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TRAVAINI PUMPS USA
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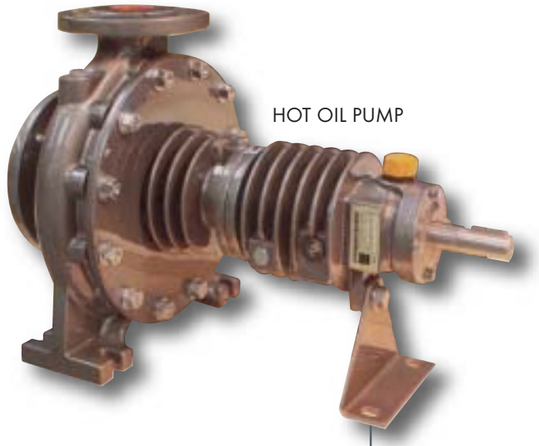
OUR PRODUCTS

CENTRIFUGAL
PUMPS

SELF-PRIMING
CENTRIFUGAL PUMPS



HOT OIL PUMP

MULTISTAGE
CENTRIFUGAL PUMPS

TRAVAINI PUMPS USA
Liquid Ring & Rotary Vane Vacuum Pumps and Systems

TRH-TRS-TRM-TRV

LIQUID RING VACUUM PUMPS AND COMPRESSORS
Capacity up to 2100 ACFM
Vacuum to 29" Hg

TRAVAINI PUMPS USA

TRAVAINI PUMPS USA

Liquid Ring & Rotary Vane Vacuum Pumps and Systems

Travaini Pumps, USA is one of the leading worldwide manufacturers of liquid ring vacuum pumps with single stage (TRS), two stage (TRH), and single stage variported (TRM/TRV) designs. With the experience developed over decades of engineering research, continual in the latest technologically advanced machinery, and sound mechanical know-how, Travaini Pumps' product is synonymous with high quality, high efficiency, robust construction and maximum reliability.

APPLICATIONS

- CENTRAL VACUUM SYSTEMS
- DE-AERATION
- IMPREGNATION
- BOILING PROCESSES
- VACUUM CONDENSING
- DISTILLATION
- DRYING SYSTEMS
- STERILIZATION
- FILTRATION
- SOLVENT RECOVERY
- VACUUM HOLD DOWN
- SOIL REMEDIATION

Pumps series **TRH**
Capacity = 2-2100 ACFM
Vacuum = 25-760 Torr

LIQUID HANDLING CAPABILITY

Pumps are capable of handling high volumes of vapors, condensables and liquids, without detrimental consequences to their performance or their mechanical reliability. Pump service liquid can be water or other liquids such as oils, solvents, etc. to satisfy almost any process requirements.

DISCHARGE OIL FREE AIR

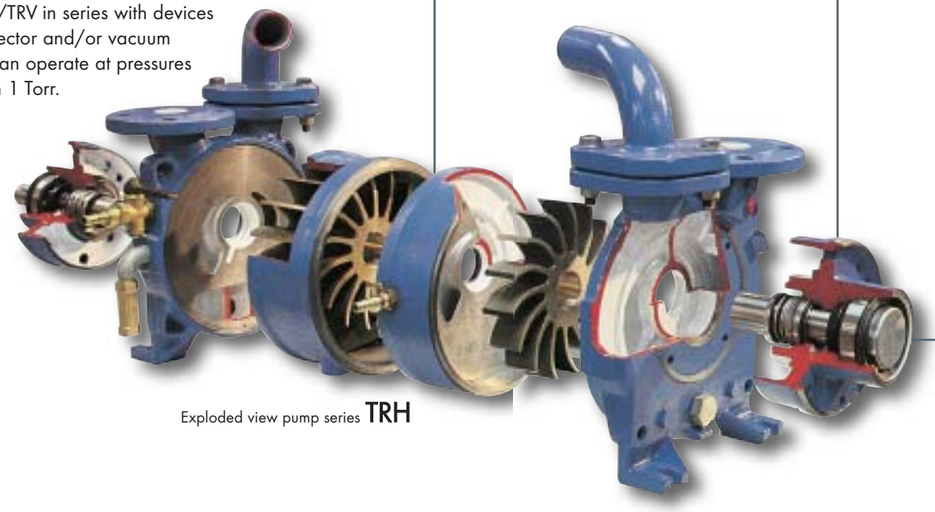
With clean water as pump service liquid, the aspirated air (or gas) is "washed clean" within the pump. Contrary to other types of vacuum pumps the discharged air can be completely free of any oils, carbon or plastic particles.

MOUNTING TO NEMA MOTORS

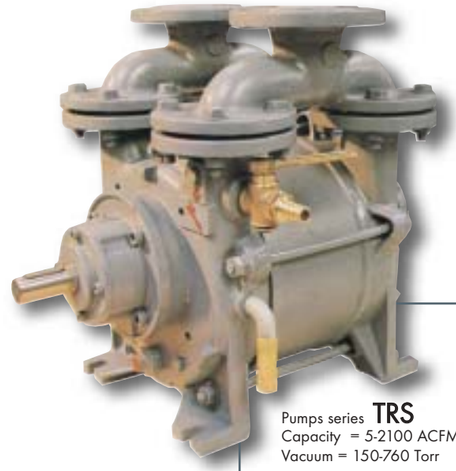
Travaini Pumps standard design may be base-mounted coupled to standard NEMA Motors. Pumps up to 40 HP can be close coupled to C or D flanged NEMA Motors utilizing specially designed attachment flanges. This close-coupled arrangement allows utilization of standard readily available electric motors, eliminates lenghty alignment procedures and costly breakdowns associated with misalignments. Overall dimensions are reduced and engineered baseplates are no longer required.

PRESSURE TO LESS THAN 25 TORR

Liquid ring vacuum pumps, type TRH/TRM/TRV in series with devices such as ejector and/or vacuum boosters can operate at pressures lower than 1 Torr.



Exploded view pump series **TRH**



Pumps series **TRS**
Capacity = 5-2100 ACFM
Vacuum = 150-760 Torr

TRM/TRV
Capacity = 5-300CFM
Vacuum = 25-760 Torr

LIQUID RING VACUUM PUMPS SERIES TRH-TRS-TRM-TRV

FEATURES

QUALITY

Designed and manufactured utilizing ISO 9001 standards, every components is guaranteed for the selected materials, workmanship and performance through scrupulous inspections during production and final testing of finished product.

