English

Original Instructions

Installation, Operation and Maintenance Instructions

Compact Range - Mono™

OMMP/032/01
Rev 23, May 2019

Revisions

Rev.	Date dd/mm/yyyy	Reason for Issue	Prepared By	Checked By	Approved By
13	19/06/2014	Revision sheet added. Dimensions & units now dual metric & imperial. Added correct Mono logo.	M. Bailey	A. Morris	A. Morris
14	17/12/2014	Added note that suitable quench system must be provided when mounting pump in vertical position to section 1.2.2 ii).	M. Bailey	C. Griffiths	C. Griffiths
15	31/05/2016	Changed lubricants from Kluber Syntheso D4690 to GH6-460 & Kluberoil 4 UHI to UH1 6 - 460.	M. Bailey	M. Bailey	C. Griffiths
16	22/06/2016	Updated to new format.	M. Bailey	M. Bailey	C. Griffiths
17	10/11/2016	Page 69 updated 45mm & 55mm seal part numbers	M. Bailey	M. Bailey	M. Bailey
18	24/01/2017	Updated EC Declaration & added Authorised European Distributors	M. Bailey	M. Bailey	M. Bailey
19	30/05/2017	Added additional safety, transport & disposal information to Installation, Operation & Maintenance section. Added general information of pumps with intended & prohibited uses. Nozzle loads added.	M. Bailey	M. Bailey	A. Morris
20	16/08/2017	Added 28C & P610 to pages 23, 24, 26 & 27. Inserted boot protector page at page 74. Renumbered the following pages accordingly.	M. Bailey	P. Kenny	A. Morris
21	29/08/2018	Removed distributors pages & incorporated link to our website under Spares & Service page.	M. Bailey	M. Bailey	M. Bailey
22	15/03/2019	Updated mechanical seal setting length for 32mm shaft on page 74 as per JIRA PFTENG-2146	M. Bailey	M. Bailey	R. Summers
23	29/05/2019	Page 77 - Shaft reference 32A is now 32B	M. Bailey	M. Bailey	M. Davies
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Distributors

For local distribution, please refer to our website:
www.mono-pumps.com/en-uk/sales_network

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 your supplier 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 that 90ºC (194ºF) the maximum surface temperature will not exceed 90ºC (194ºF) provided the pump is installed, operated and maintained in accordance with this manual. Where the process fluid temperature exceeds 90ºC (194ºF) 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 your supplier.

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.

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 your supplier 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 your supplier 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.

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

The following harmonised standards are applicable: BS EN 809, BS EN ISO 12100:2010

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 2014/30/EU
The Low Voltage Directive 2014/35/EU
The Pressure Equipment Directive 2014/68/EU

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 - Director of Pump Technology for NOV PFT UK Ltd., Greengate Way, Middleton, Manchester, England, M24 1SA.

General Description

The progressive cavity pump is a type of positive displacement pump. The pumping element consists essentially of a fixed rubber stator in the form of a double internal helix and a single helical metal rotor which revolves in the stator and turns on an eccentric path.

The rotor maintains a constant seal inside the stator and this seal travels continuously from one end of the stator to the other, giving a uniform moving cavity.

Intended Use of Pump

is in good condition and in compliance with these instructions.

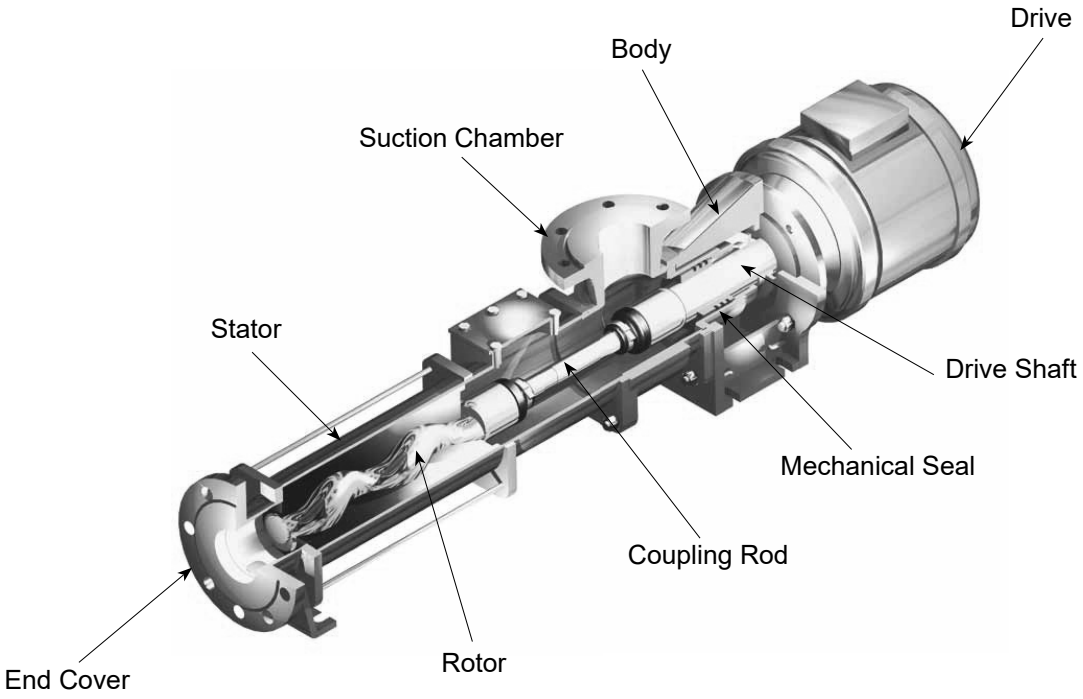
This machine must be installed in accordance with statutory regulations and these instructions.

Machine must only be run in accordance with data supplied. Before making any changes, approval must be sought from your Supplier.

Serious injury to personnel and property damage can be caused by:

- Incorrect use of machine
- Incorrect installation of machine
- Operating machine incorrectly
- Removal of necessary guards or other protective equipment

Pump Design



Installation, Operation & Maintenance

GENERAL DESCRIPTION OF PUMP

The progressive cavity pump is a type of positive displacement pump. The pumping element consists essentially of a fixed rubber stator in the form of a double internal helix and a single helical metal rotor which revolves in the stator and turns on an eccentric path.

The rotor maintains a constant seal inside the stator and this seal travels continuously from one end of the stator to the other, giving a uniform moving cavity.

GENERAL SAFETY

Appropriate PPE must always be worn.

All personnel must be suitable qualified / trained prior to carrying out any work and must comply with all safety warnings.

The Operating and Maintenance manual must always be kept close to the machine.

Instructions must be read prior to carrying out any work.

The machine must be installed correctly to ensure satisfactory & safe operation.

The machine must be maintained to a suitable standard to ensure safety of personnel and satisfactory operation of the machine is achieved.

Ensure adequate ventilation is provided to disperse dangerous concentrations of vapours.

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

The machine must be installed with provision for adequate lighting to ensure effective maintenance can be carried out.

DANGERS CAUSED BY THE MACHINE

Movement of mechanical parts

- Risk of entanglement if guards are not used correctly

Electrical voltages and currents

- Risk of electrocution, shock or burns

Hot surfaces

- Risk of burns

INTENDED USE

Use pump only if it is in good condition and in compliance with these instructions.

This machine must be installed in accordance with statutory regulations and these instructions.

Machine must only be run in accordance with data supplied. Before making any changes, approval must be sought from your Supplier.

FORESEEABLE MISUSE

- Incorrect use of machine
- Incorrect installation of machine
- Removal of guard during operation

ENVIRONMENTAL

These must be taken into account at the place of installation such as:

- abnormal temperature
- high humidity
- corrosive atmospheres
- explosive and/or fire danger zones
- vibrations
- flooding

Type of liquid to be pumped / properties while being pumped:

- flammable
- toxic
- corrosive
- abrasive

Operating System Fluctuations:

- temperature
- pressure
- flow rate
- dry running

TRANSPORT

Comply with any instructions on packaging and/or paperwork.

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, your Supplier's 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 drainage will simplify maintenance and prolong the life of pump components.

Pumps operating on high temperature duties should be allowed to cool sufficiently before anymaintenance 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 your Supplier's 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.

Ensure pipework is connected in a safe manner (refer to nozzle loads) and protected against harmful external effects.

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 your Supplier. 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 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.

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.

See section 4.2 prior to starting, for instructions on how to fit constant level oilers (where applicable).

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, your Supplier, should be consulted before proceeding. Normally the Supplier's 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 YOUR SUPPLIER HAS 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 your Supplier has 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, YOUR SUPPLIER 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 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.

Where fitted, the constant level oiler should be filled with Klubersynth GH6-460 for standard applications or Kluberoil 4UHI 460 for food applications.

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
CB / SB	No	*
Compact	Yes	†
CP0011	No	**
CP0025, CO0800, CP1600	No	*
Dosing	Yes	†
E	Yes	†
Epsilon (inc. Vertical)	Yes	†
EZstrip	Yes	†
G	No	*
Grout Mixer	No	**
Merlin Industrial	Yes	†
Merlin Widethroat	No	**
MM, ML	No	*
Monobloc B	Yes	†
MS	No	**
P	No	*
Placer	No	**
S, SL	Yes	†
W	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, YOUR SUPPLIER MUST BE CONSULTED SO THAT THE SUITABILITYOF 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

SHAFT DIAMETER	NO. OF DROPS PER MINUTE
Up to 50mm (2”)	2
50 – 75mm (2 - 3”)	3
75 – 100mm (3 - 4”)	4
100 – 125mm (4 - 5”)	5
125 – 160mm (5 - 6.3”)	6

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, 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.

The onus os on the user to fit the guards in accordance with regulations,

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 (3.3 yards) 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, 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°) for 20 mins
3. Acid wash @ 50°C (122°F) for 20 mins
4. Water rinse @ 80°C (176°) 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 (4.9 ft/s) to 2.0 m/s (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 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.

2.12 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.

2.13 MAINTENANCE OF WEARING COMPONENTS

2.13.1 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.

2.13.2 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.

2.13.2 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 parts from your Supplier to ensure maximum life.

2.13.3 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.

2.14 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

See assembly and dismantling drawings which contain 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 YOUR SUPPLIER

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 your Supplier has 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 your Supplier 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 your Supplier.

The seller warrants, for a period of 18 months from delivery or 12 months from installations, whichever is earlier, that new Equipment / Parts of its own manufacture shall conform to the material and technical specifications set forth in the agreement. Goods manufactured by others are sold “as is” except to the extent the manufacturer honours any applicable warranty made by the manufacturer.

3.2 FLOWMETER

For increased accuracy a flowmeter can be provided by your Supplier 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.

3.2 DISPOSAL OF WORN COMPONENTS

	NOTICE
	Environmental
	Drain unit in accordance with regulations **Dispose correctly in accordance with regulations**

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.

4.0 PUMP RANGE SPECIFIC

4.1 DRAINAGE

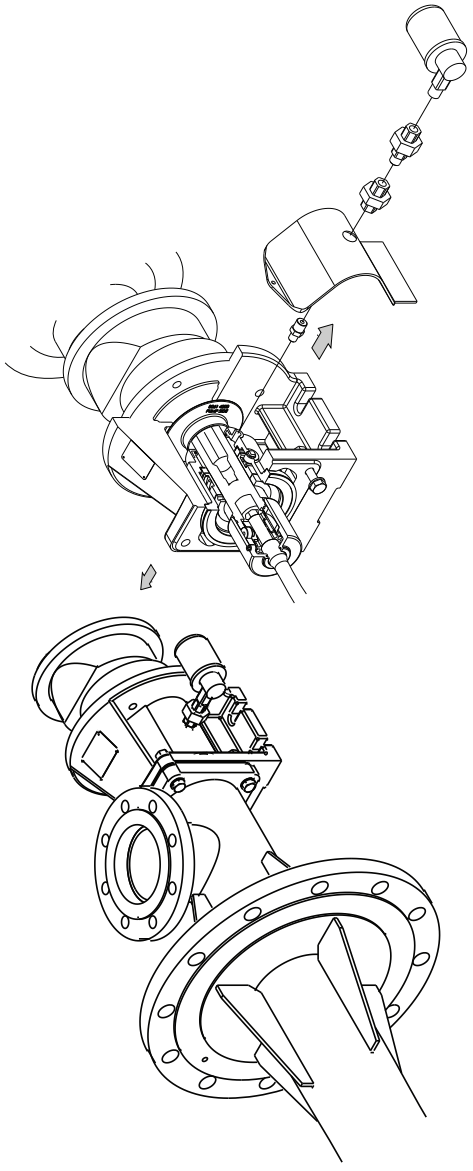
A drainage port may be provided on the suction chamber and/or end cover.

4.2 VERTICAL MOUNTING - EPSILON / P RANGE

These pumps are intended for vertical inst. Care must be taken when lifting the pump into the vertical position.

Normally these pumps will be designed with a sole plate that will be bolted to the customer’s framework.

All vertically mounted pumps require a constant level oiler to be fitted to the gland section in order to prevent the mechanical seals dry running. The oilers will be supplied loose with the pump to avoid damage during transit, so upon receipt of the equipment they will need to be installed prior to operation. Instructions for fitting the oilers are as follows:



4.3 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 while the pump is operating. If this is not possible, an emergency stop device must be fitted nearby.

Nozzle Loads

Maximum Permissible Nozzle Loads for Fabricated Stainless Steel and Mild Steel Suction Chambers and End Covers

Nominal Port Size	Nozzle Force Fx (N)	Nozzle Force Fy (N)	Nozzle Force Fz (N)	Nozzle Moment Mx (N)	Nozzle Moment My (N)	Nozzle Moment Mz (N)
1.1/4" NPT [1]	650	650	650	350	350	350
1.1/2" NPT [1]	650	650	650	350	350	350
50mm	650	650	650	350	350	350
80mm	1040	1040	1040	560	350	350
100mm	1300	1300	1300	700	700	700
150mm	1950	1950	1950	1050	1050	1050
200mm	2600	2600	2600	1400	1400	1400
250mm	3250	3250	3250	1750	1750	1750

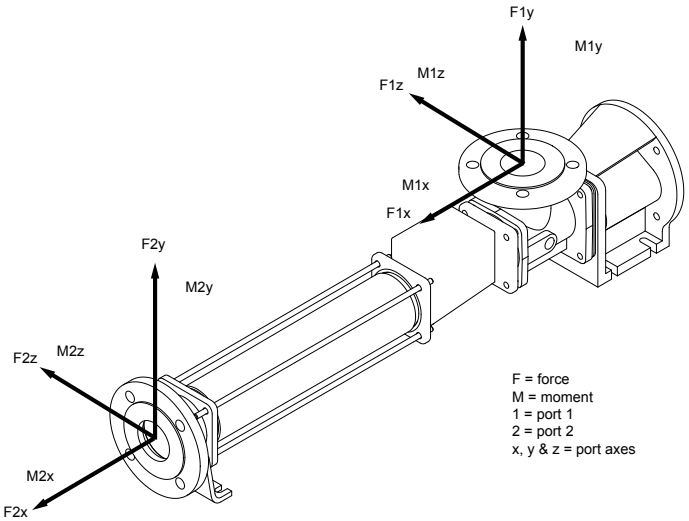
Note 1: Suction chambers and end covers with NPT ports are made from ST material.

Note 2. Where a flange/nipple assembly is used on an NPT port, the maximum permissible nozzle loads are 50% of the values stated above.

Maximum Permissible Nozzle Loads for Cast Iron Suction Chambers and End Covers

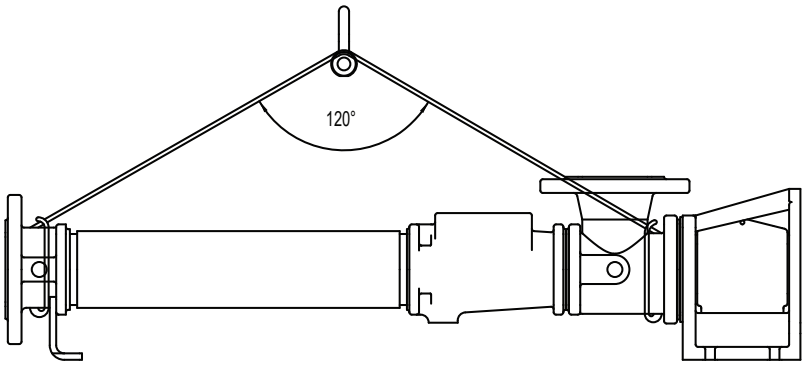
Nominal Port Size	Nozzle Force Fx (N)	Nozzle Force Fy (N)	Nozzle Force Fz (N)	Nozzle Moment Mx (N)	Nozzle Moment My (N)	Nozzle Moment Mz (N)
1.1/4" NPT [1]	650	650	650	350	350	350
1.1/2" NPT [1]	650	650	650	350	350	350
50mm	455	455	455	245	245	245
80mm	728	728	728	392	392	392
100mm	910	910	910	490	490	490
150mm	1950	1950	1950	1050	1050	1050
200mm	2600	2600	2600	1400	1400	1400
250mm	3250	3250	3250	1750	1750	1750

Note that by exceeding the specified loading, the pump body may distort causing joints to leak or even fail. There may also be a detrimental effect on shaft alignment that can cause premature bearing or seal failures.



Lifting Diagrams

1



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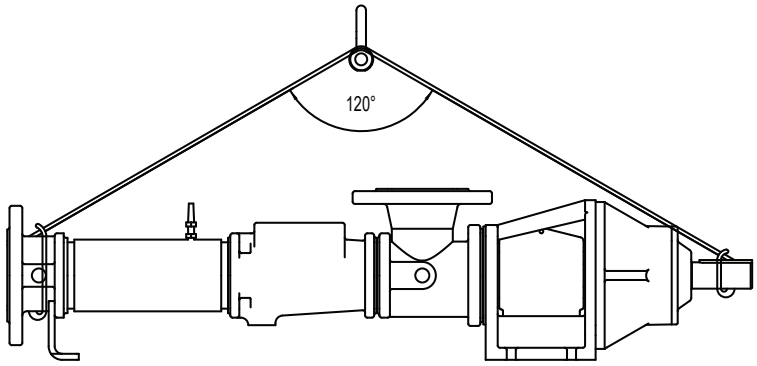

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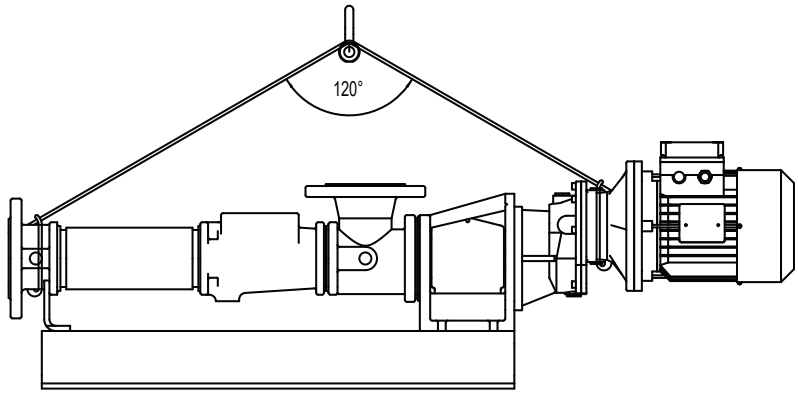

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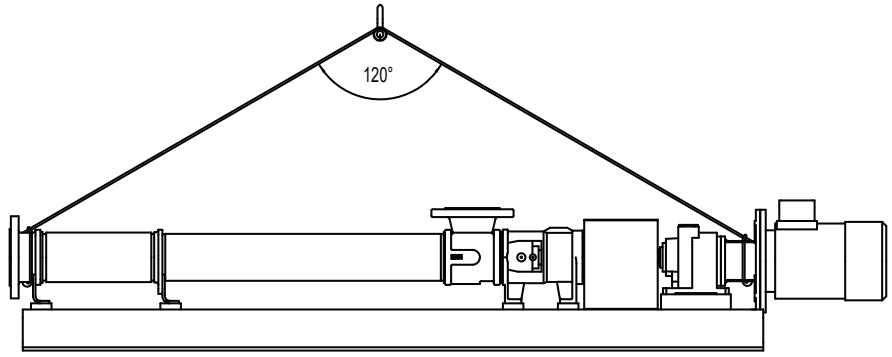

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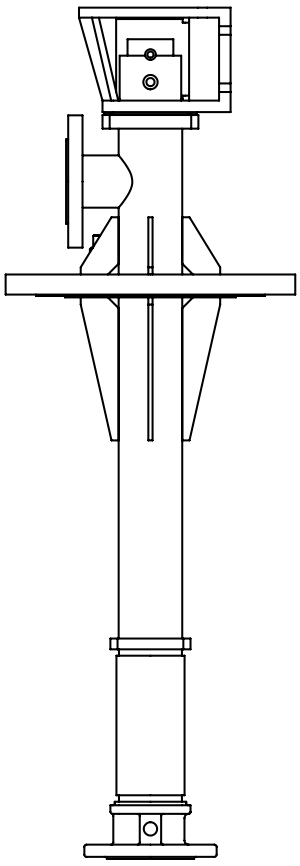


Weights

Model	Weight (kg)				
	Pump	Stator	Rotor	Coupling Rod/Joint	Shaft
C21B	12.5	1.2	0.4	0.2	0.6
C21D	14.5	2.6	0.8	0.2	0.6
C22A	12.5	1.2	0.4	0.2	0.6
C22B	14.5	2.6	0.8	0.2	0.6
C22D	23	5.5	1.6	0.4	0.7
C23A	18	1.3	1.5	0.4	0.7
C23B	20	2.6	1.5	0.4	0.7
C23K	20	2.6	1.5	0.4	0.7
C13D	32	5.3	2.9	1.2	1.7
C2XA	28	2.1	1.6	0.4	0.7
C2XB	31	5.6	2.8	0.4	0.7
C1XD	57	10.4	5.5	2.6	3.1
C1XK	32	5.1	2.7	0.4	0.7
C14A	34	3.5	2.6	1.2	1.7
C14B	46	7.1	4.5	1.2	1.7
C14D	72	14	9.2	2.4	3.1
C14K	42	7.1	4.5	1.2	1.7
C15A	50	6.3	4.9	1.2	1.7
C15B	70	12.4	9.1	2.4	3.1
C15D	106	24.5	18	4.9	4.4
C15K	57	12.3	8.8	1.2	1.7
C16A	77	11	8.4	2.4	3.1
C16B	102	21.5	15.4	4.9	4.4
C16D	180	42.5	30.2	12.3	8.7
C16K	94	5	15.3	2.4	3.1
C17A	107	17.4	13.3	4.9	4.3
C17B	150	34.3	24.5	4.6	4.3
C17D	252	68	48.9	15.3	8.7
C17K	148	34.3	24.5	4.6	4.3
C18A	113	23.1	17.9	6.2	4.3
C18B	170	24.6	33.7	12.3	8.7
C18D	291	87	65.7	15.3	9.5
C18K	172	45	33	6.2	4.3
C19A	175	41.7	25.8	12.3	8.7
C19B	286	65.9	47.6	12.3	8.7
C19DL	406	131.9	93.6	12.3	8.7
C19K	270	67.2	47.6	12.3	8.7
C1AA	215	37.4	38.8	12.3	8.7
C1AB	355	74.4	72.4	15.3	9.5
C1AK	301	74.4	71.4	12.3	8.7
C1BA	349	64.5	68.1	15.3	9.5
C1BB	650	130	132.5	21.7	35.4
C1BK	473	122.9	126.8	15.3	9.5
C1CA	650	85	129.1	21.7	35.4
C1CB	950	186.1	263.6	21.9	35.4
C1CK	950	186.1	263.8	21.9	35.4
C1DA	680	121.4	171.3	21.7	35.4
C1DB	862	176	186	21.7	35.4
C1EB	1213	451	262	21.7	35.4

Model	Weight (lb)				
	Pump	Stator	Rotor	Coupling Rod/Joint	Shaft
C21B	27.6	2.6	0.9	0.4	1.3
C21D	32.0	5.7	1.8	0.4	1.3
C22A	27.6	2.6	0.9	0.4	1.3
C22B	32.0	5.7	1.8	0.4	1.3
C22D	50.7	12.1	3.5	0.9	1.5
C23A	39.7	2.9	3.3	0.9	1.5
C23B	44.1	5.7	3.3	0.9	1.5
C23K	44.1	5.7	3.3	0.9	1.5
C13D	70.5	11.7	6.4	2.6	3.7
C2XA	61.7	4.6	3.5	0.9	1.5
C2XB	68.3	12.3	6.2	0.9	1.5
C1XD	125.7	22.9	12.1	5.7	6.8
C1XK	70.5	11.2	6.0	0.9	1.5
C14A	75.0	7.7	5.7	2.6	3.7
C14B	101.4	15.7	9.9	2.6	3.7
C14D	158.7	30.9	20.3	5.3	6.8
C14K	92.6	15.7	9.9	2.6	3.7
C15A	110.2	13.9	10.8	2.6	3.7
C15B	154.3	27.3	20.1	5.3	6.8
C15D	233.7	54.0	39.7	10.8	9.7
C15K	125.7	27.1	19.4	2.6	3.7
C16A	169.8	24.3	18.5	5.3	6.8
C16B	224.9	47.4	34.0	10.8	9.7
C16D	396.8	93.7	66.6	27.1	19.2
C16K	207.2	11.0	33.7	5.3	6.8
C17A	235.9	38.4	29.3	10.8	9.5
C17B	330.7	75.6	54.0	10.1	9.5
C17D	555.6	149.9	107.8	33.7	19.2
C17K	326.3	75.6	54.0	10.1	9.5
C18A	249.1	50.9	39.5	13.7	9.5
C18B	374.8	54.2	74.3	27.1	19.2
C18D	641.5	191.8	144.8	33.7	20.9
C18K	379.2	99.2	72.8	13.7	9.5
C19A	385.8	91.9	56.9	27.1	19.2
C19B	630.5	145.3	104.9	27.1	19.2
C19DL	895.1	290.8	206.4	27.1	19.2
C19K	595.2	148.2	104.9	27.1	19.2
C1AA	474.0	82.5	85.5	27.1	19.2
C1AB	782.6	164.0	159.6	33.7	20.9
C1AK	663.6	164.0	157.4	27.1	19.2
C1BA	769.4	142.2	150.1	33.7	20.9
C1BB	1433.0	286.6	292.1	47.8	78.0
C1BK	1042.8	270.9	279.5	33.7	20.9
C1CA	1433.0	187.4	284.6	47.8	78.0
C1CB	2094.4	410.3	581.1	48.3	78.0
C1CK	2094.4	410.3	581.6	48.3	78.0
C1DA	1499.1	267.6	377.7	47.8	78.0
C1DB	1900.4	388.0	410.1	47.8	78.0
C1EB	2674.2	994.3	577.6	47.8	78.0

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

C1XK AND ABOVE EXCLUDING 4 - STAGE MODELS

DRG. REF.	DESCRIPTION
01A	BODY-STD C.I.
06A	NAMEPLATE (SOG)
06B	NAMEPLATE (DOG)
10A	MECHANICAL SEAL
15A	THROWER GUARD
20B	GASKET-GLAND
22A	STATOR
23A	SUCTION CHAMBER
23B	SUCT CHAMB EXTENSION
24A	END COVER
25A	ROTOR
26A	COUPLING ROD
28A	SEALING COVER
28B	SEALING COVER
28C	BOOT PROTECTOR
29A	COUPLING ROD PIN
29B	COUPLING ROD PIN
29C	SHAFT PIN
32A	DRIVE SHAFT
42A	THROWER
47A	ADAPTOR PLATE
47B	ADAPTOR PLATE
62A	SUPPORT FOOT
65A	MECH SEAL CARRIER
66A	ABUTMENT RING
74A	SLEEVE (ROTOR-SHAFT)
74B	SLEEVE (ROTOR-SHAFT)
95A	TIE ROD

DRG. REF.	DESCRIPTION
P104	HEX. HD. BOLT
P105	HEX. NUT
P106	PLAIN WASHER
P107	SNGL. COIL SPR. WASHER

DRG. REF.	DESCRIPTION
P109	HEX NUT
P201	TAPER PLUG
P202	TAPER PLUG
P203	HEX. SOC. SETSCREW
P401	TORL SEAL RING
P402	TORL SEAL RING
P403	SPIRAL RET.RING
P404	SPIRAL RET.RING
P405	TIE-SEALING COVER
P406	TIE SEALING COVER
P501	TAPER PLUG
P502	TAPER PLUG
P503	HEX. NUT
P504	PLAIN WASHER
P505	SNGL. COIL SPR. WASHER
P506	HEX. NUT
P507	PLAIN WASHER
P508	SNGL. COIL SPR. WASHER
P509	TORL SEAL RING
P510	TORL SEAL RING
P519	TAPER PLUG
P520	HEX. HD. BOLT
P521	HEX. NUT
P522	PLAIN WASHER
P523	SNGL. COIL SPR. WASHER
P601	HEX HD BOLT
P602	SNGL. COIL SPR. WASHER
P603	PLAIN WASHER
P604	HEX. NUT
P610	CAP HEAD BOLT

4 - STAGE MODELS C13D TO C18D

DRG. REF.	DESCRIPTION	DRG. REF.	DESCRIPTION
01A	BODY-STD C.I.	P405	TIE-SEALING COVER
01B	BEARING HOUSING	P406	TIE SEALING COVER
01C	BODY ADAPTOR		
06A	NAMEPLATE (SOG)	P501	HEX NUT
06B	NAMEPLATE (DOG)	P502	SNGL. COIL SPR. WASHER
10A	MECHANICAL SEAL/GLAND PACKING	P503	PLAIN WASHER
15A	THROWER GUARD	P504	PLAIN WASHER
20A	GASKET-GLAND	P505	SNGL. COIL SPR. WASHER
20B	GASKET-GLAND	P506	HEX NUT
22A	STATOR	P507	HEX. HD. SCREW
23A	SUCTION CHAMBER	P508	PLAIN WASHER
23B	SUCT CHAMB EXTENSION	P509	PLAIN WASHER
24A	END COVER	P510	SNGL. COIL SPR. WASHER
25A	ROTOR	P511	HEX. NUT
26A	COUPLING ROD	P512	STUD
28A	SEALING COVER	P513	PLAIN WASHER
28B	SEALING COVER	P514	SNGL. COIL SPR. WASHER
28C	BOOT PROTECTOR	P515	HEX. NUT
29A	COUPLING ROD PIN	P516	HEX. HEAD SCREW
29B	COUPLING ROD PIN	P517	PLAIN WASHER
29C	SHAFT PIN	P518	PLAIN WASHER
32A	DRIVE SHAFT	P519	SNGL. COIL SPR. WASHER
42A	THROWER	P520	HEX NUT
62A	SUPPORT FOOT	P522	PLAIN WASHER
65A	MECH SEAL CARRIER/GLAND SECTION	P526	TAPER PLUG
66A	ABUTMENT RING	P527	TAPER PLUG
75A	SLEEVE (ROTOR-SHAFT)	P528	TAPER PLUG
75B	SLEEVE (ROTOR-SHAFT)	P529	SEAL RING
76A	ADAPTOR FLANGE	P530	STUD
95A	TIE ROD	P531	SNGL. COIL SPR. WASHER
		P532	PLAIN WASHER
P104	HEX. HD. BOLT	P533	HEX. NUT
P105	HEX. NUT	P534	STUD
P106	PLAIN WASHER	P535	HEX. NUT
P107	SNGL. COIL SPR. WASHER	P536	PLAIN WASHER
P108	SNGL. COIL SPR. WASHER	P537	SNGL. COIL SPR. WASHER
P109	HEX. NUT	P538	TOROIDAL SEAL RING
		P539	TOROIDAL SEAL RING
P201	TAPER PLUG		
P202	TAPER PLUG	P601	HEX HD BOLT
		P602	SNGL. COIL SPR. WASHER
P401	TORL SEAL RING	P603	PLAIN WASHER
P402	TORL SEAL RING	P604	HEX NUT
P403	SPIRAL RET.RING	P610	CAP HEAD BOLT
P404	SPIRAL RET.RING		

C19DL

DRG. REF.	DESCRIPTION	DRG. REF.	DESCRIPTION
01A	BODY-STD C.I.	P107	SNGL. COIL SPR. WASHER
01B	BODY ADAPTOR	P108	SNGL. COIL SPR. WASHER
06A	NAMEPLATE (SOG)	P109	HEX. NUT
06B	NAMEPLATE (DOG)	P110	PLAIN WASHER
10A	MECHANICAL SEAL		
15A	THROWER GUARD	P201	PLUG
20B	GASKET-GLAND	P202	PLUG
22A	STATOR	P203	SOC. SET SCREW
23A	SUCTION CHAMBER		
23B	SUCT CHAMB EXTENSION	P401	SEAL
24A	END COVER	P402	SEAL
25A	ROTOR	P403	SPIRAL RETAINING RING
26A	FLEXISHAFT	P404	SPIRAL RETAINING RING
28A	SEALING COVER	P405	TIE
28B	SEALING COVER	P406	TIE
29A	COUPLING ROD PIN		
29C	SHAFT PIN	P501	TAPER PLUG
32A	DRIVE SHAFT	P502	TAPER PLUG
42A	THROWER	P503	HEX. NUT
47A	STATOR SUPPORT RING	P504	PLAIN WASHER
47B	STATOR SUPPORT RING	P505	SPRING WASHER
62A	SUPPORT FOOT	P506	HEX. NUT
62B	SUPPORT FOOT	P507	PLAIN WASHER
65A	GLAND SECTION	P508	SNGL. COIL SPR. WASHER
66A	ABUTMENT RING	P509	SEAL
75A	SLEEVE ROTOR	P511	HEX. HD. BOLT
75B	SLEEVE ROTOR	P512	SNGL. COIL SPR. WASHER
76A	ADAPTOR FLANGE	P513	PLAIN WASHER
95A	TIE ROD	P514	HEX NUT
		P515	PLAIN WASHER
P101	HEX. HEAD SCREW	P518	PLAIN WASHER
P102	PLAIN WASHER	P519	HEX. HD. BOLT
P103	RD HD DRIVESCREW	P520	SNGL. COIL SPR. WASHER
P104	HEX. HEAD BOLT	P521	PLAIN WASHER
P105	HEX. NUT	P522	HEX. NUT
P106	PLAIN WASHER	P523	PLUG

C2XB AND BELOW EXCLUDING 4-STAGE MODELS

DRG. REF.	DESCRIPTION	DRG. REF.	DESCRIPTION
01A	BODY-STD C.I.	P106	PLAIN WASHER
06A	NAMEPLATE (SOG)	P107	SNGL. COIL SPR. WASHER
06B	NAMEPLATE (DOG)	P108	PLAIN WASHER
10A	MECHANICAL SEAL	P109	HEX NUT
15A	THROWER GUARD		
20A	GASKET-GLAND	P201	TAPER PLUG
20B	GASKET-GLAND	P202	TAPER PLUG
20C	SEAL RING		
22A	STATOR	P401	TORL SEAL RING
23A	SUCTION CHAMBER	P402	TORL SEAL RING
23B	SUCT CHAMB EXTENSION	P403	SPIRAL RET.RING
24A	END COVER	P404	SPIRAL RET.RING
25A	ROTOR	P405	TIE-SEALING COVER
26A	COUPLING ROD	P406	TIE SEALING COVER
28A	SEALING COVER		
28B	SEALING COVER	P501	TAPER PLUG
28C	BOOT PROTECTOR	P502	TAPER PLUG
29A	COUPLING ROD PIN	P503	TAPER PLUG
29B	COUPLING ROD PIN	P504	HEX. NUT
29C	SHAFT PIN	P505	SNGL. COIL SPR. WASHER
32A	DRIVE SHAFT	P506	PLAIN WASHER
42A	THROWER	P507	HEX. NUT
47A	ADAPTOR PLATE	P508	SNGL. COIL SPR. WASHER
47B	ADAPTOR PLATE	P509	PLAIN WASHER
62A	SUPPORT FOOT	P510	HEX. HD. BOLT
65A	MECH SEAL CARRIER	P511	SNGL. COIL SPR. WASHER
66A	ABUTMENT RING	P512	PLAIN WASHER
75A	SLEEVE	P513	HEX. NUT
75B	SLEEVE	P515	SEAL RING
95A	TIE ROD		
		P601	HEX HD BOLT
P101	HEX. HD. BOLT	P602	SNGL. COIL SPR. WASHER
P102	PLAIN WASHER	P603	PLAIN WASHER
P104	HEX. HD. BOLT	P604	HEX. NUT
P105	HEX. NUT	P610	CAP HEAD BOLT

SQUARE INLET - ALL MODELS

DRG. REF.	DESCRIPTION
01A	BODY-STD C.I.
06A	NAMEPLATE (SOG)
10A	MECHANICAL SEAL
15A	THROWER GUARD
20A	INSPECTION COVER GASKET
20B	GLAND GASKET
22A	STATOR
23A	THROAT
24A	END COVER
25A	ROTOR
27A	COUPLING ROD BUSH
27B	COUPLING ROD BUSH
28A	SEALING BOOT
28B	SEALING BOOT
28C	BOOT PROTECTOR
29A	COUPLING ROD PIN
29B	COUPLING ROD PIN
29C	DRIVE SHAFT PIN
32A	DRIVE SHAFT
38A	CONVEYOR
42A	THROWER
59A	INSPECTION COVER
62A	SUPPORT FOOT
65A	GLAND SECTION
66A	ABUTMENT RING
75A	SHAFT SLEEVE
75B	ROTOR SLEEVE
95A	TIE ROD

