



Mark-II and Mark-II-E Turbo-Meters

OIML SPECIFICATIONS

Mark-II and Mark-II-E Turbo-Meters are true axial flow turbine meters. The entire gas flow is directed through an annular area and then passes through the meter rotor. They provide accurate and reliable measurement data over a wide range of operating flows and conditions. Direct reading readouts are standard for measured line volume, and Mark-II and Mark-II-E Turbo-Meters are ideally suited for meter mounted volume correctors or easily adapted to many flow computers.

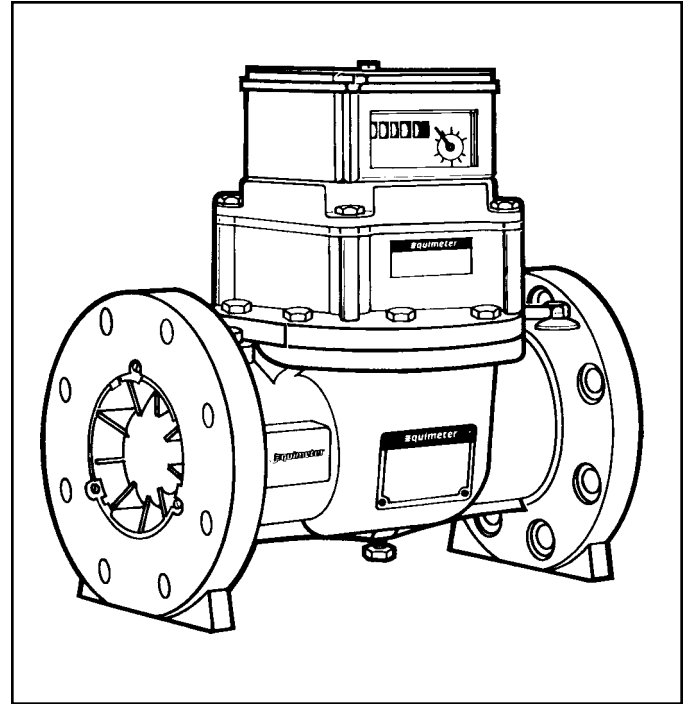
When accuracy is a primary consideration, the Mark-II Turbo-Meter can be used in a variety of applications. The wide rangeability of Turbo-Meters, low pressure loss, uninterrupted gas flow and near instantaneous response to rapid flow change makes these meters an ideal choice for many installations, such as:

- Commercial and industrial custody transfer measurement in distribution systems.
- Custody transfer measurement in transmission systems and at pipeline interconnections.
- Custody transfer measurement for town border stations.
- Measurement of fuel gas for electric generating stations, compressors, or gas engines.
- In-plant measurement for process control or cost allocation purposes.

Turbine Meter Standards

Equimeter Turbo-Meters conform to the construction, installation and usage recommendations defined in the following industry standards:

- OIML Recommendation R. 6, General Provisions for Gas Volume Meters, 1989, and Recommendation R. 32, Turbine Gas Meters, 1989.
- "Directive 71/318/EEC and Amendments."
- ISO 9951, Measurement of Gas Flow in Closed Conduits, 1993.
- ISO 7005-1, Steel Flanges, 1992.
- ISO 7005-2, Cast Iron Flanges, 1988.
- Measurement of Gas by Turbine Meters, American Gas Association, Transmission Measurement Committee Report No. 7, Catalog Number XQO585.
- Measurement of Gas Flow by Turbine Meters, American National Standard, ANSI/ASME MFC-4M, 1986.
- Gas Measurement Manual, Part No. Four, Gas Turbine Metering, American Gas Association, Catalog No. XQO684.
- Pipe Flanges and Flanged Fittings, American National Standard, ASME B16.5, 1996.
- Ductile Iron Pipe Flanges and Flanged Fittings, American National Standard, ASME/ANSI B16.42, 1987.



General Technical Data

OIML G RATING	SIZE	MODEL	CAPACITY (m ³ h)		REV. OUTPUT (m ³)	OIML RANGE
			Qmin	Qmax		
G65	50mm	T050U45	10	100	0.1	10:1
G160	80mm	T080U45	13	250	1	20:1
G250	100mm	T100U45	40	400	1	10:1
G400	100mm	T100U30	65	650	1	10:1
G650	150mm	T150U45	50	1000	1	20:1
G1000	150mm	T150U30	80	1600	1	20:1
G1000	200mm	T200U45	80	1600	10	20:1
G1600	200mm	T200U30	130	2500	10	20:1
G2500	300mm	T300U45	200	4000	10	20:1
G4000	300mm	T300U30	320	6500	10	20:1

MARK-IIIE 50mm T050U45 TYPICAL PERFORMANCE DATA (CUBIC METERS)

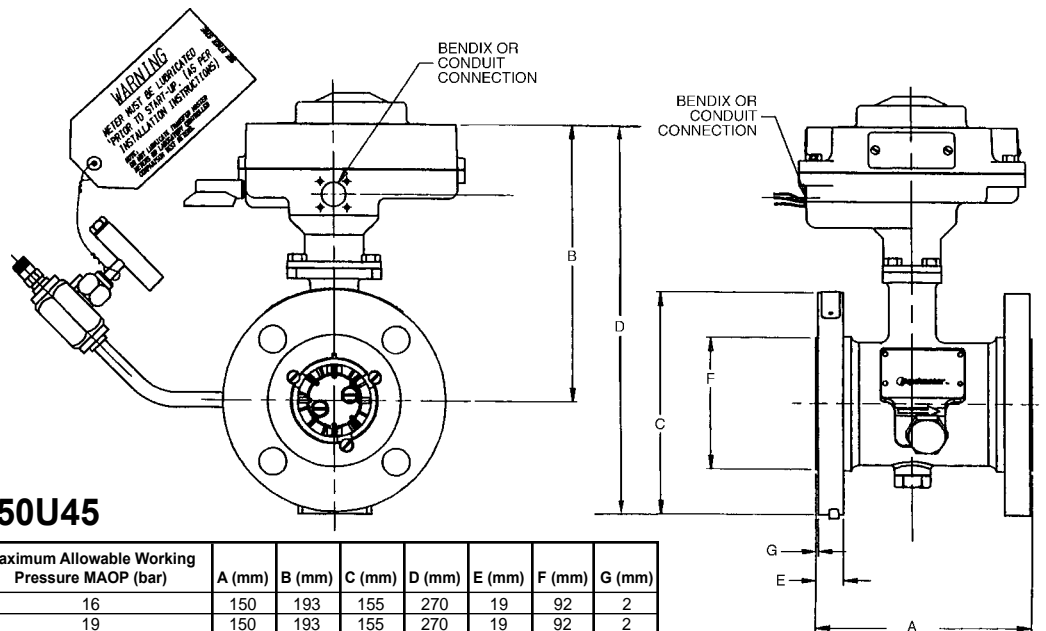
OIML G65 Rating $Q_{min} = 10\text{m}^3/\text{h}$ $Q_{max} = 130\text{m}^3/\text{h}$

Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Maximum/Minimum Flow Range	Estimated Pressure Loss kPa
1.0000	1.72	130	3,000	10	240	10	13	0.5
1.0008	34	170	4,000	11	270	8	15	0.7
1.0016	69	200	5,000	13	310	8	16	1.0
1.0024	103	250	6,000	14	340	7	18	1.0
1.0032	138	310	7,000	15	370	7	20	1.2
1.0040	172	340	8,000	16	390	6	21	1.5
1.0080	345	570	14,000	21	500	5	27	2.5
1.0121	517	790	19,000	25	590	4	32	3.0
1.0162	689	1,020	24,000	28	670	3	37	4.0
1.0203	862	1,220	29,000	31	740	3	39	5.0
1.0330	1,379	1,930	46,000	39	920	3	50	8
1.0502	2,068	2,860	69,000	47	1,130	2	61	12
1.0680	2,758	3,820	92,000	54	1,310	2	70	16
1.0863	3,447	4,840	116,000	61	1,470	2	79	21
1.1050	4,137	5,860	141,000	67	1,620	1	87	25
1.1241	4,826	6,940	167,000	73	1,750	1	95	30
1.1435	5,516	8,070	194,000	79	1,890	1	103	35
1.1630	6,205	9,210	221,000	84	2,020	1	109	40
1.1826	6,895	10,400	250,000	90	2,150	1	116	45
1.2021	7,584	11,590	278,000	95	2,270	1	122	50
1.2218	8,274	12,830	308,000	99	2,390	1	129	55
1.2397	8,963	14,110	339,000	104	2,500	1	135	61
1.2641	9,928	15,920	382,000	111	2,660	1	144	68

50mm (2") T050U45 meters of standard construction register 0.1 m^3 per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b=101.325\text{ kPa}$ and $T_b=15^\circ\text{C}$, and average atmospheric pressure $P_a=99.8\text{ kPa}$. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO_2 and N_2 (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to $130\text{ m}^3/\text{hr}$, irrespective of the operating pressure (within the maximum allowable operating pressure of the meter). Performance ratings in the above table are based on +/- 1% measurement accuracy for all pressures and flowrates shown.



Dimension T050U45

	Maximum Allowable Working Pressure MAOP (bar)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)
Ductile Iron/ISO PN20	16	150	193	155	270	19	92	2
Steel/ISO PN20	19	150	193	155	270	19	92	2
Steel/ISO PN50	50	150	193	168	276	22	92	2
Steel/ISO PN110	100	150	193	168	276	32	92	7

MARK-IIIE 80 mm T080U45 TYPICAL PERFORMANCE DATA (CUBIC METERS)

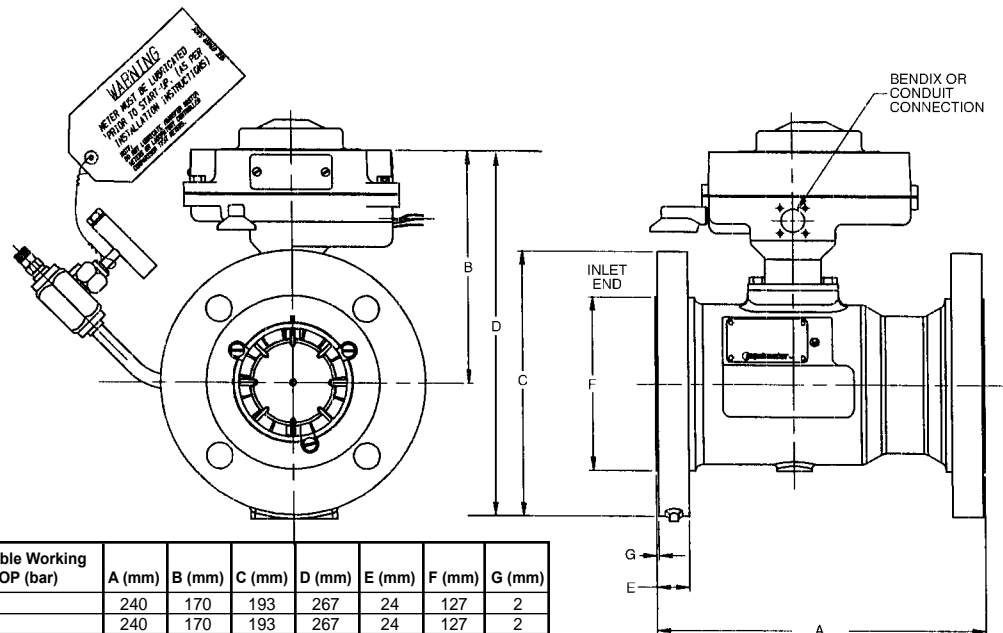
OIML G160 Rating $Q_{min} = 13m^3/h$ $Q_{max} = 250m^3/h$

Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Maximum/Minimum Flow Range	Estimated Pressure Loss kPa
1.0000	1.72	250	6,000	13	310	13	19	0.7
1.0008	34	340	8,000	15	360	11	23	1.0
1.0016	69	420	10,000	17	400	10	25	1.2
1.0024	103	510	12,000	18	440	9	28	1.5
1.0032	138	590	14,000	20	480	8	30	1.7
1.0040	172	680	16,000	21	510	8	32	2.0
1.0080	345	1,100	27,000	27	650	6	41	3.2
1.0121	517	1,530	37,000	32	780	5	47	5.0
1.0162	689	1,980	48,000	37	880	5	54	6.0
1.0203	862	2,410	58,000	41	970	4	59	7.0
1.0330	1,379	3,770	90,000	50	1,210	3	75	11
1.0502	2,068	5,610	135,000	61	1,480	3	91	17
1.0680	2,758	7,510	180,000	71	1,710	2	105	22
1.0863	3,447	9,490	228,000	80	1,920	2	118	28
1.1050	4,137	11,530	277,000	88	2,120	2	130	34
1.1241	4,826	13,630	327,000	96	2,300	2	142	41
1.1435	5,516	15,810	379,000	103	2,480	2	153	47
1.1630	6,205	18,040	433,000	110	2,650	1	163	54
1.1826	6,895	20,370	489,000	117	2,810	1	174	61
1.2021	7,584	22,750	546,000	124	2,980	1	183	68
1.2212	8,274	25,180	605,000	131	3,130	1	193	75
1.2397	8,963	27,680	664,000	137	3,280	1	202	83
1.2641	9,928	31,220	749,000	145	3,490	1	215	93

80mm (3") T080U45 meters of standard construction register 1 m³ per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b=101.325$ kPa and $T_b=15^\circ C$, and average atmospheric pressure $P_a=99.8$ kPa. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO₂ and N₂ (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to 250 m³/hr, irrespective of the operating pressure (within the maximum allowable operating pressure of the meter). Performance ratings in the above table are based on +/- 1% measurement accuracy for all pressures and flowrates shown.



