



OPERATION AND MAINTENANCE INSTRUCTIONS

**WATER POLLUTION CONTROL FACILITY IMPROVEMENTS – PHASE II
MUNCIE, IN WASTEWATER IMPROVEMENTS – SEWAGE PUMPS**

BOWEN ENGINEERING CORPORATION
CUSTOMER ORDER NUMBER: LOI 020806
WEMCO ORDER NUMBER DW05771

**SECTION 11317
RAW SEWAGE PUMPS A, B & C**
WEMCO HIDROSTAL SCREW CENTRIFUGAL PUMPS
20 X 20 MODEL L20K-SD-L4W
WEMCO SERIAL NUMBER (S) 06DW05771-04,-05,-06

**SECTION 11317
RAW SEWAGE PUMP D**
WEMCO HIDROSTAL SCREW CENTRIFUGAL PUMPS
16 X 16 MODEL I16K-MD-I4W
WEMCO SERIAL NUMBER (S) 06DW05771-07

MANUFACTURER
WEIR SPECIALTY PUMPS
440 WEST 800 SOUTH
SALT LAKE CITY, UTAH 84101
TELEPHONE: (801) 359-8731

LOCAL REPRESENTATIVE FOR PARTS & SERVICE
B L ANDERSON COMPANY
2540 KENT AVENUE
WEST LAFAYETTE, IN 47906
TELEPHONE: (765) 463-1518
FAX: (765) 463-5641

A. RAW SEWAGE PUMPS A, B & C

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A

SECTION 1

Weir Specialty Pumps
 440 West 800 South
 Salt Lake City, UT 84101
 T > 801-359-8731
 F > 801-530-7531



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



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 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, wither 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 _____
 Pressure _____ PSIG
- 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 _____



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.



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 warm-up valve to circulate liquid for preheating. Close the valve after the pump is warmed up.



- 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 full 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 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 10-15 psig above the pump discharge pressure.
 - Oil lubricated tandem mechanical seals don't required outside flush water.

VI. OPERATING CHECKS

- A. Check the pump and piping for leaks.
- B. Check and record pressure gauge readings for future reference.
 - 1. Suction _____ PSIG / KPa
 - 2. Discharge _____ PSIG / Kpa
- C. Check and record flow _____ USGPM
- D. Check and record voltage, amperage per phase and kilowatts (if available).

1. Voltage _____ / _____ / _____ Volts
2. Amperage _____ / _____ / _____ Amps

E. Measure pump shaft speed: _____ RPM

D. 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 _____

IX. GENERAL COMMENTS

X. LIST OF ATTENDEES

Name of Company performing start-up

Authorized Signature Date

Signature of Customer Date

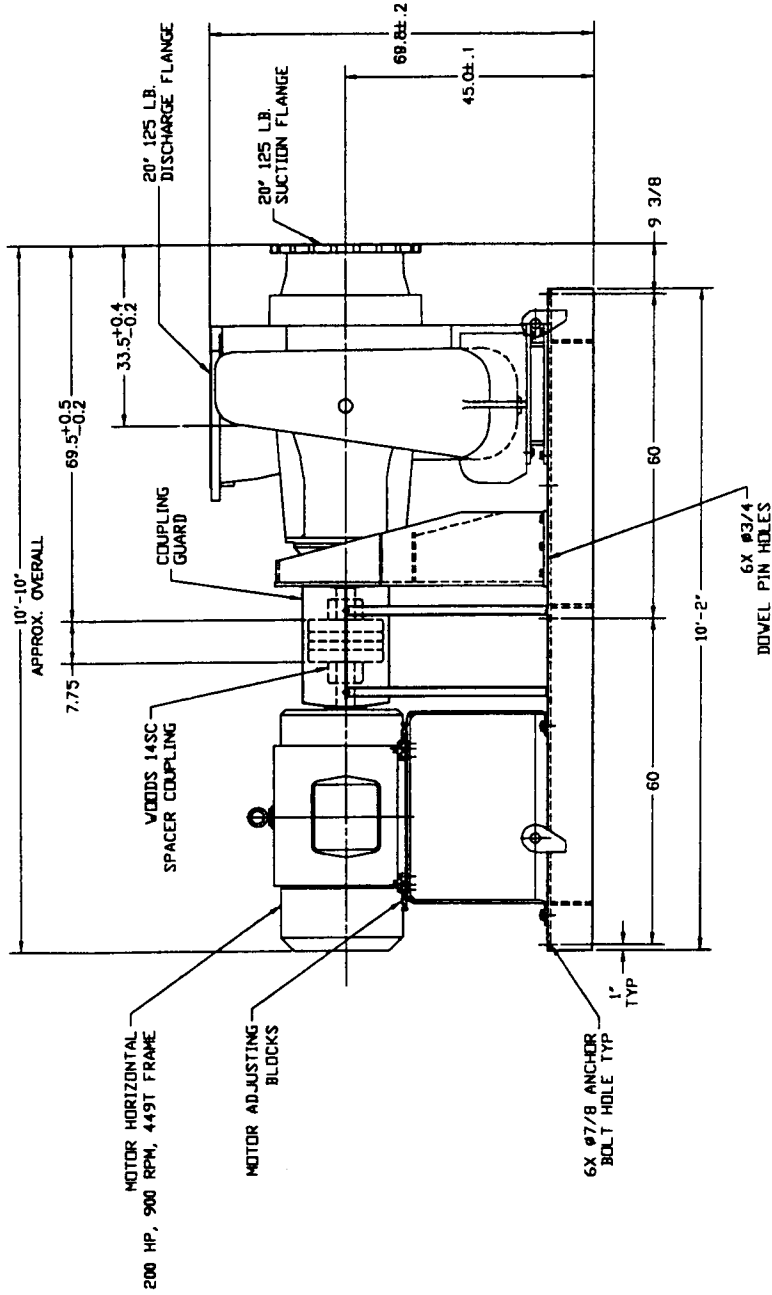
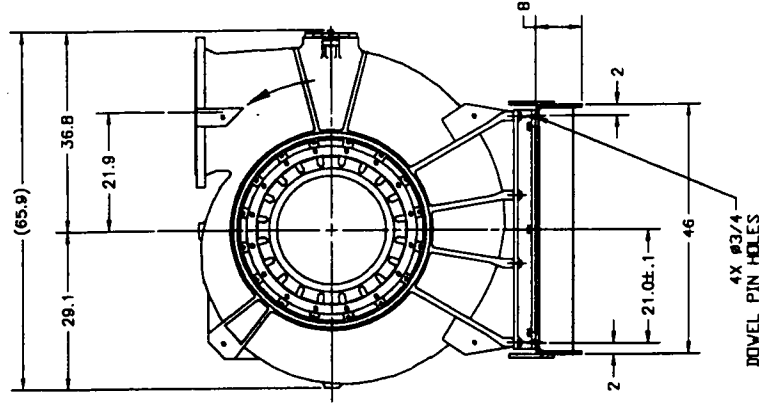
ORDER ACKNOWLEDGEMENT

SALES SHEET NUMBER **DW05771**P/O **0106056P007**

6643

BILL-TO BOWEN ENGINEERING CORPORATION
10315 ALLISONVILLE ROADFISHERS IN
46038

QTY	PART NUMBER	DESCRIPTION
3	L20K-BRG	<p>20 X 20 MODEL L20K-SD-L4W WEMCO HIDROSTAL SCREW CENTRIFUGAL PUMP WITH A GROOVED, REGULABLE, HI-CHROME LINER. DYNAMIC BALANCED, BELZONA 1321 COATED DIN 1.4122 STAINLESS STEEL IMPELLER MATERIAL: CAST IRON RIBBED CASE CONDITIONS: 14,400 GPM AGAINST: 32' TDH, AT 750 RPM MECHANICAL SEAL: HIDROSTAL DOUBLE TANDEM ALL STAINLESS STEEL HARDWARE CW VIEWED FROM PUMP SHAFT EXTENSION DISCHARGE ARRANGEMENT: VERTICAL UP DOWEL PIN LOCATION HOLES IN PUMP FEET</p> <p>1/2" THICK STEEL COMMON PUMP AND MOTOR BASE WITH GUARD. ARRANGEMENT: DIRECT CONNECT</p> <p>BASE: STEEL GUARD: FIBERGLASS</p> <p>COUPLING: WOODS 14E</p> <p>PREMIUM EFFICIENT HORIZONTAL MOTOR: 200 HP, 900 RPM, 449T FRAME TEFC MILL AND CHEMICAL ENCLOSURE WITH 1.15 SERVICE FACTOR AND CLASS F INSULATION 3 PHASE, 60 HZ, 460 VOLT</p> <p>5 POINT WITNESSED PERFORM. TEST, PE CERT NPSH TEST, PE CERT</p> <p>TESTING AND CERTIFICATION:</p> <p>PERFORMANCE TEST - PACKAGE NPSH TEST PERFORMANCE TEST - BARE PUMP</p> <p>Serial Number(s): 06DW05771-04 06DW05771-05 06DW05771-06</p>



WEIGHTS	
PUMP	6734#
BASE&GUARD	550 #
MOTOR	2500#
COUPLING	184#

WEMCO PUMP

GENERAL ARRANGEMENT
L20K-SS-LAW
HORIZONTAL (DIRECT DRIVE)
WEMCO-HORIZONTAL PUMP

DATE: 06/03/77
SCALE: 1" = 1'-0"
DRAWN BY: J. J. JEFF
CHECKED BY: R. J. JEFF

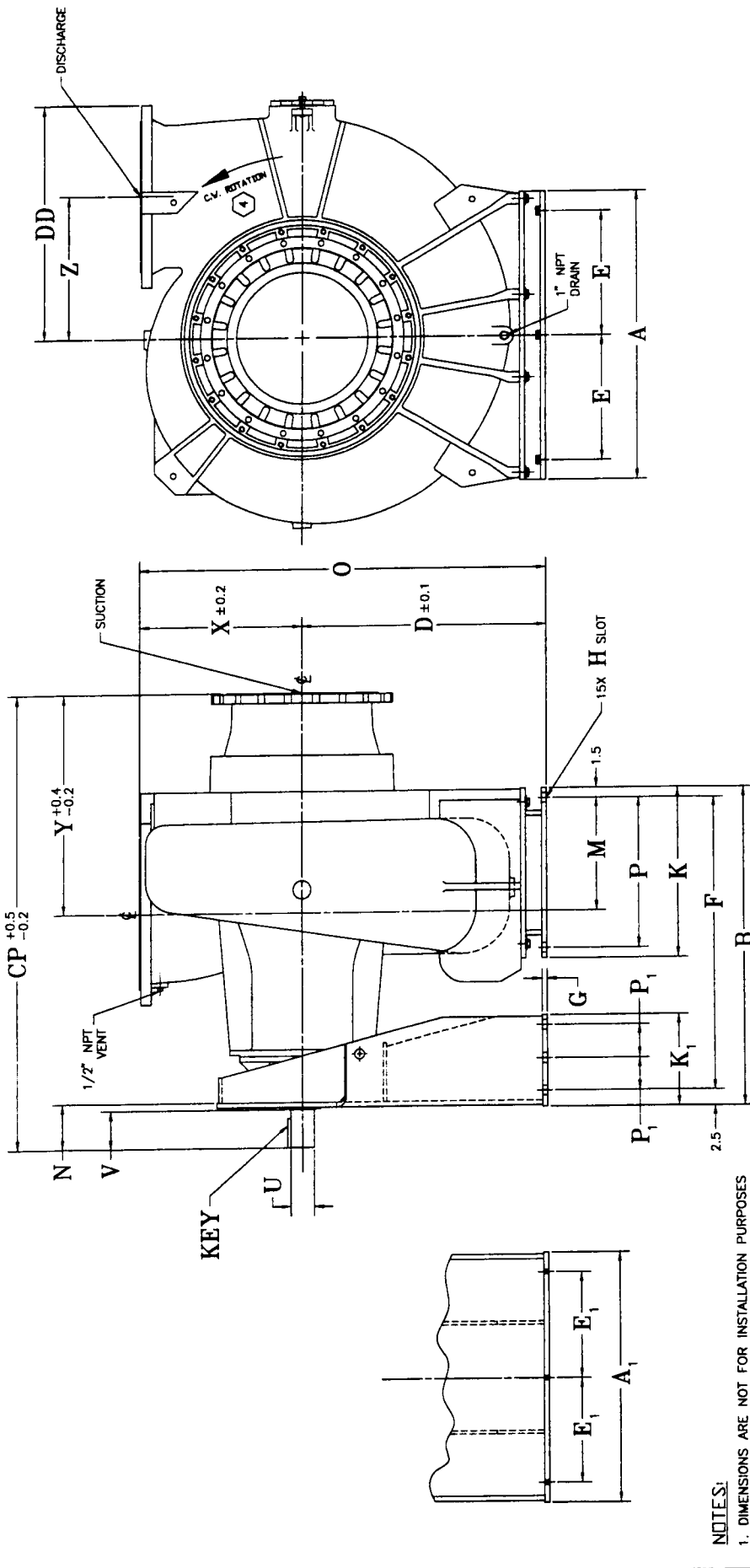
06DW05771 BA

NO.	REV.	DESCRIPTION	DATE
1		ISSUED FOR CONSTRUCTION	5-10-08
2		ISSUED FOR CONSTRUCTION	5-10-08
3		ISSUED FOR CONSTRUCTION	5-10-08
4		ISSUED FOR CONSTRUCTION	5-10-08
5		ISSUED FOR CONSTRUCTION	5-10-08
6		ISSUED FOR CONSTRUCTION	5-10-08
7		ISSUED FOR CONSTRUCTION	5-10-08
8		ISSUED FOR CONSTRUCTION	5-10-08

S/N 06DW05771-04-05-06

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PUMP SIZE	BRG FRAME	A	A ₁	B	D	E	E ₁	F	G	H	K	K ₁	M	N	O	P	P ₁	U	V	X	Y	Z	CP	DD	KEY	SUC DIS	WGT (LBS)	DDTT
L20K-144	L4W	44.00	38.00	48.71	37.0	19.00	16.00	44.71	0.75	0.69 X 1.50	26	14	17.21	7.0	61.8	22.9	5.0	90mm	5.9	24.8	33.5	21.8	69.5	35.6	25 X 14mm	20	20	67.34



NOTES:

1. DIMENSIONS ARE NOT FOR INSTALLATION PURPOSES UNLESS CERTIFIED.
2. PUMP AND ACCESSORIES ARE DESIGNED FOR CONTINUOUS DUTY.
3. PUMP SIZE, MODEL AND SERIAL NUMBER MUST BE SPECIFIED WHEN ORDERING SPARE PARTS.
4. CLOCKWISE ROTATION VIEWED FROM SHAFT END; CCW IS NOT AVAILABLE.
5. SUCTION AND DISCHARGE FLANGE MATE WITH CLASS 125 ANSI FLANGES.

EmpireTech PUMPS
QWEMCO PUMP

GENERAL ARRANGEMENT
 L20K RIBBED CASE PUMP ONLY
 L4S & L4W BEARING FRAME
 WEMCO-HIDROSTAL PUMP

DATE: 1-18-00
 DRAWN BY: JAU
 CHECKED BY: JAU
 APPROVED BY: JAU

SCALE: 1:1
 SHEET NO.: 1-8
 TOTAL SHEETS: 1-8

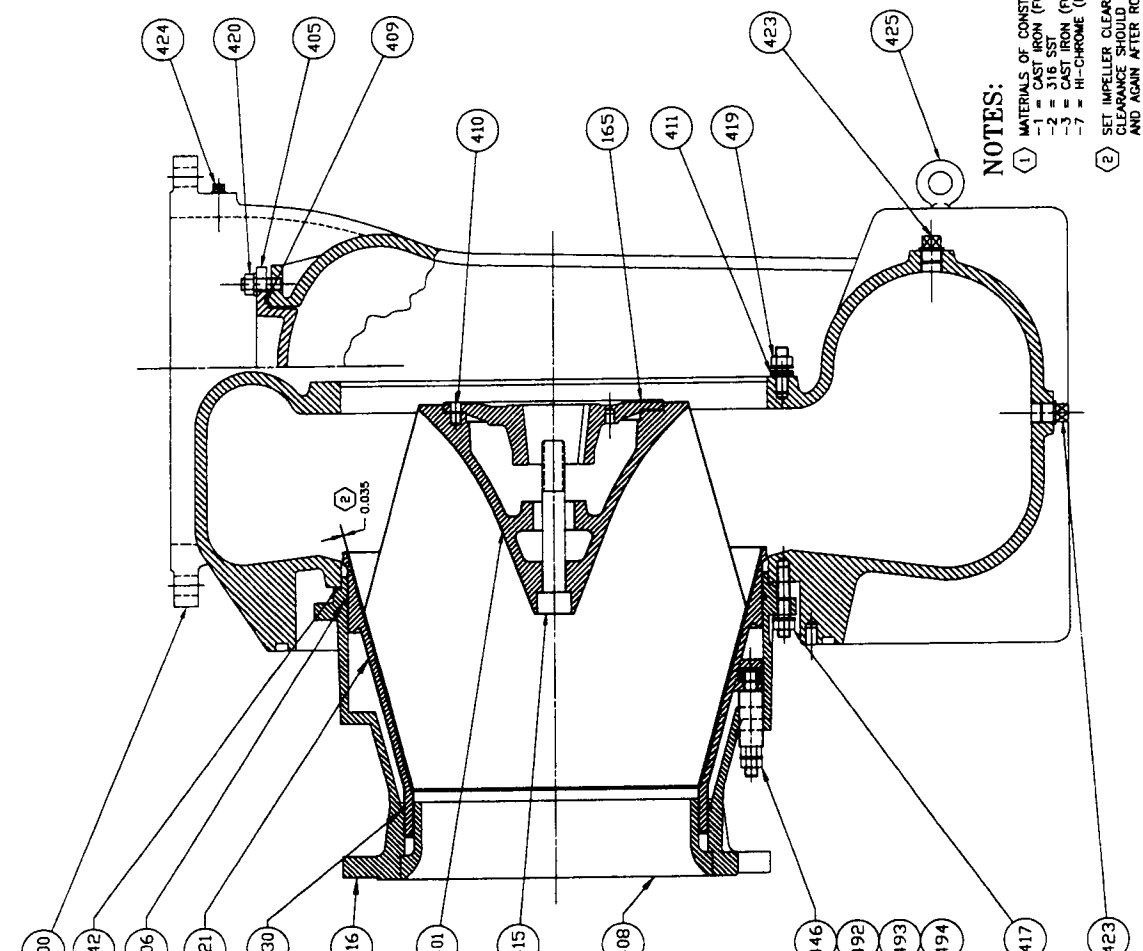
79877

REV	DATE	DESCRIPTION	BY	CHK
1	1-18-00	NEW ISSUE	JAU	JAU

S/N 069W0571-04-05-06

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ASSY	HD DTY	SD DTY	ES DTY	LT DTY	PL DTY	PART NO.	DESCRIPTION	RAW PART NO.	MATL	QTY UNIT
	1	1	1	1	1	79944-#	FLANGE, IMPELLER		316 SSS	(1)
	1	1	1	1	1	79877-1	CASING, VOLUTE		316 SSS	(1)
	1	1	1	1	1	71800-#	IMPELLER, L20K-HD		316 SSS	(1)
	1	1	1	1	1	71801-#	IMPELLER, L20K-SD		316 SSS	(1)
	1	1	1	1	1	71814-#	IMPELLER, L20K-SS		316 SSS	(1)
	1	1	1	1	1	79650-#	COVER, HANDHOLE		BUNA-N	(1)
	1	1	1	1	1	142321	O-RING, 7.0 X 686mm		BUNA-N	(1)
	1	1	1	1	1	71805-#	RING, WEAR		316 SSS	(1)
	1	1	1	1	1	142193	O-RING, 5.0 X 160mm		BUNA-N	(1)
	1	1	1	1	1	178674	PIN, BOIVEL 16mm X 30mm		STL	(1)
	1	1	1	1	1	71860-4	SHIM KIT		STL	(1)
	1	1	1	1	1	418898	BELT, IMPELLER M26 X 250mm		316 SSS	(1)
	1	1	1	1	1	71806-#	SUCTION CASING		316 SSS	(1)
	16	16	16	16	16	422270	STUD, TAP END M20 X 2.5 X 80mm		316 SSS	(3)
	16	16	16	16	16	422271	STUD, TAP END M20 X 2.5 X 80mm		316 SSS	(3)
	16	16	16	16	16	44924	NUT, HEX M20 X 2.5		316 SSS	(3)
	16	16	16	16	16	43253	NUT, HEX M20 X 2.5		316 SSS	(3)
	16	16	16	16	16	44921	WASHER, FLAT M20		316 SSS	(3)
	16	16	16	16	16	43266	WASHER, FLAT M20		316 SSS	(3)
	16	16	16	16	16	422231	STUD, TAP END M20 X 2.5 X 55mm		316 SSS	(3)
	16	16	16	16	16	422232	STUD, TAP END M20 X 2.5 X 55mm		316 SSS	(3)
	16	16	16	16	16	44924	NUT, HEX M20 X 2.5		316 SSS	(3)
	16	16	16	16	16	43253	NUT, HEX M20 X 2.5		316 SSS	(3)
	16	16	16	16	16	423723	WASHER, LOCK M20		316 SSS	(3)
	16	16	16	16	16	12827	WASHER, LOCK M20		316 SSS	(3)
	2	2	2	2	2	422211	STUD, TAP END M20 X 2.5 X 45mm		316 SSS	(3)
	2	2	2	2	2	422212	STUD, TAP END M20 X 2.5 X 45mm		316 SSS	(3)
	2	2	2	2	2	44924	NUT, HEX M20 X 2.5		316 SSS	(3)
	2	2	2	2	2	43253	NUT, HEX M20 X 2.5		316 SSS	(3)
	2	2	2	2	2	423723	WASHER, LOCK M20		316 SSS	(3)
	2	2	2	2	2	12827	WASHER, LOCK M20		316 SSS	(3)
	1	1	1	1	1	71807-#	LINER		316 SSS	(1)
	1	1	1	1	1	VE931	PLUG, PP SO HD 1"MP1		316 SSS	(1)
	1	1	1	1	1	242493	PLUG, PP SO HD 1"MP1		316 SSS	(1)
	1	1	1	1	1	242360	PLUG, PP SO HD 1/2"MP1		316 SSS	(1)
	1	1	1	1	1	242400	PLUG, PP SO HD 1/2"MP1		316 SSS	(1)
	4	4	4	4	4	407073	EYE BOLT, M24		STL	(3)
	1	1	1	1	1	1430	O-RING, 7.0 X 496mm		BUNA-N	(1)
	1	1	1	1	1	143236	O-RING, 7.0 X 705mm		BUNA-N	(1)
	3	3	3	3	3	446	NUT, REGULATOR		316 SSS	(3)
	3	3	3	3	3	492	STUD, TAP END M20 X 150mm		316 SSS	(3)
	3	3	3	3	3	493	NUT, HEX M20 X 2.5		316 SSS	(3)
	3	3	3	3	3	494	WASHER, LOCK M20		316 SSS	(3)



NOTES:

- ① MATERIALS OF CONSTRUCTION:
 - 1 = CAST IRON (FOR VOLUTE & SUCTION CASING ONLY)
 - 2 = CAST IRON (FOR IMPELLER ONLY)
 - 3 = CAST IRON (FOR IMPELLER ONLY)
 - 7 = HI-CHROME (FOR IMPELLER ONLY)
- ② SET IMPELLER CLEARANCE TO 0.035" MAXIMUM. CLEARANCE SHOULD BE CHECKED ALONG ENTIRE IMPELLER EDGE AND AGAIN AFTER ROTATING IMPELLER 1/4, 1/2 AND 3/4 TURNS.
- ③ FASTENER MATERIALS PER APPLICATION
- ④ MATERIAL AND MACHINING PER APPLICATION.

79671-1/ABC 500
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 XX ± .02
 XXX ± .01
 FRACTIONS ± 1/16
 SURF. FINISH: 1.0, .625, .315

79671-1/ABC 500
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 XX ± .02
 XXX ± .01
 FRACTIONS ± 1/16
 SURF. FINISH: 1.0, .625, .315

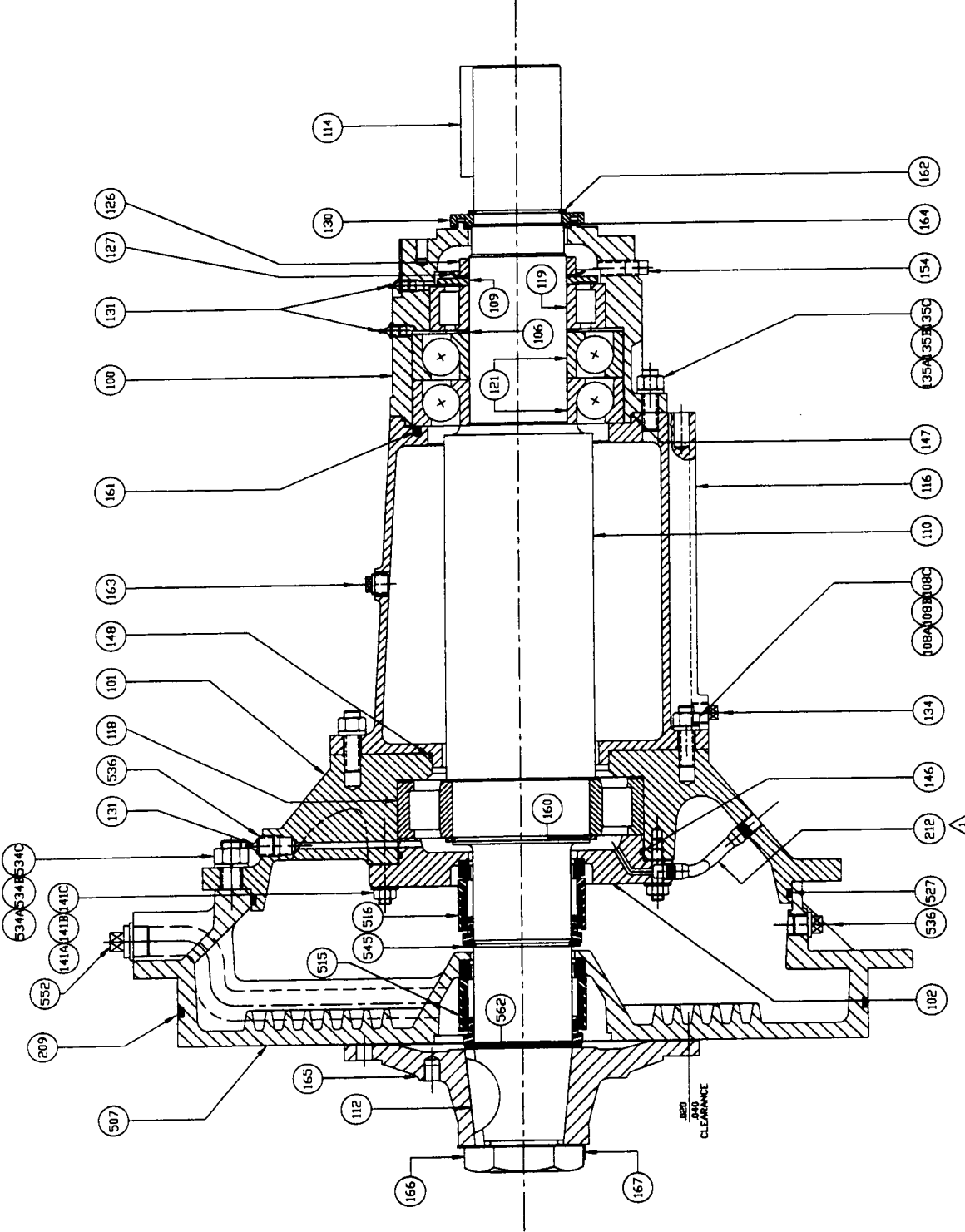
DESCRIPTION	QUANTITY	UNIT	DATE	BY	DATE	BY
REVISION						

WEMCO PUMP
 WET END ASSEMBLY
 LEAK PUMP
 REGULABLE
 VERTICO-HYDRAUSTAL PUMP

SCALE: 1/4"=1'-0"
 NET WEIGHT: 316 SSS
 79671
 79671

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69967

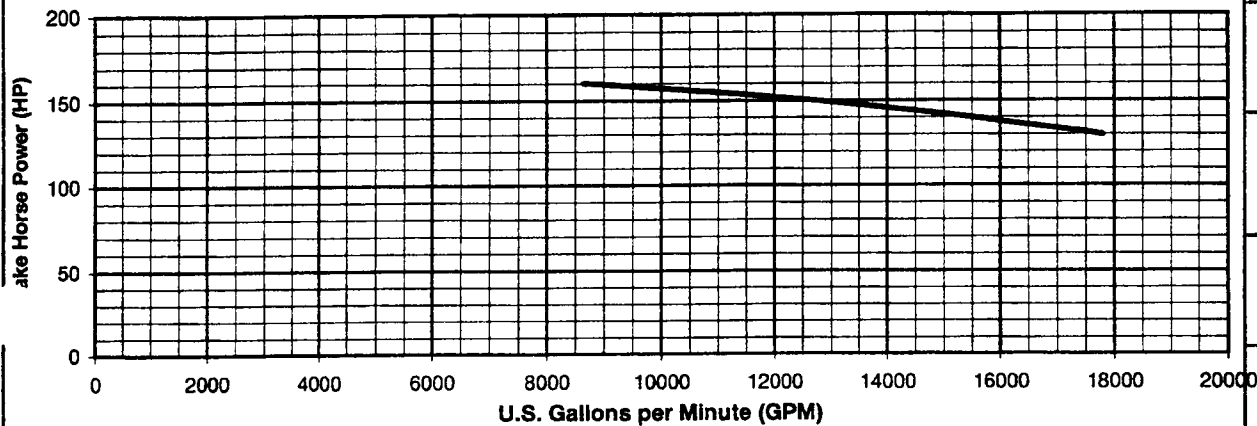
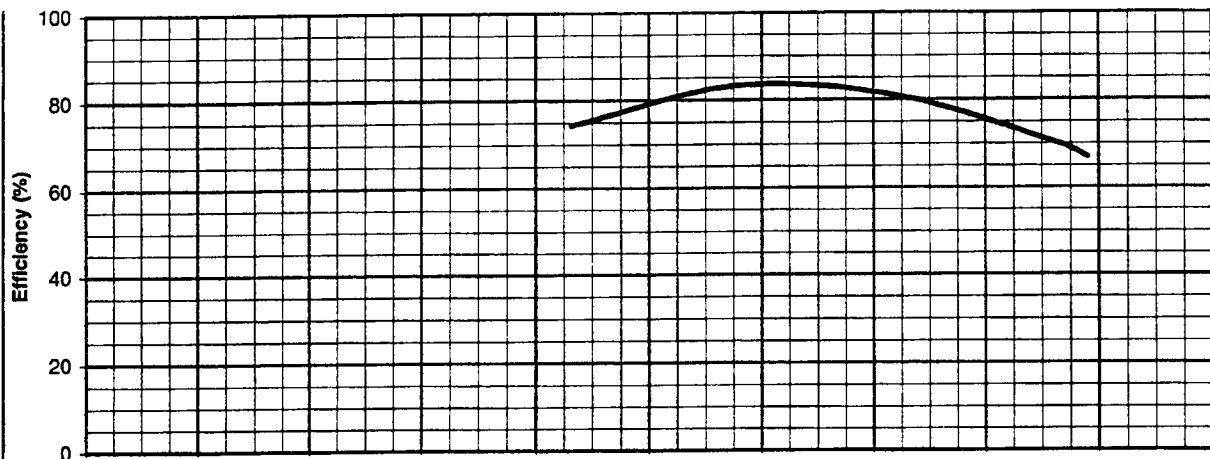
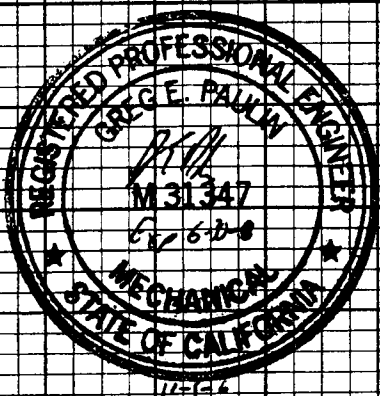
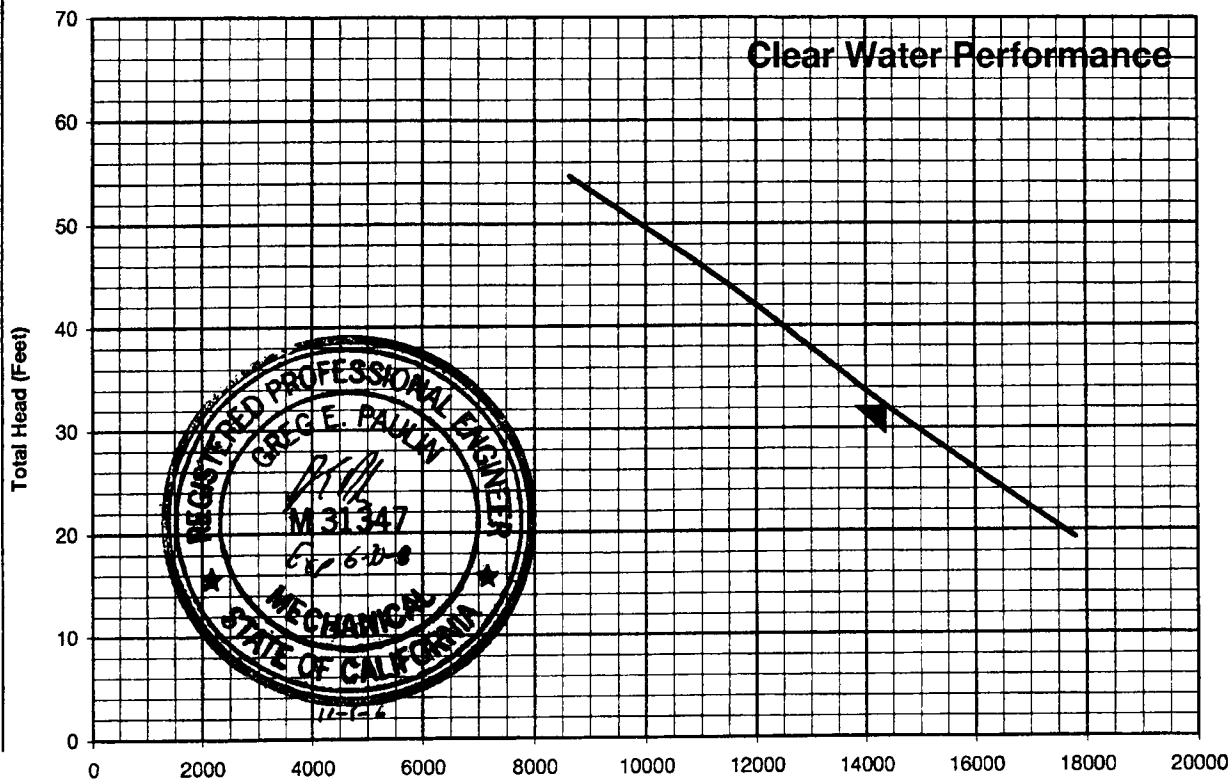