DRG. REF.	DESCRIPTION
P101	HEX. HD. SCREW
P102	PLAIN WASHER
P103	STUD
P104	HEX. HD. BOLT
P105	HEX. NUT
P106	PLAIN WASHER
P107	SNGL. COIL SPR. WASHER
P108	SNGL. COIL SPR. WASHER
P109	HEX. NUT
P201	TAPER PLUG
P202	TAPER PLUG
P203	GRUB SCREW
P401	TORL SEAL RING
P402	TORL SEAL RING
P403	SPIRAL RET.RING
P404	SPIRAL RET.RING
P405	TIE-SEALING COVER
P406	TIE SEALING COVER
P501	TAPER PLUG
P503	HEX. NUT
P504	PLAIN WASHER
P505	SNGL. COIL SPR. WASHER
P610	CAP HEAD BOLT

Coding Sheet

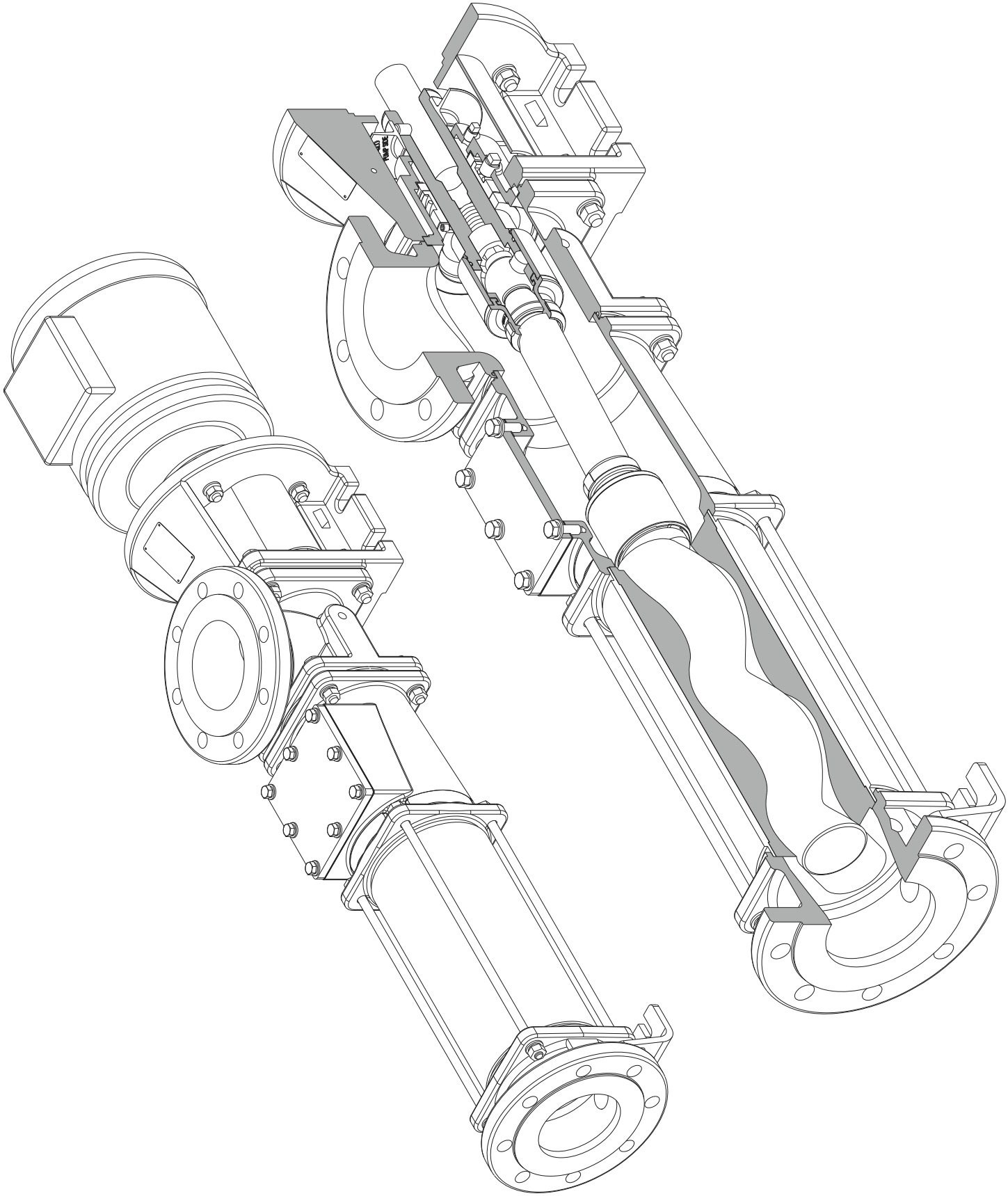
Range	Monobloc Compact	C														
	Monobloc Compact Square Inlet	S														
Design Mark No.	Monobloc		1													
	Monobloc (January 2007)		2													
Size	1.3m³/h (5.7 USGM) @ 1750 rpm			1												
	3.3m³/h (14.5 USGPM) @ 1750 rpm			2												
	10m³/h (44.1 USGPM) @ 1500 rpm			3												
	13m³/h (57.3 USGPM) @ 1000 rpm			X												
	22m³/h (96.9 USGPM) @ 1000 rpm			4												
	37m³/h (163.0 USGPM) @ 800 rpm			5												
	57m³/h (251.1 USGPM) @ 700 rpm			6												
	79m³/h (348.0 USGPM) @ 600 rpm			7												
	97m³/h (427.3 USGPM) @ 500 rpm			8												
	125m³/h (550.7 USGPM) @ 450 rpm			9												
	165m³/h (726.9 USGPM) @ 400 rpm			A												
	225m³/h (991.2 USGM) @ 350 rpm			B												
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 Mark No	MK 0 (Oversized)							0								
	MK 1 (Standard)							1								
	MK 3 (Temperature)							3								
	MK 5 (Temperature)							5								
	Light Duty							L								
Stator Mat'l	RA, RR etc.								R							
Seal Type	Mechanical Seal									M						
	Packed Gland									P						
Build Option	Refer to product manual section 2 & 3, drive selections										A					
											B					
											H					
/												/				
Variation	For special requirements contact your Supplier												A	1	2	3
Example		C	1	X	A	C	8	1	R	M	A					

C Range
Design MK 1
Size 0X
Single Stage
Cast Iron
Code 8 Rot Parts
MK1 Rotor
Nitrile Stator
Mechanical Seal
Build Option A

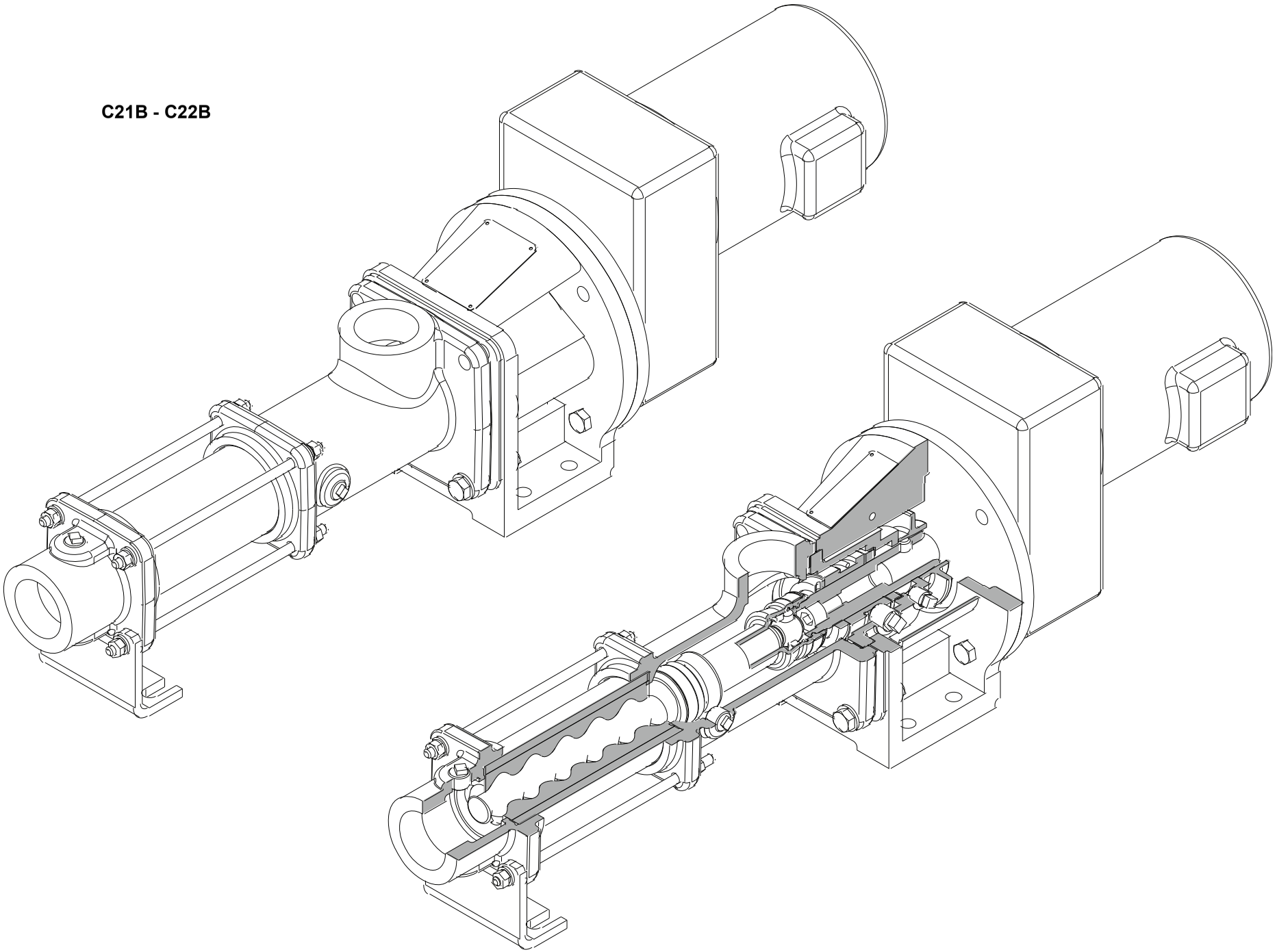
Note: Refer to Pre Selection Table for availability of pump models.

1 : For other material options please contact your Supplier.

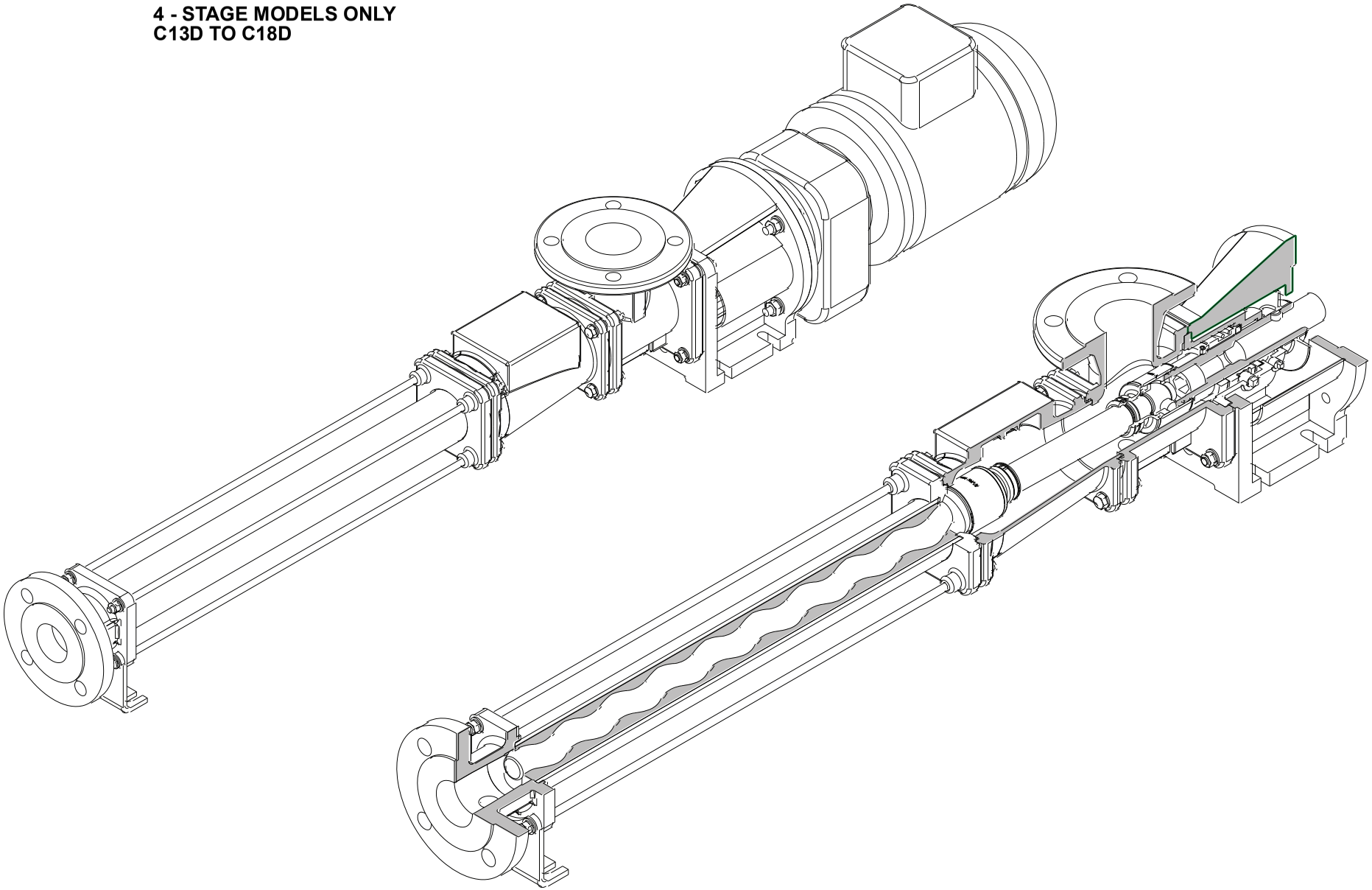
Full Pump and Quarter Assembly



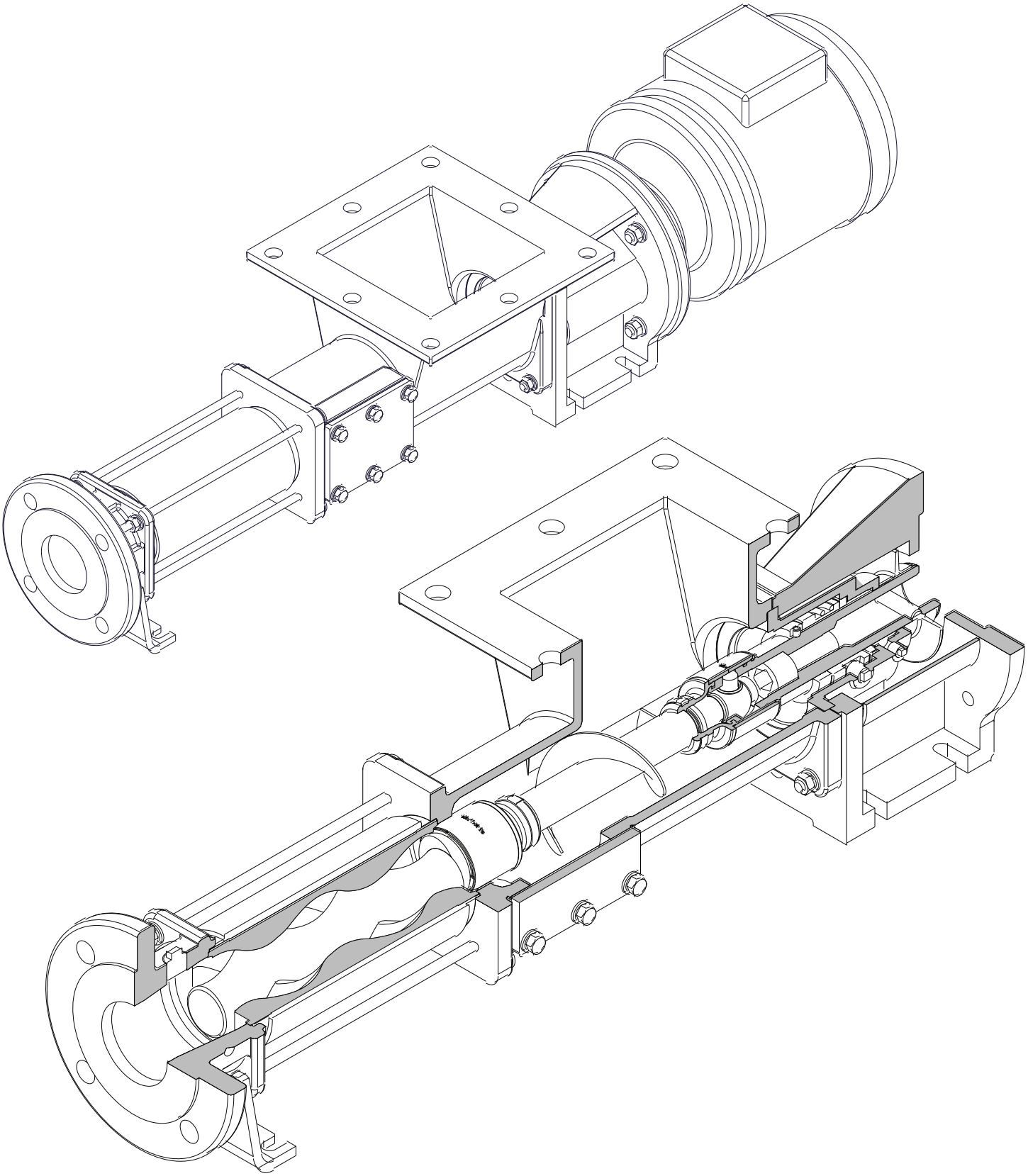
C21B - C22B



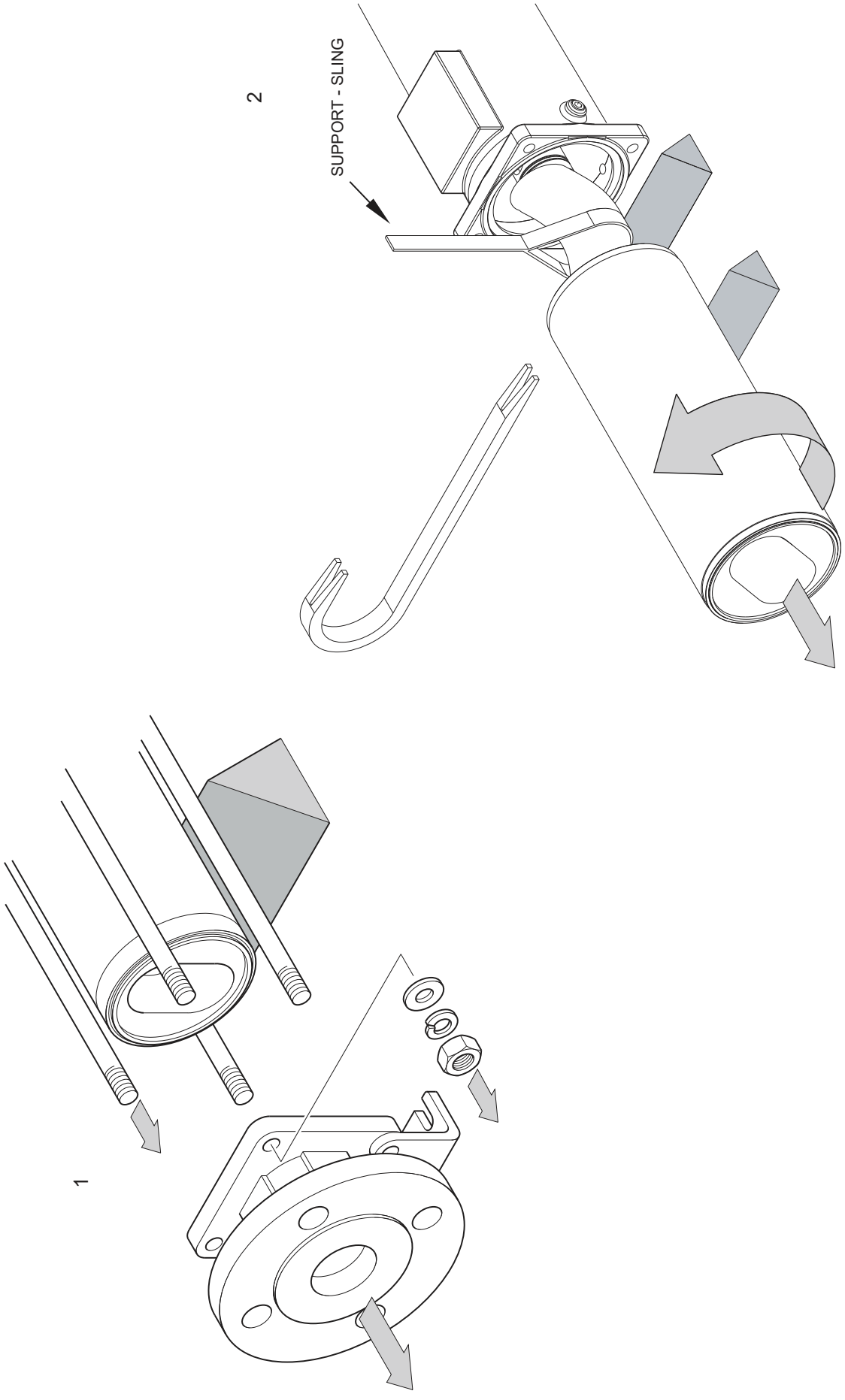
4 - STAGE MODELS ONLY
C13D TO C18D



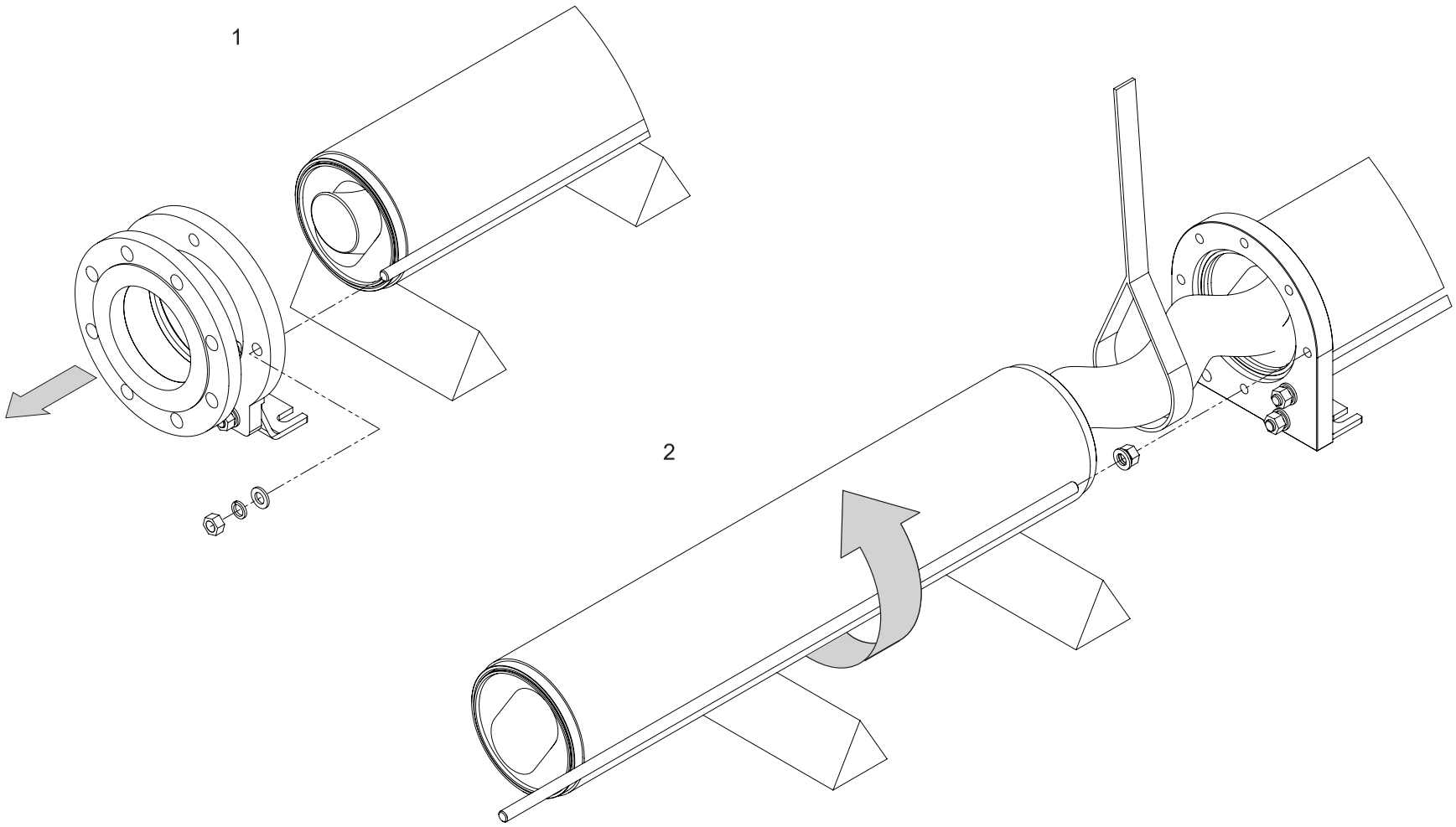
Full Pump and Quarter Assembly - Square Inlet



Dismantling

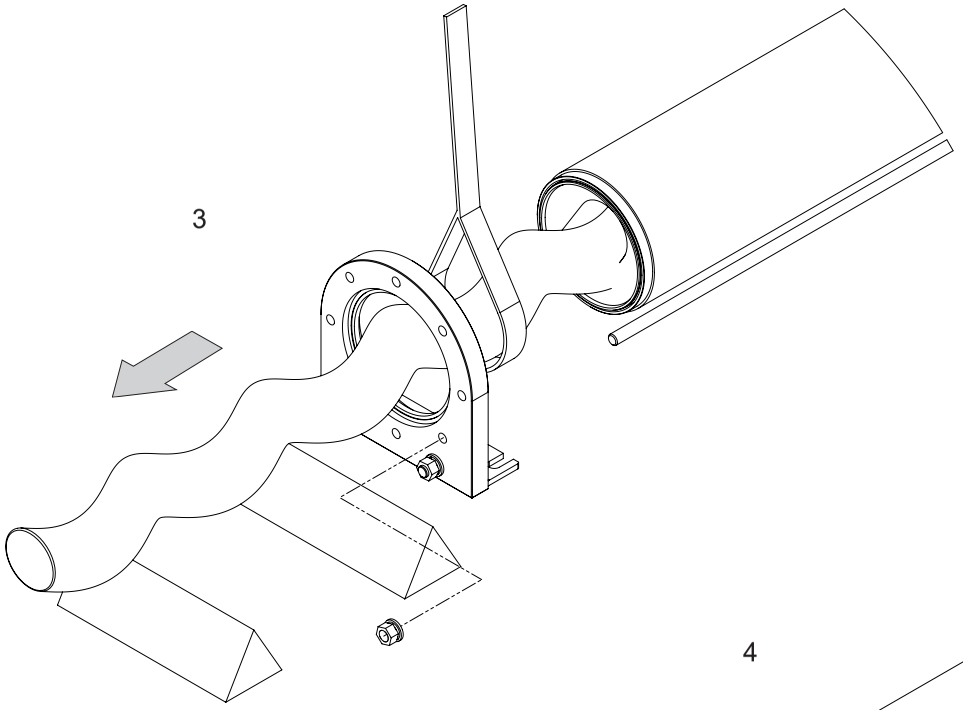


C19DL



C19DL

3



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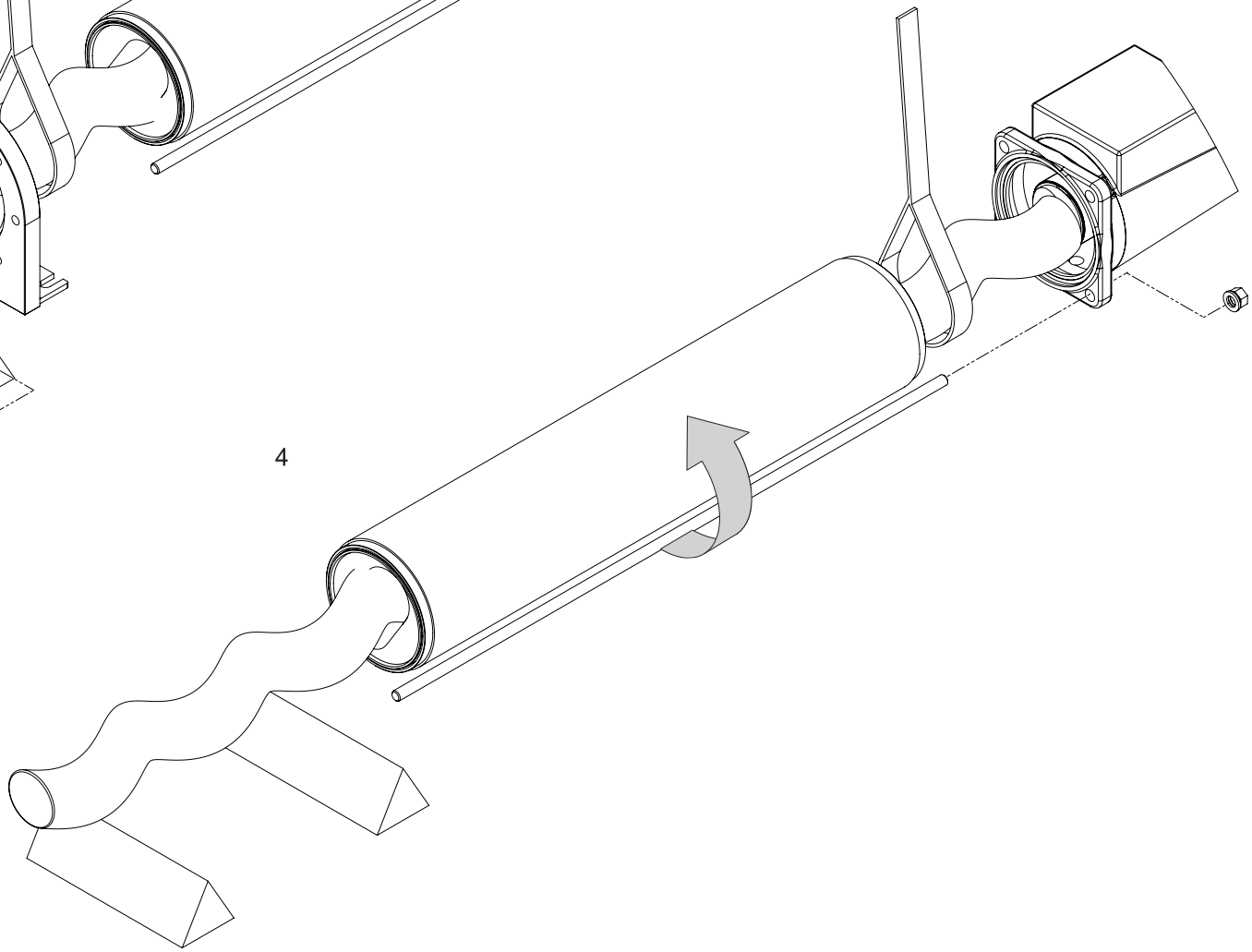
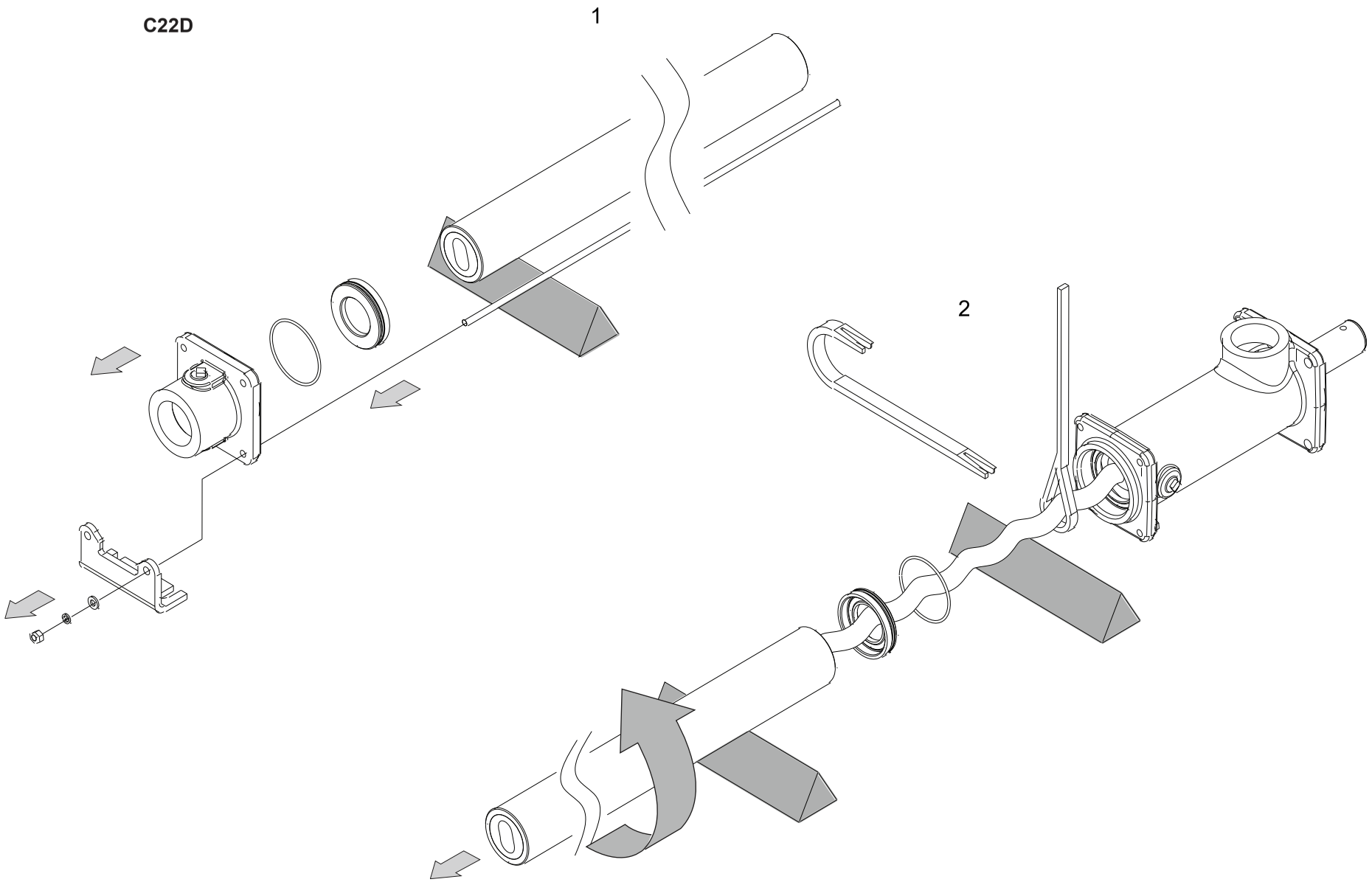
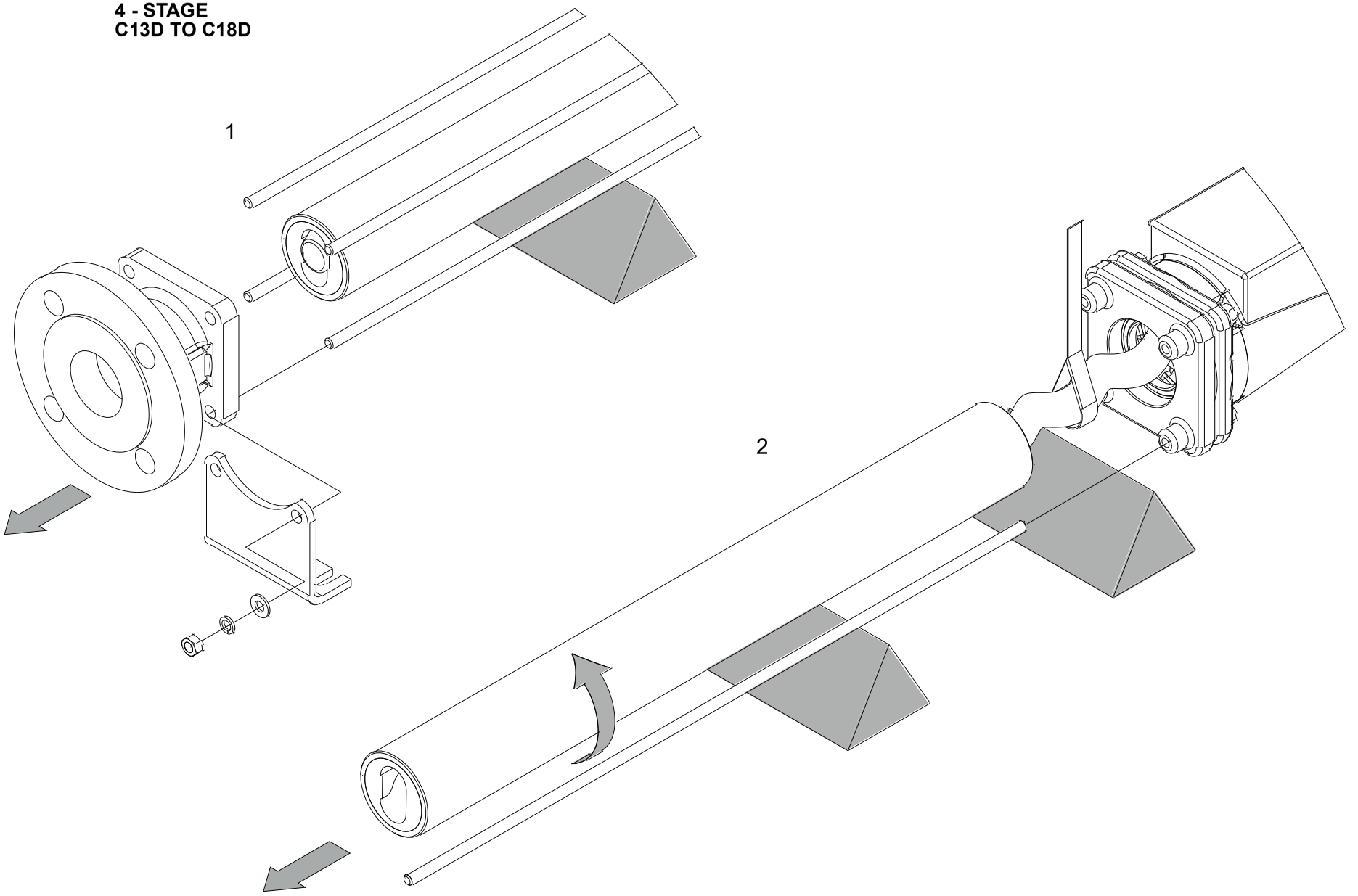


