

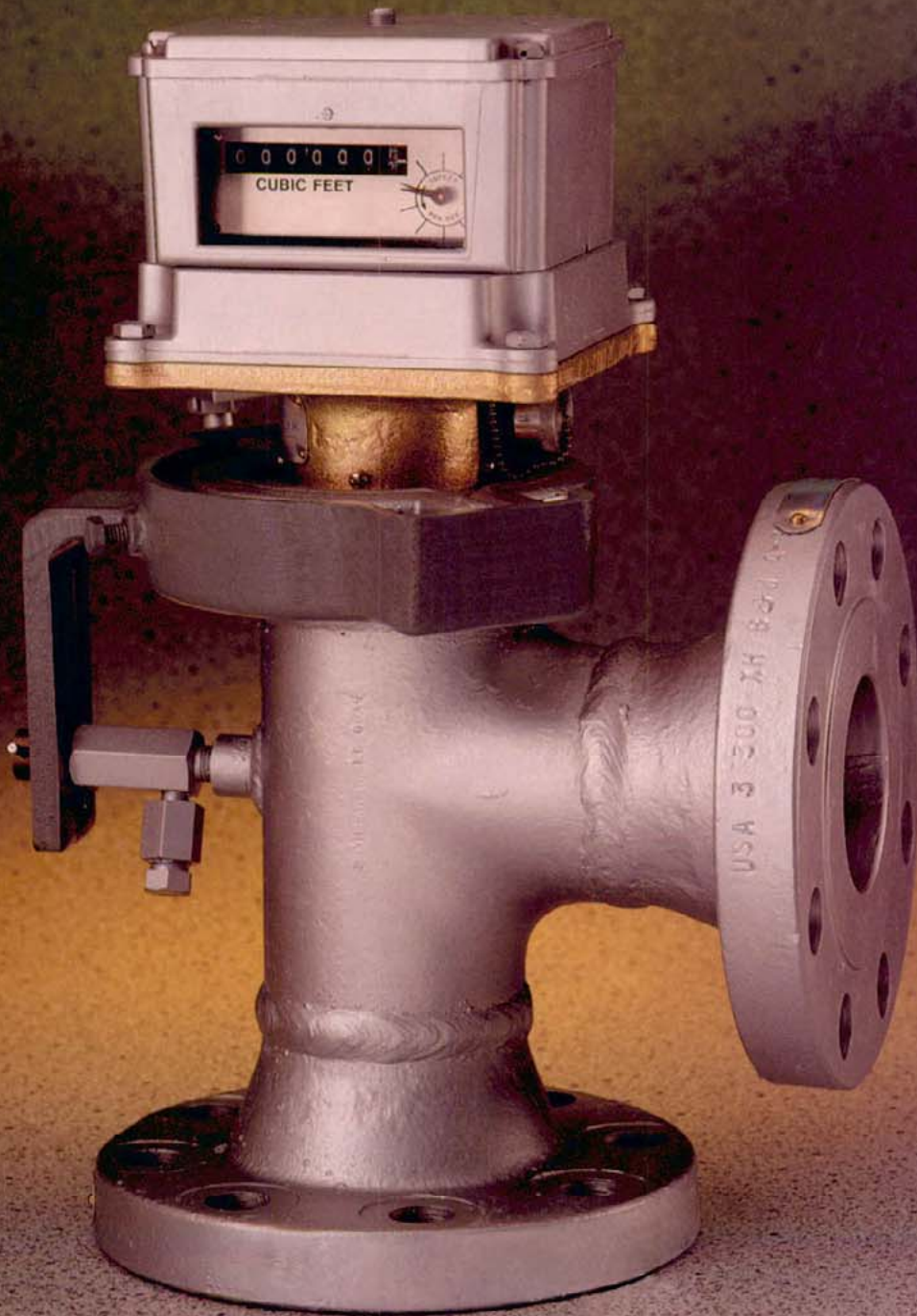
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# TPL-9 Turbo-Meters

