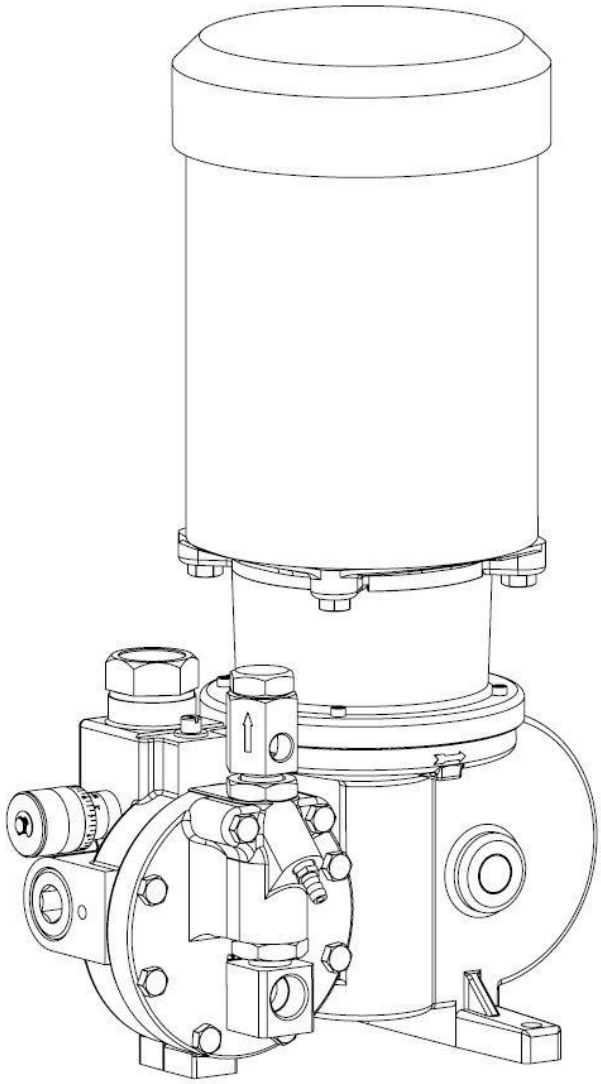
MILTON ROY®

an Accudyne Industries brand



mROY® A & B

Metering Pump IOM Manual

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Original Version

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PRECAUTIONS

The following precautions should be taken when working with metering pumps.
Please read this section carefully prior to installation.

Protective Clothing

ALWAYS wear OSHA approved protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on the solution being pumped. Refer to Safety Data Sheets (SDS) for the solution being pumped.

Hearing Protection

It is recommended that hearing protection be used if the pump is in an environment where the time weighted average sound level (TWA) of 85 dbA is exceeded.

Electrical Safety (Lock-out / Tag-out)

- Remove power and ensure that it remains off while maintaining pump.
- DO NOT FORGET TO CONNECT THE PUMP TO EARTH
- Electric protection of the motor (Thermal protection or by means of fuses) is to correspond to the rated current indicated on the motor data plate.

Liquid Compatibility

Verify if the materials of construction of the wetted components of your pump are recommended for the solution (chemical) to be pumped.

Pumps Water "Primed"

All pumps are tested with water at the factory. If your process solution is not approved with water, flush the Pump Head Assembly with an appropriate solution before introducing the process solution.

Plumbing and Electrical Connections

Always adhere to your local plumbing and electrical codes.

Line Depressurization

To reduce the risk of chemical contact during disassembly or maintenance, the suction and discharge lines should be depressurized before servicing.

Over Pressure Protection

To ensure safe operation of the system it is recommended that some type of safety/pressure relief valve be installed to protect the piping and other system components from damage due to over-pressure.

Lifting

This manual should be used as a guide only - Follow your company's recommended lifting procedures. It is not intended to replace or take precedence over recommendations, policies and procedures judged as safe due to the local environment than what is contained herein. Use lifting equipment that is rated for the weight of the equipment to be lifted.

The personnel responsible for installing, operating and maintaining this equipment must become acquainted with, assimilate and comply with the contents of this manual in order to:

• Avoid any possible risk to themselves or to third parties,

• Ensure the reliability of the equipment,

• Avoid any error or pollution due to incorrect operation.

Any servicing on this equipment must be carried out when it is stopped. Any accidental startup must be prevented (either by locking the switch or removing the fuse on the power supply line).

A notice must be attached to the location of the switch to warn that servicing is being carried out on the equipment.

During oil changing operations, the waste oil must be collected in a suitable receptacle. Any overflow of oil which may result must be removed using a degreasing agent suitable for the operating conditions.

Soiled cleaning cloths must be stored in suitable receptacles. The oil, degreasing agent and cleaning cloths must be stored in accordance with the rules on pollution.

Switch off the power supply as soon as any fault is detected during operation, such as over heating or unusual noise.

Special care has to be taken for chemicals used in the process (acids, bases, oxiding/reducing solutions, etc).

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SECTION 1 - GENERAL DESCRIPTION

1.1 INTRODUCTION

The mRoy pump is a highly reliable controlled volume pump of hydraulically actuated diaphragm design. The family of MRA & MRB frame pumps are further broken down into Model Codes. For ease of discussion, this manual will refer to either frame size as MRA and MRB rather than the specific Model Code.The product codes for the MRA & MRB are given in Figures 3 and 4. Historical Model Codes prior to 1995 found in Appendix A.

1.2 GENERAL INFORMATION

Pump capacity is adjustable while the pump is running or stopped. Capacity adjustment can be made manually or automatically by a signal from remote control instruments.

Repetitive accuracy of the metered discharge volume is maintained within a ±1% range at constant conditions of pressure, temperature and pump capacity adjustment setting.

The mRoy pump is a reliable, compact, controlled volume diaphragm pump for normal corrosive or toxic chemicals and light slurries with viscosities up to 200 S.S.U. (40 CPS). For higher viscosities, the mRoy ”V” option available to 12,200 CPS.

A plunger, reciprocating at a fixed stroke, displaces a fixed volume of hydraulic liquid, which actuates a flexible, chemically inert PTFE diaphragm to create pumping action. Double ball check valves are used on the suction and discharge to insure consistent metering accuracy. Capacity control is established by adjusting the volume of hydraulic liquid, which bypasses the diaphragm cavity.

Metering with repetitive accuracy is possible only if the volume of the hydraulic oil in the displacement chamber is maintained constant for each stroke. This is accomplished by mechanically opening the displacement chamber to the oil reservoir for a short period at the end of every suction stroke and the beginning of each pressure stroke. During this period air or vapor is bled from the system, lost oil is replenished, and allowances are made for the expansion or contraction of the oil due to temperature change. For more information, refer to Principle of Operation.

1.3 PUMP CHARACTERISTICS

For a general description of the mRoy pump you have purchased, compare the model number and product code printed on the pump’s data plate shown in Figure 3 to the appropriate model number and product code shown in Figures 4 through 6 and Figure 13.

1.4 PUMP PERFORMANCE

The charts in Figures 8 through 10 show the performance ranges for all mRoy A & B pumps. If appropriate, refer also to the derating table shown in Figure 11.

1.5 PRINCIPLE OF OPERATION

Pumping action is developed and controlled by four basic components as follows (Figures 1 & 2)

1. The pump plunger “A” reciprocates with a constant stroke length and displaces oil into and out of the diaphragm chamber “C”.
2. The flexible diaphragm “X” is a movable partition between the plunger oil and liquid being pumped.
3. An oil bypass circuit from the diaphragm chamber “C” to the reservoir “D” through passage “E” bypass port “H” and control spool valve “F.”
4. A bypass control plunger “G” which moves with and is directly coupled to the pump plunger to correlate bypass shut off at port “H” to pump plunger position.

In operation, as the pump plunger and bypass control plunger move forward as shown in Figure 1, the displaced oil is bypassed to the oil reservoir until the control plunger “G” closes the

bypass port “H” as shown in Figure 2. Then the balance of the plunger displacement is imposed on the flexible diaphragm that moves and displaces the liquid being pumped through the discharge ball checks.

On the suction stroke, the pump plunger pulls oil out of the diaphragm cavity, which moves the flexible diaphragm and pulls liquid through the suction ball checks. When the control plunger “G” opens the bypass port “H” the balance of the plunger oil displacement can be supplied from the reservoir through the bypass passages. The discharge capacity is adjusted from 0–100% by rotating the adjustment knob that moves the control spool valve “F” so that the bypass port “H” is closed at the desired percentage of the total plunger stroke. When the control spool valve is adjusted to 100% capacity, the bypass port will be positioned so that it is opened at the very end of the suction stroke. Then on the pressure stroke, the bypass port is immediately closed so the entire plunger displacement is imposed upon the flexible diaphragm.

With the control spool valve adjusted for 50% capacity, the bypass port will be positioned so that it is opened when the plungers have completed one-half of the suction stroke. On the next pressure stroke, the oil displaced by the pump plunger will be bypassed through the open port to the reservoir for the first 50% of the stroke, before the by-pass port is closed by the control plunger. The remaining 50% of the plunger displacement will then be imposed on the flexible diaphragm so that liquid is discharged for only 50% of the plunger travel. A similar analysis would apply for 0% capacity setting on the control spool valve where all the plunger oil displacement is bypassed to the reservoir.

1.6 GENERAL SPECIFICATIONS

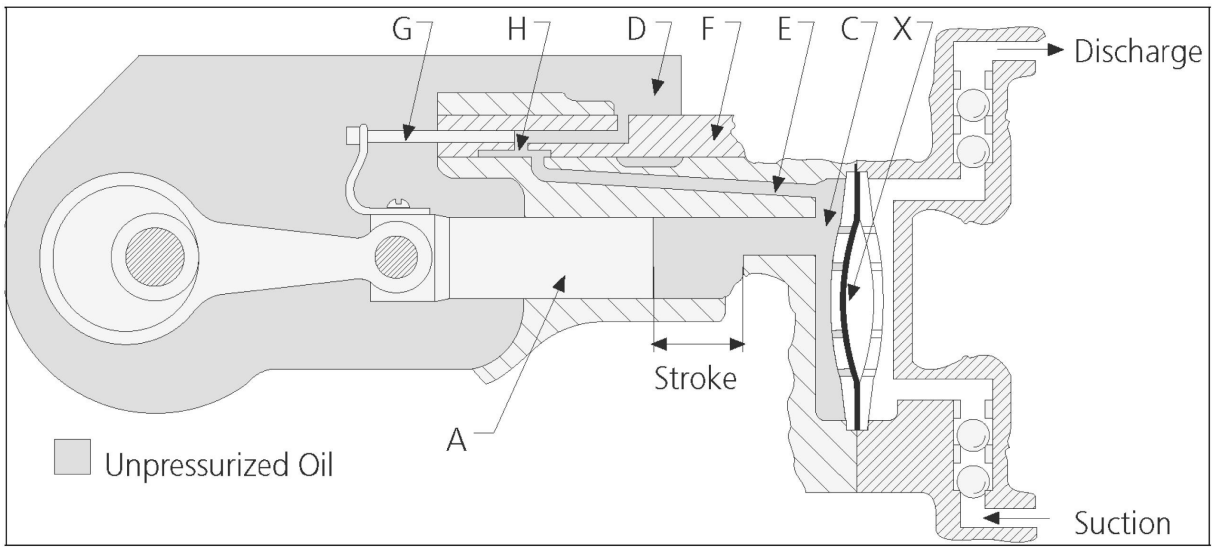


Figure 1. Pump Operation With By-Pass Port Open

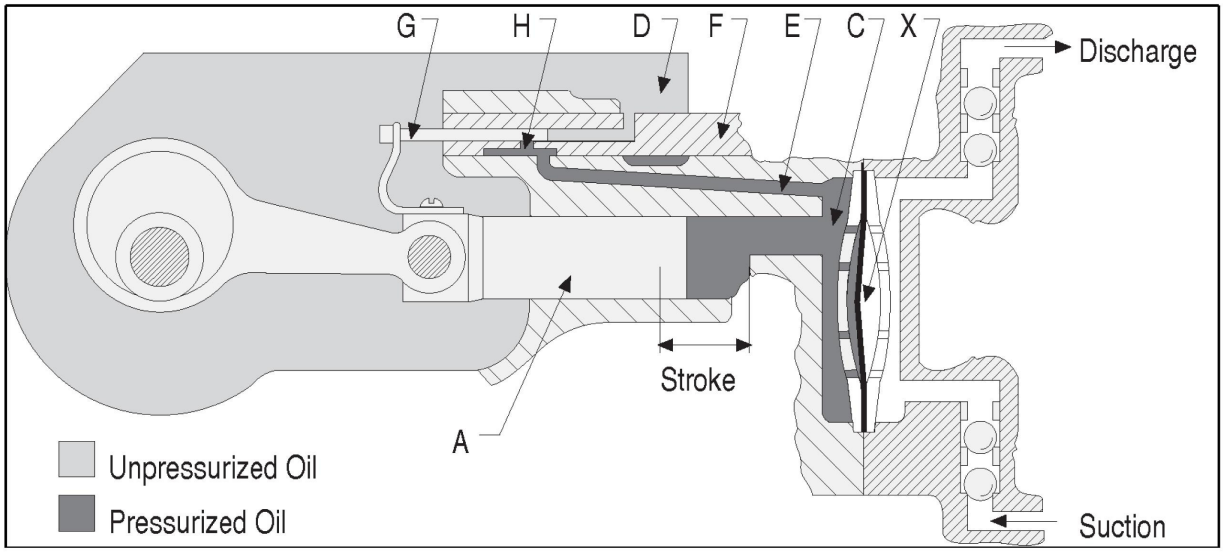


Figure 2. Pump Operation With By-Pass Port Closed

Accuracy

±1% steady state accuracy over 10:1 turndown

Drive

Hydraulic bypass design allows adjustment from 0 to 100% of rated capacity while stopped or running

Liquid End

High performance check valves

Diaphragm

Hydraulically actuated Diaphragm provides 96000 hours of long life in comparison with Mechanically actuated Diaphragm (15000 to 20000 hours).

Relief Valve

Adjustable internal relief valve

Capacity Control

Micrometer .....standard

Electronic .....4–20 mA

Pneumatic .....3–15 psi

Stroke Length

Models mRoy C, D, E, F..... 0.7” (1.78 cm)

Models mRoy K, L, R ..... 1.5” (3.81 cm)

What key features drive product sizing	Features that drive every build

Standard mRoy A & B Pump Model Code

MRA	1	1	C	48	A1	A	N	N	V	N	N	N
	10	20	30	40	50	60	70	80	90	100	110	120
End Item	# Heads	Mat'l	Plg Dia	Gear Ratio	Motor	Motor mount	Suction Conn	Dischrge Conn	O Ring Material	Cap Control	Dia Rupture Detect	Base
MRA	1	Dup L/R	Dup L/R	77		C - CC						N
MRB	2	A-B	A-B	48		A - API						Y
				38		M* - META						V (VSD)
				25								
				24								
				19								
				15								
				12.5								
				9.5								
				8								

Mat'l	
1	316L SS
2	PVC
5	Alloy 20
6	Hast C
7	PVDF
8	Fluoride

Plg Dia	
C	3/8" (9.5 mm)
D	7/16" (11.1 mm)
E	5/8" (15.9 mm)
F	1 1/16" (27 mm)
K	**19/32" (15.1 mm)**
L	**7/8 " (22.2 mm)**
R	**1 7/16" (36.5 mm)**

Motor Mount Only - Special motor	
S5	NEMA 56C
S1	NEMA 143TC/145TC
S7	IEC 71
S8	IEC 80
S9	IEC 90

Connections	
Threaded - metal	
P	NPT
H	BSPP - Horizontal
V	BSPP - Vertical (discharge only)
Threaded - plastic	
P	NPT
4	BSPP
Flanged - Metal	
A	ANSI 1/2 Class 150 RF Thd
B	ANSI 1/2 Class 300 RF Thd
C	ANSI 1/2 Class 600 RF Thd
D	ANSI 1/2 Class 150 RF Skt wld
E	ANSI 1/2 Class 300 RF Skt wld
F	ANSI 1/2 Class 600 RF Skt wld
G	ANSI 1/2 Class 150 RF/ SF Weld Neck
J	ANSI 1/2 Class 300 RF / SF Weld Neck
K	ANSI 1/2 Class 600 RF / SF Weld Neck
L	ANSI 1/2 Class 1500 RF / SF Weld Neck
M	EN 1759-1 DN15 Class150 TYPE B1 / 11
N	EN 1092-1 DN15 PN40 TYPE B1 / 11
Q	EN 1759-1 DN15 Class300 TYPE B1 / 11
R	EN 1759-1 DN15 Class600 TYPE B1 / 11
S	EN 1759-1 DN15 Class1500 TYPE B1 / 11
Flanged - Plastic	
1	ANSI 1/2 Class 150 RF Thd
2	ANSI 1/2 class 150 Plastic Slvnt wld

Capacity Control	
N	Aluminum (std)
S	Stainless Steel
L	SS Locking (API)
A	ECC NEMA 4 115V
B	ECC NEMA 4 220V
F	ECC Ex Prf 115V
G	ECC Ex Prf 220V
M	ECC Mount Only
P	Pneumatic
3	Rotork NEMA 4 w/ com
4	Rotork XP w/ com
C	ECC NEMA 4 115V - Asia
D	ECC NEMA 4 220V - Asia

O Ring Options	
N	Standard
E	EPDM
T	Teflex

Diaphragm Rupture Detection	
N	None
3	Pressure type w/gauge only
4	Pressure type w/gauge & NEMA 4 Switch
5	Pressure type w/gauge & Ex Prf Switch
6	Double Dia with intermed fluid no probe
7	Double Dia w/ intermed fluid & conduct probe
9	Pressure type w/pressure transmitter

Figure 3. Global MRA/MRB Model Code

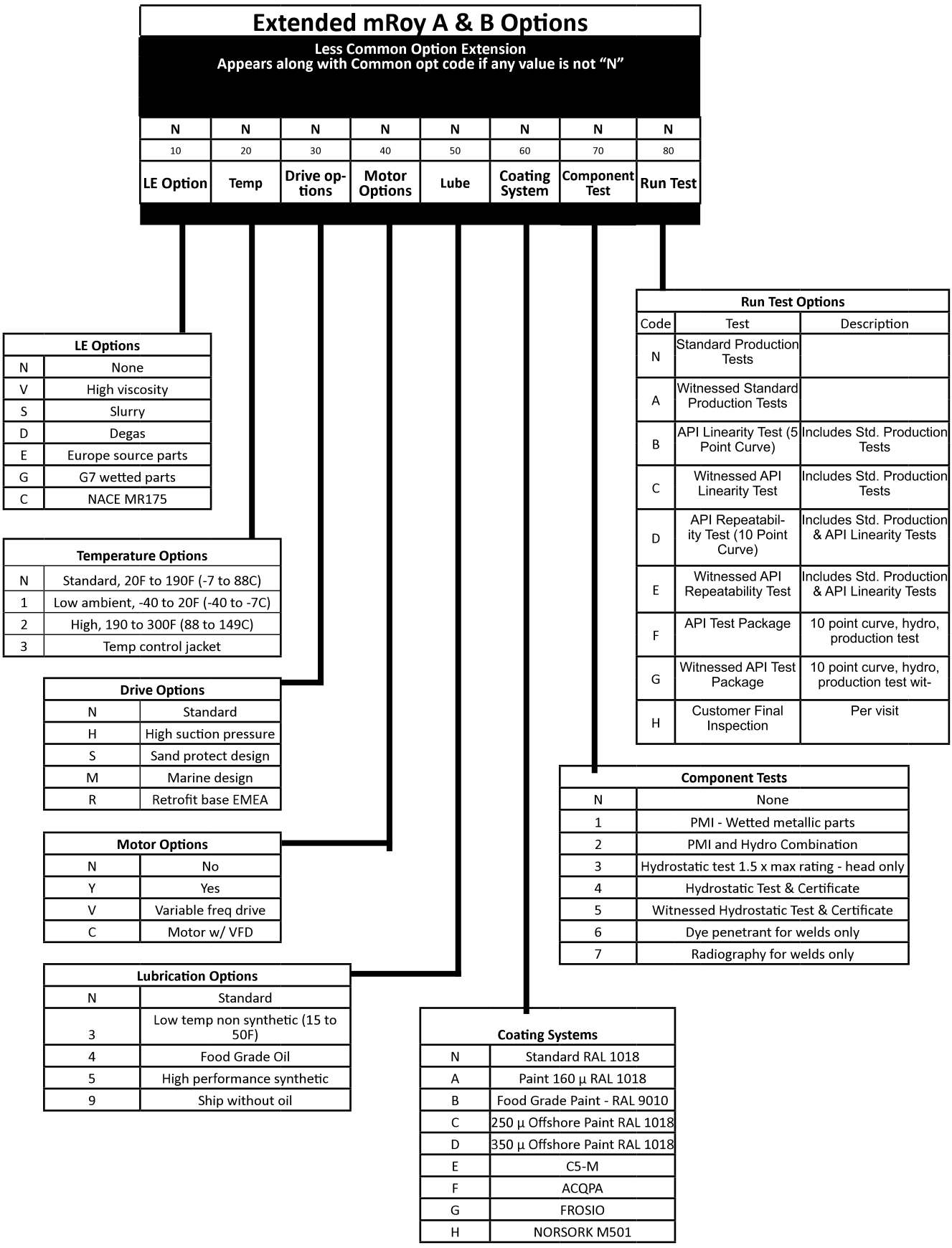


Figure 4. Global MRA/MRB Model Code Extra

ROUTINE MAINTENANCE KITS mRoy A & B

mRoy RPM kits for pumps noted above

Part Number	Description 1	Description 2
RPM1001	KIT MRA 316L VITON ORING NPT	PLGR CODE C,D,E,F
RPM1002	KIT MRA PVC VITON ORING NPT	PLGR CODE C,D
RPM1036	KIT MRA PVC TEFLEX ORING NPT	PLGR CODE C,D
RPM1037	KIT MRA PVC VITON ORING NPT	PLGR CODE E,F
RPM1038	KIT MRA PVC TEFLEX ORING NPT	PLGR CODE E,F
RPM1003	KIT MRA A20 VITON ORING NPT	PLGR CODE C,D,E,F
RPM1004	KIT MRA C22 VITON ORING NPT	PLGR CODE C,D,E,F
RPM1005	KIT MRA PVDF VITON ORING NPT	PLGR CODE C,D
RPM1039	KIT MRA PVDF TEFLEX ORING NPT	PLGR CODE E,F
RPM1040	KIT MRA PVDF VITON ORING NPT	PLGR CODE C,D
RPM1041	KIT MRA PVDF TEFLEX ORING NPT	PLGR CODE E,F
RPM1006	KIT MRA FLOR VITON ORING NPT	PLGR CODE C,D
RPM1042	KIT MRA FLOR TEFLEX ORING NPT	PLGR CODE C,D
RPM1043	KIT MRA FLOR VITON ORING NPT	PLGR CODE E,F
RPM1044	KIT MRA FLOR TEFLEX ORING NPT	PLGR CODE E,F
RPM1007	KIT MRA SLURRY VITON ORING NPT	PLGR CODE E,F
RPM1008	KIT MRA 316 HV VITON ORING NPT	PLGR CODE C,D,E,F
RPM1009	KIT MRA A20 HVVITON ORING NPT	PLGR CODE C,D,E,F
RPM1010	KIT MRA 316L EPDM ORING NPT	PLGR CODE C,D,E,F
RPM1011	KIT MRA 316L TEFLEX ORING NPT	PLGR CODE C,D,E,F
RPM1012	KIT MRA A20 EPDM ORING NPT	PLGR CODE C,D,E,F
RPM1013	KIT MRA A20 TEFLEX ORING NPT	PLGR CODE C,D,E,F
RPM1014	KIT MRB-K 316L VITON ORING	PLGR CODE K
RPM1015	KIT MRB-K A20 VITON ORING	PLGR CODE K
RPM1016	KIT MRB-K 316L EPDM ORING	PLGR CODE K
RPM1017	KIT MRB-K 316L TEFLEX ORING	PLGR CODE K
RPM1018	KIT MRB-K A20 EPDM ORING	PLGR CODE K
RPM1019	KIT MRB-K A20 TEFLEX ORING	PLGR CODE K
RPM1020	KIT MRB-L/R 316L VITON ORING	PLGR CODE L,R
RPM1021	KIT MRB-L/R 316L EPDM ORING	PLGR CODE L,R
RPM1022	KIT MRB-L/R 316L TEFLEX ORING	PLGR CODE L,R
RPM1023	KIT MRB-L/R A20 VITON ORING	PLGR CODE L,R
RPM1024	KIT MRB-L/R A20 EPDM ORING	PLGR CODE L,R
RPM1025	KIT MRB-L/R A20 TEFLEX ORING	PLGR CODE L,R
RPM1026	KIT MRB-L/R PVC VITON ORING	PLGR CODE L,R
RPM1027	KIT MRB-L/R PVC EPDM ORING	PLGR CODE L,R
RPM1028	KIT MRB-L/R PVC TEFLEX ORING	PLGR CODE L,R

