

# PMT

# TECHbrief

Wyatt-Badger Lo-Loss® Flow Tubes  
Cast Iron Primary Elements



## FEATURES:

- Lowest Pressure Loss
- Short Laying Length
- Economical Design
- Best Documented Flow Tube on the Market

## Description

The cast iron Wyatt-Badger Lo-Loss® meter is a differential producing flow tube that maintains its accuracy over a wide range of flow rates. The hydraulic shape of the PMT Lo-Loss® meter incurs a lower permanent pressure loss than any other differential producing flow device. The PMT can be provided with either 125 or 250 PSIG flanges.

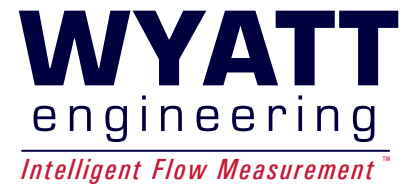
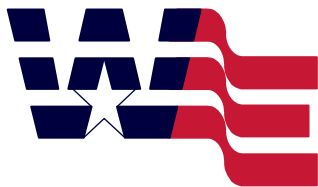
## Application

The cast iron PMT series of Lo-Loss® meters is designed to accurately and reliably measure the flow rates of water, wastewater, sludge, clean fluids, and gases in full pipe conditions. The PMT series of meters is ideally suited to applications where permanent pressure loss must be kept to a minimum, such as in gravity-fed systems, or where a savings due to lower pumping costs can be realized. The Model PMT-C is designed for rate-of-flow control applications, while the PMT-S incorporates a rugged design for cleaning the pressure taps for solids-bearing fluids.

## Flow Measurement Accuracy

For pipe Reynolds numbers greater than 100 000 and a normalized piping configuration, the Wyatt-Badger PMT Lo-Loss® meter provides a flow measurement accuracy of  $\pm 0.25\%$  with independent flow calibration and  $\pm 1.00\%$  without flow calibration.

Lo-Loss® is a registered trademark of Wyatt Engineering.



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# Technical Specifications

## Accuracy

Within the specified pipe Reynolds number range and a normalized piping configuration, the Lo-Loss® flow meter provides flow measurement uncertainties of:

- ± 1.00% for standard meters and
- ± 0.25% for flow calibrated meters.

## Pressure Loss

The permanent pressure loss of the Lo-Loss®, expressed as a percentage of the differential pressure, is the lowest of any differential producing primary element.

