MVS
SERIES

⚠ **WARNING - Reliance on this Manual Could Result in Severe Bodily Injury or Death!**

This manual is out-of-date and is provided only for its technical information, data and capacities. Portions of this manual detailing procedures or precautions in the operation, inspection, maintenance and repair of the product forming the subject matter of this manual may be inadequate, inaccurate, and/or incomplete and cannot be used, followed, or relied upon. Contact Conair at info@conairgroup.com or 1-800-654-6661 for more current information, warnings, and materials about more recent product manuals containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.

METAPLAST... The Downstream Specialists

UGE057/0802

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WARRANTY

New Apparatus Warranty: Conair/ Metaplast warrants all new equipment to be free of defects in materials and workmanship and to conform to any drawings and specifications for a period of one (1) year from the date of shipment. Equipment that is defective and found not to be in conformity with this warranty will, at the option and expense of Conair/Metaplast, be repaired or replaced.

This warranty does not cover:

1) Failures not reported within the warranty period.

2) Damage due to misapplication, abuse, improper installations or abnormal temperature, dirt or corrosive matter.

3) Failure due to operation, intentional otherwise, above rated capacities.

4) Alterations, or tampering, by anyone other than an authorized Conair/ Metaplast representative.

5) Damage in shipment.

6) Expense incurred by the Buyer in attempt to rework any alleged defects.

1.0 RECEIVING AND HANDLING

1.1 Acceptance

Thoroughly inspect equipment before accepting shipment from the transport company. Damage and shortages should be noted on your freight bill by the receiving agent. If concealed loss or damage is discovered, notify your freight, or receiving agent, at once and request for an inspection.

Conair/Metaplast will assist you in collecting claims for loss or damage in shipment; however, responsibility rests with the transport company. Claims can not be deducted nor should payment be withheld on any Conair/Metaplast invoice, as the carrier guarantees safe delivery.

1.2 Storage

If the equipment is to be stored for any period of time prior to installation, the area should be dry, and not subject to extremes in temperature, or humidity changes. Be aware that after use prior to storage, the machine should be inspected, and lubrication applied where, and as, needed. This is done in order to prevent bearings to be damaged by contaminated grease.

2.0 GENERAL DESCRIPTION

Located as part of the downstream production line, the MVS vacuum-sizing tank, holds in proper position, sizing rings or calibrator assembly, applies vacuum and cools down the extrusion in order to produce constant dimensions.

2.1 Features

2.1.1 Standard features

- Stainless steel tank construction.
- Vacuum gauge and relief valve for each section.
- Lower and upper spray individually controlled in each compartment.
- Quick fill ball valve for fast flooding.
- Quick dump drain with ball valve.
- Hold down rollers.
- Adjustable stand pipe for water level.
- Thermometer.
- Individual vacuum pump START/STOP illuminating push buttons.
- Vacuum pump selection possible through multi-bypasses.
- Rear mounted main water drain and water supply.
- Removable access panels on base frame.
- Foot walk (6 inches wide) along entire table base length.
- Caster-mounted floor stands with floor locking jackscrews.
- Heavy-duty, all steel welded construction.
- All parts painted or plated to resist corrosion.
- Gauges on each vacuum compartment.
- Right to left machine operation.

2.1.2 Optional features

- Motorized longitudinal movement.
-

2.2 Closed circuit option

The closed circuit option saves on water consumption by processing used and than reusing it to cool down the extrusion.

2.2.1 Components

- Reservoir
- Heat exchanger
- Water filtration system with bypass.

2.3 Tank Movement on Floor Stand

18" longitudinal movement
6-inch manually adjustable height movement.
3-inch manually adjustable lateral movement.

3.0 INSTALLATION / SET UP

3.1 Location

Machine is to be located where ambient temperature does not exceed 40° C, and where clean air has free access to ventilating inlets and outlets. Except for specially equipped units with protective enclosures, the location must be clean and dry.

3.2 Leveling and Alignment

MVS

The MVS is supplied with four floor lock jackscrews (mounted on the base plate) to enable a firm base.
It is recommended that a plumb line be strung from the extruder to the last machine installed to ensure proper alignment of the extrusion machinery with the extruder.

3.3 Power Supply

230, 460 or 575 volts; 3 phase; 60 Hz.

Note: All internal wiring has been performed at the Conair/Metaplast factory - it is only necessary to connect a male electrical plug to the provided wire cable and plug it into the mating female receptacle.

Before applying power, check the voltage nameplate to ensure compatibility with the power source.

4.0 OPERATION / START-UP

4.1 Operator Adjustments with closed cooling circuit

4.1.1 Water Input Supply

The water line must be connected to the rear mounted solenoid control valve to supply water to the reservoir. Once the power is applied, the reservoir tank will automatically fill to a preset level.

4.1.2 Overflow Connection

The overflow port is used as a safety measure, in case the reservoir receives a surge of water. It must be connected to the plant drain system.

4.1.3 Tank Drain Ball Valve

The tank drain ball valve is located at the base of the reservoir tank. It must be connected to the plant drain system.

4.1.4 Heat Exchanger Connections

The MVS may be equipped with a heat exchanger to remove any excessive heat build up in the reservoir.

The plant water cooling system must be connected to the heat exchanger ports (at the rear of the machine).

4.1.5 Drain-Out Line

The drain-out line is used to drain the reservoir. Connect the drain-out line from the ball valve (located at the rear of the machine) to the plant drain system.

To drain the reservoir tank

- Close off the water supply to the tank.
- Close the valve to the heat exchanger.
- Open the drain out valve.
- Start the process pump.

4.2 Operator Adjustments with open cooling circuit

4.2.1 Water Input Supply

Connect water direct to water manifold and to the vacuum pumps liquid service line.

4.2.2 Drain-Out Line

The drain-out line must be connected to the plant drain.

4.3 Operation

1) Connect the power line (supplied with the tank) to the plant power supply.
2) Connect the water line to the WATER IN solenoid valve at the rear of the tank.
3) Connect the drain-out line and overflow outlet to the plant drain system.
4) Connect the plant cooling water system to the heat exchanger[1] (located at the rear of the machine).
5) Turn on the WATER IN line to the tank.
   Note: Water will not start to flow into the reservoir tank until the power disconnect switch is turned on.
6) Turn disconnect switch (located on the main electrical panel) to the ON position to apply power to the MVS.

   The CIRCULATION STOP push-button will illuminate, and the reservoir tank will begin to fill with water. The tank will stop filling at a preset level.

   Note: The water level is controlled with a level control system. When at a low level, the tank will fill with water; at a high level, the tank will stop filling.

7) Press the CIRCULATION START push-button to start the water circulation system.

8) Start the vacuum pumps. Press START PUMP #1 and close all vacuum-tooling valves on the manifold. Suction should develop (as well as be seen) on the gauge for this pump.

9) Press START PUMP #2 and perform the same test.

10) Start the extruder, and feed the profile through the tank, haul-off, and cut-off saw.

11) Once the profile is steady within the production line, start the calibration process to begin the sizing operation.

5.0 MAINTENANCE

The MVS must be kept in good working order to assure a consistent product. Check frequently to ensure freedom from obstructions and smooth operation. The use of high quality materials and conservative machine design will result in a long, trouble-free operation providing that basic service practices are followed.

Inspection at intervals, dependent upon service conditions, is the best insurance against costly maintenance and breakdown; experience is your best guide. Record inspection results and action required or performed.

- All the bearings are sealed and lubricated for life.
- Grease nipples indicate the grease points.
- Regular lubrication will ensure low maintenance as well as long machine life.

5.1 Daily (or at each start-up)

- Check and clean, the overflow screens on the stand pipes.

[1] On models equipped with water recirculation unit only.

- Check all the water supply lines and vacuum hoses for any leaks or cracks.
- Ensure that all the guards are in place and that the door to the electrical control cabinet is closed.
- Verify that the table FORWARD and REVERSE movements are smooth and unobstructed.
- Verify that all the vacuum levels are correct.

5.2 Quarterly (or every 1500 hours)

- Disconnect the power from the MVS calibration table.
- Check and grease all the table movements, including the table movement spindle and bushings.
- Change the oil in the gear reducer for the table movement[2].

  Note: For the proper grade of oil, refer to the information sheet: Flexline, "Worm Gear Speed Reducers, Lubrication and Installation", supplied in this manual.
- Check all the vacuum pumps for any leaks.
- Verify that all the motor/pump couplings are in good shape (no wear), and that they rotate freely by hand.
- Vacuum all the dust from the electrical cabinet and all components.
- Tighten all the electrical connections inside the electrical cabinet.
- Check that all the fuses are secure in the fuse holders.
- Check all the gaskets around the electrical cabinets and have them replaced if damaged.
- Check all the wire conduits to the motors for any damage. Change the conduit if there is any damage on the outer surface.

5.3 Filters (on closed circuit equipped units)_

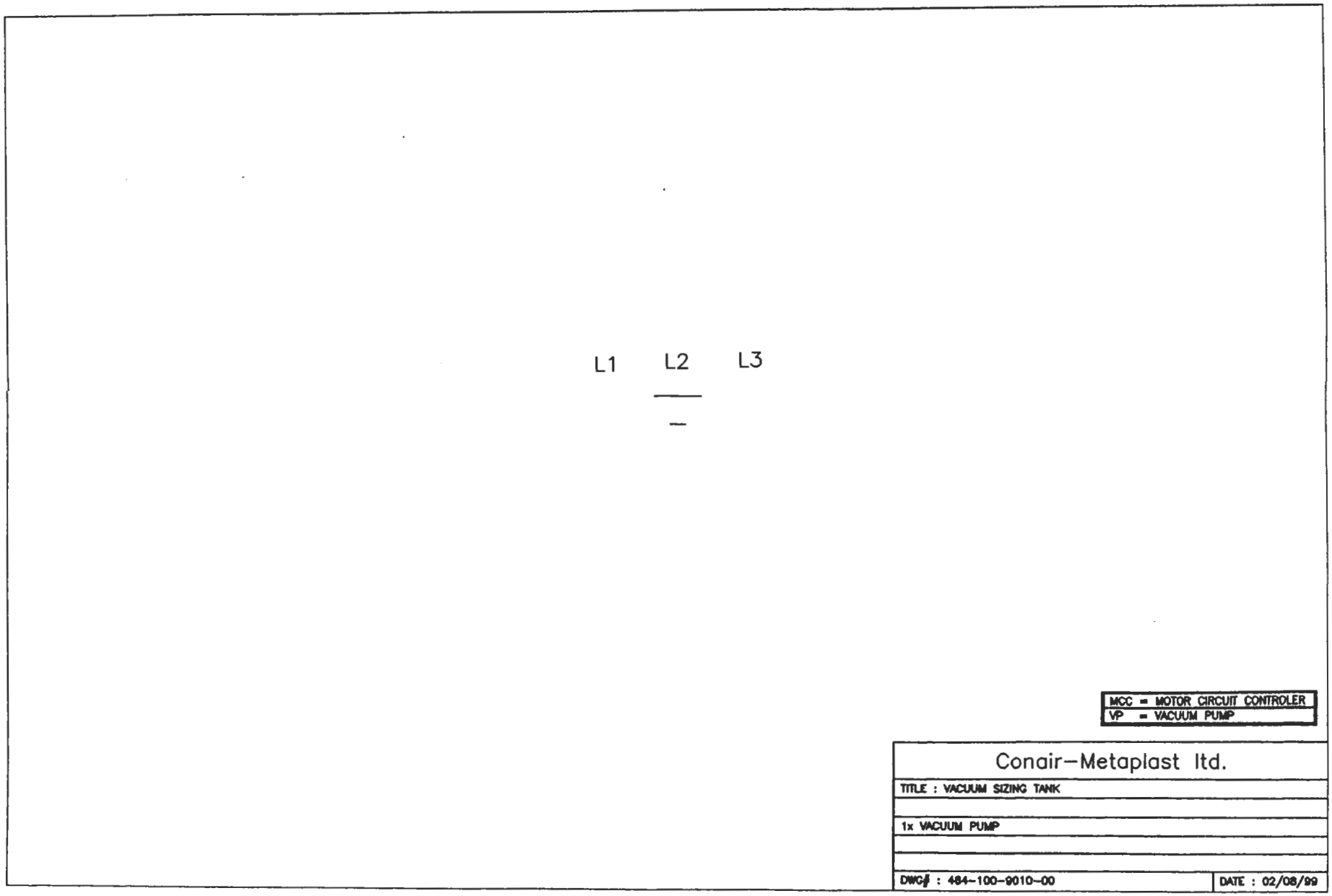
The MVS has filters used to prevent debris from entering the circulation system. To ensure maximum filtration, clean the filter weekly.

5.4 Bypass

The MVS is equipped with a bypass system in order to avoid interruption of the calibration line when a filter needs to be cleaned or changed during operation.

[2] If equipped

464-200-9010-00 *Main box (1 x Vacuum pump)*					
	Metaplast No	**Description**	**Part No**	**Manufacturer**	**Qty**
1	315-006-1006	Plastic enclosure for MCC (Nema 12)	KT3-25-KAZ	Sprecher+Schuh	1
464-200-9010-01 *230VAC (5HP Vacuum)*					
2	315-014-1022	Motor circuit controller (10 - 16A)	KTA3-25-16A	Sprecher+Schuh	1
3	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	1
464-200-9010-02 *460VAC (5HP Vacuum)*					
2	315-014-1021	Motor circuit controller (6.3 - 10A)	KTA3-25-10A	Sprecher+Schuh	1
3	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	1
464-200-9010-03 *575VAC (5HP Vacuum)*					
2	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	1
3	315-012-0053	Motor AC 5 H.P 575V	VM3615T-5	Baldor	1


L1
L2
L3
MCC = MOTOR CIRCUIT CONTROLER
VP = VACUUM PUMP
Conair–Metaplast ltd.
TITLE : VACUUM SIZING TANK
1x VACUUM PUMP
DWG# : 484–100–9010–00
DATE : 02/08/99

464-200-9011-00 *Main box (2 x Vacuum pump)*

	Metaplast No	Description	Part No	Manufacturer	Qty
7	315-011-2006	Safety covers (serie 62000-63000)	8530	Gould	3
8	315-017-3013	Splitter (4 opening 185 Amp)	63133	Gould	1
9	315-010-2020	Fuse holder 2 Pole (ATM style)	30312	Gould	1
12	315-001-1013	Breaker (1.5 Amp)	MG17413	Merlin Gerin	1
13	315-017-3001	Power supply 120V for lamp	P9PDNVO	G.E	4
14	315-011-1000	Light bulb for pushbutton (120V)	BA9S130	G.E	4
15	315-015-3007	Name plate "STOP"	P9ACP2R201	G.E	2
16	315-014-2033	Contact block N.C	P9B01VN	G.E	2
17	315-015-5028	Push button red illum.	P9CPLRGD	G.E	2
18	315-015-3006	Name plate "START"	P9ACP2R202	G.E	2
19	315-014-2035	Contact block N.O	P9B10VN	G.E	2
20	315-015-5026	Push button green illum.	P9CPLVGD	G.E	2
21	315-167-2073	Solenoid valve 3/8"	30-VX2330-03N-3D	SMC	2
22	315-168-1015	Pressure switch	H100-95303	U.E.	1
25	315-002-3099	Device support (mounting CA7)	KBD	Sprecher+Schuh	2
26	315-006-2003	Connecting module (KTA3 to CA7)	KT3-NW23	Sprecher+Schuh	2
27	315-014-2036	Auxiliary contact block (NO)	KT3-25-PE2-10	Sprecher+Schuh	2
29	315-014-6024	Auxiliary contact block (NC)	CA7-PA-01	Sprecher+Schuh	2
M	315-006-1076	Enclosure / NEMA-12	5412 ES161208	Eurobex	1

464-200-9011-01 *230VAC (5HP Vacuum)*

1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2025	Fuse covers for L10 (60Amp)	L10-FCJ60	Sprecher+Schuh	1
4	315-002-7023	Terminals shields for L10 (60 Amp)	L10-LNC2	Sprecher+Schuh	1
5	315-002-6065	Disconnect switch fusible 60A (J type)	L10-NJ060P3	Sprecher+Schuh	1
6	315-010-1021	Fuse 35 Amp AJT style	AJT-35	Gould Shawmut	3
10	315-010-1083	Fuse 1 1/2 Amp ATM style	ATM-1 1/2	Gould Shawmut	2
11	315-017-1255	Transformer 150VA 240v / 120v	DO 0150GE20	Transfab	1
23	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
24	315-017-5005	Bus bar (connect 2 KTA3-25)	KT3-25-DB-54-2	Sprecher+Schuh	1
28	315-014-1022	Motor circuit controller (10 - 16A)	KTA3-25-16A	Sprecher+Schuh	2
30	315-014-6019	Contactors (three phase)	CA7-16-10-U120	Sprecher+Schuh	2
31	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	2

464-200-9011-02 *460VAC (5HP Vacuum)*

1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2022	Fuse covers for L10 (30Amp)	L10-FCA2	Sprecher+Schuh	1
4	315-002-7016	Terminals shields for L10 (30 Amp)	L10-LNC1	Sprecher+Schuh	1
5	315-015-6061	Disconnect switch fusible 30A (J type)	L10-NJ030P3	Sprecher+Schuh	1
6	315-010-1016	Fuse 25 Amp AJT style	AJT-25	Gould Shawmut	3
10	315-010-1038	Fuse 1 Amp ATM style	ATM-1	Gould	2
11	315-017-1150	Transformer 150VA 480v / 120v	DO 0150OE20	Transfab	1
23	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
24	315-017-5005	Bus bar (connect 2 KTA3-25)	KT3-25-DB-54-2	Sprecher+Schuh	1
28	315-014-1021	Motor circuit controller (6.3 - 10A)	KTA3-25-10A	Sprecher+Schuh	2
30	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	2
31	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	2

464-200-9011-03 *575VAC (5HP Vacuum)*

1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2022	Fuse covers for L10 (30Amp)	L10-FCA2	Sprecher+Schuh	1
4	315-002-7016	Terminals shields for L10 (30 Amp)	L10-LNC1	Sprecher+Schuh	1
5	315-015-6061	Disconnect switch fusible 30A (J type)	L10-NJ030P3	Sprecher+Schuh	1
6	315-010-1019	Fuse 30 Amp AJT style	AJT-30	Gould Shawmut	3
10	315-010-1082	Fuse 3/4 Amp ATM style	ATM-3/4	Gould Shawmut	2
11	315-017-1048	Transformer 150VA 600v / 120v	DO 0150QE20	Transfab	1
23	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
24	315-017-5005	Bus bar (connect 2 KTA3-25)	KT3-25-DB-54-2	Sprecher+Schuh	1
28	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	2
30	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	2
31	315-012-0053	Motor AC 5 H.P 575V	VM3615T-5	Baldor	2

464-200-9012-00 *Main box (1 x Vacuum pump+Level control)*

	Metaplast No	Description	Part No	Manufacturer	Qty
7	315-011-2006	Safety covers (serie 62000-63000)	8530	Gould	3
8	315-017-3013	Splitter (4 opening 185 Amp)	63133	Gould	1
9	315-010-2020	Fuse holder 2 Pole (ATM style)	30312	Gould	1
12	315-001-1013	Breaker (1.5 Amp)	MG17413	Merlin Gerin	1
13	315-017-3001	Power supply 120V for lamp	P9PDNVO	G.E	7
14	315-011-1000	Light bulb for pushbutton (120V)	BA9S130	G.E	7
15	315-015-3007	Name plate "STOP"	P9ACP2R201	G.E	3
16	315-014-2033	Contact block N.C	P9B01VN	G.E	3
17	315-015-5028	Push button red illum.	P9CPLRGD	G.E	3
18	315-015-3006	Name plate "START"	P9ACP2R202	G.E	3
19	315-014-2035	Contact block N.O	P9B10VN	G.E	3
20	315-015-5026	Push button green illum.	P9CPLVGD	G.E	3
21	315-168-1015	Pressure switch	H100-95303	U.E.	1
22	315-011-1005	Pilot light green	P9CLVD	G.E	1
23	315-015-3026	Name plate "BLANK"	P9ACP2N	G.E	1
24	315-167-2074	Solenoid valve	30-VX2260-10N-3D	SMC	1
25	315-167-2073	Solenoid valve 3/8"	30-VX2330-03N-3D	SMC	1
26	315-051-1006	Hold down spring for base S411	HFN	Carlo Gavazzi	1
27	315-015-9002	Base for level control	S411	Carlo Gavazzi	1
28	315-019-3000	Level control	S195166115	Carlo Gavazzi	1
29	315-019-3004	Level sensor	VNY-3	Carlo Gavazzi	1
32	315-002-3099	Device support (mounting CA7)	KBD	Sprecher+Schuh	3
33	315-006-2003	Connecting module (KTA3 to CA7)	KT3-NW23	Sprecher+Schuh	3
34	315-014-2036	Auxiliary contact block (NO)	KT3-25-PE2-10	Sprecher+Schuh	3
38	315-014-6024	Auxiliary contact block (NC)	CA7-PA-01	Sprecher+Schuh	3
39	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
M	315-006-1108	Enclosure / NEMA-12	5412 ES201608	Eurobex	1
O	315-006-1023	Enclosure / NEMA-12	1500EDC090604	Eurobex	1

464-200-9012-01 *230VAC (5HP Vc.-2HP Rc-2HP Pr.)*

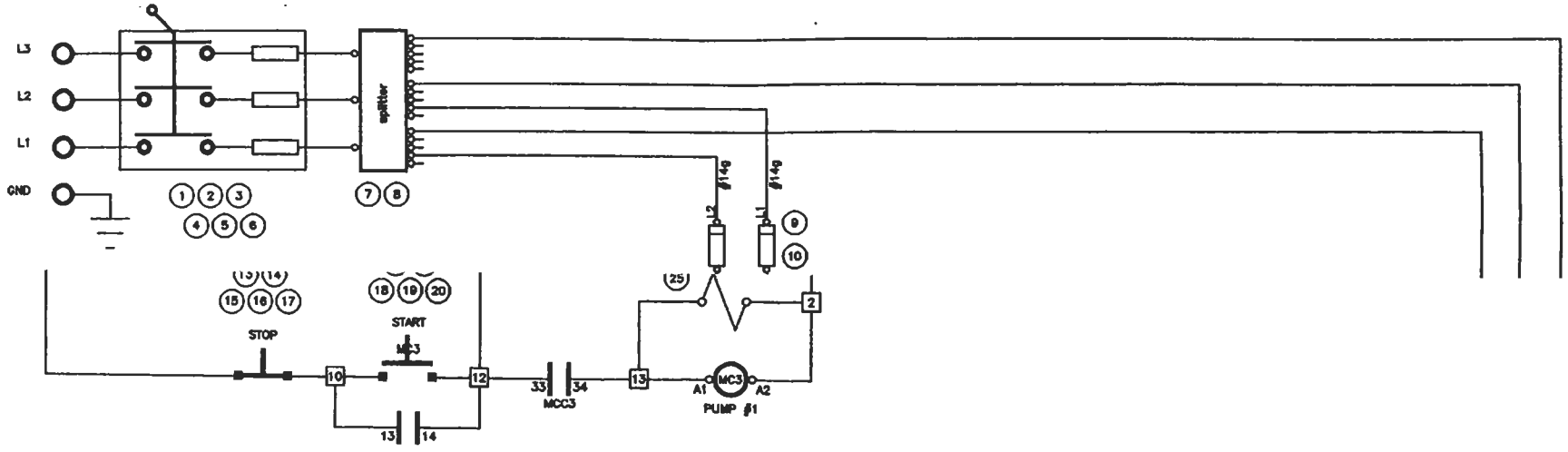
1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2025	Fuse covers for L10 (60Amp)	L10-FCJ60	Sprecher+Schuh	1
4	315-002-7023	Terminals shields for L10 (60 Amp)	L10-LNC2	Sprecher+Schuh	1
5	315-002-6065	Disconnect switch fusible 60A (J type)	L10-NJ060P3	Sprecher+Schuh	1
6	315-010-1025	Fuse 50 Amp AJT style	AJT-50	Gould Shawmut	3
10	315-010-1083	Fuse 1 1/2 Amp ATM style	ATM-1 1/2	Gould Shawmut	2
11	315-017-1255	Transformer 150VA 240v / 120v	DO 0150GE20	Transfab	1
30	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
31	315-017-5008	Bus bar (connect 3 KTA3-25)	KT3-25-DB-54-3	Sprecher+Schuh	1
35	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	1
36	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	1
37	315-014-1022	Motor circuit controller (10 - 16A)	KTA3-25-16A	Sprecher+Schuh	2
40	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
41	315-014-6019	Contactors (three phase)	CA7-16-10-U120	Sprecher+Schuh	2
42	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
43	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
44	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	2

464-200-9012-02 *460VAC (5HP Vc.-2HP Rc-2HP Pr.)*

1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2022	Fuse covers for L10 (30Amp)	L10-FCA2	Sprecher+Schuh	1
4	315-002-7016	Terminals shields for L10 (30 Amp)	L10-LNC1	Sprecher+Schuh	1
5	315-015-6061	Disconnect switch fusible 30A (J type)	L10-NJ030P3	Sprecher+Schuh	1
6	315-010-1019	Fuse 30 Amp AJT style	AJT-30	Gould Shawmut	3
10	315-010-1038	Fuse 1 Amp ATM style	ATM-1	Gould	2
11	315-017-1150	Transformer 150VA 480v / 120v	DO 0150OE20	Transfab	1
30	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
31	315-017-5008	Bus bar (connect 3 KTA3-25)	KT3-25-DB-54-3	Sprecher+Schuh	1
35	315-014-1026	Motor circuit controller (2.5 - 4A)	KTA3-25-4A	Sprecher+Schuh	1
36	315-014-1026	Motor circuit controller (2.5 - 4A)	KTA3-25-4A	Sprecher+Schuh	1
37	315-014-1021	Motor circuit controller (6.3 - 10A)	KTA3-25-10A	Sprecher+Schuh	1
40	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
41	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
42	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
43	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
44	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	1

464-200-9012-03 *575VAC (5HP Vc.-2HP Rc-2HP Pr.)*

1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2022	Fuse covers for L10 (30Amp)	L10-FCA2	Sprecher+Schuh	1
4	315-002-7016	Terminals shields for L10 (30 Amp)	L10-LNC1	Sprecher+Schuh	1
5	315-015-6061	Disconnect switch fusible 30A (J type)	L10-NJ030P3	Sprecher+Schuh	1
6	315-010-1016	Fuse 25 Amp AJT style	AJT-25	Gould Shawmut	3
10	315-010-1082	Fuse 3/4 Amp ATM style	ATM-3/4	Gould Shawmut	2
11	315-017-1048	Transformer 150VA 600v / 120v	DO 0150QE20	Transfab	1
30	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
31	315-017-5008	Bus bar (connect 3 KTA3-25)	KT3-25-DB-54-3	Sprecher+Schuh	1
35	315-014-1023	Motor circuit controller (1.6 - 2.5A)	KTA3-25-2.5A	Sprecher+Schuh	1
36	315-014-1023	Motor circuit controller (1.6 - 2.5A)	KTA3-25-2.5A	Sprecher+Schuh	1
37	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	1
40	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
41	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
42	315-164-2003	JetPump 2 H.P. 575V	1ST1G6B4	Gould	1
43	315-164-2003	JetPump 2 H.P. 575V	1ST1G6B4	Gould	1
44	315-012-0053	Motor AC 5 H.P 575V	VM3615T-5	Baldor	1



CB	= CIRCUIT BREAKER
PS	= PRESSURE SWITCH
MC	= MOTOR CONTACTOR
MCC	= MOTOR CIRCUIT CONTROLER
PHR	= PHASE RELAY
PR	= PROCESS PUMP
RC	= RECIRCULATION PUMP
SV	= SOLENOID VALVE
TR	= TRANSFORMER
VP	= VACUUM PUMP

Conair–Metaplast ltd.

