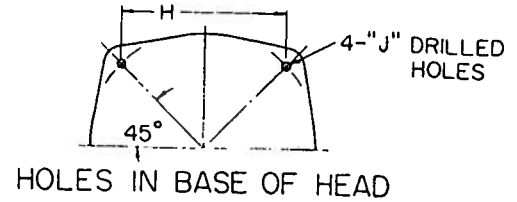
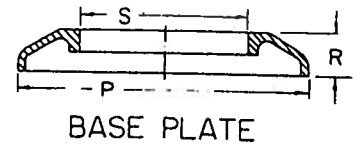
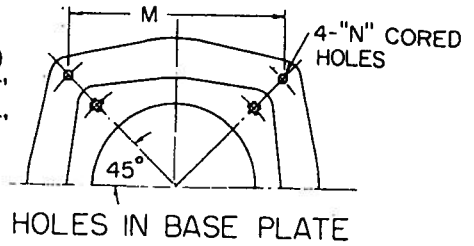
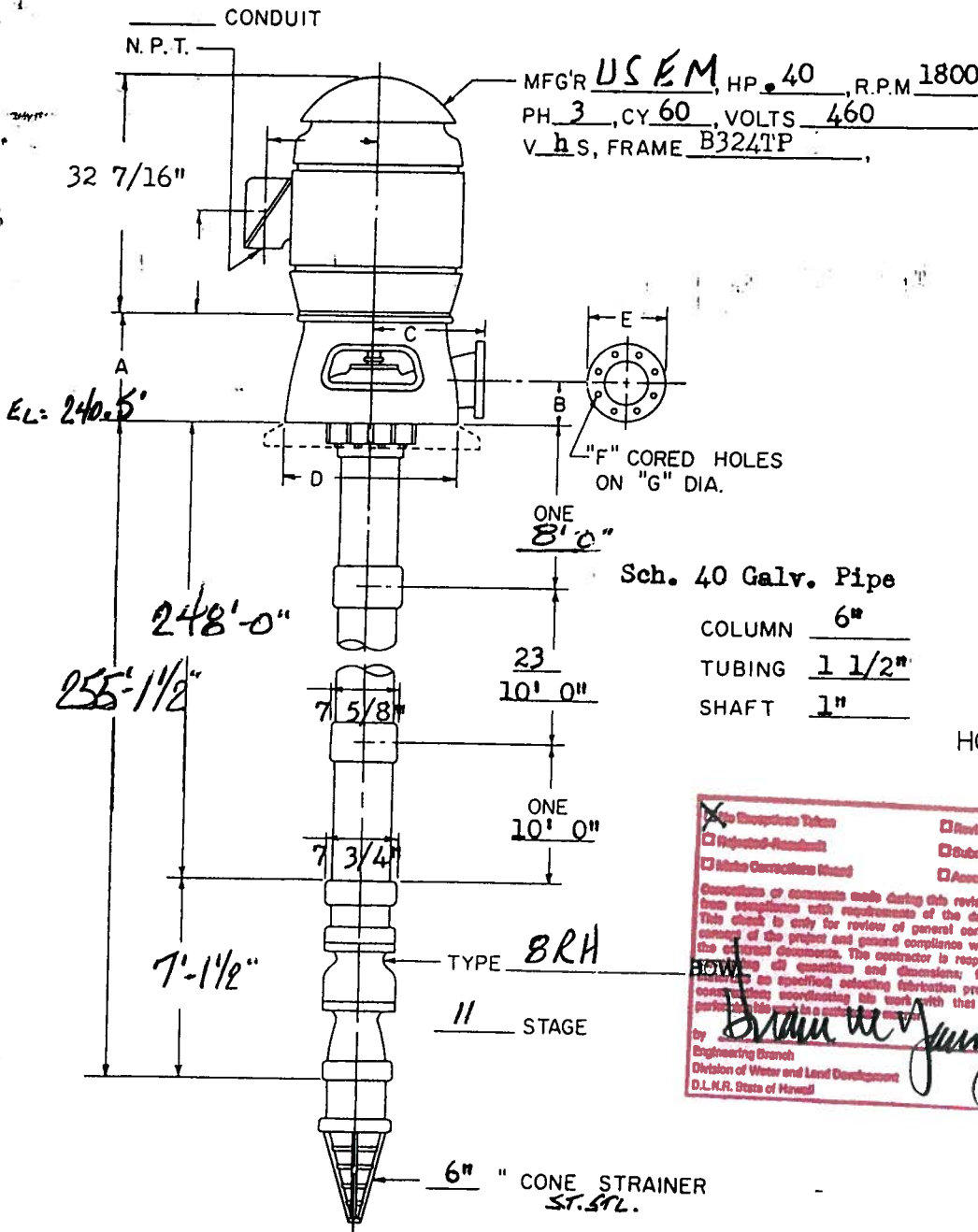


INSTALLATION PLAN
TYPE TF613 DISCHARGE HEAD



LAYNE & BOWLER INC. MEMPHIS, TENN.

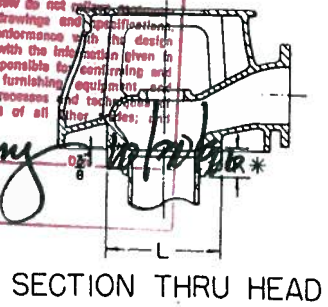
USE THESE DIMENSIONS ONLY
WHEN CERTIFIED BY FACTORY



No Exceptions Taken
 Rejected-Resubmit
 Make Corrections Noted
 Review & Resubmit
 Submit Specified Item
 Acceptable as Modified

Concisions or comments made during this review do not relieve the contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for performing and verifying all quantities and dimensions; furnishing equipment and materials as specified; selecting fabrication processes and techniques; coordinating his work with that of all other trades; and performing his work in a satisfactory manner.

by David W. Young
Engineering Branch
Division of Water and Land Development
D.L.N.R. State of Hawaii



DLNR JOB NO. 80-HP-M

* FOR COLUMN SETTINGS OF 200' OR GREATER, "K"=11"

CUSTOMER: <u>Hapuna Beach</u>	YOUR NO: <u>96512-01</u>	G.P.M. <u>350</u>
LOCATION: <u>South Kohala, HI</u>	OUR NO: <u>54-96D</u>	T.D.H. <u>274</u>
FOR APPROVAL: <u>YES</u>	PUMP NO: _____	R.P.M. <u>1760</u>
CERTIFIED: _____	DATE: <u>10-03-96</u>	B.H.P. _____