SCALE	D
1/2	
SHEET	2
OF	2
79669-2	
AutoCAD	79669

WEMCO PUMP L20K-SD-L4W



448 W. 800 S. Salt Lake City, Utah 84110
 Phone: (801) 958-8721 Fax: (801) 958-8308



SALES ORDER NO:

DW05771

RPM:

750

Customer: Bowen Engineering Corporation

Customer P.O. 0106056P007

Pump ID

Certified

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BASED ON:

TEST

DATE:

11/1/2006

SERIAL NO.:

06DW05771-04

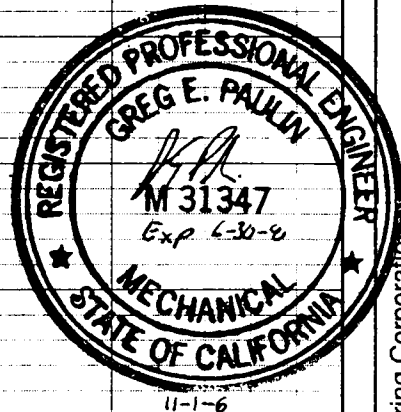
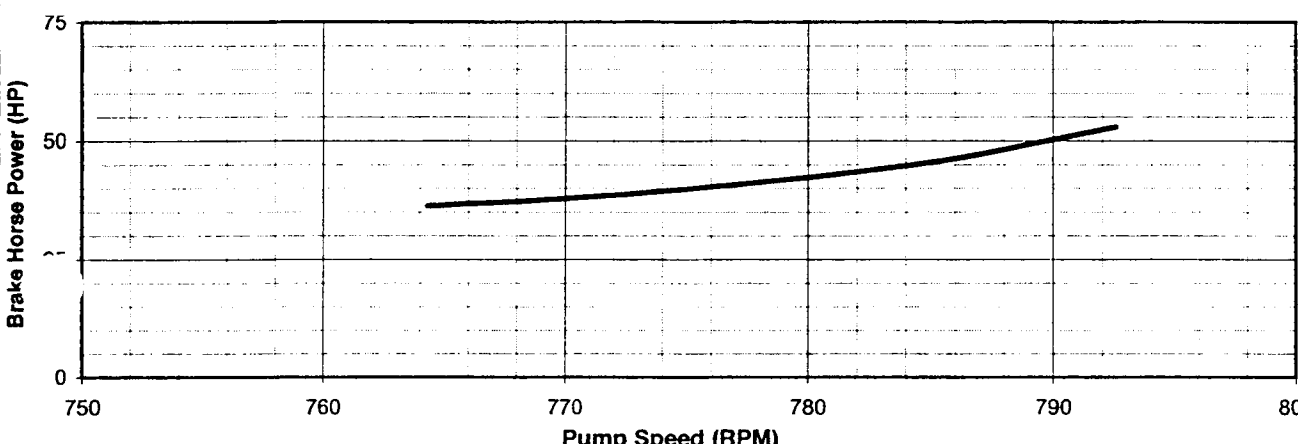
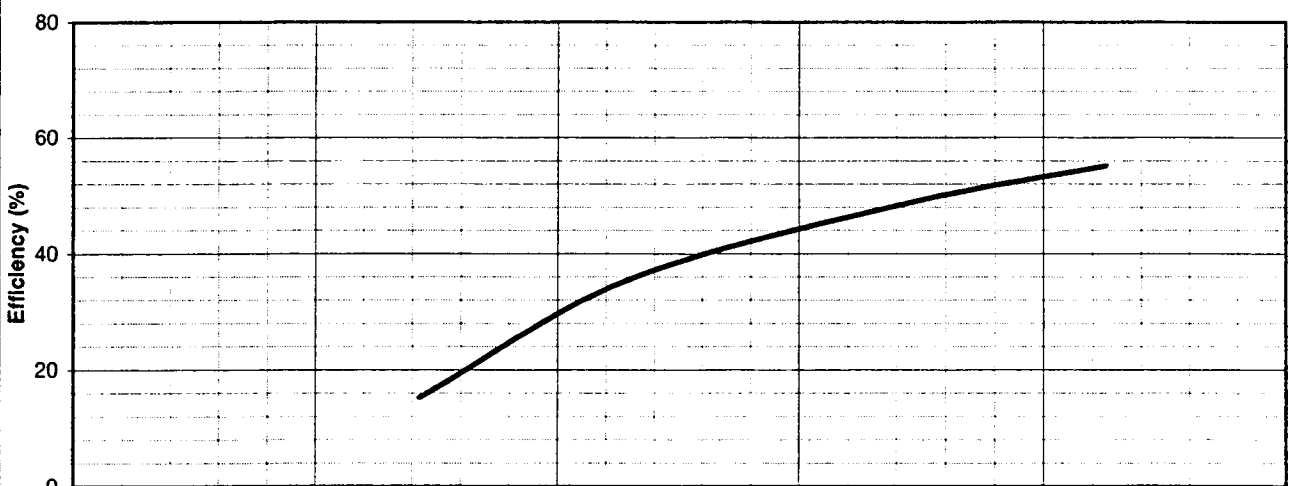
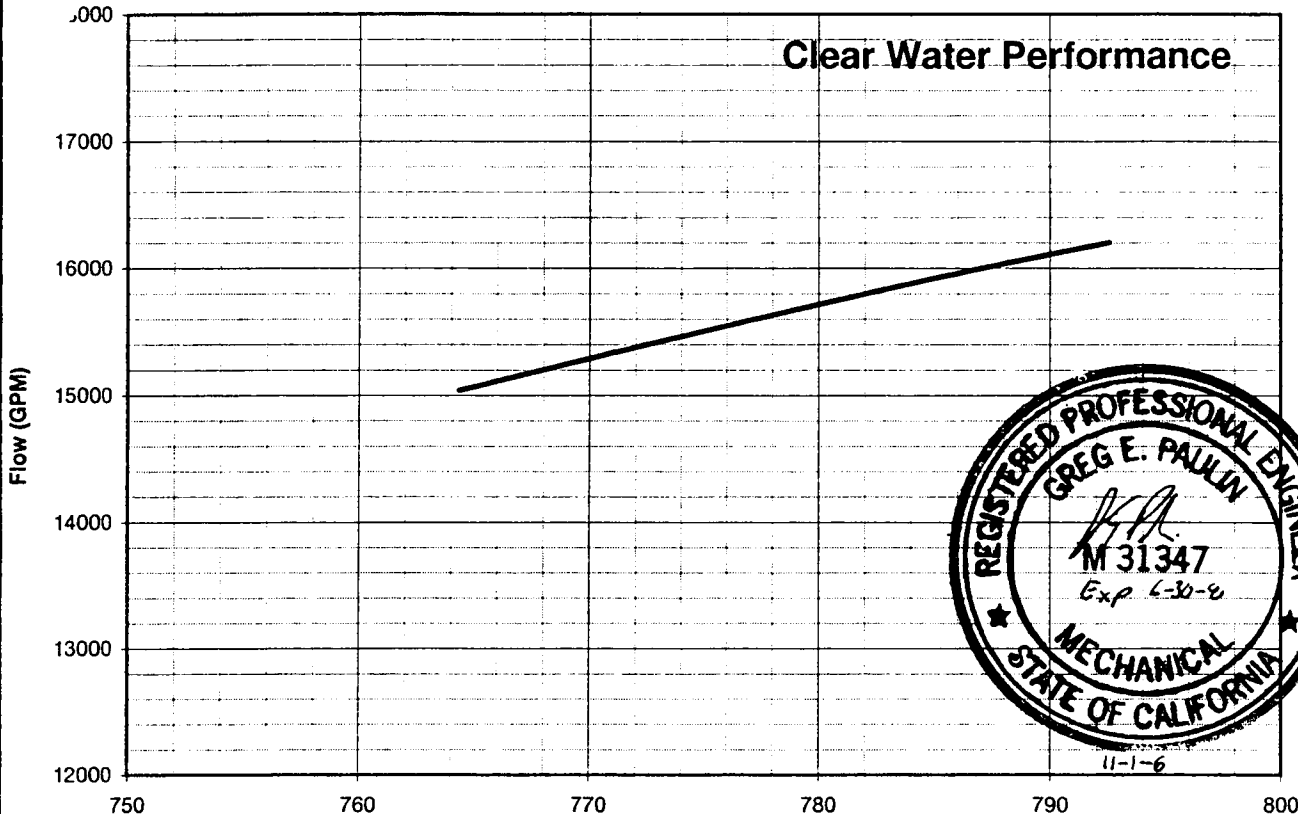
TEST NO.:

14444-1-0

Impeller Type:

HCI

11/06
Richard T. Clark



SALES ORDER NO:
DW05771

RPM:
As Indicated

Customer: Bowen Engineering Corporation
Customer PO: 0106056P007
Pump ID
Certified

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BASED ON:
TEST

DATE:
11/1/2006

SERIAL NO.:
06DW05771-04

TEST NO.:
14444-2-0

Impeller Type:
HCI

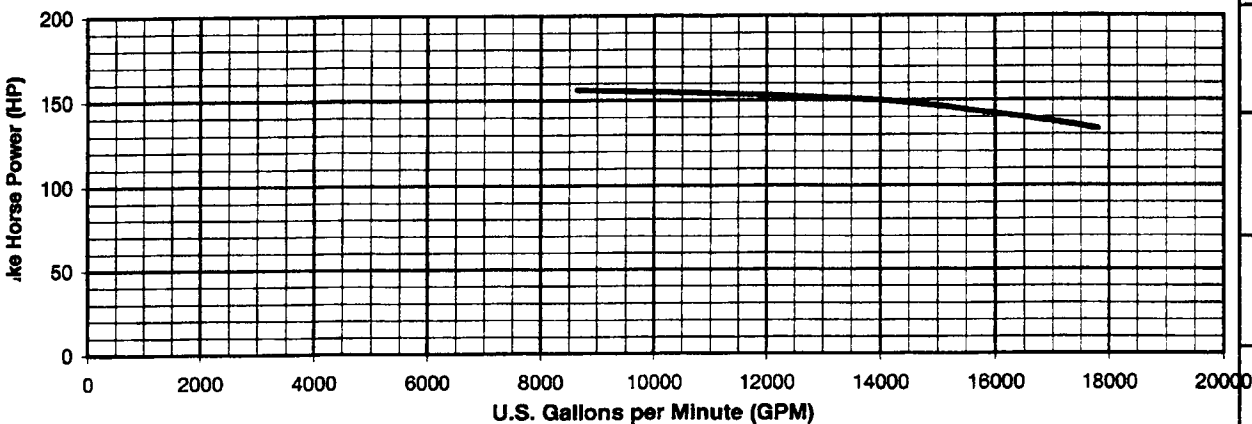
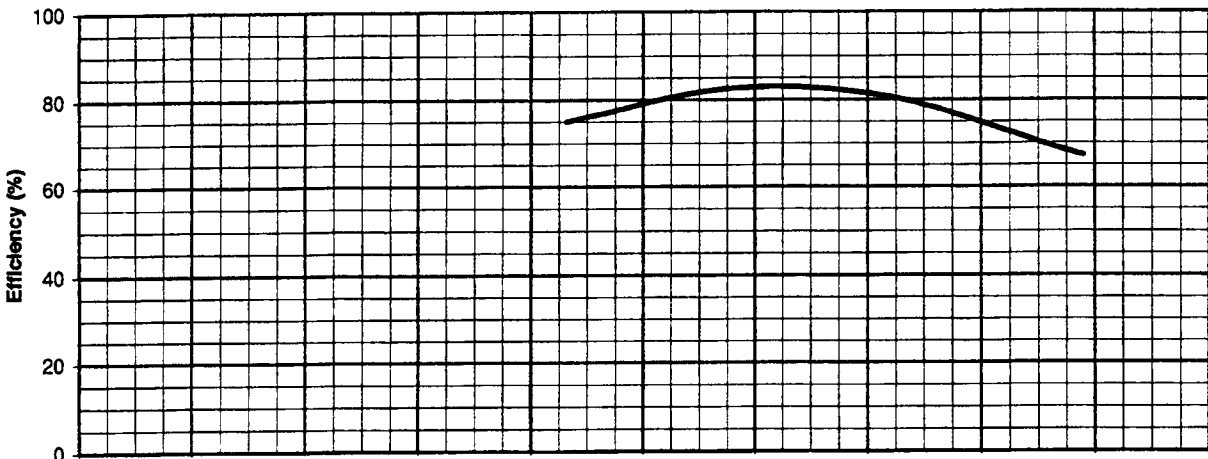
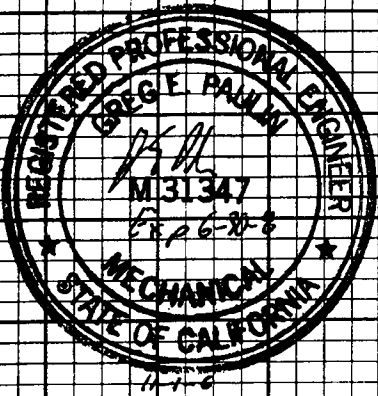
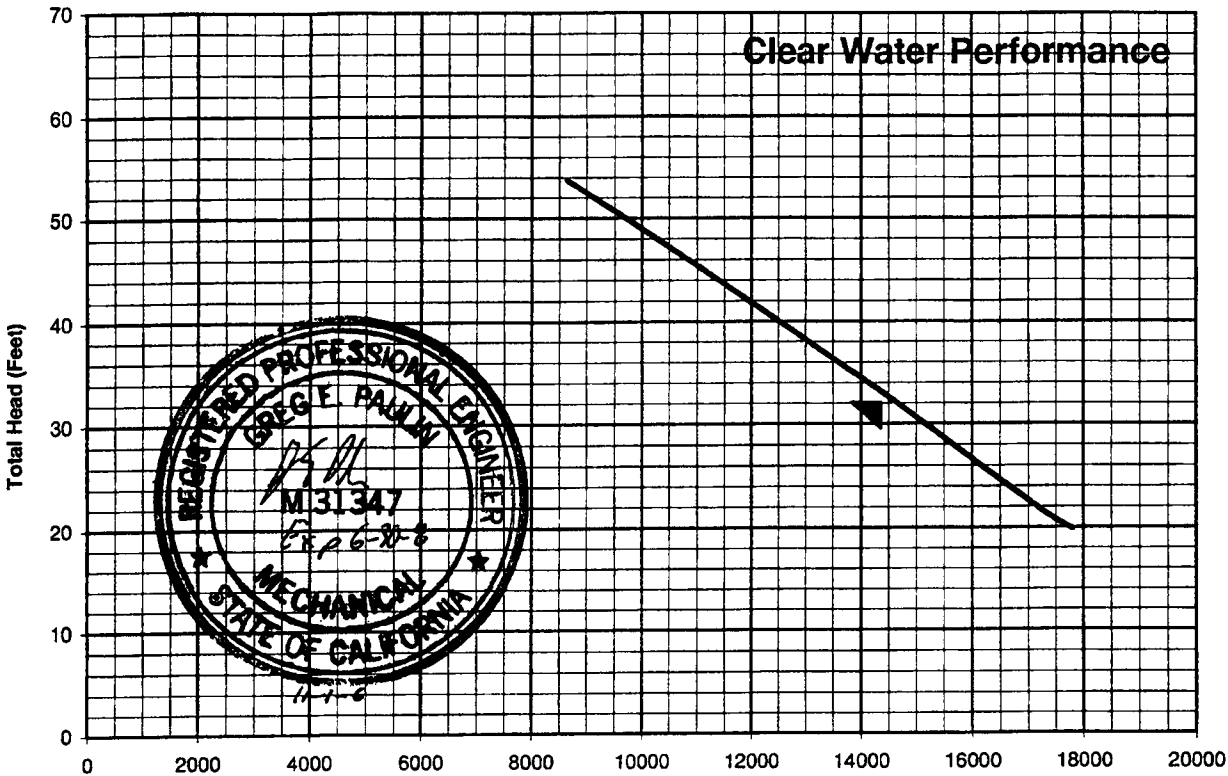


WEMCO PUMP

L20K-SD-L4W



440 W. 800 E. Salt Lake City, Utah 84110
Phone: (801) 329-8781 Fax: (801) 329-8808



SALES ORDER NO:
DW05771

RPM:
749

Customer: Bowen Engineering Corporation

Customer PO: 0106056P007

Pump ID

Certified

Richard C. Clark

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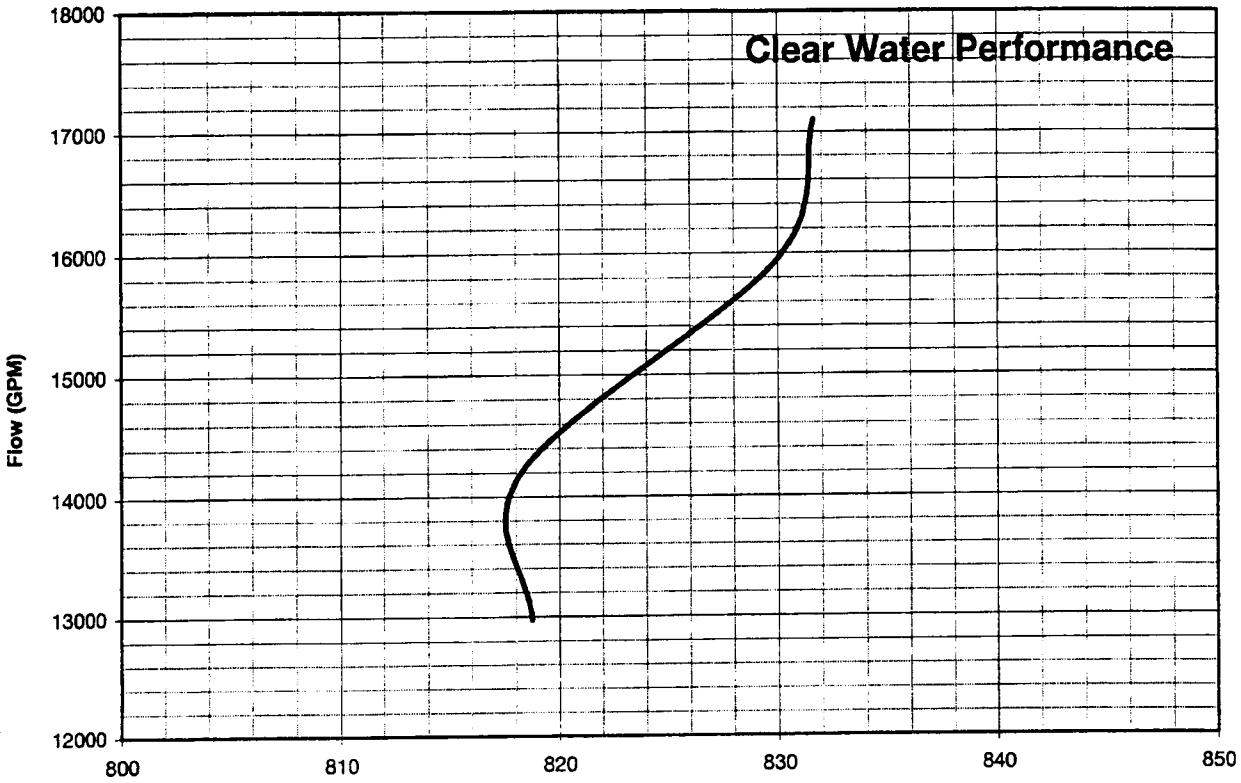
BASED ON:
TEST

DATE:
11/1/2006

SERIAL NO.:
06DW05771-05

TEST NO.:
14445-1-0

Impeller Type:
HCI



SALES ORDER NO:
DW05771

RPM:
As Indicated

Customer: Bowen Engineering Corporation

Customer PO. 0106056P007

Pump ID

Certified

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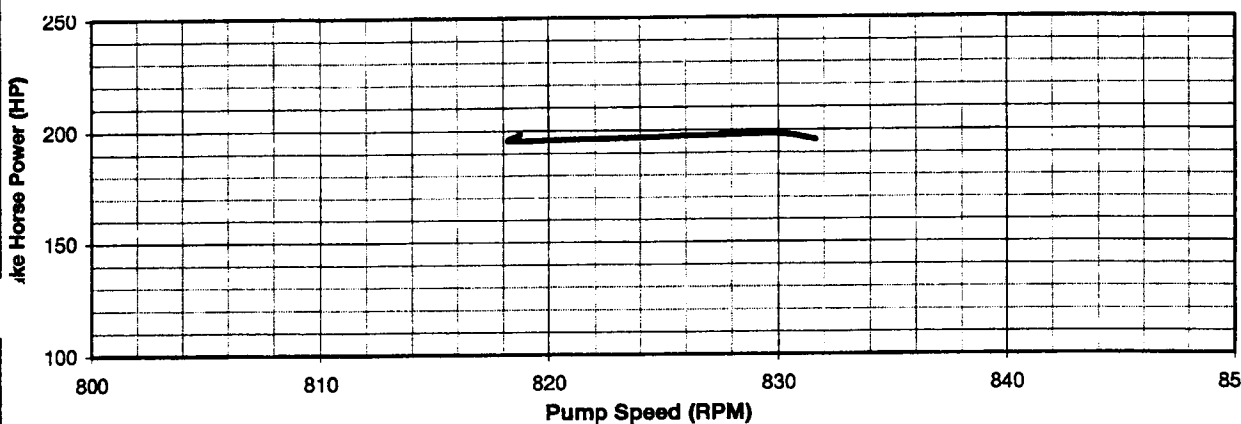
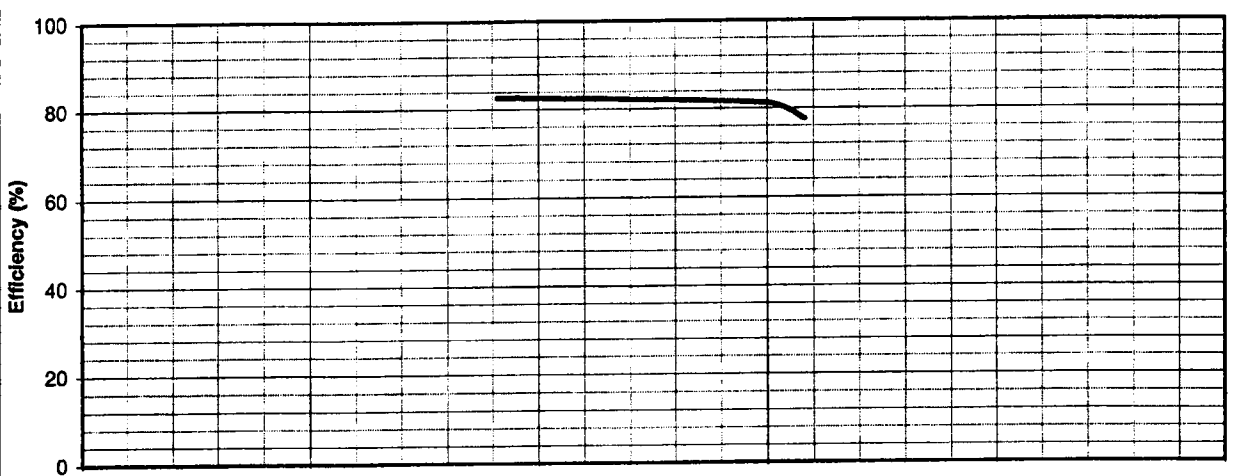
BASED ON:
TEST

DATE:
11/1/2006

SERIAL NO.:
06DW05771-05

TEST NO.:
14445-2-0

Impeller Type:
HCI



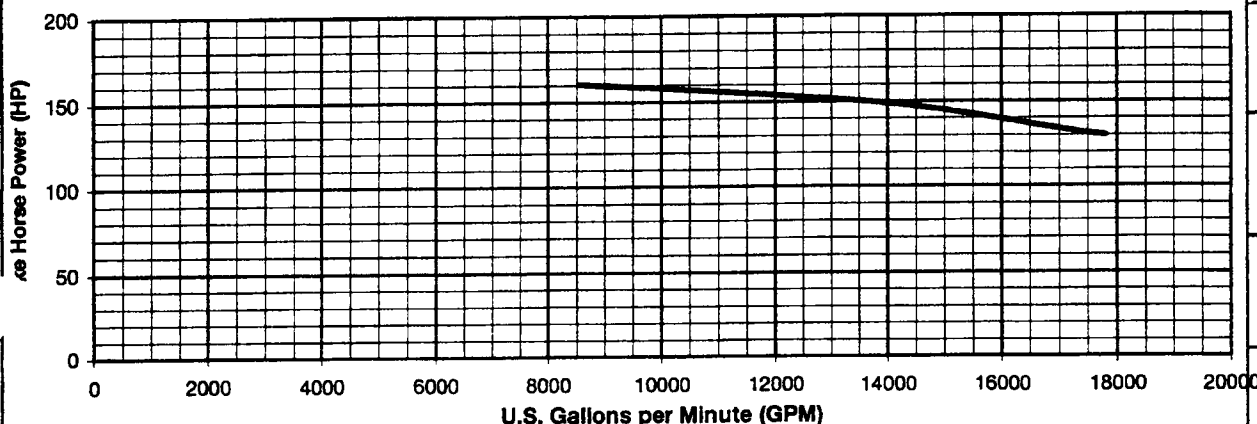
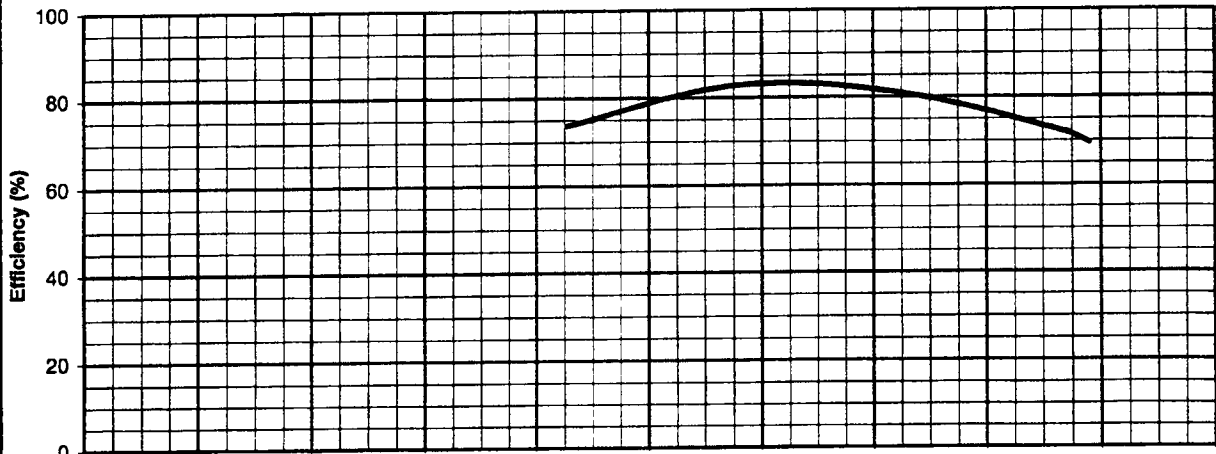
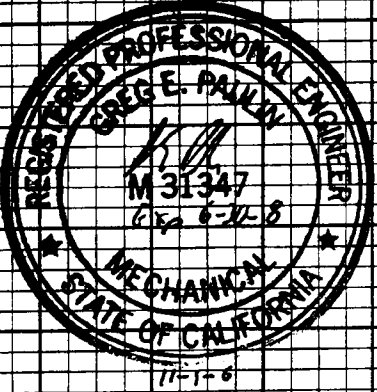
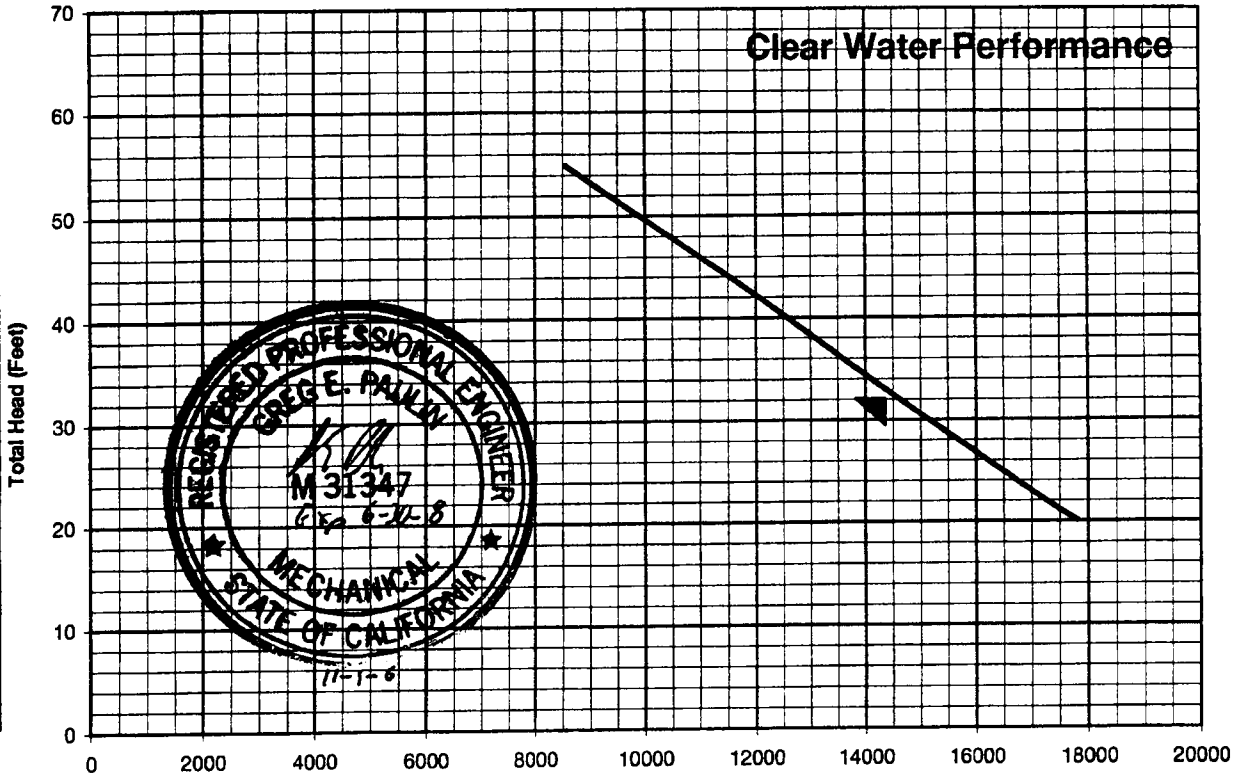


WEMCO PUMP

L20K-SD-L4W



449 W. 800 E. Salt Lake City, Utah 84110
Phone: (801) 856-6731 Fax: (801) 856-8800



SALES ORDER NO:
DW05771

RPM:
750

Customer: Bowen Engineering Corporation
 Customer PO: 0106056P007
 Pump ID: *Richard C. Slane* 11/1/06
 Certified