Dimension T080U45

	Maximum Allowable Working Pressure MAOP (bar)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)
Ductile Iron/ISO PN20	16	240	170	193	267	24	127	2
Steel/ISO PN20	19	240	170	193	267	24	127	2
Steel/ISO PN50	50	240	170	212	276	29	127	2
Steel/ISO PN110	100	240	170	212	276	38	127	7

MARK-II 100mm T100U45 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G250 Rating $Q_{min} = 34\text{m}^3/\text{h}$ $Q_{max} = 510\text{m}^3/\text{h}$

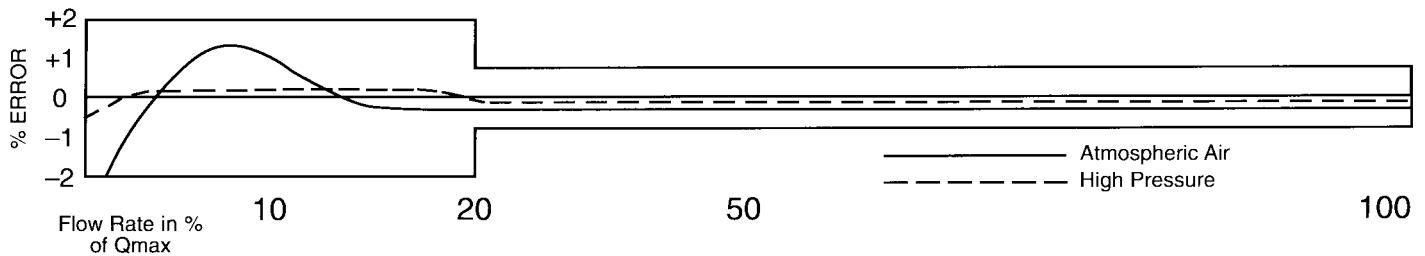
Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Maximum/Minimum Flow Range	Approximate Pressure Loss kPa
1.0000	1.72	510	12,000	34	820	34	15	0.4
1.0008	34	680	16,000	40	950	29	17	0.6
1.0016	69	850	20,000	42	1,020	26	19	0.7
1.0024	103	1,020	24,000	48	1,160	24	21	0.9
1.0032	138	1,190	29,000	51	1,220	22	23	1.1
1.0040	172	1,360	33,000	57	1,360	21	24	1.2
1.0080	345	2,240	54,000	71	1,700	16	32	2.0
1.0121	517	3,140	75,000	85	2,040	14	37	2.7
1.0162	689	4,020	97,000	96	2,310	12	42	3.5
1.0203	862	4,930	118,000	105	2,520	11	47	4.2
1.0330	1,379	7,680	184,000	133	3,200	9	58	6.7
1.0502	2,068	11,440	275,000	161	3,880	7	71	10
1.0680	2,758	15,330	368,000	187	4,490	6	82	13
1.0863	3,447	19,350	464,000	210	5,030	5	92	17
1.1050	4,137	23,510	564,000	229	5,510	5	102	21
1.1241	4,826	27,790	667,000	252	6,050	5	110	24
1.1435	5,616	32,240	774,000	269	6,460	4	120	28
1.1630	6,205	36,830	884,000	289	6,930	4	127	32
1.1826	6,895	41,530	997,000	306	7,340	4	136	37
1.2021	7,584	46,370	1,113,000	323	7,750	4	144	41
1.2212	8,274	51,330	1,232,000	340	8,160	3	151	45
1.2397	8,963	56,400	1,354,000	357	8,570	3	158	50
1.2641	9,928	63,650	1,528,000	380	9,110	3	168	56

100mm (4") T100U45 meters of standard construction register 1 m^3 per revolution of the mechanical output shaft.

Table is based on standard conditions of 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) for 0.6 specific gravity natural gas at 15.6°C and 0% CO_2 and N_2 (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to 510 m^3/hr ., irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Typical Accuracy Curve



MARK-II 100mm T100U30 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G400 Rating $Q_{min} = 51\text{m}^3/\text{h}$ $Q_{max} = 760\text{m}^3/\text{h}$

Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Max/Min Flow Range	Approx. Press Loss @760 Nm^3/hr kPa	(1) Approx. Press Loss @510 Nm^3/hr kPa
1.0000	1.72	760	18,000	51	1,220	51	15	0.76	0.36
1.0008	34	1,020	24,000	59	1,410	44	17	1.0	0.48
1.0016	69	1,270	31,000	66	1,580	40	19	1.3	0.60
1.0024	103	1,530	37,000	72	1,730	36	21	1.5	0.73
1.0032	138	1,780	43,000	78	1,880	33	23	1.8	0.85
1.0040	172	2,070	50,000	84	2,010	31	25	2.0	1.0
1.0080	345	3,370	81,000	107	2,570	24	31	3.3	1.6
1.0121	517	4,700	113,000	126	3,030	21	37	5.0	2.2
1.0162	689	6,030	145,000	143	3,440	18	42	6.0	2.9
1.0203	862	7,390	177,000	158	3,800	16	47	7.0	3.5
1.0330	1,379	11,500	276,000	198	4,750	13	58	11	5.5
1.0502	2,068	17,140	411,000	241	5,790	11	71	17	8.1
1.0680	2,758	22,970	551,000	280	6,710	9	82	23	11
1.0863	3,447	29,010	696,000	314	7,540	8	92	29	14
1.1050	4,137	35,270	846,000	346	8,310	8	102	35	17
1.1241	4,826	41,700	1,001,000	376	9,040	7	111	41	20
1.1435	5,516	48,360	1,161,000	405	9,730	7	119	48	23
1.1630	6,205	55,210	1,325,000	433	10,400	6	127	55	26
1.1826	6,895	62,290	1,495,000	460	11,040	6	135	62	30
1.2021	7,584	69,570	1,670,000	486	11,670	5	143	69	33
1.2212	8,274	77,020	1,849,000	512	12,280	5	151	76	37
1.2397	8,963	84,620	2,031,000	536	12,870	5	158	84	40
1.2641	9,928	95,470	2,291,000	570	13,670	5	168	94	45

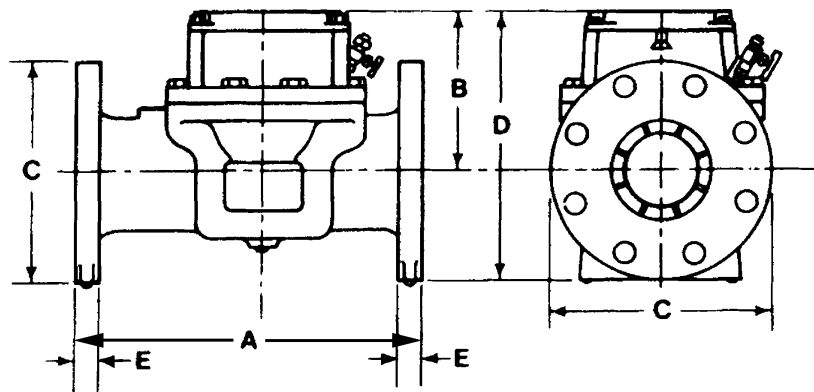
100mm (4") T100U30 meters of standard construction register 1 m³ per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b=101.325\text{ kPa}$ and $T_b=15^\circ\text{C}$, and average atmospheric pressure $P_a=99.8\text{ kPa}$. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO₂ and N₂ (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to 760 Nm^3/hr , irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Performance ratings in the above table are based on +/- 1% measurement accuracy for all pressures and flowrates shown.

