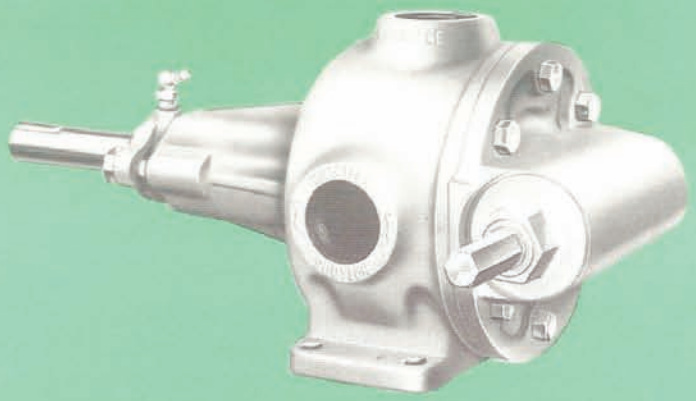
INSTRUCTION MANUAL WITH PICTORIALIZED PARTS LIST

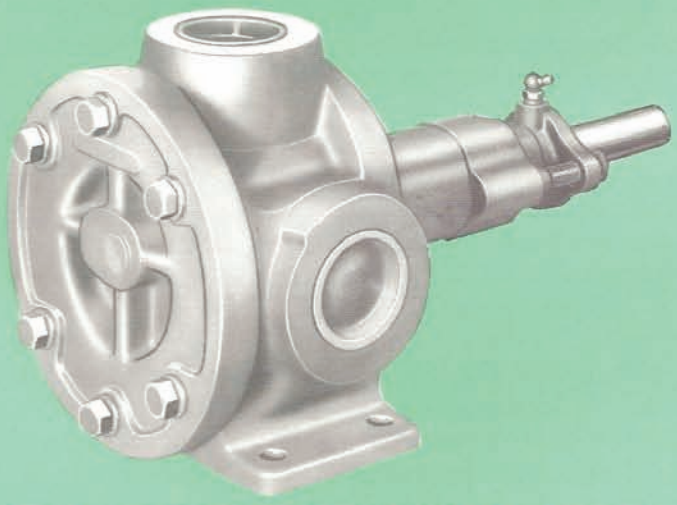
TRI-ROTOR®

SERIES 40

Positive Displacement Rotary Piston Pumps



40 AX - BYPASS HEAD PUMP (PAGE 3)



40A - SOLID HEAD PUMP (PAGE 3)

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www.trirotor.com

A	CHANGED TO 13-1/16"
B	4-5/8" IF EQUIPPED WITH 1-1/2" X 11-1/2 THD. NPT PORTS
C	8-1/8" IF EQUIPPED WITH 1-1/2" X 11-1/2 THD. NPT PORTS

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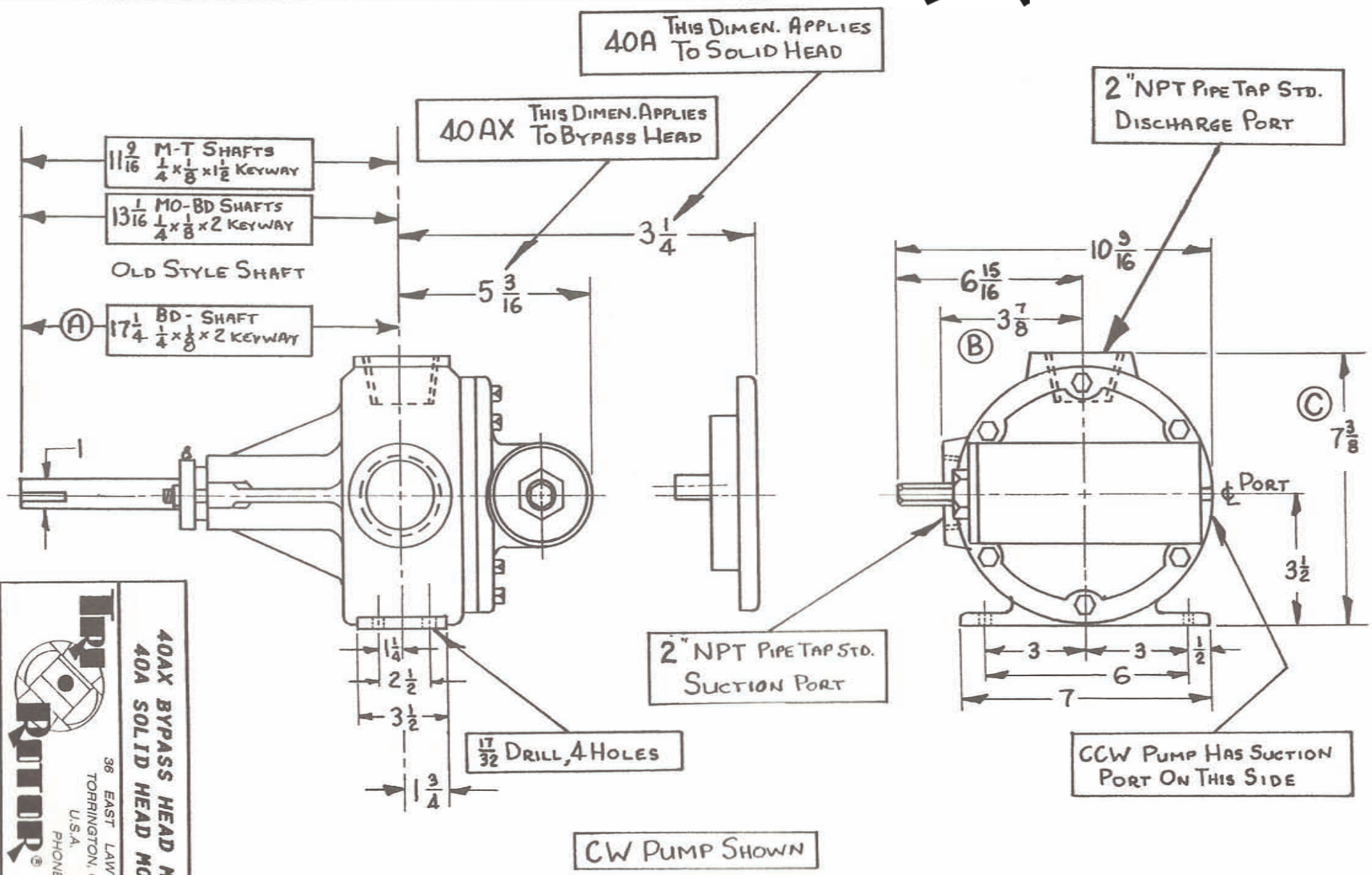