HEAD	A	B	C	D	E	F	G	H	J	K*	L	M	N	P	R	S
TF613	14	6	11	18	11	8-7/8	9-1/2	14-1/8	2-7/8	11	16-13/16	7-7/8	21	2	17	
TF618	15	6	14-1/4	23	11	8-7/8	9-1/2	17-3/8	2-7/8	12-1/2	20-1/8	7-7/8	26-1/2	2-3/4	21-3/4	
TF818	18	7-3/8	14-1/4	23	13-1/2	8-7/8	11-3/4	17-1/8	3-1/8	13-1/2	20-1/8	7-7/8	26-1/2	2-3/4	21-3/4	
TF1018	18	8-1/8	14-1/4	23	16	12-1/4	14-1/4	17-1/8	3-1/8	16	20-1/8	7-7/8	26-1/2	2-3/4	21-3/4	
TF1218	20	9-3/8	16-1/4	26	19	12-1/4	17	19-5/8	3-1/8	19	23-1/8	7-7/8	32	3-1/4	24	

HEAD	A	B	C	D	E	F	G	H	J	K*	L	M	N	P	R	S
TF625	15	8-1/8	18-1/4	31	11	8-7/8	9-1/2	23-11/16	2-7/8	12-1/2	29	1	38	3-3/4	29	
TF825	20	8-1/8	18-1/4	31	13-1/2	8-7/8	11-3/4	23-11/16	3-1/8	13-1/2	29	1	38	3-3/4	29	
TF1025	20	8-1/8	18-1/4	31	16	12-1/4	14-1/4	23-11/16	3-1/8	16	29	1	38	3-3/4	29	
TF1225	21	9-3/8	18-1/4	31	19	12-1/4	17	23-11/16	3-1/8	19	29	1	38	3-3/4	29	
TF1225I	21	9-3/8	18-1/4	31	19	12-1/4	17	23-11/16	3-1/8	21	29	1	38	3-3/4	29	
TF1425	21	10-3/8	18-1/4	31	21	12-1/4	18-3/4	23-11/16	4-1/8	21	29	1	38	3-3/4	29	
TF1227	24-1/2	9-3/4	21	36	19	12-1/4	17	27-1/8	3-1/8	19	33-3/8	1	43	4-1/4	33-3/4	

ROSCOE MOSS
 Project: DOWALD/HAPUNA BEACH
 by: GLEN DAVIS

H2O size ver: 5.01
 File: (untitled)
 Mar 8, 1996

PUMP DATA SHEET
 VERTI-LINE

CURVE: 9PC-119347

Catalog: V-L60 v. 1.1

TYPE - SPEED: VERT.TURBINE - 1800

FLUID Water tmp: 60 °F

PUMP Size: 8RH - 11 stages

SG: 1

Speed: 1750 rpm

vsc: 1.122 cP

Imp dia: 5.969 in

vapor: 0.2568 psi

atm: 14.7 psi

Max Temperature: - °F

NPSHa: - ft

Max Pressure: - psi_g

Max Sphere Size: - in

PIPING Pressure: - psi

Suction elev: - ft

Specific Speed N_s: -

Suction N_{ss}: -

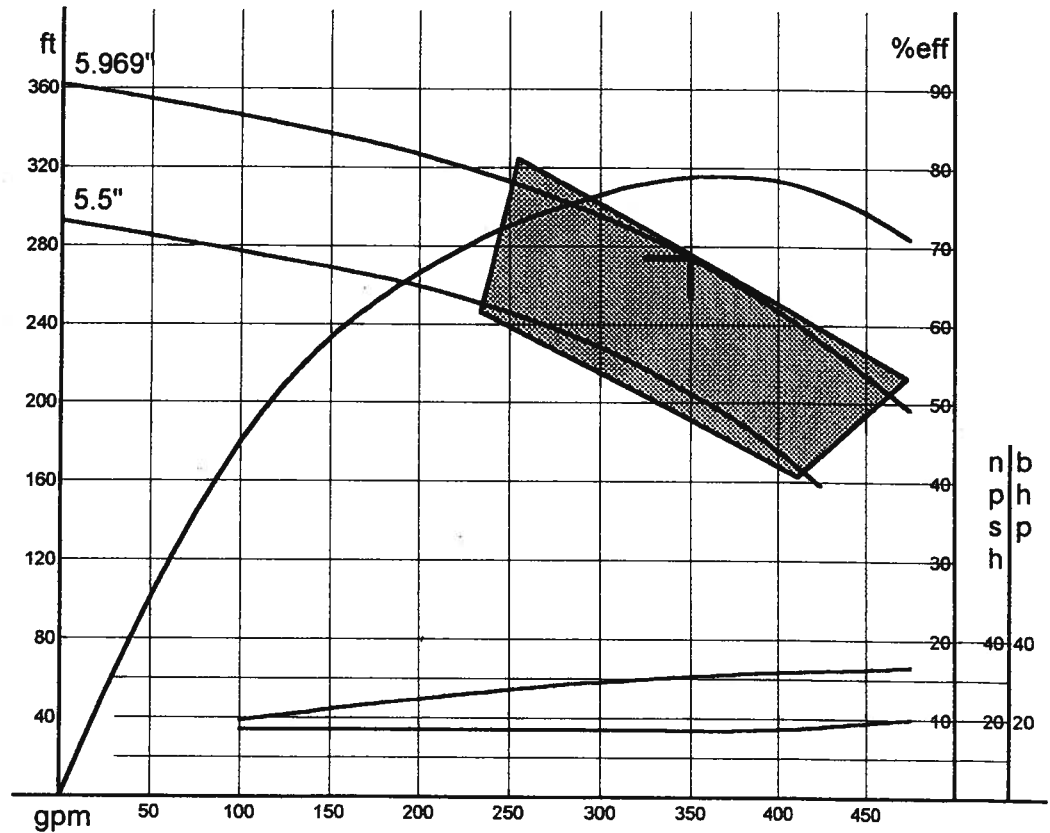
size: - in

Suction size: - in

Discharge size: - in

Discharge size: - in

DESIGN POINT
Flow: 350 gpm
Head: 274 ft
DATA POINT
Flow: 350 gpm
Head: 274 ft
Eff: 79 %
Power: 30.7 bhp
NPSHr: 17.0 ft
DESIGN CURVE
Shutoff Head: 362 ft
Pressure: 157 psi _g
Min Flow: - gpm
BEP: 79 %eff @ 366
Max: 33.3 bhp @ 475
MAX DIAMETER
Max: 33.3 bhp @ 475



PERFORMANCE EVALUATION

Flow gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Power kW	Hrs/yr	Cost
420	1750	234	77	32.3	17.9				
350	1750	274	79	30.7	17.0				
280	1750	303	75	28.6	17.0				
210	1750	323	67	25.6	17.0				
140	1750	338	53	22.5	17.0				