## 2 Inch and 3 Inch Turbo-Meters

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M-1080  
Rev. 4

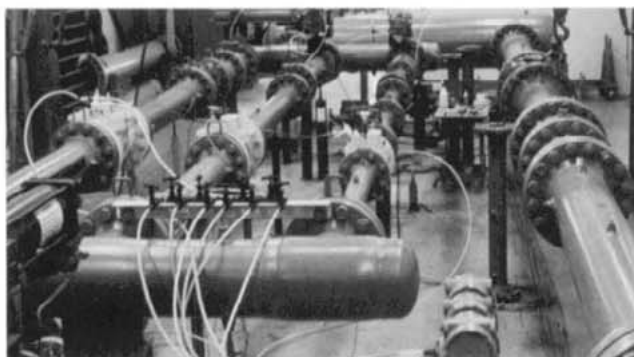


Continued research in gas turbine meter technology has resulted in the development of TPL-9 Turbo-Meters with either 2" or 3" flanged connections. These light-weight, compact and accurate gas turbine meters have been field proven on literally thousands of production, transmission, distribution and industrial applications.



#### 500' Bell Prover

Largest of its kind in the world. Flow rates to 120 MCFH air. Calibrated by National Bureau of Standards recommended procedures and referable to a standard cubic foot as defined by the Bureau.



#### High-Pressure Test Loop

This closed circuit test loop, powered by a 250 HP compressor, is the largest of its type in the world. Operating over a pressure range of 25 to 1000 psig, it can pass the equivalent of over 4½ million CFH of 0.6 Sp. Gr. gas. This unique facility is used to study the performance characteristics of Turbo-Meters under varying pressures and flow rates.

## DESIGN FEATURES

#### Capacity—

TPL-9 Turbo Meters have a nominal capacity rating at 4 ounces (2 kPa) inlet pressure of 9000 SCFH (216 MSCFD) or, in metric, 255 Nm<sup>3</sup>/h (6100 Nm<sup>3</sup>/day). At elevated inlet pressures, the meter maximum capacities increase directly with the Boyle's Law Pressure Multiplier Factor.

**Pressure Rating**—TPL-9 Turbo-Meter bodies and flanges are constructed of steel conforming to ANSI specifications for 150, 300 and 600 pressure ratings (275 lbs., 720 lbs., 1440 lbs.) (1800, 4800, 9600 kPa).

**Modular Design**—One common module, incorporating all moving parts, is used for either 2" or 3" TPL-9 Turbo-Meters regardless of the meter pressure rating. This modular design minimizes field down-time and simplifies parts inventory. Replacement calibrated modules are available as needed.

**Lubricating Bearings**—External fittings are supplied as a construction standard for lubrication of the stainless steel rotor shaft bearings under operating conditions.

**Rangeability**—The ratio of the maximum meter capacity to the minimum flow rate which can be measured within  $\pm 1\%$  accuracy at a constant inlet pressure is 10:1 at low pressure. The meter range increases significantly at elevated pressures as shown in the performance data.

**Uninterrupted Flow**—Meter failure cannot interrupt flow nor can meter operation cause a pressure pulsation in the line.

**Installation**—The 90° elbow configuration of the meter body permits compact installations with the meter inlet in either the horizontal or vertical plane.

**Readout**—The meter index plate is drilled to accept direct mounting of any standard mechanical readout device including indexes, chart recording or integrating gauges.

**Pulse Outputs**—As a construction standard, TPL-9 Turbo-Meters incorporate a switch closure to provide a pulse output per 10 or 100 cubic feet of gas at line conditions. For metric meters, the pulse output values are 0.1m<sup>3</sup> or 1.0m<sup>3</sup>. TPL-9 Turbo-Meters with a slot sensor pulser are available for higher frequency pulse outputs. (See MM-1080)

**Industry Standard**—TPL-9 Turbo-Meters conform to the Recommendations Covering Use of Axial-Flow-Type Turbine Meters in Measurement of Fuel Gas published as American Gas Association Report No. 7.

