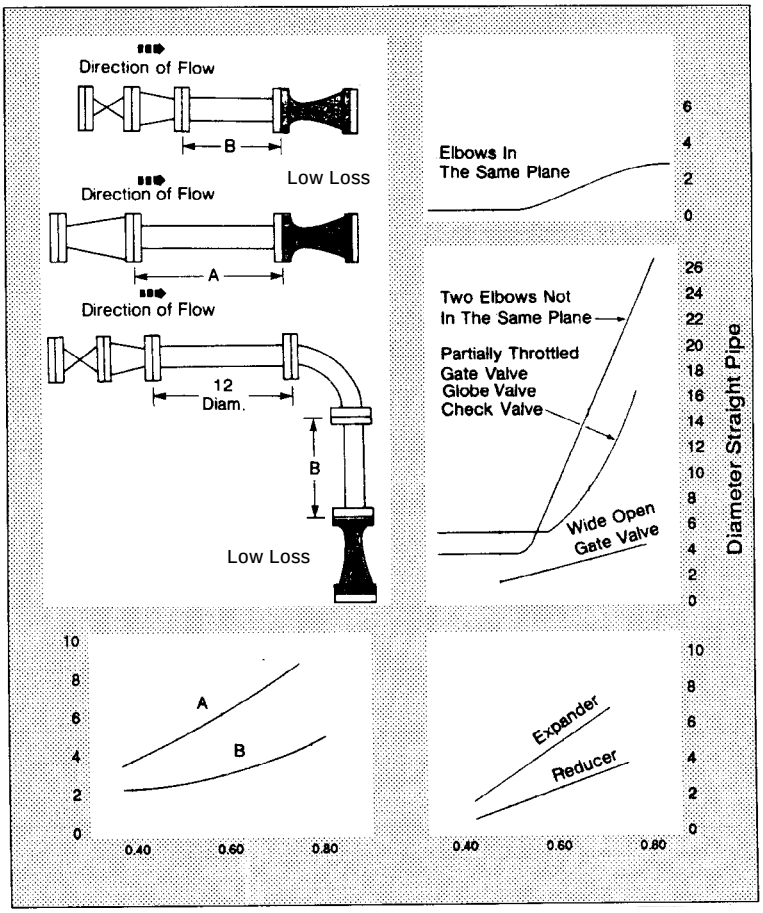
Energy consumption – the most important factor in energy usage performance of a Low Loss Flow Tube is the Downstream Cone. We do not supply unless requested a Truncated Cone. We have proven a full length cone with minimum included angle will keep the fluid closer to the wall, and create higher pressure recovery. our TA 2% Head Loss Tube is designed to save you those power consumption dollars.





Having many years of expertise in Flow has given us the confidence to offer the most reliable, accurate and repeatable Primary Flow Elements that are economically designed to offer customer satisfaction from technical and design points of view, let us offer you our fast and accurate service. Our engineering goal with the waste water industry was to create highly accurate and stable primary elements with excellent energy recovery and rangeability. The conclusion of our data, and research has resulted in our Low Loss and TA 2% Head Loss Tube (lowest head loss in the industry).

Tri-Flo, Inc. .



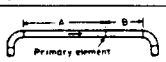
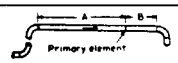
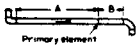
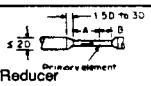
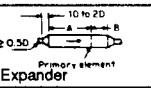
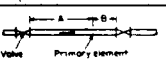
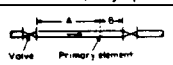
CUSTOM CRAFTED FLOW ELEMENTS T.F.I.

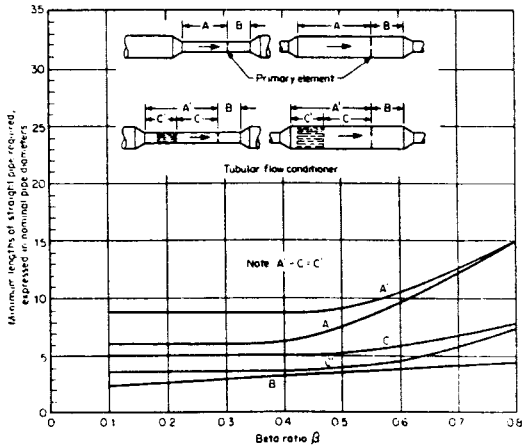
Location – Location – Location

The location of any primary element in a piping layout can be critical if a highly accurate and stable meter is desired. The Low Loss and TA 2% Head Loss Tube is located 1.5 x pipe diameter upstream of the standard Hershell Venturi recommended locations under identical conditions.

