

HDP, HDO Series

Installation, Operation
and Maintenance Manual



PRODUCTS &
SOLUTIONS



INCLUDED





INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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Revisions

The revision list for this manual is given on page 84 . The most recent version of this manual is available from www.bonfiglioli.com.

1 GENERAL INFORMATION

1.1 PURPOSE OF THIS MANUAL

This manual has been prepared by the manufacturer in order to provide information regarding the safe transport, handling, installation, maintenance, repair, disassembly and disposal of the gearbox/gearmotor.

All necessary purchasing and design information is provided in the sales catalogue. Follow good engineering practices, read the information in this manual thoroughly and apply it rigorously. Information on any electric motor coupled to the gearbox must be obtained directly from the motor's own installation, operation and maintenance manual.

Failure to observe the information provided in this manual may result in risks to personal health and safety, as well as damage to equipment.

This information is originally provided in the manufacturer's own language (Italian), but may be made available in other languages to meet legal and commercial requirements.

This manual, along with all other relevant documentation, must be stored by personnel appointed to do so, in a suitable location, and in such a way that it is always available in good condition for consultation. In case of loss or damage, request a replacement directly from the manufacturer, quoting the code of this manual.

This manual reflects the conditions prevalent at the time the gearbox was introduced.

The manufacturer reserves the right to modify, supplement and improve this manual in future, without this present revision being considered inadequate for that reason.

1.2 GLOSSARY, TERMS AND SYMBOLS

Some of the most frequently used terms in this manual are explained below to define their meaning clearly.

Scheduled maintenance: a set of operations required for maintaining the functionality and efficiency of the gearbox. These operations are usually scheduled by the manufacturer, who also establishes the competences and procedures required.

Unscheduled maintenance: a set of operations required for restoring the functionality and efficiency of the gearbox. These operations are not scheduled maintenance operations. In order to maintain the proper functioning and safety of the gearbox/gearmotor, we recommend that users have unscheduled maintenance performed by the manufacturer or by an authorised, specialist service centre. Contact the manufacturer's technical assistance service. Failure to comply with this requirement during the warranty period automatically invalidates the warranty.

Expert maintenance technician: an authorised technician who has the necessary qualifications, skills and mechanical and electrical training to perform scheduled maintenance on the gearbox.

SYMBOLS:

Particularly significant sections of the manual and important specifications are highlighted by symbols whose meanings are given below.



DANGER - WARNING

This symbol indicates situations of danger which, if ignored, may result in risks to personal health and safety.



CAUTION - ATTENTION



This symbol indicates the need to adopt specific precautions to avoid personal injury as well as damage to equipment.



IMPORTANT

This symbol indicates important technical information.



Instructions given in rectangles with a grey background, accompanied by the symbols  , alongside or above, refer only to equipment that conforms to the “ATEX” Directive 2014/34/EU. Instructions marked in this way must only be performed by professionally qualified operators who are specially trained in the safety precautions required for working in potentially explosive atmospheres. Failure to observe these instructions may result in serious safety and environmental risks.

1.3 REQUESTING TECHNICAL ASSISTANCE

For any technical service needs, contact the Manufacturer’s sales network (www.bonfiglioli.com) quoting the information indicated on the unit’s name plate, the approximate hours of service, the duty cycle and the type of defect.

1.4 MANUFACTURER’S LIABILITY

The Manufacturer declines all liability in the event of:

- use of the gearbox/gearmotor in contravention of local occupational health and safety legislation
- incorrect installation, disregard of or incorrect application of the instructions provided in this manual
- electrical power supply defects (for gearmotors and/or gearboxes with electrical devices)
- modifications or tampering
- work done on the gearbox by unqualified or unsuitable personnel

The functionality and safety of the gearbox also depends on the scrupulous application of the instructions given in this manual, in particular:

- Always operate the gearbox within its operating limits.
- Diligently observe the maintenance schedule.
- Ensure that only trained operators are authorised to inspect and service the gearbox.



- **the configurations given in the gearbox catalogue are the only permitted ones**
- **do not attempt to use the unit in any other way**
- **the instructions given in this manual do not substitute but rather supplement the provisions of established safety legislation.**

1.5 SUPPLEMENTARY INFORMATION

Additional information about the gearboxes described in this manual can be obtained from the sales catalogues, available on the website www.bonfiglioli.com.

2 SAFETY INFORMATION

2.1 SAFETY STANDARDS



Read thoroughly the instructions given in this manual and those printed directly on the gearbox, especially those regarding safety.



Use the gear unit only for the applications specific by the Manufacturer. Improper use can result in risks to personal health and safety and damage to equipment.

- Personnel appointed to work on the gearbox at any time during its service lifetime must be trained specifically for the purpose, must possess the necessary skills and experience, and must also be equipped with and trained to work with the appropriate tools and personal protection equipment required by the safety legislation applicable in the place where the gearbox/gearmotor is installed. Failure to meet these requirements constitutes a risk to personal health and safety.
- Keep the gearbox at its maximum efficiency by scrupulously following the maintenance schedule. Proper maintenance ensures maximum performance, extended service life and continued compliance with safety regulations.
- When working on the gearbox in areas that are difficult to access or hazardous, ensure that adequate safety precautions have been taken for yourself and others in compliance with applicable legislation on occupational health and safety.
- All maintenance, inspection and repairs must only be carried out by an expert maintenance technician fully familiar with the attendant hazards. It is therefore essential to implement operating procedures which address potential hazards and their prevention for the entire machine in which the gearbox is installed. Expert maintenance technicians must always work with caution and in observance of applicable safety standards.
- When working on the gearbox, wear the clothing and personal protective equipment specified in the manufacturer's instructions or required by the safety legislation applicable in the place where the gearbox is installed.
- Use only the lubricants (oil and grease) recommended by the manufacturer.
- Do not dump polluting materials into the environment. Dispose of all such materials as stipulated by applicable legislation.
- After changing lubricants, clean the gearbox and the walk-on surfaces around the work area.
- If the gearbox has to be serviced in a poorly lit area, use additional lamps and ensure that the work is done in compliance with all applicable safety legislation.
- During functional testing at the manufacturer's premises, the acoustic pressure measured under full load at a distance of 1 m from the gearbox and at 1.6 m above ground level, without vibration, was less than 85 dB(A). The gearbox is a component. The constructor of the plant or machine in which the gearbox is installed must therefore measure the level of noise emitted by the complete machine as required by the Machinery Directive 2006/42/EC. The vibrations produced by the gearbox do not constitute a health risk for personnel. Excessive vibration may be the result of a fault, and should be immediately reported and eliminated.



If a gearbox must be serviced in a potentially explosive atmosphere, the service engineer must first switch off power to its motor to ensure that it is out of service, and must take all necessary precautions against it being accidentally switched on again and against connected parts moving without warning.



All additional environmental safety precautions must also be taken (e.g. elimination of residual gas or dust, etc).



Unless they have backstop devices, gearboxes may reverse direction. If there is any risk of uncontrolled movement occurring in the event of a power failure (for example in load lifting applications), measures must be put in place to prevent such movement occurring (for example by using motors with brakes that engage automatically if the power fails).

If the gearbox is installed in a position that cannot be reached from the floor, the constructor of the plant or machine in which it is installed must provide, as necessary, suitable means for accessing a position from which the gearbox can be serviced.



The user is responsible for using the products recommended for the installation and maintenance of the gearbox in an appropriate manner and in accordance with the Manufacturer's instructions.



Before putting the gearbox into service, the user must ensure that the plant in which it is installed complies with all applicable directives, especially those regarding health and safety at work.

The constructor of the plant or machine in which the gearbox/gearmotor is installed must protect all rotating parts to prevent personnel coming into accidental contact and incurring a risk of crushing, cutting or entanglement, especially if the gearbox operates automatically and in an accessible area.

- Do not use high pressure jets of water to clean the gearbox.
- Only perform work on the gearbox when it is at a standstill.
- Protect the electric motor against accidental startup (e.g. by padlocking the main power switch or removing the power fuses). For this purpose, also affix a notice to the motor indicating that work is in progress on the gearbox.
- Do not perform welding work on the gearbox. Do not use the gearbox as an earthing post for welding operations because this could damage or destroy parts of the gear teeth and bearings.
- Switch off the motor immediately if any changes are noticed in the normal functioning of the gearbox, such as an abnormal increase in operating temperature or abnormal running noise.
- If the gearbox is to be installed in a plant or machine, the constructor of the said plant or machine is required to include the prescriptions, instructions and descriptions contained in this manual in the operating manual for the plant or machine.
- If the gearbox is installed in situations that are particularly hazardous to personal safety, or that could cause serious damage to equipment, or that involve high inertial loads, vibrations, etc., such as:
 - suspended installations
 - motors supported exclusively by the gearbox
 - output shaft with shrink disc oriented downwardssuitable safety devices, such as harnesses, safety chains and restraining systems, etc. must be installed.



Depending on operating conditions, the outer surfaces of the gearbox may reach very high temperatures. Risk of burns! When draining spent oil as part of an oil change, always bear in mind that hot oil can cause serious burns! If the gearbox is equipped with a vent plug that incorporates a pressure relief valve, wait for the oil in the gearbox to cool before removing the plug, and beware of possible jets of oil during transport, lifting, installation, adjustment, operation, cleaning, maintenance, repair, dismantling and scrapping. Wait for the gearbox to cool before inspecting it.

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

- use any accessory for any purpose other than that specified in the contract of supply
- fill any accessory with lubricants other than those recommended/permited
- use any accessory as a support or mounting surface
- use any accessory as an attachment point for the handling or transport of the gear unit/gearmotor
- modify any accessory in any way
- loosen and/or remove any component (pipe, fitting, flange, control device, etc.) while the system is functioning and/or under pressure
- fail to respect the requirements affixed to any accessory and/or to the gear unit/gearmotor, or remove, cover or render illegible any labels
- start up any accessory without any relevant guards in place and functional
- start up any accessory if damaged



All work on any accessory must be performed by qualified personnel who have a thorough knowledge of the instructions and technical specification for the product and who are authorised to perform such work by the safety supervisor. It is the responsibility of the manufacturer or assembler of the machine in which these gear units are incorporated to ensure the safety of that machine as a whole and its conformity to all relevant end product directives.

Parts of accessories may be electrically live or in motion. The removal of electrical or mechanical guards, improper use or inadequate maintenance may therefore lead to serious injury or damage.



3 TECHNICAL INFORMATION

3.1 EQUIPMENT IDENTIFICATION

The gearbox bears the following identifying nameplate. The nameplate provides essential information and specifications for correct and safe use. The designation of the gearbox is explained in the sales catalogue. If the gearbox is supplied fitted with a motor (gearing motor), all information regarding the motor itself is provided in the motor's own manual.

Nameplate information

type	A	
option	B	
code	C	batch D
ratio i =	E	M _{N2} (@ 1400 rpm) F
mount. pos.	G	P _{N1} (@ 1400 rpm) H
oil q.ty	I	approx. L
remarks	M	N

- A Gear unit type
- B Optional variants
- C Product code
- D Month / Year of manufacture
- E Transmission ratio
- F Rated torque at output shaft
- G Mounting position
- H Rated power at input shaft
- I Approximate quantity of lubricant
- L Weight
- M Notes
- N Name of Manufacturer

Nameplate data for ATEX-specified gearboxes

A		CE	
Type B		i C	
Code D		Mount.P. G	Oil R
P1 J	n1 M	M2 S	
A1 K	R1 N	xR1 O	
A2 L	R2 P	xR2 Q	
F	Ta T	E	
	RMT U	H	
	EC-Cert.No. V		
	Y		X



CE - Ex Mark

- Environmental limits (ambient temperature range: - 20°C to + 40°C)..
- Temperature class: **T4** for 2G and **135°C** for 2D..
- Temperature class: **T4** per 3G and **135°C** for 3D available on request (special execution), contact the manufacturer.
- Notified body with whom the technical file has been deposited.

- A Name of manufacturer
- B Gearbox type
- C Gear ratio
- D Product code
- E Serial number
- F Country of production
- G Mounting position
- H Bar code
- J Input power
- K Input thrust load
- L Output thrust load
- M Input speed
- N Input radial load
- O Input radial load application distance
- P Output radial load
- Q Output radial load application distance
- R Lubricant
- S Output transmissible torque [Nm]
- T Ambient temperature
- U Recommended maintenance time
- V Acknowledgement of receipt number
- X Calculation report
- Y Specific symbols of ATEX marking



Legibility of the nameplate

The nameplate and the information thereon must be legible at all times. The nameplate should therefore be cleaned from time to time.

Always quote the identifying data on the nameplate in all correspondence with the manufacturer, when ordering spare parts, requesting information or arranging technical assistance.

3.2 DESCRIPTION OF THE EQUIPMENT

The gear unit has been designed and constructed for integration, driven by motor, into an assembly of interlocking parts or mechanisms as part of a specific application.

Depending on the requirements of the application, the gear unit can be supplied in a variety of executions and configurations.

It is designed to satisfy a range of specific requirements in the mechanical, chemical, agricultural and food industries, etc..

The Manufacturer supplies a range of accessories and optional variants to make these gear units as versatile as possible. For further technical information and descriptions, refer to the corresponding sales catalogue and the «OPTIONAL ACCESSORIES AND VARIANTS» section in this manual.

The user is responsible for using the products recommended for the installation and maintenance of the gear unit in an appropriate manner and in accordance with the Manufacturer's instructions.

SAFETY SPECIFICATIONS FOR ATEX-COMPLIANT GEARBOXES



- Use only synthetic lubricants (oil and grease).
- Use only fluoroelastomer seals.
- Apply thread lock to all external bolts and plugs.
- Fit vent plugs with anti-intrusion valves.
- Oil seals with dust traps.
- Ensure that all components and products can resist temperatures above the maximum rated operating temperature.
- Ensure that there are no metal parts in sliding contact outside the gearbox.
- Ensure that plastic parts cannot accumulate an electrostatic charge, or are shielded if they can.
- Install irreversible heat sensors.
- Installations in zones 21 and 22 require the user to draft and implement a regular cleaning schedule for all surfaces and recesses to avoid the build-up of dust.
- To prevent dust building up in difficult to access areas, sealing devices, mounting flanges and external threads must be provided at all mobile couplings.

3.3 CONFORMITY

All gearboxes or gearmotors (when supplied with motor) are designed as state of the art devices in compliance with the provisions of applicable Essential Health and Safety Requirements.

All gearmotor motors conform to the provisions of the Low Voltage Directive 2006/95/EC and the Electromagnetic Compatibility Directive 2004/108/EC..



If specified for use in potentially explosive atmospheres, gearboxes must also be designed and constructed to conform with the Essential Health and Safety Requirements (EHSR) of Annex II of the ATEX Directive 2014/34/EU and must conform to the following classification:

- Equipment group: **II**.
- Category: Gas **2G** – Dust **2D**.
- Zone: Gas **1** – Dust **21**.
- Temperature class: **T4** for 2G and **135°C** for 2D.



3.4 OPERATING LIMITS AND CONDITIONS



The applications permitted by the Manufacturer are the industrial applications for which the gearbox has been designed.



Changes to the gearbox version or mounting position are only permitted if previously authorised by the manufacturer's technical assistance service.



Failure to obtain this authorisation invalidates the ATEX certification.

Refer to chapter "ALLOWED TEMPERATURE LIMITS" for the optimum ambient conditions.



The gearbox may not be used in areas and environments in direct contact with loose food products.

In the case of installation in presence of saline mist and/or corrosive vapor/dust, it's necessary to perform periodic inspections to check the possible start of a corrosive phenomenon. In this case immediately contact the Manufacturer Technical Service.

Do not use the gearbox/gearmotor, if not explicitly intended for the purpose, in a potentially explosive atmosphere or where the use of explosion-proof equipment is specified.



The maximum surface temperature specified on the nameplate refers to measurements made in normal ambient and installation conditions.



Even minimal variations in these conditions (e.g. smaller mounting compartments, proximity of external equipment to the unit, which generates heat and unforeseen by the manufacturer), may have a significant effect on heat dissipation.

The following conditions must be borne in mind if the gear unit is equipped with auxiliary cooling units (MCRW... and MCRA...) or forced lubrication pumps (MOP... and OP...):

- permissible ambient temperature: -10°C to +50°C
- maximum oil pressure: 10 bar
- minimum start-up temperature: whatever temperature guarantees a minimum oil viscosity of 1500 cSt, generally within the range of +5°C to +25°C depending on the type of oil used.



For precise temperature values, refer to the relevant sales catalogue and/or product data sheet of the lubricant manufacturer.

Irrespective of the degree of protection specified outdoor installations must be protected against direct sunlight, inclement weather, and infiltration by water and foreign bodies, without, however, compromising effective gear unit ventilation.

3.5 ALLOWED TEMPERATURE LIMITS

Symbols	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 gearbox surface temperature starting with partial load (#)	-25°C	-10°C
$t_{sc \text{ min}}$	Minimum gearbox surface temperature starting with full load	-10°C	-5°C
$t_{s \text{ Max}}$	Maximum casing surface temperature during continuous operation (measured next to the gearbox input)	+100°C	+100°C (@)
t_o	Oil temperature		
$t_{o \text{ Max}}$	Maximum oil temperature during continuous operation	+95°C	+95°C (@)

(*) = For further information about minimum and maximum values of different oil viscosity and for using hydraulic circuits refer to the table "Selection of the optimal oil viscosity" on the catalog available on www.bonfiglioli.com

(@) = Continuous operation it is not advised if t_s and t_o range is 80°C to 95 °C.

(#) = For full load start-up it is recommended to ramp-up and provide for greater absorption of the motor.

If needed, contact Bonfiglioli Technical Service. 



4 HANDLING AND TRANSPORT



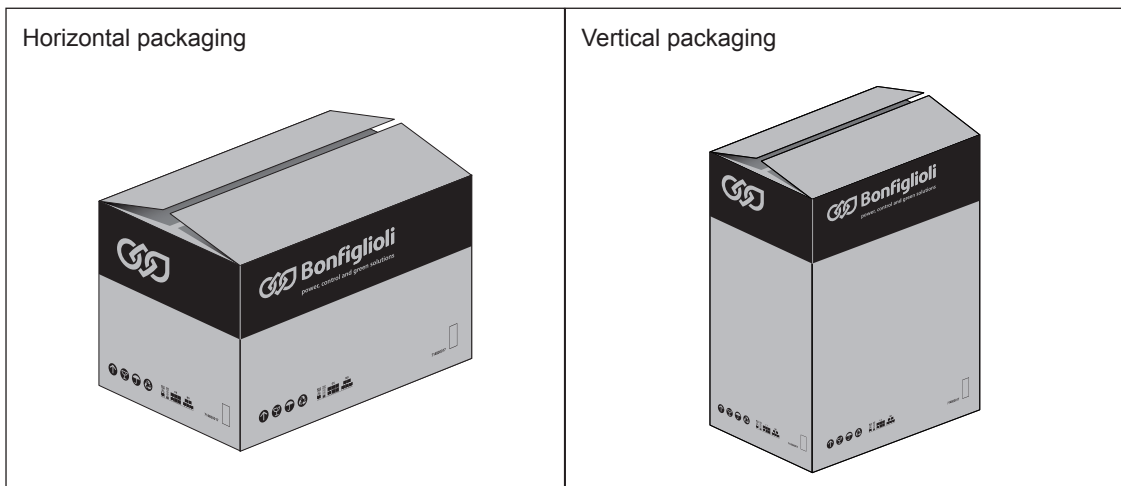
Personnel authorised to handle packages must take all necessary precautions to safeguard their own safety and that of all other persons involved.

4.1 PACKAGING SPECIFICATIONS

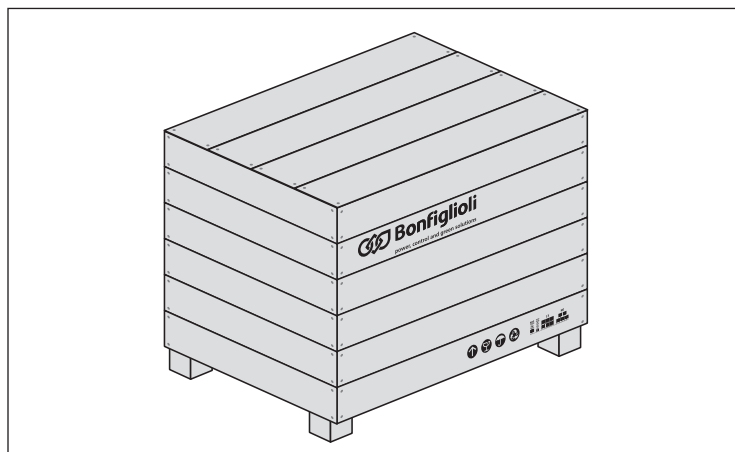
Unless otherwise agreed, standard packaging, if supplied, is not rainproof. This type of packaging is intended for shipping by ground and not by sea, and for storage in areas which are under cover and not humid. The material can be stored in suitable conditions for a period of two years under cover at a temperature within the limits specified in the chapter "ALLOWED TEMPERATURE LIMITS" and at a relative humidity not in excess of 80%. Storage in all other conditions requires specific packaging. In order to facilitate handling, heavy packages can be loaded on pallets.

The most frequent types of packaging are shown in the figures below.

Standard carton pallet packaging.



Special wooden crates.



On receipt of the gearbox, make sure the delivery corresponds to the purchase order and that it is not damaged or faulty in any way. Report any problems to the Manufacturer's sales network.



Dispose of packaging materials as stipulated by applicable legislation.

4.2 HANDLING INSTRUCTIONS



Handle packages according to the instructions provided by the manufacturer on the packages themselves, if present. If the weight and shape of the packages makes manual handling unfeasible, use special equipment to avoid damage and injury. Personnel authorised to use lifting and moving equipment must be trained and experienced in the operations required in order to avoid risks to themselves and other persons.

4.2.1 Moving the packages

- Prepare a suitable, delimited area with a level floor or surface for unloading the packages.
- Prepare the equipment required for handling the package. The lifting and handling equipment (e.g. crane or lift truck) must be of adequate capacity for the weight and size of the load, taking into account its attachment points and centre of gravity. If required, this information is indicated on the package itself. Harness heavy packages with chains, belts and steel ropes after checking that they are suitable for the weight of the load, which is always specified.
- When handling the load keep it level horizontally to avoid tipping and instability.

