

KDG

Tylors Series 7000 Turbine Flowmeters (7100, 7200, 7300)

Data sheet
1990



- High accuracy $\pm 0.25\%$
- Long bearing life
- High resolution output
- Wide rangeability
- Bi-directional flow capability
- Hydrodynamically-balanced rotor*
- Wide pressure and temperature range
- Ideal for batching blending

Series 7000 Turbine flowmeters are precise, rugged and reliable instruments for the volumetric flow measurement of clean liquids in aerospace, petrochemical and general industrial applications. Other turbine meters in the Solartron Mobrey range can be used for gas flows, hygienic applications and flows of as little as 1.6 litres per hour.

Description of Operation

The liquid passes through a flow straightening section and is accelerated onto a multiblade hydrodynamically-balanced turbine rotor*, the speed of which is proportional to volumetric flow rate.

A reluctance type pick-off coil, mounted on the turbine, senses the passage of each blade tip and generates a sine wave output whose frequency is directly proportional to

turbine speed and hence flow rate. Meters can be fitted with additional coils to provide in-phase or out-of-phase signals, typically for bi-directional flow sensing.

The selection of a 7100, 7200 or a 7300 series meter should be made using table 1. The selection of a particular model in the chosen series should be made from table 2.1, 2.2 or 2.3 on page 3.

The instrument selected should be one where the desired flow range falls within the tabulated linear flow range. Pressure drop for any given flow of water can then be calculated from table 3.1 or 3.2. For liquids other than water, pressure drop is obtained from the equation on page 4 by inserting the specific gravity, absolute viscosity of the liquid and the pressure drop for the water.

The coil output can be used to drive locally mounted readout instruments, but a UAP10 preamplifier mounted on the turbine meter body is available for electrically noisy environments, long transmission distances and hazardous areas. Details are given on data sheet IP333.

To complement the 7000 range of flowmeters, a variety of standard indicating, recording and integrating devices are available as well as the range of low cost MX1 industrial turbines. Consult the sales office for further details.

* 7100 and 7300 only

Specification

Linearity¹	DN25mm and above (1") ± 0.25% of reading or better DN20 & DN18 (5/8" and 3/4") ± 0.5% of reading over specified DN15 (1/2") ± 0.75% of reading Linear Flow Range DN10 and DN8 (3/8" and 1/4") ± 1.0% of reading	
Repeatability	± 0.02% of rate	
Pressure Rating	344 Bar maximum (5000 PSI) depending on size and rating of end connections	
Pressure Drop	Typically 0.27 Bar (4 PSI) at maximum flow on water. For other fluids and flow rates see formula on page 4 and Table 3.1 or 3.2	
End Connections	Flanged BS1560 (ANSI) [Standard] BS4504 (DIN) BS10	Screwed* (2" maximum) BSP.P [Standard] UNF NPT
	¹ Linearity error can be minimised with the use of MT800 electronics, consult factory for further details. * Series 7300 - Available flanged only.	

Table 1 - Series Selection

	7100	7200	7300
Application	General purpose high specification	Non lubricating, high purity liquids and cryogenics	Hydrocarbon use
Bearings	Fluid Lubricated Tungsten Carbide Journal Bearing	Fluid Lubricated 440 Stainless Steel Ball Race Bearing	Fluid Lubricated Tungsten Carbide Journal Bearing
Rotor	430 Stainless Steel Hydrodynamically Balanced	430 Stainless Steel	316SS Shrouded Rotor and Nickel rivets for improved resolution. (50, 65 & 80mm units only have a 430SS rotor) Hydrodynamically Balanced
Body (and flanges)*	316SS	316SS	Carbon Steel
All other*	316SS	316SS	316SS
Temperature range (for meter only)	-75°C to +150°C	-265°C to +310°C	-75°C to +150°C
Meter sizes and flow ranges	See Table 2.1	See Table 2.2	See Table 2.3

* Other material to special order

Output	All 7000 Series turbines require the use of a pickup coil to produce an output
Type	Sine wave
Voltage	Dependent upon meter size and flow rate. Typical values 50 to 500 V r.m.s. on a 50mm meter 0.5 to 5 V r.m.s. on a 300mm meter
Frequency	Proportional to flow rate - See table 1 for typical *K factors *K factor = Number of pulses per m ³ , gallon, barrel etc.
Temperature Limits of pickup coil	Type 2112 -260°C to +260°C Type 2114 -260°C to +450°C
Optional pre-amplifier	An optional UAP10 pre-amplifier can be used with the pickup coils above for transmission of up to 1500 meters. For more information about pickup and pre-amplifiers see leaflets 2014 and IP333.