NOTES:
1. For upstream and downstream lengths equal to one-half the values shown, /add = -.5 percent to the accuracy valves.
2. Any flow conditioner shall be installed in the straight lengths between the primary element and the upstream disturbance, or the fitting closest to the element. The straight length between fitting and conditioner shall be at least 20D, and the length betwen conditioner and element shall be at least 22D.
3. Interpolate pipe diameters for intermediate beta ratios.

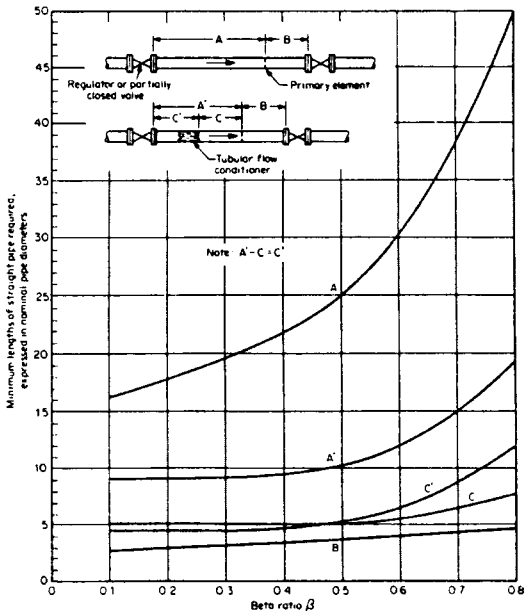
Design: Our Low Loss and TA 2% Head Loss Tube are not modifications of Venturi Tubes and they are not an ASME Nozzle with a diffusion cone (what other industries call Low Loss Tubes).
Tri-Flo Inc. TA 2% Tube is a patented design with the best pressure recovery (2.25% on Beta = 0279) available in primary flow measurement industry.

Upstream disturbance	Dimension	Device	β 0.2	0.3	0.4	0.5	0.6	0.7	0.75
	A	Orifices Nozzles	14	16	18	20	26	28	36
Single elbow		Venturis		0.5	0.5	1.5	3	4	4.5
	A	Orifices Nozzles	14	16	18	20	26	36	42
Two elbows in same plane		Venturis		1.5	1.5	2.5	3.5	4.5	4.5
	A	Orifices Nozzles	34	34	36	40	48	62	70
Two elbows in different planes		Venturis		0.5	0.5	8.5	17.5	27.5	29.5
	A	Orifices Nozzles	5	5	5	6	9	14	22
Reducer		Venturis		0.5	2.5	5.5	8.5	10.5	11.5
	A	Orifices Nozzles	16	16	16	18	22	30	38
Expander		Venturis		1.5	1.5	2.5	3.5	5.5	6.5
	A	Orifices Nozzles	18	18	20	22	26	32	36
Globe valve, fully open		Venturis							
	A	Orifices Nozzles	12	12	12	12	14	20	24
Gate valve, fully open		Venturis		1.5	2.5	3.5	4.5	5.5	5.5
Downstream length for all pictured disturbances	B	Orifices Nozzles	4	5	6	6	7	7	8
		Venturis		4d	4d	4d	4d	4d	4d



Installation lengths for primary element preceded by reducer or expander.

If there are any problems with upstream straight pipe, please consult our engineering staff. We an offer you our patented tubes with averaging rings to help the accuracy.



Installation lengths for primary element preceded by regulator or valve.

CUSTOM CRAFTED FLOW ELEMENTS T.F.I.

ACCURACY:

The patented Entrance Section to our Flow Tube is uniquely designed to establish a stable and linear velocity profile. Our Tube has been tested by independent Flow Laboratories on compressible and incompressible fluids.

