



TI-P337-08
EMM Issue 9

Gilflo 'B' Flowmeter Pipeline Unit

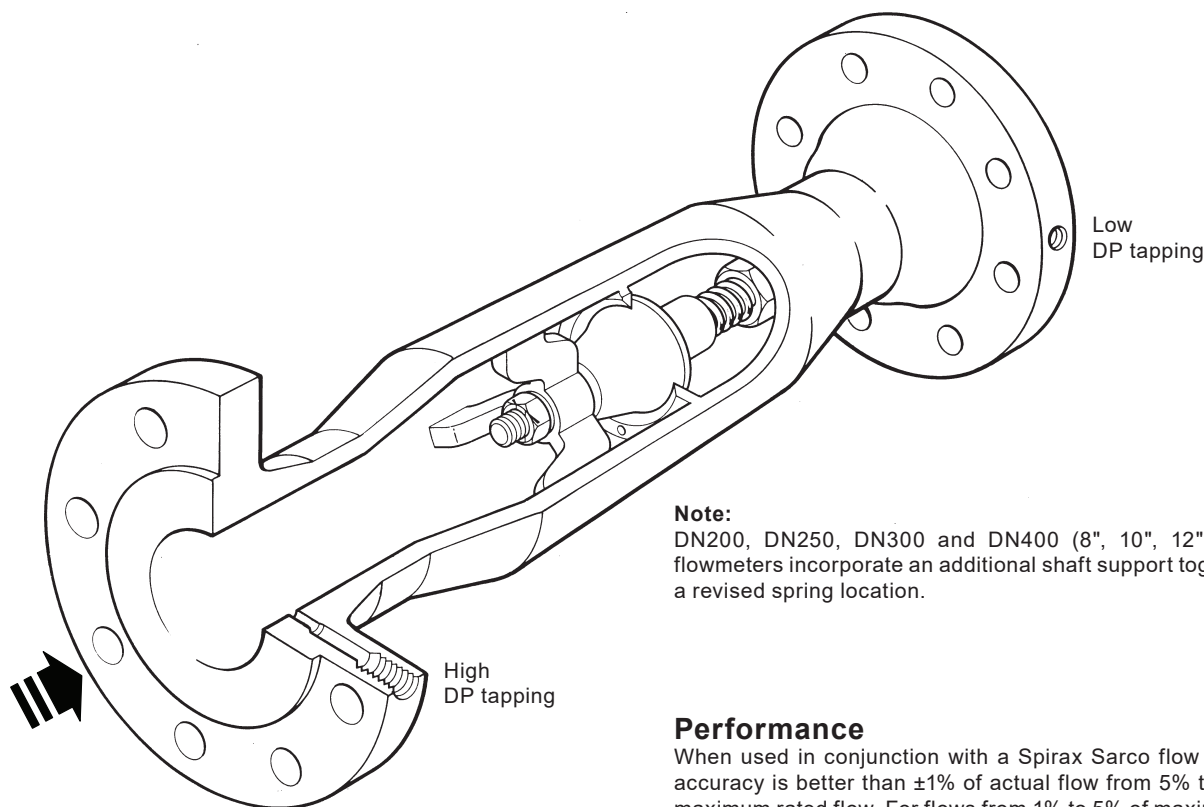
Description

The Gilflo 'B' flowmeter is installed in the pipeline and produces a differential pressure which is related to the rate of flow. It can be used with most industrial fluids, gases and both saturated and superheated steam.

Sizes and pipe connections

DN50*, DN80, DN100, DN150, DN200, DN250, DN300 and DN400 (2", 3", 4", 6", 8", 10", 12" and 16")
Flanges available to EN 1092 PN40* and ASME B 16.5 class 300.

***Note - DN50 (2") flowmeter:** flanges on the PN40 are thicker (to ASME 300, 22.2 mm) to accommodate pressure tapplings. On the DN400 (16") flowmeter, the pressure tapplings are on the body.



Note:
DN200, DN250, DN300 and DN400 (8", 10", 12" and 16") flowmeters incorporate an additional shaft support together with a revised spring location.

