



English

Original  
Instructions

# Installation, Operation and Maintenance Instructions

Dosing Pump Range

# Spares & Service Contact Details

## UK

|                |                                                     |
|----------------|-----------------------------------------------------|
| <b>Spares</b>  | +44 (0)161 214 2380 (direct line 8.15 am – 5.00 pm) |
| <b>E-mail</b>  | spares@mono-pumps.com                               |
| <b>Service</b> | +44 (0)161 214 2390 (direct line 8.15 am – 5.00 pm) |
| <b>E-mail</b>  | customerservices@mono-pumps.com                     |
| <b>Service</b> | +44 (0)161 339 9000 (24 hrs)                        |

## France

|                             |                       |
|-----------------------------|-----------------------|
| <b>Spares &amp; Service</b> | +27 (0)21 941 2900    |
| <b>E-mail</b>               | monofloafrica@nov.com |

## Africa

|                             |                       |
|-----------------------------|-----------------------|
| <b>Spares &amp; Service</b> | +27 (0)21 941 2900    |
| <b>E-mail</b>               | monofloafrica@nov.com |

## Australia

|                  |                        |
|------------------|------------------------|
| <b>Melbourne</b> | (03) 9773 7777         |
| <b>Sydney</b>    | (02) 8536 0900         |
| <b>Brisbane</b>  | (07) 3350 4582         |
| <b>Adelaide</b>  | (08) 8132 6800         |
| <b>Perth</b>     | (08) 9303 0444         |
| <b>Darwin</b>    | (08) 8931 3300         |
| <b>E-mail</b>    | ozsales@mono-pumps.com |

## New Zealand

|                             |                       |
|-----------------------------|-----------------------|
| <b>Spares &amp; Service</b> | +64 (0)9 829 0333     |
| <b>E-mail</b>               | info@mono-pumps.co.nz |

## USA

|                                     |                 |
|-------------------------------------|-----------------|
| <b>Houston Spares &amp; Service</b> | +1 281 854 0300 |
| <b>Ohio Spares &amp; Service</b>    | +1 877 486 6966 |
| <b>E-mail</b>                       | moyno@nov.com   |

## China

|                 |                      |
|-----------------|----------------------|
| <b>Beijing</b>  | +86 (0) 10 5707 0900 |
| <b>Shanghai</b> | +86 (0) 21 3990 4558 |
| <b>E-mail</b>   | monoshanghai@nov.com |

# ATEX Warning Statements

## PUMPS AND PUMP UNITS

Where a pump or pump unit is to be installed in a potentially explosive atmosphere ensure that this has been specified at the time of purchase and that the equipment has been supplied accordingly and displays an ATEX nameplate or is supplied with a certificate of conformity. If there is any doubt as to the suitability of the equipment please contact Mono Pumps Limited before commencing with installation and commissioning.

Process liquids or fluids should be kept within specified temperature limits otherwise the surface of pump or system components may become an ignition source due to temperature rises. Where the process liquid temperature is less than 90°C (194°F) the maximum surface temperature will not exceed 90°C (194°F) provided the pump is installed, operated and maintained in accordance with this manual. Where the process fluid temperature exceeds 90°C (194°F) the maximum surface temperature will be equal to the maximum process fluid temperature.

Cavities that could allow the accumulation of explosive gases, such as under guards, should where possible, be designed out of the system. Where this is not possible they should be fully purged before any work is carried out on the pump or system.

Electrical installation and maintenance work should only be carried out by suitably qualified and competent persons and must be in accordance with relevant electrical regulations.

All electrical equipment, including control and safety devices, should be suitably rated for the environment in to which they are installed.

Where there may be a risk of an accumulation of explosive gases or dust non-sparking tools should be used for installation and maintenance.

In addition to causing permanent damage to the stator, dry running of the pump could generate a rapid rise in the temperature of the stator tube or barrel, which could become an ignition source. It is therefore essential that a dry run protection device be fitted. This must shut the pump down immediately should a dry run situation occur. Details of suitable devices are available from Mono Pumps Limited.

To minimise the risk of sparking or temperature rises due to mechanical or electrical overload the following control and safety devices should be fitted in addition to a dry run protection system. A pressure relief system whereby the pump can not generate pressures in excess of the maximum rated pressure or an over pressure device which should shut the pump down when the maximum discharge pressure is exceeded. A control system that will shut the pump down if the motor current or temperature exceed specified limits. An isolator switch that will disconnect all electrical supply to the motor and ancillary electrical equipment and be capable of being locked in the off position. All control and safety devices should be fitted, operated and maintained in accordance with the manufacturer's instructions. All valves on the system should be open when the pump is started otherwise serious mechanical overload and failure may result.

It is important that the pump rotates in the direction indicated on the nameplate. This must be checked on installation and commissioning and after any maintenance has been carried out. Failure to observe this may lead to dry running or mechanical or electrical overload.

# ATEX Warning Statements

When fitting drives, couplings, belts, pulleys and guards to a pump or pump unit it is essential that these are correctly fitted, aligned and adjusted in accordance with the manufacturer's instructions. Failure to do so may result in sparking due to unintended mechanical contact or temperature rises due to mechanical or electrical overload or slipping of drive belts. Regular inspection of these parts must be carried out to ensure they are in good condition and replacement of any suspect part must be carried out immediately.

Mechanical seals should be suitably rated for the environment. The seal and any associated equipment, such as a flushing system, must be installed, operated and maintained in accordance with the manufacturer's instructions.

Where a packed gland seal is fitted this must be correctly fitted and adjusted. This type of seal relies on the process liquid to cool the shaft and packing rings so a constant drip of liquid from the gland section is required. Where this is undesirable an alternative seal type should be fitted.

Failure to operate or maintain the pump and ancillary equipment in line with the manufacturer's instructions may lead to premature and potentially dangerous failure of components. Regular inspection, and where necessary replacement, of bearings and lubrication is essential.

The pump and its components have been designed to ensure safe operation within the guidelines covered by legislation. Accordingly Mono Pumps Limited have declared the machine safe to use for the duty specified as defined by the Declaration of Incorporation or Conformity that is issued with this instruction manual.

The use of replacement parts that are not manufactured by or approved by Mono Pumps Limited may affect the safe operation of the pump and it may therefore become a safety hazard to both operators and other equipment. In these circumstances the Declaration provided will become invalid. The guarantee referenced on the Terms and Conditions of Sale will also be invalidated.

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## EC Declaration as defined by Machinery Directive 2006/42/EC.

The following harmonised standards are applicable: BS EN 809, BS EN ISO 12100 Parts 1 & 2

### EC Declaration of Incorporation

This declaration is only valid when partly completed machinery has been supplied.

In this case, the machinery meets the requirements of the said directive and is intended for incorporation into other machinery or for assembly with other machinery in order to constitute relevant machinery as defined by the said directive including any amendments, which are valid at the time of supply.

### IMPORTANT

This machinery must not be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity to the said directive.

This declaration is only valid when the machinery has been installed, operated and maintained in accordance with these instructions and safety guidelines contained within as well as instructions supplied for equipment assembled with or intended for use with this equipment.

### EC Declaration of Conformity

This declaration is not valid for partly completed machinery that has been supplied.

In this case the machinery meets the requirements of the said directive including any amendments which are valid at the time of supply.

We further declare that, where applicable, said machinery also meets the requirements of:

The EMC Directive 2004/108/EC  
The Low Voltage Directive 2006/95/E  
The Pressure Equipment Directive 2005/88/EC  
The Outdoor Noise Directive 2000/14/EC  
and subsequent amendments  
The Drinking Water Directive 98/83/EC

### IMPORTANT

This declaration is only valid when the machinery has been installed, operated and maintained in accordance with these instructions and safety guidelines contained within as well as instructions supplied for equipment assembled with or intended for use with this equipment.



Mr A. Morris - Engineering Manager - PDS  
for Mono Pumps Limited, Martin Street, Audenshaw,  
Manchester, England, M34 5JA.

# 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, Mono 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.

Pumps operating on high temperature duties should be allowed to cool sufficiently before any maintenance is carried out.

#### 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.

#### 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 20 kg (45lb) 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.

# Installation, Operation & Maintenance Instructions

## 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, Mono Pumps Limited, should be consulted before proceeding. Normally the Mono 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 nonreturn 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 MONO PUMPS LIMITED 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. May contain substances from the ECHA SVHC Candidates List (REACH - Regulation (EC) No. 1907/2006)

### 1.7 DUTY CONDITIONS

Pumps should only be installed on duties for which Mono Pumps Limited 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, MONO PUMPS LIMITED SHOULD BE CONTACTED AND THEIR RECOMMENDATIONS SOUGHT IN THE INTEREST OF APPLICATION, SAFETY OF PLANT, EFFICIENCY AND PUMP LIFE.**

# Installation, Operation & Maintenance Instructions

## 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 restarting.

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            | †       |
| Dosing                 | 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, CO0800, CP1600 | No             | *       |

\*Clockwise when viewed from drive end.

\*\*Anti-clockwise when viewed from drive end.

†Anti-clockwise gives inlet at drive end.

### 2.3.1 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.

If a barrier fluid is required, the mechanical seal carrier must include a quench port. This can be incorporated by Mono Pumps upon request.

### 2.3.2 DRAINAGE

A drainage port is provided on the suction chamber, however, a drainage port can also be incorporated into the mechanical seal housing upon request.

