OPERATOR'S MANUAL BD20X-XXX-XXX-AXX

INCLUDING: OPERATION, INSTALLATION AND MAINTENANCE

RELEASED: 1-11-21
REVISED: 7-30-21
(REV: B)

2" BAND CLAMP DIAPHRAGM PUMP

1:1 RATIO (METALLIC)

READ THIS MANUAL CAREFULLY BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

It is the responsibility of the employer to place this information in the hands of the operator. Keep for future reference.

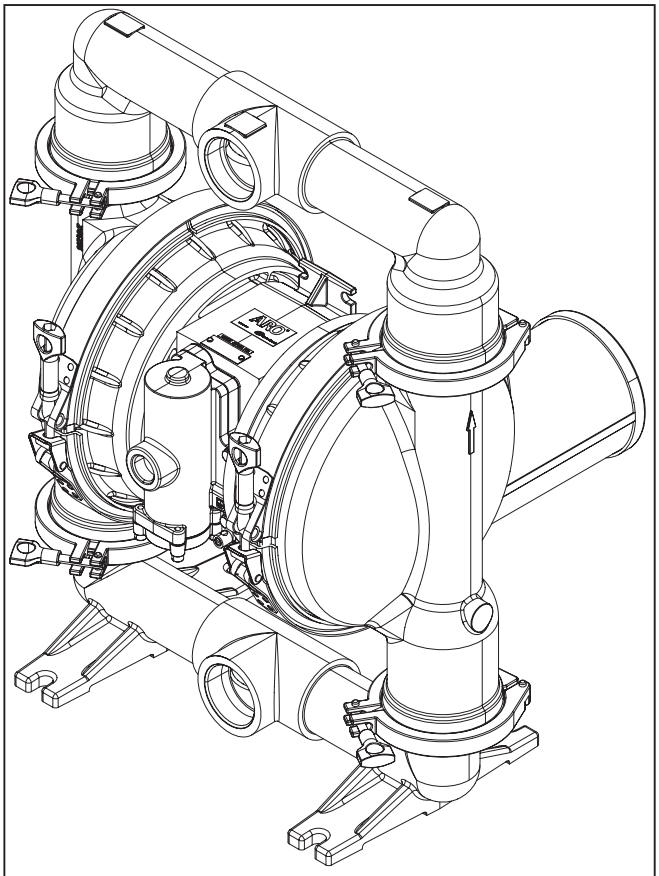
SERVICE KITS

Refer to Model Description Chart to match the pump material options.
637494-XX for fluid section repair (see page 5).
NOTE: This kit also contains several air motor seals which will need to be replaced.
637374-X major air valve assembly (see page 9).
637421 for air section repair (see page 7).

PUMP DATA

Models..... See Model Description Chart for "-XXX"
Pump Type..... Metallic Air Operated Double Diaphragm
Material..... see Model Description Chart
Weight
BD20A-XAX-XXX-AXX..... 75 lbs (34 kgs)
Maximum Air Inlet Pressure ..... 120 psig (8.3 bar)
Maximum Material Inlet Pressure 10 psig (0.69 bar)
Maximum Outlet Pressure..... 120 psig (8.3 bar)
Maximum Flow Rate..... 185 gpm (700 lpm)
Displacement / Cycle @ 100 psig. 1.4 gal. (5.3 lit.)
Maximum Suction Lift (Dry Inlet) 18 ft (5.4 m) water
(Tested using BD20A-AAS-CCA)
Maximum Suction Lift (Flooded Inlet) 31 ft (9.4 m) water
(Tested using BD20A-AAS-AAA)
Maximum Particle Size ..... 1/4" dia. (6.4 mm)
Maximum Temperature Limits (diaphragm / ball / seat material)
E.P.R / EPDM..... -60° to 280° F (-51° to 138° C)
Hytrel®..... -20° to 180° F (-29° to 82° C)
Santoprene®..... -40° to 225° F (-40° to 107° C)
PTFE..... 40° to 225° F (4° to 107° C)
Viton®..... -40° to 350° F (-40° to 177° C)
Dimensional Data..... see page 10
Noise Level @ 70 psig, 60 cpm ... 85.0 dB(A)①

① The pump sound pressure levels published here have been updated to an Equivalent Continuous Sound Level (LA_{eq}) to meet the intent of ANSI S1.13-1971, CA-GI-PNEUROP S5.1 using four microphone locations.



MODEL BD20X

Figure 1

INGERSOLL RAND COMPANY INC
209 NORTH MAIN STREET – BRYAN, OHIO 43506
(800) 495-0276 • FAX (800) 892-6276
© 2021
arozone.com

ARO Ingersoll Rand

MODEL DESCRIPTION CHART

Model Code Explanation

Example: **BD20 A - X A S - X X X - A X X**

Model Series

BD20- 2" Band Clamp Diaphragm Pump

Air Motor / Air Cap Material

A - Aluminum

Fluid Connection

A - 2 - 11-1/2 NPTF - 2
B - Rp 2 (2-11 BSP Parallel)

Fluid Caps & Manifold Material

A - Aluminum

Hardware Material

S - Stainless Steel

Seat Material

A - Santoprene®
C - Hytrel®
F - Aluminum
S - 316 Stainless Steel

Ball Material

A - Santoprene®
C - Hytrel®
S - Stainless Steel
T - PTFE

Diaphragm Material

A - Santoprene®
C - Hytrel®
K - PTFE Composite
M - Medical Grade Santoprene®
T - PTFE / Santoprene®

Revision

A - Revision

Specialty Code 1 (Blank if no Speciality Code)

A - Solenoid 120 VAC,110 VAC AND 60 VDC
B - Solenoid 12 VDC, 24 VAC AND 22 VAC
C - Solenoid 240 VAC, 220 VAC AND 120 VDC
D - Solenoid 24 VDC, 48 VAC AND 44 VAC
E - Solenoid 12 VDC NEC / CEC
F - Solenoid 24 VDC NEC / CEC
G - Solenoid 12 VDC ATEX / IECEx
H - Solenoid 24 VDC ATEX / IECEx
J - Solenoid 120 VAC NEC / CEC
K - Solenoid 220 VAC ATEX / IECEx
N - Solenoid with no Coil
P - Ported Motor (No Major Valve)
0 - Standard Valve Block (No Solenoid)
S - Cycle Sensing on Major Valve

Specialty Code 2 (Blank if no Speciality Code)

F - End of Stroke feedback
G - End of Stroke ATEX / IECEx / NEC / CEC
0 - No Option

NOTICE: All possible options are shown in the chart, however, certain combinations may not be recommended. Consult a representative or the factory if you have questions concerning availability.

OPERATING AND SAFETY PRECAUTIONS

READ, UNDERSTAND AND FOLLOW THIS INFORMATION TO AVOID INJURY AND PROPERTY DAMAGE.



⚠WARNING EXCESSIVE AIR PRESSURE. Can cause personal injury, pump damage or property damage.

- Do not exceed the maximum inlet air pressure as stated on the pump model plate.
- Be sure material hoses and other components are able to withstand fluid pressures developed by this pump. Check all hoses for damage or wear. Be certain dispensing device is clean and in proper working condition.

⚠WARNING STATIC SPARK. Can cause explosion resulting in severe injury or death. Ground pump and pumping system.

- Use the pump grounding screw terminal provided. Use ARO® part no. 66885-1 ground kit or connect a suitable ground wire (12 ga. min.) to a good earth ground source.
- Secure pump, connections and all contact points to avoid vibration and generation of contact or static spark.
- Consult local building codes and electrical codes for specific grounding requirements.
- After grounding, periodically verify continuity of electrical path to ground. Test with an ohmmeter from each component (e.g., hoses, pump, clamps, container, spray gun, etc.) to ground to insure continuity. Ohmmeter should show 0.1 ohms or less.
- Submerse the outlet hose end, dispensing valve or device in the material being dispensed if possible. (Avoid free streaming of material being dispensed.)
- Use hoses incorporating a static wire.
- Use proper ventilation.
- Keep inflammables away from heat, open flames and sparks.
- Keep containers closed when not in use.

⚠WARNING Pump exhaust may contain contaminants. Can cause severe injury. Pipe exhaust away from work area and personnel.

- In the event of a diaphragm rupture, material can be forced out of the air exhaust muffler.
- Pipe the exhaust to a safe remote location when pumping hazardous or inflammable materials.
- Use a grounded 1" minimum ID hose between the pump and the muffler.

⚠WARNING HAZARDOUS PRESSURE. Can result in serious injury or property damage. Do not service or clean pump, hoses or dispensing valve while the system is pressurized.

- Disconnect air supply line and relieve pressure from the system by opening dispensing valve or device and / or carefully and slowly loosening and removing outlet hose or piping from pump.

⚠WARNING HAZARDOUS MATERIALS. Can cause serious injury or property damage. Do not attempt to return a pump to the factory or service center that contains hazardous material. Safe handling practices must comply with local and national laws and safety code requirements.

- Obtain Material Safety Data Sheets on all materials from the supplier for proper handling instructions.

⚠WARNING EXPLOSION HAZARD. Models containing aluminum parts cannot be used with 1,1,1-trichloroethane, methylene chloride or other halogenated hydrocarbon solvents which may react and explode.

- Check pump motor section, fluid caps, manifolds and all wetted parts to assure compatibility before using with solvents of this type.

⚠WARNING MISAPPLICATION HAZARD. Do not use models containing aluminum wetted parts with food products for human consumption. Plated parts can contain trace amounts of lead.

⚠ CAUTION Verify the chemical compatibility of the pump wetted parts and the substance being pumped, flushed or recirculated. Chemical compatibility may change with temperature and concentration of the chemical(s) within the substances being pumped, flushed or circulated. For specific fluid compatibility, consult the chemical manufacturer.

⚠ CAUTION Maximum temperatures are based on mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperature. Consult the chemical manufacturer for chemical compatibility and temperature limits. Refer to PUMP DATA on page 1 of this manual.

⚠ CAUTION Be certain all operators of this equipment have been trained for safe working practices, understand it's limitations, and wear safety goggles / equipment when required.

