INSTALLATION GUIDE

- Generic
- Hydraulic pumps
- Hydraulic motors

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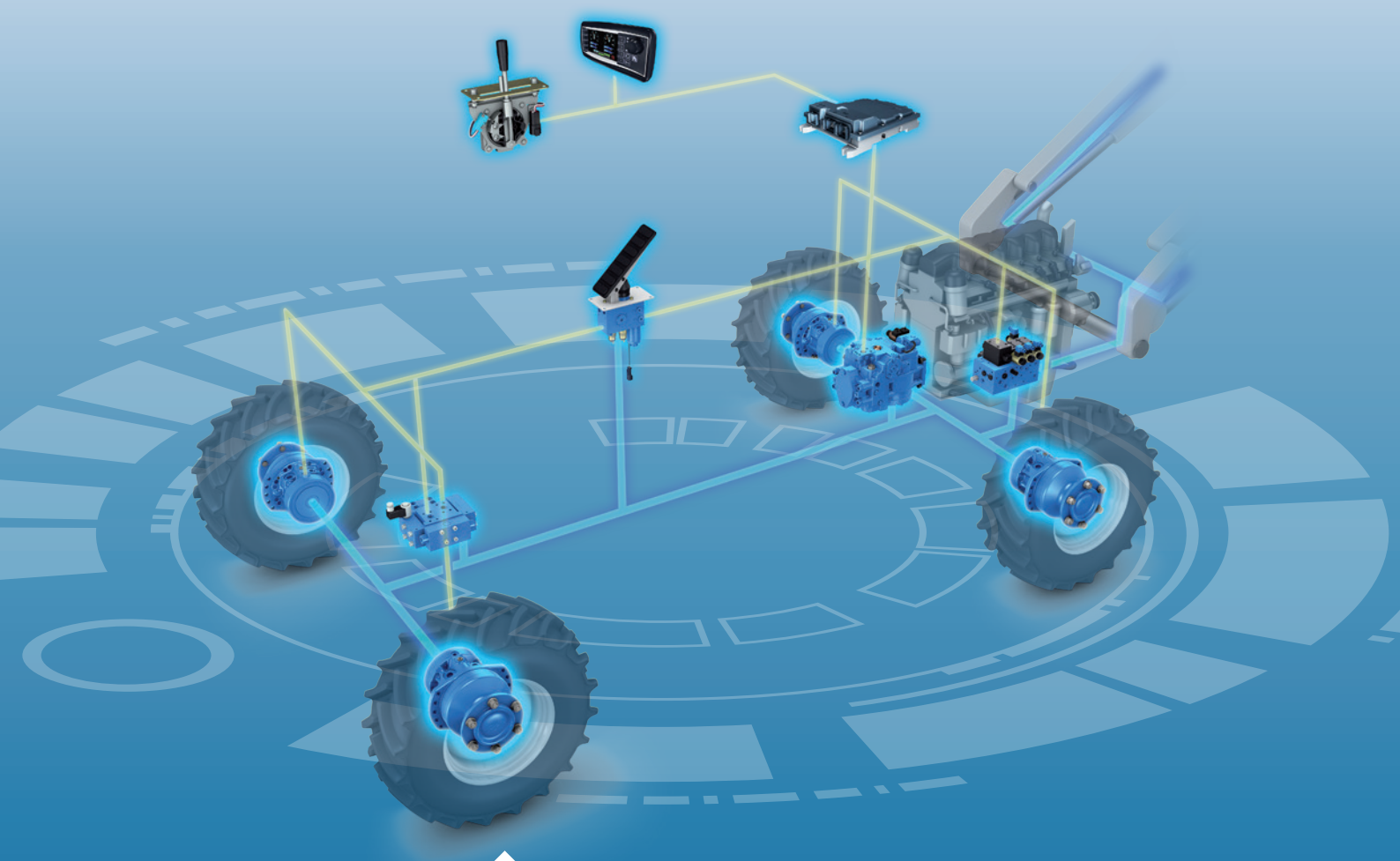

POCLAIN Hydraulics

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Generic

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1 - About this document

1.1 - Foreword

This document is intended for manufacturers of machines that incorporate Poclain Hydraulics products or for networks of repair centers that service Poclain Hydraulics products. It gives the necessary operating instructions concerning the repair,installation and diagnostics of Poclain Hydraulics products. Please read these operating instructions very carefully.

1.2 - Display of safety instructions

Standardized safety instructions, symbols, terms and abbreviations are used so that you can use this documentation to work safely with our product. They are explained below.

⚠ SIGNAL WORD

Type and source of hazard.

Consequences of not avoiding the hazard.

- Tips on how to avoid the hazard.

- **Safety sign:** Draws attention to the hazard.
- **Signal word:** Identifies the degree of the hazard.
- **Type and source of hazard:** Identifies the type and source of the hazard.
- **Consequences:** Describes what occurs if the safety instructions are not followed.
- **Precautions:** States how to avoid the hazard.

Hazard classifications in accordance with ANSI Z535.6

Safety sign, Signal word	Meaning
⚠ DANGER	Identifies a dangerous situation that will result in death or serious injuries if not avoided.
⚠ WARNING	Identifies a dangerous situation that may result in death or serious injuries if not avoided.
⚠ CAUTION	Identifies a dangerous situation that will result in moderate or minor injuries if not avoided.
NOTICE	Damage to equipment: the product or the environment risks damage.

1.3 - Symbols

The following symbols are not related to personal safety; they are intended to make this document easier to read:

Symbol	Meaning
	Poclain Hydraulics disclaims any liability for damage of any kind if use of the product is not compliant with a recommendation identified with this symbol.
	General information regarding the product or the repair procedure.
	Recycling information.
	Reference to the tool in tooling catalogue.
	Indication of necessary tightening torque.

Symbol	Meaning
	Indication to apply grease.
	Indication to apply oil.
	Screw / turn clockwise.
	Unscrew / turn counter-clockwise.

1.4 - Abbreviations

This document contains the following abbreviations:

Abbreviation	Meaning
ATEX	EU directive for explosion protection (Explosive atmosphere).
ANSI	**A**merican **N**ational **S**tandards **I**nstitute.
DIN	**D**eutsche **I**ndustrie **N**orm.
ISO	**I**nternational **O**rganization for **S**tandardization.

2 - Safety instructions

2.1 - About this chapter

Poclain Hydraulics products are designed and manufactured according to current standards, regulations and technologies. They are intended for professional use only.

To prevent the major risks of personal injury or property damage, it is mandatory to follow the safety instructions and technical notices set out in this document.

- This document must remain accessible to all.
- Before starting any repair or installation, it is mandatory to read and fully understand the information given in this document.
- Always deliver this document with every Poclain Hydraulics Product supplied to third parties.

2.2 - Intended use

Whatever their application according to EU machine directive 2006/42/EC, Poclain Hydraulics Products are hydraulic components which must not be considered either as complete or incomplete machines.

Axial piston pump

Axial piston pumps are a compact variable displacement unit with swashplate system, for closed loop hydrostatic transmissions. They provide a continuously variable flow rate. Flow rate is proportional to rotation speed and swashplate angle.

Radial piston motor

The radial piston motor is a receiver which converts a hydraulic energy (flow x pressure) supplied by a hydraulic pump to mechanical energy (speed x torque). It is designed for use in off-road, on-road and industrial applications and can be installed in an open circuit or closed circuit.

The rotation output speed depends on the flow rate supplied by the pump and motor displacement.

2.3 - Improper use

Any use that is not described as intended use in this document is considered improper and therefore not authorized.

Poclain Hydraulics will not be held liable for improper use of the product.

Any risk resulting from improper use falls under the user's responsibility.

Examples of improper use:

- Using Poclain Hydraulics Products outside the values given in the technical catalogs without approval from the application engineer.
- Using Poclain Hydraulics Products which are not in good operating condition.
- Using Poclain Hydraulics Products with unauthorized hydraulic fluids and / or fluids whose water content is too high (maximum = 0.1%).
- Modification of the factory settings of the Poclain Hydraulics Products by unauthorized parties.
- Using Poclain Hydraulics Products in a machine / system without approval of its specifications by the application engineer.
- Using Poclain Hydraulics Products with an axial or radial load not approved by the application engineer.
- Using Poclain Hydraulics Products under or in water unless approved by the application engineer.
- Using Poclain Hydraulics Products in explosive environments without component or machine/ system ATEX directive 94/9/EC authorization.
- Using Poclain Hydraulics Products in an aggressive atmosphere.
- Using Poclain Hydraulics Products in aircraft or spacecraft.

2.4 - Staff and workshop equipment

2.4.1 - Qualified personnel

Poclain Hydraulics products must be installed and repaired by qualified technicians only.

A qualified technician is someone who:

- Has basic mechanical and hydraulic knowledge.
- Has received the training required to perform the repair operations correctly.
- Is able to read and fully understand the information given in this document, especially the safety instructions.
- Is able to evaluate tasks and the risks that could result.
- Is able to avert the risk of accident and personal injury by applying the necessary safety measures.
- Is able to avert the risk of environmental pollution.
- Is able to comply with the guidelines, standards, laws and regulations in force in his/her country.

In order to emphasize the importance of the safety instructions and their application, the qualified technicians must confirm in writing that they have read and understood the instructions contained in this document.

Technicians must wear personal protective equipment (PPE) to avoid physical injury - see the "Personal Protective Equipment" chapter.

It is strictly forbidden for any person under the influence of alcohol, drugs or medical treatment to perform installation or repair of Poclain Hydraulics products.

It is recommended that personnel read the specific safety instructions for the relevant additional workshop equipment e.g. gas-oxygen torch, bearing heater, washing machine, etc.

All chemicals or special cleaning products require a MSDS material safety data sheet displayed on the product, e.g. Vaseline, rust cleaner, rust release penetrant spray, penetrant, degreaser, anticorrosion spray, etc.

Managers of repair workshops must absolutely ensure that their technicians comply with the instructions given in this document and the laws and regulations in force in their country. It is their responsibility to enforce these laws/regulations, give the required training to technicians, and provide adequate protective equipment.

Poclain Hydraulics disclaims liability for personal injuries resulting from a failure to respect safety instructions and/or mishandling the product.

2.4.2 - Workshop equipment

Required equipment

Install Poclain Hydraulics products in a sheltered and well-lit workshop. The floor, walls and working area should be clean, to avoid product pollution by external contaminants (dust, metal particles, water, etc.).

- Workstations should be equipped with a waste oil collector to collect oil when opening products to avoid spilling it on the ground, and a compressed air source with air gun to eliminate contaminants from parts before their assembly.
- Cleaning station with a sink supplied with degreasing fluid and brush to clean parts and sub-assemblies. An extraction system is required to avoid the risk of toxic fume inhalation.
- Overhead travelling crane or jib crane near the workstation equipped with a suitable hoist capacity to handle products and sub-assemblies. Refer to product weights in the technical catalogs.
- Standard workshop tooling including wrenches, Allen wrenches, pliers, retaining ring pliers, screwdrivers, nylon mallets, torque wrenches, Vernier or digital calipers and depth gages, etc.
- Measurement equipment must be checked and calibrated annually by a nationally accredited laboratory.

Specific tooling must be procured or manufactured from information and drawings contained in this document.

These tools are intended solely for the repair of Poclain Hydraulics products: they are not suitable for repair of other products.

2.4.3 - Personal protective equipment (PPE)

Providing and correctly using personal protective equipment is the responsibility of the user of the Poclain Hydraulics product. Observe the safety regulations and provisions applicable in your country.

Technicians must wear personal protective equipment during repair operations of Poclain Hydraulics products. All components of the personal protective equipment must be in working order.

Symbol	Meaning
	**Protective clothes**: against cuts and projection of hydraulic fluids, chemicals or metal particles.
	**Safety footwear**: against risk of foot crushing, cuts or perforation caused by falling parts.
	**Protective gloves**: against cuts and physical contact with hydraulic fluids and chemicals.
	**Manual handling**: parts heavier than 15 kg should not be lifted manually. Risk of back injury.

Symbol	Meaning
	**Eye protection**: against physical contact with chemicals and projection of hydraulic fluids, metal particles and dust.
	**Hearing protection**: against noise above 85 decibels (compressed air tooling, test bench, etc.)
	**Respiratory protection**: against inhalation of toxic fumes, sprays, and dust.
	**Crane handling**: mandatory for lifting parts heavier than 15 kg. Respect the load limits of the crane.

2.5 - General safety instructions

DANGER

Inappropriate components or products!

- Inappropriate components or products used in a safety-related system or application could result in serious damage to persons or property.
- Use only permitted products or components mentioned in the machine or equipment manufacturer's documentation, especially for safety or control system parts.

- Comply with the laws and regulations in effect for accident prevention and environmental protection.
- Use Poclain Hydraulics products only when they are in good technical order and condition.
- Persons who install, operate, remove or maintain Poclain Hydraulics products must not consume any alcohol, drugs or pharmaceuticals that may adversely affect their abilities.
- Use of non-genuine spare parts or incorrect spare parts could result in damage to the product and/or the machine / system, as well as pose a potential safety risk. It is strictly forbidden to rework critical surfaces of parts (e.g. re-lapping) or to modify the shape of any part shape.
- Conform to the technical data and ambient conditions specified in the product documentation.
- You may only commission the product if it has been determined that the end product (e.g. machinery or a system) into which the Poclain Hydraulics products are to be installed complies with the country-specific provisions, safety regulations and standards for the application.

2.6 - Product-specific safety instructions

The following safety instructions apply for all chapters included in this document.

DANGER

Risk of death or serious injury to technicians!

Risk of inappropriate behavior of the machine.

- In case of several people working on or around the machine, a leader must ensure the relevant organization and coordination between the various technicians.

Motor external overload!

Risk of death or serious injury: excessive external loads cause radial piston product failure.

- A technical approval by Poclain Hydraulics Engineering Department is required for each application. Please contact your Poclain Hydraulics sales partner.

Danger to life or risk of injuries, motor failure resulting in major motor break up and failure to support loads.

- To ensure the durability of the motor for the specific combination of external loads, a technical approval by Poclain Hydraulics Engineering Department is required for each application. Please contact your Poclain Hydraulics sales partner.

Risk due to excessively high pressure!

Changing the factory pressure settings can cause pressure to increase beyond the permissible maximum. Operating the unit above the permissible maximum pressure can cause component failure and escaping hydraulic fluid under high pressure.

- Changes to the factory settings must be made by Poclain Hydraulics specialist personnel.

DANGER

Risk from suspended loads!

Use of improper transportation or lifting equipment may result in dropping a Poclain Hydraulics product, potentially causing death or serious injury.

When transporting a product, always respect the safety rules, laws and regulations in effect.

- Always check that the lifting equipment is adequate for the load. Do not use lifting equipment with an insufficient load capacity rating.
- A non-exhaustive list of suggested safety rules is shown below:
  - Nobody should stand in the danger zone of the machine or system.
  - Ensure coworkers and other bystanders are out of the danger zone.
  - Never work under a suspended load.
  - Never guide a load with your hands.
  - Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

Pressurized machine/system!

Risk of death or serious injury when working on machines/systems that are not shutdown and depressurized!

Before performing any servicing or repairs, set up a safety perimeter around the machine and monitor access. Working in the danger zone of a machine or system is prohibited.

Switch off the machine or system and follow the instructions of the machine or system manufacturer.

- Nobody should stand in the danger zone of the machine or system.
- Ensure coworkers and other bystanders are out of the danger zone.
- Protect the complete system from activation. Ensure the machine/system is depressurized. Please follow the machine/ system manufacturer's instructions.
- Do not disconnect hydraulic hoses, fittings, or components while the machine / system is pressurized.

Risk of oil mist!

Risk of explosion, fire, health hazard, environmental pollution causing death or serious injury!

- Depressurize the machine / system before servicing the circuit.
- Welding work should only be done when the machine / system is depressurized.
- Keep all possible fire sources away from a hydraulic system or machine and components containing hydraulic oil.
- If the pump, radial piston motor or hydraulic hoses must be installed near sources of heat or ignition, a guard must be installed to prevent any risk of oil splashing toward this source (risk of ignition of the oil).

Hazardous electric voltage!

Risk of death or serious injury due to electric shock!

- Check that the machine / system is not switched on when you install or work on the component.
- Make sure the electrical voltage of the power source is compliant with Poclain Hydraulics product specifications.
- The connectors must be compliant with the appropriate regulations in force.
- Protect the machine / system against accidental power-up.

Presence of strong magnets!

Risk of death or serious injury, malfunction of pacemakers or similar devices.

- People who use pacemakers or similar devices are not allowed to service or disassemble the axial piston pumps or radial piston motors.
- Only handle these parts in a clean environment free of small ferromagnetic parts or particles.

DANGER

Motor with dynamic brake and/or parking brake may not provide sufficient brake torque!

Risk of death or serious injury due to improper use of brakes/worn brakes!

- Do not use lubricant or hydraulic oil on the drum brake pads.
- Ensure any fluids/lubricants used in any part of the motor are compliant with the specification in the data sheet.
- Make sure the brake of the radial piston motor is in good condition.
- Do not use the parking brake as a dynamic brake; ensure the brake is fully released during operation using the specified brake release pressure.
- Make sure the orientation of the motor is correct according to the installation drawing.

Wrong machine / system definition!

Risk of inappropriate behavior of the machine.

- The machine / system must be defined to avoid to have a full stroke swash plate when the pump control is blocked by contamination.

Risk from incorrect pump neutral!

Risk of death or serious injury to technicians!

A neutral issue can cause inappropriate behavior of the machine.

- Modifying the neutral of the pump is strictly forbidden.

WARNING

Loss of braking efficiency!

Risk of inappropriate behavior of the machine.

- Do not exceed the maximum speed or pressure.
- The machine manufacturer must provide an independent braking system, redundant to the hydrostatic transmission, able to stop and hold the machine in case of hydrostatic drive power loss.
- The braking system must be able to hold the machine in position when full torque is applied.

Excessive values!

Risk of loss of function, incorrect behavior of the hydraulic system or machine and damage to the equipment!

- Do not exceed the values given in the Poclain Hydraulics technical catalog.
- For all questions, please consult your Poclain Hydraulics application engineer.

During towing!

Risk of inappropriate behavior of the machine.

- Excessive speed and extended load / vehicle movement must be avoided while moving in bypass function.
- The load or vehicle should be moved at not more than 20% of maximum speed and for a duration not exceeding 3 minutes.
- When the bypass function is no longer needed, care should be taken to restore the initial settings of the machine.

⚠ CAUTION

High level noise generation during operation!

Risk of hearing loss or deafness!

Depending on the operating pressure and speed, Poclain Hydraulics products may generate a high level of noise.

- Always wear adequate hearing protection.

Risk of very hot surfaces on the component!

Risk of burns!

During operation, some components in a hydraulic system or machine may reach high temperatures.

- Wait for the axial piston pumps or radial piston motors to cool down before touching them.
- Always wear adequate PPE.

Incorrect routing of pipes and cables!

Risk of loss of function or incorrect behavior of the hydraulic system or machine and damage to the equipment.

- When laying out cables and lines, take care to avoid causing damage or creating trip hazards.

Risks related to the contact of hydraulic fluid!

The use of hydraulic fluid may cause eye injuries, skin damage, or poisoning.

- Avoid all contact with hydraulic fluids.
- Always follow the safety instructions provided by the hydraulic fluid manufacturer.
- During any service or repair work, always wear adequate personal protective equipment.
- If hydraulic oil comes into contact with eyes or bloodstream, or is swallowed,consult a physician immediately.

Risks related to using incorrect tools!

Risk of injury!

- Technicians must use the appropriate tools to handle, install or repair.

Risks related to hydraulic fluid leaks!

Risk of burns and injury!

- Stop and depressurize the machine / system to repair leaks.
- Never try to repair an oil leak using a cloth.

2.7 - General instructions on damage to a system or machine and products

NOTICE

Risk from improper handling!

The product may be damaged and need repair.

- Do not expose the product to a mechanical load exceeding its limits.
- Never use the product as a handle or step.
- Do not install anything on the product.
- No shocks allowed on the drive shaft of the axial piston pumps or radial piston motors.
- Do not install the axial piston pumps or radial piston motors directly on top of fittings or connectors (e.g. sensors, hoses, coils, valves, etc.).
- Do not damage the fittings or connectors (e.g. sensors, coils or valves, etc.).
- Do not damage the sealing fitting surfaces on fittings or products.
- Keep the protective caps on the ports of the axial piston pumps and radial piston motors until they are connected to the hydraulic circuit.

Risk from inadequate lubrication!

Insufficient level of oil and / or incorrect viscosity can damage or destroy the products and components.

- Never operate the axial piston pumps or radial piston motors with insufficient hydraulic fluid. Make sure the internal parts have sufficient lubrication.
- Especially if the tank is below the pump, regularly check the oil level in the pump housing and re-level if necessary. After a long downtime, it is important for the pump bearings to be properly lubricated at restart.

Risk of incorrect cleaning!

Components and hydraulic circuits may be damaged!

- Take care to seal all ports with appropriate protective plugs to prevent pollution from entering the hydraulic circuit.
- Use only appropriate solution, if necessary, to clean the axial piston pumps or radial piston motors.
- Do not use aggressive solvents or detergents.
- Do not use high pressure cleaner on shaft seals or other sensitive parts of the products and components.
- Use only lint-free cloths for cleaning.

Risk due to mixing hydraulic fluids!

Products and components may be damaged!

- Do not mix different hydraulic fluids from the same or different manufacturers in the same system or machine.
- Make sure to drain the Poclain Hydraulics products and other components before installation.

Disassembly or repair of Poclain Hydraulics products or components on the customer's premises is strictly forbidden and voids the warranty unless performed by a Poclain Hydraulics Certified Repair Center.

When commissioning a machine/system, make sure the pump housing and the hydraulic circuit are full of oil and remain full of oil during operation. Special care must be taken in pump applications requiring the pump shaft to be mounted in the vertical position (trapped air must be removed from the bearing cavity).

Hydraulic fluid contamination!

The cleanliness of the hydraulic fluid has a significant impact on the hydraulic system and service life. Contamination of the hydraulic fluid damages the components of the system, causing premature wear and malfunctioning!

- The working area must be clean, free of all possible contaminants coming from welding, metal cuttings, or dust in order to prevent the pollution of the hydraulic circuit system, components, axial piston pumps and radial piston motors.
- All connections, pipes, fittings and similar components must be checked to ensure they are clean before installation.
- Remove the protective plugs just before connecting the components.
- Before the first start-up of the machine/equipment:
  - Make sure all fittings, pipes, and connections correspond correctly to the machine/equipment and appropriate technical catalog specifications to avoid a product malfunction.
  - Make sure all fittings, pipes, and hydraulic connections are well tightened to avoid an external leak or system contamination.

Environmental pollution due to incorrect scrapping or non compliant recycling!

Negligent disposal of axial piston pumps, radial piston motors, fittings, system components, hydraulic fluid, packaging or packing materials can generate environmental pollution.

- Make sure that the recycling of hydraulic fluids, pumps, motors, other components, and packaging is compliant with the applicable laws and regulations of your country.
- Dispose of hydraulic fluid and detergents used in accordance with the manufacturer's safety data sheet and applicable laws and regulations in your country.

Hydraulic fluid spillage!

Risk of falling and environmental pollution!

- Make sure to install a containment tank under the Poclain Hydraulics products or other components during filling or draining.
- Use an absorbent product in case of a hydraulic fluid spill.
- Comply with the system manufacturer specifications and the hydraulic fluid safety data sheets.

3 - Installation recommendations

3.1 - Before installation

- Take all necessary safety precautions (people and machines) and comply with the safety regulations in force.
- Confirm that mobile equipment is immobilized.
- Confirm that the hydraulic systems' energy generator (electric motor) is stopped and electrical power is disconnected.
- Set up a safety perimeter.
- Do not perform work on a hydraulic system that is hot or under pressure (discharge the accumulators).

WARNING

Hot oil or oil under pressure can cause serious burns and infection!

- Consult a physician in case of accident.

The customer is responsible for proper analysis, design, and quality of the mating coupling, key, and applied torque on the nut.
Torque must be transmitted by the taper inserted between the shaft and mating coupling, not the key.
Failure to properly analyze the shaft assembly required to create a robust joint could result in transmitting torque through the key, which may lead to premature shaft failure.

Related documents

Consult your sales engineer for the interface drawing, technical catalog and repair manual.

3.2 - During installation

Install the hydraulic system according to the specifications and processes appearing in this document.

- Support the components using a lifting device with adequate capacity for attaching the components to the chassis.
- During handling, protect all sensitive surfaces from shocks (centering devices, bolts, connectors, plugs, etc.).
- Confirm that the components' centering and support surfaces on the chassis are clean (free of paint).
- Never heat hydraulic fluid, which can ignite at high temperature. Some solvents are also flammable.
- Do not smoke while working on the system.

3.3 - Mounting bolts

Check the tightening torque in individual cases in accordance with VDI 2230 guidelines. For more information, consult your application engineer.

3.4 - Plug tightening torque

Refer to the appropriate repair manual or interface drawing, or consult your application engineer.

3.5 - After installation

Consult repair documents for system and component maintenance and repair instructions.

It is not necessary to wear in the axial piston pumps or radial piston motors; full performance is reached after a few hours of operation.

WARNING

Setting safety valves too high!

Risk of loss of function or incorrect behavior of the hydraulic system or machine and damage to the equipment.

- Do not set the safety valves too high.

The machine must be secured on its trailer during transport to avoid oscillatory movements in transit. The parking brake is not designed to ensure this "dynamic braking".

4 - General information

4.1 - Delivery

The pumps and motors are delivered:

- In boxes.
- Without oil.
- With oil (on request: contact your sales engineer).
- Painted with primer.
- Painted with primer + topcoat (on request: contact your sales engineer).
- Special paint or no paint (on request: contact your sales engineer).
- With protected openings (Plastic/metallic plugs or plates with joints for the flanges, sealing them).
- With protected mounting surfaces (these surfaces are never painted); they are covered with a thin film of varnish to limit any oxidation.

DANGER

Hot oil or oil under pressure can cause serious burns and infection!

- Before operation, replace all plastic plugs with appropriate connectors,including metallic plugs.
- Consult a physician in case of accident.

4.2 - Paint

- Leave the bearing surfaces unpainted.
- Use paints compatible with the existing base coat.
- When applying paint, protect the shaft's lip seal. The paint could dry it and cause leaks.
- Poclain Hydraulics components (like any mechanical component) can rust. They must be effectively and regularly protected according to the environment where they are used. During installation, any trace of rust must be eliminated before painting the machine.

Primer Specifications

Number	Color	Gloss value ISO 2813	Saline mist ISO 9227	Adhesion ISO 2409	Hardness ASTM D3363
RAL 1004	Ocher yellow	5 - 10%	> 400 h	0	HB
RAL 7016	Grey	5 - 10%	> 400 h	0	HB
RAL 9005	Black	40%	> 400 h	0	HB

- These specifications vary according to supplier, but all meet these minimum specifications.
- For more information, consult your Poclain Hydraulics application engineer.

5 - Hydraulic connections

The information below is for recommendation purposes and corresponds to the generally accepted rules of technology. It is the customer's / user's responsibility to comply with the piping manufacturer's specifications and with the interface drawing of the Poclain Hydraulics product.

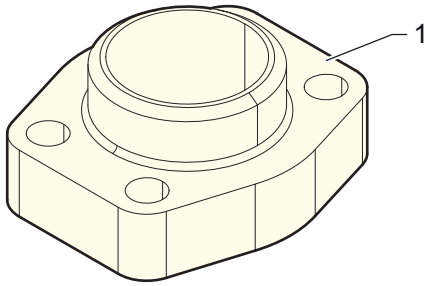
5.1 - Piping guide

5.1.1 - Piping and connections

The various components of the hydraulic circuit (tank, pumps, distributors, filters, sinks, etc.) are connected by rigid piping or flexible hoses.

Comply with the connection instructions given by the manufacturers for each part: function and marking of the ports, types of connection, diameters, types of line (flexible or rigid), etc.

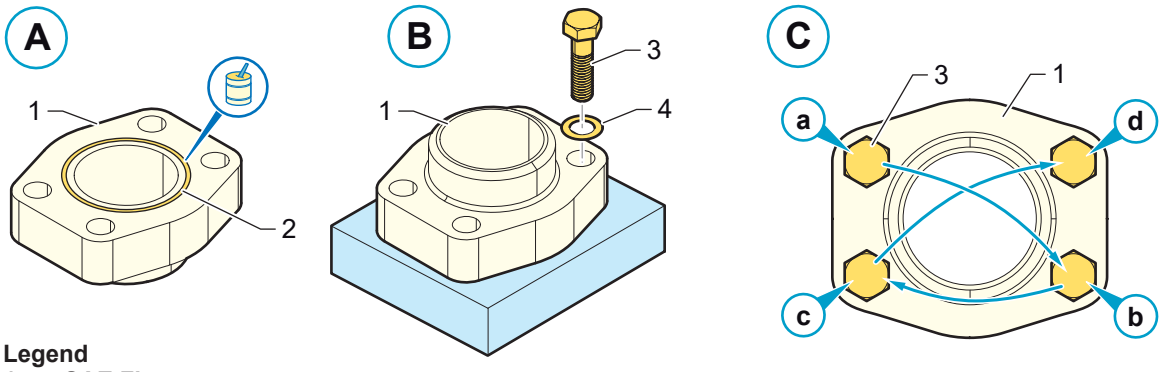
5.1.2 - Flanges



Legend
1 SAE 4 bolt flange

Assembly of flanges

- SAE flange adapters.
- SAE 4 bolt flanges.
- Gear pump flanges.
- CETOP square flanges.



Legend
1 SAE Flange
2 O-ring
3 Screw
4 Washer

- Make sure sealing surfaces are free of burrs, nicks, scratches or any contamination.
- (A) Lubricate the O-ring (2) with system fluid or compatible lubricant.
- Position the flange (1).
- (B) Install the washers (4) on the screws (3) and install them onto the flange (1).
- Hand tighten screws.
- (C) Tighten the screws (3) in diagonal sequence (a, b, c, d) in small increments to the appropriate torque level.

Screw torque

We recommend checking the tightening torque in individual cases in accordance with VDI 2230 guidelines.

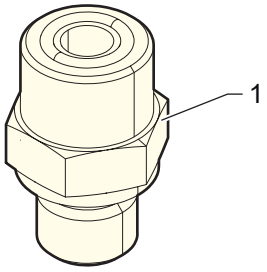
WARNING

Risk of inappropriate behavior of the machine.

- Fittings: Observe the manufacturer's specifications regarding the tightening torques of the fittings and the appropriate standard.

Please contact your Sales Engineer to get it.

5.1.3 - Port connections

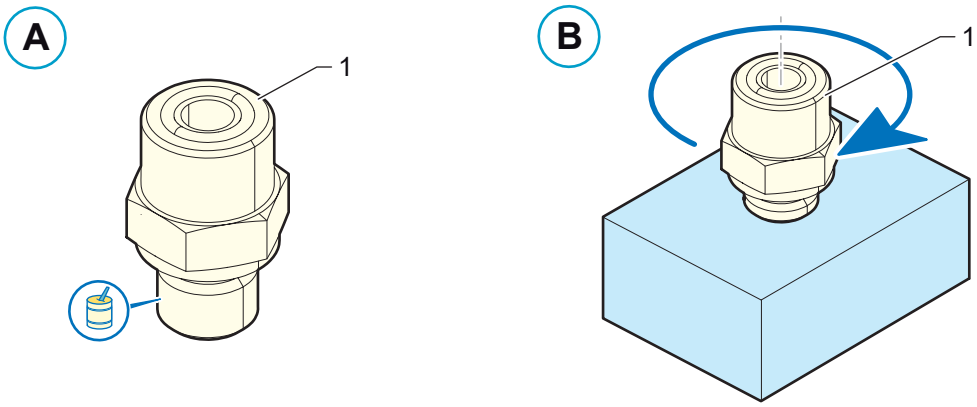


Legend
1 Port connection

Assembly of metric straight port connections

Metric Thread

- DIN ISO 6149-2/3
- ISO 9974-2/3
- DIN 3852 T1/T2.



Legend
1 Port connection

- Lubricate the fittings according to the manufacturer's specifications.
- Tighten the fitting manually.
- Tighten the fittings according to the manufacturer's specifications.

Tightening torque

We recommend checking the tightening torque in individual cases in accordance with VDI 2230 guidelines.

WARNING

Risk of inappropriate behavior of the machine.

- Fittings: Observe the manufacturer's specifications regarding the tightening torques of the fittings used and the appropriate standard.

5.1.4 - Rigid tubes

For high-pressure pipes, only use unwelded cold-drawn steel pipes.

Take the following precautions for making up the tubes:

- After arranging the length by cutting, cold bending and crimping, the tubes must be carefully deburred, rinsed with oil and blown before connection.
- After being welded or bent, the tubes must also be scraped (solution based on sulfuric acid) then rinsed with oil and neutralized (solution based on sodium hydroxide).
- The connections, clamps, threaded plugs, etc. must be deburred and cleaned before assembly.
- If assembly is not done immediately, seal the ports with plugs.
- The tubes must not be subjected to bending forces while the clamps that attach them are being tightened.

5.1.5 - Flexible tubes

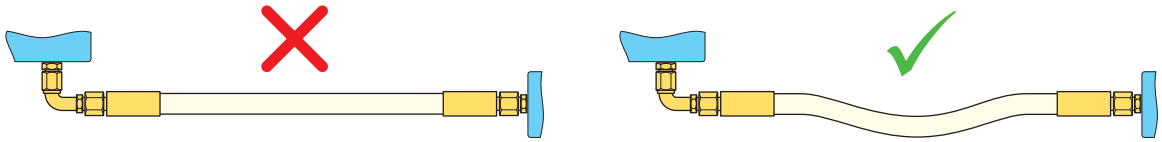
Fluid speed (data for information)

- Aspiration pump: < 1 m/s [3.28 ft/s]
- Low-pressure return (LP): < 4m/s [13.12 ft/s]
- High-pressure branch (HP): < 7 m/s [22.97 ft/s]

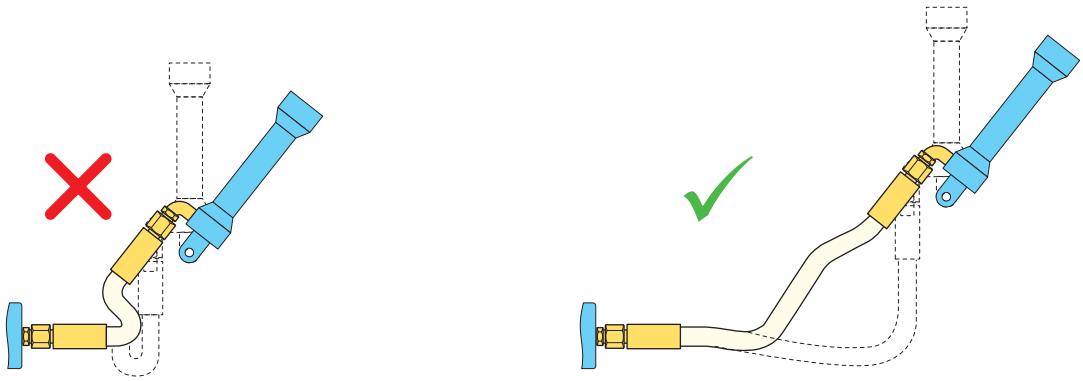
Hose installation tips

We recommend respecting the manufacturer's specifications to install the pipes and/or hoses in order to ensure their service life.

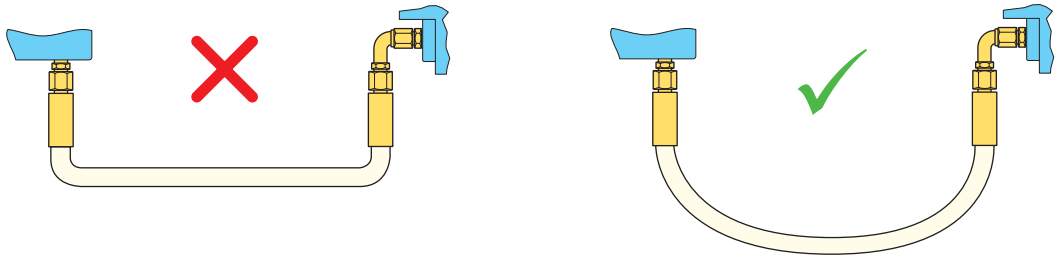
The following illustrations indicate the correct installation of hoses or pipes.



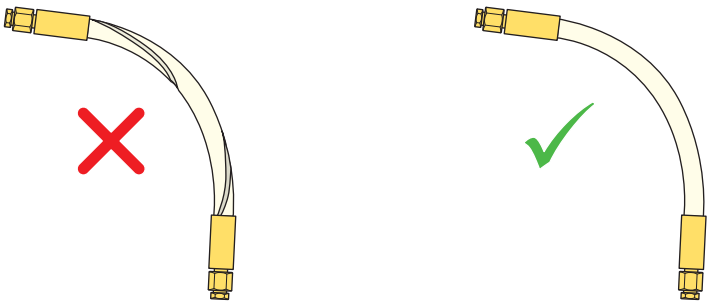
- For a straight installation, make sure the hoses or pipes are long enough to avoid stressing the fittings, pipes and hoses.
- A hose or pipe that is too short may cause failures and leaks.



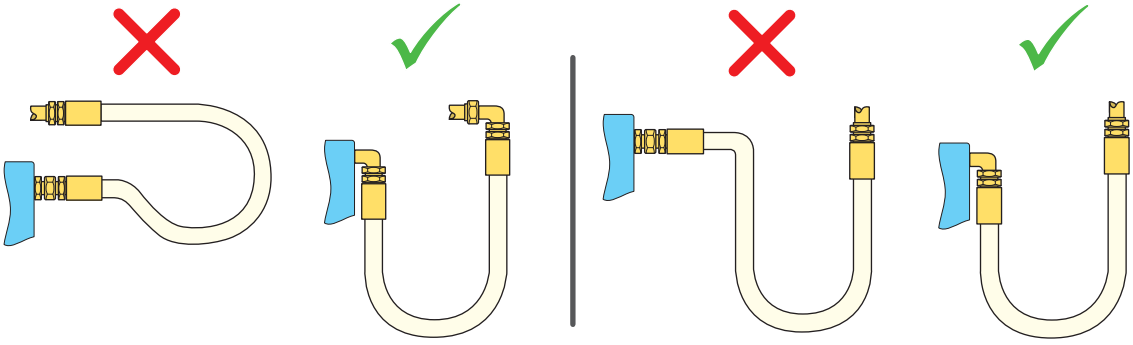
- The hose or pipe length must be determined so that the assembly has enough slack to allow movement or vibration without stress.



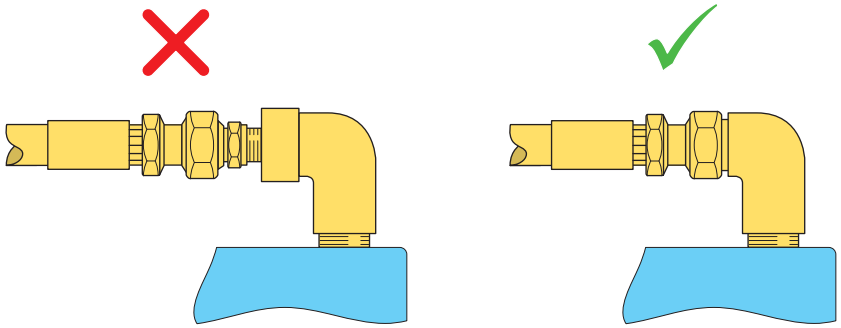
- Do not to allow too much slack, to avoid the risk of the hose snagging or rubbing with other equipment.



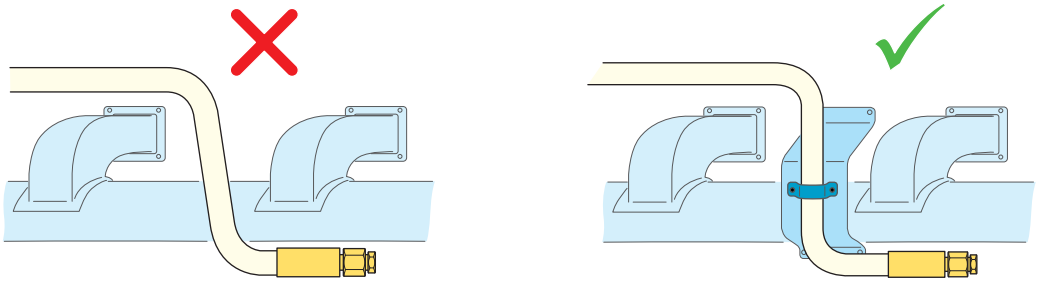
- Do not twist the hoses.



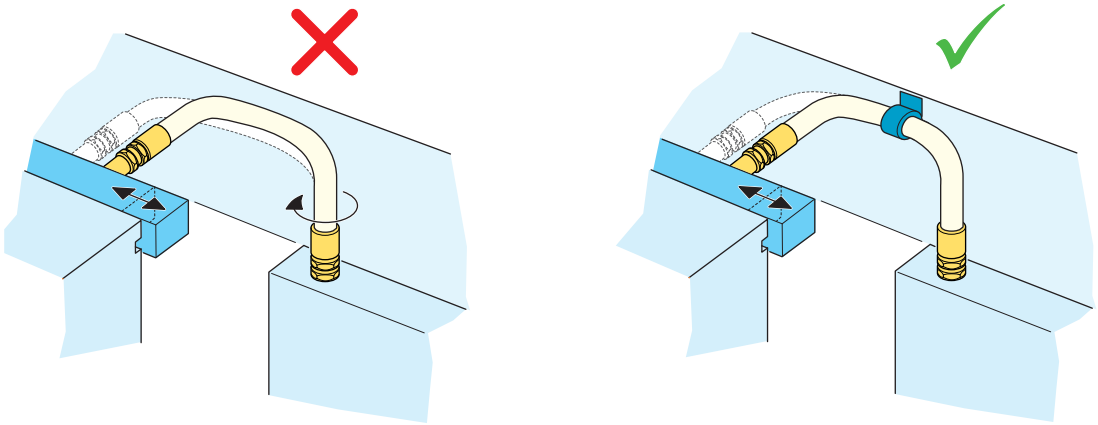
- Make sure the curvature radius is compliant with the manufacturer’s specifications.



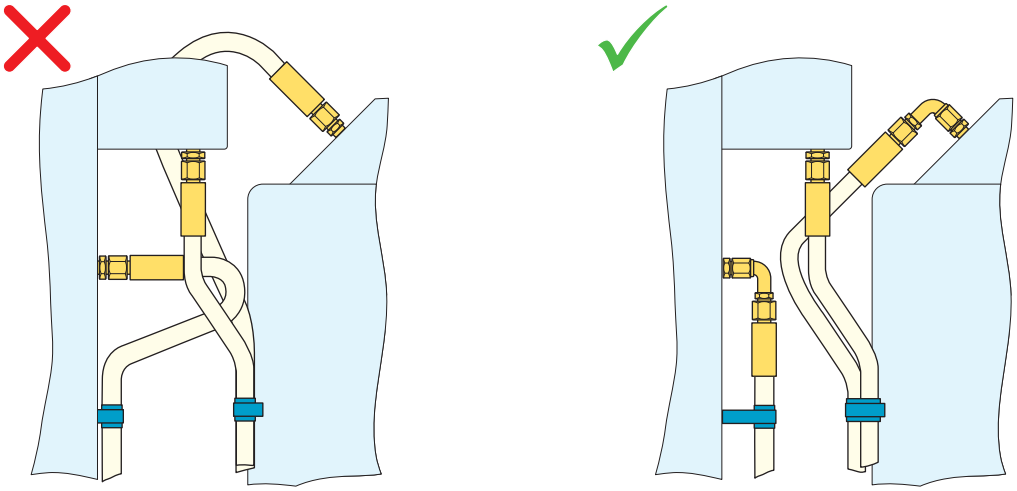
- A good choice of fittings avoids stress and reduces the length of pipes or hoses and the quantity of connections.



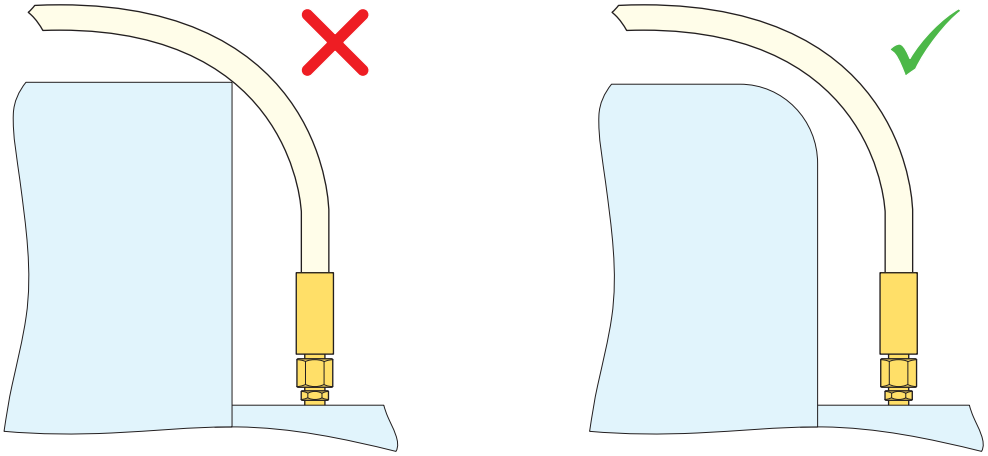
- Ensure good clamping to avoid the hoses rubbing or impact with the system environment. It is important, however, to ensure hose flexibility to avoid dimensional variation according to the pressure applied. Do not clamp together the high and low pressure hoses, in order to avoid friction wear between them.



- If the hose is installed and curved on different planes, it must be clamped.



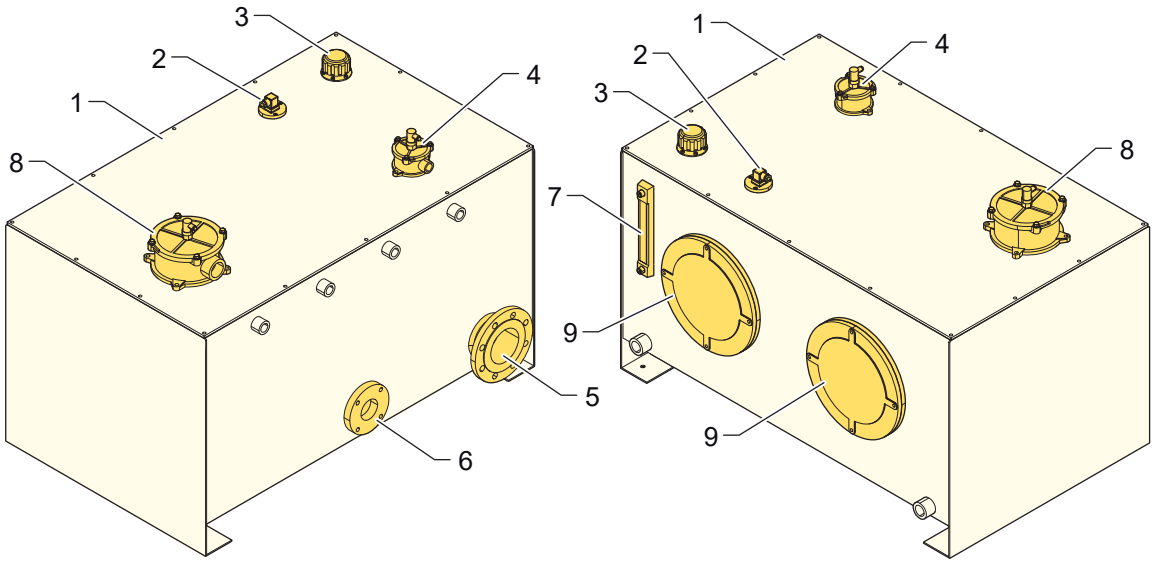
- It is recommended that the servicing of the machine be taken into consideration when designing the piping. Facilitate access to the hoses, pipes and fittings.



- Make sure to avoid contact between the hoses and any sharp edges, in order to prevent hose damage.

5.2 - Tank

5.2.1 - Description



Legend

1	**Tank**
2	**Level switch**
3	**Filling plug with breather**
4	**Return filter with clogging indicator**
5	**Filling port**
6	**Filling port**
7	**Level indicator**
8	**Return filter with clogging indicator**
9	**Inspection trapdoor**

- A drain valve must be installed at the bottom of the tank to drain it.
- Generally, tanks are divided into two sections to separate the pump suction area and the return area. This eliminates any problem of emulsion in the suction area, to prevent pump cavitation.

5.2.2 - Tank, Charge height

The tank position must provide a pressure at the charge pump inlet of at least 0.8 bar absolute [11.6 PSI absolute].

This minimum value must be available regardless of the tank pressurization, the length and section (area) of the suction hose, and the characteristics of the filter when it is located before the charge pump.

The pressure drop at the charge pump inlet must not be greater than 0.2 bar [3 PSI] at normal operating temperature with a new filter and clean oil.

Whenever the pressure drop reaches 0.3 bar [4 PSI], the filter must be replaced. It is advised to keep the flow below 1.25 m/s [50 in/s].

5.2.3 - Normal tank capacity

For a closed loop circuit, 1.5 to 2 times pump flow rate.

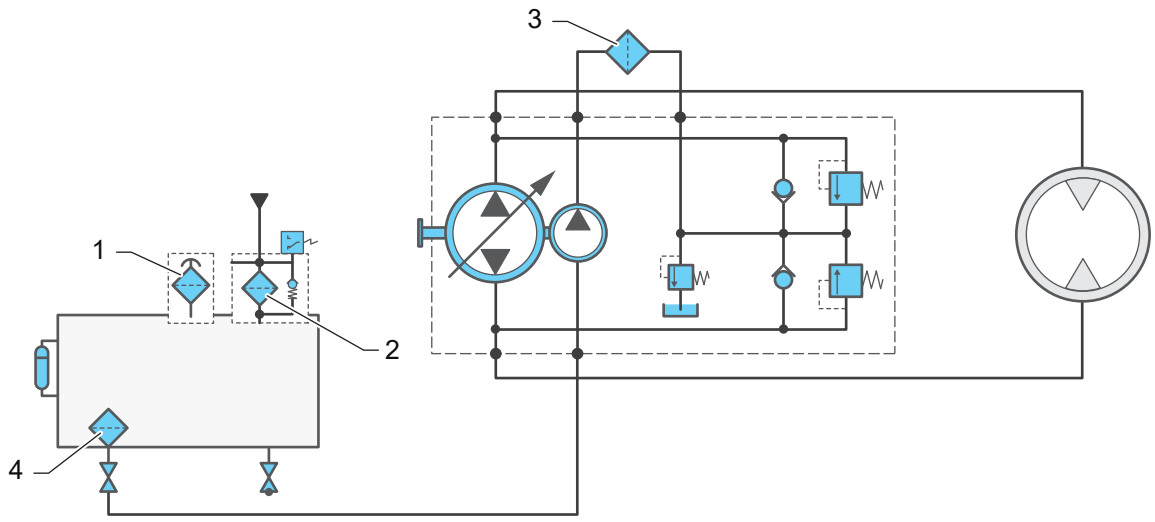
5.2.4 - Contamination and filtration

A low level of contamination will give moving parts (pistons, valves) a longer life.

The tank must be equipped with a breather with retention threshold 10µm absolute in the air or less.

The tank must be filled through a 25µm absolute filter.

5.2.5 - Filtration recommendation



Legend
1 Breather filter
2 Return filter
3 Charge pressure filter
4 Suction filter

Filter sizing

- Suction filter (4): its nominal capacity must be 3 times the flow passing through the filter.
- Return filter (2): its nominal capacity must be 2 times the flow passing through the filter.
- Charge pressure filter (3): its nominal capacity must be 2 times the flow passing through the filter.
- The charge pressure filter (3) must have a filtration capacity of 10µm and must not have a bypass valve.

5.3 - Determination of pipe inside diameter

The nomogram below is provided as an aid in determining the correct hose size.

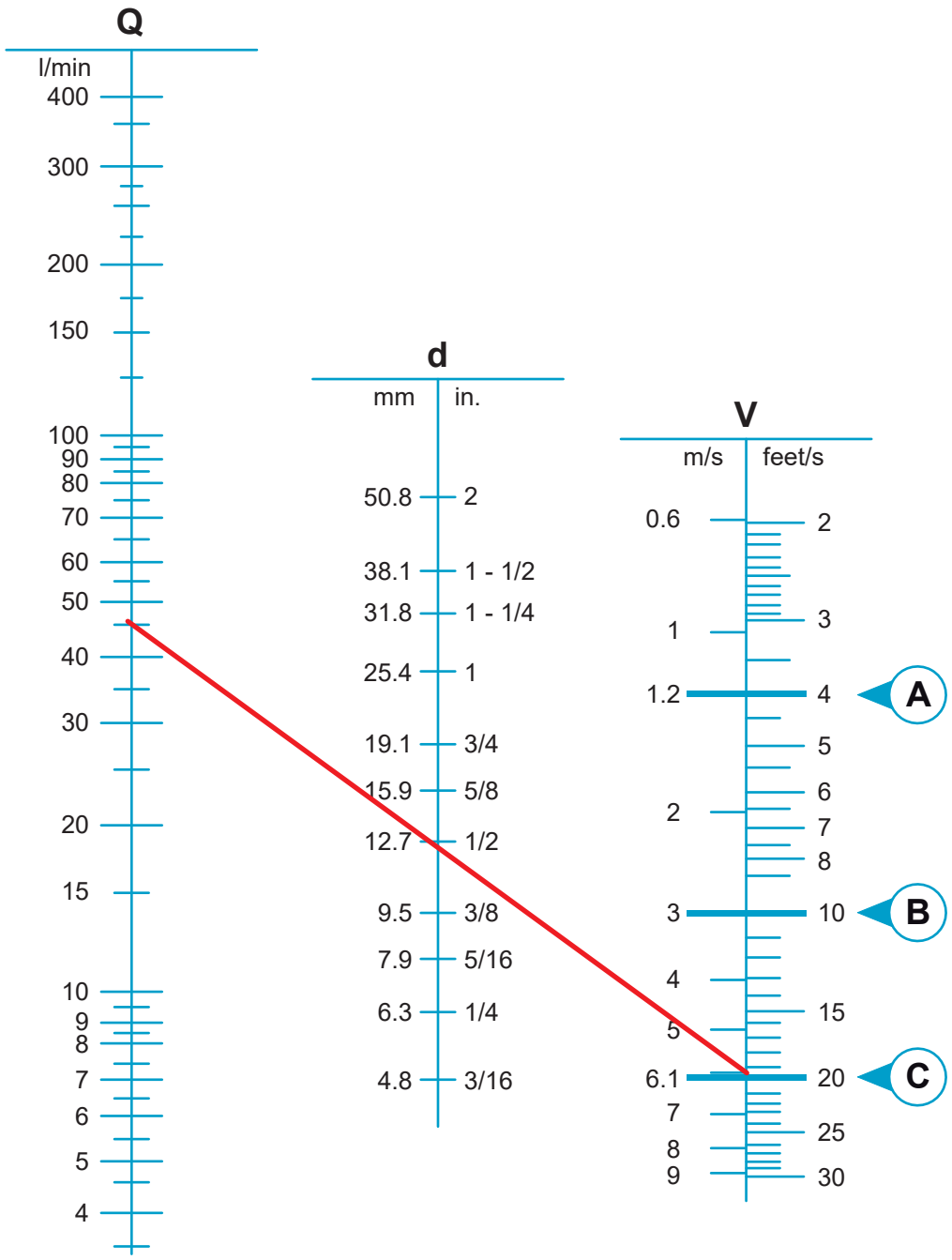
How to use the nomogram

Determine the flow rate your system requires, then connect the selected flow rate to the recommended velocity range with a straight line. The required hose I.D. will appear at the intersection of the straight line and the center column. If the straight line passes through the scale between the sizes listed, use the next larger I.D. hose.

Example (pump)

Locate 45 l/min in the left-hand column and 6.1 m/s in the right-hand column (the maximum recommended velocity range for pressure lines). Lay a straight edge across these two points. The inside diameter required is shown in the center column at or above the straight edge. In this case, we need a hose I.D. of 12.7 mm (1/2") (or larger).

Use the same procedure for suction or return lines, except utilizing their respective maximum recommend velocities.

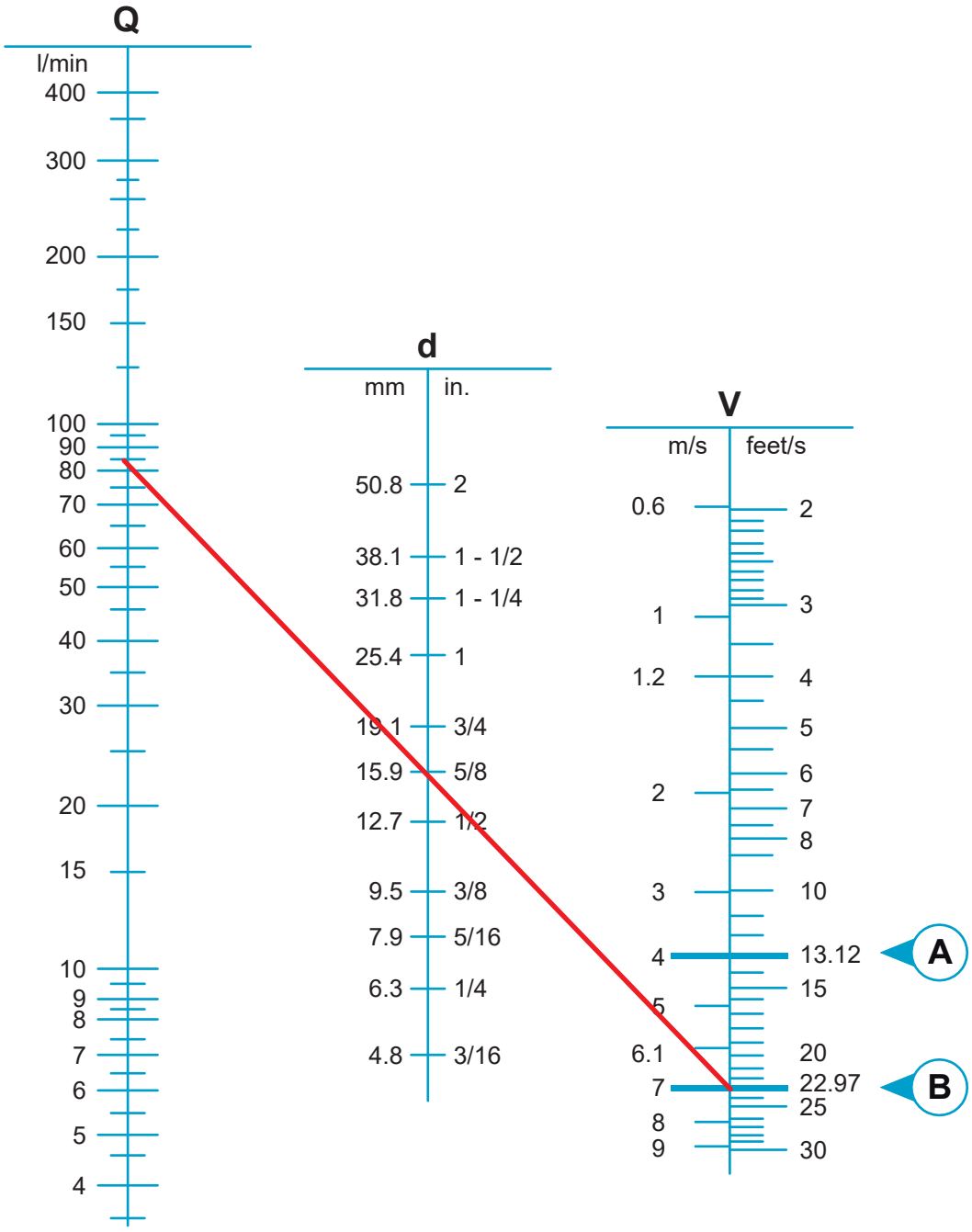


Q	Flow (l/min)
d	Hose diameter (mm - in)
V	Velocity (m/s - feet/s)
A	Maximum recommended velocity for suction lines
B	Maximum recommended velocity for return lines
C	Maximum recommended velocity for pressure lines

Example (motor)

Locate 85 l/min in the left-hand column and 7 m/s in the right-hand column (the maximum recommended velocity for the high-pressure branch). Lay a straight edge across these two points. The inside diameter required is shown in the center column at or above the straight edge. In this case, we need a hose I.D. of 15.9 mm (5/8") (or larger).

Use the same procedure for suction or return lines, except utilizing their respective maximum recommended velocities.



Q	Flow (l/min)
d	Hose diameter (mm - in)
V	Velocity (m/s - feet/s)
A	Maximum recommended velocity for low pressure return (LP) : 4m/s [13.12 ft/s].
B	Maximum recommended velocity for high pressure branch (HP) : 7m/s [22.97 ft/s].

6 - Commissioning

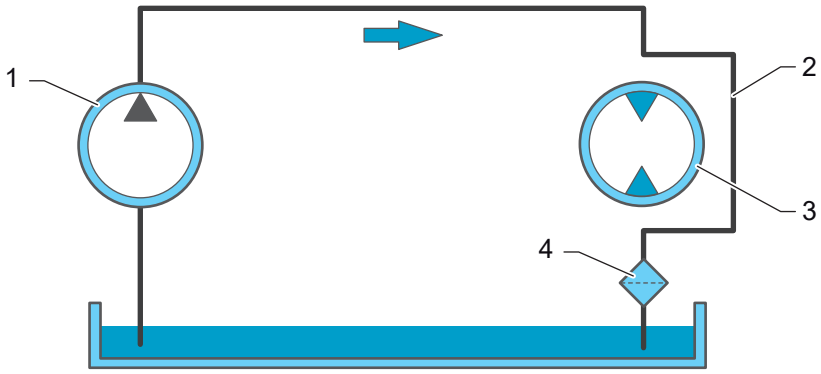
6.1 - Circuit

6.1.1 - Rinsing the circuit

Before the first start up, all possible contaminations must be removed. It exists several methods:

- Ensure before assembling the hydraulic circuit, all the parts are clean.
  - For this, all the cleanliness management must be strict and mastered (supplier, storage, …).
- Complete rinsing of the hydraulic circuit by following the paragraph here below.
  - This method must be used after contamination issue.
  - The filters must be equipped with a system that checks the state of the filters (clogging indicator).

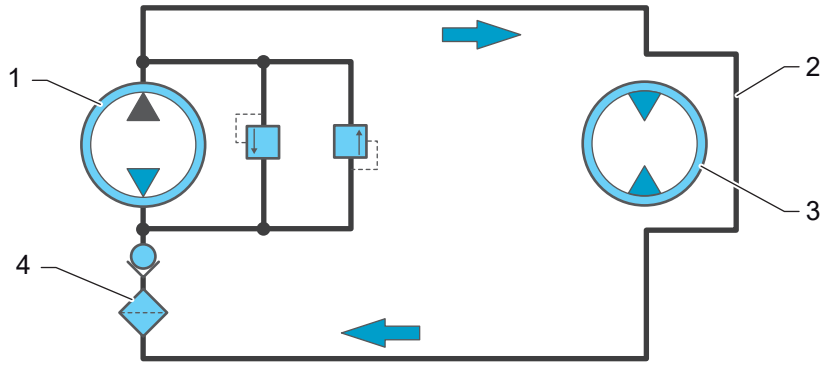
For an open circuit



Legend
1 Pump
2 Temporary rerouting
3 Motor
4 Filter

The return filter can be used to collect pollution(change the cartridge several times if necessary) or temporarily install a 10µm filter before the tank without bypass on the return line.

