

**VAREC BIOGAS 400W Series
EMERGENCY RELIEF MANHOLE COVERS**

The 400W Series is designed to provide emergency pressure and/or vacuum relief in storage tanks and vessels.

Introduction

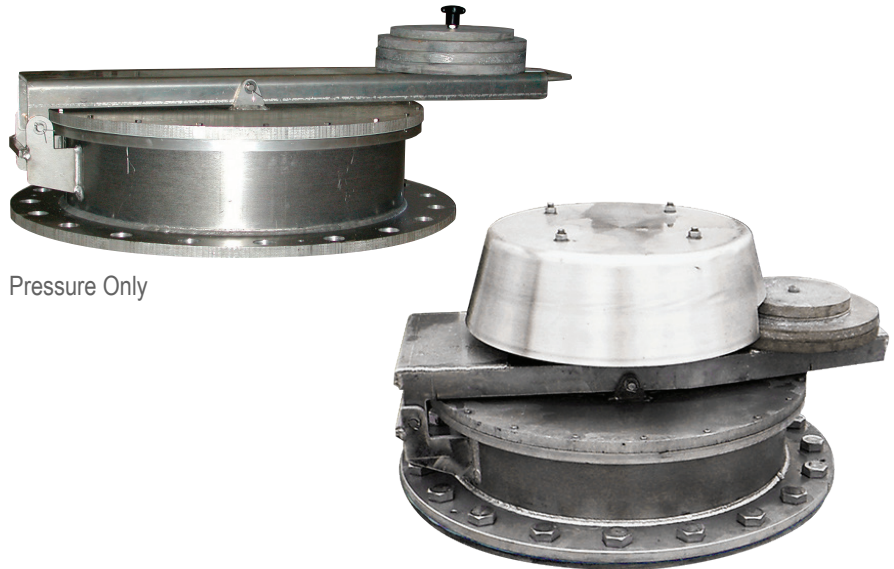
The Varec Biogas 400W Series is designed to provide emergency pressure venting and vacuum relief in storage tanks and vessels, while allowing easy access for tank inspection and maintenance.

Operation

The constant mixing of the biosolids in the digester creates excessive foam build-up, which has the potential to clog digester cover equipment. The foam could clog the flame arresters installed with the Pressure and Vacuum Relief (PVR) Valves, especially without proper and routine maintenance. This leaves the PVR valves unable to perform their intended function of emergency pressure and vacuum relief. Without a secondary safety net, the tank is susceptible to explosion and implosion as pressure or vacuum rises in the tank.

As the set pressure is reached, the cover initially floats on the seating area and then lifts to relieve the over-pressure. The hinged design allows for automatic re-seating of the cover once normal operating conditions have been restored.

For vacuum relief, a spring-loaded vacuum relief valve is provided that will relieve the vacuum condition in the vessel.



Pressure Only

Pressure & Vacuum

Design Features

- The unit is provided with interchangeable components to ensure standard parts are easily maintained and replaced.
- All products are factory tested and fully certified.
- All products are designed to ensure that condensate drains away from all seating areas.
- Standard seating design ensures maximum leakage of less than 1 scfh at 90% of set pressure.

Technical Data

- Self Draining
- Hinged Pivot Design for Automatic Re-Seating
- Combination Emergency Pressure and Vacuum Relief Available (18" and larger sizes only)
- Size Range: 10" (250mm), 12" (300mm), 16" (400mm), 18" (450mm), 20" (500mm), 24" (600mm), 30" (750mm) & 36" (900mm)
- Minimum Leakage Rate

Specifications

Size Range

10" (250mm), 12" (300mm), 16" (400mm),
18" (450mm), 20" (500mm), 24" (600mm),
30" (750mm), 36" (900mm)

Standard Pressure Settings

2" - 60" WC (0.5 kPa - 15 kPa)
Available pressure setting range is shown
on part number ordering information.

