English

Installation, Operation and Maintenance Instructions

Epsilon Range

Size E1XB and below

Monoflo® NOV

One Company, Unlimited Solutions

OMMP/035/05/R1

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Installation, Operation & Maintenance Instructions

INSTALLATION

1.1 INSTALLATION AND SAFETY RECOMMENDATIONS

In common with other items of process plant a pump must be installed correctly to ensure satisfactory and safe operation. The pump must also be maintained to a suitable standard. Following these recommendations will ensure that the safety of personnel and satisfactory operation of the pump is achieved.

1.2.1. GENERAL

When handling harmful or objectionable materials, adequate ventilation must be provided in order to disperse dangerous concentrations of vapours. It is recommended that wherever possible, Monoflo pumps should be installed with provision for adequate lighting, thus ensuring that effective maintenance can be carried out in satisfactory conditions. With certain product materials, a hosing down facility with adequate draining will simplify maintenance and prolong the life of pump components.

1.2.2. SYSTEM DESIGN & INSTALLATION

At the system design stage, consideration must be given to provision of filler plugs, and the installation of non-return and/or isolating valves. Pumps cannot be reliably used as non-return valves. Pumps in parallel and those with high static discharge head must be fitted with non-return valves.

The pumps must also be protected by suitable devices against over pressure and dry running.

i. HORIZONTAL MOUNTING

All ranges excluding P Range Mono pumps are normally installed in a horizontal position with baseplates mounted on a flat surface, grouted in and bolted, thus ensuring firm fixing and a reduction in noise and vibration.

The unit should be checked after bolting down to ensure that the alignment of the pump to its prime mover is correct.

ii. VERTICAL MOUNTING

P Range Pumps Only

The P range pumps are intended for vertical installation. Care must be taken when lifting the pump into the vertical position.

Normally 'P' range pumps will be designed with a sole plate that will be bolted to the customers framework.

If the pump is to be mounted in any way other than described above, confirmation of the installation must be agreed with Monoflo. All the pipework should be independently supported.

1.3.1 HANDLING

During installation and maintenance, attention must be paid to the safe handling of all items. Where a pump or its components weigh in excess of 45lbs (20kg) it is recommended that suitable lifting tackle should be used to ensure that personal injury or damage to components does not occur.

For safe handling of both bareshaft pumps and pump units (pump/ gearbox/motor etc.) slings should be used. The position of the slings will depend upon the specific pump/unit construction and should be carried out by personnel with the relevant experience to ensure that the pump is not damaged and injury to personnel does not occur.

If eyebolts do exist then these should only be used for lifting the individual components for which they are supplied.

1.3.2 STORAGE AND INFREQUENT OPERATION

The situation where a pump is used infrequently is also covered by the instructions in this section.

SHORT TERM STORAGE

Where a pump has to be stored for 6 months or less then the following steps are advised:-

1. Store pump inside wherever possible or if this is not feasible then provide protective covering. Do not allow moisture to collect around the pump.

2. Remove the drain plug, if fitted. Any inspection plates fitted should also be removed to ensure that the suction housing can drain and dry completely.

3. Loosen the packed gland and inject sufficient grease into the stuffing box. Tighten the gland nut hand tight. If a water flush system is to be used do not grease, a small amount of light oil is recommended for these.

4. See Manufacturers Instructions for motor/gearbox/drive instructions for storage procedures.

LONG TERM STORAGE

If the pump is to be kept in storage for more than six months then in addition to the above the following procedures should be carried out regularly (every 2 - 3 weeks if possible):

1. If practicable rotate the pump at least three quarters of one revolution to avoid the rotor setting in the stator.

2. Note, however, that the pump is not to be rotated for more than two revolutions each time because damage could be caused to the rotor/ stator elements.

IMMEDIATELY PRIOR TO INSTALLATION AND STARTING

Before installing the pump please ensure that all plugs and inspection plates are replaced and that excess grease/oil is removed from the stuffing box.

1.4 ELECTRICAL

Electrical connection should only be made using equipment suitable for both rating and environment. Where any doubts exist regarding the suitability of equipment, Monoflo, should be consulted before proceeding. Normally the Monoflo pump should be installed with starting equipment arranged to give direct on line starting.

Earthing points will be provided on electric drives (if supplied) and it is essential that these are correctly connected. When the motor is being wired and checked for rotation, the start/stop sequence must be instantaneous to prevent dry running (see 2) or pressurising upstream equipment. (Check direction arrow on pump nameplate). The electrical installation should include appropriate isolating equipment to ensure that the pump unit is safe to work on.

1.5 PRESSURE RELIEF VALVES AND NON-RETURN VALVES

1. It is recommended that a suitable safety device is installed on the discharge side of the pump to prevent over-pressurisation of the system.

2. It is also recommended that a non-return valve is installed on the discharge side of the pump to prevent reverse flow through the system.

When both are installed it is advised that the relief valve is positioned closer to the pump than the non-return valve.

IMPORTANT

The pump must never run against a closed inlet or outlet valve, as this could result in mechanical failure.

1.6 GENERAL SAFETY

GREAT CARE MUST BE TAKEN TO PROTECT ALL ELECTRICAL EQUIPMENT FROM SPLASHING WHEN HOSING DOWN. WHERE MONOFLO HAVE SUPPLIED A BARESHAFT PUMP THE ONUS IS ON THE USER TO FIT ADEQUATE GUARDS IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT REGULATIONS.

All nuts and bolts, securing flanges and base mounting fixtures must be checked for tightness before operation. To eliminate vibration, the pump must be correctly aligned with the drive unit, and all guards must be securely fixed in position. When commissioning the plant, all joints in the system must be checked thoroughly for leakage.

If, when starting, the pump does not appear to operate correctly (see 2), the plant must be shut down immediately and the cause of the malfunction established before operations are recommenced. It is recommended that depending upon plant system operation, either a combined vacuum and pressure gauge, or a vacuum gauge only be fitted to the pump inlet port, and a pressure gauge fitted to the outlet port, these will then continuously monitor the pump operating conditions.

1.7 DUTY CONDITIONS

Pumps should only be installed on duties for which Monoflo have specified the materials of construction, flow rates, pressure, temperature, speed etc. Where dangerous materials are to be pumped, consideration must be given to the safe discharge from relief valves, gland drains etc.

IF THE DUTY SHOULD BE CHANGED, MONOFLO SHOULD BE CONTACTED AND THEIR RECOMMENDATIONS SOUGHT IN THE INTEREST OF APPLICATION, SAFETY OF PLANT, EFFICIENCY AND PUMP LIFE.

2. START-UP PROCEDURE

Pumps must be filled with liquid before starting. The initial filling is not for priming purposes, but to provide the necessary lubrication of the stator until the pump primes itself. When the pump is stopped, sufficient liquid will normally be trapped in the rotor/stator assembly to provide lubrication upon re-starting.

If, however, the pump has been left standing for an appreciable time, moved to a new location, or has been dismantled and re-assembled, it must be refilled with liquid and given a few turns before starting. The pump is normally somewhat stiff to turn by hand owing to the close rotor/stator fit. However, this stiffness disappears when the pump is running normally against pressure.

2.1 DRY RUNNING

NEVER RUN THE PUMP IN A DRY CONDITION EVEN FOR A FEW REVOLUTIONS OR THE STATOR WILL BE DAMAGED IMMEDIATELY. CONTINUAL DRY RUNNING COULD PRODUCE SOME HARMFUL OR DAMAGING EFFECTS.

2.2 PUMP ROTATION DETAILS

PUMP RANGE	BI-DIRECTIONAL	COMMENT
Epsilon	Yes	†
E	Yes	†
Monobloc B	Yes	†
Compact	Yes	†
Merlin Industrial	Yes	†
S, SL	Yes	†
LF	Yes	†
W	No	**
Merlin Widethroat	No	**
MM ML	No	*
MS	No	**
G	No	*
CB/SB	No	*
Placer	No	**
Grout Injection	No	**
P	No	*
CP0011	No	**
CP0025,CP0800,CP1600	No	*

* Clockwise when viewed from drive end.
** Anti-clockwise when viewed from drive end.
† Anti-clockwise gives inlet at drive end.

DIRECTIONS OF ROTATION

BEFORE THE DIRECTION OF ROTATION IS CHANGED, MONOFLO MUST BE CONSULTED SO THAT THE SUITABILITY OF THE PUMP CAN BE CONFIRMED WHEN OPERATING ON THE NEW DUTY.

2.3.1. GLAND PACKING

Where a pump is supplied fitted with gland packing (manufactured from a non-asbestos material), the gland will require adjustment during the initial running in period. Newly packed glands must be allowed to run-in with only finger tight compression on the gland follower nuts. This should continue for about 3 days. The gland follower should be gradually tightened over the next week to achieve a leakage rate as shown in the table below. Gland followers should be adjusted at regular intervals to maintain the recommended leakage flow rate. Under normal working conditions a slight drip from the gland under pressure assists in cooling and lubricating the packing. **A correctly adjusted gland will always have small leakage of fluid**.

Typical Leakage Rates from Packed Glands

Up to 50mm shaft diameter	2 drops per minute
50 … 75mm shaft diameter	3 drops per minute
75 … 100mm shaft diameter	4 drops per minute
100 … 125mm shaft diameter	5 drops per minute
125 … 160mm shaft diameter	6 drops per minute

A gland drip is, however, undesirable when handling corrosive, degreasing, or abrasive materials. Under these conditions the gland must be tightened the minimum amount whilst the pump is running to ensure satisfactory sealing when under pressure, or to stop entry of air when under suction conditions.

The gland leakage of toxic, corrosive or hazardous liquids can cause problems of compatibility with the pumps materials of construction.

Provision of a gland drain should be considered, especially for the leakage of hazardous products.

CARE IS REQUIRED WHEN ADJUSTING THE GLAND WHILST PUMP IS RUNNING.

2.3.2 MECHANICAL SEALS - ALL PUMPS

When a mechanical seal is fitted to the pump it may be necessary to provide a barrier fluid to some part of the seal. This should be provided in line with the seal manufacturers instructions.

2.4. GUARDS

In the interests of safety all guards must be replaced after necessary adjustments have been made to the pump.

2.5 WARNING/CONTROL DEVICE

Prior to operating the pump, if any warning or control devices are fitted these must be set in accordance with their specific instructions.

2.6 PUMP OPERATING TEMPERATURE

The range of temperatures the pump surfaces will develop is dependent upon factors such as product temperature and ambient temperature of the installation. There may be instances where the external pump surface can exceed 122^{o}C.

In these instances, personnel must be made aware of this and suitable warnings/guarding used.

2.7 NOISE LEVELS

1. The noise sound pressure level will not exceed 85dB at one metre distance from the pump.

2. This is based on a typical installation and does not necessarily include noise from other sources or any contribution from building reverberation.

3. For pumps identified below, the noise levels vary between 85 and 95dB but will not exceed 95dB at one metre distance from the pump.

Pump Sizes (based on E Range Pumping Element)

Single Stage	Size 12 and above
Two Stage	Size 9 and above
Four Stage	Size 7 and above
Six Stage	Size 7 and above
Eight Stage	Size 6 and above

2.8 LUBRICATION

Pumps fitted with bearings should be inspected periodically to see if grease replenishment is necessary, and if so, grease should be added until the chambers at the ends of the bearing spacer are approximately one third full.

Periodic bearing inspection is necessary to maintain optimum bearing performance. The most expedient time to inspect is during periods of regular scheduled equipment downtime - for routine maintenance or for any other reason.

Under tropical or other arduous conditions, however, a more frequent examination may be necessary. It is therefore advisable to establish a correct maintenance schedule or periodic inspection.

BP LC2 / Mobilgrease XHP 222 or their equivalent must be used for replenishment.

2.9 PUMP UNITS

Where a pump unit is dismantled and re-assembled, consideration must be given to ensure that where appropriate the following steps are covered.

1. Correct alignment of pump/gearbox
2. Use of appropriate couplings & bushes
3. Use of appropriate belts & pulleys correctly tensioned.

2.10 CLEANING PRIOR TO OPERATION

i. **Non Food Use**

During the commissioning of a new pump or recommissioning of an overhauled pump, it is advisable to clean the pump prior to the initial operation of the pump in the process.

ii. **Food Use**

When a pump has been supplied for a food application, it is important to ensure that the pump is clean prior to initial operation of the pump.

