Western Water Constructors, Inc.
license no. 188068

Submittal Cover

Job no. 16-05

CONTRACT NAME:	Manteca WQCF Digester Improvements	**SUB #:**	271
SPEC SECTION:	11312E Screw Centrifugal Pumps	**REV #:**	1
SUBMITTAL TITLE:	Screw Centrifugal Pumps – O&M	**CODE:**	11312E-03
FILE NAME:	271-R1_11312E-03_Screw Centrifugal Pumps-OM	**DATE:**	5/16/2018

WWC REVIEW/COMMENTS: ☒ **NO EXCEPTIONS** ☐ **EXCEPTIONS / DEVIATIONS AS NOTED**

REVIEWED BY: ST **SIGNED:**

WWC HAS REVIEWED THIS SUBMITTAL FOR CONFORMANCE WITH THE PROJECT PLANS & SPECIFICATIONS.

OWNER REVIEW:

ITEM	DESCRIPTION	REVIEW STATUS				
		A	B	C	D	E
1	Screw Centrifugal Pumps O&M	☐	☐	☐	☐	☐
2		☐	☐	☐	☐	☐
3		☐	☐	☐	☐	☐
4		☐	☐	☐	☐	☐
5		☐	☐	☐	☐	☐

LEGEND: **A =** No Exceptions Taken **B =** Make Correction Noted **C =** Correct & Resubmit
D = Rejected **E** = Accepted for Record

OWNER COMMENTS:

REVIEWER'S NAME: _____

REVIEWER'S SIGNATURE: _____ **DATE:** _____

707 Aviation Blvd
Santa Rosa, CA 95403

www.westernwater.com
general engineering contractors

p 707.540.9640
f 707.540.9641

EQUIPMENT SUMMARY FORM

1. EQUIPMENT ITEM Section 11312E - Screw Centrifugal Pumps

2. MANUFACTURER Wemco

3. EQUIPMENT IDENTIFICATION NUMBER(S) DIG-PMP-07-210, 220, 230, 240
(maps equipment number)

4. LOCATION OF EQUIPMENT Digester Control Building No. 2

5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)

Each complete pump is 607lbs

6. NAMEPLATE DATA - Horsepower 7.5 HP
Amperage 10.7 FLA
Voltage 460V/3Ph/60Hz
Service Factor (S.F.) 1.15
Speed 1160 RPM
ENC Type TEFC
Capacity 800 GPM @ 23ft TDH
Other

7. MANUFACTURER'S LOCAL REPRESENTATIVE

Name MuniQuip, LLC

Address 2024 Opportunity Drive, Suite 130, Roseville, CA 95678

Telephone Number 916-787-5641

8. MAINTENANCE REQUIREMENTS Seal Oil Check every 1000hrs or once a year.

Impeller clearance adjustment as needed or once a year minimum.

Grease bearings every 2500hrs

9. LUBRICANT LIST Mobil Velocite #6, or Shell Pella (A) Oil for pump bearing frame,

SKF LGMT 3 Lithium Grease for pump bearings

10. SPARE PARTS (recommendations)

Mech. Seal M010H, 1.5", Wemco Pt# 809450 / Mech. Seal P04U, 1.5", Wemco Pt# 809452

11. COMMENTS Please refer to O&M manual for complete details & proper procedures.

ROTO-JET®
WEMCO®
WSP™

OPERATION AND MAINTENANCE INSTRUCTIONS

MANTECA, CA

CUSTOMER ORDER NUMBER: 24208
WEMCO ORDER NUMBER: DW11450

SECTION 11312E: SCREW CENTRIFUGAL PUMPS
TAG #'S: DIG-PMP-07-210, DIG-PMP-07-220, DIG-PMP-07-230 & DIG-PMP-07-240
WEMCO VERTICAL SCREW-CENTRIFUGAL PUMPS
MODEL SFE5-R-BFE2W
WEMCO SERIAL NUMBERS: 17DW11450-01, -02, -03 & -04

MANUFACTURER
WEIR SPECIALTY PUMPS
440 WEST 800 SOUTH
SALT LAKE CITY, UT 84101-2229
TELEPHONE: (801) 359-8731
FAX: (801) 530-7828

LOCAL REPRESENTATIVE FOR PARTS AND SERVICE
MUNIQUIP, INC.
2024 OPPORTUNITY DRIVE, SUITE #130
ROSEVILLA, CA 95678
TELEPHONE: (916) 787-5641
FAX: (916) 787-5642

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2. INSTRUCTIONS, PARTS & WARRANTY

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G.	Installation, Operation – Coupling Alignment	P25-D305E
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I.	Disassembly & Assembly Instructions	P25-D314
J.	Safety Precautions	3 Pages
K.	Shut Down Procedures	1 Page
L.	Addendum to Warranty	1 Page
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3. REXORD VIVA COUPLING

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4. BALDOR-RELIANCE MOTOR

A.	Motor Information Packet	11 Pages
B.	Installation & Operating Manual	MN408

5. AES MECHANICAL SEAL

A.	Series M010H & P04U Data	1 Page
B.	Series P04U Brochure	4 Pages

1. DESCRIPTION, DRAWINGS & TESTING

1. DESCRIPTION, DRAWINGS & TESTING

Weir Specialty Pumps

440 West 800 South
Salt Lake City, UT
84101

Tel: +1 801 359 8731
Fax: +1 801 355-9303
www.weirsp.com

From the office of:
Nathan Farish
+1 801 530 7515
Nathan.farish@weirgroup.com

Excellent Engineering Solutions

3 July 2017

MUNIQUIP, INC PO # 24208
WEIR SPECIALTY PUMPS SALES ORDER NO. DW11450
JOB NAME: CITY OF MANTECA DIGESTER IMPROVEMENTS PROJECT
LOCATION: MANTECA, CA

AIS Compliance

Dave,

In regards to the AIS compliance for this job, the pumping equipment being supplied for section 11312E & 11312Q is exempt from this requirement and not considered construction material per paragraph 22 of the Implementation memorandum issued by the EPA on March 20th 2014.

The paragraph which correlates to pumps and motors reads as follows:

What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

ROTO-JET®
WEMCO®
WSP™

Weir Specialty Pumps

440 West 800 South
Salt Lake City, UT 84101
P.O. Box 209
Salt Lake City, UT 84110

Tel: 801-359-8731
Fax: 801-355-9303

www.weirsp.com

START-UP CHECK LIST

Job No.:_____

Date: _____

IDENTIFICATION

User's Name: _____

Site Location: _____

Pump: Size _____ Model_____

Serial No. _____

Driver: Manufacturer _____ Type _____ HP _____

Serial No. _____

Drive: Manufacturer _____ Type _____ Size _____

Date of Start-Up: _____

I. PRE-START CHECK-OUT

- If any of the following check list items are answered "No" the customer should be advised that the unit should not be started until corrections are made.

A. Were units stored properly? Yes _____ No _____ (Refer to instruction manual)

B. Type of Foundation: Cast Base _____ Steel Base_____ Other _____

C. Does foundation appear rigid enough to maintain alignment? Yes _____ No _____

1. Sketch of foundation (isometric or cross-section)
2. Are the anchor bolts tight? Yes _____ No _____
3. Is unit grouted? Yes _____ No _____ Type of grout _____
4. Is grout sound (free of voids and cracks?) Yes _____ No _____
5. Is unit doweled to base plate? Yes _____ No _____ (Not required for small pumps)

D. Piping:

1. Is unit free from piping strains and bending moments being transmitted to the pump flanges from the piping? Yes _____ No _____

2. Is piping properly supported? Yes _____ No _____

3. Is piping free of scale, dirt and foreign matters? Yes _____ No _____

4. Check valve:

   a. Is it supplied? _____

   b. Mounting? Horizontal _____ Vertical _____

   c. How far from the pump discharge flange? _____

II. ALIGNMENT

- The pump and drive have been checked at the factory to determine that field alignment dimensionally can be made. It is mandatory that the unit is field aligned.

COUPLING OR V-BELT DRIVE:

- Generally a flexible coupling or V-belt drive is supplied with the pump and driver, which for short periods of time will accept some degree of misalignment.


CAUTION

A flexible coupling never compensates for misalignment. In all cases a coupling must be in alignment for continuous operation. Where a non-flexible coupling is used, proper alignment is indispensable to the proper functioning of pump and driver.

ALIGNMENT PROCEDURE

- See Instruction book for the pump being aligned with coupling or V-belt drive. Coupling alignments should be made with dial indicator.

FINAL COUPLING ALIGNMENT READING

Parallel	T.I.R.
Angular	T.I.R.

Instruction book used_____

- Alignment performed by the customer/contractor is acceptable. Please attach Customer's alignment report.

III. PRE-START CHECKS

A. Check all connections to motor and starting device with wiring diagram.

B. Check impeller adjustment (Where applicable see instruction book).

C. Assure that the pump is full of liquid.

D. If pump is fitted with mechanical seal, bleed air from seal chamber (stuffing box). Fill chamber with liquid before rotating, with by hand or motor.

E. Check stuffing box adjustment, lubrication and piping.

1. Lubrication type:
    a. Internal
    b. By-pass
    c. External
    d. Grease
2. Filter lubricant to stuffing box. Yes _____ No _____

F. Turn rotating element by hand to assure that it rotates freely.

G. Check lubrication.

1. Pump: Type _____
2. Driver: Type _____

H. Check rotation. (Viewed from Driver) with coupling/V-belt drive disengaged.

CW ____ CCW_____

 CAUTION

Pump must operate in the direction indicated by the arrow on the pump casing; serious damage can result if the pump is operated with incorrect rotation. Always check rotation each time the motor leads have been disconnected.

IV. PRIMING

- If the pump is installed with a positive head on the suction, it can be primed by opening the suction valve and allowing the liquid to enter the casing. At the same time, open vent until all air is out of casing.
- If the pump is installed with a suction lift, priming must be done by other methods such as foot valves, ejectors or by manually filling the casing and suction line.

 CAUTION

Pump must be completely filled with liquid before starting. Never allow pump to run dry in the hope it will prime itself. Serious damage to the pump, packing or mechanical seal may result.

V. STARTING

A. Close drain valves and valve in discharge line. (See caution below for large motors.)

B. Open fully all valves in the suction line.

C. Turn on seal water to the stuffing box. (If pumped liquid is dirty or if leakage of air is to be prevented, these lines should be always left open.)

D. Prime the pump.

1. If the pump does not prime properly, or loses prime during start-up, it should be shut down and the condition corrected before the procedure is repeated.

2. For pumps moving high temperature liquids, open the war-up valve to circulate liquid for preheating. Close the valve after the pump is warmed up.

 CAUTION

1. The gate valve in the discharge line should always be closed when the pump is started. (Applicable to large motors being started across the line.)

2. The excessive current required by the motor to start under fill load will in time cause motor trouble. (Applicable to large motors being started across the line.)

3. On start-up with the discharge valve closed, pump must not be run against closed valve for more than 30 seconds.

E. Start the pump driver (turbines and engines require warming up, consult with the manufacturer's instructions).

F. When pump is operating at full speed, open the discharge valve slowly.

G. Adjust the liquid seal valves for packed stuffing box or mechanical seals to produce a pressure of 10-15psig above the pump discharge pressure.

- Oil lubricated tandem mechanical seals don't require outside flush water.

VI. OPERATING CHECKS

A. Check the pump and piping for leaks.

B. Check and record pressure gauge reading for future reference.

1. Suction _____PSIG.KPa

2. Discharge _____PSIS/KPa

C. Check and record flow _____USGPM

D. Check and record voltage, amperage per phase and kilowatts (of available).

1. Voltage _____/_____/_____Volts _____

2. Amperage _____/_____/_____Amps _____

E. Measure pump shaft speed: _____RPM

F. Check bearing lubrication.

1. Temperatures.

a. Pump: Inboard (Coupling end) _____ Degrees F.

Outboard _____ Degrees F.

b. Driver: Inboard (Coupling end) _____ Degrees F.

Outboard _____ Degrees F.

VII. SHUTDOWN

- When stopping pump always close the discharge valve first. (Applicable to large pumps.)
- Pump should never run for any length of time with both suction and discharge valves closed due to the danger of building up pressures and temperatures.

VIII. MAINTENANCE

- Have you instructed user's supervisory and maintenance personnel on the correct operation of this equipment? Yes _____ No _____
- Do maintenance personnel have instruction books for these specific units?

  Yes _____ No _____

IV. GENERAL COMMENTS

_____

_____

_____

_____

V. LIST OF ATTENDEES

_____

_____

_____

_____

_____

Name of Company performing start-up

_____

Authorized Signature Date

_____

Signature of Customer Date

Weir Specialty Pumps
440 West 800 South
Salt Lake City, UT 84101-2229

T 801 359 8731
F 801 355 9303
weirsp.com

Job Name: MANTECA, CA
Purchase Order #: 24208
WEMCO Order #: DW11450

If you have any questions with this order please use the following contact list to reach the correct person.

Questions pertaining to:

Executed Purchase Orders and Commercial Terms and Conditions:	Adelina Parker (801) 530-7528 adelina.parker@mail.weir
Submittals or Operation & Maintenance Manuals:	Nathan Farish (801) 530-7515 nathan.farish@mail.weir
Delivery:	Nathan Farish (801) 530-7515 nathan.farish@mail.weir
Problems with shipment: (missing items, wrong items, etc.)	Nathan Farish (801) 530-7515 nathan.farish@mail.weir
Damaged or Malfunctioning Equipment:	Joris Simon (801) 530-7512 Joris.simon@mail.weir
Start-up:	MUNIQUIP, INC. (916) 787-5641 Dave Giersch DGiersch@muniquipllc.com

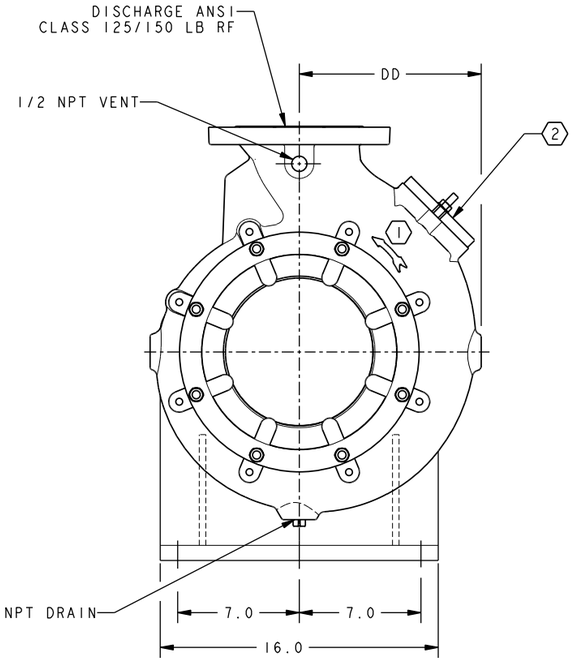
Please have the purchase order and the WEMCO order number associated with your order when you call.

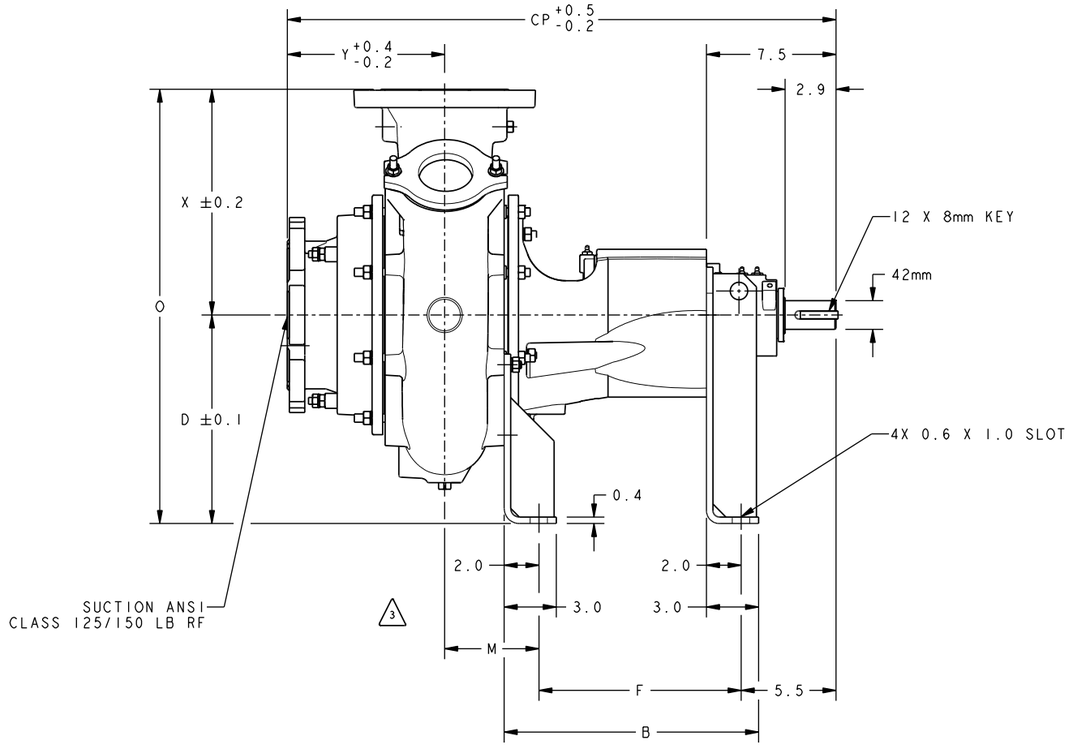
SALES ORDER DESCRIPTION

SALES SHEET NUMBER: **DW11450** P/O **24208**

QTY	PART NUMBER	DESCRIPTION
4	SFE5-BRG	SFE5-R-BFE2W VERTICAL SCREW-FLOW PUMP SECTION 11312E: SCREW CENTRIFUGAL PUMPS TAG #'S: DIG-PMP-07-210, DIG-PMP-07-220, DIG-PMP-07-230 & DIG-PMP-07-240 RPM: 1160 CONDITIONS: 800 GPM @ 23 FT TDH 416 STAINLESS STEEL SHAFT CAST IRON CASE HIGH CHROME GROOVED LINER (regulable) NITRILE ELASTOMERS STAINLESS STEEL PUMP HARDWARE HIGH CHROME IMPELLER DISCHARGE ARRANGEMENT E CAST IRON BFE2W BEARING FRAME SEAL TYPE: SINLGE TANDEM MECAHNICAL SEAL SEAL MANUFACTURER: AES PRODUCT SIDE SEAL FACE: TC VS SC BEARING SIDE SEAL FACE:CARBON VS CERAMIC 7.5HP 254HP 1200RPM SEVER DUTY MOTOR VERTICAL P-BASE INVERTER DUTY MOTOR 3/460V/60 PREMIUM EFFICIENT STAINLESS STEEL HARDWARE CAST IRON SUPPORT ELBOW -SPARE PARTS- 1)809450 SEAL,MECH AES 1.500" M010H 1)809452 SEAL,MECH AES 1.500" P04U COATING: PRIME TNEMEC 104HS EPOXY COLOR: RED TOP TNEMEC 104HS EPOXY COLOR:SAFETY BLUE TESTING AND CERTIFICATION: PERFORMANCE TEST - PACKAGE NOISE TEST VIBRATION TEST **Serial Number(s): 17DW11450-01** **17DW11450-02** **17DW11450-03** **17DW11450-04**

PUMP SIZE	BRG FRAME	MODEL NO.	B	D	F	M	O	X	Y	CP	DD	SUC	DIS	WEIGHT (LBS)
SFE4-Y	BFE2W	79758_GA1	10.5	12.0	7.5	5.1	25.0	13.0	8.6	26.7	10.4	6	4	384.0
	BFE2S	79758_GA2	14.6		11.6					30.8				392.0
SFE5-J	BFE2W	79758_GA3	10.5		7.5	5.4			9.1	27.4			5	408.0
	BFE2S	79758_GA4	14.6		11.6					31.5				415.0
SFE5-R, ~~-B, -D, -L, -Y~~	BFE2W	79758_GA5	10.5		7.5				9.6	28.0				415.0
	BFE2S	79758_GA6	14.6		11.6					32.1				423.0
SFE8-T, -Z	BFE2W	79758_GA7	10.5	15.0	7.5	5.9	30.7	15.7	10.9	29.8	13.6	8	8	566.0
	BFE2S	79758_GA8	14.6		11.6					33.9				573.0
SFE8-B, -D	BFE2W	79758_GA9	10.5		7.5				9.1	28.0		6		560.0
	BFE2S	79758_GA10	14.6		11.6					32.1				568.0





NOTES:

1. CLOCKWISE ROTATION VIEWED FROM DRIVE END.
2. CASE INSPECTION/HANDHOLE NOT AVAILABLE ON SFE4.
3. ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE SPECIFIED.

REVISIONS

NO.	BY	DATE	CHK'D	ECN	DESCRIPTION
-	JJU	6-99	JCH	52189	NEW ISSUE
1	HSS	01/16	HSS	-	REVISED FOR WEMCO SCREW CENTRIFUGAL PUMP
2	HSS	01/16	HSS	-	OLD MODEL RENAMED IN GENERAL NOTES
3	SD	03/02/17	WK	00315	REDRAWN IN CREO. REFER ECN FOR DETAILS

CERTIFIED FOR CONSTRUCTION

DATE

BY

REFERENCE

DWG. NO.	DESCRIPTION

CODE NO. CHG 11/10/15

CUSTOMER

USER

SERIAL NO.

CUSTOMER ORDER NUMBER | EPS SALES SHEET NO.

WEIR SALT LAKE CITY, UTAH, USA

WEMCO® ROTO-JET®

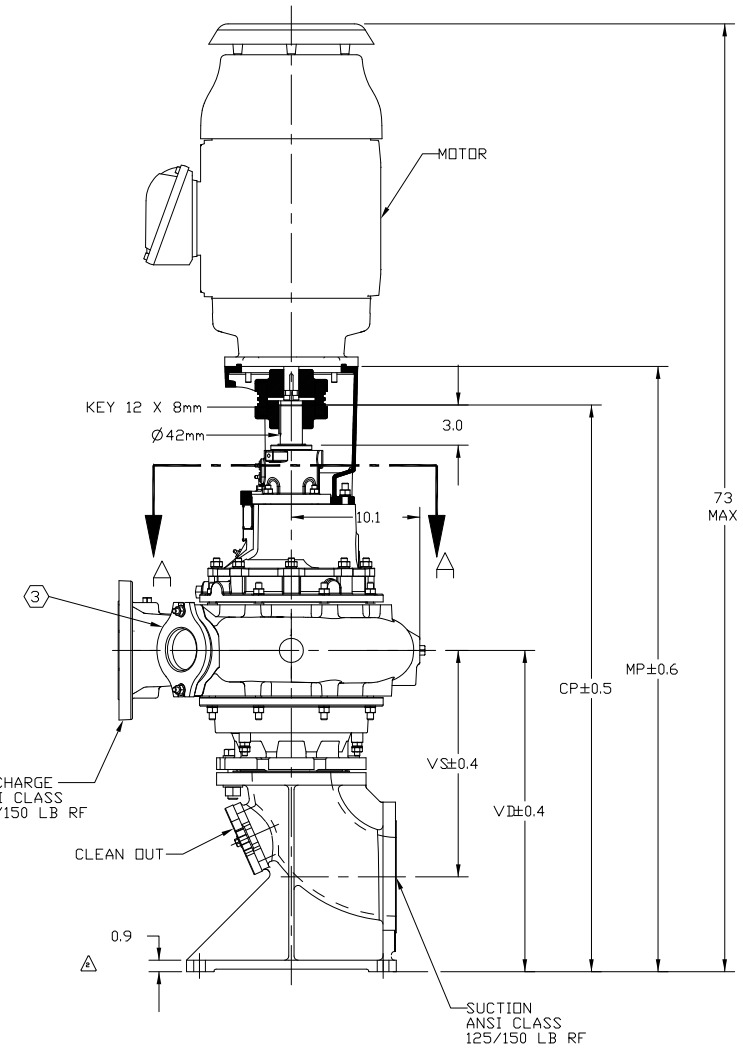
GENERAL ARRANGEMENT
~~SFE4,~~ SFE5 ~~& SFE8~~ PUMP ONLY
WEMCO SCREW-FLOW PUMP

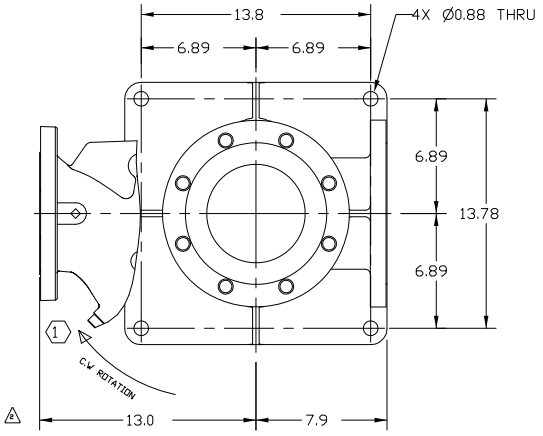
DRAWN BY	JJU	DATE	6-23-99
CHECKED	JCH	DATE	11-9-99
APPROVED	JCH	DATE	11-9-99

CAD NO. 79758-1 | SHEET 1 OF 1

SCALE NTS | SIZE D | DWG NO. 79758 | REVISION 3

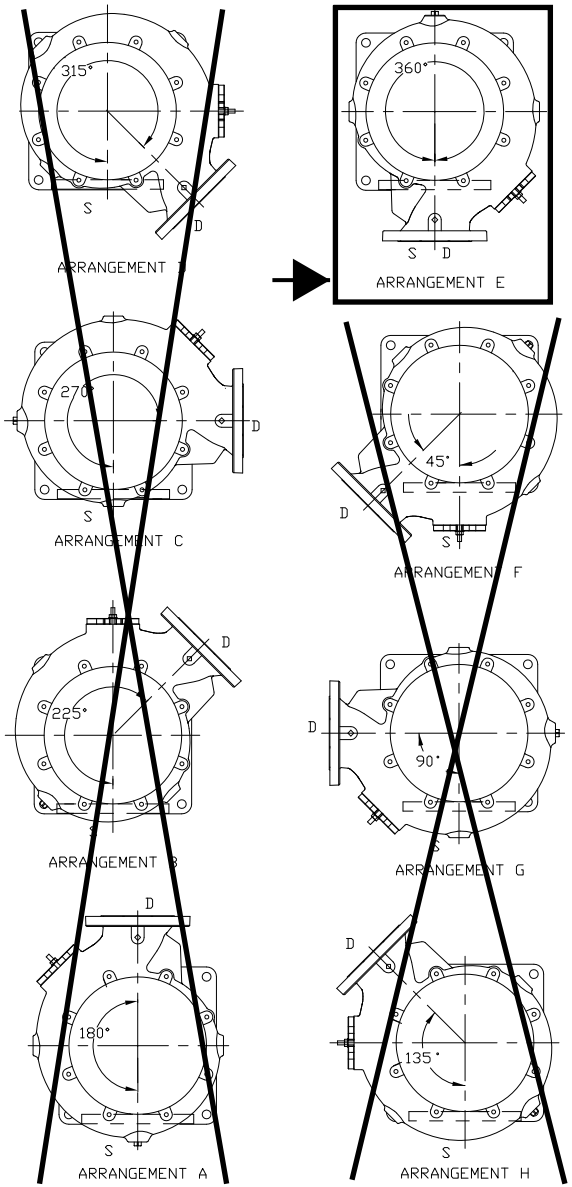
DRAWING NO. 79758





VIEW A

DISCHARGE FLANGE CAN BE ROTATED IN INCREMENTS OF 45° AS SHOWN IN ARRANGEMENTS



SUCTION AND DISCHARGE ARRANGEMENTS

PUMP	BRG	MODEL NO.	CP	MP	VS	VD	SUC	DIS	WEIGHT LESS MOTOR (LBS)
SFE5-J	BFE2S	79625_GA1	46.6	49.5	17.1	24.1	6	5	607.0
	BFE2W	79625_GA2	42.5	45.4	17.1	24.1			599.0
SFE5-R, ~~P, D, L, V~~	BFE2S	79625_GA3	47.3	50.1	17.8	24.8			615.0
	BFE2W	79625_GA4	43.1	45.9	17.8	24.8			607.0

NOTES:

1. CLOCKWISE ROTATION VIEWED FROM DRIVE END.
2. ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE SPECIFIED.
3. CASE INSPECTION/HANDHOLE.

REVISIONS

NO.	BY	DATE	CHK'D	ECN	DESCRIPTION
-	JJU	11-98	BRD	51720	NEW ISSUE
1	HSS	01/16	LM	-	REVISED FOR WEMCO SCREW CENTRIFUGAL PUMP
2	PHC	12/28/16	MK	00315	REDRAWN IN CREOREFER ECN FOR DETAILS

CERTIFIED FOR CONSTRUCTION

DATE 07-05-2017

BY SS

REFERENCE

DWG. NO.	DESCRIPTION
CODE NO.	CHG 03/07/16 6.37

CUSTOMER: MUNIQUIP LLC

USER:

SERIAL NO.: 17DW11450-01,-02,-03 &-04

CUSTOMER ORDER NUMBER: DW11450

EPS SALES SHEET NO.:

DRAWN BY: JJU DATE 11-9-98

CHECKED: BRD DATE 11-9-98

APPROVED: BRD DATE 11-9-98

WEMCO ® ROTO-JET ®

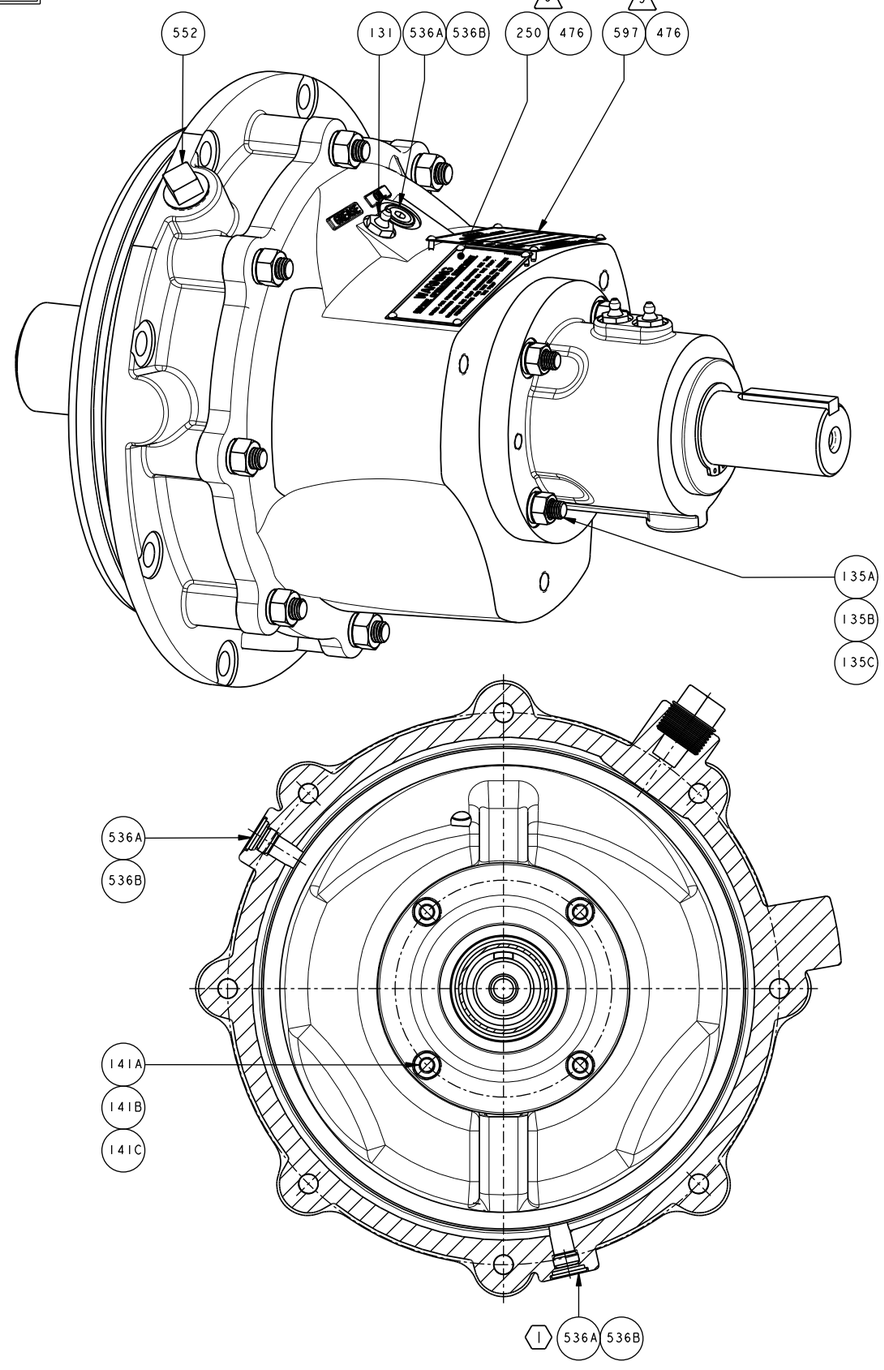
SALT LAKE CITY, UTAH, USA

GENERAL ARRANGEMENT
SFE5 WITH CI SUPPORT ELBOW
VERTICAL INSTALLATION
WEMCO SCREW-FLOW PUMP

CAD NO. 79625-1 SHEET 1 OF 1

SCALE NTS SIZE D DWG NO. 79625 REVISION 2

79625



SECTION B-B

	-01 QTY	ITEM NO.	DESCRIPTION	UNIT WT (lbs)
1	1	154	DRAIN PLUG	
	1	157	SPACER RING	
	1	162	SNAP RING	
	1	164	O-RING	
	1	165	IMPELLER FLANGE	6.3
2	1	209	O-RING	
5	1	250	PLATE, WARNING BEFORE OPERATING	
5	1	251	TAG. CAUTION BEFORE OPERATING	
5	1	252	TAG. WARNING BEFORE OPERATING	
5	1	411A	SHIM KIT	
5	8	476	SCREW, DRIVE	
5	1	507	BACK COVER	43.0
5	1	515W	MECHANICAL SEAL	
5	1	516	MECHANICAL SEAL	
	1	527	O-RING	
	8	534A	STUD, TAP END	
5	8	534B	NUT, HEX	
5	8	534C	WASHER, LOCK	
5 3	3	536A	PLUG	
5 3	3	536B	WASHER, SEAL	
	1	545	SNAP RING	
1	1	552	PLUG, PP SQ HD	
5	1	597	NAMEPLATE	
5	1	600	SCREW, HEX	
5	1	601	WASHER, FENDER	
5	1	602	SPACER	

	-01 QTY	ITEM NO.	DESCRIPTION	UNIT WT (lbs)
	1	100	BEARING HOUSING	6.9
	1	101	SUPPORT FRAME	42.8
	1	102	BEARING CAP	2.1
	1	104	SPACER RING	
	1	105	SPACER RING	
	1	106	SPACER RING	
	1	109	SPACER RING	
	1	110	SHAFT	13.3
5 1	1	112	WOODRUFF KEY	
5	1	114	COUPLING KEY	
	1	118	ROLLER BEARING	
	1	119	ROLLER BEARING	
	2	121	ANGULAR CONTACT BALL BEARING	
5	1	126	LOCK NUT, BEARING	
5	1	127	LOCK WASHER, BEARING	
	1	130	LABYRINTH, D/E	
	3	131	GREASE NIPPLE	
1	1	134	DRAIN PLUG	
	4	135A	STUD, TAP END	
5	4	135B	NUT,HEX	
5 1	4	135C	WASHER, LOCK	
	4	141A	STUD, TAP END	
5	4	141B	NUT, HEX	
5	4	141C	WASHER, LOCK	
5	1	146	O-RING	
5	1	147	O-RING	
	1	151	SPACER RING	

NOTES:

5 1 ORIENT DRAIN TO 6'0 CLOCK.

2. BEFORE ASSEMBLING WET END PARTS, ITEM 600, 601 & 602 SHOULD BE REMOVED.

REVISIONS

NO.	BY	DATE	CHK'D	ECN	DESCRIPTION
2	BRD	12/14/93	TG	44577	ADDED NOTE 3.
3	TG	11/27/96	BRD	44626	PUMP SIDE BEARING ORIENTATION REDRAWN.
4	HSS	01/16	L.M	-	REVISED FOR WEMCO SCREW CENTRIFUGAL PUMP.
5	DTK	03/27/17	S.S	00328	REDRAWN IN CREO. QTY., P/N & I/N UPDATED AS PER AS400.

CERTIFIED FOR CONSTRUCTION

DATE

BY

REFERENCE

DWG. NO.	DESCRIPTION

CODE NO. CHG 03/20/17

CUSTOMER		
USER		
SERIAL NO.		
CUSTOMER ORDER NUMBER	EPS SALES SHEET NO.	
DRAWN BY	ARD	DATE 05-07-93
CHECKED	JB	DATE 12-14-93
APPROVED	RS	DATE 12-14-93

WEIR SALT LAKE CITY, UTAH, USA

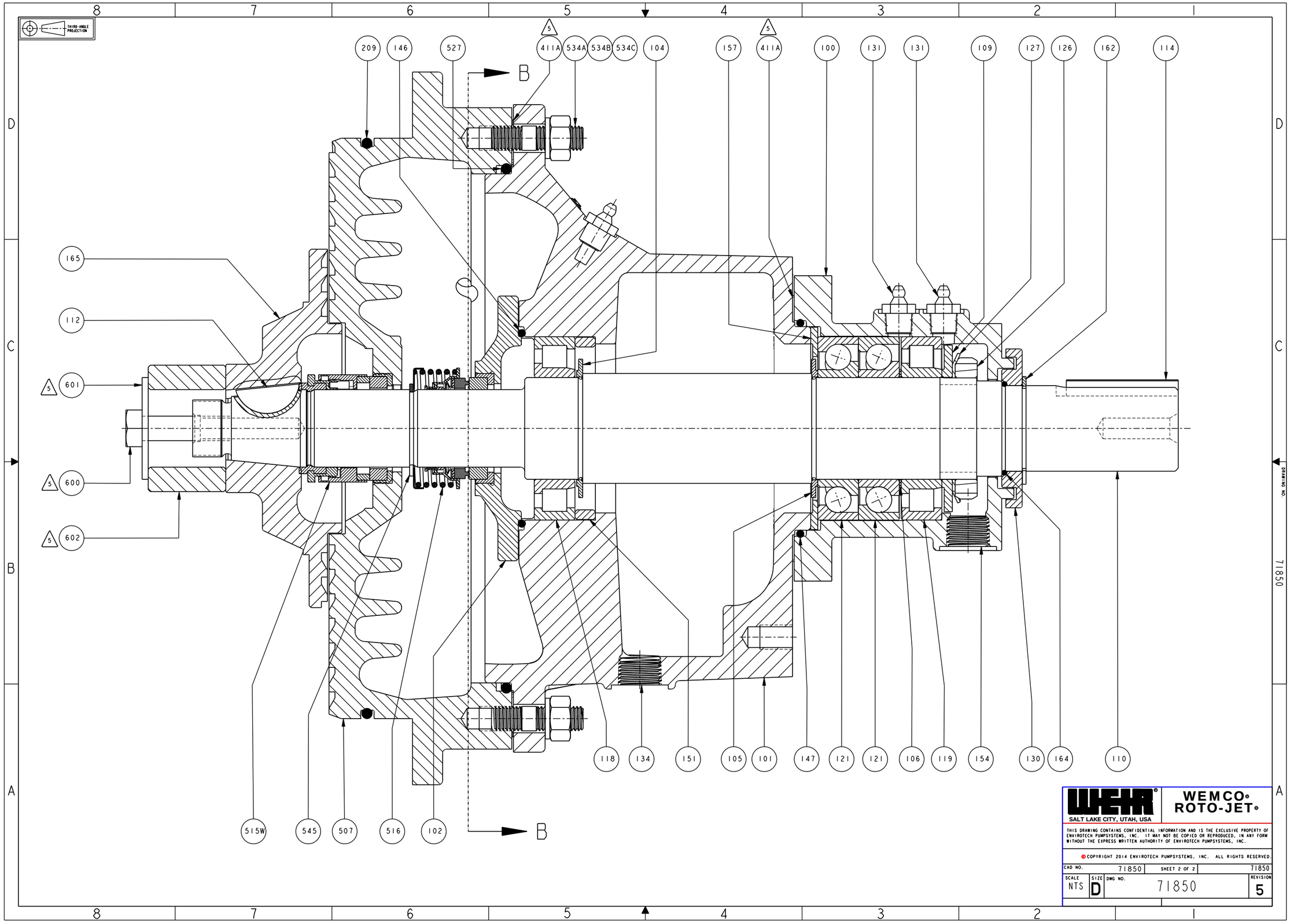
WEMCO® ROTO-JET®

BFE2W
BEARING FRAME ASSEMBLY
WITH IMPELLER FLANGE, SPACER,
WASHER & BOLT
WEMCO SCREW-FLOW PUMP

CAD NO. 71850 | SHEET 1 OF 2 | 71850

SCALE NTS | SIZE D | DWG NO. 71850 | REVISION 5

DRAWING NO. 71850

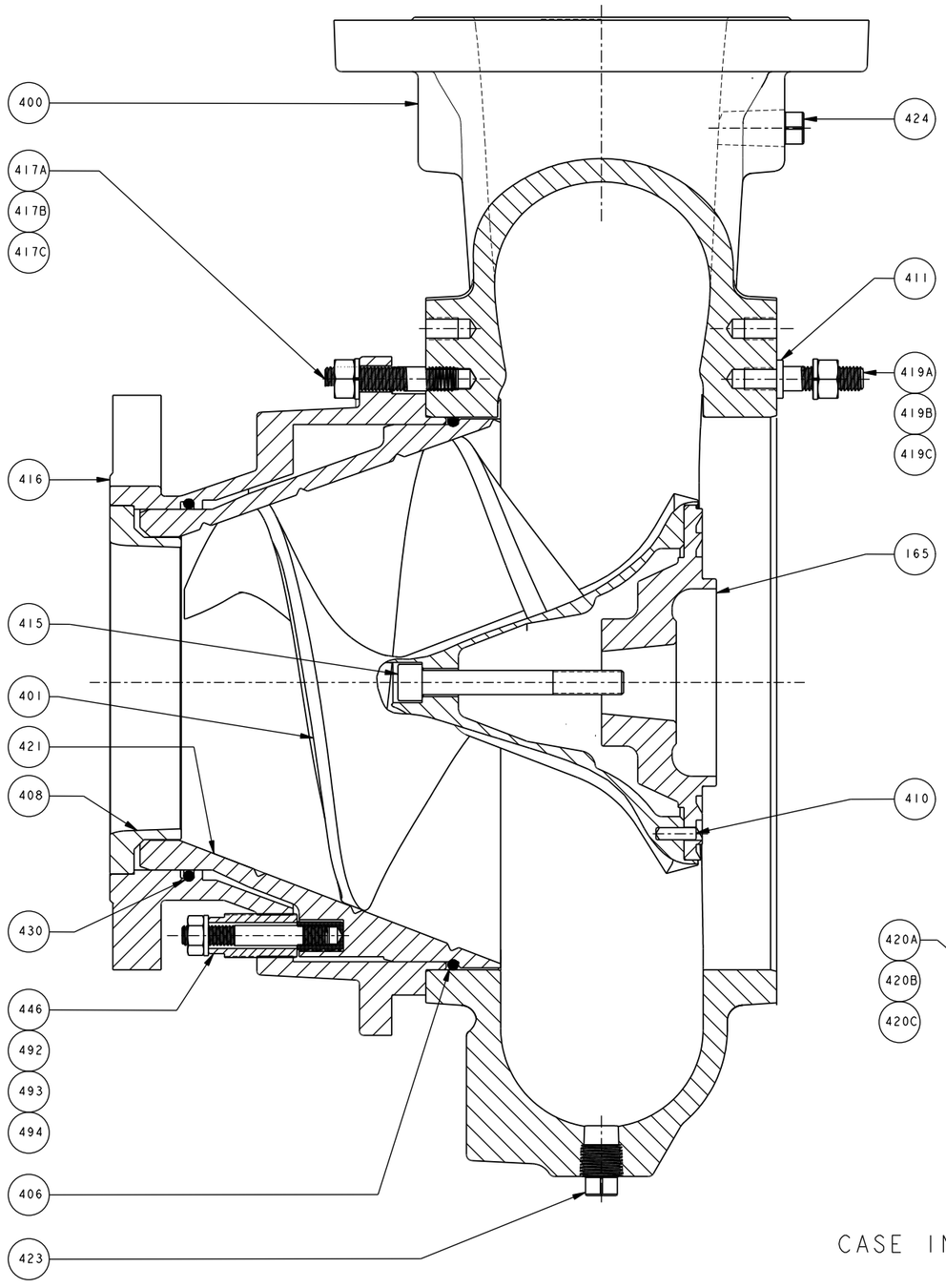


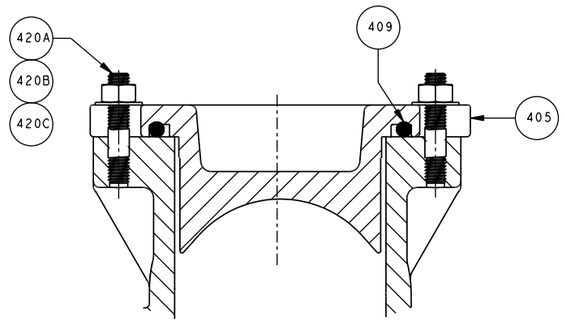
WEIR® SALT LAKE CITY, UTAH, USA

WEMCO® ROTO-JET®

CAD NO.	71850	SHEET 2 OF 2	71850
SCALE NTS	SIZE D	DWG NO. 71850	REVISION 5

DRAWING NO. 71850





CASE INSPECTION / HANDHOLE DETAILS

-R QTY	-B QTY	-J QTY	-D QTY	-L QTY	-Y QTY	ITEM NO.	DESCRIPTION	UNIT WT. (lbs)
1	1	1	1	1	1	165	IMPELLER FLANGE	6.3
1	1	1	1	1	1	400	CASING, VOLUTE SFE5	122.3
-	-	1	-	-	-	401	IMPELLER, SFE5-J	21.4
-	-	-	-	1	-	401	IMPELLER, SFE5-L	23.2
1	-	-	-	-	-	401	IMPELLER, SFE5-R	29.1
-	-	-	-	-	1	401	IMPELLER, SFE5-Y	21.0
-	1	-	-	-	-	401	IMPELLER, SFE5 / SFE8-B	15.7
-	-	-	1	-	-	401	IMPELLER, SFE5 / SFE8-D	16.6
1	1	1	1	1	1	405	COVER, HANDHOLE	5.6
1	1	1	1	1	1	406	O-RING	
1	1	1	1	1	1	408	WEAR RING	3.4
1	1	1	1	1	1	409	O-RING	
1	1	1	1	1	1	410	DOWEL PIN	
1	1	1	1	1	1	411	SHIM KIT	
1	1	1	1	1	1	415	SCREW, CAP, SOC. HD	
1	1	1	1	1	1	416	CASING, SUCTION	45.3
8	8	8	8	8	8	417A	STUD, TAP END	
8	8	8	8	8	8	417B	NUT, HEX	
8	8	8	8	8	8	417C	WASHER, LOCK	
8	8	8	8	8	8	419A	STUD, TAP END	
8	8	8	8	8	8	419B	NUT, HEX	
8	8	8	8	8	8	419C	WASHER, LOCK	
2	2	2	2	2	2	420A	STUD, TAP END	
2	2	2	2	2	2	420B	NUT,HEX	
2	2	2	2	2	2	420C	WASHER,FLAT	
1	1	1	1	1	1	421	LINER, SFE5 / SFE8	24.1
1	1	1	1	1	1	423	PLUG, PIPE SQ. HD	
1	1	1	1	1	1	424	PLUG, PIPE SQ. HD	
1	1	1	1	1	1	430	O-RING	
3	3	3	3	3	3	446	NUT, REGULATOR	
3	3	3	3	3	3	492	STUD, TAP END	
3	3	3	3	3	3	493	NUT, HEX	
3	3	3	3	3	3	494	WASHER, LOCK	

REVISIONS

NO.	BY	DATE	CHK'D	ECN	DESCRIPTION
1	JJU	10/98	BRD	51623	UPDATED PART NUMBERS.
2	ENS	05/01	BRD	53327	BALLOON 416 WAS 402;423 WAS 400.,UPDATED BORDER.
3	ENS	01/02	BRD	53631	ITEM 430 PART NO. WAS 142193.
4	HSS	01/16	L.M	-	REVISED FOR WEMCO SCREW CENTRIFUGAL PUMP.
5	DTK	04/04/17	S.S	00328	REDRAWN IN CREO. UPDATED AS PER AS400.

