

The Drive & Control Company

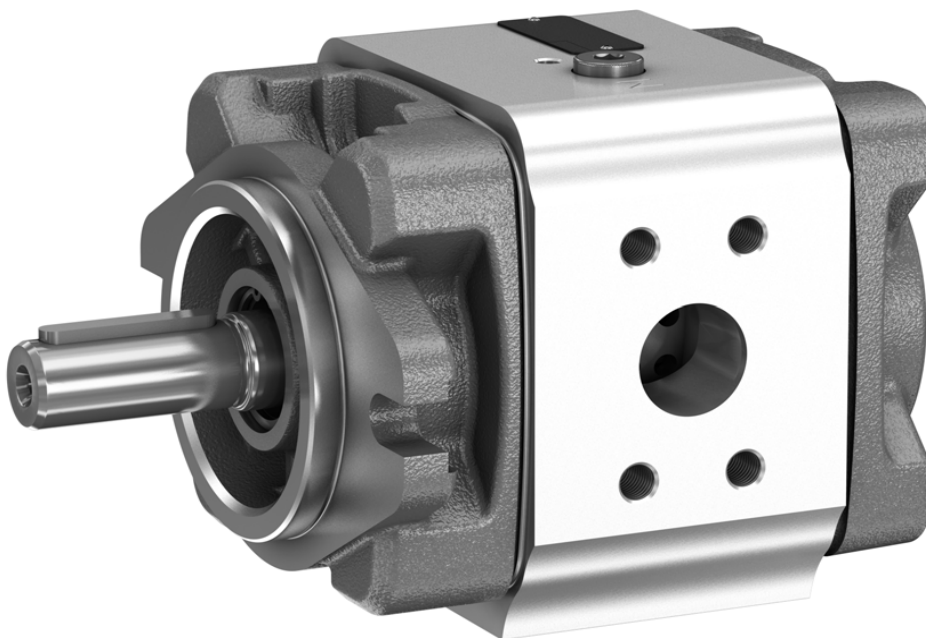
Rexroth
Bosch Group

Internal gear pump PGM

Series 4X

Instruction manual
RE 10235-B/08.2014

Replaces: –.–
English



Knowledge is POWER – Motion Force Control is our Business

HYQUIP Limited New Brunswick Street Horwich Bolton Lancashire BL6 7JB UK

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An example configuration is shown on the title page. The product delivered may therefore differ from that shown.

The original instruction manual was created in German.

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Bosch Rexroth AG, PGM Series 4X, RE 10235-B/08.2014

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1 About this manual

1.1 Validity of the documentation

This documentation applies to the following products:

- Internal gear pump PGM Series 4X

This documentation is intended for machine/system manufacturers, fitters and service technicians.

This documentation contains important information on safe and appropriate installation, transportation, commissioning, maintenance, dismantling and simple troubleshooting of the Internal gear pump PGM.

- Read this documentation completely and, in particular, chapter 2 "Safety instructions" on page 10 and chapter 3 "General instructions on damage to equipment and the product" on page 15 before you start work on the Internal gear pump.

1.2 Required and supplementary documentation

- Only commission the Internal gear pump if the documentation marked with the book symbol  is available to you and you have understood and observed it.

Table 1: Required and supplementary documentation

Title	Document number	Document type
 Internal gear pump, fixed displacement volume, type PGM, series 4X Contains the permitted technical data, operating conditions, performance limits and project planning information	10235	Data sheet
 General product information for hydraulic products Contains general information on hydraulic products	07008	Instruction manual
 Installation, commissioning and maintenance of hydraulic systems Contains general information on installation, commissioning and maintenance of hydraulic systems	07900	Data sheet
 Mineral-oil based hydraulic fluids and related hydrocarbons Describes the requirements for a mineral-oil based hydraulic fluid and related hydrocarbons for operation with Rexroth hydraulic components, and assists you in selecting a hydraulic fluid for your hydraulic system.	90220	Data sheet

The Internal gear pump PGM is a system component.

You must also follow the instructions provided for other system components and the documentation from the system manufacturer.

1.3 Display of information

Standardized safety instructions, symbols, terms and abbreviations are used so that you can use this documentation to work quickly and safely with your product. To give you a better understanding these are explained in the sections below.

1.1.1 Safety instructions

This manual includes safety instructions in chapter 2.6 "Product-specific safety instructions" on page 13 and in chapter 3 "General instructions on damage to equipment and the product" on page 15 and before a sequence of actions or an instruction involving a risk of personal injury or damage to equipment. The measures described to avert danger must be observed.

Safety instructions are set out as follows:

 SIGNAL WORD
Type and source of danger Consequences of non-compliance ▶ Measures to avert danger ▶ <List>

- **Safety sign:** draws attention to the danger
- **Signal word:** identifies the degree of danger
- **Type and source of the hazard:** identifies the type and source of the danger
- **Consequences:** describes what occurs if the safety instructions are not complied with
- **Precautions:** states how the danger can be avoided

Table 2: Hazard classes as defined in ANSI Z535.6-2006

Safety sign, signal word	Meaning
 DANGER	Identifies a dangerous situation that will result in death or serious injuries if it is not avoided.
 WARNING	Identifies a dangerous situation that may result in death or serious injuries if it is not avoided.
 CAUTION	Identifies a dangerous situation that may result in minor to moderate injuries if it is not avoided.
NOTE	Property damage: The product or the environment may be damaged.

1.1.2 Symbols

The following symbols indicate information that is not directly relevant to safety but increases understanding of the manual.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is disregarded, the product cannot be optimally used or operated.
	Single, independent step
1.	Numbered instruction:
2.	The numbers specify that the steps are completed one after the other.
3.	

1.1.3 Abbreviations

This manual uses the following abbreviations:

Table 4: Abbreviations

Abbreviation	Meaning
ATEX	EU directive on explosion protection (A tmosphère e xplosible)
ISO	I nternational O rganization for S tandardization
RE	R exroth document in the E nglish language

2 Safety instructions

2.1 About this chapter

The Internal gear pump has been manufactured according to the generally accepted rules of current technology. There is, however, still a danger of personal injury or damage to equipment if this chapter and the safety instructions in this documentation are not complied with.

- ▶ Read this documentation completely and thoroughly before working with the Internal gear pump.
- ▶ Keep this documentation in a location where it is accessible to all users at all times.
- ▶ Always include the required documentation when you pass the Internal gear pump on to third parties.

2.2 Intended use

Internal gear pumps are hydraulic components. The product is exclusively intended to be incorporated into a machine/system or to be assembled with other components to form a machine/system. The Internal gear pump may only be commissioned after it has been installed in the machine/system for which it is intended and the safety of the entire system has been established in accordance with the Machine Directive.

During project planning, the basic principles of the EU Machine Directive or comparable local regulations outside of the EU are to be observed.

The product is intended for the following use:

Internal gear pumps are intended for assembly of hydraulic drive systems, particularly in machine, plant and equipment construction.

- ▶ Observe the technical data, application and operating conditions and performance limits as specified in data sheet 10235. Information about approved hydraulic fluids can be found in data sheet 10235.

The Internal gear pump is intended for professional use and not for private use. Intended use also includes having read and understood the documentation in full, especially the chapter 2 "Safety instructions" on page 10.

2.3 Improper use

Any use other than that described as intended use shall be considered as improper and is therefore not permitted.

Bosch Rexroth AG shall accept no liability whatsoever for damages resulting from improper use. The user shall bear all risks arising from improper use.

