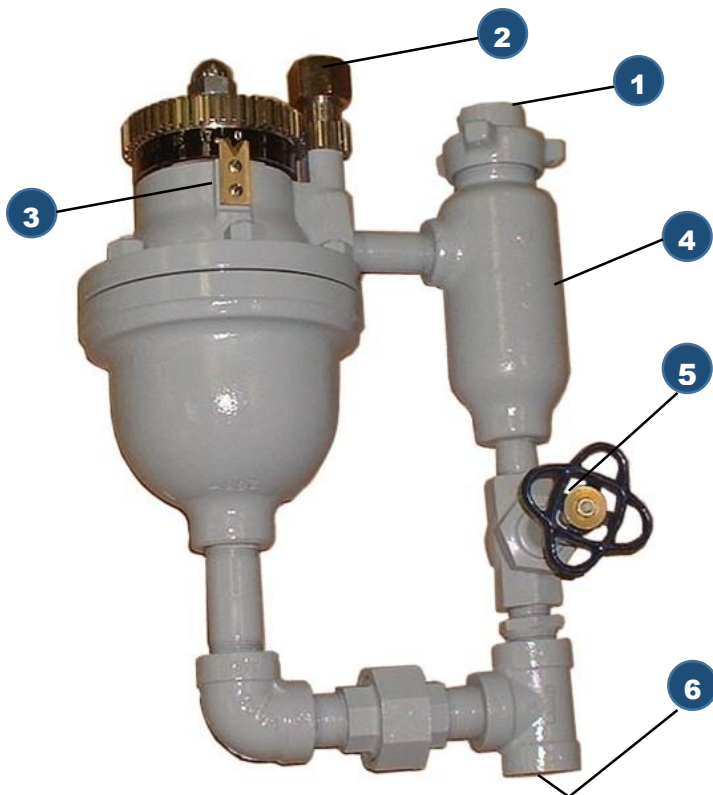


## Continuous Boiler Blowdown Flow Control Improves Boiler Efficiency and Water Quality



### Two Models:

- OM250, for boilers up to 250 psi
- OM650, for boilers up to 650 psi

### Features Include:

1. Inlet connection: 3/4" NPT
2. Adjustment pinion, removable for security
3. Index to locate orifice hole for required blowdown rate
4. Sediment chamber with stainless steel filter screen keeps large solids from clogging orifices
5. Drain valve to flush solids from the sediment chamber
6. Drain connection: 1" NPT for model OM250 and 1-1/4" for model OM650
7. Orifice Plate with 17 different hole sizes, see page 2 for details (not shown in photo on the left)

The Madden Orifice Meter gives the boiler operator precise repeatable control of the continuous blowdown flow rate. 17 different hole sizes are drilled in the stainless steel orifice plate. Each hole is precision drilled to a diameter that will produce the flow shown on the flow chart, (see pages 3 and 4). By selecting a larger hole the continuous blowdown flow is increased, or by selecting a smaller hole number on the index band the blowdown is reduced. Four different orifice plates (1A, 2A, 3A, and 4A) are available to provide a blowdown flow range suitable for the boiler operator to maintain the target boiler water quality level.

The boiler must have a continuous blowdown skimmer pipe installed inside the boiler drum, with the opening for the pipe within 6" of the normal water level in the boiler drum. The Madden Orifice Meter may be mounted near the boiler or near a continuous blowdown heat recovery system. The constant blowdown flow provided by the Madden Orifice Meter makes it an ideal device for use in conjunction with a blowdown heat recovery system, see the Madden heat recovery system brochure for details.

The Madden Orifice Meter has been in production for 60+ years. The units are generally used on industrial boilers from 200 HP up to over 100,000 PPH steam production, operating at pressures from 50 psi up to 650 psi. One unit is required for each boiler. The meter can be utilized as the sole flow control device or piped in parallel with a conductivity sensing blowdown control. The units are also used with non-fired boilers and reboilers used in refineries. The Madden Orifice Meter is guaranteed for up to 10 years against damage from cutting, wire drawing, or other distortion in the orifice plate.