EFFICIENCY:

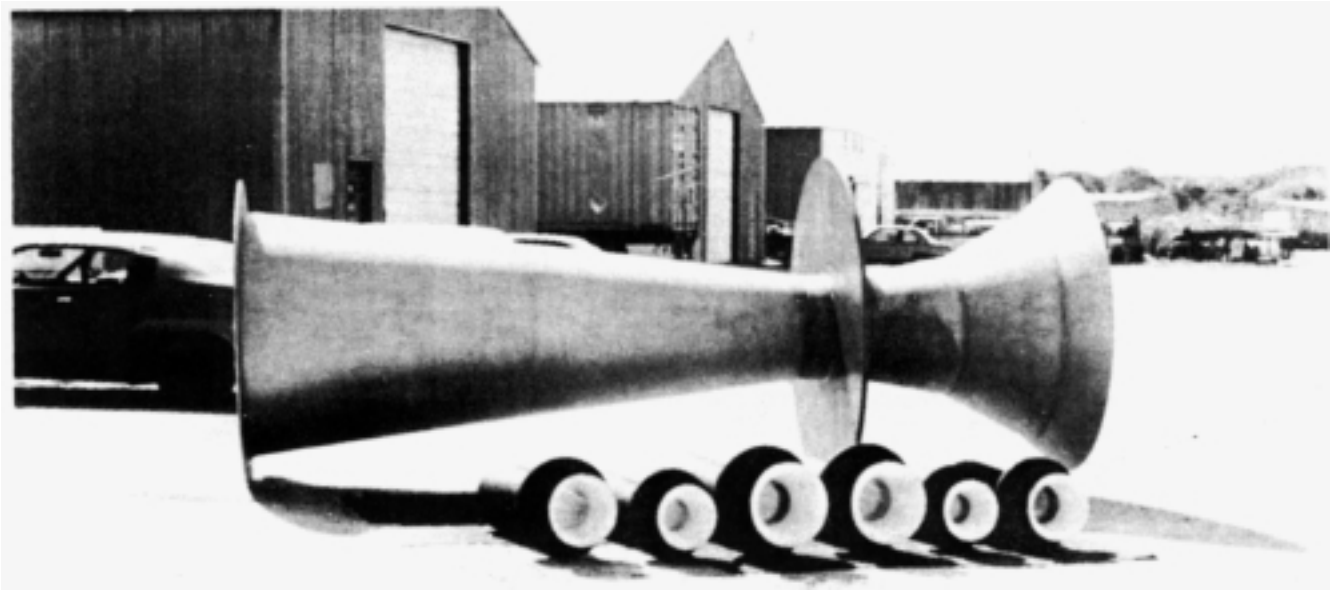
The power required to operate the system is directly related to the energy required to operate a primary element. Although the cost of a Flow Tube or TA-2% Head Loss Flow Tube may exceed an orifice plate or nozzle, the tubes can recoupe their initial cost by recovering more head pressure.

ECONOMY:

The new patent can offer 98% pressure recovery, 1 to 20 flow rangeability, keeping accuracies of ±0.50 uncalibrated and ±0.25 calibrated. It is very durable and light weight vs. cast iron. Because the upstream converging entrance is a very special contour shape, it can be manufactured economically (patent pending 07/122, 749).

DESIGN TIPS:

1. Economy — Long Term: Power cost of plant operation.
   Short Term: Purchasing cost of the tube.
2. Accuracy and repeatability.
3. Mnimize swirl, vortices or any helical disturbances in the flow.
4. The fluid must be single phase and no pulsations.
5. The throat must be installed concentric inside the pipe and the pressure taps must be perfect and free of burrs.



CUSTOM CRAFTED FLOW ELEMENTS

COLORADO ENGINEERING EXPERIMENT STATION INC.

Calibration of a subsonic TA 2% Head Loss
Tag
For:
Data
Inlet
Test
Cd:
Flow
Diff:
Rey
Pres
Temp
Dens
Ratio
% Loss: Percentage of heat pressure loss (% of PSIa-PSId/PSIa)