The following foreseeable forms of misuse of the Internal gear pump shall also be considered to be improper use (this list does not claim to be exhaustive):

- Use outside the operating parameters approved in the data sheet (unless customer-specific approval has been granted)
- Use of non-approved fluids, e.g. water or polyurethane components
- Use in explosive environments unless the component or machine/system has been certified as compliant with ATEX directive 94/9/EC
- Use in aggressive atmospheres
- Use in aircraft and spacecraft

2.4 Personnel qualifications

The activities described in this documentation require basic mechanical and hydraulic knowledge, as well as knowledge of the associated technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with lifting gear and the corresponding attachment equipment. In order to ensure safe use, these activities may therefore only be performed by an appropriately qualified person or an instructed person under the direction and supervision of a qualified person.

Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant conditions pertaining to the work to be done. Qualified personnel must observe the rules relevant to the specialist field and have the necessary hydraulics expertise.

Hydraulic expertise includes:

- Reading and fully understanding hydraulic diagrams,
- Specifically, fully understanding the relationships with regard to safety devices, and
- Having knowledge on the function and assembly of hydraulic components.



Bosch Rexroth offers training support for specialist fields. An overview of the training contents can be found on the Internet at:
<http://www.boschrexroth.com/training>.

2.5 General safety instructions

- Observe the applicable accident prevention and environmental protection regulations.
- Observe the safety regulations and provisions of the country in which the product is used/operated.
- Use Rexroth products only when they are in good technical order and condition.
- Persons who install, operate, remove or maintain Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.
- Only use genuine Rexroth accessories and spare parts to ensure there is no risk to personnel from unsuitable spare parts.
- Adhere to the technical data and ambient conditions specified in the product documentation.
- If unsuitable products are installed or used in applications that are relevant for safety, unexpected operating conditions may occur in the application, which could result in injury to personnel or damage to equipment. For this reason, only use the product in a safety-related application if this use is expressly specified and permitted in the product documentation, for example in explosion protection applications or in safety-related parts of a control system (functional safety).
- You may only commission the product if it has been determined that the end product (e.g., machinery or system) in which the Rexroth products are 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 chapters 6 to 14.

WARNING

Pressurized components and machine/system.

Danger to life or risk of injury, serious injuries when working on machines/systems not shut down. Damage to equipment.

- ▶ Protect the entire system against being re-energized.
- ▶ Make sure that all relevant components of the hydraulic system are depressurized. Follow the machine/system manufacturer's specifications.
- ▶ Do not disconnect any line connections, ports and components while the hydraulic system is pressurized.
- ▶ Before disconnecting the screw plug at the pump measuring connection **M**, make sure that the hydraulic system is depressurized.
- ▶ Only seal the pump measuring connection **M** using the G 1/4 screw plug supplied. Due to a lack of visual differentiating features, there is a risk of confusion with the thread size 1/2-20 UNF.
- ▶ Turn off all power-transmitting components and ports (electric, pneumatic, hydraulic, mechanical) in line with the manufacturer's specifications and secure them against being turned back on.

Escaping oil mist.

Risk of explosion, fire, health hazard, environmental pollution.

- ▶ Depressurize the machine/system and repair the leak.
- ▶ Only perform welding work when the machine/system is depressurized.
- ▶ Keep open flames and ignition sources away from the Internal gear pump.
- ▶ If Internal gear pumps are to be situated in the vicinity of ignition sources or powerful thermal radiators, a shield must be attached to ensure that any escaped hydraulic fluid cannot ignite, and to protect hose lines from premature aging.

Electrical voltage.

Risk of injury due to electric shock or damage to equipment.

- ▶ Always de-energize the relevant part of the machine/system before you install the product. Protect the machine/system against being energized.

CAUTION

High noise levels during operation.

Danger of hearing damage, deafness.

The noise emissions from internal gear pumps depends, among other factors, on rotational speed, operating pressure and installation conditions. The sound pressure level may rise above 70 dB (A) in certain application conditions.

- ▶ Always wear hearing protection when in the vicinity of the operating internal gear pump.

Hot surfaces on Internal gear pump.

Risk of burns.

- ▶ Allow the Internal gear pump to cool down sufficiently before touching it.
- ▶ Wear heat-resistant protective clothing, e.g. gloves.

Contact with hydraulic fluid.

Health hazard / risk of health impairment, e.g., eye injuries, skin damage, poisoning on inhalation.

- ▶ Avoid contact with hydraulic fluids.
- ▶ When working with hydraulic fluids, strictly observe the safety instructions provided by the lubricant manufacturer.
- ▶ Use your personal protective equipment (e.g., safety glasses, safety gloves, suitable working clothes, safety shoes).
- ▶ If hydraulic fluid should, nevertheless, come into contact with your eyes, get into your bloodstream or be swallowed, consult a doctor immediately.

Escaping hydraulic fluid due to machine/system leakage.

Risk of burns and risk of injury due to escaping oil jet.

- ▶ Depressurize the machine/system and repair the leak.
- ▶ Never attempt to block or seal the leak or oil jet with a cloth.

Risk of slipping.

When removing the shaft protection, protection plugs and flange covers, residual oil can escape without pressure. Slipping can lead to serious injuries.

- ▶ Mop up escaping residual oil immediately and dispose of properly.

2.7 Personal protective equipment

The personal protective equipment is the responsibility of the user of the Internal gear pump. Observe the safety regulations and provisions in your country. All components of the personal protective equipment must be intact.

3 General instructions on damage to equipment and the product

The following instructions apply to chapters 6 to 14.

NOTE

Danger from improper handling.

Product can be damaged.

- ▶ Do not expose the product to a non-permitted mechanical load.
- ▶ Never use the Internal gear pump as a handle or step.
- ▶ Do not place/lay any objects on the product.
- ▶ Do not strike the shaft of the Internal gear pump.
- ▶ Do not set/place the pump on the shaft.
- ▶ Do not strike sealing surfaces (e.g. service line ports).
- ▶ Leave the protection covers on the Internal gear pump until shortly before the lines are connected.

Damage to equipment due to improper lubrication.

Product can be damaged or destroyed.

- ▶ Never operate the Internal gear pump with insufficient hydraulic fluid. In particular, make sure that the rotary group has sufficient lubrication.

Mixing of hydraulic fluids.

Product can be damaged.

- ▶ Before installation, remove all fluids from the Internal gear pump to prevent mixing with the hydraulic fluid used in the machine/system.
- ▶ Any mixing of hydraulic fluids from different manufacturers or different types from the same manufacturer is not generally permitted.

Contamination of the hydraulic fluid.

The cleanliness of the hydraulic fluid has a considerable impact on the cleanliness and service life of the hydraulic system. Contamination of the hydraulic fluid could cause premature wear and malfunctions.

- ▶ Make sure that the working environment at the installation site is fully free of dust and foreign substances in order to prevent foreign particles, such as welding beads or metal cuttings, from getting into the hydraulic lines and causing product wear or malfunctions. The Internal gear pump must be installed in a clean condition.
- ▶ Use only clean ports, hydraulic lines and attachments (e.g., measuring devices).
- ▶ No contaminants may enter the ports when they are sealed.
- ▶ Before commissioning, make sure that all hydraulic connections are tight and that all of the connection seals and plugs are installed correctly to ensure that they are leak proof and fluids and contaminants are prevented from penetrating the product.
- ▶ Use a suitable filter system to filter hydraulic fluid during filling to minimize solid impurities and water in the hydraulic system.