TITLE : VACUUM TANK

ELECTRICAL : PRESSURE SWITCH, SOLENOID ON VACUUM PUMP,
2x VACUUM PUMP
LEVEL CONTROL, 1x RECIRCULATION PUMP, 1x PROCESS PUMP

DWG# : 464-200-9012-00

DATE : 02/08/99

464-200-9013-00 *Main box (2 x Vacuum pump+ Level control)*

	Metaplast No	Description	Part No	Manufacturer	Qty
7	315-011-2006	Safety covers (serie 62000-63000)	8530	Gould	3
8	315-017-3013	Splitter (4 opening 185 Amp)	63133	Gould	1
9	315-010-2020	Fuse holder 2 Pole (ATM style)	30312	Gould	1
12	315-001-1013	Breaker (1.5 Amp)	MG17413	Merlin Gerin	1
13	315-017-3001	Power supply 120V for lamp	P9PDNVO	G.E	9
14	315-011-1000	Light bulb for pushbutton (120V)	BA9S130	G.E	9
15	315-015-3007	Name plate "STOP"	P9ACP2R201	G.E	4
16	315-014-2033	Contact block N.C	P9B01VN	G.E	4
17	315-015-5028	Push button red illum.	P9CPLRGD	G.E	4
18	315-015-3006	Name plate "START"	P9ACP2R202	G.E	4
19	315-014-2035	Contact block N.O	P9B10VN	G.E	4
20	315-015-5026	Push button green illum.	P9CPLVGD	G.E	4
21	315-168-1015	Pressure switch	H100-95303	U.E.	1
22	315-011-1005	Pilot light green	P9CLVD	G.E	1
23	315-015-3026	Name plate "BLANK"	P9ACP2N	G.E	1
24	315-167-2074	Solenoid valve 1"	30-VX2260-10N-3D	SMC	1
25	315-167-2073	Solenoid valve 3/8"	30-VX2330-03N-3D	SMC	2
26	315-051-1006	Hold down spring for base S411	HFN	Carlo Gavazzi	1
27	315-015-9002	Base for level control	S411	Carlo Gavazzi	1
28	315-019-3000	Level control	S195166115	Carlo Gavazzi	1
29	315-019-3004	Level sensor	VNY-3	Carlo Gavazzi	1
32	315-002-3099	Device support (mounting CA7)	KBD	Sprecher+Schuh	4
33	315-006-2003	Connecting module (KTA3 to CA7)	KT3-NW23	Sprecher+Schuh	4
34	315-014-2036	Auxiliary contact block (NO)	KT3-25-PE2-10	Sprecher+Schuh	4
38	315-014-6024	Auxiliary contact block (NC)	CA7-PA-01	Sprecher+Schuh	4
39	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
M	315-006-1108	Enclosure / NEMA-12	5412 ES201608	Eurobex	1
O	315-006-1023	Enclosure / NEMA-12	1500EDC090604	Eurobex	1

315-167-2084
1 1/2" Valve

464-200-9013-01 *230VAC (5HP Vc.-2HP Rc-2HP Pr.)*

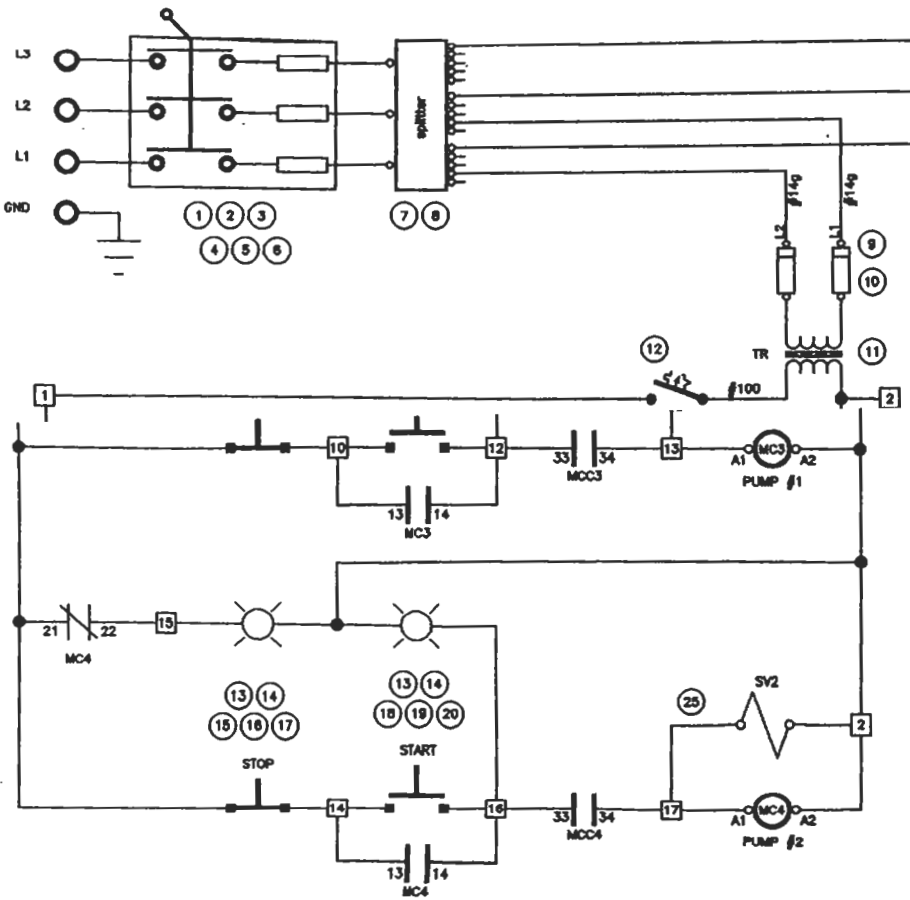
1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2025	Fuse covers for L10 (60Amp)	L10-FCJ60	Sprecher+Schuh	1
4	315-002-7023	Terminals shields for L10 (60 Amp)	L10-LNC2	Sprecher+Schuh	1
5	315-002-6065	Disconnect switch fusible 60A (J type)	L10-NJ060P3	Sprecher+Schuh	1
6	315-010-1025	Fuse 50 Amp AJT style	AJT-50	Gould Shawmut	3
10	315-010-1083	Fuse 1 1/2 Amp ATM style	ATM-1 1/2	Gould Shawmut	2
11	315-017-1255	Transformer 150VA 240v / 120v	DO 0150GE20	Transfab	1
30	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
31	315-017-5006	Bus bar (connect 4 KTA3-25)	KT3-25-DB-54-4	Sprecher+Schuh	1
35	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	1
36	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	1
37	315-014-1022	Motor circuit controller (10 - 16A)	KTA3-25-16A	Sprecher+Schuh	2
40	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
41	315-014-6019	Contactors (three phase)	CA7-16-10-U120	Sprecher+Schuh	2
42	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
43	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
44	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	2

464-200-9013-02 *460VAC (5HP Vc.-2HP Rc-2HP Pr.)*

1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2022	Fuse covers for L10 (30Amp)	L10-FCA2	Sprecher+Schuh	1
4	315-002-7016	Terminals shields for L10 (30 Amp)	L10-LNC1	Sprecher+Schuh	1
5	315-015-6061	Disconnect switch fusible 30A (J type)	L10-NJ030P3	Sprecher+Schuh	1
6	315-010-1019	Fuse 30 Amp AJT style	AJT-30	Gould Shawmut	3
10	315-010-1038	Fuse 1 Amp ATM style	ATM-1	Gould	2
11	315-017-1150	Transformer 150VA 480v / 120v	DO 0150OE20	Transfab	1
30	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
31	315-017-5006	Bus bar (connect 4 KTA3-25)	KT3-25-DB-54-4	Sprecher+Schuh	1
35	315-014-1026	Motor circuit controller (2.5 - 4A)	KTA3-25-4A	Sprecher+Schuh	1
36	315-014-1026	Motor circuit controller (2.5 - 4A)	KTA3-25-4A	Sprecher+Schuh	1
37	315-014-1021	Motor circuit controller (6.3 - 10A)	KTA3-25-10A	Sprecher+Schuh	2
40	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
41	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	2
42	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
43	315-164-2015	JetPump 2 H.P. 230/460V	1ST1G5B4	Gould	1
44	315-012-0032	Motor AC 5 H.P 230/460V	VM3615T	Baldor	2

464-200-9013-03 *575VAC (5HP Vc.-2HP Rc-2HP Pr.)*

1	315-030-1029	Switch handle for L10 "Yellow/Red"	L10-HS4E	Sprecher+Schuh	1
2	315-030-1030	Rod 256mm for L10 disconnect	L10-R1	Sprecher+Schuh	1
3	315-010-2022	Fuse covers for L10 (30Amp)	L10-FCA2	Sprecher+Schuh	1
4	315-002-7016	Terminals shields for L10 (30 Amp)	L10-LNC1	Sprecher+Schuh	1
5	315-015-6061	Disconnect switch fusible 30A (J type)	L10-NJ030P3	Sprecher+Schuh	1
6	315-010-1016	Fuse 25 Amp AJT style	AJT-25	Gould Shawmut	3
10	315-010-1082	Fuse 3/4 Amp ATM style	ATM-3/4	Gould Shawmut	2
11	315-017-1048	Transformer 150VA 600v / 120v	DO 0150QE20	Transfab	1
30	315-017-2002	Supply block	KT3-25-A3	Sprecher+Schuh	1
31	315-017-5006	Bus bar (connect 4 KTA3-25)	KT3-25-DB-54-4	Sprecher+Schuh	1
35	315-014-1023	Motor circuit controller (1.6 - 2.5A)	KTA3-25-2.5A	Sprecher+Schuh	1
36	315-014-1023	Motor circuit controller (1.6 - 2.5A)	KTA3-25-2.5A	Sprecher+Schuh	1
37	315-014-1027	Motor circuit controller (4 - 6.3A)	KTA3-25-6.3A	Sprecher+Schuh	2
40	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	1
41	315-014-6021	Contactors (three phase)	CA7-12-10-U120	Sprecher+Schuh	2
42	315-164-2003	JetPump 2 H.P. 575V	1ST1G6B4	Gould	1
43	315-164-2003	JetPump 2 H.P. 575V	1ST1G6B4	Gould	1
44	315-012-0053	Motor AC 5 H.P 575V	VM3615T-5	Baldor	2



CB	=	CIRCUIT BREAKER
PS	=	PRESSURE SWITCH
MC	=	MOTOR CONTACTOR
MCC	=	MOTOR CIRCUIT CONTROLER
PR	=	PROCESS PUMP
RC	=	RECIRCULATION PUMP
SV	=	SOLENOID VALVE
TR	=	TRANSFORMER
VP	=	VACUUM PUMP

Conair–Metaplast ltd.

TITLE : VACUUM SIZING TANK

ELECTRICAL : SOLENOID ON VACUUM PUMP,

2x VACUUM PUMP

LEVEL CONTROL, 1x RECIRCULATION PUMP, 1x PROCESS PUMP

DWG# : 464–200–9013–00

DATE : 03/08/99

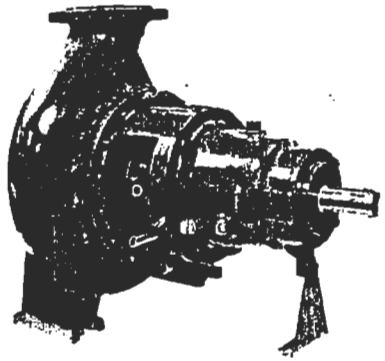
APPENDIX C

VACUUM PUMPS

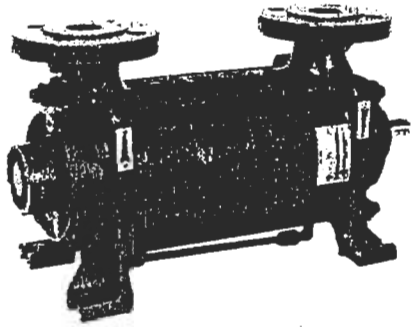
APPENDIX C

VACUUM PUMPS

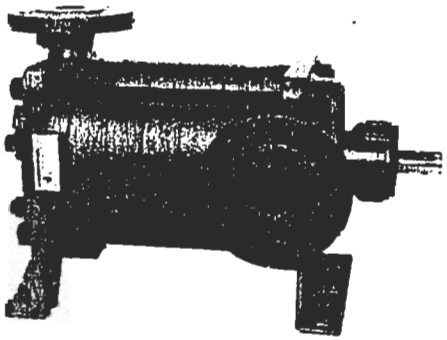
OUR PRODUCTION



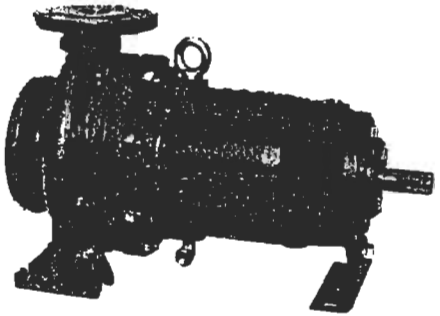
MONOSTAGE CENTRIFUGAL PUMPS



SELF-PRIMING CENTRIFUGAL PUMPS



MULTISTAGE CENTRIFUGAL PUMPS



MAGNETIC DRIVE MONOSTAGE CENTRIFUGAL PUMPS

- LIQUID RING VACUUM PUMPS
- PACKAGE VACUUM UNITS WITH TOTAL OR PARTIAL LIQUID RECIRCULATION

PRINTED ON RECYCLED PAPER

N00 5VU CA0 - 7BR7 - PRINTED IN ITALY

PREMIER FLUID SYSTEMS INC.
4161 MORRIS DRIVE
BURLINGTON, ONTARIO L7L 5L5
TEL.: (905) 637-2611 or (905) 333-3099
TOLL FREE 1 (800) 461-2611
FAX (905) 333-4722

travaini pumps

i

OPERATING MANUAL
LIQUID RING VACUUM PUMPS AND COMPRESSORS
Series
TRH - TRS - TRM - TRV - SA
&
Systems type
HYDROSYS - OILSYS

OPERATING MANUAL FOR INSTALLATION, START-UP AND MAINTENANCE FOR LIQUID RING VACUUM PUMPS AND COMPRESSORS

This manual applies to TRAVAINI liquid ring pumps single stage series TRM, TRS, TRV, double stage series TRH, compressors series SA and systems series HYDROSYS and OILSYS, which utilise above pump series. (Please see chapters 18 or 19 for details pertaining to systems).

NOTE: Unless otherwise specified, the term pump used throughout this manual means also pump/motor assembly or system type HYDROSYS and/or OILSYS.

Manufacturer:

TRAVAINI PUMPS
(POMPETRAVAINI S.p.A.)

Representative:

PREMIER FLUID SYSTEMS INC.
4161 MORRIS DRIVE
BURLINGTON, ONTARIO L7L 5L5
TEL.: (905) 637-2611 or (905) 333-3099
TOLL FREE 1 (800) 461-2611
FAX: (905) 333-4722

WARRANTY: All products manufactured by TRAVAINI PUMPS are guaranteed to meet the conditions listed on the general terms & conditions of sales and/or conditions listed on the order confirmations.
Failure to strictly adhere to the instructions and recommendations listed in this manual, will void the manufacturer's warranty.

In preparing this manual, every possible effort has been made to help the customer and operator with the proper installation and operation of the pump and/or system. Should you find errors, misunderstandings or discrepancies please do not hesitate to bring them to our attention.

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1 - GENERAL INSTRUCTIONS

This manual is intended to provide reference to:
- application and operating safety
- installation and maintenance for pump or system
- starting, operating and stopping procedures for pump or system

NOTE: All references made to pumps are also applicable to systems that employ these pumps, unless otherwise specified.

Upon receipt of this manual, the operator should complete page 35 with the requested data. The manual should then be read **CAREFULLY** and kept in a safe file for future reference. It should always be available to the qualified operating and maintenance personnel responsible for the safe operation of the pump or system.
(Qualified personnel should be experienced and knowledgeable of Safety Standards, should be recognised by the safety department manager as being capable to effectively act on safety issues, should the need arise.
A knowledge of first aid should also be required).

The pump is to be used only for the applications specified on the confirming order for which TRAVAINI PUMPS has selected the design, materials of construction and tested the pump to meet the order specifications. Therefore, the pump or system **CANNOT** be used for applications other than those specified on the order confirmation.

In the event the pump is to be used for different applications, please consult TRAVAINI PUMPS or the authorised representative. TRAVAINI PUMPS declines to assume any responsibility if the pump is used for different applications without prior written consent.
The user is responsible for the verification of the ambient conditions where the pump will be stored or installed. Extreme low or high temperatures may severely damage the pump or system unless proper precautions are taken.
TRAVAINI PUMPS does not guarantee repairs or alterations done by user or other unauthorised personnel.
Special designs and constructions may vary from the information given in this manual. Please contact TRAVAINI PUMPS or the authorised representative should you have any difficulty or doubt.

NOTE: Drawings appearing in this manual are only schematics. These drawings are not for construction. For construction drawings contact TRAVAINI PUMPS or the authorised representative.

2 - SAFETY INSTRUCTIONS

CAUTION: CAREFULLY READ FOLLOWING INSTRUCTIONS. STRICTLY ADHERE TO THE INSTRUCTIONS LISTED BELOW TO PREVENT PERSONAL INJURIES AND/OR EQUIPMENT DAMAGE.

- **ALWAYS** apply the pump for the conditions outlined on the confirming order.
- Electrical connections on the motor or accessories must **ALWAYS** be carried out by authorised personnel and in accordance to the local codes.
- Any work on the pump should be carried out by at least 2 people.
- When approaching the pump **ALWAYS** be properly dressed (avoid use of clothes with wide sleeves, neckties, necklaces, etc.) and/or wear safety equipment (hard hat, safety glasses, safety shoes, etc.) adequate for the work to be done.
- **ALWAYS** stop the pump prior to touching it, for whatever the reason.
- **ALWAYS** disconnect the power to the motor prior to working or removing the pump from the installation.
- **NEVER** work on the pump when it is hot.
- After completion of the work **ALWAYS** re-install the safety guards previously removed.
- **ALWAYS** be careful when handling pumps that convey acids or hazardous fluids.
- **ALWAYS** have a fire extinguisher in the vicinity of the pump installation.
- **DO NOT** operate the pump in the wrong direction of rotation.
- **NEVER** put hands or fingers in the pump or system openings or cavities.
- **NEVER** step on pump and/or piping connected to the pump.
- Pump or piping (connected to the pump) must **NEVER** be under pressure or vacuum when maintenance or repair is carried out.

NOTE: There are materials in the pump that may be hazardous to people suffering from allergies. Maintenance and operating personnel should consult the tab. 1 for such materials.

Tab. 1

MATERIAL	USE	POSSIBLE DANGER
Oil and Grease	General lubrication, ball or roller bearings	Skin and eye irritation
Plastic and elastomer components	O-Ring, V-Ring, Splash ring, Oil seals	Release of fumes and vapours when overheated
Teflon & Kevlar fibres	Packing rings	Release of dangerous powders, release of fumes when overheated
Varnishes	Exterior pump surface	Release of powder and fumes in case of rework, flammable
Liquid compound	Gasket between flat surfaces	Skin, eye and breathing organs irritation

3 - IN CASE OF EMERGENCY

Should the pump break down leak gas and/or service liquid, immediately disconnect the electrical power following the instructions given in chapter 11. Alert the maintenance personnel, at least two people should intervene using precautions as it is required for the specific installation: pump may be handling dangerous and/or hazardous fluids.
After correction of all the problems that created the emergency situation, it is necessary to carry out all the recommended starting procedures (see chapter 10).

3.1 - BASIC FIRST AID

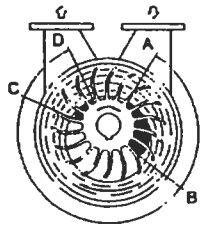
In the event dangerous substances have been inhaled and/or have come in contact with the human body, immediately contact the medical staff and follow the instructions given by the company's internal medical safety procedures.

4 - PUMP OUTLINES

The instructions given in this manual are for liquid ring vacuum pumps and compressors and for systems type HYDROSYS or OILSYS which utilise said pumps.

NOTE: Capacities, vacuum and pressures are nominal and are the maximum attainable values under standard operating conditions. Please contact TRAVAINI PUMPS or the authorised representative for data on liquid ring compressors series TR...

TRM	Single stage liquid ring vacuum pumps Capacity to 350 m^3/h, max vacuum 33 mbar
TRS	Single stage liquid ring vacuum pumps Capacity to 3500 m^3/h, max vacuum 150 mbar
TRV	Single stage vacuum pumps Capacity to 500 m^3/h, max vacuum 33 mbar
TRH	Two stage liquid ring vacuum pumps Capacity to 3500 m^3/h, max vacuum 33 mbar
SA	Double acting liquid ring compressors Capacity to 180 m^3/h, pressures to 10 bar



4.1 - PRINCIPLE OF OPERATION (See figure at side)

The aspirated gas enters the pump chamber A-B via the pump suction flange. The gas is trapped between 2 impeller vanes. The impeller rotates eccentrically in relation to the centreline of the liquid ring that, by centrifugal force, assumes the shape of the impeller casing. The progressive change of volume between the 2 vanes, the impeller hub and the liquid ring first creates a vacuum and then a compression of the gas in the B-C area till the gas is discharged, together with a portion of the liquid, through the discharge port C-D. The lost liquid must then be replenished.

4.2 - SERVICE LIQUID PROPERTIES

For a good operation the liquid ring pumps must be supplied with a service liquid which is clean, non abrasive and free of any solids.
The service liquid temperature should not exceed 60 °C and the gas handled should be maximum 100 °C; the liquid density should be between 800 and 1200 g/dm^3 and the viscosity should be less than 40 cSt (the pump performance will change if the service liquid has properties different than those of water at 15 °C). All engineering data is based on the use of 15 °C as service liquid, see chapter 17 for additional information.
Contact TRAVAINI PUMPS or the authorised representative before using liquids with properties outside the ranges listed above.

4.3 - PUMP MODELS AND TABLES FOR MATERIAL OF CONSTRUCTION

On the pump nameplate are printed the pump serial number, the year of manufacture and the pump model. Refer to the following example for understanding the coding of the pump model.
Every letter or number in the pump model designation has a specific meaning relating to the pump design.

Example of pump model number:

T R H C 80 - 750 / C - M / GH			
T	⇨ Manufacturer TRAVAINI PUMPS	750	⇨ Nominal capacity in m³/h
R	⇨ Liquid ring pump	C	⇨ C = Shaft sealing by mechanical seal B = Shaft sealing by stuffing box
H	⇨ M and V = Single stage pump with high vacuum S = Single stage pump with medium vacuum H = Two stage pump with high vacuum	M	⇨ Monoblock design with motor flange (upon request)
C	⇨ Revision of hydraulic design	GH	⇨ Material of construction GH - F - RA - A3 (see following table)
80	⇨ Ø Flange size (mm)		

STANDARD materials of construction

VDMA	Description	GH	F	RA	A3
106	Suction casing	Cast iron UNI 5007-89			
107	Discharge casing				
137	Intermediate plate				
110	Centre body				
210	Shaft	Stainless steel AISI 420		Stainless steel AISI 316	
147	Manifold	Carbon steel			
357	Bearings & M.S. Hous.	Cast iron UNI 5007-89			
230	Impeller	Bronze	Ductile iron	Stainless steel AISI 316	

For additional details regarding standard or special materials contact TRAVAINI PUMPS or the authorised representative.

Models for systems HYDROSYS and OILSYS are made out of a number which indicates the system size, followed by the pump model number which is fitted in the system.
(ex.: HYDROSYS 5 – TRHB 50-420/C – M / GH).

5 - UNCRATING, LIFTING AND MOVING INSTRUCTIONS

Upon receipt verify that the material received is in exact compliance with that listed on the packing slip.

When uncrating follow the instructions listed below:
- check for visible damages on the crate that could have occurred during transport
- carefully remove the packaging material
- check that pump/or accessories such as tanks, piping, valves, etc. are free from visible markings such as dents and damage which may have occurred during transportation
- in the event of damage, report this immediately to the transport company and to TRAVAINI PUMPS's customer service department.

Discard through controlled disposals all packaging materials that may constitute personal injury (sharp objects, nails).

The pump or assembly must **ALWAYS** be moved and transported in the horizontal position.
Prior to moving the unit find the following:
- total weight
- centre of gravity
- maximum outside dimensions
- lifting points location.

For safe lifting to prevent material damages and/or personal injuries, it is recommended to use ropes, or belts properly positioned on the pump and/or lifting eyebolts and make correct movements.
Lifting eyebolts fitted on single components of the assembly (pump or motor) should not be used to lift the total assembly.
Avoid lifts whereby the ropes or straps, form a triangle with the top angle over 90°(see fig. 3).
The fig. 4 shows several additional examples of lifting to be avoided.
Prior to moving the unit from an installation, always drain any pumped fluid from the pump, piping and accessories, rinse and plug all openings to prevent spillage. For instructions to remove the unit from installation see chapter 15.

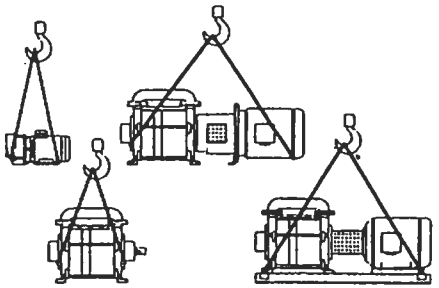


Fig. 1

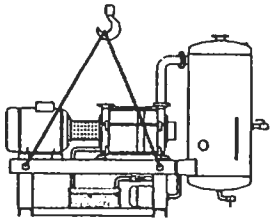
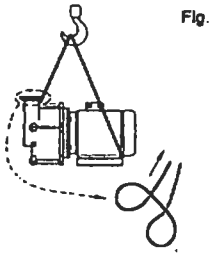


Fig. 2



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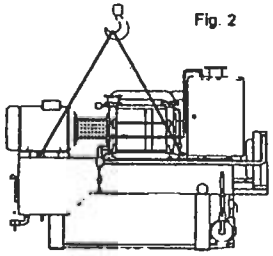
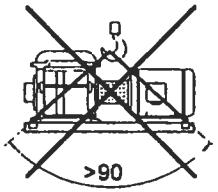


Fig. 3



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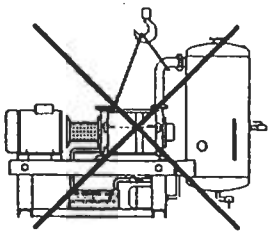
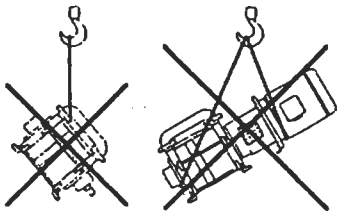
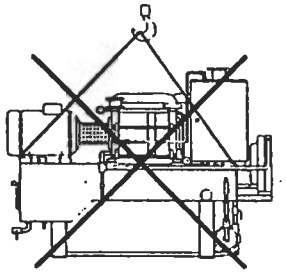


Fig. 4





6 - STORAGE INSTRUCTIONS

After receipt and inspection, if not immediately installed, the unit must be repackaged and stored.
For a proper storage proceed as follows:
- store the pump in a location that is closed, clean, dry and free of vibrations
- do not store in areas with less than 5°C temperature (for lower temperature it is necessary to completely drain the pump of any liquids that are subject to freezing)

FREEZING DANGER!
Where the ambient temperature is less than 5 °C it is recommended to drain the pump, piping, separator, heat exchanger, etc. or add an anti-freeze solution to prevent damage to the equipment.

- fill the pump halfway with an anti-rust liquid but compatible with gaskets and elastomers materials, rotate the pump shaft by hand so that all internal parts get wet and then drain the pump of the excessive anti-rust liquid
- plug all openings that connect the pump internals to the atmosphere
- protect all machined surfaces with an anti-rust material (grease, oils, etc.)
- cover the unit with plastic sheet or similar protective material
- rotate pump shaft at least every three months to avoid possible rust build-up or seizing
- pump accessories should be subjectad to similar procedure.

7 - MOUNTING AND ALIGNMENT INSTRUCTIONS

7.1 - ASSEMBLY OF BASE MOUNTED PUMP UNIT

If the pump has been purchased with free shaft end, a proper baseplate is required to mount the pump/motor assembly. The baseplate must be properly designed for maximum rigidity to prevent vibrations and distortions. It is recommended the use of a fabricated baseplate manufactured with rigid "c" shaped channel (fig. 16 illustrates an example) and/or "□" tubular steel.
When the pump has been purchased without the electric motor, it is then required to select the proper motor before proceeding to the installation of the unit. Selection of motor must consider the following:
- maximum power absorbed by the pump over the total operating range
- pump operating speed (RPM)
- available power (Hertz. voltage, etc.)
- motor enclosure type (CVE, AD-PE, ODP, TEFC, EX.PR., etc.)
- motor mount (B3, B5, horizontal, vertical, C-flange, D-flange, etc.).

Flexible couplings are selected considering:
- nominal motor horsepower
- motor operating speed
- coupling guard must meet safety standards as dictated by EN 294, OSHA, etc.

Flexible couplings must be properly aligned. Bad alignments will result in coupling failures and damage to pump and motor bearings.

Assembly instructions for MONOBLOCK design are listed on paragraph 7.3 steps 1, 2, 4, 5, 6.
Assembly instructions for PUMP-MOTOR ON BASEPLATE are listed on paragraph 7.3 steps 7, 1, 8, 5, 9, 10, 11.
For pump driven with V-Belt, please consult TRAVAINI PUMPS or the authorised representative for eventual information.

7.2 - ALIGNMENT PROCEDURES FOR MONOBLOCK AND FOR PUMP/MOTOR ASSEMBLY ON BASEPLATE.

The pump/motor assembly is properly aligned by TRAVAINI PUMPS prior to shipment.
It is however required to verify the alignment prior to the start-up. Misalignment can occur during handling, transportation, grouting of assembly, etc.
For alignment procedures of MONOBLOCK design see paragraph 7.3 steps 3, 4, 5, 6.
For alignment procedure of BASEPLATE design see paragraph 7.3 steps 7, 5, 9, 10, 11.

PLEASE NOTE: Coupling sizes and permissible coupling tolerances listed in this manual are applicable to the particular coupling brand installed by TRAVAINI PUMPS as a standard. For sizes and tolerances of other type of couplings, follow the instructions given by their respective manufacturer.

7.3 - ALIGNMENT INSTRUCTIONS

NOTICE: Alignment should be done at ambient temperature, obviously with power to the motor disconnected and following the safety procedures to avoid accidental starting (see chapter 2).
Should the pump operate at high temperatures that could upset the coupling alignment, it is necessary to check the alignment to secure proper working operation at such operating temperatures.
It is recommended the use of proper hand protections such as gloves, when carrying out the operations listed below (schematics for various assemblies are shown).

NOTE: The following points must be followed with the sequence stated above and depending upon the type of operation: alignment **assembly** or alignment **verification**.

1 - Thoroughly clean motor/pump shaft ends and shaft keys, place the shaft keys in the proper key way slots and fit the coupling halves in line with the shaft ends. The use of rubber hammers and even pre-heating of the metal half couplings may be required (see fig. 5). Lightly tighten the set screws. Verify that both pump and motor shafts rotate freely.

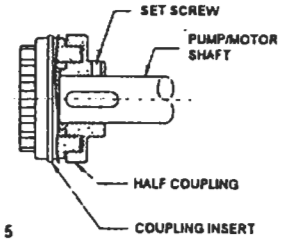


Fig. 5

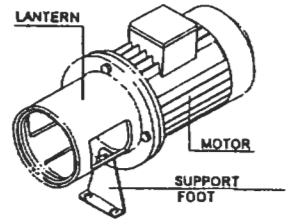


Fig. 6

2 - Insert the perforated metal sheet coupling guard inside the lantern so that the coupling is accessible from one of the lateral openings. Couple the electric motor to the pump lantern engaging the two coupling halves, hands may reach the coupling halves through the lateral opening (see fig. 7) tighten the assembly with bolts supplied with the unit and install the supporting foot, when applicable (see fig. 6).

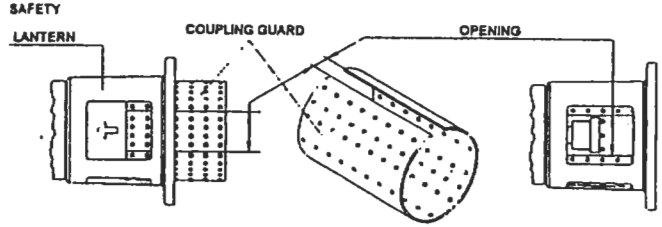


Fig. 7 - PREPARING TO ASSEMBLE THE MONOBLOCK DESIGN

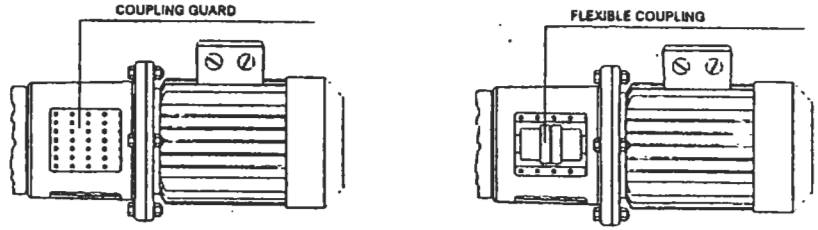


Fig. 8 - CHECKING THE ALIGNMENT ON MONOBLOCK DESIGN

3 - Applying slight hand pressure to the coupling guard, rotate it so that one opening of the lantern is accessible (see fig. 8).
4 - Rotate by hand the coupling through the lateral opening of the lantern to make sure the pump is free.
5 - With a feeler gauge, check the distance between the two coupling halves. The gap value "S" should be as listed on table 2 or as given by the coupling manufacturer.
In the event an adjustment is necessary, loosen the set screws on the coupling half and with a screw driver move the coupling half to attain the gap "S" (see fig. 12). Then tighten the set screw and rotate the rotor by hand to make sure, once more, that there is no obstruction.
6 - Rotate back the coupling guard by hand through the two openings of the lantern so that both openings are completely covered. This will complete the alignment verification of the MONOBLOCK design.
7 - Remove the coupling guard and its extension (if there is one) attached to the pump, by removing the two locking screws (see fig. 9 and 10).

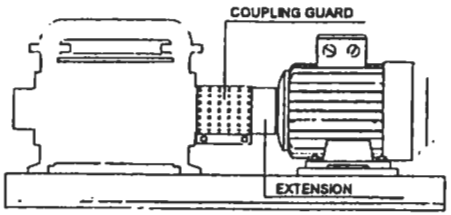


Fig 9 - CHECKING ALIGNMENT ON BASE MOUNTED PUMP DESIGN

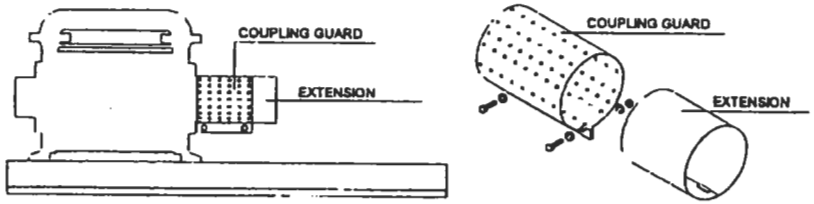


Fig. 10 - ASSEMBLING THE UNIT ON THE BASEPLATE

8 - Place the electric motor on the baseplate and bring the two coupling halves together with approx. 2 mm gap between them keeping the motor axially aligned with the pump shaft. In the event the twp shaft heights do not align, proper shimming under the pump or motor feet will be required. Mark the motor and/or pump anchoring bolt holes. Remove motor and/or pump, drill and tap the holes, clean and mount pump and/or motor in place and lightly tighten the bolts (see fig. 11).

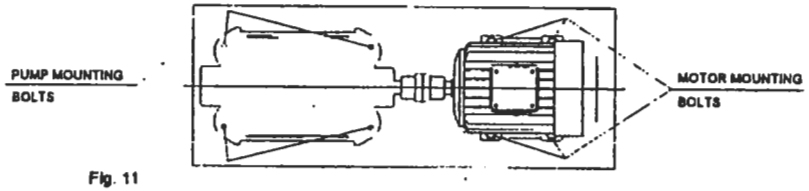


Fig. 11

9 - With a straight edge ruler check tha parallelism of the two coupling halves at several points ,90° from each other (see fig. 13).

NOTE: Easier and more accurate readings can be attained with instruments such as Dial Indicators (if readily available).