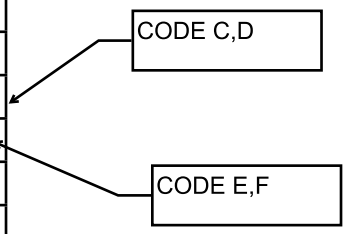


Figure 5. RPM KITS

RPM1029	KIT MRB-L/R PVDF VITON ORING	PLGR CODE L,R
RPM1030	KIT MRB-L/R PVDF EPDM ORING	PLGR CODE L,R
RPM1031	KIT MRB-L/R PVDF TEFLEX ORING	PLGR CODE L,R

Figure 5. RPM KITS

mRoy Series Capacity/Pressure Selection - Metallic Liquid Ends

- Capacities shown are for simplex. Double capacity for duplex
- Actuators, rupture detection, and high viscosity options require capacity derating per the table on the next page
- Plastic liquid ends are limitied to 150 psi - 10 bar

mRoy Series	Plunger		Gear Ratio Code	Strokes/Minute		Capacity / Pressure @ 60 hz 1725 RPM						Capacity / Pressure @ 50 hz 1425 RPM					
						Ratings at 100 psi/7 bar		Capacity at Max pressure				Ratings at 100 psi/7 bar		Capacity at Max pressure			
								Capacity		Max Pressure				Capacity		Max Pressure	
	Diameter	Code		60 hz 1725 RPM	50 hz 1425 RPM	GPH	L/hr	GPH	L/hr	PSI	Bar	GPH	L/hr	GPH	L/hr	PSI	Bar
A	3/8" 9.5 mm	C	77	23	19	0.36	1.4	0.20	0.8	2000	137.9	0.30	1.1	0.17	0.6	2000	137.9
			48	37	30	0.73	2.8	0.34	1.3	2000	137.9	0.61	2.3	0.28	1.1	2000	137.9
			24	73	60	1.44	5.5	0.68	2.6	2000	137.9	1.20	4.5	0.57	2.2	2000	137.9
			15	117	96	2.32	8.8	1.09	4.1	2000	137.9	1.93	7.3	0.91	3.4	2000	137.9
			10	185	152	3.64	13.8	1.72	6.5	2000	137.9	3.03	11.5	1.43	5.4	2000	137.9
			8	-	178	-	-	-	-	-	-	3.55	13.4	1.67	6.3	2000	137.9
	7/16" 11.1 mm	D	77	23	19	0.57	2.2	0.4	1.5	1800	124.1	0.48	1.8	0.33	1.2	1800	124.1
			48	37	30	0.8	3	0.6	2.3	1800	124.1	0.67	2.5	0.50	1.9	1800	124.1
			24	73	60	1.7	6.4	1.2	4.5	1800	124.1	1.42	5.4	1.00	3.80	1800	124.1
			15	117	96	2.8	10.6	2	7.6	1800	124.1	2.33	8.8	1.67	6.30	1800	124.1
			10	185	152	4.4	16.7	3.1	11.7	1800	124.1	3.67	13.9	2.58	9.80	1800	124.1
			8	-	178	-	-	-	-	-	-	4.30	16.3	3.02	11.40	1800	124.1
	5/8" 15.9 mm	E	48	37	30	1.8	6.8	1.6	6.1	700	48.3	1.50	5.7	1.3	5.0	700	48.3
			24	73	60	3.8	14.4	3.5	13.2	925	63.8	3.17	12	2.9	11.1	925	63.8
			15	117	96	6.2	23.5	5.7	21.6	925	63.8	5.17	19.6	4.8	18.0	925	63.8
			10	185	152	9.4	35.6	8.4	31.8	925	63.8	7.83	29.6	7.0	26.5	925	63.8
			8	-	178	-	-	-	-	-	-	9.17	34.7	8.2	31.0	925	63.8
	1 1/16" 27 mm	F	48	37	30	6.1	23.1	5.5	20.8	350	24.1	5.08	19.2	4.6	17.3	350	24.1
			24	73	60	12.3	46.6	11.2	42.4	350	24.1	10.25	38.8	9.3	35.3	350	24.1
			15	117	96	19.4	73.4	18.1	68.5	350	24.1	16.17	61.2	15.1	57.1	350	24.1
			10	185	152	30.0	113.6	29.0	109.8	200	13.8	25.00	94.6	24.2	91.5	200	13.8
			8	-	178	-	-	-	-	-	-	29.28	110.8	28.3	107.1	200	13.8

Figure 6. mRoy A Metallic Liquid End Capacity Tables

B	19/32" 15.1 mm	K	38	48	40	4.7	17.8	3.3	12.5	1500	103.4	3.92	14.8	2.8	10.4	1500	103.4
			25	72	60	7.0	26.5	5.6	21.2	1500	103.4	5.83	22.1	4.7	17.7	1500	103.4
			19	96	80	9.5	36	7.1	26.9	1500	103.4	7.92	30	5.9	22.4	1500	103.4
			12	144	120	13.3	50.3	11.4	43.1	1500	103.4	11.08	41.9	9.5	36.0	1500	103.4
			10	-	148					1500	103.4	13.67	51.7	11.72	44.3	1500	103.4
	7/8" 22.2 mm	L	38	48	40	10.0	37.9	4.7	17.8	1000	69	8.33	31.5	3.9	14.8	1000	69
			25	72	60	16.0	60.6	11.0	41.6	1000	69	13.33	50.5	9.2	34.7	1000	69
			19	96	80	21.0	79.5	16.0	60.6	1000	69	17.50	66.2	13.3	50.5	1000	69
			12	144	120	30.4	115.1	25.6	96.9	1000	69	25.33	95.9	21.3	80.7	1000	69
			10	-	148					1000	69	31.24	118.2	26.31	99.6	1000	69
	1 7/16" 36.5 mm	R	38	48	40	27.0	102.2	21.0	79.5	400	27.6	22.50	85.2	17.5	66.2	400	27.6
			25	72	60	42.0	159	36.0	136.3	400	27.6	35.00	132.5	30.0	113.6	400	27.6
			19	96	80	57.0	215.7	51.0	193	400	27.6	47.50	179.8	42.5	160.9	400	27.6
			12	144	120	85.0	321.7	79.0	299	400	27.6	70.83	268.1	65.8	249.2	400	27.6
			10	-	148	-	-	-	-	400	27.6	87.36	330.6	81.19	307.3	400	27.6

Figure 7. mRoy B Metallic Liquid End Capacity Tables

mRoy Series Capacity/Pressure Selection - Plastic Liquid Ends

- **Includes PVC, PVDF liquid ends, and liquid ends for Fluoride applications**
- Capacities shown are for simplex. Double capacity for duplex
- Actuators, rupture detection, and high viscosity options require capacity derating per the table on the next page
- Please note that plastic liquid ends are not available for plunger code "K" - mRoy B frame with 19/32" (15.1 mm) plunger.

mRoy Series	Plunger		Gear Ratio Code	Strokes/Minute		Capacity / Pressure @ 60 hz 1725 RPM						Capacity / Pressure @ 50 hz 1425 RPM					
						Ratings at 100 psi/7 bar		Capacity at Max pressure				Ratings at 100 psi/7 bar		Capacity at Max pressure			
	Diameter	Code		60 hz 1725 RPM	50 hz 1425 RPM			Capacity		Max Pressure				Capacity		Max Pressure	
						GPH	L/hr	GPH	L/hr	PSI	Bar	GPH	L/hr	GPH	L/hr	PSI	Bar
A	3/8" 9.5 mm	C	77	23	19	0.32	1.2	0.28	1.1	150	10.3	0.27	1	0.23	0.9	150	10.3
			48	37	30	0.68	2.6	0.62	2.3	150	10.3	0.57	2.2	0.52	2	150	10.3
			24	73	60	1.35	5.1	1.30	4.9	150	10.3	1.13	4.3	1.08	4.1	150	10.3
			15	117	96	2.20	8.3	2.10	7.9	150	10.3	1.83	6.9	1.75	6.6	150	10.3
	7/16" 11.1 mm	D	77	23	19	0.5	1.9	0.45	1.7	150	10.3	0.42	1.6	0.38	1.4	150	10.3
			48	37	30	0.7	2.6	0.65	2.5	150	10.3	0.58	2.2	0.54	2	150	10.3
			24	73	60	1.5	5.7	1.4	5.3	150	10.3	1.25	4.7	1.17	4.40	150	10.3
			15	117	96	2.5	9.5	2.4	9.1	150	10.3	2.08	7.9	2.00	7.60	150	10.3
	5/8" 15.9 mm	E	48	37	30	1.6	6.1	1.5	5.7	150	10.3	1.33	5	1.3	4.7	150	10.3
			24	73	60	3.5	13.2	3.4	12.9	150	10.3	2.92	11.1	2.8	10.7	150	10.3
			15	117	96	5.6	21.2	5.5	20.8	150	10.3	4.67	17.7	4.6	17.3	150	10.3
	1- 1/16" 27 mm	F	48	37	30	5.7	21.6	5.6	21.2	150	10.3	4.75	18	4.7	17.7	150	10.3
			24	73	60	11.3	42.8	11.2	42.4	150	10.3	9.42	35.7	9.3	35.3	150	10.3
			15	117	96	18.1	68.5	18.0	68.1	150	10.3	15.08	57.1	15.0	56.8	150	10.3

Figure 8. mRoy A Plastic Liquid End Capacity Tables

B	7/8″ 22.2 mm	L	**38**	48	40	10.0	37.9	4.7	17.8	150	10.3	8.33	31.5	3.9	14.8	150	10.3
			25	72	60	16.0	60.6	11.0	41.6	150	10.3	13.33	50.5	9.2	34.7	150	10.3
			19	96	80	21.0	79.5	16.0	60.6	150	10.3	17.50	66.2	13.3	50.5	150	10.3
			12	144	120	30.4	115.1	25.6	96.9	150	10.3	25.33	95.9	21.3	80.7	150	10.3
			10	-	148					150	10.3	31.24	118.2	26.31	99.6	150	10.3
	1 - 7/16″ 36.5 mm	R	**38**	48	40	27.0	102.2	21.0	79.5	150	10.3	22.50	85.2	17.5	66.2	150	10.3
			25	72	60	42.0	159	36.0	136.3	150	10.3	35.00	132.5	30.0	113.6	150	10.3
			19	96	80	57.0	215.7	51.0	193	150	10.3	47.50	179.8	42.5	160.9	150	10.3
			12	144	120	85.0	321.7	79.0	299	150	10.3	70.83	268.1	65.8	249.2	150	10.3
			10	-	148	-	-	-	-	150	10.3	87.36	330.6	81.19	307.3	150	10.3

Figure 9. mRoy B Plastic Liquid End Capacity Tables

mRoy PUMP FLOW DERATING TABLE

mRoy Frame	A				B		
Plunger Diameter	3/8" 9.5 mm	7/16" 11.1 mm	5/8" 15.9 mm	1-1/16" 27 mm	19/32" 15.1 mm	7/8" (22mm)	1 7/16" (37mm)
Plunger Code	C	D	E	F	K	L	R
Electronic or Pneumatic Capacity Control	0.95	0.95	0.95	0.95	1.00	0.90	0.90
Diaphragm Rupture Detection System	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Double Diaphragm	-	-	0.95	0.95	-	-	-
High Viscosity Option	-	0.90	0.90	0.90	-	-	-

NOTES:

Certain options require that the maximum capacity be derated. Multiply capacities in the capacity / pressure tables in Figures 7 through 10 by the appropriate factors in the table above.

Figure 11. mRoy Pump (All Models) Capacity Derating Table

SECTION 2 - INSTALLATION

2.1 UNPACKING/INSPECTION

Units are shipped Ex Works and the title passes to the customer when the carrier signs for receipt of the unit. In the event that damages occur during shipment, it is the responsibility of the customer to notify the carrier immediately and to file a damage claim. Carefully examine the shipping crate upon receipt from the carrier to be sure there is no obvious damage to the contents. Open the crate carefully so accessory items fastened to the inside of the crate will not be damaged or lost. Examine all material inside the crate and check against the packing list to be sure that all items are accounted for and intact.

2.2 STORAGE

Short Term Storage (Less than 6 Months)

It is preferable to store the material under a shelter in its original package to protect it from adverse weather conditions. In condensing atmospheres, follow the long term storage procedure.

Long Term Storage (Longer than 6 Months)

The primary consideration in storage of pump equipment is to prevent corrosion of external and internal components. This corrosion is caused by natural circulation of air as temperature of the surroundings change from day to night, day to day, and from season to season. It is not practical to prevent this circulation which carries water vapor and other corrosive gasses, so it is necessary to protect internal and external surfaces from their effects to the greatest extent possible.

When the instructions given in this section are completed, the equipment is to be stored in a shelter; protected from direct exposure to weather. The prepared equipment should be covered with a plastic sheet or a tarpaulin, but in a manner which will allow air circulation and prevent capture of moisture. Equipment should be stored 12 inches (.304 meters) or more above the ground.

If equipment is to be shipped directly from Milton Roy into long term storage, contact Milton Roy to arrange for long term storage preparation.

Pump Drive

1. Remove motor and flood the gearbox compartment with a high grade lubricating oil/rust preventative Mobile Oil Corporation product Mobilarma 524 or approved equivalent. Fill the compartment completely to minimize air space. After storage, drain this oil and refill the equipment with the recommended lubricant for equipment commissioning.
2. Brush all unpainted metal surfaces with multipurpose grease NLGI grade 2 or 3 or approved equivalent. Store these unattached.

Electrical Equipment

1. Motors should be prepared in the manner prescribed by their manufacturer. If information is not available, dismount and store motors as indicated in step 3 below.
2. Dismount electrical equipment (including motors) from the pump.
3. For all electrical equipment, place packets of Vapor Phase Corrosion Inhibitor (VPCI) inside of the enclosure, then place the entire enclosure, with additional packets, inside a plastic bag. Seal the bag tightly closed. Contact Milton Roy Service Department for recommended VPCI materials.

2.3 SAFETY PRECAUTIONS

When installing, operating, and maintaining the mRoy pump, keep safety considerations foremost. Use proper tools, protective clothing, and eye protection when working on the equipment and install the equipment in compliance of NEC, NEPA and local codes. Follow the instructions in this manual and take additional safety measures appropriate to the liquid being pumped. Be extremely careful in the presence of hazardous substances (e.g., corrosives, toxics, solvents, acids, caustics, flammables, etc.).

2.4 PUMP MOUNTING&LIFTING/ LOCATION

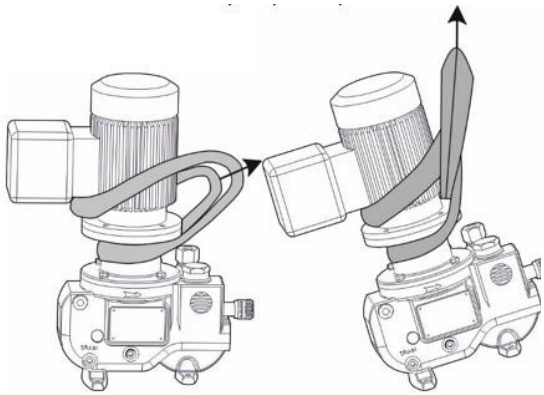
The mRoy pump can be mounted on any surface that is flat and level for the support feet. Three mounting bolt holes are provided in the support feet for use when the pump is to be firmly anchored to a base surface (see Figure 14.)

Increased reliability can be expected if pump locations are avoided which are subjected to high ambient temperatures above 100°F (38°C) with poor free-air circulation over the pump assembly.

Lifting

Put the sling under the motor terminal box and under the motor flange. Cross the two ends of the sling and close the loop (see diagrams). Before attempting to move it, check that the entire unit is well balanced.

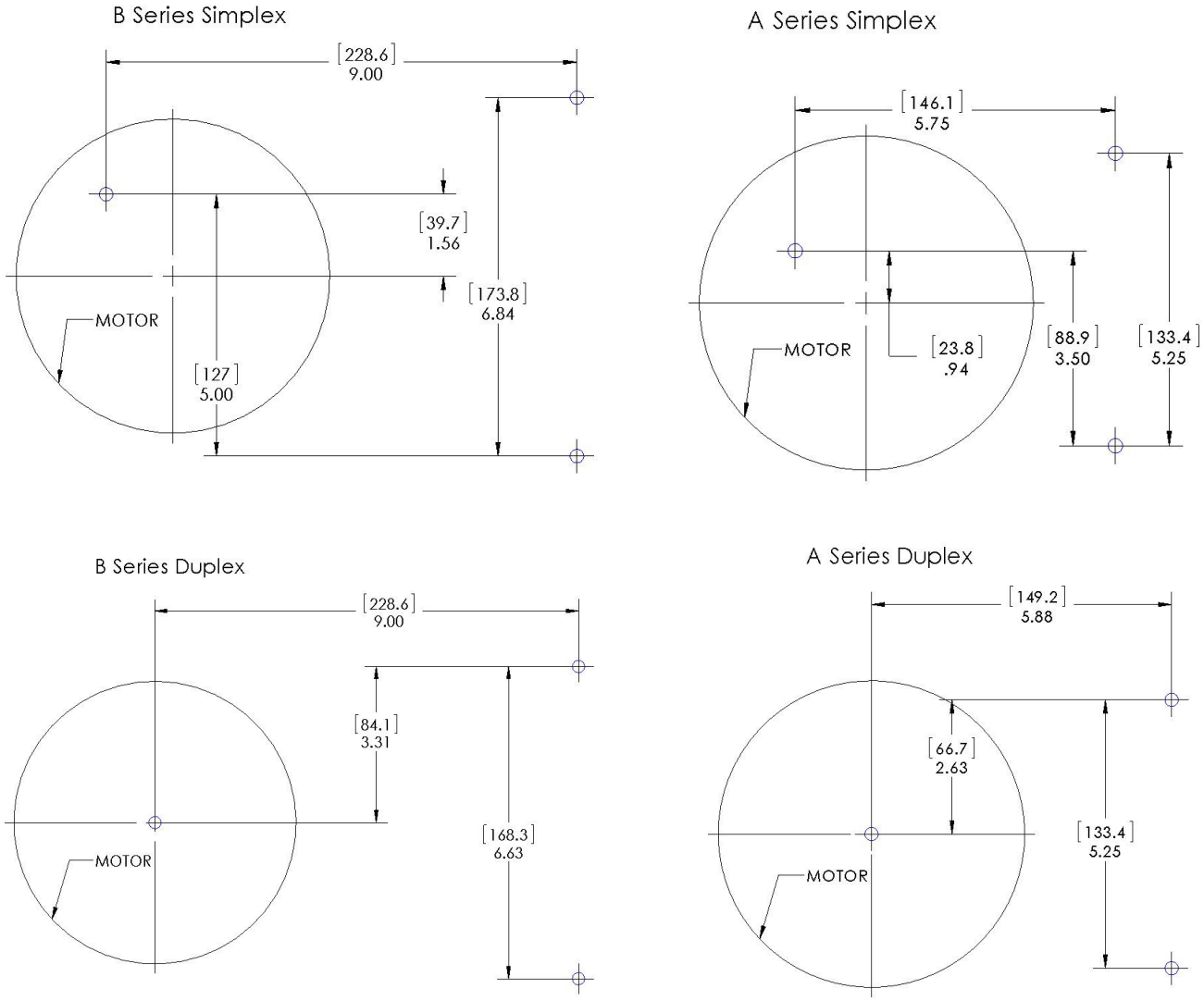
Note: As soon as the pump is in position, fasten it down.



2.5 OUTDOOR INSTALLATIONS

The mRoy pump is designed as a totally enclosed unit suitable for installation either indoors or outdoors. However, for outdoor installations the pump mounting area should be selected to provide protection against environmental extremes:

1. Operation with continuous exposure to sunshine with ambient temperatures above 90°F (32°C), which would cause higher oil temperatures and reduce lubricity should be avoided. Good installation practice would dictate providing a sun shade over the pump with open sides to obtain the best air circulation around the pump.
2. Frequent start-up where the pump has been idle in an ambient temperature below 30°F (-1°C) is not recommended. Provide a removable, insulated enclosure over the pump and mounting base with provisions for an electrical heater (100 watt light, heat lamp, heater tape etc.) to



- *B Series Hole Size = Dia 0.41" (10.4 mm)*
- *A Series Hole Size = Dia 0.38" (9.6 mm)*

Figure 14. Mounting Bolt Holes

maintain the pump oil temperature above 30°F (-1°C).

2.6 FLANGE MOUNTED MOTORS

If a flange mounted motor option was selected for the mRoy pump, the customer supplied motor will need to be mounted to the pump. This is generally a straight forward procedure. Refer to Figure 17 or 18, as appropriate.

When mounting the motor to a Close Coupled Flange, the motor mount plate (710) must be removed from the pump body and bolted to the motor. The motor/motor mount plate assembly can then be bolted to the pump.

2.7 ELECTRICAL CONNECTIONS

Check to be sure that the electrical supply matches the pump motor nameplate electrical characteristics. Motor rotation must be counter clockwise when viewed from the top end of the motor.

⚠CAUTION ON SINGLE-PHASE PUMP MOTORS THE ROTATION WILL BE DETERMINED AT THE FACTORY AND MUST NOT BE CHANGED. ON THREE-PHASE PUMP MOTORS THE ROTATION MUST BE DETERMINED AT THE TIME OF INSTALLATION AND PRIOR TO START-UP. OPERATION WITH THE WRONG ROTATION WILL DAMAGE THE PUMP AND MOTOR AND VOID THE WARRANTY. SHAFT ROTATION CAN BE OBSERVED BY REMOVING THE COVER PLATE OVER THE ELECTRICAL CONNECTIONS.

2.8 MOTORS

Adequate power is provided to the simplex mRoy A pump by the standard ¼ HP (0.25 Kw) motor. The motor is normally a totally enclosed non-ventilated, type, that is mounted on a 56C-face flange or IEC Frame 71 flange. The gear reducer (worm shaft) fits onto the standard motor without using a coupling.

On the larger mRoy B (Figures 10-13), the normal temperature rise for these motors is 50°C above ambient temperature, and it can be expected that these motors will appear to operate at higher temperatures than are normally experienced. However, there is no cause for worry if the following precautions are observed:

1. The motor is placed where there is adequate ventilation and is protected against excessive radiation from steam pipes and other heat sources.
2. The overload heater in the starting device should be correctly sized for motor full load current rating as shown on the motor data plate.

Note: For a motor that is supplied by the customer, Milton Roy is not responsible for any damage resulting from an improper installation or for a motor that is not suitable for the selected environment.

2.9 PUMP LUBRICATION

⚠CAUTION CAREFULLY UNSCREW TO REMOVE OIL RESERVOIR CAP. DO NOT APPLY PRESSURE TO JOG CAP FROM SIDE TO SIDE OR DIP STICK MAY BREAK.

Oil is supplied for the average installation (ambient temperature above 50°F (10°C). See recommendation below for lower temperature. Fill pump and gear box by slowly pouring the recommended oil through the air bleed reservoir opening until the oil level in the reservoir is level with oil level mark on outside surface of reservoir. Level can also be checked with dipstick on oil reservoir cap. Recheck while pump is operating.

⚠CAUTION DO NOT OVER FILL AS MOTOR DAMAGE CAN RESULT.

NOTE:

Synthetic oils are available that span the entire temperature range. Contact Milton Roy for further information.

Recommended Oil

Any equivalent oil is acceptable.

Oil Type	Ambient Temp. 15-50 °F (-9-10 °C)	Ambient Temp. Above 50°F(10°C)
AGMA Spec	No. 2 EP	No. 5 EP
Zurn Oil Co	No. EP 35	No. EP 95
ISO Grade	68	220

Nominal Oil Capacity

Oil Type	Ambient Temp. 15-50 °F (-9-10 °C)	Ambient Temp. Above 50°F(10°C)
AGMA Spec	No. 2 EP	No. 5 EP
Zurn Oil Co	No. EP 35	No. EP 95

2.10 PIPING

General

Refer to Figure 15 for a diagram of a typical Piping and Instrumentation Diagram.

Support all piping connections to the pump so that no stress is placed on pump fittings. In no case should the piping be sprung to make the connections to the pump. The suction and discharge cartridge pipe connections can be positioned within an arc of approximately 150° to facilitate piping to pump.

Flush and blow out all pipelines before connecting the pump. This eliminates any foreign matter that might seriously damage the internal working parts of the liquid end. Install a 20 mesh Y-type strainer that is sized to remove foreign particles with minimum pressure drop in the suction line of the pump. It is also recommended to perform a leak test of the system with a neutral liquid before pressured start-up of the final installation.

Install shut-off valves, with unions on the pump side of the valves, in the suction and discharge lines to facilitate servicing.

Use extreme care in piping to plastic liquid end pumps with rigid pipe such as PVC. If excessive stresses or vibration is unavoidable, flexible connections are recommended.

NOTE:

Many pipe joint compounds are not suitable for use with plastic pipe and, if used, will cause stress cracking at the connection. Use only compounds commended for use with plastic materials.

Suction Piping

The suction piping must be absolutely tight and leak free. For mRoy pumps on water-like solutions we recommend that the suction pipe be ¾" minimum diameter and a maximum of 6 feet (2 meters) long. The intent is that the piping must be designed to provide an adequate net positive suction head (NPSH). Obtain our NPSH Calculation software at the Milton Roy website (**www.miltonroy.com**). If assistance in determining NPSH is needed, contact the Milton Roy Aftermarket Service department through the website (**www.miltonroy.com**)

A flooded suction is recommended for optimum service life and maintenance-free operation. However, the mRoy pump can operate with less than flooded suction if necessary, in accordance with the following schedule shown in the chart below.