⚠ CAUTION Do not use the pump for the structural support of the piping system. Be certain the system components are properly supported to prevent stress on the pump parts.

- Suction and discharge connections should be flexible connections (such as hose), not rigid piped, and should be compatible with the substance being pumped.

⚠ CAUTION Prevent unnecessary damage to the pump. Do not allow pump to operate when out of material for long periods of time.

- Disconnect air line from pump when system sits idle for long periods of time.

⚠ CAUTION Use only genuine ARO replacement parts to assure compatible pressure rating and longest service life.

NOTICE Replacement warning labels are available upon request: "Static Spark & Diaphragm Rupture" pn \ 94080.

⚠WARNING	=	Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage.
⚠ CAUTION	=	Hazards or unsafe practices which could result in minor personal injury, product or property damage.
NOTICE	=	Important installation, operation or maintenance information.

GENERAL DESCRIPTION

The ARO diaphragm pump offers high volume delivery even at low air pressure and a broad range of material compatibility options are available. Refer to the model and option chart. ARO pumps feature stall resistant design, modular air motor / fluid sections.

Air operated double diaphragm pumps utilize a pressure differential in the air chambers to alternately create suction and a positive fluid pressure in the fluid chambers, valve checks insure a positive flow of fluid.

Pump cycling will begin as air pressure is applied and will continue to pump and keep up with the demand. It will build and maintain line pressure and will stop cycling once maximum line pressure is reached (dispensing device closed) and will resume pumping as needed.

AIR AND LUBE REQUIREMENTS

⚠WARNING EXCESSIVE AIR PRESSURE. Can cause pump damage, personal injury or property damage.

- A filter capable of filtering out particles larger than 50 microns should be used on the air supply. There is no lubrication required other than the "O" ring lubricant which is applied during assembly or repair.
- If lubricated air is present, make sure that it is compatible with the "O" rings and seals in the air motor section of the pump.

OPERATING INSTRUCTIONS

- Always flush the pump with a solvent compatible with the material being pumped if the material being pumped is subject to "setting up" when not in use for a period of time.
- Disconnect the air supply from the pump if it is to be inactive for a few hours.
- The outlet material volume is governed not only by the air supply, but also by the material supply available at the inlet. The material supply tubing should not be too small or restrictive. Be sure not to use hose which might collapse.
- When the diaphragm pump is used in a forced-feed (flooded inlet) situation, it is recommended that a "check valve" be installed at the air inlet.
- Secure the diaphragm pump legs to a suitable surface to insure against damage by vibration.

PARTS AND SERVICE KITS

Refer to the part views and descriptions as provided on pages 5 through 8 for parts identification and service kit information.

- Certain ARO "Smart Parts" are indicated which should be available for fast repair and reduction of down time.
- Service kits are divided to service two separate diaphragm pump functions: 1. AIR SECTION, 2. FLUID SECTION. The Fluid Section is divided further to match typical part Material Options.

MAINTENANCE

- Provide a clean work surface to protect sensitive internal moving parts from contamination from dirt and foreign matter during service disassembly and reassembly.
- Keep good records of service activity and include the pump in preventive maintenance program.
- Before disassembling, empty captured material in the outlet manifold by turning the pump upside down to drain material from the pump.

FLUID SECTION DISASSEMBLY

1. Remove (61) outlet manifold and (60) inlet manifold.
2. Remove (22) balls, (19) "O" rings (if applicable) and (21) seats.
3. Remove (15) fluid caps.

NOTE: Only PTFE diaphragm models use a primary diaphragm (7) and a backup diaphragm (8). Refer to the auxiliary view in the Fluid Section illustration.

NOTE: Do not stretch or bend the clamp during disassembly. Loosen the fastener to free the clamp and move the clamp to the air cap side of the pump to remove the fluid cap.

4. Remove the (6) diaphragm washer, (7) or (7 / 8) diaphragms and (5) backup washer.

NOTE: Do not scratch or mar the surface of (1) diaphragm rod.

FLUID SECTION REASSEMBLY

- Reassemble in reverse order. Refer to the torque requirements on page 6.
- Clean and inspect all parts. Replace worn or damaged parts with new parts as required.
- Lubricate (1) diaphragm rod and (144) "U" cups with Lubriplate® FML-2 grease (94276 grease packet is included in service kit).
- For models with PTFE diaphragms: Item (8) Santoprene diaphragm is installed with the side marked "AIR SIDE" towards the pump center body. Install the (7) PTFE diaphragm with the side marked "FLUID SIDE" towards the (15) fluid cap.

NOTE: For PTFE one-piece composite diaphragm SPECIAL INSTRUCTIONS. Refer page 6 for more detailed INSTALLATION SEQUENCES. Apply 13 - 18 psig of air pressure to ensure the first air connecting side of the air cap.Tighten PTFE one-piece composite diaphragm on connecting rod, ensuring back side of diaphragm is flush with backup washer and connecting rod, then insert rod into pump center body. Push diaphragm to first side then clamp on fluid cap. Install and tighten diaphragm on other side, in similar fashion to other side. Apply 5-8 psig of air pressure to slowly draw diaphragm down, taking care not to activate trip pin (and thus shifiting the diaphragm). Install second fluid cap.

- Re-check torque settings after the pump has been re-started and run a while.

• Viton® is a registered trademarks of the Chemours Company • Hytrel® is a registered trademark of the DuPont Company • Loctite® is a registered trademark of Henkel Corporation •
• Santoprene® is a registered trademark of ExxonMobil • ARO® is a registered trademark of Ingersoll-Rand Company •
• Lubriplate® is a registered trademark of Lubriplate Lubricants Company • 262™, 271™ and 572™ are trademarks of Henkel Corporation •

PARTS LIST / BD20X-XXX-XXX-AXX FLUID SECTION

★ **637494-XX Fluid Section Service Kits include:** Balls (see BALL Option, refer to -XX in chart below), Diaphragms (see DIAPHRAGM Option, refer to -XX in chart below), and items: 19, 70, 144 and 175 (listed below) plus 174 and 94276 Lubriplate FML-2 grease (page 7).

COMMON PARTS				
Item	Description (size)	Qty	Part No.	Mtl
1	Connecting Rod	(1)	97427	[C]
	(BD20X-XXX-XXK-AXX only)	(1)	97448	[C]
43	Ground Lug (see page 9)	(1)	93004	[Co]
★✓ 70	Gasket	(2)	94100	[B]
82	Sanitary Clamp	(4)	97323	[SS]

COMMON PARTS				
Item	Description (size)	Qty	Part No.	Mtl
83	Band-Clamp, Diaphragm	(2)	97324	[SS]
★✓ 144	"U" Cup (3/16" x 1-3/8" OD)	(2)	Y186-51	[B]
★ ✓180	Gasket (0.406" ID x 0.031" thick)	(4)	94098	[Co]
✓ Air Section Service Kit Parts, see pages 7 and 8.				

SEAT OPTIONS BD20X-XXX-XXX-AXX							
"21"							
-XXX	Seat	Qty	Mtl	-XXX	Seat	Qty	[Mtl]
-AXX	94328-A	(4)	[Sp]	-FXX	95673	(4)	[Al]
-CXX	94328-C	(4)	[H]	-SXX	94353	(4)	[SS]

BALL OPTIONS BD20X-XXX-XXX-AXX							
★ "22" (2-1/2" dia.)							
-XXX	Ball	Qty	Mtl	-XXX	Ball	Qty	Mtl
-XAX	93358-A	(4)	[Sp]	-XSX	94805	(4)	[SS]
-XCX	93358-C	(4)	[H]	-XTX	93358-4	(4)	[T]

DIAPHRAGM OPTIONS BD20X-XXX-XXX-AXX										
-XXX	★ Service Kit -XX = (Ball) -XX = (Diaphragm)	★ "7"			★ "8"			★ "19" (1/8" x 3-5/8" OD)		
		Diaphragm	Qty	Mtl	Diaphragm	Qty	Mtl	"O" Ring	Qty	Mtl
-XXA	637494-XA	97326-M	(2)	[Sp]	-----	---	---	94356	(4)	[E]
-XXC	637494-XC	97326-C	(2)	[H]	-----	---	---	Y327-237	(4)	[V]
-XXK	637494-XK	97436	(2)	[TC]				Y328-237	(4)	[T]
-XXM	637494-XM	97326-M	(2)	[MSP]				Y328-237	(4)	[T]
-XXT	637494-XT	97327-T	(2)	[T]	97328-A	(2)	[SP]	Y328-237	(4)	[T]