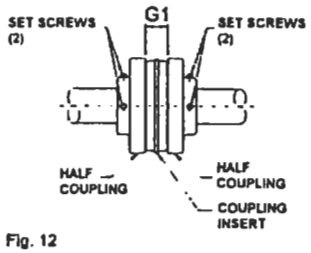


Fig. 12

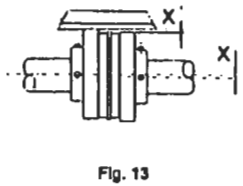


Fig. 13

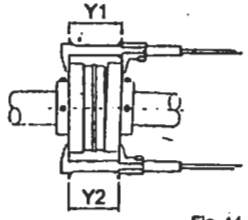


Fig. 14

If the maximum value of "X" is higher than that listed in the tab. 2 (for the given coupling size) it will be required to correct the alignment by using shims under the pump or motor feet.
When the measured values fall within the tolerances, the pump and motor mounting bolts can be tightened.

10 - Angular misalignment can be measured with a Calliper. Measure the outside coupling dimension at several points (see fig. 14). Find the minimum and maximum width of the coupling, the difference between these two readings "Y" (Y1-Y2) should no exceed the value listed in tab. 2 for the given coupling size. Should this value be greater it will be necessary to correct the alignment by shimming the pump and/or motor.
Following this operation it is recommended to check once more the value "X" to make sure that both values are within the allowed tolerance (see point 9). Make sure that both set screws on the coupling halves are properly secured.

Tab. 2

COUPLING SIZE	GAP "G1" mm (Max)	PARALLEL "X" mm (Max)	ANGULAR "Y" mm (Max)
4J	38	0.25	1.0
5J	49	0.38	1.4
6J	54	0.38	1.7
7S	65	0.50	2.0
8S	75	0.50	2.3
9S	89	0.63	2.7
10S	103	0.63	3.2
11S	124	0.81	3.8
12S	144	0.81	4.4

11 - Install the coupling guard and its extension (if applicable) on the pump, secure the two locking bolts. The gap between motor frame and the guard should not be greater than 2 to 3 mm (see fig. 15).

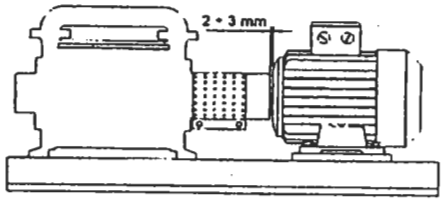


Fig. 15

8 - ELECTRICAL CONNECTIONS

Electrical connections must be made exclusively by qualified personnel in accordance with the instructions from the manufacturer of the motor or other electrical components and must adhere to the local National Electrical Code.

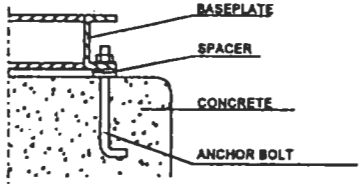
FOLLOW ALL SAFETY PRECAUTIONS AS LISTED IN CHAPTER 2.
BEFORE DOING ANY WORK TO THE INSTALLATION DISCONNECT ALL POWER SUPPLIES.

It is recommended that electric motors be protected against overloading by means of circuit breakers and/or fuses.
Circuit breakers and fuses must be sized in accordance with the full load amperage appearing on the motor nameplate.
It is advisable to have an electrical switch near the pump for emergency situations. Prior to connecting the electrical wiring, turn the pump shaft by hand to make sure that it rotates freely. Connect the electrical wiring in accordance with local electrical codes and be sure to ground the motor.
Motor connection should be as indicated on the motor tag (frequency and voltage) and as discussed in the motor instruction manual. It is recommended that motors over 7.5 HP be wired for Star-Delta start-up, to avoid electrical overloads to the motor and mechanical overloads to the pump.
Be sure to replace all safety guards before switching on the electrical power.
If possible check the direction of rotation before the motor is coupled to the pump but protect the motor shaft to prevent any accidents. When this is not possible briefly jog the pump to check its direction of rotation(see arrow on pump for correct rotation). If the direction must be changed two of the three electrical wire leads must be alternated with each other (at the terminal box or at the motor starter).
Please be aware that rotation in the wrong direction and/or pump running dry may cause severe pump damage.
Electrical instrumentation such as solenoid valves, level switches, temperature switches, etc. which are supplied with the pump or systems must be connected and handled in accordance with the instructions supplied by their respective manufacturers.

9 - INSTALLATION INSTRUCTIONS

Information to determine the piping sizes and floor space requirements can be obtained from dimension drawings and other engineering data. The information required is:
- size and location of suction and discharge flanges
- size and location of service liquid connection and connections for cooling, heating, flushing, draining, etc.
- location and size for mounting bolts for monoblock pump and/or baseplate and/or frame.

In the event additional accessories are required to complete the installation such as separators, piping, valves, etc. refer to chapters 9.2 to 9.8.
Proper lifting devices should be available for installation and repair operations.
Pump assembly should be installed in an accessible location with adequate clear and clean space all around for maintenance, so that an efficient and proper installation can be made.
It is important to have proper room around the unit for ventilation of motor and air cooled radiator, if applicable. Avoid installing the unit in hidden locations, dusty and lacking of ventilation.
Select a mounting pad that will minimise vibrations or torsion of the pump baseplate or frame. It is generally preferred to have a concrete base or sturdy steel beams.
It is important to provide adequate anchor bolting for the pump frame or baseplate to be firmly attached to the foundations (see fig. 16).



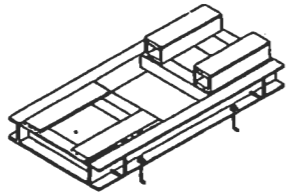


Fig. 16

Concrete pads and other concrete works must be aged, dry and clean before the pump assembly can be positioned in place. Complete all the work relating to the foundations and grouting of the pump assembly, before proceeding with the mechanical and electrical portion of the installation.

9.1 - PIPING CONNECTIONS

Identify first locations and dimensions of all connections required to interconnect the pump with the installation, then proceed with the actual piping: connect the pump suction and discharge flanges, the service liquid line and all other service connections (see fig. 17 to 26).

BE SURE TO PIPE THE CORRECT CONNECTION FROM THE INSTALLATION TO THE RESPECTIVE PUMP CONNECTION !

To prevent foreign matters from entering the pump during installation, do not remove protection cap from flanges or cover from openings until the piping is ready for hook-up.
Verify that all foreign objects such as welding bits, bolts, nuts, rags and dirt are removed from piping, separators, etc. before these are connected to the pump.
Flanges should be connected parallel with each other, without stress and with bolt holes lined up.
The flange gaskets should not interfere with the inside diameter of piping and/or flange.
All piping must be independently supported, easily located and must not transmit forces or torque to the pump due to the weight or to thermal expansions.
Piping size must never be less than the respective connection on the pump.
Suction and discharge flanges are vertical and identified with arrows.
To minimise friction losses and back-pressures, the discharge piping should be one size larger than the pump connection size. To avoid back-pressure and possibility of flooding the pump when it stops, it is recommended to limit the rise of the discharge piping to approximately 50 cm above the pump discharge flange.
Upon completion piping and connections should be tested for leakage under vacuum.

9.2 - ACCESSORIES

Listed below are common accessories that may be supplied with the pump or added at a later date. See fig. 17 to 26 for locations and connection sizes on the pumps.

Non return valve, (check valve)
Prevent back-flow of gas and liquid in the suction piping and/or discharge piping when the pump stops.
Is installed on the pump suction flange in the case of vacuum service or on the pump discharge flange in the case of compressor service.

Vacuum relief valve
It is used to protect the pump from cavitation or to regulate the suction minimum pressure (or max vacuum).
When the pump capacity exceeds the system load at a given vacuum, the relief valve opens letting in atmospheric air or gas (if connected to the discharge separator) keeping constant the pre-set vacuum.

Automatic draining valve
It is used to drain the pump to the shaft centreline when the pump stops so to prevent that the pump has excessive liquid for the next start-up. Starting the pump full or with too much liquid could severely damage the pump.

Vacuum gauge
Usually installed under the pump suction flange , will provide an indication of the pump operating vacuum (pressure).

Discharge reservoir separator
It separates the service liquid from the gases at the pump discharge.
It can be mounted on the pump discharge flange (type HSF) or on the pump baseplate (type HSP).
It is required when the system is with partial or total recovery of the service liquid.

Heat exchanger
It cools the service liquid for those systems with total liquid recovery: it can be plate and frame type, shell and tube type or radiator type, depending upon the application.

Filter
Required to stop solids from entering the pump suction. Sizing of the filter is very important as it could create excessive pressure drops which would affect the pump performance.

9.3 - INSTALLATION SCHEMATICS FOR LIQUID RING VACUUM PUMPS

The working principle of the vacuum pump requires a continuous flow of fresh and clean liquid that enters the pump at the service liquid connection identified by the letter Z (see chapter 9.11). The liquid is discharged together with the handled gas through the pump discharge flange.
The quantity of said liquid will vary with pump size and degree of working vacuum (see performance curves and/or tab. 3).
The service liquid absorbs the compression heat generated by the pump compression therefore its temperature will rise by some 3-4 °C (for additional information see chapter 17).
There are three basic installation schematics listed below that may be considered, depending upon the quantity of service liquid that is desired and possible to be recycled.

9.3.1 - Service liquid: Once-through system (no recovery)
All the service liquid is supplied from an external source. The liquid is separated from the incoming gas in the discharge separator and is totally drained.
This is a popular installation and is used where there is an abundant supply of fresh liquid and/or there is no contamination of the same. The service liquid should be supplied at the pump connection with a pressure of 0.4 bar maximum to avoid flooding the pump with too much liquid. If this is not possible it is recommended to install a reservoir fitted with a float valve, this tank is supplied with the liquid that is then pulled by the pump as required by the operating conditions.
The liquid level in the reservoir should be approximately at the pump shaft centreline.
Schematic fig. 17 illustrates the once-through system.

9.3.2 - Service liquid: Partial recovery system
This type of installation is used where it is desired to minimise the use of fresh service liquid (for calculations see chapter 17).
The service liquid enters and leaves the pump same as the once through system, however part of the liquid is recycled from the discharge separator and the balance is continuously supplied from an external source. The excessive liquid is drained through the separator overflow connection.
The temperature of the mixed liquid supplied to the pump will be higher than the temperature of the make-up liquid. Its final temperature will depend upon the amount of the recycled liquid.
It is important to remember that with higher service liquid temperature the pump performance will decrease (see chapter 17) with the possibility of operating the pump in the cavitation area.
When the separator/reservoir is installed along side of the pump (vertical cylindrical tank, type HSP), its liquid level should not be above the pump shaft centreline.
When flanged separators (vertical cylindrical pot, type HSF) are mounted on the pump discharge flange, the liquid level is automatically maintained by the location of the connections. Schematic fig. 18 illustrates the system with partial recovery of the service liquid.

9.3.3 - Service liquid: Total recovery system
This system has total recycle of the service liquid without fresh liquid make-up from an outside source.
A heat exchanger is required to lower and control the temperature of the recycled service liquid: for sizing and calculations of heat loads see chapter 17.
A circulating pump will be required for those applications where the vacuum pump operates for extended period of times in the pressure ranges above 500/600 mbar or when there are high pressure drops in the closed loop including the heat exchanger (over approximately 1,5 m).
The liquid level in the separator/reservoir should not be above the pump shaft centreline.
Losses of liquid from the closed loop must be compensated with an equal amount from an outside source.
Schematic fig. 19 illustrates the system with total recovery of the service liquid.

9.4 - INSTALLATION SCHEMATICS FOR LIQUID RING COMPRESSORS
The liquid ring vacuum pump can also operate as a compressor up to a maximum differential pressure, depending upon the models, of about 2 bar. The compressors series SA are specifically engineered to perform with differential pressures of up to 10 bar, depending on models.
The principle of operation is same as given in paragraph 9.3 for vacuum pumps and there are three possible type of installations: once-through service liquid, partial recovery service liquid and total recovery service liquid.
The service liquid entering the compressor connection should have a pressure of minimum 0.4 bar above the compressor operating inlet pressure. A booster pump will be required if the service liquid is available at lower pressures.
Separator/reservoir is considered a pressure vessel and as such it must be engineered and built to the applicable codes (ISPESL, ASME, etc.). Accessories such as pressure relief valve, check valve(non-return valve), automatic float type drain valve(water trap), etc. are required in a compressor system.
fig. 20, 21 and 22 illustrate the three possible types of installations.

9.5 - INSTALLATION OF "HYDROSYS" SYSTEMS
HYDROSYS systems are factory assembled and piped including discharge separator/reservoir, heat exchanger (air/liquid or air/air), circulating pump, and all required accessories mounted on a common compact baseplate/frame. See chapter 16 for additional details.
Installation of HYDROSYS system is similar to that of a vacuum pump or a compressor with partial recovery or total recovery of service liquid depending upon the application (see chapter 9.3 or 9.4).
It is important to properly engineer the connecting piping to the system suction and discharge, cooling lines, flushing lines, and draining lines.
The used heat exchanger is designed with service liquid being cooled approximately 4 to 6 °C over the available cooling media temperature. The cooling liquid flow is approximately same as the service liquid flow needed by the pump at the operating conditions (see chapter 9.7 or 9.8).
Schematics for once-through, partial and total service liquid recovery are shown in fig. 18 - 19 - 21 - 22.

9.6 - INSTALLATION OF "OILSYS" SYSTEMS
OILSYS are factory packaged systems including liquid ring vacuum pump using oil for service liquid. For additional details see chapter 19. The system is complete with oil circulating pump, heat exchanger, oil demister, cyclone for removal of dust (optional) and other accessories upon request.
Installation is simple and does not require additional details other than those already discussed in the previous chapter.
Suction and discharge piping should be connected to the respective pump flanges. When locating the discharge piping it should be noted that although the system is fitted with oil demister, there may still be traces of oil fumes carried by the vented gas. Make sure therefore, that the selected area for vacuum pump discharge is suitable for such purpose.
All other connections, (heat exchanger, draining, etc.) must be properly done. See fig. 37 for location of connections.

ATTENTION: HOT SURFACES, DO NOT TOUCH TO AVOID POSSIBLE BURNS!

During operation the temperature of pump, frame, separator and piping can reach values over 60 °C. Therefore take all precautions necessary to comply with the safety regulations.

9.7 - SERVICE LIQUID (H_2O at 15 °C) FLOW (in m^3/h) FOR VACUUM PUMPS
The listed values are referred to the system with "Once-through" service liquid, handling dry air at 20 °C (for more specific data see the pump's performance curve).
To reduce the amount of service liquid flow read the information given in chapter 17.
If the pump is handling saturated or condensable gases at relatively high temperatures, there will be condensation inside the pump. In those cases the service liquid flow listed below can be increased up to 25% to reduce the discharge temperature and minimise the danger of pump cavitation at high vacuum.

Tab. 3

PUMP MODEL	SUCTION PRESSURE (in mbar)		
	33 - 200	> 200 - 600	> 600
TRH 32-4	0.20	0.20	0.16
TRH 32-20	0.36	0.30	0.28
TRH 32-45			
TRH 32-60			
TRH 40-110	0.90	0.70	0.60
TRH 40-140			
TRH 40-190	1.00	0.85	0.70
TRH 50-280	2.40	1.70	0.90
TRH 50-340	3.00	2.22	1.20
TRH 50-420	3.60	2.76	1.60
TRH 80-600	2.50	1.98	1.30
TRH 80-750	3.00	2.40	1.60
TRH 100-870			
TRH 100-1260	7.40	5.70	3.80
TRH 100-1600			
TRH 150-2000	12.00	9.60	6.00
TRH 150-2600	13.20	11.10	6.60
TRH 150-3100	16.20	14.10	8.70

PUMP MODEL	SUCTION PRESSURE (in mbar)	
	200 - 600	> 600
TRS 32-20	0.34	0.24
TRS 32-50		
TRS 40-55	0.78	0.44
TRS 40-80		
TRS 40-100	0.98	0.57
TRS 40-150	1.17	0.72
TRS 50-220	2.40	1.29
TRS 100-550	2.90	1.74
TRS 100-700	3.30	2.10
TRS 100-980	9.00	5.40
TRS 125-1250	8.70	4.20
TRS 125-1550	9.90	4.50
TRS 200-1950	18.00	11.40
TRS 200-2500	20.10	11.70
TRS 200-3100	25.80	17.40

PUMP MODEL	SUCTION PRESSURE (in mbar)		
	33 - 200	> 200 - 600	> 600
TRM 32-25	0.41	0.20	0.14
TRM 32-50	0.48	0.24	0.15
TRM 32-75	0.72	0.41	0.34
TRM/V 40-110	1.20	0.80	0.50
TRM/V 40-150			0.54
TRM/V 40-200	1.30	0.90	0.60
TRM/V 50-300	1.60	1.20	0.80
TRV 65-300			
TRV 65-450	2.40	1.68	0.90

For the above pumps running as compressors without the specific performance curves, please contact TRAVAINI PUMPS or the authorised representative.

9.8 - SERVICE LIQUID FLOW (H_2O at 15 °C) AND PRESSURE FOR COMPRESSORS SERIES "SA"

Values are applicable when the compressor suction is barometric pressure (1013 mbar) and the gas is air at 20 °C.
The indicated flow and pressure requirements are valid for the compressor total performance curve.

SA0E3U = 0.90 m^3/h at minimum pressure of 2.4 bar (35 PSIG)
SA0G2D = 1.00 m^3/h at minimum pressure of 1.8 bar (25 PSIG)
SA0G2D = 1.50 m^3/h at minimum pressure of 3.4 bar (50 PSIG)

9.9 - TYPICAL INSTALLATION SCHEMATICS FOR VACUUM PUMPS

Fig. 17

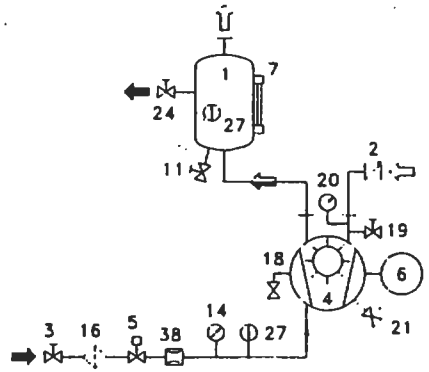


Fig.-18

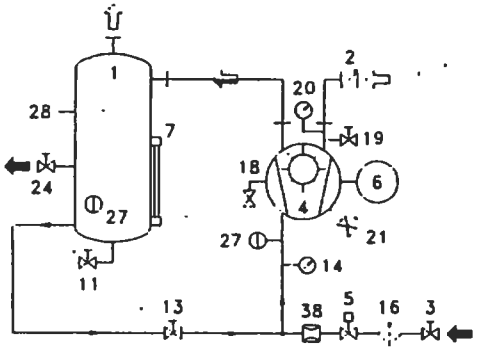
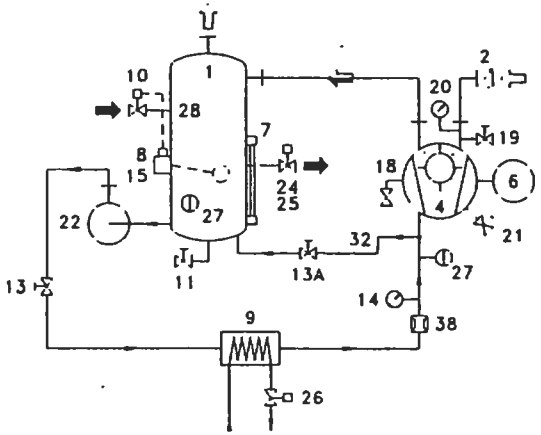


Fig. 19



1 Separator/reservoir

2 Non return valve

3 Shut off valve

4 Liquid ring vacuum pump

5 Solenoid valve

6 Electric motor

7 Level gauge glass

8 Float valve

9 Heat exchanger

10 Make-up solenoid valve

11 Drain valve

13 Flow control valve

13A By-pass valve

14 Compound gauge

15 Level switch

16 Filter (y-strainer)

18 Automatic drain valve (check valve)

9.10 - TYPICAL INSTALLATION SCHEMATICS FOR COMPRESSORS

19 Valve for spare vacuum connection

20 Vacuum gauge

21 Anti-cavitation valve

22 Circulating pump

23 Pressure relief valve

24 Overflow valve

25 Draining solenoid valve

28 Solenoid valve for heat exchanger cooling liquid

27 Temperature gauge

28 Fill-up connection

32 By-pass piping

38 Orifice flow

48 Automatic drain valve or water trap

Air or Gas

Liquid-Gas mixture

Liquid

Fig. 20

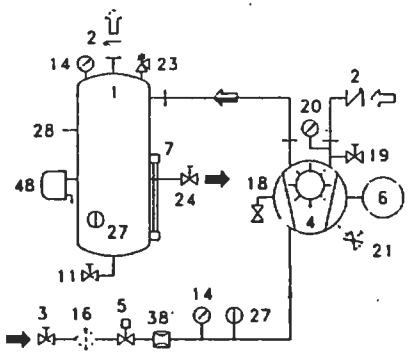


Fig. 21

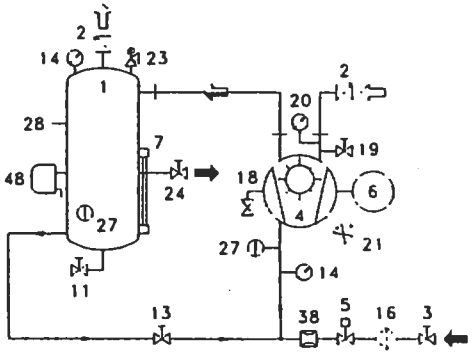
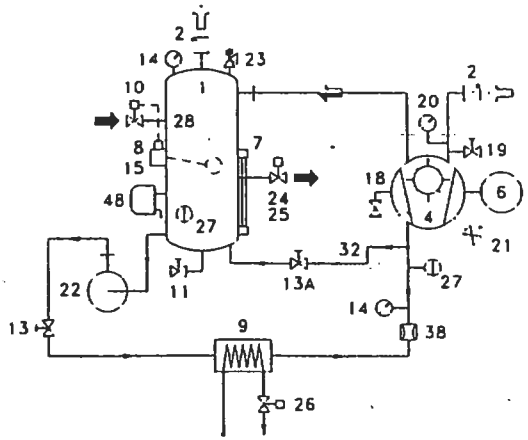


Fig. 22



9.11 - CONNECTIONS LOCATION

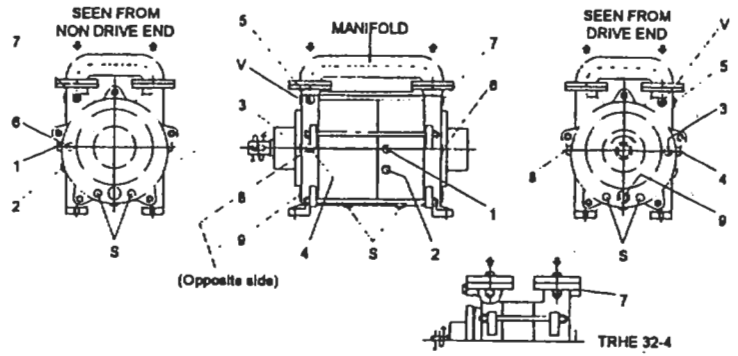


Fig. 23 - Pump series TRH (for details see tab. 4)

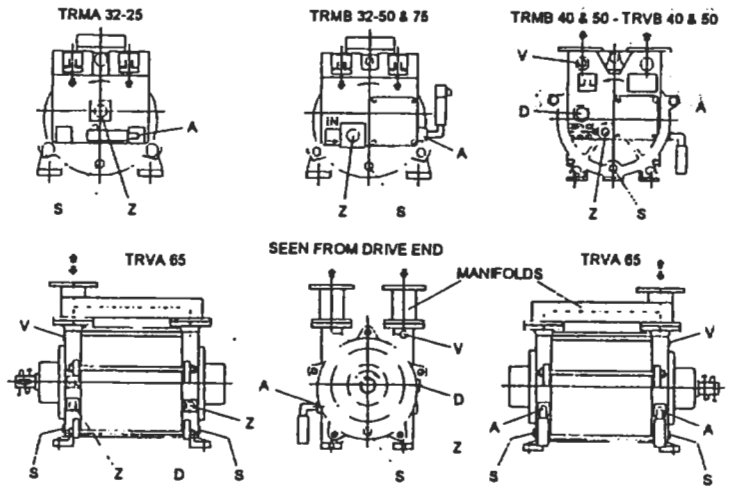


Fig. 24 - Pump series TRM - TRV (for details see tab. 5)

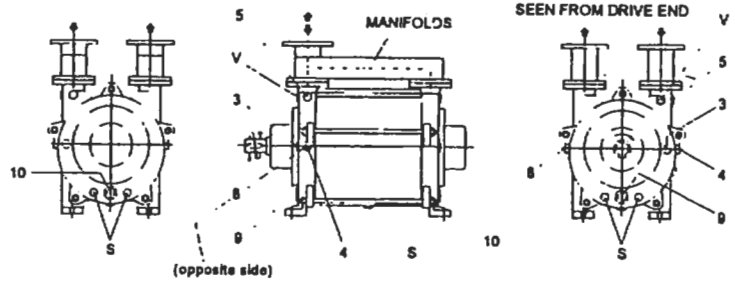


Fig. 25 - Pump series TRS (for details see tab. 6)

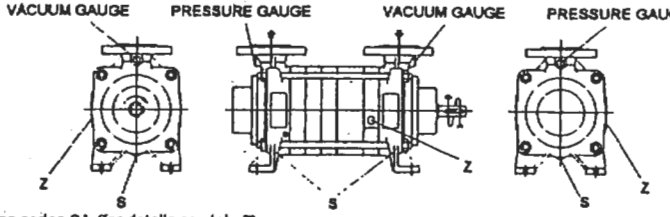


Fig. 26 - Pump series SA (for details see tab. 7)

Tab. 4 - Pump series TRH

PUMP MODEL	A Location	A Dimension	V Location	D Dimension	Z Location	Z Dimension	Qty Manifolds
TRHE 32-4	-	-			7	1/4"	
TRHE 32-20 & 45					8	3/8"	-
TRHC 32-20 & 45	1		-	-	4		
TRHE & TRHC 32-60						1/2"	1
TRHE 40-110		1/4"				3/4"	-
TRHC 40-110	2		4			1/2"	
TRHE 40-140 & 190			3	1/2"		3/4"	
TRHC 40-140 & 190			4		9	1/2"	
TRHB 50	7		3			1"	1
TRHC 80	6	3/8"	4			1 1/4"	
TRHE 100		1/2"		1"		1 1/2"	
TRHA 150	7	3/4"	4 - 5			2 1/2"	

Tab. 5
Pump series
TRM - TRV

PUMP MODEL	Dimension A	Dimension D	Dimension S	Dimension Z	Qty Manifolds
TRMA 32-25 & TRMB 32-50		-	1/8"	1/4"	
TRMB 32-75				3/8"	-
TRMB & TRVB 40	1/8"	1/2"		1/2"	
TRMB & TRVB 50		3/4"	1/4"	3/4"	
TRVA 65		1/2"		1/2"	2

Tab. 6
Pump series TRS

PUMP MODEL	D Location	D Dimension	A Location	A Dimension	Qty Manifolds
TRSE 32			8	3/8"	
TRSC 32	-	-	4		-
TRSE 40-55 to 150				3/4"	
TRSC 40-55 to 100	4	1/2"	9	1/2"	
TRSC 40-150					1
TRSE 50-220	3			3/4"	
TRSC 50-220				1/2"	
TRSB & TRSC 100	4		9 - 10	1 1/4"	2
TRSE 125		1"		1 1/2"	
TRSA 200	4 - 5			2 1/2"	

Tab. 7 - Pump series SA

COMPRESSOR MODEL	S	Z
SA0E3U	1/4"	3/8"
SA0G2D		1/2"
SA0G2G		

A = Connection anti-cavitation valve
D = Auxiliary connection for automatic draining valve, connection valve for spare vacuum pick-up, vacuum relief valve
S = Connection for draining plugs or valves
V = Connection for vacuum gauge 1/4" (series 32 excluded)
Z = Connection for service liquid

All drawings are general and schematics (for additional details see the specific pump catalogue).