Vacuum Set Range

2" - 20" WC (0.5 kPa - 10 kPa)
Combined Pressure & Vacuum Models
Only available in 18" and larger sizes

Flange Connections

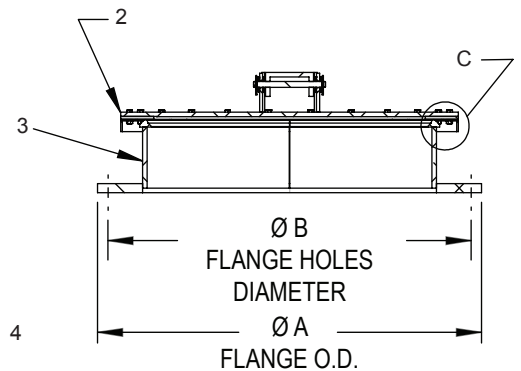
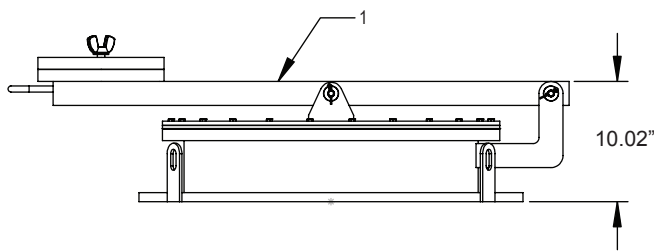
API 650 or ANSI 150 lbs.
Flat Face (Aluminum)
RF Flanges (Steel and Stainless Steel)
Special Flange Drilling Available Upon
Request

Pressure Only

Dimensions and Weights, inches [mm] and lbs. (kg)

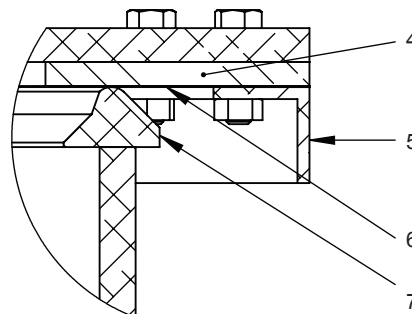
Size Code	10	12	16	18	20	24	30	36
A	16 [406]	19 [483]	23 1/2 [597]	25 [635]	27 1/2 [699]	32 [813]	38 3/4 [985]	46 [1169]
B	14 1/4 [362]	17 [432]	21 1/4 [540]	22 3/4 [578]	25 [635]	29 1/2 [750]	36 [915]	42 3/4 [1086]
Hole #	12	12	16	16	20	20	28	32
Hole Ø	1 [25]	1 [25]	1 1/8 [29]	1 1/4 [32]	1 1/4 [32]	1 3/8 [35]	1 3/8 [35]	1 5/8 [41]
Shipping	51	60	74	79	86	103	137	167
Weight (AL)	(23)	(27)	(34)	(36)	(39)	(47)	(62)	(76)
Shipping	106	128	165	177	196	239	329	408
Weight (CS/SS)	(48)	(58)	(75)	(80)	(89)	(108)	(149)	(185)

Flanges supplied in accordance with ANSI / API 650. Other flange standards available on request. Flanges are drilled only.



Materials of Construction

1. Hinged Arm	SS
2. Cover	CS/ SS/ AL
3. Base	CS/ SS/ AL
4. Gasket	Neoprene
5. Drip Ring	SS/ AL
6. Pressure Diaphragm	PTFE
7. Diaphragm Seat	SS/ AL



DETAIL C
SCALE 1:2

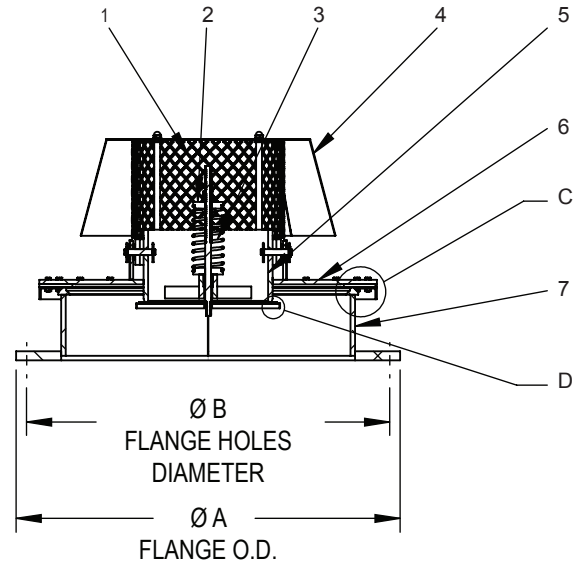
Specifications

Pressure & Vacuum

Dimensions and Weights, inches [mm] and lbs. (kg)

