

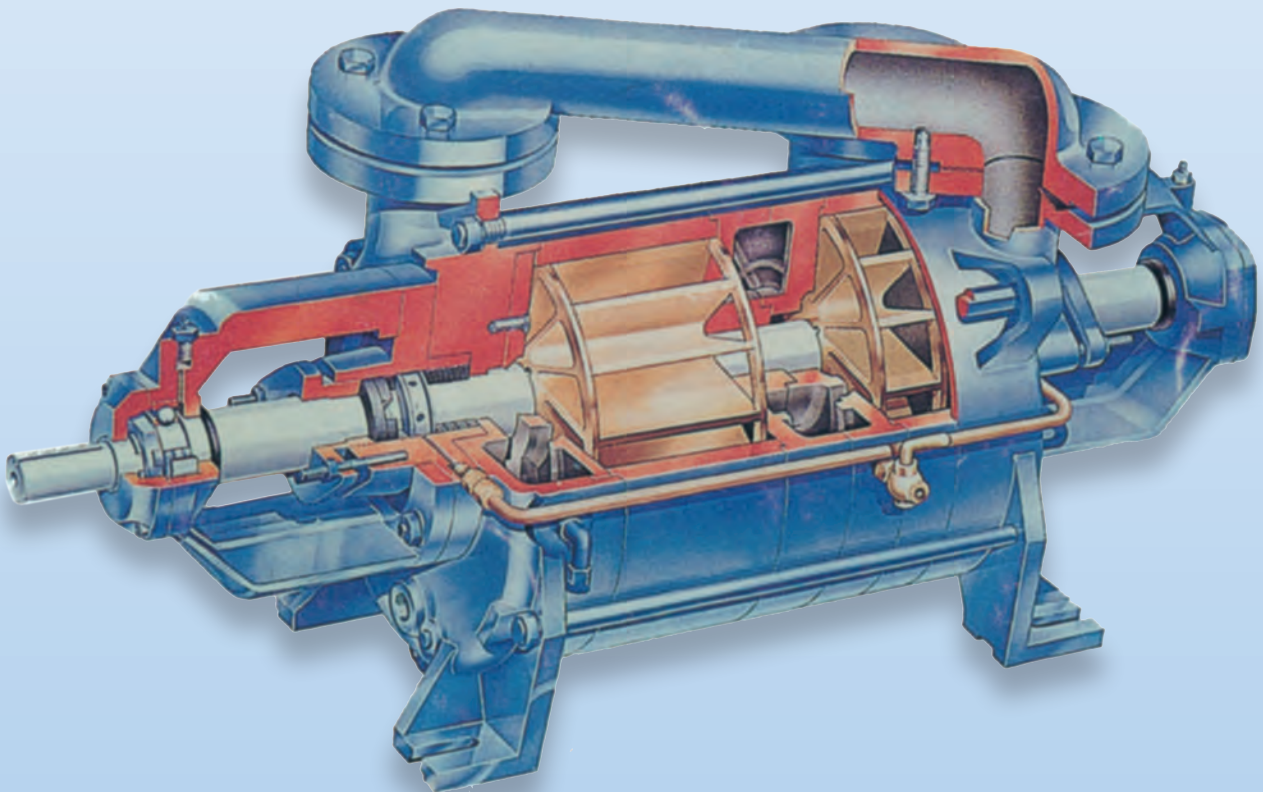


**HORMA PUMPS  
(PTY) LTD**

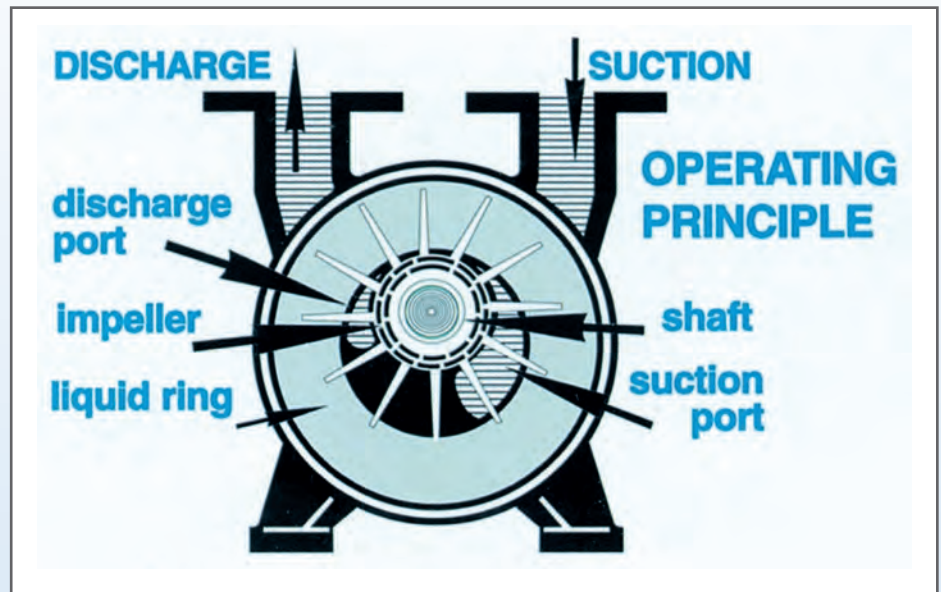
**Pump Reconditioning and  
General Engineering**

# **HI-VAC**

## **VACUUM PUMP**



**LIQUID RING VACUUM PUMPS** are constantly becoming more important in modern plant production processes. Their design and principle of operation offers many advantages over other types of rotary gas pumps. Liquid Ring Vacuum Pumps can be used on a very large scale for widely divergent applications.



