PSL FIRE & SAFETY

GIDDENS

Hydrant Flow Meter

OWNERS MANUAL

Rev: 8 Sep 2018

WATER JET REACTION

The operation and flow rates for the Giddens Flow Meter are covered in detail on page 6 & 7 of this manual.

The users of the Giddens Flow Meter should also consider that on hydrants supplied by water mains with high pressure and high flow rates requiring the use of the larger Giddens orifice sizes, there is a considerable reaction force exerted on the standpipe the gauge is fitted to.

In order to keep this to a minimum and avoid sudden shock and stress on the standpipe, after flushing the hydrant and fitting the Giddens gauge the hydrant should be opened slowly and the flow increased slowly over a period of 15—30 seconds until either the hydrant is fully open or the pressure gauge on the Giddens has reached 100 kPa, do not exceed 100 kPa on the gauge. If 100 kPa is reached on the largest orifice #5 you have reached the measurement limit of the Giddens Gauge of 54 litres per second, do not open the hydrant beyond this point as this will risk damage to the pressure gauge, and possibly the standpipe or underground hydrant.

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PSL FIRE & SAFETY

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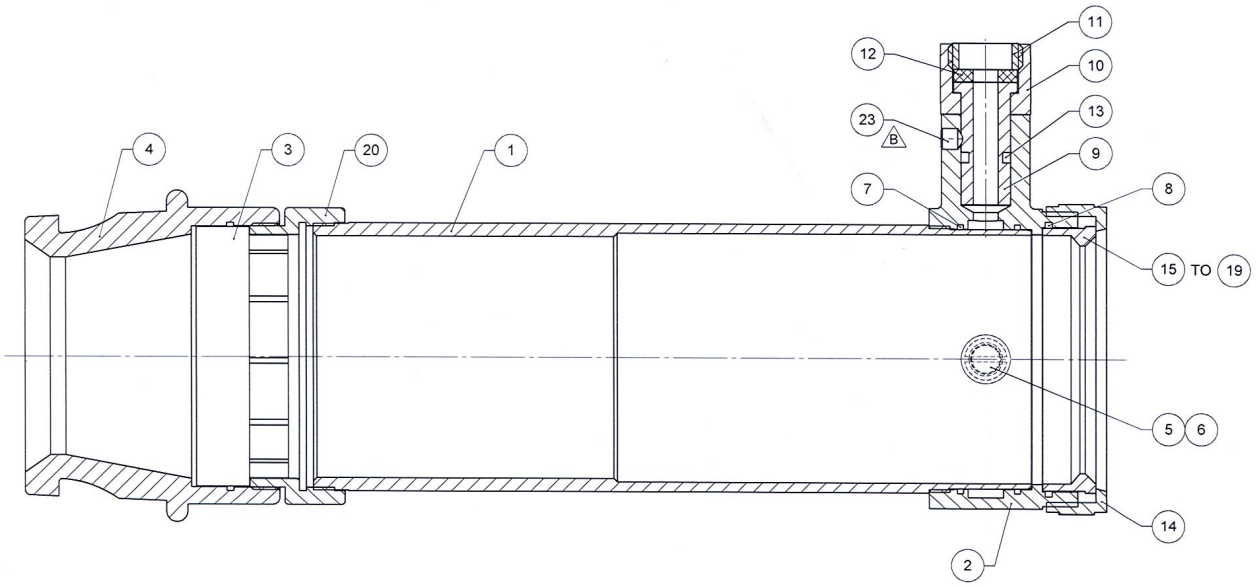
PARTS DRAWING



