



"VI" Vertical In-Line Pump

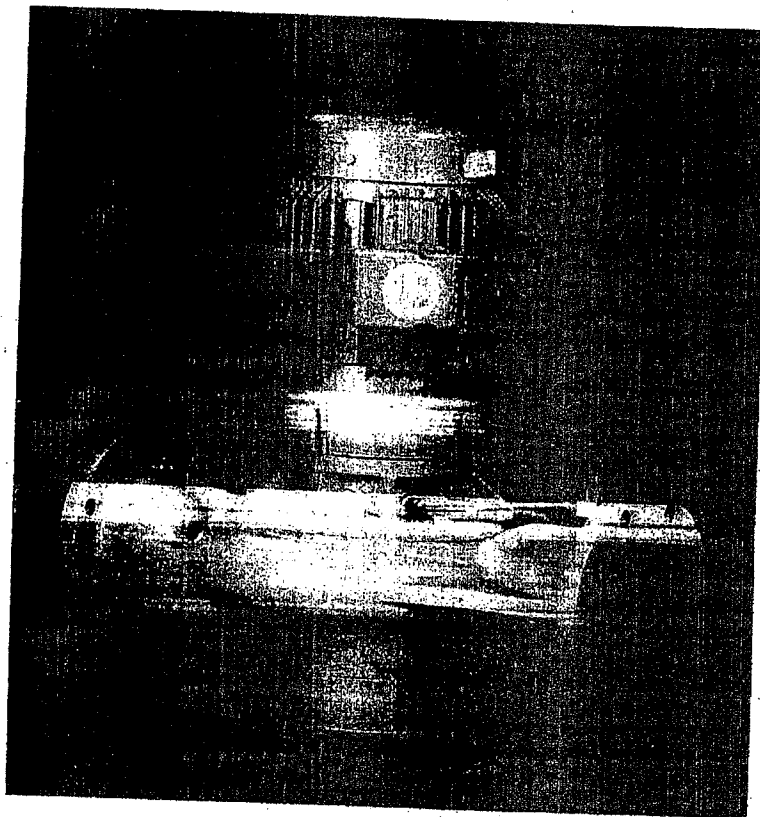
302-006

Installation, Operation & Maintenance Manual

SUPERSEDES: 302-006 Dated April 1, 1987

EFFECTIVE: June 1, 1999

HTG PUMPS # VI 2008
CHILLED WATER PUMPS # VI 3008



VI Vertical
In-Line Pump

DO IT ONCE. DO IT RIGHT.

TACO, INC., 1160 Cranston Street, Cranston, RI 02920 Telephone: (401) 942-8000 FAX: (401) 942-2360.

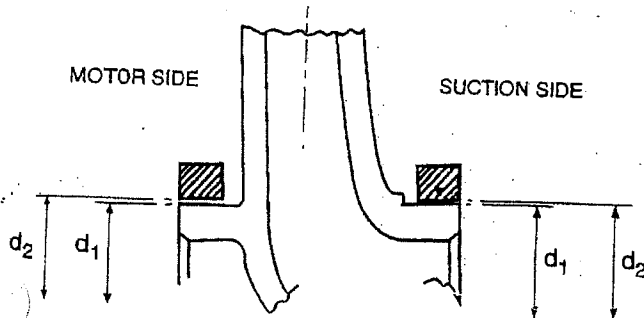
TACO (Canada), Ltd., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3. Telephone: 905/564-9422. FAX: 905/564-9436.

Printed in USA
Copyright 1999
TACO, Inc.

APPLICATION

- Working Pressure: 175 psig
 Optional Working Pressure: 300 psig for models
 VI3013, VI4013, VI6009,
 VI6011, VI6013, VI8011,
 VI8013
2. Temperature: 250°F Standard
 300°F Hi Temperature

CASING/IMPELLER WEAR RING CLEARANCES



VI CASING/IMPELLER WEAR RING CLEARANCE

PUMP SIZE	WEAR RING-SUCTION SIDE				CLEARANCE	
	DIA d_1		DIA d_2			
	MAX	MIN	MAX	MIN	MAX	MIN
1506	2.744	2.740	2.759	2.757	.019	.012
1507	2.744	2.740	2.759	2.757	.019	.012
2006	3.138	3.134	3.153	3.151	.019	.012
2007	3.138	3.134	3.153	3.151	.019	.012
2008	3.138	3.134	3.153	3.151	.019	.012
2506	3.728	3.724	3.744	3.742	.020	.012
2507	3.728	3.724	3.744	3.742	.020	.012
2508	3.728	3.724	3.744	3.742	.020	.012
2510	4.516	4.512	4.531	4.529	.019	.012
3006	4.516	4.512	4.531	4.529	.019	.012
3007	4.516	4.512	4.531	4.529	.019	.012
3008	4.516	4.512	4.531	4.529	.019	.012
3010	4.516	4.512	4.531	4.529	.019	.012
3013*	3.738	3.736	3.752	3.750	.016	.012
4007	5.102	5.098	5.122	5.120	.024	.018
4013*	4.613	4.611	4.627	4.625	.016	.012
5008	6.283	6.281	6.303	6.301	.022	.018
6009*	5.861	5.859	5.877	5.875	.018	.014
6011*	5.861	5.859	5.877	5.875	.018	.014
7013*	5.861	5.859	5.877	5.875	.018	.014
8011*	7.234	7.232	7.252	7.250	.020	.016
9013*	7.734	7.732	7.752	7.750	.020	.016

Use front and back wear ring.

CASING WEAR RING FITTED TO SUCTION SIDE ONLY

INSTALLATION

A. Receiving Pump

1. Inspect for shipping damage. If a shortage or damage occurs, contact carrier immediately.

B. Location

1. Install vertically with motor up. Consult factory for horizontal mounting.
2. Pump should be accessible for inspection and repair work, head room must be provided for the use of hoist or tackle as necessary.
3. Lift pump by slinging through motor eye bolts and securing through pump adapter.
4. In no case should any part of motor be covered with insulation.

C. Foundation

1. The pump must always be supported.
2. Pumps with smaller motors may be suspended in the piping, provided the piping is supported adjacent to the pump.
3. For pumps with larger motors, the pump should be attached to a support utilizing the tapped hole or holes in the bottom of the pump casing. **Note: Piping loads shall not be applied to the pump.**
4. Pump must be allowed to move with piping movement. Expansion of piping must be taken into account when piping and suitable devices should be employed.

OPERATION

A. Before operating for the first time check the following:

1. Is motor correctly wired for voltage available.
2. Has pump been primed. Pump should never be run dry. **Extra effort may be required to get the air out of the seal chamber.**

Caution: Make sure power supply to pump motor is locked out before touching motor shaft.

3. All rotating parts turn freely.

B. Starting pump

1. Jog pump to check proper rotation.
2. Start pump with discharge valve closed. **DANGER: MAKE SURE SUCTION VALVE IS OPEN!!**
3. When correct pressure has been reached, open discharge valve slowly.
4. Do not operate pump for prolonged periods with discharge valve closed, so as to avoid overheating and potential damaging loads.

5. Pump should be stopped if any of the following occur:
 - a. No discharge.
 - b. Insufficient discharge.
 - c. Insufficient pressure.
 - d. Loss of suction.
 - e. Excessive power consumption.
 - f. Vibration.

Check problem analysis further in the manual for help in troubleshooting.

MAINTENANCE

A. Routine Inspections

Routine inspections should be made on a regular basis. Inspections made while pump is running should reveal potential failures.

1. Inspect motor bearings for any sign of temperature rise. Temperature should not exceed 160°F. Temperature rise may indicate the early stages of bearing problems.
2. Listen for any unusual noise.
 - a. Air trapped in pump
 - b. Hydraulic noise.
 - c. Mechanical noise in motor and/or pump.
3. Check suction gauge reading and confirm that it is normal.
4. Check discharge gauge reading and confirm that it is normal.
 - a. If gauge readings are abnormal find out why.

Note: Suction and discharge gauges should read the same with pump stopped.

B. Close Coupled Pumps

The pump section is attached directly to the motor shaft and does not contain bearings.

C. Close Coupled Motors

The motor must be lubricated in accordance with the manufacturer's recommendations. **Do not over lubricate the motor bearings as this could cause premature bearing failure.**

D. Mechanical Seal

The mechanical seal is the "John Crane" Type 21 General Purpose Seal for the 175 psig pressure rating.

A "John Crane" Type 2 General Purpose Seal is used for the 300 psig pressure rating.

DIS-ASSEMBLY AND RE-ASSEMBLY

A. General

If the pump has been maintained and serviced properly, breakdowns which necessitate the pump being dis-assembled should not occur often.

1. If a problem occurs, the cause should be determined, if possible, before dis-assembling. (See "Problem Analysis")

2. If the pump is being dis-assembled, all parts must be carefully handled, avoid heavy blows and shocks.
3. All parts must be carefully cleaned and inspected for wear. Recondition or replace parts where necessary.

B. Dis-Assembly

1. Drain liquid from casing by removing drain plug.

Caution: Allow pump to cool and secure suction and discharge valves before working on pump!!

2. Remove re-circulation line.
3. Remove bolts holding cover/adaptor to casing, pry cover/adaptor and motor assembly from casing.
4. Remove impeller bolt in a counterclockwise direction. Remove impeller and key.
5. In all cases of mechanical seal arrangement, after removing the sleeve and its seal assembly, the seal rotating element may be drawn off the shaft sleeve. Note: apply silicone grease on the OD of the sleeve in the area between the seal and the end of the sleeve. This will help removal of the old seal. The stationary element is to be removed from the cover.
6. All parts must be cleaned and inspected for wear. Replace parts where necessary.

C. Re-Assembly

1. Be certain that all parts to be replaced are free from burrs, with screw threads and connecting faces clear and free from damage.
2. Insert stationary element of seal into cover-adaptor, slip cover-adaptor over shaft and engage rabbit of motor. **Note: Do not touch the seal surfaces because this may result in leakage. Do not contaminate seal faces with fingerprints.**
3. Lubricate smaller OD of shaft sleeve with silicone grease. **Do not use petroleum oil or grease.**
4. Place spring on shaft sleeve to abut against sleeve shoulder. Slide rotary seal on sleeve until it contacts spring.
5. Slide the shaft sleeve on the shaft, larger bore first. Be certain the O-ring is correctly seated in the groove.
6. Assemble impeller key and impeller on shaft. Refit with new impeller washer on impeller bolt and tighten carefully. Be certain that the impeller rotates freely by hand.
7. Apply a few spots of gasket adhesive to gasket surface of cover. Place a new casing gasket against gasket surface and press against adhesive.
8. Assemble cover-adaptor complete with motor into casing. Insure that gasket is seated correctly. Install hex-headed cap screws into casing tapings and tighten uniformly.
8. Reconnect re-circulation line and drain plug.

PROBLEM ANALYSIS

A. No Discharge

1. Pump not primed.
2. Speed too low.
3. System head too high.
4. Suction lift higher than pump is designed.
5. Impeller completely clogged.
6. Incorrect direction of rotation.
7. Air leak in suction line.

B. Insufficient Discharge Flow

1. Air leak in suction line.
2. Speed too low.
3. System head higher than anticipated.
4. Insufficient NPSH: Suction lift too high. Check gauges, also check for clogged suction line or screen.
5. Impeller partially plugged.
6. Mechanical defects.
 - a. Worn wear rings
 - b. Impeller damaged.
 - c. Incorrect direction of rotation.

C. Insufficient Discharge Pressure

1. Speed too low.
2. System head less than anticipated.
3. Air in system.
4. Mechanical defects.
 - a. Worn wear rings.
 - b. Impeller damaged.
 - c. Impeller diameter too small.
 - d. Incorrect direction of rotation.

D. Loss of Suction

1. Leak in suction line.
2. Suction lift too high.
3. Insufficient NPSH.
4. Air in system.
5. Casing gasket defective.

E. Excessive Power Consumption

1. Speed too high.
2. System head lower than rating.
3. Specific gravity of liquid too high.
4. Mechanical defects.
 - a. Shaft bent.
 - b. Rotating elements bind.
 - c. Worn wear ring.

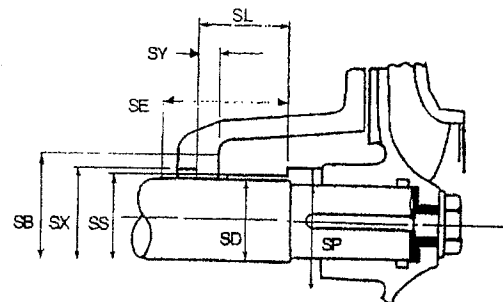
F. Vibration

1. Air leak in suction line.
2. Air in system.
3. Impeller partially plugged.
4. Foundation not rigid.
5. Mechanical defects.
 - a. Damaged impeller.
 - b. Motor bearings worn.
 - c. Rotor out of balance.
 - d. Shaft bent.

G. Motor Runs Hot

1. Speed too high.
2. Specific gravity of liquid too high.
3. Mechanical defects.
 - a. Shaft bent.
 - b. Rotating elements bind.
 - c. Defective motor.
 - d. Voltage lower than rating.