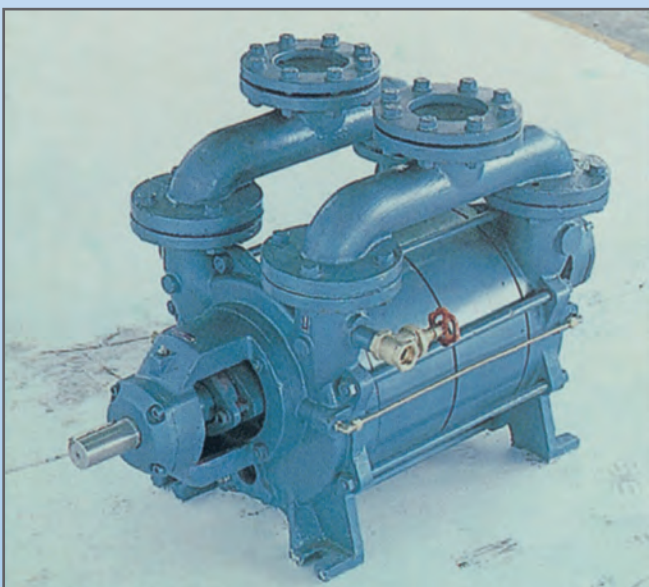
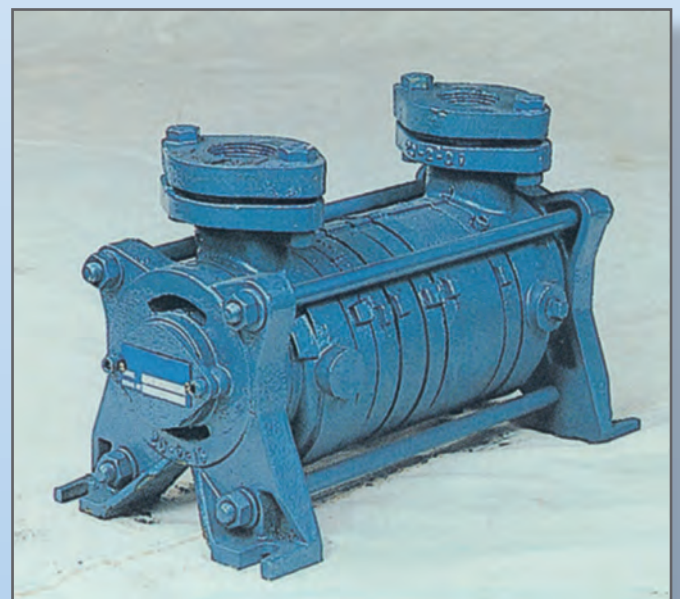
## *Operating Principle*

The diagram (above) shows a cross-section of the Liquid Ring Vacuum Pump. It operates on the rotary liquid piston principle, the shaft and impellers being the only moving parts.

The shaft and impeller assembly is mounted eccentrically relative to the pump casing. As the impeller rotates the service liquid (which is continually supplied to the pump), is forced outwards by centrifugal force to form a liquid ring revolving concentric to the pump casing.

Because of the eccentric position of the impeller, the liquid ring will move towards and away from the shaft, resulting in a liquid piston action which displaces the air or gases between the spaces of the impeller blades.

As the impeller rotates, the liquid is thrown out by the centrifugal force and air is drawn in through the suction port. After the suction port is passed, the service liquid is forced back into the spaces between the impeller blades, gradually compressing the air or gases. When the spaces between the impeller blades reach the discharge port, the liquid ring will force the air compressed between the blades into the discharge port.