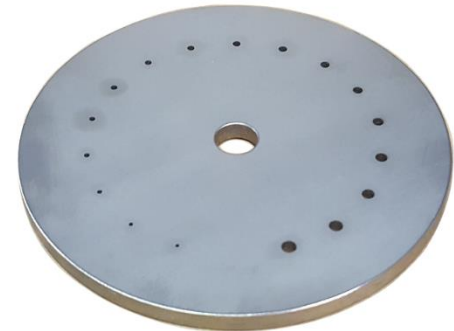
# MADDEN Orifice Meter

## Tough components at the heart of the Madden Orifice Meter

- The index slot in the steel selector disc exposes the desired orifice on the orifice plate for service. The selector disc rotates when the adjustment key is turned from one index number to another. The disc has a Stellite surface hardening coating and is lapped to the same finish and flatness as the mating orifice plate to insure a leak free seal.
- Type 420 stainless steel material is used to make the orifice plate. The plate is drilled with 17 holes of increasing size. See the flow charts on pages 3 and 4 for the actual hole sizes and the blowdown rate for each hole at various boiler pressures. The orifice plate is heat treated to 500 brinnell hardness and lapped to a mirror finish with a tolerance of three light bands (.00003"). The lapped finish prevents high pressure water from leaking through any orifice but the one selected.



**Selector Disc**



**Orifice Plate**

Part No.	Boiler Max Psi	Orifice Plate Size	Shipping wt. (lbs)	Dimensions (W x D x H)
OM2501A	250	1A	64	11.5" x 9" x 19"
OM2502A	250	2A	64	11.5" x 9" x 19"
OM2503A	250	3A	64	11.5" x 9" x 19"
OM2504A	250	4A	64	11.5" x 9" x 19"
OM6501A	650	1A	80	14" x 12.5" x 20"
OM6502A	650	2A	80	14" x 12.5" x 20"
OM6503A	650	3A	80	14" x 12.5" x 20"
OM6504A	650	4A	80	14" x 12.5" x 20"

### Specification:

1. General: The contractor shall furnish and install a flow control for continuous boiler blowdown, model no. (OM250 or OM650) as manufactured by Madden Manufacturing, Inc., Elkhart, IN. This equipment will have a maximum design working pressure of (250 or 650) p.s.i.g. The meter will be capable of precise flow control of continuous boiler blowdown using the straight edge orifice principle at a boiler operating pressure of \_\_\_ p.s.i.g., with a blowdown flow range from \_\_\_ PPH to \_\_\_ PPH.
2. The flow control shall consist of: A multiple orifice meter with an attached filter and sediment chamber designed to trap scale and suspended solids that could clog the small orifice holes. The stainless steel filter screen mesh will be smaller than the smallest hole in the orifice plate. The flow control will have a hardened stainless steel plate with not less than seventeen (17) graduated orifices, spaced and indexed so only one of the orifices will be opened to flow at a time. The orifices will be graduated in size to provide a range in rate of flow to cover the minimum and maximum continuous blowdown requirements of the boiler. The orifice plates shall be machined, heat treated, and along with the mating selector disc be ground and lapped to a flatness of three light bands to prevent leakage and wire drawing damage. The unit will have a gear driven indexing mechanism with a removable key to prevent tampering. A drain valve will be provided to flush the filter and sediment chamber.
3. A flowchart will be provided showing the blowdown flow in pounds per hour at the boiler operating pressure for each orifice setting. A manual for installation, operation and maintenance will be provided.
4. One orifice meter unit is required for each boiler.