C22D

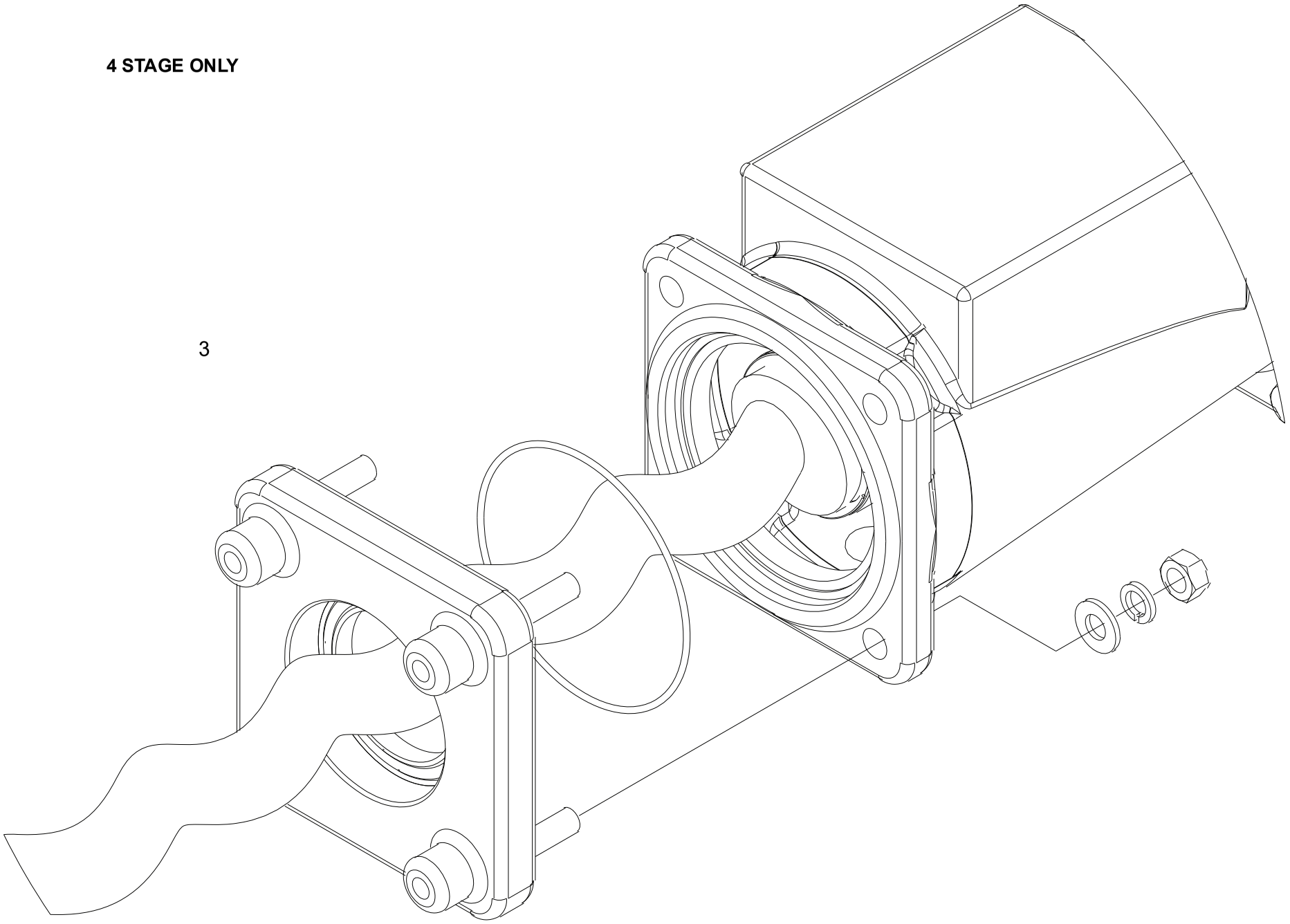


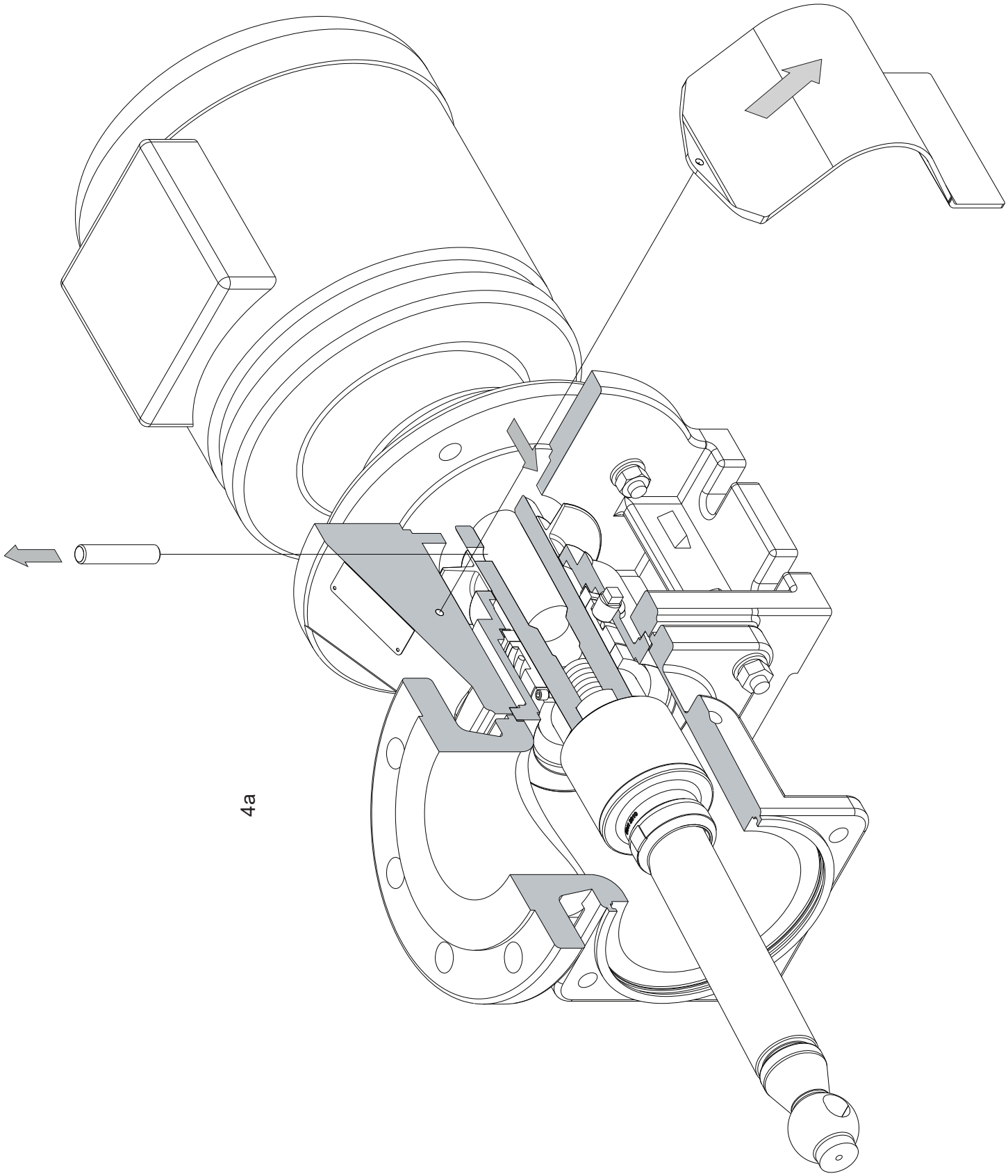
4 - STAGE
C13D TO C18D



4 STAGE ONLY

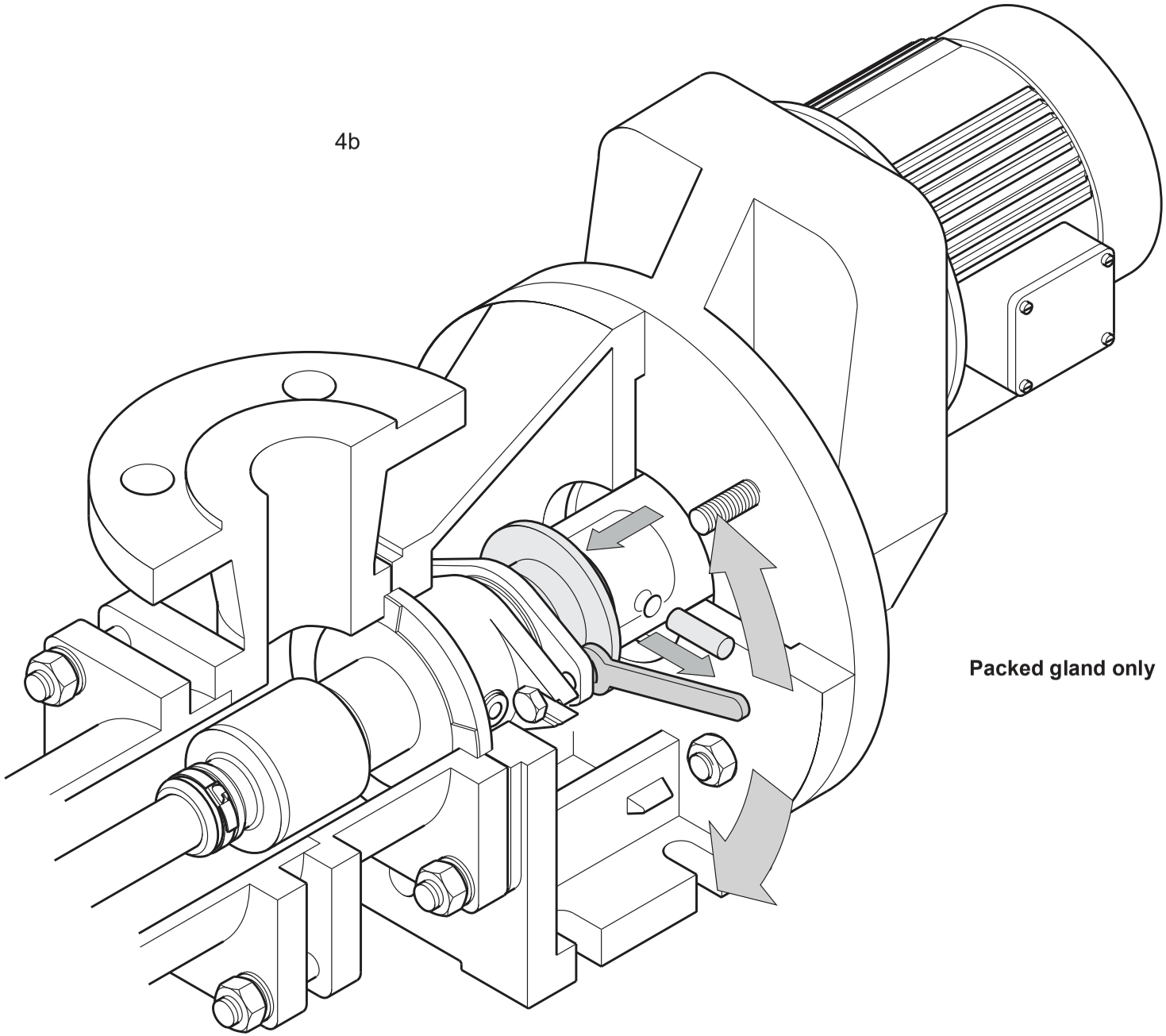
3





4a

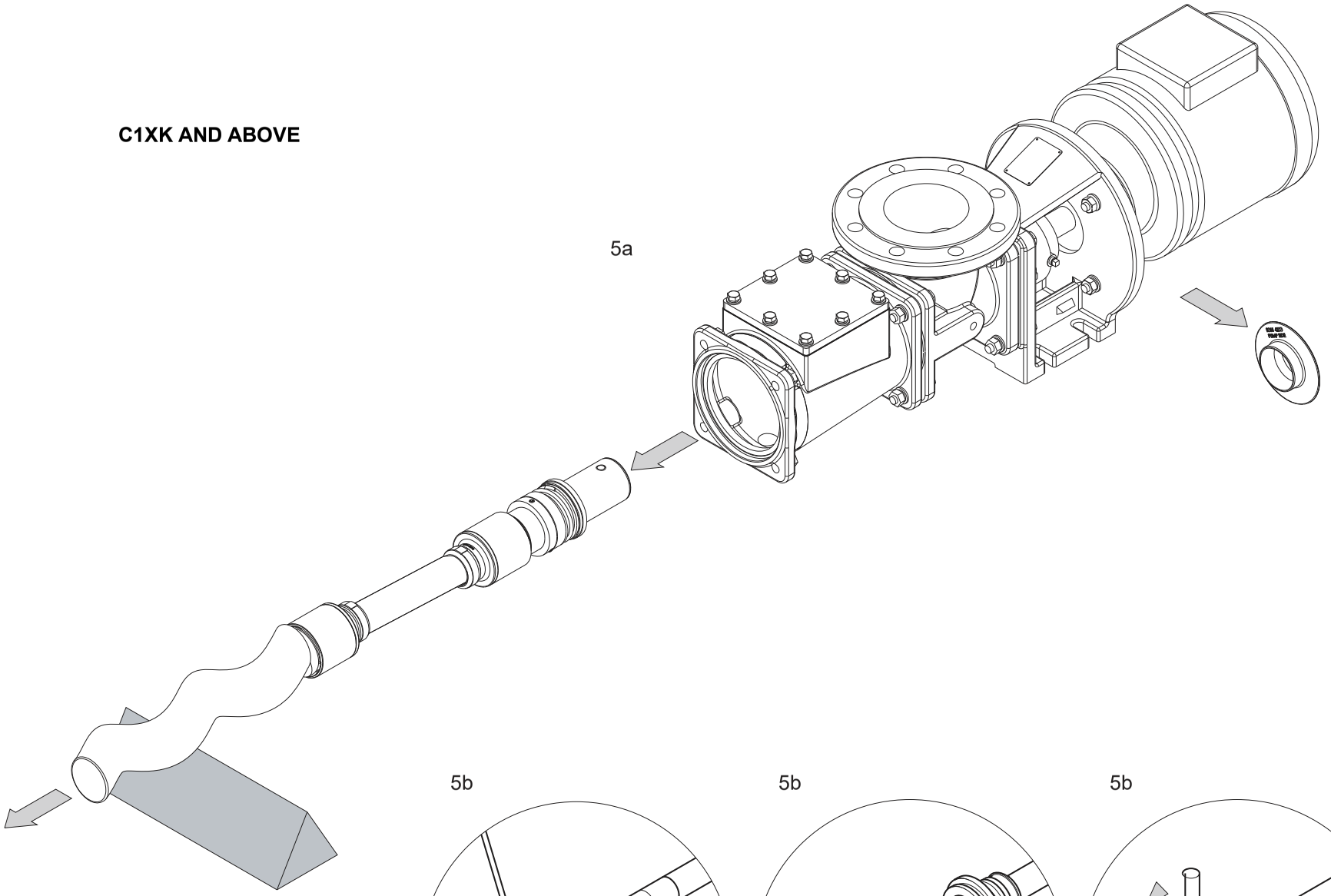
4b



Packed gland only

C1XK AND ABOVE

5a



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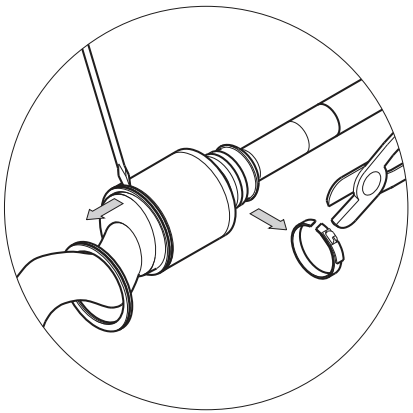

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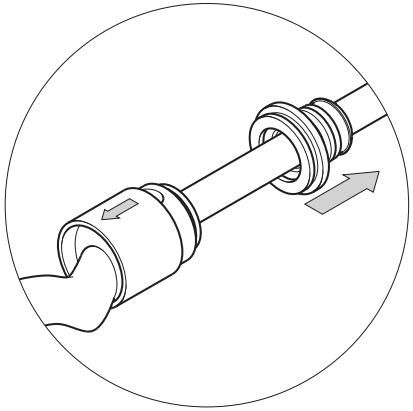

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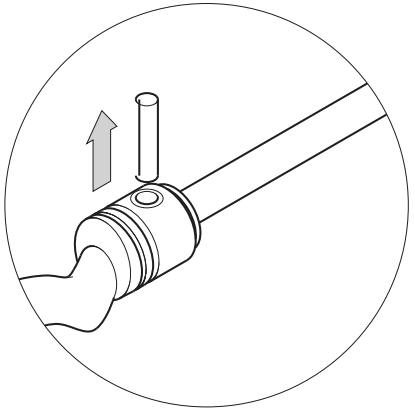
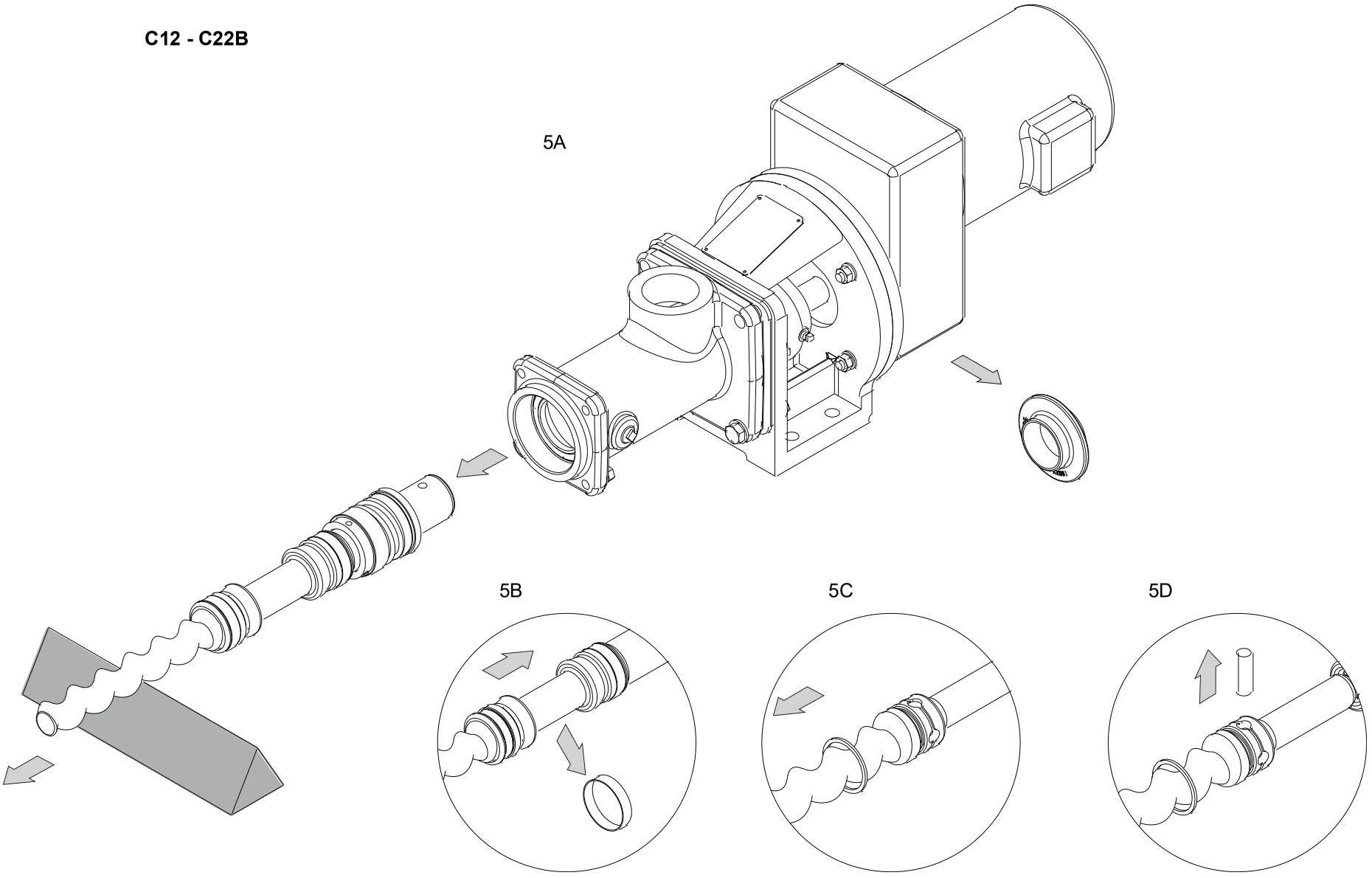
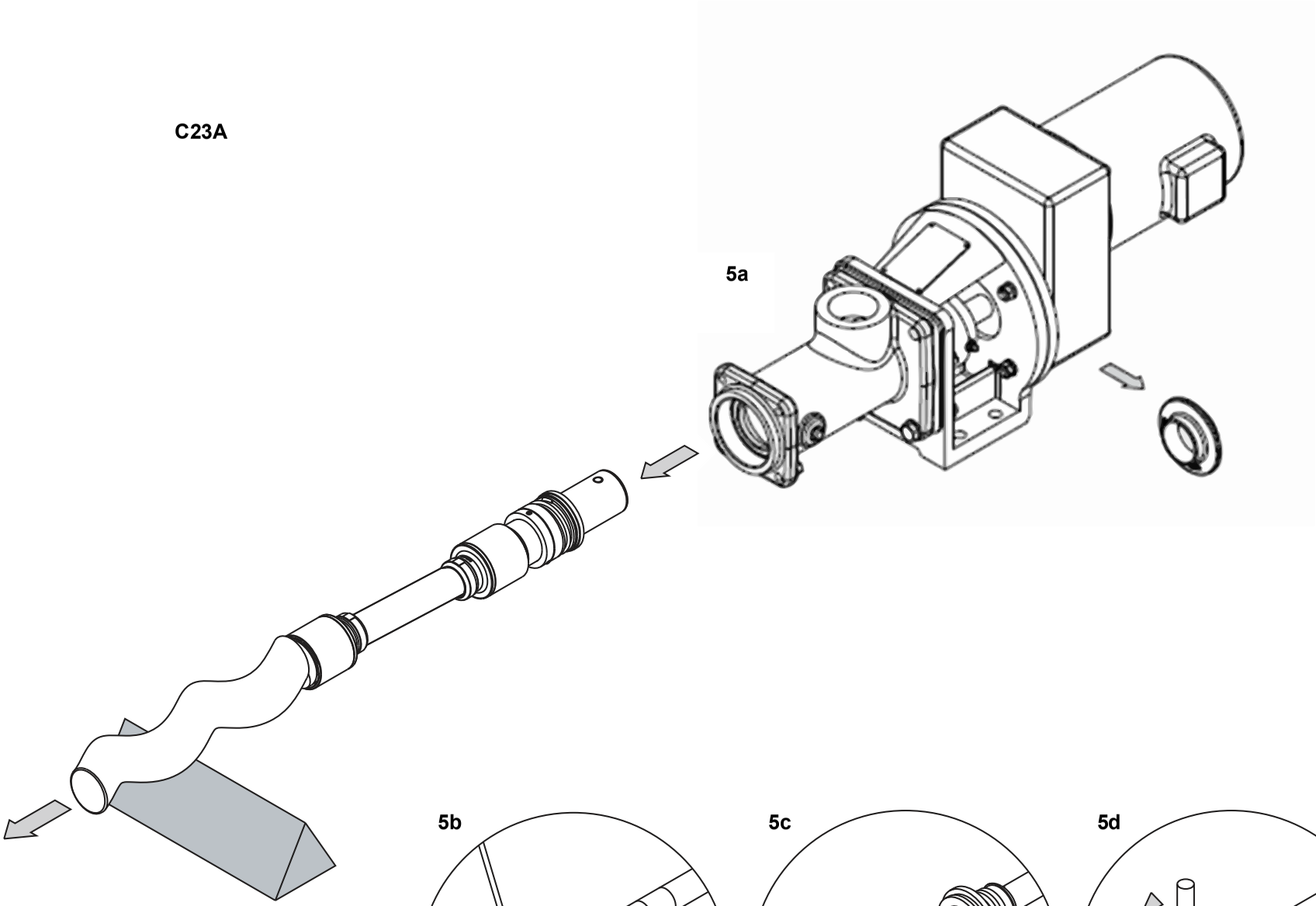
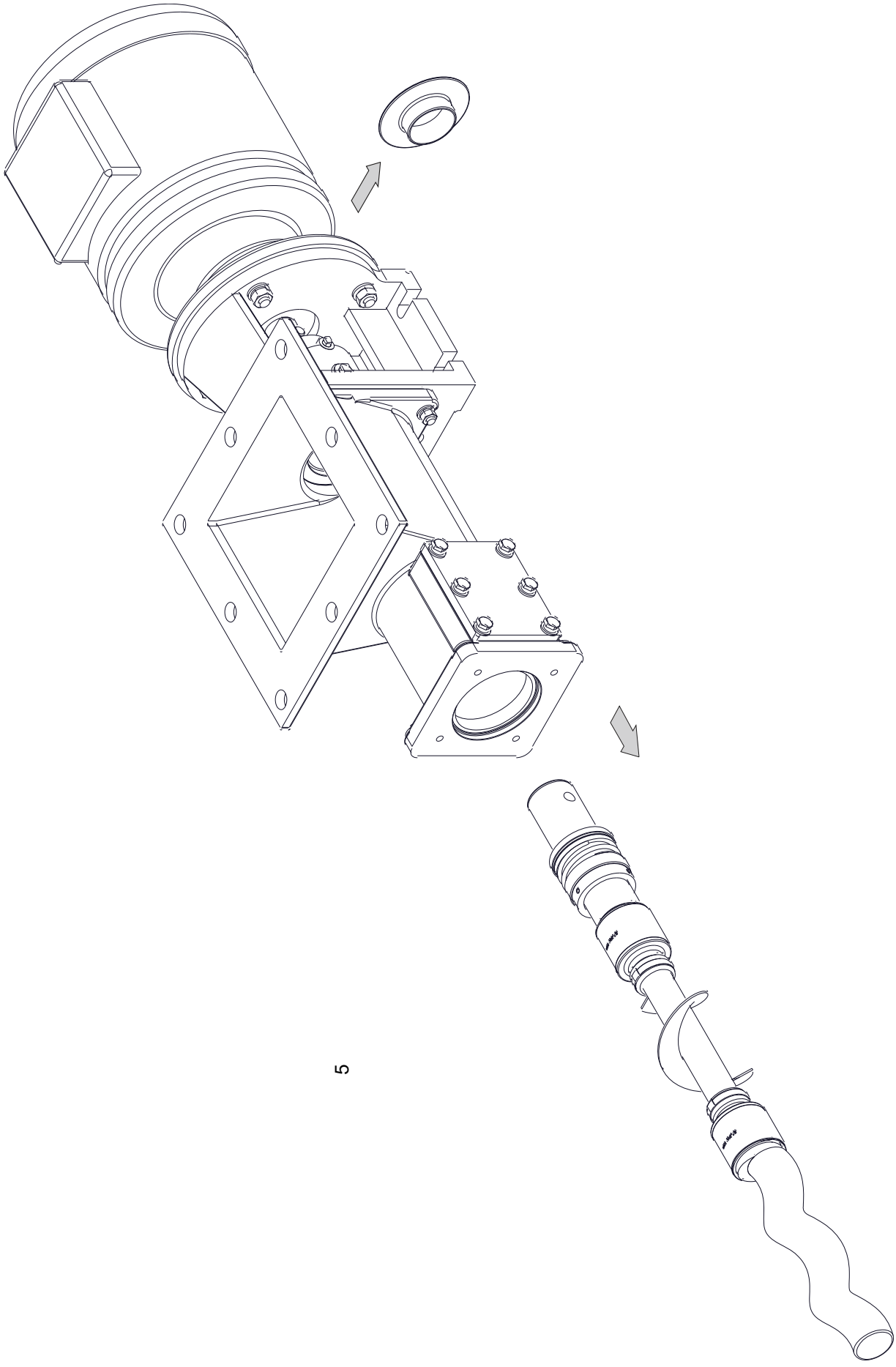


C12 - C22B



C23A

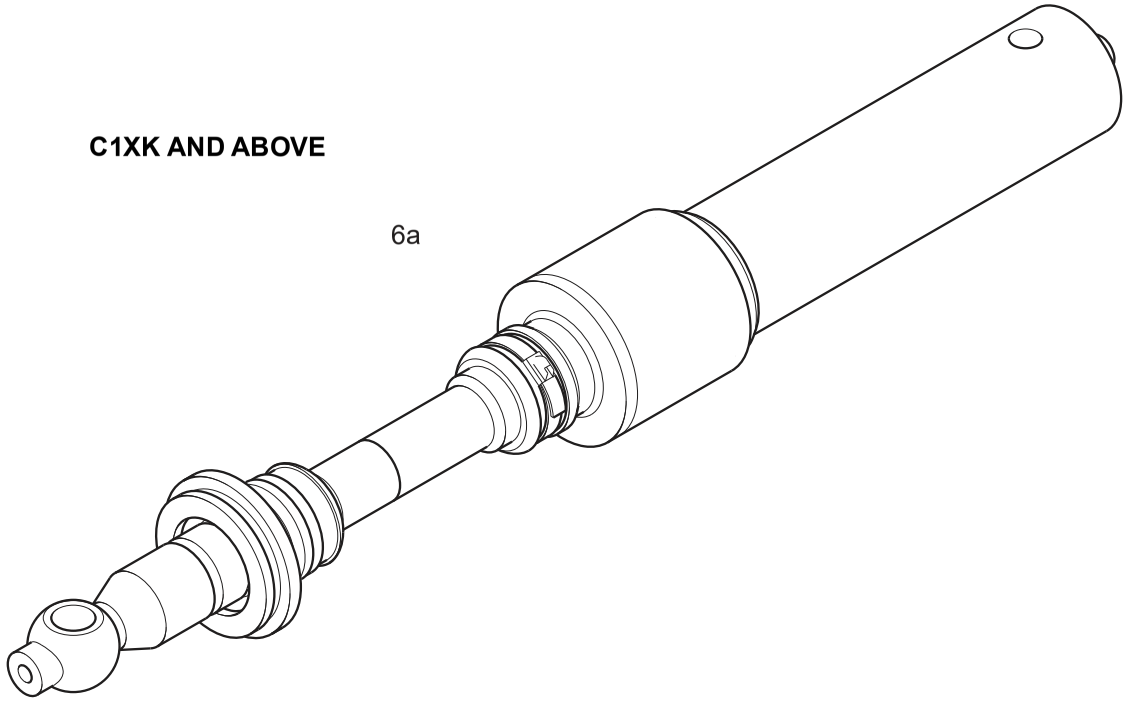




5

C1XK AND ABOVE

6a



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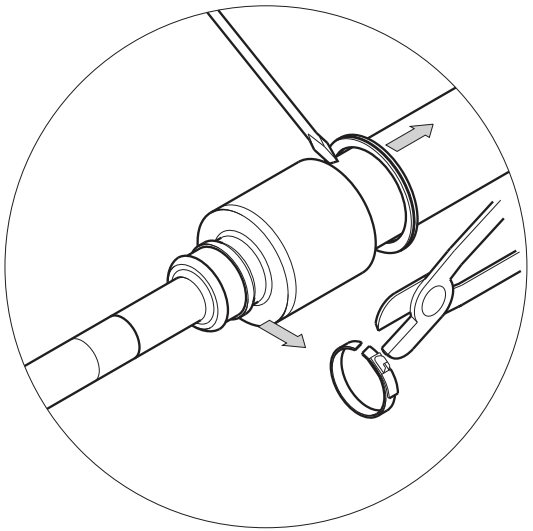

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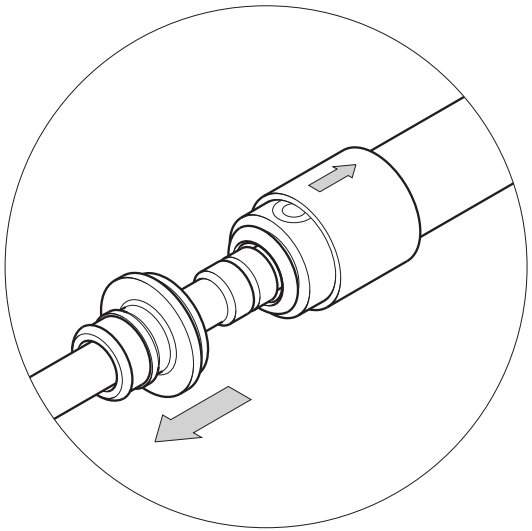

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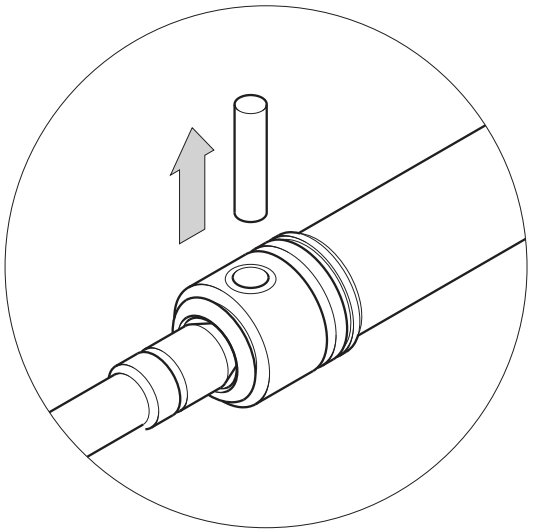
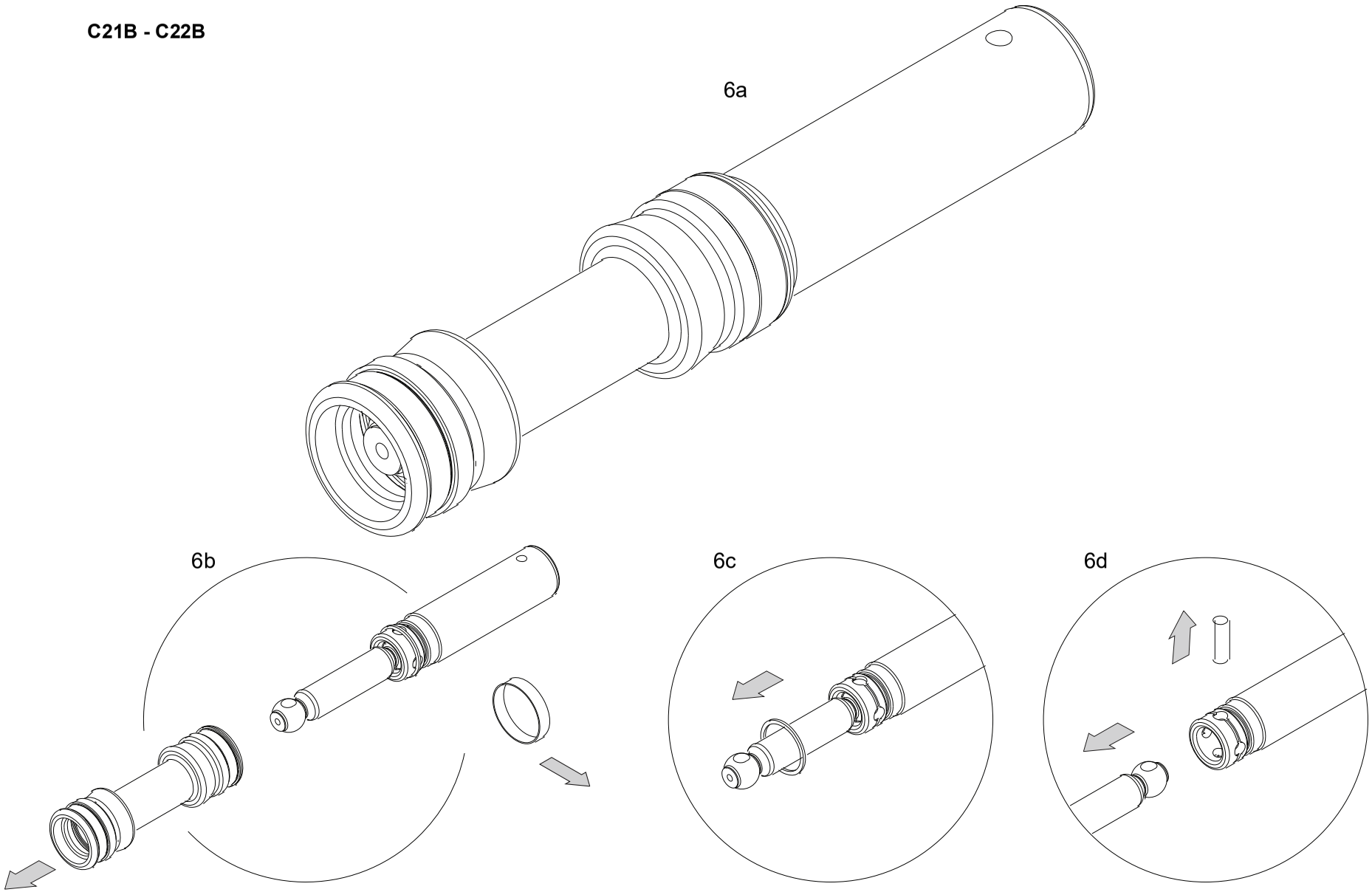