PUMP DATA SHEET

PUMP DESCRIPTION

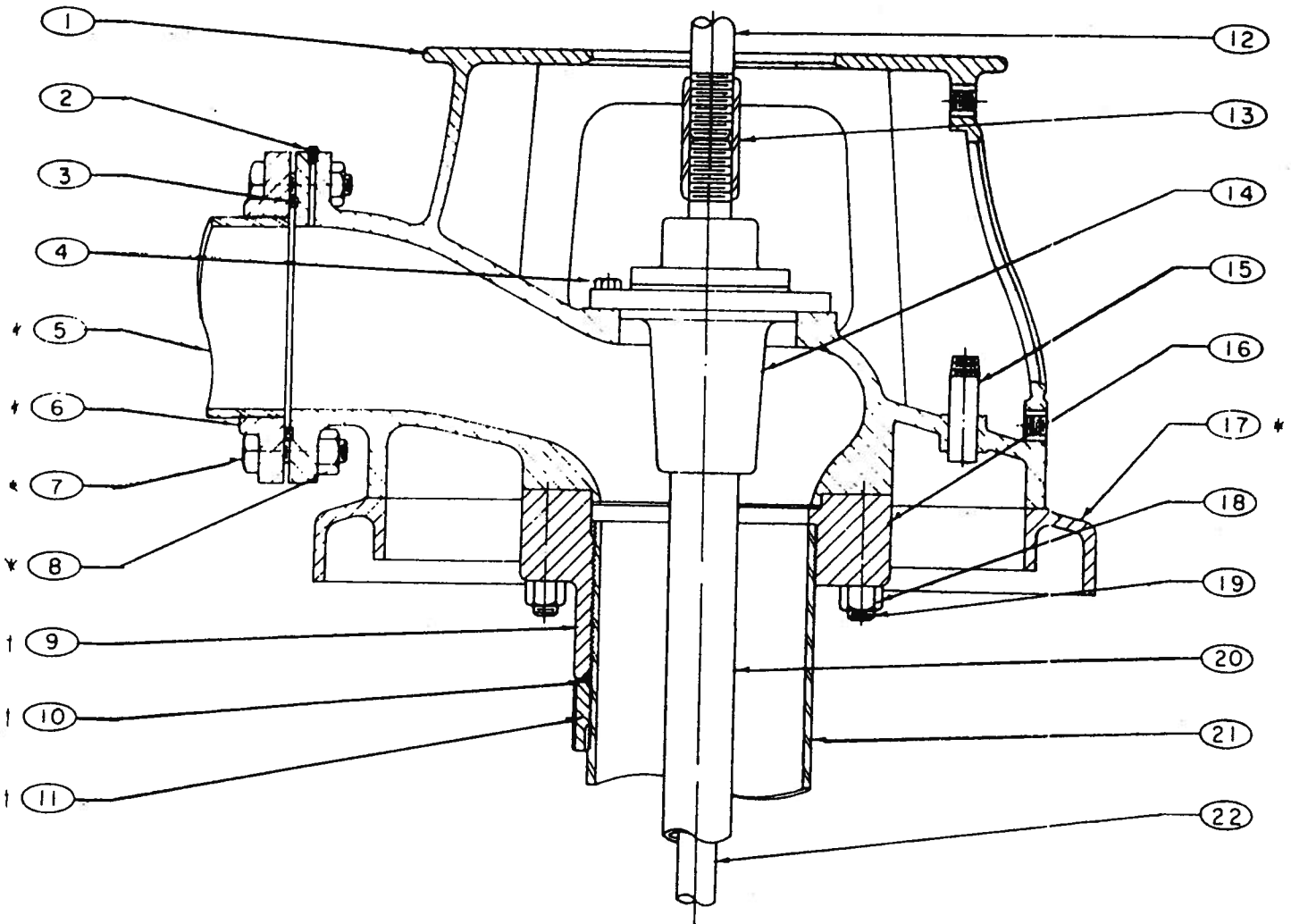
TF613 CAST IRON DISCHARGE HEAD
6 in. x 1 in. COLUMN ASSEMBLY WITH 250 ft. SETTING
8RH - 11 STAGE BOWL ASSEMBLY
40 HP MOTOR WITH EFF @ FULL LOAD = 93.2 %
3/4 LOAD = 93.7 %, and 1/2 LOAD = 93.3 %

PERFORMANCE DATA

DESIGN FLOW	=	350 GPM
TDH	=	274 FEET
BOWL EFF	=	79.00%
LAB (DESIGN) BHP	=	30.65 HP
DESIGN THRUST	=	1974 LBS.
DISCHARGE HEAD FRICTION LOSS	=	0.186 FEET
COLUMN FRICTION LOSS	=	5.306 FEET
FIELD HEAD	=	268.51 FEET
SHAFT HP LOSS	=	1.348 HP
MOTOR THRUST BEARING LOSS	=	0.264 HP
FIELD HP	=	32.27 HP
FIELD EFF	=	73.55 %
MOTOR EFF	=	93.59 %
WIRE TO WATER EFF	=	68.83 %
KWH/1000 GALLONS OF WATER	=	1.2288



TYPE TF DISCHARGE HEAD
 ENCLOSED LINE SHAFT



* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

ITEM NO.		DESCRIPTION
1	CAST IRON	DISCHARGE HEAD
2	CAST IRON	PIPE PLUG, PRESSURE GAUGE
3		PACKING, COMPANION FLANGE
4	ST. STL.	CAPSCREW (STUFFING BOX)
5		DISCHARGE PIPE
6		COMPANION FLANGE
7		MACHINE BOLT, COMPANION FLG.
8		HEX NUT, COMPANION FLANGE
9	CAST IRON	ADJ. TOP COLUMN FLANGE
10	ROPE	PACKING
11	CAST IRON	PACKING RING