4.2.2 Moving the equipment



All the following operations must be carried out with the greatest care and attention to avoid sudden movements during the handling of the gearbox.

When lifting the gearbox, only use accessories such as eyebolts, shackles, safety hooks, straps, ropes and hooks, etc. that are fully certified and adequate for the load to be lifted. Do not use eyebolts on the motor to lift gearmotors.

Miscellaneous accessories (e.g. connecting flanges, etc.) and/or motors coupled to the gearbox may significantly alter the centre of gravity and impair stability. Use an additional lifting point in such cases, if necessary.

During lifting operations, the load must not be allowed to swing beyond an arc of $\pm 15^\circ$. If greater swinging movements occur during movement, stop and repeat the operations for the lifting system adopted.

To rotate the gearbox, use the same attachment points used to lift it and proceed as instructed for lifting. Rotate the gearbox as near as possible to a supporting surface. Pay special attention to the location of the centre of gravity to prevent the load from becoming unbalanced as it is being rotated. Lifting gear must be attached in such a way that it cannot slip off or move, as this could cause the load to fall. This is especially important if the gearbox is being rotated using slings or ropes, since these are particularly prone to slipping off their attachment points.



- Identify the attachment points for lifting the gearbox, as shown in the drawings.
- Prepare the gearbox for lifting by attaching straps, hooks, etc. to its attachment points, or alternatively use a pallet for moving the load. When using a crane, first lift the gearbox vertically out of its packaging.
- If using a fork lift or pallet truck, remove the packaging and insert the forks at the positions provided.
- Lift the load very slowly and to a limited height above the ground, and check that it is stable.
- Move the gearbox to the unloading area and lower it gently into position, taking care not to cause sudden oscillations while moving it.

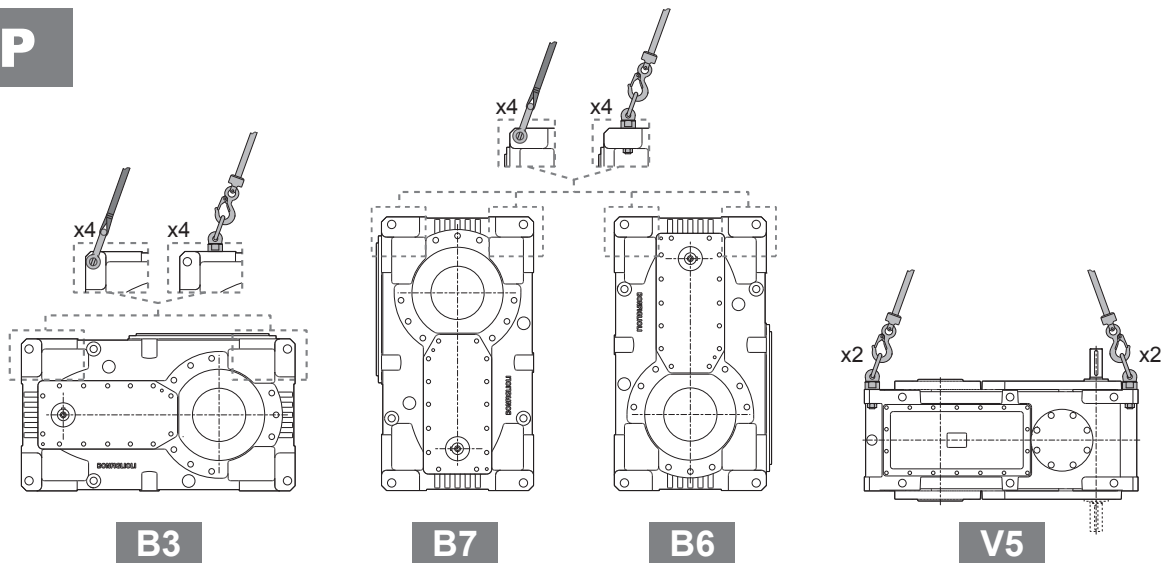


Do not use the shaft end threads or external pipes as lifting points. Take care not to damage any lubrication or cooling system accessories when lifting, moving or positioning the gear unit.



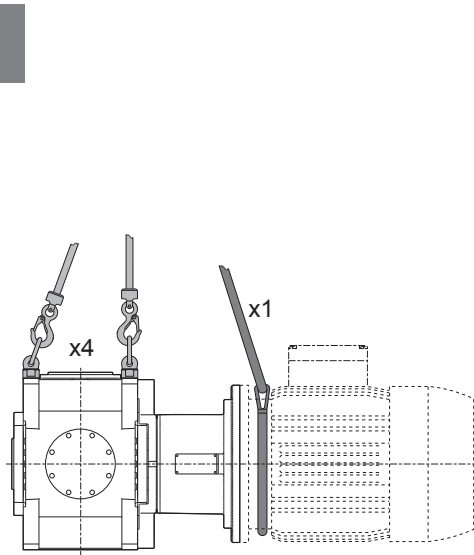
Miscellaneous accessories (e.g. connecting flanges etc.) and/or motors coupled to the gear unit may significantly alter the centre of gravity, thereby impairing the stability of the gear unit. In such cases it may be necessary to use an additional anchor point.

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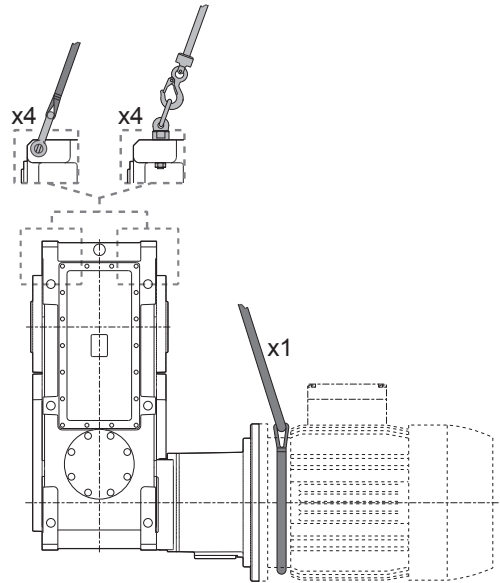




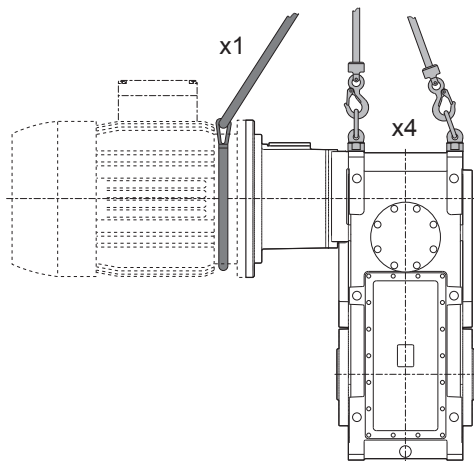
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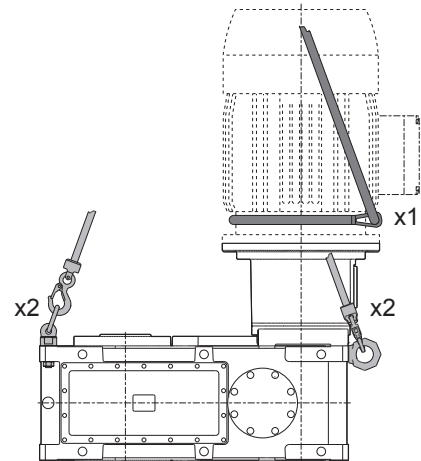
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B7

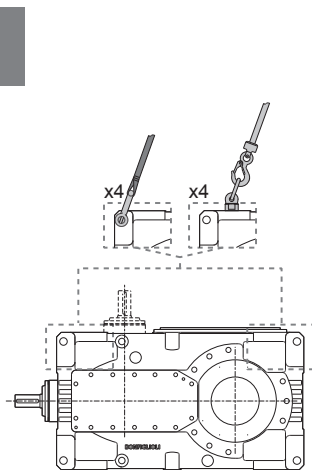


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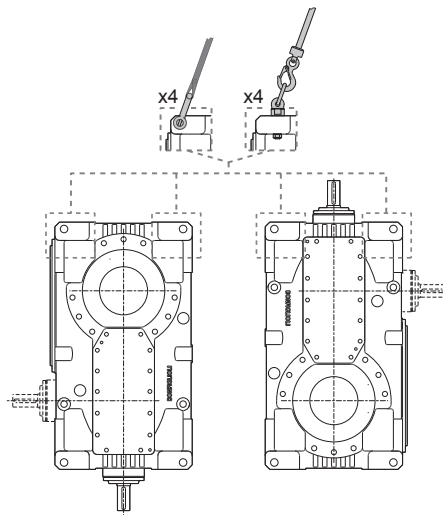


V5

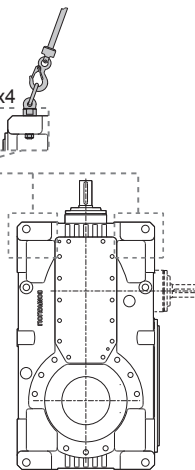
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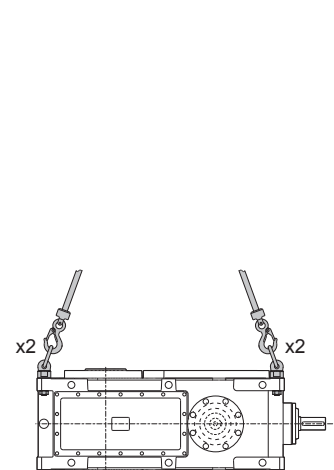
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B7



B6



V5

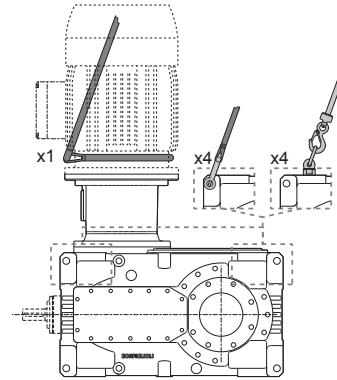
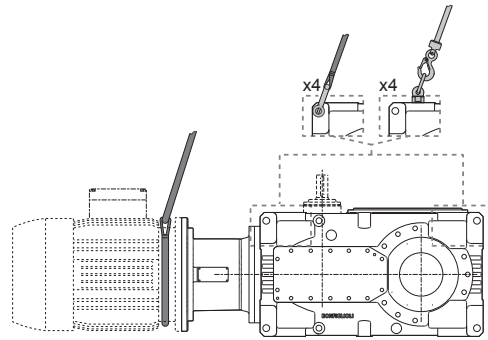


HDO

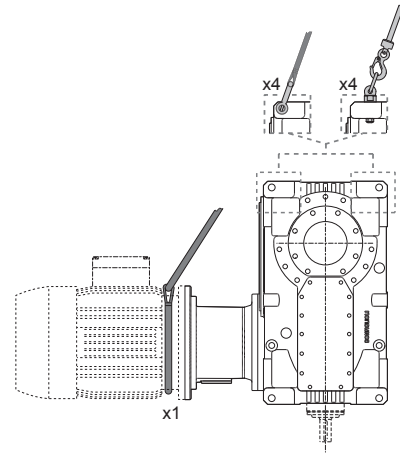
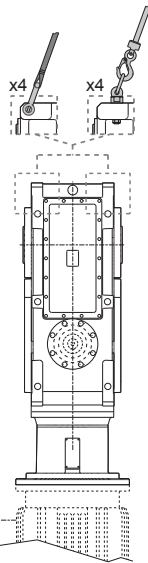
G

GJ

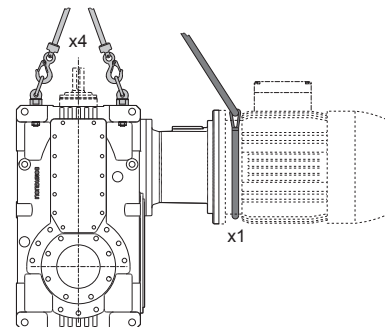
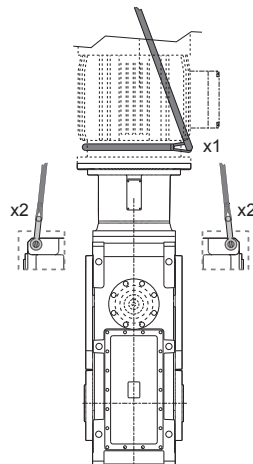
B3



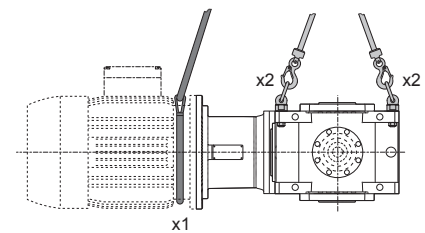
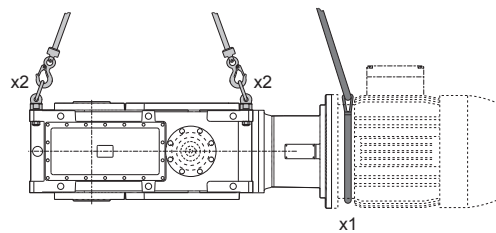
B7



B6



V5



4.3 STORAGE



Place the gearbox/gearmotor on a stable base and make sure that there is no risk of it moving or falling off.

The following recommendations should be followed when storing the gearbox/gearmotor.

1. Do not store the unit in excessively humid conditions or where it is exposed to the weather (i.e. outdoors).
2. Avoid excessive variations in temperature as this can cause condensation inside the gearbox and its accessories.
3. Do not place the gearbox directly on the ground.
4. Store the packaged gearbox (if allowed) in accordance with the instructions on the packaging itself.



If the gearbox/gearmotor is stored temporarily outdoors it must be protected to ensure that humidity and foreign matters cannot penetrate to the interior.

If gear units and accessories are to be stored for periods under 6 months, if required, fill them with oil to the right level (see the "LUBRICATION" section in this manual) and run them at regular intervals (at least once every 4 weeks) for at least 1 hour, following all the requirements given in this manual.

If the unit is to be stored for more than 6 months, the following additional precautions must be taken:

5. Coat all external machined surfaces with a protective anti-corrosion product such as Shell Ensis Fluid SX, Tectyl 506-EH or other product with similar properties and application range. Check the surfaces regularly and re-apply the coating as necessary.
6. Fill the gear unit with lubricating oil and replace the vent plugs with blind plugs.
7. Periodically rotate the gear unit's input and output shafts through a few turns to avoid damage to bearings and seals.

PRECAUTIONS to be taken when preparing gearboxes for service after storage.



Thoroughly clean the output shaft and external surfaces to remove all rustproofing products, contaminants and other impurities (using a standard commercial solvent). Do this outside the explosion hazard area.

Do not allow solvent to come into contact with seal rings as this may damage them and cause them to leak.



If the oil or protective product used during storage is not compatible with the synthetic oil required for service, clean out the inside of the gearbox thoroughly before filling with the service oil.

Storage for periods of over 1 year reduces the service life of bearing grease. Bearing grease must be synthetic.



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



To store gear units/gearmotors with a drywell sealing device, and for specific needs and types of storage, consult the Manufacturer's Technical Service.



5 INSTALLATION

5.1 INSTALLING THE GEARBOX



All phases of installation and maintenance must be taken into consideration from the machine design stage. Design personnel must, if necessary, implement a safety plan to protect the health and safety of all persons directly involved and to ensure the rigorous application of all relevant legislation.

It is essential for impact and stress to be avoided during the installation process.

Before installing a gearmotor, also refer to the instructions contained in the installation and user manual for the electric motor.

Before installing the gearbox:

1. Drain out the oil used for storage if it is not the same as the oil used for normal functioning, and flush the inside of the gearbox out thoroughly (see the "LUBRICATION" section in this manual).
2. Carefully remove all packaging and protective coatings from the gearbox suitable solvents. Take special care when cleaning mating surfaces. Avoid getting solvents on the shaft seal rings.
3. Check that the data on the nameplate correspond to those specified in the order.
4. Ensure that the structure in which the gearbox is to be mounted is sufficiently robust and rigid to support its weight and operating forces. If normal service is likely to involve impacts, extended overloads or possible seizures, fit the necessary hydraulic couplings, clutches, torque limiters, etc..
5. Check that the machine in which the gearbox is to be installed is switched off and cannot be accidentally started up.
6. Check that all coupling surfaces are flat.
7. Check that the shaft/shaft or shaft/ bore are perfectly aligned for coupling.
8. Fit suitable guards to prevent accidental contact with rotating parts outside the gearbox.
9. If the work environment is corrosive for the gearbox or any of its parts, follow the special precautions required for aggressive environments. Contact the manufacturer's technical assistance service for further details.
- 10. We recommend applying a protective paste such as Klüberpaste 46 MR 401 (or a product with similar properties and application range) to all key type couplings to ensure optimal coupling and protection against fretting corrosion. Clean all friction couplings thoroughly but do not apply any protective pastes to them.**
11. To ensure effective coupling, the driven shafts should be machined to the tolerances specified in the "PREPARING CUSTOMER SHAFTS" section in this manual.
12. In the case of outdoor installations, protect the gear unit and any motor from direct sunlight and inclement weather by means of guards or a casing. Also make sure that the assembly is properly ventilated.
13. Make sure that the casing of the gear unit is connected to the earth circuit of the machine in which it is installed.
14. Evaluate whether accessible surfaces may exceed the temperature limits established in EN ISO 13732-1 on the basis of the gearbox conditions of use and ambient temperatures; if these limits can be easily reached or exceeded, the surfaces in question must be protected to prevent contact (by means of guards and/or lagging). Wherever impossible, signs bearing symbol 5041 of IEC standard 60417 "Warning! Hot surfaces" must be displayed in such a way that they are clearly visible to machine operators (bearing in mind the position and orientation of the gearbox). Refer to chapter "ALLOWED TEMPERATURE LIMITS" for further details.



Symbol 5041 of IEC standard 60417 "Risk of burns! Hot Parts"

Proceed as follows to install the gearbox.

15. Place the gearbox in the vicinity of the installation area.
16. Mount the gearbox and secure it to the structure at the fixing points provided. Secure the gearbox to the structure using all the fixing points on the relevant mounting (foot or flange).
17. Locate the closed oil plug used during shipping and replace it with the vent plug supplied in the shipment (if required).
18. Tighten down the mounting bolts and check that the service plugs are screwed down to the torque values given in the following table.

(tab 1)

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



Installing ATEX-specified gearboxes

- Category 2D gearboxes must be installed in compliance with the provisions of standards EN 1127-1, EN 61241-14 and EN 61241-17. Installation technicians must be fully qualified to work in potentially explosive atmospheres.
- Installation technicians must be aware of the ATEX classification of the installation area, must understand the risks associated with potentially explosive atmospheres with particular reference to explosion and fire hazards, and must adopt all necessary safety precautions.
- All maintenance, assembly and disassembly work must be done by specialist personnel outside the explosion hazard area.
- Check that all accessory components (cables, joints, cable clamps, heat exchangers, etc.) also comply with the requirements of the ATEX directive. Handle all components with extreme care to avoid altering their characteristics.
- Insert the supplied screws, or plastic caps, into the threaded holes not used for fixing the gearbox (eg. Provision for output flange). The screws, or caps, should be placed “flush” on the surface taking care not to damage the mating surfaces.
- When installing gearboxes with reaction arms, make sure that no sliding movement is generated between metallic parts when the gearbox is functioning. If necessary, fit non-metallic anti-friction elements conforming to Directive 2014/34/EU between moving metal parts.
- Do not connect any object with an electrical resistance greater than $10^9 \Omega$ to the gearbox.
- Install guards to prevent hazardous accumulations of dust and liquids at the seals of protruding shafts and to protect them mechanically.
- The gearbox input speed (or the speed of the motor coupled to it) must not exceed the speed stated on the nameplate.
- When installing a gearmotor with the electric motor arranged vertically with its shaft facing down, the motor must be covered by a protective canopy.
- The output shaft and any pulleys or other transmission components must be perfectly aligned.
- Only install the gearbox in the version and in the mounting position specified in the order. Shaft-mounted gearboxes can be installed with a tolerance of $\pm 5^\circ$ to the theoretical plane of installation.
- If the gearbox is supplied without lubricant it must be installed as it is and only filled with lubricant on completion of installation.
- Secure the gearbox to a flat, vibration-free surface capable of bearing the torsional stresses it produces in service. Take care not to deform mating surfaces, mounting feet or flanges by over-tightening fixing bolts.
- Use bolts graded no lower than 8.8 for mounting the gearbox. For heavy duty installations 10.9 grade bolts can be used. See the “INSTALLING THE GEARBOX” section in this manual for tightening torque values. To stop mounting bolts becoming loose, apply Loctite 510 (or a product with similar properties and application range) to the threads of all service plugs (including those which may be removed to checking, before positioning) and bolts securing the gearbox to the machine structure and to the electric motor, also apply it to the threads of all the oil plugs (even on those eventually removed for oil level check, before their relocation).
- Make sure that overhung and thrust loads and operating torques do not exceed those for which the gearbox is specified.
- Make sure that the vent plugs and oil level plugs are easy to access for inspection.
- Clean the gearbox thoroughly after installation.



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.

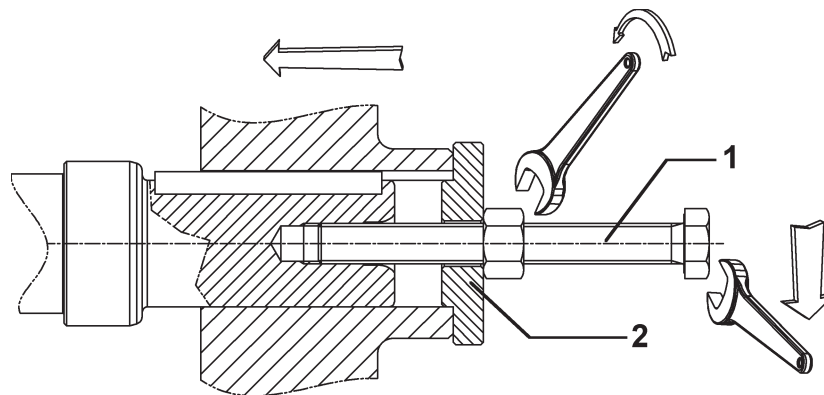


If the gear unit is equipped with a fan or an auxiliary cooling unit with an oil/air heat exchanger, leave enough room to ensure adequate air circulation.