CERTIFIED FOR CONSTRUCTION

DATE _____

BY _____

REFERENCE	DWG. NO.	DESCRIPTION
CODE NO.	CHG 010514.1056	15.29

CUSTOMER

USER

SERIAL NO.

CUSTOMER ORDER NUMBER	EPS SALES SHEET NO.

DRAWN BY	NNS	DATE 02/03/97
CHECKED	BRD	DATE 06/17/97
APPROVED	BRD	DATE 06/17/97

WEMCO ROTO-JET

SALT LAKE CITY, UTAH, USA

SFE5
WET END ASSEMBLY
REGULABLE
WEMCO SCREW-FLOW PUMP

CAD NO.	79195	SHEET 1 OF 1	79195
SCALE NTS	SIZE D	DWG NO. 79195	REVISION 5

DRAWING NO. 79195

Bearing Life & Shaft Critical Speed Analysis

Excellent Power & Industrial Solutions

ROTO-JET PUMP
WEMCO PUMP
WEMCO-Hidrostal

Pump Information
Make: WEMCO SCREW FLOW
Model: SFE5-R-BFE2W
Serial Number: 17DW11450-01 THRU -04
Orientation: VERTICAL
Drive Type: DIRECT CONNECT

Prepared By: Shiva
Sales Order: DW11450
Date: 7/06/17

REGISTERED PROFESSIONAL ENGINEER
7-6-2017
No. 7877350-2202
LANE M LARSEN
STATE OF UTAH

Operating Conditions

Motor HP:	$P_{motor} := 7.5hp$	Pump Head:	$h_{pump} := 23ft$
Motor Speed:	$n_{motor} := 1200rpm$	Specific Gravity:	$SG_{liquid} := 1.0$
Pump Speed:	$n_{pump} := 1160rpm$	Hydraulic Load, Radial:	$H_{rad} := Load_{Rad} = 46.25 \cdot lbf$
Input Belt Force:	$F_{belt} := 0lbf$	Hydraulic Load, Axial:	$H_{ax} := Load_{Axial} = 454.47 \cdot lbf$

Bearing Life Analysis

Input

Reactions at Bearings (Varies by Pump Model)

Drive Brg, Max Reaction: $(R_{drv.ac}) := 0lbf$ $(R_{drv.roller}) := 40.34lbf$

Impeller Brg Max Reaction: $R_{imp.roller} := 86.58lbf$

Intermediate Calculations and Constants

	Impeller End	Drive End
Number of Bearings taking thrust:	$i_{imp.thr} := 0$	$i_{drv.thr} := 2$
Number of Bearings taking radial load:	$i_{imp.rad} := 1$	$i_{drv.rad} := 1$
Bearing Axial Load:	$Fa_{imp.ac} := 0$	$Fa_{drv.ac} := \frac{H_{ax}}{i_{drv.thr}^{.7}} = 279.76\,lbf$
Bearing Radial Load:	$Fr_{imp.roll} := \frac{R_{imp.roller}}{i_{imp.rad}^{.7}} = 86.58\,lbf$	$Fr_{drv.roll} := \frac{R_{drv.roller}}{i_{drv.rad}^{.7}} = 40.34\,lbf$
		$Fr_{drv.ball} := 0$
Radial Factor:	$X_{imp.roll} := 0$	$(X_{drv.roll}) := .92$ $((X_{drv.ball})) := 0.35$
Thrust Factor:	$Y_{imp.roll} := .6$	$Y_{drv.roll} := .6$ $(Y_{drv.ball}) := 0.57$

Dynamic Equivalent Radial Load:

$P_{imp.rad} := Fr_{imp.roll} + Y_{imp.roll} \cdot Fa_{imp.ac} = 86.58\,lbf$

$P_{drv.rad} := X_{drv.roll} \cdot Fr_{drv.roll} + Y_{drv.roll} \cdot Fa_{drv.ac} = 204.969\,lbf$

$P_{drv.ax} := X_{drv.ball} \cdot Fr_{drv.ball} + Y_{drv.ball} \cdot Fa_{drv.ac} = 159.463\,lbf$

Basic Dynamic Load Rating: $C_{roll} := 16523lbf$ $C_{ball} := 8430lbf$

Life Exponent: $p_{ball.brg} := 3$ $p_{roller.brg} := \frac{10}{3}$

Nominal Rating Life:

$B_{10.drv.rad} := \left(\frac{C_{roll}}{P_{drv.rad}}\right)^{p_{roller.brg}} = 2262927.32$ $B_{10.drv.ax} := \left(\frac{C_{ball}}{P_{drv.ax}}\right)^{p_{ball.brg}} = 147741.137$

$B_{10.imp.rad} := \left(\frac{C_{roll}}{P_{imp.rad}}\right)^{p_{roller.brg}} = 40016374.419$

Output

Bearing Life in Hours:

$$B_{h10.imp.roller} := \left[\frac{\left(B_{10.imp.rad} \cdot 10^6 \frac{rev}{min}\right)}{\left(n_{pump} \cdot 60\right)}\right] hr = 574947908 \cdot hr$$

$$B_{h10.drv.roller} := \left[\frac{\left(B_{10.drv.rad} \cdot 10^6 \frac{rev}{min}\right)}{\left(n_{pump} \cdot 60\right)}\right] hr = 32513324 \cdot hr$$

$$B_{h10.drv.ball} := \left[\frac{\left(B_{10.drv.ax} \cdot 10^6 \frac{rev}{min}\right)}{\left(n_{pump} \cdot 60\right)}\right] hr = 2122717 \cdot hr$$

Shaft Critical Speed Analysis

Shaft P/N: 70916-1

Input

Dimensional Data (Geometry)

Shaft Dia, Drv End: $SD_{drv} := 1.655in$

Shaft Dia, Imp End: $SD_{imp} := 1.5in$

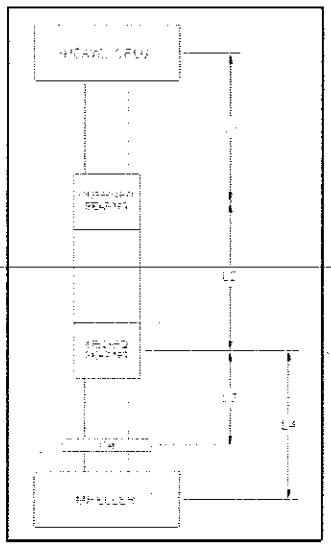
Shaft Dia, Span: $SD_{span} := 2.126in$

Impeller Diameter: $D_{imp} := 11in$

Impeller Width: $W_{imp} := 10.4in$

Impeller Weight, Horizontal: $m_{hrz} := 0lbf$

Impeller Weight, Vertical: $m_{vrt} := 23.9lbf$



$L_1 := 4.1in$ $L_3 := 3.5in$

$L_2 := 7.98in$ $L_4 := 6.961in$

Intermediate Calculations and Constants

Modulus of Elasticity of Steel: $E := 29000000psi$

Ultimate Tensile Strength of Material: $S_{ut} := 80000psi$

Shaft Moment of Inertia: $I_{imp} := \frac{\left(\pi SD_{imp}^{4}\right)}{64} = 0.249 \cdot in^4$ $I_{drv} := \frac{\left(\pi SD_{drv}^{4}\right)}{64} = 0.368 \cdot in^4$

Shaft Section Modulus: $Sm_{imp} := \frac{\left(\pi SD_{imp}^{3}\right)}{32} = 0.331 \cdot in^3$ $Sm_{drv} := \frac{\left(\pi SD_{drv}^{3}\right)}{32} = 0.445 \cdot in^3$

Polar Moment of Inertia: $Ip_{imp} := \frac{\left(\pi \cdot SD_{imp}^{4}\right)}{32} = 0.497 \cdot in^4$ $Ip_{drv} := \frac{\left(\pi \cdot SD_{drv}^{4}\right)}{32} = 0.737 \cdot in^4$

Radius of Shaft: $r_{imp} := \frac{SD_{imp}}{2} = 0.75 \cdot in$ $r_{drv} := \frac{SD_{drv}}{2} = 0.828 \cdot in$

Calculated Torque: $Tq := \left(\frac{P_{motor}}{n_{motor}}\right) = 393.908 \cdot lbf \cdot in$

Output

Shaft Design Information

Deflection at the Impeller: $\delta st_{imp} := \left[\frac{m_{vrt} \cdot L_4^{\,2} \cdot (L_4 + L_2)}{3 \cdot E \cdot I_{imp}}\right] = 0.001 \cdot in$

Deflection at the Drive Sheave or Coupling: $\delta st_{drv} := \left[\frac{m_{vrt} \cdot L_1^{\,2} \cdot (L_1 + L_2)}{3 \cdot E \cdot I_{drv}}\right] = 0 \cdot in$

Deflection at the Seal: $\delta st_{seal} := \left[\frac{m_{vrt} \cdot L_3 \cdot \left(2L_2 \cdot L_4 + 3L_4 \cdot L_3 - L_3^{\,2}\right)}{6 \cdot E \cdot I_{imp}}\right] = 0 \cdot in$

Max Shaft Bending Stress: $\sigma_{bend.imp} := \left[\frac{\left[\left(m_{vrt} + H_{rad}\right)L_4\right]}{Sm_{imp}}\right] = 1473.679 \cdot psi$

$\sigma_{bend.drv} := \left[\frac{\left[\left(F_{belt}\right)L_1\right]}{Sm_{drv}}\right] = 0 \cdot psi$

Max Shaft Torsional Stress: $\tau_{imp} := \frac{Tq \cdot r_{imp}}{Ip_{imp}} = 594.418 \cdot psi$

$\tau_{drv} := \frac{Tq \cdot r_{drv}}{Ip_{drv}} = 442.559 \cdot psi$

$\sigma_{axial.drv} := 0psi$

Max Shaft Axial Stress: $\sigma_{axial.imp} := \frac{H_{ax}}{0.785 \cdot SD_{imp}^{\,2}} = 257.309 \cdot psi$

Max Combined Stress:

$$\sigma_{max.imp} := \left[\left(\frac{\sigma_{bend.imp} + \sigma_{axial.imp}}{2}\right) + \sqrt{\left[\frac{\left(\sigma_{bend.imp} + \sigma_{axial.imp}\right)}{2}\right]^2 + \tau_{imp}^2}\right] = 1915.452 \cdot psi$$

$$\sigma_{max.drv} := \left[\left(\frac{\sigma_{bend.drv} + \sigma_{axial.drv}}{2}\right) + \sqrt{\left[\frac{\left(\sigma_{bend.drv} + \sigma_{axial.drv}\right)}{2}\right]^2 + \tau_{drv}^2}\right] = 442.559 \cdot psi$$

First Bending Natural Frequency (Critical Speed):

$$\omega_n := \frac{1}{(2\pi)} \cdot \sqrt{\frac{(g)}{\delta st_{imp}}} = 110.543 \cdot Hz$$

$$Nc := \left(\omega_n \cdot 60s\right)\frac{rev}{min} = 6632.565 \cdot rpm$$

Endurance Limit Variables

Surface Finish Factor: $((Ka) := 0.8)$

Size Factor: $Kb_{imp} := 0.869 \cdot SD_{imp}^{(-0.097)} \cdot in^{.097} = 0.835$

$Kb_{drv} := 0.869 \cdot SD_{drv}^{(-0.097)} \cdot in^{.097} = 0.828$

Reliablity Factor: $(Kc := (0.753))$

Temperature Factor: $(Kd := (1))$

Stress Concentration Factor: $(Ke := (0.45))$

Miscellaneous Factor: $(Kf := (1))$

Estimated Endurance Limit: $S'e := 0.5 \cdot S_{ut} = 40000 \cdot psi$

Calculated Endurance Limit:

$$Se_{imp} := Ka \cdot Kb_{imp} \cdot Kc \cdot Kd \cdot Ke \cdot Kf \cdot S'e = 9059.337 \cdot psi$$

$$Se_{drv} := Ka \cdot Kb_{drv} \cdot Kc \cdot Kd \cdot Ke \cdot Kf \cdot S'e = 8973.334 \cdot psi$$

Shaft Safety Factor: $SF_{imp} := \left(\frac{Se_{imp}}{\sigma_{max.imp}} \right) = 4.73$ $SF_{drv} := \left(\frac{Se_{drv}}{\sigma_{max.drv}} \right) = 20.276$

STRUCTURAL CALCULATIONS FOR
SEISMIC ANCHORAGE

WEIR SPECIALTY PUMPS – DW11450

CITY OF MANTECA

SHEETS	ITEM
1-3	SFER-5 PUMP SEISMIC ANCHORAGE
4-5	6X4 CF2 PUMP SEISMIC ANCHORAGE

Signed: 2/7/18

David K. Okasaki, SE
9085 Bader Road
Elk Grove, CA 95624
(916) 686-8160

DAVID K. OKASAKI
STRUCTURAL ENGINEER
9085 BADER ROAD
ELK GROVE, CA 95624
(916) 686-8160

JOB: DW11450 Manteca
Weir SFE5-R Pump
SHEET NO. 1 of 6
BY: DKO DATE: 2/6/2018

WEIR SFE5-R PUMP SEISMIC ANCHORAGE:

CODE: 2016 CBC

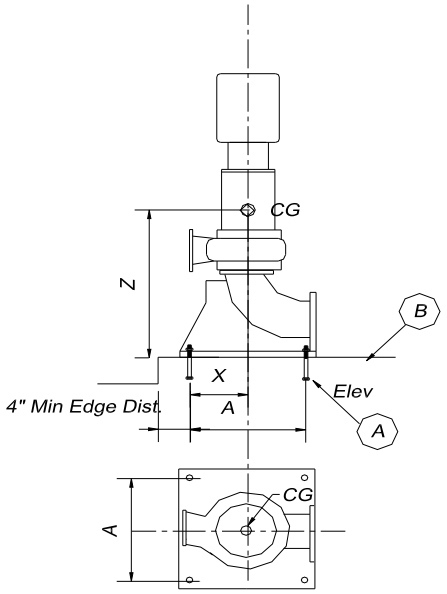
Ip = 1.50
Sds = 0.753 Site Class: D
SDC = D
z/h = 0.00 ap = 1.0
Rp = 2.5

Fp = 0.4ap*Sds(1+2z/h)Wp/(Rp/Ip) = 0.18 Wp
= 136 lbs

or
Fp = 0.3Sds Ip Wp
= 0.34 Wp lbs.
Fp = 254 lbs (controls)

Fpv =0.2SdsWp
= 0.15 Wp
Fpv = 113 lbs

Wp = 750 lbs
`X' = 6.89 in
`Z' = 33.80 in
`A' = 13.78 in



Base Plate Plan

KEYNOTES

A *3/4" DIA HAS-R 316 SS THR'D ROD AB W/HILTI HIT-RE 500 V3 ADHESIVE, 4 TOTAL WITH 5" MIN. EMBED INTO CONC., 4" MIN EDGE DIST.*

B *CONCRETE SLAB OR PAD*

ANCHOR BOLTS: Apply Ωo = 2.5 Overstrength factor for non-ductile Anchor design per ASCE 7-10, Section 13.4.2 and ACI Appendix D, Section 3.3

Seismic to Right:

OTM =(ΩoFp *Z) = 21475 in-lbs (Input to Hilti Profis Anchor Design Program)
Effective Resisting Dead Load = 0.9Wp -Fpv = 562 lbs
or 0.6Wp per Specs = 450 lbs Controls (Input to Hilti Profis Program)
Vu = ΩoFp = 635 lbs (Input to Hilti Profis Program)

Anchor Design Forces and Capacities From Hilti Profis Program V2.7.5
3/4" dia. HAS-R 304/316 SS Thr'd rods w/ Hilti RE-500 SD Adhesive in 3,000 psi min. conc.,
5" min. embed, 4" edge dist ea way (See Attached Profis Output, Sheets 2 & 3 of 3)

Forces: Vu = 437 lbs Shear on Anchor Group
Nu = 1270 lbs on Tension Anchor Group

Limiting Anchor Capacities:
Capacities: ΦVn = 3057 lbs ΦVcb, Concrete Edge Breakout Strength in Shear
ΦNn = 4429 lbs. ΦNcb, Bond Strength in Tension of Group

combined:

Vu /ΦVn + Nu /ΦNn ≤ 1.2
= 0.43 < 1.2 OK

Use 4 - 3/4" Dia HAS-R 316 SS Thr'd Rod AB
W/Hilti HIT-RE 500 V3 Adhesive
5" Min. Embed into Conc., 4" Min Edge Dist. Special Inspection Required

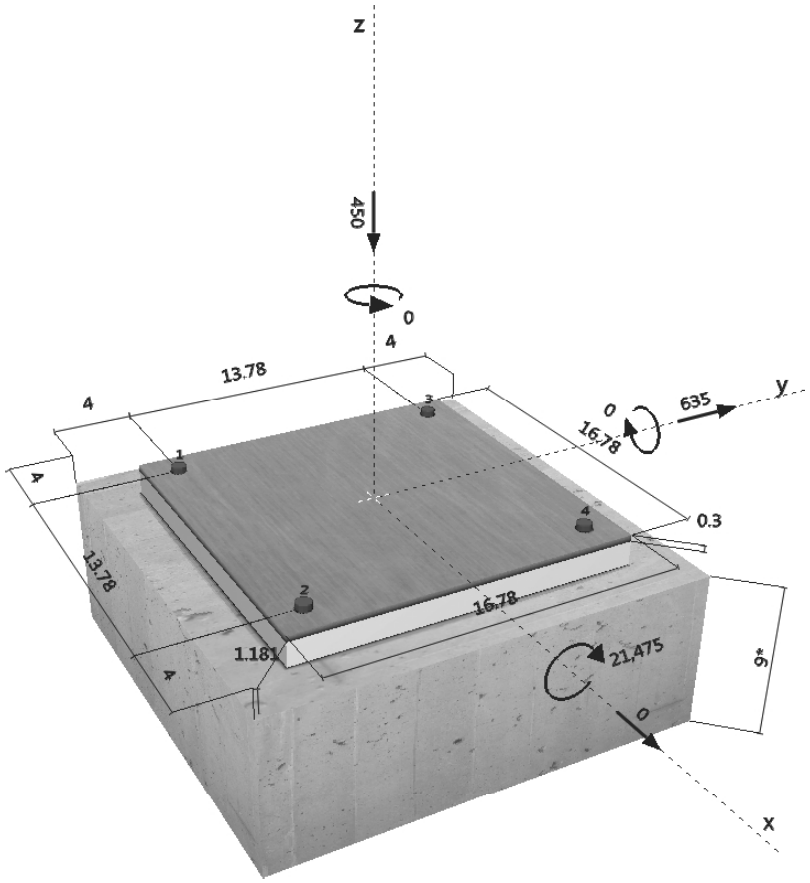
Company:	David K Okasaki, S.E.	Page:	2
Specifier:	DKO	Project:	Weir DW11450
Address:	9085 Bader Road	Sub-Project I Pos. No.:	Manteca
Phone I Fax:	916-686-8160 |	Date:	2/7/2018
E-Mail:			

Specifier's comments: SFE5-R Pump Seismic Anchorage

1 Input data

Anchor type and diameter:	**HIT-RE 500 V3 + HAS-R 316 SS 3/4**
Effective embedment depth:	$h_{ef,act}$ = 5.000 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM F 593
Evaluation Service Report:	ESR-3814
Issued I Valid:	1/1/2017 | 1/1/2019
Proof:	Design method ACI 318-08 / Chem
Stand-off installation:	without clamping (anchor); restraint level (anchor plate): 2.00; e_b = 1.181 in.; t = 0.300 in.
	Hilti Grout: CB-G EG, epoxy, $f_{c,Grout}$ = 14939 psi
Anchor plate:	l_x x l_y x t = 16.780 in. x 16.780 in. x 0.300 in.; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3000 psi; h = 9.000 in., Temp. short/long: 110/85 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	yes (D.3.3.6)

Geometry [in.] & Loading [lb, in.lb]



Company: David K Okasaki, S.E.
Specifier: DKO
Address: 9085 Bader Road
Phone I Fax: 916-686-8160 |
E-Mail:

2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	Bond Strength	1270	4229	31 / -	OK
Shear	Concrete edge failure in direction y+	635	3057	- / 21	OK

Loading	β_N	β_V	ζ	**Utilization $\beta_{N,V}$ [%]**	**Status**
Combined tension and shear loads	0.300	0.208	5/3	21	OK

Fastening meets the design criteria!

Remarks; Your Cooperation Duties

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BEARING TEMPERATURES		
TIME	**DRIVE**	**ROTOR**
11:50	69.3	69.3
12:05	113	77.9
12:20	113.4	84.8
12:35	113.9	86
12:50	115.3	88.1
1:05	115.4	86.8
1:20	117	89
1:35	118.1	89.6
1:50	117.3	90.3

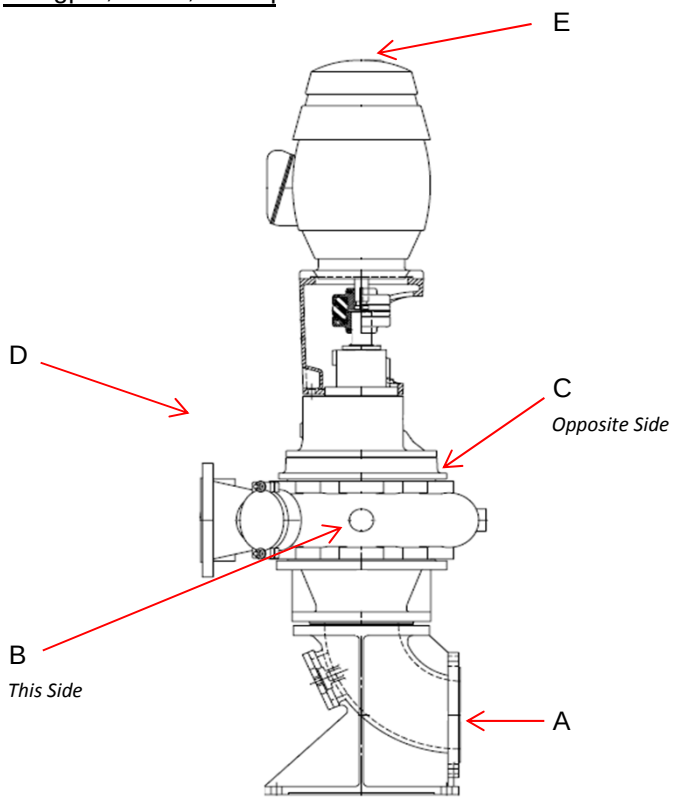
BEARING TEMPERATURES		
TIME	**DRIVE**	**ROTOR**
9:00	66.9	66.9
9:15	90.8	72.7
9:30	91.5	75.9
9:45	95	78.1
10:00	96.1	81
10:15	96.2	79.3
10:30	98.8	81.5
10:45	99.6	84.8
11:00	99.9	84.9

BEARING TEMPERATURES		
TIME	**DRIVE**	**ROTOR**
7:10	68.6	68.6
7:25	72.4	86.6
7:40	74.1	91.3
7:55	75.4	94.6
8:10	77.4	96.8
8:25	75.8	96.4
8:40	78.2	99.5
8:55	78.2	99.1
9:10	78.7	99.5

BEARING TEMPERATURES		
TIME	**DRIVE**	**ROTOR**
1:05	70.3	70.3
1:20	72.7	89.8
1:35	74.3	91.6
1:50	75.5	94.5
2:05	76.9	96
2:20	77.6	98
2:35	77.8	99.5
2:50	78.3	100.6
3:05	77.9	100.6

WSC VERTICAL NOISE DATA

Date: 2/8/2018
S/N: 17DW11450-01
Lab Tech: B. SPARKS
Con Point: 800gpm, 23tdh, 1160r

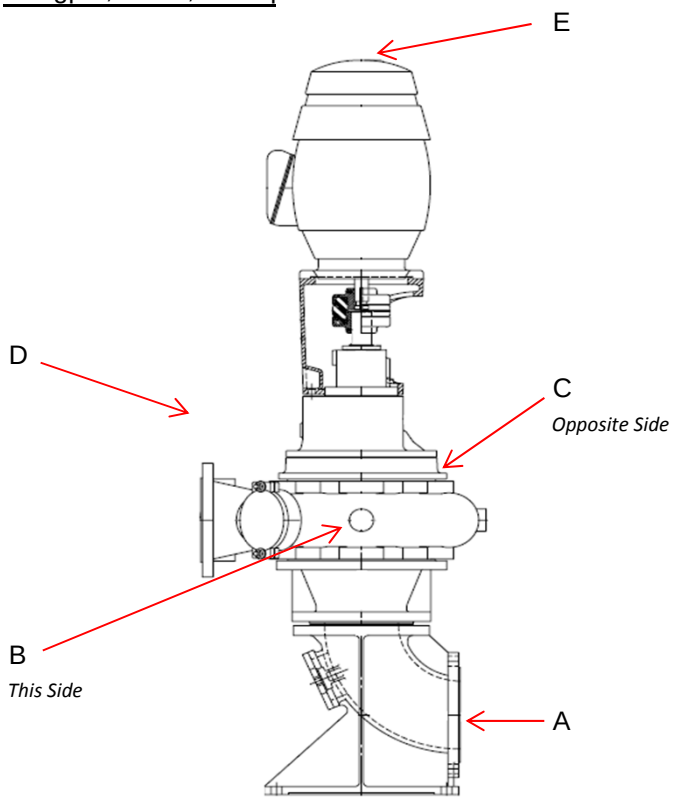


Noise Data		
Test Point		Dba
Ambient		60.5
Wet End	A	68.4
Left Side	B	67.9
Right Side	C	71.3
Discharge	D	74.2
Drive End	E	67.8

Because of the difficulty in placing microphones specific distances from various surfaces, as well as the difficulty in isolating motor and drive train noise, meaningful pump noise data may be unattainable. Consequently, noise tests are only conducted at the customer's specific request. Noise measurements are made and recorded per customer specification. The published noise test procedure in the "Hydraulic Institute Standards", where applicable, may also be used as a guide. Also, outside noise specialists may be used when required.

WSC VERTICAL NOISE DATA

Date: 2/8/2018
S/N: 17DW11450-02
Lab Tech: B. SPARKS
Con Point: 800gpm, 23tdh, 1160r

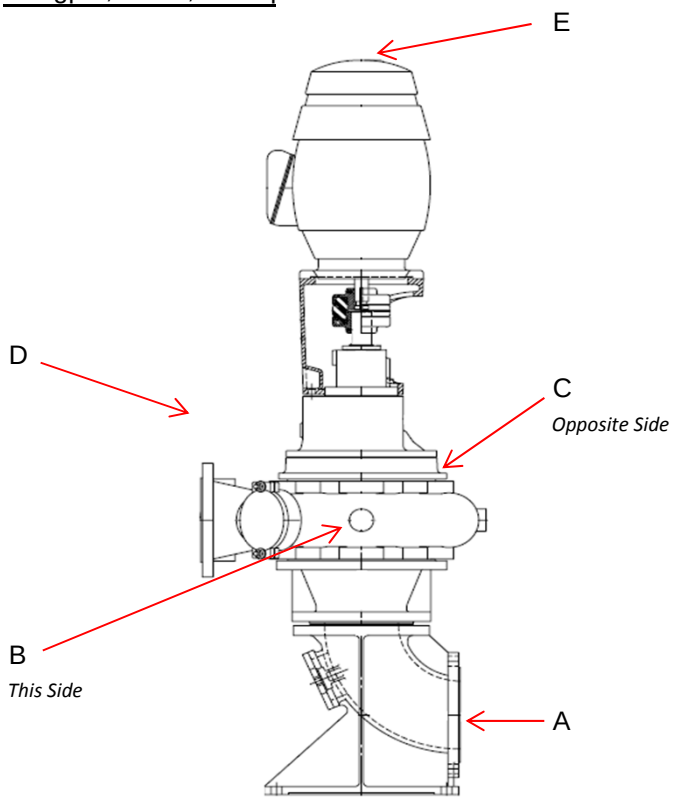


Noise Data		
Test Point		Dba
Ambient		60.5
Wet End	A	73.6
Left Side	B	69.1
Right Side	C	68.9
Discharge	D	78.2
Drive End	E	78

Because of the difficulty in placing microphones specific distances from various surfaces, as well as the difficulty in isolating motor and drive train noise, meaningful pump noise data may be unattainable. Consequently, noise tests are only conducted at the customer's specific request. Noise measurements are made and recorded per customer specification. The published noise test procedure in the "Hydraulic Institute Standards", where applicable, may also be used as a guide. Also, outside noise specialists may be used when required.

WSC VERTICAL NOISE DATA

Date: 2/13/2018
S/N: 17DW11450-03
Lab Tech: M. WHITE
Con Point: 800gpm, 23tdh, 1160r

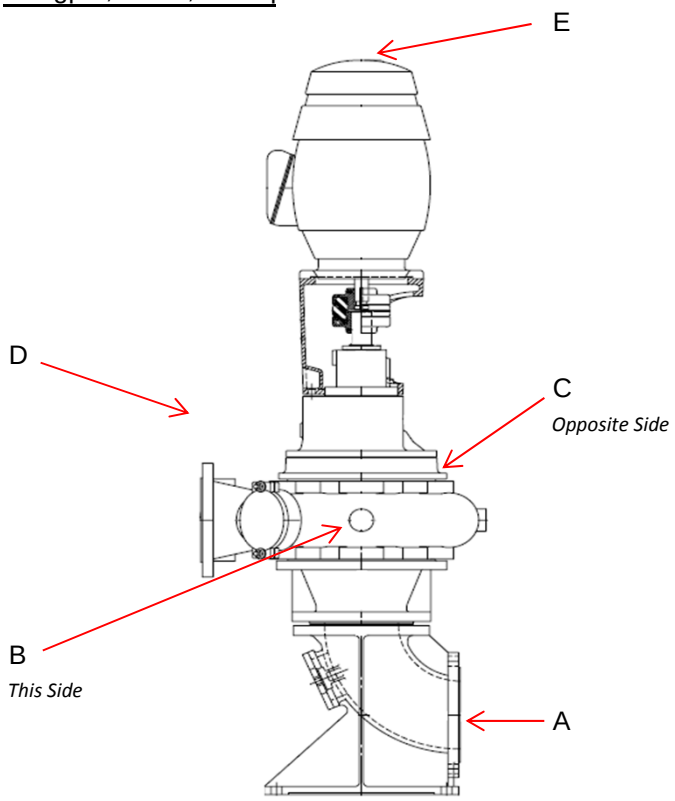


Noise Data		
Test Point		Dba
Ambient		63.6
Wet End	A	73.4
Left Side	B	73.6
Right Side	C	74.8
Discharge	D	74.1
Drive End	E	84

Because of the difficulty in placing microphones specific distances from various surfaces, as well as the difficulty in isolating motor and drive train noise, meaningful pump noise data may be unattainable. Consequently, noise tests are only conducted at the customer's specific request. Noise measurements are made and recorded per customer specification. The published noise test procedure in the "Hydraulic Institute Standards", where applicable, may also be used as a guide. Also, outside noise specialists may be used when required.

WSC VERTICAL NOISE DATA

Date: 2/9/2018
S/N: 17DW11450-04
Lab Tech: M. WHITE
Con Point: 800gpm, 23tdh, 1160r



Noise Data		
Test Point		Dba
Ambient		63.6
Wet End	A	66.4
Left Side	B	66.6
Right Side	C	67.1
Discharge	D	68.5
Drive End	E	68

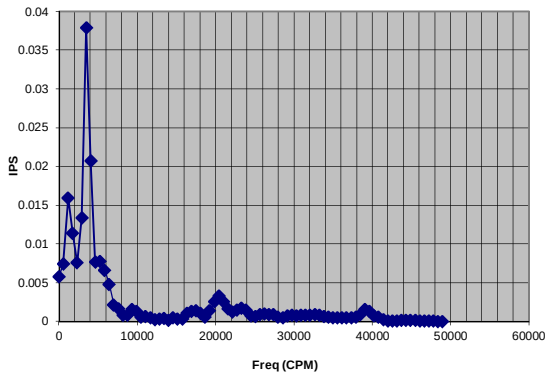
Because of the difficulty in placing microphones specific distances from various surfaces, as well as the difficulty in isolating motor and drive train noise, meaningful pump noise data may be unattainable. Consequently, noise tests are only conducted at the customer's specific request. Noise measurements are made and recorded per customer specification. The published noise test procedure in the "Hydraulic Institute Standards", where applicable, may also be used as a guide. Also, outside noise specialists may be used when required.

Pump Vibration Report (Peak)

Date 2/8/2018 11:48

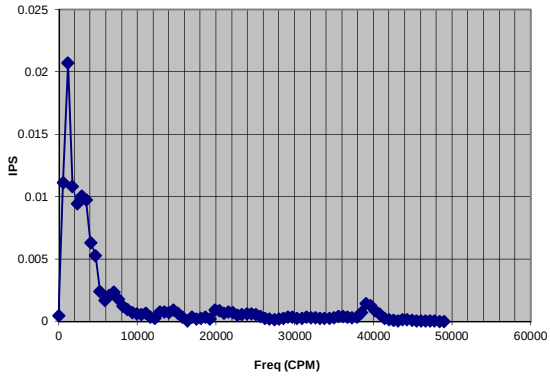
Serial # 17DW11450-01

Drive Vertical



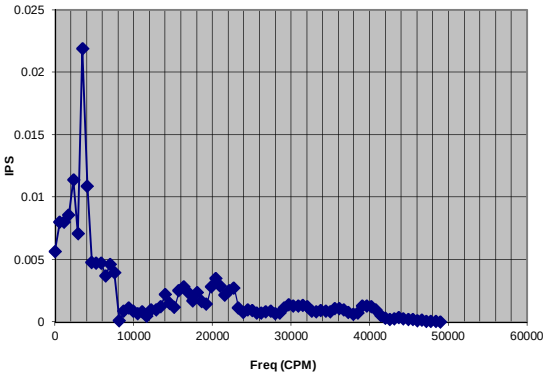
Overall 0.042623 ips

Drive Horizontal



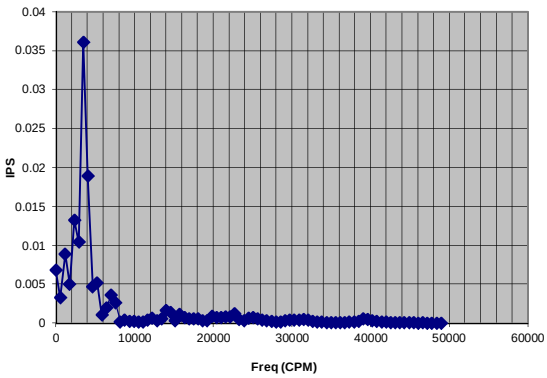
Overall 0.031723 ips

Front Vertical



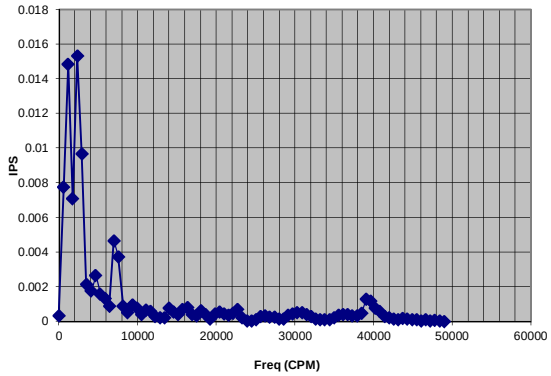
Overall 0.035266 ips

Front Horizontal



Overall 0.041983 ips

Axial



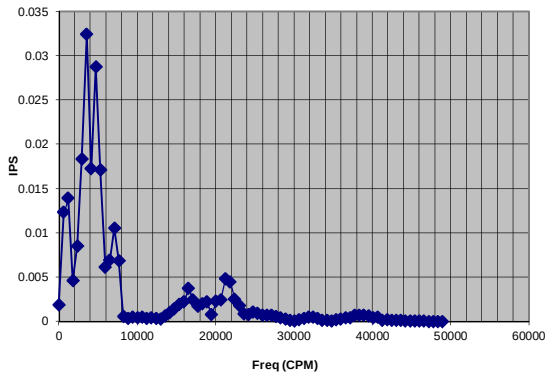
Overall 0.029053 ips

Pump Vibration Report (Peak)

Date 2/8/2018 10:46

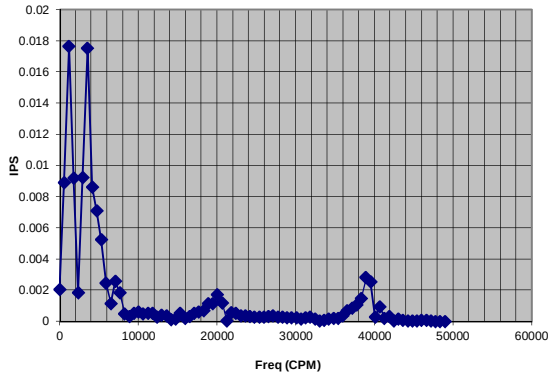
Serial # 17DW11450-02

Drive Vertical



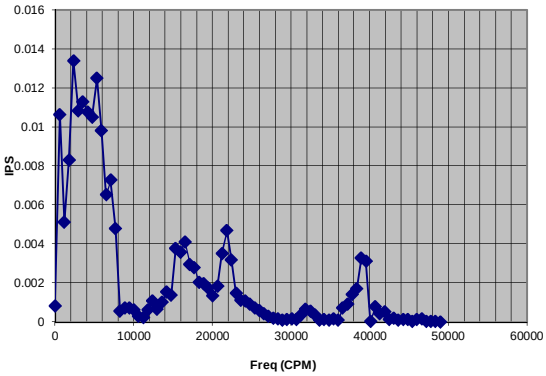
Overall 0.052256 ips

Drive Horizontal



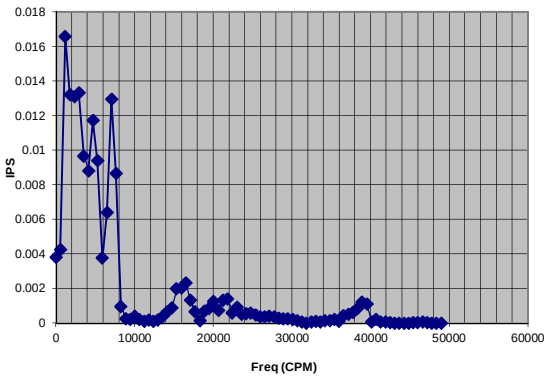
Overall 0.027086 ips

Front Vertical



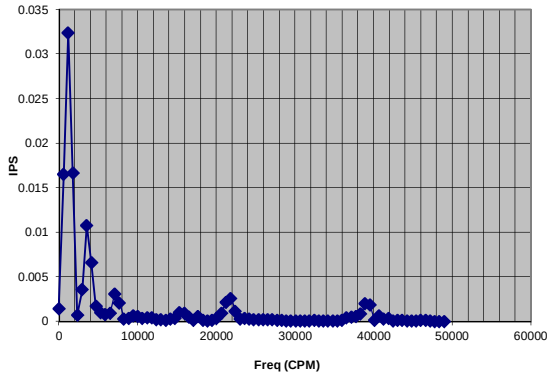
Overall 0.037553 ips

Front Horizontal



Overall 0.038042 ips

Axial



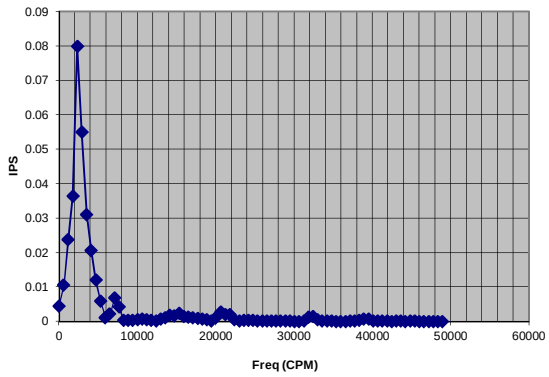
Overall 0.034172 ips

Pump Vibration Report (Peak)

Date 2/13/2018 9:14

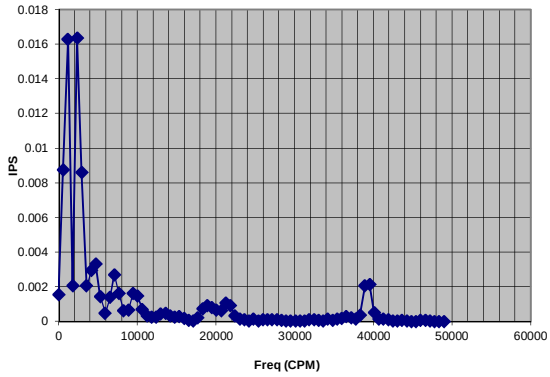
Serial # 17DW11450-03

Drive Vertical



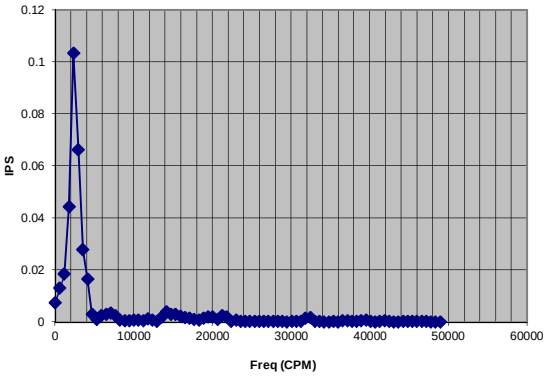
Overall 0.089487 ips

Drive Horizontal



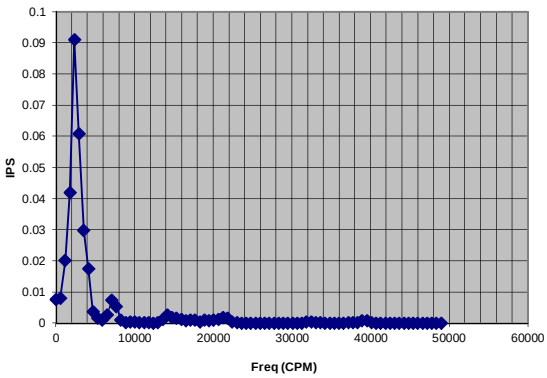
Overall 0.023644 ips

Front Vertical



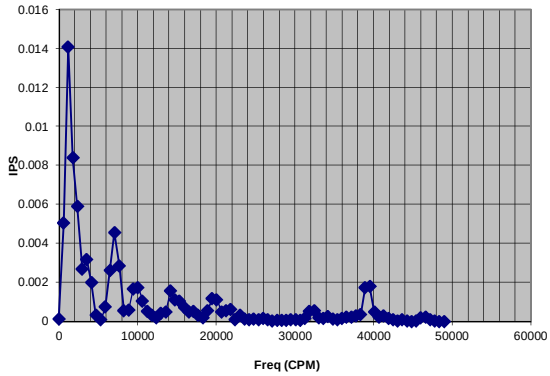
Overall 0.107644 ips

Front Horizontal



Overall 0.097307 ips

Axial



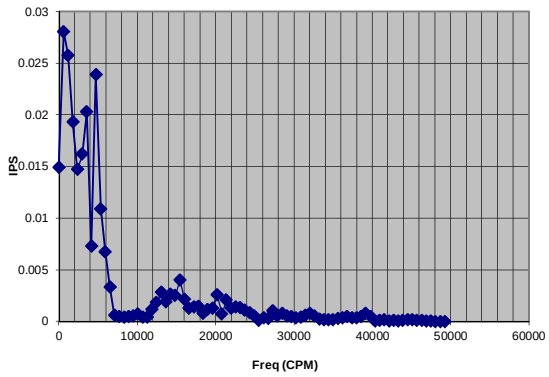
Overall 0.017122 ips

Pump Vibration Report (Peak)