For a closed circuit



Legend
1 Pump
2 Temporary rerouting
3 Motor
4 Filter

Fill the circuit with hydraulic oil.

On the high-pressure return line, place a 10µm absolute filter, without bypass, appropriate to the flow rate. This filter will be placed near each pump, before the exchange and security blocks (see adjacent drawing).

- In any case, also place a temporary bypass circuit near the ports of each hydraulic motor to isolate the circuit.
- Change the filter cartridge several times if necessary.
- Change the filter cartridge before using.

Checking after rinsing

Check the hydraulic fluid level in the tank and top up if necessary.

For a closed circuit

- Set the high-pressure valve(s).
- Check the exchange valve pressure setting and the exchange flow.
- Check the feed valve pressure setting on the pump.
- Confirm that the receivers are not driven when the pump control system is in a neutral position.

7 - Oils

7.1 - Fluid selection

7.1.1 - General recommendations

The ISO 6743 standard describes Lubricants, industrial oils and related products (class L).

The ISO 6743-4 standard describes hydraulic fluids (H family) used in hydraulic systems.

In the H family, three sub-families are described in the dedicated standard:

- ISO 11158 (Mineral fluid): HH, HL, HM, HV and HG.
  - Poclain Hydraulics recommends the use of HM for fixed installations.
    HM is a mineral fluid with special antioxidant, anticorrosion and antiwear properties
    (HLP equivalent according to German DIN-51524).
  - Poclain Hydraulics recommends the use of HV for mobile installations.
    HV is an HM providing improved temperature and viscosity properties
    (HVLP equivalent according to German DIN-51524).
- ISO 15380 (Environmental Acceptable Lubricant – EAL): HETG, HEPG, HEES and HEPR.
  - Poclain Hydraulics recommends the use of HEES with application engineer consultation
    (compatibility check is required).
- ISO 12922 (Fire Resistant fluid): HFAE, HFAS, HFB, HFC, HFDR and HFDU.
  - Poclain Hydraulics recommends the use of HFDR and HFDU with application engineer
    consultation (compatibility check is required).
- For all other fluids, consult your Poclain Hydraulics application engineer.

7.1.2 - Temperature and viscosity

- To achieve the standard characteristics and good performance, the recommended temperature is between 20 to 80°C [68 to 176°F].
- For all applications outside these limits, please consult your Poclain Hydraulics application engineer.

The ISO 3448 standard describes the ISO viscosity classification.

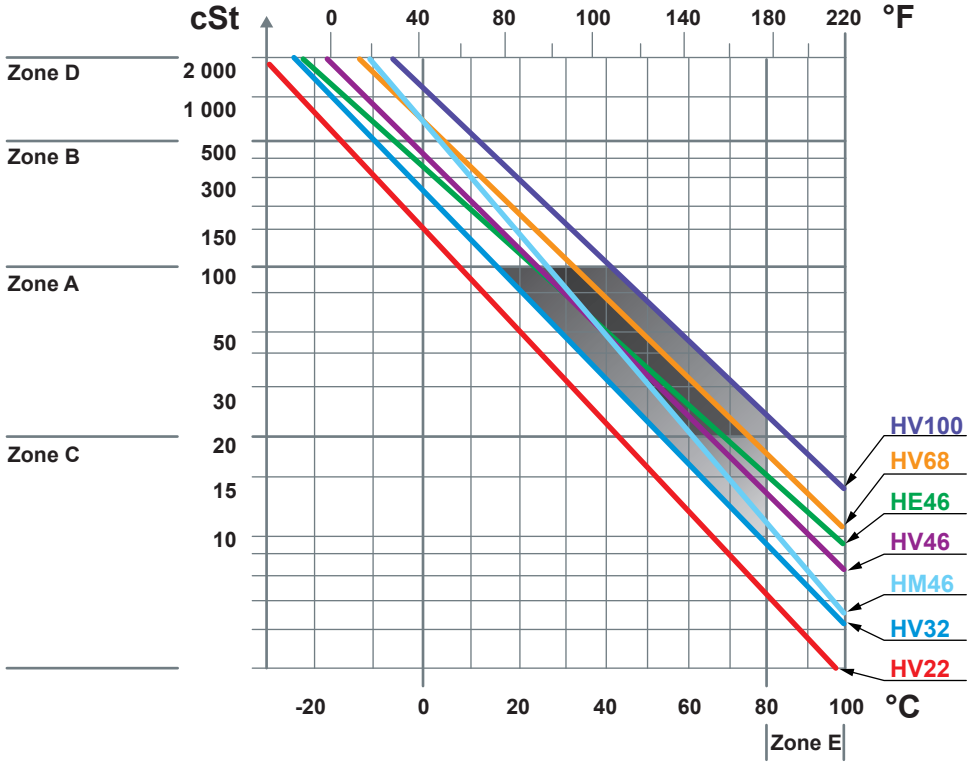
In operating conditions, the fluid kinematic viscosity must stay between 9 and 500 cSt.

The fluid Viscosity Grade (ISO VG) must be chosen to fit with this criterion considering the other constraints (climate, system, availability).

Example of current Viscosity Grades:

- Class 32 (ISO VG 32): Viscosity of 32 cSt at 40°C.
- Class 46 (ISO VG 46): Viscosity of 46 cSt at 40°C.
- Class 68 (ISO VG 68): Viscosity of 68 cSt at 40°C.

The best performance is obtained by having the system operate in the regimes shaded gray.



Zone A	Maximum efficiency zone. In this zone, temperature variations have a weak effect on the response time, efficiency and life expectancy of the components. Poclain Hydraulics components can operate at all speeds, pressures and powers specified in their technical documentation.
Zone B	High speeds can lead to vibrations and a reduction in mechanical efficiency. The charge pump can cavitate if the intake conditions are too tight, but without risk to the system as long as the pump remains charged. Poclain Hydraulics components can operate at the pressures specified in their documentation, but it is not advisable to use the pumps at full displacement. In a translation circuit, a rapid rise in the pump speed from zone B is allowed, but ordering the translation when the temperature has reached zone A is recommended.
Zone C	The efficiency is reduced and the use of effective antiwear additives is required. Poclain Hydraulics components can operate temporarily at a power level 20 to 50% lower than the power stated in the technical documentation, or for 20% of the operating time at the stated power.
Zone D	The restrictions specified for zone B likewise apply to zone D. In addition, the pumps must startup at low speed and no displacement. They must not be used in their normal operating conditions until the charge pressure has stabilized and the hydraulic fluid temperature in the reservoir has come up to zone B.
Zone E	The efficiency is reduced and the risk of wear on the pump and hydraulic fluid is increased. The system can operate in zone E at low pressure, only during short periods. The temperature of the hydraulic fluid in the power circuit must not be more than 10°C above the temperature of the hydraulic fluid in the reservoir, and must not be more than 20°C warmer than the hydraulic fluid in the components' cases.

7.2 - Hydraulic fluid and contamination

7.2.1 - For radial products

The hydraulic fluid of the machine or system must be checked regularly to prevent any contamination, viscosity deviation or water in the circuit,by taking an oil sample.

The oil sample shall be analyzed according to the ISO 4406 standard and shall be compliant with class 18/16/13. The hydraulic fluid should be maintained clean at a class of 18/16/13 by using an appropriate filter.

New hydraulic fluid delivered by the supplier is generally lower quality than our requirements. Poclain Hydraulics recommends filling or adjusting the tank level in a clean environment using a pump and appropriate filter.

7.2.2 - For axial products and valves

The hydraulic fluid of the machine or system must be checked regularly to prevent any contamination, viscosity deviation or water in the circuit, by taking an oil sample.

The oil sample shall be analyzed according to the ISO 4406 standard and shall be compliant with class 17/15/12.

The hydraulic fluid should be maintained clean at a class of 17/15/12 by using an appropriate filter.

New hydraulic fluid delivered by the supplier is generally lower quality than our requirements. Poclain Hydraulics recommends filling or adjusting the tank level in a clean environment using a pump and appropriate filter.

7.2.3 - Hydraulic fluid and water content

The ISO 12922 standard allows for water content up to 0.05%. Poclain Hydraulics components tolerate up to 0.1%.

7.3 - First start-up of the machine or system

Before the first start-up, the hydraulic circuit of the machine or system must be rinsed to remove all possible contamination. The filters must be equipped with a clogging indicator.

7.4 - Hydraulic fluid and filter change interval

The proper scheduling and intervals of oil changes are strongly linked to:

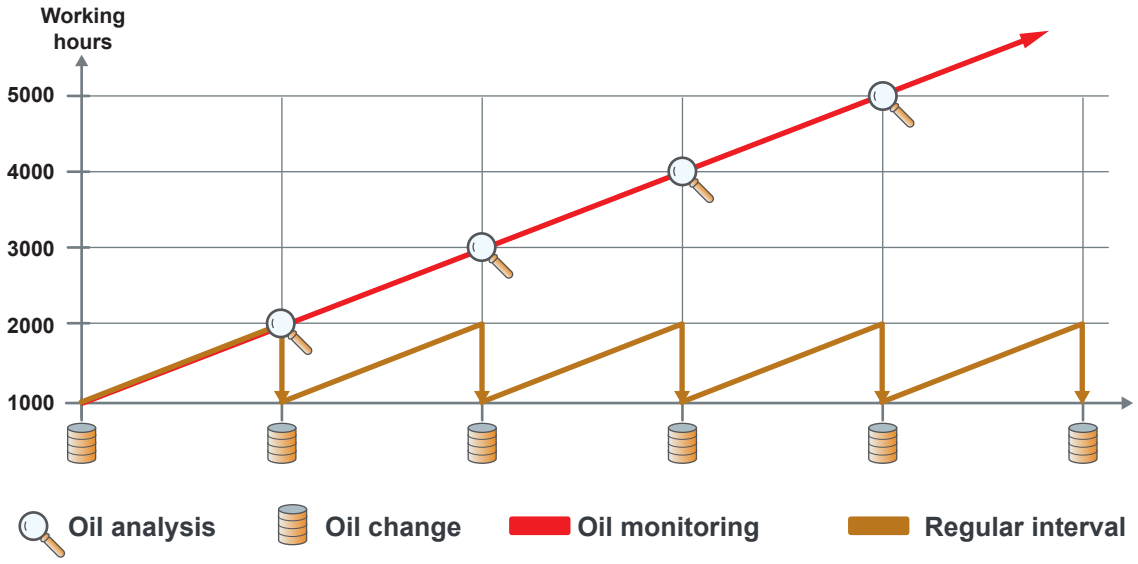
- Quality of the machine assembly process.
- Quality of the oil used.
- Severity of external environment in which the machine is working.
- Quality of the machine’s filtration system.
- Quality of the machine’s cooling system (there is very fast oil degradation with temperature).

7.5 - Scheduling in the machine or system lifetime

All explanations below are examples only, and must be defined by the machine or system manufacturer.

- **Hydraulic fluid Monitoring**: Oil Analysis or permanent monitoring, diagnostics of machine system and change of filter / oil depend on the results.

The contamination level of the oil is an indicator of system reliability and condition.



- **Regular interval**: Oil change at regular intervals.
  - First filter replacement after 50/100 working hours.
  - Every 400 working hours or once a year for oil filter replacement.
  - Every 2000 working hours or two-year interval for oil change with rinsing of circuit.

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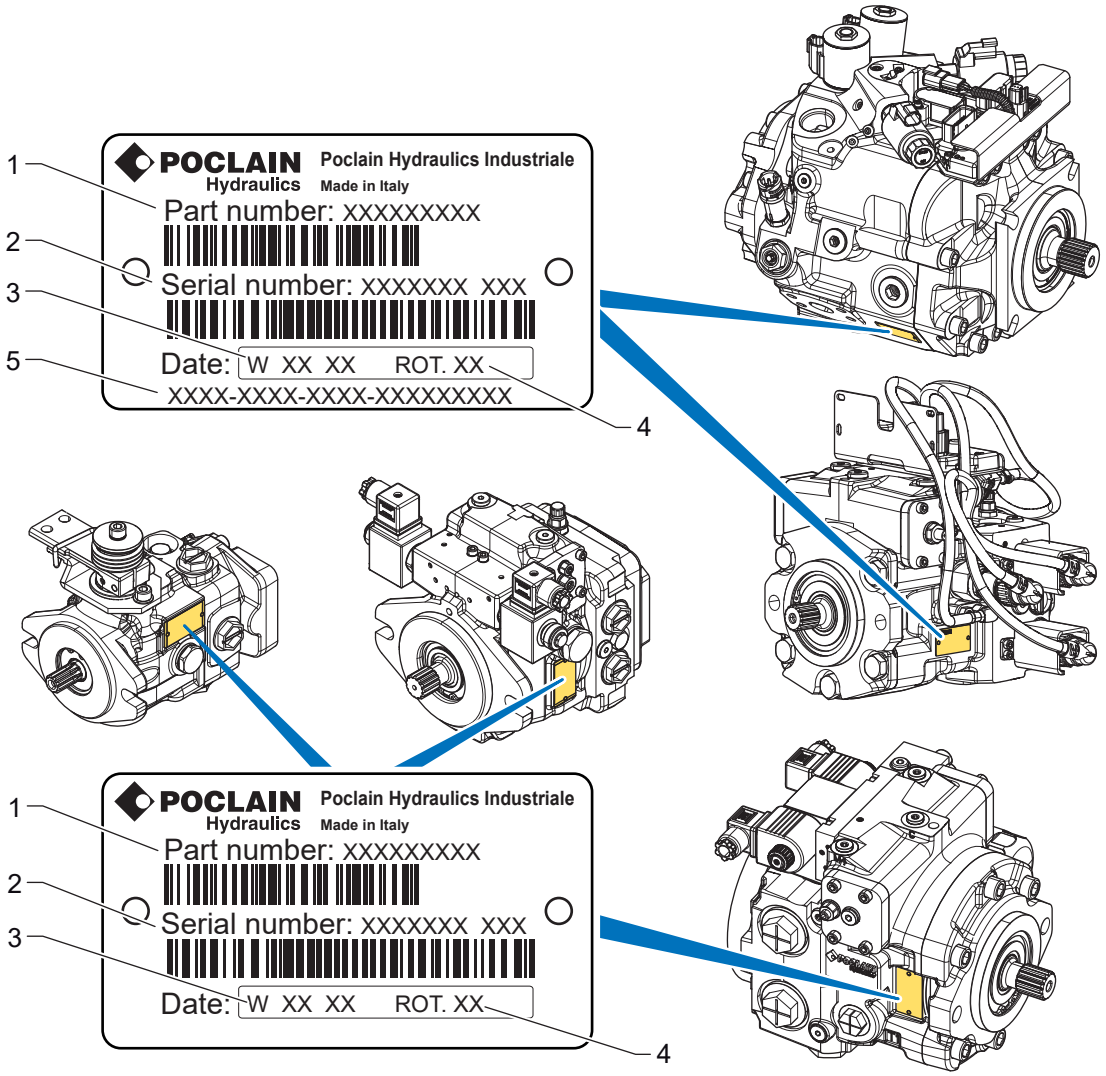
1 - Overview

1.1 - Component identification

1.1.1 - Product identification plate



		Example		
		PM	**PMe**	**PWe**
1	Part number	B40313S	B40254D	B22055W
2	Serial number	T1X1398888 001	T1X1398888 001	T1X1234567 001
3	Manufacturing date	W 36 17	W 36 17	W 03 17
4	Direction of rotation	ROT. CW	ROT. CW	ROT. CW
5	Customer part number or other information		PME3035S4P120840 R2508A17 PSTSVS0000	PWE085-R6A0BB3A00-8D000-AA00

- DX (former designation Destra) = CW (Clockwise).
- SX (former designation Sinistra) = CCW (Counter-clockwise).
- When ordering spare parts, the part number and serial number must be specified.
- Service the pump in a sheltered and clean area on a flat and horizontal surface.

1.2 - Delivery

For more information, refer to page 18.

1.3 - Storage

The pumps are delivered in boxes. If they must be stored, store them in the original containers.

Requirements

- Storage areas must be free from corrosive materials and gases.
- To prevent damage to the seals, ozone-forming equipment (e.g. mercury-vapor lamps, high voltage equipment, electric motors, sources of electric sparks or electric discharge) must not be operated in storage areas.
- The storage areas must be dry.
- Ideal storage temperature: +5°C to +20°C [+41 to +68°F].
- Minimum storage temperature: -50°C [-58°F] (exception: units with on-board-electronics).
- Maximum storage temperature: +60°C [+140°F].
- Minimum storage temperature for smart drive on-board electronics: - 40°C [-40°F].
- Avoid strong light (e.g. bright windows or direct fluorescent lighting).
- Do not stack axial piston units. Store them away from potential shock hazards.
- Do not store the axial piston unit on the drive shaft or fitting, e.g. sensors or valves.
- Obey the product-specific technical catalog manual.
- Check the axial piston unit monthly to ensure proper storage.

- **Do not store the pump in open-air outdoor areas.**
- **Do not place the pump directly on the ground.**
- **If the pump falls during handling, it must be returned to Poclain Hydraulics.**

1.3.1 - Storage interval

Check the storage period to ensure proper storage of the axial piston unit.

According to the storage duration and conditions, it is necessary to protect the internal components of the hydraulic parts.

These operations must be performed before storing components or before stopping use of the machine.

	Storage interval (months)			
Climate	3	6	12	24
Temperate	A	B	C	C
Tropical	B	C	D	D
Maritime	C	D	D	D

Legend
A No specific precaution; just check for proper mounting of the plugs and covers
B Fill with hydraulic fluid
C Rinse with storage fluid
D Fill with storage fluid

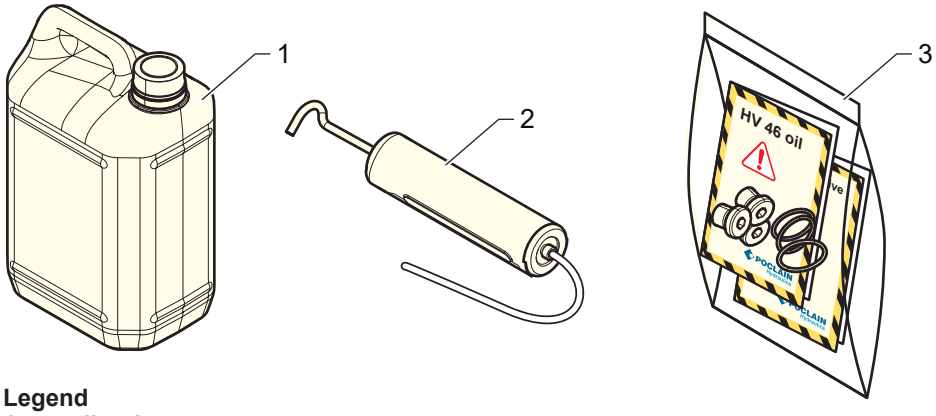
1.3.2 - Long storage

Follow these instructions to fill your hydraulic pump with a long-term storage oil.

The long-term storage oil is a special HV 46 oil mixed with an anticorrosive additive.

If you want to maintain your pump in good condition, you must comply with the following specifications:

- The duration of storage must not exceed 4 years.
- It is mandatory to stock the pump in a protected and temperate area between 15°C and 30°C [between 59°F and 86°F]. It is permissible to go down to a temperature of 0°C [32 °F] if the proper sealing capacity of the pump is verified, to prevent any intake of humid air or sources of condensation. These would cause deterioration of the properties of the anticorrosion additive.
- The pump must be filled correctly to limit the presence of harmful air pockets during long-term storage.
- You must use the Poclain Hydraulics long-term storage kit to fill the pump.



Legend
1 5 liter jerrycan
2 Oil syringe with a flexible pipe
3 Plastic bag

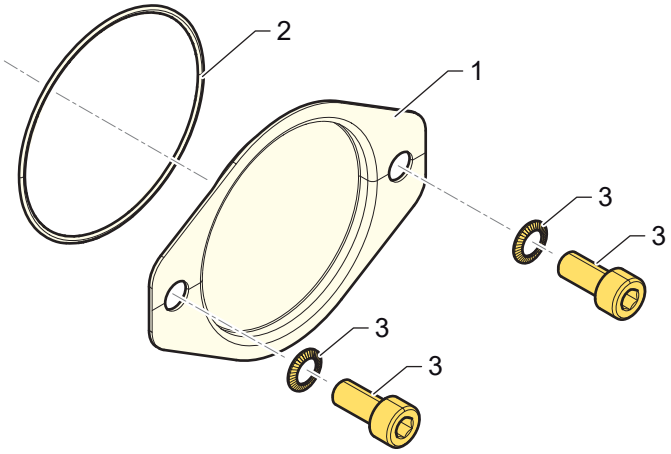
1.3.2.1 - Contents of the kit

- (1) A 5 liter jerrycan filled with a special oil mixture (HV 46 and anticorrosive additive).
- (2) Oil syringe with a flexible pipe.
- (3) Plastic bag containing :
  - Technical sheet and safety sheet for special oil (HV 46).
  - Technical sheet and safety sheet for anticorrosive additive.
  - A kit of plugs, bleed screws and seals.

1.3.2.2 - Filling instructions

- Check that the pump ports are properly sealed and the charge pump cover is installed. If not, use the kit, P/N.: 9465.

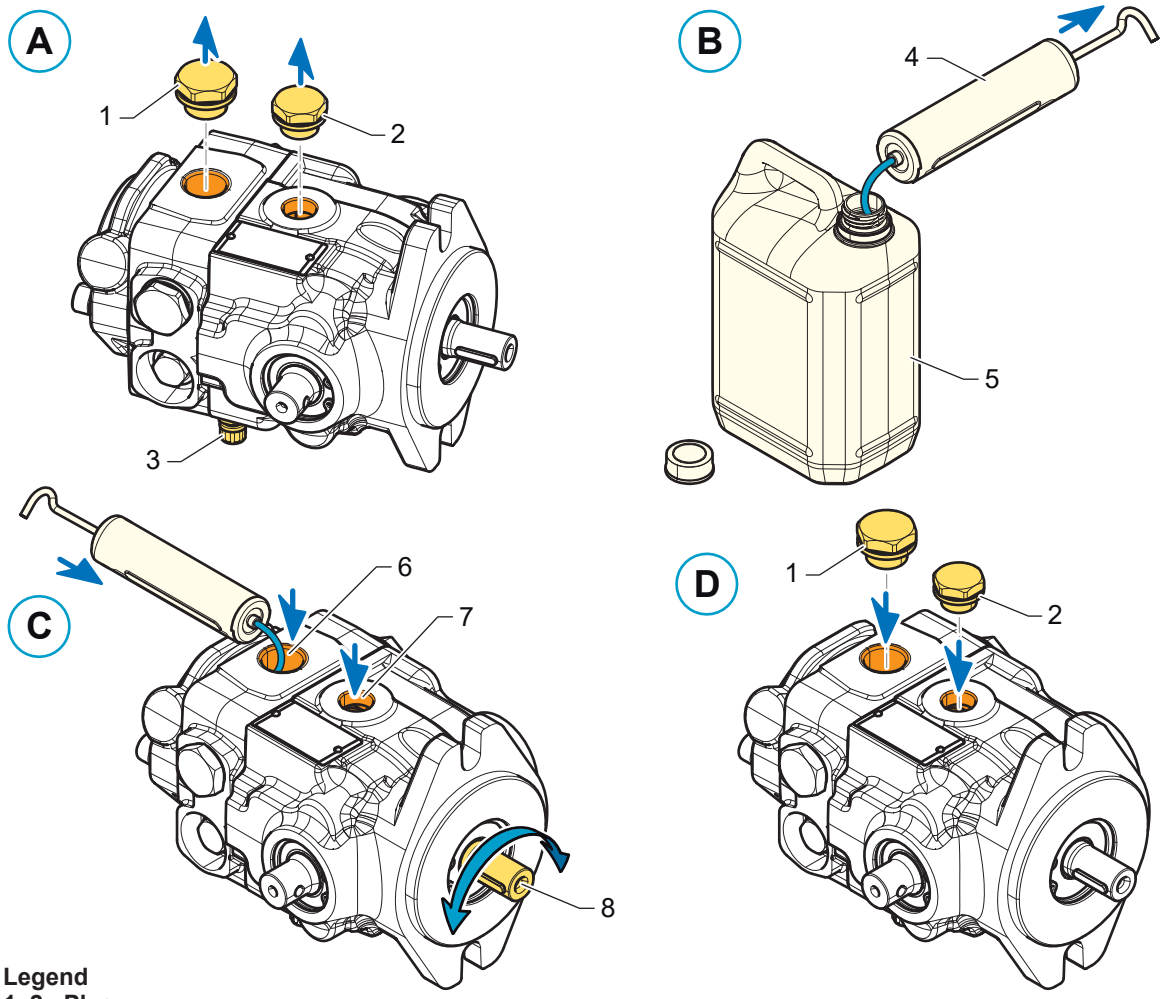
Kit Cat. No.: 9465



Legend
1 Lock plate
2 O-ring
3 Screw + Washer

Ref.	Designation	Pump
B44238J	Lock plate SAE A-PLAST	PM10 / PM20 / PM30 / PM50
B45502H	Lock plate SAE B-PLAST	PM30 / PM50
B45504K	Lock plate SAE A-PLAST	PW085 / PW096
B45503J	Lock plate SAE B-PLAST	PW085 / PW096
B45505L	Lock plate SAE C-PLAST	PW085 / PW096

PMV0



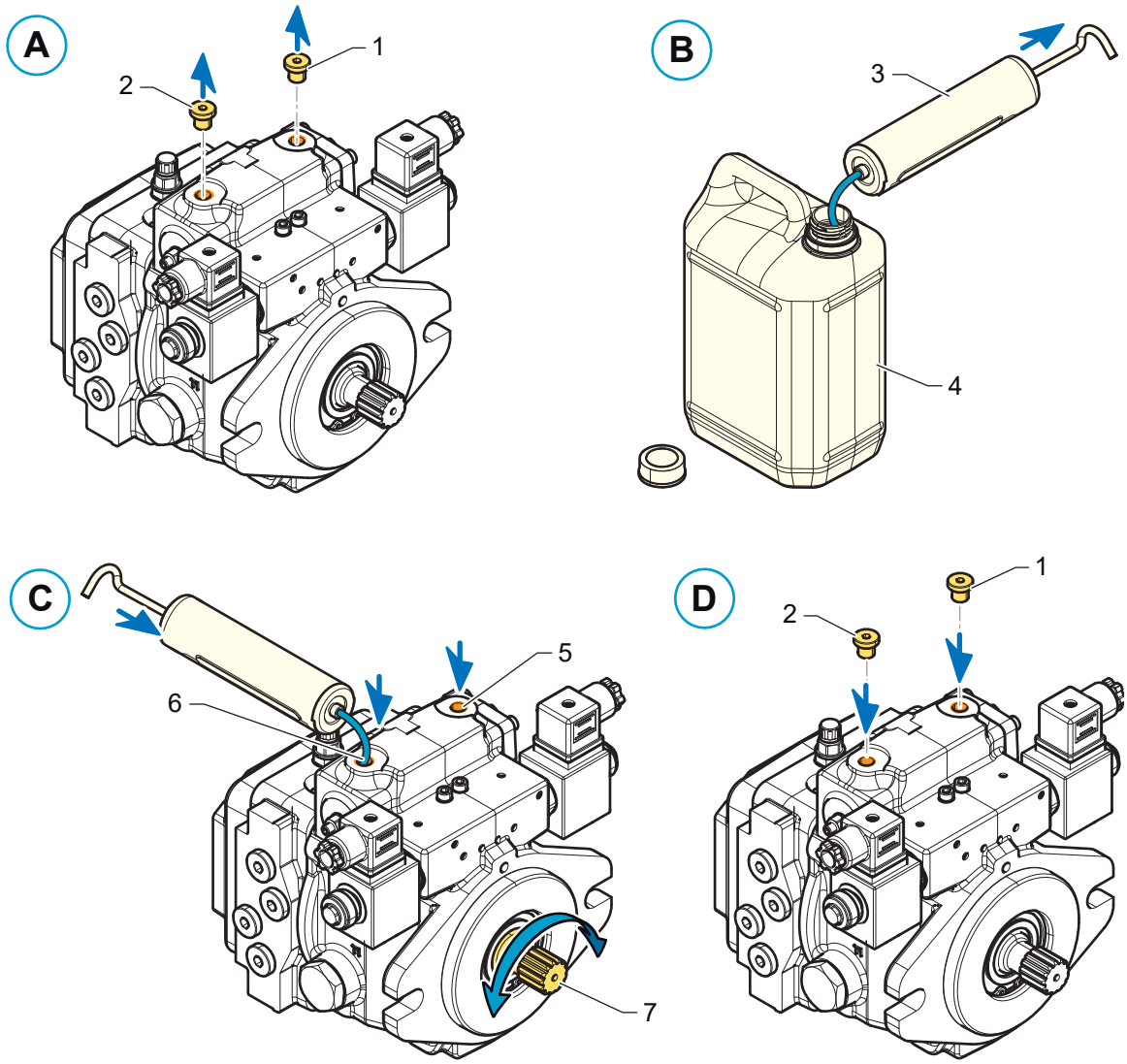
Legend

1, 2	**Plug**
3	**Charge pump pressure valve**
4	**Oil syringe with a flexible pipe**
5	**5 liter jerrycan**
6	**Suction port**
7	**Case drain port**
8	**Pump shaft**

- Place the pump in horizontal position on a workstation equipped with a waste oil collector.
- Take care not to damage the charge pump pressure valve (3).
- Remove plugs (1) and (2).
- Using the syringe (4), aspirate the oil from the jerrycan (5).
- Insert the flexible pipe in the plug ports (6, 7) and fill the pump until oil flows out of the plug ports.
- Turn the pump shaft (8) in both directions and check the oil level in the pump.
- Reinsert the plugs in the pump (Tightening torque: 15 ±1.5Nm [11.1 ±1.1 lbf.ft]).
- Clean any traces of oil from the outside of the pump using a soft lint-free cloth.
- Store the pump.
- Before using the pump on a machine, it must be properly emptied.
- Rinse the pump with a neutral oil rinse that is compatible with your machine oil.
- Then fill the pump with the machine oil.

Recovering the storage oil.

PM10 / PM20

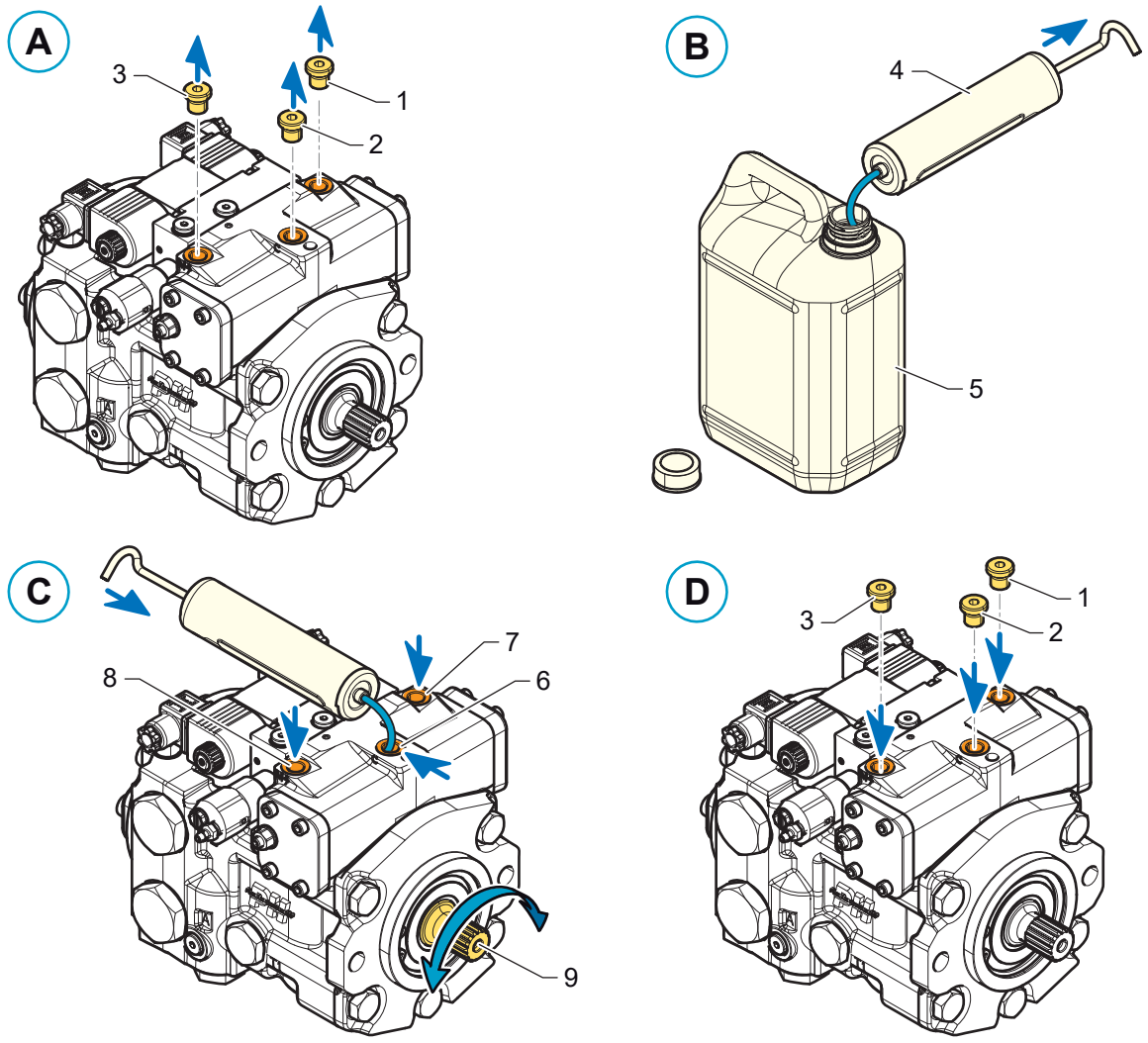


Legend
1, 2 Plug
3 Oil syringe with a flexible pipe
4 5 liter jerrycan
5, 6 Port
7 Pump shaft

- Place the pump in horizontal position on a workstation equipped with a waste oil collector.
- Remove plugs (1) and (2).
- Using the syringe (3), aspirate the oil from the jerrycan (4).
- Insert the flexible pipe in the plug ports (5, 6) and fill the pump until oil flows out of the plug ports.
- Turn the pump shaft (7) in both directions and check the oil level in the pump.
- Reinsert the plugs in the pump (Tightening torque: 15 ±1.5Nm [11.1 ±1.1 lbf.ft]).
- Clean any traces of oil from the outside of the pump using a soft lint-free cloth.
- Store the pump.
- Before using the pump on a machine, it must be properly emptied.
- Rinse the pump with a neutral oil rinse that is compatible with your machine oil.
- Then fill the pump with the machine oil.

Recovering the storage oil.

PM30 / PMe30 / PM50 / PMe50



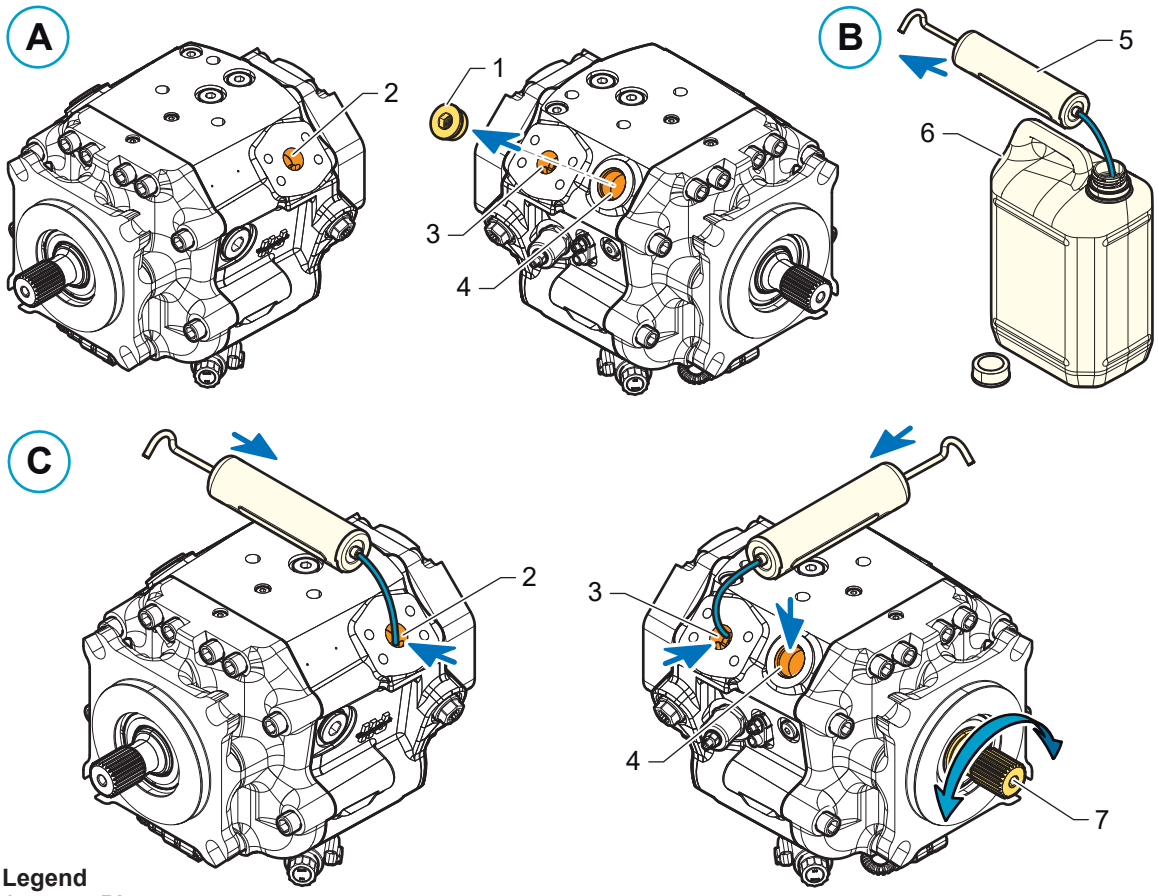
Legend

1, 2, 3	**Plug**
4	**Oil syringe with a flexible pipe**
5	**5 liter jerrycan**
6, 7, 8	**Port**
9	**Pump shaft**

- Place the pump in horizontal position on a workstation equipped with a waste oil collector.
- Remove plugs (1), (2) and (3).
- Using the syringe (4), aspirate the oil from the jerrycan (5).
- Insert the flexible pipe in the plug ports (6, 7, 8) and fill the pump until the oil flows out of the plug ports.
- Turn the pump shaft (9) in both directions and check the oil level in the pump.
- Reinsert the plugs in the pump (Tightening torque: 15 ±1.5Nm [11.1 ±1.1 lbf.ft]).
- Clean any traces of oil from the outside of the pump using a soft lint-free cloth.
- Store the pump.
- Before using the pump on a machine, it must be properly emptied.
- Rinse the pump with a neutral oil rinse that is compatible with your machine oil.
- Then fill the pump with the machine oil.

Recovering the storage oil.

PW085 / PWe085 / PW096 / PWe096



Legend

1	**Plug**
2, 3, 4	**Port**
5	**Oil syringe with a flexible pipe**
6	**5 liter jerrycan**
7	**Pump shaft**

- Turn the pump to position the ECU and the electric solenoid cartridges under the pump.
- Place the pump in a horizontal position on a workstation equipped with a waste oil collector.

NOTICE

Risk from improper handling!

- Handle carefully to avoid damaging the solenoid cartridges, coil, and potentiometer during this operation.

- Remove the plug (1) and the plugs on ports (2) and (3).
- Using the syringe (5), aspirate the oil from the jerrycan (6).
- Insert the flexible pipe in the port (2) and fill the pump until oil overflows from the pump housing.
- Insert the flexible pipe in the port (3) and fill the pump until oil overflows from the pump housing.
- Insert the flexible pipe in the port (4) and fill the pump until oil overflows from the pump housing.
- Turn the pump shaft (7) in both directions and check the oil level in the pump.
- If the level has decreased, add oil.
- Otherwise, replace and tighten all the plugs on the pump.
- Clean any traces of oil from the outside of the pump using a soft lint-free cloth.
- Store the pump.
- Before using the pump on a machine, it must be properly emptied.
- Rinse the pump with a neutral oil rinse that is compatible with your machine oil.
- Then fill the pump with the machine oil.

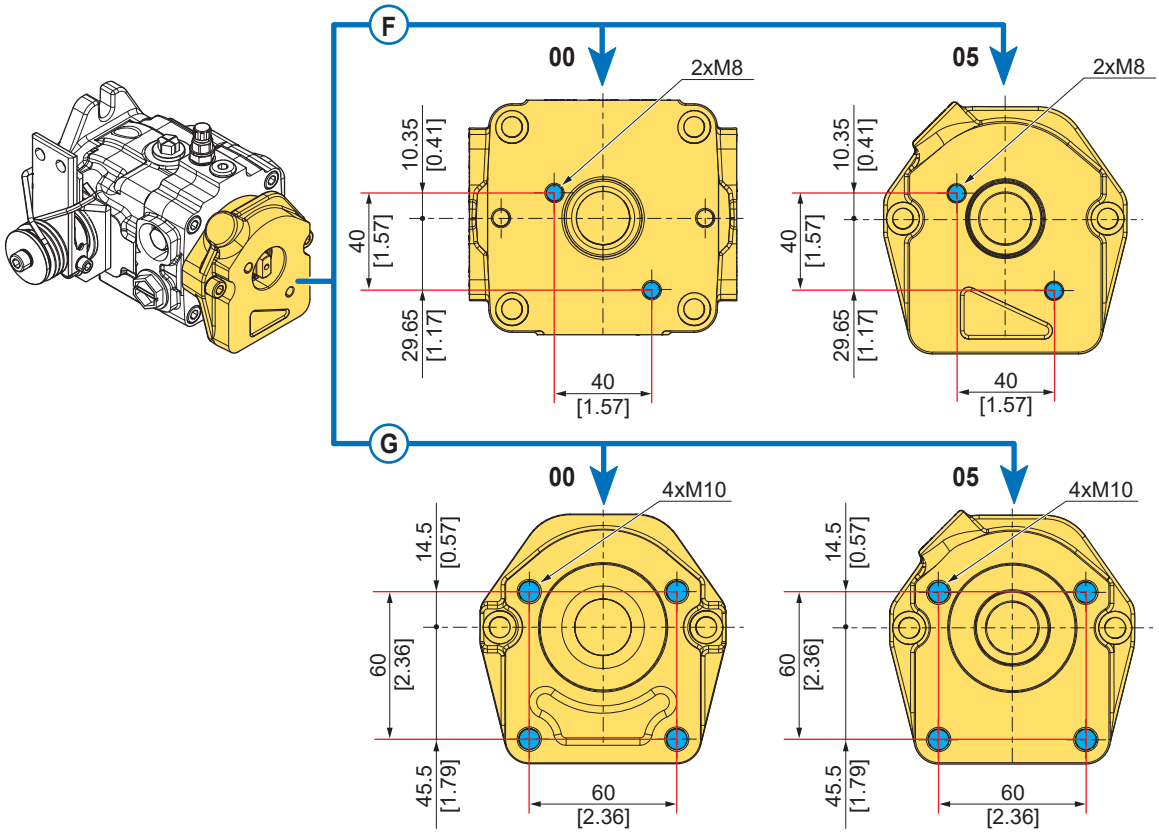
Recovering the storage oil.

1.4 - Paint

For more information, refer to page 18.

1.5 - Auxiliary mounting pad permissible torque

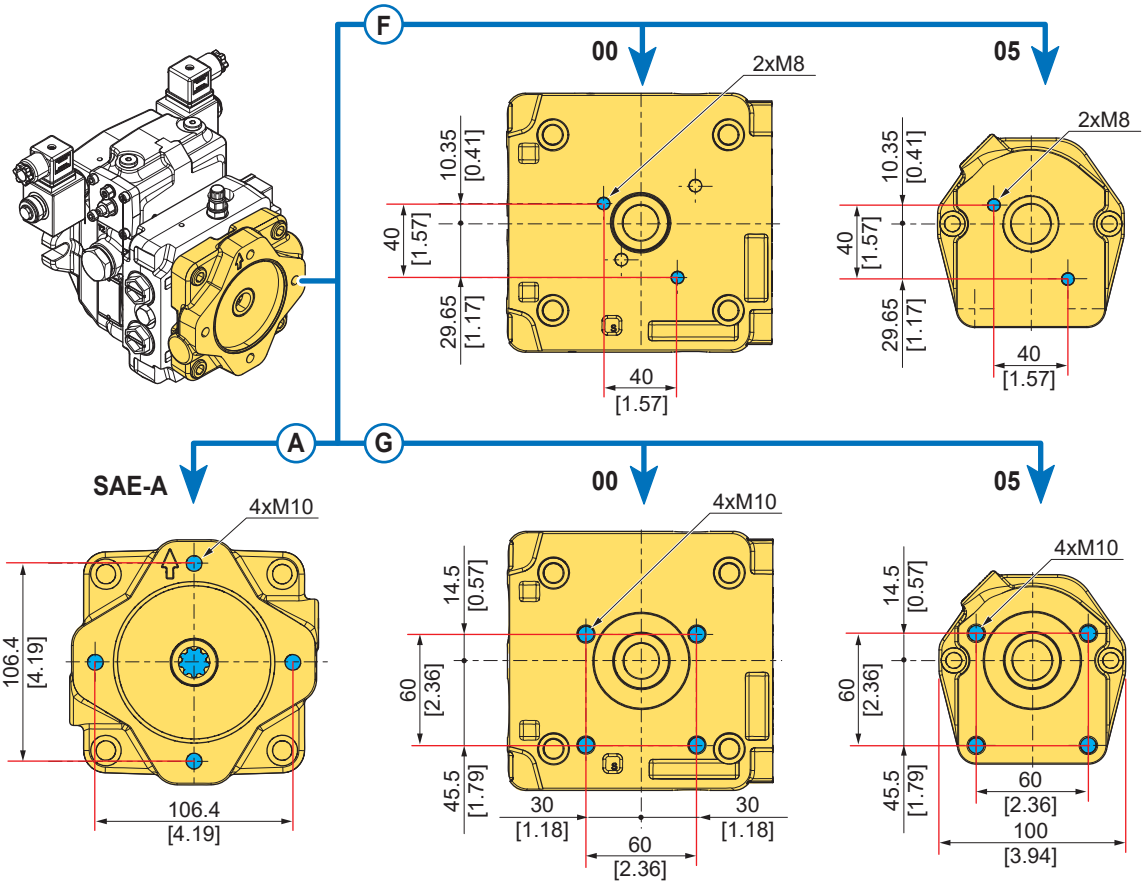
1.5.1 - PMV0



Model code	Flange type	Max. torque	
		Nm	in.lbf
F	German group 1 - 00	48	425
F	German group 1 - 05	48	425
G	German group 2 - 00	70	620
G	German group 2 - 05	70	620

- Flange 00 type: Without charge pump.
- Flange type 05: With charge pump 4.9 cm³/rev [0.30 in³/rev].

1.5.2 - PM10

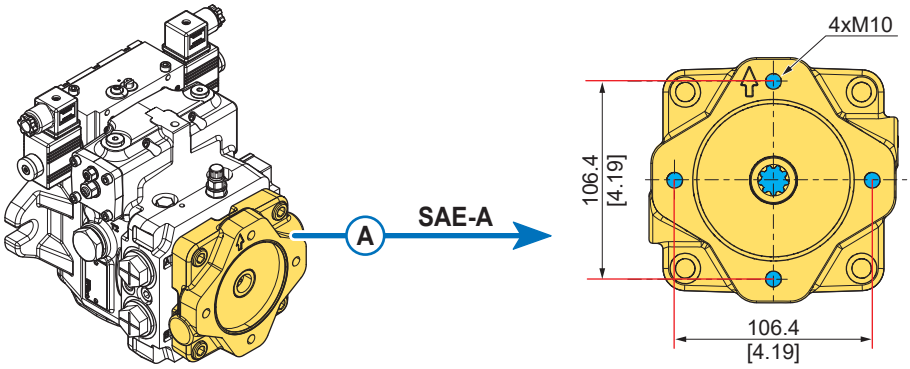


Model code	Flange type	Number of teeth	Pitch	Max. torque	
				Nm	in.lbf
A	SAE A	9	5/8" pitch 16/32" DP	80	708
A	SAE A	11	3/4" pitch 16/32" DP	125	1106

Model code	Flange type	Max. torque	
		Nm	in.lbf
F	German group 1 - 00	48	425
F	German group 1 - 05	48	425
G	German group 2 - 00	70	620
G	German group 2 - 05	70	620

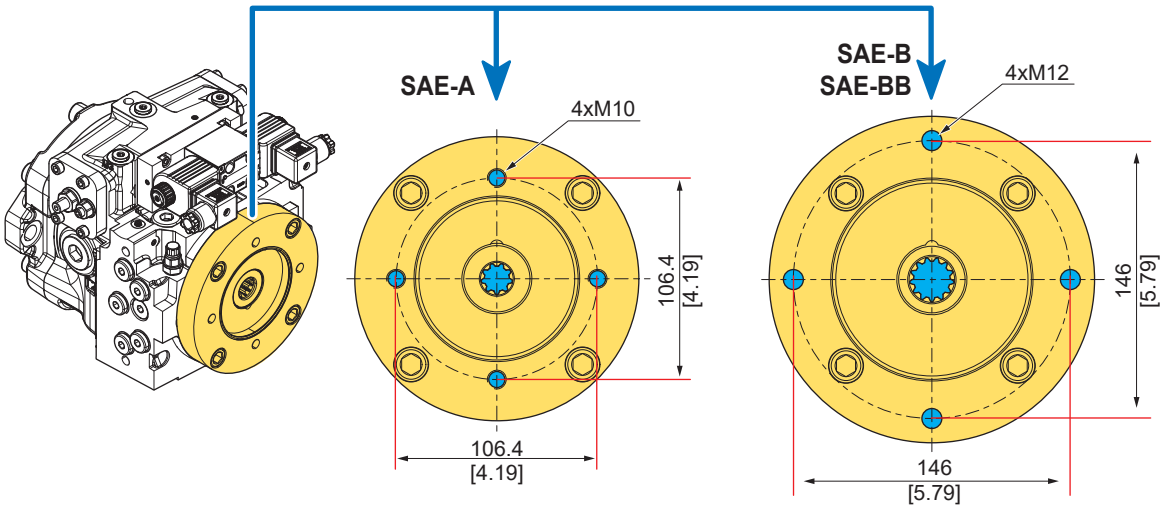
- Flange 00 type: Without charge pump.
- Flange type 05: With charge pump 4.9 cm³/rev [0.30 in³/rev].

1.5.3 - PM20



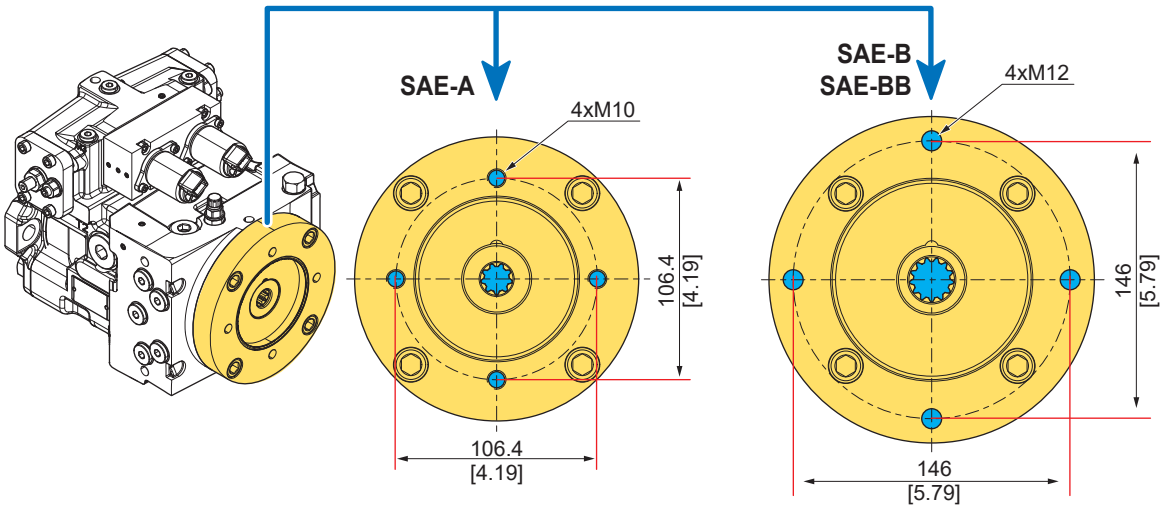
Model code	Flange type	Number of teeth	Pitch	Max. torque	
				Nm	in.lbf
A	SAE A	9	5/8" pitch 16/32" DP	80	708

1.5.4 - PM30 / PMe30



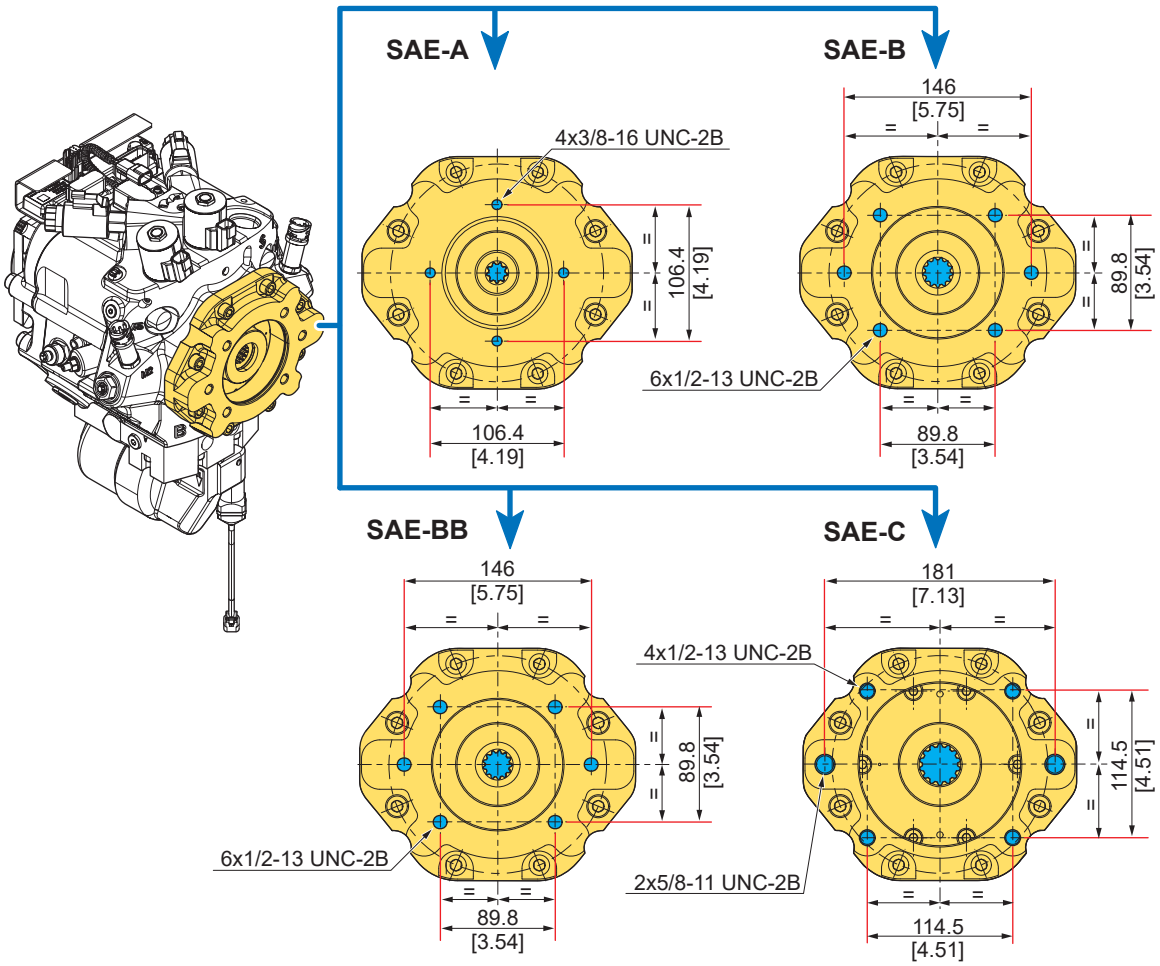
Model code	Flange type	Number of teeth	Pitch	Max. torque	
				Nm	in.lbf
A	SAE A	9	5/8" pitch 16/32" DP	80	708
E	SAE A	11	3/4" pitch 16/32" DP	160	1 416
B	SAE B	13	7/8" pitch 16/32" DP	220	1 950
				230	2 036
C	SAE BB	15	1" pitch 16/32" DP	220	1 950

1.5.5 - PM50 / PMe50



Model code	Flange type	Number of teeth	Pitch	Max. torque	
				Nm	in.lbf
A	SAE A	9	5/8" pitch 16/32" DP	80	708
E	SAE A	11	3/4" pitch 16/32" DP	160	1 416
B	SAE B	13	7/8" pitch 16/32" DP	220	1 950
				230	2 036
C	SAE BB	15	1" pitch 16/32" DP	220	1 950

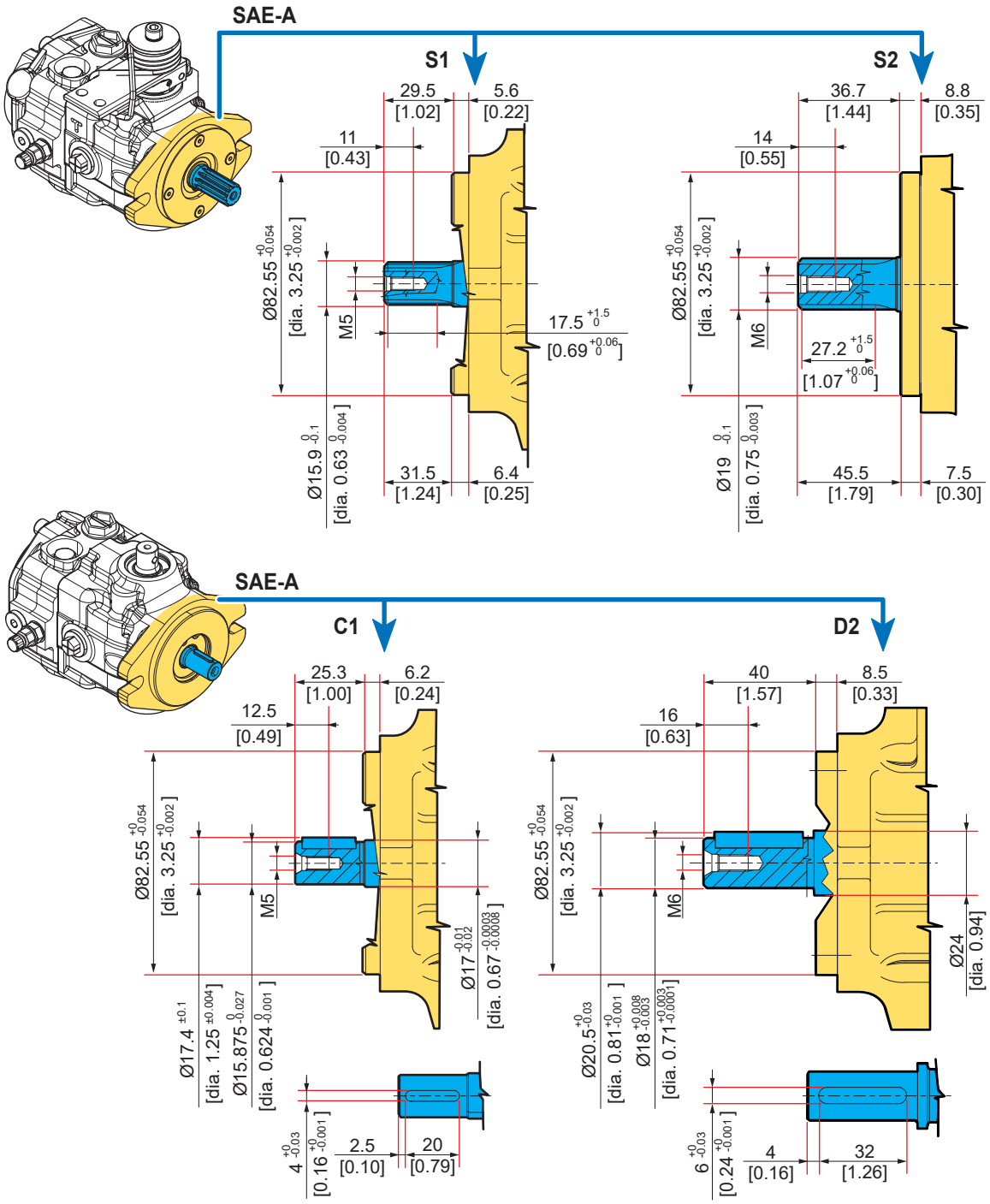
1.5.6 - PW085 / PWe085 / PW096 / PWe096



Pump	Model code	Flange type	Number of teeth	Pitch	Max. torque	
					Nm	in.lbf
PW085	1	SAE A	9	Pitch 16/32" DP	113	1 000
	2	SAE B	13	Pitch 16/32" DP	283	2 505
	3	SAE BB	15	Pitch 16/32" DP	407	3 602
	4	SAE C	14	Pitch 12/24" DP	701	6 204
	5	SAE C	21	Pitch 16/32" DP	918	8 125
PW096	1	SAE A	9	Pitch 16/32" DP	113	1 000
	2	SAE B	13	Pitch 16/32" DP	283	2 505
	3	SAE BB	15	Pitch 16/32" DP	407	3 602
	4	SAE C	14	Pitch 12/24" DP	701	6 204
	5	SAE C	21	Pitch 16/32" DP	918	8 125