	Model Number	Min. NPSH (PSI) (Bar)	Max. Lift (Ft. (meter) H2O)
mRoy A	RA	10	10 (3)
mRoy H/T	RH or RT	10	10 (3)
mRoy P	RP	10	10 (3)

Refer to "Installation with Suction Lift," which outlines limiting conditions if suction lift requirements are anticipated.

The supply tank should incorporate a low-level switch to cut off the pump motor before the suction intake is exposed to air. Otherwise, the pump may occasionally run dry.

Discharge Piping

The installation of an external Safety Valve is recommended, since the pump's internal relief valve is not intended to protect the piping system. Refer to "Setting the Relief Valve" in Section 3, for further relief valve discussion. (Milton Roy offers a complete line of back pressure and safety valves).

For satisfactory metering and capacity control, the discharge pressure at the pump must be 50 PSI (3.5 Bar) minimum for the mRoy A and 70 PSI (4.8 Bar) minimum for the mRoy B. Therefore, when the pump is to discharge into an open system, a back pressure device must be installed in the pump discharge line.

⚠ CAUTION **REMOTE HEAD SYSTEMS: DO NOT INSTALL A BACK PRESSURE SPRING IN DISCHARGE BALL CHECK CARTRIDGE OF DIAPHRAGM HEADS WHICH ARE "REMOTE MOUNTED" (NOT ATTACHED TO THE MAIN HOUSING). A SEPARATE BACK PRESSURE VALVE MUST BE INSTALLED IN THE**

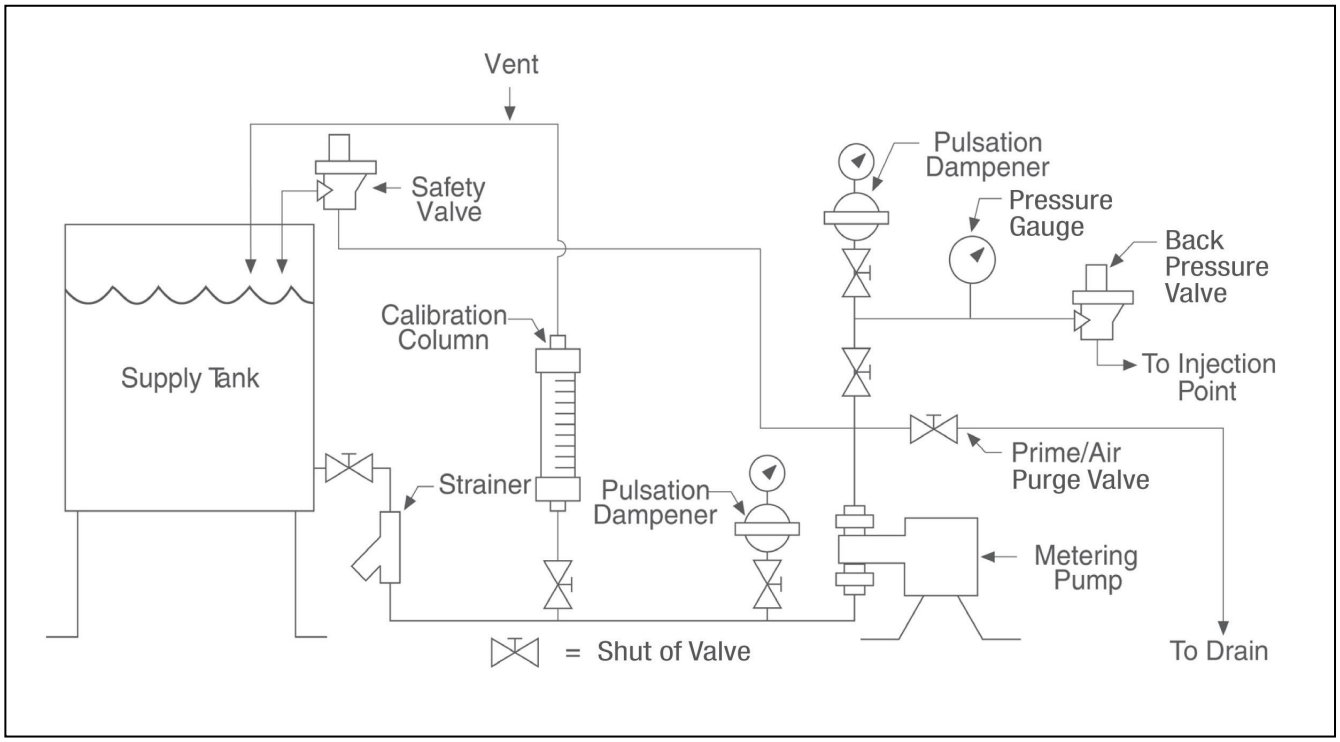


Figure 15. Typical Piping and Instrumentation Diagram

2.11 OPERATION WITH SUCTION LIFT

It is desirable that the mRoy pump operate with a flooded suction; however, operation with net positive suction head (NPSH) less than atmospheric pressure is possible.

NPSH is the head available, above the vapor pressure of the liquid being pumped, to feed the liquid into the pump suction port. NPSH minimum is the head below which the pump cavitates.

Both values are calculated at the suction port of the pump. In controlled volume pump applications, two conditions must be considered in the selection of a pump to meet the NPSH minimum requirements:

1. At the start of the suction stroke, the liquid in the suction line has no velocity and NPSH minimum depends on the force necessary to accelerate the liquid in the suction pipeline.
2. At the peak of the suction stroke there is no acceleration factor and NPSH minimum depends on friction losses as calculated from standard flow equations. With all viscous liquids and in pilot plants and other places where unusual numbers of fittings and valves are used, the second condition that includes friction losses should be considered. For water-like liquids, the first condition will define the limiting configuration.

For Static NPSH (Condition 1)

Available NPSH = Pa + Ph – Pv (must be equal to or greater than minimum NPSH as listed under Installation Instructions).

$$\text{Required NPSH min} = \frac{\text{Sp. Gr. } (0.0925)\ LpD}{Dp^2}$$

For Dynamic NPSH (Condition 2)

Available NPSH = Pa ± Ph – Pf Le (must be equal to or greater than minimum NPSH as listed under Installation Instructions).

D = Plunger Diameter (inches)

Dp= Pipe Diameter (inches)

Lp = Actual Length of suction pipe (feet)

Le = Equivalent length of suction pipe including allowance for fittings (feet)

Pa = Ambient pressure above liquid (PSI)

Ph = Head of liquid column above (+) or below (–) center line of plunger (PSI) equals Head in feet x (0.435) (Sp.Gr.)

Pv = Vapor pressure of liquid (PSI)

Pf = Friction loss per foot of pipe calculated from Reynold Number evaluation (PSI) (Use 3.2 times average velocity for calculating friction losses when referring to a standard pipe losses table)

Minimum NPSH = Minimum hydraulic pressure at plunger (listed under Installation Instructions).

When operating the pump with a NPSH of less than atmospheric pressure (negative suction head or suction lift), special attention should be given to keep the suction line strainer clean and prevent other system conditions that might inadvertently decrease the NPSH available.

NOTE:

Obtain our NPSH calculation software at the Milton Roy website (miltonroy.com). If assistance in determining NPSH is needed, contact the Milton Roy Aftermarket Service Department.

3.1 INITIAL START-UP

Before initial start up of the pump, check the following:

⚠WARNING FAILURE TO CHECK TORQUE ON NON METALLIC HEAD BOLTS PRIOR TO STARTUP AND AFTER ONE WEEK OF OPERATION MAY EXPOSE OPERATING PERSONNEL TO HAZARDOUS LIQUIDS.

1. Check the torque on all non-metallic head bolts prior to startup. After one week of operation, reduce torque on all nonmetallic head bolts. Torque the head assembly screws in a crosswise pattern (Figure 16) as follows:

   a) mRoy Model A Plastic Heads: 60–70 in. lbs. (7-8 N-m) bolting torque.

   b) mRoy Model B Plastic Heads:75–85 in. lbs. (8.5-9.6 N-m) bolting torque, tie down nuts 25 in. lbs. (3 N-m).

2. Check the oil level in air bleed filler reservoir up to or slightly above the indicated oil level.
3. Set the capacity control knob to approximately 30- 40% of maximum capacity.
4. Make certain that the suction line, liquid end and discharge cartridge are filled with water or system liquid.
5. Relieve all back pressure in the discharge line and pump hydraulic system to allow air to purge. Reduce pressure on the oil relief valve until air is purged. Refer to “Start-Up after the Suction System has Run Dry” section.
6. If practical, install a temporary discharge line piped back to the suction tank incorporating a 100 PSI (7 Bar) relief valve to facilitate establishing performance during first hours of operation.

Priming

In order to prime the pump, it is necessary to purge the liquid end (to release air) by the bleeder valve (360). For toxic liquids, it is recommended to collect this fluid to safe drain point during this operation.

- First turn the pump ON
- Place the micrometer on the 50% position, for 10 minutes.
- Untighten the bleeder valve (360) by around 1/4 turn located on the liquid end.

Thus, the air trapped in the suction piping and the pump head can escape via the drain. Wait until the liquid comes up to the evacuation level of this drain. Let it flow for a few seconds in order to degas it completely, then retighten the drain plug.

On initial start up with 0% capacity, run the pump for 10–20 seconds, then stop for 20–30 seconds. Repeat a few times in order to fill the diaphragm oil cavity. Check for proper motor rotation as described in general installation instructions. During these short runs listen for any abnormal motor or crank noises, and if present, refer to Section 5, Troubleshooting.

Run pump for 1/2 to 1-1/2 hours to warm up oil. Check discharge line for indication of flow.

Increase capacity adjustment setting to 100% of capacity and operate for 10–20 minutes.

⚠CAUTION DO NOT SET THE CAPACITY ADJUSTMENT KNOB IN EXCESS OF 100% BECAUSE ERRATIC OR REDUCED METERING WILL DEVELOP.

Reduce capacity adjustment setting to 30–40% of maximum capacity and operate for several minutes, then increase capacity adjustment back to 100% for approximately 10 minutes. Repeat several times to insure that the air is bled from the pump displacement chamber and the liquid end. (As a general rule, to bleed air or vapor from the pump oil displacement chamber reduce the capacity adjustment to the 20 to 40% range, and to bleed air or vapor from the liquid end increase

capacity to 100%, or if possible reduce the discharge pressure to atmospheric pressure for 30 seconds to one minute).

The pump is now ready for calibration. Calculate what the desired capacity as a percentage of either the maximum capacity rating on the pump data plate, or the nominal capacity at the required system pressure. Each pump is tested at the factory to confirm that the performance meets these capacity-pressure requirements (tested with water). Milton Roy offers a complete line of calibration columns for calibrating the pump.

Start-Up after the Suction System has Run Dry

In applications where the suction tank does not have a low level cutoff interconnected into the pump motor circuit, the pump may occasionally run dry. This should be avoided to ensure full integrity of the diaphragm. Running the pump dry occasionally for no longer than 2 minutes will not harm the diaphragm or the pump. However, when the pump is repeatedly allowed to run dry, especially for long periods of time, the diaphragm is fatigued and could fail before the next scheduled replacement.

Before restarting a pump that has run dry, provisions should be made for filling the liquid end with liquid by opening the discharge line to atmospheric pressure to either refill liquid end with flooded suction pressure or start pump with open discharge and run for a short period of time (up to 2 minutes) that will 'prime' the liquid end if the ball checks are wet. If these steps fail, remove the discharge cartridge and fill liquid end with liquid through the top discharge opening in the head. After establishing flow, return to the regular discharge system configuration.

3.2 RESETTING THE RELIEF VALVE DESCRIPTION

The mRoy pump incorporates an internal relief valve that is preset at the factory to relieve when the hydraulic liquid pressure exceeds 125 PSI (8.6 Bar). This setting can be readjusted as required up to 15% above the maximum rated pressure of the pump. Resetting the internal relief valve will change the potential discharge pressure of the pump.

Refer Figure 18 for a pictorial description of the mechanism.

Examination of these figures will reveal a small passage connecting the oil side of the diaphragm head cavity with the oil reservoir (See Figures 1 & 2). This passage is stopped off by a poppet that is held in place by a spring secured by a set screw. A plastic screw plug keeps the adjusting threads free of dirt.

In operation, the spring-loaded poppet is held against the seat in the housing until the pressure in the oil side of the diaphragm cavity exceeds the pressure for which the valve has been set. When this occurs, the poppet is forced off its seat, permitting the oil to flow from the diaphragm cavity through the mechanical passage to an opening (Figure 17) in the side of the oil reservoir. The resilient material of the poppet permits the relief valve to actuate without erosion of the poppet or seat surface.

Relief Valve Setting

The Pump must be at operational pressure and 95% capacity setting.

1. Remove yellow plastic plug located at top of pump next to the oil fill hole.
2. Using a 3/16" hex. key (mRoy A), or a 5/16" hex. key (mRoy B) as required for the different models, turn the adjusting screw clockwise to increase cracking pressure until pump ceases to bypass through the relief valve at the desired working pressure. When relieving has stopped, adjust the screw clockwise up to one full turn beyond this point to set a reasonable buffer zone between operating pressure and relief pressure. To determine if relieving is taking place, insert your index figure into the oil reservoir opening and place it against the bypass opening (Figure 17) where the oil pulse from the relief valve can be determined.
3. Reinstall the plastic yellow plug

NOTE:

No moving parts are present in the oil reservoir in this location.

⚠CAUTION **WHEN OPERATING WITH RELIEF VALVES, ESPECIALLY ON PUMPS WITH LARGE PLUNGER SIZE, OIL MAY BE EJECTED AT HIGH VELOCITY FROM THE BYPASS PORT. NORMAL PRECAUTION SHOULD BE OBSERVED TO PREVENT THIS FROM SPLASHING THE SURROUNDING AREA.**

NOTE:

This relief is intended primarily for pump protection in the event that the discharge or suction system is blocked while the pump is in operation. It is a good practice to install a high-grade chemical type relief valve in the pump discharge line as close to the pump as possible, and always between the pump and any shut-off valve. Pipe the outlet of the system relief valve back to the suction tank, with the open end of the pipe visible at all times. In this way, relief valve leakage may be easily detected.

⚠CAUTION **FOR SAFETY REASONS, A CHECK VALVE IS RECOMMENDED FOR USE IN THE DISCHARGE LINE NEAR THE POINT WHERE THE LINE ENTERS A HIGH PRESSURE PROCESS VESSEL.**

3.3 OPERATION

The mRoy pump is designed for reliable, unassisted operation. During normal operation, a periodic check of the pump is recommended every 24 or 48 hours to visually confirm satisfactory operation:

1. Make sure the oil level in the air bleed filler reservoir is above the oil level mark.
2. Inspect the pump liquid end for indication of leakage or seepage.

If anything seems to be abnormal, refer to Section 4, Maintenance.

4.1 SPARE PARTS

To avoid excessive downtime in the event of a parts malfunction, the spare parts shown below should be maintained in your stores to support each mRoy pump. For your convenience, these parts can be purchased either separately or packaged in the form of Routine Preventive Maintenance (RPM) Kits. RPM kit numbers are listed in Section 1, Figure 7 (mRoy A) & Figure 12 (mRoy B).

Double quantities required for duplex pumps. Two diaphragms are required for double diaphragm simplex liquid ends; four are required for double diaphragm duplex liquid ends.

4.2 RPM KIT COMPONENTS

mRoy A Metallic Liquid End

1 Relief Valve Poppet
1 Suction Check Valve
1 Discharge Check Valve Diaphragm(s) of various sizes
2 Check Valve O-Ring
2 Split Ring
1 Ball (used on “V” high viscosity option only)

mRoy A Plastic Liquid End

1 Relief Valve Poppet
1 Suction Check Valve
1 Discharge Check Valve Diaphragm(s) of various sizes
2 Check Valve Seals
1 Square Ring
2 Tube Coupling Nut (used on tube connection checks only)

mRoy B Plastic Liquid End

1 Relief Valve Poppet
1 Suction Check Valve
1 Discharge Check Valve
1 Diaphragm
3 Check Valve O-ring

Parts Orders Must Include The Following Information:

1. Quantity required (in this manual)
2. Part number (in this manual)
3. Part description (in this manual)
4. Pump model no. (on pump nameplate)
5. Pump product code (on pump nameplate)
6. Pump serial no. (on pump nameplate)

Always include the serial number, product code, and model number in all correspondence regarding the unit.

4.3 RETURNING UNITS TO THE FACTORY

Pumps will not be accepted for repair without a Return Material Authorization Form, available from the Aftermarket Department or at the website (**www.miltonroy.com**). Process liquid must be flushed from the pump liquid end, and oil should be drained from the pump housing before the pump is shipped. Label the unit clearly to indicate the liquid being pumped.

NOTE:

Federal law prohibits handling of equipment that is not accompanied by an OSHA Safety Data Sheet (SDS). A completed SDS must be packed in the shipping crate with any pump returned to the factory. These safety precautions will aid the troubleshooting and repair procedure and preclude serious injury to repair personnel from hazardous residue in the pump liquid end.

All inquiries or parts orders should be addressed to your local Milton Roy representative. Representatives can be found on our website (**www.miltonroy.com**).

⚠ CAUTION **BEFORE CARRYING OUT ANY SERVICING OPERATION ON THE METERING UNIT OR PIPES, DISCONNECT ELECTRICAL POWER FROM THE PUMP. TAKE THE NECESSARY STEPS TO ENSURE THAT ANY HARMFUL LIQUID IN THE PUMP OR PIPING SYSTEM CANNOT ESCAPE OR COME INTO CONTACT WITH PERSONNEL. SUITABLE PROTECTIVE EQUIPMENT MUST BE PROVIDED. CHECK THAT THERE IS NO PRESSURE BEFORE PROCEEDING WITH DISMANTLING.**

4.4 ROUTINE MAINTENANCE

The mRoy pump is designed for reliable service with a minimum amount of maintenance required. Part of regular maintenance includes:

• Clean the pump regularly to prevent dust or liquid build-up.

• Check for leaks regularly.

• Check oil levels regularly to prevent pump damage or overheating.

Yearly replacement of check valves, diaphragm, and relief valve poppet is recommended. For convenience, these parts are available in a Routine Preventative Maintenance (RPM) Kit from your local representative. RPM kit numbers are listed in Section 1, Figure 7 (mRoy A) & Figure 12 (mRoy B).

4.5 SEMI ANNUAL OIL CHANGE

The oil in the main housing should be drained twice a year, using the drain plug provided, and new oil installed. This can usually be scheduled to coincide with the change from winter to summer grade oil and vice versa. Refer to “Pump Lubricants” in Section 2, Installation, for information on recommended oil and oil capacity.

NOTE:

When adding oil, pour in a thin, slow stream to avoid overflow, then check level.

4.6 CHECK VALVE CARTRIDGES

Milton Roy Company recommends that the check valves are replaced on an annual basis. If highly corrosive material (acids, slurries, etc.) is being pumped, some applications may require more frequent replacement.

In general, poor or reduced pump performance indicates that the check valves need to be replaced (refer to Section 5, Troubleshooting).

Complete instructions for replacing worn check valves are given in the “Corrective Maintenance” section.

The mRoy check valves are complete assemblies manufactured at the factory and should not be disassembled in the field.

To determine if the check valves need replacement, with the pump off and pressure removed from system unscrew the check valve from the liquid end and look through the hole in the check valve seat. The ball should appear perfectly round and free of pits, mars, or scratches. If the ball and/or seat is excessively damaged, the replacement schedule should be shortened accordingly. If the ball and seat are both in good condition, the replacement schedule can be lengthened.

4.7 DIAPHRAGM(S)

The mRoy PTFE diaphragm is extremely durable and often lasts for many years. As a preventative measure, Milton Roy recommends that the mRoy diaphragm be replaced yearly to coincide with check valve replacement. Also whenever the head is removed freeing the diaphragm the diaphragm must be replaced. Refer to the instructions in the “Corrective Maintenance” section for diaphragm replacement.

4.8 RELIEF VALVE POPPET

Milton Roy recommends that the relief valve poppet be replaced yearly during preventative maintenance. This can usually be timed to coincide with check valve replacement. Refer to the instructions in the “Corrective Maintenance” section.

4.9 CORRECTIVE MAINTENANCE

4.9.1 Check Valve Cartridge Replacement

With the exception of the mRoy A and L plastic versions, mRoy suction and discharge check valve cartridges are precision machined and assembled at the factory. Do not attempt to disassemble these cartridges. If they become inoperative, flush them with Safety Solvent, wash them with warm detergent and blow them out with compressed air to remove any foreign matter. (Refer step 4, from topic section 4.9.1.1). If this treatment does not eliminate the trouble, the cartridge assembly should be replaced. mRoy A plastic suction and discharge check valve cartridges may be disassembled for cleaning or parts replacement.

4.9.1.1 Metallic Liquid Ends (Figures 19, 20, 21 & 24)

Disassembly

1. The check valve cartridge assemblies use a SAE straight thread with an O-ring seal to facilitate port alignment with the connecting pipes. To remove the cartridge from the liquid end, first loosen the lock nut (520) one or two threads then unscrew the cartridge.
2. Remove and discard the O-ring (540) and spiral back-up ring (530).
3. On model MRA High Viscosity pumps only, the ball in the suction port of the liquid end is not sealed inside the suction check valve. This ball should fall out easily when the suction check valve is removed.
4. Carefully clean any parts to be reused. If any chemicals are used in the cleaning process, ensure that they are approved with the process liquid.

Reassembly

1. To install the cartridge, position the lock nut (520) toward the shoulder of the cartridge so that the recess on the face of the lock nut is adjacent to the O-ring (540) land (thread undercut) in the cartridge.
2. Make certain the spiral back-up ring (530) is coiled in a counterclockwise helix (this is opposite the direction normally employed by suppliers of these rings. Fit the spiral back-up ring (530) in the lock nut (520) recess. Push it firmly down in the recess as completely as possible.
3. Install a new O-ring (540) against the spiral back-up ring (530).

NOTE:
To assure a tight, leak free seal, new O-rings and spiral back-up rings should be used each time the check valves are disassembled.

4. On model mRoy “V’ option pumps only (Figure 19), the separate ball (570) needs to be balanced on the end of the suction check valve cartridge so that it will be held in place in the suction port by the check valve when it is screwed in.
5. Screw the cartridge assembly into the liquid end until the O-ring band is approximately level with the top of the spot face in the liquid end, then screw it in one (1) additional turn plus a partial turn as required to align the pipe thread port with connecting pipe.

⚠CAUTION **SUCTION AND CHECK VALVE CARTRIDGES ARE NOT IDENTICAL. BE SURE THAT THE CORRECT CARTRIDGE IS BEING SCREWED INTO THE PROPER PORT. (DISCHARGE CARTRIDGES HAVE HEXAGONAL CAP ON THE TOP; SUCTION CARTRIDGES DO NOT.) IF CHECK VALVE CARTRIDGES ARE INSTALLED INTO THE WRONG PORT, ONE OF THE FOLLOWING WILL OCCUR: (A) IMMEDIATE SEVERE DAMAGE TO PUMP MECHANISM, (B) NO PUMPING, (C) REVERSE PUMPING ACTION (FROM DISCHARGE LINE INTO SUCTION LINE).**

6. After completing pipe connection, tighten lock nut (520) securely against spot face so that O-ring (540) is trapped in chamfer of liquid end thread. Make sure that the spiral back-up ring (530) is completely contained in its recess and not extending to the outside.

4.9.1.2 mRoy A Plastic, Current Design (Figure 19)

Disassembly

1. Unscrew the check valve assembly from the pump liquid end.
2. Both the suction and discharge check valves may be disassembled in the same way. While carefully holding the body use a 5/16” rod to push out the internal parts. Do not damage the sealing face (opposite the threaded end) on the valve body. It is essential to reinstall the ball guides and ball stop in the proper direction, so take note during disassembly and follow the assembly drawing.
3. Carefully clean any parts to be reused. If any chemicals are used in the cleaning process, ensure that they are approved with the process liquid.

Reassembly

NOTE:
To assure a tight, leak free seal, new seals and O-rings should be used each time the check valves are disassembled.

1. Lightly coat the O-rings on the ball guides with mineral oil or other food grade lubricant (Refer step 3, from topic section 4.9.1.2). It is essential to reinstall the ball guides and ball stop in the proper direction. Remember the ball always lifts off the seat in the direction of liquid flow. The ball stop is used to retain the last ball check on the suction cartridge.
2. Remove the old valve-to-head seal (435) from the head and install a new seal. A fracture of the diaphragm head may result from installing the check valve against two seals or excessive tightening. The groove in the seal is to be oriented against the check valve body.

4.9.1.3 mRoy B Plastic Liquid End (Figure 24)

Disassembly

1. The mRoy B plastic check valves are held in place by two long bolts (521) that extend through the diaphragm head. Unscrew the nuts (519) to remove the check valves from the liquid end. Use caution when doing so, as the suction check valve and compression plate (518) will fall off when the bolt is removed.
2. Remove and discard the check valve O-rings (540).
3. Carefully clean any parts to be reused. If any chemicals are used in the cleaning process, ensure that they are approved with the process liquid.