40AX BYPASS HEAD MODEL
40A SOLID HEAD MODEL

DRWN. BY:
APPROVED:

J6014

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36 EAST LAWTON STREET
TORRINGTON, CONNECTICUT 06790-6712
U.S.A.
PHONE: 860-482-8581

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SERIES 40 PUMPS

MODEL **40AX** BYPASS HEAD PUMP, **40A** SOLID HEAD PUMP RATED 40 GPM @ 540 RPM (MAXIMUM RATING 42 GPM @ 600 RPM)

PUTTING PUMP INTO SERVICE

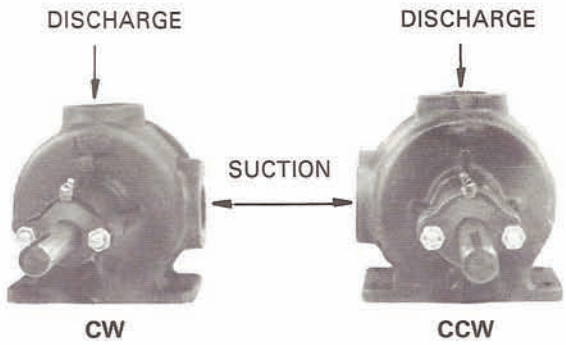
CAUTION: When receiving a pump, carefully check for damage, broken port seals, and misalignment incurred during shipping.

CORRECT PIPING HOOK-UP: The series 40 pump comes with two 2" N.P.T. ports (1 1/2" optional) designed for use with schedule 40 steel pipe. Connect piping based on direction of shaft rotation.

SERIES 40 CW (CLOCKWISE) rotation pump has the suction port on the right side and discharge port on top (viewed with shaft end towards you).

SERIES 40 CCW (COUNTER CLOCKWISE) rotation pump has the suction port on the left side and discharge on top.

- Any pump may be run in reverse temporarily for such purposes as stripping lines etc.
  WARNING: CAVITATION COULD ENSUE



MOUNTING AND ALIGNMENT

The following will cause misalignment:
(1) Warped base plate (correct by shimming pump and drive components)
(2) Pipe strain (correct by using hangers or appropriate pipe supports)
If pump is connected to drive member by couplings, shim components until coupling halves are aligned.

To prevent misalignment of pump and drive components, fasten base securely in place using the foundation bolt holes provided.

- **SHAFT SHOULD ALWAYS BE TURNABLE BY HAND**
- As a last check before starting pump: remove gland nuts and slide packing gland out of housing. If gland does not slide back into housing without interference, pump is misaligned.

DIRECT MOTOR DRIVEN UNITS AND GEAR DRIVEN UNITS: Abutting shafts must be at least 1/8 of an inch apart and coupling inserts and / or chains should be loose enough to prevent end thrust on pump shaft.

BELT DRIVEN UNITS: An outboard bearing must be used to prevent side thrust on pump shaft. Pump shaft must be free to slide longitudinally through outboard bearing, so that rotor group will not be forced against pump case components. Align sheaves using straight edge or stretched cord.

OPEN GEAR DRIVEN UNITS: Proper alignment and engagement of gear and pinion can be checked by passing foil or cellophane through them. An outboard bearing should be used to prevent side thrust on pump shaft. Pump shaft must be free to slide longitudinally through outboard bearing, so that rotor group will not be forced against pump case components. CAUTION: Use gear and pinion set of same pressure angle such as furnished by factory, otherwise fibre motor pinion life will be short.

PACKING GLAND

The packing gland serves a dual function; first as packing follower and second as a bearing which, with the shaft housing bushing, forms a support for the rotor and shaft. As shipped from the factory the gland is LOOSE ENOUGH TO BE ROCKED BY HAND. At first start-up DO NOT tighten gland until pump has run long enough for packing to expand from absorption of pumpage. Thereafter, to adjust, tighten nuts evenly one quarter turn at a time and adjust enough to reduce leakage - NO MORE - a drop or two of the pumpage should normally drip from the gland every few minutes (except of course with mechanical seals, zero leak packing, or external scavenging systems). SHAFT SHOULD ALWAYS BE TURNABLE BY HAND. Keep shaft lubricated with appropriate lubrication through fitting provided.

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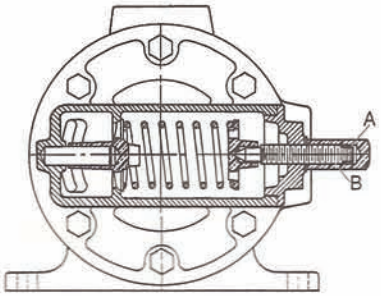
BYPASS HEAD MODEL 40 AX

This Tri-Rotor pump model has an integral dash pot relief valve in head. The standard spring can be set up to 50 PSI at which setting it will bypass full volume; the heavy duty spring can be set up to 100 PSI.

TO ADJUST BYPASS RELIEF PRESSURE

Remove hexagonal cap (A) and loosen locknut. Turn adjusting screw (B) in to increase pressure and out to decrease pressure.

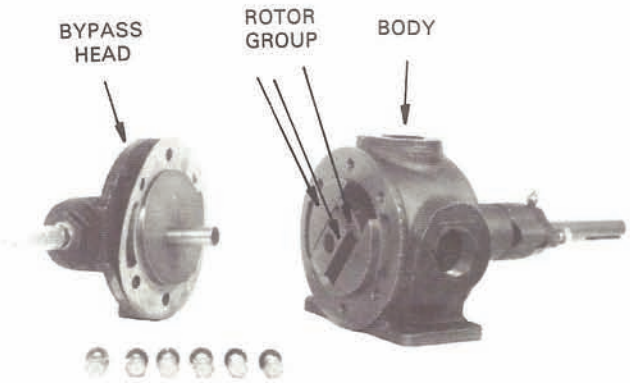
Tighten locknut and replace hexagonal cap, making sure copper gaskets are in place.



TO REVERSE DIRECTION OR ROTATION 40AX

The rotation of the **40AX** pump may not be reversed in the field for extended periods of time. The pump may be run in reverse **TEMPORARILY** for such purposes as stripping the lines etc.