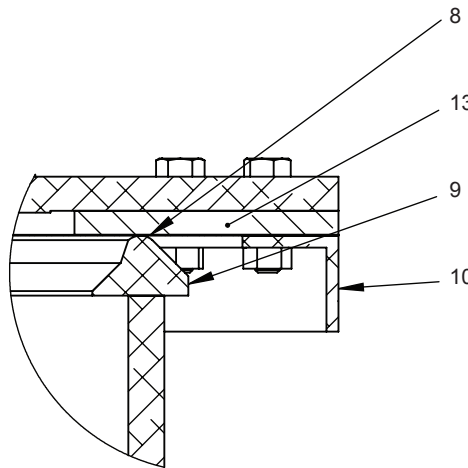
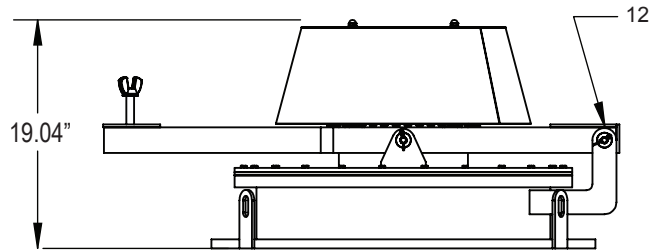
Size Code	18	20	24	30	36
A	25 [635]	27 1/2 [699]	32 [813]	38 3/4 [985]	46 [1169]
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Hole #	16	20	20	28	32
Hole Ø	1 1/4 [32]	1 1/4 [32]	1 3/8 [35]	1 3/8 [35]	1 5/8 [41]
Shipping Weight (AL)	95 (43)	101 (46)	117 (53)	152 (69)	186 (84)
Shipping Weight (CS/SS)	188 (85)	205 (93)	251 (114)	349 (158)	442 (200)

Flanges supplied in accordance with ANSI / API 650. Other flange standards available on request. Flanges are drilled only.

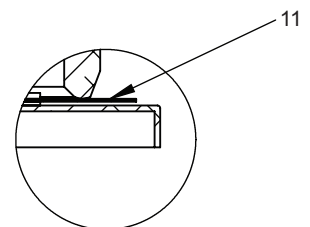


Materials of Construction

1. Protection Mesh	SS
2. Spring Holder	SS
3. Spring	SS
4. Weather Hood	AL
5. Vacuum Body	SS/ AL
6. Cover	CS/ SS/ AL
7. Base	CS/ SS/ AL
8. Pressure Diaphragm	PTFE
9. Diaphragm Seat	SS/ AL
10. Drip Ring	SS/ AL
11. Vacuum Diaphragm	PTFE
12. Hinged Arm	SS
13. Gasket	Neoprene



DETAIL C
SCALE 1:2



DETAIL D
SCALE 1:2

Flow Capacity (Pressure)