Therefore, it is important that a clean-in-place treatment is executed on the pump at the following times:-

1. When the pump is first commissioned for use.

2. When any spare components are fitted into the wetted area of the pump.

A recommended CIP procedure is as follows:

This procedure should not be used on the CP Pump Range. Please consult our application engineers for a suitable procedure.

Caustic Wash

LQ94 ex Lever Diversey or equivalent
2% concentration

Acid Wash

P3 Horolith 617 ex Henkel
Ecolab or equivalent 1% concentration

Procedure

1. Caustic wash @ 167°C for 20 mins
2. Water rinse @ 176°C for 20 mins

3. Acid wash @ 122°F for 20 mins
4. Water rinse @ 176°F for 20 mins

- CIP flow rates (hence pump speeds) should be maximised to achieve highest level of cleanability.

  A C.I.P. liquid velocity of 1.5 to 2.0 m/s is required for removal of solids and soiling.

  Pumps fitted with CIP by pass ports will permit higher flow rates without the need to increase pump speed.

- The use of neat active caustic and acid chemicals is not recommended. Proprietary cleaning agents should be used in line with manufacturers instructions.

- All seals and gaskets should be replaced with new if disturbed during maintenance.

- Pump internals should be regularly inspected to ensure hygienic integrity is maintained, especially with respect to elastomeric components and seals, and replaced if necessary.

  The four stages constitute one cycle and we recommend that this cycle is used to clean the pump before use on food.

  Once the pump has been commissioned, the cleaning process will depend upon the application. The user must therefore ensure that their cleaning procedures are suitable for the duty for which the pump has been purchased.

2.11 WIDETHROAT PUMPS

Specific pumps may have auger feed screws, with or without a bridge breaker system to feed the pumping element. If the pump installation requires that these cannot be enclosed, care must be taken to ensure personnel cannot gain access whilst the pump is operating. If this is not possible an emergency stop device must be fitted nearby.

2.12 EXPLOSIVE PRODUCTS/ HAZARDOUS ATMOSPHERES

In certain instances the product being pumped may well be of a hazardous nature.

In these installations consideration must be given to provide suitable protection and appropriate warnings to safeguard personnel and plant.

2.13 ACCESS PORTS

Where access ports are fitted then the following steps must be followed prior to removal:

1. Pump must be shut down and the electrical supply isolated.

2. Protective clothing should be worn, especially if the pumped product is obnoxious.

3. Remove access plate with care utilising where possible drip trays to collect product leakage.

   Access ports are included to assist in removing blockages and to allow a visual check on the components within the suction chamber.

   It is not to be considered as an additional method in dismantling the pump.

   Re-assembly of the plate should be completed using new gaskets prior to the pump being switched on.

2.14 ADJUSTABLE STATORS

If adjustable stators are fitted then the following steps must be followed for adjusting the clamping devices.

The adjustable stator assembly is designed to give an even compression around the stator circumference. It is designed to be used when pump performance reduces through wear to an unacceptable level, to restore the required flow rate.

The stator compression is increased using the following steps:-

1. Release the six locking screws half a turn.
2. Tighten the eight clamp screws until adjustment allowed by releasing the lock screws has been taken up.
3. Repeat steps 1 and 2 until the pump performance has been restored to its former level.

NOTE

It is imperative that when adjusting the stator that only sufficient pressure is placed on the stator to enable the capacity of the pump to be reinstated.

Over tightening of the stator could easily result in damage to the driver by overload and so extreme care must be taken when carrying out these adjustments.

It is therefore advisable to make the adjustment while the pump is running and power readings can be monitored.

REMOVAL OF ADJUSTABLE STATOR

The procedure for removal of an adjustable stator is the same as that of a standard one, except it is necessary to remove the clamp plates before the stator can be twisted off the rotor.

This can be done by undoing the clamp screws; then releasing the clamp plate by using the locking screws as jacking screws to remove the clamp plates.

Re-assembly will be done using the reverse procedure.

2.15 MAINTENANCE OF WEARING COMPONENTS

2.15.1 ROTOR AND STATOR

The wear rate on these components is dependent on many factors, such as product abrasivity, speed, pressure etc.

When pump performance has reduced to an unacceptable level one or possibly both items will need replacing.

2.15.2 DRIVE SHAFT - PACKED GLAND

The wear rate of the gland area is dependent on many factors such as product abrasivity and speed. Regular gland maintenance will maximise the life of the shaft. Replacement of both the gland packing and shaft will be necessary when shaft sealing becomes difficult to achieve.

2.15.3 COUPLING ROD JOINTS

Regular maintenance and lubrication will maximise life of the joints.

Replacement of one or both joint assemblies and possibly the coupling rod may be necessary when wear is apparent.

It is essential to replace all the joint items with genuine Mono parts to ensure maximum life.

2.15.4 FLEXISHAFT DRIVE PUMPS

With this design there are no wearing items to replace in the drive train, however, if during routine inspection the shaft is visibly damaged / distorted or the protective coating is damaged, then this item should be replaced to avoid unexpected breakdowns.

2.16 MECHANICAL SPEED VARIATORS

Refer to the manufacturers instructions.

These machines require regular maintenance, which typically includes weekly adjustment through the full speed range.

3.0 ASSEMBLY AND DISMANTLING

Section 4 contains the steps to dismantle and re-assemble the pump. All fastenings must be tightened securely and when identified the appropriate torque figures should be used.

3.1 USE OF ITEMS NOT APPROVED OR MANUFACTURED BY MONOFLO

The pump and its components have been designed to ensure that the pump will operate safely within the guidelines covered by legislation.

As a consequence Monoflo have declared the machine safe to use for the duty specified.

The use of replacement items that are not approved by or manufactured by Monoflo may affect the safe operation of the pump and it may therefore become a safety hazard to both operators and other equipment. In these instances the guarantee referenced in the Terms and Conditions of Sale will be invalidated if replacement items are used that are not approved or manufactured by Monoflo.

DISPOSAL OF WORN COMPONENTS

When replacing wearing parts, please ensure disposal of used parts is carried out in compliance with local environmental legislation. Particular care should be taken when disposing of lubricants.

Diagnostic Chart

SYMPTOMS	POSSIBLE CAUSES
1. NO DISCHARGE	1. 2. 3. 7. 26. 28. 29.
2. LOSS OF CAPACITY	3. 4. 5. 6. 7. 8. 9. 10. 22. 13. 16. 17. 21. 22. 23. 29
3. IRREGULAR DISCHARGE	3. 4. 5. 6. 7. 8. 13. 15. 29.
4. PRIMING LOST AFTER START	3. 4. 5. 6. 7. 8. 13. 15
5. PUMP STALLS AT START UP	8. 11. 24.
6. PUMP OVERHEATS	8. 9. 11. 12. 18. 20
7. MOTOR OVERHEATS	8. 11. 12. 15. 18. 20.
8. EXCESSIVE POWER ABSORBED BY PUMP	8. 11. 12. 15. 18. 20
9. NOISE AND VIBRATION	3. 4. 5. 6. 7. 8. 9. 11. 13. 15. 18. 19. 20. 22. 23. 27. 31
10. PUMP ELEMENT WEAR	9. 11.
11. EXCESSIVE GLAND OR SEAL WEAR	12. 14. 25. 30.
12. GLAND LEAKAGE	13. 14.
13. SEIZURE	9. 11. 12. 20.

LIST OF CAUSES	REMEDIAL ACTIONS
1. INCORRECT DIRECTION OF ROTATION	1. REVERSE MOTOR
2. PUMP UNPRIMED	2. BLEED SYSTEM OF AIR/GAS
3. INSUFFICIENT N.P.S.H. AVAILABLE	3. INCREASE SUCTION HEAD OR REDUCE SPEED/TEMP.
4. PRODUCT VAPORISING IN SUPPLY LINE	4. INCREASE N.P.S.H. AVAILABLE (SEE 3 ABOVE)
5. AIR ENTERING SUPPLY LINE	5. CHECK PIPE JOINTS/GLAND ADJUSTMENT
6. INSUFFICIENT HEAD ABOVE SUPPLY VESSEL OUTLET	6. RAISE VESSEL/INCREASE PIPE SIZE
7. FOOTVALVE/STRAINER OBSTRUCTED OR BLOCKED	7. CLEAN OUT SUCTION LINE/VALVES
8. PRODUCT VISCOSITY ABOVE RATED FIGURE	8. DECREASE PUMP SPEED/INCREASE TEMP.
9. PRODUCT TEMP. ABOVE RATED FIGURE	9. COOL THE PRODUCT
10. PRODUCT VISCOSITY BELOW RATED FIGURE	10. INCREASE PUMP SPEED/REDUCE TEMP.
11. DELIVERY PRESSURE ABOVE RATED FIGURE	11. CHECK FOR BLOCKAGES IN DELIVERY LINE
12. GLAND OVERTIGHT	12. ADJUST GLAND SEE O&M INSTRUCTIONS
13. GLAND UNDERTIGHT	13. ADJUST GLAND SEE O&M INSTRUCTIONS
14. GLAND FLUSHING INADEQUATE	14. CHECK FLUID FLOWS FREELY INTO GLAND
15. PUMP SPEED ABOVE RATED FIGURE	15. DECREASE PUMP SPEED
16. PUMP SPEED BELOW RATED FIGURE	16. INCREASE PUMP SPEED
17. BELT DRIVE SLIPPING	17. RE-TENSION BELTS
18. COUPLING MISALIGNED	18. CHECK AND ADJUST ALIGNMENT
19. INSECURE PUMP/DRIVE MOUNTING	19. CHECK AND TIGHTEN ALL PUMP MOUNTINGS
20. SHAFT BEARING WEAR/FAILURE	20. REPLACE BEARINGS
21. WORN PUMP ELEMENT	21. FIT NEW PARTS
22. RELIEF VALVE CHATTER	22. CHECK CONDITION OF VALVE/RENEW
23. R.V. INCORRECTLY SET	23. RE-ADJUST SPRING COMPRESSION
24. LOW VOLTAGE	24. CHECK VOLTAGE/WIRING SIZES
25. PRODUCT ENTERING PACKING AREA	25. CHECK PACKING CONDITION AND TYPE
26. DRIVE TRAIN BREAKAGE	26. CHECK AND REPLACE BROKEN COMPONENTS
27. NEGATIVE OR VERY LOW DELIVERY HEAD	27. CLOSE DELIVERY VALVE SLIGHTLY
28. DISCHARGE BLOCKED/VALVE CLOSED	28. REVERSE PUMP/RELIEVE PRESSURE/CLEAR BLOCKAGES
29. STATOR TURNING	29. REPLACE WORN PARTS/TIGHTEN UP STATOR BOLTS
30. STUFFING BOX 'EATS' PACKING	30. CHECK FOR WORN SHAFT AND REPLACE
31. VEE BELTS	31. CHECK AND ADJUST TENSION OR REPLACE

Drawing Reference Numbers

DRG. REF	DESCRIPTION
01A	BODY
01B	BODY ADAPTOR
06A	NAMEPLATE (SOG)
06B	NAMEPLATE (DOG)
08A	GLAND FOLLOWER
10A	GLAND PACKING/MECHANICAL SEAL
10B	ROTARY SHAFT LIPSEAL (OPTIONAL)
15A	THROWER GUARD
20A	GASKET - GLAND
20B	GASKET - STATOR SUPPORT RING
20C	GASKET - STATOR SUPPORT RING
22A	STATOR
23A	SUCTION CHAMBER
23B	SUCTION CHAMBER EXTENSION
24A	END COVER
25A	ROTOR
26A	FLEXISHAFT
32A	SHAFT
42A	THROWER
47A	STATOR SUPPORT RING
47B	STATOR SUPPORT RING
62A	SUPPORT FOOT
62B	SUPPORT FOOT
65A	GLAND SECTION
66A	ABUTMENT RING
75A	SLEEVE ROTOR
76A	ADAPTOR FLANGE
95A	TIE ROD
P101	HEX HD SCREW
P102	PLAIN WASHER
P103	RD HD DRIVE SCREW
P104	HEX HD BOLT
P105	HEX NUT
P106	PLAIN WASHER
P107	SPRING WASHER
P108	SPRING WASHER
P109	HEX NUT
P201	HEX HD BOLT
P202	HEX NUT
P203	PLAIN WASHER