MECHANICAL SEAL DIMENSIONS



MOTOR SIZE	SS	SB	SD	SE	SL	SP	SX	SY
143/145 JM	1.125 ± 0.002	1.750 ± 0.001	1.000	1.813	1.500	1.625	1.187	0.375
143/145 JP	1.125 ± 0.002	1.750 ± 0.001	1.000	1.984	1.500	1.375	1.312	0.375
182/184 JM	1.125 ± 0.002	1.750 ± 0.001	1.000	1.813	1.500	1.625	1.187	0.375
182/184 JP	1.125 ± 0.002	1.750 ± 0.001	1.000	1.984	1.500	1.375	1.312	0.375
213/215 JM	1.125 ± 0.002	1.750 ± 0.001	1.000	1.813	1.500	1.625	1.187	0.375
213/215 JP	1.500 ± 0.002	2.125 ± 0.001	1.375	1.963	1.563	1.750	1.688	0.375
254/256 JM	1.500 +0.003, -0.002	2.125 ± 0.001	1.375	1.990	1.563	2.000	1.562	0.375
254/256 JP	1.500 ± 0.002	2.125 ± 0.001	1.375	1.963	1.563	1.750	1.688	0.375
284/286 JM	1.500 +0.003, -0.002	2.125 ± 0.001	1.375	1.990	1.563	2.000	1.562	0.375
284/286 JP	1.500 ± 0.002	2.125 ± 0.001	1.375	1.963	1.563	1.750	1.688	0.375
324/326 JM	1.500 +0.003, -0.002	2.125 ± 0.001	1.375	1.990	1.563	2.000	1.562	0.375
324/326 JP	1.500 ± 0.002	2.125 ± 0.001	1.375	1.963	1.563	1.750	1.688	0.375
364/365 JM	1.500 +0.003, -0.002	2.125 ± 0.001	1.375	1.990	1.563	2.000	1.562	0.375

All dimensions are in inches. Mechanical seal pumps have "John Crane" Type 21 seals as standard. For 300 psig casing rating "John Crane" type 2 seals are standard.

DO IT ONCE. DO IT RIGHT.

TACO, INC., 1160 Cranston Street, Cranston, RI 02920 Telephone: (401) 942-8000 FAX: (401) 942-2360.

TACO (Canada), Ltd., 6180 Ordán Drive, Mississauga, Ontario L5T 2B3. Telephone: 905/564-9422. FAX: 905/564-9436.

Printed in USA
Copyright 1989
TACO, Inc.



Replacement Parts List

304-103

VI 2008 & 2508

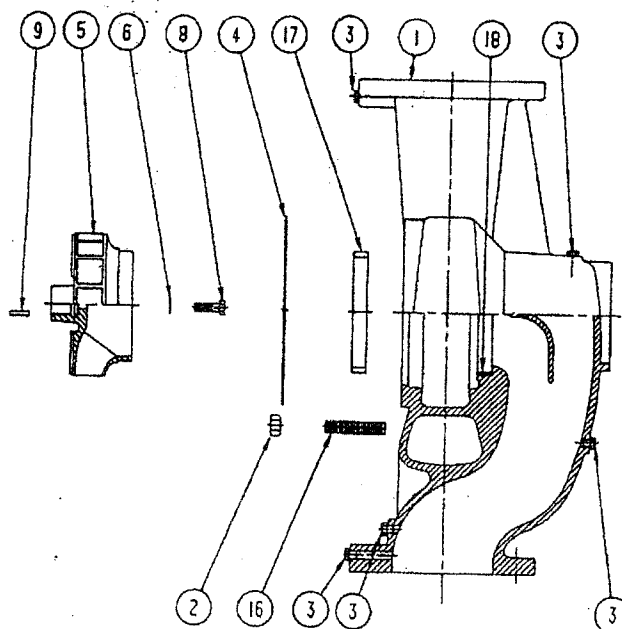
SUPERSEDES: NEW

EFFECTIVE: SEPTEMBER 1, 1999

WHEN SELECTING AND ORDERING PARTS, ALWAYS REFER TO SERIAL NUMBER ON NAME PLATE

NOMINAL IMP. DIA. — Example —
 FLANGE SIZE —
 VI — 00 00 00 0 0 0 000000
 SEAL DESIGN —

MOTOR INDEX CODE
 DESIGN NUMBER
 MOTOR FRAME
 MATERIAL OF CONSTRUCTION



ITEM NO.	NO. REQ.	DESCRIPTION	2008	2008	2508	2508
			FRAME H, J or K	FRAME L	FRAME H, J or K	FRAME L, M or N
1	1	CASING	950-1050RP	950-1050RP	950-1053RP	950-1053RP
2	8	NUT	←-----HARDWARE----->			
3	5	1/4" NPT PLUG	←-----HARDWARE----->			
4	1	GASKET	←-----950-023RP----->			
5	1	IMPELLER (CI)	950-1069RP	950-1097RP	950-1100RP	950-1072RP
5	1	IMPELLER (BRZ)	950-1069BRP	950-1097BRP	950-1100BRP	950-1072BRP
6	1	IMPELLER WASHER	951-2578RP	951-2578RP	951-2578RP	951-2579RP
8	1	IMPELLER BOLT	←-----HARDWARE----->			
9	1	IMPELLER KEY	←-----HARDWARE----->			
16	8	STUD	←-----950-1159RP----->			
17	1	WEAR RING (CI)	950-1164RP	950-1164RP	950-1165RP	950-1165RP
17	1	WEAR RING (BRZ)	950-1164BRP	950-1164BRP	950-1165BRP	950-1165BRP
18	1	DOWEL PIN	←-----N/A----->			

COMPARE. YOU'LL TAKE TACO.

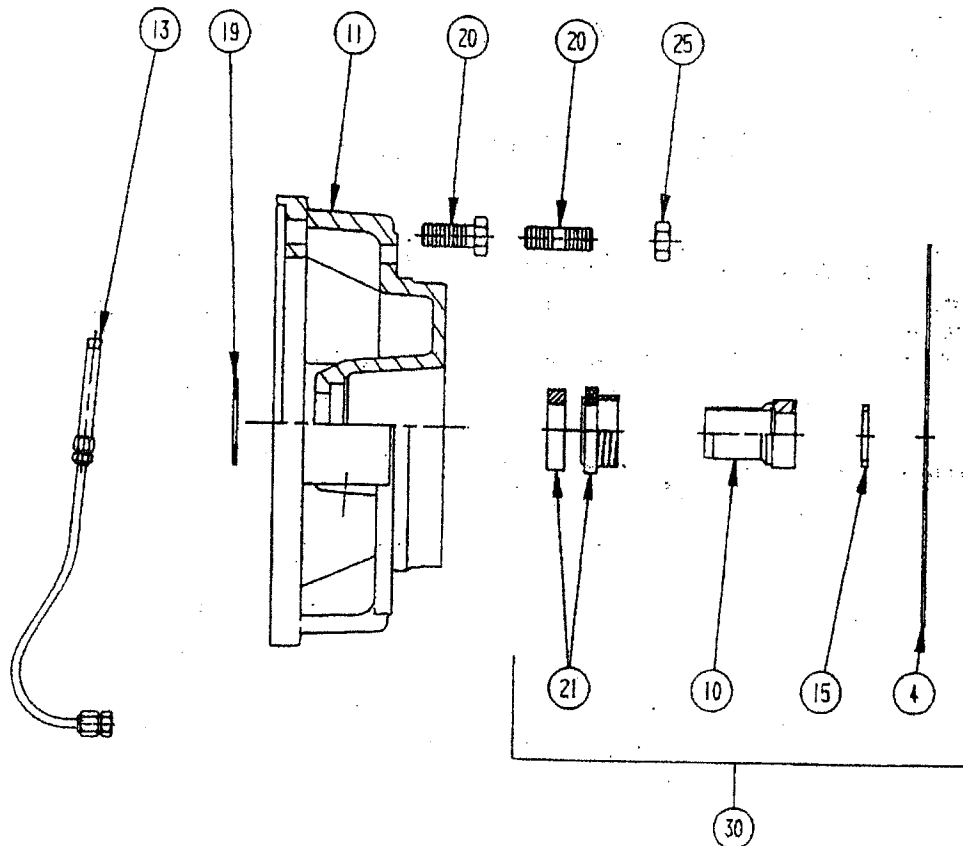
TACO, INC., 1160 Cranston Street, Cranston, RI 02920 (401) 942-8000

TACO (CANADA) LTD., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3

FAX: (401) 942-2360.

(905) 564-9422 FAX: (905) 564-9436.

Printed in USA



SEAL KIT INCLUDES ITEMS NO. 4, 6, 10, 15 & 21

ITEM NO.	NO. REQ.	DESCRIPTION	MOTOR FRAME			
			H or J	K	L	M or N
4	1	GASKET	SEE PAGE NO. 1			
10	1	SLEEVE (SS)	951-3034RP		951-3035RP	
10	1	SLEEVE (BRZ)	951-3034BRP		951-3035BRP	
11	1	COVER/BRACKET	3008	951-2285RP	951-2287RP	951-2289RP
			5008	N/A	951-2412RP	951-2290RP
13	1	TUBE FITTING KIT	951-247RP			
15	1	SLEEVE GASKET	951-3041RP		951-3042RP	
19	1	DEFLECTOR	N/A			
21	1	SEAL (TYPE E)	951-3161RP		951-3162RP	
21	1	SEAL (TYPE D)	951-3159RP		951-3160RP	
30	1	SEAL KIT (TYPE E)	(SS)	951-3161SRP		951-3162SRP
			(BRZ)	951-3161BRP		951-3162BRP
30	1	SEAL KIT (TYPE D)	(SS)	951-3159SRP		951-3160SRP
			(BRZ)	951-3159BRP		951-3160BRP
20	4	STUD	3008	N/A		
			5008	N/A	16-509RP	N/A
20	4	BOLT	HARDWARE			
25	4	NUT	HARDWARE			

PRODUCT RETURNS/WARRANTY

Commercial Pump Warranty Terms (Models CE, FE, VC, VI, TA)

Taco, Inc. will repair or replace without charge (at the Company's option) any commercial pump product or part which is proven defective under normal use within one (1) year from date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under warranty, it is the responsibility of the purchaser to promptly notify the Company in writing and promptly deliver the item in question, delivery prepaid to the factory. For complete details on warranty returns, the purchaser should contact a local Taco stocking distributor or the Company. If the product or part in question contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Motors provided on commercial pumps are not covered by this warranty, and are warranted by the motor manufacturer. For complete details on motor warranty returns, the purchaser should contact the motor manufacturer's local service repair center or contact the motor manufacturer directly.

Seals provided on commercial pumps are not covered by this warranty.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subjected to misuse, misapplication, the presence of certain chemicals (such as solvents, acids, etc.) or other abuse will not be covered by this warranty. For complete information on chemical and application restrictions, the purchaser should contact the company.

Taco, Inc. reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

Taco Incorporated offers this warranty in lieu of all other express or implied warranties. No warranties are made for merchant ability or fitness for use and there are no warranties that extend beyond the description contained herein. Taco, Inc. will not be liable for any special, incidental, or consequential damages.

Taco, Inc. 1160 Cranston Street, Cranston, RI 02920 (401) 942-8000

PRODUCT RETURNS/WARRANTY

Warranty Terms

All products except 00 series circulators, 570 series electric zone valves, commercial pumps, and commercial circulators. See separate statements of warranty terms for these products.

Taco, Inc. will repair or replace without charge (at the Company's option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the Company in writing and promptly deliver the item in question, delivery prepaid to the factory. For complete details on warranty returns, the purchaser should contact a local Taco stocking distributor or the Company. If the product or part in question contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subjected to misuse, misapplication, the presence of certain chemicals (such as solvents, acids, etc.) or other abuse will not be covered by this warranty. For complete information on chemical and application restrictions, the purchaser should contact the Company.

Taco, Inc. reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

Taco, Incorporated offers this warranty in lieu of all other express or implied warranties. No warranties are made for merchant ability or fitness for use and there are no warranties that extend beyond the description contained herein. Taco, Inc. will not be liable for any special, incidental or consequential damages.

Taco, Inc. 1160 Cranston Street, Cranston, RI 02920 (401) 942-8000

Scoop Rev. 10/00

Section VI Page 22



Instruction Sheet CA & PAX Expansion Tanks

402-002

SUPERSEDES: 402-002 dated May 1, 2001

EFFECTIVE: October 15, 2001

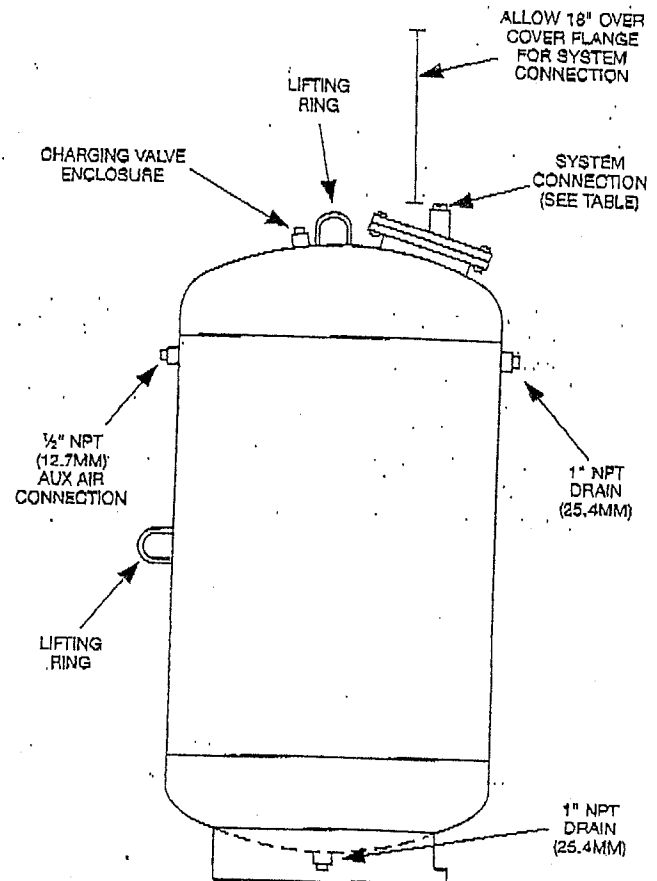
Plant ID No. 001-398

CA Tanks

1. Note location on the tank of the system connection, charging valve enclosure, and the drain plug. Note labels on the tank or refer to Diagram 1 - Location of Tank Fittings.
2. Carefully remove the plastic protective cover in the system connection coupling located at the center of the cover flange. Pause before completely removing to allow any trapped air to escape. There should not be much, if any, air pressure under the protective cover.