nd 14.696 psia

VOID

Average % Head Loss 2.25%

L	Diff	Density	Cd	Rey No.	Temp	Press	Flow	% Loss
1	77.450	0.11150	0.9912	9.591E+005	519.5	21.452	2.1145	-2.009
2	26.697	0.11270	0.9894	5.975E+005	516.1	21.531	1.3107	-.687
3	26.830	0.11240	0.9877	5.963E+005	517.1	21.520	1.3100	-.687
4	198.480	0.11270	0.9881	1.339E+006	515.2	21.502	2.9328	-2.566
5	232.830	0.13830	0.9892	1.635E+006	510.3	26.116	3.5546	-2.237
6	225.630	0.17450	0.9923	1.925E+006	508.7	32.847	4.1744	-2.031
7	233.940	0.21080	0.9939	2.217E+006	506.9	39.528	4.7949	-1.898
8	236.090	0.25380	0.9952	2.510E+006	505.5	47.451	5.4169	-1.748
9	244.080	0.31370	0.9968	2.902E+006	504.2	58.477	6.2504	-1.634
10	247.390	0.38490	0.9970	3.296E+006	503.1	71.566	7.0864	-1.663
11	249.720	0.46290	0.9993	3.690E+006	502.1	85.854	7.9218	-1.390
12	198.320	0.11250	0.9891	1.336E+006	516.8	21.524	2.9329	-5.571
13	240.790	0.14650	0.9901	1.718E+006	513.6	27.859	3.7548	-4.955
14	229.940	0.19840	0.9938	2.111E+006	509.7	37.422	4.5860	-3.226
15	248.530	0.24530	0.9967	2.500E+006	508.1	46.104	5.4174	-2.757
16	242.700	0.31510	0.9973	2.901E+006	504.9	58.815	6.2559	-2.069
17	246.530	0.38700	0.9967	3.299E+006	503.4	72.003	7.0970	-1.663
18	243.740	0.39060	0.9982	3.318E+006	500.6	72.251	7.1074	-1.634
19	240.220	0.25250	0.9969	2.538E+006	500.8	46.775	5.4386	-2.617
20	235.720	0.15010	0.9905	1.763E+006	501.7	27.871	3.7816	-4.794
21	36.296	0.11130	0.9898	6.811E+005	521.4	21.495	1.5058	-.940
22	47.409	0.11170	0.9920	7.745E+005	520.1	21.516	1.7091	-1.224
23	61.210	0.11210	0.9898	8.692E+005	518.7	21.525	1.9141	-1.558
24	96.799	0.11270	0.9900	1.060E+006	515.8	21.513	2.3250	-2.514
25	99.953	0.12720	0.9895	1.157E+006	514.2	24.206	2.5306	-2.250

Average values for above results:
Press: 38.749 psia Density: .20644 1bm/cu-ft
Temp: 510.33 Deg R Viscosity: .00000098945 1bm/inch-sec
Compressibility factor: .99873

Calibration performed by: Mike Lewis
This calibration is traceable to the National Bureau of Standards.
The flow measurement uncertainty is estimated to be: ±.5 percent of reading

CUSTOM CRAFTED FLOW ELEMENTS T.F.I.

TRI-FLO TECH, INC.

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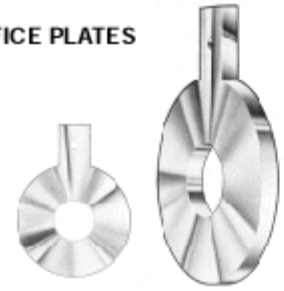
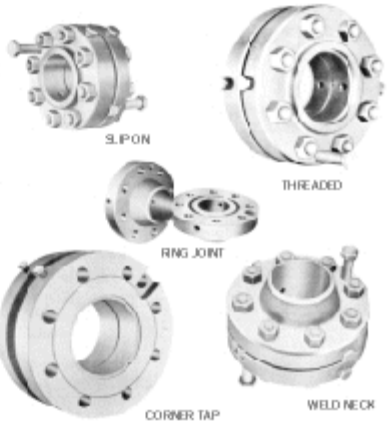
Los Angeles, CA 90023
Website: www.triflotech.com

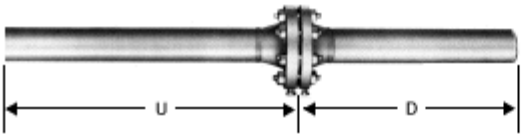
Tel: (323) 269-7700
Fax: (323) 269-7707
E-mail: sales@triflotech.com