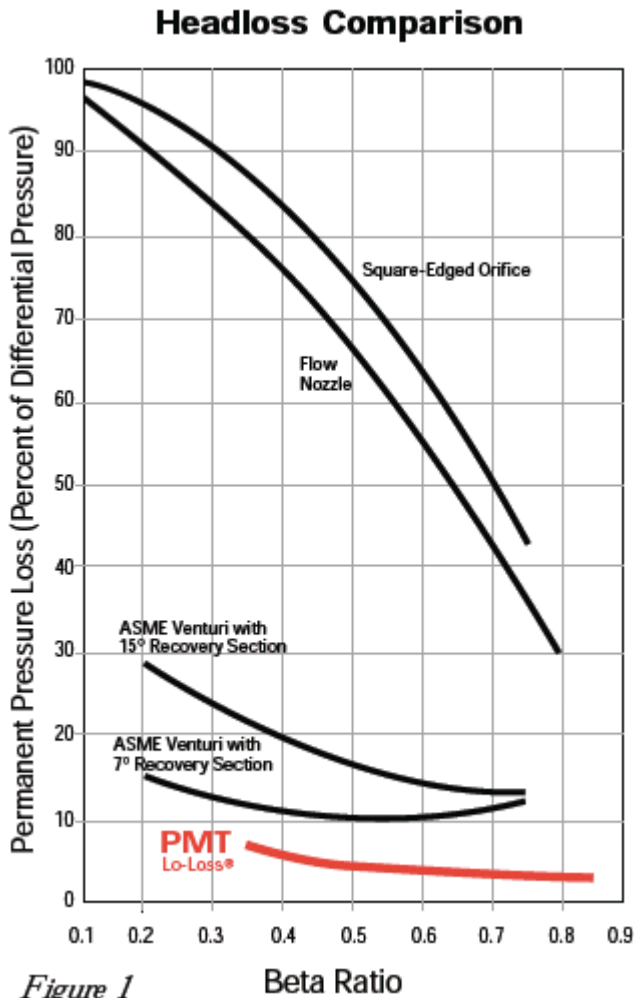


Figure 1

## Beta Ratio

Wyatt Engineering can furnish the Lo-Loss® meter with a wide range of diameter ratios (d/D). By custom designing a Lo-Loss® meter for your application's flow conditions, Wyatt-Badger can provide an accurate and reliable primary element with the low permanent pressure loss.

## Temperature Range

The fabricated series of Lo-Loss® meters can operate over the fluid temperature range of -20 °F to +450 °F (-30 °C to +175 °C).

## Pressure Range/End Connections

Flanged end connections, per ANSI B16.1 for 125 PSIG and 250 PSIG service, are available. Various other end connections are also available, including: Mechanical joint flanges, per AWWA C110 and C111, and plain-end designs.

## Piping Requirements

Designed for full-pipe flow, Lo-Loss® flow meters can be mounted horizontally, vertically, or on an angle. Refer to Wyatt Engineering Technical Manual for the Lo-Loss® Meter for recommended upstream piping.

## Energy Considerations

Figure 1 compares the permanent pressure loss of the insert Lo-Loss® design with that of other primary flow elements. Figure 2 illustrates the reduced pumping costs that are realized when using a Lo-Loss® Meter in a typical example. The pressure recovery of the Wyatt-Badger Lo-Loss® Meter means reduced pumping costs. High beta ratio Lo-Loss® Meters will recover up to 97.5% of the differential pressure produced. This is two to four times better than typical classical venturi devices, as well as most modified venturi meters.

Using venturi tubes instead of orifice plates can yield significant savings and using the Lo-Loss® meter instead of venturi tubes can realize further savings. For over 50 years, engineers have given their clients the benefits of efficiency and accuracy by doing just that.