FEWER COMPONENTS

Through engineered innovations and co-operation with technologically advanced foundries, the pumps are manufactured with less components than typically required. Fewer parts add to the rigidity and toughness of the pumps, they are easier to assemble and maintenance is greatly facilitated.

COMPACT DIMENSIONS

The conventional stuffing boxes construction is eliminated with the Travaini Pumps' standard design. The shaft length is greatly reduced thus eliminating the potential danger for shaft deflections and vibrations to the mechanical seals which would increase seals and bearing wear.

STANDARD MECHANICAL SEALS

In keeping pace with today's technology, Travaini Pumps has standardized all pumps to accept unified mechanical seals to DIN 24960 standards. Also available upon request, are constructions with double mechanical seals (tandem or back to back) or cartridge type mechanical seals.

LARGE SELECTION OF MATERIALS

In addition to the standard materials, Travaini Pumps are also available with special materials such as Ni-Resist D2B, Hastelloy B or C, Uranus B6, etc. to meet specific applications.

MECHANICAL RELIABILITY

With the simple design of liquid ring pumps there are no reciprocating parts, no valves or sliding vanes. The impeller is the only rotating component with no metal-to-metal contact. Pump operation has minimal wear, vibration free and noise levels are reduced.

CODES AND MATERIALS

EXAMPLE FOR MODEL DESIGNATION

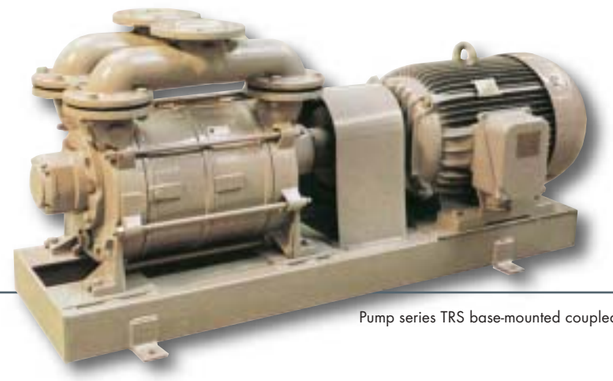
T	R	H	C	80	-	750	/	C	-	M	/	GH

T	*Travaini Pumps, USA Construction*
R	*Liquid ring pump*
H	H = *Double stage pump for high vacuum* S = *Single stage pump for medium vacuum* M = *Vari Port with Motor* V = *Vari Port without Motor*
C	*Design number*
80	*Ø Flange Size (inches)*
750	*Nominal capacity (ACFM)*
C	*Shaft sealing* C = *Mechanical seal* C2 = *Double mechanical seal* B = *Packing seal*
M	*Close-coupled construction with lantern (on request)*
GH	*Materials of costruction* GH = F = RZ = RA = A3 = — *See table*

STANDARD MATERIALS OF CONSTRUCTION

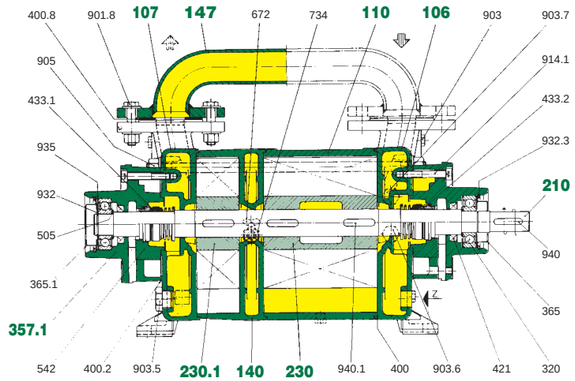
VDMA N_i	*Description*	**GH**	**F**	**RZ**	**RA**	**A3**
106	*Suction casing*	*Cast iron UNI 5007-69*				
107	*Discharge casing*					
137	*Port plate*					
110	*Impeller housing*					
210	*Shaft*	*Stainless steel AISI 420*			*Stainless steel AISI 316*	
147	*Manifold*	*Steel*				
357	*Bearing and mech. seal hous.*	*Cast iron UNI 5007-69*				
230	*Impeller*	*Bronze*	*Ductile iron*		*Stainless steel AISI 316*	

SPECIAL MATERIALS AVAILABLE UPON REQUEST



Pump series TRS base-mounted coupled construction

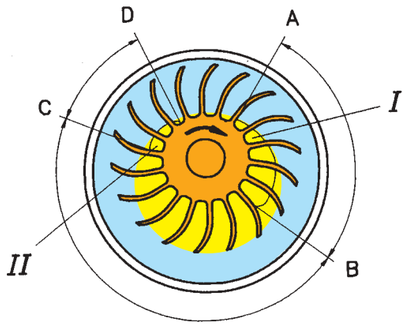
CROSS SECTION & PRINCIPLE OF OPERATION



TYPICAL CROSS SECTION OF A TWO STAGE VACUUM PUMP WITH MECHANICAL SEAL

COMPONENTS

PART NO.	DESIGNATION
106	Suction casing
107	Discharge casing
110	Impeller casing
140	Intermediate element
147	Manifold
210	Shaft
230	1st stage impeller
230.1	2nd stage impeller
357.1	Bearing and mechanical seal housing



PRINCIPLE OF OPERATION

Gas entering via the suction port is conveyed into the impeller casing AB and trapped in the space between two impeller blades. As the impeller rotates - eccentrically to the liquid ring and casing - the volume between the blades increases creating vacuum. As the cycle progresses towards the discharge port the volume decreases as the liquid ring creates compression. This compression continues until the gas is discharged through the discharge port CD. A small amount of seal liquid is discharged with the gas and it is necessary to supply make-up continuously. This make-up liquid also maintains the liquid ring and absorbs the heat energy of compression.