ORIFICE PLATES





METER RUNS & FITTING FABRICATION AND SMALL HONED METER RUNS

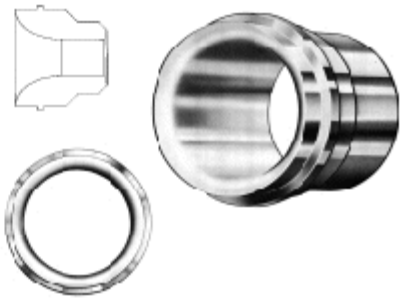


ORIFICE FLANGE UNIONS

DESIGNED AND MANUFACTURED TO AGA AND ASME AND ISA RECOMMENDATIONS

VENTURI TUBES

FLOW NOZZLES



CUSTOM CRAFTED FLOW ELEMENTS

FLOW TUBES

Tri-Flo Flow Tubes combine increased rangeability with lower permanent pressure loss. These tubes are offered in Flanged Type, Weld-In Type and Insert Type. Tril-Flo Flow Tubes are a versatile differential pressure device capable of extreme pressure and/or temperature limits, yet maintaining highly accurate readings with the lowest permanent pressure loss.

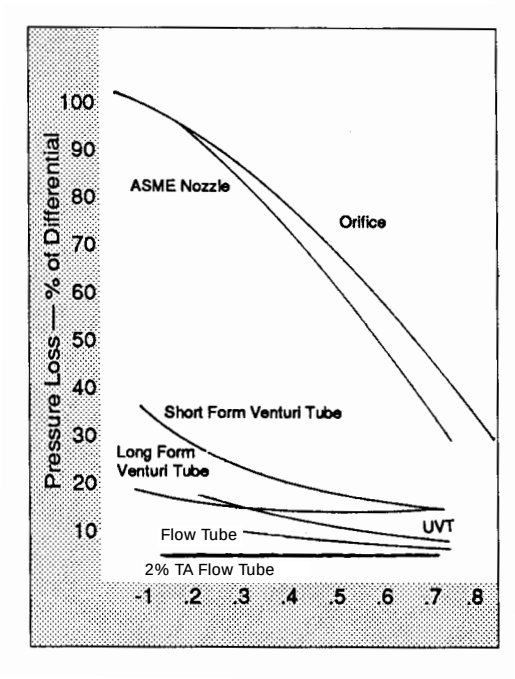
ACCURACY

The completeness of published research data permits Tri-Flo to provide the ASME type tube with an accuracy of ± 5% without the need of flow calibration. Flow calibration is available to provide nozzles with ± 0.25% accuracy when necessary.

OPTIMIZED DESIGN

Optimum design is provided on each Tri-Flo Flow Tube since it is manufactured for a specific beta ratio or throat diameter necessary to produce the desired differential pressure consistent with minimum pressure loss, piping requirements and accuracy of measurement.

PRESSURE LOSS CURVES



MATERIALS of CONSTRUCTION

Tri-Flo Flow Tubes are constructed from different materials dependent upon the process stream requirements. Examples of material of constructions are: Carbon Steel, Stainless Steel, Fiberglass Resin, Monel, Nickel, Inconel, Chrome Molly and other material to suit specific applications.

ORDERING INFORMATION

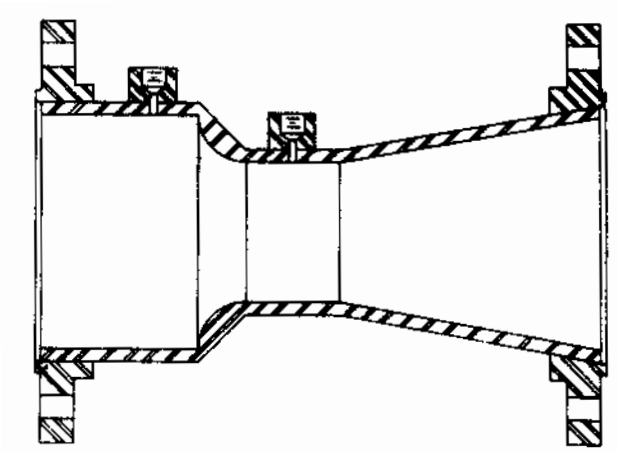
After selecting the configuration best suited to your application, please fill in the appropriate model number as well as the following information on the flowing conditions:

For all fluids specify:
Model number_____
Materials of construction:_____
Pipe I.D._____**or**
Line size_____**& Pipe Schedule**_____
Fluid_____
Units of flow_____
Max flow_____**Normal flow**_____
Specific gravity:
Operating_____**Base**_____
Temperature:
Operating_____**Base**_____
Pressure: Operating_____