Performance

When used in conjunction with a Spirax Sarco flow computer, accuracy is better than $\pm 1\%$ of actual flow from 5% to 100% of maximum rated flow. For flows from 1% to 5% of maximum rated flow, accuracy will be better than $\pm 0.1\%$ FSD. Repeatability is better than 0.25%. Note: the accuracy figures quoted are for the pipeline unit only.

Pressure drop

Less than 349 m bar (140 inches H₂O) at rated capacity.

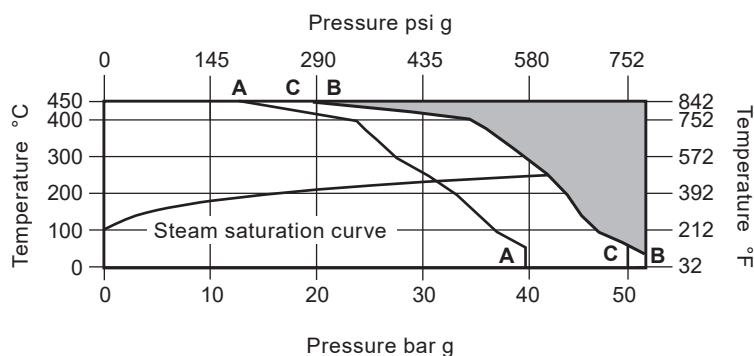
Flow capacity

To determine the maximum flow capacity of a Gilflo 'B', it is necessary to calculate the equivalent water flowrate (Q_E). See under section "Sizing the Gilflo 'B' flowmeter".

Materials

Part	Material	
Body	Carbon steel	ASTM A105/A106/A234
Internals	Mostly stainless steel	S304/S316
Spring	Inconel X750	

Pressure/temperature limits



The product **must not** be used in this region.

A - A Flanged ASME 300 DN50-DN300

B - B Flanged ASME 300 DN400

C - C Flanged EN 1092 PN40

Body design conditions			ASME 300
PMA	Maximum allowable pressure	51.1 bar g @ 38 °C	741 psi g @ 100 °F
TMA	Maximum allowable temperature	450 °C @ 23 bar g	842 °F @ 334 psi g
Minimum allowable temperature		0°C	32 °F
PMO	Maximum operating pressure	ASME	51.1 bar g @ 38 °C
		DN400	49 bar g @ 65.7 °C
Minimum operating pressure		0.6 bar g	9 psi g
TMO	Maximum operating temperature	450 °C @ 23 bar g	842 °F @ 334 psi g
Minimum operating temperature		0°C	32 °F
Note: For lower operating temperatures consult Spirax Sarco.			
Maximum viscosity			30 centipoise
ΔPMX	Maximum differential pressure		349 m bar
Designed for a maximum cold hydraulic test pressure of:		ASME	77 bar g
		PN40	60 bar g

Dimensions/weights (approximate) in mm (inches) and kg (lbs)

Size	A	B	Weight
DN50* (2")	480 (18.9)	89 (3.5)	14 (31)
DN80 (3")	543 (21.4)	114 (5.7)	22 (49)
DN100 (4")	716 (28.2)	168 (6.6)	48 (106)
DN150 (6")	797 (31.4)	219 (8.6)	87 (192)
DN200 (8")	990 (39.0)	324 (12.8)	123 (271)
DN250 (10")	1458 (57.4)	406 (16.0)	257 (567)
DN300 (12")	1599 (63.0)	457 (18.0)	340 (750)
DN400* (16")	1995 (78.5)	610 (24.0)	900 (1984)



Pressure tappings:

The H.P. and L.P. pressure tappings are threaded ¼" NPT (female). On the DN400 flowmeter, the pressure tappings are on the body.

* **Note - DN50 flowmeter:** flanges on the DN50 are thicker (to ASME 300, 22.2 mm) to accommodate pressure tappings.