5.1.1 Gearboxes with solid shafts (input and output)

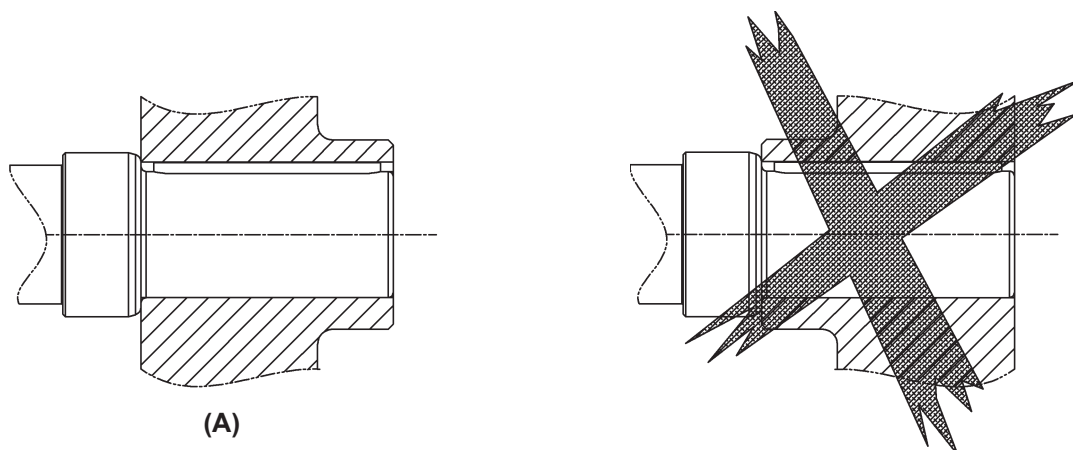


Do not use hammers or other tools which might damage the gearbox shafts or bearings to fit external parts. Proceed as shown below, following the recommendations given in the “INSTALLING CONNECTING ELEMENTS” section in this manual:



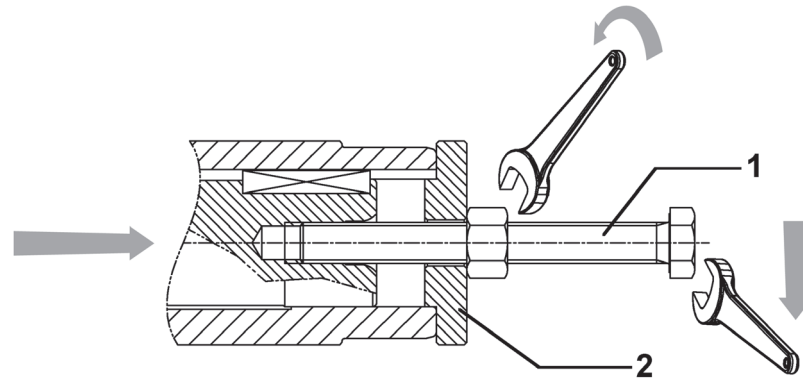
The tie bolt (1) and spacer (2) are not included in the consignment.

To minimise the loads on the shaft bearings, when mounting transmission mechanisms with asymmetrical hubs use the configuration shown in diagram (A) below:



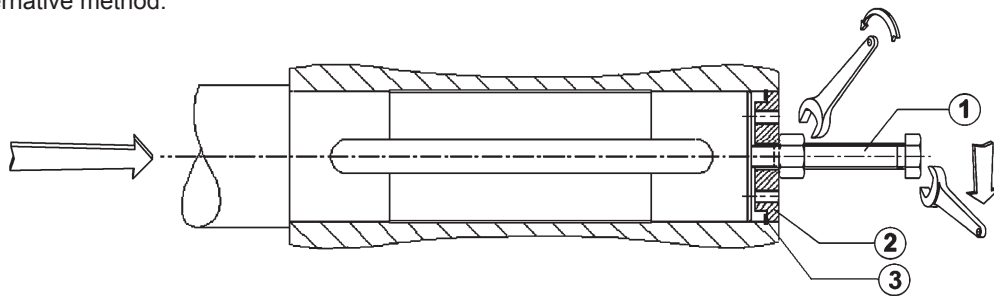
5.1.2 Gearboxes with hollow output shaft and keyway

Proceed as shown in the following diagram to couple gearboxes with a hollow output shaft to solid machine shafts. See also the “PREPARING CUSTOMER SHAFTS” section in this manual.



The tie bolt (1) and spacer (2) are not included in the consignment.

Alternative method:



The tie bolt (1), spacer (2) and circlip (3) are not included in the supply.



Install suitable devices to secure the hollow shaft to the machine shaft in an axial direction and prevent accidental decoupling.

5.1.3 Gearboxes with shrink disc

Certain gearboxes may be equipped with a shrink disc for coupling the hollow output shaft to the driven shaft. Proceed as follows to install a gearbox of this type.

1. Remove the protective guard
2. Loosen the shrink disc locking bolts gradually one at a time without completely removing them. Remove the entire shrink disc.



Clean and carefully degrease the mating surfaces on the gearbox output shaft and the machine shaft. Do not apply molybdenum disulphide or any other grease to these mating surfaces as this could significantly reduce friction and impair the performance of the shrink disc. On the other hand, take care not to remove the grease from the parts shown on the shrink disc.



Adopt one of the following techniques to facilitate subsequent disassembly at the cylindrical guide section opposite the shrink disc.

- Use a protective paste (Klüberpaste 46 MR 401 or other product with similar properties and application range).
- Design the machine shaft as suggested in the “PREPARING CUSTOMER SHAFTS” section in this manual, to accept a self-lubricating cylindrical bushing, or with a hole for the injection of an anti-corrosion liquid.

3. Fit the gearbox to the machine and couple its output shaft to the driven shaft.
4. Fit the shrink disc to the gearbox shaft.
5. Fully tighten the shrink disc bolts gradually and one at a time in a clockwise sequence using a torque wrench. This operation usually has to be repeated several times to reach the tightening torque M_t specified in the table below.

(tab 2)

	HDP 60	HDP 70	HDP 80	HDP 90	HDP 100	HDP 110	HDP 120	HDP 125	HDP 130	HDP 140	HDP 150	HDP 160	HDP 170	HDP 180
Mt [Nm]	35	35	69	127	127	250	250	250	250	490	490	490	490	490

	HDO 71	HDO 81	HDO 91	HDO 95	HDO 100	HDO 110	HDO 120	HDO 125	HDO 130	HDO 140	HDO 150	HDO 160	HDO 170	HDO 180
Mt [Nm]	35	69	127	127	127	250	250	250	250	490	490	490	490	490

Torque the shrink disc as prescribed to assure axial fixing of the transmission, in the absence of external loads.

6. Finally, fit the protective cover and tighten the screws.



For ATEX-specified gearboxes fit the protective cover applying a layer of sealant such as Loctite 5366 (or a product with similar properties and application range) to the centering and the frontal mating surfaces and tighten the bolts applying on these Loctite 510 (or a product with similar properties and application range).



In the presence of external thrust loads, vibration, safety problems, requirements for enhanced reliability, or unfavourable mounting positions (e.g. output shaft directed downwards), install suitable devices to secure the shaft in an axial direction and prevent accidental decoupling.



The shrink disc coupling must not be disassembled or lubricated before being reinstalled. Only disassemble and clean the shrink disc if it becomes dirty.



When cleaning and/or during maintenance, only lubricate the internal sliding surfaces of the shrink disc using a solid lubricant with a friction value of $\mu = 0.04$, such as Klüber Molybkombin UMF T4 (or a product offering equivalent performance and durability).



Never run the gearbox when the shrink disc protective guard is not fitted. In the presence of external thrust loads, vibration, safety problems, requirements for enhanced reliability, or unfavourable mounting positions (e.g. output shaft directed downwards), install suitable devices to secure the shaft in an axial direction and prevent accidental decoupling.

5.2 INSTALLING A MOTOR WITH AN IEC STANDARD FLANGE (optional variant AD-GL-GR)



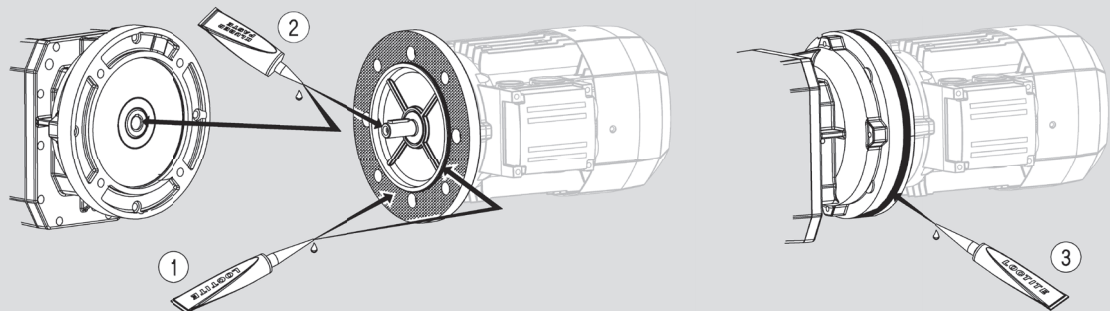
Thoroughly clean and degrease the flange of the gear unit and the area of the machine to which it is to be coupled. The correct execution of this procedure is essential for safe torque transmission. Do not use solvents or dirty rags to degrease mating surfaces.

Do not use molybdenum disulphide or any other type of grease, as this would significantly lower the friction coefficient in the contact area and therefore impair the functionality of the coupling.

- Do not force the surfaces together or use inappropriate tools to couple them. Take care not to damage the flat and/or cylindrical mating surfaces.
- Do not strain the coupling shafts with large thrust or overhung loads.
- To facilitate assembly, use a synthetic oil-based lubricating paste such as Klüberpaste 46 MR 401 (or a product with similar properties and application range).
- Tighten all the motor/gearbox fixing bolts to their prescribed torques. See the “INSTALLING THE GEARBOX” section in this manual for tightening torque values.

When the gearbox is to be coupled to a standard electric motor conforming to IEC 60072-1, proceed as follows.

- Apply a layer of sealant such as Loctite 510 (or a product with similar properties and application range) to the motor/gearbox coupling flanges, to the alignment ring and the frontal mating surfaces as shown in the figure below



1. Apply Loctite 510 to the flat surface of the flange and to the alignment ring.
2. Apply Klüberpaste 46MR401 to the inside of the gearbox input shaft and to the motor shaft.
3. Seal the joint between the gearbox and the motor with Loctite 5366, taking care to fill any gaps between the two flanges (e.g. recesses for decoupling the units).



- With the motor coupled to the gearbox, apply a film of sealant such as Loctite 5366 (or a product with similar properties and application range) around the edges of the flanges to seal any gaps between their surfaces.



- If the output shaft is also equipped with a flange, the user must take similar precautions to prevent dust accumulating in the gaps between the flanges or in the vicinity of moving couplings.



If the gearbox is installed in situations that are particularly hazardous to personal safety, install suitable safety devices, such as harnesses, safety chains and restraining systems, etc.,

5.3 INSTALLING CONNECTING ELEMENTS

Use the utmost caution when installing the various components, to ensure that no damage is caused to the gearbox and its parts, such as oil seals and mating surfaces, or internal parts such as gears and bearings.



Make sure that you have access to suitable lifting equipment to perform the installation operations correctly.



When installing external transmission parts do not use hammers or other unsuitable tools, to avoid the risk of damaging the gearbox shafts or supports.

When installing connecting elements it is advisable to preheat them slightly. Take the following precautions when doing so:



Adopt protection against contact with hot parts: risk of burns!



Protect the oil seals from damage and accidental overheating to avoid impairing their functionality (use a heat shield to protect against radiated heat).



The connecting or transmission elements must not transmit static or dynamic external loads to the shafts unless said loads have been calculated at the time of gearbox selection.

If the element to be coupled to the shaft is not fixed axially by the interference of the coupling, utilise suitable retaining components to prevent axial movement of the element in question on the shaft.



5.4 ACCESSORIES AND OPTIONAL VARIANTS

5.4.1 AUXILIARY COOLING/HEATING SYSTEMS

5.4.1.1 Forced ventilation (optional variants FANL, FANR, FANLR - FAN, FANJ)

A fan is keyed to the gear unit input shaft and protected against accidental contact by a guard.

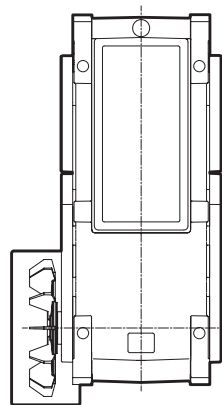


**Never run the gear unit when the fan guard is not fitted.
After each maintenance intervention refit the guards before restarting the gear unit.**

The fan draws in air through the grille in the protective guard and conveys it to the gear unit casing, thereby dissipating a quantity of heat that depends on the rotation speed.

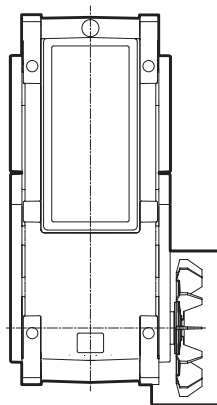


The effectiveness of forced ventilation falls off dramatically:
- at rotation speeds below $n_1=900\text{min}^{-1}$; if it proves necessary to increase the thermal capacity of the gear unit under such conditions, an auxiliary cooling device should be installed.
- if dirt builds up on the blades of the fan or blocks the protective grille over the fan. Clean regularly as instructed in the "MAINTENANCE" section in this manual.

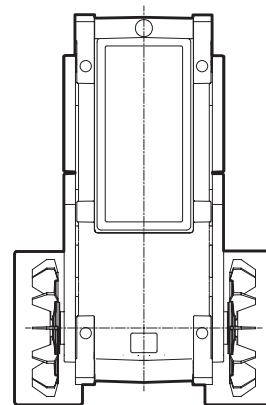


FANL

HDP 60 ... HDP 180



FANR

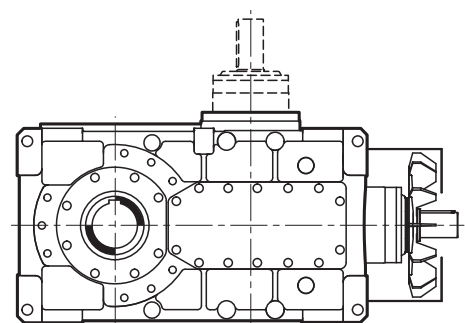
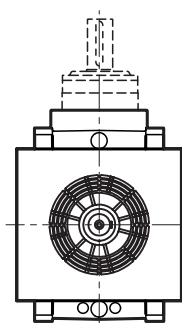


FANLR

HDP 100 ... HDP 180

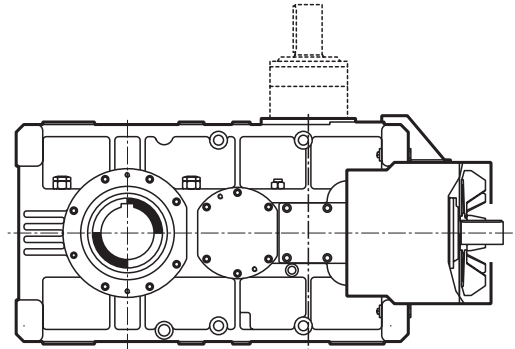
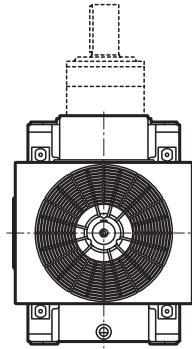
FAN

HDO 71 ... HDO 140



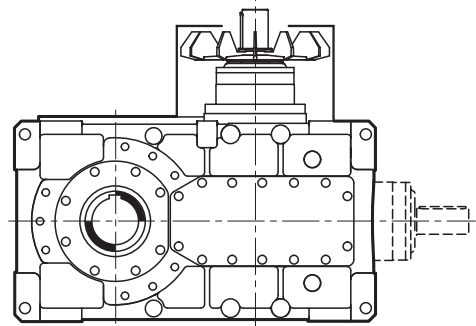
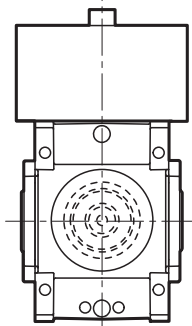
FAN

HDO 150 - HDO 160



FANJ

HDO 100 ... HDO 140



When installing a gear unit equipped with a forced air cooling fan, it is essential to allow ample space around the unit to ensure sufficient air circulation for cooling purposes.



5.4.1.2 Autonomous control units (optional variants MCRW... , MCRA...)

For ATEX component, consult catalogue and manual of the manufacturer.

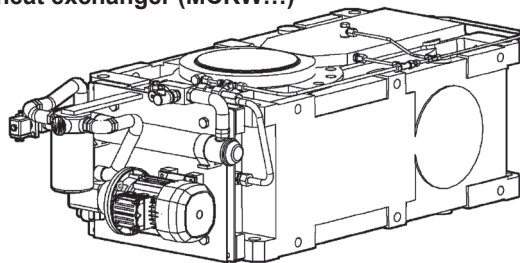
Autonomous cooling units are specially designed to cool gear unit lubricant. They come installed on board the gear units, mounted on special plates and connected to the relevant unions by rigid pipes and/or flexible hoses, also included in the supply.



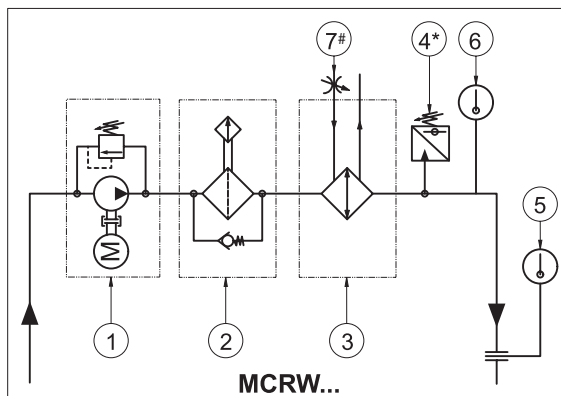
Electrical connections and/or cabling to user points are the responsibility of the Customer and must be completed prior to start-up.

Refer to the sales catalogue for information on the availability of the cooling devices for the different sizes of gear unit and for other technical specifications and dimensions.

5.4.1.2.1 Control units with oil/water heat exchanger (MCRW...)



Cooling circuit and components



- 1) Electric pump with by-pass circuit
- 2) Filter with blockage indicator and by-pass valve
- 3) Water/oil heat exchanger
- 4) Minimum pressure switch (* only with forced lubrication)
- 5) Maximum temperature thermostat
- 6) Control thermostat
- 7) Solenoid valve (# ATEX specified gear unit excluded)

Design and functional characteristics (MCRW...)

MCRW... control units are available in various sizes, each with a different flow rate and cooling capacity.

Oil is sucked directly from the gear unit casing and circulated through an external closed circuit by the electric pump [1], which has a by-pass valve calibrated at 6 bar to avoid overpressure in the system.

Before returning to the gear unit, the oil passes through:

- the filter with blockage indicator and by-pass valve [2], which eliminates any suspended solid particles and guarantees a more reliable and long lasting transmission (60 micron metal mesh filter element)
- the copper tube bundle water/oil heat exchanger [3], which removes the excess heat generated by the gear unit

To ensure the proper functioning of the auxiliary cooling system and to save energy and coolant, the following control devices are provided:

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

Technical specifications (MCRW...)

Frequency of power supply 50-60 Hz (1)

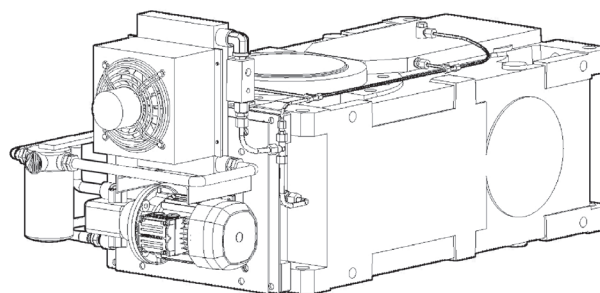
(tab 3)

Control unit	Description	Electric pump					Air/oil heat exchanger + solenoid valve			Filter with element in metal mesh 60 µm Fittings (BSP)
		V (ΔY) [V]	f [Hz]	Pn [kW]	In (Y connection) [A]	Oil flow rate (2) [l/min]	Water flow rate [l/min]	Fittings (GAS) IN OUT		
MCRW 5	BN 71B 6 IP55 CLF B35 CUS	230/400	50	0.25	0.82	5.3	10	3/8" F	3/8" M	3/4"
		265/460	60	0.3	0.79	6.4				
MCRW 9	BN 71C 4 IP55 CLF B35 CUS	230/400	50	0.55	1.55	9.5	18	1/2" F	1/2" M	3/4"
		265/460	60	0.65	1.55	11.4				
MCRW 21	BE 90S 4 IP55 CLF B35 CUS	230/400	50	1.1	2.5	21.4	31	3/4" F	1" F	3/4"
		265/460	60		2.2	25.7				
MCRW 34	BE 90LA 4 IP55 CLF B35 CUS	230/400	50	1.5	3.5	33.6	56	3/4" F	1" F	1 1/4"
		265/460	60		3.1	40.3				
MCRW 51	BE 100LA 4 IP55 CLF B35 CUS	230/400	50	3	6.6	50.8	81	3/4" F	1" F	1 1/4"
		265/460	60		5.9	61				
MCRW 70	Contact the Manufacturer's Technical Service.									

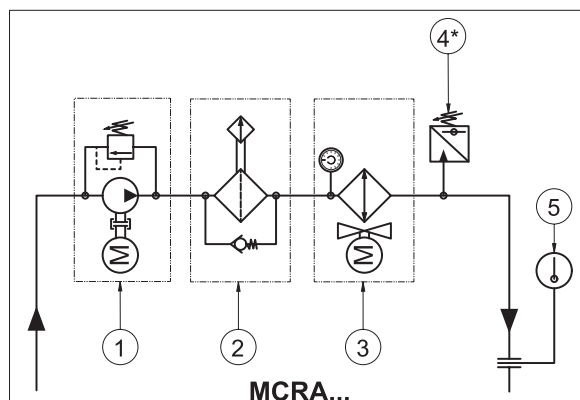
(1) For different mains frequencies, contact the Manufacturer's Technical Service.