9.12 - PUMP ENGINEERING DATA

Tab. 8

PUMP MODEL	Noise level	Weight, Bare pump	Weight ass.ly Monoblock (B5 design)	Weight ass.ly with baseplate	Operating Speed RPM		Installed Motor size kW		Electric Motor Frame size		Weight of Electric Motor kg	
	dB(A)	kg	kg	kg	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*
TRHE 32-4	67	14	19	32	1450	*1750*	0.55	*1*	80 A	*143T*	9	*20*
TRHC 32-20	66	25	31	41	2900	*3500*	1.1	*2*	80 B	*145T*	9	*23*
TRHE 32-20	66	18	22.5	34	2900	*3500*	1.1	*2*	80 B	*145T*	9	*23*
TRHC 32-45	66	28	34	44	2900	*3500*	1.5	*3*	90 S	*182T*	12.5	*35*
TRHE 32-45	66	21	25.5	37	2900	*3500*	1.5	*3*	90 S	*182T*	12.5	*35*
TRHC 32-60	66	30	36	47	2900	*3500*	2.2	*5*	90 L	*184T*	14.5	*41*
TRHE 32-60	66	26	31	43	2900	*3500*	2.2	*5*	90 L	*184T*	14.5	*41*
TRHC 40-110	65	67	79	92	1450	*1750*	4	*5*	112 M	*184T*	27	*41*
TRHE 40-110	65	49	61	74	1450	*1750*	4	*5*	112 M	*184T*	27	*41*
TRHC 40-140	65	79	88	119	1450	*1750*	4	*7.5*	112 M	*213T*	27	*63*
TRHE 40-140	65	67	76	100	1450	*1750*	4	*7.5*	112 M	*213T*	27	*63*
TRHC 40-190	65	87	105	137	1450	*1750*	5.5	*10*	132 SB	*215T*	38	*77*
TRHE 40-190	65	75	93	118	1450	*1750*	5.5	*10*	132 SB	*215T*	38	*77*
TRHB 50-280	70	130	148	195	1450	*1750*	9	*15*	132 MB	*254T*	46	*113*
TRHB 50-340	70	140	170	212	1450	*1750*	11	*20*	160 M	*256T*	80	*134*
TRHB 50-420	71	145	178	220	1450	*1750*	15	*25*	160 L	*284T*	100	*179*
TRHC 80-600	76	220	245	380	1450	*1750*	22	*40*	180 L	*324T*	148	*265*
TRHC 80-750	76	240	280	377	1450	*1750*	30	*50*	200 L	*326T*	225	*320*
TRHE 100-870	79	412	---	574	980	*1150*	30	*50*	225 M	*365T*	280	*380*
TRHE 100-1260	79	485	---	652	980	*1150*	37	*75*	250 M	*405T*	440	*551*
TRHE 100-1600	79	518	---	690	980	*1150*	45	*100*	280 S	*444T*	500	*780*
TRHA 150-2000	83	1330	---	1805	730	*880*	75	*125*	315 MA	*447T*	750	*1200*
TRHA 150-2600	84	1480	---	2095	730	*880*	90	*150*	315 MB	*449T*	750	*1400*
TRHA 150-3100	84	1630	---	2245	730	*880*	110	*200*	355 S	*5007C*	1225	*1530*

PUMP MODEL	Noise level	Weight Bare pump	Weight ass.ly Monoblock (B5 design)	Weight ass.ly with baseplate	Operating Speed RPM		Installed Motor size kW		Electric Motor Frame size		Weight of Electric Motor kg	
	dB(A)	kg	kg	kg	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*
TRSC 32-20	69	19	25	39	2900	*3500*	1.1	*1.5*	80 B	*143T*	9	*20*
TRSE 32-20	69	15	19.5	31	2900	*3500*	1.1	*1.5*	80 B	*143T*	9	*20*
TRSC 32-50	69	20	26	40	2900	*3500*	1.5	*3*	90 S	*182T*	12.5	*35*
TRSE 32-50	69	17	21.5	33	2900	*3500*	1.5	*3*	90 S	*182T*	12.5	*35*
TRSC 40-55	68	54	67	79	1450	*1750*	2.2	*3*	100 LA	*182T*	19	*35*
TRSE 40-55	68	34	47	59	1450	*1750*	2.2	*3*	100 LA	*182T*	19	*35*
TRSC 40-80	66	57	70	82	1450	*1750*	3	*5*	100 LB	*184T*	19	*41*
TRSE 40-80	66	37	50	62	1450	*1750*	3	*5*	100 LB	*184T*	19	*41*
TRSC 40-100	67	60	72	85	1450	*1750*	3	*5*	100 LB	*184T*	19	*41*
TRSE 40-100	67	39	52	64	1450	*1750*	3	*5*	100 LB	*184T*	19	*41*
TRSC 40-150	67	71	88	96	1450	*1750*	4	*7.5*	112 M	*213T*	27	*63*
TRSE 40-150	67	44	57	69	1450	*1750*	4	*7.5*	112 M	*213T*	27	*63*
TRSC 50-220	67	87	104	122	1450	*1750*	5.5	*10*	132 SB	*215T*	38	*77*
TRSE 50-220	67	74	92	109	1450	*1750*	5.5	*10*	132 SB	*215T*	38	*77*
TRSC 100-550	76	200	225	327	1450	*1750*	15	*25*	160 L	*284T*	100	*169*
TRSC 100-700	76	230	255	380	1450	*1750*	18.5	*40*	180 M	*324T*	140	*275*
TRSB 100-980	78	250	290	385	1450	*1750*	30	*50*	200 L	*326T*	225	*320*
TRSE 125-1250	79	436	---	598	980	*1150*	37	*60*	250 M	*404T*	440	*461*
TRSE 125-1550	79	482	---	634	980	*1150*	45	*75*	280 S	*405T*	500	*551*
TRSA 200-1950	83	1125	---	1600	730	*880*	75	*125*	315 MA	*447T*	750	*1200*
TRSA 200-2500	84	1225	---	1700	730	*880*	75	*150*	315 MA	*449T*	750	*1400*
TRSA 200-3100	84	1325	---	1800	730	*880*	110	*200*	355 S	*5007C*	1225	*1530*

Tab. 8 (continued)

PUMP MODEL	Noise level	Weight ass.ly Monoblock 50 Hz motor	Weight ass.ly Monoblock 60 Hz motor	Operating Speed RPM		Installed Motor size kW		Electric Motor Frame size	
	dB(A)	kg	kg	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*
TRMA 32-25	69	17	18	2900	*3500*	0.75	*1.5*	80 A	*80B*
TRMB 32-50	69	24	26	2900	*3500*	1.5	*3*	90 S	*90L*
TRMB 32-75	70	37	41.5	2900	*3500*	3	*5*	100 LA	*112M*
TRMB 40-110	68	66	71	1450	*1750*	3	*5*	100 LB	*184TC*
TRMB 40-150	69	76	106	1450	*1750*	4	*7.5*	112 M	*213TC*
TRMB 40-200	72	103	111	1450	*1750*	5.5	*10*	132 SB	*215TC*
TRMB 50-300	72	126	---	1450	---	7.5	---	132 MA	---

PUMP MODEL	Noise level	Weight of Bare pump	Weight ass.ly Monoblock (B5 design)	Weight ass.ly with baseplate	Operating Speed RPM		Installed Motor size kW	HP	Electric Motor Frame size		Weight of Electric Motor kg	
	dB(A)	kg	kg	kg	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*
TRVB 40-110	68	---	62	---	1450	*1750*	3	*5*	100 LB	*184TC*	19	*41*
TRVB 40-150	69	---	64	---	1450	*1750*	4	*7.5*	112 M	*213TC*	27	*63*
TRVB 40-200	72	---	78	---	1450	*1750*	5.5	*10*	132 SB	*215TC*	38	*77*
TRVB 50-300	72	---	88	---	1450	*1750*	7.5	*15*	132 MA	*254TC*	46	*113*
TRVA 65-300	70	133	155	161	1450	*1750*	7.5	*15*	132 MA	*254TC*	46	*113*
TRVA 65-450	70	146	176	201	1450	*1750*	11	*20*	160 M	*256TC*	80	*134*

PUMP MODEL	Noise level	Weight of Bare pump	Weight ass.ly with baseplate	Operating Speed RPM		Installed Motor size kW	HP	Electric Motor Frame size		Weight of Electric Motor kg	
	dB(A)	kg	kg	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*	50 Hz	*60 Hz*
SA0E3U	67	56	110	2900	*3500*	11 15	*20* 25	160 MA 160 MB	*256T* *284TS*	100 114	*134* *171*
SA0G2D	69	83	135	2900	*3500*	11 18.5	25 30	160 MA 160 L	*284TS* *286TS*	100 126	*171* *191*
SA0G2G	69	87	139 157	2900	*3500*	15 22	30 40	160 MB 180 M	*286TS* *324TS*	114 156	*191* *255*

NOTES:

- Noise level (measured at 1 m distance, without motor, with pump installed in the system) for pump series TRH, TRM, TRV when operating at 60 mbar and pump series TRS when operating at 250 mbar.
  Noise level test to ISO 3746 standards and with pumps at 50 Hz operating speeds.
- Weights are for pumps fitted with Mechanical Seals and in Cast Iron materials (tolerance ± 10%).
- The installed motor size cover the whole performance curve when operating as vacuum pump.
- The motor weights are for type CVE or TEFC high efficiency and are only approximate values. For exact weights refer to the specific motor manufacturer data.

10 - CHECK LIST PRIOR TO START-UP

All questions listed below must have POSITIVE answers prior to proceeding to the pump start-up. Please note that the following is a partial list. Special installations may require further precautions therefore, additional safety steps must be taken as the cases dictate.

- This manual has been completely read, including the following chapters, and is understood in its entirety?
- The piping system has been flushed of any foreign particles, welding impurities, etc.?
- Have all piping and pump obstruction been removed?
- All connections and piping are leak proof and there are no external forces or moments applied to the piping or pump flanges?
- Pump and motor are properly lubricated, per instructions?
- Pump/motor alignment has been checked?
- Mechanical seal flushing line has been connected, where required?
- All valves in the installation are in the correct position?
- All safety guards are in place?
- Pump direction of rotation has been checked by jogging the motor?
- The pump Stop switch is clear and visible?
- Pump as well as installation are ready for start-up?

11 - STARTING, OPERATING AND STOPPING PROCEDURES

Upon receipt and/or completion of installation, before turning on the power to the electric motor, rotate the pump shaft by hand to make sure that the pump rotor is free. In the event the shaft does not turn, try to free it up by applying a torque to the pump coupling with a pipe wrench. To free the rotor of a monoblock style pump (without coupling) introduce a bolt (or similar tool) at the motor shaft end that has a threaded connection and apply the torque by hand.
In the event the pump does not become free with the above procedures, fill up the pump with a suitable solvent or lubricating liquid, let it rest for several hours to allow softening of the rust build-up inside the pump, drain the pump and apply torque to the pump shaft as described above to finally free the rotor.
NOTE: The selected solvent or lubricating fluid must be compatible with the pump, seals and gasketing materials.

CHECK PUMP-MOTOR COUPLING ALIGNMENT!
This must be done prior to the first start-up and before every start-up if pump or motor has been removed from the installation for maintenance or other reasons. See chapter 7.2.

Prior to starting the pump verify that all auxiliary components are available, ready for use and, where required, they are in the open position (i.e.: double mechanical seals are pressurised with buffer liquid, cooling liquid to heat exchanger is open, etc.) and the pump bearings are lubricated.
If the gas and/or service liquid temperatures are in the dangerous levels, it is recommended to insulate the pump, piping and separator to avoid direct contact with their surface, avoid freezing, thermal shock or loosing heat energy.

NOTE: See chapters 11.4 to 11.6 for OILSYS systems start-up, operation and shut-down.

11.1 - START-UP

(In the following, reference is made to certain ITEM numbers which appear on fig. 17 to 22 of chapters 9 and 18).
Open valve at gas discharge if installed and partially open the valve at the suction side.
When operating the pump as compressor there must be a check valve ITEM 2 fitted at the discharge side.
When pump ITEM 4 is fitted in a partial recovery or total recovery or HYDROSYS systems, as built by TRAVAINI PUMPS, it is required to have drain valve ITEM 11 at separator ITEM 1 in the closed position, flow regulating valve ITEM 13 and overflow valve ITEM 24 in the open positions. Separator overflow valve ITEM 24 should be piped to drain (or collecting container). Before start-up fill the pump to the shaft centreline, separator and piping of system with service liquid through pump inlet flange or fill connection ITEM 28. Check all components for leakage.
If the automatic drain valve ITEM 48 is installed, the overflow valve ITEM 24 must be closed after the filling.
Start all accessories (temperature switches, level switches, pressure switches, etc.) open cooling and flushing lines.
Start the pump and open the service liquid valve ITEM 3 (if applicable), soon after start the circulating pump ITEM 22 (if applicable) and adjust the service liquid flow (see tab. 3).
Gradually open the valve at gas suction side till the required vacuum level is reached.
Check the system for abnormal conditions (see chapters 12 and 14).
If the system is fitted with a circulating pump and/or the service liquid has an excessive pressure the by-pass valve ITEM 13A (if available) or valve ITEM 13 can be adjusted to reduce the service liquid flow to the vacuum pump and/or optimise the thermodynamic efficiency of the heat exchanger ITEM 9.
NOTE: HYDROSYS systems engineered with multiple pumps are fitted with isolating valves at suction, discharge, and service liquid lines of each pump. When one or more pumps are not operating it is required to isolate the idle pump(s) by closing these valves. When the pumps are put back into service the said valves (at suction and discharge) must be opened.

11.2 - OPERATION

After starting the vacuum pump check the following:
- the vacuum level is as desired or adjust the flow regulating valve to the required vacuum
- flow and temperature of service liquid and/or cooling liquid are as expected (within 25% tolerance)
- motor does not draw more amperage than shown on its nameplate
- the pump-motor assembly does not have abnormal vibrations and noises such as cavitation
- the operating temperature at full load, does not exceed approximately 85 °C
- there are no leaks from mechanical seals, joints and flushing or cooling liquid lines
- liquid level in separator is between the minimum and the maximum.

NEVER OPERATE THE PUMP DRY!

If the gas discharge is not open to the immediate atmosphere but it is piped to other locations, the pump discharge should be checked for back-pressures that could cause higher power consumption and loss of pump capacity.

11.3 - SHUT DOWN

First close the service liquid flow and cooling liquid flow (if applicable) then shut down the circulating pump ITEM 22 (if there is one).
Where possible, gradually decrease the vacuum level to 400/900 mbar in about 10 seconds max or, if compressor, decrease the discharge pressure. The discharged service liquid from pump ITEM 4 helps producing a slow deceleration rather than sudden stop.
Turn off the power to motor ITEM 6 and close any accessories and flushing lines.
Make sure the non return valves ITEM 2, or similar, at suction and discharge lines are leak tight.
Should the system be idle for an extended period of time it is recommended to disconnect the electricity to the motor panel, drain all liquids from pump, separator and piping. Refer to chapter 6 for storage procedures.

11.4 - START UP OF "OILSYS" SYSTEMS

(In the following, reference is made to certain ITEM numbers which are listed in the figures and legend of chapters 12.1 and 19).
Open the valve at the gas discharge, if applicable, and partially close the valve at the suction side.
Close draining valve ITEM 11 and valves for condensate recovery ITEMS 13F and 13L which are on the frame separator ITEM 1B; open the valve ITEM 13D which is between the circulating pump ITEM 22 and the frame separator ITEM 1B, then partially open flow regulating valve ITEM 13 between the discharge of circulating pump ITEM 22 and the heat exchanger ITEM 9 and the by-pass valve ITEM 13A.
If the system is fitted with a separator cyclone ITEM 1D and the adjacent collecting tank ITEM 1E, it is required to close valves ITEM 11A and 12 and open valve ITEM 13E.
Fill frame separator with service oil through the filling plug ITEM 28. Proper oil level can be seen on sight glass ITEM 7. Refer to tab. 12 and 13 for the required oil quantity.
Start and/or open applicable accessories (temperature switches, level switches, etc.) and circuitry for cooling and flushing.
Start vacuum pump ITEM 4 and soon after start the circulating pump ITEM 22. Adjust the circulating pump capacity with valve ITEM 13.
Gradually open the system suction valve till the desired vacuum is achieved. Check the systems for abnormal noises or vibrations (see chapters 12 and 14).
Adjust by-pass valve ITEM 13A to regulate the oil flow to the vacuum pump or to improve the thermodynamic efficiency of the heat exchanger.
NOTE: OILSYS systems engineered with multiple pumps are fitted with isolating valves at suction, discharge, and service liquid lines of each pump. When one or more pumps are not operating it is required to isolate the idle pump(s) by closing these valves. When the pumps are put back into service the said valves (at suction and discharge) must be opened.

11.5 - OPERATION OF "OILSYS" SYSTEMS

After starting the vacuum pump check the following:
- the vacuum level is as desired or adjust the flow regulating valve to the required vacuum
- the oil temperature is between 60 and 80 °C. If required, adjust the thermostat on the radiator or in case of water/oil heat exchanger adjust the cooling water flow
- motor does not draw more amperage than shown on its nameplate
- the pump-motor assembly does not have abnormal vibrations or noises such as cavitation
- the frame temperature at full load, does not exceed approximately 85 °C
- that there are no leaks from mechanical seals, joints, flushing or cooling liquid lines
- liquid level in separator and frame is between the minimum and the maximum
- the pressure gauge of the oil demister separator does not read more than 0.3 bar. When this value is exceeded it will be required to change the filter element.

If the gas discharge is not open to the immediate atmosphere but it is piped to other locations, the pump discharge should be checked for back-pressures that could cause higher power consumption and loss of pump capacity.

11.6 - SHUT DOWN OF "OILSYS" SYSTEMS

Close, if applicable, the cooling water to the water/oil heat exchanger ITEM 9, then turn off the power to the circulating pump ITEM 22.
Where possible, gradually decrease the vacuum level to 400/900 mbar in about 10 seconds max. The discharged service liquid from pump ITEM 4 helps producing a slow deceleration rather than sudden stop.
Turn off motor ITEM 6, radiator ITEM 9 and any accessories and flushing circuitry.
Make sure the non return valves ITEM 2, or similar, at suction and discharge lines are leak tight.
Should the system be idle for an extended period of time it is recommended to disconnect the electricity to the motor panel, drain all liquids from pump, separator and piping. Refer to chapter 6 for storage procedures.

12 - OPERATING MAINTENANCE

Periodically check the working conditions of the system by means of the instrumentation on the installation (pressure gauges, vacuum gauges, temperature gauges, ampmeters, etc.) and if the pump is consistently handling the application for which it was selected.
The operation of the pump should be without abnormal vibrations or noises, if any of these problems is noticed, the pump should be stopped immediately, search for the cause and make the necessary corrections.
It is good practice to check the pump/motor alignment, the running conditions of the bearings and of the mechanical seals (see chapter 13) at least once a year, even if no abnormalities have been noticed.
If there is a deterioration of the pump performance, which is not attributable to changes in system demands, the pump must be stopped and proceed with necessary repairs or replacement.
If the mechanical seals are fitted with external flushing and/or quenching lines their pressures, temperatures and flows must be checked constantly.

NEVER ALLOW THE PUMP TO OPERATE IN THE CAVITATION AREA!

Cavitation has the characteristic metallic sound, like if gravel was rotating inside the pump, and it causes also high pump vibrations. This happens when the pump is running at absolute pressures close to the vapour tension of the service liquid at the running conditions.
This is a damaging condition for the impellers, port plates and casings. The cavitation causes erosion taking away metal particles and attacking the surface of the pump components. This is particularly damaging if the pump is handling corrosive gases, see chapter 14 for suggestions to correct the problem.
Pump series TRH, TRM and TRV are fitted with an anti-cavitation valve that should be left open (if required) see fig. 23 and 24 for the location. This valve should be connected toward the upper part of the discharge separator so that, depending upon the operating vacuum, the pump can either take air or discharge excessive liquid.
For OILSYS systems the anti-cavitation valve ITEM 13H is piped from pump ITEM 4 to the frame separator ITEM 1B.

During operation it must be avoided to have sudden and frequent variations from high to low vacuum. (e.g.: suddenly opening the suction valve when the pump is operating at pressures lower than 200 mbar).
This would flood the pump creating high power absorption that would put heavy stress on the motor and coupling.

Particular attention should be put on the quantity of the service liquid flow. The flow will depend upon the type of installation (see chapter 9), the pump size, and/or the desired temperature rise.
The flow of service water at 15 °C, for standard pumps and normal operating conditions at various vacuum levels, is listed on the specific pump curves and/or on tab. 3 of chapter 9.7.
Usually the temperature rise of service water, when handling dry air at 20 °C, is approximately 4 °C.
When condensable (e.g.: vapours) are present in the gas stream the heat load to be removed by the service water will be higher, therefore the service water temperature rise will be higher.
The service liquid flow and its temperature will affect the pump performance.
Generally the low service liquid flow will decrease the pump capacity, while a high service liquid flow will increase the absorbed power by flooding the pump (see chapter 17 for information and calculations).
Hard service water will generate lime build-up inside the pump. The severity of the deposit will vary with the water temperature. Lime or mineral deposits on the surface of the internal pump components will cause an increase of absorbed power, wear of the components and eventually will seize the pump.
It is recommended to monitor the water hardness and, if too high, treat the water. If there are no alternatives, there should be periodical flushing of the pump with a solution that will remove the specific deposits, or the pump must be periodically disassembled, cleaned of all incrustations and re-assembled.
Systems with total service liquid recovery require periodical change of the service liquid contained in the closed loop. The heat exchanger must be kept well cleaned of all mineral deposits for an effective thermodynamic heat exchange.
During operation, a closed loop system will loose some of the service liquid, due to evaporation and/or saturation of the discharged gases. It will be required to periodically make-up fresh liquid into the system.
This operation is not required for those systems that are fitted with a float type automatic make-up valve ITEM 8. This valve requires water at a pressure of approximately 2 bar.
Systems that handle condensable will experience a rise in the level of the service liquid in the separator. The excessive liquid will be overflowed through the overflow valve or connection.

If the specific gravity of the condensable is higher than that of the service liquid, the condensable must be discharged through the separator drain valve ITEM 11, preferably with system not running.

12.1 - "OILSYS" SYSTEMS

(For ITEM numbers refer to fig. 27 and legend of chapter 19).
It is very important to keep the service oil temperature under control; when the oil temperature exceeds 90 °C there is the danger of seizing the pump and the gasketing may start leaking.
Every 100-200 working hours it is suggested to check the oil level in the frame reservoir ITEM 1B, make-up oil if necessary and change the oil every 4000-6000 working hours (depending upon the use and the application).
Those installations where the handled gases are contaminated with dust or suspended solids that can alter the oil characteristics will require more frequent oil check and changes.
The frame is fitted with two inspection ports ITEM 43 which can be used for cleaning the frame reservoir after it has been drained of all the oil. Condensable, if present during evacuation, can be flushed right through the discharge of the separator (if they have low boiling point) or, when the system is idle, can be drained by opening valves ITEM 13F and/or 13L. During the service, the oil demister filter will be impregnated with oil particles; the pressure gauge ITEM 14 installed at the housing ITEM 1C will provide an indication of the filter being plugged; pressure reading over 0.3 bar is an indication that the filter needs replacement.
At higher discharge pressures the discharged air quality will decrease and the vacuum pump absorbed power will increase. The oil separated by the filter is accumulated at the bottom of the filter cartridge. To remove this oil there is a scavenger line with a regulating valve ITEM 13G that is connected to the vacuum pump suction flange. It is recommended to keep this valve ITEM 13G minimally opened.

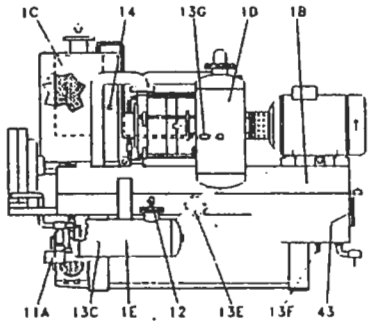


Fig. 27 (General schematic drawing)

To replace the oil demister filter, simply disconnect the oil scavenger line, remove the cover ITEM 1C, remove the used filter element, apply a liquid gasketing material over the 2 gasket faces of the new filter and place the latter in the housing, put in place the cover and the scavenger line.
For systems with separator cyclone ITEM 1D and recovery tank ITEM 1E it is required to periodically remove the accumulated materials. For this operation close the valve ITEM 13E between the cyclone and the reservoir, open the vent valve ITEM 12 situated at the upper part of the separator, open the reservoir drain valve ITEM 11A to discharge the collected materials. After the cleaning operation, return to the original position by reverting the above steps.
It is possible to by-pass the service liquid circulating pump by closing the suction and discharge valves and opening the valve ITEM 13C in the by-pass line. This will connect the frame reservoir directly with the heat exchanger.

13 - BEARINGS AND MECHANICAL SEALS MAINTENANCE

WARNING: The maintenance must be carried out with the pump turned off and the electrical power, or other driving mechanism, must be disconnected. The power should only be turned back on by the same person doing the maintenance. It is however recommended to have at least a team of two workers doing the maintenance and the supervisors should be fully aware of the work in progress.

CAREFULLY FOLLOW THE SAFETY PROCEDURES LISTED IN CHAPTER 2.

13.1 - BEARINGS

At assembly time the pump bearings are lubricated with quality grease (sealed bearings are greased for life). Some of the recommended greases are:

BP - ENERGREASE LS - EP 2	MOBIL - MOBILUX EP 2
ESSO - BEACON EP 2	SHELL - SHELL ALVANIA EP GREASER

Bearings for pumps working in standard conditions should be lubricated every 2000/2500 working hours with a quality grease (see "Disassembly & Assembly" for the replacement of bearings).
Bearing temperature should not exceed the 85 °C during normal working conditions and normal environments.
Bearings can overheat for reasons such as too much grease, misalignment of flexible coupling, wrong bearings, excessive vibrations, bearing wear. See tab. 9 for bearing numbers and type used for each pump.

13.2 - MECHANICAL SEALS

Mechanical seals can be with many types of materials, design and installations (see fig. 28).
Their selection has been evaluated by TRAVAINI PUMPS at the time of pump design, in function of the fluid and working conditions.
The seals are supplied with the proper flow of liquid for their lubrication, through internal pump passages. Upon request, the pump can ba provided with seal lubrication coming from an outside source; the set-up must be such that the seals are guaranteed the liquid quantity and pressure as recommanded by TRAVAINI PUMPS or by the seal manufacturer.
For mechanical seal shaft size see tab. 9.
Mechanical seals normally fitted in the vacuum pumps are to DIN 24960 standards. See "Disassembly & Assembly Instructions" for major seal dimensions.
Normally mechanical seals do not require maintenance until there is a visible liquid loss (leakage). See "Disassembly & Assembly Instructions" for seal replacement.

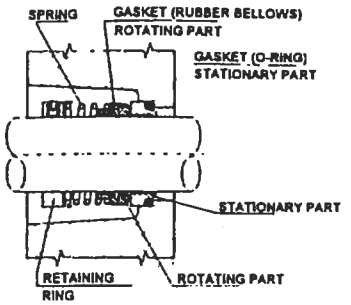


Fig. 28

Mechanical seals MUST NOT run dry! When seals are operated without lubricant and/or flushing liquid their faces and the elastomers may suffer damages beyond repair. It is suggested to check the conditions of the seal faces every approximately 4000 working hours.

Tab. 9

PUMP MODEL	BEARING			MECHANICAL SEAL	
	Quantity	Type	Grease Quantity each bearing - gr.	Quantity	Diameter-mm
TRHE 32-4	1	6302.2RSR		1	16
TRHC and TRSC 32 TRHE 32-20/45/60 - TRSE 32	2	6304.2RSR		2	22
TRHE 40-110 - TRSE 40		6305.2RSR			
TRMA 32-25	1 1	6304.2RSR 6204.2RSR			28
TRMB 32-50	1 1	6305.2RSR 6205.2RSR			24
TRMB 32-75	1 1	6306.2RSR 6206.2RSR			28
TRMB 40-110	1 1	3208.2RSR 6206.2RSR		1	35
TRMB 40-150	1 1	3208.2RSR 6306.2RSR			
TRVB 40-110/150	2	6208.2RSR			
TRMB 40-200 and 50-300	1 1	3210.2RSR 6308.2RSR			45
TRVB 40-200 and 50-300	1 1	6210.2RSR 6208.2RSR			
TRHC and TRSC 40 TRHE 40-140/190 TRSC and TRSE 50	2	6306.2RSR		2	35
TRHB 50 - TRVA 50 and 65		6308	20		43
TRHB/C 80 - TRSB/C 100		6310	35		55
TRHE 100 - TRSE 125	1 1	6314 NU 314	50		75
TRHA 150 - TRSA 200	2 1	7320B.MB.UA 22320ES.TVPB.C3	180		110

NOTE: The supplied data are for pumps in STANDARD construction. For special construction please contact TRAVAINI PUMPS or the authorised representative.

14 - TROUBLE SHOOTING: PROBLEMS, CAUSES AND SOLUTIONS

Consult the following table when problems are experienced. If solutions are not found in this chart or should there be any doubts, do not hesitate to contact TRAVAINI PUMPS or the authorised representative.

Tab. 10 - LIST OF PROBLEMS

PROBLEM	LIST OF POSSIBLE CAUSES
Pump does not create or the vacuum is too low	1 - 2 - 3 - 4 - 9 - 11 - 18 - 19 - 22 - 23 - 24 - 25
Excessive noise	1 - 4 - 5 - 6 - 7 - 10 - 24
High power consumption	1 - 5 - 6 - 8 - 9 - 15 - 24 - 25
Vibration	5 - 6 - 7 - 8 - 10 - 12 - 13 - 24
Mechanical seal leaking	11 - 14
Pump looses liquid	11 - 19 - 23
Bearing failure	5 - 6 - 7
Pump does not start	1 - 6 - 20 - 21
Shaft partially or totally locked	6 - 10 - 15 - 16 - 21
Cavitation	3 - 4 - 8 - 9 - 17 - 24

	CAUSES	SOLUTIONS
1	Defective motor or wired wrong	Check the voltage, the frequency, motor type, power consumption, rotation, wiring connections, phase consistency
2	Leakage in suction piping	Repair piping; check valves for leakage
3	Service liquid high temperature	Lower the service liquid temperature; check the level of the service liquid; adjust the cooling liquid flow; adjust the radiator thermostat to lower temperature setting
4	Low service liquid flow	Increase the service liquid flow
5	Coupling misalignment	Re-align the coupling and the pump/motor assembly (see cap. 7)
6	Faulty bearing	Replace the bearing(see "Disassembly & Assembly Instructions")
7	Cavitation	Open the anti-cavitation valve or set the relief valve to a lower vacuum (see tab. 4 to 6)
8	High service liquid flow	Reduce the service liquid flow; adjust the by-pass valve
9	High back pressure	Check the discharge line for obstructions or high friction losses; reduce the back-pressure to maximum 0.1 bar
10	Wrong pump/motor assembly	Verify that the base surface is level and that all pump feet are resting on the surface, add spacers if required (see chapter 11)
11	Mechanical seal failure	Change the mechanical seal (see "Disassembly & Assembly Instructions")
12	Wrong pump mounting	Remount the pump (see chapter 7)
13	Piping weight resting on pump	Support the piping with hangers or other means (see chapter 11)
14	Inadequate seal lubrication	Check flushing liquid temperature, flow and pressure
15	Mineral deposits from hard water	Clean the pump
16	Foreign particles in pump	Disassemble the pump to remove the foreign objects (see "Disassembly & Assembly Instructions")
17	Low suction pressure	Open the vacuum regulating valve and/or the anti-cavitation valve (vacuum relief valve)
18	Wrong pump rotation	Reverse the rotation (see chapter 8)
19	Bad gaskets	Replace the defective gaskets (see the "Disassembly & Assembly Instructions")
20	Wrong motor connections	Check the electrical connections (connectors, fuses, breakers) and the power supply line (see chapter 8)
21	Pump seized	Disassemble and repair the pump (see "Disassembly & Assembly Instructions")
22	Pump undersized	Select a pump with higher capacity
23	Pump worn-out	Disassemble and repair the pump (see "Disassembly & Assembly Instructions")
24	Excessive liquid flow through suction line	Reduce the liquid flow through the pump suction; install a centrifugal separator (cyclone) before the pump
25	Instrumentation out of calibration	Check the working characteristics, replace if required

15 - REPAIRING AND REMOVING PUMP FROM THE INSTALLATION

Should there be the need for pump repair a knowledge of the specific "Disassembly and Assembly Instructions" is required.

FOLLOW THE SAFETY PRECAUTION MEASURES OUTLINED IN CHAPTER 2.

Before working on the pump it is important to:
- procure and wear the proper safety equipment (hard hat, safety glasses, gloves, safety shoes, etc.)
- disconnect the electrical power supply and, if required, disconnect the electrical cable from the motor
- close the isolating valves at pump inlet, outlet and service liquid
- let the pump cool down to ambient temperature if it has been handling hot fluids
- adopt safety measures if the pump has been handling hazardous liquids
- drain the pump internals of the pumped liquid through the draining connections, if necessary rinse with neutral liquid.

To remove the pump and the motor from the installation proceed as follows:
- remove bolts from pump suction and discharge flanges
- remove the coupling guard
- remove the spacer of the coupling, if there is one
- if required, remove the motor anchor bolts on the baseplate, for base mounted assembly, or the bolts on the adapter flange in the case of monoblock design
- remove the pump anchor bolts on the baseplate
- remove the pump from the installation. Avoid damaging other system components.

After pump repairs, re-install following the steps from "Assembly and Alignment" procedures and after (see the applicable chapters).

16 - SPARE PARTS

When ordering the pump it is good practice to also order the necessary spare parts, especially when there are no stand-by pumps in the installation. This will minimise unnecessary down times in the event of pump failure or routine maintenance.
It is therefore, recommended to stock the following spare parts for each pump size:

1	Impeller set
1	Complete shaft assembly
1	Bearing set
1	Mechanical seal set (or packing set)
1	Gasket sets
1	Radial seal ring set
1	Bearing spacer set
1	Coupling rubber insert set

For better parts management, the VDMA 24296 standards suggest to stock the number of parts as a function of the number of pumps being used in the plant.
On the pump nameplate are printed pump model, year of manufacture and pump serial number. When ordering spare parts always provide this information. Pump type, parts item number (VDMA) and description as per the pump sectional drawing and parts list is useful information that helps to supply correct spare parts for your pump.

17 - ENGINEERING DATA

17.1 - INFLUENCE OF SERVICE LIQUID TEMPERATURE, SPECIFIC GRAVITY AND VISCOSITY ON PUMP PERFORMANCE

The performance of liquid ring vacuum pumps is based on the use of water at 15 °C as service liquid. With water at different temperatures the pump capacity and the maximum attainable vacuum level will vary in function of the type of pump, as illustrated by the curve sets of fig. 29 and 30.

EXAMPLE: Pressure = 60 mbar - Water temperature = 24°C - Pump series TRH - Capacity (15°C water) = 120 m^3/h
From curves of fig. 30 we find the correcting factor of 0.80, therefore the actual capacity for the pump at the given conditions will be: 120 x 0.80 = 96 m^3/h.
The maximum suction pressure before incurring cavitation will be approximately 45 mbar.

Regarding the performance variation due to changes of specific gravity and viscosity, it can be assumed a proportional variation in power consumption however, the changes in capacity at different pressures must be analysed case by case. Please refer the conditions to TRAVAINI PUMPS when these corrections are needed.