1.6 - Mounting flange and shaft permissible torque

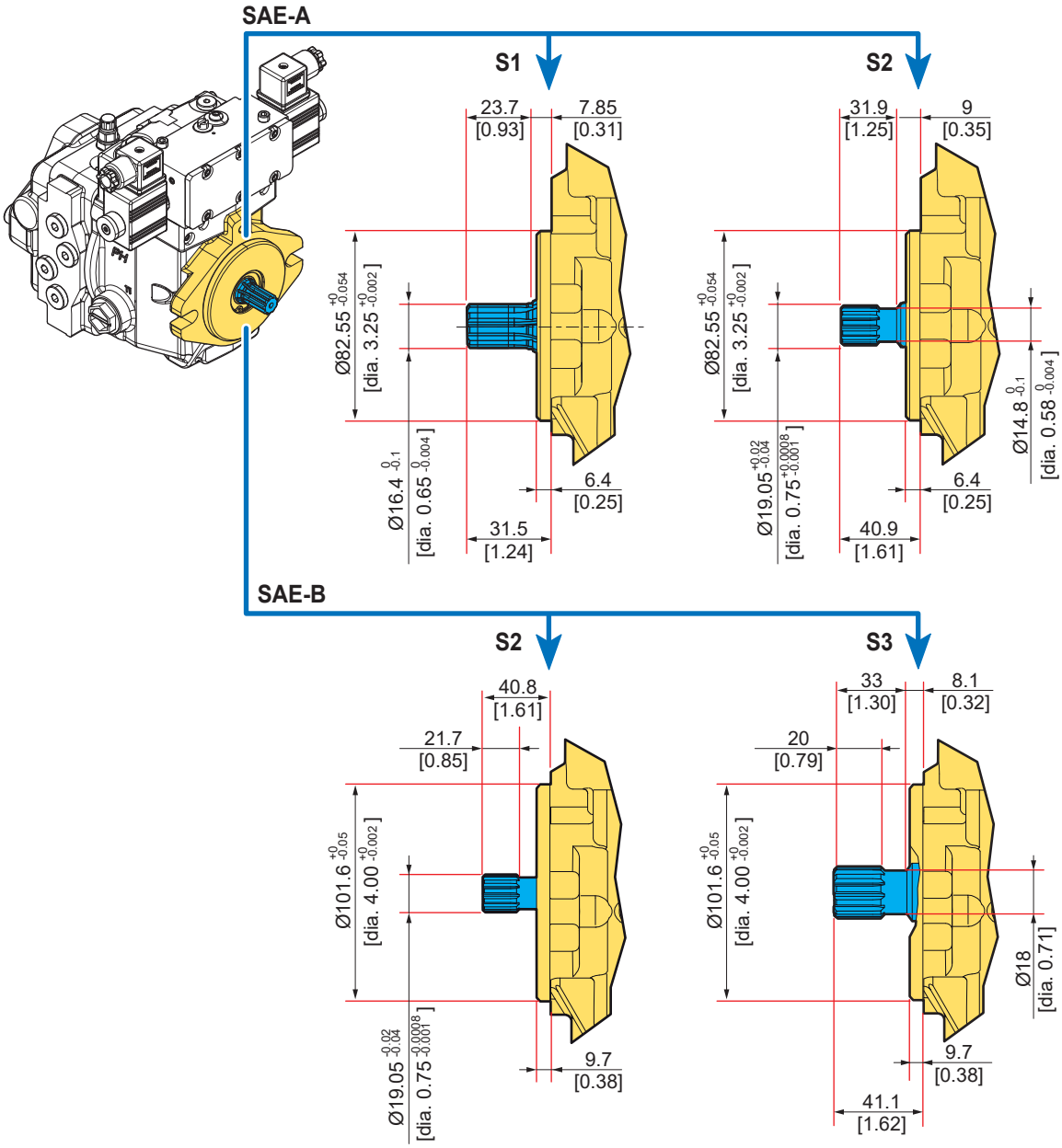
1.6.1 - PMV0



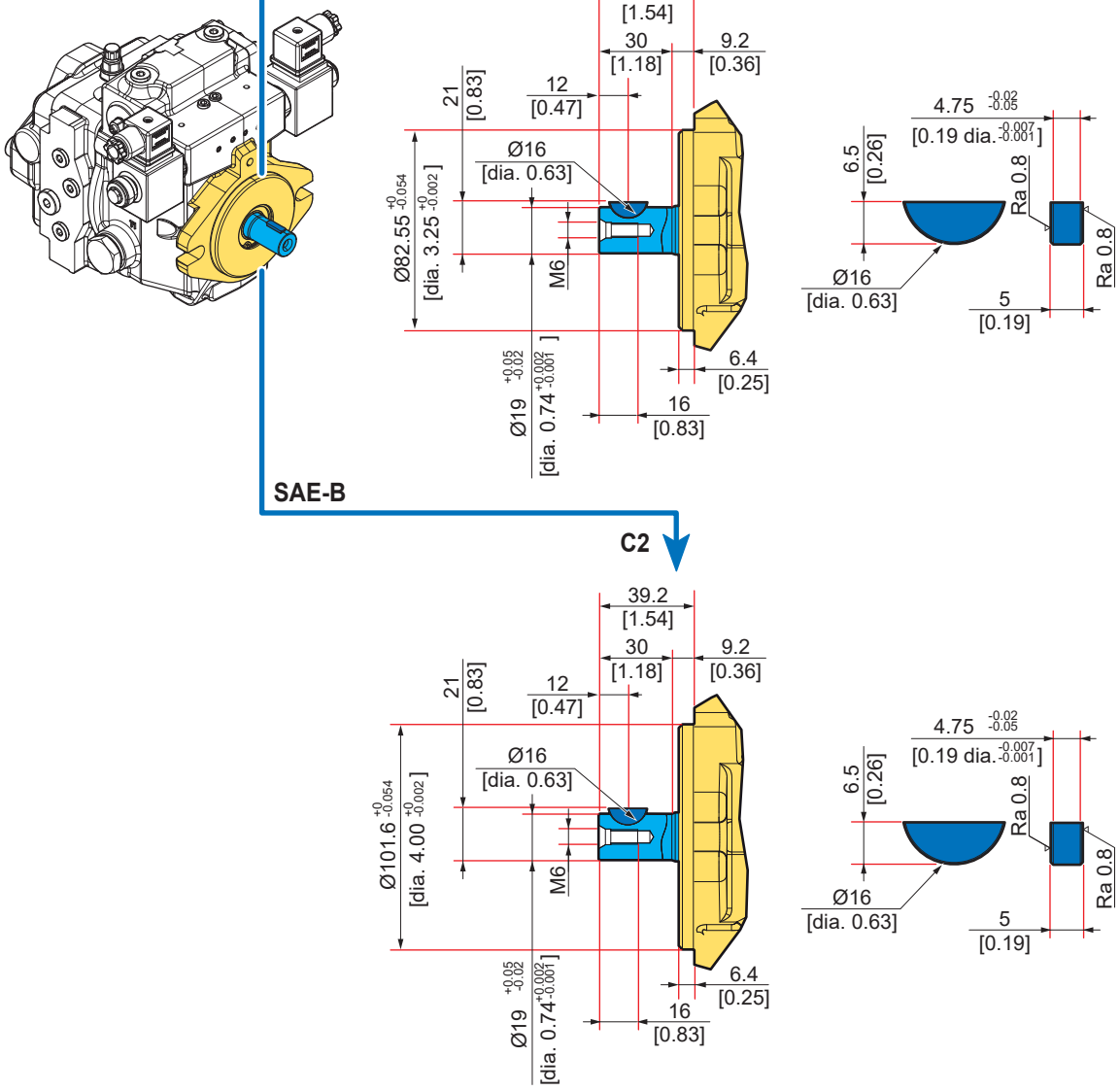
Model code	Flange type	Number of teeth	Pitch	Pressure angle	Tolerance class	Max. torque	
						Nm	in.lbf
S1	SAE A	13	16/32" DP	30 °	5	80	708
S2	SAE A	11	16/32" DP	30 °	5	140	1 239

Model code	Flange type	Ø		Max. torque	
		mm	in	Nm	in.lbf
C1	SAE A	15.875	0.624	65	575
D2	SAE A	18	0.71	100	885

1.6.2 - PM10

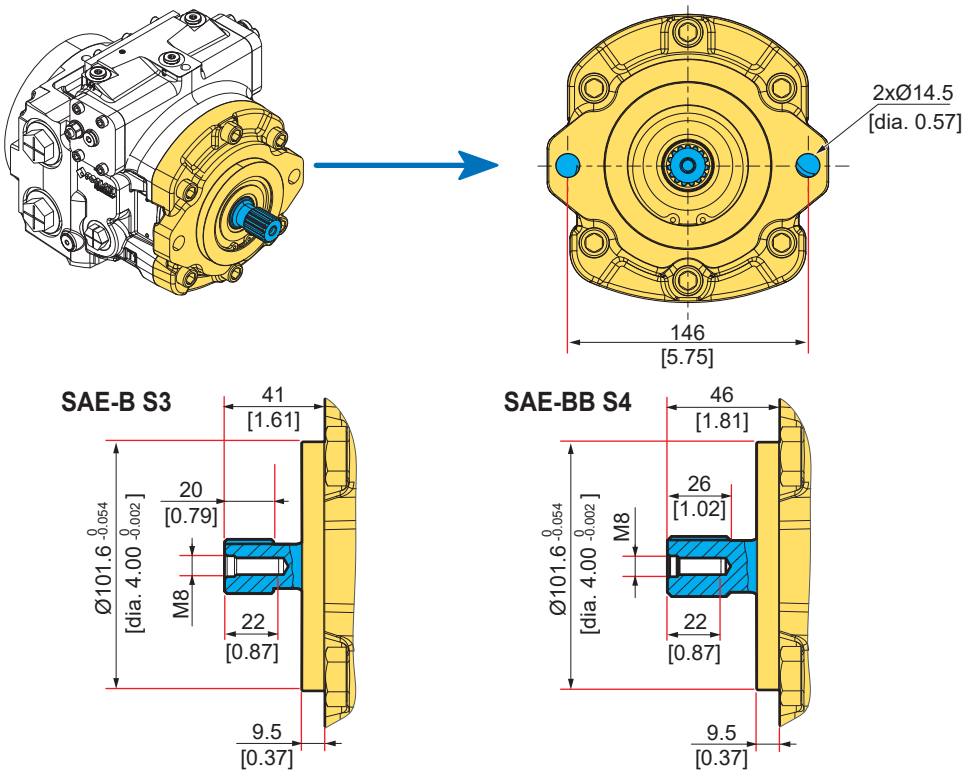


Model code	Flange type	Number of teeth	Pitch	Pressure angle	Tolerance class	Max. torque	
						Nm	in.lbf
S1	SAE A	9	16/32" DP	30 °	5	80	708
S2	SAE A	11	16/32" DP	30 °	5	140	1 239
S2	SAE B	11	16/32" DP	30 °	5	140	1 239
S3	SAE B	13	16/32" DP	30 °	5	220	1 947



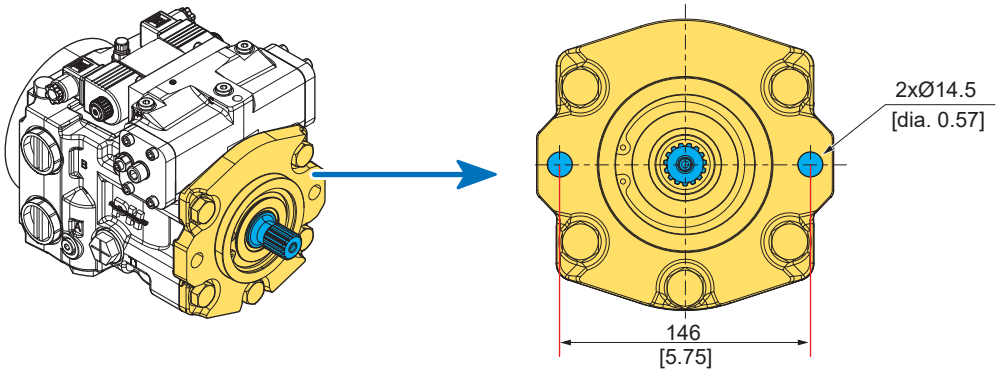
Model code	Flange type	Ø shaft	Max. torque	
			Nm	in.lbf
C2	SAE A	19 [0.75 in]	140	1 239
C2	SAE B	19 [0.75 in]	140	1 239

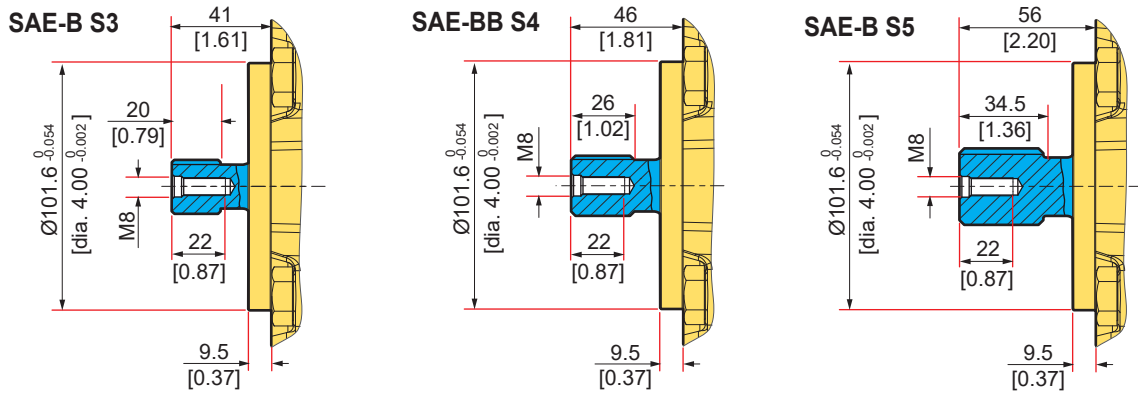
1.6.3 - PM20 / PM30 / PMe30

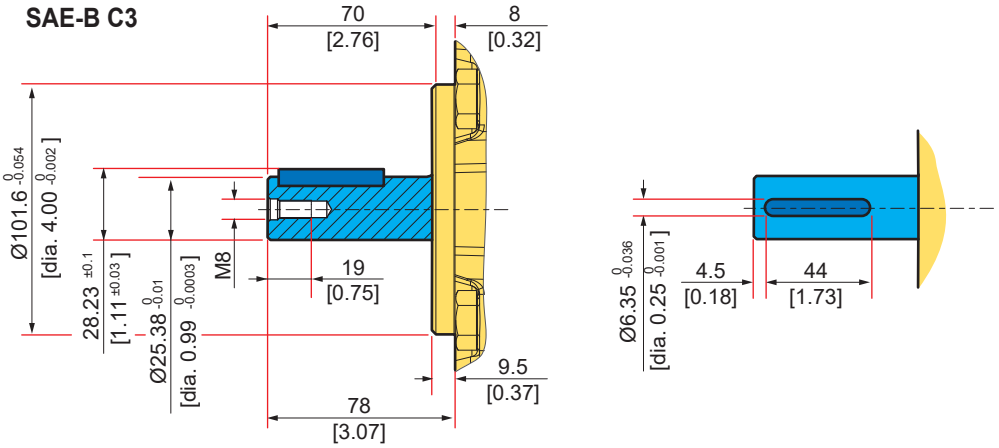


Model code	Flange type	Number of teeth	Pitch	Pressure angle	Tolerance class	Max. torque	
						Nm	in.lbf
S3	SAE B	13	16/32" DP	30 °	5	220	1 947
S4	SAE BB	15	16/32" DP	30 °	5	360	3 186

1.6.4 - PM50 / PMe50



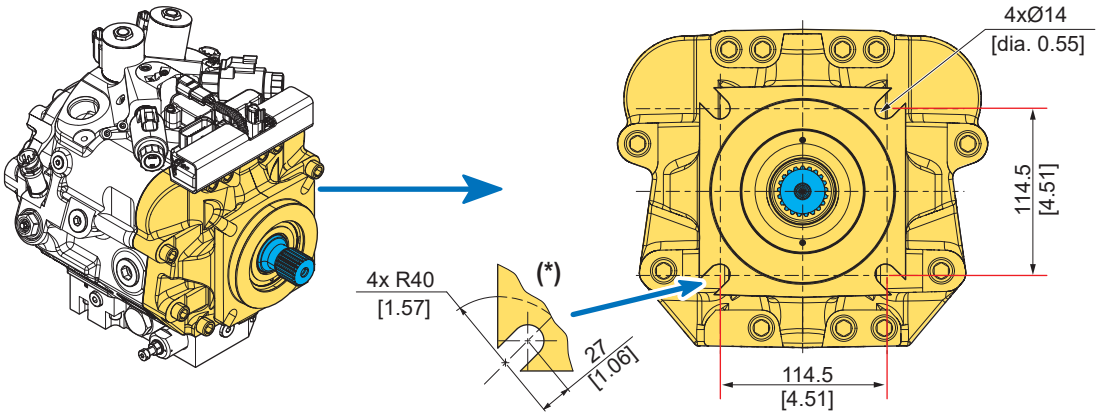


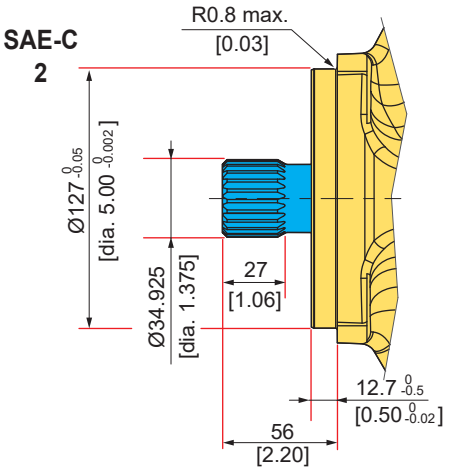


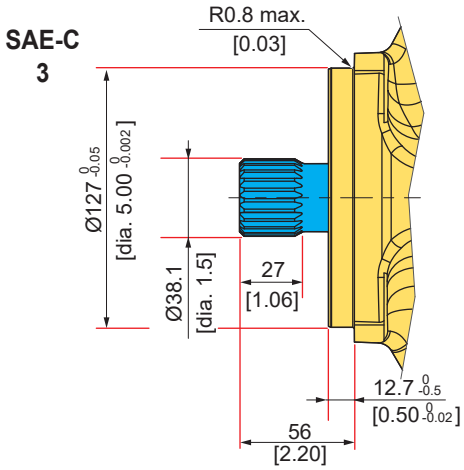
Model code	Flange type	Number of teeth	Pitch	Pressure angle	Tolerance class	Max. torque	
						Nm	in.lbf
S3	SAE B	13	16/32" DP	30 °	5	220	1 947
S4	SAE BB	15	16/32" DP	30 °	5	360	3 186
S5	SAE B	14	12/24" DP	30 °	5	600	5 310

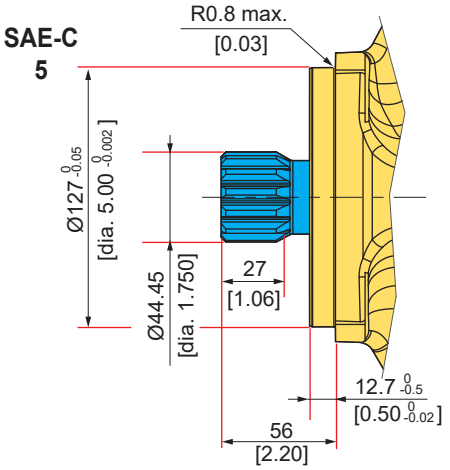
Model code	Flange type	Ø shaft	Max. torque	
			Nm	in.lbf
C3	SAE B	25.38 [1 in]	220	1 947

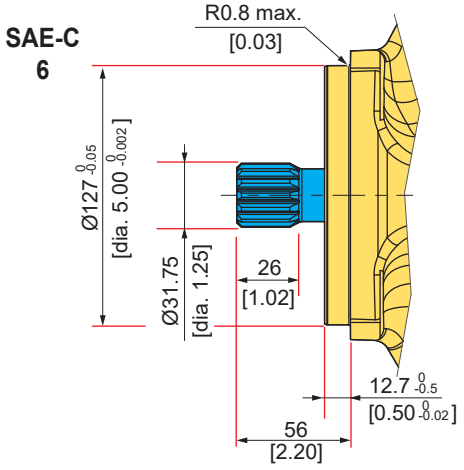
1.6.5 - PW085 / PWe085 / PW096 / PWe096











Model code	Flange type	Number of teeth	Pitch	Pressure angle	Tolerance class	Max. torque	
						Nm	in.lbf
2	SAE-C	21	16/32" DP	30 °	5	820	7 258
3	SAE-C	23	16/32" DP	30 °	5	1 000	8 851
5	SAE-C	13	8/16" DP	30 °	5	1 500	13 276
6	SAE B	14	12/24" DP	30 °	5	600	5 310

(*) Screw head and washer space.

1.7 - Lifting points

- For handling, the pump can be connected to a lifting device via a ring screw or a lifting strap.
- For more information on the lifting points, refer to the interface drawing of your pump.
- Please contact your sales engineer to request it.

Transport with lifting strap

DANGER

Risk from suspended loads!

Use of improper transportation or lifting equipment may result in dropping a Poclain Hydraulics product, potentially causing death or serious injury.

When transporting a product, always respect the safety rules, laws and regulations in effect.

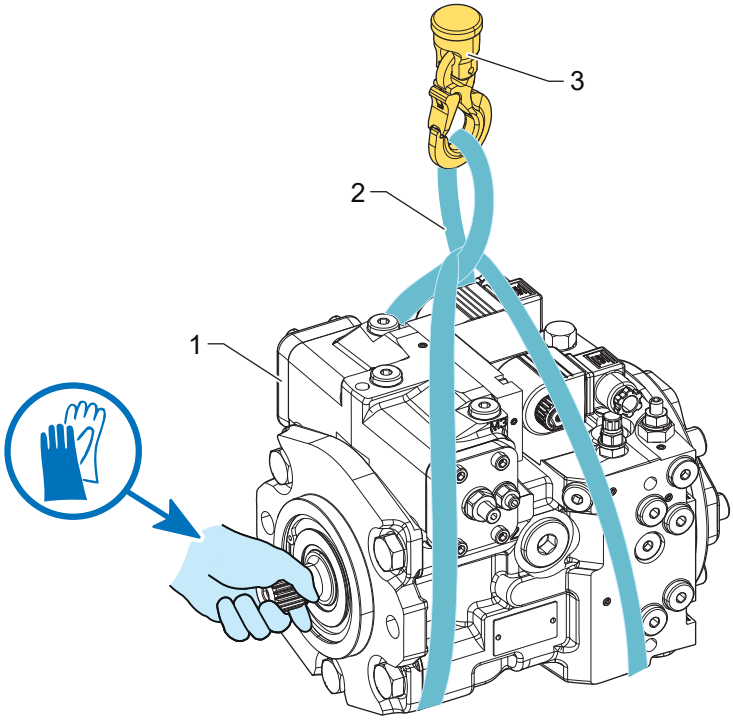
- Always check that the lifting equipment is adequate for the load. Do not use lifting equipment with an insufficient load capacity rating.
- A non-exhaustive list of suggested safety rules is shown below:
  - Nobody should stand in the danger zone of the machine or system.
  - Ensure coworkers and other bystanders are out of the danger zone.
  - Never work under a suspended load.
  - Never guide a load with your hands.
  - Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

If the pump falls during handling, it must be returned to Poclain Hydraulics.

NOTICE

Risk from improper handling!

- Handle carefully to avoid damaging the solenoid cartridges, coil, and potentiometer during this operation.



Legend
1 Pump (PM for example)
2 Lifting straps
3 Lifting hook

During handling with a lifting device, the pump can fall out of the lifting strap and cause injuries.

- Use the widest possible lifting strap.
- Ensure that the pump is securely held in the lifting strap.

DANGER

Risk from suspended loads!

Use of improper transportation or lifting equipment may result in dropping a Poclain Hydraulics product, potentially causing death or serious injury.

When transporting a product, always respect the safety rules, laws and regulations in effect.

- Always check that the lifting equipment is adequate for the load. Do not use lifting equipment with an insufficient load capacity rating.
- A non-exhaustive list of suggested safety rules is shown below:
  - Nobody should stand in the danger zone of the machine or system.
  - Ensure coworkers and other bystanders are out of the danger zone.
  - Never work under a suspended load.
  - Never guide a load with your hands.
  - Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

- Place the lifting strap around the pump so that it does not pass over the attachment parts (e.g. valves); do not hang axial piston unit from attachment parts.

2 - Installation

2.1 - Mechanical

2.1.1 - Coupling and fixing on electric motor / engine

2.1.1.1 - Positioning

NOTICE

Risk of malfunction and product damage!

- Check that the direction of rotation of the pump and generator (electric motor / engine) are compatible.

Ensure access to the various ports and the possibility of removing components from the pump (charge pump, auxiliary pumps, etc.).

Depending on the orientation of the pump, the highest case drain should be used (port T1 or T2).

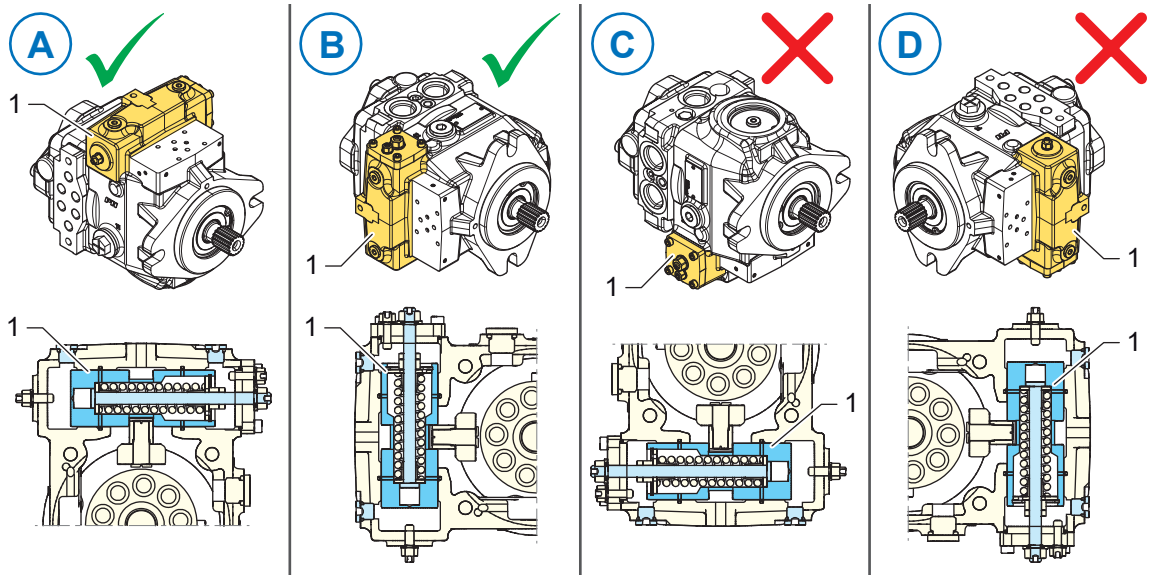
- The pump must be installed in a clean environment. Make sure that the environment during installation is free of pollution (dust, water…).
- We recommend installing the pump lower than the tank, below the minimum oil level.
- Install the pump with the drain port (T2) up, connected to the cooler (Refer to the appropriate technical catalog port overviews).
- The suction port S should generally be positioned downward.

Considerations for mounting orientation

DANGER

Under some circumstances, such as contamination, the control spool could stick and cause the pump to stay blocked in a certain position.

Poclain Hydraulics recommends installing pump with servo control on the top or side.



Legend
1 Servo piston

A - Servo piston horizontal at top of pump

- **Preferred orientation.**
- Best air bleeding.
- Minimizes contamination setting.

B - Servo piston vertical with open end facing up

- **Possible orientation.**

C - Servo piston horizontal at bottom of pump

- **Not recommended orientation.**
- Air bleeding more difficult.
- Increased risk of contamination setting around servo piston.

D - Servo piston vertical with open end facing down

- **Not recommended orientation.**
- Potential air trapped in servo piston that is difficult to bleed.

2.1.1.2 - Mounting on the electric motor or engine

Before installing, completely empty the axial piston unit to prevent any mixing with the hydraulic fluid used in the machine/system.

Details about required tools and tightening torques for the mounting bolts are available from the manufacturer of the electric motor or engine.

Splines or shafts must be lubricated before connection to the mating part. We recommend using high-load Molybdenum grease.

NOTICE

Risk of damage to the product!

- No axial or radial loads are allowed.

The clearance between the splines of the pump and motor shafts should be even to avoid stress on the shaft. Respect the coherence of the splines (dimensions, shapes and tolerances) between the motor and the pump.

When the machine environment does not allow assembly in a vertical position, the weight of the pump must be supported before tightening the screws.

⚠ WARNING

Risk of inappropriate behavior of the machine.

- Fittings: Observe the manufacturer's specifications regarding the tightening torques of the fittings and the appropriate standard.

Check the tightening torque in individual cases in accordance with VDI 2230 guidelines. For more information, consult your application engineer.

The surface conditions on the engine or electric motor must fulfill the following conditions:

- Perpendicularity : following spline standard.
- Roughness (Ra): 12.5 µm [492 µin] without IP requirement. 1.6 µm [63 µin] with IP 67 requirement.

The bore diameter of the chassis (electric motor or engine) must enable spline centering without stress.

(Clearance 0.2 ~ 0.3 mm [0.008 ~ 0.01in]).

⚠ WARNING

Risk of pump shaft breakage!

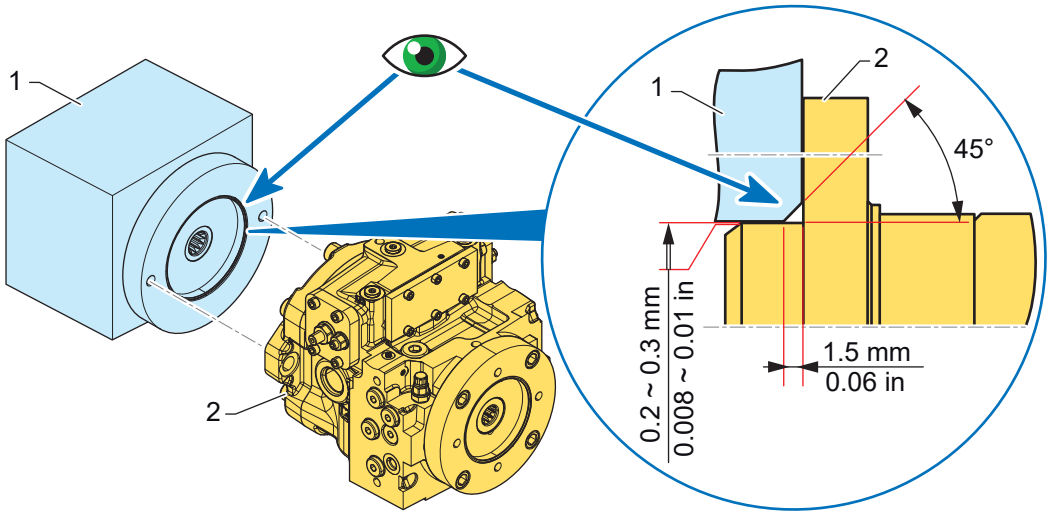
- Assemble the pump on the engine or electric motor in such a way as to avoid parasitic radial forces.

- A 1.5-mm [0.06 in] chamfer at 45° on the chassis.

WARNING

Risk of component breakage!

- To ensure the protection rating (IP code), make sure the required seal is properly installed between the pump and the engine or electric motor (refer to the component documentation for the seal specifications).



Legend
1 Electric motor / Engine
2 Pump

Before mounting the pump, turn the shaft and test for free movement (no stiff points, no noise).

The pump must be secured to the machine chassis equipped with an Anti-Vibration Mount.

Secure the pump so that the expected forces and torques can be effectively transferred.

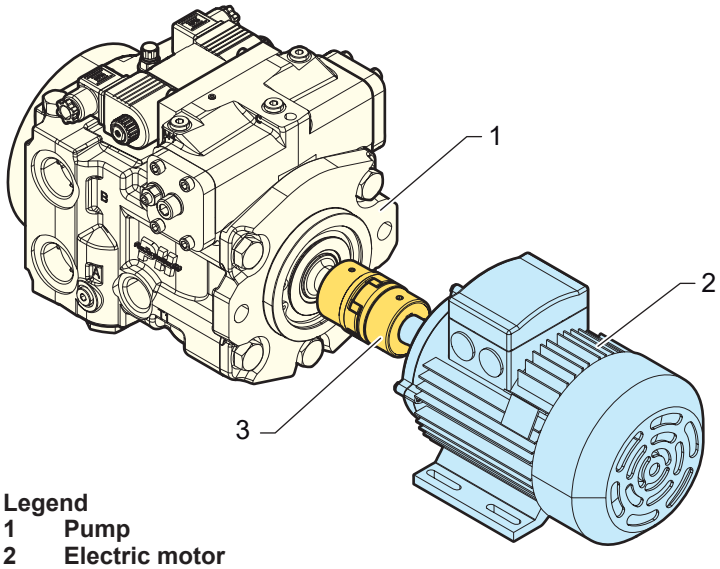
2.1.1.3 - Coupling with the generator

NOTICE

Risk of product damage!

- No axial or radial load allowed.

Elastic jaw

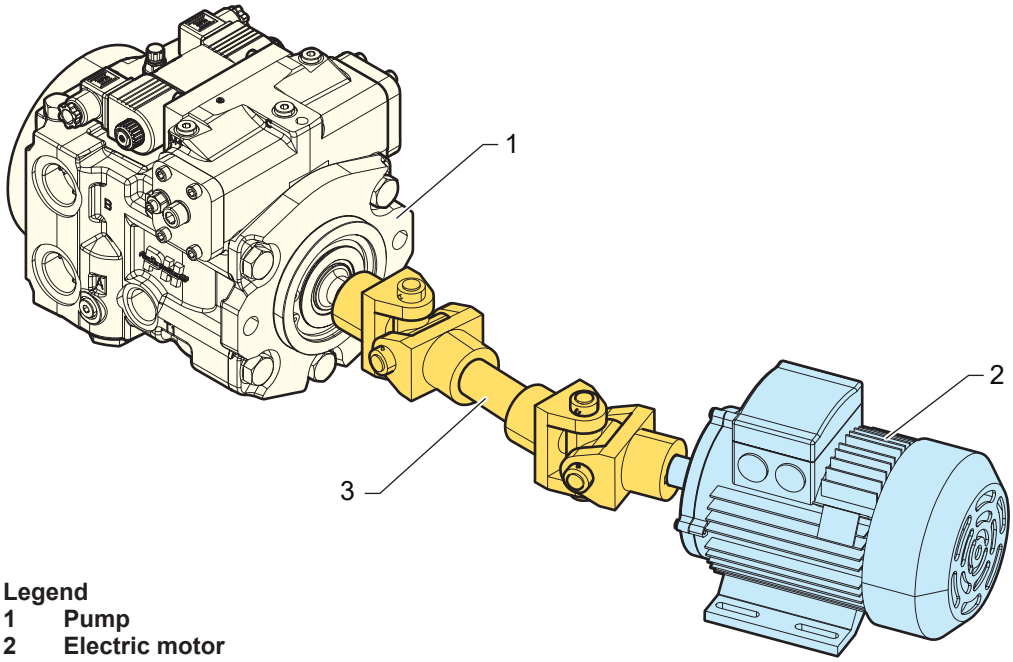


Legend
1 Pump
2 Electric motor
3 Elastic jaw

Recommendation

- Check the alignment to limit stray forces and promote the transmission of torque.
- Consult the manufacturer's technical data.
- Splines or shafts must be lubricated before connection to the mating part.
- We recommend using high-load Molybdenum grease.

Coupling with double cardan shaft

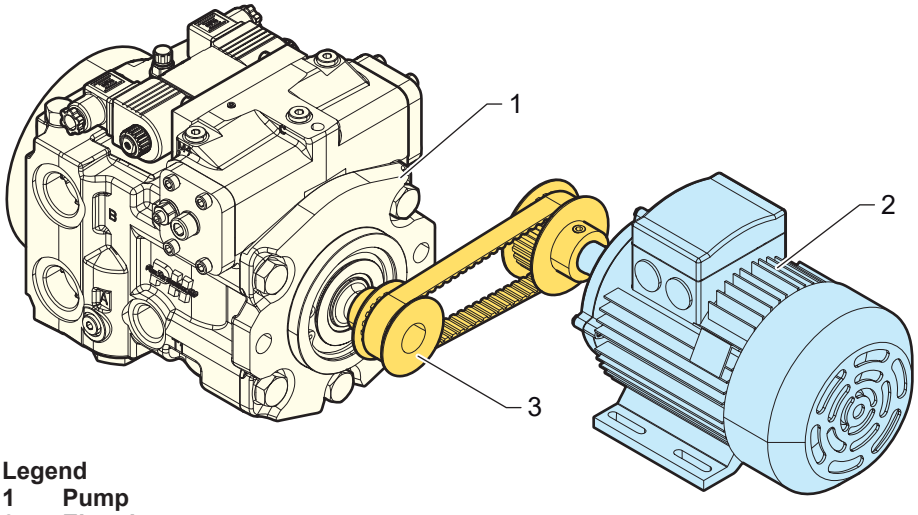


Legend
1 Pump
2 Electric motor
3 Direct drive

Recommendation

- Select a pump shaft with a tapping at the end of the shaft to perform an axial locking of the sleeve (option not available as standard, consult your sales engineer).
- Follow the driveshaft manufacturer's recommendations.
- Consult your application engineer to validate the assembly.
- Splines or shafts must be lubricated before connection to the mating part.
- We recommend using high-load Molybdenum grease.

Pulley / belt coupling



Legend
1 Pump
2 Electric motor
3 Pulley / Belt

Recommendation

- Consult your application engineer to validate the assembly.
- Splines or shafts must be lubricated before connection to the mating part.
- We recommend using high-load Molybdenum grease.

Admissible torque

NOTICE

Risk of product damage!

- The tensile load of the belt must be taken into account: see technical documentation chapter "Bearing life and external shaft loading".
- Make sure the torque delivered by the output shaft of the engine is permissible for the input shaft of the pump.

Refer to the table below:

Pump	Model code	SAE type	Number of teeth	Pitch type	Max. torque	
					Nm	in.lbf
PMV0	S1	SAE A	13	Pitch 16/32" DP	80	708
PMV0	S2	SAE A	11	Pitch 16/32" DP	140	1 239
PMV0	C1	SAE A	Key shaft	Ø 15.875 mm [dia. 0.624 in]	65	575
PMV0	D2	SAE A	Key shaft	Ø 18 mm [dia. 0.71 in]	100	885
PM10	S1	SAE A	9	Pitch 16/32" DP	80	708
PM10	S2	SAE A	11	Pitch 16/32" DP	140	1 239
PM10	S2	SAE B	11	Pitch 16/32" DP	140	1 239
PM10	S3	SAE B	13	Pitch 16/32" DP	220	1 947
PM10	C2	SAE A	Key shaft	Ø 19 mm [dia. 0.75 in]	140	1 239
PM10	C2	SAE B	Key shaft	Ø 19 mm [dia. 0.75 in]	140	1 239
PM20/PM30	S3	SAE B	13	Pitch 16/32" DP	220	1 947
PM20/PM30	S4	SAE BB	15	Pitch 16/32" DP	360	3 186
PM50	S3	SAE B	13	Pitch 16/32" DP	220	1 947
PM50	S4	SAE BB	15	Pitch 16/32" DP	360	3 186
PM50	S5	SAE B	14	Pitch 12/24" DP	600	5 310
PM50	C3	SAE B	Key shaft	Ø 25.38 mm [dia. 1 in]	220	1 947
PW085	2	SAE C	21	Pitch 16/32" DP	820	7 258
PW085	3	SAE C	23	Pitch 16/32" DP	1000	8 851
PW085	5	SAE C	13	Pitch 8/16" DP	1500	13 276
PW085	6	SAE C	14	Pitch 12/24" DP	600	5 310
PW096	2	SAE C	21	Pitch 16/32" DP	820	7 258
PW096	3	SAE C	23	Pitch 16/32" DP	1000	8 851
PW096	5	SAE C	13	Pitch 8/16" DP	1500	13 276
PW096	6	SAE C	14	Pitch 12/24" DP	600	5 310

2.2 - Hydraulic connections

2.2.1 - Piping guide

For more information, refer to page 19.

2.2.2 - Tank

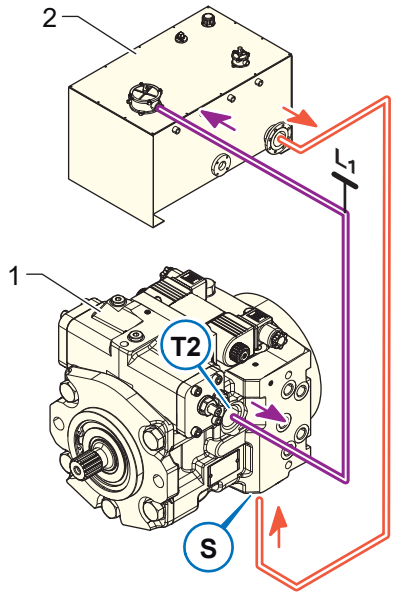
For more information, refer to page 25.

2.2.2.1 - Installation - Pump under the tank (standard)

"Pump under tank installation" is when the pump is installed outside of the tank below the minimum hydraulic fluid level.

The following installation positions are permissible.

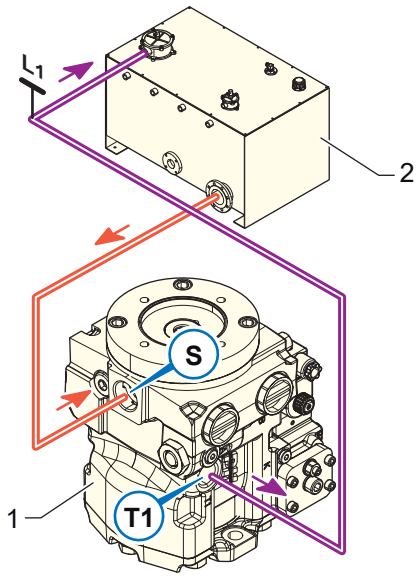
Horizontal drive shaft (Recommended)



Legend
1 Pump
2 Tank
S Suction port
T2 Drain port
L1 Filling / Air bleeding

- Filling: Suction port (S) and Drain port (T2 / L1).

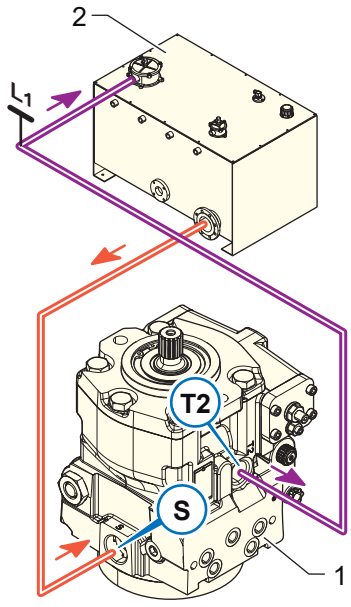
Downward drive shaft (Recommended)



Legend
1 Pump
2 Tank
S Suction port
T1 Drain port
L1 Filling / Air bleeding

- Filling: Suction port (S) and Drain port (T1 / L1).

Upward drive shaft

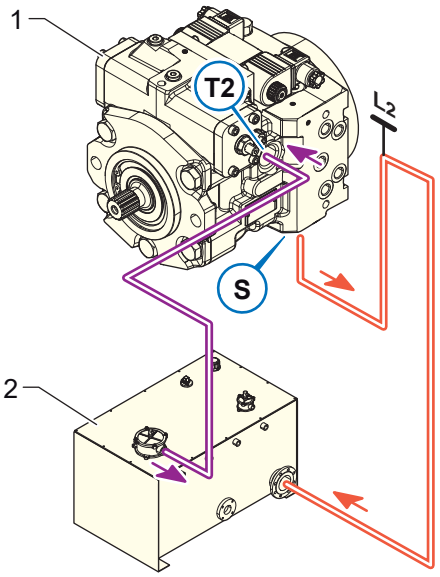


Legend
1 Pump
2 Tank
S Suction port
T2 Drain port
L1 Filling / Air bleeding

- Filling: Suction port (S) and Drain port (T2 / L1).

2.2.2.2 - Installation - Pump above the tank (standard)

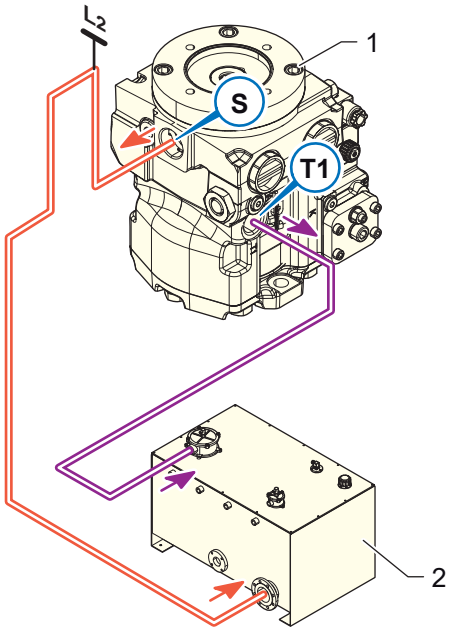
Horizontal drive shaft



Legend
1 Pump
2 Tank
S Suction port
T2 Drain port
L2 Filling / Air bleeding

- Filling: Drain port (T2 / L2).

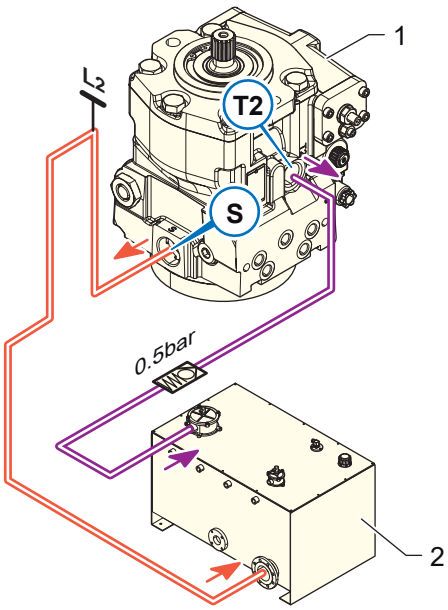
Downward drive shaft



Legend
1 Pump
2 Tank
S Suction port
T1 Drain port
L2 Filling / Air bleeding

- Filling: Suction port (S / L2) and Drain port (T1).

Upward drive shaft



Legend
1 Pump
2 Tank
S Suction port
T2 Drain port
L2 Filling / Air bleeding

- Filling: Suction port (S / L2) and Drain port (T2).

2.2.3 - Case draining

The drain must be adequate to limit the case internal pressure to 2 bar [30psi] at normal working temperature. The drain outlet must be placed at least at the shaft height.

2.2.4 - Charge pump

The pressure drop at the charge pump inlet must not be more than 0.2 bar [3 psi] at ambient temperature with a new filter and clean oil.

NOTICE

Risk of product damage!

- All excessive pressure drops coming from filtration, cooler or any other devices (clogged filter, poor plumbing, etc.) could lead to charge pump damage.

Contamination and filtration

NOTICE

Risk of product damage!

Clogged filters can cause cavitation, which can damage the charge pump and pump.

- The filter must be equipped with a bypass and a clogging indicator.

Minimizing contamination allows for a longer life for moving parts (pistons, valving).

To prevent premature wear, it is essential that only clean fluid enter the hydrostatic transmission circuit. The hydraulic fluid should be maintained decontaminated to level 17/15/12 or better the ISO 4406 standard by using an appropriate filter.

The filter may be located either on the inlet (suction filtration) or discharge (charge pressure filtration) side of the charge pump.

The choice of filter depends on a number of factors including the contaminant ingression rate, the generation of contaminants in the system, the required fluid cleanliness, and the desired maintenance interval.

Filters are selected to meet the above requirements using rating parameters of efficiency and capacity.

NOTICE

Insufficient suction pressure!

Generally, a minimum permissible suction pressure at port "S" is specified for axial piston pumps in all installation positions. If the pressure at port "S" drops below the specified values, irreparable damage to the pump could occur.

- Ensure that the necessary suction pressure is not undercut.

This is affected by:

- The piping (e.g. suction cross-section, pipe diameter, length of suction line).
- The position of the reservoir.
- The viscosity of the hydraulic fluid.
- If installed, a filter cartridge at the pump suction (regularly check the level of soiling of the filter cartridge).

When using the pressure side filter, the charge pump inlet line must have a screen to protect the charge pump. The screen should be 100µ mesh to catch particles 0.15 mm [0.006 inch] or larger.

The size of the charge pump inlet filter must ensure inlet pressure at the charge pump higher than or equal to 0.8 bar absolute [11.67 PSI absolute] at normal operating temperatures. This condition applies to both pressurized and breather tank systems.

Poclain Hydraulics supplies charge pumps with connections for pressure side filter use. The pressure side filter is connected between the charge pump outlet and the charge pump return port. Refer to the table below to see the available options.

Filtration options available

Option	Code	PMV0	PM10	PM20	PM30 PMe30	PM50 PMe50	PW Pwe
Filter on suction line	FA	X					
Filter on pressure line without clogging indicator	F0	X	X	X	X	X	
Filter on pressure line with clogging indicator	F2	X	X	X	X	X	
External connections for filter	F3		X	X	X	X	
Suction filtration	0						X
Integral filter	A						X
Integral filter with pollution indicator	B						X
Remote filtration + pressure dump relief valve	C						X
Integral filter with exchange valve	A						X
Integral filter with pollution indicator and with exchange valve	B						X

Filter on suction line code FA

The max. pressure drop on the filtration element must not exceed 0.4 bar absolute [5.8 PSI absolute] (0.8 bar absolute [11.6 PSI absolute] with cold starting).

The "S" suction port can swivel through 360°.

Filter on pressure line with or without clogging indicator (code F2 F0)

With clogging indicator (F2) or without indicator (F0). The flow thru the filter is only the flow that enters the closed loop. The filter fineness is 10 microns.

Maximum pressure difference between filter cartridge input and output is 2 bar [29 PSI]. When reaching 2 bar [29 PSI], the cartridge must be changed.

The suction filtration (code 0)

The suction filter is placed in the circuit between the reservoir and the inlet to the charge pump. The use of a filter contamination monitor is recommended.

Integral filter with pollution indicator (code B)

An integral filter can be equipped with pollution indicator for early warning that the filter needs to be cleaned or replaced.

Remote filtration + dumped LRPV (code C)

The pressure filter can be mounted remotely for easy servicing. A 100-125 µm mesh screen, located in the reservoir or the charge inlet line, is recommended when using charge pressure filtration. The remote pressure filter must be capable of withstanding charge pressure.

2.2.5 - Determination of pipe inside diameter

For more information, refer to page 26.

2.3 - Electrical connection

Electrical connection of the appliance must be performed only by a qualified professional.

DANGER

Hazardous electric voltage!

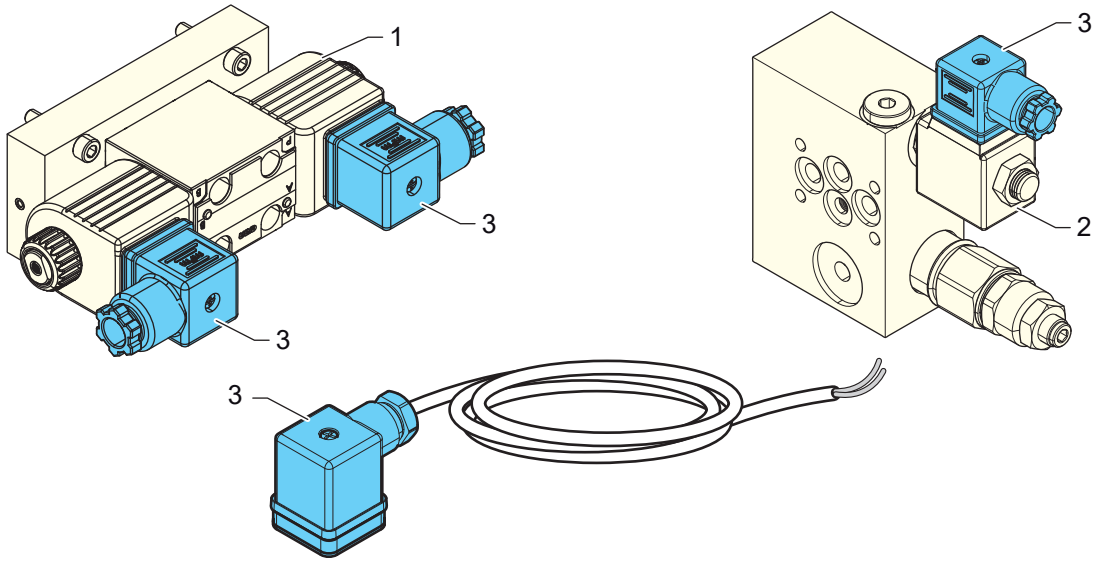
Risk of death or serious injury due to electric shock!

In case of incorrect installation, there is a risk of electric shock and damage to the appliance.

- Check the installation before start-up.

2.3.1 - SA control kit connector

Typical application



Legend

1 Electrical on-off servo control
2 Electrical by-pass with brake engaged
3 Kit connector for control

Suitable command

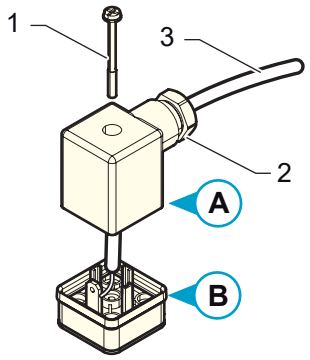
- Refer to the appropriate technical catalog for definitions.

Command	Pump					
	PMV0	PM10	PM30	PM50	PMe30	PMe50
Electrical by-pass with brake engaged "BF12 BF24 DIN 43650"	X					
Hydraulic automotive control "D-HI DIN 43650"		X				
Electro-proportional servo control DIN 43650		X				
Electrical on-off servo control (Hirschmann)		X				
Electrical on-off servo control "B"		X	X	X		
Electrical on-off servo control "B-HI"			X	X		
Electro-proportional servo control with feedback "Q"		X	X	X	X	X
Hydraulic servo control "S-VPU"		X	X	X		
Hydraulic automotive control "D-IC"		X	X	X		
Mechanical servo control "A-VPU"			X	X		
Mechanical servo control "A-MI-VPU"			X	X		

Connector characteristics

Commercial name	KIT CONNECT CDE SA
Part number	007142211X
Manufacturer	Hirschmann
Standard	EN 175301 - 803 style A (DIN 43650)
Max. current	16 A
Max. voltage	250 V (AV)
Wire section	max. 1.5 mm²
Cable diameter	6 mm [0.24 in] to 9 mm [0.35 in]
Operating temperature	-40°C to +125°C [-40°F to +257°F]
Ingress Protection	IP65
Necessary tools	Screwdriver

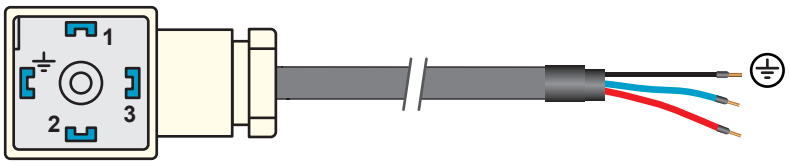
Connector mounting



Legend
1 Screw
2 Cable gland
3 Wire

- Unscrew the cable gland (2) and the screw (1).
- Open the connector with a flat-headed screwdriver inserted in part B of the slot.
- Strip the wire (3) over a length of 5 mm [0.19 in].
- Pass the wire (3) through the gland, then through cover A.
- Plug the wire into B according to connector wiring.
- Re-assemble B and A: The "3" mark must be nearest the gland.
- Refit the cable gland (2) and the screw (1).
- Install the connector subassembly onto the pump, and then tighten manually screw (1).

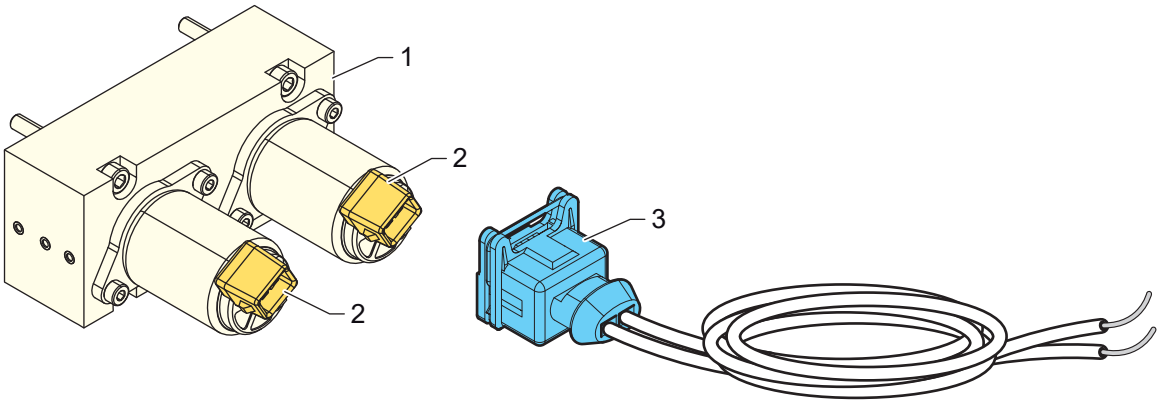
Connector wiring



Connector	Cable	Designation
1	Red	System connection (+)
2	Blue	System connection (-)
3	-	Not connected
Shield	Shield	Shield

2.3.2 - VMA kit connector

Typical application



Legend
1 Proportional electric servo control
2 Connector
3 Kit connector for control

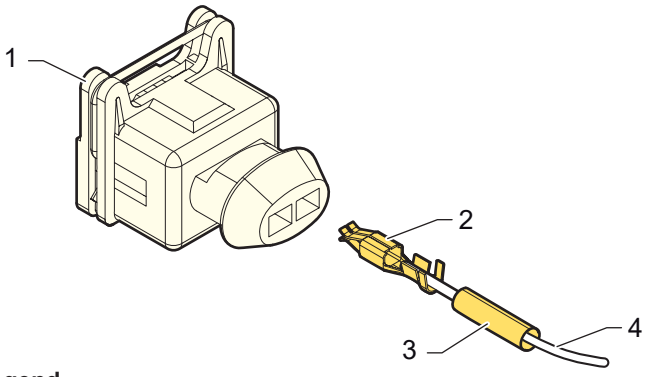
Suitable command

Command	Pump			
	PM30	PM50	PMe30	PMe50
Electro-proportional servo control "P"	X	X	X	X

Designation

Commercial name	VMA CONNECTOR VALVE KIT
Part number	007142206S
Manufacturer	AMP
Wire section	0.5 to 1 mm²
Insulation diameter	1.4 to 2.1 mm
Necessary tools	AMP CERTI-LOCK 169400

Connector mounting



Legend
1 Body connector
2 Lug
3 Heat-shrink tubing
4 Wire

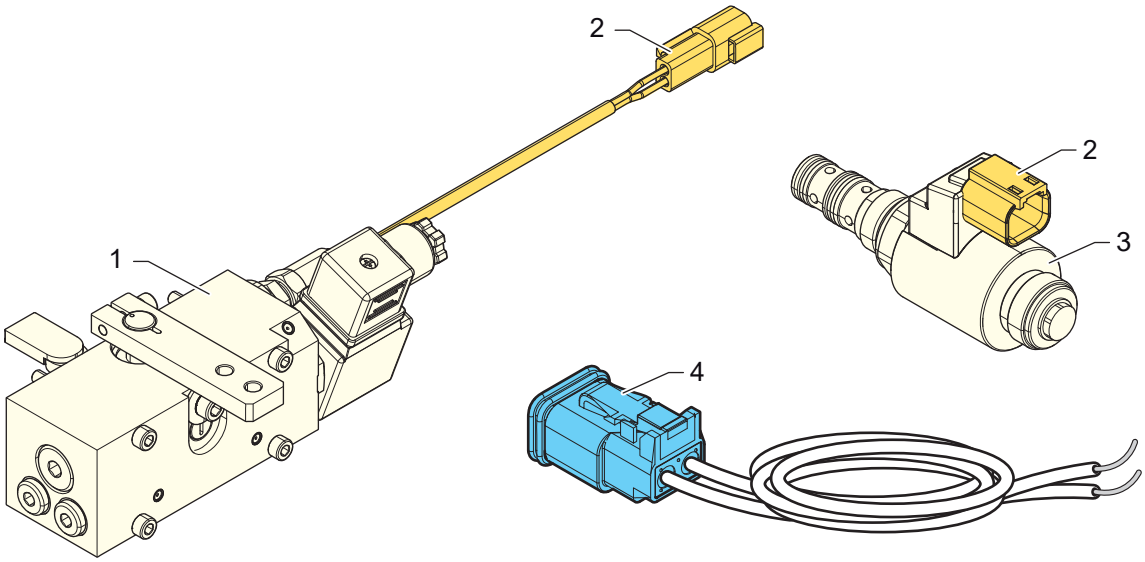
- Strip 5 mm [0.19 in] of insulation off the wires (4).
- Crimp the lugs (2) using an AMP CERTI-LOCK 169400 tool.
- Protect the connection with heat-shrink tubing (3), or Rilsan fixed plastic tubing.
- Refer to your general wiring diagram, inserting each lug into its housing until it clicks into place.

Connector wiring

Connector	Designation
1	System connection
2	System connection

2.3.3 - Kit connector 2-pin Deutsch

Typical application



Legend
1 Mechanical control & MI
2 Connector
3 Proportional electric servo control P
4 Kit connector 2-pin Deutsch

Suitable command

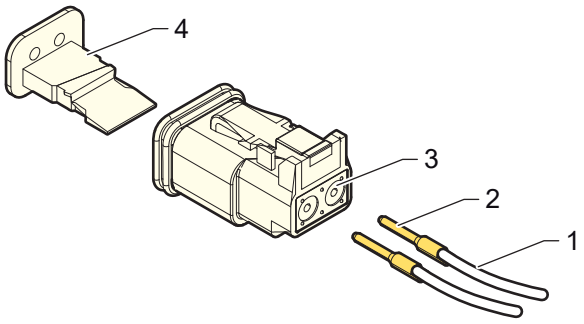
	Pump				
	PM10	PM30	PM50	PWe085	PWe096
Electro-proportional servo control P	X				
Electro-proportional control with feedback, (Deutsch) Q (*)	X				
Mechanical control A option VPU (Deutsch DT04-2P)	X				
Electro-proportional servo control "P"		X	X		
Electro-proportional servo control with feedback		X	X		
Kit mechanical servo control "A-MI-VPU"		X	X		
Solenoids				X	X
Cut-off valves				X	X
By-pass valves				X	X
Filtration				X	X

(*) On request only.

Designation

Commercial name	KIT-CONNECT-2-PIN-DEUTSCH
Part number	A42310P
Manufacturer	DEUTSCH
Wire section	0.5 to 0.1 mm²
Cable diameter	2.23 to 3.68 mm
Operating temperature	-40°C to +125°C [-40°F to +257°F]
Ingress Protection	IP67
Necessary tools	Crimp tool: HDT-48-00

Connector mounting



Legend
1 Wire
2 Contact
3 Connector grommet
4 Wedgelock

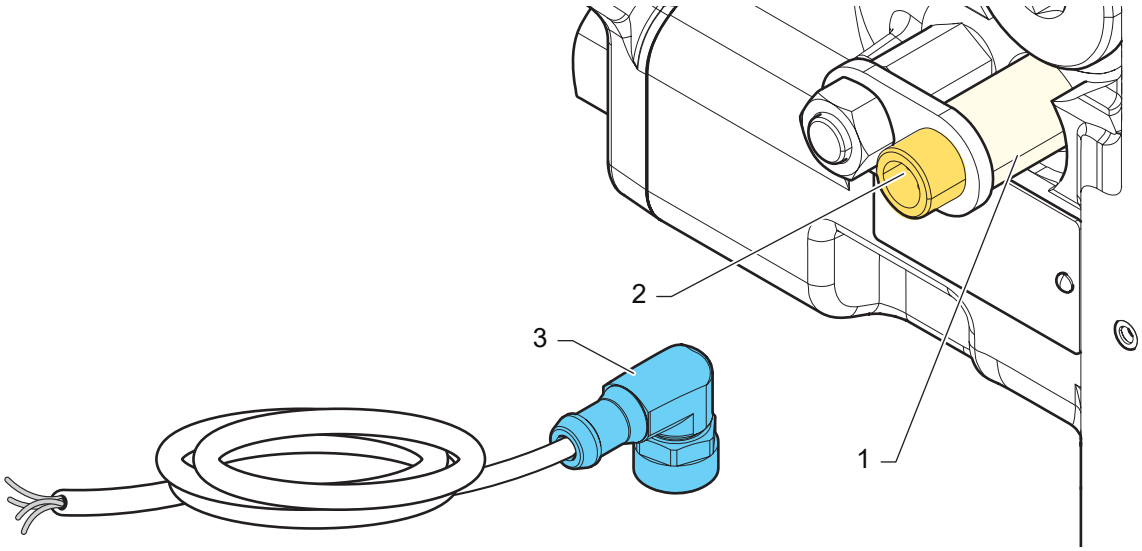
- Crimp the contact (2) using an HDT-48-00 crimping tool.
- Push contact (2) straight into connector grommet (3) until a click is felt. A slight tug will confirm that it is properly locked in place.
- Once all contacts (2) are in place, insert the wedgelock (4). Push it until a click is felt.