NOTE

Improper cleaning.

Product can be damaged.

- ▶ Plug all openings with suitable protective equipment.
- ▶ Never use solvents or aggressive cleaning agents. Only clean the Internal gear pump with a lint-free cloth.
- ▶ Do not use a high-pressure cleaner for cleaning.

Environmental pollution due to incorrect disposal.

Careless disposal of the Internal gear pump and its fittings, the hydraulic fluid and the packaging material could lead to pollution of the environment.

- ▶ Dispose of the Internal gear pump, hydraulic fluid and packaging in accordance with the national regulations in your country.
- ▶ Dispose of the hydraulic fluid in accordance with the applicable safety data sheet for the hydraulic fluid.

Escaping or spilling hydraulic fluid.

Environmental pollution and contamination of groundwater.

- ▶ When filling and draining the hydraulic fluid, always place a drip tray under the Internal gear pump.
- ▶ Use an oil binding agent if hydraulic fluid is spilt.
- ▶ Observe the information in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

The warranty only applies to the delivered configuration.

The warranty entitlement is rendered void if the product is incorrectly installed, commissioned or operated, as well as in cases of improper use and/or handling.

4 Delivery contents

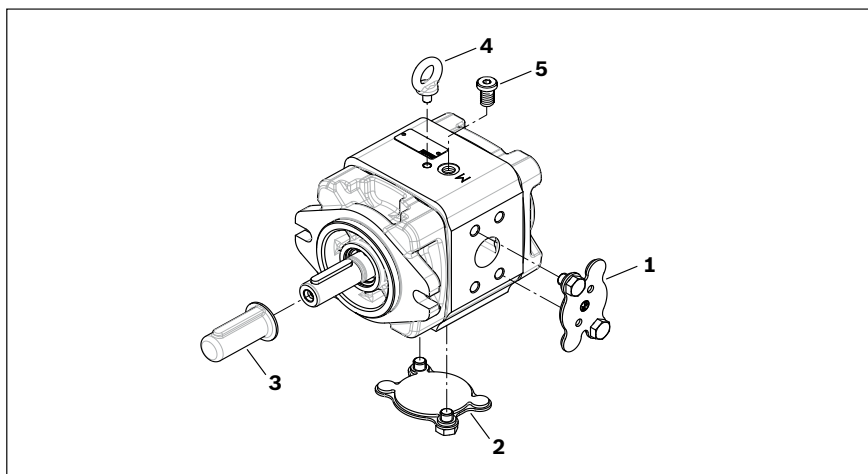


Fig. 1: Internal gear pump PGM

The delivery includes the following:

- Internal gear pump PGM Series 4X

The following parts are also fitted prior to delivery:

- Flange cover for pressure port (1)
- Flange cover for suction port (2)
- Protection plug for shaft protection (3)
- Ring screw (4)
- Screw plug G 1/4 (5)

5 About this product

Technical data, operating conditions, port dimensions and performance limits of the Internal gear pump can be found in data sheet 10235.

5.1 Product description

Type PGM-4X hydraulic pumps are gap-compensated internal gear pumps with fixed displacement. They essentially consist of: mounting flange (**1**), housing (**2**), cover (**3**), pinion shaft (**4**), ring gear (**5**), slide bearings (**6**), axial washers (**7**) and stop pin (**8**) as well as the radial compensation, consisting of segment (**9**), segment support (**10**) and the seal rolls (**11**).

1.1.4 Assembly of the Internal gear pump

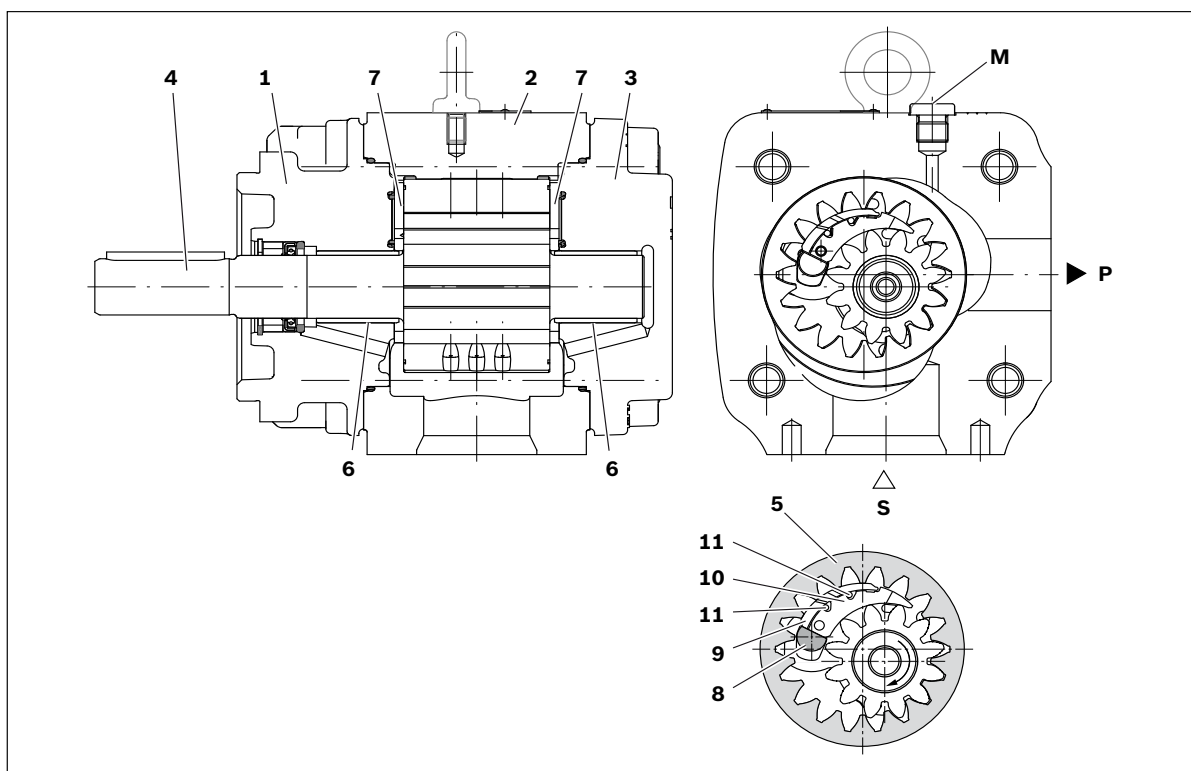


Fig. 2: Assembly of the Internal gear pump

- | | | |
|--------------------------|---------------------------|------------------------|
| 1 Mounting flange | 7 Axial washers | S Suction port |
| 2 Housing | 8 Stop pin | P Pressure port |
| 3 Cover | 9 Segment | M Gauge port |
| 4 Pinion shaft | 10 Segment support | |
| 5 Ring gear | 11 Seal rolls | |
| 6 Slide bearings | | |

5.2 Product identification

The Internal gear pump can be identified by the name plate. The following example shows the name plate of a Internal gear pump of type PGM:

