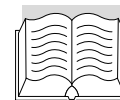


3/H SERIES

Installation, use and maintenance manual

 **Bonfiglioli**



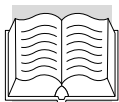
INSTALLATION, USE AND MAINTENANCE MANUAL

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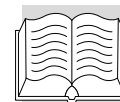


INSTALLATION, USE AND MAINTENANCE MANUAL

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Revisions

The revision index of the Manual is shown on page 58. The most recent revisions of the manuals are available at www.bonfiglioli.com.



1 GENERAL INFORMATION

1.1 PURPOSE OF THE MANUAL

This manual has been drafted by the Manufacturer to provide the necessary information to those who are authorised to safely carry out transport, handling, installation, maintenance, repair, dismantling and disposal activities in relation to the gear unit/gearmotor.

All the information necessary for purchasers and designers is provided in the sales catalogue. In addition to adopting good construction practices, the information must be read carefully and applied strictly. Information regarding any electric motor coupled to the gear unit can be found in the electric motor's Use, installation and maintenance manual.

Failure to comply with this information may result in risks to human health and safety and economic damage.

This information, written by the manufacturer in its original language (Italian), may also be made available in other languages to meet legislative and/or commercial requirements. The documentation must be kept by the person responsible for this purpose, in a suitable place, so that it is always available for consultation in the best condition.

In case of loss or deterioration, replacement documentation must be requested directly to the Manufacturer, indicating the code of this Manual.

The manual reflects the state of the art at the time the gear unit was placed on the market.

However, the Manufacturer reserves the right to make changes, additions or improvements to the manual itself, without this constituting grounds for considering this publication inadequate.

1.2 GLOSSARY, TERMINOLOGY AND SYMBOLS

Some terms that recur throughout the manual are described in order to clearly define their meaning.

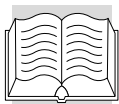
Routine maintenance: all operations necessary to maintain the functionality and efficiency of the gear unit. These operations are normally scheduled by the manufacturer, who defines the necessary skills and methods of intervention.

Extraordinary maintenance: all operations necessary to restore the functionality and efficiency of the gear unit. These operations are not scheduled and, in order to maintain the proper functioning and safety level of the gear unit/gearmotor, it is recommended that extraordinary maintenance be performed by the Manufacturer or a specialised and authorised centre.

Contact the manufacturer's sales network. Failure to comply with this instruction during the warranty period will void the warranty.

Experienced maintenance technician: a technician selected and authorised from among those who have the requirements, skills and information to perform routine maintenance on the gear unit.

1.3 SYMBOLS



To highlight certain parts of the text that are of particular importance or to indicate certain important specifications, a number of symbols have been adopted, the meanings of which are described below.

**DANGER – CAUTION**

This symbol indicates situations of serious danger which, if ignored, could seriously endanger the health and safety of people.

**CAUTION – WARNING**

This symbol indicates that appropriate behaviour must be adopted in order not to endanger the health and safety of people and not to cause economic damage.

**IMPORTANT**

This symbol indicates technical information of particular importance that should not be ignored.

**DANGER RELATED TO HOT PARTS**

This sign indicates the presence of high temperatures.

1.4 HOW TO REQUEST SUPPORT TO THE TECHNICAL SERVICE

For any technical assistance requests, please contact the manufacturer's sales network directly (www.bonfiglioli.com), providing the information shown on the identification plate, the approximate hours of use, the work cycle and the type of fault encountered.

1.5 MANUFACTURER'S LIABILITY

The manufacturer declines all responsibility in case of:

- use of the gear unit/gearmotor contrary to national safety and accident prevention laws;
- incorrect installation, failure to follow or incorrect observance of the instructions provided in this Manual;
- power supply faults (for gearmotors and/or gear units equipped with electrical devices);
- modifications or tampering with;
- operations carried out by untrained or unsuitable personnel.

The gear unit functionality and safety depend on strict compliance with the instructions provided in this Manual. In particular, it is necessary to:

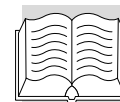
- Always operate within the limits of use of the gear unit.
- Always carry out diligent maintenance.
- Assign inspection and maintenance tasks to operators trained for this purpose.



- The configurations specified in the gear unit catalogue are the only ones permitted.
- Do not attempt to use the gear unit in a manner that does not comply with the instructions provided.
- The instructions in this manual do not replace, but summarise, the requirements of current legislation on safety standards.

1.6 ADDITIONAL INFORMATION

Additional information on the gear units covered by this manual can be found in the relevant sales catalogues, available on the website www.bonfiglioli.com.



2 SAFETY INFORMATION

2.1 SAFETY REGULATIONS



Carefully read the instructions in this Manual and, if necessary, those applied directly to the gear unit, paying particular attention to those about safety.



Use the gear unit only for the purposes intended by the manufacturer. Improper use may pose risks to the safety and health of people and cause economic damage.

- Personnel who carry out any type of intervention throughout the life of the gear unit must possess specific technical skills, particular abilities and experience acquired and recognised in the specific sector, as well as being equipped with and knowing how to use the necessary work tools and appropriate safety protections in accordance with the applicable legislative provisions in force in the place where the gear unit/gearmotor is used.
Failure to meet these requirements may cause damage to the safety and health of people.
- Keep the gear unit in the best possible condition by carrying out the scheduled maintenance operations. Good maintenance will ensure top performance, a longer service life and constant compliance with safety requirements.
- When performing maintenance in areas that are not easily accessible or dangerous, ensure adequate safety conditions for yourself and others in accordance with current workplace safety laws.
- Maintenance, inspection and repair activities may only be carried out by an experienced maintenance technician who is aware of the hazardous conditions. It is therefore necessary to establish operating procedures for the entire machine to manage any hazardous situations that may arise and methods to prevent them. The experienced maintenance technician must always work with extreme caution, paying the utmost attention and fully complying with safety regulations.
- During maintenance, only use the clothing and/or personal protective equipment indicated in the instructions for use provided by the manufacturer and in accordance with the applicable legislation in force at the place of use of the gear unit.
- Use the oils and greases recommended by the manufacturer.
- Do not release polluting material into the environment. Dispose of waste in accordance with applicable laws.
- After replacing the lubricants, clean the surfaces of the gear unit and the walking surfaces near the area of intervention.
- When carrying out maintenance work in poorly lit areas, use additional lamps to ensure that the work is carried out safely in accordance with current legislation.
- During the manufacturer's operational tests, the acoustic pressure measured at full load at a distance of 1 m, 1.6 m above the ground and in the absence of reverberation was less than 85 dB(A). As the gear unit is a component, the manufacturer of the machine on which the gear unit will be mounted must measure the airborne noise emitted by the machine in accordance with the requirements of Machinery Directive 2006/42/EC. The vibrations produced by the gear unit are not hazardous to the health of personnel. Excessive vibration may be caused by a fault, which must be reported and rectified immediately.



Gear units - except those equipped with a backstop device - can be reversible; if there is a risk of uncontrolled movement in case of a power failure (e.g. when lifting loads), measures must be taken to prevent this from happening (e.g. by using motors equipped with a brake that engages automatically when the power is cut).

If the gear unit is installed in places that cannot be reached from ground level, the manufacturer of the system or machine in which it is integrated must, where necessary, provide suitable means of access to the locations where work on the gear unit is to be carried out.



It is the user's responsibility to use the products recommended for the correct installation and maintenance of the gear units in an appropriate manner, in accordance with the manufacturer's instructions.



Before starting up the gear unit, it is necessary to check that the system in which it is installed complies with all applicable directives, in particular those relating to the health and safety of people in the workplace.

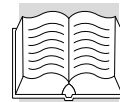
The rotating parts of the gear unit/gearmotor must be protected by adequate guards provided by the manufacturer of the system in which it is installed, in order to prevent any exposed person from being subjected to mechanical risks from direct contact (crushing, cutting, dragging), especially when the gear unit is operating automatically and in an accessible area.

- Cleaning with high-pressure water jets is not permitted.
 - Any work must only be carried out when the gear unit is stationary.
 - The electric motor must be secured against unintentional start (e.g. by locking the main switch or removing the power supply fuses). To this end, also attach a warning sign to the motor indicating that work is being carried out on the speed gear unit.
 - Welding work must not be carried out on the gear unit. The gear unit must not be used as a grounding point for welding work, as this could damage or destroy parts of the toothing and bearings.
 - The electric motor must be switched off as soon as possible if changes in the normal operation of the gear unit are noticed during operation, such as an increase in operating temperature or unusual noises.
 - If the gear unit is installed in systems or machines, the manufacturer of such systems or machines is required to include the requirements, instructions and descriptions in this manual in the operating manual.
 - If the gear unit is installed in applications that are particularly dangerous to human safety or that could cause significant economic damage, or in the presence of high inertial loads, vibrations, etc., such as:
 - suspended installations
 - motors supported solely by the gear unit
 - output shaft facing downwards with a shrink disc
- Appropriate safety devices must be provided, such as harnesses, safety chains, restraint systems, etc.



Depending on the conditions of use, the external surfaces of the gear unit can reach high temperatures. There is a serious risk of burns!

When draining the used oil for replacement, remember that its temperature can cause serious burns! If there are vent plugs with an overpressure valve, wait for the oil in the gear unit to cool before opening the plug and be careful of any oil jets during transport, lifting, installation, adjustment, operation, cleaning, maintenance, repair, disassembly and demolition. Wait for the gear unit to cool down before inspecting it.



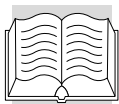
In the presence of accessories (optional variants), it is strictly forbidden to:

- use any accessory for any purpose other than those agreed in the supply contract;
- use any accessory with lubricants other than those recommended/permitted;
- use any accessory as a support surface, fastening device, etc.
- use any accessory as a lifting point for handling and transporting the gear unit/gearmotor;
- modify any accessory in any way;
- loosen and/or dismantle any component (pipes, fittings, flanges, control devices, etc.) when the system is in operation and/or under pressure;
- fail to comply with any instructions on any accessory and/or on the gear unit/gearmotor; remove, cover or obscure them;
- start any accessory without the relevant protective devices, which must be intact and in working order;
- start any accessory if it is damaged.



It must be ensured that any work on any accessory is carried out by qualified personnel who are familiar with the instructions and technical data relating to the product and have been authorised by the safety manager to carry out the work.

It is the responsibility of the manufacturer or assembler of the equipment incorporating the gear units as components to ensure the safety and compliance of the final product with the directives. During operation, some accessories have live or moving parts and therefore the removal of the necessary electrical and mechanical guards, improper use or inadequate maintenance can cause serious damage to people or property.





3 TECHNICAL INFORMATION

3.1 EQUIPMENT IDENTIFICATION

The identification plate shown is affixed to the gear unit. It contains the references and all the information necessary for correct and safe operation. To understand the meaning of the gear unit identification code, see the sales catalogue.

If the gear unit is complete with an electric motor (gearmotor), information about the motor can be found in the corresponding manual.

Nameplate information

 Bonfiglioli Riduttori			
Combined Unit code & type A			PU C
B			
ratio D	mount.pos. E	oil q.ty F	batch G
$i =$			
approx. H	 M_{nz} (@1500 rpm) I	P_{n1} (@1500 rpm) L	
Gearbox code M	Motor code N	QR code O	
P			
serial R Made in S		Bc T	

- A** Identification of gear unit or gearmotor
- B** Product name
- C** Production unit code
- D** Gear ratio
- E** Mounting position
- F** Approximate quantity of lubricant
- G** Month/year of manufacture
- H** Weight of the gear unit
- I** Rated torque referring to the output shaft
- L** Rated power referred to the input shaft
- M** Gear unit code (only for gearmotors)
- N** Motor code (only for gearmotors)
- O** QR number
- P** Notes
- R** Serial number or production order
- S** Place of manufacture
- T** Bar code



Legibility of the plate

The identification plate must always be kept legible with regard to all the data contained therein, and must be cleaned periodically.

Refer to the identification data on the plate for all communications with the Manufacturer, such as requests for spare parts, information or assistance.

3.2 DESCRIPTION OF THE EQUIPMENT

The speed gear unit has been designed and built to be incorporated, possibly driven by an electric motor, into a set of parts or components that are firmly connected in order to achieve a specific application. Depending on the different operating requirements, the gear unit can be supplied in different versions and configurations.

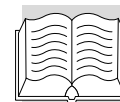
It can meet specific requirements for the mechanical, chemical, agri-food industries, etc. In order to increase the versatility of its gear units, the Manufacturer makes a series of accessories and optional variants available for them. For all technical and descriptive information, please refer to the corresponding sales catalogue and the chapter "ACCESSORIES AND OPTIONAL VARIANTS" in this Manual.

It is the user's responsibility to use the products recommended for the correct installation and maintenance of the gear units in an appropriate manner, in accordance with the instructions.

3.3 REGULATORY COMPLIANCE

The gear units and gearmotors are designed according to the state of the art and in consideration of the Essential Safety Requirements applicable to them.

The electric motors of the gearmotors comply with the Low Voltage Directive 2014/35/EU and the Electromagnetic Compatibility Directive 2014/30/EU.



3.4 LIMITS AND CONDITIONS OF USE



The uses intended by the Manufacturer are industrial applications, for which the gear units have been developed.

Any modification to the version or mounting position is only permitted after consultation with and authorisation from the **manufacturer's Technical Service**.

The gear unit must not be used in environments and areas in direct contact with bulk food products. In the case of installations in the presence of salt spray and/or corrosive vapours/dust, periodic checks must be carried out to verify the state of any incipient corrosion. In this case, the **manufacturer's Technical Service** must be contacted.

It is forbidden to use the gear unit/gearmotor, unless explicitly provided for, in potentially explosive atmospheres or where the use of explosion-proof components is required.

The following conditions must be taken into account when the gear unit is equipped with auxiliary cooling units (MCRW... and MCRA...) or forced lubrication pumps (MOP...):

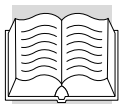
- permissible ambient temperature: 10 °C / +50 °C
- maximum operating oil pressure: 10 bar
- minimum start-up temperature:

that required to ensure a minimum lubricant viscosity of 1500 cst, generally variable between +5 °C and +25 °C, depending on the type of oil used.



For exact values, refer to the specific sales catalogue and/or the technical data sheets of the lubricants and the suppliers' instructions.

Regardless of the degree of protection specified, for outdoor installations, protection must be provided against direct sunlight, bad weather, water ingress and solid objects, while ensuring sufficient ventilation for the gear unit.




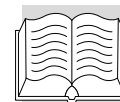
3.5 PERMITTED TEMPERATURE LIMITS

Symbol	Description / Condition	Value (*)	
		synthetic oil	mineral oil
t_a	Ambient temperature		
$t_{au \text{ min}}$	Minimum operating ambient temperature	-30 °C	-10 °C
$t_{au \text{ Max}}$	Maximum operating ambient temperature	+50 °C	+40 °C
$t_{as \text{ min}}$	Minimum storage ambient temperature	-40 °C	-10 °C
$t_{as \text{ Max}}$	Maximum storage ambient temperature	+50 °C	+50 °C
t_s	Surface temperature		
$t_{s \text{ min}}$	Minimum surface temperature of the gear unit for starting with partial load (#)	-25 °C	-10 °C
$t_{sc \text{ min}}$	Minimum surface temperature of the gear unit for starting under full load	-10 °C	-5 °C
$t_{s \text{ Max}}$	Maximum surface temperature of the housing for continuous operation at full speed (measured near the fast input area)	+100 °C	+100 °C (@)
t_o	Oil temperature		
$t_{o \text{ Max}}$	Maximum oil temperature for use in continuous operation mode at full load	+95 °C	+95 °C (@)

(*) = For the specific minimum and maximum values for different oil viscosities, as well as for the use of hydraulic circuits, refer to the table "Choice of optimum oil viscosity" in the sales catalogue available on the website www.bonfiglioli.com.

(@) = For surface and oil temperatures > 80 °C and < 95 °C, continuous operation is not recommended.

(#) = For full-load start-up, it is advisable to use a gradual ramp and allow for greater motor absorption. If necessary, contact Bonfiglioli Technical Service. 



4 HANDLING AND TRANSPORT



Personnel authorised to handle the goods must ensure that all necessary conditions are in place to guarantee their own safety and that of those directly involved.

4.1 PACKAGING SPECIFICATIONS

Unless otherwise agreed, standard packaging does not guarantee protection against rain. It is designed for transport by land and storage in covered, dry environments. The material, when properly stored, can be kept for a period of approximately two years in covered areas where the ambient temperature is within the limits indicated in the chapter "PERMITTED TEMPERATURE LIMITS" and with relative humidity not exceeding 80%.

For environmental conditions other than these, specific packaging must be provided. To facilitate handling operations, the packages are equipped with pallets.



Upon receipt of the gear unit, make sure that it complies with the purchase specifications and that it is not damaged or defective. Report any problems to the manufacturer's sales network. Dispose of packaging materials in accordance with the relevant legislation.



4.2 HANDLING STAGES

Handle the packages in accordance with the instructions provided by the manufacturer and indicated directly on the packaging. Considering that the weight and shape do not always allow for manual handling, it is necessary to use specific equipment in order to avoid damage to people or property. Those authorised to carry out such operations must have specific skills and experience in order to safeguard their own safety and that of the people involved.



The person authorised to handle the goods must ensure that all necessary conditions are in place to guarantee his/her own safety and that of those directly involved.

4.2.1 Moving packages

- Set up a suitable, enclosed area with flat flooring or ground for unloading and storing packages on the ground.
- Prepare the necessary equipment for handling the package. The choice of lifting and handling equipment (e.g. crane or forklift truck) must take into account the mass to be handled, the overall dimensions, the lifting points and the centre of gravity. Where necessary, this information is indicated on the package to be handled. Heavy packages may be slung using chains, straps and ropes, the suitability of which must be verified in relation to the load to be handled, the weight of which is always indicated.
- During handling, it is always advisable to keep packages horizontal to avoid the risk of loss of stability and/or overturning.

4.2.2 Moving equipment



All of the following operations must always be carried out with caution and without sudden acceleration during the handling phase.



During lifting, use accessories such as eyebolts, shackles, carabiners, slings, ropes, hooks, etc. that are certified and suitable for the weight to be lifted.

The weight of the products to be handled can be found in the relevant sales catalogue.

Various accessories (e.g. connecting flanges, etc.) and/or control motors applied to the gear unit can significantly alter the position of the centre of gravity, compromising stability. In such situations, an additional anchoring point may be necessary.

During all lifting phases, the load must not swing by more than $\pm 15^\circ$. If oscillation greater than this value occurs during the operation, it is advisable to stop and repeat the operations prescribed for the type of lifting used.

To rotate the gear units, use the lifting points provided for lifting operations, in accordance with the procedures for lifting. Rotation operations must be carried out keeping the gear units as close as possible to a support surface; it is essential to pay attention to the position of the centre of gravity so that the load does not become too unbalanced during the entire rotation phase. The hooks must be positioned so that they do not protrude from the lifting points or move in such a way as to create a risk of the load falling.

This is particularly important if rotation is carried out using straps or ropes, which are more prone to shifting from the load attachment points.