## 50Hz

## CAPACITY TABLES GDH SERIES

MODEL GDH	MOTOR kW	SPEED rev/min	FLANGE CONN mm	SERVICE LIQUID CONN	260 TORR		160 TORR		80 TORR		60 TORR		40 TORR		30 TORR		25 TORR		SERVICE LIQUID FLOW RATE l/min
					m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	
20/2	1,5	2800	32	3/8" BSP	-	-	39	1,35	37	1,3	34	1,3	27	1,3	18	1,3	-	-	5,9
30	3	1450	40	1/2" BSP	57	2,24	57	2,24	52	2,24	49	2,24	42	2,24	33	2,24	25	2,24	12
60	4	1450	40	1/2" BSP	108	2,98	108	2,98	105	2,83	100	2,76	84	2,69	72	2,61	54	2,61	14
80	4	1450	40	3/4" BSP	126	3,58	132	3,51	150	3,78	145	3,13	120	2,98	90	2,83	72	2,76	19
100	5,5	1450	40	3/4" BSP	146	4,18	145	4,18	180	3,88	180	3,88	155	3,8	125	3,73	100	3,73	23
150	11	1450	50	1" BSP	270	7,46	290	7,31	280	6,94	270	6,86	220	6,79	190	6,71	165	6,71	32
200	11	1450	50	1" BSP	330	9,33	360	8,95	350	8,21	340	7,83	300	7,53	240	7,53	200	7,46	37
250	11	1450	50	1" BSP	390	10,44	440	10,07	440	9,4	420	9,25	360	8,95	290	8,95	225	8,8	46
300	18,5	1450	80	1 1/4" BSP	510	14,92	540	14,92	510	14,55	480	14,55	420	14,17	330	14,17	-	-	75
450	30	1450	80	1 1/4" BSP	720	22,38	780	20,89	750	20,14	690	19,4	510	19,4	390	18,65	-	-	89
500	30	960	100	2" BSP	840	24	900	24	870	22	840	22	780	21	660	21	-	-	96
750	37	960	100	2" BSP	1200	34	1350	34	1320	30	1230	29	1020	28	800	28	-	-	110
950	45	960	100	2" BSP	1320	37	1500	37	1700	34	1620	33	1320	31	1080	30	-	-	120
1200	75	720	150	2 1/2" BSP	1920	58	2100	57	2100	48	1980	46	1680	44	1320	43	-	-	166
1500	75	720	150	2 1/2" BSP	2280	70	2500	69	2650	60	2500	57	2200	55	1740	54	-	-	191
1800	90	720	150	2 1/2" BSP	2630	82	3000	83	3200	72	3100	69	2800	66	2200	65	-	-	232

The above capacities are based on dry air at 20°C and seal water at 15°C. The barometric pressure is 760mm hg abs. Tolerance 10%.

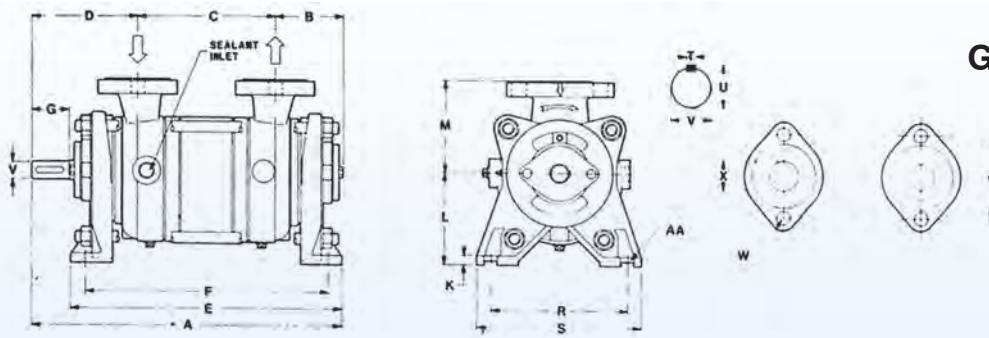
## 60Hz

MODEL GDH	MOTOR kW	SPEED rev/min	FLANGE CONN mm	SERVICE LIQUID CONN	160 TORR		110 TORR		80 TORR		60 TORR		40 TORR		30 TORR		25 TORR		SERVICE LIQUID FLOW RATE l/min
					m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	m³/h	kW	
20/2	2,2	3400	32	3/8" BSP	53	1,9	53	1,9	49	1,8	44	1,8	32	1,8	20	1,8	-	-	7,5
30	3	1750	40	1/2" BSP	69	2,76	68	2,76	64	2,76	56	2,83	45	2,83	34	2,83	25	2,83	15
60	4	1750	40	1/2" BSP	127	3,65	126	3,65	114	3,6	102	3,5	84	3,43	71	3,43	55	3,36	19
80	5,5	1750	40	3/4" BSP	166	4,85	168	4,4	174	4,4	166	4,4	146	4,33	123	4,26	101	4,18	22
100	7,5	1750	40	3/4" BSP	195	5,97	220	5,74	220	5,7	209	5,67	186	5,59	161	5,55	135	5,52	25
150	11	1750	50	1" BSP	333	10,44	338	10,3	331	10	312	9,84	261	9,7	224	9,55	199	9,55	38
200	15	1750	50	1" BSP	420	12,3	420	11,6	413	11,4	405	11,2	301	11	272	10,6	207	10,4	45
250	15	1750	50	1" BSP	520	14,17	526	13,8	520	13,4	492	13,1	400	13,1	314	13,05	237	12,5	50
300	22	1750	80	1 1/4" BSP	626	20,8	628	20,8	611	20,5	570	20,1	485	19,9	395	19,76	-	-	80
450	30	1750	80	1 1/4" BSP	917	28,3	949	27,6	912	27,1	841	26,8	635	26	445	25,4	-	-	95
500	37	1150	100	2" BSP	985	36	994	35	968	34	883	33	765	32	578	32	-	-	110
750	45	1150	100	2" BSP	1334	43	1427	42	1359	41	1249	40	1036	40	824	40	-	-	115
950	75	1150	100	2" BSP	1640	57	1699	56	1690	56	1631	55	1368	51	1113	82	-	-	125
1200	110	880	150	2 1/2" BSP	2294	90	2345	90	2251	90	2090	88	1716	86	1359	82	-	-	190
1500	110	880	150	2 1/2" BSP	2701	105	2940	107	2786	106	2549	105	2081	100	1648	97	-	-	220
1800	132	880	150	2 1/2" BSP	3500	125	3636	126	3568	120	3347	116	2735	113	1954	110	-	-	250