(2) Nominal flow rate may vary as a function of oil type and functioning temperature.

5.4.1.2.2 Control units with oil/air heat exchanger (MCRA...)



Cooling circuit and components



- 1) Electric pump with by-pass circuit
- 2) Filter with blockage indicator and by-pass valve
- 3) Air/oil heat exchanger with control thermostat
- 4) Minimum pressure switch (*only with forced lubrication)
- 5) Maximum temperature thermostat



Design and functional characteristics (MCRA...)

MCRA... cooling units are available in various sizes, each with a different flow rate and cooling capacity.

Oil is sucked directly from the gear unit casing and circulated through an external closed circuit by the electric pump [1], which has a by-pass valve calibrated at 6 bar to avoid overpressure in the system.

Before returning to the gear unit, the oil passes through:

- the filter with blockage indicator and by-pass valve [2], which eliminates any suspended solid particles and guarantees a more reliable and long lasting transmission (60 micron metal mesh filter element)
- the air/oil heat exchanger unit aluminium radiator, electric fan and control thermostat [3], dimensioned to remove the excess heat generated by the gear unit

The following control devices are provided to ensure the correct functioning of the accessory and to save energy:

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

Technical specifications (MCRA...)

Frequency of power supply 50-60 Hz (1)

(tab 4)

Control unit	Description	Electric pump					Air/oil heat exchanger					Filter with element in metal mesh 60 µm Fittings (BSP)	
		V	f	Pn	In	Oil flow rate	Degree of protection	V a.c.	P	I	Fittings (GAS)		
		(Δ/Y) [V]	[Hz]	[kW]	(Y con.) [A]	(2) [l/min]		[V]	[W]	[A]	IN		OUT
MCRA 5	BN 71B 6 IP55 CLF B35 CUS	230/400	50	0.25	0.82	5.3	IP 44	1~230	55	0.25	3/4" F	3/4" F	3/4"
		265/460	60	0.3	0.79	6.4			55	0.25			
MCRA 9	BN 71C 4 IP55 CLF B35 CUS	230/400	50	0.55	1.55	9.5	IP 44	1~230	120	0.53	1" F	1" F	3/4"
		265/460	60	0.65	1.55	11.4			160	0.70			
MCRA 21	BE 90S 4 IP55 CLF B35 CUS	230/400	50	1.1	2.5	21.4	IP 54	3~230 Δ/400Y	180	0.61/0.35	1" F	1" F	3/4"
		265/460	60		2.2	25.7			260	0.74/0.43			
MCRA 34	BE 90LA 4 IP55 CLF B35 CUS	230/400	50	1.5	3.5	33.6	IP 55	3~280 Δ/480Y	230	1.12/0.65	1" F	1" F	1 1/4"
		265/460	60		3.1	40.3			300	1.10/0.63			
MCRA 51	BN 100LB 4 IP55 CLF B35 CUS	230/400	50	3	6.6	50.8	IP 55	3~280 Δ/480Y	230	1.12/0.65	1-1/2" F	1-1/2" F	1 1/4"
		265/460	60		5.9	61			300	1.10/0.63			
MCRA 70	BE 100LB 4 IP55 CLF B35 CUS	230/400	50	3	6.8	75.8	IP 54	3~260 Δ/460Y	560	2.46/1.42	1-1/2" F	1-1/2" F	1 1/2"
		265/460	60		5.9	93			810	2.3/1.3			

(1) For different mains frequencies, contact the Manufacturer's Technical Service.

(2) Nominal flow rate may vary as a function of oil type and functioning temperature.

5.4.1.2.3 Installing autonomous control units (MCRW... , MCRA...)



Check that the actual mains power, mounting and service conditions correspond to those declared on the name plates of the components and/or specified in this manual.

Electric motors must rotate in the direction shown on the components.

Make sure that all electrical power cables are big enough to carry the current draw and suitable for the installation conditions. Inadequate cables can cause overheating and/or voltage drops.

Information about the pump's motor must be obtained directly from the motor's own sales catalogue or installation, operation and maintenance manual. For all other devices, see the "SENSORS" section in this manual.



Wiring and connections must permit a functioning logic suited to the functionalities of the control unit as described in the following section.

MCRW...: Connections to the solenoid valve must respect the following specifications:

Connection type: three pole, connector type DIN 43650

Contact type: NC (normally closed)

Power [V/Hz]: 220-240/50 - 240/60

Consumption: 9 W DC

Degree of protection: IP 65 (with connector fitted)

To ensure maximum efficiency, provide a water supply system that corresponds to the following specifications:

– max. pressure 10 bar

– maximum water delivery temperature 20°C

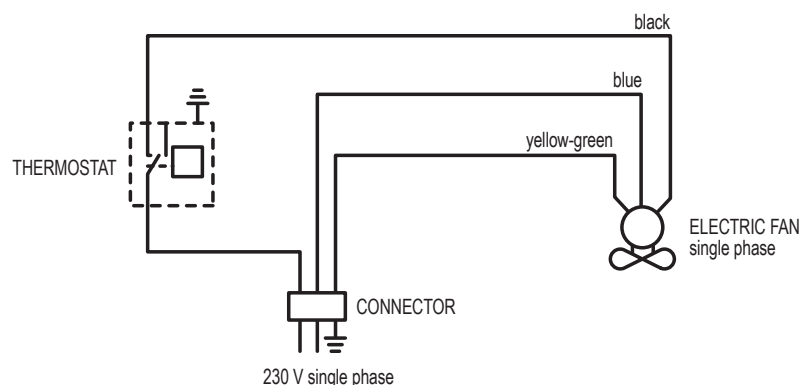
– minimum flow rate according to the table in the previous section

and make the connections to the water supply circuit so that water enters the heat exchanger via the solenoid valve and the fitting furthest away from the oil circulation pipes, and leaves the heat exchanger through the fitting nearest to them.

If the cooling water is very hard the use of a water softener is recommended. In the case of freezing temperatures or long periods of disuse, to avoid possible damage, the cooling water should be drained from the circuit and compressed air blown through the empty circuit to eliminate all residual moisture.

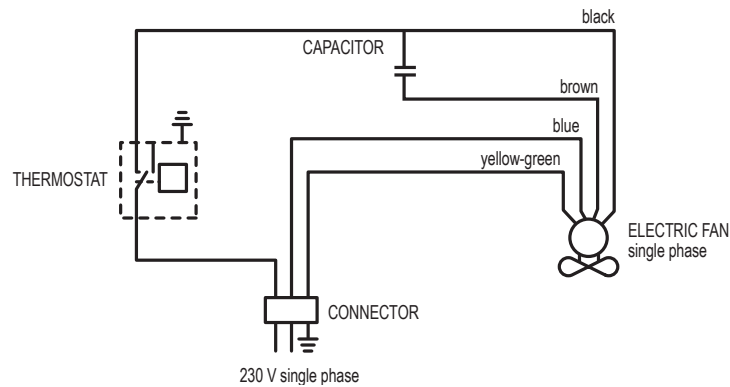
MCRA...: Connections to the electric fan of the air/oil heat exchanger must respect the following specifications:

MCRA5: Single phase power supply

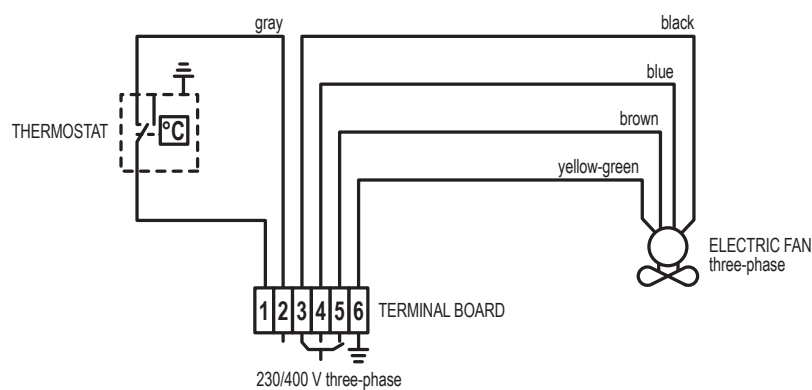




MCRA9: Single phase power supply



MCRA21 – MCRA34 – MCRA51: Three phase power supply



To ensure an adequate air flow and good thermal efficiency, install the heat exchanger with at least 1 m of free space around it.

In the case of indoor installations and installations in restricted spaces, make sure that there is sufficient ventilation and/or air recycling to prevent overheating.

For more general information on installation, refer to the “INSTALLING THE GEAR UNIT” section in this manual.

5.4.1.3 Cooling coil (optional variant SR)

The cooling coil, designed for integration in a cooling circuit created by the customer, is installed inside the gear unit sump and is not removable.

For optimal efficiency the cooling circuit supply must comply with the following specifications:

- max. pressure 8 bar
- min. flow rate 5 l/min for HDP 60 ... HDP 90
- min. flow rate 10 l/min for HDP 100 ... HDP 140 - HDO 100 ... HDO 140
- max. water temperature 20°C

Cooling water can circulate through the coil in either direction.

If the cooling water is very hard the use of a water softener is recommended.

To avoid excessive energy consumption it is good practice to equip the cooling circuit with a thermostatic valve that admits coolant only when the gear unit oil reaches a temperature max. of 70°C.

In the case of freezing temperatures or long periods of disuse, to avoid possible damage, the cooling water should be drained from the circuit and compressed air blown through the empty circuit to eliminate all residual moisture.



Before starting the gear unit ensure that all the connections have been made properly. It is also advisable to check the cross section of water passages periodically to ensure that they are free from sediment and/or obstructions that could impair the efficiency of the external cooling system.: If necessary, clean the circuit by flushing with a suitable chemical agent, checking with the manufacturer of the cleaning agent that it is compatible with the construction material of the coil. The intervals at which to check the condition of the cooling system depend on the characteristics of the cooling water used (see the “ROUTINE MAINTENANCE” section in this manual).



Pay the maximum attention when using hazardous chemical detergents and take all the necessary precautions to ensure they are disposed of in compliance with the law.

5.4.1.4 Oil heater (optional variant HE)

In significantly low ambient temperatures (refer to chapter “ALLOWED TEMPERATURE LIMITS”), increased viscosity can prevent correct oil flow. In such conditions the gear unit can be equipped with one or more electrical heating elements and a minimum temperature thermostat to switch them on and off. Unless otherwise agreed or required this thermostat is set at $25 \pm 5^{\circ}\text{C}$ (see the “SENSORS” section in this manual). Examples of situations requiring oil heating include:

- operation at temperatures below 0°C
- starting of gear units featuring oil bath and splash lubrication if the minimum ambient temperature is not at least 10°C higher than the oil drop point.
- start-up of gear units with forced lubrication if oil viscosity exceeds 1500 cSt. Depending on the lubricant used, kinematic viscosity is generally between 220 and 460 cSt, and maximum permissible viscosity occurs at ambient temperatures between approximately 5°C and 25°C .



For precise temperature values, refer to the relevant sales catalogue and/or product data sheet of the lubricant manufacturer.

The heating elements are installed directly in the gear unit casing, below the level of the oil. The gear unit must therefore be completely drained before the elements can be removed.

The standard power supply voltage is 220 V AC.

Consumption varies according to size/configuration.

For more detailed information and to ensure correct product selection, contact the Manufacturer’s Technical Service.

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

- the heating element/s is/are switched on to heat the oil at temperatures below the minimum threshold
- the heating element/s is/are switched off when the oil temperature reaches the upper threshold

Contact the Manufacturer’s Technical Service to determine the ideal temperature thresholds. These may coincide with other thresholds and in any case need to be determined on the basis of the application and the type of lubricant used.



All electrical connections are to be made by the customer prior to the startup of the gear unit.

The heater must remain disconnected during periods in which the gear unit is not in use: the heater must be switched on before the gear unit is started, only when it is completely immersed in the oil, and only for the time required for the oil to reach its minimum specified temperature. The use of the heater for longer periods than specified can result in carbonisation of the oil molecules, impairing lubrication performance and producing residues that are harmful to the gear unit and its components.



Unless stated otherwise, the requirements and specifications given above are valid even if non-standard control devices have been supplied with the gear unit instead of the standard ones described in this manual.

If the normal heater/s is/are insufficient to heat the oil to the minimum temperature required for startup or operation, or if shorter warm-up times are required, consult the Manufacturer's Technical Service.

In the presence of forced lubrication, if the circuit components, such as the connecting pipelines and pump, etc., are exposed to freezing temperatures, they too must be equipped with a heating system to ensure correct oil circulation following startup.

5.4.2 LUBRICATION SYSTEM

The gear unit's internal parts are usually lubricated with a mixed oil bath and oil splash system. In some configurations certain bearings may be grease lubricated and equipped with Nilos seal rings. A forced lubrication system can be supplied on request.

5.4.2.1 Splash lubrication

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

To guarantee effective lubrication the oil must be sufficiently fluid, i.e. its viscosity must allow it to flow freely, while simultaneously maintaining suitable characteristics to support high gear meshing loads. In particular, special care must be taken in the following conditions and suitable cooling/heating systems provided as required:

- applications involving oil temperatures above the allowed limit (refer to chapter "ALLOWED TEMPERATURE LIMITS")
- starting in situations in which the minimum ambient temperature is less than 10°C higher than the oil's drop point
- gear unit operation in ambient temperatures outside the allowed range (refer to chapter "ALLOWED TEMPERATURE LIMITS")

5.4.2.2 Grease lubrication

Gearboxes of sizes HDP 60... HDP 90 and HDO 71... HDO 95 in mounting position V5 are supplied with the upper bearings (not immersed in oil) lubricated with grease and do not require periodic maintenance. Gearboxes of sizes HDO 71 ... HDO 95 in mounting position B6 or B3 (with input J) are supplied with upper bearings (not immersed in oil) lubricated with grease and require periodic maintenance.

For lubrication intervals, methodology, quantity and type of grease, see following chapters in this manual.

5.4.2.3 Forced lubrication

The gear unit is equipped with a volumetric pump when forced lubrication of gears and/or bearings is required. The oil pump can be driven mechanically off one of the shafts of the gear unit or connected to a motor fixed to the gear unit casing.



If forced lubrication is installed, pay special attention to the maximum permissible viscosity (1500 cSt), especially at the time of plant startup. Depending on the lubricant used, kinematic viscosity is generally between 220 and 460 cSt, and maximum permissible viscosity occurs at ambient temperatures between approximately 5°C and 25°C.

For precise temperature values, refer to the relevant sales catalogue and/or product data sheet of the lubricant manufacturer.

If this value is not reached under normal conditions, the oil must be preheated.

The plant can be equipped with suitable devices to ensure correct operation and to monitor the main functional parameters. For further information, refer to the “SENSORS” section in this manual.

5.4.2.4 Forced lubrication with pump (optional variants OP, OP1, OP2, OP...)

This system comprises a reversible pump keyed directly to a gear unit shaft, a coarse mesh filter, a minimum pressure switch and any necessary connecting pipelines.



To ensure an optimum supply of lubricant, a constant rotation speed must be maintained at a value that is as close as possible to the rotation speed for which the pump is designed (see sales catalogue).



All electrical connections are to be made by the customer prior to the startup of the gear unit.



The electrical contacts of the minimum pressure switch supply an alarm signal when pressure in the lubrication system falls below the minimum permissible value (0.5 bar) (see the “SENSORS” section in this manual).

If an alarm occurs, stop the gear unit as soon as possible and locate the cause of the problem.

5.4.2.5 Forced lubrication with electric pump (optional variant MOP)

This system comprises an electric pump with a separate power supply, a coarse mesh filter, a minimum pressure switch and any necessary connecting pipelines.

To ensure a good lubricant flow rate, make sure that the power supply to the pump motor conforms to the requirements on the motor name plate and to the requirements given in the following tables, unless specified otherwise.

(tab 5)

		HDP... V5... MOP... (without DW)			
		Mains frequency		60 Hz	
		50 Hz		265Δ/460Y	
		230Δ/400Y		265Δ/460Y	
Size	Description	Pn [kW]	In [400V] [A]	Pn [kW]	In [460 V] [A]
HDP 60 HDP 70	BN 63B 6 IP55 CLF B34 CUS	0.12	0.64	0.14	0.64
HDP 80 HDP 90	BN 71A 6 IP55 CLF B34 CUS	0.18	0.67	0.21	0.60
HDP 100 HDP 110 HDP 120 HDP 125	BN 71A 6 IP55 CLF B34 CUS	0.18	0.67	0.21	0.60
HDP 130 HDP 140	BN 71A 4 IP55 CLF B34 CUS	0.25	0.78	0.30	0.78
HDP 150 HDP 160	BN 71B 6 IP55 CLF B34 CUS	0.25	0.82	0.30	0.79



(tab 6)

		HDP... V5... MOP... DW					
		Mains frequency		50 Hz 230Δ/400Y		60 Hz 265Δ/460Y	
Size	Description	Pn [kW]	In [400V] [A]	Pn [kW]	In [460 V] [A]		
HDP 60 HDP 70	BN 63A 4 IP55 CLF B34 CUS	0.12	0.47	0.14	0.46		
HDP 80	BN 71A 6 IP55 CLF B34 CUS	0.18	0.67	0.21	0.60		
HDP 90	BN 71A 4 IP55 CLF B34 CUS	0.25	0.78	0.30	0.78		
HDP 100 ... HDP 160	Contact the Manufacturer's Technical Service.						

(tab 7)

		HDO... V5... MOP... (without DW)					
		Mains frequency		50 Hz 230Δ/400Y		60 Hz 265Δ/460Y	
Size	Description	Pn [kW]	In [400V] [A]	Pn [kW]	In [460 V] [A]		
HDO 71 HDO 81 HDO 91 HDO 95	BN 63A 4 IP55 CLF B34 CUS	0.12	0.47	0.14	0.46		
HDO 100 HDO 110 HDO 120 HDO 125	BN 71A 6 IP55 CLF B34 CUS	0.18	0.67	0.21	0.60		
HDO 130 HDO 140	BN 71A 4 IP55 CLF B34 CUS	0.25	0.78	0.30	0.78		
HDO 150 HDO 160	BN 71B 6 IP55 CLF B34 CUS	0.25	0.82	0.30	0.79		

For HDO 100 ... HDO 160 with drywell device (option DW) contact the Manufacturer's Technical Service.



All electrical connections are to be made by the customer prior to the startup of the gear unit.



The electrical contacts of the minimum pressure switch supply an alarm signal when pressure in the lubrication system falls below the minimum permissible value (0.5 bar) (see the "SENSORS" section in this manual).

If an alarm occurs, stop the gear unit as soon as possible and locate the cause of the problem.

The lubrication system must be started up before the gear unit is started.

Do not start up the gear unit until the electric pump has been functioning for a few minutes.

The electric pump must always run along with the gear unit and must only be switched off after the gear unit has effectively stopped.



Check that the actual mains power, mounting and service conditions correspond to those declared on the name plates of the components and/or specified in this manual.

Electric motors must rotate in the direction shown on the components.

Make sure that all electrical power cables are big enough to carry the current draw and suitable for the installation conditions. Inadequate cables can cause overheating and/or voltage drops.

Information about the pump's electric motor must be obtained directly from the electric motor's own sales catalogue or installation, operation and maintenance manual. For all other devices, see the "SENSORS" section in this manual.

5.4.3 BACKSTOP DEVICE (optional variant A CW, A CCW)

The backstop device ensures that the gear unit only turns in one direction and prevents reverse movement caused by the load applied to the output shaft. The device consists of a free wheel with centrifugal shoes.



In certain cases the backstop device can transmit less torque than the gearbox. Consult the sales catalogue for detailed information on this subject.

Before putting the gearbox into service, ensure that the output shaft turns freely in the required direction of travel without having to apply excessive force.

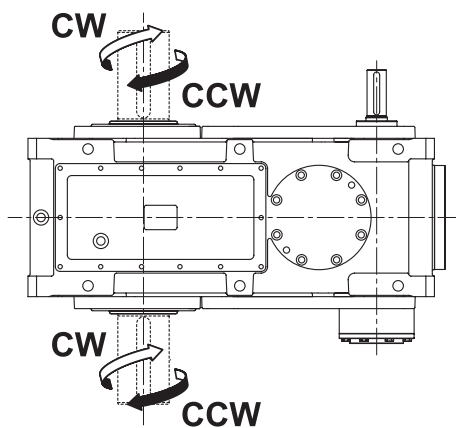


It is essential to prevent the motor from rotating in the wrong direction to avoid damaging the backstop device or the gear train.



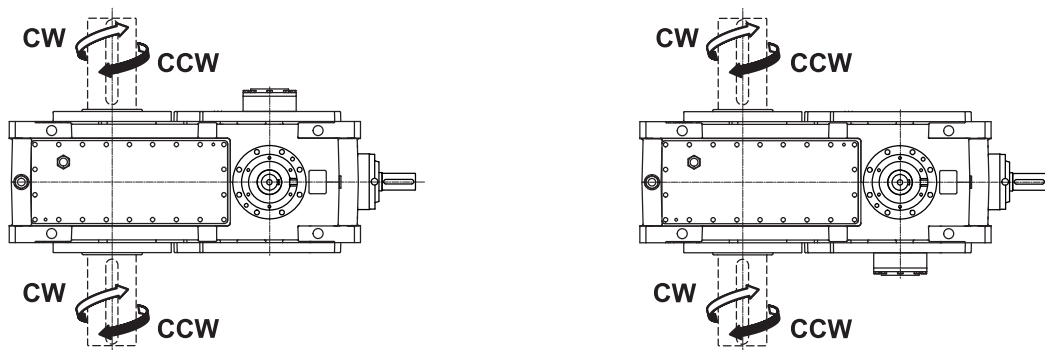
Under continuous operating conditions, it is advisable to maintain a neutral rotation speed n_{1min} greater than that specified in the catalogue in order to ensure the effective centrifugal release of all the shoes and avoid unnecessary wear. For further details, contact the Manufacturer's Technical Service.