(1) There is approximately 20% less pressure loss when compared to our T100U45 Turbo-Meter at 510 Nm^3/hr .



Dimension T100U45/30

	Maximum Allowable Working Pressure MAOP (bar)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
Ductile Iron/ISO PN20	16	300	271	232	387	27
Steel/ISO PN50	50	300	277	259	406	37
Steel/ISO PN110	100	300	277	277	415	51



MARK-II 150mm T150U45 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G650 Rating Qmin = 50m³/h Qmax = 1000m³/h

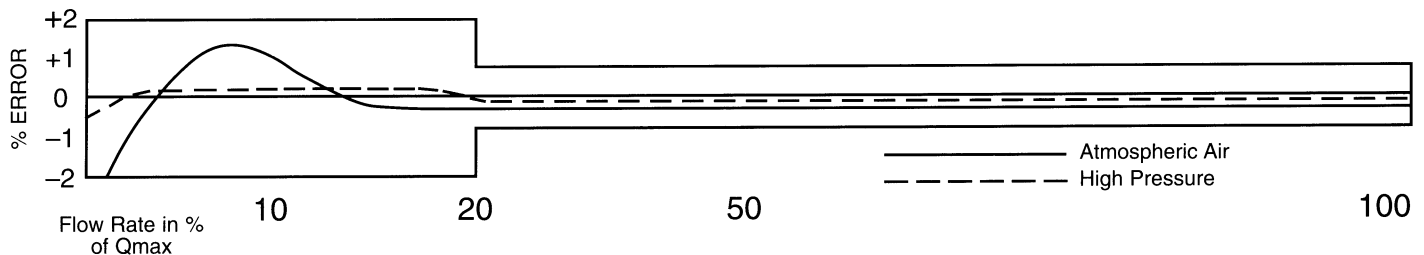
Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm ³ /hr	Maximum Flowrate Nm ³ /day	Minimum Flowrate Nm ³ /hr	Minimum Flowrate Nm ³ /day	Minimum Dial Rate m ³ /hr	Maximum/Minimum Flow Range	Approx. Press Loss @1000 Nm ³ /hr kPa
1.0000	1.72	1,000	24,000	50	1,190	50	20	0.6
1.0008	34	1,300	31,000	57	1,370	43	23	0.8
1.0016	69	1,640	39,000	64	1,540	39	26	1.0
1.0024	103	1,980	48,000	70	1,690	34	28	1.2
1.0032	138	2,320	56,000	76	1,820	32	31	1.5
1.0040	172	2,660	64,000	81	1,950	30	33	1.5
1.0080	345	4,360	105,000	104	2,500	24	42	2.7
1.0121	517	6,090	146,000	123	2,950	20	50	4.0
1.0162	689	7,820	188,000	139	3,390	18	56	5.0
1.0203	862	9,570	230,000	154	3,700	16	62	6.0
1.0330	1379	14,900	357,000	192	4,620	13	70	9.0
1.0502	2068	22,240	534,000	235	5,640	10	95	13.0
1.0680	2758	29,800	715,000	272	6,520	9	110	18.0
1.0863	3447	37,620	903,000	305	7,330	8	123	23.0
1.1050	4137	45,690	1,097,000	337	8,080	7	136	28.0
1.1241	4826	54,050	1,297,000	366	8,780	7	148	33.0
1.1435	5616	62,690	1,505,000	394	9,460	6	159	38.0
1.1630	6205	71,580	1,718,000	421	10,110	6	170	43.0
1.1826	6895	80,760	1,938,000	447	10,740	5	181	49.0
1.2021	7584	90,170	2,164,000	473	11,350	5	191	54.0
1.2212	8274	99,830	2,396,000	497	11,940	5	201	60.0
1.2397	8963	109,690	2,633,000	522	12,520	5	210	66.0
1.2641	9928	123,770	2,970,000	554	13,290	5	223	75.0

150mm (6") T150U45 meters of standard construction register 1 m³ per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of Pb = 101.325 kPa and Tb = 15°C, and average atmospheric pressure Pa = 99.8 kPa. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO₂ and N₂ (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to 1000 m³/hr., irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Typical Accuracy Curve



MARK-II 150mm T150U30 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G1000 Rating $Q_{min} = 80\text{m}^3/\text{h}$ $Q_{max} = 1600\text{m}^3/\text{h}$

Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Max/Min Flow Range	Approx. Press Loss @1600 Nm^3/hr kPa	(1) Approx. Press Loss @1000 Nm^3/hr kPa
1.0000	1.72	1,610	39,000	80	1,940	80	20	1.3	0.51
1.0008	34	2,120	51,000	93	2,230	70	23	1.7	0.68
1.0016	69	2,690	65,000	104	2,500	63	26	2.1	0.85
1.0024	103	3,230	78,000	114	2,750	57	28	2.5	1.0
1.0032	138	3,800	91,000	124	2,970	53	31	3.0	1.2
1.0040	172	4,330	104,000	133	3,180	49	33	3.5	1.4
1.0080	345	7,140	171,000	170	4,070	39	42	5.7	2.3
1.0121	517	9,910	238,000	200	4,810	33	50	8.0	3.2
1.0162	689	12,750	306,000	227	5,450	29	56	10	4.0
1.0203	862	15,610	374,000	251	6,020	26	62	12	5.0
1.0330	1,379	24,280	583,000	313	7,510	21	78	19	7.7
1.0502	2,068	36,200	869,000	382	9,180	17	95	28	11
1.0680	2,758	48,530	1,165,000	442	10,620	15	110	38	15
1.0863	3,447	61,270	1,471,000	497	11,940	13	123	48	19
1.1050	4,137	74,420	1,786,000	548	13,160	12	136	59	23
1.1241	4,826	88,040	2,113,000	596	14,300	11	148	69	28
1.1435	5,516	102,090	2,450,000	642	15,410	10	159	80	32
1.1630	6,205	116,600	2,798,000	686	16,470	10	170	92	37
1.1826	6,895	131,530	3,157,000	729	17,490	9	181	103	42
1.2021	7,584	146,850	3,525,000	770	18,480	8	191	115	46
1.2212	8,274	162,570	3,902,000	810	19,440	8	201	128	51
1.2397	8,963	178,640	4,287,000	849	20,380	8	210	140	56
1.2641	9,928	201,550	4,837,000	902	21,650	7	223	158	64