- Identify the lifting points for the gear unit indicated in the diagrams.
- Prepare the gear unit for lifting using slings, hooks, shackles, etc. attached to the lifting points, or move it using a pallet as a support platform. When moving with a crane, first lift the gear unit and remove it from the top of the packaging.
- When handling with a forklift or pallet truck, remove the packaging and lift the load by placing the forks of the truck in the designated points.
- Perform a very slow initial lifting manoeuvre, keeping the gear units as close to the ground as possible to ensure that the load is balanced.
- Move and gently place the gear unit in the unloading area, taking care not to cause sudden oscillations during movement.



The threads at the ends of the shaft and the pipes cannot be used as lifting points. Take care to ensure that any lubrication/cooling system accessories are not damaged during lifting, handling and positioning.

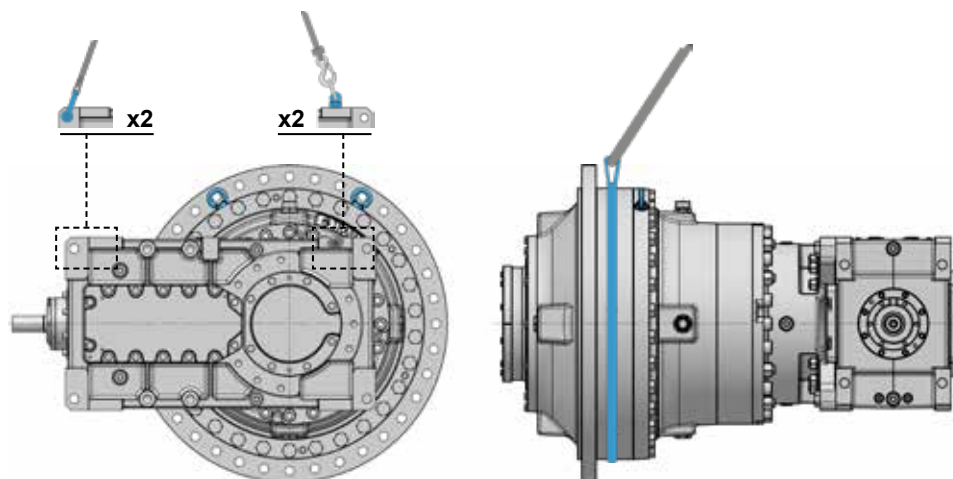


Various accessories (e.g. connecting flanges, etc.) and/or control motors applied to the gear unit can significantly alter the position of the centre of gravity, compromising stability. In such situations an additional anchoring point may be necessary.

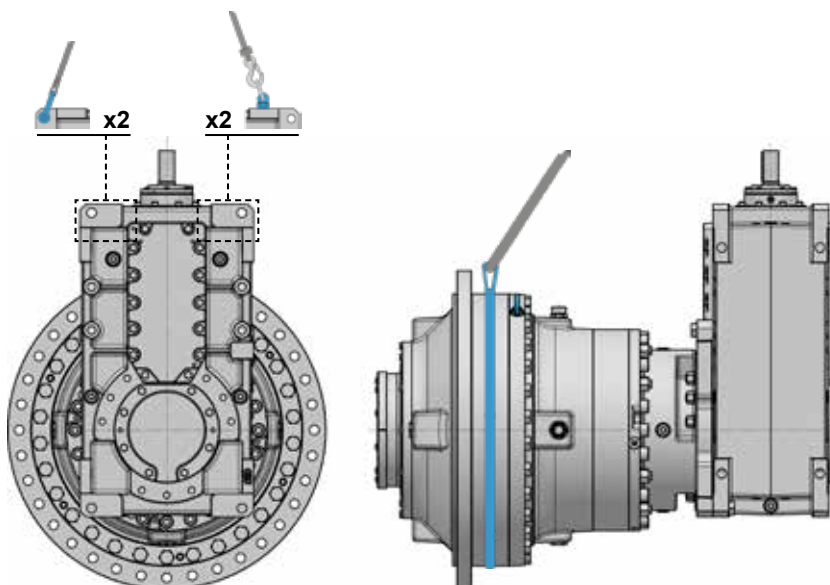


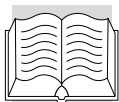
If an electric motor is connected to the gear unit, do not use any eyebolts on the motor to lift the assembly, unless expressly indicated.

AB3

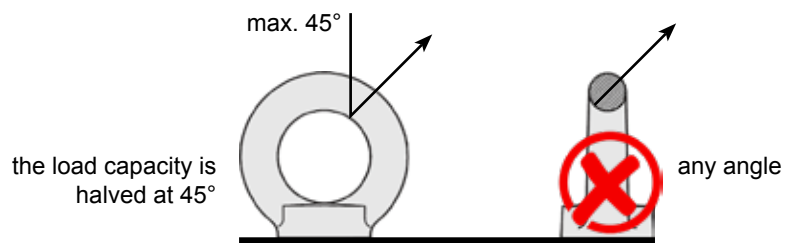


AB6

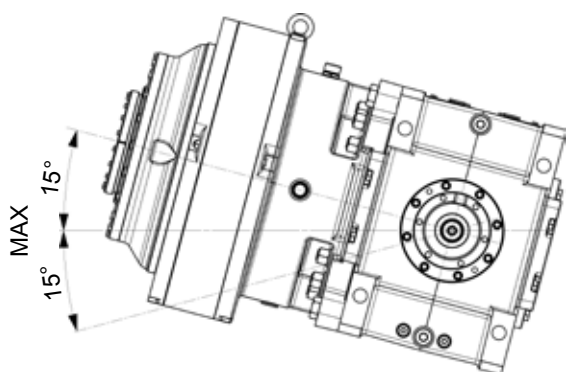




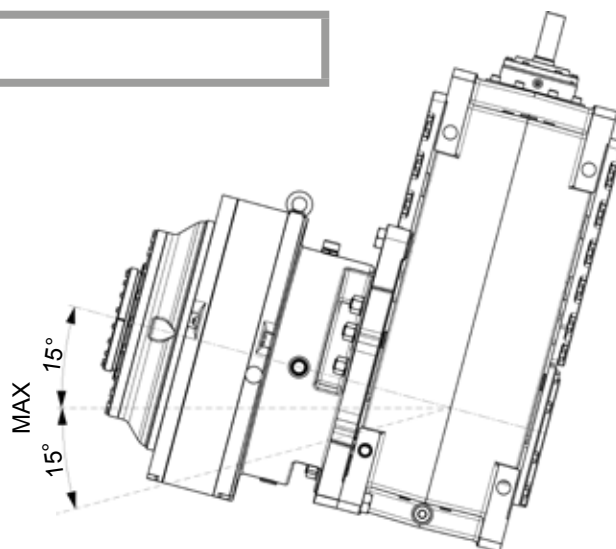
When using the eyebolts on the gear unit, ensure that the plane of the eyelet marches the pull axis. If this is not the case, place one or more metal washers between the eyebolt and the load, with a diameter at least equal to that of the base of the eyebolt and of adequate thickness, so that the plane of the eyelet matches as much as possible the pull axis.



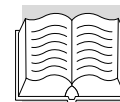
Maximum permissible inclination during handling: 15°



AB3



AB6



4.3 STORAGE



Position the gear unit/gearmotor so that it has a stable base and ensure that there is no risk of unexpected movement.

Below are some recommendations to follow for storing the gear unit/gearmotor.

1. Avoid environments with excessive humidity and exposed to the elements (exclude outdoor areas).
2. Avoid excessive temperature changes that could cause condensation to form inside the gear unit and installed accessories.
3. Avoid direct contact between the gear unit and the ground.
4. Stack the packaged gear unit (if permitted) following the instructions on the packaging itself.



When the gear unit/gearmotor is temporarily stored outdoors, it must be carefully protected so that neither moisture nor foreign objects can contaminate the interior.

For storage periods of less than 6 months, the gear unit and any accessories, where required, must be filled to the correct level with lubricant (see the "LUBRICATION" section of this Manual) and must be run at regular intervals (at least once every 4 weeks) for at least 1 hour, following all the instructions in this Manual. For storage periods exceeding 6 months, perform the following additional operations:

5. Cover all external machined parts with an anti-rust protective coating such as Shell Ensio Fluid SX, Tectyl 506EH or similar in terms of properties and field of use, regularly checking the integrity of the coating and restoring it where necessary.
6. Fill completely with lubricating oil, replacing the vent plugs with sealing plugs.
7. Periodically rotate the input and output shafts of the gear unit a few turns to prevent damage to bearings and seals.



SAFETY PRECAUTIONS for restoring the gear unit after storage.

The output shafts and external surfaces must be thoroughly cleaned of rust, contaminants or other impurities (use a commercially available solvent).

Perform this operation outside the explosion hazard zone.

The solvent must not come into contact with the oil seals to avoid damaging the material and compromising their functionality!

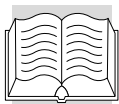
If the oil or protective product used for storage is not compatible with the synthetic oil used for operation, the inside of the gear unit must be thoroughly washed before filling with operating oil. The service life of the bearing grease is reduced if storage periods exceed 1 year. The greases used for the bearings must be synthetic.



At the end of the storage period, replace the vent plugs before starting up.



For gear units/gearmotors equipped with a drywell seal device, or for other storage requirements/types, consult the **Bonfiglioli Technical Service**.



4.3.1 Long-term storage

The following are the appropriate technical requirements to be followed to ensure LONG-TERM STORAGE of the unit for a maximum storage period of up to 2 years.

The service can be extended for another two years before expiry. To extend this service, contact the **Bonfiglioli** service centre available on the company website.

Unit acceptance conditions

The customer receives the gear unit or gearmotor with the LONG-TERM STORAGE option inside the following containers:

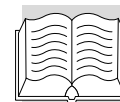
- WOODEN CRATE with the words "LONG-TERM STORAGE - OPEN ONLY BEFORE INSTALLATION" written on each of the 4 outer walls of the crate.



The container must be stored and must not be opened by the customer until the unit is ready to be put into service.

Inside the container, the unit is packaged in a protective VpCI (Vapour Phase Corrosion Inhibitor) bag:

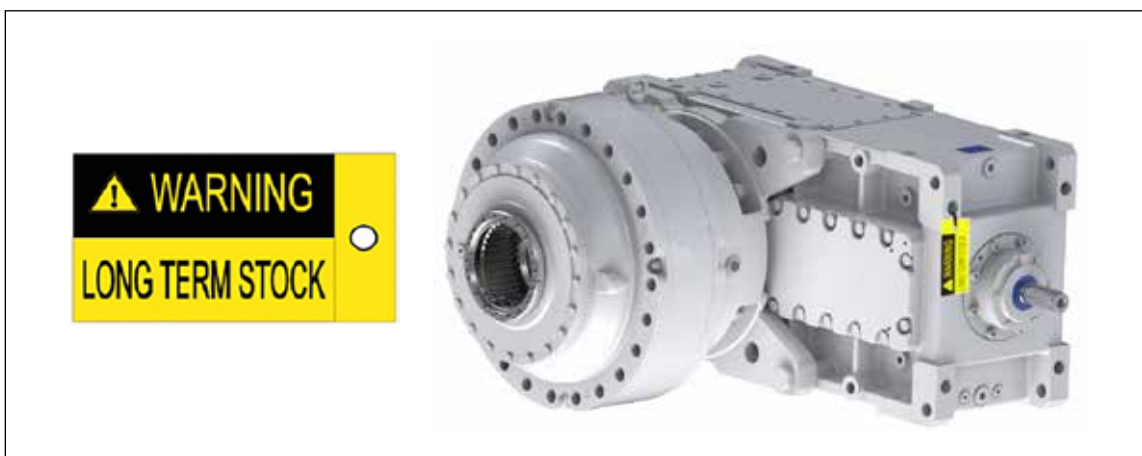




The unit packaged inside a VpCI is identified by a specific adhesive label "LONG-TERM STORAGE WARNING" placed on the outer surface of the VpCI bag.



Inside the VpCI bag, a "LONG-TERM STORAGE WARNING" tag, attached to a cord, will be visible on the surface of the gear unit:



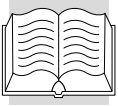
The gear unit nameplate will be a conventional nameplate with the addition of the Long-Term Storage option in the description.

Actions appropriate for long-term storage

- Do not store the container in excessively humid conditions or exposed to the elements (do not store outdoors)
- Do not place the container directly on the ground. Place the container on a pallet
- Do not place the container in environments subject to excessive temperature fluctuations, as this may cause condensation to form inside the gear unit and installed accessories.
- Store the container in accordance with the following environmental conditions: ambient temperature from min 10 °C to max +40 °C, dry environment and away from direct sunlight.
- The container must be stored and must not be opened before the unit is put into service.

After 2 years of storage, the unit with the Long-Term Storage option must be checked at a Bonfiglioli service centre. If the product has not been stored properly, Bonfiglioli will issue a quote for the complete restoration of the unit.

Once the restoration has been successfully completed, the unit with the Long-Term Storage option can be stored again in the customer's warehouse for a maximum of another 24 months, in accordance with the above precautions.



5 INSTALLATION



All installation and maintenance phases must be considered from the outset of the general design. Personnel authorised to carry out these operations must, if necessary, implement a safety plan to safeguard the safety of those directly involved and strictly apply all existing laws on the subject. During assembly, any impact or forcing must be strictly avoided.

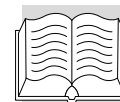
5.1 INSTALLATION OF THE GEAR UNIT

Before installing the gear unit:

1. Drain the gear unit of the lubricant used for storage and thoroughly wash the interior if it is not compatible with the lubricant used for operation (see the "LUBRICATION" section of this Manual).
2. Thoroughly clean the gear unit of any packaging residues and any products used for storage with suitable solvents. Pay particular attention to the coupling surfaces and avoid any contact with the shaft oil seals.
3. Check that the data on the identification plate corresponds to that specified in the order.
4. Ensure that the structure to which the gear unit is attached is sufficiently rigid and sturdy to support its own weight and the forces generated during operation. Install hydraulic couplings, clutches, torque limiters, etc. (if impacts, prolonged overloads or possible blockages are expected).
5. Check that the machine on which the gear unit is installed is stationary and/or not powered and that accidental restarting is prevented.
6. Check that the coupling surfaces are flat.
7. Check the correct alignment of shaft/shaft or shaft/hole.
8. Provide adequate safety guards for rotating parts external to the gear unit.
9. If the working environment is considered corrosive for the gear unit or its components, specific equipment designed for aggressive environments must be used. In this case, consult the manufacturer's sales network.
10. **After thorough cleaning, it is advisable to use a protective paste (Klüberpaste 46 MR 401, or a product with similar properties and field of use) on all tongue couplings to facilitate coupling and prevent contact oxidation. Thoroughly clean all friction couplings and do not use protective pastes.**
11. To ensure effective coupling, it is advisable to manufacture driven shafts with the tolerances described in the chapter "MANUFACTURE OF CUSTOMER MACHINE SHAFT" in this Manual.
12. In case of outdoor installation, protect the gear unit and any electric motor from direct sunlight and the effects of bad weather by using screens or carters. Always ensure adequate ventilation.
13. Ensure that the gear unit body is connected to the equipotential protection circuit (earthing) of the machine on which it is mounted.
14. It is necessary to assess whether the accessible surfaces exceed the temperature limits of standard EN ISO 137321 depending on the conditions of use of the gear unit and the ambient temperatures; if these limits can be easily reached or exceeded, the hot surfaces must be protected so that they cannot be reached (e.g. by means of guards and/or insulation) and, if this is not possible, signs using symbol 5041 of standard IEC 60417 "Caution, hot surfaces" must be affixed on site; these signs must be affixed in such a way that they are visible to operators (taking into account the position and orientation of the gear unit). Refer to the chapter "PERMITTED TEMPERATURE LIMITS" for further information.



Symbol 5041 of standard IEC 60417 "Caution, hot surfaces"



Then proceed with installation as indicated:

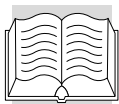
15. Position the gear unit near the installation area.
16. Assemble the gear unit and secure it properly to the structure at the designated points. The gear unit must be secured using all the anchoring points provided on the chosen coupling device (feet or flange).
17. Locate the closed plug used for transport and replace it with the vent plug, when provided and supplied.
18. Tighten the fixing screws and check that the service plugs are correctly tightened to the torques indicated in the table below.

Bolt size	Bolt torque [Nm] +5% /-10%	
	Bolt class	
	8.8	10.9
M4	3	4.5
M5	5.9	8.9
M6	10.3	15.3
M8	25.5	37
M10	50	73
M12	87.3	127
M14	138.3	201
M16	210.9	314
M18	306	435
M20	432	615
M22	592	843
M24	744	1060
M27	1100	1570
M30	1500	2130
M33	1850	2600
M36	2350	3300
M39 X 3	3200	4500
M42 X 3	4050	5700

Thread Plug/Vent	Pitch (threads per inch)	Tightening torque [Nm] +5%/-10%
1/8"	28	5
1/4"	19	7
3/8"	19	7
1/2"	14	14
3/4"	14	14
1"	11	25
1" 1/2	11	25



After having tightened the fixing bolts check the alignment of the shafts again. Alignment must be checked again and, if necessary, corrected after a few days of operation.
In the presence of high external loads, in particularly dangerous mounting positions and in mounting positions other than B3, use Class 10.9 fixing bolts.

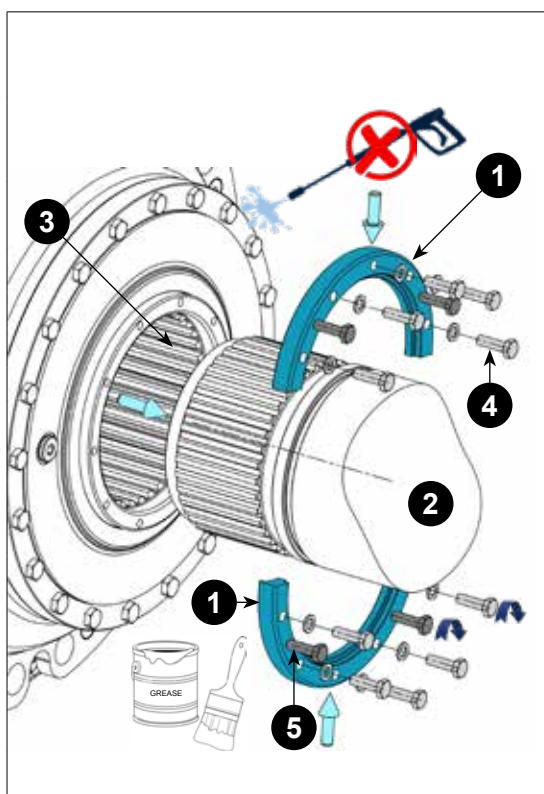


19. Fill the gearbox with oil or top up as necessary, as instructed in the “LUBRICATION” section in this manual.



If the gear unit is equipped with a fan or an auxiliary cooling unit with an oil/air heat exchanger, leave enough room to ensure adequate air circulation.