DRG. REF	DESCRIPTION
P401	PIN
P402	SEAL
P403	SEAL
P404	SEAL
P405	CAP SCREW
P406	PLAIN WASHER
P407	SPIRAL RET. RING
P408	PIN
P501	PLUG
P502	PLUG
P503	PLUG
P504	HEXAGON NUT
P505	SPRING WASHER
P506	PLAIN WASHER
P507	HEXAGON NUT
P508	SPRING WASHER
P509	PLAIN WASHER
P510	HEXAGON HEAD BOLT
P511	HEXAGON NUT
P512	SPRING WASHER
P513	PLAIN WASHER
P514	SEAL
P515	SEAL

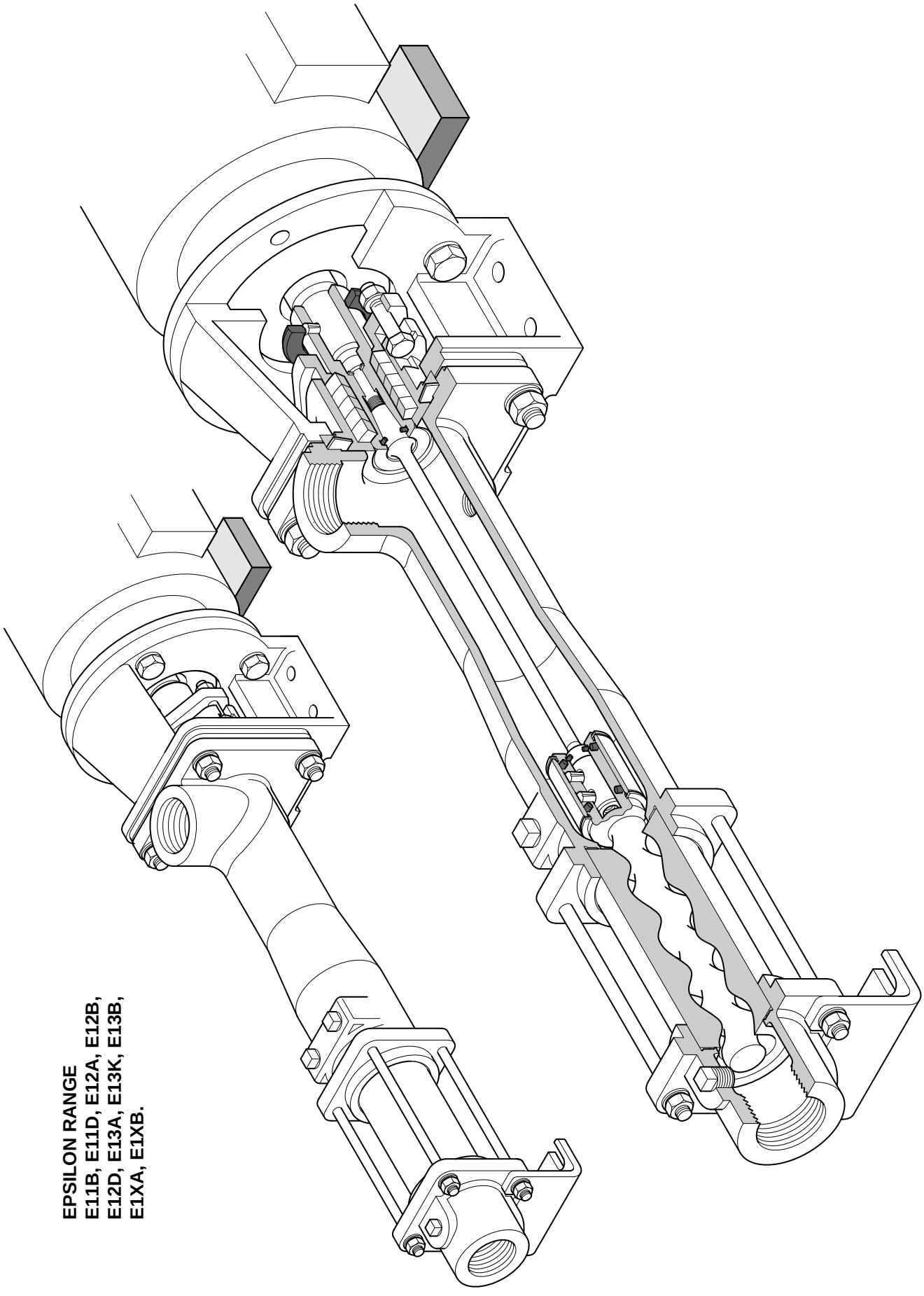
IMPORTANT NOTE

THE DRAWING REFERENCES SHOWN GIVE THE DESCRIPTION OF ALL THE PARTS DETAILED ON THE SECTIONAL DRAWINGS IN THIS SECTION OF THE BOOK. THEREFORE SOME OF THE REFERENCES MAY NOT BE SHOWN ON ANY ONE.

Pump Coding

Features	Description	Basic Pump Code										Standard Variation				
		1	2	3	4	5	6	7	8	9	10	/	12	13	14	15
Range	Epsilon	**E**														
Design Mk No	2007		**1**													
Maximum Pump Capacity at Maximum Speed and Zero Pressure	5.7 gpm @ 1750 rpm			**1**												
	14.5 gpm @ 1750 rpm			**2**												
	44.0 gpm @ 1500 rpm			**3**												
	57.2 gpm @ 1500 rpm			**X**												
	96.8 gpm @ 1000 rpm			**4**												
	162.9 gpm @ 800 rpm			**5**												
	250.9 gpm @ 700 rpm			**6**												
	347.8 gpm @ 600 rpm			**7**												
	427.0 gpm @ 500 rpm			**8**												
	550.3 gpm @ 450 rpm			**9**												
	726.4 gpm @ 400rpm			**A**												
	990.6 gpm @ 350 rpm			**B**												
	924.6 gpm @ 270 rpm			**C**												
	1276.8 gpm @ 270 rpm			**D**												
	1849.2 gpm @ 200 rpm			**E**												
Stages	Single stage				**A**											
	Two stage				**B**											
	Four stage				**D**											
	Single stage - extended pitch				**K**											
Casing Material	Cast Iron					**C**										
	Stainless steel					**S**										
Rotating Parts	Code 1						**1**									
	Code 5						**5**									
	Code 8						**8**									
Rotor Mk No	Mk 0 (Oversized)							**0**								
	Mk1 (Standard)							**1**								
	Mk3 (Temperature)							**3**								
	Mk5 (Temperature)							**5**								
Stator Material	RA, RR etc.								**R**							
Flexishaft / Seal Type	Mechanical Seal - Std Flexishaft									**M**						
	Packed Gland - Std Flexishaft									**P**						
	Mechanical Seal - Short Flexishaft									**R**						
	Packed Gland - Sshort Flexishaft									**S**						
Build Option	Refer to product manual section 2 & 3, drive selections										**A**					
											B					
											H					
/												**/**				
Variation	For special requirements contact Monoflo												**A**	**1**	**2**	**3**

Dismantling & Assembly Diagrams



EPSILON RANGE
E11B, E11D, E12A, E12B,
E12D, E13A, E13K, E13B,
E1XA, E1XB.

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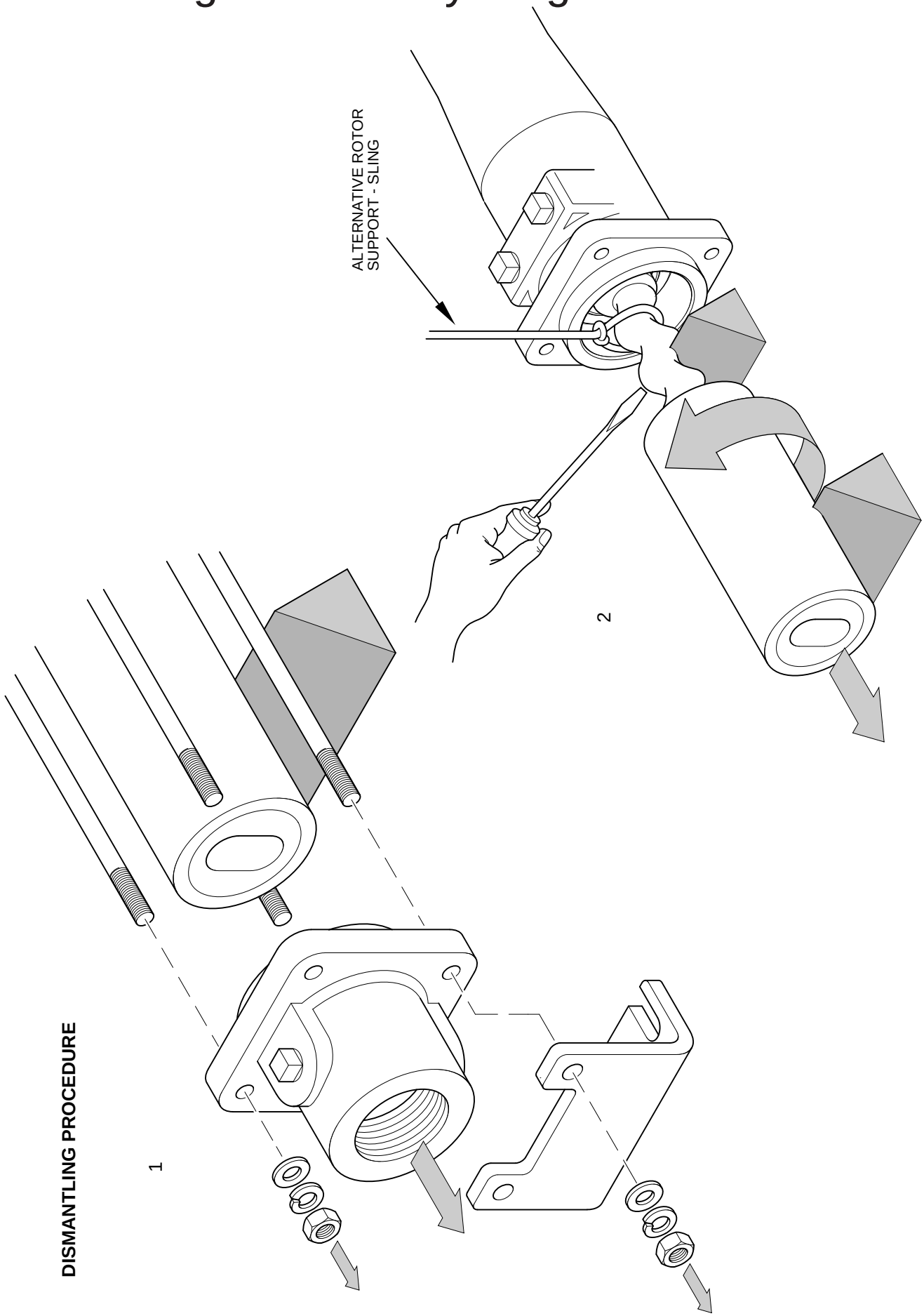
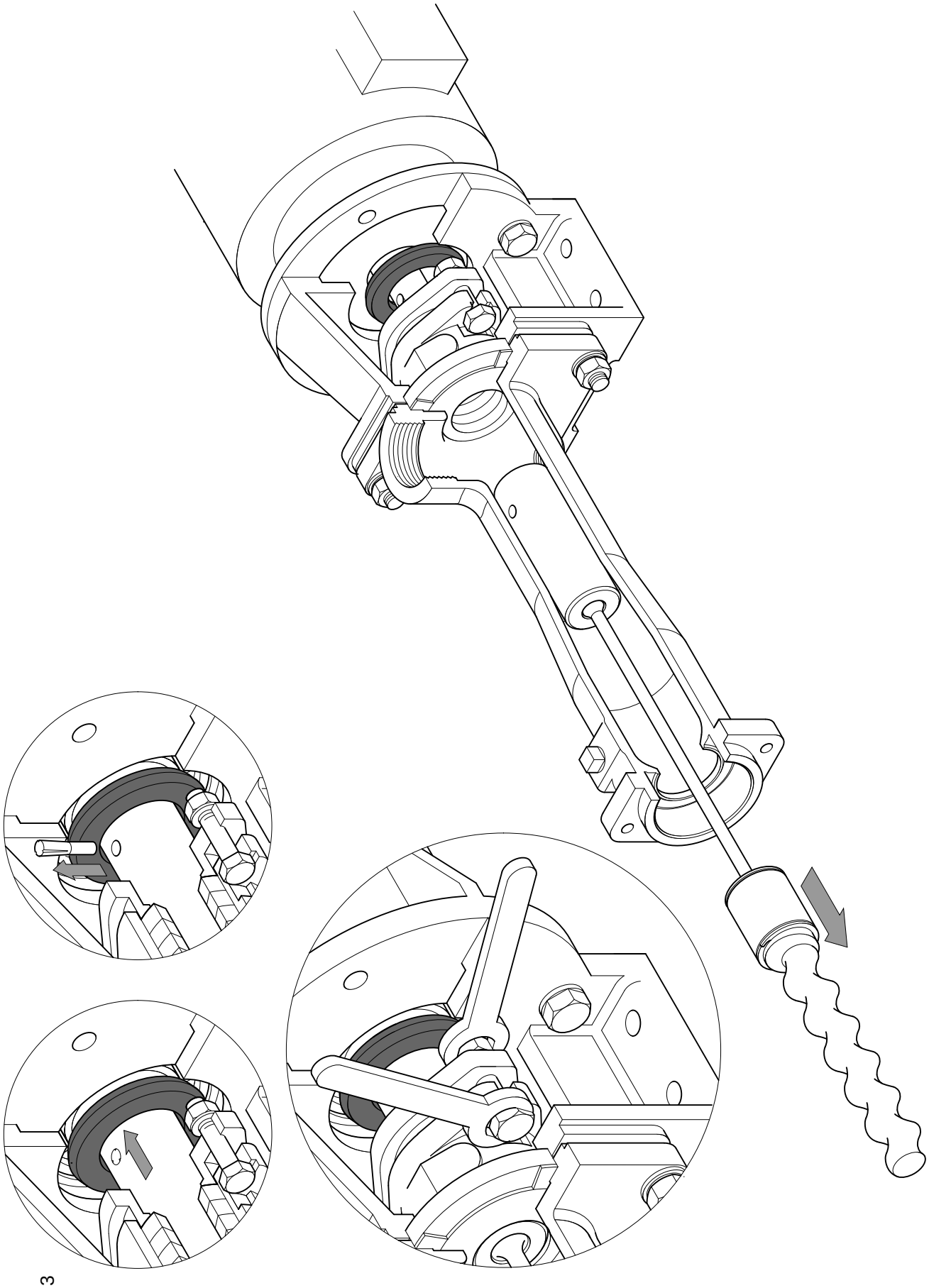
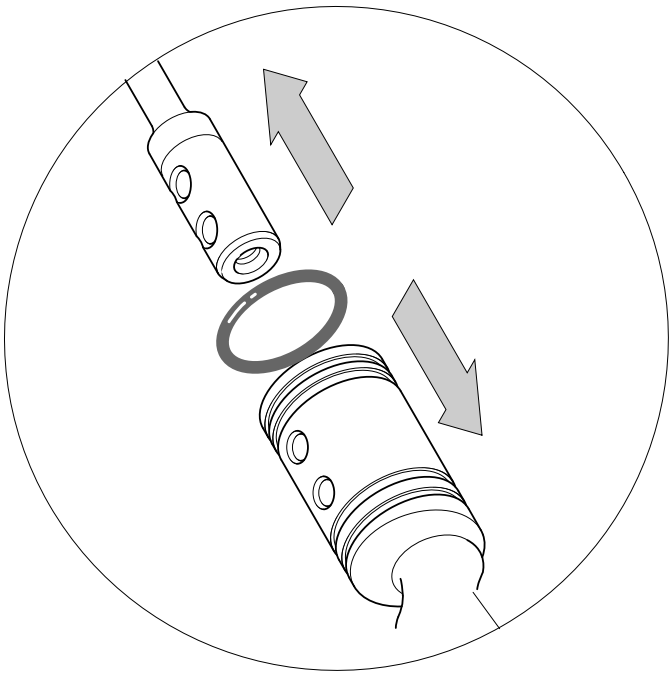
Dismantling & Assembly Diagrams