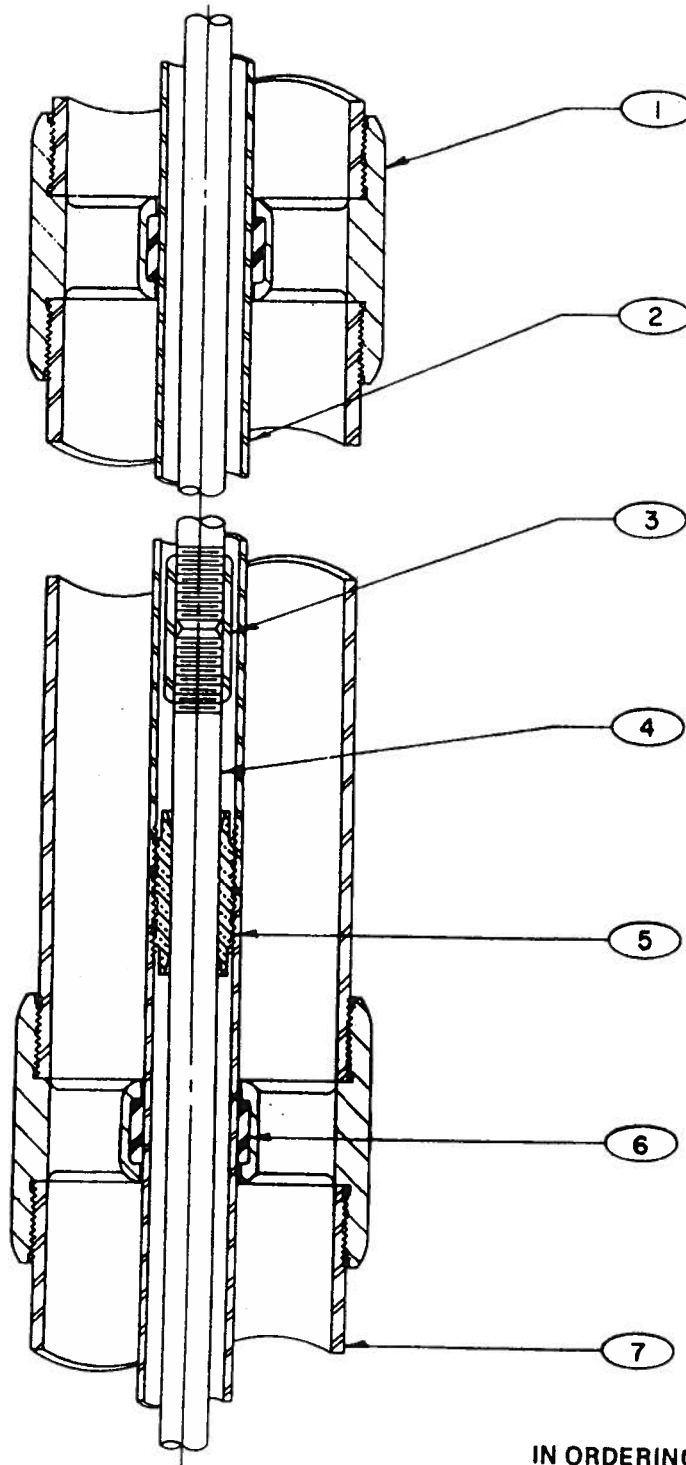
† USED FOR SETTINGS GREATER THAN 200 FT

ITEM NO.		DESCRIPTION
12	416 S. STL.	MOTOR DRIVE SHAFT
13	UNR. HARD STL.	HEAD COUPLING
14		STUFFING BOX (ASSEMBLY)
15		PIPE NIPPLE (AUXILIARY OP'G)
16		TOP COLUMN FLANGE
17	CAST IRON	BASE PLATE
18	STL.	HEX NUT
19	STL.	STUD
20	SCH. 40 STL.	TUBING
21	SCH. 40 STL.	TOP COLUMN PIPE
22	UNR. HARD STL.	LINE SHAFT, TOP PIECE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.



LAYNE TYPE DISCHARGE COLUMN
 Screw Coupled—Enclosed Line Shaft



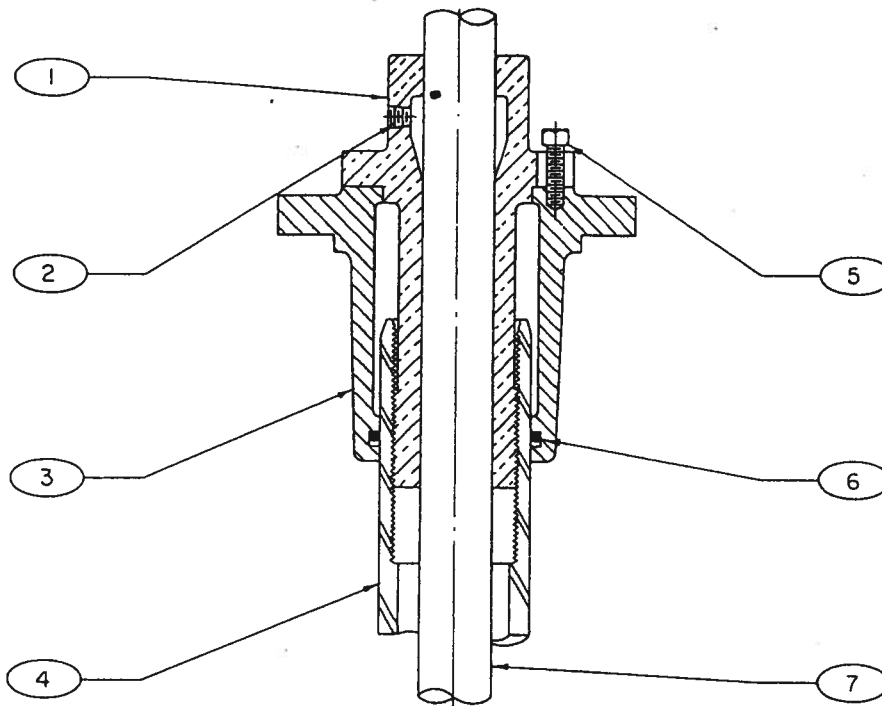
IN ORDERING REPLACEMENT PARTS,
 SPECIFY PARTS NAME & PUMP SERIAL
 NO.

ITEM NO.	DESCRIPTION
1	<i>CAST IRON</i> COMBINATION COUPLING
2	<i>SCH. 40 STL.</i> SHAFT TUBING
3	<i>STL.</i> SHAFT COUPLING
4	<i>CARBON STL.</i> LINE SHAFT

ITEM NO.	DESCRIPTION
5	<i>BRONZE</i> SHAFT BOX
6	<i>RUBBER</i> RUBBER BEARING
7	<i>SCH. 40 STL.</i> COLUMN PIPE <i>GR. B</i>
	<i>BRN. IN AND OUT</i>

STYLE 60 STUFFING BOX OIL LUBRICATION

LAYNE & BOWLER, INC. - MEMPHIS, TENNESSEE



ITEM NO.	DESCRIPTION
1	TENSION BEARING
2	OIL INLET
3	STUFFING BOX
4	TUBING

ITEM NO.	DESCRIPTION
5	LOCK SCREW
6	'O' RING SEAL
7	PUMP SHAFT

IN ORDERING REPLACEMENT PARTS, SPECIFY PARTS DESCRIPTION AND PUMP SERIAL NO.

ASSEMBLY INSTRUCTIONS

- STEP 1. CLEAN THE TENSION BEARING AND STUFFING BOX THOROUGHLY BEFORE CONTINUING WITH INSTALLATION.
- STEP 2. INSERT THE STUFFING BOX FIRST, HAVING THE 'O' RING IN PLACE (A LIGHT COAT OF OIL SHOULD BE GIVEN THE 'O' RING).
- STEP 3. THE TENSION BEARING CAN NOW BE INSTALLED, THE THREAD PORTION BEING COATED WITH OIL. SLIP BEARING OVER SHAFT AND SCREW INTO TUBING UNTIL THE BEARING FLANGE BUTTS THE STUFFING BOX. (THIS SHOULD BE A TIGHT SNUG FIT).

