Operator's Manual Table of Contents
Darley HD100 Fire Pump
Direct Mount PTO Driven

IF FURTHER INFORMATION IS NEEDED, CALL W.S. DARLEY & CO. AT CHIPPEWA FALLS, WI. AT 800-634-7812 or 715-726-2650

This manual is for DARLEY FIRE PUMP:

Model: **HD100** Pump Serial Number: ______________________

Description of Pump Type

The **Type HD100** pump is a high speed, single stage, centrifugal pump. The pump impeller shaft is driven via a helical tooth, two gear speed increasing gear box.

The pump assembly is direct mounted to a standard SAE ‘B’ PTO adapter flange and is driven by the 13T, involute spline, PTO output shaft. The PTO clutch system is utilized to engage and disengage the pump.

OPERATION AND MAINTENANCE OF TYPE HD100 FIRE PUMP

Lubrication

Keep the gear case filled with oil to the level of the oil level plug, which is marked on the pump gear case.

Check the oil level every 25 hours or every three months, and change it every 50 hours or 6 months.

Use 80W/90 gear lube oil - not grease - in the pump transmission.

CAUTION: Do not overfill.

Operation of Pump

The pump is directly coupled to the PTO through a step up gear box. Prepare the pump for operation before engaging the pump drive PTO. Prime the pump system, and then engage the pump.

Never run the pump dry except momentarily and at low speeds.

Never engage the pump at high RPM.

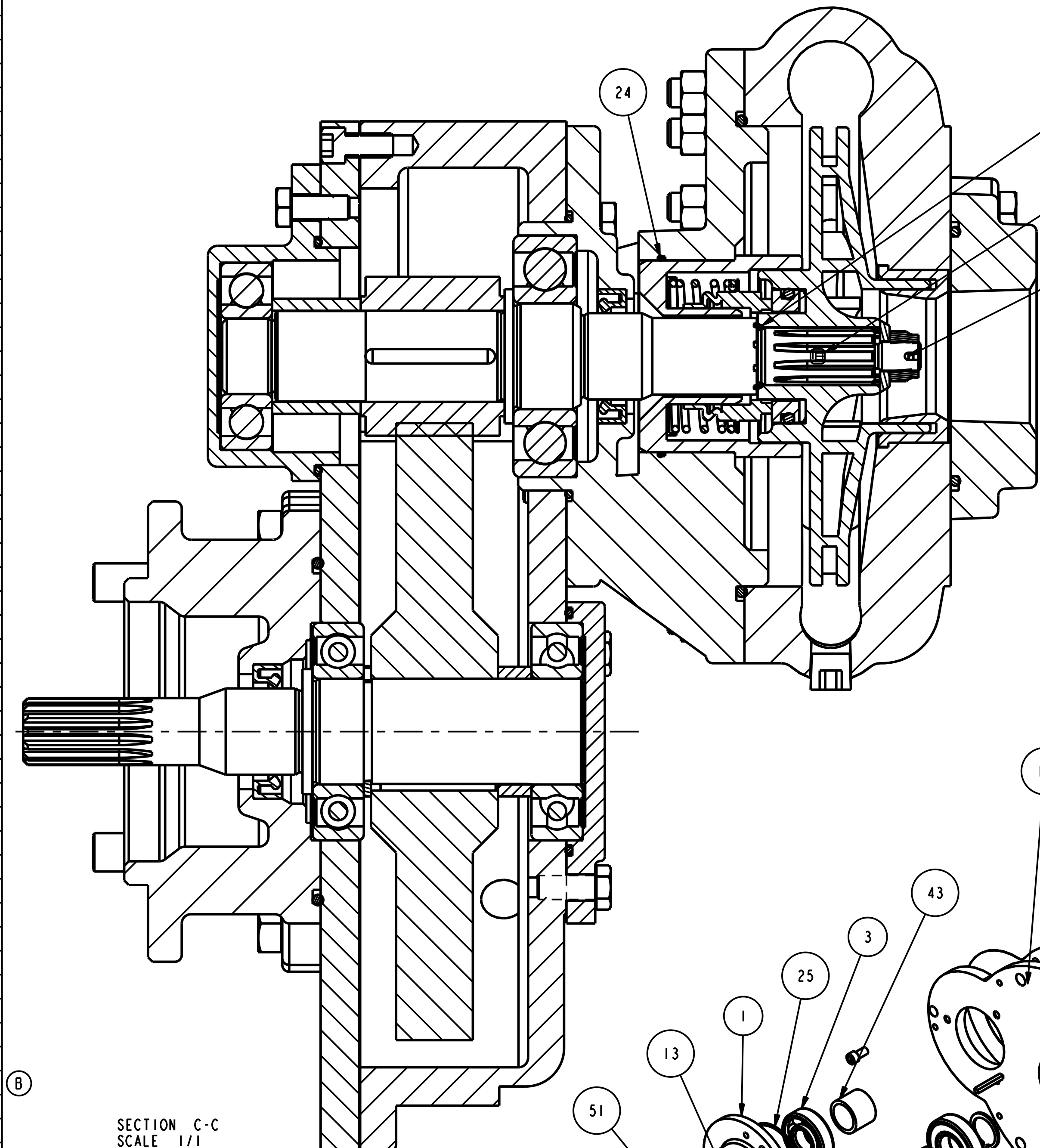
Never run the pump at high speed at any time unless it is discharging water.

WARNING: Do not use this pump for hose testing.

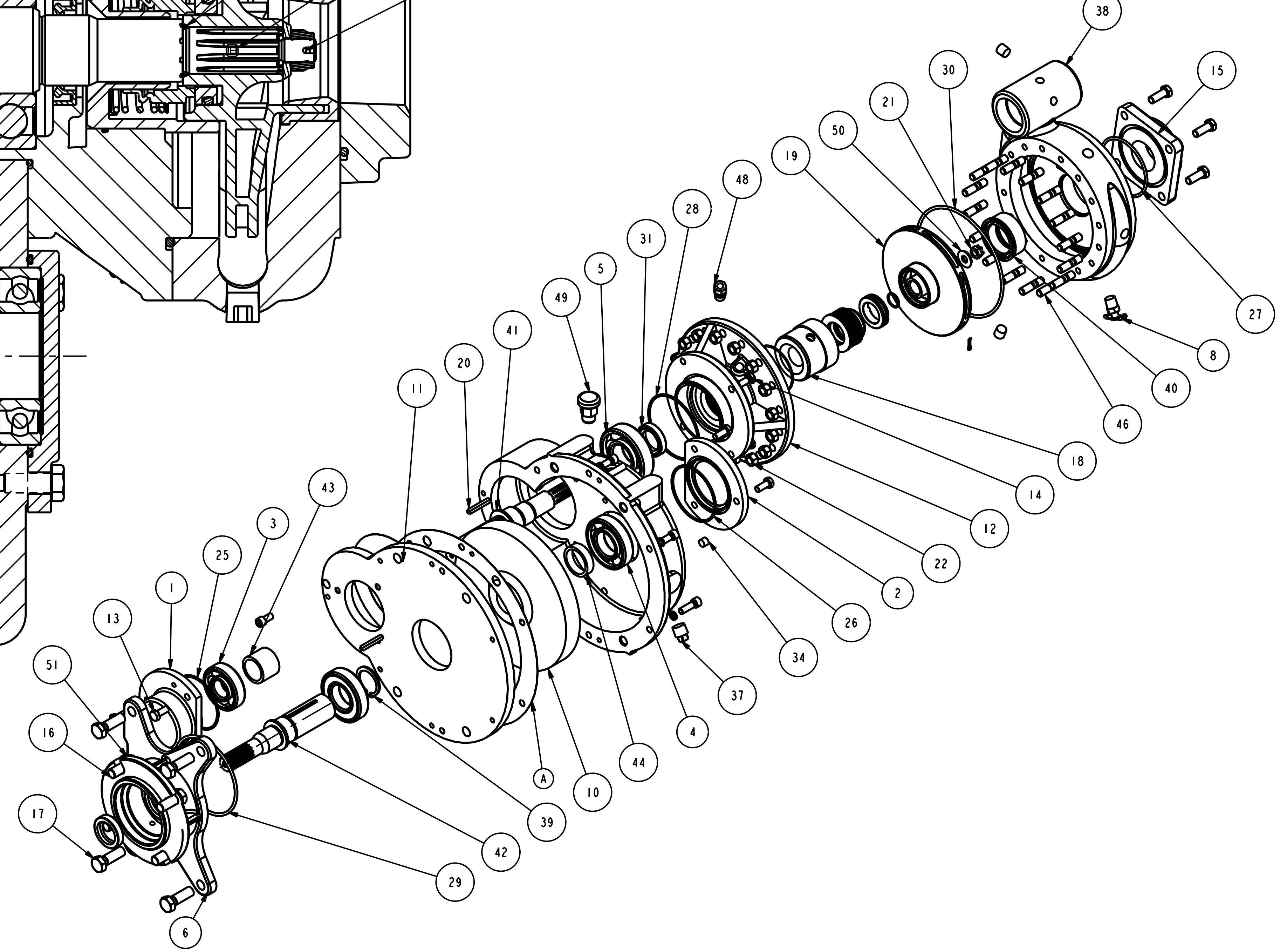
NO.	DESCRIPTION	PART NO.	QTY.
1	BEARING CAP	2300601	1
2	BEARING CAP	2301008	1
3	BEARING-BALL	1721702	1
4	BEARING-BALL, 207SF	1720103	2
5	BEARING-BALL, 307SF	1721903	1
6	BRACKET - HD100, SAE 'B'	4028700	1
7	CRANE SEAL - 1.250	1843602	1
8	DRAINCOCK - 0.250 NPTM, 9KC BR	5203600	1
9	FLANGE - 1.5 NPT, O-RING	1920421	1
10	GEAR - DRIVE, H100, 12 DP	2713204	1
11	GEAR - PINION, H100, 12DP	2713901	1
12	HEAD - INBOARD, H100, BR	2805601	1
13	HHCS - .313-18 x 0.75, GR5	5400018	6
14	HHCS - .313-18 x 1.00, GR5	5400020	4
15	HHCS - .375-16 x 1.00, SST	5400617	4
16	HHCS - .500-13 x 1.25, GR5	5400066	4
17	HHCS - .500-13 x 1.50, GR5	5400067	4
18	HOUSING - MECHANICAL SEAL	1844400	1
19	IMPELLER - H100, MECH SEAL	2908002	1
20	KEY - SQ., 0.19 x 1.50, GR2	3602428	2
21	NUT - CASTLE, .375-24, 303	5403431	1
22	NUT - HEX, .375-16, SST	5403003	16
23	O-RING - 0.81 X 0.69 X 0.06	3601020	1
24	O-RING - 2.50 x 2.62 x 0.06	3601010	1
25	O-RING - 2.88 x 3.06 X 0.09	3601126	1
26	O-RING - 3.00 x 3.19 X 0.09	3601125	1
27	O-RING - 3.12 x 3.38 x 0.12	3601200	1
28	O-RING - 3.50 x 3.69 X 0.09	3601124	1
29	O-RING - 4.25 x 4.50 X 0.12	3601239	1
30	O-RING - 6.00 x 6.25 x 0.12	3601226	1
31	OIL SEAL - 1.125 ID X 1.750 OD	3600559	2
32	PIN - COTTER, .094 x 1.00, SST	3605202_B	1
33	PLUG - PIPE, 0.250, SST SOC HD	1080535	4
34	PLUG - PIPE, 0.125, SST SOC HD	1080533	1
37	PLUG - PIPE, 0.375, MAG SQ HD	1080509	1
38	PUMP CASING - S, BRASS	2054903	1
39	RING - RETAINER, 5160-137	3600421	1
40	SEAL RING - HH100	3406001	1
41	SHAFT - IMPELLER, H100	5016904	1
42	SHAFT - INPUT, HD100, 13T INV	5019800	1
43	SPACER - 1.19 x 1.50 x 1.153	3302205	1
44	SPACER - 1.38 x 1.69 x 0.62	3301704	1
45	SSS - NO.10-24 x 0.19, SST	5402627	2
46	STUD - 0.375-16 X 1.500, 303	3606208	16
47	TRANS - GEARCASE ASSY, J	TG00316	1 (B)
48	TUBE FITTING - STR, .31 x .25	3500010	1
49	VENT - GEARCASE	4401800	1
50	WASHER	3603303	1
51	WASHER - FLAT, 1/2 SAE, STEEL	3603817	4

(A) GASKET - GEARCASE - 3811300 - REF

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
B	WAS TG00300	20MAR02	2002-52	DWS



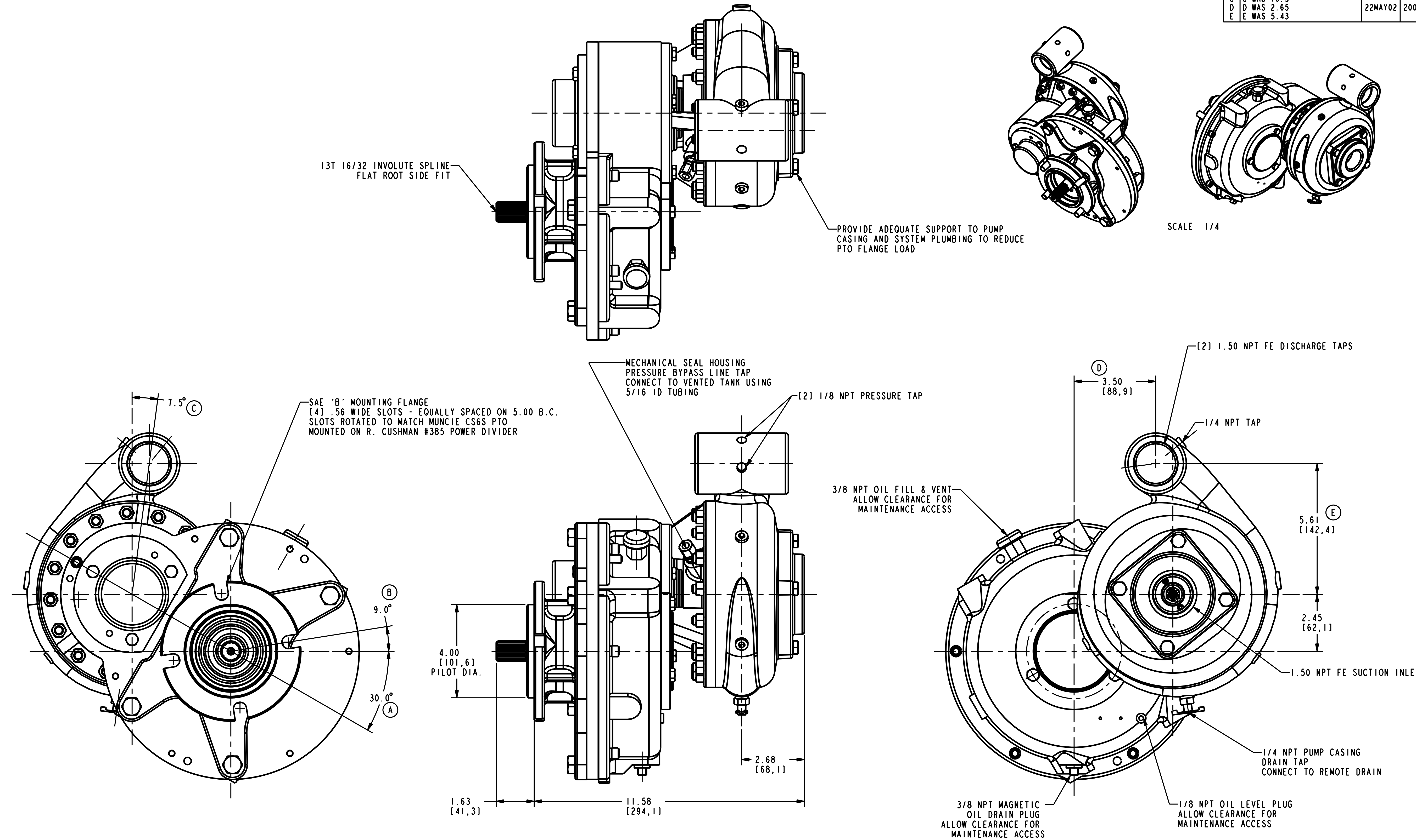
SECTION C-C
SCALE 1/1



REMOVE SHARP EDGES	INCH (MILLIMETER)	OLD PART NO.	TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°	W.S. Darley & Co. CHIPPEWA FALLS, WI - MELROSE PARK, IL
MATERIAL DESCRIPTION: -		MATERIAL NO. - / PATTERN NO.		LAYOUT - H100 MECH SEAL
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED	ALL DIMENSIONS IN INCHES UNLESS NOTED	DO NOT SCALE PRINT	DR'N DWS / CHKD TED / TRCD	DATE 06-AUG-01 / SCALE 5/16 / DHC1500

MODEL NAME PH00509 | MDL CREATED 16-JULY-2000 | SHEET 1/1 | D

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A B	A WAS 0 DEGREE (HORIZONTAL) B WAS 39 DEGREE	20MAR02	2002-52	DWS
C D E	C WAS 16.3° D WAS 2.65 E WAS 5.43	22MAY02	2002-88	DWS



APPROXIMATE WEIGHT: 135LBS [61.2 Kg] (BRASS CASING)

REMOVE SHARP EDGES

INCH (MILLIMETER)

MATERIAL DESCRIPTION: -

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

OLD PART NO. | MATERIAL NO. | PATTERN NO.

TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°

MODEL NAME PH00509 | MDL CREATED 16-JULY-2000 | SHEET 1/1 | D

W.S. Darley & Co. CHIPPEWA FALLS, WI - MELROSE PARK, IL

LAYOUT - H100 MECH SEAL

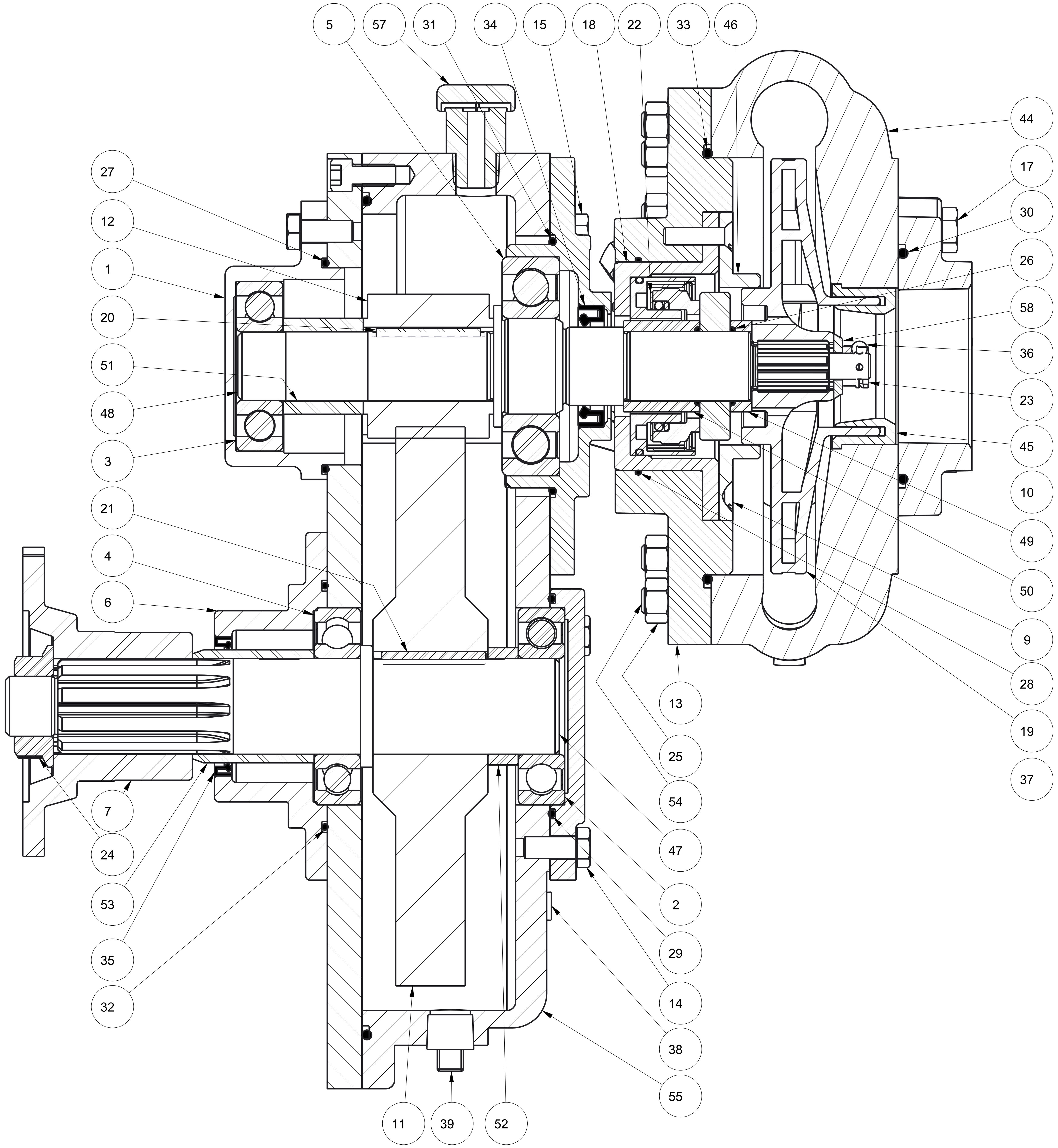
DR'N DWS | CHKD TED | TRCD

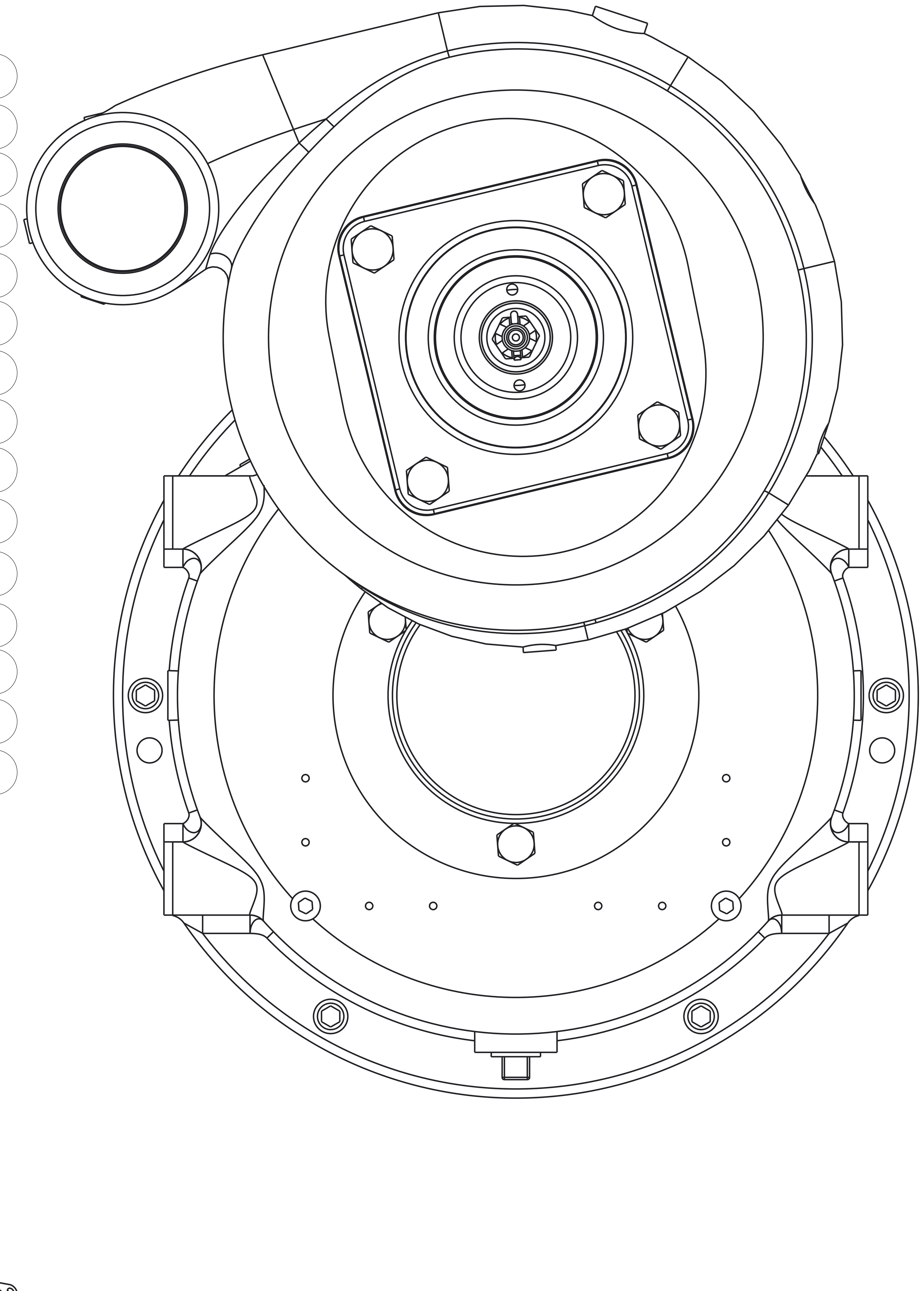
DATE 06-Aug-01 | SCALE 1/2

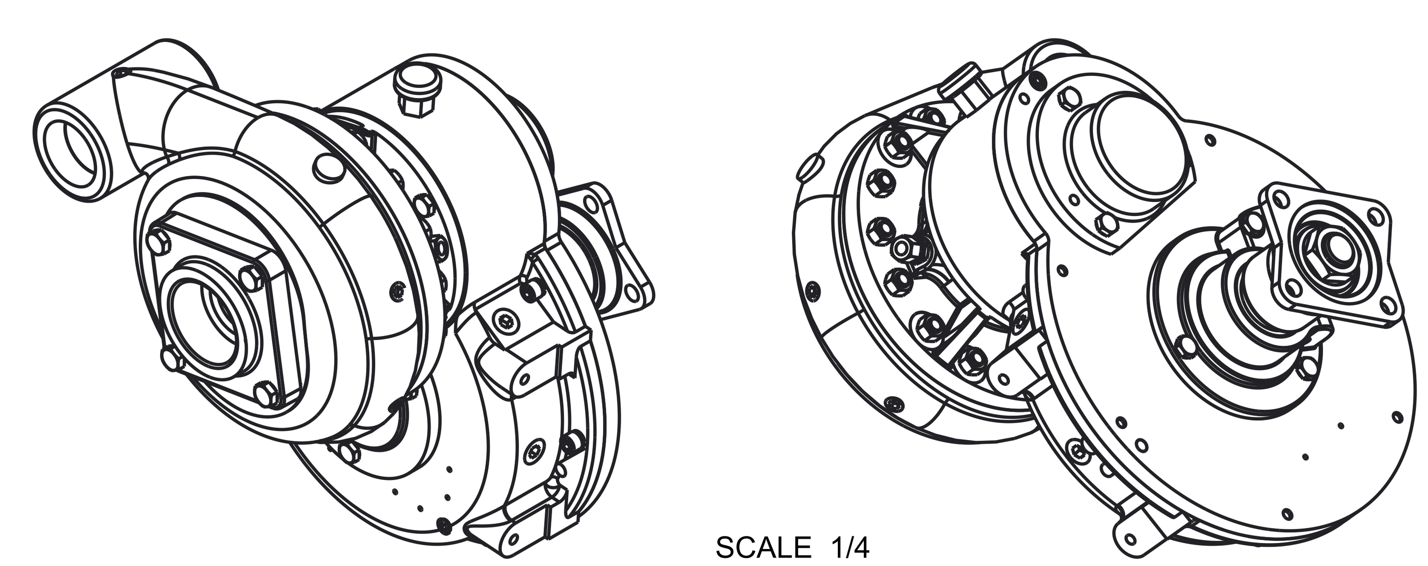
DHD1300

NO.	DESCRIPTION	PART NO.	QTY.
1	BEARING CAP	2300601	1
2	BEARING CAP	2301008	1
3	BEARING-BALL	1721702	1
4	BEARING-BALL, 207SF	1720103	2
5	BEARING-BALL, 307SF	1721903	1
6	CAP - BEARING	2303207	1
7	COMP FLANGE - 1350/1410, 1.38"	4817807	1
9	FHMS - .250-20 x 1.00, BR	5402405	4
10	FLANGE - 2 BSP, O-RING, CDI	1920414	1
11	GEAR - DRIVE, 12DP, 91, LH	2713203	1
12	GEAR - PINION, 19T, RH	2713404	1
13	HEAD - INBOARD, H100	2805603	1
14	HHCS - .313-18 x 0.75, GR5	5400018	8
15	HHCS - .313-18 x 1.00, GR5	5400020	4
16	HHCS - .313-18 x 1.75, GR5	5400022	1
17	HHCS - .375-16 x 1.00, GR5	5400036	4
18	HOUSING - MECHANICAL SEAL, H100	1846101	1
19	IMPELLER - H100, MECH SEAL	2908004	1
20	KEY - SQ., 0.12 X 1.50 GR2	3602423	1
21	KEY - SQ., 0.19X1.50 GR2	3602441	1
22	MECHANICAL SEAL - 1.00" KSPAH	1846100	1
23	NUT - CASTLE, .375-24, 303	5403431	1
24	NUT - FLANGE, 7/8-14	4814501	1
25	NUT - HEX, .375-16, GR2	5403002	16
26	O-RING - 1.00 x 1.12 x 0.06	3601016	2
27	O-RING - 2.88 x 3.06 X 0.09	3601126	1
28	O-RING - 3.00 x 3.12 x 0.06	3601011	1
29	O-RING - 3.00 x 3.19 X 0.09	3601125	1
30	O-RING - 3.12 x 3.38 x 0.12	3601200	1
31	O-RING - 3.50 x 3.69 X 0.09	3601124	1
32	O-RING - 3.50 x 3.69 x 0.09	3601124-FORM	1
33	O-RING - 6.00 x 6.25 x 0.12	3601226	1
34	OIL SEAL - 1.125 ID X 1.750 OD	3600559	1
35	OIL SEAL - 1.625 ID X 2.000 OD	3600554	1
36	PIN - COTTER, .094 x 1.00, SST	3605202_B	1
37	PLUG - PIPE 1/4 BSP	1080554	5
38	PLUG - PIPE, 0.125, ZN SOC HD	1080537	3
39	PLUG - PIPE, 0.375, MAG SQ HD	1080536	1
40	PLUG - PIPE, 0.375, ZN SOC HD	1080541	4
41	PLUG - PIPE. 1/8 BSP	1080555	2
42	PLUG - TACH SHAFT	4402501	1
43	PLUG - TACH, .750-20, ALUM	1142100	1
44	PUMP CASING H100	2054908	1
45	SEAL RING - HH100	3406001	1
46	SEAL RING - KSPAH	3407401	1
47	SHAFT - DRIVE, JMP LOCK ON	5018401	1
48	SHAFT - IMPELLER, H100	5016906	1
49	SLEEVE - KSPAH, EXTERNAL	1886801	1
50	SLEEVE - KSPAH, INTERNAL	1886800	1
51	SPACER - 1.00 X 1.38 X 1.15	3306200	1
52	SPACER - 1.38 x 1.69 x 0.44	3301704	1
53	SPACER - 1.63 x 1.37 x .75	3306401	1
54	STUD - 0.375-16 X 1.500, GR5	3606203	16
55	TRANS - GEARCASE ASSY, J	TG00313	1
56	TUBE FITTING - STR, .31 x .25	3500010	1
57	VENT - GEARCASE	4401800	1
58	WASHER - 0.39 X 0.94 X .12 303	3603303	1

NOTE:
1) O-RINGS (26) ARE SUPPLIED WITH MECHANICAL SEAL







SCALE 1/4

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D

REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO.