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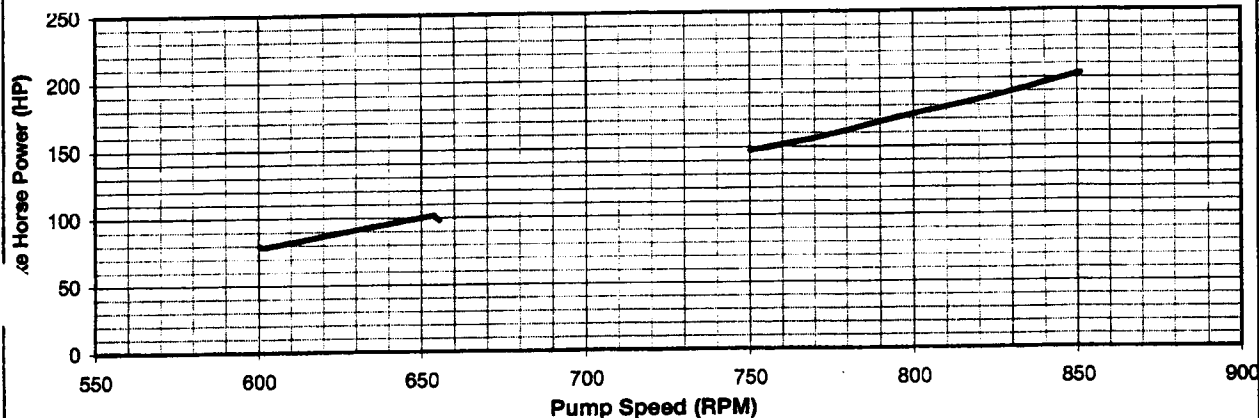
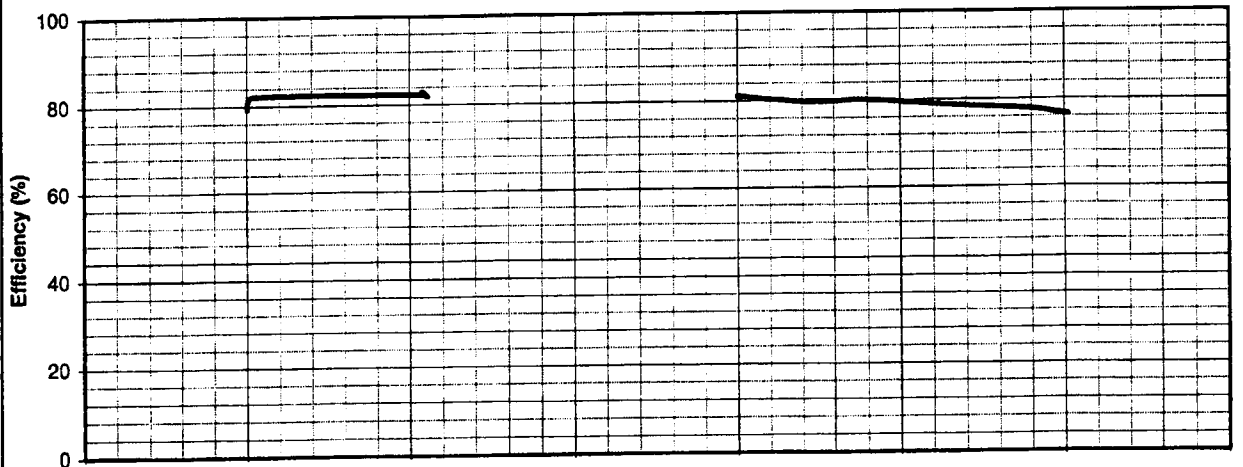
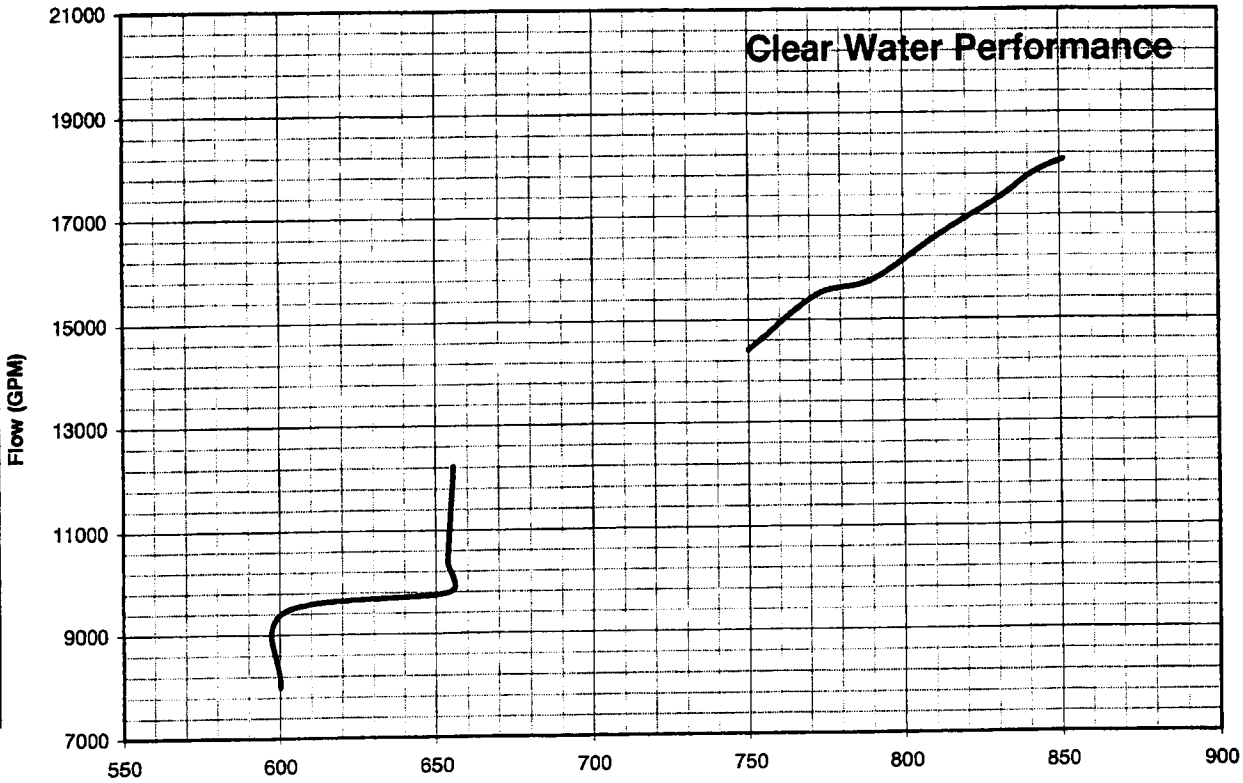
BASED ON:
TEST

DATE:
11/1/2006

SERIAL NO.:
06DW05771-06

TEST NO.:
14446-1-0

Impeller Type:
HCI



SALES ORDER NO:

DW05771

RPM:
As Indicated

Customer: Bowen Engineering Corporation

Customer P.O. 0106056P007

Pump ID

Certified

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BASED ON:

TEST

DATE:

11/1/2006

SERIAL NO.:

06DW05771-06

TEST NO.:

14446-2-0

Impeller Type:

HCI

A
SECTION 2

MAINTENANCE SUMMARY FORM

1. Equipment Item.	20 X 20 MODEL L20K-SD-L4W HIDROSTAL SCREW CENTRIFUGAL PUMPS RAW SEWAGE PUMPS A, B & C
2. Manufacturer.	WEMCO, 440 WEST 800 SOUTH, SALT LAKE CITY, UT 84101, TELEPHONE: (801) 359-8731
3. Equipment Identification Number (s).	SERIAL NUMBERS: 06DW05771-04, -05, -06
4. Total Weight.	APPROXIMATELY 11,000 LBS EACH
5. Nameplate Data (hp, voltage, speed, etc.).	200 HP, 3 PHASE, 60 HZ, 460 VOLT 900 RPM HORIZONTAL MTR COS: 14,400 GPM AGAINST 32' TDH @ 710 RPM
6. Manufacturer's Local Representative.	BL ANDERSON COMPANY 2540 KENT AVENUE WEST LAFAYETTE, IN 47906 TELEPHONE: (765) 463-1518 FAX: (765) 463-5641

7. MAINTENANCE REQUIREMENT

<u>Maintenance Operation</u> List briefly each maintenance operation req'd & refer to specific information in mfr's std. Maintenance manual, if applicable.	<u>Frequency</u> List required frequency of each maintenance operation.	<u>Lubricant (If Applicable)</u> Refer by symbol to lubricant list required.	<u>Comments</u>
Inspect pump for proper operation	Daily	---	Clean/clear as needed
Check seal chamber oil	After 1000 hrs & every 6 months thereafter.	-C-	Increase frequency as experience dictates
Check coupling	Semi-annually	---	Adjust as required
Ch'k bearing housing lubrication	1200 oper. Hrs.	-A-	Grease as required
Check motor for proper operation	Daily	---	Clean/clear as required
Motor lubrication	Semi-Annually	-B-	Lube as required

8. LUBRICANT LIST

Reference Symbol	Shell	Mobil	Texaco	Chevron	Exxon
-A- Bearing Housing		Mobilux EP2	Marafax EP2	Industrial Grease Med.	
-B- Reliance Motor	Dolium R		Premium RB #2	SR 1 #2	Unirex #2
-C- Seal Chamber	Pella A or equal				

9. RECOMMENDED SPARE PARTS

The following are our recommendations regarding what spare parts, if any should be kept on the job.

Quantity	Description	Item Numbers
1	O-Ring	209
1	O-Ring	406
1	O-Ring	409
1	O-Ring	430
1	O-Ring	442
1	O-Ring	527
1	Mechanical Seal X100	515
1	Coupling Sleeve 14E	P/N 254455

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

Weir Specialty Pumps

P.O. Box 209 (84110-0209)
440 West 800 South
Salt Lake City, UT 84101

Tel: 801-359-8731
Fax: 801-530-7531
www.weirsp.com

ISO 9001:2000 Certified • ISO 14001 Certified

WEMCO PUMP
WEMCO-HIDROSTAL
ROTO-JET PUMP

REPRESENTATIVE FOR PARTS & SERVICES

B L ANDERSON COMPANY
2540 KENT AVENUE
WEST LAFAYETTE, IN 47906
TELEPHONE: (765) 463-1518
FAX: (765) 463-5641

**JOB NAME: WATER POLLUTION CONTROL FACILITY IMPROVEMENT – PHASE II
MUNCIE, IN WASTEWATER IMPROVEMENTS – SEWAGE PUMPS
CUSTOMER ORDER NUMBER: LOI 020806
WEMCO ORDER NUMBER: DW05771**

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 parts (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 parts(s) required.

Note: A complete parts list is not available nor is it required. See the "Spare Parts Ordering Instructions": above.

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Solutions

WEIR
CLEAR LIQUID

SAMPLE FORM
GUARANTEE FOR EQUIPMENT ITEM

Project: _____

Owner of Project: _____

Engineer: _____

Equipment Item: _____

Model No.: _____ Serial No.: _____

Manufacturer/Supplier: _____

Address of Manuf./Supplier: _____

Address of Sales Rep.: _____

Contractor: _____

Address of Contractor: _____

The undersigned company guarantees to _____ (Contractor) that the above equipment is of good merchantable quality; free from defects in materials and workmanship; fully meets the type, quality, design, and performance requirements defined in the Contract Specifications of the above project; and that the equipment will, in actual operation, satisfactorily perform the functions for which it has been installed.

The undersigned agrees to repair, replace, or otherwise make good any defect in workmanship or materials in the above described equipment, free of all charges including transportation, which are found to be defective within one year after the date of substantial completion of the work or the date of final acceptance by the Owner, whichever comes first.

This guaranty shall run from the Contractor to the Owner of the above named Project.

Guarantee Starts _____ Guarantee Expires _____

Manufacturer/Supplier

Contractor

Signed by: _____

Signed by: _____

Title: _____

Title: _____

Date: _____

Date: _____

Weir Specialty Pumps

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ISO 9001:2000 Certified • ISO 14001 Certified

WEMCO PUMP 
WEMCO-HIDROSTAL
ROTO-JET PUMP

EMERGENCY SHUT DOWN PROCEDURES

Shut down problem pump, start-up spare pump, being careful to open and close appropriate suction and discharge valves associated with each pump.

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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-HIDROSTAL 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 of 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.**

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

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**

**INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS**

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.**

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.

WARNING

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

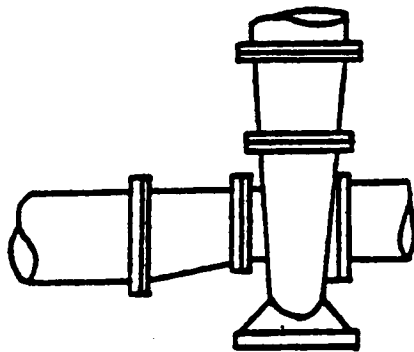


FIGURE 1
Recommended

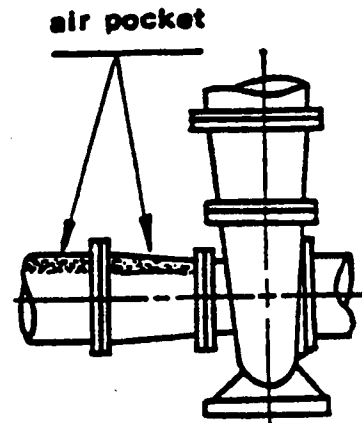


FIGURE 2
Not Recommended

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.

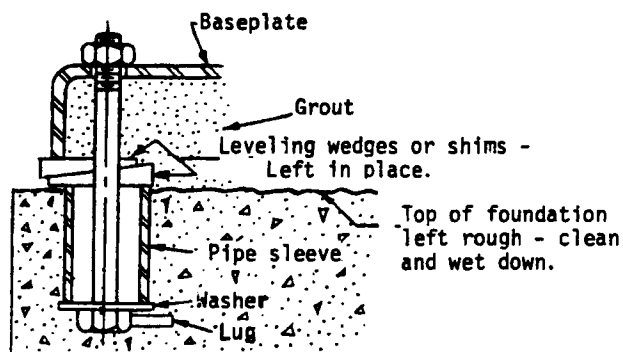
C. Installation on Foundation

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

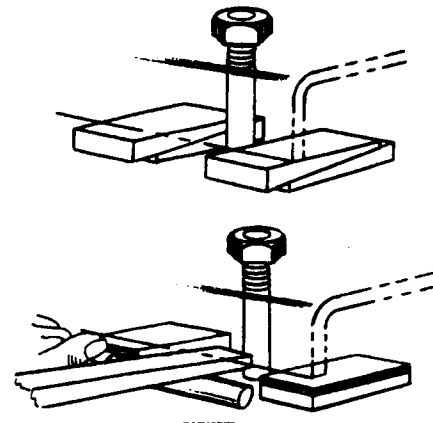
**INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS**

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

WARNING

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°F or less and 10-20 psi over the maximum pump discharge pressure. WEMCO-HIDROSTAL pumps are supplied with various service connections for this purpose. Refer to appropriate "Service Connections" manual and cross sectional drawings for proper connections.

NOTE: 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.

WARNING

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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. CONTACT WITH INCORRECTLY WIRED EQUIPMENT COULD RESULT IN INJURY.

WARNING

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.

VI. OPERATION

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

8. Pump is primed. Hidrostal 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-HIDROSTAL 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.

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.

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

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

this is considered normal. At start-up, skin temperature of the bearing housing may exceed 200°F, but should be under this after a 30-40 hour run-in period. Actual bearing temperature will be 20-30°F 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.

WARNING

**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.

**INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS**

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.

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

WARNING

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.

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

**INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS**

WARNING

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.

**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.

**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-HIDROSTAL PUMP. OPERATING PERSONNEL MUST READ AND UNDERSTAND THE START-UP AND OPERATION PROCEDURES.

I. SERVICE CONNECTIONS

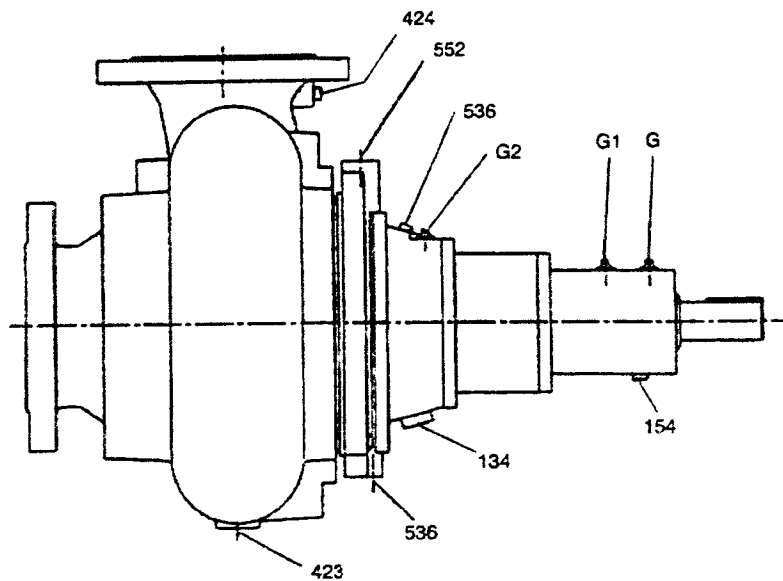


FIGURE 1. Refer also to bearing frame cross section drawing.

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.

INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME

Oil Lubricated Mechanical Seal: These pumps are supplied with mechanical seals of the tandem design. The sealing faces are carbon/ceramic for the outboard seal, and tungsten carbide/silicon carbide for the inboard 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
D0W	3/4	*	*	1/4	1/2	1/2	R1/4
E2W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
F2W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
H2W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
H4W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
I4W	1	1/4	1/4	1/4	1/2	1/2	R1/4
L4W	1	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

**INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME**

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 outboard (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 inboard (lower) 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.

NOTE: 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 Hidrostal factory uses the following oil:

MOTOREX 155
Flame point min. 132°C
Specific Gravity: at 20°C: 0.812
Maximum viscosity at 40°C: 3.52 centistoke
Viscosity at 20°C: 6.75 centistoke
Solidification Point: -38°C

Recommended oil in U.S.A.:

SHELL PELLA (A) OIL,
MOBIL VELOCITE #6
GULF MINERAL SEAL OIL 896,

or equal with same specifications as above.

INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME

Bearing Frame	Oil Quantity
D0W, E2W	4 L (1 Gal.)
F2W	7.5 L (1.4 Gal.)
H2W, H4W	14 L (3.7 Gal.)
I4W	22 L (5.8 Gal.)
L4W	34 L (9 Gal.)

Note: 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°F or more. Bearings are lubricated at the factory with the following type of grease. Use this type, or equivalent, for greasing:

Mobilux EP No. 2 or
Chevron Industrial Grease Medium
Shell Dolium R

C. LUBRICATION PROCEDURE (Refer to service connections drawing, Figure 1.)

Bearing Frame D0W: Lubricate only grease fitting G2. (The outboard bearing is permanently lubricated for the life of the bearing).

Bearing Frame E2W: Lubricate grease fittings G1 and G2.

**WEMCO
DATA SHEET**

**WEMCO-HIDROSTAL PUMPS
BEARING FRAME MODELS, K LINE**

P25-D305C

Rev. 0
Supersedes P25-D305

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**INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME**

Bearing Frames F2W, H2W, H4W, I4W, L4W:

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
DOW	1500	4000	None	14
	1800	3400		14
E2W	1500	2800	25	15
	1800	2300	25	15
F2W	1800	650	40	10
H2W	1200	3800	40	42
	1500	2700	40	42
H4W	1500	530	95	10
	1800	380	95	10
I4W	1200	770	95	15
L4W	800	1200	73	73
	900	1070	70	70

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

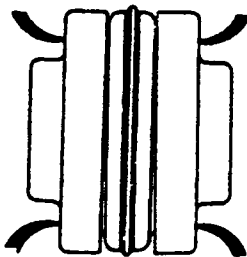
INSTALLATION, OPERATION AND MAINTENANCE
COUPLING ALIGNMENT – DIRECT DRIVE MODELS

WARNING

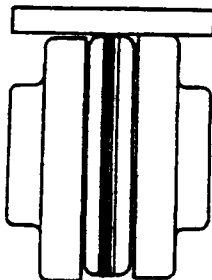
ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED COUPLINGS COULD RESULT IN INJURY.

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

**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, J, L 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 L8) 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 E4K 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 of the treaded 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.

INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END

TABLE A

PUMP TYPE	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	
E4K	0.35	.014	0.60	.024	1/3
E5K	0.4	.016	1.12	0.44	2/3
E8K- LS/LL			1.55	.061	1
E8K- HD/SS			0.68	.027	1/2
F4K			1.40	.055	1
F6K	0.5	.020	1.93	.076	1-1/3
F10K			0.85	.033	1/2
H5K			1.67	.066	1-1/6
H8K	0.6	.024	2.32	.091	1-1/2
H12K			1.02	.040	2/3
I6K			2.09	.082	1-1/3
I10K			2.90	.114	2
I16K	0.75	.030	1.28	.050	5/6
L8K			2.51	.099	1-2/3
L12K			3.48	.137	2-1/3
L20K	0.9	.035			

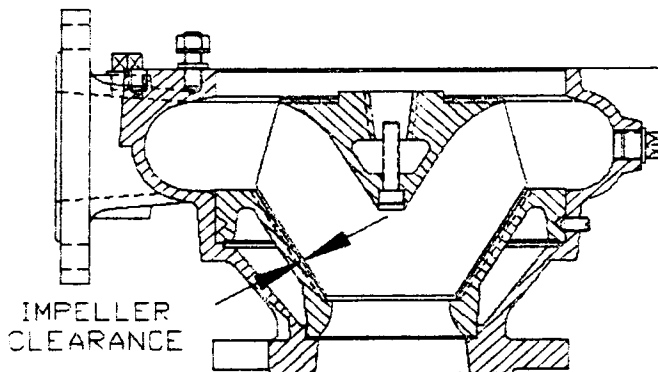


FIGURE 1

NOTE: Clearance should be checked along entire impeller edge and again after rotating impeller 1/4, 1/2, and 3/4 turns.

INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END

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 vise grip 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:	<u>E</u>	<u>F</u>	<u>H</u>	<u>I</u>	<u>L</u>
Wrench size:	10mm	14mm	19mm	27mm	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

INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END

casing only if badly damaged by unusual circumstances. Press out suction ring with a hydraulic press.


NOTE: F4K, H5K, I6K, and L8K pumps will not have a suction ring (the necessary lip is cast directly into the liner). Also, E4K 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	L
Torque (ft-lb):	60	90	250	350	350



Note: 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.

INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END

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.

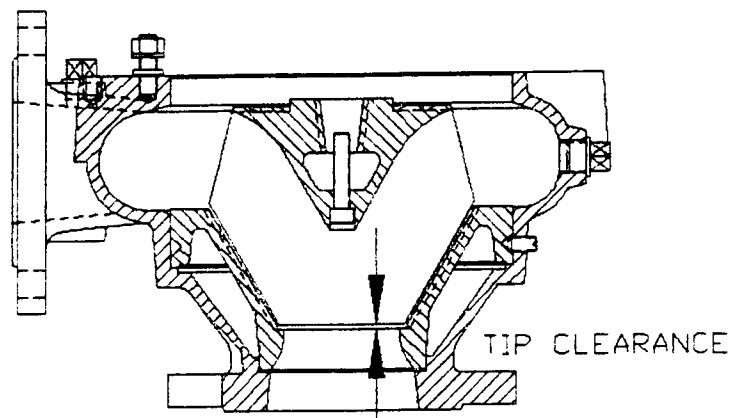


FIGURE 2

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

Refer to Drawing 71378 (I4W), 79669 (L4W)

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.
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. Remove the woodruff key (112) and seal retaining snap ring (562) from the shaft. Check for and remove any burrs on the edge of the snap ring groove and along the woodruff key slot to avoid damage to the seal o-ring.
5. Loosen the three set screws in the rotating part of the seal (515). Gently pry the rotating part of the seal from the shaft with two screwdrivers on opposite sides of the lip where the set screws are located. Lubrication of the shaft under the seal helps this disassembly.
6. Place the bearing frame in a vertical position, with blocks under the back cover on either side of the shaft for stability. The bearing frame is best handled in this position with a lifting eye bolt screwed into the drive end of the shaft (M20 screw size).
7. Unfasten nuts (534) and carefully lift the shaft and bearing frame assembly out of the back cover (507). Make sure that the stationary part of the seal is not damaged by contact with the shaft.
8. Press out the seal 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. Assemble back cover (507) to bearing frame (101), and fasten 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 oil, and press it all the way into its seat in the back cover (507). 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 PIPE WHILE PROTECTING THE SEAL FACE WITH CARDBOARD RING.

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. Check to make sure that the o-ring is in place inside the rotating part of the seal, and that it is not damaged. Lubricate the o-ring with oil, and slide the rotating assembly onto the shaft, pushing it up as far as possible by hand.
6. Place the snap ring (562) on the shaft. With a sleeve or pipe, push the seal assembly (515) onto the shaft until the snap ring is engaged in its groove. Tighten the set screws in the rotating part of the seal.
7. Turn the shaft by hand. The seal housing should turn evenly, with little runout.
8. 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.

9. 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 1. The acceptable clearance range is .030 to .040". 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 .030" from the actual clearance measured, rounded to the nearest common shim stock size.

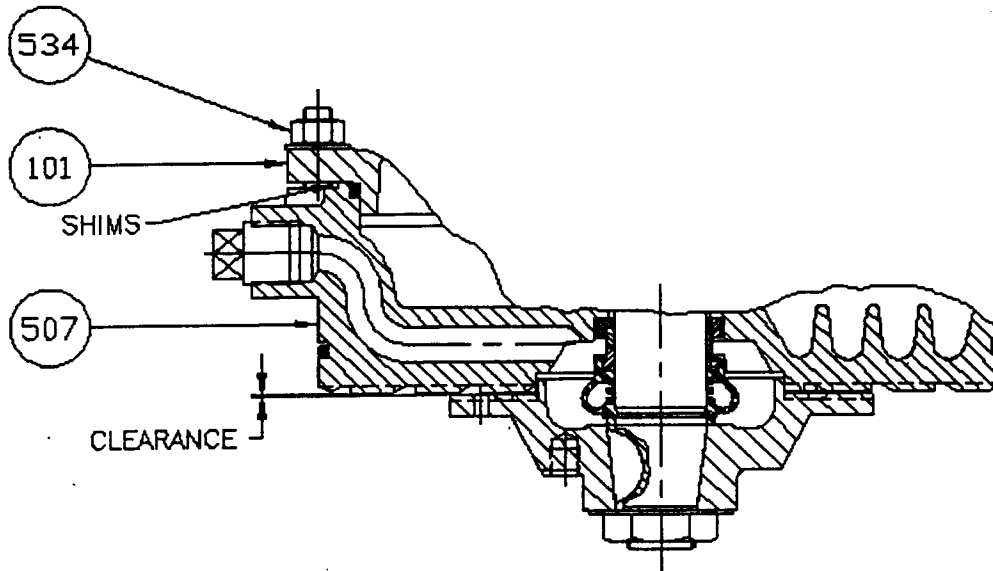


FIGURE 1

10. 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. With the bearing frame in a horizontal position, remove the snap ring (545), and remove any burrs from the edges of the groove.
2. Loosen the set screws on the rotating part of the seal (516), then grasp the seal and slide it from the shaft. (It may be necessary to pry the seal at the lip where the set screws are located, as was done with the lower seal.)
3. Disconnect one end of the seal drain tube assembly (212).
4. Loosen nuts from fastening studs (141), and remove bearing cap (102), taking care not to damage stationary seal ring by contact with shaft.
5. 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 oil, and press it all the way into its seat in the bearing cap (102). The seal should sit firmly at the bottom of the seat bore.
3. Reinstall bearing cap (102), tighten fasteners (141), and re-connect seal drain pipe assembly (212).
4. Check to make sure that the o-ring is in place inside the rotating part of the seal, and that it is not damaged. Lubricate the o-ring with oil, and slide the rotating assembly onto the shaft, pushing it up as far as possible by hand.
5. Place the snap ring (545) on the shaft. With a sleeve or pipe, push the seal assembly (516) onto the shaft until the snap ring is engaged in its groove. Tighten the set screws in the rotating part of the seal.

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

III. BEARING FRAME DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

A. Disassembly

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

1. Place the bearing frame in a vertical position, stabilized on blocks supporting the bearing frame on either side of the shaft.
2. Remove fasteners (134) joining the bearing support (101) and the intermediate frame (116). Lift the shaft assembly up out of the bearing support.
3. Install jacking screws in the backside of the bearing support (101) and push the outer race of the bearing (118) out of its bore.
4. Remove the snap ring (160) from the shaft, and pull the inner race of the pumpside bearing (118) from the shaft with a bearing puller.
5. Re-support the shaft assembly in the vertical position with blocks under the intermediate frame (116). Remove the snap ring (162) at the drive end of the shaft, then the labyrinth (130) and o-ring (164).

6. Loosen fasteners (135), and pull the drive bearing cap from the shaft (110). Small wedges or screwdrivers may be required, as this part has a tight fit. Save any shims that may be between this cap and the bearing frame.
7. Lift the shaft assembly up out of the bearing housing (101).
8. Remove the preload springs (161) from end of bearing frame, making sure none are lost.
9. On the shaft assembly, bend bearing lockwasher tab (127) away from locknut (126) and remove locknut, lockwasher, and bearing grease retainer (109) from the shaft.
10. Protect the seal mounting surfaces with duct or electrical tape. The drive (119) and thrust (121) bearings, with the bearing spacer (106) can now be removed from the shaft with a hydraulic press.

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. Place thrust bearing (121) on bearing heater and heat to 150°F. With hot pads, place the bearing on the shaft with the thinner edge of the inner race facing the shaft shoulder. Repeat for second thrust bearing, installing with the same orientation.
3. Install bearing spacer (106) on shaft (110) drive end, next to thrust bearings (121). Heat inner race of drive bearing (119) to 150°F, and install with lip against spacer (106).
4. When the bearings have cooled to under 100°F, hand pack the bearings (121) with Chevron Industrial Grease Medium (No. 2) or equivalent. Place outer race of drive bearing (119) onto inner race, and pack with the same grease.
5. 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.
6. Support the intermediate frame (116) vertically with the drive end up. Place thrust bearing preload springs (161) into holes in drive end of support frame. A spot of grease on each spring is helpful to hold them in place during installation.

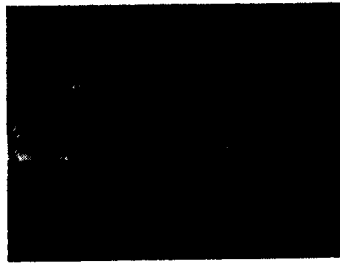
7. Slide shaft assembly into bearing frame (101) from the drive end. Make sure the springs (161) are properly seated in their holes.
8. Place o-ring (147) on register of bearing cap (100), and slide bearing cap into place over shaft, with the grease fittings facing the top of the bearing frame (toward name plate). Tighten fasteners (135) finger tight only at this time.
9. Place inner race of pumpside bearing (118) on a bearing heater to expand the race. Heat the inner race to approximately 150°F and with hot pads place the bearing race on the shaft (110). Install snap ring (160) to hold it in place.
10. Place bearing housing (101) in a vertical position with the pump side facing up. Place outer race assembly of the 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.

11. Turn bearing housing (101) over, with the pump side facing down. Place a new o-ring (148) on the register of the intermediate frame (116), and install the shaft assembly into the bearing housing. If the pump will be installed horizontally, make sure that the bearing housing is oriented so that the upper seal drain tube (112) will exit at the bottom of the housing when installed. Tighten fasteners (108).
12. 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.
13. Set the bearing end play as follows: Evenly tighten fasteners (135) until drag on the shaft is felt. Measure the gap between the bearing cap (100) and support frame (116) with feeler gages at three locations around the cap. Take the average of the readings and add .008". Round up to next common size shim thickness. The result is the thickness of shims to be added. Place shims at each fastener (135) between the cap and bearing frame, and tighten fasteners securely. Recheck free shaft rotation.

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



WARRANTY

Job Name MUNCIE,IN RAWSEWAGE PUMPABC

Customer Order Number 0106056P007

WEMCO Order Number DW05771

WEMCO® pumps and pump equipment are backed by the following warranty:

For the benefit of the original user, WEMCO PUMP™ warrants all new equipment to be free from defects in workmanship; and will replace or repair, at its discretion and F.O.B. its factories or other location designated by it, any part or parts returned to it which WEMCO PUMP's™ examination shall show to have failed under normal use and service by the original user within ~~one year following initial shipment to the purchaser.~~ Such repair or replacement shall be free of charge for all items except for those items that are consumable and normally replaced during maintenance. Repair or replacement of such consumable items shall be subject to pro-rata charge based upon WEMCO PUMP's™ estimate of the percentage of normal service life realized from the item. WEMCO PUMP's™ obligation under this Warranty is conditioned upon its receiving prompt notice of claimed defects which shall in no event be later than thirty (30) days following expiration of the above warranty period and is limited to repair or replacement as aforesaid.

THIS WARRANTY IS EXPRESSLY MADE BY WEMCO PUMP™ AND ACCEPTED BY PURCHASER IN LIEU OF ALL OTHER WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, WHETHER WRITTEN, ORAL, EXPRESS, IMPLIED, OR STATUTORY. WEMCO PUMP™ NEITHER ASSUMES, NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT, ANY OTHER LIABILITIES WITH RESPECT TO ITS EQUIPMENT INCLUDING NEGLIGENCE IN DESIGN OR MANUFACTURE. WEMCO PUMP™ SHALL NOT BE LIABLE FOR NORMAL WEAR AND TEAR NOR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE DUE TO USE OR IN OPERABILITY OF ITS EQUIPMENT FOR ANY REASON WHATSOEVER.

This Warranty shall not apply to equipment or parts thereof which have been altered or repaired outside of an authorized WEMCO PUMP™ facility or factory, or damaged by improper installation or application, or subject to misuse, abuse, neglect or accident.

This Warranty applies only to WEMCO® pumps and pump equipment manufactured and sold by Weir Specialty Pumps.

WEMCO PUMP™ makes no warranty with respect to parts, coatings, accessories, or components manufactured by others. The warranty which applies to such items is offered by their respective manufacturers except that WEMCO PUMP™ does warrant that any special coatings have been applied in accordance with their respective manufacturer's recommendations.

Signature: 
Eric Tobin - Applications Engineer


± 3 years, prorated from 3-5 years.

Date: 6/27/06

WEMCO PUMP™



PRODUCTS OF Weir Specialty Pumps
A Weir Group Company

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GSD-31 4/01 (Mod.)