### 2.4. GUARDS



In the interests of safety, and in accordance with the U.K. Health and Safety at Work Act 1974, 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 50°C (122°F).

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

### 2.7 NOISE LEVELS

1. The sound pressure level should 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 or installation pipework
3. It is recommended the actual pump unit noise levels are ascertained once the unit is installed and running at duty conditions

### 2.8 LUBRICATION

Pumps fitted with bearings should be inspected periodically to see if grease replenishment is necessary,



# Installation, Operation & Maintenance Instructions

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 @ 75°C (167°F) for 20 mins
2. Water rinse @ 80°C (176°F) for 20 mins
3. Acid wash @ 50°C (122°F) for 20 mins
4. Water rinse @ 80°C (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 (4.9 to 6.6 ft/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.

# Installation, Operation & Maintenance Instructions

## 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.

## 2.15 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 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.

## 2.16 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 MONO PUMPS LIMITED

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

As a consequence Mono Pumps Limited have declared the machine safe to use for the duty specified as defined by the Declaration of Incorporation or Conformity that is issued with this Instruction Manual.

The use of replacement items that are not approved by or manufactured by Mono Pumps Limited 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 Declaration provided will therefore become invalid. The guarantee referenced in the Terms and Conditions of Sale will also be invalidated if replacement items are used that are not approved or manufactured by Mono Pumps Limited.

### 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.*

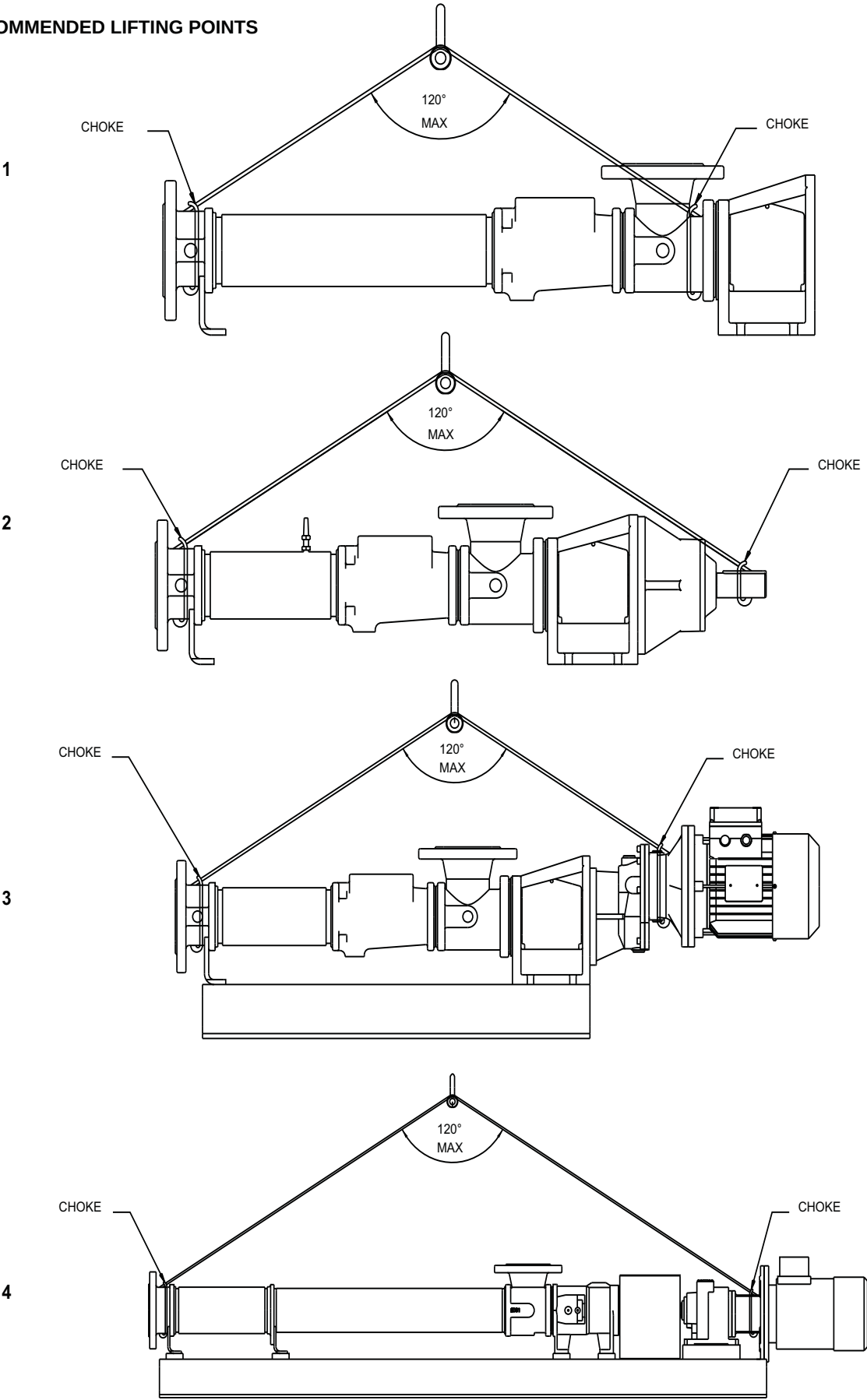
### 3.2 FLOWMETER

For increased accuracy a flowmeter can be provided by Mono Pumps to monitor the flow rate during pump operation. The flowmeter must be installed on the suction end of the pump. Failure to do so may result in damaging effects.

The flowmeter must be used in accordance with the manufacturers instructions.

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## 3.2 RECOMMENDED LIFTING POINTS



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### 3.3 PUMP AND WEAR PARTS WEIGHTS.

**NOTE:** Weights are for guidance purpose only. Please refer to the documentation issued with your pump or spares.

#### Dosing Pump

| Model | Pump weight Kg (lb) |
|-------|---------------------|
|       | Motorised           |
| LTM   | 15 kg<br>(33 lb)    |
| LVH   |                     |
| LWD   |                     |
| LXB   |                     |

All wear parts are less than 12 kg (26.5 lb)

### 3.4 FLOWMETER.

Where a flowmeter is provided, this must be connected to the suction end of the pump. Failure to do so could damage the flowmeter.

# Diagnostic Chart

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

# Drawing Reference Numbers

| <b>DRG.<br/>REF.</b> | <b>DESCRIPTION</b> |
|----------------------|--------------------|
|                      |                    |
| 01A                  | BODY               |
| 06A/B                | NAMEPLATE          |
| 10A                  | MECHANICAL SEAL    |
| 15A                  | THROWER GUARD      |
| 20A                  | GASKET             |
| 22A                  | STATOR             |
| 23A                  | SUCTION CHAMBER    |
| 24A                  | END COVER          |
| 25A                  | ROTOR              |
| 26A                  | COUPLING ROD       |
| 28A                  | SEALING COVER      |
| 29A                  | COUPLING ROD PIN   |
| 29B                  | COUPLING ROD PIN   |
| 29C                  | SHAFT PIN          |
| 32A                  | DRIVE SHAFT        |
| 42A                  | THOWER             |
| 47A                  | SUPPORT FOOT       |
| 65A                  | MECH SEAL CARRIER  |
| 76A                  | SUPPORT PLATE      |
| 95A                  | TIE BAR            |

| <b>DRG.<br/>REF.</b> | <b>DESCRIPTION</b>  |
|----------------------|---------------------|
|                      |                     |
| P101                 | HEXAGONAL HEAD BOLT |
| P104                 | HEXAGONAL HEAD BOLT |
| P105                 | HEXAGONAL NUT       |
| P106                 | FLAT WASHER         |
| P107                 | PLAIN WASHER        |
|                      |                     |
| P405                 | TIE - SEALING COVER |
| P406                 | TIE - SEALING COVER |
|                      |                     |
|                      |                     |
| P501A                | PLUG                |
| P504                 | HEXAGONAL NUT       |
| P505                 | FLAT WASHER         |
| P506                 | SPRING WASHER       |
|                      |                     |
| P601                 | HEXAGONAL HEAD BOLT |
| P602                 | SPRING WASHER       |
| P603                 | FLAT WASHER         |
| P604                 | HEXAGONAL NUT       |