CAUTION: DO NOT REMOVE THE PIPE PLUGS LOCATED ON THE SIDE AND BOTTOM OF THE TANK (TANK DRAINS). THESE PLUGS SHOULD NEVER BE REMOVED UNLESS NECESSARY AND THEN ONLY AFTER THE AIR PRESSURE IN THE TANK HAS BEEN BLEDED OFF TO ZERO GAUGE PRESSURE. BEFORE BLEEDING OFF ANY OF THE AIR CHARGE, ALWAYS ISOLATE THE TANK FROM THE SYSTEM WITH A SHUT-OFF VALVE.

3. Before making any connections to the tank, check the tank air charge. Use an accurate automotive or similar type gauge on the air valve located on the top head of the tank. **The air charge pressure must be equal to the pre-charge pressure specified for the system. Refer to the label on the tank for the specified tank pre-charge pressure. In most cases the specified tank pre-charge pressure is equal to the system fill pressure at the tank location. Use Diagram No. 3 - Air Charge Check Chart to correct the value read on the pressure gauge for the ambient temperature at the tank location.**
4. The pipe connection to the system may now be made. The piping requirements for captive air tanks are different from those of plain steel expansion tanks. Note the Captive Air Tank Piping Diagrams. Piping and air elimination devices should be arranged so that air will not be trapped in the tank, above the tank or in the nozzle. Pitch the piping connection up away from the tank and use automatic air vents where necessary. Note the piping diagram.
5. Locate the CA tank connection as close as possible to the suction side of the pump. This ensures that the pressures realized from the pump head will be additive in the system. A combination shut-off and drain valve should be located in the connection piping to provide for tank



SYSTEM CONNECTION	
CA140 TO CA2000	1½" NPT (38MM)
CA4000 & CA5000	2" NPT (51MM)
CA7500 & CA10000	3" NPT (76MM)

Diagram 1 - Location of Tank Fittings

PAX Tanks

1. Note location on the tank of the system connection, charging valve enclosure, coupling and the drain plug. Note labels on the tank or refer to Diagram 2 – Location of Tank Fittings.
2. Carefully remove the shipping pipe-cap on the system connection located in the center of the tank head. Pause before completely removing to allow any trapped air to escape. There should not be much, if any, air pressure under the protective cover.

CAUTION: DO NOT REMOVE THE PIPE PLUGS LOCATED ON THE SIDE AND BOTTOM OF THE TANK (TANK DRAINS). THESE PLUGS SHOULD NEVER BE REMOVED UNLESS NECESSARY AND THEN ONLY AFTER THE AIR PRESSURE IN THE TANK HAS BEEN BLEDED OFF TO ZERO GAUGE PRESSURE. BEFORE BLEEDING OFF ANY OF THE AIR CHARGE, ALWAYS ISOLATE THE TANK FROM THE SYSTEM WITH A SHUT-OFF VALVE.

Before making any connections to the tank, check the tank air charge. Use an accurate automotive or similar type gauge on the air valve located on the top head of the tank. **The air charge pressure must be equal to the pre-charge pressure specified for the system.** Refer to the label on the tank for the specified tank pre-charge pressure. In most cases the specified tank pre-charge pressure is equal to the system fill pressure at the tank location. Use Diagram No. 3 – Air Charge Check Chart to correct the value read on the pressure gauge for the ambient temperature at the tank location.

4. The pipe connection to the system may now be made. The piping requirements for captive air tanks are different from those of plain steel expansion tanks. Note the Captive Air Tank Piping Diagrams. Piping and air elimination devices should be arranged so that air will not be trapped in the tank, above the tank or in the nozzle. Pitch the piping connection up away from the tank and use automatic air vents where necessary. Note the piping diagram.
5. Locate the PAX tank connection as close as possible to the suction side of the pump. This ensures that the pressures realized from the pump head will be additive in the system. A combination shut-off and drain valve should be located in the connection piping to provide for tank isolation during the initial hydrostatic test.

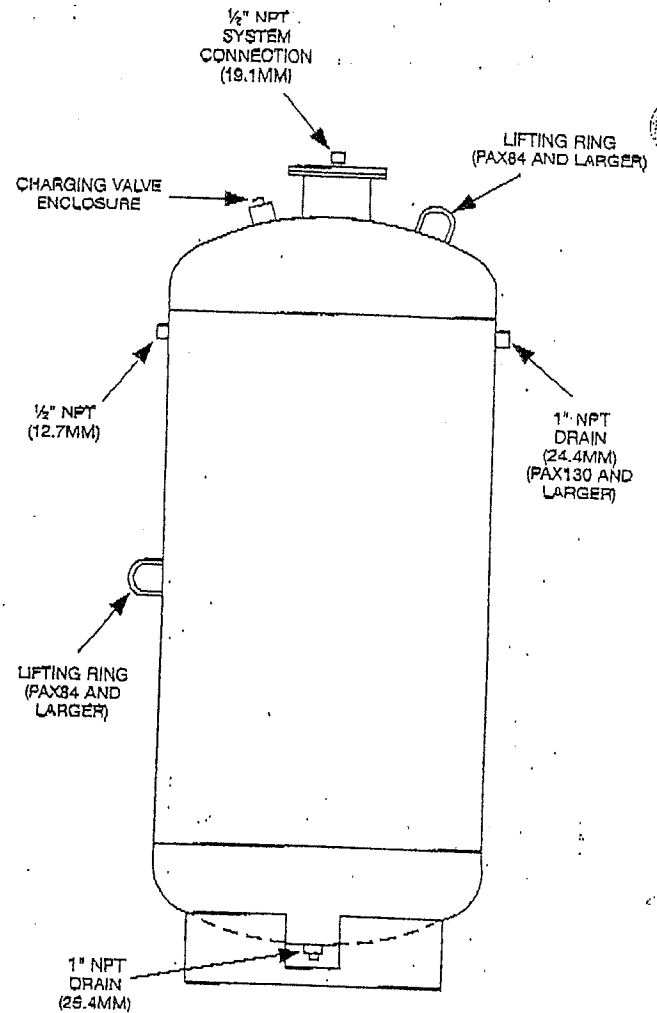


Diagram 2 – Location of Tank Fittings

Air Charge Check Chart

How to Use the Chart

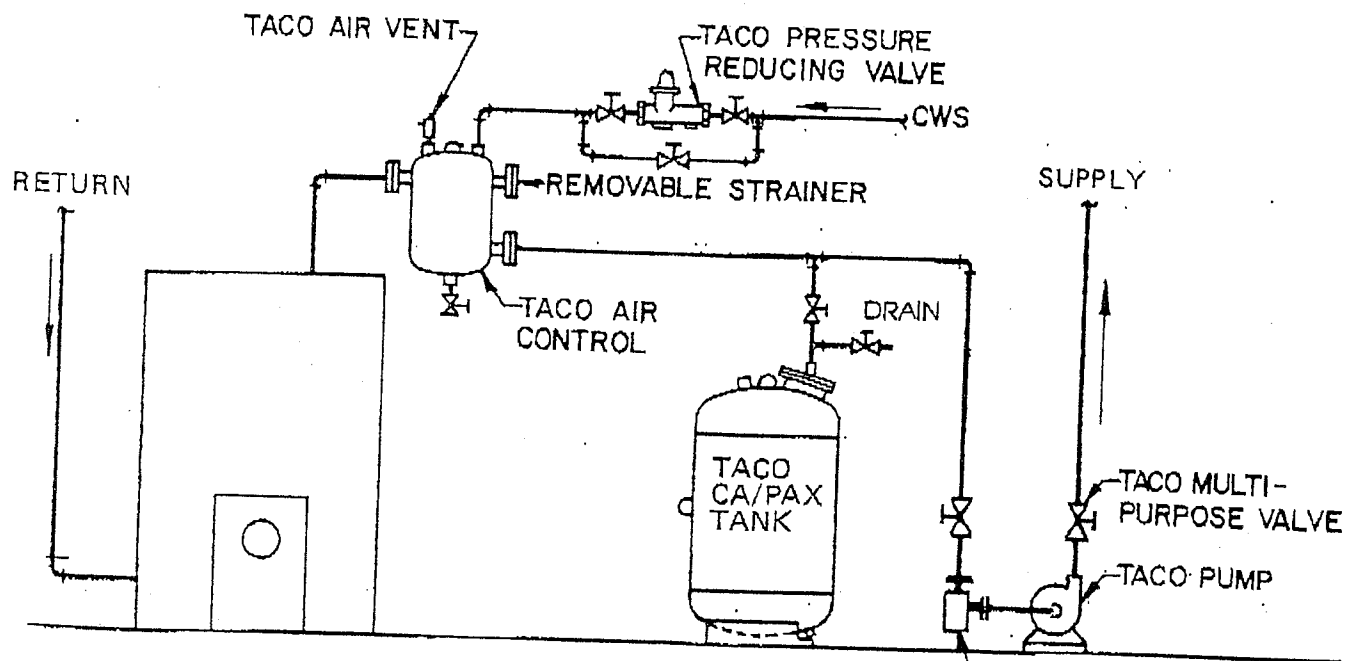
Specified Pre Charge Pressure P.S.I. (at 68°F)	Ambient Temperature (°F)								
	36	44	52	60	68	76	84	92	100
12	10.4	10.8	11.2	11.6	12.0	12.4	12.8	13.2	13.6
20	17.9	18.4	18.9	19.5	20.0	20.5	21.1	21.6	22.1
30	27.3	28.0	28.6	29.3	30.0	30.7	31.4	32.0	32.7
40	36.7	37.5	38.2	39.2	40.0	40.8	41.6	42.5	43.3
50	46.1	47.1	48.0	49.0	50.0	51.0	52.0	52.9	53.9
60	55.5	56.6	57.7	58.9	60.0	61.1	62.3	63.4	64.5
70	64.9	66.1	67.4	68.7	70.0	71.3	72.6	73.9	75.1

Diagram 3 - Air Charge Check Chart

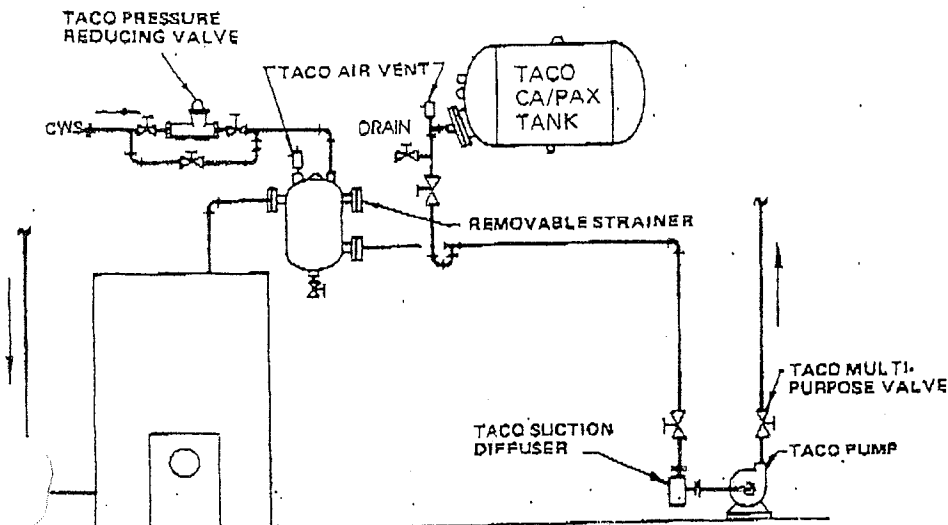
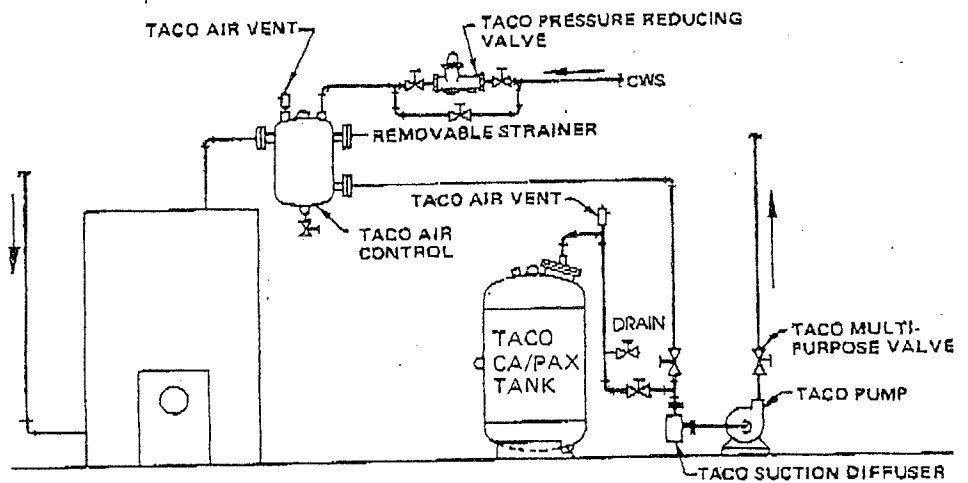
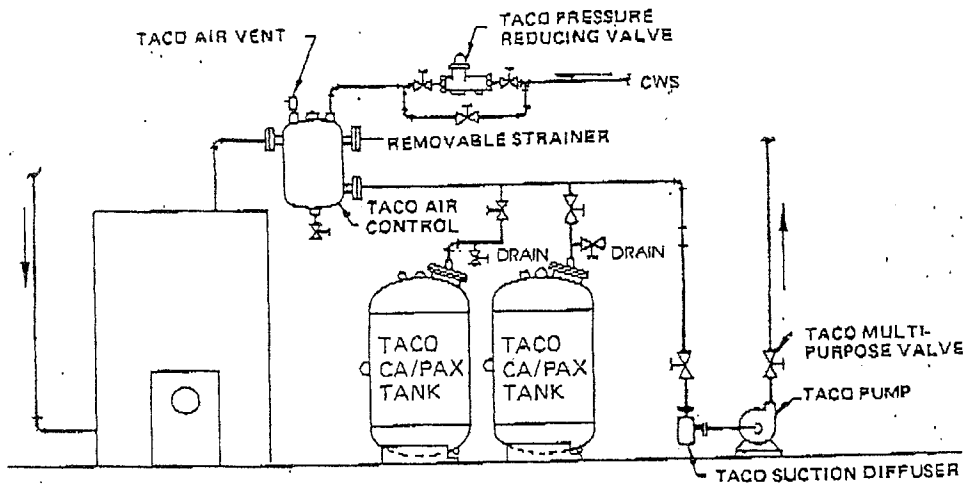
1. Determine ambient air temperature where the tank is being checked.
2. Locate the specified pre-charge pressure in the left hand column.
3. Follow across horizontally to the number under the ambient air temperature.
4. The number found under Step No. 3 is the temperature corrected air charge pressure in p.s.i. and should agree with the gauge reading observed at the tank.
5. If the temperature corrected air charge pressure differs by more than 1 p.s.i. from the pre-charge pressure specified for the system, then correct it by bleeding pressure through the air charge valve or by adding pressure with an air compressor.