Reassembly

NOTE:
To assure a tight, leak free seal, new O-rings should be used each time the check valves are disassembled.

1. The discharge check valve consists of two separate pieces that are shipped held together

with masking tape. Leaving the masking tape in place during assembly will make the process easier. These parts already have an O-ring in place between them.

2. Drop a new O-ring (540) into position in the discharge port of the liquid end. Slip the entire discharge cartridge (still held together with masking tape) into the discharge port (only one end will fit in).
3. Screw a nut (521) two or three turns (just enough to hold) on one end of each through bolt. Slide the compression plate over the discharge cartridge (517). Slip the bolts (521) through the holes in the compression plate and diaphragm head so that they fall through and hang out the bottom.
4. Fit a new O-ring (540) into position on the top of the suction cartridge.
5. Insert the suction cartridge and O-ring up into the suction port of the liquid end. Position the other compression plate (518) under the suction check valve by sliding it up on the bolts. Screw on the two remaining nuts (519). The suction check valve should now be held in place in the liquid end. Tighten the nuts on the through bolts firmly. Do not over-tighten or plastic fittings may be damaged.

4.9.2 Relief Valve Poppet Replacement (Figure 18)

If the pump is allowed to operate for long periods with the relief valve relieving pressure, there is a possibility that the poppet will wear, causing erratic flow and discharge pressure. If this occurs, the relief valve poppet should be replaced. Even if excessive wear has not occurred, it is still recommended that the poppet be replaced on a yearly basis.

Disassembly

1. Unscrew and remove the relief valve screw plug (1350).
2. Unscrew and remove the relief valve adjustment screw (50).
3. Remove the relief valve spring (40). A pair of tweezers may be required to remove the spring from the relief valve port.
4. Remove the relief valve poppet (30) with a tweezer or by “jogging” the motor, causing oil to flow up through the relief port to float the poppet up and out of the threaded hole.

Reassembly

1. Temporarily secure a new poppet (30) into the end of the spring (40) with thick grease. Drop this assembly into place in the relief valve port.
2. Install the relief valve adjustment screw (50) until the spring (40) is lightly compressed. Follow the instructions for resetting the relief valve given in Section 3, Operation.

4.9.3 Diaphragm replacement (Figure 19-26)

The mRoy A & B models have different assembly depending on whether they have leak detection. Be sure to refer to the appropriate Figure (19-26) when replacing the diaphragm(s).

Disassembly

1. Remove the eight (8) bolts (350 or 355) from the diaphragm head (330), depending on the model.
2. Remove the diaphragm (290).
3. Remove the contour plate(s) (282).
4. If servicing a pump with a square ring (260), remove and discard the square ring.
5. If servicing a double diaphragm style pump, remove the intermediate chamber and square head plated pipe.
6. Carefully clean any parts to be reused. If any chemicals are used in the cleaning process, ensure that they are approved with the process liquid and hydraulic oil.

Reassembly

1. Place pump on its side with diaphragm cavity facing up.
2. Install contour plate(s) (282) into position in the housing and/or diaphragm head (330), as appropriate.
3. Carefully center diaphragm (290) in the shallow recess in the housing.
4. If servicing a double diaphragm style pump, position the intermediate chamber and square head plated pipe over the diaphragm. Fit a second new square ring (260) (if required) into position in the recessed square ring groove. Carefully center the second diaphragm (290) in the shallow recess in the intermediate ring.
5. Retain diaphragm with thin, flat blade 1/2" to 1" (12.7 mm to 25.4) mm wide.
6. Carefully position the diaphragm head and contour plate (this diaphragm head side contour plate is not used on some models) in place, aligning bolts holes. Remove blade and torque bolts as follows (See Figure 16):

   a. mRoy Model A Metal Heads: 265–275 in. lbs. (30-31 N-m) bolting torque (grade 5 or stronger bolts)

   b. mRoy Model A Plastic Heads: 60–70 in. lbs. (7-8 N-m) bolting torque

   c. mRoy Model B Metal Heads: 340-360 in lbs. (38-41 N-m) bolting torque

   d. mRoy Model B Plastic Heads: 75–85 in. lbs. (8.5-9.6 N-m) bolting torque tie down nuts 25 in. lbs. (3 N-m).

Procedures for complete disassembly of the mRoy pump are listed below. Some steps can be omitted depending on which part is replaced.

4.9.4 Motor and Worm Replacement (Figures 17 & 18)

Be certain that the motor is disconnected before it is removed in order to replace or inspect the motor or the gears.

Disassembly

1. Remove oil drain plug and drain oil.
2. Remove the screws that attach the motor to the pump.
3. On plate mounted units, remove motor; the gear shaft may come out as well. If the motor separates from the worm shaft (640), use care not to lose the shaft key and coil spring.
4. Remove worm assembly (120).
5. On units with API motor mount adapters; removal of the motor and adapter together will also lift the worm gear shaft from the pump.

Reassembly

1. Reinstall by reversing steps 1 through 5 or follow the "motor conversion" directions.

Note: Apply sealant all around the edge and around the 4 bolt holes of the face of the motor mount as shown. Before you assemble the motor mount on the pump make sure you have sealant all around the flange and covering the 4 holes.

4.9.5 Control Spool O-Rings Replacement (Figure 17, 19 & 20)

Occasionally, the control spool O-rings may need to be replaced. Replacement is usually indicated if pump delivers less rated flow than expected.

Disassembly

1. Remove E-ring (220).
2. Unscrew and remove capacity control knob (210).
3. Remove screw (180) in threaded sleeve (170) (capacity control).
4. Remove diaphragm head (330), diaphragm (290), contour plate (280 & 285), and motor and motor mount.

5. Remove control spool (160) from bore.
6. For mRoy A pumps, fabricate a tool by inserting a 3/16" diameter x 4-in. long soft plastic (e.g. Nylon) solid rod into the 3/16" hole and shaping the end with a 7/16" reamer inserted into the control spool bore. For the mRoy B pumps, a tool is not required.

⚠ CAUTION **CAREFUL USE OF REAMER IS HIGHLY RECOMMENDED AS DAMAGE MAY OCCUR TO THE SURFACE OF THE BORE. A TOOL, PART NUMBER O-RING TOOL CAN BE PURCHASED FROM MILTON ROY.**

Reassembly

1. Place new O-rings (150) on control spool (160) and coat O-rings liberally with grease to hold them in place.
2. Place O-ring tool (notch facing up to guide O-ring across intersecting passage), into 3/16 hole at 12:00 o'clock position behind the contour plate.
3. Push control spool and O-rings into bore carefully, using a O-ring tool to guide O-ring across intersecting passage. This is done to prevent damage to O-rings. Finally, guide control piston into center of control spool, motor side.

4.9.6 Worm Gear Replacement (Figure 17)

Disassembly

1. Remove motor assembly, following instructions shown in "Motor and Worm Replacement" section.
2. Remove two screws (250), linkage arm (240), and control plunger (230).
3. Use arbor press or hammer and brass punch to remove the gear shaft from the gear.
4. Lift worm gear, connecting rod, and plunger assembly up and out of pump housing.

Reassembly

1. Once the gear along with plunger and connecting rod assembly is in the housing you are ready to slide the gear shaft back into the housing.
2. When installing gear shaft into the pump housing you will need to Loctite the ends of the shaft to prevent oil leaking.
3. Make sure sealing grooves are clean. by wiping down with isopropanol 70/30 alcohol and allowing it to evaporate for 10 sec.
4. Loctite primer must be applied completely around the gear shaft O.D. and the pump housing I.D for the gear shaft.
5. Make sure sealing grooves are clean. by wiping down with isopropanol 70/30 alcohol and allowing it to evaporate for 10 sec.
6. While the shaft is hanging out of the hole, apply Loctite 242 to the O.D. of the exposed shaft of side A and on the other side of the housing apply Loctite to the I.D. of the pump housing gearshaft hole on side B. Then push the shaft thru exposing side B shaft, then you can repeat the Loctite step on side B.
7. Make sure the shaft is flush or below flush on both sides of the housing.
8. Note: Loctite has a 45 minute working time and 24 hours for a full cure. Wipe off any excess Loctite.
9. Complete Reassembly by reversing steps 1 & 2.

4.9.7 Connecting Rod and Plunger Replacement (Figure 17)

Disassembly

1. Lift connecting rod (100) up and back to disengage plunger (90) from bore.
2. Use arbor press or hammer and brass punch to remove wrist pin (110) from connecting rod (100) and plunger (90).
3. To assure proper installation, note position of oil groove for wrist pin (110) and oil groove for worm gear (120) with respect to connecting rod (100) and plunger (90). Groove should be located at bottom of bore.

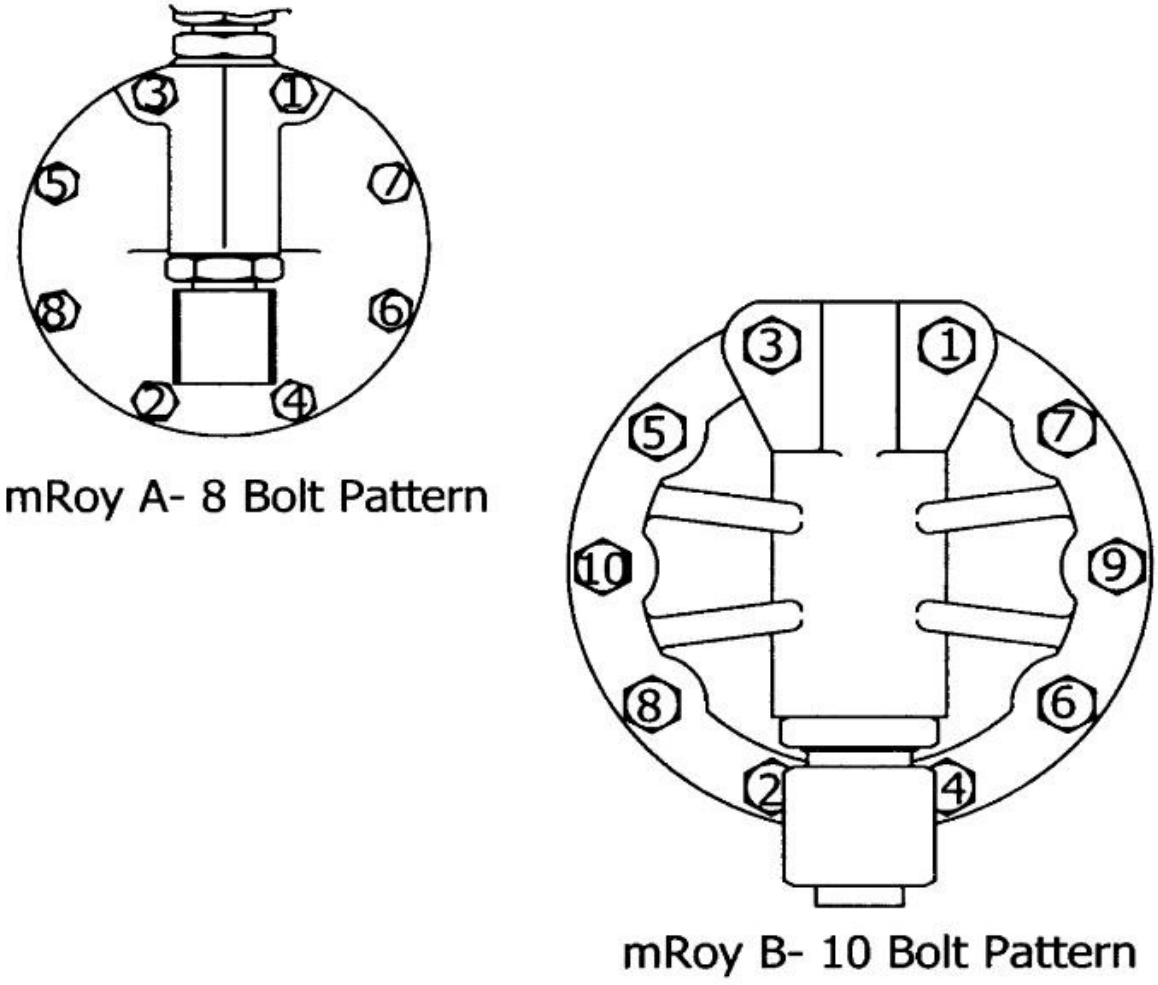


Figure 16. Diaphragm Head Bolt Torque Pattern

SYMPTOMS	REMEDIES
Pump motor won't operate.	• No power. Supply correct power in accordance with motor nameplate. • Blown fuse. Check for short circuit or overload. • Open thermal overload device in starter. Reset overload. • Broken wire. Locate and repair. • Low voltage. Check for too thin wiring. • Low liquid level (where low level cutoff is used). Fill tank. • Oil is frozen in pump. Thaw out. • Bad motor. Replace motor.
Pump doesn't deliver rated capacity.	• Starved suction. Replace suction piping with larger size, or increase suction head. • Leaky suction piping. Repair or replace defective piping. • Excessive suction lift. Rearrange equipment location to reduce suction lift. • Liquid too close to boiling point. Lower temperature or increase suction pressure. • Air in hydraulic or reagent system. Bleed system. • Air or gas trapped in oil or pumpage. Decrease capacity to 20% for 5 mins. then increase to 100% for 5 mins. • Worn or dirty valves or seats. Clean or replace cartridges. • Viscosity of liquid too high (cps). Reduce viscosity by heating or other means, or increase size of suction piping, or increase suction pressure. • Insoluble materials; crystallization of liquid; settling of solids. Limit solution strength to proper value. Flush and clean solution tank periodically. Suction connection should be 2" to 4" from bottom of solution tank. • Low discharge pressure. A minimum discharge pressure is required to insure proper capacity control (see Discharge Piping, Section II.) • Relief valve being actuated. Refer to symptom marked with an *. • Capacity adjustment set above 100% capacity mark. Reposition adjustment knob to 100% mark.
Pump delivers erratically.	• Leaky suction line. Repair or replace piping. • Worn or dirty valves or seats. Clean or replace cartridges. • Excessive excursion of ball valves from seats (indicated by ball chatter). Replace cartridges. • Insufficient suction pressure. Increase suction pressure by raising tank level or pressurizing suction tank. • Liquid too close to boiling point. Reduce temperature or raise suction pressure. • Leaky system relief valve. Repair or replace relief valve.

SECTION 5 - TROUBLESHOOTING GUIDE

SYMPTOMS	REMEDIES
Motor overheats thermal overload switches.	• Power supply does not match motor characteristics. Check power supply against motor nameplate data. • Overload caused by operating pump above its discharge pressure. Check operating pressure against pump manufacturer's data plate max. rating and correct the cause of the pressure abnormality.
Noisy operation of pump liquid end. Noisy operating in drive casing (pounding noise at high discharge pressure).	• Pump valves must move to open and close, and they will make a clicking noise as they operate. These noises are sometimes amplified by natural resonances in the piping system. They are usually indications of normal valve functioning. • Fluid compressibility causes reversal load on gears at end of pressure stroke. Not considered detrimental. No action needed. • Pump internal relief valve actuating, caused by excessive suction lift conditions. Lower pump or raise level of liquid. • Pump internal relief valve actuating, caused by insufficient suction pressure. Correct poor suction condition. • Pump internal relief valve actuating, caused by clogged or partially blocked filter or strainer in suction line. Clean strainer. • Pump internal relief valve actuating, caused by clogged or fouled suction or discharge check valves. Clean or replace. • Pump internal relief valve actuating, caused by blocked discharge line. Remove blockage.
Improper oil level in reservoir increases and overflows. Pump delivery is not adjustable. Pump does not develop required pressure.	• Flexible diaphragm punctured by foreign material. Replace diaphragm. • System pressure too low. Install a back pressure valve in the discharge line (preferred method), or install a back pressure spring (provided) into discharge cartridge. • Refer to symptom marked with an *, or check to see if system pressure exceeds rated capacity on data plate. • O-rings on control spool are nicked. Replace O-rings. (Note: you must use a special tool. See section on control spool disassembly.)

6.1 GENERAL

1. This section gives information regarding replaceable components.

6.2 ILLUSTRATED PARTS LIST

1. Figure and Item Number Column

   a) The item numbers shown in the detailed parts list correspond to the item numbers appearing on the exploded view illustration. To find an unknown part number, locate the part on the illustration and note the item number. Look for the item number on the detailed parts list. The part number is on the same line. A dash (-) precedes non-illustrated item numbers.

2. Description Column

   a) The name of the item is in the description column.

3. Part Number Column

   a) The supplier's part number is listed in the part number column.

4. Material/SPM Column

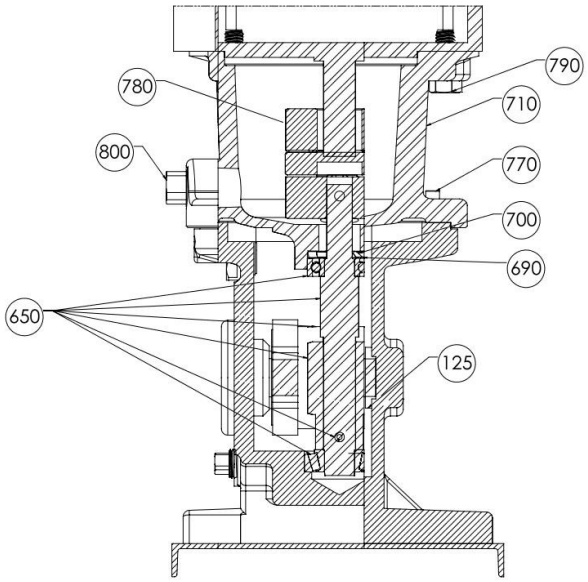
   a) The material used to manufacture the part is listed in the material/SPM column.

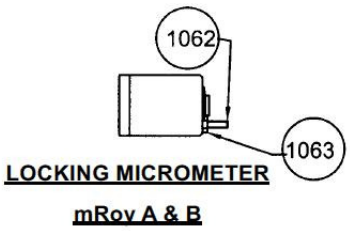
   b) The strokes per minute is listed for all worm and shaft assemblies in the material/SPM column.

5. Quantity Column

   a) The numbers appearing in the quantity column are the total quantity of the listed part required in its immediate assembly.

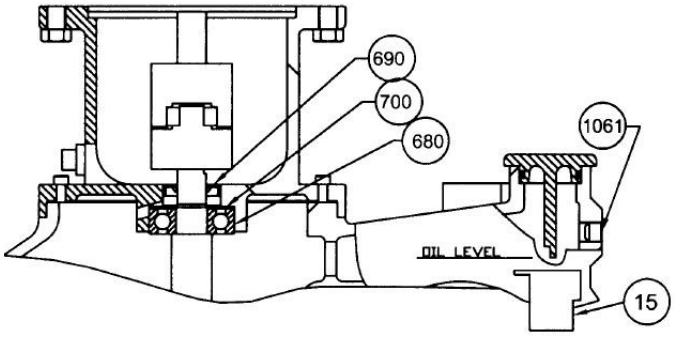
Refer to table numbers (6.3 to 6.23) for the above Parts List information.





LOCKING MICROMETER

mRoy A & B



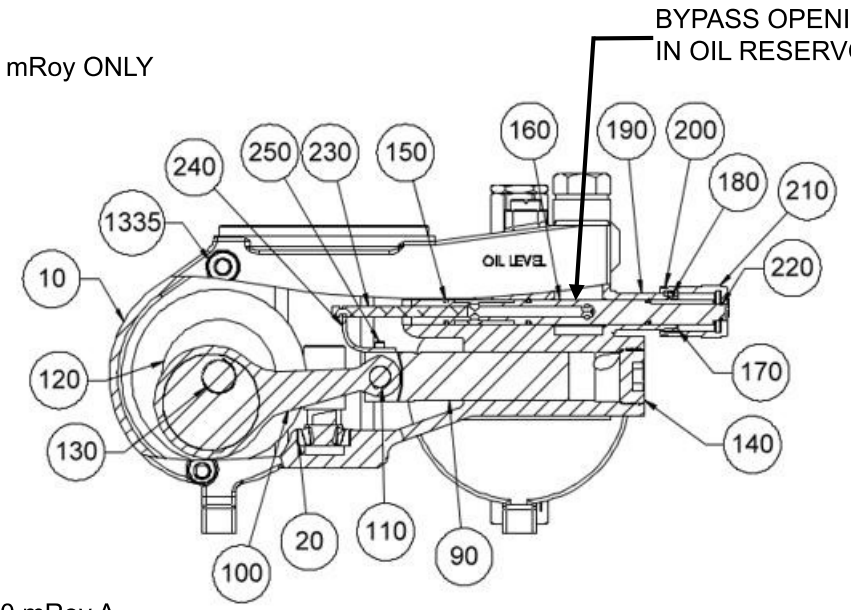
API FLANGE MOTOR MOUNT

mRoy Drive, Side View

BAFFLE FOR DUPLEX

NOTES:
ITEMS 650 SOLD AS AN ASSEMBLY

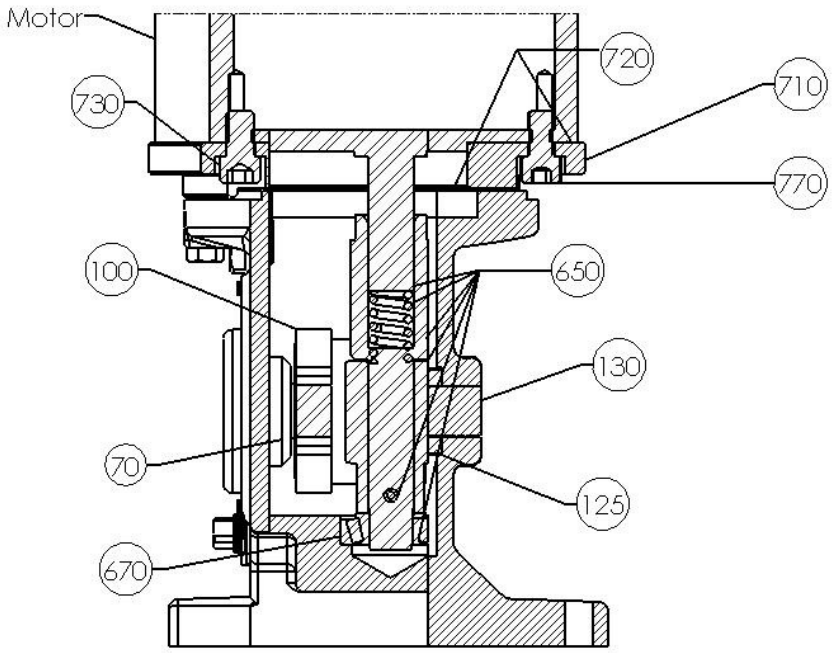
ITEM 125 mRoy ONLY



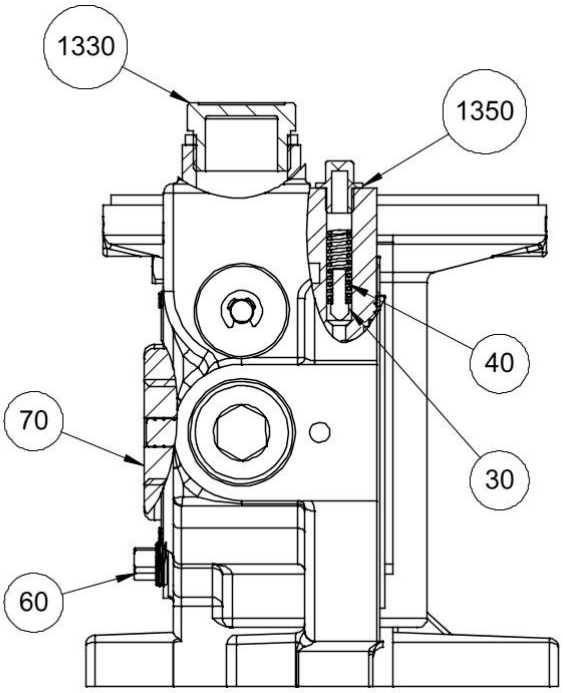
NOTE:
ITEMS 75&80 mRoy A ONLY

DRIVE, SIDE VIEW

Figure 17. Common Parts - mRoy A & B Side View and API Motor Mount (DWG(s) 999-2009-0011 and 999-2009-0010)



CLOSED COUPLED MOTOR MOUNT FLANGE



HOUSING END VIEW

Figure 18. Common Parts - mRoy A & B End View and mRoy A Close Coupled Motor Mount (DWG(s) 999-2009-0011 and 999-2009-0009)