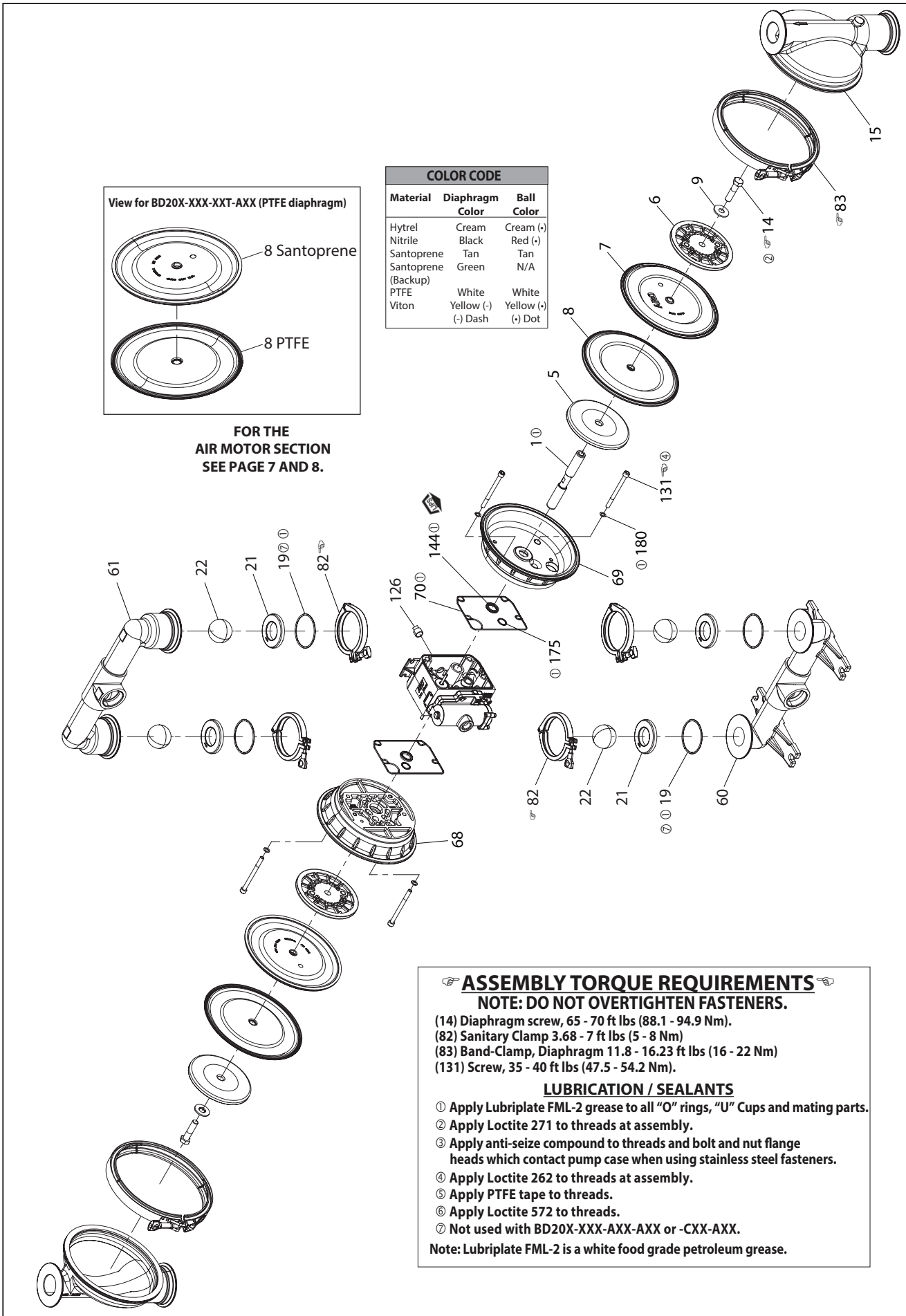
NOTE: Seat options -AXX and -CXX do not require item 19 "O" ring.

CENTER SECTION OPTIONS BD20X-XXX-XXX-AXX				
Item	Description (size)	Qty	Aluminum BD20A-XXX-XXX-AXX	
			Part No.	Mtl
5	Backup Washer	(2)	96503	[A]
	(BD20X-XXX-XXK-AXX only)	(2)	97449	[SS]
68	Air Cap	(1)	98237-1	[A]
69	Air Cap	(1)	98237-2	[A]
126	Plug (BD20X-XXX-XXX-AX0 only)	(1)	Y17-13-S	[SS]
131	Screw (M10 x 1.5 - 6g x 120 mm)	(4)	94531	[C]
★✓175	"O" Ring (3/32" x 1" OD)	(2)	Y325-117	[B]
181	Roll Pin (5/32" OD x 3/4" long) (shown on page 9)	(4)	Y178-56-S	[SS]

MATERIAL CODE	
[A]	= Aluminum
[B]	= Nitrile
[C]	= Carbon Steel
[CI]	= Cast Iron
[Co]	= Copper
[E]	= E.P.R.
[H]	= Hytrel
[Ha]	= Hastelloy-C
[K]	= PVDF
[L]	= Long Life PTFE
[MSP]	= Medical Grade Santoprene
[SH]	= Hard Stainless Steel
[SP]	= Santoprene
[SS]	= Stainless Steel
[T]	= PTFE
[TC]	= PTFE Composite
[V]	= Viton

MANIFOLD / FLUID CAP MATERIAL OPTIONS BD20X-XXX-XXX-AXX						
			BD20X-AAX-XXX 2-11-1/2 NPTF		BD20X-BAX-XXX Rp 2 (2-11 BSPP)	
Item	Description (size)	Qty	Part No.	[Mtl]	Part No.	[Mtl]
❖ 6	Diaphragm Washer	(2)	96503	[A]	96503	[A]
❖ 9	Washer	(2)	93065	[SS]	93065	[SS]
❖ 14	Diaphragm Screw (5/8" - 18 x 2-1/2")	(2)	Y5-111-T	[SS]	Y5-111-T	[SS]
15	Fluid Cap	(2)	98238	[A]	98238	[A]
60	Inlet Manifold	(1)	98239	[A]	98239-1	[A]
61	Outlet Manifold	(1)	98240	[A]	98240-1	[A]

❖ Items not required with diaphragm options BD20X-XXX-XXK-AXX



ASSEMBLY TORQUE REQUIREMENTS

NOTE: DO NOT OVERTIGHTEN FASTENERS.

(14) Diaphragm screw, 65 - 70 ft lbs (88.1 - 94.9 Nm).
(82) Sanitary Clamp 3.68 - 7 ft lbs (5 - 8 Nm)
(83) Band-Clamp, Diaphragm 11.8 - 16.23 ft lbs (16 - 22 Nm)
(131) Screw, 35 - 40 ft lbs (47.5 - 54.2 Nm).

LUBRICATION / SEALANTS

① Apply Lubriplate FML-2 grease to all "O" rings, "U" Cups and mating parts.
② Apply Loctite 271 to threads at assembly.
③ Apply anti-seize compound to threads and bolt and nut flange heads which contact pump case when using stainless steel fasteners.
④ Apply Loctite 262 to threads at assembly.
⑤ Apply PTFE tape to threads.
⑥ Apply Loctite 572 to threads.
⑦ Not used with BD20X-XXX-AXX-AXX or -CXX-AXX.

Note: Lubriplate FML-2 is a white food grade petroleum grease.

Figure 2

PARTS LIST / BD20X-XXX-XXX-AXX AIR MOTOR SECTION

❷ Indicates parts included in 637421 air section service kit shown below and items (70), (144), (175) and (180) shown on page 5.

Item	Description (size)	Qty	Part No.	Mtl
76	Plug (BD20X-XXX-XXX-ASX)	(1)	Y17-50-S	[SS]
❸ 101	Center Body	(1)	97031	[A]
❸ 103	Bushing	(1)	97394	[D]
105	Screw (M6 x 1 - 6g x 20 mm)	(4)	95887	[SS]
111	Spool (BD20X-XXX-XXX-A0X only)	(1)	95651	[D]
	(BD20X-XXX-XXX-ASX only)	(1)	95651-1	[D]
	(all other models)	(1)	95651-2	[D]
118	Actuator Pin (0.250" x 2.276" long)	(2)	94083	[SS]
121	Plug ❸ (BD20X-XXX-XXX-APX only)	(2)	96613	[D]
	Sleeve	(2)	94084	[D]
❸ 127	90° St. Elbow (1-1/2 - 11-1/2 N.P.T.)	(1)	94860	[C/I]
128	Set Screw (1/4" - 20 x 1/4")	(2)	Y29-42-S	[SS]
❸ ❷ 132	Gasket	(1)	94099	[B]
❸ 133	Lockwasher (1/4")	(3)	Y117-416-C	[C]
❸ 134	Screw (M6 x 1 - 6g x 35 mm)	(4)	95923	[SS]
135	Valve Block (BD20X-XXX-XXX-A0X only)	(1)	96334-1	[A]
	(BD20X-XXX-XXX-ASX only)	(1)	96334-2	[A]
	(All BD20X with Solenoid)	(1)	96334-3	[A]
136	Plug	(1)	96335	[A]
❷ 137	"O" Ring (1/16" x 2" OD)	(1)	Y325-32	[B]
❷ 138	"U" Cup (3/16" x 1.792" OD)	(1)	95966	[B]
❷ 139	"U" Cup (3/16" x 1-1/4" OD)	(1)	Y186-50	[B]
140	Valve Insert	(1)	95650	[AO
141	Valve Plate	(1)	95659	[AO]
❸ 160	Air Manifold (BD20X-XXX-XXX-APX only)	(1)	96612	[A]
❸ ❷ 166	Track Gasket	(1)	94026	[B]
❷ 167	Pilot Piston (includes 168 and 169)	(1)	67164	[D]
168	"O" Ring (3/32" x 5/8" OD)	(2)	94433	[U]
169	"U" Cup (1/8" x 7/8" OD)	(1)	Y240-9	[B]
170	Piston Sleeve	(1)	94081	[D]
❷ 171	"O" Ring (3/32" x 1-1/8" OD)	(1)	Y325-119	[B]
❷ 172	"O" Ring (1/16" x 1-1/8" OD)	(1)	Y325-22	[B]
❸ ❷ 173	"O" Ring (1/16" x 1-3/8" OD)	(2)	Y325-26	[B]
❶ 174	"O" Ring (1/8" x 1/2" OD)	(2)	Y325-202	[B]
❸ ❷ 176	Diaphragm (check valve)	(2)	94102	[Sp]
❷ 199	Track Gasket	(1)	95666	[B]
❷ 200	Gasket	(1)	95665	[B]
❸ 201	Muffler Kit (includes item 127)	(1)	67213	
233	Adapter Plate	(1)	96336	[A]
240	Screw (M6 x 1 - 6g x 16 mm)	(2)	95991	[SS]
❷ 241	Track Gasket	(1)	96344	[B]
❷ 242	"O" Ring (1/16" x 7/32" OD)	(1)	Y325-5	[B]
❷ 243	"O" Ring (1/8" x 5/8" OD)	(1)	Y325-204	[B]
❷ 244	"O" Ring (1/8" x 7/8" OD)	(1)	Y325-208	[B]