Table 2.1 - 7100 Model Selection

Model number	Nom. meter size mm in		Min repeatable flowrange m³/h Gal/min		Linear flowrange				Max. Extended Flowrange m³/h Gal/min		Nominal output frequency		
					Min. Linear		Max. Linear				Pulses × 1000/m³	Pulses /gal	Nom. Freq at rated max
					m³/h	Gal/min	m³/h	Gal/min					
7182	8	¼	0.034	0.13	0.06	0.21	0.57	2.1	0.68	2.5	12885	58565	2040
7183	10	⅜	0.068	0.25	0.115	0.42	1.14	4.1	1.36	5.0	4895	22250	1550
7184	15	½	0.115	0.42	0.23	0.83	2.27	8.3	2.73	10.0	3330	13140	2100
7185	18	⅝	0.180	0.67	0.37	1.4	3.65	13.3	4.55	16.7	2020	9190	2050
7186	20	¾	0.340	1.25	0.64	2.4	6.35	23.3	8.0	29.1	850	3865	1500
7101	25	1	0.455	1.66	1.36	5.0	13.6	50	17.0	62.5	355	1625	1350
7145	32	1¼	0.91	3.3	2.05	7.5	20.5	75.0	25.0	92.0	165	740	930
7146	40	1½	1.41	4.2	2.95	10.8	29.5	108	36.3	133	100	455	823
7102	50	2	2.05	7.5	5.45	20.0	54.5	200	68.2	250	60	275	920
7125	65	2½	3.41	12.5	10.2	37.5	102	375	127	470	30	135	825
7103	80	3	4.54	16.6	16.0	58.6	159	580	199	728	18.5	85	816
7104	100	4	11.4	42.0	28.5	104.0	284	1040	354	1300	8	36	625
7105	125	5	18.2	67.0	41.3	151.5	413	1515	515	1890	4	20	485
7106	150	6	27.3	100	68.1	250.0	681	2500	852	3125	2.3	10.5	435
7108	200	8	54.5	200	122.6	450.0	1226	4500	1533	5620	1	4.5	333
7110	250	10	90.9	335	186.2	683.0	1862	6830	2318	8500	0.65	3	340
7112	300	12	125	460	272.5	1000	2725	10000	3405	12500	0.5	2	320

Table 2.2 - 7200 Model Selection

Model number	Nom. meter size mm in		Min repeatable flowrange m³/h Gal/min		Linear flowrange				Max. Extended Flowrange m³/h Gal/min		Nominal output frequency		
					Min. Linear		Max. Linear				K Pulses × 1000/m³	K Pulses /gal	Nom. Freq at rated max Hz.
					m³/h	Gal/min	m³/h	Gal/min					
7282	8	¼	0.034	0.13	0.06	0.21	0.57	2.1	0.68	2.5	10770	48710	1705
7283	10	⅜	0.068	0.25	0.115	0.42	1.14	4.1	1.36	5.0	4075	18875	1290
7284	15	½	0.115	0.42	0.23	0.83	2.27	8.3	2.73	10.0	2785	12650	1750
7285	18	⅝	0.16	0.58	0.37	1.4	3.65	13.3	4.55	16.7	1680	7690	1705
7286	20	¾	0.32	1.2	0.64	2.4	6.35	23.3	8.0	29.1	714	3245	1260
7201	25	1	0.41	1.5	1.36	5.0	13.6	50	17.0	62.5	295	1330	1110
7245	32	1¼	0.8	2.9	2.05	7.5	20.5	75.0	25.0	92.0	135	610	765
7246	40	1½	1.02	3.8	2.95	10.8	29.5	108	36.3	133	84	385	695
7202	50	2	1.93	7.1	5.45	20.0	54.5	200	68.2	250	50	225	760
7225	65	2½	3.18	11.6	10.2	37.5	102	375	127	470	24	110	690
7203	80	3	4.1	15.0	16.0	58.6	159	580	199	728	15	70	690
7204	100	4	10.2	37.5	28.5	104.0	284	1040	354	1300	6.5	30	520
7205	125	5	15.9	58.3	41.3	151.5	413	1515	515	1890	3.5	16	405
7206	150	6	25.0	92.0	68.1	250.0	681	2500	852	3125	1.9	8.5	360
7208	200	8	50.0	183	122.6	450.0	1226	4500	1533	5620	0.82	3.5	280
7210	250	10	86.3	317	186.2	683.0	1862	6830	2318	8500	0.55	2.5	285
7212	300	12	120	437	272.5	1000	2725	10000	3405	12500	0.35	1.5	260