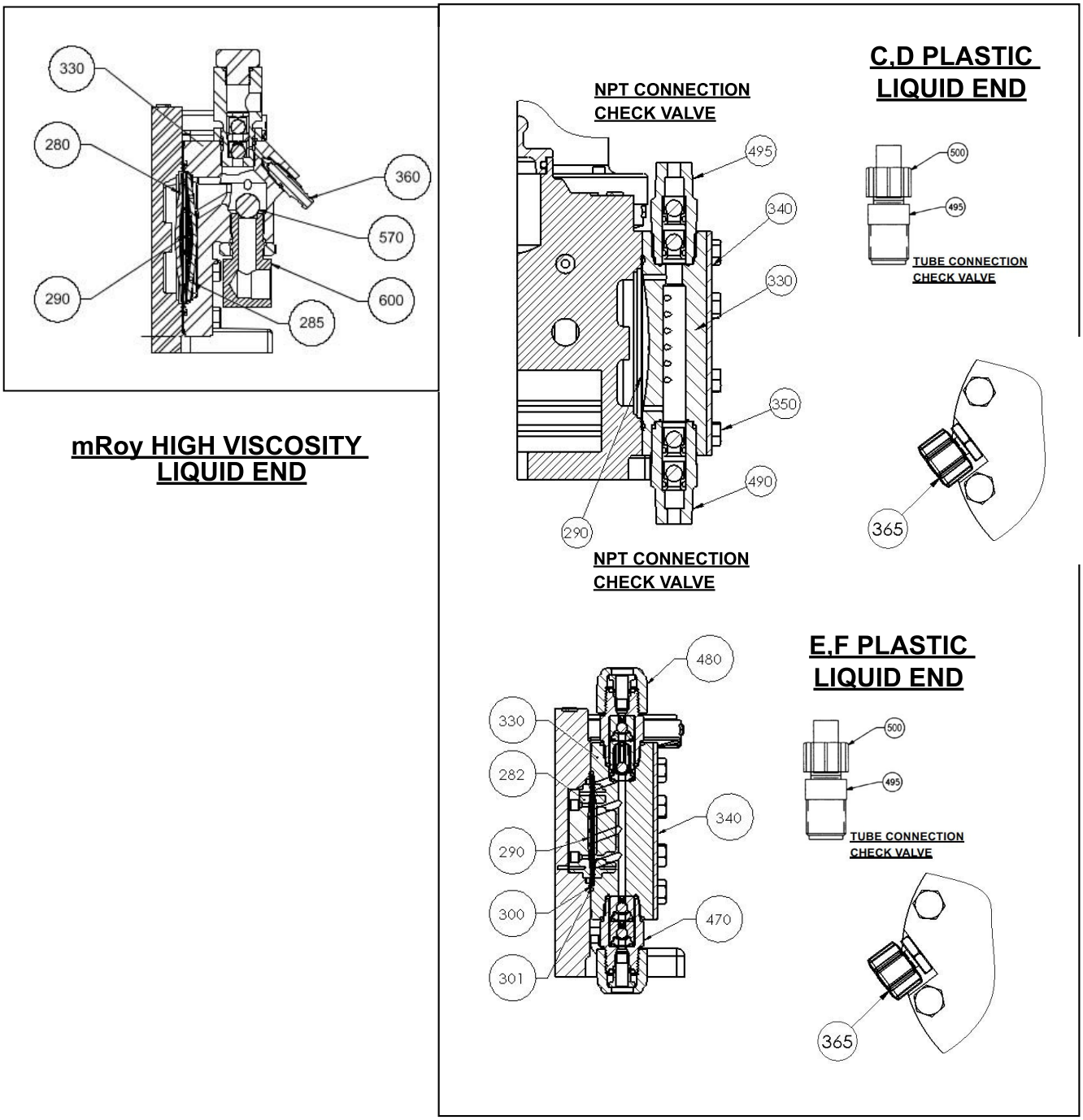
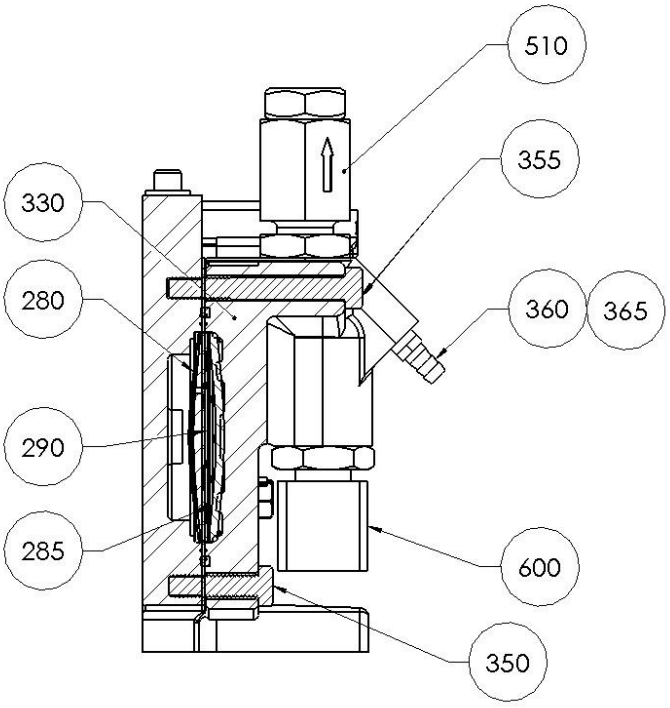
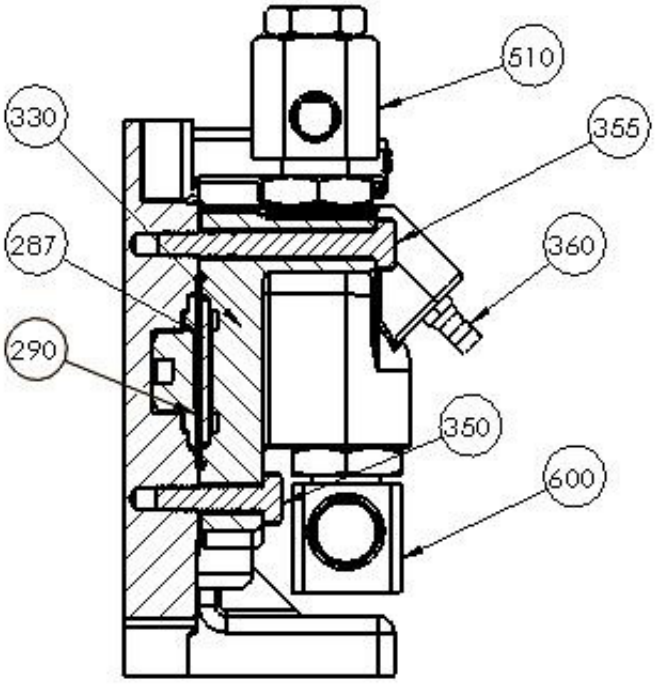


Figure 19. mRoy A High Viscosity & Plastic Liquid Ends
(DWG 999-2009-0001 & 999-2009-0002)

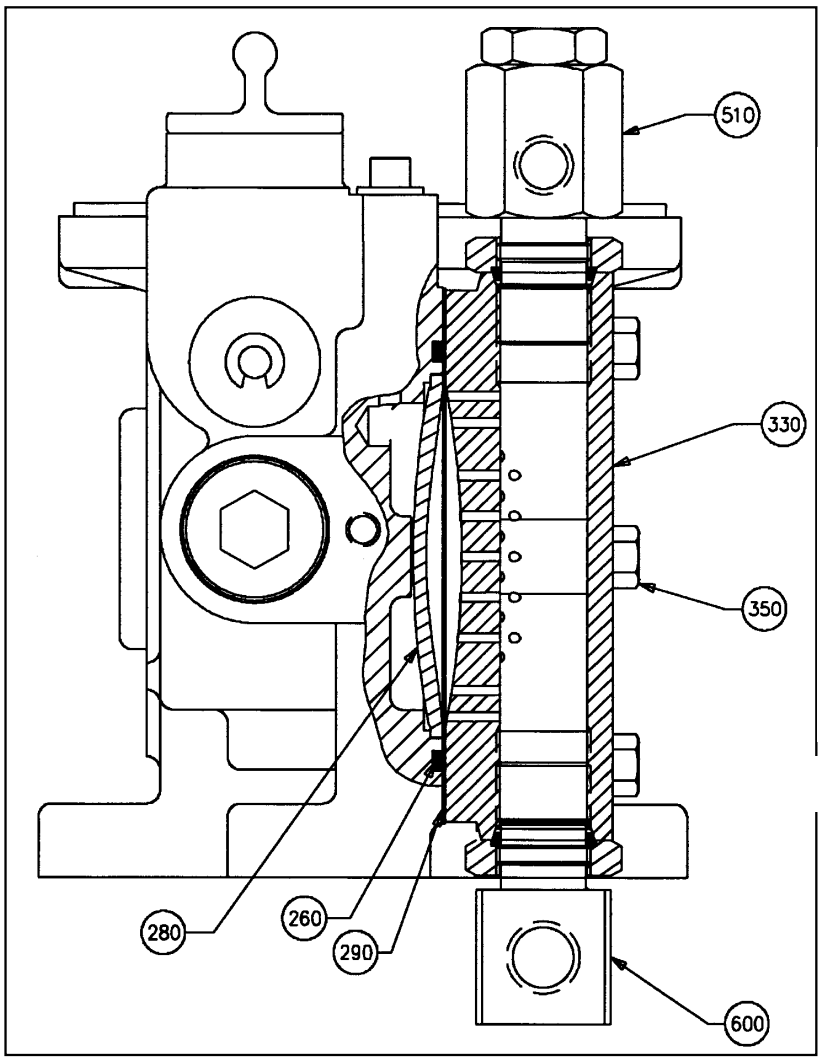


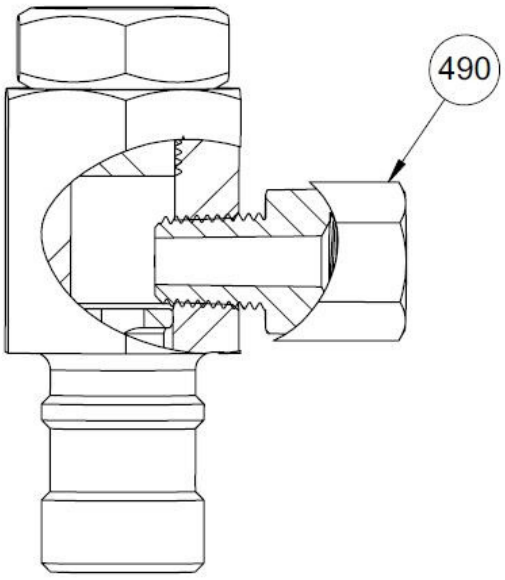
mRoy A: E,F PLUNGER LIQUID ENDS



mRoy A: C,D PLUNGER LIQUID END

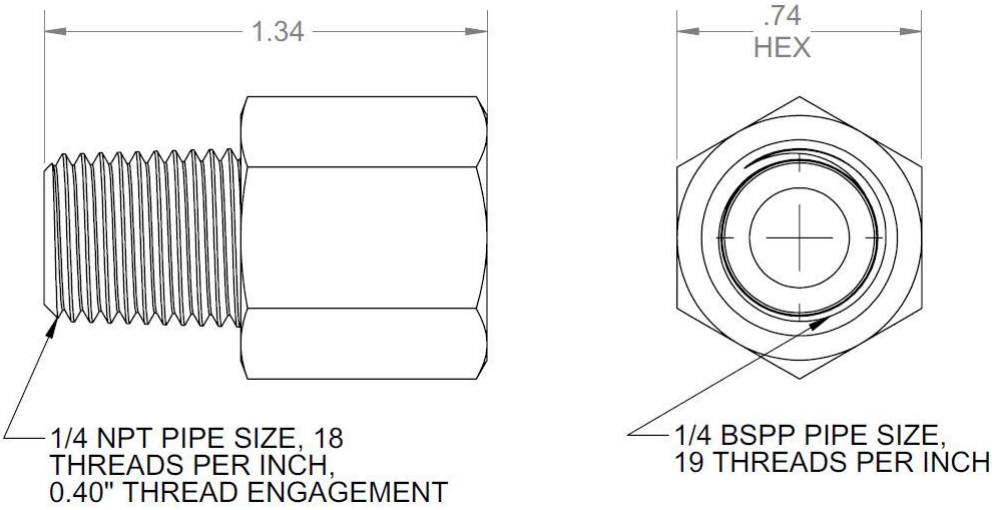
Figure 20. mRoy A Metallic Liquid Ends
(DWG 999-2009-0003 & 999-2009-0004)





MRA HORIZONTAL BSP

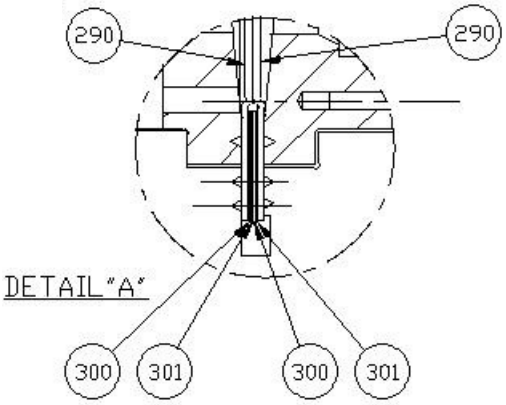
BAR STOCK LIQUID END



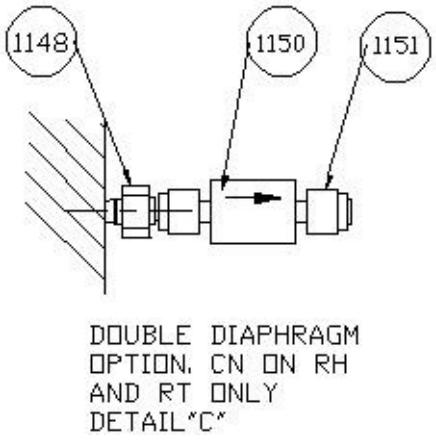
1/4 NPT TO BSP ADAPTER

Figure 21. mRoy A Bar Stock Liquid End and BSP check valve option (DWG 999-2009-0020 and 54626)

• *Below Drawings Applicable only to mRoy A - C,D Liquid Ends only*

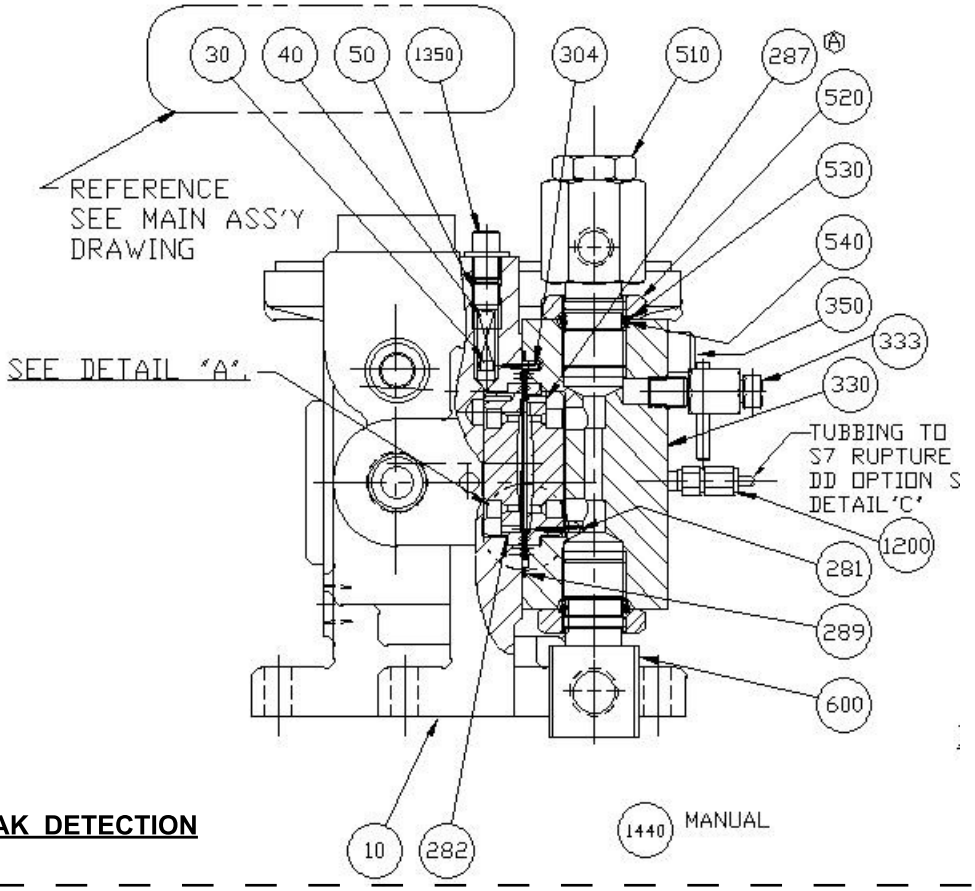


Detail



Detail

Detail

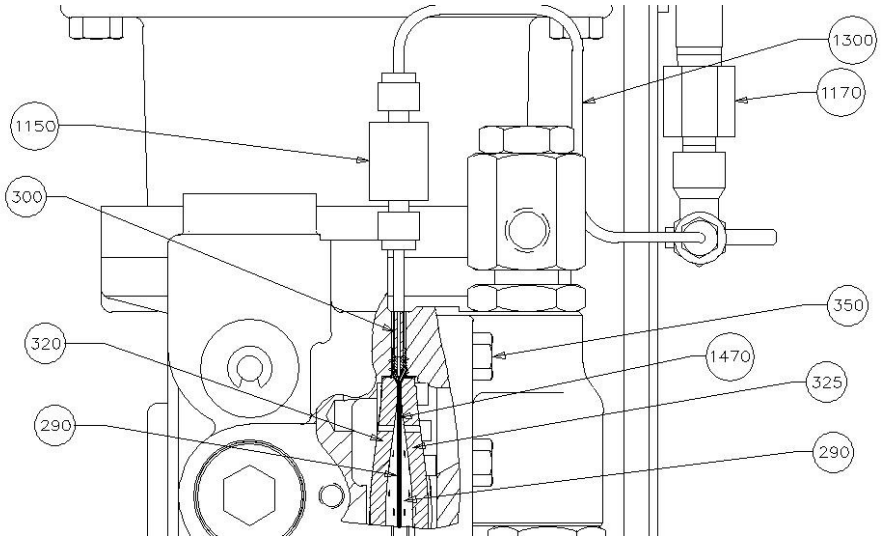


LEAK DETECTION

Figure 22. mRoy A Double Diaphragm and Leak Detection (DWG(s) 999-2009-0005

DOUBLE DIAPHRAGM LIQUID END

• *Drawings Applicable to mRoy A - E,F Liquid Ends*



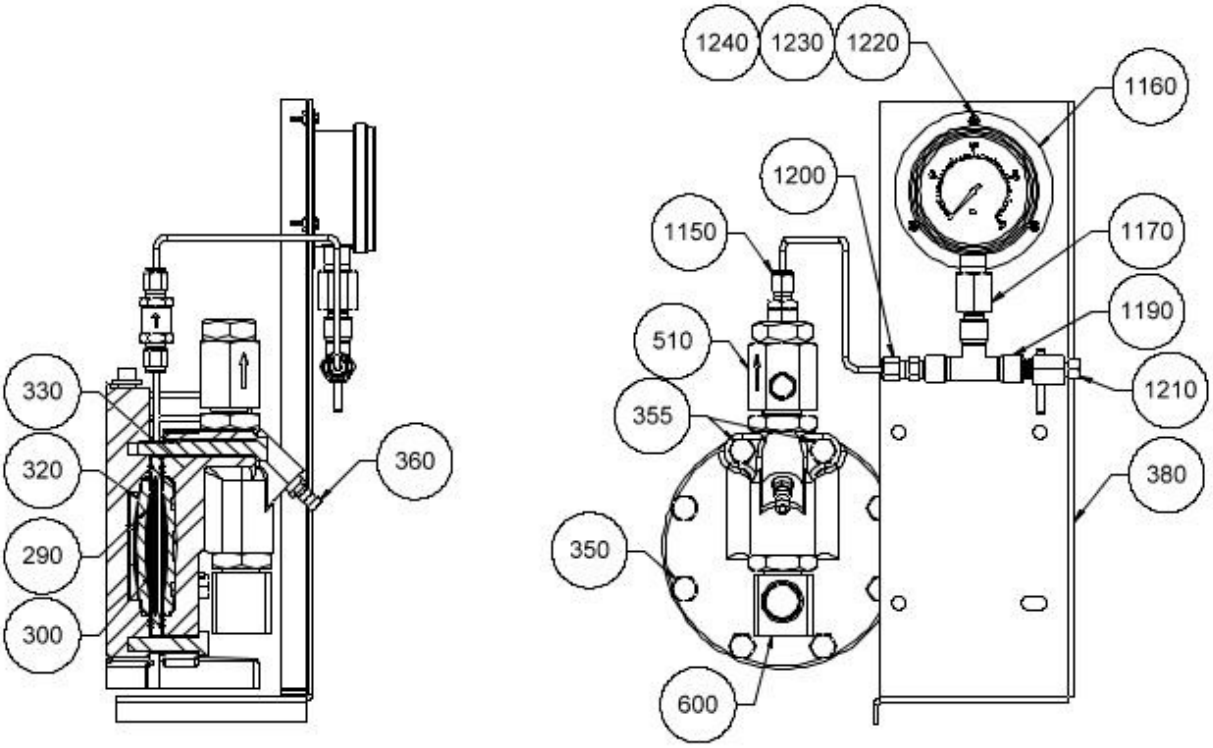


Figure 22. mRoy A Double Diaphragm and Leak Detection (DWG(s) 999-2009-0005

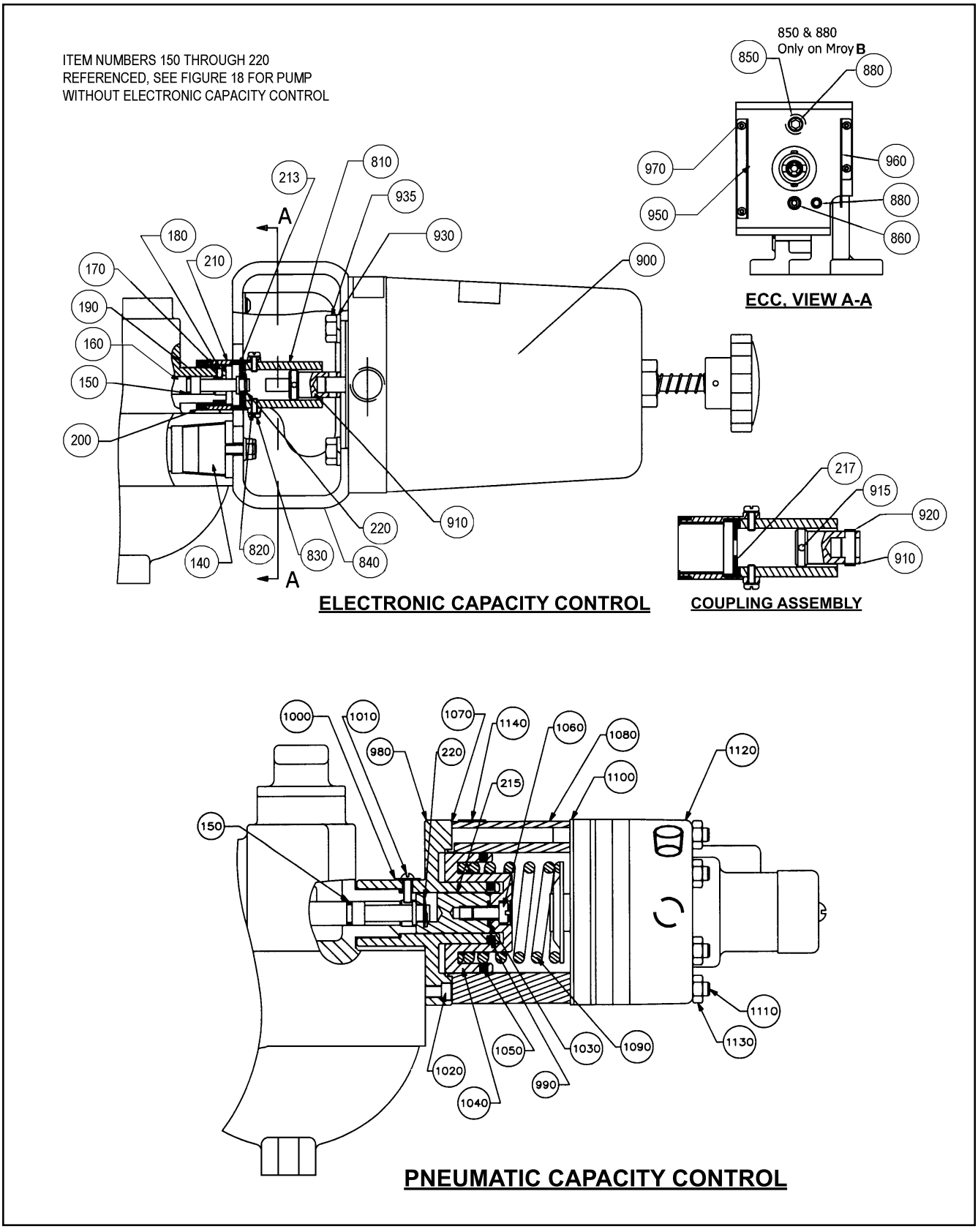


Figure 23. mRoy A and B Actuator (DWG(s) 999-2009-0008 and 999-2009-0007)