# MADDEN MANUFACTURING: Continuous Boiler Blowdown Orifice Meter Flow Chart

## Orifice Plate Number 1-A Flow in lbs. of Water Per Hour

### Model OM250-1A

### Model OM650-1A

Pressure - PSIG	50	75	100	125	150	175	200	225	250	300	350	400	450	500	550	600	650
Orifice #1 – Dia - .040"	75	94	106	118	130	139	149	159	167	183	198	212	225	236	248	259	270
Orifice #2 – Dia - .0468"	103	130	146	162	179	191	205	218	230	251	272	291	308	324	342	356	368
Orifice #3 – Dia - .0555"	143	181	204	224	250	267	286	304	321	351	380	407	432	454	473	496	515
Orifice #4 – Dia - .0625"	183	232	260	288	318	340	366	389	409	448	484	519	549	578	608	633	656
Orifice #5 – Dia - .070"	228	289	326	361	398	426	457	486	512	560	606	649	687	725	760	797	830
Orifice #6 – Dia - .0785"	287	364	409	454	501	535	576	610	645	704	763	816	865	911	956	995	1030
Orifice #7 – Dia - .086"	344	438	490	545	600	642	690	733	772	845	916	978	1038	1091	1148	1194	1248
Orifice #8 – Dia - .0935"	406	520	579	642	710	758	815	866	914	998	1080	1155	1223	1290	1356	1411	1465
Orifice #9 – Dia - .0995"	462	589	657	730	806	861	926	985	1039	1132	1229	1312	1390	1465	1540	1605	1667
Orifice #10 – Dia - .1065"	530	676	755	837	925	987	1061	1129	1186	1300	1409	1507	1595	1680	1762	1840	1920
Orifice #11 – Dia - .113"	595	756	847	941	1039	1110	1192	1269	1338	1460	1581	1691	1791	1889	1985	2066	2145
Orifice #12 – Dia - .120"	670	854	955	1060	1170	1250	1345	1430	1503	1643	1785	1903	2015	2128	2232	2325	2420
Orifice #13 – Dia - .1285"	771	977	1097	1218	1345	1437	1545	1640	1730	1890	2048	2190	2320	2443	2570	2676	2780
Orifice #14 – Dia - .136"	864	1089	1230	1364	1508	1610	1730	1838	1936	2119	2295	2455	2600	2740	2872	2990	3105
Orifice #15 – Dia - .144"	966	1229	1378	1529	1689	1800	1936	2060	2170	2372	2570	2742	2908	3055	3218	3355	3490
Orifice #16 – Dia - .152"	1079	1370	1532	1702	1880	2008	2160	2295	2420	2640	2862	3060	3243	3420	3590	3741	3890
Orifice #17 – Dia - .161"	1210	1538	1722	1911	2115	2256	2425	2580	2720	2970	3220	3440	3648	3840	4040	4205	4365