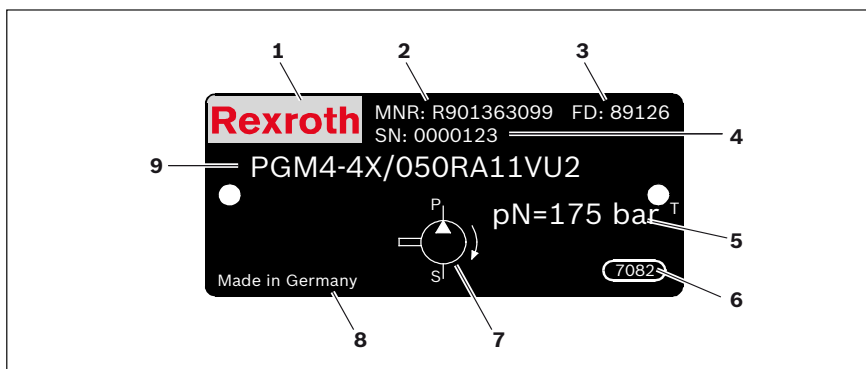


Fig. 3: Name plate Internal gear pump PGM

- | | |
|--------------------|--------------------------------|
| 1 Manufacturer | 6 Area/plant number |
| 2 Material number | 7 Symbol according to ISO 1219 |
| 3 Production date | 8 Designation of origin |
| 4 Serial number | 9 Material description |
| 5 Nominal pressure | |

6 Transport and storage

- ▶ Always observe the required ambient conditions for transport and storage, see chapter 6.2 "Storing the Internal gear pump" on page 22.



Notes on unpacking can be found in chapter 7.1 "Unpacking" on page 24.

6.1 Transporting the Internal gear pump

 **WARNING**

Danger from suspended loads.
Danger to life or risk of injury, damage to equipment.
Improper transportation may cause the internal gear pump to fall down, which can lead to injuries e.g. crushing or broken bones, or damage to the product.

- ▶ Make sure that the load capacity of the lifting gear is sufficient to safely bear the weight of the pump.
- ▶ Never step or reach under a suspended load.
- ▶ Ensure a stable position during transportation.
- ▶ Use your personal protective equipment (e.g., safety glasses, safety gloves, suitable working clothes, safety shoes).
- ▶ Use suitable lifting gear for transportation.
- ▶ Observe the prescribed position of the lifting strap.
- ▶ Carefully place the Internal gear pump components on the seating to prevent them from being damaged.
- ▶ Observe the national laws and regulations for health and safety and transportation.

The following transportation options are available depending on the weight and duration of transport:

- Transporting by hand
- Transporting with lifting gear (eye bolt or lifting strap)

Dimensions and weights

Table 5: Dimensions and weights

Size			PGM4					PGM5		
Nominal size			25	32	40	50	63	80	100	125
Mass	m	kg	12	12.5	13.5	14	14.5	36.5	38	39.5

1.1.5 Transporting by hand

Internal gear pumps with a weight of up to 15 kg can be transported manually for a short time if necessary.

CAUTION. Risk of injury from heavy loads.

There is a risk of injury when carrying internal gear pumps.

- ▶ Use suitable lifting, placement and relocation equipment.
- ▶ Use your personal protective equipment (e.g., safety glasses, safety gloves, suitable working clothes, safety shoes).

1.1.6 Transporting with lifting gear

For transportation, the Internal gear pump can be connected to lifting gear using an eye bolt or a lifting strap.

- ▶ Always use the eye bolt supplied or a lifting strap to lift the pump. Observe the prescribed position of the lifting strap.

Transportation with eye bolt

You can suspend the internal gear pump at the eye bolt.

- ▶ Check that the eye bolt is securely positioned before transportation.
- ▶ Lift the internal gear pump with the eye bolt screwed in, as shown in Fig. 4.

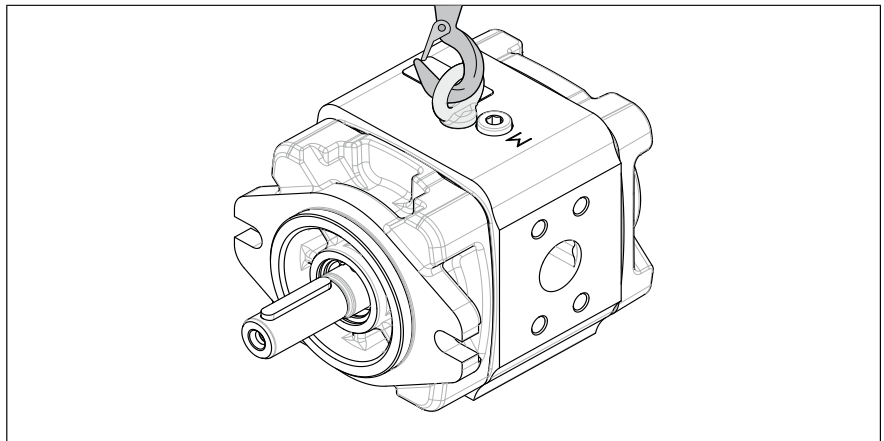


Fig. 4: Transportation with eye bolt

Transportation with lifting strap

WARNING! Risk of injury!

During transportation with a lifting strap, the internal gear pump can tip out of the strap and cause injuries.

- ▶ Use the widest possible lifting strap.
- ▶ Make sure that the internal gear pump is securely attached to the lifting strap.
- ▶ Only guide the internal gear pump by hand for precise positioning and to avoid oscillations.
- ▶ Place the lifting strap around the flange and rear cover in such a way that the strap cannot slip off and the pump cannot fall out (see Fig. 5).

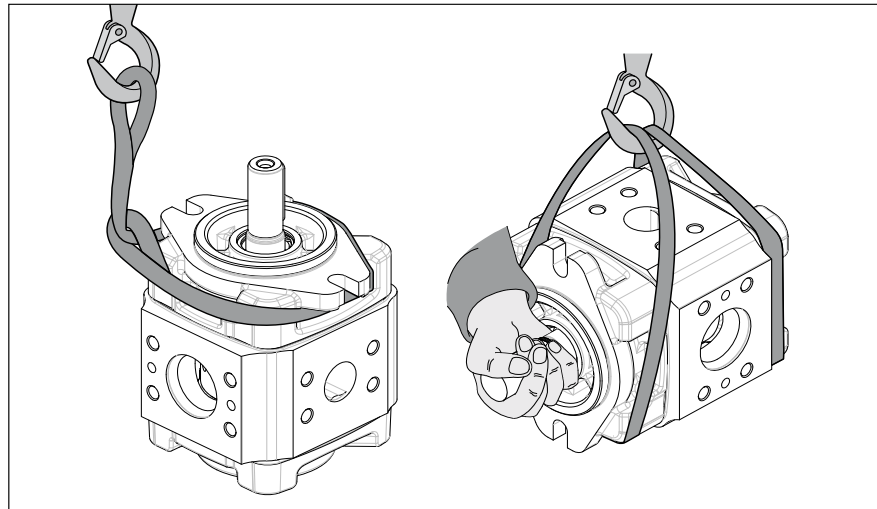


Fig. 5: Transportation with lifting strap

6.2 Storing the Internal gear pump

Requirements

- The storage areas must be free of 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 electrical sparks or electrical discharge) must not be operated in storage areas.
- The storage areas must be dry.
- Ideal storage temperature: +5 °C to +20 °C. The temperature should ideally remain constant.
- Avoid significant exposure to light (e.g. bright windows or direct fluorescent lighting).
- Store the Internal gear pump in a shock-proof location, do not stack.
- Do not store the Internal gear pump on the shaft.

Maximum storage time The maximum storage time is 24 months.

Storage up to 9 months ▶ Leave the Internal gear pump in the delivery condition (coated in mineral oil).