- To reverse direction of rotation, a bypass head pump of opposite rotation must be ordered from the factory. See "putting pump into service" section on page 1.



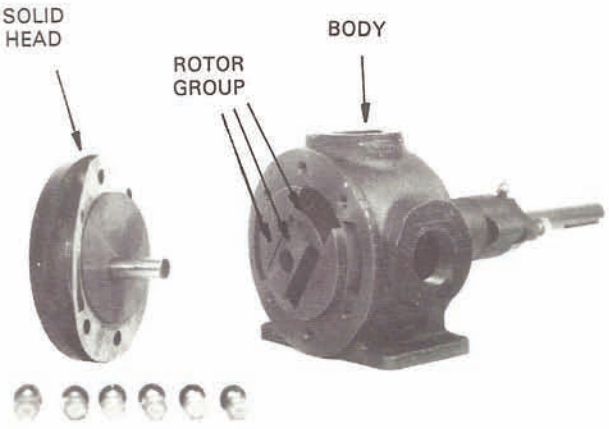
SOLID HEAD MODEL 40A

The model **40A** has a solid head with the shuttle pin set in a fixed position to give constant volume for simple transfer service. A RELIEF VALVE SHOULD BE INSTALLED IN THE DISCHARGE LINE FOR PROTECTION.

TO REVERSE DIRECTION OF ROTATION 40A

The rotation of the **40AX** pump may not be reversed in the field for extended periods of time. The pump may be run in reverse TEMPORARILY for such purposes as stripping the lines etc.

- To reverse direction of rotation, a solid head pump of opposite rotation must be ordered from the factory. See "putting pump into service" section on page 1.



SERIES 40 PUMPS

RATED 40 G.P.M.
@540 R.P.M.

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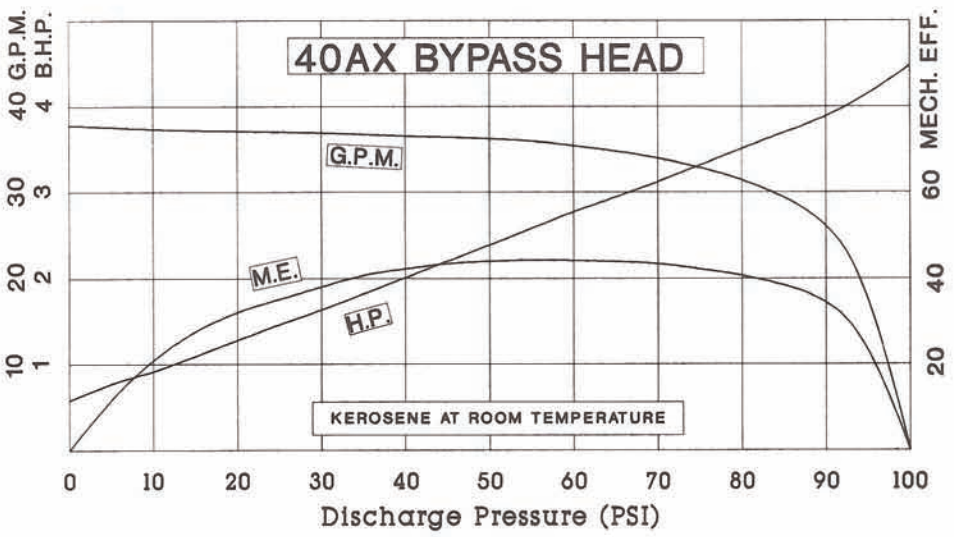
MAXIMUM RECOMMENDED PUMP SPEEDS FOR VARIOUS VISCOSITIES

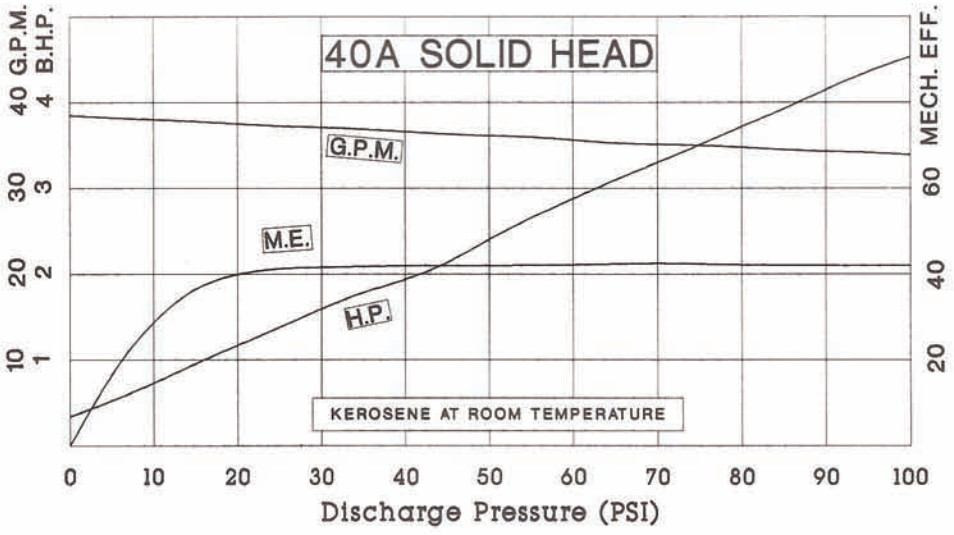
	SERIES 40		
Rating	40 GPM @ 540 RPM		
Displacement Factor	6.9 Gal./100 Revs.		
Port Size	1½"x1½" THD NPT		
SSU / CPS	RPM	**GPM**	Suct.
40 / 4	600	**42**	1½
100 / 20	600	**42**	1½
400 / 78	590	**41**	1½
600 / 125	580	**40**	1½
800 / 165	570	**39**	1½
1,000 / 200	560	**38**	1½
1,600 / 335	540	**37**	1½
2,000 / 410	530	**36**	2
3,000 / 620	500	**34**	2
5,000 / 1,060	480	**33**	2
8,000 / 1,700	440	**30**	2
9,000 / 1,900	420	**29**	2

For Viscosities Below, Pump Must Have Relieved Rotor Group
(For Sticky, Tacky Fluids.)