Captive Air Tank Piping Diagrams

Recommended Location



Captive Air Tank Piping Diagrams – Alternate Locations



Do it Once. Do it Right.

TACO, INC., 1160 Cranston Street, Cranston, RI 02920 Telephone: (401) 942-8000 FAX: (401) 942-2360.
TACO (Canada), Ltd., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3. Telephone: 905/564-9422. FAX: 905/564-9436.

Visit our web site at: <http://www.taco-hvac.com>

Printed in USA
Copyright 2001
TACO, Inc.



Instruction Sheet

402-014

CAX EXP Tank Replacement Bag

SUPERSEDES: NEW

EFFECTIVE: MARCH 21, 1988

PLANT I.D. #001-953

Before proceeding with replacement, read instructions carefully and check that you have required tools and supplies available.

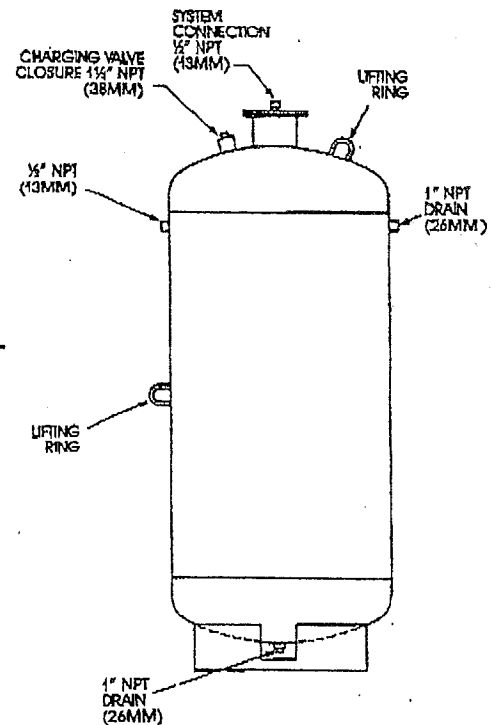
- Plumbers tool box
- Source for compressed air
- 20 foot light cord
- Extension cord
- Rope
- Pressure Gauge
- Air valve tool to remove valve core
- Replacement bag

TO REMOVE EXISTING BAG

- A. Isolate tank from system.
- B. Remove air valve cover to bleed remaining air from tank by removing valve core.
- C. When system is at zero gauge pressure, remove head bolts and head, pull out enough hose to detach hose clamp at the head, remove hose from head fitting.
- D. Lubricate inner surface of nozzle with soap or soapy water.
 - * **NOTE: DO NOT USE HYDROCARBON GREASE OR OIL, AS THEY ATTACK THE BAG MATERIAL.**
- E. Twist the bag so that it wraps itself cylindrically about the internal hose. Then lift and twist bag, gradually working it up through the nozzle until it is out of tank.
- F. If a drain plug is removed, install using a seal compound or equivalent. Connection must be absolutely air tight, otherwise, air charge will be lost.
 - * **NOTE: To inspect bag: follow steps A thru F**

TO INSTALL NEW BAG

- A. Roll up new bag lengthwise and tie with rope if needed.
- B. It is best to re-assemble upper hose to the cover fitting, re-install the hose clamp and air test for tightness before replacing bag into tank. Then insert bag into tank thru tank flange.
- C. If rope is used to tie bag, remove rope ties as they near tank opening.
- D. Assemble upper flange, tightening bolts evenly.
- E. Apply 1 psi air pressure to flange connection to ensure proper positioning of the bag, then relieve pressure.
- F. Re-install air valve core and charge to fill pressure or minimum operating pressure.
- G. Check the drain fitting, air valve, and flange joint for leakage using soapy water.
- H. Connect tank to system, open fill-valve and check operation.
 - * **NOTE: ALWAYS PRE-CHARGE TANK BEFORE COMPLETING THIS LAST STEP.**



COMPARE. YOU'LL TAKE TACO.

TACO, Inc., 1160 Cranston St., Cranston, RI 02920 (401) 942-8000 Telex: 92-7627

Printed in U.S.A.
Copyright 1988
TACO, INC.

PRODUCT RETURNS/WARRANTY

Warranty Terms

All products except 00 series circulators, 570 series electric zone valves, commercial pumps, and commercial circulators. See separate statements of warranty terms for these products.

Taco, Inc. will repair or replace without charge (at the Company's option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the Company in writing and promptly deliver the item in question, delivery prepaid to the factory. For complete details on warranty returns, the purchaser should contact a local Taco stocking distributor or the Company. If the product or part in question contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subjected to misuse, misapplication, the presence of certain chemicals (such as solvents, acids, etc.) or other abuse will not be covered by this warranty. For complete information on chemical and application restrictions, the purchaser should contact the Company.

Taco, Inc. reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

Taco, Incorporated offers this warranty in lieu of all other express or implied warranties. No warranties are made for merchant ability or fitness for use and there are no warranties that extend beyond the description contained herein. Taco, Inc. will not be liable for any special, incidental or consequential damages.

Taco, Inc. 1160 Cranston Street, Cranston, RI 02920 (401) 942-8000

**Commercial Pump Warranty Terms
(Models CE, FE, VC, VI, TA)**

Taco, Inc. will repair or replace without charge (at the Company's option) any commercial pump product or part which is proven defective under normal use within one (1) year from date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under warranty, it is the responsibility of the purchaser to promptly notify the Company in writing and promptly deliver the item in question, delivery prepaid to the factory. For complete details on warranty returns, the purchaser should contact a local Taco stocking distributor or the Company. If the product or part in question contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Motors provided on commercial pumps are not covered by this warranty, and are warranted by the motor manufacturer. For complete details on motor warranty returns, the purchaser should contact the motor manufacturer's local service repair center or contact the motor manufacturer directly.


Seals provided on commercial pumps are not covered by this warranty.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subjected to misuse, misapplication, the presence of certain chemicals (such as solvents, acids, etc.) or other abuse will not be covered by this warranty. For complete information on chemical and application restrictions, the purchaser should contact the company.

Taco, Inc. reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

Taco Incorporated offers this warranty in lieu of all other express or implied warranties. No warranties are made for merchant ability or fitness for use and there are no warranties that extend beyond the description contained herein. Taco, Inc. will not be liable for any special, incidental, or consequential damages.

Taco, Inc. 1160 Cranston Street, Cranston, RI 02920 (401) 942-8000

	INSTRUCTION SHEET
NUMBER IS-400-1.1(281)	Effective: March 1, 1981 Supersedes: IS400-2-1 dated 7/30/76

AIR**CONTROL**

1 — Select proper size based on flow (GPM) thru System

<i>Taco Air Control Less Strainer</i>	<i>Maximum Flow GPM</i>	<i>Taco Air Control With Strainer</i>
AC2	80	AC2F
AC25	130	AC25F
AC3	190	AC3F
AC4	330	AC4F
AC5	550	AC5F
AC6	900	AC6F
AC8	1500	AC8F
AC10	2600	AC10F
AC12	3400	AC12F
AC14	4700	AC14F
AC16	6000	AC16F
AC18	8000	AC18F
AC20	10000	AC20F

2 — Install Air Control in Supply Line between boiler and pump(s) as indicated in Diagram on reverse side.

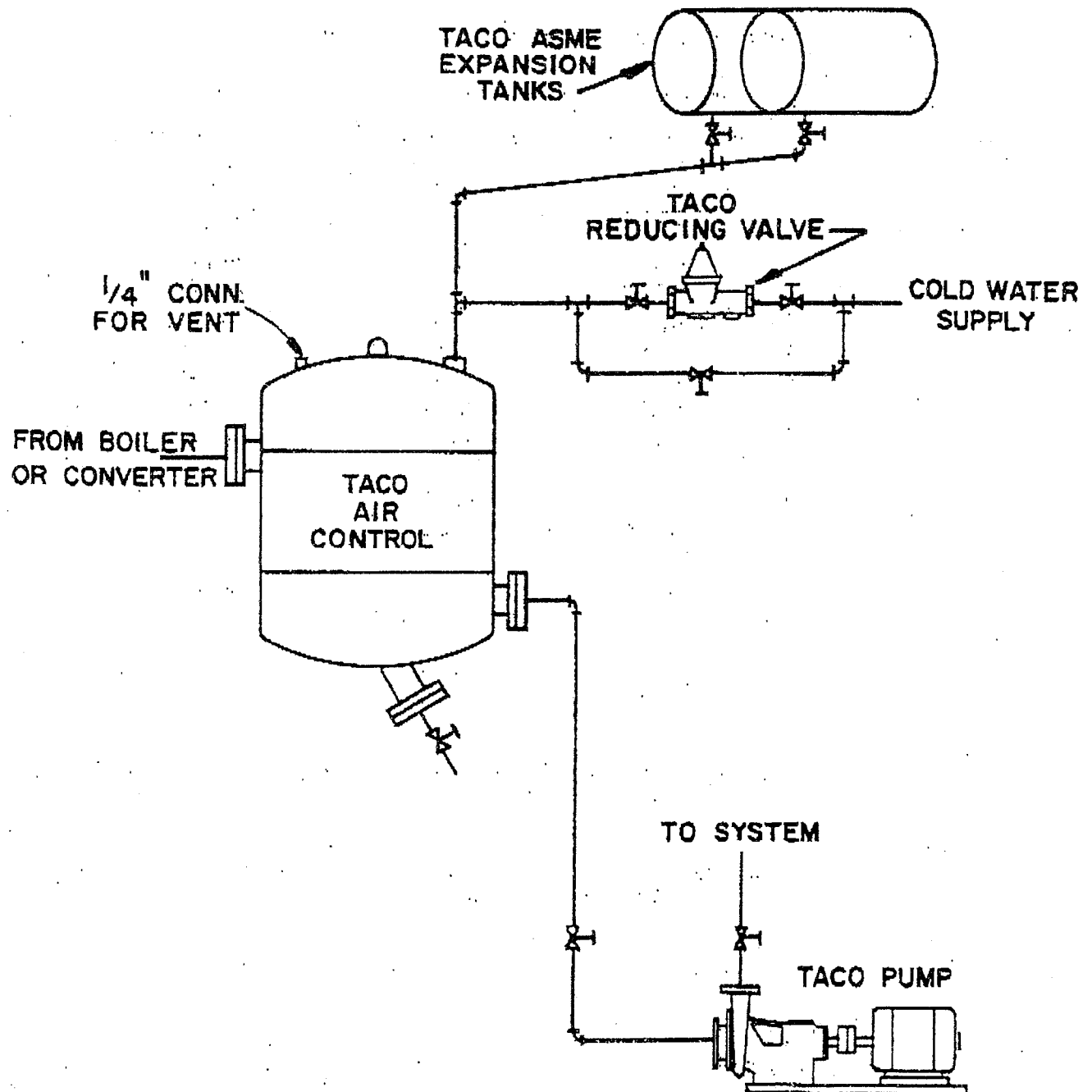
3 — Install Expansion Tank (s) as close to Air Control as possible with horizontal pipe (if any) pitching up to tank.

4 — If a shutoff valve is installed in Expansion Tank line, use a Gate Valve and make certain it is fully open when system is in operation.

5 — A connection for a Vent is provided at the top of the Air Control.

When the system is first filled, all you have to do is Vent heating units and high points if necessary for quick filling. Thereafter, any entrained air is separated continuously as water is pumped thru the Air Control.