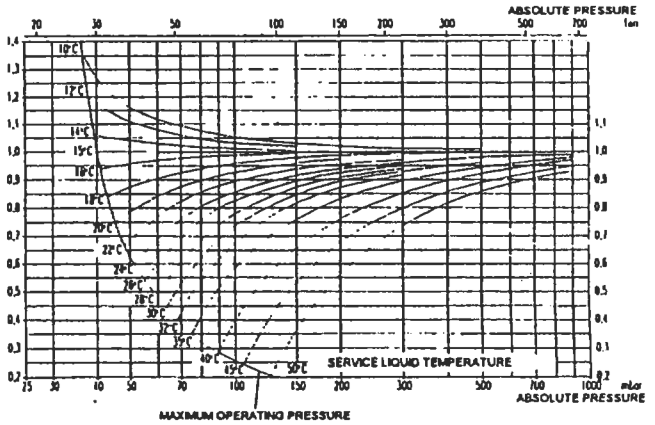


Fig. 29
Single stage pump
(series TRM, TRS, TRV)

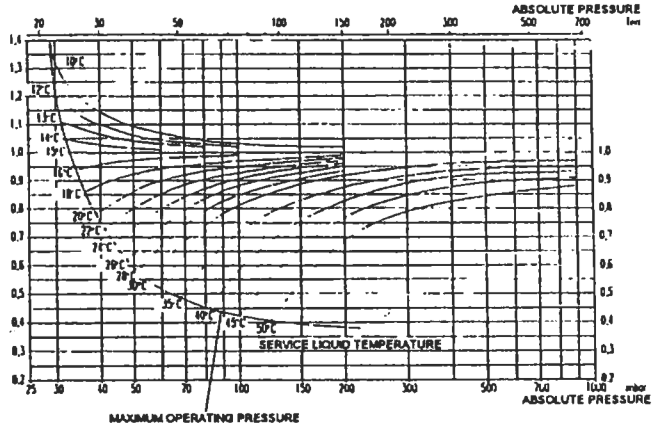


Fig. 30
Two stage pump
(series TRH)

17.2 - SERVICE LIQUID TEMPERATURE CHANGE ACROSS THE PUMP

The service liquid of a liquid ring pump absorbs total heat Q_T as follows:

$$Q_T\,(kJ/h) = Q_c + Q_K + Q_R$$

Where:

- Q_C = $0.9 \times P \times 3600$ = Isothermal compression heat
- Q_K = $m_v \times r$ = Condensation heat
- Q_R = $m_g \times c_p \times \Delta T_a$ = Cooling heat (Generally negligible, ignored in calculation of Q_T)

- m_v = mass condensed incoming vapour in kg/h
- m_g = mass incoming gas in kg/h
- P = absorbed power at operating point in kW
- c_p = gas specific heat in kJ/Kg x K
- r = heat of vaporisation in kJ/Kg
- ΔT_a = differential temperature in K, between incoming gas T_G and service liquid discharge temperature ($T_2 + \Delta T$)
- K = Kelvin temperature

Once the Q_T is known it is possible to calculate the differential temperature ΔT of the pump service liquid:

$$\Delta T = \frac{Q_T}{Q_A \cdot \rho \cdot c_p}$$

Where:

- Q_T = total heat load before calculated in kJ/h
- Q_A = pump service liquid flow in m^3/h
- ρ = service liquid density in kg/m^3 (water = 1000)
- c_p = service liquid specific heat in kJ/kg x K
  (Some values for c_p: Water = 4.2 - Air = 1.0 - Water Vapour = 1.84)

NOTE: it can be assumed that the discharge gas and service liquid have same temperature.

17.3 - OPERATION WITH PARTIAL RECOVERY OF SERVICE LIQUID

Where the working conditions will allow it, the service liquid temperature can be increased utilising a smaller quantity of fresh liquid from an outside source. A similar flow as the make-up is discharged to the drain while the balance of liquid required by the pump is recirculated. In these cases the service liquid working temperature rises and the pump capacity will require correction per curves of fig. 29 and 30. The system installation will be similar to the schematic of fig. 31.

Depending upon the affordable loss of capacity the service liquid temperature T_2 may be set and the make-up flow of fresh liquid Q_F can then be calculated:

$$Q_F\left(m^3/h\right) = \frac{Q_A \cdot \Delta T}{T_2 - T_1 + \Delta T}$$

where:

- Q_F = Fresh make-up flow from outside source in m^3/h
- Q_A = Total service liquid flow required for the operating conditions in m^3/h
- ΔT = Service liquid temperature rise (see chapter 17.2)
- T_2 = Service liquid temperature to pump
- T_1 = Temperature of make-up liquid

The fig. 31 indicates a generic schematic of a liquid ring vacuum pump in a partial recovery system.

By closing the recirculation line the system would become a "once through" installation where all the service liquid is drained, therefore:

$$Q_A = Q_F \quad \text{and} \quad T_2 = T_1$$

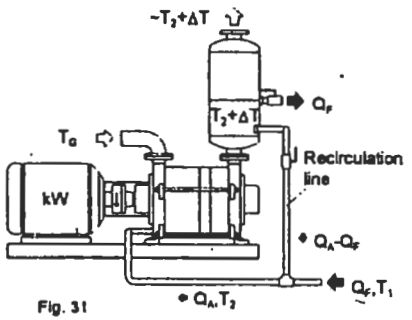
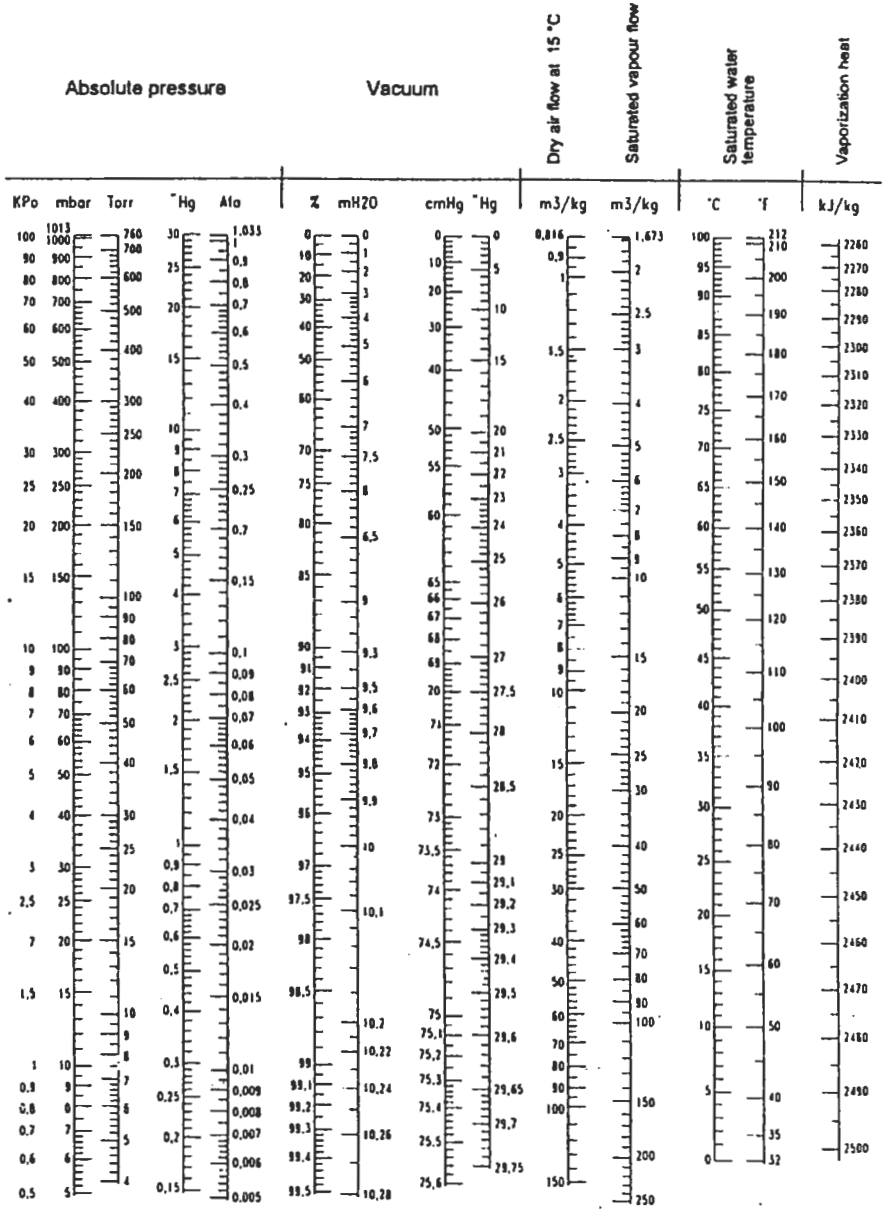


Fig. 31

17.4 - UNIT CONVERSION TABLE



18 - ENGINEERING DATA FOR "HYDROSYS" SYSTEMS

WORKING PRINCIPLE

The HYDROSYS packages main components are: a liquid ring vacuum pump ITEM 4 from series TRH, TRS, TRM, TRV, an air/liquid separator reservoir ITEM 1, a heat exchanger ITEM 9, all mounted on a common and compact frame ITEM 30. When working, the vacuum pump discharges from the discharge port the gas handled with a portion of the liquid from the pump internal liquid ring. This liquid must be continuously returned to the pump.

The gas/liquid mixture is separated in a cylindrical tank (separator), the gas is vented through the top mounted discharge flange of the separator and the liquid is collected at the bottom of the separator ready to be returned to the vacuum pump.

(General and schematic system drawing)

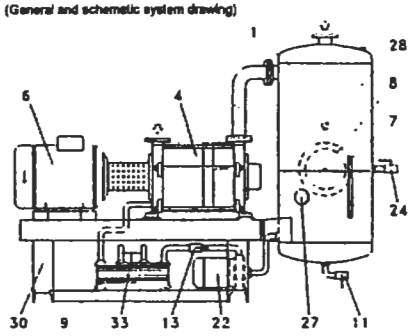


Fig. 32 - TOTAL RECOVERY system

During the suction and compression cycle of the vacuum pump, all the energy is transformed into heat energy and almost all of it is absorbed by the service liquid. Therefore the liquid must be cooled prior to be returned to the pump, either with a heat exchanger (total recovery system) or with the addition of cool make-up liquid (partial recovery system).

The **TOTAL RECOVERY** system (see fig. 32 and legend on following page) does not require an appreciable flow of make-up from an external source but only the necessary amount to compensate for the liquid lost due to evaporation, with the discharged gases.

The heat exchanger sizing should be based on using a minimum amount of cooling liquid (usually water) to keep the service liquid at the ideal temperature for the best efficiency of the vacuum pump. Remember, the higher the temperature of the service liquid the higher the losses in pump capacity and maximum vacuum, see chapter 17.

This system is particular suitable where the service liquid and the condensed gases cannot be discharged to the environment, either for pollution reasons or because the fluids are too valuable.

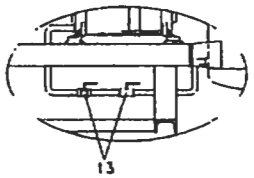


Fig. 33 - PARTIAL RECOVERY system

The **PARTIAL RECOVERY** system (see fig. 33 and legend on following page) requires a constant flow of cold make-up liquid from an external source. This liquid must be of the same nature as the service liquid being used by the pump. The mixture of the make-up and the service liquid being discharged by the pump, will have a constant temperature when enters the vacuum pump service liquid connection.

The same amount of service liquid taken from the outside source must be overflowed through the separator overflow connection situated at the pump shaft centreline.

This system is utilised in many applications for conditions where there is intermittent use, or low vacuum levels, or there is no danger of pollution and the liquid can easily be drained.

Furthermore this may prove to be the only alternative to the total recovery system for those installations where the cooling liquid is not available or it is too warm.

Numerous accessories are available to meet the customers' requests and suitable for the installation, process and maintenance.

For materials of construction and some engineering data see tab. 11 and 12.

Tab. 11 - STANDARD MATERIALS FOR "HYDROSYS" SYSTEMS

COMPONENT		MATERIAL DESIGN	
Vacuum pump		GH - F - RA	A3
Separator reservoir		Carbon steel	AISI 316 SS
Frame			
Heat Exchanger	Plates	AISI 316 SS	
	Gaskets	Nitrile rubber / Viton	
Circulating pump		Cast iron	AISI 316 SS
Piping		Carbon steel	
Valves – Thermometer		Brass	
Level gauge		Polycarbonate	"Pirex" Glass

For vacuum pump materials (GH - F - RA - A3) see chapter 4.

SOME EXAMPLES OF "HYDROSYS" SYSTEMS (General schematic drawings)

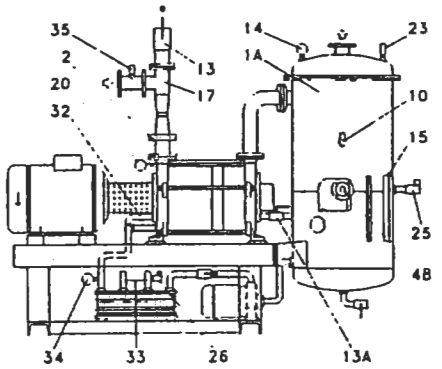


Fig. 34 - Accessories upon request

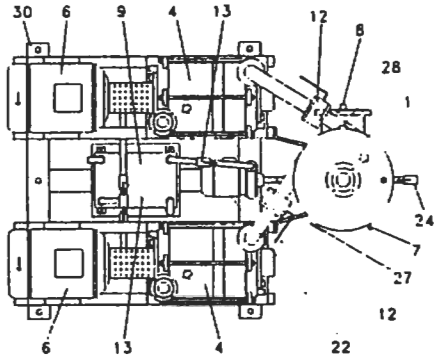


Fig. 36 - Duplex system, total recovery (Top view)

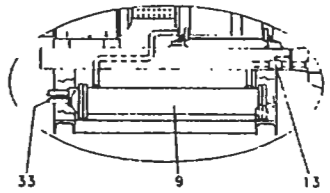


Fig. 35 - Option with Shell & Tubes heat exchanger

LEGEND

1	Separator reservoir
1A	Separator reservoir with removable lid
2	Check valve
4	Vacuum pump
6	Electric motor
7	Level gauge
8	Float valve
9	Heat exchanger
10	Solenoid valve liquid make-up
11	Drain valve
12	Isolating valve
13	Service liquid flow regulating valve
13A	By-pass valve
14	Pressure gauge
15	Level switch
17	Air ejector
20	Vacuum gauge
22	Circulating pump
23	Pressure relief valve
24	Overflow valve
25	Solenoid valve for overflow
28	Solenoid valve for cooling liquid
27	Thermometer
28	Fill connection
30	Frame
32	By-pass piping
33	Connection cooling lines
34	Temperature switch
35	Vacuum relief valve
48	Automatic drain valve (for systems used as Compressor only)

Tab. 12 - GENERAL AND NOT BINDING ENGINEERING DETAILS FOR "HYDROSYS" & "OILSYS" SYSTEMS

PACKAGE SERIES		Motor size	Dry weight without Pump and Motor kg		Service Liquid Quantity litres	Service Oil Quantity litres
			HYDROSYS	OILSYS	HYDROSYS	OILSYS
HYDROSYS OILSYS	2	5 HP 2 poles / 60 Hz	80	180	12	40
HYDROSYS OILSYS	3	7.5 HP 4 poles / 60 Hz	90	220	35	80
HYDROSYS OILSYS	4	10 HP 4 poles / 60 Hz	120	280	50	100
HYDROSYS OILSYS	5	20 HP 4 poles / 60 Hz	150	350	80	140
HYDROSYS OILSYS	6	40 HP 4 poles / 60 Hz	230	500	135	180
HYDROSYS OILSYS	7	60 HP 6 poles / 60 Hz	500	750	320	370

19 - ENGINEERING DATA FOR "OILSYS" SYSTEMS

WORKING PRINCIPLE

OILSYS packages main components are: a liquid ring vacuum pump ITEM 4 from series TRH, TRS, TRM, TRV, an air/liquid separator reservoir ITEM 1B which is also a self-contained frame, a heat exchanger ITEM 9 and an oil demister filter ITEM 1C.

Turbine type mineral oil, or equal (see tab. 13), is used for service liquid. The characteristics of the chosen oil are such that at pressures below 100 mbar, the pump capacity is greater than what would be when using water, and higher vacuum levels are attainable.

Tab. 13 - SUGGESTED OILS

MANUFACTURER	TYPE
AGIP	OTE 32
ESSO	TERESSO 32
LUBRA	OLNEO 32
MOBIL	DTE LIGHT 32
SHELL	TURBO OIL 32
TOTAL	PRESLIA 32

When working, the vacuum pump discharges the gas handled with a portion of the liquid in the special frame ITEM 1B that acts as separator of gas from the oil and let settle any condensable or particles coming through the pump suction flange. The circulator pump ITEM 22 pumps the oil back to the vacuum pump after it has been through the heat exchanger ITEM 9 and cooled at about 60/80 °C.

The gas is vented after being cleaned of all oil with the special oil demister element; a pressure gauge ITEM 14 on the filter housing ITEM 1C gives indication of the degree of dirt contained by the filter element. Special inspection openings ITEMS 43 are easily accessible for maintenance and cleaning of the frame separator.

Contrary to rotary vane vacuum pumps, there are no moving parts that come in contact with each other, therefore there is no need for lubrication of the pump internals; these are very robust and reliable pump packages which offer extended operating life even when handling condensable gases.

See tab. 14 for materials of construction and tab. 12 in chapter 18 for some engineering data.

COMPONENT		MATERIAL DESIGN
Vacuum pump		GH - F - RA
Frame separator reservoir		Carbon steel
Heat exchanger air-oil	Cooler core	Aluminium
	Shroud	Carbon steel
	Fan – Guard	Carbon steel-Plastic coated
Circulating pump		Cast iron
Piping		Carbon steel - Carburite rubber
Valves – Thermometer		Brass
Level gauge		Polycarbonate

Tab. 14 - STANDARD MATERIALS FOR "OILSYS" SYSTEMS

See chapter 4 for vacuum pump materials of construction (GH - F - RA).

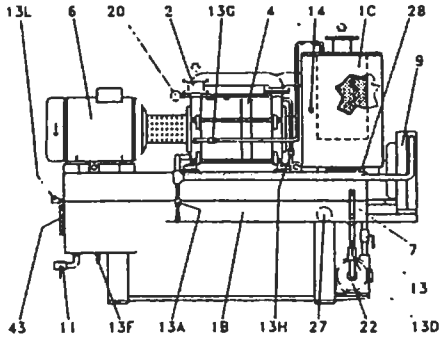


Fig. 37 - STANDARD design

(General schematic drawing)

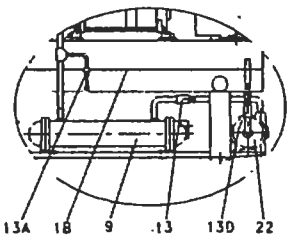


Fig. 38 - Option with Shell & Tube heat exchanger

LEGEND

1B - Frame separator
1C - Filter housing
1D - Cyclone separator
1E - Collecting tank
2 - Check valve
4 - Vacuum pump
6 - Electric motor
7 - Level gauge
9 - Heat exchanger
11 - Drain valve
11A - Drain valve
12 - Overflow valve
13 - Flow regulating valve
13A - By-pass valve
13C - By-pass valve
13D - Isolating valve
13E - Isolating valve
13F - Condensate drain valve
13G - Oil drain valve
13H - Anti-cavitation valve
13L - Condensate drain valve
14 - Pressure gauge
20 - Vacuum gauge
22 - Circuleting pump
27 - Thermometer
28 - Fill connection
43 - Inspection openings

NOTES

PUMP model	Serial Number	Computer Number	Year of manufacture

GAS handled	Temperature °C	Capacity m^3/h	Suction Pressure mbar	Discharge Pressure mbar

Service LIQUID	Temperature °C	Capacity m^3/h	Absorbed Power HP

INSTALLATION
- ☐ Outside.....
- ☐ Inside.....

SERVICE
- ☐ Continuous.....
- ☐ Intermittent.....

MOTOR type	No. Poles	Frame	RPM
Frequency Hz	Supply Volt	Absorbed power Amp	Power HP
Enclosure	Insulation class		

COMMENTS

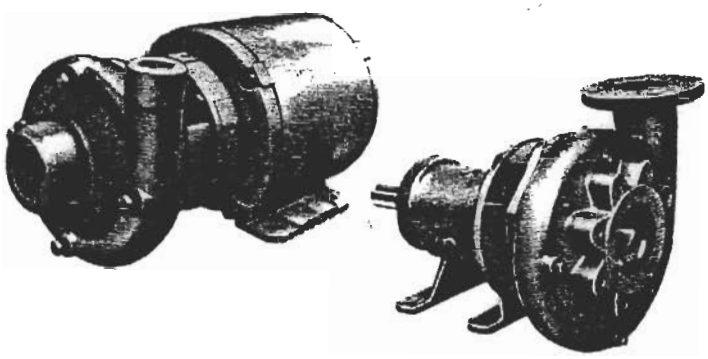
APPENDIX D

WATER PUMPS

Installation, Operation and Maintenance Instructions

Model 3656/3756

A9700199



DESCRIPTION & SPECIFICATIONS:

The Models 3656 (close-coupled) and 3756 (frame-mounted) are single-stage end-suction pumps for general service, liquid transfer, booster applications, etc. They are available in three different materials of construction: all-iron, bronze-fitted and all-bronze ("S" Group only). Application will depend on the material of construction.

The pumps have fully enclosed impellers, key driven and held in position by an axial bolt and washer. Casings are full volute in design with replaceable wear ring. Depending on the size, they have either threaded or flanged inlet and discharge connections. Shafts are protected by stainless steel sleeves and shaft sealing is with mechanical seal.

Close-coupled units have NEMA frame motors, C-face mounting, JM shaft extension. Frame mounted units can be coupled to motors through a spacer coupling, or belt driven.

1. Important:

1.1. Inspect unit for damage. Report damage to carrier immediately.

1.2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire size, etc., per National and Local electrical codes. Install an all-leg disconnect switch near pump.

CAUTION

Always disconnect electrical power when handling pump or control.

1.3. Motor must be wired for proper voltage (check nameplate). Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.

1.4. Always use horsepower-rated contactors and starters.

1.5. Motor Protection

1.5.1. Single-phase: Thermal protection for single-phase unit is sometimes built in (check nameplate). If no built-in protection is provided, use a contactor with a proper overload. Fusing is permissible.

1.5.2. Three-Phase: Provide three-leg protection with properly sized magnetic starter and thermal overloads.

1.6. Maximum Liquid Temperatures:
212°F (100°C) with standard seal.
250°F (120°C) with optional high temperature seal.

1.7. Allowable operating pressure: 175 PSI.

1.8. Maximum number of starts per hour: 20, evenly distributed.

1.9. Regular inspection and maintenance will increase service life. Base schedule on operating time. Refer To Section 8.

2. Installation:

2.1. General

2.1.1. Locate pump as near liquid source as possible (below level of liquid for automatic operation).

CAUTION

Do not install with motor below pump. Any leakage or condensation will effect the motor.

2.1.2. Protect from freezing or flooding.

2.1.3. Allow adequate space for servicing and ventilation.

2.1.4. All piping must be supported independently of the pump, and must "line-up" naturally.

CAUTION

Never draw piping into place by forcing the pump suction and discharge connection.

2.1.5. Avoid unnecessary fittings. Select sizes to keep friction losses to a minimum.

2.1.6. After the piping is complete rotate the unit by hand to check for any binding.

2.2. Close-coupled units:

2.2.1. Units may be installed horizontally, inclined or vertically.

2.2.2. Foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration.

2.2.3. Tighten motor hold-down bolts before connecting piping to pump.

2.3. Frame-mounted units:

2.3.1. Bedplate must be grouted to a foundation with solid footing. Refer to Fig. 1.

2.3.2. Place unit in position on wedges located at four points (two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit. Level or plumb suction and discharge flanges.

2.3.3. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming, if necessary.

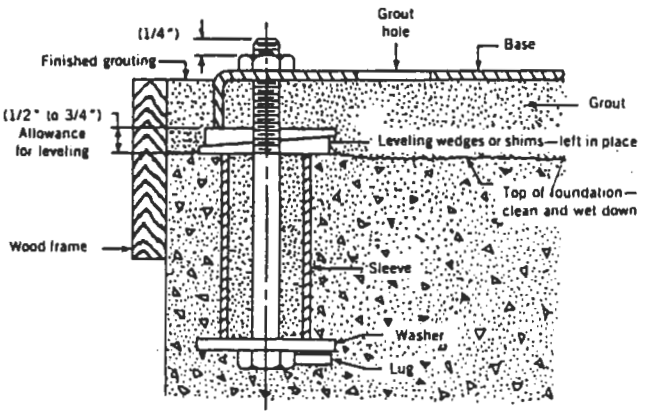


Figure 1

2.3.4. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before fully tightening foundation bolts.

2.3.5. Tighten pump and motor hold-down bolts before connecting to piping to pump.

3. Suction Piping:

3.1. Low static lift and short, direct, suction piping is desired. For suction lift over 10 feet and liquid temperature over 120 F, consult pump performance curve for Net Positive Suction Head Required.

3.2. Suction pipe size must be at least equal to suction connection of pump.

3.3. If larger pipe is required, an eccentric pipe reducer (with straight side up) must be installed at the pump.

3.4. Installation with pump below source of supply:

3.4.1. Install isolation valve in piping for inspection and maintenance.

CAUTION

Do not use suction isolation valve to throttle pump.

3.5. Installation with pump above source of supply:

3.5.1. To avoid air pockets, no part of piping should be higher than pump suction connection. Slope piping upward from liquid source.

3.5.2. All joints must be airtight.

3.5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.

3.5.4. Suction strainer open area must be at least triple the pipe area.

3.6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump through vortexing. See Figs. 2-5.

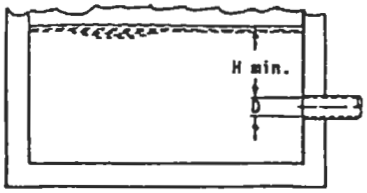


Figure 2

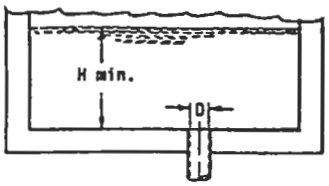


Figure 3

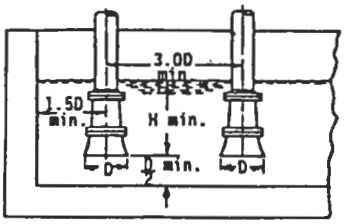


Figure 4

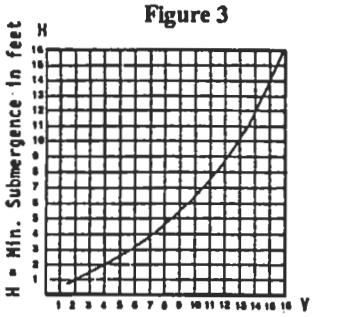


Figure 5

4. Discharge piping:

4.1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or for inspection of the pump or check valve.

4.2. If an increaser is required, place between check valve and pump.

5. Motor-To-Pump Shaft Alignment:

5.1. Closed Coupled Units:

5.1.1. No field alignment necessary.

5.2. Frame-Mounted Units:

5.2.1. Even though the pump-motor unit may have a factory alignment, this could be disturbed in transit and must be checked prior to running. See Fig. 6.

5.2.2. Tighten all hold-down bolts before checking the alignment.

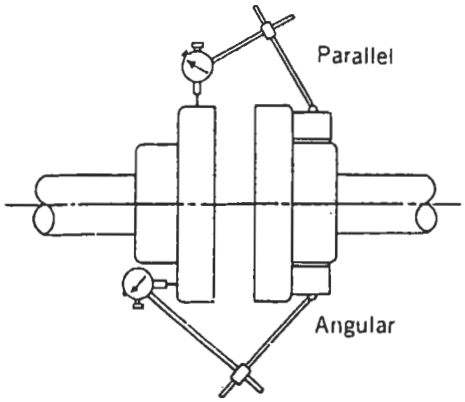


Figure 6

5.2.3. If re-alignment is necessary, always move the motor. Shim as required.

5.2.4. Parallel misalignment-shafts with axes parallel but not concentric. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Residing is .005", or less.

5.2.5. Angular misalignment-shafts with axes concentric but not parallel. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005", or less.

5.2.6. Final alignment is achieved when parallel and angular requirements are satisfied with motor hold-down bolts tight.

CAUTION

Always recheck both alignments after making any adjustment.

6. Rotation:

6.1. Correct rotation is right-hand (Clockwise when viewed from the driver end). Switch power on and off, very briefly. Observe shaft rotation. To change rotation:

6.1.1. Single-Phase: Refer to wiring diagram on motor.

6.1.2. Three-Phase: Interchange any two power supply leads.

7. Operation:

7.1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

CAUTION

Pumped liquid provides lubrication. If pump is run dry, rotating parts will seize and mechanical seal will be damaged. Do not operate at or near zero flow. Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent scoring or seizing.

7.2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. On frame-mounted units coupling alignment may have changed due to the temperature differential between pump and motor. Recheck alignment.

8. Maintenance:

8.1. Close-Coupled Units: Bearings are located in and are part of the motor. For lubrication procedure, refer to motor manufacturer's instructions.

8.2. Frame Mounted Units:

8.2.1. Bearing frame should be regreased every 2,000 hours or 3 month interval, whichever occurs first. Use a #2 sodium or lithium based grease. Fill until grease comes out of relief fittings, or lip seals, then wipe off excess.

8.2.2 Follow motor and coupling manufacturers' lubrication instructions.

8.2.3. Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

9. Disassembly:

Complete disassembly of the unit will be described. Proceed only as far as required to perform the maintenance work needed.

9.1. Turn off power.

9.2. Drain system. Flush if necessary.

9.3. Close-Coupled Units: Remove motor hold-down bolts.

Frame-Mounted Units Remove coupling, spacer, coupling guard and frame hold-down bolts.

9.4. Disassembly of Liquid End:

9.4.1. Remove casing bolts (370).

9.4.2. Remove back pull-out assembly from casing (100).

9.4.3. Unscrew impeller bolt (198) with a socket wrench.

CAUTION

Do not insert screwdriver between impeller vanes to prevent rotation.

It may be necessary to use a strap wrench around the impeller if impacting the socket wrench will not loosen the impeller blot. Hold shaft on frame mounted units.

9.4.4. Remove impeller washer (199).

9.4.5. Use two pry bars, 180 degrees apart, to remove the impeller (101) from shaft.

9.4.6. Remove impeller key (178) and seal spring.

9.4.7. Remove mechanical seal (383) rotating member by using two pry bars, 180 degrees apart. Gently break the bond between the shaft sleeve (126) and the rubber part of the mechanical seal by wedging.

9.4.8. Remove mechanical seal stationary seat by unbolting the adapter (108) from the motor or bearing frame and pushing the seat and rubber cup from the motor side. Adapters for close coupled and frame mounted units are the same.

On all-bronze units a separate seal housing (not illustrated) is used. Unbolt the seal housing from the adapter and remove the stationary seat as explained previously.

9.4.9. Shaft sleeve is bonded and sealed to the shaft with locking compound (Loctite 271, or equal). The bond must be broken before removal can be attempted. Break bond by heating the sleeve with a torch to about 250°F to 300°F. Pull off sleeve.

9.4.10. Casing wear rig (103) and/or seal housing wear ring (203) is removed by drilling a hole about the size of the ring thickness axially to relieve tension. Chisel off the ring toward center.

9.5. Disassembly of Bearing Frame:

9.5.1. Remove bearing cover (134).

9.5.2. Remove shaft assembly from frame (228).

9.5.3. Remove lip seals (333A) from bearing frame and bearing cover.

9.5.4. Straighten tang in lockwasher (382). Remove locknut (136) and lockwasher.

9.5.5. Use bearing puller or arbor press to remove ball bearings (112 & 168).

10. Reassembly:

10.1. All parts should be cleaned before assembly.

10.2. Refer to parts list to identify required replacement items. Specify pump index number when ordering parts.

10.3. Reassembly is the reverse of disassembly.

10.4. Observe the following when reassembling the bearing frame:

10.4.1. Replace lip seals if worn or damaged.

10.4.2. Replace ball bearings if loose, rough or noisy when rotated.

10.4.3. Check shaft for runout at the sleeve area. Maximum permissible is .002" T.I.R.

10.5. Observe the following when reassembling the liquid-end:

10.5.1. Shaft sleeve is locked and sealed against the shaft with locking compound. Shaft and sleeve bore must be clean and oil free. Apply Loctite #271 (Goulds part no. AL2172), or equal, on shaft where sleeve fits. Slide shaft sleeve over shaft, twisting back and forth a couple of times to evenly spread the compound.

CAUTION

Sleeve must seat against shaft shoulder. Let cure according to instructions. Wipe off uncured excess compound.

10.5.2. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.

It is permissible to use a light lubricant, such as glycerine, for the mechanical seal seat and on the shaft to facilitate assembly. Do not contaminate the mechanical seal sealing faces with lubricant.