Port Size	2"x1½" THD NPT		
10,000 / 2,150	500	**34**	2½
15,000 / 3,100	480	**31**	3
20,000 / 4,250	440	**28**	3
30,000 / 6,500	380	**25**	3
40,000 / 8,610	320	**21**	3
50,000 / 10,800	280	**15**	3
75,000 / 16,210	210	**11**	3
100,000 / 21,625	150	**8**	3

GENERAL RULE: Viscous fluids which retain their "slipperiness" or which readily thin out with slight temperature increase or agitation do not require a relieved rotor group.





CAUTION: Suction piping diameter and length must be separately determined, regardless of pump port size, where (1) volatile liquids or (2) viscous pumpages are concerned. The sizes shown in the above chart are for suction lines no longer than 10 feet and containing no more than 2 pipe fittings.

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TROUBLESHOOTING GUIDE

TROUBLE	TYPE OF PUMP			LOOK FOR
	VARIABLE HEAD	BYPASS HEAD	SOLID HEAD	
NO FLOW		●	●	CW PUMP RUNNING CCW, OR VICE VERSA (1)* MOTOR WIRING REVERSED PIPING TO WRONG PORTS
		●	●	DISCHARGE HEAD TOO HIGH PIPING TOO SMALL, TOO LONG(3) VISCOSITY TOO HIGH (3)
				FLOW CONTROL TURNED DOWN TO ZERO
				PAWL PIN MISSING CONTROL SPRING - not adjusted - wound backwards - distorted - broken out of top or bottom spring plate
		●		RELIEF VALVE SPRING - not adjusted (3) - not in correct position (2) - spring broken
				PLUNGER FROZEN IN BOTTOM POSITION - corroded parts - pumpage shear sensitive - dirt accumulation preventing movement
		●		RELIEF VALVE - not fully seated (2) - stuck on valve guide pin - need lapping into seat - spring adjusting plate missing
		●	●	INADEQUATE PRIMING CONDITIONS SUCH AS - suction line air leak - foot valve stuck - lift too great - altitude too high - vapor lock
		●	●	ROTOR GROUP WORN / MECHANICAL SEAL WORN OR BROKEN
CAVITATING VIBRATING HIGH AMP. DRAIN		●	●	STARVED SUCTION LINE DUE TO - suction line restricted - viscosity too great for piping - RPM too high for viscosity (3)
PUMP RUNNING HOT		●	●	PACKING TOO TIGHT (1) MISALIGNED PUMP (1) INSUFFICIENT LUBRICATION OF SHAFT (1)
		●	●	TOO LONG RUNNING IN FULL BYPASS CYCLE OR ZERO STROKE
		●	●	OVERSPEEDING (3) CAVITATION
PUMP FROZEN CAN'T TURN SHAFT		●	●	PACKING TOO TIGHT (1) MISALIGNMENT (1) OBSTRUCTION IN ROTOR GROUP - rotor group part broken RUSTED PARTS- blush rust causing parts to sieze together
		●	●	PUMPAGE - shear sensitive - congealed - caramelized - solidified TEMPERATURE OF ALL BRONZE OR BRONZE FITTED PUMP EXCEEDING 140° F ROTOR GROUP NOT RELIEVED
NOISY PUMP		●	●	CAVITATION WORN ROTOR GROUP AIR LEAK INTO SUCTION LINE
		●		PLUNGER OR VALVE BOUNCING DUE TO - suction line restriction - relief valve in discharge line reacting with pump spring setting - PIPING RESONANCE
EXCESSIVE LEAKAGE FROM PACKING GLAND		●	●	PACKING NUTS INCORRECTLY ADJUSTED PACKING WORN MECHANICAL SHAFT SEAL WORN OR BROKEN SHAFT SCORED
REDUCTION OF FLOW OR PRESSURE				PAWL PIN BROKEN CONTROL SPRING SETTING INCORRECT CONTROL PLUNGER STUCK
		●		BYPASS SPRING SETTING INCORRECT (2) VALVE UNSEATED OR WORN (2)
		●	●	PUMP WORN RESTRICTION OR TOO HIGH VISCOSITY IN SUCTION LINE (3)
PREMATURE WEAR SHORT PUMP LIFE		●	●	MISALIGNMENT - end or side thrust on shaft (1) PACKING TOO TIGHT OR ADJUSTED INCORRECTLY DIRTY OR ABRASIVE PUMPAGE RUNNING PUMP DRY - repeated suction lift OVERSPEEDING (3) NON-LUBRICATING PUMPAGE OPERATING ABOVE 50 PSI & 350 RPM
				FLOW CONTROL SET BELOW 25% CAPACITY FOR TOO LONG PERIODS SUCTION LINE RESTRICTED CAUSING PLUNGER "BOUNCE"
RAPID WEAR OF PINIONS		●	●	MISALIGNMENT - excessive side thrust on gear PRESSURE ANGLE NOT SAME AS GEAR

* NUMBERS IN PARENTHESIS PERTAIN TO PAGE NUMBERS WHERE MORE INFORMATION CAN BE FOUND.

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MODEL 40AX (Exploded View)