# Pump Coding

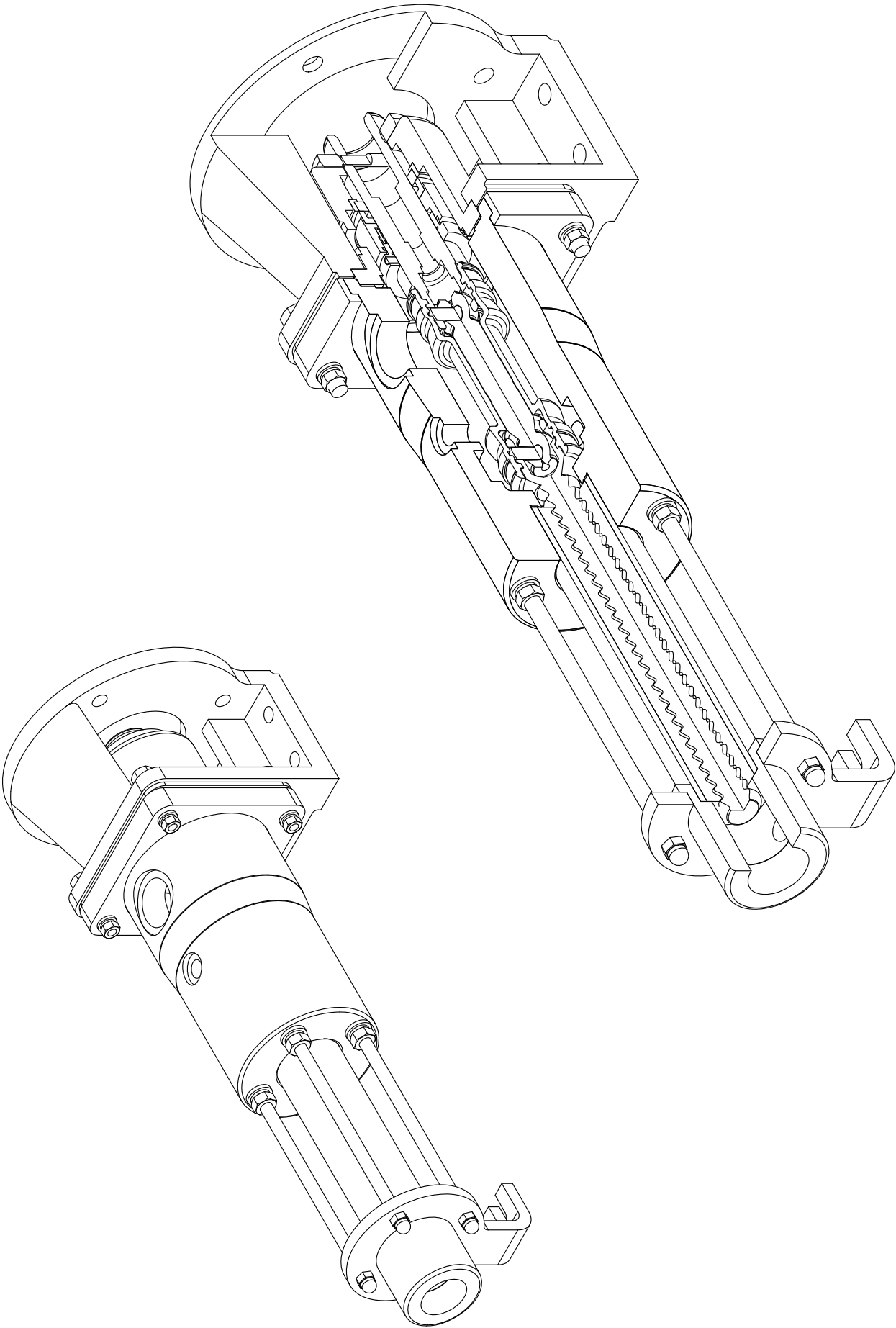
|                    |                                                  |                |             |        |           |           |                  |            |                |                 |                |   |  |   |
|--------------------|--------------------------------------------------|----------------|-------------|--------|-----------|-----------|------------------|------------|----------------|-----------------|----------------|---|--|---|
| Range              | Low Flow                                         | L              |             |        |           |           |                  |            |                |                 |                |   |  |   |
| Design Mk No       | 2013                                             |                | 1           |        |           |           |                  |            |                |                 |                |   |  |   |
| Size               | 45 L/hr (0.2 USGPM) @ 500 rpm                    |                |             | T      |           |           |                  |            |                |                 |                |   |  |   |
|                    | 90 L/hr (0.4 USGPM) @ 500 rpm                    |                |             | V      |           |           |                  |            |                |                 |                |   |  |   |
|                    | 185 L/hr (0.8 USGPM) @ 500 rpm                   |                |             | W      |           |           |                  |            |                |                 |                |   |  |   |
|                    | 365 L/hr (1.6 USGPM) @ 500 rpm                   |                |             | X      |           |           |                  |            |                |                 |                |   |  |   |
| Stages             | Two stage                                        |                |             |        | B         |           |                  |            |                |                 |                |   |  |   |
|                    | Four Stage                                       |                |             |        | D         |           |                  |            |                |                 |                |   |  |   |
|                    | Eight stage                                      |                |             |        | H         |           |                  |            |                |                 |                |   |  |   |
|                    | Twelve stage                                     |                |             |        | M         |           |                  |            |                |                 |                |   |  |   |
| Delivery Materials | Stainless                                        |                |             |        |           | S         |                  |            |                |                 |                |   |  |   |
|                    | Plastic                                          |                |             |        |           | P         |                  |            |                |                 |                |   |  |   |
| Rotating Parts     | Code 5                                           |                |             |        |           |           | 5                |            |                |                 |                |   |  |   |
|                    | Code 8                                           |                |             |        |           |           | 8                |            |                |                 |                |   |  |   |
|                    | Code 9                                           |                |             |        |           |           | 9                |            |                |                 |                |   |  |   |
| Rotor Mk No        | MK0                                              |                |             |        |           |           |                  | 0          |                |                 |                |   |  |   |
|                    | MKA                                              |                |             |        |           |           |                  | A          |                |                 |                |   |  |   |
|                    | MK1                                              |                |             |        |           |           |                  | 1          |                |                 |                |   |  |   |
|                    | MK3                                              |                |             |        |           |           |                  | 3          |                |                 |                |   |  |   |
|                    | MK5                                              |                |             |        |           |           |                  | 5          |                |                 |                |   |  |   |
| Stator Material    | Nitrile                                          |                |             |        |           |           |                  |            | R              |                 |                |   |  |   |
|                    | EPDM                                             |                |             |        |           |           |                  |            | E              |                 |                |   |  |   |
|                    | High Nitrile                                     |                |             |        |           |           |                  |            | J              |                 |                |   |  |   |
|                    | Viton                                            |                |             |        |           |           |                  |            | V              |                 |                |   |  |   |
| Seal Type          | Mechanical Seal                                  |                |             |        |           |           |                  |            |                | M               |                |   |  |   |
|                    | Packed Gland                                     |                |             |        |           |           |                  |            |                | P               |                |   |  |   |
| Build Option       | Standard                                         |                |             |        |           |           |                  |            |                |                 | A              |   |  |   |
| /                  |                                                  |                |             |        |           |           |                  |            |                |                 |                | / |  |   |
| Variation          | For special requirements please contact NOV Mono |                |             |        |           |           |                  |            |                |                 |                |   |  | G |
| Example            |                                                  | L              | 1           | T      | B         | S         | 8                | 1          | R              | M               | A              |   |  |   |
|                    |                                                  |                |             |        |           |           |                  |            |                |                 |                |   |  |   |
|                    |                                                  | Low Flow Range | Design Mk 1 | Size T | Two Stage | Stainless | Code 8 Rot Parts | Mk 1 Rotor | Nitrile Stator | Mechanical Seal | Build Option A |   |  |   |

## Note:-

\* MKA to be selected for RE rubber grade only.

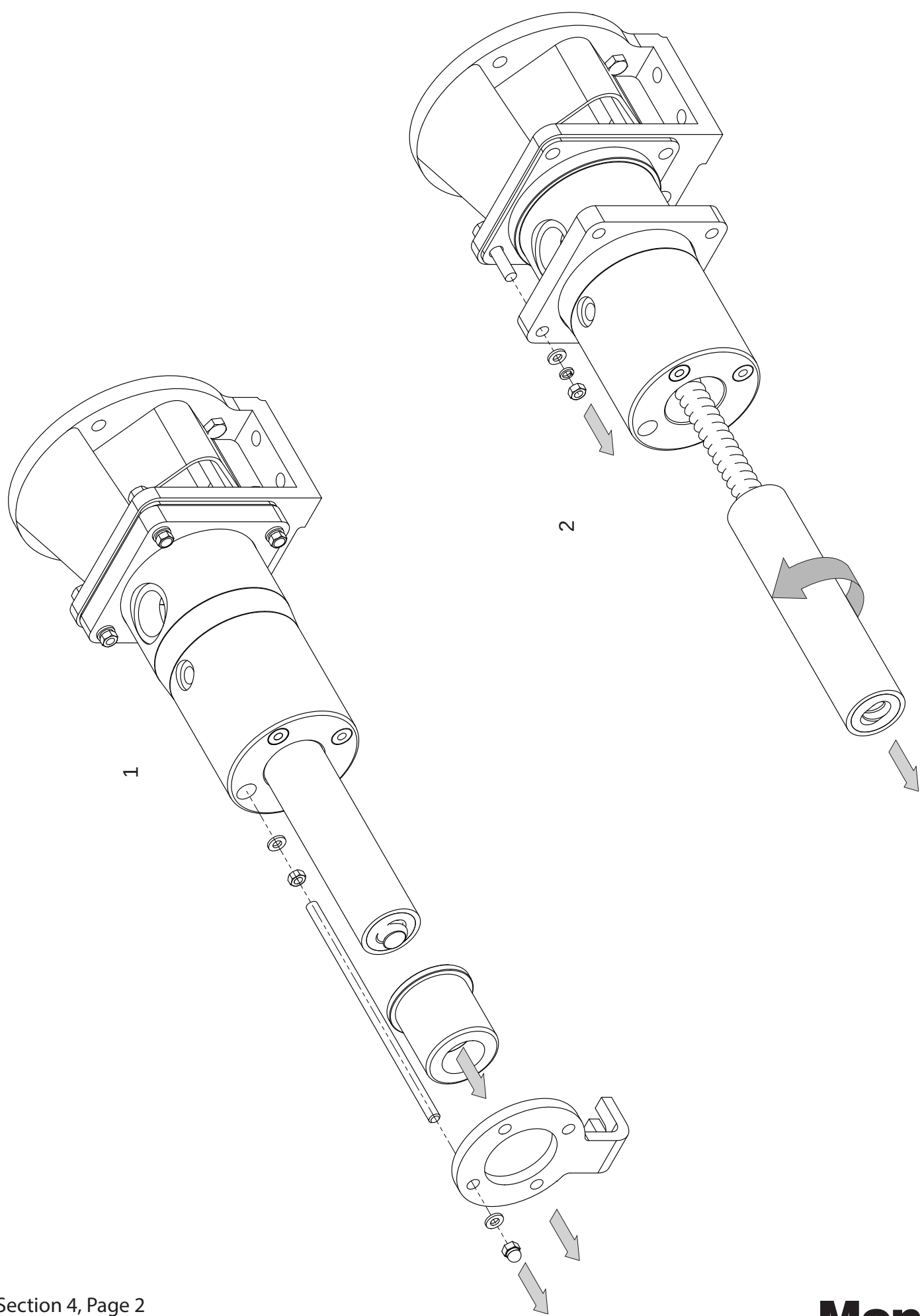
Only use Mark 0 if viscosity is less than 2 Stoke, and pressure is greater than 2 bar per stage.