Storage up to 24 months ▶ Fill the Internal gear pump with mineral oil.

Commissioning after storage

- ▶ Procedure after expiry of the maximum storage time:
- ▶ Check the entire Internal gear pump for damage and corrosion prior to installation.
- ▶ Check the Internal gear pump for proper function and leaks during a test run.
- ▶ If the storage time exceeds 24 months, the shaft seal must be replaced.



Warranty entitlement will be rendered void if the requirements and storage conditions are not adhered to or after expiration of the maximum storage time.

After expiration of the maximum storage time, we recommend that you have the Internal gear pump checked and the seals replaced by your responsible Bosch Rexroth Service partner.

In the event of questions regarding repair and spare parts, contact your responsible Bosch Rexroth Service partner or the service department of the manufacturer's plant for the Internal gear pump, see chapter 10.2 "Repair" on page 32.

After removal

If a removed Internal gear pump is to be stored, it must be preserved against corrosion for the duration of storage.



The following instructions only refer to Internal gear pumps that are operated with a mineral-oil based hydraulic fluid. Other hydraulic fluids require preservation methods that are specifically designed for them. In such cases, consult Bosch Rexroth Service, see chapter 10.2 "Repair" on page 32.

Bosch Rexroth recommends the following procedure:

1. Clean the Internal gear pump.
2. Drain the Internal gear pump.
3. For storage periods up to 9 months: Coat the inside of the Internal gear pump with mineral oil by filling with approx. 100 ml.
 For storage periods up to 24 months: Completely fill the Internal gear pump with mineral oil.
 Filling is performed using the suction port **S** or the pressure port **P**, see chapter 7.5 "Installing the Internal gear pump", Fig. 8 on page 27.
4. Seal all ports so they are airtight.
5. Coat the unpainted surfaces of the Internal gear pump with mineral oil or a suitable, easily removed corrosion protection agent, e.g. acid-free grease.
6. Package the Internal gear pump along with desiccant in corrosion protection film so that it is airtight.
7. Store the Internal gear pump so that it is protected against jolts, see "Requirements" on page 22 in this chapter.

7 Installation

Prior to installation, the following documents should be to hand:

- Hydraulic circuit diagram for the machine/system (available from the machine/system manufacturer)
- Data sheet for the Internal gear pump (contains the permitted technical data)

7.1 Unpacking

CAUTION! Danger from parts falling out.

If the packaging is not opened correctly, parts may fall out and damage the parts or even cause injuries.

- ▶ Place the packaging on a flat and solid surface.
- ▶ Only open the packaging from the top.
- ▶ Remove the packaging from the Internal gear pump.
- ▶ Check the Internal gear pump for transport damage and completeness, see chapter 4 "Delivery contents" on page 17.
- ▶ Dispose of the packaging material according to the national regulations in your country.

7.2 Installation conditions

Cleanliness	Absolute cleanliness is required. The Internal gear pump and all other parts used must be installed in a clean condition. Contamination of the hydraulic fluid can have a considerable impact on the service life of the Internal gear pump.
Cleaning	Use lint-free cloths for cleaning.
Temperature	The temperature of the Internal gear pump must be the same as the ambient temperature of the installation site. Allow sufficient time for the Internal gear pump to adjust to the temperature conditions.
Mounting the pump	For installing and removing the pump on or from the drive accessibility must be ensured on the system side. On the machine side, the screws have to be accessible so that the required tightening torque can be applied. The tightening torque is based on the operating conditions and the components involved in the screw connection and has to be specified by the manufacturer when engineering the assembly, machine or system. Screws of tensile strength class 8.8 or 10.9 are to be provided for mounting purposes.

7.3 Installation instructions

- Fluid reservoir**
- ▶ The permitted fluid temperature must not be exceeded; provide a cooler if necessary.
- Lines and ports**
- ▶ Remove the protection plugs on the pump.
 - ▶ Carefully clean the pipelines and fittings prior to installation.
 - ▶ Under no circumstances may returning fluid be re-aspired directly, i.e., select the largest possible distance between the suction line and return line.
 - ▶ Make certain that the suction and return lines lead into the reservoir below the minimum fluid level in all operating conditions. This will prevent air from being drawn in, which could result in the formation of foam.
 - ▶ Make sure the connections and connecting elements are airtight.

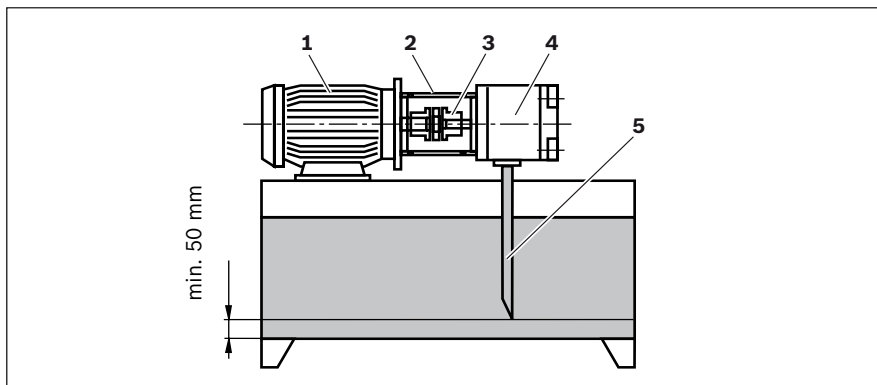


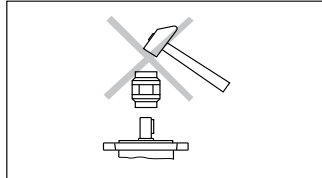
Fig. 6: Recommendation for arrangement of the suction line

- | | |
|------------------|----------------|
| 1 Electric motor | 4 Pump |
| 2 Pump support | 5 Suction line |
| 3 Coupling | |

- Filters** If possible, use return line filters or pressure filters.
(Only use suction filters in combination with underpressure switch/contamination indicator.)

- Hydraulic fluid**
- ▶ Observe our specifications as set out in data sheet 90220.
 - ▶ Different types of hydraulic fluid must not be mixed.
 - ▶ The hydraulic fluid must be replaced at regular intervals according to the operating conditions. When doing this, the oil reservoir must also be cleaned of residues.

- Drive**
- ▶ No radial or axial forces are permitted on the pump drive shaft.
 - ▶ Make certain that the motor and pump are exactly aligned.
 - ▶ Always use a coupling that is suitable for compensating for shaft offsets.
 - ▶ When installing the coupling, avoid axial forces, i.e., when installing, do not hammer or press the coupling onto the shaft. Use the female thread on the drive shaft.



7.4 Required tools

Details of the required tools and the tightening torques for the mounting bolts are available from the machine and system manufacturer.

7.5 Installing the Internal gear pump

1.1.7 Preparation

- ▶ Before installing, completely empty the Internal gear pump to prevent mixing with the hydraulic fluid used in the machine/system.

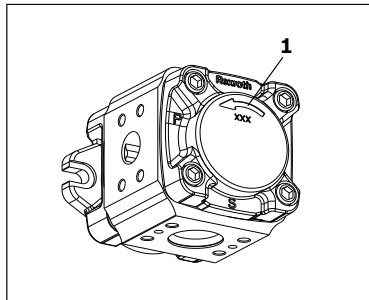


Fig. 7: Direction of rotation for Internal gear pump

- 1** Arrow indicating the direction of rotation on the housing
- ▶ Make certain that the direction of rotation for the Internal gear pump, as specified by the arrow indicating the direction of rotation on the cover, matches the direction of rotation of the electric motor.