Item	Description (size)	Qty	Part No.	Mtl
403	Valve (All BD20X with solenoid)	(1)	114102	
407	Carrot Plug (All BD20X with Solenoid)	(1)	96317	
410	Sensor (for Cycle Sensing) (BD20X-XXX-XXX-ASX)	(1)	95276	
410	ASM, Adapter - Sensor (BD20X-XXX-XXX-AXF)	(1)	97121	
	(BD20X-XXX-XXX-AXG)	(1)	97411	
411	Adapter (for Cycle Sensing) (BD20X-XXX-XXX-ASX)	(1)	96584	
	(All BD20X with solenoid)	(1)	96953	
413	Coil Nut (All BD20X with Solenoid)	(1)	119380	
414	Coil, 120 VAC (BD20X-XXX-XXX-AAX)	(1)	116218-33	
	Coil, 12 VDC (BD20X-XXX-XXX-ABX)	(1)	116218-38	
	Coil, 240 VAC (BD20X-XXX-XXX-ACX)	(1)	116218-35	
	Coil, 24 VDC (BD20X-XXX-XXX-ADX)	(1)	116218-39	
	Coil 12 VDC NEC/CEC (BD20X-XXX-XXX-AEX)	(1)	114772-38	
	Coil 24 VDC NEC/CEC (BD20X-XXX-XXX-AFX)	(1)	114772-39	
	Coil 12 VDC ATEX (BD20X-XXX-XXX-AGX)	(1)	117345-38	
	Coil 24 VDC ATEX (BD20X-XXX-XXX-AHX)	(1)	117345-39	
	Coil 120 VAC NEC/CEC (BD20X-XXX-XXX-AJX)	(1)	114772-33	
	Coil 220 VAC NEC/CEC (BD20X-XXX-XXX-AKX)	(1)	117345-35	
415	O-Ring (All BD20X with Solenoid)	(1)	114103	
416	O-Ring (All BD20X with Solenoid)	(1)	114104	
417	Screw (All BD20X with Solenoid)	(2)	96728647	
418	Tube (All BD20X with Solenoid)	(1)	15309974	
❷ 419	Seal (All BD20X with Solenoid)	(1)	96957	
420	Snap Ring (All BD20X with Solenoid)	(1)	Y147-43	
421	Retainer (All BD20X with Solenoid)	(1)	15309990	
425	Magnet (for Cycle Sensing) (BD20X-XXX-XXX-ASX)	(1)	95275	
428	O-Ring (All BD20X with Solenoid)	(1)	Y325-13	
429	Solenoid Muffler (All BD20X with Solenoid)	(1)	116464	
❶ ❷	Lubriplate FML-2 grease	(1)	94276	
	Lubriplate Grease Packets (10)		637308	

❶ Items included in fluid section service kit, see pages 5 and 6.
❸ For model BD20X-XXX-XXX-APX include ONLY these items.

MATERIAL CODE	
[A]	= Aluminum
[AO]	= Alumina Oxide
[B]	= Nitrile
[Br]	= Brass
[C]	= Carbon Steel

MATERIAL CODE	
[D]	= Acetal
[I]	= Iron
[SP]	= Santoprene
[SS]	= Stainless Steel
[U]	= Polyurethane

AIR MOTOR SECTION SERVICE

Service is divided into two parts - 1. Pilot Valve, 2. Major Valve.

GENERAL REASSEMBLY NOTES:

- Air Motor Section service is continued from Fluid Section repair.
- Inspect and replace old parts with new parts as necessary. Look for deep scratches on metallic surfaces, and nicks or cuts in "O" rings.
- Take precautions to prevent cutting "O" rings upon installation.
- Lubricate "O" rings with Lubriplate FML-2 grease.
- Do not over-tighten fasteners. Refer to torque specification block on view.
- Re-torque fasteners following restart.
- SERVICE TOOLS - To aid in the installation of (168) "O" rings onto the (167) pilot piston, use tool # 204130-T, available from ARO.

PILOT VALVE DISASSEMBLY

1. A light tap on (118) actuator pin should expose the opposite (121) sleeve, (167) pilot piston and other parts.
2. Remove (170) sleeve. Inspect inner bore of sleeve for damage.

PILOT VALVE REASSEMBLY

1. Clean and lubricate parts not being replaced from service kit.
2. Install new (171 and 172) "O" rings. Replace (170) sleeve.
3. Install new (168) "O" rings and (169) "U" cup - Note the lip direction. Lubricate and replace (167) pilot piston.
4. Reassemble remaining parts. Replace (173 and 174) "O" rings.

MAJOR VALVE DISASSEMBLY

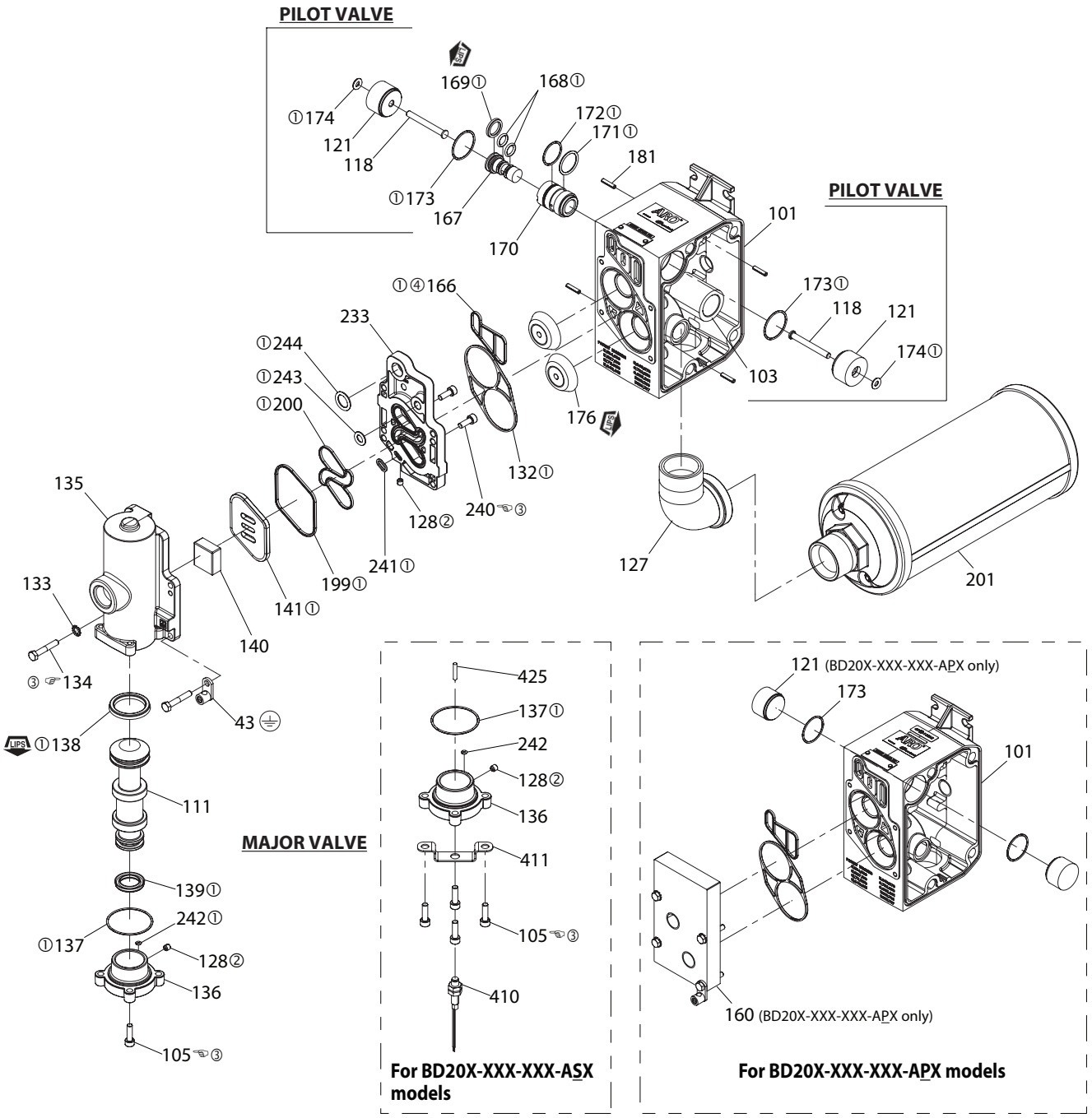
1. Remove (135) valve block and (233) adapter plate, exposing (132 and 166) gaskets and (176) checks.
2. Remove (233) adapter plate, releasing (140) valve insert, (141) valve plate, (199, 200 and 241) gaskets and (243 and 244) "O" rings.
3. Remove (136) plug and (137) "O" ring, releasing (111) spool.

MAJOR VALVE REASSEMBLY

1. Install new (138 and 139) "U" cups on (111) spool - **LIPS MUST FACE EACH OTHER.**
2. Insert (111) spool into (135) valve block.
3. Install (137 and 242) "O" rings on (136) plug and assemble plug to (135) valve block, securing with (105) screws.
4. Install (140) valve insert, (141) valve plate, (199) gasket and (243 and 244) „O" rings into (135) valve block.

NOTE: Assemble (140) valve insert with "dished" side toward (141) valve plate. Assemble (141) valve plate with part number identification toward (140) valve insert.

5. Assemble (200 and 241) gaskets and (233) adapter plate to (135) valve block, securing with (240) screws.
6. Assemble (132 and 166) gaskets and (176) checks to (101) center body.
7. Assemble (135) valve block and components to (101) center body, securing with (134) screws.



A replacement Major Valve Service Assembly is available separately, which includes the following:

Major Valve 637374-2 : 105 (4), 111, 128 (2), 132, 133 (3), 134 (4), 135, 136, 137, 138, 139, 140, 141, 166, 176 (2), 199, 200, 233, 240 (2), 241, 242, 243 and 244.

Major Valve 637374-3: 76, 105 (4), 111, 128 (2), 132, 133 (3), 134 (4), 135, 136, 137, 138, 139, 140, 141, 166, 176 (2), 199, 200, 233, 240 (2), 241, 242, 243 and 244.

☞ASSEMBLY TORQUE REQUIREMENTS☜

NOTE: DO NOT OVERTIGHTEN FASTENERS.

(105) Screw, 40 - 50 in. Lbs (4.5 - 5.6 Nm).
(134) Screw, 40 - 50 in. Lbs (4.5 - 5.6 Nm).
(240) Screw, 40 - 50 in. Lbs (4.5 - 5.6 Nm).

LUBRICATION / SEALANTS

① Apply Lubriplate FML-2 grease to all "O" rings, "U" cups and mating parts.