# Dismantling & Assembly Drawings

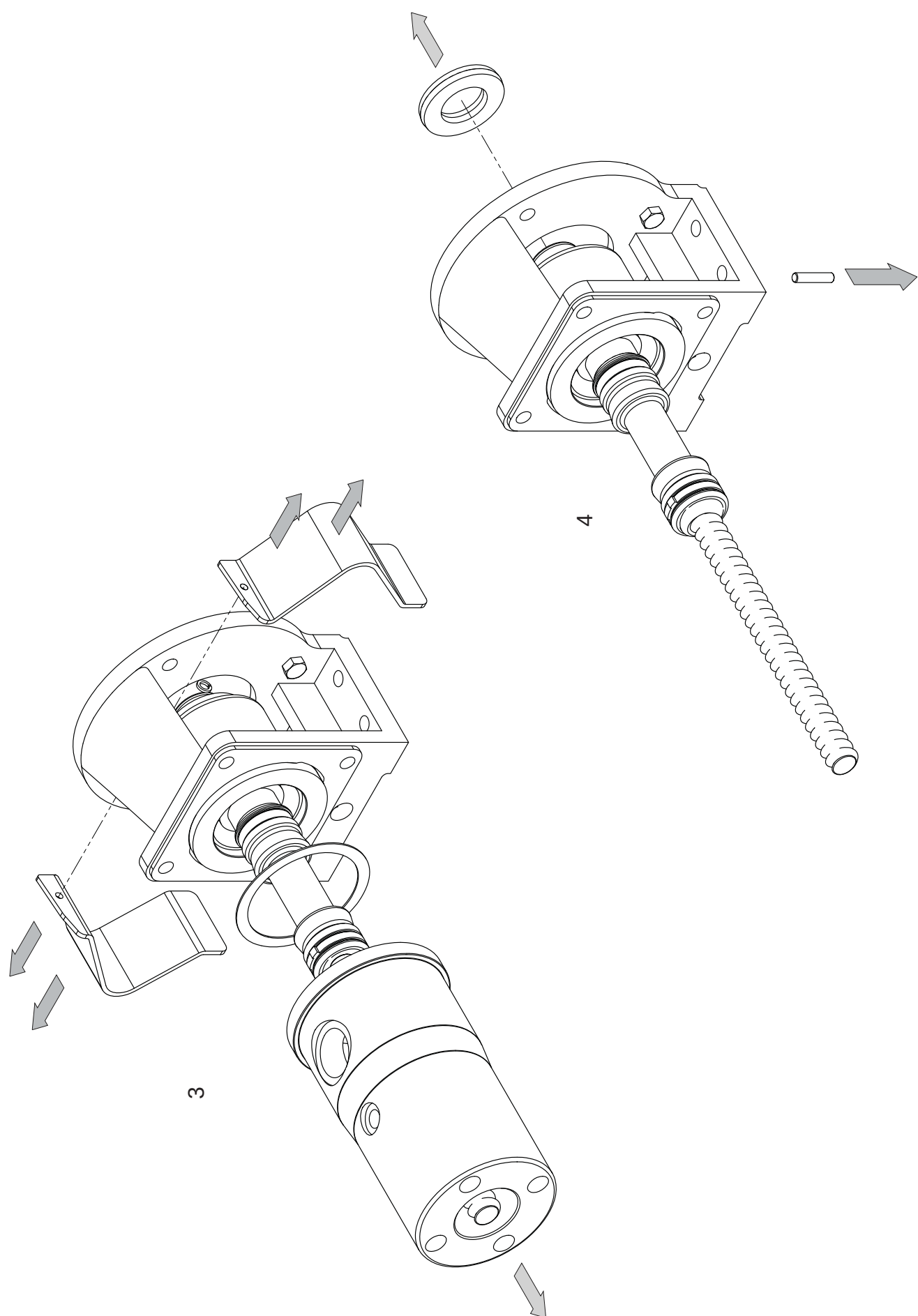




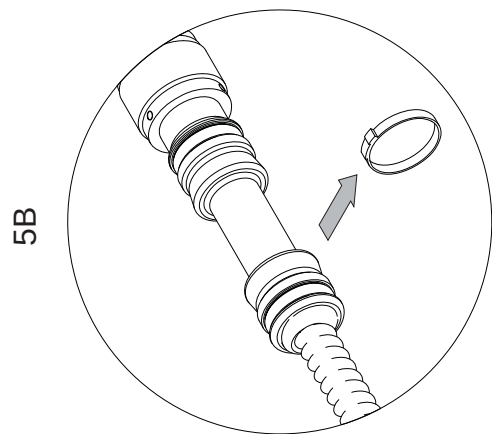
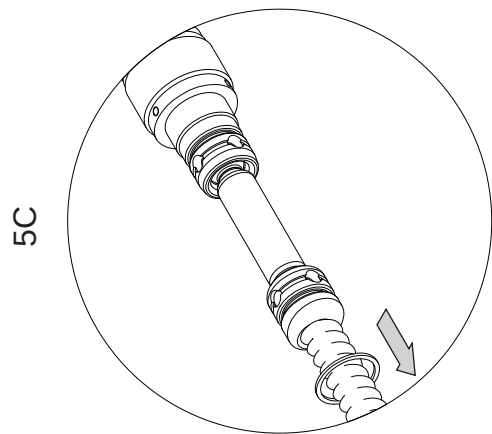
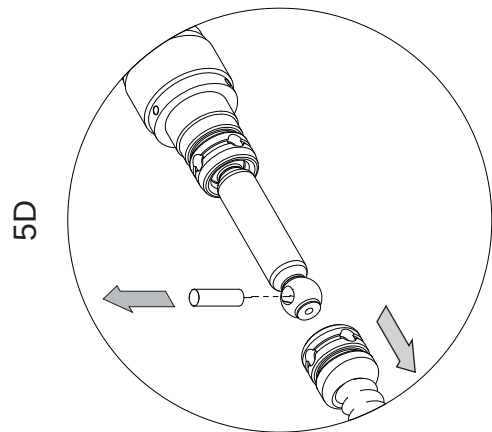
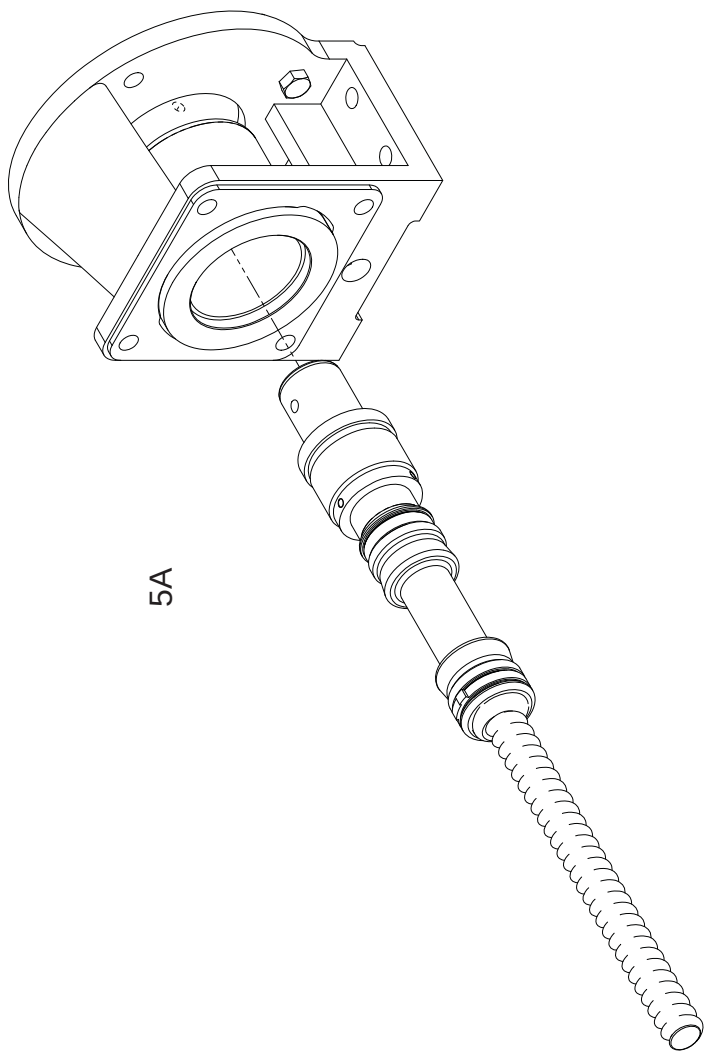
# Dismantling & Assembly Drawings