If liquid specify:
Viscosity @ Operating temperature_____

If gas specify:
Molecular weight_____
Base pressure_____
Gas composition_____**or**
Specific heat ratio_____**and**
Compressibility ratio (Z_f)_____

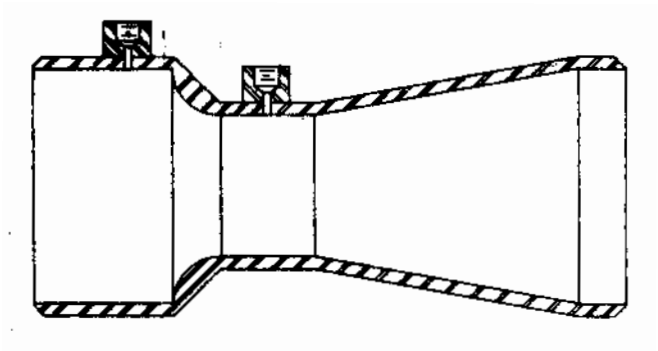
Model # FT-10



FLANGED TYPE FLOW TUBE

Tri-Flo Flanged Type Flow Tube is a full flanged type tube constructed of a flanged section, throat section with a flanged recovery cone. The entrance section is fabricated from specified material with a continuous radius into the throat section. The high pressure taps are located within this section. The flanges shall be designed as to allow mounting between standard flange ratings. They are designed per specification or beta ratios.

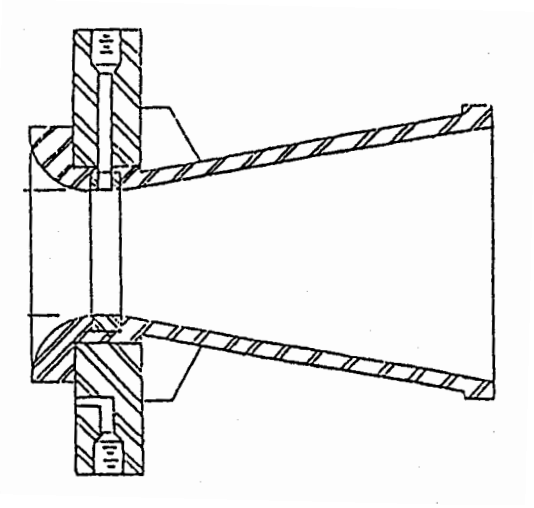
Model # FT-20



WELD-IN TYPE FLOW TUBE

Tri-Flo Weld-In Type Flow Tube is constructed of a shell body, throat section with a weld-in recovery cone. The entrance section is fabricated from specified material with a continuous radius into the throat section. The high pressure taps shall be located within this section. This flow tube is fabricated as beveled ends allowing it to be ready for welding into the pipe line.

Model # FT-130



INSERT TYPE FLOW TUBE

Tri-Flo Insert Type Flow Tube is constructed of an entrance section, throat and holding flange section with a recovery cone. The entrance section shall be fabricated from specified material with a continuous radius into the throat section. The high and low pressure metering taps shall be made a part of the holding flange and shall not require any drilling or tapping of the external pipeline. The Holding flange section shall be so designed as to allow mounting between standard flanges, the recovery cone section shall be fabricated from specified material designed to minimize permanent pressure loss. This flow tune shall have the capability of being designed to specification or any beta ratio.

CUSTOM CRAFTED FLOW ELEMENTS

TRI-FLO INC.

3410 E. 14th Street
Los Angeles, Ca 90023

Tel: (323) 269-7700
Fax:(323) 269-7707

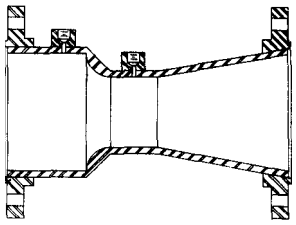
Website: www.triflotech.com

E-mail: sales@triflotech.com

ENGINEERING SPECIFICATIONS:
MODEL FT-10
MODEL FT-15
LOW HEAD LOSS FABRICATED FLANGED FLOW TUBE FT-10 & FT-15

A differential producing primary flow element(s) shall be installed in the flanged schedule type, _____ inch piping as shown on the plans and specifications and in accordance with the manufacturer's recommendations. The flow element shall be of the concentric type, short form, low head loss as manufactured by Tri-Flo Inc. Los Angeles, CA.