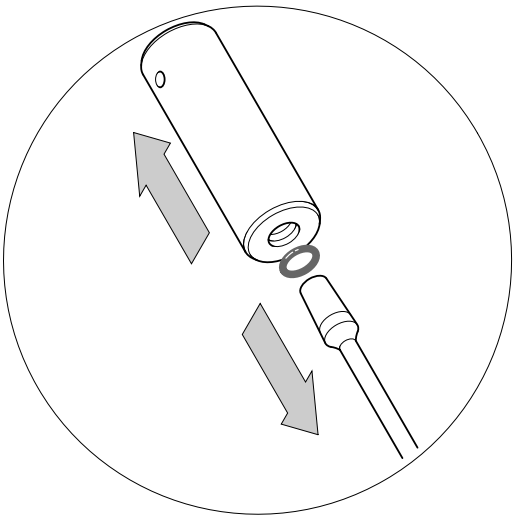


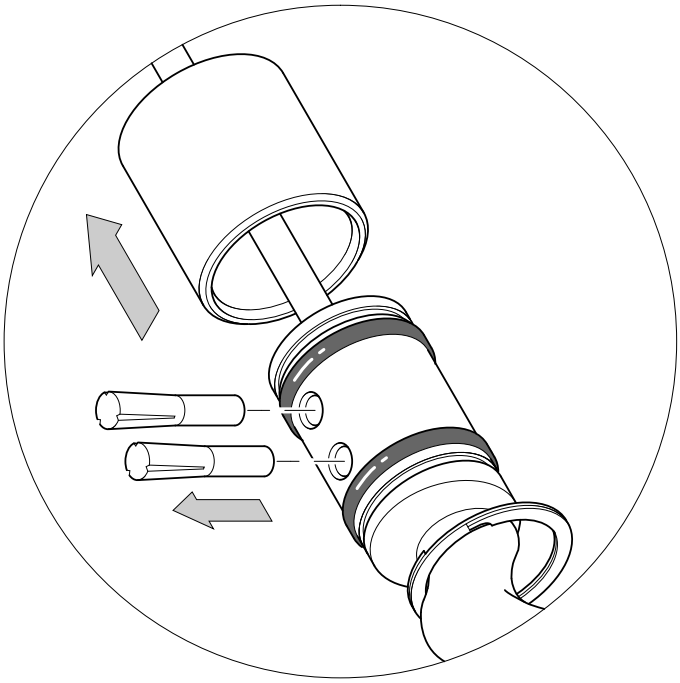
Dismantling & Assembly Diagrams

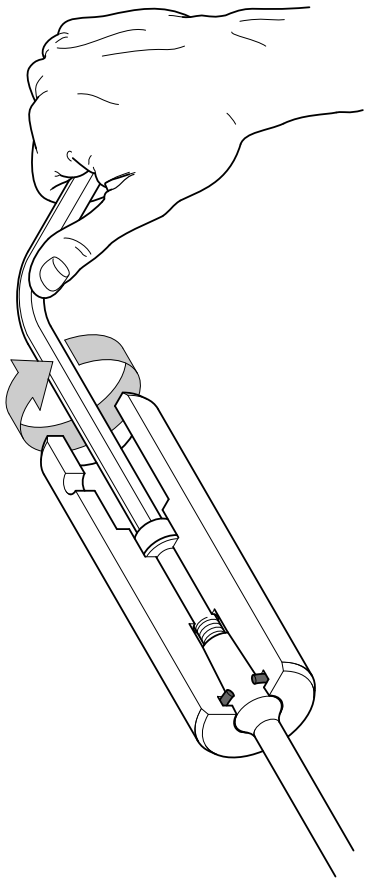


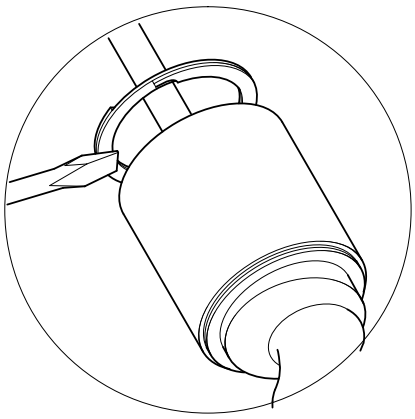
Dismantling & Assembly Diagrams











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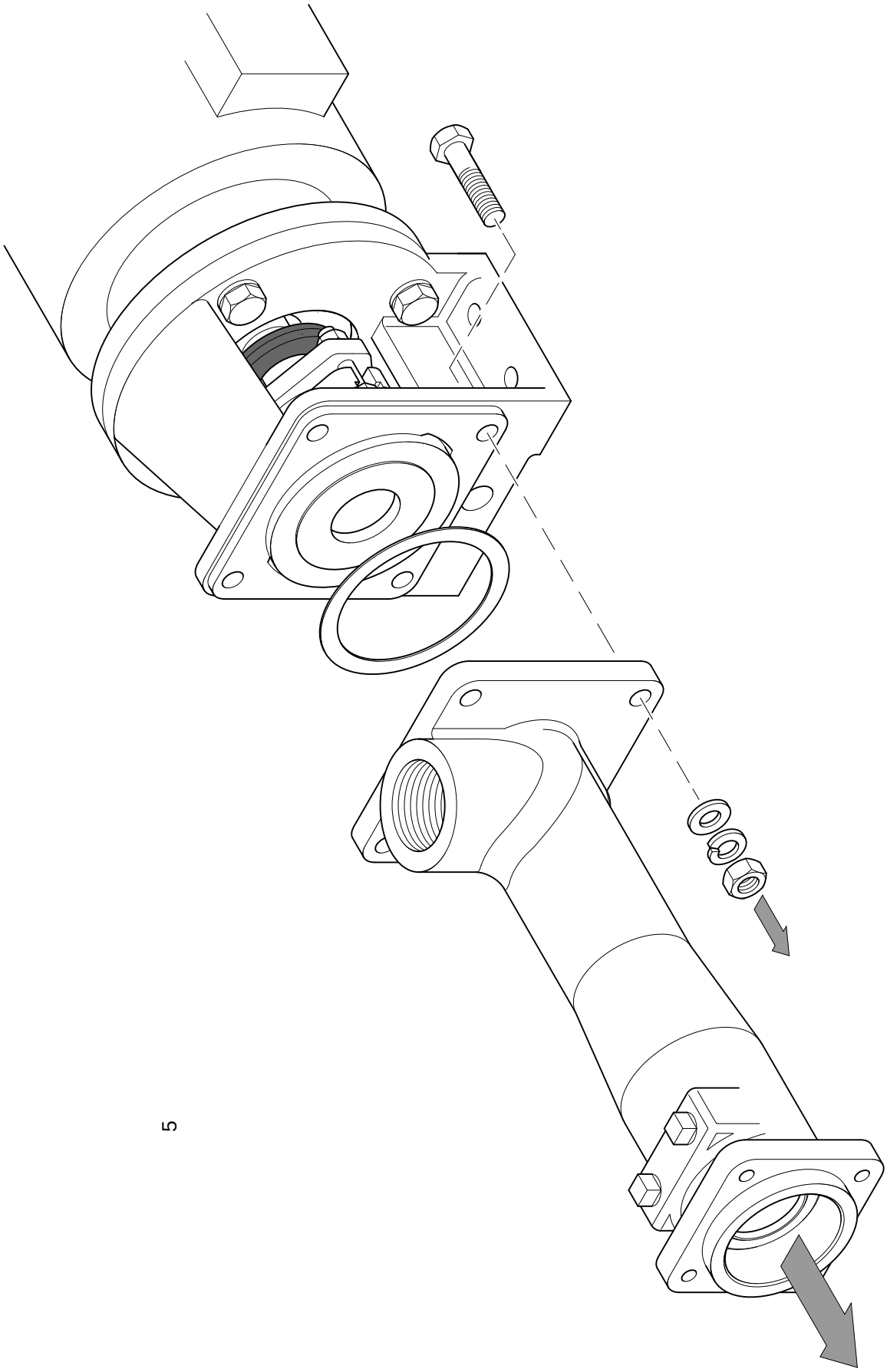