5.2 CUSTOMER SHAFT FASTENING FOR FZP



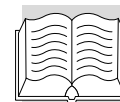
Size	Screws	Class	Tightening torque [Nm]	Removal screws
11L2	No. 10 M8	10.9	37	M8
13L2	No. 10 M8	10.9	37	M8
15L2	No. 10 M8	10.9	37	M8
15L3				
16L2	No. 10 M8	10.9	73	M8
16L3				
17L2	No. 10 M10	10.9	73	M8
17L3				
18L2	No. 10 M12	10.9	127	M10
18L3				
19L2	No. 12 M14	10.9	201	M10
19L3				
21L2	No. 12 M16	10.9	314	M12
23L3	No. 12 M18	10.9	435	M20
25L3	No. 12 M22	10.9	843	M20



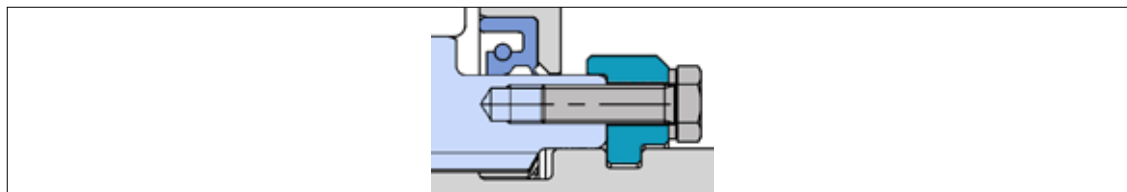
Do **NOT** use low or high pressure water to clean the gear unit. Use detergents and degreasers suitable for treating metal materials.

Mounting sequence

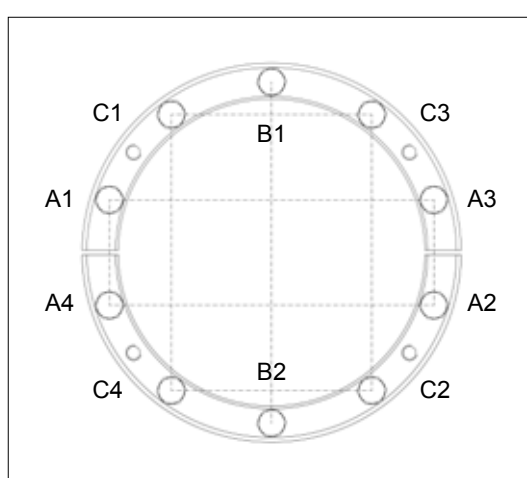
- Make the customer shaft (2) according to the instructions in the technical catalogue (see www.bonfiglioli.com for the most up-to-date version).
- Remove the two axial fixing half-rings (1) from the gear unit.
- Ensure that the coupling surfaces of the customer shaft (2) and gear unit seat (3), as well as the two axial fixing half-rings from the gear unit (1), are clean and free of burrs.
- Lubricate evenly and thoroughly with a water-resistant anti-seize paste such as Klüberpaste 46 MR 401 and Tecnolube WRL 115 or similar (to protect the parts from corrosion, seizing and wear) both the shaft and its seat, then couple the shaft and gear unit (1) (2) (3)
- Ensure that the customer shaft (2) and gear unit seat (3) are perfectly aligned



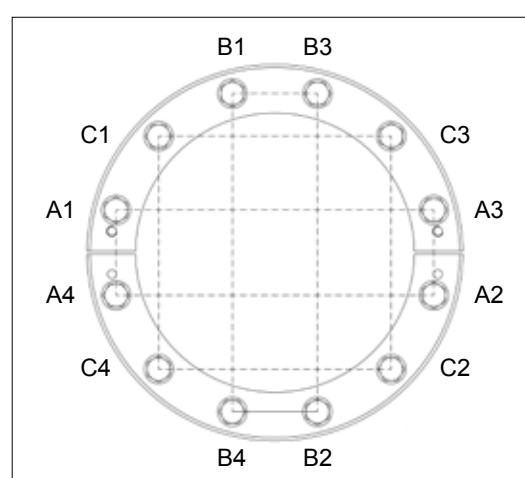
- Mount the gear unit on the customer shaft gradually, maintaining the alignment of the two parts. Near the circumferential seat carved into the customer shaft, insert one of the two half-rings and ensure that it fits fully home onto the hub of the gear unit seat, as shown in the image.



- Apply the second axial fixing half-ring, positioning it in the respective circumferential seat created on the shaft.
- Fit the fixing screws (4), tightening them gradually as shown in the diagram, applying the tightening torque indicated in the table.



11L2 - 18L3



19L2 - 25L3

- To remove the shaft, loosen all the screws. Obtain an additional 4 screws (5) (as per the table, not supplied with the gear unit) and screw them back into the threaded holes on the two half-rings, applying pressure to the gear unit until the shaft (2) is released.

5.3 SHAFT MOUNTING

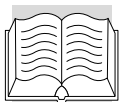


Thoroughly clean and degrease the coupling areas between the output shaft of the gear unit and the shaft of the machine to be driven.

Do not use molybdenum disulphide or any other type of grease on these surfaces, as this would significantly reduce the friction coefficient in the contact area and compromise the functionality of the shrink disc. Conversely, the grease present in the indicated areas of the shrink disc must not be removed under any circumstances.

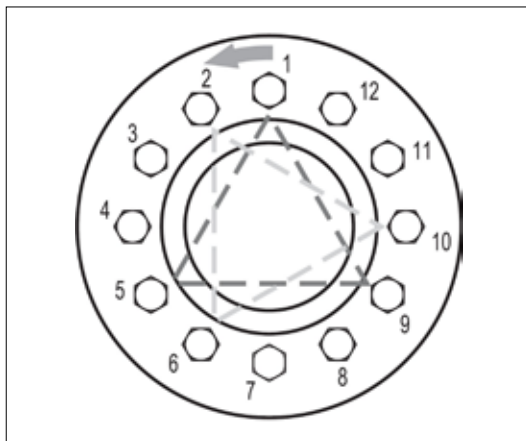
Mounting sequence to be used for friction couplings used in sizes 11L2 and 13L3.

- Lightly tighten a first group of 3 screws, positioned according to the vertices of an equilateral triangle (example: screws pos. 159 in the diagram below). Couple the gear unit to the shaft to be driven.
- Tighten the screws gradually (according to the equilateral triangle diagram) in a circular motion, repeating the process several times until all the screws are tightened to the torque specified in table 2, depending on the type of coupling/gear unit.

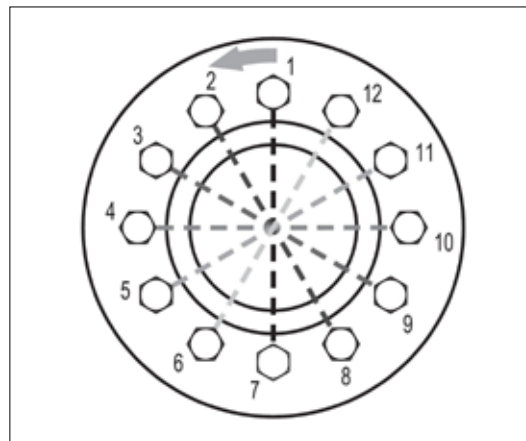


Assembly sequence to be used for friction couplings used from sizes 15L2 to 25L3,

- Tighten 4 screws equidistant at 50% of the tightening torque value indicated in table 2, following a cross pattern. (example: screws 17410)
- Tighten 4 screws equidistant at 100% of the tightening torque value indicated in table 2, following a cross pattern. (example: screws 28511)
- Tighten all screws until, when applying the tightening torque indicated in Table 2, they no longer move.
- Check that the inner and outer rings of the coupling are aligned.



11L2 - 13L3



15L2 - 25L3

Screws for tightening friction couplings

	11L2	13L2	15L2 15L3	16L2 16L3	17L2 17L3	18L2 18L3	19L2 19L3	21L3	23L3	23L3
Screw	M16	M16	M20	M20	M20	M20	M24	M27	M30	M30
Quantity	10	10	15	15	16	20	18	16	21	24
Class	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque [Nm]	250	250	490	570	570	570	840	1250	1640	1640

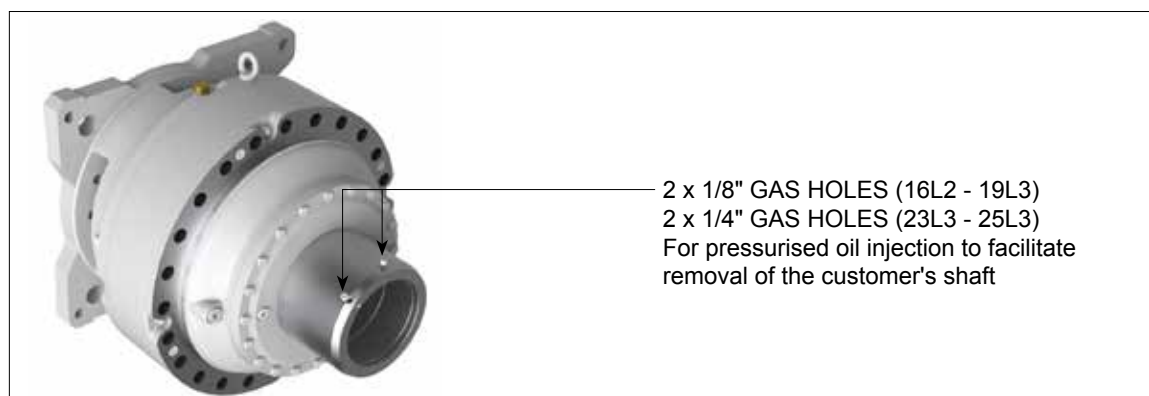
Disassembly sequence

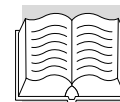
Gradually loosen the fastening screws in a circular pattern. Do not remove the screws completely to prevent the coupling rings from separating violently.

If it is still not possible to remove the gear unit from the customer's shaft, use the holes described here to inject pressurised oil (see image below).

During cleaning and/or maintenance, only the internal sliding surfaces of the shrink disc should be lubricated, using a solid lubricant with a friction value of $\mu = 0.04$

(such as Klüber Molybkombin UMF T4 or an equivalent product that guarantees the same performance over time).

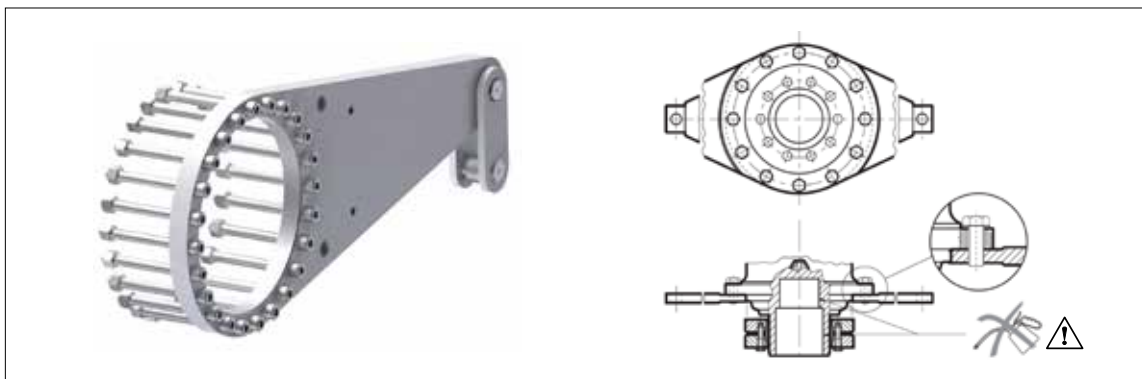




5.4 TORQUE ARM (TA)

Provide a torque arm (TA) for shaft mounting to prevent rotation.

The following table shows the torques and classes of screws for securing the torque arm.

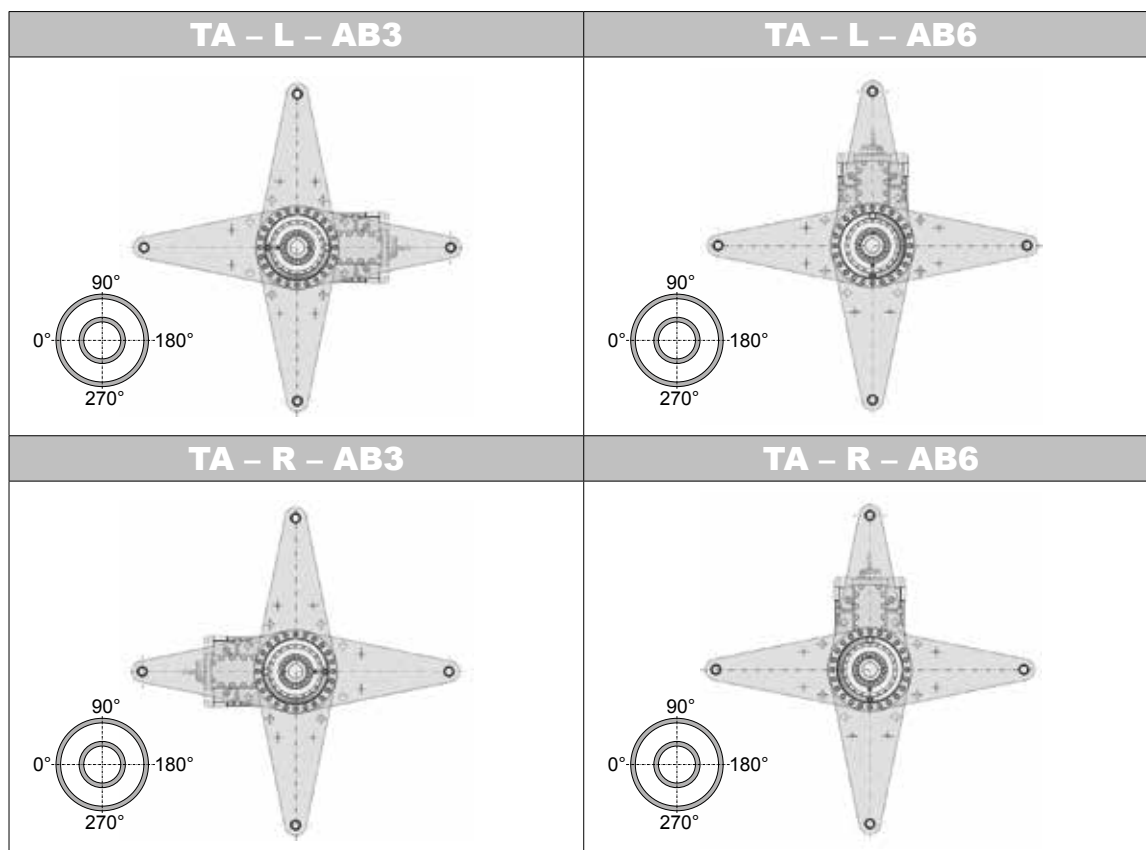


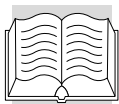
	11L2	13L2	15L2 15L3	16L2 16L3	17L2 17L3	18L2 18L3	19L2 19L3	21L3	23L3	23L3
Screw	M16	M16	M20	M20	M30	M27	M30	M30	M42	M420
Quantity	24	30	20	30	24	32	30	36	36	36
Class	12.9	12.9	10.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
Tightening torque [Nm]	350	350	690	690	2350	1750	1750	1750	6750	6750



The machine shaft must support the gear unit radially and axially, and the torque arm must be fixed without forcing.

Torque arm position





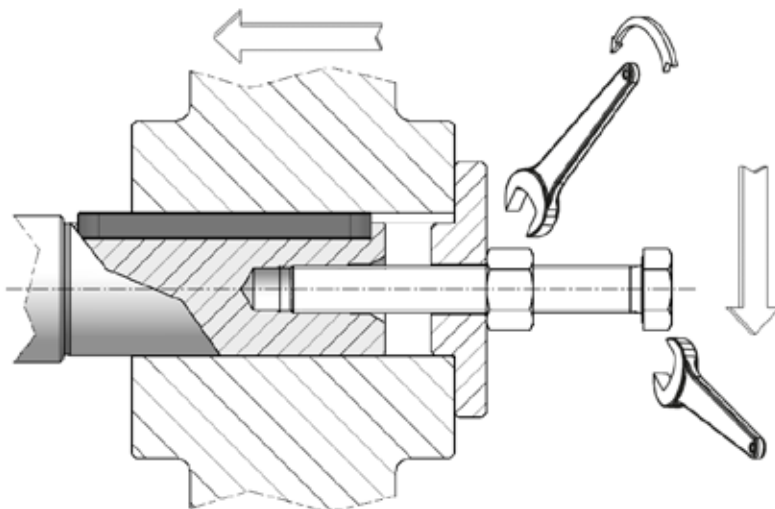
5.5 INSTALLATION OF INPUT SHAFT ACCESSORIES



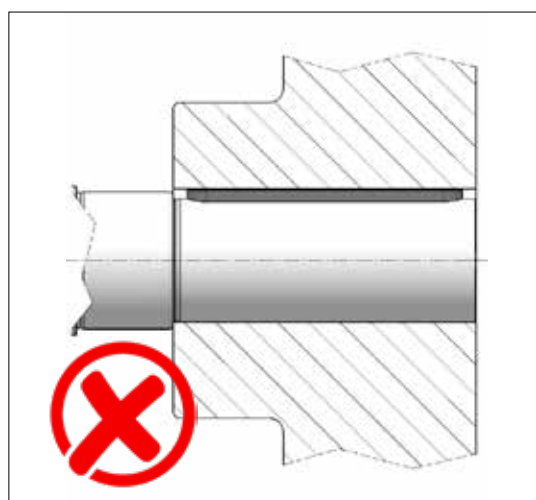
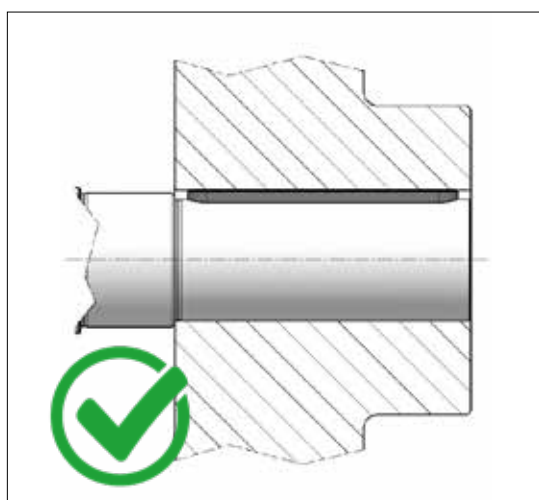
do not use hammers or other tools to assemble external components, as this may damage the shafts or gear unit supports. Instead, proceed as illustrated in the following diagram:

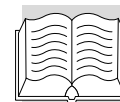
Not included in the supply:

1. Tie rod screw
2. Washer



In order to minimise the forces acting on the shaft supports, when mounting transmission components with an asymmetrical hub, we recommend the arrangement shown in the diagram below:





6 ACCESSORIES AND OPTIONAL VARIANTS

6.1 AUXILIARY THERMAL DEVICES

6.1.1 Forced ventilation (FAN optional variants)

The fan is keyed onto the input shaft of the gear unit and is equipped with a protective cover to prevent accidental contact.