10.5.3. If wear ring is being replaced, use no lubricants on the metal-to-metal fit when pressing in the replacement.

10.5.4. Use a new impeller bolt.

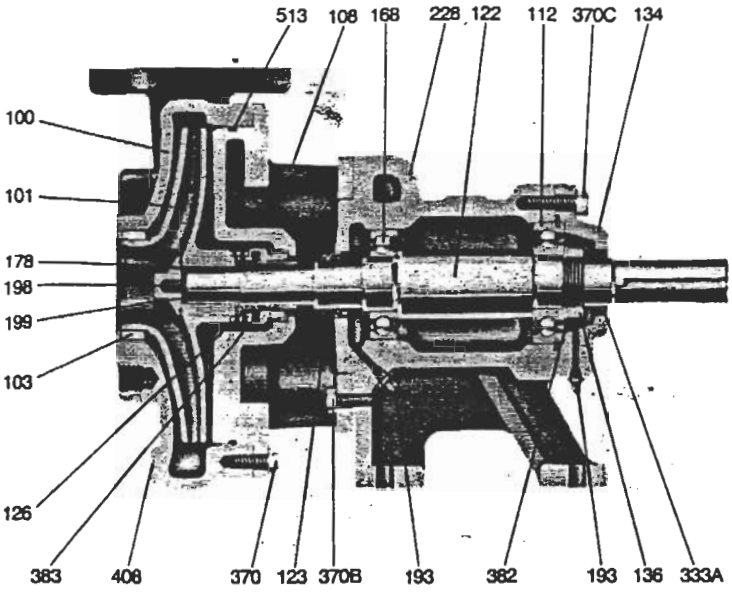
10.5.5. Inspect seal housing O-ring (513) and replace if damaged.

10.6. Check reassembled unit for binding. Correct as required.

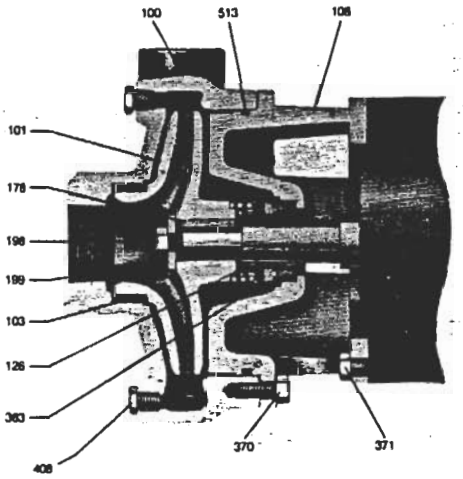
11. Trouble Shooting Chart:

MOTOR NOT RUNNING:
(See Cases 1 thru 6)
LITTLE OR NO LIQUID DELIVERED:
(See Cases 7 thru 17)
POWER CONSUMPTION TOO HIGH:
(See Cases 4, 17, 18, 19, 22)
EXCESSIVE NOISE AND VIBRATION:
(See Cases 4. 6, 9, 13, 15, 16, 18, 20, 21, 22)
PROBABLE CAUSE:

1. Tripped thermal protector
2. Open circuit breaker
3. Blown fuse
4. Rotating parts binding
5. Motor wired improperly
6. Defective motor
7. Not primed
8. Discharge plugged or valve closed
9. Incorrect rotation
10. Foot valve too small or suction not submerged
11. Low voltage
12. Phase loss
13. Air or gases in liquid
14. System head too high
15. NPSHA too low:
Suction lift too high or friction losses excessive. Check with vacuum gauge
16. Impeller worn or plugged
17. Incorrect impeller diameter
18. Head too low causing excessive flow rate
19. Viscosity or specific gravity too high
20. Worn bearings
21. Pump or piping loose
22. Pump and motor misaligned



Model 3756



Model 3656

Back Wear Ring

Materials of Construction

Liquid End Components				
Item No.	Part Name	Material		
		All Iron	Bronze Fitted	
100	Casing	1001	1001	
101	Impeller		1102	
103	Casing Wear Ring		1102	
108	Adapter/Seal Housing		1001	
203	Back Wear Ring		1102	
184	Seal Housing‹	(1-pc. w/adapter)	1102	
126	Shaft Sleeve	AISI Type 300 Series Stainless Steel		
178	Impeller Key			
198	Impeller Bolt			
199	Impeller Washer			
370	Hex Head Screw (Adapter to Case)	Steel SAE 1200 Grade 5		
371	Hex Head Cap Screw (Adapter to Motor)			

John Crane Type 21						
	Mechanical Seal	Service	Rotary	Stationary	Elastomers	Metal Parts
383	STD	General		Ceramic	Buna	Type 316 S.S.
	OPT.	Hi-Temp.	Carbon	Ni-Resist	EPR	
	OPT.	Chem. Duty		Ceramic	Viton	
408	Pipe Plug 1/4" or 3/8"			Steel	Brass	
513	O-Ring			Buna-N		

Power End Components		
108	Adapter	Cast Iron ASTM A48 CL20
228	Bearing Frame	
134	Bearing Cover	
122	Pump Shaft	Steel ASTM A108/ SAE 1200 Series
168	Ball Bearing (Outboard)	
112	Ball Bearing (Inboard)	
136	Locknut, Bearing	
382	Lock Washer, Bearing	
370B	Hex Head Cap Screw (Adapter to Bearing Frame)	
370C	Hex Head Cap Screw (Bearing Frame to Cover)	
333A	Lip Seal	Buna-N
193	Grease Fitting	Steel
123	V-Ring Deflector	Buna-N

Materials of Construction	Material Code	Engineering Standard
	1001	Cast Iron ASTM A48 CL20
	1102	Bronze ASTM B584

Goulds Limited Warranty

This warranty applies to all water systems pumps and related accessories manufactured and/or supplied by Goulds.
Any part or parts found to be defective within the warranty period shall be replaced at no charge to the buyer or ant subsequent owner during the warranty period. the warranty period shall exist for a period of twelve (12) months from date of installation or eighteen months from the date of manufacture, whichever period is shorter. A consumer who believes that a warranty claim exists must contact the authorized Goulds dealer from whom the equipment was originally purchased and furnish complete details regarding the claim. The dealer is authorized to adjust any warranty claims utilizing Goulds Customer Relations Department and its distributor organization.

This warranty excludes: (a) Labor, transportation and related costs incurred by the consumer to make the allegedly defective equipment available to the dealer for inspection. (b) Re-installation costs of repaired equipment. (c) Re-installation costs of replacement equipment. (d) Consequential damages of any kind.

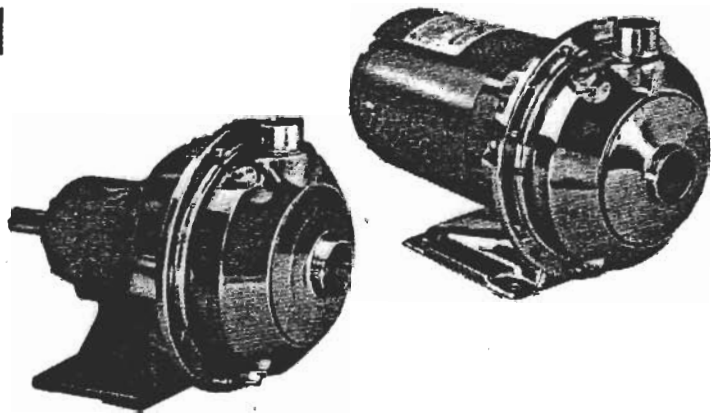
GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

G&L
A GOULDS PUMPS COMPANY

Form No. 3656-3756-10/88

Installation, Operation and Maintenance Instructions

Model NPE/ NPE-F



DESCRIPTION & SPECIFICATIONS:

The Models NPE (close-coupled) and NPE-F (frame-mounted) are end suction, single stage centrifugal pumps for general liquid transfer service, booster applications, etc. Liquid-end construction is all AISI Type 304 stainless steel, stamped and welded. Impellers are fully enclosed, non-trimable to intermediate diameters. Casings are fitted with a diffuser for efficiency and for negligible radial shaft loading.

Close-coupled units have NEMA 48J or 56J motors with C-face mounting and threaded shaft extension. Frame-mounted units can be coupled to motors through a spacer coupling, or belt driven.

1. Important:

1.1. Inspect unit for damage. Report any damage to carrier/dealer immediately.

1.2. Electrical supply must be a separate branch circuit with fuses or circuit breakers, wire sizes, etc., per National and Local electrical codes. Install an all-leg disconnect switch near pump.

CAUTION

Always disconnect electrical power when handling pump or controls.

1.3. Motors must be wired for proper voltage. Motor wiring diagram is on motor nameplate. Wire size must limit maximum voltage drop to 10% of nameplate voltage at motor terminals, or motor life and pump performance will be lowered.

1.4. Always use horsepower-rated switches, contactor and starters.

1.5. Motor Protection

1.5.1. Single-phase: Thermal protection for single-phase units is sometimes built in (check nameplate). If no built-in protection is provided, use a contactor with a proper overload. Fusing is permissible.

1.5.2. Three-phase: Provide three-leg protection with properly sized magnetic starter and thermal overloads.

1.6. Maximum Operating Limits:

Liquid Temperature:	212 F (100 C) with standard seal.
	250 F (120 C) with optional high temp seal.
Pressure:	75 PSI.
Starts Per Hour:	20, evenly distributed.

1.7. Regular inspection and maintenance will increase service life. Base schedule on operating time. Refer to Section 8.

2. Installation:

2.1. General

2.1.1. Locate pump as near liquid source as possible (below level of liquid for automatic operation).

2.1.2. Protect from freezing or flooding.

2.1.3. Allow adequate space for servicing and ventilation.

2.1.4. All piping must be supported independently of the pump, and must "line-up" naturally.

CAUTION

Never draw piping into place by forcing the pump suction and discharge connections.

2.1.5. Avoid unnecessary fittings. Select sizes to keep friction losses to a minimum.

2.2. Close-Coupled Units:

2.2.1. Units may be installed horizontally, inclined or vertically.

CAUTION

Do not install with motor below pump. Any leakage or condensation will affect the motor.

2.2.2. Foundation must be flat and substantial to eliminate strain when tightening bolts. Use rubber mounts to minimize noise and vibration.

2.2.3. Tighten motor hold-down bolts before connecting piping to pump.

2.3. Frame-Mounted Units:

2.3.1. Bedplate must be grouted to a foundation with solid footing. Refer to Fig.1.

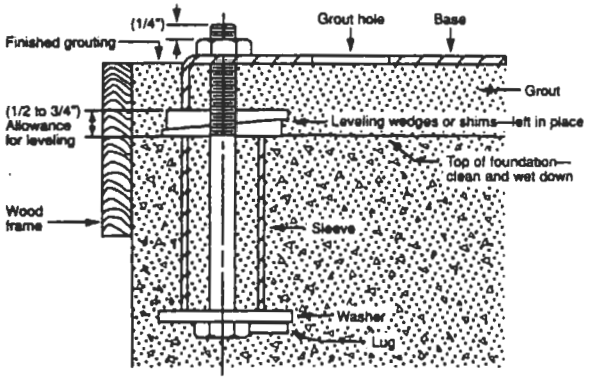


Figure 1

IM013R01

2.3.2. Place unit in position on wedges located at four points (two below approximate center of driver and two below approximate center of pump). Adjust wedges to level unit. Level or plumb suction and discharge flanges.

2.3.3. Make sure bedplate is not distorted and final coupling alignment can be made within the limits of movement of motor and by shimming, if necessary.

2.3.4. Tighten foundation bolts finger tight and build dam around foundation. Pour grout under bedplate making sure the areas under pump and motor feet are filled solid. Allow grout to harden 48 hours before fully tightening foundation bolts.

2.3.5. Tighten pump and motor hold-down bolts before connecting the piping to pump.

3. Suction Piping:

3.1. Low static suction lift and short, direct, suction piping is desired. For suction lift over 10 feet and liquid temperatures over 120 F, consult pump performance curve for Net Positive Suction Head Required.

3.2. Suction pipe must be at least as large as the suction connection of the pump. Smaller size will degrade performance.

3.3. If larger pipe is required, an eccentric pipe reducer (with straight side up) must be installed at the pump.

3.4. Installation with pump below source of supply:

3.4.1. Install full flow isolation valve in piping for inspection and maintenance.

CAUTION

Do not use suction isolation valve to throttle pump.

3.5. Installation with pump above source of supply:

3.5.1. Avoid air pockets. No part of piping should be higher than pump suction connection. Slope piping upward from liquid source.

3.5.2. All joints must be airtight.

3.5.3. Foot valve to be used only if necessary for priming, or to hold prime on intermittent service.

3.5.4. Suction strainer open area must be at least triple the pipe area.

3.6. Size of inlet from liquid source, and minimum submergence over inlet, must be sufficient to prevent air entering pump through vortexing. See Figs. 2-5

3.7. Use 3-4 wraps of Teflon tape to seal threaded connections.

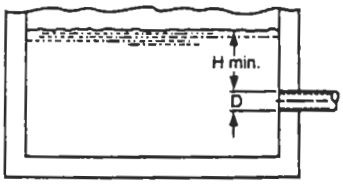


Figure 2

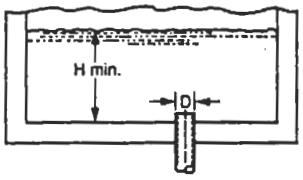


Figure 3

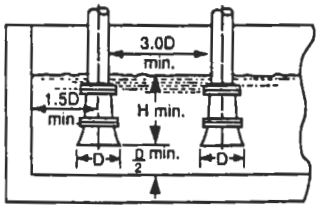


Figure 4

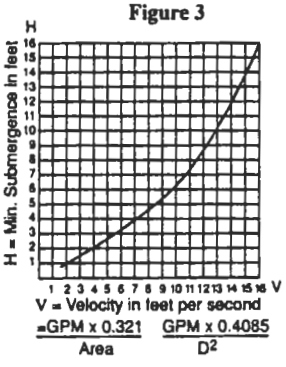


Figure 5

4. Discharge Piping:

4.1. Arrangement must include a check valve located between a gate valve and the pump. The gate valve is for regulation of capacity, or for inspection of the pump or check valve.

4.2. If an increaser is required, place between check valve and pump.

4.3. Use 3-4 wraps of Teflon tape to seal threaded connections.

5. Motor-To-Pump Shaft Alignment:

5.1. Close-Coupled Units:

5.1.1. No field alignment necessary.

5.2. Frame-Mounted Units:

5.2.1. Even though the pump-motor unit may have a factory alignment, this could be disturbed in transit and must be checked prior to running. See Fig. 6.

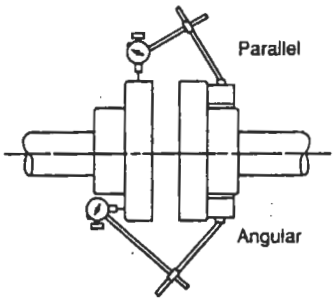


Figure 6

5.2.2. Tighten all hold-down bolts before checking the alignment.

5.2.3. If re-alignment is necessary, always move the motor. Shim as required.

5.2.4. Parallel misalignment - shafts with axis parallel but not concentric. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the outside diameter of the other hub. Parallel alignment occurs when Total Indicator Reading is .005", or less.

5.2.5. Angular misalignment - shafts with axis concentric but not parallel. Place dial indicator on one hub and rotate this hub 360 degrees while taking readings on the face of the other hub. Angular alignment is achieved when Total Indicator Reading is .005", or less.

5.2.6. Final alignment is achieved when parallel and angular requirements are satisfied with motor hold-down bolts tight.

CAUTION

Always recheck both alignments after making any adjustment.

6. Rotation:

6.1. Correct rotation is right-hand (clockwise when viewed from the motor end). Switch power on and off quickly. Observe shaft rotation. To change rotation:

6.1.1. Single-phase motor: Non-reversible.

6.1.2. Three-phase motor: Interchange any two power supply leads.

7. Operation:

7.1. Before starting, pump must be primed (free of air and suction pipe full of liquid) and discharge valve partially open.

CAUTION

Pumped liquid provides lubrication. If pump is run dry, rotating parts will seize and mechanical seal will be damaged. Do not operate at or near zero flow. Energy imparted to the liquid is converted into heat. Liquid may flash to vapor. Rotating parts require liquid to prevent scoring or seizing.

7.2. Make complete check after unit is run under operating conditions and temperature has stabilized. Check for expansion of piping. On frame-mounted units coupling alignment may have changed due to the temperature differential between pump and motor. Recheck alignment.

8. Maintenance:

8.1. Close-Coupled Unit. Ball bearings are located in and are part of the motor. They are permanently lubricated. No greasing required.

8.2. Frame-Mounted Units:

8.2.1. Bearing frame should be regreased every 2,000 hours or 3 month interval, whichever occurs first. Use a #2 sodium or lithium based grease. Fill until grease comes out of relief fittings, or lip seals, then wipe off excess.

8.2.2. Follow motor and coupling manufacturers' lubrication instructions.

8.2.3. Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

9. Disassembly:

Complete disassembly of the unit will be described. Proceed only as far as required to perform the maintenance work needed.

9.1. Turn off power.

9.2. Drain system. Flush if necessary.

9.3. Close-Coupled Units: Remove motor hold-down bolts.

Frame-Mounted Units: Remove coupling, spacer, coupling guard and frame hold-down bolts.

9.4. Disassembly of Liquid End:

9.4.1. Remove casing bolts (370).

9.4.2. Remove back pull-out assembly from casing (100).

9.4.3. Remove impeller locknut (304).

CAUTION

Do not insert screwdriver between impeller vanes to prevent rotation of close-coupled units. Remove cap at opposite end of motor. A screwdriver slot or a pair of flats will be exposed. Using them will prevent impeller damage.

9.4.4. Remove impeller (101) by turning counter-clockwise when looking at the front of the pump. Protect hand with rag or glove.

CAUTION

Failure to remove the impeller in a counter-clockwise direction may damage threading on the impeller, shaft or both.

9.4.5. With two pry bars 180 degrees apart and inserted between the seal housing (184) and the motor adapter (108), carefully separate the two parts. The mechanical seal rotary unit (383) should come off the shaft with the seal housing.

9.4.6. Push out the mechanical seal stationary seat from the motor side of the seal housing.

9.5. Disassembly of Bearing Frame:

9.5.1. Remove bearing cover (109).

9.5.2. Remove shaft assembly from frame (228).

9.5.3. Remove lip seals (138 & 139) from bearing frame and bearing cover if worn and are being replaced.

9.5.5. Use bearing puller or arbor press to remove ball bearings (112 & 168).

10. Reassembly:

10.1. All parts should be cleaned before assembly.

10.2. Refer to parts list to identify required replacement items. Specify pump index or catalog number when ordering parts.

10.3. Reassembly is the reverse of disassembly.

10.4. Observe the following when reassembling the bearing frame:

10.4.1. Replace lip seals if worn or damaged.

10.4.2. Replace ball bearings if loose, rough or noisy when rotated.

10.4.3. Check shaft for runout. Maximum permissible is .002" T.I.R.

10.5. Observe the following when reassembling the liquid-end:

10.5.1. All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice.

It is permissible to use a light lubricant, such as glycerin, to facilitate assembly. Do not contaminate the mechanical seal faces with lubricant.

10.5.2. Inspect casing O-ring (513) and replace if damaged. This O-ring may be lubricated with petroleum jelly to ease assembly.

10.5.3. Inspect guidevane O-ring (349) and replace if worn.

CAUTION

Do not lubricate guidevane O-ring (349). Insure it is not pinched by the impeller on reassembly.

10.6. Check reassembled unit for binding. Correct as required.

10.7. Tighten casing bolts in a star pattern to prevent O-ring binding.

11. Trouble Shooting Chart:

MOTOR NOT RUNNING
(See causes 1 thru 6)

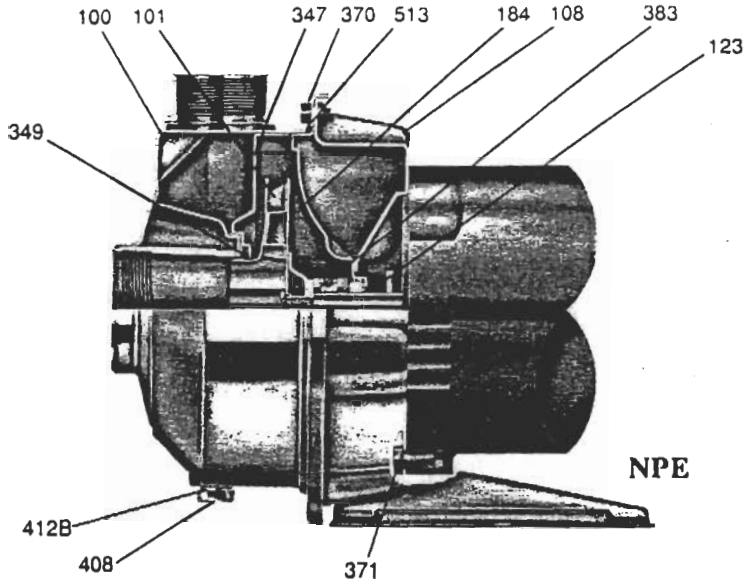
LITTLE OR NO LIQUID DELIVERED:
(See causes 7 thru 17)

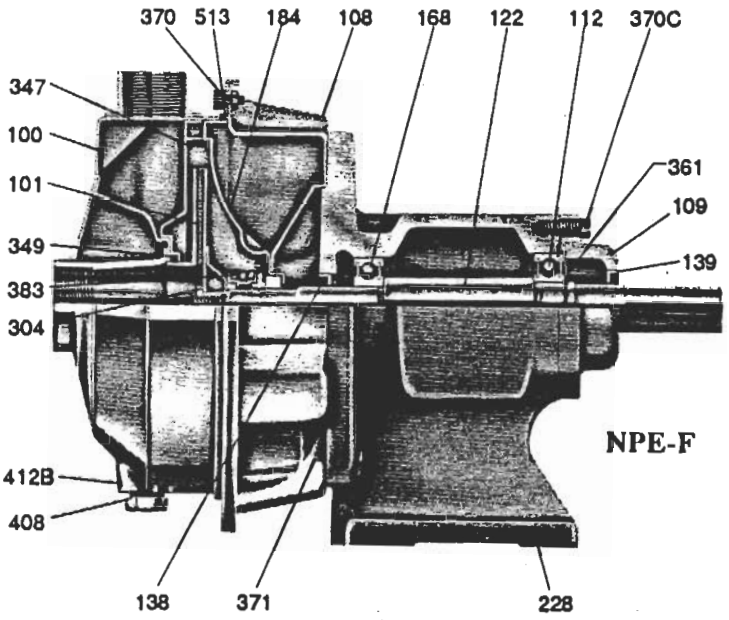
POWER CONSUMPTION TOO HIGH:
(See causes 4, 17, 18, 19, 22)

EXCESSIVE NOISE AND VIBRATION:
(See causes 4, 6, 9, 13, 15, 16, 18, 20, 21, 22)

PROBABLE CAUSE:

1. Tripped thermal protector
2. Open circuit breaker
3. Blown fuse
4. Rotating parts binding
5. Motor wired improperly
6. Defective motor
7. Not primed
8. Discharge plugged or valve closed
9. Incorrect rotation
10. Foot valve too small, suction not submerged, inlet screen plugged.
11. Low voltage
12. Phase loss (3-phase only)
13. Air or gasses in liquid
14. System head too high
15. NPSHA too low:
    Suction lift too high or suction losses excessive. Check with vacuum gauge.
16. Impeller worn or plugged
17. Incorrect impeller diameter
18. Head too low causing excessive flow rate
19. Viscosity or specific gravity too high
20. Worn bearings
21. Pump or piping loose
22. Pump and motor misaligned





Liquid End Components		
Item No.	Description	Materials
100	Casing	AISI 304 Stainless Steel
101	Impeller	
184	Seal Housing	
304	Impeller Locknut	
347	Guidevane	
349	O-Ring, Guidevane	Buna-N
370	Socket Hd. Screws, Casing	AISI 304 S.S.
383	Mechanical Seal	** see chart
408	Drain & Vent Plug, Casing	AISI 304 S.S.
412B	O-Ring, Drain & Vent Plug	Buna-N
513	O-Ring, Casing	Buna-N
	Power End Components	
108	Adapter	AISI 304 S.S.
109	Bearing Cover	Cast Iron
112	Ball Bearing (Outboard)	Steel
122	Shaft	AISI 303 S.S.
138	Lip Seal (Inboard)	Buna/Steel
139	Lip Seal (Outboard)	Buna/Steel
168	Ball Bearing (Inboard)	Steel
228	Bearing Frame	Cast Iron
361	Snap Ring	Steel
370C	Hex. Hd. Cap Screw, Brg. Cvr.	Plated Steel
371	Hex. Hd. Cap Screw, Adapter	Plated Steel

**Mechanical Seals–Item 383						
Part No.	Service	Rotary	Stationary	Elastomer	Metal Parts	Crane Type
10K46	Standard	Carbon	Ceramic	Buna	18-8 S.S.	21
10K18	Option-High Temp.		Ni-Resist	EPR		
10K24	Option-Chemeical Duty		Ceramic	Viton		
10K55	Option-High Temp.		Tungsten			
10K29	Option-Severe Duty	Silicon Carbon		Buna		

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The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;

(b) Reinstallation costs of repaired equipment;

(c) Reinstallation costs of replacement equipment;

(d) Consequential damages of any kind; and,

(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds and the dealer in purchases, consignments or contracts for sale of the subject pumps.

(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.

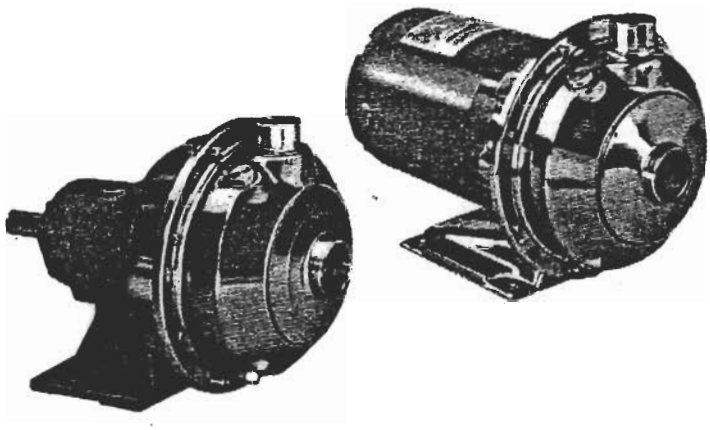
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

G&L Pumps
ITT Industries

Instrucciones De Instalación, Operación Y Mantenimiento

Modelo NPE/ NPE-F



DESCRIPCIÓN Y ESPECIFICACIONES:

Los modelos NPE (compacto) y NPE-F (montado en marco) son bombas centrífugas de una etapa, de succión axial para el servicio de transferencia de líquidos en general, aplicaciones de refuerzo de presión, etc. La construcción del extremo sumergido es toda de AISI (Instituto Norteamericano del Hierro y el Acero) de acero inoxidable Tipo 304, estampada y soldada. Los impulsores son totalmente cerrados, y no se pueden recortar a diámetros intermedios. Las carcasas están equipadas con un difusor para eficiencia y que las cargas radiales sean negligibles en el eje.

Las unidades compactas tienen motores NEMA 48J o 561, con montaje de cara C y extensión roscada del eje. Las unidades montadas en marco se pueden acoplar a los motores a través de un espaciador de acoplamiento, o ser accionadas por correa.

1. Importante:

1.1. Inspeccione si la unidad tiene daños. Informe inmediatamente de cualquier daño al transportista o al agente.

1.2. La alimentación eléctrica debe ser un circuito separado con los fusibles o interruptores automáticos, tamaños de alambres, etc., de acuerdo con los Códigos Eléctricos Nacional y Local. Instale un interruptor de desconexión en todos los alambres cerca de la bomba.

PRECAUCIÓN

Siempre desconecte la corriente eléctrica cuando maneje la bomba o los controles.

1.3. El cableado de los motores debe ser adecuado para la tensión. El diagrama del cableado del motor está en la placa del fabricante del motor. El tamaño del los alambres debe limitar la máxima caída de tensión al 10% de la tensión de la placa del fabricante en los terminales del motor, o la vida del motor y el rendimiento de la bomba se disminuirán.

1.4. Siempre use interruptores, contactores y arrancadores con clasificación de potencia nominal.

1.5. Protección del motor

1.5.1. Monofásico: La protección térmica en las unidades monofásicas a veces está incorporada (verifique la placa del fabricante). Si no se provee protección incorporada, use un contactor con la sobrecarga apropiada. Se permite usar fusible.

1.5.2. Trifásico: Proporcione protección en los tres alambres con arrancador magnético de tamaño apropiado y sobrecargas térmicas.

1.6. Límites máximos de operación:

Temperatura del líquido:	210°F (100°C) con sello estándar 250°F (120°C) con sello de alta temperatura opcional
Presión:	75 lib/pulg^2
Arranques por hora:	20, distribuidos uniformemente

1.7. La inspección y el mantenimiento regular aumentarán la vida de servicio. Establezca el programa de acuerdo al tiempo de funcionamiento. Refiérase a la Sección 8.

2. Instalación:

2.1. Generalidades

2.1.1. Coloque la bomba tan cerca de la fuente del líquido como sea posible (debajo del nivel del líquido para operación automática).

2.1.2. Proteja de la congelación o inundación.

2.1.3. Deje espacio libre adecuado para el servicio y la ventilación.

2.1.4. Toda la tubería debe estar soportada independientemente de la bomba, y debe "estar alineada" naturalmente.

PRECAUCIÓN

Nunca estire la tubería en el lugar forzando las conexiones de la succión y descarga de la bomba.

2.1.5. Evite los accesorios innecesarios. Seleccione los tamaños para mantener las pérdidas de fricción al mínimo.

2.2. Unidades compactas:

2.2.1. Estas unidades pueden instalarse horizontalmente, inclinadas o verticalmente.

PRECAUCIÓN

No instale con el motor debajo de la bomba. Cualquier fuga o condensación afectará al motor.

2.2.2. La cimentación debe ser plana y substancial para eliminar las deformaciones cuando se aprieten los pernos. Use montajes de goma para minimizar el ruido y las vibraciones.

2.2.3. Apriete los pernos de sujeción del motor antes de conectar la tubería a la bomba.

2.3. Unidades montadas en marco:

2.3.1. La placa de base debe estar unida, con lechada, a una cimentación con zapata sólida. Vea la Fig. 1.

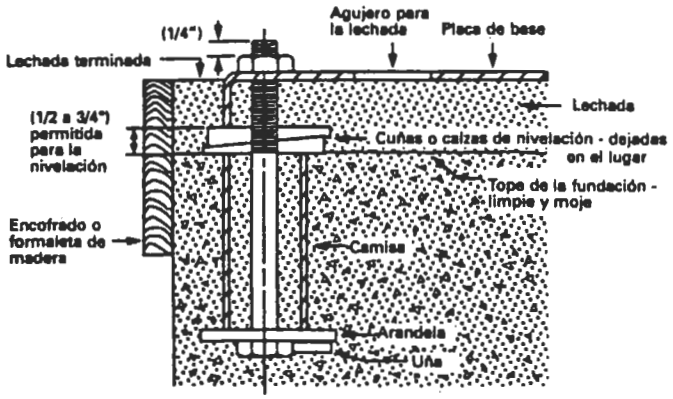


Figura 1

2.3.2. Coloque la unidad en posición sobre las cuñas ubicadas en cuatro puntos, (dos aproximadamente debajo del centro del motor y dos aproximadamente debajo del centro de la bomba). Ajuste las cuñas para nivelar la unidad. Nivele o ponga vertical las bridas de succión y de descarga.

2.3.3. Asegúrese de que la placa de base no esté distorsionada y se pueda hacer la alineación final del acoplamiento dentro de los límites del movimiento del motor y poniendo calzas, si fuera necesario.

2.3.4. Apriete con los dedos los pernos de la cimentación y construya la presa alrededor de la cimentación. Vierta la lechada debajo de la placa de base asegurándose de que las áreas debajo de la bomba y de la pata del motor estén bien rellenas. Deje que la lechada fragüe por 48 horas antes de apretar totalmente los pernos de la cimentación.

2.3.5. Apriete los pernos de sujeción de la bomba y del motor antes de conectar la tubería a la bomba.

3. Tubería de succión:

3.1. Es deseable tener una tubería de succión directa, corta y una altura de aspiración estática baja. Para alturas de succión superiores a 10 pies y temperaturas del líquido superiores a 120°F, consulte la curva de rendimiento de la bomba para ver la Altura de Succión Positiva Neta requerida.

3.2. La tubería de succión debe ser por lo menos tan grande como la conexión de succión a la bomba. Un tamaño más pequeño disminuirá el rendimiento.