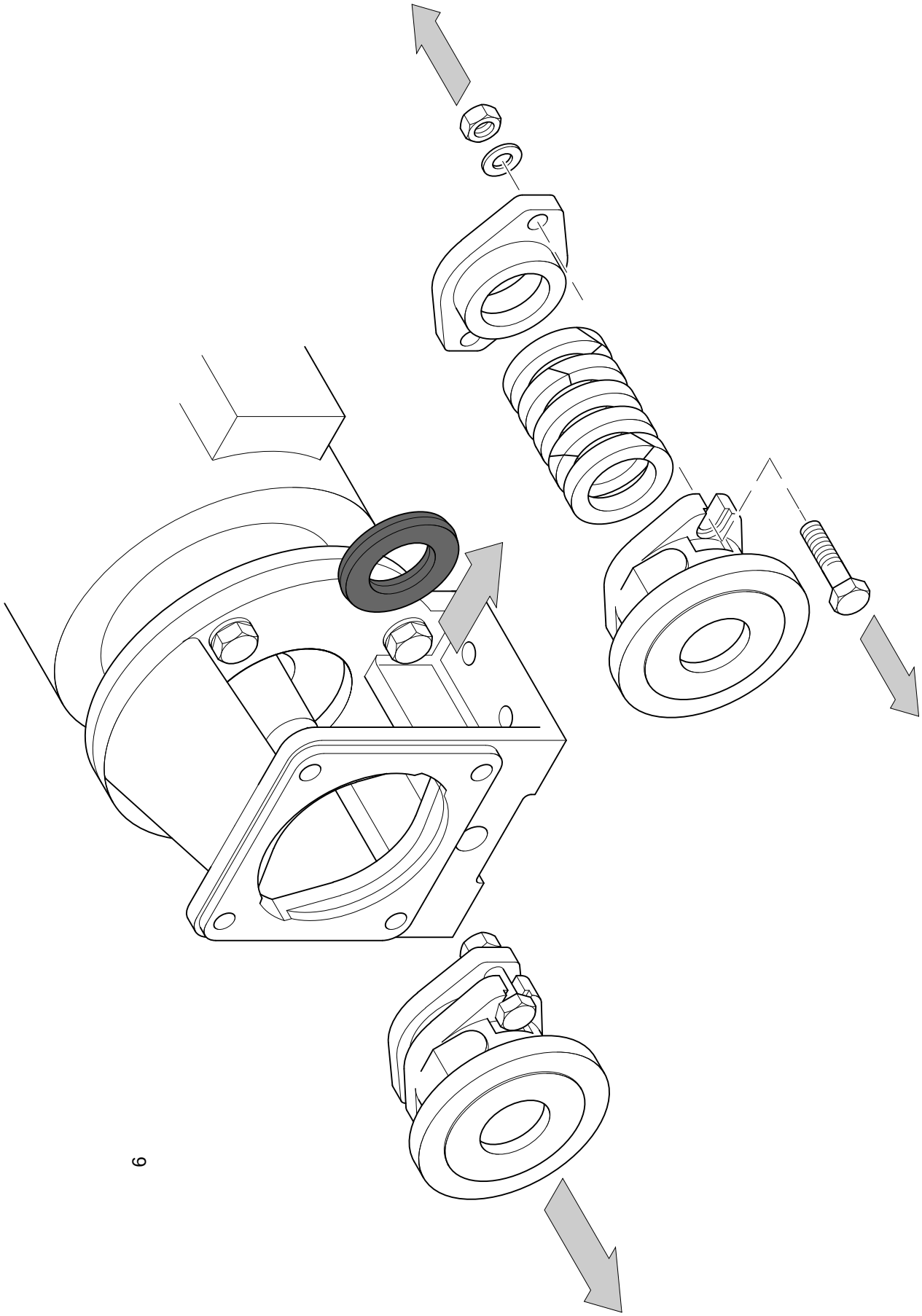
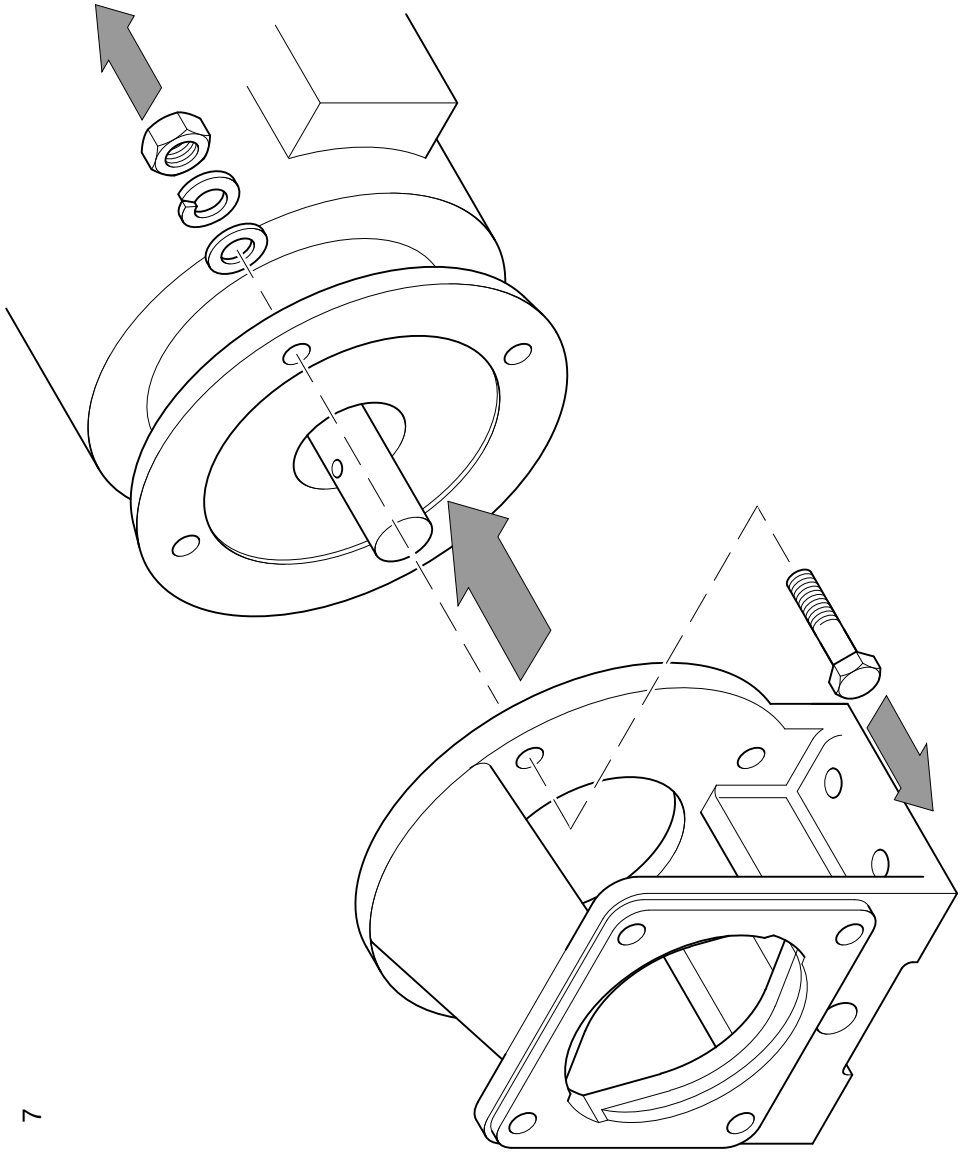
Dismantling & Assembly Diagrams



Dismantling & Assembly Diagrams



Dismantling & Assembly Diagrams



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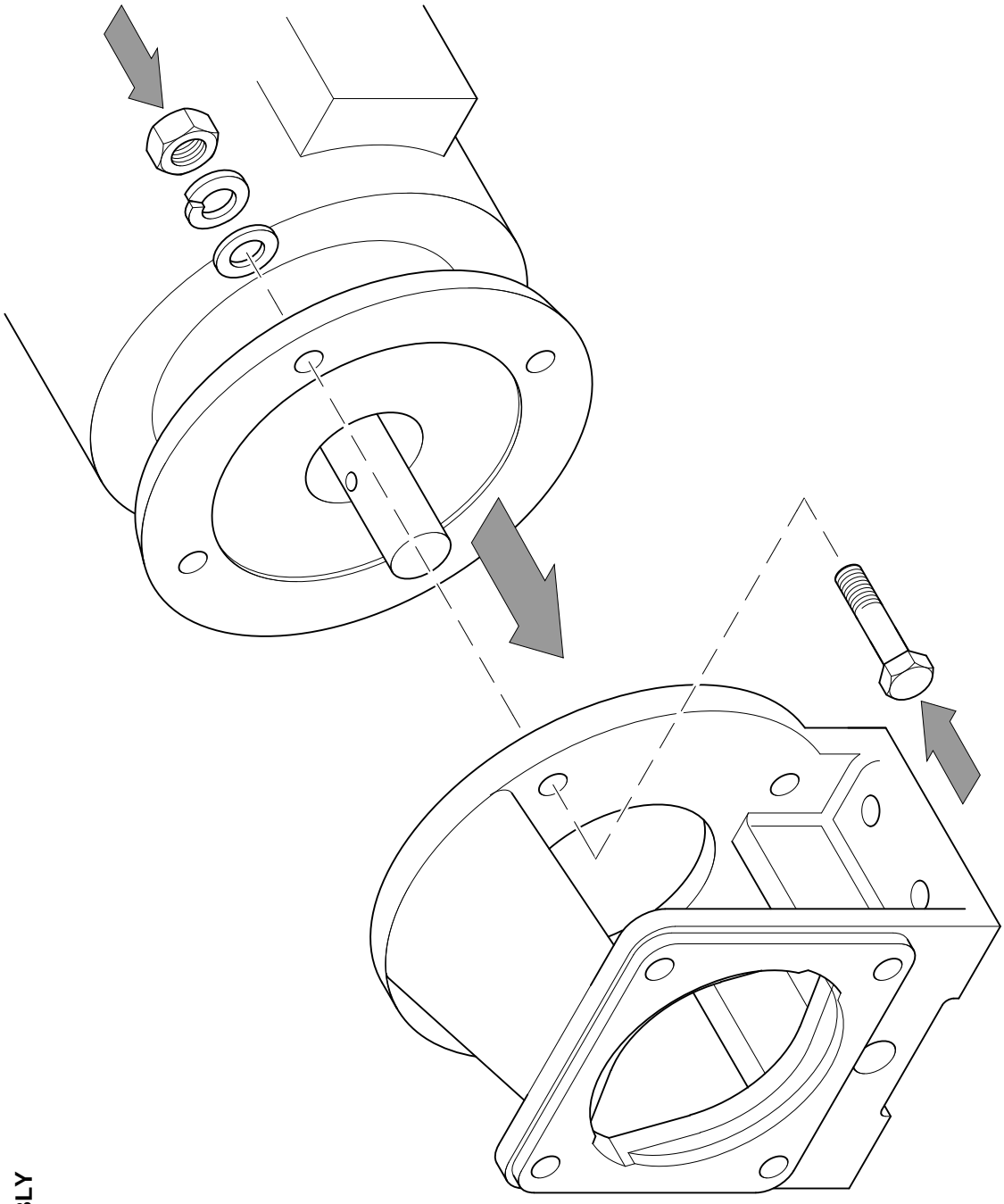
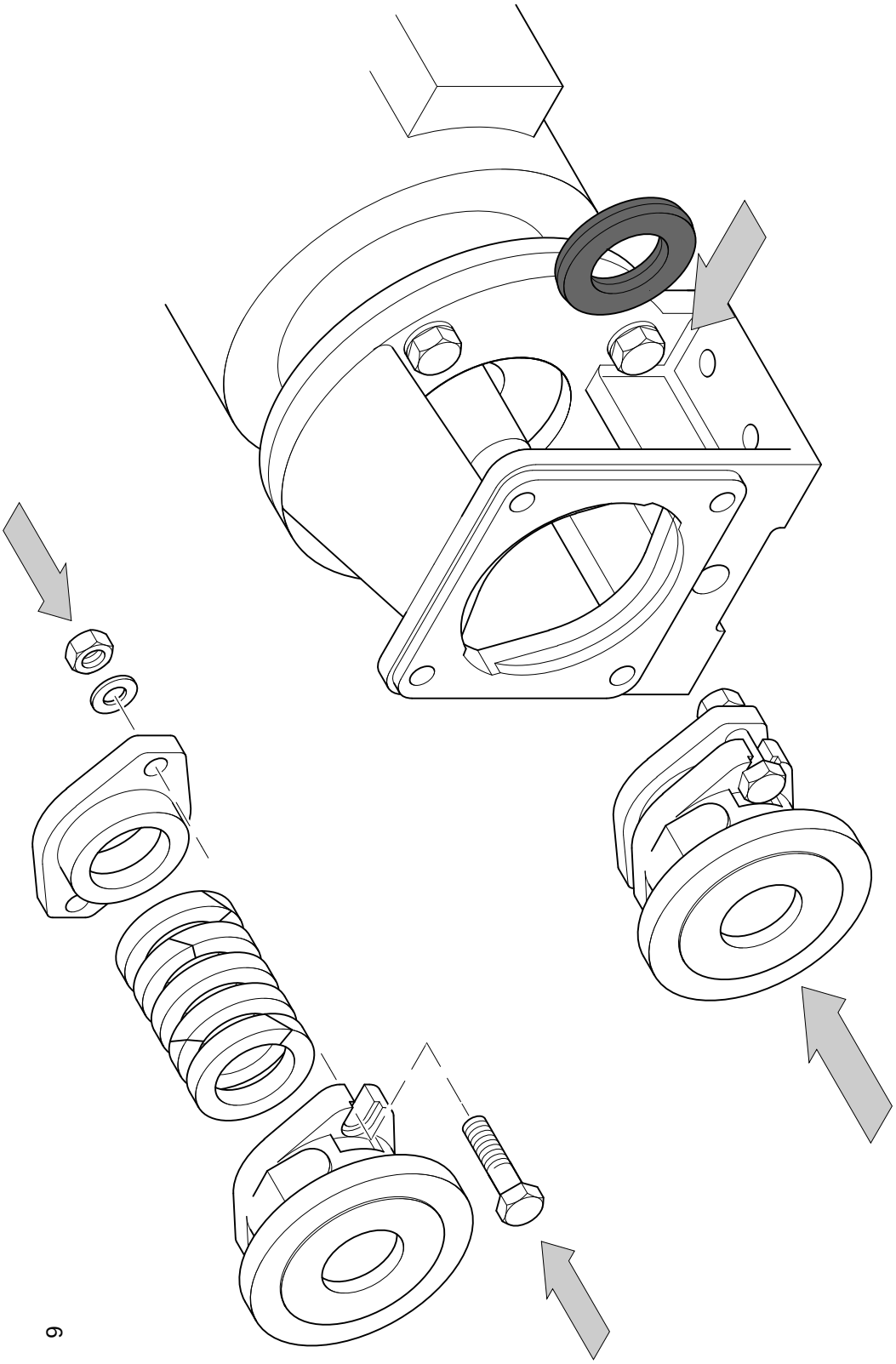
Dismantling & Assembly Diagrams