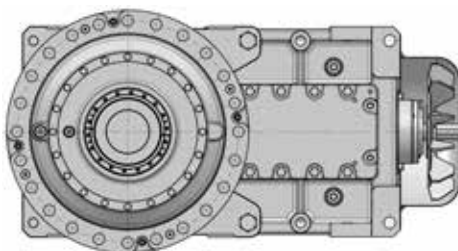
Never operate the gear unit without the protective guard.
After any maintenance work, replace the guards before restarting the gear unit.

The fan draws air through the protective cover grille and conveys it to the gear unit housing, thereby removing a quantity of heat depending on the speed of rotation.



The effectiveness of forced ventilation is significantly reduced:

- at operating speeds lower than $n_1=900 \text{ min}^{-1}$; in this case, if it is necessary to increase the thermal power of the gear unit, it is advisable to use other auxiliary thermal devices;
- if dirt accumulates on the fan blades or obstructs the protective guard grille; clean regularly as indicated in the "MAINTENANCE" section of this manual.



When installing a gear unit equipped with a fan for forced cooling, it is essential to provide ample and adequate space for the air circulation necessary for cooling.

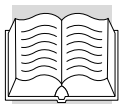
6.1.2 Cooling coil (SR optional variants)

The cooling coil, designed to be integrated into a cooling circuit to be provided by the customer, is installed inside the gear unit and cannot be removed.

For optimum performance, the supply circuit must meet the following specifications:

Pressure	Flow rate	Temperature
8 bar max	10 l/min	20 °C max

Water can circulate in either direction.



If the cooling water is very hard, it is advisable to descale it. For energy saving reasons, it is good practice to equip the system with a thermostatic valve that allows water to pass only when the gear unit oil has reached a maximum temperature of approximately 70 °C. In case of frost or long periods of inactivity, in order to avoid possible damage, the cooling water in the circuit must be completely drained, removing any residues with a jet of compressed air if necessary.



Before starting the gear unit, ensure that all connections have been made. We recommend periodically checking the passage section to ensure that it is free of sediment and/or obstructions. The interval at which maintenance checks should be carried out depends on the characteristics of the cooling water used.

6.1.3 Cooling units (optional variants MCRW... , MCRA...)

The autonomous cooling units are designed to cool the oil in the gear units and are supplied on board the gear units themselves, mounted on special plates and connected by rigid pipes and/or flexible hoses and related fittings, which are an integral part of the supply.

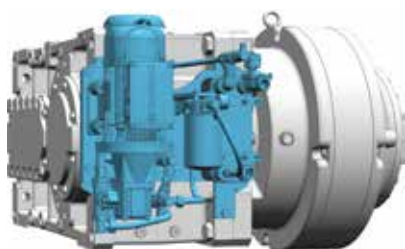


The wiring and electrical connections and/or connections to the various utilities are the responsibility of the customer and must be made before start-up.

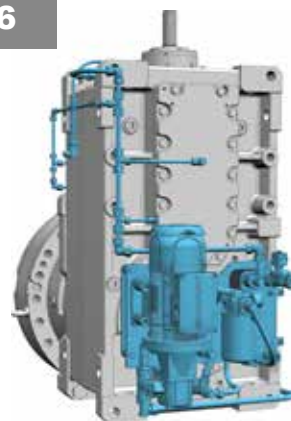
For information on the availability of the device for each gear unit size and for all technical/dimensional information, please refer to the Sales catalogue.

6.1.3.1 Water-oil control units (MCRW...)

AB3

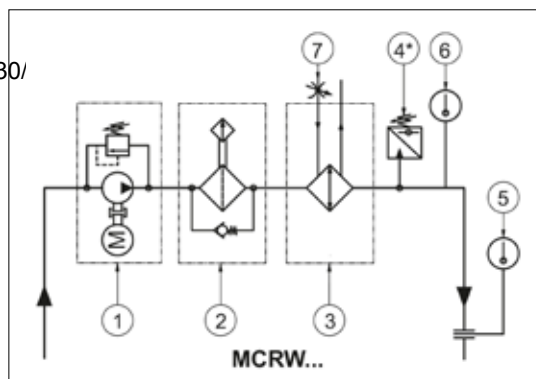


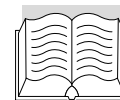
AB6



Hydraulic diagram and main components MCRW...

- 1) Motor pump with motor by-pass circuit (230/40050, 230/40050)
 - 2) Filter with visual clogging indicator
 - 3) Water/oil heat exchanger
 - 4) Minimum pressure switch (only present in case of forced lubrication)
 - 5) Maximum temperature thermostat
 - 6) Insertion thermostat
 - 7) Solenoid valve
- Power supply (23050, 24060)





Design and functional features (MCRW...)

MCRW... control units are available in several sizes, each corresponding to different flow rates and consequent cooling capacities.

The oil is drawn directly from the housing and circulated through a closed external circuit by the motor pump [1], equipped with a bypass calibrated to 6 bar to prevent overpressure in the system.

Before being returned to the gear unit, the lubricant passes through:

- the filter with visual clogging indicator and bypass valve [2], which eliminates any suspended solid particles and ensures greater reliability and durability of the transmission (metal mesh cartridge with 60 micron filtration rating);
- the copper tube bundle or plate water/oil heat exchanger [3], suitable for removing excess heat generated by the gear unit.

To ensure the correct operation of the auxiliary device and to guarantee both energy and coolant savings, the following regulation and control devices are present:

- minimum pressure switch [4];
- maximum temperature thermostat [5];
- insertion thermostat [6];
- water shut-off solenoid valve [7].

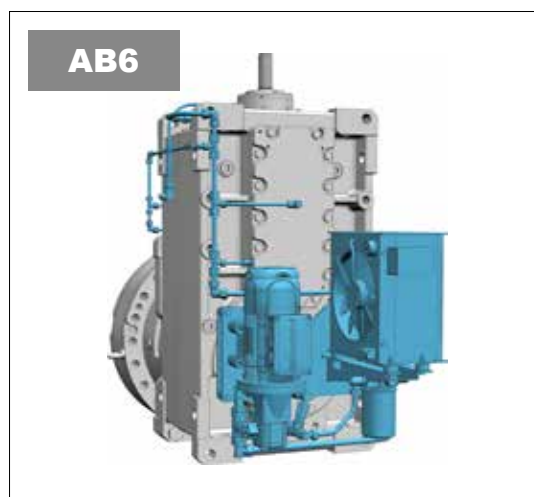
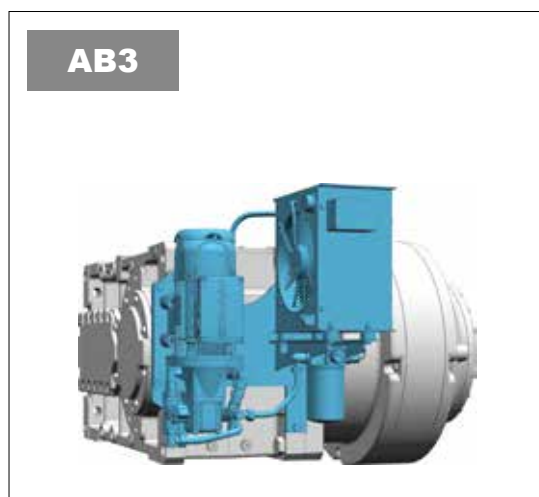
Technical data (MCRW...)

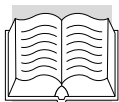
Control unit	Motor pump						Water/oil exchanger + solenoid valve		Filter with metal mesh cartridge	
	Description	V (Δ/Y)	f	Pn	In (Y Conn.)	Oil flow rate ⁽²⁾	Water flow rate [l/mm]	Con- nections (GAS)		60 μm Con- nections (BSP)
		[V]	[Hz]	[kW]	[A]	[l/mm]		IN	OUT	
MCRW 5	BXT 80B 6 IP55 CLF B35	230/400	50	0.55	2.52	7.3	15	3/4"	3/4"	3/4"
		280/480	60		1.47	8.7				
MCRW 9	BXN 80MA 4 WD1 IP55 CLF B35 S	230/400	50	0.55	1.31	11.3	25	3/4"	3/4"	3/4"
		265/460	60		1.15	13.7				
MCRW 21	BXN 90S 4 WD1 IP55 CLF B35 S	230/400	50	1.1	2.38	22.6	35	3/4"	3/4"	3/4"
		265/460	60		2.10	27.4				
MCRW 34	BXN 90L 4 WD1 IP55 CLF B35 S	230/400	50	1.5	3.44	6.4	56	3/8"	1"	1 1/4"
		265/460	60		2.92	6.4				

⁽¹⁾ For different mains frequencies, please contact **Bonfiglioli Technical Service**.

⁽²⁾ The nominal flow rate may vary depending on the characteristics of the oil and the operating temperature.

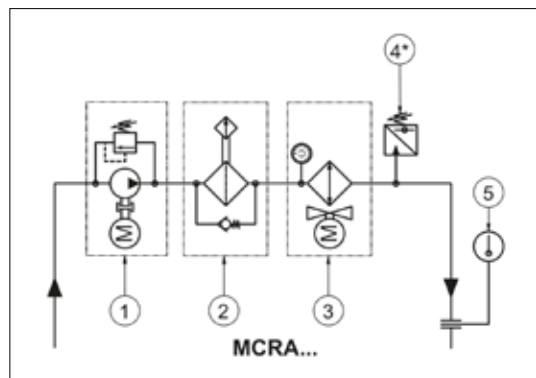
6.1.3.2 Air-oil control units (MCRA...)





Hydraulic diagram and main components MCRA...

- 1) Motor pump with motor by-pass circuit (230/40050, 230/265/46060)
- 2) Filter with visual clogging indicator
- 3) Air/oil heat exchanger with thermostat
- 4) Minimum pressure switch (only present in case of forced lubrication)
- 5) Maximum temperature thermostat



Design and functional features (MCRA...)

MCRA... control units are available in several sizes, each corresponding to different flow rates and consequent cooling capacities.

The oil is drawn directly from the housing and circulated through a closed external circuit by the motor pump [1], equipped with a bypass calibrated to 6 bar to prevent overpressure in the system.

Before being returned to the gear unit, the lubricant passes through:

- the filter with visual clogging indicator and bypass valve [2], which eliminates any suspended solid particles and ensures greater reliability and durability of the transmission (metal mesh cartridge with 60 micron filtration rating);
- the air/oil exchanger with aluminium radiator pack with electric fan and insertion thermostat [3], suitable for removing excess heat generated by the gear unit.

To ensure correct operation of the accessory and to guarantee energy savings, the following regulation and control devices are provided:

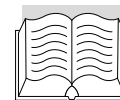
- minimum pressure switch [4];
- maximum temperature thermostat [5];
- adjustable insertion thermostat (directly on the heat exchanger [3])

Technical data (MCRA...)

Control unit	Motor pump						Water/oil exchanger						Filter with metal mesh cartridge
	Description	V (Δ/Y)	f	Pn	In (Y Conn.)	Oil flow rate ⁽²⁾	Level of protection	V a.c.	P	I	Con- nections (GAS)		60 μm Con- nections (BSP)
		[V]	[Hz]	[kW]	[A]	[l/mm]		[V]	[W]	[A]	IN	OUT	
MCRW 5	BXT 80B 6 IP55 CLF B35	230/400	50	0.55	2.52	7.3	IP 54	1~230	65	0.17	3/4"	3/4"	3/4"
		280/480	60		1.47	8.7			70	0.13			
MCRW 9	BXN 80MA 4 WD1 IP55 CLF B35 S	230/400	50	0.55	1.31	11.3	IP 54	1~230	100	0.2	1"	1"	3/4"
		265/460	60		1.15	13.7			140	0.23			
MCRW 21	BXN 90S 4 WD1 IP55 CLF B35 S	230/400	50	1.1	2.38	22.6	IP 55	3~230	110/205	0.57/0.39	1"	1"	3/4"
		265/460	60		2.10	27.4			110/200	0.57/0.33			
MCRW 34	BXN 90L 4 WD1 IP55 CLF B35 S	230/400	50	1.5	3.44	6.4	IP 55	3~280	110/180	0.57/0.33	1"	1"	1 1/4"
		265/460	60		2.92	6.4			145/260	0.60/0.39			

⁽¹⁾ For different mains frequencies, please contact **Bonfiglioli Technical Service**.

⁽²⁾ The nominal flow rate may vary depending on the characteristics of the oil and the operating temperature.



6.1.3.3 Control unit installation (MCRW... , MCRA...)



Check that the power supply, installation and operating conditions correspond to those indicated on the component nameplates and/or described in this manual.

The direction of rotation of the motors must comply with the indications on the components.

Use power cables with a cross-section suitable for the current absorbed and suitable for the expected installation conditions, avoiding excessive heating and/or voltage drops.

Information regarding the electric motor of the motor pump can be found in the Sales Catalogue and/or the Use, Installation and Maintenance Manual for the electric motor itself; for all other devices, please refer to this Manual.



Carry out the wiring and connections in such a way as to ensure that the operating logic is consistent with the functionality of the control unit, as described in the following paragraph.

MCRW...: With regard to the solenoid valve, follow these instructions: Connection type: three-pole for DIN 43650 type connector

Contact type: NC (normally closed) Power supply [V/Hz]: 230/50, 240/60 Power: 9W DC

Level of protection: IP 65 (with connector fitted)

For optimal performance, provide a water supply circuit that meets the following specifications:

- max. pressure 10 bar
- maximum water flow temperature 20 °C
- minimum flow rate as per table in previous paragraph

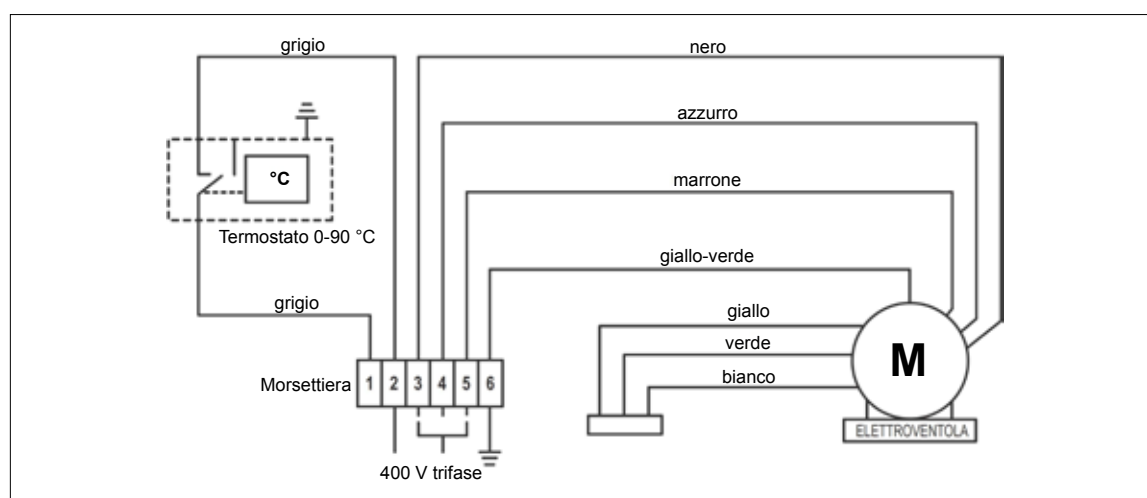
and connect to the water circuit so that water enters the exchanger through the solenoid valve, from the connection furthest from the oil circulation pipes, and flows out from the connection closest to them.

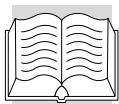
If the cooling water is very hard, it is advisable to descale it. In case of frost or long periods of inactivity, in order to avoid possible damage, the cooling water in the circuit must be completely drained, removing any residues with a jet of compressed air if necessary.

MCRA...: With regard to the electric fan of the air/oil heat exchanger, comply with the following requirements:

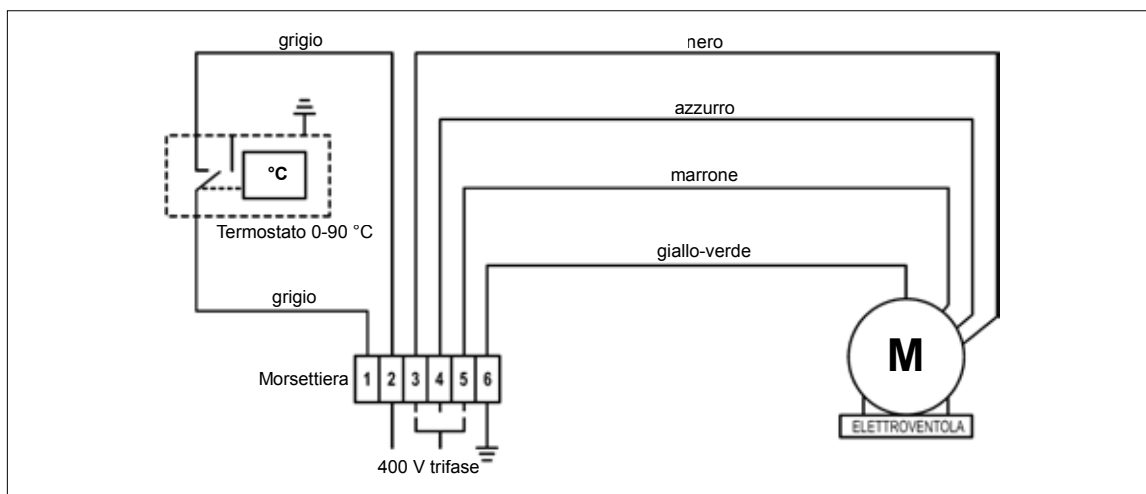
MCRA5 – MCRA9: Three-phase power supply

MCRA21 – MCRA34: Three-phase power supply

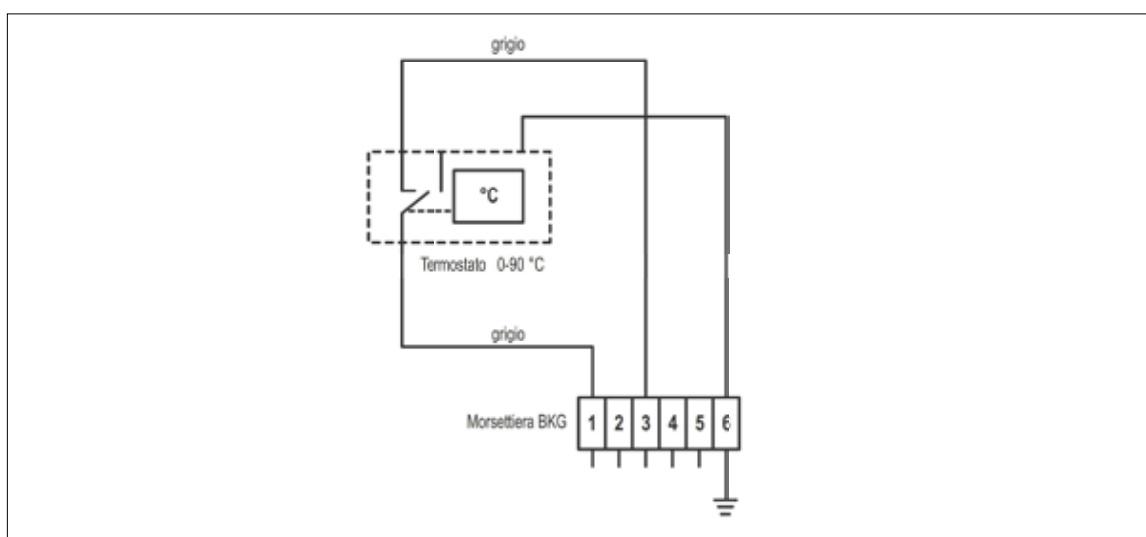




The fan is connected to 400 V; to connect to 230 V three-phase, the YELLOW cables must be joined with BLACK, BLUE with GREEN, BROWN with WHITE.