## Orifice Plate Number 2-A Flow in lbs. of Water Per Hour

### Model OM250-2A

### Model OM650-2A

Pressure - PSIG	50	75	100	125	150	175	200	225	250	300	350	400	450	500	550	600	650
Orifice #1 – Dia - .0785"	287	364	409	454	501	535	576	610	645	704	763	816	865	911	956	995	1030
Orifice #2 – Dia - .086"	344	438	490	545	600	642	690	733	772	845	916	978	1038	1091	1148	1194	1248
Orifice #3 – Dia - .0935"	406	520	579	642	710	758	815	866	914	998	1080	1155	1223	1290	1356	1411	1465
Orifice #4 – Dia - .0995"	462	589	657	730	806	861	926	985	1039	1132	1229	1312	1390	1465	1540	1605	1667
Orifice #5 – Dia - .1065"	530	676	755	837	925	987	1061	1129	1186	1300	1409	1507	1595	1680	1762	1840	1920
Orifice #6 – Dia - .113"	595	756	847	941	1039	1110	1192	1269	1338	1460	1581	1691	1791	1889	1985	2066	2145
Orifice #7 – Dia - .120"	670	854	955	1060	1170	1250	1345	1430	1503	1643	1785	1903	2015	2128	2232	2325	2420
Orifice #8 – Dia - .1285"	771	977	1097	1218	1345	1437	1545	1640	1730	1890	2048	2190	2320	2443	2570	2676	2780
Orifice #9 – Dia - .136"	864	1089	1230	1364	1508	1610	1730	1838	1936	2119	2295	2455	2600	2740	2872	2990	3105
Orifice #10 – Dia - .144"	966	1229	1378	1529	1689	1800	1936	2060	2170	2372	2570	2742	2908	3055	3218	3355	3490
Orifice #11 – Dia - .152"	1079	1370	1532	1702	1880	2008	2160	2295	2420	2640	2862	3060	3243	3420	3590	3741	3890
Orifice #12 – Dia - .161"	1210	1538	1722	1911	2115	2256	2425	2580	2720	2970	3220	3440	3648	3840	4040	4205	4365
Orifice #13 – Dia - .1718"	1378	1747	1960	2175	2400	2563	2760	2930	3090	3370	3660	3910	4149	4365	4590	4780	4960
Orifice #14 – Dia - .182"	1548	1958	2200	2444	2700	2880	3100	3295	3470	3794	4110	4385	4655	4900	5150	5361	5560
Orifice #15 – Dia - .1935"	1749	2215	2490	2761	3050	3260	3510	3720	3923	4290	4650	4960	5260	5550	5820	6060	6290
Orifice #16 – Dia - .2055"	1970	2490	2800	3110	3430	3665	3942	4190	4420	4830	5230	5595	5925	6245	6550	6835	7110
Orifice #17 – Dia - .2187"	2238	2835	3180	3530	3900	4160	4480	4760	5020	5485	5950	6360	6740	7090	7450	7760	8060

# MADDEN MANUFACTURING: Continuous Boiler Blowdown Orifice Meter Flow Chart

## Orifice Plate Number 3-A Flow in lbs. of Water Per Hour

### Model OM250-3A

### Model OM650-3A

Pressure - PSIG	50	75	100	125	150	175	200	225	250	300	350	400	450	500	550	600	650
Orifice #1 – Dia - .113"	595	756	847	941	1039	1110	1192	1269	1338	1460	1581	1691	1791	1889	1985	2066	2145
Orifice #2 – Dia - .120"	670	854	955	1060	1170	1250	1345	1430	1503	1643	1785	1903	2015	2128	2232	2325	2420
Orifice #3 – Dia - .1285"	771	977	1097	1218	1345	1437	1545	1640	1730	1890	2048	2190	2320	2443	2570	2676	2780
Orifice #4 – Dia - .136"	864	1089	1230	1364	1508	1610	1730	1838	1936	2119	2295	2455	2600	2740	2872	2990	3105
Orifice #5 – Dia - .144"	966	1229	1378	1529	1689	1800	1936	2060	2170	2372	2570	2742	2908	3055	3218	3355	3490
Orifice #6 – Dia - .152"	1079	1370	1532	1702	1880	2008	2160	2295	2420	2640	2862	3060	3243	3420	3590	3741	3890
Orifice #7 – Dia - .161"	1210	1538	1722	1911	2115	2256	2425	2580	2720	2970	3220	3440	3648	3840	4040	4205	4365
Orifice #8 – Dia - .1718"	1378	1747	1960	2175	2400	2563	2760	2930	3090	3370	3660	3910	4149	4365	4590	4780	4960
Orifice #9 – Dia - .182"	1548	1958	2200	2444	2700	2880	3100	3295	3470	3794	4110	4385	4655	4900	5150	5361	5560
Orifice #10 – Dia - .1935"	1749	2215	2490	2761	3050	3260	3510	3720	3923	4290	4650	4960	5260	5550	5820	6060	6290
Orifice #11 – Dia - .2055"	1970	2490	2800	3110	3430	3665	3942	4190	4420	4830	5230	5595	5925	6245	6550	6835	7110
Orifice #12 – Dia - .2187"	2238	2835	3180	3530	3900	4160	4480	4760	5020	5485	5950	6360	6740	7090	7450	7760	8060
Orifice #13 – Dia - .234"	2543	3215	3620	4020	4440	4740	5100	5420	5710	6240	6765	7230	7660	8060	8480	8840	9190
Orifice #14 – Dia - .246"	2825	3580	4025	4460	4942	5260	5660	6020	6345	6940	7518	8040	8510	8960	9415	9830	10230
Orifice #15 – Dia - .261"	3180	4025	4515	5015	5530	5905	6355	6760	7119	7775	8445	9010	9555	10060	10560	11105	11585
Orifice #16 – Dia - .277"	3579	4528	5090	5650	6240	6660	7160	7620	8020	8770	9510	10180	10770	11320	11900	12400	12890
Orifice #17 – Dia - .295"	4060	5130	5760	6405	7085	7555	8125	8635	9100	9940	10790	11510	12205	12850	13500	14070	14620