Connector wiring

Connector	Designation
1	System connection
2	System connection

2.3.4 - Speed sensor cable - M12 - 90°

Typical application



Legend
1 Speed sensor
2 Connector
3 Speed sensor cable - M12 - 90°

Suitable sensor

Sensor	Pump					
	PM30	PM50	PMe30	PMe50	PWe085	PWe096
Speed sensor	X	X	X	X		
T4 SENSOR 12-44					X	X

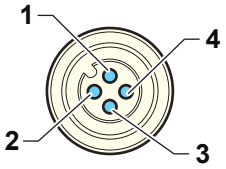
Designation

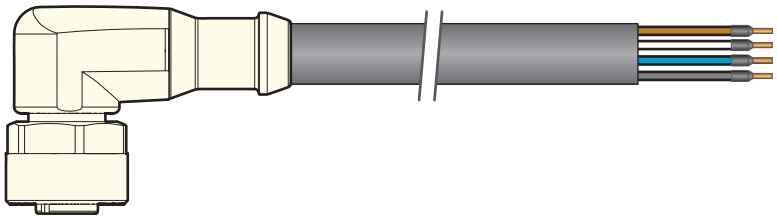
Commercial name	ELEC-CABLE- M12-90°-5000
Part number	A04999J
Manufacturer	Poclain Hydraulics
Length of cable	5 m
Material	PUR
Number of wires	4
Wire section	0.34 mm²
Ingress Protection	IP68

Connector mounting

- Securely hand tighten the cable's ring to sensor connector M12.

Connector wiring

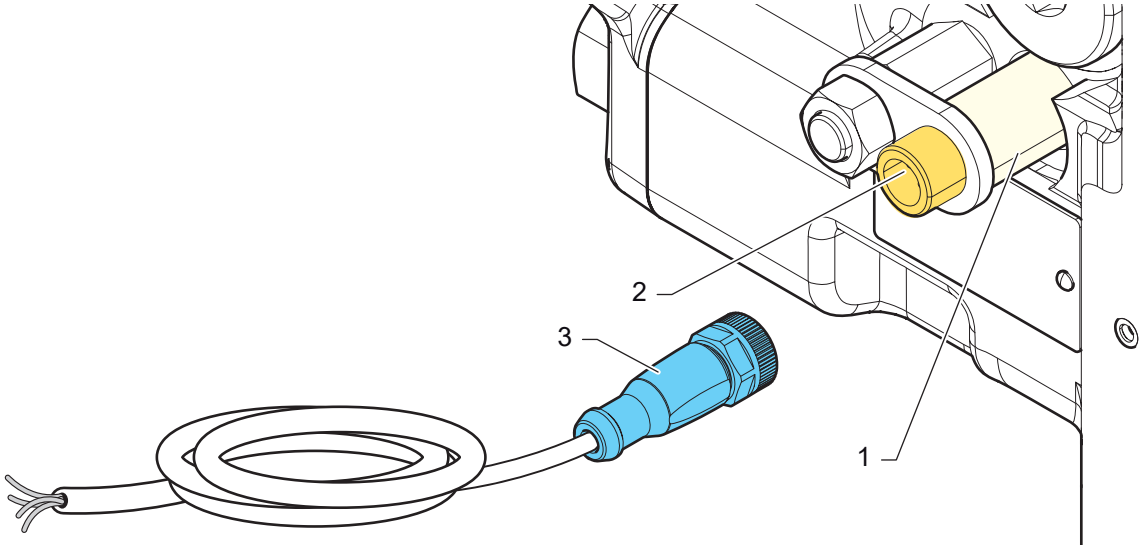




Connector	Wire	Designation
1	Brown	Power supply (+V)
2	White	Not connected
3	Blue	Ground
4	Black	Square wave signal

2.3.5 - Speed sensor cable - M12 - 180°

Typical application



Legend
1 Speed sensor
2 Connector
3 Speed sensor cable - M12 - 180°

Suitable sensor

Sensor	Pump					
	PM30	PM50	PMe30	PMe50	PWe085	PWe096
Speed sensor	X	X	X	X		
T4 SENSOR 12-44					X	X

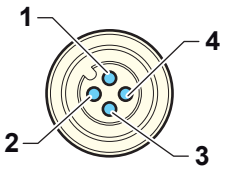
Designation

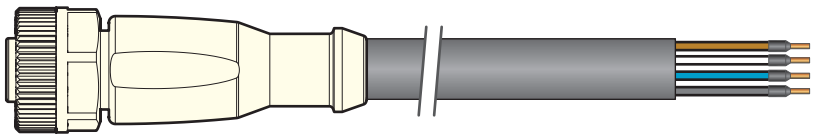
Commercial name	ELEC-CABLE-M12-180°-5000
Part number	A07468S
Manufacturer	Poclain Hydraulics
Length of cable	5 m
Material	PUR
Number of wires	4
Wire section	0.34 mm²
Ingress Protection	IP68

Connector mounting

- Securely hand tighten the cable's ring to sensor connector M12.

Connector wiring

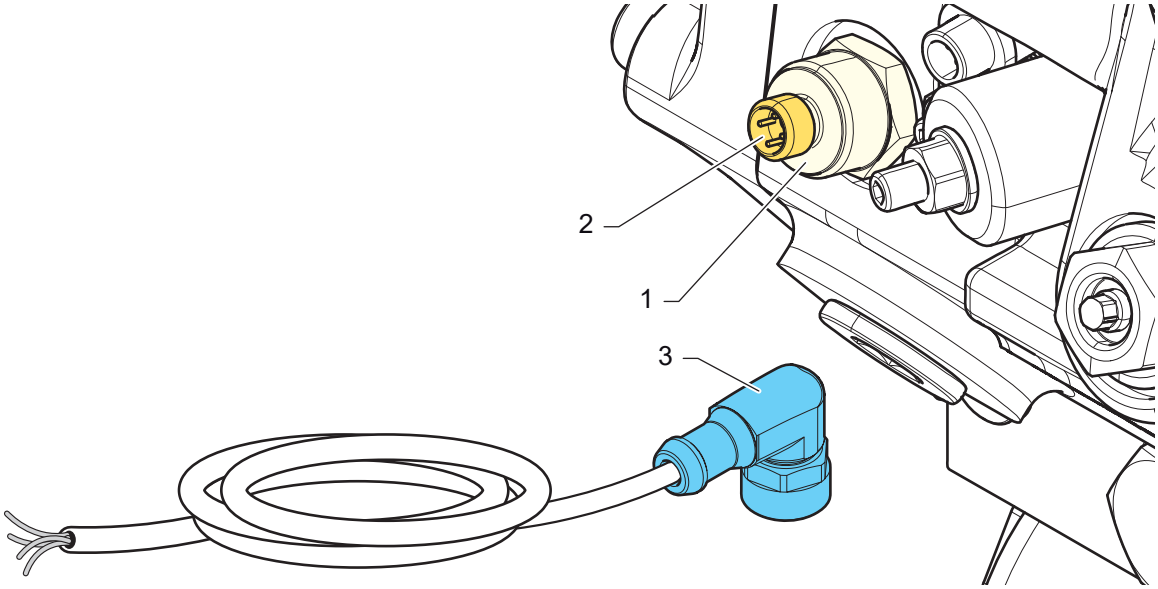




Connector	Wire	Designation
1	Brown	Power supply (+V)
2	White	Not connected
3	Blue	Ground
4	Black	Square wave signal

2.3.6 - Temperature sensor cable - M12 - 90°

Typical application



Legend
1 Temperature sensor
2 Connector
3 Temperature sensor cable - M12 - 90°

Suitable sensor

Sensor	Pump	
	PWe085	PWe096
B45088H, TEMP-SENS-G1/4-M12-7	X	X

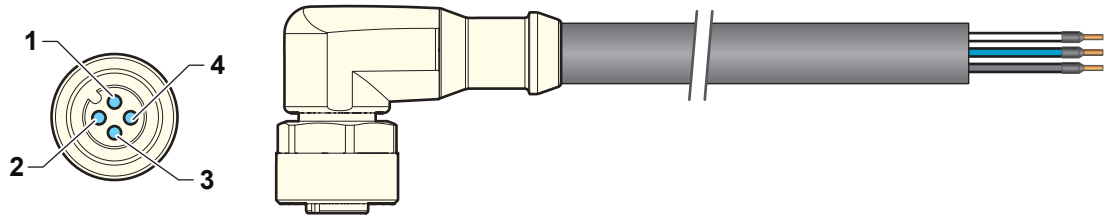
Designation

Commercial name	ELEC-CABLE- M12-90°-5000
Part number	A04999J
Manufacturer	Poclain Hydraulics
Length of cable	5 m
Material	PUR
Number of wires	4
Wire section	0.34 mm²
Ingress Protection	IP68

Connector mounting

- Securely hand tighten the cable's ring to sensor connector M12.

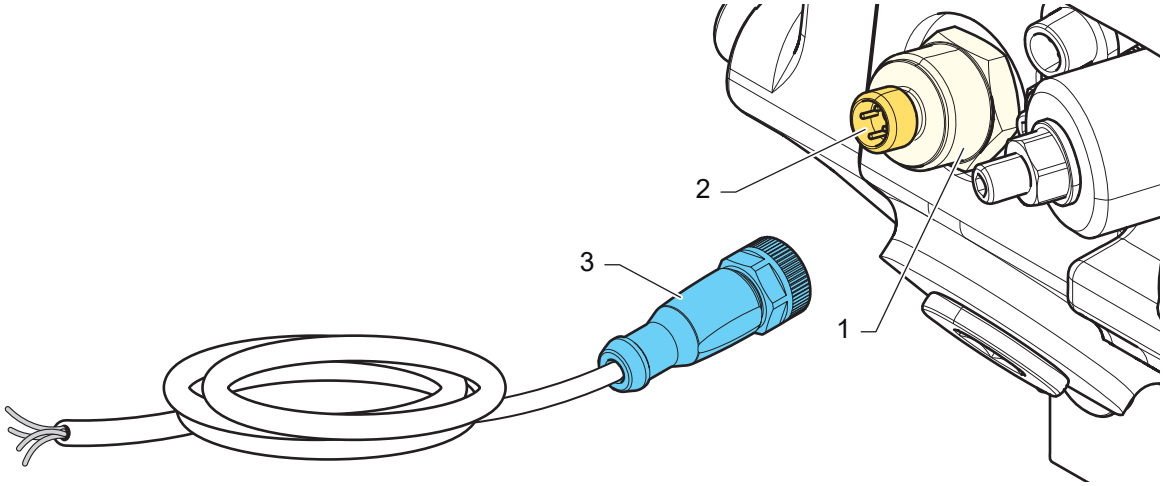
Connector wiring



Connector	Wire	Designation
1	-	Not connected
2	White	+5 V
3	Blue	Output signal 0.5 / 4.5V
4	Black	0V (Ground)

2.3.7 - Temperature sensor cable - M12 - 180°

Typical application



Legend
1 Temperature sensor
2 Connector
3 Temperature sensor cable - M12 - 180°

Suitable sensor

Sensor	Pump	
	PWe085	PWe096
A22147X TEMP-SENSOR-ANALOG-G1/4-M12	X	X

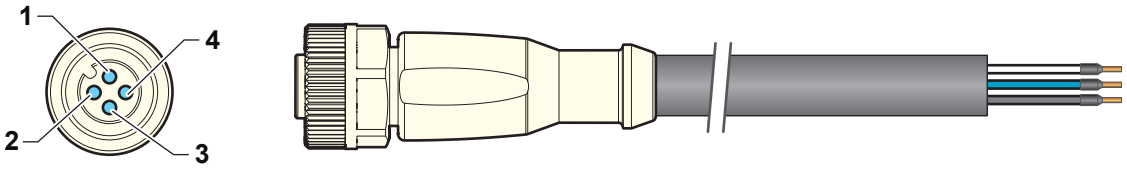
Designation

Commercial name	ELEC-CABLE-M12-180°-5000
Part number	A07468S
Manufacturer	Poclain Hydraulics
Length of cable	5 m
Material	PUR
Number of wires	4
Wire section	0.34 mm²
Ingress Protection	IP68

Connector mounting

- Securely hand tighten the cable's ring to sensor connector M12.

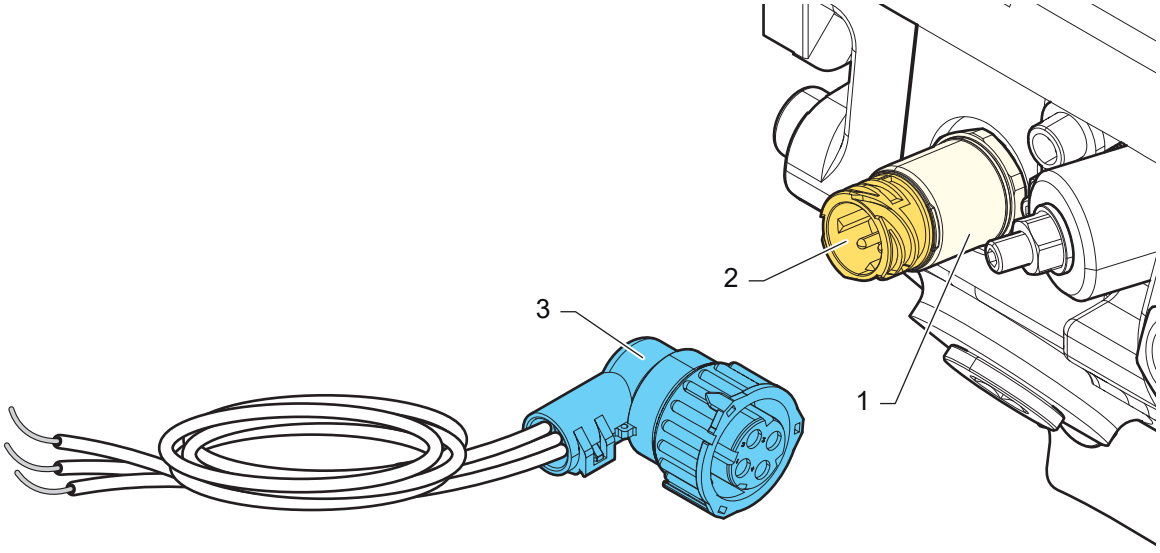
Connector wiring



Connector	Wire	Designation
1	-	Not connected
2	White	+5 V
3	Blue	Output signal 0.5 / 4.5V
4	Black	0V (Ground)

2.3.8 - Temperature sensor cable - DIN 7 - DIN 52

Typical application



Legend
1 Temperature sensor
2 Connector
3 Temperature sensor cable

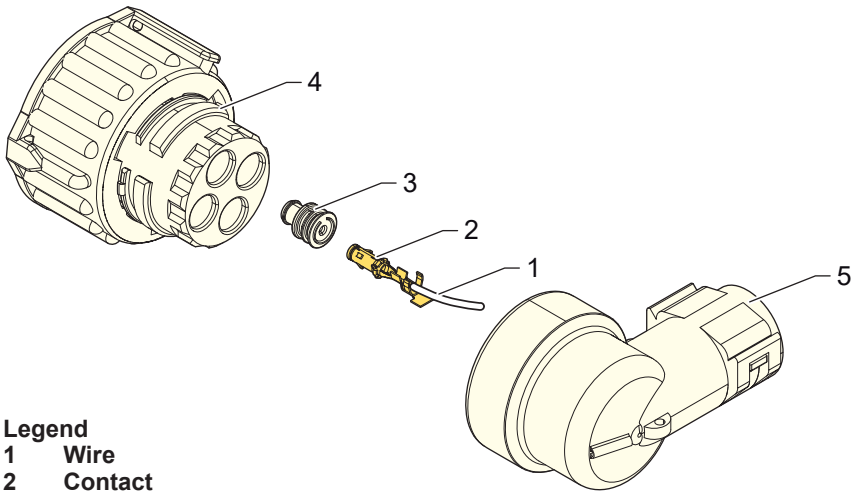
Suitable sensor

Sensor	Pump			
	PMe30	PMe50	PWe085	PWe096
B31477N TEMP-SENSOR-G1/4-DIN 7	X	X	X	X
B00091X TEMP-SENSOR-G1/4-DIN 52	X	X	X	X

Temperature sensor mating connector (2)

Commercial name	KIT-CONNECT-4-PIN-DIN72585
Part number	B02394B
Manufacturer	TYCO
Wire section	0.5 to 1mm²
Insulation diameter	1.2 to 2.1 mm [0.05 to 0.11 in]
Operating temperature	-40°C to +130°C [-40°F to 257°F]
Ingress Protection	IP6K9K
Necessary tools	Crimp tool: AMP 734289-1 Extraction tool AMP Ref. 1-1579007-8

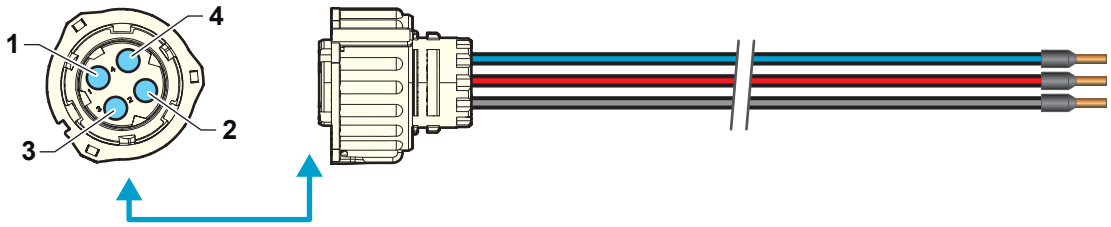
Connector mounting



Legend
1 Wire
2 Contact
3 Seal
4 Connector socket
5 Cap

- Fit a seal (3) on each wire.
- Strip 5 mm [0.19 in] off the wires (1).
- Crimp the socket contacts (2) with the 734289-1 hand tool pliers in position 2 for wire range 0.5 to 1mm², pinching the seal with the lug.
- Plug the terminal into its compartment.
- If a terminal is incorrectly inserted, use extraction tool AMP Ref. 1-1579007-8 to remove it.
- Place the cap (5) on the connector socket (4).

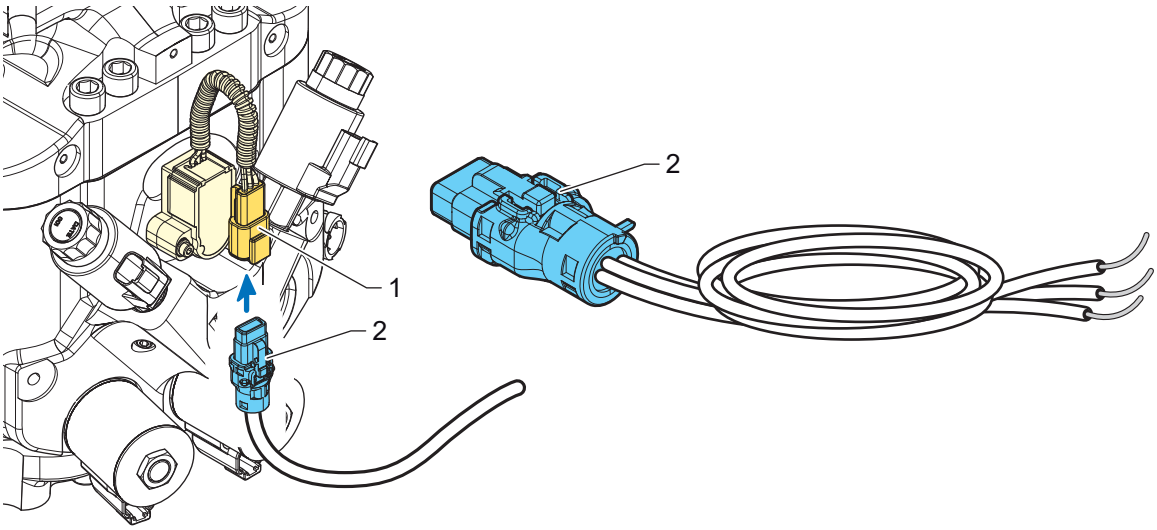
Connector wiring



Connector	Cable	Designation
1	Red	+5V DC
2	Black	Ground
3	Blue	Output signal (0.5V to 4.5V)
4	-	Not used

2.3.9 - Position sensor connector

Typical application



Legend
1 Position sensor connector
2 Position sensor mating connector kit

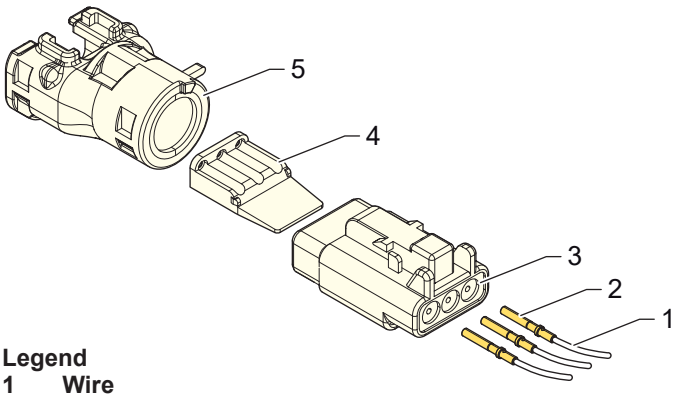
Suitable sensor

Sensor	Pump	
	PWe085	PWe096
Position sensor	X	X

Designation

Commercial name	KIT-CONNECT-DTM-3S-NW8.5
Part number	B02468G
Manufacturer	DEUTSCH
Wire section	0.2 to 0.5 mm²
Cable diameter	1.35 to 3.05 mm
Operating temperature	-55°C to +125°C [-40°F to +257°F]
Ingress Protection	IP6K9K
Necessary tools	Crimp tool: HDT-48-00

Connector mounting



Legend
1 Wire
2 Contact
3 Connector grommet
4 Wedgelock
5 Backshell

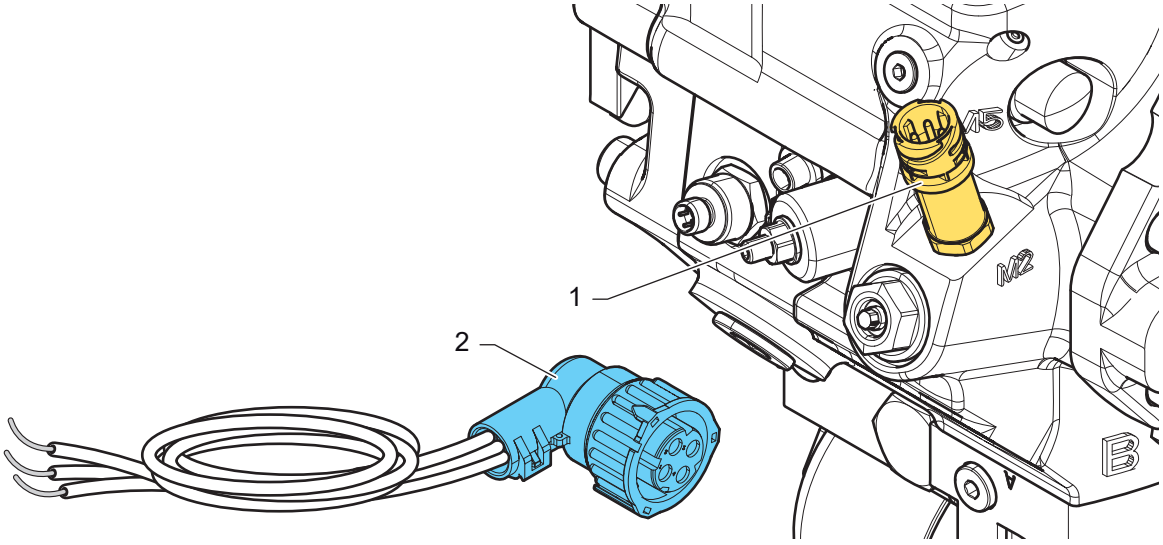
- Crimp the contact using an HDT-48-00 crimping tool.
- Push contact (2) straight into connector grommet (3) until a click is felt. A slight tug will confirm that it is properly locked in place.
- Once all contacts (2) are in place, insert the wedgelock (4). Push it until a click is felt.
- Place the backshell (5) on the connector.

Connector wiring

Connector	Cable	Designation
1	Black	Ground
2	Blue	Signal
3	Red	V supply

2.3.10 - Pressure sensor connector

Typical application



Legend
1 Pressure sensor
2 Pressure sensor mating connector

Suitable sensor

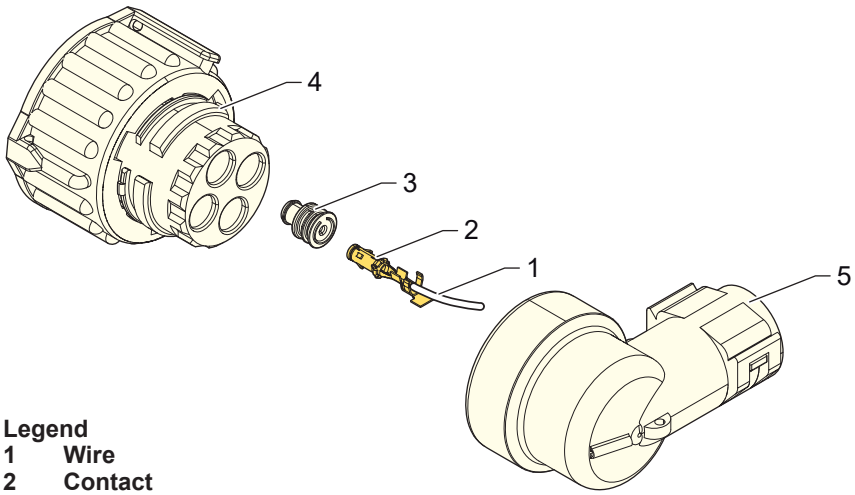
Sensor	Pump	
	PWe085	PWe096
A53472W PRES-SENSOR-600B-G1/4-DIN (1)	X	X

Designation

Pressure sensor mating connector (2)

Commercial name	KIT-CONNECT-4-PIN-DIN72585
Part number	B02394B
Manufacturer	TYCO
Wire section	0.5 to 1mm²
Insulation diameter	1.2 to 2.1 mm [0.05 to 0.11 in]
Operating temperature	-40°C to +130°C [-40°F to 257°F]
Ingress Protection	IP6K9K
Necessary tools	Crimp tool: AMP 734289-1 Extraction tool AMP Ref. 1-1579007-8

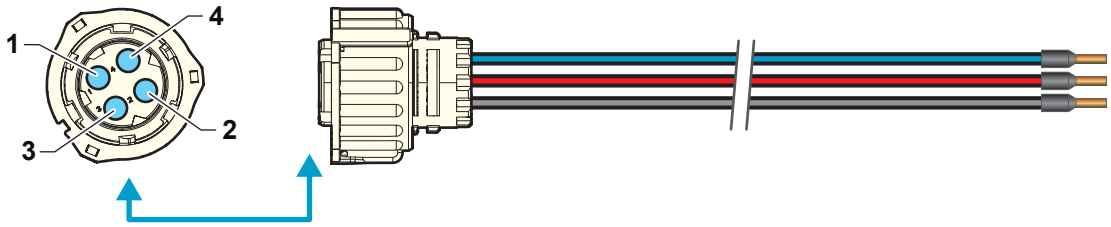
Connector mounting



Legend
1 Wire
2 Contact
3 Seal
4 Connector socket
5 Cap

- Fit a seal (3) on each wire.
- Strip 5 mm [0.19 in] off the wires (1).
- Crimp the socket contacts (2) with the 734289-1 hand tool pliers in position 2 for wire range 0.5 to 1mm², pinching the seal with the lug.
- Plug the terminal into its compartment.
- If a terminal is incorrectly inserted, use extraction tool AMP Ref. 1-1579007-8 to remove it.
- Place the cap (5) on the connector socket (4).

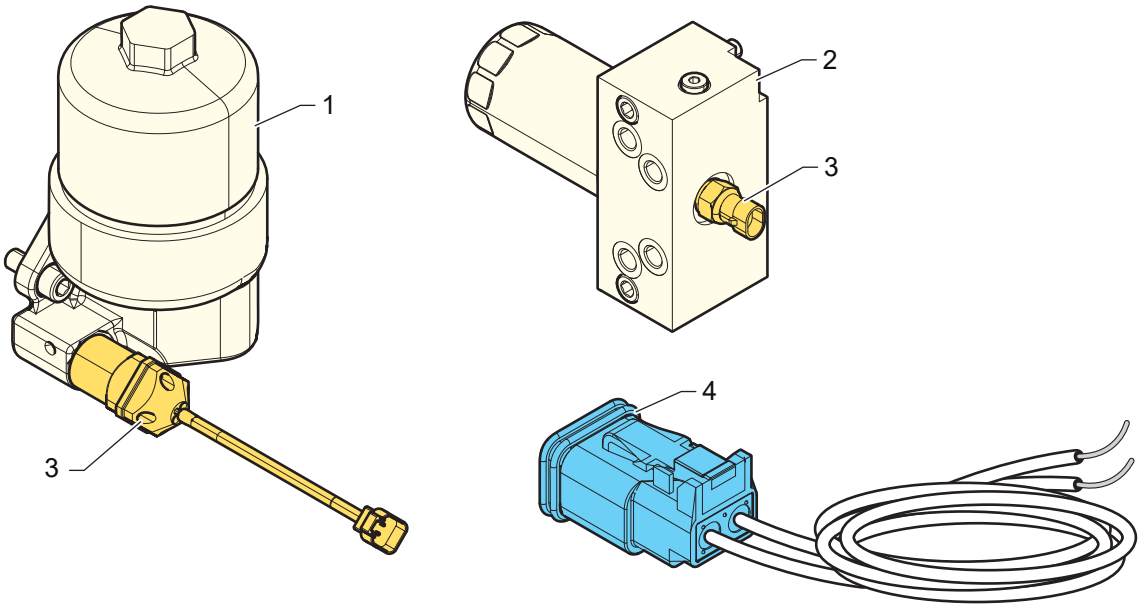
Connector wiring



Connector	Cable	Designation
1	Red	+5V DC
2	Black	Ground
3	Blue	Output signal (0.5V to 4.5V)
4	-	Not used

2.3.11 - Clogging indicator connector

Typical application



Legend
1 Filter for PWe pumps
2 Filter for PM30 / PM50 pumps
3 Clogging indicator
4 Clogging indicator mating connector

Suitable pump

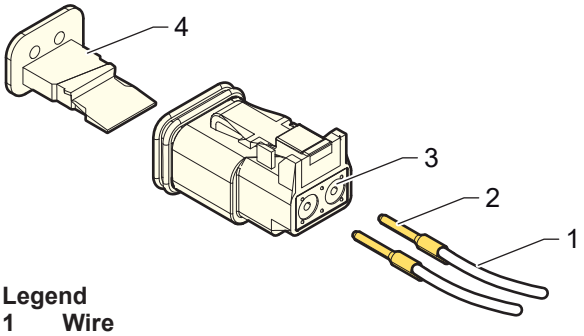
Option	Pump							
	PMV0	PM10	PM30	PM50	PMe30	PMe50	PWe085	PWe096
Filter on pressure line with clogging indicator code F2	X	X	X	X	X	X	X	X

Designation

Clogging indicator mating connector (4)

Commercial name	KIT-CONNECT-2-PIN-DEUTSCH
Part number	A42310P
Manufacturer	DEUTSCH
Wire section	0.5 to 0.1 mm²
Cable diameter	2.23 to 3.68 mm
Operating temperature	-40°C to +125°C [-40°F to +257°F]
Ingress Protection	IP67
Necessary tools	Crimp tool: HDT-48-00

Connector mounting



Legend
1 Wire
2 Contact
3 Connector grommet
4 Wedgelock

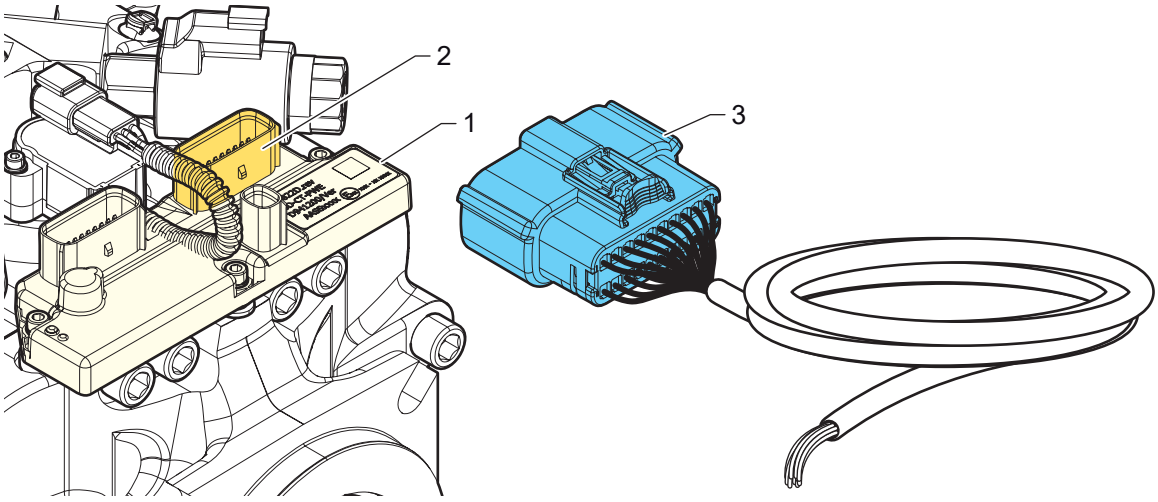
- Crimp the contact (2) using an HDT-48-00 crimping tool.
- Push contact (2) straight into connector grommet (3) until a click is felt. A slight tug will confirm that it is properly locked in place.
- Once all contacts (2) are in place, insert the wedgelock (4). Push it until a click is felt.

Connector wiring

Connector	Designation
1	Connection system
2	Connection system

2.3.12 - Kit connector PWe - PMe customer

Typical application



Legend
1 Electronic transmission management with SmartDrive™ CT controller
2 Connector
3 ECU mating connector kit

Suitable pump

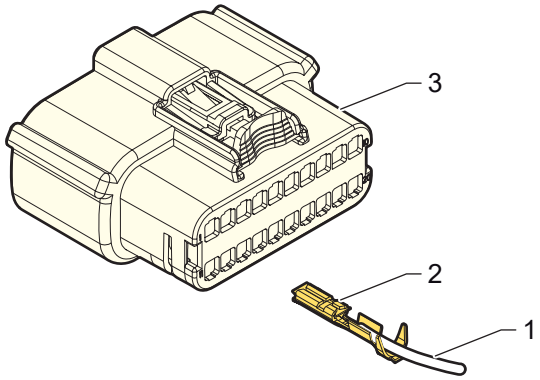
Option	Pump			
	PWe085	PWe096	PMe30	PMe50
Electronic transmission management with SmartDrive™ CT controller (1)	X	X	X	X

Designation

ECU mating connector kit (3)

Commercial name	KIT-CONNECT-PWE-CUSTOMER
Part number	B03982C
Manufacturer	Molex
Function	SD-CT-30 Counter-part connectors
Compatibility	Electronic transmission management with SD-CT-30
Insulation diameter	1.5 to 2.5 mm [0.05 to 0.098 in]
Operating temperature	-40°C to 125°C [-40°F to 257°F]
Necessary tools	Molex crimping tool: 63811-5900 (1.5 mm² to 2 mm²) Molex crimping tool: 63811-6000 (0.35 mm² to 1 mm²) Molex pin extractor: 63813-1500

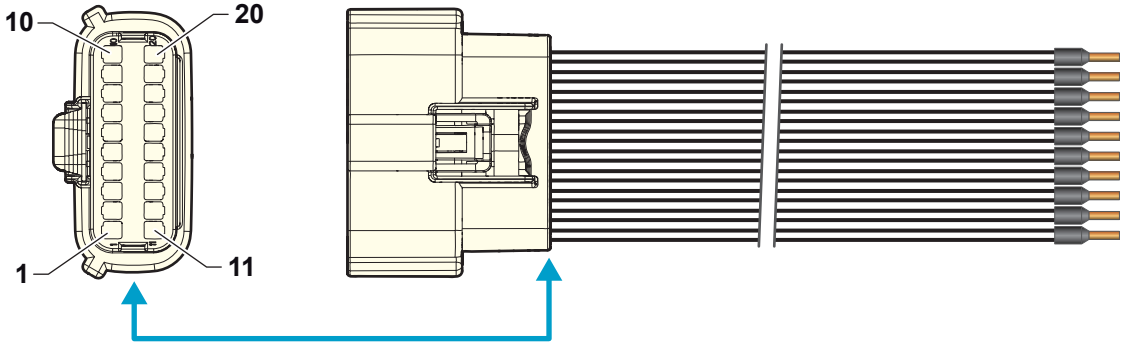
Connector mounting



Legend
1 Wire
2 Contact
3 Connector

- Crimp the contact (2) using either Molex: 63811-590 or 63811-6000 crimping tools.
- Push contact (2) straight into connector (3) until a click is felt. A slight tug will confirm that it is properly locked in place.
- If a contact is incorrectly inserted, use Molex pin extractor: 63813-1500 to remove it.

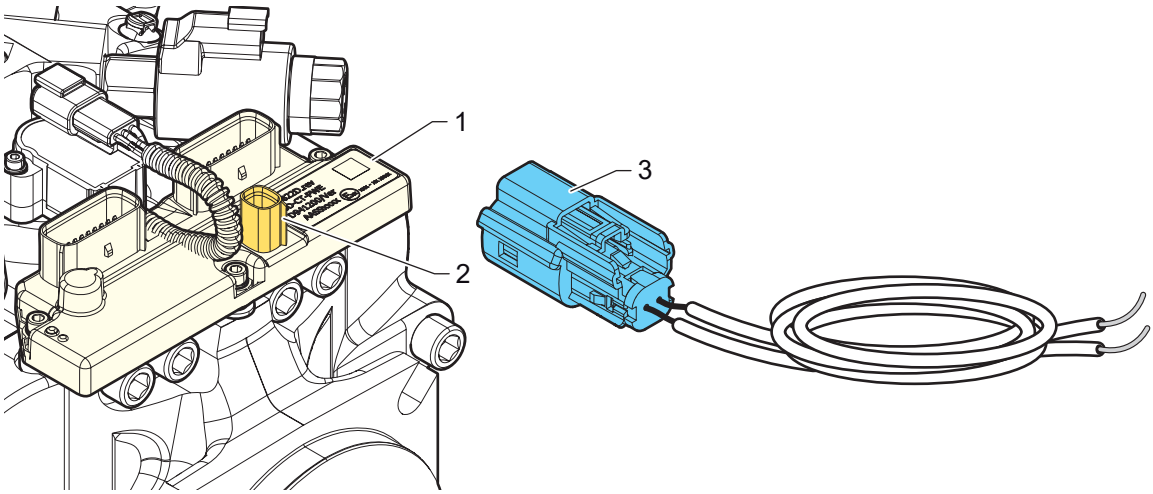
Connector wiring



Pin	Name	Function	Wire gage (mm²)
1	DIGOUT_4	Digital output 4	0.75 to 1
2	DIGOUT_1	Fault Lamp	0.75 to 1
3	DIG_2	Reverse_in	0.35 to 0.5
4	DIG_4	Neutral_in	0.35 to 0.5
5	NC	Not connected	-
6	ANA_6	Inching / Braking pedal	0.35 to 0.5
7	CAN1L	Vehicle CAN 1 bus low	0.35 to 0.5
8	CAN1H	Vehicle CAN 1 bus high	0.35 to 0.5
9	AGND	Analog ground	0.35 to 0.5
10	VBAT -	Battery -	1.5 to 2
11	DIGOUT_3	Not used	-
12	DIGOUT_2	Brake lamp relay	0.75 to 1
13	DIG_1	Forward_in	0.35 to 0.5
14	DIG_3	Pedal brake_in	0.35 to 0.5
15	DIG_5	Operator presence	0.35 to 0.5
16	ANA_5	Travel pedal / Joystick / Inching	0.35 to 0.5
17	UN_1	Pump speed signal	0.35 to 0.5
18	UN_2	Travel pedal / Joystick	0.35 to 0.5
19	5V sensor	5V sensor supply	0.35 to 0.5
20	VBAT +	Battery +	1 to 2

2.3.13 - Kit connector PWe - PMe diag

Typical application



Legend
1 Electronic transmission management with SmartDrive™ CT controller
2 Diag connector
3 Kit mating connector PWe - PMe diag

Suitable pump

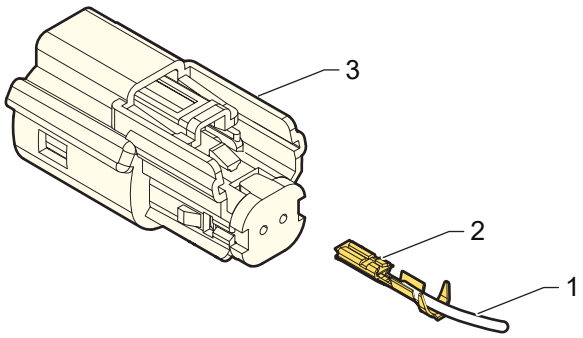
Option	Pump			
	PWe085	PWe096	PMe30	PMe50
Electronic transmission management with SmartDrive™ CT controller (1)	X	X	X	X

Designation

Kit mating connector PWe - PMe diag (3)

Commercial name	KIT-CONNECT-PWE-DIAG
Part number	B03983D
Manufacturer	Molex
Function	SD-CT-30 Counter-part connectors
Compatibility	Electronic transmission management with SD-CT-30
Insulation diameter	1.2 to 2.69 mm [0.047 to 0.105 in]
Operating temperature	-40°C to 125°C [-40°F to 257°F]
Necessary tools	Molex crimping tool: 63811-5900 (1.5 mm² to 2 mm²) Molex crimping tool: 63811-6000 (0.35 mm² to 1 mm²) Molex pin extractor: 63813-1500

Connector mounting



Legend
1 Wire
2 Contact
3 Connector

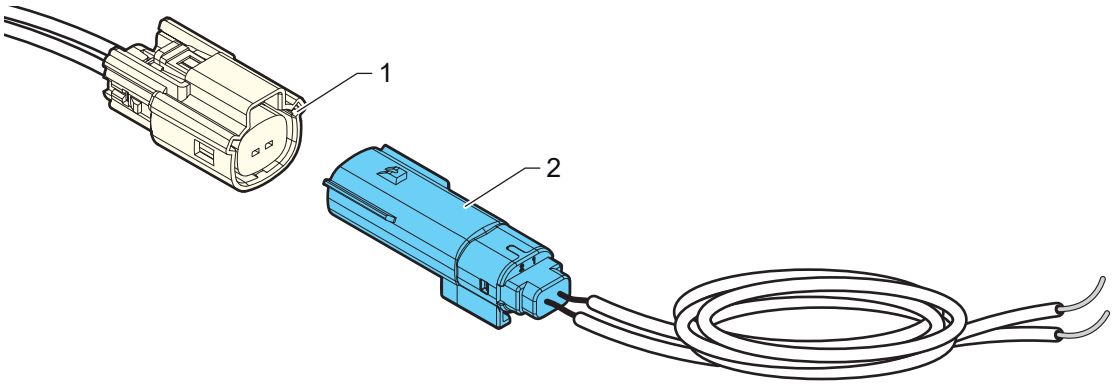
- Crimp the contact (2) using a Molex 63811-6000 crimping tool.
- Push contact (2) straight into connector (3) until a click is felt. A slight tug will confirm that it is properly locked in place.
- If a contact is incorrectly inserted, use Molex pin extractor: 63813-1500 to remove it.

Connector wiring

Connector	Designation
1	PH CAN bus high
2	PH CAN bus low

2.3.14 - Kit extension connector PWe - PMe diag (MX2-M)

Typical application



Legend
1 Diagnostic connector in cabin
2 Kit connector PWe - PMe diag - Extension for cabin

Suitable pump

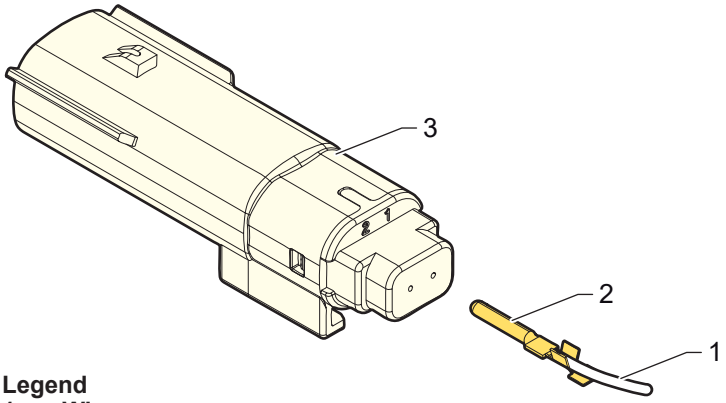
Designation	Pump			
	PWe085	PWe096	PMe30	PMe50
Male communication connector (for cabin usage interface) (1)	X	X	X	X

Designation

Kit connector PWe - PMe diag - Extension for cabin (2)

Commercial name	KIT-CONNECT-MX2-M
Part number	B26740P
Manufacturer	Molex
Function	Extension of SD-CT-30 diagnostic male connector for cabin usage
Compatibility	Electronic transmission management with SD-CT-30
Wire gage	0.35 to 0.5 mm² [0.0005 to 0.0007 in²]
Insulation diameter	1.2 to 2.69 mm [0.047 to 0.105 in]
Operating temperature	-40°C to 125°C [-40°F to 257°F]
Necessary tools	Molex crimping tool: 63811-5900 (1.5 mm² to 2 mm²) Molex crimping tool: 63811-6000 (0.35 mm² to 1 mm²) Molex pin extractor: 63813-1500

Connector mounting



Legend
1 Wire
2 Contact
3 Connector

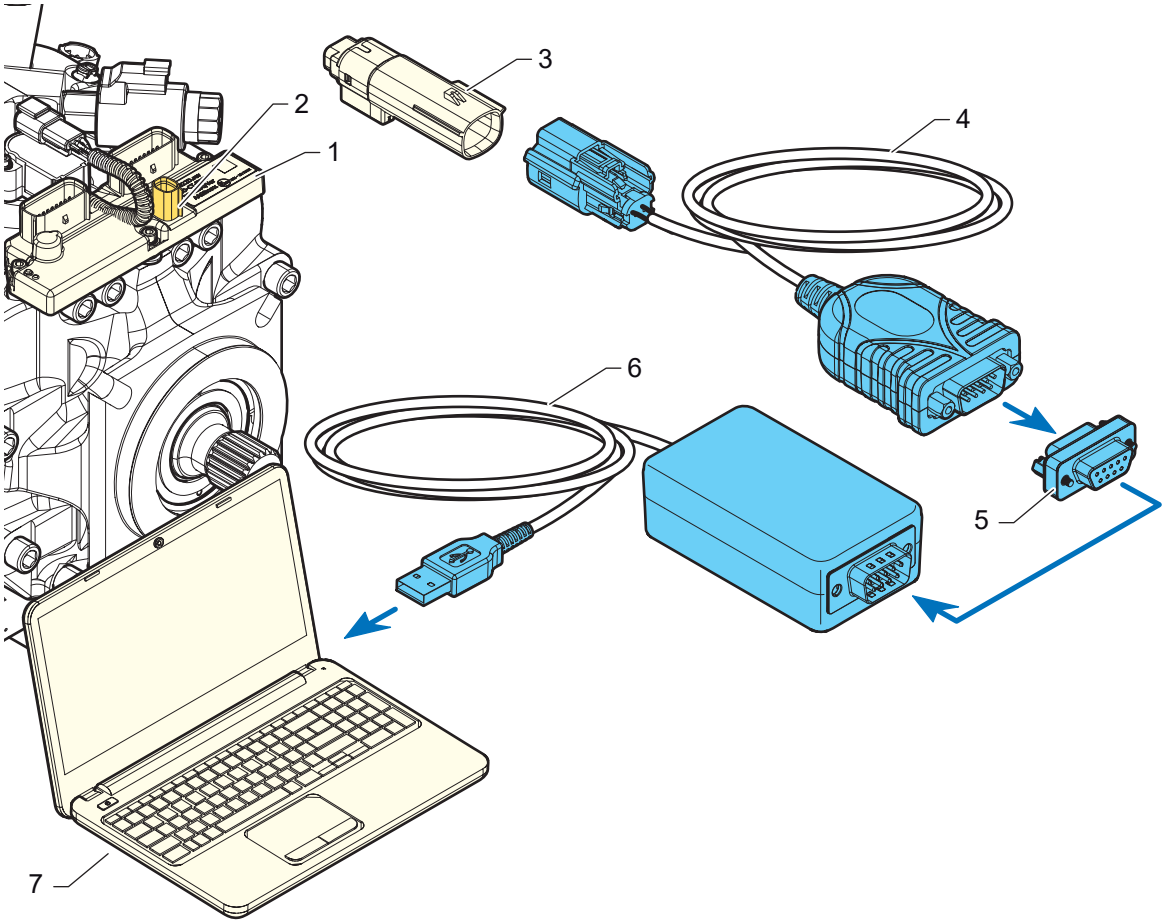
- Crimp the contact (2) using a Molex 63811-6000 crimping tool.
- Push contact (2) straight into connector (3) until a click is felt. A slight tug will confirm that it is properly locked in place.
- If a contact is incorrectly inserted, use Molex pin extractor: 63813-1500 to remove it.

Connector wiring

Connector	Designation
1	PH CAN bus high
2	PH CAN bus low

2.3.15 - ECU configurator and phases CT

Typical application



Legend

1 Electronic transmission management with SmartDrive™ CT PWe controller
2 Diag connector
3 Diagnostic connector in cabin
4 PWE communication cable
5 Gender changer SubD
6 CAN converter cable
7 PC with PWe ECU configuration software

Suitable pump

Designation	Pump			
	PWe085	PWe096	PMe30	PMe50
ECU configurator and phases CT	X	X	X	X

Designation

Rep.	Designation	Part number
4	CABLE-COM -PWE-MOLEX	B08453M
5	CONNECT-CT-DB9-CAN-120	A48781X
6	CABLE-USB-CAN-CONVERTER	A48780W

3 - Commissioning

3.1 - Circuit

For more information, refer to page 29.

3.2 - Oils

For more information, refer to page 31.

3.3 - Start-up

DANGER

Risk of death or serious injury to technicians!

Modifying the Poclain Hydraulics neutral setting can cause inappropriate behavior of the machine and is strictly prohibited!

- Do not modify the neutral setting of the pump.

The use of an incorrect external control linkage and mechanical control could modify the neutral of the pump and can affect the behavior of the machine. Poclain Hydraulics cannot be held responsible.

- Be sure to use a correct external control linkage and mechanical control.

WARNING

All these operations must be carried out under safe conditions!

Install a safety perimeter around the machine and monitor access. Working in the danger zone of a machine or system is strictly prohibited.

- The machine or system may only be operated once a safe environment is ensured.
- Identify and correct any potential danger sources before operating the machine or system.
- Nobody should stand in the danger zone of the machine or system.
- The emergency stop button for the machine or system must always be within the operator's reach.
- Always follow the instructions of the machine or system manufacturer during commissioning.

When initially starting a new or a rebuilt transmission system, it is extremely important to follow the start-up procedure.

Following these procedures avoids possible damage of the components that could occur if the system is not correctly purged before startup.

The specific installation instructions for each Poclain Hydraulics component appear in the technical catalog or the Poclain Hydraulics interface drawing.

Check on delivery:

- The P/N of the pump.

3.3.1 - Before start-up

NOTICE

Risk of product damage!

- Ensure that the system is clean and free of any foreign material.
- Fill the pump with a 10 µm filter grade.
- Do not operate the pump while filling.
- Make sure the suction line from the tank to the charge pump is full of oil.
- Check if the pump housing is filled with oil to the highest drain port.
- It is essential for the hydraulic circuit to be full of oil before starting up.

After the transmission components have been properly installed:

- Check oil level in the tank and adjust if necessary.
- Check all line connections for leaks and tighten if necessary.
- Disable all electrical components.
- Install pressure gages to measure charge pressure, exchange pressure, HP pressures and case pressure.

3.3.2 - System start-up

Poclain Hydraulics can help you during system start up. Contact your sales engineer.

List of points to check:

- Ensure that the part number of the pump matches the system.
- Ensure that the system matches the model code of the pump.
- Check the voltage.
- During the start-up procedure, ensure the oil level remains above the minimum level in the tank.

- The machine must have the wheels lifted.
- Use a safe method to disable the engine and prevent the engine from starting. Crank the starter for several seconds until charge pressure begins to appear. Do not exceed the engine manufacturer's recommendation.
- Wait 30 seconds, and then repeat the same procedure to crank the engine a second time.
- Refill the tank to recommended full oil level.
- Enable and start engine.
- Let the engine run for at least 30 seconds at low idle to allow air to work itself out of the system.
- Check for leaks at all line connections and listen for cavitation.
- Check the oil level in the tank and adjust if necessary.

DANGER

Risk of death or serious injury to technicians!

- No one may be in front of or behind the machine during start up.

- Let the engine or electric motor run at low speed for 3 to 5 minutes maximum .
  - Check there is no leakage.
  - Check the neutral of the pump.
- Enable all electrical components.
  - Check the neutral of the pump.
  - Check for the correct direction of wheel rotation while limiting the pump to a maximum of 10% displacement.
  - Cycle for 20 seconds forward and reverse to a maximum of 10% of the pump displacement. Repeat the cycle three times.
- Let the system idle for 20 to 30 minutes.

- Run the engine or electric motor at 1500 rpm according to the model code of the pump.
  - Ensure that case pressure is lower than 3 bar.
  - Check the charge pressure when the exchange valve is activated in both directions.
- Put the machine on wheels.
- Ensure than the machine is immobilized.
- Limit operating speed to 1500 rpm and increase the displacement of the pump gradually until maximum pressure is reached. Maintain the maximum level for no more 10 seconds.
  - Check the setting of the high-pressure relief valves.
  - Check for leakage.

3.3.3 - After start-up

Check the oil level in the tank and adjust if necessary.

3.4 - Troubleshooting

The actions described in this section are suggestions only, and can only be performed under the sole responsibility of the user.

For PMe and PWe pump troubleshooting, refer to DOC-REPAIR-TROUBLESHOOTING-SD-CT-30-EN, part number: B41971U.

Neutral difficult or impossible to find

DANGER

Risk of death or serious injury to technicians!

A neutral issue can cause inappropriate behavior of the machine.

- Do not modify the neutral setting of the pump.
- Changes to the factory settings must be made by a Poclain Hydraulics specialist or by Poclain Hydraulics Certified Repair Centers.

Possible cause	Action
Servo piston zero position setting.	Refer to the repair manual to set the neutral.
External control linkages are operating incorrectly.	Reset the system (electronic control). Disconnect the external control, check the neutral of the pump. Check and correct the external control linkage and controller.
Mechanical control	
Asymmetrical control mechanical linkages.	Adjust the linkage.
Pump control neutral setting for mechanical servo control (A).	Refer to the repair manual to set the neutral.
Hydraulic control	
Check pilot pressure (control S - T).	If pilot pressure is ok, replace the control. If pilot pressure is not ok, check the control.
Pump control neutral setting for hydraulic servo control (T).	Refer to the repair manual to set the neutral.
Electrical control	
Check control current signal.	Check the piloting system.
Pump control neutral setting for electroproportional servo control with feedback (Q).	Refer to the repair manual to set the neutral.
Pump control neutral setting for electroproportional servo control without feedback (P).	Replace the pressure reducer.
The pump controller is operating improperly. Control neutral setting for PW, Pwe, PMe.	Check the error code on display. Refer to the appropriate DOC-REPAIR-TROUBLESHOOTING.
Pump issue	Remove the pump for analysis or replace it.

No charge pressure, too low or irregular

Possible cause	Action
Bad rotation direction.	Reverse the direction.
Oil tank level too low.	Fill the tank to the proper level.
Air in the oil.	Bleed the circuit, check the oil stabilization in the tank.
System suction valve closed.	Open the suction valve.
Clogged suction filter.	Replace the suction filter.
Obstructed suction line.	Clean the suction line.
Oil temperature too high.	Check the heating or cooling system.
Excessive leakage.	Isolate the high pressure line of the pump from the circuit, and then check the charge pressure level.
Bad charge relief valve setting (static only).	Reset, repair or replace the charge relief valve.
Incorrect hot oil shuttle relief valve setting (dynamic only).	Reset ,repair or replace the hot oil shuttle relief valve.
Incorrect hydraulic automotive control setting, damaged or badly assembled.	Reset, repair or replace the automotive control.
Pump damaged.	Remove the pump for analysis or replace it.

Charge pressure too high or irregular

Possible cause	Action
Incorrect charge relief valve setting.	Reset, repair or replace the charge relief valve.
Air in the oil.	Bleed the circuit, check the oil stabilization in the tank.
Oil temperature too low.	Check the heating or cooling system.
Housing pressure too high.	Check the pump drain line.
Pump damaged.	Remove the pump for analysis or replace it.

High pressure too low

Possible cause	Action
Excessive internal leaks.	Check the internal leaks. Isolate the high pressure line of the pump from the circuit, and then check the maximum pressure level.
Incorrect high-pressure relief valve setting, damaged or badly assembled.	Reset, repair or replace the high-pressure relief valve.

High pressure too high

DANGER

Risk due to excessively high pressure!

Changing the factory pressure settings can cause pressure to increase beyond the permissible maximum. Operating the unit above the permissible maximum pressure can cause component failure and escaping hydraulic fluid under high pressure.

Excessive high pressure could lead to rupture of piping and oil projection.

- Do not change the factory settings.
- Changes to the factory settings must be made by a Poclain Hydraulics specialist or by Poclain Hydraulics Certified Repair Centers.

Possible cause	Action
Incorrect high-pressure relief valve setting, damaged or badly assembled.	Reset, repair or replace the high-pressure relief valve.
HPRV blocked by contamination.	Check and clean the HPRV or replace it. If oil is contaminated, clean and / or replace the oil.

Irregular high pressure

Possible cause	Action
Air in the oil.	Bleed the circuit. Check if the oil level is too low in the tank.

Excessive heat

⚠ CAUTION

Risk of extremely hot surfaces on the component!

Risk of burns!

- Wait for the pump cool down before touching it.
- Wear heat-resistant protective equipment, eg. gloves.

Possible cause	Action
Engine or electric motor speed too high.	Check and set the speed.
Oil tank level too low.	Fill the tank to the proper level.
Excessive system load.	Check, adjust system pressure levels and load.
High-pressure relief valve open.	Reset, repair or replace the high-pressure relief valve.
Insufficient oil exchange.	Check, reset exchange valve.
Faulty or Insufficient oil cooling system.	Check and repair oil cooling system.
Incorrect oil viscosity.	Replace oil.
Clogged filters.	Replace filters.
Obstructed suction line.	Clean the suction line.
Charge pump damaged or badly assembled.	Check, repair or replace the charge pump.
Excessive internal leaks.	Check the internal leaks.
Pump, motor, valve or other component damaged.	Check and / or replace pump, motor, valve or other damaged component.

System operates normally in one direction only

Possible cause	Action
All control	
System pressure limiters functioning poorly, high-pressure relief valves and / or system check valves.	Interchange high-pressure relief valves. If the problem changes direction, repair or replace the valve on the side that does not operate.
Charge pressure drops in one direction.	Replace the pump.
Flushing valve blocked in one direction.	Repair or replace the flushing valve.
Control orifices are blocked.	Check orifice cleanliness.
Mechanical control	
Asymmetrical control mechanical linkages.	Adjust the linkage.
Hydraulic control	
Check pilot pressure.	If pilot pressure is ok, replace the control. If pilot pressure is not ok, check the control.
Electrical control	
Check wiring of defective direction (S1 or S2, open circuit, short circuit).	Repair S1 or S2 wiring.
Check Ohmic values of defective direction (S1 or S2) coil.	Replace the defective coil.
Check control current signal of defective direction.	Check the piloting system.

System does not operate in either direction

Possible cause	Action
All control	
Charge pressure too low.	Reset, repair or replace the charge relief valve.
Charge pressure drops in both directions.	Replace the pump.
Bypass valve(s) open.	Check and close bypass valve(s).
Oil tank level too low.	Fill the tank to the proper level.
Clogged suction filter.	Replace the suction filter.
Incorrect setting of high-pressure relief valve, damaged or badly assembled.	Reset, repair or replace the high-pressure relief valve.
Mechanical control	
Problem in pump control mechanical linkages.	Adjust and repair the linkage. Replace the pump.
Hydraulic control	
Check pilot pressure.	If pilot pressure is ok, replace the control. If pilot pressure is not ok, check the control.
Electrical control	
Check wiring (S1 or S2, open circuit, short circuit).	Repair S1 or S2 wiring.
Check control current signal.	Check the piloting system.
Check Ohmic values of S1 and S2 coils.	Replace the defective coil. Replace the pump.

Excessive noise

Possible cause	Action
Wrong rotation direction.	Check and reverse the direction of rotation.
Oscillating high pressure.	Check air bleeding. Check high and low pressure relief valves.
Shaft and coupling engine and motor-pump damaged or bad alignment.	Check, repair or replace shaft and coupling, alignment.
Suction valve closed.	Open the suction valve.
Oil tank level too low.	Fill the tank to the proper level.
Oil temperature too low or bad viscosity.	Activate the heater system and / or replace the oil.
Clogged suction filter.	Replace the suction filter.
Clogged air breather.	Clean up or replace the air breather.
Obstructed suction line.	Clean the suction line.
Air in the oil.	Bleed the circuit.
Charge pressure too low.	Reset, repair or replace the charge relief valve.
Pump damaged.	Remove the pump for analysis or replace it.

System response is sluggish

Possible cause	Action
Charge pressure too low.	Reset, repair or replace the charge relief valve.
Control orifices are blocked.	Check cleanliness of orifices.
Incorrect setting of high-pressure relief valve, damaged or badly assembled.	Reset, repair or replace the high-pressure relief valve.
Oil temperature too low.	Activate the heater system and / or replace the oil.
Excessive internal leaks.	Replace the pump.

Insufficient flow

Possible cause	Action
Engine or electric motor speed too low.	Check and set the speed.
Wrong direction of rotation.	Check and reverse the direction of rotation.
Insufficient pump displacement.	Check the displacement stop limiter.
Charge pump damaged or badly assembled.	Check, repair or replace the charge pump.
Oil temperature too high.	Activate the cooler system.
By-pass system is open.	Check and close the by-pass system.
Mechanical control	
Insufficient lever stroke.	Check and adjust the linkage.
Hydraulic control	
Insufficient pilot pressure.	Check and adjust the control.
Electrical control	
Check Ohmic values of defective direction (S1 or S2) coil.	Replace the defective coil.
Check control current signal of defective direction.	Check the piloting system.

Machine moves in the wrong direction

DANGER

Risk of death or serious injury to technicians!

Risk of inappropriate behavior of the machine.

- No one may be in front of or behind the machine during start up.

Possible cause	Action
Check S1 and S2 wiring inversion.	Reverse the S1 and S2 wiring. Reverse he hydraulic piping.

Machine does not move

Possible cause	Action
Check S1 and S2 wiring.	Repair S1 and S2 wiring.
Check control current signal.	Check the piloting system. Check hydraulics.

Machine does not reach max speed

Possible cause	Action
Check the consistency between the battery voltage and the coil voltage.	Replace coil.
Check control current signal.	Check the piloting system.
Check hydraulic system (charge pressure).	Replace the pump.
Check mechanical stop.	Readjust the mechanical stop system.