A
SECTION 3

WOOD'S COUPLING SELECTION

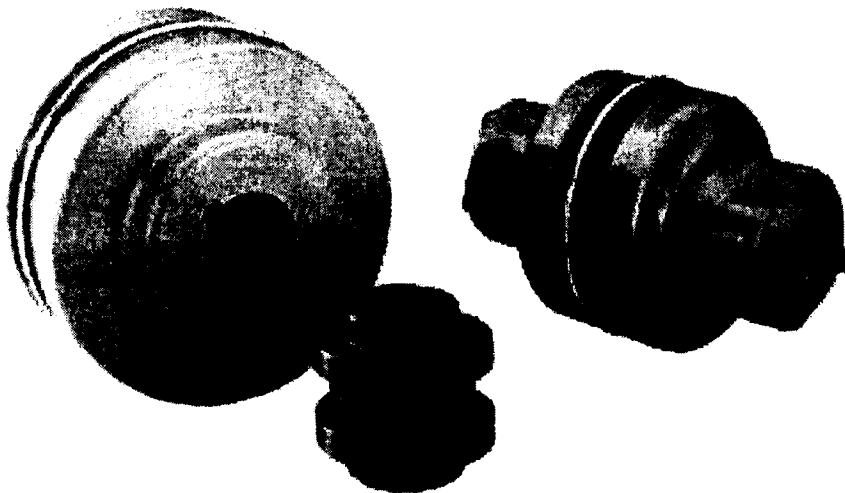
Alt	Part Number	Description	Qty/Per	UM	ITEM#
Bom					ON DRAW
	257066	FLANGE,CPLG.WOODS 14SC78 C	1.	EA	604
	257066	FLANGE,CPLG.WOODS 14SC78 C	1.	EA	605
	254455	SLEEVE,WOODS 14E (EDPM)	1.	EA	606
	258092	HUB,CPLG.WOODS 14H, 90MM BORE	1.	EA	654
	258090	HUB,CPLG.WOODS 14H, 3 3/8 BORE	1.	EA	655

SURE-FLEX®

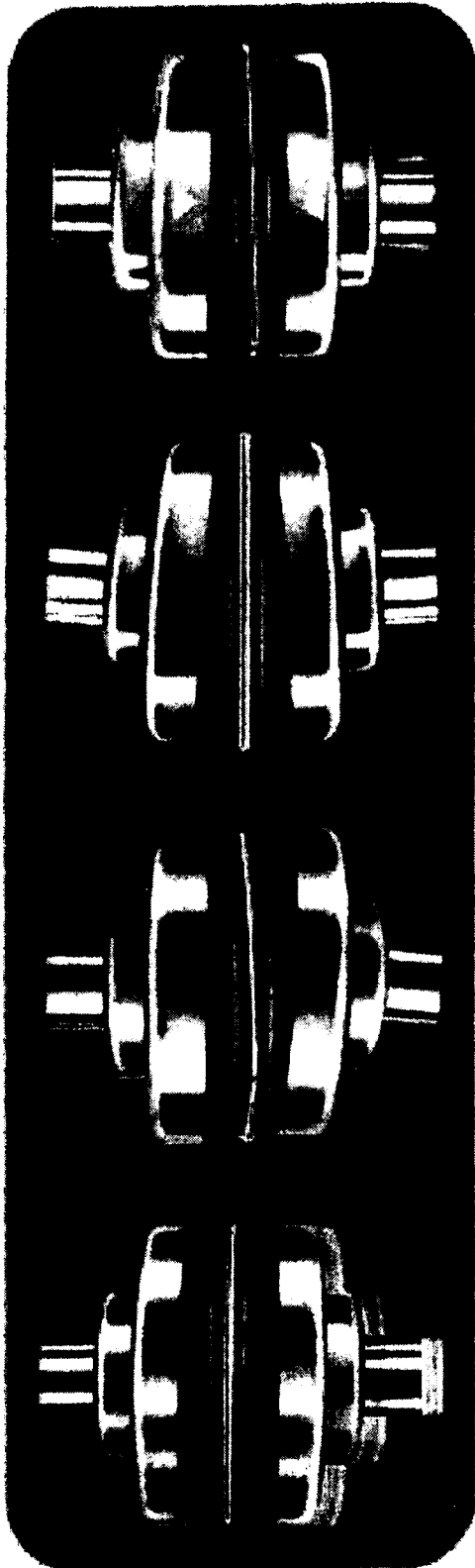
ELASTOMERIC

COUPLINGS

- **Need No Lubrication, No Maintenance**
- **Quick, Easy Installation**
- **Clean, Quiet Performance**



4-WAY FLEXING ACTION absorbs all types of shock, vibration and misalignment



TORSIONAL

Sure-Flex coupling sleeves have an exceptional ability to absorb torsional shock and dampen torsional vibrations. The EPDM and Neoprene sleeves wind-up approximately 15° torsionally at their rated torque. Hytrel sleeves will wind-up about 7°.

ANGULAR

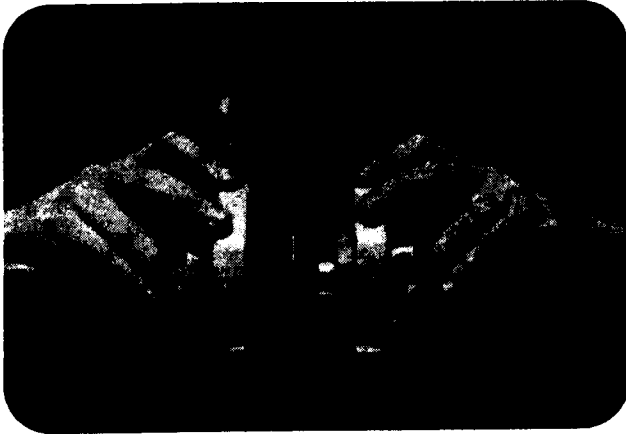
The unique design of the Sure-Flex coupling's teeth allows for the absorption of angular misalignment without wear. Refer to page F1—18 for actual allowable misalignment limits. These limits allow for the alignment of the coupling using only a scale and calipers.

PARALLEL

Parallel misalignment is absorbed without wear or appreciable energy losses. The lateral flexibility of the coupling sleeve minimizes radial bearing loads normally associated with parallel misalignment. This feature also allows for easier installation by the use of components bored for slip fits without fretting corrosion occurring at the shaft. Refer to page F1—18 for parallel misalignment limits. Only a straight-edge and feeler gage are required to obtain these limits.

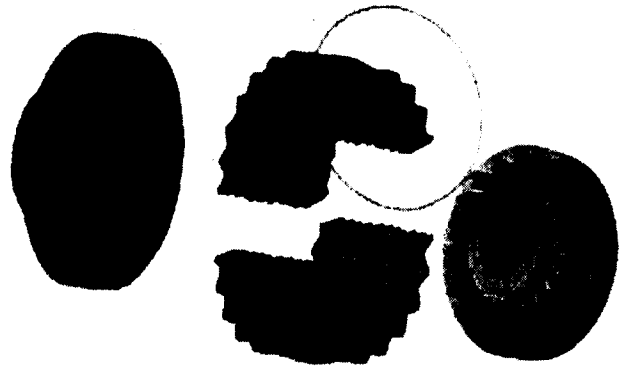
AXIAL

Sure-Flex couplings may be used in applications with limited axial shaft movements. The axial compressibility of the EPDM and Neoprene sleeves allows for shaft end-float without the absolute transfer of thrust loads.



EASY, QUICK INSTALLATION

Sure-Flex can be installed quickly and easily, because there are no bolts, gaskets, covers or seals. Alignment can be checked with a straightedge placed across the outside of the precision-machined flanges. No special tools are needed for installation, alignment or removal.



NO LUBRICATION, TROUBLE-FREE OPERATION

The teeth of the sleeve lock into the teeth of the flanges without clamps or screws, tightening under torque to provide smooth transmission of power. There is no rubbing action of metal against rubber to cause wear. Couplings are not affected by abrasives, dirt, or moisture. This eliminates the need for lubrication or maintenance, provides clean, dependable, quiet performance.

SURE-FLEX SELECTION

Sure-Flex couplings are selected as component parts.

1. Determine SLEEVE material and type.
Refer to pages F1—4 & 5
2. Determine coupling SIZE.
Refer to pages F1—6, 7, & 8
3. Determine FLANGES to be used.
Refer to pages F1—9 thru 16

Specify coupling components.

- Example #1 - Close coupled
 - Size 6, Type S flange w 1-3/8 bore
 - Size 6, Type S flange w 1" bore
 - Size 6, Solid EPDM sleeve
- Example #2 - 5" Between shaft spacer
 - Size 9, Type SC flange for #11 hub
 - Size 9, Type SC flange for #9 hub
 - Size 11 hub w 2-3/8 bore
 - Size 9 short hub w 1-1/8 bore
 - Size 9 Solid Hytrel sleeve

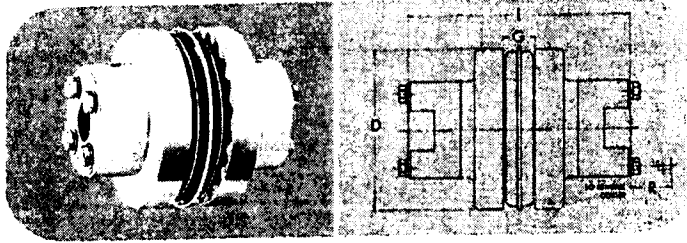
PROD. NUMBER	PROD. DESCRIPTION
6S138	6Sx1-3/8
6S1	6Sx1
6J	6JE
9SC5011	9SC50-11
9SC50	9SC50
11SCH238	11SCH x 2-3/8
9SCHS118	9SCHS x 1-1/8
9H	9H



TYPE SC SPACER COUPLINGS

BTS - CONVENTIONAL SPACER DESIGN

BTS - CONVENTIONAL SPACER DESIGN



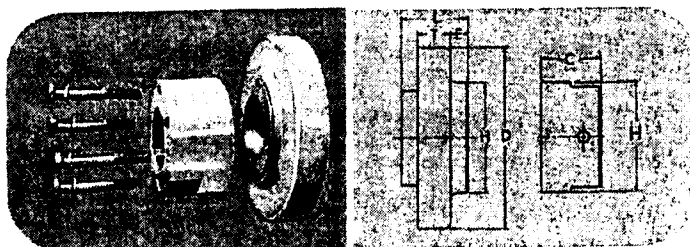
The table below shows assembled dimensions of Sure-Flex Type SC Spacer Couplings. For dimensions of separate components, refer to page F1—15.

Coupling Size	Required Distance Between Shafts	Use Flange No.	Use Hub No.	Max. Bore Std. KS	Dimensions				Wt. (lbs.) ■
					D	L(2)	G	R	
4JSC	3-1/2	4JSC35	....	1-1/8 (1)	2.460	5-5/8	5/8	....	2.7
5SC	3-1/2	5SC35	5SCH	1-1/8	3.250	5-5/8	3/4	9/16	4.5
6SC	3-1/2	6SC35	6SCH-6SCHS	1-3/8	4.000	5-7/8	7/8	3/4	7.3
	4-3/8	6SC44	6SCH-6SCHS	1-3/8	4.000	6-3/4	7/8	3/4	8.1
7SC	5	6SC50	6SCH-6SCHS	1-3/8	4.000	7-3/8	7/8	3/4	8.7
	3-1/2	7SC35	7SCH-7SCHS	1-5/8	4.625	6-3/8	1	5/8	9.9
	4-3/8	7SC44	7SCH-7SCHS	1-5/8	4.625	7-1/4	1	5/8	10.8
8SC	5	7SC50	7SCH-7SCHS	1-5/8	4.625	7-7/8	1	5/8	11.4
	3-1/2	8SC35	8SCH-8SCHS	1-7/8	5.450	6-7/8	1-1/8	13/16	15.2
		8SC35-10	10SCH-10SCHS	2-3/8	5.450	8-1/8	1-1/8	13/16	23.2
	4-3/8	8SC44	8SCH-8SCHS	1-7/8	5.450	7-3/4	1-1/8	13/16	16.4
9SC	5	8SC50	8SCH-8SCHS	1-7/8	5.450	8-3/8	1-1/8	1-3/16	17.4
	3-1/2	9SC35	9SCH-9SCHS	2-1/8	6.350	7-1/2	1-7/16	1-1/16	18.6
		9SC44	9SCH-9SCHS	2-1/8	6.350	8-1/4	1-7/16	1-1/16	22.2
	5	9SC50	9SCH-9SCHS	2-1/8	6.350	8-7/8	1-7/16	1-1/16	23.2
	7	9SC50-11	11SCH-11SCHS	2-7/8	6.350	10-3/8	1-7/16	1-3/16	40.4
10SC	7-3/4	9SC78-11	11SCH-11SCHS	2-7/8	6.350	12-3/8	1-7/16	1-3/16	48.2
	4-3/4	10SC48	10SCH-10SCHS	2-3/8	7.500	9-3/8	1-5/8	1-3/16	37.6
		5	10SC50	10SCH-10SCHS	2-3/8	7.500	9-5/8	1-5/8	1-3/16	38.4
	7	10SC70-13	13SCH-13SCHS	3-3/8	7.500	13-5/8	1-5/8	1-7/8	72.0
	7-3/4	10SC78-13	13SCH-13SCHS	3-3/8	7.500	14-3/8	1-5/8	1-7/8	76.0
11SC	10	10SC100-13	13SCH-13SCHS	3-3/8	7.500	16-5/8	1-5/8	1-7/8	88.0
	4-3/4	11SC48	11SCH-11SCHS	2-7/8	8.625	10-5/16	1-7/8	1-3/16	54.5
	5	11SC50	11SCH-11SCHS	2-7/8	8.625	10-3/8	1-7/8	1-3/16	54.7
	7	11SC70-14	14SCH	3-7/8	8.625	14-5/8	1-7/8	2	86.1
12SC	7-3/4	11SC78-14	14SCH	3-7/8	8.625	15-3/8	1-7/8	2	90.3
	10	11SC100-14	14SCH	3-7/8	8.625	17-5/8	1-7/8	2	102.7
	7	12SC70	12SCH-12SCHS	2-7/8	10.000	12-7/8	2-5/16	1-1/2	88.1
		12SC70-14	14SCH	3-7/8	10.000	14-5/8	2-5/16	2	99.1
	7-3/4	12SC78	12SCH-12SCHS	2-7/8	10.000	13-5/8	2-5/16	1-1/2	91.9
13SC	10	12SC78-14	14SCH	3-7/8	10.000	15-3/8	2-5/16	2	103.3
	10	12SC100-14	14SCH	3-7/8	10.000	17-5/8	2-5/16	2	115.7
14SC	7-3/4	13SC78	13SCH-13SCHS	3-3/8	11.750	14-3/8	2-11/16	1-7/8	129.6
14SC	7-3/4	14SC78	14SCH	3-7/8	13.875	15-3/8	3-1/4	2	179.9

■ Approximate weight for completely assembled spacer coupling.

(1) 4JSC35 x 1-1/8 has shallow keyseat. (2) "L" dimension and weight will change if one or two short (HS) hubs used.

Note: Refer to page F1—15 to order — specify components separately.



TYPE SC FLANGES AND HUBS

Tables on page F1—15 provide dimensional information for flanges and hubs used for Spacer Couplings. For assembled dimensions, see table above. Any of the sleeves shown on page F1—5 may be used.

TYPE SC FLANGES AND HUBS

BTS - CONVENTIONAL SPACER DESIGN



(ILLUSTRATION AND DIMENSIONAL DRAWINGS SHOWN AT BOTTOM OF PAGE F1-14.)

Coupling Size	Flange No.	For Distance Between Shafts*	For Hub	Dimensions					Wt. (lbs.) ■
				D	E	H	L	T	
4JSC	4JSC35	3-1/8	...	2.460	2-1/16	2	2-1/2	7/16	1.3
5SC	5SC35	3-1/2	5SCH	3.250	5/16	2	1-11/16	19/32	1.3
6SC	6SC35	3-1/2	6SCH-6SCHS	4.000	19/32	2-1/2	1-5/8	23/32	2.0
	6SC44	4-3/8	6SCH-6SCHS	4.000	1-1/32	2-1/2	2-1/16	23/32	2.4
	6SC50	5	6SCH-6SCHS	4.000	1-11/32	2-1/2	2-3/8	23/32	2.7
7SC	7SC35	3-1/2	7SCH-7SCHS	4.625	15/32	2-13/16	1-5/8	25/32	2.5
	7SC44	4-3/8	7SCH-7SCHS	4.625	29/32	2-13/16	2-1/16	25/32	3.0
	7SC50	5	7SCH-7SCHS	4.625	1-7/32	2-13/16	2-3/8	25/32	3.3
8SC	8SC35	3-1/2	8SCH-8SCHS	5.450	9/32	3-1/4	1-5/8	29/32	3.7
	8SC35-10s	3-1/2	10SCH-10SCHS	5.450	9/32	4-3/8	1-5/8	29/32	3.5
	8SC44	4-3/8	8SCH-8SCHS	5.450	23/32	3-1/4	2-1/16	29/32	4.3
	8SC50	5	8SCH-8SCHS	5.450	1-1/32	3-1/4	2-3/8	29/32	4.8
	8SC50-10	5	10SCH-10SCHS	5.450	1-1/32	4-3/8	2-3/8	29/32	5.5
9SC	9SC35	3-1/2	9SCH-9SCHS	6.350	1/16	3-5/8	1-11/16	1-1/32	4.1
	9SC44	4-3/8	9SCH-9SCHS	6.350	7/16	3-5/8	2-1/16	1-1/32	5.9
	9SC50	5	9SCH-9SCHS	6.350	3/4	3-5/8	2-3/8	1-1/32	6.4
	9SC50-11	5	11SCH-11SCHS	6.350	3/4	5-1/4	2-3/8	1-1/32	7.0
	9SC70-11	7	11SCH-11SCHS	6.350	1-3/4	5-1/4	3-3/8	1-1/32	10.9
	9SC78-11	7-3/4	11SCH-11SCHS	6.350	2-1/8	5-1/4	3-3/4	1-1/32	12.3
10SC	10SC48	4-3/4	10SCH-10SCHS	7.500	11/32	4-3/8	2-1/4	1-7/32	9.8
	10SC50	5	10SCH-10SCHS	7.500	15/32	4-3/8	2-3/8	1-7/32	10.2
	10SC70-13	7	13SCH-13SCHS	7.500	1-15/32	6-1/8	3-3/8	1-7/32	14.5
	10SC78-13	7-3/4	13SCH-13SCHS	7.500	1-27/32	6-1/8	3-3/4	1-7/32	16.5
	10SC100-13	10	13SCH-13SCHS	7.500	2-31/32	6-1/8	4-7/8	1-7/32	22.5
11SC	11SC48	4-3/4	11SCH-11SCHS	8.625	1/32	5-1/4	1-1/2	1-1/2	12.5
	11SC50	5	11SCH-11SCHS	8.625	1/16	5-1/4	1-9/16	1-1/2	12.6
	11SC70-14	7	14SCH	8.625	1-1/16	6-1/2	2-9/16	1-1/2	16.3
	11SC78-14	7-3/4	14SCH	8.625	1-7/16	6-1/2	2-15/16	1-1/2	18.4
	11SC100-14	10	14SCH	8.625	2-9/16	6-1/2	4-1/16	1-1/2	24.6
12SC	12SC70	7	12SCH-12SCHS	10.000	21/32	5-3/4	2-15/32	1-11/16	23.4
	12SC70-14	7	14SCH	10.000	21/32	6-1/2	2-15/32	1-11/16	21.3
	12SC78	7-3/4	12SCH-12SCHS	10.000	1-1/32	5-3/4	2-27/32	1-11/16	25.3
	12SC78-14	7-3/4	14SCH	10.000	1-1/32	6-1/2	2-27/32	1-11/16	23.4
	12SC100-14	10	14SCH	10.000	2-5/32	6-1/2	3-31/32	1-11/16	29.6
13SC	13SC78	7-3/4	13SCH-13SCHS	11.750	9/16	6-1/8	3-1/4	1-31/32	38.4
14SC	14SC78	7-3/4	14SCH	13.875	1/32	6-1/2	2-23/32	2-1/4	55.2

* Flanges can be mixed to form different Between-Shaft Dimensions. See chart page F1-18. ■ Approximate weight for each flange.

▲ If using 10HS hub, 7/16-14NC x 2-1/4 long capscrew needed (not furnished).

Coupling Size	Hub No.	Max. Bore	STOCK BORES *		Dimensions			Wt. (lbs.) ■
			Plain Bore	Bore with Standard Keyway & Set Screw	C	H	Cap Screws Furnished	
4JSC	†	1-1/8	...	5/8 - 7/8 - 1-1/8*	1-1/16	2	...	...
5SC	5SCH	1-1/8	1/2	5/8 - 3/4 - 7/8 - 1-1/8	1-3/32	2	4-10 x 1-1/2	.8
6SC	6SCH	1-3/8	5/8	3/4 - 7/8 - 1 - 1-1/8 - 1-1/4 - 1-3/8	1-7/32	2-1/2	4-1/4 x 1-3/4	1.4
	6SCHS	7/8	...	7/8	31/32	2-1/2	4-1/4 x 1-1/2	1.1
7SC	7SCH	1-5/8	5/8	7/8 - 1 - 1-1/8 - 1-3/8 - 1-1/2 - 1-5/8	1-15/32	2-13/16	4-1/4 x 1-7/8	2.0
	7SCHS	7/8	...	7/8	1-3/32	2-13/16	4-1/4 x 1-1/2	1.5
8SC	8SCH	1-7/8	3/4	7/8 - 1 - 1-1/8 - 1-3/8 - 1-1/2 - 1-5/8 - 1-3/4 - 1-7/8	1-23/32	3-1/4	4-5/16 x 2-1/4	3.2
	8SCHS	7/8	...	7/8	1-23/32	3-3/4	4-5/16 x 1-3/4	2.0
9SC	9SCH	2-1/8	7/8	1 - 1-1/8 - 1-3/8 - 1-1/2 - 1-5/8 - 1-3/4 - 1-7/8 - 2-1/8	1-31/32	3-5/8	4-3/8 x 2-3/4	4.2
	9SCHS	1-1/2	...	1-1/8	1-17/32	3-5/8	4-3/8 x 2-1/4	3.7
10SC	10SCH	2-3/8	1-1/8	1-5/8 - 1-7/8 - 2-1/8 - 2-3/8	2-11/32	4-3/8	4-7/16 x 3-1/4	7.4
	10SCHS	1-5/8	...	1-1/8	1-21/32	4-3/8	4-7/16 x 2-1/2	5.5
11SC	11SCH	2-7/8	1-1/8	1-7/8 - 2-1/8 - 2-3/8 - 2-7/8	2-23/32	5-1/4	4-1/2 x 3-1/2	12.2
	11SCHS	1-7/8	...	1-1/8 - 1-5/8	1-29/32	5-1/4	4-1/2 x 2-3/4	9.3
12SC	12SCH	2-7/8	1-3/8	2-1/8 - 2-3/8 - 2-7/8	2-21/32	5-3/4	4-5/8 x 4	16.6
	12SCHS	2-1/2	...	2-3/8	2-17/32	5-3/4	4-5/8 x 3-1/2	14.1
13SC	13SCH	3-3/8	1-3/8	2-3/8 - 2-7/8 - 3-3/8	3-11/32	6-1/8	4-5/8 x 4-1/2	19.9
	13SCHS	2-1/2	...	2-1/8 - 2-3/8	2-15/32	6-1/8	4-5/8 x 3-1/2	16.0
14SC	14SCH	3-7/8	1-5/8	2-3/8 - 2-7/8 - 3-3/8 - 3-7/8	3-27/32	6-1/2	4-5/8 x 5	24.2

† FOR 4JSC the hub is an integral part of the flange. 4JSC x 1-1/8 has 1/4 x 1/8 shallow keyseat. ■ Approximate weight for each hub.

* See page F1-10 for bore tolerances F1-13 for std. keyseat dimensions.

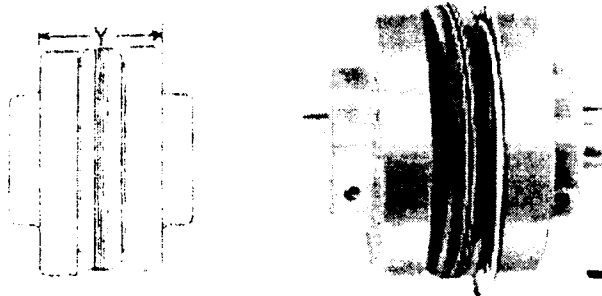


SURE-FLEX® COUPLINGS

Installation Instructions

Sure-Flex flanges (outer metallic parts) and sleeves (inner elastomeric members) come in many sizes and types. First, determine the size and type of components being used. Remove all components from their boxes, and loosely assemble the coupling on any convenient surface. (Do not attempt to install the wire ring on the two-piece E or N sleeve at this time.) Also check maximum RPM values in the table against operating speed. All rubber sleeves (EPDM and Neoprene) have the same ratings for a given size and may be used interchangeably. However, because rubber and Hytrel sleeves have completely different ratings, they never should be used interchangeably.

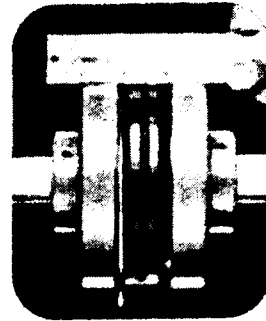
- 1** Inspect all coupling components and remove any protective coatings or lubricants from bores, mating surfaces and fasteners. Remove any existing burrs, etc. from the shafts.
- 2** Slide one coupling flange onto each shaft, using snug-fitting keys where required. When using Type B flanges, follow the instructions furnished with the Sure-Grip bushing.
- 3** Position the flanges on the shafts to approximately achieve the Y dimension shown in the table. It is usually best to have an equal length of shaft extending into each flange. Move one flange to its final position. Torque fasteners to proper values. Slide the other flange far enough away to install the sleeve. With a two-piece sleeve, do not move the wire ring to its final position; allow it to hang loosely in the groove adjacent to the teeth.



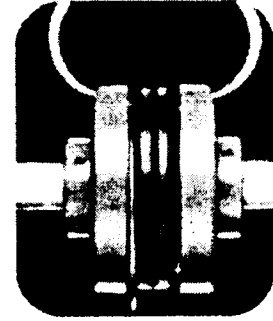
4 Slide the loose flange on the shaft until the sleeve is completely seated in the teeth of each flange. (The "Y" dimension is for reference and not critical.) Secure the flange to the shaft. Different coupling sleeves require different degrees of alignment precision. Locate the alignment values for your sleeve size and type in the table.

5 Check parallel alignment by placing a straight-edge across the two coupling flanges and measuring the maximum offset at various points around the periphery of the coupling without rotating the coupling. If the maximum offset exceeds the figure shown under "Parallel" in the table, realign the shafts.

6 Check angular alignment with a micrometer or caliper. Measure from the outside of one flange to the outside of the other at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions without rotating the coupling. The difference between the maximum and minimum must not exceed the figure given under "Angular" in the table. If a correction is necessary, be sure to recheck the parallel alignment.



Parallel



Angular

MAXIMUM RPM AND ALLOWABLE MISALIGNMENT

(Dimensions in inches)

Sleeve Size	Maximum RPM	Types JE, JN JES, JNS, E & N			*Type H & HS		
		Parallel	Angular	Y	Parallel	Angular	Y
3	9200	.010	.035	1.188	...	...	...
4	7600	.010	.043	1.500	...	...	...
5	7600	.015	.056	1.938	...	...	...
6	6000	.015	.070	2.375	.010	.036	2.375
7	5250	.020	.081	2.563	.012	.020	2.563
8	4500	.020	.094	2.938	.015	.025	2.938
9	3750	.025	.109	3.500	.017	.038	3.500
10	3600	.025	.128	4.063	.020	.038	4.063
11	3600	.032	.151	4.875	.022	.037	4.875
12	2800	.032	.175	4.688	.022	.042	5.688
13	2400	.032	.175	6.688	.030	.050	6.625
14	2200	.045	.242	7.750	.035	.060	7.750
16	1500	.060	.330	10.250	...	...	...

Note: Values shown above apply if the actual torque transmitted is more than 1/4 the coupling rating. For lesser torque, reduce the above values by 1/2.

*Type H and HS sleeves should not be used as direct replacements for EPDM or Neoprene sleeves.

7 If the coupling employs the two-piece sleeve with the wire ring, force the ring into its groove in the center of the sleeve. It may be necessary to pry the ring into position with a blunt screwdriver.

8 Install coupling guards per OSHA requirements.

CAUTION: Coupling sleeves may be thrown from the coupling assembly with substantial force when the coupling is subjected to a severe shock load or abuse.

A
SECTION 4

SIEMENS

NEMA Motor Data

Part Number: 1LA04498SE4N

Nameplate Data				Bearing Data	
Type	RGZESD	Rating	Cont.	DE Bearing Size	6320
HP	200	Ins. Class	F	DE Bearing Type	Ball Bearing
Voltage	460	S.F.	1.15	DE AFBMA	
Amps	/ 241	Amb. Temp.	40 deg C	ODE Bearing Size	6316
FL RPM	885	Temp. Rise	Class B	ODE Bearing Type	Ball Bearing
FL Efficiency	94.5%	kVA Code	G	ODE AFBMA	80BC03JP3
FRAME	449T	NEMA Des	B		
DE AFBMA		Mtr WT	2300		
ODE AFBMA	80BC03JP3	Hertz	60 Ph 3		

Typical Performance Data					
Load	No Load	1/2	3/4	Full Load	
Efficiency		94.8%	94.9%	94.5%	LRA 1450
Power Factor		0.71	0.79	0.82	
Current (A)	101	139.6	188.4	241	

Mechanical Data					
SAFE STALL TIME	HOT (s)	15	COLD (s)	25	
Rtr wt (lbs)	764	Rtr WK2			Ext Load Inertia (WK2) Capability 12400 lb-ft ²
FLT (ft-lbs)	1186	LRT	125%	BDT 200%	

Typical Noise Data									
A-weighted Sound Pressure Level dB(A) at 3 feet	Octave Band Center Frequencies Hertz (Hz)								
	63	125	250	500	1000	2000	4000	8000	SPL
	38	54	64	68	69	71	76	68	79
									SPwrL 90

Wiring Connection Information					
Description:	Voltage	L1	L2	L3	Connected Together
3 PHASE - 3 LEAD - DELTA	-- --	-- --	-- --	-- --	-- --
	HIGH	T1	T2	T3	-- --

Lubrication Information			
Manufacturer:	Mobil Polyrex EM or equal	DE Capacity (oz.)	14.5
Type:	Polyurea grease	ODEnd Capacity (oz.)	7.5
Relubricate bearings every six months (more frequent if conditions require). See Instruction Manual.			

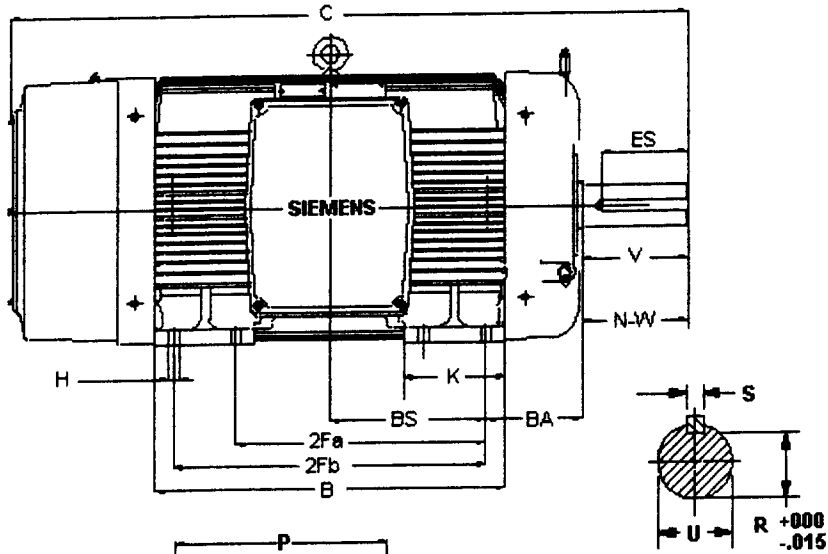
Recommended Spare Parts List			
Fan Housing	51-817-031-001	Drip Cover	Not applicable
Fan Grid	51-817-046-001	DE Bearing Part #	51-380-865-020
Fan	51-516-500-501	ODE Bearing Part #	51-380-865-016

Data is subject to change without notice.

SIEMENS

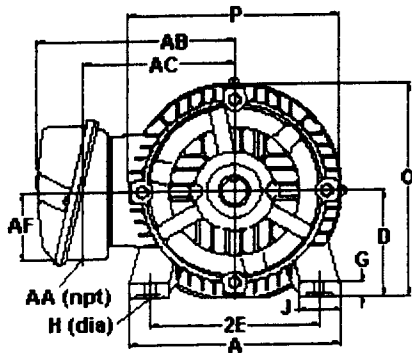
NEMA Dimensional Drawing

Part #: 1LA04498SE4N
 Frame: 449T Type: RGZESD - Severe Duty-TEFC-High Efficient

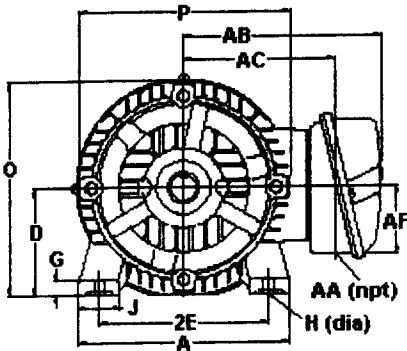


Standard dimensions in inches

FRAME	449T
A	22.0
B	28.0
C	54.06
D	11.0
2E	18.0
2Fb	25.0
G	1.19
H	0.812
J	4.0
K	8.0
N-W	8.5
O	21.88
P	21.75
U	3.375
V	8.25
ES	6.88
BA	7.5
BS	12.5
AA (npt)	3.0
AB	19.94
AC	15.06
AF	7.0
R	2.88
S	0.875



F1 Assembly



F2 Assembly

Approx. Ship Wt: 2300 lbs

Data is subject to change without notice.

Dimensions are for estimating purposes only.

Auxiliary box and/or RTD options are not reflected in the drawing.

For certified NEMA dimensional prints, please contact the factory or visit: <http://www.sea.siemens.com/motorsbu/cgi-bin/drawingselector/default.asp>

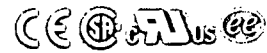
RGZESD
TEFC Motors

High efficiency severe duty TEFC motors are ideal for both indoor and outdoor applications and in severe duty operating atmospheres. These motors are ideal for use in chemical processing, mining, foundry, pulp and paper, waste management and petro/chemical.

Performance Specifications

- 1 to 400 HP
- 1.15 service factor, 40°C ambient
- 3600, 1800, 1200, 900 or 720 RPM
- 3 phase, 60 Hz; 230/460 volt operation under 25 HP, 460 volt 25 HP and above; 200 & 575 volt available
- Meets or exceeds NEMA Energy Efficiency standards
- Class F insulation, Class B temperature rise
- NEMA Design B, Continuous Duty
- 143T through S449 frame

HIGH EFFICIENT • SEVERE DUTY • CAST IRON FRAME



nema
MOTORS

RGZESD TEFC Motors



Features for Long Life

Frame & End Shields – Cast iron construction for exceptional structural integrity with condensation T-drains. Lifting eyebolts are included for frames 213T to S449.