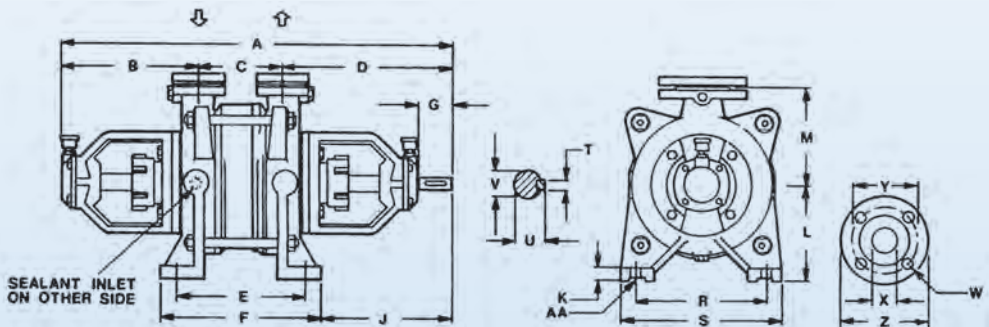
The above capacities are based on dry air at 20°C and seal water at 15°C. The barometric pressure is 760mm hg abs. Tolerance 10%.



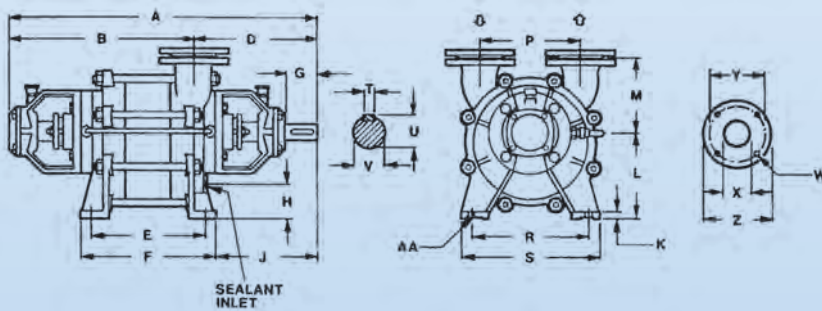
# Outline Dimensions GDM SERIES - Bareshaft



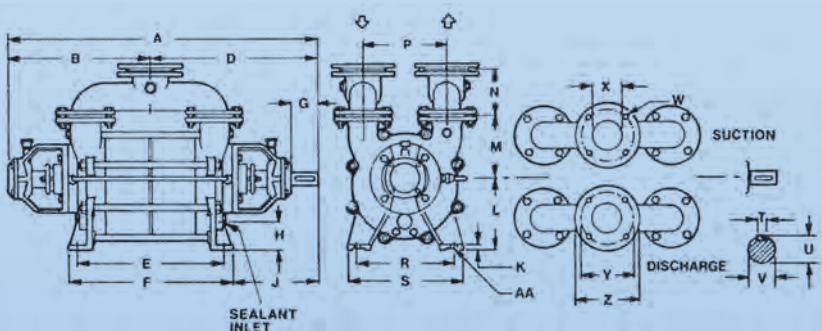
MODEL GDM	A	B	C	D	E	F	G	K	L	M	R	S	T	U	V	Bolt Dia W	X	PCD Y	Bolt Dia AA	No of Bolts per Flange Z	Inlet Conn BSP	Mass Kg
20/2	336	69	150	115	294	264	40	10	100	100	150	180	6	21,5	19	12	32	90	12	2	3/8"	23