ITEM	PART NO:	DESCRIPTION	NO. OF
1	063302	Flow Tube	1
2	063303	Piezometer Ring	1
3	063304	Inlet Grating	1
4	063305	Male Inlet Adaptor	1
5	063310	Plug	2
6	P4140	Fibre Washer	2
7	P4098	'O' Ring 040	2
8	P4099	'O' Ring 041	1
9	063309	Gauge Union Liner	1
10	063307	Gauge Union Nut	1
11	063308	Gauge Union Bush	1
12	P4139	Washer	1
13	P4037	'O' Ring 110	1
14	063311	Retaining Nut	1
15	063312	Orifice Ring No. 1	1
16	063313	Orifice Ring No. 2	1
17	063314	Orifice Ring No. 3	1
18	063315	Orifice Ring No. 4	1
19	063316	Orifice Ring No. 5	1
20	063321	Strainer Holder S/S	1
21	063319	Pressure Gauge 0/160kPa (not shown)	1
22	063317	Blank Cap Assy (not shown)	1
23	P2523	Grub Screw SS M6 x 6	1

The Type A hydrant flow meter comprises a short flow tube fitted at the inlet end with an instantaneous coupling and at the outlet end with a socket for holding any one of a series of five interchangeable orifices. If the inlet grating provided to catch any large foreign objects should become damaged and require replacement, then the Gidden flow gauge should be returned to PSL to have this work carried out. Near the outlet end of the tube, a piezometer gallery is provided around the tube and two small diameter holes allow access for the tube pressure into the gallery. Opposite these holes are plugs which can be removed to give access to the holes for cleaning if necessary. The gallery leads the tube pressure to the top of the instrument where it is measured by a pressure gauge.

The Type A hydrant flow meter is designed to be fitted directly on to a hydrant standpipe from which the flow discharges horizontally through a sharply curving 90° bend. Such a bend causes the flow to be uneven and one of tasks of the meter is to even out this flow before the measuring point. One way of doing this would be to incorporate in the meter a sufficient length of straight pipe but then the meter could become large and cumbersome. In the GIDDENS hydrant flow meter various principles are used in the design to enable to length of the meter to be reduced to a minimum.

The manufacturing tolerances are such that any component can be replaced without the need to recalibrate the meter by flow testing. The screw threads for installing the pressure gauge and 1/2" BSP parallel allow other pressure gauges or pressure transducers to be fitted, or supplied on request. The standard issue is a general purpose industrial pressure gauge, 100mm dial, 0 to 160 kPa, Class 1.

The flow range of the instrument is 3.3 - 54.0 litres per second, 200 - 3240 litres per minute or 44 – 712 imperial gallons per minute. This range is covered by three orifices, D1, D3 and D5 and two additional orifices, D2 and D4, are supplied to overlap these ranges.

The instrument exerts a small back pressure on the outlet and this back pressure depends on the particular orifice being used and the flow rate through it. In practice, the minimum back pressure exerted on a hydrant is the pressure necessary to ensure the inflation of the layflat hose. The instrument has been designed not to exceed this back pressure because an excessive back pressure would reduce the flow rate and the full working capacity of the hydrant would be not measured. A more detailed discussion of back pressure occurs later in this manual.

It may be found that on dismounting the meter, foreign matter has been trapped or caught on the grating. By and large, small quantities of fibrous matter wrapped around the blades of the grating will not influence the operation or the accuracy of the meter but the reading should be repeated if a solid object such as a stone, that will not pass through the grating, is retained.

METHOD OF OPERATION

The use of a New Zealand Fire Service fire hydrant is recommended.

1. Fit the hydrant standpipe and flush out the line until the water runs clean and free from stones, etc. Estimate the flow rate with a view to choosing the right size orifice.

2. Remove the meter from the case complete with the pressure gauge. The pressure gauge union is fitted with a captive washer and hand tightness is sufficient.

3. Fit the meter to the standpipe with the pressure gauge vertical, making sure it is securely engaged.

4. Fit the most likely orifice.

5. Turn on the water with care. If the pressure is to exceed 100 kPa, fit a larger orifice. If the reading is less than 15 kPa, with the valve fully open, fit a smaller orifice. If the operating pressure is in the range of 15 - 40 kPa the use of the next smaller orifice is optional. If the pressure is in the range of 40 - 100 kPa, the use of the next larger orifice size is optional.

Some leakage may drip or trickle slowly from the joints in the meter when in use. The pressure gauge connections should not leak but some leakage from the other joints is normal and quite insignificant in comparison with the flow being measured. If any difficulty is experienced in operating the meter, check the condition of the standpipe rubber sealing washer and replace if necessary.