## TPL-9 2" and 3" TURBO-METERS TYPICAL PERFORMANCE DATA

U.S. Units = Cubic Feet

Compressibility Ratio $s = (Fpv)^2$	Meter Pressure PSIG	Maximum Flow Rate SCFH	Maximum Flow Rate MSCFD	Minimum Flow Rate SCFH	Minimum Flow Rate MSCFD	Minimum Dial Rate ACFH	Maximum/ Minimum Range	Approximate Pressure Loss Inches W.C.
1.0000	0.25	9,000	220	900	22	900	10	1.8
1.0008	5	12,000	290	1,000	24	780	12	2.3
1.0016	10	15,000	360	1,200	29	700	13	2.9
1.0024	15	18,000	430	1,300	31	640	14	3.5
1.0032	20	21,000	500	1,400	34	590	15	4.1
1.0040	25	24,000	580	1,500	36	550	16	4.7
1.0080	50	40,000	960	1,900	46	430	21	7.7
1.0121	75	55,000	1,320	2,200	53	370	25	11
1.0162	100	71,000	1,700	2,500	60	320	28	14
1.0203	125	87,000	2,090	2,800	67	290	31	17
1.0330	200	135,000	3,240	3,500	84	240	39	26
1.0502	300	202,000	4,850	4,400	106	190	46	39
1.0680	400	270,000	6,480	5,100	122	170	53	53
1.0863	500	341,000	8,180	5,800	139	150	59	66
1.1050	600	415,000	9,960	6,400	154	140	65	81
1.1241	700	491,000	11,780	7,000	168	130	70	95
1.1435	800	569,000	13,660	7,700	185	120	74	111
1.1630	900	650,000	15,600	8,200	197	115	79	126
1.1826	1,000	733,000	17,590	8,800	211	110	83	143
1.2021	1,100	819,000	19,660	9,400	226	105	87	159
1.2212	1,200	906,000	21,740	10,000	240	100	91	176
1.2397	1,300	996,000	23,900	10,500	252	95	95	194
1.2641	1,440	1,123,000	26,950	11,300	271	90	99	218

Table is based on base conditions of  $P_b = 14.73$  PSIA and  $T_b = 60^\circ\text{F}$ , and average atmospheric pressure  $P_a = 14.48$  PSIA. Table incorporates effect of supercompressibility factor  $(Fpv)^2$  for 0.6 specific gravity natural gas at  $60^\circ\text{F}$  and 0%  $\text{CO}_2$  and  $\text{N}_2$  (per A.G.A. Report No. 8).

Note: Maximum flow rate (dial rate) at flowing conditions is equal to 9,000 ACFH, irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