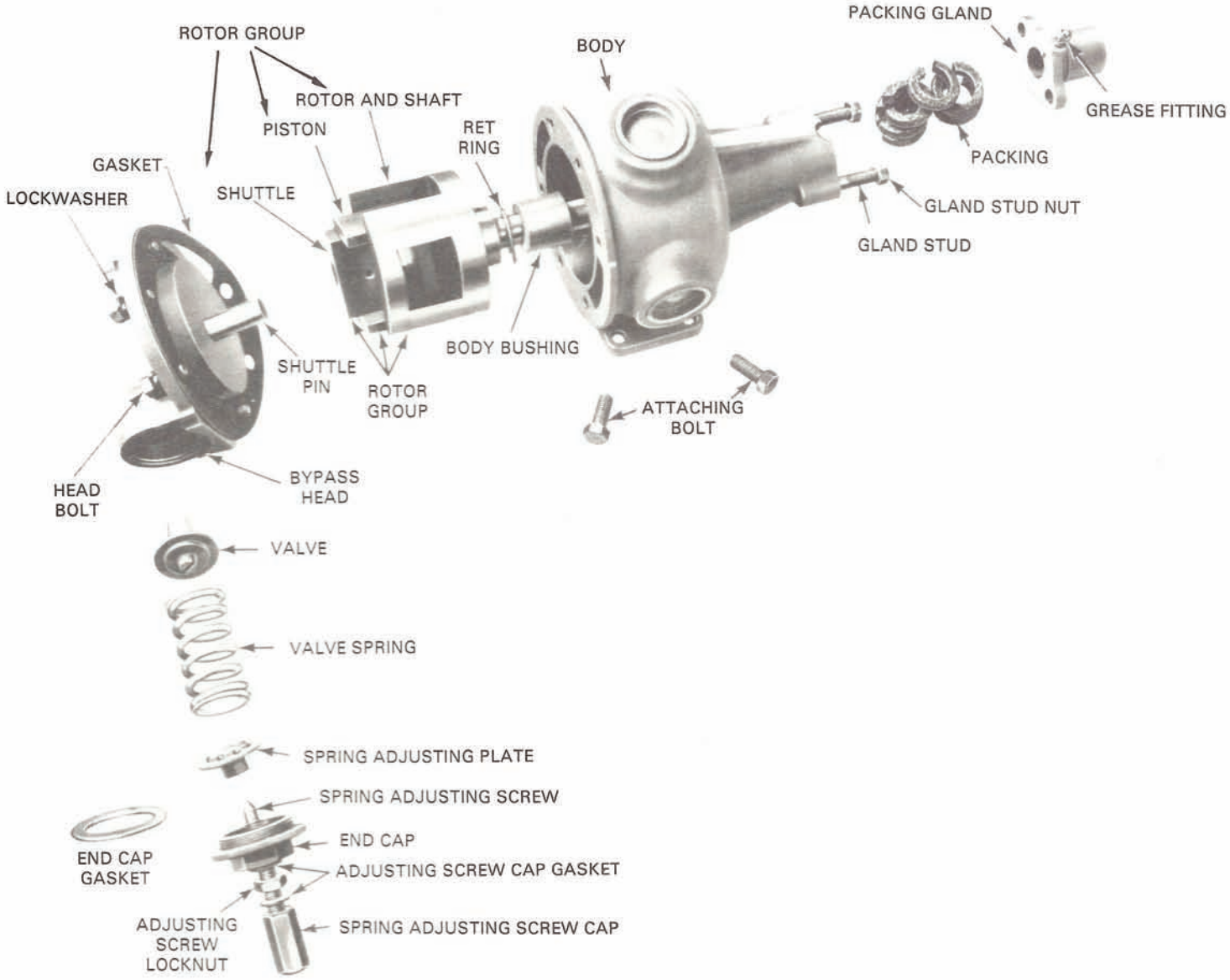
AVOID SYSTEM DOWN TIME!

KEEP ESSENTIAL SPARE PARTS ON HAND

(1) ROTOR GROUP
(2) PACKING GLAND
(3) SET OF ALL GASKETS
(4) PACKING
(5) SHAFT HOUSING BUSHING

WHEN ORDERING PARTS ALWAYS GIVE:

(1) PUMP SERIAL NUMBER
(2) ROTATION OF PUMP (CW or CCW)
(3) SHAFT LENGTH (from port centerline)



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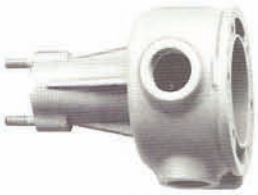
WHEN ORDERING PARTS ALWAYS GIVE:

1) PUMP SERIAL NUMBER
2) ROTATION OF PUMP (CW or CCW)
3) SHAFT LENGTH (from port centerline)

INTERCHANGEABLE PARTS FOR SERIES 40



GJ30-204CW
GJ30-178CCW

J30-255
J30-196

GJ493

J4360

J494

CAUTION: Part Numbers under pictured parts represent examples only. For exact identification of required part for your pump, select part number from lists shown.

J30-192

J30-181

J30-267

J30-194
J1203(HR)

J30-189

J30-206

BODY PARTS

Part No.	Part Name	
GJ30-178	Body CCW 1 1/2" NPT Ports*	
GJ30-181	**Packing Gland/Fitting**	
J30-189	Gland Stud	2/Set
J30-192	**Standard Packing**	**Set**
J30-194	**Body Gasket**	
J30-195	Attaching Bolt	4/Set
J30-196	**Body Bushing (Bronze)**	
GJ30-204	Body CW 1 1/2" NPT Ports*	
GJAB30-204	Body (Bze) CW/CCW 1 1/2" NPT Ports*	
J30-206	Gland Stud Nut	2/Set
J30-255	Retaining Ring	
J30-267	Grease Fitting	
J687	Lantern Ring	
J740	Food Packing	Set
GJ928	Body CW 2" NPT Ports*	
GJAB928	Body (Bze) CW/CCW 2" NPT Ports*	
GJ929	Body CCW 2" NPT Ports*	
J1719	Drain Plug	
J5972	Teflon Packing	Set
J6049	Teflon Impregnated Packing	Set
J6054	Teflon Composition Bushing	
J6261	Zero Leak Packing #3 (Beaded)	Set
J6265	Zero Leak Packing #30 (Non-Beaded)	Set

ALL IRON PARTS

Part No.	Part Name
J1225	Body Bushing (Iron)
GJ1825	Packing Gland/Fitting Iron/ENP

STEAM JACKETED PARTS

Part No.	Part Name	
J1203	Body Gasket (HR)	
J1204	Heat Packing+	Set
GJ3181	Body CCW 1 1/2" NPT Ports*	
GJ3184	Body CW 1 1/2" NPT Ports*	
GJAB3184	Body (Bze) CW/CCW 1 1/2" NPT Ports*	
GJ6210	Body CW 2" NPT Ports*	
GJAB6210	Body (Bze) CW/CCW 2" NPT Ports*	
GJ6211	Body CCW 2" NPT Ports*	

ROTOR GROUP PARTS

(See Chart below for Added Relieving Costs)

Part No.	Part Name	
J30-183	**Piston Iron**	
J4360	Piston Bronze	
J4665	Piston Steel	
J30-184	**Shuttle Iron**	
J494	Shuttle Bronze	
J5711	Formed Shuttle Bronze	
J5712	Formed Shuttle Iron	
J6120	Shuttle Teflon	
J6157	Shuttle Hardened Iron	
GJ30-180	**Rotor & Shaft Iron****	
GJ493	Rotor & Shaft Bronze**	
GJAB493	Rotor & Shaft (For All Bze Pump)**	
GJI-30-182	Rotor Group Iron	T or M
GJB-30-182	Rotor Group Bronze	11 9/16"
GJAB-30-182	Rotor Group (For All Bze Pump)	
GJI-30-259	Rotor Group Iron	BD or MO
GJB-30-259	Rotor Group Bronze	13 1/16"
GJAB-30-259	Rotor Group (For All Bze Pump)	
GJI-4582	Rotor Group Iron	Old Style
GJB-4582	Rotor Group Bronze	BD 17 1/4"

WHEN FOLLOWING PARTS ARE RELIEVED (REL), ADVISE AND ADD TO ORDER

Shuttle
Piston
Rotor & Shaft
Rotor Group

* Includes Bushing and Retaining Ring.
** Furnished with following shaft lengths: T or M 11 9/16", MO or BD 13 1/16", Old Style BD 17 1/4".
+ For temperatures under 500°F use J6049

NOTE: ALWAYS GIVE PUMP SERIAL NUMBER WHEN ORDERING PARTS.