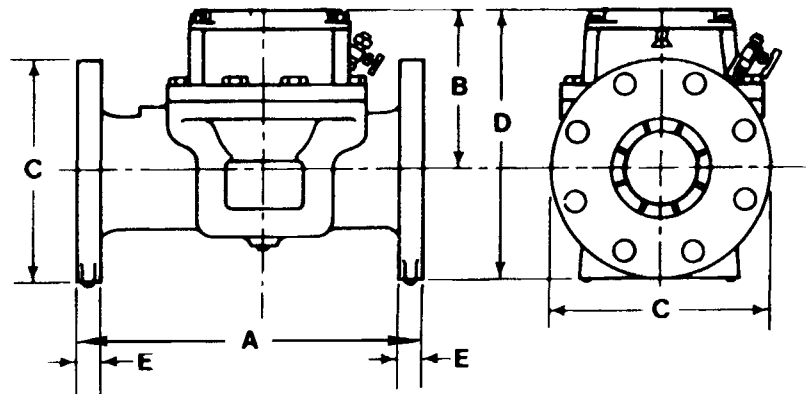
150mm (6") T150U30 meters of standard construction register 10 m³ per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b=101.325\text{ kPa}$ and $T_b=15^\circ\text{C}$, and average atmospheric pressure $P_a=99.8\text{ kPa}$. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO₂ and N₂ (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to 1,600 Nm³/hr, irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Performance ratings in the above table are based on +/- 1% measurement accuracy for all pressures and flowrates shown.

(1) There is approximately 15% less pressure loss when compared to our T150U45 Turbo-Meter at 1000 Nm³/hr.



Dimension T150U45/30

	Maximum Allowable Working Pressure MAOP (bar)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
Ductile Iron/ISO PN20	16	450	218	287	362	26
Steel/ISO PN50	50	450	225	325	369	37
Steel/ISO PN110	100	450	225	360	405	56



MARK-II 200mm T200U45 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G1000 Rating $Q_{min} = 80\text{m}^3/\text{h}$ $Q_{max} = 1700\text{m}^3/\text{h}$

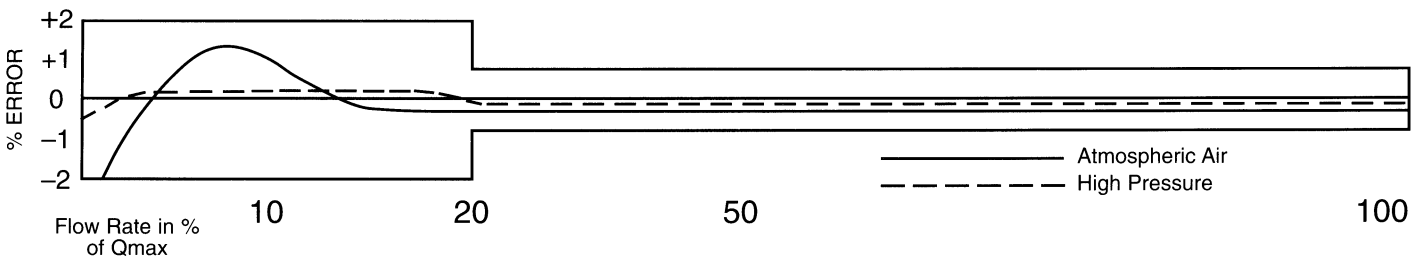
Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Maximum/Minimum Flow Range	Approximate Pressure Loss kPa
1.0000	1.72	1,700	41,000	80	2,040	80	20	0.5
1.0008	34	2,240	54,000	99	2,380	74	23	0.7
1.0016	69	2,830	68,000	110	2,650	68	26	0.8
1.0024	103	3,400	82,000	119	2,860	60	29	1.0
1.0032	138	3,990	96,000	130	3,130	56	31	1.2
1.0040	172	4,560	109,000	139	3,330	52	33	1.3
1.0080	345	7,510	180,000	178	4,280	40	42	2.2
1.0121	517	10,450	251,000	210	5,030	34	50	3.0
1.0162	689	13,430	322,000	238	5,710	30	56	4.0
1.0203	862	16,430	394,000	263	6,320	27	62	4.7
1.0330	1,379	25,550	613,000	329	7,890	22	78	7.5
1.0502	2,068	38,100	914,000	402	9,650	18	95	11.0
1.0680	2,758	51,080	1,226,000	465	11,150	16	110	15.0
1.0863	3,447	64,470	1,547,000	524	12,580	14	123	19.0
1.1050	4,137	78,360	1,880,000	578	13,870	12	136	23.0
1.1241	4,826	92,660	2,224,000	629	15,090	12	147	27.0
1.1435	5,616	107,480	2,580,000	677	16,250	11	159	31.0
1.1630	6,205	122,720	2,945,000	722	17,340	10	170	36.0
1.1826	6,895	138,440	3,323,000	768	18,420	9	180	41.0
1.2021	7,584	154,590	3,710,000	810	19,440	9	191	45.0
1.2212	8,274	171,130	4,107,000	853	20,460	8	201	50.0
1.2397	8,963	188,040	4,513,000	895	21,480	8	210	55.0
1.2641	9,928	212,150	5,092,000	949	21,780	8	224	62.0

200mm (8") T200U45 meters of standard construction register 10 m^3 per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b = 101.325\text{ kPa}$ and $T_b = 15^\circ\text{C}$, and average atmospheric pressure $P_a = 99.8\text{ kPa}$. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO_2 and N_2 (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to $1700\text{ m}^3/\text{hr}$, irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Typical Accuracy Curve



MARK-II 200mm T200U30 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G1600 Rating $Q_{min} = 127\text{m}^3/\text{h}$ $Q_{max} = 2550\text{m}^3/\text{h}$

Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Max/Min Flow Range	Approx. Press Loss @2550 Nm^3/hr kPa	(1) Approx. Press Loss @1700 Nm^3/hr kPa
1.0000	1.72	2,550	61,000	127	3,060	127	20	1.0	0.46
1.0008	34	3,370	81,000	147	3,520	111	23	1.3	0.61
1.0016	69	4,250	102,000	165	3,950	99	26	1.6	0.77
1.0024	103	5,130	123,000	180	4,330	90	28	1.9	0.92
1.0032	138	5,980	143,000	195	4,690	83	31	2.3	1.1
1.0040	172	6,860	165,000	209	5,020	78	33	2.6	1.2
1.0080	345	11,250	270,000	268	6,420	61	42	4.3	2.0
1.0121	517	15,670	376,000	316	7,590	51	50	6.0	2.8
1.0162	689	20,140	483,000	358	8,600	45	56	7.6	3.6
1.0203	862	24,650	591,000	396	9,510	41	62	9.4	4.4
1.0330	1,379	38,360	921,000	494	11,860	33	78	15	6.9
1.0502	2,068	57,170	1,372,000	604	14,490	27	95	22	10
1.0680	2,758	76,630	1,839,000	699	16,770	23	110	29	14
1.0863	3,447	96,740	2,322,000	785	18,850	21	123	37	17
1.1050	4,137	117,530	2,821,000	865	20,770	19	136	45	21
1.1241	4,826	139,010	3,336,000	941	22,590	17	148	53	25
1.1435	5,516	161,210	3,869,000	1,014	24,330	16	159	61	29
1.1630	6,205	184,080	4,418,000	1,083	26,000	15	170	70	33
1.1826	6,895	207,640	4,983,000	1,150	27,610	14	180	79	37
1.2021	7,584	231,890	5,565,000	1,216	29,180	13	191	88	42
1.2212	8,274	256,710	6,161,000	1,279	30,700	13	201	97	46
1.2397	8,963	282,060	6,770,000	1,341	32,180	12	210	107	51
1.2641	9,928	318,240	7,638,000	1,424	34,180	11	223	121	57