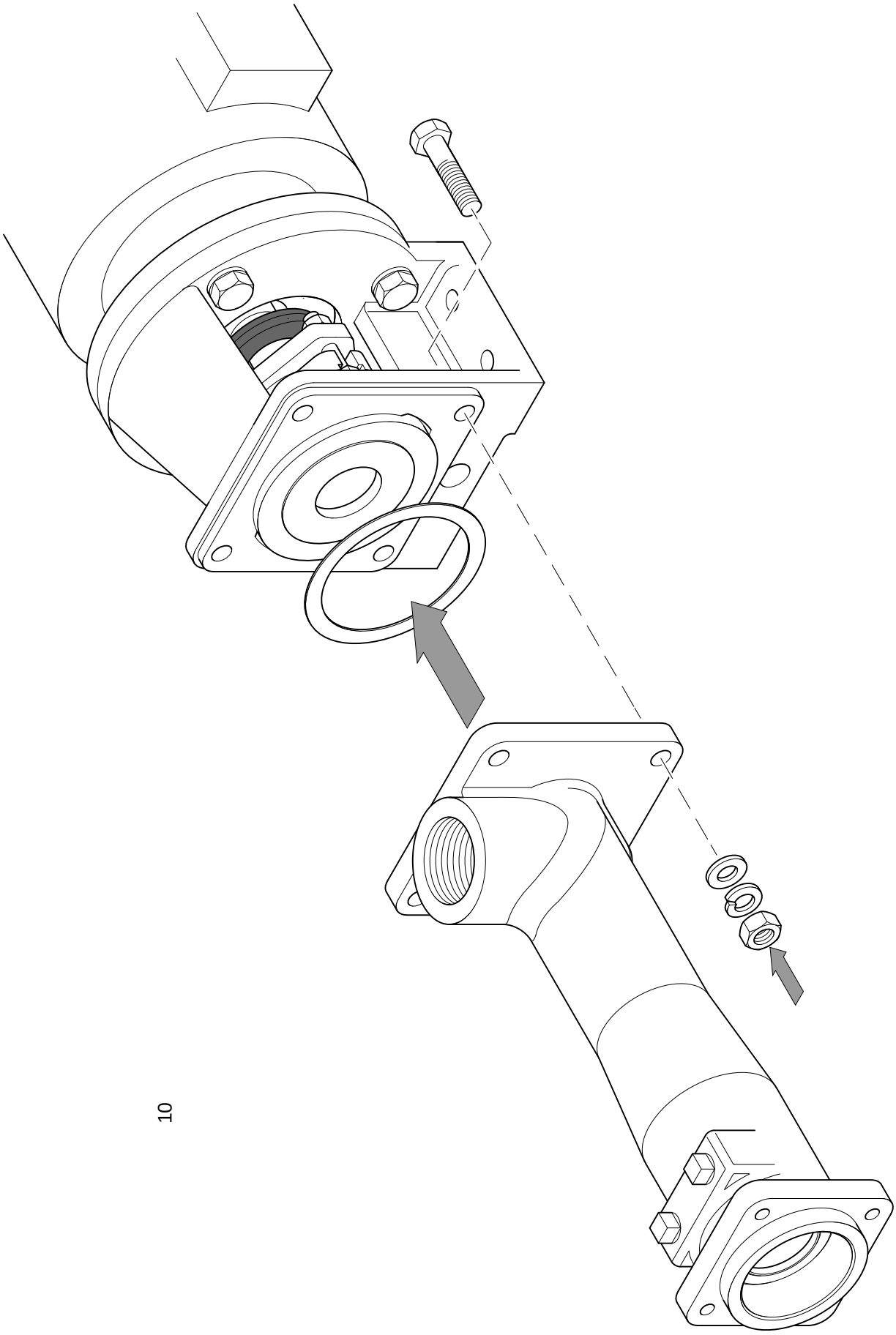


ASSEMBLY 8

Dismantling & Assembly Diagrams



Dismantling & Assembly Diagrams



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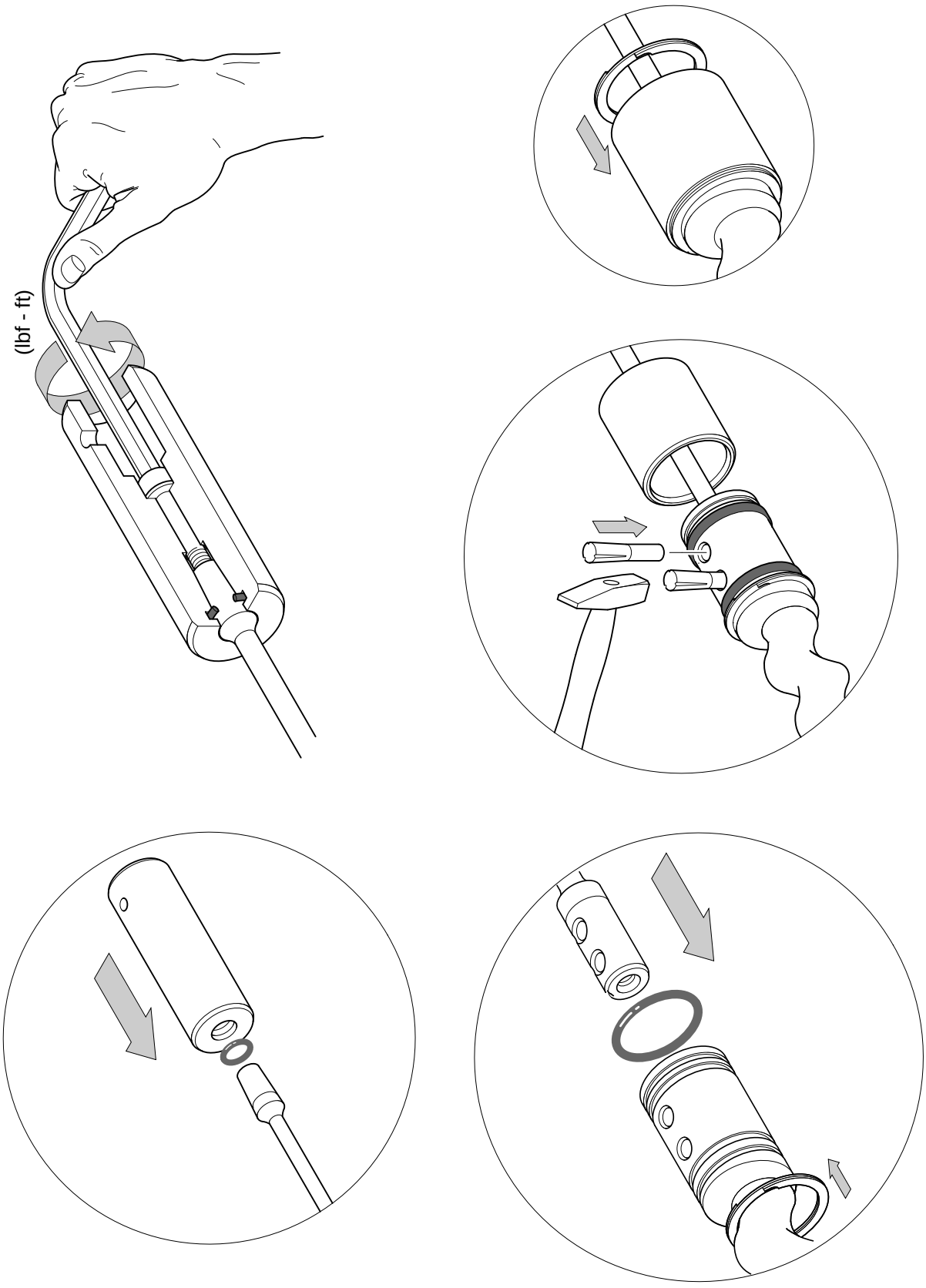
Dismantling & Assembly Diagrams