TENSION

- STEP 4. THE AMOUNT OF TENSION SHOULD BE BASED ON $\frac{1}{8}$ " TUBE TRAVEL PER 100 FEET OF SETTING, THIS IS PUT IN TERMS OF NO. OF TURNS OF THE TENSION BEARING IN THE TABLE BELOW.

SIZE TUBING	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4" & UP
NO. OF THDS/IN.	16	12	10	10	8		10
NO. OF TURNS PER 100' SETTING	2	1 1/2	1 1/4	NEW STD.	OLD STD.		
				1 1/4	1		1 1/4

LUBRICATING

- STEP 5. CONNECT THE LUBRICATOR TO THE OIL CONNECTION IN THE TENSION BEARING. WHEN FIRST CONNECTED ALLOW ABOUT ONE CUP FULL OF OIL TO ENTER THE TUBING. THEN ADJUST THE FEED TO ALLOW A FLOW OF ONE DROP PER MINUTE PER 10 FOOT OF TUBING.
- STEP 6. WHEN USING A FORCE FEED OIL PUMP INJECT ABOUT ONE CUP FULL OF OIL FOR EACH 24 HOURS OF OPERATION.
- STEP 7. THE OIL SHOULD BE OF A GOOD GRADE MINERAL OIL WITH A VISCOSITY OF APPROXIMATELY S.A.E. 10.



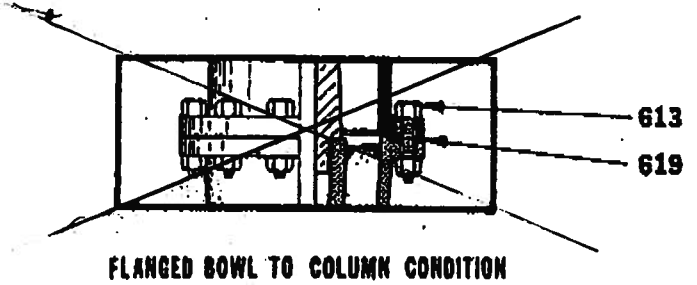
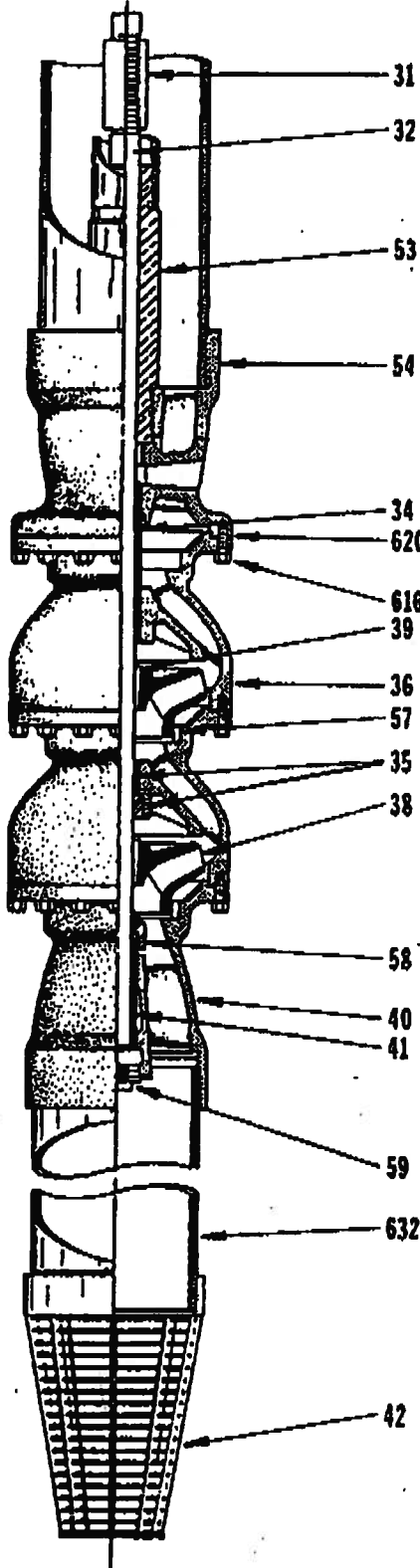
VERTI-LINE PUMPS