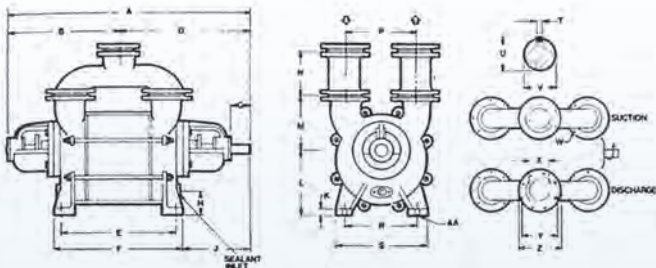
MODEL GDM	A	B	C	D	E	F	G	J	K	L	M	R	S	T	U	V	Bolt Dia W	X	PCD Y	Z	Bolt Dia AA	No of Bolts per Flange	Inlet Conn BSP	Mass Kg
30	578	180	164	235	236	266	50	184	18	150	170	200	250	6	24,5	22	16	40	110	150	16	4	1/2"	56
60	615	180	204	235	276	306	50	184	18	150	170	200	250	6	24,5	22	16	40	110	150	16	4	1/2"	62
85	658	180	244	235	316	346	50	184	18	150	170	200	250	6	24,5	22	16	40	110	150	16	4	1/2"	68



MODEL GDM	A	B	D	E	F	G	H	J	K	L	M	P	R	S	T	U	V	Bolt Dia W	X	PCD Y	Z	Bolt Dia AA	No of Bolts per Flange	Inlet Conn BSP	Mass Kg
100	735	408	327	240	290	70	85	260	20	210	180	230	240	300	10	38,3	35	16	50	125	165	16	4	1"	130
150	775	448	327	280	330	70	85	260	20	210	180	230	240	300	10	38,3	35	16	50	125	165	16	4	1"	139
300	915	561	354	370	420	90	100	294	20	250	223	290	320	400	14	48,5	45	16	80	160	200	16	8	1 1/4"	316

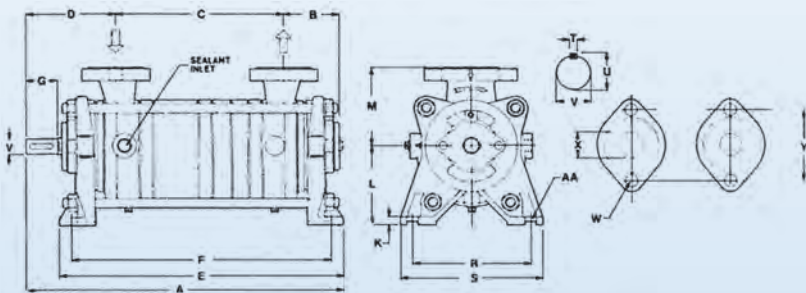


MODEL GDM	A	B	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	Bolt Dia W	X	PCD Y	Z	Bolt Dia AA	No of Bolts per Flange	Inlet Conn BSP	Mass Kg
200	815	370	445	320	370	70	85	260	20	210	180	135	230	240	300	10	38,3	35	16	65	145	185	16	4	1"	149
240	855	390	465	360	410	70	85	260	20	210	180	135	230	240	300	10	38,3	35	16	65	145	185	16	4	1"	159
450	995	450	545	450	500	90	100	294	20	250	223	165	290	320	400	14	48,5	45	16	100	180	220	16	8	1 1/4"	340
580	1091	498	593	546	596	90	100	294	20	250	223	165	290	320	400	14	48,5	45	16	100	180	220	16	8	1 1/4"	388

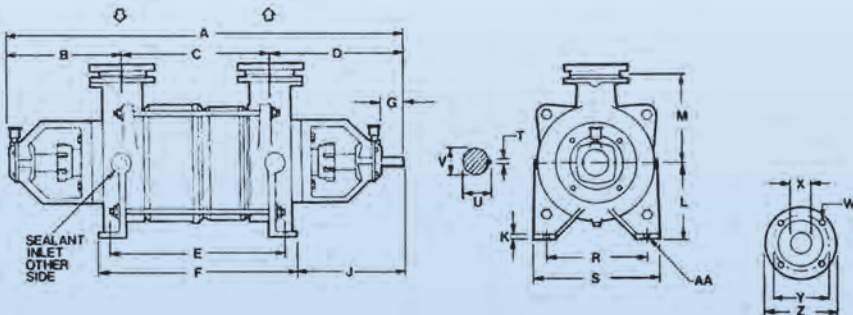


MODEL GDM	A	B	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	X	Bolt Dia W	X	PCD Y	Z	Bolt Dia AA	No of Bolts per Flange	Inlet Conn BSP	Mass Kg
700	1230	537	693	575	645	120	100	370	30	330	290	280	370	370	470	20	74,6	70	16	125	210	250	20	8	2"	525
900	1330	587	743	675	745	120	100	370	30	330	290	280	370	370	470	20	74,6	70	16	125	210	250	20	8	2"	570
1200	1540	680	860	690	740	160	150	490	50	440	370	340	520	570	700	22	85,5	80	20	200	295	340	24	12	2 1/2"	1150
1500	1640	730	910	790	840	160	150	490	50	440	370	340	520	570	700	22	85,5	80	20	200	295	340	24	12	2 1/2"	1235
1800	1740	780	960	890	940	160	150	490	50	440	370	340	520	570	700	22	85,5	80	20	200	295	340	24	12	2 1/2"	1300
2200	1915	867	1048	1065	1115	160	150	490	50	440	370	340	520	570	700	22	85,5	80	20	200	295	340	24	12	2X2 1/2"	1465