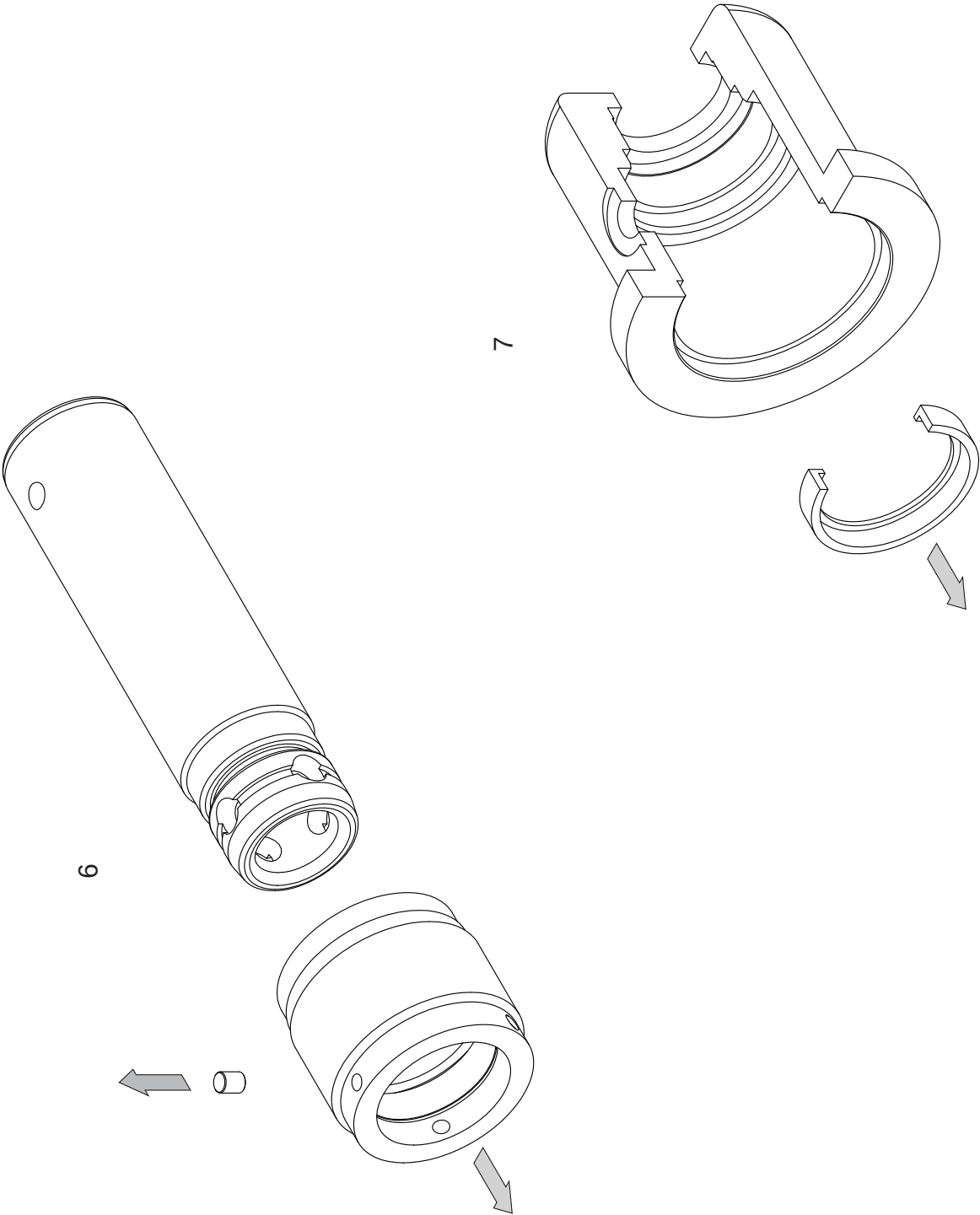
# Dismantling & Assembly Drawings



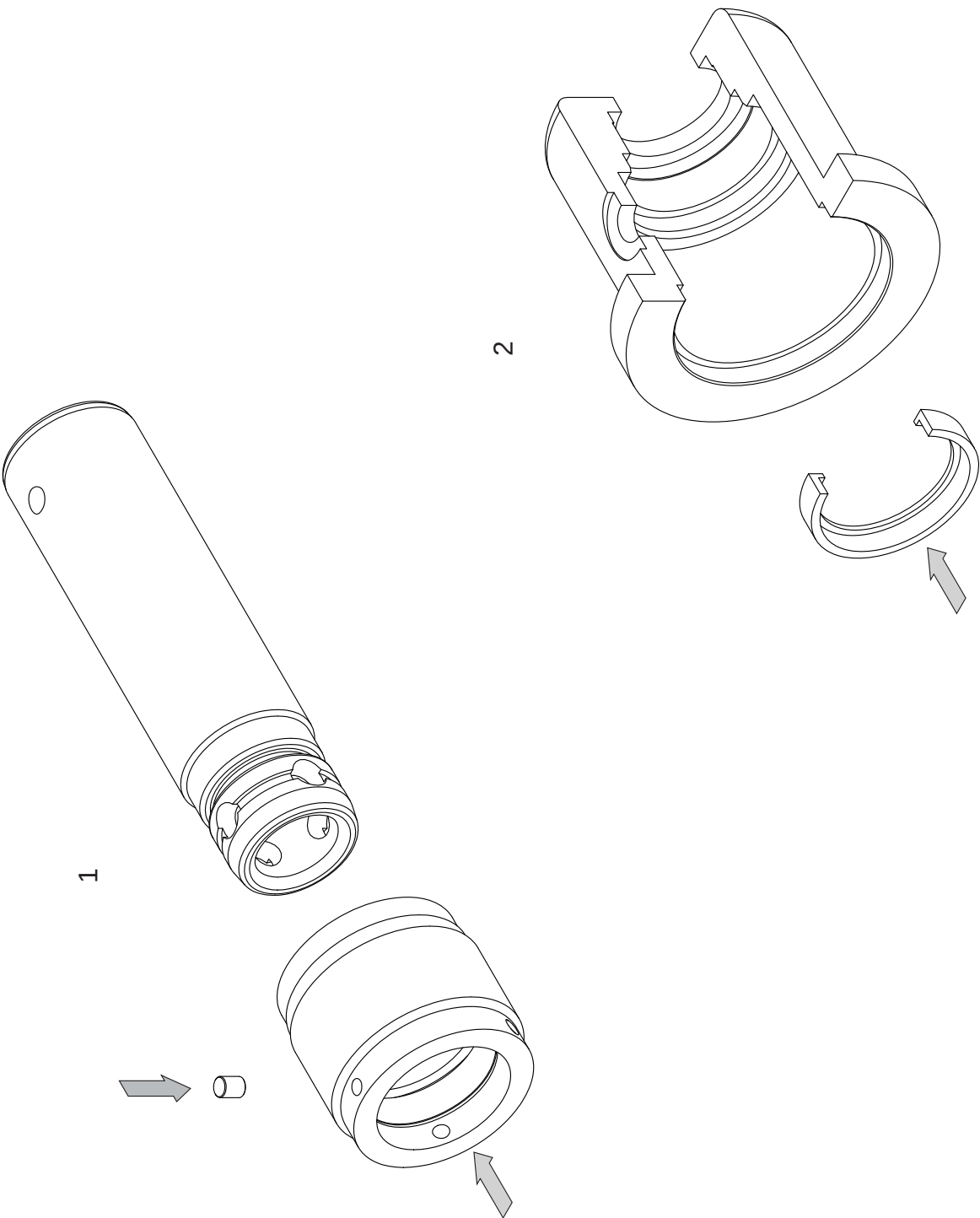
# Dismantling & Assembly Drawings



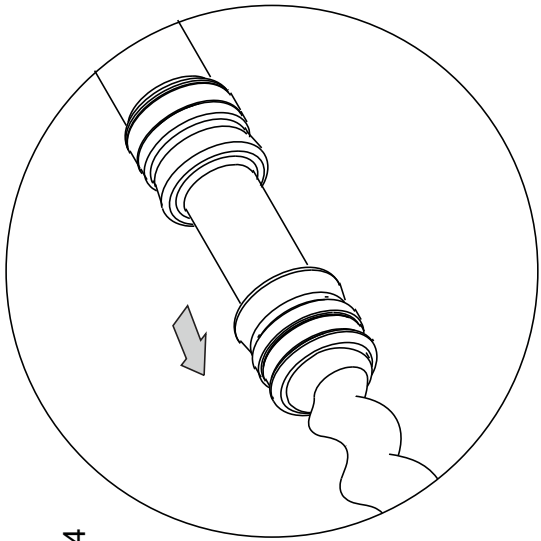
# Dismantling & Assembly Drawings



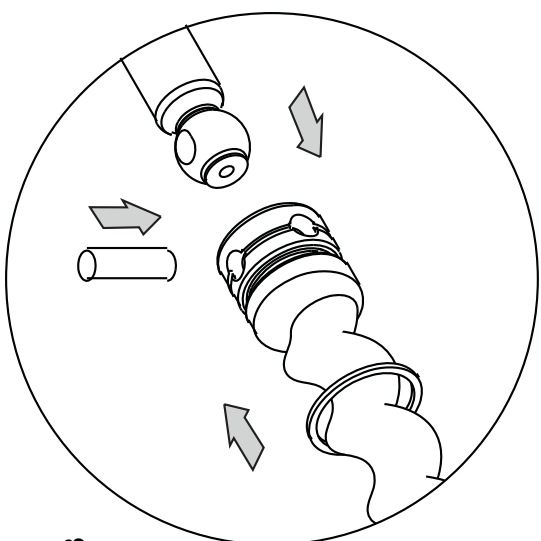
# Dismantling & Assembly Drawings



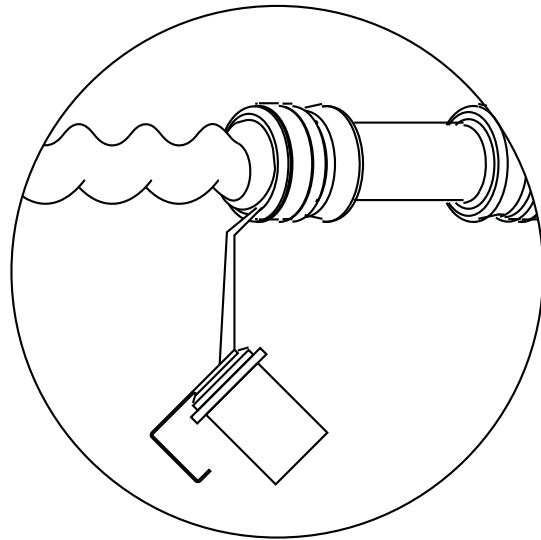
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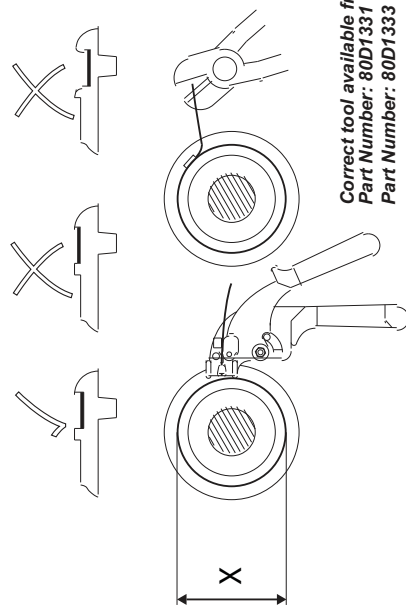
4



3



5



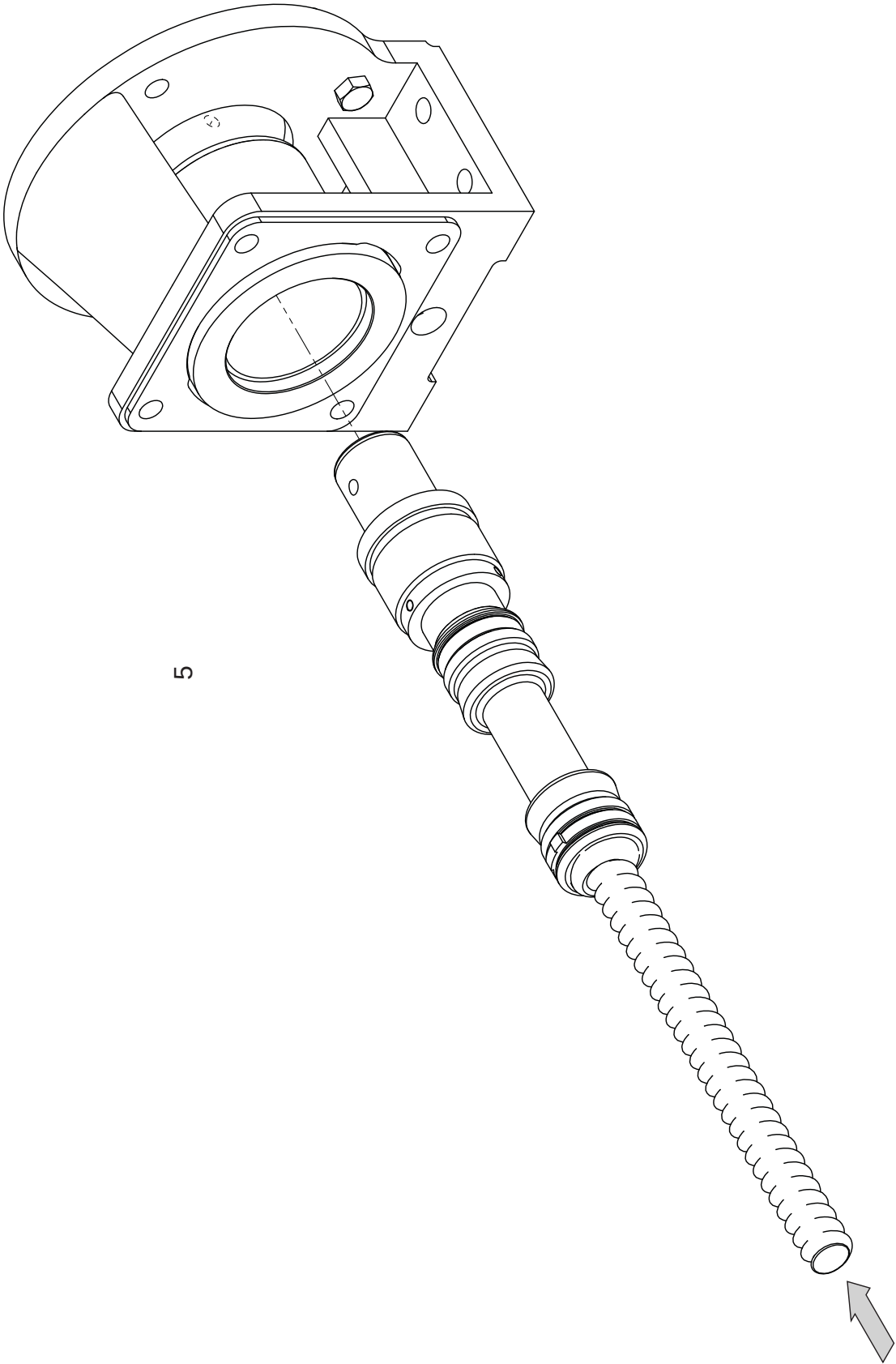
Correct tool available from Mono  
Part Number: 80D1331 for stainless ties  
Part Number: 80D1333 for plastic cable ties

Compressed Diameter (X): 39.50 - 40mm (1.56" - 1.57")  
Do not tighten below 39.4 mm (1.55")

# Pin Joint Lubrication

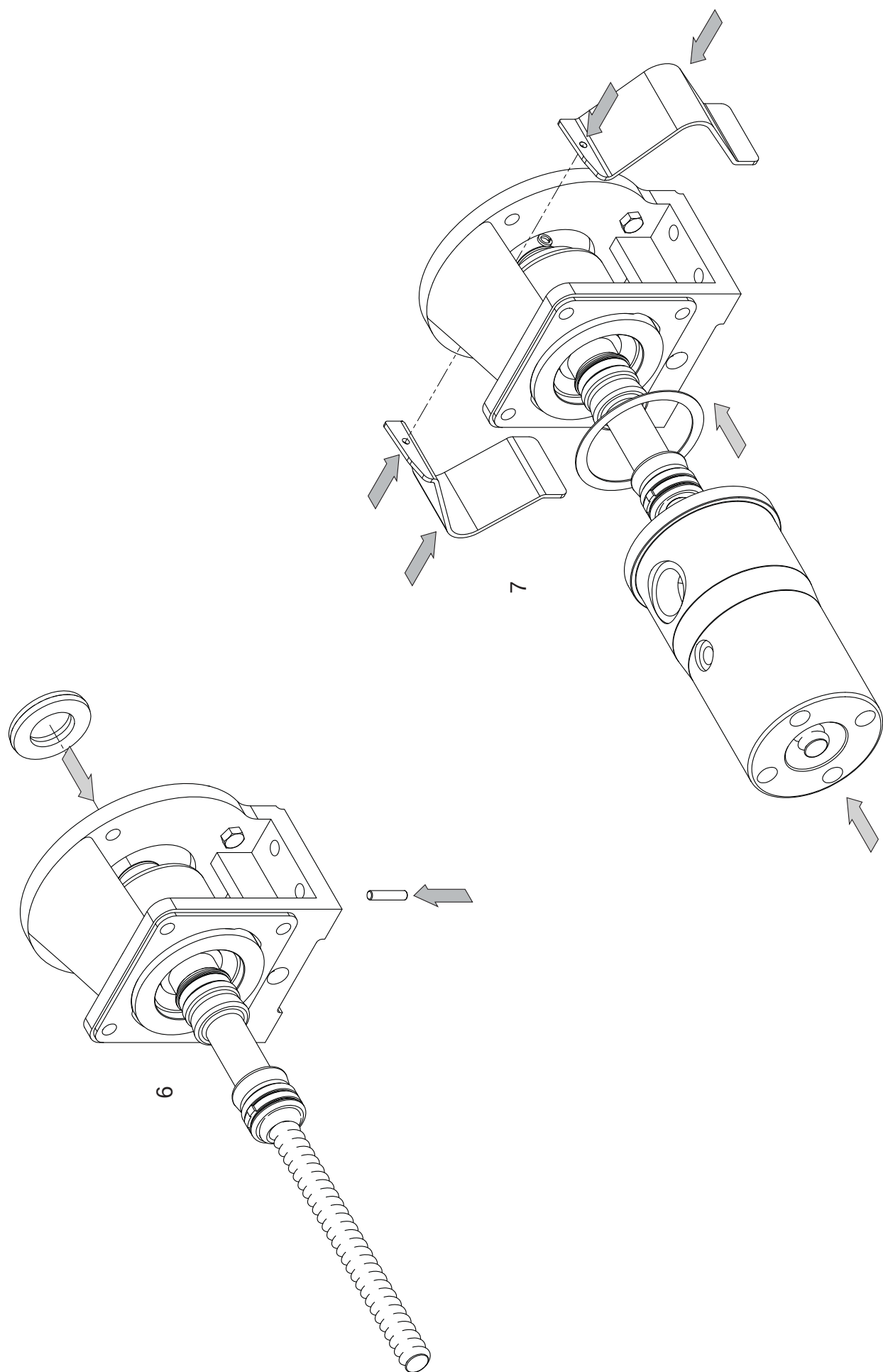
| PUMP<br>MODEL            | JOINT LUBRICATION<br>CAPACITY (APPROX.)<br>PER JOINT - ml*<br>(inches <sup>3</sup> ) | NON-FOOD APPLICATIONS ONLY |                                                                                                                                      | FOOD<br>APPLICATIONS   |
|--------------------------|--------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                          |                                                                                      | RECOMMENDED                | SUITABLE ALTERNATIVE                                                                                                                 |                        |
| LXB<br>LWD<br>LVH<br>LTM | 6<br>(0.37)                                                                          | KLUBERSYNTH<br>GH6-460     | <div>MOBILITH<br/>SHC 007<br/>SEMI-FLUID<br/>GREASE</div> <div>SHELL<br/>RETINAX<br/>CSZ</div> <div>MOBIL GEAR<br/>OIL SHC 320</div> | KLUBEROIL<br>4 UHI 460 |