Layne & Bowyer

SECTIONAL DRAWING

**DEEP WELL BOWLS
ENCLOSED LINE SHAFT**

**SECTION:
DWG. NO.:
DATE:
SUPERSEDES:**

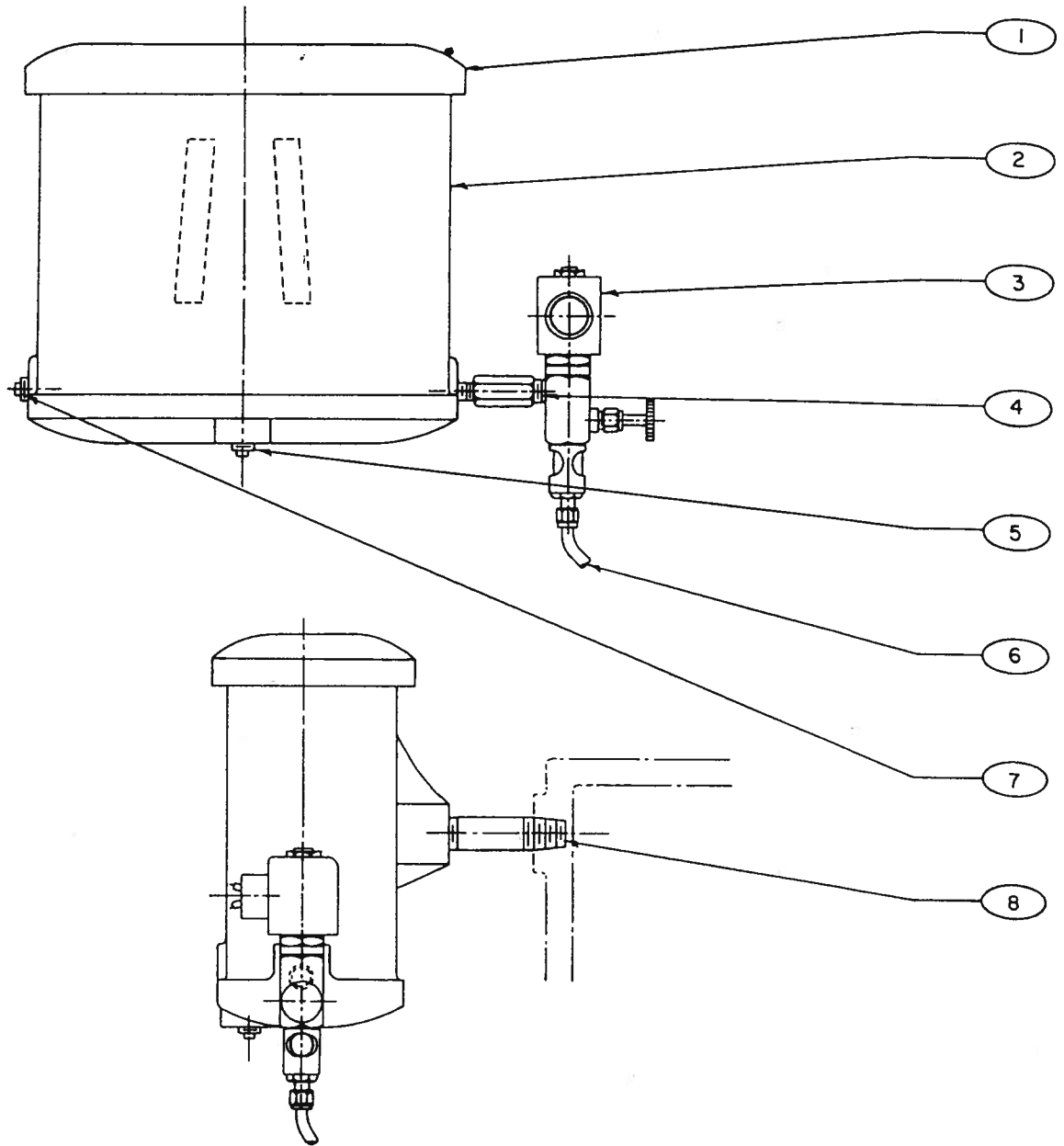


ITEM NO.	PART NAME	MATERIAL	
		STD.	OPTIONAL
880	BOWL ASSY.	-----	
31	IMP. SHAFT COUPLING	STFEL	
32	IMPELLER SHAFT	410 SS	
34	BEARING, TOP INT	BRONZE	
35	BEARING, INT.	<i>BRZ/RBB</i>	
36	INTERMEDIATE	C.I. CL 30	
38	IMPELLER	<i>BRONZE</i>	<i>NI-RESIST</i>
39	COLLET	STN. STL.	
40	SUCTION CASE	C.I. CL 30	
41	BEARING, SUCTION	BRONZE	
42	STRAINER	STEEL	<i>SI. STL.</i>
53	TUBE ADAPTOR	<i>BRONZE</i>	
54	DISCHARGE CASE	C.I. CL 30	
57	WEAR RING	BRONZE	
58	SAND COLLAR	<i>RUBBER</i>	
59	SUCTION PLUG	C.I.	
613	MACH. BOLT, BOWL/COL.	STEEL	
616	CAPSCREW, BOWL	H.T. STL.	
619	GASKET, BOWL/COL.	-----	
620	GASKET, BOWL	-----	
832	SUCTION PIPE	STEEL	

ONE GALLON CAST IRON LUBRICATOR ASSEMBLY SOLENOID DRIP FEED OPERATION WITH T436 BRACKET



LAYNE & BOWLER, INC., MEMPHIS, TENNESSEE



ITEM NO.		DESCRIPTION
1		CAP
2		TANK
3	120 VAC	SOLENOID & DRIP FEED VALVE ASSM.
4		MALE COUPLING $\frac{1}{8}'' \times \frac{1}{4}''$

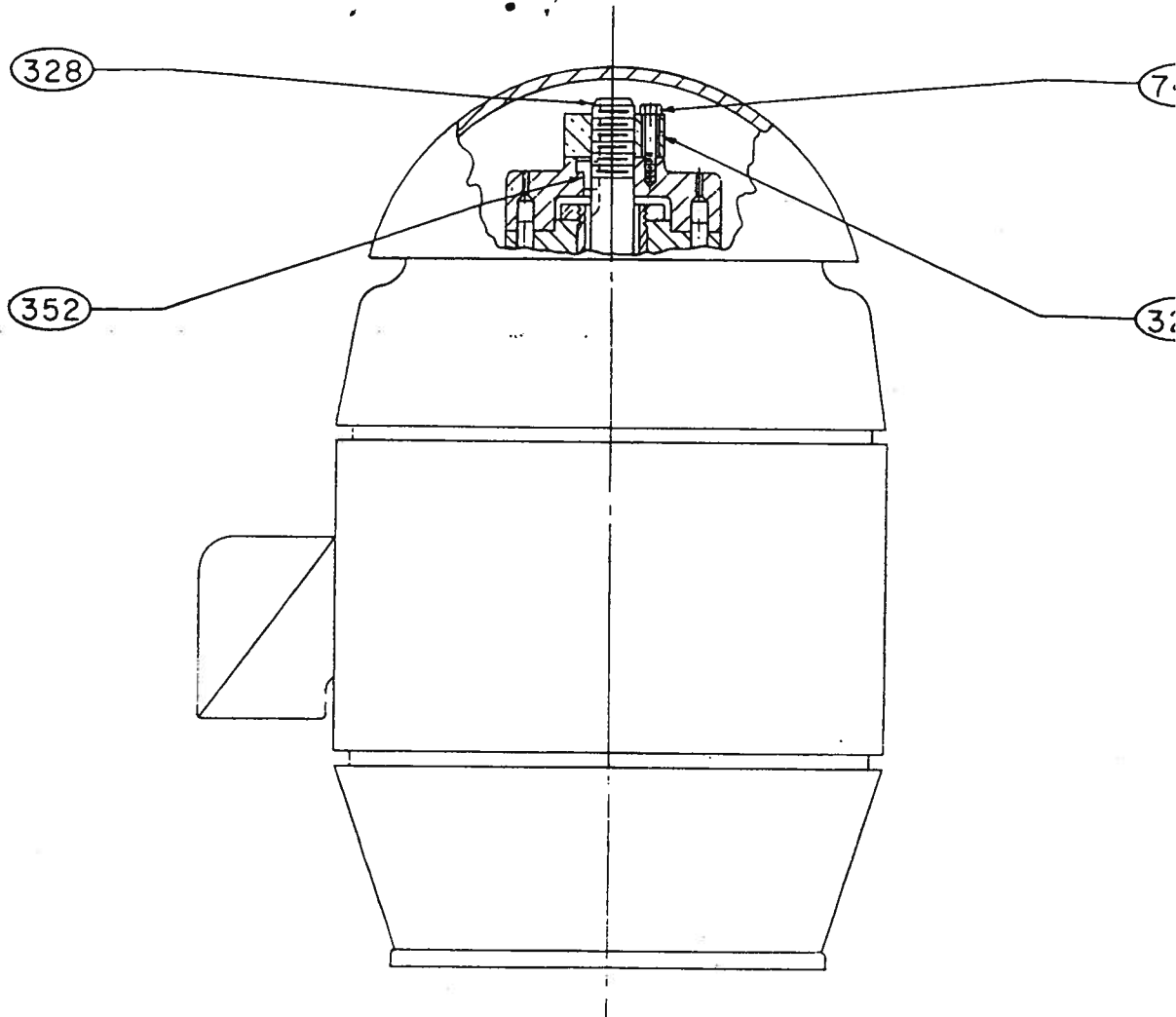
ITEM NO.		DESCRIPTION
5		PIPE PLUG, DRAIN - $\frac{1}{8}''$ N.P.T.
6		OIL LINE - $\frac{1}{4}''$ COPPER
7		PIPE PLUG, ALT. CONN. - $\frac{1}{8}''$ N.P.T.
8		BRACKET

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.