Table 2.3 - 7300 Model Selection

Model number	Nom. meter size mm in		Min repeatable flowrange m³/h Bar/h		Linear flowrange				Max. Extended Flowrange m³/h Bar/h		Nominal output frequency		
					Min. Linear		Max. Linear				K Pulses × m³	K Pulses /barrel	Nom. Freq at rated max Hz.
					m³/h	Bar/h	m³/h	Bar/h					
7302	50	2	1.82	12	5.4	34.0	54	340	67.5	425	63000	10000	945
7325	65	2½	3.6	23	9.5	60.0	95	600	119	750	31640	5000	835
7303	80	3	6.4	40	15.9	100.0	159	1000	191	1200	12570	2000	550
7304	100	4	12.0	75	28.2	178.0	282	1780	350	2200	6285	1000	495
7305	125	5	19	120	45.6	287.0	456	2870	572	3600	6285	1000	795
7306	150	6	27	170	66.8	420.0	668	4200	827	5200	6285	1000	1165
7308	200	8	54	340	118.0	724.0	1180	7240	1465	9200	3140	500	1030
7310	250	10	90	570	186.0	1170	1860	11700	2320	14600	1260	200	650
7312	300	12	122	770	273.5	1720	2735	17200	2400	21400	1260	200	955
7316	400	16	207	1300	413.4	2600	4134	26000	5185	32600	625	100	720
7318	450	18	254	1680	540.5	3400	5405	34000	6805	42800	625	100	945
7320	500	20	334	2100	667.7	4200	6677	42000	8270	52000	625	100	1165
7324	600	24	477	3000	922.0	5800	9220	58000	11600	73000	500	80	1290

1 Barrel = 35 Imperial Gallons = 42 US Gallons = 159 Litres

Sizing Turbine Flowmeters For Liquid Applications

Choose the meter size whose rated maximum flowrate is closest to the maximum required flowrate.

If the specific gravity is 1.0 (or 0.8 for 7300 Series), read the minimum linear flowrate from the relevant table on page 3. If the specific gravity of the liquid to be measured is not 1.0 (or 0.8 for 7300 Series) compute the minimum linear flowrate for the size chosen as follows:

$$\text{Minimum linear flowrate} = \frac{1}{\sqrt{\text{S.G.}}} \times \text{Rated Min Linear flowrate} \left(\text{or } \frac{0.8}{\sqrt{\text{S.G.}}} \times \text{Rated Min Linear flowrate} \right) \text{ For a 7300 Series}$$

Pressure Drop

To calculate the pressure drop of a liquid other than water (or a 0.8 hydrocarbon) the following formula should be used:

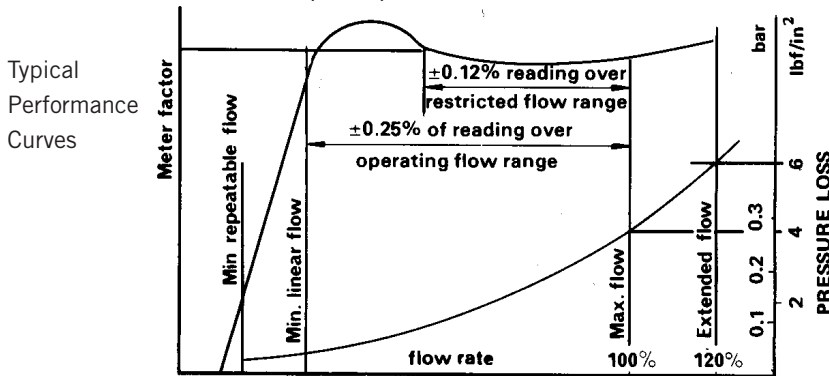
$$\delta p = \mu^{1/4} \times \text{s.g.}^{3/4} \times \delta p_{\text{H}_2\text{O}}$$