AIR CONTROL



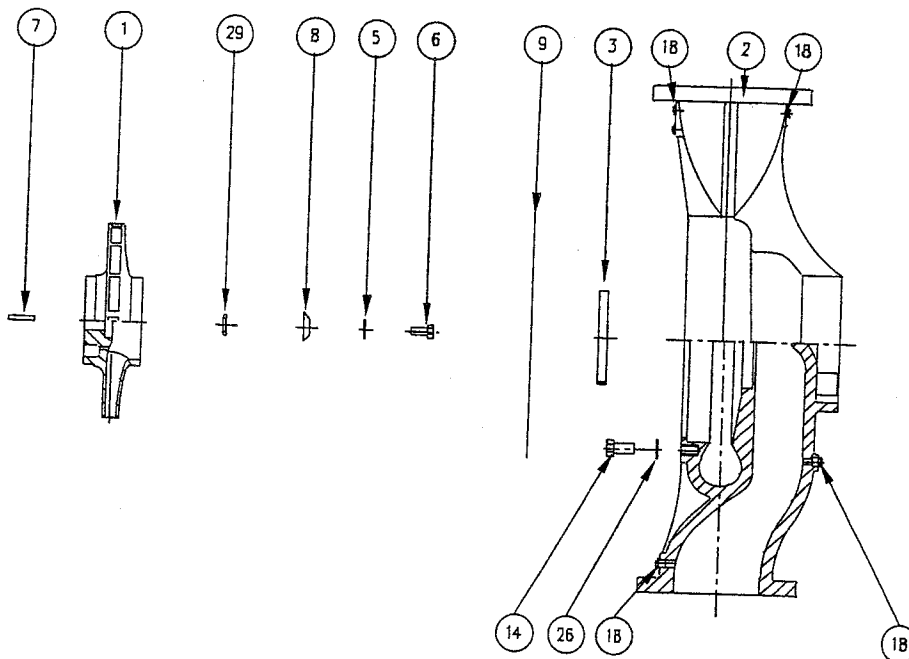
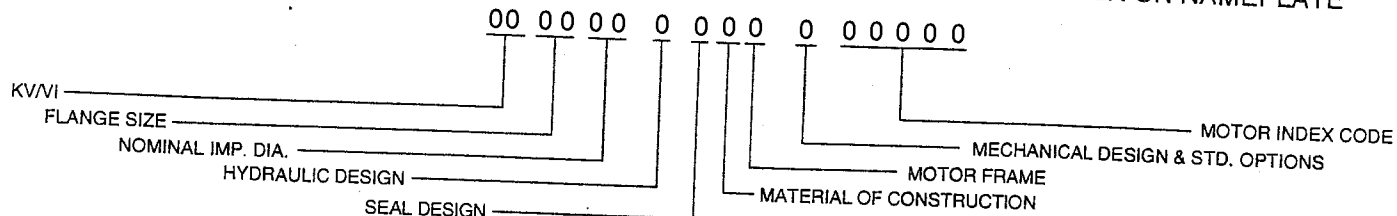


Replacement Parts List

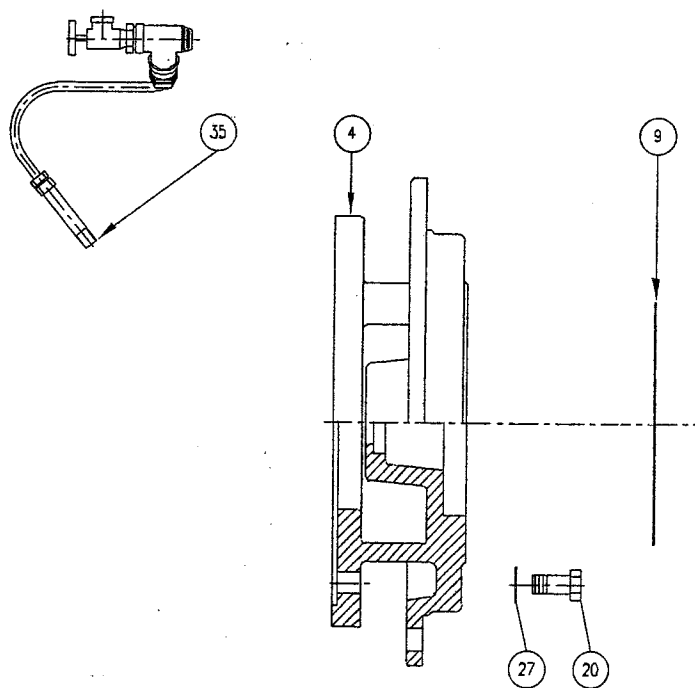
304- 329

KV 2009, 3009

WHEN SELECTING AND ORDERING PARTS, ALWAYS REFER TO SERIAL NUMBER ON NAMEPLATE



ITEM NO.	NO. REQ.	DESCRIPTION	2009	2009	3009	3009
			FRAME H,J OR K	FRAME L,M OR N	FRAME H,J OR K	FRAME L,M OR N
1	1	IMPELLER (CI)	953-1233RP	953-1235RP	953-1066RP	953-1068RP
1	1	IMPELLER (BRZ)	953-1234RP	953-1236RP	953-1067RP	953-1069RP
2	1	CASING (125#)(W/WR OPT)	953-1239RP	953-1239RP	953-1072RP	953-1072RP
2	1	CASING (250#)(W/WR OPT)	953-1240RP	953-1240RP	953-1073RP	953-1073RP
2	1	CASING (125#)(NO WR STD)	953-1427P	953-1427P	953-1431RP	953-1431RP
2	1	CASING (250#)(NO WR STD)	953-1429RP	953-1429RP	953-1433RP	953-1433RP
3	1(W/R)	WEAR RING (BRZ) (OPT)	953-1221RP	953-1221RP	953-1076RP	953-1076RP
5	1	DOWDY WASHER	951-2578RP	951-2579RP	951-2578RP	951-2579RP
6	1	IMPELLER BOLT	HARDWARE		HARDWARE	
7	1	IMPELLER KEY	HARDWARE		HARDWARE	
8	1	IMPELLER WASHER	953-828RP	953-829RP	953-828RP	953-829RP
9	1	GASKET (CASING)	953-1009RP	953-1009RP	953-1009RP	953-1009RP
14	8	CASING BOLT	HARDWARE		HARDWARE	
18	5	PIPE PLUG	HARDWARE		HARDWARE	
26	8	CASING WASHER	HARDWARE		HARDWARE	
29	1	IMPELLER GASKET	953-830RP	953-759RP	953-830RP	953-759RP



ITEM NO.	NO. REQ.	DESCRIPTION	MOTOR FRAME				MODEL NO
			H OR J	K	L	M OR N	
4	1	COVER	953-1242RP	953-1243RP	953-1244RP	953-1631RP	2009
4	1	COVER	953-849RP	953-853RP	953-900RP	953-903RP	3009
4	1	COVER	953-850RP	953-854RP	953-901RP	953-904RP	4009
	1	COVER	953-1131RP	953-1132RP	953-1129RP	953-1130RP	6009
9	1	GASKET (CASING)	SEE PAGE 1	SEE PAGE 1	SEE PAGE 1	SEE PAGE 1	ALL ABOVE
20	4	MOTOR BOLT	HARDWARE				
27	4	MOTOR WASHER	HARDWARE				
35	1	TUBE KIT	953-1547RP	953-1547RP	953-1547RP	953-1547RP	

Installation and Operation Instructions

SUPERSEDES: 302-012 dated 1994

EFFECTIVE: April 15, 2001

Plant ID No. 001-937

A: INSTALLATION

SAFETY REQUIREMENTS

- IMPORTANT!** These instructions should be read completely prior to installation of the equipment. A copy of these instructions should be retained on file for future reference.
- This pump is intended for the circulation of water or other suitable HVAC media. It is not intended for hazardous, corrosive, or flammable liquids.
- Pump must not be operated without guards in place.**
- Pump must not be operated until all plumbing and/or electrical connections are in place.
- Proper care and suitable equipment should be used to move and install this heavy equipment.
- Care should be taken when installing pipe systems to avoid placing an excessive load on the pump unions.
- Refer to motor installation instructions to determine proper terminal connections in order to obtain correct pump rotation.
- When the system piping is used as an earth bonding path for the building electrical services (check local codes), the pump should not be relied upon as part of the circuit. A properly installed bridging connection should be provided.
- If electrical connection is to be made using any means other than rigid conduit, proper strain relief must be provided (min 100N tension).
- Pump should be installed according to local electrical and safety codes using appropriate size wire and suitable over current protection. It should use a lockable isolator or circuit breaker conforming to EN60947-3.
- It is recommended that the pump be fitted with a suitable "emergency stop" per the requirements of EN418.
- It is recommended that sound (noise) level reading be taken following installation per requirement of EN809.

RECEIVING PUMP

- Check pump for shortage and damage immediately after arrival. Prompt reporting to the carrier's agent, with notations made on the freight bill, will expedite satisfactory adjustment by the carrier.
- Unload and handle the unit by lifting around the motor frame. Do not lift by pump casing or flanges.
- Pumps are shipped from the factory ready to mount on a solid base. They are painted with one finish coat. Required accessories are packaged in a separate container and shipped with the pump.
- If the pump is not to be installed and operated soon after arrival, store it in a clean dry place having slow moderate change in ambient temperature. Rotate the shaft weekly to coat the bearings with lubricant and to retard oxidation and corrosion. Follow motor storage recommendations.

A1: LOCATION

Locate pump in an easily accessible place with sufficient space around it for maintenance and servicing. On larger pumps

allow head room for the use of hoists or overhead cranes. Locate pump on a dry and clean place so that motor will be protected from moisture and dust.

On closed heating systems, place expansion tank at the suction side of the pump. When pump head is less than 20 feet, it is permissible to connect expansion tank to discharge side of the pump.

On open systems, install pump close to liquid supply and make suction piping as short and as straight as possible.

A2: FOUNDATION

The foundation serves to carry the pump weight and to absorb vibration. Normally, the foundation is made of a concrete pad, preferably tied in with the floor or ground. Make the foundation pad about 6" longer and 6" wider than the base of the frame. Height of the pad should be at least 6". When foundation is poured, provide a hole near each of the four (4) corners to match the holes in the pump base. To simplify installation and maintenance use lead Anchors.

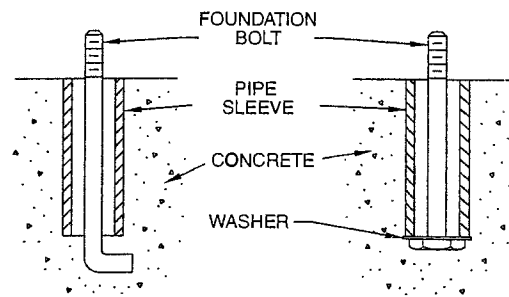


Fig. 1 – Anchor Bolts

A3: PUMP SETTING

When pump is set on its foundation, make sure to have it properly levelled. Place baseplate over foundation bolts. Place shims at corners of baseplate when required and level with a spirit gauge. Check also level of suction and discharge flanges.

A4: COUPLING ALIGNMENT



WARNING: UNEXPECTED STARTUP HAZARD

Disconnect and lockout power before servicing. Failure to follow these instructions could result in serious personal injury or death, or property damage.

Proper alignment of pump and driver will assure trouble-free operation and long life of the pump. Misalignment will cause rapid wear of seals, couplings and bearings. All pumps are carefully aligned before leaving the factory. However, experience indicates that alignment invariably changes in shipping and handling. Therefore, it is of utmost importance that alignment be checked at various steps of the installation process; i.e. after leveling, after piping and after first few weeks of operation.

Check alignment by placing a slotted straight edge across the coupling halves at top, bottom and at the sides. If any light is seen between the straight edge and one of the coupling flanges, it means the unit is out of alignment (Fig. 2).

If light is seen at top and bottom position of the straight edge, alignment is out of height. Usually shims are placed under the feet. Loosen the four motor bolts, remove or add shims as required to correct proper height. Tighten the motor bolts and check to make sure alignment was corrected properly.

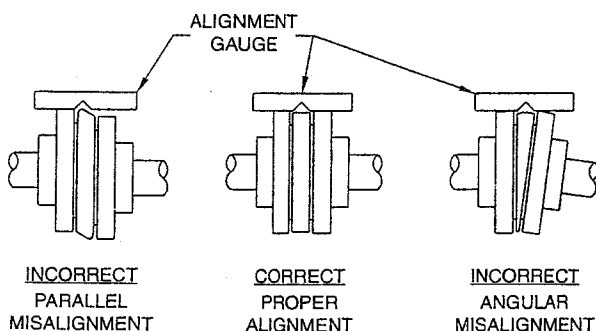


Fig. 2 – Coupling Alignment

If alignment is out on the sides of the coupling, loosen the four motor bolts and lightly tap the motor in the direction required. Tighten the four motor bolts and check to make sure alignment was corrected properly.

An alignment in one direction may alter the alignment in another. Be sure to check all alignments made.

ROTATING COMPONENT HAZARD

Do not operate pump without all guards in place. Failure to follow these instructions could result in serious personal injury or death, or property damage.

A5: GROUTING

When alignment is correct, the foundation bolts should be tightened evenly but not too firmly. The base plate can then be completely filled with grout, encasing the levelling shims or wedges. Foundation bolts should not be fully tightened until the grout is fully hardened, approximately 48 hours after pouring. Recheck alignment as outlined above.

A6: PIPING

Correct piping is of prime importance for the proper operation and long life of the pump. Stresses induced by piping will cause excessive wear of seals, bearings and couplings that could ultimately destroy these elements.

Both suction and discharge piping should be suspended close to the pump connections so that no pipe weight rests on the pump. Pipe flanges and pump flanges should align perfectly before connections are made. Piping should **never** be drawn by force into place.

Thermal expansion of piping requires special attention on heating installations. If no room is provided for pipe expansion, stresses are induced in the piping that will exert a load on the pump. Forces created by pipe stresses can exceed by far the weight of the pump, bend shafts, wear out seals and impeller wear rings and ultimately burn out bearings. To protect pump from thermal pipe stresses, provide spring hangers and flexible connectors that are suitable to compensate for pipe expansion. (Fig. 4)

Install gate valves on both suction and discharge side of the pump to allow servicing without draining the system.

On open pumping systems drawing water from a level below the pump (suction lift), install a foot valve with strainer.

On open systems where the pump is located below the suction water level (suction head), install a check valve in the discharge line close to the pump.