Jerky machine

Possible cause	Action
Check the consistency between the battery voltage and the coil voltage.	Replace coil.
Check control current signal.	Check the piloting system.
Check hydraulic system (charge pressure).	Replace the pump.

Creeping machine

DANGER

In case of creep!

Risk of inappropriate behavior of the machine.

- The user must immediately stop the machine and contact the manufacturer.

Possible cause	Action
Check control current signal at neutral is equal to zero.	Check the piloting system.

Pump does not deliver any speed information

Possible cause	Action
Check speed sensor wiring inversion and connection.	Correct speed sensor wiring and connection.
Check speed sensor airgap.	Correct speed sensor airgap. Replace speed sensor.

Pump does not deliver any pressure information

Possible cause	Action
Check pressure sensor wiring inversion and connection.	Correct pressure sensor wiring and connection. Replace pressure sensor.

Pump does not deliver any temperature information

Possible cause	Action
Check temperature sensor wiring inversion and connection.	Correct temperature sensor wiring and connection. Replace temperature sensor.

Hydraulic motors

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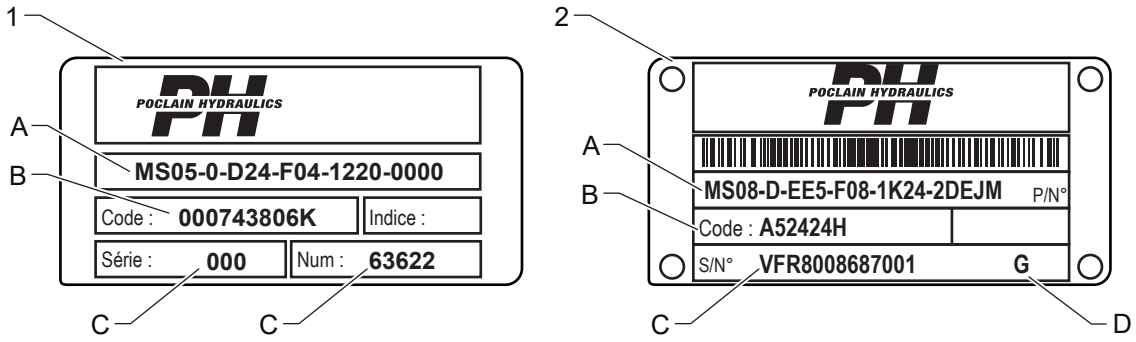
1 - Overview

1.1 - Component identification

1.1.1 - Product identification plate



Legend
1 Older type
2 Present type

A	Model code ex.	MS05-0-D24-F04-1220-0000		MS08-D-EE5-F08-1K24-2DEJM	
B	Part number ex.	000743806 K		A52424H	
C	Serial number ex.	002-63622		VFR8008687001	
D	Primer / topcoat	Primer	Topcoat	Primer	Topcoat
		J	K	J	K
		N	H	N	FN
		G	-	G	H
		-	-	-	J1
		-	-	-	FJ
		-	-	-	B
		-	-	-	CN
		-	-	-	FV
		-	-	-	FG

When ordering spare parts, the part number and serial number must be specified.

1.2 - Delivery

For more information, refer to page 18.

1.3 - Storage

1.3.1 - Storage requirements

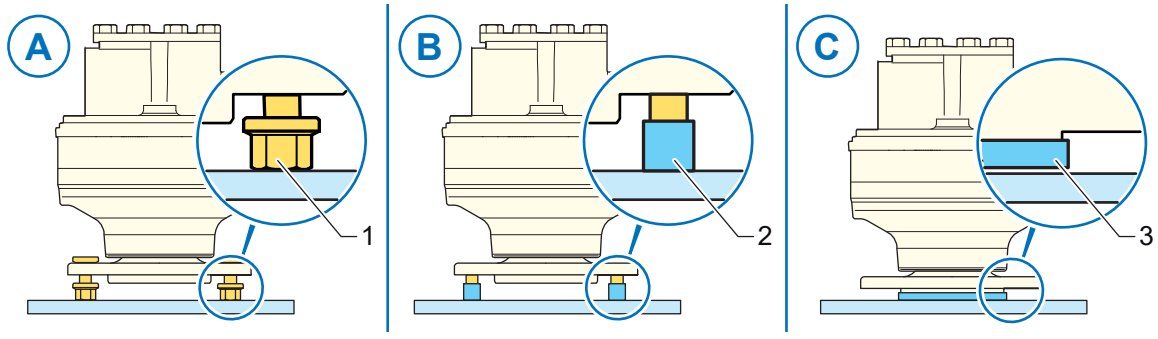
- Storage areas must be in a suitable building for this purpose.
- Storage areas must be separate from areas where processes or activities could cause damage and/or contamination.
- Storage areas must be free from dust, corrosive materials and gases.
- Storage areas must be protected against ultraviolet rays (e.g. direct fluorescent lighting or direct sunlight).
- Storage areas must be kept away from sources of heat or vibration.
- Storage areas must be dry and not subject to temperature fluctuations.
- Ideal storage temperature: +5°C to +20°C [+41 to +68°F].
- Minimum storage temperature: -50°C [-58°F] (except for units with on-board-electronics).
- Minimum storage temperature for smart drive on-board electronics: - 40°C [-40°F].
- Maximum storage temperature: +60°C [+140°F].
- Do not store motors near appliances which generate ozone (e.g. fluorescent lighting, mercury-vapour lamps, copier and printer consumables, electric motors or devices producing sparks or electric discharges).
- Do not stack motors, to prevent risk of falling.
- Store motors in a location where they are safe from potential shocks.
- Check motor condition monthly to ensure proper storage.
- Set up stock rotation so that older stored motors are used first (FIFO system).
- Stored motors must be properly and visibly marked to avoid any confusion.

NOTICE

Risk of product damage!

- Motors are delivered in boxes or on pallets. If they must be stored, we recommend storing them in the original containers. If not possible, comply with the storage instructions below to prevent premature damage to sensitive parts.
- Untreated motor surfaces are coated with a rust-proof oil film. Do not remove during storage to prevent rust and corrosion of these surfaces.

Wheel motor



Legend
1 Nut
2 Studs protected by plastic plug protection
3 Protection against paint scratches

On shaft

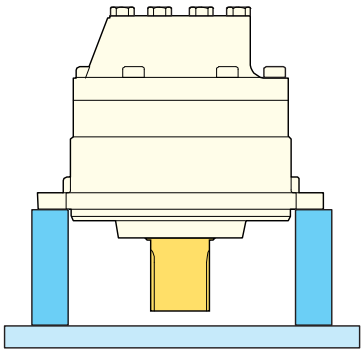
The motor can be delivered with and without nuts or without studs.

A : When motor is delivered with studs and nuts, studs are protected by nuts screwed on the threads.

B : When nuts are not delivered, studs are protected by plastic plug protection.

C : When studs are not delivered, the rim plate surface in contact with the floor as to be protect against scratches.

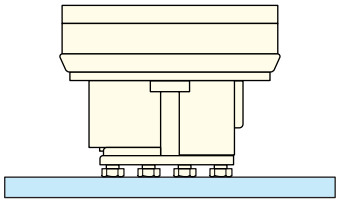
Shaft motor



On attachments

- No contact with the shaft.

Hydrobasis



On the valving cover

- **Do not store the motor in open-air outdoor areas.**
- **Do not place the motor directly on the ground.**
- **If the motor falls during handling, it must be returned to Poclain Hydraulics.**

1.3.2 - Storage interval

Check the storage period to ensure proper storage of the motor.

Depending on the interval and storage conditions, the internal components of the motor must be protected.

These operations must be performed before storing components or before stopping use of the machine.

	Storage interval (months)			
Climate	3	6	12	24
Temperate	A	B	C	C
Tropical	B	C	D	D
Maritime	C	D	D	D

Legend
A No specific precaution; just check for proper mounting of the plugs and covers
B Fill with hydraulic fluid
C Rinse with storage fluid
D Fill with storage fluid

- **Do not store the motor in open-air outdoor areas.**
- **Do not place the motor directly on the ground.**
- **If the motor falls during handling, it must be returned to Poclain Hydraulics.**

1.3.3 - Long storage

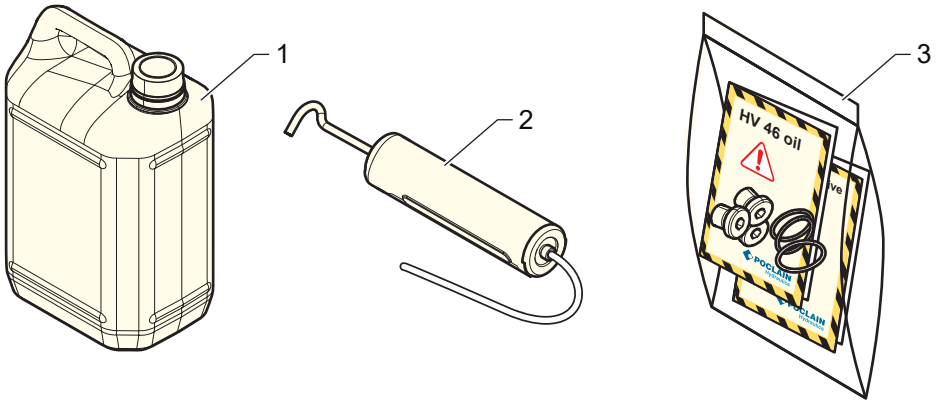
Follow these instructions to fill your hydraulic motor with long-term storage oil.

This procedure for filling with long-term storage oil is applicable to all types of hydraulic motor.

The long-term storage oil is a special HV 46 oil mixed with an anticorrosive additive.

If you want to store your motor in good conditions, you must comply with the following specifications:

- The duration of storage must not exceed 4 years.
- It is mandatory to store the motor in a protected and temperate area between 15°C and 30°C [between 59°F and 86°F]. It is permissible to go down to a temperature of 0°C [32°F] if proper sealing capacity of the pump is verified to prevent humid air inlets or condensation sources. These would lead to deterioration of the properties of the anticorrosion additive.
- The motor must be filled correctly to limit the presence of harmful air pockets during long-term storage.
- You must use the Poclain Hydraulics long-term storage kit to fill the motor.



Legend
1 5 liter jerrycan
2 Oil syringe with a flexible pipe
3 Plastic bag

1.3.3.1 - Contents of the kit

- (1) A 5 liter jerrycan filled with a special oil mixture (HV 46 and anticorrosive additive).
- (2) Oil syringe with a flexible pipe.
- (3) Plastic bag containing:
  - Technical sheet and safety sheet for special oil (HV 46).
  - Technical sheet and safety sheet for anticorrosive additive.
  - A kit of plugs, bleed screws and seals.

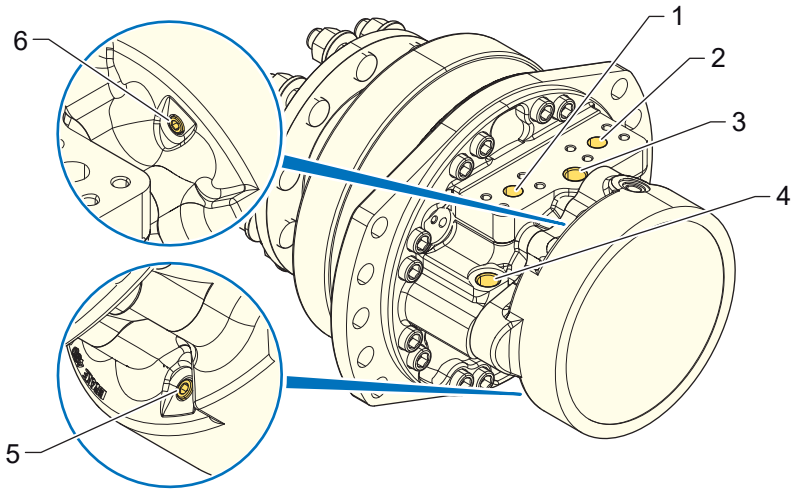
1.3.3.2 - Filling instructions

- Place the motor in a horizontal position on a workstation equipped with a waste oil collector.

NOTICE

Risk from improper handling!

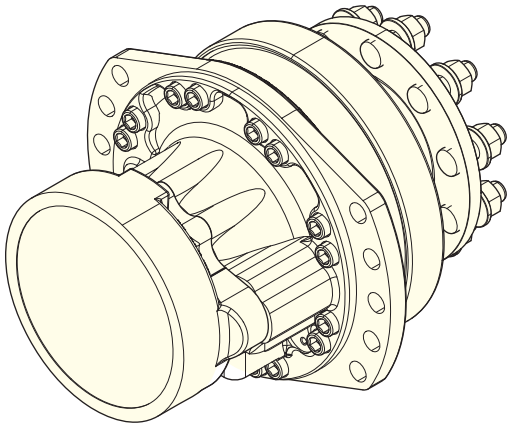
- Handle carefully to avoid motor damage.



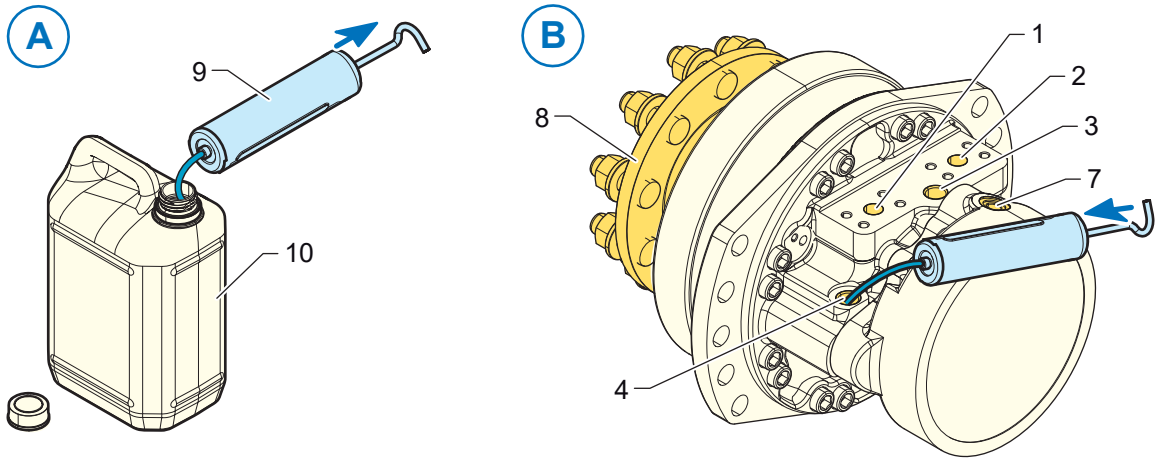
Legend

1	**Outlet port**
2	**Inlet port**
3	**Casing drain port**
4	**Dual displacement control port**
5	**Brake bleed screw**
6	**Brake bleed screw**

- Depending on the motor type, remove all the plugs from the ports:
  - Motor supply ports A and R, R and L or A1, A2 and R.
  - Drain ports 1 and / or 2.
  - Brake control ports X and XD.
  - Displacement spool control ports Y, Y1 and Y2.
- Remove all bleed screws (5, 6) from the cover and the brake.



- Position the motor by orienting the supply ports downwards.
- Fully empty the oil from the motor casing, the valving cover, the displacement control chambers (for dual displacement motors) and the brake.
- When the motor is drained, position it with the feed ports facing upwards.
- Clean oil traces from the external areas of the motor using a soft lint-free cloth.
- Install the bleed screws (5, 6) fitted with new sealing rings.



Legend

1	**Outlet port**
2	**Inlet port**
3	**Casing drain port**
4	**Dual displacement control port**
7	**Brake control port**
8	**Motor shaft**
9	**Syringe**
10	**Jerrycan**

- Using the syringe (9), aspirate the oil from the jerrycan (10).
- Insert the flexible pipe in the dual displacement control port (4) and fill it until oil flows through this port.
- Reinstall the plug on the dual displacement control port.
- Using the syringe (9), aspirate the oil from the jerrycan (10).
- Insert the flexible pipe in the casing drain port (3) and fill it until oil flows through this port.
- Insert the flexible pipe in the inlet port (2) and fill it until oil flows through this port.
- Insert the flexible pipe in the outlet port (1) and fill it until oil flows through this port.
- Insert the flexible pipe in the brake control port (7) and fill it until oil flows through this port.
- If the motor is not equipped with a parking brake, turn the motor shaft (8) in both directions and check the oil level in the motor.
- If the level has decreased, add oil.
- Otherwise, close all the ports with metallic plugs.
- Tighten the plugs to the required torque according to the table below.

Type of plug	Tightening torque	
	Nm	ft lb
Flange DN13	35 ±3.5	26 ±2.6
Flange DN19	35 ±3.5	26 ±2.6
M14	35 ±3.5	26 ±2.6
M16	60 ±6	44 ±4.4
M18	70 ±7	51 ±5.1
M22	80 ±8	59 ±5.9

- Clean oil traces from the external areas of the motor using a soft lint-free cloth.
- Store the motor in strict compliance with the storage requirements.

NOTICE

Risk from improper port sealing!

- Check that motor ports are properly airtight to prevent damage to internal parts.

Always empty and rinse motor before use

- Motor must be fully emptied of storage oil and must be rinsed before installation in system circuit.

Recover the storage oil.

1.3.4 - Rinsing of hydraulic motor after long storage

NOTICE

Always empty and rinse motor before use

- Motor must be fully emptied of storage oil and must be rinsed with a neutral flushing oil before installation in system circuit.
- Ensure that flushing oil characteristics are compatible with system oil.

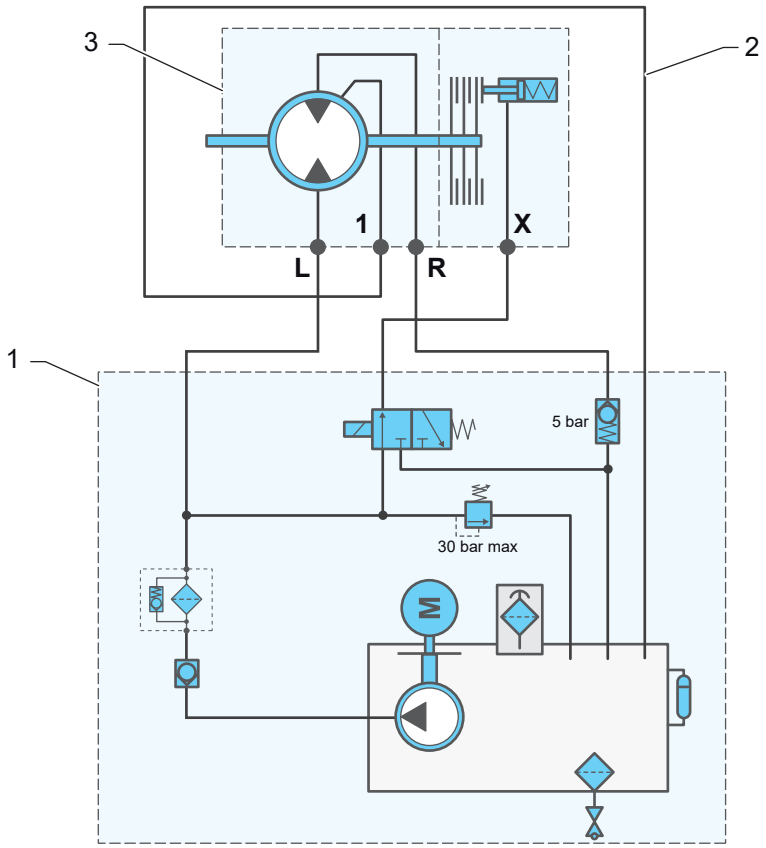
- Place the motor in a horizontal position on a workstation equipped with a waste oil collector.

NOTICE

Risk from improper handling!

- Handle carefully to avoid motor damage.

- Remove all the plugs from the supply ports, drain port(s), brake port(s) and displacement spool control port(s). Remove all bleed screws from the valving cover and brake.
- Position the motor by orienting the supply ports downwards.
- Fully empty the storage oil from the motor casing, the valving cover, and the displacement control and brake chambers.
- Using an oil syringe, rinse the motor with the neutral flushing fluid by filling and emptying the motor casing several times, the valving cover and the displacement control and brake chambers.
- Fill all motor ports with the neutral flushing fluid.
- Connect the motor to a hydraulic unit with open-loop circuit according to the diagram below.



Legend
1 Hydraulic unit circuit
2 Drain
3 Motor

- Supply the motor with flushing oil in the direction L. For a dual-displacement motor, switch the motor to full displacement (1C).
- Adjust the flow rate to reach a rotation speed between 8 and 10 rpm.
- Pressure on the return line must be between 2 and 5 bar.
- Run the motor for 2 minutes.

- Reverse the motor supply to direction R.
- Run the motor in the above-mentioned conditions of rotation speed and pressure for 2 minutes.
- Fully empty the neutral flushing oil from the motor and rinse it several times with system oil according to the foregoing instructions.
- Install the motor in the system circuit and then fill the motor with system oil.

NOTICE

- Do not forget to fill the brake control chambers and displacement changer.

Recover the storage oil.

1.4 - Handling

The motors must be handled and moved with suitable lifting equipment depending on the dimensions and weight of the motor.

Consult the technical documentation to find out the dimensions and weight of motors.

WARNING

Risk from handling a "hydrobasis" motor!

Some components of a hydrobasis motor can be mounted hold-free and could fall during handling. They can therefore cause serious injury.

1.4.1 - Manual handling

WARNING

Risk from manual handling and heavy loads!

Manual handling and heavy loads may expose personnel to physical risk factors.

- Musculoskeletal disorders can occur due to heavy loads, excessive physical exertion, repetitive movements and awkward postures.
- Acute trauma can occur, such as cuts (sharp edges), jamming or crushing of fingers or hands.
- A poor grip can cause the product to slip out of hands and fall on the ground. This can result in a risk of accident and injuries to the technician.
- Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

1.4.2 - Handling with lifting equipment

The motor can be handled and transported via:

- An eye bolt.
- A lifting hook.
- A lifting sling.

DANGER

Risk from suspended loads!

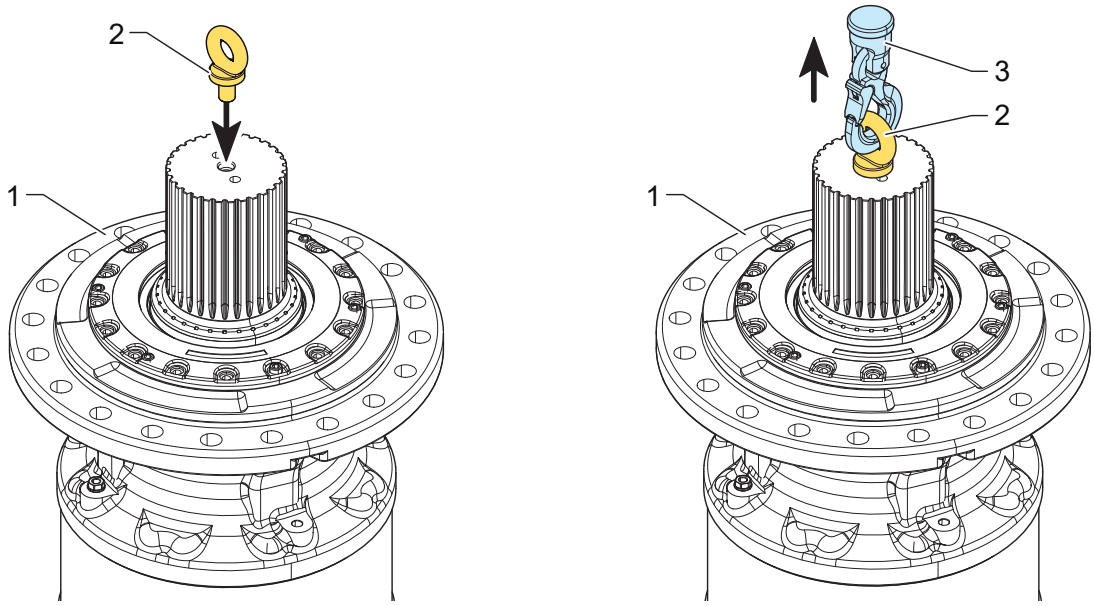
Use of improper transportation or lifting equipment may result in dropping a Poclain Hydraulics product, potentially causing death or serious injury.

When transporting a product, always respect the safety rules, laws and regulations in effect.

- Always check that the lifting equipment is adequate for the load. Do not use lifting equipment with an insufficient load capacity rating.
- A non-exhaustive list of suggested safety rules is shown below:
  - Nobody should stand in the danger zone of the machine or system.
  - Ensure coworkers and other bystanders are out of the danger zone.
  - Never work under a suspended load.
  - Never guide a load with your hands.
  - Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

Handling with eye bolt

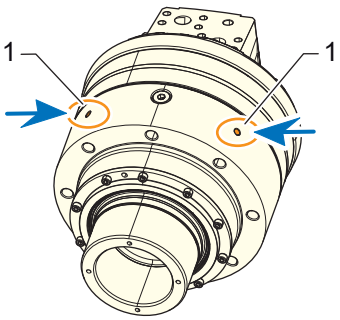
Handling with an eye bolt can be used for the shaft motors machined with an axial threaded hole.



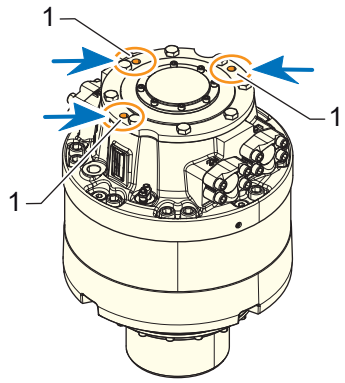
Legend
1 Motor
2 Eye bolt
3 Lifting hook with safety latch

For the following motors we have handling threads (lifting points):

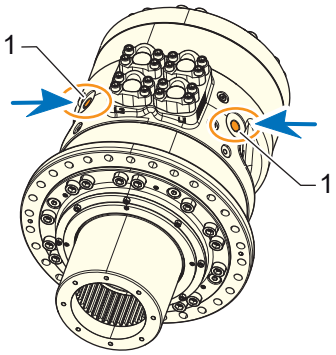
MHP20/27



MS83 / MS125



MI250



Legend
1 Lifting points

Motor	Handling threads
MHP20/27 (*)	2 x M12
MS83 / MS125	3 x M16
MI250	2 x M20

(*) Only with Female Spline Shaft and Shrink Disc Shaft.

- To lift the motor, insert handles in handling threads and then lift the motor.

When assembling the motor on the machine, we recommend also using either the torque arm or front fixation flange to help in the lifting operation.

WARNING

Risk of load falling if using a non-compliant lifting device!

Use of an inappropriate lifting device may cause the load to fall, and therefore brings a risk of accident and serious injury.

- The eye bolt must be compliant with the relevant standard and regulations in force.
- Use an eye bolt corresponding to the size (diameter, pitch) of the threaded hole in the motor shaft.
- Ensure that the eye bolt can support the weight of the motor plus a safety margin of 20%.
- The eye bolt must be fully screwed into the threaded hole of the motor shaft before handling.
- Ensure that the safety latch of lifting hook (3) is correctly closed before handling.

Risk due to oscillating motion of load!

An oscillating motion of the load may cause the load to collide with nearby equipment or personnel (impact) or cause the load to fall. This could result in product damage and a risk of accident and serious injury to the technician.

- Always obey the safety rules and regulations in force during handling operations.
- Maintain a moderate handling speed without jerking.
- Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

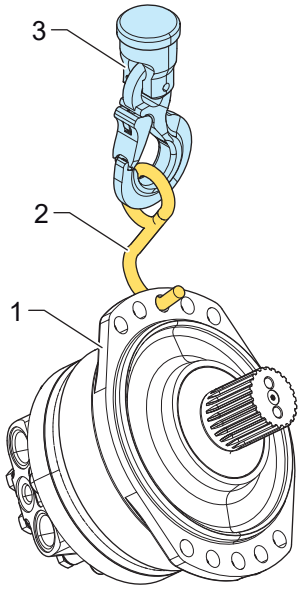
NOTICE

Risk of internal part damage!

- When handled by an eye bolt, the motor must be subjected to an axial force in the axis of the motor shaft only.
- Handle carefully to avoid damaging the sensitive areas of the motor and the external installed components (speed sensor, valve block, solenoid valve, etc.).

Handling with a lifting hook

Handling with a lifting hook can be used for motors with a mounting flange.



Legend
1 Motor
2 Lifting hook
3 Lifting hook with safety latch

WARNING

Risk of load falling if using a non-compliant lifting device!

Use of an inappropriate lifting device may cause the load to fall, and therefore brings a risk of accident and serious injury.

- The lifting hook must be compliant with the relevant standard and regulations in force.
- Ensure that the lifting hook can support the weight of the motor plus a safety margin of 20%.
- Ensure that the lifting hook is sufficiently engaged in the hole of the motor flange to avoid it slipping out of the motor during handling.
- Ensure that the safety latch of lifting hook (3) is correctly closed before handling.

Risk due to oscillating motion of load!

An oscillating motion of the load may cause the load to collide with nearby equipment or personnel (impact) or cause the load to fall. This could result in product damage and a risk of accident and serious injury to the technician.

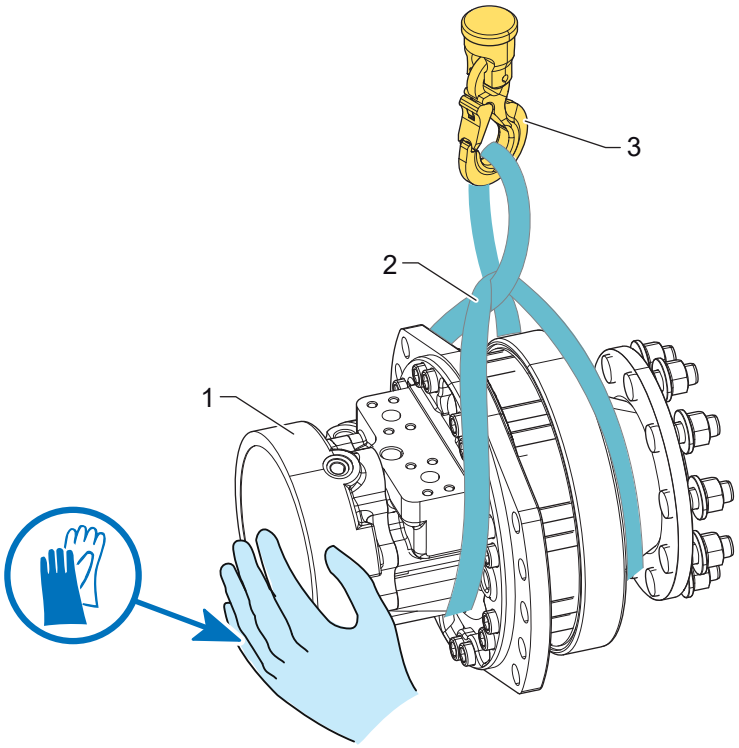
- Always obey the safety rules and regulations in force during handling operations.
- Maintain a moderate handling speed without jerking.
- Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

NOTICE

Risk of motor damage!

- Handle carefully to avoid damaging the sensitive areas of the motor and the external installed components (speed sensor, valve block, solenoid valve, etc.).

Handling with a lifting sling



Legend
1 Motor
2 Lifting sling
3 Lifting hook

When mounting the motor in the machine, guide the motor by hand to avoid an oscillating motion and position it accurately in its seating.

DANGER

Risk from manual handling of a suspended load!

Handling a suspended load manually may causing serious injury or death.

- When handling a motor, always obey the safety rules, laws and regulations in force.
- Only use a hand to position the product accurately the machine system.
- Always wear gloves to stabilize the motor.
- Take care to not position fingers or hand under the load to avoid risk of crushing.
- Never stand under the suspended load.
- Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

WARNING

Risk of load falling if using a non-compliant lifting device!

Use of an inappropriate lifting device may cause the load to fall, and therefore brings a risk of accident and serious injury.

- The lifting sling must be compliant with the relevant standard and regulations in force.
- Ensure that the lifting sling can support the weight of the motor plus a safety margin of 20%.
- Ensure that the motor is securely held by the lifting slings to prevent its falling.
- Ensure that the end loops of the sling are correctly inserted in the lifting hook and that the safety latch of the lifting hook is properly closed before handling.

Risk due to oscillating motion of load!

An oscillating motion of the load may cause the load to collide with nearby equipment or personnel (impact) or cause the load to fall. This could result in product damage and a risk of accident and serious injury to the technician.

- Always obey the safety rules and regulations in force during handling operations.
- Maintain a moderate handling speed without jerking.
- Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

NOTICE

Risk of motor damage!

- Place the lifting sling around the motor so that it does not pass over the attached components (speed sensor, valve block , solenoid valve, etc.).
- Handle carefully to avoid damaging the sensitive areas of the motor and the attached components.

If the motor falls during handling, it must be returned to a Poclain Hydraulics Certified Repair Center for inspection and operational testing.

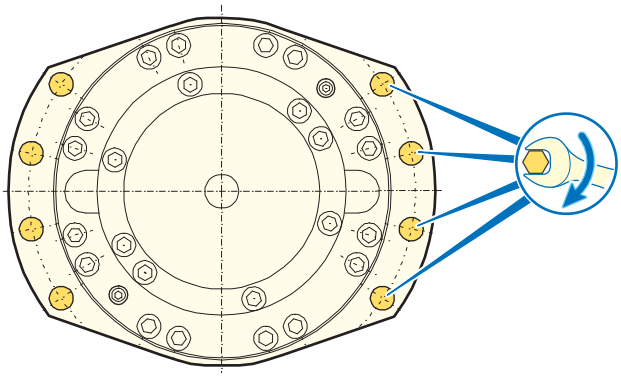
1.5 - Paint

For more information, refer to page 18.

2 - Products

2.1 - Fixations

2.1.1 - Attachment to the chassis



Consult the technical documentation to find out the dimensions of the motor mounts.

- Clean the surfaces of the motor mounting flange and the mating surface of the machine chassis to remove all traces of contaminants (dirt, paint traces, rust, sand, grease...) to ensure the correct "surface-to-surface" contact.
- Install the motor onto the chassis of machine with suitable lifting equipment.
- Secure the motor with bolts and nuts.
- Tighten the nuts to the required tightening torque.

Observe the tightening torques recommended by the machine manufacturer. Poclain Hydraulics recommends calculating the tightening torques according to calculation note VDI 2230 guidelines.

NOTICE

Risk of premature motor failure!

An improper permanent filling of the motor casing may result in motor failure

- Ensure that the motor casing drain, port 1, is located at the highest point when the motor is mounted in the machine.
- If this is not possible, the shape of the circuit piping must ensure that the motor casing remains full of oil.
- In case of a long period with the machine not in use, a siphoning effect may occur. Check the filling of the motor casing.

WARNING

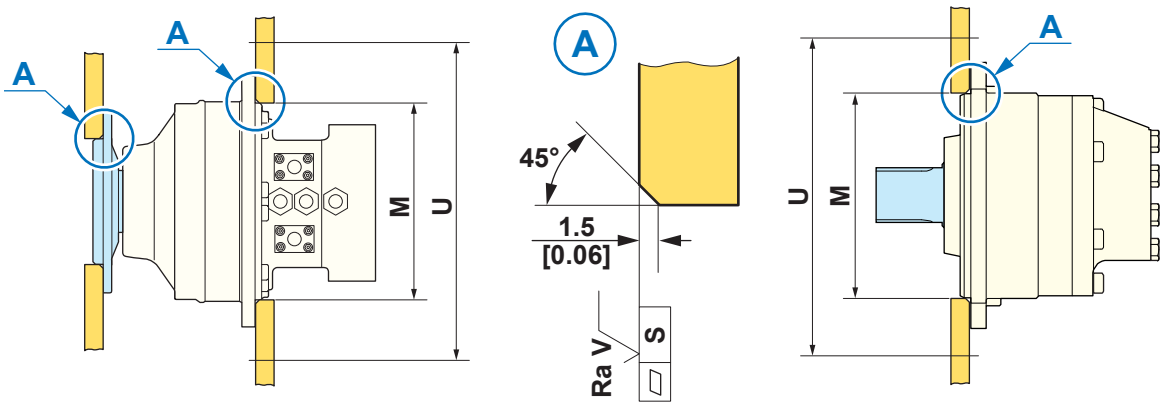
Risk of damage and injury!

The mating face of the chassis must be flat and perpendicular to the motor axis to avoid motor breakage.

Risk of product damage due to improper tightening!

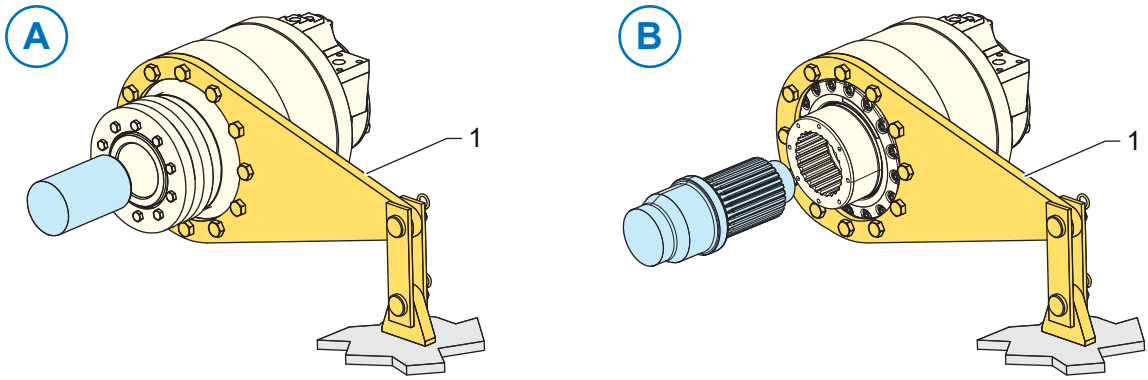
Screws improperly tightened may cause loose and free movement of the motor. This may result in inappropriate behavior of the machine and cause breakage of the motor, and consequently, injury and death.

- Eliminate all traces of contaminants (dirt, sand, rust, metal burrs, etc.) on the mating surfaces.
- Do not under-tighten or over-tighten the screws.
- Use a torque wrench to apply the required tightening torque accurately.



- Respect the flatness and the chamfer on the chassis.
- Consult the technical documentation to find out the dimensions (ØU, ØM , S and RaV).

2.1.2 - Coupling by torque arm



Legend
1 Torque arm

A Shrink disk version
B Female splines version

Setting up and keeping the coupling in place can also be made easier with a torque arm that does not generate axial stress.

General conditions of industrial use

- Use in fixed (immobile) position for an extended lifetime (> 25,000 hours). For example: winch, crusher, conveyor belt, etc.
- Irrigation of the casing required to control the hydraulic motor's temperature during progressive start-up and to renew the fluid during operation.

Orientation

- The motor is intended to operate in a horizontal position. It is essential for the motor casing to be permanently filled with hydraulic fluid.
- For vertical mounting (shaft pointed upwards), it is essential to provide an irrigation port on the bearing (option B).
- Provide for access to connect and disconnect connections, and to purge the motors.
- Provide the appropriate means of handling components for mounting and removal.

Torque arm mounting

To avoid loading the bearing, follow the instructions below.

- The length of the counter torque arm must be at least equal to R min (see the table below).
- The counter torque arm's reaction stress must be accounted for in the motor's attachment plan.

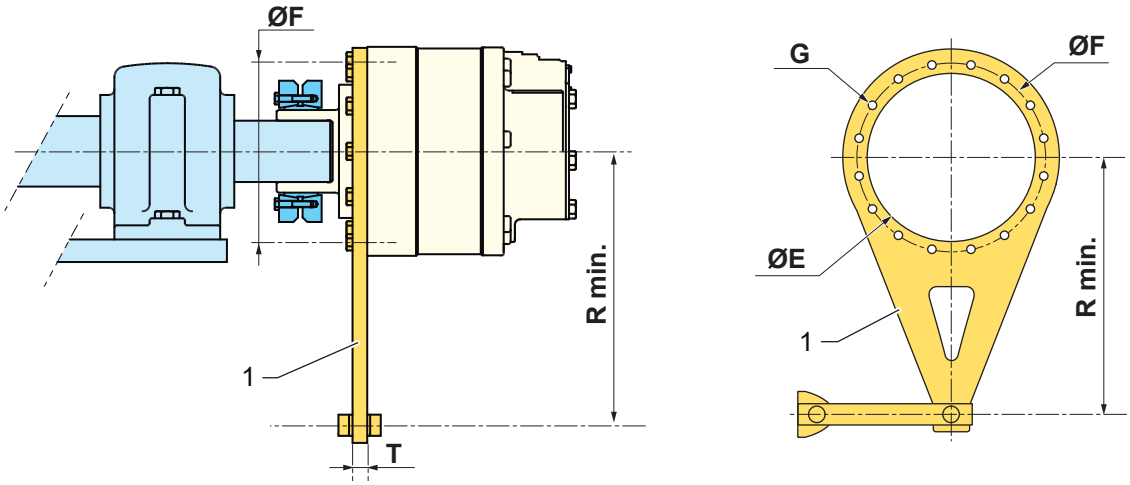
NOTICE

Risk from incorrect system sizing!

Incorrect sizing of the system may result in shorter motor lifetime and motor failure.

- Check that the combination of stresses applied to the shaft is compatible with the loads allowed by the motor, and that the resulting life expectancies conform to the application specifications.

The resulting radial stress is the combination of the counter torque arm's reaction and the combined weight of the motor and the counter torque arm.



Legend
1 Torque arm

Motor	R min. mm	R min. in	ØF mm	ØF in	G	Thickness T mm	Thickness T in
MHP20/27	500	19.68	290	11.42	8 x M20	25	0.98
MS50	600	23.62	340	13.39	12 x M20	40	1.57
MS83	800	31.5	380	14.96	16 x M20	40	1.57
MS125	800	31.5	394	15.51	16 x M24	40	1.57
MI250	1250	49.21	580	22.83	30 x M20	40	1.57

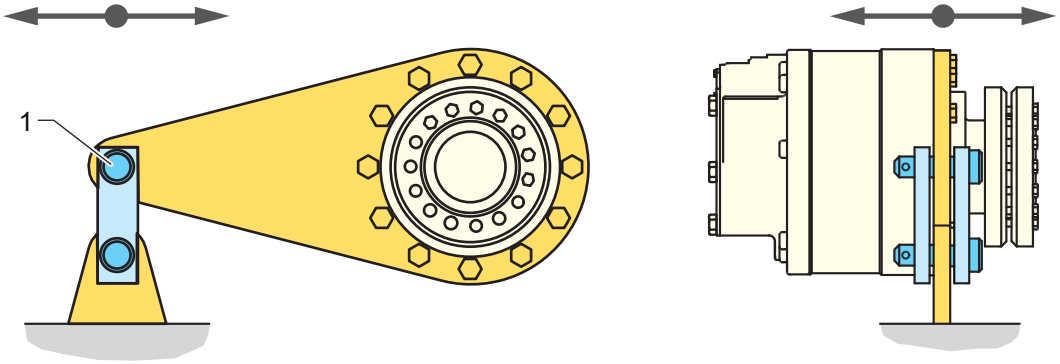
To connect the torque arm to the motor case, please find here below a table summarizing recommended bolts and tightening torque.

Motor Size	Fixation bolt	Nr. of bolts	Tightening torque (Nm)
MHP20/27	Screw CHC M20x50 - CL12.9	8	690 ±70
MS50	Screw CHC M20x50 - CL12.9	12	690 ±70
MS83	Screw CHC M20x65 - CL12.9	16	690 ±70
MS125	Screw CHC M24x70 - CL12.9	16	1200 ±120
MI88	Screw CHC M24x75 - CL12.9	18	1200 ±120
MI250	Screw CHC M20x80 - CL12.9	30	690 ±70

Poclain Hydraulics offers torque arms for sale for the following motors:

Motor size	Torque arm P/N
MHP20/27	B33549Q
MS50	B32517T
MS83	B32518U
MS125	B32519V
MI88	B33472G
MI250	B32520W

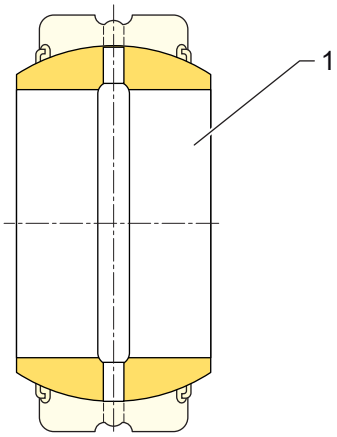
Coupling of the arms



Legend
1 Swivel if necessary

In order to avoid parasitic stress due to defects in geometries and deformations, the end of the arm must still have a motion with two degrees of freedom.

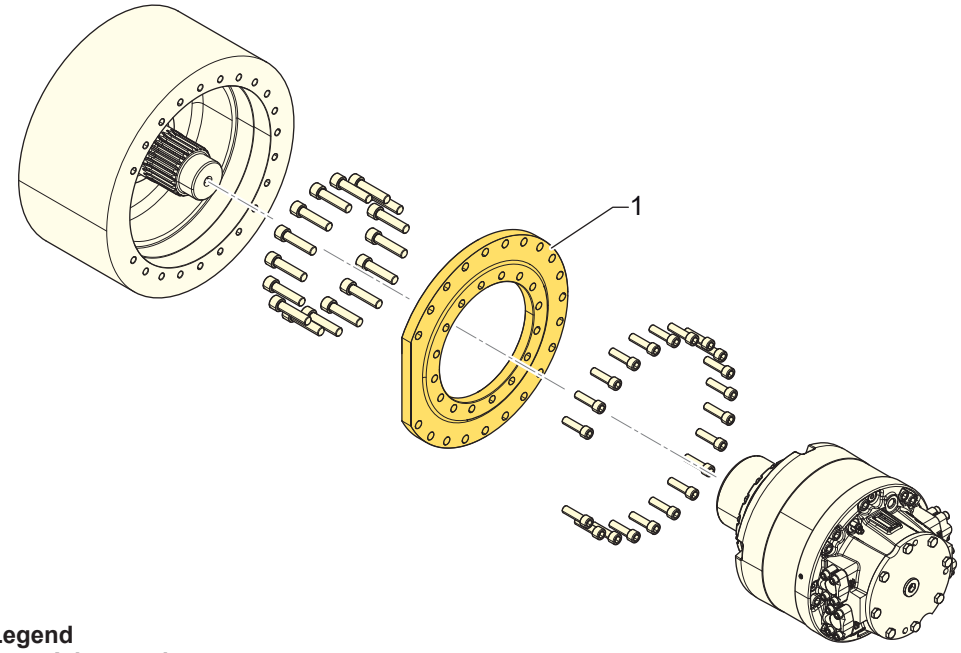
Poclain Hydraulics recommends the use of SKF ball joints to guarantee this motion with two degrees of freedom.



Legend
1 SKF ball joint

Motor	SKF ball joint
MHP20/27	GE40 ESX-2LS
MS50	GE40 ESX-2LS
MS83	GE50 ESX-2LS
MS125	GE50 ESX-2LS
MI88	GE50 ESX-2LS
MI250	GE50 ESX-2LS

2.1.3 - Adaptor plates for Hagglunds motor replacement

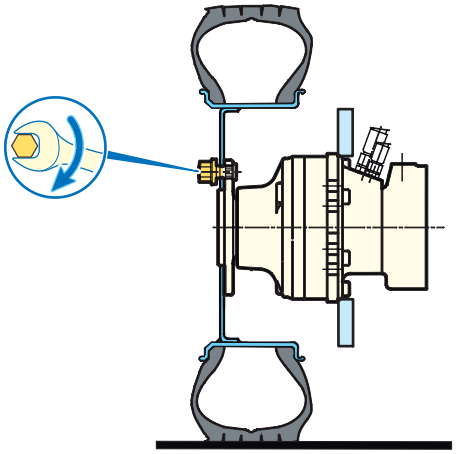


Legend
1 Adaptor plate

Poclain Hydraulics motor	Hagglunds motor	Adaptor plate ref.
MS83	CA100	B28837T
MS83	CA140	B29434S
MS125	CA210	B28699T
MI250	CB400	B28899L

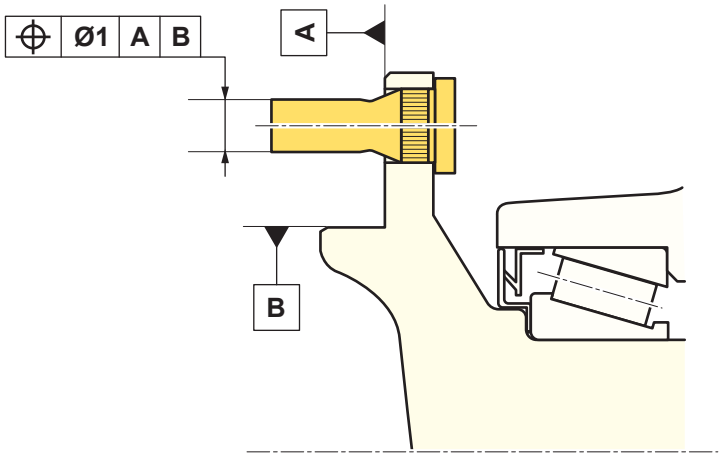
2.2 - Output shaft mounting

2.2.1 - Mobile application - Motor/Wheel coupling



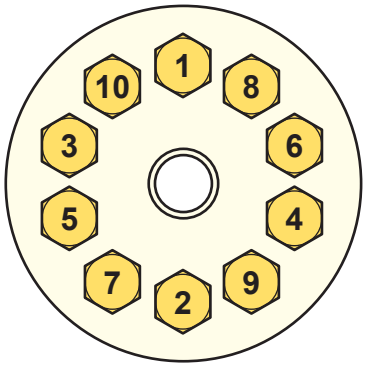
Consult the technical documentation to find out the characteristics of wheel motors.

Poclain Hydraulics recommends the dimensions and drilling tolerances of the fixing holes in the rims according to the figure below:



- Before installing, check studs, nuts and mating surfaces of wheel rim and motor output shaft conditions. Ensure that they are not worn or damaged, flat, clean and free of grease. Replace any damaged parts.
- Slide the wheel rim onto the studs without damaging the threads.
- Screw the wheel nuts onto the studs according to the criss-cross sequence shown in the figure below. Do not tighten them fully to permit the uniform seating of nuts and ensure the correct "surface-to-surface" contact of wheel rim and motor output shaft.

- Tighten the nuts to the required tightening torque according to the same criss-cross sequence.



Poclain Hydraulics recommends checking the tightening torques according to calculation note VDI 2230 guidelines.
For more information, consult your application engineer.

WARNING

Risk from improperly tightened wheel nuts!

Improperly tightened wheel nuts may cause loosening of the wheel rim and then breakage of studs and/or detachment of the wheel rim from the machine. It may result in serious injuries and death.

- Do not rub the wheel rim on the stud bolts, to avoid damaging the threads and therefore also avoid modification of the tightening conditions.
- Do not lubricate the studs and wheel nuts.
- Use wheel nuts appropriate for the contact surface of the wheel rim to ensure proper mounting and tightening.
- Do not under-tighten or over-tighten the wheel nuts.
- Use a torque wrench to apply the required tightening torque accurately.
- Eliminate all traces of contaminants (dirt, sand, rust, metal burrs, etc.) on the mating surfaces of the wheel rim.

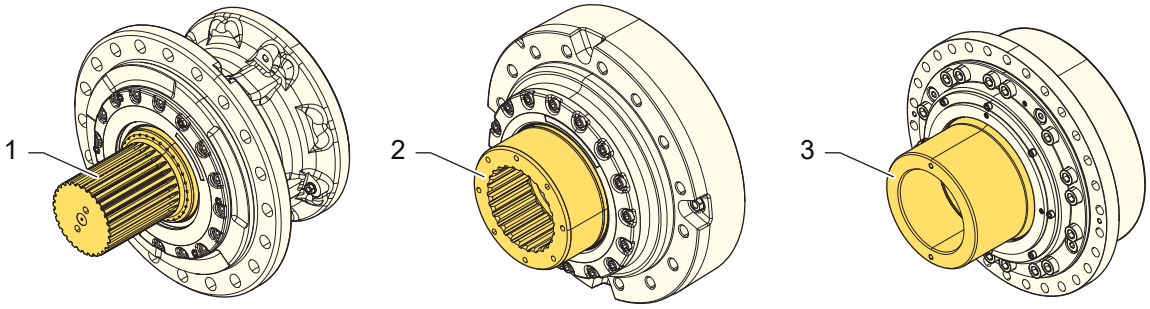
It is recommended to check the tightening torque of the wheel nuts after installation:

- **After 40 km.**
- **After 100 km.**
- **Then, periodically.**

2.2.2 - Industrial application

Poclain Hydraulics motors for industrial applications are available with 3 different types of output shaft:

- Male splines (1).
- Female splines (2).
- Shrink disk coupling (3).



Legend
1 Male splines
2 Female splines
3 Shrink disk

The motor can be secured to the machine with a torque arm or by the motor mounting flange onto the chassis of machine using mounting bolts.

Not all shaft versions are suitable for both types of assembly on the machine.

The table below shows the possible combinations of shaft type and motor mounting.

Shaft Type	Torque arm	Chassis mounting
Male splines	-	■
Female splines	■	■
Shrink disk	■	-

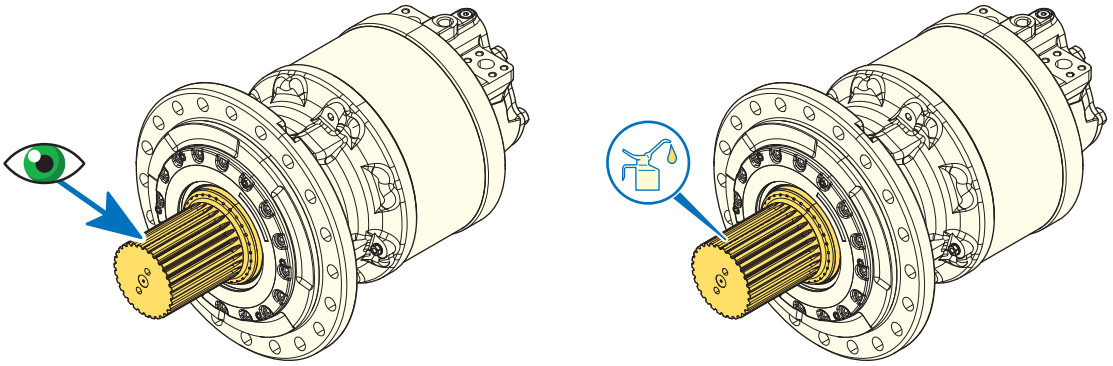
Refer below to see the available shafts according to motor type.

Motor	Male splines	Female splines	Shrink disks
MS02 / MSE02	■	-	-
MS05 / MSE05	■	-	-
MS08 / MSE08	■	-	-
MS11 / MSE11	■	-	-
MS18 / MSE18	■	-	-
MS25	■	-	-
MS35	■	-	■
MS50	■	■	■
MS83	■	■	■
MS125	■	■	■
MI88	■	-	■
MI250	■	■	■
MHP20 / MHP27	■	■	■

2.2.2.1 - Coupling by male splines shaft

Motors with a male splines shaft must be assembled only with chassis mounting.

A male splines shaft can be interfaced with a female shaft, a pinion gear, a chain sprocket, joints, etc.



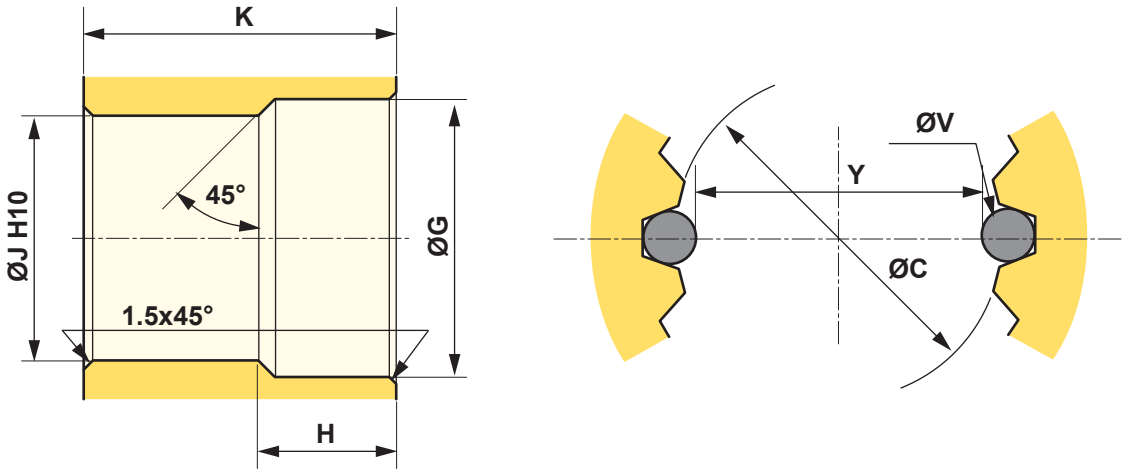
- Check that shaft splines are not damaged.
- Eliminate all traces of contaminants (dirt, sand, rust, metal burrs…) on the splines shaft.
- Lubricate the splines shaft with high load Molybdenum grease before assembly.

Customer splines definition

Presented below are the recommendations for machining the mating part interfaced with the Poclain Hydraulics male shaft (DIN 5480 spline version).

Splines must be designed for flank-centered free fit.

Coupling for male splines



	ØG	H	ØJ	K	N	Mo	Z	Offset	ØC H10	ØV	Y	Tol.
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	µm
MHP20/27	122	29	110	109	120	5	22	2.25	110	9	101.104	+87/0
MS50	132	33	120	135	130	5	24	2.25	120	9	111.104	+87/0
MS83	152	33	140	149	150	5	28	2.25	140	9	131.104	+87/0
MS125	152	33	140	149	150	5	28	2.25	140	9	131.104	+87/0
MI88	-	-	-	-	165	5	31	-	155	-	-	-
MI250	-	-	-	-	200	5	38	-	190	-	-	-

- Standard: DIN 5480.
- Pressure angle 30°.
- Centering on flanks.
- Slide fit (7H quality).
- N: Nominal Ø.
- Mo: Module.
- Z: Number of teeth

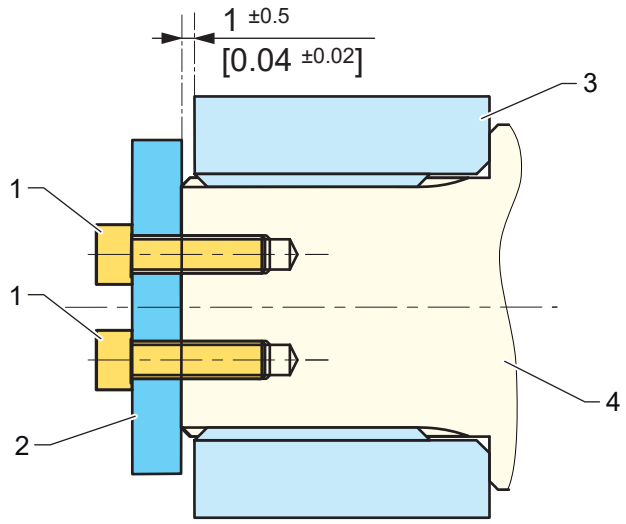
- For motors not mentionned in the table or spline shafts according to the NF E 22-141 standard, consult the technical documentation for the dimensions.
- For more information, consult your application engineer.

- Lubricate the female splines of the mating part with high load Mobybdenum grease before assembly.

Tightening screws for splined connections

	Screw	Class
MS02/MSE02, MS05/MSE05, MS08/MSE08, MS11/MSE11	2 x M10	8.8 10.9
MS18/MSE18, MS25	2 x M14	8.8 10.9
MS35, MS50, MS83, MS125	2 x M16	8.8 10.9
MI250	4 x M12	8.8 10.9

Poclain Hydraulics recommends checking the tightening torques according to calculation note VDI 2230 guidelines.
For more information, consult your application engineer.



Legend
1 Attachment screws
2 Thrust washer
3 Pinion
4 Splined shaft

NOTICE

Risk of malfunction and product damage from improper tightening!

Incorrectly tightened screws may cause loose and free movement of the mating female part. This may result in inappropriate behavior of the machine and cause damage to components.

- Do not under-tighten or over-tighten the screws.
- Use a torque wrench to apply the required tightening torque accurately.

2.2.2.2 - Coupling by female spline shaft

Motors with a female spline shaft can be assembled with torque arm mounting or chassis mounting.

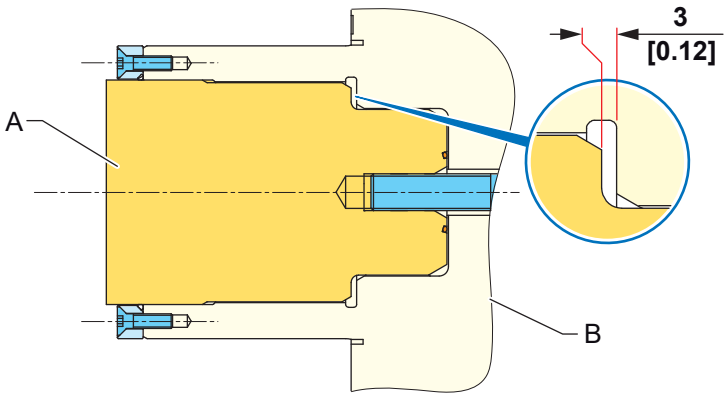
Machine spline shaft definition

There are different interface drawings available depending on the hydraulic motor type. Please contact your Poclain Hydraulics application engineer for more information.

NOTICE

Risk of motor damage!

When mounting the motor on a chassis, a 3 mm [0.12 in] axial clearance between the motor shaft and the machine shaft must be maintained to avoid additional axial forces on the motor shaft.



Legend
A **Machine shaft**
B **Motor shaft**

For female spline shafts, you can see below the standard bearing support offer for each motor depending on the mounting:

Motor	Torque arm mounting	Chassis mounting
MHP20 / MHP27	6ABX	6ABX
MS50	6ABX	6ABX
MS83	6ADX	6ABX
MS125	6ADX	6ABX
MI250	6ABX	6ABX

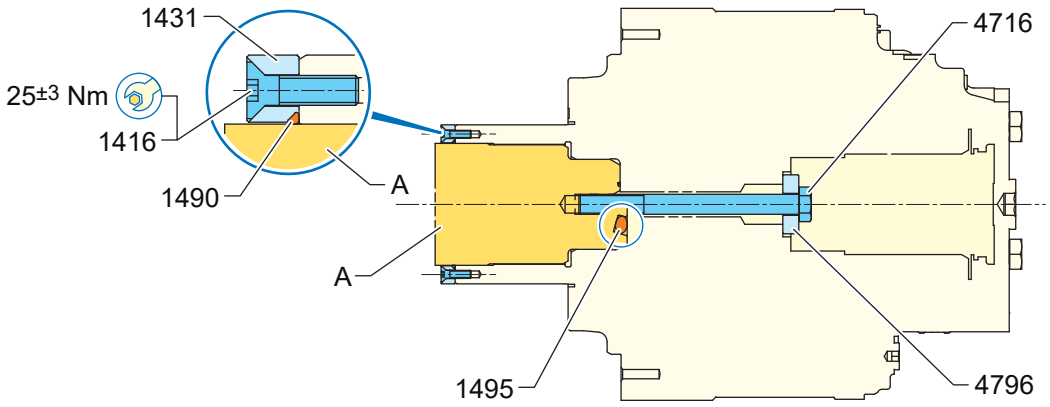
Pay attention that for the MS83 and MS125 bearing support the standard offer is not the same for torque arm mounting and chassis mounting.
This document refers to our standard offer.
In case a different solution will be used, please contact your application engineer.