Date 2/9/2018 13:03

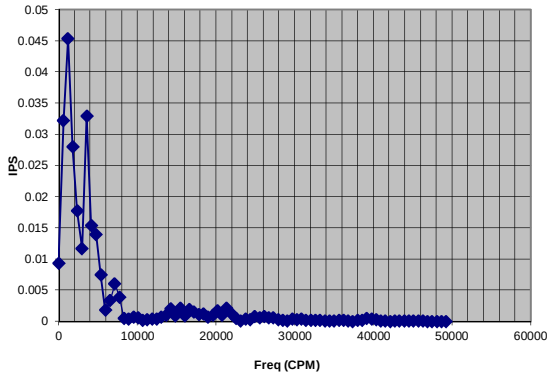
Serial # 17DW11450-04

Drive Vertical



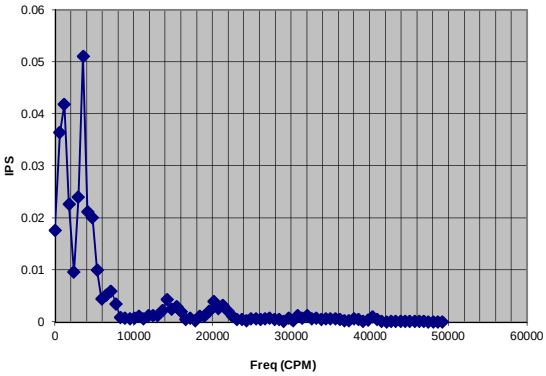
Overall 0.05449 ips

Drive Horizontal



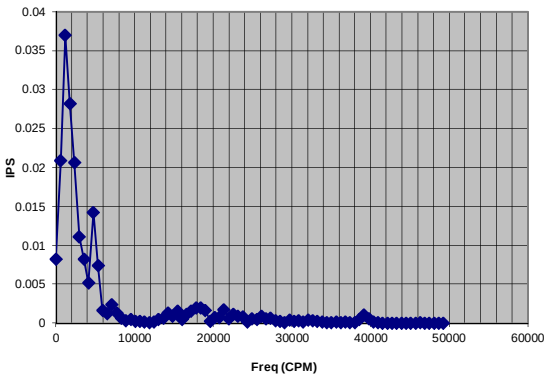
Overall 0.060291 ips

Front Vertical



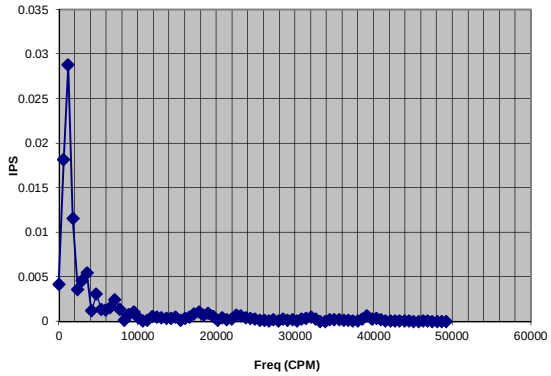
Overall 0.070272 ips

Front Horizontal



Overall 0.056028 ips

Axial



Overall 0.031228 ips

WEMCO®
Pumps & Systems

Pump Test Report

Weir Specialty Pumps

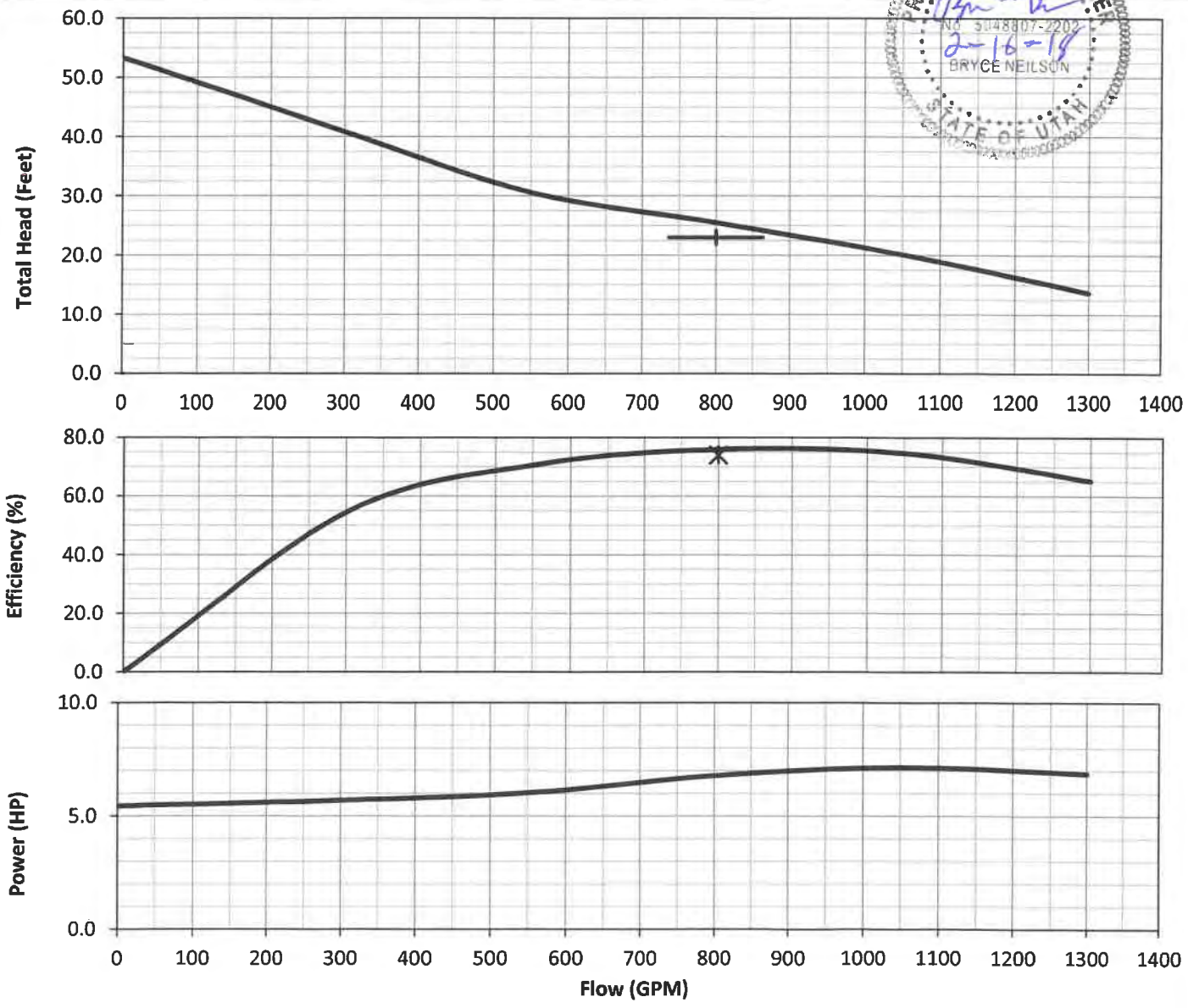
Sales Order: DW11450	Pump Model: SFE5-R-BFE2W	Date: 2/15/2018	Guarantee Point: Flow 800.0 Head 23.0	Unilateral Tolerance Band
Serial Number: 17DW11450-01	Customer: WESTERN WATER CONSTRUCTORS INC	Speed: As shown		Bilateral Tolerance Band
Test No.: 19626-1-0	Customer PO: 24208R1	Impeller: High Chrome	Acceptance Grade: HI 14.6 2B	Secondary Duty Point

	Speed	(GPM)	(Feet)	(HP)	(%)
1	1194	0.2	53.3	5.4	0.1
2	1192	300.6	40.8	5.7	54.5
3	1192	550.5	30.6	6.0	70.6
4	1191	800.4	25.5	6.8	76.0
5	1191	1050.4	20.1	7.1	74.6
6	1191	1300.3	13.6	6.9	65.2
7					
8					
9					
10					

Test was performed with clear water

Certified by: Kitita Clegg

PROFESSIONAL ENGINEER
No. 5048807-2202
2-16-19
BRYCE NEILSON
STATE OF UTAH



WEMCO®
Pumps & Systems

WEIR

Pump Test Report

Weir Specialty Pumps

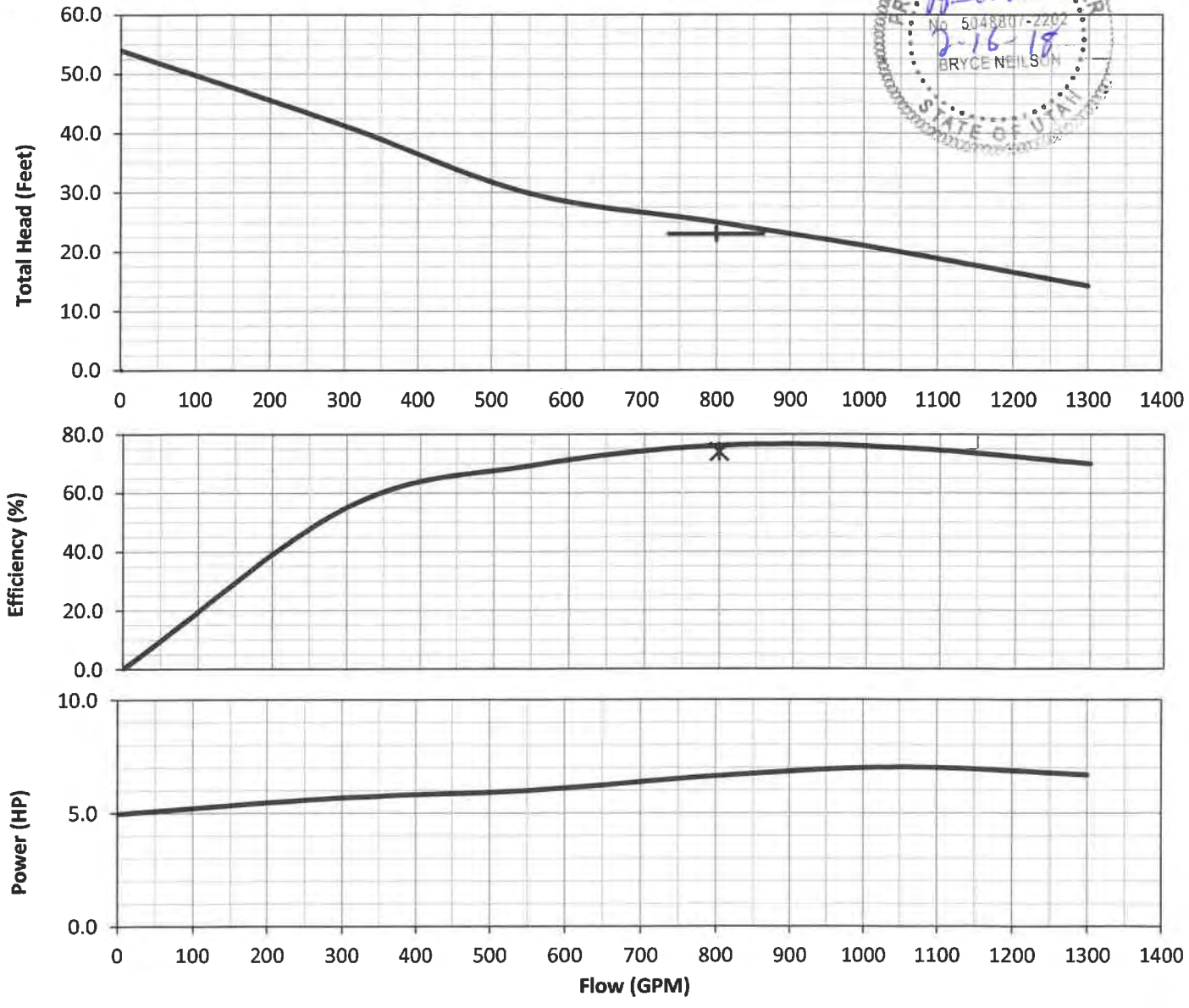
Sales Order: DW11450	Pump Model: SFE5-R-BFE2W	Date: 2/16/2018	Guarantee Point: Flow 800.0 Head 23.0	Unilateral Tolerance Band
Serial Number: 17DW11450-02	Customer: WESTERN WATER CONSTRUCTORS INC	Speed: As shown		Bilateral Tolerance Band
Test No.: 19627-1-0	Customer PO: 24208R1	Impeller: High Chrome	Acceptance Grade: HI 14.6 2B	Secondary Duty Point

	Speed	(GPM)	(Feet)	(HP)	(%)
1	1194	0.3	54.0	5.0	0.1
2	1193	300.8	41.2	5.7	55.2
3	1192	550.8	29.9	6.0	69.4
4	1191	800.6	25.0	6.6	76.2
5	1191	1050.7	20.0	7.0	75.4
6	1191	1300.1	14.2	6.7	70.0
7					
8					
9					
10					

Test was performed with clear water

Certified by: Kitita Clegg

PROFESSIONAL ENGINEER
No. 5048801-2202
2-16-18
BRYCE NEILSON
STATE OF UTAH



WEMCO®
Pumps & Systems

WEIR

Pump Test Report

Weir Specialty Pumps

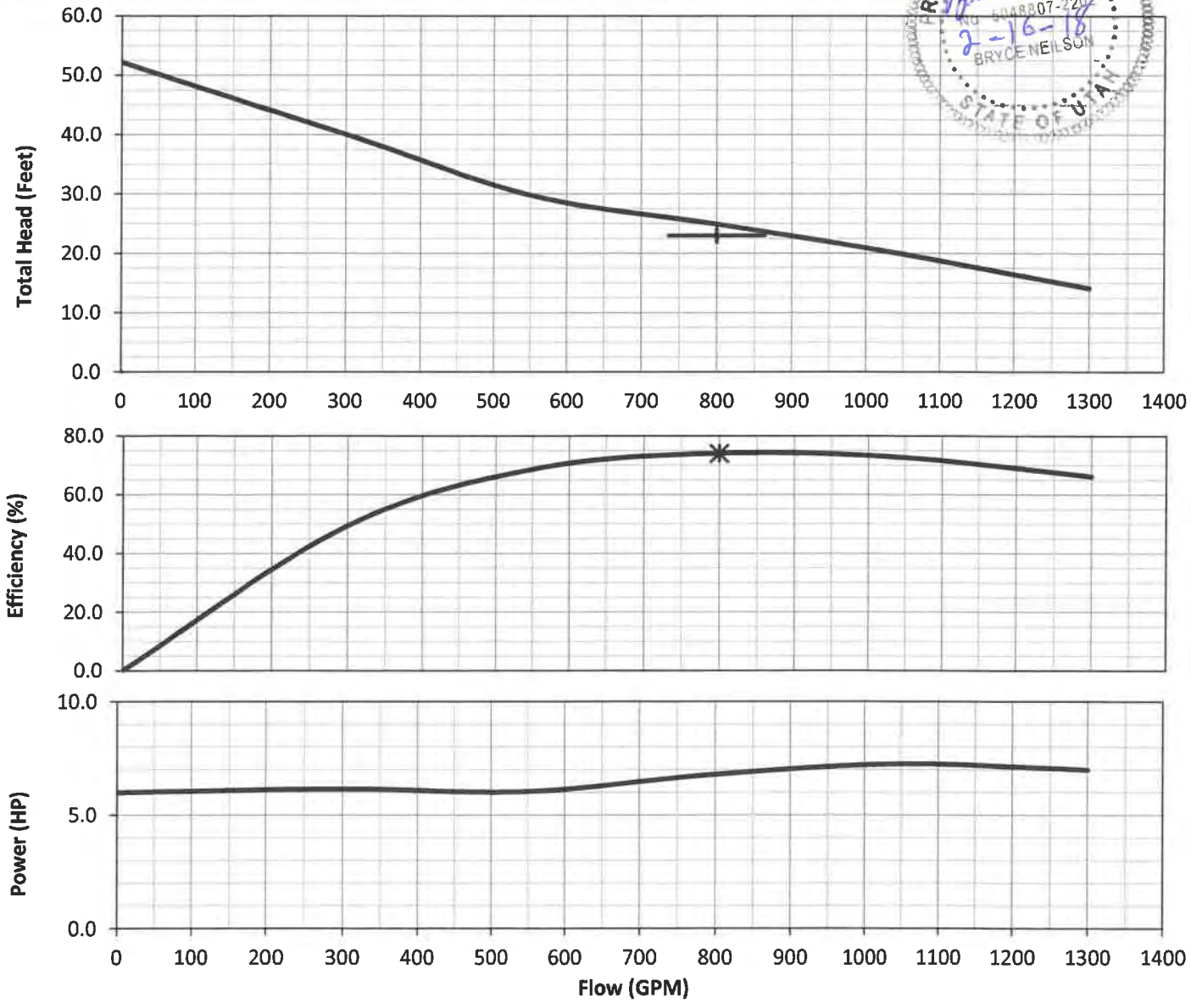
Sales Order: DW11450	Pump Model: SFE5-R-BFE2W	Date: 2/16/2018	Guarantee Point: Flow 800.0 Head 23.0	Unilateral Tolerance Band
Serial Number: 17DW11450-03	Customer: WESTERN WATER CONSTRUCTORS INC	Speed: As shown		Bilateral Tolerance Band
Test No.: 19628-1-0	Customer PO: 24208R1	Impeller: High Chrome	Acceptance Grade: HI 14.6 2B	Secondary Duty Point

	Speed	(GPM)	(Feet)	(HP)	(%)
1	1191	0.8	52.2	6.0	0.2
2	1192	300.7	40.0	6.1	49.5
3	1192	550.1	29.8	6.0	68.6
4	1190	800.9	24.9	6.8	74.1
5	1190	1050.6	19.8	7.2	72.6
6	1192	1300.1	14.1	7.0	66.2
7					
8					
9					
10					

Test was performed with clear water

Certified by: Kitita Clegg

PROFESSIONAL ENGINEER
NO. 5048807-2202
2-16-18
BRYCE NELSON
STATE OF UTAH



WEMCO®
Pumps & Systems

Pump Test Report

Weir Specialty Pumps

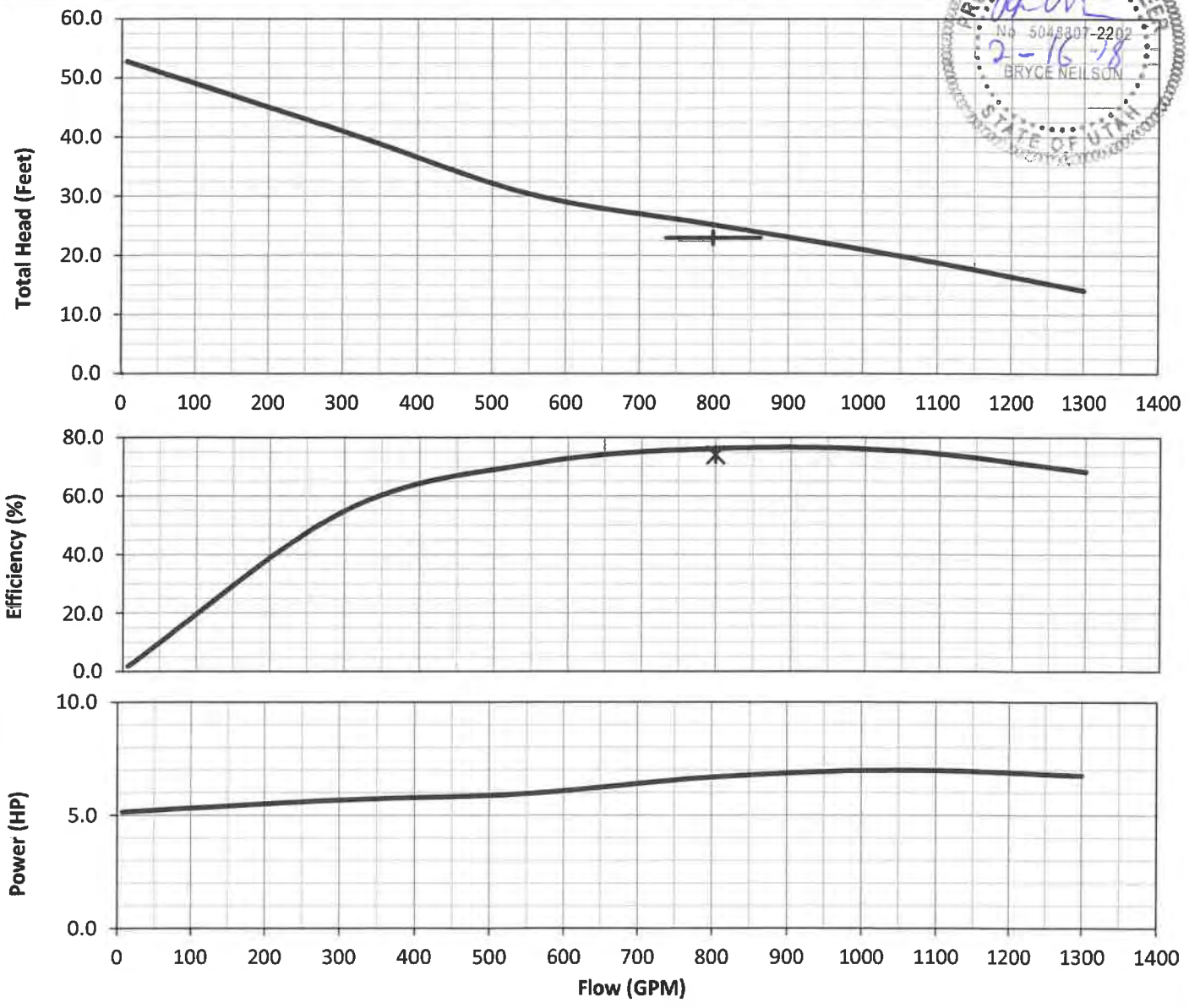
Sales Order:	Pump Model:	Date:	Guarantee Point:	
DW11450	SFE5-R-BFE2W	2/16/2018	Flow 800.0	Unilateral Tolerance Band
Serial Number:	Customer:	Speed:	Head 23.0	Bilateral Tolerance Band
17DW11450-04	WESTERN WATER CONSTRUCTORS INC	As shown		
Test No.:	Customer PO:	Impeller:	Acceptance Grade:	Secondary Duty Point
19629-1-0	24208R1	High Chrome	HI 14.6 2B	

	Speed	(GPM)	(Feet)	(HP)	(%)
1	1193	6.8	52.8	5.1	1.8
2	1192	300.1	41.0	5.7	54.8
3	1191	550.6	30.4	6.0	71.0
4	1190	800.1	25.2	6.7	76.2
5	1189	1050.4	19.9	7.0	75.4
6	1189	1300.3	14.0	6.7	68.3
7					
8					
9					
10					

Test was performed with clear water

Certified by: Kitita Clegg

PROFESSIONAL ENGINEER
No. 5048807-2202
2-16-18
BRYCE NEILSON
STATE OF UTAH



2. INSTRUCTIONS, PARTS & WARRANTY

2. INSTRUCTIONS, PARTS & WARRANTY

MAINTENANCE SUMMARY FORM

1. Equipment Item.	WEMCO VERTICAL SCREW-CENTRIFUGAL PUMPS MODEL SFE5-R-BFE2W **SECTION 11312E: SCREW CENTRIFUGAL PUMPS**
2. Manufacturer.	WEMCO, 440 WEST 800 SOUTH, SALT LAKE CITY, UT 84101, TELEPHONE: (801) 359-8731
3. Equipment Identification #(s).	SERIAL NUMBERS: 17DW11450-01, -02, -03 & -04 **TAG #'S: DIG-PMP-07-210, DIG-PMP-07-220, DIG-PMP-07-230 & DIG-PMP-07-240**
4. Total Weight.	APPROXIMATELY 776 LBS EACH
5. Nameplate Data (HP, voltage, speed, etc.).	7.5 HP, 3 PHASE, 60 HZ, 460 VOLT @ 1200 RPM – MOTOR COS: 800 GPM AGAINST 23' TDH @ 1160 RPM – PUMP
6. Manufacturer's Local Representative.	MUNIQUIP, INC. 2024 OPPORTUNITY DRIVE, SUITE #130 ROSEVILLA, CA 95678 TELEPHONE: (916) 787-5641 FAX: (916) 787-5642

MAINTENANCE REQUIREMENTS

Maintenance Operation List briefly each maintenance operation required & refer to specific information in mfr's std. maintenance manual, if applicable.	Frequency List required frequency of each maintenance operation.	Lubricant (If Applicable) Refer by symbol to lubricant list required.	Comments
Inspect pump for proper operation.	Daily	---	Clean/clear as needed.
Check bearing housing lubrication.	2800 operating hours	-A-	Grease as required.
Check coupling alignment.	Semi-Annually	---	Adjust as required. Take out and inspect sheaves for proper operation.
Check motor for proper operation.	Daily	---	Clean/clear as required.
Motor lubrication.	Semi-Annually	-B-	Lube as required.

LUBRICANT LIST

Reference Symbol	
-A- Bearing Housing	Refer to WEMCO Instructions P25-D305CE – Pgs.4-5
-B- Baldor-Reliance Motor	Refer to Motor Instructions Manual MN408 – Section 3-1

LIFE OF THE WEAR COMPONENTS IS DEPENDENT UPON THE QUALITY OF THE MAINTENANCE OF THE EQUIPMENT. NORMAL WEAR LIFE IS APPROXIMATELY 3-5 YEARS.

NO SPECIAL TOOLS REQUIRED.

Weir Specialty Pumps

BILL OF MATERIALS

Ship-to: WESTERN WATER CONSTRUCTORS INC
Model: SFE5-BRG
Model Desc: SFE5 SCREW CNTFGL W/BRG FRAME
Sales Sheet #: DW11450 Line: 001 Quantity 4
Serial Number(s): 17DW11450-01
Serial Number(s): 17DW11450-02
Serial Number(s): 17DW11450-03
Serial Number(s): 17DW11450-04

Item #	Quantity	Part #	Description
	1	X1100	ASSEMBLY TIME.
	1	X3000	ENGINEERING ASSISTED, PURCHASE
	1	X3000	ENGINEERING ASSISTED, PURCHASE
	1	X3000	ENGINEERING ASSISTED, PURCHASE
	1	00503	PAINT, THINNER/CLEANER, TNEMEC
		00503	PAINT, THINNER/CLEANER, TNEMEC
		07922	PAINT, EPOXY TNEMEC 104-1211
		800715	PAINT, EPOXY TNEMEC 104-SC06
	1	806557	CPLG VIVA V130 1.125/42MM
	1	810340	MTR,7.5HP 1200RPM 254HP BALDOR
100	1	70540-1	HOUSING,BEARING BFD/BFE CI
101	1	70541-1	SUPPORT FRAME,BFD0W,BFE2W, CI
102	1	70542-1	CAP,BEARING BFD0W,BFE2W CI
104	1	70332-1	RING,SPACER 50X68X3.0 MM
105	1	70332-1	RING,SPACER 50X68X3.0 MM
106	1	70335-1	RING,SPACER 50X62X1.0MM
109	1	70918-1	SPACER,BRG BFD2/BFE2 STL
110	1	70916-4	SHAFT,BFE2W 416SST
112	1	707596-1	KEY,WOODRUFF BFE2S/BFE2W STL
114	1	707602-1	KEY,CPLG BFE2S/BFE2W 12X8X50MM
118	1	100376	BRG,CYL ROLLER NJ210
119	1	100376	BRG,CYL ROLLER NJ210
121	2	100377	BRG,ANG CONTACT 7210BUA
126	1	404641	LOCKNUT,BEARING KM10 STL
127	1	39351	LOCKWASHER, MB-10
130	1	70665-1	LABYRINTH BFD/BFE BRG FRM CI
131	3	127008	FITTING,GRS STL 1/4NPT X 29/32
134	1	242405	PLUG,PP SOC HD 1/2-14NPT STL
146	1	142177	O-RING,BUNA-N 3.5 X 90 MM ID
147	1	142177	O-RING,BUNA-N 3.5 X 90 MM ID
151	1	70338-1	RING,SPACER 80X89.5X10.2MM STL
154	1	242405	PLUG,PP SOC HD 1/2-14NPT STL
157	1	70340-1	RING,SPACER 80X100X3.5MM
162	1	142217	RING,SNAP,EXT,DIN 471 #42
164	1	142165	O-RING,BUNA-N 2.5 X 41 MM ID
165	1	71852-1	FLANGE,IMP. E/38MM LABYR. CI
209	1	142202	O-RING,BUNA-N 5.0 X 275 MM ID
250	1	703473-1	PLATE,WARNING BEFORE OPERATING
251	1	703642-1	TAG,CAUTION BEFORE OPERATING
252	1	703471-1	TAG,WARNING BEFORE OPERATING
253	1	706616-3	CD,O&M MANUALS WEMCO SCREW CP
400	1	70010-1	CASE,SFE5 W/HANDHOLE CI
401	1	70037-7	IMPELLER,SFE5-R HCI
405	1	70443-1	COVER,HANDHOLE SFE5/H5 CI
406	1	142202	O-RING,BUNA-N 5.0 X 275 MM ID

Weir Specialty Pumps

BILL OF MATERIALS

Ship-to: WESTERN WATER CONSTRUCTORS INC
Model: SFE5-BRG
Model Desc: SFE5 SCREW CNTFGL W/BRG FRAME
Sales Sheet #: DW11450 Line: 001 Quantity 4
Serial Number(s): 17DW11450-01
Serial Number(s): 17DW11450-02
Serial Number(s): 17DW11450-03
Serial Number(s): 17DW11450-04

Item #	Quantity	Part #	Description
408	1	70424-7	RING,WEAR SFE5,SFE8-B,D HCI
409	1	142259	O-RING,BUNA-N 7.0 X 110 MM ID
411	8	78296E	SHIM .135" THICK 304SST
411	8	78296K	SHIM .024 THICK 316SST
415	1	413502	SCREW,CAP SOC HD M12X120 316SS
416	1	71914-1	CASING,SUCT SFE5-R/B/D/L/Y CI
421	1	70429-7	LINER,GRVD SFE5,SFE8-B/D HCI
423	1	242400	PLUG,PP SQ HD 1/2NPTM 316SST
424	1	242400	PLUG,PP SQ HD 1/2NPTM 316SST
430	1	142304	O-RING,BUNA-N 5.0 X 187 MM ID
446	3	707587	NUT,REGULATOR SFE5,SFE8
450	1	70146-1	SUCT ELBOW/STAND 6" CI
454	1	145035	GASKET,FLG 6 RF 150# 6
455	8	204619	SCR,HEX 3/4-10UNCX3-1/4LG
456	8	V2628	NUT,HEX 3/4-10UNC
457	16	233276	WASHER,FLAT 3/4 STL GRADE 8
462	1	70439-1	COVER,HANDHOLE SFF6 CI
463	2	V4360	WASHER,FLAT 3/8 STL USS
464	2	V0519	SCR,HEX 3/8-16UNCX1-1/4LG
465	1	142339	O-RING,BUNA-N 7.0 X 113 MM ID
476	8	V2885	SCR,DRIVE #4 X 1/4 LG TYPE U
477	3	421251	STUD,TAP END M12X1.75X65 MM
492	3	420985	STUD,TAP END M10X1.5X60MM 316
493	3	20970	NUT,HEX M10X1.5 316SS
494	3	20939	WASHER,LOCK M10 STD 316SS
507	1	71927-1	COVER,BACK BFE2W 1-1/2 CI
516	1	809452	SEAL,MECH AES 1.500" P04U
527	1	142199	O-RING,BUNA-N 5.0 X 240 MM ID
545	1	142215	RING,SNAP,EXT,DIN 471 #38
552	1	242420	PLUG,PP SQ HD 3/4NPTM STL
597	1	70500-2	NAMEPLATE,WEMCO SCREW
600	1	809824	BOLT, FLANGE M12-1.75 X 45MM
601	1	809822	WASHER,FENDER M16 X 50MM OD
602	1	70545-1	GUARD,VERT MTR BRKT STYRENE
602	1	809823	SPACER, 1-1/2" LG X 1-1/2"
604	1	70220-1	BRACKET,VERT MTR SUPPORT D,E
608	4	220960	STUD,3/8-16X3/4,3/8-16X1/2X2 S
135A	4	420941	STUD,TAP END M10X1.5X35MM LG
135B	4	44869	NUT,HEX M10X1.5 CLASS 8
135C	4	55494	WASHER,LOCK M10 STD
141A	4	420661	STUD,TAP END M8X1.25X20 MM
141B	4	44670	NUT,HEX M8X1.25 CLASS 8
141C	4	44669	WASHER,LOCK M8 STD
411A	16	707581A	SHIM, SST .5 X .8 X .005"
411A	16	707581B	SHIM, SST .5 X .8 X .010"

Weir Specialty Pumps

BILL OF MATERIALS

Ship-to: WESTERN WATER CONSTRUCTORS INC
Model: SFE5-BRG
Model Desc: SFE5 SCREW CNTFGL W/BRG FRAME
Sales Sheet #: DW11450 Line: 001 Quantity 4
Serial Number(s): 17DW11450-01
Serial Number(s): 17DW11450-02
Serial Number(s): 17DW11450-03
Serial Number(s): 17DW11450-04

Item #	Quantity	Part #	Description
411A	16	707581C	SHIM, SST .5 X .8 X .020"
411A	16	707583A	SHIM, STL 1.6 X .9 X .005"
411A	16	707583B	SHIM, STL 1.6 X .9 X .010"
411A	16	707583C	SHIM, STL 1.6 X .9 X .020"
417A	8	421222	STUD,TAP END M12X1.75X50MM 316
417B	8	43678	NUT,HEX M12X1.75 316SS
417C	16	20973	WASHER,LOCK M12 STD 316SS
419A	8	421202	STUD,TAP END M12X1.75X40MM
419B	8	43678	NUT,HEX M12X1.75 316SS
419C	8	20973	WASHER,LOCK M12 STD 316SS
420A	2	420952	STUD,TAP END M10X1.5X40 MM
420B	2	20970	NUT,HEX M10X1.5 316SS
420C	2	V4384	WASHER,FLAT 3/8 316SS
515W	1	809450	SEAL,MECH AES 1.500" M010H
534A	8	421181	STUD,TAP END M12X1.75X30 MM
534B	8	44673	NUT,HEX M12X1.75 CLASS 8
534C	8	44672	WASHER,LOCK M12 STD
536A	3	242281	PLUG,#910SX R1/4" 316SST BSPP
536B	3	181773	WASHER,SEAL SOFT COPPER 1/4

Weir Specialty Pumps
440 West 800 South
Salt Lake City, UT 84101-2229

T 801 359 8731
F 801 355 9303
weirsp.com

SPARE PARTS PROVIDED

Part Number	Description	Qty/Per	UM
809450	SEAL,MECH AES 1.500" M010H	1.	EA
809452	SEAL,MECH AES 1.500" P04U	1.	EA

Weir Specialty Pumps
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weirsp.com

REPRESENTATIVE FOR PARTS & SERVICES

MUNIQUIP, INC.
2024 OPPORTUNITY DRIVE, SUITE #130
ROSEVILLA, CA 95678
TELEPHONE: (916) 787-5641
FAX: (916) 787-5642

JOB NAME: MANTECA, CA
CUSTOMER ORDER NUMBER: 24208
WEMCO ORDER NUMBER: DW11450

SPARE PARTS ORDERING INSTRUCTIONS

1. Using the General Assembly drawing(s) in this Operation and Maintenance manual, locate the part(s) that need to be replaced on the equipment being repaired. Then identify the part(s) with the item number(s) shown in the drawing(s). Record the serial number of the pump(s) being repaired, the Item No., description, and the number of the drawing(s) from which this information was obtained for all the part(s) needed.

2. Contact your local WEMCO representative, given above, to obtain price and availability of the part(s). You will need to give them all the information you recorded in No. 1 above.

3. Once a quotation has been provided, your local WEMCO representative will be pleased to accept your purchase order for the part(s) required.

Installation, Operation, and Maintenance
General Instructions, All Models

 WARNING	**PLEASE STUDY THESE INSTRUCTIONS CAREFULLY BEFORE PUTTING THE PUMP INTO SERVICE. ADHERENCE TO THESE INSTRUCTIONS IS NECESSARY FOR SATISFACTORY START-UP OF YOUR WEMCO-SCREW CENTRIFUGAL PUMP. OPERATING PERSONNEL MUST READ AND UNDERSTAND THE START-UP AND OPERATION PROCEDURES.**

I. INTRODUCTION

A. General Information

The WEMCO distribution network provides service wherever our pumps are sold. Should you require additional service information, do not hesitate to contact your local WEMCO representative.

B. Nameplate Data

Each pump has a nameplate affixed to it, with the pertinent data including pump characteristics, model and serial number. When inquiring about parts or service, the above data should be supplied.

II. RECEIVING INSPECTION

Prior to signing any shipping documents, inspect the shipment for shortages or damages, and promptly report any to the carrier, noting damage on the freight bill, receipt, and bill of lading. MAKE ANY CLAIMS TO THE TRANSPORTATION COMPANY PROMPTLY.

 CAUTION	**DO NOT REMOVE ANY TAGS.**
	INSTRUCTION SHEETS ON VARIOUS COMPONENTS AS WELL AS THE OPERATION AND MAINTENANCE MANUAL FOR THE PUMP MAY BE INCLUDED IN THE SHIPMENT. DO NOT DISCARD!

III. UNLOADING

Care must be taken when unloading pumps.

	**EQUIPMENT LIFTING DEVICES SUCH AS CHAIN, LIFTING EYES, HOOKS, ETC. MUST BE APPROVED BY LOCAL, STATE, OR FEDERAL SAFETY CODES.**
	HOISTS AND CRANES MUST BE ADEQUATELY SIZED TO LIFT RATED LOADS.
	**FAILURE TO USE APPROVED LIFTING DEVICES MAY RESULT IN INJURY.**
	WHEN LIFTING THE PUMP IT IS IMPORTANT TO MAKE SURE THAT THE CHAIN AND CABLES ARE FASTENED RELIABLY TO THEIR RETAINING HOOKS.

When a horizontal pump is unloaded, it must be lifted at four equal points on the baseplate. When a vertical pump is unloaded, use lifting lugs on motor mount. Couplings, extended shafts, and other accessories are normally shipped in separate containers to avoid damage.

IV. STORAGE INSTRUCTIONS

If the pump is not to be installed and operated immediately, store in a clean, dry place. WEMCO assumes the units will be placed in operation a few weeks after shipment, so no special protection is given the pump, drive or motor.

IF THE PUMP IS TO BE STORED MORE THAN TWO WEEKS:

A. Store pump in a clean, dry place free from vibration and extremes in temperature.
B. Protect all exposed, unpainted surfaces from rust.
C. Fully grease motor bearings initially, re-grease every six months and rotate the shaft by hand every week.
D. Vents and drains on motors should be fully operable. Any drain plugs should be removed.
E. On pumps with grease lubricated bearing housings, fully grease bearings initially and re-grease every six months. ROTATE THE SHAFT 2 OR 3 REVOLUTIONS BY HAND EVERY WEEK. After prolonged storage, the bearing lubrication instructions in this Operation and Maintenance Manual must be followed.
F. Accessories such as drives, etc. should be protected in accordance with the accessory manufacturer's instructions.

Following these recommendations will help ensure that the pumps will operate without problems and give long, trouble free service.

V. INSTALLATION

A. Location of Pump

The pump should be placed as near the liquid source as possible, avoiding elbows whenever possible.

B. Piping

Guidelines for piping are given in the "Hydraulic Institute Standards" and should be reviewed prior to pump installation. All piping should be supported independently of, and line up naturally with, the pump flanges. NEVER DRAW PIPING INTO PLACE BY USE OF FORCE AT THE FLANGED CONNECTIONS OF THE PUMP.

DANGER	**WEMCO RECOMMENDS THAT FLEXIBLE COUPLINGS OR EXPANSION JOINTS BE INSTALLED IN THE SUCTION AND DISCHARGE PIPING AS NEAR THE PUMP AS POSSIBLE (TO ALLOW FOR TEMPERATURE AND PRESSURE EXPANSION) SO THAT THERE WILL BE NO STRAIN ON THE PUMP CASING.**
	SUCH STRAINS COULD RESULT IN STRUCTURAL FAILURE LEADING TO INJURY.

To obtain maximum available suction head, the suction line should be as direct and as short as possible, avoiding elbows. If elbows must be used, a long radius type is preferred. It is important to avoid any high point in a suction line in which air may accumulate and cause loss of prime. For the same reason, it is important to have the suction line airtight when suction lift exists.

The suction pipe must be installed so that no air pockets can form, and the pipe must be level or slope upward to the pump intake. To prevent excessive losses, the suction piping must never be smaller in diameter than the pump suction, and preferably one pipe size larger. Eccentric reducers should be used on the suction side, with the flat side on top as shown in Figure 1. Use as few fittings as possible, and when elevating to any height, go vertically upward from the pump, then horizontally to the point of discharge.

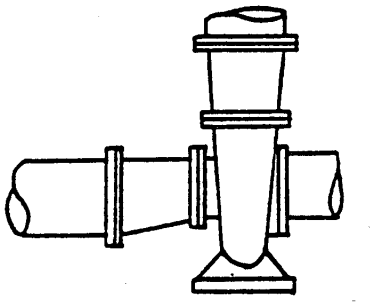


FIGURE 1
Recommended

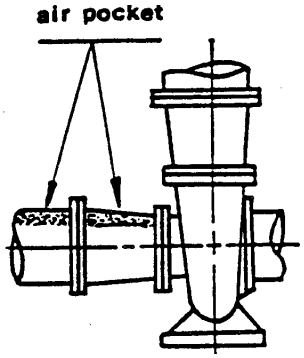


FIGURE 2
Not Recommended

Suction conditions such as liquid temperature, altitude above sea level and specific gravity should be compensated for by proper selection of the suction line.

The pump should not operate on a suction lift when pumping liquid with entrained air or gas. Check valves should not be used in the suction line and gate valves should be installed with the stem horizontal to prevent trapping air or gas. Suction valves must be fully open during operation.

C. Installation on Foundation

The pump and drive assembly should be placed on the foundation with the coupling halves disconnected. On belt driven units, the belts may remain on the sheaves. The alignment operation must be completed before the coupling is reassembled. The baseplate should be supported on metal wedges or metal blocks as illustrated in figures 3 and 4. The support wedges, or blocks, should be placed close to the anchor bolts.

Adjust the metal wedges, or blocks, around base edge until the base is level. Suction flanges and discharge flanges should be checked by means of a level, and coupling alignment should be checked with a straightedge. Corrections may be made for flange or coupling level or plumb by shims under the pump or motor.

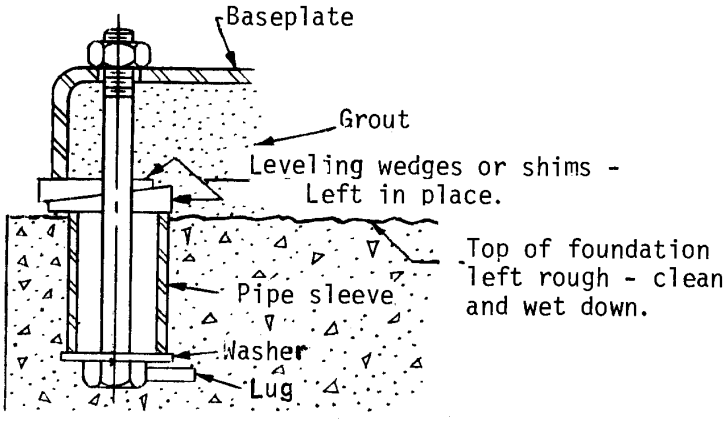


FIGURE 3
Typical Foundation Bolt Design

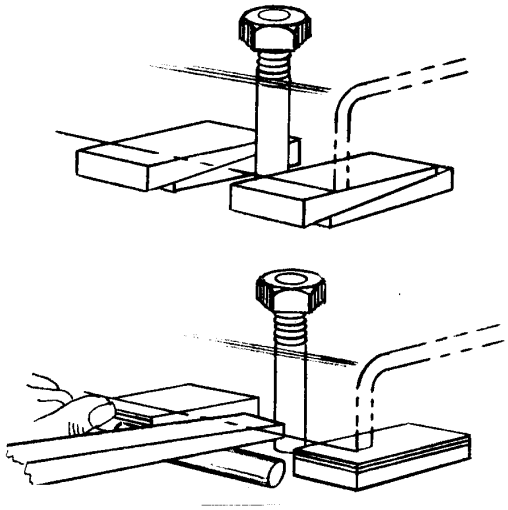


FIGURE 4
Method of Leveling

D. Grouting

Evenly adjust all anchor bolts, but not too firmly, after first alignment is completed. The baseplate can be grouted to the foundation; all voids under the baseplate must be filled with grout. It is desirable to grout all wedges and blocks in place. Anchor bolts should not be fully tightened until the grout has hardened, approximately 48 hours after pouring.