6. Tap the pressure gauge. Read the pressure gauge and refer to the table for the flow rate in the required units. The instantaneous coupling is of necessity an easy fit and it can leave the meter free to vibrate and this can make the pressure gauge needle fluctuate. This can be reduced by steadying the meter by hand when reading the pressure gauge.

7. If the static pressure in the main is required, remove the meter and use the static pressure gauge to measure the static supply pressure.

CARE OF THE METER

The meter is a precision instrument and should be treated as such.

The pressure gauge will not withstand severe jarring and should not be over-pressured beyond full scale.

Avoid excessive water remaining in the case for extended periods and dry the instrument when returning from field measurements to protect the equipment.

ACCURACY

As a result of exhaustive testing and standardized manufacturing dimensions, the flow tables are provided and considered to be accurate to + or - 1/2 %. However, the accuracy with which the discharge will be measured in the field then depends on the accuracy of reading the pressure gauge.

The allowable error in a Class 1 pressure gauge as delivered by the manufacturer is 1% of full scale. In this case, that is + or - 1.6 kPa. Thus, if the gauge is read carefully at 100 kPa, to the nearest 1 kPa, the total possible error in flow rate is 1½%.

If the gauge reading were 40 kPa the overall accuracy would be 3% and if the gauge reading were 15 kPa the overall accuracy would be 7%. With overlapping ranges of the 5 orifices, it is possible to measure all flow rates, except those below 5.2 l/s (69 gpm or 210 l/m) in the 40 - 100 kPa pressure range.

To maintain the initial accuracy the pressure gauge needs to be handled with due care. It should not be dropped and it should not be over pressured beyond its full scale range. Furthermore it should be checked periodically to ensure it remains in adjustment. The use of smaller sized gauges could be considered. Smaller gauges are likely to be more rugged but less accurate to use.

BACK PRESSURE

The flow rate that can be drawn from any water supply system depends on the back pressure. If a system is fully opened to atmosphere, the back pressure will be zero and a maximum discharge will occur. The only way in which that discharge can be increased is by reducing the back pressure below zero and sucking more water out to the system - this is normally to be avoided.

In the normal case, the equipment that is coupled to the system will impose some back pressure on the system and the greater this back pressure the less water that will be drawn from the system. In the case of a layflat hose and nozzle coupled to a hydrant the back pressure will be high due to the back pressure of the nozzle itself. This is communicated back to the system through the layflat hose which will itself be under this high pressure and the nozzle discharge will be much less than the free flow rate of the hydrant discharging to atmosphere.

In the case of a layflat hose coupled to a hydrant and leading to the suction intake or a pump, the action of the pump will be to reduce the back pressure on the system and draw more water from it. This is then pressurized by the pump up to a sufficient pressure for fire fighting purposes. However, the pressure in the layflat hose has to be sufficient to maintain the inflation of the hose and for this purpose a back pressure in the hose of 40 - 100 kPa is considered sufficient. The back pressure created by the hydrant flow meter is matched to this duty.

The back pressure of the meter can be ascertained from the pressure gauge reading and for the three smallest orifices (D1, D2 and D3) the back pressure is, in fact the same as the pressure gauge reading. The relationship between the pressure gauge reading and the back pressure for the full range of gauge pressures from 15 - 100 kPa is given for each orifice size below.

ORIFICE	BACK PRESSURE
D1	The same as the pressure gauge reading.
D2	The same as the pressure gauge reading.
D3	The same as the pressure gauge reading.
D4	90% of the pressure gauge reading.
D5	75% of the pressure gauge reading.

(a) AS REQUIRED

The grating should be checked for fouling. The interchangeable, measuring orifices should be checked for damage due to stones etc. If used on very dirty water the small internal orifices should be inspected to see if they could be blocked. If blockage is suspected the plugs could be removed and holes cleared. The holes should not be enlarged above their original diameter of 1.0 mm. If there is any possibility the gallery is blocked with mud or silt it can be cleaned, after removing the pressure gauge by flushing out the gallery with high pressure water or compressed air. If an orifice becomes damaged due to the action of stones etc. and doubts are held for the accuracy of the flow measurement the particular orifice should be sent to PSL and it will be tested and returned or a new replacement forwarded.