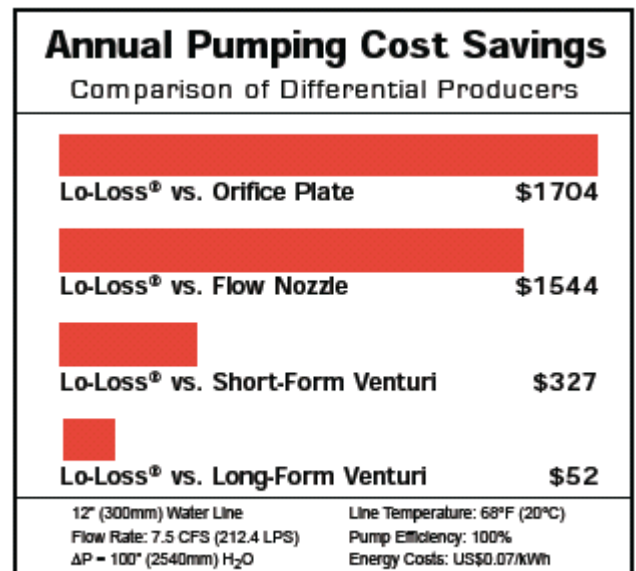


Figure 2

# PMT Sizing Table



Inlet Diameter		Throat Diameter		Beta Ratio	Overall Length		Outlet Diameter		ΔP = Differential Pressure of 100" wc (24.864 kPa)						
(inches)	(mm)	(inches)	(mm)		(inches)	(mm)	(inches)	(mm)	Water Flow at 60 °F (16 °C)				ΔH = Headloss		
									US GPM	US MGD	LPS	m³/d	Re(10 <sup>-3</sup> )	in. wc	kPa
3.00	76	1.609	40.9	0.5363	7.35	187	2.50	64	128.02	0.184	8.08	697.858	121	4.1	1.02
3.00	76	1.798	45.7	0.5993	6.65	169	2.55	65	160.16	0.231	10.10	873.009	151	3.7	0.92
3.00	76	2.171	55.1	0.7237	5.25	133	2.70	69	239.64	0.345	15.12	1306.29	226	2.9	0.73
4.00	102	1.750	44.5	0.4375	11.35	288	3.30	84	152.57	0.220	9.63	831.679	108	5.0	1.25
4.00	102	2.203	56.0	0.5508	9.15	232	3.35	85	239.98	0.346	15.14	1308.12	170	4.0	0.99
4.00	102	2.814	71.5	0.7035	6.80	173	3.60	91	399.78	0.576	25.22	2179.22	282	3.1	0.76
6.00	152	2.529	64.2	0.4215	16.25	413	4.85	123	319.37	0.460	20.15	1740.86	150	5.3	1.31
6.00	152	3.114	79.1	0.5190	14.00	356	5.00	127	479.75	0.691	30.27	2615.10	226	4.2	1.05
6.00	152	4.000	101.6	0.6667	9.75	248	5.20	132	800.08	1.152	50.48	4361.26	377	3.3	0.82
6.00	152	4.428	112.5	0.7380	9.25	235	5.60	142	1002.9	1.444	63.27	5466.74	472	2.8	0.71
8.00	203	3.466	88.0	0.4333	21.00	533	4.85	123	598.84	0.862	37.78	3264.27	211	5.1	1.27
8.00	203	4.018	102.1	0.5023	19.00	483	5.00	127	799.35	1.151	50.43	4357.27	282	4.3	1.08
8.00	203	4.919	124.9	0.6149	15.50	394	5.20	132	1200.4	1.729	75.73	6543.25	424	3.6	0.90
8.00	203	5.978	151.8	0.7473	11.60	295	5.60	142	1835.8	2.644	115.8	10007.1	648	2.8	0.69
10.00	254	3.991	101.4	0.3991	27.50	699	8.00	203	798.27	1.150	50.36	4351.38	226	5.7	1.41
10.00	254	4.919	124.9	0.4919	24.00	610	8.35	212	1198.8	1.726	75.63	6534.83	339	4.4	1.10
10.00	254	6.343	161.1	0.6343	17.00	432	8.65	220	2000.6	2.881	126.2	10905.5	565	3.5	0.87
10.00	254	6.907	175.4	0.6907	13.75	349	18.65	474	2399.5	3.455	151.4	13079.6	678	3.2	0.79
12.00	305	4.892	124.3	0.4077	32.00	813	9.70	246	1197.6	1.725	75.56	6528.24	282	5.5	1.37
12.00	305	6.966	176.9	0.5805	24.50	622	10.50	267	2401.2	3.458	151.5	13089.0	565	3.8	0.95
12.00	305	8.000	203.2	0.6667	18.75	476	10.80	274	3200.3	4.608	201.9	17445.0	753	3.3	0.82
14.00	356	5.600	142.2	0.4000	38.00	965	11.25	286	1571.4	2.263	99.14	8565.86	317	5.7	1.41
14.00	356	6.958	176.7	0.4970	31.50	800	11.55	293	2397.9	3.453	151.3	13070.8	484	4.4	1.09
14.00	356	8.044	204.3	0.5746	28.50	724	12.15	309	3201.1	4.610	202.0	17449.3	646	3.9	0.96
14.00	356	9.757	247.8	0.6969	24.00	610	13.80	351	4796.7	6.907	302.6	26146.7	968	3.1	0.78
14.00	356	10.33	262.3	0.7377	20.00	508	13.00	330	5455.2	7.856	344.2	29736.5	1101	2.8	0.71
16.00	406	6.932	176.1	0.4333	40.90	1039	13.10	333	2395.4	3.449	151.1	13057.1	423	5.1	1.27
16.00	406	8.036	204.1	0.5023	37.00	940	13.50	343	3197.4	4.604	201.7	17429.1	565	4.3	1.08