E. Connection of Piping

The initial alignment of the pump and driver should be completed before the piping is connected to the pump. After the grout has thoroughly set and anchor bolts have been tightened, connect the discharge and suction pipes to the pump flanges with gaskets in place, and tighten firmly. Make sure the pipe flanges are parallel and in line so that no piping loads are transmitted to the pump.

	**ALL MODELS ARE CONSTRUCTED OF BRITTLE MATERIALS AND GREAT CARE MUST BE USED IN CONNECTING THESE FLANGES. TIGHTEN EVENLY AND ADJUST TO A SNUG FIT.**
	UNDER NO CIRCUMSTANCES SHOULD THE CASING BE SUBJECTED TO PIPING STRAINS. SUCH STRAINS COULD RESULT IN STRUCTURAL FAILURE LEADING TO INJURY.

F. Service Connections

Packing and mechanical seals (except Type 'W' bearing frames) must be flushed with a clean liquid with lubricating quality at 120^0F or less and 10-20 psi over the maximum pump discharge pressure. WEMCO Screw Centrifugal pumps are supplied with various service connections for this purpose. Refer to appropriate "Service Connections" manual and cross sectional drawings for proper connections.

	**TO AVOID THE POSSIBILITY OF THE PUMP RUNNING WITHOUT THE NECESSARY FLUSHING LIQUID, HAVE THE FLUSHING LIQUID LINE INTERLOCKED WITH THE MOTOR SO THAT THE FLUSH LIQUID STARTS BEFORE, OR WHEN, THE MOTOR STARTS.**
	**ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED BELTS, OR COUPLINGS COULD RESULT IN INJURY.**

G. ELECTRIC MOTOR DRIVE

If the pump driver is an electric motor, a motor starter with overload protection should be provided. The overload resets should be set according to local code. Refer to motor nameplate. Direction of rotation of pump impeller must be clockwise when standing at the driver end facing pump. On vertical pumps, rotation must be clockwise when looking down on pump from driver end. Make motor electrical connections accordingly. Changing any two leads on a three-phase motor will change direction of motor rotation.

	**ALL ELECTRICAL CONNECTIONS AND WIRING ARE TO BE IN COMPLIANCE WITH LOCAL BUILDING AND SAFETY CODES.**

	**DO NOT OPERATE EQUIPMENT WITH OPEN ELECTRICAL BOXES OR FITTINGS. CONTACT WITH INCORRECTLY WIRED EQUIPMENT COULD RESULT IN INJURY.**

VI. OPERATION

	**DO NOT OPERATE PUMP WITH BOTH SUCTION AND DISCHARGE VALVES CLOSED OR WITH SUCTION OR DISCHARGE CLOSED BY CLOGGING - THIS COULD CAUSE DAMAGE AND IS DANGEROUS.**
	**WEMCO PUMPS ARE TO BE USED FOR LIQUID SERVICE ONLY. EXCESS PRESSURE CAN CAUSE MALFUNCTION LEADING TO INJURY.**

A. BEFORE STARTING

The pump is ready to start when the following have been completed:

1. All construction debris has been removed from suction well.

2. Pump baseplate is grouted and bolted to the foundation.

3. Pump and driver are correctly aligned.

4. Bearings are lubricated with adequate grease. All bearings are lubricated at the factory prior to shipment. In all cases, refer to lubrication instructions in this manual.

5. Bump motor to check for rotation, which is clockwise when facing pump shaft.

6. All rotating parts are found to turn freely by hand.

7. Suction and discharge valves are OPEN.

8. Pump is primed. WEMCO pumps can be run dry, but are not always self priming. If installed with suction lift, the pump may be primed by using an ejector or vacuum pump. Vertically installed WEMCO Screw Centrifugal solids handling pumps will prime themselves if the liquid level is to the volute (impeller submerged), and if air evacuation through pump casing or service connection No. 2 is provided.

9. Seal water has been provided to packing box or seal, if required. See appropriate "SERVICE CONNECTIONS" manual.

10. As the moment of inertia of the impeller is small, full load and full speed are typically reached within one second. Therefore, if reduced voltage starters are used, the time adjustment for transition should be no longer than two or three

seconds.

11. All guards are installed.

B. START-UP

1. Start pump and verify performance. If trouble is experienced upon initial or subsequent operation, refer to chart entitled "OPERATING TROUBLES" and correct defect.

2. Make an additional check of alignment between pump and driver after a few hours of operation. Repeat this check after one week of initial run.

	**WHEN CHECKING ALIGNMENT, OR PERFORMING ANY WORK ON THE UNITS, ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.**
	**ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED BELTS, OR COUPLINGS COULD RESULT IN INJURY.**

3. A rubbing type noise in the bearing area and a relatively high bearing operating temperature may be experienced due to the unique design of this pump, and this is considered normal. At start-up, skin temperature of the bearing housing may exceed 200^0F, but should be under this after a 30-40 hour run-in period. Actual bearing temperature will be 20-30^0F above the bearing housing temperature, and this is not detrimental as long as they are properly lubricated with the recommended grease.

C. GENERAL OPERATING CONDITIONS

It is not recommended that the pump operate continuously to the left of lowest efficiency line or dotted line on performance curve (high discharge pressures with low flow); bearing life is shortened and abrasive wear is accelerated in this operating condition. For the same reasons, do not start this type pump against a closed discharge valve.

	**DO NOT OPERATE THE PUMP AGAINST A CLOSED DISCHARGE VALVE.**
	DO NOT OPERATE THE PUMP UNLESS THE PUMP IS FILLED WITH LIQUID.

D. SHUTDOWN

To shut the pump down, proceed as follows:

1. Disconnect power to the driver.

2. Close suction and discharge valves, and isolate any external service connections that the pump may have. For municipal sludge service, or other applications where pressure could build within the pump while it is out of service, leave one valve open, or supply an appropriate pressure relief device.

3. If the pump is to remain out of service for a period of time longer than two weeks, the shaft must be rotated on a weekly basis, to ensure positive coating on lubricated faces, thus retarding or preventing rust or oxidation.

	**WHEN PERFORMING EQUIPMENT MAINTENANCE OR IF THE PUMP IS TO REMAIN OUT OF SERVICE FOR A PERIOD OF TIME, THE EQUIPMENT ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.**

E. FREEZING PROTECTION

If the pump is to be subjected to freezing temperatures, it must be drained. Remove casing drain plug 423 to drain volute casing. Also drain packing box area as follows: Remove fastening set (221), slide stuffing box cover (201) assembly towards the bearing frame and thoroughly blow out all liquid with clean and dry compressed air. Install packing box cover (201) assembly and secure with fastening set (221).

F. EMERGENCY INSTRUCTIONS

Shut down the pump according to VI.D above. Proceed as required to put another pump into service, then proceed to Section VII, Troubleshooting.

VII. OPERATING PROBLEMS

TROUBLE SHOOTING

A. NO LIQUID DELIVERED AT END DELIVERY POINT OR THROUGH FLOW METER	
Possible Causes	**Corrective Action**
1. Pump not primed.	1. Prime with vacuum or liquid.
2. Speed too low; check voltage and frequency.	2. Supply proper voltage and frequency. Increase pump speed. Watch motor for overload.
3. Air leak in suction or stuffing box.	3. Tighten all flange bolting. Supply liquid to stuffing box.
4. Discharge head too high.	4. Reduce head or increase pump speed. Watch motor for overload.
5. Suction lift too high.	5. Lower pump or raise liquid level on suction side.
6. Suction or discharge line plugged.	6. Unplug line.
7. Wrong direction of rotation.	7. On 3-phase motor, reverse any 2 leads.
8. Suction or discharge valve closed.	8. Open valves.
9. Gas or vapor pocket in suction line.	9. Vent or release vapor.
10. Liquid heavier or more viscous than rating.	10. Increase speed, but watch for motor overload.

B. NOT ENOUGH PRESSURE ON PRESSURE GAUGE	
Possible Causes	**Corrective Action**
1. Speed too low; check voltage and frequency.	1. Provide proper voltage and frequency. Increase pump speed. Watch for motor overload.
2. Air or gas in liquid.	2. Vent case.
3. Air leak in suction or stuffing box.	3. Tighten all flange bolting. Supply liquid to stuffing box.
4. Impeller performance class too low.	4. Increase speed. Install higher performance impeller, do not overload motor.
5. Damaged impeller or casing.	5. Replace impeller or case.

C. MOTOR RUNS HOT - OVER 170°F WITH THERMOMETER ON MOTOR HOUSING - DO NOT TOUCH	
Possible Causes	**Corrective Action**
1. Speed too high.	1. Lower pump speed.
2. System head lower than rating, allowing pump to handle too much liquid.	2. Lower pump speed. Fully open discharge valve.
3. Liquid heavier or more viscous than rating.	3. Install larger motor.
4. Packing too tight.	4. Loosen packing gland. Be sure liquid is flowing into packing area.
5. Impeller binding or rubbing.	5. Disassemble pump and correct bind.
6. Voltage and frequency lower than rating.	6. Supply proper voltage and frequency.
7. Defects in motor.	7. Take to authorized motor repair shop.
8. Pump or motor bearing over-lubricated.	8. Decrease lubrication.

D. STUFFING BOX OVERHEATS – OVER 120°F WITH THERMOMETER ON HOUSING	
Possible Causes	**Corrective Action**
1. Packing too tight. Not enough leakage of flush liquid.	1. Loosen gland. Increase flush liquid pressure and flow.
2. Packing not sufficiently lubricated and cooled.	2. Be sure lantern ring is below flush opening.
3. Wrong grade of packing.	3. Use graphite impregnated acrylic packing.
4. Box not properly packed.	4. Pull packing and repack loosely.

E. BEARINGS OVERHEAT - OVER 180°F WITH THERMOMETER - DO NOT TOUCH	
Possible Causes	**Corrective Action**
1. Dirt or water in bearings.	1. Replace bearings.
2. Misalignment.	2. Align pump and motor sheave or coupling.
3. Over-greased.	3. Remove grease fitting and relieve.

F. BEARINGS WEAR RAPIDLY – INDICATED BY NOISE, HEAT, OR SEIZURE	
Possible Causes	**Corrective Action**
1. Misalignment	1. Align pump and motor sheave or coupling.
2. Bent shaft.	2. Replace shaft.
3. Vibration.	3. Tighten bearing cap bolting or replace bearings.
4. Lack of lubrication.	4. Grease at recommended intervals.
5. Bearing improperly installed.	5. Install new bearings in accord with WEMCO instructions.
6. Moisture in grease.	6. Inspect bearings for rust. If rust found, replace bearings.
7. Dirt in bearings.	7. Replace bearings.
8. Over-lubrications.	8. Relieve over-greasing.

G. NOT ENOUGH LIQUID DELIVERED THROUGH FLOW METER OR AT END DELIVERY POINT	
Possible Causes	**Corrective Action**
1. Air leaks in suction or stuffing box.	1. Tighten all flange bolting. Supply water to stuffing box.
2. Speed too low. Check voltage and frequency.	2. Install smaller pump sheave. Supply proper voltage and frequency.
3. Suction lift too high.	3. Increase level on suction side, or lower pump.
4. Suction or discharge line partially plugged.	4. Unplug.
5. Low NPSH.	5. Increase liquid level on suction side of pump, or lower pump.
6. Total system head too high.	6. Speed up pump. Do not overload motor.
7. Damaged impeller or casing.	7. Replace impellers or case.
8. Flow meter not properly calibrated.	8. Recalibrate flow meter.

H. PUMP WORKS FOR AWHILE, THEN LOSES SUCTION - INDICATED BY NO FLOW THROUGH FLOW METER OR AT END DELIVERY POINT	
Possible Causes	**Corrective Action**
1. Leaky suction line.	1. Tighten bolts on flanges.
2. Gas or vapor pocket in suction line.	2. Vent suction line.
3. Suction lift too high.	3. Lower pump or raise suction liquid level.
4. Air or gas in liquid.	4. Vent case.
5. Air leaks in suction or at stuffing box.	5. Tighten flange bolting and supply water to stuffing box.
6. End of suction line uncovered.	6. Submerge end of line.

I. VIBRATION - INDICATED BY EXTREME SHAKING AND/OR NOISE	
Possible Causes	**Corrective Action**
1. Gas or vapor in the liquid.	1. Vent pump.
2. Available net positive suction head not sufficient.	2. Raise suction liquid level or lower pump.
3. Inlet to suction line not sufficiently submerged.	3. Submerge line.
4. Misalignment of coupling and shafts.	4. Align sheave or coupling.
5. Worn or loose bearings.	5. Replace bearings. Tighten bearing cap bolts.
6. Impeller out of balance.	6. Balance impeller.
7. Shaft bent.	7. Replace shaft.
8. Impeller damaged and unbalanced.	8. Replace impeller.

	**ANY SPEED INCREASE MEANS THE BRAKE HORSEPOWER INCREASES AS THE CUBE OF THE SPEED, SO THE MOTOR POWER DRAW MUST BE MONITORED TO DISCOVER ANY MOTOR OVERLOAD.**
	**DO NOT TOUCH OVERHEATED COMPONENTS WITHOUT WEARING ADEQUATE PPE.**

Installation, Operation, and Maintenance
Service Connections, Sealing & Lubrication
Type 'W' Tandem Seal Bearing Frame

WARNING	**PLEASE STUDY THESE INSTRUCTIONS CAREFULLY BEFORE PUTTING THE PUMP INTO SERVICE. ADHERENCE TO THESE INSTRUCTIONS IS NECESSARY FOR SATISFACTORY START-UP OF YOUR WEMCO SCREW CENTRIFUGAL PUMP. OPERATING PERSONNEL MUST READ AND UNDERSTAND THE START-UP AND OPERATION PROCEDURES.**

I. SERVICE CONNECTIONS

Refer To Bearing Frame Cross Section Drawing.

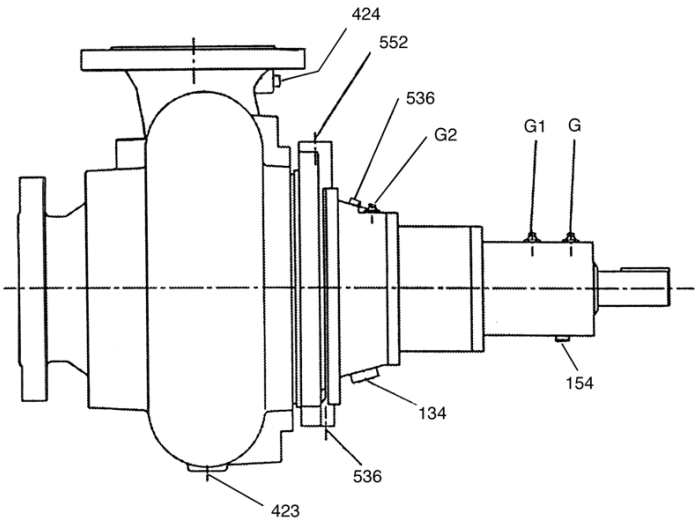


FIGURE 1

Connection Number	Connection Use	
552	FLUSHING CONNECTION:	For flushing the rear of the impeller. Use with pump products which tend to crystallize or dehydrate, such as sludge and paper stock. Also used as air bleeder in vertical installations
G/G1/G2 (131)	GREASING CONNECTIONS:	Standard grease nipples are supplied.
423	DRAIN PLUG:	For draining of pump casing when mounted horizontally. Can be supplied in three different locations.
424	GAUGE CONNECTION:	For measurement of pump discharge pressure.
134/154	GREASE REMOVAL PLUGS:	For removal of used grease during re-greasing.

Oil Lubricated Mechanical Seal: These pumps are supplied with mechanical seals of the tandem design. The sealing faces are carbon/ceramic for the process side seal, and tungsten carbide/silicon carbide for the bearing side seal.

The sealing faces run in an oil bath. Because of the tandem design, no external cooling or pressure connections are required. This provides a compact and relatively maintenance-free sealing system. When pumping media with high solids concentration which may have a tendency for sedimentation or dehydration, like paper pulp, sludge or mud, cleaning water should be supplied through connection 552.

This connection will conduct cleaning water between impeller flange (165) and the lower mechanical seal housing (507), providing periodic cleaning of accumulated solids, by water admission at pre-determined intervals, approximately 60 seconds at a time.

It is not necessary to install a permanent connection for this operation, as the same results may be obtained with a portable water hose connection. Alternatively, a remotely controlled solenoid valve can be programmed to provide periodic cleaning.

BEARING FRAME SIZE	CONNECTION CODE NUMBER CONNECTION SIZE (THREAD-INCHES)						
	2 552	G 131	G1 131	G2 131	134	154	536
SFE2W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4

* 1/4" plugged connection. The outboard bearing on the D0W bearing frame is permanently lubricated for the life

II. PERIODIC SEAL OIL CHECK

A. Inspection

During routine maintenance (every 1000 operating hours or once a year), inspect the oil level and quality. After running the pump for a few minutes to distribute any impurities in the oil, use a straw or pipette to withdraw some oil from top or fill opening (536), or drain a small quantity from the lower drain opening.

1. If the level has not dropped significantly, and the oil is clear, the seals are in acceptable condition. Top off the oil level, if necessary, and replace the plug.

2. If there has been a significant loss of oil, but the oil still appears clean, remove plug #134 and check for oil in the bearing cavity. The presence of significant oil here indicates failure of the bearing side (upper) seal. The bearing frame should be removed and disassembled for inspection per the assembly/disassembly manual.

3. If the oil is relatively clean, but shows small traces of water, the seals are still intact, but another check of the oil condition should be done after 500 hours of pump operation. A new or recently rebuilt pump may be in this condition as occasionally a small quantity of water will leak past the seal faces during the run-in period. If enough water is present, drain the oil and separate the water. The oil may be reused. Top off with additional oil, and replace the plug.

4. Failure of the bearing side (upper) seal is indicated by dirty oil, thick or milky oil, or a large percentage of water in the oil chamber. The bearing frame should be removed and the seal replaced per the instructions in the assembly/disassembly manual.

WHEN REPLACING ANY DRAIN OR FILL PLUGS, THE COPPER WASHER SHOULD BE FIRST ANNEALED BY HEATING IT TO A DULL RED, THEN IMMEDIATELY QUENCHING IN WATER.

B. Oil Quantity and Specification

The WEMCO factory uses the following oil:

MOBIL VELOCITE #6

Flash point min. 154°C
Specific Gravity: at 15°C: 0.844
Maximum viscosity at 40°C: 10.0 centistoke
Viscosity at 100°C: 2.6 centistoke
Solidification Point: -30°C

Recommended oil in U.S.A.:

SHELL PELLA (A) OIL
MOTOREX 155
GULF MINERAL SEAL OIL 896

or equal with same specifications as above.

Bearing Frame	Oil Quantity
SFE2W	4 L (1 Gal.)

FILLING BEARING FRAME TO BOTTOM OF FILL HOLE (HORIZONTAL OR VERTICAL) WILL APPROXIMATE PROPER QUANTITY.

III. LUBRICATION INSTRUCTIONS

A. Prior To Greasing

Establish the quantity of grease discharged from your grease gun per stroke as follows:

1. Weigh the quantity of grease per 10 strokes.

2. Calculate the average per stroke and record on grease gun in grams per stroke. It is important to inject the required quantity of grease. Improper quantities (too little or too much) will reduce bearing life.

B. Quality of Grease

The grease must be water repellent, of calcium, lithium, or combined qualities, with a dropping point of 350^0F or more. The bearings are packed with grease at the factory and ordinarily will require no attention before starting provided the pump has been stored in a clean, dry place prior to its first operation.

1. Approved Greases:

   The pump is lubricated at the factory with Chevron Multifak EP No. 2 grease. Do not use any grease that is not listed unless it is approved by the factory. Failure to comply may result in voiding of the warranty.

2. Approved Substitute Greases for Multifak EP No. 2

APPROVED GREASE		BASE MATERIAL	NLGI NO.
SKF	LGMT 3	Lithium	3
Exxon Mobil	Mobilux EP No. 2	Lithium	2

DO NOT MIX GREASES. GREASE INCOMPATIBILITY MAY CAUSE BEARING FAILURE.

C. Lubrication Procedure (Refer to service connections drawing, Figure 1.)

Bearing Frame SFE2W: Lubricate grease fittings G1 and G2.

If pump is vertical, lubricate only grease fittings G and G2. (To avoid over-greasing, replace grease fitting G1 with a 1/4 NPT plug, if not already done at factory).

If pump is horizontal, lubricate only grease fittings G1 and G2. (To avoid over-greasing, replace grease fitting G with a 1/4 NPT plug, if not already done at factory.)

Run the pump for 10 minutes to heat up the old grease. Inject grease quantity according to chart) into each fitting as discussed above. Remove plugs 154 and 134 to allow old grease to evacuate. After 20 minutes operation, replace plugs 154 and 134.

LUBRICATION INTERVAL FOR BEARING FRAMES

BEARING FRAME	RPM	LUBRICATION INTERVAL IN OPERATING HOURS	AMOUNT OF GREASE IN GRAMS	
			G or G1*	G2
SFE2W	1500 1800	2800 2300	25 25	15 15

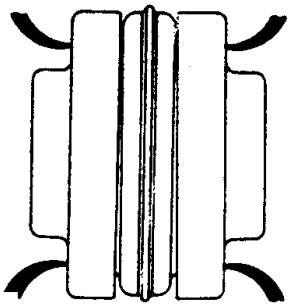
* Which to use depends on whether pump is horizontal or vertical.

Installation, Operation, and Maintenance
Coupling Alignment – Direct Drive Models

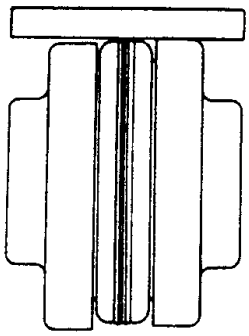
WARNING	**ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED COUPLINGS COULD RESULT IN INJURY.**

The pump driver, if supplied, was only preliminarily aligned at the factory since the unit can shift during shipment. The couplings may have been disconnected for shipment. The pump and driver shafts must be checked for angular and parallel alignment before the piping is connected to the pump, and before the baseplate is grouted to the foundation. The alignment must be finally checked and adjusted after the piping is connected, the grout has hardened and the anchor bolts have been tightened, and should be rechecked periodically. Inaccurate alignment results in vibration and excessive wear on bearings, shaft sleeves, and mechanical seals.

The coupling must be checked for parallel alignment with a straightedge and for angular alignment with a micrometer, calipers, or taper gauge. If a Woods coupling is supplied, it must be aligned within the tolerances in the chart below. Other couplings must be aligned according to the manufacturer's recommendations supplied with the order.



Angular



Parallel

REFER TO MANUFACTURER'S INSTRUCTIONS

~~Maximum Allowable Misalignment~~
~~(In inches)~~

Coupling or Sleeve Size	Parallel	Angular
3	.010	.035
4	.010	.043
5	.015	.056
6	.015	.070
7	.020	.081
8	.020	.094
9	.025	.109
10	.025	.128
11	.032	.151
12	.032	.175
13	.040	.195
14	.045	.242
16	.062	.330

Installation, Operation, and Maintenance
Size E, F, H, I Regulable Wet End

	Refer to Wet End Section Drawings

I. IMPELLER CLEARANCE ADJUSTMENT FOR WEAR

After some time of operation, the impeller and suction liner may have worn, increasing the impeller gap. The impeller gap should be checked and readjusted whenever a significant decrease in pump performance is noticed, or at least once every year (until a history is developed at each different application to indicate how often adjustment will be required). Adjustment is most critical on high-pressure pumps (E4, F4, H5, I6) and least critical on low-pressure pumps.

Regulable pumps are easily adjusted by means of a movable liner (421); its position is changed by three external regulator nuts (446) found on the suction casing (416). [For SFE4 models these are found on the one-piece volute casing (400)].

 WARNING	**WHEN IMPELLER CLEARANCE IS BEING CHECKED, THE PUMP ELECTRICAL SERVICE MUST BE LOCKED OUT USING AN APPROVED LOCKOUT AND KEY.** **FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY**

Loosen and back off standard hex nuts on end of each regulator nut assembly. Now, slowly and evenly screw in each threaded regulator nut just until pump shaft cannot be turned (this will eliminate all clearance between the impeller and the liner). Be sure to take the same number of turns on each threaded regulator nut; this keeps the liner concentric to the impeller.

Now back off the threaded regulator nut exactly the number of turns specified in the last column of Table A (according to pump size). Holding each threaded regulator nut from turning, tighten the three standard hex nuts (this pulls liner away from impeller the required clearance, and also locks the regulator nut in place).

With a feeler gauge, check the actual clearance between impeller and liner (reaching in through the handhole cover (405) or through the suction of the pump). If the clearance is significantly different than shown in column 2 of Table A, it is possible that the wear is excessive or not uniform: disassembly and inspection is recommended.

TABLE A

	CLEARANCE "A" "MAXIMUM"		SHIM THICKNESS OR TRAVEL OF REGULATOR NUT FROM IMPELLER TOUCHING		APPROX. NO OF TURNS OF REGULATOR NUT FROM IMPELLER TOUCHING
	mm	inches	Mm	inches	
SFE4	0.35	.014	0.60	.024	1/3
SFE5	0.4	.016	1.12	0.44	2/3
SFE8-B/D					
SFE8-T/Z			1.55	.061	1
SFF4			0.68	.027	1/2
SFF6	0.5	.020	1.40	.055	1
SFF10			1.93	.076	1-1/3
SFH5			0.85	.033	1/2
SFH8	0.6	.024	1.67	.066	1-1/6
SFH12			2.32	.091	1-1/2
SFI6			1.02	.040	2/3
SFI10	0.75	.030	2.09	.082	1-1/3
SFI16			2.90	.114	2

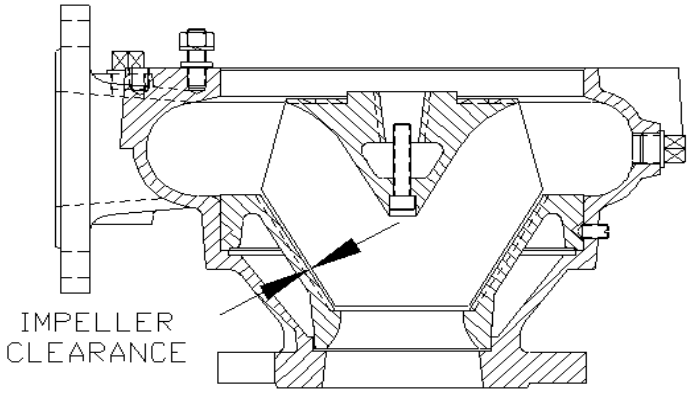


FIGURE 1

CLEARANCE SHOULD BE CHECKED ALONG ENTIRE IMPELLER EDGE AND AGAIN AFTER ROTATING IMPELLER 1/4, 1/2, AND 3/4 TURNS.

II. DISASSEMBLY & ASSEMBLY OF HYDRAULIC PARTS

Refer to Wet End Section Drawings

A. Disassembly For Inspection

The rotating assembly including impeller, impeller flange, and bearing frame can be pulled from the pump casing after removing nuts (419) around the bearing frame flange. Areas to be examined for wear will be the impeller surface (especially the edges) and the conical machined surface in the liner. Uniform wear on any of these surfaces can be compensated for, up to a point, by adjusting according to Section I of this manual. However, excessive or uneven wear will require replacement of the worn parts.

B. Removal of Impeller

Hold the impeller (401) from turning by hand, or by a strap wrench, or by a visegrip clamped to the impeller. Insert a hexagonal key wrench (allen-head wrench) into the impeller bolt (415) and with a hammer, tap the wrench counterclockwise to loosen the bolt.

Wrench sizes

Pump size:	E	F	H	I
Wrench size:	10mm	14mm	19mm	27mm

After removal of bolt, a few taps with a rubber mallet can tap the impeller loose from its fit against the impeller flange (165).

C. Removal of Liner And Suction Casing

These pumps have an externally adjustable liner (421), held in place by a suction casing (416), which is bolted to the volute casing (400) by studs and nuts (417). This construction can be recognized by the presence of three large regulator nuts (446) threaded into the suction casing just behind the suction flange.

If the conical surface is worn, only the liner need be replaced, and the suction casing may be removed from the volute casing by removing nuts (417). Note correct positioning of spacer ring (414) between suction casing and volute casing, if applicable.

To remove liner, completely remove small nuts on end of regulators (446), then push the three studs through the holes in the large regulator nuts to push the liner out. If stubborn, the large regulator nuts can be turned all the way into the casing to force the liner out. No attempt should be made to disassemble the regulator studs from the liner until the liner is removed from the pump; they are glued in place, and must be heated with a torch to break the Locktite bond.

The suction ring (408) should not typically require disassembly; remove from suction casing only if badly damaged by unusual circumstances. Press out suction ring with a hydraulic press.

SFF4, SFH5 AND SFI6 PUMPS WILL NOT HAVE A SUCTION RING (THE NECESSARY LIP IS CAST DIRECTLY INTO THE LINER). ALSO, SFE4 WILL NOT HAVE A SEPARATE SUCTION CASING BOLTED TO THE VOLUTE CASING; THE ENTIRE CASING IS ONE PIECE.

D. Assembly Of Impeller

De-grease the impeller bolt threads and apply Loctite 242 with primer “Locquic T”, or equal. Install and tighten to following torque:

For 316 stainless steel bolt -

Pump Size:	E	F	H	I
Torque (ft-lb):	60	90	250	350

IF TORQUE WRENCH IS NOT AVAILABLE, HITTING LONG END OF STANDARD L-SHAPED ALLEN WRENCH WITH SEVERAL SHARP HAMMER BLOWS CAN APPROXIMATE CORRECT TIGHTNESS.

E. Replacement Of Liner And Suction Casing

Install three regulator studs (446) into liner, using Loctite 242 with primer “Locquic T”, or equal.

Thoroughly grease O-ring (430) and install into groove in suction casing (416) - this groove is nearly hidden by the suction ring in some pump models.

If suction ring (408) was removed, tap suction ring until it is flush with the flange face of the casing. Ping the surface mating line between the suction ring and suction casing at three locations with a punch.

Now place liner into suction casing, engaging the three studs into the holes through the three regulator nuts. (Note: the three studs are not spaced evenly around the liner, so there is only one orientation of the liner where the studs will correctly fit through the regulator nuts).

Now grease O-ring (442) and install in groove on edge of suction casing (Note: this O-ring is not used on some models).

Install suction casing into volute casing opening on the side of the volute casing where the cast-in arrow points counterclockwise. CAUTION: since both sides of the volute casing are machined identically in some models, it is possible to assemble the pump with the volute casing backwards. Pay particular attention to the arrow direction as described above.

Fasten suction casing to volute casing with fastening set (417), using Loctite 242 with primer “Locquic T”, or equal.

F. Final Assembly

Whenever a new impeller is fitted, without also replacing the liner or suction cover at the same time, the following clearance check must be done: install impeller-bearing frame assembly into volute casing assembly. If the tip of the impeller touches the suction ring (408) or the lip in the liner -- or if there is less than 1mm clearance between the tip and the lip when the spiral edge of the impeller is firmly seated against the conical taper inside the liner, then the impeller tip must be ground off -- parallel to the suction flange -- until 1 to 2mm clearance is obtained.

See Figure 2.

If (411) is a spacer ring, place this ring over the spigot of the bearing frame.

Grease O-ring (209) and place into groove on spigot of bearing frame.

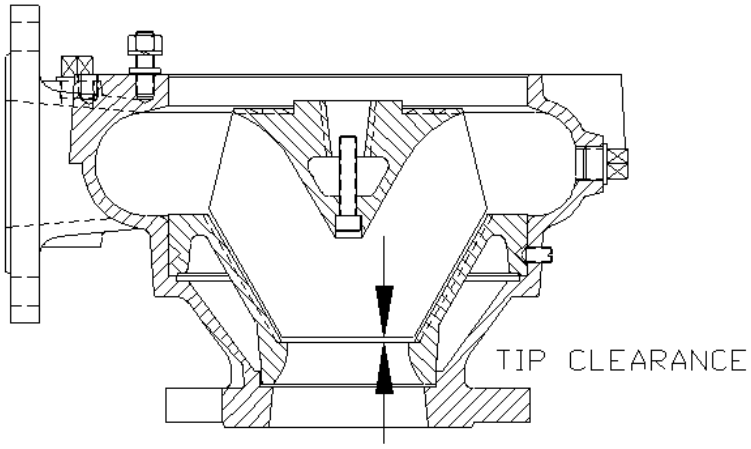


FIGURE 2

Now install bearing frame - impeller assembly into volute casing. Install and tighten nuts (416).

	See Section I of these instructions for correct setting of regulator nuts during adjustment of impeller clearance.

Disassembly And Assembly Instructions

	~~BFD2W: Refer to Drawing 70788 (CI), 70789 (SST)~~ BFE2W: Refer to Drawing 71850 (CI), ~~71871 (SST)~~

I. LOWER SEAL DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

A. Disassembly

1. After removal of the bearing frame (101) from the hydraulic parts, place the bearing frame (101) in the horizontal position. Remove the impeller bolt (415) and impeller (401).
2. Remove the impeller flange locknut (166) and lockwasher (167). Use a puller or a pair of thin wedges to remove the impeller flange (165) from the shaft taper. (Note: The D2W may not have an impeller flange, depending on the impeller. Also, some versions of both bearing frames may not have items 166 &167.)
3. Remove drain and vent plugs (536), and drain oil into suitable container. If the oil is clear, and not dirty or emulsified, it may be reused. Otherwise, dispose of waste oil in accordance with local environmental and safety regulations.
4. Make sure the shaft has no sharp edges or burrs that could damage the rubber parts as the seal is removed. Gently insert a small dull pry bar between the shaft and the rubber boot. By lifting and turning the Pry bar around the shaft, the lip of the rubber boot can be lifted out of the shaft groove. Lubrication of the shaft and the boot helps this disassembly. Once the boot is free of the groove, the entire rotating part of the seal with boot can be pulled off the shaft.
5. Insert two pry bars, such as dull-edged pry bars, under the upper lip on the seal and remove the seal by gently prying with the two pry bars on opposite sides. See Figure 1.

 **WARNING**	**USE ONLY DULL EDGED PRY BARS SINCE SHARP EDGES COULD CUT THE ELASTOMERS. DO NOT TWIST PRY BARS AS THIS CAN PUNCTURE ELASTOMERS. RATHER, LAY SOME CONVENIENT OBJECT ONTO BACKPLATE TO ACT AS A FULCRUM FOR EACH PRY BAR, AND PRY RING DIRECTLY UP AWAY FROM BACKPLATE. (SEE FIGURE 1).**

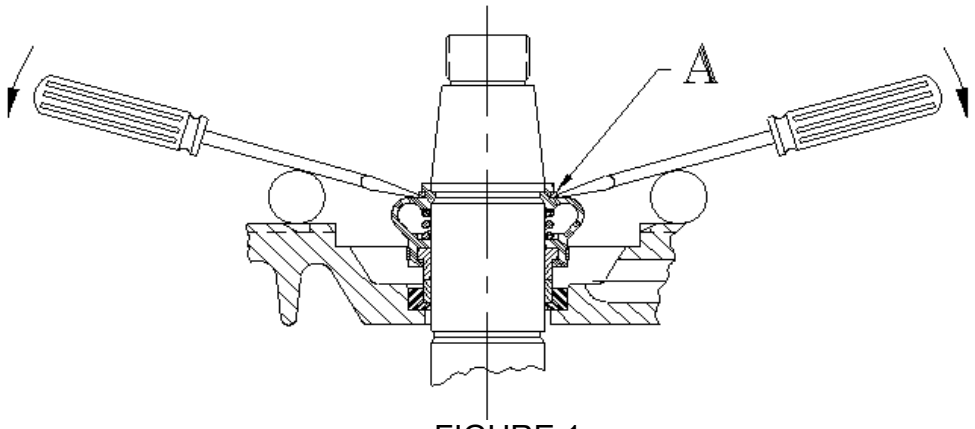


FIGURE 1

6. To remove the stationary part of the seal, unfasten nuts (534) and carefully remove the back cover (507) from the bearing frame. Make sure that the stationary part of the seal is not damaged by contact with the shaft. If a hoist or crane is available, it may be easier to place the bearing frame in a vertical position, and lift the bearing frame out of the back cover with a lifting eye bolt screwed into the drive end of the shaft (M12 screw size). Support the back cover with blocks on either side of the shaft for stability while doing this.

7. Press out the stationary ring from the inside of the back cover.

If the upper seal (516) is also to be disassembled, proceed to Section II.

B. Assembly

1. Inspect all parts, new and used, to be sure they are free from burrs and thoroughly clean. Insure threads are not damaged and replace all o-rings with new ones. Studs to be refitted should be coated with LOCTITE ADHESIVE 307 or similar.

2. Place a new o-ring (527) on the bearing frame register. Orient back cover (507) to bearing frame (101) with oil drain plug (536) oriented at the 6 o'clock position and impeller flush plug (552) oriented at approximately 11 o'clock position as viewed from Drive End. Fasten back cover (507) to bearing frame (101) with fastening set (534).

3. Place the stationary seal face into the rubber mounting seat, making sure that the dull surface of the seal faces the rubber seat. Lubricate the outside of the rubber seat of the stationary seal part with seal lubricant such as P-80 or a soapy water mixture, and press it all the way into its seat in the back cover. The seal should sit firmly at the bottom of the seat bore. The gap between the stationary ring and the shaft will be uniform all the way around when the ring is correctly installed.

WARNING	**THE SEAL FACES ARE BRITTLE, AND CAN EASILY BREAK UNLESS UNIFORM PRESSURE IS USED DURING INSTALLATION. PRESS SEAL PARTS WITH A SLEEVE OR TOOL SIMILAR TO FIGURE 2. PROTECT SEAL FACE WITH CARDBOARD RING WHILE DOING THIS.**

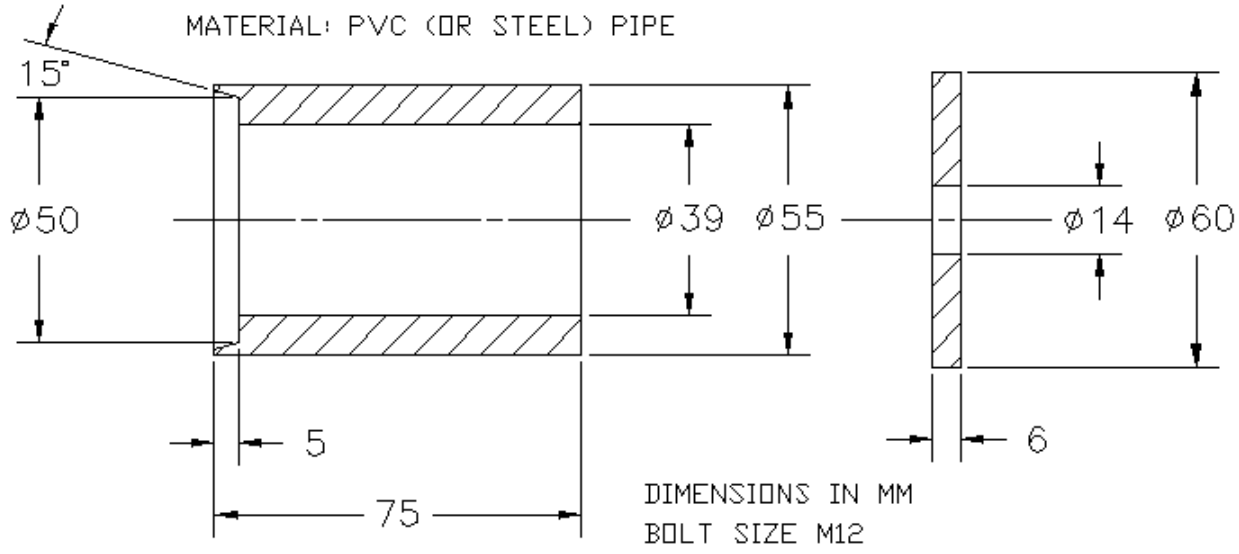


FIGURE 2

4. Clean both seal faces thoroughly with an alcohol wipe or similar. There should be no specks of debris or contamination on the faces. Then place a couple of drops of clean oil on the rotating face.

5. Place the rotating part on the shaft, and push it up as far as possible by hand. With a sleeve or tool similar to Figure 2, push the boot onto the shaft until the lip on the inside of the boot is securely engaged in the groove in the shaft.

6. Remove tool and turn the shaft by hand. The seal should turn in line with the shaft, and not cocked. Pull on the boot by hand to make sure the lip is properly engaged in the groove.

7. Check the seals by removing one plug (536) and pressurizing the oil chamber to approximately 7psi with a dry compressed air source, such as a bicycle tire pump, and a low-pressure gage. Check for leaks by watching for gage pressure loss, or by applying a soapy water solution to the seal and o-ring areas and looking for bubbles.

WARNING	**MAKE SURE THAT THE OIL CHAMBER PRESSURE NEVER EXCEEDS 14 PSI, AS THIS COULD DISPLACE THE SEAL.**

8. Install the impeller flange (165), and check the clearance between this part and the back cover (507) with a feeler gage, as shown in Figure 3. The acceptable clearance range is .011 to .019". If the clearance is excessive, add shim stock at each fastener (534) between the bearing frame (101) and the back cover (507). The thickness to be added can be calculated by subtracting .015" from the actual clearance measured, rounded to the nearest common shim stock size.

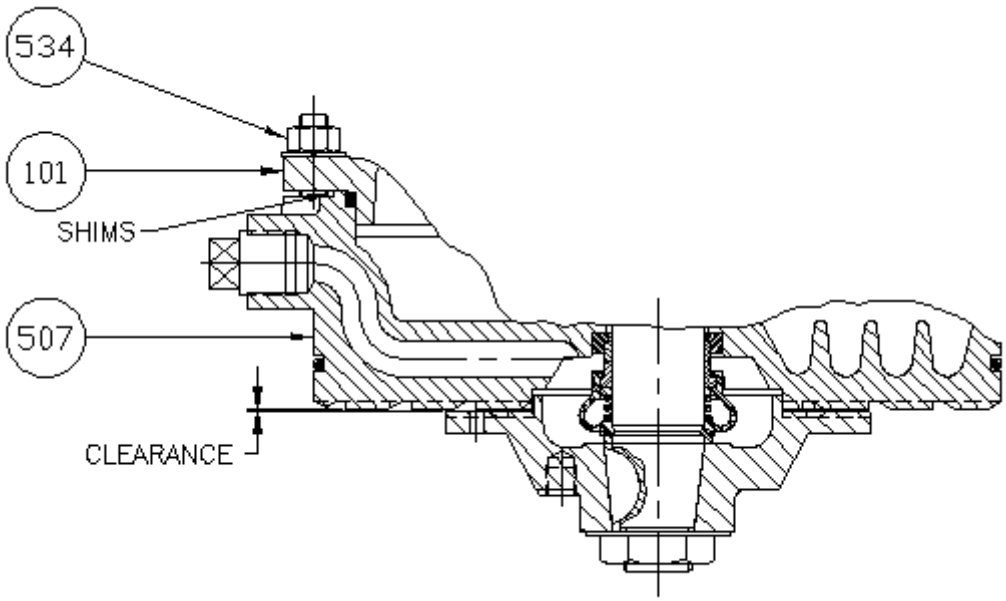


FIGURE 3

9. Refill the oil chamber with proper quantity and type of oil, and replace plugs. Refer to Operation and Maintenance manual for oil type and quantity.

II. UPPER SEAL DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

A. Disassembly

Follow instructions in Section I for disassembly of lower seal.

1. Remove the snap ring (545), and slide the seal spring retainer and spring off the shaft.

2. Check for and remove burrs from the snap ring groove, then grasp the rotating seal part and slide it from the shaft.

3. Loosen nuts from fastening studs (141), and remove bearing cap (102), taking care not to damage stationary seal ring by contact with shaft.

4. Carefully press stationary seal ring out of bearing cap bore.

If the shaft and bearings are to be disassembled, proceed to Section III.

B. Assembly of upper seal

1. Inspect all parts, new and used, to be sure they are free from burrs and thoroughly clean. Insure threads are not damaged and replace o-rings with new ones. Studs to be refitted should be coated with LOCTITE ADHESIVE 307 or similar.

2. Place the stationary seal face into the rubber mounting seat, making sure that the dull surface of the seal faces the rubber seat. Lubricate the outside of the rubber seat of the stationary seal assembly with seal lubricant such as P-80 or a soapy water mixture, and press it all the way into its seat in the bearing cap. The seal should sit firmly at the bottom of the seat bore.

3. Place a new o-ring (146) on the bearing cap (102) register. Assemble bearing cap (102) to bearing frame (101), and fasten with fastening set (141).

4. Clean both seal faces thoroughly with an alcohol wipe or similar. There should be no specks of debris or contamination on the faces. Then place a couple of drops of clean oil on the rotating face, and lightly lubricate the inside of the rubber rotating seal carrier. Do not allow lubricant on the surface between the rubber and the seal face itself.

5. Slide the rotating seal assembly onto the shaft until the seal faces are in contact. A sleeve or tool similar to Figure 3 above may be used.

6. Install the seal spring, spring retainer, and snap ring.

Proceed to Section I B for assembly of the lower seal.

BEARING FRAME DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

A. Disassembly

Follow instructions in Sections I & II for disassembly of lower and upper seals.

1. Remove the snap ring (162) at the drive end of the shaft, then the labyrinth (130) and o-ring (164).

2. Loosen fasteners (135), and pull the drive bearing cap from the shaft (110). Small wedges or pry bars may be required, as this part has a tight fit. Save any shims that may be between this cap and the bearing frame.