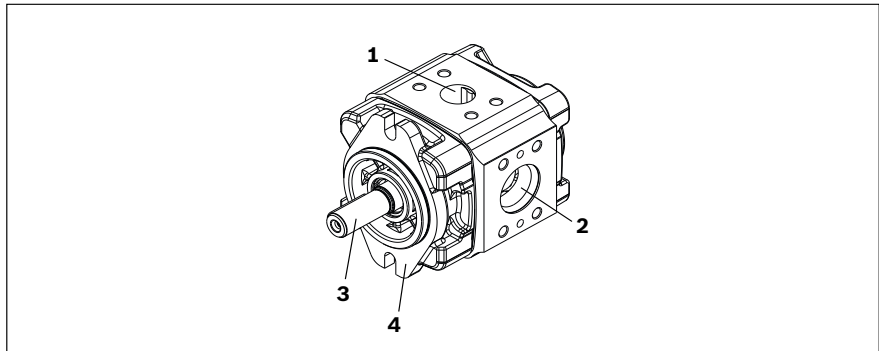


Fig. 8: Internal gear pump installation PGM

- | | |
|-------------------|-------------------|
| 1 Pressure port P | 3 Shaft |
| 2 Suction port S | 4 Mounting flange |

1.1.8 Installing the coupling

1. Remove the protection plugs on the shaft.
2. Lightly grease the shaft end and the coupling half.
3. Push the first coupling half onto the shaft end.
4. Axially align the coupling half according to the manufacturer's instructions.
5. Secure the coupling half on the shaft.
6. Check whether the position of the coupling half corresponds to the manufacturer's instructions and correct if necessary.
7. Screw the pump support onto the mounting flange.
8. Grease the motor shaft and its coupling half.
9. Push the second coupling half onto the motor shaft.
10. Align the coupling half on the motor shaft.
11. Secure the coupling half on the motor shaft.
12. Mount the gear crown or another elastic coupling part on the motor shaft coupling half.
13. Place the pump on the pump support mounted on the motor shaft and secure the pump. Use suitable screw lengths here that are appropriate for the load situation.
14. Check the required coupling backlash between the pump/motor and correct if necessary. Refer to the specifications from the coupling manufacturer for the coupling backlash.
15. When using flexible couplings, check that the drive is free of resonance after completing the installation.

1.1.9 Hydraulically connecting the Internal gear pump

- ▶ Remove the flange covers on the suction and pressure port.
- ▶ Check the lines for cleanliness.
- ▶ Make certain that the line connection contains the specified seals.
- ▶ If necessary, secure the O-ring against slipping with installation grease.
- ▶ Hydraulically connect the pump in line with the instructions from the system or machine manufacturer.

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8 Commissioning

CAUTION

Risk of personal injury and damage to equipment.

If the Internal gear pump was not correctly installed, personnel could be injured and the product or the system damaged or even destroyed during commissioning of the Internal gear pump.

- ▶ Make certain that the Internal gear pump was installed by qualified personnel before commissioning the Internal gear pump.
- ▶ In particular, make sure that the direction of rotation of the pump is the same as the direction of rotation of the drive motor. Also make sure that the drive motor is correctly connected electrically.

NOTE

Damage to equipment due to improper lubrication.

Commissioning the Internal gear pump with no or insufficient hydraulic fluid will immediately damage or even destroy the Internal gear pump.

- ▶ When commissioning or re-commissioning a machine or system, make sure that the suction and pressure lines for the internal gear pump are filled with hydraulic fluid and remain filled during operation.

Contamination of the hydraulic fluid.

Contaminated hydraulic fluid can lead to wear and malfunctions. In particular, foreign particles, such as welding beads or metal cuttings in the suction line, may damage the Internal gear pump.

- ▶ Ensure the utmost cleanliness during commissioning.
- ▶ Make sure that no contaminants can penetrate when sealing the gauge ports.



During all work for commissioning the Internal gear pump, observe the general safety instructions and intended use detailed in chapter 2 "Safety instructions" on page 10.

To commission the Internal gear pump, observe the instruction manual for the hydraulic system.

Only commission the Internal gear pump with approved hydraulic fluid. Observe data sheet 10235 here.

8.1 Preparing for commissioning

- ▶ Make certain that the suction channel is clear.
- ▶ Make certain that the piping is clean and installed without leaks.
- ▶ Check the hydraulic circuit diagram for immediate functions/movements when pressure has built up.
- ▶ Check the hydraulic fluid vessel for cleanliness.
- ▶ Fill the hydraulic fluid according to the system manufacturer's specifications. To do this, use only filters with the required minimum retention rate.
- ▶ Check the suction side for leak-free installation.

- ▶ Make certain that the direction of rotation of the motor is the same as the direction of rotation of the pump.
- ▶ If the pump has been commissioned with the incorrect direction of rotation, it must be bled again.

8.2 Initial commissioning

To commission the Internal gear pump, proceed as follows:

- ▶ Place a drip tray under the Internal gear pump to collect any hydraulic fluid that may escape.
- ▶ Fill the pump with filtered hydraulic fluid. Depending on the installation position, filling can be performed using the suction, pressure, or gauge port. Refer to the instruction manual for the system for information on a suitable port.
- ▶ Bleed the pump. Refer to the instruction manual for the system for information on how to bleed the Internal gear pump.

If no switchable or automatic bleeding is provided, you must bleed the pump manually.

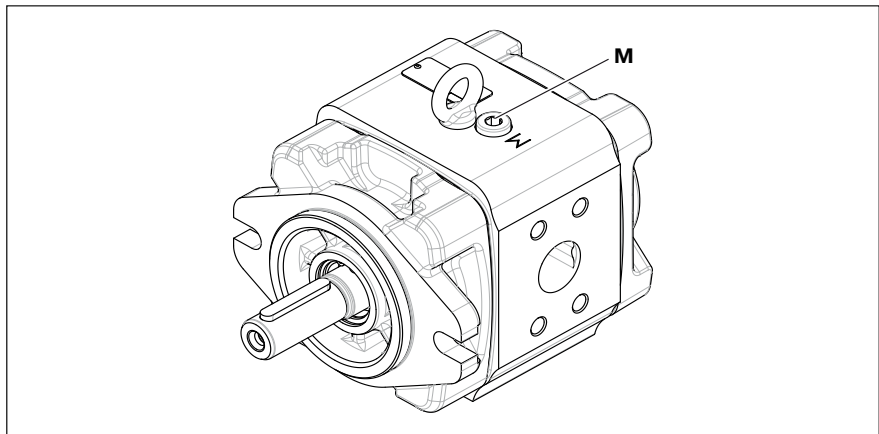


Fig. 9: Bleeding and gauge port (M)

Manually bleeding the pump

As standard, the bleeding and gauge port **M** on the Internal gear pump is sealed with a screw plug G 1/4.

1. Open the bleeding and gauge port by removing the screw plug or switch to depressurized circulation as described in the system operating manual.
2. To bleed the pump, briefly turn on the motor and then turn it off again (inching mode) Repeat this procedure until the hydraulic fluid drains without bubbles and complete bleeding is ensured.
3. Reseal the manually opened bleeding port by screwing in the screw plug G 1/4. Tightening torque $T = 23 \text{ Nm}$.