C21B - C22B



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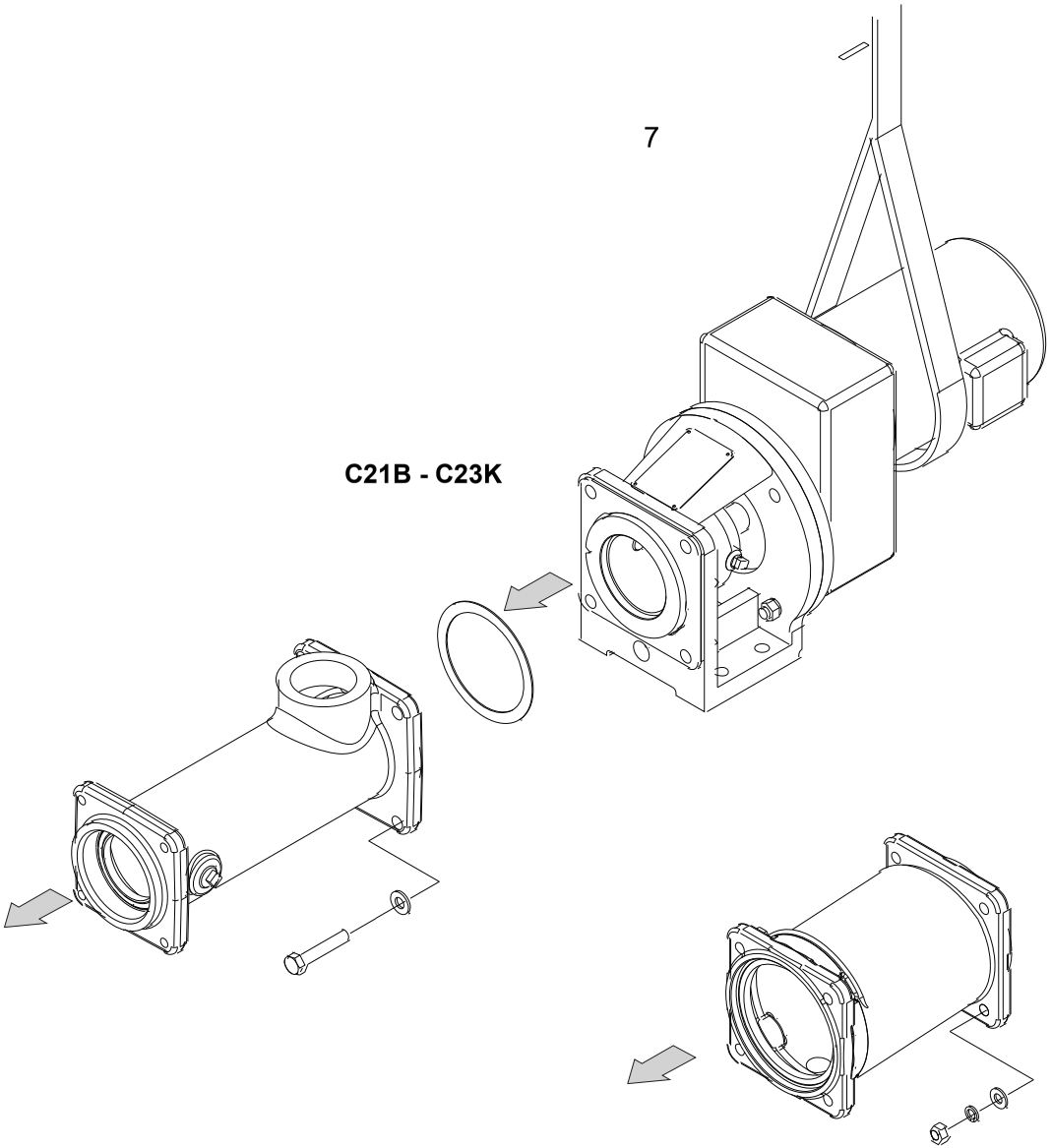
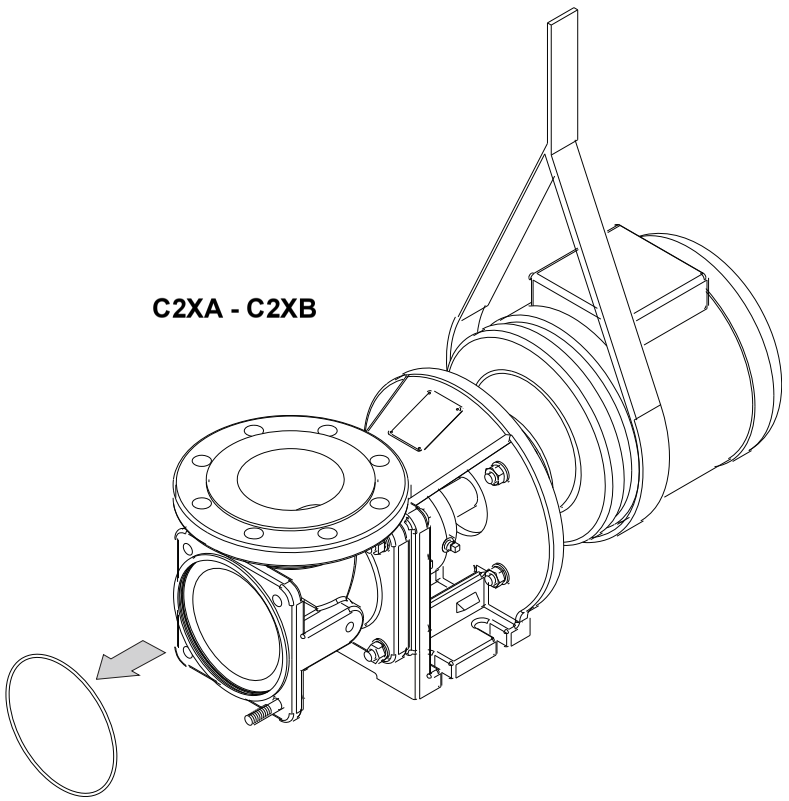
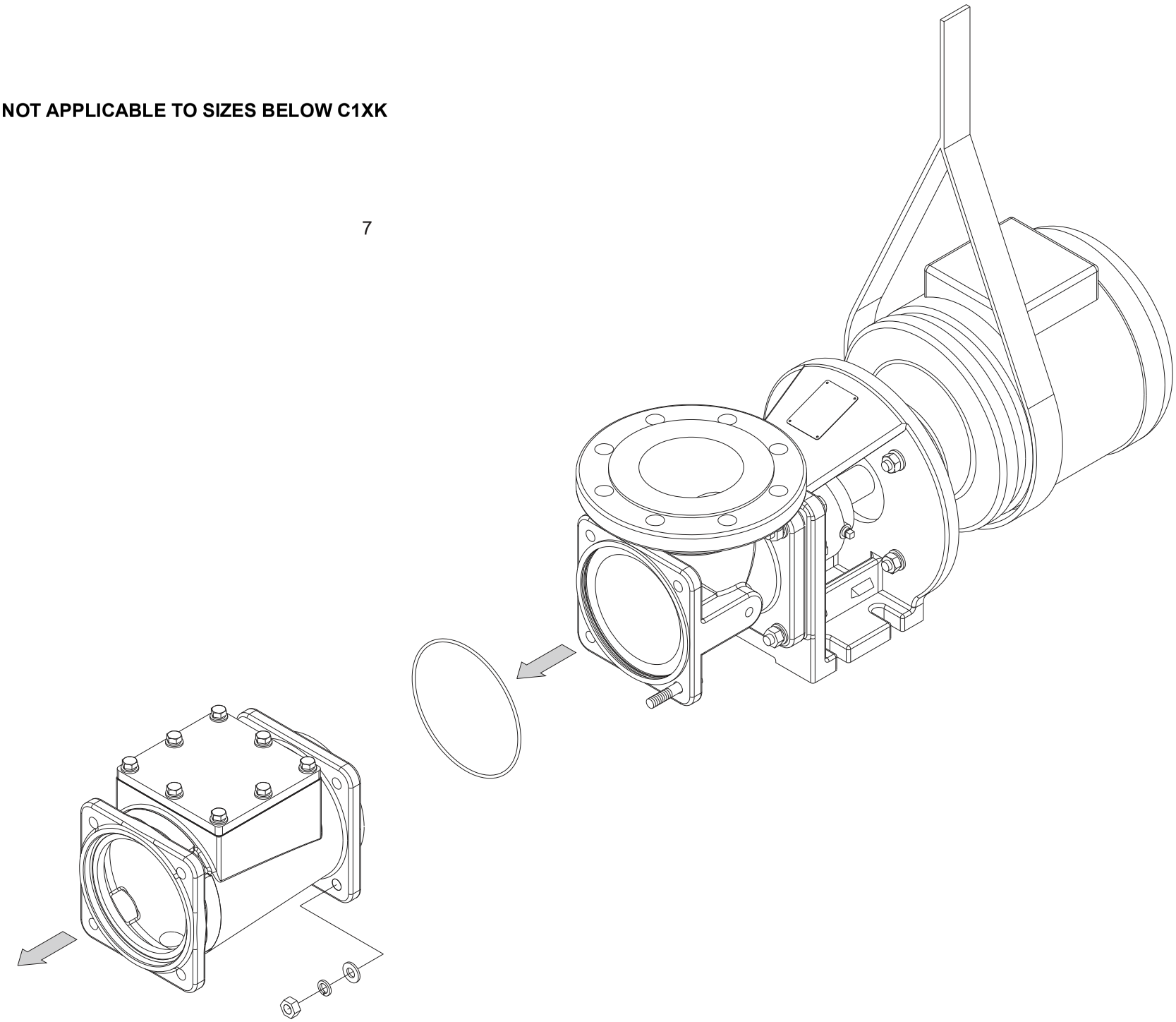
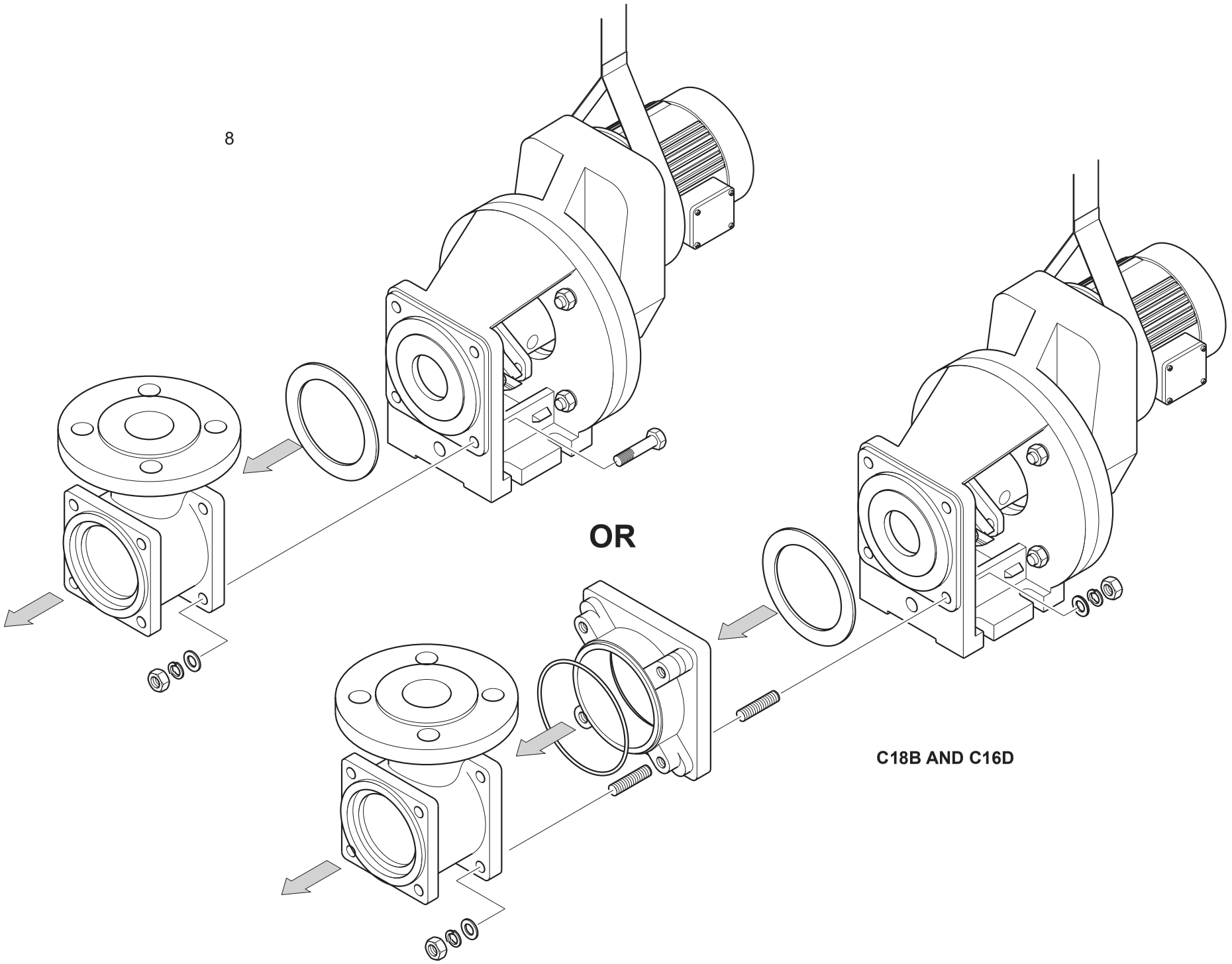


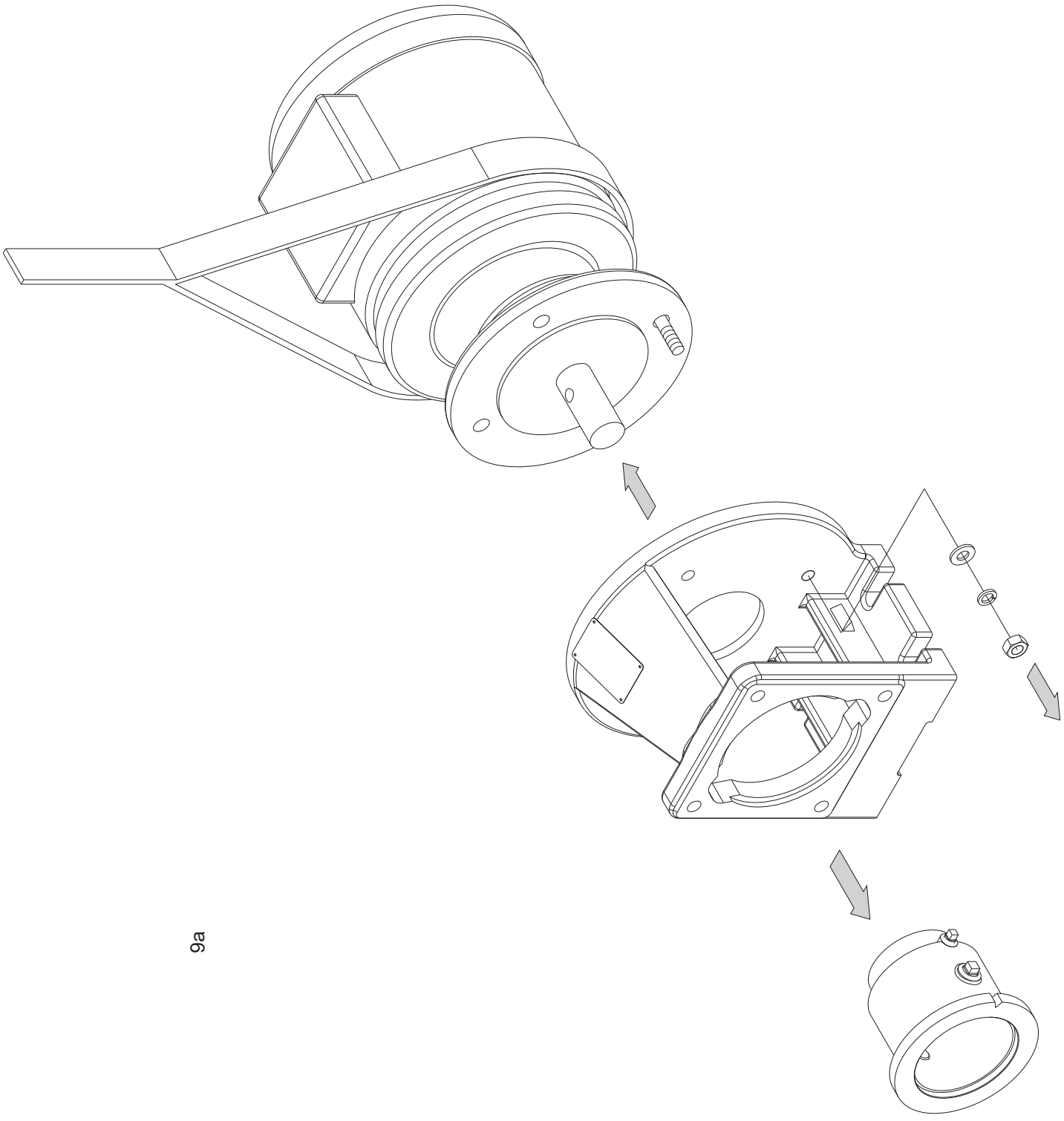


NOT APPLICABLE TO SIZES BELOW C1XK

7

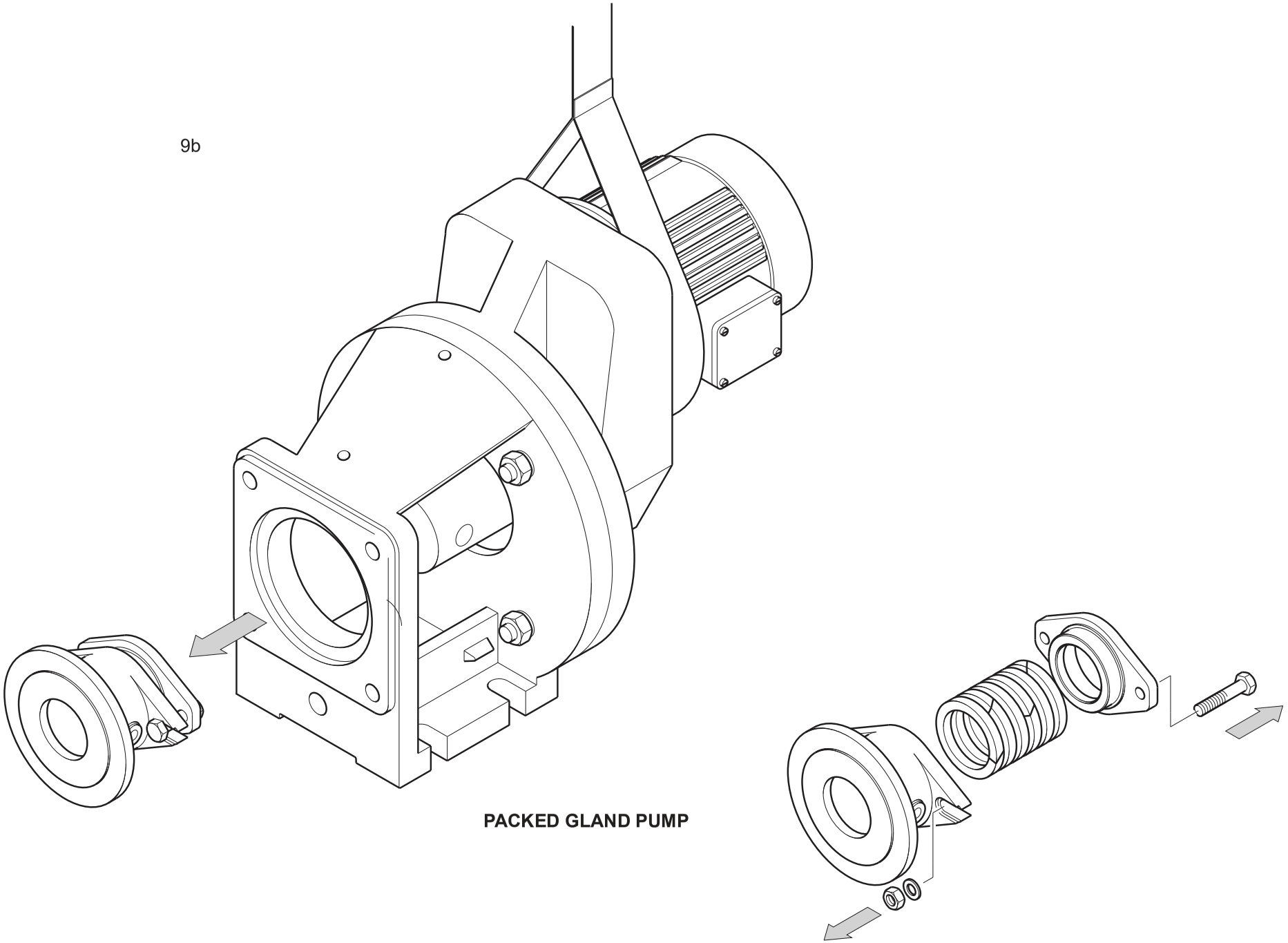



OR
C18B AND C16D

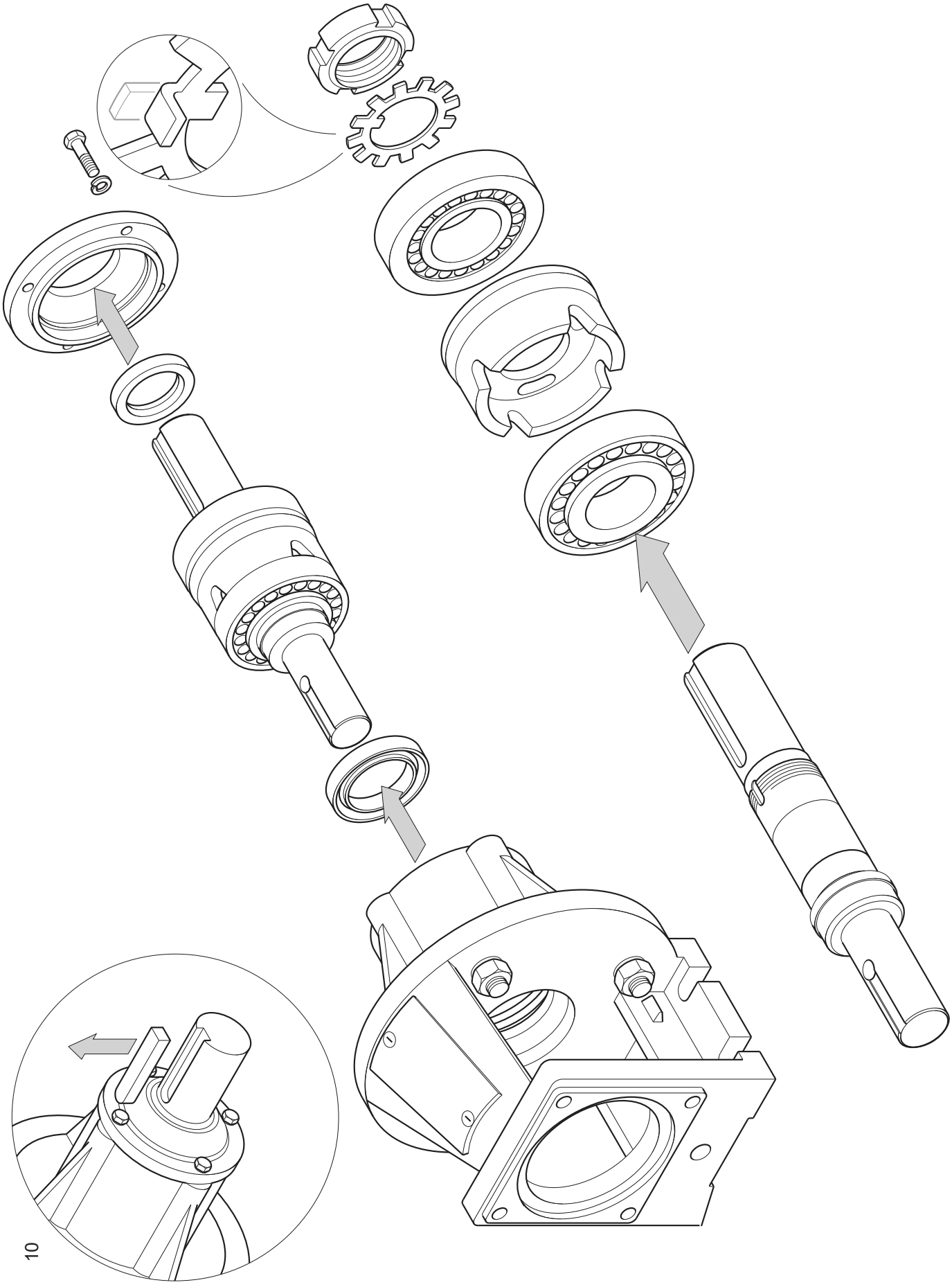


9a

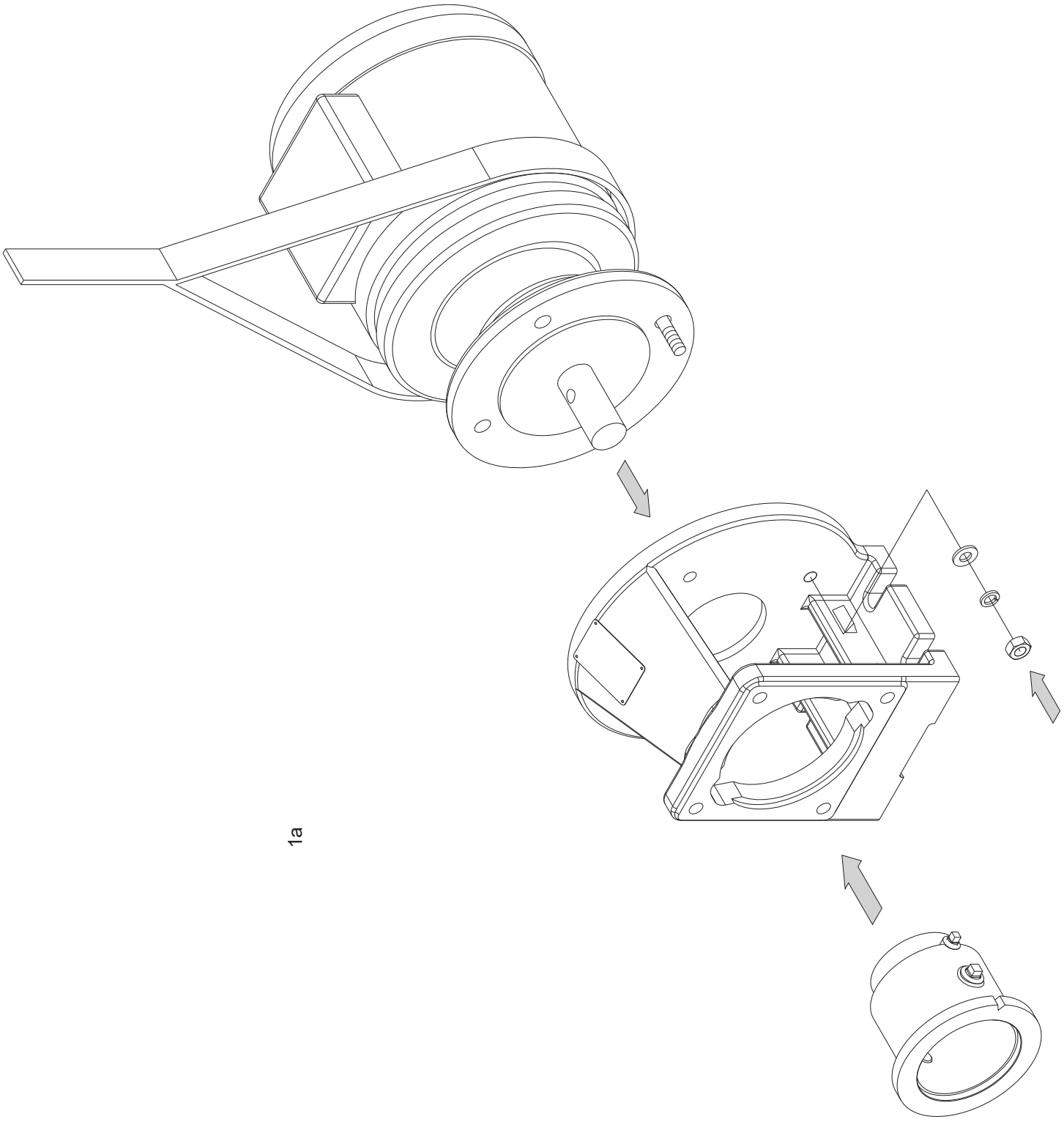
9b



PACKED GLAND PUMP


10

Assembly



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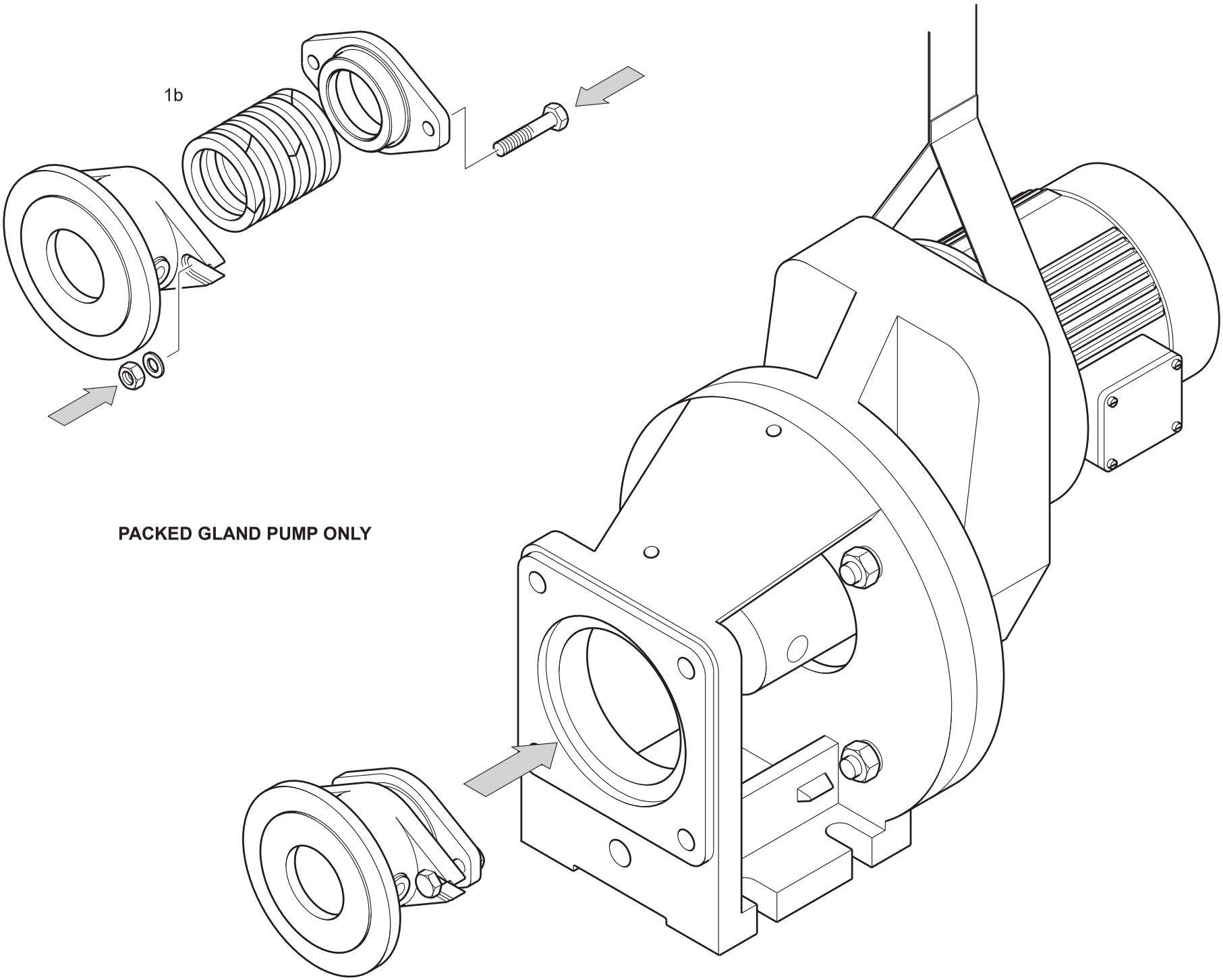
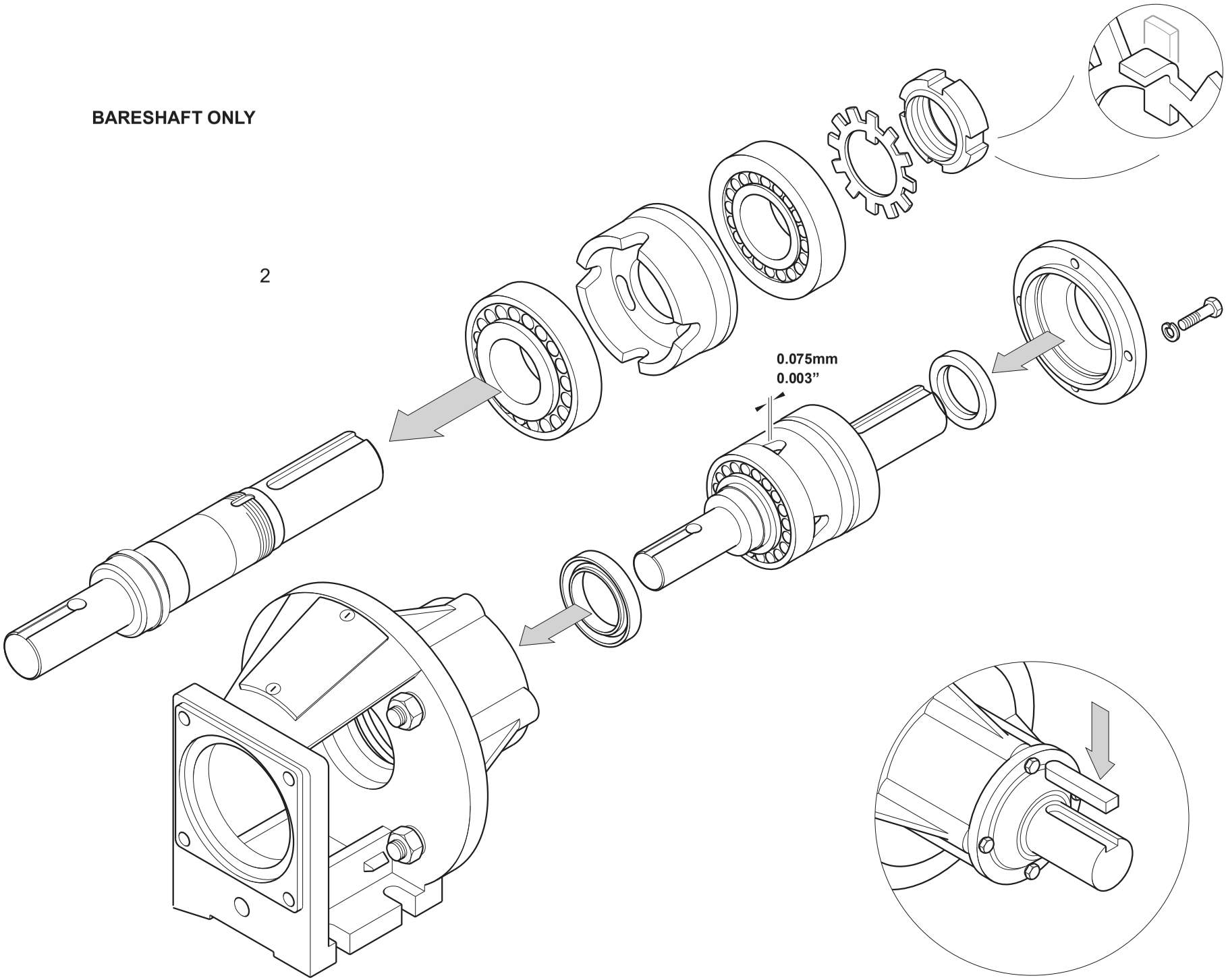
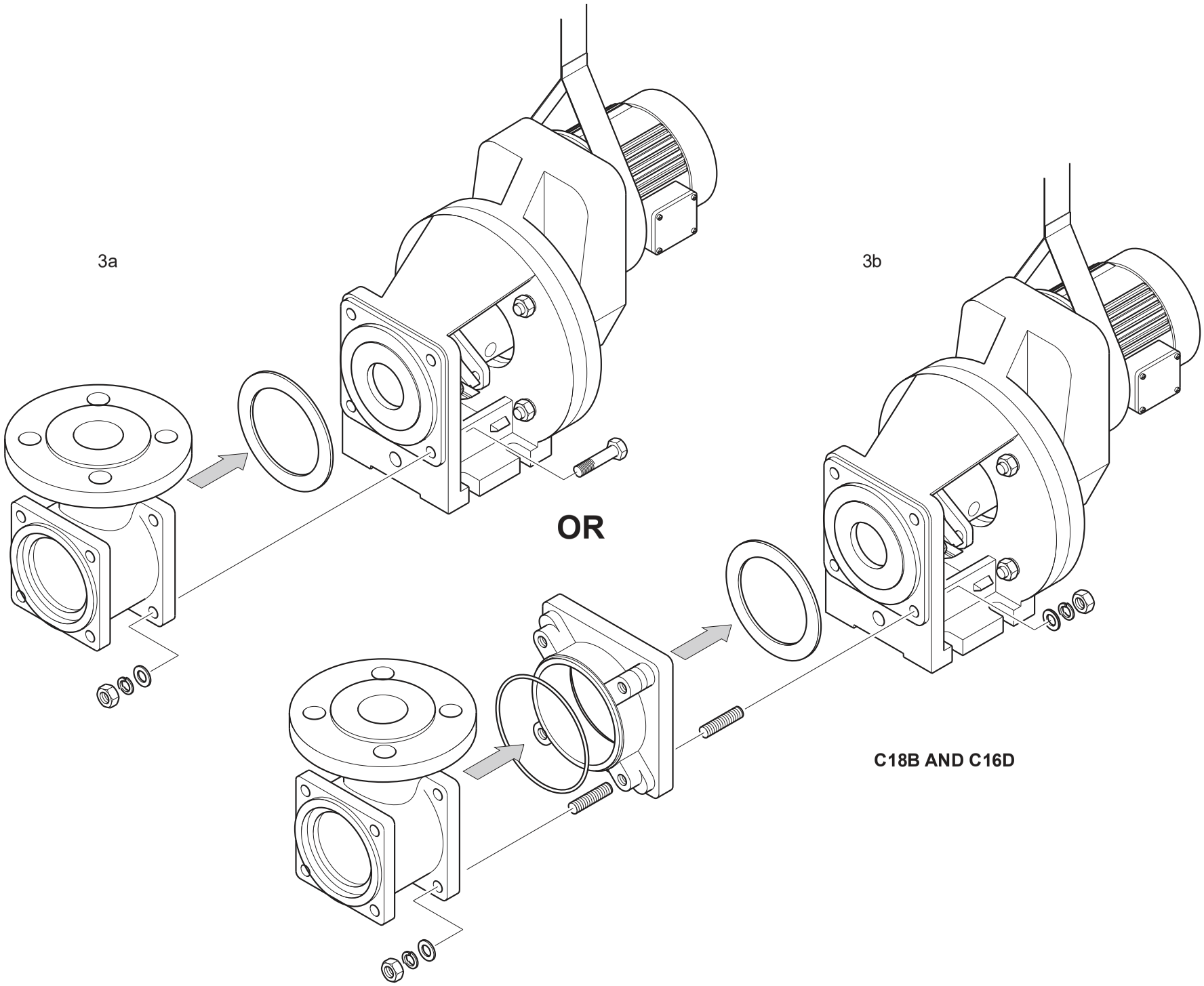