(b) PERIODIC

If it is suspected that the pressure gauge has gone out of adjustment if should be checked immediately. Otherwise check at regular intervals of no more than 12 months. The most convenient means of checking is a simple comparator.
Use a pressure regulator to control the municipal water supply to give a controlled pressure covering the range of 15 - 100 kPa and a reliable reference gauge against which to compare the field gauges. In designing such equipment it is important that the pressure gauges can not be accidentally over pressured. Advice is available on application on the design or supply of suitable equipment for this purpose. If a gauge were out of adjustment it would be normal to reset the adjustments and restore the correct reading over the range. This would normally be done by an instrument mechanic.

LITRES PER SECOND

Calibration Date - September 1983

PRESSURE	DISCHARGE				
kPa	D1 l/s	D2 l/s	D3 l/s	D4 l/s	D5 l/s
15	3.3	5.2	8.2	13.2	21.6
16	3.4	5.4	8.5	13.6	22.3
17	3.5	5.5	8.7	14.0	22.9
18	3.6	5.7	9.0	14.3	23.5
19	3.7	5.8	9.2	14.7	24.2
20	3.8	6.0	9.4	15.1	24.8
21	3.9	6.1	9.6	15.4	25.3
22	4.0	6.3	9.9	15.8	25.9
23	4.1	6.4	10.1	16.1	26.5
24	4.2	6.5	10.3	16.4	27.0
25	4.3	6.7	10.5	16.8	27.5
26	4.3	6.8	10.7	17.1	28.1
27	4.4	6.9	10.9	17.4	28.6
28	4.5	7.0	11.1	17.7	29.1
29	4.6	7.2	11.3	18.0	29.6
30	4.6	7.3	11.5	18.3	30.1
31	4.7	7.4	11.6	18.6	30.5
32	4.8	7.5	11.8	18.9	31.0
33	4.9	7.6	12.0	19.2	31.5
34	4.9	7.7	12.2	19.4	31.9
35	5.0	7.8	12.3	19.7	32.4
36	5.1	7.9	12.5	20.0	32.8
37	5.1	8.0	12.7	20.3	33.3
38	5.2	8.2	12.8	20.5	33.7
39	5.3	8.3	13.0	20.8	34.1
40	5.3	8.4	13.2	21.0	34.5
41	5.4	8.5	13.3	21.3	35.0
42	5.5	8.6	13.5	21.5	35.4
43	5.5	8.7	13.6	21.8	35.8
44	5.6	8.8	13.8	22.0	36.2
45	5.6	8.8	13.9	22.3	36.6
46	5.7	8.9	14.1	22.5	37.0
47	5.8	9.0	14.2	22.7	37.3
48	5.8	9.1	14.4	23.0	37.7
49	5.9	9.2	14.5	23.2	38.1
50	5.9	9.3	14.7	23.4	38.5
51	6.0	9.4	14.8	23.7	38.9
52	6.1	9.5	15.0	23.9	39.2
53	6.1	9.6	15.1	24.1	39.6
54	6.2	9.7	15.2	24.3	40.0
55	6.2	9.8	15.4	24.6	40.3
56	6.3	9.8	15.5	24.8	40.7
57	6.3	9.9	15.6	25.0	41.0