Rotor – A unique offset rotor bar design provides improved efficiency while larger bars and end rings reduce resistance for lower rotor losses. Each die cast aluminum rotor assembly is dynamically balanced for extended bearing life, and includes a high-strength carbon steel (C1045) shaft for maximum rotor performance.

Stator/Windings – Manufactured with premium electrical-grade steel laminations and copper electrical magnet wire to lower losses for improved efficiencies. A unique stator core design lowers flux density while increasing cooling capacity. Large conductor cross section reduces resistance, also lowering stator losses.

Insulation – Proprietary inverter-rated Class F non-hygroscopic insulation system with NEMA Class B temperature rise, provides an extra margin of thermal life. Varnish system application ensures maximum wire penetration to provide protection from moisture, corrosion and electrical shock. This insulation system meets or exceeds NEMA MG1-2003, Part 31 making all motors suitable for operation with variable frequency drives.

Cooling – A bi-directional, non-sparking fan is locked and keyed to the shaft. Its low-inertia design reduces windage losses, improves airflow, reduces noise and provides dependable cooling. Cast iron fan covers are provided on all frame sizes.

Bearings – Regreasable, oversized single-shielded with cast iron inner caps. Alemite grease fittings on the inlets and pipe plugs on the relief ports for ease of routine maintenance. For added bearing protection, 143T-256T frames have a drive end shaft seal and 284T-449T frames have a drive end shaft V-ring slinger.

Lubrication – A specially formulated, high temperature tested, polyurea-based grease is used to provide more than four times the lubrication life of other polyurea greases.

Oversized Conduit Box – Cast iron construction that is larger than industry standards, diagonally split, neoprene-gasketed and rotatable in 90° increments for quick and easy connections. Includes a ground lug and non-wicking, clearly and permanently marked leads.

Corrosion Resistance – Cast iron construction, zinc-plated hardware, epoxy enamel paint and stainless steel nameplate resist rust and corrosion.

Modifiable – All Siemens motors are available with a wide variety of modifications to meet your specific motor needs.

Siemens Energy & Automation, Inc.
3333 Old Milton Parkway
Alpharetta, GA 30005

1-800-964-4114
info.sea@siemens.com
www.sea.siemens.com

Siemens Canada, Ltd.
2185 Derry Road West
Mississauga, ON L5N 7A6

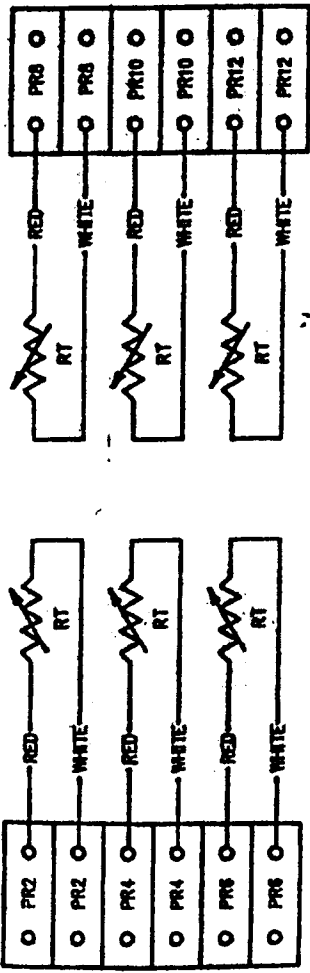
905-819-5800
Customer Interaction Centre **888-303-3353**
www.siemens.ca

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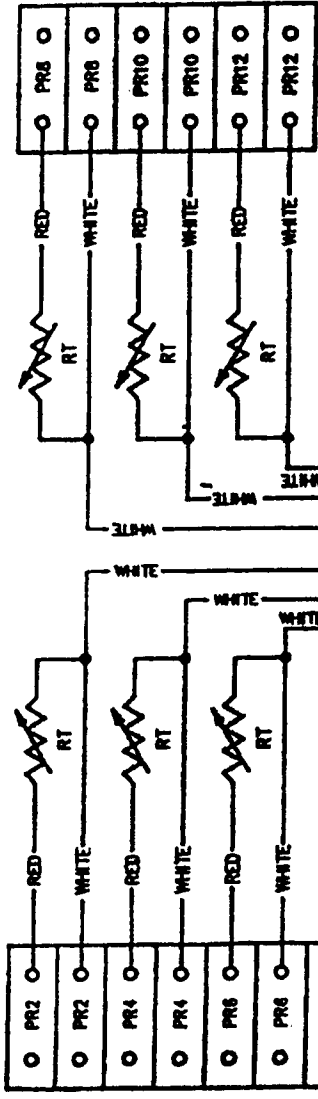
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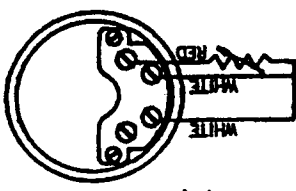
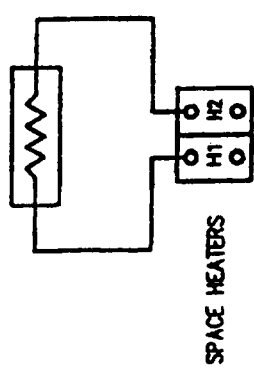
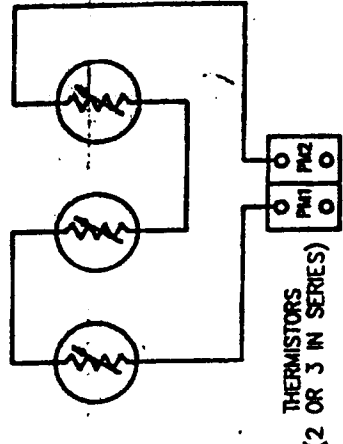
FIG. 8-A USE PREVIOUS EDITIONS
 O1 2-28-90 TS



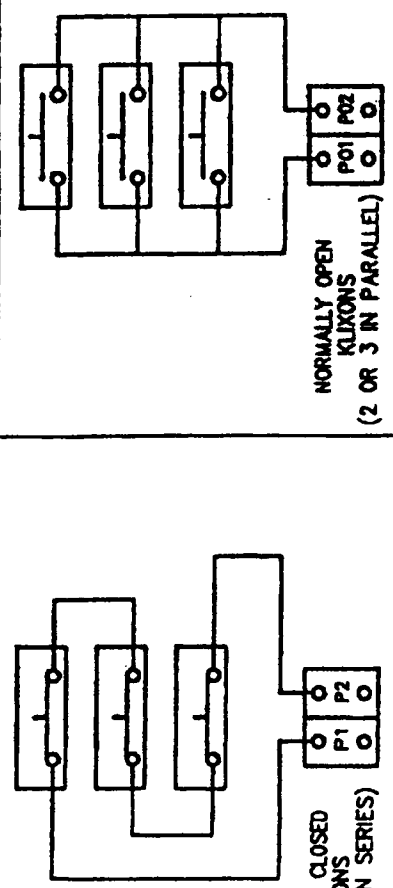
2 WIRE STATOR RTD'S



3 WIRE STATOR RTD'S



3 WIRE
 BRG.
 RTD'S



PROPERTY OF
Siemens Energy & Automation, Inc.
 Industrial Motor Division - Little Rock, AR

CONNECTION DRAWING

DATE: 2-28-90

1 OF 1

51-010-556-1B

SIEMENS

Installation • Operation • Maintenance

Instructions

**Induction Motors
143-449 Frame**

NMIM-L1000



TABLE OF CONTENTS

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These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

The contents of this instruction manual shall not become part or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

INTRODUCTION

THIS EQUIPMENT CONTAINS HAZARDOUS VOLTAGES, ROTATING PARTS AND HOT SURFACES. SEVERE PERSONAL INJURY OR PROPERTY DAMAGE CAN RESULT IF SAFETY INSTRUCTIONS ARE NOT FOLLOWED. ONLY QUALIFIED PERSONNEL SHOULD WORK ON OR AROUND THIS EQUIPMENT AFTER BECOMING THOROUGHLY FAMILIAR WITH ALL WARNINGS, SAFETY NOTICES, AND MAINTENANCE PROCEDURES CONTAINED HEREIN. THE SUCCESSFUL AND SAFE OPERATION OF THIS EQUIPMENT IS DEPENDENT UPON PROPER HANDLING, INSTALLATION, OPERATION AND MAINTENANCE.

QUALIFIED PERSON

For the purpose of this manual and product labels, a qualified person is one who is familiar with the installation, construction and operation of the equipment, and the hazards involved. In addition, he has the following qualifications:

- a) Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- b) Is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.



DANGER

For the purpose of this manual and product labels, DANGER indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.



WARNING

For the purpose of this manual and product labels, WARNING indicates death, severe personal injury or substantial property damage can result if proper precautions are not taken.



CAUTION

For the purpose of this manual and product labels, CAUTION indicates minor personal injury or property damage can result if proper precautions are not taken.

INSPECTION

Care is taken at the factory to assure that the motor arrives at its destination in first class condition. If there is evidence of rough handling or damage in shipping, file a claim at once with the carrier and notify your Siemens Sales Office.

Examine the outside of the motor carefully for damage, with particular attention to conduit box, fans, and covers. Inspect and tighten all hardware and accessories which may have become loosened during shipping and handling. Turn the shaft by hand to be sure that it rotates freely. If the motor has been mishandled sufficiently to break external parts, the end shield should also be removed to check for internal damage unless the motor is explosion-proof. See warning below on explosion proof motors.



WARNING

Explosion-proof motors—these motors are constructed to comply with the U.L. Label Service Procedure Manual. When repairing and reassembling a motor that has an underwriter's label, it is imperative that the unit be reinspected and:

1. All original fits and tolerance be maintained.
2. All plugs and hardware be securely fastened.
3. Any parts replacements, including hardware, be accurate duplicates of the originals.

Repair work on explosion-proof motors can only be done by the original manufacturing or U.L. certified shops. Violations of any of the above items will invalidate the significance of the U.L. Label.

STORAGE

Motors must be stored in a clean, dry, well ventilated location free from vibration and rapid or wide temperature variations. If the unit is to be stored longer than three months, consult factory. Ball bearing motors are shipped from the factory properly lubricated and ready to operate. When in storage, the motor shaft must be turned several rotations every month and the bearing relubricated every year. On non-explosion-proof TEFC motors, a removable plug in the bottom of the frame or housing permits removal of accumulated moisture. Drain regularly if storage atmosphere result in formation of condensation.

INSTALLATION

Installation must be handled by qualified service or maintenance personnel. The motor foundation must rigidly support all four feet in the same plane. Place shims under the motor feet, as required, so they will not be pulled out of plane when mounting bolts are tightened. All wiring to the motor and control must be in accordance with the National Electrical Code and all local regulations. Before drive is connected, momentarily energize motor to check that direction of rotations proper. For direct drive, accurate alignment is 0.004 inch/ft. (radius to dial indicator = one foot.)

Any change in shims requires rechecking alignment. When alignment is within limits, dowel two feet of each unit. When installing flat belt pulley, V-belt sheave, spur or helical pinion or chain drives, be certain that they are within NEMA limitations. Refer to NEMA motor and general standards, MG-1 14.07 and 14.42.

OPERATION

Repeated trial starts can overheat the motor and may result in motor burnout (particularly for across the line starting). If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from windings and rotor to prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current.

After installation is completed, but before motor is put in regular service, make an initial start as follows:

1. Check motor starting and control device connections against wiring diagrams.
2. Check voltage, phase, and frequency of line circuit (power supply) against motor nameplate.
3. If possible, remove external load (disconnect drive) and turn shaft by hand to ensure free rotation. This may have been done during installation procedure; if so, and conditions have not changed since, this check may not be necessary.
 - a. If drive is disconnected, run motor at no load long enough to be certain that no unusual conditions develop. Listen and feel for excessive noise, vibration, clicking, or pounding. If present, stop motor immediately. Investigate the cause and correct before putting motor in service.
 - b. If drive is not disconnected, interrupt the starting cycle after motor has accelerated to low speed. Carefully observe for unusual conditions as motor coasts to a stop.
4. When checks are satisfactory, operate at minimum load and look for unusual condition. Increase load slowly to maximum. Check unit for satisfactory operation.



CAUTION

Guard against overloading. Overloading causes overheating and overheating means shortened insulation life. A motor subjected to a 10°C temperature rise above the maximum limit for the insulation may cause the insulation life to be reduced by 50%. To avoid overloading, be sure motor current does not exceed nameplate current when nameplate voltage is applied.

Electric motors operating under normal conditions become quite warm. Although some places may feel hot to the touch, the unit may be operational within limits. Use a thermocouple to measure winding temperature when there is any concern.

The total temperature, not the temperature rise, is the measure of safe operation. Investigate the operating conditions if the total temperature measured by a thermocouple placed on the winding exceeds:

230°F (110°C) for class "B" insulation

275°F (135°C) for class "F" insulation

302°F (150°C) for class "H" insulation

VOLTAGE REGULATION

Motors will operate successfully under the following conditions of voltage and frequency variation, but not necessarily in accordance with the standards established for operation under rated conditions:

- a. When the variation in voltage does not exceed 10% above or below normal, with all phases balanced.
- b. When the variation in frequency does not exceed 5% above or below normal.
- c. When the sum of the voltage and frequency does not exceed 10% above or below normal (provided the frequency variation does not exceed 5%).

MAINTENANCE

Failure to properly maintain the equipment can result in severe personal injury and product failure. The instructions contained herein should be carefully reviewed, understood and followed. The following maintenance procedures should be performed regularly:

1. Bearing lubrication
2. Insulation resistance check
3. Cleaning

This checklist does not represent an exhaustive survey of maintenance steps necessary to ensure safe operation of the equipment. Particular applications may require further procedures. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

Dangerous voltages are present in the equipment which can cause severe personal injury and product failure. Always de-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personnel.

The use of unauthorized parts in the repair of the equipment, tampering by unqualified personnel, or removal or alteration of guards or conduit covers will result in dangerous conditions which can cause severe personal injury or equipment damage. Follow all safety instructions contained herein.

BEARING LUBRICATION



CAUTION

Do not lubricate motor while in operation, since excess grease will be forced through the bearings and into the motor before it will force its way out of the drain plug. Excess grease accumulation on windings reduces insulation life.

Bearing life is assured by maintaining proper alignment, proper belt or chain tension, and good lubrication at all times.

Prior to shipment, motor bearings are lubricated with the proper amount and grade to provide six months of satisfactory service under normal operation and conditions.

For best results, grease should be compounded from a polyurea base and a good grade of petroleum oil. It should be of No. 2 consistency and stabilized against oxidation. Operating temperature range should be from -15°F to +250°F for class B insulation, and to +300°F for class F and H. Most leading oil companies have special bearing greases that are satisfactory.

Relubricate bearings every six months (more often if conditions require), as follows:

1. Stop the motor. Lock out the switch.
2. Thoroughly clean off pipe plugs and remove from housings.
3. Remove hardened grease from drains with stiff wire or rod.
4. Add grease to inlet with hand gun until small amount of new grease is forced out of drain.
5. Remove excess grease from ports, replace inlet plugs, and run motor 1/2 hour before replacing drain plug.
6. Put motor back in operation.

INSULATION RESISTANCE

Check insulation resistance periodically. Any approved method of measuring insulation resistance may be used, provided the voltage across the insulation is at a safe value for the type and condition of the insulation. A hand cranked megger of not over 500 volts is the most convenient and safest method. Standards of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) recommended that the insulation resistance of stator windings at 75°C, measure at 500 volts DC, after one minute should not be less than:

$$\frac{\text{Rated voltage of machine} + 1000}{1000} = \text{Insulation resistance in Megohms}$$

This formula is satisfactory for most checks. for more information, see IEEE Standard No. 43, "Recommended Practice for Insulation Resistance Testing of AC Rotating Machinery."

CLEANING



WARNING

Do not attempt to clean motor while it is operating.. Contact with rotating parts can cause severe personal injury or property damage. Stop the motor and lock out switch before cleaning.

The motor exterior must be kept free of oil, dust, dirt, water, and chemicals. For fan cooled motors, it is particularly important to keep the air intake openings free of foreign material. Do not block air outlet or inlet.

On non-explosion-proof TEFC motors, a removable plug in the bottom center of the motor frame or housing permits removal of accumulated moisture. Drain regularly.

VERTICAL MOTOR THRUST BEARINGS

Top bearings — high external thrust from the driven unit is usually carried by the top bearing or bearings. If replacement is necessary, the new bearing must be the same size and type as the original. Duplex bearings must also be the same type and mounted in an identical manner. When angular contact type bearings are replaced, the new bearing must have the same thrust capacity.

Bottom bearings — grease lubricated lower bearings adequately lubricated at the factory for at least three months operation. The relubrication procedure is the same as outlined above under "Bearing Lubrication." It is important to maintain the lower cavity full of grease at all times.

The correct replacement bearings are given on the nameplate by AFBMA (Anti-Friction Bearing Manufacturers Association) number.

SERVICE

For immediate action on your motor problems call your certified service center or contact your nearest Siemens District Office.

B. RAW SEWAGE PUMPS D

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B
SECTION 1

Weir Specialty Pumps
 440 West 800 South
 Salt Lake City, UT 84101
 T > 801-358-8731
 F > 801-530-7531



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



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 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, wither 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 _____
 Pressure _____ PSIG _____

- 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 _____



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.



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 warm-up valve to circulate liquid for preheating. Close the valve after the pump is warmed up.



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 full 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 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 10-15 psig above the pump discharge pressure.
- Oil lubricated tandem mechanical seals don't required outside flush water.

VI. OPERATING CHECKS

- A. Check the pump and piping for leaks.
- B. Check and record pressure gauge readings for future reference.
 1. Suction _____ PSIG / KPa
 2. Discharge _____ PSIG / Kpa
- C. Check and record flow _____ USGPM
- D. Check and record voltage, amperage per phase and kilowatts (if available).

1. Voltage _____ / _____ / _____ Volts
2. Amperage _____ / _____ / _____ Amps

E. Measure pump shaft speed: _____ RPM

D. 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 _____

IX. GENERAL COMMENTS

X. LIST OF ATTENDEES

Name of Company performing start-up

Authorized Signature Date

Signature of Customer Date

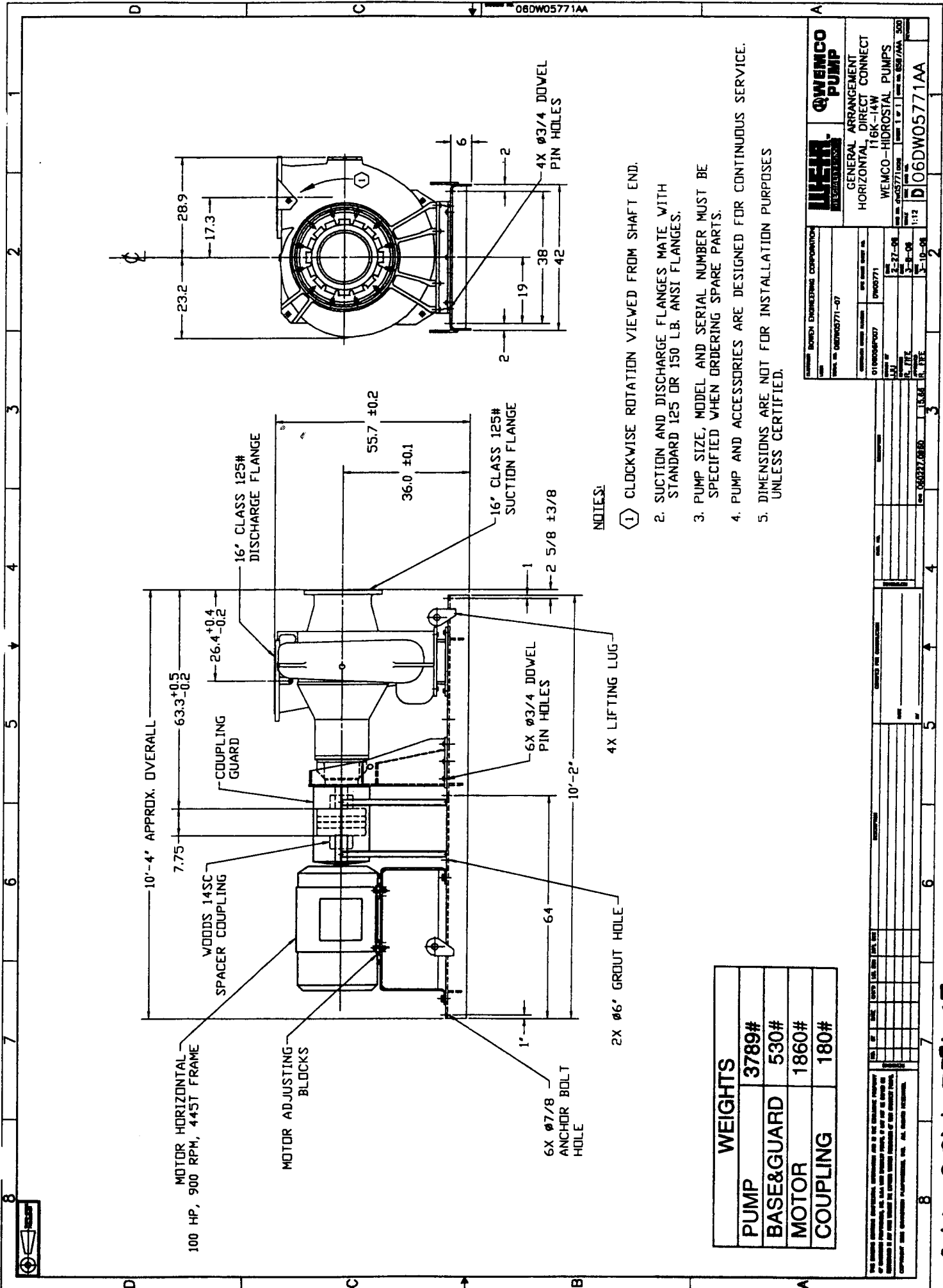
ORDER ACKNOWLEDGEMENT

SALES SHEET NUMBER **DW05771**P/O **0106056P007**

6643

BILL-TO BOWEN ENGINEERING CORPORATION
10315 ALLISONVILLE ROADFISHERS IN
46038

QTY	PART NUMBER	DESCRIPTION
1	I16K-BRG	<p>16 X 16 MODEL I16K-MD-I4W WEMCO HIDROSTAL SCREW CENTRIFUGAL PUMP WITH A REGULABLE LINER. MATERIAL: CAST IRON RIBBED CASE WITH DOWEL PIN LOCATING HOLES AND STAINLESS STEEL HARDWARE CONDITIONS: 7000 GPM AGAINST: 31' TDH, AT 880 RPM MECHANICAL SEAL: HIDROSTAL DOUBLE TANDEM DYNAMIC BALANCE HI-CHROME IMPELLER GROOVED HI-CHROME REGULABLE LINER CW VIEWED FROM PUMP SHAFT EXTENSION DISCHARGE ARRANGEMENT: VERTICAL UP</p> <p>1/2" THICK STEEL COMMON PUMP AND MOTOR BASE WITH GUARD. ARRANGEMENT: DIRECT CONNECT</p> <p>BASE: STEEL GUARD: FIBERGLASS MOTOR BASE WITH JACK SCREWS</p> <p>COUPLING: TB WOODS 14E</p> <p>PREMIUM EFFICIENT HORIZONTAL MOTOR: 100 HP, 900 RPM, 445T FRAME TEFC MILL AND CHEMICAL ENCLOSURE WITH 1.15 SERVICE FACTOR AND CLASS F INSULATION 3 PHASE, 60 HZ, 460 VOLT DOWEL PIN LOCATING HOLES</p> <p>5 POINT PERFORMANCE TEST, PE CERT NPSH TEST, PE CERT</p> <p>TESTING AND CERTIFICATION:</p> <p>PERFORMANCE TEST - PACKAGE NPSH TEST PERFORMANCE TEST - BARE PUMP</p> <p>Serial Number(s): 06DW05771-07</p>



- NOTES:**
- 1) CLOCKWISE ROTATION VIEWED FROM SHAFT END.
 - 2) SUCTION AND DISCHARGE FLANGES MATE WITH STANDARD 125 OR 150 L.B. ANSI FLANGES.
 - 3) PUMP SIZE, MODEL AND SERIAL NUMBER MUST BE SPECIFIED WHEN ORDERING SPARE PARTS.
 - 4) PUMP AND ACCESSORIES ARE DESIGNED FOR CONTINUOUS SERVICE.
 - 5) DIMENSIONS ARE NOT FOR INSTALLATION PURPOSES UNLESS CERTIFIED.

WEIGHTS	
PUMP	3789#
BASE&GUARD	530#
MOTOR	1860#
COUPLING	180#

WEMCO PUMP

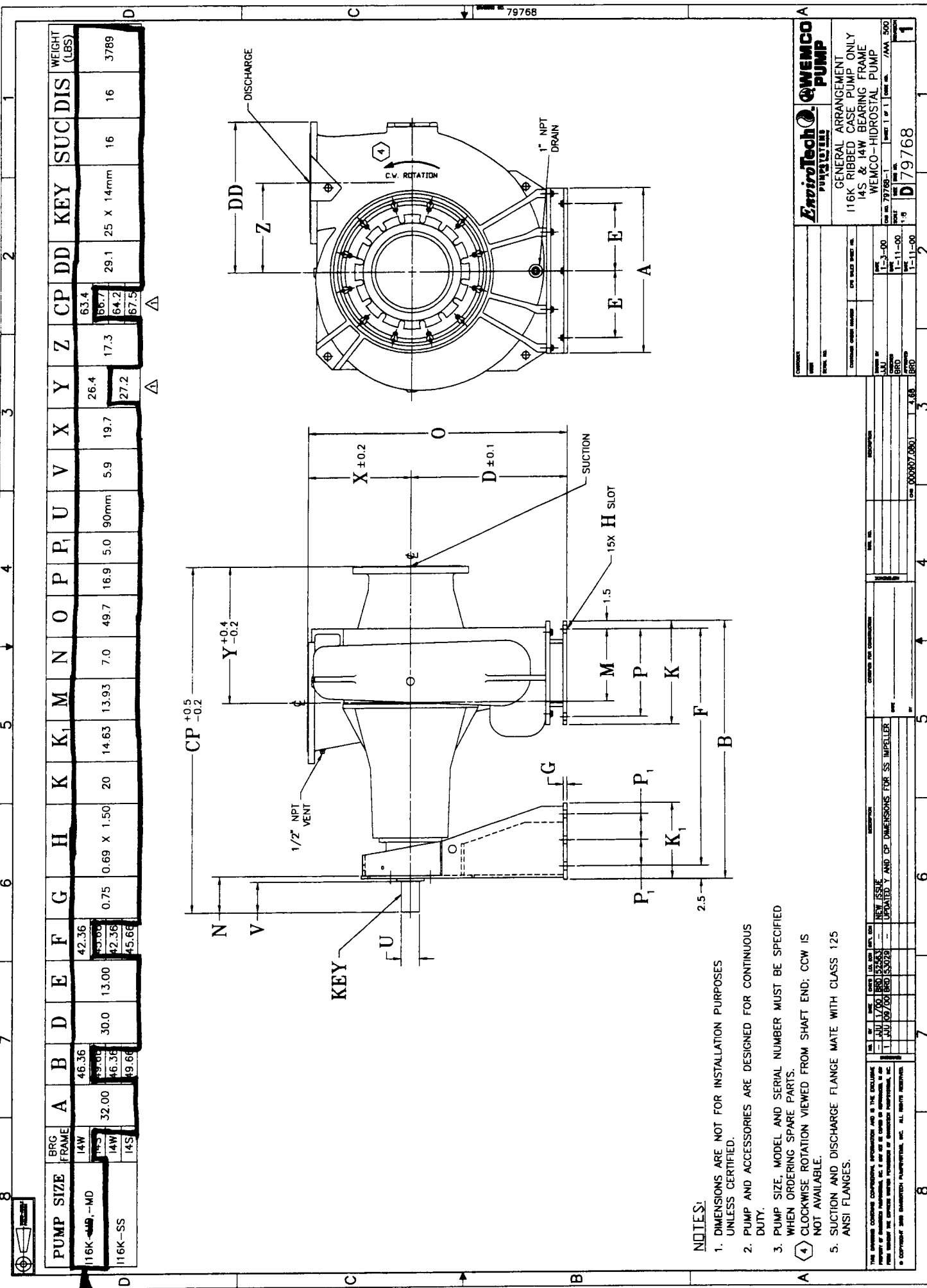
GENERAL ARRANGEMENT
HORIZONTAL DIRECT CONNECT
116K-14W
WEMCO-HIDROSTAL PUMPS

08DW05771AA

REV.	DATE	DESCRIPTION	BY	CHKD.
1	2-27-08	REVISED TO ADD 10'-4" OVERALL DIMENSION		
2	3-8-08	REVISED TO ADD 10'-2" DIMENSION		
3	3-10-08	REVISED TO ADD 10'-4" OVERALL DIMENSION		

S/N 08DW05771-07

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PUMP SIZE	BRG FRAME	A	B	D	E	F	G	H	K	K ₁	M	N	O	P	P ₁	U	V	X	Y	Z	CP	DD	KEY	SUC DIS	WEIGHT (LBS)
116K-SS	14W	32.00	46.36	30.0	13.00	42.36	0.75	0.69 X 1.50	20	14.63	13.93	7.0	49.7	16.9	5.0	90mm	5.9	19.7	26.4	17.3	29.1	25 X 14mm	16	3789	
116K-MD	14W	32.00	46.36	30.0	13.00	42.36	0.75	0.69 X 1.50	20	14.63	13.93	7.0	49.7	16.9	5.0	90mm	5.9	19.7	26.4	17.3	29.1	25 X 14mm	16	3789	
116K-SS	14S	49.66	49.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66	45.66

- NOTES:**
- DIMENSIONS ARE NOT FOR INSTALLATION PURPOSES UNLESS CERTIFIED.
 - PUMP AND ACCESSORIES ARE DESIGNED FOR CONTINUOUS DUTY.
 - PUMP SIZE MODEL AND SERIAL NUMBER MUST BE SPECIFIED WHEN ORDERING SPARE PARTS.
 - CLOCKWISE ROTATION VIEWED FROM SHAFT END; CCW IS NOT AVAILABLE.
 - SUCTION AND DISCHARGE FLANGE MATE WITH CLASS 125 ANSI FLANGES.

EmproTech Pumping Solutions

WEMCO PUMP

GENERAL ARRANGEMENT
116K RIBBED CASE PUMP ONLY
14S & 14W BEARING FRAME
WEMCO-HIDROSTAL PUMP

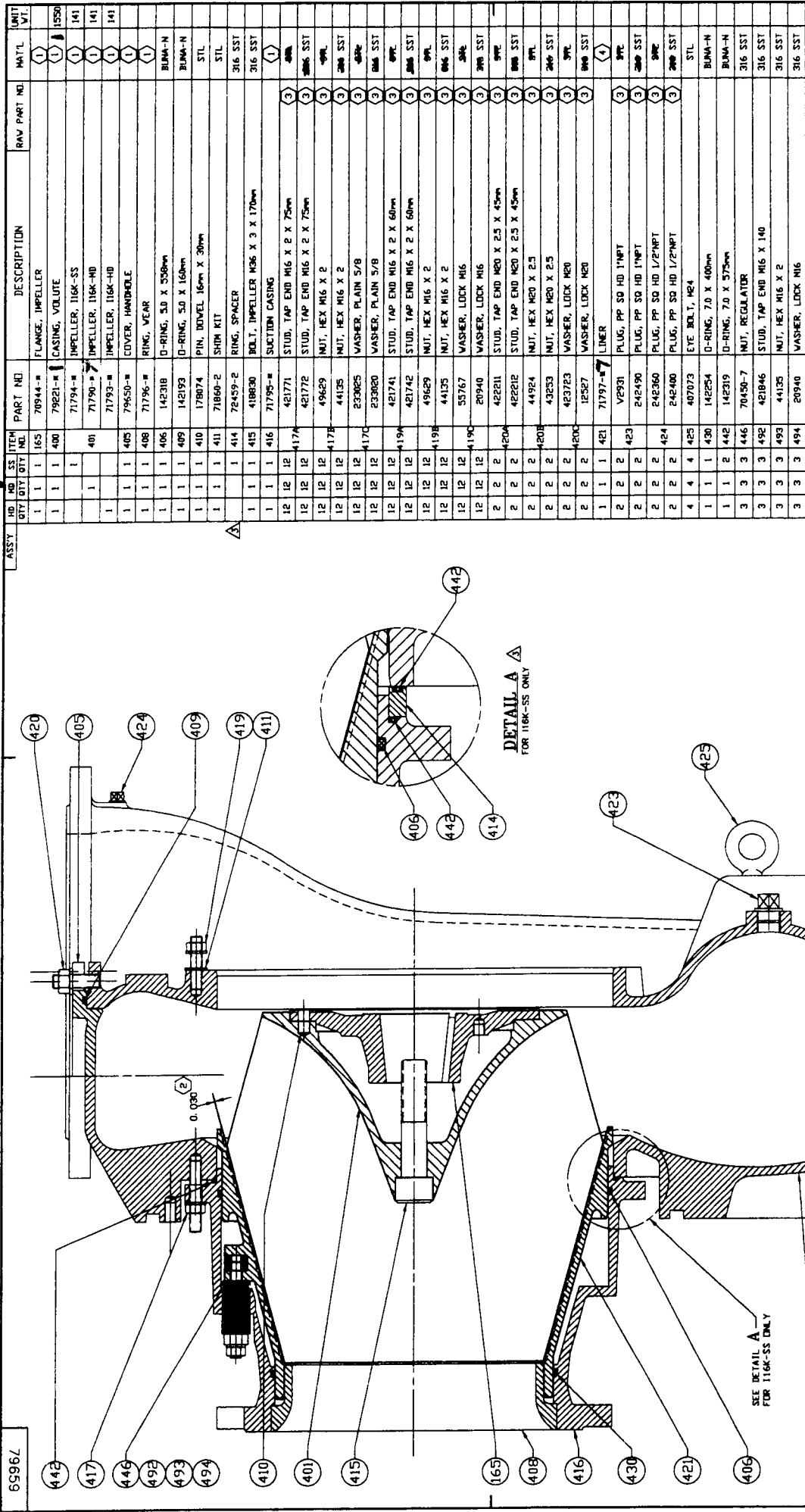
DATE: 08/07/00
REV: 1
DRAWING NO: 79768-1
SHEET 1 OF 1

REV	DATE	BY	CHKD	DESCRIPTION
1	JUL 17 00	BRD	BRD	NEW ISSUE
1	JUL 09 00	BRD	BRD	UPDATED Y AND CP DIMENSIONS FOR SS IMPELLER

DATE: 08/07/00
REV: 1
DRAWING NO: 79768-1
SHEET 1 OF 1

S/N 000W0571-07

THIS DRAWING HAS A CORRESPONDING .pdf FILE. UPDATE .pdf WHEN REVISING THIS DRAWING.