Where δp = actual pressure drop

s.g. = specific gravity

μ = absolute viscosity in centipoise

$\delta p_{\text{H}_2\text{O}}$ = pressure drop for water (or 0.8 S.G. Hydrocarbon) from table 2.1 (or 2.2)



Installation

To ensure accurate operation the turbine meter should be installed in a straight length of pipe of the same diameter, with at least 10 diameters upstream and 5 diameters downstream.

For fluids with suspended particles entrained it is recommended that 40 to 80 mesh filtration be employed.

NOTE: All transmission cables should be installed in such a manner that they do not run in close proximity to power cables, other signal cables or where electrical noise may interfere with transmission.

For further information see TTS2. For viscous applications see data sheet IP308.

For **BATCHING APPLICATIONS** where **IMPROVED ACCURACY** is required, please ask about the MT800 Series electronics.

How To Order

Series					
71	General				
72	Non-lubricating, high purity and cryogenic liquids				
73	Hydrocarbon and custody transfer use				
Size					
XX	Meter size, see page 3 for last two digits of model number				
End connections					
A1RF	Flanged ANS1 150 raised face				
A3RF	Flanged ANS1 300 raised face				
A4RF	Flanged ANS1 400 raised face				
A6RF	Flanged ANS1 600 raised face				
A9RF	Flanged ANS1 900 raised face				
BSP1	Screwed BSP.P				
UNF1	Screwed UNF				
NPT1	Screwed NPT				
ZZZZ	Other, please state e.g. BS4504 PN16 raised face				
Calibration					
M	Standard water metric				
I	Standard water imperial				
Z	Special please state				
Pickup coil facility					
1	Single				
2	Double (for bi-directional applications or pulse integrity checking)				
+ Any other special details					
71	02	A1RF	M	1	Typical Ordering Information