I = Suction phase II = Compression phase

TYPICAL TRW WATER SEALED SYSTEMS

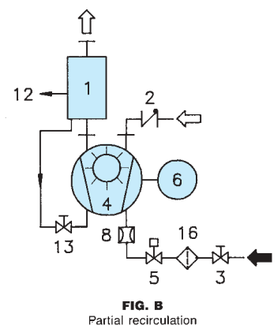


FIG. B
Partial recirculation

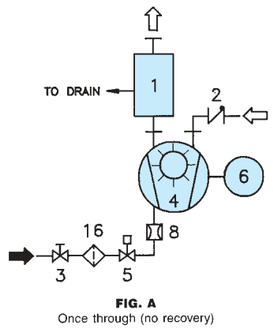


FIG. A
Once through (no recovery)

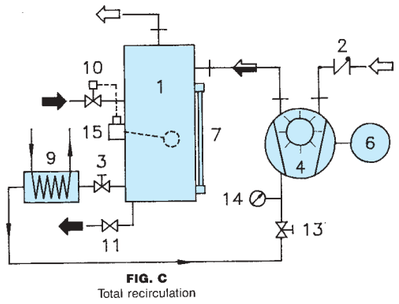


FIG. C
Total recirculation

⇧ AIR OR GAS

⇧ LIQUID-GAS MIXTURE

⬆ LIQUID

PARTIAL RECIRCULATION

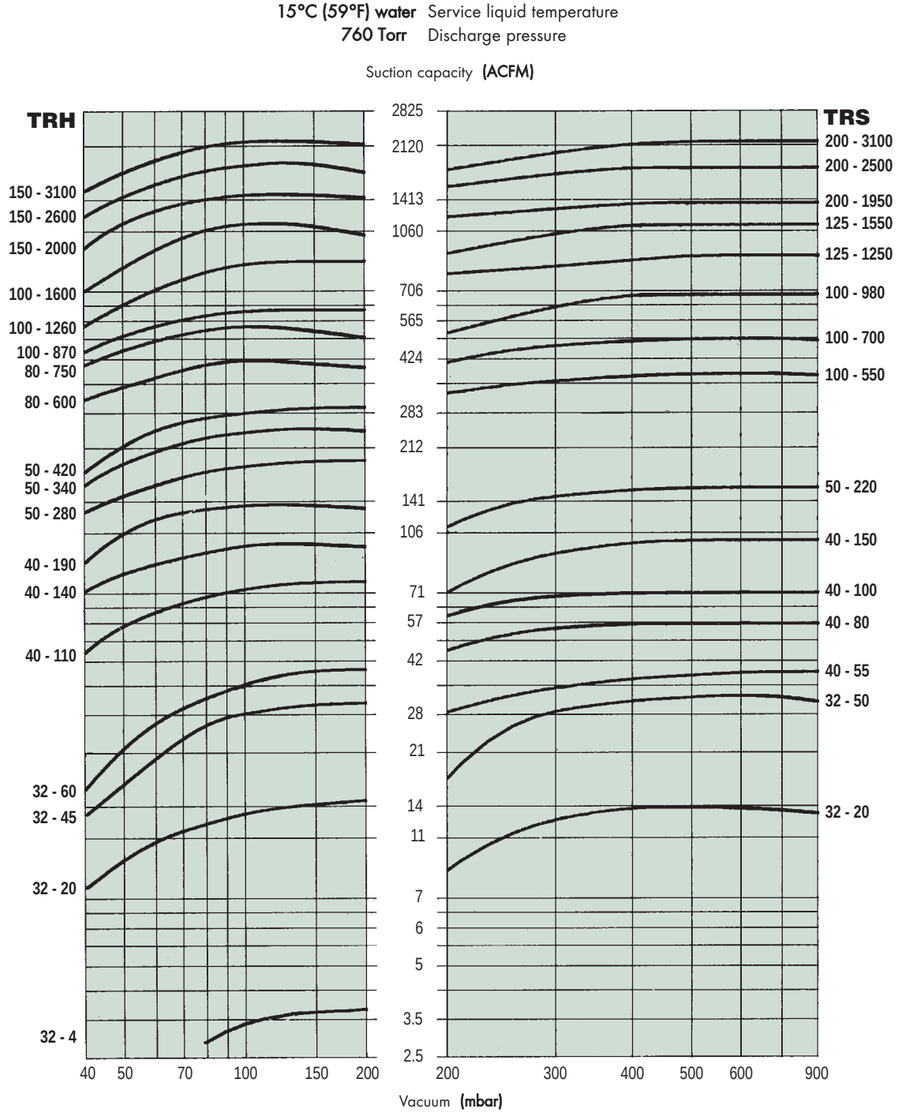
1 Separator tank
2 Check (non-return) valve
3 Isolating valve
4 Vacuum pump
5 Solenoid valve
6 Electric motor
7 Level indicator
8 Flow control
9 Cooler
10 Solenoid valve for make-up liquid
11 Drain valve
12 Overflow
13 Regulating valve
14 Compound gauge
15 Low level switch
16 Strainer