6.3 BASIC PARTS LIST FOR DRIVE MODELS mRoy A (FIGURES 17 &18)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
10	Housing, Main	Consult with aftermarket group for replacement. Provide serial number and model number of pump.		1
20	Cup, Race	409-0064-020	Steel	1
30	Poppet, Relief Valve	212-0056-074	Nylon	1
40	Spring, Relief Valve	280-0043-041	Steel	1
50	Adjusting Screw, Relief Valve	405-0241-014	Steel	1
60	Plug - 1/4” NPT, Sq. Head	402-0009-111	Steel	1
70	Gear Shaft Bushing, (factory installed, not recommended for field service, call factory)	237-0029-006	Steel	1
80	Housing Sleeve 7/16”, High viscosity option only	237-0073-006	Steel	1
90	Plunger, 7/16”	212-0055-006	Steel	1
	Plunger, 3/8	212-0055-106	Steel	1
	Plunger, 5/8”	212-0054-006	Steel	1
	Plunger, 1-1/16”	212-0053-006	Steel	1
100	Rod, Connecting	214-0025-062	Aluminum	1
110	Pin, Wrist	211-0030-006	Steel	1
125	Gear Spacer, Simplex	219-0071-006	Steel	1
	Gear Spacer, Duplex	219-0109-006	Steel	1
130	Gear Shaft, Simplex	268-0021-006	Steel	1
	Gear Shaft, Duplex	268-0018-006	Steel	1
140	Plug, 1” NPT Socket Hex Head	402-0095-061		1
	Plug, 1/2” NPT Socket Hex Head	402-0095-041		1
150	O-Ring, Parker 2-011	408-0109-082	Polyurethane	3
160	Control Spool	268-0037-006	Steel	1
170	Sleeve, Threaded	243-0058-016	316SS	1
180	Screw, Socket Set - 6-32NC x 1/4	405-0039-035		1
190	Plate, % Capacity	253-0015-062	Aluminum	1
200	Ring, Calibration	253-0024-062	Aluminum	1
	Ring, Calibration	253-0024-071	PVC	1
210	Knob, Control	255-0019-016	316SS	1
	Knob, Capacity Adjust	255-0019-071	PVC	1

- Parts Not Illustrated

Parts Continued Next Page

BASIC PARTS LIST FOR DRIVE MODELS mRoy A (FIGURES 17 &18)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
	Knob, Capacity Adjust, (Locking Micrometer)	255-0045-000		1
220	E-Ring - 1/4”, Control Knob	404-0124-096	Steel	1
230	Plunger, Control	212-0036-039	Steel	1
240	Arm, Linkage	214-0009-006	Steel	1
250	Screw, Linkage - 8-32 x 1/4” Socket head	405-0245-011	Steel	2
1062	Screw, Socket Head - 6-32 x 1, Locking Micrometer Knob	40201	Steel	1
1063	Nut, Hex Head - 6-32NC (Locking Micrometer)	405-0060-017	Steel	1
1330	Cap, Reservoir With O-Ring	432-0457-0060N		1
1340	O-Ring, Reservoir Cap	408-0095-071	NBR	1
1350	Screw Plug, Relief Valve	405-2001-011	Plastic	1
-	Screw, Mount Data Plate	405-0280-000	Steel	2
-	Plate, Data	253-0186-000		1
-	Decal, Caution Motor	253-0021-198		1
Lubrication				
-	Oil, Gear - EP-35	407-0195-010	1 Quart	1
-	Oil, Gear - EP-95	407-0152-010	1 Quart	1
-	Oil, Gear - EP-95	407-0152-040	1 Gallon	A/R

- Parts Not Illustrated

6.4 PARTS COMMON TO METALLIC LIQUID END MODELS mRoy A (FIGURES 19 & 20)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
280	Contour Plate–Oil Side - 3-1/2”	298-0061-016	316 SS	1
285	Contour Plate-Process Side, Also Used With Double Non-Contacting Diaphragms)	298-0061-016	316SS	1
		298-0061-028	Alloy 20	1
		298-0061-030	Alloy C-22	1
460	O-Ring, Discharge Check Valve Cap	54436	Viton	1
510	Cartridge, Discharge Assembly	54157	316SS	1
		54295	Alloy 20	1
		54302	Alloy C-22	1
	Cartridge, Discharge Assembly BSP Vertical	54354	316SS	1
		54355	Alloy 20	1
		54356	Alloy C-22	1
	Cartridge, Discharge Assembly BSP Horizontal	54626	316SS	1
		54627	Alloy 20	1
		54628	Alloy C-22	1
520	Nut, Locking, Check Valve	209-0020-014	Stainless Steel	1
530	Back-up Ring, Spiral, Check Valve Lock Nut	408-0073-141	PTFE	2
540	O-Ring, Check Valve Lock Nut	408-0068-065	FKM (VITON)	2
600	Cartridge, Suction Assembly (Double Ball) 1/2” NPT Connection, (Except Model “RP”)	221-0896-216	316SS	1
		221-0896-228	Alloy 20	1
		221-0896-230	Alloy C-22	1
	Cartridge Suction BSP	54304	316 SS	1
		54306	Alloy 20	1
		54308	Hast C-22	1
-	Bushing, Reducing - 1/2” x 3/8”, Used To Install New Suction Check Valve to	402-0001-045	316SS	1
		402-0001-049	Alloy 20	1

- Parts Not Illustrated

Parts Continued Next Page

Diaphragm Head Designs And Diaphragms Are Grouped According To Size And Are Not Interchangeable

6.5 DIAPHRAGM HEAD DESIGN- 8 BOLT E & F LIQUID ENDS MODEL mRoy A (FIGURE 20)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
290	Diaphragm, 8 Bolt E, F Liquid Ends	2980005175	PTFE	1
300	Ring, Intermediate, Leak Detection, (Contacting Diaphragm)	219-0127-000	316SS	1
	Ring, Intermediate Chamber, Double	54629	316SS	1
325	Contour Plate- (Process Side) Leak Detection, (Contacting Diaphragm)	298-0091-016	316SS	1
		298-0091-028	Alloy 20	1
330	Head, Diaphragm - 8 Bolt E & F Liquid Ends	54155	316 SS	1
		54229	Alloy 20	1
		54255	Hast C-22	1
350	Screw, Hex Head - 5/16” x 1-1/4” (Head material: 1 & 5)	405-0017-139	Steel - Ultra coat	6
	Screw, Hex Head - 5/16” x 3-1/4” (Head material code 6)	54444	Steel - Ultra coat	8
	Screw, Hex Head - 5/16” x 1-1/2” (Head material: 1 & 5)	405-0017-189	Steel - Ultra coat	2

6.6 DIAPHRAGM HEAD DESIGN- 8 BOLT (2-7/8”) C & D LIQUID ENDS MODEL mRoy (FIGURE 20)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
281	Pin, Spring - 0.062 x ½	401-0001-061	Steel	1
282	Contour Plate–Oil Side - 2-1/2´´ (After 1998)	298-0107-006	Steel	1
	Contour Plate–Oil Side - 2-1/2´´ (Before 1998)	298-0007-016	316 SS	1
287	Contour Plate-Process Side	298-0007-016	316SS	1
		298-0007-028	Alloy 20	1
289	O-Ring - 2-039	21146	Viton	1

- Parts Not Illustrated

Parts Continued Next Page

DIAPHRAGM HEAD DESIGN- 8 BOLT (2-7/8”) LIQUID END MODEL mRoy C & D (FIGURE 20)

290	Diaphragm - 2-7/8” Diameter, 8 bolt Diaphragm Design	298-0005-275	PTFE	1
330	Head, Diaphragm - 2-7/8” Diameter, 8 bolt Diaphragm design	54182	316SS	1
		54282	Alloy 20	1
		54287	Alloy C-22	1
350	Screw, Socket Head - 5/16-18, 1-1/4” (Material 1 & 5)	405-0017-139	Steel - Ultra Coat	6
350	Screw, Socket Head - 5/16-18 1-1/4” (Head material: 6)	54444	Steel - Ultra Coat	8
355	Screw, Socket Head - 5/16–18, 2-1/2”	405-0017-189	Steel	2
460	Seal, Discharge Check Valve Cap	54436	Viton	1
510	Cartridge Assembly, Discharge (Double Ball)	54157	316SS	1
		54295	Alloy 20	1
		54302	Hast C-22	1
	Cartridge Assembly Discharge (Double Ball) BSP Vertical	54354	316SS	1
		54355	Alloy 20	1
		54356	Hast C-22	1
	Cartridge Assembly Discharge (Double Ball) BSP Vertical	54626	316 SS	1
		54627	Alloy 20	1
		54628	Hast C-22	1
520	Nut, Locking, Check Valve	209-0020-014	Stainless Steel	1
530	Ring, Spiral Back-up, Check Valve	408-0073-141	PTFE	2
540	O-Ring, Check Valve Lock Nut	408-0068-065	FKM (VITON)	2
600	Cartridge Assembly, Suction (Double Ball) 1/2” NPT Connection	221-0896-216	316SS	1
		221-0896-228	Alloy 20	1
		221-0896-230	Hast C-22	1
	Cartridge Assembly, Suction BSP	54304	316 SS	1
		54306	Alloy 20	1
		54308	Hast C-22	1

6.8 MODEL mRoy HIGH VISCOSITY “V” OPTION SUCTION CHECK VALVE OPTION PARTS (FIGURE 19)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
330	Head	54155	316 SS	1
		54229	Alloy 20	1
		54255	Hast C-22	1
570	Ball Check, Suction - 5/8”	407-0014-172	316 SS	1
		407-0014-173	Alloy 20	1
		407-0014-076	Alloy C	1

Parts Continued Next Page

600	Valve Body, Suction	221-0864-016	316 SS	1
		221-0864-028	Alloy -20	1
		221-0864-030	Alloy C-22	1

6.9 MODEL mRoy A: E & F PLASTIC LIQUID END PARTS (FIGURE 19)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
280	Contour Plate	298-0061-016	316 SS	1
290	Diaphragm 5”	298-0005-175	PTFE	1
330	Head	54092	PVC	1
340	Plate, Back-Up	54321	304 SS	1
350	Screw, Hex Head - 5/16-18 x 2	405-0017-163	18-8 SS	8
360	Fastprime Valve	48848	PVC	1
390	Lock-Washer, Spring - 5/16	404-0040-028	Zinc Plated	3
400	Nut, Hex - 5/16-18NC	405-0065-013	18-8 SS	3
435	Seal- Head to Check Valve (PVC & PVDF Checks)	408-0143-075	PTFE	2
500	Nut, Coupling - Tubing Connection ONLY	407-0350-079		2
540	O-ring	4080068065	Viton	1
490	Check Valve Assembly, Suction -Tube End	20287	PVC	1
Parts Included	O-Ring - 3/8 x 3/32	225-0032-675	PTFE	2
	Ball Stop	20289	PVC	2
	Seat	20290	PVC	2
	Ball, 3/8 Ad995	407-0015-111	Ceramic	2
	Body, Cartridge	20288	PVC	1
490	Suction Assembly, NPT	20299	PVC	1
	Suction Assembly, BSP	54379	PVC	1
Parts Included	O-Ring - 3/8 x 3/32	225-0032-675	PTFE	2
	Ball Stop	20289	PVC	2
	Seat	20290	PVC	2
	Ball, 3/8 Ad995	407-0015-111	Ceramic	2
	Body, Cartridge	20291	PVC	1
495	Discharge Assembly-Tube End	20292	PVC	1

- Parts Not Illustrated

Parts Continued Next Page

MODEL mRoy A: E & F PLASTIC LIQUID END PARTS (FIGURE 19)

Parts Included	O-Ring - 3/8 x 3/32	225-0032-675	PTFE	2
	Ball Stop	20289	PVC	2
	Seat	20290	PVC	2
	Ball, 3/8 Ad995	407-0015-111	Ceramic	2
	Body, Cartridge	20288	PVC	1
495	Discharge Assembly, NPT	20302	PVC	1
	Discharge Assembly, BSP	54364	PVC	1
Parts Included	O-Ring - 3/8 x 3/32	225-0032-675	PTFE	2
	Ball Stop	20289	PVC	2
	Seat	20290	PVC	2
	Ball, 3/8 Ad995	407-0015-111	Ceramic	2
	Body, Cartridge	20291	PVC	1

6.9 MODEL mRoy A: C & D PLASTIC LIQUID END PARTS (FIGURE 19)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
280	Contour Plate	298-0007-016	316 SS	1
281	Spring Pin	4010001041		1
290	Diaphragm 5”	298-0005-275	PTFE	1
330	Head	53961	PVC	1
340	Plate, Back-Up	54320	304 SS	1
350	Screw, Hex Head - 5/16-18 x 2-1/4	54441	18-8 SS	8
365	Fastprime Valve	48848	PVC	1
470	Check Valve Assembly, Suction NPT	49163	PVC	1
	Check Valve Assembly, Suction BSP	54383	PVC	1
480	Check Valve Assembly Discharge NPT	49243	PVC	1
	Check Valve Assembly, Discharge BSP	54375	PVC	1

- Parts Not Illustrated

Parts Continued Next Page

6.10 mRoy A MOTOR MOUNT PARTS (FIGURES 17 & 18)

Close Coupled Flange Mount NEMA 56C (CC with S5 or 5X)

(NEMA 56C) Worm and Shaft Assembly includes Worm Shaft (640), Worm (650), Pin (660), Cone Bearing (670) and Spring (740).

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER		MATERIAL/SPM	QUANTITY
650	Worm, Worm Gear and Shaft Assembly	54679	77:1	23 spm @1725 RPM	1
		54680	48:1	37 spm @1725 RPM	1
		54681	24:1	73 spm @1725 RPM	1
		54682		117 spm @1725 RPM	1
		54683	9.5:1	185 spm @1725 RPM	1
670	Bearing, Tapered Rolle	409-0066-010			1
680		409-9994-000			1
710	Plate motor, mount	272-0130-062		Aluminum	1
720	3/8-16 x 5/8 Screw Socket Hd	225-0115-099		Steel	4
730	Gasket, motor	405-0029-086		Rubber	2
740	Spring, compression	403-0166-011		Steel	1
770	Screw 1/4-20 x 1 Socket Hd	405-0027-111		Steel	2

mRoy A MOTOR MOUNT PARTS (FIGURES 17 & 18)

Close Coupled Flange IEC Frame 71, B5 (CC with S7 or 7X)

(IEC Frame 71, B5) Worm and Shaft Assembly includes Worm Shaft (640), Worm (650), Pin (660), Cone Bearing(670) and Spring (740).

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER		MATERIAL/SPM	QUANTITY
650	Worm and worm gear and Shaft Assembly	54674	77:1	23 spm @1725 RPM	1
		54675	48:1	37 spm @1725 RPM	1
		54676	24:1	73 spm @1725 RPM	1
		54677	15:1	117 spm @1725 RPM	1
		54678	9.5:1	185 spm @1725 RPM	1
670	Bearing, Tapered Rolle	409-0066-010			1
680		409-9994-000			1
710	Plate IEC motor mount	272-0130-062		Aluminum	1
720	Gasket, motor	225-0115-099		Rubber	1
-	Gasket, IEC71 motor	225-0121-099		Rubber	1
730	SHCS 8mm x 1.25 x 30	405-2007-074		Steel	4
740	Spring	60059		Steel	1
770	Screw 1/4-20 x 1 Socket Hd	405-0027-111		Steel	2

- Parts Not Illustrated

Parts Continued Next Page

mRoy A MOTOR MOUNT PARTS (FIGURES 17 & 18)

Parts Common To ALL API Motor Mounts (A)

(NEMA 56C) Stub Shaft Assembly includes Worm Shaft (640), Worm (650), Pin (660), Cone Bearing (670), & Ball bearing (680).

FR (NEMA 56C) Stub Shaft Assembly includes Worm Shaft (640), Worm (650), Pin (660), Cone Bearing (670), & Ball bearing (680).					
640	Shaft, Worm	252-0048-006		Steel	1
650	Worm, Gear, & Shaft Assembly	54684	77:1	23 spm @1725 RPM	1
		54685	48:1	37 spm @1725 RPM	1
		54686	24:1	73 spm @1725 RPM	1
		54687	15:1	117 spm @1725 RPM	1
		54688	9.5:1	185 spm @1725 RPM	
670	Bearing, Cone	409-0064-010			
680	Bearing, Ball	409-0094-020			

API Flange Mount NEMA 56C (FR)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
75	Plug, Expansion - 9/32	40059	Steel	2
690	Washer, Flat	219-0030-006	Steel	1
700	Spring, Finger - 0.563	403-0121-006	Steel	1
710	Adapter, Motor	272-0090-001	Cast Iron	1
770	Screw, Socket Head - 8-32NC x 3/4	405-0132-031	Steel	4
780	Coupling - 1/2 x 5/8 Key	410-0127-040		1
790	Screw, Hex Head - 3/8-16 x 1 GR5	405-0018-119	Steel	4
800	Plug, Sq. Head Pipe - 1/2” NPT	402-0009-137	Steel	1

- Parts Not Illustrated

Parts Continued Next Page

mRoy A MOTOR MOUNT PARTS (FIGURES 17 & 18)

API Flange Mount NEMA 143/145TC (F4)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
75	Plug, Expansion - 9/32	40059	Steel	2
690	Washer, Flat	219-0030-006		1
700	Spring, Finger - 0.563	403-0121-006		1
710	Adapter, Nema 56c - 143/145 TC	272-0090-001		1
770	Screw, Socket Head - 8-32NC x 3/4	405-0132-031	Steel	4
780	Coupling - 5/8 x 7/8 3/16 Key	410-0064-120		1
790	Screw, Hex Head - 3/8-16 x 1 GR5	405-0018-119		4

API Flange Mount NEMA IEC Frame 71, B5 (FS)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
75	Plug, Expansion - 9/32	40059	Steel	2
690	Washer, Flat	219-0030-006		1
700	Spring, Finger - 0.563	403-0121-006		1
710	Adapter, Motor, mRoy A API IEC	272-0146-001		1
770	Screw, Socket Head - 8-32NC x 1/4	405-0132-031	Steel	4
780	Coupling - 1/2 x 14MM(Lovejoy L095)	40202		1
-	Nut, Hex - 5/16-18NC	405-0065-013		
790	Screw, Hex Head - 3/8-16 x 1 Gr5	405-0018-119	Steel	4
-	Lock-Washer, Spring - 5/16	404-0040-028		
800	Plug, Sq. Head Pipe - 1/2” NPT	402-0009-137	Steel	1

API Flange Mount IEC 80 B5 (MD)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
75	Plug, Expansion - 9/32	40059	Steel	2
690	Washer, Flat	219-0030-006		1
700	Spring, Finger - 0.563	403-0121-006		1
710	Adapter, Motor - IEC 80 B5	272-0090-001		1
-	Plate, Motor Adapter	60199		1
770	Screw, Socket Head - 8-32NC x 3/4	405-0132-031	Steel	4
780	Coupling - 5/8 x 19mm (Lovejoy l-100)	40244		1
790	Screw, Hex Head - M10 x 25mm	435-0001-732	Steel	4
800	Plug, Sq. Head Pipe - 1/2” NPT	402-0009-137	Steel	1

- Parts Not Illustrated

Parts Continued Next Page

6.11 ELECTRONIC CAPACITY CONTROL MOUNTING (FIGURE 23)

Complete Kits: 30268 7/16", 3/8" & 5/8" plungers & 335-1401-040 for 1-1/16" plunger. Parts included are below:

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
140	Plug, Adapter - RA & RP Pumps (1" NPT)	243-0045-020	Steel	1
	Plug, Adapter - RT, RH, & RJ Pumps (1/2" NPT)	243-0045-000	Steel	1
150	O-Ring, Parker - 2-011	408-0109-082	Polyurethane	3
160	Control Spool	268-0037-006	Steel	1
170	Sleeve, Threaded	243-0058-016	316SS	1
180	Screw, Socket Set - 6-32NC x 1/4	405-0039-035		1
190	Plate, % Capacity	253-0015-062	Aluminum	1
200	Ring, Calibration	253-0024-062	Aluminum	1
210	Knob, Capacity Adjust	255-0035-077	Acetal	1
213	Bearing, Control Spool ECC	237-0076-052		1
217	Washer, Thrust - 5/16	404-0147-031	Steel	1
220	E-Ring (1/4" for Control Knob)	404-0124-096	Steel	1
810	Coupling, Drive ECC	252-0138-077		1
820	Lock-Washer - #6	404-0104-071	Steel, Zinc Plated	2
830	Screw, Pan Head - 6-32NC x 3/8	405-0178-033	18.8SS	2
840	Bracket, Mounting, Mroy A ECC	204-0149-006		1
860	Nut, Serrated Flange - 1/4-20NC	405-0323-036	Steel, Zinc Plated	1
880	Screw, Socket Head - 5/16-18 x 5/8	405-0157-024	Steel / Nylon	1
900	Actuator (mRoy)	per SPEC		1
910	Shaft, Drive ECC Assembly: Includes Items 915 & 920.	268-0055-000		1
915	Pin, Dowel - 1/8" Assemble w/268- 0052-077	401-0021-133		1
920	Pin, Spring - 0.187dia.x 5/8	401-0005-032	Steel	1
930	Lock-Washer, Spring - 3/8"	404-0041-022	18.8SS	4
935	Screw, Hex Head - 3/8-16 x 3/4	405-0018-096	Steel, Zinc Plated	4
950	Guard, Left Side ECC	249-0110-006	Steel	1
960	Guard, Right Side ECC	249-0109-006	Steel	1
970	Screw, Button Head - 10-32 x 5/16	405-0282-087	18.8SS	4
1440	Mroy ECC Instruction Manual	339-0083-000		1

- Parts Not Illustrated

Parts Continued Next Page

6.12 PNEUMATIC CAPACITY CONTROL (3-15 PSI DIRECT, FIGURE 23)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
150	O-Ring, Parker - 2-011	408-0109-082	Polyurethane	3
215	Adapter	272-0052-017		1
220	E-Ring (1/4” for Control Knob)	404-0124-096	Steel	1
980	Flange, Mount mRoy A PCC	204-0070-062	Aluminum	1
990	O-Ring - 0.921 x 0.139	408-0095-041	NBR	1
1000	Lock-Washer, Int. Tooth - #6	404-0104-071	Steel, Zinc Plated	1
1010	Screw, Rd. Head - 6-32NC x 7/16	405-0002-061	Steel, Zinc Plated	1
1020	Screw, Slotted Shoulder - 5/16-18	405-0299-000	Steel	1
1030	O-Ring, Parker - 2-011	408-0109-082	Polyurethane	1
1040	Piston	212-0051-062	Aluminum	1
1050	O-Ring, - 2-226	408-0095-171	NBR	1
1060	Screw, - 1/4-20 x 1/2	405-0112-039	Steel, Zinc Plated	1
1070	Gasket, Pneumatic Cylinder	225-0073-098		1
1080	Cylinder, Pneumatic	281-0173-198		1
1090	Spring, Actuator	280-0041-000		1
1100	Gasket, Pneumatic Positioner	225-0030-098		1
1110	Stud	232-0010-106	Steel	6
1120	Postioner, Moore	403-0043-002		1
1130	Nut, Hex - 1/4-20NC	405-0064-012	18.8SS	6
1140	Decal, Pneumatic % Capacity	253-0029-198		1
1440	Mroy PCC Instruction Manual	339-0004-000		1

6.13 SIMPLEX LEAK DETECTION PARTS, FIGURE 22 (DOUBLE QUANTITIES FOR DUPLEX PUMPS) (THIS PARTS LIST IS APPLICABLE ONLY TO mRoy E, F PUMPS, ALSO “V” CHECK VALVE OPTION).