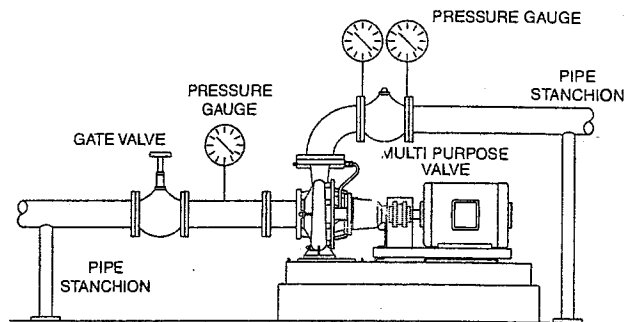


Fig. 3 – Typical Installation - Horizontal Piping

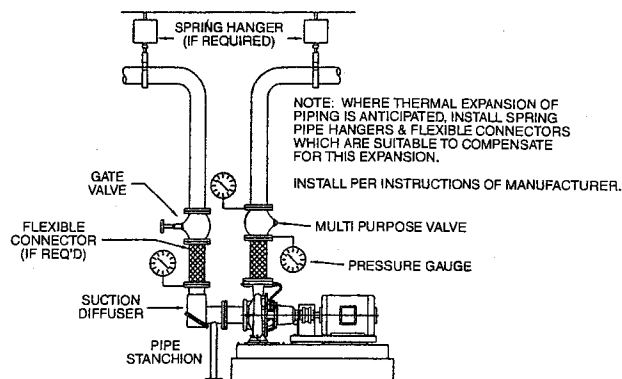


Fig. 4 – Typical Installation - Vertical Piping

A7: CONNECTING PIPING

Piping may now be connected to pump. Make sure that pump and pipe flanges are strictly parallel and properly spaced for the gasket that will be used. Also check that pipes are supported properly and **do not** rest on pump flanges. **Never** draw pipes by force to pump flanges. Recheck alignment after piping connections are made. If misalignment was caused by piping, it is a sign that pipe stresses distorted the pump. Correct piping to relieve stresses.

B: PUMP START-UP & OPERATION

Before starting up pump for the first time, several items are to be checked to avoid damaging pump.

B1: LUBRICATION

• FRAME MOUNTED PUMPS (Grease Lubricated Design)

NOTE: FI pump standard construction has permanently lubricated sealed bearings. For FI pumps with optional regreasable bearings and all FE pumps, follow instructions below.

Bearings are initially lubricated during manufacture. The regreasing interval depends upon the running speed of the unit:

PUMP RUNNING SPEED	REGREASING INTERVAL
1750 rpm	4250 hours
3450 rpm	2000 hours

To recharge the bearings with fresh grease, shut down pump (completely) and remove grease drain plug. Clean Alemite fitting and apply grease gun using enough strokes to equal 1.5 table-spoons. Restart pump and run for another fifteen minutes. Shut down pump (completely) and reinsert drain plug. Restart pump.

CAUTION: Overgreasing bearings can cause premature bearing failures. Do not mix dissimilar greases. Do not lubricate while pump is running. Do not remove or install drain plug while pump is running.

RECOMMENDED GREASES	
MAKE	GRADE
Exxon	Unirex N2
Valvoline	Valplex EP
Mobil	Mobilith AW2
Esso	Temperex N2

• CLOSE COUPLED PUMPS

The pump element is fixed directly to the motor shaft. Therefore, the motor bearings must be lubricated in accordance with the manufacturer's recommendations.

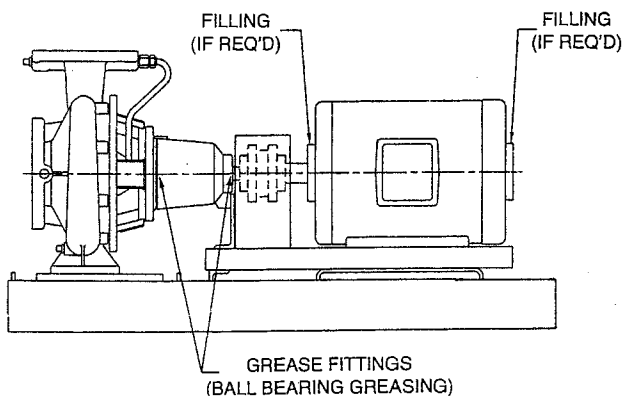


Fig. 5 – Lubrication Points

B2: MOTOR WIRING & ROTATION

Check wiring of motor before starting to make sure that connections are wired properly for the voltage in use. Overvoltage can burn out motor windings. Check heater element in magnetic starter to see that it is properly sized to adequately handle the full load amp draw of the motor.

Before attempting to check out rotation of pump, open isolation valves and fill pump with water to provide lubrication of the seal. **Never operate the pump dry!!!**

Next throw the switch and see if direction of rotation corresponds with arrows on frame of pump. The direction of rotation is counterclockwise facing the suction end of pump. Direction of rotation of three phase motors can be easily reversed by interchanging two of the three wires at the terminal board of the motor. Reversing of single phase motors is done by interchanging some internal wires or clamps. Instructions for reversing are found either on the motor nameplate or inside the motor terminal cover.

B3: PUMP START-UP

After you have checked lubrication and wiring, you are ready to start the pump.

Make sure the isolation valve is open on the suction side and close the valve on the discharge side. Start motor. Wait until unit has come to full speed and then open discharge valve slowly. Do not run pump for more than a few minutes with completely shut discharge valve. If system conditions call for part-time operation against shut valves, install a bypass line from discharge to suction.

• OPERATION - BEFORE STARTING

The pump is ready for starting when:

- The unit base plate is grouted and bolted to the foundation.
- Motor is correctly wired to starter switch, ensuring correct rotation.
- Pump and driver are correctly aligned.
- Bearing lubrication is provided.
- Mechanical seal has been fitted.
- All rotating parts are found to be free when turned by hand.
- Pump is primed. **Never run the unit dry.** The liquid in the pump serves as a lubricant for close running fits within the pump and the pump may be damaged if operated dry. The pump may be primed by using an ejector, exhauster or vacuum pump. If a foot valve is used in the suction line, the pump may be primed by venting and filling the casing and suction line with liquid.

B4: MECHANICAL SEAL

Mechanical seals are the most delicate component of the pump. Special care has to be given to them to assure trouble-free operation.

The sealing element of a mechanical seal consists of a carbon washer rotating against a stationary metallic or ceramic ring. Surfaces of both are highly lapped to assure sealing.

Any dirt that penetrates between the two mating parts will cause a rapid wear of the seal faces and will ultimately result in seal leakage.

New heating systems are usually contaminated by various materials such as construction debris, welding slugs, pipe joint compound, mill scale, etc. It is of utmost importance that such systems be cleaned out thoroughly before putting pump into continuous operation.

Cleaning of a heating system is simple and easy. First flush out system with cold water at city pressure to remove all loose foreign matter that penetrated into the system. Afterwards, boil out system with chemicals to remove dirt adhering to pipes.

Chemicals most commonly used for this procedure are sodium triphosphate, sodium carbonate, or caustic soda but any non-foaming detergents as used in dishwashers can be applied.

Fill system with clean water, add cleaning chemicals (1 lb. for every 40 to 50 gallons of water or manufacturer's instruction). Start pump and heat up system. Let system run for a few hours and then drain and refill with fresh water. Your pumps are now ready for continuous duty.

CAUTION: The addition of certain chemical additives to systems utilizing TACO equipment voids the warranty.

Problem Analysis

A. NO DISCHARGE

1. Pump not primed
- Speed too low (when direct connected to electric motor, determine whether or not motor is across the line and receives full voltage)
3. System head too high
4. Suction lift higher than that for which pump is designed
5. Impeller completely plugged
6. Wrong direction of rotation
7. Air leak in the suction line
8. Air leak through stuffing box

B. INSUFFICIENT DISCHARGE

1. Air leaks in suction line or stuffing box
2. Speed too low (when direct connected to electric motor, determine whether or not motor is across the line and receives full voltage)
3. System head higher than anticipated
4. Insufficient NPSH (net positive suction head). Suction lift too high. Check with gauges. Check also for clogged suction line or screen.
5. Not enough suction head for hot or volatile liquids
6. Foot valve too small
7. Impeller partially plugged
8. Mechanical defects:
 - Wearing rings worn
 - Impeller damaged
 - Foot valve or suction opening not submerged enough
 - Wrong direction of rotation

C. INSUFFICIENT PRESSURE

1. Speed too low (when direct connected to electric motor, determine whether or not motor is across the line and receives full voltage)
2. System head less than anticipated
3. Air or gas in liquid
4. Mechanical defects:
 - Wearing rings worn
 - Impeller damaged
 - Impeller diameter too small
 - Wrong direction of rotation

D. LOSS OF SUCTION FOLLOWING PERIOD OF SATISFACTORY OPERATION

1. Leaky suction line
2. Waterseal plugged
3. Suction lift too high or insufficient NPSH
4. Air or gas in liquid
5. Casing gasket defective
6. Clogging of strainer

E. EXCESSIVE POWER CONSUMPTION

1. Speed too high
2. System head lower than rating, pumps too much liquid
3. Specific gravity or viscosity of liquid is too high
4. Mechanical defects:
 - Shaft bent
 - Rotating element binds
 - Stuffing boxes too tight
 - Wearing rings worn

F. VIBRATION

1. Air leak in suction line
2. Air or gas in liquid
3. Impeller partially plugged
4. Mechanical defects:
 - Damaged impeller
 - Misalignment of pump and driver
 - Bearing worn
 - Rotor out of balance
 - Shaft bent
5. Foundation not rigid

G. MOTOR RUNS HOT

1. Speed too high
2. Specific gravity or viscosity of liquid pumped is too high
3. Mechanical defects:
 - Shaft bent
 - Rotating element binds
 - Defects in motor
 - Voltage and/or frequency lower than rating
 - Misalignment of pump and driver

H. PUMP BEARINGS OVERHEAT

1. Contaminated lubricant
2. Mechanical defects:
 - Shaft bent
 - Rotor out of balance
 - Misalignment of pump and driver



Commercial Pump Warranty Terms

(Models FI, CI, FE, CE, KV, KS, TA)

Taco, Inc. will repair or replace without charge (at the Company's option any commercial pump product or part which is proven defective under normal use within one year from date of start-up or one year and six months from date of shipment (whichever occurs first).

In order to obtain service under warranty, it is the responsibility of the purchaser to promptly notify the Company in writing and promptly deliver the item in question, delivery prepaid to the

factory. For complete details on warranty returns, the purchaser should contact a local Taco stocking distributor or the Company. If the product or part in question contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination or repair.

Motors provided on commercial pumps are not covered by this warranty, and are warranted by the motor manufacturer. For complete details on motor warranty returns, the purchaser should contact the motor manufacturer's local service repair center or contact the motor manufacturer directly.

Seals provided on commercial pumps are not covered by this warranty.

Any Taco product or part not installed or operated in conformity with Taco instructions or which

has been subjected to misuse, misapplication, the presence of certain chemicals (such as solvents, acids, etc.) or other abuse will not be covered by this warranty. For complete information on chemical and application restrictions, the purchaser should contact the company.

Taco, Inc. reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

Taco, Incorporated offers this warranty in lieu of all other express or implied warranties. No warranties are made for merchantability or fitness for use and there are no warranties which extend beyond the description contained herein. Taco, Inc. will not be liable for any special, incidental, or consequential damages.

Do it Once. Do it Right.

TACO, INC., 1160 Cranston Street, Cranston, RI 02920 Telephone: (401) 942-8000 FAX: (401) 942-2360.

TACO (Canada), Ltd., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3. Telephone: 905/564-9422. FAX: 905/564-9436.

Visit our web site at: <http://www.taco-hvac.com>

Printed in USA

Copyright 2001

TACO, Inc.



KV Vertical In-Line Pump

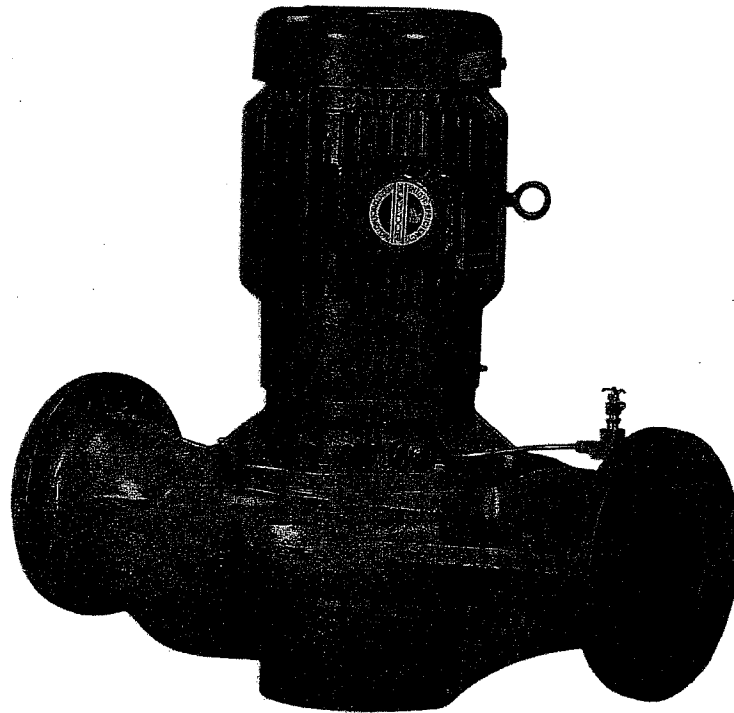
302-031

Installation, Operation & Maintenance Manual

SUPERSEDES: New

EFFECTIVE: November 15, 2000

Plant ID No. 001-1013

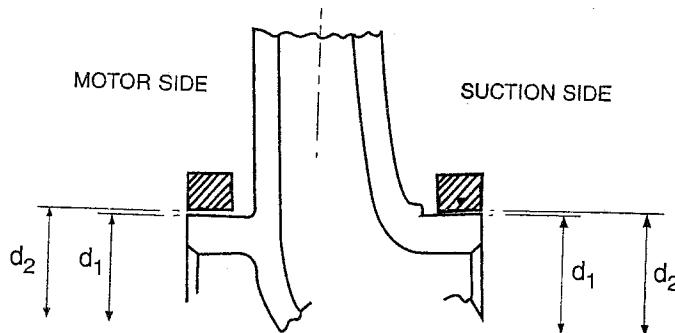


**KV Vertical
In-Line Pump**

APPLICATION

1. Working Pressure: 175 psig
 Optional Working Pressure: 300 psig
 Temperature: 250°F Standard
 300°F Hi Temperature

CASING/IMPELLER WEAR RING CLEARANCES



KV CASING/IMPELLER WEAR RING CLEARANCE

PUMP SIZE	WEAR RING-SUCTION SIDE				CLEARANCE	
	DIA d ₁		DIA d ₂			
	MAX	MIN	MAX	MIN	MAX	MIN
1506	2.363	2.361	2.377	2.375	.016	.012
1507	2.738	2.736	2.752	2.750	.016	.012
2006	2.863	2.861	2.877	2.875	.016	.012
2007	2.938	2.936	2.952	2.950	.016	.012
2009	3.363	3.361	3.377	3.375	.016	.012
2011	3.488	3.486	3.502	3.500	.016	.012
3006	3.238	3.236	3.252	3.250	.016	.012
3007	3.688	3.686	3.702	3.700	.016	.012
3009	3.613	3.611	3.627	3.625	.016	.012
3011	3.988	3.986	4.002	4.000	.016	.012
3013	3.738	3.736	3.752	3.750	.016	.012
4007	4.238	4.236	4.252	4.250	.016	.012
4009	4.611	4.609	4.627	4.625	.018	.014
4011	4.738	4.736	4.752	4.750	.016	.012
4013	4.613	4.611	4.627	4.625	.016	.012
5007	4.988	4.986	5.002	5.000	.016	.012
6009	5.861	5.859	5.877	5.875	.018	.014
6011	5.861	5.859	5.877	5.875	.018	.014
6013	5.861	5.859	5.877	5.875	.018	.014
8011	7.234	7.232	7.252	7.250	.020	.016
8013	7.734	7.732	7.752	7.750	.020	.016