3.3. Si se requiere una tubería más grande, se debe instalar una reducción excéntrica (con el lado recto hacia arriba), en la bomba.

3.4. Instalación con la bomba abajo de la fuente de alimentación:

3.4.1. Instale en la tubería una válvula de aislación de todo el caudal para la inspección y mantenimiento.

PRECAUCIÓN

No use la válvula de aislación de succión para estrangular la bomba.

3.5. Instalación con la bomba arriba de la fuente de alimentación:

3.5.1. Evite las bolsas de aire. Ninguna de las partes de la tubería debe ser más alta que la conexión de succión de la bomba. Incline la tubería hacia arriba, partiendo de la fuente del líquido.

3.5.2. Todas las juntas deben ser estancas.

3.5.3. La válvula de pie debe usarse solamente si es necesario para el cebado o para mantener el cebado durante el servicio intermitente.

3.5.4. El área abierta del colador de succión debe ser por lo menos el triple del área de la tubería.

3.6. El tamaño de la entrada de la fuente del líquido, y la inmersión mínima sobre la succión, deben ser suficientes para impedir la entrada de aire a la bomba a través de vórtices. Vea las Figuras 2 a 5.

3.7. Use 3 a 4 vueltas de cinta de Teflon para sellar las conexiones roscadas.

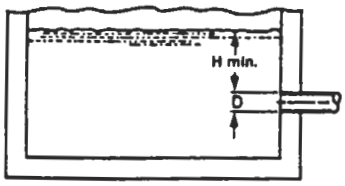


Figura 2

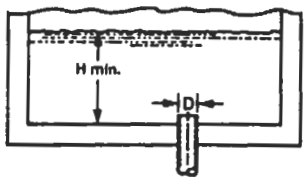


Figura 3

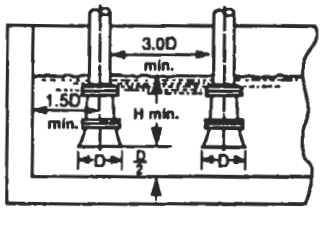


Figura 4

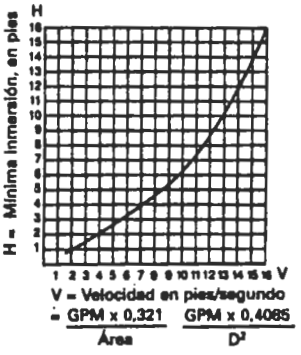


Figura 5

4. Tubería de descarga:

4.1. La disposición debe incluir una válvula de retención ubicada entre una válvula de compuerta y la bomba. La válvula de compuerta es para la regulación de la capacidad o para la inspección de la bomba o de la válvula de retención.

4.2. Si se requiere un aumentador, instale entre la válvula de retención y la bomba.

4.3. Use 3 a 4 vueltas de cinta de Teflón para sellar las conexiones roscadas.

5. Alineación del eje del motor al de la bomba:

5.1. Unidades compactas:

5.1.1. No se necesita alinear en el campo.

5.2. Unidades montadas en marco:

5.2.1. Aunque la unidad del motor y bomba pueda tener una alineación de fábrica, ésta pudo haberse alterado en tránsito y debe verificarse antes de hacer funcionar. Vea la Figura 6.

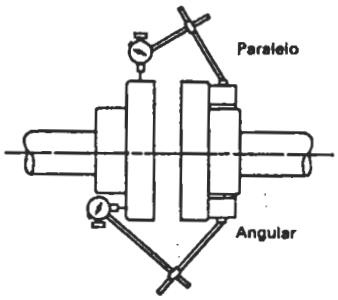


Figura 6

5.2.2. Apriete todos los pernos de sujeción antes de verificar la alineación.

5.2.3. Si es necesario realinear, siempre mueva el motor. Ponga calzas según se requiera.

5.2.4. Mala alineación paralela (ejes con ejes paralelos pero no concéntricos). Ponga el indicador de cuadrante en un cubo y gire este cubo 360° mientras hace lecturas en el diámetro exterior del otro cubo. La alineación paralela se obtiene cuando la lectura indicada total es de 0,005" (0,127 mm) o menos.

5.2.5. Mala alineación angular (ejes con ejes concéntricos pero no paralelos). Ponga el indicador de cuadrante en un cubo y gire este cubo 360° mientras hace lecturas en la cara del otro cubo. La alineación angular se obtiene cuando la lectura indicada total es de 0,005" (0,127 mm) o menos.

5.2.6. La alineación final se obtiene cuando se satisfacen los requerimientos de alineación paralela y angular, con los pernos de sujeción del motor apretados.

PRECAUCIÓN

Siempre vuelva a verificar ambas alineaciones después de hacer cualquier ajuste.

6. Rotación:

6.1. La rotación correcta es a la derecha (en sentido dextrorso cuando se mira desde el extremo del motor). Encienda y apague la corriente rápidamente. Observe la rotación del eje. Para cambiar la rotación:

6.1.1. Motores monofásicos: No reversibles.

6.1.2. Motores trifásicos: Intercambie dos cualesquiera de los conductores de alimentación de potencia.

7. Operación:

7.1. Antes de arrancar, se debe cebar la bomba (la tubería de succión llena de líquido y sin aire), y abrir parcialmente la válvula de descarga.

PRECAUCIÓN

El líquido bombeado proporciona lubricación. Si se hace funcionar la bomba en seco, las partes que giran se agarrotarán y se dañará el sello mecánico. No haga funcionar con caudal muy bajo o cerca de cero. La energía impartida al líquido se convierte en calor y el líquido puede convertirse en vapor. Las partes giratorias requieren líquido para impedir la formación de estrías o el agarrotamiento.

7.2. Haga una verificación completa después de que haya funcionado la unidad bajo condiciones de operación y se haya estabilizado la temperatura. Verifique la expansión de la tubería. En las unidades montadas en marco la alineación del acoplamiento pudo haber cambiado debido a la diferencial de temperatura entre el motor y la bomba. Vuelva a verificar la alineación.

8. Mantenimiento:

8.1. Unidad compacta. Los cojinetes de bolas están colocados adentro y son parte del motor. Están lubricados permanentemente y no requieren engrase.

8.2. Unidades montadas en marco:

8.2.1. El marco del cojinete se debe volver a engrasar cada 2.000 horas o a intervalos de 3 meses, el que ocurra primero. Use una grasa #2 con base de sodio o litio. Llene hasta que la grasa salga de las graseras o de los sellos de reborde, luego limpie el exceso.

8.2.2. Siga las instrucciones de lubricación del fabricante del motor y del acoplamiento.

8.2.3. La alineación se debe volver a verificar después de cualquier trabajo de mantenimiento que implique alguna alteración de la unidad.

9. Desmontaje:

Se describirá el desmontaje completo de la unidad. Prosiga solamente hasta donde se requiera para realizar el trabajo de mantenimiento necesario.

9.1. Apague la alimentación eléctrica.

9.2. Drene el sistema. Lave con chorro, si es necesario.

9.3. Unidades compactas: Quite los pernos de sujeción del motor.

Unidades montadas en marco: Quite el acoplamiento, el espaciador, el resguardo del acoplamiento y los pernos de sujeción del marco.

9.4. Desmontaje del extremo sumergido:

9.4.1. Quite los pernos (370) de la carcasa.

9.4.2. Quite el conjunto de desmontaje de la caja de rodamientos de la carcasa (100).

9.4.3. Quite la tuerca de seguridad (304) del impulsor.

PRECAUCIÓN

No inserte un destornillador entre los álabes del impulsor para impedir la rotación de las unidades compactas. Quite la tapa en el lado opuesto del motor. Se expondrá una ranura del destornillador o un par de filos normales al eje. Usándolos impedirá daños al impulsor.

9.4.4. Quite el impulsor (101) girando en sentido sinistrorso mirando al frente de la bomba. Protéjase las manos con telas o guantes.

PRECAUCIÓN

No quitar el impulsor en sentido sinistrorso puede dañar las roscas en el impulsor, el eje o en ambos.

9.4.5. Con dos barras de hacer palanca separadas en 180 grados e insertadas entre el alojamiento del sello (184) y el adaptador del motor (108), cuidadosamente separe las dos partes. La unidad giratoria del sello mecánico (383) debe salir del eje con el alojamiento del sello.

9.4.6. Empuje afuera el asiento estacionario del sello mecánico, del lado del motor del alojamiento del sello.

9.5. Desmontaje del marco del cojinete:

9.5.1. Quite la tapa (109) del cojinete.

9.5.2. Quite el conjunto del eje del marco (228).

9.5.3. Quite los sellos de reborde (138 y 139) del marco del cojinete y de la tapa del cojinete si están desgastados y se están cambiando.

9.5.5. Use un extractor de cojinetes o prensa de eje para quitar los cojinetes de bolas (112 y 168).

10. Reensamble:

10.1. Todas las piezas deben limpiarse antes del montaje.

10.2. Consulte la lista de piezas para identificar las piezas necesarias para la reparación. Especifique la bomba o el número de catálogo cuando pida las piezas.

10.3. Reensamblar o volver a montar es lo contrario de desmontar.

10.4. Observe lo siguiente cuando vuelva a montar el marco del cojinete:

10.4.1. Cambie los sellos de reborde si están desgastados o dañados.

10.4.2. Cambie los cojinetes de bolas si están flojos, ásperos o ruidosos al girarlos.

10.4.3. Verifique si el eje está descentrado. El máximo permisible es una lectura de indicador total de 0,002".

10.5. Observe lo siguiente cuando vuelva a montar el extremo sumergido:

10.5.1. Todos los componentes del sello mecánico deben estar en buenas condiciones o pueden haber fugas. Es buena práctica estándar cambiar todo el conjunto del sello en cualquier momento en que se haya quitado el sello.

Se permite usar un lubricante ligero, tal como glicerina, para facilitar el montaje. No contamine las caras del sello mecánico con lubricante.

10.5.2. Inspeccione el anillo en O (513) de la carcasa y cámbielo si está dañado. Este anillo en O puede lubricarse con vaselina para facilitar el montaje.

10.5.3. Inspeccione el anillo en O (349) del álabe director y cámbielo si está desgastado.

PRECAUCIÓN

No lubrique el anillo en O (349) del álabe director. Asegúrese de que no esté pellizcado por el impulsor al volver a montar.

10.6. Verifique la unidad que volvió a montarse viendo si está agarrotada. Corrija según se requiera.

10.7. Apriete los pernos de la carcasa en un patrón de estrella para impedir que se trabe el anillo en O.

11. Investigación de averías:

MOTOR NO FUNCIONA:
(Vea las causas 1 a 6)

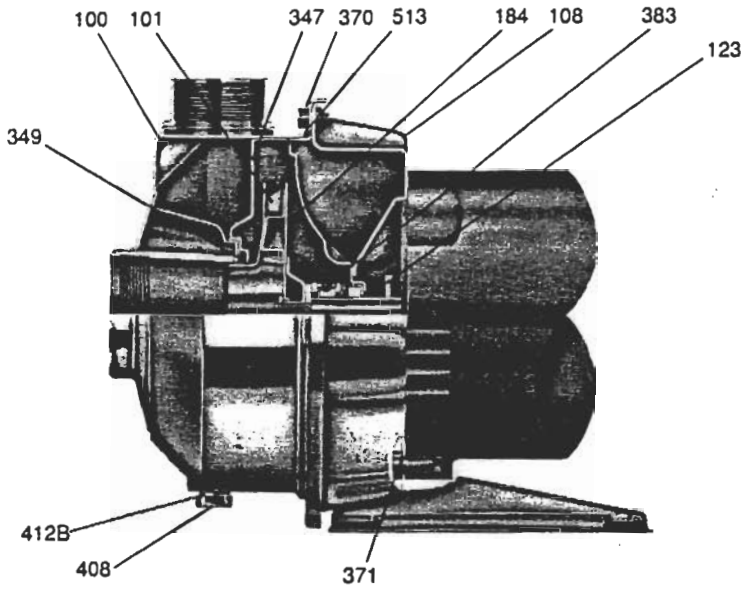
ENTREGA POCO O NADA DE LÍQUIDO:
(Vea las causas 7 a 17)

CONSUMO MUY ALTO DE CORRIENTE:
(Vea las causas 4, 17, 18, 19, 22)

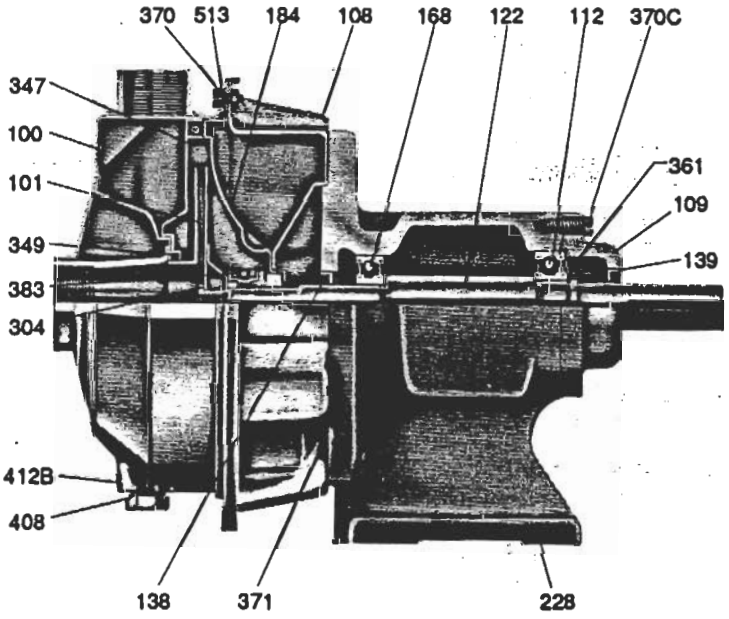
EXCESIVO RUIDO Y VIBRACIONES:
(Vea las causas 4, 6, 9, 13, 15, 16, 18, 20, 21, 22)

CAUSA PROBABLE:

1. Protector térmico del motor disparado
2. Interruptor automático abierto
3. Fusible quemado
4. Partes giratorias agarrotadas
5. Motor mal conectado
6. Motor defectuoso
7. Bomba no cebada
8. Taponada la descarga o cerrada la válvula
9. Rotación incorrecta
10. Válvula de pie demasiado pequeña, succión no sumergida, taponada la malla de entrada
11. Tensión baja
12. Pérdida de fase (trifásico solamente)
13. Aire o gases en el líquido
14. Demasiado alta la altura o carga del sistema
15. Demasiado baja la ASPN$_D$; (altura de succión positiva neta disponible);
    Demasiado alta la altura de aspiración o excesivas las pérdidas. Verifique con un calibrador de vacío.
16. Impulsor desgastado o taponado
17. Incorrecto el diámetro del impulsor
18. Demasiado baja la altura de descarga causando caudal excesivo
19. Demasiado alta la viscosidad o gravedad específica
20. Cojinetes desgastados
21. Bomba o tubería flojas
22. Bomba y motor mal alineados



NPE



NPE-F

Materiales de construcción

Componentes del extremo sumergido		
Artículo No.	**Descripción**	**Materiales**
100	Carcasa	AISI A.I. 304
101	Impulsor	
184	Alojamiento del sello	
304	Tuerca de seguridad del impulsor	
347	Álabe director	
349	Anillo en O, álabe director	Buna-N
370	Tornillos de cabeza hueca, carcasa	AISI A.I. 304
383	Sello mecánico	** vea el gráfico
408	Tapón de drenaje y ventilación, carcasa	AISI A.I. 304
412B	Anillo en O, tapón de drenaje y ventilación	Buna-N
513	Anillo en O, carcasa	Buna-N
Componentes del extremo motriz		
108	Adaptador	AISI A.I. 304
109	Tapa del cojinete	Hierro fundido
112	Cojinete de bolas (externo)	Acero
122	Eje	AISI A.I. 304
138	Sello de reborde (interno)	Buna/acero
139	Sello de reborde (externo)	Buna/acero
168	Cojinete de bolas (interno)	Acero
228	Marco del cojinete	Hierro fundido
361	Anillo de resorte	Acero
370C	Tornillo de casquete de cabeza hex., tapa cojinete	Acero anchapado
371	Tornillo de casquete de cabeza hex., adaptador	Acero enchapado

**Sellos mecánicos - Art. 383						
Pieza No.	**Servicio**	**Giratorio**	**Estacionario**	**Elastómero**	**Partes metálicas**	**Cara tipo**
10K46	Estándar	Carbono	Cerámica	Buna	18.8 S.S.	21
10K18	Alta temperatura - opcional		Resist. Ni.	EPR		
10K24	Servicio químico - opcional		Cerámica	Viton		
10K55	Alta temperatura - opcional		Tungsteno			
10K29	Servicio severo - opcional	Carbono de silicio		Buna		

GARANTÍA LIMITADA DE GOULDS

Esta garantía es aplicable a todas las bombas para sistemas de agua fabricadas por Goulds.

Toda parte o partes que resultaren defectuosas dentro del período de garantía serán reemplazadas, sin cargo para el comerciante, durante dicho período. Tal período de garantía se extiende por doce (12) meses a partir de la fecha de instalación, o dieciocho (18) meses a partir de la fecha de fabricación, cualquiera que se cumpla primero.

Todo comerciante que considere que existe lugar a un reclamo de garantía deberá ponerse en contacto con el distribuidor autorizado de Goulds del cual adquiera la bomba, y ofrecer información detallada con respecto del reclamo. El distribuidor está autorizado a liquidar todos los reclamos por garantía a través del Departamento de Servicios a Clientes de Goulds.

La presente garantía excluye: a) La mano de obra, el transporte y los costos relacionados en los que incurra el comerciante; **b)** los costos de reinstalación del equipo reparado; **c)** los costos de reinstalación del equipo reemplazado; **d)** daños emergentes de cualquier naturaleza; y **e)** el reembolso de cualquier pérdida causada por la interrupción del servicio.

Para los fines de esta garantía, los términos "Distribuidor", "Comerciante" y "Cliente" se definen como sigue: 1) "Distribuidor" es aquel individuo, sociedad, corporación, asociación u otra entidad jurídica que opera entre Goulds y el comerciante para la compra, consignación o contratos de venta de las bombas en cuestión. 2) Comerciante" es todo individuo, sociedad, corporación, asociación u otra entidad jurídica que realiza negocios de venta o alquiler-venta (leasing) de bombas a clientes. 3) "Cliente" es toda entidad que compra o que adquiere bajo la modalidad de "leasing" las bombas en cuestión de un comerciante. El término "cliente" puede significar un individuo, sociedad, corporación, sociedad de responsabilidad limitada, asociación o cualquier otra entidad jurídica con actividades en cualquier tipo de negocios.

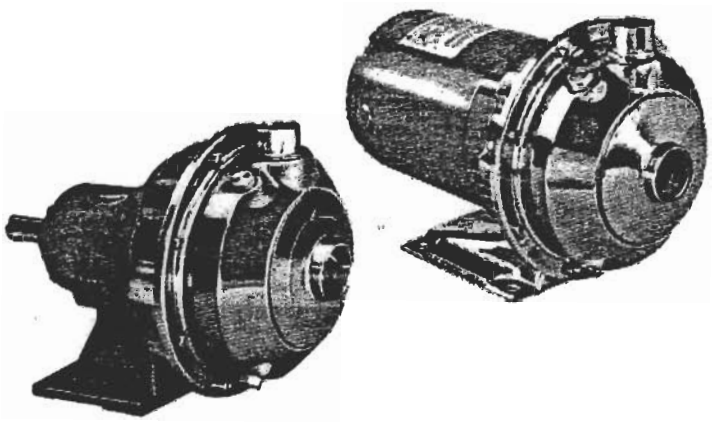
LA PRESENTE GARANTÍA SE EXTIENDE AL COMERCIANTE ÚNICAMENTE

G&L Pumps
ITT Industries

G&L Pumps
ITT Industries

Directives d'installation, d'utilisation et d'entretien

Modèles NPE et NPE-F



DESCRIPTION ET CARACTÉRISTIQUES

Les pompes de modèles NPE (montées sur moteur) et NPE-F (montées sur socle) sont des pompes centrifuges à un étage et à orifice d'aspiration situé à l'extrémité. Elles sont utilisées pour le transfert général de liquides, le gavage, etc. Les composants de la pompe proprement dite sont tous en inox AISI de type 304 estampé ou soudé. L'impulseur est de type fermé. On ne peut l'usiner pour en réduire le diamètre. Le corps de pompe est muni d'un diffuseur pour en améliorer l'efficacité et diminuer la charge radiale de l'arbre.

Les pompes de modèle NPE sont montées sur des moteurs NEMA 48J ou 56J au moyen d'un support (entretoise) en C. Le bout de l'arbre du moteur est fileté. Les pompes montées sur socle peuvent être reliées au moteur par un accouplement à entretoise ou par une courroie.

1. Informations importantes

1.1. Inspecter l'appareil et signaler immédiatement tout dommage au transporteur ou au détaillant.

1.2. L'alimentation en électricité doit être assurée par un circuit de dérivation distinct dont les fusibles ou les disjoncteurs, le calibre des fils, etc., sont conformes aux prescriptions du code provincial ou national de l'électricité. Poser un sectionneur tout conducteur près de la pompe.

ATTENTION

On doit toujours couper le courant lorsque l'on effectue quelque travail que ce soit sur la pompe ou les commandes.

1.3. Le câblage d'alimentation du moteur doit convenir à la tension de fonctionnement. Le schéma de câblage se trouve sur la plaque signalétique du moteur. Les fils doivent avoir un calibre limitant la chute de tension maximale, aux bornes du moteur, à 10 % de la valeur de tension indiquée sur la plaque signalétique, sinon la durée de vie du moteur et les performances de la pompe diminueront.

1.4. Il faut toujours employer des contacteurs et des démarreurs conçus pour les puissances nominales en horse-power (hp).

1.5. Protection du moteur

1.5.1. Moteurs monophasés – Ces moteurs sont parfois munis d'une protection thermique intégrée (consulter la plaque signalétique). Dans le cas contraire, utiliser un contacteur à protection appropriée contre les surcharges. Les dispositifs fusibles sont permis.

1.5.2. Moteurs triphasés – Employer une protection trois conducteurs appropriée contre les surcharges thermiques ainsi qu'un démarreur magnétique convenant à la charge électrique.

1.6. Limites d'utilisation maximales

Température du liquide:	100°C (212°F), avec joint standard; 120°C (250°F), avec joint pour hautes températures en option.
Pression:	517 kPa (75 lb/po^2)
Démarrages par heure:	20, répartis uniformément

1.7. Une inspection et un entretien réguliers augmenteront la durée de vie de l'appareil. Établir un programme d'entretien et d'inspection basé sur le temps de fonctionnement. Voir la section 8.

2. Installation

2.1. Généralités

2.1.1. Placer la pompe aussi près de la source de liquide que possible, mais plus bas pour assurer l'amorçage automatique.

2.1.2. Protéger l'appareil contre les inondations et le gel.

2.1.3. Laisser assez d'espace pour l'entretien et l'aération.

2.1.4. La tuyauterie doit posséder ses propres supports et «s'aligner» correctement sur la pompe.

ATTENTION

Ne jamais tirer sur la tuyauterie pour la relier aux raccords d'aspiration et de refoulement.

2.1.5. Ne poser aucun accessoire de tuyauterie superflu. Choisir le calibre qui réduit les pertes de charge par frottement au minimum.

2.2. Pompes montées sur moteur:

2.2.1. Les pompes peuvent être installées sur une surface horizontale, inclinée ou verticale.

ATTENTION

Ne pas placer le moteur plus bas que la pompe afin de le protéger contre les fuites et l'eau de condensation.

2.2.2. L'assise doit être plane et solide pour empêcher que le serrage des boulons ne cause de contraintes. Monter l'appareil sur caoutchouc pour réduire le bruit et les vibrations au minimum.

2.2.3. Serrer les boulons de fixation du moteur avant de raccorder la tuyauterie à la pompe.

2.3. Pompes montées sur socle:

2.3.1. On doit fixer la plaque d'assise à une dalle reposant sur une semelle de fondation solide et remplir de coulis l'espace séparant la plaque et la dalle (V. fig. 1).

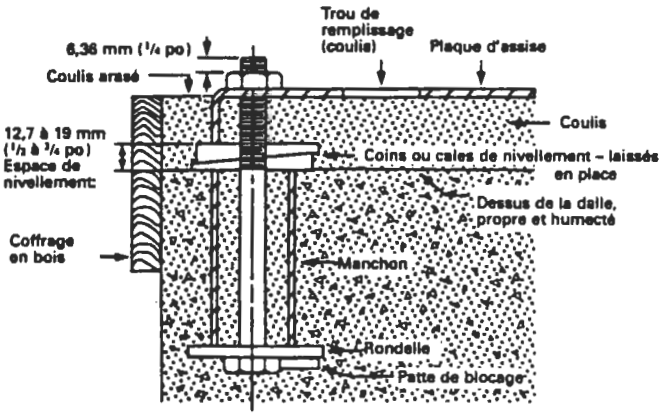


Figure 1

2.3.2. Placer l'appareil sur des cales de nivellement situés en quatre points distincts: deux sous le centre approximatif du moteur et deux sous celui de la pompe. Régler la position de l'appareil de manière à ce que la bride des raccords d'aspiration et de refoulement soit de niveau (avec un fil à plomb ou un niveau).

2.3.3. S'assurer que la plaque d'assise n'est pas déformée et que le centrage définitif de l'accouplement est possible dans les limites de déplacement ou de calage du moteur.

2.3.4. Serrer les boulons d'ancrage à la main et construire un coffrage pour l'assise. Verser du coulis sous la plaque d'assise et s'assurer que les zones situées sous les pieds de la pompe et du moteur sont entièrement pleines. Laisser le coulis durcir pendant 48 heures avant de serrer les boulons d'ancrage à fond.

2.3.5. Serrer les boulons de fixation de la pompe et du moteur avant de raccorder les tuyaux à la pompe.

3. Tuyauterie d'aspiration

3.1. Une hauteur d'aspiration réduite et une tuyauterie directe et courte sont souhaitables. Si la hauteur d'aspiration dépasse 3 m (10pi), et la température du liquide, 49°C (120°F), consulter la courbe de débit de la pompe pour obtenir la charge nette requise à l'aspiration.

3.2. Le calibre du tuyau d'aspiration doit être au moins égal à celui du raccord d'aspiration de la pompe pour éviter une diminution du débit.

3.3. S'il faut un tuyau plus gros, on doit installer près de la pompe un raccord réducteur excentrique (à la verticale).

3.4. Pompe placée plus bas que la source de liquide:

3.4.1. Poser un robinet d'isolement à passage intégral sur le tuyau d'aspiration pour l'inspection et l'entretien.

ATTENTION

Ne pas employer le robinet d'isolement pour réduire la section de passage vers la pompe.

3.5. Pompe placée plus haut que la source de liquide:

3.5.1. Afin de prévenir les poches d'air, aucun élément de la tuyauterie d'aspiration ne devrait être plus haut que le raccord d'aspiration de la pompe. Incliner la tuyauterie vers le haut à partir de la source de liquide.

3.5.2. Chaque joint doit être étanche.

3.5.3. N'employer un clapet de pied que s'il est nécessaire pour amorcer la pompe ou la maintenir amorcée au cours des interruptions de service.

3.5.4. La section de passage de la crépine du tuyau d'aspiration doit être au moins le triple de celle du tuyau.

3.6. Le diamètre (d) et la hauteur de submersion (h) de l'orifice d'entrée du tuyau d'aspiration doivent être suffisants pour empêcher l'aspiration d'air par vortex (V. fig. 2 à 5).

3.7. Enrouler les raccords filetés de 3 ou 4 couches de ruban de téflon pour les étancher.

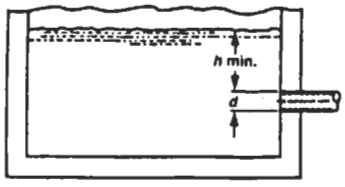


Figure 2

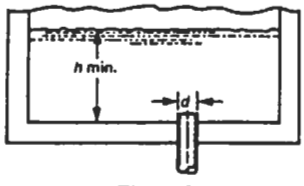


Figure 3

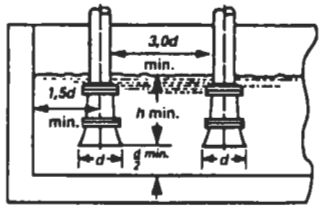


Figure 4

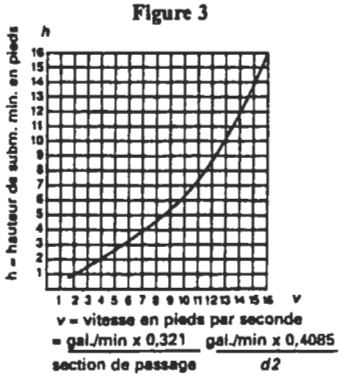


Figure 5

4. Tuyauterie de refoulement

4.1. L'installation doit comporter un robinet-vanne, ainsi qu'un clapet de non-retour placé entre le robinet-vanne et la pompe. Le robinet-vanne sert à la régularisation du débit et à l'inspection de la pompe et du clapet de non-retour.

4.2. Lorsqu'un raccord agrandisseur est nécessaire, le poser entre le clapet de non-retour et la pompe.

4.3. Enrouler les raccords filetés de 3 ou 4 couches de ruban de téflon pour les étancher.

5. Centrage des arbres – moteur et pompe

5.1. Pompes montées sur moteur:

5.1.1. Aucun centrage sur place n'est requis.

5.2. Pompes montées sur socle:

5.2.1. Bien que les arbres aient été centrés en usine, ils peuvent avoir été décentrés pendant le transport. On doit donc vérifier le centrage avant la mise en service (V. fig. 6).

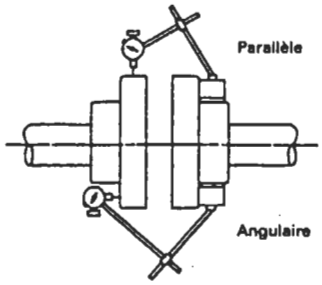


Figure 6

5.2.2. Serrer tous les boulons de fixation avant de vérifier le centrage.

5.2.3. Si un recentrage est nécessaire, on ne doit déplacer que le moteur. Employer des cales au besoin.

5.2.4. Désalignement parallèle (arbres parallèles mais non concentriques) – Fixer sur un moyeu un comparateur à cadran que l'on tourne de 360° le long de la circonférence de l'autre moyeu tout en notant l'amplitude de déplacement de l'aiguille. L'alignement est correct si le faux-rond total est de 0,127 mm (0,005 po) ou moins.

5.2.5. Désalignement angulaire (arbres concentriques mais non parallèles) – Fixer sur un moyeu un comparateur à cadran que l'on tourne de 360° le long d'une face plane de l'autre moyeu tout en notant l'amplitude de déplacement de l'aiguille. L'alignement est correct si le faux-rond total est de 0,127 mm (0,005 po) ou moins.

5.2.6. Le centrage convient lorsqu'il satisfait aux exigences relatives à l'alignement parallèle et angulaire (après le serrage à fond des boulons de fixation du moteur).

ATTENTION

On doit toujours vérifier les deux types d'alignement après chaque réglage.

6. Rotation

6.1. La rotation appropriée s'effectue en sens horaire (vers la droite, vue de l'extrémité du moteur). Couper et rétablir le courant rapidement pour observer le sens de rotation de l'arbre. Changer le sens de rotation comme suit.

6.1.1. Moteur monophasé: irréversible.

6.1.2. Moteur triphasé: intervertir deux des trois conducteurs du moteur.

7. Utilisation

7.1. Avant la mise en service, on doit amorcer la pompe (pour en faire sortir l'air), remplir de liquide le tuyau d'aspiration et entrouvrir le robinet de refoulement.

ATTENTION

Les liquides pompés servent de lubrifiant. En cas de fonctionnement à sec, les pièces tournantes gripperaient et le joint mécanique s'endommagerait. Ne pas faire fonctionner la pompe lorsque le débit est nul ou presque. L'énergie absorbée par le liquide se transforme en chaleur, et le liquide peut alors se changer rapidement en vapeur. Les pièces tournantes doivent être lubrifiées par le liquide pour ne pas subir de dommages ni se gripper.

7.2. Après le fonctionnement de l'appareil dans des conditions de service normales et la stabilisation de la température, vérifier tout le système. Vérifier également si la tuyauterie s'est dilatée. Dans le cas des pompes montées sur socle, la différence de température entre le moteur et la pompe peut altérer le centrage de l'accouplement. Vérifier le centrage de nouveau.