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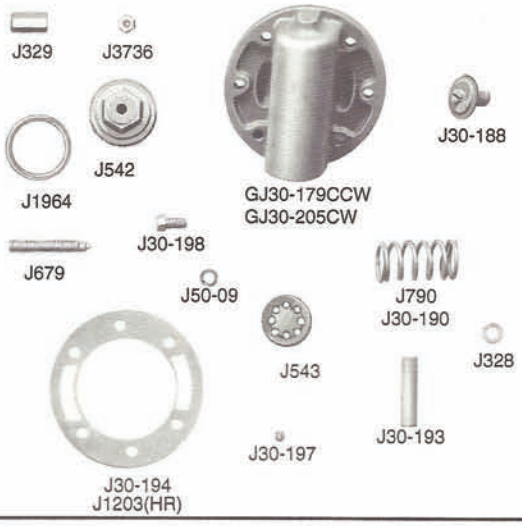
40AX BYPASS HEAD PARTS AND 40A SOLID HEAD PARTS

40AX BYPASS HEAD PARTS

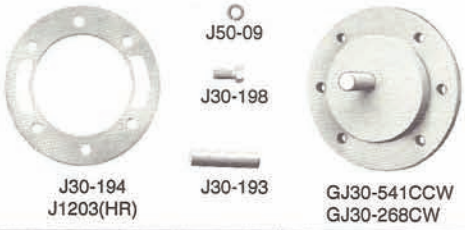
CAUTION: Part Numbers under pictured parts represent examples only. For exact identification of required part for your pump, select part number from lists shown.

Part No.	Part Name	
GJ30-179	Bypass Head/Pins CCW	
GJAB30-179	Bypass Head/Pins CCW (Bze)	
J30-188	**Valve (Bronze)**	
J30-190	Valve Spring (Std) 50 PSI	
J30-193	Shuttle Pin	
J30-194	**Bypass Head Gasket**	
J30-198	Head Bolt	6/Set
GJ30-205	Bypass Head/Pins CW	
GJAB30-205	Bypass Head/Pins CW (Bze)	
J50-09	Lockwasher	6/Set
J328	**Ad. Screw Cap Gasket**	**2/Set**
J329	Spring Adj. Screw Cap	
J542	End Cap	
J543	Spring Adjusting Plate	
J679	Spring Adjusting Screw	
J790	Valve Spring (HD) 100 PSI	
J1203	Body Gasket (HR)	
J1964	**End Cap Gasket**	
J3082	Valve Iron	
J3736	Adjusting Screw Locknut	
GJ4584	Bypass Head Complete CW***	
GJ4585	Bypass Head Complete CCW***	
GJX5707	Bypass Head/Offset Pin CW/CCW+	



40A SOLID HEAD PARTS

Part No.	Part Name	
J30-193	Shuttle Pin	
J30-194	**Solid Head Gasket**	
J30-198	Head Bolt	6/Set
GJ30-268	Solid Head/Pin CW	
GJAB30-268	Solid Head/Pin CW (Bze)	
GJ30-541	**Solid Head/Pin CCW**	
GJAB30-541	Solid Head/Pin CCW (Bze)	
J50-09	Lockwasher	6/Set
J1203	Body Gasket (HR)	
GJ5707	Solid Head/Offset Pin CW/CCW+	



MISCELLANEOUS

Part No.	Part Name
GJ30-257	Outboard Bearing Complete
GJ5863	Mechanical Seal Gland, Type 9
J5957B	Mechanical Seal, Type 1, Buna
J5957V	Mechanical Seal, Type 1, Viton
GJ6122	Mechanical Seal Gland, Type 1
J6214	Mechanical Seal, Type 9, Teflon

*** Advise if Standard or Heavy Duty Spring required
+ Specify Offset Pin position

NOTE: ALWAYS GIVE PUMP SERIAL NUMBER WHEN ORDERING PARTS.