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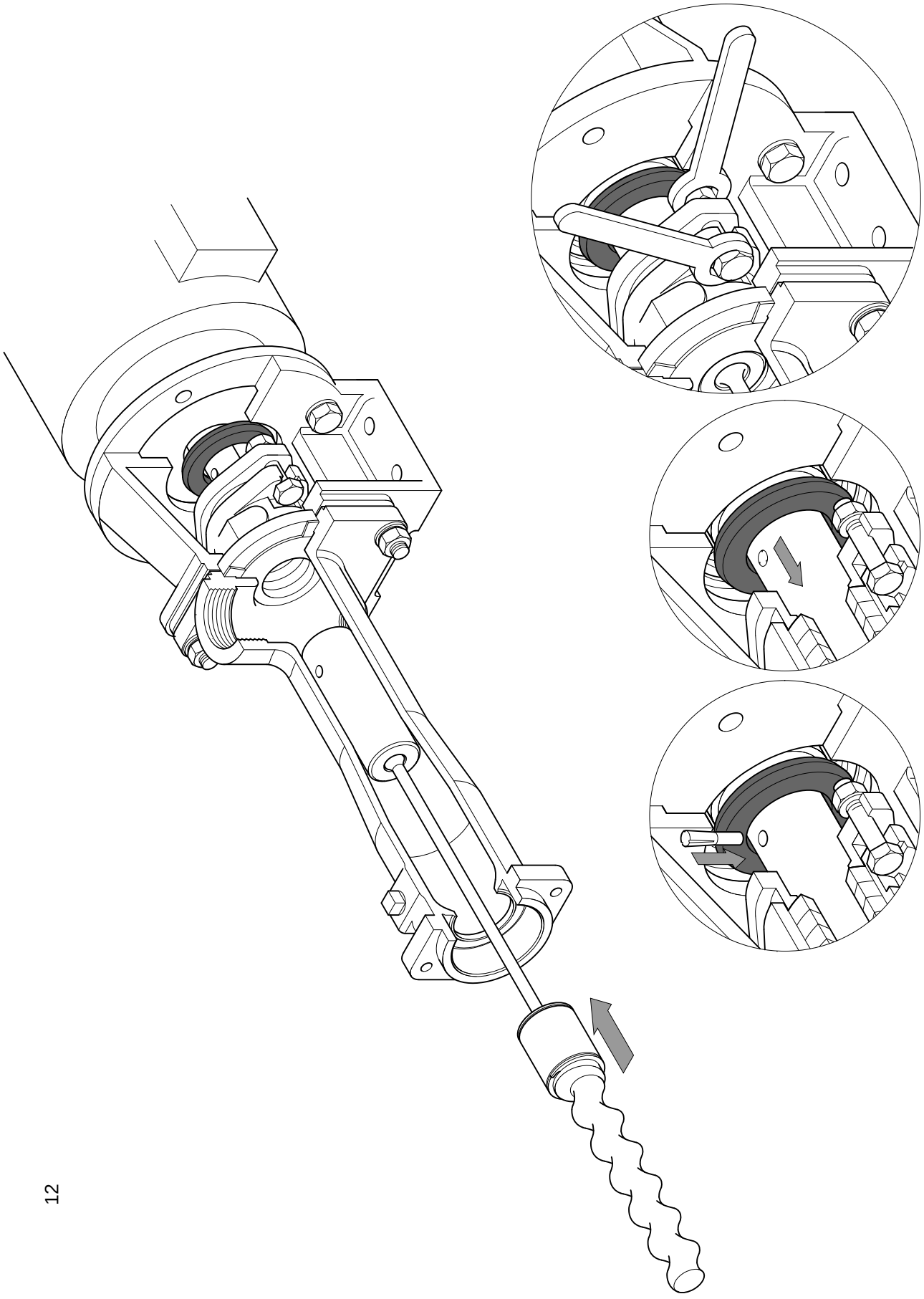
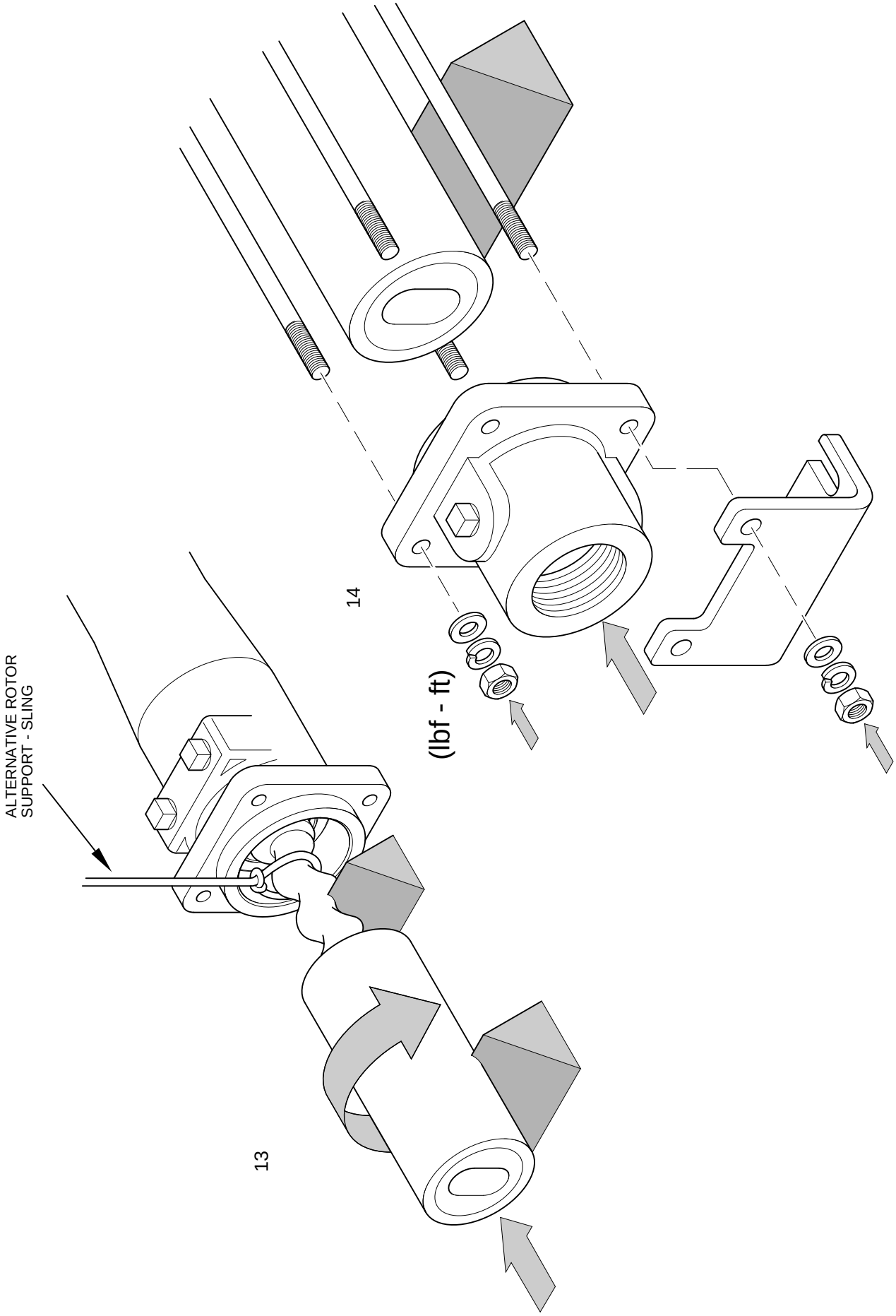
Dismantling & Assembly Diagrams

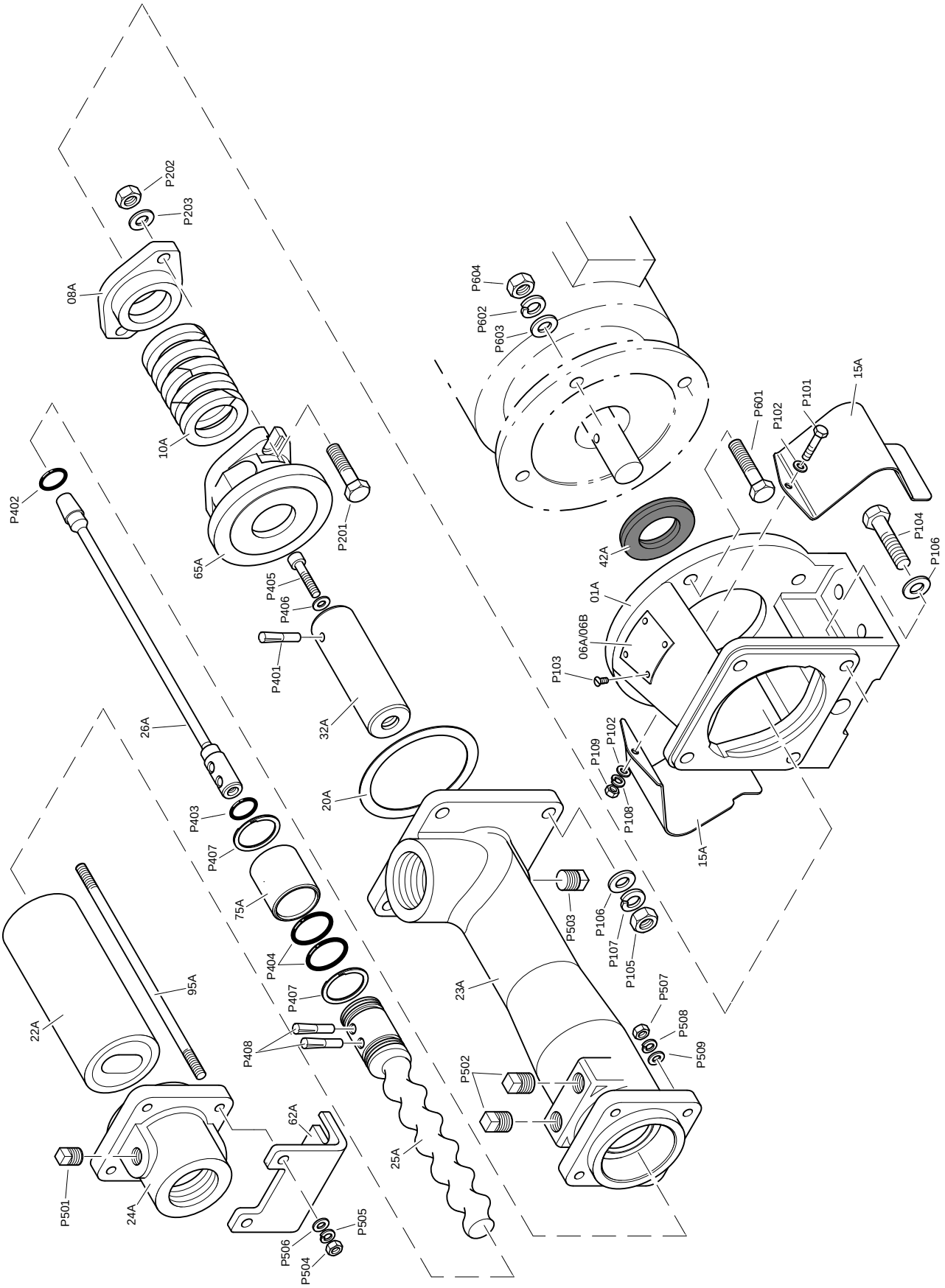


12

Dismantling & Assembly Diagrams



Exploded Views



E11B, E11D, E12A, E12B, E12D, E13A, E13K, E13B.

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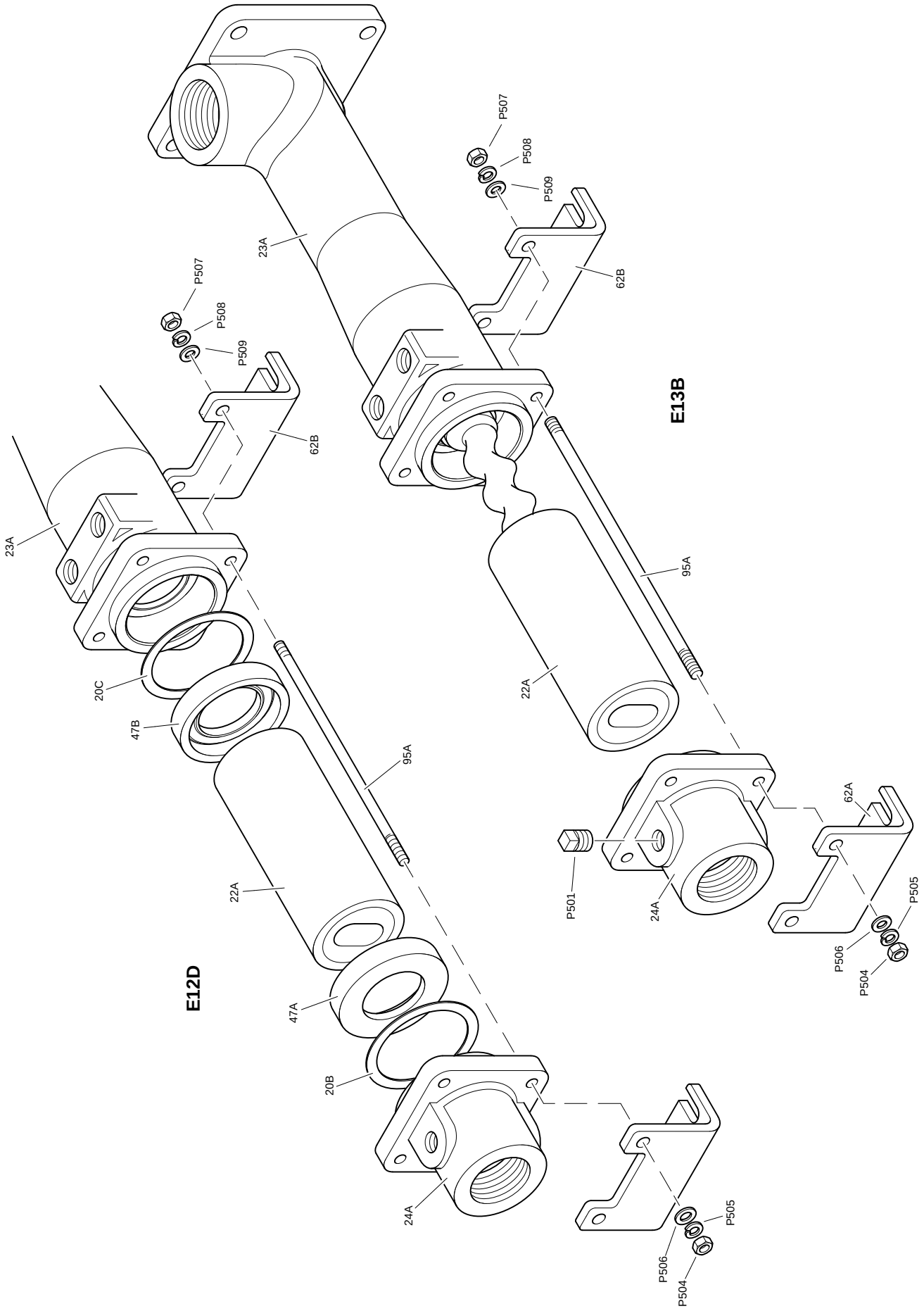
Exploded Views