The Internal gear pump is now bled.

- ▶ Make sure that the system is depressurized.
- ▶ Turn on the drive motor and allow the pump to start up.
- ▶ Slowly build up the pressure. Follow the system manufacturer's instructions.
- ▶ When commissioning the system, make sure that no hydraulic fluid escapes at high pressure.

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- ▶ Check that no bubbles or foam forms in the hydraulic fluid.
- ▶ Turn the motor off again.

8.3 Recommissioning after stoppage

- ▶ During recommissioning, check that the direction of rotation of the electric motor matches the direction of rotation arrow on the pump housing after disconnecting from the mains.
- ▶ Inspect the pump and system for leaks. Loss of fluid indicates leaks below the hydraulic fluid level. An increased hydraulic fluid level in the reservoir indicates leaks above the hydraulic fluid level.
- ▶ If the pump is positioned above the hydraulic fluid level, the pump can drain due to leaks, for example due to a worn-out shaft seal ring. In this case, bleeding must be carried out again during recommissioning. Have the damage repaired.
- ▶ Turn on the motor when the system is in an intact condition.

9 Operation

The Internal gear pump may only be operated with the permitted data, see data sheet 10235.

The pump may only be operated when in perfect condition.

To ensure a long and reliable service life of the Internal gear pump, Bosch Rexroth recommends regularly inspecting the hydraulic system and the Internal gear pump: Constantly monitor noises, vibrations and temperatures.

After some time in operation, check the hydraulic fluid in the reservoir for bubbles or the formation of foam on the surface.

During operation, pay attention to changes in the noise characteristics. A slight increase in the noise level is normal due to heating of the hydraulic fluid. A significant increase in the noise level or short-term and irregular changes in the noise characteristics may indicate the aspiration of air. If the suction pipe opening is below – but too close – to the surface of the hydraulic fluid, air may be drawn in via a vortex.

Changes in operating speeds, temperatures, increases in the noise level or power consumption indicate wear or damage to the system or pump.

10 Maintenance and repair

Maintenance Installation, maintenance and repair of the pump may only be performed by the manufacturer or their authorized dealers and subsidiaries. Repairs carried out by the customer render entitlement to warranty cover void.

Inspection Check the lines, line connections and shaft seals for leaks. Follow the system manufacturer's instructions.

Checking warning equipment After completing the maintenance and repair work, check that all warning and safety devices have been re-installed and are in perfect condition.

Replacing wearing parts When replacing wearing parts, use only genuine spare parts. As a precaution, wearing and plastic parts of the drive coupling should be replaced after no more than 5 years, even if they are not yet worn. Also follow the coupling manufacturer's instructions.

Sealing openings For transportation, seal all openings with appropriate protection caps or devices to protect dirt or moisture from getting into the Internal gear pump.

10.1 Maintenance

To ensure safe operation and a long service life of the pump, a maintenance schedule has to be developed for the assembly, machine, or system. The maintenance schedule must ensure that the operating conditions of the pump remain in the specified range during the entire service life.

In particular, compliance with the following operating parameters has to be ensured:

- Required cleanliness of the hydraulic fluid
- Operating temperature range
- Fill level of the hydraulic fluid.

Furthermore, the pump and the system are to be checked for changes to the following parameters on a regular basis:

- Vibrations
- Noises
- Pressure difference between pump and hydraulic fluid tank
- Foaming in the vessel
- Leaks

Changes to these parameters indicate wear to components (e.g., drive motor, coupling, pump, etc.). The cause has to be determined and remedied immediately. In order to achieve high operational reliability of the pump in the machine/system, we recommend checking the parameters mentioned above continuously and automatically and automatic shut-down in case of changes exceeding the usual fluctuations in the specified operating range.

For preventive maintenance of the pump, we recommend having the shaft seals replaced by an authorized Bosch Rexroth service company after an operating period of no more than 5 years.

Refer to the instruction manual for the system for additional information on maintenance.

10.2 Repair

Repairs to the Internal gear pump may only be performed by Bosch Rexroth or dealers authorized by Bosch Rexroth. Repairs carried out by the customer render entitlement to warranty cover void.

Address all questions regarding spare parts and repairs to your responsible Bosch Rexroth Service partner or the service department of the plant that manufactures the Internal gear pump:

Bosch Rexroth AG
Service
Bgm.-Dr.-Nebel-Str. 8
97816 Lohr am Main
Tel. +49 9352 18-0
service@boschrexroth.de

Addresses of our country representatives can be found under
www.boschrexroth.com/addresses

11 Removal and replacement

11.1 Required tools

Removal of the Internal gear pump can be performed with standard tools.

You will need:

- A set of Allen keys for the housing screws.
- An extractor for the shaft key on the cylindrical shaft end.
- A flat-tip screwdriver to pry off the cover.
- A drip tray and cloths for collecting the remaining oil.

11.2 Preparing for removal

Take the entire system out of service as described in the instruction manual for the system.

Then prepare removal of the Internal gear pump as follows:

- ▶ Depressurize the pressure side (P-line).
- ▶ Make certain that the relevant system components are not under pressure or voltage.

11.3 Removal

Proceed as follows to remove the Internal gear pump:

1. Shut off the suction port of the pump. In doing so, follow the instructions in the instruction manual of the system.
2. Place a drip tray under the Internal gear pump to collect any hydraulic fluid that may escape.
3. Disconnect the pipe on the pressure side.
4. Loosen the mounting bolts on the pump.

The pump is removed.

11.4 Preparing the components for storage or further use

- ▶ Proceed as described in chapter 6.2 "Storing the Internal gear pump" on page 22.

12 Disposal

Careless disposal of the Internal gear pump, the hydraulic fluid and the packaging material could lead to pollution of the environment.

Observe the following points when disposing of the Internal gear pump:

- ▶ Completely drain the Internal gear pump.
- ▶ Dispose of the hydraulic fluid according to the national regulations in your country. Also observe the applicable safety data sheet for the hydraulic fluid.
- ▶ Dispose of the Internal gear pump and the packaging material in accordance with the national regulations in your country.
- ▶ Dismantle the Internal gear pump into its individual parts and properly recycle these parts.
- ▶ Separate according to, for instance:
 - Cast parts
 - Steel
 - Aluminum
 - Seals

13 Extension and conversion

Pump combinations When used together with genuine Bosch Rexroth combi parts, Internal gear pumps can be combined as the rear pump to form multiple pumps.

Conversion Do not modify the Internal gear pump in any way.



The Bosch Rexroth warranty only applies to the delivered configuration. In case of conversion or extension, the entitlement under warranty will be rendered void.

14 Troubleshooting

Table 6 and may help you when troubleshooting. The table makes no claim for completeness.

In practical use, problems which are not listed here may also occur.