# Dismantling & Assembly Diagrams

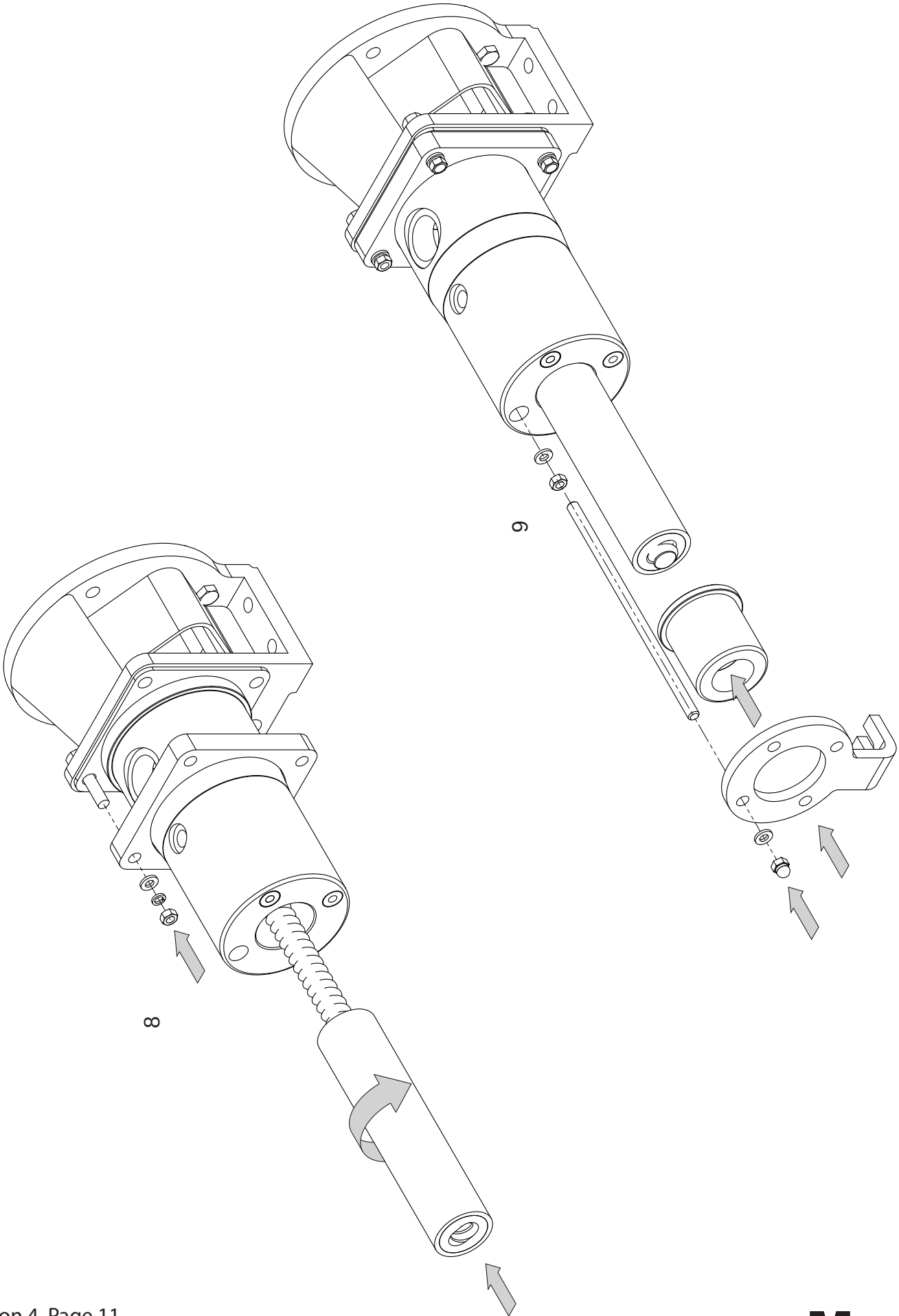




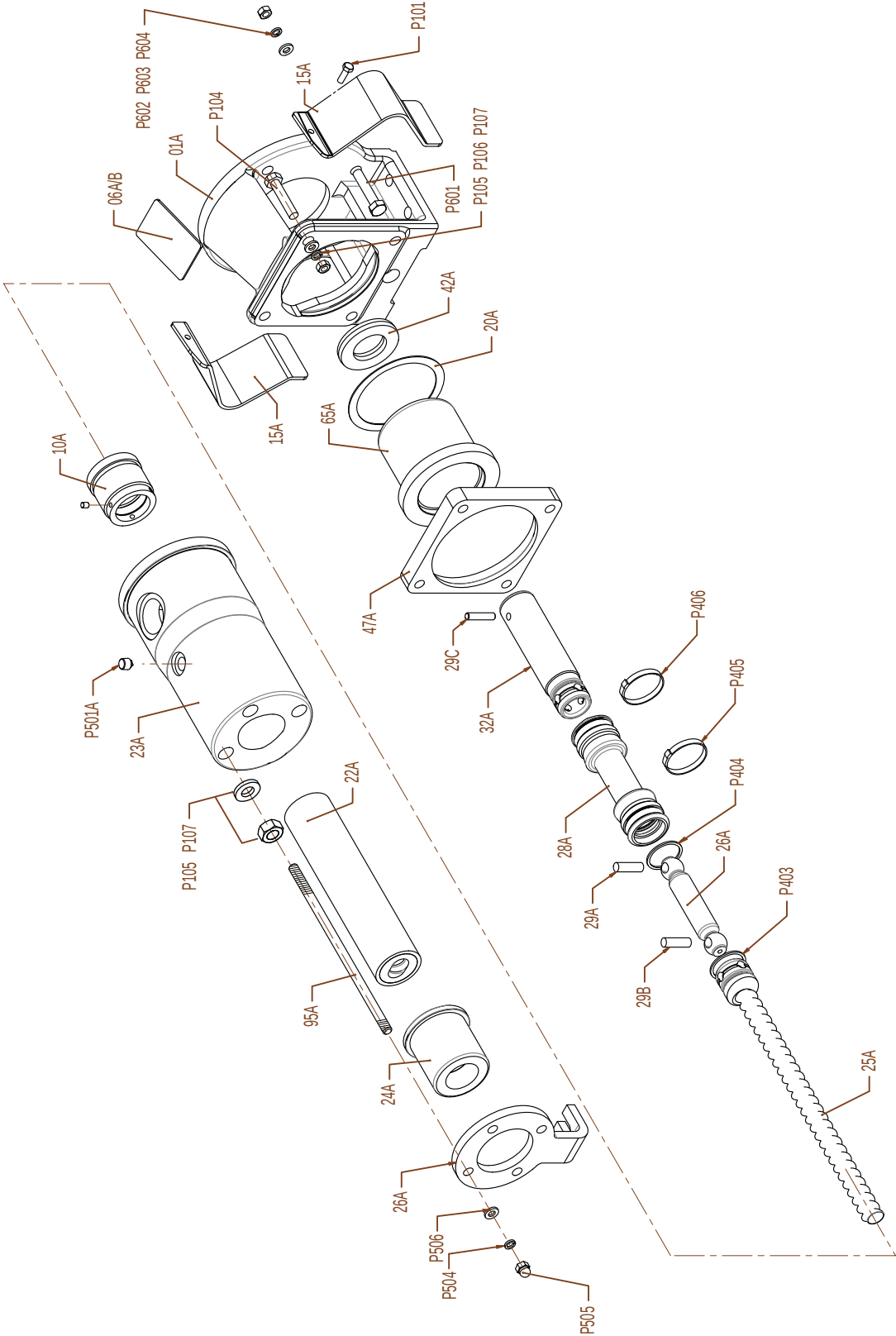
# Dismantling & Assembly Diagrams



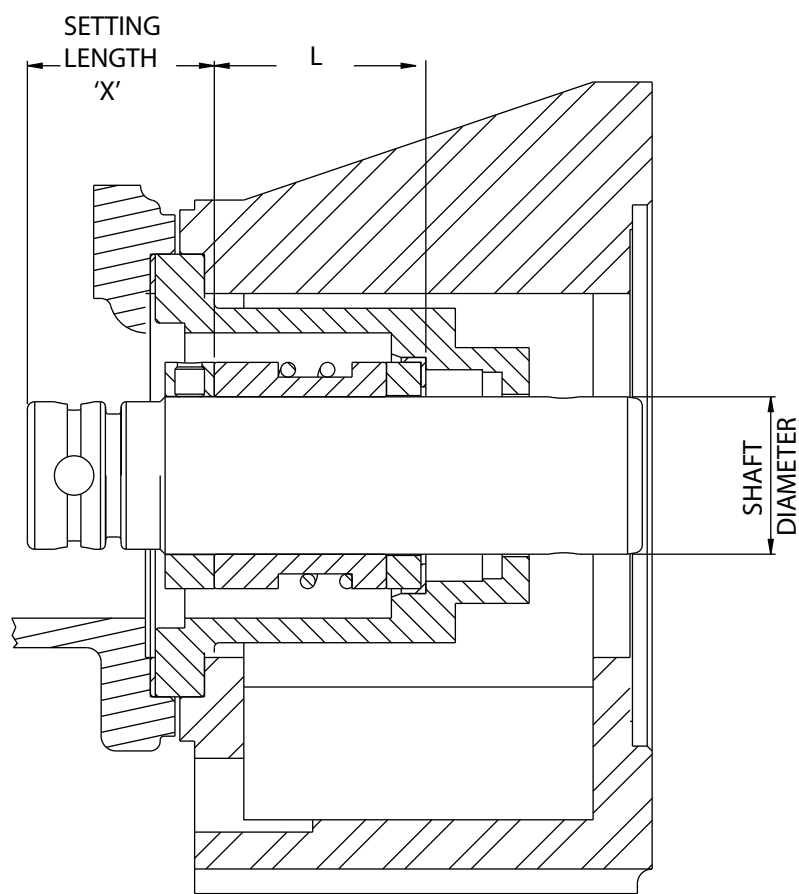
# Dismantling & Assembly Diagrams



# Exploded Views



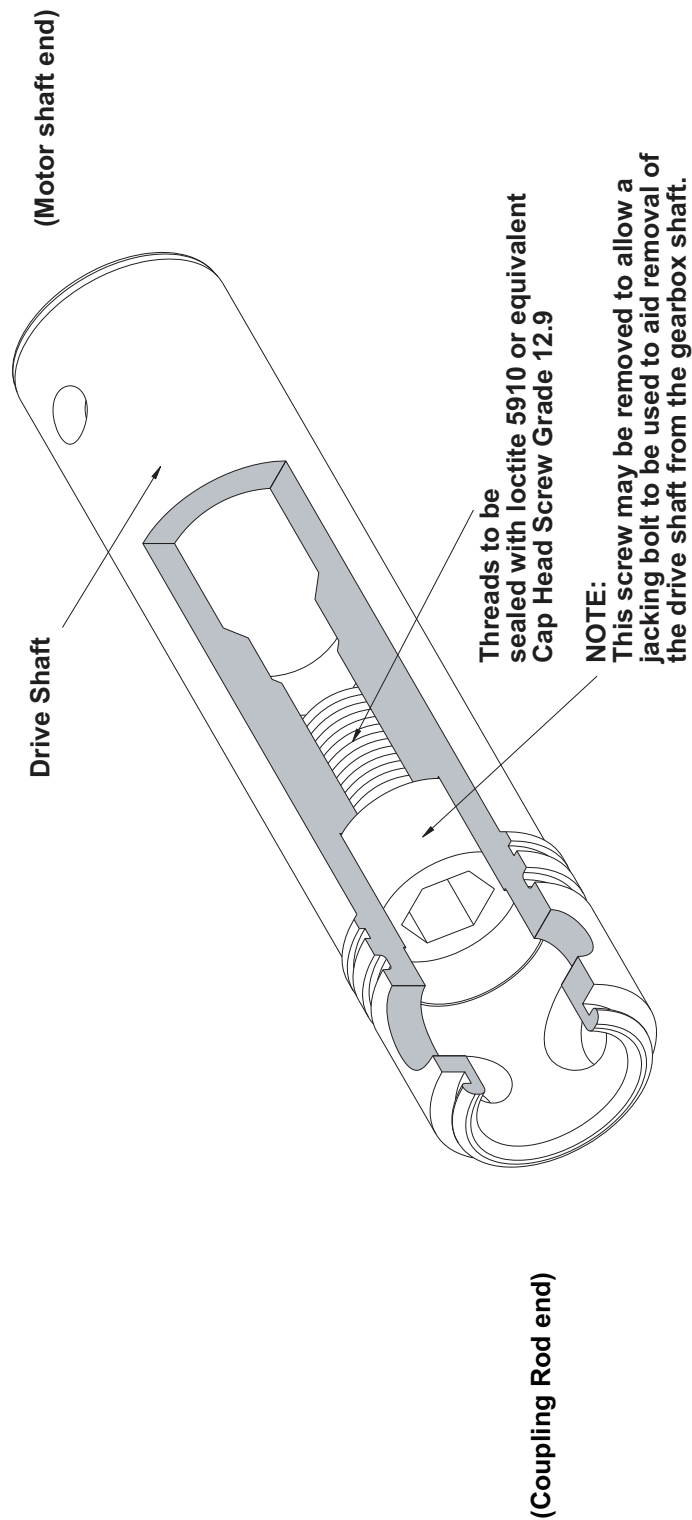
# Setting Length - Mechanical Seal



| Shaft Diameter<br>mm<br>(inches) | Seal Part No. | Seal Working<br>Length L mm<br>(inches) | Setting<br>Distance 'X'<br>mm (inches) | Metal Parts   |
|----------------------------------|---------------|-----------------------------------------|----------------------------------------|---------------|
| 32<br>(1.26)                     | M032192G      | 42.5<br>(1.67)                          | 38<br>(1.50)                           | Hastelloy NH  |
| 32<br>(1.26)                     | M032195G      | 32.5<br>(1.28)                          | 41.5<br>(1.63)                         | Stainless 316 |

**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 seat except for 85mm (3.35") which uses 'BS' type or 'M' type.  
This table is not necessarily compatible with any other seal type - check with  
Mono Pumps Technical Dept.

# Drive Shaft Assembly with Plug



**NOTE: ENSURE THE CAP HEAD SCREW IS TIGHTEND &  
SEALED BEFORE ASSEMBLING WITH COUPLING ROD**

# Torque Tightening Figures

| PUMP<br>SIZE | SUCTION CHAMBER<br>Nm<br>(ft/lbf)<br>P105 | STATOR TIE BARS<br>Nm<br>(ft/lbf)<br>P505 |