MATERIAL DESCRIPTION:
-

MATERIAL NO.

PATTERN NO.

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

TOLERANCE
EXCEPT AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

DR'N KMD
CHKD MCR
TRCD

MODEL NAME PH00521 | MDL CREATED 10/16/13 | SHEET 1/2 | D

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

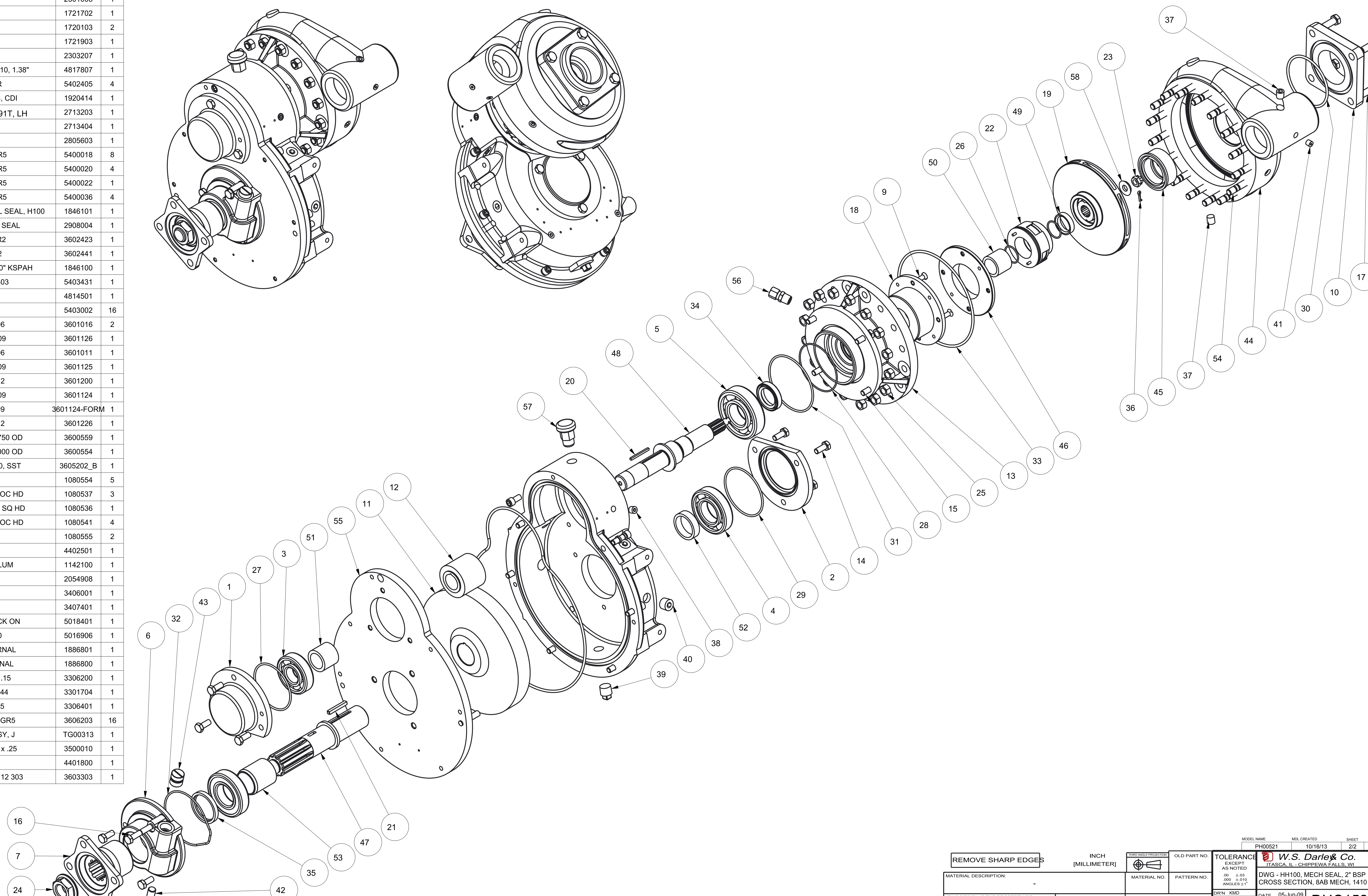
DWG - HH100, MECH SEAL, 2" BSP
CROSS SECTION, 8AB MECH, 1410

DATE 02-Jun-09
SCALE 1/1

DHC1520

NO.	DESCRIPTION	PART NO.	QTY.
1	BEARING CAP	2300601	1
2	BEARING CAP	2301008	1
3	BEARING-BALL	1721702	1
4	BEARING-BALL, 207SF	1720103	2
5	BEARING-BALL, 307SF	1721903	1
6	CAP - BEARING	2303207	1
7	COMP FLANGE - 1350/1410, 1.38"	4817807	1
9	FHMS - .250-20 x 1.00, BR	5402405	4
10	FLANGE - 2 BSP, O-RING, CDI	1920414	1
11	GEAR - DRIVE, 12DP, 91T, LH	2713203	1
12	GEAR - PINION, 19T, RH	2713404	1
13	HEAD - INBOARD, H100	2805603	1
14	HHCS - .313-18 x 0.75, GR5	5400018	8
15	HHCS - .313-18 x 1.00, GR5	5400020	4
16	HHCS - .313-18 x 1.75, GR5	5400022	1
17	HHCS - .375-16 x 1.00, GR5	5400036	4
18	HOUSING - MECHANICAL SEAL, H100	1846101	1
19	IMPELLER - H100, MECH SEAL	2908004	1
20	KEY - SQ., 0.12 X 1.50 GR2	3602423	1
21	KEY - SQ., 0.19X1.50 GR2	3602441	1
22	MECHANICAL SEAL - 1.00" KSPAH	1846100	1
23	NUT - CASTLE, .375-24, 303	5403431	1
24	NUT - FLANGE, 7/8-14	4814501	1
25	NUT - HEX, .375-16, GR2	5403002	16
26	O-RING - 1.00 x 1.12 x 0.06	3601016	2
27	O-RING - 2.88 x 3.06 X 0.09	3601126	1
28	O-RING - 3.00 x 3.12 x 0.06	3601011	1
29	O-RING - 3.00 x 3.19 X 0.09	3601125	1
30	O-RING - 3.12 x 3.38 x 0.12	3601200	1
31	O-RING - 3.50 x 3.69 X 0.09	3601124	1
32	O-RING - 3.50 x 3.69 x 0.09	3601124-FORM	1
33	O-RING - 6.00 x 6.25 x 0.12	3601226	1
34	OIL SEAL - 1.125 ID X 1.750 OD	3600559	1
35	OIL SEAL - 1.625 ID X 2.000 OD	3600554	1
36	PIN - COTTER, .094 x 1.00, SST	3605202_B	1
37	PLUG - PIPE 1/4 BSP	1080554	5
38	PLUG - PIPE, 0.125, ZN SOC HD	1080537	3
39	PLUG - PIPE, 0.375, MAG SQ HD	1080536	1
40	PLUG - PIPE, 0.375, ZN SOC HD	1080541	4
41	PLUG - PIPE. 1/8 BSP	1080555	2
42	PLUG - TACH SHAFT	4402501	1
43	PLUG - TACH, .750-20, ALUM	1142100	1
44	PUMP CASING H100	2054908	1
45	SEAL RING - HH100	3406001	1
46	SEAL RING - KSPAH	3407401	1
47	SHAFT - DRIVE, JMP LOCK ON	5018401	1
48	SHAFT - IMPELLER, H100	5016906	1
49	SLEEVE - KSPAH, EXTERNAL	1886801	1
50	SLEEVE - KSPAH, INTERNAL	1886800	1
51	SPACER - 1.00 X 1.38 X 1.15	3306200	1
52	SPACER - 1.38 x 1.69 x 0.44	3301704	1
53	SPACER - 1.63 x 1.37 x .75	3306401	1
54	STUD - 0.375-16 X 1.500, GR5	3606203	16
55	TRANS - GEARCASE ASSY, J	TG00313	1
56	TUBE FITTING - STR, .31 x .25	3500010	1
57	VENT - GEARCASE	4401800	1
58	WASHER - 0.39 X 0.94 X .12 303	3603303	1

NOTE:
1) O-RINGS (26) ARE SUPPLIED WITH MECHANICAL SEAL



REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D

REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO.

MATERIAL DESCRIPTION:
-

MATERIAL NO. | PATTERN NO.

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

TOLERANCE EXCEPT AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

DR'N KMD
CHKD MCR
TRCD

MODEL NAME PH00521 | MDL CREATED 10/16/13 | SHEET 2/2 | D

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

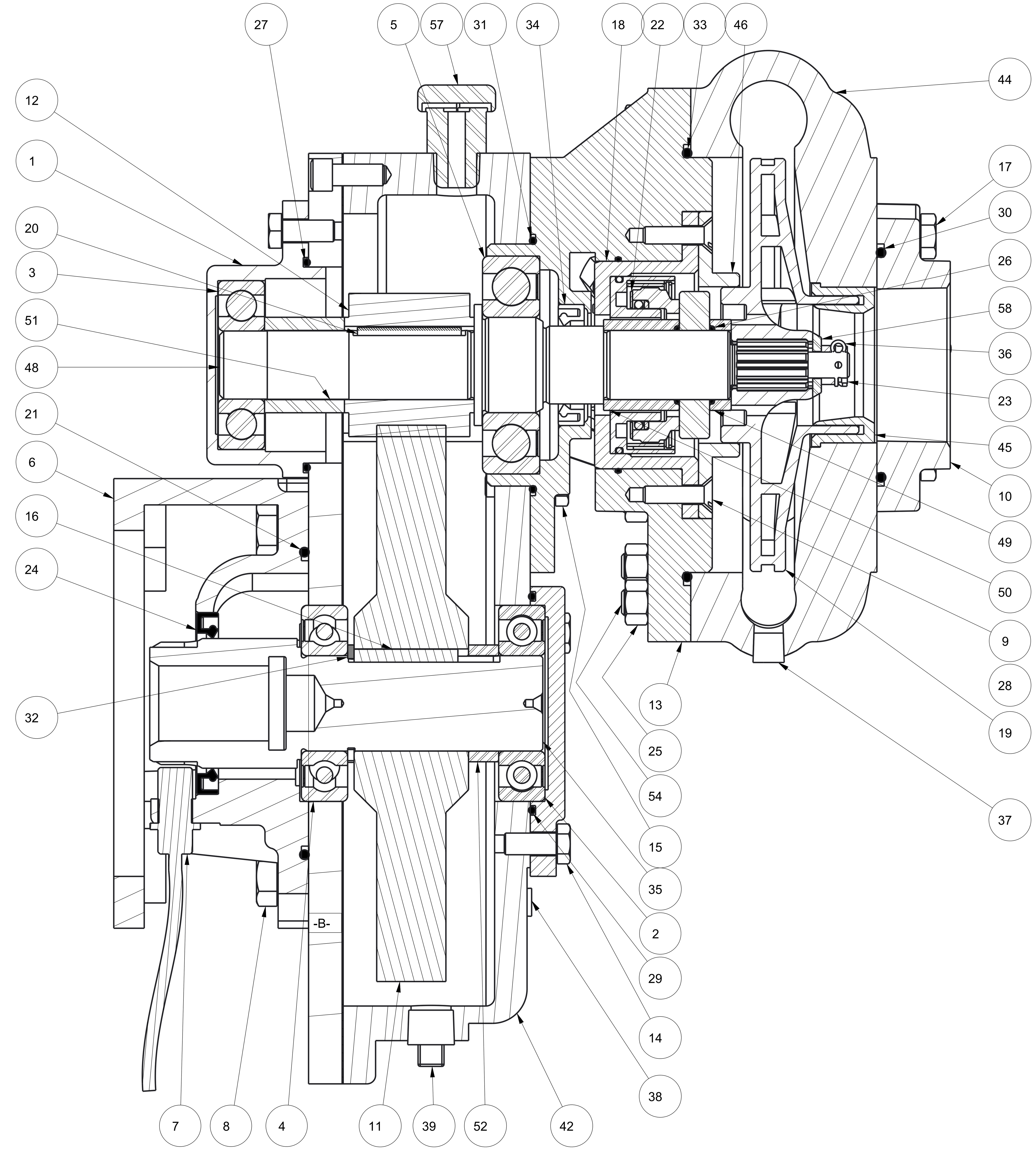
DWG - HH100, MECH SEAL, 2" BSP
CROSS SECTION, 8AB MECH, 1410

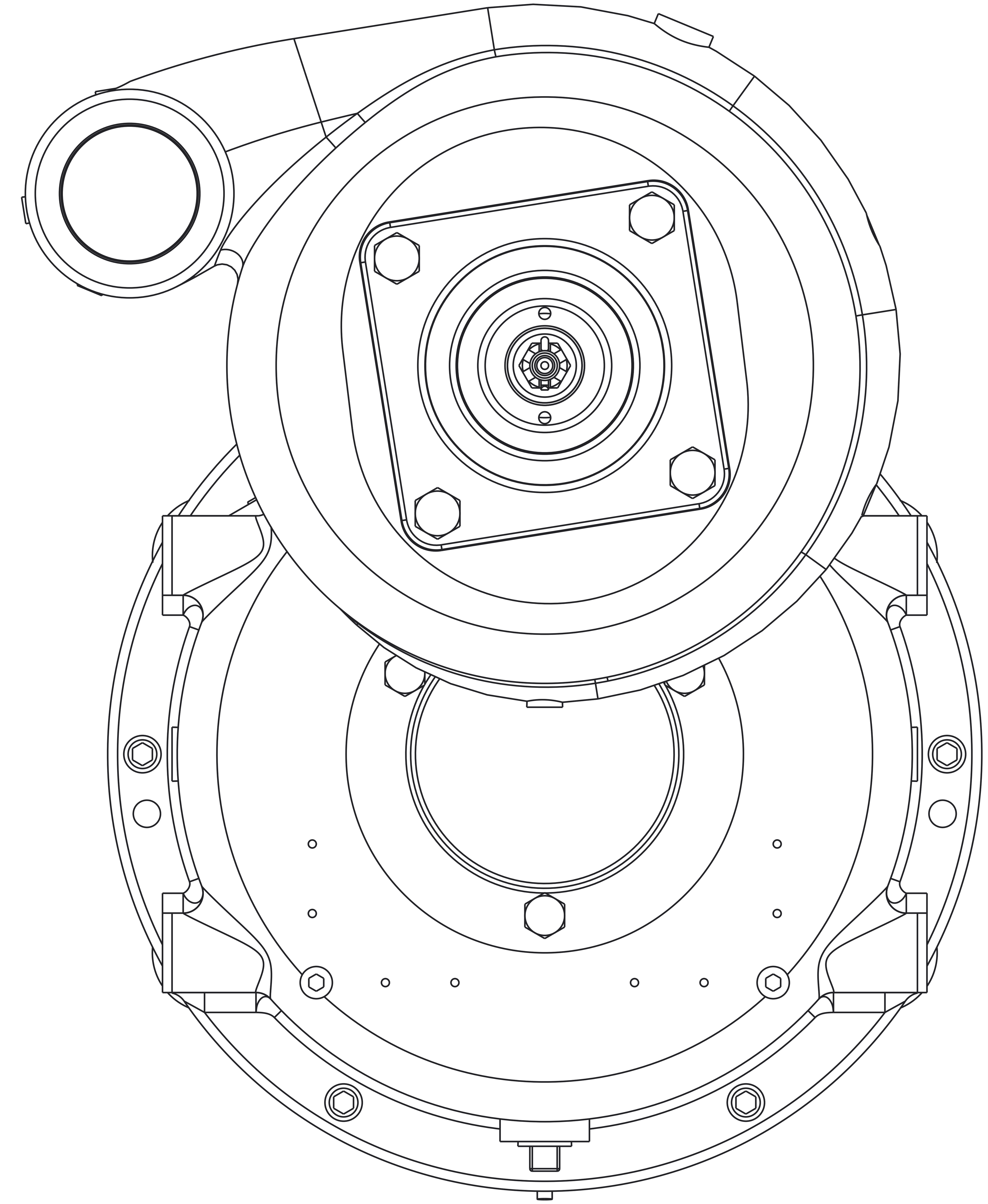
DATE 05-Jun-09
SCALE 3/8

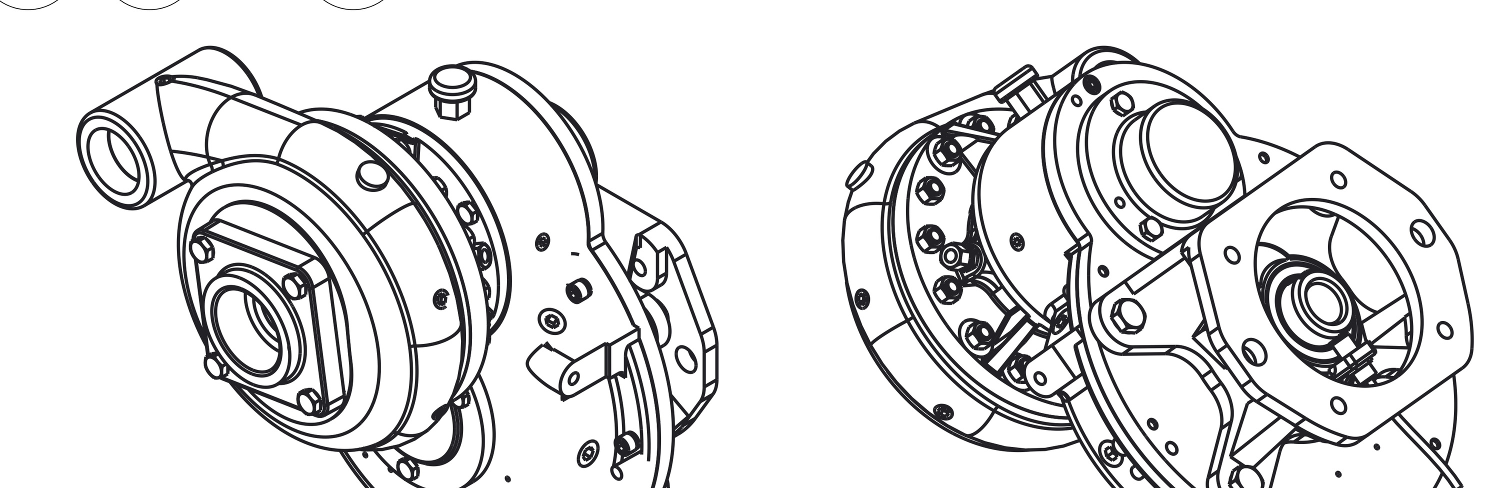
DHC1520

NO.	DESCRIPTION	PART NO.	QTY.
1	BEARING CAP	2300601	1
2	BEARING CAP	2301008	1
3	BEARING-BALL	1721702	1
4	BEARING-BALL, 207SF	1720103	2
5	BEARING-BALL, 307SF	1721903	1
6	BRACKET - HYD MOTOR, JMP/JMH	4013101	1
7	ENCODER - TACHOMETER	4220200	1
8	HHCS - .500-13 x 1.50, GR5	5400067	4
9	FHMS - .250-20 x 1.00, BR	5402405	4
10	FLANGE - 2 BSP, O-RING, CDI	1920414	1
11	GEAR - DRIVE, H100, 12 DP	2713203	1
12	GEAR - PINION, 19T, RH	2713404	1
13	HEAD - INBOARD, H100	2805603	1
14	HHCS - .313-18 x 0.75, GR5	5400018	6
15	HHCS - .313-18 x 1.00, GR5	5400020	4
16	KEY - SQ., 0.19 x 1.50, GR2	3602428	1
17	HHCS - .375-16 x 1.00, GR5	5400036	4
18	HOUSING - MECHANICAL SEAL, H100	1846101	1
19	IMPELLER - H100, MECH SEAL	2908004	1
20	KEY - SQ., 0.12 X 1.50 GR2	3602423	1
21	O-RING - 4.25 x 4.50 X 0.12	3601239	1
22	MECHANICAL SEAL - 1.00" KSPAH	1846100	1
23	NUT - CASTLE, .375-24, 303	5403431	1
24	OIL SEAL - 1.875 ID X 2.627 OD	3600530	1
25	NUT - HEX, .375-16, GR2	5403002	16
26	O-RING - 1.00 x 1.12 x 0.06	3601016	2
27	O-RING - 2.88 x 3.06 X 0.09	3601126	1
28	O-RING - 3.00 x 3.12 x 0.06	3601011	1
29	O-RING - 3.00 x 3.19 X 0.09	3601125	1
30	O-RING - 3.12 x 3.38 x 0.12	3601200	1
31	O-RING - 3.50 x 3.69 X 0.09	3601124	1
32	RING - RETAINER, 5160-137	3600421	1
33	O-RING - 6.00 x 6.25 x 0.12	3601226	1
34	OIL SEAL - 1.125 ID X 1.750 OD	3600559	1
35	SHAFT - DRIVE, HH100	5005301	1
36	PIN - COTTER, .094 x 1.00, SST	3605202_B	1
37	PLUG - PIPE 1/4 BSP	1080554	5
38	PLUG - PIPE, 0.125, ZN SOC HD	1080537	4
39	PLUG - PIPE, 0.375, MAG SQ HD	1080536	1
40	PLUG - PIPE, 0.375, ZN SOC HD	1080541	4
41	PLUG - PIPE. 1/8 BSP	1080555	2
42	TRANS - GEARCASE ASSY, J	TG00300	1
44	PUMP CASING H100	2054908	1
45	SEAL RING - HH100	3406001	1
46	SEAL RING - KSPAH	3407401	1
48	SHAFT - IMPELLER, H100	5016906	1
49	SLEEVE - KSPAH, EXTERNAL	1886801	1
50	SLEEVE - KSPAH, INTERNAL	1886800	1
51	SPACER - 1.00 X 1.38 X 1.15	3306200	1
52	SPACER - 1.38 x 1.69 x 0.44	3301704	1
54	STUD - 0.375-16 X 1.500, GR5	3606203	16
56	TUBE FITTING - STR, .31 x .25	3500010	1
57	VENT - GEARCASE	4401800	1
58	WASHER - 0.39 X 0.94 X .12 303	3603303	1

NOTE:
1) O-RINGS (26) ARE SUPPLIED WITH MECHANICAL SEAL







SCALE 1/4

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D

REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO.

MATERIAL DESCRIPTION:
-

MATERIAL NO.

PATTERN NO.

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

TOLERANCE
EXCEPT
AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

DR'N KMD
CHKD MCR
TRCD

MODEL NAME PH00522
MDL CREATED 10/16/13
SHEET 1/2
D

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

DWG - HH100, 8AB MECH SEAL, BSP 'C' FLANGE ADAPT. CROSS SECTION

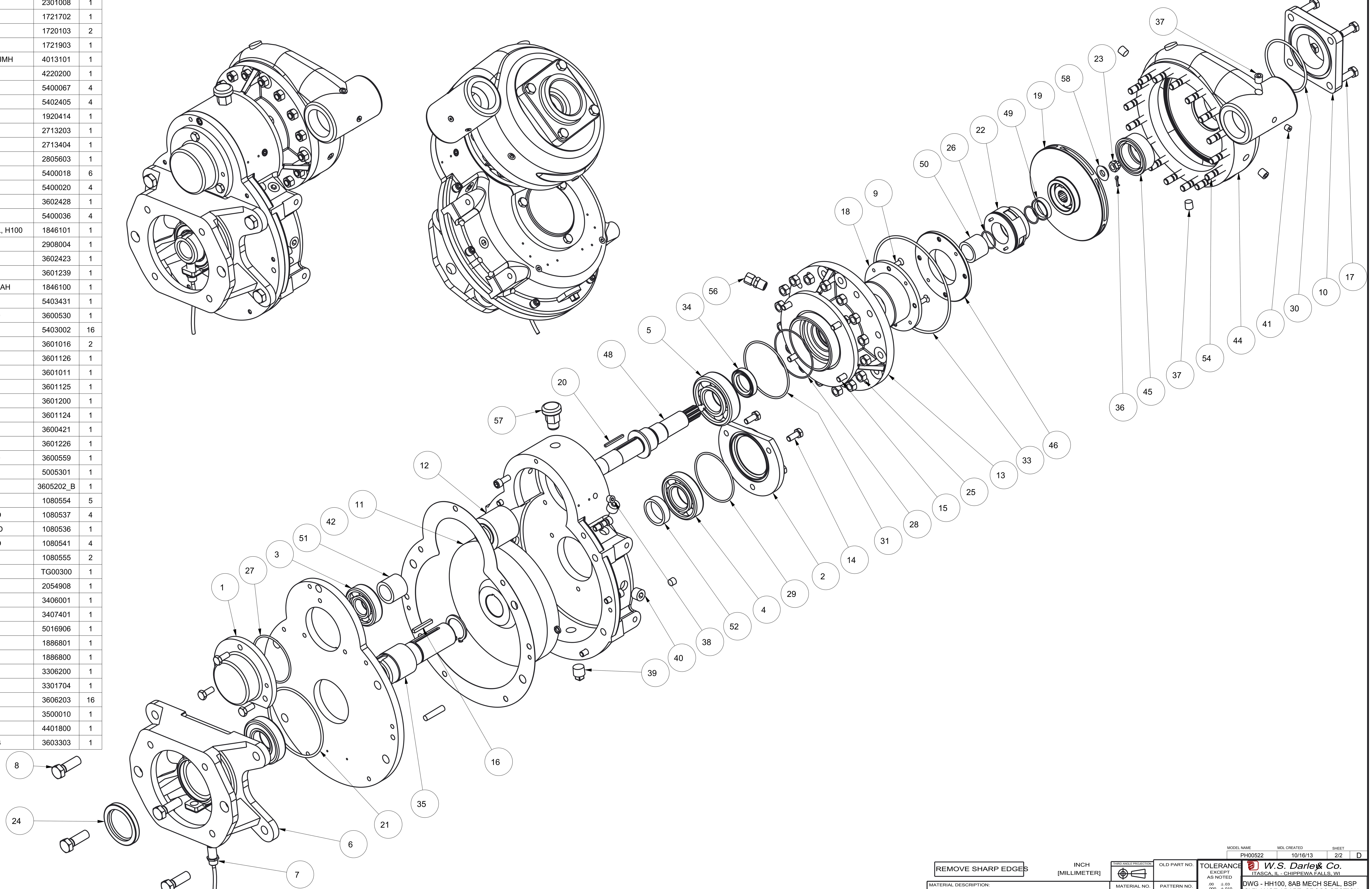
DATE 02-Jun-09
SCALE 1/1

DHC1521

NO.	DESCRIPTION	PART NO.	QTY.
1	BEARING CAP	2300601	1
2	BEARING CAP	2301008	1
3	BEARING-BALL	1721702	1
4	BEARING-BALL, 207SF	1720103	2
5	BEARING-BALL, 307SF	1721903	1
6	BRACKET - HYD MOTOR, JMP/JMH	4013101	1
7	ENCODER - TACHOMETER	4220200	1
8	HHCS - .500-13 x 1.50, GR5	5400067	4
9	FHMS - .250-20 x 1.00, BR	5402405	4
10	FLANGE - 2 BSP, O-RING, CDI	1920414	1
11	GEAR - DRIVE, H100, 12 DP	2713203	1
12	GEAR - PINION, 19T, RH	2713404	1
13	HEAD - INBOARD, H100	2805603	1
14	HHCS - .313-18 x 0.75, GR5	5400018	6
15	HHCS - .313-18 x 1.00, GR5	5400020	4
16	KEY - SQ., 0.19 x 1.50, GR2	3602428	1
17	HHCS - .375-16 x 1.00, GR5	5400036	4
18	HOUSING - MECHANICAL SEAL, H100	1846101	1
19	IMPELLER - H100, MECH SEAL	2908004	1
20	KEY - SQ., 0.12 X 1.50 GR2	3602423	1
21	O-RING - 4.25 x 4.50 X 0.12	3601239	1
22	MECHANICAL SEAL - 1.00" KSPAH	1846100	1
23	NUT - CASTLE, .375-24, 303	5403431	1
24	OIL SEAL - 1.875 ID X 2.627 OD	3600530	1
25	NUT - HEX, .375-16, GR2	5403002	16
26	O-RING - 1.00 x 1.12 x 0.06	3601016	2
27	O-RING - 2.88 x 3.06 X 0.09	3601126	1
28	O-RING - 3.00 x 3.12 x 0.06	3601011	1
29	O-RING - 3.00 x 3.19 X 0.09	3601125	1
30	O-RING - 3.12 x 3.38 x 0.12	3601200	1
31	O-RING - 3.50 x 3.69 X 0.09	3601124	1
32	RING - RETAINER, 5160-137	3600421	1
33	O-RING - 6.00 x 6.25 x 0.12	3601226	1
34	OIL SEAL - 1.125 ID X 1.750 OD	3600559	1
35	SHAFT - DRIVE, HH100	5005301	1
36	PIN - COTTER, .094 x 1.00, SST	3605202_B	1
37	PLUG - PIPE 1/4 BSP	1080554	5
38	PLUG - PIPE, 0.125, ZN SOC HD	1080537	4
39	PLUG - PIPE, 0.375, MAG SQ HD	1080536	1
40	PLUG - PIPE, 0.375, ZN SOC HD	1080541	4
41	PLUG - PIPE. 1/8 BSP	1080555	2
42	TRANS - GEARCASE ASSY, J	TG00300	1
44	PUMP CASING H100	2054908	1
45	SEAL RING - HH100	3406001	1
46	SEAL RING - KSPAH	3407401	1
48	SHAFT - IMPELLER, H100	5016906	1
49	SLEEVE - KSPAH, EXTERNAL	1886801	1
50	SLEEVE - KSPAH, INTERNAL	1886800	1
51	SPACER - 1.00 X 1.38 X 1.15	3306200	1
52	SPACER - 1.38 x 1.69 x 0.44	3301704	1
54	STUD - 0.375-16 X 1.500, GR5	3606203	16
56	TUBE FITTING - STR, .31 x .25	3500010	1
57	VENT - GEARCASE	4401800	1
58	WASHER - 0.39 X 0.94 X .12 303	3603303	1

NOTE:
1) O-RINGS (26) ARE SUPPLIED WITH MECHANICAL SEAL

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D



REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

MATERIAL DESCRIPTION:
-

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

OLD PART NO.