The flow element shall be constructed of an entrance section, throat and end flange section with a recovery cone. The entrance section shall be fabricated from (CS) - (304SS) (316SS) (Fiberglass) with a continuous nozzle radius into the throat section provided by Tri-Flo Inc. to maintain upstream shear forces within boundary layer for maximum efficiency. The high pressure tap shall be located within this section. **There shall not be any protrusion or exposed edges to allow solids to accumulate.**



The throat section shall be fabricated from (304SS) (316SS) and shall have (One set) (Two sets) low pressure tap. Throat section **shall not** be mechanically attached or inserted into the body of the flow tube. The high and low pressure metering taps shall be made a part of the holding flange and shall not require any drilling or tapping of the external pipeline.

The flanges shall be so designed as to allow mounting between standard lb. flanges and be of (CS) - (304SS) (316SS) material.

The recovery cone section shall be fabricated from (CS) - (304SS) (316SS) designed to minimize permanent pressure loss. The primary element shall have the capability to be designed with any beta ratio in the range of 0.35 to 0.85 and maintain a permanent pressure loss to 7% or less of the maximum differential pressure. The flow element shall be designed to monitor _____ with _____ lbs. of pressure over a flow range of _____to _____ . The accuracy of the uncalibrated primary element shall be within 0.5% of actual flow or 0.25% for a calibrated device over the flow range specified.

MODEL SFT-10

MODEL FT-10 and FT-15 can be provided in **ALL STAINLESS STEEL (304) (316)** Wetted Parts.
The flanges shall be so designed as to allow mounting between standard _____ lb. flanges and be of (CS) - (304SS) (316SS) material.
In case of Carbon steel end flanges, there shall be no contact between the end flanges and the media (ALL Stainless Steel Wetted Parts).

Flanges to be (Primed) (Epoxy coated per AWWA C207).

CUSTOM CRAFTED FLOW ELEMENTS

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Los Angeles, CA 90023 U.S.A. **FAX: (323) 269-7707**

WEBSITE: www.triflotech.com **E-mail: sales@triflotech.com**

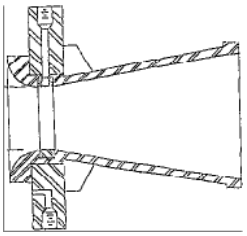
ENGINEERING SPECIFICATIONS:

MODEL FTI-30

LOW HEAD LOSS FABRICATED INSERT TYPE FLOW TUBE FTI-30

A differential producing primary flow element(s) shall be installed in the schedule , type, inch piping as shown on the plans and specifications and in accordance with the manufacturer's recommendations. The flow element shall be of the concentric type, short form, low head loss as manufactured by Tri-Flo Inc. Los Angeles, Ca.

The flow element shall be constructed of an entrance section, throat and holding flange section with a recovery cone. The entrance section shall be fabricated from (CS) - (304SS) (316SS) (Fiberglass) with a continuous nozzle radius into the throat section provided by Tri-Flo Inc. to maintain upstream shear forces within boundary layer for maximum efficiency. The high pressure tap shall be located within this section. **There shall not be any protrusion or exposed edges to allow solids to accumulate.**



The throat section shall be fabricated from (304SS) (316SS) and shall have (One set) (Two sets) low pressure tap. Throat section **shall not** be mechanically attached or inserted into the body of the flow tube. The high and low pressure metering taps shall be made a part of the holding flange and shall not require any drilling or tapping of the external pipeline.

The holding flange section shall be so designed as to allow mounting between standard lb. flanges and be of (CS) - (304SS) (316SS) material.

The recovery cone section shall be fabricated from (CS) - (304SS) (316SS) designed to minimize permanent pressure loss. The primary element shall have the capability of being designed with any beta ratio in the range of 0.35 to 0.85 and maintain a permanent pressure loss to 7% or less of the maximum differential pressure. The flow element shall be designed to monitor with _____ lbs. of pressure over a flow range of _____ to_____ . The accuracy of the uncalibrated primary element shall be within 0.5% of actual flow or 0.25% for a calibrated device over the flow range specified.

CUSTOM CRAFTED FLOW ELEMENTS