PERFORMANCE FIELDS

PERFORMANCE CURVES AT 60 CYCLES

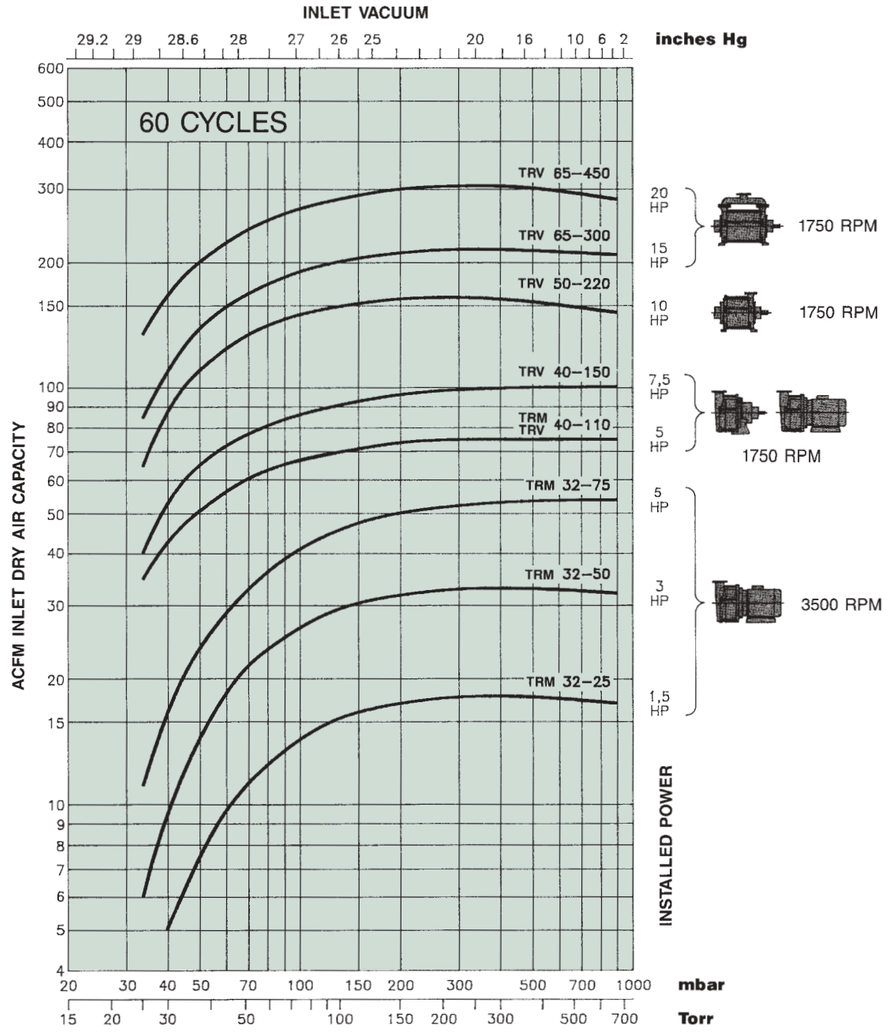
DATA BASED ON:

20°C (68°F)	Suction dry air
15°C (59°F) water	Service liquid temperature
760 Torr	Discharge pressure



When handling saturated air and/or using service liquid with temperature other than 15°C (59°F) the capacity will change substantially (see diagrams on page 16).
The vacuum pumps can operate as compressors at a pressure 25 psi maximum higher than standard atmospheric pressure. For working performances contact our Sales Office.

PERFORMANCE FIELDS



Series: TRV and TRM

Data refers to:	Series TRV-TRM
Discharge pressure:	29.92" Hg - 760 Torr
Service liquid:	water at 60°F
Specific gravity:	1 kg/dm3
Viscosity:	32 SSU
Minimum suction pressure:	25 Torr

PERFORMANCE OF PUMPS SERIES TRH

Absolute Pressure			PSIA	3.0		2.15		1.50		1.10		0.78		0.58		0.48		Average Service Liquid
			Torr	160		110		80		60		40		30		25		
Vacuum“Hg				23.6		25.6		26.8		27.5		28.3		28.7		28.9		
PumpType	Flang Size	Motor Power	RPM	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	GPM
TRH32-4	1 1/4”	0.75	1450	2.6	0.55	2.5	0.5	2.9	0.5	2.0	0.5	-	-	-	-	-	-	0.7
		1.00	1750	3.4	0.8	3.0	0.8	2.9	0.8	2.9	0.8	-	-	-	-	-	-	
TRH32-20	1 1/4”	1.5	2900	12.4	1.1	11.8	1.1	11.2	1.1	10	1.1	8.2	1.1	6.5	1.1	-	-	1.3
		2.0	3500	14.7	1.8	14.4	1.8	13.5	1.8	12.4	1.8	10	1.8	7.5	1.8	-	-	
TRH32-45	1 1/4”	2.0	2900	26	1.7	25	1.7	24	1.7	21	1.7	16	1.7	12	1.7	-	-	1.3
		3.0	3500	31	2.5	31	2.4	28	2.4	26	2.4	18	2.4	14	2.4	-	-	
TRH32-60	1 1/4”	3.0	2900	32	2.5	32	2.4	30	2.4	27	2.4	19	2.4	14	2.4	10	2.4	3.0
		5.0	3500	35	3.1	35	3.1	34	3.1	32	3.1	24	3.1	17	3.1	13	3.1	
TRH40-110	1 1/2”	5.0	1450	62	3.9	63	3.9	60	3.9	58	3.8	48	3.7	39	3.5	30	3.5	3.3
		5.0	1750	74	5.1	74	5.0	68	4.9	62	4.9	50	4.7	42	4.7	33	4.7	
TRH40-140	1 1/2”	5.0	1450	82	4.6	85	4.3	83	4.0	80	3.9	72	3.8	62	3.8	38	3.8	3.5
		7.5	1750	97	6.0	99	5.8	95	5.5	91	5.3	79	5.2	71	4.9	59	4.9	
TRH40-190	1 1/2”	7.5	1450	108	6.0	112	5.7	112	5.3	110	5.1	95	5.0	77	4.8	59	4.8	3.7
		10.0	1750	128	8.0	132	7.5	130	7.4	128	7.1	118	7.0	88	6.8	70	6.8	
TRH50-280	2”	10.0	1450	168	10.1	165	9.8	159	9.4	150	8.9	127	8.9	106	8.9	94	8.9	5.0
		15.0	1750	182	14.5	180	13.8	171	13.4	160	13.4	143	13.4	129	13.4	118	13.4	
TRH50-340	2”	15.0	1450	200	12.2	203	11.5	200	11.1	191	11.0	166	10.9	135	10.9	109	10.9	7.0
		20.0	1750	235	16.5	235	15.8	228	15.3	218	14.8	182	14.8	152	14.8	124	14.8	
TRH50-420	2”	15.0	1450	244	14.5	247	13.8	241	12.9	230	12.3	194	11.8	154	11.8	124	11.8	9.0
		20.0	1750	274	18.6	271	17.4	259	17.3	241	17.3	200	17.3	162	17.3	132	17.3	
TRH80-600	2”	20.0	1150	260	19	270	19	280	17	275	17	250	16	210	15	175	15	9.0
		40.0	1750	291	35	400	34	406	33	394	32	340	30	288	30	253	29	
TRH80-750	3”	30.0	1150	360	20	370	28.2	360	27.1	350	26.6	320	25.2	290	24.1	270	23.6	10.0
		50.0	1750	483	43	500	41	503	40	492	38	427	36	374	35	321	34	
TRH100-870	4”	40.0	960	512	32	518	31	506	30	483	29	436	29	371	29	335	30	20.0
		50.0	1150	574	49.3	574	48	559	46	530	44	456	44	375	44	340	44	
TRH100-1260	4”	40.0	880	660	37	660	37	625	36	575	35	480	35	405	35	375	35	22.0
		60.0	1150	818	62	848	60	818	58	730	57	610	57	470	57	400	57	
TRH100-1600	4”	50.0	880	853	50	830	48	830	47	780	45	650	39	540	44	460	44	25.0
		75.0	1150	959	75	1101	75	1001	75	955	73	824	71	650	71	507	71	
TRH150-2000	6”	100.0	730	1142	78	1207	74	1224	70	1177	67	954	64	812	62	706	60	40.0
		125.0	880	1324	118	1366	118	1295	118	1189	115	965	110	789	108	-	-	
TRH150-2600	6”	100.0	730	1383	94	1542	91	1530	87	1418	83	1207	79	1030	76	871	75	45.0
		150.0	880	1560	141	1730	143	1683	143	1507	138	1177	131	977	130	-	-	
TRH150-3100	6”	125.0	730	1766	114	1854	106	1872	92	1813	94	1560	89	1271	87	1001	87	55.0
		200.0	880	2090	165	2148	162	2125	158	1989	152	1442	146	1130	145	-	-	