PACKED GLAND PUMP ONLY

BARESHAFT ONLY

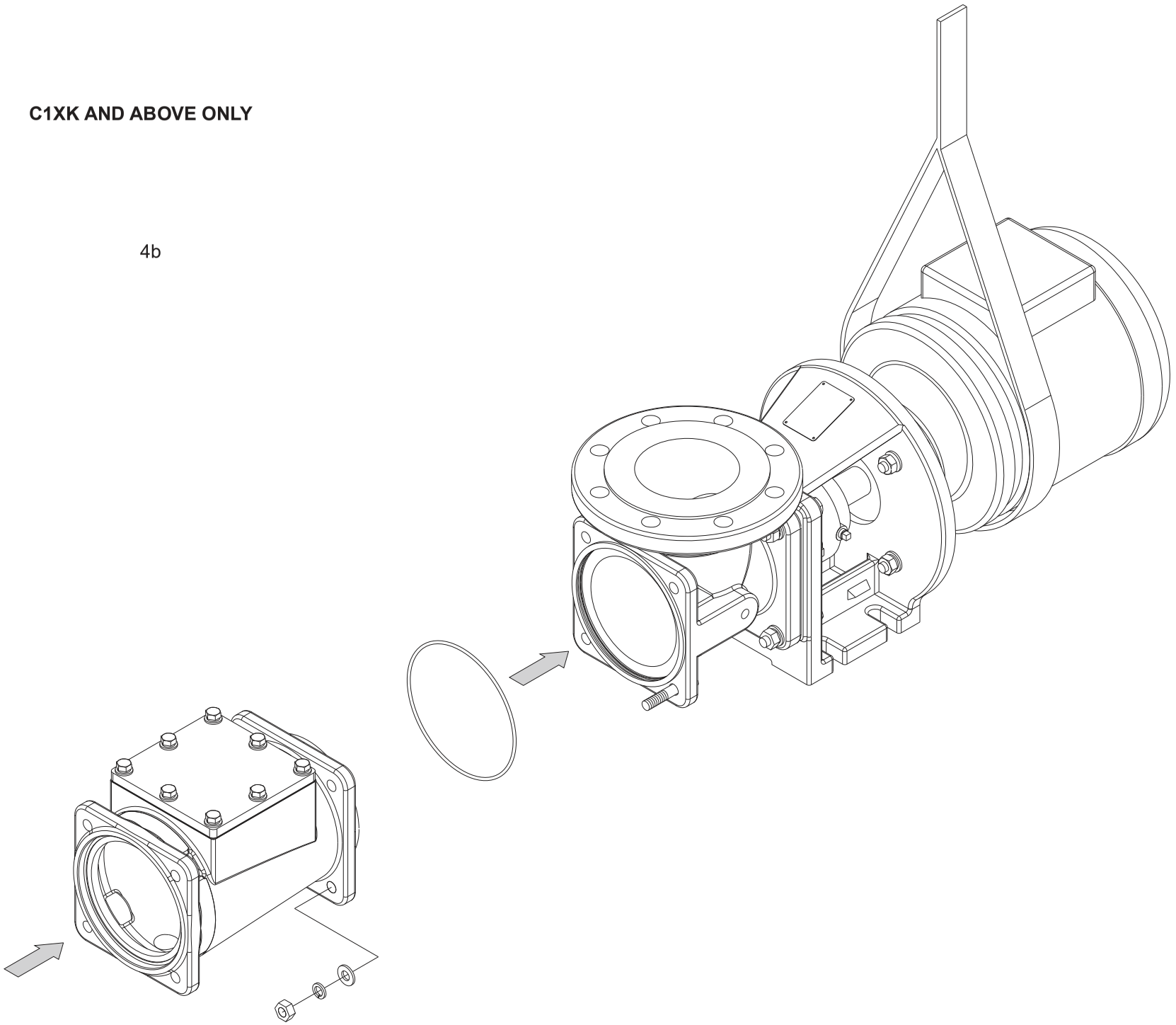
2




3a
3b
OR
C18B AND C16D

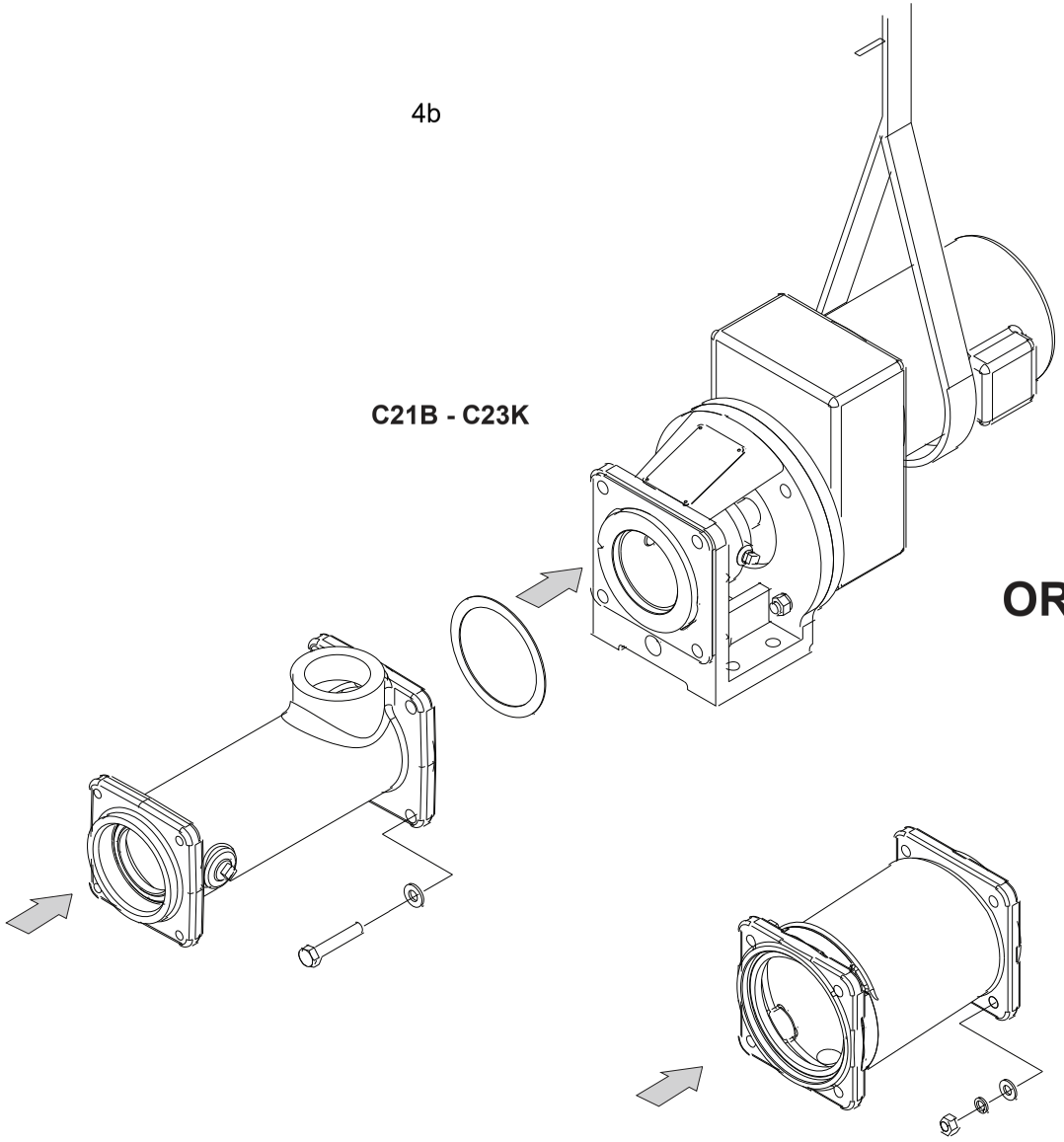
C1XK AND ABOVE ONLY

4b



4b

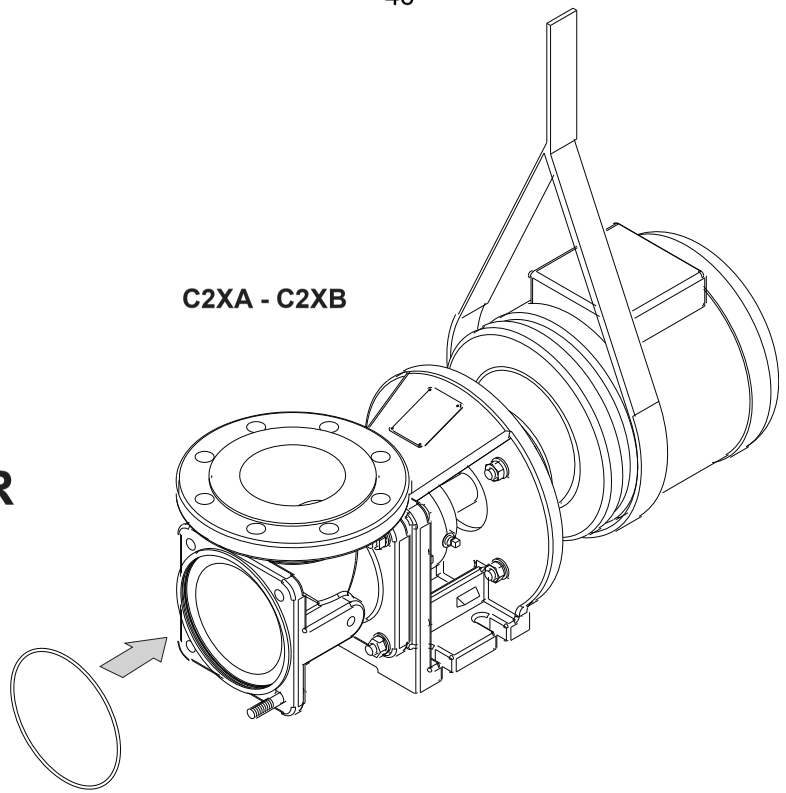
C21B - C23K



OR

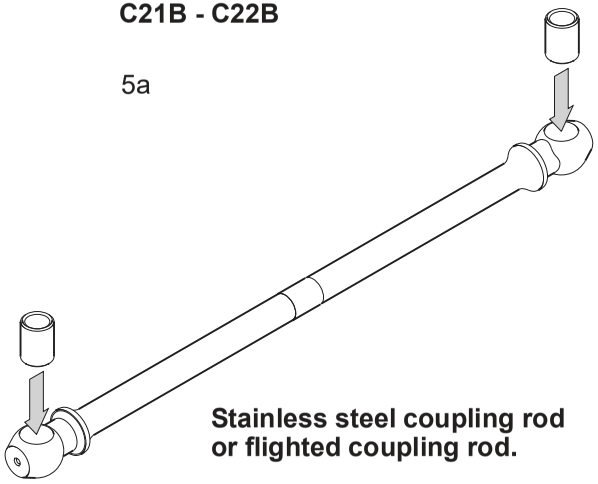
4c

C2XA - C2XB

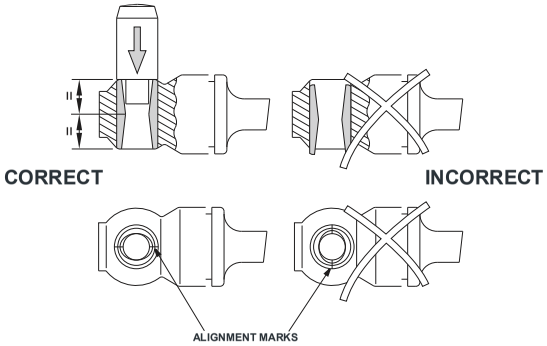


C21B - C22B

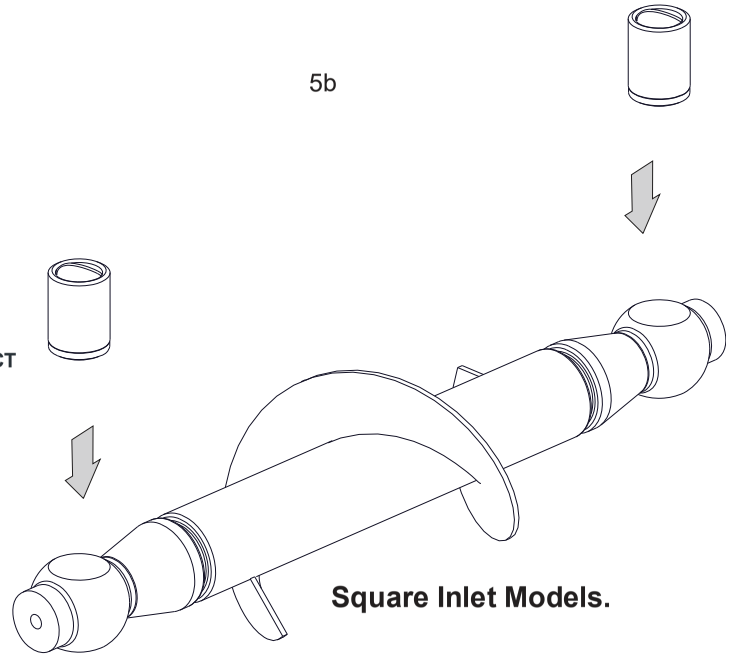
5a



Stainless steel coupling rod or flighted coupling rod.

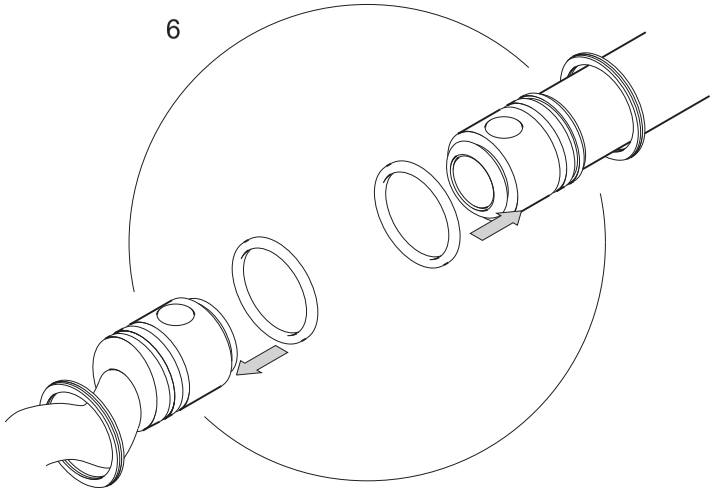


5b



Square Inlet Models.

6



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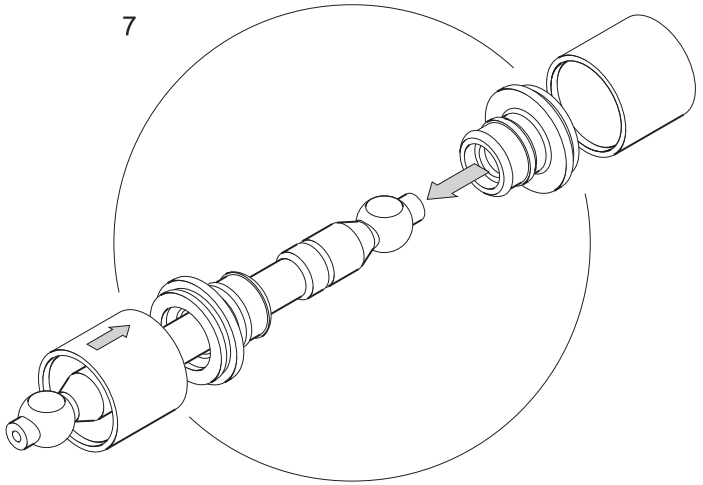
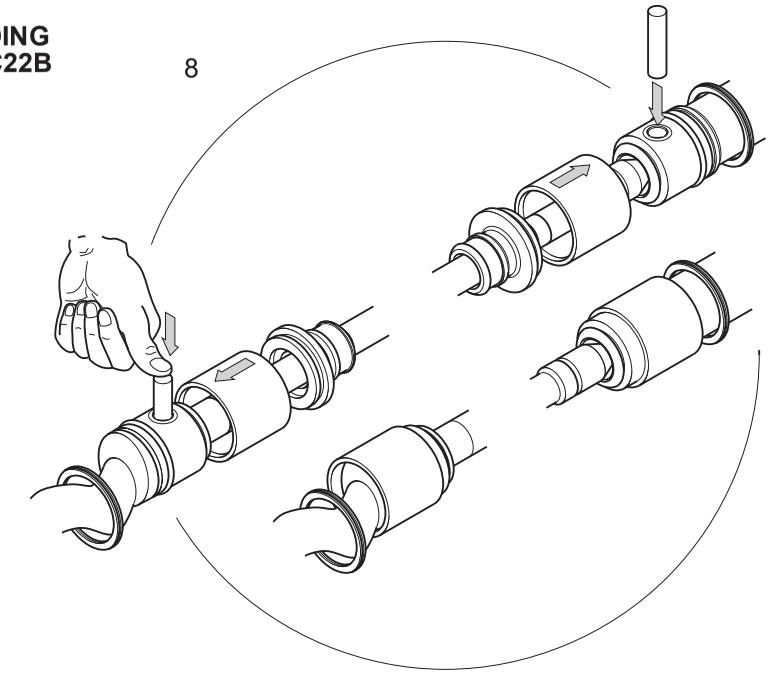


EXCLUDING
C21B - C22B

8



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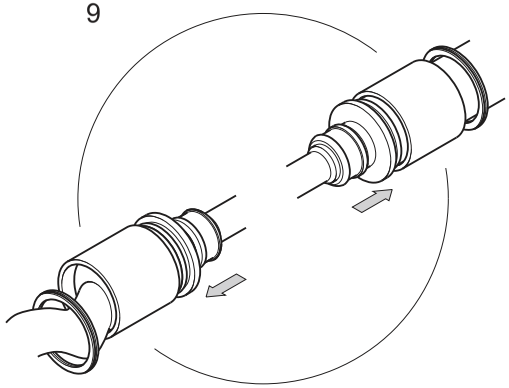

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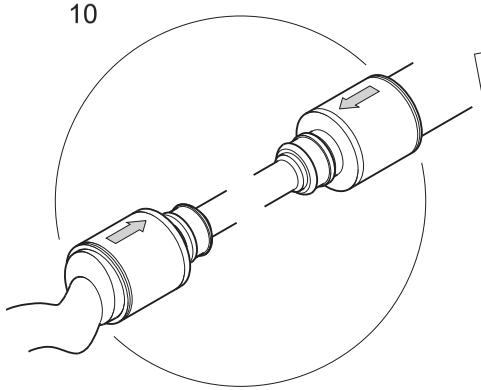

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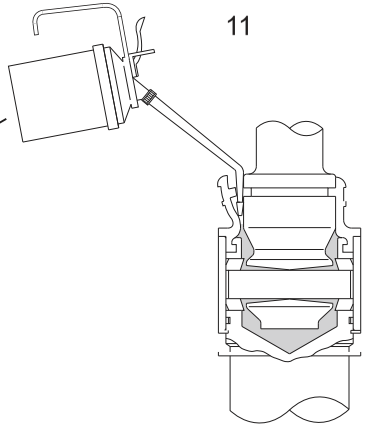

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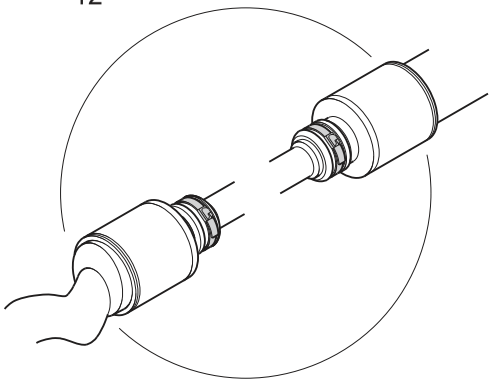
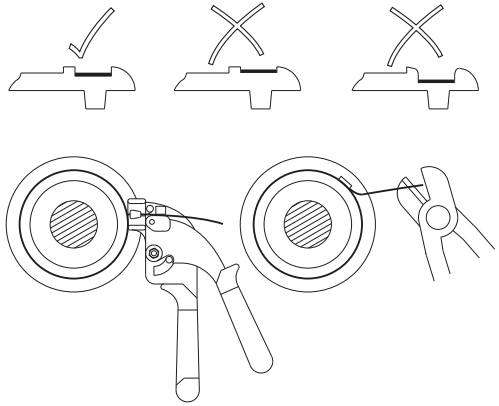
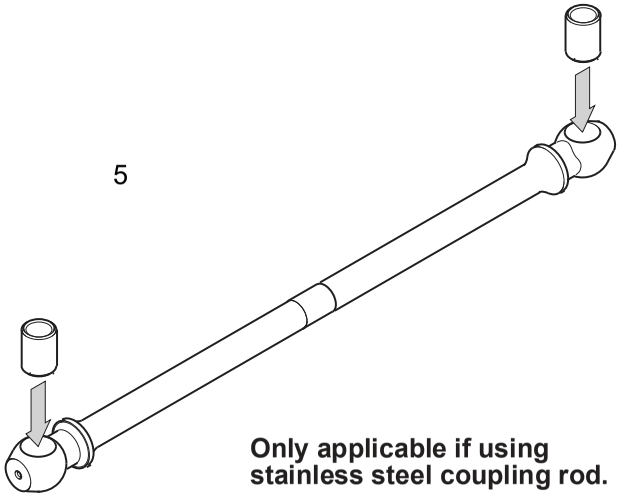




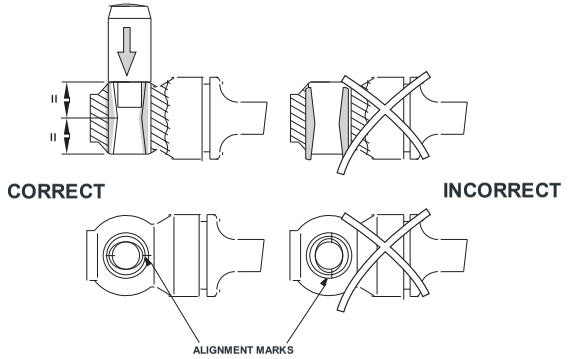
Correct tool available from your Supplier
Part Number: 80D1331

C21B - C22B ONLY

5



Only applicable if using stainless steel coupling rod.



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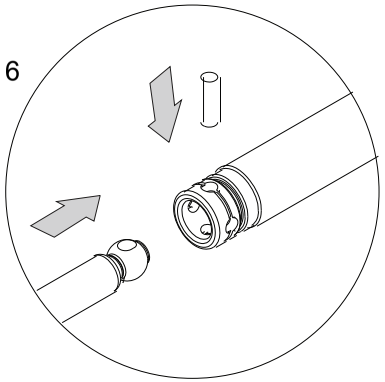

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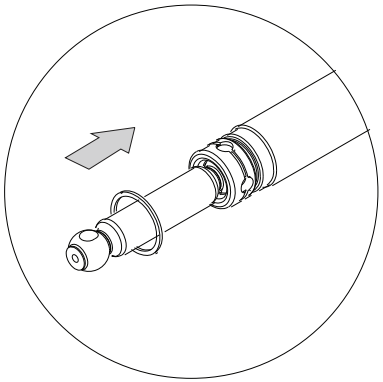

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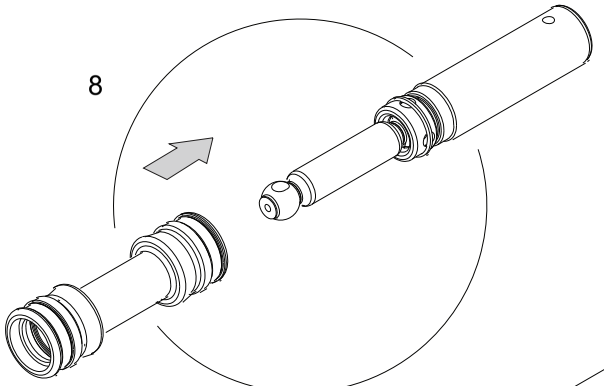

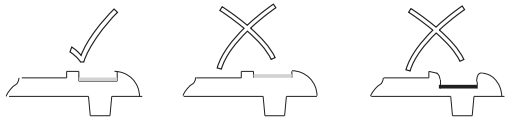

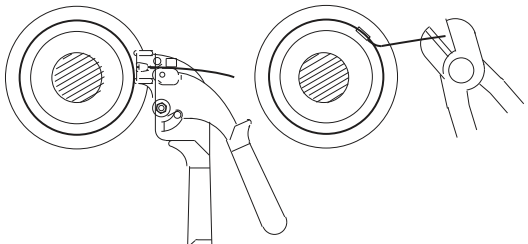

Correct tool available from your Supplier
Part Number: 80D1331

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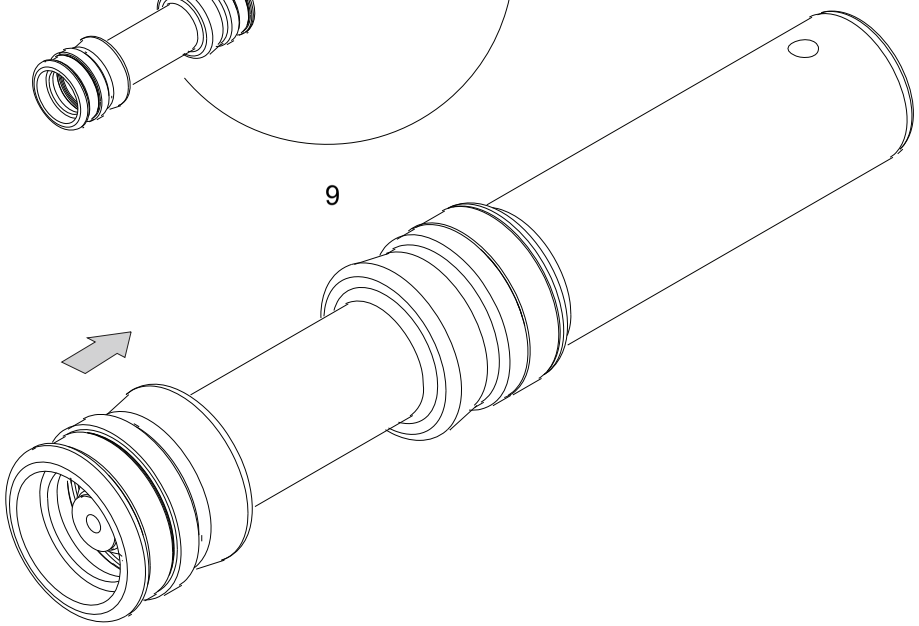

C21B - C22B ONLY

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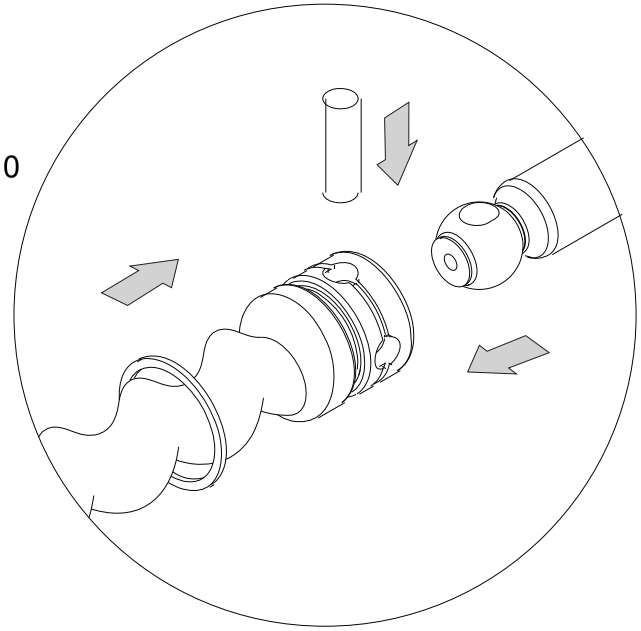

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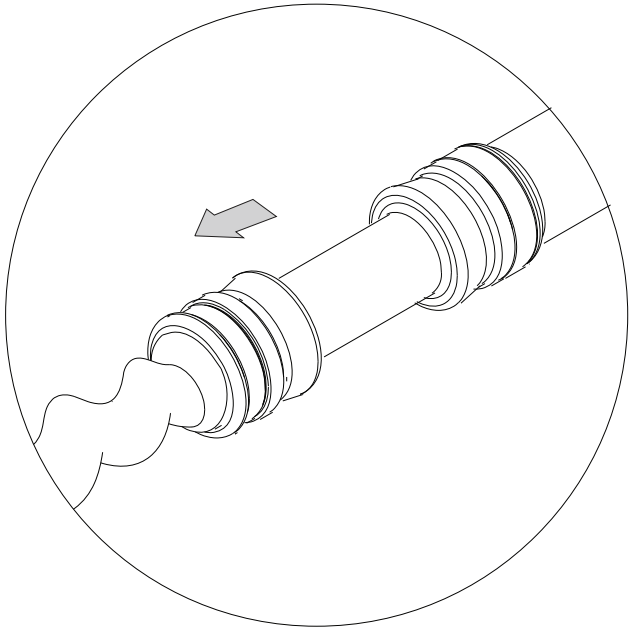

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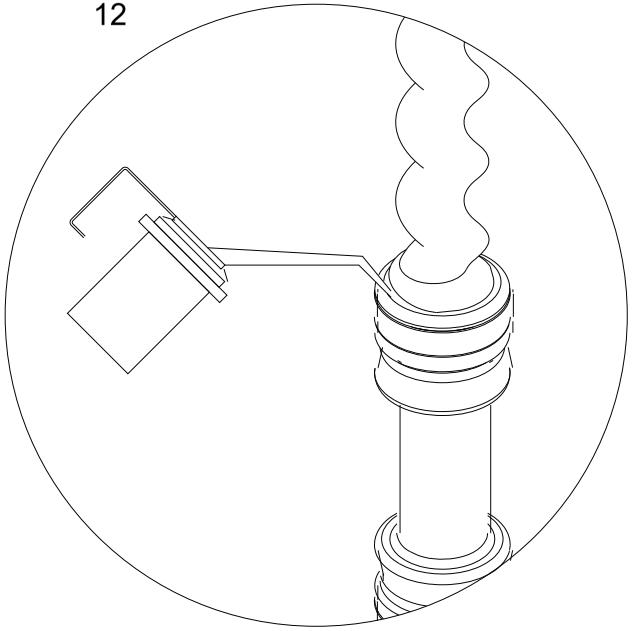
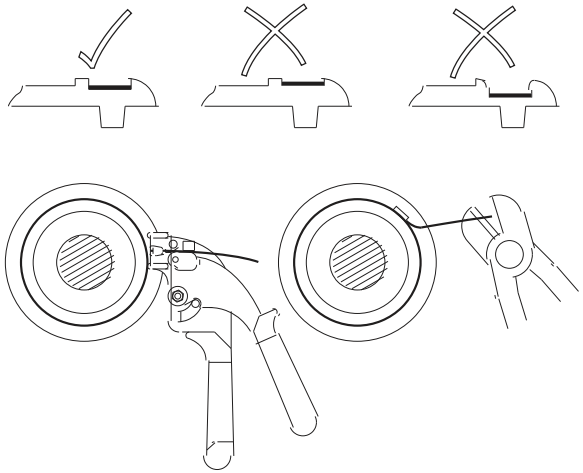
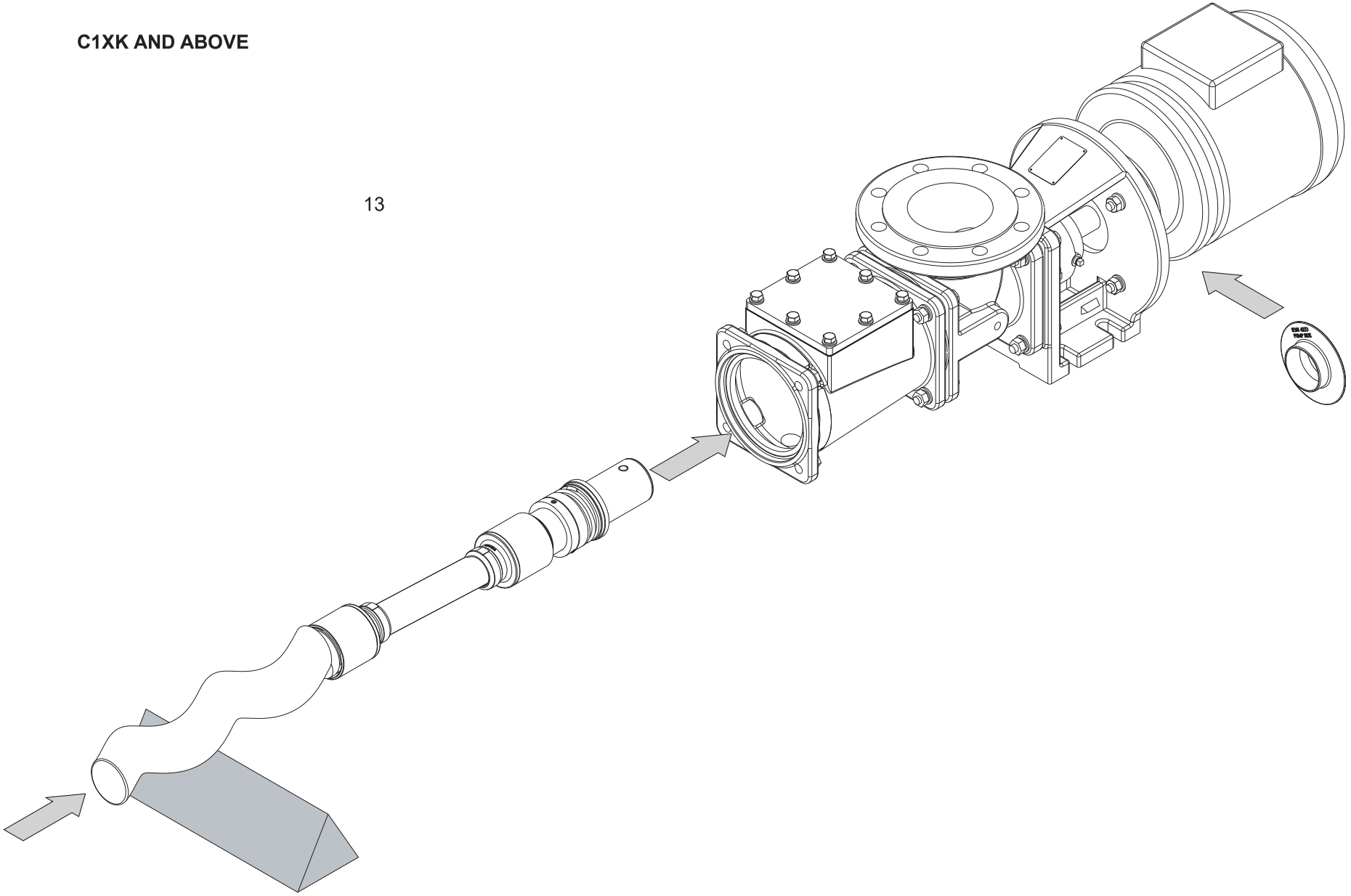