## TPL-9 50mm and 80mm TURBO-METERS TYPICAL PERFORMANCE DATA

S.I. Units = Cubic Meters

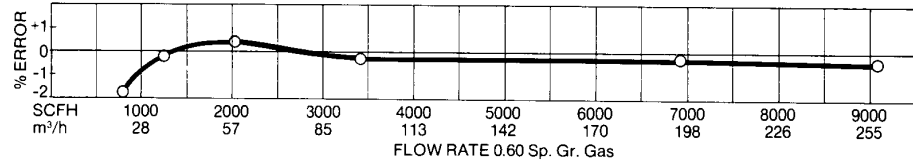
Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa (gage)	Maximum Flow Rate Nm <sup>3</sup> /h	Maximum Flow Rate Nm <sup>3</sup> /day	Minimum Flow Rate Nm <sup>3</sup> /h	Minimum Flow Rate Nm <sup>3</sup> /day	Minimum Dial Rate m <sup>3</sup> /h	Maximum/Minimum Range	Approximate Pressure Loss kPa
1.0000	2	255	6,117	26	612	26	10	0.4
1.0008	34	340	8,200	29	710	22	12	0.6
1.0016	69	430	10,300	33	790	20	13	0.7
1.0024	103	510	12,200	36	870	18	14	0.9
1.0032	138	600	14,400	39	940	17	15	1.0
1.0040	172	690	16,600	42	1,010	16	16	1.2
1.0080	345	1,130	27,100	54	1,290	12	21	1.9
1.0121	517	1,570	37,700	64	1,530	10	25	2.7
1.0162	689	2,020	48,500	72	1,740	9.1	28	3.4
1.0203	862	2,470	59,300	80	1,920	8.3	31	4.2
1.0330	1,379	3,840	92,200	101	2,420	6.7	38	6.6
1.0502	2,068	5,730	137,500	124	2,970	5.5	46	9.8
1.0680	2,758	7,680	184,300	145	3,470	4.8	53	13
1.0863	3,447	9,690	232,600	164	3,930	4.3	59	17
1.1050	4,137	11,780	282,700	182	4,370	3.9	65	20
1.1241	4,826	13,930	334,300	200	4,800	3.7	70	24
1.1435	5,516	16,150	387,600	217	5,210	3.4	74	28
1.1630	6,205	18,440	442,600	234	5,610	3.2	79	32
1.1826	6,895	20,810	499,400	251	6,010	3.1	83	36
1.2021	7,584	23,230	557,500	267	6,410	2.9	87	40
1.2212	8,274	25,720	617,300	283	6,790	2.8	91	44
1.2397	8,963	28,260	678,200	299	7,180	2.7	95	48
1.2641	9,928	31,880	765,100	321	7,700	2.6	99	54

Table is based on base conditions of  $P_b = 101.325$  kPa and  $T_b = 15^\circ\text{C}$ , and average atmospheric pressure  $P_a = 99.8$  kPa. Table incorporates effect of supercompressibility factor  $(Fpv)^2$  for 0.6 specific gravity natural gas at  $15.6^\circ\text{C}$  and 0%  $\text{CO}_2$  and  $\text{N}_2$  (per A.G.A. Report No. 8).

Note: Maximum flow rate (dial rate) at flowing conditions is equal to 255 m<sup>3</sup>/hr, irrespective of the operating pressure (within the maximum allowable operating pressure of the meter). Nm<sup>3</sup>/h — denote normal cubic meters per hour at base conditions.

## TYPICAL PERFORMANCE CURVES

2" or 3" TPL-9 Turbo-Meter



## DIMENSIONS

(inches)

	2" - TPL-9			3" - TPL-9		
	ANSI 150	ANSI 300	ANSI 600	ANSI 150	ANSI 300	ANSI 600
A	5 <sup>1</sup> / <sub>16</sub>	5 <sup>5</sup> / <sub>16</sub>	5 <sup>11</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>16</sub>	6 <sup>9</sup> / <sub>16</sub>	6 <sup>15</sup> / <sub>16</sub>
B	8 <sup>1</sup> / <sub>16</sub>	8 <sup>9</sup> / <sub>16</sub>	8 <sup>15</sup> / <sub>16</sub>	9 <sup>15</sup> / <sub>16</sub>	10 <sup>11</sup> / <sub>16</sub>	11 <sup>1</sup> / <sub>16</sub>
C	6	6 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub>	7 <sup>1</sup> / <sub>2</sub>	8 <sup>1</sup> / <sub>4</sub>	8 <sup>1</sup> / <sub>4</sub>
D	13 <sup>5</sup> / <sub>8</sub>	13 <sup>3</sup> / <sub>8</sub>	14 <sup>1</sup> / <sub>4</sub>	14 <sup>5</sup> / <sub>16</sub>	14 <sup>11</sup> / <sub>16</sub>	15 <sup>1</sup> / <sub>16</sub>
E	3 <sup>3</sup> / <sub>4</sub>	7 <sup>7</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>15</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
F	6 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>16</sub>
Weight (lbs.)	35	39	43	45	58	58