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation:

Installation and Maintenance Instructions are supplied with each flowmeter. The following main points are given for guidance:-

1. The Gilflo flowmeter should be installed with a minimum of 6 straight pipe diameters upstream and 3 downstream. No valves, fittings or cross sectional changes are permitted within these pipe lengths. Where an increase in pipe diameter is necessary upstream of a Gilflo flowmeter, the length of straight pipe should be increased to 12 diameters. Similarly, where a Gilflo flowmeter is installed downstream of two 90° bends in two planes, a pressure reducing valve or a partially open valve, 12 pipe diameters should be allowed.
2. The Gilflo flowmeter should normally be mounted horizontally. Vertical installation (with flow vertically downward) is also permissible and must be specified at the time of ordering. Ensure flow is in the correct direction and avoid reverse flow.
3. For steam applications, good basic steam engineering practice should be followed:
 - Ensure all pipework is adequately lagged.
 - Ensure correct line drainage through adequate trapping.
 - Where practicable, fit a steam separator upstream of the flowmeter. This should be drained using a float trap set.
 - Ensure good alignment and support of all associated pipework.
 - Achieve line size reduction by the use of eccentric reducers.
 - Avoid close installation (less than 25 pipe diameters) upstream or downstream of a pressure reducing valve or modulating valve.
4. See the 'Gilflo flowmeters - system overview', TI-S41-10 which provides information on the installation of a Gilflo flowmetering system.

Maintenance note:

There are no user serviceable parts within the Gilflo 'B' flowmeter.

Sizing the Gilflo 'B' flowmeter (metric)

In order to determine the flow capacity of a Gilflo 'B' flowmeter for a particular application, it is necessary to calculate the equivalent water flowrate (Q_E) based on the maximum anticipated actual flow.

	Mass flow units	Volumetric units
Liquids	$Q_E = \frac{q_m}{\sqrt{SG}}$	$Q_E = Q_L \sqrt{SG}$
Gases and steam actual flow conditions	$Q_E = q_m \sqrt{\frac{1\,000}{D_F}}$	$Q_E = Q_F \sqrt{\frac{D_F}{1\,000}}$
Gases standard conditions	$Q_E = \frac{q_m}{\sqrt{\frac{D_s}{1\,000} \times \frac{P_F}{P_s} \times \frac{T_s}{T_F}}}$	$Q_E = Q_s \sqrt{\frac{D_s}{1\,000} \times \frac{P_s}{P_F} \times \frac{T_F}{T_s}}$

Where:

D_s = Density of gas at standard conditions (kg/m³)

D_F = Density of gas at actual flow conditions (kg/m³)

= 1.013 bar a

P_s = Standard pressure (atmospheric) = 1.033 kg/cm² a

= 14.70 psi a

P_F = Actual flow pressure in same absolute units as P_s

Q_E = Equivalent water flowrate (litres/min)

Q_L = Maximum liquid flowrate (litres/min)

Q_s = Maximum gas flowrate at standard conditions (litres/min)

Q_F = Maximum gas flowrate at actual flow conditions (litres/min)

q_m = Mass flowrate (kg/min)

SG = Specific gravity

T_s = Standard temperature (K) = °C + 273

T_F = Actual flow temperature (K) = °C + 273

Sizing - Gilflo 'B' flowmeter minimum and maximum saturated steam flowrate in kg/h

Notes:

1. Q_E = The equivalent water flowrate litres/min for a Gilflo 'B' flowmeter. These equivalent water flowrates are based on a differential pressure across the flowmeter of 349 m bar.
2. Minimum flow is 1% of maximum (100:1 turndown).
3. The table below is a guide only.

Size		QE	Steam pressure bar g										
			1	3	5	7	10	12	15	20	25	30	40
DN50	Max.	355	732	1016	1233	1415	1651	1791	1983	2269	2526	2763	3195
	Min.	4	7	10	12	14	17	18	20	23	25	28	32
DN80	Max.	1165	2403	3335	4046	4645	5418	5877	6508	7447	8291	9068	10485
	Min.	12	24	33	40	46	54	59	65	74	83	91	105
DN100	Max.	1870	3857	5353	6494	7456	8697	9434	10446	11954	13308	14556	16830
	Min.	19	39	54	65	75	87	94	104	120	133	146	168
DN150	Max.	4550	9385	13025	15802	18141	21161	22955	25416	29085	32382	35416	40951
	Min.	46	94	130	158	181	212	230	254	291	324	354	410
DN200	Max.	8085	16675	23144	28078	32235	37601	40789	45163	51683	57539	62932	72767
	Min.	81	167	231	281	322	376	408	452	517	575	629	728
DN250	Max.	11120	22936	31832	38619	44335	51716	56101	62116	71084	79139	86556	100083
	Min.	111	229	318	386	443	517	561	621	711	791	866	1001
DN300	Max.	19305	39818	55262	67044	76970	89783	97395	107838	123406	137390	150267	173750
	Min.	193	398	553	670	770	898	974	1078	1234	1374	1503	1738
DN400	Max.	31360	64682	89770	108910	125033	145847	158213	175177	200467	223183	244101	282248
	Min.	314	647	898	1089	1250	1458	1582	1752	2005	2232	2441	2822