Correct tool available from your Supplier
Part Number: 80D1331

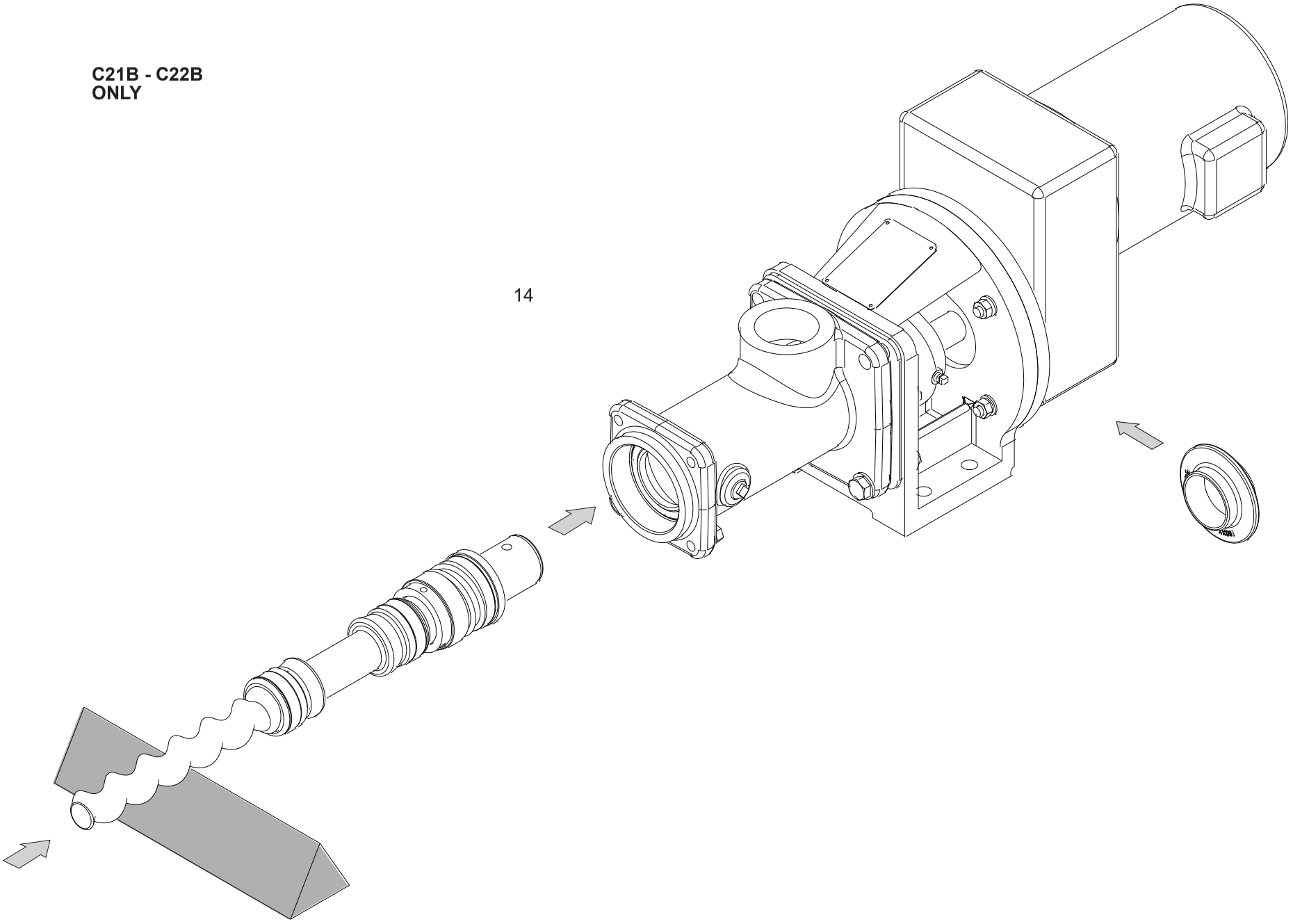
C1XK AND ABOVE

13



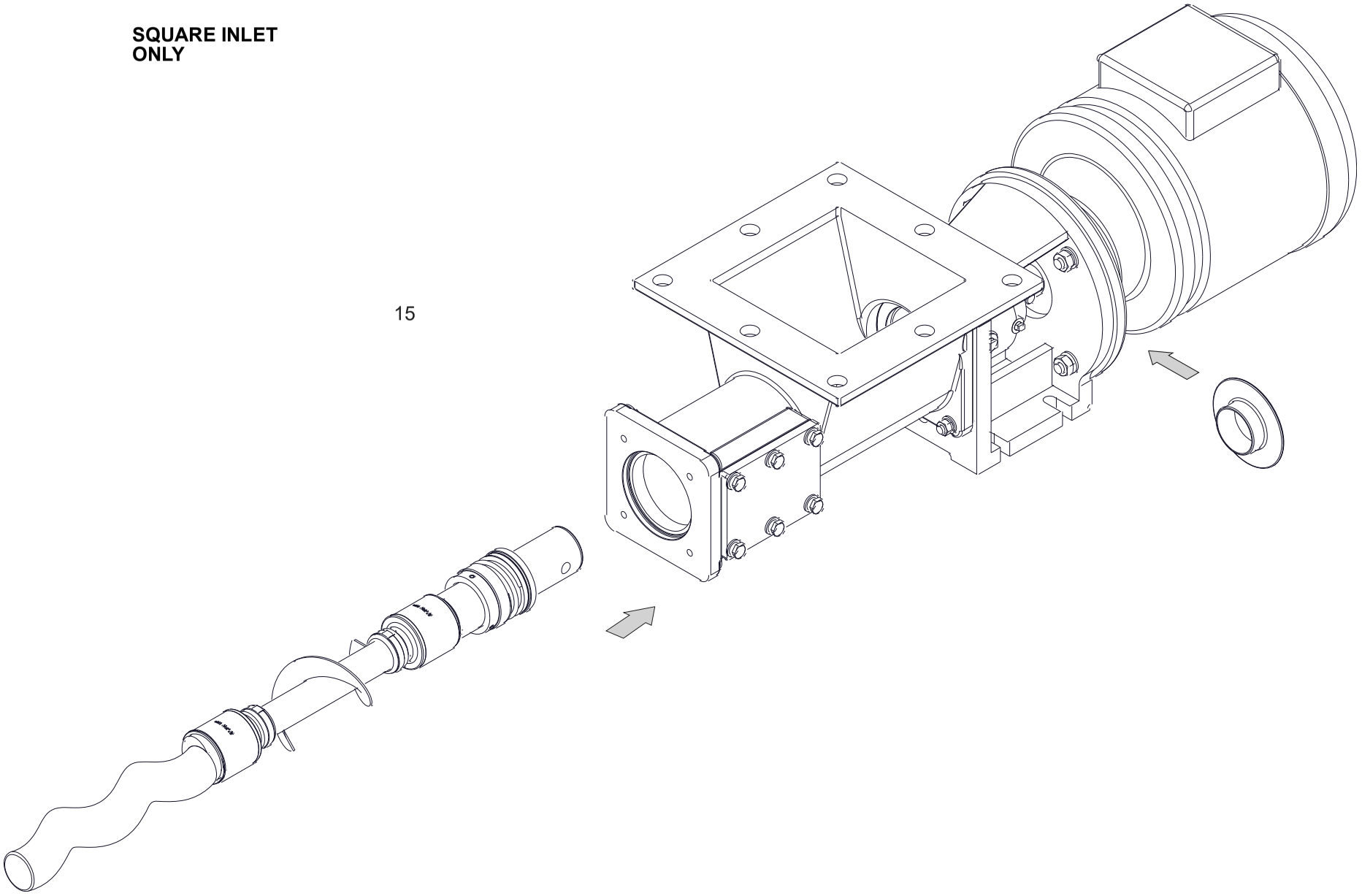
C21B - C22B
ONLY

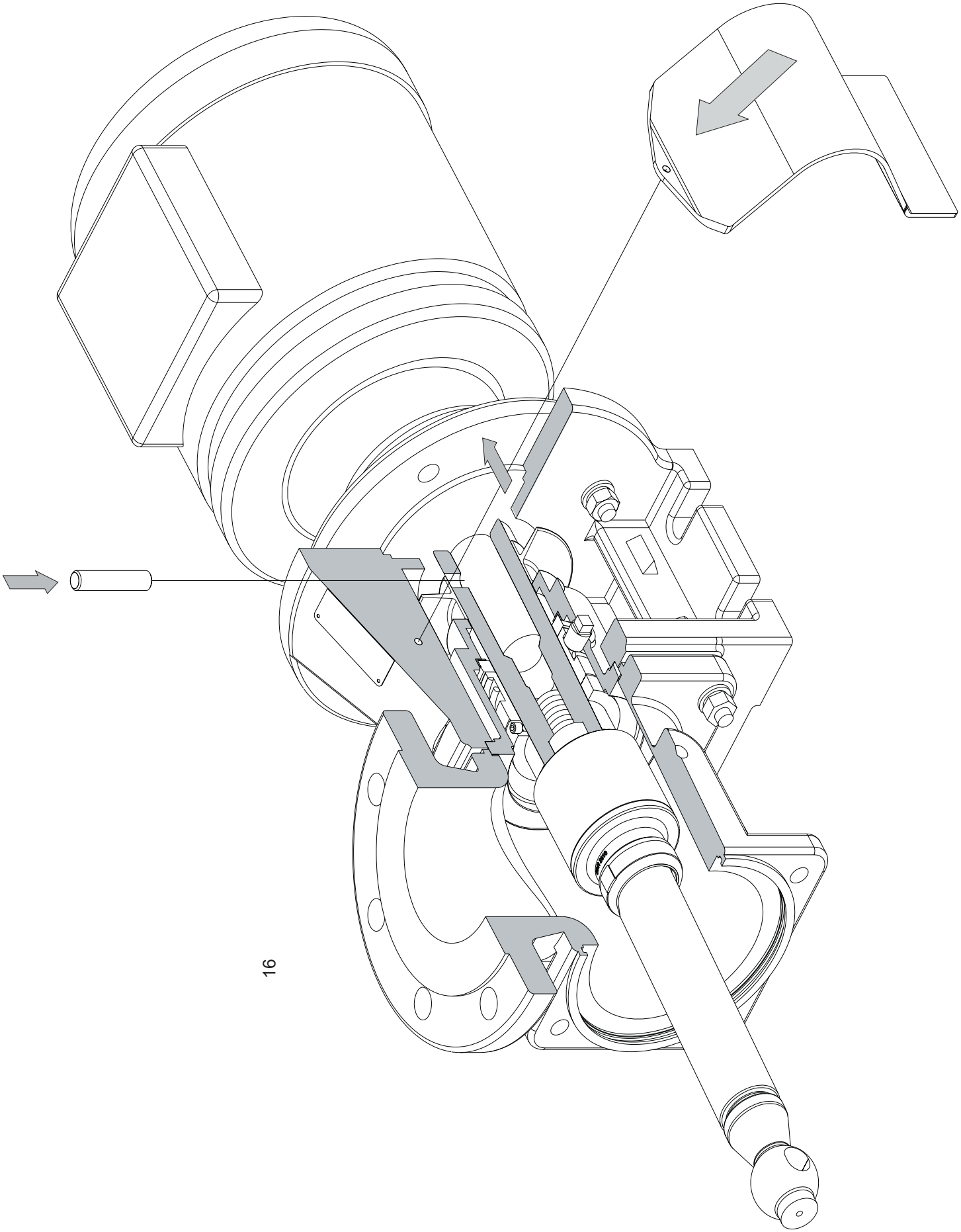
14



SQUARE INLET ONLY

15





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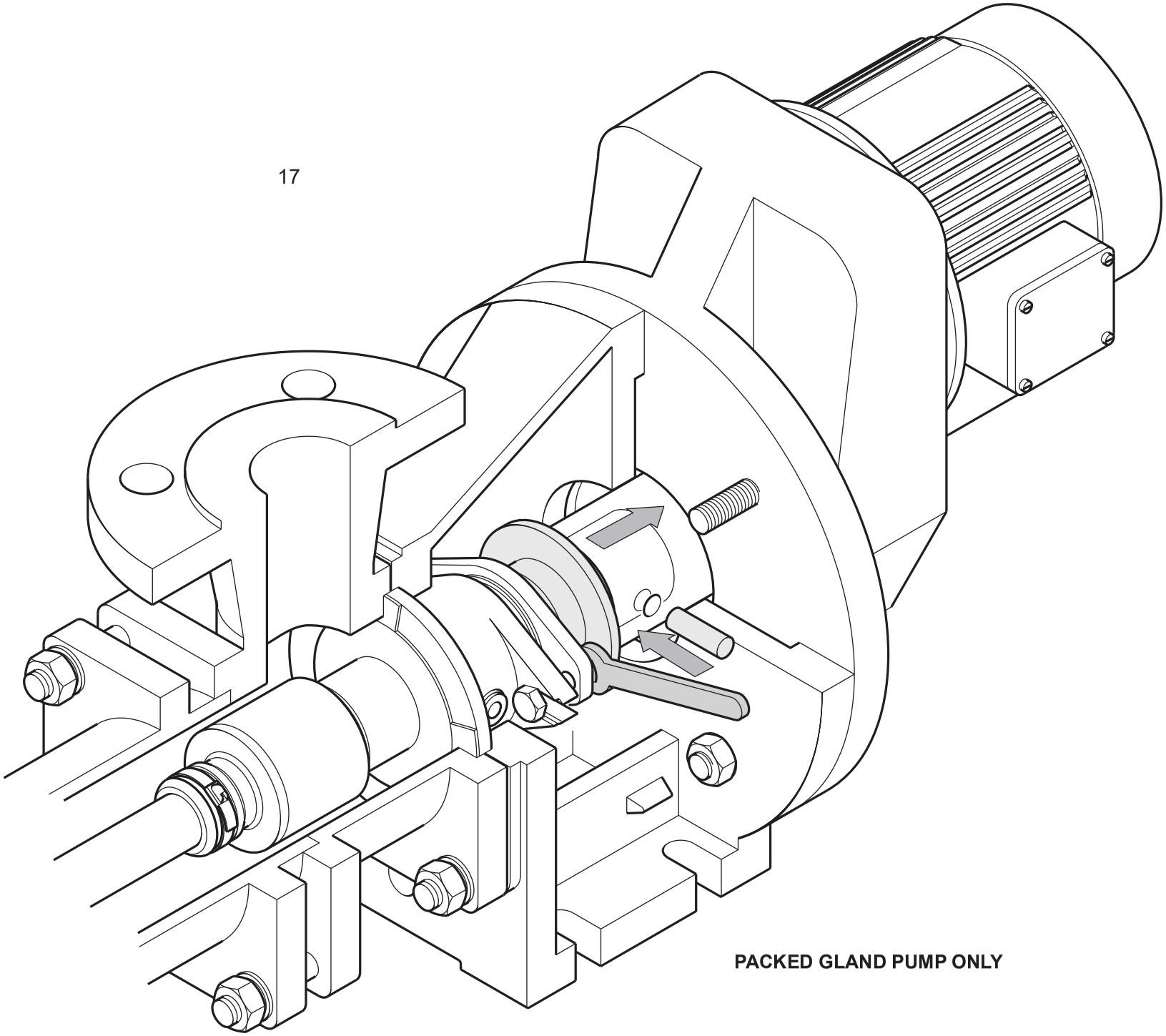
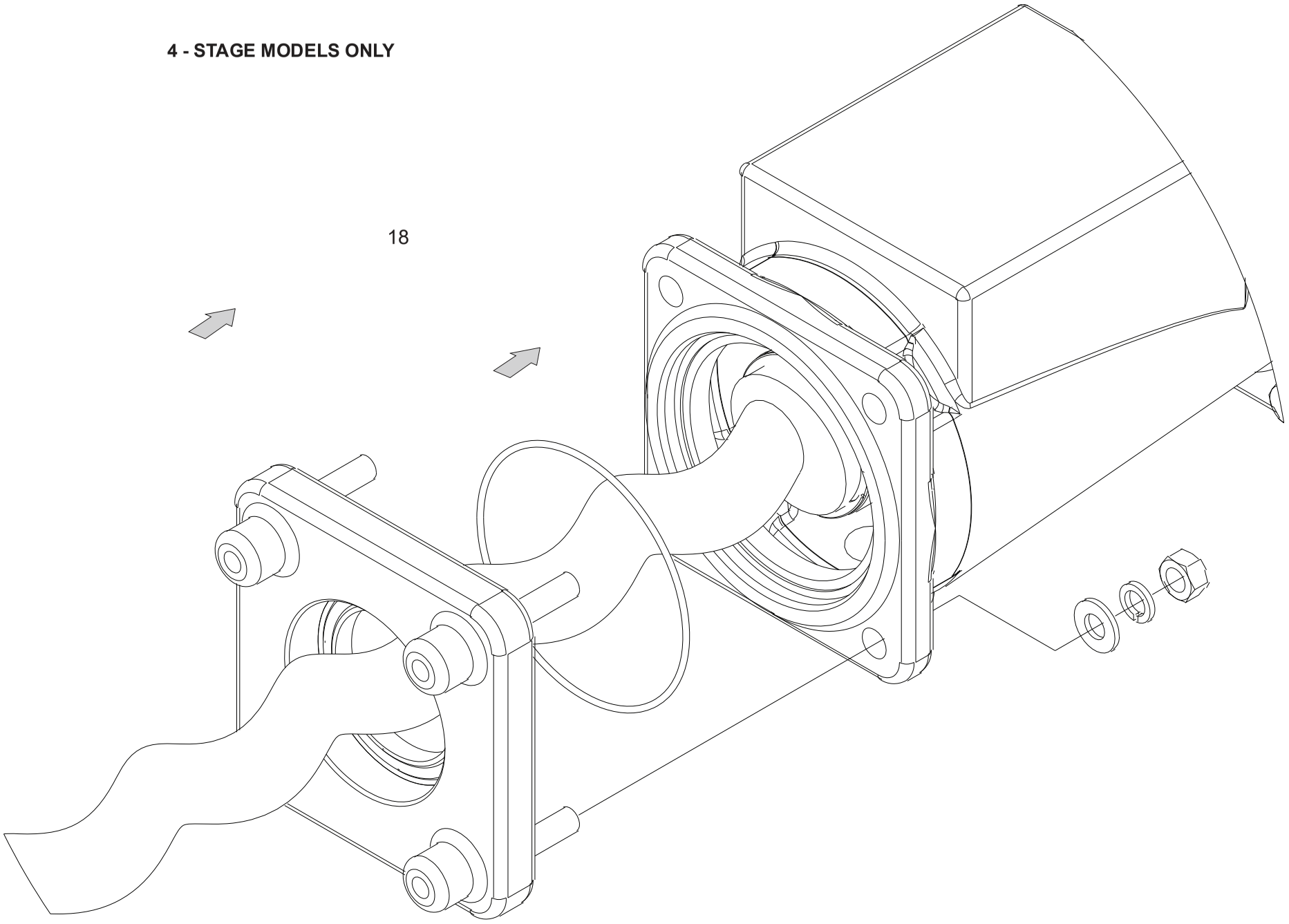


PACKED GLAND PUMP ONLY

4 - STAGE MODELS ONLY

18



C1XK AND ABOVE

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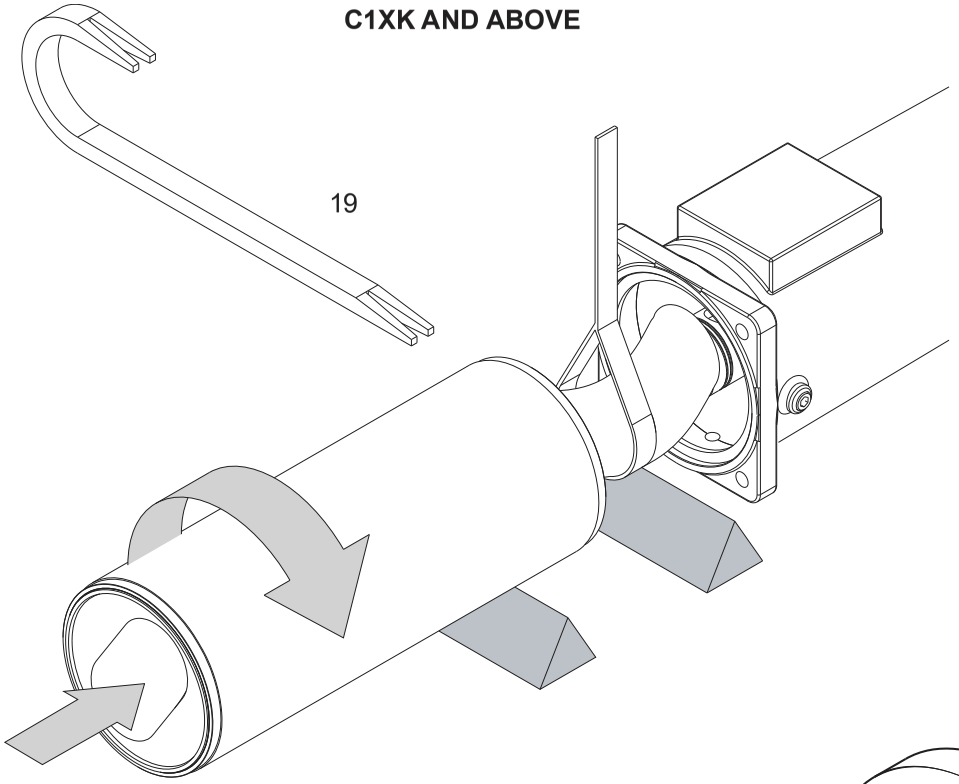

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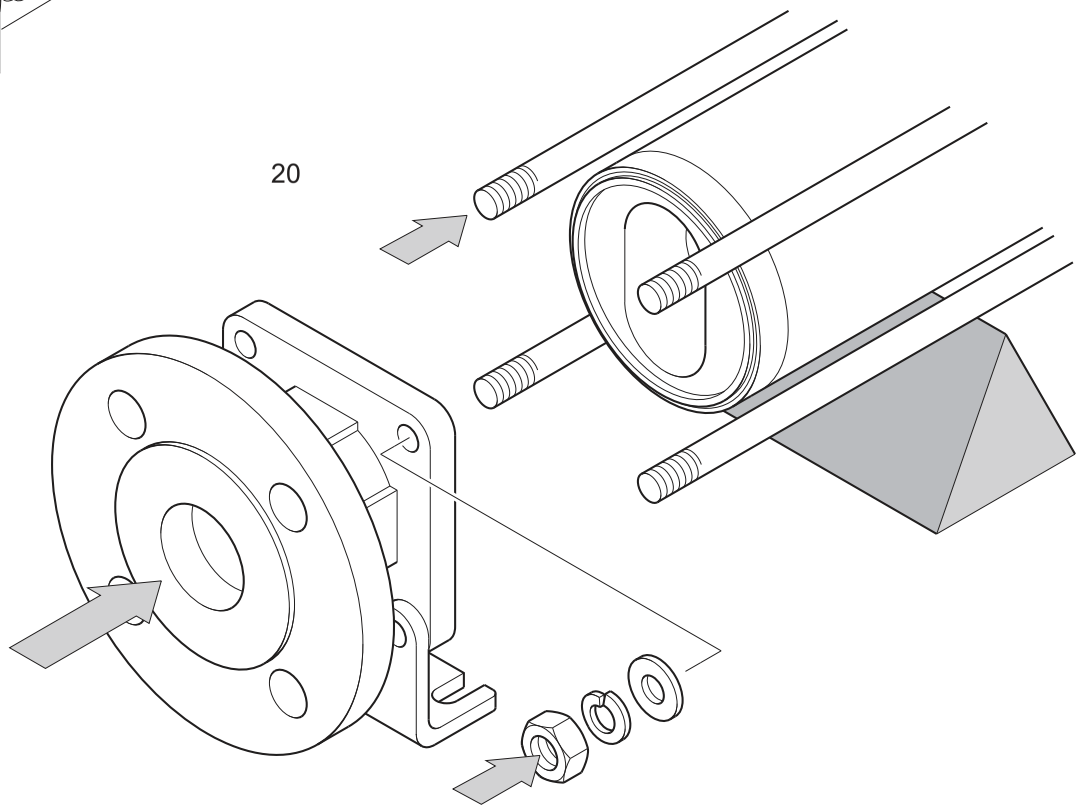
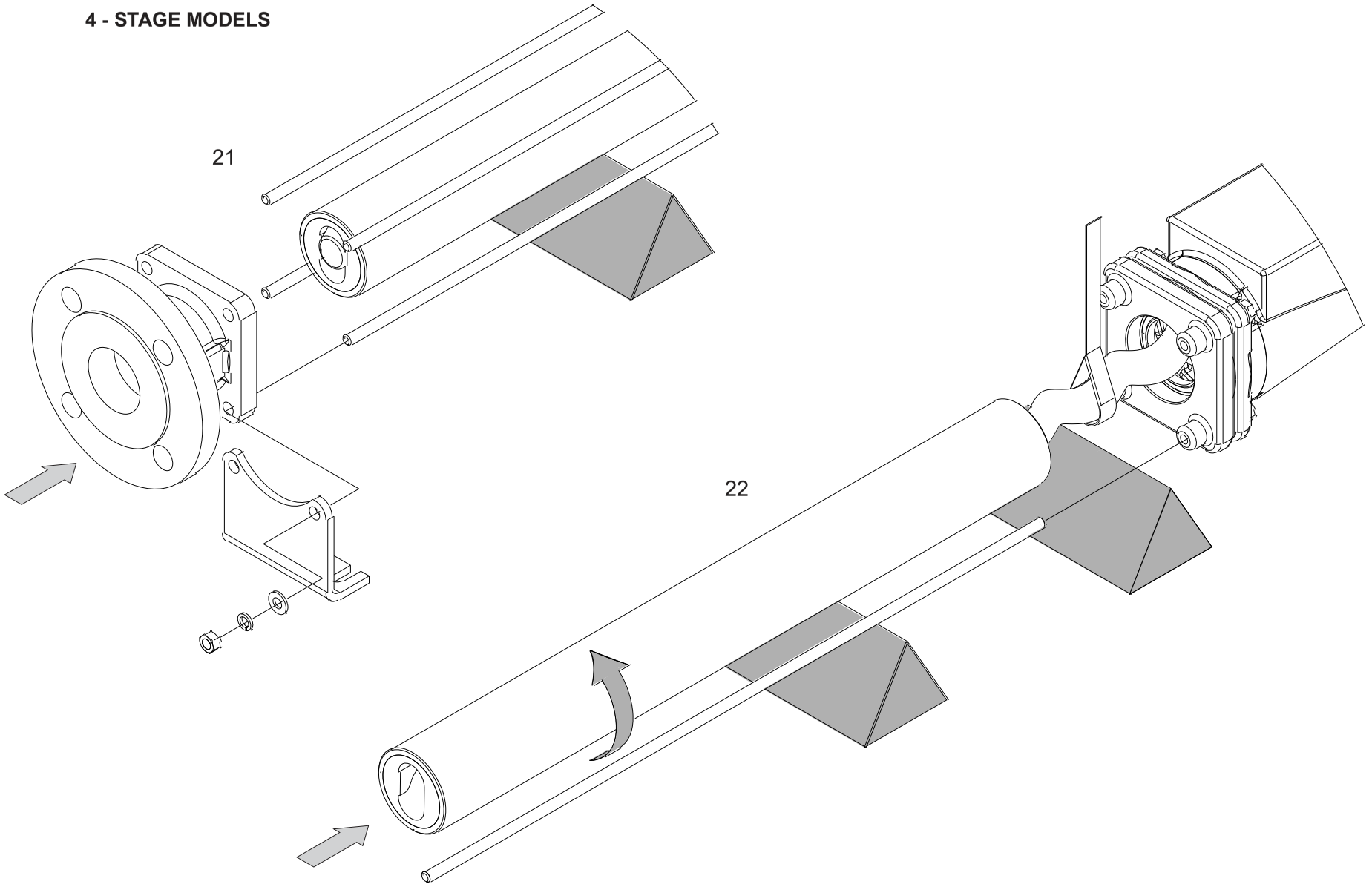
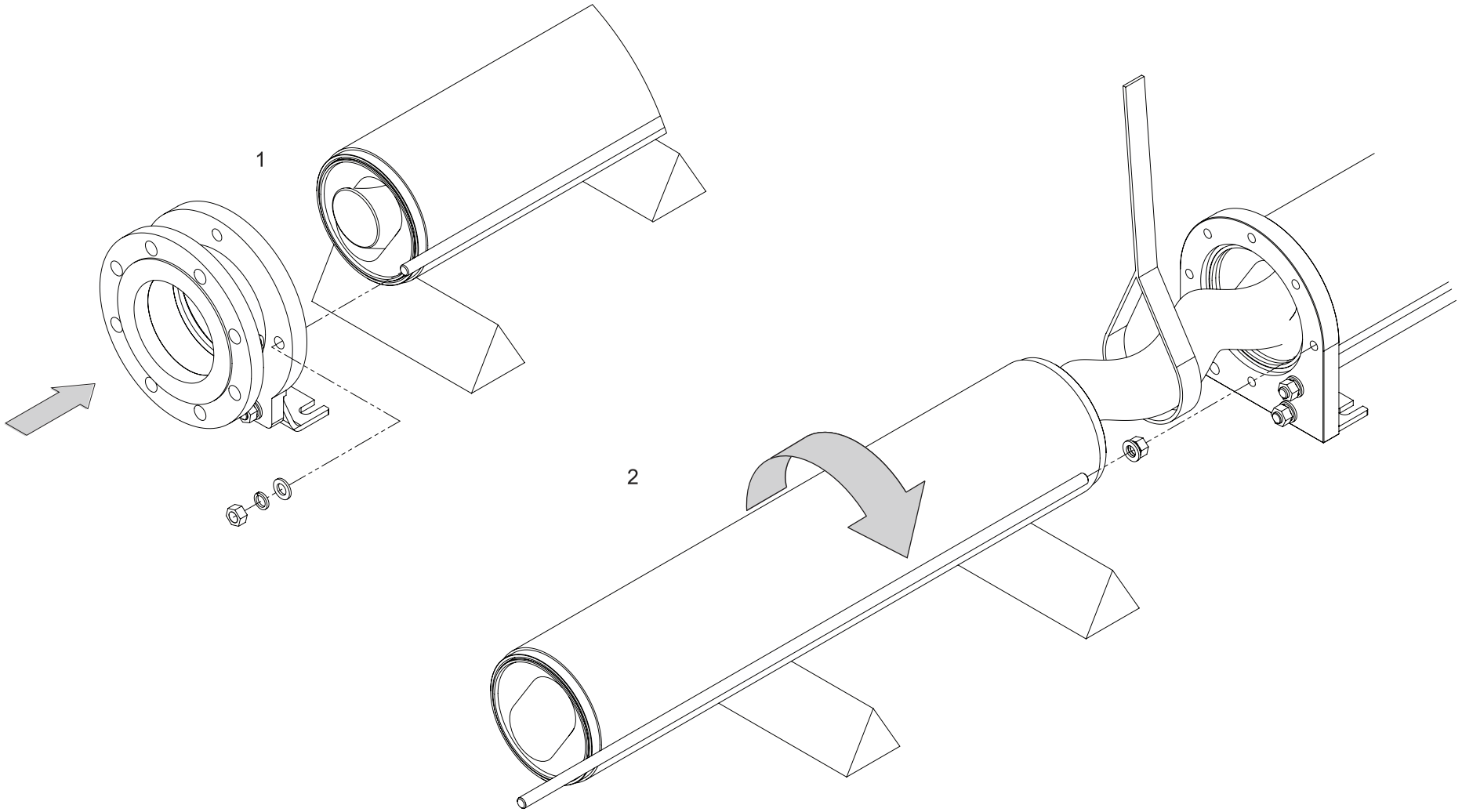
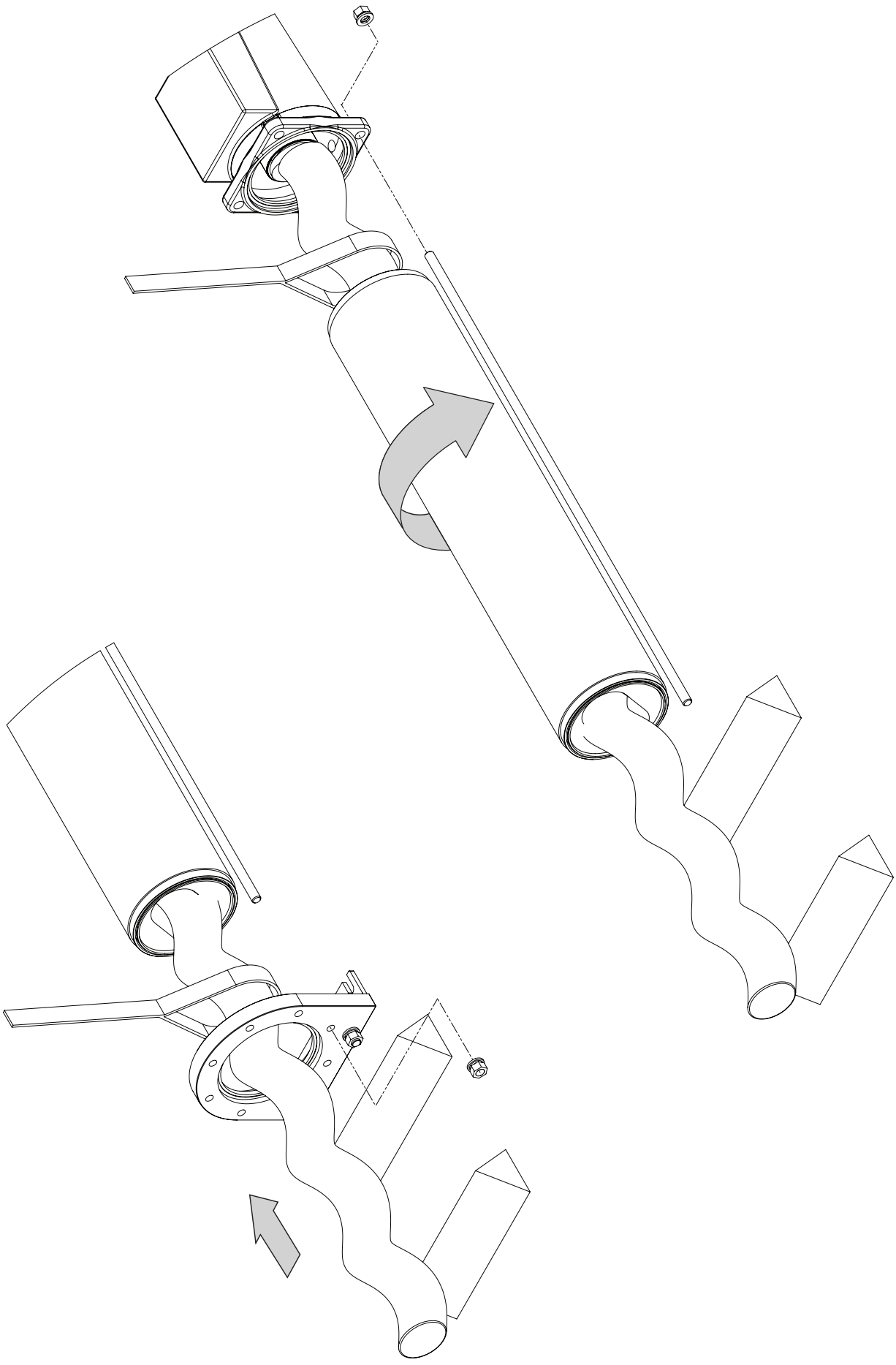