16.00	406	9.838	249.9	0.6149	25.90	658	13.35	339	4801.5	6.914	302.9	26173.0	848	3.6	0.90
16.00	406	11.26	285.9	0.7034	22.90	582	14.30	363	6395.3	9.209	403.5	34860.6	1129	3.1	0.77
18.00	457	8.011	203.5	0.4451	45.00	1143	14.80	376	3194.2	4.600	201.5	17411.3	501	4.9	1.23
18.00	457	8.984	228.2	0.4991	41.65	1058	15.15	385	3997.0	5.756	252.2	21787.9	627	4.4	1.08
18.00	457	9.849	250.2	0.5472	38.30	973	15.50	394	4796.5	6.907	302.6	26145.8	753	4.0	1.00
18.00	457	11.35	288.3	0.6306	27.40	696	15.35	390	6402.5	9.220	403.9	34900.1	1005	3.5	0.88
18.00	457	12.62	320.5	0.7010	28.35	720	16.50	419	8031.9	11.57	506.7	43782.1	1261	3.1	0.77
20.00	508	8.959	227.6	0.4480	49.95	1269	16.50	419	3993.4	5.751	251.9	21768.2	564	4.9	1.22
20.00	508	9.839	249.9	0.4920	46.70	1186	16.80	427	4796.3	6.907	302.6	26144.4	678	4.4	1.10
20.00	508	11.38	289.0	0.5689	40.90	1039	17.35	441	6402.1	9.219	403.9	34897.9	904	3.9	0.97
20.00	508	13.81	350.9	0.6907	31.70	805	18.20	462	9596.3	13.82	605.4	52309.2	1356	3.2	0.79
24.00	610	9.783	248.5	0.4076	62.90	1598	19.45	494	4789.6	6.897	302.2	26107.8	564	5.5	1.37
24.00	610	11.35	288.3	0.4729	57.65	1464	20.35	517	6391.3	9.203	403.2	34839.0	752	4.6	1.14
24.00	610	13.93	353.8	0.5805	45.50	1156	20.45	519	9603.5	13.83	605.9	52348.5	1131	3.8	0.95
24.00	610	16.000	406.4	0.6667	33.50	851	20.55	522	12801	18.43	807.6	69780.1	1507	3.3	0.82
24.00	610	17.68	449.0	0.7365	33.50	851	20.25	514	15973	23.00	1008	87066.1	1880	2.9	0.71
30.00	762	11.27	286.1	0.3755	82.30	2090	23.90	607	6388.6	9.200	403.1	34824.3	602	6.2	1.54
30.00	762	12.65	321.2	0.4215	77.30	1963	24.40	620	7984.2	11.50	503.7	43521.6	752	5.3	1.31
30.00	762	16.09	408.6	0.5362	64.60	1641	25.70	653	12796	18.43	807.3	69751.2	1205	4.1	1.02
30.00	762	17.98	456.6	0.5992	57.60	1463	26.35	669	16006	23.05	1010	87251.3	1507	3.7	0.92
30.00	762	21.711	551.5	0.7237	43.20	1097	27.75	705	23967	34.51	1512	130642	2257	2.9	0.73
36.00	914	16.02	407.0	0.4451	89.50	2273	29.65	753	12777	18.40	806.1	69645.2	1003	4.9	1.23
36.00	914	19.71	500.5	0.5474	75.90	1928	31.00	787	19200	27.65	1211	104657	1507	4.0	1.00
36.00	914	22.00	558.9	0.6112	67.20	1707	31.85	809	24011	34.58	1515	130884	1884	3.6	0.91
36.00	914	25.18	639.6	0.6995	55.10	1400	33.00	838	31979	46.05	2018	174315	2510	3.1	0.77
42.00	1067	22.023	559.4	0.5244	91.90	2334	35.85	911	23991	34.55	1514	130775	1614	4.2	1.04
42.00	1067	25.414	645.5	0.6051	79.40	2017	37.05	941	32012	46.10	2020	174497	2153	3.7	0.91
42.00	1067	30.664	778.9	0.7301	59.00	1499	38.95	989	47931	69.02	3024	261273	3224	2.9	0.72
48.00	1219	19.567	497.0	0.4076	125.50	3188	38.85	987	19160	27.59	1209	104442	1128	5.5	1.37
48.00	1219	25.437	646.1	0.5299	103.90	2639	41.05	1043	32001	46.08	2019	174437	1884	4.1	1.03
48.00	1219	31.045	788.5	0.6468	82.90	2106	43.05	1093	48016	69.14	3029	261734	2826	3.4	0.85
48.00	1219	35.353	898.0	0.7365	69.50	1765	45.00	1143	63886	92.00	4031	348241	3760	2.9	0.71