MATERIAL NO. | PATTERN NO.

DO NOT SCALE PRINT

TOLERANCE
EXCEPT AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

DR'N KMD
CHKD MCR
TRCD

MODEL NAME: PH00522 | MDL CREATED: 10/16/13 | SHEET: 2/2 | D

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

DWG - HH100, 8AB MECH SEAL, BSP
'C' FLANGE ADAPT. CROSS SECTION

DATE 05-Jun-09
SCALE 3/8

DHC1521

Mechanical Shaft Seal

This pump assembly incorporates high quality mechanical shaft seal(s) separating the pump housing components from atmosphere. Depending on the pump design, there may be one or two seals on each impeller shaft.

The seal size, design type, component materials, and housing configuration have been specifically designed for this pump application and rated operating parameters.

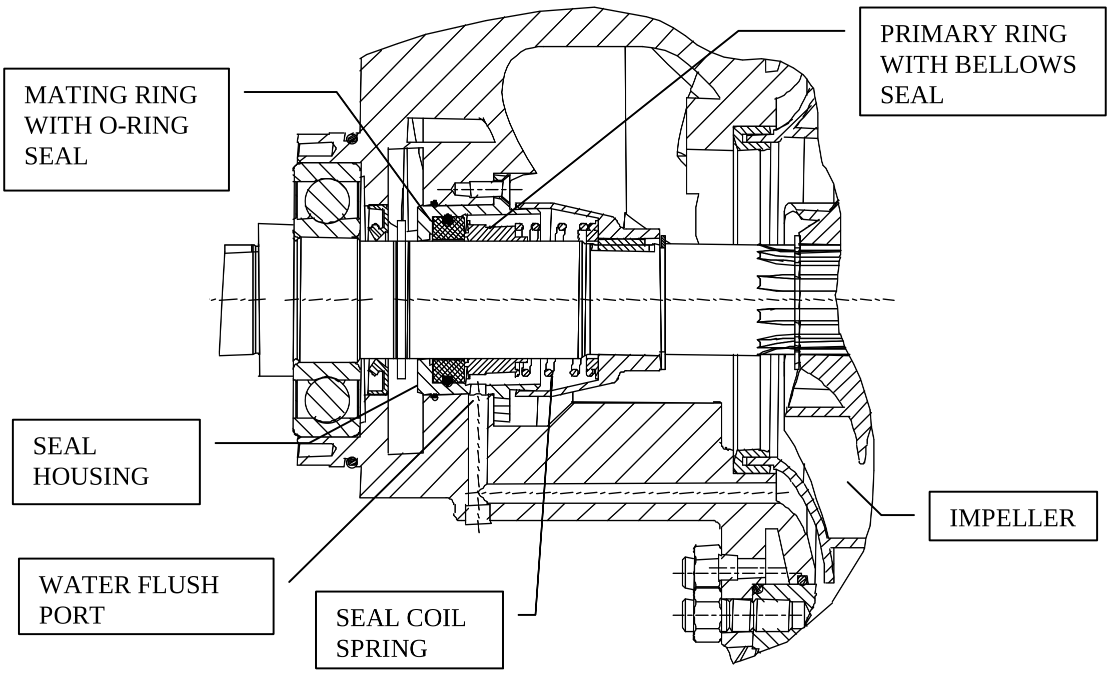
Mechanical Seal Basics

A mechanical seal is a device that houses two highly polished components (known as faces). One face rotates, the other is stationary. A secondary elastomer bellows seals the primary ring to the shaft. An o-ring or cup seal seals the mating ring in the housing. The polished seal faces of the primary and mating rings are pressed together by a spring mechanism to provide adequate force to affect a seal. The force acting between the seal faces increases in direct proportion to product pressure.

The elastomer bellows seal utilized in this pump has the following design features:

- Mechanical drive of the primary seal ring. The drive band's notch design eliminates overstressing the elastomer sealing bellows.
- Bellows design provides automatic compensation for shaft endplay, run out, and primary ring wear.
- Seal face contact pressure is controlled by a single, non-clogging coil spring. This coil spring has been custom welded per Darley specifications to eliminate high-speed spring distortion.

The seal housing is designed and ported to provide optimal water flow and pressure assuring proper cooling and flushing of the seal components.



Operation and Maintenance

When operated within rated operating conditions of this pump, these seals will provide trouble free service for extended periods.

Properly selected and applied mechanical shaft seals are leak free and require no adjustment. Should the seal area develop a leak, investigate the cause as soon as possible. Seal failure, leakage, may be the result of; worn seal faces, leaking bellows, or damaged o-rings. These failures may be attributed to bearing failure, impeller blockage, impeller imbalance, seal housing contamination, operating beyond pump design rating, or dry running,

Mechanical shaft seal design relies on the sealed media, in this case, water, to cool and lubricate the sealing surfaces. Therefore, extended dry operation may cause overheating and scoring or damage to the sealing surfaces, resulting in excessive leakage or a much shortened seal life.

To maximize seal life, minimize operation at pump pressures higher than pump rating. While operating at pressures beyond rating will not immediately damage the seal, it will increase sealing surface wear rate.

CAUTION: **DO NOT RUN THE PUMP DRY EXCEPT MOMENTARILY AND AT LOW SPEEDS**

CAUTION: **DO NOT USE THIS PUMP FOR HOSE TESTING**

CAUTION: **THE MECHANICAL SEAL SHOULD NOT BE RUN DRY, WHILE THE PUMP IS NOT ENTRAINED WITH WATER, FOR A PERIOD LONGER THAN 2 MINUTES. FAILURE TO FOLLOW THIS RECOMMENDATION WILL LEAD TO PREMATURE WEAR AND FAILURE OF YOUR MECHANICAL SHAFT SEAL.**

DARLEY

INSTALLATION OF MECHANICAL FACE SEAL WITH O'RING

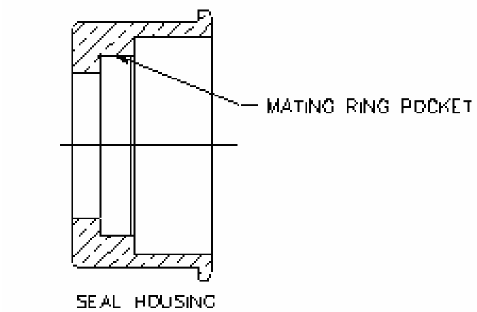
SPECIAL HANDLING

Study the engineering layout before installing the seal. This shaft seal is a precision product and should be handled and treated with care. Take special care to prevent scratches on the lapped faces of the primary and mating ring. Provide a very clean work area where the assembly will take place. Clean hands prior to assembly.

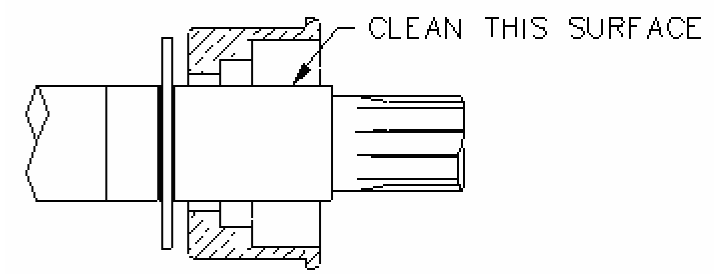
INSTRUCTION STEPS:

Instructions for Installing a Mechanical Shaft Seal

1. Inspect mating ring pocket in seal housing ensuring it is clean, free of chips, and nick free, to provide a proper sealing surface. Isopropyl alcohol may be used to clean the surfaces if required.

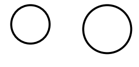


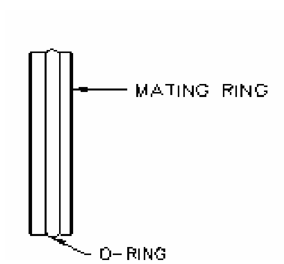
2. Inspect the pump shaft surface under the bellows, ensuring it is clean and nick free to provide a proper sealing surface. Isopropyl alcohol may be used to clean surface if required.

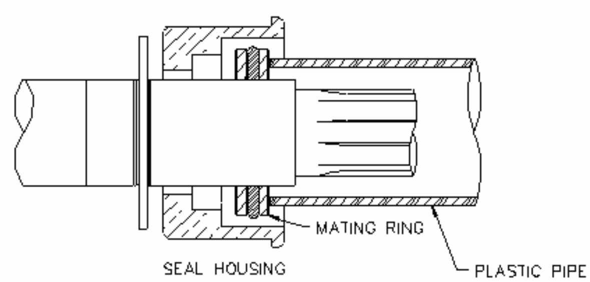


3. Lightly lubricate the o-ring on the mating ring with a single drop of P-80 water soluble rubber lubricant (do not over lubricate) and push it into the cavity using the recommended installation tool or other suitable plastic tube free of contaminants, firmly seating the mating ring square.
   Note: The polished face of the mating ring must face out – away from the pump's gear case. Try to not touch the polished sealing face with your fingers; the oils from your fingerprint can cause the seal to leak. Remove any P-80 from the sealing face after installation.

The approximate size of a drop should be between the sizes of these two circles.





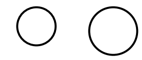


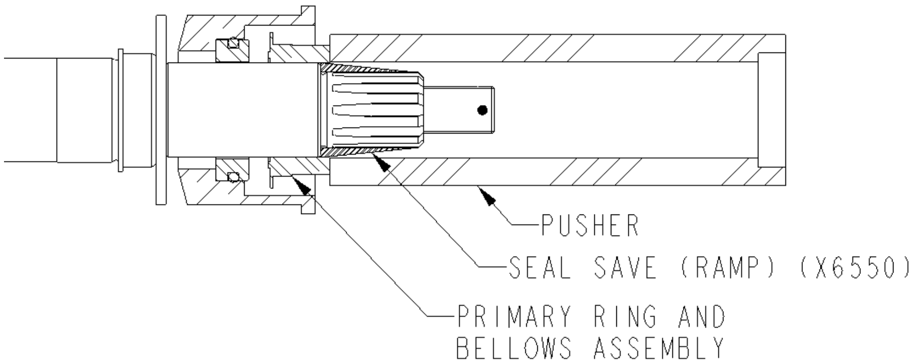
4. Clean the mating ring surface with isopropyl alcohol to remove any fingerprints and any other contaminants left on mating ring.

Note: Steps 5 – 9 need to all be completed with in 15 minutes <u>or less</u>.

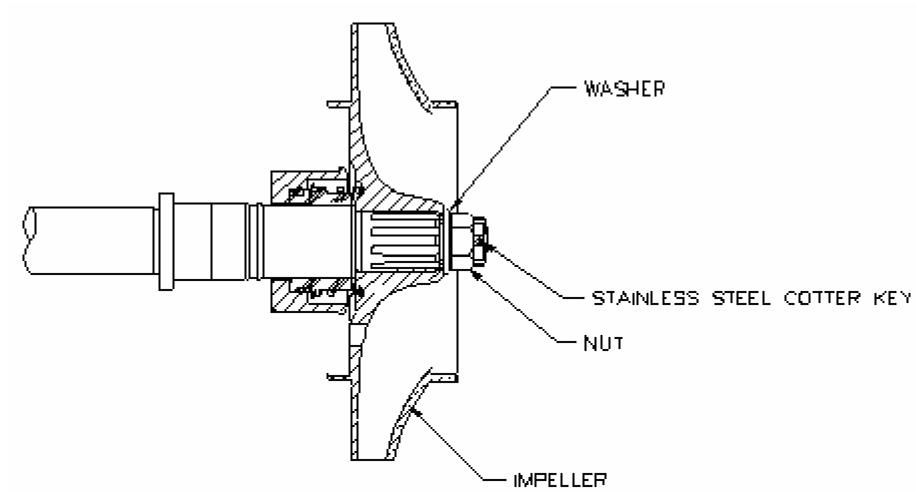
5. Apply a small drop of P-80 rubber lubricant or water-soluble lubricant (not soapy water) to the inside diameter of the bellows assembly allowing it to be pushed easily into position.
6. Clean the polished sealing face of the primary ring with a clean lint free rag with isopropyl alcohol to remove all fingerprints and other contaminants.
7. Slide a seal save, similar to X6550, over the shaft splines to ensure that the seal is not damaged during installation. Place the primary ring and lubricated bellows assembly (without the spring) on the shaft, using a proper pusher - push the assembly into position so that the seal surfaces are in contact. Remove the seal save from the shaft.

The approximate size of a drop should be between the sizes of these two circles.





8. Put the spring in place, seated tight against the spring retainer on the primary ring.
   Note: Some springs may be slightly tapered, so one end fits the seal better than the other. The end of the spring that best fits the seal should go towards the seal to ensure even spring pressure all the way around.
9. Slide impeller onto impeller shaft, engage the spring into the groove of the impeller hub and install impeller washer, impeller nut, and stainless steel cotter key.



*** Reference pump configuration for individual mechanical seal instructions.*
*** Reference pump assembly drawings and pump assembly tips for further assembly.*

Note: If the seal leaks slightly after assembly, it may be necessary to run the pump for approximately 30 minutes at 50-60 psi to rinse out excess lubricant and other contaminants.
Once a mechanical seal has been installed, it is recommended that it not be reused.

If further information is needed, call **DARLEY** in
Chippewa Falls, WI. at 800-634-7812 or 715-726-2650

WARNING: DO NOT USE THIS PUMP FOR HOSE TESTING

OPERATING THE ENGINE

After the pump has been primed, the engine speed should be increased gradually -- never jerk throttle wide open. Likewise, the engine speed should be decreased gradually when shutting down.

Watch the pump pressure gage and open throttle only enough to give the desired pressure. The pressure may rise high enough to burst the discharge hose, when using small nozzles, if the engine is given full throttle (except pumps equipped with pressure regulators set for desired pressure).

Never run engine at high speeds except when pump is primed and ready to discharge water.

COOLING THE ENGINE

NFPA 1901 requires that a supplementary heat exchanger cooling system be provided. On most models, this heat exchanger is an integral part of the pump, and the installation of two hoses from the engine cooling system to the pump is all that is required.

On some models an external heat exchanger must be used. In that case two hoses from the engine cooling system and two lines from the pump will run to the heat exchanger.

The cooling line should not be opened until pressure develops in the pump, and pump should never be operated under heavy loads prolonged without an adequate supply of cooling water flowing.

Coolant temperatures should never be allowed to exceed 200^{o} F while pumping and 180^{o} F is usually taken as a safe operating temperature.

Always shut off cooling line when through pumping.

SUCTION STRAINERS

A large suction strainer, which will prevent the passage of a body larger than the pump impeller ports, must always be used on the free end of the suction line when pumping from draft.

The small hydrant strainer must always be inserted in the suction manifold of pump, when pumping from hydrants and at all other times except when maximum capacity is required from draft.

Failure to use a strainer at all times when pumping will cause serious trouble by clogging the pump because, even in water mains, foreign matter is invariably present, and will be drawn into pump by the high velocity of the water entering.

SUCTION LINE

The suction line of a fire pump can be the source of more operating difficulties than all the rest of the pump when working with a suction lift. Faults in the suction line which cause trouble in operation are as follows:

AIR LEAKS -- A small amount of air, expanding in the vacuum of the suction line, displaces a considerable volume of water which subtracts from the capacity that the pump is able to deliver, makes the priming difficult or causes pump to lose its prime. Therefore, it is absolutely essential to keep the suction line and the suction side of pump casing air tight at all time when drafting water.

Air leakage into pump while operating is usually indicated by a rattling sound in pump casing, miniature explosions in stream issuing from the nozzle, or by losing of prime when operating at very low capacities.

The usual cause of leaky suction lines is carelessness in handling of suction hose. Bruising of hose threads by bumping against hard surfaces or sand in the coupling often prevents tightening of the joints up against the gaskets. The hose gaskets are often defective and are sometimes lost without being noticed by the operator.

INSUFFICIENT SUBMERGENCE -- The free end of suction hose must be submerged to a sufficient depth to prevent the entrance of air that may be sucked down from the surface of the water to a considerable depth when operating at large capacities.

Entrance of air into suction lines in this manner is indicated by a small whirlpool, or vortex, on the surface of the water over the end of the hose.

A minimum submergence of 4 times the hose diameter to the upper holes in suction strainer is recommended where full capacity of pump is required. Where sufficient submergence is not possible, a board or sheet of metal laid over end of suction line will keep air from entering.

SUCTION LINE ENTRANCE TOO CLOSE TO BOTTOM -- If the end of suction line is laid on the bottom of the source of supply, a part of the suction opening will be shut off; and if the bottom is soft the hose will suck itself down into the earth, closing more of the opening and loosening sand and mud to be carried into the pump.

The suction entrance should be suspended a foot or more above the bottom, or if this is not possible, it should be laid on a board or piece of sheet metal. A rope tied to the suction strainer is a convenient means of holding it off the bottom.

OBSTRUCTION OF SUCTION STRAINER BY FOREIGN MATTER -- The high velocity of water entering the suction line will carry loose foreign bodies in against the strainer from a considerable distance. Therefore, all weeds and refuse should be removed from close proximity of the suction entrance.

SUCTION LINE TOO SMALL OR TOO LONG -- The flow of water into the pump is opposed by the frictional resistance in the suction line. This friction loss must be added to the height of the pump above the water (static lift) to determine the “total lift” of the pump. When all of the vacuum in the pump (atmospheric pressure) is consumed in raising water through this total life, then the limit of capacity has been reached. This capacity can be increased only by decreasing total lift. If the static lift cannot be reduced, then the friction loss must be reduced by using a shorter or larger suction hose.

The rated capacity of the pump is guaranteed for a static lift of 10 feet, with 20 feet of recommended suction hose at sea level. To increase the capacity without reducing the static lift, or to increase lift without sacrificing capacity, requires larger suction hose.

An excessively long suction line is a handicap to any pump, for besides reducing capacity through the added friction lose, it retards priming and it produces a detrimental effect known as “cavitation”. This means a separation of the water column in the pump suction, or void spaces, produced by the inertia of the heavy mass of water in the line resisting sudden change in the velocity when the pump starts to deliver or when discharge valves are opened or closed. This phenomenon reduces capacity further, and usually sets up a vibratory motion and “water hammer” as the water surges in and out of the void spaces.

When operating with a long suction line, the driving engine should be accelerated gradually, the discharge gates opened gradually, and the capacities of the pump should be held down to within the range of smooth performance.

AIR TRAP IN SUCTION LINE -- If the suction line is laid so that part of it is higher than any other part that is nearer to the pump, as when hose is laid over a high bridge rail, an air trap is formed at the highest part of the hose from which the air cannot be sucked out by the primer. This trapped air is expanded and carried into the pump with the first rush of water causing the pump to immediately lose its prime.

If suction line cannot be laid so that it slopes all the way from pump to water, it can still be primed easily by simply allowing the primer to continue to function until all the trapped air in the hose has been carried into the pump and picked up by the primer.

TESTING FOR AIR LEAKS

Tests for leakage should be made with the suction hose attached and capped, discharge gate open, and all other openings closed tightly.

Run electric priming pump with primer shut-off valve open, until maximum vacuum is shown on the gage. The vacuum should hold for several minutes before satisfactory performance of pump can be expected.

If excessive leakage of air occurs, the source of leaks can be located by shutting off primer motor, with vacuum at its highest point, and listening for the hiss of air.

In the absence of a vacuum gage, the vacuum in pump may be judged by closing suction opening with the flat of hand or a rubber pad.

Water or air pressure may be applied to pump casing to test for air leakage if more convenient. DO NOT pressurize with air beyond 10 PSI

SOURCE OF WATER SUPPLY

Water may be drafted from a pond, lake, stream, cistern, stock tank, or well; but whatever the source, the static lift must not exceed 20 feet from the center of the pump to the surface of the water and a lift not exceeding 10 feet is recommended. The source of supply should be reasonably clear and free from foreign matter. It is recommended that all water holes, which may be needed for fire protection, be deepened if necessary and kept free from weeds and refuse. In many fire protection areas, cisterns or reservoirs are built and allowed to fill up with rain water to be used in emergencies.

PUMPING IN COLD WEATHER

The first insurance against cold weather trouble is to keep fire apparatus stored in heated quarters. All water must be eliminated from pump casing and primer line between periods of operations.

When setting up for pumping, unnecessary delays should be avoided by having thoroughly trained pump operators. Be sure that primer and booster lines are kept closed until ready for use. Having discharge lines ready so that pump may be started as soon as it have become primed. Do not stop flow of water through the pump until ready to drain and return to the station.

Engine Coolant from the engine circulated through the heater jacket in pump casing prevents all ordinary freezing troubles.

WHEN FINISHED PUMPING

Drain water out of pump casing immediately. (Drain valve is located at lowest point in pump casing, and accessible from underneath chassis.)

Don’t forget to close all drain cocks after all water has been drained out. Trouble in priming will follow on the next run if this is forgotten.

Shut off cooling line to make pump ready for priming again.

If pump transmission is equipped with a transmission cooler it must be drained also. If the master drain is located below the cooler outlets it can be connected to the master drain, if not, two separate drains must be connected to the transmission cooler. **Failure to drain transmission cooler will result in water in the gearcase if water in the cooling coil freezes.**

If pump is equipped with an external heat exchanger, drain heat exchanger using gravity and vacuum drain on all trucks as follows: Close all open lines and drain cocks. Open cooler valve and open air vent at top or drain cock at bottom of heat exchanger depending on model. With the pump air-tight open primer with engine running for about a minute and then close primer. Drain pump of water which was deposited when heat exchanger and lines were being drained.

Pump not often used for fire service should be inspected and run periodically to ensure that they will be in readiness for an emergency.

PUMPING SALT WATER

The pump should be flushed out with fresh water immediately after pumping salt water to prevent excessive rusting. (Except pumps which are built of special material to resist the corrosive action of the brine.)

When measuring sea water with a Pitot Gage, capacities shown in Table No. 2 should be discounted approximately 1 1/2% to determine the correct capacity.

A centrifugal pump will show 2 1/2% higher pressure and require 2 1/2% more power when handling sea water than when handling fresh water if operated at the same speed and capacity.

TESTING OF EQUIPMENT FOR PRACTICE

It frequently happens that operators of fire apparatus, who are not thoroughly familiar with its operations, become confused under the stress of emergency and neglect some little detail that may cause trouble or delay in getting the equipment into operation. Therefore, we urge that practice tests be conducted repeatedly until operators are thoroughly trained. More than one person in the department should be a competent operator.

Practice should include pumping from low lifts, high lifts with short and long suction lines, with suction line elevated to form an air trap, and from hydrants, at large and small capacities.

It is well, also, to note the effects of air leaks in hose, insufficient submergence and restriction of suction line. (Suction line can be restricted by placing a can or other strong closure around the suction strainer).

NEVER BREAK OR RESTRICT SUCTION OR ALLOW AIR TO ENTER SUCTION LINE WHILE ENGINE IS OPERATING WITH THROTTLE OPEN. This will release the load and allow engine to run away.

Do not allow personnel to hold a large nozzle while working at high pressures for serious accidents may result if hose breaks loose.

MEASURING PUMP PERFORMANCE

Pump performance is measured by the quantity of water it can deliver per minute against a certain pressure called “Total Head” or “Net Pump Pressure”, as it is usually termed in fire pump testing.

The net pump pressure is the sum of the pump discharge pressure, as shown on the pressure gage with which the pump is regularly equipped, and the total suction lift converted to equivalent pounds per square inch. If pump is operating from a hydrant, the net pump pressure is the discharge pressure less the incoming pressure from hydrant measured at the suction entrance of pump.

Capacity of fire pump is measured in gallons per minute. The usual method of measurement is to determine the pressure of the jet of water leaving a given size of nozzle by means of a “Pitot Gage” from which the capacity is computed mathematically.

A Pitot Gage consists of a small tube adapted to a point directly into the hose nozzle from the center of the issuing stream, the other end of the tube being connected to an accurate pressure gage.

The nozzle jet drives straight into the Pitot tube and converts the velocity of the jet to pressure which is an accurate measure of velocity of the water as it leaves the nozzle. The tip of the Pitot tube should be one-half the diameter of the nozzle away from nozzle tip while taking reading. Table No. 2 gives nozzle capacities for various Pitot Gage readings.

If a Pitot gage is not available approximate pump capacities can be determined by reference to Table No.3

ACCEPTANCE TESTS

Acceptance tests require continuous tests of three hours duration: 2 hours at 100% rated capacity and 150 PSI net pump pressure; one-half hour at 70% capacity and 200 PSI; one-half hour at 50% capacity and 250 PSI; and a spurt test at 100% capacity and 165 PSI.

Table No. 1 shows recommended set-ups and gage readings for rating tests.

To adjust nozzle pressure for the correct capacity, while maintaining the correct pump pressure, it is necessary to make simultaneous adjustments of engine throttle and the discharge gate valve, partially closing the latter until just the right discharge resistance is built up.

ENGINES

An Underwriter fire pump imposes heavy loads on the engine that drives it, often absorbing all of the power the engine is capable of delivering at full throttle. Continuous pumping gives the engine no time to rest. Therefore, a new engine and pump unit must be thoroughly broken-in before it is required to deliver prolonged maximum pump performance.

We recommend a minimum break in period of 20 hours at light pumping loads, with occasional spurt tests and interruptions. Temperature and lubrication should be checked during this period.

Engine manufacturers' power ratings usually show maximum performance of a selected, factory adjusted engine, operating without fan, generator, muffler or other accessories, and corrected for "ideal" conditions, i.e. sea level barometer (29.92" of mercury) 60^{o}F and high humidity. Therefore, the actual power delivered by an average truck mounted engine is considerably lower than the manufacturers' rating, and allowances must be made in predicting pump performance.

EFFECTS OF ATMOSPHERIC CONDITIONS ON ENGINE AND PUMP PERFORMANCE

Each one inch of drop in Barometric pressure or each 1000 feet of elevation of the pumping site reduces engine power approximately 3 1/2% for engines not equipped with a turbo charger.

Each 12^{o} rise in temperature above 60^{o} F of carburetor intake air reduces engine power approximately 1%.

Lowering of humidity reduces power slightly.

Each one inch drop in Barometric pressure or each 1000 feet of elevation reduces the maximum possible static lift of a pump approximately one foot.

Temperature of the water supply affects the attainable suction lift of a pump. The effect is slight at low water temperatures but becomes increasingly detrimental as the temperature rises.

A 10^{o} rise from 70^{o}F will subtract about 1/2 foot from the maximum attainable suction lift, while an equal rise from 100^{o}F will reduce the lift at least 1 1/2 feet.

Temperature is an important consideration when pumping from a test pit where the water is heated by recirculation.

IF FURTHER INFORMATION IS NEEDED, CALL W.S. DARLEY & CO. AT CHIPPEWA FALLS, WI. AT 800-634-7812 or 715-726-2650

DEFINITIONS

HEAD OF WATER -- vertical depth of water measured in feet or in pressure per unit or area. In hydraulics, head always represents pressure and it is expressed interchangeably in feet of water or pounds per square inch and sometimes in inches of depth of mercury.

STATIC HEAD -- the pressure that is exerted by a stationary column of water of a given height or depth.

TOTAL HEAD OR TOTAL DYNAMIC HEAD -- the maximum height above the source of supply to which the pump would elevate the water plus all the resistance to flow in the pipe or hose line.

DISCHARGE HEAD -- the pressure measured at the discharge outlet of a pump.

SUCTION HEAD -- the positive pressure measured at the suction entrance of a pump (when pumping from an elevated tank or hydrant).

VELOCITY HEAD -- the equivalent pressure represented by fluid in motion as measured by means of a Pitot Gage.

STATIC LIFT -- the vertical height of the center of the pump above the source of supply (when pump from draft).

TOTAL SUCTION LIFT -- the static lift plus the friction in suction line plus entrance losses.

NET PUMP PRESSURE -- the total dynamic head of the pump.

EFFECTIVE NOZZLE PRESSURE -- the pump discharge pressure minus hose friction plus or minus the difference in elevation above or below pump.

WATER HORSEPOWER - the theoretical power required to deliver a given quantity of water per minute against a given head.

BRAKE HORSEPOWER -- Actual power as delivered by a motor or engine to a driven machine.

PUMP EFFICIENCY -- The quotient of the water horsepower divided by brake horsepower required to produce it.

WATER HAMMER -- a series of shock waves produced in a pipeline or pump by a sudden change in water velocity. A sudden change in flow velocity can result from rapid closure of valves. A pressure wave is set up which travels back and forth in the water column at extremely high speed producing rapid vibrations that may be violent and destructive if the water column is long.

THE MAXIMUM THEORETICAL LIFT of a pump is 34 feet, which is the pressure of the atmosphere at sea level. The maximum practical total lift at sea level is 20 to 25 feet (depending on the type and condition of the pump) and this decreases with drops in barometric pressure.

OPERATING CHARACTERISTICS OF PUMPS

CENTRIFUGAL PUMPS: A centrifugal pump develops pressure by centrifugal force of the liquid rotating in the impeller wheel. The pressure developed depends upon the peripheral speed of the impeller (increasing as the square of the speed) and it remains fairly constant over a wide range of capacities up to the maximum output of the pump, if speed remains constant.

If the discharge outlet of a centrifugal pump is entirely shut off, with speed kept constant, there is a small rise in pressure, the water churns in the pump casing and the power drops to a low value. If the discharge is opened wide, with little resistance to flow the pressure drops while the capacity and power both increase to their maximum.

A centrifugal pump is an extremely simple mechanism mechanically, but rather complex hydraulically; in that many factors enter into the design of the impeller and water ways which will affect the pump's efficiency.

DISPLACEMENT PUMPS: Rotary and piston pumps are termed "Positive Displacement" pumps because each revolution displaces or discharge (theoretically) an exact amount of liquid, regardless of the resistance. The capacity is, therefore, proportional to the number of revolutions of the pump per minute and independent of the discharge pressure except as it is reduced by "slip" (leakage past the pistons or rotors). For a given speed the power is directly proportional to the head. If the discharge is completely shut off, the pressure, power, and torque climb indefinitely until the drive power is stalled or breakage occurs.