HDP



The backstop device is keyed to the end of the input shaft opposite the drive side in such a way that it is accessible for inspection and maintenance. The device shares the gear unit's own lubrication system.

HDO



The device keyed on to an intermediate shaft shares the same lubrication as the gear unit but is easily accessible for inspection and maintenance purposes.



The direction of the backstop device can be reversed by turning the device's outer cage around. Contact the Manufacturer's Technical Service for information on how to proceed if you wish to change the direction of the backstop device.

5.4.4 GEAR UNIT WITH FIXING FLANGE (optional variant F...L, F...R)



Thoroughly clean and degrease the flange of the gear unit and the area of the machine to which it is to be coupled. Safe torque transmission depends largely on the correct execution of this procedure. Do not use solvents or dirty rags to degrease mating surfaces.

Do not apply any type of grease, as this would significantly lower the friction coefficient in the contact area and therefore impair the functionality of the coupling.

Tighten the bolts fully down, working in a crosswise sequence and applying the maximum tightening torque shown in the table below using a torque wrench.

(tab 8)

	Thread	Screw UNI 5737	Nut UNI 5588	Tightening torque
HDP 60	M16	cl. 10.9	cl. 10	314 Nm
HDP 70	M16	cl. 10.9	cl. 10	314 Nm
HDP 80	M16	cl. 10.9	cl. 10	314 Nm
HDP 90	M16	cl. 10.9	cl. 10	314 Nm
HDP 100	M20	cl. 10.9	cl. 10	615 Nm
HDP 110	M20	cl. 10.9	cl. 10	615 Nm
HDP 120	M20	cl. 10.9	cl. 10	615 Nm
HDP 125	M24	cl. 10.9	cl. 10	1060 Nm
HDP 130	M24	cl. 10.9	cl. 10	1060 Nm
HDP 140	M24	cl. 10.9	cl. 10	1060 Nm
HDP 150 ... HDP 180	Contact the Manufacturer's Technical Service.			

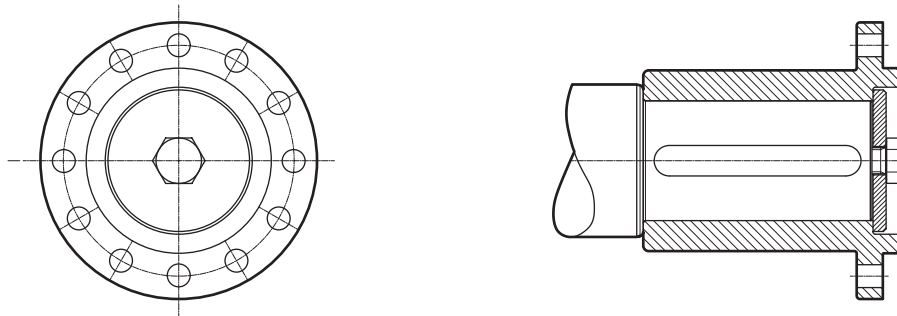
(tab 9)

	Thread	Screw UNI 5737	Nut UNI 5588	Tightening torque
HDO 71	M16	cl. 10.9	cl. 10	314 Nm
HDO 81	M16	cl. 10.9	cl. 10	314 Nm
HDO 91	M16	cl. 10.9	cl. 10	314 Nm
HDO 95	M20	cl. 10.9	cl. 10	615 Nm
HDO 100	M20	cl. 10.9	cl. 10	615 Nm
HDO 110	M20	cl. 10.9	cl. 10	615 Nm
HDO 120	M20	cl. 10.9	cl. 10	615 Nm
HDO 125	M24	cl. 10.9	cl. 10	1060 Nm
HDO 130	M24	cl. 10.9	cl. 10	1060 Nm
HDO 140	M24	cl. 10.9	cl. 10	1060 Nm
HDO 150 ... HDO 180	Contact the Manufacturer's Technical Service			



If the gearbox is installed in situations that are particularly hazardous to personal safety, install suitable safety devices, such as harnesses, safety chains and restraining systems, etc.,

5.4.5 GEAR UNIT WITH SLEEVE FLANGE (optional variant FM)



Thoroughly clean and degrease the flange of the gear unit and the area of the machine to which it is to be coupled. Safe torque transmission depends largely on the correct execution of this procedure. Do not use solvents or dirty rags to degrease mating surfaces.

Do not apply any type of grease, as this would significantly lower the friction coefficient in the contact area and therefore impair the functionality of the coupling.

Tighten the bolts fully down, working in a crosswise sequence and applying the maximum tightening torque shown in the table below using a torque wrench.

(tab 10)

	Thread	Screw UNI 5737	Nut UNI 5588	Tightening torque
HDP 60	M18	cl. 10.9	cl. 10	435 Nm
HDP 70	M18	cl. 10.9	cl. 10	435 Nm
HDP 80	M20	cl. 10.9	cl. 10	615 Nm
HDP 90	M20	cl. 10.9	cl. 10	615 Nm
HDP 100	M24	cl. 10.9	cl. 10	1060 Nm
HDP 110	M24	cl. 10.9	cl. 10	1060 Nm
HDP 120	M24	cl. 10.9	cl. 10	1060 Nm
HDP 125	M30	cl. 10.9	cl. 10	2130 Nm
HDP 130	M30	cl. 10.9	cl. 10	2130 Nm
HDP 140	M30	cl. 10.9	cl. 10	2130 Nm
HDP 150 ... HDP 180	Contact the Manufacturer's Technical Service.			



(tab 11)

	Thread	Screw UNI 5737	Nut UNI 5588	Tightening torque
HDO 71	M18	cl. 10.9	cl. 10	435 Nm
HDO 81	M20	cl. 10.9	cl. 10	615 Nm
HDO 91	M20	cl. 10.9	cl. 10	615 Nm
HDO 95	M24	cl. 10.9	cl. 10	1060 Nm
HDO 100	M24	cl. 10.9	cl. 10	1060 Nm
HDO 110	M24	cl. 10.9	cl. 10	1060 Nm
HDO 120	M24	cl. 10.9	cl. 10	1060 Nm
HDO 125	M30	cl. 10.9	cl. 10	2130 Nm
HDO 130	M30	cl. 10.9	cl. 10	2130 Nm
HDO 140	M30	cl. 10.9	cl. 10	2130 Nm
HDO 150 ... HDO 180	Contact the Manufacturer's Technical Service			



If the gearbox is installed in situations that are particularly hazardous to personal safety, install suitable safety devices, such as harnesses, safety chains and restraining systems, etc.,

5.4.6 SEALS AND GASKETS (optional variants VS, DS, DVS, TK)

The gear units can be supplied with alternative seal systems on request:

Contact seals:

- single or double (DS) nitrile rubber compound seal rings
- single (VS) or double (DS) Viton® compound seal rings
- Taconite (TK) seals are recommended for environments characterised by the presence of abrasive dust or powders. Taconite seals incorporate a combination of sealing rings, labyrinths and grease chambers. At the intervals specified in the "ROUTINE MAINTENANCE" section in this manual, inject about 30 grams of grease for rolling contact bearings through the grease nipples.



All work must be performed exclusively with the gear unit at a standstill. The motor must be protected against accidental startup (e.g. by padlocking the main power switch or removing the power fuses). For this purpose, also affix a notice to the motor indicating that work is in progress on the gear unit.

5.4.7 SENSORS

For ATEX component, consult catalogue and manual of the manufacturer.

5.4.7.1 Bimetal thermostat (optional variant TG)

Non-adjustable thermostats are preset to a fixed switching temperature. The actual temperature depends on the thermostat's function and the accessory with which it is used, as shown below:

- $90^{\circ}\text{C} \pm 5^{\circ}\text{C}$ – optional variant TG, in this case the thermostat trips when the lubricant reaches its maximum permissible temperature. If an alarm occurs, stop the gear unit as soon as possible and locate the cause of the problem.
- $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ – setting of optional variant HE, see the “Oil heater” section in this manual for further details.
- $60^{\circ}\text{C} \pm 5^{\circ}\text{C}$ e $90^{\circ}\text{C} \pm 5^{\circ}\text{C}$ – settings of optional variant MCRW..., see the “Autonomous control units” section in this manual for further details.
- $90^{\circ}\text{C} \pm 5^{\circ}\text{C}$ – setting of optional variant MCRA..., see the “Autonomous control units” section in this manual for further details.

Depending on configuration, thermostats may be installed on board the gear unit or supplied separately. If supplied separately, remove the blind plug fitted for transport purposes and fit the thermostat in its place.



Electrical connections and/or cabling to user points are the responsibility of the Customer and must be completed prior to start-up.

Contact type: NC (normally closed)
 Contact current rating: 5 A (resistive) / 240 V AC
 5 A (resistive) / 24 V DC
 Degree of protection: IP 65 (with connector fitted)
 Threaded fitting: GAS 1/2" M

5.4.7.2 Oil level sensor (optional variant OLG)

A sensor for the remote monitoring of lubricant safety level can also be installed on request. If the sensor is supplied separately, remove the clearly identified blind plug fitted for transport purposes and fit the sensor in its place.

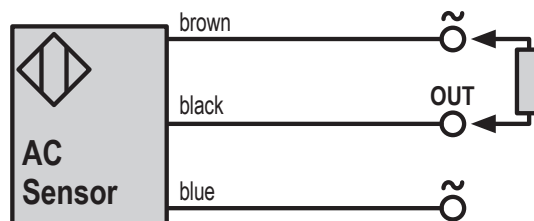


The device functions when the gear unit is idle. When the gear unit is running the oil level sensor must be bypassed.



Electrical connections and/or cabling to user points are the responsibility of the Customer and must be completed prior to start-up.

Contact type: NC (normally closed) in air



Power supply: 28 V AC
 Degree of protection: IP 65
 Threaded fitting: GAS 1/2" M



5.4.7.3 Minimum pressure switch

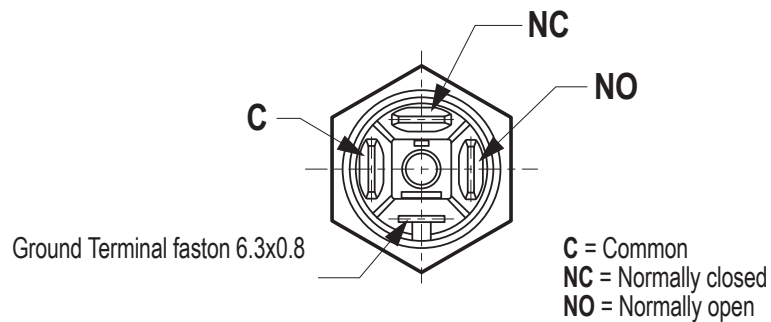
The minimum pressure switch used with forced lubrication (see optional variants **OP...**, **MOP**, **MCRW...**, **MCRA...**, and refer to the "AUXILIARY THERMAL DEVICES" and "LUBRICATION SYSTEM" sections in this manual), provides an alarm signal if pressure in the lubrication system falls below the minimum permissible value of 0.5 bar. The output of the pressure switch must be bypassed for a brief period (approx. 30 seconds) immediately after start-up while the oil starts to circulate.



Do not modify the pressure switch trip setting with the adjuster screw at the top of the device.

Electrical connections and/or cabling to user points are the responsibility of the Customer and must be completed prior to start-up.

Contact type: SPDT (changeover contact)



The position of the contacts is purely indicative.

Contact current rating: 5 A (resistive) / 240 V AC
2 A (resistive) / 24 V DC
Degree of protection: IP 65 (with connector fitted)

5.4.8 DRYWELL (optional variant DW)

The drywell device prevents oil leaking from the gear unit's output shaft seals into the driven machine. It consists of a grease-filled chamber that stops oil leaks and provides the necessary lubrication for the shaft's bottom bearing.

At the intervals specified in the Operating and Maintenance table, inject about 40 grams of grease for rolling contact bearings through the grease nipples.

(tab 12)

Quantity of grease [kg] - Optional variant DW														
	HDP 60	HDP 70	HDP 80	HDP 90	HDP 100	HDP 110	HDP 120	HDP 125	HDP 130	HDP 140	HDP 150	HDP 160	HDP 170	HDP 180
Initial	0.100	0.150	0.250	0.350	Contact the Manufacturer's Technical Service.									
Topping up	0.030	0.030	0.040	0.040										

HDO 100 ... HDO 180
Contact the Manufacturer's Technical Service.



The gear unit is supplied with no grease in the output shaft's bottom bearing.



All work must be performed exclusively with the gear unit at a standstill. The motor must be protected against accidental startup (e.g. by padlocking the main power switch or removing the power fuses). For this purpose, also affix a notice to the motor indicating that work is in progress on the gear unit.



The gear unit must always be drained of oil before it is moved, to avoid oil overflowing into the grease chamber.

5.4.9 ANCHORING OF TORQUE ARM (optional variant TA)

For shaft-mounted solutions the gear unit can be equipped with a torque arm on request. Depending on circumstances, this type of device may be equipped either with an anti-vibration bushing or a cup spring damper (included in the supply). Because it is designed and sized specifically for the purpose, this type of device provides the best possible guarantee for the correct operation of the assembly.

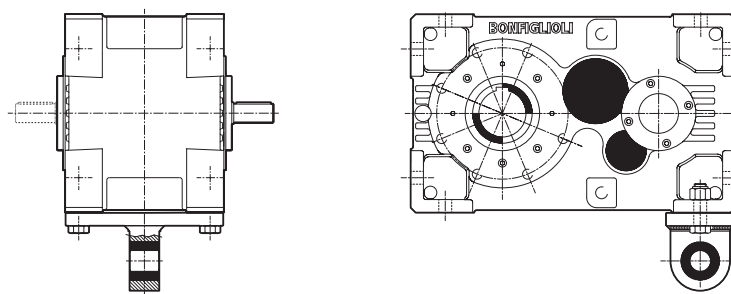


The machine shaft must be able to support the gearbox radially and axially. The torque arm must fit without stress.

The torque bolt must be fitted on the side of the gearbox next to the driven machine. Supporting surfaces should be hardened and tempered (minimum hardness 58 HRC, with case hardening to a minimum depth of 0.6 mm), smoothed and ground if possible. Nitriding is an alternative treatment that guarantees a base material capable of resisting compression and scoring.

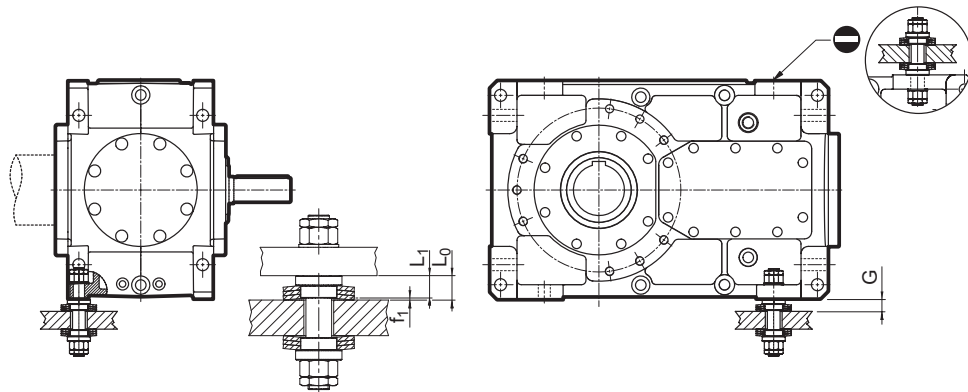
If safety is at risk and/or maximum reliability is required, install suitable devices to stop the gearbox rotating or breaking free if the torque arm or machine shaft should break.

HDP 60 ... HDP 90





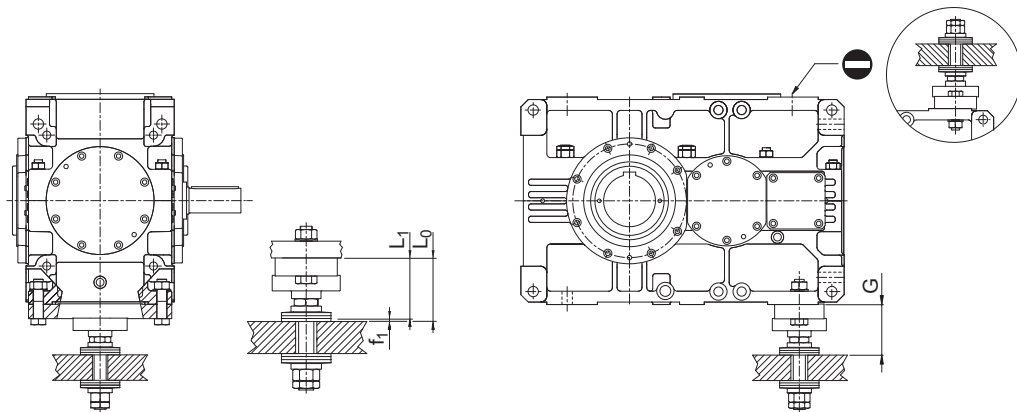
HDP 100 ... HDP 140



(tab 13)

	HDP 100	HDP 110	HDP 120	HDP 125	HDP 130	HDP 140
G* [mm]	33.4	33.4	33.4	Contact the Manufacturer's Technical Service.	42.7	42.7
f₁ [mm]	0.8 ^{+0.1} ₀	0.8 ^{+0.1} ₀	0.8 ^{+0.1} ₀		0.9 ^{+0.25} ₀	0.9 ^{+0.25} ₀

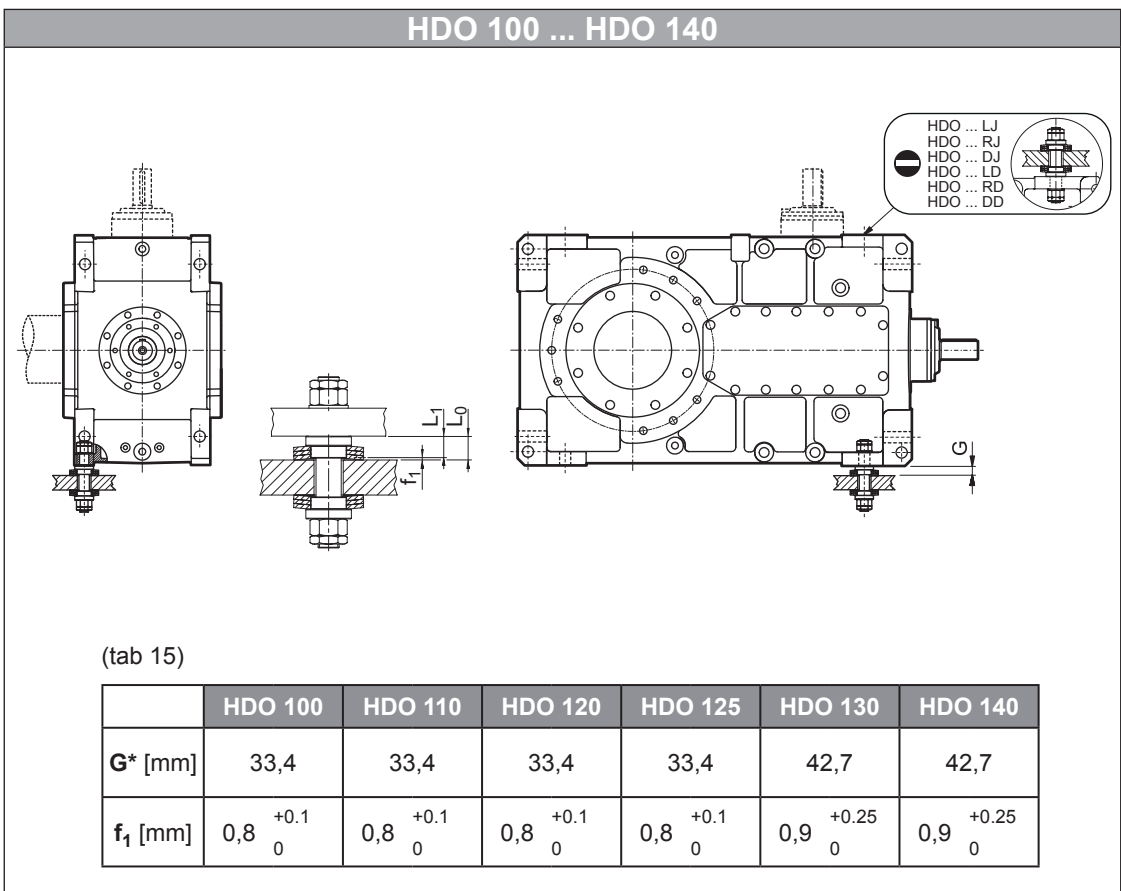
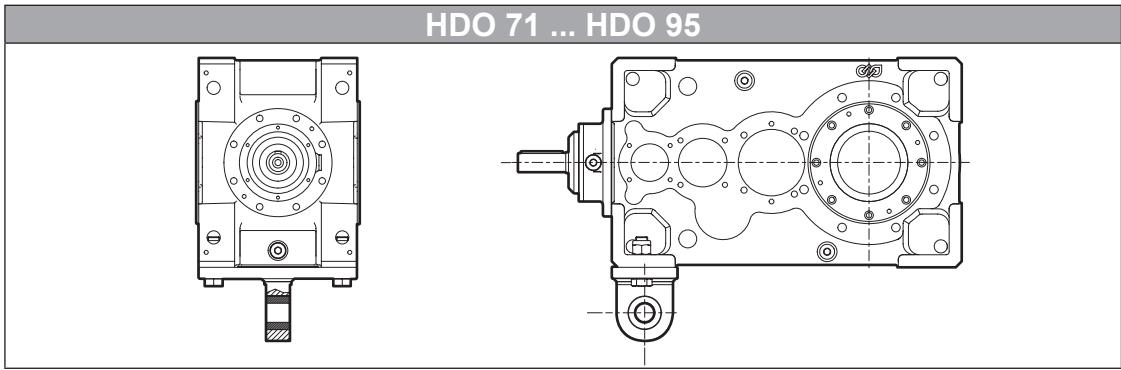
HDP 150 ... HDP 180



(tab 14)

	HDP 150	HDP 160	HDP 170	HDP 180
G* [mm]	204.3	204.3	Contact the Manufacturer's Technical Service.	
f₁ [mm]	1.05 ^{+0.5} ₀	1.05 ^{+0.5} ₀		

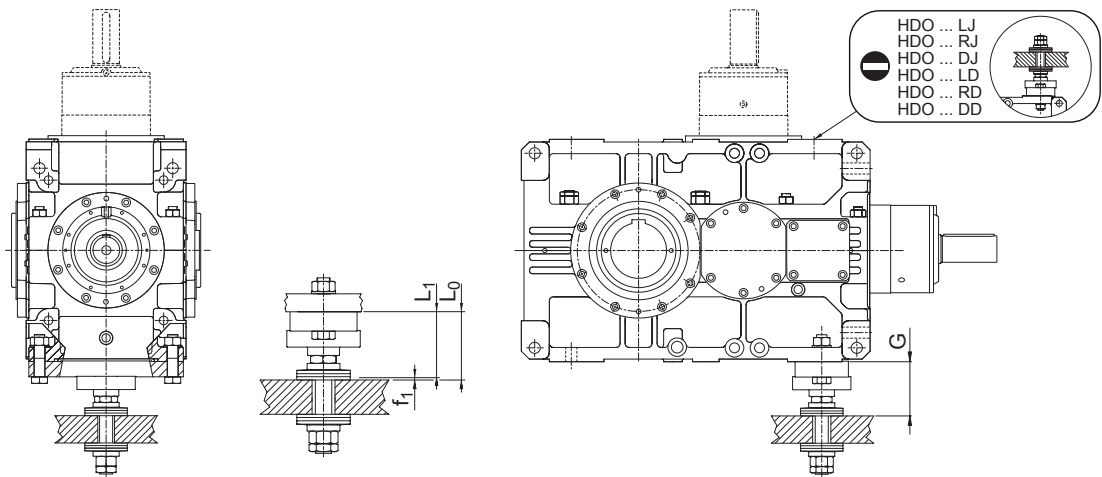
L_0 = Free height [mm] - L_1 = Height under load [mm] - f_1 = Deflection $L_0 - L_1$ [mm]
* (nominal value)



L_0 = Free height [mm] - L_1 = Height under load [mm] - f_1 = Deflection L_0-L_1 [mm]
 * (nominal value)



HDO 150 ... HDO 180



(tab 16)

	HDO 150	HDO 160	HDO 170 - HDO 180
G* [mm]	204.3	204.3	Contact the Manufacturer's Technical Service.
f₁ [mm]	1.05 ^{+0.5} ₀	1.05 ^{+0.5} ₀	

L_0 = Free height [mm] - L_1 = Height under load [mm] - f_1 = Deflection $L_0 - L_1$ [mm]
* (nominal value)



To ensure the necessary preload, the user must adjust the torque arm before the gear unit is started up in line with gap G shown in the table.
In spring sets, friction and spring height change over time. After the initial running in period, and then at regular intervals, check for wear and the adjustment setting G.