PERFORMANCE OF PUMPS SERIES TRS

ABSOLUTE PRESSURE			PSIA	12.7		10.6		8.7		6.8		4.8		2.9		2.5		*Average service liquid flow*
			Torr	660		550		450		350		250		150		130		
VACUUM“Hg				4"		8"		12"		16"		20"		24"		26"		
PUMP TYPE	Flange Size	Motor Power	RPM	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	GPM
TRS32-20	11/4"	1.0	2900	11	0.5	11	0.6	12	0.7	12	0.8	11	0.9	8	1.0	4	1.0	1.3
		1.5	3500	14	1.1	14	1.1	15	1.3	15	1.3	14	1.5	12	1.5	8	1.5	
TRS32-50	11/4"	2.0	2900	25	0.9	27	1.0	28	1.3	27	1.5	24	1.7	16	1.7	6	1.7	1.4
		3.0	3500	29	1.3	30	1.6	31	1.8	31	2.1	30	2.3	25	2.6	15	2.6	
TRS40-55	11/2"	3.0	1450	32	1.2	30	1.3	30	1.7	29	1.9	29	2.1	25	2.1	19	2.1	2.2
		3.0	1750	40	1.9	39	2.0	39	2.1	39	2.3	39	2.5	32	2.6	22	2.6	
TRS40-80	11/2"	3.0	1450	47	1.6	47	2.0	47	2.4	47	2.6	46	2.8	40	2.8	29	2.8	2.4
		5.0	1750	59	2.7	59	3.0	59	3.2	59	3.4	58	3.6	48	3.7	32	3.7	
TRS40-100	11/2"	5.0	1450	59	2.4	59	3.0	59	3.2	59	3.4	58	3.6	50	3.9	38	3.9	2.9
		5.0	1750	75	3.2	75	3.5	75	3.8	75	4	74	4.2	65	4.4	44	4.4	
TRS40-150	11/2"	5.0	1450	85	2.6	85	3.1	85	3.6	85	4	80	4.4	62	4.4	38	4.4	3.2
		7.5	1750	106	3.5	106	4.2	106	4.7	103	5.4	98	5.8	75	6.4	53	6.6	
TRS50-220	2"	7.5	1450	129	4.2	129	5.1	129	6.3	129	6.3	124	6.7	97	6.8	68	6.9	4.4
		10.0	1750	152	6.6	156	7.0	158	7.5	158	7.9	152	8.4	125	8.8	94	8.8	
TRS100-550	4"	20	1450	300	11.3	306	12.9	312	14.3	325	15.7	310	17.2	280	18.4	250	18.4	8.0
		25	1750	371	16.1	377	18.2	378	20	378	21	377	22	347	22	315	23	
TRS100-700	4"	25	1450	406	18.5	415	19.8	430	21	432	23	415	22	359	22	300	22	9.0
		40	1750	490	21	495	23	500	25	500	27	495	29	450	30	383	30	
TRS100-980	4"	40	1450	577	27	577	30	577	32	575	32	550	34	424	35	-	-	21.0
		50	1750	700	39	700	40	700	41	700	43	675	46	485	48	-	-	
TRS125-1250	5"	40	880	575	30	575	38	575	39	575	40	550	42	450	43	-	-	18.0
		60	1150	825	52	820	53	800	54	800	55	715	57	675	57	-	-	
TRS125-1550	5"	50	880	825	40	825	50	825	51	825	52	800	53	777	53	-	-	20.0
		75	1150	1060	69	1060	71	1060	72	1060	72	1040	75	820	74	-	-	
TRS200-1950	8"	75	730	1148	50	1150	56	1150	63	1140	67	1100	71	1007	75	-	-	44.0
		125	880	1410	75	1410	86	1410	95	1400	102	1350	110	1130	114	-	-	
TRS200-2500	8"	100	730	1472	62	1475	70	1475	79	1475	84	1450	89	1301	94	-	-	53.0
		150	880	1751	94	1750	106	1750	121	1725	129	1700	135	1390	141	-	-	
TRS200-3100	8"	125	730	1825	87	1825	94	1825	99	1825	103	1710	109	1501	114	-	-	62.0
		200	880	2154	130	2154	138	2154	148	2120	156	2110	165	1600	173	-	-	

This data represents average values for pumps in standard and all iron materials of construction (GH, RZ, F), discharging against atmospheric pressure at sea level (760 Torr). All stainless steel (A3) pumps have 10% less capacity. Capacity in ACFM subject to 10% tolerance handling dry air at 20°C (68°F) and using 15°C (59°F) water as service liquid. When handling 100% saturated air capacity increases substantially (see diagrams on page 16).