OPTIONAL CASING WEAR RING FITTED TO SUCTION SIDE ONLY

INSTALLATION

A. Receiving Pump

1. Inspect for shipping damage. If a shortage or damage occurs, contact carrier immediately.

B. Location

1. Install vertically with motor up. Consult factory for horizontal mounting.
2. Pump should be accessible for inspection and repair work, head room must be provided for the use of hoist or tackle as necessary.
3. Lift pump by slinging through motor eye bolts and securing through pump adapter.
4. In no case should any part of motor be covered with insulation.

C. Foundation

1. The pump must always be supported.
2. Pumps with smaller motors may be suspended in the piping, provided the piping is supported adjacent to the pump.
3. For pumps with larger motors, the pump should be attached to a support utilizing the tapped hole or holes in the bottom of the pump casing. **Note: Piping loads shall not be applied to the pump.**
4. Pump must be allowed to move with piping movement. Expansion of piping must be taken into account when piping and suitable devices should be employed. Do not rigidly connect the pump to the floor. **Note: Provide vibration isolation pads under floor mounted supports. Do not support unit by the motor eye-bolts.**

OPERATION

A. Before operating for the first time check the following:

1. Is motor correctly wired for voltage available.
2. Has pump been primed. Pump should never be run dry. **Extra effort may be required to get the air out of the seal chamber.**

Caution: Make sure power supply to pump motor is locked out before touching motor shaft.

3. All rotating parts turn freely.

B. Starting pump

1. Jog pump to check proper rotation.
2. Start pump with discharge valve closed. **DANGER: MAKE SURE SUCTION VALVE IS OPEN!!**
3. When correct pressure has been reached, open discharge valve slowly.
4. Do not operate pump for prolonged periods with discharge valve closed, so as to avoid overheating and potential damaging loads.

5. Pump should be stopped if any of the following occur:
 - a. No discharge.
 - b. Insufficient discharge.
 - c. Insufficient pressure.
 - d. Loss of suction.
 - e. Excessive power consumption.
 - f. Vibration.

Check problem analysis further in the manual for help in troubleshooting.

MAINTENANCE

A. Routine Inspections

Routine inspections should be made on a regular basis. Inspections made while pump is running should reveal potential failures.

1. Inspect motor bearings for any sign of temperature rise. Temperature should not exceed 160°F. Temperature rise may indicate the early stages of bearing problems.
2. Listen for any unusual noise.
 - a. Air trapped in pump
 - b. Hydraulic noise.
 - c. Mechanical noise in motor and/or pump.
3. Check suction gauge reading and confirm that it is normal.
4. Check discharge gauge reading and confirm that it is normal.
 - a. If gauge readings are abnormal find out why.

Note: Suction and discharge gauges should read the same with pump stopped.

B. Close Coupled Pumps

The pump section is attached directly to the motor shaft and does not contain bearings.

C. Close Coupled Motors

The motor must be lubricated in accordance with the manufacturer's recommendations. **Do not over lubricate the motor bearings as this could cause premature bearing failure.**

D. Mechanical Seal

The mechanical seal is the "John Crane" Type 21 General Purpose Seal for the 175 psig pressure rating.

A "John Crane" Type 2 General Purpose Seal is used for the 300 psig pressure rating.

DIS-ASSEMBLY AND RE-ASSEMBLY

A. General

If the pump has been maintained and serviced properly, breakdowns which necessitate the pump being dis-assembled should not occur often.

1. If a problem occurs, the cause should be determined, if possible, before dis-assembling. (See "Problem Analysis")

2. If the pump is being dis-assembled, all parts must be carefully handled, avoid heavy blows and shocks.
3. All parts must be carefully cleaned and inspected for wear. Recondition or replace parts where necessary.

B. Dis-Assembly

1. Drain liquid from casing by removing drain plug.

Caution: Allow pump to cool and secure suction and discharge valves before working on pump!!

2. Remove re-circulation line.
3. Remove bolts holding cover/adaptor to casing, pry cover/adaptor and motor assembly from casing.
4. Remove impeller bolt in a counterclockwise direction. Remove impeller and key.
5. In all cases of mechanical seal arrangement, after removing the sleeve and its seal assembly, the seal rotating element may be drawn off the shaft sleeve. Note: apply silicone grease on the OD of the sleeve in the area between the seal and the end of the sleeve. This will help removal of the old seal. The stationary element is to be removed from the cover.
6. All parts must be cleaned and inspected for wear. Replace parts where necessary.

C. Re-Assembly

1. Be certain that all parts to be replaced are free from burrs, with screw threads and connecting faces clear and free from damage.
2. Insert stationary element of seal into cover-adaptor, slip cover-adaptor over shaft and engage rabbit of motor. **Note: Do not touch the seal surfaces because this may result in leakage. Do not contaminate seal faces with fingerprints.**
3. Lubricate smaller OD of shaft sleeve with silicone grease. **Do not use petroleum oil or grease.**
4. Place spring on shaft sleeve to abut against sleeve shoulder. Slide rotary seal on sleeve until it contacts spring.
5. Slide the shaft sleeve on the shaft, larger bore first. Be certain the O-ring is correctly seated in the groove.
6. Assemble impeller key and impeller on shaft. Refit with new impeller washer on impeller bolt and tighten carefully. Be certain that the impeller rotates freely by hand.
7. Apply a few spots of gasket adhesive to gasket surface of cover. Place a new casing gasket against gasket surface and press against adhesive.
8. Assemble cover-adaptor complete with motor into casing. Insure that gasket is seated correctly. Install hex-headed cap screws into casing tapings and tighten uniformly.
8. Reconnect re-circulation line and drain plug.

PROBLEM ANALYSIS

A. No Discharge

1. Pump not primed.
2. Speed too low.
3. System head too high.
4. Suction lift higher than pump is designed.
5. Impeller completely clogged.
6. Incorrect direction of rotation.
7. Air leak in suction line.

B. Insufficient Discharge Flow

1. Air leak in suction line.
2. Speed too low.
3. System head higher than anticipated.
4. Insufficient NPSH: Suction lift too high. Check gauges, also check for clogged suction line or screen.
5. Impeller partially plugged.
6. Mechanical defects.
 - a. Worn wear rings.
 - b. Impeller damaged.
 - c. Incorrect direction of rotation.

C. Insufficient Discharge Pressure

1. Speed too low.
2. System head less than anticipated.
3. Air in system.
4. Mechanical defects.
 - a. Worn wear rings.
 - b. Impeller damaged.
 - c. Impeller diameter too small.
 - d. Incorrect direction of rotation.

D. Loss of Suction

1. Leak in suction line.
2. Suction lift too high.
3. Insufficient NPSH.
4. Air in system.
5. Casing gasket defective.

E. Excessive Power Consumption

1. Speed too high.
2. System head lower than rating.
3. Specific gravity of liquid too high.
4. Mechanical defects.
 - a. Shaft bent.
 - b. Rotating elements bind.
 - c. Worn wear ring.

F. Vibration

1. Air leak in suction line.
2. Air in system.
3. Impeller partially plugged.
4. Foundation not rigid.
5. Mechanical defects.
 - a. Damaged impeller.
 - b. Motor bearings worn.
 - c. Rotor out of balance.
 - d. Shaft bent.

G. Motor Runs Hot

1. Speed too high.
2. Specific gravity of liquid too high.
3. Mechanical defects.
 - a. Shaft bent.
 - b. Rotating elements bind.
 - c. Defective motor.
 - d. Voltage lower than rating.

Do it Once. Do it Right.

TACO, INC., 1160 Cranston Street, Cranston, RI 02920 Telephone: (401) 942-8000 FAX: (401) 942-2360.
TACO (Canada), Ltd., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3. Telephone: 905/564-9422. FAX: 905/564-9436.

Visit our web site at: <http://www.taco-hvac.com>

Printed in USA
Copyright 2000
TACO, Inc.



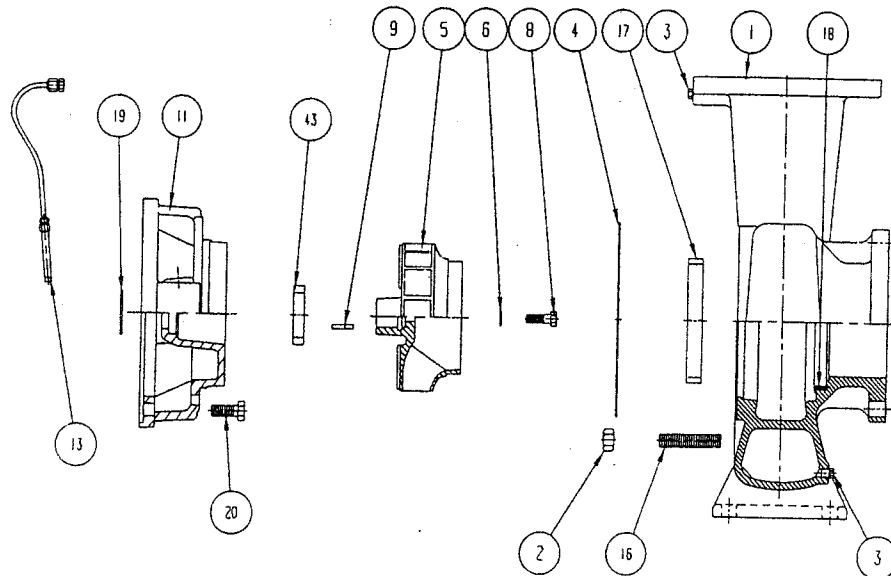
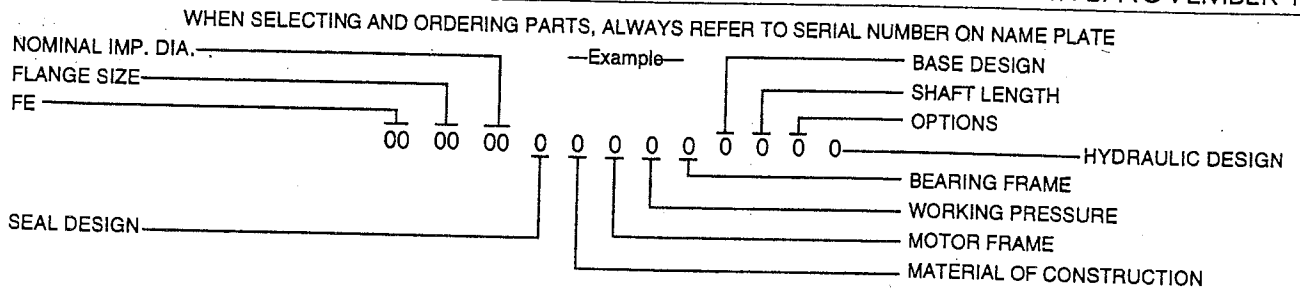
Replacement Parts List

304-303

FE 2507, 3007, 2008 & 2508

SUPERSEDES: NEW

EFFECTIVE: NOVEMBER 1, 19



ITEM NO.	NO. REQ.	DESCRIPTION	2507	3007	2008	2508
1	1	CASING	950-1009RP	950-1010RP	950-1011RP	950-1012RP
2	8	NUT	HARDWARE	HARDWARE	HARDWARE	HARDWARE
3	2	SQ. HEAD PLUG	HARDWARE	HARDWARE	HARDWARE	HARDWARE
4	1	GASKET	950-022RP	950-022RP	950-023RP	950-023RP
5	1	IMPELLER (CI)	950-1070RP	950-1071RP	950-1072RP	950-1073RP
5	1	IMPELLER (BRZ)	950-1070BRP	950-1071BRP	950-1072BRP	950-1073BRP
6	1	IMPELLER WASHER	951-2579RP	951-2579RP	951-2579RP	951-2579RP
8	1	IMPELLER BOLT (SS)	HARDWARE	HARDWARE	HARDWARE	HARDWARE
9	1	IMPELLER KEY (SS)	HARDWARE	HARDWARE	HARDWARE	HARDWARE
11	1	COVER	951-2282RP	951-2282RP	951-2289RP	951-2289RP
13	1	TUBE FITTING KIT	951-247RP	951-247RP	951-247RP	951-247RP
16	8	STUD	950-1158RP	950-1158RP	950-1159RP	950-1159RP
17	1	WEAR RING (CI)	950-1166RP	950-1167RP	950-1165RP	950-1166RP
17	1	WEAR RING (BRZ)	950-1166BRP	950-1167BRP	950-1165BRP	950-1166BRP
18	1	DOWEL PIN	N/A	N/A	N/A	N/A
20	1	BOLT	HARDWARE			
43	1	COVER WEAR RING (CI)	N/A	N/A	N/A	N/A
43	1	COVER WEAR RING (BRZ)	N/A	N/A	N/A	N/A