3. Slide the shaft assembly out toward the drive end, and remove it from the bearing housing.

4. Bend bearing lockwasher tab (127) away from locknut (126) and remove locknut, lockwasher, and bearing grease retainer (109) from the shaft.

5. Protect the seal mounting surfaces with duct or electrical tape. The drive (119) and thrust (121) bearings, bearing spacers (104,105,106), and the inner

race of the Pumpside bearing (118) can now be removed from the shaft with a hydraulic press.

6. Place the bearing housing (101) in a vertical position with the pumpside down. Using a hammer and punch or small bar, tap the outer race of the pumpside bearing (118) out of the bearing frame, working around the race as you tap. The bearing spacer (151) only needs to be removed if it requires replacement due to damage.

B. Assembly

It is advisable to assemble the components in a clean environment so that no dirt or foreign items can enter the bearing area. All bearings and o-rings should be replaced with new parts.

1. Inspect all parts, new and used, to be sure they are free from burrs and thoroughly clean. Insure threads are not damaged. Studs to be refitted should be coated with LOCTITE ADHESIVE 307 or similar. Shaft should be inspected for straightness and to ensure there is no surface damage to the seal mounting areas.

2. Install spacer ring (104) on pump end of shaft (110). Place inner race of pumpside bearing (118) on a bearing heater to expand the race. Heat the inner race to approximately 150^0F and with hot pads place the bearing race on the shaft (110) with the lip against the bearing spacer (104).

3. Install spacer ring (105) on drive end of shaft. (110). Place thrust bearing (121) on bearing heater and heat to 150^0F. With hot pads, place the bearing on the shaft with the thinner edge of the inner race facing the bearing spacer (105). Repeat for second thrust bearing, installing with the same orientation.

4. Install bearing spacer (106) on shaft (110) drive end, next to thrust bearings (121). Heat inner race of drive bearing (119) to 150^0F, and install with lip against spacer (106).

5. When the bearings have cooled to under 100^0F, hand packs the bearings (121) with Mobil Velocite #6 or equivalent. Place outer race of drive bearing (119) onto inner race, and pack with the same grease.

6. Place grease retainer (109) onto shaft with the lip on the inside diameter facing the drive bearing (119). Install lockwasher (127) and bearing locknut (126). Tighten locknut securely, and bend one tab of the lockwasher into a corresponding slot in the locknut.

7. Place bearing housing (101) in a vertical position with the pumpside facing up. If bearing spacer (151) was removed, replace it at this time. Place outer race of pumpside bearing (118) into bore and tap into place with a punch or short bar. Work around the race as you tap. Hand pack bearing with grease.

WARNING	**MAKE SURE TO TAP ONLY ON THE STEEL OUTER RACE. DAMAGE TO THE BEARING ROLLERS OR CAGE WILL CAUSE BEARING FAILURE.**

8. Install outer spacer ring (157) onto shaft (110), and slide shaft assembly into bearing frame (101) from the drive end.

9. Place o-ring (147) on register of bearing frame (101), and slide bearing cap into place over shaft, with the grease fittings facing the top of the bearing frame (toward name plate). Tighten fasteners (135) finger tight only at this time.

10. Install labyrinth drive o-ring (164) onto shaft, followed by the labyrinth (130) and snap ring (162). Push on the snap ring with a sleeve, or tap with a plastic hammer to compress the o-ring until the snap ring is securely in its groove. Check free shaft rotation.

11. Set the bearing end play as follows: Evenly tighten fasteners (135) until drag on the shaft is felt. Measure the gap between the bearing housing (100) and bearing frame (101) with feeler gages at three locations around the cap. Take the average of the readings and add .005” (0.127 mm). Round up to next common size shim thickness. The result is the thickness of shims (411A) to be added. Place shims (411A) at each fastener (135) between the bearing housing and bearing frame, and tighten fasteners securely. Verify shaft endplay is .005” (0.127 mm) to .007” (0.178 mm) and recheck free shaft rotation.

Proceed to Section II B for assembly of the upper seal.

SAFETY PRECAUTIONS & INSTRUCTIONS

WARNING

PLEASE STUDY THESE INSTRUCTIONS CAREFULLY BEFORE PUTTING THE PUMP INTO SERVICE. ADHERENCE TO THESE INSTRUCTIONS IS NECESSARY FOR SATISFACTORY START-UP OF YOUR WEMCO PUMP. OPERATING PERSONNEL MUST READ AND UNDERSTAND THE START-UP AND OPERATING PARAGRAPHS.

WARNING

EQUIPMENT LIFTING DEVICES SUCH AS CHAIN, LIFTING EYES, HOOKS, ETC. MUST BE APPROVED BY LOCAL, STATE OR FEDERAL SAFETY CODES.

HOISTS AND CRANES MUST BE ADEQUATELY SIZED TO LIFT RATED LOADS.

FAILURE TO USE APPROVED LIFTING DEVICES MAY RESULT IN INJURY.

WHEN LIFTING THE PUMP IT IS IMPORTANT TO MAKE SURE THAT THE CHAIN AND CABLES ARE FASTENED RELIABLY TO THEIR RETAINING HOOKS.

WARNING

SUCH STRAINS COULD RESULT IN STRUCTURAL FAILURE LEADING TO INJURY.

WARNING

ALL PUMP MODELS ARE CONSTRUCTED OF BRITTLE MATERIALS AND GREAT CARE MUST BE USED IN CONNECTING THESE FLANGES. TIGHTEN EVENLY AND ADJUST TO A SNUG FIT. UNDER NO CIRCUMSTANCES SHOULD THE CASING BE SUBJECTED TO PIPING STRAINS. SUCH STRAINS COULD RESULT IN STRUCTURAL FAILURE LEADING TO INJURY.

SAFETY PRECAUTIONS & INSTRUCTIONS

WARNING

ALL ELECTRICAL CONNECTIONS AND WIRING ARE TO BE IN COMPLIANCE WITH LOCAL BUILDING AND SAFETY CODES.

DO NOT OPERATE EQUIPMENT WITH OPEN ELECTRICAL BOXES OR FITTINGS. CONCTACT WITH INCORRECTLY WIRED EQUIPMENT COULD RESULT IN INJURY.

WARNING

DO NOT OPERATE PUMP WITH BOTH SUCTION AND DISCHARGE VALVES CLOSED OR WITH SUCTION AND DISCHARGE CLOSED BY CLOGGING - THIS COULD CAUSE DAMAGE AND IS DANGEROUS. WEMCO PUMPS ARE TO BE USED FOR LIQUID SERVICE ONLY. EXCESSIVE PRESSURE CAN CAUSE MALFUNCTION LEADING TO INJURY.

AVOID ISOLATING THE PUMP COMPLETELY BY CLOSING BOTH THE SUCTION AND DISCHARGE VALVE AT THE SAME TIME IF THE PUMP CONTAINS A BIOLOGICALLY ACTIVE SLUDGE. DECOMPOSING SLUDGE WILL PRODUCE GAS AND IF THE GAS IS NOT VENTED OR OTHERWISE RELIEVED WITH AN APPROVED RELIEF DEVICE, A PRESSURE BUILD-UP WILL OCCUR WHICH COULD RUPTURE THE PUMP AND/OR PIPING, CAUSING POSSIBLE INJURY AND/OR PROPERTY LOSS. REFER TO THE "WATER ENVIRONMENT FEDERATION MANUAL" OF PRACTICE SM-1 FOR MORE INFORMATION ON THIS HAZARD.

WARNING

DO NOT OPERATE THE PUMP AGAINST A CLOSED DISCHARGE VALVE. DO NOT OPERATE THE PUMP UNLESS THE PUMP IS FILLED WITH LIQUID.

SAFETY PRECAUTIONS & INSTRUCTIONS

WARNING

WHEN CHECKING ALIGNMENT, OR PERFORMING ANY WORK ON THE UNITS, ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.

ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED BELTS, SHEAVES OR COUPLINGS COULD RESULT IN INJURY.

WARNING

WHEN PERFORMING EQUIPMENT MAINTENANCE OR IF THE PUMP IS TO REMAIN OUT OF SERVICE FOR A PERIOD OF TIME, THE EQUIPMENT ELECTRICAL SERVICE MUST BE LOCKED OUT WITH AN APPROVED LOCKOUT AND KEY. FAILURE TO LOCKOUT EQUIPMENT MAY RESULT IN INJURY.

Weir Specialty Pumps
440 West 800 South
Salt Lake City, UT 84101-2229

T 801 359 8731
F 801 355 9303
weirsp.com

SHUT DOWN PROCEDURES

1. Turn off motor and/or disengage power source.
2. Allow all movement to stop before touching the equipment.
3. Follow all safety procedures required by the facility within which this pump is operating, including but not limited to Lock Out / Tag Out.

EnviroTech Pumpsystems, Inc d.b.a.

Weir Specialty Pumps (WSP)

An Unincorporated Division of THE WEIR GROUP PLC

ADDENDUM to Warranty Period of Original LIMITED WARRANTY

Facility Location:	**City of Manteca, CA**
Buyer:	**City of Manteca, CA**
Purchase Order:	**24208**
WSP Sales Order:	**DW11450**

MODIFIED WARRANTY PERIOD: The original warranty period is hereby modified to cover a period of twelve (12) months from SUBSTANTIAL COMPLETION provided that Buyer: (a) performs and documents required maintenance per storage instructions as specified in the equipment Operation and Maintenance Manual, (b) notifies WSP of the date of SUBSTANTIAL COMPLETION in writing within 30 days of same.

ALL OTHER TERMS OF THE LIMITED WARRANTY REMAIN UNCHANGED.

WSP Authorization: _____ **Date** July 5/17

Buyer Approval: _____ **Date** _____

EnviroTech Pumpsystems, Inc d.b.a.

Weir Specialty Pumps (WSP)

An Unincorporated Division of THE WEIR GROUP PLC

LIMITED WARRANTY

COVERAGE: WSP (Seller) warrants its products to be free from defects in materials and workmanship when operated under the normal conditions for which the products were designed.

WARRANTY PERIOD: This warranty covers a period of twelve (12) months from the date product was placed into service, or eighteen (18) months from the date of shipment, whichever occurs first.

REMEDIES: If the product fails due to defective materials or workmanship within the warranty period, WSP's sole obligation after verification of the defect, shall be at its discretion the repair or replacement of the product. THIS PARAGRAPH PROVIDES THE EXCLUSIVE REMEDIES FOR ALL CLAIMS BASED ON FAILURE OF OR DEFECT IN A PRODUCT, WHETHER THE FAILURE OR DEFECT ARISES BEFORE, DURING, OR AFTER THE APPLICABLE WARRANTY PERIOD AND WHETHER A CLAIM, HOWEVER DESCRIBED, IS BASED ON CONTRACT, WARRANTY, INDEMNITY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, OR OTHERWISE, AND IS SUBJECT TO ALL LIMITATIONS OF LIABILITY FOUND HERE OR ELSEWHERE IN THE TERMS AND CONDITIONS.

OWNER'S OBLIGATIONS: Owner shall notify Seller of a defect within ten (10) days of its discovery. At Owner's expense, the defect may be verified at Owner's site, at Seller's authorized facility, or by returning the product to Seller's factory.

EXCLUSIONS: This warranty does not apply to consumable items that are normally replaced during maintenance; and defects resulting from improper installation, operation, maintenance, storage, neglect, or accident. This warranty does not cover any expense for repairs or alteration performed outside Seller's factory without Seller's prior authorization. Equipment and accessories not manufactured by Seller are warranted only by the original manufacturer's warranty. Seller shall not be liable for costs of removal, transportation, or reinstallation of products. Seller shall not be liable for any consequential, special, incidental, or indirect damages or delays resulting from or related to defective products.

SELLER MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AND DISCLAIMS ALL IMPLIED WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, AND ANY IMPLIED WARRANTY THAT COULD ARISE FROM COURSE OF DEALING OR USAGE OF TRADE. SELLER ALSO DISCLAIMS ALL STATUTORY WARRANTIES.

PRODUCT DATA SHEET

H.S. EPOXY SERIES 104

PRIME COAT: RED — TOP COAT: SAFETY BLUE

PRODUCT PROFILE

GENERIC DESCRIPTION Cycloaliphatic Amine Epoxy

COMMON USAGE Versatile coating applies up to 10 mils per coat on steel or concrete. Protects in immersion, salt spray and chemical exposures. Superior abrasion- and stain-resistance.

COLORS Primer: 1211 Red. Topcoat: Refer to Tnemec Color Guide. **Note:** Epoxies chalk with extended exposure to sunlight. Lack of ventilation, incomplete mixing, miscatalyzation or the use of heaters that emit carbon dioxide and carbon monoxide during application and initial stages of curing may cause yellowing to occur.

FINISH Semi-gloss. Gloss can vary with texture, porosity of substrate and thickness of film.

SPECIAL QUALIFICATIONS Conforms to the performance requirements of AWWA C 210 (not for potable water contact).

PERFORMANCE CRITERIA Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

PRIMERS
Steel: Self-priming or Series 66, L69, L69F, N69, N69F, V69, V69F, 90E-92, 90-97, 90G-1K97, 161
Concrete: Self-priming or Series 215, 218.
CMU: Self-priming or Series 130, 215, 218

TOPCOATS Series 66, L69, L69F, N69, N69F, V69, V69F, 73, 104, 1074, 1074U, 1075, 1075U
Refer to COLORS on applicable topcoat data sheets for additional information. **Note:** When topcoating with Endura-Shield polyurethane finish, exterior exposed Series 104 has the following maximum time to recoat: Series 73, 1074, 1074U, 1075 or 1075U, 60 days. If this time is exceeded, an epoxy intermediate coat or scarification is required before topcoating. Refer to appropriate topcoat data sheet for additional information.

SURFACE PREPARATION

STEEL
Immersion Service: SSPC-SP10/NACE 2 Near White Blast Cleaning with a minimum angular anchor profile of 2.0 mils
Non-Immersion Service: SSPC-SP6/NACE 3 Commercial Blast Cleaning with a minimum angular anchor profile of 2.0 mils

CONCRETE Allow new concrete to cure for 28 days. Abrasive blast referencing SSPC-SP13/NACE 6, ICRI-CSP3-5 Surface Preparation of Concrete and Tnemec's Surface Preparation and Application Guide.

CMU Allow mortar to cure for 28 days. Level protrusions and mortar spatter.

PRIMED SURFACES **Immersion Service:** Scarify the surface before topcoating if the Series 66, L69, L69F, N69, N69F, V69, V69F, 104 or 161 prime coat has been exterior exposed for 14 days or longer.

ALL SURFACES Must be clean, dry and free of oil, grease, chalk and other contaminants.

TECHNICAL DATA

VOLUME SOLIDS 82.0 ± 2.0% (mixed) †

RECOMMENDED DFT 4.0 to 10.0 mils (100 to 255 microns) per coat. **Note:** Number of coats and thickness requirements will vary with substrate, application method and exposure. Contact your Tnemec representative.

CURING TIME

Temperature	To Handle	To Recoat	Immersion
75°F (24°C)	6 hours at 4.0 mils (100 microns) DFT 10 hours at 10.0 mils (255 microns) DFT	16-18 hours	7 days

Curing time varies with surface temperature, air movement, humidity and film thickness.

VOLATILE ORGANIC COMPOUNDS EPA Method 24 †
Unthinned: 0.80 lbs/gallon (96 grams/litre)
Thinned 10% (No. 2 Thinner): 1.92 lbs/gallon (230 grams/litre)
Thinned 10% (No. 49 Thinner): 0.80 lbs/gallon (96 grams/litre)

HAPS
Unthinned: 1.60 lbs/gal solids
Thinned 10% (No. 2 Thinner): 2.50 lbs/gal solids
Thinned 10% (No. 49 Thinner): 1.60 lbs/gal solids

THEORETICAL COVERAGE 1,315 mil sq ft/gal (32.3 m²/L at 25 microns). See APPLICATION for coverage rates. †

NUMBER OF COMPONENTS Two: Part A (amine) and Part B (epoxy)

PACKAGING 5 gallon (18.9L) pails and 1 gallon (3.79L) cans — Order in multiples of 2.

NET WEIGHT PER GALLON 14.70 ± 0.25 lbs (6.67 ± .11 kg) (mixed) †

STORAGE TEMPERATURE Minimum 20°F (-7°C) Maximum 120°F (49°C)
For optimum application properties, material temperature must be above 60°F (16°C) prior to application.

TEMPERATURE RESISTANCE (Dry) Continuous 250°F (121°C) Intermittent 275°F (135°C)

SHELF LIFE 24 months at recommended storage temperature.

FLASH POINT - SETA Part A & Part B: 81°F (27°C)

HEALTH & SAFETY Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

H.S. EPOXY | SERIES 104

APPLICATION

COVERAGE RATES

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Minimum	4.0 (100)	5.0 (125)	329 (30.5)
Maximum	10.0 (255)	12.0 (305)	131 (12.2)

Allow for overspray and surface irregularities. Film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. †

MIXING

Power mix contents of each container, making sure no pigment remains on the bottom. Pour a measured amount of Part B into a clean container large enough to hold both components. Add an equal volume of Part A to Part B while under agitation. Continue agitation until the two components are thoroughly mixed. Do not use mixed material beyond pot life limits. **Note:** Both components must be above 60°F (16°C) prior to mixing. Mixing ratio is one to one by volume. A large volume of material will set up quickly if not applied or reduced in volume.
Caution: Do not reseal mixed material. An explosion hazard may be created.

THINNING

Use No. 2 Thinner. For air spray, airless spray or roller, thin up to 10% or 3/4 pint (380 mL) per gallon. Thin up to 10% or 3/4 pint (380 mL) per gallon with No. 49 Thinner when required by air pollution regulations.

POT LIFE

2 1/2 hours at 60°F (16°C) 2 hours at 77°F (25°C) 1 hour at 100°F (38°C)

APPLICATION EQUIPMENT

Air Spray

Gun	Fluid Tip	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pot Pressure
DeVilbiss JGA	E	765 or 704	5/16" or 3/8" (7.9 or 9.5 mm)	3/8" or 1/2" (9.5 or 12.7 mm)	60-90 psi (4.2-6.2 bar)	10-20 psi (0.7-1.4 bar)

Low temperatures or longer hoses require higher pot pressure.

Airless Spray

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.015"-0.021" (380-535 microns)	3000-3800 psi (207-262 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.
Note: Application over inorganic zinc-rich primers: Apply a wet mist coat and allow tiny bubbles to form. When bubbles disappear in 1 to 2 minutes, apply a full wet coat at specified mil thickness.
Roller: Roller application optional when environmental restrictions do not allow spraying. Use 3/8" or 1/2" (9.5 mm to 12.7 mm) synthetic woven nap covers. **Note:** Two or more coats may be required to obtain recommended film thicknesses.
Brush: Recommended for small areas only. Use high quality natural or synthetic bristle brushes. **Note:** Two or more coats may be required to obtain recommended film thicknesses.

SURFACE TEMPERATURE

Minimum 60°F (16°C) Maximum 135°F (57°C)
The surface should be dry and at least 5°F (3°C) above the dew point. Coating will not cure below minimum surface temperature.

CLEANUP

Flush and clean all equipment immediately after use with the recommended thinner or xylol.

† Values may vary with color.

3. REXNORD VIVA COUPLING

3. REXNORD VIVA COUPLING

Weir Specialty Pumps
440 West 800 South
Salt Lake City, UT 84101-2229

T 801 359 8731
F 801 355 9303
weirsp.com

REXNORD VIVA COUPLING STRUCTURE SELECTION

Part Number -- 810-0467
VERT CPLG E2 182-256HP V130

PART NUMBER	DESCRIPTION	QTY/PER	UM
806557	CPLG VIVA V130 1.125/42MM	1.	EA

REXNORD

PRECISION. POWER. PERFORMANCE.

Rex Viva™

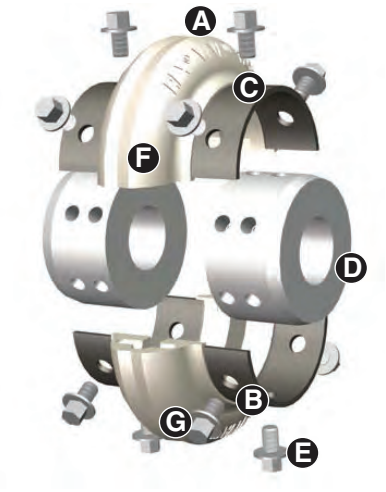
Elastomeric Couplings

Acoplamientos Elastoméricos

Accouplements à Élastomère

GB E F

Description



Rex Viva Close-Coupled Couplings
Acoplamientos estándar Rex Viva
Accouplement Rex Viva Standard

A - Two-piece flex element design allows for simple replacement without disturbing hubs or moving and realigning connected equipment.

B - Tough polyurethane material is bonded to a corrosion resistant coated shoe, eliminating the need for mechanical clamping hardware.

C - Adhesive coated high strength carbon steel shoe resists corrosion.

D - Easily aligned reversible hubs accomodate multiple shaft gaps. Hubs are available in rough bore, custom bore, or bushed designs. Optional hub materials are available.

E - High grade capscrews are provided with self locking nylon thread patches. Stainless steel capscrews are also available.

F - Torsionally soft polyurethane element cushions shock loads, accomodates unavoidable misalignment and is compatible with most environments.

G - “V” notch design directs stress concentration away from the bond area providing a uniform failure area for overload protection if required.

Descripción

A - El diseño de los elementos flexibles en dos mitades permite un recambio sencillo sin afectar a los núcleos, ni desplazar, ni realinear el equipo conectado.

B - El elemento de poliuretano está vulcanizado a una pieza en forma de teja, resistente a la corrosión, lo cual elimina la necesidad de mecanismo de fijación.

C - Teja de acero al carbono de gran resistencia con revestimiento resiste la corrosión.

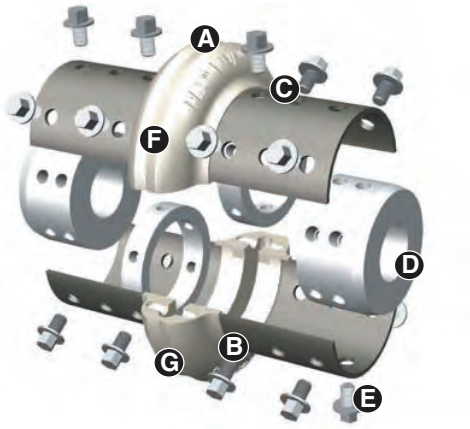
D - Los núcleos de acero son reversibles, de fácil alineación, y admiten múltiples distancias entre los árboles. Hay disponibles núcleos ciegos, con agujero acabado, o según diseño requerido. Hay disponibles otras opciones de material para los núcleos.

E - Los tornillos hexagonales, de alta calidad, van equipados con sistema de autobloqueo Nyloc. También hay disponibles tornillos hexagonales de acero inoxidable.

F - El elemento de poliuretano, flexible a la torsión, absorbe las cargas de choque, compensa la falta de alineación y es compatible con la mayor parte de los entornos.

G - El diseño de ranura en “V” aleja la concentración del esfuerzo, en el área de vulcanizado, proporcionando un área de fallo uniforme para protección contra sobrecarga en caso necesario.

Description



Rex Viva Spacer Couplings
Acoplamientos Rex Viva versión larga
Accouplement Rex Viva Version longue

A - La conception des éléments flexibles en deux pièces permet le remplacement simple sans déplacer les moyeux et/ou réalignement des équipements connectés.

B - L'élément en polyuréthanne est lié chimiquement à une coquille résistant à la corrosion, éliminant l'utilisation de liaison mécanique.

C - Les coquilles ont une protection adhésive assurant une bonne tenue à la corrosion.

D - Facilement alignables, les moyeux réversibles permettent de multiples combinaisons d'espaces entre les arbres. Les moyeux sont disponibles non-alésés, alésés ou pour douille universelle. Plusieurs matériaux sont disponibles.

E - Les vis de haute qualité sont autofreinées par Nyloc. Des vis en acier inoxydable sont également disponibles.

F - Souple en torsion, l'élément en polyuréthanne amorti les chocs, s'accommode des inévitables défauts d'alignements et est compatible avec la majorité des environnements.

G - La forme en “V” éloigne les concentrations de contraintes de la surface de liaison en créant une ligne de déchirement en cas de surcharges.

Description

Rex Viva is based on the design of its reputable predecessor, Rex Omega. Design upgrades allow Rex Viva to transmit greater torque with a smaller coupling that, in addition, can accept larger bores. Although they have similar configurations, their parts are not interchangeable.

Rex Viva is a non-lubricated, torsionally flexible coupling with no wearing parts. Its angular, axial and radial flexibility comes from its polyurethane membrane. It consists of only four components; two axially-split half flexible elements with capscrews and two hubs. All versions are field adjustable to meet ISO, DIN and ANSI shaft spacing specifications of up to 300 mm without the need of additional parts.

The Flexible Element
The unique two-piece, split-in-half flexible element allows replacement without disturbing the hubs or connected equipment. A half element consists of a polyurethane membrane chemically bonded to two formed steel shoes. It transmits torque in shear through the membrane. Patented stress relief notches found on the end of each membrane uniformly distribute shear stresses. The polyurethane is formulated to withstand cyclic fatigue, common environmental conditions, and industrial chemicals. Although not to be used as a torque limiting device, the membrane serves as a fuse disconnecting the equipment in case of lockup or severe overload conditions. The steel shoes are coated, not painted, for optimal resistance against oxidation and industrial chemicals. Paired half elements are supplied factory weight matched to ensure standard balance conform with ISO G16 and AGMA Class 8.

Upgrades
The 'V' notch on the polyurethane membrane channels stresses to provide a uniform center-line tear for overload protection.

Longer shoes for the smaller sizes reduce the need to oversize selections to meet required distance between shaft ends.

Increased material cross-sections derived from Finite Element Analysis minimize stresses during operation to the connected equipment.

*The **new VSX version** connects shafts with extra wide gaps (up to 300 mm) maintaining the basic four component design; two axially-split half flex elements and two hubs. No special hubs or sleeves are required.*

Descripción

El Rex Viva se basa en el diseño de su reputado predecesor, el Rex Omega. Las mejoras de diseño permiten al Rex Viva transmitir un mayor par de torsión con una talla más pequeña de acoplamiento, aceptando, además, diámetros de árboles más grandes.
A pesar de que tienen configuraciones similares, sus piezas no son intercambiables.
El Rex Viva es un acoplamiento flexible a la torsión, sin mantenimiento, y sin piezas desgastables. Su flexibilidad angular, axial y radial, proviene del elemento de poliuretano. Está formado por sólo cuatro elementos: dos mitades flexibles unidas sentido axial, con tornillos hexagonales, y dos núcleos. Todas las versiones pueden ajustarse para cumplir las especificaciones ISO, DIN y ANSI referentes al espaciado de los árboles, hasta 300mm, sin necesidad de piezas adicionales.

El Elemento Flexible
El exclusivo elemento flexible en dos mitades, permite el recambio sin afectar a los núcleos ni al equipo conectado. Una mitad consta de una semi cubierta de poliuretano, no reforzada, vulcanizada a dos tejas de acero perforadas. La transmisión del par motor se realiza por cizallamiento a través de la cubierta. Las ranuras, patentadas, para disipación del esfuerzo, realizadas en cada semicubierta, distribuyen de modo uniforme los esfuerzos de cizallamiento. El poliuretano se ha diseñado para soportar la fatiga cíclica, las circunstancias ambientales habituales y los productos químicos industriales. Aunque no debe utilizarse como dispositivo limitador del par de torsión, la cubierta, actúa a modo de fusible desconectando el equipo en caso de que se produzcan un bloqueo o una sobrecarga, graves. Las tejas de acero están revestidas, no pintadas, para ofrecer una resistencia óptima contra la oxidación y los productos químicos industriales. Las dos mitades se suministran emparejadas desde fábrica, con el peso igualado para garantizar el equilibrio en cumplimiento de las normas ISO G16 y AGMA Clase 8.

Mejoras
La ranura en 'V'en la cubierta de poliuretano canaliza los esfuerzos, con el fin de proporcionar una línea central de ruptura uniforme, para protección contra sobrecargas.

La mayor longitud de las tejas, paralas tallas más pequeñas, reduce la necesidad de aumentar las dimensiones de las selecciones, para cumplir las condiciones de distancia, necesaria entre los extremos de los árboles.

El aumento de las secciones transversales del material, derivado del análisis por elementos finitos, minimiza los esfuerzos que se transmiten al equipo conectado durante su funcionamiento.

*La **nueva versión VSX** conecta árboles con espacios intermedios de gran tamaño, hasta 300 mm., manteniendo*

Description

La conception du Rex Viva est basée sur celle de son prédécesseur, Rex Omega. Les améliorations de conception permettent au Rex Viva de transmettre un couple plus élevé dans un encombrement plus petit, ceci en autorisant de plus grands alésages. Bien qu'ils soient de conception similaire, leur pièces ne sont pas interchangeables.

Rex Viva est un accouplement flexible en torsion, non lubrifié sans pièce d'usure. Ses flexibilités angulaire, axiale et radiale proviennent de sa membrane en polyuréthanne. Il est composé de seulement quatre composants : deux demi éléments flexibles séparés axialement, des vis de fixation et deux moyeux. Toutes les versions sont réglables pour se conformer aux normes ISO, DIN et ANSI, des spécifications d'espacement des bouts d'arbres jusqu'à 300 mm sans utiliser de pièce supplémentaire.

L'élément Flexible
La conception originale en deux pièces symétriques de l'élément flexible permet son remplacement sans déplacement des machines connectées. Un demi élément consiste en une membrane de polyuréthanne non renforcée liée chimiquement à deux coquilles en acier, préformées et perforées. L'élément flexible transmet le couple par cisaillement à travers la membrane. Les formes en fossette brevetées de chaque bout de section de membrane répartissent uniformément les contraintes de cisaillement. Le polyuréthanne a été spécialement étudié pour résister à la fatigue cyclique, conditions d'environnement normales, et aux ambiances chimiques industrielles. Sans être utilisée comme un organe de limitation de couple, la membrane peut servir d'élément fusible déconnectant les équipements en cas de blocage ou de sérieuses conditions de surcharges. Les coquilles en acier sont protéges et non peintes, pour obtenir un résistance optimale contre l'oxydation et les produits chimiques industriels. Les demi éléments sont appairés en fonction de leur poids en usine pour assurer un équilibrage conforme aux normes ISO G16 et AGMA Classe 8.

Améliorations
La forme en 'V' de la membrane en polyuréthanne canalise les contraintes pour obtenir une ligne uniforme de déchirement pour la protection contre les surcharges.

Les petites tailles disposent de coquilles plus longues réduisant ainsi la nécessité de surdimensionner la sélection pour obtenir la distance entre bouts d'arbres souhaitée.

La section de matière accrue dérivée d'une Analyse par Elements Finis minimise les contraintes sur les machines connectées pendant le fonctionnement.

*La **nouvelle version VSX** connecte des arbres trés espacés (jusqu'à 300 mm) tout en conservant les quatre composants de base : deux demi éléments flexibles*

Description

Capscrews
Metric capscrews with self-locking Nyloc thread patches are in standard steel (stainless steel optional). They conform to precise engineering specifications and are supplied standard with flexible elements. They fasten radially for easy accessibility. Blind mounting of capscrews, therefore, is avoided. The capscrews generate a clamping force between the hub's outer diameter and the inner shoe surface.

Upgrades
Larger and more numerous fasteners enhance the robust base design.

Hubs
In standard steel, hubs are also available in stainless steel or with special surface treatment for particular corrosion resistance. They can be used interchangeably with V, VS and VSX (see below) versions for any given size.

Upgrades
A cylindrical hub, without a step for the smaller sizes, accepts larger bores. Two rows of radial holes grant more field spacing adjustability.

High Speed Rings
Machined from cold rolled steel, the rings are optional as reinforcement for the VS version.

Upgrades
Not required for any size of the VS version.

Descripción

el diseño básico de cuatro componentes: dos mitades flexibles unidas siguiendo el eje axial y dos núcleos. No son necesarios núcleos ni manguitos especiales.

Tornillos hexagonales
Los tornillos hexagonales métricos con sistema de autobloqueo Nyloc se suministran en acero estándar (acero inoxidable opcional). Cumplen especificaciones precisas y se suministran conjuntamente con los elementos flexibles. Su montaje radial facilita el acceso a los mismos y evita de ese modo el montaje a ciegas de los tornillos, generandose una fuerza de sujeción entre el diámetro exterior del núcleo y la superficie interior de las tejas.

Mejoras
Mayor número y tamaño de los tornillos, para mejorar, el ya de por si, robusto diseño básico.

Núcleos
En acero fundido convencional, se encuentran también disponibles en acero inoxidable o con tratamientos especiales de superficie para conseguir una resistencia específica a la corrosión. Pueden utilizarse de modo intercambiable con las versiones V, VS y VSX de culquier talla dada (ver más adelante).

Mejoras
Un núcleo cilíndrico, sin valonas para las tallas más pequeñas y que acepta diámetros interiores mayores. Dos hileras de orificios radiales proporcionan mayor posibilidad de ajuste in situ.

Anillos de alta velocidad
Fabricados de acero laminado en frío. Los anillos son opcionales como refuerzo para la versión VS.

Mejoras
No se necesitan para ningún tamaño de la versión VS.

Description

séparés axialement et deux moyeux. Il ne nécessite aucun manchon ni moyeux spécial.

Vis de Fixation
Les vis de fixation métriques en acier (acier inoxydable en option) sont étudiées pour être également utilisées avec des clefs en pouce. Elles se conforment à de précises spécifications techniques et sont livrées automatiquement avec les éléments flexibles. Leur montage radial offre une bonne accessibilité et évite ainsi leur montage en aveugle. Les vis de fixation créent une adhérence entre le diamètre extérieur des moyeux et la surface intérieure de la coquille. Elles sont autofreinées par Nyloc.

Améliorations
Un plus grand nombre de vis de dimension supérieure renforce la conception de base déjà robuste.

Moyeux
En fonte et en acier en standard, les moyeux sont également disponibles en acier inoxydable ou avec un traitement de surface spécial pour obtenir une résistance particulière à la corrosion. Ils peuvent être utilisés indifféremment sur les versions V, VS ou VSX (voir ci-dessous) pour quelques tailles données.

Améliorations
Un moyeu cylindrique sans épaulement pour les plus petites tailles accepte de plus grands alésages.
Deux rangées de trous radiaux autorisent une plus grande possibilité de d'ajustement de distance entre bouts d'arbres.

Anneaux de Survitesse
Usinés dans de l'acier roulé à froid, les anneaux pour renforcer l'accouplement sont facultatifs pour les versions VS.

Améliorations
Ne sont plus exigés pour la version VS.

Coding	Codificación	Codification

V	2	3 130	4	-	5	-	6 HCB	7	8 1.125(.250) / 42MM(12X8MM)

2

Version
No code: standard
S: spacer
SX: extented spacer

Versión
Sin código: estándar
S: separador
SX: separador extralargo

Version
Aucun : standard
S : longue
SX : Extra longue

3

Size
110, 125, 130, 150, 170, 190, 215, 245, 290, 365, 425, 460

Tamaño
110, 125, 130, 150, 170, 190, 215, 245, 290, 365, 425, 460

Taille
110, 125, 130, 150, 170, 190, 215, 245, 290, 365, 425, 460

4

Shoe and capscrew material
No code: standard

Material de tejas y tornillos
Sin código: estándar

Matière des coquilles et vis
Aucun : standard

5

High speed ring
(Only S and SX version)
No code: without ring
R: with high speed rings; Standard on SX version.

Anillo de alta velocidad
(Sólo versiones S y SX)
Sin código: sin anillo
R: con anillos de alta velocidad; estándar en la versión SX.

Anneau de haute vitesse
(Versions S et SX seulement)
Aucun : sans anneau
R : avec anneaux ; Standard sur la version SX.

6

Hub type
HRB: pilot bored
HCB: custom bored
HTL: bored for *Magic-Lock*® bushings

Tipo de núcleo
HRB: ciego
HCB: con agujero acabado específico
HTL: para casquillo Magic-Lock®

Type de moyeux
HRB : préalésés
HCB : alésages spécifiques
HTL : pour douille *Magic-Lock*®

7

Hub material
No code: standard
STL: steel
SS: stainless steel
X: other

Material del núcleo
Sin código: estándar
STL: acero
SS: acero inoxidable
X: otro

Matière des moyeux
Aucun : standard
STL : acier
SS : acier inoxydable
X : autre

8

Bores and keyways specifications
Without specification, keyways as per ISO R773.

Especificaciones de diámetros interiores y chaveteros
Sin especificación, chaveteros según ISO R773.

Spécification d'alésage et de clavetage
Sans spécification, clavetage selon ISO R773.

Example | **Ejemplo** | **Exemple**

V	S	125		-	R	-	HCB	ø28 mm H7 / ø30 mm H7

Rex Viva complete coupling, spacer version, size 125, capscrews, high speed ring, custom bored standard hubs to ø28mm H7 tolerance and ø30mm H7 tolerance with standard keyways as per ISO R773.

Acoplamiento completo Rex Viva, con separador, tamaño 125, tejas y tornillos de acero inoxidable, anillo de alta velocidad, núcleos con agujeros de ø28mm H7 de tolerancia y ø30mm H7 de tolerancia con chaveteros estándar según ISO R773.

Accouplement Rex Viva version longue, taille 125, à coquilles et vis en acier inoxydable, anneaux de haute vitesse, moyeux standard alésés ø28mm tolérance H7 et ø30mm tolérance H7 avec clavetages normalisés suivant ISO R773.

Magic-Lock® is a registered trademark of taper bushings completely interchangeable with Taper-Lock® bushings.
Taper-Lock® is a registered trademark of Reliance Electric Company.

Magic-Lock®es una marca registrada de casquillos cónicos completamente intercambiables con casquillos Taper-Lock®.
Taper-Lock® es una marca registrada de Reliance Electric Company.

Magic-Lock® est une marque enregistrée de douilles complètement interchangeables avec les douilles Taper-Lock®.
Taper-Lock® est une marque enregistrée par la société Reliance Electric Company.

V			
	Standard version	**Versión estándar**	**Version normale**
100 ▶ 460	**Size**	**Talla**	**Taille**
-			
HRB / HCB	**Hub type**	**Tipo de núcleo**	**Type de moyeux**
- / STL / SS / X	**Hub material**	**Material del núcleo**	**Matière des moyeux**

The user is responsible for the provision of safety guards and correct installation of all equipment.

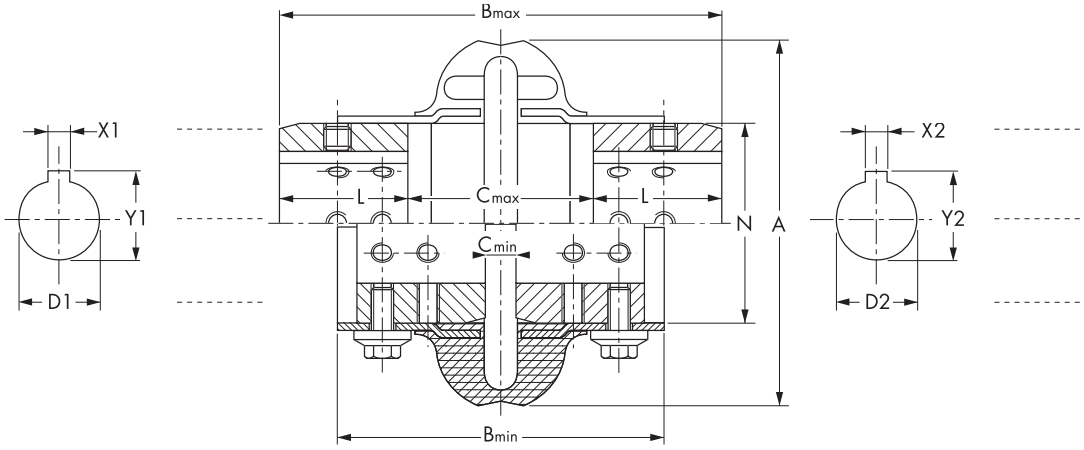
Certified dimensions available upon request.

El usuario es responsable de la provisión de dispositivos de seguridad y de la correcta instalación de todo el equipo.

Se proporcionarán las dimensiones certificadas si así se solicita.

Les dispositifs de protection doivent être prévus par l'utilisateur. Celui-ci est responsable de l'installation correcte de l'ensemble.

Dimensions définitives sur demande.



Remarks:
Unless specified on the order draft, couplings are delivered without boring.
(1) For speeds > nmax : consult factory.
(2) Maximum bores for keyways as per ISO R773.
(3) With maximum bore.

Notas:
A no ser que se 245 especifique en el 290 borrador de pedido, los acoplamientos se suministran sin agujeros acabados.
(1) Para velocidades > n máx: consulte a la fábrica.
(2) Diámetros interiores máximos para chaveteros según ISO R773.
(3) Para diámetro interior máximo.

Remarques :
Sans indication à la commande, les accouplements sont livrés non alésés.
(1) Pour des vitesses > nmax : nous consulter.
(2) Alésages maximum pour rainures suivant ISO R773.
(3) Pour alésage maximum.

Size **Tamaño** **Taille**	**T_N** (Nm) 9550.kW **min^{-1}**	**n_{max}** min^{-1} **(1)**	**D1** **D2** min.	**D1** **D2** max. **(2)**	**A**	**B** min.	**B** max.	**C** min.	**C** max.	**L**	**N**	**J** kgm^2 **(3)**	**m** kg **(3)**
110	62	5 400	10	38	110	97	132	9	55	38	60	0,00123	1,4
125	105	5 400	10	48	120	98	132	9	55	38	70	0,00202	1,7
130	164	5 100	11	55	129	97	136	7	55	41	80	0,00310	2,1
150	250	4 800	10	65	150	111	162	9	60	51	95	0,009	4,2
170	308	4 800	11	65	168	111	162	9	60	51	95	0,00931	4,3
190	412	4 600	19	75	190	116	164	7	60	52	117	0,0173	5,5
215	662	4 300	19	80	213	134	191	11	64	64	140	0,0303	9,6
245	938	4 100	19	95	245	137	202	7	73	65	171	0,076	14,4
290	1 412	3 900	27	110	290	153	241	8	94	73	215	0,192	24,9
365	3 200	3 600	35	127	365	200	311	20	131	90	235	0,373	42,0
425	5 580	2 000	35	155	425	247	361	19	133	114	286	1,180	85,0
460	6 270	2 000	48	165	460	267	380	19	132	124	302	1,720	93,0

Selection Procedure

1/ Choice of coupling type:
The choice is based on the type of application and the operating conditions.
The reference charts on page 13 and 14 can help with the choice of coupling type.
(Note: only use couplings with positive engagement for lifting motion!)

2/ Calculation of the nominal torque Ta (Nm) of the driven machine

$$Ta = \frac{9550 \times Pa}{n}$$

where: Pa = absorbed torque (kW) of the driven machine,
n = speed (min^{-1})

3/ Service factor determination SF
See table in each catalogue.
Service factor adders should be used if:
• the driven machine is an internal combustion engine where torque fluctuations of more than 20% may occur (see page 12),
• the operating speed approaches the critical speed (consult factory),
• the ambient temperature exceeds 60°C (consult factory).
• the number of starts per hour is more than 10 (consult factory).

4/ Calculation of the equivalent torque Teq (Nm)

$$Teq = Ta \times (SF + S_t) \quad *$$

where: Ta = torque (Nm) of the driven machine,
SF = service factor
S_t = Temperature service factor (see p.15)

5/ Select the coupling size so that:

$$TN \geq Teq$$

where: TN = nominal torque of the coupling (see dimensional drawings)

6/ Checking of the selection
The maximal peak torque:

$$Tmax \leq 2 \times TN$$

7/ Checking of the bores
Check when the shaft diameters are known, whether the corresponding bores are available.
If the coupling is to be bored and keywayed, the correct dimensions and tolerances should be advised.

Procedimiento de selección

1/ Elección del tipo de acoplamiento:
La elección se basa en el tipo de aplicación y en las condiciones de operación.
Las tablas de referencia en las páginas 13 y 14 pueden facilitar la elección del tipo de acoplamiento.
(Nota: ¡utilice sólo acoplamientos con clavamiento seguro para un movimiento de elevación!)

2/ Cálculo del par de torsión nominal Ta (Nm) de la máquina impulsada

donde: Pa = par de torsión absorbido (kW) de la máquina impulsada,
n = velocidad (min^{-1}).

3/ Determinación del factor de servicio SF
Véase la tabla en cada catálogo.
Deberían utilizarse factores de servicio adicionales si:
• la máquina impulsora es un motor decombustión interna en el que pueden ocurrir variaciones del par de torsión superiores al 20 %, ver la página 9.
• la velocidad de funcionamiento se acerca a la velocidad crítica, consúltenos.
• la temperatura ambiente supera los 60 °C, consultenos.
• el número de encendidos por hora es mayor de 10, consultenos.

4/ Cálculo del par de torsión corregido Teq (Nm)

donde: Ta = par de torsión (Nm) de la máquina impulsada,
SF = factor de servicio
St = factor de servicio de la temperatura (véase la p. 15)

5/ Seleccione el tamaño del acoplamiento de modo que:

donde: TN = par de torsión nominal del acoplamiento (véanse los dibujos acotados)

6/ Comprobación de la selección
El par de torsión máximo:

7/ Comprobación de los diámetros internos
Cuando se conozcan los diámetros de los árboles, compruebe si están disponibles los diámetros internos correspondientes.
Si el acoplamiento debe agujerearse y amortajar, deberían indicarse las dimensiones y tolerancias correctas.

Méthode de sélection

1/ Choix du type d'accouplement :
Celui-ci est déterminé par le genre d'application et par les conditions de fonctionnement.
Les tableaux synthétiques des pages 13 à 14 peuvent aider à ce choix.
(Remarque : employer uniquement un accouplement assurant une liaison positive sûre pour un mouvement de levage !)