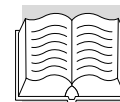
(*) For the connection of the exchanger JUNCTION BOX TERMINAL BOX, follow the diagram below.



Maintain a minimum distance of at least 1 m from any obstacles around the exchanger to ensure proper air flow and optimal heat output.
In installations in closed environments and/or confined spaces, ensure that there is sufficient ventilation to prevent overheating and/or hot air recirculation.



If the MCRW or MCRA lubrication system is also to be used as a lubrication system, the oil circulation system (motor pump) must ALWAYS be activated BEFORE starting the gear unit in order to allow oil circulation and lubrication of the components.



6.1.3.4 Regulation devices (MCRW..., MCRA...)

Minimum pressure switch

The minimum pressure switch provides an alarm signal when the pressure in the lubrication system falls below the minimum permitted value of 0.5 bar.

In the SPDT version, the pressure exerted by the fluid on the separator element causes a microswitch to be activated.

It is possible to use either **N.C.** contacts (pressure lower than the calibration value) or **N.O.** contacts (pressure higher than the calibration value), but only one of them.

The reading must be bypassed for a period of time immediately after start-up to allow the oil to circulate correctly (approx. 30 seconds).



Do not change the pressure switch tripping value by adjusting the adjustment screw located at the top of the switch.

The wiring and electrical connections and/or connections to the various utilities are the responsibility of the customer and must be made before start-up.

Contact type: SPDT (changeover contacts)

Contact capacity:

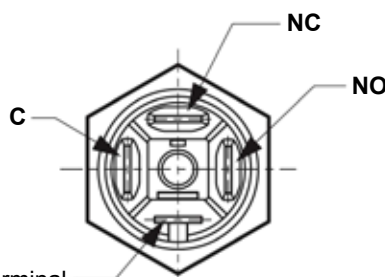
5 A (resistive) / 240 V AC

2 A (resistive) / 24 V DC

Level of protection:

IP 65 (with connector fitted)

6.3x0.8 faston earth terminal



C = Common

NC = Normally closed

NO = Normally open

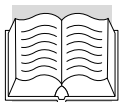
60°C insertion thermostat

The non-adjustable insertion thermostat is calibrated to a fixed tripping temperature of $60\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. It is supplied with normally closed (N.C.) contacts. At temperatures up to $60\text{ }^{\circ}\text{C}$, the contacts are closed and the signal is present. When the set temperature is reached, the electrical contact lifts, interrupting the signal.

90°C maximum temperature thermostat

The non-adjustable maximum temperature thermostat is calibrated to a fixed tripping temperature of $90\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. It is supplied with normally closed (N.C.) contacts. At temperatures up to $90\text{ }^{\circ}\text{C}$, the contacts are closed and the signal is present. When the set temperature is reached, the electrical contact lifts, interrupting the signal.

In this case, stop the gear unit as soon as possible and identify the fault cause.



Contact type: NC (Normally Closed)

Contact capacity:

5 A (resistive) / 240 V AC

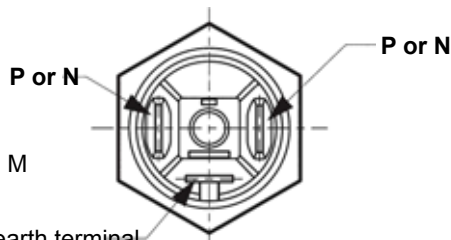
5 A (resistive) / 24 V DC

Level of protection:

IP 65 (with connector fitted)

Threaded connection: GAS 1/2" M

6.3x0.8 faston earth terminal



P = Phase

N = Neutral



The wiring and electrical connections and/or connections to the various utilities are the responsibility of the customer and must be made before start-up.



Depending on the different configurations, the thermostats can be mounted on the gear unit or supplied as accessories; in this case, it is necessary to locate the closed caps used for transport, which are clearly marked, and replace them.

6.1.4 Heater (HE optional variant)

In the presence of very low ambient temperatures (refer to the chapter "PERMITTED TEMPERATURE LIMITS") which cause an increase in oil viscosity and hinder its correct flow, the gear unit can be equipped with one or more electric heaters and a minimum thermostat to control them, unless otherwise agreed in the contract or required by regulations, calibrated to 25 ± 5 °C. Typical examples of possible situations are as follows:

- operation at temperatures below 0 °C
- start-up of immersion-lubricated and splash-lubricated gear units when the minimum ambient temperature is not at least 10 °C above the oil's pour point;
- starting of gear units with forced lubrication if the oil viscosity is greater than 1500 cSt. Depending on the lubricant used, generally characterised by a kinematic viscosity between 220 and 460 cst, this value is typically found at ambient temperatures between 5 °C and 25 °C.



For exact values, refer to the specific sales catalogue and/or the technical data sheets of the lubricants and the suppliers' instructions.

The heaters are inserted directly into the casing below the oil level. Before removing them, the gear unit must be drained of lubricant.

The standard supply voltage is 220 V AC.

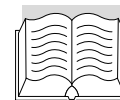
Power consumption varies depending on size/configuration.

For detailed information and correct selection, contact Bonfiglioli Technical Service.

The electrical circuit connected to the thermostat must be set up so that:

- below the lower temperature threshold, the heaters are activated to heat the oil;
- when the upper temperature threshold is reached, the heaters are deactivated.

To define the temperature thresholds, which may coincide and must be evaluated according to the application and type of lubricant used, contact Bonfiglioli Technical Service.



25°C maximum temperature thermostat

The non-adjustable maximum temperature thermostat is calibrated to a fixed tripping temperature of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$. It is supplied with normally closed (N.C.) contacts. At temperatures up to 25°C , the contacts are closed and the signal is present. When the set temperature is reached, the electrical contact lifts, interrupting the signal.

In this case, switch off the power supply to the electric heaters.

Contact capacity:

5 A (resistive) / 240 V AC

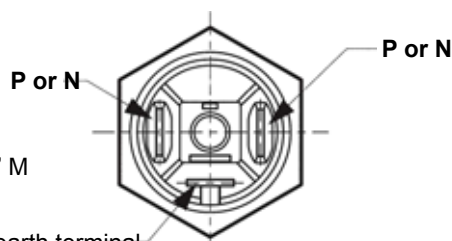
5 A (resistive) / 24 V DC

Level of protection:

IP 65 (with connector fitted)

Threaded connection: GAS 1/2" M

6.3x0.8 faston earth terminal



P = Phase

N = Neutral



All electrical connections are the responsibility of the customer and must be made before starting up the gear unit.

During periods when the gear unit is not in use, the heater must remain off: it must be switched on before starting the gear unit, only if completely immersed in oil and only for the time necessary to reach the minimum required temperature.

Use of the heater above the recommended maximum value may cause carbonisation of the oil molecules, compromising its functionality and producing residues that are harmful to the gear unit or its components.



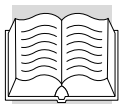
Depending on the different configurations, the thermostat can be mounted on the gear unit or supplied as accessories; in this case, it is necessary to locate the closed caps used for transport, which are clearly marked, and replace it.

If the heaters are insufficient to heat the oil to the minimum temperature required for start-up or operation, or if shorter heating times are desired, contact **Bonfiglioli Technical Service**.

In the presence of forced lubrication, if the circuit components, such as the connecting pipes, pump, etc., have frozen, they must also be heated before start-up to allow the lubricant to circulate properly.



Unless otherwise specified, the above instructions and values are also valid in the presence of regulation and control devices supplied with the gear unit or as an accessory to it, replacing the standard ones described in this Manual.



6.1.5 Lubrication system

The internal parts of the gear unit are generally lubricated with a mixed oil immersion and splash system. In mounting position **AB6**, some bearings must be lubricated with a forced lubrication system.

6.1.5.1 Splash lubrication

In gear units with splash lubrication, the rotation of the gears distributes the lubricant to the teeth and bearings, even in areas above the oil level.

To ensure effective lubrication, the oil must be sufficiently fluid, i.e. it must have a viscosity that allows it to flow freely, while at the same time being able to withstand high gear loads. In particular, attention must be paid to the following conditions, providing appropriate auxiliary heating/cooling devices:

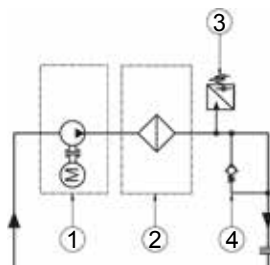
- operation with oil temperature above the maximum permitted limit (refer to the chapter "PERMITTED TEMPERATURE LIMITS");
- start-up in situations where the minimum ambient temperature is not at least 10 °C above the oil's pour point;
- operation of gear units with ambient temperatures outside the permitted limits (refer to the chapter "PERMITTED TEMPERATURE LIMITS").

6.1.5.2 Forced lubrication (MOP optional variant)

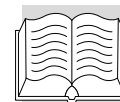
The gear unit is equipped with a system consisting of an independently powered motor pump, a Y-filter with 60 micron filtration, a minimum pressure switch, an overpressure valve and the relevant connection pipes. To ensure an optimal supply of lubricant, the electric motor must be powered correctly according to the nameplate specifications, in accordance with the data shown in the following table, unless otherwise specified.

MOP...

- 1) Motor pump
Motor (230/40050, 230/265/46060)
- 2) Y-filter with 60-micron filtration
- 3) Minimum pressure switch
- 4) Overpressure valve



Size	Supply frequency	50 Hz (230Δ/400Y)		60 Hz (265Δ/460Y)	
	Description	Pn [kW]	In [400 V] [A]	Pn [kW]	In [460 V] [A]
11L2	BXN 71MA 4 WD1 IP55 CLF B34 S	0.25	0.67	0.25	0.59
13L2	BXN 71MA 4 WD1 IP55 CLF B34 S	0.25	0.67	0.25	0.59
15L2	BXN 71MA 4 WD1 IP55 CLF B34 S	0.25	0.67	0.25	0.59
15L3	BXN 71MA 4 WD1 IP55 CLF B34 S	0.25	0.67	0.25	0.59
16L2	BXN 71MA 4 WD1 IP55 CLF B34 S	0.25	0.67	0.25	0.59
16L3	BXN 71MA 4 WD1 IP55 CLF B35 S	0.25	0.67	0.25	0.59
17L2	BXN 80MA 4 WD1 IP55 CLF B34 S	0.55	1.31	0.55	1.15
17L3	BXN 71MA 4 WD1 IP55 CLF B35 S	0.25	0.67	0.25	0.59
18L2	BXN 80MA 4 WD1 IP55 CLF B34 S	0.55	1.31	0.55	1.15
18L3	BXN 71MA 4 WD1 IP55 CLF B35 S	0.25	0.67	0.25	0.59
19L2	BXN 80MA 4 WD1 IP55 CLF B34 S	0.55	1.31	0.55	1.15
19L3	BXN 71MA 4 WD1 IP55 CLF B35 S	0.25	0.67	0.25	0.59
21L3	BXN 80MA 4 WD1 IP55 CLF B34 S	0.55	1.31	0.55	1.15
23L3	BXN 80MA 4 WD1 IP55 CLF B34 S	0.55	1.31	0.55	1.15
25L3	BXN 80MA 4 WD1 IP55 CLF B34 S	0.55	1.31	0.55	1.15



Minimum pressure switch

The minimum pressure switch provides an alarm signal when the pressure in the lubrication system falls below the minimum permitted value of 0.5 bar.

In the SPDT version, the pressure exerted by the fluid on the separator element causes a microswitch to be activated.

It is possible to use either **N.C.** contacts (pressure lower than the calibration value) or **N.O.** contacts (pressure higher than the calibration value), but only one of them.

The reading must be bypassed for a period of time immediately after start-up to allow the oil to circulate correctly (approx. 30 seconds).

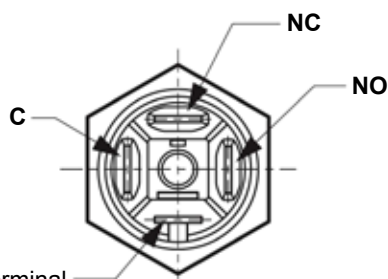
Contact capacity:

5 A (resistive) / 240 V AC

2 A (resistive) / 24 V DC

Level of protection:

IP 65 (with connector fitted)



C = Common

NC = Normally closed

NO = Normally open

Note: The position of the contacts is indicative.



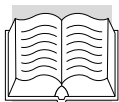
In case of alarm, stop the gear unit as soon as possible and identify the fault cause. It is recommended to activate the lubrication system before starting the gear unit. Start the gear unit only after the motor pump has been running for a few minutes.

The motor pump must always operate simultaneously with the gear unit and must only be switched off after the gear unit has come to a complete stop.

Check that the power supply, installation and operating conditions correspond to those indicated on the component nameplates and/or described in this manual.

The direction of rotation of the motors must comply with the indications on the components. Use power cables with a cross-section suitable for the current absorbed and suitable for the expected installation conditions, avoiding excessive heating and/or voltage drops.

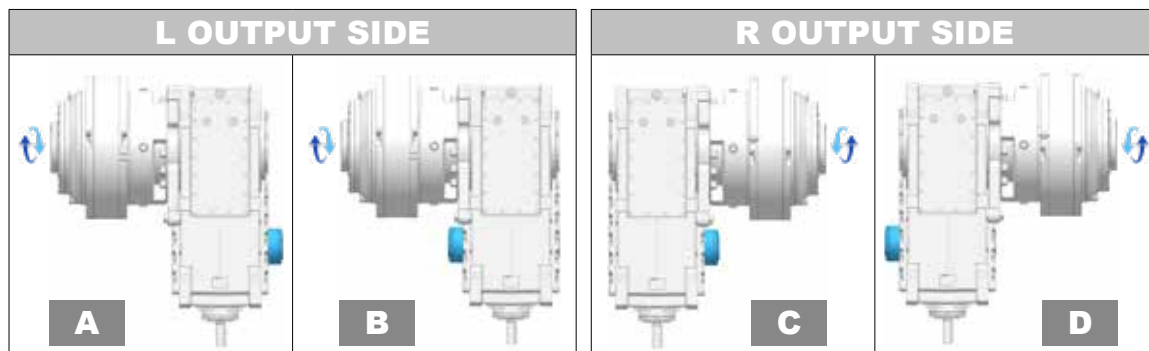
Information regarding the electric motor of the motor pump can be found in the Sales Catalogue and/or the Use, Installation and Maintenance Manual for the electric motor itself.



6.1.6 Backstop device (A CW, A CCW optional variant)

The backstop device, consisting of a freewheel with centrifugal release contact bodies, ensures unidirectional operation of the gear unit and prevents rearward motion due to the load connected to the output shaft.

For the free rotation direction, refer to the table below.



Rotations	1	Input	Output	2	Input	Output	3	Input	Output	4	Input	Output
		CW	CW		CCW	CCW		CW	CCW		CCW	CW

	i =	A	B	C	D		i =	A	B	C	D
3/H 11L2	30.3 - 65.0	1-2	⊖	⊖	1-2	3/H 17L3	125.6 - 268.0	1-2	3-4	3-4	1-2
	76.0 - 270.3	3-4	1-2	1-2	3-4		314.1 921.1	3-4	1-2	1-2	3-4
	355.4 - 1099	1-2	3-4	3-4	1-2	3/H 18L2	99.4 - 295.2	3-4	1-2	1-2	3-4
3/H 13L2	30.6 - 65.8	1-2	⊖	⊖	1-2	3/H 18L3	314.6 - 964.0	1-2	3-4	3-4	1-2
	77.0 - 273.7	3-4	1-2	1-2	3-4		119.7 - 364.3	1-2	⊖	⊖	1-2
	339.5 - 1113	1-2	3-4	3-4	1-2	3/H 19L2	444.2 - 1128	3-4	1-2	1-2	3-4
3/H 15L2	93.5 - 1039	3-4	12	1-2	3-4		105.6 - 387.2	3-4	1-2	1-2	3-4
	329.0 - 1039	1-2	3-4	3-4	1-2	3/H 19L3	412.6 - 1098	1-2	3-4	3-4	1-2
3/H 15L3	128.8 - 354.6	1-2	3-4	3-4	1-2		132.5 - 320.9	1-2	⊖	⊖	1-2
	414.8 - 1160	3-4	1-2	1-2	3-4	3/H 21L3	391.2 - 993.6	3-4	1-2	1-2	3-4
3/H 16L2	111.4 - 413.1	3-4	1-2	1-2	3-4		120.1 - 361.2	1-2	⊖	⊖	1-2
	456.8 - 1150	1-2	3-4	3-4	1-2	3/H 23L3	403.1 - 960.0	3-4	1-2	1-2	3-4
3/H 16L3	128.8 - 354.6	1-2	3-4	3-4	1-2		121.5 - 266.6	1-2	⊖	⊖	1-2
	414.8 - 1160	3-4	1-2	1-2	3-4	3/H 25L3	297.9 - 936.9	3-4	1-2	1-2	3-4
3/H 17L2	102.4 - 412.7	3-4	1-2	1-2	3-4		127.7 - 304.6	1-2	⊖	⊖	1-2
	456.8 - 943.4	1-2	3-4	3-4	1-2		340.5 - 1071	3-4	1-2	1-2	3-4



In some cases, the torque that can be transmitted by the device may be limited compared to the torque transmitted by the gear unit. Consult the sales catalogue for detailed information.

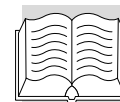
Before commissioning, check that the output shaft rotates freely in the desired direction of travel without excessive force.



In permanent operation, it is advisable to maintain an idle (overdrive) rotation speed $n_{1\min}$ higher than that indicated in the catalogue, in order to guarantee the centrifugal separation of all bodies, preserving them from wear. For further information, please contact Bonfiglioli Technical Service.



By turning the outer cage, you can change the locking direction of the backstop device. If you wish to do this, you must first contact Bonfiglioli Technical Service for the procedure to follow.