Mounting kit for shaft sealing and mounting

To ensure the front seal between the motor shaft and the machine shaft, it is essential to use the seal assembly included in the shaft sealing kit.

It is essential to lubricate the splines and diameters of the motor shaft and the machine shaft with high load molybdenum grease before assembly.

MS50 shaft sealing kit: B40970G

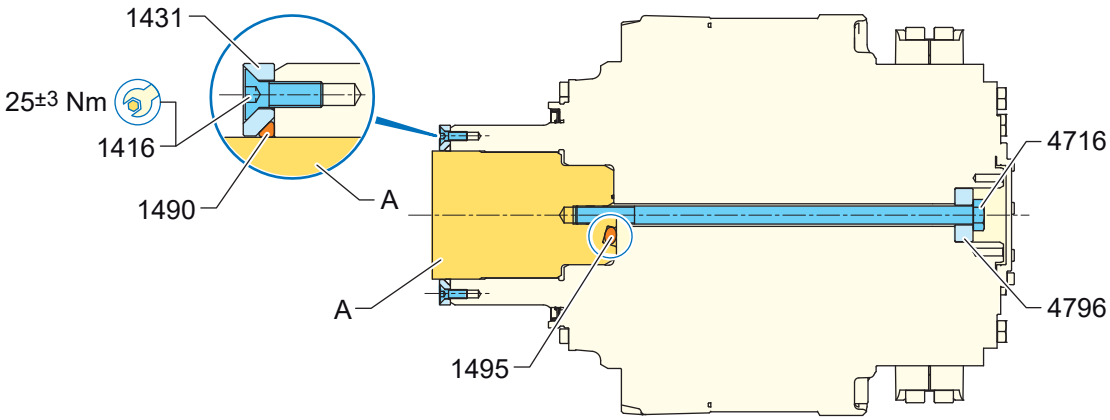


Legend

A	**Machine shaft**
1416	**Countersunk screw**
1431	**Front plate**
1490	**O-ring**
1495	**O-ring**
4716	**Hex screw**
4796	**Washer**

MS83 shaft sealing kit: B39302T

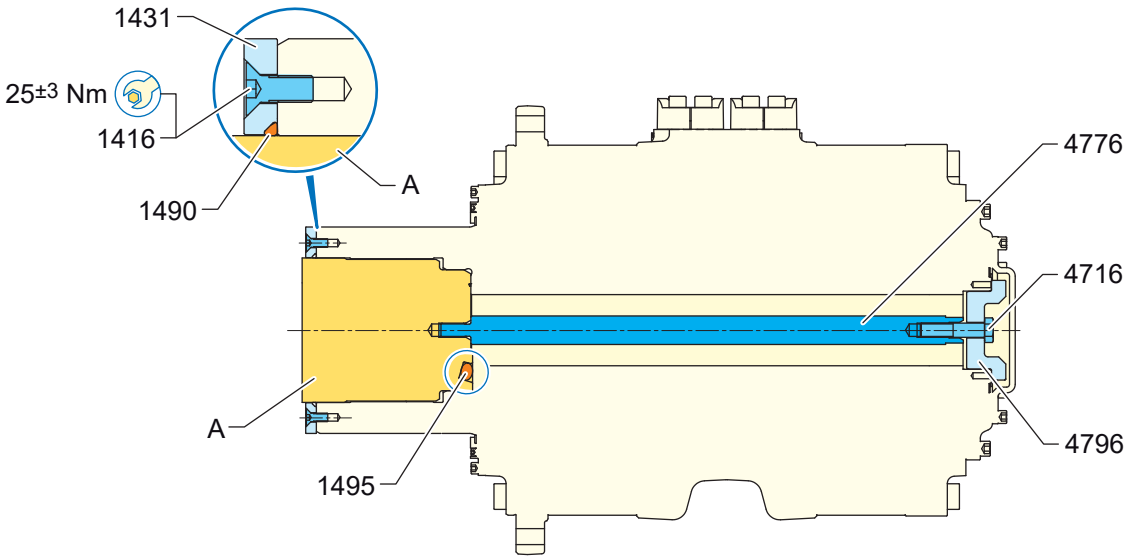
MS125 shaft sealing kit: B39303U



Legend

A	**Machine shaft**
1416	**Countersunk screw**
1431	**Front plate**
1490	**O-ring**
1495	**O-ring**
4716	**Hex screw**
4796	**Washer**

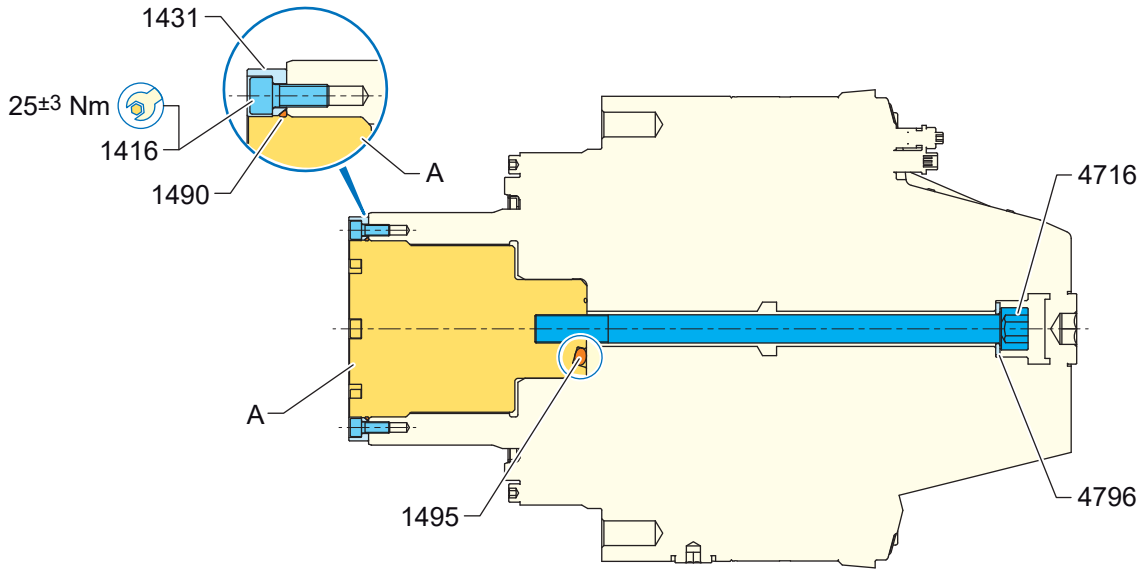
MI250 shaft sealing kit: B39304V



Legend

A	**Machine shaft**
1416	**Countersunk screw**
1431	**Front plate**
1490	**O-ring**
1495	**O-ring**
4716	**Hex screw**
4776	**Rod**
4796	**Washer**

MHP20/27 shaft sealing kit: B55079S

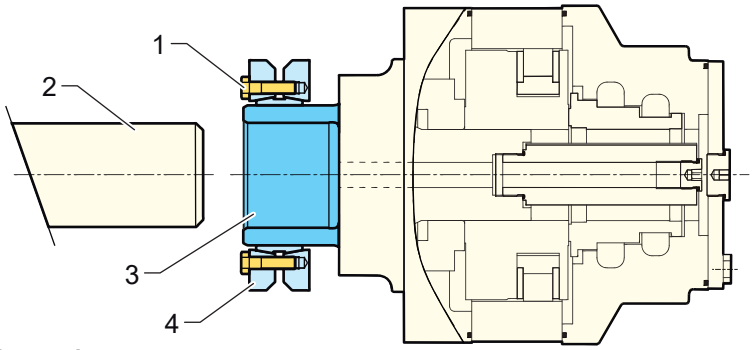


Legend

A	**Machine shaft**
1416	**Screw**
1431	**Front plate**
1490	**O-ring**
1495	**O-ring**
4716	**Screw**
4796	**Washer**

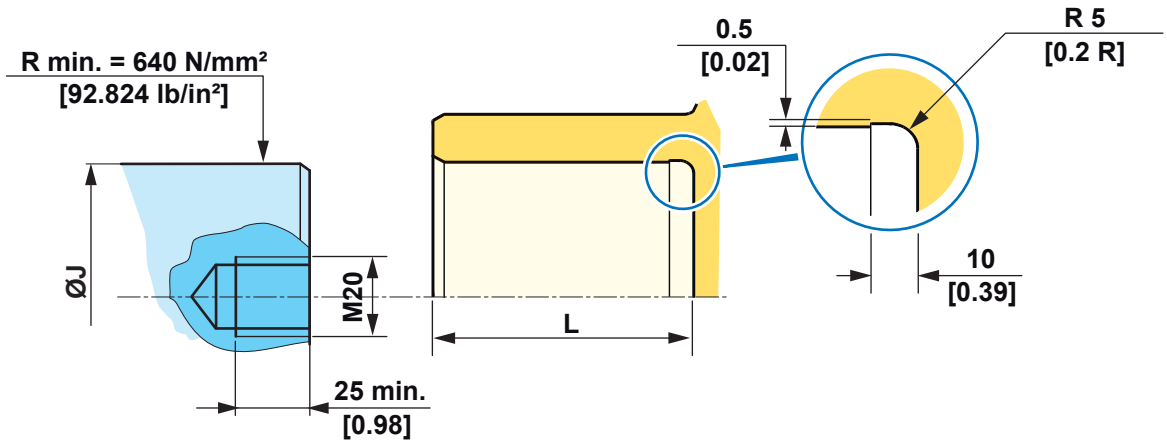
2.2.2.3 - Coupling by shrink disk

Motors with a shrink disk shaft can be assembled only with torque arm.



Legend
1 Screw
2 Machine shaft
3 Hydraulic motor shaft
4 Disks

Machine shaft definition

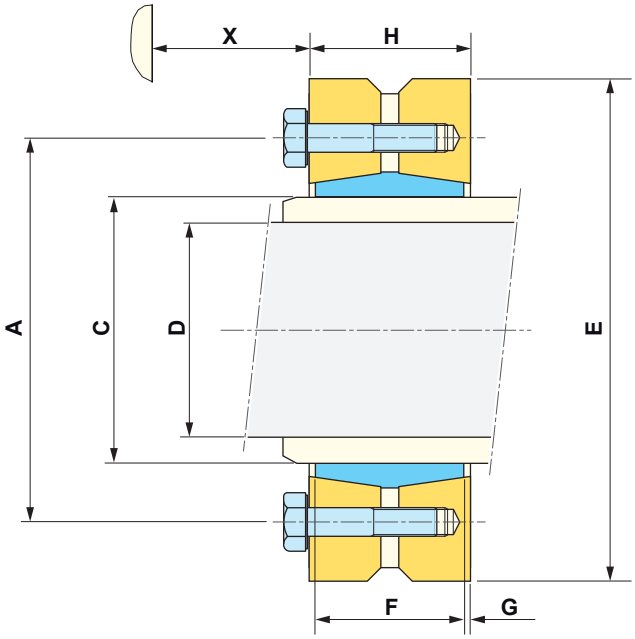


Presented below are the main dimensions for male shafts to fit in the motor female shaft.

For information, thread M20, 25 min depth is only used to assist in the assembly of the motor to machine shaft.

	ØJ	Tolerance	L	Assembly thread	
	mm	-	mm	mm	
MHP20/27	120	h6	95	M20	Depth at least 25 mm
MS50	115	h6	105	M20	Depth at least 25 mm
MS83	140	h6	140	M20	Depth at least 25 mm
MS125	160	h6	140	M20	Depth at least 25 mm
MI250	200	g7	130	M20	Depth at least 25 mm

Shrink disk definition



Legend

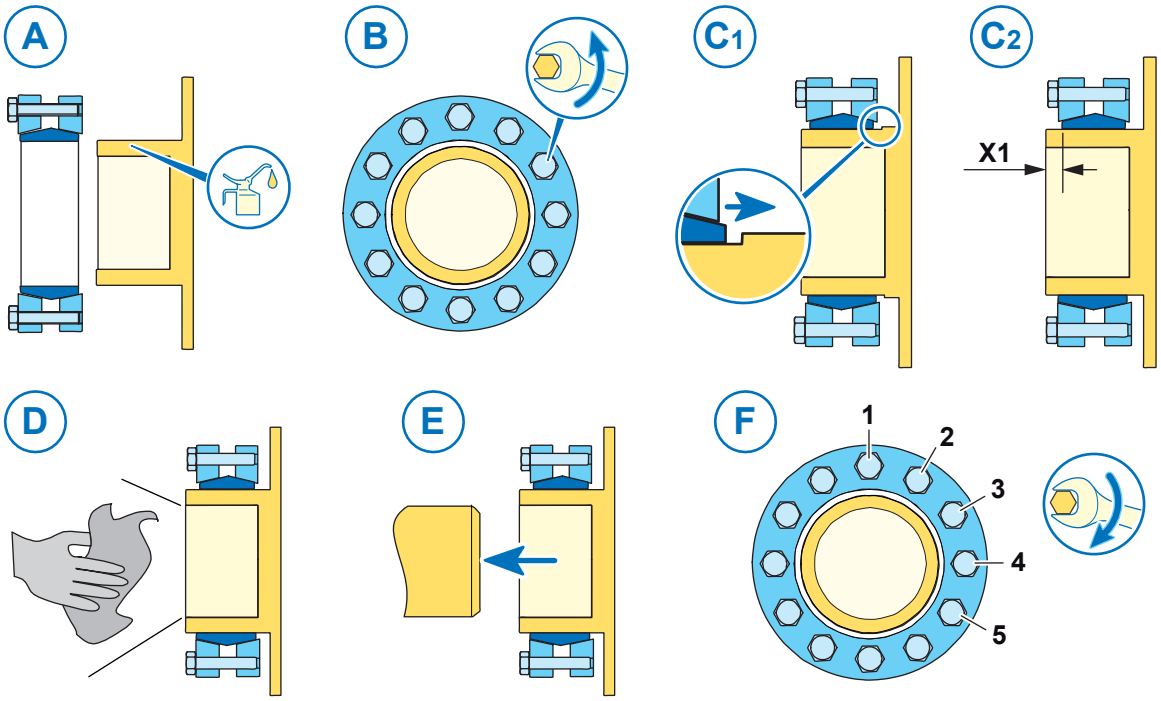
H & G	**These values are advisable before tightening**
M	**Torque transmissible by the shrink disks**
X	**Provide sufficient clearance for the torque wrench**

	D mm in	C mm in	A mm in	E mm in	F mm in	G mm in	H mm in
MS50	115 [4.257]	155 [6.102]	198 [7.8]	265 [10.433]	66 [2.598]	7 [0.276]	80 [3.150]
MS83	140 [5.512]	185 [7.283]	236 [9.291]	330 [12.992]	92 [3.622]	10 [0.394]	112 [4.409]
MS125	160 [6.299]	200 [7.874]	246 [9.685]	350 [13.779]	92 [3.622]	10 [0.394]	112 [4.409]

	Transmissible torque		Part number
	Nm	lb.ft	
MS50	40 100	29 576	B43001P
MS83	81 700	60 259	A49466S
MS125	101 000	74 494	A47333Z
MI250	179 000	132 024	A52512D
MHP20/27	38 700	28 544	B20416Q

For all technical characteristics of the shrink disc, please refer to the part drawing.
Contact your Poclain Hydraulics application engineer.

Shrink disk installation



- (A) Lubricate the external diameter of motor output shaft.
- (B) Loosen the screws to allow the shrink disk ring to rotate freely.
- (C1) For motors MS83 - MS125 - MI250 - MHP20/27:
  - Place the shrink disk on the motor shaft until it reaches the mechanical stop.
- (C2) For motors MS35, MS50 and MI88:
  - Place the shrink disk on the motor shaft by ensuring the dimension X1.

Motors	X1 mm [in]
MS50	14.5 [0.571]
MI88	14.5 [0.571]

- (D) Clean and degrease the bore of the motor shaft and the external diameter of the driven shaft.
- (E) Mount the motor on the shaft to be driven.
- (F) Tighten the screws gradually according to the tightening sequence shown and ensuring the disks remain parallel. Tighten the screws to the required tightening torque.

NOTICE

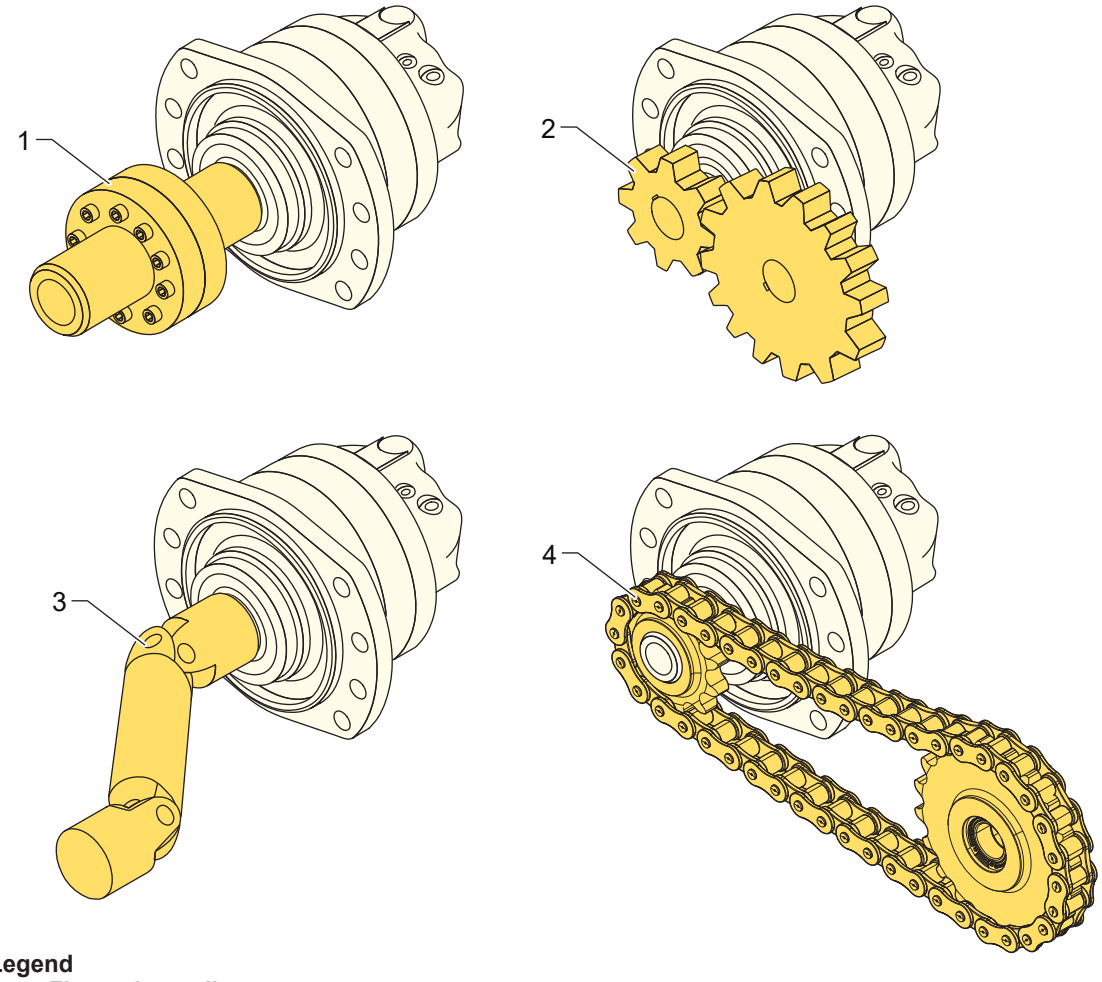
Risk of malfunction and product damage from improper tightening!

Incorrectly tightened screws may cause the sliding of the driven shaft in the motor output shaft. This may result in inappropriate behavior of the machine and cause damage to components.

- Do not under-tighten or over-tighten the screws.
- Use a torque wrench to apply the required tightening torque accurately.

2.2.2.4 - Other kinds of coupling

Coupling can also be done with flanged coupling (1), straight teeth pinions (2), universal joint (3) and chain (4).



Legend

1 Flanged coupling
2 Straight teeth pinions
3 Universal joint
4 Chain

2.3 - Industrial motor - Assembly / Disassembly

The assembly / disassembly instructions described below concern motors with female spline shaft and motors with shrink disk shaft.

2.3.1 - Motor assembly on the machine

WARNING

Risk from suspended loads!

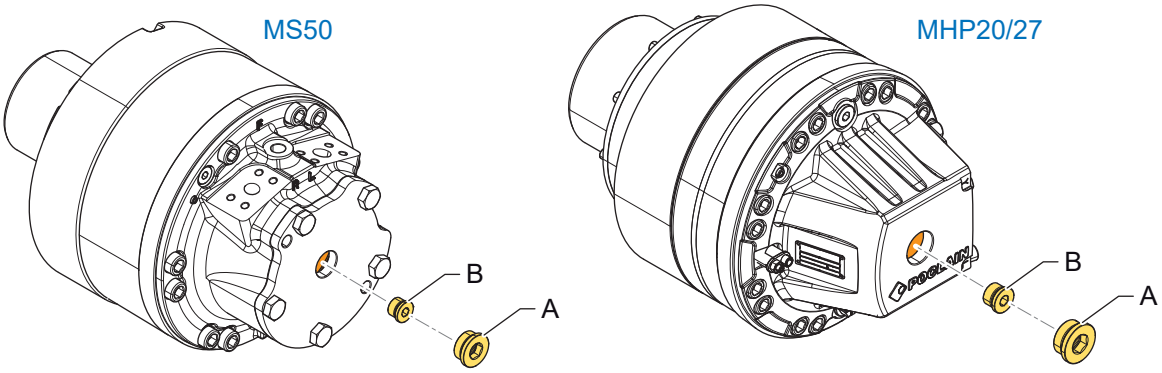
Use of improper transportation or lifting equipment may result in the motor falling, potentially causing serious injury or death.

- Always obey the safety rules, laws, and regulations in force.
- Always check that the lifting equipment is adequate for the load. Do not use lifting equipment with an insufficient load capacity rating.
- Set up a safety perimeter around the working area.
- Ensure coworkers not working on the machine / system are out of the safety zone.
- Never work under a suspended load.
- Never guide a load with your hands.
- Only use a hand to position the product accurately the machine system.
- Take care to not position fingers or hand under the load to avoid risk of crushing.
- Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

2.3.1.1 - Motor with female spline shaft

- For motor secured with torque arm, install the torque arm on the centering diameter.

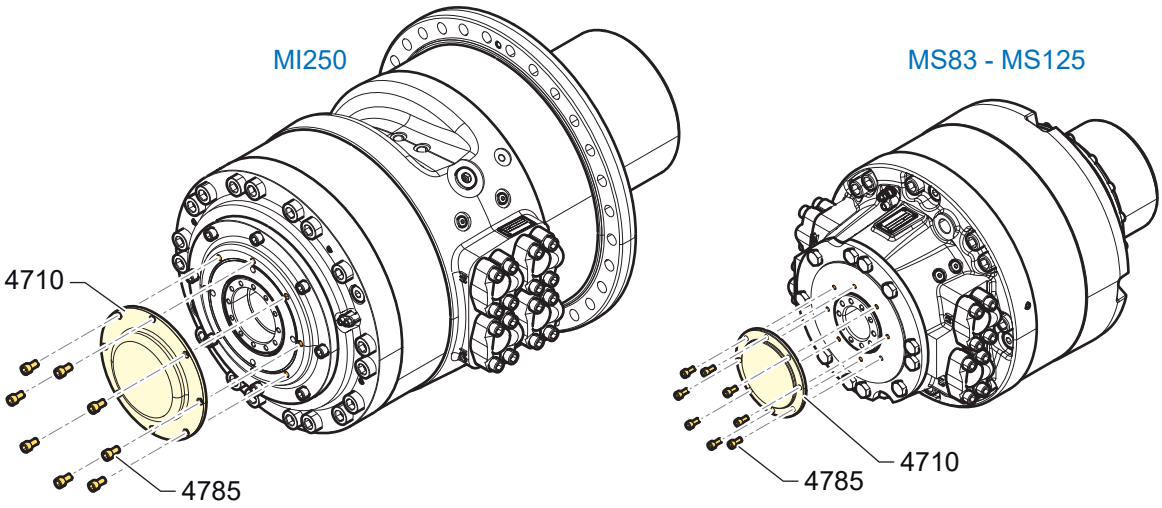
MS50 – MHP20/27



Legend
A Rear plate plug
B Plug on motor shaft

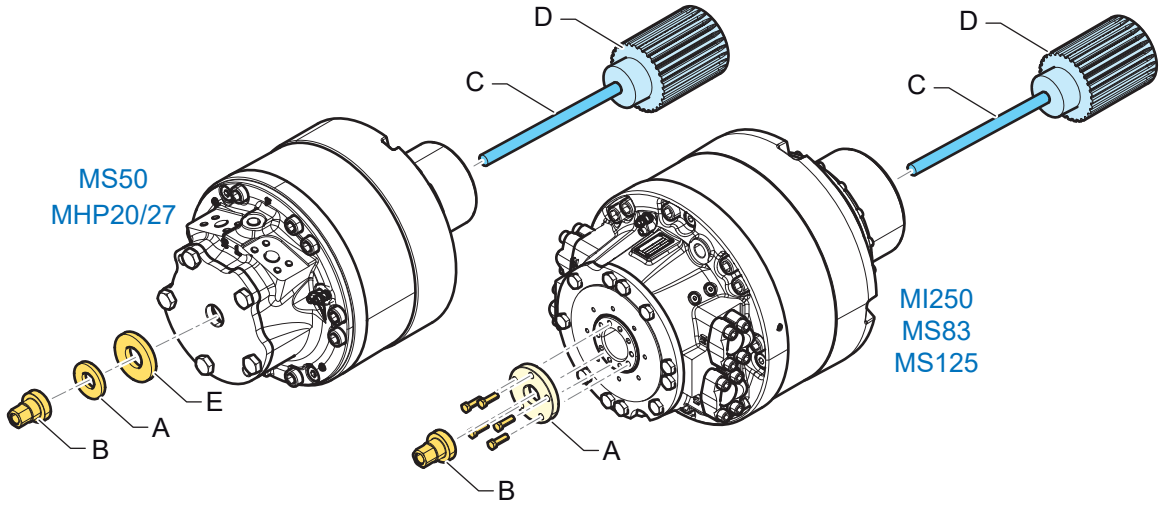
- Remove the plug (A) from the rear plate for MS50 or from the valving cover for MHP20/27.
- Remove the plug (B) from the motor shaft.

MS83 / MS125 / MI250



Legend
4710 Rear plate
4785 Mounting screw

- Unscrew the mounting screw (4785) and remove the rear plate (4710) from the end cover of the motor.



Legend
A Washer
B Nut
C Guiding threaded rod
D Customer shaft (with splines)
E Plastic washer

- Install a guiding screw (threaded bar) into threaded hole of the machine shaft.

  See data below for guide screw:

Motor	Screw length (mm)	Diameter (mm)
MHP20/27	650	M20 x 2.5
MS50	800	M20 x 2.5
MS83	800	M20 x 2.5
MS125	900	M20 x 2.5
MI88	1 100	M20 x 2.5
MI250	1 100	M20 x 2.5

- Lubricate the spline of the motor shaft and the machine shaft with high load molybdenum grease.
- Place the front sealing, cap and O-ring carefully on the customer shaft. For more information refer to the chapter: Mounting kit for shaft sealing and securing.

- For motor secured with torque arm: grease and install the O-ring (1495) in the groove of the machine shaft.
- Carefully pre-install the sealing cap (1431) and O-ring (1490) on the machine shaft.

Refer to chapter "2.2.2.2 - Coupling by female spline shaft" for more details about the shaft sealing kit.

NOTICE

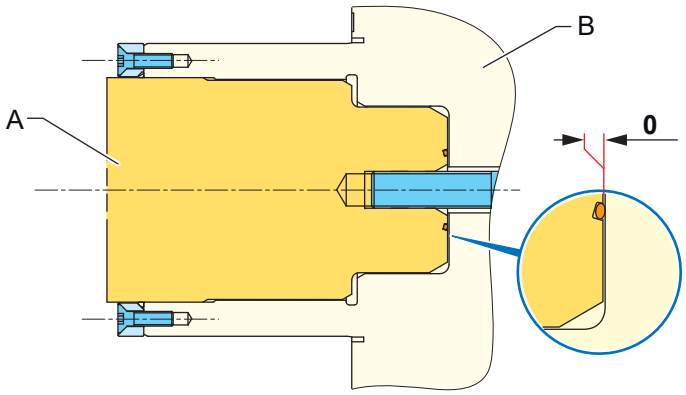
Risk of shaft seal damage!

Do not install the cap (1431) with O-ring (1490) secured to the motor shaft with the mounting screws (1416) before mounting the motor on the machine shaft, in order to avoid damaging the O-ring with the splines of machine shaft during insertion into the motor shaft.

- Lift the motor carefully.
- Let the motor go through the guiding screw until the machine and motor shafts come in contact.
- For the MS50 and MHP20/27: install a plastic washer against the rear plate of the motor to prevent damage, and then install the metallic washer over it.
- For the MS83, MS125 and MI250: install the washer (A) on the motor shaft using mounting screws.

  Washer dimensions (A):
  - Outer diameter: 140 mm.
  - Inner diameter: 22 mm.
  - Thickness : 20 mm.
- Install the nut on the guide screw and tighten it using a wrench until the motor is mounted in its final position according to the type of mounting.
  - **Torque arm mounting**

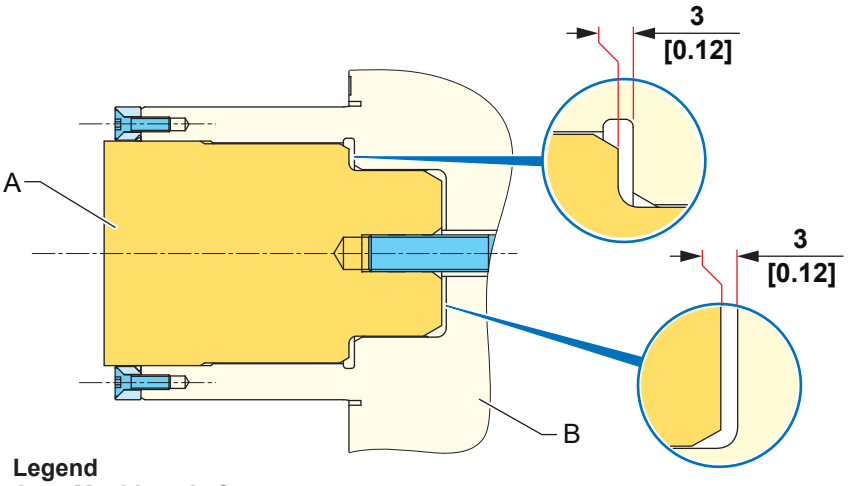
    The motor and machine shafts must be in axial contact.



Legend
A Machine shaft
B Motor shaft

– **Chassis mounting**

An axial clearance between the motor shaft and machine shaft must be allowed, to avoid additional axial loads on bearings of the motor. A clearance of 3 mm [0.12 "] is recommended.



Legend
A Machine shaft
B Motor shaft

- Remove the nut, washer(s), and guiding screw.
- Install the hex pipe (4776) (for MI250 motor only), the washer (4796) and the screw (4716).
- Tighten the hex pipe and the screw to the required torque: 580 ±58 Nm [427,78 ±42.77 ft.lbf].

Refer to chapter "2.2.2.2 - Coupling by female spline shaft" for more details about the shaft sealing kit.

- Install the plug (B) on the rear plate for MS50 or on the valving cover for MHP20/27.
- For motor MS83, MS125 and MI250: install the rear plate (4710) on the motor end cover using the mounting screws (4785). Tighten the mounting screws to the required torque: 41 ±4 Nm [31.24 ±2.95 ft.lbf].
- Carefully install the cap (1431) with O-ring (1490) in contact with the motor shaft. Then install the mounting screws (1416) and tighten to the required torque.

Motor	Torque (Nm)
MS50	25 ±3
MS83/125	49 ±5
MHP20/27	35 ±3.5
MI250	86 ±9

- For motor secured with torque arm, connect the torque arm to the machine.
- For motor mounted on a chassis, mount the motor flange on the machine frame. Tighten the mounting bolts to the required torque.

Observe the tightening torques recommended by the machine manufacturer. Poclain Hydraulics recommends calculating the tightening torques according to calculation note VDI 2230 guidelines.

2.3.1.2 - Motor with shrink disk shaft

- For motor secured with torque arm, install the torque arm on the centering diameter.
- Remove the plug (A) from the rear plate for MS50, MS83 and MS125 or from the valving cover for MHP20/27. Then remove the plug (B) from the motor shaft.
- For motors MI88 and MI250, unscrew the fixing screw and remove the rear plate of the motor.
- Pre install the shrink disk on the motor shaft according to the instructions given in paragraph "Shrink disk installation".
- Carefully lift and install the motor on the machine shaft according to the instructions given in paragraph "2.3.1.1 - Motor with female spline shaft".

NOTICE

Risk of incorrect machine coupling!

Incorrect coupling between motor shaft and machine shafts may result in abnormal behavior of the machine during operation, potentially damaging the machine.

- Do not lubricate the bore of the motor shaft or the external diameter of the machine shaft.
- Always clean and degrease the bore of the motor shaft and the machine shaft.

- Tighten the screws of the shrink disks according to the instructions given in paragraph "Shrink disk installation".
- For motors MS50, MS83 and MS125 and MHP20/27 :
  - Install and tighten the plug (B) on the motor shaft.
  - Install and tighten the plug (A) on the rear plate.
- For motors MI88 and MI250, install the rear plate using the mounting screws.
- Connect the torque arm to the machine.

2.3.2 - Removing the motor from the machine

- Disconnect all hydraulic pipes and speed sensor cable if necessary.
- Disconnect the torque arm from the machine.

Before applying the next disassembly instructions, install lifting equipment (eye bolts, slings) on the motor to secure its lifting and transportation.

WARNING

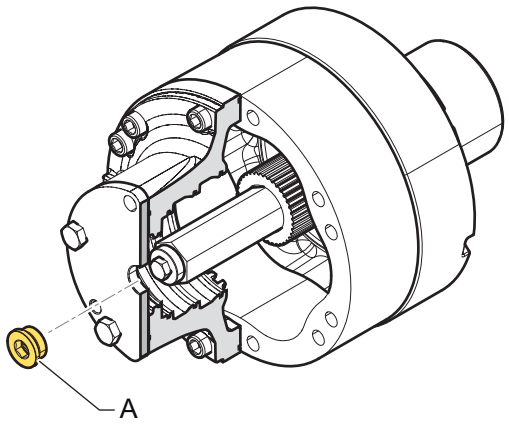
Risk from suspended loads!

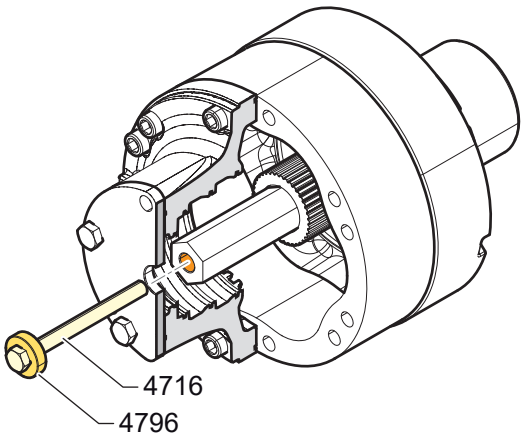
Use of improper transportation or lifting equipment may result in the motor falling, potentially causing serious injury or death.

- Always obey the safety rules, laws, and regulations in force.
- Always check that the lifting equipment is adequate for the load. Do not use lifting equipment with an insufficient load capacity rating.
- Set up a safety perimeter around the working area.
- Ensure coworkers not working on the machine / system are out of the safety zone.
- Never work under a suspended load.
- Never guide a load with your hands.
- Only use a hand to position the product accurately the machine system.
- Take care to not position fingers or hand under the load to avoid risk of crushing.
- Always wear adequate Personal Protective Equipment (PPE) such as steel-toed shoes, gloves, hard hat, safety goggles, etc.

2.3.2.1 - Motor with female spline shaft

MS50 – MHP20/27

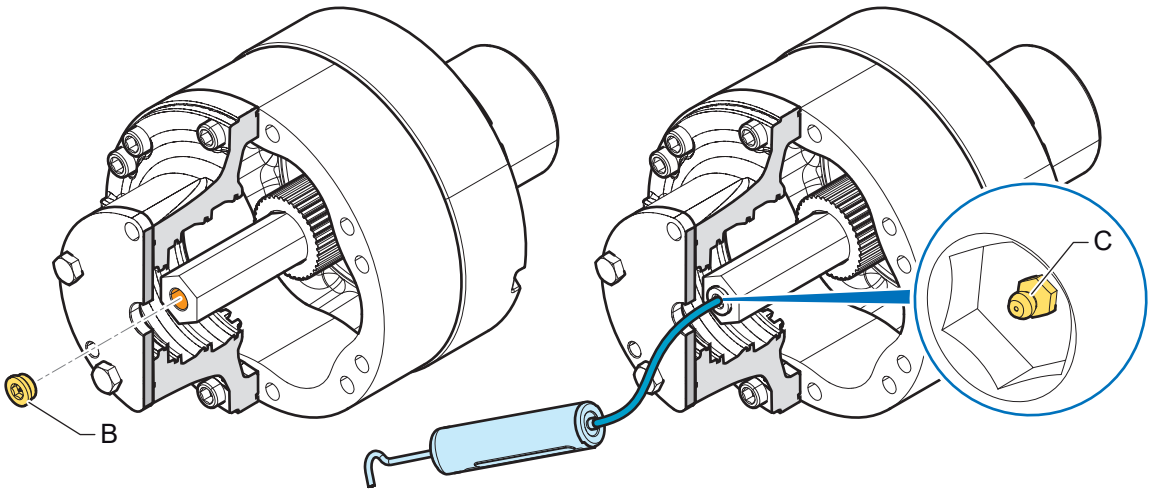




Legend

A	**Rear plug**
4716	**Hex screw**
4796	**Washer**

- Remove the rear plug (A) from the rear plate.
- Remove the hex screw (4716) and the washer (4796).
- Unscrew the mounting screws (1416) to separate the cap (1431) with O-ring (1490) from the motor shaft.



Legend
B Cap with lubricator
C Lubricator

- Install the plug (C) equipped with a grease nipple on the shaft.
- Connect a manual or electric grease pump to the grease nipple (C).
- Activate the pump to insert grease in the hole of the motor shaft.
- Under the pressure applied by the grease, the motor shaft is extracted gradually from the machine shaft. Stop pumping when the motor shaft is fully out.

⚠ CAUTION

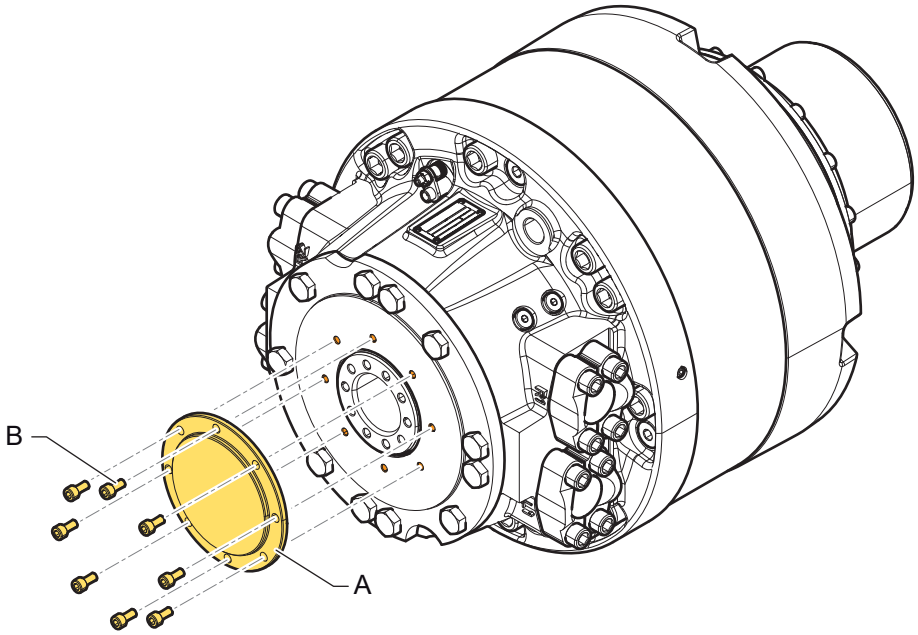
Risk of grease spillage!

During the disassembly process, grease could fall out onto the ground, and may cause pollution or put the technician at risk of slipping.

- Install a grease collection container under the motor shaft to avoid grease spillage in the machine or on the ground.
- Lay the motor on a clean surface respecting recommendations of storage.

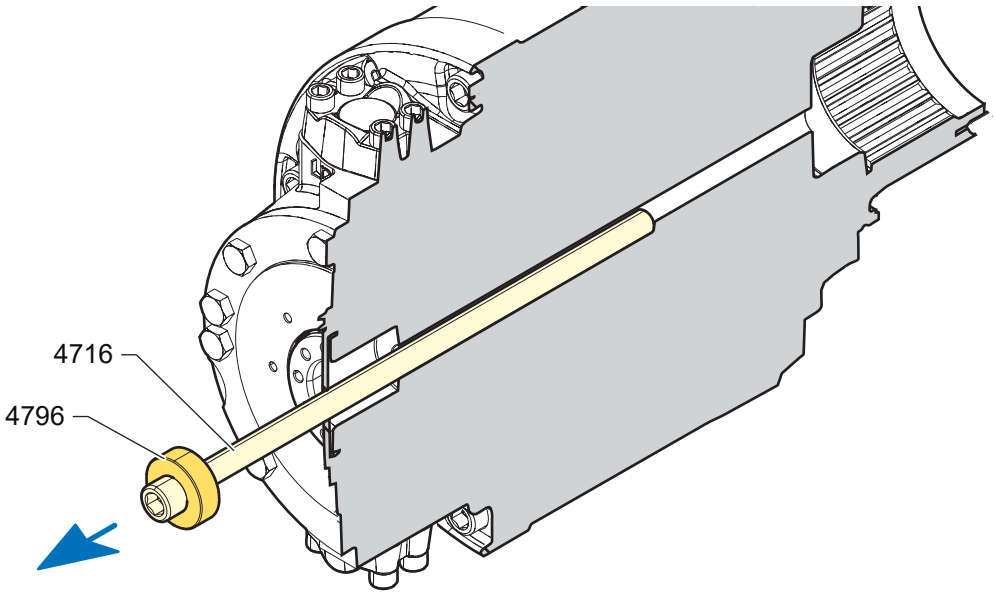
MS83 / MS125 / MI250

- Disconnect the torque arm from the machine.
- Unscrew the mounting screws (1416) to separate the cap (1431) with O-ring (1490) from the motor shaft.



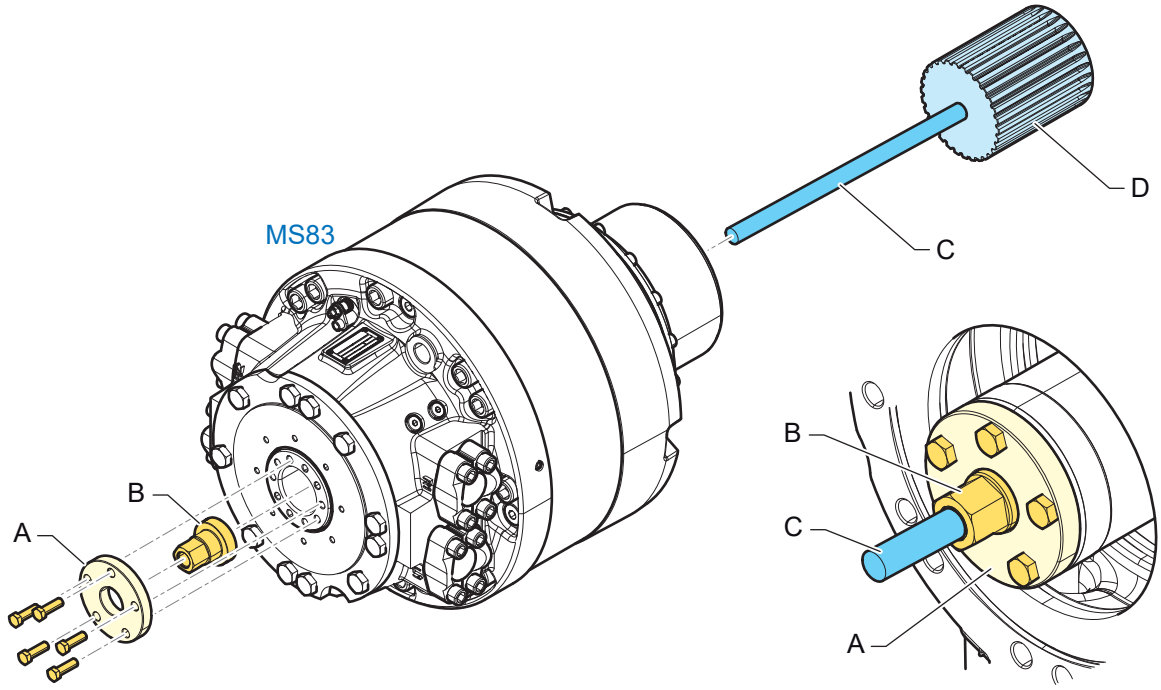
Legend
A Rear plate
B Screw

- Unscrew the mounting screw (B) and remove the rear plate (A).



Legend
4716 Hex screw
4796 Washer

- Remove the hex screw (4716) and the washer (4796).



Legend
A Washer
B Nut
C Guiding screw
D Customer shaft (with splines)

- Install a guiding screw (C) (threaded bar) onto the machine shaft (D).

> Refer to the dimensions of the threaded bar given in paragraph "2.3.1.1 - Motor with female spline shaft".

- Thread in the disassembly nut (B) by respecting its orientation.
- Fix the disassembly washer (A) with screws on the shaft of the motor.
- Rotate the nut (B) in the counter-clockwise direction to remove the motor.
- As soon as the motor shaft is out of the machine shaft (D), stop turning the nut (B).
- Remove the disassembly washer (A) from motor shaft and remove the nut (B) from the guiding screw.
- Move the motor away carefully from the machine paying attention not to damage the internal splines of motor shaft.
- Install the rear plate.
- Lay the motor on a clean surface respecting recommendations of storage.

2.3.2.2 - Motor with shrink disk shaft

- For motor fixed with torque arm, disconnect the torque arm from the machine.
- Remove the plug (A) from the rear plate for MS50, MS83 and MS125 or from the valving cover for MHP20/27.
- For motors MI88 and MI250, unscrew the fixing screw and remove the rear plate of the motor.
- Remove the plug (B) from the motor shaft.
- Install the plug equipped with a grease nipple (C) onto the motor shaft.
- Connect a manual or electric grease pump to the grease nipple (C).
- Loosen the shrink disk bolts to release the shrink fit forces on the motor shaft.
- Start pumping to insert grease into the motor shaft hole. Under the pressure applied by the grease, the motor shaft is extracted gradually from the machine shaft. If the motor does not move axially, loosen the shrink disk bolts a little more.
- Stop pumping when the motor shaft is fully out.

⚠ CAUTION

Risk of grease spillage!

During the disassembly process, grease could fall out onto the ground, and may cause pollution or put the technician at risk of slipping.

- Install a grease collection container under the motor shaft to avoid grease spillage in the machine or on the ground.

- Lay the motor on a clean surface respecting recommendations of storage.

2.4 - Hydrobasis installation

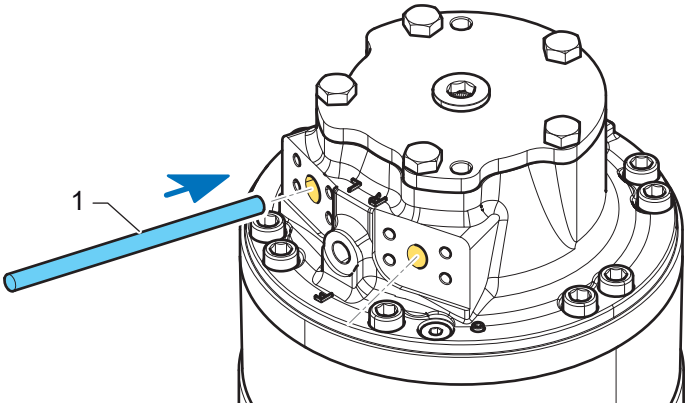
WARNING

Risk from handling a "hydrobasis" motor!

Some components of a hydrobasis motor can be mounted hold-free and could fall during handling. They can therefore cause serious injury.

The installation of a "hydrobasis" motor requires the machine interface to be designed according to the dimensional recommendations given in the interface drawings.

Consult your sales engineer for the interface drawings.



Legend
1 Soft material or plastic bar

Use soft material or plastic bar (1) to insert it through one of the ports (R/L or A/R) to valving block from falling of the valving cover.

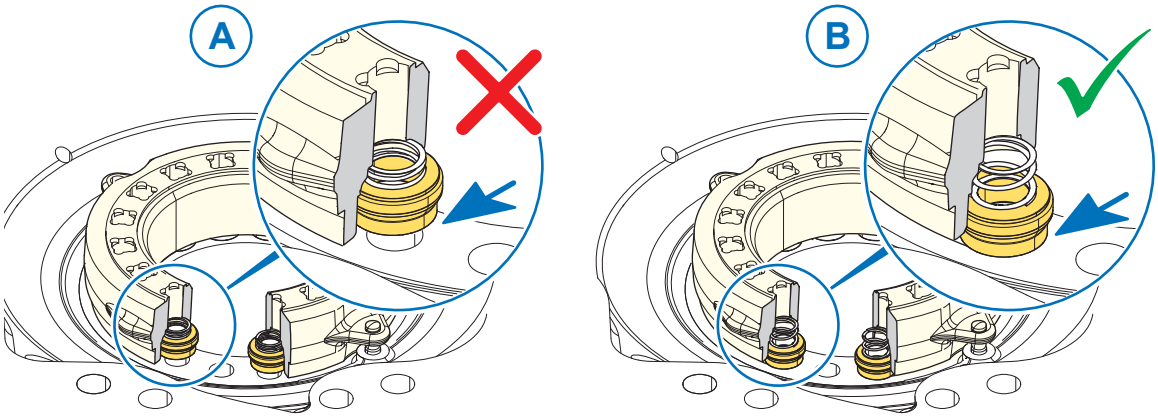
NOTICE

Risk of "hydrobasis" motor damage!

- Non-compliance with the recommendations given in the interface drawing may result in damage of the hydrobasis motor's internal components and the machine.

Checking contact of valving slippers

Hydrobasis motors MS83 and MS125 can be equipped with a valving with slippers.



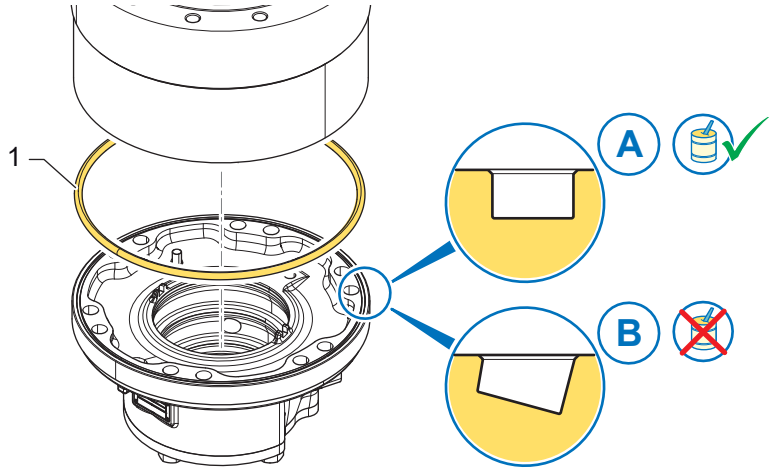
Legend
A Wrong position of a slipper in the valving
B Right position of a slipper in the valving

NOTICE

Risk of poor machine operation!

All slippers must be correctly in contact with the valving cover's surface to avoid internal leaks in the "hydrobasis" motor. Otherwise, poor machine operation could occur.

- Check that all slippers are in contact with the valving cover (B).
- Use a plastic rod to push the slippers in contact.



Legend
A Straight groove
B Autolock ™ groove

1 O-ring

NOTICE

Special care to O-ring (1) does not go out from its groove during hydrobase installation.

- (A) Straight groove :
  - Before installation O-ring (1) must be lubricated with grease.
- (B) Autolock ™ groove:
  - Never lubricate O-ring (1) before installation.

2.5 - Drum brakes

Extract from the KNOTT procedure (Ref: TM4993 and TM148_19).

Functional characteristics of hydraulic servo brakes

The functional principle of this brake is the application of the two brake shoes in the brake drum after expansion of the wheel cylinder, whereby one brake shoe (primary shoe) is driven in the direction of rotation of the brake drum, while the secondary shoe, determined by its floating suspension, rests against an upper fixed stop at the brake plate.

The resulting travel of the brake shoes is used to actuate the automatic adjuster.

2.5.1 - Automatic adjuster

Technical information 49/93.

- Automatic adjuster for hydraulic servo brakes: Functional characteristics and mounting instructions

2.5.1.1 - Function and working method

By means of an adjusting bolt (1) , the primary shoe pushes a sleeve (2) through a U-shaped bracket (3), which at the same time acts as the bearing bracket.

This thrust movement causes the adjusting lever (4) to be actuated by means of an adjusting disk (5) and to migrate to the side as the result of transmission.

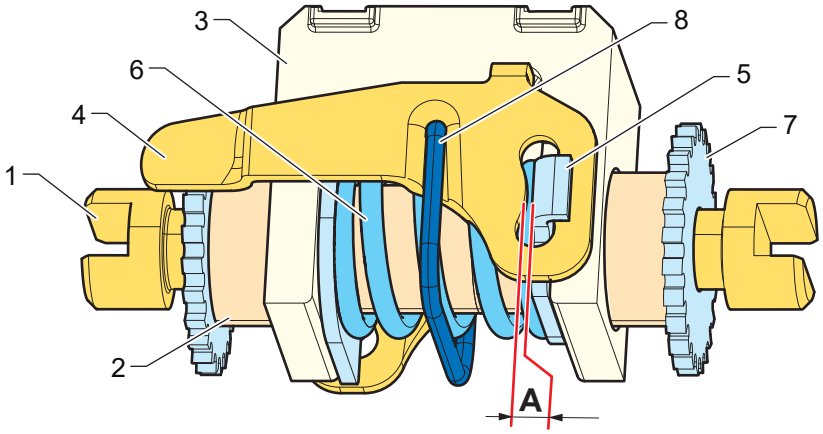
As soon as the braking process and the associated movement of the brake shoes have finished, and the shoes have returned to their ideal position supported by the compression spring (6) which at the same time serves as a centering point, an adjusting wheel (7) is rotated as a result of engagement by the adjusting lever which is tensioned by the compressed spring (8) and which is restored by the support of the compression spring (6) and the adjusting disk (5).

In this way, the adjusting bolt (1), in which the brake shoe is mounted, is unscrewed.

This adjusting process per braking action is repeated until the sliding movement of the primary brake shoe is no longer sufficient to overcome a fixed clearance marked in the adjusting lever.

This set clearance ensures that the diameter of the brake remains constantly adjustable at a certain dimension.

The automatic adjustment function is equally effective for forward or reverse travel.



Legend

1	**Adjusting bolt**
2	**Sleeve**
3	**U-shaped bracket**
4	**Adjusting lever**
5	**Adjusting disk**
6	**Compression spring**
7	**Adjusting wheel**
8	**Compressed spring**
A	**Notch**

2.5.2 - Wheel cylinder

Technical information 25/82

- Functional Characteristics and Maintenance Instructions - Hydraulic-Servo-Brakes.

2.5.2.1 - Maintenance

With every periodical brake check it is necessary to check the wheel cylinder and connecting parts for leakage.

2.5.2.2 - Repair instructions

After having dismantled the cylinder, all individual parts, as well as the casing itself, have to be thoroughly visually controlled.

For the renewal of individual parts, repair sets can be provided, whereby we strongly recommend that you exchange these sets completely and not partially.

Use only methylated spirits to clean the cylinder and its individual parts.

Never use mineral oil containing cleaning agents.

When the visual control shows deficiencies in the casing such as rust scars, grooves, or other damage, then the wheel cylinder must be exchanged completely.

After having finished the work on the hydraulic installation, check the level of the brake fluid in the reservoir, refill if necessary and finally bleed the main and wheel cylinders thoroughly.

2.5.3 - Brake shoes

Technical information 25/82

- Functional Characteristics and Maintenance Instructions - Hydraulic-Servo-Brakes.

2.5.3.1 - Maintenance and inspection

Properly speaking, the brake shoes need no maintenance. They should only be checked for damaged parts, and for the free movement of the parking brake mechanism.

The thickness of the linings has to be checked by sight control through the wear checking hole at regular intervals, depending on the use of the vehicle, but at least twice a year.

When the remaining lining thickness is small, these intervals have to be shortened correspondingly in order to avoid greater damage to the brake and drum.

Glued brake linings: Remaining thickness min. 2.0 mm at the thinnest point of the lining.

The brake lining has to be replaced according to the following instructions when these thickness have been attained.

2.5.3.2 - Repair and exchange of the brake shoes

The brake linings and shoes have to be replaced or exchange in the case of soiling, unequal wear, insufficient braking power or after having attained the minimum remaining thickness.

In order to avoid unequal braking behaviour it is necessary in all cases to replace all the brake shoes and linings of an axle.

Important!
In the case of glued linings the renewal can only be done by exchanging the brake shoes.
There is no guarantee on the brake when using other parts or gluing new linings to the shoes.

After the installation of new brake shoes or after a repair the brake has to be correctly set according to paragraph 2.5 instructions.

2.5.4 - General information

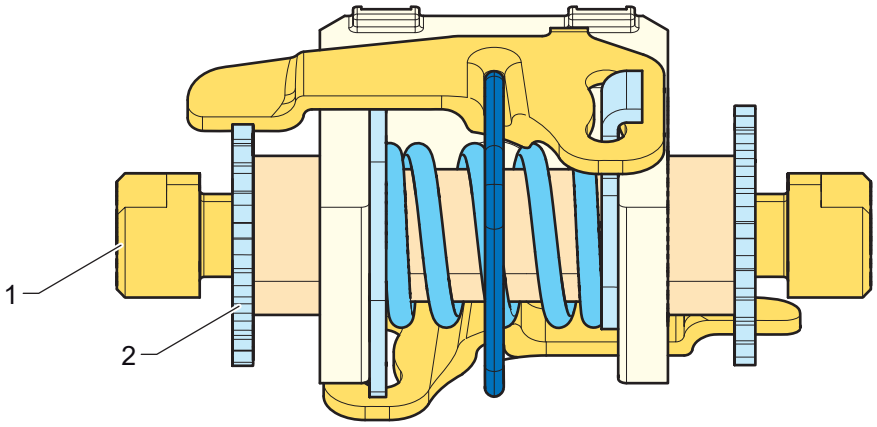
It is a matter of course that ascertained deficiencies or damage of parts not mentioned here, have to be repaired or replaced by original Knott spare parts.

Missing specifications or more detailed instructions are to be demanded from the vehicle or brake manufacturer.

2.5.5 - Maintenance and setting instructions

2.5.5.1 - Maintenance

The automatic adjuster must be examined during every periodic brake inspection by making a visual check for damaged components.



Legend
1 Adjusting screw
2 Adjusting wheel

No repairs may be carried out on the automatic adjuster. If necessary, the entire adjuster unit must be replaced.

The adjuster is largely maintenance-free.

- Grease lightly the thread of the adjusting screw (1) when dismantling the brake shoes, using a heat-resistant grease (at intervals of max. 500 hours).
- When soiled, the adjuster may only be cleaned using compressed air.

Dismantling of individual components is not permissible!
Do not readjust the brakes manually by turning the individual adjusting wheels (2).
Uneven adjustment may occur, due to limited access to both adjusting wheels.

2.5.5.2 - Setting specification

Brake setting is essential when:

- Receiving a new motor.
- Renewing, removing or mounting the automatic adjuster.
- Mounting new brake shoes and brake drums at all stages of repair.
- Repair work on the brake, whereby the basic setting of the threaded bolts has been altered at the automatic adjuster.

Setting work, as well as checking the clearance between the brake shoes and brake drum, must be carried out when the brake is cold.

The driving and parking brake must always be adjusted together.

2.5.5.3 - Setting procedure

During setting, the parking brake must be released i.e. the cables should not be tensioned.

1 • Jack up the vehicle.

2 • Release the brake cables.

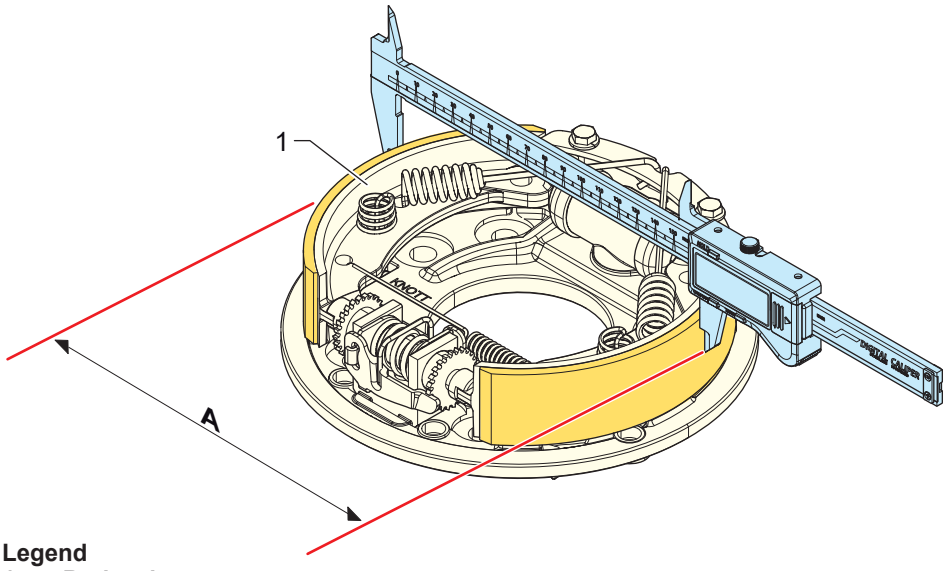
3 • Remove the brake drum.

NOTICE

Risk of automatic adjuster damage!

With run-in brake drums, remember when resetting the adjusting wheel, that it is locked by the adjusting lever.

- Do not use force.
- Carefully raise the adjusting lever using a screwdriver or similar tool through the opening in the brake plate to permit the adjusting wheel to turn freely.



Legend
1 Brake shoes

4 • Check that the brake shoes (1) are centered correctly.

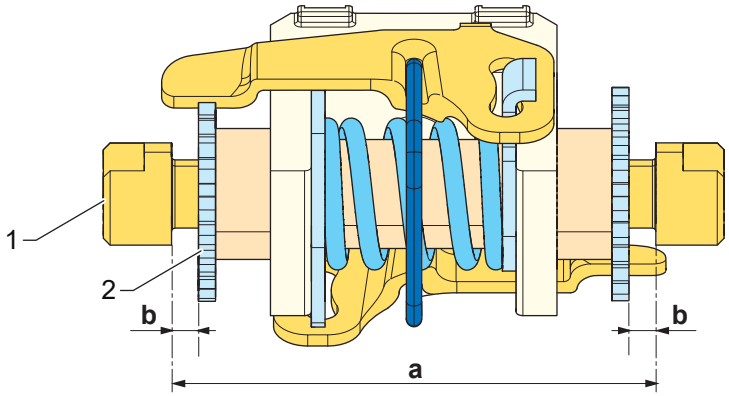
5 • Check that the diameter (A) of the brake shoes (1) matches the Knott recommendations in the table.