2/ Calcul du couple nominal Ta(Nm) de la machine

où : Pa = puissance absorbée (kW) par la machine,
n = vitesse (min^{-1}).

3/ Choix du facteur de service SF
Voir tableau dans chaque catalogue.
Des facteurs de service complémentaires doivent être appliqués lorsque :
• la machine motrice est un moteur à combustion interne pouvant occasionner des variations de couple de plus de 20% (voir page 9),
• la vitesse de régime se rapproche sensiblement de la vitesse critique (nous consulter),
• la température ambiante dépasse 60°C (nous consulter).
• le nombre de démarrages par heure est supérieur à 10 (nous consulter).

4/ Calcul du couple équivalent Teq (Nm)

où : Ta = couple (Nm) de la machine entraînée,
SF = facteur de service
S_t = Facteur de service température (voir p.15)

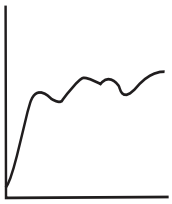
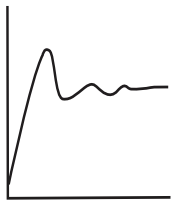
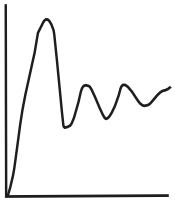
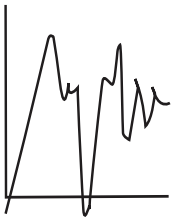
5/ Sélection de la taille de l'accouplement, de manière que :

où : TN = couple nominal de l'accouplement (voir plans d'encombrements).

6/ Vérification de la sélection
Couple de pointe maximum :

7/ Contrôle des alésages
Les diamètres des bouts d'arbre étant connus, contrôler que les alésages correspondants peuvent être réalisés.
Si les accouplements doivent être fournis alésés et rainurés, il y a lieu d'indiquer les cotes exactes et les tolérances désirées.

Selection | Selección | Sélection

	Load Classifications Clasificación de cargas *Classifications des charges*	Service Factors *Factores de servicio* *Facteur de Service* S_R
	Continous Service and running Loads vary only slightly *El servicio continuo y las cargas de funcionamiento varían sólo ligeramente* *Service continu et le fonctionnement en charge varie seulement légèrement*	1.0
	Torque loading varies during operation of equipment *Epar de carga varía durante el funcinamiento del equipo.* *Le couple varie pendant le fonctionnement*	1.5
	Torque varies during operation, frequent stop/start cycles are encountered *El par de torsión varía durante la operación, se encuentran numerosos ciclos de encendido y parada* *Le couple varie pendant le fonctionnement comportant des démarrage / freinage fréquents*	2.0
	For shock loading and substantial torque variations *Para carga de choque y variaciones importantes del par de torsión* *Pour des chocs en charge et des variations de couple importantes*	2.5
	For heavy shock loading or light reversing drives *Para fuerte carga de choque o ligeros impulsos de inversión* *Pour des chocs importants ou de légères inversion de sens de rotation*	3.0
	Reversing torque loads do not necessarly mean reversal of rotation. Depending on severity of torque reversal, such loads must be classified between “medium” and “extreme”. *La inversión de las cargas del par de torsión no significa necesariamente la inversión de la rotación.* *Dependiendo de la gravedad de la inversión del par de torsión, dichas cargas deben clasificarse entre “medias” y “extremas”* *Inversions de couple ne voulant pas forcement dire inversion de rotation.* *Cela dépend de la sévérité de l'inversion de couple, aussi les charges doivent être classées entre “moyenne” et “extrême”.*	Consult factory *Consúltenos* *Nous consulter*

* If the application is not listed in pages 14 and 15, use the factor S_R in place of SF.

* Si la aplicación no aparece listada en f las páginas 14 y 15, utilice el factor SR en lugar del SF.

* Si l’application n’est pas trouvée dans la liste des pages 14 et 15, remplacer SF par le facteur SR ci-dessus.

SF	Service Factor	Factor de servicio	Facteur de service
	AGITATORS	**AGITADORES**	**AGITATEURS**
1,5	Pure Liquids	Líquidos puros	Liquides purs
2,0	Variable density	Densidad variable	Densité variable
1,5	**ALTERNATOR**	**ALTERNADOR**	**ALTERNATEUR**
	BLOWERS	**SOPLANTES**	**MACHINES SOUFFLANTES**
1,0	Centrifugal	Centrífugos	Centrifuges
1,5	Lobe	De lóbulos	A lobes
1,5	Vane	De paletas	A pales
2,0	**BRIQUETTER MACHINES**	**BRIQUETEADORAS**	**MACHINES DE BRIQUETERIE**
1,0	**CAN FILLING MACHINES**	**RELLENADORAS DE LATAS**	**MACHINES DE MISE EN BOîTE**
2,0	**CANE KNIVES**	**CUCHILLAS PICADORAS DE CAÑA**	**COUPE BAMBOU**
2,0	**CAR DUMPERS**	**VUELCAVAGONES**	**COMPACTEUR**
2,0	**CAR PULLERS**	**TORNOS ARRASTRADORES DE VAGONES**	**VEHICULE DE REMORQUAGE**
2,0	**CLAY WORKING MACHINERY**	**MAQUINARIA PARA TRABAJAR ARCILLA**	**MACHINES DE TRAVAIL DE L'ARGILE**
	COMPRESSORS	**COMPRESORES**	**COMPRESSEURS**
1,0	Centrifugal	Centrífugos	Centrifuge
1,5	Lobe, Vane, Screws	De lóbulos, de paletas, con tornillos	A lobes, à pales, à vis
*	Reciprocating - Multi-Cylinder	De pistón - Policilíndrico	A piston, multicylindre
1,0	Axial	Axial	Axial
	CONVEYORS	**CINTAS TRANSPORTADORAS**	**CONVOYEURS**
1,5	Uniformly loaded or fed	De alimentación o carga uniforme	Chargé ou alimenté uniformément
3,0	Heavy duty - not uniformly fed	De alta resistencia - de carga no uniforme	Service lourd - alimenté non uniformément
2,0	**CRANES AND HOISTS**	**GRÚAS Y POLIPASTOS**	**LEVAGE**
3,0	**CRUSHERS**	**TRITURADORES**	**CONCASSEURS**
	DREDGES	**DRAGAS**	**DRAGAGE**
2,0	Cable Reels	Carretes de cables	Enrouleurs de câble
2,0	Conveyors	Cintas transportadoras	Convoyeurs
3,0	Cutter Head Drives	Excavadoras	Excavatrices
3,0	Jig Drives	Arrastre de plantillas	Entraînement de calibre
2,5	Maneuvering Winches	Tornos de maniobras	Treuils de manoeuvre
2,0	Pumps	Bombas	Pompes
2,0	Screen Drives	Arrastre de tamiz	Entraînement de cribles
2,0	Stackers	Apiladoras	Entasseurs
2,0	Utility Winches	Tornos utilitarios	Treuil utilitaire
	ELEVATORS	**ELEVADORES**	**ELEVATEURS**
2,5	Bucket	Con cubetas	A godets
2,5	Centrifugal Discharge	De descarga centrífuga	A déchargement centrifuge
2,5	Escalators	Rodantes	Escaliers roulants
2,0	Freight	Montacargas	Monte charge
2,5	Gravity Discharge	De descarga por gravedad	A déchargement par gravité
	EXTRUDERS	**EXTRUSORAS**	**EXTRUDEURS**
2,0	Plastic	Plástico	Matières plastiques
2,5	Metal	Metal	Matières métalliques
	FANS	**VENTILADORES**	**VENTILATEURS**
	Centrifugal	Centrífugos	Centrifuges
1,5	Forced Draft	Corriente forzada	Flux forcé
1,5	Induced Draft	Corriente inducida	Flux induit
	Axial	Axial	Axial
1,5	Forced Draft	Corriente forzada	Flux forcé
1,5	Induced Draft	Corriente inducida	Flux induit
2,0	Mine Ventilation	Ventilación de minas	Ventilation de mines
2,0	Cooling Towers	Torres de ventilación	Tour de réfrigération
1,0	Light Duty Blower & Fans	Ventiladores y soplantes para trabajos ligeros	Ventilateurs peu chargés
	FEEDERS	**ALIMENTADORES**	**ALIMENTATEURS**
1,5	Light Duty	Para trabajos ligeros	Service léger
2,5	Heavy Duty	Para trabajos pesados	Service lourd
	FOOD INDUSTRY	**INDUSTRIA ALIMENTICIA**	**INDUSTRIE ALIMENTAIRE**
2,0	Beet Slicer	Rebanadora de remolacha	Coupe betteraves
1,5	Cereal Cooker	Tostador de cereales	Four à céréales
2,0	Dough Mixer	Amasadora	Pétrins, mélangeurs
2,0	Meat Grinders	Picadoras de carne	Hachoirs à viande
1,0	Can Filling Machine	Rellenadora de latas	Machines de mise en boîte
1,5	Bottling	Embotellado	Machines à embouteiller
	GENERATORS	**GENERADORES**	**GENERATRICES**
1,0	Non-Welding	Excepto soldadura	Normales
3,0	Welding	Para soldadura	De soudure
2,5	**HAMMER MILLS**	**TRITURADORAS DE MARTILLOS**	**BROYEURS A MARTEAUX**
	LUMBER INDUSTRY	**INDUSTRIA MADERERA**	**INDUSTRIE DU BOIS**
2,0	Barkers - Drum Type	Descortezadoras - De tambor	Ecorceur type tambour
2,0	Edger Feed - Live Rolls	Alimentación de canteadora - Rodillos activos	Transporteurs à chaines
2,0	Log Haul - Incline	Arrastre de troncos - Plano inclinado	Transporteur de bûches - Incliné
2,0	Log Haul - Well Type	Arrastre de troncos - En pozo	Transporteur de bûches - Normal
2,0	Planer Feed Chains	Cadenas de alimentación de la cepilladora	Chaînes d'alimentation de raboteuse
2,0	Planer Tilting Hoist	Polipasto basculante de la cepilladora	Portique d'inclinaison de rabotage
1,5	Slab Conveyor	Cinta transportadora de costeros	Convoyeur de plaque
1,5	Sorting Table	Mesa de clasificación	Table de triage
2,0	Trimmer Feed	Alimentación de recortadora	Alimentation de machine à trancher
	MACHINE TOOLS	**MÁQUINAS HERRAMIENTA**	**MACHINES OUTIL**
2,0	Bending Roll	Rodillo plegador	Cintreuse, plieuse
1,5	Plate Planer	Cepilladora para chapas	Machine à planer
2,0	Punch Press - Gear Driven	Prensa punzonadora - Accionada por engranajes	Poinçonneuses
2,5	Tapping Machines	Fileteadoras	Machines à tarauder
	Other Machines Tools	Otras máquinas herramienta	Autres machines outil
1,5	Main Drives	Impulsores principales	Entraînement principal
1,5	Auxiliary Drives	Impulsores auxiliares	Entraînement auxiliaire
	METAL MILLS	**METALURGIA**	**METALLURGIE**
2,0	Draw - Bench - Carriage	Carro de máquina estiradora	Bancs à tréfiler - Chargement
2,0	Draw - Bench - Main Drive	Impulsor principal de máquina estiradora	Bancs à tréfiler - Entraînement principal
2,5	Forming Machines	Formadoras	Machine de formage
2,0	Slitters	Sierras longitudinales	Fendoir
	Table Conveyor	Mesa transportadora	Convoyeur
3,0	Non-Reversing	No reversible	Non réversible
4,5	Reversing	Reversible	Réversible
2,0	Wire Drawing & Flattening Machine	Trefiladora y aplanadora de cables	Machine à tréfiler & à laminer le fil
2,0	Wire Winding Machine	Enrolladora de alambre	Bobineuse de fil
	MILLS ROTARY TYPE	**MOLINOS DE TIPO ROTATORIO**	**BROYEURS ROTATIFS**
3,0	Ball	De bolas	A boulets
2,5	Cement Kilns	Hornos de cemento	Four à ciment
2,0	Dryers & Coolers	Secadores y enfriadores	Sécheurs & Refroidisseurs
2,5	Kilns	Hornos	Fours
2,0	Pebble	De cantos	A galets
3,0	Rod	De varillas	A barres
2,0	Tumbling Barrels	Tambores desarenadores	Tambour désableur
	MIXERS	**MEZCLADORAS**	**MELANGEURS**
2,0	Concrete Mixers	Hormigoneras	Bétonnières
2,0	Drum Type	Factor de servicio	Tambours
	OIL INDUSTRY	**INDUSTRIA PETROLERA**	**PETROCHIMIE**
1,5	Chillers	Refrigeradores	Réfrigérateurs
2,0	Oil Well Pumping	Bombeo de pozos petrolíferos	Pompe à puits de pétrole
2,0	Paraffin-Filter-Press	Prensa de filtro de parafina	Filtres-presses pour paraffine

SF	Service Factor	Factor de servicio	Facteur de service
2,5	Rotary Kilns	Hornos giratorios	Fours rotatifs
	PAPER MILLS	**FÁBRICAS DE PAPEL**	**PAPETERIE**
2,0	Barker Auxiliaries Hydraulic	Accesorios para descortezadoras, hidráulicos	Hydraulique auxiliaire d'écorcheur
2,0	Barker Mechanical	Descortezadora mecánica	Ecorcheur mécanique
3,0	Barking Drum (Spur Gear Only)	Tambor de descortezado (sólo engranaje recto)	Tambour écorcheur (Engrenage droit seulement)
2,0	Beater & Pulper	Batidor y desintegrador	Pulpeur
1,0	Bleacher	Blanqueadora	Blanchiment
2,5	Calenders	Calandria	Calandres
1,5	Converting Machines except Cutters	Máquinas conversoras excepto cortadoras	Machine de conversion sauf couteaux
2,0	Couch	Prensa manchón	Coucheuse
2,0	Cutters	Cortadoras	Couteaux
2,0	Cylinders	Cilindros	Cylindres
2,0	Dryers & Coolers	Secadoras y enfriadoras	Sécheurs & refroidisseurs
1,5	Felt Stretcher	Tensor de fieltro	Rouleaux presseurs
2,0	Felt Whipper	Dedos de arrastre de fieltro	Rouleaux entraîneurs
2,5	Log Haul	Transportador de troncos	Traîne grume
2,5	Presses	Prensas	Presses
2,0	Reel	Carrete	Dévidoir
2,5	Suction Roll	Rodillo de succión	Rouleaux aspirants
2,0	Washers and Thickeners	Arandelas y espesadoras	Laveurs et épaississeurs
2,0	Winders	Enrolladoras	Enrouleur
1,5	**PRINTING PRESSES**	**PRENSAS DE IMPRESIÓN**	**IMPRIMERIE**
2,0	**BARGE HAUL**	**REMOLQUE DE BARCAZAS**	**REMORQUEURS**
	PUMPS	**BOMBAS**	**POMPES**
	Centrifugal	Centrífugas	Centrifuges
1,0	General Duty (Liquid)	Para uso general (líquidos)	Usage général (Liquide)
*	Boiler Feed	Alimentación de calderas	Alimentaires
1,5	Slurry (Sewage etc.)	Fangos (alcantarillado, etc.)	Relevage d'eaux usées
2,0	Dredge	Drenaje	Drague
	Reciprocating	Aspirante e impelente	A pistons
*	Double Acting	De doble acción	Double effet
	Single Acting	De acción única	Simple effet
*	1 or 2 Cylinders	1 o 2 cilindros	1 ou 2 cylindres
*	3 or more Cylinders	3 o más cilindros	3 cylindres ou plus
1,5	Rotary - Gear, Lobe, Vane	Giratorias: mediante engranajes, lóbulos, paletas	A engrenage, à lobes, à pales
	RUBBER INDUSTRY	**INDUSTRIA DEL CAUCHO**	**INDUSTRIE DU CAOUTCHOUC**
3,0	Mixer - Banbury	Mezcladora - Banbury	Malaxeur
2,5	Rubber Calendar	Calandria de caucho	Calandre
2,5	Rubber Mill (2 or more)	Laminadora de caucho (2 o más)	Laminoirs
2,0	Sheeter	Resmadora	Massicot
2,5	Tire Building Machines	Máquinas para fabricación de neumáticos	Machines pour fabrications des pneumatiques
1,0	Tire & Tube Press Openers	Abridoras de prensa de neumáticos y cámaras	Ouverture des presses à pneumatiques
2,0	Strainers	Depuradoras	Raidisseurs
	SCREENS	**PANTALLAS**	**CRIBLES**
1,0	Air Washing	Lavado de aire	Filtre à air
1,5	Rotary - Stone or Gravel	Giratorias - piedra o gravilla	Rotatif - Pierres ou graviers
1,5	Traveling Water intake	Admisión de agua en movimiento	A circulation d'eau
2,5	Vibratory	Vibratoria	Vibreur
1,5	**SEWAGE DISPOSAL EQUIPMENT**	**EQUIPO DE DEPURACIÓN DE AGUAS RESIDUALES**	**EQUIPEMENT DE TRAITEMENT DES EAUX**
1,5	**SEWAGE TREATMENT PUMPS**	**BOMBAS DE TRATAMIENTO DE AGUAS RESIDUALES**	**POMPES DE TRAITEMENT DES EAUX**
	TEXTILE INDUSTRY	**INDUSTRIA TEXTIL**	**INDUSTRIE TEXTILE**
2,0	Calenders	Calandrias	Calandres
2,0	Card Machines	Máquinas de tarjetas	Cardeuses
2,0	Cloth - Finishing Machines (washers, pads, tenters, dryers, calenders, etc.)	Tela - Máquinas acabadoras (lavadoras, fulards, tensadoras, secadoras, calandrias, etc.)	Machines de finition de l'habillement (Machines à laver, sécheurs, calandres, etc.)
2,0	Dry Cans	Tambores secadores	Machines à cannettes
1,5	Dryers	Secadoras	Sécheurs
1,0	Dyeing Machinery	Teñidoras	Machines à teinter
2,0	Looms	Telares	Métier à tisser
1,5	Mangles	Calandradoras	Essoreuses à rouleaux
1,5	Nappers	Perchadoras	Molletoneuses
1,5	Soapers	Enjabonadoras	Savonneurs
2,0	Spinners	Hiladoras	Fileurs
2,0	Tenter - Frames	Rama tensadora - Marcos	Machine à mèches
2,0	Winders (other than Batchers)	Devanadoras (excepto enrolladoras-desenrolladoras)	Bobineuses
2,0	**WINDLASS**	**MOLINETE**	**TREUILS ET GUINDEAUX**
1,5	**WOODWORKING MACHINERY**	**MAQUINARIA PARA TRANSFORMACIÓN DE LA MADERA**	**MACHINE A BOIS**
	Note:	**Nota:**	**Nota :**
*	Consult supplier	Consulte con su proveedor	Consulter le fournisseur

Ambiant Temperature Temperatura ambiente Temperature Ambiante	Service Factor S_t* Factor de servicio S_t* Facteur de Service S_t*
50°< T° 66°	0,25
66°< T° 74°	0,5
74°< T° 82°	0,75
82°< T° 93°	1

* For relative humidity < 50%
for humidity relative > 50% consult us

In general, the Viva service factor adjustment for high temperature is in addition to the service factor considération for the driver and driven equipment.However, if high temperatures are typical for a specific application, maximum temperature consideration is incorporated into the "typical" service factor (e.g steel mill tables conveyors).

* Para una humedad relativa < 50 %
para una humedad relativa > 50 % consúltenos

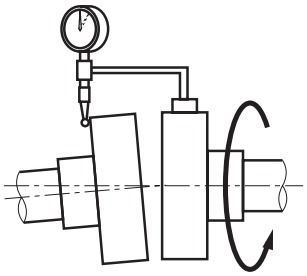
En general, el ajuste del factor de servicio Viva para altas temperaturas se añade a la consideración del factor de servicio para el equipamiento impulsado e impulsor. Sin embargo, si son típicas las temperaturas altas para una aplicación específica, la consideración de la temperatura máxima se incorpora en el factor de servicio "típico" (por ejemplo, mesas transportadoras en acerías).

* Pour humidité relative < 50%
au delà nous consulter

Cependant, si les temperatures sont typiques pour une application spécifique, la notion de temperature maximum est incorporée dans le facteur de service typique (par exemple convoyeurs de sidérurgie)

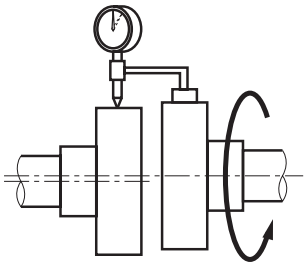
Alignment

Alignment significantly impacts the life cycle of transmission components. Shaft misalignment produces stress on the couplings and the engine and reduction gear box bearings and shafts, leading to damage. Moreover, the higher the rotational speed, the more stringent the alignment accuracy requirement.
In general, radial, angular, and in certain cases, axial misalignments occur simultaneously. For misalignments not to induce an unacceptable aggravated fault, alignment adjustment shall not be made based on the values given in the catalogue or technical manuals.



Angular Alignment
Use a sturdy means to attach a dial indicator to a shaft or hub and read off the opposite hub's flange as shown below.

With the indicator set to zero, check the shaft alignment by rotating the shaft and recording the maximum and minimum reading on the dial indicator. This values' difference should not exceed the published value (b-a) for each type of coupling.



Radial Alignment
Use a sturdy means to attach a dial indicator to a shaft or hub and read off the opposite hub's external referenced diameter as shown below.

With the indicator set to zero, check the shaft alignment by rotating the shaft and recording the maximum and minimum reading on the dial indicator. This values' difference should not exceed the published value Δr for each type of coupling.

Alineación

La alineación influye de manera significativa en el ciclo vital de los componentes de la transmisión. Una mala alineación de los árboles produce esfuerzos sobre los acoplamientos, el motor, y los rodamientos y árboles de la caja de cambios, lo cual se traduce en daños. Además, cuanto más alta sea la velocidad de giro, más estricta es la necesidad de precisión de la alineación.
En general, las malas alineaciones radiales, angulares y, en ciertos casos, axiales, se presentan a la vez. Para que la falta de alineación no provoque un fallo acumulado inaceptable, el ajuste de la alineación no deberá realizarse basándose en los valores máximos proporcionados en el catálogo o en los manuales técnicos.

Alineación angular
Utilice un medio resistente para unir un reloj comparador a un árbol o cubo,y lea en el reborde del núcleo opuesto, según se muestra en la figura.

Con el indicador en cero, compruebe la alineación de los árboles girando el árbol y anotando las lecturas máxima y mínima mostradas por el reloj comparador. La diferencia entre estos valores no debería superar el valor publicado (b-a) para cada tipo de acoplamiento.

Alineación radial
Utilice un medio resistente para unir un reloj comparador a un árbol o cubo, y lea el perímetro exterior, referenciado, del núcleo opuesto según se muestra en el esquema.
Con el indicador a cero, compruebe la alineación de los árboles girando el eje, y anotando las lecturas máxima y mínima en el reloj comparador. La diferencia entre estos valores no debería exceder el valor publicado Δr para cada tipo de acoplamiento.

Alignement

L'alignement joue un rôle prépondérant sur la durée de vie des éléments d'une transmission. Un mauvais alignement des arbres, produit un effort sur les accouplements et les roulements des arbres du moteur et du réducteur provoquant leur détérioration. De plus, l'accélération des vitesses de rotation augmente la précision nécessaire de l'alignement.
En général, les défauts d'alignements radiaux, angulaires et dans certains cas, axiaux surviennent simultanément. Afin que ceux-ci n'induisent pas un défaut total non acceptable, le réglage de l'alignement ne devra pas afficher les valeurs maximales données dans le catalogue ou les notices techniques.

Alignement Angulaire
Pour compenser un défaut d'alignement angulaire, fixer un comparateur solidement sur l'un des plateaux ou moyeux de sorte de le point de mesure soit effectué sur l'une des faces de l'autre plateaux ou moyeu.

Le comparateur réglé à zéro, faire tourner l'arbre supportant le comparateur et relever les valeurs minimale et maximale affichées. Dans un premier temps, la différence de ces valeurs ne doit pas excéder la valeur (b-a) indiquée pour chaque type d'accouplement.

Alignement Radial
Pour compenser un défaut d'alignement radial, fixer un comparateur solidement sur l'un des plateaux ou moyeux de sorte de le point de mesure soit effectué sur la circonférence de l'autre plateaux ou moyeu.

Le comparateur réglé à zéro, faire tourner l'arbre supportant le comparateur et relever les valeurs minimale et maximale affichées. Dans un premier temps, la différence de ces valeurs ne doit pas excéder la valeur Δr indiquée pour chaque type d'accouplement.

Alignment

Record each misalignment value, calculate the ratio of this value by the maximum indicated value. The sum of these ratios shall not exceed 1:

$$dr/\Delta r + d\alpha/\Delta\alpha \quad 1$$

where:
- dr = recorded radial misalignment value
- Δr = max. radial misalignment value
- $d\alpha$ = recorded angular misalignment value
- $\Delta\alpha$ = max. angular misalignment value

Correct alignment if this sum is greater than 1.

Alineación

Anote cada valor de falta de alineación y calcule la razón de este valor respecto al valor máximo indicado. La suma de estas razones no debería superar 1:

donde:
- dr = valor registrado de mala alineación radial
- Δr = máx. valor de mala alineación radial.
- $d\alpha$ = valor registrado de mala alineación angular
- $\Delta\alpha$ = máx. valor de mala alineación angular

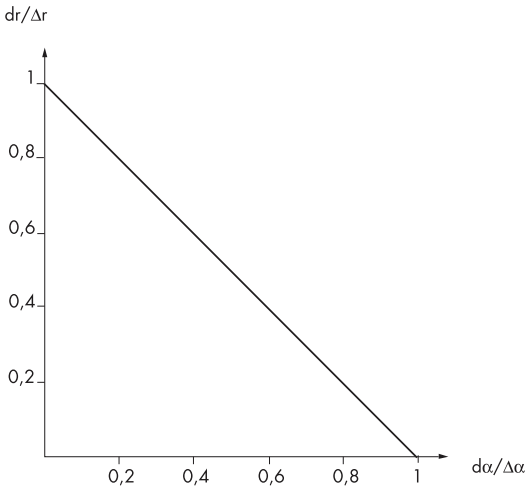
Rehaga la alineación si esta suma es superior a 1.

Alignement

Relever chaque valeur de désalignement, faire le rapport de cette valeur par la valeur maximum indiquée. La somme de ces rapports ne doit excéder 1, c'est à dire :

où :
- dr = valeur de désalignement radial relevée
- Δr = valeur de désalignement radial max.
- $d\alpha$ = valeur de désalignement angulaire relevée
- $\Delta\alpha$ = valeur de désalignement angulaire max.

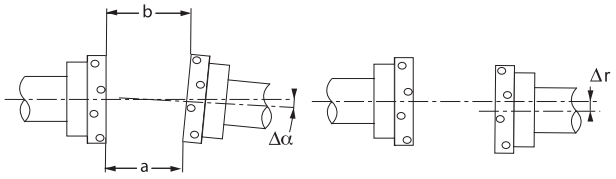
Affiner l'alignement si cette somme est supérieure à 1.



Size Tamaño Taille	110	125	130	150	170	190	215	245	290	365	425	460
(b - a) mm	4,2	4,9	5,5	6,1	6,6	6,1	7,3	8,9	11,2	8,2	9,9	9,4
³ r mm	1,6	1,6	1,6	1,6	1,6	2,4	2,4	2,4	2,4	3,2	3,2	3,2

V110 - V170

V190 - V290



Installation

1 - Install and secure both hubs to the shaft using a half element using the capscrew hole pattern that best accomodates the shaft gap requirements.

2 - Rotate the shaft 180° and install the other half element side to side if the shaft cannot be rotated

3 - Check the capscrews for proper installation torque and you are done. Element replacement does not require moving the hubs or connected equipment.

Instalación

1 - Instale y fije bien ambos núcleos a los árboles utilizando una mitad, siguiendo el modelo de orificios para tornillos que mejor, se ajuste a los requisitos de distancia entre árboles.

2 - Rote el árbol 180° e instale la otra mitad restante al lado de la otra si el eje no puede rotar.

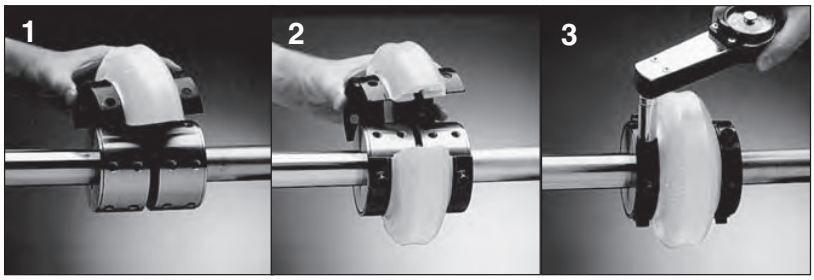
3 - Compruebe que los tornillos están apretados hasta el par de apriete necesario y eso es todo. El recambio de los elementos no necesita mover los núcleos ni el equipo conectado.

Montage

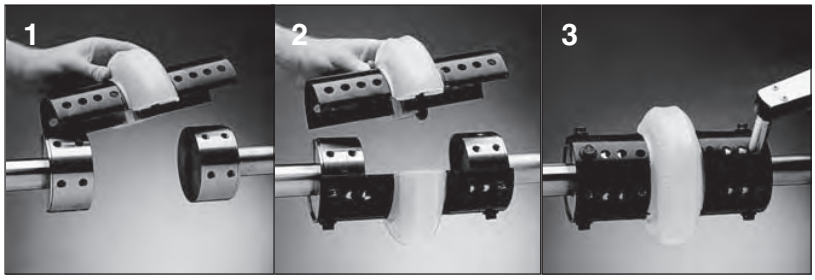
1 - Installer et bien fixer les deux moyeux sur l'arbre en utilisant un demi-elément élastique comme patron pour l'espace entre moyeux. Positionner le démi-élément du dessus en utilisant les trous des vis qui s'accomodent au mieux des conditions requises d'espace entre bout d'arbres

2 - Tourner l'arbre à 180° et installer l'autre demi-élément. Monter les demi-éléments côte à côte si l'arbre ne peut être tourné.

3 - Vérifier le couple de serrage des vis et c'est tout.
Le remplacement des éléments ne nécessite pas de déplacer les moyeux et/ou réaligner l'équipement connecté.



Rex Viva Close-Coupled Couplings - Acoplamientos Rex Viva estándar - Accouplement Rex Viva Standard



Rex Viva Spacer Couplings - Acoplamientos Rex Viva largos - Accouplement Rex Viva Version longue

See installation and maintenance instructions for additional information.

Consulte las instrucciones de instalación y mantenimiento para más información.

Voir la notice d'installation et de maintenance pour de plus amples informations.

Features and Benefits

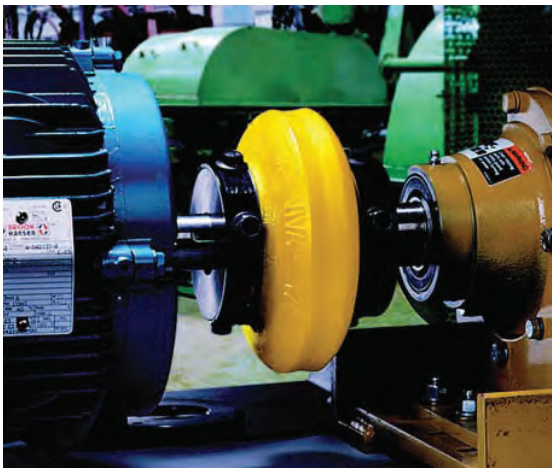
The new Rex Viva Coupling is a unique general purpose coupling ideal for use in industrial applications such as pumps, compressors, blowers, mixers and many other drive applications.

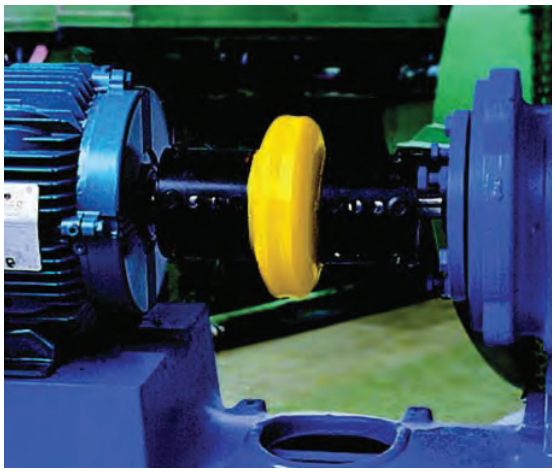
Características y beneficios

El nuevo acoplamiento Rex Viva es un acoplamiento exclusivo de uso general ideal para ser utilizado en aplicaciones industriales como bombas, compresores, soplantes, mezcladoras y muchas otras aplicaciones impulsoras.

Caractéristiques et avantages

Le nouvel accouplement Rex Viva est un accouplement à usage général idéal pour l'utilisation dans les applications industrielles comme les pompes, compresseurs, ventilateurs, mélangeurs et beaucoup d'autres





Feature	Benefit
• Split-in-half flex element design	• Easy replacement without moving the hubs or connected equipment.
• Radial bolting	• Capscrews are easily accessible in tight spaces.
• Special formulated polyurethane flex element	• Optimal tensile strength and fatigue resistance. • Excellent chemical and environmental aging resistance.
• Torsionally Soft	• No lubrication required. • Protects equipment by cushioning shock loads and dampening torsional vibration.
• High misalignment capacity	• Accommodates unavoidable misalignment with low reactionary forces.
• Visual inspection	• No need for coupling disassembly to inspect.
• Interchangeable hubs	• Close-coupled and spacer coupling hubs are identical allowing reduced inventories.

Característica	Beneficio
• Diseño del elemento flexible dividido en dos	• Fácil recambio sin mover los núcleos ni el equipamiento conectado.
• Pernos radiales	• Puede accederse fácilmente a los tornillos en espacios reducidos.
• Elemento flexible de poliuretano especialmente formulado	• Óptima resistencia a la tracción y a la fatiga. • Excelente resistencia al envejecimiento por factores químicos y ambientales.
• Flexible a la torsión	• No se necesita lubricación alguna. • Protege el equipo absorviendo las cargas de choque y la vibración de torsión.
• Alta capacidad de compensación de alineaciones	• Admite una mala alineación de cracter inevitable, con unas fuerzas de reacción bajas en los rodamientos de los árboles.
• Inspección visual	• No se necesita desmontar los acoplamientos para revisarlos.
• Núcleos intercambiables	• Los núcleos o cubos de los acoplamientos estándar y largos son idénticos, lo cual reduce el inventario.

Caractéristiques	Avantages
• Elément flexible en deux parties symétriques	• Remplacement facile sans déplacement des moyeux ou des équipements connectés.
• Montage radial des vis	• Les vis sont facilement accessibles dans les espaces réduits.
• Elément flexible en polyuréthanne formulé spécialement	• Résistance optimale à la traction et à la fatigue. • Excellente résistance chimique et au vieillissement.
• Souple en torsion	• Pas de lubrification. • Protège les équipements en absorbant les chocs et en amortissant les vibrations de torsion.
• Grande acceptation des défauts d'alignement	• S'accommode des inévitables défauts d'alignement avec des faibles forces de réaction.
• Inspection visuelle	• Démontage de l'accouplement non nécessaire pour l'inspection.
• Moyeux interchangeables	• Les moyeux pour accouplement version standard et version longue sont identiques, permettant ainsi des stocks réduits.

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4044ENESFR / 12.2006

Viva® Coupling Installation Instructions

Rex Viva

The designation **ATEX** (**At**mosphere **Ex**plosibles) has been established in the 15 member states of the European Union in addition to Czech Republic, Norway and Sweden for equipment which may be used in potentially explosive atmospheres. Viva couplings meet ATEX II 2 GD c T5.

Model number_____ Category_____

Mfg year_____ Maximum temperature_____

WARNING

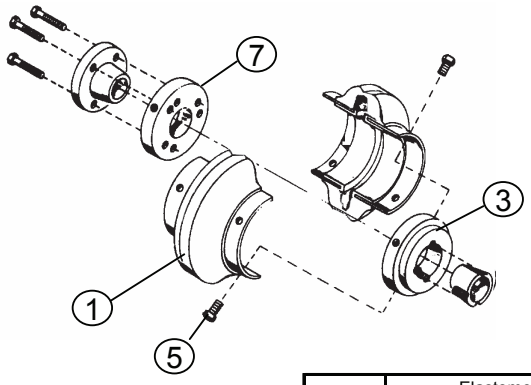
- All rotating power transmission products are potentially dangerous and can cause serious injury. They must be guarded in compliance with OSHA, ANSI and local standards for the applications they are used. It is the responsibility of the user to provide proper guarding.
- Failure to secure capscrews properly could cause coupling to dislodge during operation and result in personal injury. See table 4.2 for proper tightening torques.
- Do not use on turbine drives if the coupling cannot be protected from steam leakage or overspeed situations.
- Before installing this coupling on systems involving sleeve bearings, herringbone gearsets or other axially sensitive devices, consult Rexnord.

1.0 Installation Procedure

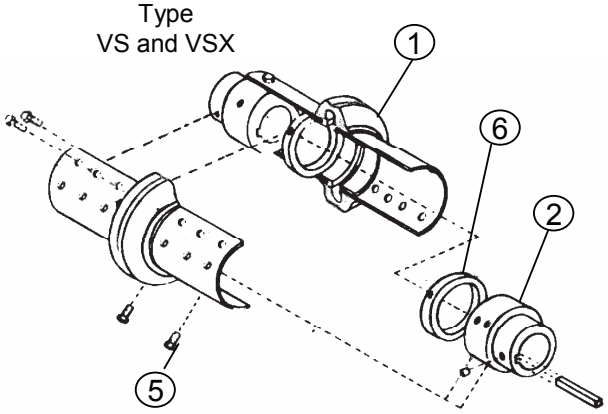
- Install the coupling per the installation instructions, pay particular attention to capscrew installation torques.
- Align the equipment considering angular, parallel and axial misalignment ratings of the coupling.
- An expanded metal coupling guard is recommended for ventilation with a minimum of 25 mm clearance for the coupling.

2.0 Rex Viva Coupling Design and Part Numbers

Type V



Type
VS and VSX



Note: hubs are interchangeable with standard or spacer flex elements

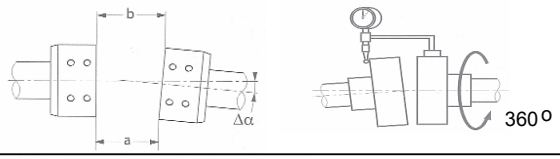
Viva coupling size	Elastomer Element			Hubs			Element Capscrews (5)	High speed rings (6)
	Type V (1)	Type VS (1)	Type VSX (1)	Rough Bore Steel (2)	Taper Bush hubs (3)*	QD hubs (7)*		
110	7392646	7392702	7392702X	7392746	7392770	7392766	7393097	7393046
125	7392650	7392706	7392706X	7392774	7392799	7392795	7393097	7393049
130	7392654	7392710	7392710X	7392803	7392829	7392825	7393097	7393052
150	7392656	7392712	7392712X	7392833	7392858	7392854	7393101	7393055
170	7392658	7392714	7392714X	7392833	7392858	7392854	7393101	7393055
190	7392662	7392718	7392718X	7392862	7392886	7392882	7393101	7393058
215	7392666	7392722	7392722X	7392890	7392914	7392910	7393105	7393061
245	7392670	7392726	7392726X	7392918	7392935	7392931	7393105	7393064
290	7392674	7392730	7392730X	7392939	7392956	7392952	7393109	7393067
365	7392678	7392734	7392734X	7392960	7392969	7392964	7393120	7393070
425	7392682	7392738	7392738X	7392972	7392981	7392976	7393120	7393073
460	7392686	7392742	7392742X	7392984	7392993	7392988	7393120	7393076

*Bushings are not included

Note: Stop the motor and lock it out to prevent start-up during installation of coupling.

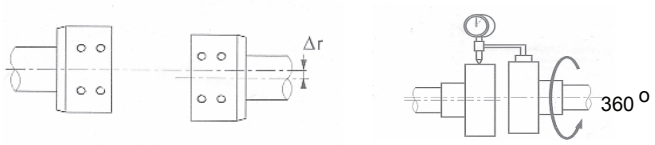
3.0 Drive alignment

Step 1.



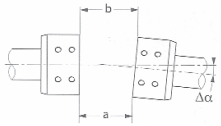
b (max)_____mm
a (min)_____mm
b-a (diff)_____mm

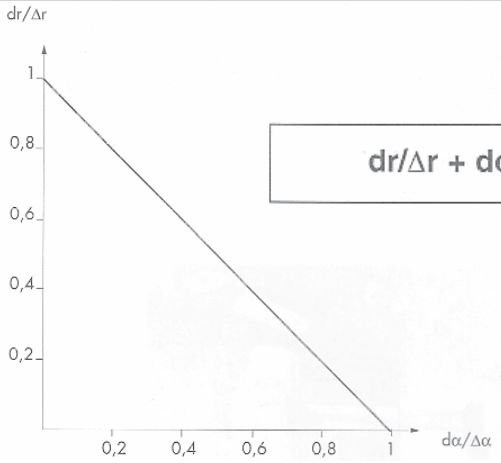
Step 2.



Δr _____mm

Step 3.





	110	125	130	150	170	190	215	245	290	365	425	460
(b - a) mm	4,2	4,9	5,5	6,1	6,6	6,1	7,3	8,9	11,2	8,2	9,9	9,4
Δ r mm	1,6	1,6	1,6	1,6	1,6	2,4	2,4	2,4	2,4	3,2	3,2	3,2

4.0 Rex Viva Coupling Installation

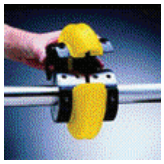
Type **V**

Step 1.

- Clean dirt and burrs from shafts and hub bores.
- Be sure the keys fit shafts properly.
- Position both hubs on the shaft without tightening the setscrews.
- Use a half element to set proper hub spacing.
- When the hubs are properly spaced, tighten the setscrews.
- When using tapered bushings, follow bushing manufacturers instructions.

Type **VS** and **VSX**

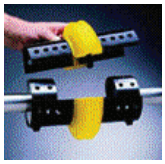
Type **V**



Step 2.

- Mount first half element to the hubs using capscrews provided.
- Rotate the shaft 180 degrees and secure second half element.
- If shaft cannot be rotated, mount half elements at 90 degrees.

Type **VS** and **VSX**



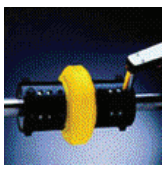
Type **V**

Step 3.

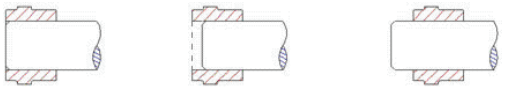
- Tighten all capscrews to the torques specified in section 4.2.
- Align equipment.
- Install proper guarding prior to equipment start up.

Note: When installing the element, first seat all the capscrews with a light torque, then tighten all capscrews to the proper torque using a torque wrench.

Type **VS** and **VSX**



4.1 Rex Viva hub mounting options



Hubs can be installed:
- •flush with the shaft end (D)
- •extended beyond the end of the shaft (E)
- •recessed behind the shaft end (F)

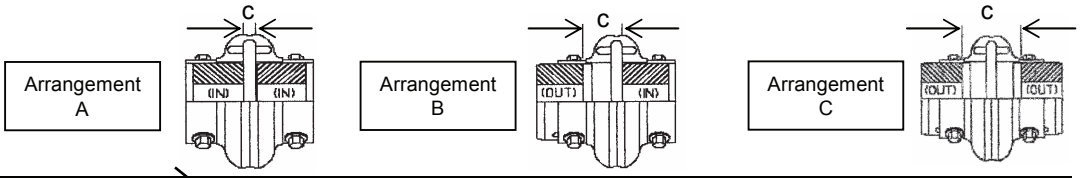
Note: Shaft engagement length should be > 0,8 times shaft diameter, bushed hubs must engage 100%.

4.2 Capscrew Torque

- •Do not lubricate capscrew threads.
- •Capscrews must to have a thread-locking adhesive applied.