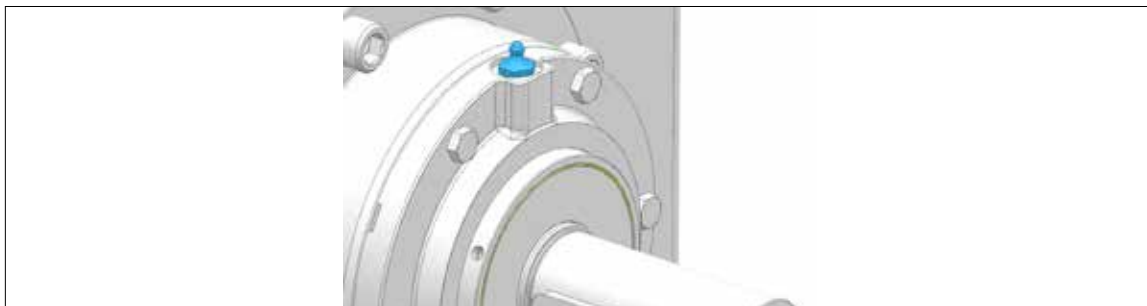
6.1.7 Seals and gaskets (VS, TK optional variants)

On request, the gear units can be fitted with different sealing systems: Sliding seals:

- single oil seals (VS) with Viton® compound;
- Taconite seals (TK) recommended in environments characterised by the presence of abrasive dust, consisting of a combination of oil seals, labyrinths and grease chamber.

Using the appropriate grease nipples, apply grease at the correct pressure until it emerges evenly around the entire circumference of the seal cap.

Once the filling operation is complete, clean any grease spillage from the surfaces.



For maintenance, add approximately 30 grams of grease suitable for lubricating rolling bearings, according to the intervals indicated in the "SCHEDULED MAINTENANCE" section of this manual.



To avoid damage to the seal or gears, do not use high or low pressure cleaning equipment.



Any work must only be carried out when the gear unit is stationary.

The electric motor must be secured against unintentional start (e.g. by locking the main switch or removing the power supply fuses). To this end, also attach a warning sign to the motor indicating that work is being carried out on the speed gear unit.

6.1.8 Sensors (TG, PT100, OLG optional variants)

TG variant

The thermostat detects when the maximum permissible temperature of the lubricant has been reached. It is not adjustable and is calibrated to a fixed tripping temperature of $90\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. It is supplied with normally closed (N.C.) contacts. At temperatures up to $90\text{ }^{\circ}\text{C}$, the contacts are closed and the signal is present. When the set temperature is reached, the electrical contact lifts, interrupting the signal.

In this case, stop the gear unit as soon as possible and identify the fault cause.

Contact capacity:

5 A (resistive) / 240 V AC

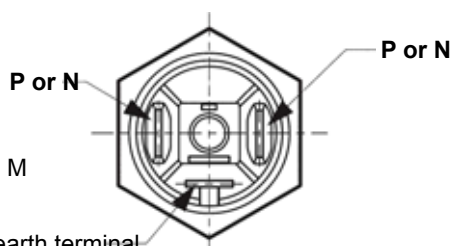
5 A (resistive) / 24 V DC

Level of protection:

IP 65 (with connector fitted)

Threaded connection: GAS 1/2" M

6.3x0.8 faston earth terminal

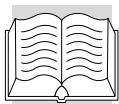


P = Phase

N = Neutral



The wiring and electrical connections and/or connections to the various utilities are the responsibility of the customer and must be made before start-up.



PT100 variant (temperature control)

When the PT100 option is specified, an analogue temperature probe is supplied to detect the oil temperature in a linear way.

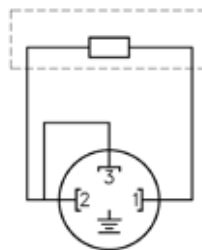
PT100 type

Resistance at 0 °C: 100 Ω

Level of protection: IP 67

Threaded connection: GAS 1/2" M

Temperature threshold: 50 °C / +200 °C



The wiring and electrical connections and/or connections to the various utilities are the responsibility of the customer and must be made before start-up.



Depending on the different configurations, the thermostat can be mounted on the gear unit or supplied as accessories; in this case, it is necessary to locate the closed caps used for transport, which are clearly marked, and replace it.

OLG variant (oil level control)

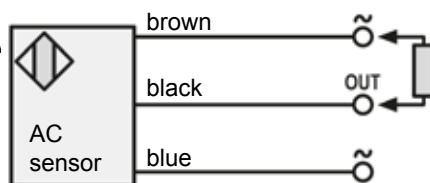
On request, a sensor can be installed for remote control of the lubricant safety level. If supplied as standard, locate the closed plug used for transport, which is clearly marked, and replace it.

Contact type: NC (Normally closed) in air

Power supply: 28 V AC

Level of protection: IP 65

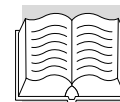
Threaded connection: GAS 1/2" M



The device operates when the gear unit is **inactive**. During operation, it must be bypassed. If a lack of lubricant is reported, restore the oil level to its initial conditions and identify the causes.

6.1.9 Other accessories

For any special accessories installed on the gear unit as specified in the contract, refer to the instructions provided by the manufacturer and/or the relevant manuals, as these components may require special maintenance and/or lubrication.



6.2 PAINT COATING

The gear units, which, where no specific protection class is required, in the painted (ferrous) areas comply with protection class **C3** (UNI EN ISO 129442) as a minimum requirement, are supplied with surface protection **C4** for improved resistance to atmospheric corrosion, obtained by paint coating the complete assembly.



If the gear unit is to be painted, protect the identification plate and oil seals beforehand to prevent them from coming into contact with paints and solvents.

It is advisable not to paint the surfaces intended for coupling in the final installation (feet and flanges). If this happens, optimal support and shaft alignment conditions must be ensured after mounting.

For the paint coating of any control devices applied to the gear unit, contact the **Bonfiglioli Riduttori S.p.A.** sales network.

6.3 LUBRICATION

Before commissioning, check the lubricating oil level for gear units that have a special plug. This operation, as well as filling, must be carried out with the gear unit in the mounting position in which it will actually be installed. If necessary, fill or top up the gear unit referring to the midpoint of the transparent level cap or the dipstick (reference mark) or ensuring the fluid reaches (without overflowing) the hole in the cap, if of the closed type.

The position of the service caps is shown in the tables on the following pages.

The lubricant used must be new and uncontaminated and can be introduced through the filling hole or the inspection cover, using a filling filter with a filtration grade of 25 µm and taking care to refit the seal without damaging it or to restore the appropriate sealant to ensure a tight seal.



Transparent level cap



Dipstick cap



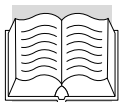
The oil level must never fall below the minimum mark and must be checked periodically when the gear unit is at a standstill, after a short cooling period.

Do not mix oils of different brands or characteristics and check that the oil in use has high anti-foaming and EP (Extreme Pressure) characteristics.

If you do not have the same type of lubricant, completely empty the gear unit of oil and wash the inside with the new lubricant, taking care to remove any residue of the old lubricant and any impurities present in the gear unit before refilling.



In the case of gear units equipped with forced lubrication, the oil circuit must also be filled. In this case, it is necessary to run the device for a short period and check the oil level again.



Protect yourself from hot parts, danger of burns!









Lubricants, solvents and detergents are toxic/harmful to health:

- if they come into direct contact with the skin, they can cause irritation;
- if inhaled, they can cause serious poisoning;
- If swallowed, they may cause death.


Handle with care using appropriate personal protective equipment. Do not release them into the environment and dispose of them in accordance with current legislation.


6.3.1 Synthetic-based oils and mineral-based oils with EP (Extreme Pressure) additives


 Shell			 Agip			 KLÜBER LUBRICATION				 Mobil					 Castrol	 TOTAL	
Omala S4 WE			Blasia			Klübersynth GH 6				Mobil Glygoyle					Mobil Glygoyle		
Omala S4 GXV			Blasia SX			Klübersynth UH1 6				Mobil SHC GEAR					Mobil Glygoyle		
*						Klübersynth GEM 4 N				Mobil SHC 600					Mobil SHC GEAR		
						Klüberoil GEM 1				Mobilgear XMP							
										Mobil Glygoyle (USDA H1)							

 Recommended use.

 Food use.

 Allowed use. The quality and suitability of lubricants cannot be guaranteed by Bonfiglioli and must be verified with the manufacturer of the selected lubricant (or request oil certification from **Bonfiglioli Technical Service**).

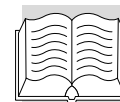
 PoliGlycol (PAG) synthetic base oil (Group V according to API classification)

 Synthetic polyalphaolefin (PAO) base oil (Group IV according to API classification)

 Mineral-based oil with EP additives



For the viscosity to be used, please refer to the specific sales catalogue.







6.3.2 Long-term storage (optional variant)





With the long-term storage option, the configured product is supplied without the standard lubricating oil but with an anti-corrosion protective liquid to guarantee the integrity and full functionality of the gear unit in cases where the unit will not be immediately installed but will be stored for a long period of time (installation beyond 6 months from the delivery date).

The anti-corrosion protective fluid can be requested in two versions according to the SL option.

1) SLM: Long-term storage _ mineral oil







With this option, the anti-corrosion protective liquid is compatible with all mineral-based lubricating oils and with the synthetic polyalphaolefin (PAO) oils listed in the table below:

Mineral lubricant used	
Producer	Product name
	Omala S2 GX
	Blasia
	Klüberoil GEM 1
	Mobilgear XMP

Synthetic lubricant (PAO) used	
Producer	Product name
	Omala S4 GVX
	Blasia SX
	Klübersynth GEM 4 N
	Mobil SHC Gear
	Mobil SHC 600

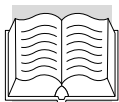
2) SLP: Long-term storage _ Polyglycol oil

With this option, the anti-corrosion protective liquid is compatible with all synthetic polyglycol (PAG) lubricating oils listed in the table below:

Synthetic lubricant (PAG) used	
Producer	Product name
	Omala S4 WE
	Blasia S
	Klübersynth GH 6
	Mobil Glygoyle
	Alphasyn PG
	Carter SG



Do not use in gear units that will be filled with lubricating oils suitable for contact with food.



6.3.3 Compatible greases

- Klüber Staburags NBU 8 EP (for bearings)
- Klüber Asonic GHY 72 (for DW chamber)
- Klüberpaste 46 MR 401 (to facilitate cylindrical couplings)
- ITP Fluorocarbon gel 880 (for greasing sliding seals)
- Klüber Petamo GHY 133 N (for taconite seals)

6.3.4 Lubricant quantity

The quantity of lubricant described in the table below is indicative and must be verified by referring to the midpoint of the transparent level cap or the dipstick (reference mark) or ensuring the fluid reaches (without overflowing) the hole in the cap, depending on the mounting position specified when ordering.

	i =	oil [l]	
		AB3	AB6
3/H 11L2	30.3 - 65.0	22	13
	76.0 - 270.3	27	
	355.4 - 1099	27	
3/H 13L2	30.6 - 65.8	24	15
	77.0 - 273.7	29	
	339.5 - 1113	28	
3/H 15L2	93.5 - 286.9	48	26
	329.0 - 1039	47	
3/H 15L3	128.8 - 354.6	32	22
	414.8 - 1160	36	
3/H 16L2	111.4 - 413.1	49	28
	456.8 - 1150	50	
3/H 16L3	128.8 - 354.6	33	24
	414.8 - 1160	37	
3/H 17L2	102.4 - 412.7	74	48
	456.8 - 943.4	75	
3/H 17L3	125.6 - 268.0	40	31
	314.1 - 921.1	44	
3/H 18L2	99.4 - 295.2	110	65
	314.6 - 964.0	109	
3/H 18L3	119.7 - 364.3	60	45
	444.2 - 1128	66	
3/H 19L2	105.6 - 387.2	124	77
	412.6 - 1098	123	
3/H 19L3	132.5 - 320.9	85	70
	391.2 - 993.6	88	
3/H 21L3	120.1 - 361.2	97	88
	403.1 - 960.0	112	
3/H 23L3	121.5 - 266.6	153	129
	297.9 - 936.9	174	
3/H 25L3	127.7 - 304.6	177	147
	340.5 - 1071	202	

6.3.5 Service plugs



The following tables are for reference in interpreting the positions of the service plugs.



Filling and venting



Visual level



Vent



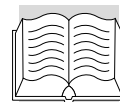
Drain



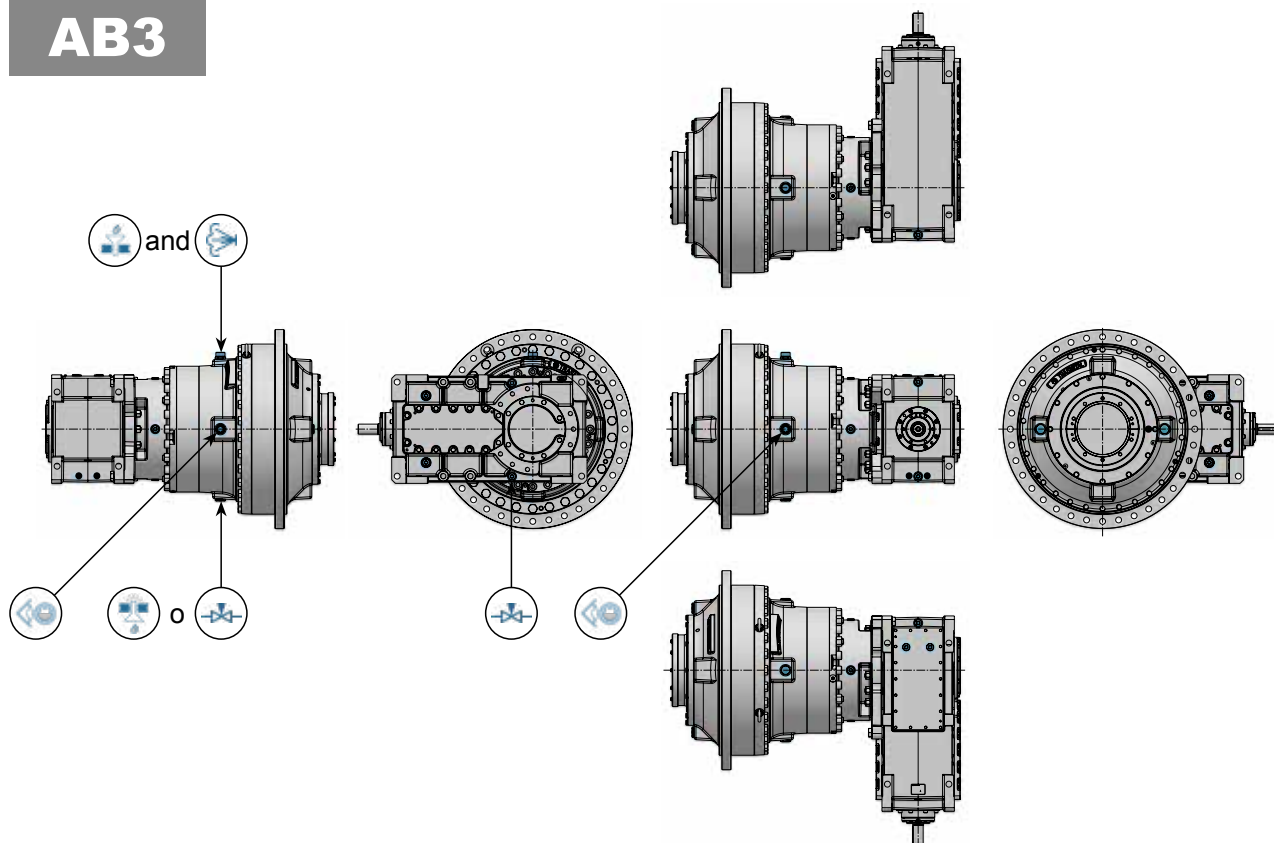
Magnetic drain



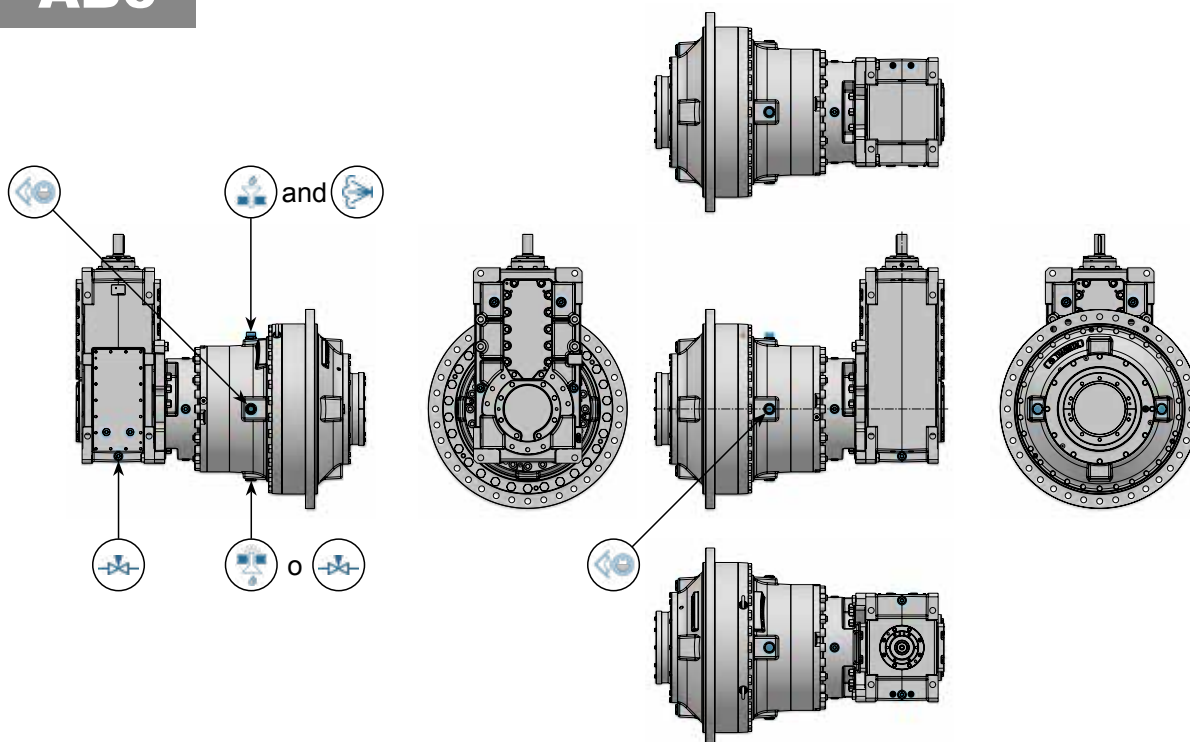
OD drain kit

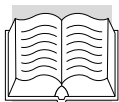


AB3



AB6





6.3.6 Vent filter with drying salts

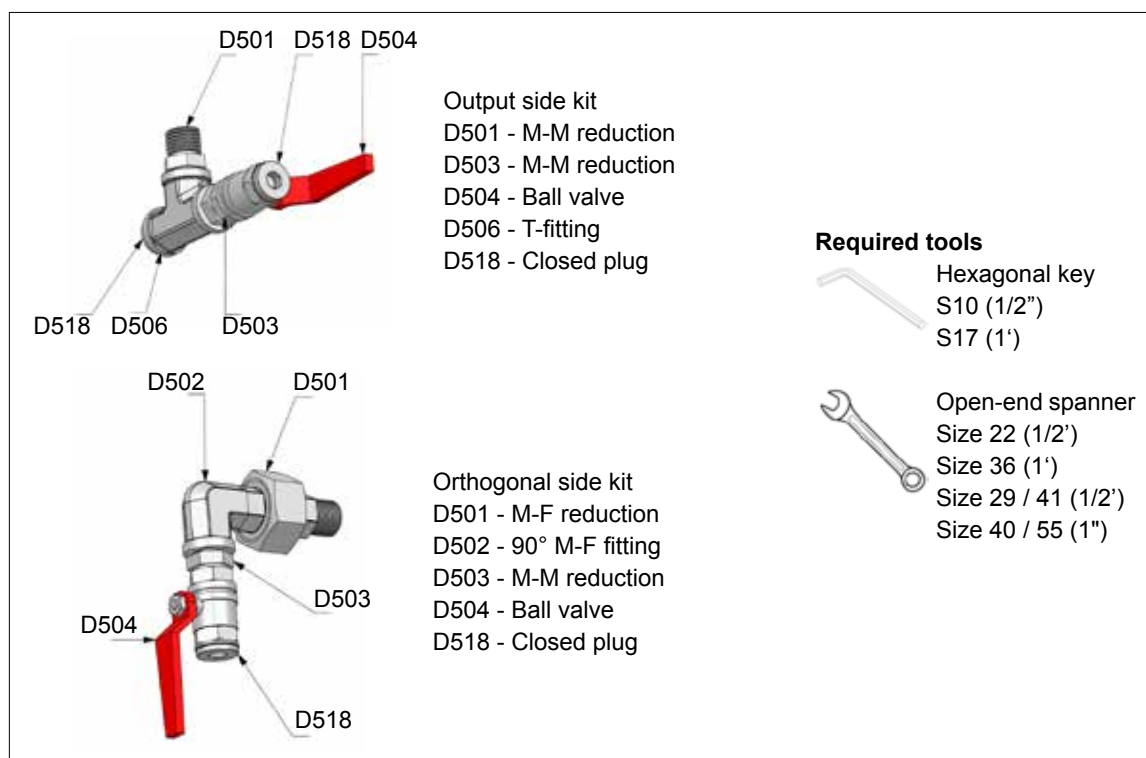
The change of colour of the gel contained inside the filter indicates that the solution adopted is working correctly and efficiently. The control valve in the device ensures that no overpressure is created inside the gear unit (opening at 0.017 bar). This device is designed to replace the vent plug. Check the correct positioning (as a replacement for the closed plug) in the relevant tables in the chapter on service plugs.