② Apply Loctite 271 to threads.

③ Apply anti-seize compound to threads and bolt and nut flange heads which contact pump case when using stainless steel fasteners.

④ Apply PTFE tape to threads.

Figure 3

TROUBLESHOOTING

Product discharged from exhaust outlet.
- Check for diaphragm rupture.
- Check tightness of (14) diaphragm screw.

Air bubbles in product discharge.
- Check connections of suction plumbing.
- Check "O" rings between intake manifold and inlet side fluid caps.
- Check tightness of (14) diaphragm screw.

Motor blows air or stalls.
- Check (176) check valve for damage or wear.
- Check for restrictions in valve / exhaust.

Low output volume, erratic flow or no flow.
- Check air supply.
- Check for plugged outlet hose.
- Check for kinked (restrictive) outlet material hose.
- Check for kinked (restrictive) or collapsed inlet material hose.
- Check for pump cavitation - suction pipe should be sized at least as large as the inlet thread diameter of the pump for proper flow if high viscosity fluids are being pumped. Suction hose must be a non-collapsing type, capable of pulling a high volume.
- Check all joints on the inlet manifolds and suction connections. These must be air tight.
- Inspect the pump for solid objects lodged in the diaphragm chamber or the seat area.

DIMENSIONAL DATA

Dimensions shown are for reference only, they are displayed in inches and millimeters (mm).

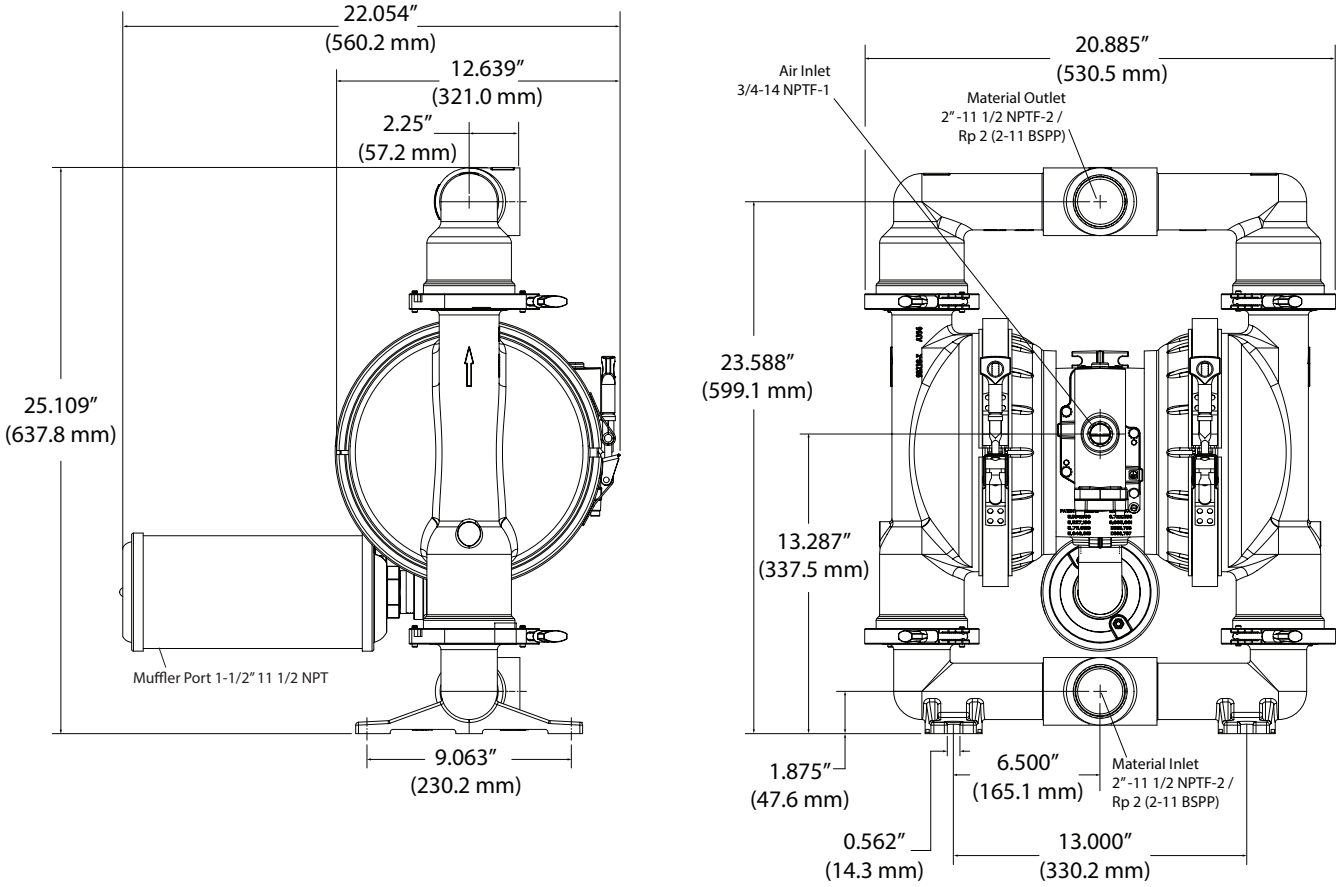


Figure 4

ELECTRONIC INTERFACE

GENERAL DESCRIPTION

This electronic interface includes options for solenoid control, end of stroke feedback, cycle counting on the major valve, and a ported motor with no major valve for user-supplied control directly to the two diaphragm air chambers.
Solenoid control allows the cycle rate of the pump to be controlled electronically.
With Solenoid control, when the solenoid is energized, the pump strokes and dispenses the fluid in one chamber. When the solenoid is de-energized, the pump strokes in the opposite direction, dispensing the fluid in the other chamber.
By providing continuous ON - OFF signals to the solenoid, the fluid transfer rate may be increased or decreased remotely.
End of stroke feedback can be used in conjunction with the solenoid valve to cycle the pump based upon completion of each stroke.
The cycle counter option provides a closed contact output each time the pump completes a cycle. This option is not available combined with solenoid control.
The ported motor with no major valve is provided as an option for users who want to supply compressed air directly to each diaphragm and control the operation of the pump with their own external air controls.

SOLENOID

GENERAL DESCRIPTION

Without end of stroke feedback, solenoid control can only be used to cycle the pump based on timing. The following curves represent the flow rates of a pump based on timed operation of the solenoid at a common operating point of 70 psig air pressure and 30 psi of back pressure.

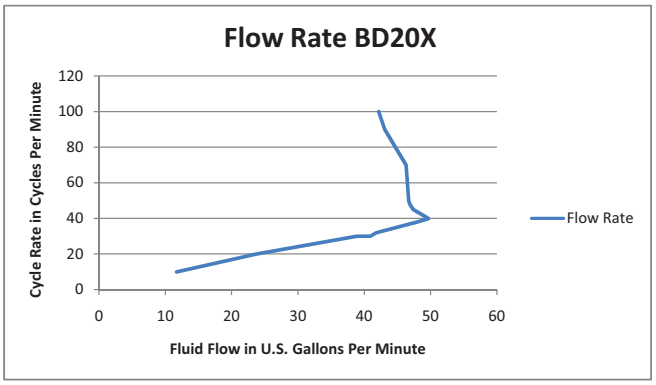
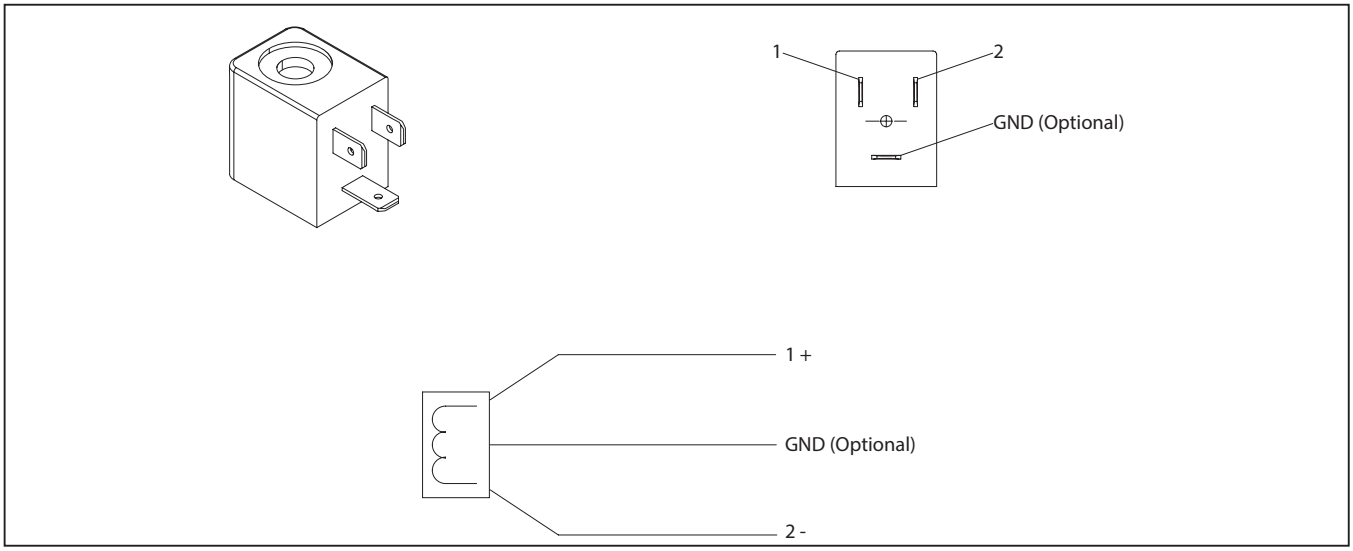
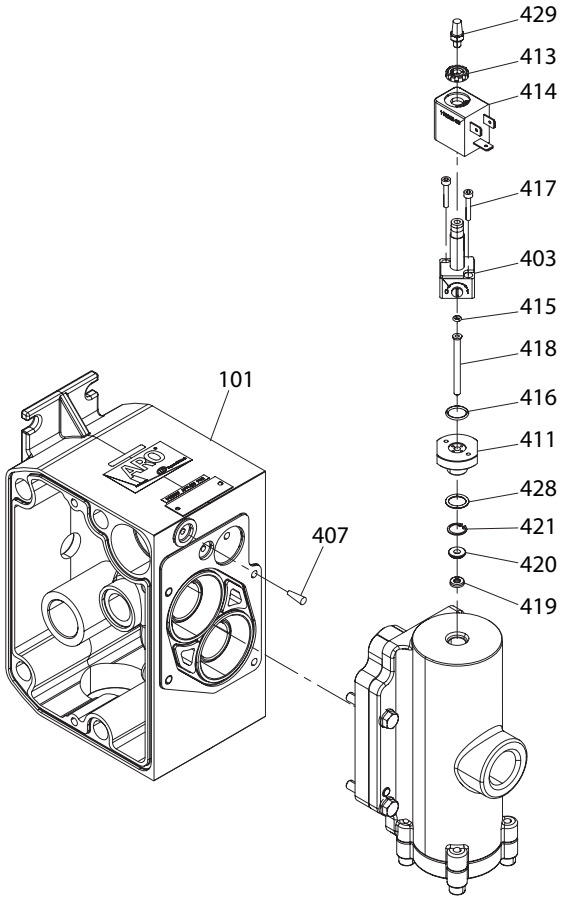