Slip is the greatest factor affecting efficiency of a displacement pump, and this factor is greatly influenced by the condition of and wears on the working parts.

IF FURTHER INFORMATION IS NEEDED, CALL W.S. DARLEY & CO. AT CHIPPEWA FALLS, WI. AT 800-634-7812 or 715-726-2650

CONVERSION FACTORS

One pound per square inch	=	2.31 feet of water
	=	2.04 inches of mercury
	=	27.7 inches of water
One foot of water	=	0.43 pounds per square inch
One inch of mercury	=	1.13 feet of water
	=	0.49 pounds per square inch
One cubic foot of water	=	62.4 pounds
	=	7.5 gallons
One gallon of water	=	231 cubic inches
	=	0.13 cubic feet
	=	8.34 pounds
	=	3.8 liters
One Imperial Gallon	=	1.2 U.S. gallons
Atmospheric Pressure (Sea Level)	=	14.8 pounds per square inch
	=	29.9 inches of mercury
	=	34 feet of water

W.S. DARLEY & CO.

OPERATING INSTRUCTIONS - ELECTRIC PRIMING PUMP

The Darley electric primer will develop up to 25 in. Hg. in an air tight pumping system.

The Primer is activated by a combination spring return on-off valve and electric switch. Pulling the valve out opens the valve and closes the electrical circuit to start the motor.

Before the pump can be primed, booster line valves, drain valves, cooling line valve, and all other openings into the pump must be closed and absolutely air tight. The discharge side of the pump is sealed by a check valve, therefore the main discharge valves need not be closed.

When operating from draft, suction hose connections must be tight and free of air leaks.

Make certain the suction hose strainer is properly submerged and free of foreign material.

The main pump drive should remain disengaged until priming is complete to prevent possible damage to impeller seal rings by running "dry".

Pull the primer shutoff valve all the way out to start priming and hold open until water discharges from primer pump exhaust port. Push valve all the way in to shut off primer motor and seal tight.

CAUTION: FOR PRIMING UP TO 10' OF LIFT:

If water does not discharge from the primer exhaust within about 30 seconds (45 seconds with 2 – 20' lengths of hose) stop the primer pump, check for air leaks and make sure primer pump is receiving lubricant from its reservoir, if one is present. MAX PRIMER OPERATION TIME = 90 seconds every 5 minutes. DO NOT EXCEED 90 SECONDS OF PRIMER OPERATION.

CAUTION: FOR PRIMING 10' OF LIFT AND HIGHER:

If water does not discharge from the primer exhaust within 90 seconds stop the primer pump, check for air leaks and make sure primer pump is receiving lubricant from its reservoir, if one is present. DO NOT EXCEED 90 SECONDS OF PRIMER OPERATION.

CAUTION: **The primer pump and motor will begin to generate heat as soon as operation begins. Extended run times (up to 90 seconds) and repeating priming cycles consecutively or within short time periods may lead to premature failure of the primer pump assembly: such failures include but are not limited to: overheating of the motor, seizure of the rotor, and cracking of primer vanes. To avoid this, after your first priming attempt, thoroughly inspect the pump system for air leaks, check that the primer is**

receiving lubricant from its reservoir if such is present, and resolve the issue before attempting re-prime.

Engage “Pump” shift to start pumping water.

When pumping from hydrants, the primer is not needed and must be kept closed.

It may be necessary to use the primer momentarily when pumping from a booster tank when the suction head is insufficient to force all the air out of the pump.

LUBRICATING SYSTEM - ELECTRIC PRIMING PUMPS WITH FLUID RESERVOIR

The electric motor rotary van primer pump creates a high vacuum by continuous lubrication of rotor and vanes. Therefore the primer lubricant supply tanks (4 quarts) should be kept full at all times. Recommended primer system lubricant is Darley PRIME GREEN. PRIME GREEN is an environmentally safe, non-toxic, biodegradable lubricant. Its use assures proper primer vane lubricant while minimizing environmental effects.

After the main pump is drained, run the primer motor to drain primer lines and re-lubricate the primer pump.

The vent hole on the lubricant tank cap should be kept open at all times to prevent siphoning lubricant from the tank after the pump is stopped. Do not increase the size of the hole.

Locate the lubricant tank where it may be conveniently inspected and filled.

Should water appear in the lubricant supply tank, the primer valve is leaking. Check and replace valve plug seal o-ring if necessary.

ELECTRIC PRIMING PUMPS WITHOUT FLUID RESERVOIR

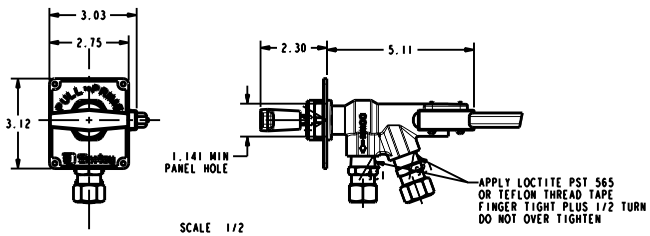
The fluidless electric-motor rotary-vane primer pump creates a high vacuum by using a special material for the vanes and an initial factory applied lubricant film. This film must be present in order for the primer to operate properly and to provide maximum life for the primer components.

This film should not wash away completely if the pump is used to pump clean water. If the priming pump is disassembled for any reason, all internal surfaces of the housing and end caps must be cleaned and coated completely with Dow Corning #111 Silicone valve lubricant prior to operating the primer. If a degradation of performance is noticed, performance may be restored by re-applying the film in this manner. It is recommended to service the primer annually to clean and re-apply the silicone film to the inside of the primer housing and end caps. Do not apply grease to the rotor slots, or the sides of the vanes.

After the main pump is drained, run the primer motor to drain primer lines.

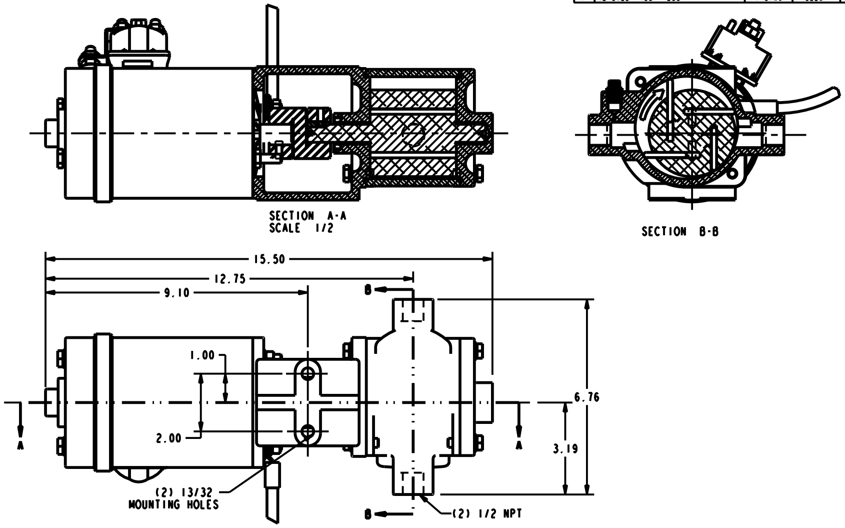
NO.	DESCRIPTION	PART NO.	QTY.
1	ASSEMBLY - PRIMER, ROTOR	4420105	1
2	BEARING - OILITE, 0.626 ID	1760023	2
3	COUPLING - #44093	2404500	1
4	CYLINDER - VACUUM PUMP	1020800	1
5	HEAD - CYLINDER INBOARD	2808904	1
6	HEAD - CYLINDER, OUTBOARD	2808800	1
7	HHCS - .313-18 x 1.00, SST	5400610	4
8	KEY - SQ., 0.19 X 0.62 GR2	3602425	1
9	KEY - WOODRUFF, 606	3602200	1
10	MOTOR - PRIMER, 12V	4223400	1
11	NUT - HEX, .313-15, SST	5403024	2
12	O-RING - 3.50 x 3.69 x 0.09	3601101	2
13	OIL SEAL - 0.625 ID X 1.128 OD	3600505	1
15	PLUG - PIPE, 0.250, BR SQ HD	1080504	1
16	STRAP - GROUND, 12V PRIMER	2600516	1
17	VANE - ROTOR, ELEC PRIMER	4407601	4
18	WASHER - FLAT, 5/16, STEEL	3603802	2
19	WASHER - LOCK, 0.313 ID	3603502	6

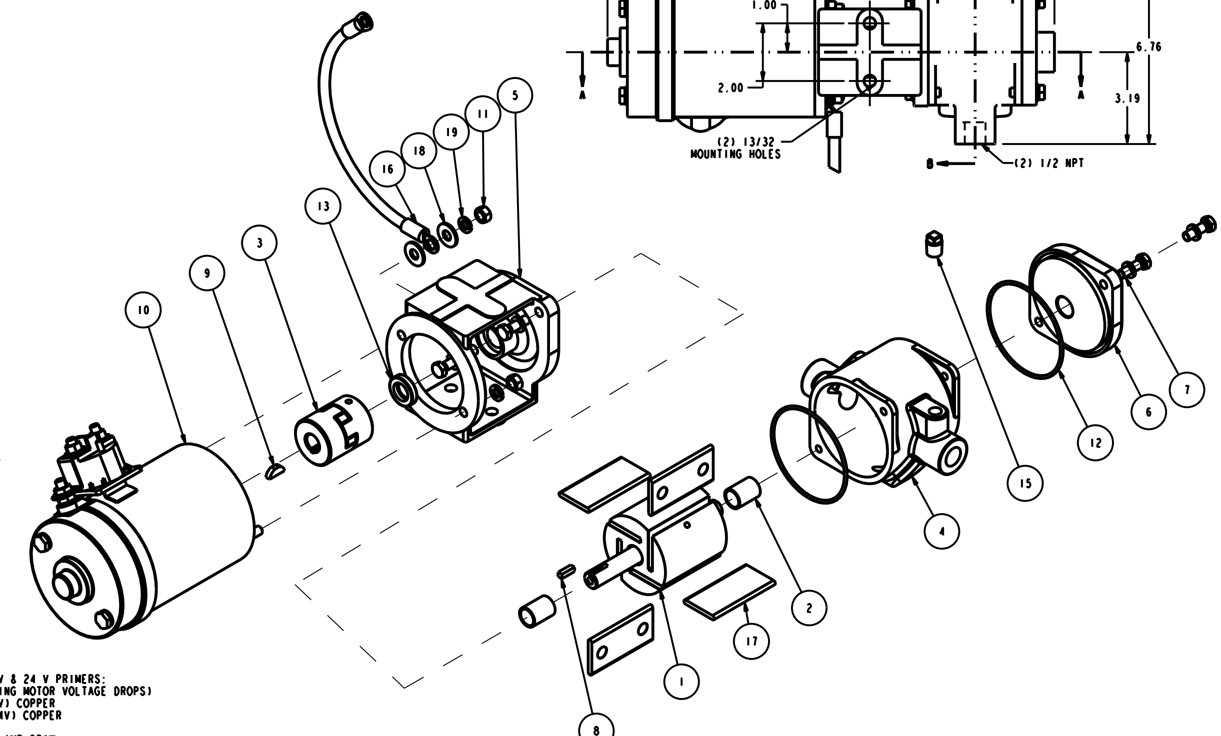
REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A	REMOVED FROST PLUG	4/15/09	5226	AAN

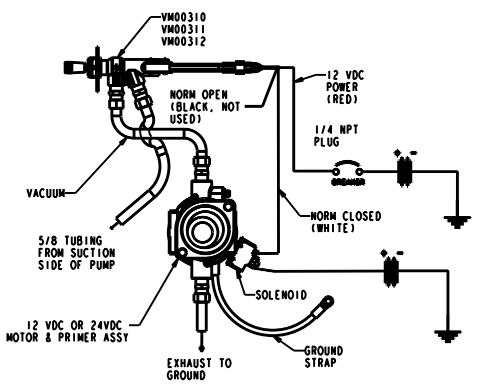


SCALE 1/2

NOTE:
- FOR CROSS SECTION AND EXPLODED VIEW DRAWING SEE DVC0203, DVC0204 & DVC0205
- ALSO, WHEN REPLACING THE OLD VERSION OF THIS VALVE WITH THIS NEW VERSION; BUSHING 1762500 CAN BE USED TO RETROFIT IT TO THE EXISTING PANEL.







NOTE:

MOUNT WITH EXHAUST OUTLET DOWN

CONNECT 4 GA COPPER GROUND STRAP TO CLEAN, PAINT FREE GROUNDING SURFACE

IF SUPPLIED GROUND STRAP IS REMOVED FROM ASSEMBLY, RETIGHTEN CYLINDER HEAD ADAPTER RETAINING NUTS EQUALLY TO 90 IN.LB.

POSITIVE LEAD WIRE SIZES FOR 12 V & 24 V PRIMERS:
PER SAE STANDARD 541J (MAX STARTING MOTOR VOLTAGE DROPS)
0' TO 20' ..... #0 (12V), #3 (24V) COPPER
0' TO 25' ..... #00 (12V), #2 (24V) COPPER

THESE GAGE WIRES CORRESPOND WITH AMP DRAW REQUIREMENTS FOR EACH MOTOR, AS WELL AS IN RELATION TO RESISTANCE OVER GIVEN LENGTH.
12 V = 240 AMP
24 V = 140 AMP

WEIGHT = 27 LB (12.1 KG)

REMOVE SHARP EDGES

INCH
(MILLIMETER)

MATERIAL DESCRIPTION: -		MATERIAL NO. -	PATTERN NO. -	TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°	W.S. Darley & Co. ITASCA, IL · CHIPPEWA FALLS, WI
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. · UNAUTHORIZED REPRODUCTION IS PROHIBITED	ALL DIMENSIONS IN INCHES UNLESS NOTED	DO NOT SCALE PRINT	OLD PART NO.	DR'N RJS CHKD DHS TRCD	DWG · ELEC. PRIMER, VLV, 4 V NO TANK, CR. SECTION, EXPLODED

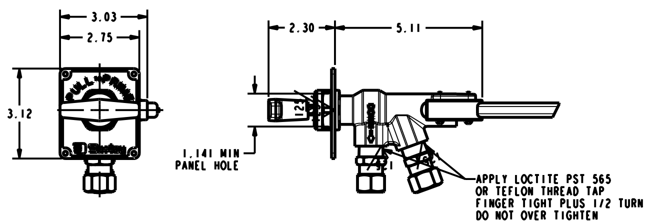
MODEL NAME: DVC0207 | MDL CREATED: 04/18/08 | SHEET: 1/1 | D

DATE 18-Apr-08 | SCALE 1/2 | DVC0207

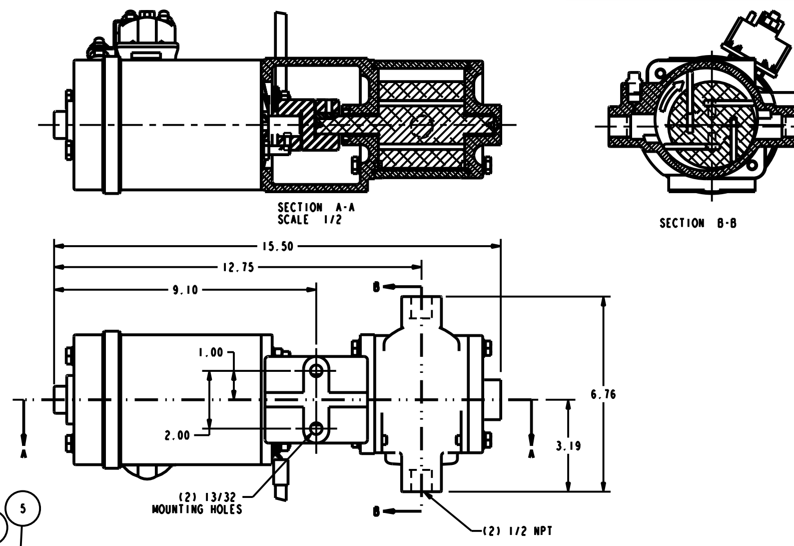
NAME:AAN OBJECT:DVC0207 DATE:17-Apr-09 09:42:43

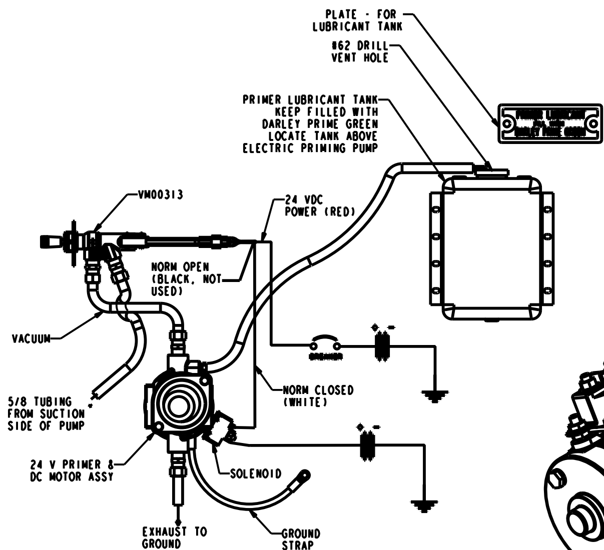
NO.	DESCRIPTION	PART NO.	QTY.
1	ASSEMBLY - PRIMER, ROTOR	4420105	1
2	BEARING - OILITE, 0.626 ID	1760023	2
3	COUPLING - #44093	2404500	1
4	CYLINDER - VACUUM PUMP	1020800	1
5	HEAD - CYLINDER INBOARD	2808904	1
6	HEAD - CYLINDER, OUTBOARD	2808800	1
7	HHCS - .313-18 x 1.00, SST	5400610	4
8	KEY - SQ., 0.19 X 0.62 GR2	3602425	1
9	KEY - WOODRUFF, 606	3602200	1
10	MOTOR - PRIMER, 24V	4223500	1
11	NUT - HEX, .313-15, SST	5403024	2
12	O-RING - 3.50 x 3.69 x 0.09	3601101	2
13	OIL SEAL - 0.625 ID X 1.128 OD	3600505	1
15	TUBE FITTING - STR, .25 X .19	3500021	1
16	STRAP - GROUND, 12V PRIMER	2600516	1
17	VANE - ROTOR, ELEC PRIMER	4407601	4
18	WASHER - FLAT, 5/16, STEEL	3603802	2
19	WASHER - LOCK, 0.313 ID	3603502	6

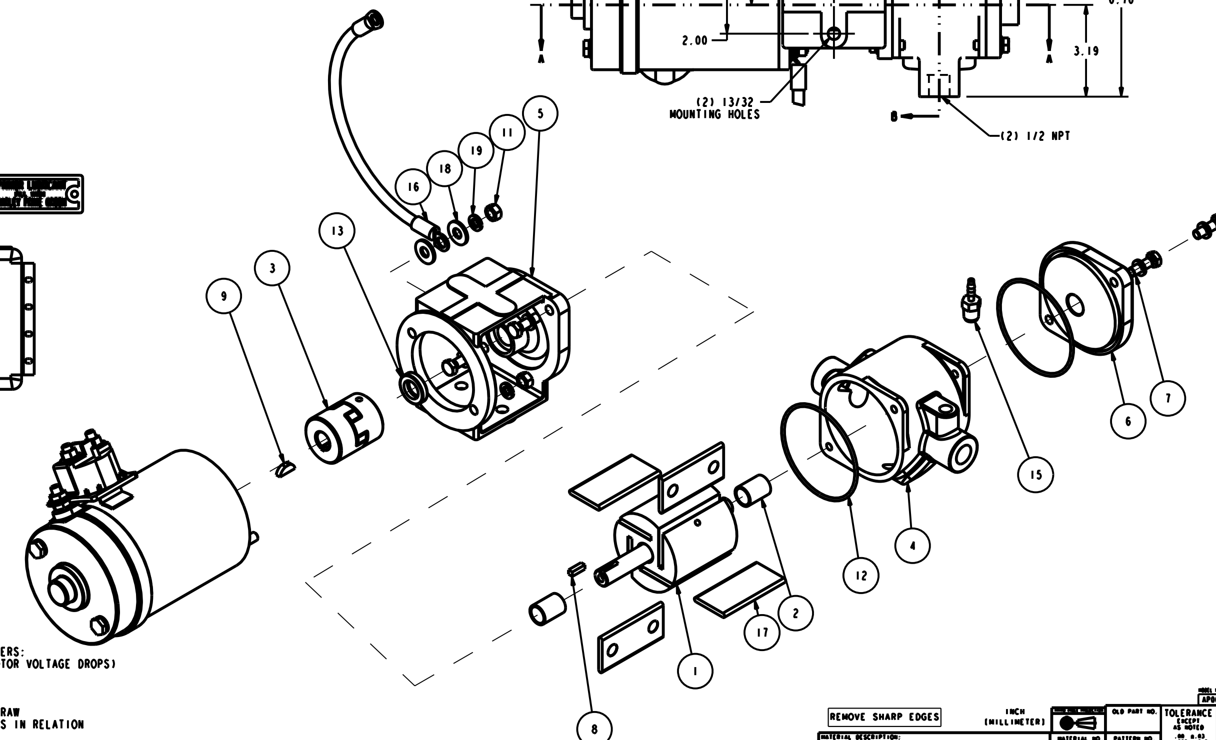
REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A	REMOVED FROST PLUG	4/15/09	5226	AAN



NOTE:
- FOR CROSS SECTION AND EXPLODED VIEW DRAWING SEE DRAWING DVC0203
- ALSO, WHEN REPLACING THE OLD VERSION OF THIS VALVE WITH THIS NEW VERSION; BUSHING 1762500 CAN BE USED TO RETROFIT IT TO THE EXISTING PANEL.







NOTE:

MOUNT WITH EXHAUST OUTLET DOWN

CONNECT 4 GA COPPER GROUND STRAP TO CLEAN, PAINT FREE GROUNDING SURFACE

IF SUPPLIED GROUND STRAP IS REMOVED FROM ASSEMBLY, RETIGHTEN CYLINDER HEAD ADAPTER RETAINING NUTS EQUALLY TO 90 IN.LB.

POSITIVE LEAD WIRE SIZES FOR 24 V PRIMERS:
PER SAE STANDARD 541J (MAX STARTING MOTOR VOLTAGE DROPS)
0' TO 20' ..... #3 COPPER
0' TO 25' ..... #2 COPPER

THESE GAGE WIRES CORRESPOND WITH AMP DRAW REQUIREMENTS FOR EACH MOTOR, AS WELL AS IN RELATION TO RESISTANCE OVER GIVEN LENGTH.
24 V = 140 AMP

WEIGHT = 27 LB (12.1 KG)

REMOVE SHARP EDGES

INCH
(MILLIMETER)

MATERIAL DESCRIPTION:

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

OLD PART NO. | MATERIAL NO. - | PATTERN NO. -

DO NOT SCALE PRINT

TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°

DR'N RJS | CHK'D DHS | TRC'D

MODEL NAME AP00913,CHINA | DATE CREATED 24-SEP-2004 | SHEET 1/1 | D

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

DWG - ELEC, PRIMER, VLV, 4 VANE W/TANK, DARLEY, CR. SEC., EXPL.

DATE 18-Apr-08 | SCALE 1/2

DVC0209

NAME:AAN OBJECT:DVC0209 DATE:29-Apr-09 10:21:45

W.S. DARLEY & CO.

OPERATING INSTRUCTIONS - ELECTRIC PRIMING PUMP

PUSH BUTTON ELECTRIC ACTUATED VALVE

The Darley electric primer will develop up to 25 in. Hg. in an air tight pumping system.

The Primer is activated by a push button, 0.8 second cycle time, electric-actuated valve. This valve has three wires: ground (black), +12 or +24 VDC constant power (red), and +12 or +24 VDC energizing power (white). The valve has two internal micro-switches that cut the power to the valve when it is either fully closed or fully open. The push button is a simple SPST switch, that bypasses the red (constant power) wire with the white wire and energizes the valve to the open position when it is pushed; and cuts power to the white wire and resumes power to the red wire, closing the valve when it is released. When the button is pushed, the circuit for the primer motor is also completed, priming will begin instantaneously, and likewise when the button is released, the primer motor will shut off instantaneously.

Before the pump can be primed, booster line valves, drain valves, cooling line valve, and all other openings into the pump must be closed and absolutely air tight. The discharge side of the pump is sealed by a check valve; therefore the main discharge valves need not be closed.

When operating from draft, suction hose connections must be tight and free of air leaks.

Make certain the suction hose strainer is properly submerged and free of foreign material.

The main pump drive should remain disengaged until priming is complete to prevent possible damage to impeller seal rings by running “dry”.

Push the primer/valve activation button, located on your control panel, and hold until water discharges from primer pump exhaust port.

If water does not discharge from primer exhaust within about 30 seconds (45 seconds with 2-20’ lengths) stop primer pump, check for air leaks and make sure primer pump is receiving lubricant from its reservoir.

NOTE: Do not run the primer for more than one minute; it will burn up the motor, if prime is not reached within one minute, repeat the steps above.

Engage “Pump” shift to start pumping water.

When pumping from hydrants, the primer is not needed and must be kept closed.

It may be necessary to use the primer momentarily when pumping from a booster tank when the suction head is insufficient to force all the air out of the pump.

LUBRICATING SYSTEM - ELECTRIC PRIMING PUMPS WITH FLUID RESERVOIR

The electric motor rotary van primer pump creates a high vacuum by continuous lubrication of rotor and vanes. Therefore the primer lubricant supply tanks (4 quarts) should be kept full at all times. Recommended primer system lubricant is Darley PRIME GREEN. PRIME GREEN is an environmentally safe, non-toxic, biodegradable lubricant. Its use assures proper primer vane lubricant while minimizing environmental effects.

After the main pump is drained, run the primer motor to drain primer lines and re-lubricate the primer pump.

The vent hole on the lubricant tank cap should be kept open at all times to prevent siphoning lubricant from the tank after the pump is stopped. Do not increase the size of the hole.

Locate the lubricant tank where it may be conveniently inspected and filled.

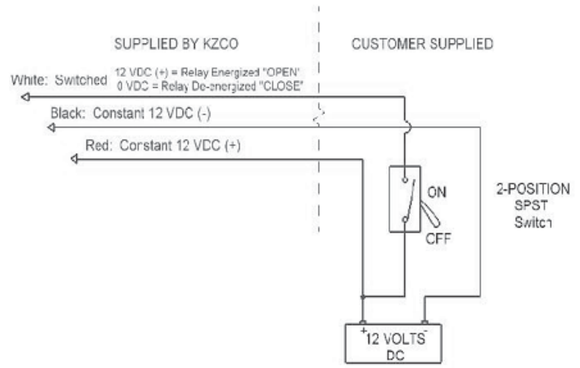
Should water appear in the lubricant supply tank, the primer valve is leaking. Check and replace valve plug seal o-ring if necessary.

ELECTRIC PRIMING PUMPS WITHOUT FLUID RESERVOIR

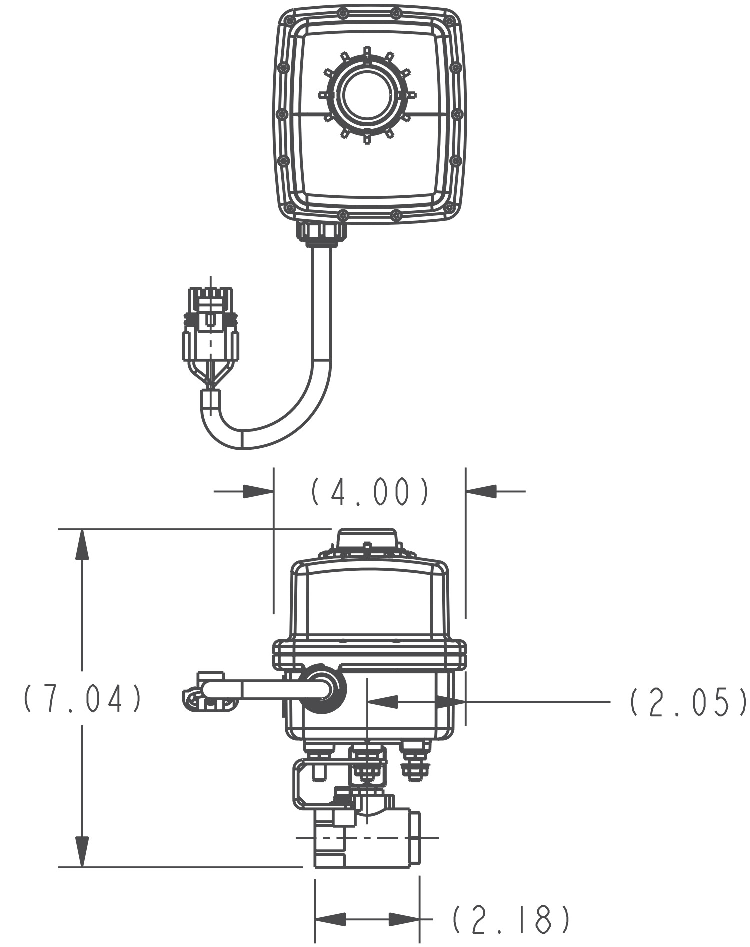
The fluidless electric-motor rotary-vane primer pump creates a high vacuum by using a special material for the vanes and an initial factory applied lubricant film. This film must be present in order for the primer to operate properly and to provide maximum life for the primer components.

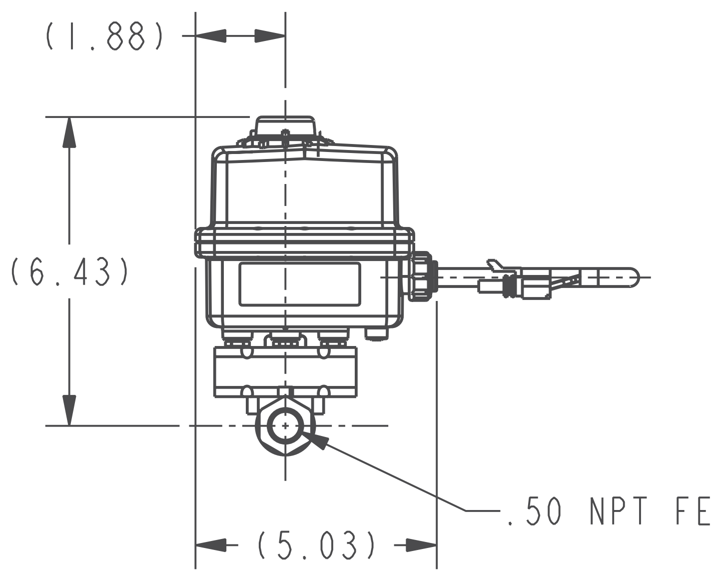
This film will not wash away completely if the pump is used to pump water. If the priming pump is disassembled for any reason, all internal surfaces of the housing and end caps must be coated completely with Dow Corning #111 Silicone valve lubricant prior to operating the primer. If after several years, a degradation of performance is noticed, performance may be restored by re-applying the film in this manner.