		A	B	Ø C		A	B	Ø C
	3/H 11L2	3/8"	171	64	3/H 18L2	1"	230.3	104
	3/H 13L2	3/8"	171	64	3/H 18L3	1"	230.3	104
	3/H 15L2	3/8"	171	64	3/H 19L2	1"	230.3	104
	3/H 15L3	3/8"	171	64	3/H 19L3	1"	230.3	104
	3/H 16L2	3/8"	171	64	3/H 21L3	1"	230.3	104
	3/H 16L3	3/8"	171	64	3/H 23L3	1"	230.3	104
	3/H 17L2	3/8"	171	64	3/H 25L3	1"	230.3	104
	3/H 17L3	3/8"	171	64				

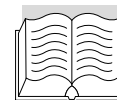
6.3.7 Oil drain (OD variant)

The gear unit with OD variant is supplied with two oil drain kits to ensure complete emptying. To identify where to position the kits, refer to the images relating to the service plugs. The removal of closed plugs and assembly of the oil drain kit must be carried out before filling the gear unit with the quantity of oil indicated on the previous pages.

All operations are to be carried out by the customer.



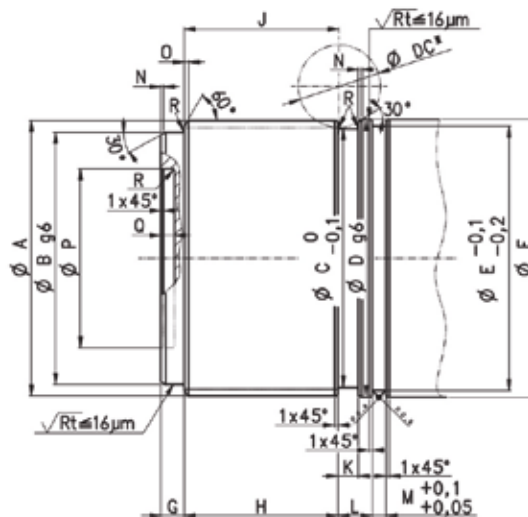
If you wish to change the position of the oil drain kits, we recommend contacting **Bonfiglioli Technical Service**.



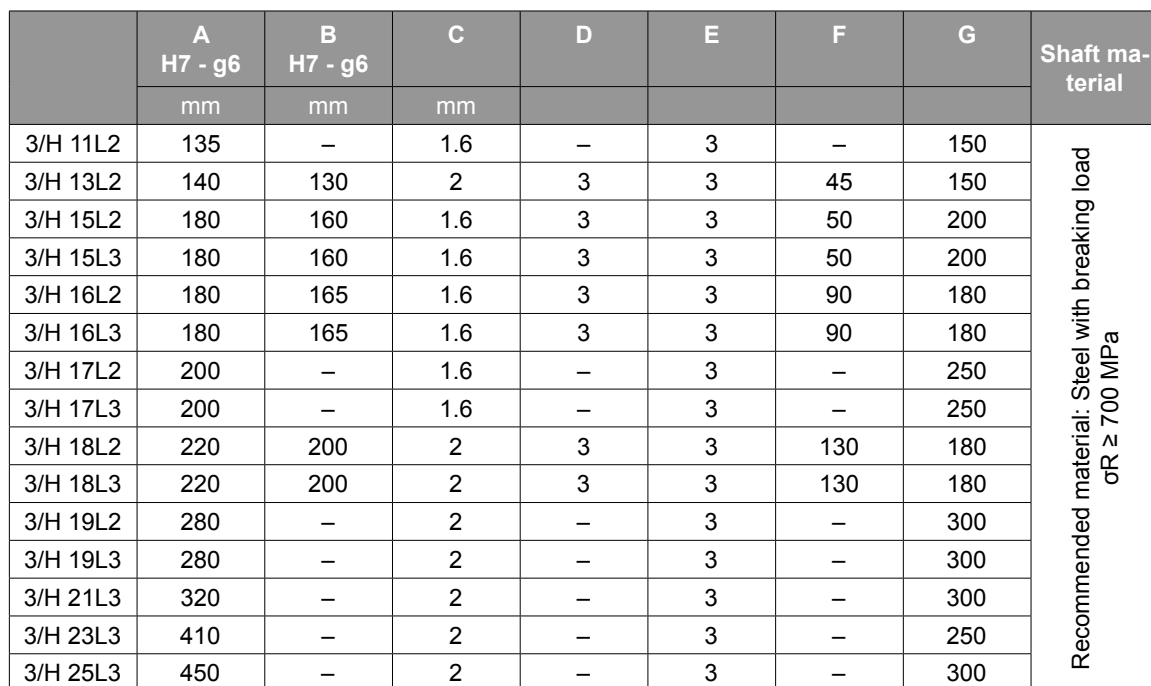
6.4 CUSTOMER MACHINE SHAFT MANUFACTURING

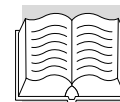
We recommend manufacturing the driven shaft that will be coupled with the gear unit using good quality steel, in accordance with the dimensions shown in the table. We also recommend completing the assembly, taking care to check and size the various components according to the different application requirements.

FZP



	A	B	C	Shaft material	D	E	F	G	H	K	J	L	M	N	O	P	Q	R	DC*
	Splined DIN 5480	Ø H7 - g6	Groove diameter																
	mm	mm	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
3/H 11L2	120x3x38	108	112	Recommended material: Steel with breaking load σ _R ≥ 900 MPa	124	112	124	19	69	9	70	18.5	6	1	1.6	—	—	1.6	60
3/H 13L2	140x5x26	110	132		142	132	142	26	83	189	84	30	6	1	2	—	—	3	60
3/H 15L2	150x5x28	136	136		152	136	152	16	103	8	104	20	8	1	2	—	—	1.6	60
3/H 15L3	150x5x28	136	136		152	136	152	16	103	8	104	20	8	1	2	—	—	1.6	60
3/H 16L2	170x5x32	150	154		172	154	172	30	113	20	114	45	9	1	3	—	—	3	60
3/H 16L3	170x5x32	150	154		172	154	172	30	113	20	114	45	9	1	3	—	—	3	60
3/H 17L2	200x5x38	187	186		202	192	202	16	100	19	101	33	9	1	3.5	130	10	1.6	60
3/H 17L3	200x5x38	187	186		202	192	202	16	100	19	101	33	9	1	3.5	130	10	1.6	60
3/H 18L2	210x5x40	190	194		212	194	212	27	133	20	134	45	9	2	3	—	—	3	60
3/H 18L3	210x5x40	190	194		212	194	212	27	133	20	134	45	9	2	3	—	—	3	60
3/H 19L2	260x5x50	248	243		265	243	265	29	144	20	145	40	11	2	3	—	—	3	60
3/H 19L3	260x5x50	248	243		265	243	265	29	144	20	145	40	11	2	3	—	—	3	60
3/H 21L3	300x8x36	282	281		305	281	305	25	158	25	159	50	12	2	3	—	—	3	70
3/H 23L3	400x8x48	360	381		405	381	405	35	254	26	256	53.5	12	2	4	—	—	5	70
3/H 25L3	450x8x55	410	431		455	431	455	34	272	24	274	66	12	2	4	—	—	5	70





7 TESTING AND COMMISSIONING OF THE GEAR UNIT

7.1 COMMISSIONING

The gear unit is tested in advance at the factory by the manufacturer. Before starting up, check:

- that the machine, or part it, intended to incorporate the gear unit/gearmotor has been declared compliant with the provisions of Machinery Directive 2006/42/EC and any other applicable safety regulations in force;
- that the mounting position of the gear unit is as specified and indicated on the identification plate;
- the suitability and correct functioning of the electrical power supply and control systems in accordance with standard EN 602041, as well as earthing in accordance with standard EN 600790;
- that the power supply voltage of the motor and any electrical components installed corresponds to that specified and that its value is within the limits of +/- 10% of the nominal value;
- the oil level for the gear unit/gearmotor and for any accessories installed that require it is as specified and that there are no lubricant leaks from the caps, gaskets or any pipes;
- the lubrication system, where provided, is activated in advance of the gear unit/gearmotor starting, within a limit of approximately 5 minutes;
- that the vent plug is not obstructed by dirt or paint;
- that any connections to parts and/or accessories that may have been removed during transport have been restored;
- for versions with optional TK and DW variants, that grease has been added by the manufacturer or that the need for filling by the customer has been indicated with appropriate signs. If there is no grease, fill using the type of product described in paragraph 7.3.3 Compatible greases;
- that any protective covers provided by the manufacturer that may have been removed have been refitted;
- once the gear unit/gearmotor has been started, check that there is no abnormal noise and/or vibration;
- after the first 100 hours of operation, check the tightening torques of all screw couplings:
 - shrink discs
 - motor flanges
 - machine side flanges
 - supports



If optional accessories are present, it is also necessary to check that all the operations required for their correct functioning, as described in the relevant chapters and/or reference manuals, have been carried out.

The gear unit must first be started up without load and at low speed; only after a few hours, if no irregularities in operation are noticed, can the load and speed be gradually increased to the expected operating conditions within a reasonable period of time, during which the gear unit must be kept under control.

7.2 PREPARATORY ACTIVITIES FOR COMMISSIONING WITH SLP OPTION

The activities that must be carried out for the commissioning of the gear unit or gearmotor with Long-Term Storage option, within the expiry date of the service contract, are:

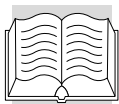
- the customer must remove the unit from its packaging and protective VpCI bag;
- the gear unit or gearmotor with Long-Term Storage option requires certain precautions before being put into service;
- **case A | anti-corrosion protective liquid compatible with lubricating oil**

Before putting the gear unit or gearmotor with Long-Term Storage option into service, the product must be filled with a compatible lubricating oil.

When the product with the Long-Term Storage option is selected, Bonfiglioli supplies a vent plug with the unit, which must be fitted to the unit before it is put into service.

The filler and drain plugs are closed plugs and are supplied already fitted to the gear units.

During installation, the filler plug must be removed. The lubricating oil must then be filled to the level corresponding to the mounting position indicated on the product nameplate.



After filling with lubricating oil and before putting the product into service, the vent plug supplied with the product must be fitted to the unit in place of the filler plug that was previously removed.

- **case B | anti-corrosion protective liquid not compatible with lubricating oil**

Before commissioning the gear unit or gearmotor with the Long-Term Storage option, the following precautions must be taken:

- 1) drain the anti-corrosion protective fluid;
- 2) fill the unit with a small amount of compatible lubricating oil to remove any residues of anti-corrosion protective fluid. The small amount of lubricating oil must be equal to 20% of the amount of lubricating oil required for horizontal mounting;
- 3) perform a rotation test ("flushing test" without load) to distribute the lubricating oil inside and, at the end of this operation, drain the small amount of lubricating oil in order to remove any residual anti-corrosion protective liquid;
- 4) refill the unit with a compatible lubricating oil in the quantity corresponding to the mounting position indicated on the product nameplate.

The filler and drain plugs are closed plugs and are supplied already fitted to the gear units.

During installation, the filler plug must be removed. The lubricating oil must then be filled to the level corresponding to the mounting position indicated on the product nameplate.

After filling with lubricating oil and before putting the product into service, the vent plug supplied with the product must be fitted to the unit in place of the filler plug that was previously removed.

7.3 USE OF THE EQUIPMENT

Before starting up the gear unit, it is necessary to check that the system in which it is installed complies with all applicable directives, in particular those relating to the health and safety of people in the workplace.

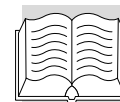


The gear unit must not be used in environments and areas:

- with highly corrosive and/or abrasive vapours, fumes or dust;
- in direct contact with bulk food products.

Dangerous areas and exposed persons:

The hazardous area of the gear unit is the free protrusion of the shaft where exposed persons may be subject to mechanical risks from direct contact (crushing, cutting, dragging). In particular, when the gear unit is operating automatically and in an accessible area, it is mandatory to protect the shaft with a suitable guard.



7.4 STARTING THE COOLING UNIT (MCRW..., MCRA...)

If the gear unit is equipped with an independent cooling unit, the additional instructions below must also be followed during start-up.



Unless otherwise specified, the instructions and values below are also valid in the presence of regulation and control devices supplied with the gear unit or as an accessory to it, replacing the standard ones described in this Manual. In order to identify any malfunctions or anomalies in a timely manner, regular monitoring during operation is recommended.



During operation, care must be taken to avoid any contact, even accidental, with the surfaces of the heat exchangers, which can reach high temperatures.

Case 1) Functionality: Oil cooling

Oil/water exchanger (MCRW...)

- once the gear unit has started, when the lubricant reaches a temperature of 60 °C, the insertion thermostat must give the signal for the motor pump to start and the water supply solenoid valve to open;
- when the lubricant reaches a temperature of 90 °C, the maximum thermostat must activate an alarm and stop the gear unit as soon as possible;

Oil/air exchanger (MCRA...)

- once the gear unit has started, start the control unit following the instructions in the "Limits and conditions of use" section of this manual;
- to prevent the fan from running continuously when not necessary, the start-up of the relevant motor can be adjusted within a pre-set range using the thermostat on the heat exchanger itself. Unless otherwise specified, it is recommended to set the electric fan activation temperature, using the aforementioned thermostat where possible, to a value of 60 °C.
- when the lubricant reaches a temperature of 90 °C, the maximum temperature thermostat must activate an alarm and stop the gear unit as soon as possible;

Case 2) Functionality: Oil cooling and forced lubrication of internal components

- Start the control unit following the instructions in the "Limits and conditions of use" section of this manual;
- Start the gear unit only after the control unit has been running for a few minutes.

Oil/water exchanger (MCRW...)

When the lubricant reaches a temperature of 60 °C, the switch-on thermostat must give the signal for the water supply solenoid valve to open;

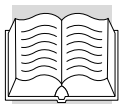
- when the lubricant reaches a temperature of 90 °C, the maximum temperature thermostat must activate an alarm and stop the gear unit as soon as possible;
- when the pressure drops below 0.5 bar, the minimum pressure switch must activate an alarm and stop the gear unit as soon as possible.

Air/oil exchanger (MCRA...)

- to prevent the fan from running continuously when not necessary, the start-up of the relevant motor can be adjusted within a pre-set range using the thermostat on the heat exchanger itself. Unless otherwise specified, it is recommended to set the electric fan activation temperature, using the aforementioned thermostat where possible, to a value of 60 °C.
- when the lubricant reaches a temperature of 90 °C, the maximum thermostat must activate an alarm and stop the gear unit as soon as possible;
- when the pressure drops below 0.5 bar, the minimum pressure switch must activate an alarm and stop the gear unit as soon as possible.



Any oil circuit used for gear lubrication must always operate simultaneously with the gear unit itself and must only be switched off after the gear unit has actually stopped.



8 MAINTENANCE

8.1 MAINTENANCE ACTIVITIES



Maintenance/replacement operations must be carried out by experienced maintenance personnel in compliance with current workplace safety laws and the environmental issues of the specific installation. In order to maintain the proper functioning and safety level of the gear unit/gearmotor, it is recommended that extraordinary maintenance be performed by the Manufacturer or a specialised and authorised centre. Contact the manufacturer's sales network.

Failure to comply with this instruction during the warranty period will void the warranty.

- Before performing any maintenance work, the power sources of the machine in which the gear units are integrated must be disconnected, locking the disconnectors in the isolated circuit position; the disconnectors must be locked by each person performing work using personal devices (e.g. padlocks) whose unlocking devices (e.g. keys) must be kept with them for the entire duration of the work.
- Ensure that the surfaces have cooled down before performing any work; if necessary, operators must wear heat-resistant gloves when working on the gear unit. For further information, refer to the chapter "PERMITTED TEMPERATURE LIMITS".
- Before carrying out any maintenance work, activate all safety devices and assess whether it is necessary to inform the personnel working on and near the equipment. In particular, adequately mark the surrounding areas and prevent access to all devices that, if activated, could cause unexpected hazardous conditions, compromising the health and safety of persons.
- Use the oils and greases recommended by the manufacturer.
- When working on the gear unit, always replace the oil seals with new original seals.
- If a bearing needs to be replaced, it is advisable to also replace the other bearing that supports the same shaft.
- After each maintenance operation, it is advisable to replace the lubricant.
- For operations in which contact with lubricating fluids and greases is possible, all the warnings contained in the respective manufacturers' safety data sheets must be followed and any personal protective equipment specified therein must be used.

If the gear unit remains inactive for a long period of time after installation or running-in, it must be started up at least once a month. If this is not possible, it must be protected against corrosion with a suitable inhibitor or by filling it completely with fresh oil of the type normally used for operation (see the "STORAGE" section of this manual).

This will ensure the functionality of the gear unit and the expected level of safety.