10"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	130417	137586	144755	151112	157327	163436	169475	175408	181235	187027
10	3693	3896	4099	4279	4455	4628	4799	4967	5132	5296
8	184343	194478	204613	213583	222377	231029	239504	247874	256138	264295
20	5220	5507	5794	6048	6297	6542	6782	7019	7253	7484
12	225696	238092	250487	261470	272241	282800	293183	303389	313489	323447
30	6391	6742	7093	7404	7709	8008	8302	8591	8877	9159
16	260517	274819	289086	301764	314160	326343	338315	350110	361728	373241
40	7377	7782	8186	8545	8896	9241	9580	9914	10243	10569
20	291170	307097	323059	337220	351063	364660	378009	391181	404177	416996
50	8245	8696	9148	9549	9941	10326	10704	11077	11445	11808
24	318821	336267	353747	369215	384365	399233	413853	428261	442458	456478
60	9028	9522	10017	10455	10884	11305	11719	12127	12529	12926
28	344212	363070	381928	398597	414948	430981	446766	462269	477596	492711
70	9747	10281	10815	11287	11750	12204	12651	13090	13524	13952
32	367838	387967	408097	425931	443376	460468	477313	493876	510227	526330
80	10416	10986	11556	12061	12555	13039	13516	13985	14448	14904
36	390016	411346	432640	451534	470003	488155	505954	523505	540809	557866
90	11044	11648	12251	12786	13309	13823	14327	14824	15314	15797
40	410957	433417	455842	475724	495183	514253	533005	551474	569661	587637
100	11637	12273	12908	13471	14022	14562	15093	15616	16131	16640

12"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	187804	198115	208427	217609	226579	235372	244025	252571	260976	269310
10	5318	5610	5902	6162	6416	6665	6910	7152	7390	7626
8	265461	280046	294631	307556	320234	332664	344919	356961	368827	380587
20	7517	7930	8343	8709	9068	9420	9767	10108	10444	10777
12	325001	342835	360704	376525	391993	407214	422152	436913	451428	465766
30	9203	9708	10214	10662	11100	11531	11954	12372	12783	13189
16	375148	395737	416290	434547	452417	469933	487166	504153	520927	537454
40	10623	11206	11788	12305	12811	13307	13795	14276	14751	15219
20	419256	442246	465236	485577	505530	525094	544341	563305	582022	600456
50	11872	12523	13174	13750	14315	14869	15414	15951	16481	17003
24	459091	484235	509415	531663	553487	574923	595971	616701	637148	657313
60	13000	13712	14425	15055	15673	16280	16876	17463	18042	18613
28	495677	522834	549956	574005	597525	620621	643328	665682	687718	709472
70	14036	14805	15573	16254	16920	17574	18217	18850	19474	20090
32	529721	558679	587672	613310	638454	663104	687330	711203	734722	757924
80	15000	15820	16641	17367	18079	18777	19463	20139	20805	21462
36	561610	592333	623022	650214	676806	702939	728578	753863	778760	803339
90	15903	16773	17642	18412	19165	19905	20631	21347	22052	22748
40	591768	624117	656430	685035	713039	740514	767530	794122	820325	846211
100	16757	17673	18588	19398	20191	20969	21734	22487	23229	23962

Flow Capacity (Pressure)

16"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	333795	352158	370522	386802	402729	418373	433770	448956	463894	478691
10	9452	9972	10492	10953	11404	11847	12283	12713	13136	13555
8	471875	497796	523752	546742	569238	591345	613099	634499	655617	676488
20	13362	14096	14831	15482	16119	16745	17361	17967	18565	19156
12	577713	609426	641138	669284	696794	723845	750437	776606	802421	827953
30	16359	17257	18155	18952	19731	20497	21250	21991	22722	23445
16	666847	703398	740020	772438	804186	835334	865987	896181	925951	955369
40	18883	19918	20955	21873	22772	23654	24522	25377	26220	27053
20	745246	786105	826964	863162	898618	933403	967623	1001313	1034544	1067387
50	21103	22260	23417	24442	25446	26431	27400	28354	29295	30225
24	816087	860760	905469	945092	983868	1021937	1059335	1096204	1132542	1168422
60	23109	24374	25640	26762	27860	28938	29997	31041	32070	33086
28	881102	929342	977582	1020312	1062125	1103196	1143525	1183290	1222454	1261159
70	24950	26316	27682	28892	30076	31239	32381	33507	34616	35712
32	941596	993085	1044609	1090200	1134873	1178699	1221747	1264160	1306008	1347291
80	26663	28121	29580	30871	32136	33377	34596	35797	36982	38151
36	998311	1052872	1107469	1155780	1203066	1249469	1295096	1340016	1384301	1427985
90	28269	29814	31360	32728	34067	35381	36673	37945	39199	40436
40	1051919	1109376	1166833	1217686	1267480	1316320	1364348	1411599	1458179	1504194
100	29787	31414	33041	34481	35891	37274	38634	39972	41291	42594