|--------------|-------------------------------------------|-------------------------------------------|
| LXB          | 10                                        | 3                                         |
| LWD          | 10                                        | 3                                         |
| LVH          | 10                                        | 3                                         |

# Notes

**Africa**

NOV  
No. 10 Dipka Road  
Kaymore Industrial Area  
Stikland, Bellville 7530  
Cape Town, South Africa  
T. +27 (0)21 941 2900

**Europe**

Mono Pumps Ltd  
Martin Street, Audenshaw  
Manchester, M34 5JA, England  
T. +44 (0)161 339 9000  
E. info-mono@nov.com

NOV Mono  
56, rue du Pont  
88300 Rebeuville, France  
T. +33 (0)3 29 94 26 88  
E. monofrance@nov.com

**Americas**

Moyno  
8708 W. Little York Rd, Suite 100  
Houston, Texas 77040, USA  
T. +1 281 854 0300  
E. moyno@nov.com

Moyno  
1895 W. Jefferson Street  
Springfield, Ohio, 45506, USA  
T. +1 877 486 6966  
E. moyno@nov.com

**Australasia**

Mono Pumps (Australia) Pty Ltd  
75 Frankston Gardens Drive  
Carrum Downs, Victoria 3201, Australia  
T. 1800 333 138  
E. ozsales@nov.com

Mono Pumps (New Zealand) Ltd  
35-41 Fremlin Place, Avondale  
Auckland 1026, New Zealand  
T. +64 (0)9 829 0333  
E. info@mono-pumps.co.nz

**Asia**

Mono Pumps Ltd  
Building 5, Madong Industrial Park  
1250 Sicheng Road, Malu Town  
Jiading District  
Shanghai 201801, P.R. China  
T. +86 (0)21 3990 4588  
E. monoshanghai@nov.com