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
290	Diaphragm E & F plungers	298-0005-175	PTFE	2
300	Ring Assembly, Intermediate E & F	219-0127-000	316 SS	1
320	Contour Plate, Process Side	298-0091-016	316 SS	1
325	Contour Plate, Oil Side	298-0091-016	316 SS	1
350	Screw, Hex Head - 5/16-18 x 1-1/2 Gr5,	405-0017-149	Steel	6
355	Screw, Hex Head - 5/16-18 x 2-3/4 Gr5	405-0017-199	Steel	2
360	Base, Simplex Mroy A	201-0441-006	Steel	1
	Base, Duplex Mroy A	201-0434-006	Steel	1
370	Screw, Hex Head - 5/16-18 x 1-1/4 Gr5	405-0017-139	Steel	3

SIMPLEX LEAK DETECTION PARTS, FIGURE 22 (DOUBLE QUANTITIES FOR DUPLEX PUMPS)

380	Bracket	204-0199-006	Steel	1
390	Lock-Washer, Spring - 5/16	404-0040-028	Zinc Plated	3
400	Nut, Hex - 5/16-18nc	405-0065-013	18-8 SS	3
1150	Check Valve - 1/8tube, 1/3 PSI	40065	316 SS	1
1160	Gage, Press - 0-400psi, Dual Flange Mount	40066		1
	Gage, Press - 1000psi, Dual Flange Mount	40176		1
1170	Adapter, Red - 1/4f x 1/8m, NPT	40067	316 SS	1
1180	Tee, Branch - 1/8NPTf x 1/8 tube	40060	316 SS	1
1190	Tee, - 1/8npt Female	40062	316 SS	1
1191	Tee, - 1/8npt Female	40062	316 SS	1
1200	Tube Conn.- 1/8 Tube x 1/8 NPT	40061	316 SS	1
1201	Tube Conn.- 1/8 Tube x 1/8 NPT	40061	316 SS	2
1210	Valve, Bleed - 1/8 NPT	40063	316 SS	1
1220	Screw, Pan Head - 4-40 x 1/2	405-0263-050	Zinc Plated	3
1230	Lock-Washer, Spring #4	404-0095-023	18-8 SS	3
1240	Nut, Hex - 4-40nc	405-0182-012	18.8 SS	3
1250	Switch, Pressure, Nema 4 - 5-30 PSI	406-0388-001		1
1250	Switch, Pressure, Nema 7 - 5-30 PSI	406-0389-001		1
1260	Nipple, Red Hex - 1/2x1/8, NPT	40064	316 SS	1
1270	Screw, Hex Head - 1/4-20x3/4	405-0016-095	18-8 SS	2
1280	Lock-Washer, Spring - 1/4	404-0039-022	18.8 SS	2
1290	Nut, Hex - 1/4-20nc	405-0064-012	18.8 SS	2
1300	Tubing, Pump To Gauge (formed)	249-0137-116		1
	Tube - 1/8 od x 0.035 wall	402-0502-993	316 SS	12 in.
1320	Tubing, Gauge To Switch Nema 4	249-0136-016		1
	Tubing, Gauge To Switch Nema 7	249-0138-016		1
	Tubing, - 1/8 od x 0.035 wall	402-0502-993	316 SS	20 in.
1440	Leak Detector Instruction Manual	339-0036-000		1
1470	Mineral Oil (available at drug stores)			

- Parts Not Illustrated

Parts Continued Next Page

6.15 SIMPLEX LEAK DETECTION PARTS, FIGURE 22 (DOUBLE QUANTITIES FOR DUPLEX PUMPS) (THIS PARTS LIST IS APPLICABLE ONLY TO mRoy C, D PUMPS, ALSO "V" CHECK VALVE OPTION)

DRAWING NUMBER LOCATION	DESCRIPTION	PART NUMBER	MATERIAL/SPM	Quantity
289	O-Ring 2-041 Viton	4080109385	VITON	1
290	Diaphragm XT- GYLON .030 THK	40741	GYLON	2
300	Intermediate Ring -A- XT11	21029	316 SS	2
301	Intermediate Ring-B- XT11	21031	316 SS	2
304	Spring Pin 1/16 X 3/8 18-8 S/S	4010001041		3
320	Contour 316SS	22134	316 SS	1
350	Hex Hd Screw 3/8-16 X 3-1/4 GR8	54461	STEEL	8
360	Base, Simplex Mroy A	201-0441-006		1
	Base, Duplex Mroy A	201-0434-006		1
370	HEX HD SCR 5/16-18X1-1/4 GR8	4050017139	STEEL	2
380	BRACKET	2040199006	316 SS	1
390	SPRING LOCK WASHER 5/16 Z PL	4040040028	SS	2
400	5/16-18 HEX NUT SS	C0-0065	SS	2
1148	TUBE CONN 1/8 TUBEX 1/8NPT 316	40061	316SS	1
1148	TUBE CONN 1/8 TUBEX 1/8NPT 316	40061	316SS	1
1150	CHECK VALVE 1/8TUBE 1/3PSI 316	40065	316SS	1
1160	PRESS GAGE 0-5000 PSI DUAL FLG	40405		1
1170	RED ADAPTER 1/4F X1/8M NPT 316	40067	316SS	1
1191	TEE 1/8NPT FEMALE 316SS	40062	316SS	1
1210	BLEED VALVE 1/8 NPT 316SS	40063	316SS	1
1220	PAN HD SCR #4-40X1/2 ZNCR	4050263050		3
1230	SPRING LOCK WASHER #4 18-8SS	4040095023	18-8 SS	3
1240	4-40 NUT SS	C0-0051	SS	3
1270	Hex HD Screw 1/4-20X3/4 18-8SS	4050016095	SS	2
1280	Washer, 1/4" Split Lock, 18-8	L12216	18-8SS	2

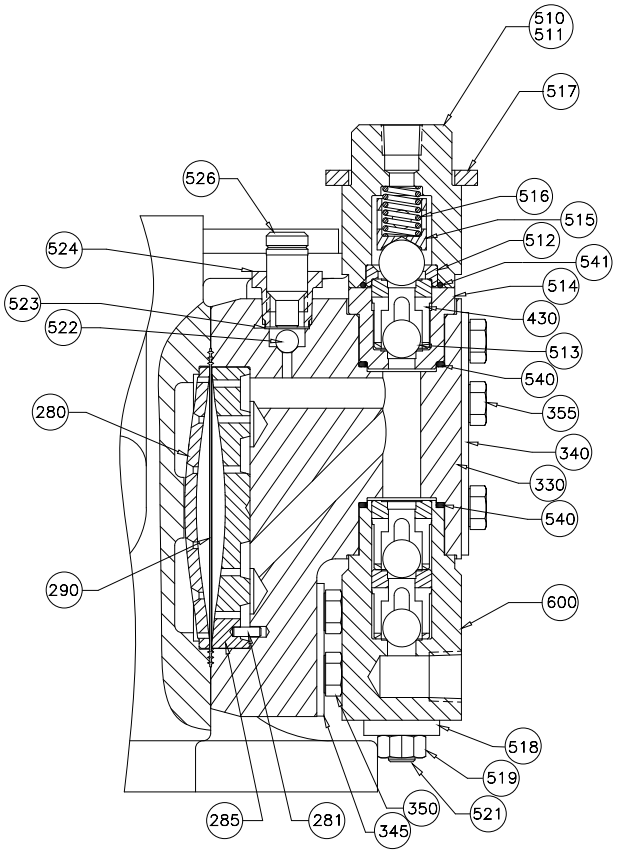
- Parts Not Illustrated

Parts Continued Next Page

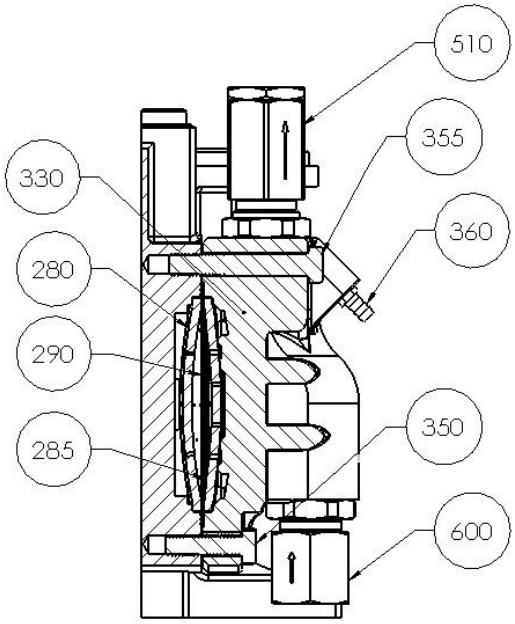
6.14 DOUBLE DIAPHRAGM PARTS E & F Plungers (FIGURE 22)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
285	Contour Plate, Process Side, also used with double non-contacting diaphragms)	298-0091-016	316SS	1
		298-0091-028	Alloy 20	1
		298-0091-030	Alloy C-22	1
290	Diaphragm (4”, 8 bolt design), model “RJ”	298-0005-175	PTFE	2
300	Ring Assembly, Intermediate	54817		1
-	Probe, Alarm Conductivity	301-0307-000		1
310	Plug, - 1/8” THRD. SQ Head Pipe	402-0011-013		1
350	Screw, Hex Head - 5/16-18 x 3	402-0017-233	Steel	6

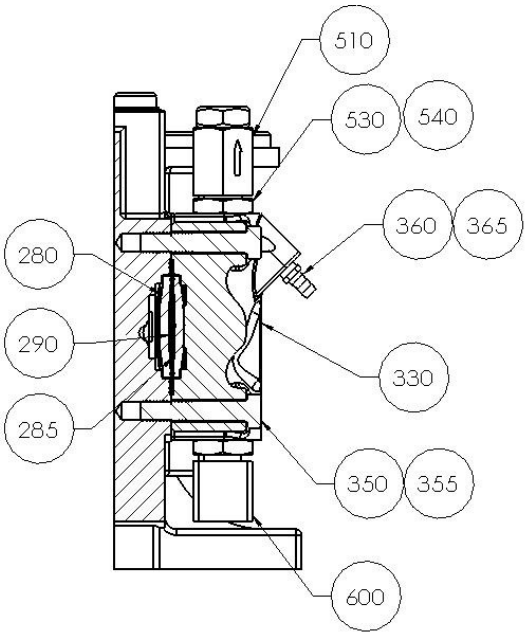
-	Oil, Vegetable	40104		0.013 Gal



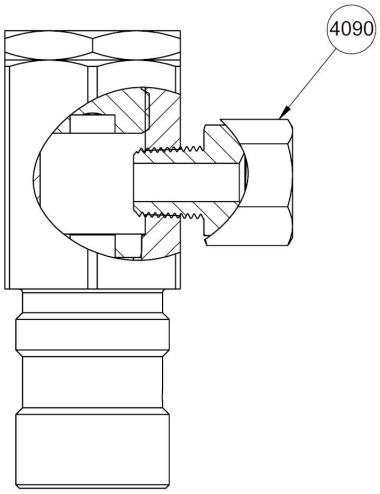
mRoy B: L & R PLASTIC LIQUID END



mRoy B: L & R METALLIC LIQUID END LOW PRESSURE



mRoy B - K METALLIC LIQUID END HIGH PRESSURE



MRB BSP HORIZONTAL

Figure 24. mRoy B Metallic and Plastic Liquid End (DWG 999-2010-0013 999-2010-0014, 102-9597-0015)

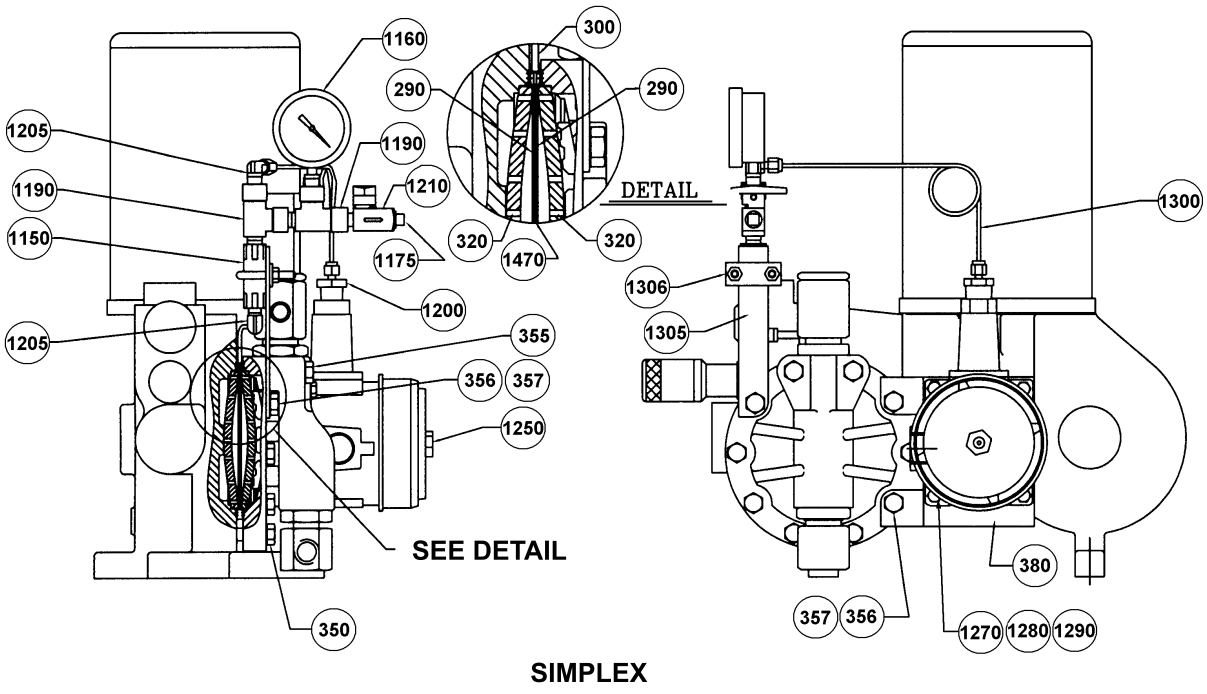


Figure 25. mRoy B Leak Detection With Switch and Gauge (DWG 999-2010-0005)

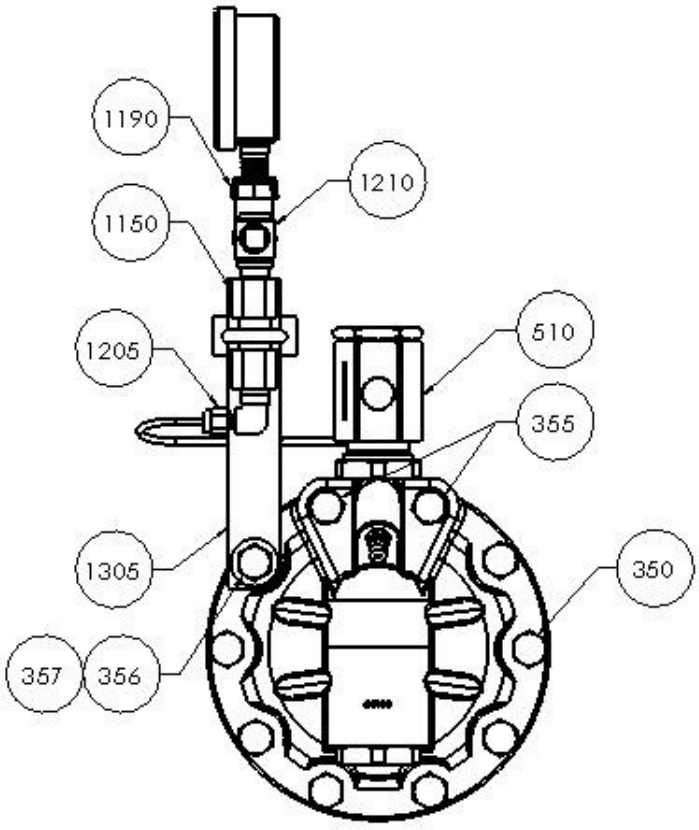


Figure 26. mRoy B Gage Only (999-2010-0005)

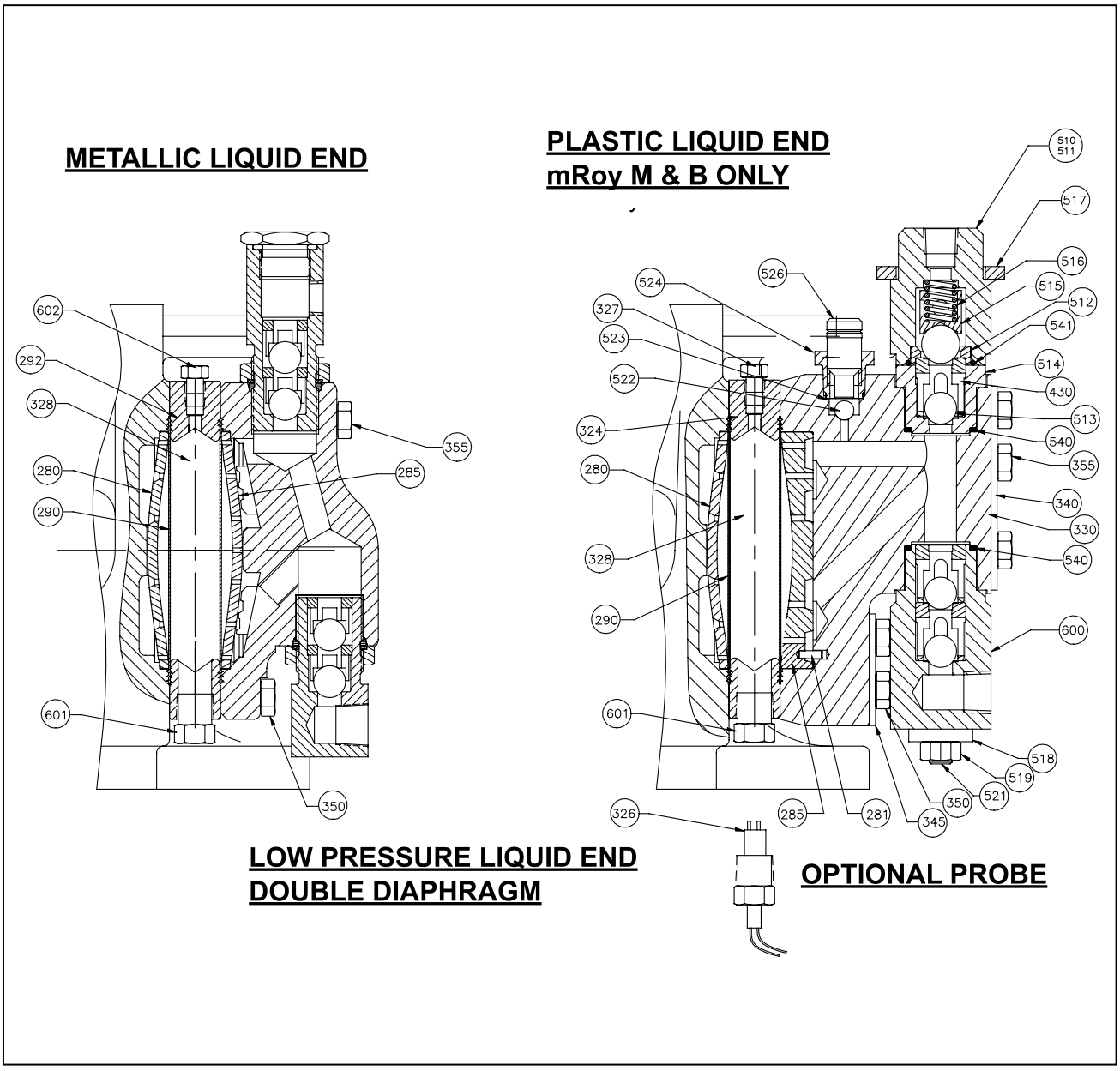


Figure 26. mRoy B Double Diaphragm (DWG 999-2010-0025 & 999-2010-0026)

6.15 BASIC PARTS LIST FOR DRIVE MODELS mRoy B (FIGURES 17 & 18)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
10	Housing, Main Simplex 19/32”	54076		1
	Housing, Main Duplex 19/32”	54074		1
	Housing, Main Simplex 7/8”	54077		1
	Housing, Main Duplex 7/8”	54079		1
	Housing, Main Simplex 1 7/16”	54078		1
	Housing, Main Duplex 1 7/16”	54080		1
20	Cup, Race	409-0066-020	Steel	1
30	Poppet, Relief Valve	212-0057-074	Nylon	1
40	Spring, Relief Valve	280-0046-541	Steel	1
50	Adjusting Screw, Relief Valve	256-0037-051	Brass	1
60	Plug - 1/4” NPT, Sq. Head	402-0009-111		1
90	Plunger, 19/32	22714		1
	Plunger, 7/8	22716		1
	Plunger, 1-7/16	22715		1
100	Rod, Connecting	214-0013-162	Aluminum	1
110	Pin, Dowel 5/8x1-1/2	401-0028-031	Steel	1
130	Gear Shaft	268-0030-006	Simplex, Steel	1
	Gear Shaft	268-0022-006	Duplex, Steel	1
140	Plug, 1-1/4 NPT, Socket Hex Head	402-0095-076		1
	Plug, 3/4 NPT, Socket Hex Head, Models	402-0095-056		1
150	O-Ring, Parker 2-113, Control Spool	408-0068-032	Urethane	1
160	Control Spool	268-0049-006	Steel	1
170	Sleeve, Threaded, Mroy B ECC	243-0059-051		1

- Parts Not Illustrated

Parts Continued Next Page

BASIC PARTS LIST FOR DRIVE MODELS mRoy B (FIGURES 17 & 18)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
180	Screw, Socket Set, Cup Pt. - 6-32NC x 1/4	405-0039-035		1
190	Decal, Capacity	253-0026-062		1
200	Ring, Calibration	253-0025-062	Aluminum	1
210	Knob, Control	255-0020-062	Aluminum	1
220	E Ring Clip, External	404-9983-151		1
230	Plunger, Control	212-0048-039		1
240	Arm, Linkage	214-0014-006		1
250	Screw, Socket Head - 8-32NC x 1/2	405-0245-031	Steel	2
1061	Screw, Socket Set - 7/16-14 x 3/8	405-0133-024	Steel	2
1062	Screw, Socket Head - 8-32 x 1-5/8 (Locking Micrometer)	40224	Steel	1
1063	Nut, Hex - 8-32 NC 18-8SS (Locking Micrometer)	405-0061-017	Steel	1
1330	Cap, Reservoir Simplex	432-0457-0060N		1
	Cap, Reservoir Duplex	281-0269-000		1
1340	O-Ring, Parker - 2-216, Simplex, Reservoir Cap	408-0095-071	BUNA	1
	O-Ring Parker - 2-216, Duplex, Reservoir Cap	408-0095-075	VITON	1
1350	Screw Plug - 7/8-14	405-2001-021	Plastic	1
-	Plate, Data	253-0186-000		1

6.16 LIQUID END mRoy L, R (FIGURE 24)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
280	Contour Plate - Oil Side	298-0012-006	Steel	1
285	Contour Plate - Process Side	298-0016-016	316 SS	1
		298-0016-028	Alloy 20	1
		298-0016-030	Alloy C-22	1
290	Diaphragm - 5.230 Dia.	298-0013-075	PTFE	1
350	Screw, Hex Head - 7/16-14 x 1-1/2 Gr5	405-0019-149	Steel	8
355	Screw, Hex Head - 7/16-14 x 2-3/4	405-0019-191	Steel	2

- Parts Not Illustrated

Parts Continued Next Page

LIQUID END mRoy L,R (FIGURE 24)

330	Head, Diaphragm	54184	316 SS	1
		54284	Alloy 20	1
-	Contour Plate - Process Side	201-0395-000		1
		201-0428-000		1
370	Screw, Hex Head - 5/16-18 x 1-1/2 Gr5	405-0017-149	Steel	3
390	Lock-Washer, Spring - 5/16	404-0040-028	Zinc Plated	3
460	O-Ring, Discharge Check Valve Cap	408-0068-043	PTFE	1
510	Check Valve Assembly, Discharge NPT	54345	316 SS	1
		54346	Alloy 20	1
		54413	Hast C22	1
	Check Valve Assembly, Discharge BSP	54359	316 SS	1
		54360	Alloy 20	1
		54415	Hast C-22	1
	Check Valve Assembly, Discharge (Slurry Applications)	22077	316SS	1
520	Nut, Lock	209-0021-017	416 SS	1
530	Back Up Ring, Spiral	408-0073-221	PTFE	1
540	O-Ring, Check Valve locking Nut - 3- 916, 1.171 x 0.116	408-9998-151	VITON	1
600	Check Valve Assembly, Suction NPT	221-0154-016	316 SS	1
		221-0154-028	Alloy 20	1
		30578	Hast C22	1
	Check Valve Assembly, Suction BSP	54363	316 SS	1
		54366	Alloy 20	1
		54417	Hast C-22	1
	Check Valve Assembly, Suction (Slurry Applic)ation	22078	316SS	1

- Parts Not Illustrated

Parts Continued Next Page

6.17 LIQUID END mRoy K (FIGURE 24)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
280	Contour Plate - Oil Side	298-0014-006	Steel	1
285	Contour Plate - Process Side	298-0014-006	Steel	1
		298-0014-016	316 SS	1
		298-0014-028	Alloy 20	1
		298-0014-030	Alloy C-22	1
290	Diaphragm - 3.390 Dia.	298-0015-075	PTFE	1
300	Head, Diaphragm	54186	316 SS	1
		54286	Alloy 20	1
350	Screw Hex Head - 7/16-14 x 1-1/2	405-0019-149	Steel	4
355	Screw Hex Head - 7/16-14 x 2-1/4	405-0019-171	Steel	4
-	Base, Simplex	201-0395-000		1
	Base, Duplex	201-0428-000		1
370	Screw, Hex Head - 5/16-18 x 1-1/2 Gr5	405-0017-149	Steel	3
390	Lock-Washer, Spring - 5/16	404-0040-028	Zinc Plated	3
400	Nut, Hex - 5/16-18NC	405-0065-013	18-8 SS	3
460	O-Ring, Discharge Check Valve Cap	408-0068-113	PTFE	1
510	Check valve, Discharge	54345	316 SS	1
		54346	Alloy 20	1
		54413	Alloy C-22	1
520	Nut Lock - Check Valve	209-0020-014	303 SS	1
530	Ring, Spiral Back Up	408-0073-141	PTFE	1
540	O-Ring, Check Valve Lock Nut - 2- 116,	408-0068-065	FKM (VITON)	1
600	Check valve, Suction	221-0896-216	316 SS	1
		221-0896-228	Alloy 20	1
		221-0896-030	Alloy C-22	1

6.18 MODEL mRoy B12 & M12 PLASTIC LIQUID END PARTS (FIGURE 24)

Conversion Kit (P/N: PARTSKIT307) includes the following parts:

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
280	Contour Plate - Oil Side	298-0014-006	Steel	1
281	Pin, Orientation	211-0043-071	PVC	1
285	Contour Plate	298-0038-071	PVC	1
290	Diaphragm - 5.230 Dia.	298-0013-075	PTFE	1
330	Head, Diaphragm	221-0359-071-001	PVC	1

- Parts Not Illustrated

Parts Continued Next Page

MODEL mRoy B12 & M12 PLASTIC LIQUID END PARTS (FIGURE 24)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
-	Head Assembly Kit, Diaphragm (Includes 330, 522, 523, 524 , 526, and 527)	221-0393-100		
340	Reinforcing Plate, Upper	204-0088-016	316SS	1
345	Reinforcing Plate, Lower	204-0089-016	316SS	1
350	Screw, Hex Head - 7/16- 14 x 2-1/2	405-0019-187	18-8S	4
355	Screw, Hex Head- 7/16-14 x 5	405-0019-297	18-8SS	6
-	Base, Simplex	201-0395-000		1
-	Base, Duplex	201-0428-000		1
510	Check Valve Assembly, Discharge (Includes 430, 511, 512, 513, 514, 515,516, and 541)	221-0464-007	PVC	1
		221-0464-009	PVDF	1
517	Plate, Compression	204-0091-016	316SS	1
518	Plate, Compression	204-0090-016	316SS	1
519	Nut, Hex- 5/16-18NC	405-0065-013	18-8SS	4
521	Stud- 5/16-18UNC x 10 1/4	232-0014-216	316SS	2
522	Ball - 3/8" Dia.	407-0015-111	Ceramic AD995	1
523	Diaphragm- 0.703 Dia.	298-0062-075	PTFE	1
524	Bushing- 1/2 NPT	237-0049-171	PVC	1
526	Plug, Purge	243-0047-171	PVC	1
527	Connector, (Tubing 1/4 x 1/4)	402-04 79-028	PVC	1
540	0-Ring,-3-916, 1.171 x0.116, Check Valve	408-9998-151	FKM (VITON)	2
600	Check Valve Assembly, Suction	221-0360-007	PVC / Ceramic Ball	1
		221-0360-009	PVDF	1

6.19 mRoy B MOTOR MOUNTS (FIGURES 17 & 18)

Parts Common To All Motor Mounts

Worm and Shaft Assembly includes Stub Shaft (640), Worm (650), Spring Pin (660), Tapered Roller Bearing (670), and Single Roll Bearing (680).