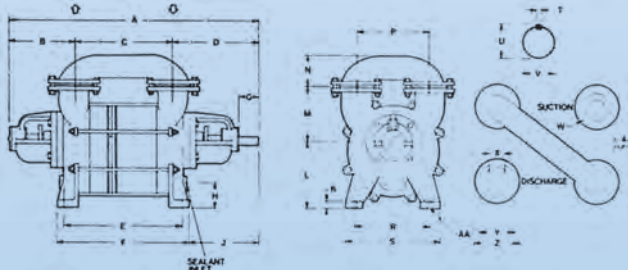
## Outline Dimensions GDH SERIES - Bareshaft



MODEL GDH	A	B	C	D	E	F	G	K	L	M	R	S	T	U	V	Bolt Dia W	X	PCD Y	Bolt Dia AA	No of Bolts per Flange	Inlet Conn BSP	Mass Kg
20/2	400	69	213	115	358	328	40	10	100	100	150	180	6	21,5	19	12	32	90	12	2	3/8"	27



MODEL GDH	A	B	C	D	E	F	G	J	K	L	M	R	S	T	U	V	Bolt Dia W	X	PCD Y	Z	Bolt Dia AA	No of Bolts per Flange	Inlet Conn BSP	Mass Kg
30	669	180	254	235	326	356	50	184	18	150	170	200	250	6	24,5	22	16	40	110	150	16	4	1/2"	70
60	709	180	294	235	366	396	50	184	18	150	170	200	250	6	24,5	22	16	40	110	150	16	4	1/2"	76



MODEL GDH	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	Bolt Dia W	X	PCD Y	Z	Bolt Dia AA	No of Bolts per Flange	Inlet Conn BSP	Mass Kg
80	761	219	266	276	345	395	55	65	212	18	175	155	79	160	210	270	8	27,9	25	16	40	110	150	12	4	3/4"	113
100	821	219	326	276	405	455	55	65	212	18	175	155	79	160	210	270	8	27,9	25	16	40	110	150	12	4	3/4"	125
150	895	253	315	327	400	450	70	85	260	20	210	180	90	230	240	300	10	38,3	35	16	50	125	165	16	4	1"	170
200	955	253	375	327	460	510	70	85	260	20	210	180	90	230	240	300	10	38,3	35	16	50	125	165	16	4	1"	184
250	955	253	415	327	500	550	70	85	260	20	210	180	90	230	240	300	10	38,3	35	16	50	125	165	16	4	1"	193
300	1055	259	442	354	510	560	90	100	294	20	250	223	118	290	320	400	14	48,5	45	16	80	160	200	16	8	1 1/4"	361
450	1175	259	562	354	630	680	90	100	294	20	250	223	118	290	320	400	14	48,5	45	16	80	160	200	16	8	1 1/4"	398
500	1300	300	545	455	645	715	120	100	370	30	330	290	165	370	370	470	20	74,6	70	16	100	180	220	20	8	2"	585
750	1450	300	695	455	795	865	120	100	370	30	330	290	165	370	370	470	20	74,6	70	16	100	180	220	20	8	2"	640
950	1550	300	795	455	895	965	120	100	370	30	330	290	165	370	370	470	20	74,6	70	16	100	180	220	20	8	2"	685
1200	1790	380	850	560	940	990	160	150	490	50	440	370	245	570	520	700	22	85,5	80	20	150	240	285	24	8	2 1/2"	1360
1500	1940	380	1000	560	1090	1140	160	150	490	50	440	370	245	570	520	700	22	85,5	80	20	150	240	285	24	8	2 1/2"	1470
1800	2040	380	1100	560	1190	1240	160	150	490	50	440	370	245	570	520	700	22	85,5	80	20	150	240	285	24	8	2 1/2"	1550