ASSY	HD	NO	SS	ITEM	PART NO	DESCRIPTION	RAW PART NO	MAT'L	UNIT
QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY
1	1	1	1	165	70944-M	FLANGE, IMPELLER		1	1550
1	1	1	1	400	79221-M	CASING, VOLUTE		1	141
1	1	1	1	401	71794-M	IMPELLER, 116K-SS		1	141
1	1	1	1	402	71790-M	IMPELLER, 116K-HD		1	141
1	1	1	1	403	71793-M	IMPELLER, 116K-HD		1	141
1	1	1	1	405	79650-M	COVER, HANDHOLE		1	
1	1	1	1	408	71796-M	RING, WEAR		1	
1	1	1	1	406	142318	O-RING, 5.0 X 5.08mm		1	
1	1	1	1	409	142193	O-RING, 5.0 X 1.68mm		1	
1	1	1	1	410	178074	PIN, BOWEL 16mm X 30mm		1	
1	1	1	1	411	71860-2	SHIM KIT		1	
1	1	1	1	414	72459-2	RING, SPACER		1	
1	1	1	1	415	418630	BOLT, IMPELLER M36 X 3 X 170mm		1	
1	1	1	1	416	71795-M	SUCTION CASING		1	
12	12	12	12	417	421771	STUD, TAP END M16 X 2 X 75mm		3	
12	12	12	12	418	421772	STUD, TAP END M16 X 2 X 75mm		3	
12	12	12	12	419	49629	NUT, HEX M16 X 2		3	
12	12	12	12	417B	44135	NUT, HEX M16 X 2		3	
12	12	12	12	23062S	WASHER, PLAIN 5/8		3		
12	12	12	12	23062S	WASHER, PLAIN 5/8		3		
12	12	12	12	23062S	WASHER, PLAIN 5/8		3		
12	12	12	12	421741	STUD, TAP END M16 X 2 X 60mm		3		
12	12	12	12	421742	STUD, TAP END M16 X 2 X 60mm		3		
12	12	12	12	49629	NUT, HEX M16 X 2		3		
12	12	12	12	44135	NUT, HEX M16 X 2		3		
12	12	12	12	55767	WASHER, LOCK M16		3		
12	12	12	12	20940	WASHER, LOCK M16		3		
2	2	2	2	42221L	STUD, TAP END M20 X 2.5 X 45mm		3		
2	2	2	2	42221L	STUD, TAP END M20 X 2.5 X 45mm		3		
2	2	2	2	44924	NUT, HEX M20 X 2.5		3		
2	2	2	2	42323	WASHER, LOCK M20		3		
2	2	2	2	42323	WASHER, LOCK M20		3		
2	2	2	2	12527	WASHER, LOCK M20		3		
1	1	1	1	71797-M	LINER		3		
2	2	2	2	V2933	PLUG, PP SD HD 1/2" NPT		3		
2	2	2	2	242490	PLUG, PP SD HD 1/2" NPT		3		
2	2	2	2	242360	PLUG, PP SD HD 1/2" NPT		3		
2	2	2	2	242400	PLUG, PP SD HD 1/2" NPT		3		
4	4	4	4	407073	EYE BOLT, M24		3		
1	1	1	1	142254	O-RING, 7.0 X 4.00mm		3		
1	1	1	1	142319	O-RING, 7.0 X 5.75mm		3		
3	3	3	3	70450-7	NUT, REGULATOR		3		
3	3	3	3	421846	STUD, TAP END M16 X 140		3		
3	3	3	3	44125	NUT, HEX M16 X 2		3		
3	3	3	3	20940	WASHER, LOCK M16		3		

NOTES:

- MATERIALS OF CONSTRUCTION:
 -1 = CAST IRON (FOR VOLUTE & SUCTION CASING ONLY)
 -2 = 316 SST
 -3 = 316 SST (FOR IMPELLER ONLY)
 -4 = 17-4 PH (FOR IMPELLER & LINER ONLY)
- SET IMPELLER CLEARANCE TO 0.030" MAXIMUM. IMPELLER EDGE CLEARANCE SHOULD BE CHECKED ALONG ENTIRE AND AGAIN AFTER ROTATING IMPELLER 1/4, 1/2 AND 3/4 TURNS
- FASTENER MATERIALS PER APPLICATION.
- MATERIAL AND MACHINING PER APPLICATION.

ADDED ITEM 414 AND DETAIL A FOR SS IMPELLER

REVISED PART NUMBERS FOR ITEM 417A & 419A

79659-1
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 XX ± .02
 XXX ± .010
 FRACTIONS ± 1/16
 ANGLE ± 1°

SCALE: 3/8"
 SHEET 1 OF 1
 79659

WEMCO PUMP
 VET END ASSEMBLY
 116K PUMP WITH RUBBER CASE
 REGULABLE
 VEMCO-HYDROSTAT PUMPS

WEMCO PUMP
 53000
 55009
 50763

S/N 06 DW05771-07

THIS DRAWING HAS A CORRESPONDING .pdf FILE. UPDATE .pdf WHEN REVISING THIS DRAWING.

8/5/17

QTY	ITEM NO.	PART NO.	DESCRIPTION	RAW PART NO.	MATL	UNIT
8	161	163025	SPRING, 7.5 X 11 F, H, I, L, C (W) S		STL	VT
1	162	142244	SNAP RING A 90		STL	
1	163	242405	PLUG, NPT 1/2		STL	
1	164	142176	O-RING 3.5 X 88mm		BUNA-N	
1	165	70944-1	IMPELLER FLANGE 1/L 100		C.I.	
1	166	70969-1	IMPELLER NUT M72		316SS	
1	167	70970-1	IMPELLER LOCKING WASHER M72		316SS	
1	209	142318	O-RING 7 X 58mm		BUNA-N	
1	212	182239	ASSEMBLY, DRAIN PIPE			
1	307	77809-1	BACK COVER 14H		STL	
1	515	157594	SEAL MECH HYDROSTAL X 100		TUNG/STL	
1	516	157594	SEAL MECH HYDROSTAL X 100		CARB/STAINLESS	
1	527	142539	O-RING 5 X 340mm		BUNA-N	
6	5344	422211	STUD, TAP END M20 X 45		STL	
6	5348	44924	NUT, HEX M20		STL	
6	5340	423723	WASHER, LOCK M20		STL	
2	5364	242281	PLUG, 910SX 1/4" BSP PARAL		316SS	
2	5365	181773	WASHER, SEAL		COPPER	
1	545	142245	RING, SNAP A 100		STL	
1	552	105092	PLUG, TAPERED HEX STD. 1"		STL	
1	562	142245	RING, SNAP A 100		STL	

NOTES:

- GREASE WITH MOBILUX EP NO. 2 OR EQUAL.
- SET BEARING END PLAY .008" TO .012"

QTY	ITEM NO.	PART NO.	DESCRIPTION	RAW PART NO.	MATL	UNIT
1	100	70960-1	BEARING HOUSING 14S		C.I.	
1	101	79506-1	BEARING SUPPORT 14H		C.I.	
1	102	79507-1	BEARING CAP P.S. 14H		C.I.	
1	106	70334-1	SPACER RING		STL	
4	108A	421711	STUD M16 X 45		STL	
4	108B	49629	NUT M16		STL	
4	108C	55767	WASHER, LOCK M16		STL	
1	109	70942-1	BEARING SPACER		STL	
1	110	79508-1	SHAFT, 14H		STL	
1	112	70700-1	WOODRUFF KEY 20A		STL	
1	114	70701-7	COUPLING KEY 25 X 14 X 130		STL	
1	116	70959-1	SUPPORT FRAME		C.I.	
1	118	100404	ROLLER BEARING P.S.		STL	
1	119	100401	ROLLER BEARING M.S.		STL	
2	121	100386	ANGULAR CONTACT BALL BEARING		STL	
1	126	423282	NUT, BRG LOCK M20		STL	
1	127	424668	WASHER, LOCK M20		STL	
1	130	70943-1	Labyrinth M.S. H4-1-L		C.I.	
3	131	127008	GREASE NIPPLE NPT 1/4		STL	
1	134	242405	LUBRICANT DRAIN PLUG NPT 1/2		STL	
4	135A	421711	STUD M16 X 45		STL	
4	135B	49629	NUT, HEX M16		STL	
4	135C	55767	WASHER, LOCK M16		STL	
4	141A	421191	STUD M12 X 35		STL	
4	141B	44673	NUT, HEX M12		STL	
4	141C	44672	WASHER, LOCK M12		STL	
1	146	142199	O-RING 5 X 240mm		BUNA-N	
1	147	142184	O-RING 3.5 X 230mm		BUNA-N	
1	148	142181	O-RING 3.5mm X 170mm		BUNA-N	
1	154	242405	LUBRICANT DRAIN PLUG NPT 1/2		STL	
1	160	142247	SNAP RING A 140		STL	

71378-1
877 /RAD 500

ADDED ITEM#162 ITEM#146 P/N 142199 WAS 142206 ECU 52388 JCU BRD
 CHANGED MATL FROM STL TO COPPER ON ITEM 308B ECU 51763 JCU BRD
 NEW ISSUE ECU 51828 JCU BRD

REVISION: ECU 51828 JCU BRD
 ECU 51828 JCU BRD
 ECU 51828 JCU BRD

WEMCO PUMP
 3611 LAKE CITY, UTM
 U.S.A.

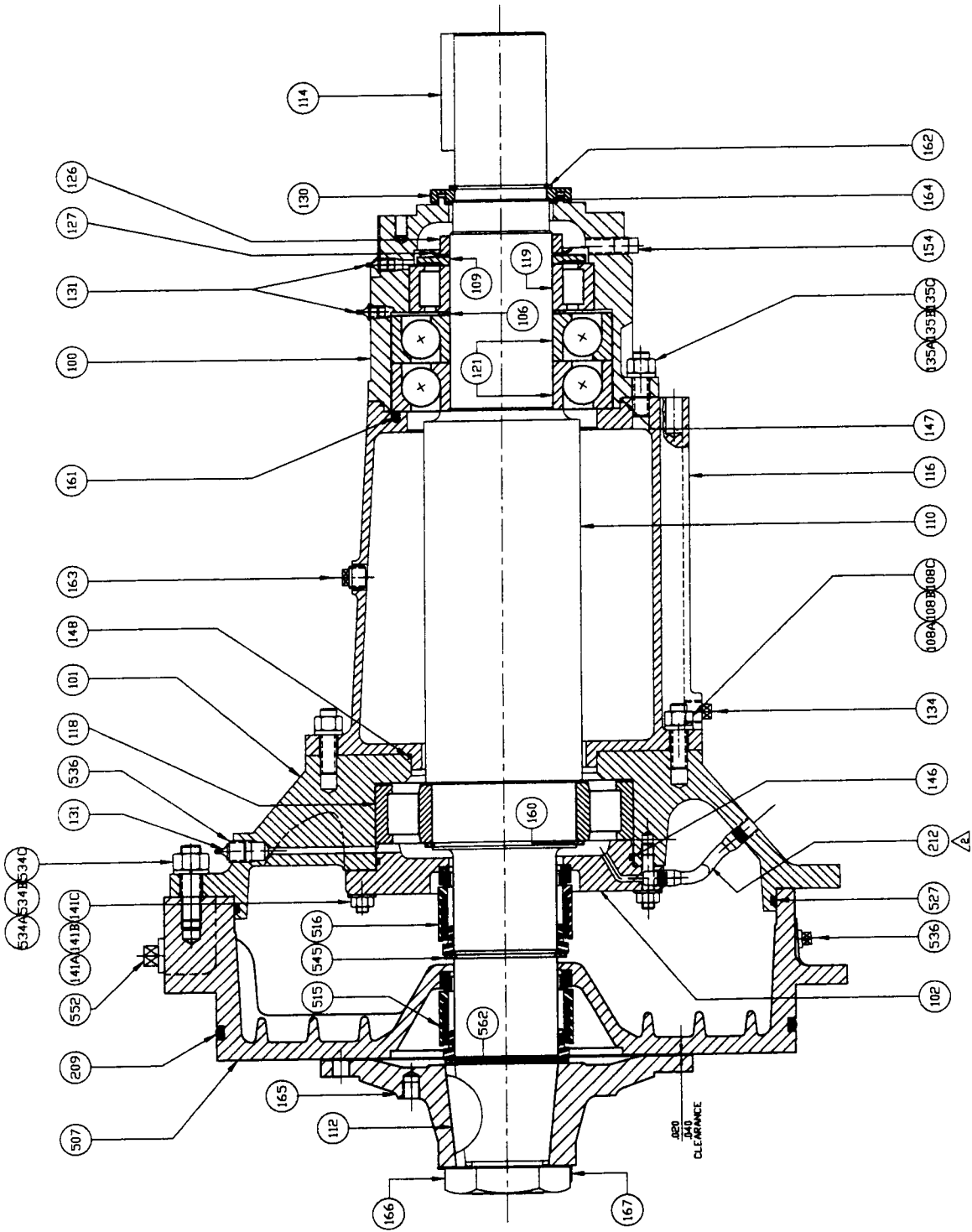
71378-1
 DIMENSIONS ARE IN INCHES
 TOLERANCE:
 .XX ± .02
 .XXX ± .010
 FRACTIONS ± 1/16
 ANGLE ± 1°
 SURF. FINISH: /R/S

SCALE: 1/2"
 DWT 1 OF 2
 71378

SN 06 DW06771-07

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8/15/17



SCALE	D
1/2	
SHEET	2
OF	2
DATE	
7/13/78	
AUTOCAD	

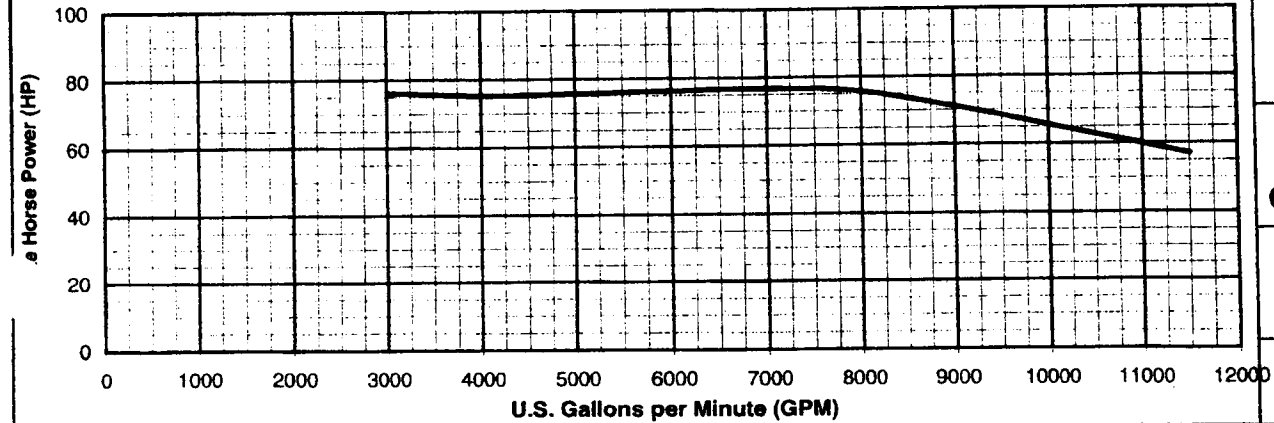
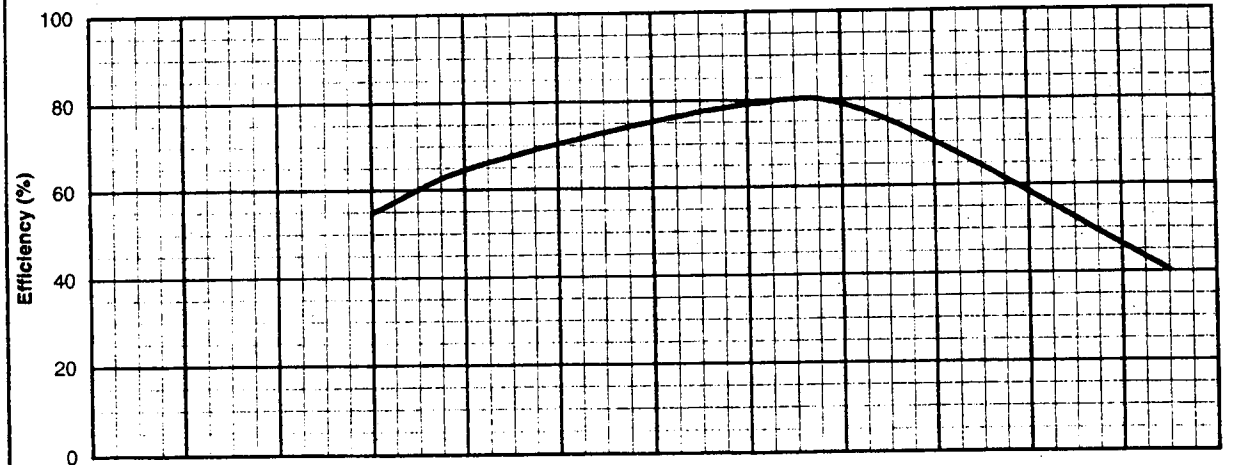
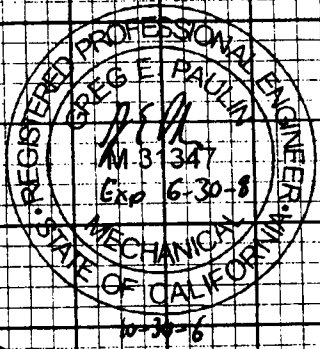
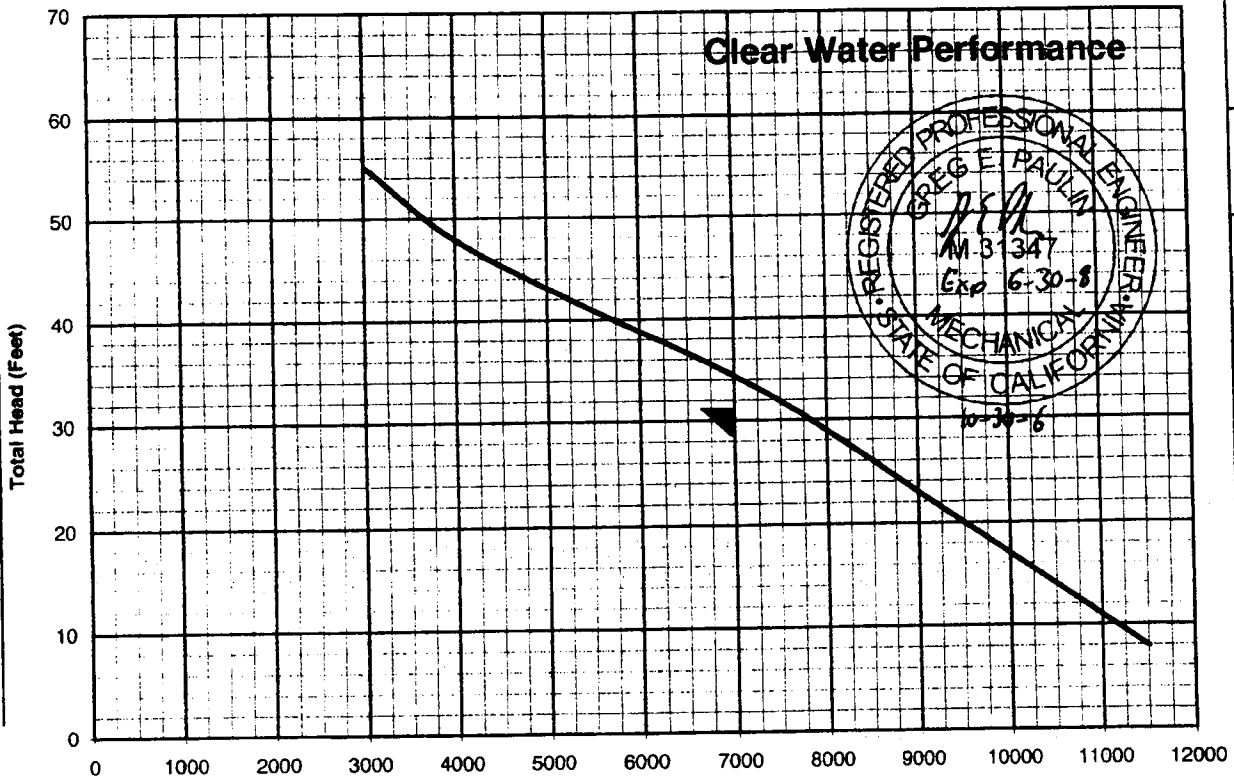


WEMCO PUMP

I16K-MD-I4W



440 W. 800 S. Salt Lake City, Utah 84110
Phone: (801) 358-8731 Fax: (801) 358-9300



SALES ORDER NO:
DW05771

RPM:
892

Customer: Bowen Engineering Corporation

Customer PO. 0106056P007

Pump ID

Certified

"D" accepted
Pump ID
Richard C. Clark
10/30/06

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BASED ON:
TEST

DATE:
10/30/2006

SERIAL NO.:
06DW05771-07

TEST NO.:
14441-1-0

Impeller Type:
HCI

B
SECTION 2

MAINTENANCE SUMMARY FORM

1. Equipment Item.	16 X 16 MODEL I16K-MD-I4W HIDROSTALSCREWCENTRIFUGAL RAW SEWAGE PUMP D
2. Manufacturer.	WEMCO, 440 WEST 800 SOUTH, SALT LAKE CITY, UT 84101, TELEPHONE: (801) 359-8731
3. Equipment Identification Number (s).	SERIAL NUMBERS: 06DW05771-07.
4. Total Weight.	APPROXIMATELY 7100 LBS EACH
5. Nameplate Data (hp, voltage, speed, etc.).	100 HP, 3 PHASE, 60 HZ, 460 VOLT 900 RPM MOTOR COS: 7000 GPM AGAINST 33' TDH @ 800 RPM
6. Manufacturer's Local Representative.	MUNIQUEP, INC. 1098 MELODY LANE SUITE #402 ROSEVILLE, CA 95678 TELEPHONE: (916) 787-5641

7. MAINTENANCE REQUIREMENT

<u>Maintenance Operation</u> List briefly each maintenance operation req'd & refer to specific information in mfr's std. Maintenance manual, if applicable.	<u>Frequency</u> List required frequency of each maintenance operation.	<u>Lubricant (If Applicable)</u> Refer by symbol to lubricant list required.	<u>Comments</u>
Inspect pump for proper operation	Daily	---	Clean/clear as needed
Check seal chamber oil	After 1000 hrs. & once a year thereafter	-C-	Increase frequency as experience dictates
Check bearing housing lubrication.	770 operating hours	-A-	Grease as required.
Check motor for proper operation	Daily	---	Clean/clear as required
Motor lubrication	Semi-Annually	-B-	Lube as required

8. LUBRICANT LIST

Reference Symbol	Shell	Mobil	Texaco	Chevron	Exxon
-A- Bearing Housing		Mobilux EP2		Industrial Grease Med.	
-B- Reliance Motor	Dolium R		Premium RB #2	SR 1 #2	Unirex #2
-C- Seal Chamber	Transformer grade oil				

9. RECOMMENDED SPARE PARTS

The following are our recommendations regarding what spare parts, if any, should be kept on the job.

Quantity	Description	Item Number
1	O-Ring	209
1	O-Ring	406
1	O-Ring	409
1	O-Ring	430
1	O-Ring	442
1	O-Ring	527
1	Mechanical Seal X100	515
1	Coupling Sleeve 14E	P/N 254455

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

Weir Specialty Pumps

P.O. Box 209 (84110-0209)
440 West 800 South
Salt Lake City, UT 84101

Tel: 801-359-8731
Fax: 801-530-7531
www.weirsp.com

ISO 9001:2000 Certified • ISO 14001 Certified

WEMCO PUMP 
WEMCO-HIDROSTAL
ROTO-JET PUMP

REPRESENTATIVE FOR PARTS & SERVICES

B L ANDERSON COMPANY
2540 KENT AVENUE
WEST LAFAYETTE, IN 47906
TELEPHONE: (765) 463-1518
FAX: (765) 463-5641

**JOB NAME: WATER POLLUTION CONTROL FACILITY IMPROVEMENT – PHASE II
MUNCIE, IN WASTEWATER IMPROVEMENTS – SEWAGE PUMPS
CUSTOMER ORDER NUMBER: LOI 020806
WEMCO ORDER NUMBER: DW05771**

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 parts (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 parts(s) required.

Note: A complete parts list is not available nor is it required. See the "Spare Parts Ordering Instructions": above.

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**SAMPLE FORM
GUARANTEE FOR EQUIPMENT ITEM**

Project: _____

Owner of Project: _____

Engineer: _____

Equipment Item: _____

Model No.: _____ Serial No.: _____

Manufacturer/Supplier: _____

Address of Manuf./Supplier: _____

Address of Sales Rep.: _____

Contractor: _____

Address of Contractor: _____

The undersigned company guarantees to _____ (Contractor) that the above equipment is of good merchantable quality, free from defects in materials and workmanship; fully meets the type, quality, design, and performance requirements defined in the Contract Specifications of the above project; and that the equipment will, in actual operation, satisfactorily perform the functions for which it has been installed.

The undersigned agrees to repair, replace, or otherwise make good any defect in workmanship or materials in the above described equipment, free of all charges including transportation, which are found to be defective within one year after the date of substantial completion of the work or the date of final acceptance by the Owner, whichever comes first.

This guaranty shall run from the Contractor to the Owner of the above named Project.

Guarantee Starts _____ Guarantee Expires _____

Manufacturer/Supplier

Contractor

Signed by: _____

Signed by: _____

Title: _____

Title: _____

Date: _____

Date: _____

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WEMCO PUMP 
WEMCO-HIDROSTAL
ROTO-JET PUMP

EMERGENCY SHUT DOWN PROCEDURES

Shut down problem pump, start-up spare pump, being careful to open and close appropriate suction and discharge valves associated with each pump.

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**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-HIDROSTAL 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 of 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.**

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

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**

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.**

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.

WARNING

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

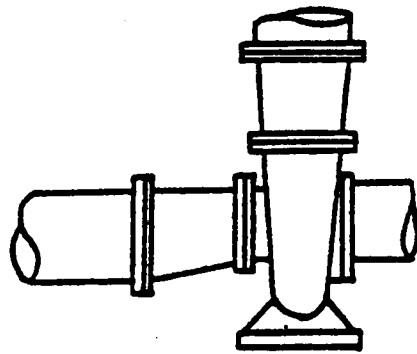


FIGURE 1
Recommended

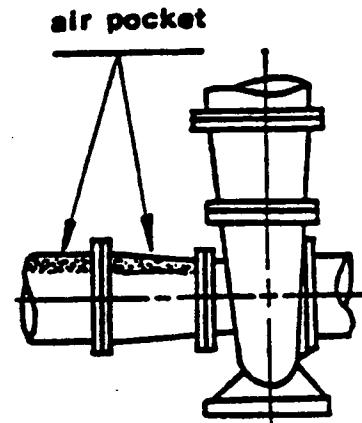


FIGURE 2
Not Recommended

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

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

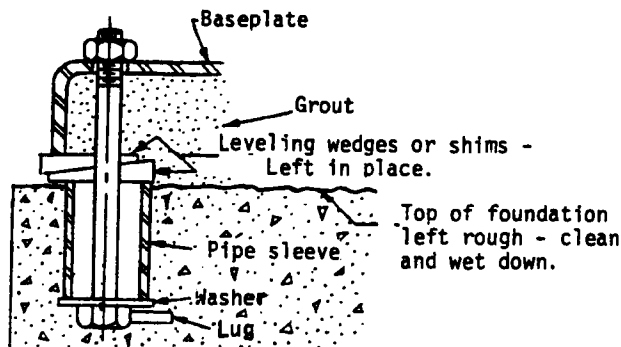


FIGURE 3
Typical Foundation Bolt Design

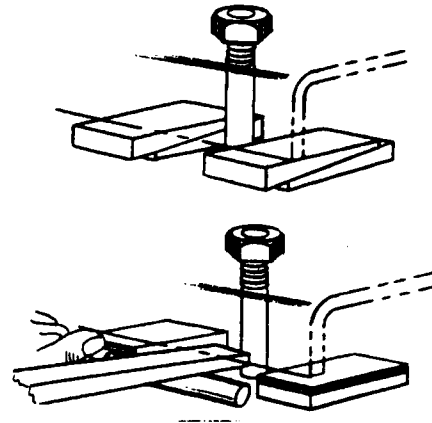


FIGURE 4
Method of Leveling

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

WARNING

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°F or less and 10-20 psi over the maximum pump discharge pressure. WEMCO-HIDROSTAL pumps are supplied with various service connections for this purpose. Refer to appropriate "Service Connections" manual and cross sectional drawings for proper connections.

NOTE: 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.

WARNING

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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. CONTACT WITH INCORRECTLY WIRED EQUIPMENT COULD RESULT IN INJURY.

WARNING

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.

VI. OPERATION

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

8. Pump is primed. Hidrostal 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-HIDROSTAL 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.

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.

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

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

this is considered normal. At start-up, skin temperature of the bearing housing may exceed 200°F, but should be under this after a 30-40 hour run-in period. Actual bearing temperature will be 20-30°F 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.

WARNING

**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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

WARNING

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.

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.

INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS

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.

**INSTALLATION, OPERATION AND MAINTENANCE
GENERAL INSTRUCTIONS, ALL MODELS**

WARNING

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.

**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.

**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-HIDROSTAL PUMP. OPERATING PERSONNEL MUST READ AND UNDERSTAND THE START-UP AND OPERATION PROCEDURES.

I. SERVICE CONNECTIONS

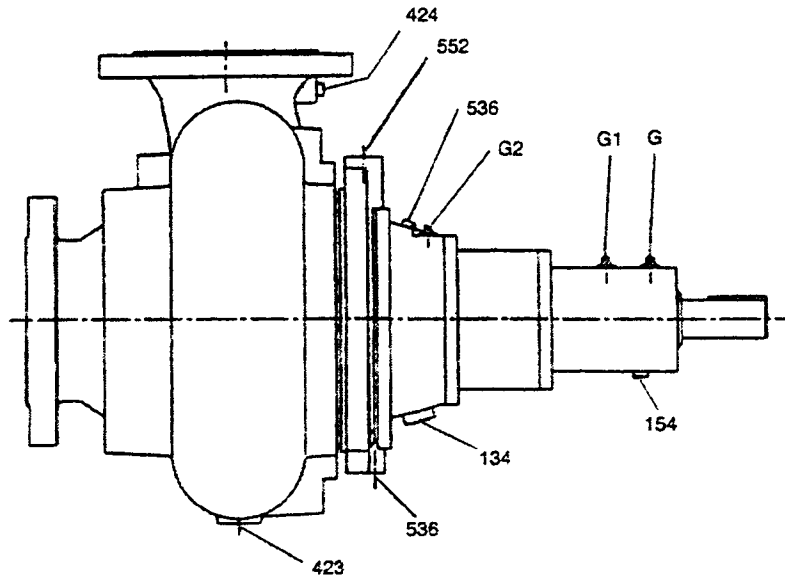


FIGURE 1. Refer also to bearing frame cross section drawing.

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.

**INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME**

Oil Lubricated Mechanical Seal: These pumps are supplied with mechanical seals of the tandem design. The sealing faces are carbon/ceramic for the outboard seal, and tungsten carbide/silicon carbide for the inboard 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
D0W	3/4	*	*	1/4	1/2	1/2	R1/4
E2W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
F2W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
H2W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
H4W	3/4	1/4	1/4	1/4	1/2	1/2	R1/4
I4W	1	1/4	1/4	1/4	1/2	1/2	R1/4
L4W	1	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

**INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME**

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 outboard (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 inboard (lower) 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.

NOTE: 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 Hidrostal factory uses the following oil:

MOTOREX 155
Flame point min. 132°C
Specific Gravity: at 20°C: 0.812
Maximum viscosity at 40°C: 3.52 centistoke
Viscosity at 20°C: 6.75 centistoke
Solidification Point: -38°C

Recommended oil in U.S.A.:

SHELL PELLA (A) OIL,
MOBIL VELOCITE #6
GULF MINERAL SEAL OIL 896,

or equal with same specifications as above.

**INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME**

Bearing Frame	Oil Quantity
D0W, E2W	4 L (1 Gal.)
F2W	7.5 L (1.4 Gal.)
H2W, H4W	14 L (3.7 Gal.)
I4W	22 L (5.8 Gal.)
L4W	34 L (9 Gal.)

Note: 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°F or more. Bearings are lubricated at the factory with the following type of grease. Use this type, or equivalent, for greasing:

Mobilux EP No. 2 or
Chevron Industrial Grease Medium
Shell Dolium R

C. LUBRICATION PROCEDURE (Refer to service connections drawing, Figure 1.)

Bearing Frame D0W: Lubricate only grease fitting G2. (The outboard bearing is permanently lubricated for the life of the bearing).

Bearing Frame E2W: Lubricate grease fittings G1 and G2.