After the main pump is drained, run the primer motor to drain primer lines.



REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D





MODEL NAME: 5209401 | MDL CREATED: 11/13/08 | SHEET: 1/2 | A

REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO.

TOLERANCE
EXCEPT
AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

VALVE - ACTUATED, 12VDC, .50NPT FE
KZCO 84D23-10D20-P01

MATERIAL DESCRIPTION:
KZCO 84D23-10D20-P01

MATERIAL NO. -

PATTERN NO. -

DR'N RJG
CHKD DWS
TRCD

DATE 13-Nov-08
SCALE 1/4

5209401

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

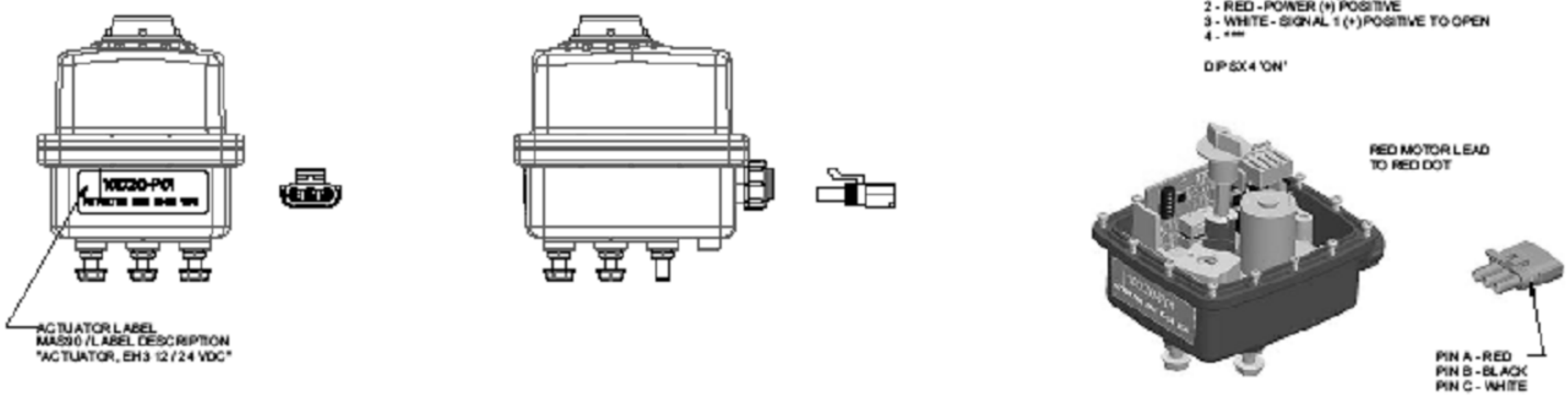
ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

REVISION	REVISED ECO	REVISION DATE	REVISED BY
-.2+		7/15/2008 9:41:57 AM	bgotschall

INPUT/OUTPUT
POWER = 12/24 VDC
1 - BLACK - POWER (-) NEGATIVE
2 - RED - POWER (+) POSITIVE
3 - WHITE - SIGNAL 1 (+) POSITIVE TO OPEN
4 - ****

DIP SX 4 'ON'



SCALE .500

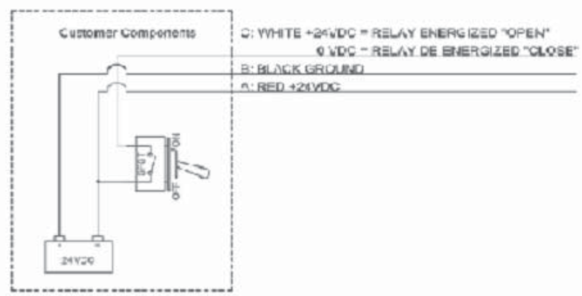
PROGRAM NOTE:

MAS90 SET DATA
CONTROL INPUT = 1
FEEDBACK = 0
OPERATION = 0
MOTOR = M2
SPEED CT = 0.8
ZEROSET = 135
RANGE TOLERANCE = 1
ROTATION = CC392
ACTUATOR RANGE = 0.00-0.00
DESIGN VOLTAGE = E
DIP SX = 3
LABEL = KZCO
OPTIONS = 0
PLUG TYPE = P
TEST PLUG =

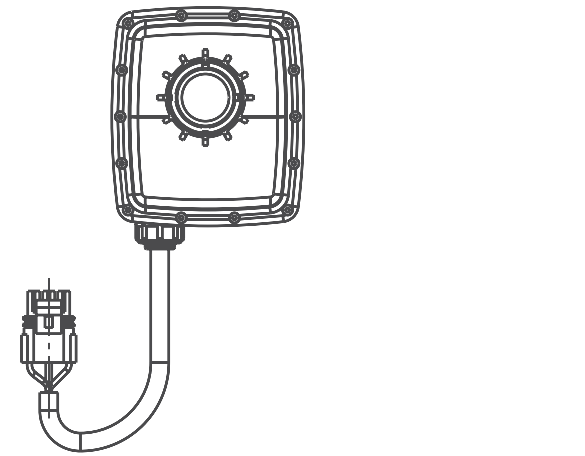
ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
21	1	EH-502	LABEL, EH ACTUATOR, 2.5" X 1", THERMAL TRANSFER, WHITE	NO_MATERIAL
20	1	800018	HARNESS, 69A,3ST, WP3T,22.5"	
19	1	EH3-115-Y	FLAG, YELLOW	POLYPROPYLENE_TALC_20
18	1	399-0029	PCB ASSY, EH3 L1 SOLID STATE 12 VDC	
17	1	100401	GEAR MOTOR, M2 18 RPM/NOLON	NO_MATERIAL
16	3	QX-222	NUT, HEX HEAD, SERRATED FLANGE, .250-20 UNC-2B	STAINLESS_STEEL_TYPE_303
15	4	EH3-135	STUD, 1/4-20 X 1/2 MTG	STAINLESS_STEEL_TYPE_303
14	1	EH-104	RETAINER, PUSH-ON 5/16" SHAFT	STAINLESS_STEEL_TYPE_18-8
13	1	499-0100	CAM ASSY, EXTD LOBE FOR EH2/5 E-OPT	
12	1	EH-502	LABEL, EH ACTUATOR, 2.5" X 1", THERMAL TRANSFER, WHITE	NO_MATERIAL
11	1	EH-130	O-RING, DOME	SILICONE,RED,55_DUROMETER
10	1	EH3-114	DOME, CLEAR	POLYCARBONATE,
9	14	EHPT-1103	SCREW, PAN, PHILLIPS, HIGH-LOW, 5-20 X .562	STAINLESS_STEEL_TYPE_410
8	1	EH3-1001-N	LID, CASE, EH3, DOME	NYLON_DPC_6N33-L_BLACK
7	4	EH3-139	SCREW, 8-32 X 1.25 PPHMS SS	STAINLESS_STEEL_TYPE_18-8
6	1	EH-157	SCREW, 8-18 x 3/8" TSB PPH SS	STAINLESS_STEEL_TYPE_18-8
5	1	EH3-1030	O-RING, EH3, CASE LID, #120	SILICONE,RED,55_DUROMETER
4	1	EH-139	O-RING, #006, PRESSURE TEST PORT	FLUOROCARBON,BLACK,75_DUROMETER
3	1	EHPT-140	O-RING, #112, MOTOR SHAFT, VITON	FLUOROCARBON,BLACK,75_DUROMETER
2	1	EH3-1003-N	LOWER CASE - EH3 INTERNAL MTG	NYLON,DPC_6N33-L,BLACK
1	1	498-0002	CASE KIT, EH3 IM DOME NYLON M2 MTR	

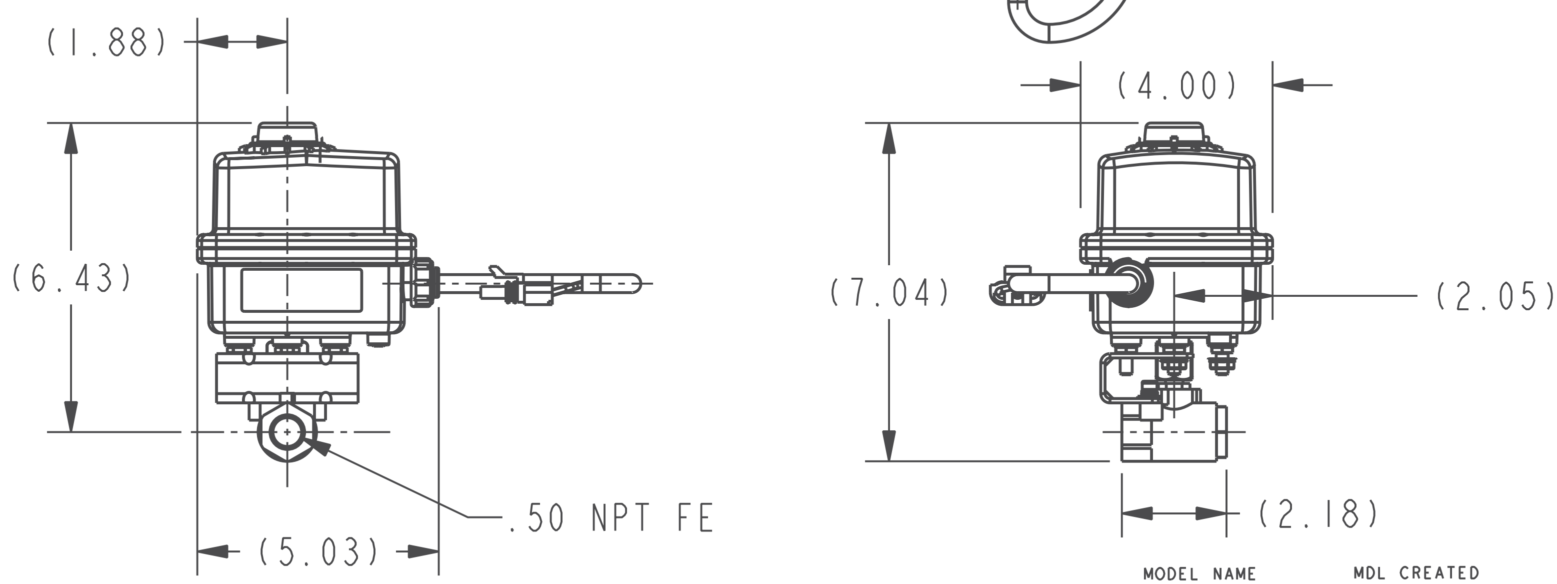
STANDARD TOLERANCES ALL DIMENSIONS IN INCHES [mm]	DATE 2008-05-29	KZCO Inc.	
	DESIGNED L. ERDKAMP		
	DRAWN W. FEDDE	TITLE ACTUATOR, EH3, SOLID STATE	
	APPROVED A. KOTTAS	REF.	
	SCALE .500 / SIZE B	PART NO. 10020-P01	REVISION -2+
	MATERIAL	DRAWING NO. 10020-P01	SHEET 1 OF 1

60AD WIRING
Standard On/Off applications, SPST Switch
24 VDC



REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D





MODEL NAME	MDL CREATED	SHEET	
5209402	11/13/08	1/3	A

REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO.	TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°	W.S. Darley & Co. ITASCA, IL - CHIPPEWA FALLS, WI
MATERIAL DESCRIPTION: KZCO 84D23-60AD-M	MATERIAL NO. -	PATTERN NO. -
DR'N RJG	CHKD DWS	TRCD
VALVE - ACTUATED, 24VDC, .50NPT FE KZCO 84D23-60AD-M	DATE 13-Nov-08	SCALE 1/4

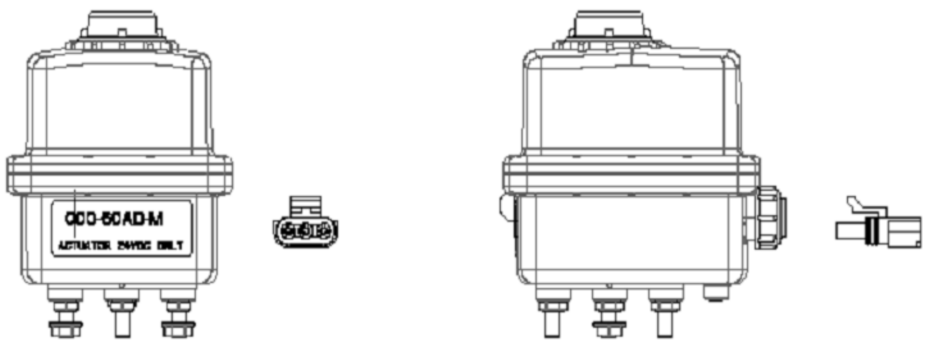
5209402

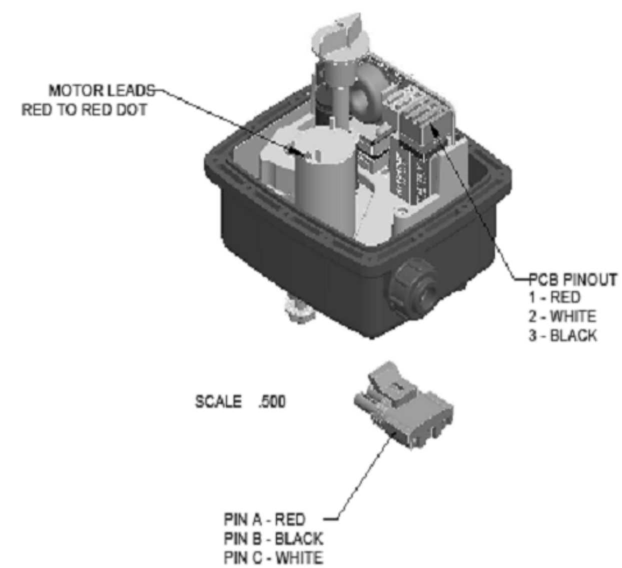
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

REV/VER	REVISION ECO	REVISION/VERSION DATE	REVISION/VERSION BY
*** .1		3/28/2008 1:49:38 PM	wfedde





MAS90 SET DATA
CONTROL INPUT = 1
FEEDBACK = 0
OPERATION = 0
MOTOR = M
SPEED CT = 0.8
ZEROSET = 135
RANGE TOLERANCE = 1
ROTATION = CC091
ACTUATOR RANGE = 0.00/0.00
DESIGN VOLTAGE = D
DIP SX =
LABEL = KZCO
OPTIONS = 0
PLUG TYPE =
TEST PLUG =

DET	QTY	PART NUMBER	DESCRIPTION	MATERIAL
8	1	EH-502	LABEL, EH ACTUATOR, 2.5" X 1", THERMAL TRANSFER, WHITE	NO_MATERIAL
7	2	QX-222	NUT, HEX HEAD, SERRATED FLANGE, .250-20 UNC-2B	STAINLESS_STEEL,TYPE_303
6	4	EH3-135	STUD, 1/4-20 X 1/2 MTG	STAINLESS_STEEL,TYPE_303
5	1	800018	HARNESS, 60A,3ST, WP3T,22.5"	
4	1	EH3-115-Y	FLAG, YELLOW	POLYPROPYLENE_TALC_20
3	1	800488	PCB ASSY, EH3 24VDC 60AD/60DF	
2	1	EH3-110	GEAR MOTOR, EH3 SERIES M1 18 RPM @ 12VDC	
1	1	498-0005	CASE KIT, EH3 IM DOME NYLON M1 & N1 MTR	

-STANDARD TOLERANCES-
-ALL DIMENSIONS IN INCHES [mm]-
.Xa .1 / .XXa .01 / .XXXa .005 / XX°±1°
TOTAL RUNOUT: .005 RIM
CORNER BREAK: .001/.010
SURFACE FINISH: 125µIN
DENSITY: .047 LBM/CU IN
MASS: .562 LBM
SURF AREA: 163.793 SQ IN
VOLUME: 12.043 CU IN

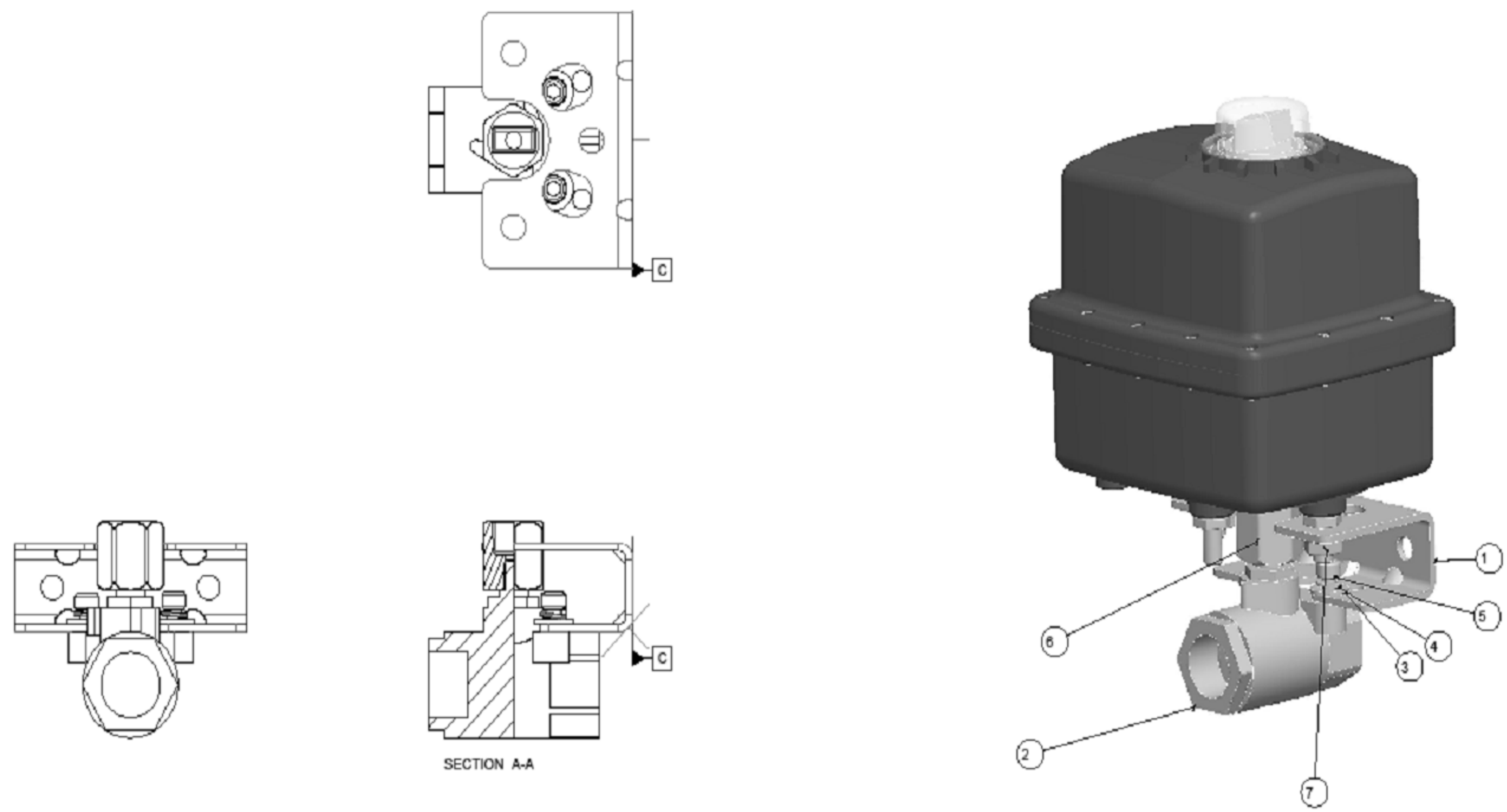
DATE: 2007-04-16	
DESIGNED: L. ERDKAMP	
DRAWN: W. FEDDE	
APPROVED: A. KOTTAS	
SCALE: .500	SIZE: B
MATERIAL:	

KZCO inc.
23860 KZ PARKWAY
GREENWOOD, NE 68366 USA
PHONE: +1.402.944.2767
FAX: +1.402.944.2402

TITLE: ACTUATOR, EH3, .8S @24VDC
REF:
PART NO: 000-60AD-M — REV/VER: *** .1
DRAWING NO: 000-60AD-M — SHEET: 1 OF 1

CREATED BY: wfedde CREATED ON: 3/28/2008 1:49:38 PM REV: *** VER: -- REL: -- LOCATION: Root Folder/EngineeringParts BRANCH: --

REVIWER	REVISION ECO	REVISION/VERSION DATE	REVISION/VERSION BY
-.6+		8/12/2008 9:18:50 AM	bgotschall



ACTUATOR SHOWN IS REPRESENTITVE USED
ONLY TO SHOW PROPER ORIENTATION TO VALVE.

DET	QTY	PART NUMBER	DESCRIPTION	MATERIAL
7	3	QX-222	NUT, HEX HEAD, SERRATED FLANGE, .250-20 UNC-2B	STAINLESS_STEEL,TYPE_303
6	1	EH-145	COUPLER, 1/4" ~ 1/2" APOLLO	STAINLESS_STEEL_TYPE_316
5	2	EH-158	SCREW, #10-24 X 3/8" SS SOCKET HEAD	STAINLESS_STEEL,TYPE_303_OR_316
4	2	EHPT-109	WASHER, LOCK, .197 ID X .334 OD X .047 T	STAINLESS_STEEL_TYPE_316
3	2	EHPT-150	WASHER, FLAT, #10 18-8 SS	STAINLESS_STEEL_TYPE_316
2	1	EH3-84D	VALVE, 1/2" 2-WAY APOLLO 70-103-01 BRONZE BALL VALVE	BRONZE
1	1	EH3-174	BRACKET, MOUNTING EH3 SERIES	STAINLESS_STEEL_TYPE_304

-STANDARD TOLERANCES-
-ALL DIMENSIONS IN INCHES [mm]-
.X±.1 .XX±.01 .XXX±.005 .XX°±1°
TOTAL RUNOUT: .005 RIM
CORNER BREAK: .001/.010
SURFACE FINISH: 125μIN

DENSITY: .258 LBM/CU IN
MASS: 3.134 LBM
SURF AREA: 142.873 SQ IN
VOLUME: 12.142 CU IN

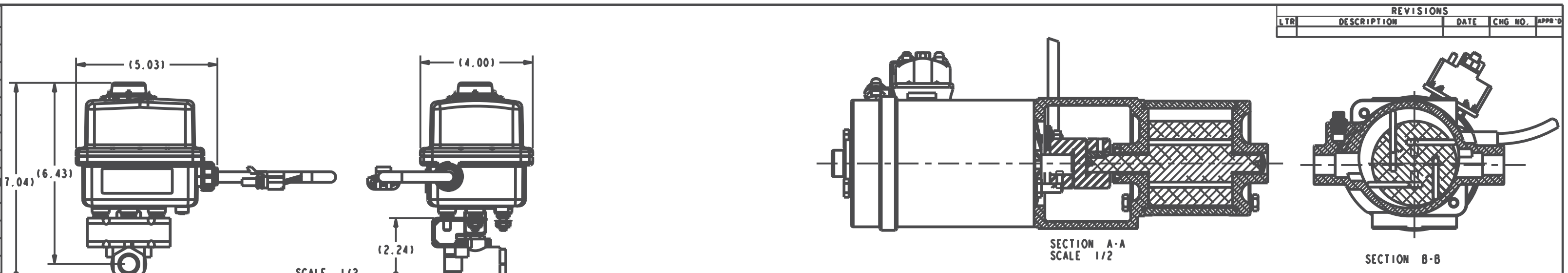
DATE: 2007-06-08	
DESIGNED: L. ERDKAMP	
DRAWN: C. HOWARD	
APPROVED: L.ERDKAMP	
SCALE: .750	SIZE: B
MATERIAL: AS NOTED	

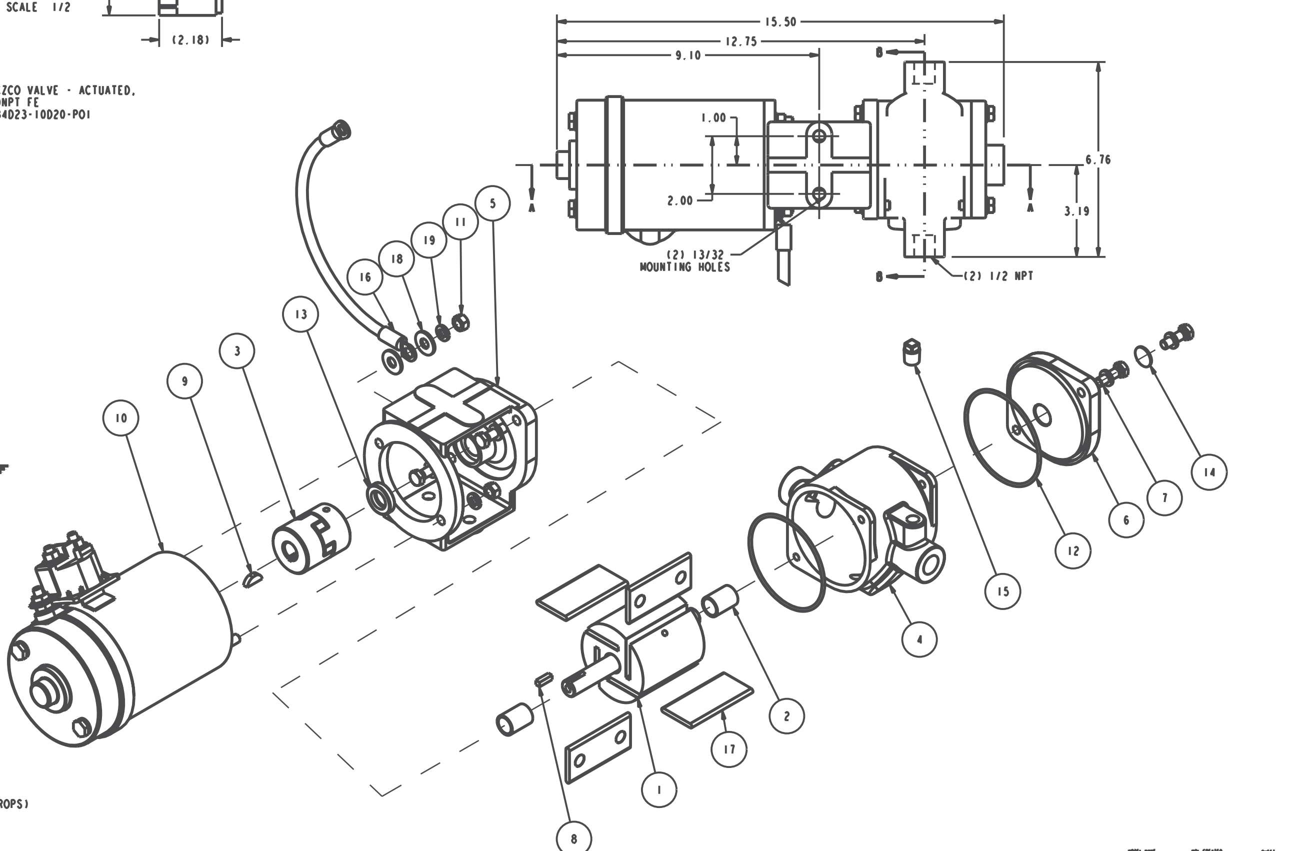
KZCO inc.
23800 KZ PARKWAY
GREENWOOD, NE 68366 USA
PHONE: +1.402.944.2767
FAX: +1.402.944.2402

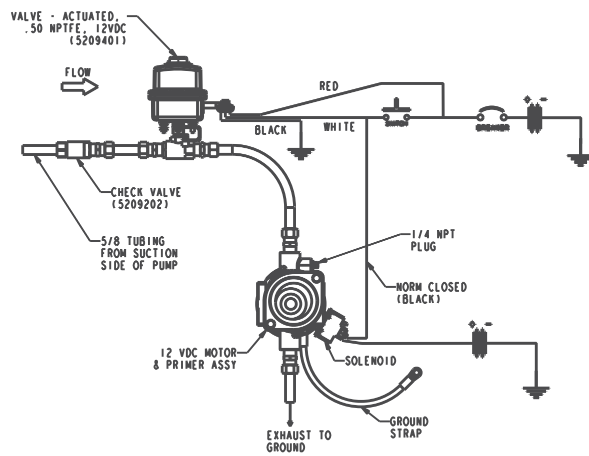
TITLE: VALVE KIT, EH3 OFFSET MTG 1/2" 2-PC BRZ	
REF:	
PART NO: 84D23	REVIWER: -.6+
DRAWING NO: 84D23	SHEET: 1 OF 1

CREATED BY: bgotschall CREATED ON: 8/12/2008 9:18:50 AM REV: - VER: 6+ REL: Revision LOCATION: Root Folder/Engineering/Parts BRANCH: main

NO.	DESCRIPTION	PART NO.	QTY.
1	ASSEMBLY - PRIMER, ROTOR	4420105	1
2	BEARING - OILITE, 0.626 ID	1760023	2
3	COUPLING - #44093	2404500	1
4	CYLINDER - VACUUM PUMP	1020800	1
5	HEAD - CYLINDER INBOARD	2808904	1
6	HEAD - CYLINDER, OUTBOARD	2808800	1
7	HHCS - .313-18 x 1.00, SST	5400610	4
8	KEY - SQ., 0.19 X 0.62 GR2	3602425	1
9	KEY - WOODRUFF, 606	3602200	1
10	MOTOR - PRIMER, 12V	4223400	1
11	NUT - HEX, .313-15, SST	5403024	2
12	O-RING - 3.50 x 3.69 x 0.09	3601101	2
13	OIL SEAL - 0.625 ID X 1.128 OD	3600505	1
14	PLUG - 0.75", FREEZE	4402500	1
15	PLUG - PIPE, 0.250, BR SQ HD	1080504	1
16	STRAP - GROUND, 12V PRIMER	2600516	1
17	VANE - ROTOR, ELEC PRIMER	4407601	4
18	WASHER - FLAT, 5/16, STEEL	3603802	2
19	WASHER - LOCK, 0.313 ID	3603502	6







NOTE:

MOUNT WITH EXHAUST OUTLET DOWN

CONNECT 4 GA COPPER GROUND STRAP
TO CLEAN, PAINT FREE GROUNDING SURFACE

IF SUPPLIED GROUND STRAP
IS REMOVED FROM ASSEMBLY,
RETIGHTEN CYLINDER HEAD ADAPTER
RETAINING NUTS EQUALLY
TO 90 IN.LB.