Note: Pickup Coils, Pre-Amplifiers and Readouts should be ordered separately

Table 3.1 - Pressure Drops of 7100 or 7200 Series Meter

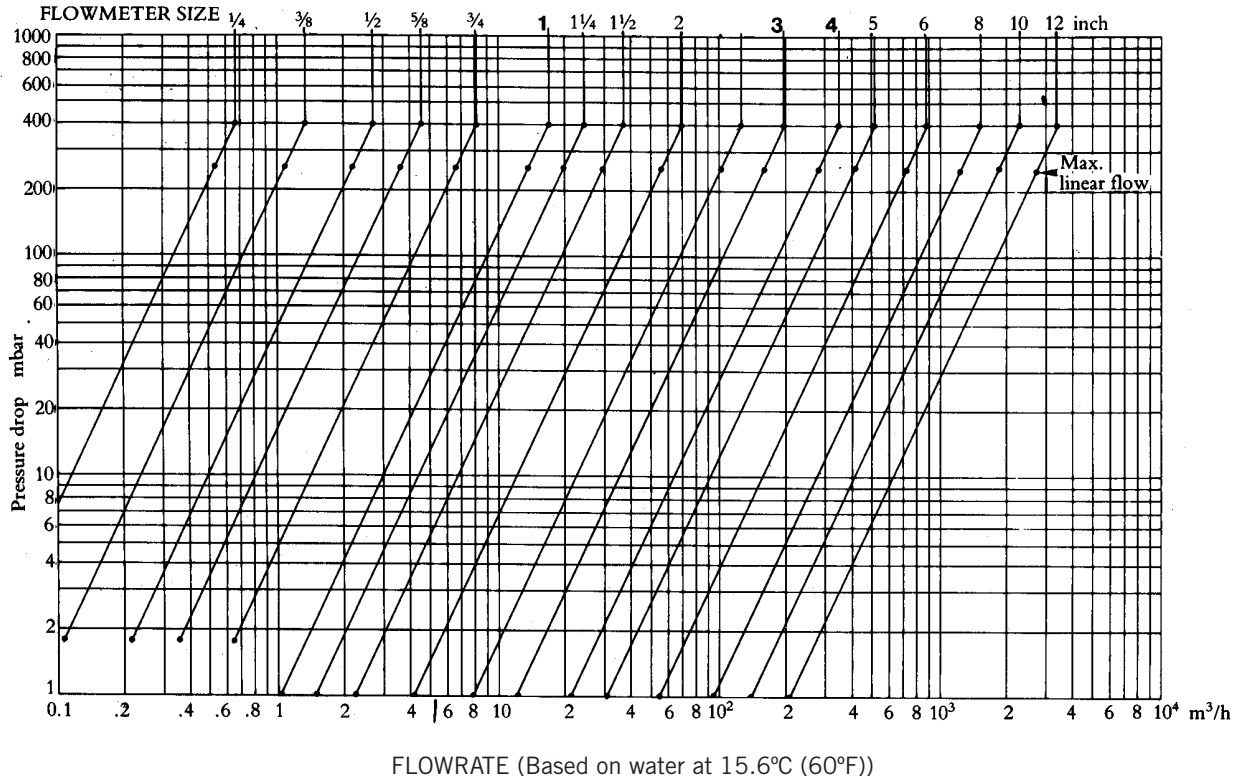
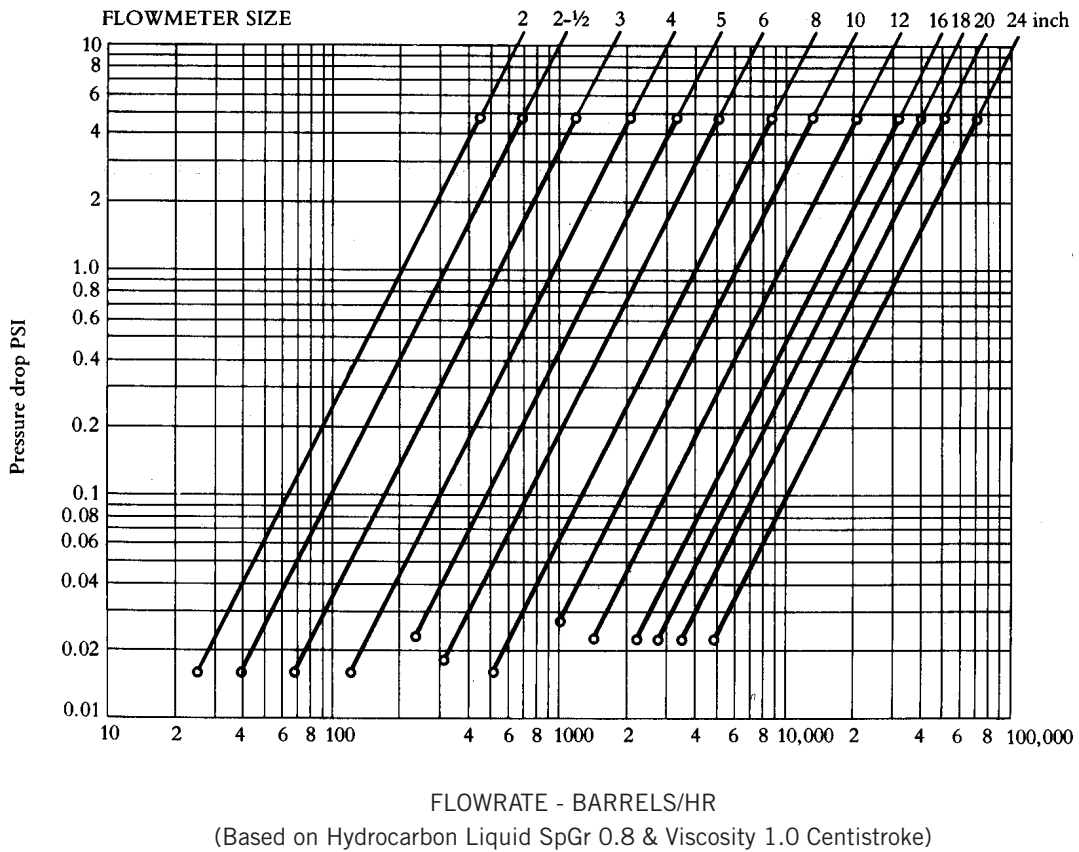