PRESSURE	DISCHARGE				
kPa	D1 l/s	D2 l/s	D3 l/s	D4 l/s	D5 l/s
58	6.4	10.0	15.8	25.2	41.4
59	6.4	10.1	15.9	25.4	41.7
60	6.5	10.2	16.0	25.6	42.1
61	6.5	10.3	16.2	25.8	42.4
62	6.6	10.3	16.3	26.0	42.7
63	6.7	10.4	16.4	26.2	43.1
64	6.7	10.5	16.6	26.4	43.4
65	6.8	10.6	16.7	26.6	43.7
66	6.8	10.7	16.8	26.8	44.1
67	6.9	10.7	16.9	27.0	44.4
68	6.9	10.8	17.1	27.2	44.7
69	7.0	10.9	17.2	27.4	45.0
70	7.0	11.0	17.3	27.6	45.3
71	7.1	11.1	17.4	27.8	45.7
72	7.1	11.1	17.5	28.0	46.0
73	7.2	11.2	17.7	28.2	46.3
74	7.2	11.3	17.8	28.4	46.6
75	7.2	11.4	17.9	28.5	46.9
76	7.3	11.4	18.0	28.7	47.2
77	7.3	11.5	18.1	28.9	47.5
78	7.4	11.6	18.2	29.1	47.8
79	7.4	11.6	18.4	29.3	48.1
80	7.5	11.7	18.5	29.5	48.4
81	7.5	11.8	18.6	29.6	48.7
82	7.6	11.9	18.7	29.8	49.0
83	7.6	11.9	18.8	30.0	49.3
84	7.7	12.0	18.9	30.2	49.6
85	7.7	12.1	19.0	30.3	49.9
86	7.7	12.1	19.1	30.5	50.1
87	7.8	12.2	19.2	30.7	50.4
88	7.8	12.3	19.4	30.9	50.7
89	7.9	12.3	19.5	31.0	51.0
90	7.9	12.4	19.6	31.2	51.3
91	8.0	12.5	19.7	31.4	51.5
92	8.0	12.5	19.8	31.5	51.8
93	8.0	12.6	19.9	31.7	52.1
94	8.1	12.7	20.0	31.9	52.4
95	8.1	12.7	20.1	32.0	52.6
96	8.2	12.8	20.2	32.2	52.9
97	8.2	12.9	20.3	32.4	53.2
98	8.3	12.9	20.4	32.5	53.4
99	8.3	13.0	20.5	32.7	53.7
100	8.3	13.1	20.6	32.8	54.0

LITRES PER MINUTE

Calibration Date - September 1983

PRESSURE	DISCHARGE				
kPa	D1 l/m	D2 l/m	D3 l/m	D4 l/m	D5 l/m
15	200	310	490	790	1300
16	210	320	510	810	1340
17	210	330	520	840	1380
18	220	340	540	860	1410
19	220	350	550	880	1450
20	230	360	570	900	1490
21	230	370	580	930	1520
22	240	380	590	950	1550
23	250	380	600	970	1590
24	250	390	620	990	1620
25	260	400	630	1010	1650
26	260	410	640	1030	1680
27	260	410	650	1040	1710
28	270	420	660	1060	1740
29	270	430	680	1080	1770
30	280	440	690	1100	1800
31	280	440	700	1120	1830
32	290	450	710	1130	1860
33	290	460	720	1150	1890
34	300	460	730	1170	1920
35	300	470	740	1180	1940
36	300	480	750	1200	1970
37	310	480	760	1220	2000
38	310	490	770	1230	2020
39	320	500	780	1250	2050
40	320	500	790	1260	2070
41	320	510	800	1280	2100
42	330	510	810	1290	2120
43	330	520	820	1310	2150
44	340	530	830	1320	2170
45	340	530	840	1340	2190
46	340	540	850	1350	2220
47	350	540	850	1360	2240
48	350	550	860	1380	2260
49	350	550	870	1390	2290
50	360	560	880	1410	2310
51	360	560	890	1420	2330
52	360	570	900	1430	2350
53	370	580	910	1450	2380
54	370	580	910	1460	2400
55	370	590	920	1470	2420
56	380	590	930	1490	2440
57	380	600	940	1500	2460