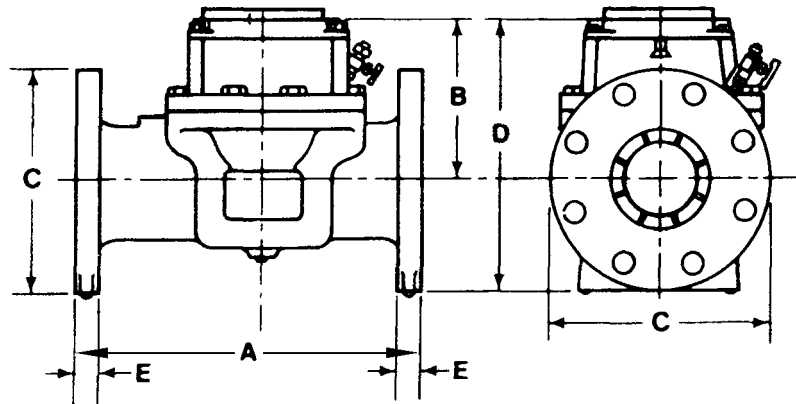
200mm (8") T200U30 meters of standard construction register 10 m³ per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b=101.325\text{ kPa}$ and $T_b=15^\circ\text{C}$, and average atmospheric pressure $P_a=99.8\text{ kPa}$. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO₂ and N₂ (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to 2,550 Nm^3/hr , irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Performance ratings in the above table are based on +/- 1% measurement accuracy for all pressures and flowrates shown.

(1) There is approximately 7% less pressure loss when compared to our T200U45 Turbo-Meter at 1,700 Nm^3/hr .



Dimension T200U45/30

	Maximum Allowable Working Pressure MAOP (bar)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
Ductile Iron/ISO PN20	16	600	249	345	422	29
Steel/ISO PN50	50	600	262	386	455	42
Steel/ISO P110	100	600	262	435	480	56



MARK-II 300mm T300U45 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G2500 Rating $Q_{min} = 200\text{m}^3/\text{h}$ $Q_{max} = 4000\text{m}^3/\text{h}$

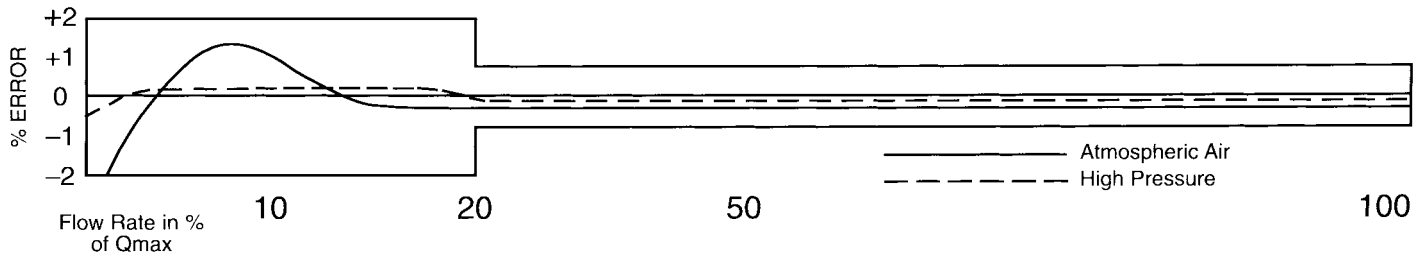
Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Maximum/Minimum Flow Range	Approximate Pressure Loss kPa
1.0000	1.72	4,000	96,000	200	4,800	200	20	0.3
1.0008	34	5,290	126,960	229	5,496	173	23	0.5
1.0016	69	6,670	160,080	258	6,192	154	26	0.5
1.0024	103	8,030	192,720	283	6,792	141	28	0.7
1.0032	138	9,420	226,080	306	7,344	130	31	0.7
1.0040	172	10,770	258,480	328	7,872	121	33	0.9
1.0080	345	17,700	424,800	420	10,080	95	42	1.5
1.0121	517	24,640	591,360	496	11,904	80	50	2.2
1.0162	689	31,640	759,360	562	13,488	71	56	2.7
1.0203	862	38,740	929,760	622	14,928	64	62	3.0
1.0330	1,379	60,300	1,447,200	776	18,624	51	78	5.0
1.0502	2,068	89,870	2,156,880	948	22,752	42	95	8.0
1.0680	2,758	120,490	2,891,760	1,097	26,328	36	110	10.0
1.0863	3,447	152,100	3,650,400	1,233	29,592	32	123	13.0
1.1050	4,137	184,820	4,435,680	1,359	32,616	29	136	16.0
1.1241	4,826	218,590	5,246,160	1,478	35,472	27	148	19.0
1.1435	5,616	258,020	6,192,480	1,606	38,544	24	161	22.0
1.1630	6,205	289,460	6,947,040	1,701	40,824	23	170	25.0
1.1826	6,895	326,560	7,837,440	1,807	43,368	22	181	28.0
1.2021	7,584	364,640	8,751,360	1,909	45,816	20	191	32.0
1.2212	8,274	403,690	9,688,560	2,009	48,216	19	201	35.0
1.2397	8,963	443,530	10,644,720	2,106	50,544	18	211	39.0
1.2641	9,928	500,420	12,010,080	2,236	53,664	17	224	43.0

300mm (12") T300U45 meters of standard construction register 10 m^3 per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b = 101.325\text{ kPa}$ and $T_b = 15^\circ\text{C}$, and average atmospheric pressure $P_a = 99.8\text{ kPa}$. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO_2 and N_2 (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to $4000\text{ m}^3/\text{hr}$, irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Typical Accuracy Curve



MARK-II 300mm T300U30 TURBO-METER TYPICAL PERFORMANCE DATA (CUBIC METERS)

OIML G4000 Rating $Q_{min} = 261\text{m}^3/\text{h}$ $Q_{max} = 6520\text{m}^3/\text{h}$