Brakes	Diameter of the brake shoes (A)	
	mm	in
250 x 40	248.6 ±0.3	9.79 ±0.012
203 x 60	201.8 ±0.2	7.94 ±0.008
250 x 60	248.6 ±0.3	9.79 ±0.012
270 x 60	268.6 ±0.3	10.1 ±0.012
315 x 80	313.5 ±0.3	12.34 ±0.012
350 x 60	348.5 ±0.4	13.72 ±0.016
432 x 102	430 ±0.4	16.93 ±0.016

NOTICE

Risk of automatic adjuster damage!

Precise adjustment of the relevant brake diameter is very important to the function of the automatic adjuster. An insufficiently high setting could result in damage to the adjuster.



Legend
a Adjusting measurement
1 Adjusting screw
2 Adjusting wheel

6 • If not adjust the diameter of the brake shoes with the two adjusting wheel (2).

NOTICE

Risk of wear to the two brake shoes is not identical!
During this setting work, take care to ensure an even distance "b" of the adjusting screws (1) to the relevant adjusting wheel (2).

7 • Adjust the brake cables so that the relevant brake diameter is not altered.

NOTICE

Risk of non-compliant operation of automatic adjuster!
The brake cables may not be pretensioned, because otherwise it is not possible to guarantee perfect operation of the adjuster.

8 • Mount the brake drum.

9 • Release the hexagon bolt for fastening the automatic adjuster.

10 • Actuate the brake several times to center the brake shoes / the adjuster in the brake drum.

11 • Afterwards, tighten the hexagonal screw with the following tightening torque.

Screw size	Type of fastening: Hexagonal screw Grad 8.8 With washer and spring washer		Hexagonal screw Grad 8.8 With NORD-LOCK washer		Safety screw Property Class 100 z.B. Verbus Ripp Kamax Ripp Durlok, Tensilock	
	Nm	lb ft	Nm	lb ft	Nm	lb ft
M 8	23 +5/0	17 +3.7/0	27 +5/0	20 +3.7/0	42 +5/0	31 +3.7/0
M 10	45 +5/0	33 +3.7/0	53 +5/0	39 +3.7/0	80 +5/0	59 +3.7/0
M 12	80 +10/0	59 +7.4/0	90 +10/0	66 +7.4/0	140 +10/0	103 +7.4/0
M 12 x 1.5	85 +10/0	63 +7.4/0	100 +10/0	74 +7.4/0	150 +15/0	110 +11/0
M 14	110 +15/0	81 +11/0	120 +20/0	89 +15/0	225 +20/0	166 +15/0

12 • Tighten the hand brake lever in accordance with the latch specification of the vehicle manufacturer. The wheels should be equally difficult to turn in this setting.

Adjustment of wheels that turn with difficulty and irregularly may only be performed via the brake cables,not the automatic adjuster.

13 • Lower the vehicle.

14 • Carry out approximately 10 braking processes (not emergency braking) with a starting speed of around 10 km/h in forward/reverse travel, observing the braking characteristics of the vehicle. The automatic adjuster is then ideally set.

15 • This setting procedure must always be carried out on all the vehicle's brakes.

2.5.6 - Fluid

The hydraulic brake fluid used in the brake system depends on the type of drum brake mounted on the motor. The hydraulic brake fluid may be mineral, DOT 3 or DOT 4.

Consult the technical catalogs for the type of brake fluid used in the motor drum brake.

WARNING

The drum brake may not provide sufficient brake torque!

Improper use of drum brakes may cause risk of injury and death.

- Ensure the hydraulic brake fluid used complies with the drum brake specifications.
- Ensure the brake system circuit is separate from the motor's hydraulic circuit.
- Check that there is no grease or oil on the friction surface of brake drum or brake shoe linings. If there is, identify and eliminate the source of grease or oil leakage. Replace the brake shoes.
- Do not apply chemical products or oil onto the brake shoe linings or brake drum.

CAUTION

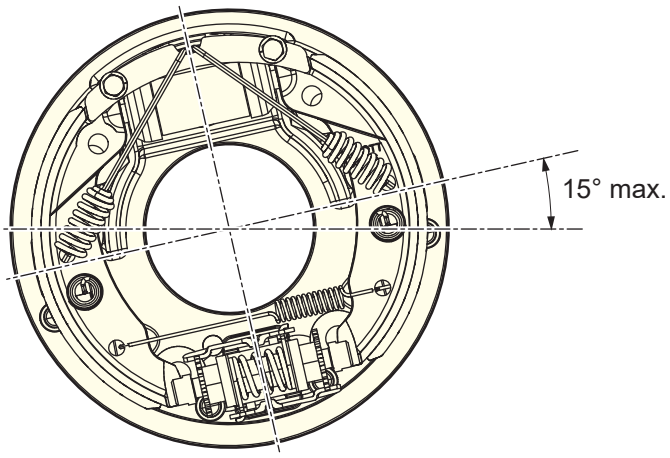
Risks related to the use and handling of hydraulic brake fluid!

The use and handling of hydraulic brake fluid may cause health hazards such as eye and skin injuries or poisoning.

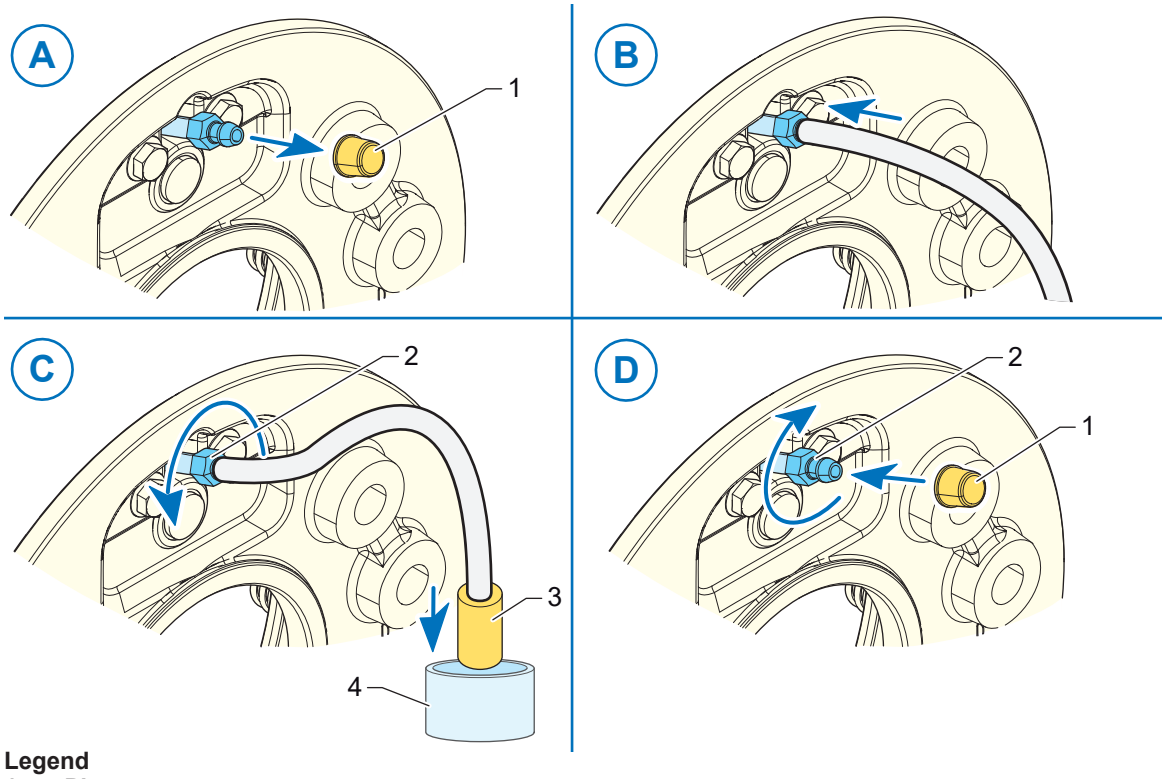
- Always follow the safety instructions provided by the hydraulic brake fluid manufacturer.
- Avoid all contact with hydraulic brake fluid.
- Always wear adequate personal protective equipment (protective gloves, suitable protective clothes, safety goggles, safety footwear).
- If hydraulic brake fluid comes into contact with eyes or skin, flush immediately with water and then seek medical advice.
- In case of ingestion or inhalation of hydraulic brake fluid, obtain medical attention immediately.

2.5.7 - Drum brake orientation

To facilitate the bleeding of the drum brake wheel cylinder, the motor should be attached to the chassis with an inclination.



2.5.8 - Bleeding of drum brake wheel cylinder



Legend
1 Plug
2 Bleed screw
3 Check valve
4 Glass container

Always start bleeding from the drum brake furthest from the brake control actuator.

⚠ CAUTION

Risks associated with the use and handling of brakes controlled by a hydraulic brake valve with an external, continuous power source!

- Reduce supply pressure and/or limit brake control to bleed the brakes at very low pressure.

- For systems using mineral fluid, activate the flow source, or charge the hydraulic accumulator or the brake circuit.
- Remove the plug (1).
- Install one end of a plastic tube equipped with a check valve (3) (to avoid allowing air into the circuit) over the brake bleed screw (2). Put the check valve (3) in a glass container (4).
- Completely fill the reservoir of the master cylinder with hydraulic brake fluid (for systems using DOT fluid).
- Loosen the bleed screw (2) between a quarter turn and half turn.
- Slowly and fully depress the brake pedal several times until the hydraulic brake fluid comes out of the wheel cylinder free of air bubbles.
- For DOT fluid, it is also possible to use a brake fluid bleeder system by modulating the pressure to follow the recommendations of the DOT fluid tank manufacturer.

NOTICE

Risk of air intake into the brake system!

During this "pumping" step with the brake pedal, take care concerning the level of hydraulic brake fluid in the master cylinder reservoir. If it were to empty completely, air would enter the circuit again, and the bleeding operation must be started again.

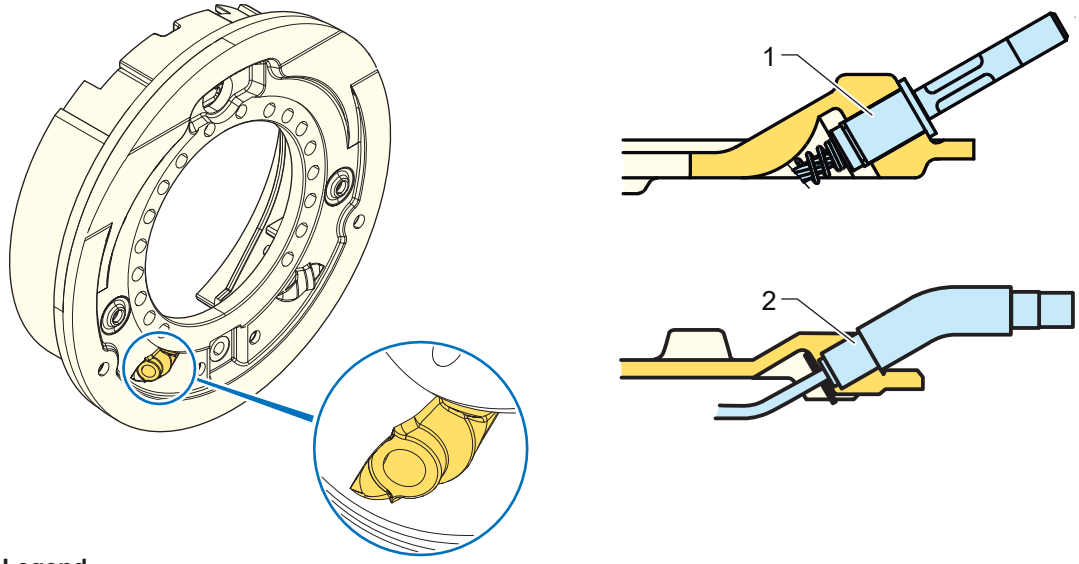
- Tighten the bleed screw (2) to 5 ±1 Nm [3.7 ±0.7 lbf.ft] using a torque wrench.

Recover and recycle the brake fluid.

2.5.9 - Cable

The drum brakes can be controlled mechanically by a cable (control for parking brake).

2.5.9.1 - Cable placement



Legend
1 Screw-down receptor
2 Hook

There are two types of attachment:

- By screw-down receptor (1).
- By hook (2).

- Refer to the interface drawing of the motor for brake cable characteristics.
- Pay attention to the location of the brake cable outlet (left or right).
- Refer to the model code of motors described in the technical catalogs to determine the location of the brake cable outlet.

Provide sufficient clearance for the control cable to ensure correct operation of the drum brake when the motor is in extreme positions (wheel motor fully turned).

2.5.9.2 - Adjusting the parking brake cable

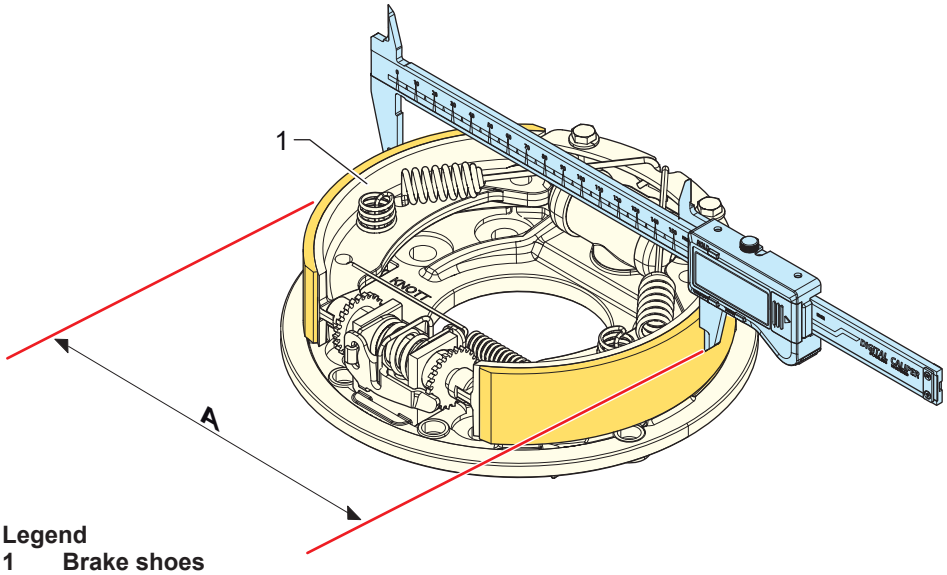
WARNING

Risk of machine movement due to parking brake not yet being operational!

Risk of injury or serious injury and risk to life.

- Installation of the parking brake cable must be carried out when the machine is either on chocks on level ground or on an assembly line.

- Poclain Hydraulics recommends the use of a Knott brake cable.
- The cable must be connected to the control system before adjustment.

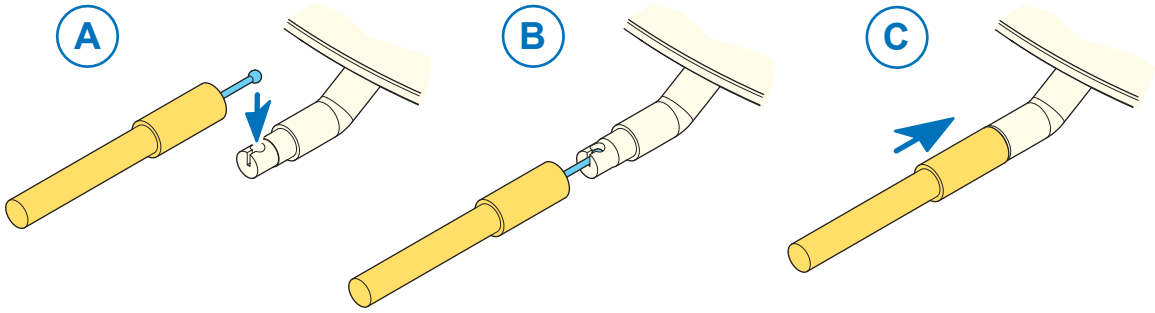


Legend
1 Brake shoes

- Remove the drum.
- Check that the brake shoes (1) are centered correctly.
- Check that the diameter (A) of the brake shoes (1) matches the Knott recommendations.

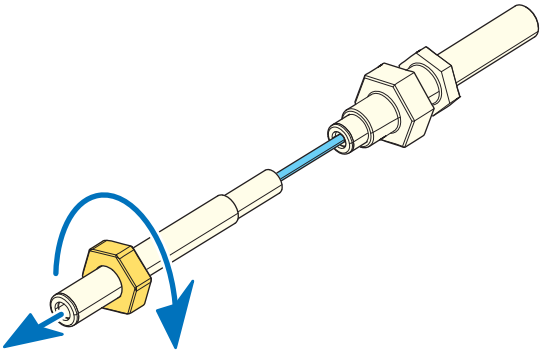
Brakes	Diameter of the brake shoes (A)	
	mm	in
250 x 40	248.6 ±0.3	9.79 ±0.012
203 x 60	201.8 ±0.2	7.94 ±0.008
250 x 60	248.6 ±0.3	9.79 ±0.012
270 x 60	268.6 ±0.3	10.1 ±0.012
315 x 80	313.5 ±0.3	12.34 ±0.012
350 x 60	348.5 ±0.4	13.72 ±0.016
432 x 102	430 ±0.4	16.93 ±0.016

- Position the cable on the designated receptor at the brake output (there are two types of fixture).



- Check that the handbrake lever of the vehicle is in the released position.

- Secure the threaded end of the drum brake cable onto the handbrake lever connection. Screw the adjusting nut to tighten the brake cable until all the cable slack is removed without movement of the brake shoes.

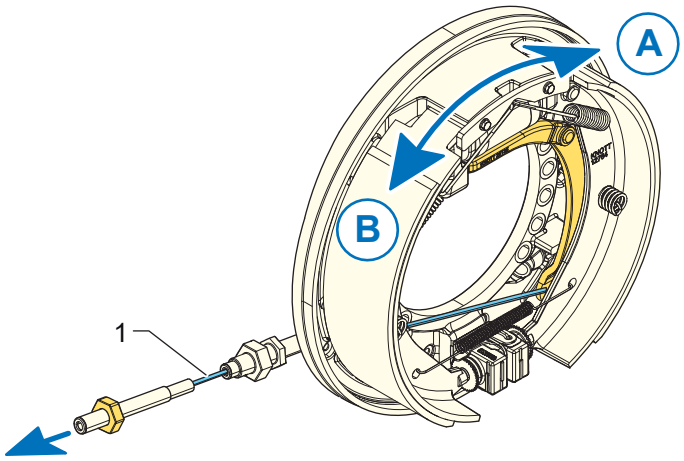


NOTICE

Risk of improper drum brake setting!

If the brake shoes cannot freely return to their resting position, the operation of the slack adjuster will be ineffective.

- Lock the adjusting nut in position using a lock nut.
- Check the traction force of the cable (braking torque / traction on the cable).



Legend
1 Cable

Brakes	250 x 40		203 x 60		250 x 60		270 x 60		315 x 80		350 x 60		432 x 102	
	Nm	N	Nm	N	Nm	N	Nm	N	Nm	N	Nm	N	Nm	N
A	*	*	2 000	987	2 000	548	1 500	482	5 000	1 362	5 000	1 135	10 000	1 844
B	*	*	2 000	1 148	2 000	567	1 500	541	5 000	1 605	5 000	1 309	10 000	2 133

(*) No parking brake.

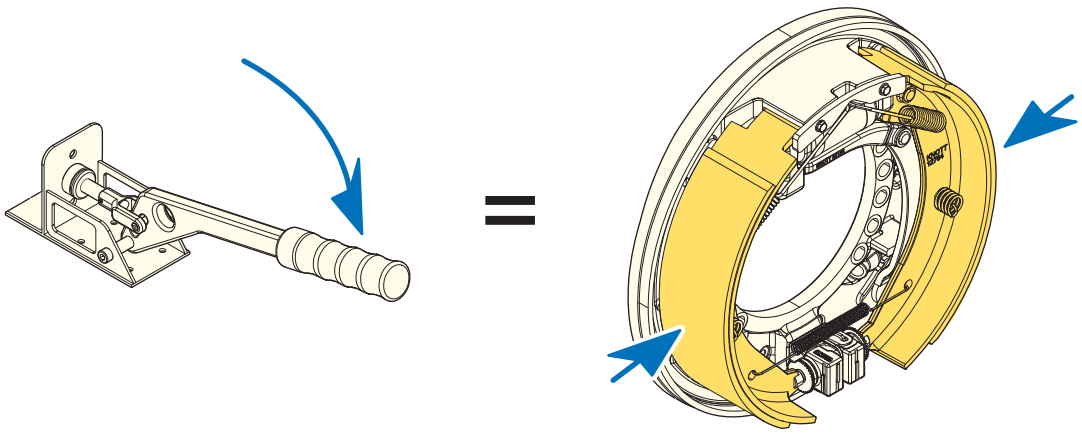
- Perform the parking brake tests using the handbrake lever.

When the handbrake lever is in the released position, the brake shoes must return to the resting position against the backing plate (wheel cylinder side).

- Reinstall the drum.
- Test the parking brake in a safe area, on a slight slope, and then on a steep slope.

For brakes with automatic wear adjustment, do not retighten the parking brake cable.

2.5.9.3 - Parking brake with drum brakes



WARNING

Risk from incorrect servicing of brakes!

Incorrect servicing of drum brakes may result in a malfunction of the parking brake,causing risk of injuries or risk to life.

- The laws in some countries require mobile engine manufacturers to define a procedure that indicates the conditions for servicing the brakes.

Risk from undue force on the brake cable!

Undue force on the brake cable may result in a malfunction of the parking brake,causing risk of injuries or risk to life.

- Do not exceed the maximum allowable force on the cable, in order to ensure effective action of the parking brake.

Risk due to frequent dynamic braking actuated by brake cable!

Repeated use in dynamic braking of the drum brake actuated with the brake cable causes irregular wear of the brake linings, and the automatic adjuster may not operate correctly. This could result in a malfunction of the drum brake,causing risk of injuries or death.

- Use the drum brake with the cable for emergency braking only.
- Never use the cable for dynamic braking during normal machine operation. Use the hydraulic brake system.

Refer to the "Brakes" tab in the MS Motors technical catalog to find the maximum allowable stress on the brake cable.

2.5.10 - Running-in of the drum brake

Extract from the KNOTT documentation (Ref: TM 122/10).

WARNING

Risk from insufficient drum brake torque!

An improper running-in of drum brake linings can prevent optimal braking of the machine. This may result in a risk of injuries or death.

- It is mandatory to apply the running-in procedure to a new drum brake or after replacing the brake linings.

Due to the fact that new brake linings don't have their full brake performance, is it necessary with competent running-in of the brakes and therewith the burnishing of the brake linings to ensure that the friction system between brake drum and brake linings optimally works.

The running-in process must be performed on machined as well as unmachined surfaces of the brake linings.

The purpose of the running-in process has two fundamental targets:

1 • To adapt the lining geometry at the brake drum.

2 • Creation of the so-called reaction layer from carbonised surface.

According to the lining type, a different temperature target must be reach during the running-in:

Drum brake type	Motor type	Target temperature of the lining surface in contact with the drum
200 x 40 Beral 1106 rolled flexible band mat	MS02 MSE02	200 to 250 °C [392 to 482 °F]
203 x 60 Jurid 421 pressed lining	MS02 MSE02	300 to 350 °C [572 to 662 °F]
250 x 60 Beral 1117 rolled flexible band mat	MS05 MSE05	200 to 250 °C [392 to 482 °F]
270 x 60 Beral 1109 rolled flexible band mat	MS08 MSE08	200 to 250 °C [392 to 482 °F]
315 x 80 Beral 1518 pressed lining	MS08 MSE08 MS11 MSE11	300 to 350 °C [572 to 662 °F]
350 x 60 Beral 1109 rolled flexible band mat	MS018 MSE18	200 to 250 °C [392 to 482 °F]
432 x 102 Beral 1109 rolled flexible band mat Jurid 505 pressed lining	MS18 MSE18 MS25 MS35 MS50	Consult your application engineer to determine the brake lining type used. ■ 200 to 250 °C [392 to 482 °F] (For rolled flexible band mat) ■ 300 to 350 °C [572 to 662 °F] (For pressed lining)

NOTICE

Risk of brake lining damage!

It is important to not exceed the target temperature.

Generic running-in procedure

WARNING

It is necessary to carry out sufficient tests under real operation conditions, especially to confirm thermal behaviour of the brakes, measurement methodology, and suitability of the running-in procedure with the application.

For more information, consult your application engineer.

If the temperature measurement is realized on the outer surface of the drum, it is necessary to carry out sufficient tests under real operation conditions to correlate drum surface temperature and lining temperature.

1 • Run the hydraulic motor and maintain its speed at 50 rpm.

2 • Activate the brake for about 3 to 5 seconds with a control pressure of 60 bar maximum.

3 • Release the brake for about 20 seconds.

Repeat steps 2 to 3 in both rotating directions until the temperature of the lining surface in contact with the drum reaches the target value shown in the table above.

Total duration of the procedure: between 5 and 10 minutes. It is necessary to give priority to short braking (maximum 5 seconds) and repetition to reach the degassing temperature (2 to 3 cycles per minute).

Automatic adjusting device of the gap between the brake linings and the drum is activate automatically during dynamic braking realized in both rotation direction during the running-in process.

4 • Running-in check:

- Brake linings at ambient temperatures.
- Brake the machine to the maximum available operating pressure and check that the brakes reach the expected performance (deceleration, holding the machine on a slope, engine torque holding with motor under pressure ... etc..).

2.6 - Multidisk brake

Poclain Hydraulics multidisk brakes are designed to be used in static mode for parking or in dynamic mode during machine operation.

2.6.1 - Parking brake release

WARNING

Risk from parking brake release!

When the parking brake is released, the machine could move freely and cause injuries or risk to life.

- Perform parking brake release on a level surface.
- Nobody should stand in the danger area of the machine or system.
- To use the system as a winch, place the load on the ground.

This operation may be necessary when mounting the motor or in certain cases for moving a machine.

Brake release will depend on the type and size of the motor. Refer to the table below:

Mechanical or hydraulic release.

Hydraulic release only.

For MS/MSE motors

	MS02 MSE02	MSE03	MS05 MSE05	MS08 MSE08	MS11 MSE11	MS18 MSE18	MS25	MS35	MS50	MS83	MS125
C12					■	■		■			
F03/T03	■	■									
F04/T04			■								
F05			■								
F08/T09				■							
F12/T12					■	■		■			
G12						■					
F19/T19						■		■			
P21/P35							■	■	■		
F42/T42							■	■	■		
F50/T50							■	■	■	■	
F83/T83									■	■	■

For MK/MKE motors

	MK04	MK05	MK09	MK12 MKE12	MK16	MK18 MKE18	MK23 MKE23	MK35	MK47
K04	■								
K05		■							
F04/T04		■							
F07		■							
F08			■						
F12/T12						■			
F19/T19						■			
Bearing				■	■		■	■	■

For MHP motors

	MHP11	MHP13	MHP17	MHP20	MHP27
C27				■	■
P17	■	■	■		
P20				■	
P27				■	
S17	■	■	■		
S20				■	■

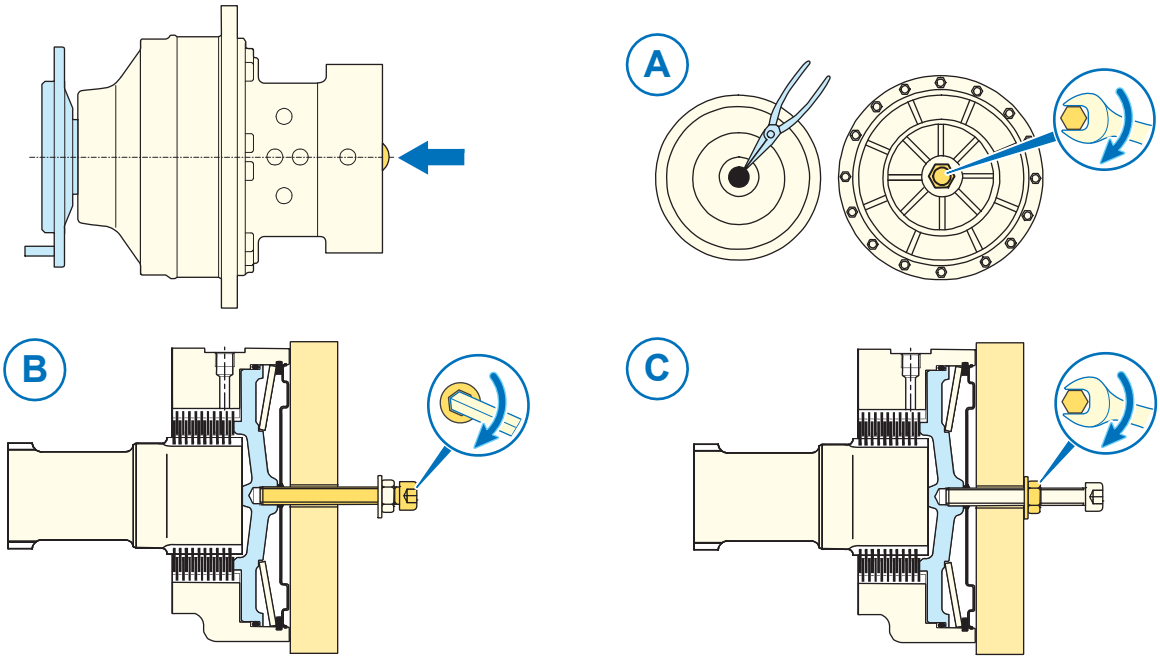
For ML motors

ML06
■

For ES / ESE motors

ESE02	ES05	ES08
■	■	■

2.6.1.1 - Mechanical brake release



- (A) Depending on the brake design, extract and discard the rubber plug or loosen the metallic plug from the brake cover.
- (B) Install the mandrel in contact with the brake.
- Fully tighten the screw equipped with washer and nut in the threaded hole of the brake piston.
- Lubricate the screw thread and the contact surface of the nut and washer.
- (C) Then tighten the nut while holding the screw until the motor shaft turns freely.

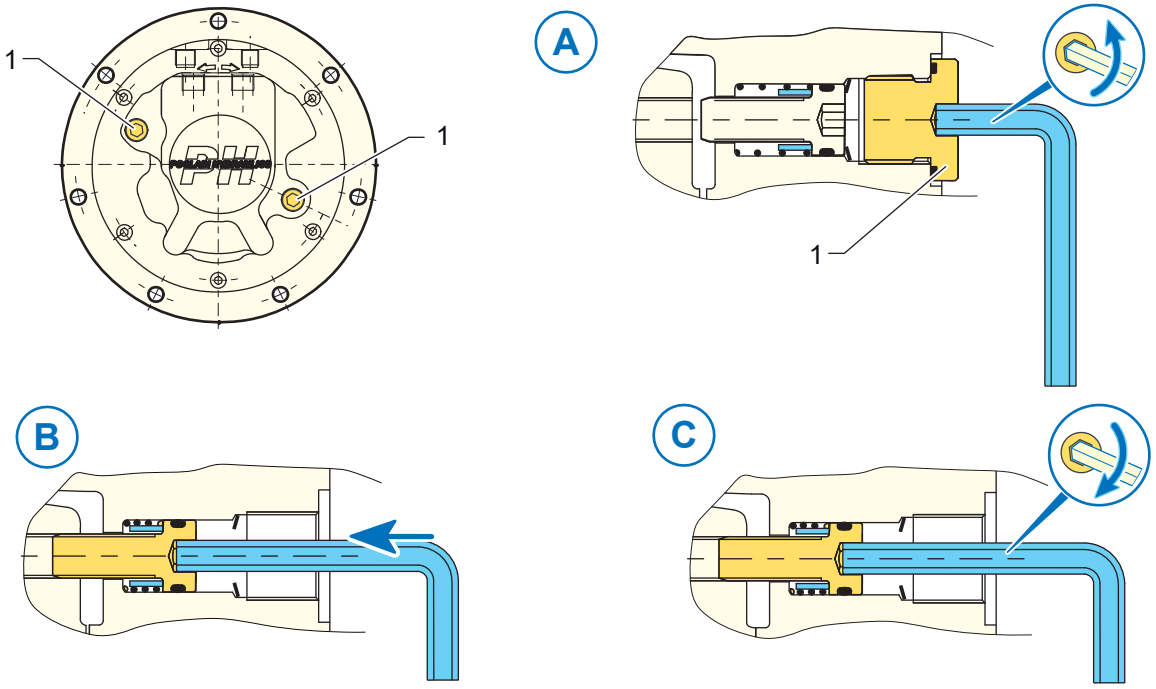
After releasing, insert a new rubber plug or retighten the metallic plug according to the tightening torque (refer to table below).

Metallic plug required tightening torque:

Brake	Torque (Nm)
T03 / T04	60 ±5
T09 / T11 / T12 / T19 / T26 / T30 / T35 / T42 / T50 / T80 / T83	40 ±4

For MK 04 (Option 3)

The brakes should be mechanically released alternately and gradually on the two screws.

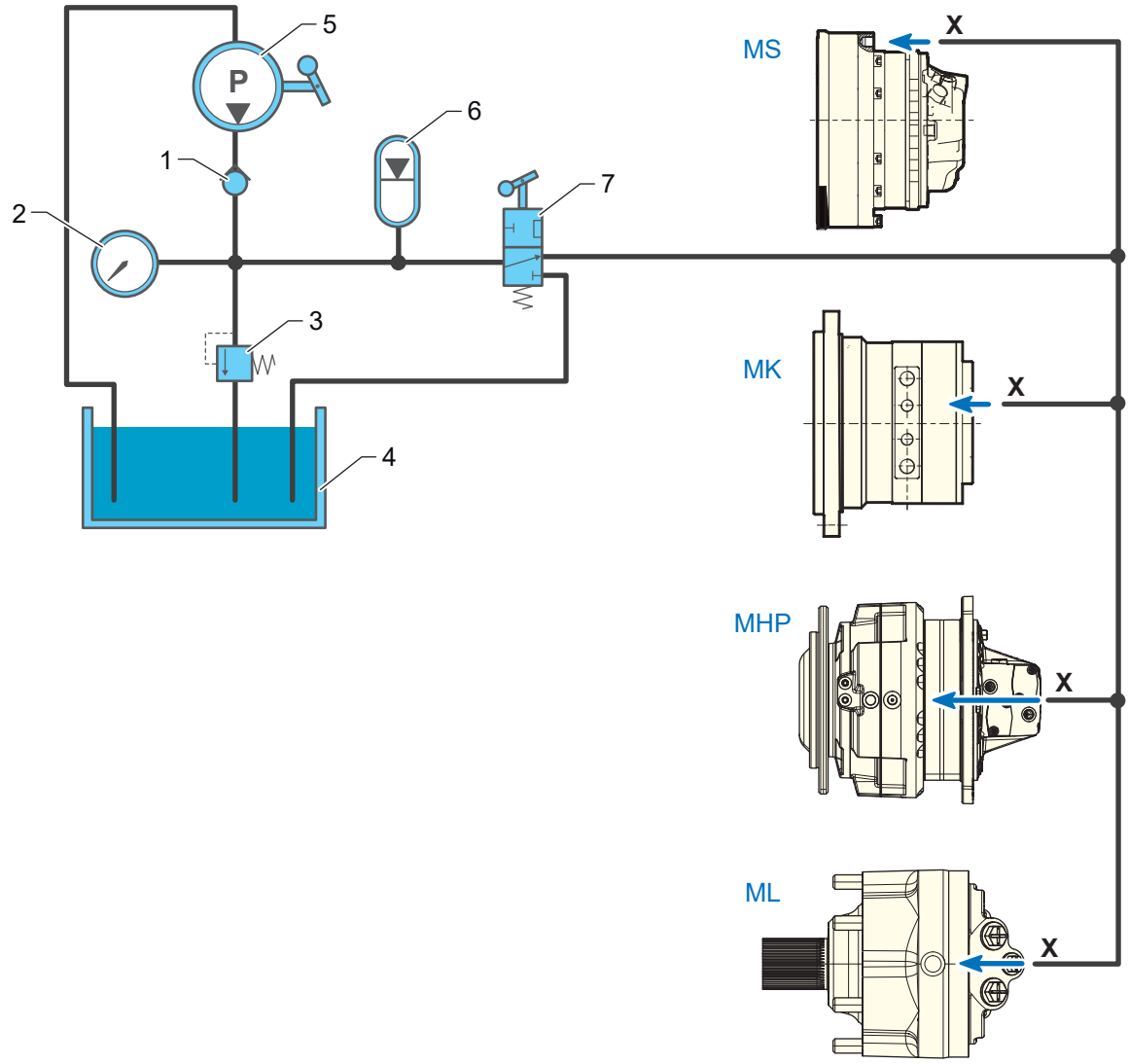


Legend
1 Metallic plug

- (A) Unscrew the metallic plug (1).
- (B) Press the spring screw to engage it in the brake piston internal threading.
- (C) Now tighten the screws alternately and gradually until the motor shaft turns freely.

After releasing, retighten the metallic plug (1).

2.6.1.2 - Hydraulic brake release



Legend

1	Check valve
2	Manometer 0 - 100 bar [0 - 1450 PSI]
3	Safety valve rated at 30 bar [435 PSI]
4	Tank (1 liter minimum) [61 cu.in minimum]
5	Pump
6	Hydro pneumatic accumulator
7	Drain valve

2.6.1.3 - Brake release pressure

WARNING

Risk from braking efficiency loss!

An insufficient release pressure may not allow full brake release and may cause premature wear of the brake disk linings.

- Take care to observe the recommended brake release pressure.

Brake release pressure	
Min.	Refer to the corresponding catalogs.
Max.	30 bar [426 PSI].

Refer to the technical catalogs to find the volume required for proper parking braking.

2.6.1.4 - Parking brake efficiency check

WARNING

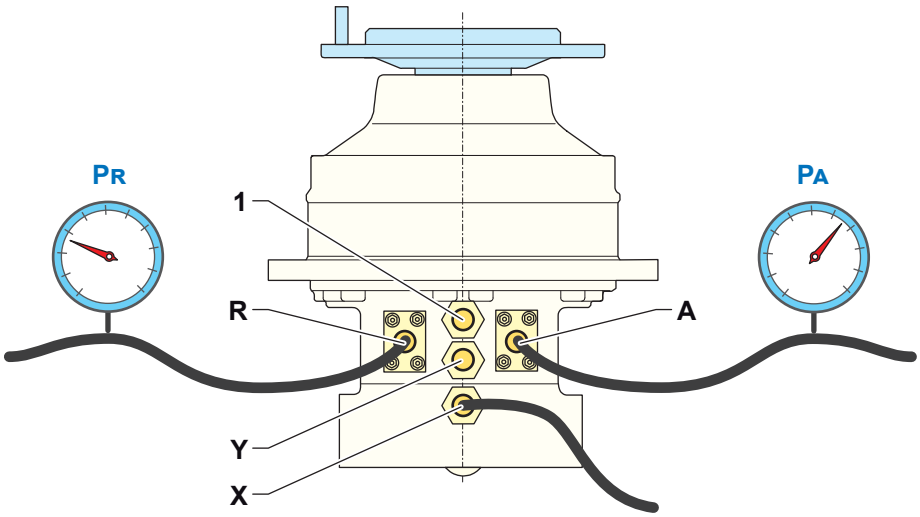
Risk from insufficient parking brake torque!

Incorrect use of parking brakes may cause risk of injuries and death.

- Ensure the brake system is compliant with the machine specifications.
- Ensure the brake system circuit is separate from the motor's hydraulic circuit.
- Perform the efficiency test on a level surface.
- Nobody should stand in the danger area of the machine or system.

Do not run-in the multidisk parking brakes.

The goal of this test is to check that parking brake torque is compliant.



- Connect a hose to the brake's supply port X.
- Connect hoses to the motor's supply port A and R.
- For a dual displacement motor, leave the Y two-speed shift spool port in open air.
- Leave the 1 drain port in open air.
- Supply pressure to the brake.
- Shut off the brake release pressure. Make sure that the brake release pressure is zero.
- Gradually increase the motor main supply pressure until the pressure limit (PA).

Consult the machine manufacturer's specifications to find out the pressure limit.
The motor pressure limit may be calculated theoretically by applying the formula below:

$$\Delta P = \frac{C}{15.9 \times 0.9 \times Cyl}$$

- **ΔP**: Pressure limit for the brake test, in bars. This value is the difference between the supply pressure PA and the return line pressure PR. For a result in PSI, multiply by around 14.5.
- **C**: Residual parking brake torque (in case the brake had been used dynamically), in Nm, defined in the associated technical catalog. If this value is not indicated, subtract 25% from the value of parking brake torque (new brake).
- **15.9**: Coefficient.
- **0.9**: Typical mechanical efficiency.
- **Cyl**: Motor displacement, in l/rev, defined in the associated technical catalog.

NOTICE

Risk of motor damage!

Never exceed the maximum motor operating pressure indicated in the technical catalog, to avoid internal damage to the motor.

- The motor shaft must not turn; otherwise the brake assembly must be checked.

2.6.1.5 - Holding test of brake release pressure in the parking brake

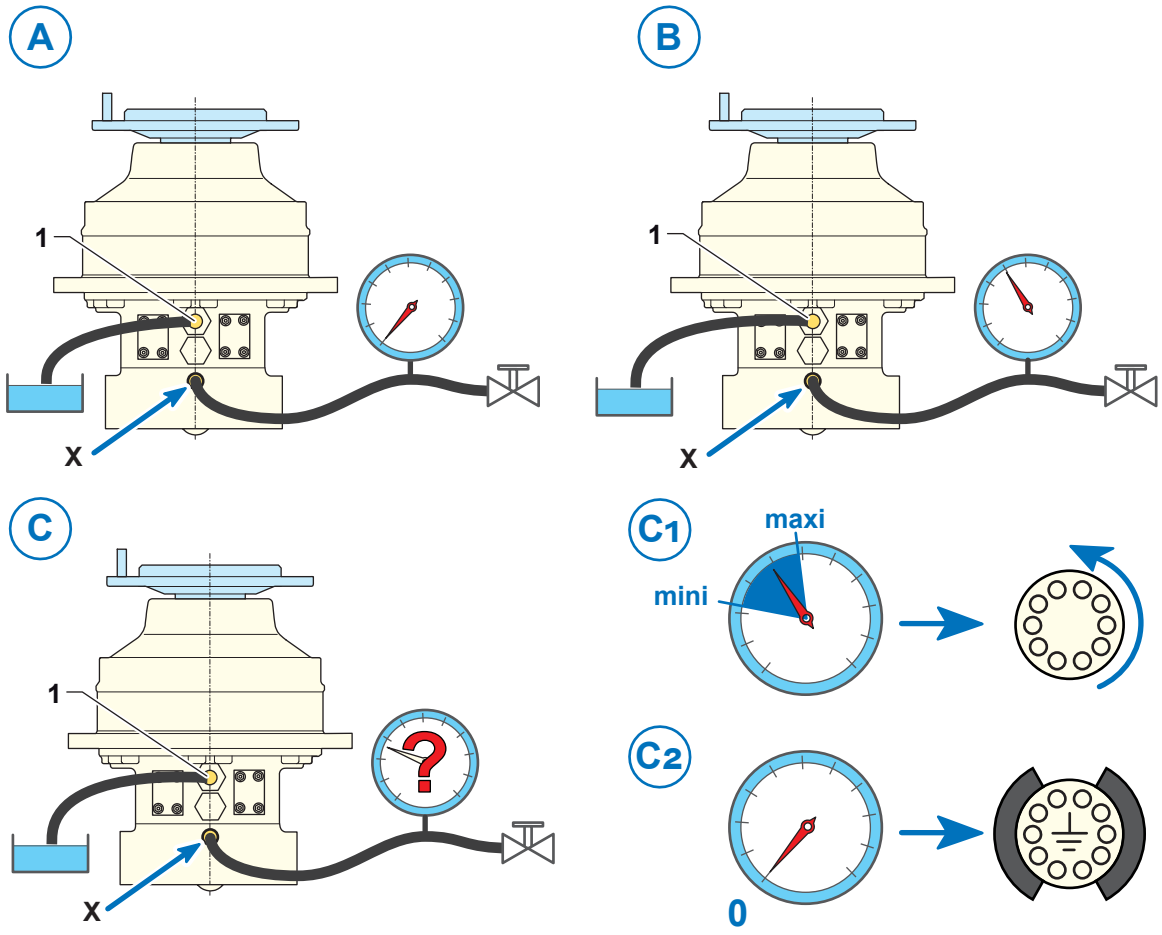
WARNING

Risk from parking brake release!

When the parking brake is released, the machine could move freely and cause injuries or risk to life.

- Perform parking brake release on a level surface.
- Nobody should stand in the danger area of the machine or system.
- To use the system as a winch, place the load on the ground.

The goal of this test is to check that the minimum release pressure is held to allow proper brake release.



- (A) Connect a hose equipped with a manometer and a stop valve to the brake's supply port X.
- (B) Gradually increase the brake's supply pressure up to its brake release pressure.
- Stop the supply to the brake by closing the stop valve.
- (C) Wait 5 minutes and check the pressure indicated on the manometer.
  - Confirm that the residual brake release pressure is between the minimum and maximum pressure (C1).
  - If the pressure is below the minimum pressure or close to 0, check the condition of the brake shaft seal (C2).

- Brake release failure is often due to faulty operation of the brake release valve.
- To avoid back pressure on the brake, it is necessary to connect the drain (1) to the tank.

2.6.2 - Service brake

WARNING

Risk from service braking efficiency loss!

Excessive residual braking pressure may cause premature wear of the brake disk linings, resulting in poor braking behavior of the machine.

- Check that the residual pressure in the service brake chamber does not exceed the motor case pressure during machine operation without actuated service braking.

- Refer to the technical catalogs to find the volume required for proper service braking.
- Do not run-in the multidisk service brakes.

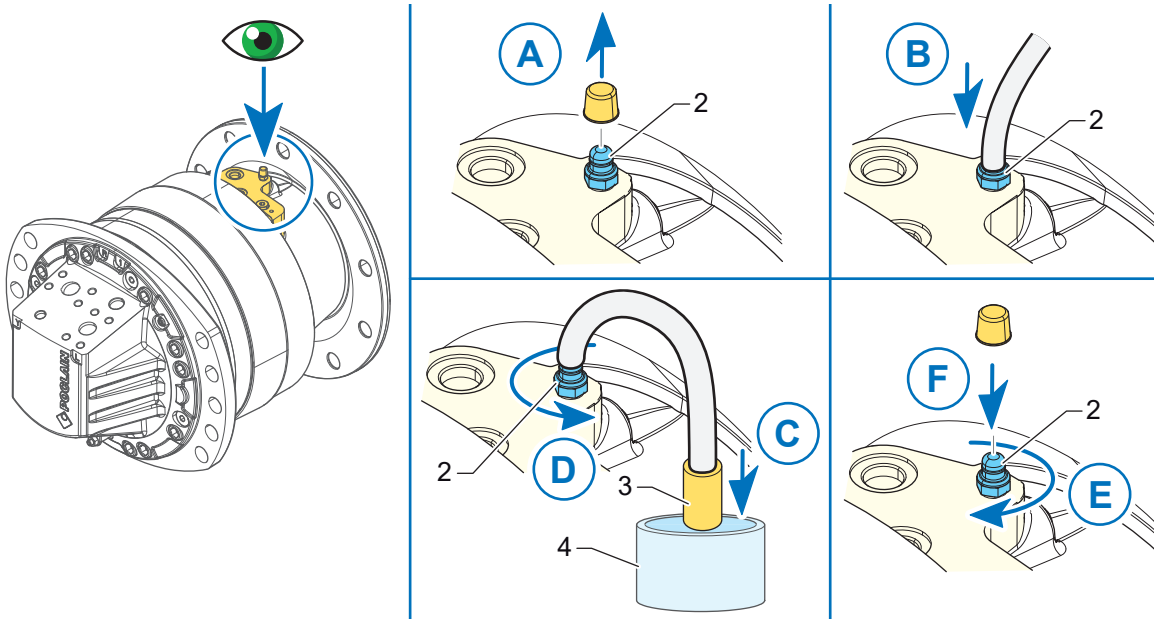
2.6.3 - Orientation of the multi-disc brake

To facilitate bleeding the brake, the hydraulic motor should be attached to the frame in such a way that the bleed screw (or one of the bleed screws) is on top of the brake body.

2.6.4 - Bleeding the multi-disc brake chamber

This paragraph is intended for service brakes.

For parking brakes, refer to paragraph 4.4 on page 183.



Legend
1 Plug
2 Bleed screw
3 Check valve
4 Glass container

Always start bleeding the multi-disc brake the furthest from the brake control actuator.

- For systems using mineral fluid, activate the flow source, or charge the hydraulic accumulator or the brake circuit.
- Remove the plug (1).
- Install one end of a plastic tube equipped with a check valve (3) (to avoid allowing air into the circuit) over the brake bleed screw (2). Put the check valve (3) in a glass container (4).
- Loosen the bleed screw (2) between a quarter turn and half turn.
- Slowly and fully depress the brake pedal several times until the hydraulic brake fluid comes out of the wheel cylinder free of air bubbles.

CAUTION

Risks associated with the use and handling of brakes controlled by a hydraulic brake valve that has an external, continuous power source.

- Decrease supply pressure and/or limit brake control to bleed the brakes at very low pressure.

- Tighten the bleed screw (2) to 18 ±2 Nm [13.28 ±1.48 lbf.ft] using a torque wrench.

Recover and recycle the brake fluid.

2.7 - Disc brake

The disc brake is designed to be used in service brake mode while the machine is running. This brake is used on the motor type MS02/MSE02.

WARNING

Danger of loss of service brake effectiveness!

Excessive residual brake pressure can cause premature wear of the brake disc linings and poor machine braking performance.

- Check that there is no residual pressure in the service brake while the machine is running without the service brake being applied.

Warning! The use of other parts or the gluing of the brake linings voids the warranty.
The brake must be adjusted correctly after any installation of new brake linings or repairs.

- Any defects or damage found which are not mentioned below must of course be rectified, or the parts in question must be replaced with spare parts of the same origin.

2.7.1 - Technical information

Disc

The replacement of the disc is mandatory if its thickness is less than 8.2 mm.

Brake pads

Brake pads are maintenance-free, only a check for damage is necessary. The thickness of the brake pad should be checked visually at regular intervals.

In the case of quick lining wear, these inspection frequencies must be increased accordingly, in order to avoid significant damage to the brake.

The brake pad must be replaced in the following cases:

- Pollution (particules, dust or fatty substances).
- Uneven wear.
- The minimum lining thickness of 1mm is reached.

- In each case, to avoid any risk of irregular braking behavior:
  - All the pads of the same brake must be replaced.
  - All the brake pads on the axle must be replaced.

2.7.2 - Brake fluid

The hydraulic brake fluid used in the brake system is DOT 3 or DOT 4.

WARNING

The disc brake may not provide sufficient brake torque!

Improper use of disc brakes may cause risk of injury and death.

- Ensure the hydraulic brake fluid used complies with the drum brake specifications.
- Ensure the brake system circuit is separate from the motor's hydraulic circuit.
- Check that there is no grease or oil on the friction surface of brake disc or on the brake pad linings. If there is, identify and eliminate the source of grease or oil leakage. Replace the brake pads and degrease the disc.
- Do not apply chemical products or oil onto the linings or disc.

CAUTION

Risks related to the use and handling of hydraulic brake fluid!

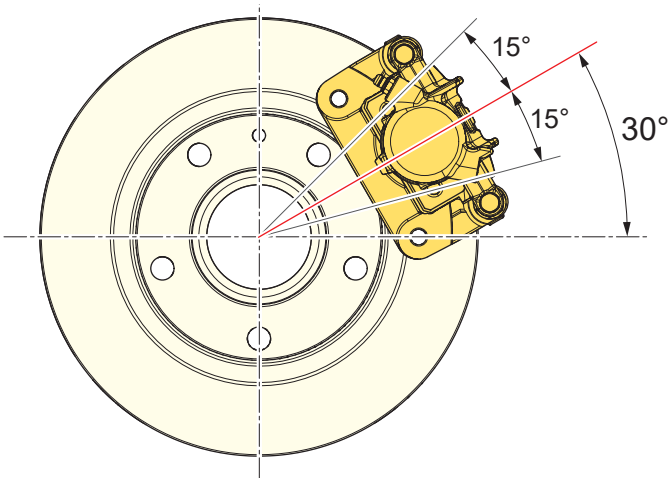
The use and handling of hydraulic brake fluid may cause health hazards such as eye and skin injuries or poisoning.

- Always follow the safety instructions provided by the hydraulic brake fluid manufacturer.
- Avoid all contact with hydraulic brake fluid.
- Always wear adequate personal protective equipment (protective gloves, suitable protective clothes, safety goggles, safety footwear).
- If hydraulic brake fluid comes into contact with eyes or skin, flush immediately with water and then seek medical advice.
- In case of ingestion or inhalation of hydraulic brake fluid, obtain medical attention immediately.

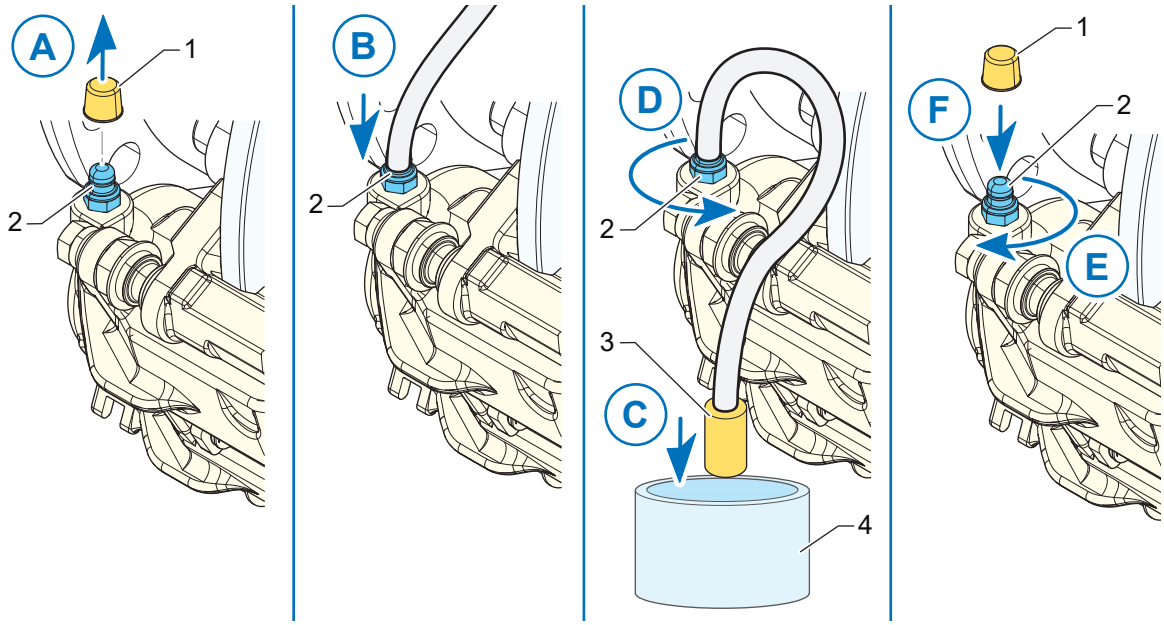
2.7.3 - Disc brake orientation

To facilitate bleeding of the brake cylinder, the motor should be attached to the frame in such a way that the bleed screw is located on the top of the brake caliper.

The ideal position is 30° to the horizontal. A tolerance of ±15° is allowed.



2.7.4 - Bleeding of the disc brake cylinder



Legend
1 Plug
2 Bleed screw
3 Check valve
4 Glass container

Always start bleeding from the motor caliper brake furthest from the brake control actuator.

- Remove the plug (1).
- Install one end of a plastic tube equipped with a check valve (3) (to avoid allowing air into the circuit) over the brake bleed screw (2). Put the check valve (3) in a glass container (4).
- Completely fill the reservoir of the master cylinder with hydraulic brake fluid (for systems using DOT fluid).
- Loosen the bleed screw (2) between a quarter turn and half turn.

- Slowly and fully depress the brake pedal several times until the hydraulic brake fluid comes out of the wheel cylinder free of air bubbles.
- For DOT fluid, it is also possible to use a brake fluid bleeder system by modulating the pressure to follow the recommendations of the DOT fluid tank manufacturer.

NOTICE

Risk of air intake into the brake system!

During this "pumping" step with the brake pedal, take care concerning the level of hydraulic brake fluid in the master cylinder reservoir. If it were to empty completely, air would enter the circuit again, and the bleeding operation must be started again.

- Tighten the bleed screw (2) to 8 ±2 Nm [5.9 ±1.48 lbf.ft] using a torque wrench.

Recover and recycle the brake fluid.

2.7.5 - Disc brake running-in

WARNING

Risk from insufficient disc brake torque!

An improper running-in of brake pads can prevent optimal braking of the machine or damages on brakes.

This may result in a risk of injuries or death.

- It is mandatory to apply the running-in procedure to a new brake caliper or after replacing the brake pads or the disc.

Due to the fact that new brake pads don't have their full brake performance, it is necessary to running-in of brakes to ensure that the friction system between brake disc and brake pads optimally works.

Generic running-in procedure

WARNING

It is important to check the braking performance, after running-in procedure.

For more information, consult your application engineer.

1 • Run the vehicle at low speed.

2 • Activate the brakes till vehicle stops.

Repeat steps 1 to 2 minimum five time.

3 • Running-in check:

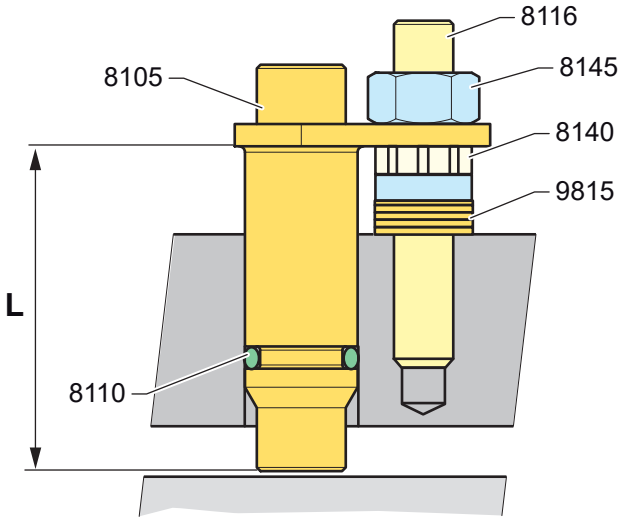
- Brake pads at ambient temperatures.
- Brake the machine to the maximum available operating pressure and check that the brakes reach the expected performance (deceleration, holding the machine on a slope, engine torque holding with motor under pressure ... etc).

4 • Repeat steps 1 to 3 till brake performance are reached.

3 - Electrical connection

3.1 - Speed sensors TD, TR and T4

Description



Legend
8105 Sensor
8110 Rubber seal
8116 Stud
8140 Adjustment nut
8145 Attachment Pre-glued nut
9815 Shimming

Sensor	Commercial name	L		Connections
		mm	in	
TD	TD SENSOR 12-44	44	1.73	M12
	TD SENSOR 12-53	53	2.09	
	TD SENSOR 12-62	62	2.44	
TR	TR SENSOR 12-44	44	1.73	
	TR SENSOR 12-53	53	2.09	
	TR SENSOR 12-62	62	2.44	
T4	T4 SENSOR 12-44	44	1.73	
	T4 SENSOR 12-53	53	2.09	
	T4 SENSOR 12-62	62	2.44	

Properties

Speed sensor	TD	TR	T4
Maximum range	1.15 mm [0.045"]		
Supply voltage	8 - 32 V		8 - 30 V
Electrical protection	Reverse polarity		
Current consumption	20 mA max.		
Output type	2 push-pull shifted square frequency signals (phase shift from 25° to 155°)	1 push-pull square frequency signal	
		1 push-pull direction signal	-
	Maximum load current: 20 mA		
	Voltage at low state: < 1.5 V		
	Voltage at high state: > (power supply voltage - 3.5 V)		
Frequency range	0 to 15 kHz		
Instantaneous frequency deviation	10% with sensor mounted on Poclain Hydraulics motors.		
Operating temperature	- 40°C to + 125°C [- 40°F to 257°F]		
Protection rating	IP68 (sensitive side) / IP67 (connector side)		
Material	Stainless steel		

- Signals are not protected against short circuit to ground or supply.
- The high frequency cylinder block (120 holes) is only compatible with speed sensor T4.

Mounting the speed sensors TD, TR and T4 on motors equipped to accommodate a speed sensor

In the case of motors equipped to accommodate a speed sensor, the existing sealing plug needs to be removed and discarded before installing the sensor and its attachment device.

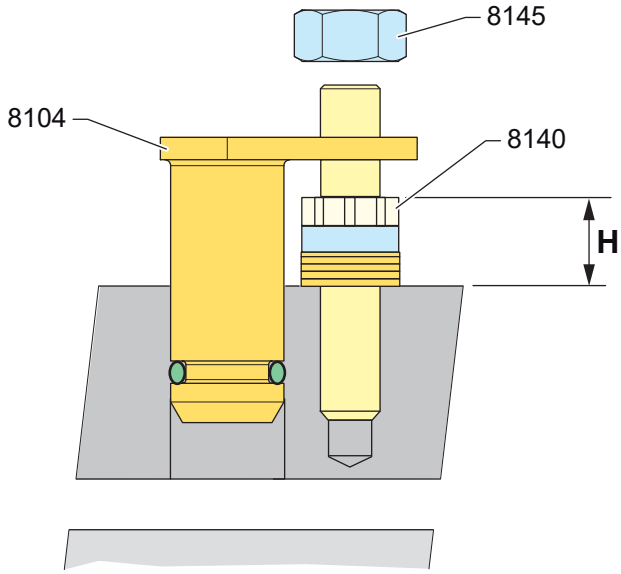
⚠ CAUTION

Risk of hydraulic fluid spraying!

Spraying of hydraulic fluid may cause eye injuries, skin burns and damage, or poisoning. Before mounting speed sensor:

- Stop and depressurize the machine / system.
- Wait for the radial piston motors to cool down.

Use a waste oil collector to recover the escaping hydraulic fluid during removal of sealing plug.



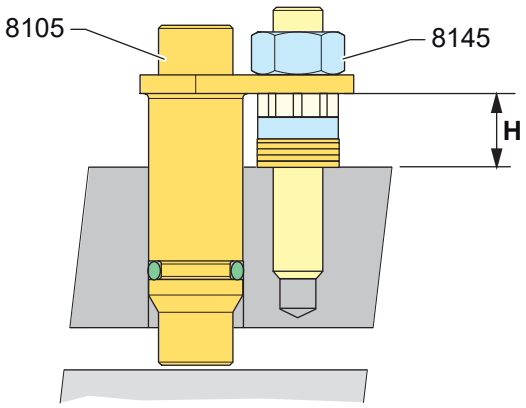
Legend
8104 Sealing plug
8140 Adjustment nut
8145 Attachment Pre-glued nut

- Completely unscrew and discard the nut (8145).
- Remove and discard the sealing plug (8104).

NOTICE

Risk of speed sensor damage!

The shimming height H is set at the plant. Never remove the adjustment nut (8140) or modify the number of installed shims.