18"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	422470	445707	468944	489532	509697	529509	549002	568178	587142	605859
10	11963	12621	13279	13862	14433	14994	15546	16089	16626	17156
8	597242	630050	662857	691956	720455	748424	775935	803021	829790	856205
20	16912	17841	18770	19594	20401	21193	21972	22739	23497	24245
12	731191	771308	811461	847058	881879	916099	949754	982879	1015580	1047893
30	20705	21841	22978	23986	24972	25941	26894	27832	28758	29673
16	843951	890248	936581	977582	1017770	1057216	1096027	1134238	1171918	1209140
40	23898	25209	26521	27682	28820	29937	31036	32118	33185	34239
20	943220	994921	1046622	1092460	1137310	1181347	1224643	1267303	1309363	1350893
50	26709	28173	29637	30935	32205	33452	34678	35886	37077	38253
24	1032849	1089423	1145997	1196109	1245196	1293366	1340723	1387373	1433353	1478803
60	29247	30849	32451	33870	35260	36624	37965	39286	40588	41875
28	1115168	1176191	1237251	1291317	1344254	1396202	1447302	1497590	1547172	1596154
70	31578	33306	35035	36566	38065	39536	40983	42407	43811	45198
32	1191695	1256885	1322076	1379816	1436319	1491764	1546289	1599968	1652905	1705135
80	33745	35591	37437	39072	40672	42242	43786	45306	46805	48284
36	1263489	1332565	1401640	1462770	1522629	1581392	1639096	1695953	1751998	1807300
90	35778	37734	39690	41421	43116	44780	46414	48024	49611	51177
40	1331329	1404042	1476755	1541134	1604170	1665971	1726748	1786535	1845511	1903745
100	37699	39758	41817	43640	45425	47175	48896	50589	52259	53908

Flow Capacity (Pressure)

20"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	521351	550026	578702	604093	628990	653463	677513	701173	724552	747648
10	14763	15575	16387	17106	17811	18504	19185	19855	20517	21171
8	737018	777524	817994	853909	889083	923585	957558	991001	1023985	1056581
20	20870	22017	23163	24180	25176	26153	27115	28062	28996	29919
12	902326	951837	1001384	1045315	1088328	1130529	1172060	1212954	1253283	1293154
30	25551	26953	28356	29600	30818	32013	33189	34347	35489	36618
16	1041501	1098640	1155780	1206421	1256003	1304702	1352553	1399698	1446208	1492152
40	29492	31110	32728	34162	35566	36945	38300	39635	40952	42253
20	1164008	1227786	1291600	1348139	1403512	1457861	1511293	1563911	1615824	1667101
50	32961	34767	36574	38175	39743	41282	42795	44285	45755	47207
24	1274578	1344395	1414248	1476084	1536649	1596118	1654564	1712092	1768878	1824922
60	36092	38069	40047	41798	43513	45197	46852	48481	50089	51676
28	1376179	1451505	1526866	1593576	1658908	1723004	1786041	1848124	1909325	1969748
70	38969	41102	43236	45125	46975	48790	50575	52333	54066	55777
32	1470645	1551057	1631539	1702769	1772515	1840955	1908230	1974445	2039777	2104262
80	41644	43921	46200	48217	50192	52130	54035	55910	57760	59586
36	1559250	1644464	1729714	1805146	1879025	1951526	2022755	2092890	2162072	2230335
90	44153	46566	48980	51116	53208	55261	57278	59264	61223	63156
40	1642946	1732680	1822415	1901873	1979636	2055916	2130889	2204732	2277480	2349346
100	46523	49064	51605	53855	56057	58217	60340	62431	64491	66526