## 50Hz

## CAPACITY TABLES GDM SERIES

MODEL GDM	MOTOR kW	SPEED rev/min	FLANGE CONN mm	SERVICE LIQUID CONN	660 TORR		560 TORR		460 TORR		350 TORR		250 TORR		250 TORR		SERVICE LIQUID FLOW RATE l/min
					m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	
20/2	1,5	2800	32	3/8" BSP	34	0,6	35	0,8	35	0,9	32	1,1	28	1,2	19	1,3	5,9
30	2,2	1450	38	1/2" BSP	54	0,75	54	0,97	54	1,19	54	1,34	52	1,49	42	1,49	7
60	3	1450	38	1/2" BSP	105	1,72	105	2,28	105	2,39	105	2,54	105	2,61	88	2,69	12
85	4	1450	38	3/4" BSP	150	2,61	150	2,98	150	3,21	150	3,51	145	3,88	130	4	16
100	5,5	1450	50	3/4" BSP	170	3,21	160	3,73	160	4,1	160	4,4	160	4,85	152	5,22	20
150	7,5	1450	50	1" BSP	255	4,85	255	5,37	255	5,97	255	6,42	245	6,86	220	7,46	25
200	11	1450	64	1" BSP	340	5,97	340	6,71	340	7,46	340	8,06	330	8,65	300	9,33	30
240	15	1450	64	1" BSP	410	7,46	410	8,21	410	8,95	410	9,7	400	10,44	360	11,19	40
300	18,5	1450	80	1 1/4" BSP	510	8,95	510	10,82	510	12,31	510	13,65	490	14,92	440	16,04	50
450	22	1450	100	1 1/4" BSP	750	15	750	16	750	17	750	18	730	19	660	20	62
580	30	1450	100	2x1 1/4" BSP	1000	20	1000	22	1000	24	1000	27	930	28	720	30	70
700	37	960	127	2" BSP	1250	28	1250	29	1250	30	1250	31	1200	31	1100	31	90
900	45	960	127	2" BSP	1550	36	1550	37	1550	39	1550	40	1500	41	1300	41	105
1200	75	720	203	2 1/2" BSP	2000	31	2000	37	2000	43	2000	49	2000	54	1800	58	150
1500	75	720	203	2 1/2" BSP	2600	46	2600	51	2600	56	2600	63	2500	67	2200	71	175
1800	90	720	203	2 1/2" BSP	3150	55	3150	61	3150	69	3150	76	3050	82	2600	87	200
2200	110	720	203	2x2 1/2" BSP	3700	63	3700	72	3700	81	3700	88	3600	95	3300	100	250

The above capacities are based on dry air at 20°C and seal water at 15°C. The barometric pressure is 760mm hg abs. Tolerance 10%.

## 60Hz

MODEL GDM	MOTOR kW	SPEED rev/min	FLANGE CONN mm	SERVICE LIQUID CONN	660 TORR		560 TORR		460 TORR		360 TORR		260 TORR		160 TORR		SERVICE LIQUID FLOW RATE l/min
					m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	m <sup>3</sup> /h	kW	
20/2	2,2	3400	32	3/8" BSP	50	1,0	57	1,2	58	1,4	58	1,6	55	1,7	42	1,8	5,8
30	2,2	1740	38	1/2" BSP	73	1,4	73	1,5	73	1,6	70	1,7	70	1,9	56	1,9	9
60	4	1740	38	1/2" BSP	140	2,4	140	2,6	140	2,8	140	3,0	136	3,1	114	3,2	15
85	5,5	1740	38	1/2" BSP	197	3,4	197	3,7	197	4,0	197	4,3	190	4,4	173	4,5	19
100	7,5	1740	50	1" BSP	210	4,5	212	5,0	218	5,6	220	6,2	218	6,5	200	6,7	26
150	11	1740	50	1" BSP	315	6,8	318	7,1	322	7,9	322	8,6	317	9,1	274	9,5	32
200	15	1740	64	1" BSP	425	9,0	425	9,3	425	10,2	425	11,0	416	11,8	348	12,4	37
240	18,5	1740	64	1" BSP	470	11,12	480	11,6	490	12,7	480	13,7	460	14,7	405	15,5	48
300	22	1740	80	1 1/4" BSP	625	16	625	16,5	625	17	625	17,5	580	18	440	19	59
450	30	1740	100	1 1/4" BSP	940	22	940	23	940	25	940	26	910	27	800	28	75
580	45	1740	100	2x1 1/4" BSP	1200	30	1200	31	1200	32	1200	33	1150	34	870	36	100
700	45	1150	127	2" BSP	1400	40	1400	40	1400	41	1380	42	1350	43	1150	43	130
900	75	1150	127	2" BSP	1800	52	1800	54	1800	55	1800	56	1800	57	1485	57	150
1200	90	880	203	2 1/2" BSP	2400	57	2400	65	2400	72	2400	77	2295	84	2040	87	220
1500	110	880	203	2 1/2" BSP	2755	71	2755	81	2755	91	2755	98	2700	102	2395	107	250
1800	150	880	203	2 1/2" BSP	3300	99	3300	104	3300	111	3300	118	3160	125	2805	131	300
2200	185	880	203	2x2 1/2" BSP	4400	108	4400	120	4400	134	4400	147	4320	159	3750	164	370

The above capacities are based on dry air at 20°C and seal water at 15°C. The barometric pressure is 760mm hg abs. Tolerance 10%.