**WEMCO
DATA SHEET**

**WEMCO-HIDROSTAL PUMPS
BEARING FRAME MODELS, K LINE**

P25-D305C

Rev. 0
Supersedes P25-D305

5/28/99
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**INSTALLATION, OPERATION AND MAINTENANCE
SERVICE CONNECTIONS, SEALING & LUBRICATION
TYPE 'W' TANDEM SEAL BEARING FRAME**

Bearing Frames F2W, H2W, H4W, I4W, L4W:

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
DOW	1500	4000	None	14
	1800	3400		14
E2W	1500	2800	25	15
	1800	2300	25	15
F2W	1800	650	40	10
H2W	1200	3800	40	42
	1500	2700	40	42
H4W	1500	530	95	10
	1800	380	95	10
I4W	1200	770	95	15
	800	1200	73	73
L4W	800	1200	73	73
	900	1070	73	73

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

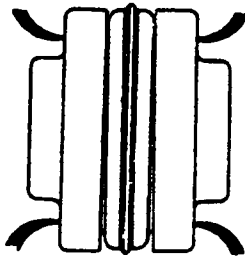
INSTALLATION, OPERATION AND MAINTENANCE
COUPLING ALIGNMENT – DIRECT DRIVE MODELS

WARNING

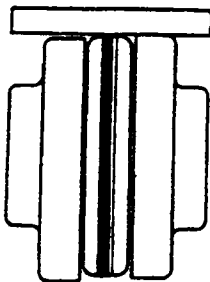
ALL GUARDS AND PROTECTIVE DEVICES MUST BE INSTALLED BEFORE THE PUMP IS STARTED. CONTACT WITH UNGUARDED COUPLINGS COULD RESULT IN INJURY.

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

**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, L 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 L8) 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 E4K 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 of the treaded 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.

**INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END**

TABLE A

PUMP TYPE	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	
E4K	0.35	.014	0.60	.024	1/3
E5K	0.4	.016	1.12	0.44	2/3
E8K- LS/LL			1.55	.061	1
E8K- HD/SS			0.68	.027	1/2
F4K			1.40	.055	1
F6K	0.5	.020	1.93	.076	1-1/3
F10K			0.85	.033	1/2
H5K			1.67	.066	1-1/6
H8K	0.6	.024	2.32	.091	1-1/2
H12K			1.02	.040	2/3
I6K			0.80	.030	1-1/3
I16K			2.90	.114	2
L8K	0.75	.030	1.90	.050	5/6
L12K			2.51	.099	1-2/3
L20K			3.48	.137	2-1/3

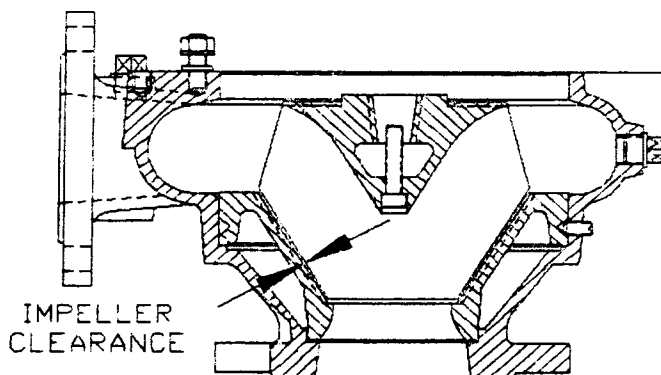


FIGURE 1

NOTE: Clearance should be checked along entire impeller edge and again after rotating impeller 1/4, 1/2, and 3/4 turns.

INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END

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 vise-grip 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:	<u>E</u>	<u>F</u>	<u>H</u>	<u>I</u>	<u>L</u>
Wrench size:	10mm	14mm	19mm	27mm	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 Loctite bond.

The suction ring (408) should not typically require disassembly; remove from suction

INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END

casing only if badly damaged by unusual circumstances. Press out suction ring with a hydraulic press.

NOTE: F4K, H5K, I6K, and L8K pumps will not have a suction ring (the necessary lip is cast directly into the liner). Also, E4K 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	L
Torque (ft-lb):	60	90	250	350	350



Note: 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.

INSTALLATION, OPERATION AND MAINTENANCE
SIZE E, F, H, I, L REGULABLE WET END

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.

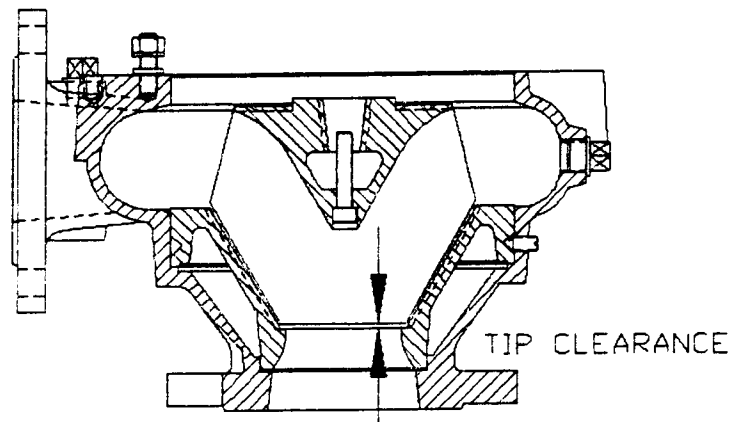


FIGURE 2

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

Refer to Drawing 71378 (I4W), 79669 (L4W)

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.
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. Remove the woodruff key (112) and seal retaining snap ring (562) from the shaft. Check for and remove any burrs on the edge of the snap ring groove and along the woodruff key slot to avoid damage to the seal o-ring.
5. Loosen the three set screws in the rotating part of the seal (515). Gently pry the rotating part of the seal from the shaft with two screwdrivers on opposite sides of the lip where the set screws are located. Lubrication of the shaft under the seal helps this disassembly.
6. Place the bearing frame in a vertical position, with blocks under the back cover on either side of the shaft for stability. The bearing frame is best handled in this position with a lifting eye bolt screwed into the drive end of the shaft (M20 screw size).
7. Unfasten nuts (534) and carefully lift the shaft and bearing frame assembly out of the back cover (507). Make sure that the stationary part of the seal is not damaged by contact with the shaft.
8. Press out the seal 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. Assemble back cover (507) to bearing frame (101), and fasten 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 oil, and press it all the way into its seat in the back cover (507). 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 PIPE WHILE PROTECTING THE SEAL FACE WITH CARDBOARD RING.

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. Check to make sure that the o-ring is in place inside the rotating part of the seal, and that it is not damaged. Lubricate the o-ring with oil, and slide the rotating assembly onto the shaft, pushing it up as far as possible by hand.
6. Place the snap ring (562) on the shaft. With a sleeve or pipe, push the seal assembly (515) onto the shaft until the snap ring is engaged in its groove. Tighten the set screws in the rotating part of the seal.
7. Turn the shaft by hand. The seal housing should turn evenly, with little runout.
8. 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.

9. 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 1. The acceptable clearance range is .030 to .040". 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 .030" from the actual clearance measured, rounded to the nearest common shim stock size.

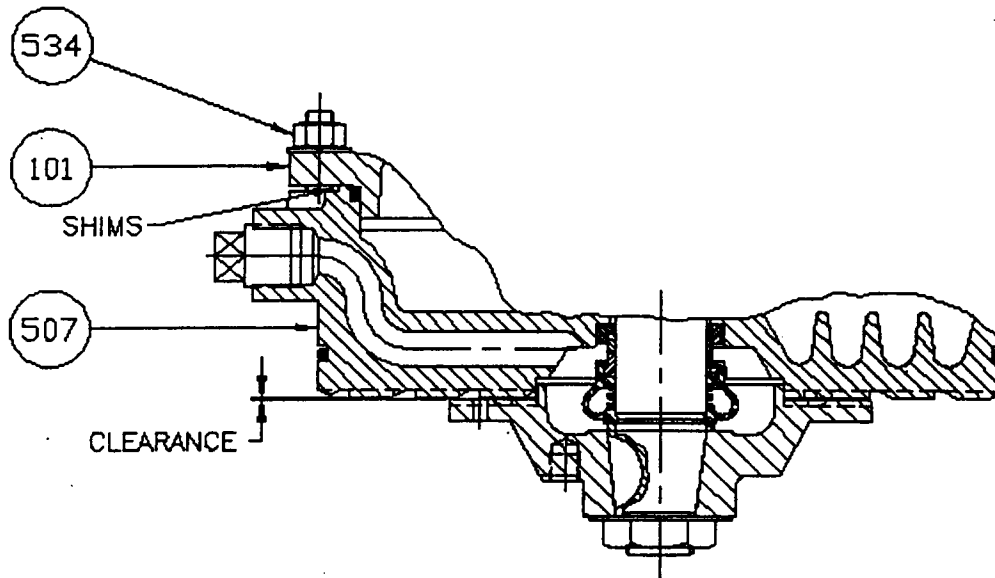


FIGURE 1

10. 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. With the bearing frame in a horizontal position, remove the snap ring (545), and remove any burrs from the edges of the groove.
2. Loosen the set screws on the rotating part of the seal (516), then grasp the seal and slide it from the shaft. (It may be necessary to pry the seal at the lip where the set screws are located, as was done with the lower seal.)
3. Disconnect one end of the seal drain tube assembly (212).
4. Loosen nuts from fastening studs (141), and remove bearing cap (102), taking care not to damage stationary seal ring by contact with shaft.
5. 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 oil, and press it all the way into its seat in the bearing cap (102). The seal should sit firmly at the bottom of the seat bore.
3. Reinstall bearing cap (102), tighten fasteners (141), and re-connect seal drain pipe assembly (212).
4. Check to make sure that the o-ring is in place inside the rotating part of the seal, and that it is not damaged. Lubricate the o-ring with oil, and slide the rotating assembly onto the shaft, pushing it up as far as possible by hand.
5. Place the snap ring (545) on the shaft. With a sleeve or pipe, push the seal assembly (516) onto the shaft until the snap ring is engaged in its groove. Tighten the set screws in the rotating part of the seal.

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

III. BEARING FRAME DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

A. Disassembly

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

1. Place the bearing frame in a vertical position, stabilized on blocks supporting the bearing frame on either side of the shaft.
2. Remove fasteners (134) joining the bearing support (101) and the intermediate frame (116). Lift the shaft assembly up out of the bearing support.
3. Install jacking screws in the backside of the bearing support (101) and push the outer race of the bearing (118) out of its bore.
4. Remove the snap ring (160) from the shaft, and pull the inner race of the pumpside bearing (118) from the shaft with a bearing puller.
5. Re-support the shaft assembly in the vertical position with blocks under the intermediate frame (116). Remove the snap ring (162) at the drive end of the shaft, then the labyrinth (130) and o-ring (164).

6. Loosen fasteners (135), and pull the drive bearing cap from the shaft (110). Small wedges or screwdrivers may be required, as this part has a tight fit. Save any shims that may be between this cap and the bearing frame.
7. Lift the shaft assembly up out of the bearing housing (101).
8. Remove the preload springs (161) from end of bearing frame, making sure none are lost.
9. On the shaft assembly, bend bearing lockwasher tab (127) away from locknut (126) and remove locknut, lockwasher, and bearing grease retainer (109) from the shaft.
10. Protect the seal mounting surfaces with duct or electrical tape. The drive (119) and thrust (121) bearings, with the bearing spacer (106) can now be removed from the shaft with a hydraulic press.

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. Place thrust bearing (121) on bearing heater and heat to 150°F. With hot pads, place the bearing on the shaft with the thinner edge of the inner race facing the shaft shoulder. Repeat for second thrust bearing, installing with the same orientation.
3. Install bearing spacer (106) on shaft (110) drive end, next to thrust bearings (121). Heat inner race of drive bearing (119) to 150°F, and install with lip against spacer (106).
4. When the bearings have cooled to under 100°F, hand pack the bearings (121) with Chevron Industrial Grease Medium (No. 2) or equivalent. Place outer race of drive bearing (119) onto inner race, and pack with the same grease.
5. 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.
6. Support the intermediate frame (116) vertically with the drive end up. Place thrust bearing preload springs (161) into holes in drive end of support frame. A spot of grease on each spring is helpful to hold them in place during installation.

7. Slide shaft assembly into bearing frame (101) from the drive end. Make sure the springs (161) are properly seated in their holes.
8. Place o-ring (147) on register of bearing cap (100), 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.
9. Place inner race of pumpside bearing (118) on a bearing heater to expand the race. Heat the inner race to approximately 150°F and with hot pads place the bearing race on the shaft (110). Install snap ring (160) to hold it in place.
10. Place bearing housing (101) in a vertical position with the pump side facing up. Place outer race assembly of the 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.

11. Turn bearing housing (101) over, with the pump side facing down. Place a new o-ring (148) on the register of the intermediate frame (116), and install the shaft assembly into the bearing housing. If the pump will be installed horizontally, make sure that the bearing housing is oriented so that the upper seal drain tube (112) will exit at the bottom of the housing when installed. Tighten fasteners (108).
12. 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.
13. Set the bearing end play as follows: Evenly tighten fasteners (135) until drag on the shaft is felt. Measure the gap between the bearing cap (100) and support frame (116) with feeler gages at three locations around the cap. Take the average of the readings and add .008". Round up to next common size shim thickness. The result is the thickness of shims to be added. Place shims at each fastener (135) between the cap and bearing frame, and tighten fasteners securely. Recheck free shaft rotation.

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



WARRANTY

Job Name MUNCIE,IN RAWSEWAGE PUMPABC

Customer Order Number 0106056P007

WEMCO Order Number DW05771

WEMCO® pumps and pump equipment are backed by the following warranty:

For the benefit of the original user, WEMCO PUMP™ warrants all new equipment to be free from defects in workmanship; and will replace or repair, at its discretion and F.O.B. its factories or other location designated by it, any part or parts returned to it which WEMCO PUMP's™ examination shall show to have failed under normal use and service by the original user within ~~one year following initial shipment to the purchaser.~~ Such repair or replacement shall be free of charge for all items except for those items that are consumable and normally replaced during maintenance. Repair or replacement of such consumable items shall be subject to pro-rata charge based upon WEMCO PUMP's™ estimate of the percentage of normal service life realized from the item. WEMCO PUMP's™ obligation under this Warranty is conditioned upon its receiving prompt notice of claimed defects which shall in no event be later than thirty (30) days following expiration of the above warranty period and is limited to repair or replacement as aforesaid.

THIS WARRANTY IS EXPRESSLY MADE BY WEMCO PUMP™ AND ACCEPTED BY PURCHASER IN LIEU OF ALL OTHER WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, WHETHER WRITTEN, ORAL, EXPRESS, IMPLIED, OR STATUTORY. WEMCO PUMP™ NEITHER ASSUMES, NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT, ANY OTHER LIABILITIES WITH RESPECT TO ITS EQUIPMENT INCLUDING NEGLIGENCE IN DESIGN OR MANUFACTURE. WEMCO PUMP™ SHALL NOT BE LIABLE FOR NORMAL WEAR AND TEAR NOR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE DUE TO USE OR IN OPERABILITY OF ITS EQUIPMENT FOR ANY REASON WHATSOEVER.

This Warranty shall not apply to equipment or parts thereof which have been altered or repaired outside of an authorized WEMCO PUMP™ facility or factory, or damaged by improper installation or application, or subject to misuse, abuse, neglect or accident.

This Warranty applies only to WEMCO® pumps and pump equipment manufactured and sold by Weir Specialty Pumps.

WEMCO PUMP™ makes no warranty with respect to parts, coatings, accessories, or components manufactured by others. The warranty which applies to such items is offered by their respective manufacturers except that WEMCO PUMP™ does warrant that any special coatings have been applied in accordance with their respective manufacturer's recommendations.

Signature: *Eric Tobin*
Eric Tobin -Applications Engineer


± 3 years, prorated from 3-5 years.

Date: 6/27/06

WEMCO PUMP™



PRODUCTS OF Weir Specialty Pumps
A Weir Group Company

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GSD-31 4/01 (Mod.)

B
SECTION 3

WOODS COUPLING SELECTION

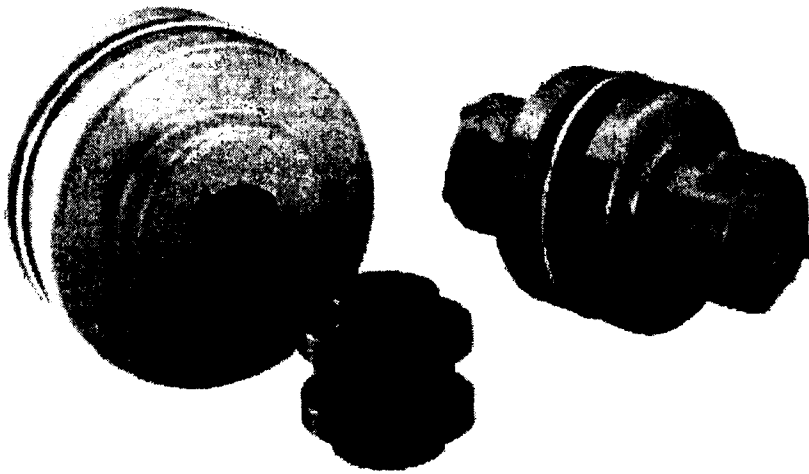
Alt	<u>Part Number</u>	<u>Description</u>	<u>Qty/Per</u>	<u>UM</u>	<u>ON DRAW</u>
Bom	257066	FLANGE,CPLG.WOODS 14SC78 C	1.	EA	604
..	257066	FLANGE,CPLG.WOODS 14SC78 C	1.	EA	605
..	254455	SLEEVE,WOODS 14E (EDPM)	1.	EA	606
..	258092	HUB,CPLG.WOODS 14H, 90MM BORE	1.	EA	654
..	258090	HUB,CPLG.WOODS 14H, 3 3/8 BORE	1.	EA	655

SURE-FLEX[®]

ELASTOMERIC

COUPLINGS

- **Need No Lubrication, No Maintenance**
- **Quick, Easy Installation**
- **Clean, Quiet Performance**

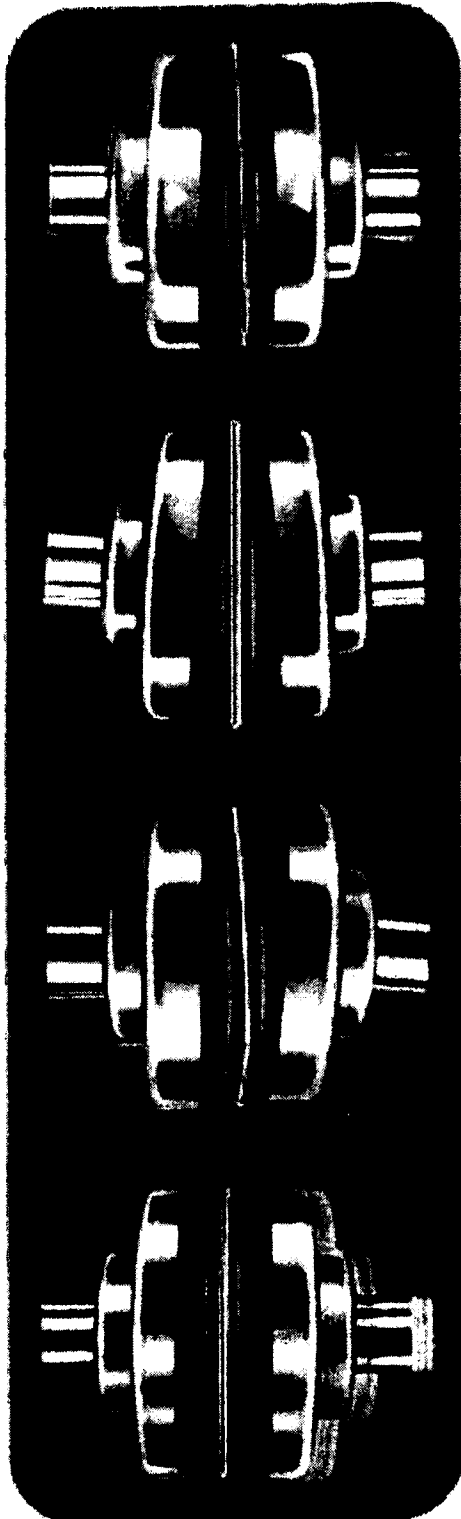


TB WOOD'S INCORPORATED ■ Chambersburg, Pennsylvania 17201
T.B. WOOD'S CANADA LTD. ■ Stratford, Ontario N5A 6V6



SURE-FLEX CAPABILITIES

4-WAY FLEXING ACTION absorbs all types of shock, vibration and misalignment



TORSIONAL

Sure-Flex coupling sleeves have an exceptional ability to absorb torsional shock and dampen torsional vibrations. The EPDM and Neoprene sleeves wind-up approximately 15° torsionally at their rated torque. Hytrel sleeves will wind-up about 7°.

ANGULAR

The unique design of the Sure-Flex coupling's teeth allows for the absorption of angular misalignment without wear. Refer to page F1—18 for actual allowable misalignment limits. These limits allow for the alignment of the coupling using only a scale and calipers.

PARALLEL

Parallel misalignment is absorbed without wear or appreciable energy losses. The lateral flexibility of the coupling sleeve minimizes radial bearing loads normally associated with parallel misalignment. This feature also allows for easier installation by the use of components bored for slip fits without fretting corrosion occurring at the shaft. Refer to page F1—18 for parallel misalignment limits. Only a straight-edge and feeler gage are required to obtain these limits.

AXIAL

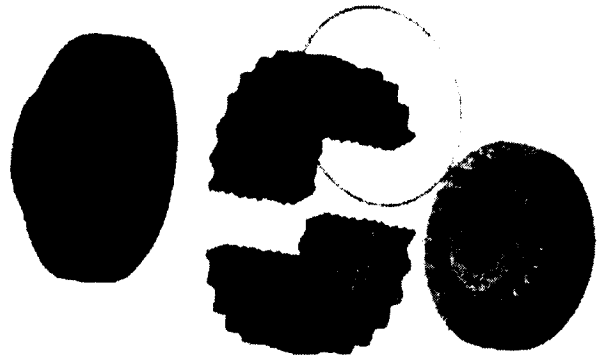
Sure-Flex couplings may be used in applications with limited axial shaft movements. The axial compressibility of the EPDM and Neoprene sleeves allows for shaft end-float without the absolute transfer of thrust loads.

SURE-FLEX FEATURES



EASY, QUICK INSTALLATION

Sure-Flex can be installed quickly and easily, because there are no bolts, gaskets, covers or seals. Alignment can be checked with a straightedge placed across the outside of the precision-machined flanges. No special tools are needed for installation, alignment or removal.



NO LUBRICATION, TROUBLE-FREE OPERATION

The teeth of the sleeve lock into the teeth of the flanges without clamps or screws, tightening under torque to provide smooth transmission of power. There is no rubbing action of metal against rubber to cause wear. Couplings are not affected by abrasives, dirt, or moisture. This eliminates the need for lubrication or maintenance, provides clean, dependable, quiet performance.

SURE-FLEX SELECTION

Sure-Flex couplings are selected as component parts.

1. Determine SLEEVE material and type.
Refer to pages F1—4 & 5
2. Determine coupling SIZE.
Refer to pages F1—6, 7, & 8
3. Determine FLANGES to be used.
Refer to pages F1—9 thru 16

Specify coupling components.

- Example #1 - Close coupled
 - Size 6, Type S flange w 1-3/8 bore
 - Size 6, Type S flange w 1" bore
 - Size 6, Solid EPDM sleeve
- Example #2 - 5" Between shaft spacer
 - Size 9, Type SC flange for #11 hub
 - Size 9, Type SC flange for #9 hub
 - Size 11 hub w 2-3/8 bore
 - Size 9 short hub w 1-1/8 bore
 - Size 9 Solid Hytrel sleeve

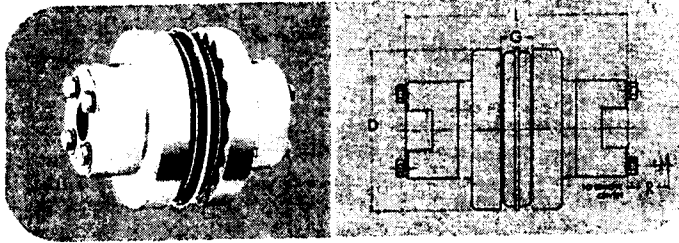
PROD. NUMBER	PROD. DESCRIPTION
6S138	6Sx1-3/8
6S1	6Sx1
6J	6JE
9SC5011	9SC50-11
9SC50	9SC50
11SCH238	11SCH x 2-3/8
9SCHS118	9SCHS x 1-1/8
9H	9H



TYPE SC SPACER COUPLINGS

BTS - CONVENTIONAL SPACER DESIGN

BTS - CONVENTIONAL SPACER DESIGN



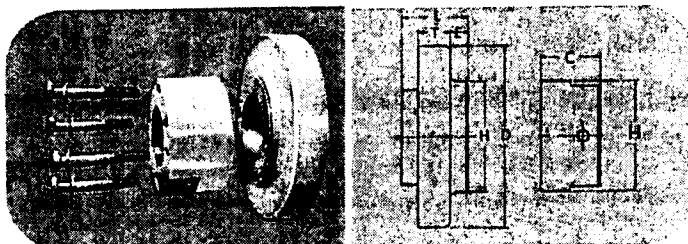
The table below shows assembled dimensions of Sure-Flex Type SC Spacer Couplings. For dimensions of separate components, refer to page F1—15.

Coupling Size	Required Distance Between Shafts	Use Flange No.	Use Hub No.	Max. Bore Std. KS	Dimensions				Wt. (lbs.) ■
					D	L (2)	G	R	
4JSC	3-1/2	4JSC35	....	1-1/8 (1)	2.460	5-5/8	5/8	....	2.7
5SC	3-1/2	5SC35	5SCH	1-1/8	3.250	5-5/8	3/4	9/16	4.5
6SC	3-1/2	6SC35	6SCH-6SCHS	1-3/8	4.000	5-7/8	7/8	3/4	7.3
	4-3/8	6SC44	6SCH-6SCHS	1-3/8	4.000	6-3/4	7/8	3/4	8.1
7SC	5	6SC50	6SCH-6SCHS	1-3/8	4.000	7-3/8	7/8	3/4	8.7
	3-1/2	7SC35	7SCH-7SCHS	1-5/8	4.625	6-3/8	1	5/8	9.9
	4-3/8	7SC44	7SCH-7SCHS	1-5/8	4.625	7-1/4	1	5/8	10.8
8SC	5	7SC50	7SCH-7SCHS	1-5/8	4.625	7-7/8	1	5/8	11.4
		8SC35	8SCH-8SCHS	1-7/8	5.450	6-7/8	1-1/8	13/16	15.2
	3-1/2	8SC35-10	10SCH-10SCHS	2-3/8	5.450	8-1/8	1-1/8	13/16	23.2
	4-3/8	8SC44	8SCH-8SCHS	1-7/8	5.450	7-3/4	1-1/8	13/16	16.4
9SC	5	8SC50	8SCH-8SCHS	1-7/8	5.450	8-3/8	1-1/8	1-3/16	17.4
		8SC50-10	10SCH-10SCHS	2-3/8	5.450	9-5/8	1-1/8	1-3/16	27.2
	3-1/2	9SC35	9SCH-9SCHS	2-1/8	6.350	7-1/2	1-7/16	1-1/16	18.6
	4-3/8	9SC44	9SCH-9SCHS	2-1/8	6.350	8-1/4	1-7/16	1-1/16	22.2
	5	9SC50	9SCH-9SCHS	2-1/8	6.350	8-7/8	1-7/16	1-1/16	23.2
10SC	7	9SC50-11	11SCH-11SCHS	2-7/8	6.350	10-3/8	1-7/16	1-3/16	40.4
		9SC70-11	11SCH-11SCHS	2-7/8	6.350	12-3/8	1-7/16	1-3/16	48.2
	7-3/4	9SC78-11	11SCH-11SCHS	2-7/8	6.350	13-1/8	1-7/16	1-3/16	51.0
	4-3/4	10SC48	10SCH-10SCHS	2-3/8	7.500	9-3/8	1-5/8	1-3/16	37.6
	5	10SC50	10SCH-10SCHS	2-3/8	7.500	9-5/8	1-5/8	1-3/16	38.4
11SC	7	10SC70-13	13SCH-13SCHS	3-3/8	7.500	13-5/8	1-5/8	1-7/8	72.0
	7-3/4	10SC78-13	13SCH-13SCHS	3-3/8	7.500	14-3/8	1-5/8	1-7/8	76.0
	10	10SC100-13	13SCH-13SCHS	3-3/8	7.500	16-5/8	1-5/8	1-7/8	88.0
12SC	4-3/4	11SC48	11SCH-11SCHS	2-7/8	8.625	10-5/16	1-7/8	1-3/16	54.5
		5	11SC50	11SCH-11SCHS	2-7/8	8.625	10-3/8	1-7/8	1-3/16	54.7
	7	11SC70-14	14SCH	3-7/8	8.625	14-5/8	1-7/8	2	86.1
	7-3/4	11SC78-14	14SCH	3-7/8	8.625	15-3/8	1-7/8	2	90.3
13SC	10	11SC100-14	14SCH	3-7/8	8.625	17-5/8	1-7/8	2	102.7
		7	12SC70	12SCH-12SCHS	2-7/8	10.000	12-7/8	2-5/16	1-1/2	88.1
	7-3/4	12SC70-14	14SCH	3-7/8	10.000	14-5/8	2-5/16	2	99.1
		12SC78	12SCH-12SCHS	2-7/8	10.000	13-5/8	2-5/16	1-1/2	91.9
14SC	10	12SC78-14	14SCH	3-7/8	10.000	15-3/8	2-5/16	2	103.3
		12SC100-14	14SCH	3-7/8	10.000	17-5/8	2-5/16	2	115.7
13SC	7-3/4	13SC78	13SCH-13SCHS	3-3/8	11.750	14-3/8	2-11/16	1-7/8	129.6
14SC	7-3/4	14SC78	14SCH	3-7/8	13.875	15-3/8	3-1/4	2	179.9

■ Approximate weight for completely assembled spacer coupling.

(1) 4JSC35 x 1-1/8 has shallow keyseat. (2) "L" dimension and weight will change if one or two short (HS) hubs used.

Note: Refer to page F1—15 to order — specify components separately.



TYPE SC FLANGES AND HUBS

Tables on page F1—15 provide dimensional information for flanges and hubs used for Spacer Couplings. For assembled dimensions, see table above. Any of the sleeves shown on page F1—5 may be used.

TYPE SC FLANGES AND HUBS

BTS - CONVENTIONAL SPACER DESIGN



(ILLUSTRATION AND DIMENSIONAL DRAWINGS SHOWN AT BOTTOM OF PAGE F1—14.)

Coupling Size	Flange No.	For Distance Between Shafts*	For Hub	Dimensions					Wt. (lbs.) ■
				D	E	H	L	T	
4JSC	4JSC35	3-1/8	...	2.460	2-1/16	2	2-1/2	7/16	1.3
5SC	5SC35	3-1/2	5SCH	3.250	51/64	2	1-11/16	19/32	1.3
6SC	6SC35	3-1/2	6SCH-6SCHS	4.000	19/32	2-1/2	1-5/8	23/32	2.0
	6SC44	4-3/8	6SCH-6SCHS	4.000	1-1/32	2-1/2	2-1/16	23/32	2.4
	6SC50	5	6SCH-6SCHS	4.000	1-11/32	2-1/2	2-3/8	23/32	2.7
7SC	7SC35	3-1/2	7SCH-7SCHS	4.625	15/32	2-13/16	1-5/8	25/32	2.5
	7SC44	4-3/8	7SCH-7SCHS	4.625	29/32	2-13/16	2-1/16	25/32	3.0
	7SC50	5	7SCH-7SCHS	4.625	1-7/32	2-13/16	2-3/8	25/32	3.3
8SC	8SC35	3-1/2	8SCH-8SCHS	5.450	9/32	3-1/4	1-5/8	29/32	3.7
	8SC35-10s	3-1/2	10SCH-10SCHS	5.450	9/32	4-3/8	1-5/8	29/32	3.5
	8SC44	4-3/8	8SCH-8SCHS	5.450	23/32	3-1/4	2-1/16	29/32	4.3
	8SC50	5	8SCH-8SCHS	5.450	1-1/32	3-1/4	2-3/8	29/32	4.8
	8SC50-10	5	10SCH-10SCHS	5.450	1-1/32	4-3/8	2-3/8	29/32	5.5
9SC	9SC35	3-1/2	9SCH-9SCHS	6.350	1/16	3-5/8	1-11/16	1-1/32	4.1
	9SC44	4-3/8	9SCH-9SCHS	6.350	7/16	3-5/8	2-1/16	1-1/32	5.9
	9SC50	5	9SCH-9SCHS	6.350	3/4	3-5/8	2-3/8	1-1/32	6.4
	9SC50-11	5	11SCH-11SCHS	6.350	3/4	5-1/4	2-3/8	1-1/32	7.0
	9SC70-11	7	11SCH-11SCHS	6.350	1-3/4	5-1/4	3-3/8	1-1/32	10.9
	9SC78-11	7-3/4	11SCH-11SCHS	6.350	2-1/8	5-1/4	3-3/4	1-1/32	12.3
	10SC48	4-3/4	10SCH-10SCHS	7.500	11/32	4-3/8	2-1/4	1-7/32	9.8
10SC	10SC50	5	10SCH-10SCHS	7.500	15/32	4-3/8	2-3/8	1-7/32	10.2
	10SC70-13	7	13SCH-13SCHS	7.500	1-15/32	6-1/8	3-3/8	1-7/32	14.5
	10SC78-13	7-3/4	13SCH-13SCHS	7.500	1-27/32	6-1/8	3-3/4	1-7/32	16.5
	10SC100-13	10	13SCH-13SCHS	7.500	2-31/32	6-1/8	4-7/8	1-7/32	22.5
	11SC48	4-3/4	11SCH-11SCHS	8.625	1/32	5-1/4	1-1/2	1-1/2	12.5
11SC	11SC50	5	11SCH-11SCHS	8.625	1/16	5-1/4	1-9/16	1-1/2	12.6
	11SC70-14	7	14SCH	8.625	1-1/16	6-1/2	2-9/16	1-1/2	16.3
	11SC78-14	7-3/4	14SCH	8.625	1-7/16	6-1/2	2-15/16	1-1/2	18.4
	11SC100-14	10	14SCH	8.625	2-9/16	6-1/2	4-1/16	1-1/2	24.6
	12SC70	7	12SCH-12SCHS	10.000	21/32	5-3/4	2-15/32	1-11/16	23.4
12SC	12SC70-14	7	14SCH	10.000	21/32	6-1/2	2-15/32	1-11/16	21.3
	12SC78	7-3/4	12SCH-12SCHS	10.000	1-1/32	5-3/4	2-27/32	1-11/16	25.3
	12SC78-14	7-3/4	14SCH	10.000	1-1/32	6-1/2	2-27/32	1-11/16	23.4
	12SC100-14	10	14SCH	10.000	2-5/32	6-1/2	3-31/32	1-11/16	29.6
	13SC78	7-3/4	13SCH-13SCHS	11.750	9/16	6-1/8	3-1/4	1-31/32	38.4
14SC78	7-3/4	14SCH	13.875	1/32	6-1/2	2-23/32	2-1/4	55.2	

* Flanges can be mixed to form different Between-Shaft Dimensions. See chart page F1—18. ■ Approximate weight for each flange.
 ▲ If using 10HS hub, 7/16-14NC x 2-1/4 long capscrew needed (not furnished).