PRESSURE DISCHARGE

kPa	D1 l/m	D2 l/m	D3 l/m	D4 l/m	D5 l/m
58	380	600	950	1510	2480
59	390	610	950	1520	2500
60	390	610	960	1540	2520
61	390	620	970	1550	2540
62	400	620	980	1560	2560
63	400	630	990	1570	2580
64	400	630	990	1590	2600
65	410	640	1000	1600	2620
66	410	640	1010	1610	2640
67	410	640	1020	1620	2660
68	410	650	1020	1630	2680
69	420	650	1030	1640	2700
70	420	660	1040	1660	2720
71	420	660	1050	1670	2740
72	430	670	1050	1680	2760
73	430	670	1060	1690	2780
74	430	680	1070	1700	2800
75	430	680	1070	1710	2810
76	440	690	1080	1720	2830
77	440	690	1090	1740	2850
78	440	690	1090	1750	2870
79	450	700	1100	1760	2890
80	450	700	1110	1770	2900
81	450	710	1120	1780	2920
82	450	710	1120	1790	2940
83	460	720	1130	1800	2960
84	460	720	1140	1810	2970
85	460	720	1140	1820	2990
86	460	730	1150	1830	3010
87	470	730	1150	1840	3030
88	470	740	1160	1850	3040
89	470	740	1170	1860	3060
90	480	740	1170	1870	3080
91	480	750	1180	1880	3090
92	480	750	1190	1890	3110
93	480	760	1190	1900	3130
94	490	760	1200	1910	3140
95	490	760	1210	1920	3160
96	490	770	1210	1930	3170
97	490	770	1220	1940	3190
98	500	780	1220	1950	3210
99	500	780	1230	1960	3220
100	500	780	1240	1970	3240

GALLONS PER MINUTE

Calibration Date - September 1983

PRESSURE	DISCHARGE				
kPa	D1 g/m	D2 g/m	D3 g/m	D4 g/m	D5 g/m
15	44	69	109	174	285
16	45	71	112	179	294
17	47	73	115	184	303
18	48	75	118	189	311
19	49	77	121	194	319
20	50	79	124	199	327
21	52	81	127	204	334
22	53	83	130	208	342
23	54	84	133	213	349
24	55	86	136	217	356
25	56	88	138	221	363
26	57	90	141	226	370
27	58	91	144	230	377
28	59	93	146	234	384
29	60	94	149	238	390
30	61	96	151	242	397
31	62	97	154	245	403
32	63	99	156	249	409
33	64	100	158	253	415
34	65	102	161	257	421
35	66	103	163	260	427
36	67	105	165	264	433
37	68	106	167	267	439
38	69	108	169	271	445
39	70	109	172	274	450
40	70	110	174	278	456
41	71	112	176	281	461
42	72	113	178	284	467
43	73	114	180	288	472
44	74	116	182	291	477
45	75	117	184	294	483
46	75	118	186	297	488
47	76	119	188	300	493
48	77	121	190	303	498
49	78	122	192	306	503
50	78	123	194	309	508
51	79	124	196	312	513
52	80	125	197	315	518
53	81	126	199	318	523
54	81	128	201	321	527
55	82	129	203	324	532
56	83	130	205	327	537
57	84	131	206	330	541

PRESSURE DISCHARGE

kPa	D1 g/m	D2 g/m	D3 g/m	D4 g/m	D5 g/m
58	84	132	208	332	546
59	85	133	210	335	551
60	86	134	212	338	555
61	86	135	213	341	560
62	87	137	215	343	564
63	88	138	217	346	569
64	88	139	219	349	573
65	89	140	220	351	577
66	90	141	222	354	582
67	90	142	223	357	586
68	91	143	225	359	590
69	92	144	227	362	594
70	92	145	228	364	598
71	93	146	230	367	603
72	94	147	232	369	607
73	94	148	233	372	611
74	95	149	235	374	615
75	96	150	236	377	619
76	96	151	238	379	623
77	97	152	239	382	627
78	97	153	241	384	631
79	98	154	242	386	635
80	99	155	244	389	639
81	99	156	245	391	643
82	100	157	247	394	647
83	100	157	248	396	650
84	101	158	250	398	654
85	102	159	251	400	658
86	102	160	253	403	662
87	103	161	254	405	665
88	103	162	255	407	669
89	104	163	257	410	673
90	105	164	258	412	677
91	105	165	260	414	680
92	106	166	261	416	684
93	106	167	263	418	687
94	107	167	264	421	691
95	107	168	265	423	695
96	108	169	267	425	698
97	108	170	268	427	702
98	109	171	269	429	705
99	110	172	271	431	709
100	110	173	272	433	712