Break horse power refers to water at 15°C (59°F), used as service liquid and tolerance 10%.
(1) For detailed information pls consult the specific performance curves of the requested pump.

PERFORMANCE OF PUMPS SERIES TRM-TRV

Absolute Pressure			PSIA	12.7		8.7		4.8		2.9		1.5		0.78		0.48		Average Service Liquid
			Torr	660		450		250		150		80		40		25		
Vacuum "Hg				4		12		20		24		26.8		28.3		28.9		
Pump Type	Flange Size	Motor Power	RPM	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	ACFM	BHP	GPM
TRMB 25-30	1"	1.0	2900	15.5	0.75	16.5	0.8	16.5	0.9	15.5	0.9	13.5	0.85	9.5	0.75	6.0	0.5	1.0
		1.5	3550	19	1.05	19.5	1.15	20	1.3	19	1.35	16.5	1.25	12	1.05	6.5	0.9	
TRMA 32-25	1"	1.0	2900	92.5	0.6	12,5	0.8	12.3	0.9	12	0.9	10.5	0.9	7.0	0.75	4.5	0.65	1.25
		1.5	3500	14.5	0.85	15	1.1	15.3	1.3	14.5	1.3	12	1.25	7.5	1.05	4.6	0.9	
TRMB 32-50	1"	2.0	2900	30	1.30	28	1.55	27.5	1.8	25	1.8	20	1.5	11	1.4	4.0	1.3	1.5
		3.0	3500	36	1.75	35	2.3	35	2.5	32	2.5	27	2.3	13	2.0	5.0	1.9	
TRMB 32-75	1 1/2"	3.0	2900	44	2.60	45	2.8	45	3.0	40	3.0	32	2.8	20	2.4	8.0	2.2	2.5
		5.0	3500	56	4.20	57	4,5	53	4.7	48	4.6	40	4.2	25	3.7	12	3.5	
TRMB/TRVB 40-110	1 1/2"	5.0	1450	60	3.60	60	3.7	60	3.7	59	3.6	54	3.5	40	3.2	30	3.1	4.0
		5.0*	1750	68	5.2	70	5,2	70	5.1	67	5.2	60	4.9	47	4.4	35	4.0	
TRMB/TRVB 40-150	1 1/2"	5.0	1450	85	4.4	88	4.7	85	5.0	82	4.7	70	4.4	48	3.9	32	3.7	4.5
		7.5	1750	100	6.3	104	6.7	105	7.0	99	6.7	85	6.4	57	5.5	33	5.2	
TRMB/TRVB 40-200	1 1/2"	7.5	1450	120	5.0	122	6.5	125	7	121	6.9	110	5.9	80	4.7	75	4.2	5.0
		10	1750	141	8.5	145	9.5	145	10	140	9.5	125	8.5	95	7.8	85	7.5	
TRVB 65-300	2 1/2"	10	1450	162	6.5	170	7.7	168	8.8	165	8.5	150	7.0	110	6.0	70	5.5	6.0
		10	1750	200	9.9	208	12	202	13	198	12,9	179	11.5	120	9.5	77	9.5	
TRVB 65-450	2 1/2"	15	1450	235	9.9	240	12	250	13.7	245	13	230	10.5	177	9.0	120	8.5	8.0
		20	1750	285	15	300	17	305	19	290	19	270	17	200	15	130	13.5	

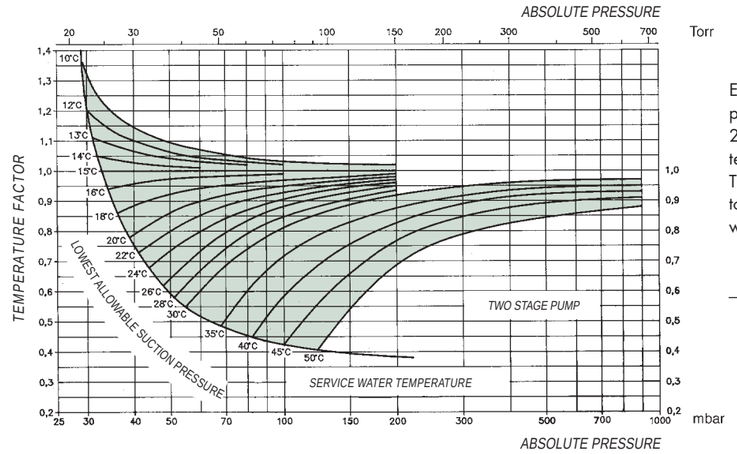
TRM are all motor mounted pumps
TRV is pump only
*USE MOTOR @ 1.15 S.F.

TRM/TRV
Capacity = 5-300CFM
Vacuum = 25-760 Torr

TECHNICAL INFORMATION

Effect of service water temperature and saturated air on the capacity of liquid ring vacuum pump.

The performance data published for vacuum pumps is based on using water at 15°C (59°F) as the service liquid. The vapor pressure of the service liquid has a direct influence on pump capacity.
The following diagrams allow to make corrections to the published data when using service water at temperatures other than 15°C (59°F).

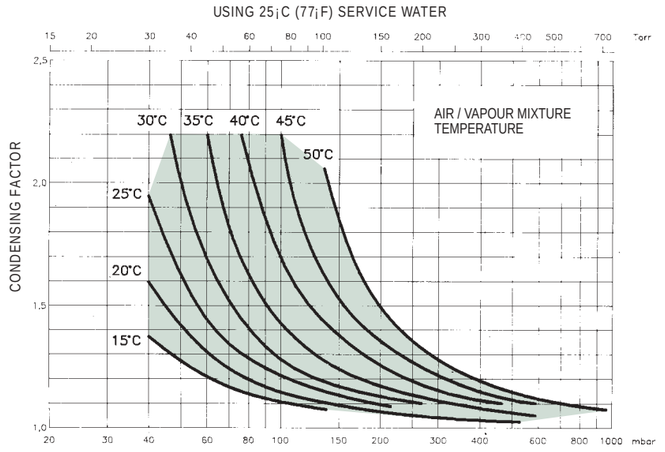


Example of double stage vacuum pump that operates at 38 Torr with 22°C (71°F) service water temperature.
The necessary capacity Q referred to the published data (see page 10) will be:

$$\frac{Qty}{0.8}$$

where Qty is the requested capacity and 0.8 the value obtained from diagram.