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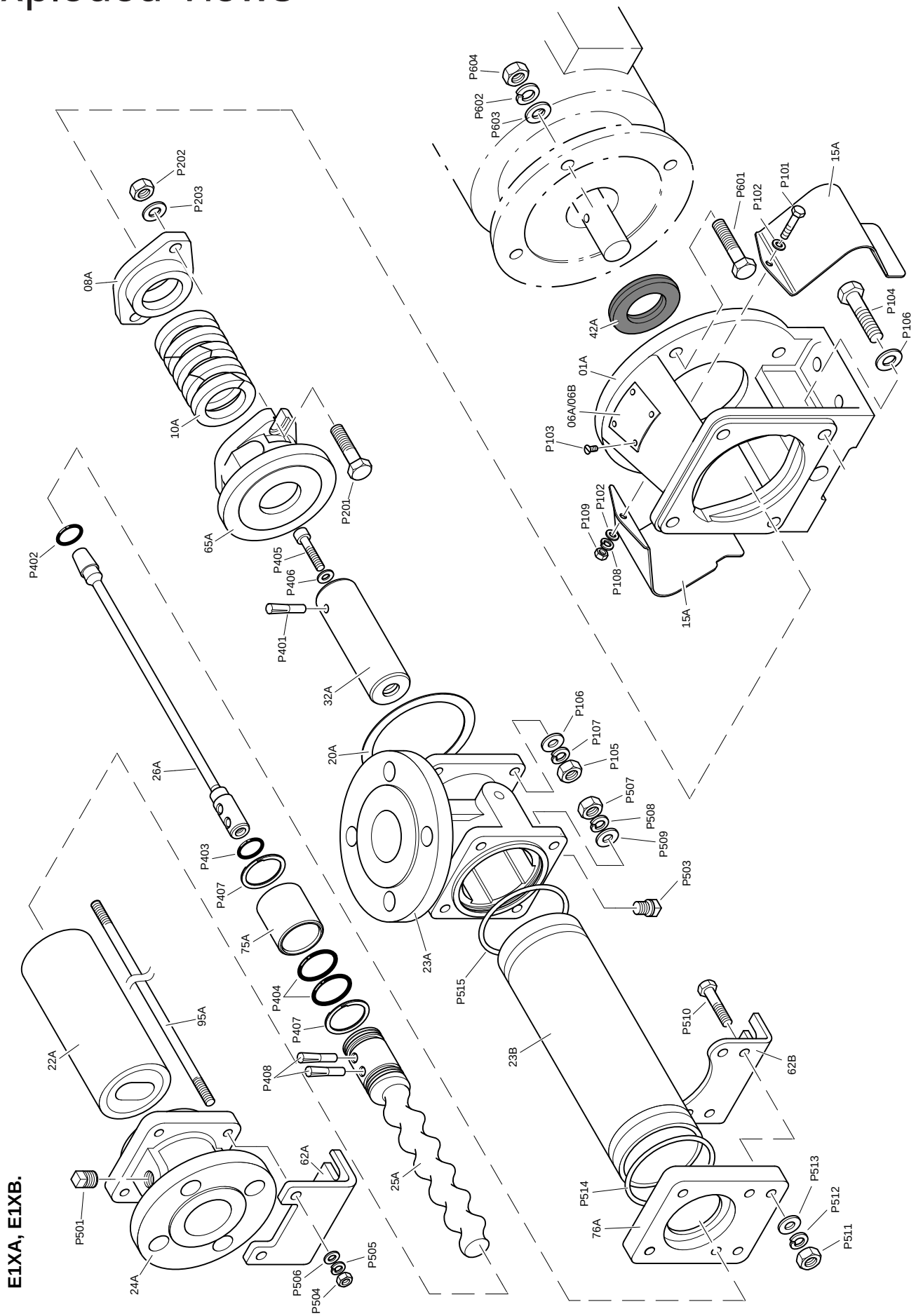
Exploded Views



E1XA, E1XB.

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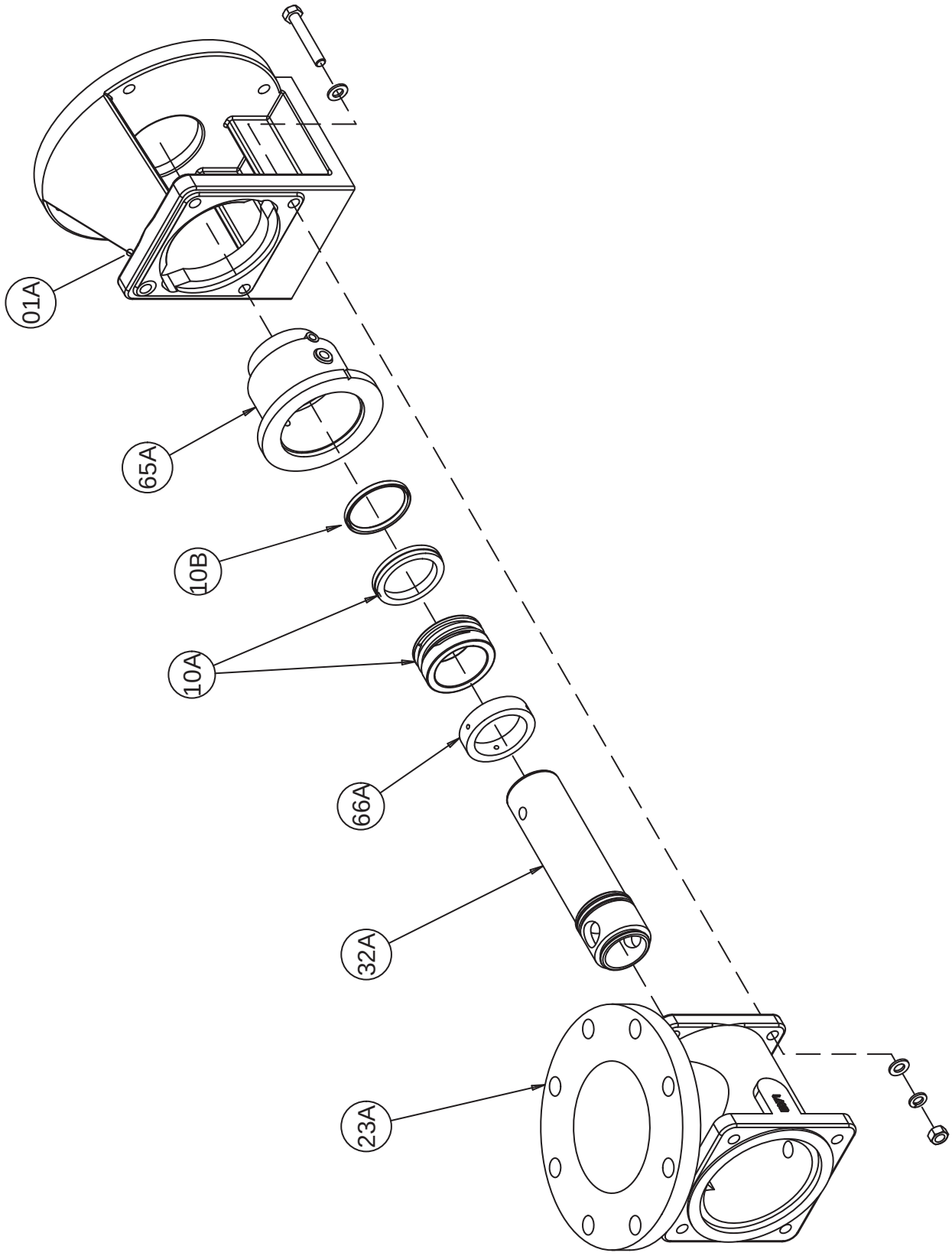
Exploded Views - Mechanical Seal



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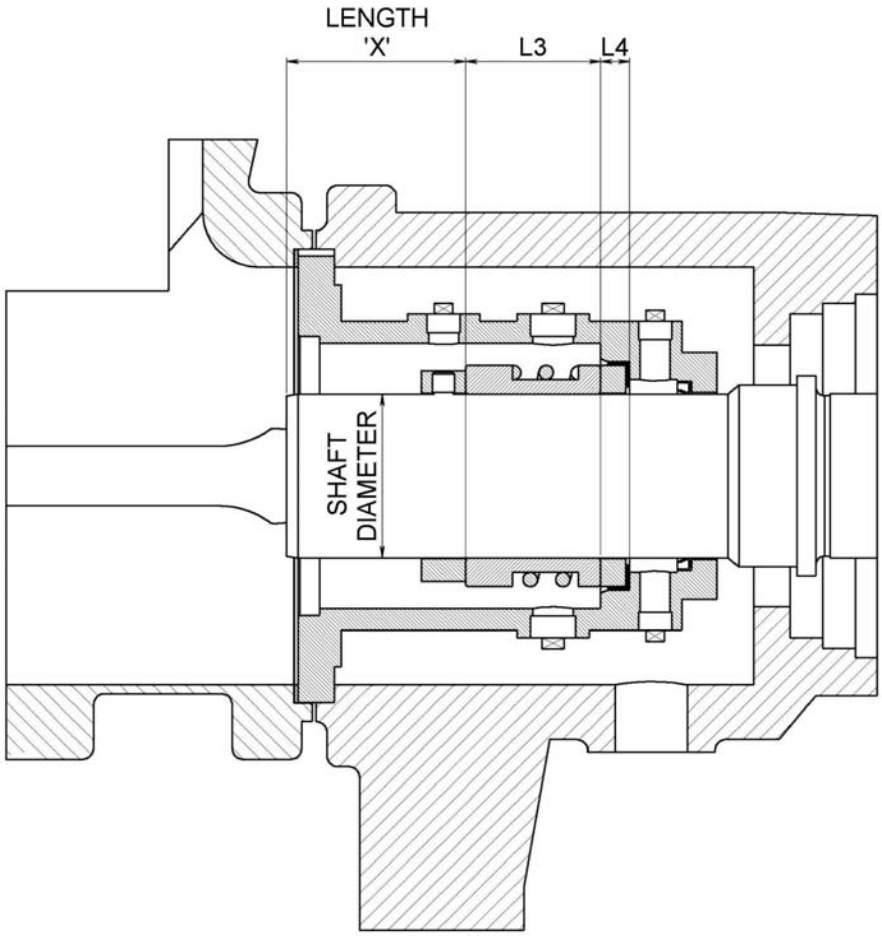
Setting Length - Mechanical Seal



Pump size	Drive Type	Shaft dia. mm	Seal Part number	Seal working length L3 inch	Seat length L4 mm	Setting distance 'X' inch
E11B	Flexishaft	32	M032139G	1.39	7	0.53
E11D						
E12A						
E12B						
E12D						
E13A						
E13B						
E13K						
E1XA						
E1XB		45	M045139G	1.45	8	1.73

Note: All seal working lengths are to DIN L1K dimensions.
This table is not to be used for standard or DIN L1N working length seals.
All seals use 'M' type seats except for 85mm which uses 'BS' type.
This table is not necessarily compatible with any other seal type - check with MonofloTechnical Dept.

Torque Tightening Figures

PUMP SIZE	SUCTION CHAMBER/ SUCTION EXT. lbf - ft P105	STATOR TIE BAR lbf - ft P504, P507	**DRIVE END FLEXISHAFT CAP SCREW lbf - ft P405
E11B	7.3	2.9	11.0
E11D	7.3	2.9	11.0
E12A	7.3	2.9	11.0
E12B	7.3	2.9	11.0
E12D	7.3	2.9	11.0
E13A	7.3	2.9	11.0
E13K	7.3	2.9	11.0
E13B	7.3	2.9	11.0
E1XA	7.3	7.3	11.0
E1XB	8.1	7.3	11.0

Note: Torque tolerances are +/-5% of stated nominal figures.

**** Apply thread-locking compound to screw threads prior to assembly.**

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