ADJUSTING NUT ASSEMBLY VERTICAL HOLLOW SHAFT MOTOR

LAYNE & BOWLER INC MEMPHIS · TENNESSEE.



PART NO.		DESCRIPTION
3 2 8	416 S.STL.	MOTOR DRIVE SHAFT
3 2 9	BRONZE	ADJUSTING NUT
3 5 2	ST. STL.	GIB. HEAD KEY (CLUTCH)
7 4 0	ST. STL.	MACHINE SCREW (ADJUSTING NUT)

IN ORDERING REPLACEMENT PARTS, ALWAYS SPECIFY PARTS NO, DESCRIPTION, MOTOR SIZE, TYPE, & PUMP SERIAL NO.

MOTOR MFG. USEM HP. 40 R.P.M. 1800
 VOLTS 460 PHASE 3 CY. 60 FRAME B324TP

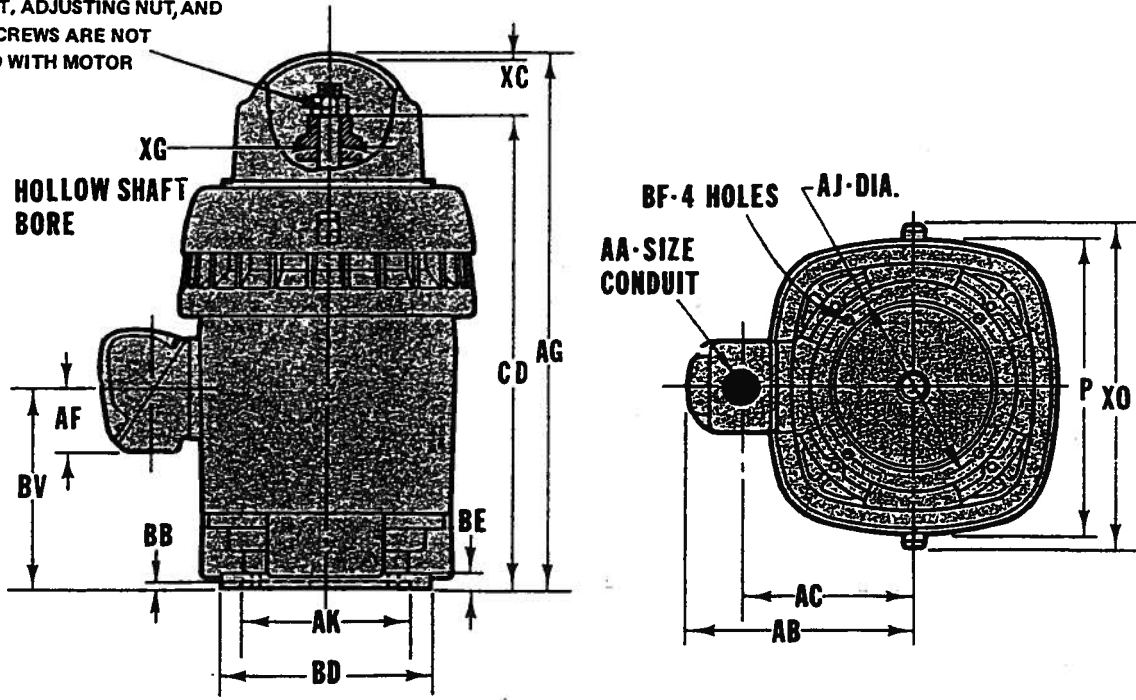
VERTICAL MOTORS



DIMENSIONS

FRAMES 324TP THRU 405TPA -- TYPES RU, RUE (DRIPPROOF) -- WEATHER PROTECTED TYPE 1

PUMP SHAFT, ADJUSTING NUT, AND LOCKING SCREWS ARE NOT FURNISHED WITH MOTOR



ALL DIMENSIONS ARE IN INCHES

BASIC FRAME	P*	AA	AB	AC	AF	AG	BE	BV	CD	XC	XO
320	18-3/8	3	15-3/16	11-5/8	4	32-5/8	11/16	11-1/16	28-7/32	4-7/32	21
360	18-3/8	3	15-3/16	11-5/8	4	35-9/16	11/16	14	31-5/32	4-7/32	21
400	20-1/2	3	16-3/8	12-3/4	4	41-5/8	3/4	18-1/8	36-15/16	4-9/16	23-3/8

FRAME	AJ	AK	BB	BD MAX.	BF	XG	BRACKET PART NO.
324, 326TP	14-3/4	13-1/2	1/4	16-1/2	11/16	1-9/16	182169
324, 326TPH	9-1/8	8-1/4	3/16	12	7/16	1-9/16	192163
364, 365TP	14-3/4	13-1/2	1/4	16-1/2	11/16	1-9/16	192169
364, 365TPA	9-1/8	8-1/4	3/16	12	7/16	1-9/16	192163
404, 405TP	14-3/4	13-1/2	1/4	16-1/2	11/16	1-7/8	188662
404, 405TPA	14-3/4	13-1/2	1/4	20	11/16	1-7/8	188664

* Largest motor width.

Conduit box opening may be located in steps of 90 degrees. Standard as shown with conduit opening down.

All rough casting dimensions may vary by 1/4" due to casting variations.

TOLERANCES	AK DIMENSION	
	8-1/4	13-1/2
Face runout	.004 F.I.R.	.007 F.I.R.
Permissible eccentricity of mounting rabbet	.004 F.I.R.	.007 F.I.R.
AK dimension	+.003	+.005



U.S. ELECTRICAL MOTORS DIVISION EMERSON ELECTRIC CO.

Printed in U.S.A.