Figure 5

NON- HAZARDOUS DUTY SOLENOID WIRING DIAGRAM





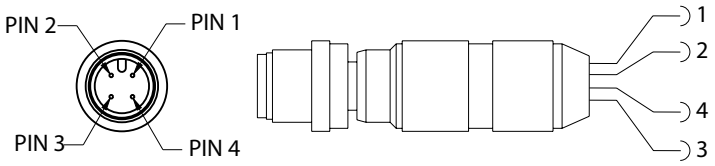
For BD20X-XXX-XXX-AXX models

Figure 6

NON - HAZARDOUS DUTY END OF STROKE

With End of Stroke feedback, the End of stroke sensor detects when the diaphragm rod has reached the end of each stroke. This allows closed loop control of the diaphragm pump, verifying each stroke is complete.

End of Stroke / Cycle Sensor Pinout, M12 Connector

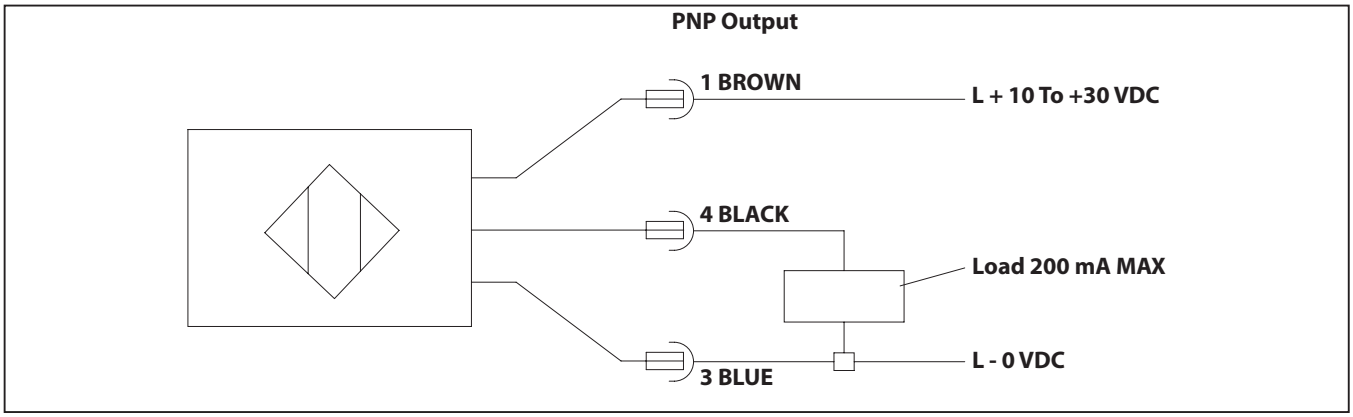


CABLE ASSEMBLY WIRING COLORS:

PIN 1 - BROWN, POSITIVE VOLTAGE (+10 TO +30 VDC)
PIN 2 - WHITE, NOT USED
PIN 3 - BLUE, ZERO VOLTS
PIN 4 - BLACK, SIGNAL

NOTE: WIRING COLORS ARE BASED ON AUTOMATION DIRECT CD12L AND CD12M 4-POLE CABLE ASSEMBLIES.

End of Stroke / Cycle Sensor Pinout, Wiring Diagram (No Connector)



PART LIST / SENSOR

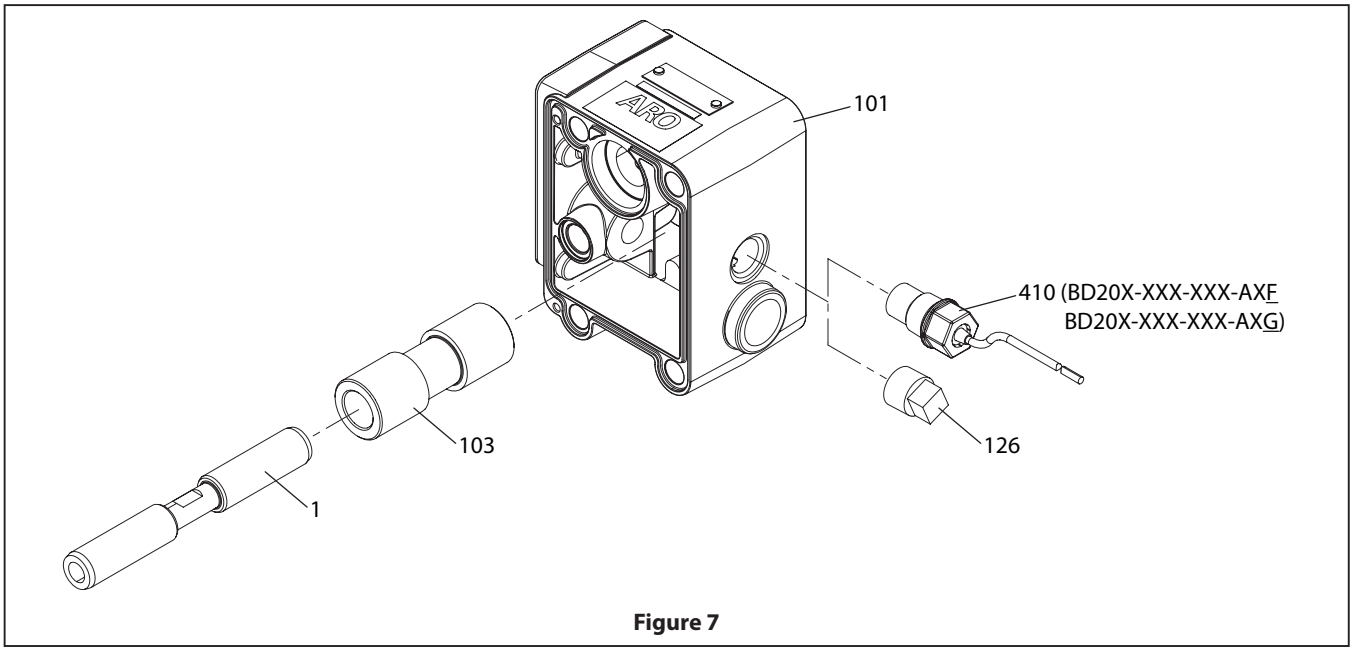
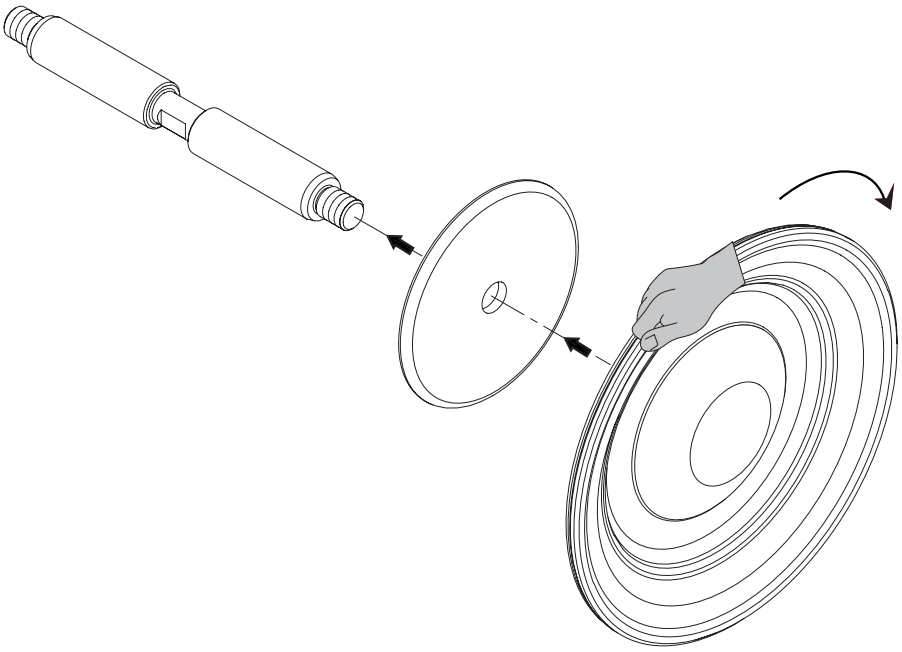
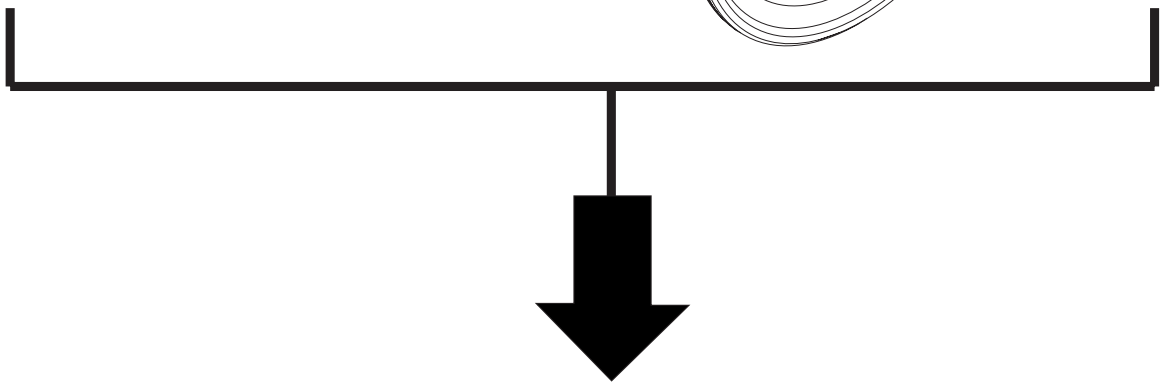