To improve drive conditions, reduce friction and extend the working life of the cup springs, lubricate the sliding paths with grease, a paste with molybdenum disulphide additives, lubricating paints or other solid lubricants.

5.4.10 OTHER ACCESSORIES

For any special accessories installed on the gear unit in accordance with contractual specifications refer to the instructions supplied by the manufacturer of the accessories in question or to any accompanying manuals. Such components may require special maintenance and/or lubrication.

5.5 PAINTWORK

HDP 60 ... 90 - HDO 71 ... 95

When no specific protection class is requested, the painted (ferrous) surfaces of gearboxes are protected to at least corrosivity class C2 (UNI EN ISO 12944-2). For improved resistance to atmospheric corrosion, gearboxes can be delivered with C3 and C4 surface protection, obtained by painting the complete gearbox.

HDP 100 ... 180 - HDO 100 ... 180

When no specific protection class is requested, the painted surfaces of gearboxes are protected to at least corrosivity class C3 (UNI EN ISO 12944-2). For improved resistance to atmospheric corrosion, gearboxes can be delivered with C4 surface protection, obtained by painting the complete gearbox.



If the gearbox has to be painted, protect the nameplate and seal rings against contact with paint and solvent.

Do not paint the mating surfaces that will be used for the final installation (foot or flanges). If mating surfaces are painted, carefully check that the gearbox is rigidly mounted and that its shafts are correctly aligned on completion of the installation.

Contact the manufacturer's technical assistance service before painting any control devices fitted to the gearbox.

5.6 LUBRICATION

On gearboxes with an oil level plug, check the oil level before starting up the gearbox. As with filling, this operation must be done with the gearbox in the mounting position in which it will be used in the application. If necessary, fill or top up the lubricant to the half way point in the level window, to the reference notch on the dipstick, or until it starts to flow out of the plug hole.

The charts on the following pages show the position of the service plugs.

The lubricant utilised must be new and uncontaminated and can be poured in through the filler hole or from the inspection cover opening using a filler filter with 25 µm mesh, ensuring that the relative gasket is refitted without damaging it or reapplying the sealant to provide a perfectly oil-tight fit.



The oil level must never be below the minimum mark and must be checked periodically with the gear unit at a standstill after allowing it to cool for a short period.

Do not mix oils of different makes or specifications and check that the oil is highly resistant to foaming and is EP (Extreme Pressure) rated.

If you do not have the same type of oil, completely drain the gearbox and flush it out thoroughly with the new oil to remove all traces of the old oil and any contaminants from inside the casing before filling the gearbox with the new oil.



Adopt protection against contact with hot parts: risk of burns!



In the case of gear units equipped with forced lubrication, the oil circuit must also be filled. In this case the unit must be run for a short period and then stopped before rechecking the oil level.








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

- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they may be fatal if swallowed.

Handle them with care using suitable personal protection equipment. Do not dump them into the environment and dispose of in accordance with applicable legislation.

5.6.1 Synthetic oils and mineral oils with EP (Extreme Pressure) additives

(tab 17)

											Mobil							
	Omala S4 WE	Omala S4 GXV	Omala S2 GX	Blasia	Blasia SX	Blasia S	Klübersynth GH 6	Klübersynth UH1 6	Klübersynth GEM2	Klüberoil GEM1	Mobil Glygoyle	Mobil SHC GEAR	Mobil SHC 600	Mobilgear XMP	Mobil Glygoyle (USDA H1)	Alphasyn PG 320	Carter SG	Nevastane SY
HDP			*	*	*													
HDO																		

F Food grade.

■ Recommended use.

***** Permitted use. The manufacturer cannot guarantee the quality or suitability of lubricants. Characteristics must be verified directly with the manufacturer of the chosen lubricant (or ask Bonfiglioli Technical Service for oil certification).

■ PolyAlkylene Glycol (PAG) synthetic oil (API group V)

□ PolyAlphaOlefin (PAO) synthetic oil (API group IV)

■ Mineral oil with EP additives



Refer to the individual sales catalogue for lubricant viscosity.

5.6.2 Compatible greases

- Klüber Staburags NBU 8 EP (for bearings)
- Klüberpaste 46 MR 401 (to facilitate the coupling of cylindrical parts)
- ITP Fluorocarbon gel 880 (to grease contact seals)
- Klüber Petamo GHY 133 N (for Taconite seals)

Lubricants for ATEX-specified gearboxes

Greases:

- Klüber Asonic GHY 72 (for bearings)
- Klüber Klüberquiet BQ 72-72 (for bearings)
- Klüberpaste 46 MR 401 (for easy engagement of cylindrical couplings)
- ITP Fluorocarbon gel 880 (for lubricating sliding seals)



Oils (alternatives to Shell Omala S4 WE 320 - standard supply):

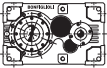


- Shell: Tivela Oil S320
- Klüber: Klübersynth GH 6 320
- Total: Carter SY 320
- Mobil: Glygoyle 320
- Castrol Alphasyn PG 320



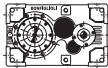


5.6.3 Quantity of lubricant

The quantity of lubricant specified in the following tables is purely indicative. Gear units must be filled to the mid point of the sight glass, or to the reference notch on the dipstick, or until oil starts to flow out of the plug hole, according to the mounting position specified on order.

(tab 18)

	 			
	B3	B6	B7	V5
HDP 60 2	10	14.8	14.6	16
HDP 60 3				
HDP 70 2	11	16	15	17
HDP 70 3				
HDP 80 2	16	24	24	26
HDP 80 3				
HDP 90 2	23	34	33	37
HDP 90 3				
HDP 100 2	27	61	49	51
HDP 100 3	32			
HDP 100 4	34	70	56	58
HDP 110 2	27	61	49	51
HDP 110 3	32	70	56	58
HDP 110 4				
HDP 120 2	35	83	64	68
HDP 120 3	45	96	74	79
HDP 120 4				
HDP 125 2	44	85	63	72
HDP 125 3	54	105	83	92
HDP 125 4				
HDP 130 2	57	154	119	128
HDP 130 3	86	181	140	150
HDP 130 4				
HDP 140 2	76	163	126	115
HDP 140 3	89	191	147	135
HDP 140 4	88			
HDP 150 2	109	244	189	173
HDP 150 3	125	281	217	199
HDP 150 4				
HDP 160 2	118	264	204	187
HDP 160 3	135	303	234	214
HDP 160 4				
HDP 170	Contact the Manufacturer's Technical Service.			
HDP 180				

(tab 19)

	 			
	B3	B6	B7	V5
HDO 71 2	10	13	16	15
HDO 71 3	10	14	16	15
HDO 71 4	10	18	15	15
HDO 81 2	15	22	25	25
HDO 81 3	17	30	25	26
HDO 81 4	17	30	25	26
HDO 91 2	16	21	24	28
HDO 91 3	21	28	33	35
HDO 91 4	22	38	33	36
HDO 95 2	23	26	32	39
HDO 95 3	29	40	42	47
HDO 95 4	30	51	42	47
HDO 100 2	27	42	49	51
HDO 100 3	32	52	56	58
HDO 100 4	34	70		
HDO 110 2	27	44	49	51
HDO 110 3	32	52	56	58
HDO 110 4		70		
HDO 120 2	35	59	64	68
HDO 120 3	45	72	74	79
HDO 120 4		96		
HDO 125 2	44	70	63	72
HDO 125 3	54	90	83	92
HDO 125 4				
HDO 130 2	57	110	119	128
HDO 130 3	86	138	140	150
HDO 130 4		181		
HDO 140 2	76	117	126	115
HDO 140 3	89	146	147	135
HDO 140 4	88	191		
HDO 150 2	109	174	189	173
HDO 150 3	125	212	217	199
HDO 150 4		281		
HDO 160 2	118	191	204	187
HDO 160 3	135	230	234	214
HDO 160 4		303		
HDO 170	Contact the Manufacturer's Technical Service.			
HDO 180				

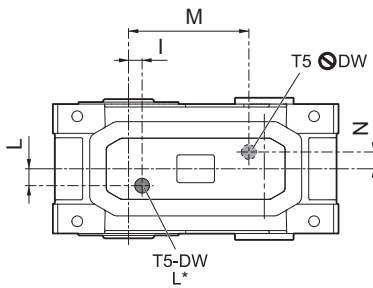
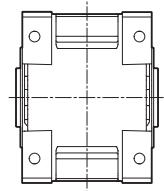
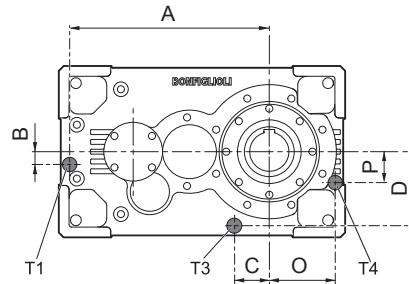
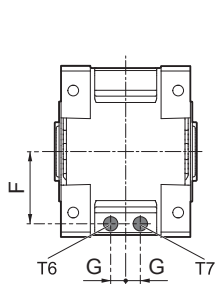
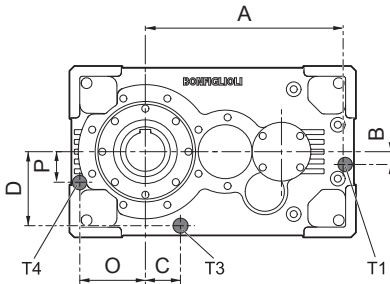


5.6.4 Service plugs

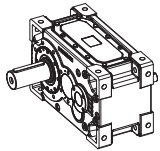
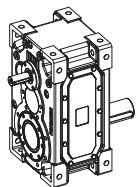
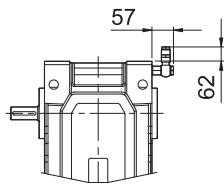
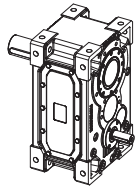
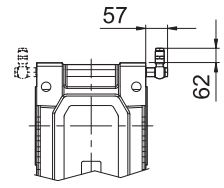
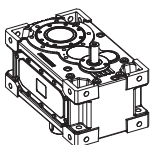


The following charts identify the position of the various service plugs.

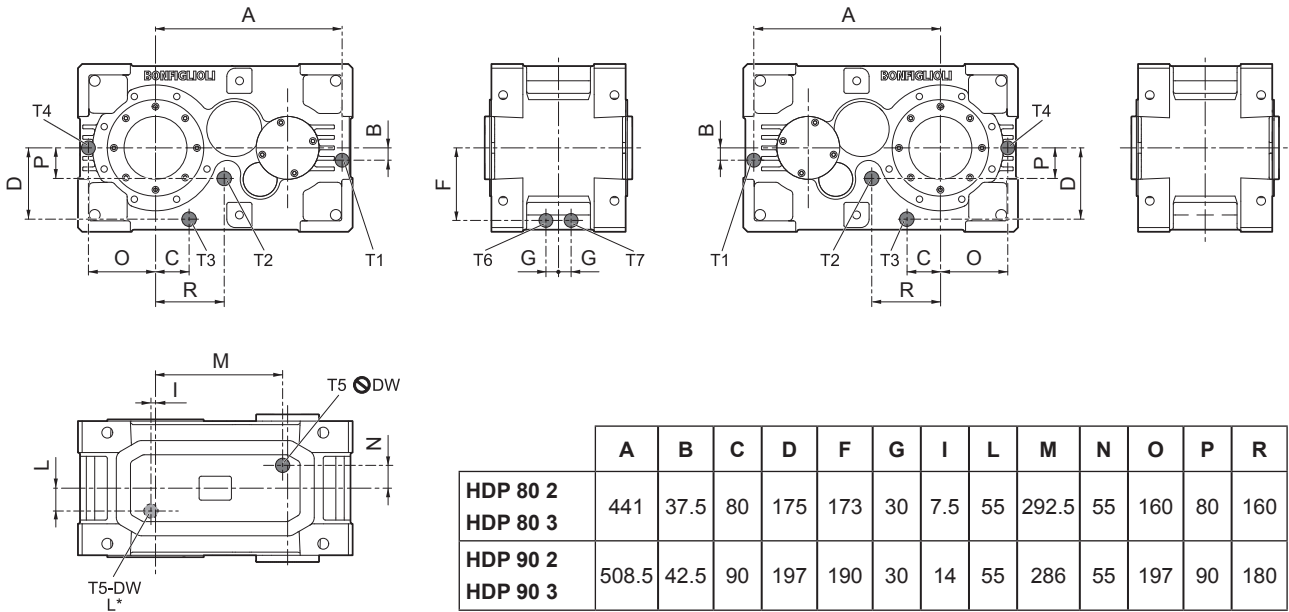
HDP 60 - HDP 70



	A	B	C	D	F	G	I	L	M	N	O	P
HDP 60 2	368.5	25	60	149	147	30	9	25	231	25	130.5	60
HDP 60 3												
HDP 70 2	404	25	70	149	147	30	27.5	35	247.5	35	135	62.5
HDP 70 3												

C = Filler plug with air vent								T = Blank plug
L = Level plug								⊖ = No plug present
S = Drain plug								L* = Overflow level plug
	B3							
	T1	T2	T3	T4	T5	T6	T7	
	L	⊖	S	T	C	T	T	
	B6							
	T1	T2	T3	T4	T5	T6	T7	
	C	⊖	T	S	L	T	T	
	B7							
	T1	T2	T3	T4	T5	T6	T7	
	S	⊖	L	C	T	T	T	
	V5							
	T1	T2	T3	T4	T5	T6	T7	
	C		S	T	L	T	T	

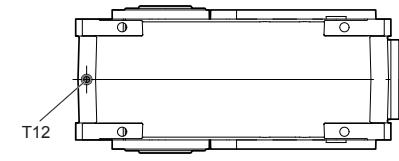
HDP 80 - HDP 90



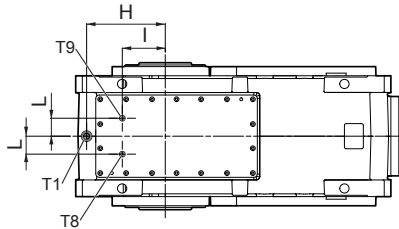
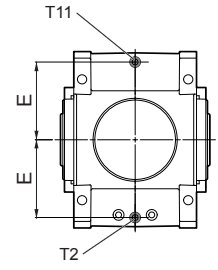
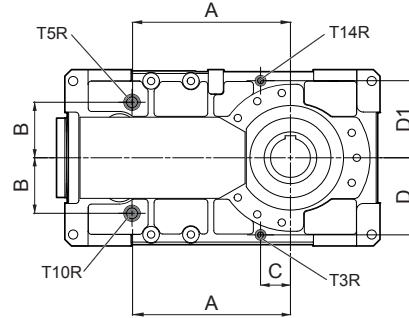
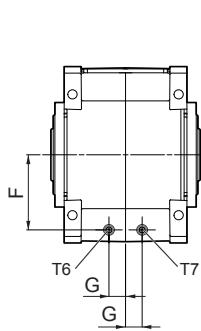
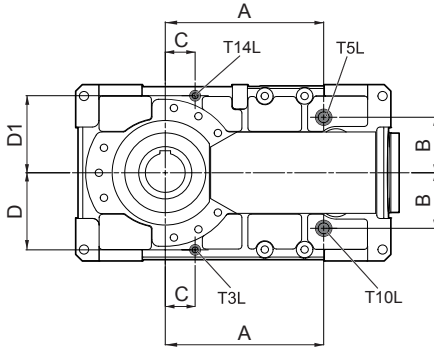
C = Filler plug with air vent	T = Blank plug																										
L = Level plug	⊖ = No plug present																										
S = Drain plug	L* = Overflow level plug																										
	B3	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>T1</td> <td>T2</td> <td>T3</td> <td>T4</td> <td>T5</td> <td>T6</td> <td>T7</td> <td rowspan="2" style="text-align: center;">HDP 80 (i≤75.2)</td> <td rowspan="2" style="text-align: center;">HDP 90 (i≤73.3)</td> </tr> <tr> <td>L</td> <td>T</td> <td>S</td> <td>T</td> <td>C</td> <td>T</td> <td>T</td> </tr> <tr> <td>T1</td> <td>T2</td> <td>T3</td> <td>T4</td> <td>T5</td> <td>T6</td> <td>T7</td> <td style="text-align: center;">HDP 80 (i≥76.4)</td> <td style="text-align: center;">HDP 90 (i≥77.9)</td> </tr> </table>	T1	T2	T3	T4	T5	T6	T7	HDP 80 (i≤75.2)	HDP 90 (i≤73.3)	L	T	S	T	C	T	T	T1	T2	T3	T4	T5	T6	T7	HDP 80 (i≥76.4)	HDP 90 (i≥77.9)
	T1		T2	T3	T4	T5	T6	T7	HDP 80 (i≤75.2)			HDP 90 (i≤73.3)															
	L		T	S	T	C	T	T																			
T1	T2	T3	T4	T5	T6	T7	HDP 80 (i≥76.4)	HDP 90 (i≥77.9)																			
B6																											
	B7																										
	B6																										
	B7																										
	V5																										
	V5																										
	V5																										



HDP 100 ... HDP 125



	A	B	C	D	D1	E	F	G	H	I	L
HDP 100 2	385	170	90	236	236	238	230	50	237	129.5	55
HDP 110 2	400	170	105	236	236	238	230	50	222	114.5	55
HDP 120 2	410	185	115	261	255	261	258	50	261	127.5	66
HDP 125 2	460	185	125	282	282	300	288	50	300	161	66

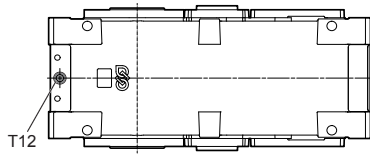


	A	B	C	D	D1	E	F	G	H	I	L
HDP 100 3	477.5	170	90	236	236	238	230	50	237	129.5	55
HDP 100 4											
HDP 110 3	492.5	170	105	236	236	238	230	50	222	114.5	55
HDP 110 4											
HDP 120 3	590	185	115	261	255	261	258	50	261	127.5	66
HDP 120 4											
HDP 125 3	610	185	125	282	282	300	288	50	300	161	66
HDP 125 4											

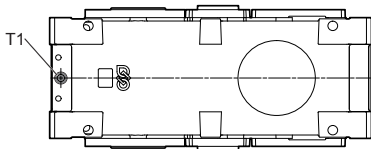
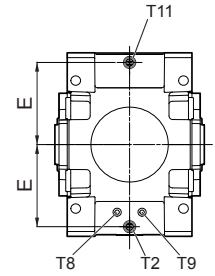
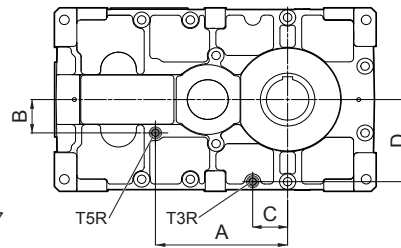
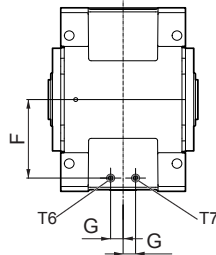
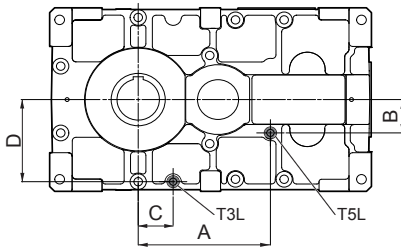
C = Filler plug with air vent						T = Blank plug						
L = Level plug						⊖ = No plug present						
S = Drain plug						L* = Overflow level plug						
	B3											
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L	T14R
	L	S	T	T	T	T	Shaft configuration		Shaft configuration		T	T
							LR, RR, LD, DR, DD	RL, LL, RD, DL	LR, RR, LD, DR, DD	RL, LL, RD, DL		
							LD, RL, LL, DL	LR, RR, DR, DD, RD	LD, RL, LL, DL	LR, RR, DR, DD, RD		
							C	T	T	C		
	B6											
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L	T14R
S	L/C	T	T	T	T	T		T		T	T	
	B7											
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L	T14R
T	S	L	L	T	C	T		T		T	T	
	V5 (*)											
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L	T14R
T	T	S	C	T	T	T		T		T	L	