The performance data published for vacuum pumps are based on handling dry air at 20°C (68°F). When handling mixtures of air and vapour the pump capacity will increase depending upon the air/vapour temperature as well as the service water temperature being used. These diagrams will allow the users to determine the condensing factors when handling saturated air at various temperatures and using service water at 15°C (59°F) or 25°C (77°F).
For more detailed informations contact our Sales Office.



Example of two stage vacuum pump that operates at 60 Torr with 40°C (104°F) saturated air and 25°C (77°F) service water temperature. The capacity Q referred to the published data (see page 10) will be:

$$\frac{Qty}{2.1 \times 0.85}$$

Where Qty is the requested capacity, 2.1 the condensing factor and 0.85 the temperature factor (values obtained from diagrams).

TECHNICAL INFORMATION

EVACUATION FROM A CLOSED VESSEL

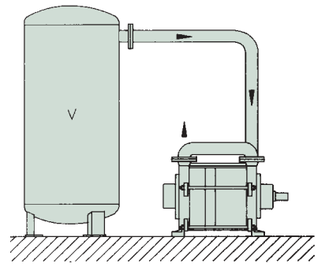
To determine necessary time to change the absolute pressure inside a closed vessel of rated volume (V) from P2 to P1 the following formula has to be used:

$$t = \frac{V}{Q} \times 60 \times \ln \frac{P2}{P1} \qquad \text{or} \qquad Q = \frac{V}{t} \times 60 \times \ln \frac{P2}{P1}$$

where:

t = Requested time (minutes)
V = Total volume to evacuate (ft^3)
Q = Capacity of the vacuum pump (ACFM)
P1 = Final pressure (Torr)
P2 = Starting pressure (Torr)

$\ln \left(\frac{P2}{P1}\right)$ = See below table



PRIMING OF CENTRIFUGAL PUMPS

he liquid ring vacuum pumps are used also for the priming of centrifugal pumps or similar.
According to plant design the following formulas are to be used:

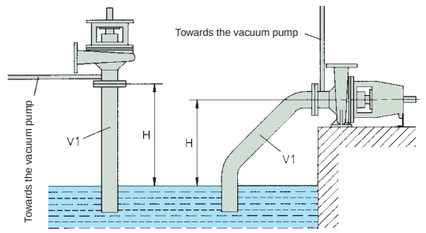
a) $$t = \frac{V1}{Q} \times 60 \times \left(2 - \frac{P1}{P1 - P2} \times \ln \frac{P2}{P1}\right)$$

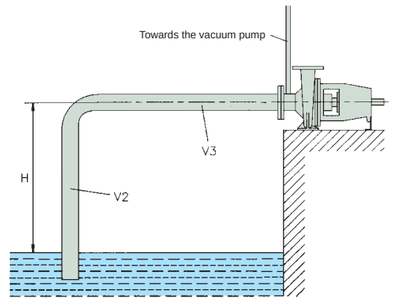
b) $$t = \frac{V2}{Q} \times 60 \times \left(2 - \frac{P1}{P1 - P2} \times \ln \frac{P2}{P1}\right) + \frac{V3}{Q} \left(\ln \frac{P2}{P1} 1\right)$$

where:

t = Requested time (minutes)
V1 = Total volume of piping (ft^3)
V2 = Total volume of vertical piping (ft^3)
V3 = Total volume of horizontal piping (ft^3)
P1 = Absolute pressure (Torr) at the suction of the pump when the piping is full (generally using water is: ~ barometric pressure [Torr] - H [m] x 98)
P2 = Starting absolute pressure (mbar) inside the piping before priming (generally is the barometric pressure)
Q = Capacity of vacuum pump (ACFM)

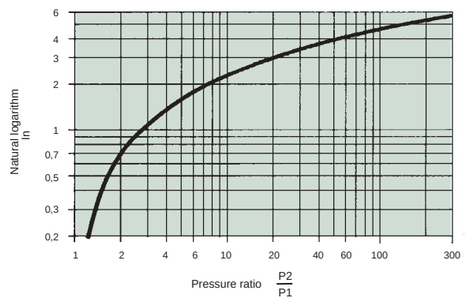
$\ln \left(\frac{P2}{P1}\right)$ = See below table



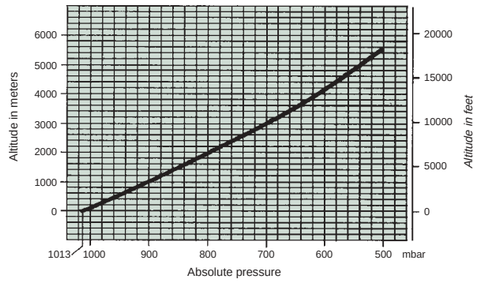


Note: The above mentioned formulas are applied when the capacity (Q) of vacuum pump between P2 → P1 is constant: if this is not possible, it is necessary to split calculation in more steps where the capacity (Q) could be considered constant.