Compressibility Ratio $s = (Fpv)^2$	Meter Pressure kPa	Maximum Flowrate Nm^3/hr	Maximum Flowrate Nm^3/day	Minimum Flowrate Nm^3/hr	Minimum Flowrate Nm^3/day	Minimum Dial Rate m^3/hr	Max/Min Flow Range	Approx. Press Loss @6520 Nm^3/hr kPa	(1) Approx. Press Loss @4000 Nm^3/hr kPa
1.0000	1.72	6,520	156,000	261	6,250	261	25	0.66	0.27
1.0008	34	8,610	207,000	300	7,190	227	29	0.88	0.36
1.0016	69	10,850	260,000	336	8,070	202	32	1.1	0.46
1.0024	103	13,060	313,000	369	8,860	184	35	1.3	0.55
1.0032	138	15,300	367,000	399	9,590	170	38	1.6	0.64
1.0040	172	17,540	421,000	427	10,260	159	41	1.8	0.74
1.0080	345	28,750	690,000	548	13,140	124	53	2.9	1.2
1.0121	517	40,060	961,000	646	15,510	105	62	4.0	1.7
1.0162	689	51,440	1,235,000	732	17,570	93	70	5.0	2.2
1.0203	862	62,940	1,511,000	810	19,440	84	78	6.0	2.7
1.0330	1,379	97,990	2,352,000	1,011	24,260	67	97	10	4.2
1.0502	2,068	146,090	3,506,000	1,234	29,620	55	118	15	6.2
1.0680	2,758	195,800	4,699,000	1,429	34,290	48	137	20	8.2
1.0863	3,447	247,220	5,933,000	1,605	38,530	42	154	25	10
1.1050	4,137	300,330	7,208,000	1,769	42,460	39	170	31	13
1.1241	4,826	355,260	8,526,000	1,924	46,180	35	185	36	15
1.1435	5,516	411,970	9,887,000	2,072	49,740	33	199	42	17
1.1630	6,205	470,440	11,291,000	2,214	53,150	31	212	48	20
1.1826	6,895	530,670	12,736,000	2,352	56,450	29	226	54	22
1.2021	7,584	592,590	14,222,000	2,485	59,650	27	238	60	25
1.2212	8,274	656,020	15,744,000	2,615	62,770	26	251	67	28
1.2397	8,963	720,810	17,299,000	2,741	65,790	25	263	74	30
1.2641	9,928	813,270	19,519,000	2,912	69,880	23	279	83	34

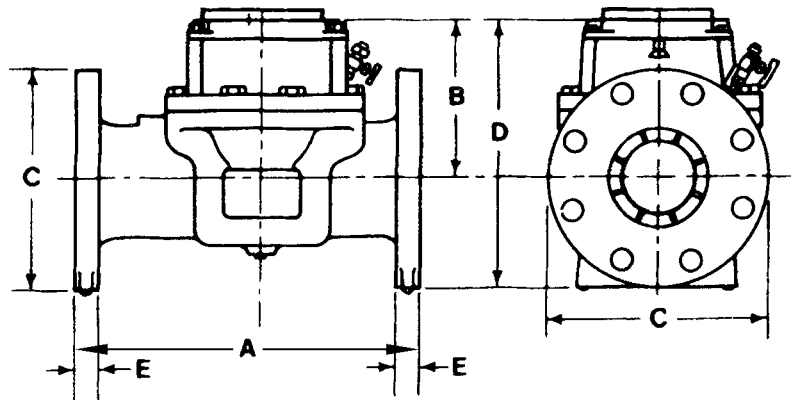
300mm (12") T300U30 meters of standard construction register 10 m³ per revolution of the mechanical output shaft.

Table is based on IGU standard reference conditions of $P_b=101.325\text{ kPa}$ and $T_b=15^\circ\text{C}$, and average atmospheric pressure $P_a=99.8\text{ kPa}$. Table incorporates effect of supercompressibility factor (Fpv) for 0.6 specific gravity natural gas at 15.6°C and 0% CO₂ and N₂ (per A.G.A. Report No. 8).

NOTE: Maximum flow rate (dial rate) at flowing conditions is equal to 6,520 Nm^3/hr , irrespective of the operating pressure (within the maximum allowable operating pressure of the meter).

Performance ratings in the above table are based on +/- 1% measurement accuracy for all pressures and flowrates shown.

(1) There is approximately 20% less pressure loss when compared to our T300U45 Turbo-Meter at 4000 Nm^3/hr .



Dimension T300U45/30

	Maximum Allowable Working Pressure MAOP (bar)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
Ductile Iron/ISO PN20	16	900	320	485	573	32
Steel/ISO PN50	50	900	330	520	590	51
Steel/ISO PN110	100	900	330	560	610	67

MARK-II AND MARK-II-E TURBO-METERS, DESIGN FEATURES

Mark-II shown

1 Any of a wide variety of mechanical, electromechanical or electronic readout devices can be direct-mounted to the meter index plate.

2 Calibration of meter output shaft rotations to precise engineering units is affected by change gears which are readily accessible at the top of the intermediate gear assembly.

3 A magnet coupling transmits rotor rotations from the pressurized to the non-pressurized area.

4 An external fitting permits rotor shaft bearing lubrication and flushing while the meter is operating. An optional hand pump manual lubricator, mounted to rear of meter, is also available.