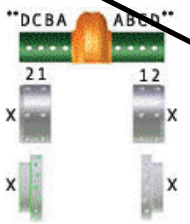
Viva Size	Part Number	Bolt Size	Wrench size (mm)	Torque Nm	Torque Ft Lbs	Torque In. Lbs
110	7393097	M8	13	27	20	240
125	7393097	M8	13	27	20	240
130	7393097	M8	13	27	20	240
150	7393101	M10	13	53	39	468
170	7393101	M10	13	53	39	468
190	7393101	M10	13	53	39	468
215	7393105	M10	13	53	39	468
245	7393105	M10	13	53	39	468
290	7393109	M12	15	92	68	816
365	7393120	M14	19	141	105	1401
425	7393120	M14	19	141	105	1401
460	7393120	M14	19	141	105	1401

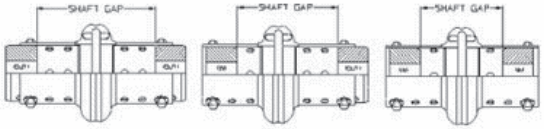
4.3 Rex Viva "Type V" Mounting options



Hub arrangement	COUPLING SIZE 110	125	130	150	170	190	215	245	290	365	425	460
	Dimension C (mm)											
A	9	9	7	9	9	7	11	7	8	20	19	19
B	32	32	31	35	35	34	38	40	51	76	76	76
C	55	55	55	60	60	60	64	73	94	131	133	132

4.4 Rex Viva "Type VS and VSX" Mounting options





Viva size	Mounting options for Industry standard shaft gaps — ISO (mm) 100	140	180	250	300	ANSI 3,5	5	7	9,5	11,75
110	C2-B1	C1-C1	C1-C1			B1-B1	C2-C1	C1-C1		
125	B1-B1	C1-C2*	C1-C1			B1-B2	C2-C2*	C1-C1		
130	C2-C2	C1-C1	C1-C1			B1-B1	C2*-C2*	C1-C1		
150	B1-B1	C1-C1	D1-D1	C1-C1		B1*-D1*	D1*-D1*	D1-D2*	C1-C1	
170	B1-B1	C1-C1	D1-D1	C1-C1		B1*-D1*	D1*-D1*	D1-D2*	C1-C1	
190	B1-B1	C1-C1	D1-D1	C1-C1		C1*-C1*	D1*-D1*	D1-D1	C1-C1	
215	B1-B1	C1-C1	D1-D1	C1-C1		C1*-C1*	D1*-D1*	D1-D1	C1-C1	
245	B1-B2	D1-C1*	D2-D1	C1-C1		B1*-D1*	B2-C1	D1-C1	C2-C2	
290	B2*-B2*	B2*-B1	C1-B2*	C1-C1	C1-C1	B1*-B2*	C2*-B1*	B2-B1	C1-C2	C1-C1
365		C1*-C1*	B1-B1	C1-C1	D1-D1		B1-B1*	B1-B1	C1-C1	D1-D1
425		C2*-C2*	B1-B1	C1-C1	D1-D1		B1-B2*	B1-B1	C1-C1	D1-D1
460		C2*-C2*	B1-B1	C1-C1	D1-D1		B1-B2*	B1-B1	C1-C1	D1-D1

VSX couplings

* hub mounted inboard

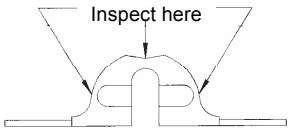
5.0 Preventative Maintenance

Periodic visual inspection is necessary to evaluate the condition of the flex element. Inspection can be done during the operation using a strobe light.

When inspecting the element look for:

- Fatigue cracks at element splits
- Discoloration
- Surface cracking in body of element.

Replace Element if necessary. Expected element life is 6-8 years from date of manufacture. Elements are included with manufacturing date code.



5.1 Element Replacement

⚠ **Note:** Stop the motor and lock it out to prevent start-up during installation of coupling.

- Always replace both half elements.
- Install both half elements from the same box.
- Follow installation instructions (see section 4.0).
- Tighten element capscrews to proper torque (see section 4.2).

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http://www.rexnord.eu

4. BALDOR-RELIANCE MOTOR

4. BALDOR-RELIANCE MOTOR

BALDOR • RELIANCE

Product Information Packet

WEIR SPECIALTY PUMPS

CECP2276T

7.5HP,1180RPM,3PH,60HZ,254TC,0954M,TEFC

Part Detail

Revision:	Q	**Status:**	PRD/A	**Change #:**		**Proprietary:**	No
Type:	AC	**Elec. Spec:**	09WGX827	**CD Diagram:**	CD0005	**Mfg Plant:**	
Mech. Spec:	09H180	**Layout:**	09LYH180	**Poles:**	06	**Created Date:**	11-14-2013
Base:	RG	**Eff. Date:**	07-06-2017	**Leads:**	9#12		

Specs

Catalog Number:	CECP2276T	**Heater Indicator:**	No Heater
Enclosure:	TEFC	**Insulation Class:**	F
Frame:	254TC	**Inverter Code:**	Inverter Duty
Frame Material:	Iron	**KVA Code:**	J
Output @ Frequency:	7.500 HP @ 60 HZ	**Lifting Lugs:**	Standard Lifting Lugs
Synchronous Speed @ Frequency:	1200 RPM @ 60 HZ	**Locked Bearing Indicator:**	Locked Bearing
Voltage @ Frequency:	460.0 V @ 60 HZ	**Motor Lead Quantity/Wire Size:**	9 @ 12 AWG
	230.0 V @ 60 HZ	**Motor Lead Exit:**	Ko Box
XP Class and Group:	None	**Motor Lead Termination:**	Flying Leads
XP Division:	Division II	**Motor Type:**	0954M
Agency Approvals:	UR	**Mounting Arrangement:**	F1
	CSA EEV	**Power Factor:**	71
	CSA	**Product Family:**	Super-E Chemical Processing
Auxillary Box:	No Auxillary Box	**Pulley End Bearing Type:**	Ball
Auxillary Box Lead Termination:	None	**Pulley Face Code:**	C-Face
Base Indicator:	Rigid	**Pulley Shaft Indicator:**	Standard
Bearing Grease Type:	Polyrex EM (-20F +300F)	**Rodent Screen:**	None
Blower:	None	**Shaft Extension Location:**	Pulley End

Constant Torque Speed Range:	1.0
Current @ Voltage:	10.700 A @ 460.0 V
	21.400 A @ 230.0 V
	25.000 A @ 208.0 V
Design Code:	A
Drip Cover:	No Drip Cover
Duty Rating:	CONT
Electrically Isolated Bearing:	Not Electrically Isolated
Feedback Device:	NO FEEDBACK
Front Face Code:	Standard
Front Shaft Indicator:	None

Shaft Ground Indicator:	No Shaft Grounding
Shaft Rotation:	Reversible
Shaft Slinger Indicator:	Shaft Slinger
Speed Code:	Single Speed
Motor Standards:	NEMA
Starting Method:	Direct on line
Thermal Device - Bearing:	None
Thermal Device - Winding:	None
Vibration Sensor Indicator:	No Vibration Sensor
Winding Thermal 1:	None
Winding Thermal 2:	None
XP Temp Code:	T3C

Nameplate NP3241

CAT.NO.	CECP2276T	**P/N**		**ENCLOSURE**	TEFC				
SPEC.	09H180X827	**CC**	010A	**FRAME**	254TC	**S/N**			
HP	7.5	**CLASS**	F	**HZ**	60	**DES**	A		
RPM	1180	**RPM MAX**	1800	**PH**	3	**KVA-CODE**	J		
VOLT	230/460	**MOTOR WEIGHT**	305						
AMP	21.4/10.7	**SER.F.**	1.15	**PF**	71	**ODE BRG**	6309	**DE BRG**	6309
RATING	40C AMB-CONT	**NEMA-NOM-EFF**	91	**GREASE**	POLYREX EM				
				INV.TYPE	PWM				
TEMP CODE	T3C	**INVERTER-TEMP-CODE**	180						
TEMP =	160	**C HP FR**	60	**C HP TO**	90				
CT HZ FROM	1.0	**CT HZ TO**	60						
HTR-VOLTS		**HTR-AMPS**		**HTR-WATTS**		**MAX. SPACE HEATER TEMP.**		**VT HZ FROM**	O	**VT HZ TO**	60

Parts List

Part Number	Description	Quantity
SA272285	SA 09H180X827	1.000 EA
RA258895	RA 09H180X827	1.000 EA
09FN3001D01SP	EXTERNAL FAN, PLASTIC	1.000 EA
09CB1002A12P	KOBX W/1.25 NPT LEAD HOLE & 2.38 MTG HOL	1.000 EA
09GS1010	GASKET, DWG, LEADWIRE SEPERATOR	1.000 EA
10XN2520K12	1/4-20 X.75 GRD 5	2.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	2.000 EA
WD1000B16	T&B CX70TN TERMINAL	1.000 EA
10XN2520K08	1/4-20 X .50 GRADE #5, STL, ZINC PLATE	1.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	1.000 EA
HA3400A39	STUD- 3/8-16 X 6.44 OAL HEX	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
HA4017A08	.125X3.50 GREASER EXTEN.	1.000 EA
HA4017A02	.125X2.50 GREASER EXTENS.F/S	1.000 EA
HW4019A01	PIPE COUPLING 1/8 NPT,STEEL,ZINC COATING	1.000 EA
HW5100A11	W3917-042 WVY WSHR (WB)	1.000 EA
10XN2520K36	1/4-20 X 2.25" HX HD SCRWGRADE 5, ZINC P	2.000 EA
09FH1000P	FAN COVER, CAST W/EPOXY PRIMER	1.000 EA
09EP1300A12P	ENDPLATE, MACH EPOXY PRIMER	1.000 EA
10XN3816K28	3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
10XN2520K36	1/4-20 X 2.25" HX HD SCRWGRADE 5, ZINC P	4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I	4.000 EA
XY3816A12	3/8-16 FINISHED NUT	4.000 EA

Parts List (continued)

Part Number	Description	Quantity
HW4600B44	V-RING SLINGER 1.500 X 1.810 X .28 VITON	1.000 EA
HA1005A26	SLINGER, OD 3.00, ID 1.75, 309 BRG	1.000 EA
12CB1503P	CONDUIT BOX LID, CAST W/EPOXY PRIMER	1.000 EA
12GS1002	GASKET, CONDUIT BOX LID, NEOP	1.000 EA
10XN3118K16	5/16-18 X 1' GRADE #5, STL, ZINC PLATE	2.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I	2.000 EA
HW2501G25	KEY, 3/8 SQ X 2.875	1.000 EA
MJ5001A27	32220KN GRAY SEALER *MIN BUY 4 QTS=1GAL	0.031 QT
MJ5001A14	DYNAPRO SEAL, CP MOTORS VC#2508050 (603	0.023 EA
LB1115N	LABEL,LIFTING DEVICE (ON ROLLS)	1.000 EA
09EP1118A05GP6	FREP MACH, 309 BRG. EPOXY PRIMER	1.000 EA
MN416A01	TAG-INSTAL-MAINT no wire (1100/bx) 11/14	1.000 EA
LB1002N	LABEL,MARINE DUTY (ON ROLLS)	1.000 EA
HW4500A17	317400 ALEMITE GREASE RELIEF	1.000 EA
HW4500A21	1618BALEMITE FITTING 825 UNIVERSAL	1.000 EA
HA4054	SHORT T-DRAIN FITTING, .125" N.P.T.	1.000 EA
HA4051A00	PLASTIC CAP FOR GREASE FITTING	1.000 EA
MJ1000A02	GREASE, POLYREX EM EXXON (USe 4824-15A)	0.080 LB
HW4500A03	GREASE FITTING, .125 NPT 1610(ALEMITE) 8	1.000 EA
HW4500A17	317400 ALEMITE GREASE RELIEF	1.000 EA
HA4054	SHORT T-DRAIN FITTING, .125" N.P.T.	1.000 EA
HA4051A00	PLASTIC CAP FOR GREASE FITTING	1.000 EA
HW2500A25	WOODRUFF KEY USA #1008 #BLOW CARBON STEE	1.000 EA
51XB1214A20	12-14X1.25 HXWSSLD SERTYB	1.000 EA

MG1025N19	WILKOFAST, 778.50, RELIANCE BLUE-GREEN	0.050 GA
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	4.000 EA
LC0005E02	SPL CONN.DIA./WARN.LABEL(LC0005/LB1119)	1.000 EA
NP3241	SS SUPER-E INV UL CSA-EEV PREM CC	1.000 EA
40PA1005	PACKAGING GROUP, 09 STD	1.000 EA
LB1449	DIV-2/NEC WARNING LABEL	1.000 EA

AC Induction Motor Performance Data

Record # 47260 - Typical performance - not guaranteed values

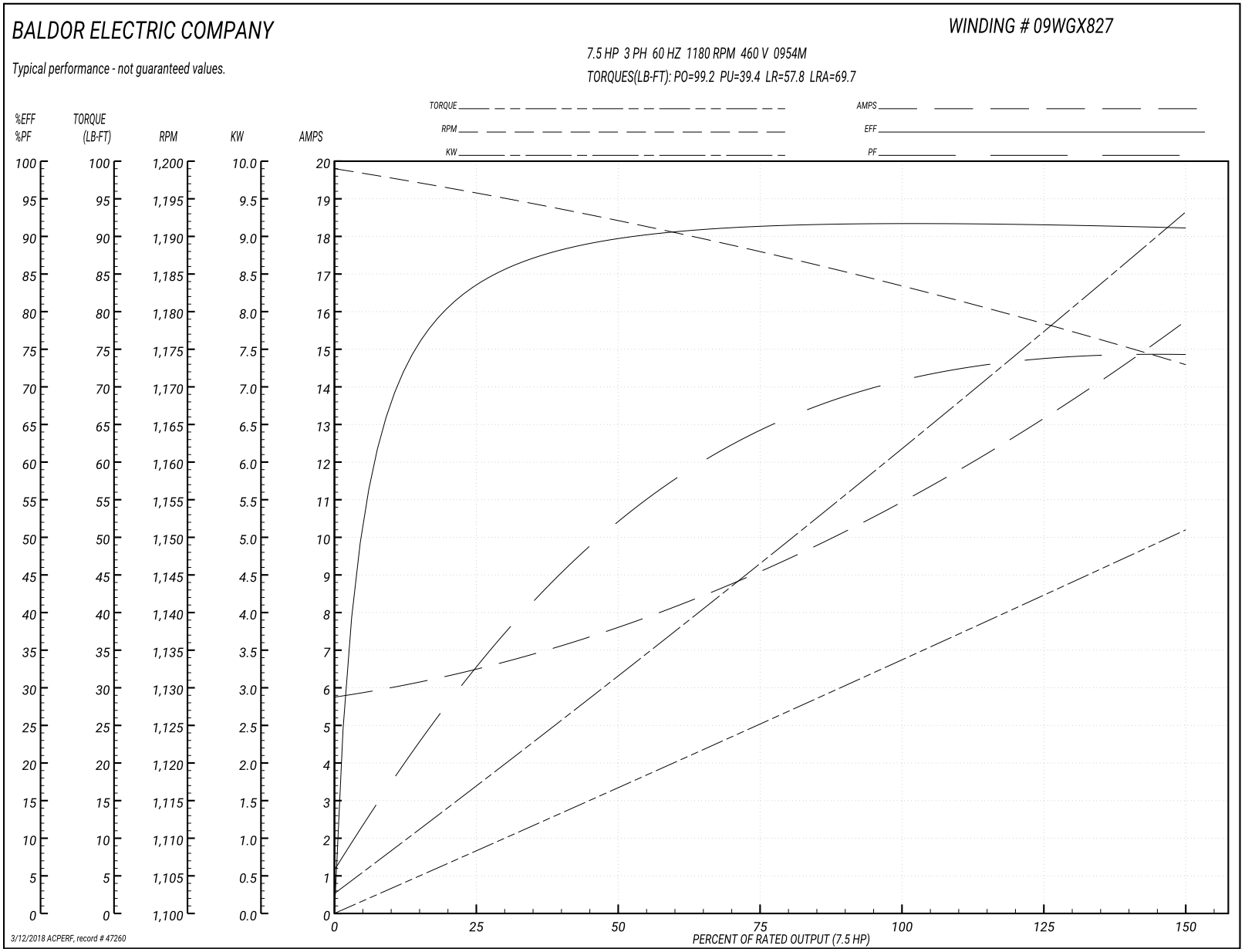
Winding: 09WGX827-R040	**Type:** 0954M	**Enclosure:** TEFC

Nameplate Data				460 V, 60 Hz: High Voltage Connection	
Rated Output (HP)	7.5			Full Load Torque	32.4 LB-FT
Volts	230/460			Start Configuration	direct on line
Full Load Amps	21.4/10.7			Breakdown Torque	99.2 LB-FT
R.P.M.	1180			Pull-up Torque	39.4 LB-FT
Hz	60	Phase	3	Locked-rotor Torque	57.8 LB-FT
NEMA Design Code	A	KVA Code	J	Starting Current	69.7 A
Service Factor (S.F.)	1.15			No-load Current	5.84 A
NEMA Nom. Eff.	91	Power Factor	71	Line-line Res. @ 25ºC	0.89 Ω
Rating - Duty	40C AMB-CONT			Temp. Rise @ Rated Load	31°C
S.F. Amps				Temp. Rise @ S.F. Load	36°C
				Rotor inertia	4.34 LB-FT2

Load Characteristics 460 V, 60 Hz, 7.5 HP

% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor	32	52	63	71	73	75	72
Efficiency	83	89.7	91.5	91.5	91.8	91.2	91.9
Speed	1196	1192	1189	1184	1179	1173	1181
Line amperes	6.34	7.49	8.87	10.7	12.9	15.7	12

Performance Graph at 460V, 60Hz, 7.5HP Typical performance - Not guaranteed values



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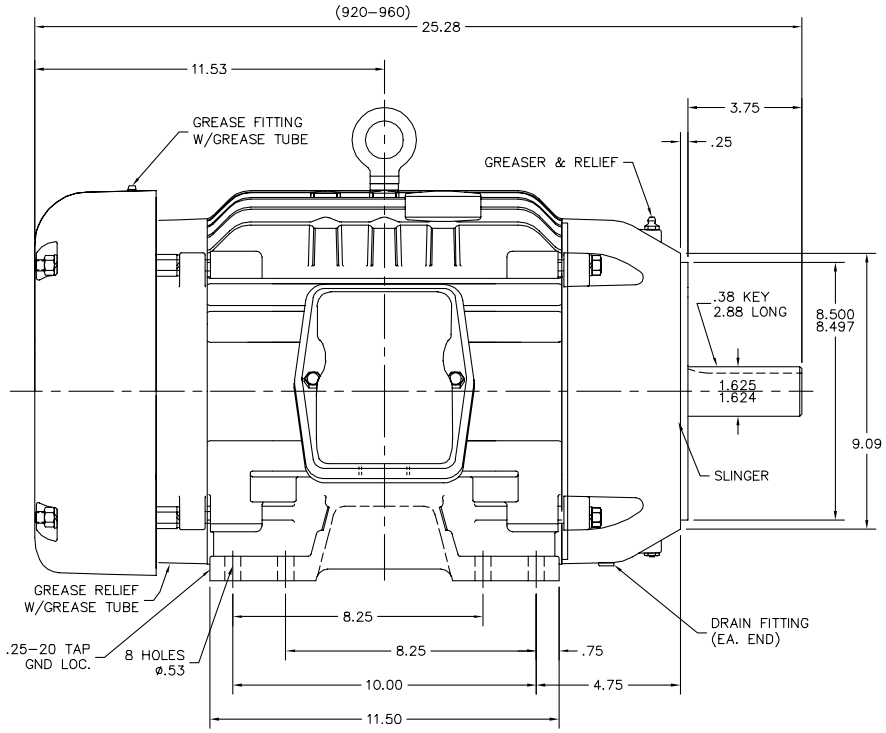

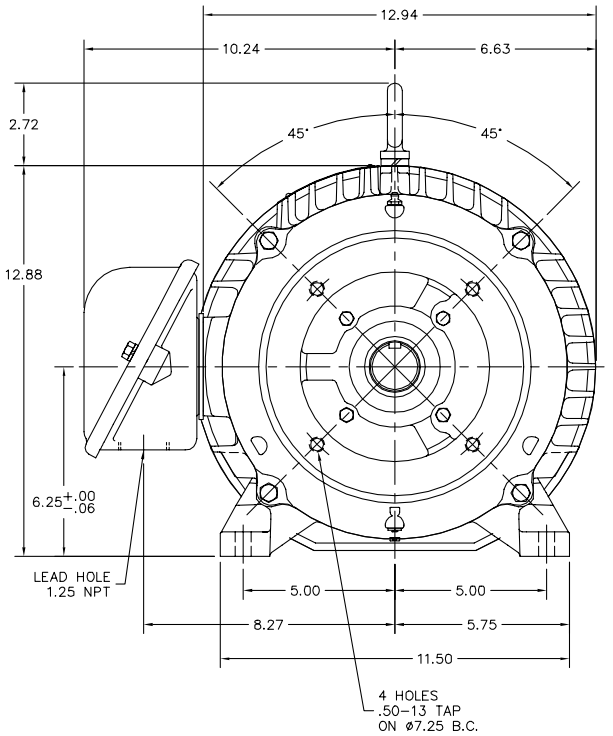

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CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

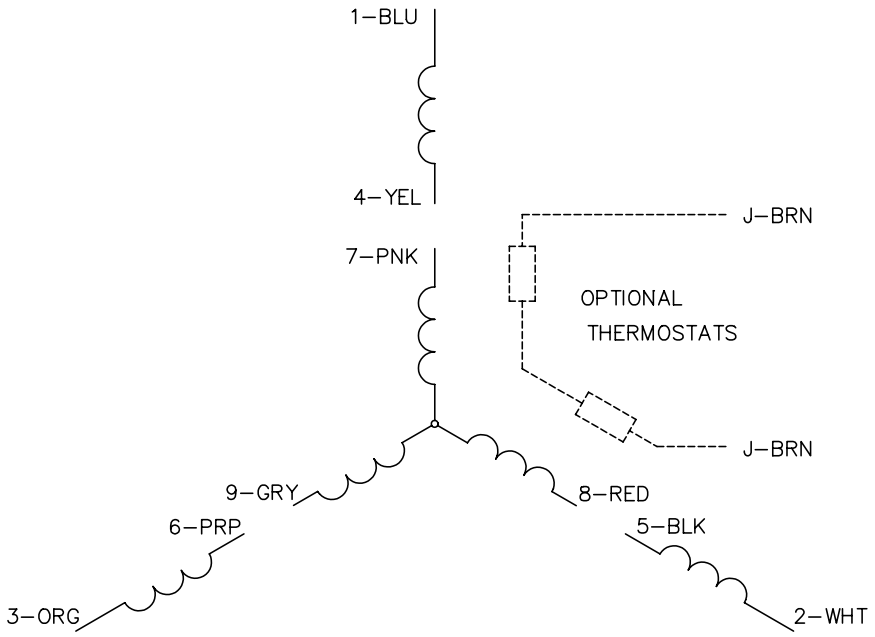
REV. DESC: REMOVE LOCKNUT & ADDED GND HOLE TAP SIZE		
REV. LTR: J	VERSION: 09	TDR: 000000955850
FILE: \AAA\00137\913	REVISED: 01:06:30 12/07/2015	BY: ENNIND0
MTL: –		

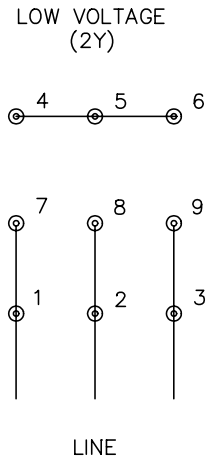
BALDOR

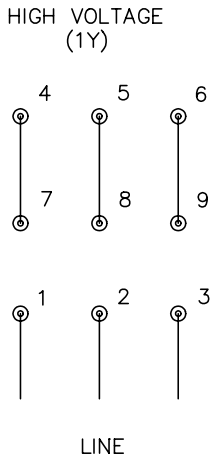
HORZ TEFC 254–6TC ECP W/309 BRGS

SH 1 of 1

CD0005







NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

CD0005

BALDOR • RELIANCE

Integral Horsepower
AC Induction Motors
ODP, WPI Enclosures
TENV, TEAO, TEFC Enclosure
Explosion Proof

8/12 Installation & Operating Manual MN408

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Important:
Be sure to check www.baldor.com to download the latest version of this manual in Adobe Acrobat PDF format.

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Section 1

General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements.
A Warning statement indicates a possible unsafe condition that can cause harm to personnel.
A Caution statement indicates a condition that can cause damage to equipment.

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- IEC 34–1 Electrical and IEC72–1 Mechanical specifications
- ANSI C51.5, the National Electrical Code (NEC) and local codes and practices.

Limited Warranty

www.baldor.com/support/warranty_standard.asp

Safety Notice: **This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment. Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.**

WARNING: **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**

WARNING: **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**

WARNING: **Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.**

WARNING: **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**

WARNING: **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**

WARNING: **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**

WARNING: **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**

WARNING: **UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.**

WARNING: **Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.**

WARNING: **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**

WARNING: **Pacemaker danger – Magnetic and electromagnetic fields in the vicinity of current carrying carrying conductors and permanent magnet motors can result result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay way from the area surrounding a permanent magnet motor.**

WARNING: **Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.**

Continued on next page.

Safety Notice Continued

WARNING: **Do not use non UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.**

WARNING: **Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.**

WARNING: **Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.**

Caution: **To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.**

Caution: **Do not over tension belts. Excess tension may damage the motor or driven equipment.**

Caution: **Do not over–lubricate motor as this may cause premature bearing failure.**

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.**

Caution: **If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20 ° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.**

Caution: **To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**

Caution: **If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.**

Caution: **The space heaters are designed to operate at or below the maximum surface temperature stated on the nameplate. If the marked ambient and/or voltage are exceeded this maximum surface temperature can be exceeded and can damage the motor windings. If applied in a division 2 or zone 2 environment this excessive temperature may cause ignition of hazardous materials.**

Caution: **Shaker Duty motors must be properly lubricated prior to Start Up to prevent damage. See Section 3.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.**

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WPII motor.
2. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
3. When lifting a WPII (Weather Proof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
4. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift the assembly using the motor lugs or eye bolts provided. Lugs or eye bolts are designed to lift motor only. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Storage

Storage requirements for motors and generators that will not be placed in service for at least six months from date of shipment.

Improper motor storage will result in seriously reduced reliability and failure. An electric motor that does not experience regular usage while being exposed to normally humid atmospheric conditions is likely to develop rust in the bearings or rust particles from surrounding surfaces may contaminate the bearings. The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.

A wooden crate "shell" should be constructed to secure the motor during storage. This is similar to an export box but the sides & top must be secured to the wooden base with lag bolts (not nailed as export boxes are) to allow opening and reclosing many times without damage to the "shell".

Minimum resistance of motor winding insulation is 5 Meg ohms or the calculated minimum, which ever is greater. Minimum resistance is calculated as follows: Rm = kV + 1

where: (Rm is minimum resistance to ground in Meg–Ohms and kV is rated nameplate voltage defined as Kilo–Volts.)

Example: For a 480VAC rated motor Rm =1.48 meg–ohms (use 5 M Ω).

For a 4160VAC rated motor Rm = 5.16 meg–ohms.

Preparation for Storage

1. Some motors have a shipping brace attached to the shaft to prevent damage during transportation. The shipping brace, if provided, must be removed and stored for future use. The brace must be reinstalled to hold the shaft firmly in place against the bearing before the motor is moved.
2. Store in a clean, dry, protected warehouse where control is maintained as follows:
   a. Shock or vibration must not exceed 2 mils maximum at 60 hertz, to prevent the bearings from brinelling. If shock or vibration exceeds this limit vibration isolation pads must be used.
   b. Storage temperatures of 10 ºC (50 ºF) to 49 ºC (120 ºF) must be maintained.
   c. Relative humidity must not exceed 60%.
   d. Motor space heaters (when present) are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional.

Note: Remove motor from containers when heaters are energized, reprotect if necessary.

3. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
   a. If motor insulation resistance decreases below the minimum resistance, contact your Baldor District office.
   b. Place new desiccant inside the vapor bag and re–seal by taping it closed.
   c. If a zipper–closing type bag is used instead of the heat–sealed type bag, zip the bag closed instead of taping it. Be sure to place new desiccant inside bag after each monthly inspection.
   d. Place the shell over the motor and secure with lag bolts.
4. Where motors are mounted to machinery, the mounting must be such that the drains and breathers are fully operable and are at the lowest point of the motor. Vertical motors must be stored in the vertical position. Storage environment must be maintained as stated in step 2.
5. Motors with anti–friction bearings are to be greased at the time of going into extended storage with periodic service as follows:
   a. Motors marked "Do Not Lubricate" on the nameplate do not need to be greased before or during storage.
   b. Ball and roller bearing (anti–friction) motor shafts are to be rotated manually every 3 months and greased every 6 months in accordance with the Maintenance section of this manual.
   c. Sleeve bearing (oil lube) motors are drained of oil prior to shipment. The oil reservoirs must be refilled to the indicated level with the specified lubricant, (see Maintenance). The shaft should be rotated monthly by hand at least 10 to 15 revolutions to distribute oil to bearing surfaces.
   d. "Provisions for oil mist lubrication" – These motors are packed with grease. Storage procedures are the same as paragraph 5b.
   e. "Oil Mist Lubricated" – These bearings are protected for temporary storage by a corrosion inhibitor. If stored for greater than 3 months or outdoor storage is anticipated, connected to the oil mist system while in storage. If this is not possible, add the amount of grease indicated under "Standard Condition" in Section 3, then rotate the shaft 15 times by hand.

6. All breather drains are to be fully operable while in storage (drain plugs removed). The motors must be stored so that the drain is at the lowest point. All breathers and automatic “T” drains must be operable to allow breathing and draining at points other than through the bearings around the shaft. Vertical motors should be stored in a safe stable vertical position.
7. Coat all external machined surfaces with a rust preventing material.
   An acceptable product for this purpose is Exxon Rust Ban # 392.
8. Carbon brushes should be lifted and held in place in the holders, above the commutator, by the brush holder fingers. The commutator should be wrapped with a suitable material such as cardboard paper as a mechanical protection against damage.

Non–Regreaseable Motors

Non–regreasable motors with “Do Not Lubricate” on the nameplate should have the motor shaft rotated 15 times to redistribute the grease within the bearing every 3 months or more often.

All Other Motor Types

Before storage, the following procedure must be performed.

1. Remove the grease drain plug, if supplied, (opposite the grease fitting) on the bottom of each bracket prior to lubricating the motor.
2. The motor with regreasable bearing must be greased as instructed in Section 3 of this manual.
3. Replace the grease drain plug after greasing.
4. The motor shaft must be rotated a minimum of 15 times after greasing.
5. Motor Shafts are to be rotated at least 15 revolutions manually every 3 months and additional grease added every nine months (see Section 3) to each bearing.
6. Bearings are to be greased at the time of removal from storage.

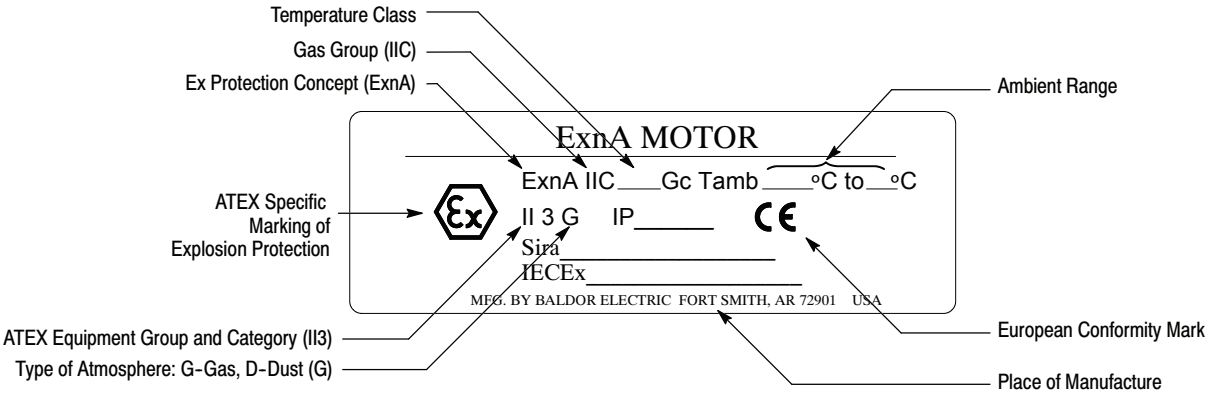
Removal From Storage

1. Remove all packing material.
2. Measure and record the electrical resistance of the winding insulation resistance meter at the time of removal from storage. The insulation resistance must not be less than 50% from the initial reading recorded when the motor was placed into storage. A decrease in resistance indicates moisture in the windings and necessitates electrical or mechanical drying before the motor can be placed into service. If resistance is low, contact your Baldor District office.
3. Regrease the bearings as instructed in Section 3 of this manual.
4. Reinstall the original shipping brace if motor is to be moved. This will hold the shaft firmly against the bearing and prevent damage during movement.

Equipment Marking for IEC Certified Product

IEC certified products have special markings that identify the protection concept and environment requirements. An example is shown in Figure 1-1.

Figure 1-1 IEC Certified Product Markings



Specific Conditions of Use:

If the motor certificate number is followed by the symbol "X", this indicates that the motor has specific conditions of use which are indicated on the certificate. It is necessary to review the product certification certificate in conjunction with this instruction manual.

Operation On Frequency Converters:

If the motor is evaluated for operation with an adjustable speed drive, the type of converter (for example PWM for Pulse Width Modulated) and safe speed ranges (for example 0- 120Hz) will be specified in the certification documents or on motor nameplates. It is necessary to consult the adjustable speed drive

manual for proper set up. IECEx Certificates are available online at www.iecex.com

Unit Conversions	
Inches to Millimeters	Inches x 25.4 = mm
Millimeters to Inches	mm x .03937 = Inches
Horsepower to Kilowatts	Hp x .746 = Kw
Kilowatts to Horsepower	Kw x 1.341 = Hp
Pounds to Kilograms	Lbs x .454 = Kg
Kilograms to Pounds	Kg x 2.205 = Lbs

EMC Compliance Statement for European Union

The motors described in this instruction manual are designed to comply 2004/108/EC . These motors are commercial in design and not intended for residential use. When used with converters, please consult converter manufacturers literature regarding recommendations on cable types, cable shielding, cable shielding termination, connection recommendations and any filters which may be recommended for EMC compliance. For additional information, consult Baldor MN1383.

Section 2

Installation & Operation

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

It is important that motors be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor.

Proper ventilation for the motor must be provided. Obstructed airflow can lead to reduction of motor life.

1. **Open Drip–Proof/WPI** motors are intended for use indoors where atmosphere is relatively clean, dry, well ventilated and non–corrosive.
2. **Totally Enclosed and WPII** motors may be installed where dirt, moisture or dust are present and in outdoor locations.

Severe Duty, IEEE 841 and Washdown Duty enclosed motors are designed for installations with high corrosion or excessive moisture conditions. These motors should not be placed into an environment where there is the presence of flammable or combustible vapors, dust or any combustible material, unless specifically designed for this type of service. IEEE841 motors are suitable for application in Class I Division 2 and Class I Zone 2 areas on sine wave power in accordance with the applicable codes and standards.

Hazardous Locations are those where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers, or flyings. Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements. In the US market, guidance is provided by the National Electric Code.

EMC Compliance Statement for European Union

The motors described in this instruction manual are designed to comply 2004/108/EC . These motors are commercial in design and not intended for residential use.

Mounting Location

The motor should be installed in a location compatible with the motor enclosure and specific ambient. To allow adequate air flow, the following clearances must be maintained between the motor and any obstruction:

Table 2-1 Enclosure Clearance

TEFC / TENV (IC0141) Enclosures	
Fan Cover Air Intake	180 – 210T Frame 1” (25mm)
Fan Cover Air Intake	250 – 449T Frame 4” (100mm)
	IEC 112 – 132 1” (25mm)
	IEC 160 – 280 4” (100mm)
Exhaust	Envelope equal to the P Dimension on the motor dimension sheet
OPEN/Protected Enclosures	
Bracket Intake	Same as TEFC
Frame Exhaust	Exhaust out the sides envelope A minimum of the P dimension plus 2” (50mm) Exhaust out the end same as intake.

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

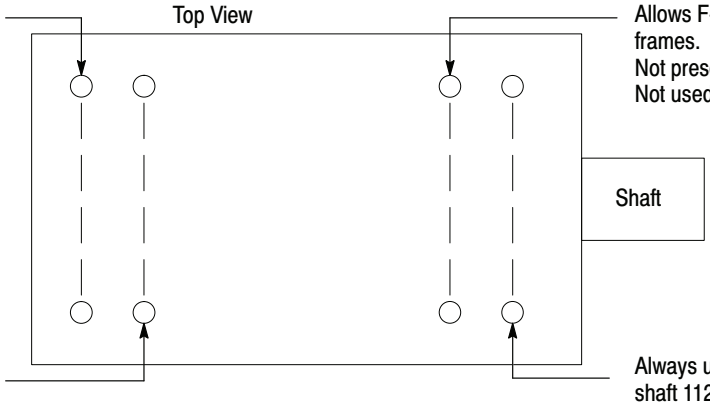
When installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Frame Mounting Holes

Some motors have standardized frames containing 6 or 8 mounting holes. 6 hole frames are not suitable for field reversal of mounting from F–1 to F–2, etc. Figure 2-1 indicates the proper mounting holes to use.

Figure 2-1 6 & 8 Hole Motor Frame Mounting



For short frame designations 182, 213, 254, 284, 324, 364, 404, 444 (NEMA)

Allows F-1 to F-2 Conversion on 8 hole frames.
Not present on 6 hole frames.
Not used on 8 hole frames.

For long frame designations 184, 215, 256, 286, 326, 365, 405, 445 (NEMA) (IEC) 112M, 132M, 160L, 200L, 225M, 250M, 280M

Always use these holes, closer to the shaft 112S, 132S, 160M, 180M, 200M, 225S, 250S, 280S, (IEC)

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.**

In the case of assemblies on a common base, any lifting means provided on the motor should not be used to lift the assembly and base but, rather, the assembly should be lifted by a sling around the base or by other lifting means provided on the base. Assure lifting in the direction intended in the design of the lifting means. Likewise, precautions should be taken to prevent hazardous overloads due to deceleration, acceleration or shock forces.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important. The pulley, sprocket, or gear used in the drive should be located on the shaft as close to the shaft shoulder as possible. It is recommended to heat the pulley, sprocket, or gear before installing on the motor shaft. Forcibly driving a unit on the motor shaft will damage the bearings.

1. Direct Coupling
   For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. End-Play Adjustment
   The axial position of the motor frame with respect to its load is also extremely important. The standard motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. Pulley Ratio
   The best practice is to not exceed an 8:1 pulley ratio.

Caution: **Do not over tension belts. Excess tension may damage the motor or driven equipment.**

4. Belt Drive
   Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor•Reliance motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment.

Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure.

Flanged nuts or bolts may be used as an alternative to washers.

WARNING: **Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.**

Guarding

Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions. This is particularly important where the parts have surface irregularities such as keys, key ways or set screws. Some satisfactory methods of guarding are:

1. Covering the machine and associated rotating parts with structural or decorative parts of the driven equipment.
2. Providing covers for the rotating parts. Covers should be sufficiently rigid to maintain adequate guarding during normal service.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

For ExnA hazardous location motors, it is a specific condition of use that all terminations in a conduit box be fully insulated. Fully insulated and lugged terminations must be bolted and provided with lock washer to prevent rotation. Flying leads must be insulated with two full wraps of electrical grade insulating tape or heat shrink tubing.

Grounding

In the USA consult the National Electrical Code, Article 430 for information on grounding of motors and generators, and Article 250 for general information on grounding. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor or generator terminal housing, and the motor or generator frame. In non–USA locations consult the appropriate national or local code applicable.

Motors with resilient cushion rings usually must be provided with a bonding conductor across the resilient member. Some motors are supplied with the bonding conductor on the concealed side of the cushion ring to protect the bond from damage. Motors with bonded cushion rings should usually be grounded at the time of installation in accordance with the above recommendations for making ground connections. When motors with bonded cushion rings are used in multimotor installations employing group fusing or group protection, the bonding of the cushion ring should be checked to determine that it is adequate for the rating of the branch circuit over current protective device being used.

There are applications where grounding the exterior parts of a motor or generator may result in greater hazard by increasing the possibility of a person in the area simultaneously contacting ground and some other nearby live electrical parts of other ungrounded electrical equipment. In portable equipment it is difficult to be sure that a positive ground connection is maintained as the equipment is moved, and providing a grounding conductor may lead to a false sense of security.

Select a motor starter and over current protection suitable for this motor and its application. Consult motor starter application data as well as the National Electric Code and/or other applicable local codes.

For motors installed in compliance with IEC requirements, the following minimum cross sectional area of the protective conductors should be used:

Crosssectional area of phase conductors, S	Minimum crosssectional area of the corresponding protective conductor, S_p
mm^2	mm^2
$S < 16$	S
$16 < S \leq 35$	16
$S > 35$	$0{,}5\ S$

Equipotential bonding connection shall made using a conductor with a cross-sectional area of at least 4 mm^2.

Conduit Box

For ease of making connections, an oversize conduit box is provided. Most conduit boxes can be rotated 360 ° in 90 ° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

AC Power

Motors with flying lead construction must be properly terminated and insulated.

Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within ±10% of rated voltage with rated frequency. (See motor name plate for ratings).

OR

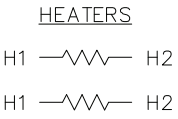
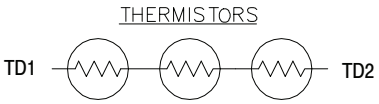
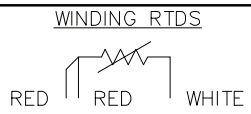
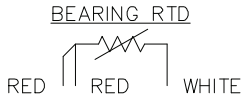
2. AC power is within ±5% of rated frequency with rated voltage.

OR

3. A combined variation in voltage and frequency of ±10% (sum of absolute values) of rated values, provided the frequency variation does not exceed ±5% of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-3.

Figure 2-2 Accessory Connections

	One heater is installed in each end of motor. Leads for each heater are labeled H1 & H2. (Like numbers should be tied together).
	Three thermistors are installed in windings and tied in series. Leads are labeled TD1 & TD2.
	Winding RTDs are installed in windings (2) per phase. Each set of leads is labeled 1TD1, 1TD2, 1TD3, 2TD1, 2TD2, 2TD3 etc.
	* One bearing RTD is installed in Drive endplate (PUEP), leads are labeled RTDDE. * One bearing RTD is installed in Opposite Drive endplate (FREP), leads are labeled RTDODE. * Note RTD may have 2−Red/1−White leads; or 2−White/1−Red Lead.

Rotation

All three phase motors are reversible. To reverse the direction of rotation, disconnect and lock out power and interchange any two of the three line leads for three phase motors. For single phase motors, check the connection diagram to determine if the motor is reversible and follow the connection instructions for lead numbers to be interchanged. Not all single phase motors are reversible.

Adjustable Frequency Power Inverters used to supply adjustable frequency power to induction motors produce wave forms with lower order harmonics with voltage spikes superimposed. Turn–to–turn, phase–to–phase, and ground insulation of stator windings are subject to the resulting dielectric stresses. Suitable precautions should be taken in the design of these drive systems to minimize the magnitude of these voltage spikes. Consult the drive instructions for maximum acceptable motor lead lengths, and proper grounding.

Note: Main power leads for CE Marked Motors may be marked U,V,W – for standard configurations, please consult connection diagrams.

Caution: **The space heaters are designed to operate at or below the maximum surface temperature stated on the nameplate. If the marked ambient and/or voltage are exceeded this maximum surface temperature can be exceeded and can damage the motor windings. If applied in a division 2 or zone 2 environment this excessive temperature may cause ignition of hazardous materials.**

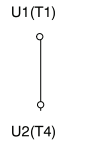
AC Motor Connection Diagram

IEC VERSUS NEMA LEAD MARKING

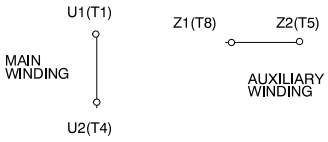
EXAMPLE COMPARISIONS OF IEC AND NEMA LEADING MARKINGS FOR COMMON CONNECTION TYPES ARE SHOWN BELOW.

SINGLE PHASE MOTORS

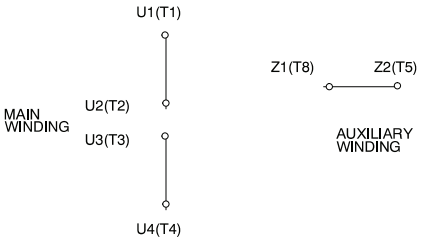
SINGLE VOLTAGE NON REVERSIBLE



SINGLE VOLTAGE REVERSIBLE



DUAL VOLTAGE REVERSIBLE



AC Motor Connection Diagram

THREE PHASE

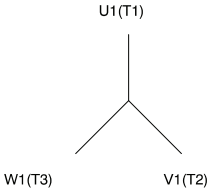
FOR SINGLE WINDING 3 PHASE MOTORS, LEAD MARKINGS CAN BE DIRECTLY TRANSLATED BETWEEN IEC AND NEMA DESIGNATIONS. FOR THESE MOTORS, THE LEAD MARKINGS ARE EQUIVALENT AS FOLLOWS:

U1=T1	U2=T4	U5=T7	U6=T10
V1=T2	V2=T5	V5=T8	V6=T11
W1=T3	W2=T6	W5=T9	W6=T12

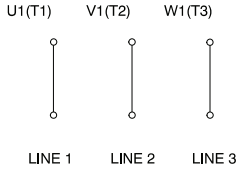
EXAMPLES OF COMMON CONNECTIONS ARE GIVEN BELOW.