EFFECTIVE: OCTOBER 28, 1984
SUPERSEDES: APRIL 24, 1983

SECTION : 505
PAGE : 3

DO NOT USE FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED



VERTICAL PREMIUM EFFICIENT

WPI HOLLOWSHAFT & SOLID SHAFT

230, 460, & 575 VOLTS; 3 PHASE, 60 HERTZ

HIGH THRUST ENGINEERING DATA

SECTION: 504
 PAGE: 22
 EFFECTIVE: 01-15-93
 SUPERSEDES: PG 8.2
 DATED: 11-15-92

H.P.	RPM		% EFFICIENCY			% POWER FACTOR			CURRENT (AMPS) 460VOLTS		TORQUE AT FULL VOLTAGE (FT.-LBS.)			NEMA CODE
	NO LOAD	FULL LOAD	FULL LOAD	3/4 LOAD	1/2 LOAD	FULL LOAD	3/4 LOAD	1/2 LOAD	FULL LOAD	LOCKED STARTING	FULL LOAD TORQUE AT FULL LOAD SPEED	LOCKED (STARTING)	PULLOUT BREAKDOWN	
5	900	880	88.4	88.7	87.3	71.4	64.5	52.5	7.4	48	30	130	205	H
7-1/2	1800	1760	91.2	91.6	91.0	85.9	83.1	78.1	9.3	63.5	22	175	215	H
	1200	1170	89.5	90.1	89.3	80.4	75.1	64.5	9.8	68	34	150	205	J
	900	875	88.6	89.3	88.5	73.3	66.7	55.2	10.8	63.5	45	125	200	H
10	1800	1760	91.2	91.9	91.6	86.3	83.8	77.1	12.3	78	30	165	200	G
	1200	1170	88.8	89.7	89.2	81.4	75.8	65.2	13.0	91	45	150	200	J
	900	875	88.6	89.9	89.8	75.9	70.7	60.6	13.9	81	60	125	200	G
15	1800	1765	91.7	92.2	91.4	81.9	78.2	69.4	18.7	116	45	160	200	G
	1200	1170	90.5	91.4	91.2	81.5	76.6	66.7	19.1	136	67	140	200	J
	900	875	87.9	89.1	88.7	74.0	67.4	55.9	21.6	116	90	125	200	G
20	3600	3525	90.5	91.4	91.1	88.0	87.4	83.4	23.5	145	30	130	200	G
	1800	1770	92.4	93.3	93.2	85.0	83.7	78.4	23.8	145	60	150	200	G
	1200	1170	90.5	91.7	91.7	82.2	77.6	68.0	25.2	200	90	135	200	J
	900	880	90.1	91.1	90.8	75.1	70.5	60.1	27.7	145	119	125	200	G
25	3600	3530	91.2	92.1	91.8	87.1	86.2	81.6	29.4	182.5	37	130	200	G
	1800	1770	93.0	93.9	93.9	83.8	81.6	74.8	30.0	182.5	74	150	200	G
	1200	1175	90.9	92.0	92.0	85.0	83.4	77.9	30.3	200	112	135	200	G
	900	880	90.3	91.6	91.7	76.8	73.0	63.7	33.8	182.5	149	125	200	G
30	3600	3520	90.7	92.0	92.1	88.2	87.4	83.1	35.1	217.5	45	130	200	G
	1800	1765	92.9	94.0	94.2	84.2	82.5	76.4	35.9	217.5	89	150	200	G
	1200	1180	91.5	92.6	92.6	85.5	83.8	78.3	35.9	258	134	135	200	G
	900	880	90.9	92.0	91.7	76.1	70.8	59.7	40.6	217.5	179	125	200	G
	8600	3520	92.1	93.3	93.4	89.1	88.5	84.7	45.7	290	60	125	200	G
40	1800	1780	93.2	93.7	93.3	87.2	86.4	82.2	46.1	290	118	140	200	G
	1200	1175	91.5	92.8	93.0	84.6	82.3	75.4	48.4	236	170	135	200	H
	900	880	91.2	92.5	92.6	77.4	72.8	62.4	53.1	290	239	125	200	G
	3600	3545	90.7	90.8	89.4	85.3	83.9	78.4	60.5	362.5	74	120	200	G
50	1800	1780	93.9	94.4	94.0	87.6	86.1	80.8	58.7	36.5	148	140	200	G
	1200	1175	92.5	93.7	93.9	86.2	84.1	77.8	58.7	429	223	135	200	H
	900	880	91.1	92.1	92.0	79.5	75.2	65.5	64.6	362.5	299	125	200	G
	3600	3550	91.4	91.8	90.8	87.7	87.0	83.1	70.1	435	89	120	200	G
60	1800	1780	94.1	94.7	94.5	87.9	86.7	81.7	67.9	435	178	140	200	G
	1200	1175	92.4	93.4	93.4	86.8	84.9	78.9	70.1	478	268	135	200	H
	900	880	91.7	92.7	92.6	80.3	76.3	67.1	76.4	435	358	125	200	G
	3600	3540	91.6	92.4	92.0	88.1	88.5	86.1	87.0	542.5	111	105	200	G
75	1800	1775	94.1	94.9	94.9	88.0	86.9	82.0	84.8	542.5	222	140	200	G
	1200	1175	93.4	94.3	94.4	87.8	86.4	81.7	85.6	636	335	135	200	H
	900	890	93.7	94.4	94.2	80.1	77.2	69.1	93.6	542.5	443	125	200	G
	3600	3535	92.1	93.1	93.0	89.1	89.4	87.2	114.1	725	149	105	200	G
100	1800	1780	94.6	95.2	95.0	87.0	86.1	81.5	108.9	725	295	125	200	G
	1200	1185	93.4	94.2	94.0	84.5	82.1	75.1	118.6	792	443	125	200	H
	900	890	93.8	94.5	94.4	80.2	76.9	68.2	124.5	725	591	125	200	G
	3600	3545	92.9	93.5	93.1	88.9	88.1	83.9	141.7	907.5	185	100	200	G
125	1800	1780	94.9	95.5	95.4	87.0	86.0	81.4	141.7	907.5	369	110	200	G
	1200	1190	94.0	94.6	94.3	84.0	80.8	72.6	148.2	1113	553	125	200	H
	3600	3545	93.1	93.9	93.8	89.9	89.2	85.4	167.8	1085	222	100	200	G
150	1800	1785	95.5	95.7	95.2	85.8	82.8	75.1	171.2	1085	443	110	200	G
	1200	1185	93.7	94.8	95.1	86.8	85.6	80.8	172.7	1180	665	120	200	H
	3600	3560	93.4	93.7	92.8	89.1	88.3	84.4	224.9	1450	295	100	200	G
200	1800	1780	95.5	95.9	95.7	87.4	85.5	79.3	224.3	1450	591	100	200	G
	3600	3550	93.4	93.9	93.4	89.2	88.4	84.3	280.8	1825	370	70	175	G
250	1800	1780	95.1	95.8	95.8	86.7	84.8	78.4	283.8	1825	738	80	175	G

Efficiency & power factor values listed above are representative values. For guaranteed and certified values, refer to company.

The code letter is an indication of the locked rotor K.V.A. in accordance with the National Electrical Code.

When performance values have been quoted, they should be shown on the order.

For data not listed, refer to company. Data subject to change without notice.

Extra high thrust may decrease typical efficiency below values listed above.

★ ADDED OR CHANGED
THIS ISSUE



U. S. ELECTRICAL MOTORS
 DIVISION OF EMERSON ELECTRIC CO.