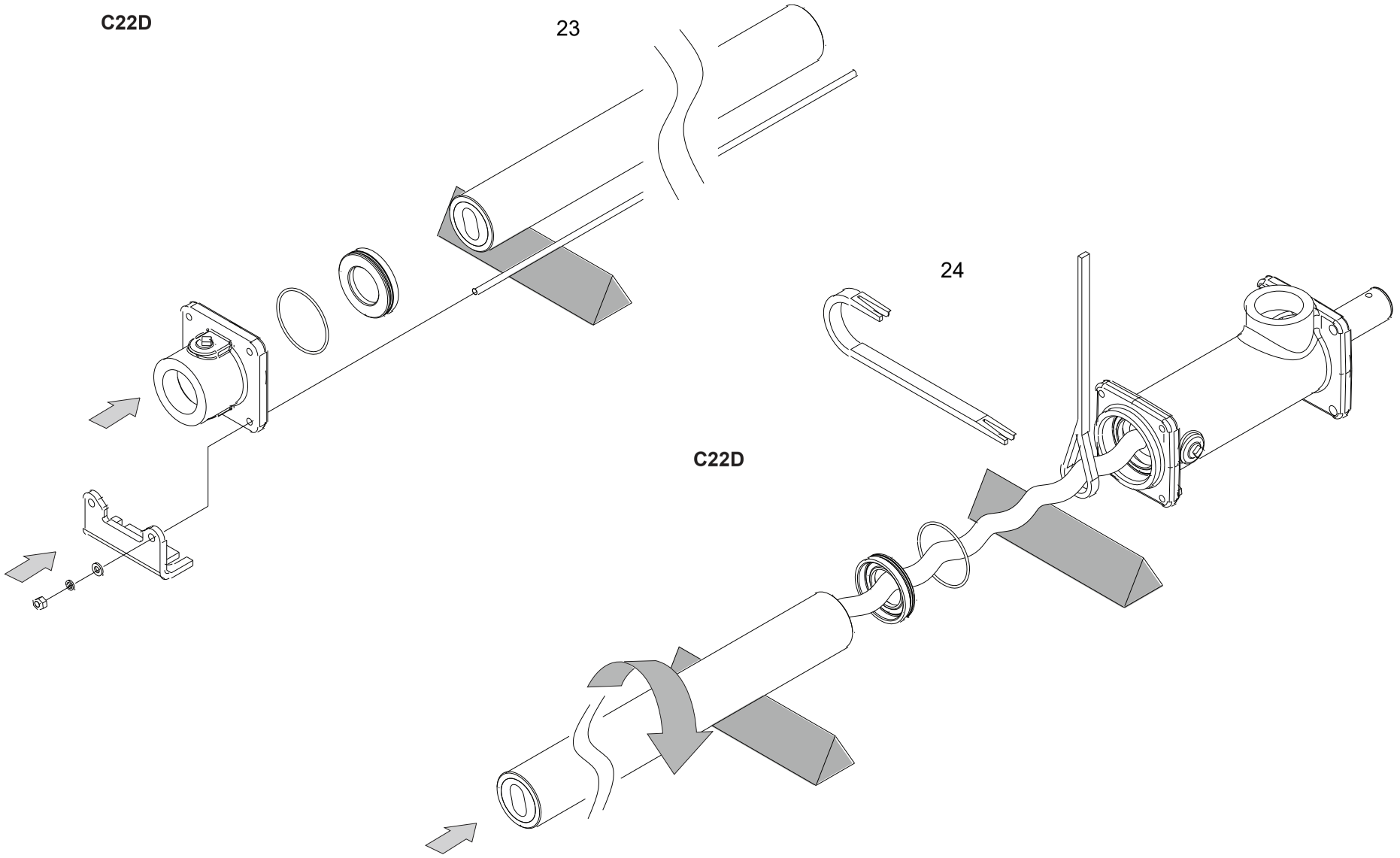
4 - STAGE MODELS



C19DL ONLY

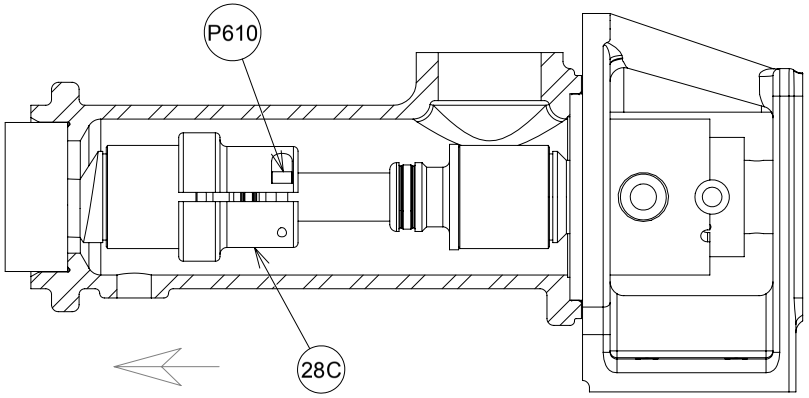





C22D
23
24
C22D

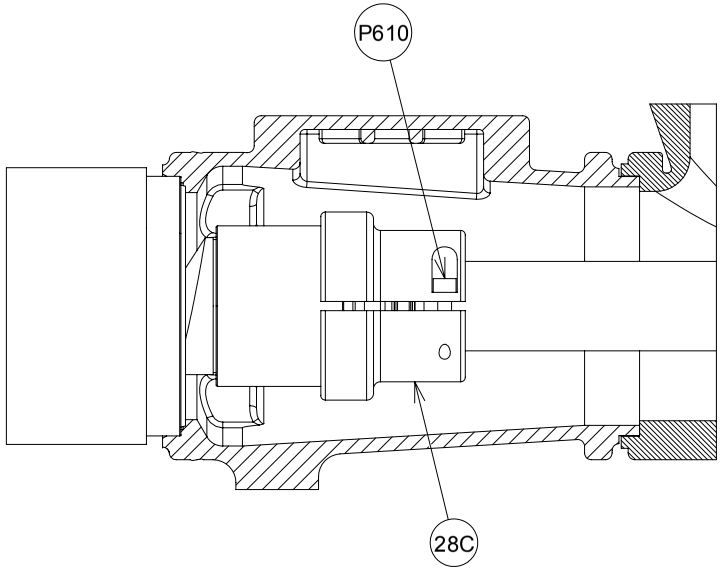
BOOT PROTECTORS

C22D, C23A, C23B, C23K, C2XA, C2XB, C1XK



ON PUMPS WITH BOOT PROTECTOR C0XK 2880 THE SUCTION CHAMBER CAN ONLY BE ASSEMBLED AND REMOVED IN ONE DIRECTION; OVER THE ROTOR

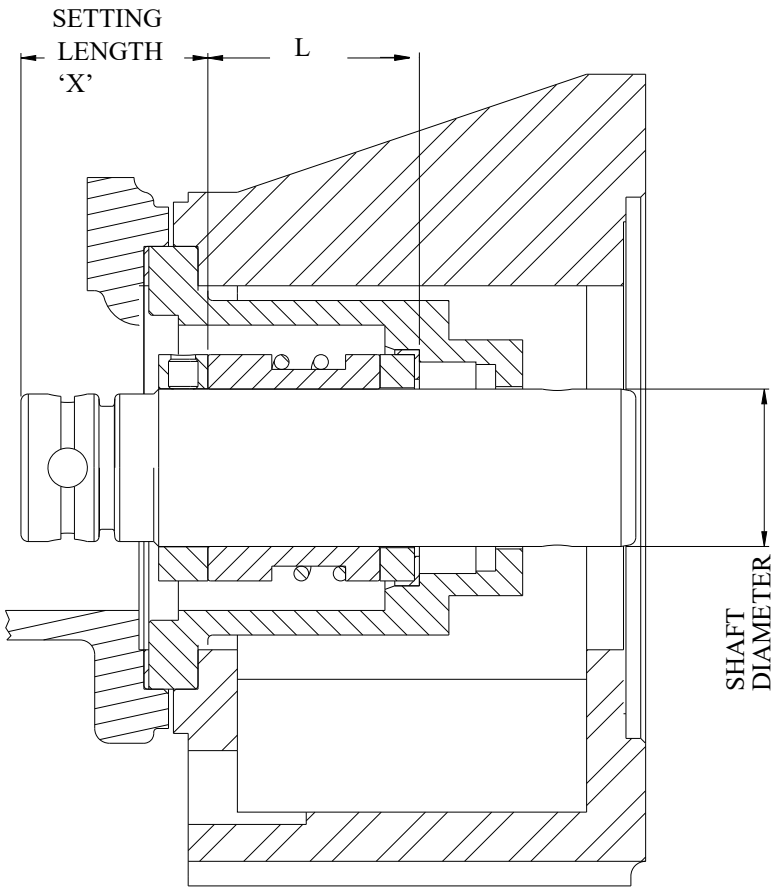
ALL OTHER SIZES



THE SUCTION CHAMBER CAN BE ASSEMBLED AND REMOVED IN EITHER DIRECTION

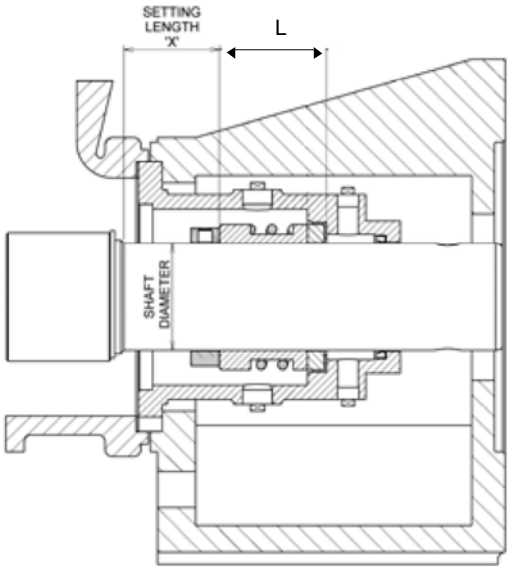
NB. PICTORAL VIEWS ONLY. NOT ALL PUMP COMPONENTS ARE SHOWN.

Mechanical Seal Setting Length



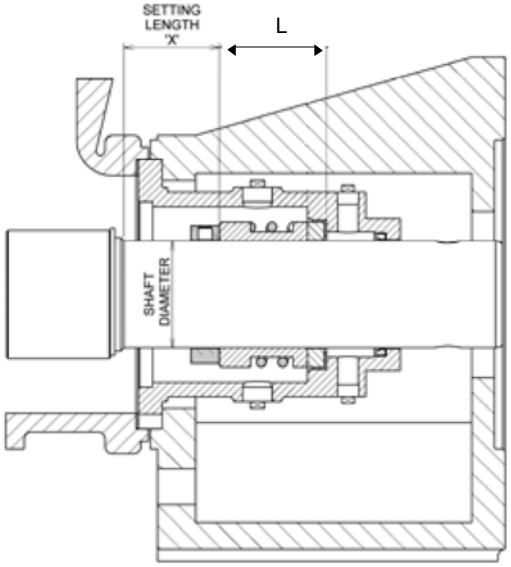
Pump Size	Drive Type	Shaft Diameter mm (inches)	Seal Part No.	Seal Working Length L mm (inches)	Setting Distance 'X' mm (inches)
C21B C12D C22A C22B	Pin Joint	32 (1.26)	M032139G	42.5 (1.67)	38 (1.50)

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 your Supplier.



Pump Size	Drive Type	Shaft Diameter mm (inches)	Seal Part No.	Seal Working Length L mm (inches)	Setting Distance 'X' mm (inches)
C22D C23A C23B C23K C2XA C2XB C1XK	Pin Joint	32 (1.26)	M032139G	42.5 (1.67)	12.5 (0.50)
C13D C14A C14B C14K C15A C15K	Pin Joint	45 (1.26)	M045139G	45.0 (1.77)	41 (1.61)
C1XD C14D C15B C16A C16K	Pin Joint	55 (1.26)	M055139G	47.5 (1.87)	34.5 (1.36)
C15D C16B C17A C17B C17K C18A C18K	Pin Joint	65 (2.56)	M065139G	52.5 (2.07)	33.5 (1.32)

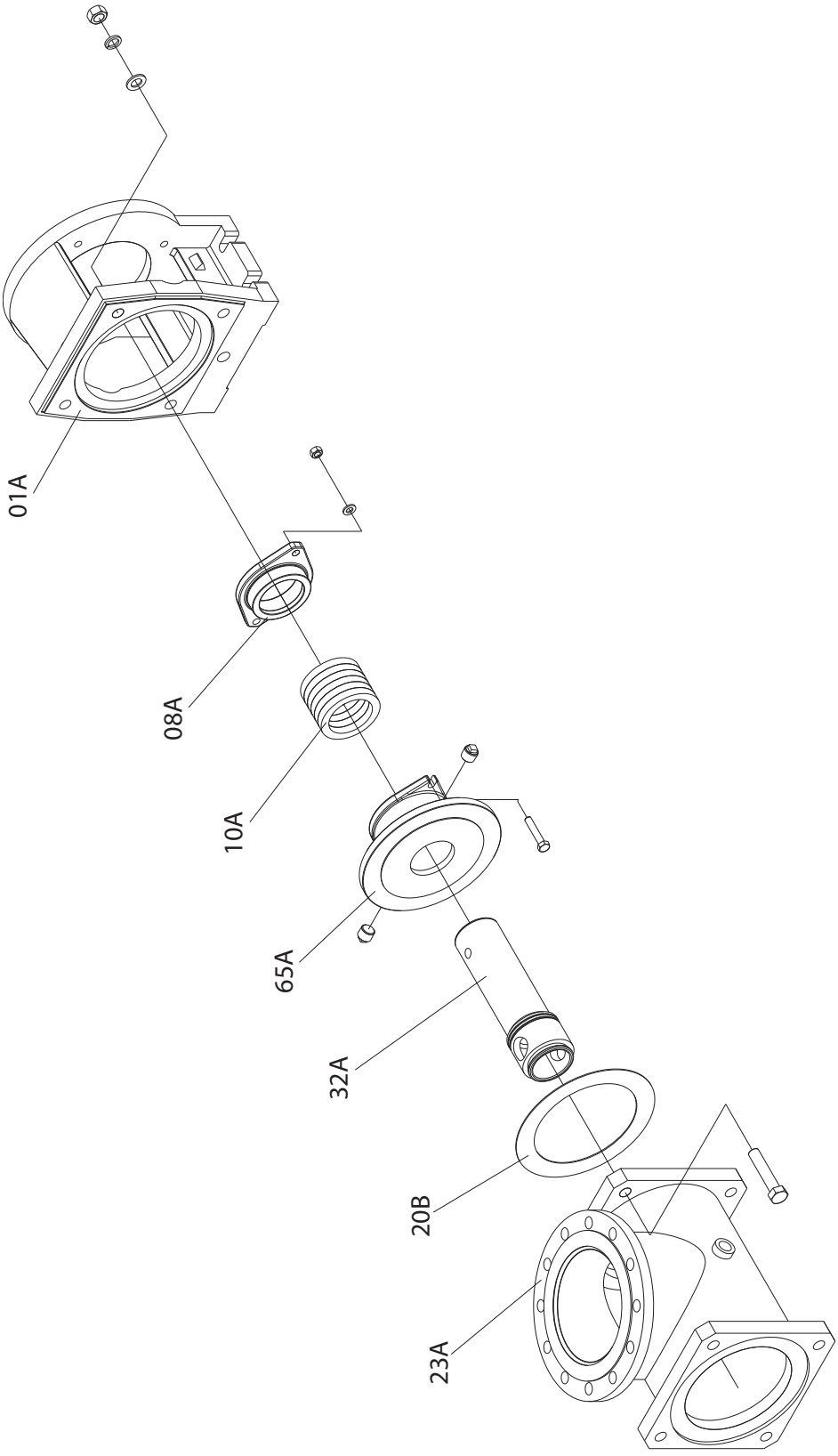
NOTE: All seal working lengths are to DIN L1K dimensions.
This table is not to be used for standard or DIN L1N working length seals.
All seals use 'M' type seat except for 85mm (3.35") which uses 'BS' type or 'M' type.
This table is not necessarily compatible with any other seal type - check with your Supplier.



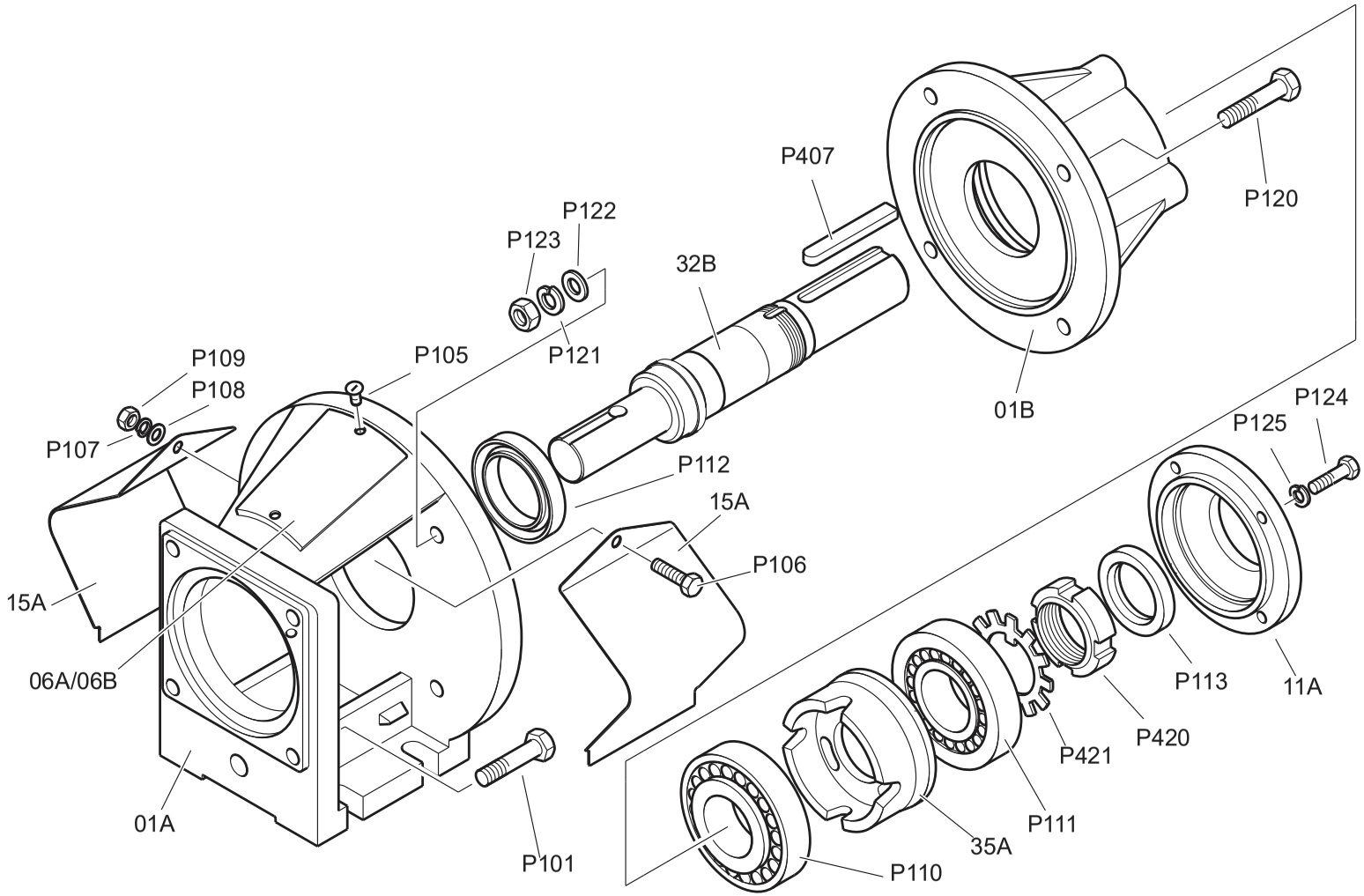
Pump Size	Drive Type	Shaft Diameter mm (inches)	Seal Part No.	Seal Working Length L mm (inches)	Setting Distance 'X' mm (inches)
C16D C18B C19A C19B C19DL C19K C1AA C1AK	Pin Joint	85 (3.35)	M085139G	60.0 (2.36)	33 (1.30)
C17D C1AB C1BA C1BK	Pin Joint	85 (3.35)	M085139G	60.0 (2.36)	58 (2.28)

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 your Supplier

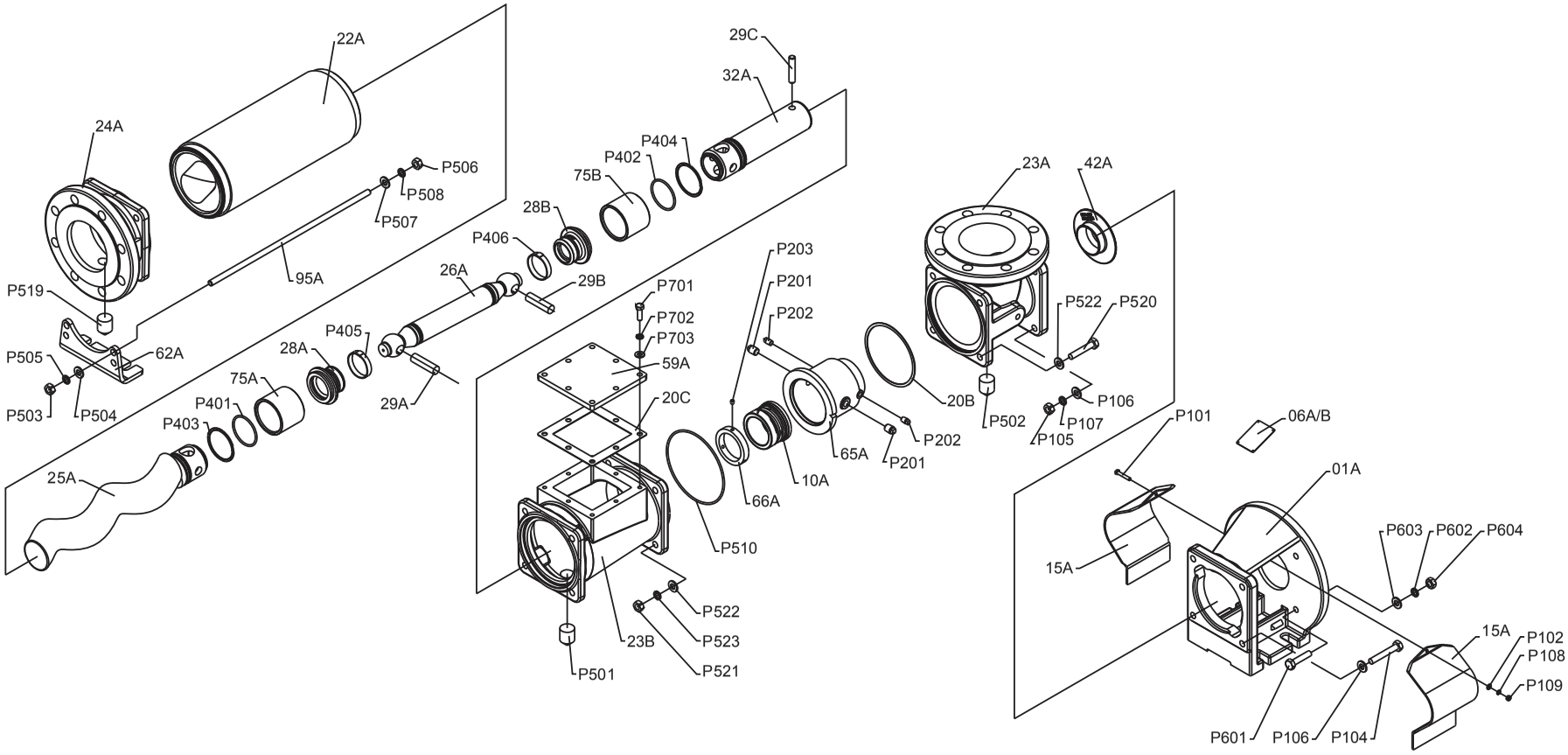
Exploded Views



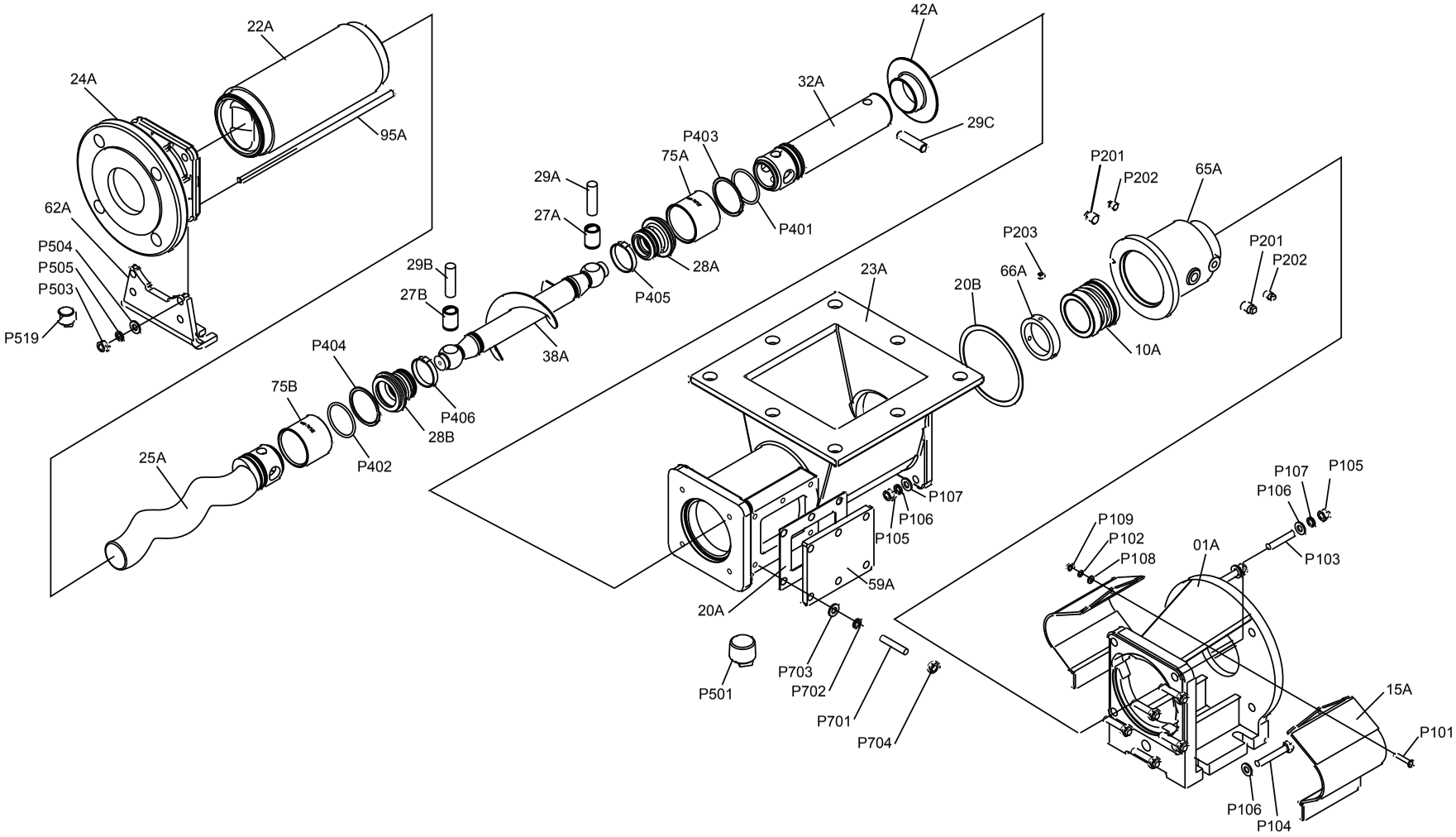
BEARING HOUSING ONLY



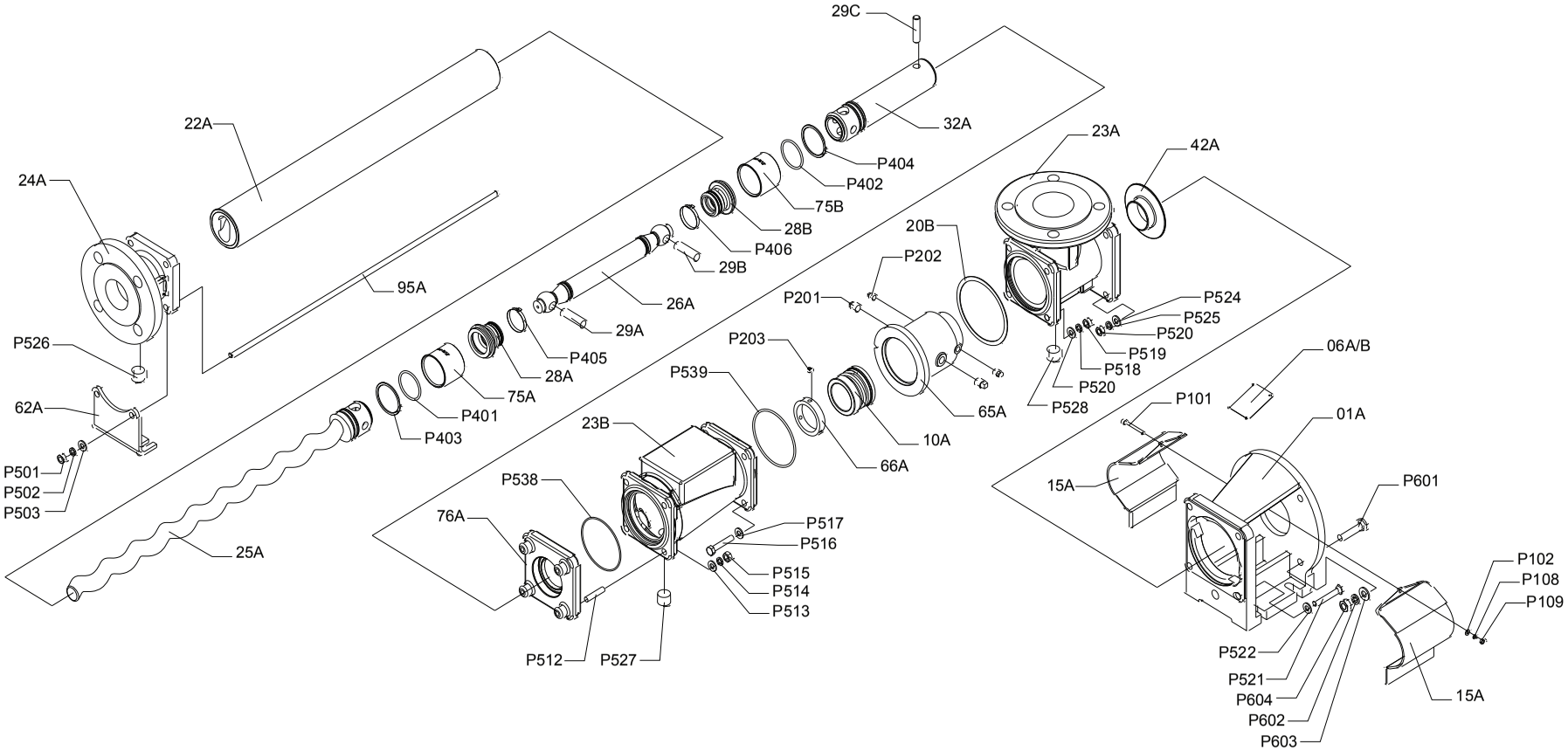
C1XK AND ABOVE
EXCLUDING C18B, C1AB, C1BA & C1BK



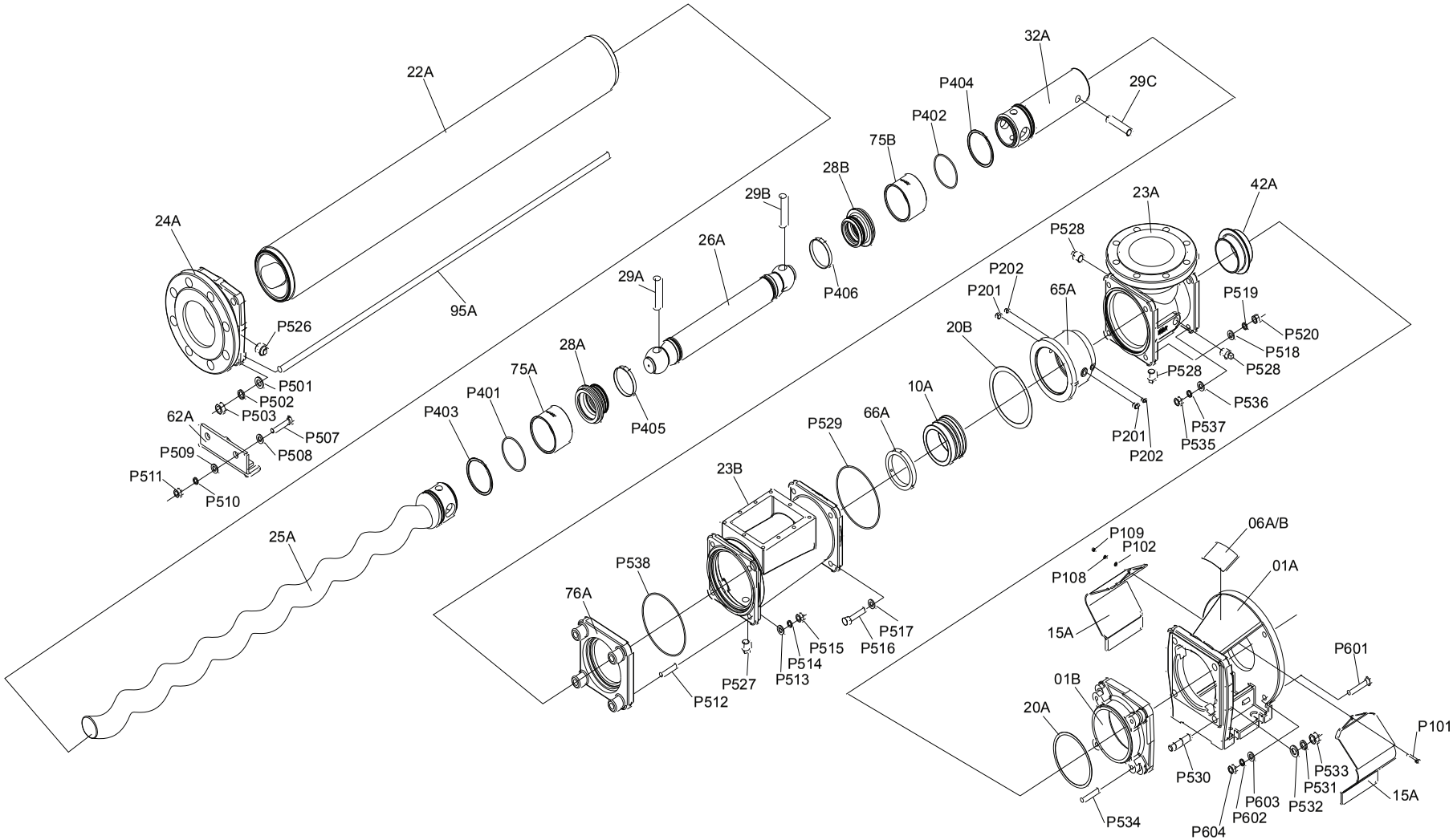
SQUARE INLET



4 - STAGE
EXCLUDING C16D
C13D TO C18D



4 - STAGE C16D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75A
28A
29A
P405
26A
29B
P406
28B
75B
P402
P404
32A
29C
P538
76A
23B
P512
P527
P513
P514
P515
P516
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P529
66A
10A
20B
P201
P202
65A
P528
23A
42A
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P520
P518
P536
P537
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06A/B
P109
P102
P108
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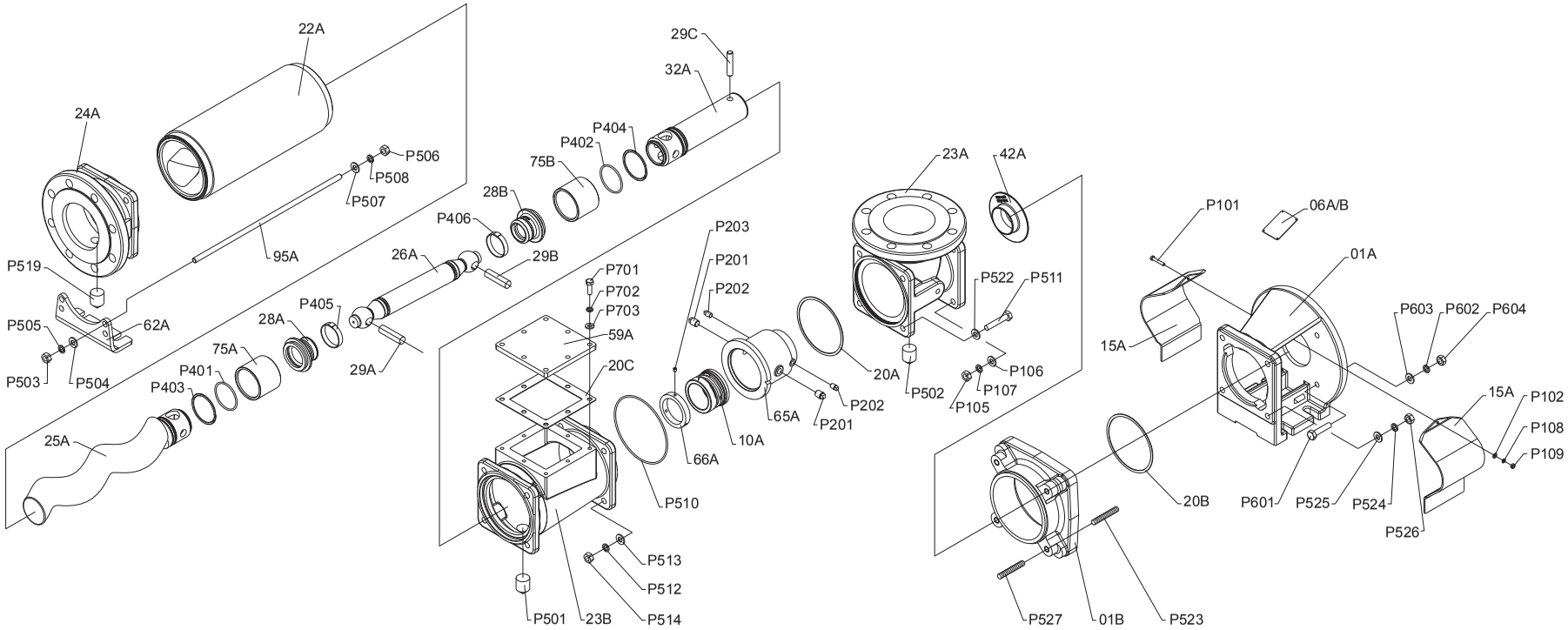
P101