POSITIVE LEAD WIRE SIZES FOR 12 V PRIMER:
PER SAE STANDARD 541J (MAX STARTING MOTOR VOLTAGE DROPS)
0' TO 20' ..... #0 (12V)
0' TO 25' ..... #00 (12V)

THESE GAGE WIRES CORRESPOND WITH AMP DRAW
REQUIREMENTS FOR EACH MOTOR, AS WELL AS IN RELATION
TO RESISTANCE OVER GIVEN LENGTH.
12 V = 240 AMP

WEIGHT = 27 LB (12.1 KG)

REMOVE SHARP EDGES

INCH
(MILLIMETER)

MODEL NAME	MDL CREATED	SHEET	
DVC0210	04/18/08	1/1	D

OLD PART NO. — TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

MATERIAL DESCRIPTION: -

MATERIAL NO. - | PATTERN NO. -

DWG - ELEC. PRIMER, VLV, 4 V
NO TANK, CR. SECTION, EXPLODED

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

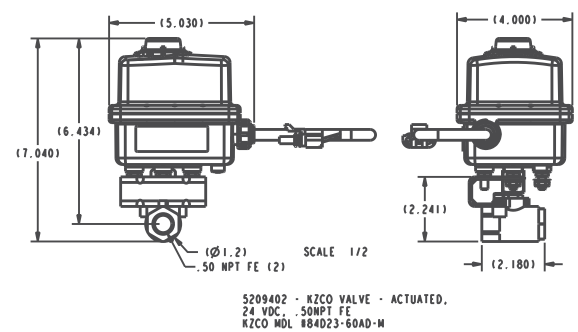
DO NOT SCALE PRINT

DR'N RJG
CHKD DWS
TRCD

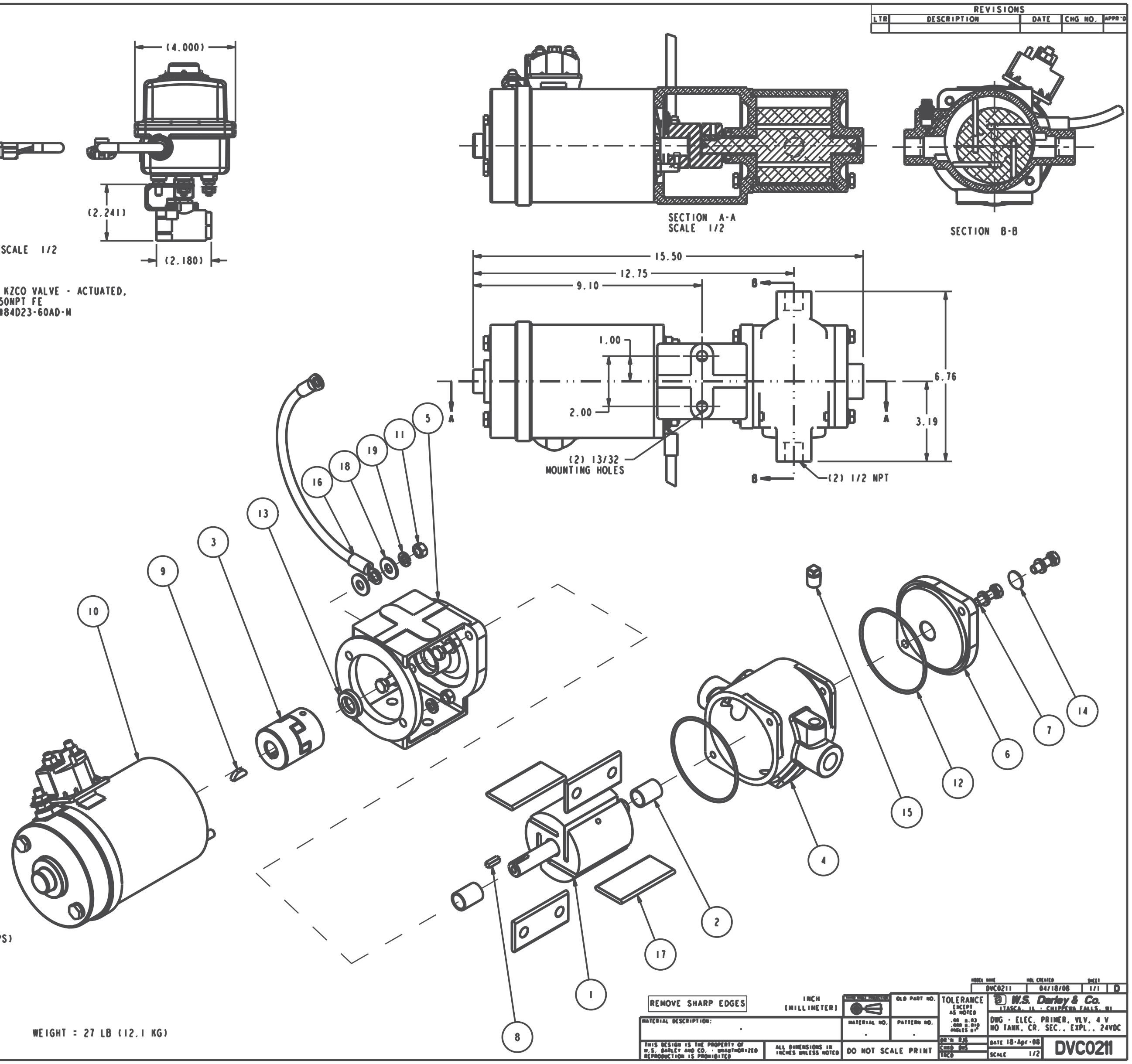
DATE 18-Apr-08
SCALE 1/2

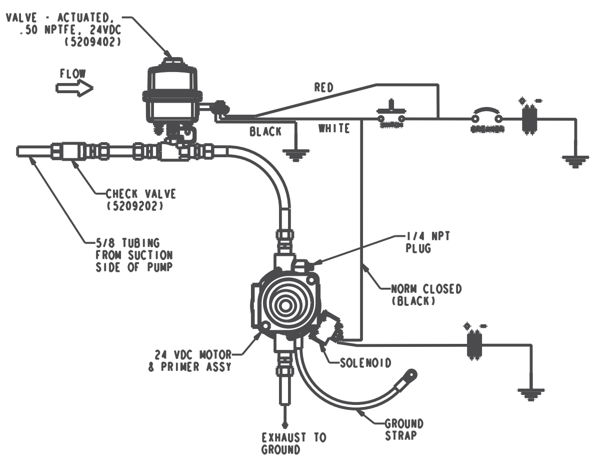
DVC0210

NO.	DESCRIPTION	PART NO.	QTY.
1	ASSEMBLY - PRIMER, ROTOR	4420105	1
2	BEARING - OILITE, 0.626 ID	1760023	2
3	COUPLING - #44093	2404500	1
4	CYLINDER - VACUUM PUMP	1020800	1
5	HEAD - CYLINDER INBOARD	2808904	1
6	HEAD - CYLINDER, OUTBOARD	2808800	1
7	HHCS - .313-18 x 1.00, SST	5400610	4
8	KEY - SQ., 0.19 X 0.62 GR2	3602425	1
9	KEY - WOODRUFF, 606	3602200	1
10	MOTOR - PRIMER, 24V	4223500	1
11	NUT - HEX, .313-15, SST	5403024	2
12	O-RING - 3.50 x 3.69 x 0.09	3601101	2
13	OIL SEAL - 0.625 ID X 1.128 OD	3600505	1
14	PLUG - 0.75", FREEZE	4402500	1
15	PLUG - PIPE, 0.250, BR SQ HD	1080504	1
16	STRAP - GROUND, 12V PRIMER	2600516	1
17	VANE - ROTOR, ELEC PRIMER	4407601	4
18	WASHER - FLAT, 5/16, STEEL	3603802	2
19	WASHER - LOCK, 0.313 ID	3603502	6



5209402 - KZCO VALVE - ACTUATED,
24 VDC, .50NPT FE
KZCO MDL #84D23-60AD-M





NOTE:

MOUNT WITH EXHAUST OUTLET DOWN

CONNECT 4 GA COPPER GROUND STRAP
TO CLEAN, PAINT FREE GROUNDING SURFACE

IF SUPPLIED GROUND STRAP
IS REMOVED FROM ASSEMBLY,
RETIGHTEN CYLINDER HEAD ADAPTER
RETAINING NUTS EQUALLY
TO 90 IN.LB.

POSITIVE LEAD WIRE SIZES FOR 24 V PRIMER:
PER SAE STANDARD 541J (MAX STARTING MOTOR VOLTAGE DROPS)
0' TO 20' ..... #3 COPPER (24V)
0' TO 25' ..... #2 COPPER (24V)

THESE GAGE WIRES CORRESPOND WITH AMP DRAW
REQUIREMENTS FOR EACH MOTOR, AS WELL AS IN RELATION
TO RESISTANCE OVER GIVEN LENGTH.
24 V = 140 AMP

WEIGHT = 27 LB (12.1 KG)

REMOVE SHARP EDGES

INCH
(MILLIMETER)

MODEL NAME	DWL CREATED	SHEET	
DVC0211	04/18/08	1/1	D

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

DWG - ELEC. PRIMER, VLV, 4 V
NO TANK, CR. SEC., EXPL., 24VDC

MATERIAL DESCRIPTION: -
MATERIAL NO. -
PATTERN NO. -
OLD PART NO.

TOLERANCE
EXCEPT
AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

DR'N RJG
CHK'D DWS
TRC'D

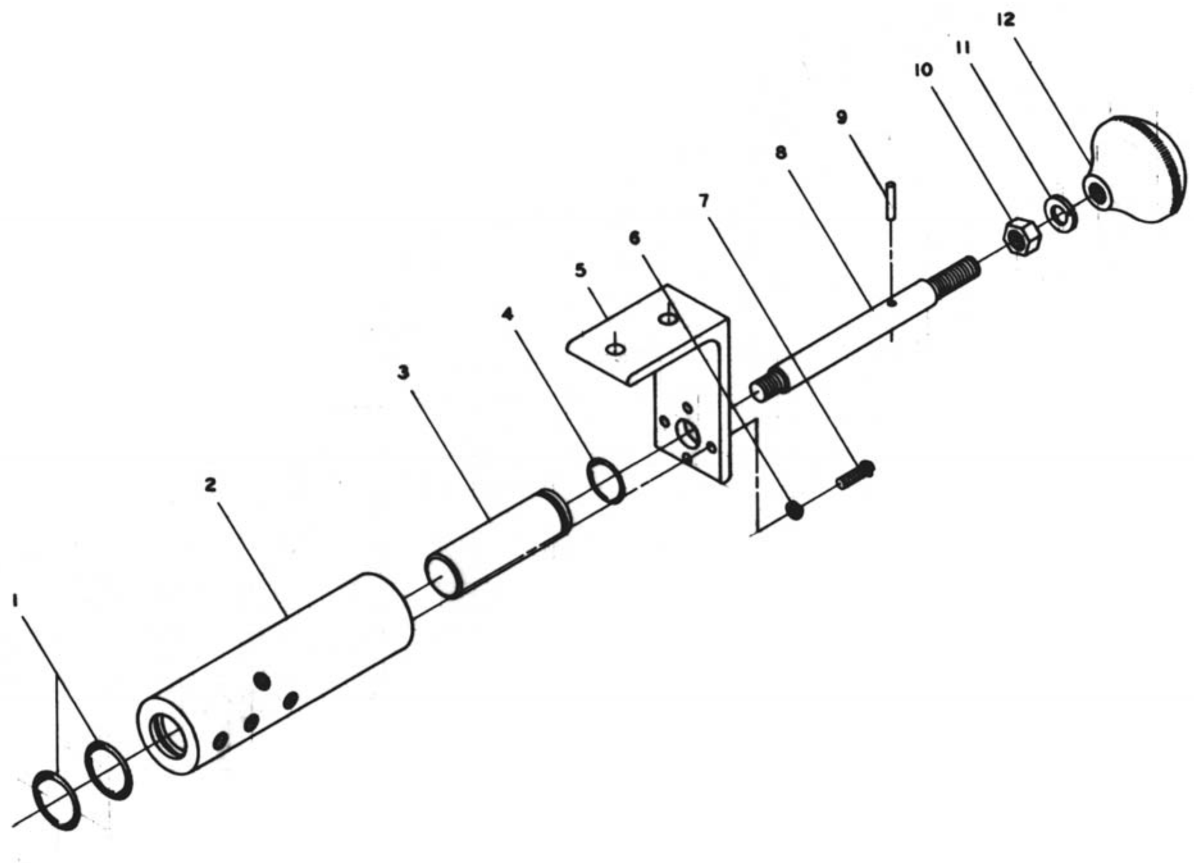
DATE 18-Apr-08
SCALE 1/2

DVC0211

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT



PARTS LIST FOR MULTIPLE DRAIN VALVE

DRAWING NO. DGC0112

Rep. No.	Name of Part	Qty	Rep. No.	Name of Part	Qty
1	O-ring – Body	2	7	Round Head Cap Screw	4
2	Drain Valve Body	1	8	Drain Valve Stem	1
3	Drain Valve Plug	1	9	Pin	1
4	O-ring – Plug	1	10	Hex Nut	1
5	Drain Valve Mounting Bracket	1	11	Lock Washer	1
6	Lock Washer	4	12	Knob	1

NO.	DESCRIPTION	PART NO.	QTY.	
1	BEARING - OILITE, 0.500 ID	1760024	1	
2	BODY - MULTI DRAIN VALVE	5329401	1	B
3	BRACKET - MULTI DRAIN VALVE	4031300	1	
4	CAP - MULTI DRAIN VALVE	5323802	1	
5	DECAL - DRAIN VALVE	1963200	1	
6	GREASE ZERK - .25-28	4403200	1	
7	HANDWHEEL	3001800	1	
8	HHCS - .250-20 x 0.88, 18-8	5400658	2	D
9	O-RING - 0.38 x 0.50 x 0.06	3601000	1	
10	O-RING - 1.62 x 2.00 x 0.19	3601305	1	
11	RHMS - NO.10-24 x 0.50, SST	5402046	3	
12	RING - RETAINER, 68011	3600435	1	
13	SEAL - MULTI DRAIN VALVE	3802602	1	
14	SSS - 1/4-20 x 0.38, SST	5402603	1	
15	STEM - MULTIPLE DRAIN VALVE	5241302	1	
16	WASHER - .52 X 1.12 X .12	3603319	1	
17	NUT - JAM, .500-20, 18-8 SST	5403219	1	C
18	NUT - HEX, .250-20, 18-8 SST	5403027	2	E

A

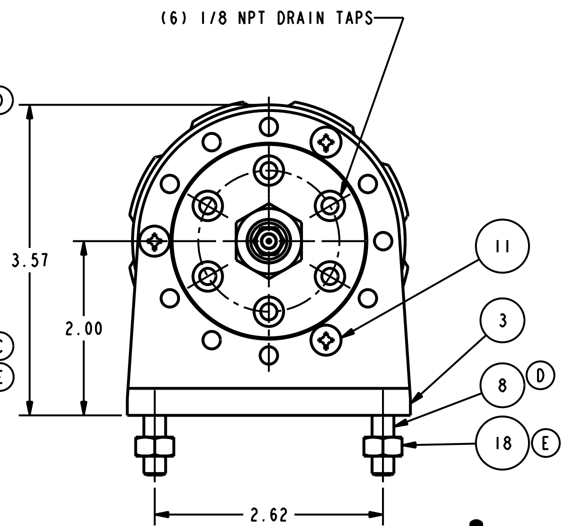
NOTE:

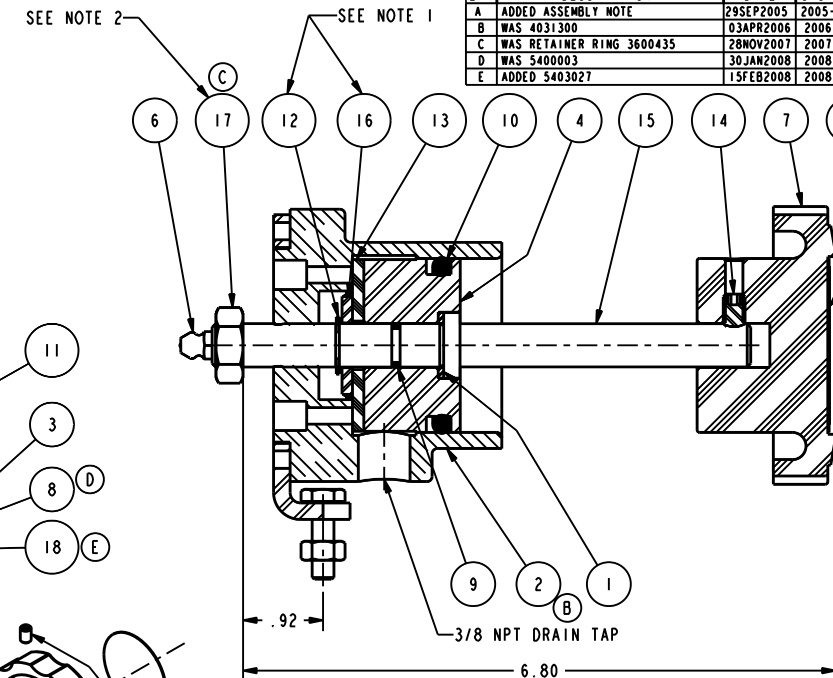
1) ASSEMBLE WASHER (REF 16) AND MATING RETAINING RING (REF 12) WITH SHARP EDGES FACING AWAY FROM SEAL (REF 13)

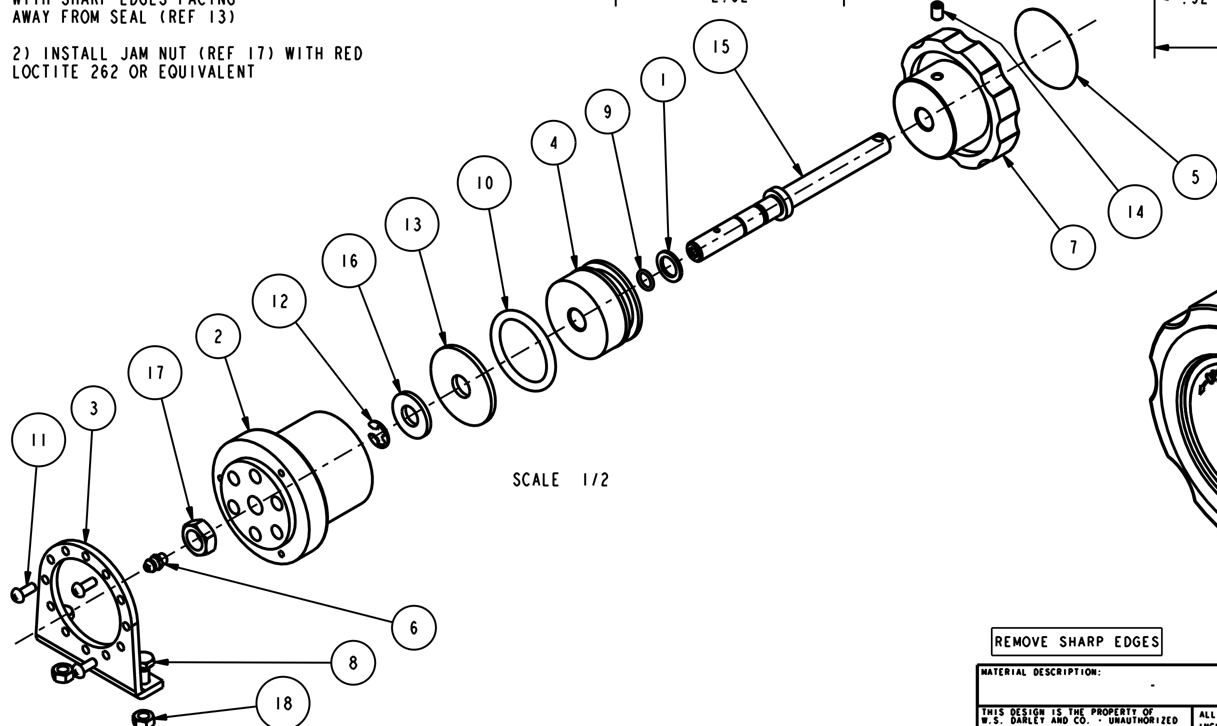
2) INSTALL JAM NUT (REF 17) WITH RED LOCTITE 262 OR EQUIVALENT

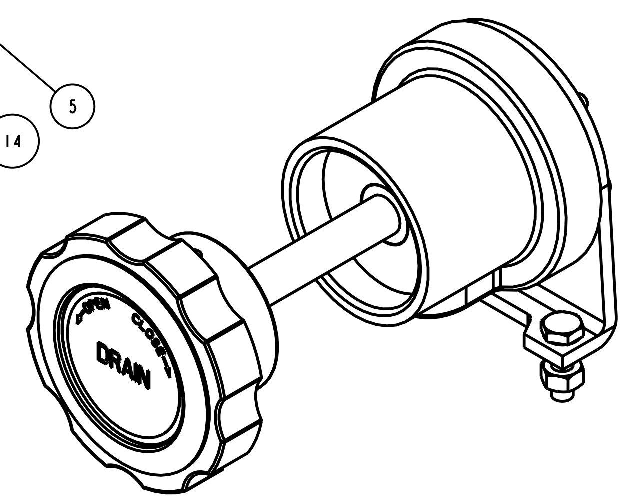
REVISIONS

LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A	ADDED ASSEMBLY NOTE	29SEP2005	2005-287	EWH
B	WAS 4031300	03APR2006	2006-110	
C	WAS RETAINER RING 3600435	28NOV2007	2007-456	SMS
D	WAS 5400003	30JAN2008	2008-042	SMS
E	ADDED 5403027	15FEB2008	2008-061	SMS









REMOVE SHARP EDGES

INCH [MILLIMETER]

MODEL NAME	MDL CREATED	SHEET	
VD00500	12/29/04	1/1	C

W.S. Darley & Co. ITASCA, IL - CHIPPEWA FALLS, WI

DWG - MULTIPLE DRAIN VALVE SCREW TYPE, VARIABLE POSITION

TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°

THIRD ANGLE PROJECTION | OLD PART NO.

MATERIAL DESCRIPTION: -

MATERIAL NO. - | PATTERN NO. -

DR'N JSS | CHKD DMD | TRCD

DATE 29-Dec-04 | SCALE 1/1

DGC0903

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

NAME:SMS OBJECT:DGC0903 DATE:15-Feb-08 13:11:45

BALL VALVE QUARTER TURN - SELF LOCKING

The Darley Ball Valve is a quarter turn, all bronze valve designed for the fire service.

The ball is cast bronze, precision machined *stainless steel ball* for long trouble free service. It is easily serviced in the field.

The lever is self locking and easily adjusted, even under extreme high pressure.

TO DISASSEMBLE AND REPAIR THE BALL VALVE
ILLUSTRATION DGC0100

TOOLS REQUIRED:

- 3/16” Allen Wrench
- 1-1/8” Wrench
- 3/4” & 1” Wrench
- Vise Grips or Pliers

1. Remove cap nut (20) and adjusting nut (16).

2. Lever Assembly (11) pulls straight up. Watch for 2 cam balls (12).

3. Unbolt and remove clutch ring (9), clutch sleeve (8), valve stem (7), spring (14), and valve stem washer (15). Check clutch ring (9) and sleeve (8) for scoring or excessive wear. Check o-ring (26). Replace if necessary.

4. Remove nipple (2). Check Quad Ring (25). Replace if necessary.

5. Unscrew ball guide screw (6). Check o-ring (23). Replace if necessary.

6. Remove valve ball (3). Check for scratches, corrosion, and wear. Replace if necessary.

7. Remove seat assembly (4). Check condition of rubber seat. Replace seat assembly if necessary.

REASSEMBLY OF BALL VALVE
ILLUSTRATION DGC0100

1. Position ball (3) in body so ball guide screw (6) engages bottom of ball as it is screwed into position.

2. Put valve stem (7) into position. Make certain stem engages slot on top of ball.

3. Slip washer (15), spring (14), and clutch sleeve (8) over the stem. Place clutch ring (9) over the sleeve and secure with the four (4) 1/4″ NC x 5/8″ socket head cap screws.

4. Set the two cam balls (12) into the V grooves in the clutch sleeve (8) and drop lever assembly over them. Tighten the adjusting nut (16) so that approximately 1/8″ play is left at the end of a 6″ lever. Over tightening this nut will make the clutch lock inoperative. Lock adjusting nut (16) with cap nut (20). Recheck this adjustment after valve is placed in service.

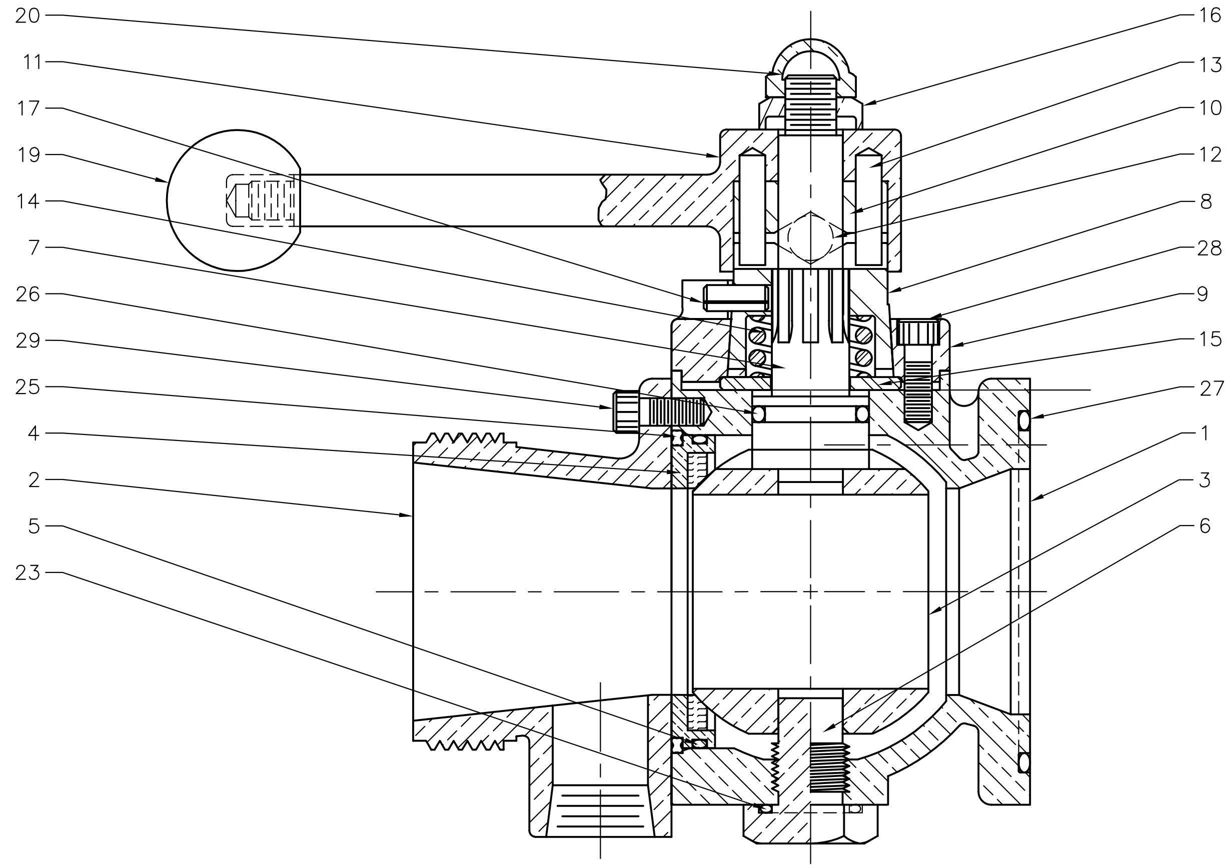
5. Place seat assembly (4), seat o-ring (5), and quad ring (25) into position.

6. Secure nipple (2) to valve body with eight (8) 1/4″ NC x 5/8″ socket head cap screws.

If more information is needed, call W.S. DARLEY & CO. at
Chippewa Falls, WI at 800-634-7812 or 715-726-2650

LETTER	CHANGE NO.	DATE
A	96-53	5/15/96

REP NO.	NAME OF PART	QTY.
1	DISCHARGE VALVE BODY	1
2	VALVE NIPPLE	1
3	VALVE BALL	1
4	VALVE SEAT	1
5	O'RING	1
6	BALL GUIDE SCREW	1
7	VALVE STEM	1
8	CLUTCH SLEEVE	1
9	CLUTCH RING	1
10	LEVER CAM	1
11	FRONT MOUNT LEVER	1
12	CAM BALL	2
13	VALVE PIN	2
14	VALVE SPRING	1
15	VALVE STEM WASHER	1
16	ADJUSTING NUT	1
17	SPRING PIN-STL (A)	1
19	CONTROL LEVER BALL	1
20	CAP NUT	1
23	O'RING	1
25	QUAD RING	1
26	O'RING	1
27	O'RING	1
28	SOCKET HEAD CAP SCREW	4
29	SOCKET HEAD CAP SCREW	8



INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO. G1200

TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°	W.S. DARLEY & Co. MELROSE PARK, IL – CHIPPEWA FALLS, WI	
	DWG – BALL VALVE ASSEMBLY CROSS SECTION	
DR'N JCM	DATE NOV12,65	DGC0100
CHKD		
TRCDLMH 5/96	SCALE 1/1	

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

W.S. DARLEY & CO.

REMOTE CONTROL PRESSURE RELIEF VALVE WITH MECHANICAL SHUTOFF

Refer to Drawing DGC0141

The relief valve bypasses water from the pump discharge manifold to the suction chamber at a set pump pressure, preventing excessive rise of discharge pressure when hose lines are shut off.

Turning pressure setting hand wheel (14) clockwise raises the relief pressure, and counter clockwise lowers it.

The self-cleaning fine mesh strainer will prevent the entry of solids that could cause the relief valve to malfunction. Open the strainer flush valve to remove small accumulations. This is accomplished by turning the strainer flush valve knob (6) counter clockwise 2 to 3 full turns. Strainer trapped debris will be flushed to the ground. Pump supply pressure should be 50-100 PSI when performing this procedure.

TO SET RELIEF VALVE

1. Turn four-way valve OFF.

2. Open at least one discharge valve and increase engine throttle setting until pressure gage indicates the pressure at which relief valve is to open.