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER		MATERIAL/SPM	QUANTITY
650	Worm, worm gear, and Shaft Assembly	54703	38:1	48 spm @1725 RPM	1
		54702	25:1	72 spm @1725 RPM	1
		54701	19:1	96 spm @1725 RPM	1
		54700	12.5:1	144 spm @1725 RPM	1
		54699	9.5:1	148 spm @1425 RPM	1
670	Bearing, Tapered Rolle	409-0066-010			1
680	Bearing, ball	409-9994-000			1

mRoy B MOTOR MOUNTS (FIGURES 17 & 18)

API Flange Mount NEMA 56C (FR)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
690	Seal, Oil	408-9997-011		1
700	Spring , Finger	403-0121-009		1
690	Seal, Oil	408-9997-011		1
700	Spring , Finger	403-0121-009		1
710	Adapter Nema 56c- 143/145 TC	272-0051-001		1
770	Screw, Socket Head - 10-32 x 3/4	405-0026-094	Steel	2/4
780	Coupling - 5/8 x 5/8, Key 3/16	410-0064-020		1
790	Screw, Hex Head- 3/8-16 x 1 Gr5	405-0018-119	Steel	1

API Flange Mount 143/145 TC

690	Seal, Oil	408-9997-011		1
700	Spring, Finger	403-0121-009		1
710	Adapter Nema 56c- 143/145 TC	272-0051-001		1
770	Screw, Socket Head - 10-32 x 3/4	405-0026-094	Steel	2/4
780	Coupling - 5/8 x 7/8 3/16 Key	410-0064-090		1

API Flange Mount IEC 80 B5

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
690	Seal, Oil	408-9997-011		1
700	Spring, Finger	403-0121-009		1
-	Lock-Washer, Spring - 3/8"	404-0041-022	18-8 SS	1
-	Nut, Hex - 3/8-16NC	405-0066 -012	18-8 SS	1
710	Adapter, Motor- IEC 80 85	607-20388-001		1
770	Screw, Socket Head - 10-32 x 3/4	405-0026-094	Steel	2/4
780	Coupling Assembly- 5/8 x 19mm	39238		1
790	Screw, Hex Head - 3/8-16 x 1-1/4	405-0018-136	Zinc Plated	1

- Parts Not Illustrated

Parts Continued Next Page

mRoy B MOTOR MOUNTS (FIGURES 17 & 18)

API Flange Mount IEC 90 B5

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
690	Seal, Oil	408-9997-011		1
700	Spring , Finger	403-0121-009		1
-	Lock-Washer , Spring - 3/8"	404-0041 -022	18-8 ss	4
-	Nut, Hex - 3/8-16NC	405-0066-012	18-8 ss	4
710	Adapter, Motor- IEC 80 85	607-20388-001		1
780	Coupling Assembly- 5/8 x 24mm	30459		1
790	Screw, Hex Head - 3/8-16 x 1-1/4	405-0018-136	Zinc Plated	4

6.20 ELECTRONIC CAPACITY CONTROL MOUNTING (FIGURE 23)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
140	Plug, Adapter- 1-7/16 and 7/8 Plunger 1-1/4 NPT	243-0045-030		1
	Plug, Adapter- 19/32 Plunger, 3/4 NPT	243-0045-010		1
170	Sleeve, Threaded Mroy B ECC	243-0059-051		1
180	Screw, Socket Set- 6-32NCx1/4	405-0039-035		1
190	Decal, Capacity	253-0026-062		1
200	Ring, Calibration	253-0025-062	Aluminum	1
210	Knob, Capacity Adjust	255-0036-077	Acetal	1
213	Bearing, Control Spool	237-0075-052		1
217	Washer , Thrust - 1/2"	404-0147-051	Steel	1
220	Clip, E Ring - External	404-9983-151		1
810	Coupling , Drive	252-0120-077		1
820	Lock-Washer , Internal Tooth- 8	404-0104-082	Zinc Plated	2
830	Screw, Pan Head- 8-32NC x 1/2	405-0179-073	18-8 ss	2
840	Bracket , Mounting	204-0148-006	Steel	1
850	Stud , Mounting	232-0033-006		1
860	Nut, Serrated Flange- 1/4-20NC	405-0323-036	Zinc Plated	1
880	Screw, Socket Head - 5116-18 x 5/8	405-0157-024	Steel	1
880	Bolt, Tri-Groove - 5/16 x 3/4 L	405-0336-011		1
900	Actuator, Mroy	Per Spec		1
910	Shaft, Drive	268-0053-077	Acetal	1

- Parts Not Illustrated

Parts Continued Next Page

ELECTRONIC CAPACITY CONTROL MOUNTING (FIGURE 23)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
915	Pin, Dowel - 1/8 x 1-3/8	401-0021-143	Steel	1
920	Pin, Spring, 0.187 x 13/16 CRS	401-0005-062		1
930	Lock-Washer , Spring - 3/8	404-0041-022	18-8 ss	4
935	Screw, Hex Head - 3/8-16 x 3/4	405-0018-096	Zinc Plated	4
950	Guard, Side	249-0108-006		2
970	Screw, Button Head - 10-32 x 5/16	405-0282-087	18-8 ss	4
1442	Mroy ECC Instruction Manual	339-0002-000		1

6.21 SIMPLEX LEAK DETECTOR PARTS- GAUGE & NEMA SWITCH (FIGURE 25)

Double Quantities For Duplex Pumps

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
290	Diaphragm, 5.230 Dia.	298-0013-075	PTFE	2
	Diaphragm, 3.390 Dia., K Plunger	298-0015-075	PTFE	2
300	Ring Assembly, Intermediate	219-0089-116	316 ss	1
	Ring Assembly , Intermediate K Plunger	179-1260-116	316 ss	1

- Parts Not Illustrated

Parts Continued Next Page

SIMPLEX LEAK DETECTOR PARTS- GAUGE & NEMA SWITCH (FIGURE 25)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
DRAWING LOCATION NUMBER	**DESCRIPTION**	**PART NUMBER**	**MATERIAL/SPM**	**QUANTITY**
290	Diaphragm, 5.230 Dia. L & R plunger	298-0013-075	PTFE	2
	Diaphragm, 3.390 Dia. K plunger	298-0015-075	PTFE	2
300	Ring Assembly, Intermediate	219-0089-116	316 ss	1
	Ring Assembly , Intermediate	179-1260-116	316 ss	1

6.22 DOUBLE DIAPHRAGM PARTS FOR METALLIC LIQUID END (FIGURE 26)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
280	Contour Plate - Oil Side	298-0012-006		
285	Contour Plate - Process Side	298-0016-016	316 ss	1
		298-0016-028	Alloy 20	1
		298-0016-030	Alloy C-22	1
290	Diaphragm - 5.230 Dia.	298-0013-075	PTFE	2
292	Intermediate Chamber	20539	316 ss	1
328	Oil, Vegetable	40104		105-115 ml (3.6-3.9 oz)
350	Screw, Hex Head- 7/16-14 x 2 1/2	405-0019-181	Steel	8
355	Screw, Hex Head- 7/16-14 x 3 3/4	40894	Steel	2
601	Plug, Pipe- 3/8" Threaded	402-0011-033	316 ss	1
602	Plug, Pipe- 1/8" Threaded	402-0011-013	316 ss	1

- Parts Not Illustrated

Parts Continued Next Page

6.23 DOUBLE DIAPHRAGM PARTS- WITH CONDUCTIVITY PROBE FOR PLASTIC LIQUID END (mRoy M & B) (FIGURE 26)

DRAWING LOCATION NUMBER	DESCRIPTION	PART NUMBER	MATERIAL/SPM	QUANTITY
290	Diaphragm 5.230 Dia.	298-0013-075	PTFE	2
324	Intermediate Chamber	20539	316 ss	1
326	Probe, Alarm Conductivity	301-0307-000		1
	Plug, Pipe- 3/8", Used without Alarm Probe	402-0011-033	316SS	1
327	Plug, Pipe- 1/8" Threaded	402-0011-013	316 ss	1
328	Oil, Vegetable	40104		105-115 ml (3.6-3.9 oz)
355	Screw, Hex Head- 7/16-14 X 3 1/2	40448	18-8 ss	4
	Screw, Hex Head- 7/16-14 X 6	40447	18-8 ss	6

- Parts Not Illustrated

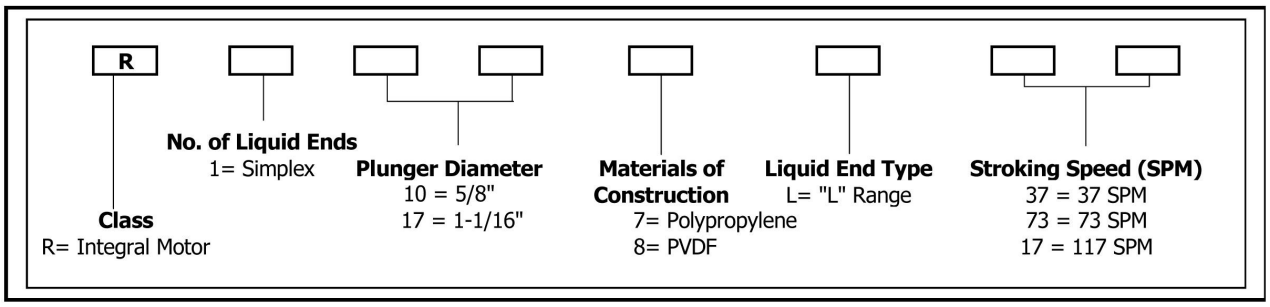
Parts Continued Next Page

1.1 APPENDIX A

1.2 MODEL CODE HISTORY

(PRIOR TO 2016)

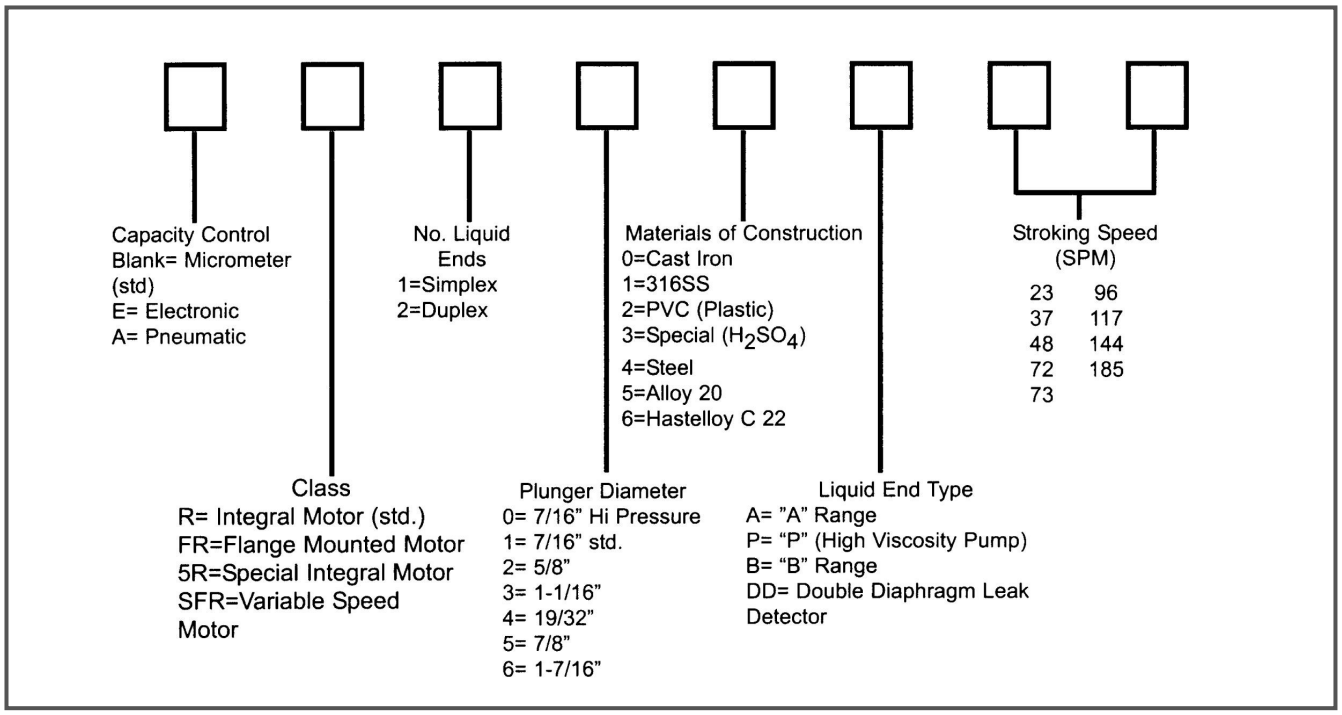
mRoy L History



PUMP SPECIFICATIONS (mRoy L) :

- Liquid End: Hydraulically actuated, simplex only
- Plunger Diameter: 5/8” or 1-1/16”
- Capacity Range: 0.2 GPH to 18 GPH (0.752 LPH to 68 LPH)

mRoy A History



MODEL CODE SELECTION

END ITEM OPTION SELECT NUMBER

mRoy A SERIES

End item Model Code						Option Selected Number											
R	A	1*		-													
			Material Code		Plunger Diameter		Gear Set		Mount / Motor		Suction Connection		Discharge Connection		Capacity Control		Rupture Detection & Base

* 2 for Duplex

mRoy A LIQUID END MATERIAL CODE SELECTION

Code	Description
0	Cast Iron
1	316 SS **(STANDARD)**
2	PVC (N/A with 9.5 :1 Gear Ratio)
7	PVDF (N/A with 9.5 :1 Gear Ratio)
5	Alloy 20
6	Alloy C22

mRoy A PLUNGER DIAMETER

Code	Description
7	7/16" Diameter
10	5/8 " Diameter
17	1-1/16" Diameter

mRoy H/T SERIES

RH= 7/16" Dia. Plunger

RT= 3/8" Dia. Plunger

End item Model Code						Option Selected Number									
R	H	1		-											
			Material Code		Gear Set		Mount / Motor		Suction Connection		Discharge Connection		Capacity Control		Base

mRoy H LIQUID END MATERIAL

Code	Description
0	Cast Iron
1	316 SS **(STANDARD)**
5	Alloy 20

mRoy J SERIES

End item Model Code						Option Selected Number									
R	J	1		-											
			Material Code		Gear Set		Mount / Motor		Suction Connection		Discharge Connection		Capacity Control		Rupture Detection & Base

mRoy J LIQUID END MATERIAL

Code	Description
1	316 SS **(STANDARD)**
5	Alloy 20

mRoy P SERIES

End item Model Code						Option Selected Number											
R	P	1		-													
			Material Code		Plunger Diameter		Gear Set		Mount / Motor		Suction Connection		Discharge Connection		Capacity Control		Rupture Detection & Base

mRoy P LIQUID END MATERIAL

Code	Description
0	Cast Iron
1	316 SS **(STANDARD)**
5	Alloy 20

mRoy P PLUNGER DIAMETER

Code	Description
7	7/16" Diameter
10	5/8 " Diameter
17	1-1/16" Diameter

Figure 4. mRoy A, H, T, J and P Model Code

GEAR SET (ALL mRoy A FRAME)

Code	Description		1725 rpm	1425 rpm	1140 rpm
77	77 : 1 Gear Ratio	N/ A for mRoy J or P	23 spm	19 spm	15 spm
48	48 : 1 Gear Ratio		37 spm	30 spm	24 spm
24	24 : 1 Gear Ratio		73 spm	60 spm	47 spm
15	15 : 1 Gear Ratio		117 spm	96 spm	76 spm
10	9.5 : 1 Gear Ratio	N/ A for mRoy J or P	185 spm	152 spm	120 spm

MOTORS and MOUNTS

STANDARD MOTOR with Close Coupled Flange

Does not require motor mount from below

Code	Description
A1	1/4 HP Motor, TE, 1725 RPM, 1 phase, 60 Hertz, 115 Volt & Close Coupled Flange
A8	1/4 HP Motor, TE, 1725 RPM, 3 phase, 60 Hertz, 230/460 Volt & Close Coupled Flange

***NOTE*:** *These motors replace the obsolete integral motor offering. They are standard NEMA 56 C frame motor on a short flange*

MOTOR MOUNTS (Use only when motor is ordered from Milton Roy)

1/4 HP minimum

Motor supplied by Milton Roy from Accessory Section

Code	Description
SR	Close Coupled Flange, NEMA 56C (STANDARD)
SS	Close Coupled Flange, IEC Frame 71, B5 Flange
FR	API Flange Mount, NEMA 56C
F4	API Flange Mount, NEMA 143TC/145 TC
FS	API Flange Mount, IEC Frame 71, B5 Flange
MD	API Flange Mount, IEC Frame 80, B5 Flange

MOTOR MOUNTS

1/4 HP minimum

Motor supplied by others

Code	Description
1X	Close Coupled Flange, NEMA 56C
2X	Close Coupled Flange, IEC Frame 71, B5 Flange
3X	API Flange Mount, NEMA 56C
4X	API Flange Mount, NEMA 143TC/ 145TC
5X	API Flange Mount, IEC Frame 71, B5 Flange
6X	API Flange Mount, IEC Frame 80, B5 Flange

NOTE: *Must be used when pump is not ordered with motor*

SUCTION CONNECTION

Metallic Liquid Ends

Code	Description	PVC	316 SS	Alloy 20
SE	NPT 1/2” Female (STANDARD)	N/A	Standard	Standard
T1	ANSI 150 # RF 1/2” Threaded	N/A		
T3	ANSI 300 # RF 1/2” Threaded	N/A		
S1	ANSI 150 # RF 1/2” Socket Welded	N/A		
S3	ANSI 300 # RF 1/2” Socket Welded	N/A		

Plastic Liquid Ends

Code	Description	PVC	316 SS	Alloy 20
SE	NPT 1/2” Male (STANDARD)	Standard	N/A	N/A
T1	150 # 1/2” Thd flange		N/A	N/A

NOTES:

1. Base option recommended with flanged connections.

2. Flanges can only be welded at flanged end.

DISCHARGE CONNECTION

Codes and prices are the same as Suction Connection

Discharge connections size for SE code on metallic liquid ends is 1/4” NPT

CAPACITY CONTROL

Code	Description
M2	Manual Micrometer Knob - PVC (STANDARD)
M1	Manual Micrometer Knob - 316 SS
ML	Locking Manual Micrometer Knob - 316 SS
E1	Electronic - NEMA 4, 4-20 mA,115 Volt
E2	Electronic - NEMA 4, 4-20 mA,220 Volt
EA	Electronic - Explosion Proof, 4-20 mA, 115 Volt
EB	Electronic - Explosion Proof, 4-20 mA, 220 Volt
EE	Mount for Electronic, Less Actuator
PN	Pneumatic, 3-15 psi, Direct Acting

Figure 5. mRoy A, H, T, J and P Gear/Motor Mount / Connection / Capacity Control; Select Mode Code

MODEL CODE SELECTION

END ITEM OPTION SELECT NUMBER

mRoy B SERIES

End item Model Code				Option Selected Number					
R [ ] 1*	[ ]	-	[ ][ ]	[ ][ ]	[ ][ ]	[ ][ ]	[ ][ ]	[ ][ ]	[ ][ ]
Plunger Diameter	Liquid End Material		Gear Set	Motor Mount	Suction Connection	Discharge Connection	Capacity Control	Rupture Detection & Base	

* 2 for Duplex

PLUNGER DIAMETER

Code	Description
S	19/32 " Diameter
M	7/8 " Diameter
B	1-7/16 " Diamater

LIQUID END MATERIAL

Code	Description
1	316 SS **(STANDARD)**
2	PVC (not available with plunger code "5")
5	Alloy 20
7	PVDF (Plunger code "B" only)

GEAR SET

Code	Description	1725 rpm	1425 rpm	1140 rpm
38	38 : 1 Gear Ration	48 spm	40 spm	31 spm
25	25 : 1 Gear Ration	72 spm	60 spm	48 spm
19	19 : 1 Gear Ration	96 spm	80 spm	62 spm
12	12 : 1 Gear Ration	144 spm	120 spm	95 spm
10	10 : 1 Gear Ration	N/A	148 spm	N/A

MOTOR MOUNTS

MOTOR MOUNT (Use only when motor is ordered from Milton Roy - see section 4100)

Refer to capacity/ pressure table for horsepower required

Motor supplied by Milton Roy from Accessory Section

Code	Description
FR	API Flange Mount, NEMA 56C
F4	API Flange Mount, NEMA 143TC/145TC
F8	API Flange Mount, IEC Frame 80, B5 Flange
F9	API Flange Mount, IEC Frame 90, B5 Flange

MOTOR MOUNTS

Refer to capacity/ pressure table for horsepower required

Code	Description
3X	API Flange Mount, NEMA 56C
4X	API Flange Mount, NEMA 143TC/145TC
5X	API Flange Mount, IEC Frame 80, B5 Flange
6X	API Flange Mount, IEC Frame 90, B5 Flange

NOTE: *Must be used when pump is not ordered with motor (to cover added cost of testing)*

SUCTION CONNECTION

Metallic Liquid Ends

Code	Description	PVC	316 SS	Alloy 20
SE	NPT 1/2" Female (STANDARD)	N/A	Standard	Standard
T1	ANSI 150 # RF 1/2" Threaded	N/A		
T3	ANSI 300 # RF 1/2" Threaded	N/A		
S1	ANSI 150 # RF 1/2" Socket Welded	N/A		
S3	ANSI 300 # RF 1/2" Socket Welded	N/A		

Plastic Liquid Ends

Code	Description	PVC	316 SS	Alloy 20
SE	NPT 1/2" Male (STANDARD)			
T1	150 # 1/2" Thd flange			

NOTES:

1. Base option recommended with flanged connections.

2. Flanges can only be welded at flanged end.

DISCHARGE CONNECTION

Same codes and prices as Suction Connection

NOTE: *Connection sizes for SE code metallic are 3/8" NPT on mRoy M & B series, and NPT on mRoy S series*

CAPACITY CONTROL

Code	Description	
AL	Manual Micrometer Knob - Aluminium (STANDARD)	
ML	Manual Micrometer Locking Knob - 316 SS	
E1	Electronic - NEMA 4, 4-20 mA,115 Volt	Remember to derate pump
E2	Electronic - NEMA 4, 4-20 mA,220 Volt	Remember to derate pump
EA	Electronic - Explosion Proof, 4-20 mA, 115 Volt	Remember to derate pump
EB	Electronic - Explosion Proof, 4-20 mA, 220 Volt	Remember to derate pump
EE	Mount for Electronic, Less Actuator	
PN	Pneumatic, 3-15 psi, Direct Acting	Remember to derate pump

RUPTURE DETECTION & BASE

All Liquid Ends

Code	Description	
NN	None (STANDARD)	Standard
NB	Base	

Metallic Liquid Ends Only

Code	Description	
C5	Rupture Detection with & Gauge	Remember to derate pump
SN	Rupture Detection W/Gauge, & NEMA 4 Switch	Remember to derate pump
S7	Rupture Detection W/Gauge, & Exp. Prf 5 Switch	Remember to derate pump

Plastic Liquid End Only

Code	Description	
DD	Double Diaphragm	Remember to derate pump
DP	Double Diaphragm w/Conductivity probe Relay supplied separately - see accessory pricing	Remember to derate pump

Figure 13. mRoy B Model Codes

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