C18B ONLY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29B
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P505
62A
P503
P504
28A
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75A
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25A
29A
P701
P702
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20C
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P202
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P101
06A/B
01A
15A
P603
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P108
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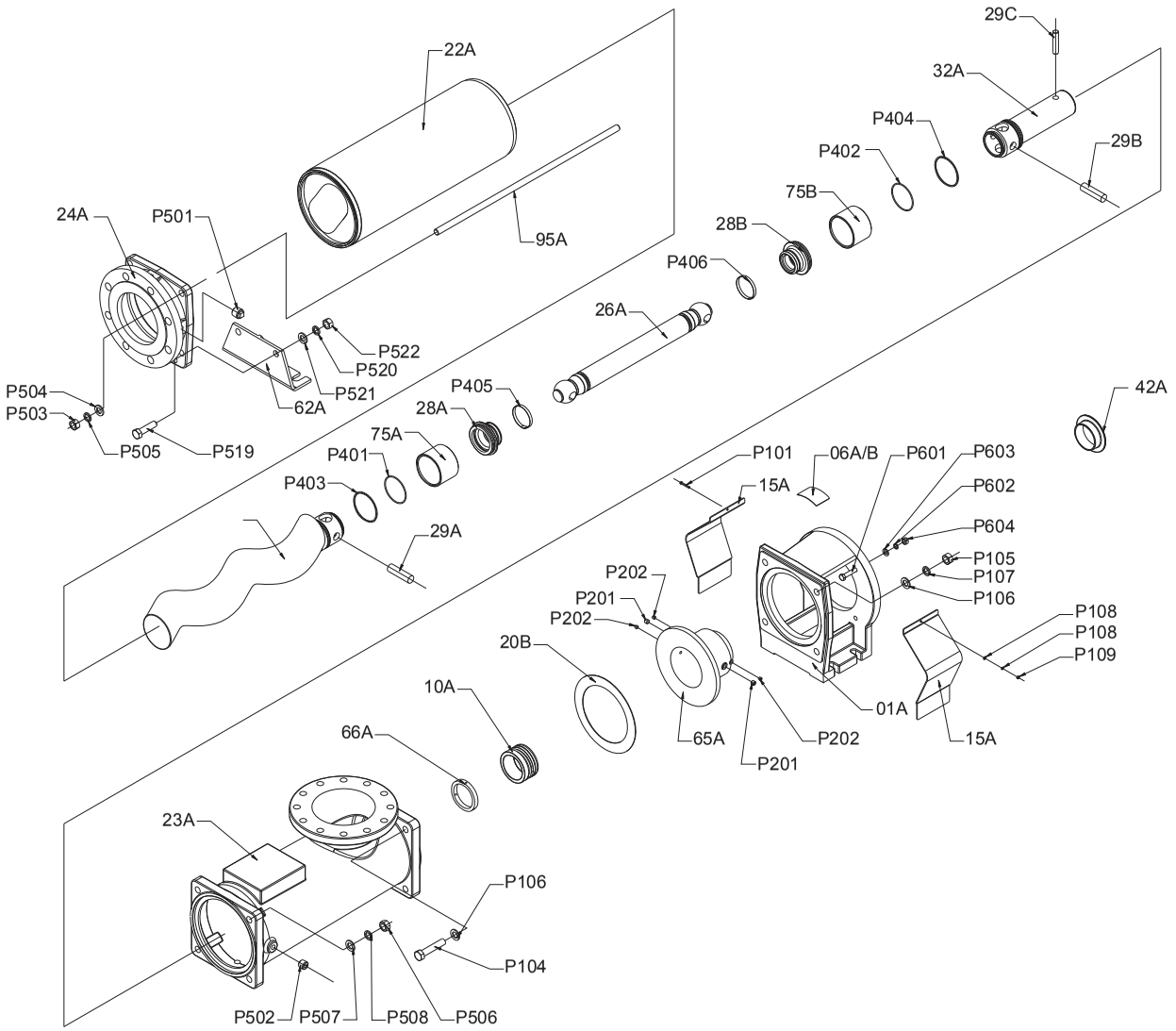
01B
P523

C1AB ONLY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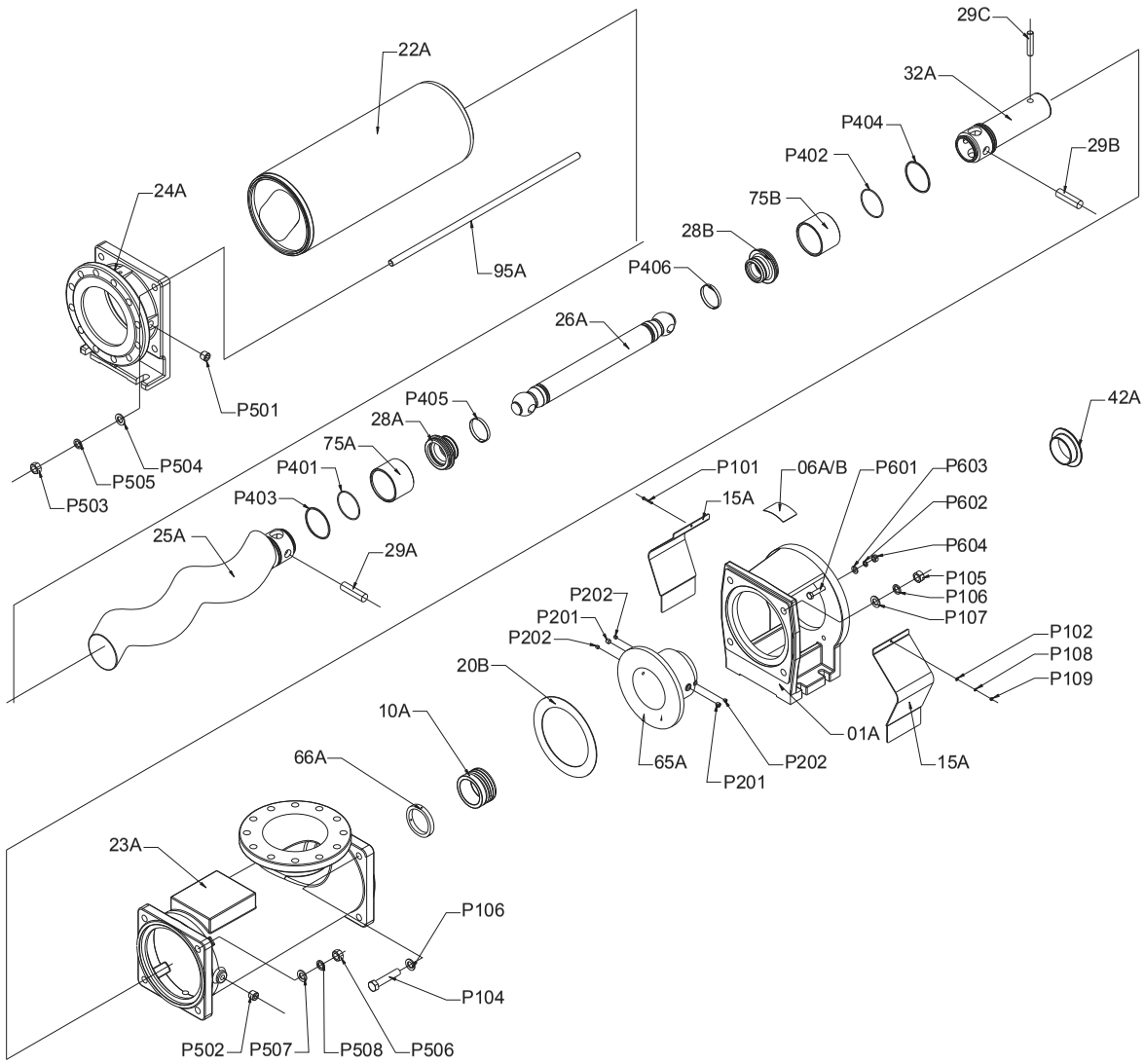
P506

C1BA & C1BK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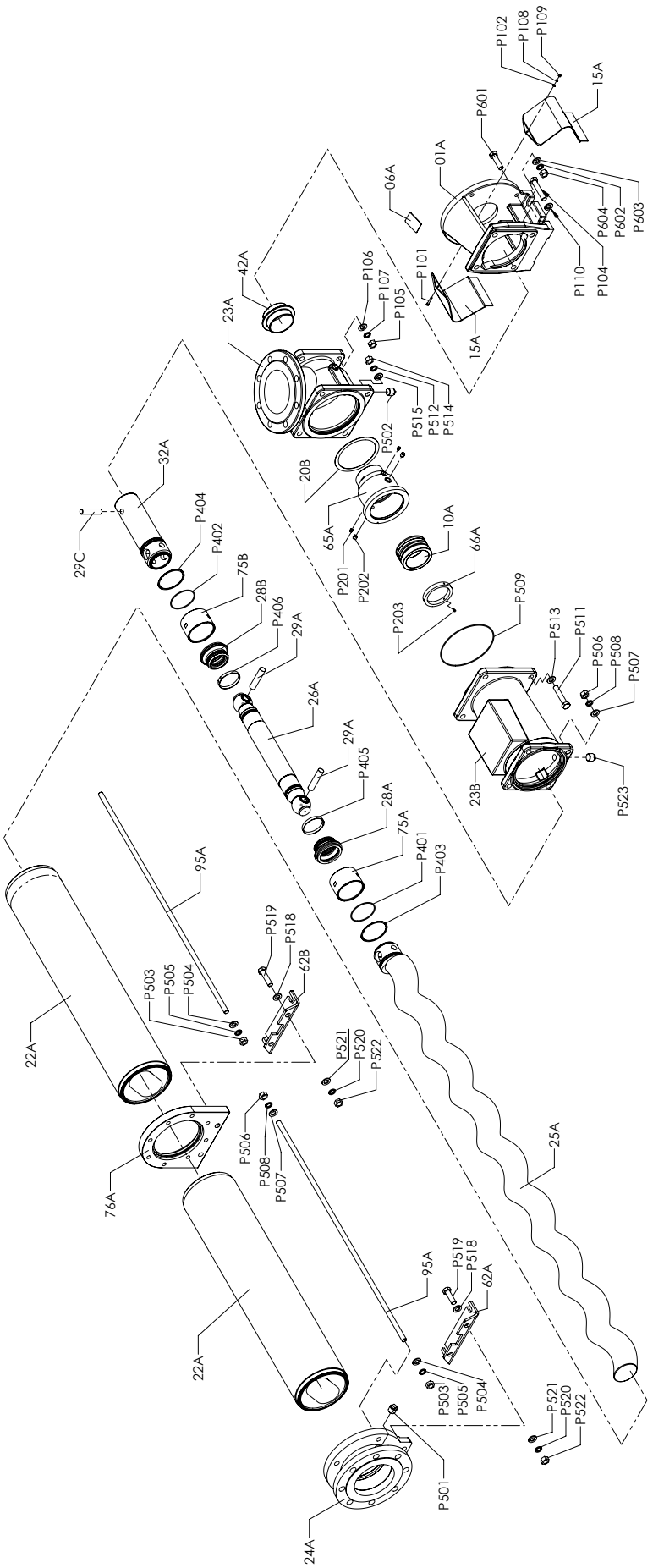
C19D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29C
P404
P402
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P202
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P523
75B
28B
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26A
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P401
P403
95A
P519
P518
62B
P503
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22A
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P507
25A
76A
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P520
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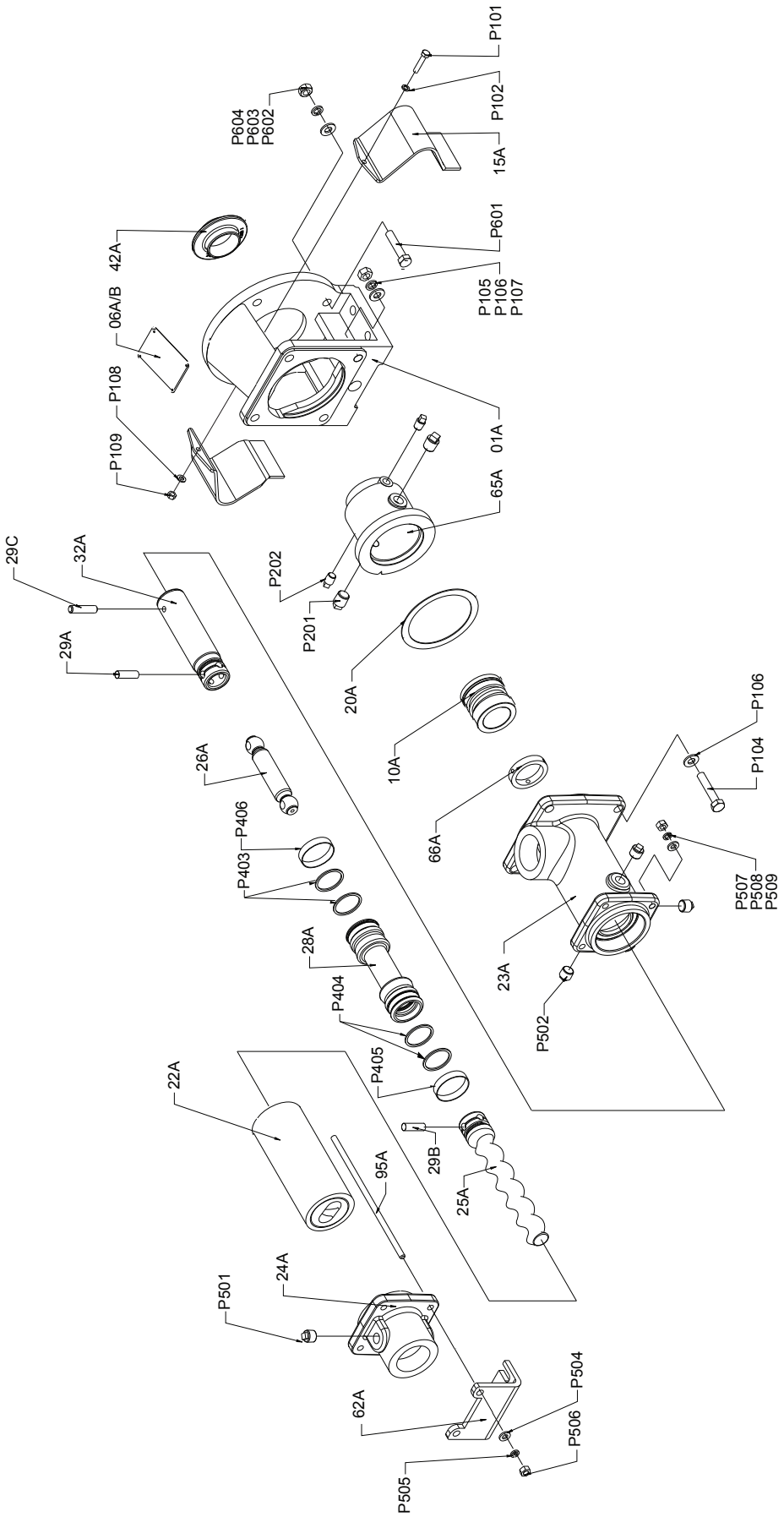
P501
24A

C21B - C22B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P202
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29C
32A
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26A
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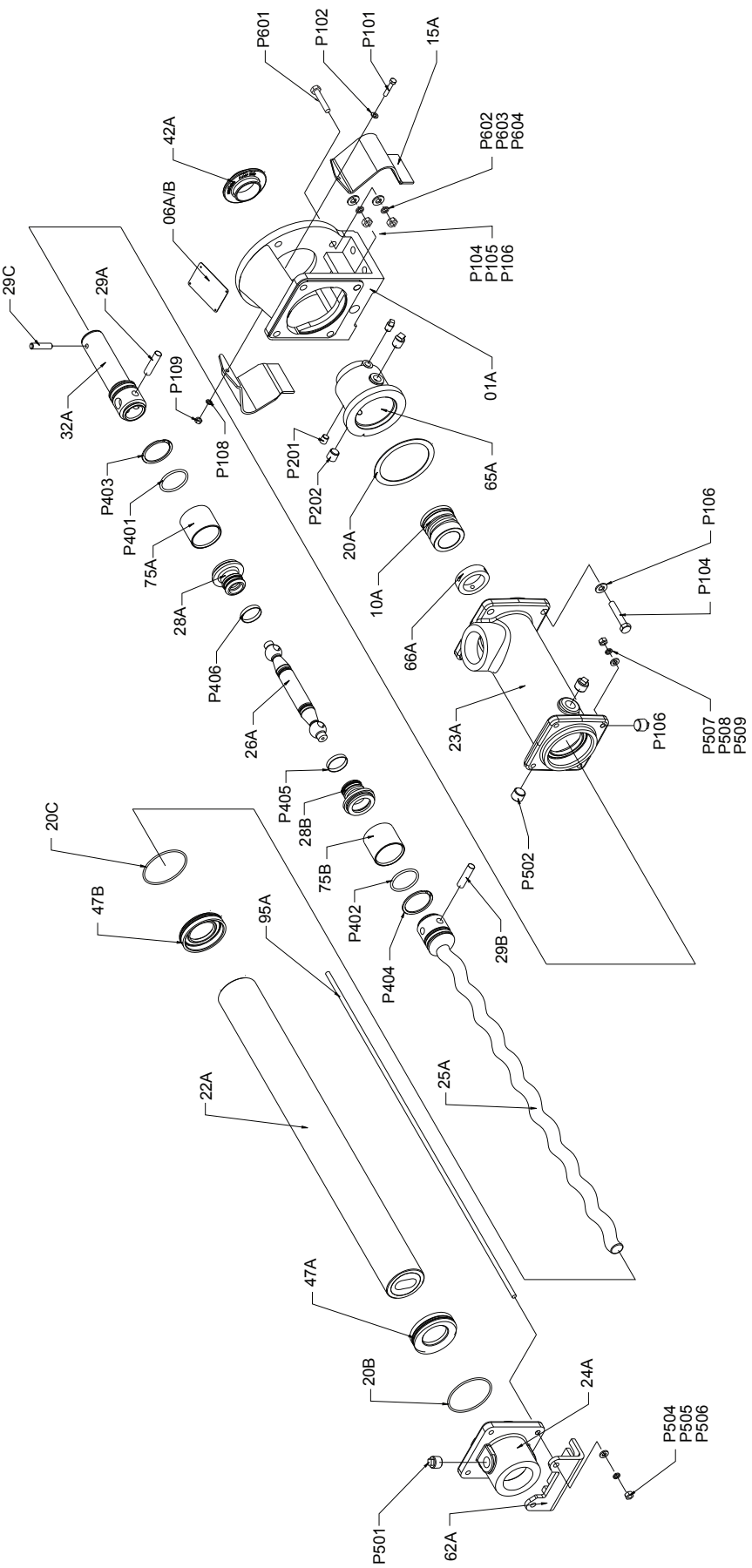
C22D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47B
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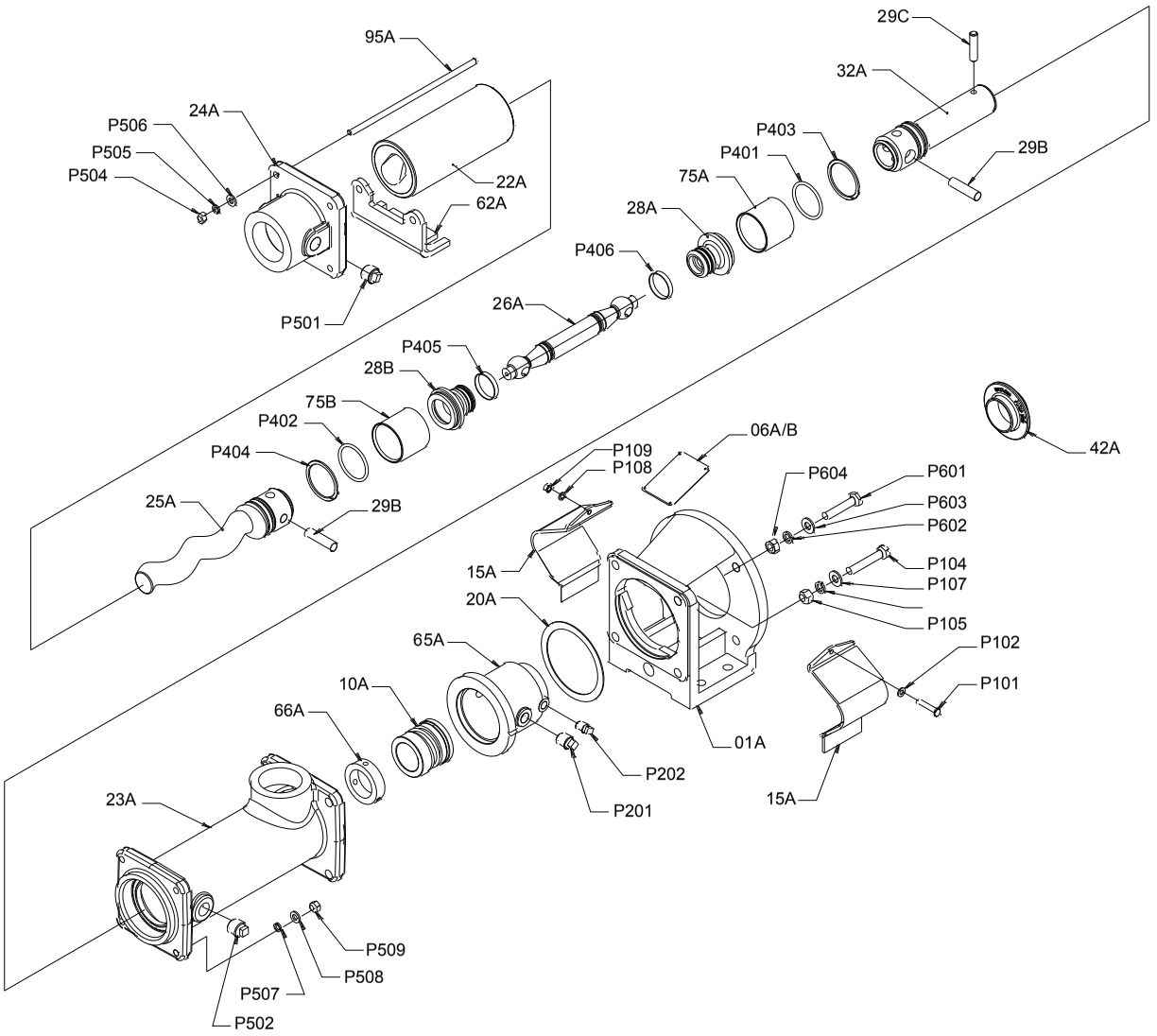
62A

C23A - C23K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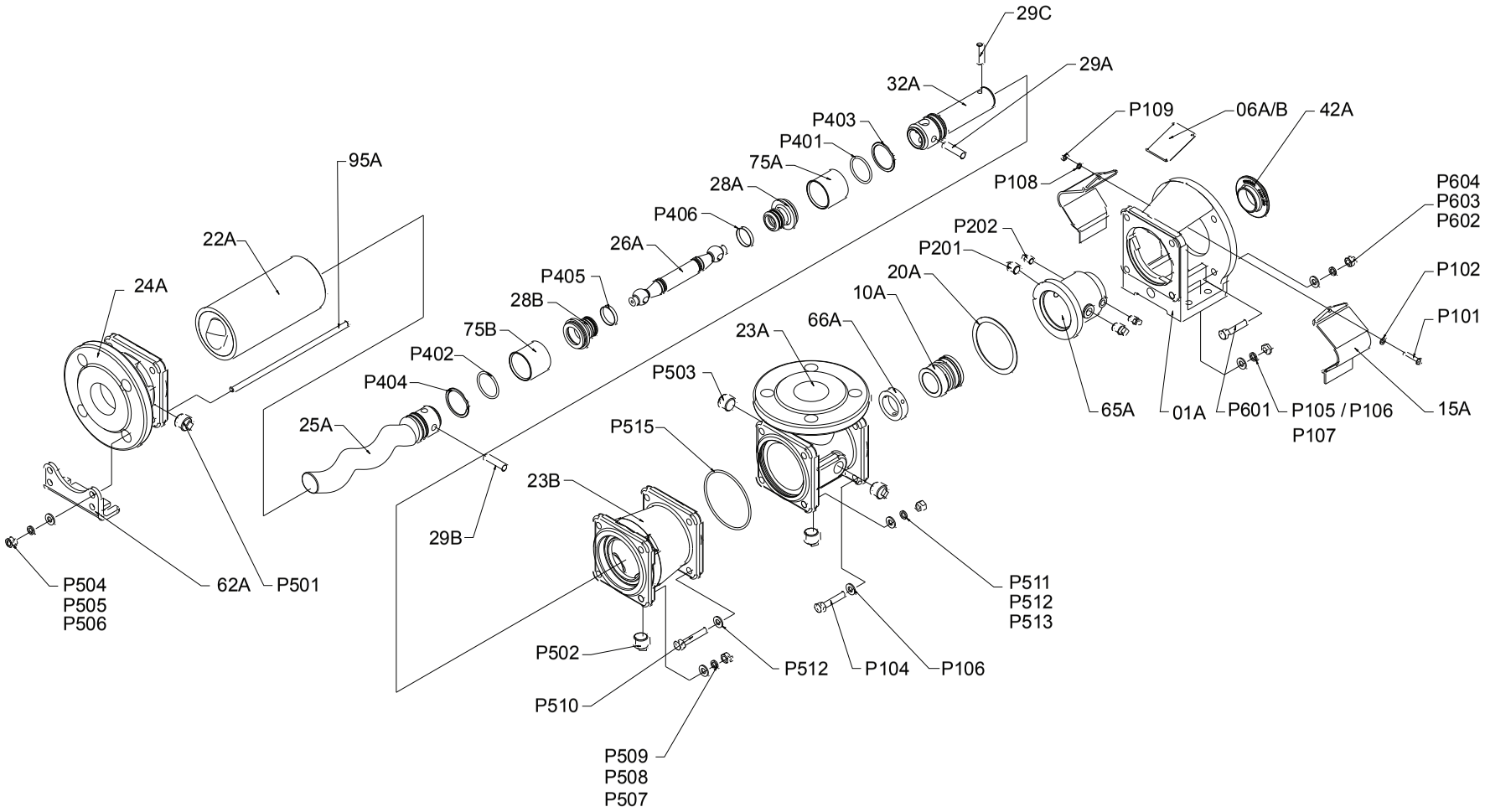
C2XA - C2XB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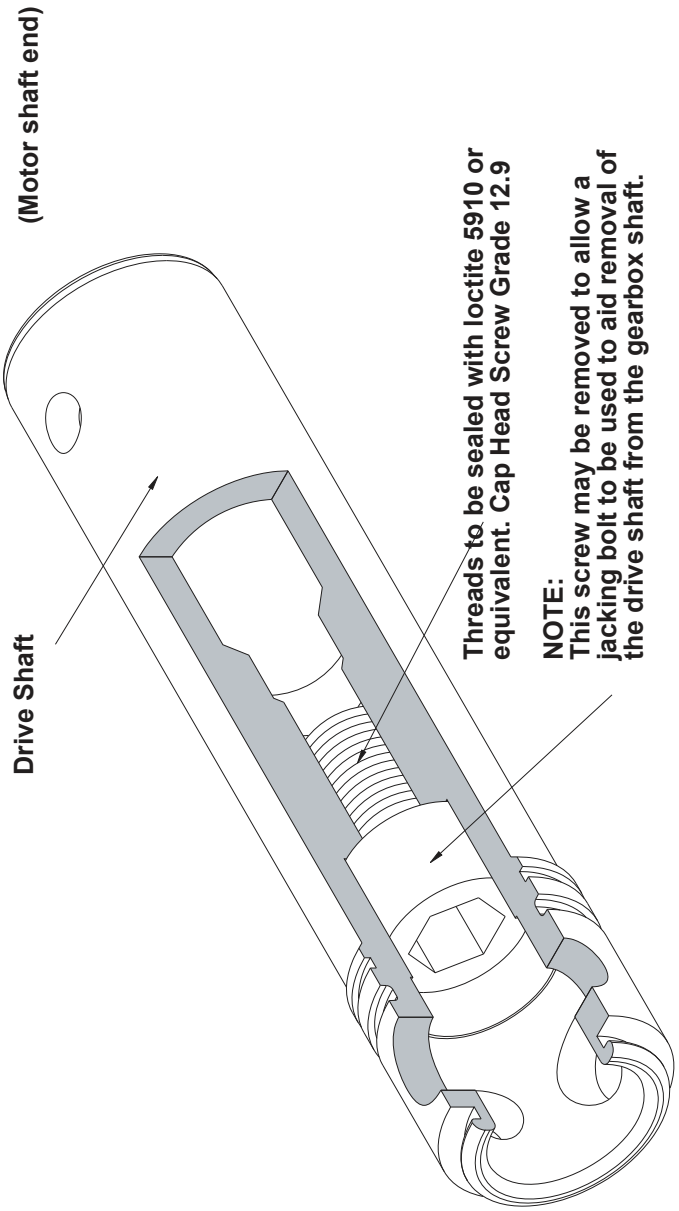
15A

Drive Shaft Assembly With Plug



NOTE: ENSURE THE CAP HEAD SCREW IS TIGHTENED & SEALED BEFORE ASSEMBLING WITH COUPLING ROD.

Torque Settings

PUMP SIZE	BODY/SUCT. CHAMBER Nm			STATOR TIE BARS Nm
	P526	P105	P530	P506 P503
C1XK	10			10
C14A	11			11
C14K	11			11
C14B	11			11
C15A	11			11
C15K	21			11
C15B	21			11
C16A	21			24
C16K	21			24
C16B	36			24
C17A	36			24
C17K	36			24
C17B	36			24
C18A	36			40
C18K	36			40
C18B	50	-	36	40
C19A	90			75
C19K	90			75
C19B	90			75
C19DL	90			75
C1AA	90			75
C1AK	90			75
C1AB	90			75
C1BA	176			120
C1BK	176			120

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

PUMP SIZE	BODY/SUCT. CHAMBER lb/ftf P526	P105	P530	STATOR TIE BARS lb/ftf P506 P503
C1XK		7.4		7.4
C14A		8.1		8.1
C14K		8.1		8.1
C14B		8.1		8.1
C15A		8.1		8.1
C15K		15.5		8.1
C15B		15.5		8.1
C16A		15.5		17.7
C16K		15.5		17.7
C16B		26.6		17.7
C17A		26.6		17.7
C17K		26.6		17.7
C17B		26.6		17.7
C18A		26.6		29.5
C18K		26.6		29.5
C18B	36.9	-	26.6	29.5
C19A		66.4		55.3
C19K		66.4		55.3
C19B		66.4		55.3
C19DL		66.4		55.3
C1AA		66.4		55.3
C1AK		66.4		55.3
C1AB		66.4		55.3
C1BA		129.8		88.5
C1BK		129.8		88.5

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

4 - STAGE C13D TO C18D

PUMP SIZE	BODY/SUCTION CHAMBER Nm			STATOR TIE BARS Nm	ADAPTOR FLANGE	SCTN. CHMB./SCTN. CHMB. EXT.
	P533	*P105*	*P535*	*P501*	*m P515*	*m P520*
C13D		1		1	1	1
C1XD		21		1	1	1
C14D		21		21	1	1
C15D		40		40	21	21
C16D	50	-	40	75	40	40
C17D		176		75	75	-
C18D		176		120	75	-

PUMP SIZE	BODY/SUCTION CHAMBER lb/ftf			STATOR TIE BARS lb/ftf	ADAPTOR FLANGE lb/ftf	SCTN. CHMB./SCTN. CHMB. EXT. lb/ftf
	P533	*P105*	*P535*	*P501*	*P515*	*P520*
C13D		0.7		0.7	0.7	0.7
C1XD		15.5		0.7	0.7	0.7
C14D		15.5		15.5	0.7	0.7
C15D		29.5		29.5	15.5	15.5
C16D	36.9	-	29.5	55.3	29.5	29.5
C17D		129.8		55.3	55.3	-
C18D		129.8		88.5	55.3	-

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

C2XB AND BELOW

PUMP SIZE	SUCTION CHAMBER/ SUCTION EXT. Nm P105	STATOR TIE BARS Nm P504, P507
C21B	10	4
C21D	10	4
C22A	10	4
C22B	10	4
C22D	10	4
C23A	10	4
C23B	10	4
C23K	10	4
C2XA	10	10
C2XB	11	10

PUMP SIZE	SUCTION CHAMBER/ SUCTION EXT. ft/lbf P105	STATOR TIE BARS ft/lbf P504 / P507
C21B	7.4	3.0
C21D	7.4	3.0
C22A	7.4	3.0
C22B	7.4	3.0
C22D	7.4	3.0
C23A	7.4	3.0
C23B	7.4	3.0
C23K	7.4	3.0
C2XA	7.4	7.4
C2XB	8.1	7.4

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

Recommended Lubricationand Service Intervals

PUMP MODEL	JOINT LUBRICATION CAPACITY (APPROX.) PER JOINT ml* (in³)	NON-FOOD APPLICATIONS ONLY			FOOD APPLICATIONS
		RECOMMENDED	SUITABLE ALTERNATIVE		
C21B C21D C22A C22B	6 (0.4)	KLUBERSYNTH GH6-460 OIL	MOBILITH SHC 007 SEMI-FLUID GREASE	SHELL RETINAX CSZ	KLUBEROIL UH1 6 - 460
C22D C23A C23B C23K C2XA C2XB C1XK	12 (0.7)				
C13D C14A C14B C14K C15A C15K	22 (1.3)				
C1XD C14D C15B C16A C16K	45 (2.7)				
C15D C16B C17A C17B C17K C18A C18K	55 (3.4)				
C16D C18B C19A C19B C19DL C19K C1AA C1AK	95 (5.8)		MOBIL GEAR OIL SHC 320		
C17D C18D C1AB C1BA C1BK	175 (10.7)				
C1BB C1CA C1DA	620 (37.8)				
C1CB C1CK C1DB C1EB	1600 (97.6)				

COMPONENTS	ALL APPLICATION EXCEPT FOOD	FOOD APPLICATIONS ONLY	SERVICE COMMENTS
PUMP DRIVE JOINTS	SEE PAGE 90		INSPECT AND LUBRICATE AS NECESSARY EVERY 4000 OPERATING HOURS
PUMP BEARINGS (WHERE FITTED)	BP Energrease LC2 OR EQUIVALENT		INSPECT AND RE GREASE IF NECESSARY EVERY 12 MONTHS
GEARED DRIVERS (WHERE FITTED)	AS RECOMMENDED BY THE MANUFACTURER		
NOTE: ABOVE SERVICE AND LUBRICATION INTERVALS ARE FOR GUIDANCE ONLY TO ENSURE MAXIMUM COMPONENT LIFE. PUMP WILL OPERATE FOR CONSIDERABLY LONGER PERIODS WITHOUT ATTENTION DEPENDING ON SERVICE CONDITIONS			

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