This sizing table can be used as a guide to aid the user in choosing the proper PMT for a given application. Depending on the details of that application, a more appropriate selection, or a more accurate estimation of the performance of a given selection, may be available. Wyatt Engineering encourages users to contact their local Wyatt-Badger representatives, or call us directly, for definitive sizing information.

**Incompressible Flow Relationships:**

$$\Delta P_N = 100 (Q_N / Q)^2$$

$$\Delta H_N = \Delta H (Q_N / Q)^{1.88}$$

$$Q_N = Q (DP / 100)^{0.5}$$

**Examples:** For a 30.00" x 21.711" PMT, find

$$\Delta P \text{ at } 50\,000 \text{ US GPM}$$

$$\Delta H \text{ at } 50\,000 \text{ US GPM}$$

$$Q_N \text{ at } 750" \text{ wc}$$

**Solutions:** Found using the "Incompressible Flow Relationships"

$$\Delta P_N = 100 (50\,000 / 23\,966.72)^2 = 435.23" \text{ wc}$$

$$\Delta H_N = 2.9 (50\,000 / 23\,966.72)^{1.88} = 11.6" \text{ wc}$$

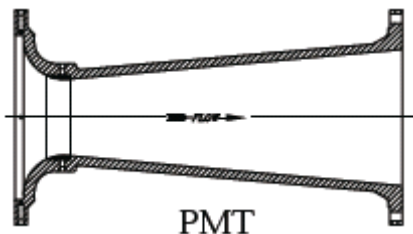
$$Q_N = 23\,966.72 (750 / 100)^{0.5} = 65\,635.57 \text{ US GPM}$$

# Available Options



The cast iron Lo-Loss® is designed to measure the flow of gases, water, wastewater, sludge, and slurry flows in full pipes. The iron Lo-Loss® design is furnished in four models, depending on the application.

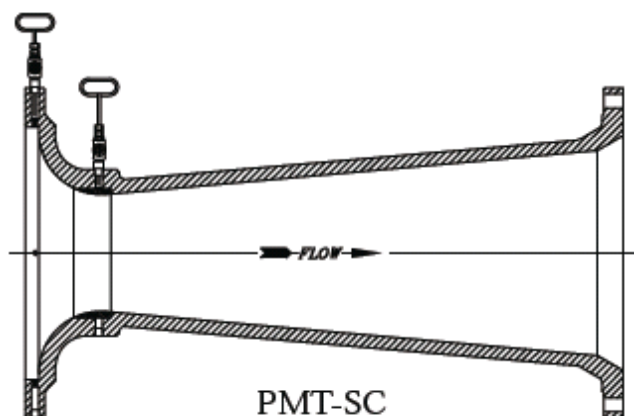
**Model PMT** is a flanged cast iron Lo-Loss® meter designed for liquid and gas flow measurement. Available throat materials are bronze and stainless steel. All valves, except butterfly valves, may be direct-coupled downstream for control purposes without loss of accuracy. The Lo-Loss® can be supplied with flanges, mechanical joints, or plain ends. Typical throat materials are bronze and stainless steel.



**Model PMT-C** is a flanged cast iron primary element designed to utilize a direct-coupled butterfly valve in a rate-of-flow controller for liquid or gas service. The direct-coupling of the butterfly valve will not affect the discharge coefficient of the primary element. The meter outlet can be modified to accommodate a valve one or more line sizes smaller than the main piping run.

**Model PMT-S** is a flanged primary element designed for wastewater, sludge, slurry, or other fluids with suspended solids. Manual vent cleaners are provided as standard; automatic vent cleaners or a sealed diaphragm system are available as options. An inspection port and water purge systems, either continuous or timed, are also available.

**Model PMT-SC** is a rate-of-flow controller designed for use in applications where the line fluid contains suspended solids. The primary element is provided with vent cleaners or a purge system and will accept a butterfly valve bolted directly to the downstream flange. This allows the PMT-SC to be used in many applications where other standard venturi or flow tubes cannot be used.



*Consult your local representative or Wyatt Engineering for information on other materials of construction.*