## Orifice Plate Number 4-A Flow in lbs. of Water Per Hour

### Model OM250-4A

### Model OM650-4A

Pressure - PSIG	50	75	100	125	150	175	200	225	250	300	350	400	450	500	550	600	650
Orifice #1 – Dia - .152"	1079	1370	1532	1702	1880	2008	2160	2295	2420	2640	2862	3060	3243	3420	3590	3741	3890
Orifice #2 – Dia - .161"	1210	1538	1722	1911	2115	2256	2425	2580	2720	2970	3220	3440	3648	3840	4040	4205	4365
Orifice #3 – Dia - .1718"	1378	1747	1960	2175	2400	2563	2760	2930	3090	3370	3660	3910	4149	4365	4590	4780	4960
Orifice #4 – Dia - .182"	1548	1958	2200	2444	2700	2880	3100	3295	3470	3794	4110	4385	4655	4900	5150	5361	5560
Orifice #5 – Dia - .1935"	1749	2215	2490	2761	3050	3260	3510	3720	3923	4290	4650	4960	5260	5550	5820	6060	6290
Orifice #6 – Dia - .2055"	1970	2490	2800	3110	3430	3665	3942	4190	4420	4830	5230	5595	5925	6245	6550	6835	7110
Orifice #7 – Dia - .2187"	2238	2835	3180	3530	3900	4160	4480	4760	5020	5485	5950	6360	6740	7090	7450	7760	8060
Orifice #8 – Dia - .234"	2543	3215	3620	4020	4440	4740	5100	5420	5710	6240	6765	7230	7660	8060	8480	8840	9190
Orifice #9 – Dia - .246"	2825	3580	4025	4460	4942	5260	5660	6020	6345	6940	7518	8040	8510	8960	9415	9830	10230
Orifice #10 – Dia - .261"	3180	4025	4515	5015	5530	5905	6355	6760	7119	7775	8445	9010	9555	10060	10560	11105	11585
Orifice #11 – Dia - .277"	3579	4528	5090	5650	6240	6660	7160	7620	8020	8770	9510	10180	10770	11320	11900	12400	12890
Orifice #12 – Dia - .295"	4060	5130	5760	6405	7085	7555	8125	8635	9100	9940	10790	11510	12205	12850	13500	14070	14620
Orifice #13 – Dia - .3125"	4560	5775	6500	7210	7960	8530	9150	9730	10240	11200	12150	12980	13750	14490	15200	15850	16470
Orifice #14 – Dia - .3281"	5030	6350	7150	7940	8760	9355	10070	10700	11280	12305	13340	14270	15105	15910	16710	17410	18060
Orifice #15 – Dia - .3437"	5499	6945	7820	8690	9590	10240	11010	11710	12315	13490	14600	15600	16560	17410	18300	19100	19860
Orifice #16 – Dia - .358"	5985	7570	8500	9450	10420	11120	11995	12720	13410	14685	15900	17000	18010	18980	19915	20755	21550
Orifice #17 – Dia - .375"	6550	8295	9320	10350	11410	12200	13110	13950	14700	16050	17400	18600	19705	20760	21800	22720	23590