How to order example

1 off Spirax Sarco DN150 Gilflo 'B' flowmeter flanged to EN 1092 PN16.

Sizing the ILVA flowmeter (imperial)

In order to determine the flow capacity of a Gilflo 'B' flowmeter for a particular application, it is necessary to calculate the equivalent water flowrate (Q_E) in US GPM using the following formulas.

Liquids

$$Q_E = \frac{m}{500} \sqrt{\frac{D_E}{D_L}}$$

or

$$Q_E = Q_L \sqrt{\frac{D_L}{D_E}}$$

Gases and steam actual flow conditions

$$Q_E = (0.0158) \times m \sqrt{v}$$

Gases standard conditions

$$Q_E = \sqrt{(0.0158) \times m \times D \times \frac{P_F}{P_S} \times \frac{T_S}{T_F}}$$

or

$$Q_E = (0.948) \times Q_G \sqrt{D \times \frac{P_S}{P_F} \times \frac{T_F}{T_S}}$$

D_s = Density of gas at 14.7 psi a, 520 °R (60 °F) (lb/ft³)

D_E = Density of gas at of water at calibration (62.305 lb/ft³)

D_L = Maximum flow rate of service liquid (US GPM)

m = maximum flow rate of service liquid (lb/hr)

P_s = Standard pressure 14.70 psi a

P_F = Actual flow pressure in same absolute units as P_s

Q_E = Equivalent water flowrate 70 °F (U.S. GPM)

Q_L = Maximum liquid flowrate (U.S. GPM)

Q_G = Maximum gas flowrate (SFCM)

T_s = Standard temperature (520 °R)

T_F = Actual flow temperature (°R = °F + 460)

v = specific volume of steam at normal pressure and temperature (ft³/lb)

Sizing - Gilflo 'B' flowmeter minimum and maximum saturated steam flowrate in lb/h

Notes:

1. Q_E = The equivalent water flowrate U.S. GPM for a Gilflo 'B' flowmeter. These equivalent water flowrates are based on a differential pressure across the flowmeter of 140 inches H_2O .
2. Minimum flow is 1% of maximum (100:1 turndown).
3. The table below is a guide only.

Size		Q_E	Steam pressure psi g						
			15	50	75	100	150	200	400
2"	Max.	94	1625	2353	2748	3096	3690	4203	5842
	Min.	2	16	24	27	31	37	42	58
3"	Max.	308	5332	7721	9018	10162	12110	13793	19172
	Min.	7	53	77	90	102	121	138	192
4"	Max.	494	8559	12394	14475	16311	19438	22139	30773
	Min.	11	86	124	145	165	195	221	308
6"	Max.	1202	20825	30156	35220	39687	47295	53868	74876
	Min.	12	207	302	352	399	473	539	749
8"	Max.	2136	37004	53585	62582	70520	84040	95719	133050
	Min.	21	368	530	626	710	841	956	1331
10"	Max.	2938	50894	73700	86075	96993	115587	131651	182995
	Min.	29	505	737	861	977	1156	1317	1830
12"	Max.	5100	88356	127948	149431	168385	200666	228554	317690
	Min.	51	877	1280	1494	1698	2007	2286	3177
16"	Max.	8284	143530	207845	242744	273534	325972	371275	516072
	Min.	83	1430	2079	2428	2735	3260	3713	5161

How to order example

1 off Spirax Sarco DN150 Gilflo 'B' flowmeter flanged to EN 1092 PN16.