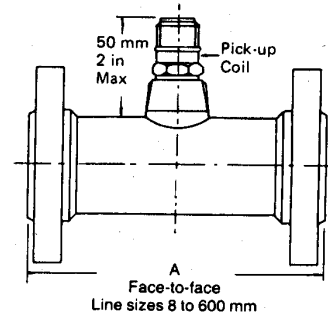
Table 3.2 - Pressure Drops of 7300 Series Meter



Dimensions

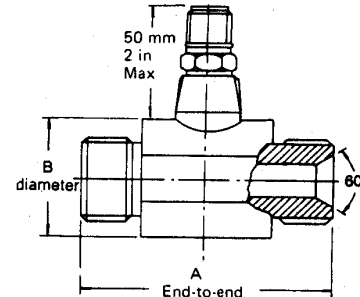
Flanged Ends Face-To-Face

Rating BS1560 (ANSI)	Up to ANSI 600		Dimension A ANSI 900 & 1500		ANSI 2500	
	BS4504 (DIN) Up to NP64		NP 100 & 160		NP 250 & 320	
BS10	Up to Table R		Tables S & T			
Nominal meter size (mm)	mm	inch	mm	inch	mm	inch
8, 10, 15	127	5	178	7	178	7
18, 20	140	5½	178	7	178	7
25	140	5½	203	8	203	8
32	152	6	203	8	203	8
40	152	6	229	9	229	9
50	165	6½	229	9	229	9
65	178	7	254	10	254	10
80	254	10	254	10	279	11
100	305	12	305	12	305	12
125	356	14	356	14	406	16
150	356	14	356	14	406	16
200	406	16	406	16	457	18
250	508	20	508	20	559	22
300	610	24	610	24	610	24
400	813	32	813	32	-	-
450	914	36	914	36	-	-
500	1016	40	1016	40	-	-
600	1219	48	1219	48	-	-

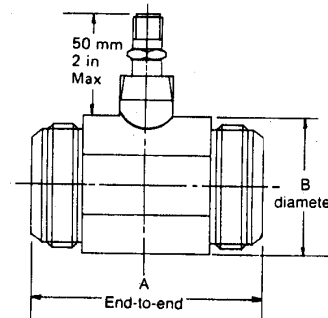


Screwed Ends

Nominal meter size mm	BSP.P Thread	A		B (diameter)	
		mm	inch	mm	inch
8	½	70	2¾	28.6	1¼
10	½	70	2¾	28.6	1¼
15	½	70	2¾	28.6	1¼
18	¾	70	2¾	32	1¼
20	¾	83	3¼	32	1¼
25	1	89	3½	40	1½
32	1¼	98	3⅞	47.6	1⅞
40	1½	111	4⅜	57	2¼
50	2	121	4¾	70	2¾



Nominal meter size mm	UNF Thread	A		B	
		mm	inch	mm	inch
8	¾"-16-UNF	64	2½	28.6	1¼
10	¾"-16-UNF	64	2½	28.6	1¼
15	¾"-16-UNF	64	2½	28.6	1¼
18	7/8"-14-UNF	70	2¾	32	1¼
20	1 1/16"-12-UN	82.5	3¼	32	1¼
25	1 5/16"-12-UN	89	3½	40	1½
32	1 5/8"-12-UN	98.5	3 7/8	47.6	1 7/8
40	1 7/8"-12-UN	111	4 3/8	57	2¼
50	2½"-12-UN	120.5	4¾	70	2¾



KDG Instruments

Crompton Way Crawley West Sussex UK RH10 2YZ
 Tel: 01293 866000 Fax: 01293 530849
 e-mail: sales@solartron.com www.solartronmobrey.com
 a Roxboro Group Company

Solartron Mobrey GmbH Deutschland tel: 0211/99 808-0
 Solartron Mobrey Ltd China tel: 021 6353 5652
 Mobrey sp z o o Polska tel: 022 871 7865
 Solartron Mobrey AB Sverige tel: 08-725 01 00
 Mobrey SA France tel: 01.34.30.28.30
 Solartron Mobrey SA-NV Belgium tel: 02/465 3879
 Solartron Mobrey USA tel: (281) 398 7890

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