(*) Excluding DW

HDP 130 - HDP 140



	A	B	C	D	E	F	G	H
HDP 130 2	555	180	140	340	340	325	50	310
HDP 140 2	595	180	150	340	340	325	50	335



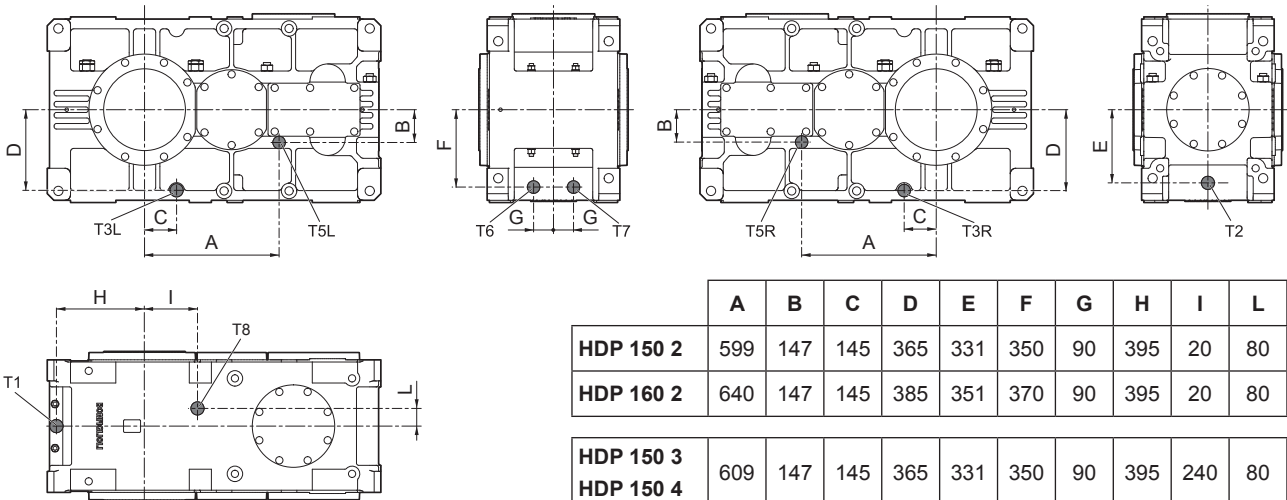
	A	B	C	D	E	F	G	H
HDP 130 3	530	138	140	340	340	325	50	310
HDP 130 4	560	195	150	340	340	325	50	335

C = Filler plug with air vent	T = Blank plug							
L = Level plug	⊖ = No plug present							
S = Drain plug	L* = Overflow level plug							
	B3							
	T1	T2	T3L	T3R	T5R - T5L - T7 - T12 - T13			T6
	L/C	S	T	T	T			T
	B6							
	T1	T2	T3L	T3R	T5R - T5L - T7 - T9 - T12 - T13		T8	T6
	S	T	T	T	T		L/C	T
	B7							
	T1	T2	T3L	T3R	T5R - T5L - T7 - T12 - T13			T6
	T	S	L	L	T			C
	V5 (*)							
	T1	T2	T3L	T3R	T5R - T5L - T7 - T12 - T13			T6
	T	T	S	L	T			T

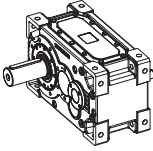
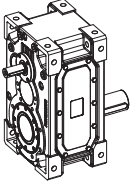
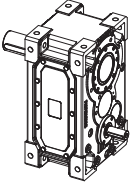
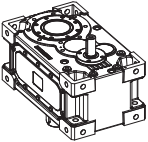
(*) Excluding DW



HDP 150 - HDP 160



	A	B	C	D	E	F	G	H	I	L
HDP 150 2	599	147	145	365	331	350	90	395	20	80
HDP 160 2	640	147	145	385	351	370	90	395	20	80
HDP 150 3	609	147	145	365	331	350	90	395	240	80
HDP 150 4										
HDP 160 3	650	147	145	385	351	370	90	395	240	80
HDP 160 4										

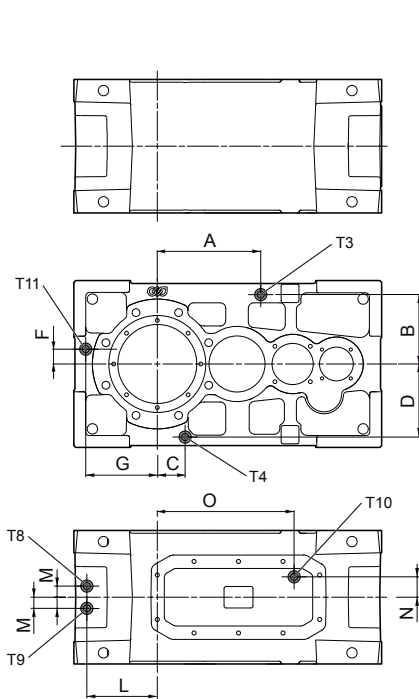
C = Filler plug with air vent										
L = Level plug	T = Blank plug									
S = Drain plug	⊖ = No plug present									
	L* = Overflow level plug									
	B3									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	L/C	T	S	S	T	T	T	T	T	
	B6									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	S	L/C	T	T	T	T	T	T	T	
	B7									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	T	S	L	L	T	T	C	T	T	
	V5 (*)									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	T	T	S	C	T	T	T	T	L	

(*) Excluding DW

HDP 170 - HDP 180

Contact the Manufacturer's Technical Service

HDO 71 ... HDO 95



	A	B	C	D	E	F	G	H	I	L	M	N	O
HDO 71 2													
HDO 71 3	208	137	70	149	147	0	135	147	30	122	30	35	247.5
HDO 71 4													
HDO 81 2													
HDO 81 3	267	162	65	175	173	25	160	173	30	158	30	55	326
HDO 81 4													

	A	B	C	D	E	F	G	H	I	L	M	N	O
HDO 91 2	190	187	75	197	190	40	193	190	30	190	30	55	281
HDO 91 3	279	187	75	197	190	40	193	190	30	190	30	55	369
HDO 91 4													
HDO 95 3	220	211	80	222	215	30	218	215	30	217	30	55	200
HDO 95 4													

C = Filler plug with air vent												T = Blank plug	
L = Level plug												● = No plug present	
S = Drain plug												L* = Overflow level plug	
	B3												
	T1	T2	T3	T4	T5	T6	T7	T8		T9		T10	T11
	T	T	T	T	S	T	T	Exec. 1 T	Exec. 2 L/C	Exec. 1 L/C	Exec. 2 T	T	T
	B6												
	T1	T2		T3	T4		T5	T6	T7	T8	T9	T10	T11
	T	Exec. 1 T	Exec. 2 ●	T	Exec. 1 ●	Exec. 2 T	L/C C(#)	T	T	T	S	T L(#)	T
	B7												
	T1	T2	T3	T4	T5	T6	T7	T8		T9		T14L	T14R
	T	L	T	L	S	T	T	Exec. 1 T	Exec. 2 C	Exec. 1 C	Exec. 2 T	T	T
	V5 (*)												
	T1	T2	T3	T4	T5	T6	T7	T8		T9		T10	T11
	C	T	S	T	T	T	T	T		T		L	T



(#) 71-81-91 3 Stage

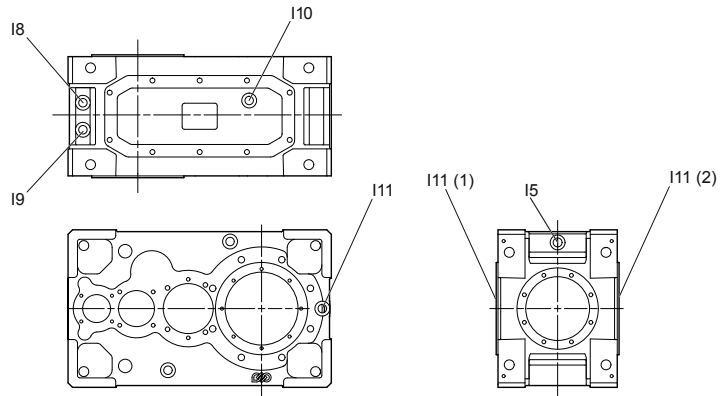
(*) Excluding DW



Service plugs position of HDO 71 ... HDO 95 in mounting position B3 with the inspection cover on the bottom side (B3 flip over).

The HDO 71 ... HDO 95 sizes could be positioned by the user with the inspection cover on the bottom side. The quantity of lubricant specified in the following table is purely indicative. Gear units must be filled to the mid point of the sight glass.

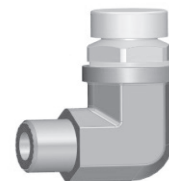
	 [l]
HDO 71 2	10
HDO 71 3	10
HDO 71 4	10
HDO 81 2	15
HDO 81 3	15
HDO 81 4	15
HDO 91 2	16
HDO 91 3	20
HDO 91 4	20
HDO 95 3	28
HDO 95 4	28



The positions of some plugs must be modified as shown below:

- in pos. 15 apply an 90° elbow pipe and the air vent plug mounted in T10 (see B3 chart).

90° elbow pipe "1/2" gas + air vent plug "1/2" gas



- in position 18 (execution 2), position 19 (execution 1) and in position 110 apply the blank plug mounted in T5 (see diagram B3) removing any breather/level plugs that may be present. Always make sure that the plug does not protrude from the feet plane.

blank plug "1/2" gas



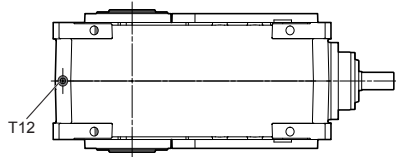
- in pos. 111 on side (1) or (2) depending on the need, replace the blank plug with a level plug.

level plug "1/2" gas

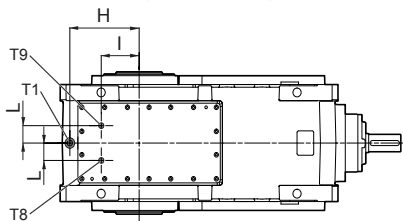
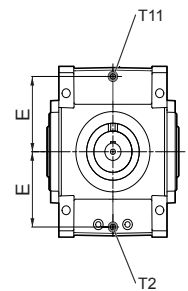
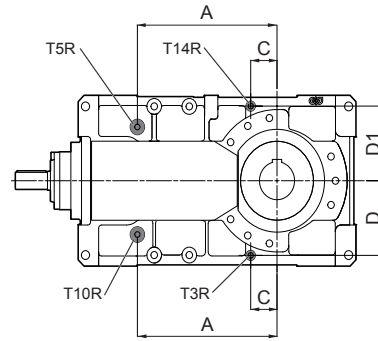
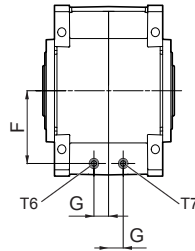
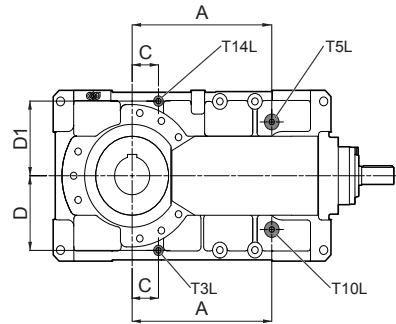


The plugs do not recoverable from those present on the gear unit are not included in the delivery.

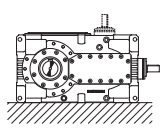
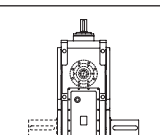
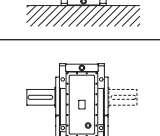
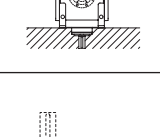
HDO 100 ... HDO 125



	A	B	C	D	D1	E	F	G	H	I	L
HDO 100 2	385	170	90	236	236	238	230	50	237	129.5	55
HDO 110 2	400	170	105	236	236	238	230	55	222	114.5	55
HDO 120 2	410	185	115	261	255	261	258	50	261	127.5	66
HDO 125 2	460	185	125	282	282	300	288	50	300	161	66



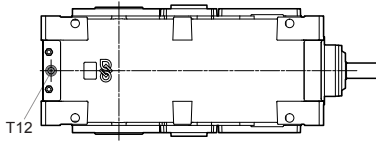
	A	B	C	D	D1	E	F	G	H	I	L
HDO 100 3 HDO 100 4	477.5	170	90	236	236	238	230	50	237	129.5	55
HDO 110 3 HDO 110 4	492.5	170	105	236	236	238	230	50	222	114.5	55
HDO 120 3 HDO 120 4	590	185	115	261	255	261	258	50	261	127.5	66
HDO 125 3 HDO 125 4	610	185	125	282	282	300	288	50	300	161	66

C = Filler plug with air vent					T = Blank plug						
L = Level plug					⊖ = No plug present						
S = Drain plug					L* = Overflow level plug						
	B3										
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L
	L	S	T	T	T	Exec. 1 C	Exec. 2 T	Exec. 1 T	Exec. 2 C	T	T
	B6										
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L
	S	L/C	T	T	T	T		T		T	T
	B7										
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L
	T	S	L	L	T	C		T		T	T
	V5 (*)										
	T1	T2	T3L	T3R	T5R-T5L-T7-T10 T10L-T11-T12	T6	T8		T9		T14L
	T	T	S	C	T	T		T		T	L

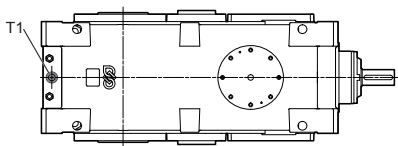
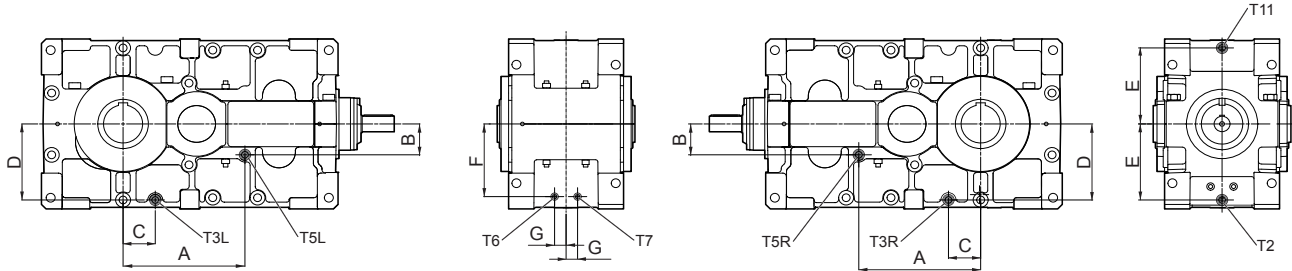
(*) Excluding DW



HDO 130 - HDO 140



	A	B	C	D	E	F	G	H
HDO 130 2	555	180	140	340	340	325	50	310
HDO 140 2	595	180	150	340	340	325	50	335

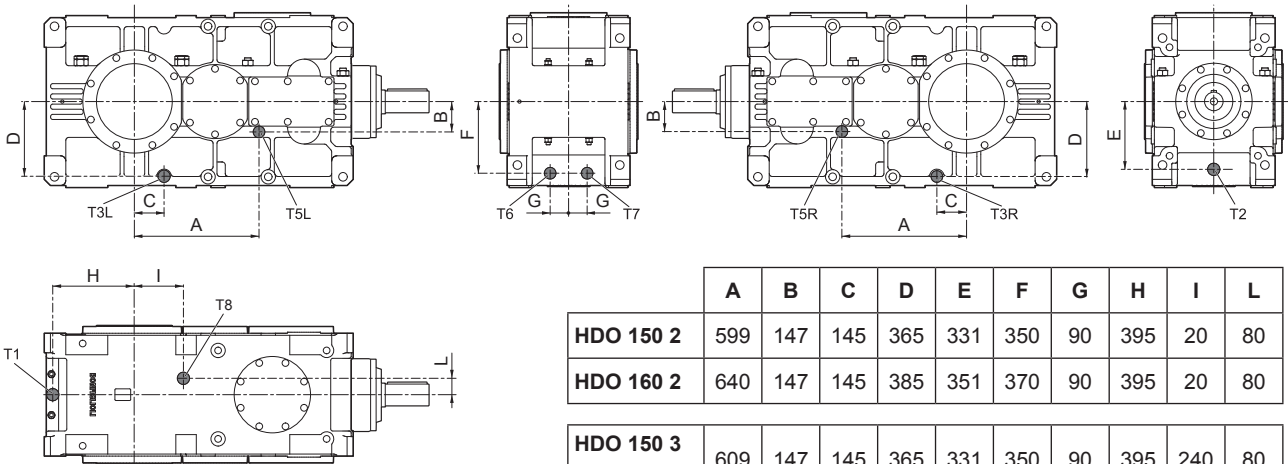


	A	B	C	D	E	F	G	H
HDO 130 3	530	138	140	340	340	325	50	310
HDO 130 4								
HDO 140 3	560	195	150	340	340	325	50	335
HDO 140 4								

C = Filler plug with air vent							T = Blank plug
L = Level plug							⊖ = No plug present
S = Drain plug							L* = Overflow level plug
	B3						
	T1	T2	T3L	T3R	T5R - T5L - T7 - T11 - T12		T6
	L/C	S	T	T	T		T
	B6						
	T1	T2	T3L	T3R	T5R - T5L - T7 - T11 - T12		T6
	S	L/C	T	T	T		T
	B7						
	T1	T2	T3L	T3R	T5R - T5L - T7 - T11 - T12		T6
	T	S	L	L	T		C
	V5 (*)						
	T1	T2	T3L	T3R	T5R - T5L - T7 - T11 - T12		T6
	T	T	S	L/C	T		T

(*) Excluding DW

HDO 150 - HDO 160



	A	B	C	D	E	F	G	H	I	L
HDO 150 2	599	147	145	365	331	350	90	395	20	80
HDO 160 2	640	147	145	385	351	370	90	395	20	80
HDO 150 3	609	147	145	365	331	350	90	395	240	80
HDO 150 4										
HDO 160 3	650	147	145	385	351	370	90	395	240	80
HDO 160 4										

C = Filler plug with air vent										
L = Level plug	T = Blank plug									
S = Drain plug	● = No plug present									
	L* = Overflow level plug									
	B3									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	L/C	T	S	S	T	T	T	T	T	T
	B6									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	S	C	T	T	T/L(#)	L(#)	T	T	T	T
	B7									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	T	S	L	L	T	T	C	T	T	T
	V5 (*)									
	T1	T2	T3L	T3R	T5R	T5L	T6	T7	T8	
	T	T	S	C	T	T	T	T	T	L

(#) Only 3 Stage

(*) Excluding DW

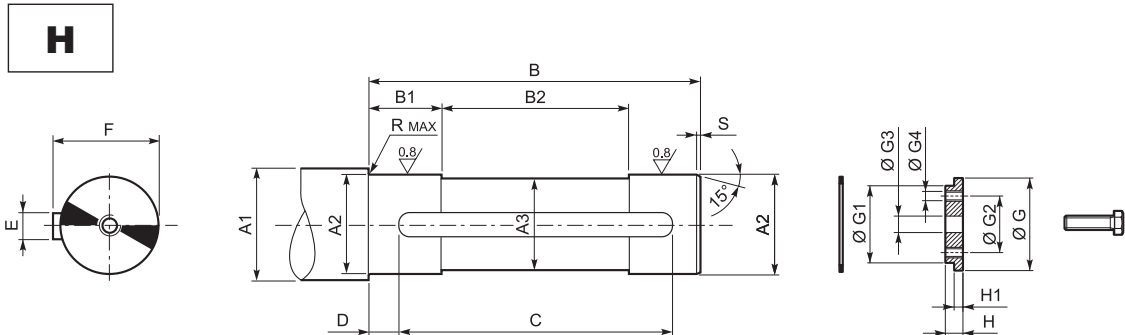
HDO 170 - HDO 180


Contact the Manufacturer's Technical Service





5.7 PREPARING CUSTOMER SHAFT

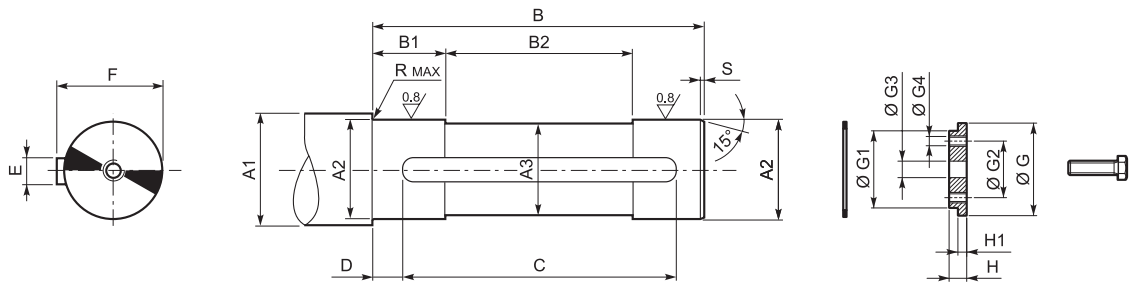
Make the driven shaft to be coupled to the gearbox's output shaft from a good quality steel, respecting the dimensions given in the table. A device such as that illustrated below should also be installed to secure the shaft axially. Take care to verify and dimension the various components to suit the needs of the application.