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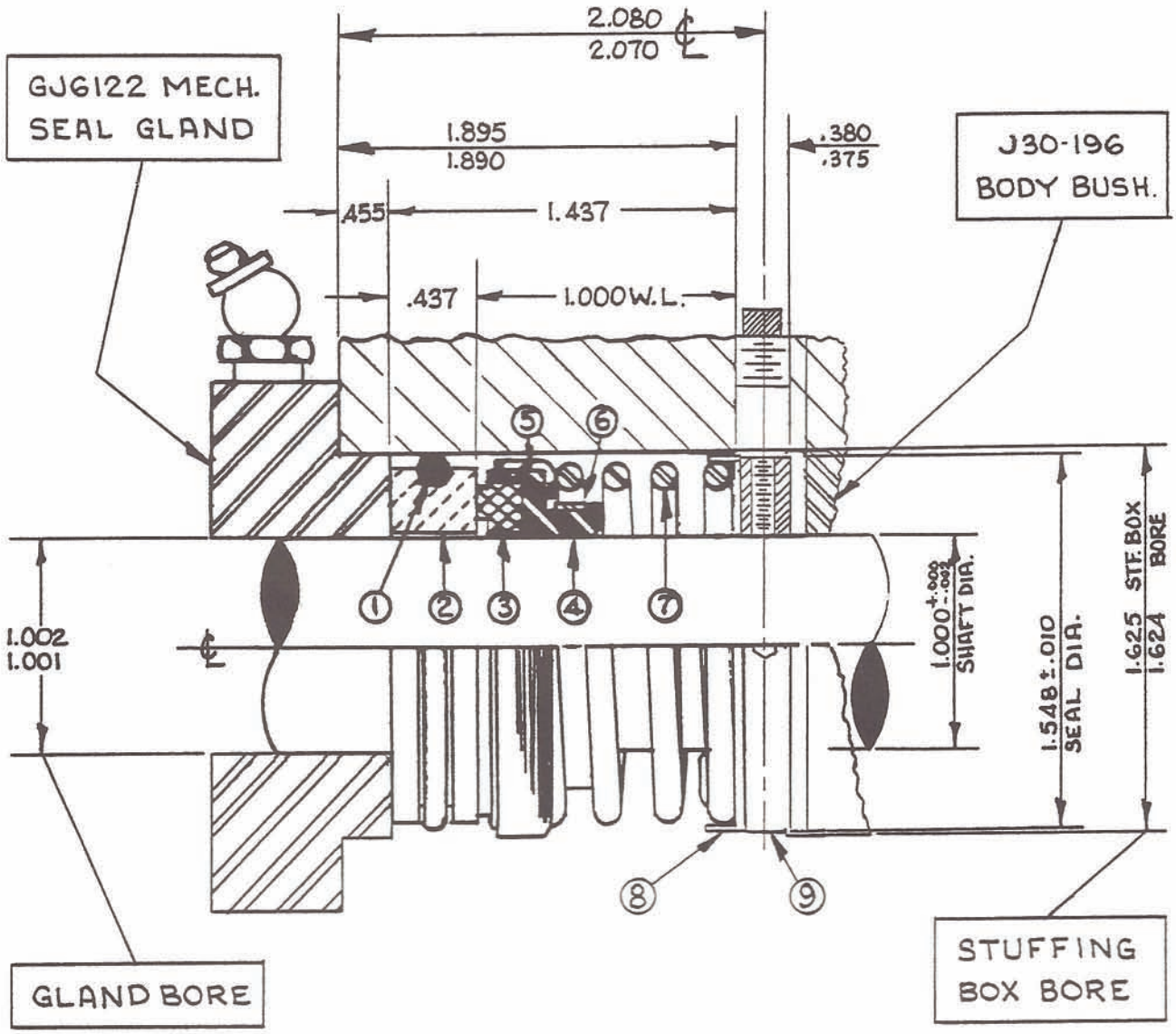

ITEM	NAME	QTY	MATERIAL
1	O-RING	1	VITON A
2	SEAL SEAT	1	NI RESIST
3	SEAL FACE	1	CARBON
4	FRICTION RING	1	VITON A
5	SHELL	1	STAINLESS STL.
6	BAND	1	STAINLESS STL.
7	SPRING	1	STAINLESS STL.
8	SPRING HOLDER	1	STAINLESS STL.
9	STOP COLLAR	1	PLATED STEEL

MODEL 40 TYPE I MECHANICAL SHAFT SEAL ASSEMBLY

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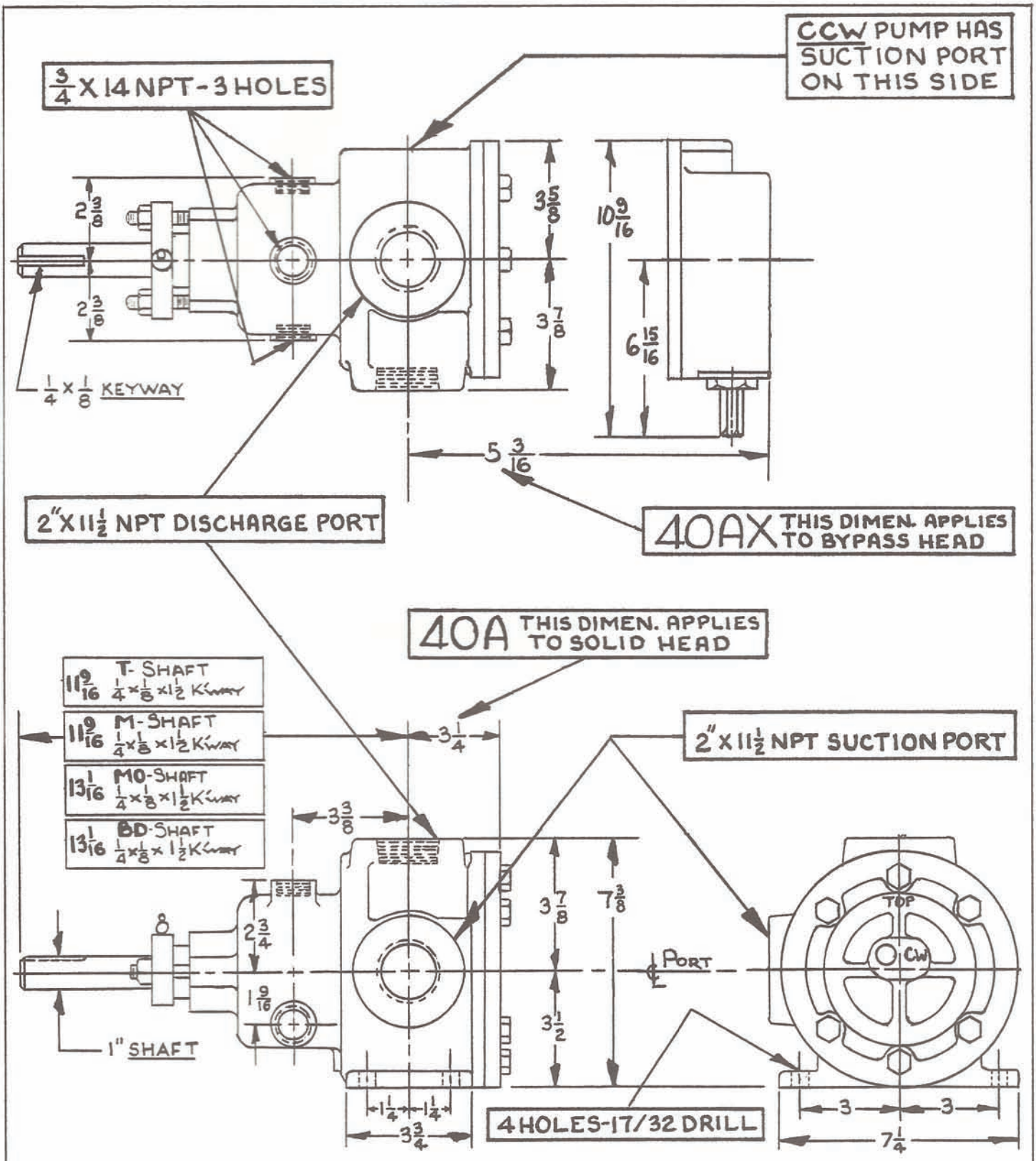
36 EAST LAWTON STREET
TORRINGTON, CONNECTICUT
U.S.A. 06790-6712
PHONE: 860-482-8581