14.1 Troubleshooting procedure

- ▶ Always act systematically and in a targeted way, even under pressure of time. Random and imprudent removal could result in the inability to determine the original cause of a fault.
- ▶ First obtain a general overview of how your product works in conjunction with the entire system.
- ▶ Try to find out whether the product was working properly in conjunction with the entire system before the problem occurred.
- ▶ Try to determine any changes to the entire system in which the product is installed.
 - Have there been any changes to the product's operating conditions or operating range?
 - Has maintenance work recently been carried out? Is there an inspection or maintenance log?
 - Have any changes (e.g. upgrades) or repairs been made to the overall system (machine/system, electrics, control) or to the product? If so, what were they?
 - Has the hydraulic fluid been changed?
 - Has the product or machine been used as intended?
 - How did the malfunction appear?
- ▶ Try to get a clear idea of the cause of the fault. Directly ask the (machine) operator.
- ▶ Document the work carried out.
- ▶ If you cannot rectify the fault, contact one of the contact addresses which can be found at: www.boschrexroth.com/addresses, or:

Bosch Rexroth AG
Service
Bgm.-Dr.-Nebel-Str. 8
97816 Lohr am Main
Tel. +49 9352 18-0

14.2 Malfunction table

Table 6: Malfunction table for Internal gear pump PGM

Malfunction	Possible cause	Remedy
Pump does not deliver / draw in	Pump not bled	Bleed pump
	O-ring defective (incorrect hydraulic fluid, seal damage, missing O-ring, incorrect O-ring)	Insert/replace original O-ring
	Sealing surface soiled or damaged	Ensure cleanliness and intactness of the sealing surface
	Coupling missing or parts of the coupling missing	Supplement coupling or coupling parts
	See "Drive motor rotating in wrong direction" fault	
	See "Air entry through output drive" fault	
	See "Rear pump is blocked" fault	
Insufficient delivery pressure	See "Rear components exceed maximum torque" fault	
	See "Inlet pressure < 0.6 bar" fault	
	See "Permitted contamination level exceeded" fault	
Pump too loud	See "Output flow not achieved" fault	
	See "Interfaces leaking" fault	
	See "Drive motor rotating in wrong direction" fault	
	Ambient temperature below -20 °C	Establish suitable ambient temperature
	Intake of air bubbles	Bleed system
	Vortex formation in the suction area of the hydraulic fluid tank	Check fill level of the hydraulic fluid tank
	See "Viscosity < 10 mm ² /s" fault	
Interfaces leaking	See "Viscosity > 2000 mm ² /s" fault	
	O-ring defective (incorrect hydraulic fluid, seal damage, missing O-ring, incorrect O-ring)	Use original O-ring
	Sealing surface soiled or damaged	Ensure cleanliness and intactness of the sealing surface
	Incorrect installation (screws too long)	Installation only by authorized, trained and instructed specialist personnel; use only genuine spare parts
Pressure peaks above > 210 bar from system	Combi part does not fit	Observe project planning information in data sheet 10235
	Backlash from hydraulic system	Observe permitted pressure peak in data sheet 10235 in project planning
		Fit pressure limiting valves
System interfaces cannot be installed	Incorrect connection flange/screws, suction port and/or pressure port selected	Observe specifications for flange dimensions in data sheet 10235
Viscosity < 10 mm ² /s	Hydraulic fluid too hot	Information on hydraulic fluids in data sheet 90220; observe project planning information in data sheet 10235; regularly check water content, viscosity, turbidity and odor
	Service life of the hydraulic fluid exceeded	
	Incorrect hydraulic fluid filled	
Viscosity > 300 mm ² /s	Hydraulic fluid temperature too low	Information on hydraulic fluids in data sheet 90220; observe project planning information in data sheet 10235; regularly check water content, viscosity, turbidity and odor
	Incorrect hydraulic fluid filled	
	Thickening due to mixture	

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Knowledge is POWER – Motion Force Control is our Business

HYQUIP Limited New Brunswick Street Horwich Bolton Lancashire BL6 7JB UK

Table 6: Malfunction table for Internal gear pump PGM

Malfunction	Possible cause	Remedy
Volumetric or mechanical efficiency not achieved	See "Viscosity > 300 mm ² /s" fault	
	See "Viscosity < 10 mm ² /s" fault	
	See "Output flow not achieved" fault	
	Operation with rotational speed that was configured either too low or too high	Observe project planning information in data sheet 10235
	See "Permitted contamination of hydraulic fluid exceeded" fault	
	Mixture of different fluids	Observe information on hydraulic fluids in data sheet 90220
Permitted contamination of hydraulic fluid exceeded	Aging hydraulic fluid and residues (abrasion) from system	Check hydraulic fluid for contamination according to maintenance schedule
	Insufficient filtration	Observe project planning information in data sheet 10235 and check according to maintenance schedule
	Unexpected ingress of dirt (e.g., while changing the hydraulic fluid)	Ensure a clean environment, fill only via filter
Drive motor rotating in wrong direction	Drive motor connected incorrectly	Installation only by authorized, trained and instructed specialist personnel
		Check direction of rotation during recommissioning after disconnecting from mains
Motor circuit breaker trips	Drive motor too weak	Observe information regarding required drive power in data sheet 10235
	See "Drive motor rotating in wrong direction" fault	
	See "Pump wear" fault	
Drive speed too high/too low	Motor configured with insufficient/excessive rotational speed	Observe project planning information in data sheet 10235
Air entry through output drive	O-ring defective (incorrect hydraulic fluid, seal damage, missing O-ring, incorrect O-ring)	Use genuine combi part set, replace seals
Discharge of hydraulic fluid	Vessel hangs too high	Observe project planning information during maintenance and commissioning of hydraulic components in data sheet 07900
	Level of hydraulic fluid too high	
	Precharged hydraulic fluid tank (charged with excessively high pressure) or precharge pump	Observe project planning information for precharged vessel or precharge pump
	Seal defective	Replace damaged O-ring
	See "Interfaces leaking" fault	
Inlet pressure < 0.6 bar	Incorrect dimensioning of the suction line (length, cross section, angle)	Observe project planning information in data sheet 10235
	Rotational speed too high	Observe maximum rotational speed during project planning
	Foreign particles in the suction channel	Remove foreign particles
	Air pressure too low (also for vessels without pressure compensation)	Observe absolute pressure during project planning
Inlet pressure > 2 bar	See "Discharge of hydraulic fluid" fault	

RE 10235-B/08.2014, PGM Series 4X, Bosch Rexroth AG

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Table 6: Malfunction table for Internal gear pump PGM

Malfunction	Possible cause	Remedy
Output flow not achieved	Pump draws in air	Check fill level in the hydraulic fluid tank and correct if necessary Observe the information on the design of lines in the hydraulic trainer, volume 3 and project planning information
	Drive speed too low	Observe average characteristic values of drive power in data sheet 10235 during project planning
	See "Permitted contamination of hydraulic fluid exceeded" fault	
	See "Pump wear" fault	
Continuous outlet pressure > 175 bar	Line cross section too low	Observe the information on the design of lines in the hydraulic trainer, volume 3 and project planning information
	Flow resistance too high	
	Permitted load exceeded	To limit the operating pressure and for solenoid-actuated relief of the operating pressure, install a pump safety block. Observe the information in data sheet 10235
Wear due to radial force on the shaft	Incorrect installation	Observe the installation instructions
	Unsuitable parts	Use only genuine combi part set
	Tightening torque for screws too low	Observe tightening torques in the installation instructions
	See "Pump wear" fault	
Wear due to axial force on the shaft	Incorrect installation	Observe installation instructions from the coupling manufacturer
	Unsuitable parts	Use only genuine combi part set
	See "Pump wear" fault	
Pump wear	Soiled or incorrect hydraulic fluid	Filter or change hydraulic fluid, perform regular inspections.

15 Technical data

The permitted technical data for the Internal gear pump can be found in data sheet 10235.

The data sheet can be found on the internet at
www.boschrexroth.com/variouss/utilities/mediadirectory

Further information can be found in the online product catalog
 Industrial hydraulics: www.boschrexroth.com/ics

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