We accept no responsibility for damage to persons or components resulting from the use of non-original spare parts and extraordinary interventions that may modify the safety requirements without the manufacturer's authorisation. For component requests, refer to the information in the spare parts catalogue for the specific gear unit.



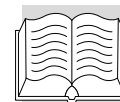
Never carry out improvised or makeshift repairs!

Before carrying out any work, the personnel in charge must strictly deactivate the power supply to the gear unit, putting it in "out of service" mode and taking precautions against any condition that could lead to its unintentional reactivation, and in any case preventing any movement of the gear unit components (movements generated by suspended masses or similar).

Personnel must also implement all additional necessary environmental safety measures (e.g. removal of gas or residual dust, etc.).



Do not disperse polluting liquids, worn parts and maintenance residues into the environment. Dispose of waste in accordance with applicable laws.



8.2 EFFICIENCY CHECK

- Periodically clean the surfaces of the gear unit and motor, removing any dust deposited on the casings.
- Check that the noise level does not vary in intensity under constant load. Excessive vibrations or noise may indicate gear wear or bearing failure.
- Check the power consumption and voltage, comparing them with the nominal values indicated on the motor nameplate.
- Check the wear on the friction surfaces and brake seal of any self-braking motors and, if necessary, adjust the air gap.
- Check that there are no lubricant leaks from seals, caps, housings and pipes.
- Check that there are no increases in temperature compared to normal operating conditions (refer to the chapter "PERMITTED TEMPERATURE LIMITS"). If not justified by an increase in the applied load, rotation speed, ambient temperature or any other factor, the gear unit must be stopped as soon as possible and the causes of the anomaly identified.
- Check the bolted joints to ensure that they are not worn, deformed or corroded and tighten them without exceeding the torques specified in the chapter "INSTALLATION OF THE GEAR UNIT" in this Manual.

8.3 CLEANING

Clean the gear unit of dust and any machining residues.

Do not use solvents or other products that are not compatible with the construction materials and do not direct high-pressure water jets at the gear unit.

8.4 SCHEDULED MAINTENANCE



Keep the gear unit/gearmotor in peak condition by carrying out the scheduled maintenance operations specified by the manufacturer.
Good maintenance will ensure top performance, a longer service life and constant compliance with safety requirements.

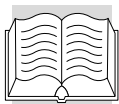
List of checks to be performed:

We recommend keeping an inspection log so that any changes in the individual control parameters can be easily identified as quickly as possible.



The times indicated in the following tables depend a lot on the conditions of use of the gear unit and are to be considered valid in the absence of problems of a different nature.

Control parameter	Frequency
Oil change	see specific table
Oil pressure (in the presence of circuits)	24 h
Noise, vibrations	24 h
External conditions of the gear unit (dirt, oil deposits)	170 h ... 720 h
Oil leaks, external seals and gaskets	720 h
Oil level	720 h
Oil filter contamination indicator (where applicable)	720 h
Bearing grease refill (where applicable)	see specific table
Vent filter (where applicable)	2200 h
Check the tightness and condition of the anchor bolts, connecting flanges and torque transmission elements	2000 h ... 4000 h
Check wear on the elastic element of the coupling (where applicable)	2000 h ... 4000 h
Drywell grease refill (on series where applicable) and seals (where applicable)	2000 h ... 4000 h
Check wear on Belleville washers and torque arm adjustment	3000 h
Condition of the polymer bushings of the torque arm (ageing/cracking)	3000 h
Alignment of the gear unit shafts with those of the connected machines at each replacement	9000 h ... 18000 h
Cleanliness requirements for the fan, fan cover and casing	at every oil change



Depending on the temperatures reached by the lubricant, it should be replaced at approximately the intervals shown in the following table:

Average operating temperature of the oil [C°]	Replacement interval [h]		
	mineral oil	synthetic oil	
	EP (*)	PAO	PAG
$t_0 < 65$	8000	25000	25000
$65 < t_0 < 80$	4000	15000	15000
$80 < t_0 < 95$	2000 (@) (#)	12500	12500

(*) = Replacement within 1 year in any case

(@) = For values of $t_0 > 80$ °C and < 95 °C, continuous operation is not recommended

(#) = Recommended check every 6 months

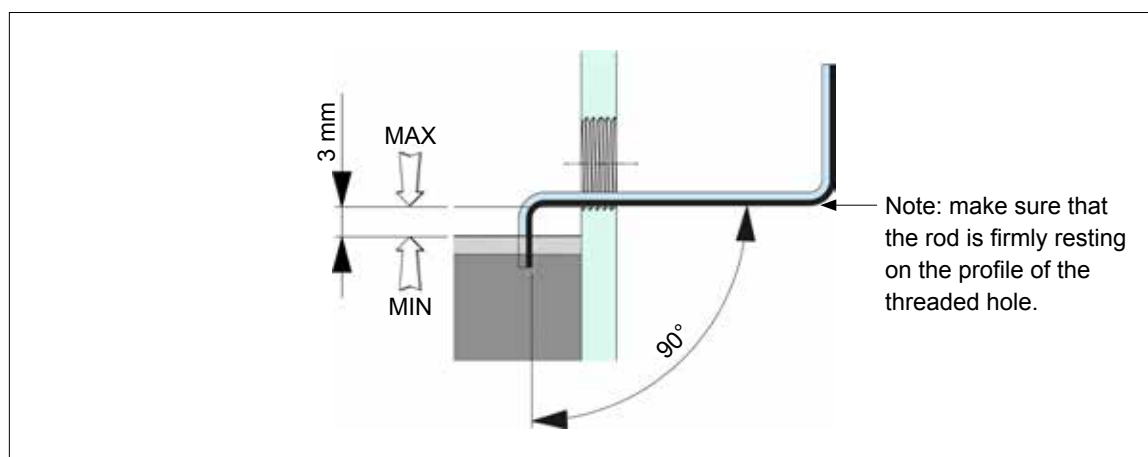
8.5 OIL LEVEL CHECK

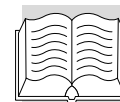
Visible level indicator:

To check the correct lubricant level, refer to the midpoint of the transparent sight glass or the marks on the dipstick. If the level is below the lower part of the sight glass or the lower mark, restore the correct quantity and investigate the causes of the decrease in level.

Gear units, when equipped with specific optional variants, can be supplied with a yellow cap for checking the lubricant level by touch. To check the correct lubricant level, first locate the yellow service cap on the gear unit. Remove it and insert a rod of a size compatible with the hole and of the shape shown in the diagram below.

If the level is more than 3 mm below the touch level, restore the correct quantity and investigate the causes of the decrease in level.





8.6 OIL CHANGE

1. Place a container of adequate capacity under the drain plug.
2. Remove the filler and drain plugs and allow the oil to drain out.
3. Wait a few minutes for all the oil to drain out, then screw the drain plug back in after replacing the gasket and thoroughly cleaning the magnet, if present.
4. Only add new oil after installing the gear unit in its final position, until it reaches the midpoint of the transparent level cap or dipstick (reference mark) or until the fluid reaches (without overflowing) the hole in the plug, if of the closed type. Use the type of lubricant indicated on the nameplate. For further information, refer to the chapter entitled "Lubrication".
5. Screw the filler plug back on after replacing the relevant gasket.



The quantity of oil to be added is indicated in the "Lubrication" section of this manual. However, please note that this quantity is indicative and that in any case reference should be made to the midpoint of the transparent level cap, or to the dipstick (reference mark) or to the touch level cap, which is arranged according to the mounting position specified at the time of ordering.



Lubricants, solvents and detergents are toxic/harmful to health:

- if they come into direct contact with the skin, they can cause irritation;
- if inhaled, they can cause serious poisoning;
- If swallowed, they may cause death.

Handle with care using appropriate personal protective equipment. Do not release them into the environment and dispose of them in accordance with current legislation.



If a leak is found, before replenishing the lubricant, the cause of the defect must be identified with certainty before putting the gear unit back into service.

8.7 MAINTENANCE OF COOLING UNITS (MCRW - MCRA optional variant)

If the gear unit is equipped with an independent cooling unit, the additional instructions below must also be followed.



Before carrying out any cleaning and/or maintenance work, it is recommended to:

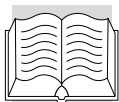
- activate all necessary safety devices to prevent accidental start-up of the gear unit and control unit
- wait for the gear unit and all control unit components to cool down
- empty the gear unit or lower the lubricant level so that it does not overflow during component replacement

In particular, it is recommended to check the following at regular intervals:

- the visual clogging indicator, always reading it when the oil is hot and servicing and/or replacing the cartridge with one with the same characteristics if the pressure gauge, depending on the type installed:
 - detects a pressure greater than 6 bar or 1.5 bar higher than the value detected with a new cartridge, or if the clogging indicator is in the red range;
- the water passage section (MCRW...), to check that it is free of sediment and/or obstructions that compromise the efficiency of the thermal aid device: if necessary, clean it using suitable chemical agents, checking with specialist companies that the detergents are compatible with the heat exchanger material. The interval at which the condition of the exchanger is checked and any maintenance work carried out depends on the characteristics of the cooling water used.

Any faults in the heat exchanger's water supply circuit can be identified by checking the condition of the lubricating oil in the gear unit, as the presence of water causes it to become very foamy.
- the condition of the radiant pack (MCRA...), to check that it is free of sediment and/or obstructions that could compromise heat exchange efficiency: if necessary, clean it with compressed air (max pressure 6 bar), taking care to direct the jet parallel to the fins so as not to damage them and to duly protect the electrical components. Only if essential, cleaning products compatible with the exchanger material may be used, to be sprayed before blowing.

The interval at which the condition of the exchanger should be checked and any maintenance work carried out depends on the characteristics of the installation environment.



Lubricants, solvents and detergents are toxic/harmful to health:

- if they come into direct contact with the skin, they can cause irritation;
- if inhaled, they can cause serious poisoning;
- If swallowed, they may cause death.

Handle with care using appropriate personal protective equipment. Do not release them into the environment and dispose of them in accordance with current legislation.

It is recommended to pay utmost attention when using hazardous chemical detergents and to take the appropriate measures for their disposal in accordance with the law.

Before restarting the gear unit or control unit, it is necessary to fill the gear unit itself and any accessories that require it with oil to the correct level.

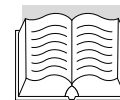
Never operate the cooling unit without the relevant guards and, after any work, replace them before starting up.

9 FAULTS AND REMEDIES

The information below is intended to help identify and correct any faults and malfunctions. In some cases, these problems may also depend on the machinery in which the gear unit is installed, so the cause and possible solution must be sought in the technical documentation provided by the machinery manufacturer. In the event of breakage and/or replacement of mechanical components that show signs of wear that could compromise the operation of the gear unit, contact the manufacturer's sales network.

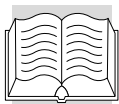
9.1 GEAR UNIT

FAULT	CAUSE	SOLUTION
High temperature in the bearings.	Oil level too low.	Top up the oil level.
	Oil too old.	Replace the oil.
	Defective bearings.	Contact an authorised workshop.
Operating temperature too high.	Oil level too high.	Check the oil level.
	Oil too old.	Replace the oil.
	Impurities in the oil.	Replace the oil.
Abnormal noises during operation.	Damaged gears.	Contact an authorised workshop.
	Excessive axial play in the bearings.	Contact an authorised workshop.
	External load too high.	Correct the external load values according to the nominal data shown in the sales catalogue.
	Impurities in the oil.	Replace the oil.
Abnormal noises in the gear unit mounting area.	Loose fixing screws.	Tighten the screws to the correct torque.
	Worn fixing screws.	Replace the fixing screws.
Oil leaks.	Oil level too high.	Check the oil level.
	Insufficient seal on the cover or couplings.	Contact an authorised workshop.
	Worn seals/gaskets.	Contact an authorised workshop.
The gear unit does not work or works with difficulty.	Oil viscosity too high.	Change oil (see recommended lubricants table).
	Oil level too high.	Check the oil level.
	External load too high.	Set the transmission for the intended use.
The output shaft does not rotate while the motor is running.	Damaged gears.	Contact an authorised workshop.



9.2 COOLING UNITS (MCRW..., MCRA...)

FAULT	CAUSE	SOLUTION
Operating temperature too high.	Missing or insufficient oil circulation.	Check the speed and direction of rotation of the motor pump. Check the cleanliness of the filter. Check that the insertion thermostat is working properly. Check that the pressure switch is working correctly.
	Inefficient water/oil exchanger (MCRW...).	Check the water supply circuit. Check that the solenoid valve is working properly. Check the cleanliness of the exchanger. Check that the insertion thermostat is working properly.
	Inefficient air/oil exchanger (MCRA...).	Check the speed and direction of rotation of the electric fan. Check the cleanliness of the exchanger. Check that the insertion thermostat is working properly.
High temperature in the bearings.	Missing or insufficient oil circulation.	Contact an authorised workshop.
Abnormal noises during operation (in general) due to no or insufficient pressure in the circuit.	Missing or insufficient oil circulation.	Check the oil level. Check the lubricant used. Check that the various components are correctly secured and tightened. Check that the motor pump is working properly. Check the cleanliness of the filter.
	Motor pump damaged or worn. Bypass circuit valve damaged or worn. Pressure switch damage or wrong calibration.	Contact an authorised workshop.
	Clogged suction pipe.	Check the cleanliness of the pipe.
	Operating temperature too high.	See relevant paragraph.
Abnormal noises during operation (in general) due to excessive pressure in the circuit.	Excessive oil viscosity.	Check the lubricant used. Wait for the gear unit to reach operating temperature.
	Clogged pipes or delivery components.	Check the cleanliness of the pipes. Check the cleanliness of the filter. Check the cleanliness of the exchanger.
Abnormal noises during operation (air/oil exchanger).	Damaged or worn electric fan.	Check that the electric fan is working properly. Check the cleanliness of the exchanger.



FAULT	CAUSE	SOLUTION
Oil leaks or excessive oil consumption.	Loose connections.	Check that they are tightened correctly.
	Damaged seals/gaskets.	Check that they are tightened correctly. Contact an authorised workshop.
	Damaged filter seals.	Check that they are tightened correctly. Replace the cartridge.
	Leaks in the heat exchanger.	Contact an authorised workshop.
Water leaks (MCRW...).	Damaged exchanger, loose connections.	Check the integrity of the water exchanger. Check the water supply circuit.
Excessive frequency of filter clogging with the presence of micro-metallic impurities.	Oil too old or excessive presence of impurities.	Replace the oil.
	Motor pump damaged or worn.	Contact an authorised workshop.
	Clogged pipes or components.	Check the cleanliness of the pipes. Check the cleanliness of the exchanger.
	Abnormal wear of gear unit components.	Check the integrity of the internal components (gears, bearings, etc.).

10 GEAR UNIT DISPOSAL



Ensure that the gear unit/gearmotor cannot be accidentally activated during disposal operations.

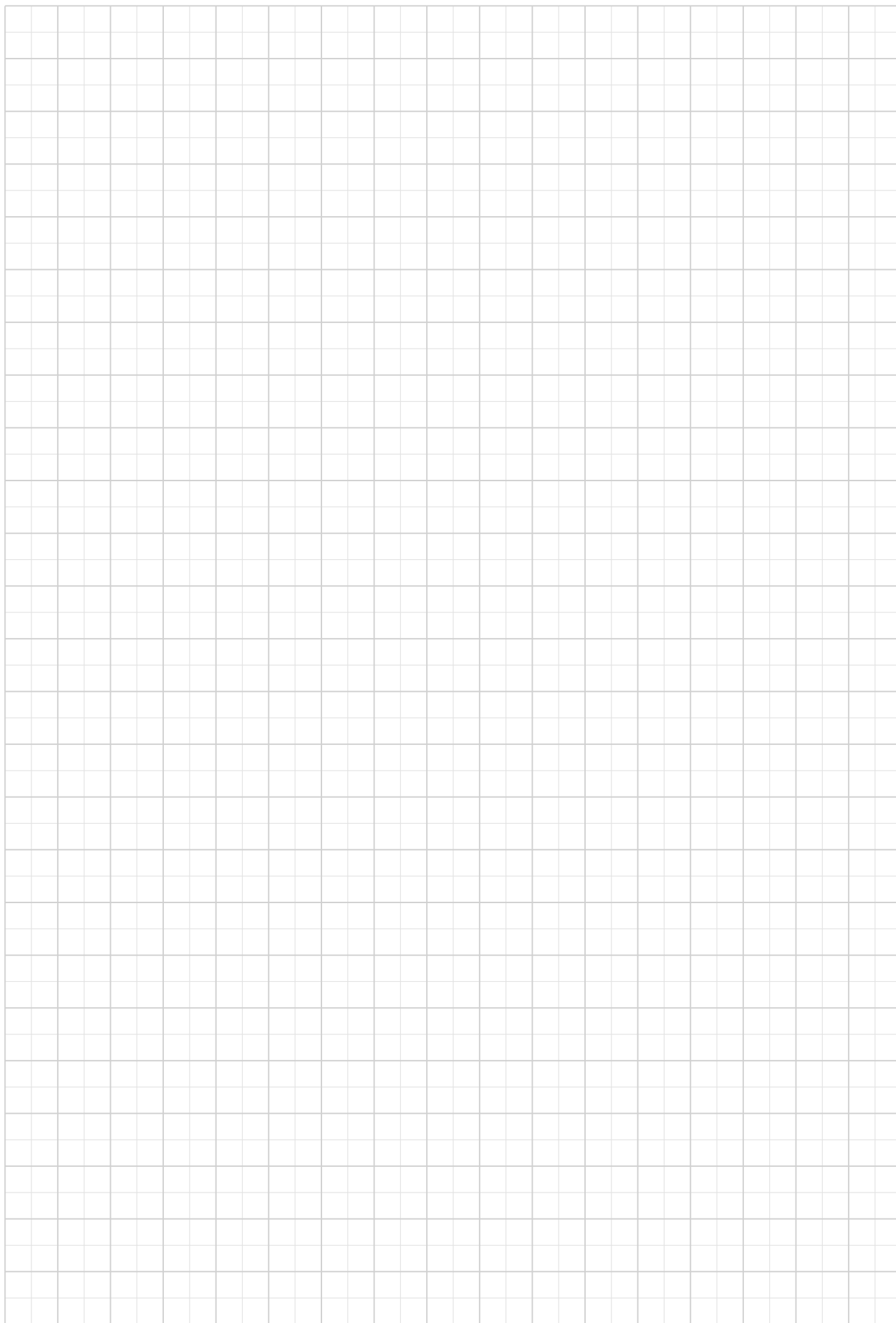
The disposal of the gear unit/gearmotor must be carried out in an environmentally friendly manner, sending the various materials to a suitable disposal/recycling centre.



This operation must be carried out by experienced operators in compliance with current workplace safety laws.

Do not dispose of non-biodegradable products, lubricating oils and non-ferrous components (rubber, PVC, resins, etc.) in the environment. Dispose of them in accordance with current environmental protection laws.

Do not attempt to reuse parts or components that may appear to be intact once they have been declared unsuitable following checks and tests and/or replacements carried out by specialised personnel.





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