3. Turn four-way valve ON.

4. If gage reading drops below pressure set in step 2, turn hand wheel (14) clockwise until pressure returns to set point.

5. If gage reading does not drop, turn hand wheel (14) counter clockwise until pressure drops 5 to 10 PSI below set point. Then slowly turn hand wheel clockwise until pressure returns to pressure set in step 2.

The relief valve will now prevent the discharge pressure from rising above that for which it is set, and requires no further attention.

Should a higher or lower relief pressure be desired, repeat above procedure.

CAUTION

With all discharge valves closed, water in the auxiliary pump casing will heat up rapidly. To avoid possible damage, allow a very small stream of water to discharge when the pump is running.

REMOTE CONTROL PRESSURE RELIEF VALVE WITH MECHANICAL SHUTOFF

MAINTENANCE
DRAWING DGC0141

Open the relief valve strainer flush valve (6) during every operation at 50-100 PSI supply pressure to insure foreign material is not blocking the screen.

The 3/32" diameter metering orifice and diaphragm chamber at (21) may be back-flushed if necessary while the pump is delivering water by opening the pilot head drain and placing valve handle (9) midway between ON and OFF position.

The relief valve, pilot unit, and strainer assemblies should be taken apart for inspection and cleaning at least annually, or as often as found necessary to insure trouble free performance.

To disassemble pilot head, first turn hand wheel (14) counter clockwise to remove spring compression. Remove the four 1/4" screws holding regulator spring housing (18). Lift out diaphragm (23) and pilot valve (51) assembly. Clean and make certain 3/32" diameter orifice hole is free of obstruction.

When reassembling pilot head, turn hand wheel (14) a few times clockwise to compress spring before tightening four screws holding spring housing. This will properly center valve seat and diaphragm.

The valve piston (40) and spring (44) chamber should be inspected and cleaned.

Replace diaphragm and o-rings if damaged or deteriorated.

Apply a thin coating of waterproof grease lubricant: to spring housing counterbore that guides the pilot valve (51) and ball (52), to end of tension screw (17), and between piston (40) and center post.

Self-cleaning strainer (63) can be removed for inspection or replacement by alternately turning valve knob (6) and stop nut (7) counter clockwise until stem is free for removal. To avoid discharging water through opening created by stem (62) removal, pump should be completely shut down before stem (62) is removed. Inspect and clean screen (63) if required. Check quad ring (64) for damage or deterioration. Reverse procedure to reassemble valve. Use case when initially inserting screen into body to avoid damaging quad ring (64) or valve seat.

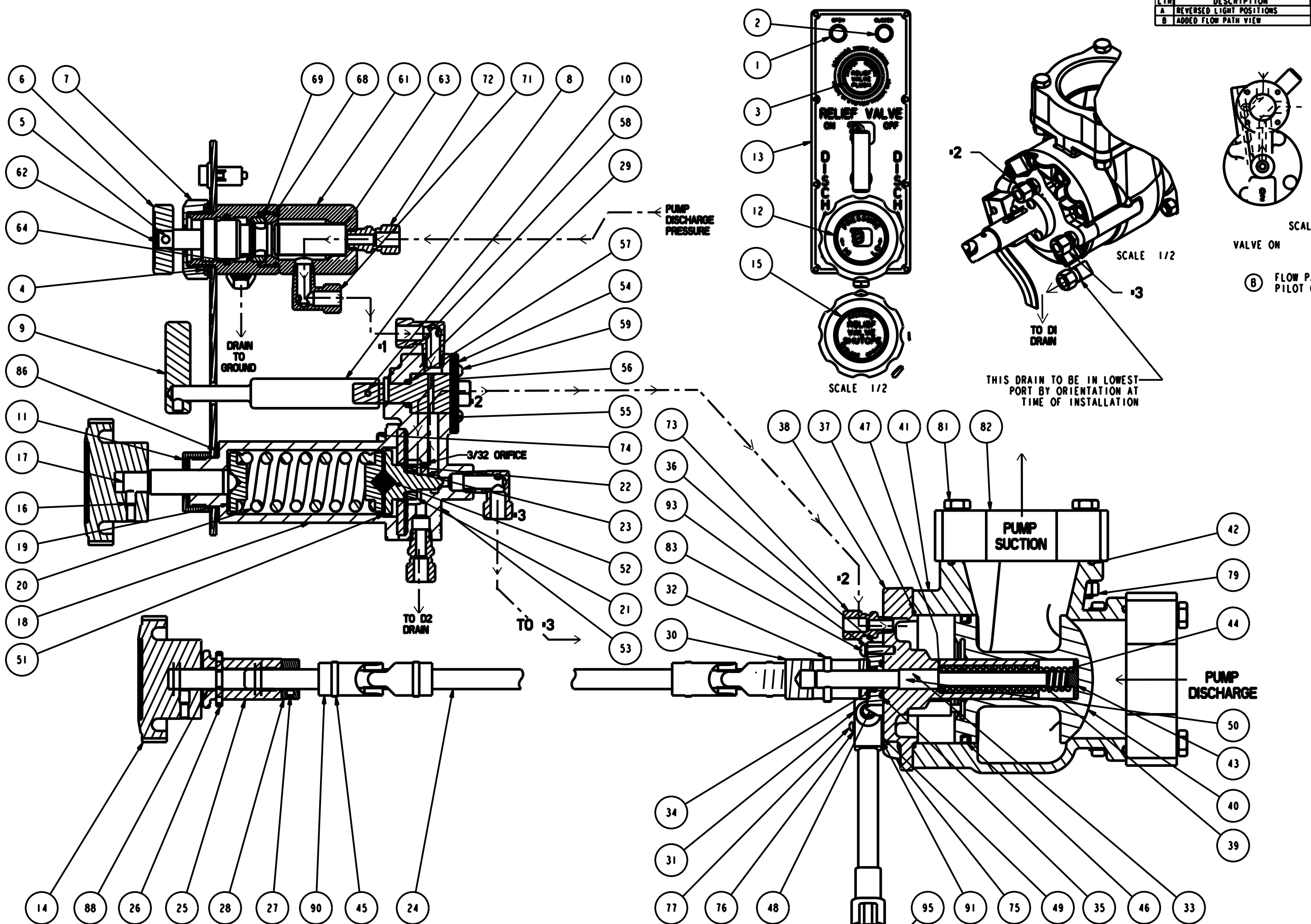
To replace flush valve seat (69), remove stem/screen assembly, disconnect tubing lines attached to (61) body half and unscrew (61) body half from (70) body half. Replace (69) valve seat. Reverse procedure to reassemble valve.

All Darley relief valves can be provided with a micro switch and either one or two pilot lights to indicate when the valve is open or closed.

IF FURTHER INFORMATION IS NEEDED, CALL W.S. DARLEY & CO. AT CHIPPEWA FALLS, WI. AT 800-634-7812 or 715-726-2650

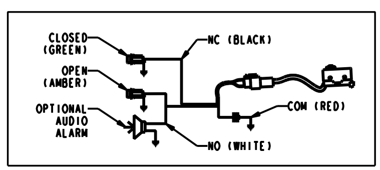
NO.	DESCRIPTION	PART NO.	QTY.
1	LIGHT - AMBER, 24V	-	1
2	LIGHT - GREEN, 24V	-	1
3	DECAL - FLUSH SCREEN	-	1
4	NUT - PANEL, FLUSH VALVE	-	1
5	SSS - NO.10-32 x 0.38, GR5	-	1
6	KNOB - FLUSH VALVE	-	1
7	NUT - PANEL, 1.38-12	-	1
8	COUPLING - RELEIF VALVE STEM	-	1
9	LEVER - R.V. ON/OFF	-	1
10	PIN - DRIVE LOK, 0.125 x 0.750	-	1
11	NUT - PANEL VALVE, 1.250-12	-	1
12	DECAL - PRESSURE, HI/LO	-	1
13	PLATE - TRIM, REMOTE HEAD	-	1
14	HANDWHEEL	-	2
15	DECAL - PRESSURE RELIEF VALVE	-	1
16	SSS - 1/4-20 x 0.38, SST	-	3
17	SCREW - SPRING TENSION	-	1
18	HOUSING - PILOT VALVE	-	1
19	RETAINER - SPRING	-	2
20	SPRING - PRESSURE REGULATOR	-	1
21	NUT - PILOT VALVE	-	1
22	RING - HOUSING PILOT	-	1
23	DIAPHRAM - PIOLET HEAD	-	1
24	SHAFT - R.V. EXTENSION, 24"	-	1
25	BUSHING - RETAINER, PANEL	-	1
26	NUT - .750, CONDUIT	-	1
27	SSS - NO.10-24 x 0.19, GR5	-	1
28	COLLAR - SHAFT, 1/2" BORE	-	1
29	SSS - .313 x 0.31, GR5	-	1
30	COUPLING - RELIEF VALVE STEM	-	1
31	MICROSWITCH - OMRON	-	1
32	PIN - SPRING, 0.19 X 1.12	-	1
33	O-RING - 0.38 x 0.50 x 0.06	-	2
34	O-RING - 0.44 x 0.62 x 0.09	-	1
35	O-RING - 0.75 x 0.94 x 0.09	-	1
36	PLATE - SEAL, VALVE STEM	-	1
37	O-RING - 3.25 x 3.38 x 0.06	-	1
38	HEAD - RELIEF VALVE, REMOTE, 3"	-	1
39	STEM - RELIEF VALVE, 3"	-	1
40	PISTON - RELIEF VALVE, 3"	-	1
41	BODY - RELIEF VALVE, 3"	-	1
42	O-RING - 3.50 x 3.69 x 0.09	-	2
43	CENTER PLUG - PISTON SPRING	-	1
44	SPRING - PISTON	-	1
45	PIN - SPRING, 0.16 X 0.88	-	4
46	QUAD RING - 2.88 x 3.25 x 0.19	-	1
47	WASHER - 0.39 x 0.61 x .06 BR	-	1
48	STEM - RELIEF VALVE SWITCH	-	1
49	SHIM - SWITCH SPACER, 0.0125	-	1
50	PLUG - PIPE, 0.125, SST SOC HD	-	1
51	PIN - PILOT VALVE	-	1
52	BALL - CAM, 0.44"	-	1
53	HEAD - PILOT CONTROL	-	1
54	COVER - ON/OFF VALVE	-	1
55	O-RING - 1.12 x 1.25 x 0.06	-	1
56	PLUG - VALVE	-	1
57	O-RING - 0.50 x 0.69 x 0.09	-	1
58	PIN - SPRING, 0.12 X 0.62, SST	-	1
59	RHMS - NO.8-32 X 0.50, BR	-	4
61	BODY - FLUSH VALVE, COMPLETE	-	1
62	STEM - FLUSH VALVE	-	1
63	STRAINER - SCREEN	-	1
64	QUAD RING - 1.00 x 1.25 x 0.12	-	1
68	O-RING - 1.19 x 1.38 x 0.09	-	1
69	SEAT - FLUSH VALVE	-	1
71	TUBE FITTING - EL, .38 x .25	-	5
72	TUBE FITTING - STR, .38 cf x .25 MPTM	-	4
73	TUBE FITTING - STR, .38 cf x .12 MPTM	-	1
74	SHCS - .250-20 X 0.88, SST	-	4
75	SHCS - .313-18 x 0.75, GR8	-	8
76	WASHER - LOCK, NO.6 ID, SST	-	2
77	RHMS - NO.6-32 X1.00, BR	-	2
79	NUT - HEX, .375-16, GR2	-	8
81	HHCS - .375-16 x 2.25, GR5	-	8
82	FLANGE - ADAPTER, 3 NPT	-	2
83	RHMS - NO.10-24 X 0.75, GR5	-	3
86	WASHER - INT. TOOTH, 1.250 ID	-	1
88	BEARING - NYLINER, 0.50 ID	-	2
90	JOINT - UNIVERSAL, .500"	-	2
91	SHIM - SWITCH SPACER, 0.025	-	1
93	WASHER - LOCK, NO.10 ID, SST	-	3
95	CONNECTOR - DEUTCH DT 06-3S	-	1

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A	REVERSED LIGHT POSITIONS	12JUL07	2007-285	RJG
B	ADDED FLOW PATH VIEW	21NOV2007	2007-451	SMS



Ⓑ FLOW PATH THRU PILOT CONTROL VALVE

Ⓐ



EXTENSION SHAFT - PART #24 - TO BE CUT AND DRILLED AT TIME OF INSTALLATION

SHOWN WITH OPTIONAL 3" NPT FLANGES P.N. 1920503

DO NOT CONNECT A DI DRAIN TO A D2 DRAIN PORT ON MULTIPLE DRAIN VALVE
DRAIN MUST BE CLOSED DURING OPERATION

SEE DRAWING #DGC0112 FOR DETAILED LOCATION

REMOVE SHARP EDGES

INCH (MILLIMETER)

MODEL NAME	DWG CREATED	SHEET	
DGC0141	08JUN05	1/2	D

W.S. Darley & Co.
CHIPPEWA FALLS, WI - MELROSE PARK, IL

RELIEF VALVE

OLD PART NO.

MATERIAL DESCRIPTION:

MATERIAL NO. | PATTERN NO.

TOLERANCE EXCEPT AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

DR'N MAL
CHKD SJL
TRCD

DATE 13-Jun-05
SCALE 3/4

DGC0141

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

NAME:SMS OBJECT:DGC0141_1 DATE:28-Nov-07 08:10:07

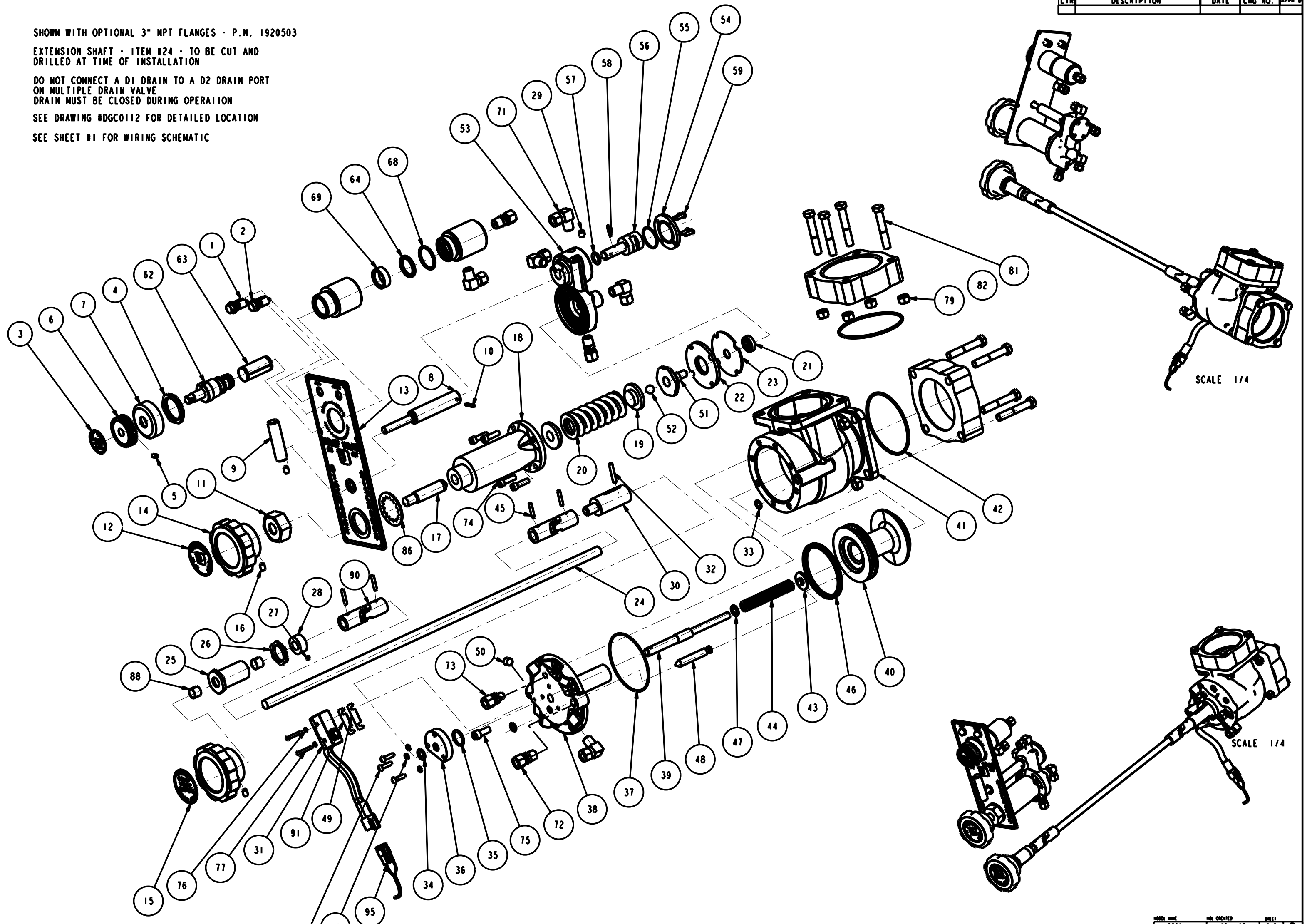
SHOWN WITH OPTIONAL 3" NPT FLANGES - P.N. 1920503

EXTENSION SHAFT - ITEM #24 - TO BE CUT AND
DRILLED AT TIME OF INSTALLATION

DO NOT CONNECT A D1 DRAIN TO A D2 DRAIN PORT
ON MULTIPLE DRAIN VALVE
DRAIN MUST BE CLOSED DURING OPERATION

SEE DRAWING #DGC0112 FOR DETAILED LOCATION

SEE SHEET #1 FOR WIRING SCHEMATIC



NO.	DESCRIPTION	PART NO.	QTY.
1	LIGHT - AMBER, 24V	-	1
2	LIGHT - GREEN, 24V	-	1
3	DECAL - FLUSH SCREEN	-	1
4	NUT - PANEL, FLUSH VALVE	-	1
5	SSS - NO.10-32 x 0.38, GR5	-	1
6	KNOB - FLUSH VALVE	-	1
7	NUT - PANEL, 1.38-12	-	1
8	COUPLING - RELEIF VALVE STEM	-	1
9	LEVER - R.V. ON/OFF	-	1
10	PIN - DRIVE LOK, 0.125 x 0.750	-	1
11	NUT - PANEL VALVE, 1.250-12	-	1
12	DECAL - PRESSURE, HI/LO	-	1
13	PLATE - TRIM, REMOTE HEAD	-	1
14	HANDWHEEL	-	2
15	DECAL - PRESSURE RELIEF VALVE	-	1
16	SSS - 1/4-20 x 0.38, SST	-	3
17	SCREW - SPRING TENSION	-	1
18	HOUSING - PILOT VALVE	-	1
19	RETAINER - SPRING	-	2
20	SPRING - PRESSURE REGULATOR	-	1
21	NUT - PILOT VALVE	-	1
22	RING - HOUSING PILOT	-	1
23	DIAPHRAM - PIOLET HEAD	-	1
24	SHAFT - R.V. EXTENSION, 24"	-	1
25	BUSHING - RETAINER, PANEL	-	1
26	NUT - .750, CONDUIT	-	1
27	SSS - NO.10-24 x 0.19, GR5	-	1
28	COLLAR - SHAFT, 1/2" BORE	-	1
29	SSS - .313 x 0.31, GR5	-	1
30	COUPLING - RELIEF VALVE STEM	-	1
31	MICROSWITCH - OMRON	-	1
32	PIN - SPRING, 0.19 x 1.12	-	1
33	O-RING - 0.38 x 0.50 x 0.06	-	2
34	O-RING - 0.44 x 0.62 x 0.09	-	1
35	O-RING - 0.75 x 0.94 x 0.09	-	1
36	PLATE - SEAL, VALVE STEM	-	1
37	O-RING - 3.25 x 3.38 x 0.06	-	1
38	HEAD - RELIEF VALVE, REMOTE, 3"	-	1
39	STEM - RELIEF VALVE, 3"	-	1
40	PISTON - RELIEF VALVE, 3"	-	1
41	BODY - RELIEF VALVE, 3"	-	1
42	O-RING - 3.50 x 3.69 x 0.09	-	2
43	CENTER PLUG - PISTON SPRING	-	1
44	SPRING - PISTON	-	1
45	PIN - SPRING, 0.16 x 0.88	-	4
46	QUAD RING - 2.88 x 3.25 x 0.19	-	1
47	WASHER - 0.39 x 0.61 x .06 BR	-	1
48	STEM - RELIEF VALVE SWITCH	-	1
49	SHIM - SWITCH SPACER, 0.0125	-	1
50	PLUG - PIPE, 0.125, SST SOC HD	-	1
51	PIN - PILOT VALVE	-	1
52	BALL - CAM, 0.44"	-	1
53	HEAD - PILOT CONTROL	-	1
54	COVER - ON/OFF VALVE	-	1
55	O-RING - 1.12 x 1.25 x 0.06	-	1
56	PLUG - VALVE	-	1
57	O-RING - 0.50 x 0.69 x 0.09	-	1
58	PIN - SPRING, 0.12 x 0.62, SST	-	1
59	RHMS - NO.8-32 x 0.50, BR	-	4
61	BODY - FLUSH VALVE, COMPLETE	-	1
62	STEM - FLUSH VALVE	-	1
63	STRAINER - SCREEN	-	1
64	QUAD RING - 1.00 x 1.25 x 0.12	-	1
68	O-RING - 1.19 x 1.38 x 0.09	-	1
69	SEAT - FLUSH VALVE	-	1
71	TUBE FITTING - EL, .38 x .25	-	5
72	TUBE FITTING - STR, .38 cf x .25 MPTM	-	4
73	TUBE FITTING - STR, .38 cf x .12 MPTM	-	1
74	SHCS - .250-20 x 0.88, SST	-	4
75	SHCS - .313-18 x 0.75, GR8	-	8
76	WASHER - LOCK, NO.6 ID, SST	-	2
77	RHMS - NO.6-32 x1.00, BR	-	2
79	NUT - HEX, .375-16, GR2	-	8
81	HHCS - .375-16 x 2.25, GR5	-	8
82	FLANGE - ADAPTER, 3 NPT	-	2
83	RHMS - NO.10-24 x 0.75, GR5	-	3
86	WASHER - INT. TOOTH, 1.250 ID	-	1
88	BEARING - NYLINER, 0.50 ID	-	2
90	JOINT - UNIVERSAL, .500"	-	2
91	SHIM - SWITCH SPACER, 0.025	-	1
93	WASHER - LOCK, NO.10 ID, SST	-	3
95	CONNECTOR - DUETCH DT 06-3S	-	1

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D

REMOVE SHARP EDGES

INCH (MILLIMETER)

MATERIAL DESCRIPTION:	MATERIAL NO.	PATTERN NO.	OLD PART NO.	TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED	ALL DIMENSIONS IN INCHES UNLESS NOTED	DO NOT SCALE PRINT		DR'N HAL / CHKD SJL / TRCD

W.S. Darley & Co.
CHIPPEWA FALLS, WI - MELROSE PARK, IL

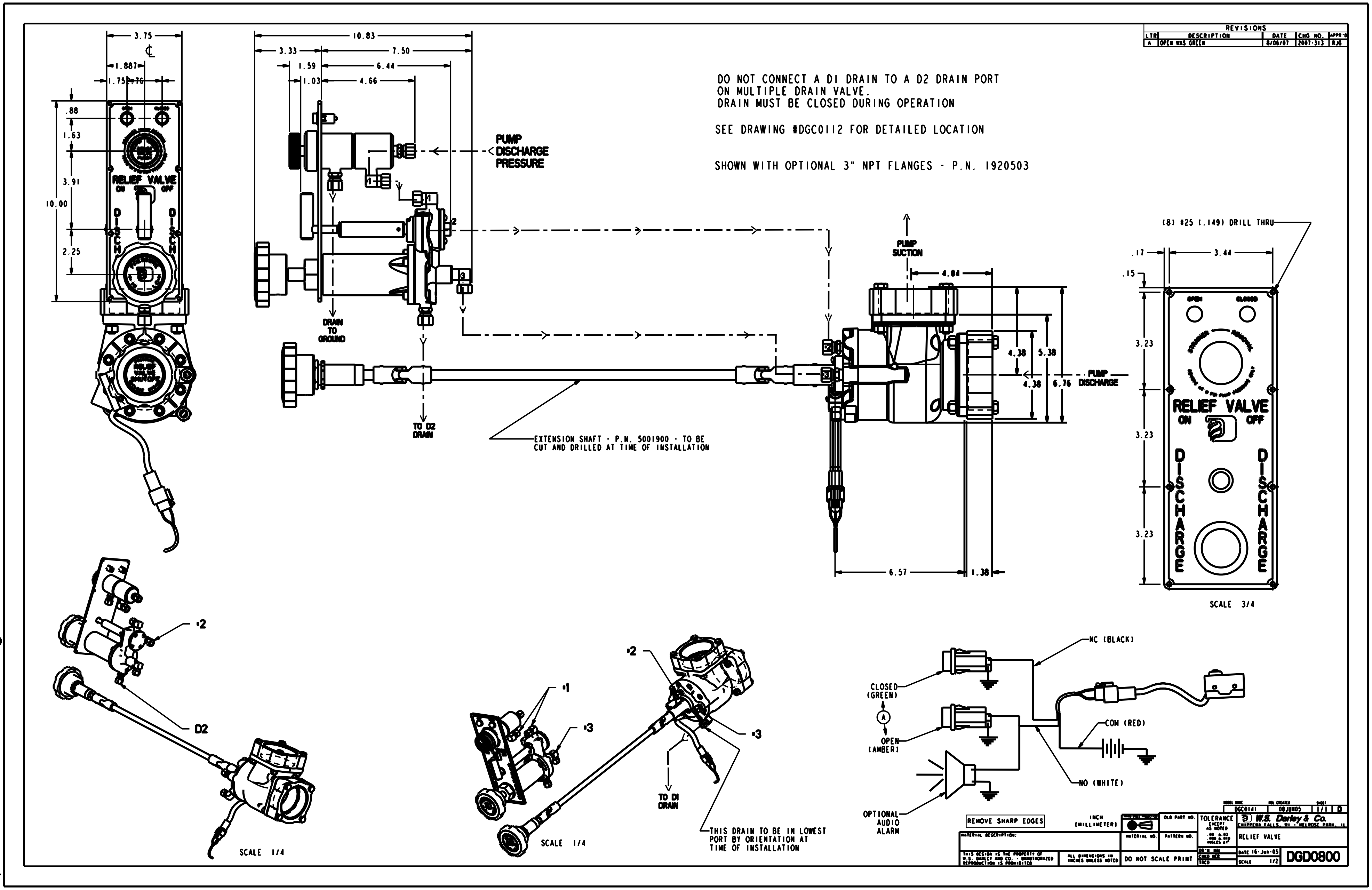
RELIEF VALVE

MODEL NAME	DATE CREATED	SHEET	
DGC0141	08JUN05	2/2	D

DATE 15-Jun-05
SCALE 3/4

DGC0141

NAME:SMS OBJECT:DGC0141_2 DATE:28-Nov-07 08:10:16



NAME:RG OBJECT:DGD0800 DATE:06-Aug-07 09:18:21

W.S. DARLEY & CO.

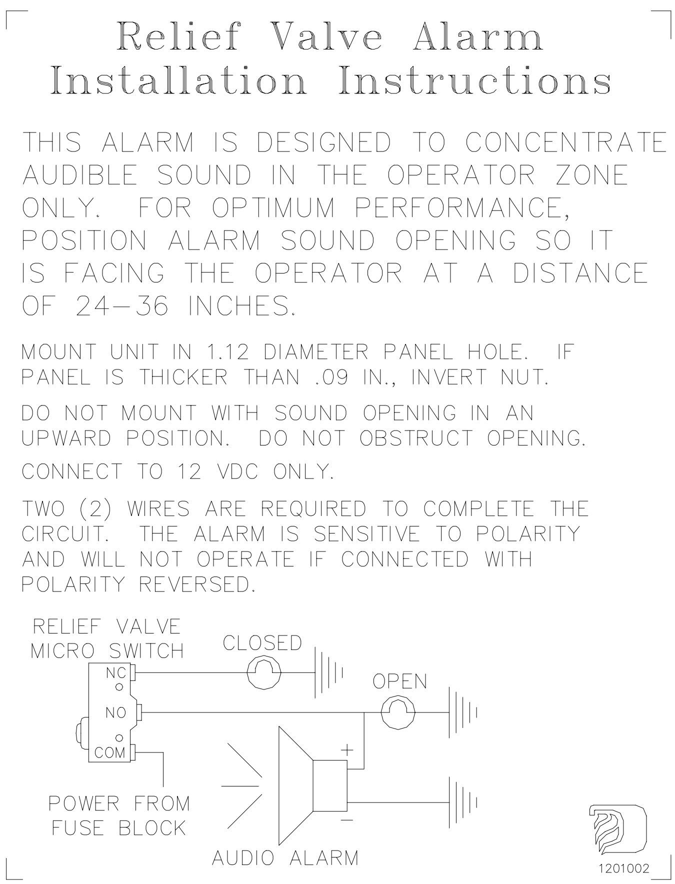
Relief Valve Alarm
Installation Instruction

This Alarm is designed to concentrate audible sound in the operator zone only. For optimum Performance, position alarm sound opening so it is facing the operator at a distance of 24 - 36 inches.

Mount unit in 1.12 diameter panel hole. If panel is thicker than .09 inches, invert nut.

Do not mount with sound opening in an upward position. Do not obstruct opening.

Connect to 12 VDC only.
Two (2) wires are required to complete the circuit. The alarm is sensitive to polarity and will not operate if connected with polarity reversed.