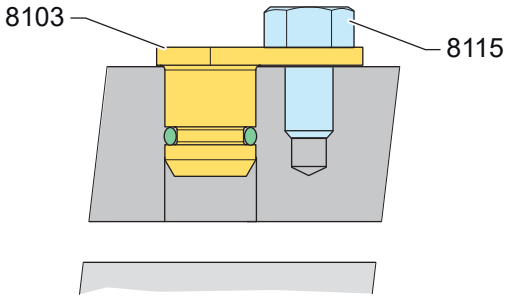
Legend
8105 Sensor
8145 Attachment nut

- Remove the plastic plug on the end of the sensor.
- Insert the sensor (8105) in place of the sealing plug (8105).
- Thread on the new pre-glued nut (8145) and tighten it to the following torque:
  - ► 15 ± 2 Nm [11.06 ± 1.47 lb.ft].

Any installing of speed sensors not supplied by Poclain Hydraulics must have prior approval from our technical services.

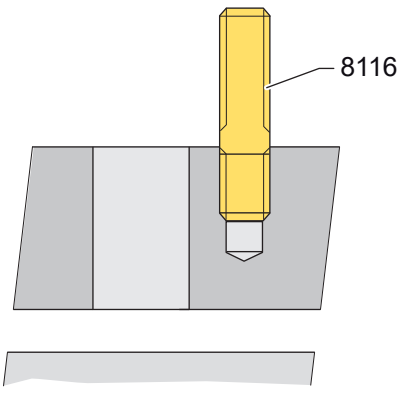
Mounting the speed sensors TD, TR and T4 on hydrobases

Sensor shimming must be carried out after installing the hydrobase on the customer's bearing support.



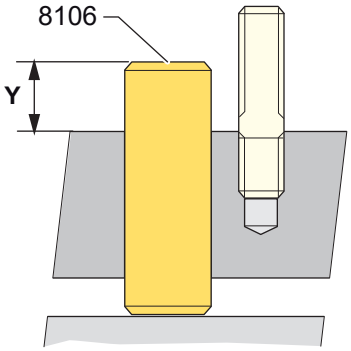
Legend
8103 Sealing plug
8115 Screw

- Remove the sealing plug (8103) and its screw (8115).



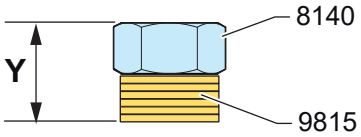
Legend
8116 Stud

- Screw the stud (8116) in at a torque setting of 15 ± 2 Nm [11.06 ± 1.47 ft-lb].



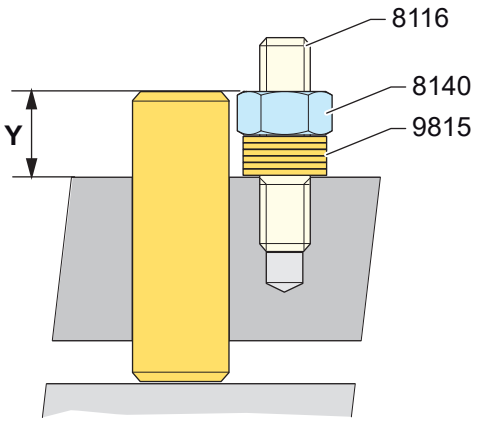
Legend
8106 Dummy sensor

- Insert the dummy sensor (8106) into the port until it touches the cylinder block.
- Measure the distance Y ± 0.01.



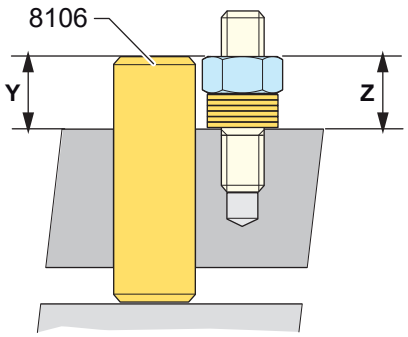
Legend
8140 Adjustment nut
9815 Shim

- Add the number of shims (9815) required to the thickness of the adjustment nut (8140) to reach the Y measurement.



Legend
8116 Stud
8140 Adjustment nut
9815 Shim

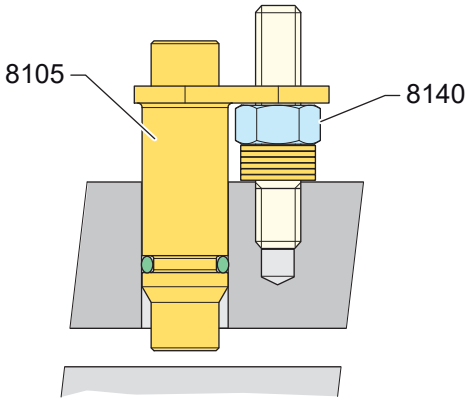
- Stack the shims (9815) and screw the adjustment nut (8140) onto the stud (8116).
- Tighten the adjustment nut (8140) to a tightening torque of 15 ± 2 Nm [11.06 ± 1.47 ft-lb].



Legend
8106 Dummy sensor

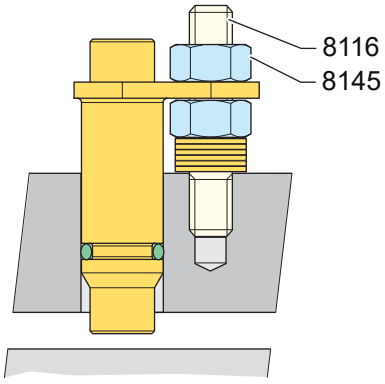
Check the shimming:

- Measure the Z dimension.
  - If (Y - Z) is equal to 0 ± 0.1 then go to the next step.
  - If (Y - Z) differs from 0 ± 0.1 then repeat the installation procedure.



Legend
8105 Sensor
8106 Dummy sensor
8140 Adjustment nut

- Remove the dummy sensor (8106).
- Insert the sensor (8105) until it rests on the adjustment nut (8140).



Legend
8116 Stud
8145 Pre-glued nut

- Set the pre-glued nut (8145) on the stud (8116).
- Tighten the pre-glued nut (8145) to a tightening torque of 15 ± 2 Nm [11.06 ± 1.47 ft-lb].

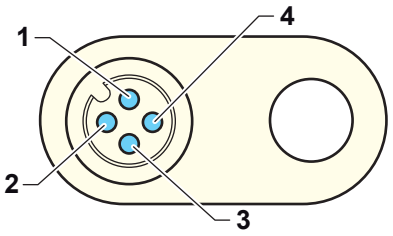
NOTICE

Risk of speed sensor damage!

Carry out this procedure after every hydrobase or bearing support part change, so that the sensor is correctly located.

Connecting the speed sensor

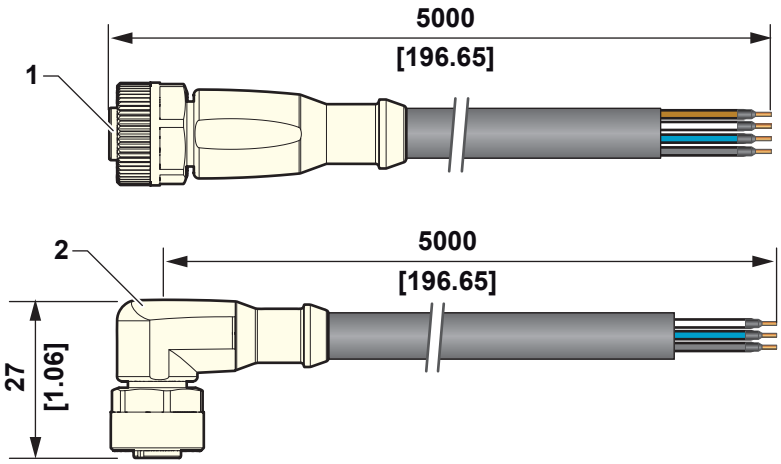
Remove the plastic plug on the connector.



Pin number	Function		
	TD	TR	T4
1	Power supply		
2	Square frequency signal n°2	Direction signal	Not present
3	Ground		
4	Square frequency signal n°1	Square frequency signal	

For the connection of connectors, please refer to the connection table and the general cabling plan contained in the machine brochure provided by the manufacturer.

Connector kit for connection of speed sensors TD, TR and T4



Rep.	Sales Code	Item Code
1	ELEC-CABLE-M12-180°-5000	A07468S
2	ELEC-CABLE-M12-90°-5000	A04999J

Connector mounting

Securely hand tighten the cable's ring to sensor connector M12.

Pin number	Color
1	Brown
2	White
3	Blue
4	Black

- Installation of the Poclain Hydraulics cable provides a protection rating of IP68.
- If using an M12 90° cable (A04999J), pay attention to the alignment of the elbow with the sensor´s bracket to avoid twisting the sensor´s connector pins.

4 - Circuits

4.1 - Hydraulic connections

4.1.1 - Piping guide

For more information, refer to page 19.

NOTICE

Risk from use of Banjo fittings!

The use of Banjo fittings in the motor supply line can cause motor operating issues. This can damage the internal components over time.

- The use of Banjo fittings is prohibited.

4.1.2 - Determination of pipe inside diameter

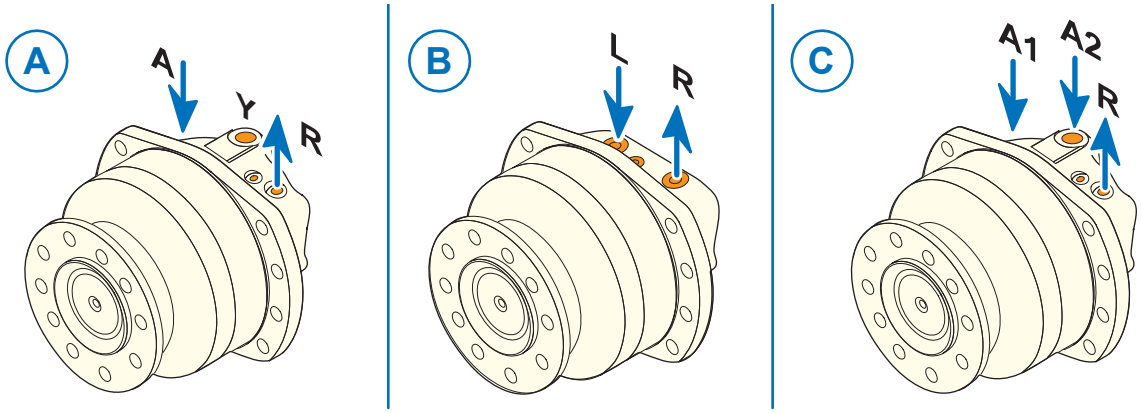
Before the first startup, perform a complete rinsing of the hydraulic circuit to remove all possible contamination.

For more information, refer to page 26.

4.1.3 - Motor port connection

For specific motors not described in the technical catalog, refer to the dedicated interface drawing.

Motor supply



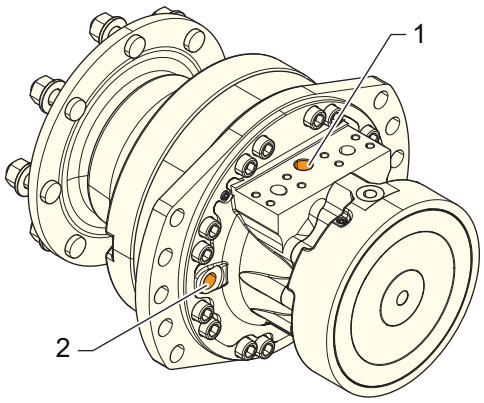
A 2-displacement motor with non symmetrical valving
B Single displacement motor or dual displacement motor with symmetrical valving
C Twinlock® motor

High pressure lines: ports A and R, R and L, or A1, A2 and R.

Can be implemented:

- either with unwelded, cold drawn, steel tubes,
- or with flexible tubes.

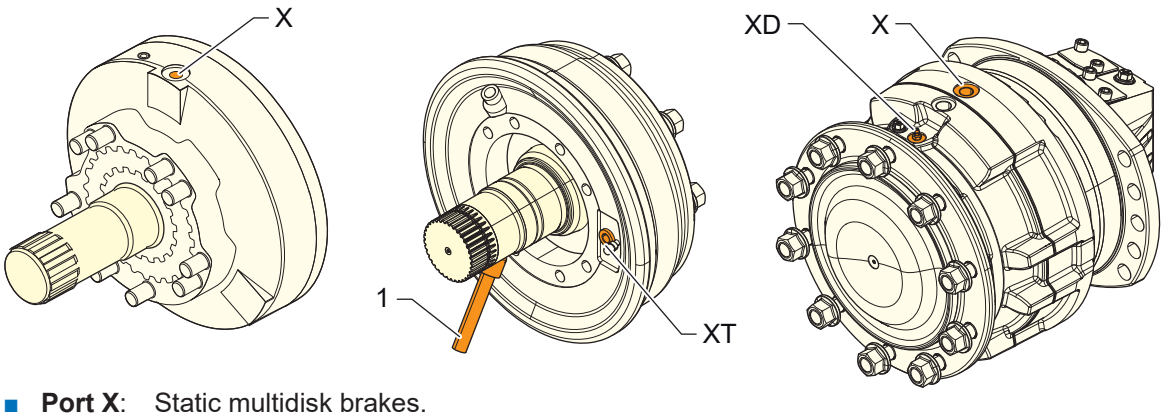
Drainage



Ports 1 and/or 2.

- Use rigid low-pressure pipes or flexible tubes to avoid pinching the hose.
- The tube should have an inner diameter that will allow for rapid piston output without generating excess overpressure (3 bar [43 psi]).
- The amount of oil to be evacuated is around 10% of the total capacity in case of freewheeling circuits.

Brake control



- **Port X**: Static multidisk brakes.
- **Port XT**: Drum brake.
  The control is implemented with flexible tubes with a minimum interior diameter of 8 mm [0.31 in], to obtain the correct response time.
- **Port XD**: Dynamic braking.
- **1**: Cable output.

Rinse the brake pilot circuits before connection.

Displacement selection spool control (Ports Y, Y1 or Y2)

The pressure to actuate the displacement spool valve is between 12 bar (minimum) and 30 bar (maximum).

⚠ CAUTION

Risk of incorrect motor operation!

Risk of irregular machine behavior due to incorrect circuit design.

- Do not place either a check valve or a poppet valve on the pilot lines (parking brake and displacement change) between the charge pump and the pilot valve.
- Do not use a pilot valve with built-in check valve.

4.1.4 - Tank

For more information, refer to page 25.

4.2 - Rinsing the circuit

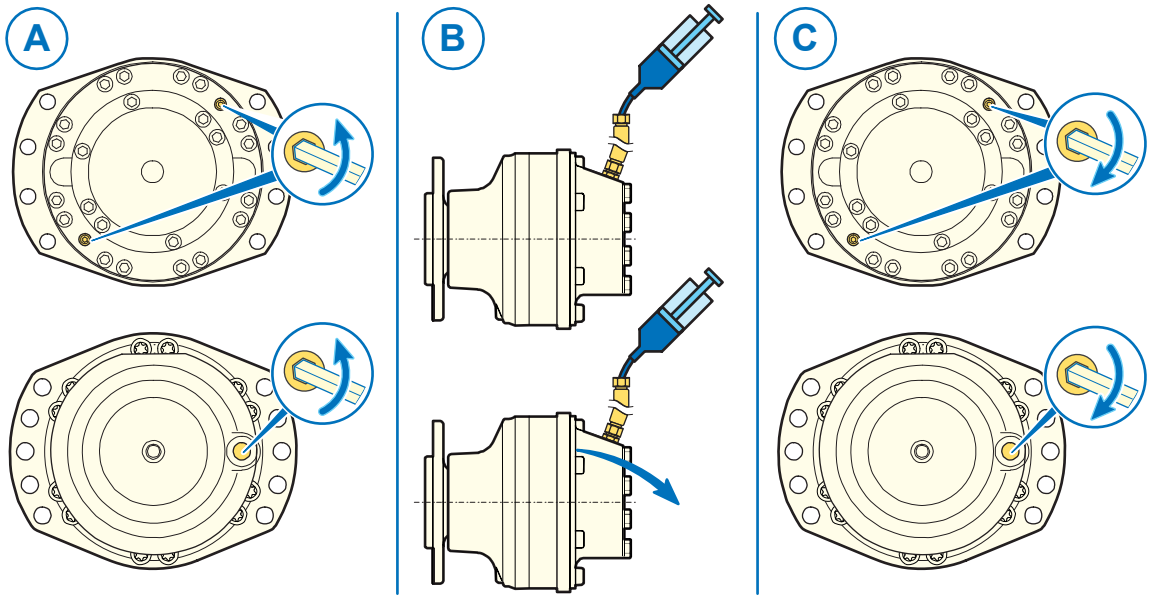
For more information, refer to page 29.

4.3 - Motor casing

Filling the motor casing

NOTICE

Risk of motor damage!
It is **MANDATORY** to perform this operation before motor start-up.



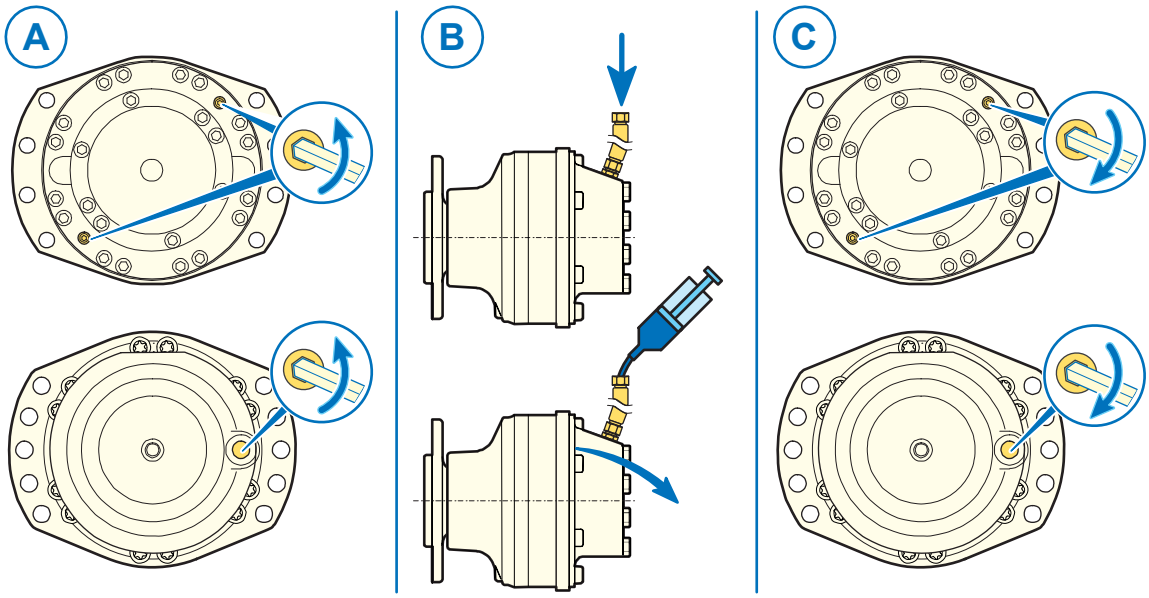
- Loosen the highest bleed screw (or the drainage ports for MS03 and MK04 motors).
- Fill with new oil using a syringe.

For more information about oil characteristics, refer to page 31.

- Retighten the bleed screw to 5 Nm 0/+1 [3.69 0/+0.74 ft·lb] when the oil flows from it.

Use a waste oil collector to recover escaping hydraulic fluid during filling of motor casing.

Bleed the casing



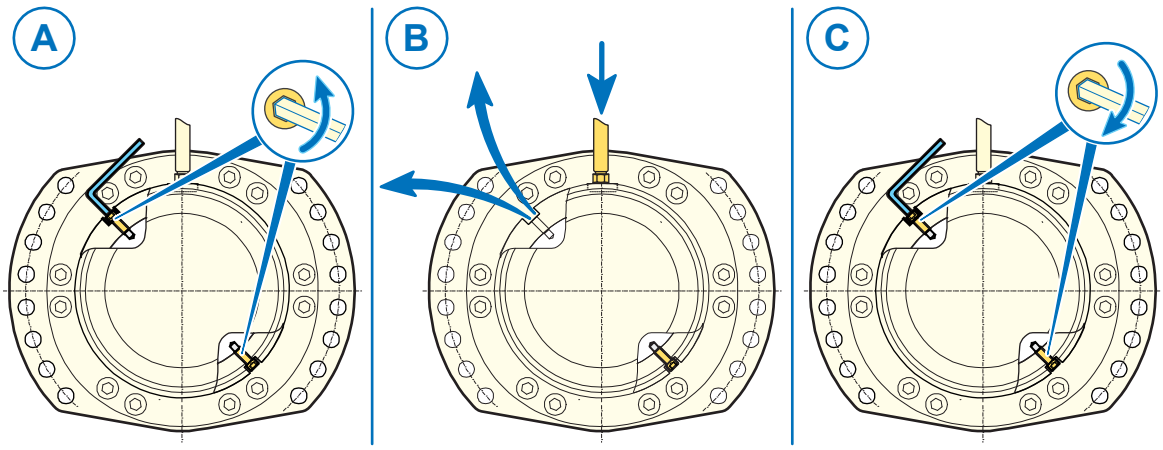
- Loosen the bleed screws.
- Supply with oil.
- Stop the supply and retighten bleed screw to 5 Nm 0/+1 [3.69 0/+0.74 ft.lb] when the oil stops flowing.

Use a waste oil collector to recover escaping hydraulic fluid during filling of motor casing.

4.4 - Brake bleed

Static multidisk brakes

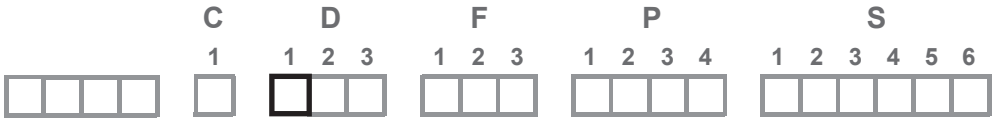
The oil used for static braking is the same as for the operation of the motor.



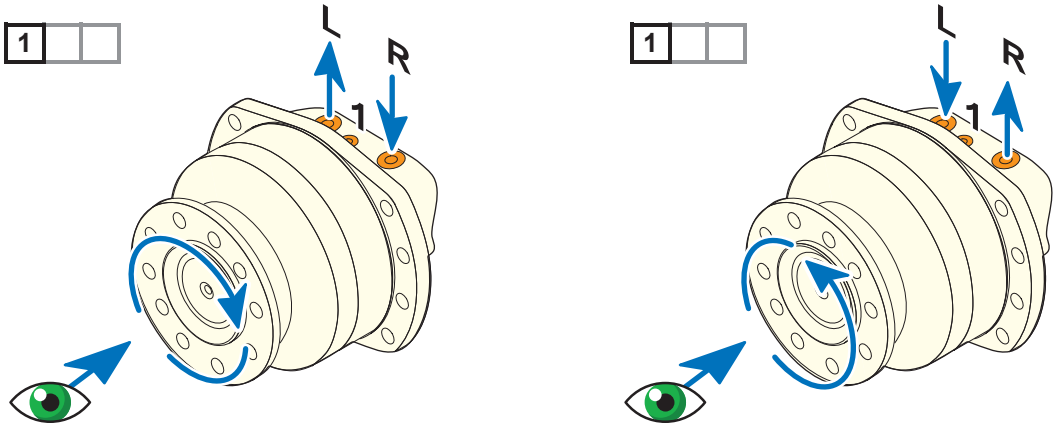
- Loosen the bleed screws.
- Supply with fluid just until it flows from the bleed screw.
- Retighten the bleed screw to 5 Nm 0/+1 [3.69 0/+0.74 ft.lb].

Use a waste oil collector to recover escaping hydraulic fluid during filling of motor casing.

4.5 - Determining motor direction of rotation

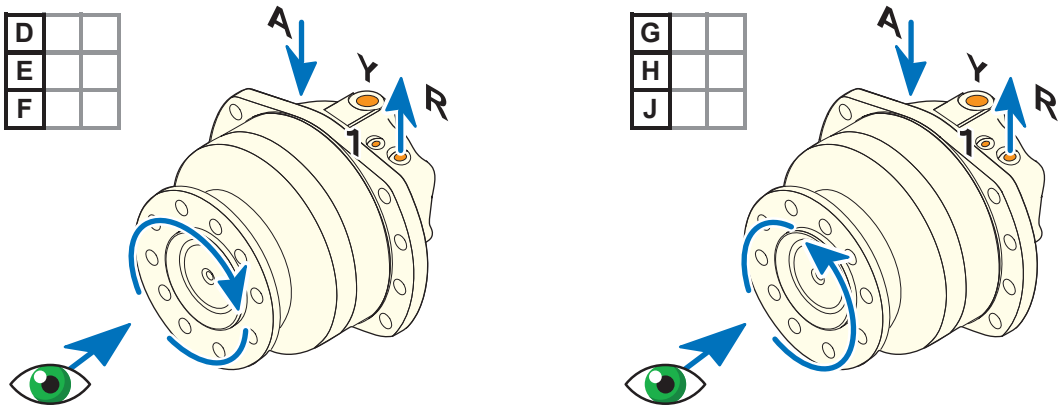


Single displacement motor



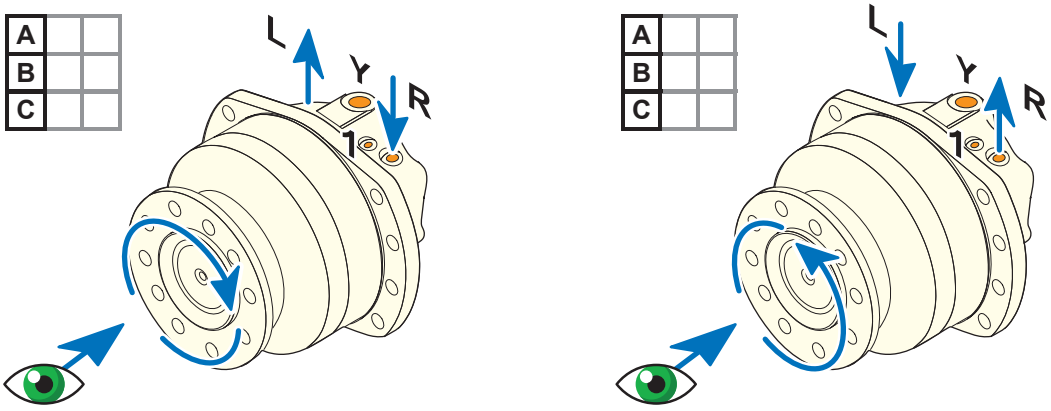
- This motor has no preferred direction of operation.
- Reversing the fluid flow direction will reverse the motor's direction of rotation.

Asymmetric dual displacement motor



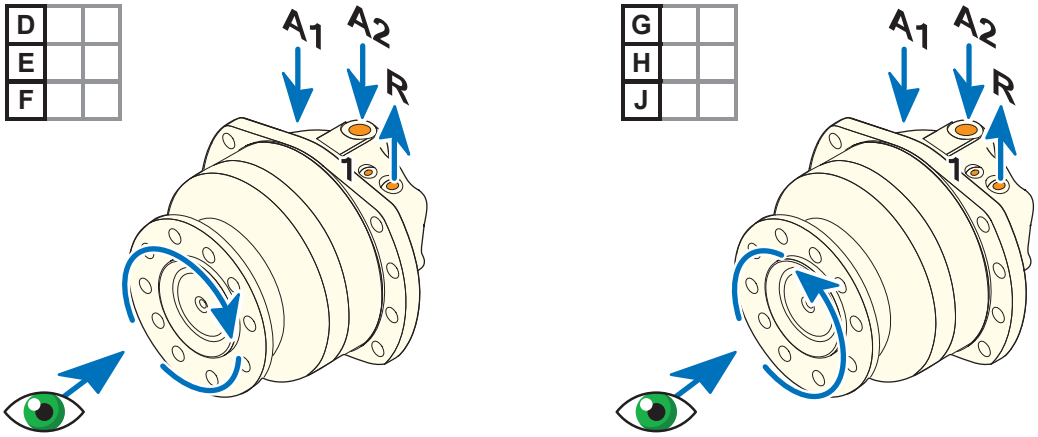
- This motor has a preferred direction of rotation for small capacity.
- Motor fluid is always supplied in the direction of A.
- Reversing the fluid flow direction will reverse the motor's direction of rotation.

Symmetric dual displacement motor



- This motor has no preferred direction of operation.
- Reversing the fluid flow direction will reverse the motor's direction of rotation.

Twinlock® motor



- This motor has a preferred rotation direction.
- Motor fluid is generally supplied in the direction of A1-A2. It is also possible to change its direction to R (contact Poclain Hydraulics for further information).
- Reversing the fluid flow direction will reverse the motor's direction of rotation.

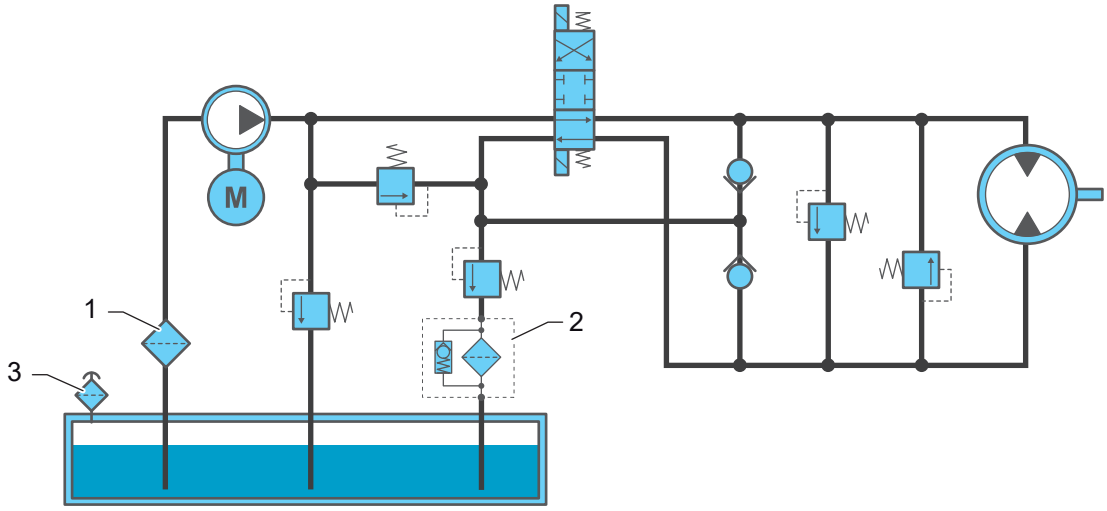
4.6 - Decontamination and filtration

Hydraulic components have a longer life when the contamination level is low.

Industrial circuit (open circuit)

The hydraulic fluid should be maintained decontaminated to level 18/16/13 or better the standard ISO 4406 by using an appropriate filter.

Example



Data for information only:

1 - A 120 µm strainer on the intake line.

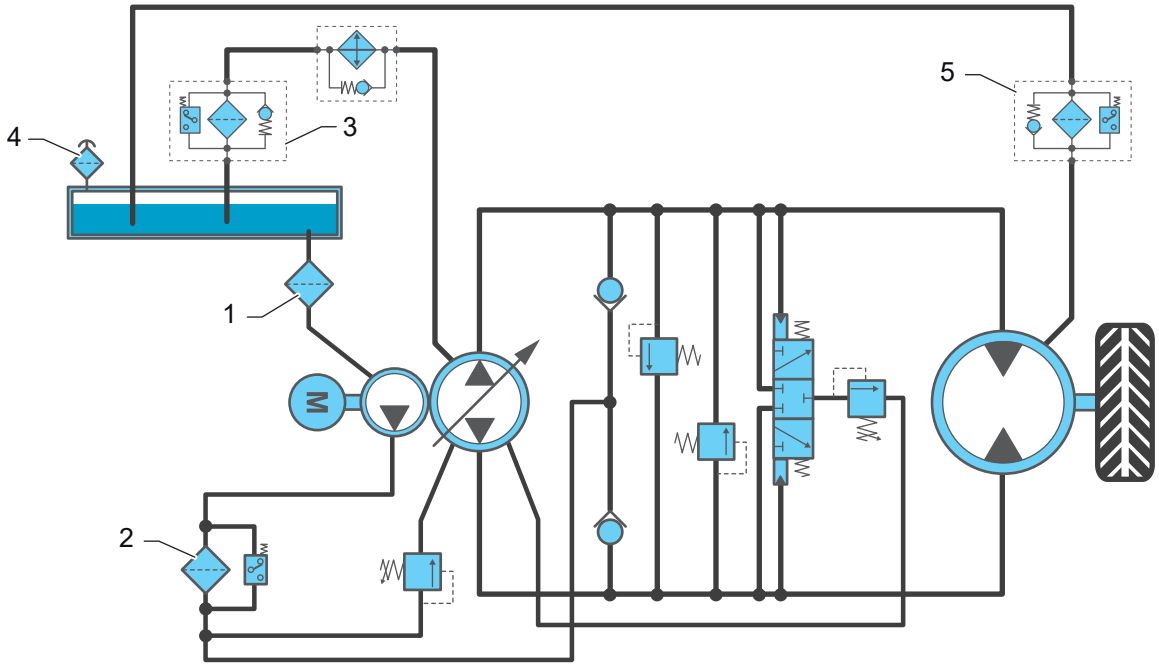
2 - A $ß_{20}$ > 100 filter with a clogging indicator on the return line.

3 - A breather at 10 µm absolute on the tank.

Closed circuit

The hydraulic fluid should be maintained decontaminated to level 18/16/13 or better of the standard ISO 4406 by using an appropriate filter in the supply loop of the closed circuit.

Example



Data for information only:

1 • A 120 µm strainer on the intake line.

2 • A $ß_{10}$ > 100 low-pressure filter with a clogging indicator with no bypass valve on the output from the charge pump.

3 • A $ß_{10}$ > 100 low-pressure filter with a clogging indicator and a bypass valve for mobile hydraulics located on the pump's drain line after the refrigerant.

4 • A breather at 10 µm absolute on the tank.

5 • Optionally, a magnetic or low-pressure filter on the hydraulic motor's drain line.

NOTICE

Risk from circuit contamination!

It is mandatory to maintain proper cleanliness to avoid premature wear and malfunctions of hydraulic components.

- Motor installation must take place in a clean environment free of contaminants (dust, water, metallic particles, etc.).
- The level of cleanliness required.
- Determination of the cleanliness of the hydraulic fluid.
- Hydraulic fluid samples must be taken.
- New hydraulic fluid is generally of lower quality than the Poclain Hydraulics requirements. The use of a filter system during filling or when adjusting the level in the tank is recommended, in order to limit the entry of contaminants from the hydraulic fluid into the circuit.

- Refer to the manufacturer's instructions for the cleanliness requirements for each component (filters, pumps, valves, etc.).
- For more information, Poclain Hydraulics offers training in hydraulic systems. Go to www.Poclain-Hydraulics.com

Closed circuit

On the low pressure side of the loop, pressure must be kept between 15 and 30 bar max. [217.5 and 435 PSI].

Open loop circuit

Cavitation (0 bar [0 PSI]) is strictly forbidden on either high pressure port. Depending on the application, the minimum low pressure must be kept between 5 and 20 bar [71.5 and 209 PSI].

Consult your Poclain Hydraulics application engineer.

5 - Oils

5.1 - Fluid selection

For more information, refer to page 31.

5.2 - Water content

For more information, refer to page 31.

6 - Startup

WARNING

Risk during startup operations on the system / machine!

Startup operations must be carried out under safe conditions, to prevent all risk of injuries or risk to life.

- All plastic plugs must be removed before pressurizing the circuit. Contact your Poclain Hydraulics application engineer if necessary.
- Install a safety perimeter around the machine and monitor access. The machine or system may only be operated once a safe environment is ensured.
- Identify and correct any potential danger sources before operating the machine or system.
- Nobody should stand in the danger zone of the machine or system.
- The emergency stop button for the machine or system must always be within the operator's reach.
- A poor grip can cause the product to slip out of hands and fall on the ground. This can result in a risk of accident and injuries to the technician.
- Always follow the instructions of the machine or system manufacturer during start-up.

NOTICE

Risk from improper commissioning!

During the start-up process, an incorrect commissioning of new or rebuilt hydraulic components (motor, pump, valve) can result in damage to their internal parts through inadequate lubrication, air presence, cavitation, etc. Generally, this damage is not visible immediately, but will be the main root cause of hydraulic component failure occurring after several operating hours.

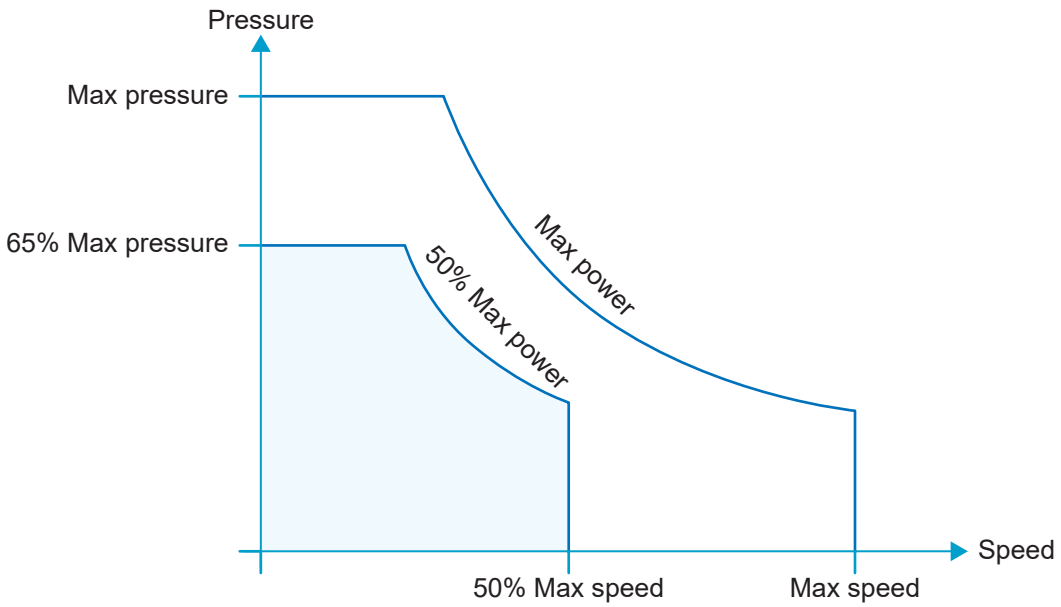
- Refer to the commissioning procedures and recommendations specific to the system / machine provided by manufacturer.
- Take the required training to learn how to apply these commissioning procedures effectively.
- Refer to the general commissioning instructions given in the various installation guidebooks for Poclain Hydraulics components.
- Consult your Poclain Hydraulics application engineer to obtain all specific commissioning information.

The specific commissioning instructions for each Poclain Hydraulics component are available in the technical catalogs or the interface drawings.

6.1 - Running-in period

Poclain Hydraulics motors achieve their optimum performance and efficiency during the first hours of use. So an initial running-in period is recommended for at least the first ten hours for new or rebuilt motors in accordance with the following instructions:

- Limit the operating power to 50% of the maximum motor power capacity stated in the technical catalog.
- Limit the operating rotation speed to 50% of the maximum motor rotation speed stated in the technical catalog.
- Limit the operating pressure to 65% of the maximum motor pressure stated in the technical catalog.



- Consult your Poclain Hydraulics application engineer to obtain the required running-in procedure for the specific applications in which power and rotational speed cannot be limited or have high severity operating conditions.
- For motors mounted with a drum brake, follow the instructions described in section "2.5.10 - Running-in of the drum brake" to achieve the maximum braking performance.

WARNING

For MHP motors, due their high volumetric efficiency, flushing 5 l/min must be carried out during running in period.

NOTICE

Normal pollution in the initial operating hours

During the running-in period, the friction of the moving parts against each other generates metal and plastic particles until the surfaces of the parts have reached a stable state of wear. These pollutant particles are removed from the circuit by the filters.

- Check the clogged filter indicator during the first 50/100 working hours.
- Do the first filter replacement after 50/100 working hours.

6.2 - Before start-up

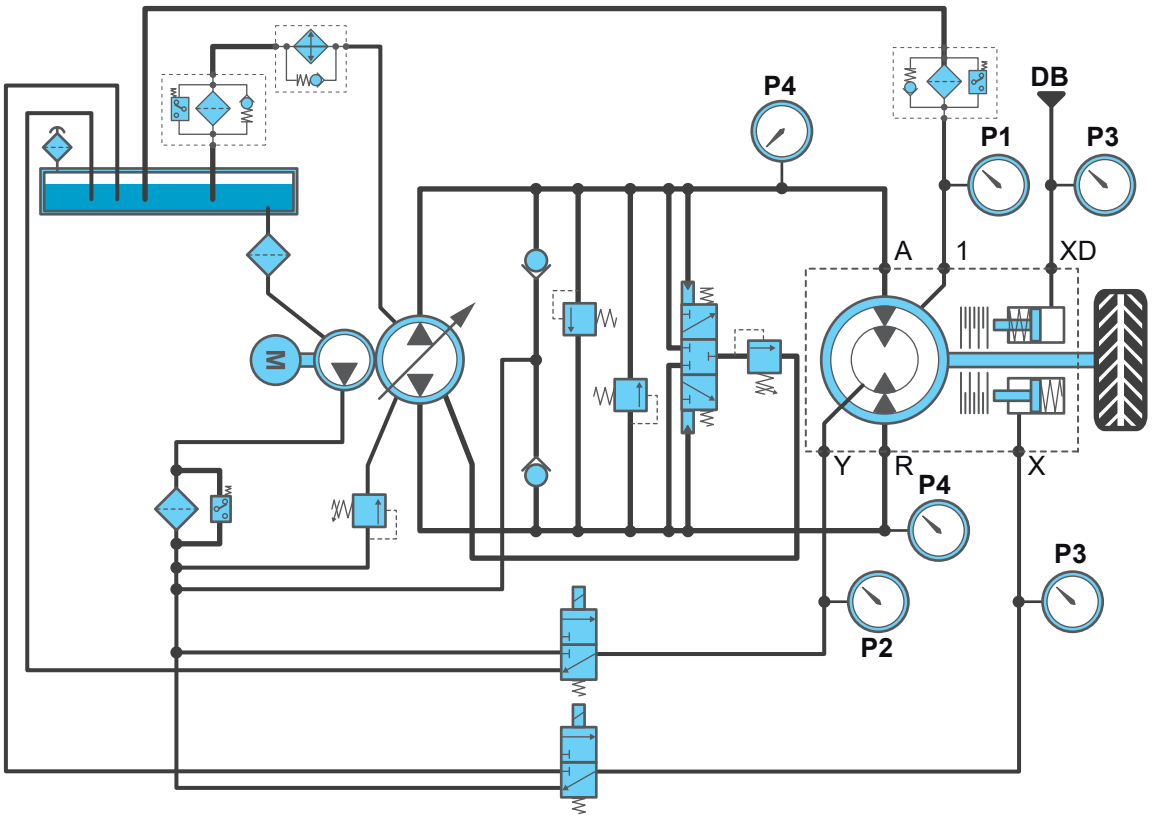
- Check that the part number of the delivered hydraulic motor matches the recommendations of the system / machine manufacturer.
- Check the mechanical mounting of the motor on the chassis of the machine / system. Refer to section "2.1 - Fixations".
- Check the output shaft coupling. Refer to the section "2.2 - Output shaft mounting".
- Check that the mounting of the pipes and fittings is compliant with the recommendations given in page 19.
- Check the condition of all pipes and hoses. Replace any suspect lines to prevent damage to the motor through destructive phenomena (temperature rise, cavitation...).
- Check that all pipes and hose connections are tightened to the required torque to prevent hydraulic fluid leaks and air infiltration into the circuit.
- Clean the tank before filling to ensure it is free from contamination (metallic particles, sand, water...).
- Fill the tank with clean and filtered hydraulic fluid. Confirm that the tank fluid level is above the minimum.
- Fill the motor case with clean and filtered hydraulic fluid through the highest drain port.
- For vertical mounting of the motor (shaft up) on the machine, it is mandatory to ensure proper lubrication of the front shaft bearings and seal. Use gooseneck piping to ensure that the hydraulic fluid level is sufficiently high in the motor case.
- In case of a large volume or large length of pipes, it is advisable to fill the high-pressure lines.

New hydraulic fluid delivered in barrels or bulk tank by suppliers is generally lower quality than the requirements stated in page 31. The use of a filling unit with filtration is recommended.

- Connect pressure gages to check the motor supply pressure levels.

WARNING

The no-load test should not exceed 15 minutes. Running for too long could damage the motor.



P1: Pressure gage 0-10 bar [0 - 145 PSI] on the drainage pipe close to the motor (port 1 or 2).

P2: Pressure gage 0-60 bar [0 - 870 PSI] on the displacement change pilot pipe (port Y).

P3: Pressure gage 0-200 bar [0-1450 PSI] on the control pipe of each brake release (port X), of the drum brake (port XT) and dynamic brake (DB) (port XD)

P4: Pressure gage 0-600 bar [0-8700 PSI] on each motor supply pipe (pipes L and R, A and R or A1, A2 and R).

6.3 - Circuit bleeding

It is important to bleed air from the hydraulic system before performing the off load test and on load test to avoid mechanical damage and erratic operation.

For a vehicle, ensure that the wheels are lifted (no contact with ground). For any other rotating tool, do not apply any load to the motor.

- In case of high-pressure lines equipped with quick coupling ports at each end of the pipe, connect one quick coupling port to the filling pump and the second one to the tank or the return line of the filling pump.

Fill the high-pressure lines with clean and filtered hydraulic fluid until the air has all been removed.

- In any case, start the engine and let it run for at least 30 seconds at low idle to allow air to work itself out of the system (at this step, the pump is bled but the high pressure lines between pump and motor still contain air: The bleeding procedure is not complete).
- Check the oil level in the tank and refill if needed.
- Run the motor slowly in both directions by gradually increasing the speed until it reaches 10 to 20% of normal speed. During this step, high-pressure lines will be bled:
  - In closed loop: air removal is done by the exchange valve.
  - In open loop: oil circulation allows the air to be removed.
- Check the oil level in the tank again, and refill if needed.

After a prolonged period of machine stoppage (e.g., in case of seasonal use), bleed the motor and circuit to remove trapped air that may have collected there during this period.

6.4 - Off load test

For a vehicle, ensure that the wheels are lifted (no contact with ground). For any other rotating tool, do not apply any load to the motor.

- For motor with parking brake, check the brake release pressure. Perform a brake release test.
- Run the motor slowly by gradually increasing the speed until it reaches 10 to 20% of normal speed.
- Check the direction of rotation (refer to section 4.5 - Determining motor direction of rotation).
- Check the tightness of components and hydraulic connections.
- Listen for abnormal noises.
- Check the case pressure. Generally, case pressure is less than 1 bar.
- Check the back pressure.
  - In open loop: refer to minimum operating pressure recommended by the manufacturer.
  - In closed loop: generally, the back pressure is close to the charge pressure value.
- Check the pilot pressure of the displacement spool. Run the motor in full and half displacement.
  - In open loop: refer to the pressure recommended by the manufacturer.
  - In closed loop: generally, pilot pressure is close to the charge pressure value.
- For motor with dynamic brake (disk brakes or drum brakes), check the brake pressure: refer to the residual pressure and the maximum pressure given in the motor technical catalogs.
- Perform a braking test.

- Motors fitted with a duo cone seal (option C) could leak slightly during the first run. This slight leak is normal. The motor must run for two hours to be waterproof.
- Clean the motor shaft output (rim) and check for absence of leakage at the end.

6.5 - On load test

For a vehicle, perform a road test on a safe test track. For any other rotating tool, apply load to the motor.

- Perform all checking operations described in the off load test.

The test results may be different due to the machine operating under high pressure.

- Check that the component temperature, especially that of the motor casing, increases gradually and stabilizes after one hour of operation. A proper cooler should maintain the working temperature in accordance with the recommendations given in page 31.
- Perform a test to reach the maximum operating speed and check that the minimum charge pressure in the return line is compliant.

For all applications where operating temperature exceeds the recommended limits, consult your Poclain Hydraulics application engineer.

- Perform all machine-specific tests recommended by the machine manufacturer.

6.6 - After start-up

The motor and the hydraulic circuit in general require a regular inspection after a certain working period.

Observe the periodic servicing timetable recommended by the machine manufacturer.

- Check the oil level in the tank and adjust if necessary.
- Check the working temperatures and pressures.
- Check the tightness of components, piping and hydraulic connections.
- Check the condition of filters.
- Check the condition of hydraulic fluid (visual color and smell inspection and sample analysis).
- Check the condition of mechanical and electronic sensors.
- Check the parking and service brakes.

6.7 - Check list

WARNING

Risk during test operation of the system / machine!

Test operations must be carried out under safe conditions to prevent all risk of injuries or risk to life.

- Install a safety perimeter around the machine and monitor access. The machine or system may only be operated once a safe environment is ensured.
- Observe all regulations regarding the safety of personnel.

Check list

Date:	**Auditor:**
Machine description:	
Motor P/N:	**Motor model code:**

Before start-up			OK	NOK
Attachment	Chassis	Mounting flange state (clean, degreased, unpainted)		
		All fastening parts present		
		Tightening torque applied and checked		
	Coupling	All fastening parts present		
		Mounting procedure applied		
		Tightening torque applied and checked		
Connection	Mechanical	Drum brake cable		
	Hydraulic	High-pressure ports		
		Drain port(s)		
		Displacement change port(s)		
		Static brake port		
		Dynamic brake port		
	Electrical	Sensors		
		Solenoid valve connector (s)		
Circuit	Tank cleanliness			
	Isolation taps open			
	Oil	Oil type designed for application		
		Use filling tool with filter in uncontaminated area		
		Fill tank, piping and component casings		
	Pump priming			
	Bleed entire circuit			
	Check oil tank level			
Tightness	Component and piping tightness			
Rinsing	Filter to reach required cleanliness level			
	Rinsing time respected			

After start-up			OK	NOK
Circuit	Check oil tank level			
	Bleed entire circuit			
Tightness	Component and piping tightness			
Brake	Static	Bleeding		
		Brake operation and efficiency tests		
	Dynamic	Bleeding		
		Brake operation and efficiency tests		
Pressure	Casing			
	High-pressure supply			
	Low-pressure return			
	Displacement change			
	Static brakes			
	Dynamic brakes			
	Charge pressure			
Temperature	Cooling system operation			

7 - Troubleshooting

- This section includes the potential faults that could affect the motor and the potential root cause and solutions to solve them. Note that the list is not exhaustive.
- The action to resolve the issues can only be performed under the sole responsibility of the user.

WARNING

Risk during system / machine troubleshooting procedure!

The troubleshooting procedure must be carried out under safe conditions to prevent all risk of injuries or risk to life.

- Install a safety perimeter around the machine and monitor access. The machine or system may only be operated once a safe environment is ensured.
- Observe all regulations regarding the safety of personnel.
- The troubleshooting procedure must be carried out by qualified and trained technicians.

Motor output shaft does not rotate

Probable cause	Solution
No or insufficient hydraulic fluid flow in motor inlet ports.	■ Refer to main faults "No hydraulic fluid flow" and "Hydraulic fluid flow too slow".
Parking brake not released.	■ Refer to main fault "Brake does not release".
System operating pressure not reached.	■ Check and adjust the pressure setting of the high-pressure relief valve.
Excessive load applied.	■ If the output shaft does not rotate yet when the limit setting value of the relief valve is reached, reduce the load applied to the output shaft.
Excessive internal leaks.	■ Return the motor to a Poclain Hydraulics Repair Center for inspection and repair of internal components.

Motor output shaft does not rotate at its expected speed under load

Probable cause	Solution
Low hydraulic fluid flow in motor inlet ports.	■ Check IC engine or electric motor drive speed. ■ Check the pump flow (refer to page 95).
System operating pressure too low.	■ Check and adjust the pressure setting of the high-pressure relief valve.
Poor operation of charge circuit.	■ Check the charge circuit (charge pump, valves, etc.).
Irregular rotation of output shaft due to inconsistent pump flow.	■ Check IC engine or electric motor drive speed. ■ Check the pump flow (refer to page 95).
Displacement spool partially or not shifted.	■ Check that the shifting pressure of displacement spool is not too low. If so, check, adjust and repair the pilot line and source. ■ Check that the motor casing pressure is not too high. If so, check the line condition to eliminate the blocking source. ■ Return the motor to a Poclain Hydraulics Repair Center for inspection and replacement of the displacement spool and valving cover.

Motor output shaft rotates in wrong direction

Probable cause	Solution
Incorrect pipe connection to the supply ports.	■ Check and connect the piping to the correct motor supply ports.

External leakage

Probable cause	Solution
Incorrect tightening of securing screws.	■ Return the motor to a Poclain Hydraulics Repair Center.
Incorrect tightening of bleed screws.	■ Check and, if needed, re-tighten to 5 0/+1 Nm [3.69 0/+0.74 ft·lb].
Incorrect tightening of pipe connections.	■ Check and tighten to the required tightening torque according to the machine manufacturer specifications.
External seals damaged due to excessive pressure in the motor casing.	■ Check drain line condition. ■ Check that filters are not clogged. ■ Return the motor to a Poclain Hydraulics Repair Center for inspection and replacement of external and internal seals.

Excessive heat

CAUTION

Risk of extremely hot surfaces of component and piping!

Risk of burns!

- Wait for the component and piping to cool down before touching it.
- Wear heat-resistant protective equipment (gloves).

Probable cause	Solution
Cooling system defective or inadequate.	■ Check the oil cooling system conditions. Repair if needed. ■ Review the cooling system design with reference to the machine manufacturer specifications.
Motor output shaft speed too fast.	■ Check that motor characteristics are compliant with machine manufacturer specifications. ■ Check the pump rotation speed (refer to page 95).
Insufficient hydraulic fluid exchange.	■ Check the conditions and adjust the exchange valve. ■ For a motor equipped with integrated exchange valve, check that drain pressure in motor casing is not abnormally high compared to machine specifications and causing a blockage of the exchange valve opening. If so, check the condition of the drain line. ■ Check that charge pump pressure is not too low compared to exchange valve pressure (refer to page 95).
Throttling of hydraulic fluid.	■ Adjust the high-pressure relief valves to within the intended limits. ■ Check the condition of all control valves (high pressure relief valve, flow divider, directional control valve, etc.).
Excessive internal leaks.	■ Check the motor drain pressure and flow. If pressure and flow are too high, return the motor to a Poclain Hydraulics Repair Center for inspection and repair.
Insufficient hydraulic fluid volume.	■ Check that the hydraulic fluid level is not too low in the tank. If so, refill the system with hydraulic fluid. ■ Check that the tank capacity is sufficient to achieve the machine operating specifications.
Head loss in system circuit.	■ Check the temperature of hydraulic pipes and hoses to identify the head losses. Clean or change the defective pipe / hose. ■ Use pipes and hoses of suitable diameter to ensure proper flow of hydraulic fluid.
Clogged filters.	■ Replace filter.
Hydraulic fluid too viscous, contaminated, or of poor quality.	■ Change the hydraulic fluid.
Pump, motor, valve or other component damaged.	■ Check and / or replace pump, motor, valve or other damaged component.

Abnormal noise

Probable cause	Solution
Incorrect attachment of motor on the machine chassis causing moving and hitting of motor against chassis.	■ Consult the recommendations given in section 2.1.1 - Attachment to the chassis. ■ Check and tighten the mounting bolts to the required tightening torque according to machine manufacturer specifications.
Incorrect securing of wheel or load to motor output shaft.	■ Consult the recommendations given in section 2.2 - Output shaft mounting.
Incorrect mounting of hydraulic pipes causing their moving and hitting against machine parts.	■ Consult the recommendations given in page 19. ■ Tighten the hydraulic pipe mounting hardware according to machine manufacturer specifications.
Air intake.	■ Check the tightness of all piping connections. ■ Check and tighten the connections to the required tightening torque according to machine manufacturer specifications. ■ Check that the circuit is fully bled.
Cavitation and/or the hitting of pistons against the cam due to excessive speed of motor output shaft.	■ Check IC engine or electric motor drive speed. ■ Check the pump setting (refer to page 95).
Cavitation and/or hitting of pistons against the cam due to low charge pressure.	■ Check the charge circuit (charge pump, valves, etc.).
Displacement spool partially shifted.	■ Check that the displacement spool pilot pressure is not too low. If so, check, adjust and repair the pilot line and source. ■ Check that the motor casing pressure is not too high. If so, check the condition of the drain line. ■ Return the motor to a Poclain Hydraulics Repair Center for inspection and replacement of the displacement spool and valving cover.
Friction of brake disks (disk brake) or brake lining against the drum (drum brake) due to parking brake not being fully released.	■ Refer to main fault "Brake does not release".
Internal components of motor damaged (regular rumbling from bearing support, internal whistling from valving cover, etc.).	■ Return the motor to a Poclain Hydraulics Repair Center for inspection and repair of internal components.
Safety valve is noisy due to a pressure setting too close to the operating pressure or the pressure setting of another valve.	■ Check and adjust proper pressure according to the machine manufacturer specifications.
Worn internal components of safety valve (Poppet, seat).	■ Repair or replace the safety valve.

Brake does not release

Probable cause	Solution
Brake release pressure too low (disk brake).	■ Check that the pilot pressure is compliant with the brake release pressure stated in the motor technical catalog. If needed, adjust the pressure. ■ Check the brake control valve. Replace it if needed. ■ If the pilot pressure is in conformity with requirements, perform a holding test of brake release pressure (refer to instructions given in section 2.6.1.5 - Holding test of brake release pressure in the parking brake). If the pressure is below the minimum pressure or close to 0, return the motor to a Poclain Hydraulics Repair Center for inspection and repair of internal brake components.
Parking handbrake lever not fully released (drum brake).	■ Fully release the parking handbrake lever.

Insufficient brake torque

Probable cause	Solution
Incorrect cable adjustment (drum brake).	■ Check and perform cable adjustment (refer to instructions given in section 2.5.9.2 - Adjusting the parking brake cable).
Incorrect running-in of linings (drum brake).	■ Perform the running-in of drum brake linings (refer to instructions given in section 2.5.10 - Running-in of the drum brake).
Residual brake release pressure (disk brake).	■ Check that the line pressure is under the brake release pressure minimum stated in the motor technical catalog. ■ Check that the drain pressure is not too high. If so, check the line condition to eliminate the blocking source. ■ Check the brake control valve. Replace it if needed.
Incorrect dynamic brake pressure.	■ Check and adjust the line pressure according to the brake actuation pressure given in the motor technical catalog. ■ Check the brake control valve. Replace it if needed.
Disks (disk brake) or linings (drum brake) worn.	■ Return the motor to a Poclain Hydraulics Repair Center for inspection and repair.

No hydraulic fluid flow

Probable cause	Solution
No flow from the pump.	■ Check IC engine or electric motor drive speed. ■ Check the pump flow (refer to page 95).
Incorrect distributor valve operation.	■ Check the mounting of the distributor valve. ■ Check the electrical circuit and the solenoid valve(s).
All the flow passes through the safety valve.	■ Check and adjust the safety valve setting. ■ Check the condition of the safety valve (no foreign material or dirt). Repair or replace it.

Hydraulic fluid flow too low

Probable cause	Solution
Insufficient flow from the pump.	■ Check IC engine or electric motor drive speed. ■ Check the pump flow (refer to page 95).
Flow regulator valve misadjusted.	■ Check and adjust to proper setting.
Safety valve set at too low a pressure.	■ Check and adjust to proper setting.
External leaks in the circuit.	■ Check the tightness of all piping connections. ■ Check and tighten the connections to the required tightening torque according to machine manufacturer specifications.
Hydraulic fluid too viscous.	■ Check that the properties of the hydraulic fluid are compliant with the machine / system. ■ Change the hydraulic fluid.

Hydraulic fluid flow too high

Probable cause	Solution
Incorrect pump operation.	■ Check the pump conditions (refer to page 95).
Flow regulator valve misadjusted.	■ Check and adjust to proper setting.

Pressure too low – Insufficient torque

Probable cause	Solution
Excessive pressure drop from piping or valves.	■ Check the condition and dimensions of pipes and hoses to ensure a proper flow of hydraulic fluid. ■ Check the internal section of fittings. The use of Banjo fittings is prohibited. ■ Check the head loss in valves. Check and adjust to proper setting.
Pressure reducing valve misadjusted.	■ Check and adjust to proper setting.
Pressure reducing valve worn or damaged.	■ Repair or replace the pressure reducing valve.
External leaks in the circuit.	■ Check the tightness of all piping connections. ■ Check and tighten the connections to the required tightening torque according to machine manufacturer specifications.

Fluctuating pressure– Insufficient torque

Probable cause	Solution
Safety valve worn.	■ Repair or replace the safety valve.
Air intake.	■ Check the tightness of all piping connections. ■ Check and tighten the connections to the required tightening torque according to machine manufacturer specifications. ■ Check that the circuit is fully bled.
Hydraulic fluid too viscous, contaminated, or of poor quality.	■ Change the hydraulic fluid. ■ Change the filters.
Pump or hydraulic receivers worn.	■ Repair or replace.

Pressure too high

Probable cause	Solution
Incorrect pump operation.	■ Check the pump conditions (refer to page 95).
Pressure reducing valve or safety valve misadjusted.	■ Check and adjust to proper setting.
Pressure reducing valve or safety valve worn or damaged.	■ Repair or replace.

8 - Tightening torques

- **The tightening torques given in this section are for information only.**
- **Poclain Hydraulics recommends checking the tightening torques according to calculation note VDI 2230 guidelines.**
- **For more information, consult your application engineer.**

Quality class of different wrenches

Hardware						
Accuracy class	**Accuracy**	**Manual portable**	**Motorized portable**		**Motorized fixed**	
D	± 50 %	Hand wrench	Simple impact wrench	Sliding sleeve screwdriver		
C	± 20 %	Simple release torque wrench	Simple screwdriver with pneumatic display	Simple screwdriver with electric setting	Simple pneumatic motor	
			Stored energy impact wrench	Wrench with angle return setting		
B	± 10 %	Auto. release and rearming torque wrench	Wrench with angle return to release		Hydraulic screwdriver	Pulse motor
		Dial torque wrench with direct read			Torque control pneumatic motor	
A	≤± 5 %	Electronic torque wrench			Electric screwdriver	Two-speed motor
					Electronically synchronized motor	

Attachment

Recommended tightening for the INBUS screw according to DIN 912, DIN 7984 and W233.

Screws and bolts		**Nominal dimension**	**Quality Class**		
			8.8	**10.9**	**12.9**
			Nm [ft lb]	**Nm [ft lb]**	**Nm [ft lb]**
Normal Spaced Threads	**C HC**	M6	10 [7]	14 [10]	17 [13]
		M8	24 [18]	35 [26]	41 [30]
		M10	49 [36]	69 [51]	83 [61]
		M12	86 [63]	120 [89]	145 [107]
		M14	135 [100]	190 [140]	230 [170]
		M16	210 [155]	295 [218]	355 [262]
		M18	290 [214]	405 [299]	485 [358]
		M20	410 [303]	580 [428]	690 [509]
		M22	550 [406]	780 [576]	930 [686]
		M24	710 [524]	1000 [738]	1200 [886]
Fine spaced threads	**C HC**	M6 x 0.75	11 [8]	15 [11]	18 [13]
		M8 x 1	26 [19]	36 [27]	43 [32]
		M10 x 1.25	52 [38]	73 [54]	88 [65]
		M12 x 1.25	95 [70]	135 [100]	160 [118]
		M12 x 1.5	90 [66]	125 [92]	150 [111]
		M14 x 1.5	150 [111]	210 [155]	250 [185]
		M16 x 1.5	225 [166]	315 [232]	380 [280]
		M18 x 1.5	325 [240]	460 [339]	550 [406]
		M20 x 1.5	460 [339]	640 [472]	770 [568]
		M22 x 1.5	510 [376]	860 [635]	1050 [775]
		M24 x 2	780 [576]	1100 [812]	1300 [959]

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