LOGARITHMIC TABLE

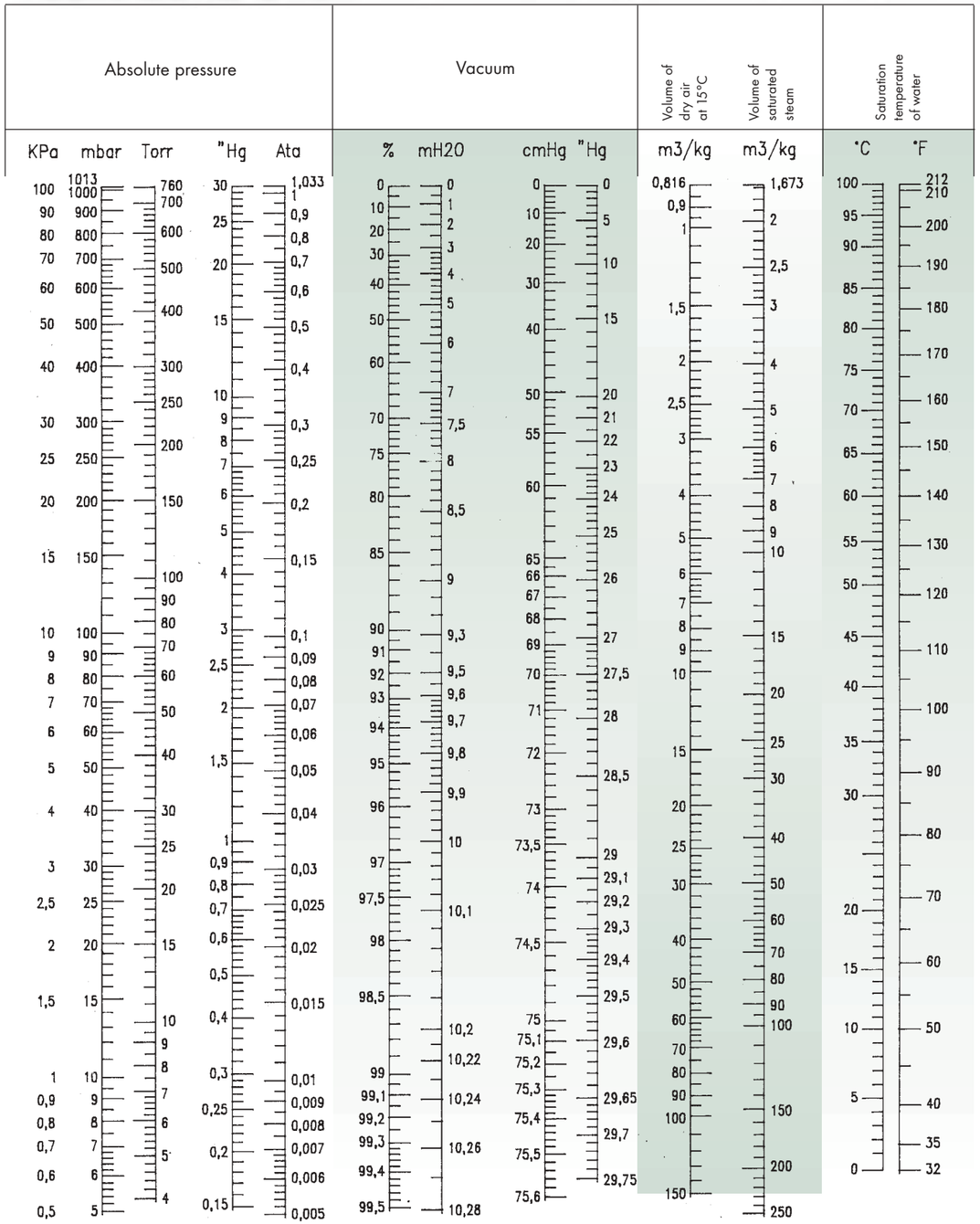


BAROMETRIC PRESSURE VARIATION RELATED TO ALTITUDE

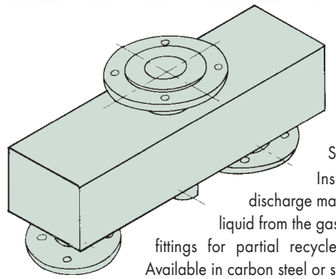


TECHNICAL DATA

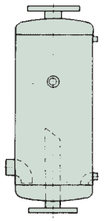
UNIT CONVERSION AND TECHNICAL DATA FOR VACUUM



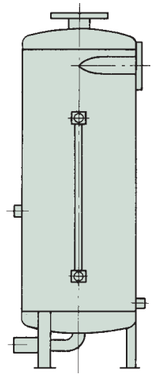
ACCESSORIES



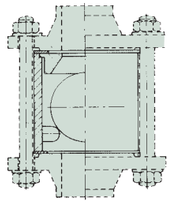
SEPARATOR / MANIFOLD
Installed in place of the discharge manifold to separate the seal liquid from the gas. Supplied with pipes and fittings for partial recycle and drain connection. Available in carbon steel or stainless steel AISI 316.



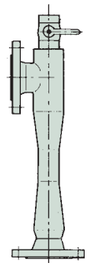
PUMP MOUNTED SEPARATOR
Installed on the discharge branch it separates the gas/liquid. Complete with pipes and fittings for partial recycle drain. Available in carbon steel and stainless steel AISI 316.



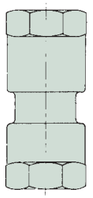
FREE STANDING SEPARATOR
FOR FULL RECOVERY SYSTEM
Affords excellent separation of gas/liquid mixture. Essential when the seal liquid is recycled a close circuit and cooled by a heat exchanger. Supplied complete with level gauge, thermometer drain valve, excess liquid drain valve and connection for pressure gauge. Available in carbon steel and stainless steel AISI 316.



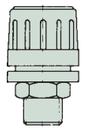
NON-RETURN VALVE WITH LOW PRESSURE DROP
Installed between the suction flange and the counter flange of the suction pipe. Prevents backflow into the system in the event of the pump stopping. It has a very low pressure drop and ideal for higher vacuum conditions. Available in a variety of materials.



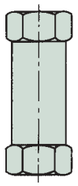
ATMOSPHERIC AIR (or gas)
OPERATED EJECTOR.
Provided when suction pressure below 25 Torr are required. Will operate down to 5 Torr. Installed on the suction branch and utilizes air from the atmosphere as motive air. Available in a variety of materials.



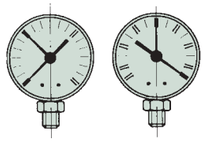
AUTOMATIC DRAIN VALVE
Provided to drain the pump casing down to the centre line when the pump is stopped. Prevents starting the pump with the casing full of seal liquid and avoids heavy starting loads. Available in brass with nitrile seal ring.



VACUUM RELIEF VALVE
A manually adjustable safety valve. Used to control the degree of vacuum and assist in the prevention of cavitation.



VALVE
Installed in the seal liquid supply pipe in the place of regulating valves. Ensures the correct amount of seal liquid is supplied to the pump irrespective of the supply pressure. Effects economies in the quantity of seal liquid.



VACUUM GAUGES,
PRESSURE GAUGES
AND COMPOUND GAUGES

TRAVAINI PUMPS USA