5 Optional blade tip sensor (BTS) provides highest pulse output.

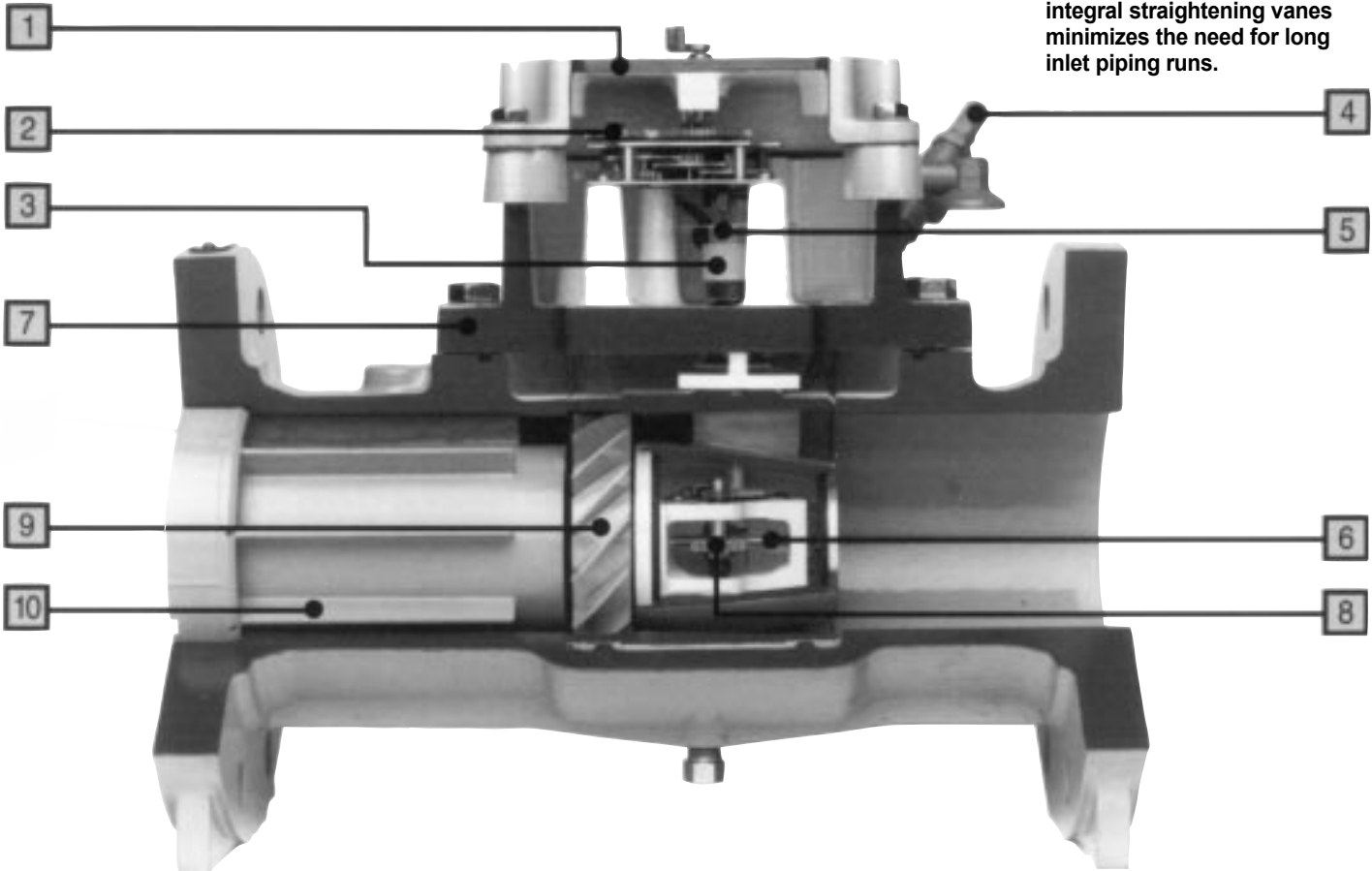
6 Advanced meter design achieves thrust load balancing for rotor bearings at all operating conditions.

7 All moving parts are contained in an interchangeable module which lifts out through the top of the meter body. Once installed, the body remains in the line. (Mark-II only)

8 Gears and other moving parts are housed in a sealed chamber protected from line contaminants. Pressure equalization is achieved via stainless steel screens located on the upstream and downstream side of the chamber.

9 Improved rotor design extracts maximum amount of kinetic energy from the flowing gas. Dynamic balancing of rotor assembly assures minimum drag at all flow rates.

10 Optimized nose cone with integral straightening vanes minimizes the need for long inlet piping runs.



MEASURING MODULE EXCHANGE (Mark-II only)

Equimeter maintains a stock of factory rebuilt and calibrated measuring modules for all models of Mark II Turbo-Meters. These rebuilt modules are available at nominal cost as replacements for modules which may be damaged in service. Each exchange module is shipped with its individual six point calibration curve and numerical calibration

data plus the appropriate set of change gears and illustrated instructions on module exchange.

Where Turbo-Meter users do not have adequate proving facilities for large volume meters, utilization of this program affords an inexpensive, convenient method of maintaining measurement accuracy.

If requested, Equimeter will test the returned measuring module to complete utility records.

Please contact your local Equimeter sales representative for details of the Measuring Module Exchange Program.



302 Measuring Module
Inlet End View

CALIBRATION FACILITIES

Each Turbo-Meter produced receives a low pressure calibration test at six different flow rates. A computer generated performance curve plus relevant numerical calibration data is furnished with each meter. Optional high pressure calibration between 172 kPa and 6,205 kPa is also available at six different flow rates to 1700 m³/hr upon request.

Published flow rates are based on +2% accuracy of measurement for Q_{min} to 0.2 Q_{max} and ±1% accuracy of measurement for 0.2 Q_{max} to Q_{max}.

In parallel with the development of the broad product line of Turbo-Meters, Equimeter also engineered and installed one of the most technologically sophisticated and

accurate large volume, high pressure meter calibration facilities in the world. Repeated correlation tests with other large volume meter proving facilities, using various flowing media and different reference standards, have verified the accuracy of Equimeter Turbo-Meter calibrations.

SPECIFICATIONS

Mark-II and Mark-II-E Turbo-Meter flange dimensions conform to ISO7005-1 or ANSI B16.5 (steel bodies) and ISO7005-2 or ANSI B16.42 (ductile iron bodies).

All Mark-II and Mark-II-E Turbo-Meter pressure castings are hydro-statically tested at 1.5 or 2.0 times

(depending on material) the maximum rated working pressure stated on the meter body manufacturer's badge. This maximum rated working pressure must not be exceeded in service. Additionally, each meter receives an air leak test a 1.1 times the pressure rating to verify

pressure integrity.

Standard construction Equimeter steel body Turbo-Meters will operate over an ambient temperature range of -40 degrees Celsius to +74 degrees Celsius. Ductile iron body meters are limited to a low temperature of -28.9 degrees Celsius.

HOW TO ORDER MARK-II AND MARK-II-E TURBO-METERS

- Select meter size to equal or exceed the maximum anticipated instantaneous flow rate at the operating pressure.
- Select meter working pressure rating to equal or exceed the maximum anticipated operating pressure.
- Detail type of flanges: ISO or ANSI.
- Select type of meter-mounted readout desired. Options are as follows:

- A. Vertical Circular Reading (VCR) index reading in cubic feet or cubic meters in Lexan index box.
- B. Vertical Direct Reading (VDR) index reading in cubic feet or cubic meters in either a Lexan or aluminum index box.
- C. Vertical Direct Reading (VDR) index reading in cubic feet or cubic meters in aluminum box with one or ten

electrical pulses per revolution of the meter output shaft. If this option is selected, also detail whether a plug-in or conduit type connector is desired.

- D. None (For addition of meter-mounted instrument).

- Select Optional High Pressure Calibration.
- For high frequency pulse output, see below:

OPTIONAL MARK-II AND MARK-II-E TURBO-METERS WITH BLADE TIP SENSOR (BTS)

The BTS Pulser provides a high frequency electrical pulse signal which is directly proportional to the Turbo-Meter's mechanical output. Factory installed in new meters, the pulser signals can be used to actuate a wide variety of remotely located

electronic volume totalization or rate-of-flow devices. The signal is generated from a sensor mounted near the meter's rotor assembly. When the meter is operating, this sensor detects the presence or absence of metal.

Wiring from the sensor exits the meter top-plate casting through either a 1/2" 14 NPT standard conduit fitting or a plug-in connector.

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Authorized Distributor

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