# GDH VACUUM PUMP

## Design features

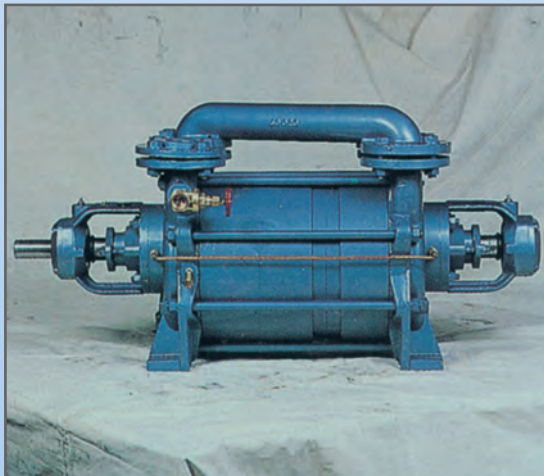
Liquid Ring Vacuum Pumps offer the following advantages:

1. High Vacuum. Up to 25 mm Hg absolute, and higher (with other service liquid).
2. Long Life and Low Maintenance Cost.  
The impellers and shaft are the only moving parts. The impellers have no contact with the casing. There are no sliding vanes or valves.
3. Vibration-free and Noiseless Operation.  
Rugged construction and absence of reciprocating parts ensure vibration-free and noiseless operation.
4. Non-pulsating Gas Flow.
5. No Internal Lubrication.
6. Liquid and Vapor Handling.  
Liquid Ring Vacuum Pumps are capable of handling large quantities of vapor. Small amounts of liquid drawn in from the system will pass through the pump without causing damage.
7. Low Starting Torque.
8. Different service liquids may be used.
9. Materials of construction.

Pumps can be constructed from a wide range of materials to suit corrosive conditions.

10. Delivery of absolutely oil-free air.

When unit is used as a compressor.



## Maximum Vacuum

Maximum vacuum and capacity obtainable with Liquid Ring Vacuum Pumps depends directly on the vapor pressure of the service liquid. Higher vacuum and capacities than indicated in the capacity tables may be achieved by using the following methods:

- a) Using a special oil as the service liquid instead of water. The low vapor pressure of the oil allows maximum vacuums down to 12 mm Hg absolute. In addition the capacity in the higher vacuum range will increase.
- b) By replacing one or more gas ejectors in series with the pump.
- c) By operating a Liquid Ring Vacuum Pump in series with a mechanical booster, ultimate vacuums down to 1 mm Hg absolute and capacities up to 8000 m<sup>3</sup>/h are obtainable with this combination.





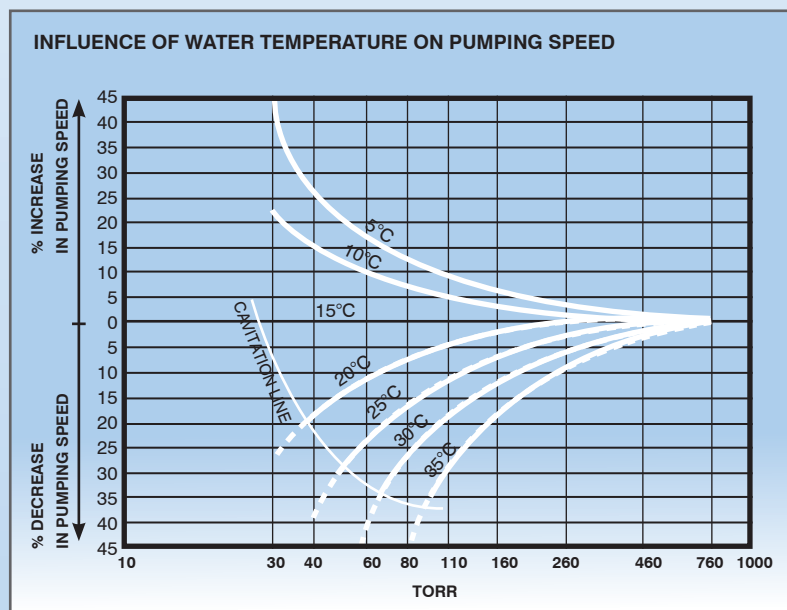
## Influence of service liquid temperature on pumping speed

The temperature of sealing water has a marked influence on the pumping speed of the pump. If the temperature is higher than 15°C, then the pumping speed of the pump is reduced, conversely this increases when the temperature is below 15°C. Therefore, it is standard practice for capacity tables and curves to be based on water as the sealant at a temperature of 15°C at sea level. The following graph shows the percentage increase or decrease of pumping speeds related to the water temperature.

It is recommended that the pump is not operated at temperatures and vacuum below the dotted line on the graph, otherwise cavitation can occur within the pump. This can cause a loud noise and badly damage the impeller.

As an example, it is required to calculate the pumping speed of a GDH 1500 vacuum pump operating at 1 500m above sea level, with a sealing water temperature of 25°C. A gauge reading of 555mm hg is required.

Barometric pressure at 1 500m above sea level .....	635 Torr
Gauge vacuum required .....	555mm hg
Absolute vacuum required .....	80 Torr
Pumping speed of GDH 1500 at sea level and sealing water at 15°C with vacuum measured at 80 Torr .....	2600m <sup>3</sup> /h
Decrease in pumping speed with vacuum measured at 80 Torr with sealing water at 25°C .....	16%
Pumping speed of GDH 1500 at site conditions - 2600 m <sup>3</sup> /h x 0,84 .....	2184m <sup>3</sup> /h



# HORMA PUMPS (PTY) LTD

## Pump Reconditioning and General Engineering