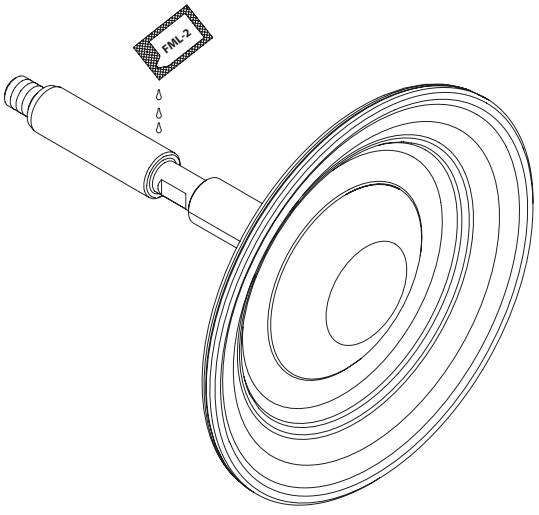
Figure 7

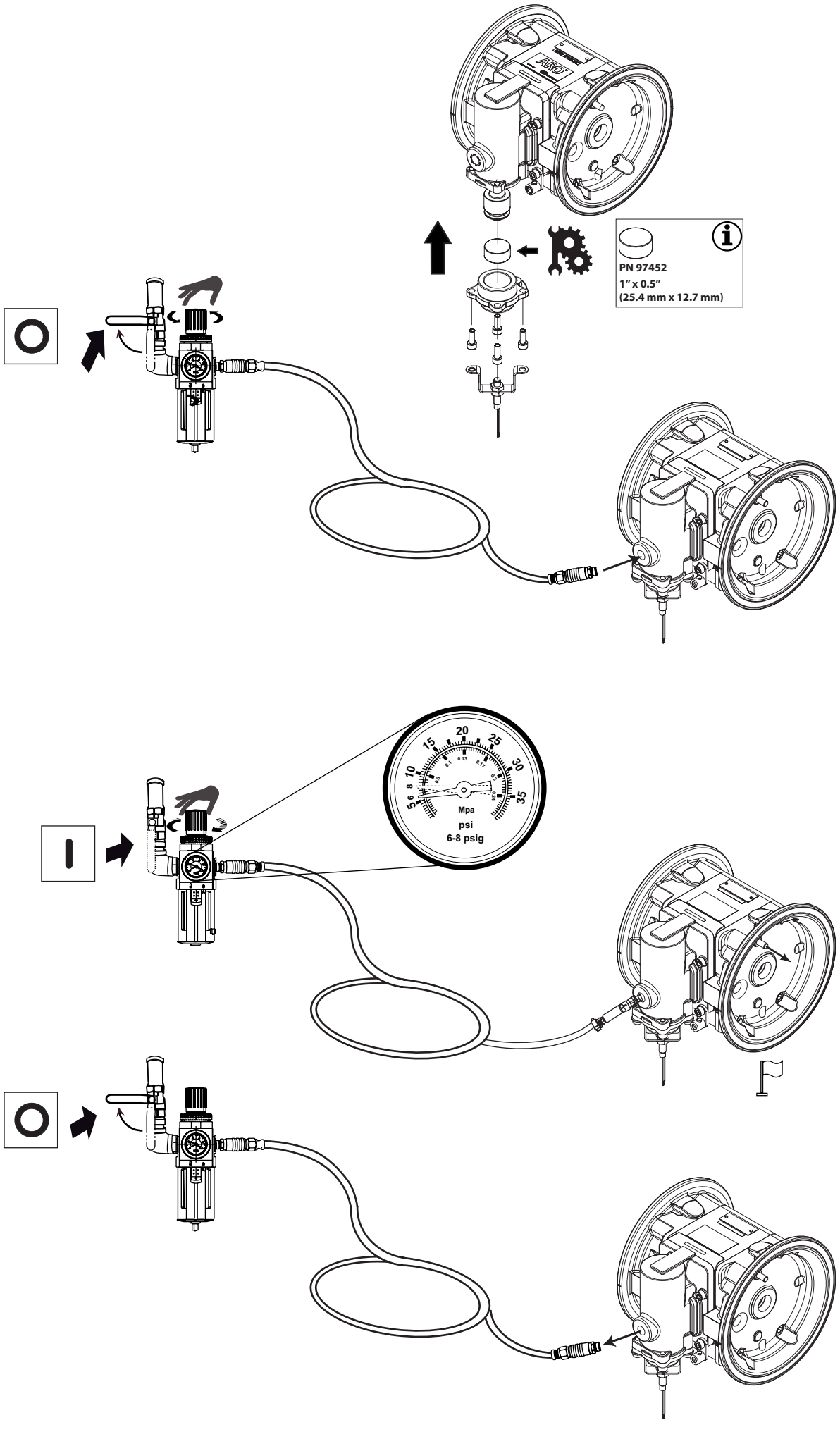
INSTALLATION SEQUENCE
(FOR PTFE COMPOSITE DIAPHRAGMS ONLY)