DRWN. BY:
APPROVED:

GJ5957



CW PUMP SHOWN

PUMP MODELS 40AX & 40A WITH STEAM JACKETED BODY

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U.S.A. 06790-6712
PHONE: 860-482-8581

DRWN. BY:
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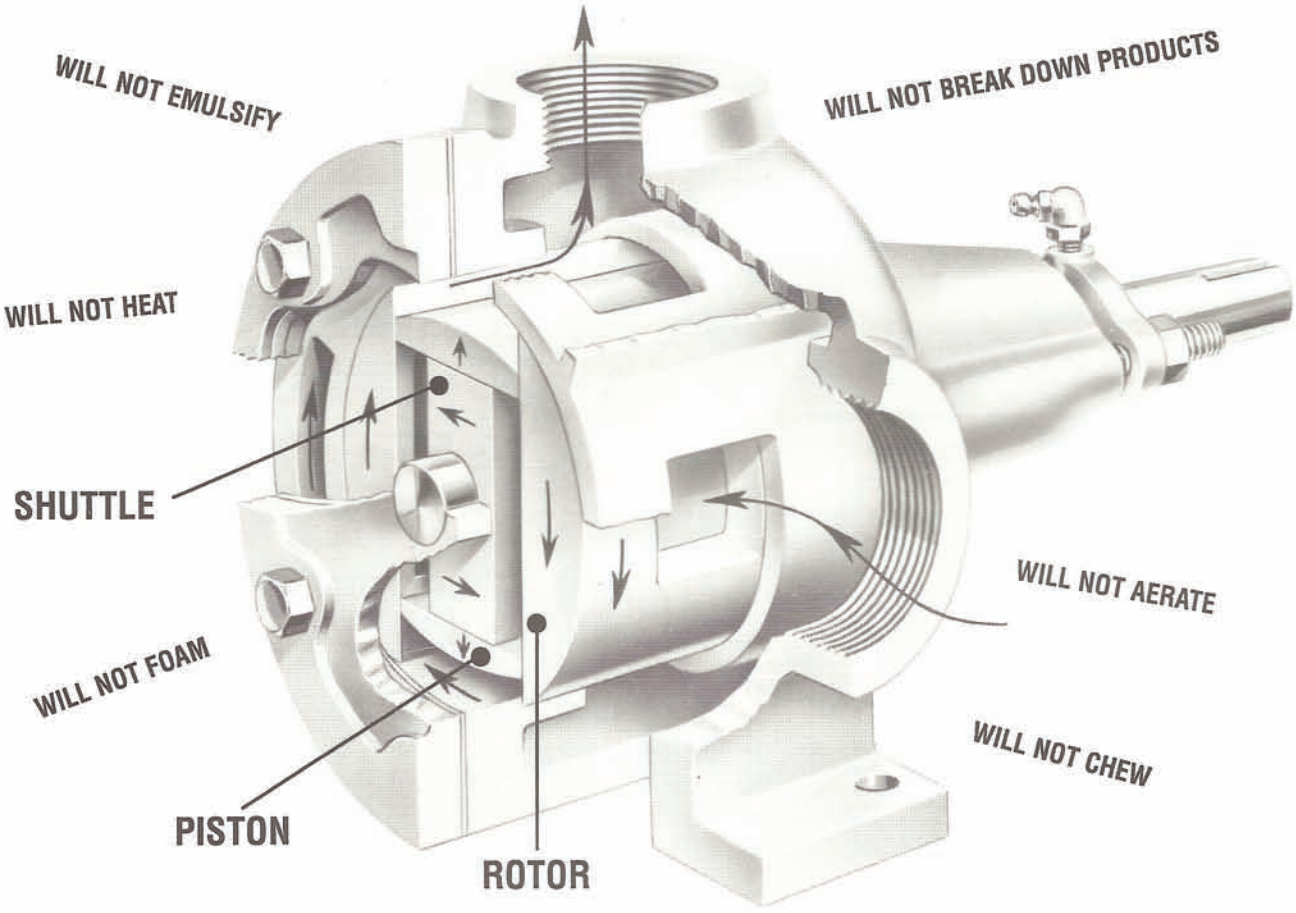
TRI-ROTOR® PUMPING PRINCIPLE



The mechanical principle of the Tri-Rotor Pump is explained as follows and incorporates the pump casing, the rotor, the piston, and the shuttle. The rotor is a liquid-tight fit within the casing, with the piston and shuttle being equally liquid-tight in their fit to each other and to the rotor. In operation the piston slides back and forth in the rotor slot and discharging from the opposite end. At the same time the shuttle slides back and forth within the piston slot (picture), drawing liquid through one rotor port and discharging through the other. The rotor, which functions as a rotating valve, channels the liquid from the intake port around through the casing and out the discharge port.

This action, while rotary, actually accomplishes the same type of pumping principle as a direct-acting piston pump. There are, therefore, two direct-acting pistons pumping through two cylinders, being valved by the rotary action of the rotor.

The reciprocating piston action is accomplished by the center bearing of the shuttle which rotates on a shuttle pin eccentric to the rotor shaft. Since the rotor is concentric with the shaft and the shuttle bearing is eccentric to the shaft, a reciprocating action of the piston and shuttle within their respective cylinder slots is created by revolving the rotor. Four overlapping strokes of the piston and shuttle for each revolution of the rotor create a smooth discharge with a pulsation reduced to a minimum. An extremely high volumetric efficiency is obtained because of the piston-type action and the liquid-tight fit of the moving members.

Highly viscous materials are easily handled with exceptionally high volumetric efficiency while thin, volatile materials are handled with little loss in slippage through the pumping members. Materials critical to agitation are handled with little or no mechanical beating, since the product is carried through the pump by piston action without being subjected to the combination centrifugal and gear or paddle agitation.

TRI-ROTOR, INC. • PHONE: 800-782-4477 860-482-8581 • FAX: 860-482-8435
EMAIL: info@trirotor.com • www.trirotor.com