Coupling Size	Hub No.	Max. Bore	STOCK BORES *		Dimensions			Wt. (lbs.) ■
			Plain Bore	Bore with Standard Keyway & Set Screw	C	H	Cap Screws Furnished	
4JSC	†	1-1/8	...	5/8 - 7/8 - 1-1/8*	1-1/16	2	...	...
5SC	5SCH	1-1/8	1/2	5/8 - 3/4 - 7/8 - 1-1/8	1-3/32	2	4-10 x 1-1/2	.8
6SC	6SCH	1-3/8	5/8	3/4 - 7/8 - 1 - 1-1/8 - 1-1/4 - 1-3/8	1-7/32	2-1/2	4-1/4 x 1-3/4	1.4
	6SCHS	7/8	...	7/8	31/32	2-1/2	4-1/4 x 1-1/2	1.1
7SC	7SCH	1-5/8	5/8	7/8 - 1 - 1-1/8 - 1-3/8 - 1-1/2 - 1-5/8	1-15/32	2-13/16	4-1/4 x 1-7/8	2.0
	7SCHS	7/8	...	7/8	1-3/32	2-13/16	4-1/4 x 1-1/2	1.5
8SC	8SCH	1-7/8	3/4	7/8 - 1 - 1-1/8 - 1-3/8 - 1-1/2 - 1-5/8 - 1-3/4 - 1-7/8	1-23/32	3-1/4	4-5/16 x 2-1/4	3.2
	8SCHS	7/8	...	7/8	1-23/32	3-3/4	4-5/16 x 1-3/4	2.0
9SC	9SCH	2-1/8	7/8	1 - 1-1/8 - 1-3/8 - 1-1/2 - 1-5/8 - 1-3/4 - 1-7/8 - 2-1/8	1-31/32	3-5/8	4-3/8 x 2-3/4	4.2
	9SCHS	1-1/2	...	1-1/8	1-17/32	3-5/8	4-3/8 x 2-1/4	3.7
10SC	10SCH	2-3/8	1-1/8	1-5/8 - 1-7/8 - 2-1/8 - 2-3/8	2-11/32	4-3/8	4-7/16 x 3-1/4	7.4
	10SCHS	1-5/8	...	1-1/8	1-21/32	4-3/8	4-7/16 x 2-1/2	5.5
11SC	11SCH	2-7/8	1-1/8	1-7/8 - 2-1/8 - 2-3/8 - 2-7/8	2-23/32	5-1/4	4-1/2 x 3-1/2	12.2
	11SCHS	1-7/8	...	1-1/8 - 1-5/8	1-29/32	5-1/4	4-1/2 x 2-3/4	9.3
12SC	12SCH	2-7/8	1-3/8	2-1/8 - 2-3/8 - 2-7/8	2-21/32	5-3/4	4-5/8 x 4	16.6
	12SCHS	2-1/2	...	2-3/8	2-17/32	5-3/4	4-5/8 x 3-1/2	14.1
13SC	13SCH	3-3/8	1-3/8	2-3/8 - 2-7/8 - 3-3/8	3-11/32	6-1/8	4-5/8 x 4-1/2	19.9
	13SCHS	2-1/2	...	2-1/8 - 2-3/8	2-15/32	6-1/8	4-5/8 x 3-1/2	16.0
14SC	14SCH	3-7/8	1-5/8	2-3/8 - 2-7/8 - 3-3/8 - 3-7/8	3-27/32	6-1/2	4-5/8 x 5	24.2

† FOR 4JSC the hub is an integral part of the flange. 4JSC x 1-1/8 has 1/4 x 1/6 shallow keyseat. ■ Approximate weight for each hub.
 * See page F1—10 for bore tolerances F1—13 for std. keyseat dimensions.

Woods® SURE-FLEX® COUPLINGS

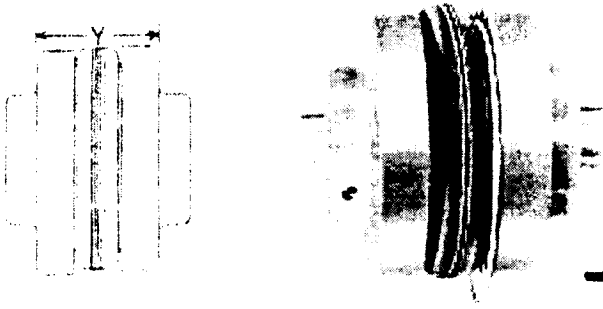
Installation Instructions

Sure-Flex flanges (outer metallic parts) and sleeves (inner elastomeric members) come in many sizes and types. First, determine the size and type of components being used. Remove all components from their boxes, and loosely assemble the coupling on any convenient surface. (Do not attempt to install the wire ring on the two-piece E or N sleeve at this time.) Also check maximum RPM values in the table against operating speed. All rubber sleeves (EPDM and Neoprene) have the same ratings for a given size and may be used interchangeably. However, because rubber and Hytrel sleeves have completely different ratings, they never should be used interchangeably.

1 Inspect all coupling components and remove any protective coatings or lubricants from bores, mating surfaces and fasteners. Remove any existing burrs, etc. from the shafts.

2 Slide one coupling flange onto each shaft, using snug-fitting keys where required. When using Type B flanges, follow the instructions furnished with the Sure-Grip bushing.

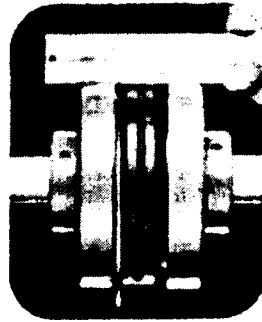
3 Position the flanges on the shafts to approximately achieve the Y dimension shown in the table. It is usually best to have an equal length of shaft extending into each flange. Move one flange to its final position. Torque fasteners to proper values. Slide the other flange far enough away to install the sleeve. With a two-piece sleeve, do not move the wire ring to its final position; allow it to hang loosely in the groove adjacent to the teeth.



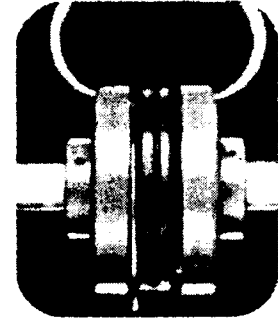
4 Slide the loose flange on the shaft until the sleeve is completely seated in the teeth of each flange. (The "Y" dimension is for reference and not critical.) Secure the flange to the shaft. Different coupling sleeves require different degrees of alignment precision. Locate the alignment values for your sleeve size and type in the table.

5 Check parallel alignment by placing a straight-edge across the two coupling flanges and measuring the maximum offset at various points around the periphery of the coupling without rotating the coupling. If the maximum offset exceeds the figure shown under "Parallel" in the table, realign the shafts.

6 Check angular alignment with a micrometer or caliper. Measure from the outside of one flange to the outside of the other at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions without rotating the coupling. The difference between the maximum and minimum must not exceed the figure given under "Angular" in the table. If a correction is necessary, be sure to recheck the parallel alignment.



Parallel



Angular

MAXIMUM RPM AND ALLOWABLE MISALIGNMENT

(Dimensions in inches)

Sleeve Size	Maximum RPM	Types JE, JN, JES, JNS, E & N			*Type H & HS	
		Parallel	Angular	Y	Parallel	Angular
3	9200	.010	.035	1.188	...	...
4	7600	.010	.043	1.500	...	...
5	7600	.015	.056	1.938	...	...
6	6000	.015	.070	2.375	.010	.016
7	5250	.020	.081	2.563	.012	.020
8	4500	.020	.094	2.938	.015	.025
9	3750	.025	.109	3.500	.015	.028
10	3600	.025	.128	4.063	.020	.032
11	3600	.032	.151	4.875	.022	.037
12	2800	.032	.175	4.688	.025	.042
13	2400	.040	.195	6.625	.030	.050
14	2200	.045	.242	7.750	.035	.060
16	1500	.060	.300	10.250	...	...

Note: Values shown above apply if the actual torque transmitted is more than 1/4 the coupling rating. For lesser torque, reduce the above values by 1/2.

*Type H and HS sleeves **should not** be used as direct replacements for EPDM or Neoprene sleeves.

7 If the coupling employs the two-piece sleeve with the wire ring, force the ring into its groove in the center of the sleeve. It may be necessary to pry the ring into position with a blunt screwdriver.

8 Install coupling guards per OSHA requirements.

CAUTION: Coupling sleeves may be thrown from the coupling assembly with substantial force when the coupling is subjected to a severe shock load or abuse.

B
SECTION 4

SIEMENS

NEMA Motor Data

Part Number: 1LA04458SE4N

Nameplate Data				Bearing Data	
Type	RGZESD	Rating	Cont.	DE Bearing Size	6318
HP	100	Ins. Class	F	DE Bearing Type	Ball Bearing
Voltage	460	S.F.	1.15	DE AFBMA	90BC03JP3
Amps	/ 123	Amb. Temp.	40 deg C	ODE Bearing Size	6316
FL RPM	885	Temp. Rise	Class B	ODE Bearing Type	Ball Bearing
FL Efficiency	94.1%	kVA Code	G	ODE AFBMA	80BC03JP3
FRAME	445T	NEMA Des	B		
DE AFBMA	90BC03JP3	Mtr WT	1740		
ODE AFBMA	80BC03JP3	Hertz	60 Ph 3		

Typical Performance Data					
Load	No Load	1/2	3/4	Full Load	
Efficiency		94.2%	94.5%	94.1%	LRA 725
Power Factor		0.7	0.78	0.81	
Current (A)	48	71.2	96.2	123	

Mechanical Data					
SAFE STALL TIME	HOT (s)	22	COLD (s)	30	
Rtr wt (lbs)	587	Rtr WK2			Ext Load Inertia (WK2) Capability 6250 lb-ft ²
FLT (ft-lbs)	593	LRT	130%	BDT	200%

Typical Noise Data									
A-weighted Sound Pressure Level dB(A) at 3 feet	Octave Band Center Frequencies Hertz (Hz)								
	63	125	250	500	1000	2000	4000	8000	SPL
	34	46	58	61	61	59	56	41	66
									SPwrL 77

Wiring Connection Information					
Description:	Voltage	L1	L2	L3	Connected Together
3 PHASE - 3 LEAD - DELTA	---	---	---	---	---
	HIGH	T1	T2	T3	---

Lubrication Information			
Manufacturer:	Mobil Polyrex EM or equal	DE Capacity (oz.)	14.5
Type:	Polyurea grease	ODEnd Capacity (oz.)	7.5
Relubricate bearings every six months (more frequent if conditions require). See Instruction Manual.			

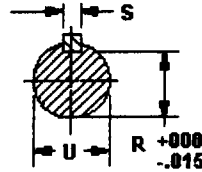
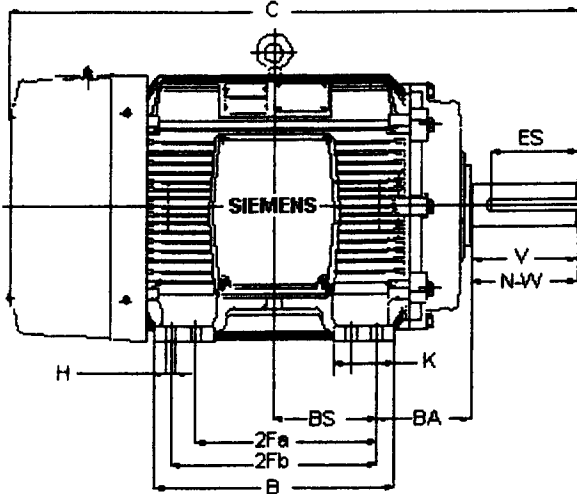
Recommended Spare Parts List			
Fan Housing	51-817-031-001	Drip Cover	Not applicable
Fan Grid	51-817-046-001	DE Bearing Part #	51-380-865-018
Fan	51-816-861-001	ODE Bearing Part #	51-380-865-016

Data is subject to change without notice.

SIEMENS

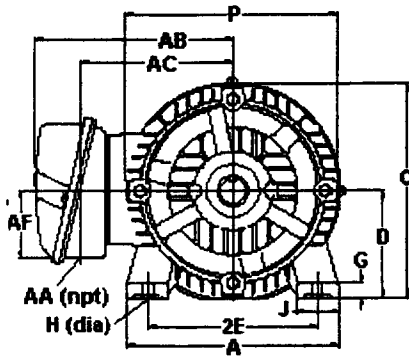
NEMA Dimensional Drawing

Part #: 1LA04458SE4N
 Frame: 445T Type: RGZESD - Severe Duty-TEFC-High Efficient

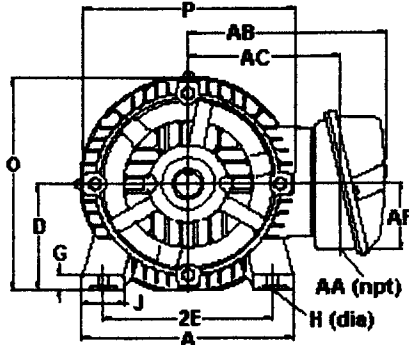


Standard dimensions in inches

FRAME	445T
A	22.0
B	19.25
C	45.56
D	11.0
2E	18.0
2Fb	16.5
G	1.19
H	0.812
J	4.0
K	4.75
N-W	8.5
O	21.88
P	21.69
U	3.375
V	8.25
ES	6.88
BA	7.5
BS	8.25
AA (npt)	3.0
AB	19.94
AC	15.06
AF	7.0
R	2.88
S	0.875



F1 Assembly



F2 Assembly

Approx. Ship Wt: 1740 lbs

Data is subject to change without notice.

Dimensions are for estimating purposes only.

Auxiliary box and/or RTD options are not reflected in the drawing.

For certified NEMA dimensional prints, please contact the factory or visit: <http://www.sea.siemens.com/motorsbu/cgi-bin/drawingselector/default.asp>

RGZESD
TEFC Motors

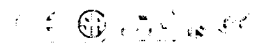
High efficiency severe duty TEFC motors are ideal for both indoor and outdoor applications and in severe duty operating atmospheres. These motors are ideal for use in chemical processing, mining, foundry, pulp and paper, waste management and petro/chemical.

Performance Specifications

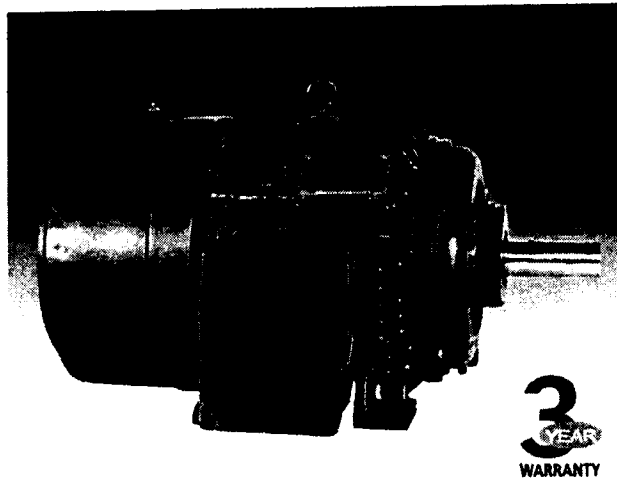
- 1 to 400 HP
- 1.15 service factor, 40°C ambient
- 3600, 1800, 1200, 900 or 720 RPM
- 3 phase, 60 Hz; 230/460 volt operation under 25 HP, 460 volt 25 HP and above; 200 & 575 volt available
- Meets or exceeds NEMA Energy Efficiency standards
- Class F insulation, Class B temperature rise
- NEMA Design B, Continuous Duty
- 143T through S449 frame

HIGH EFFICIENT • SEVERE DUTY • CAST IRON FRAME

nema
MOTORS



RGZESD TEFC Motors



Features for Long Life

Frame & End Shields – Cast iron construction for exceptional structural integrity with condensation T-drains. Lifting eyebolts are included for frames 213T to S449.

Rotor – A unique offset rotor bar design provides improved efficiency while larger bars and end rings reduce resistance for lower rotor losses. Each die cast aluminum rotor assembly is dynamically balanced for extended bearing life, and includes a high-strength carbon steel (C1045) shaft for maximum rotor performance.

Stator/Windings – Manufactured with premium electrical-grade steel laminations and copper electrical magnet wire to lower losses for improved efficiencies. A unique stator core design lowers flux density while increasing cooling capacity. Large conductor cross section reduces resistance, also lowering stator losses.

Insulation – Proprietary inverter-rated Class F non-hygroscopic insulation system with NEMA Class B temperature rise, provides an extra margin of thermal life. Varnish system application ensures maximum wire penetration to provide protection from moisture, corrosion and electrical shock. This insulation system meets or exceeds NEMA MG1-2003, Part 31 making all motors suitable for operation with variable frequency drives.

Cooling – A bi-directional, non-sparking fan is locked and keyed to the shaft. Its low-inertia design reduces windage losses, improves airflow, reduces noise and provides dependable cooling. Cast iron fan covers are provided on all frame sizes.

Bearings – Regreasable, oversized single-shielded with cast iron inner caps. Alemite grease fittings on the inlets and pipe plugs on the relief ports for ease of routine maintenance. For added bearing protection, 143T-256T frames have a drive end shaft seal and 284T-449T frames have a drive end shaft V-ring slinger.

Lubrication – A specially formulated, high temperature tested, polyurea-based grease is used to provide more than four times the lubrication life of other polyurea greases.

Oversized Conduit Box – Cast iron construction that is larger than industry standards, diagonally split, neoprene-gasketed and rotatable in 90° increments for quick and easy connections. Includes a ground lug and non-wicking, clearly and permanently marked leads.

Corrosion Resistance – Cast iron construction, zinc-plated hardware, epoxy enamel paint and stainless steel nameplate resist rust and corrosion.

Modifiable – All Siemens motors are available with a wide variety of modifications to meet your specific motor needs.

Siemens Energy & Automation, Inc.
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Alpharetta, GA 30005

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info.sea@siemens.com
www.sea.siemens.com

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Mississauga, ON L5N 7A6

905-819-5800
Customer Interaction Centre 888-303-3353
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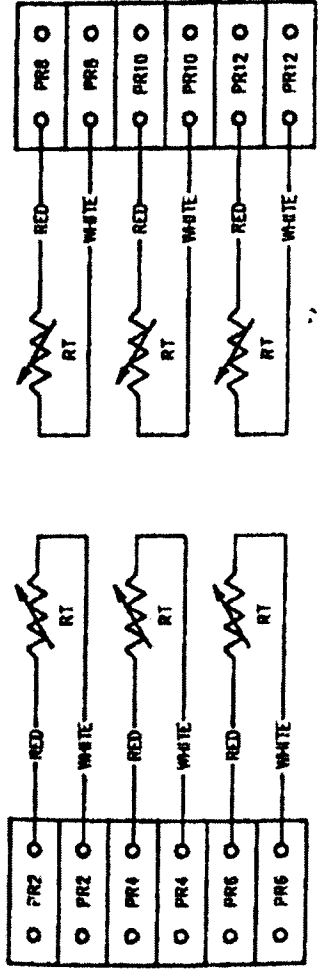
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NMFL-00802-0106 New 5M0106M2 Printed in USA

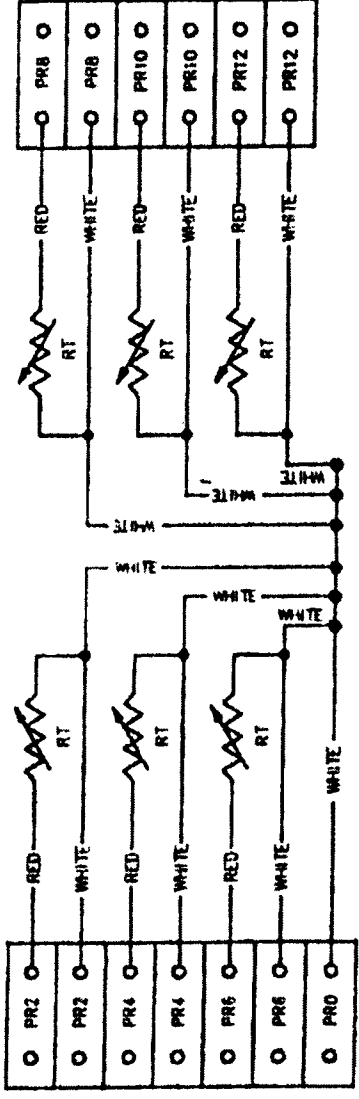
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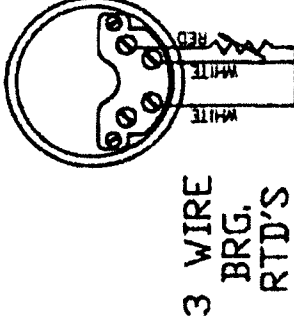
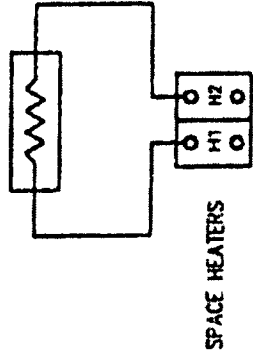
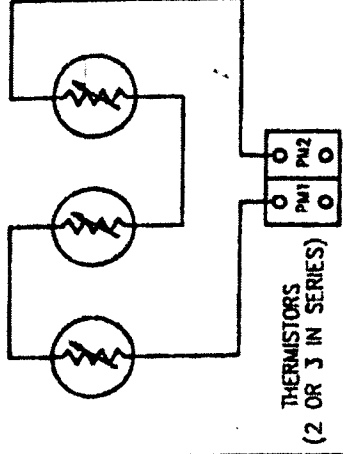
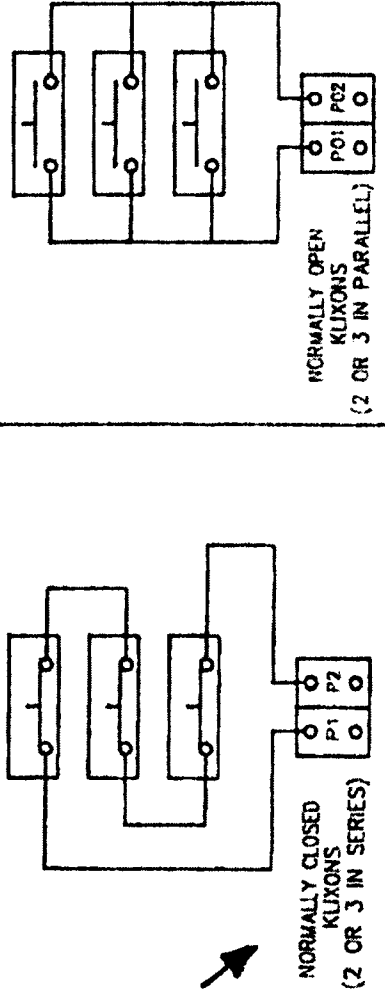
4



2 WIRE STATOR RTD'S



3 WIRE STATOR RTD'S



THIS IS A CAR GRAMME
DO NOT MAKE UNLESS CHANGES
01/2-28-90 TS

PROPERTY OF
Siemens Energy & Automation, Inc.
Industrial Motor Division - Little Rock, AR

CONNECTION DRAWING

DATE: 2-28-90

1 OF 1

51-010-556-①

SIEMENS

Installation • Operation • Maintenance

Instructions

**Induction Motors
143-449 Frame**

NMIM-L1000



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These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

The contents of this instruction manual shall not become part or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

INTRODUCTION

THIS EQUIPMENT CONTAINS HAZARDOUS VOLTAGES, ROTATING PARTS AND HOT SURFACES. SEVERE PERSONAL INJURY OR PROPERTY DAMAGE CAN RESULT IF SAFETY INSTRUCTIONS ARE NOT FOLLOWED. ONLY QUALIFIED PERSONNEL SHOULD WORK ON OR AROUND THIS EQUIPMENT AFTER BECOMING THOROUGHLY FAMILIAR WITH ALL WARNINGS, SAFETY NOTICES, AND MAINTENANCE PROCEDURES CONTAINED HEREIN. THE SUCCESSFUL AND SAFE OPERATION OF THIS EQUIPMENT IS DEPENDENT UPON PROPER HANDLING, INSTALLATION, OPERATION AND MAINTENANCE.

QUALIFIED PERSON

For the purpose of this manual and product labels, a qualified person is one who is familiar with the installation, construction and operation of the equipment, and the hazards involved. In addition, he has the following qualifications:

- a) Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- b) Is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.



DANGER

For the purpose of this manual and product labels, DANGER indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.



WARNING

For the purpose of this manual and product labels, WARNING indicates death, severe personal injury or substantial property damage can result if proper precautions are not taken.



CAUTION

For the purpose of this manual and product labels, CAUTION indicates minor personal injury or property damage can result if proper precautions are not taken.

INSPECTION

Care is taken at the factory to assure that the motor arrives at its destination in first class condition. If there is evidence of rough handling or damage in shipping, file a claim at once with the carrier and notify your Siemens Sales Office.

Examine the outside of the motor carefully for damage, with particular attention to conduit box, fans, and covers. Inspect and tighten all hardware and accessories which may have become loosened during shipping and handling. Turn the shaft by hand to be sure that it rotates freely. If the motor has been mishandled sufficiently to break external parts, the end shield should also be removed to check for internal damage unless the motor is explosion-proof. See warning below on explosion proof motors.



WARNING

Explosion-proof motors—these motors are constructed to comply with the U.L. Label Service Procedure Manual. When repairing and reassembling a motor that has an underwriter's label, it is imperative that the unit be reinspected and:

1. All original fits and tolerance be maintained.
2. All plugs and hardware be securely fastened.
3. Any parts replacements, including hardware, be accurate duplicates of the originals.

Repair work on explosion-proof motors can only be done by the original manufacturing or U.L. certified shops. Violations of any of the above items will invalidate the significance of the U.L. Label.

STORAGE

Motors must be stored in a clean, dry, well ventilated location free from vibration and rapid or wide temperature variations. If the unit is to be stored longer than three months, consult factory. Ball bearing motors are shipped from the factory properly lubricated and ready to operate. When in storage, the motor shaft must be turned several rotations every month and the bearing relubricated every year. On non-explosion-proof TEFC motors, a removable plug in the bottom of the frame or housing permits removal of accumulated moisture. Drain regularly if storage atmosphere result in formation of condensation.

INSTALLATION

Installation must be handled by qualified service or maintenance personnel. The motor foundation must rigidly support all four feet in the same plane. Place shims under the motor feet, as required, so they will not be pulled out of plane when mounting bolts are tightened. All wiring to the motor and control must be in accordance with the National Electrical Code and all local regulations. Before drive is connected, momentarily energize motor to check that direction of rotations proper. For direct drive, accurate alignment is 0.004 inch/ft. (radius to dial indicator = one foot.)

Any change in shims requires rechecking alignment. When alignment is within limits, dowel two feet of each unit. When installing flat belt pulley, V-belt sheave, spur or helical pinion or chain drives, be certain that they are within NEMA limitations. Refer to NEMA motor and general standards, MG-1 14.07 and 14.42.

OPERATION

Repeated trial starts can overheat the motor and may result in motor burnout (particularly for across the line starting). If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from windings and rotor to prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current.

After installation is completed, but before motor is put in regular service, make an initial start as follows:

1. Check motor starting and control device connections against wiring diagrams.
2. Check voltage, phase, and frequency of line circuit (power supply) against motor nameplate.
3. If possible, remove external load (disconnect drive) and turn shaft by hand to ensure free rotation. This may have been done during installation procedure; if so, and conditions have not changed since, this check may not be necessary.
 - a. If drive is disconnected, run motor at no load long enough to be certain that no unusual conditions develop. Listen and feel for excessive noise, vibration, clicking, or pounding. If present, stop motor immediately. Investigate the cause and correct before putting motor in service.
 - b. If drive is not disconnected, interrupt the starting cycle after motor has accelerated to low speed. Carefully observe for unusual conditions as motor coasts to a stop.
4. When checks are satisfactory, operate at minimum load and look for unusual condition. Increase load slowly to maximum. Check unit for satisfactory operation.



CAUTION

Guard against overloading. Overloading causes overheating and overheating means shortened insulation life. A motor subjected to a 10°C temperature rise above the maximum limit for the insulation may cause the insulation life to be reduced by 50%. To avoid overloading, be sure motor current does not exceed nameplate current when nameplate voltage is applied.

Electric motors operating under normal conditions become quite warm. Although some places may feel hot to the touch, the unit may be operational within limits. Use a thermocouple to measure winding temperature when there is any concern.

The total temperature, not the temperature rise, is the measure of safe operation. Investigate the operating conditions if the total temperature measured by a thermocouple placed on the winding exceeds:

230°F (110°C) for class "B" insulation

275°F (135°C) for class "F" insulation

302°F (150°C) for class "H" insulation

VOLTAGE REGULATION

Motors will operate successfully under the following conditions of voltage and frequency variation, but not necessarily in accordance with the standards established for operation under rated conditions:

- a. When the variation in voltage does not exceed 10% above or below normal, with all phases balanced.
- b. When the variation in frequency does not exceed 5% above or below normal.
- c. When the sum of the voltage and frequency does not exceed 10% above or below normal (provided the frequency variation does not exceed 5%).

MAINTENANCE

Failure to properly maintain the equipment can result in severe personal injury and product failure. The instructions contained herein should be carefully reviewed, understood and followed. The following maintenance procedures should be performed regularly:

1. Bearing lubrication
2. Insulation resistance check
3. Cleaning

This checklist does not represent an exhaustive survey of maintenance steps necessary to ensure safe operation of the equipment. Particular applications may require further procedures. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

Dangerous voltages are present in the equipment which can cause severe personal injury and product failure. Always de-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personnel.

The use of unauthorized parts in the repair of the equipment, tampering by unqualified personnel, or removal or alteration of guards or conduit covers will result in dangerous conditions which can cause severe personal injury or equipment damage. Follow all safety instructions contained herein.

BEARING LUBRICATION



CAUTION

Do not lubricate motor while in operation, since excess grease will be forced through the bearings and into the motor before it will force its way out of the drain plug. Excess grease accumulation on windings reduces insulation life.

Bearing life is assured by maintaining proper alignment, proper belt or chain tension, and good lubrication at all times.

Prior to shipment, motor bearings are lubricated with the proper amount and grade to provide six months of satisfactory service under normal operation and conditions.

For best results, grease should be compounded from a polyurea base and a good grade of petroleum oil. It should be of No. 2 consistency and stabilized against oxidation. Operating temperature range should be from -15°F to +250°F for class B insulation, and to +300°F for class F and H. Most leading oil companies have special bearing greases that are satisfactory.

Relubricate bearings every six months (more often if conditions require), as follows:

1. Stop the motor. Lock out the switch.
2. Thoroughly clean off pipe plugs and remove from housings.
3. Remove hardened grease from drains with stiff wire or rod.
4. Add grease to inlet with hand gun until small amount of new grease is forced out of drain.
5. Remove excess grease from ports, replace inlet plugs, and run motor 1/2 hour before replacing drain plug.
6. Put motor back in operation.

INSULATION RESISTANCE

Check insulation resistance periodically. Any approved method of measuring insulation resistance may be used, provided the voltage across the insulation is at a safe value for the type and condition of the insulation. A hand cranked megger of not over 500 volts is the most convenient and safest method. Standards of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) recommended that the insulation resistance of stator windings at 75°C, measure at 500 volts DC, after one minute should not be less than:

$$\frac{\text{Rated voltage of machine} + 1000}{1000} = \text{Insulation resistance in Megohms}$$

This formula is satisfactory for most checks. for more information, see IEEE Standard No. 43, "Recommended Practice for Insulation Resistance Testing of AC Rotating Machinery."

CLEANING



WARNING

Do not attempt to clean motor while it is operating.. Contact with rotating parts can cause severe personal injury or property damage. Stop the motor and lock out switch before cleaning.

The motor exterior must be kept free of oil, dust, dirt, water, and chemicals. For fan cooled motors, it is particularly important to keep the air intake openings free of foreign material. Do not block air outlet or inlet.

On non-explosion-proof TEFC motors, a removable plug in the bottom center of the motor frame or housing permits removal of accumulated moisture. Drain regularly.

VERTICAL MOTOR THRUST BEARINGS

Top bearings — high external thrust from the driven unit is usually carried by the top bearing or bearings. If replacement is necessary, the new bearing must be the same size and type as the original. Duplex bearings must also be the same type and mounted in an identical manner. When angular contact type bearings are replaced, the new bearing must have the same thrust capacity.

Bottom bearings — grease lubricated lower bearings adequately lubricated at the factory for at least three months operation. The relubrication procedure is the same as outlined above under "Bearing Lubrication." It is important to maintain the lower cavity full of grease at all times.

The correct replacement bearings are given on the nameplate by AFBMA (Anti-Friction Bearing Manufacturers Association) number.

SERVICE

For immediate action on your motor problems call your certified service center or contact your nearest Siemens District Office.