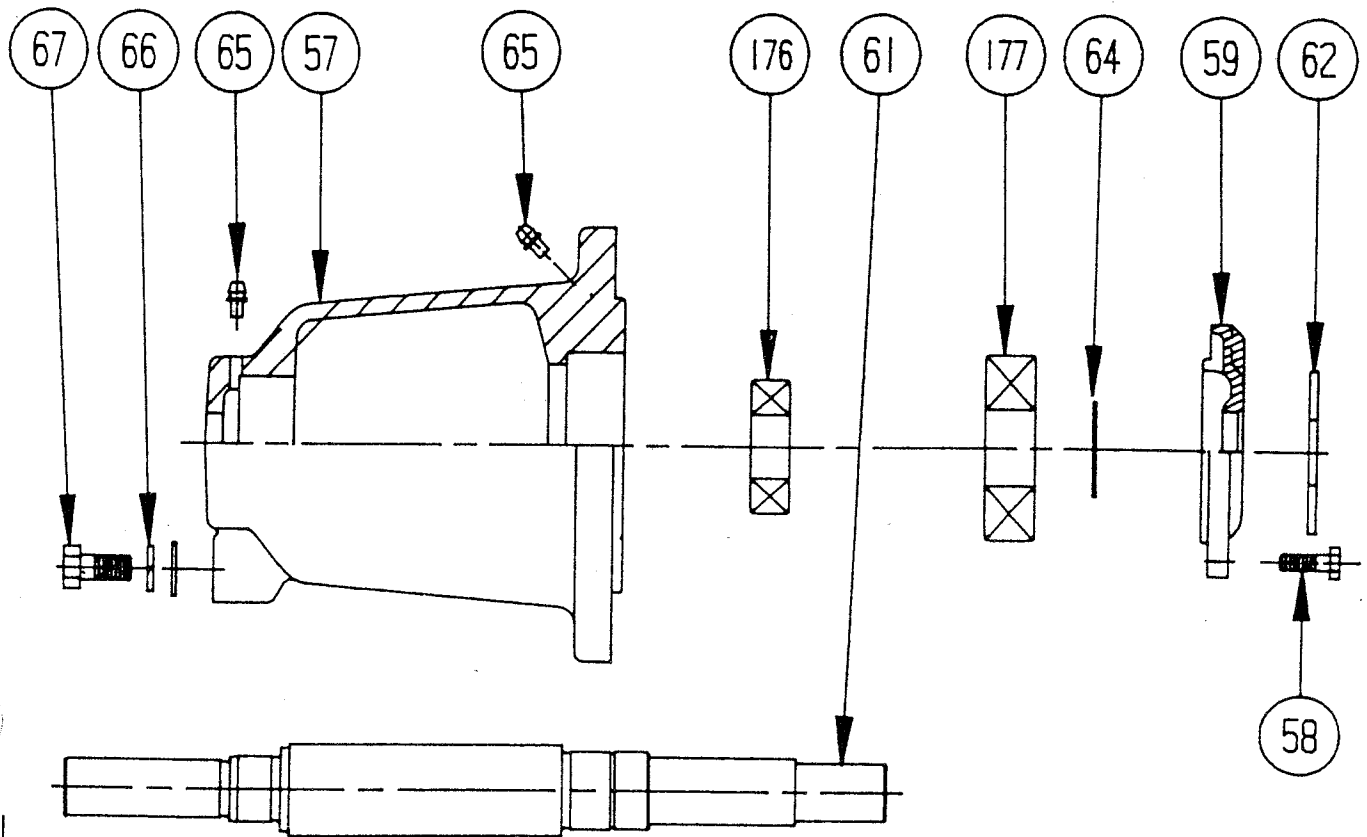
COMPARE. YOU'LL TAKE TACO.

TACO, INC., 1160 Cranston Street, Cranston, RI 02920 (401) 942-8000 FAX: (401) 942-2360.

TACO (CANADA) LTD., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3 (905) 564-9422 FAX: (905) 564-9436

Printed in USA

FRAME PARTS

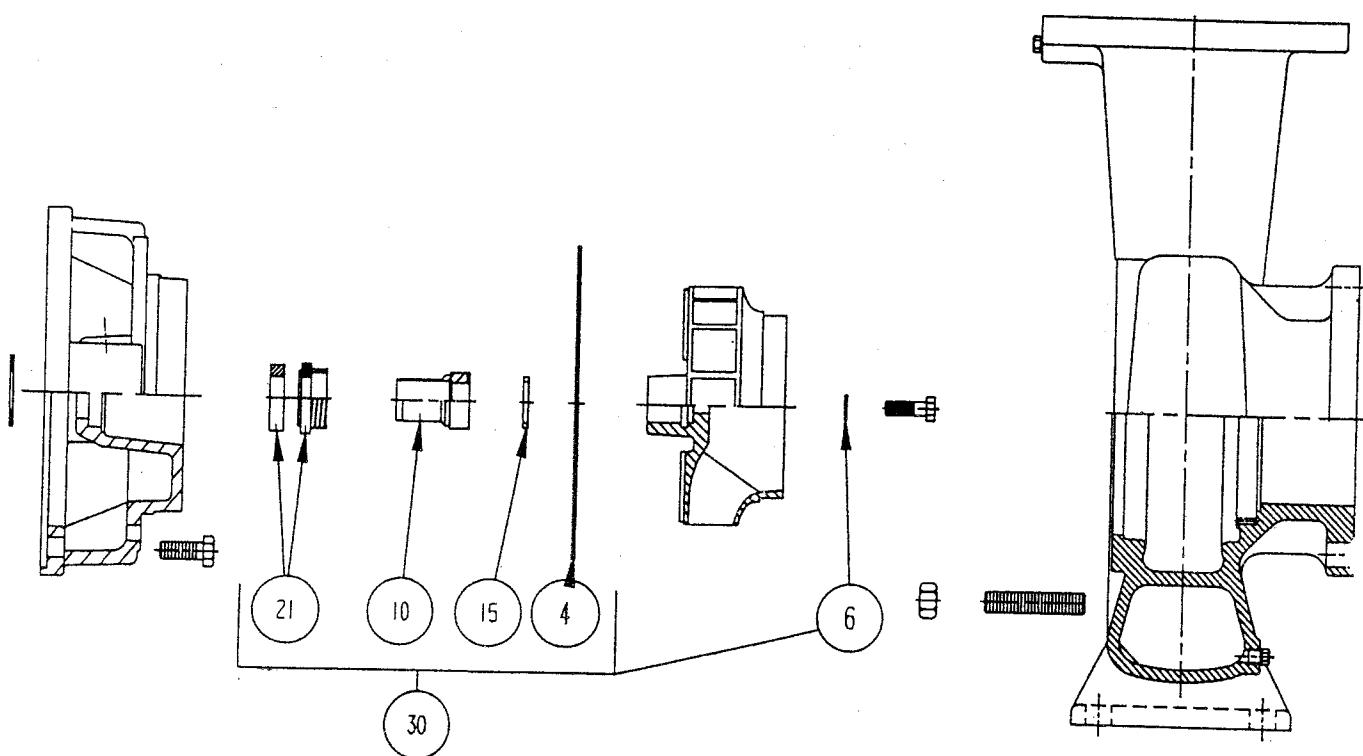


72

FRAME PARTS FOR "F" SIZE PUMP

ITEM NO.	NO. REQ.	DESCRIPTION	PART NO.	REMARKS
72	1	FRAME ASSEMBLY (CS)	951-2493RP	CARBON STEEL SHAFT
72	1	FRAME ASSEMBLY (SS)	951-2953RP	STAINLESS STEEL SHAFT
57	1	FRAME	N/A	
58	4	HEX HD. SCREWS	HARDWARE	
59	1	BEARING COVER	951-2405RP	
176	1	BALL BEARING	951-2491RP	
177	1	BALL BEARING	950-963RP	
61	1	SHAFT (CS)	951-2407RP	CARBON STEEL
61	1	SHAFT (SS)	951-2950RP	STAINLESS STEEL
62	1	DEFLECTOR	N/A	
64	1	RETAINING RING	15-140RP	
65	2	GREASE FITTING	15-203RP	
66	1	WASHER	HARDWARE	
67	1	BOLT	HARDWARE	

MECHANICAL SEAL DESIGN

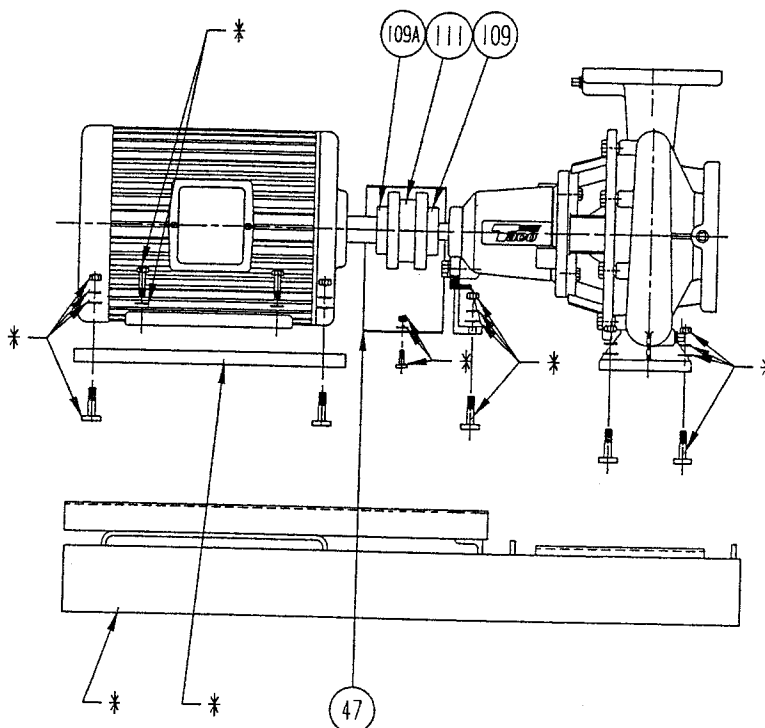


TYPE "E" STANDARD, TYPE "D" HI TEMP

ITEM NO.	NO. REQ.	DESCRIPTION	SEAL DESIGN	
			TYPE "E"	TYPE "D"
4	1	GASKET	SEE PAGE 1	
6	1	IMPELLER WASHER	951-2579RP	
10	1	SLEEVE (SS)	951-3035RP	
10	1	SLEEVE (BRZ)	951-3035BRP	
15	1	SLEEVE GASKET	951-3042RP	
30	1	SEAL KIT	951-3162SRP	951-3160SRP
30	1	SEAL KIT	951-3162BRP	951-3160BRP
21	1	WATER SEAL	951-3162RP	951-3160RP

SEAL KIT INCLUDES ITEMS NUMBER 4, 6, 10, 15 & 21.

MOTOR PARTS



*SEE FE BASE HARDWARE SPREAD SHEET FOR ALL PUMPS

FOR FE PUMPS NO. 2507

PART 21 - Coupling NO. 2507													
NO. REQ.	DESCRIPTION	MOTOR FRAME SIZE (NEMA STD.) "T"											
		143T	145T	182T	184T	213T	215T	254T	256T	284TS	286TS		
	1	COUPL. GUARD	951-3075RP				951-3078RP						
109	1	PUMP COUPL. HALF	900-328RP				900-364RP				900-427RP		
109A	1	MTR. COUPL. HALF	900-325RP		900-327RP		900-328RP		900-365RP		900-428RP		
111	1	COUPL. INSERT	900-513RP				900-514RP				900-515RP		

FOR FE PUMPS NO. 3007

ITEM NO.	NO. REQ.	DESCRIPTION	MOTOR FRAME SIZE (NEMA STD.) "T"											
			145T	182T	184T	213T	215T	254T	256T	284TS	286TS	324TS	326TS	
47	1	COUPL. GUARD	951-3076RP					951-3079RP						
109	1	PUMP COUPL. HALF	900-328RP					900-364RP		900-427RP				
109A	1	MTR. COUPL. HALF	900-325RP	900-327RP		900-328RP		951-367RP	900-365RP		900-428RP	900-437RP		
111	1	COUPL. INSERT	900-513RP					900-514RP		900-515RP				

FOR FE PUMPS NO. 2008

PART 21 - GMP - NO. 2008													
ITEM NO.	NO. REQ.	DESCRIPTION	MOTOR FRAME SIZE (NEMA STD.) "T"										
			143T	145T	182T	184T	213T	215T	254T	256T	284TS	286TS	
47	1	COUPL. GUARD	951-3075RP					951-3078RP					
109	1	PUMP COUPL. HALF	900-328RP					900-364RP					900-427RP
109A	1	MTR. COUPL. HALF	900-325RP		900-327RP		900-328RP		900-365RP			900-428RP	
111	1	COUPL. INSERT	900-513RP					900-514RP				900-515RP	

FOR FE PUMPS NO. 2508

PORT 1 - SNO: 2506														
ITEM	NO. REQ.	DESCRIPTION	MOTOR FRAME SIZE (NEMA STD.) "T"											
			145T	182T	184T	213T	215T	254T	256T	284TS	286TS	324TS	326TS	
	1	COUPL. GUARD	951-3076RP						951-3079RP					
	1	PUMP COUPL. HALF	900-328RP						900-364RP		900-427RP			
109A	1	MTR. COUPL. HALF	900-325RP	900-327RP		900-328RP		951-367RP	900-365RP		900-428RP	900-437RP		
111	1	COUPL. INSERT	900-513RP						900-514RP		900-515RP			