24"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	751073	792356	833639	870260	906140	941349	975992	1010106	1043797	1077063
10	21268	22437	23606	24643	25659	26656	27637	28603	29557	30499
8	1061772	1120076	1178416	1230117	1280794	1330517	1379427	1427632	1475166	1522134
20	30066	31717	33369	34833	36268	37676	39061	40426	41772	43102
12	1299863	1371234	1442605	1505854	1567796	1628643	1688431	1747371	1805499	1862886
30	36808	38829	40850	42641	44395	46118	47811	49480	51126	52751
16	1500380	1582664	1665017	1737942	1809384	1879519	1948489	2016399	2083391	2149570
40	42486	44816	47148	49213	51236	53222	55175	57098	58995	60869
20	1676848	1768737	1860661	1942132	2021908	2100165	2177151	2252972	2327733	2401576
50	47483	50085	52688	54995	57254	59470	61650	63797	65914	68005
24	1836153	1936729	2037340	2126439	2213702	2299340	2383530	2466449	2548203	2628968
60	51994	54842	57691	60214	62685	65110	67494	69842	72157	74444
28	1982497	2091019	2199576	2295703	2389816	2482164	2572958	2662375	2750521	2837607
70	56138	59211	62285	65007	67672	70287	72858	75390	77886	80352
32	2118564	2234467	2350370	2452994	2553465	2652028	2748967	2844387	2938466	3031379
80	59991	63273	66555	69461	72306	75097	77842	80544	83208	85839
36	2246227	2368981	2491770	2600504	2706907	2811333	2913957	3015028	3114651	3213002
90	63606	67082	70559	73638	76651	79608	82514	85376	88197	90982
40	2366791	2496078	2625365	2739820	2851839	2961738	3069766	3176098	3280912	3384420
100	67020	70681	74342	77583	80755	83867	86926	89937	92905	95836

Flow Capacity (Pressure)

30"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	1173719	1238204	1302759	1359969	1416049	1471069	1525207	1578532	1631151	1683134
10	33236	35062	36890	38510	40098	41656	43189	44699	46189	47661
6	1437202	1516166	1595165	1665229	1733811	1801191	1867441	1932703	1997082	2060683
15	40697	42933	45170	47154	49096	51004	52880	54728	56551	58352
8	1659226	1750373	1841520	1922356	2001531	2079224	2155680	2230971	2305273	2378657
20	46984	49565	52146	54435	56677	58877	61042	63174	65278	67356
12	2031337	2142825	2254385	2353230	2450063	2545095	2638573	2730639	2821468	2911167
30	57521	60678	63837	66636	69378	72069	74716	77323	79895	82435
16	2344684	2473265	2601952	2715912	2827577	2937159	3044939	3151060	3255768	3359170
40	66394	70035	73679	76906	80068	83171	86223	89228	92193	95121
20	2620421	2764046	2907706	3035016	3159642	3282007	3402289	3520770	3639745	3752999
50	74202	78269	82337	85942	89471	92936	96342	99697	103066	106273
24	2869425	3026576	3183797	3323043	3459393	3593200	3724783	3854352	3982121	4108300
60	81253	85703	90155	94098	97959	101748	105474	109143	112761	116334
28	3098123	3267705	3437286	3587514	3734600	3878931	4020826	4160531	4298329	4434361
70	87729	92531	97333	101587	105752	109839	113857	117813	121715	125567
32	3310753	3491812	3675060	3833305	3990349	4144392	4295857	4444991	4592006	4737184
80	93750	98877	104066	108547	112994	117356	121645	125868	130031	134142
36	3510211	3702075	3893940	4063839	4230136	4393325	4553725	4711617	4867319	5021009
90	99398	104831	110264	115075	119784	124405	128947	133418	137827	142179
40	3698650	3900685	4102721	4281554	4456609	4628345	4797149	4963340	5127165	5288906
100	104734	110455	116176	121240	126197	131060	135840	140546	145185	149765