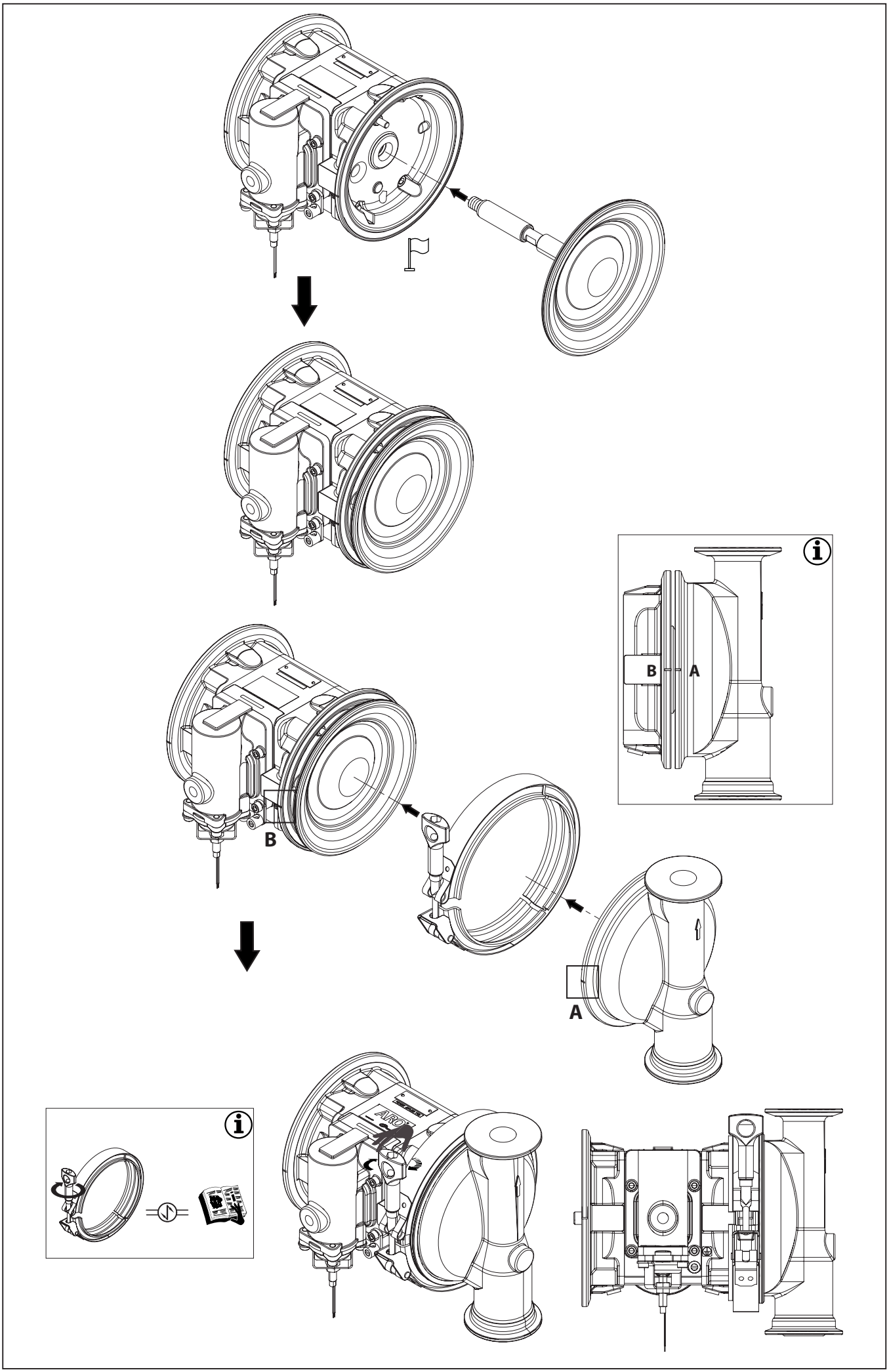


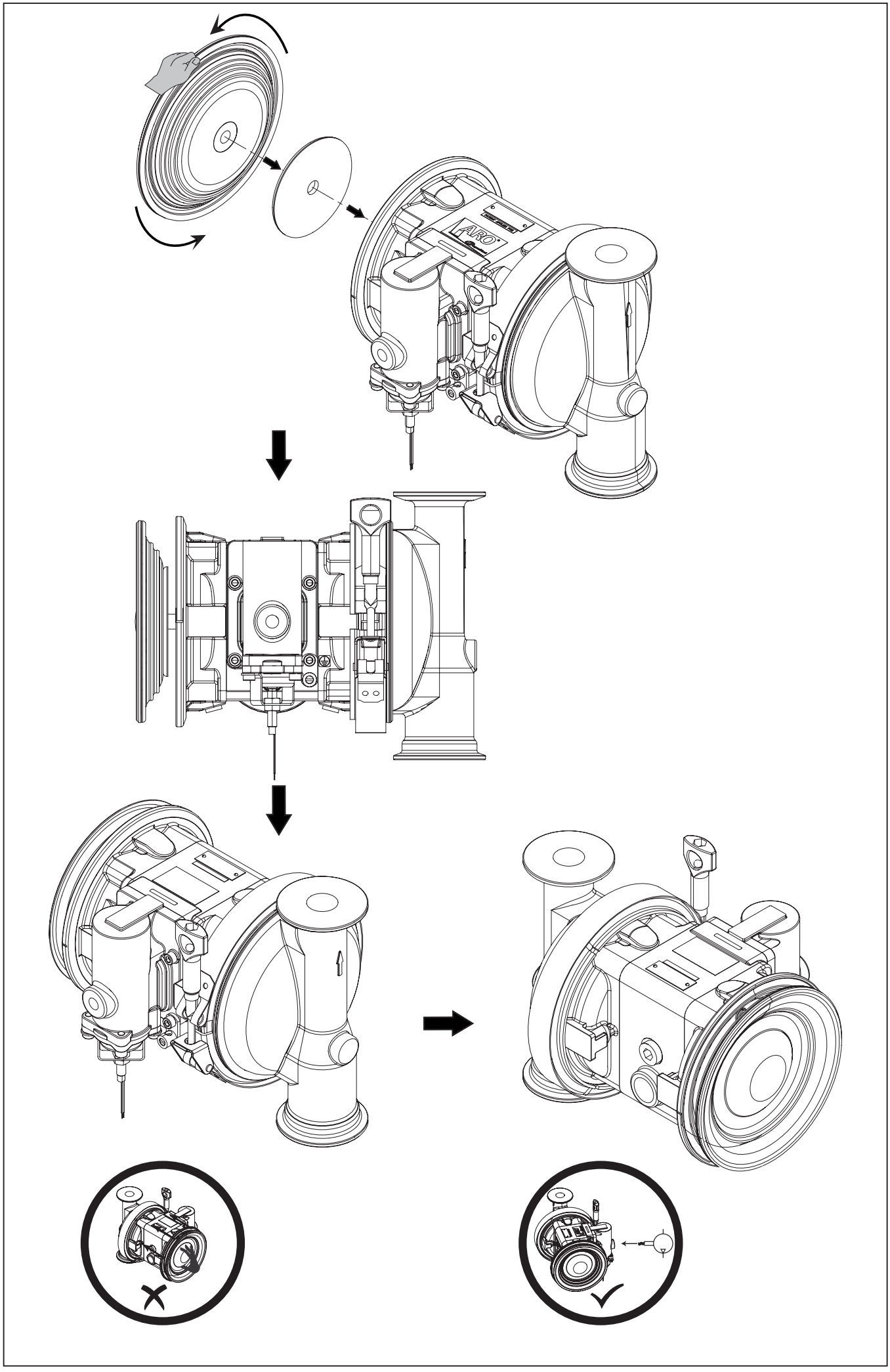


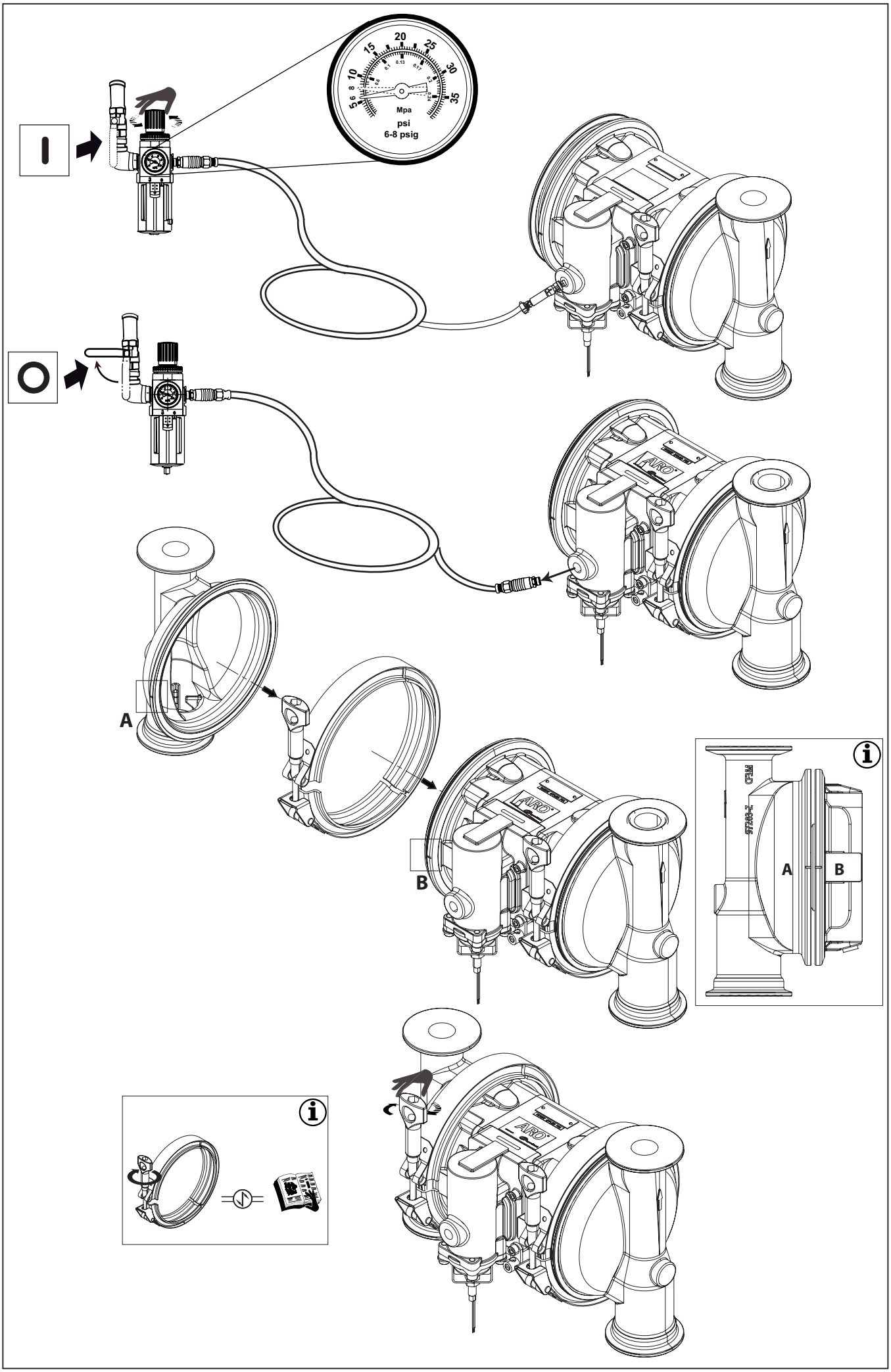


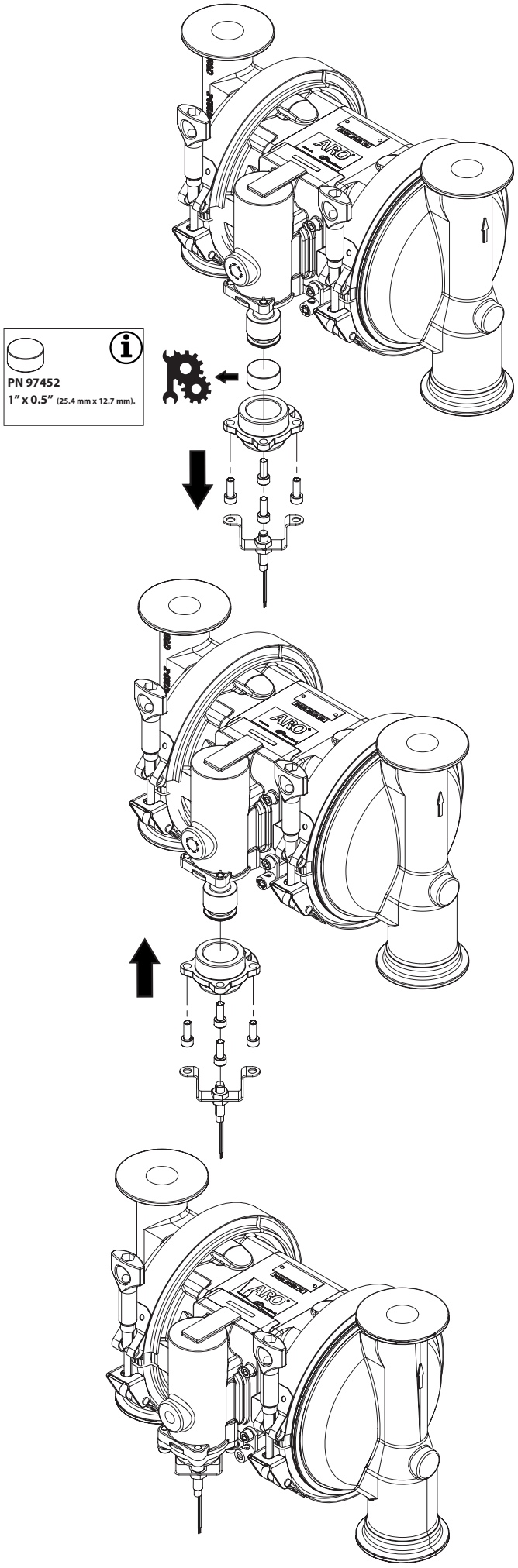



PN 97452
1" x 0.5"
(25.4 mm x 12.7 mm)
Mpa
psi
6-8 psig


B
A
B
A




Mpa
psi
6-8 psig
A
B
CFM
97283-2
A
B


PN 97452
1" x 0.5" (25.4 mm x 12.7 mm).