8. Entretien

8.1. Dans le cas des pompes montées sur moteur, les roulements sont situés à l'intérieur du moteur et sont lubrifiés à vie. Aucun graissage n'est requis.

8.2. Pompes montées sur socle:

8.2.1. Les roulements de palier devraient être graissés toutes les 2000 heures ou tous les trois mois, soit la période prenant fin la première. Employer une graisse au lithium ou au sodium nº 2. Remplir le roulement jusqu'à ce que la graisse sorte par les garnitures ou par la lèvre des joints, puis essuyer le surplus.

8.2.2. Suivre les directives de lubrification du fabricant du moteur et de l'accouplement.

8.2.3. Vérifier le centrage de nouveau après tout travail d'entretien nécessitant le déplacement ou le desserrage des boulons de fixation de l'appareil.

9. Démontage

Le démontage complet de la pompe est décrit ci-dessous. Ne démonter que ce qui est approprié à l'entretien nécessaire.

9.1. Couper le courant.

9.2. Vidanger le système. Le rincer au besoin.

9.3. Dans le cas des pompes montées sur moteur, enlever les boulons de fixation de ce dernier. Quant aux pompes montées sur socle, enlever le grillage ou l'écran protecteur, l'entretoise, l'accouplement et les boulons de fixation du socle.

9.4. Pompe:

9.4.1. Enlever les vis de fixation (370) du corps de pompe.

9.4.2. Écarter l'ensemble pompe du corps de pompe (100).

9.4.3. Enlever l'écrou de blocage (304) de l'impulseur.

ATTENTION

Ne pas insérer de tournevis entre les aubes de l'impulseur pour l'empêcher de tourner: enlever le couvercle d'extrémité du moteur et utiliser la fente ou les méplats de blocage de l'arbre; on préviendra ainsi l'endommagement de l'impulseur.

9.4.4. Dévisser l'impulseur (101) dans le sens antihoraire (vu du devant de la pompe). Se protéger les mains avec un linge ou des gants.

ATTENTION

Toute tentative de dévissage dans le sens horaire peut endommager les filets de l'impulseur ou de l'arbre, ou des deux.

9.4.5. Retirer le logement de joint (184) avec soin au moyen de deux leviers placés dans un angle de 180° entre le logement et l'adaptateur de moteur (108). L'élément tournant du joint mécanique (383) devrait sortir de l'arbre avec le logement.

9.4.6. Pousser l'élément immobile du joint mécanique hors du logement.

9.5. Palier:

9.5.1. Enlever le couvercle de palier (109).

9.5.2. Sortir l'arbre (122) du palier (228).

9.5.3. Si les joints à lèvre (138 et 139) sont usés et doivent être remplacés, les retirer du palier et du couvercle de palier.

9.5.4. À l'aide d'un arrache-roulement ou d'une presse à mandriner, extraire les roulements (112 et 168).

10. Remontage

10.1. Chaque pièce devrait être nettoyée avant le remontage.

10.2. Voir la liste des pièces pour déterminer celles qui sont requises. Préciser le numéro de pièce ou de catalogue de la pompe lorsque l'on commande des pièces.

10.3. Le remontage se fait dans l'ordre inverse du démontage.

10.4. Observer les directives suivantes pendant le remontage du palier:

10.4.1. Remplacer les joints à lèvre s'ils sont usés ou endommagés.

10.4.2. Remplacer les roulements à billes s'ils ont du jeu, s'ils ne tournent pas rond ou s'ils sont bruyants.

10.4.3. Vérifier si l'arbre comporte des faux-ronds: le faux-rond maximal admissible est de 0,051 mm (0,002 po).

10.5. Observer les directives suivantes pendant le remontage de la pompe:

10.5.1. Tous les composants du joint mécanique doivent être en bon état pour empêcher les fuites. Le remplacement du joint en entier est une pratique courante appropriée chaque fois que le joint est enlevé. On peut utiliser un lubrifiant léger comme la glycérine pour faciliter l'assemblage. Ne pas contaminer la surface du joint mécanique avec le lubrifiant.

10.5.2. Inspecter le joint torique (513) du corps de pompe et le remplacer s'il est endommagé. On peut employer du pétrolatum (vaseline) pour faciliter sa pose.

10.5.3. Inspecter le joint torique (349) de l'aube (enveloppe) directrice et le remplacer s'il est endommagé.

ATTENTION

Ne pas lubrifier le joint torique (349) de l'aube directrice. S'assurer que le joint n'est pas pincé par l'impulseur au cours du remontage.

10.6. Une fois la pompe remontée, vérifier s'il y a grippage. Apporter les corrections nécessaires.

10.7. Serrer les vis de fixation du corps de pompe en étoile pour prévenir le coincement du joint torique.

11. Diagnostic des anomalies

Moteur ne fonctionne pas
(V. causes 1 à 6)

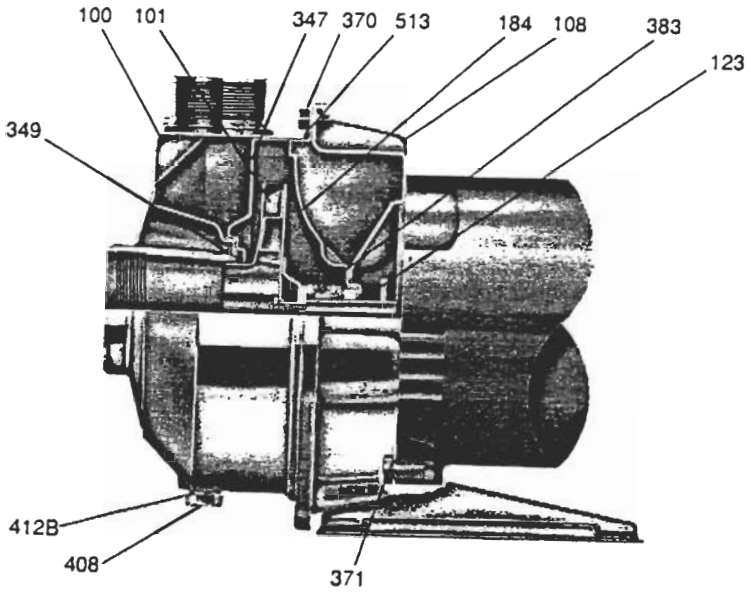
Débit de liquide faible ou nul:
(V. causes 7 à 17)

Consommation d'électricité excessive:
(V. causes 4, 17, 18, 19 et 22)

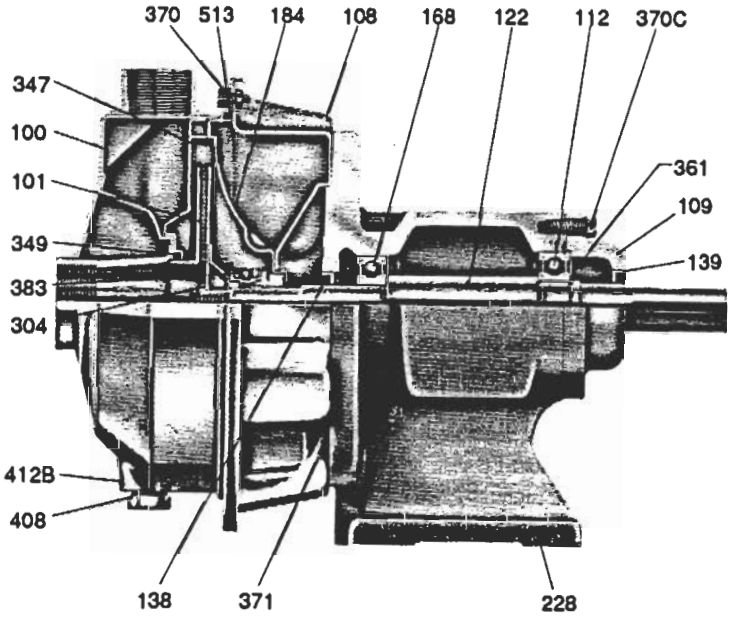
Vibration et bruit excessifs:
(V. causes 4, 6, 9, 13, 15, 16, 18, 20, 21 et 22)

CAUSES PROBABLES:

1. Protecteur thermique déclenché.
2. Disjoncteur ouvert.
3. Fusible sauté.
4. Pièces tournantes grippées.
5. Moteur mal connecté.
6. Moteur défectueux.
7. Pompe non amorcée.
8. Tuyau de refoulement obstrué ou robinet fermé.
9. Mauvais sens de rotation.
10. Clapet de pied trop petit, entrée de tuyau d'aspiration non submergée, crépine de tuyau d'aspiration obstruée.
11. Basse tension électrique.
12. Perte de phase (moteurs triphasés seulement).
13. Présence d'air ou de gaz dans le liquide.
14. Hauteur du système trop grande.
15. Charge nette absolue à l'aspiration trop faible – hauteur ou perte d'aspiration excessives – vérifier avec un vacuomètre.
16. Impulseur usé ou obstrué.
17. Diamètre d'impulseur inapproprié.
18. Hauteur trop faible – vitesse d'écoulement excessive.
19. Viscosité ou densité trop élevée.
20. Roulements usés.
21. Pompe ou tuyauterie mal assujetties.
22. Pompe et moteur désalignés.



NPE



NPE-F

Composants et matériaux de fabrication

Composants de la pompe		
N° d'article	**Description**	**Matériau**
100	Corps de pompe	Inox AISI 304
101	Impulseur	
184	Logement de joint	
304	Écrou de blocage – impulseur	
347	Aube (enveloppe) directrice	
349	Joint torique – aube directrice	Buna-N
370	Vis à tête creuse – corps de pompe	Inox AISI 304
383	Joint mécanique	V. tableau**
408	Bouchons de vidange et de mise à l'air libre – corps de pompe	Inox AISI 304
412B	Joint torique – bouchons de vidange et de mise à l'air libre	Buna-N
513	Joint torique – corps de pompe	Buna-N
Organes d'entraînement		
108	Adaptateur	Inox AISI 304
109	Couvercle de palier	Fonte
112	Roulement à billes extérieur	Acier
122	Arbre	Inox AISI 304
138	Joint à lèvre intérieur	Buna, acier
139	Joint à lèvre extérieur	Buna, acier
168	Roulement à billes intérieur	Acier
228	Palier	Fonte
361	Bague de retenue	Acier
370C	Vis à tête hexagonale – couvercle de palier	Acier plaqué
371	Vis à tête hexagonale – adaptateur	Acier plaqué

****Choix de joints mécaniques – article n° 383**						
N° de pièce	**Service**	**Joint tournant**	**Joint immobile**	**Élastomères**	**Métal**	**Crane, type**
10K46	Standard	Carbone	Céramique	Buna	Inox 18-8	21
10K18	Hautes températures (option)		Fonte Ni-Résist	Éthylène-propylène		
10K24	Produits chimiques, (option)		Céramique	Viton		
10K55	Hautes températures (option)		Tungstène			
10K29	Très dur (option)	Carbone, silicium		Buna		

GARANTIE LIMITÉE DE GOULDS

La présente garantie s'applique à chaque pompe de système d'alimentation en eau fabriquée par Goulds.

Toute pièce se révélant défectueuse durant la période de garantie sera remplacée sans frais pour le détaillant durant ladite période, qui dure douze (12) mois à compter de la date d'installation ou dix-huit (18) mois à partir de la date de fabrication, soit la période qui expirera la première.

Le détaillant qui, aux termes de cette garantie, désire effectuer une demande de règlement doit s'adresser au distributeur Goulds agréé chez lequel la pompe a été achetée et fournir tous les détails à l'appui de sa demande. Le distributeur est autorisé à régler toute demande par le biais du service à la clientèle de Goulds.

La garantie ne couvre pas : a) les frais de main-d'oeuvre ou de transport ni les frais connexes encourus par le détaillant ; **b)** les frais de réinstallation de l'équipement réparé ; **c)** les frais de réinstallation de l'équipement de remplacement ; **d)** les dommages indirects de quelque nature que ce soit ; **e)** ni les pertes découlant de la panne.

Aux fins de la présente garantie, les termes ci-dessous sont définis comme suit : 1) « Distributeur » signifie une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique servant d'intermédiaire entre Goulds et le détaillant pour les achats, les consignations ou les contrats de vente des pompes en question. **2)** « Détaillant » veut dire une personne, une société de personnes, une société de capitaux, une association ou autre entité juridique dont les activités commerciales sont la vente ou la location de pompes à des clients. **3)** « Client » signifie une entité qui achète ou loue les pompes en question chez un détaillant. Un « client » peut être une personne, une société de personnes, une société de capitaux, une société à responsabilité limitée, une association ou autre entité juridique se livrant à quelque activité que ce soit.

CETTE GARANTIE SE RAPPORTE AU DÉTAILLANT SEULEMENT.

G&L Pumps
ITT Industries

APPENDIX A

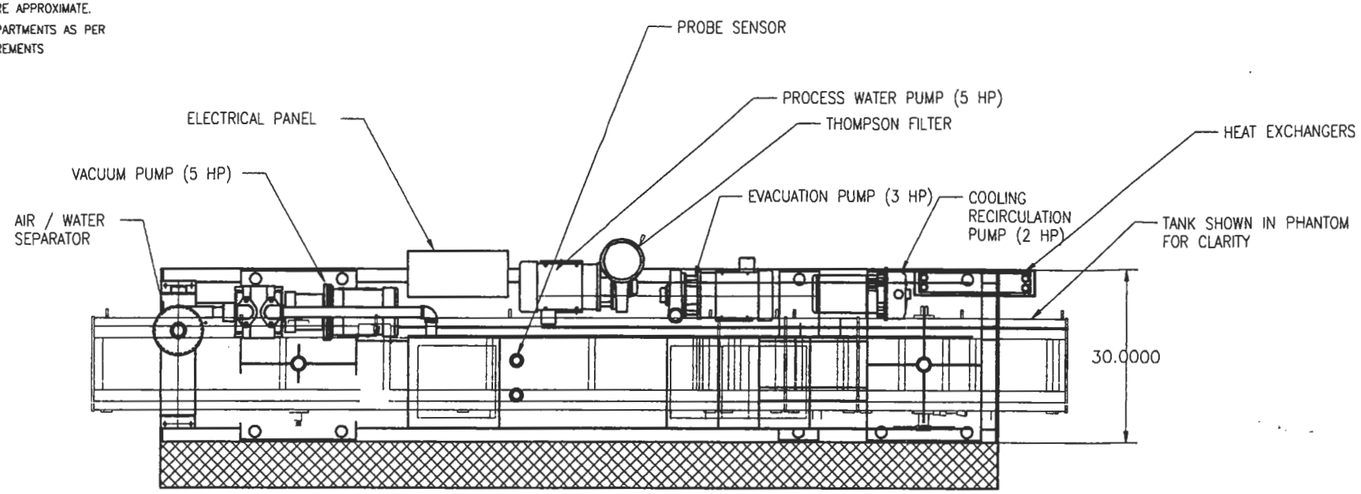
DRAWING

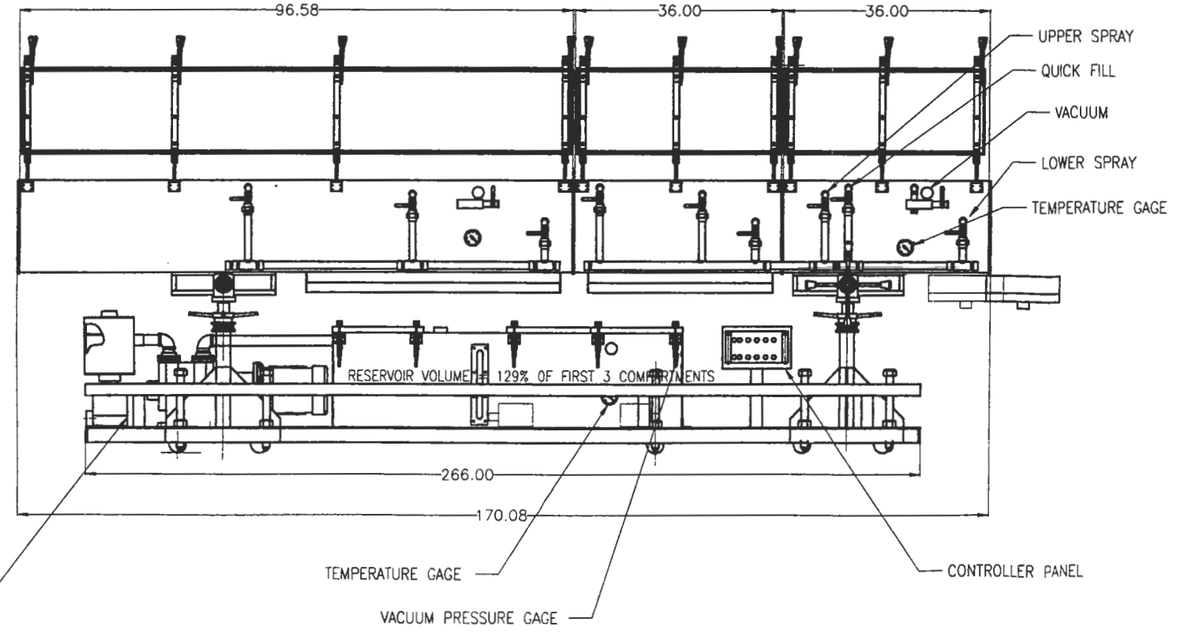
APPENDIX B

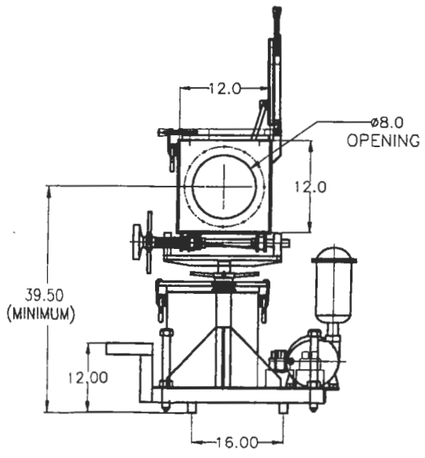
ELECTRIC DIAGRAM

NOTE:

ALL DIMENSION ARE APPROXIMATE.
NUMBER OF COMPARTMENTS AS PER
CUSTOMER REQUIREMENTS







USED ON SUB ASSY	USED ON FINISHED GOOD
X	X
X	X
X	X
X	X
X	X

MATERIAL

FINISH: √ 125

CONTRACT NO

APPROVALS	DATE
DRAWN: ART SZILVESZTER	98/09/21
CHECKED	-/-/-
ISSUED	-/-/-
APPROVED	-/-/-

ZONE	REV	DESCRIPTION	DATE	APPROVED

REVISIONS

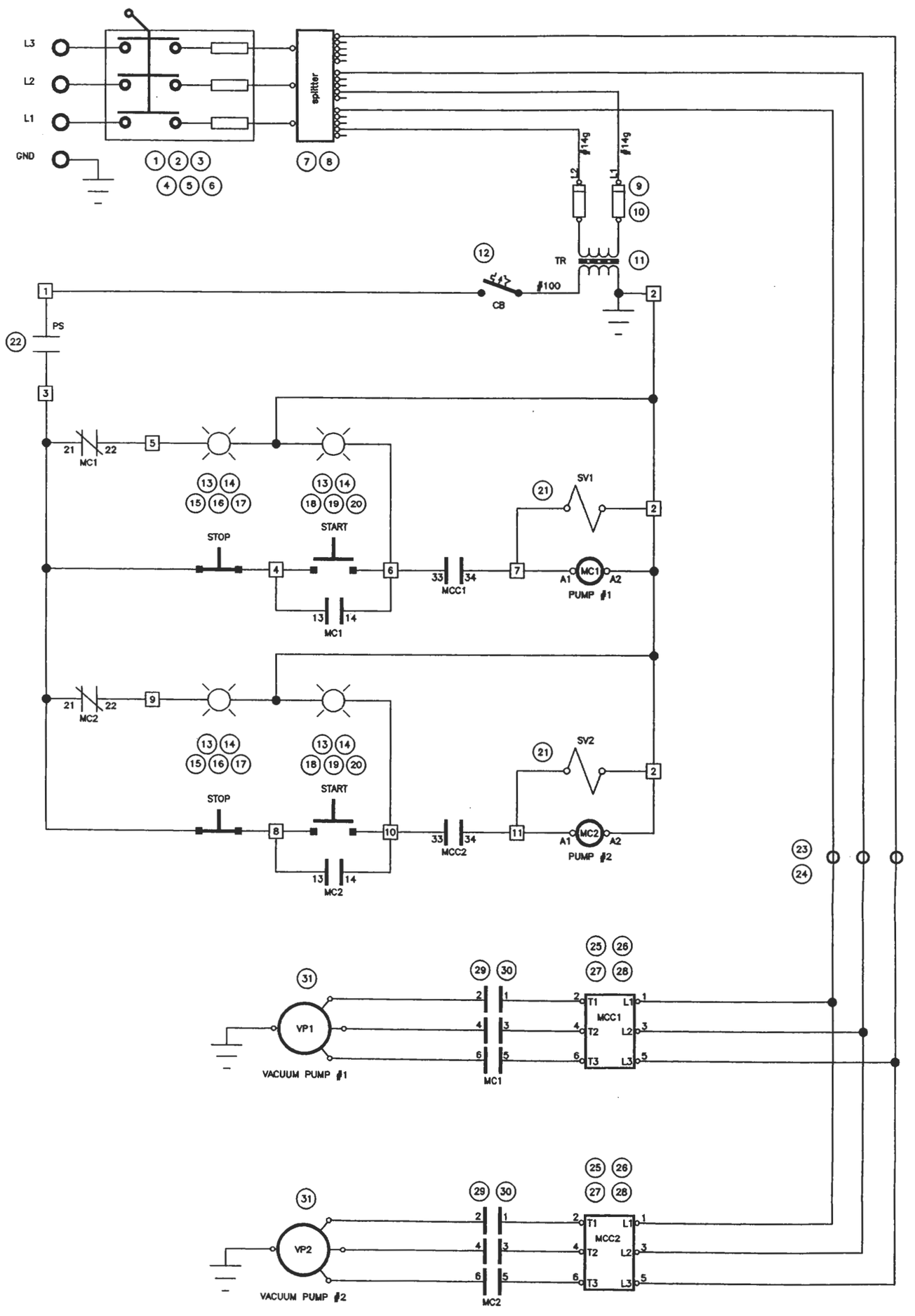
CONAIR METAPLAST LTD.

TITLE: GENERAL ASSEMBLY
14' VACUUM TANK

SIZE: D | KMC CODE: NIL | DWG NO: 461-896-1200 | REV: B

ISSUE: 1/12 | RELEASE DATE | DWG FILE: 461-896-12000.DWG | SHEET: 1 / 1

461-896-1000 REV 01



CB	= CIRCUIT BREAKER
PS	= PRESSURE SWITCH
MC	= MOTOR CONTACTOR
MCC	= MOTOR CIRCUIT CONTROLER
PHR	= PHASE RELAY
SV	= SOLENOID VALVE
TR	= TRANSFORMER
VP	= VACUUM PUMP

Conair—Metaplast ltd.

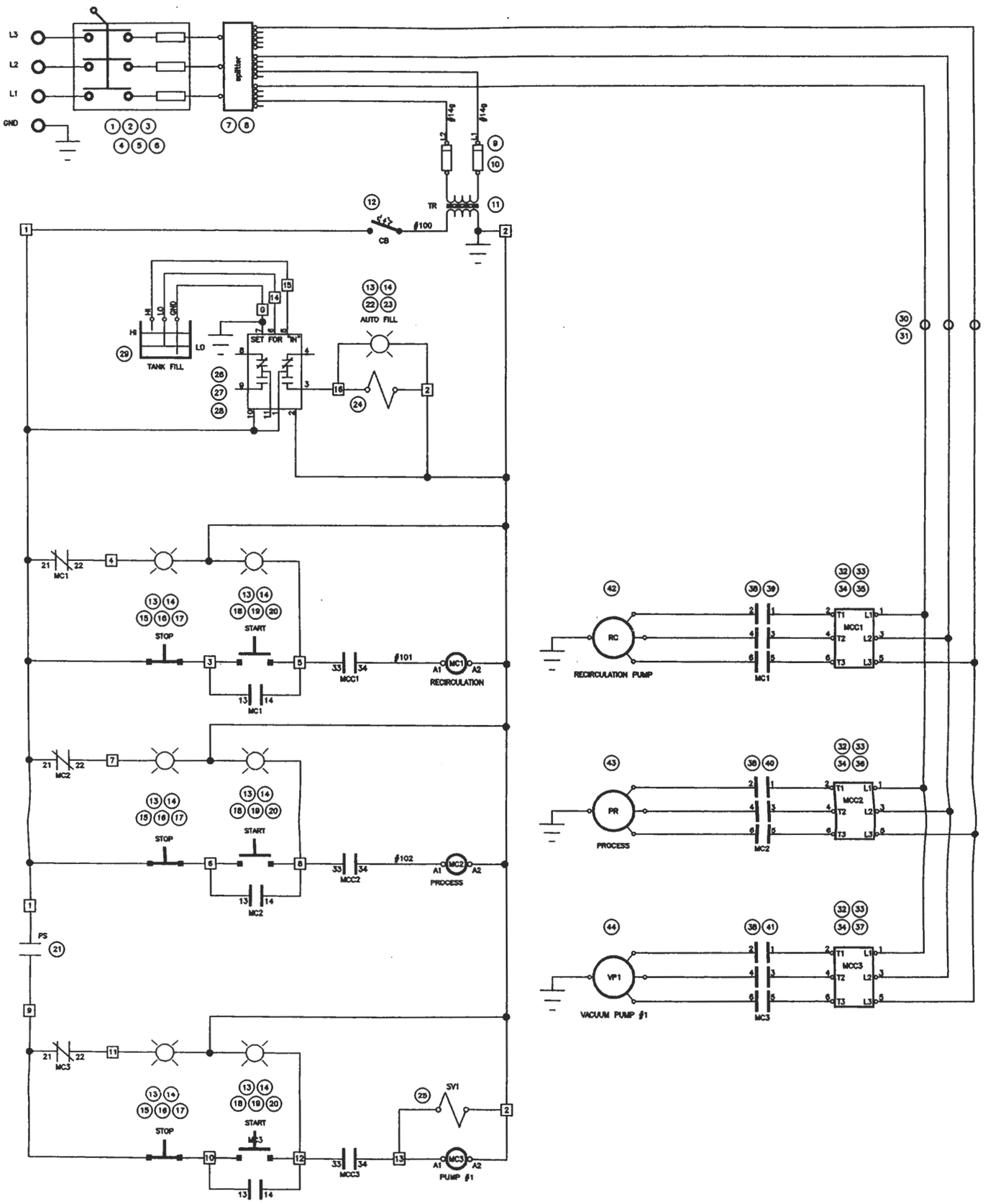
TITLE : VACUUM SIZING TANK

ELECTRICAL : SOLENOID ON VACUUM PUMP

2x VACUUM PUMP AND SAFETY PHASE RELAY

DWG# : 464-200-9011-00

DATE : 02/08/99



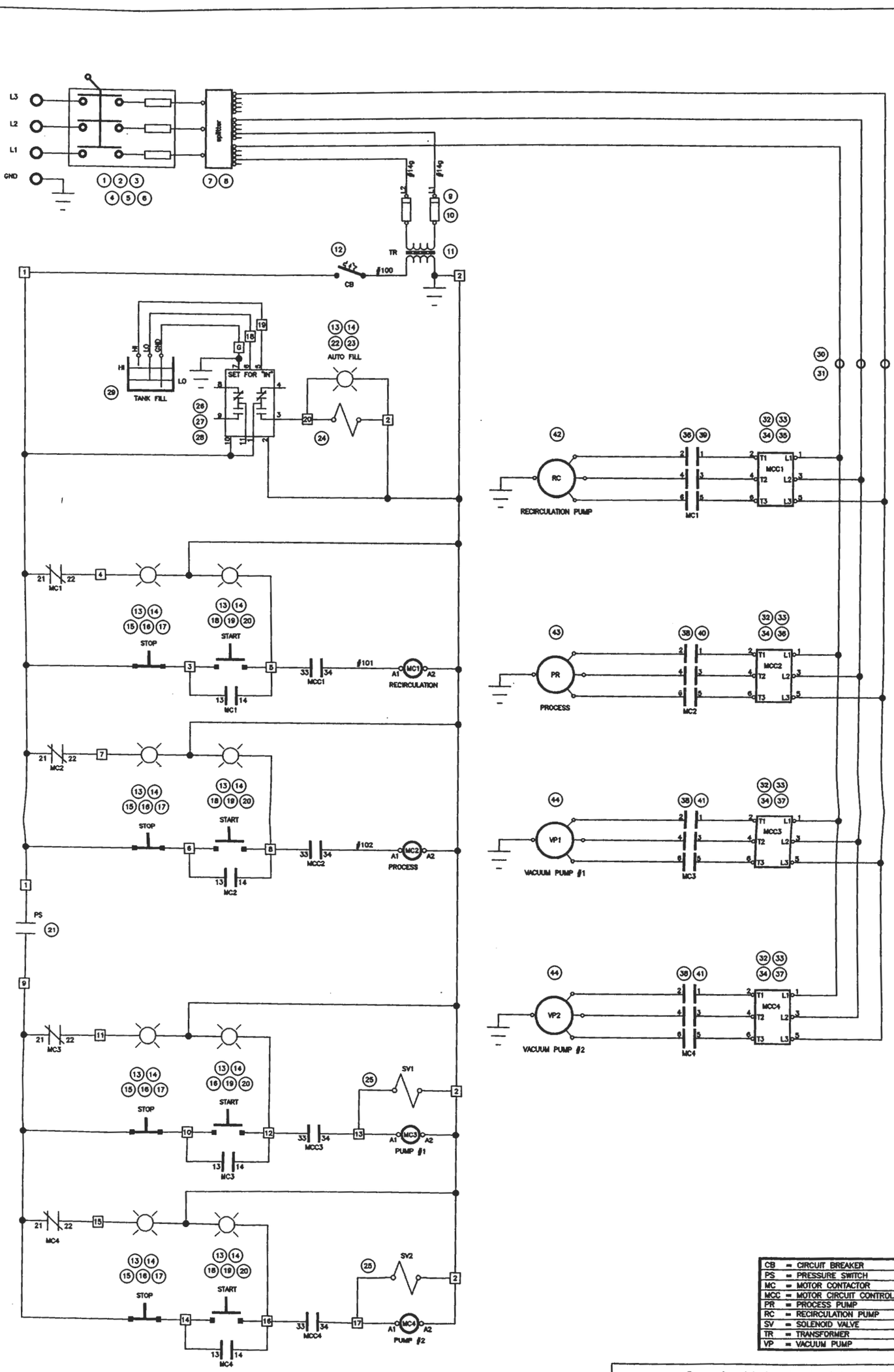
CB	= CIRCUIT BREAKER
PS	= PRESSURE SWITCH
MC	= MOTOR CONTACTOR
MCC	= MOTOR CIRCUIT CONTROLER
PHR	= PHASE RELAY
PR	= PROCESS PUMP
RC	= RECIRCULATION PUMP
SV	= SOLENOID VALVE
TR	= TRANSFORMER
VP	= VACUUM PUMP

Conair–Metaplast ltd.

TITLE : VACUUM TANK

ELECTRICAL : PRESSURE SWITCH, SOLENOID ON VACUUM PUMP,
2x VACUUM PUMP
LEVEL CONTROL, 1x RECIRCULATION PUMP, 1x PROCESS PUMP

DWG# : 464-200-9012-00 | DATE : 02/06/99



CB	= CIRCUIT BREAKER
PS	= PRESSURE SWITCH
MC	= MOTOR CONTACTOR
MCC	= MOTOR CIRCUIT CONTROLER
PR	= PROCESS PUMP
RC	= RECIRCULATION PUMP
SV	= SOLENOID VALVE
TR	= TRANSFORMER
VP	= VACUUM PUMP

Conair–Metaplast ltd.

TITLE : VACUUM SIZING TANK

ELECTRICAL : SOLENOID ON VACUUM PUMP,

2x VACUUM PUMP

LEVEL CONTROL, 1x RECIRCULATION PUMP, 1x PROCESS PUMP

DWG# : 464–200–9013–00

DATE : 03/08/99