36"	SCFH m3/hr									
	Set Pressure inWC Mbar	10%	20%	30%	40%	50%	60%	70%	80%	90%
4	1692139	1785123	1878177	1960672	2041472	2120824	2198870	2275750	2351641	2426579
10	47916	50549	53184	55520	57808	60055	62265	64442	66591	68713
6	2072019	2185839	2299764	2400729	2499645	2596725	2692251	2786330	2879172	2970884
15	58673	61896	65122	67981	70782	73531	76236	78900	81529	84126
8	2392112	2523483	2654924	2771427	2885458	2997618	3107800	3216357	3323466	3429269
20	67737	71457	75179	78478	81707	84883	88003	91077	94110	97106
12	2928577	3089295	3250118	3392613	3532212	3669233	3803994	3936741	4067688	4197011
30	82928	87479	92033	96068	100021	103901	107717	111476	115184	118846
16	3380323	3565690	3751198	3915517	4076482	4234480	4389829	4542848	4693818	4842881
40	95720	100969	106222	110875	115433	119907	124306	128639	132914	137135
20	3777825	3984875	4192031	4375527	4555243	4731605	4905035	5075852	5244304	5410671
50	106976	112839	118705	123901	128990	133984	138895	143732	148502	153213
24	4136799	4363378	4590028	4790792	4987389	5180313	5369989	5556768	5741005	5922911
60	117141	123557	129975	135660	141227	146690	152061	157350	162567	167718
28	4466533	4710981	4955535	5172085	5384114	5592189	5796767	5998202	6196847	6392985
70	126478	133400	140325	146457	152461	158353	164146	169850	175475	181029
32	4773064	5034146	5295263	5526468	5752835	5974929	6193280	6408276	6620270	6829545
80	135158	142551	149945	156492	162902	169191	175374	181462	187465	193391
36	5060632	5337252	5613872	5858815	6098566	6321909	6565038	6792712	7017172	7238737
90	143301	151134	158967	165903	172692	179353	185901	192348	198704	204978
40	5332308	5623583	5914824	6172656	6425051	6672677	6916031	7155606	7391790	7624938
100	150994	159242	167489	174790	181937	188949	195840	202624	209312	215914

Flow Capacity (Vacuum)

Set Pressure inWC Mbar	SCFH m3/hr		
	10%	20%	50%
1	13667	20200	32560
2.5	387	572	922
2	18964	27899	46509
5	537	790	1317
4	27475	40365	65473
10	778	1143	1854

Note: Vacuum relief available from 18" size and larger and capacity shown is for all sizes.

Ordering Information

Model
400W

Description
Emergency Relief Manhole Covers

Code	Size
10	10" (250mm)
12	12" (300mm)
16	16" (400mm)
18	18" (450mm)
20	20" (500mm)
24	24" (600mm)
30	30" (750mm)
36	36" (900mm)

Code	Material (Base / Cover)
11	Aluminum / Aluminum
12	Steel / Aluminum
22	Steel / Steel
33	316 SS / 316 SS

Code	Settings ^{1,2}
0	1.6" - 6.4" WC (AL, CS, SS)
1	6.5" - 16.3" WC (AL, CS, SS)
2	16.4" - 22.7" WC (AL, CS, SS)
3	22.8" - 42.3" WC (CS, SS)
4	42.4" - 51.0" WC (CS, SS)
5	51.1" - 58.7" WC (CS, SS)

Code	Vacuum Requirements ²
0	No Vacuum Required
1	Vacuum Required (Range 1.4" - 20" WC)

Code	Flange Options
0	API 650
1	ANSI 150#
2	Special (Specify)

Code	Flange Facing Options
F	Flat Faced
R	Raised Face (Steel and SS Base Only)

400W 24 11 2 1 1 F (Example)

Example: 24" Emergency Relief Manhole Cover, Aluminum Construction, Set Range 16.4" - 22.7" WC Pressure, Vacuum Required, ANSI 150 FF Flanged Connection.

NOTE: *Carbon Steel Base for welded connection only - for Drilled Base Consult Factory.

1. Consult Factory if pressure settings greater than 1 PSIG are required for Aluminum.
2. Specify Pressure and Vacuum (When Applicable) Setting.