THREE LEADS

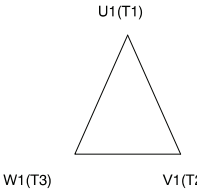
WYE CONNECT



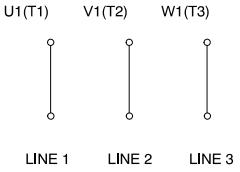
WIRING DIAGRAM



DELTA CONNECT



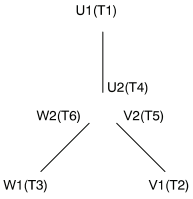
WIRING DIAGRAM



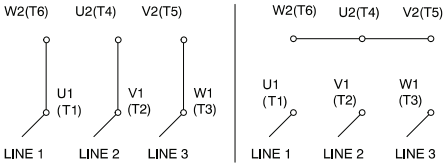
AC Motor Connection Diagram

SIX LEADS

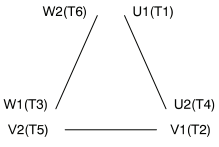
DELTA-WYE CONNECT



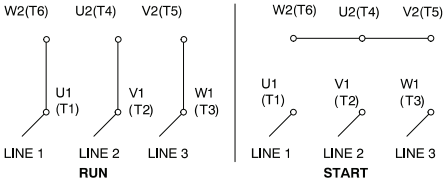
DUAL VOLTAGE-HIGH TO LOW VOLTAGE RATIO 1.73:1



WYE-DELTA CONNECT



WYE START-DELTA RUN SINGLE VOLTAGE

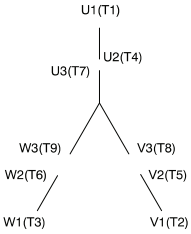


AC Motor Connection Diagram

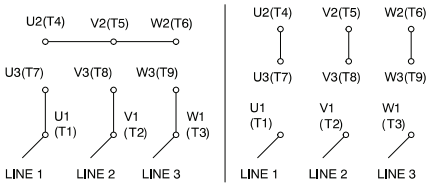
NINE LEADS

DUAL VOLTAGE-HIGH TO LOW VOLTAGE RATIO 2:1

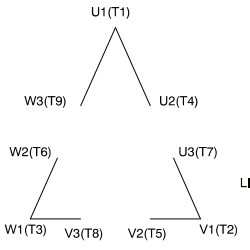
WYE CONNECT



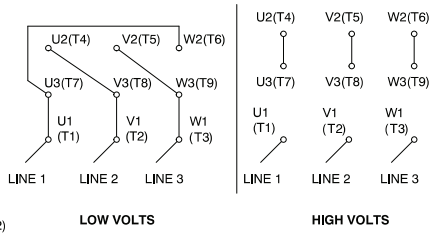
WIRING DIAGRAM



DELTA CONNECT



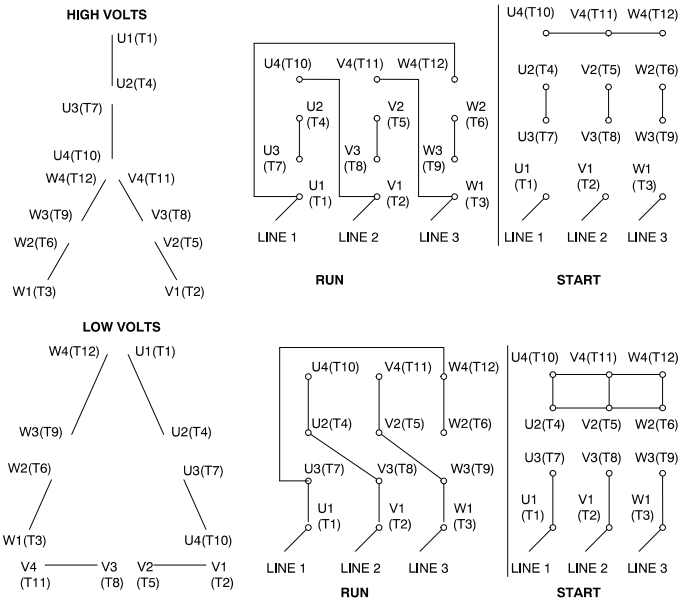
WIRING DIAGRAM



AC Motor Connection Diagram

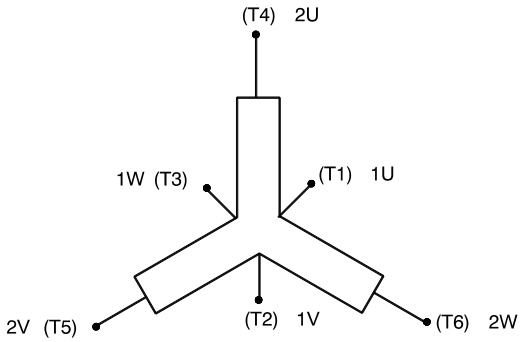
TWELVE LEADS

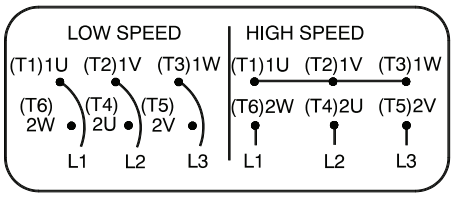
DUAL VOLTAGE WYE START – DELTA – RUN



AC Motor Connection Diagram

SINGLE WINDING MULTI-SPEEDS CONSTANT TORQUE

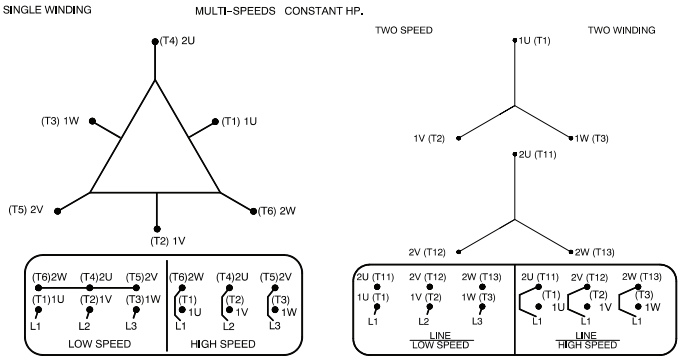




(N.P. 1634-DE)

AC Motor Connection Diagram

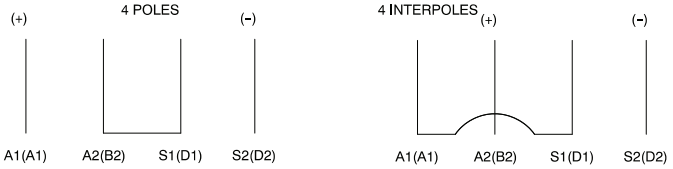
SINGLE WINDING MULTI-SPEEDS CONSTANT HP.



TWO SPEED TWO WINDING

DC Motor Connection Diagram

WIRING DIAGRAM TYPE "T" MOTOR



COUNTERCLOCKWISE ROTATION

CLOCKWISE ROTATION

ROTATION - FACING COMMUTATOR END

COMPARISON OF IEC AND NEMA LEAD MARKINGS
FOR DIRECT CURRENT MOTORS

A1--A1
A2--B2
S1--D1

S2--D2

MOTOR WINDING THERMOSTATS

CONTACTS _____ @ _____ °C
FIGURE NUMBER _____

CONTACT RATING

VOLTS	CONTINUOUS AMPERES	INRUSH AMPERES
110 - 120	3.0	30
220 - 240	1.5	15
440 - 480	0.75	7.5
550 - 600	0.60	6.0

THERMOSTATS

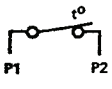
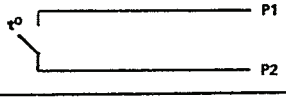
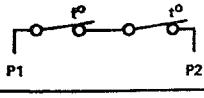
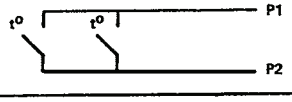
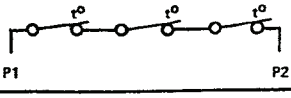
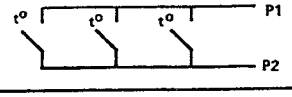
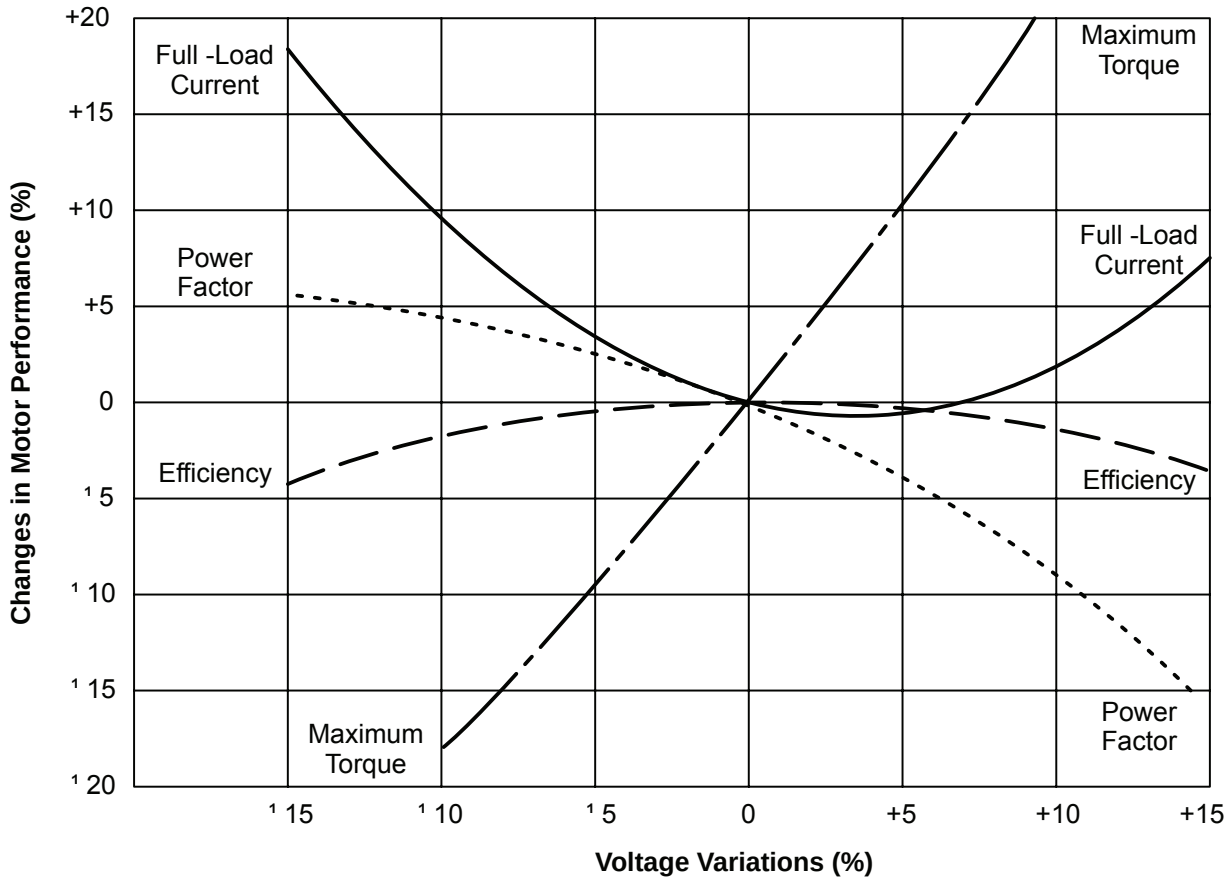
NORMALLY CLOSED	NORMALLY OPEN
FIGURE 1 	FIGURE 4 
FIGURE 2 	FIGURE 5 
FIGURE 3 	FIGURE 6 

Figure 2-3 Typical Motor Performance VS Voltage Variations



Initial Lubrication

Baldor•Reliance motors are shipped from the factory with the bearings properly packed with grease and ready to operate. Where the unit has been subjected to extended storage (6 months or more) the bearings should be relubricated (regreasable type) prior to starting. When motors are equipped for oil mist lubrication refer to the instruction manual for installation, operation, and maintenance of oil mist lubrication systems.

Caution: **Shaker Duty motors must be properly lubricated prior to Start Up to prevent damage. See Section 3.**

First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.

10. After 1 hour of operation, disconnect power and connect the load to the motor shaft.
    Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.
11. If motor is totally enclosed fan–cooled or non–ventilated it is recommended that condensation drain plugs, if present, be removed. These are located in the lower portion of the end–shields. Totally enclosed fan–cooled “XT” motors are normally equipped with automatic drains which may be left in place as received.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor though the coupling or the foundation.
   Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts

Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate.
Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Hazardous Locations

Hazardous locations are those where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers or flyings.

Selection

Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements. In the US market, guidance is provided by the National Electric Code. In international hazardous location areas, guidance for gas / vapor / mist classification is given in IEC60079–14, or for dust in IEC61241–14. This classification process lets the installer know what equipment is suitable for installation in that environment, and identifies what the maximum safe temperature or temperature class is required.
It is the customer or users responsibility to determine the area classification and select proper equipment.

Areas are classified with respect to risk and exposure to the hazard. In the US market, areas are typically classified as follows Class, Division, Group and Temperature Class. In some newer installations in the US and in most international markets, areas are classified in Zones.

Protection Concepts

Class I Division 1 / Zone 1 [Equipment Group I (mining) or II (surface), Equipment Protection Level (EPL) Gb, Mb]

Baldor offers a range of motors suitable for installation in a Division 1 or Zone 1 environment.
These motors are known as explosion proof or flameproof.
Motors that are explosion proof or flameproof use specially machined flameproof joints between the end bell or bracket and the frame, as well as along the rotating shaft and at connection box covers and entries.
The fit of these flameproof joints are designed to contain the combustion or quench the flame of an explosive gas atmosphere prior to it exiting the motor. These flameproof joints have lengths and widths selected and tested based on the gas group present in the atmosphere. Baldor•Reliance motors are typically designed to meet Class I (Division 1) Group C and D (explosion proof) or Ex d IIB (flameproof).

An application note regarding equipment applied in accordance with the US National Electric Code (NFPA 70–2008) – according to Article 500.8(C) Marking, sub clause (2) in the fine print note, it is noted that Equipment not marked to indicate a division is suitable for both Division 1 and Division 2 locations.
These motors are not gas tight. To the contrary, this protection concept assumes that due to the normal heating and cooling cycle of motor operation that any gas present will be drawn into the motor. Since flameproof or explosion proof motors are designed to contain the combustion and extinguish any flame transmission, for this protection concept, only external surface temperatures are of concern. Thermal limiting devices such as thermostats, thermistors or RTDs may be provided on these motors to limit the external surface temperature during overload conditions.

If thermostats are provided as a condition of certification, it is the installer's responsibility to make sure that these devices are properly connected to a suitable switching device. The ATEX directive requires that motor shutdown on thermal trip be accomplished without an intermediate software command. Where intermediate circuitry is involved the circuit shall fall within the scope of a safety, controlling and regulating device as defined in article 1(2) of European Directive 94/9/EC, and shall be covered by an appropriate EC Type Examination Certificate.

Flameproof motors, internationally referred to as Ex d use a protection concept similar to that used in Class I Division 1 motors, with minor differences in the flameproof joints and cable entry designs. Flameproof and explosion proof motors are both type tested. Representative motors are connected to a reference gas and ignited in laboratory conditions to verify that the flame is not transmitted outside the motor enclosure and to determine the maximum internal pressure encountered.

Explosion proof and Flame proof motors shipped without a conduit box require use of a certified box of suitable dimensions and that is appropriate for the classification. Openings in connection boxes must be closed with suitably certified and dimensioned device.

Class I Division 2 / Zone 2 Ex nA, [Equipment Protection Level (EPL) Gc]

This protection concept relies on having no sources of ignition present such as arcing parts or hot surfaces. For this protection concept, internal temperatures as well as external temperatures are considered. In many cases, the internal temperatures are higher than the external temperatures and therefore become the limiting factor in determination of temperature code designation. In these applications, it is very important to use a motor that has been evaluated thermally for use with an inverter or converter, if variable speed operation is desired. Thermostats used for Class I Division 2 and Ex nA motors are used to protect the motor only. For motors using flying lead construction, it is important to use connection lugs and insulate with heat shrink tubing or a double wrap of insulation grade electrical tape to avoid the risk of spark or ignition.

Class II Division 1 / Zone 21 [Equipment Group III, Equipment Protection Level (EPL) Db]

This area classification is one where the risk of ignitable concentrations of dust is present at all or some of the time. The protection concepts used for Class II Division 1 is similar to flamepath, except with additional dust exclusion paths designed for the rotating shaft. In the international designations, this concept is referred to as dust ignition proof or Ex tD. External surface temperature remains the limiting factor. Thermal limiting devices such as thermostats, thermistors or RTDs may be provided on these motors to limit the external surface temperature during overload conditions. If thermostats are provided as a condition of certification, it is the installer's responsibility to make sure that these devices are properly connected to a suitable switching device.

Note: In the North American area classification system, Class III exists for fibers and flyings.
In the IEC designation, both dusts and flyings are absorbed into Group III.

Class II Division 2 / Zone 22 [Equipment Group III, Equipment Protection Level (EPL) Dc]

This area classification is one where the risk of exposure to ignitable concentrations of dust are not likely to occur under normal operating conditions and relies heavily on the housekeeping practices within the installation.

Sine Wave Power Operation for Division 1 or 2 and Zone 1 or 2 and Zone 21 or 22 Hazardous Location.

These motors are designed to operate at or below the maximum surface temperature (or T–Code) stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded. If applied in a Division 1 or 2 / Zone 1 or 2 and Zone 21 or 22 environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor at any of the following conditions can cause the marked surface temperature to be exceeded.

1. Motor load exceeding service factor nameplate value
2. Ambient temperatures above nameplate value
3. Voltages above or below nameplate value
4. Unbalanced voltages
5. Loss of proper ventilation
6. Altitude above 3300 feet / 1000 meters
7. Severe duty cycles of repeated starts
8. Motor stall
9. Motor reversing
10. Single phase operation of polyphase equipment
11. Variable frequency operation

Variable Frequency Power Operation for Division 1 or 2 and Zone 1 or 2 and Zone 21 or 22

Hazardous Location (motors with maximum surface temperature listed on the nameplate).
Only motors with nameplates marked for use on inverter (variable frequency) power, and labeled for specific hazardous areas may be used in those hazardous areas on inverter power. The motor is designed to operate at or below the maximum surface temperature (or T–Code) stated on the nameplate.
Failure to operate the motor properly can cause this maximum surface temperature to be exceeded.

If applied in a Division 1 or 2 / Zone 1 or 2 and Zone 21 or 22 environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor at any of the following conditions can cause the marked surface temperature to be exceeded.

1. Motor load exceeding service factor nameplate value
2. Ambient temperature above nameplate value
3. Voltage (at each operating frequency) above or below rated nameplate value
4. Unbalanced voltages
5. Loss of proper ventilation
6. Operation outside of the nameplate speed / frequency range
7. Altitudes above 3300 feet / 1000 meters
8. Single phase operation of polyphase equipment
9. Unstable current wave forms
10. Lower than name plate minimum carrier frequency

Thermal Limiting
Thermal limiting devices are temperature sensing control components installed inside the motor to limit the internal temperature of the motor frame by interrupting the circuit of the holding coil of the magnetic switch or contactor. They are required for most Division 1 and Zone 1 applications. For Division 2 or Zone 2 applications, motors should be selected that preclude running temperatures from exceeding the ignition temperatures for the designated hazardous material. In Division 2 or Zone 2 classified locations, thermal limiting devices should only be used for winding protection and not considered for limiting all internal motor temperatures to specific ignition temperatures.

Equipotential Bonding and Shaft Current Reduction
Larger motors (ie WP construction) may require proper bonding between motor enclosures and covers to avoid the risk of stray currents during start up. Fastening methods and bonding straps must not be modified. Bearing currents can exist in some motors for both line–fed and inverter–fed applications. Larger line–fed motors may require at least one insulated bearing to prevent a flow of current through the bearings. Do not defeat such insulation whether the motor is line–fed or inverter–fed applications. Inverter–fed motors may require additional bearing insulation or even a shaft brush. Do not defeat such features. When the motor and the coupled load are not on a common conductive baseplate, it may also be necessary to electrically bond together the stationary parts of the motor and the coupled equipment.

Repair of Motors used in Hazardous Locations

Repair of hazardous certified motors requires additional information, skill, and care. It is the customer's responsibility to select service shops with proper qualifications to repair hazardous location motors. Contact the manufacture for additional repair details. Use only original manufacturer's parts.

Repair of Explosion Proof or Flame Proof Motors Class I Division 1 and Zone 1

In the North American market, recertification programs are offered by Underwriters Laboratories and Canadian Standards Association which allow authorized service shops to mark the rebuilt motors as certified. In the international markets using IEC based requirements, repair should be undertaken only after consulting IEC60079–19 Explosive Atmospheres–Part 19 Equipment repair, overhaul and reclamation. If use of a certified repair facility is desired, consult the IECEX Repair Scheme at http://www.iecex.com/service_facilities.htm

Explosion proof and flameproof motors achieve their safety based on the mechanical construction – flameproof joints and bearing clearance, and the electrical design including any thermal limiting devices. If it is necessary to repair a flameproof or explosion proof motor, it is critical that the mechanical flameproof joints be maintained. Consult Baldor Electric Company for flameproof joint construction details.
Use only Baldor•Reliance supplied parts. Baldor does not recommend reclamation of parts.
Since this protection method also relies on temperature being maintained, make sure that any rewinding uses the original electrical designs, including any thermal protection that may be present.

Repair of Dust Ignition Proof Motors – Class II Division 1 and 2, Zone 21 and 22.

For Dust Ignition Proof, proper sealing is required. Do not modify the motor construction to add any additional opening, and ensure that proper sealing is maintained in the connection box and at the shaft seal. Since this protection method also relies on temperature being maintained, make sure that any rewinding uses the original electrical designs, including any thermal protection that may be present

Repair of Class I Division 2 and Zone 2 motors

For Division 2 and Zone 2, the internal and external temperatures are of concern. Since this protection method also relies on temperature being maintained, make sure that any rewinding uses the original electrical designs, including any thermal protection that may be present. Use only Baldor replacement thermostats, if provided.

Section 3

Maintenance & Troubleshooting

WARNING: UL and EX Listed motors must only be serviced by UL or EX Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Perform a dielectric with stand test periodically to ensure that the integrity of the winding insulation has been maintained. Record the readings. Immediately investigate any significant decrease in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Relubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease A high grade ball or roller bearing grease should be used. Baldor motors are pregreased, normally with Polyrex EM (Exxon Mobil) or as stated on the nameplate.
Do not mix greases unless compatibility has been checked and verified.

Ball Bearing Motors

Operating Temperature –25 ºC (–15 ºF) to 50 ºC (120 ºF)

EXXON	POLYREX EM (Standard on Baldor motors)
EXXON	UNIREX N2
EXXON	BEACON 325
CHEVRON OIL	SRI NO. 2 (Compatible with Polyrex EM)
CHEVRON OIL	BLACK PEARL
TEXACO, INC.	PREMIUM RB
TEXACO, INC.	POLYSTAR
AMOCO	RYKON # 2
PENNZOIL	PENNZLUBE EM–2
DARMEX	DARMEX 707
DARMEX	DARMEX 711
PETRO–CANADA	PEERLESS LLG
SHELL OIL	DOLIUM BRB

Minimum Starting Temperature –60 ºC (–76 ºF)

SHELL OIL CO.	AEROSHELL 7 (Standard on Baldor motors)
MOBIL	MOBIL 28
MOBIL	MOBILITH SHC 100 (Low Temperature – Arctic Duty)

Roller Bearing Motors

Operating Temperature –25 ºC (–15 ºF) to 50 ºC (120 ºF)

TEXACO, INC.	PREMIUM RB
MOBIL	MOBILITH SHC 220 (Standard on Baldor motors)
CHEVRON OIL	BLACK PEARL

Relubrication Intervals

Recommended relubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-2 are based on average use.

Refer to additional information contained in Tables 3-2, 3-3 and 3-4.

Table 3-1 Relubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)		**	3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)		**	* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 449 incl. (315)		**	*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Relubrication intervals are for ball bearings.
For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table 3-2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40 ºC	Clean, Little Corrosion
Severe	16 Plus	50 ºC	Moderate dirt, Corrosion
Extreme	16 Plus	>50 ºC* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<–29 ºC **	

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Relubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor Drive endplate. For best relubrication results, only use the appropriate amount of grease for each bearing size (not the same for both).

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add * oz (Grams)	Volume of grease to be added	
			in^3	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100–112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6318	1.52(40)	2.5	8.2
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315–355)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315–355)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225–280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB of grease to be added

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Caution: **To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.**

Relubrication Procedure Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: **Do not over–lubricate motor as this may cause premature bearing failure.**

With Grease Outlet Plug

1. With the motor stopped, clean all grease fittings with a clean cloth.
2. Remove grease outlet plug.

Caution: **Over–lubricating can cause excessive bearing temperatures, premature lubrication breakdown and bearing failure.**

3. Add the recommended amount of grease.
4. Operate the motor for 15 minutes with grease plug removed. This allows excess grease to purge.
5. Re-install grease outlet plug.

Without Grease Provisions

Note: Only a Baldor authorized and UL or CSA certified service center can disassemble a UL/CSA listed explosion proof motor to maintain it's UL/CSA listing.

1. Disassemble the motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)
3. Assemble the motor.

Sample Relubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43 ºC and the atmosphere is moderately corrosive.

1. Table 3-2 list 9500 hours for standard conditions.
2. Table 3-3 classifies severity of service as "Severe".
3. Table 3-5 shows that 1.2 in^3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Shaker Duty Motors only

Caution: **Shaker Duty motors must be properly lubricated prior to Start Up to prevent damage. See Table 3-6.**

Lubrication should be performed before Start Up and at regular maintenance intervals. Follow these recommendations to ensure proper lubrication.

Recommended Lubricant

For ambient temperatures between –15 ºF to 120 ºF the following lubricants are recommended: Mobil PolyrexEM, Texaco Premium RB, Exxon Unirex N–2.

Do not mix greases unless compatibility has been checked and verified.

Table 3-5 Lubrication Volume

NEMA Frame Size	Volume in Cubic Inches					
	Normal Duty		Severe Duty		Extreme Duty	
	Start Up	Relub	Start Up	Relub	Start Up	Relub
184TY	1.4	0.5	1.4	0.5	2.7	0.5
215TY	1.6	0.5	1.6	0.5	4.5	1
256TY	7	1			11	2
286TY	9	1			15	3

Lubrication Frequency

Normal Duty 8 hours per day (16 hours per day in a clean environment). Lubricate every 2 months.

Severe Duty 16 hours per day or more in a dirty environment (corrosive atmosphere, chemical fumes, acids, alkalies or extreme high humidity). Lubricate every month or 700 hours of operation.

Extreme Duty operation in extremely dirty or dusty environments and high ambient temperatures exceeding 104 ºF (40 ºC). Lubricate twice a month or 350 hours of operation.

Lubrication Procedure

1. Locate the grease inlet and outlet. Clean the areas.
2. Remove the plug(s) and install a grease fitting in the inlet if grease fitting is not already installed.
3. Add the recommended amount of lubricant.
4. Run the motor for two hours with the outlet plug removed.
5. Install outlet plug.

Note: To loosen hardened grease it may be necessary to insert a rod or wire into the grease inlet and outlet holes.

Table 3-6 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage. Eccentric air gap.	Check input line connections. Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings. Tighten “Thru Bolts”.
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately 3/4 filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately 3/4 filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately 3/4 filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately 3/4 filled.

Suggested bearing and winding RTD setting guidelines for Non–Hazardous Locations ONLY

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80 °C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTD (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

Table 3-7 Winding RTDs – Temperature Limit In °C (40 °C Maximum Ambient)

Motor Load (Typical Design)	Class B Temp Rise ≤ 80 °C		Class F Temp Rise ≤ 105 °C		Class H Temp Rise ≤ 125 °C	
	Alarm	Trip	Alarm	Trip	Alarm	Trip
≤ Rated Load	130	140	155	165	175	185
Rated Load to 1.15 S.F.	140	150	160	165	180	185

Note: • Winding RTDs are factory production installed, not from Mod–Express.

When Class H temperatures are used, consider bearing temperatures and relubrication requirements.

Table 3-8 Bearing RTDs – Temperature Limit In oC (40 °C Maximum Ambient)

Bearing Type Oil or Grease	Anti–Friction		Sleeve	
	Alarm	Trip	Alarm	Trip
Standard*	95	100	85	95
High Temperature**	110	115	105	110

Notes: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.

** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as “standard” lubricants include the following:

– Texaco Polystar – Rykon Premium #2 – Chevron SRI #2

– Mobilith SHC–100 – Pennzoil Pennzlube EM–2 – Chevron Black Pearl

– Darmex 707 – Darmex 711 – Petro–Canada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation.

Contact Baldor application engineering for special lubricants or further clarifications.

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FAX: 856-663-6363

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159 PROMINENCE DRIVE
NEW KENSINGTON, PA 15068
PHONE: 724-889-0092
FAX: 724-889-0094

TENNESSEE
MEMPHIS
4000 WINCHESTER ROAD
MEMPHIS, TN 38118
PHONE: 901-365-2020
FAX: 901-365-3914

TEXAS
DALLAS
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GRAND PRAIRIE, TX 75050
PHONE: 214-634-7271
FAX: 214-634-8874

HOUSTON
10355 W. LITTLE YORK ROAD
SUITE 300
HOUSTON, TX 77041
PHONE: 281-977-6500
FAX: 281-977-6510

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SALT LAKE CITY
2230 SOUTH MAIN STREET
SALT LAKE CITY, UT 84115
PHONE: 801-832-0127
FAX: 801-832-8911

WISCONSIN
MILWAUKEE
1960 SOUTH CALHOUN ROAD
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FAX: 262-784-1215

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FORT SMITH, AR 72902
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MN408
8/12

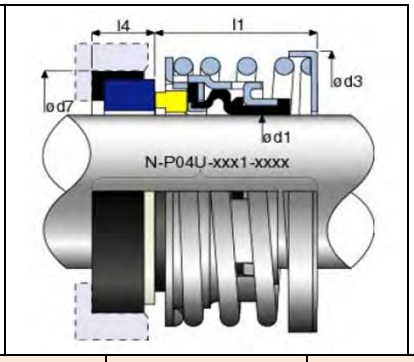
5. AES MECHANICAL SEAL

5. AES MECHANICAL SEAL

WEMCO® SCREW CENTRIFUGAL PUMP SEALS

TYPE P04U

Seat Mat'l: Carb/Cer/Viton

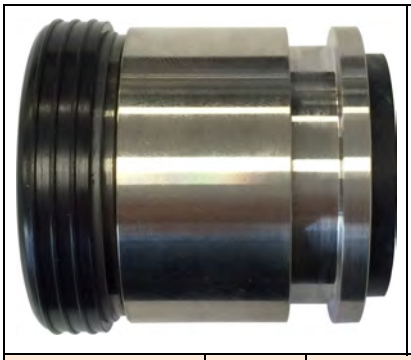


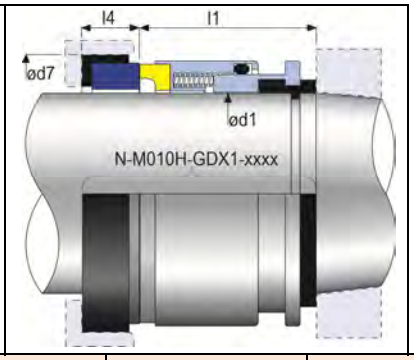
TYPE P04U seals:
Used in the bearing side with oil bath for D, E, F, & H size bearing frames.

SHAFT SIZE, Ød1		SIZE CODE	Ød3		Ød7		l1		l4	
IMPERIAL	METRIC		IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC
1.500	38.1	0381	2.331	59.20	2.122	53.90	1.126	28.60	0.437	11.10
2.000	50.8	0508	3.012	76.50	2.748	69.80	1.500	38.10	0.500	12.70
3.000	76.2	0762	4.252	108.00	3.874	98.40	2.063	52.40	0.626	15.90

TYPE M010H

Seal Mat'l: TC/SiC/Nitrile



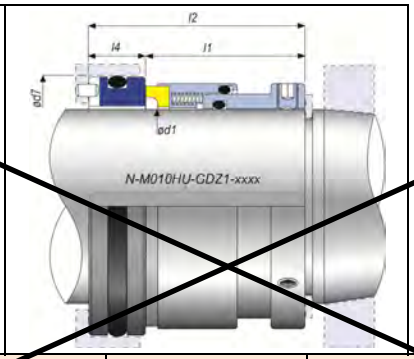


TYPE M010H seals:
Used in the process side for D, E & F size bearing frames.

SHAFT SIZE, Ød1		SIZE CODE	Ød7		l1		l4	
IMPERIAL	METRIC		IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC
1.125	28.6	286	1.752	44.50	1.283	32.60	0.417	10.60
1.500	38.1	381	2.126	54.00	1.366	34.70	0.437	11.10
2.000	50.8	508	2.748	69.80	1.783	45.30	0.500	12.70

TYPE M010HU

Seal Mat'l: TC/SiC/Viton



TYPE M010HU seals:
Used in the process side for H, I & L size bearing frames and the bearing side for I & L size bearing frames.

** 3.0" seal has cup mounted stationary face.

SHAFT SIZE, Ød1		SIZE CODE	Ød7		l1		l4	
IMPERIAL	METRIC		IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC
3.000	76.20	0762	3.874	98.40	2.063	52.40	0.626	15.9
3.740	95.00	0950	4.876	123.85	2.441	62.00	0.685	17.4
3.937	100.00	1000	4.876	123.85	2.441	62.00	0.685	17.4

Drawing 707998

AESSEAL®

ENVIRONMENTAL TECHNOLOGY

P04U™ and P05U™

Single Bellows Component Seal Range

- PATENTED ROTARY BELLOWS DESIGN
- INNOVATIVE ROTARY DRIVE MECHANISM
- ENGINEERED DRIVE PLATE RETAINMENT
- SEAL SUPPLIED COMPLETE WITH STATIONARY

AESSEAL® - Component Seal Division overview

Growing environmental awareness, changing consumer behavior and more aggressive competition mean that both new and traditional markets are demanding ideas, innovative products and above all, service.

P04U™ and P05U™ development is the result of a global strategy to expand the AESSEAL® product range which will allow further penetration into new markets and offer a more complete service to existing customers.

At the core of this strategy is the improvement of existing products and design excellence which has helped us achieve superior product performance.

AESSEAL® Inventory Carousel system

AESSEAL Inc. North American headquarters.

AESSEAL® has probably the widest component seal range in the industry. Products include unitized rubber bellows designs as well as conventional single & multi spring pusher products. For further information see or download our comprehensive component seal literature from www.aesseal.com

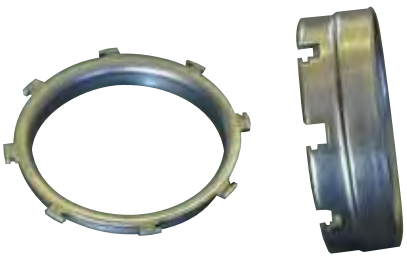
AESSEAL® embraces new technology throughout the entire corporation. Component Seals are inventoried in state of the art, computer controlled carousel systems. This un-manned storage facility is linked to the corporate business system to automate customer order processing. This strong customer focus results in exceptional customer service.

P04U™/P05U™ - better by design

P04U™ & P05U™ Development

The P04U™ and P05U™ seal range has been developed in the UK at the AESSEAL® Global Research & Development headquarters using the latest 3D CAD software. The result is a truly world class innovative solution.

A common failure mode in seals of this type, is the drive mechanism between two relatively thin metallic members.



Non-AESSEAL® design showing seal failure as a result of poor metal to metal drive technology.

The design above shows the effect of thin metal parts digging into each other. This is not an AESSEAL® design and was rejected during the development of the P04U and P05U seals.

To overcome this problem, AESSEAL® has spread the drive force over a large surface area. The resulting AESSEAL® patent pending design incorporates over 250% additional drive area compared to some seals found in the market place. This reduces the possibility of seal face hang-up and/or premature seal failure.

A further unique design feature of the product range is the engineered rotary retainment mechanism, which aids seal installation.

AESSEAL® design showing engineered rotary retainment technology.

Not only is the AESSEAL® design unique, premium "cartridge seal" materials have been incorporated into the seal face technology.

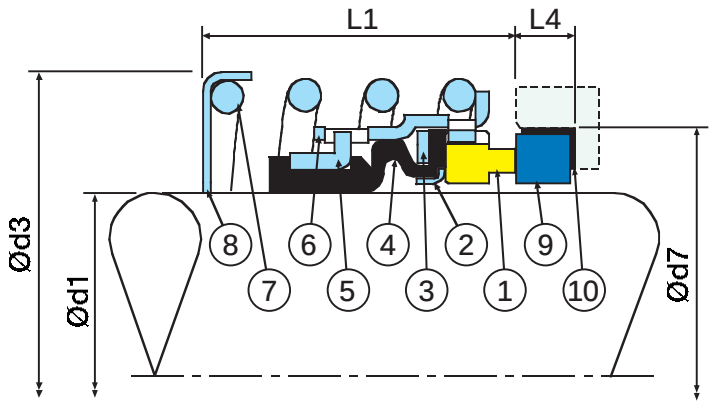
The P04U™ and P05U™ product have been verified by performance tests, each result scientifically analyzed. Test results were further compared against multiple competitor benchmark test results, all conducted in identical conditions over many thousands of hours duration.

The result is a P04U™ and P05U™ design, which is, in the opinion of AESSEAL®, unsurpassed in the market place.

As standard the P04U™ and P05U™ are offered with a boot mounted stationary seat. However O-ring mounted stationary seats can be supplied from an extensive inventoried product range upon request.

The P04U™ and P05U™ use superior Carbon which is triple impregnated. This higher grade of carbon allows for a higher PV rating, and is a significant advantage over other products in this market.

P04U™ - Dimensional information



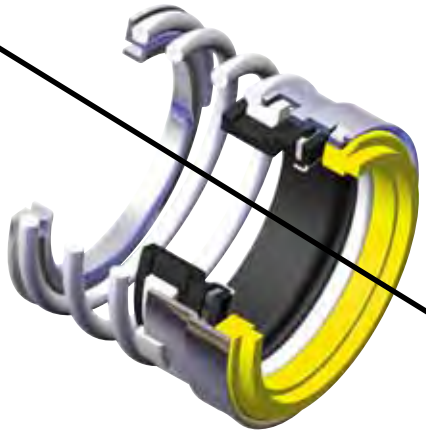
Item	Description	Material
1	Seal Face	Carbon-TC-SiC
2	Disk	Stainless Steel
3	Face Plate	Stainless Steel
4	Bellows Unit	Nitrile-EPR-Viton®
5	Drive Plate	Stainless Steel
6	Retainer	Stainless Steel
7	Spring	Stainless Steel
8	Base	Stainless Steel
9	Stationary	Carbon-TC-SiC
10	Stationary Boot	Nitrile-EPR-Viton®

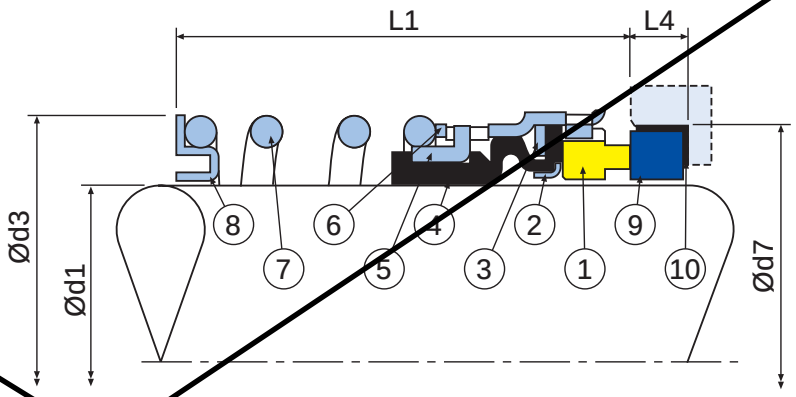
P04U™ - Inch (Imperial) Sizes

Ød1	Ød3	Ød7	L1	L4
0.500	1.187	1.000	0.813	0.312
0.625	1.312	1.250	0.875	0.405
0.750	1.438	1.375	0.875	0.405
0.875	1.564	1.500	0.937	0.405
1.000	1.783	1.625	1.000	0.437
1.125	1.908	1.750	1.062	0.437
1.250	2.079	1.875	1.062	0.437
1.375	2.204	2.000	1.007	0.437
1.500	2.329	2.125	1.125	0.437
1.625	2.636	2.375	1.375	0.500
1.750	2.761	2.500	1.375	0.500
1.875	2.880	2.625	1.500	0.500
2.000	3.011	2.750	1.500	0.500
2.125	3.256	3.000	1.687	0.562
2.250	3.381	3.125	1.687	0.562
2.375	3.506	3.250	1.812	0.562
2.500	3.631	3.375	1.812	0.562
2.625	3.875	3.375	1.937	0.625
2.750	4.000	3.500	1.937	0.625
2.875	4.125	3.750	2.062	0.625
3.000	4.250	3.875	2.062	0.625

Seals available for Inch (Imperial) shaft sizes only

P05U™ - Dimensional information





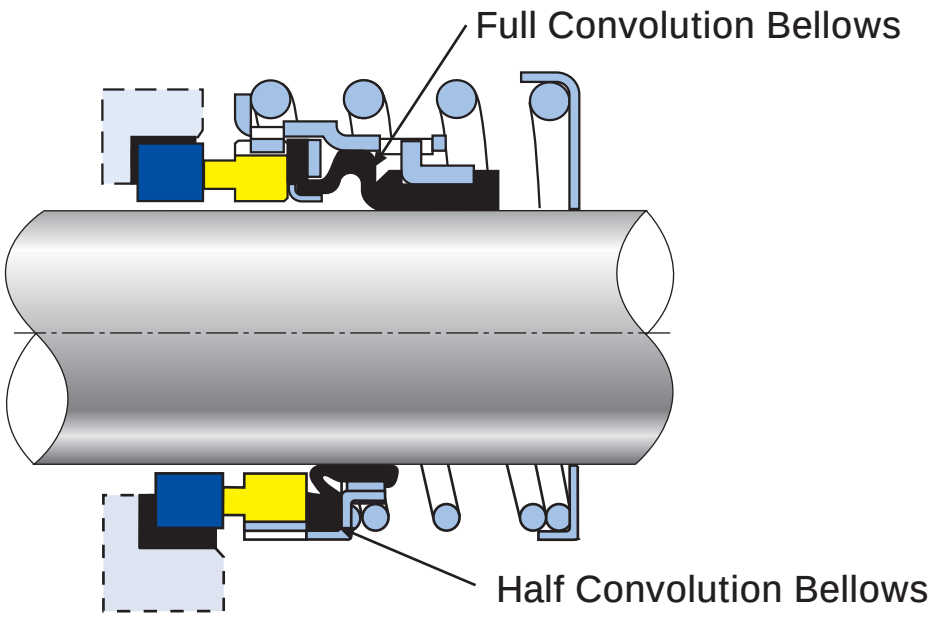
Item	Description	Material
1	Seal Face	Carbon-TC-SiC
2	Disk	Stainless Steel
3	Face Plate	Stainless Steel
4	Bellows Unit	Nitrile-EPR-Viton®
5	Drive Plate	Stainless Steel
6	Retainer	Stainless Steel
7	Spring	Stainless Steel
8	Base	Stainless Steel
9	Stationary	Ceramic-TC-SiC
10	Stationary Boot	Nitrile-EPR-Viton®

P05U™ - Inch (Imperial) Sizes

Ød1	Ød3	Ød7	L1	L4
0.500	0.937	1.000	1.187	0.312
0.625	1.093	1.250	1.312	0.405
0.750	1.218	1.375	1.312	0.405
0.875	1.343	1.500	1.375	0.405
1.000	1.500	1.625	1.562	0.437
1.125	1.625	1.750	1.625	0.437
1.250	1.812	1.875	1.625	0.437
1.375	1.917	2.000	1.687	0.437
1.500	2.041	2.125	1.687	0.437
1.625	2.287	2.375	2.000	0.500
1.750	2.412	2.500	2.000	0.500
1.875	2.537	2.625	2.125	0.500
2.000	2.662	2.750	2.125	0.500
2.125	2.835	3.000	2.375	0.562
2.250	2.965	3.125	2.375	0.562
2.375	3.083	3.250	2.500	0.562
2.500	3.210	3.375	2.500	0.562
2.625	3.394	3.375	2.750	0.625
2.750	3.520	3.500	2.750	0.625
2.875	3.644	3.750	2.875	0.625
3.000	3.770	3.875	2.875	0.625

Seals available for Inch (Imperial) shaft sizes only

P04U™/P05U™ - Full Convolution Bellows vs. Half Convolution Bellows



The Full Convolution Bellows allows for more axial movement of the rotary face than the Half-Convolution Bellows.

This enables the seal rotary to track the stationary much better in the event of misalignment of the two faces (due to seat mis-positioning, shaft mis-alignment, etc).

The full convolution bellows can also compensate for more wear of the rotary face, and handle higher pressures, than the half-convolution bellows.

The full convolution bellows is standard on the P04U™ and P05U™ seals.

The half-convolution bellows is standard on the P04™ and P05™ seals.

Other AESSEAL® Single Spring Component Seals

AESSEAL® is able to offer one of the largest ranges of Component (Single-Spring) Mechanical Seals in the industry.

Through continued development, our Component Seal range offers a seal to cover almost all of your low to medium-duty sealing requirements. Due to our commitment and investment in the Component Seal market, we ship most of our orders the same day that they are placed.

The Component Seal range covers the following major product families: Enclosed Rubber Bellows Seals in metric and imperial sizes, Parallel-Spring Rubber Diaphragm Seals in metric and imperial sizes, Tapered Spring Seals in metric sizes, PTFE Wedge Seals in metric and imperial sizes and many OEM specific seals.

For more information on any AESSEAL® Component Seal contact our UK and USA branches at the addresses below.

To order the literature contact the Marketing Department at **marketing@aesseal.com** or download it from **www.aesseal.com.**

THIS DOCUMENT IS DESIGNED TO PROVIDE DIMENSIONAL INFORMATION AND AN INDICATION OF AVAILABILITY.
FOR FURTHER INFORMATION AND SAFE OPERATING LIMITS CONTACT OUR TECHNICAL SPECIALISTS AT THE LOCATIONS BELOW.

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USE DOUBLE MECHANICAL SEALS WITH HAZARDOUS PRODUCTS. ALWAYS TAKE SAFETY PRECAUTIONS:

- **GUARD YOUR EQUIPMENT**
- **WEAR PROTECTIVE CLOTHING**

WARNING

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