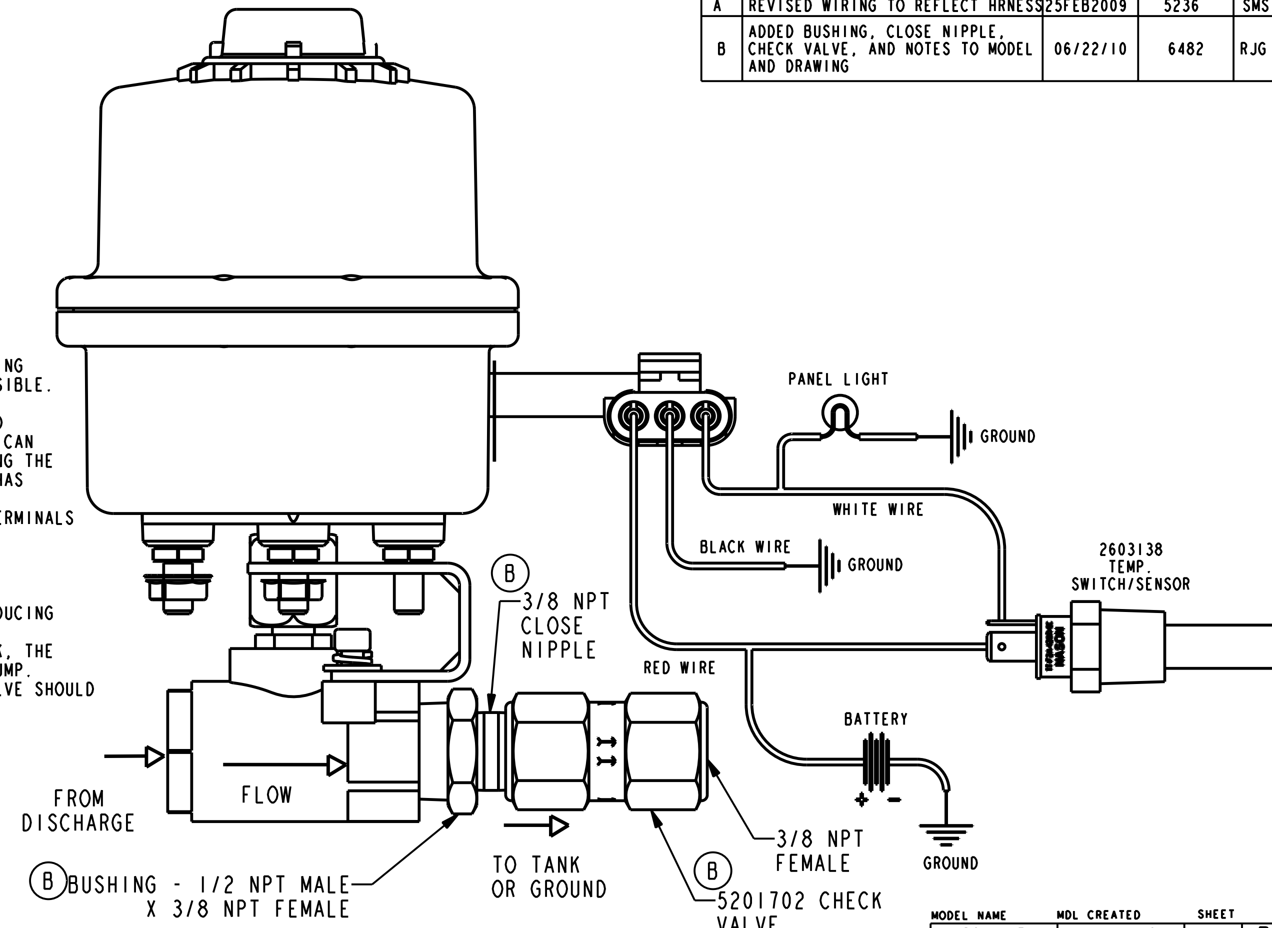
IF FURTHER INFORMATION IS NEEDED, CALL W.S. DARLEY & CO. AT CHIPPEWA FALLS, WI. AT 800-634-7812 or 715-726-2650

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A	REVISED WIRING TO REFLECT HRNESS	25FEB2009	5236	SMS
B	ADDED BUSHING, CLOSE NIPPLE, CHECK VALVE, AND NOTES TO MODEL AND DRAWING	06/22/10	6482	RJG

INSTALLATION INSTRUCTIONS:

1) INSTALL TEMPERATURE SWITCH ON SUCTION SIDE OF PUMP, AS NEAR TO IMPELLER AS POSSIBLE, PREFERABLY BETWEEN THE IMPELLER AND THE RELIEF VALVE.
2) INSTALL THE ACTUATOR VALVE ON THE DISCHARGE SIDE OF THE PUMP. ITS LOCATION IS NOT CRITICAL.* IT CAN BE MOUNTED DIRECTLY TO THE PUMP OR POSITIONED REMOTELY AND CONNECTED WITH A 3/8 OD MINIMUM LINE.
3) VALVE DOES NOT NEED TO BE MOUNTED VERTICALLY AS SHOWN.
4) *PLUMB THE VALVE OUTLET TO TANK , IF DESIRED, USING 3/8 OD MINIMUM LINE. KEEP ALL LINES AS SHORT AS POSSIBLE.
5) ATTACH ONE LEAD OF VALVE TO THE TERMINAL ON THE TEMPERATURE SWITCH. ATTACH THE OTHER LEAD TO A FUSED VOLATAGE SOURCE. IF DESIRED, THE TEMPERATURE SWITCH CAN ALSO BE USED TO CONTROL A LIGHT ON THE PANEL NOTIFYING THE OPERATOR THAT OVERHEATING IS OCCURRING AND THE UNIT HAS BEEN ACTIVATED.
6) TO TEST THE VALVE: WITH PUMP RUNNING, JUMP THE TERMINALS ON THE TEMPERATURE SWITCH. IF THE VALVE DOES NOT DISCHARGE, IT MAY BE INSTALLED BACKWARDS OR WIRING CONNECTIONS MAY BE INCORRECT.

* CONNECTION TO TANK MAY CAUSE TANK TO OVERHEAT, REDUCING THE EFFECTIVENESS OF THIS DEVICE.
TO PREVENT FREEZING DAMAGE, WHEN CONNECTING TO TANK, THE VALVE SHOULD BE MOUNTED ON THE TANK, BUT ABOVE THE PUMP.
IF THE VALVE IS TO DISCHARGE TO ATMOSPHERE, THE VALVE SHOULD BE MOUNTED ON, OR AS CLOSE TO THE PUMP AS POSSIBLE.



MODEL NAME	MDL CREATED	SHEET	
DGM0117	11/14/08	1/1	B

REMOVE SHARP EDGES

INCH [MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO.

TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°

W.S. Darley & Co. ITASCA, IL - CHIPPEWA FALLS, WI

DWG - THERMAL RELIEF SYSTEM KZCO VALVE, 2603138 TEMP. SENSOR

MATERIAL DESCRIPTION: -

MATERIAL NO. -

PATTERN NO. -

DR'N RJG
CHKD DWS
TRCD

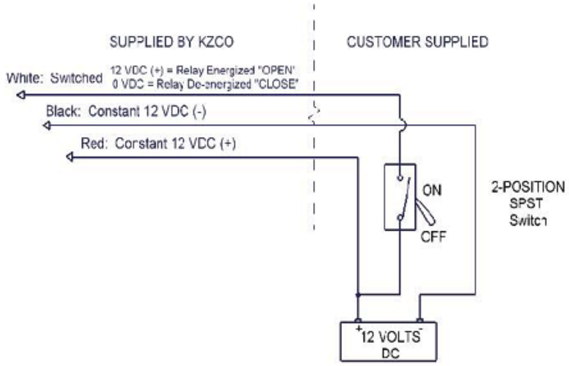
DATE 14-Nov-08
SCALE 1/1

DGM0117

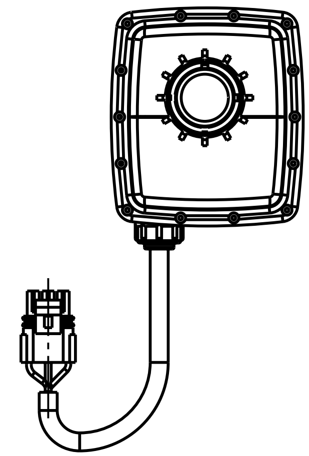
ALL DIMENSIONS IN INCHES UNLESS NOTED

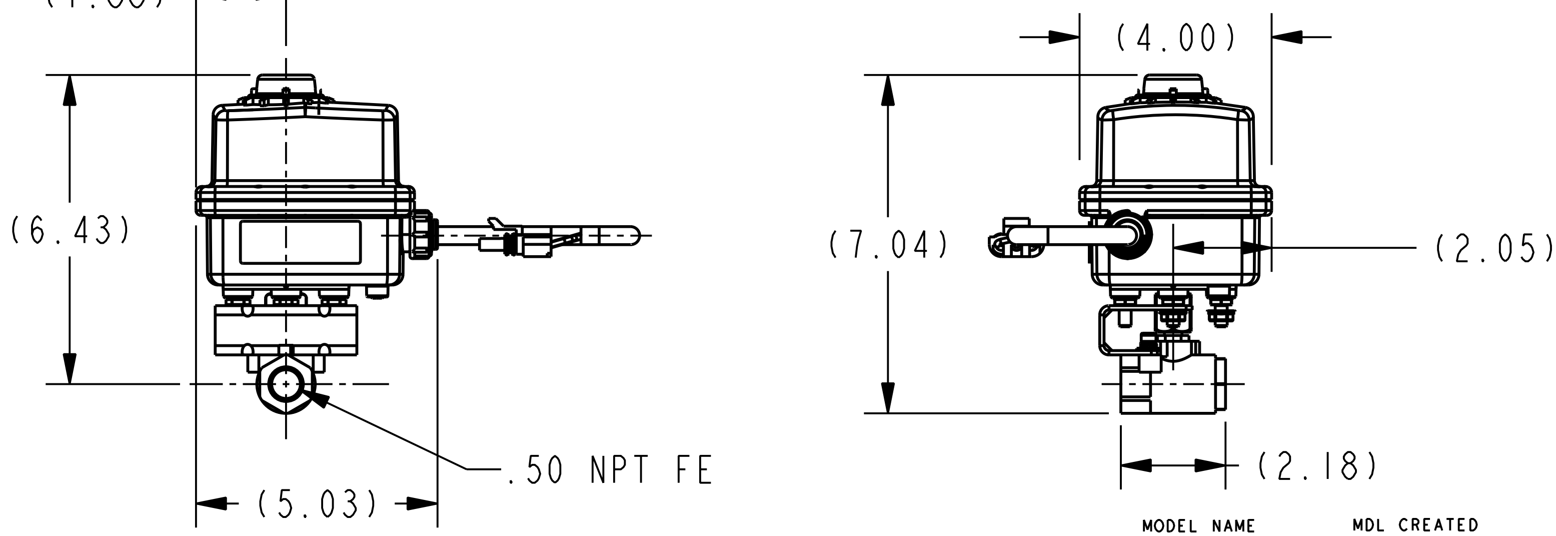
DO NOT SCALE PRINT

NAME:RJG OBJECT:DGM0117 DATE:22-Jun-10 14:41:12



REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D





MODEL NAME	MDL CREATED	SHEET	
5209401	11/13/08	1/2	A

REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

OLD PART NO.

TOLERANCE
EXCEPT
AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

MATERIAL DESCRIPTION:
KZCO 84D23-10D20-P01

MATERIAL NO. -

PATTERN NO. -

VALVE - ACTUATED, 12VDC, .50NPT FE
KZCO 84D23-10D20-P01

DR'N RJG
CHKD DWS
TRCD

DATE 13-Nov-08
SCALE 1/4

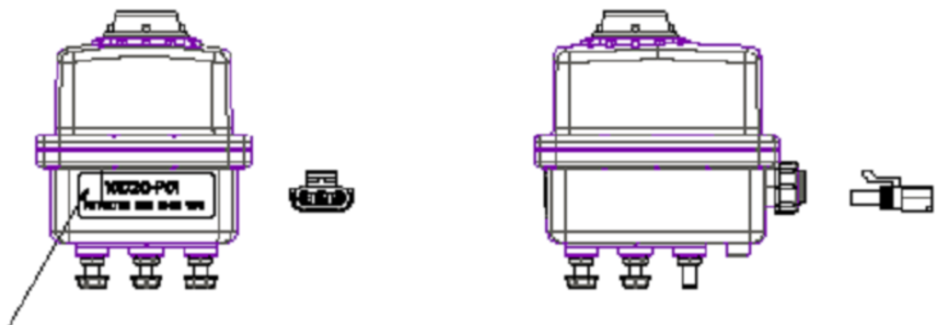
5209401

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

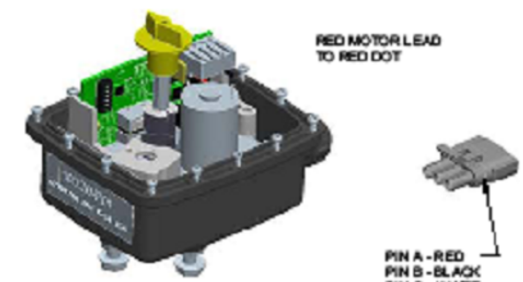
NAME:RJG OBJECT:5209401_1 DATE:17-Nov-08 11:49:17

REV/VER	REVISED BY	REVISION DATE	REVISION BY
-.2+		7/15/2008 9:41:57 AM	bgotschall



INPUT/OUTPUT
POWER = 12/24 VDC
1 - BLACK - POWER (-) NEGATIVE
2 - RED - POWER (+) POSITIVE
3 - WHITE - SIGNAL 1 (+) POSITIVE TO OPEN
4 - ***

DIP SX 4 'ON'



SCALE .500

PROGRAM NOTE:

MAS90 SET DATA
CONTROL INPUT = 1
FEEDBACK = 0
OPERATION = 0
MOTOR = M2
SPEED CT = 0.8
ZEROSET = 135
RANGE TOLERANCE = 1
ROTATION = CC092
ACTUATOR RANGE = 0.00-0.00
DESIGN VOLTAGE = E
DIP SX = 3
LABEL = KZCO
OPTIONS = 0
PLUG TYPE = P
TEST PLUG =

ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
21	1	EH-502	LABEL, EH ACTUATOR, 2.5" X 1", THERMAL TRANSFER, WHITE	NO_MATERIAL
20	1	800018	HARNESS, 89A,3ST, WP3T,22.5"	
19	1	EH3-115-Y	FLAG, YELLOW	POLYPROPYLENE_TALC_20
18	1	399-0029	PCB ASSY, EH3 L1 SOLID STATE 12 VDC	
17	1	100401	GEAR MOTOR, M2 18 RPM/MOLON	NO_MATERIAL
16	3	QX-222	NUT, HEX HEAD, SERRATED FLANGE, .250-20 UNC-2B	STAINLESS_STEEL_TYPE_303
15	4	EH3-135	STUD, 1/4-20 X 1/2 MTG	STAINLESS_STEEL_TYPE_303
14	1	EH-104	RETAINER, PUSH-ON 5/16" SHAFT	STAINLESS_STEEL_TYPE_18-8
13	1	499-0100	CAM ASSY, EXTD LOBE FOR EH2/5 E-OPT	
12	1	EH-502	LABEL, EH ACTUATOR, 2.5" X 1", THERMAL TRANSFER, WHITE	NO_MATERIAL
11	1	EH-130	O-RING, DOME	SILICONE_RED_55_DUROMETER
10	1	EH3-114	DOME, CLEAR	POLYCARBONATE,
9	14	EHPT-1103	SCREW, PAN, PHILLIPS, HIGH-LOW, 5-20 X .562	STAINLESS_STEEL_TYPE_410
8	1	EH3-1001-N	LID, CASE, EH3, DOME	NYLON_DPC_6N33-L_BLACK
7	4	EH3-139	SCREW, 8-32 X 1.25 PPHMS SS	STAINLESS_STEEL_TYPE_18-8
6	1	EH-157	SCREW, 8-18 x 3/8" TSB PPH SS	STAINLESS_STEEL_TYPE_18-8
5	1	EH3-1030	O-RING, EH3, CASE I.D., #120	SILICONE_RED_55_DUROMETER
4	1	EH-139	O-RING, #008, PRESSURE TEST PORT	FLUOROCARBON_BLACK_75_DUROMETER
3	1	EHPT-140	O-RING, #112, MOTOR SHAFT, VITON	FLUOROCARBON_BLACK_75_DUROMETER
2	1	EH3-1003-N	LOWER CASE - EH3 INTERNAL MTG	NYLON_DPC_6N33-L_BLACK
1	1	498-0002	CASE KIT, EH3 IM DOME NYLON M2 MTR	

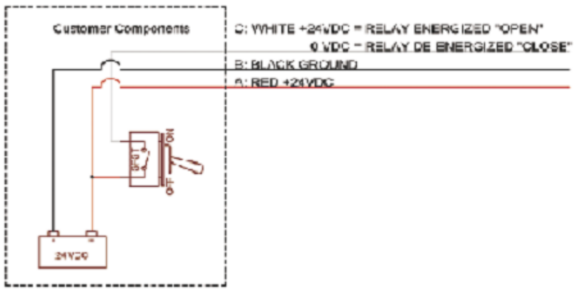
DATE	2008-05-29
DESIGNED	L. ERDKAMP
DRAWN	W. FEDDE
APPROVED	A. KOTTAS
SCALE	.500
SIZE	B
MATERIAL	

KZCO Inc.

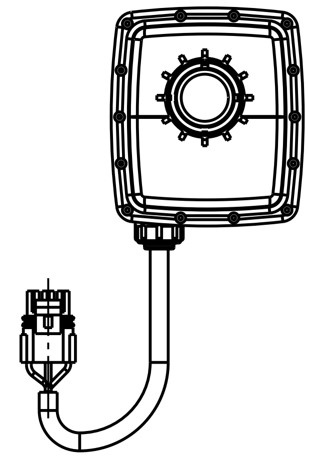
TITLE	ACTUATOR, EH3, SOLID STATE
REF.	
PART NO.	10020-P01
REVISION	-2+
DRAWING NO.	10020-P01
SHEET	1 OF 1

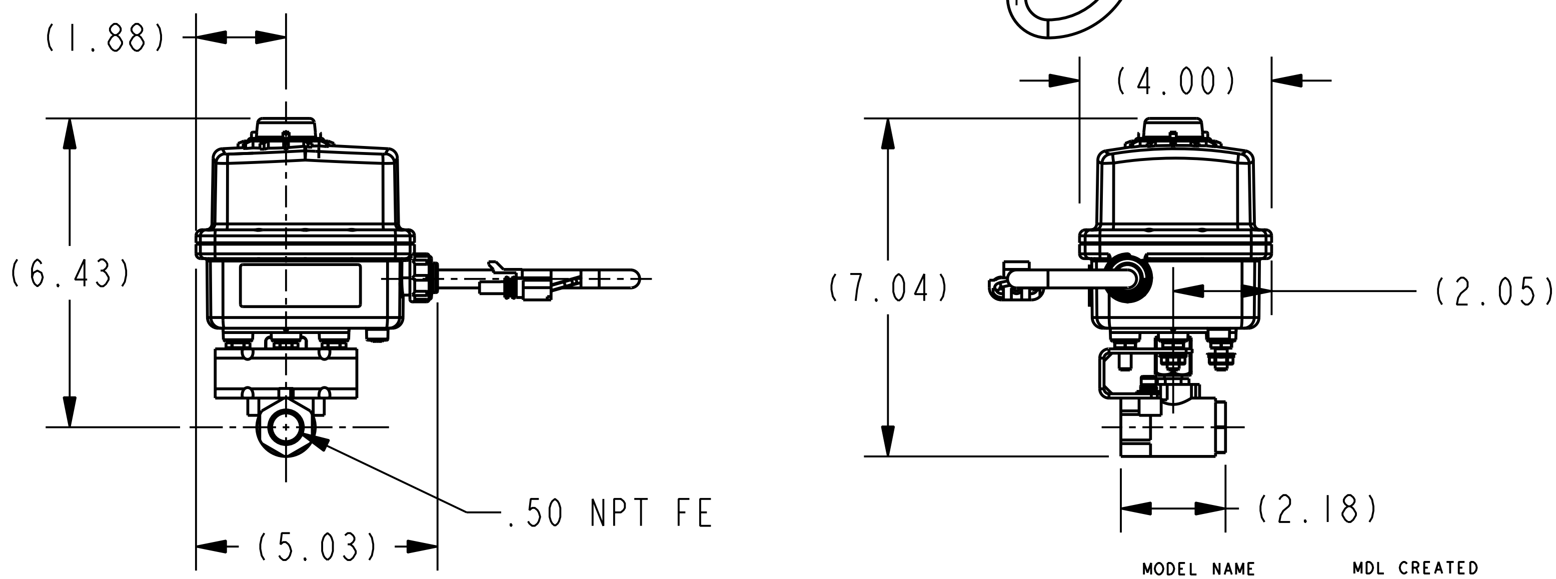
NAME:RJG OBJECT:5209401_2 DATE:17-Nov-08 11:49:19

60AD WIRING
Standard On/Off applications, SPST Switch
24 VDC



REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D





MODEL NAME	MDL CREATED	SHEET	
5209402	11/13/08	1/3	A

REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

MATERIAL DESCRIPTION: KZCO 84D23-60AD-M	MATERIAL NO. -	PATTERN NO. -	OLD PART NO.	
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED	ALL DIMENSIONS IN INCHES UNLESS NOTED	DO NOT SCALE PRINT		

TOLERANCE EXCEPT AS NOTED
.00 ±.03
.000 ±.010
ANGLES ±1°

DR'N	RJG
CHKD	DWS
TRCD	

W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI

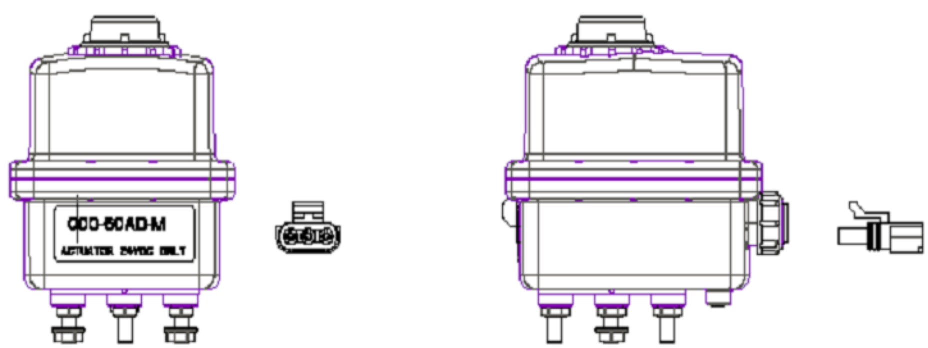
VALVE - ACTUATED, 24VDC, .50NPT FE
KZCO 84D23-60AD-M

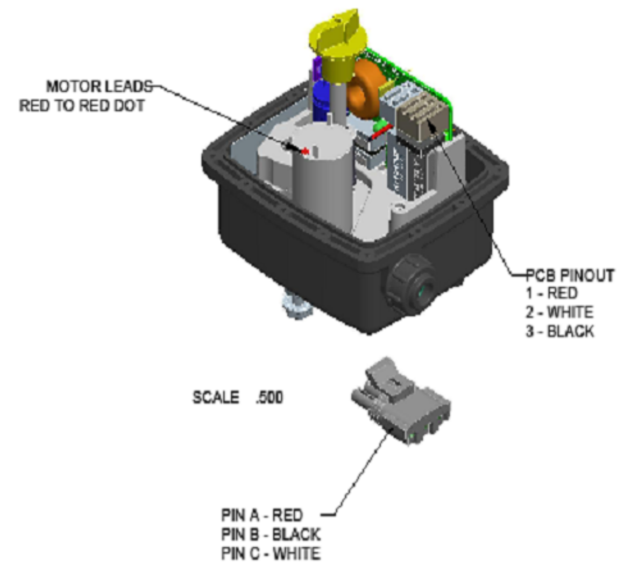
DATE 13-Nov-08
SCALE 1/4

5209402

NAME:RJG OBJECT:5209402_1 DATE:19-Nov-08 13:40:10

REV/VER	REVISION ECO	REVISION/VERSION DATE	REVISION/VERSION BY
*** .1		3/28/2008 1:49:38 PM	wfedde





MAS90 SET DATA
CONTROL INPUT = 1
FEEDBACK = 0
OPERATION = 0
MOTOR = M
SPEED CT = 0.8
ZEROSET = 135
RANGE TOLERANCE = 1
ROTATION = CC091
ACTUATOR RANGE = 0.00/0.00
DESIGN VOLTAGE = D
DIP SX =
LABEL = KZCO
OPTIONS = 0
PLUG TYPE =
TEST PLUG =

DET	QTY	PART NUMBER	DESCRIPTION	MATERIAL
8	1	EH-502	LABEL, EH ACTUATOR, 2.5" X 1", THERMAL TRANSFER, WHITE	NO_MATERIAL
7	2	QX-222	NUT, HEX HEAD, SERRATED FLANGE, .250-20 UNC-2B	STAINLESS_STEEL,TYPE_303
6	4	EH3-135	STUD, 1/4-20 X 1/2 MTG	STAINLESS_STEEL,TYPE_303
5	1	800018	HARNESS, 60A,3ST, WP3T,22.5"	
4	1	EH3-115-Y	FLAG, YELLOW	POLYPROPYLENE_TALC_20
3	1	800488	PCB ASSY, EH3 24VDC 60AD/60DF	
2	1	EH3-110	GEAR MOTOR, EH3 SERIES M1 18 RPM @ 12VDC	
1	1	498-0005	CASE KIT, EH3 IM DOME NYLON M1 & N1 MTR	

-STANDARD TOLERANCES-
-ALL DIMENSIONS IN INCHES [mm]-
X± .1 .XX± .01 .XXX± .005 XX°±1°
TOTAL RUNOUT: .005 FIM
CORNER BREAK: .001/.010
SURFACE FINISH: 125μIN
DENSITY: .047 LBM/CU IN
MASS: .562 LBM
SURF AREA: 163.793 SQ IN
VOLUME: 12.043 CU IN

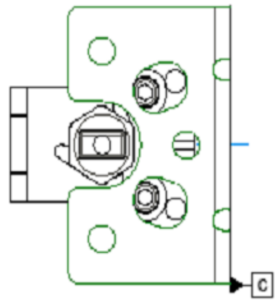
DATE: 2007-04-16
DESIGNED: L. ERDKAMP
DRAWN: W. FEDDE
APPROVED: A. KOTTAS
SCALE: .500 SIZE: B
MATERIAL:

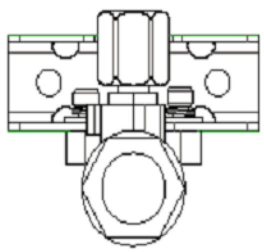
KZCO inc.
23360 KZ PARKWAY
GREENWOOD, NE 68366 USA
PHONE: +1.402.944.2767
FAX: +1.402.944.2402

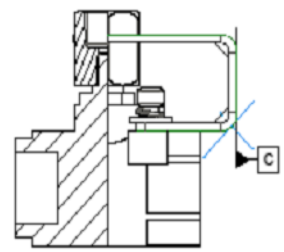
TITLE: ACTUATOR, EH3, .8S @24VDC
REF:
PART NO: 000-60AD-M
REV/VER: *** .1
DRAWING NO: 000-60AD-M
SHEET: 1 OF 1

NAME:RJG OBJECT:5209402_2 DATE:19-Nov-08 13:40:13

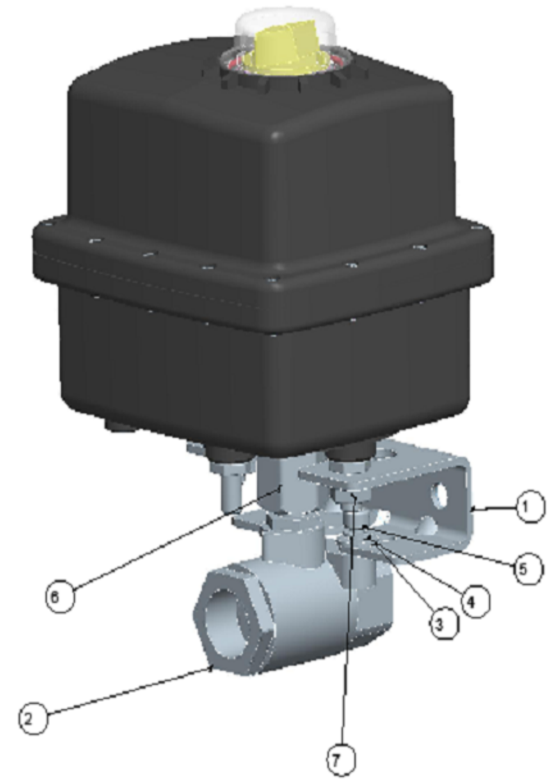
REVIWER	REVISION ECO	REVISION/VERSION DATE	REVISION/VERSION BY
-.6+		8/12/2008 9:18:50 AM	bgotschall







SECTION A-A



ACTUATOR SHOWN IS REPRESENTITVE USED
ONLY TO SHOW PROPER ORIENTATION TO VALVE.

DET	QTY	PART NUMBER	DESCRIPTION	MATERIAL
7	3	QX-222	NUT, HEX HEAD, SERRATED FLANGE, .250-20 UNC-2B	STAINLESS_STEEL_TYPE_303
6	1	EH-145	COUPLER, 1/4" ~ 1/2" APOLLO	STAINLESS_STEEL_TYPE_316
5	2	EH-158	SCREW, #10-24 X 3/8" SS SOCKET HEAD	STAINLESS_STEEL_TYPE_303_OR_316
4	2	EHPT-109	WASHER, LOCK, .197 ID X .334 OD X .047 T	STAINLESS_STEEL_TYPE_316
3	2	EHPT-150	WASHER, FLAT, #10 18-8 SS	STAINLESS_STEEL_TYPE_316
2	1	EH3-84D	VALVE, 1/2" 2-WAY APOLLO 70-103-01 BRONZE BALL VALVE	BRONZE
1	1	EH3-174	BRACKET, MOUNTING EH3 SERIES	STAINLESS_STEEL_TYPE_304

-STANDARD TOLERANCES-
-ALL DIMENSIONS IN INCHES [mm]-
X±.1
.XX±.01
.XXX±.005
XX°±1°
TOTAL RUNOUT: .005 FIM
CORNER BREAK: .001/.010
SURFACE FINISH: 125µIN
DENSITY: .258 LBM/CU IN
MASS: 3.134 LBM
SURF AREA: 142.873 SQ IN
VOLUME: 12.142 CU IN

DATE: 2007-06-08
DESIGNED: L. ERDKAMP
DRAWN: C. HOWARD
APPROVED: L.ERDKAMP
SCALE: .750 SIZE: B
MATERIAL: AS NOTED

KZCO inc.
23800 KZ PARKWAY
GREENWOOD, NE 68366 USA
PHONE: +1.402.944.2767
FAX: +1.402.944.2402

TITLE: VALVE KIT, EH3 OFFSET MTG 1/2" 2-PC BRZ
REF:
PART NO: 84D23 REVIWER: -.6+
DRAWING NO: 84D23 SHEET: 1 OF 1

CREATED BY: bgotschall CREATED ON: 8/12/2008 9:18:50 AM REV: - VER:6+ REL: Revision LOCATION: Root Folder/Engineering/Parts BRANCH: main

NAME:RJG OBJECT:5209402_3 DATE:19-Nov-08 13:40:18