	A1	A2	A3	B	B1	B2	C	D	E	F	R	S	 UNI 6604
HDP 60	≥ 78	70 h6	69	283	56	172	220	30	20 h9	74.5	2.5	2	20x12x220A
HDP 70	≥ 89	80 h6	79	283	78	127	220	30	22 h9	85	2.5	2.5	22x14x220A
HDP 80	≥ 104	95 h6	94	338	73	192	280	30	25 h9	100	2.5	2.5	25x14x280A
HDP 90	≥ 121	110 h6	109	378	88	202	320	30	28 h9	116	2.5	2.5	28x16x320A
HDP 100	≥ 133	120 h6	119.5	420	100	250	360	30	32 h9	127	3	2.5	32x18x360A
HDP 110	≥ 143	130 h6	129.5	420	100	250	360	30	32 h9	137	3	2.5	32x18x360A
HDP 120	≥ 153	140 h6	139.5	444	110	260	400	40	36 h9	148	3	2.5	36x20x400A
HDP 125	≥ 163	150 h6	149.5	444	110	260	400	40	36 h9	158	3	2.5	36x20x400A
HDP 130	≥ 183	170 h6	169.5	540	135	310	400	80	40 h9	179	3	2.5	40x22x400A
HDP 140	≥ 193	180 h6	179.5	540	135	310	400	80	45 h9	190	3	2.5	45x25x400A
HDP 150	≥ 223	210 h6	209.5	667	155	400	500	100	50 h9	221	3	3	50x28x450B
HDP 160	≥ 223	210 h6	209.5	667	155	400	500	100	50 h9	221	3	3	50x28x450B
HDP 170	≥ 255	240 h6	239.5	697	170	400	506	100	56 h9	252	3	3	56x32x450B
HDP 180	Contact the Manufacturer's Technical Service.												

	Not included in the supply								
	 UNI 7437	G	G1	G2	G3	G4	H	H1	 UNI 5739
HDP 60	—	90	70 d9	—	22	—	10	8.5	M20x50
HDP 70	—	100	80 d9	—	22	—	10	8.5	M20x50
HDP 80	—	115	95 d9	—	26	—	15	13.5	M24x60
HDP 90	—	130	110 d9	—	26	—	15	13.5	M24x60
HDP 100	120x4	120 d9	96	64	26	M16	24	12	M24x70
HDP 110	130x4	130 d9	105	69	26	M20	24	12	M24x70
HDP 120	140x4	140 d9	115	79	26	M20	30	15	M24x80
HDP 125	150x4	150 d9	122	86	26	M20	30	15	M24x80
HDP 130	170x4	170 d9	142	102	33	M24	34	17	M30x90
HDP 140	180x4	180 d9	150	110	33	M24	34	17	M30x90
HDP 150	210x5	210 d9	178	140	33	M24	36	18	M30x100
HDP 160	210x5	210 d9	178	140	33	M24	36	18	M30x100
HDP 170	240x5	240 d9	208	160	39	M24	36	18	M36x100
HDP 180	Contact the Manufacturer's Technical Service.								

H

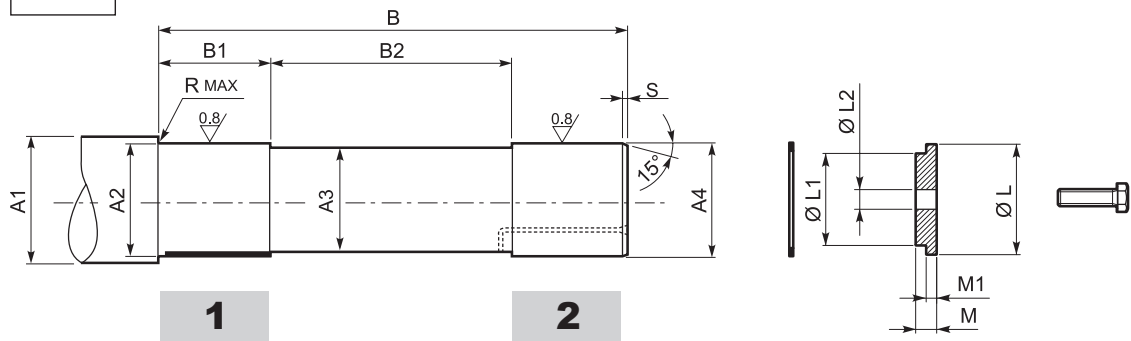


	A1	A2	A3	B	B1	B2	C	D	E	F	R	S	UNI 6604
HDO 71	≥ 89	80 h6	79	283	78	127	220	30	22 h9	85	2.5	2.5	22x14x220A
HDO 81	≥ 104	95 h6	94	338	73	192	280	30	25 h9	100	2.5	2.5	25x14x280A
HDO 91	≥ 121	110 h6	109	378	88	202	320	30	28 h9	116	2.5	2.5	28x16x320A
HDO 95	≥ 128	115 h6	114	398	100	228	340	30	32 h9	122	2.5	2.5	32x18x340A
HDO 100	≥ 133	120 h6	119.5	420	100	250	360	30	32 h9	127	3	2.5	32x18x360A
HDO 110	≥ 143	130 h6	129.5	420	100	250	360	30	32 h9	137	3	2.5	32x18x360A
HDO 120	≥ 153	140 h6	139.5	444	110	260	400	40	36 h9	148	3	2.5	36x20x400A
HDO 125	≥ 163	150 h6	149.5	444	110	260	400	40	36 h9	158	3	2.5	36x20x400A
HDO 130	≥ 183	170 h6	169.5	540	135	310	400	80	40 h9	179	3	2.5	40x22x400A
HDO 140	≥ 193	180 h6	179.5	540	135	310	400	80	45 h9	190	3	2.5	45x25x400A
HDO 150	≥ 223	210 h6	209.5	667	155	400	500	100	50 h9	221	3	3	50x28x450B
HDO 160	≥ 223	210 h6	209.5	667	155	400	500	100	50 h9	221	3	3	50x28x450B
HDO 170	≥ 255	240 h6	239.5	697	170	400	506	100	56 h9	252	3	3	56x32x450B
HDO 180	Contact the Manufacturer's Technical Service.												




	Not included in the supply								
	UNI 7437	G	G1	G2	G3	G4	H	H1	UNI 5739
HDO 71	—	100	80 d9	—	22	—	10	8.5	M20x50
HDO 81	—	115	95 d9	—	26	—	15	13.5	M24x60
HDO 91	—	130	110 d9	—	26	—	15	13.5	M24x60
HDO 95	115x4	115 d9	91	59	26	M16	24	12	M24x70
HDO 100	120x4	120 d9	96	64	26	M16	24	12	M24x70
HDO 110	130x4	130 d9	105	69	26	M20	24	12	M24x70
HDO 120	140x4	140 d9	115	79	26	M20	30	15	M24x80
HDO 125	150x4	150 d9	122	86	26	M20	30	15	M24x80
HDO 130	170x4	170 d9	142	102	33	M24	34	17	M30x90
HDO 140	180x4	180 d9	150	110	33	M24	34	17	M30x90
HDO 150	210x5	210 d9	178	140	33	M24	36	18	M30x100
HDO 160	210x5	210 d9	178	140	33	M24	36	18	M30x100
HDO 170	240x5	240 d9	208	160	39	M24	36	18	M36x110
HDO 180	Contact the Manufacturer's Technical Service.								

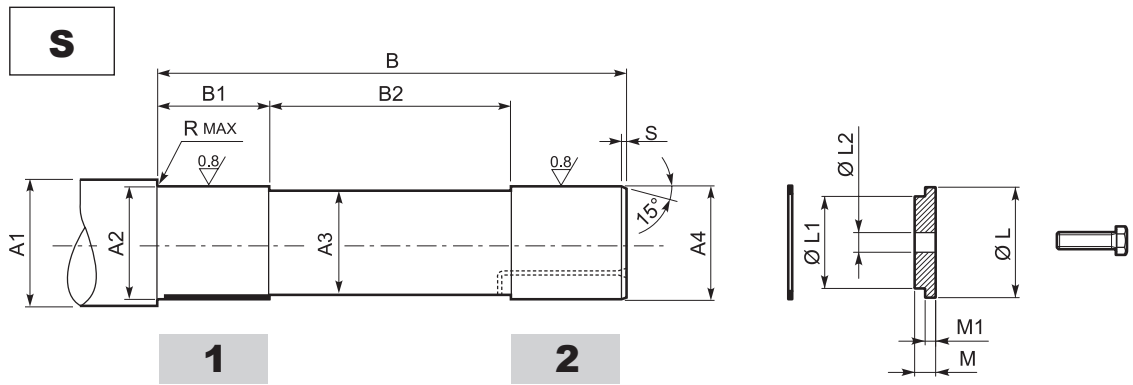


S



	A1	A2	A3	A4	B	B1	B2	R	S
HDP 60	≥ 90	72 h7	69	70 g6	328	59	194	2.5	2.5
HDP 70	≥ 104	82 h7	79	80 g6	332	77	174	2.5	2.5
HDP 80	≥ 119	97 h7	94	95 g6	398	95	205	2.5	2.5
HDP 90	≥ 136	112 h7	109	110 g6	440	87	273	2.5	2.5
HDP 100	≥ 138	125 h6	119.5	120 g6	517	104	328	3	2.5
HDP 110	≥ 148	135 h6	129.5	130 g6	523	104	334	3	2.5
HDP 120	≥ 158	145 h6	139.5	140 g6	550	104	354	3	2.5
HDP 125	≥ 168	155 h6	149.5	150 g6	570	104	363	3	2.5
HDP 130	≥ 188	175 h6	169.5	170 g6	681	104	462	3	2.5
HDP 140	≥ 198	185 h6	179.5	180 g6	689	104	470	3	2.5
HDP 150	≥ 228	215 h6	209.5	210 g6	839	104	593	3	3
HDP 160	≥ 228	215 h6	209.5	210 g6	839	104	593	3	3
HDP 170 - HDP 180	Contact the Manufacturer's Technical Service.								

	Not included in the supply						
	 UNI 7437	L	L1	 L2	M	M1	 UNI 5739
HDP 60	—	90	70 d9	22	10	8.5	M20x50
HDP 70	—	100	80 d9	22	10	8.5	M20x50
HDP 80	—	115	95 d9	26	15	13.5	M24x60
HDP 90	—	130	110 d9	26	15	13.5	M24x60
HDP 100	120x4	120 d9	96	26	16	12	M24x65
HDP 110	130x4	130 d9	105	26	16	12	M24x65
HDP 120	140x4	140 d9	115	26	19	15	M24x70
HDP 125	150x4	150 d9	122	26	19	15	M24x70
HDP 130	170x4	170 d9	142	33	21	17	M30x80
HDP 140	180x4	180 d9	150	33	21	17	M30x80
HDP 150	210x5	210 d9	178	33	29	18	M30x90
HDP 160	210x5	210 d9	178	33	29	18	M30x90
HDP 170 - HDP 180	Contact the Manufacturer's Technical Service.						



	A1	A2	A3	A4	B	B1	B2	R	S
HDO 71	≥ 104	82 h7	79	80 g6	332	77	174	2.5	2.5
HDO 81	≥ 119	97 h7	94	95 g6	398	95	205	2.5	2.5
HDO 91	≥ 128	112 h7	109	110 g6	440	87	273	2.5	2.5
HDO 95	≥ 133	120 h6	114.5	115 g6	498	104	309	2.5	2.5
HDO 100	≥ 138	125 h6	119.5	120 g6	517	104	328	3	2.5
HDO 110	≥ 148	135 h6	129.5	130 g6	523	104	334	3	2.5
HDO 120	≥ 158	145 h6	139.5	140 g6	550	104	354	3	2.5
HDO 125	≥ 168	155 h6	149.5	150 g6	570	104	363	3	2.5
HDO 130	≥ 188	175 h6	169.5	170 g6	681	104	462	3	2.5
HDO 140	≥ 198	185 h6	179.5	180 g6	689	104	470	3	2.5
HDO 150	≥ 228	215 h6	209.5	210 g6	839	104	593	3	3
HDO 160	≥ 228	215 h6	209.5	210 g6	839	104	593	3	3
HDO 170	Contact the Manufacturer's Technical Service.								
HDO 180									

	Not included in the supply						
	UNI 7437	L	L1	L2	M	M1	UNI 5739
HDO 71	—	100	80 d9	22	10	8.5	M20x50
HDO 81	—	115	95 d9	26	15	13.5	M24x60
HDO 91	—	130	110 d9	26	15	13.5	M24x60
HDO 95	115x4	115 d9	91	26	16	12	M24x65
HDO 100	120x4	120 d9	96	26	16	12	M24x65
HDO 110	130x4	130 d9	105	26	16	12	M24x65
HDO 120	140x4	140 d9	115	26	19	15	M24x70
HDO 125	150x4	150 d9	122	26	19	15	M24x70
HDO 130	170x4	170 d9	142	33	21	17	M30x80
HDO 140	180x4	180 d9	150	33	21	17	M30x80
HDO 150	210x5	210 d9	178	33	29	18	M30x90
HDO 160	210x5	210 d9	178	33	29	18	M30x90
HDO 170	Contact the Manufacturer's Technical Service.						
HDO 180							

To facilitate disassembly, provide a machine shaft with a hole through which an anti-corrosion fluid can be injected (2) or a machine shaft with provision for fitting a self-lubricating bush at the cylindrical guide section opposite the shrink disc (1).

In the presence of external thrust loads, vibration, safety problems, requirements for enhanced reliability, or unfavourable mounting positions (e.g. V5 mounting positions, output shaft directed downwards), install suitable devices to secure the shaft in an axial direction and prevent accidental decoupling.



5.8 STARTING UP THE GEAR UNIT

The gear unit has been factory tested by the Manufacturer.

Before starting the unit, make sure:

- that the machine or part of the machine in which the the gear unit/gearmotor is to be installed has been declared to conform to the requirements of the Machinery Directive 2006/42/EC and to any other relevant and applicable safety standards
- that the gear unit's mounting position in the installation corresponds to that prescribed and indicated on the name plate
- that the electrical power supply is suitable and operational as prescribed in EN 60204-1, and is grounded as per EN 60079
- that the rating of the power supply to the motor and any installed electrical devices corresponds to that prescribed and is within +/- 10% of the rated value
- that the oil level in the gear unit/gearmotor and any lubricated installed accessories is as required and that there are no leaks from any plugs, seals or pipes
- that any connections to parts and/or accessories disconnected for transport purposes have been reconnected
- that any of the Manufacturer's guards that might have been removed have been refitted
- that there are no unusual noises and/or vibrations when the gear unit/gearmotor is started up
- After the first 100 hours of operation, check the tightening torque of all screw couplings:
 - shrink discs
 - motor flanges
 - machine flanges
 - supports

Before putting the gearbox into service, make sure that:

- Assembly will not be carried out in a potentially explosive atmosphere (oil, acid, gas, vapour, radiation) and that dust deposits on the gearbox do not exceed 5 mm in depth.
- Clean the gearbox thoroughly after installation.
- The oil level, drain and vent plugs are all easily accessible.
- All guards designed to prevent accidental contact between operators and rotating parts, and all oil seals, are fully efficient.
- Gearboxes with hollow shafts, with or without shrink disc, have been correctly mounted.
- All types of accessory installed on the gearbox are ATEX specified and have been installed in accordance with ATEX requirements.



During service make sure that:

- The gearbox is sufficiently ventilated and that it is not subject to radiation from external heat sources.
- The temperature of the cooling air does not exceed 40°C.



Measuring the gearbox surface temperature

- The gearbox maximum surface temperature depends on motor speed, transmission ratio and motor version, but must never exceed 135°C.
- The maximum surface temperature specified on the nameplate refers to measurements made in normal ambient and correct installation conditions. Even minimal variations in these conditions (e.g. smaller mounting compartments) may have a significant effect on heat dissipation.
- When putting the gearbox into service, the surface temperature must be measured in the same conditions as those in which the gearbox will operate. The surface temperature must be measured at the coupling between the gearbox and motor, and at the points which are most shielded from the forced ventilation provided by the motor fan.

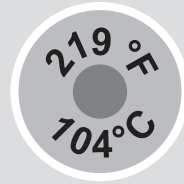
IMPORTANT:

Maximum surface temperature is reached after 3 hours operation at full load. Maximum surface temperature measured at these points must not exceed ambient temperature by more than 75 K (ΔT).

If the temperature differential exceeds this value, stop the gearbox at once and contact the manufacturer's technical assistance service.

- If the temperature differential lies within the above value, wait for the gearbox to cool down and then install the heat sensor included in the supply at the point of maximum temperature.

Example:



- Check that the gearbox functions normally (no unusual vibrations and/or noise).

- Provided all the above checks have been completed positively, and provided all the instructions in this manual have been strictly observed, an electric motor with ATEX rating equal to or higher than that of the gearbox may be installed to form a gearmotor that complies with the provisions of Directive 2014/34/EU.

- If, on the other hand, the motor and gearbox have been coupled in a way other than that prescribed in this manual, or if one or more of the instructions provided in this manual has been ignored, the user must perform a risk assessment specific to the motor-gearbox coupling.

- Risk assessment is mandatory if the motor is to be powered by an inverter. Only if this is done and self-certification issued by the assembler will the complete assembly in which the gearbox is installed conform to the requirements of Directive 2014/34/EU. The inverter control system must not allow the motor to exceed the gearbox maximum input speed ($n_1=1500 \text{ min}^{-1}$) or to generate overloads under any circumstances.



In the presence of optional accessories it is also necessary to check that all the operations required for their correct functioning have been carried out as described in the relative sections and/or manuals.

When the gear unit is started for the first time, allow it to run at slow speed and at zero load for some time. If no irregular operation is noted during this period, the load and speed can be gradually increased to the rated operating conditions over a reasonable period of time during which the gear unit must be monitored closely.



5.8.1 Starting up autonomous control units (MCRW... , MCRA...)

For ATEX component, consult catalogue and manual of the manufacturer.

If the gear unit is equipped with an autonomous control unit, also follow the instructions given below during start-up.



Unless stated otherwise, the requirements and specifications given below are valid even if non-standard control devices have been supplied with the gear unit instead of the standard ones described in this manual.
Perform regular checks during functioning to identify any malfunctions or problems as early as possible.



Under operating conditions, take care to avoid all contact, including accidental contact, with the surfaces of the heat exchanger, which can reach high temperatures.

Case 1) Functionality: cooling with oil/water heat exchanger (MCRW...)

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

Cooling with oil/air heat exchanger (MCRA...)

- once the gear unit has started, start the control unit in compliance with the requirements of the "Operating limits and conditions" section in this manual
- to avoid the fan running continuously even when not needed, its motor can be controlled to run over a range of temperatures by a thermostat in the heat exchanger. Unless instructed otherwise, set the said thermostat to switch on the electric fan at a temperature of 60°C whenever possible.
- when oil temperature reaches 90°C, the maximum temperature thermostat must activate an alarm and stop the gear unit as soon as possible

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

- start the control unit in compliance with the requirements of the "Operating limits and conditions" section in this manual
- do not start up the gear unit until the control unit has been functioning for a few minutes



The control unit's electric pump must always run along with the gear unit and must only be switched off after the gear unit has effectively stopped.

Autonomous control units with oil/water heat exchanger (MCRW...)

- once the oil has reached a temperature of 60°C, the control thermostat must give the signal to open the water supply solenoid valve
- when oil temperature reaches 90°C, the maximum temperature thermostat must activate an alarm and stop the gear unit as soon as possible
- when pressure falls below 0.5 bar, the minimum pressure switch must activate an alarm and stop the gear unit as soon as possible

Autonomous control units with oil/air heat exchanger (MCRA...)

- to avoid the fan running continuously even when not needed, its motor can be controlled to run over a range of temperatures by a thermostat in the heat exchanger. Unless instructed otherwise, set the said thermostat to switch on the electric fan at a temperature of 60°C whenever possible.
- when oil temperature reaches 90°C, the maximum temperature thermostat must activate an alarm and stop the gear unit as soon as possible
- when pressure falls below 0.5 bar, the minimum pressure switch must activate an alarm and stop the gear unit as soon as possible

6 MAINTENANCE



Maintenance and replacement work must be carried out by expert maintenance technicians trained in the observance of applicable laws on health and safety at work and the special ambient problems attendant on the installation. In order to maintain the proper functioning and safety of the gearbox/gearmotor, we recommend that users have non-routine maintenance performed by the Manufacturer or an authorised, specialist service centre. Contact the manufacturer's sales network. Failure to comply with this requirement during the warranty period automatically invalidates the warranty.



Never improvise repairs.

Before doing any work on the unit, the operator must first switch off power to the gearbox and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning (due to suspended loads or similar external factors).

Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc.).

- Disconnect power to the machine in which the gearbox is installed before commencing any maintenance work, and secure all switches in the OFF position. All persons performing maintenance must secure the disconnecting switches for themselves, using personal devices (e.g. padlocks) the keys of which they must keep with them for the duration of the work.
- Ensure surfaces have cooled before commencing work. If necessary, wear anti-burn safety gloves when working on gearboxes. Refer to chapter "ALLOWED TEMPERATURE LIMITS" for further details.
- Before commencing any maintenance work, activate all the safety devices provided and, if necessary, inform persons working in the vicinity. Cordon off the area around the gearbox and prevent access to any equipment which, if activated, might be the cause of unexpected health and safety hazards.
- Use only recommended lubricants (oil and grease).
- When working on the gearbox, always replace all gaskets and seals with original new ones.
- If a bearing requires replacement, it is good practice to replace the other bearing on the same shaft as well.
- Change the oil after completing maintenance work.
- If, during work, there is any risk of coming into contact with oils and greases, respect the safety precautions provided on the manufacturer's data sheets and use all items of personal protective equipment specified therein.

If the gearbox is not going to be used for a prolonged period following installation or run-in, it must be run at least once a month. If this is not possible, the gearbox must be protected against corrosion with a suitable rust inhibitor, or completely filled with new oil of the type normally utilised for operating duty. (See the "STORAGE" section in this manual.)

The above instructions are aimed at ensuring the efficient and safe operation of the gearbox. The manufacturer declines all liability for injury to persons or damage to components due to the use of non-original spare parts or non-routine work that compromises safety requirements without express prior authorisation. Refer to the specific spare parts catalogue when ordering spare parts for the gearbox.



Do not disperse contaminant liquids, worn parts and maintenance residues in the environment. Dispose of all such substances in strict compliance with applicable statutory legislation.



- Respect scheduled inspection and maintenance intervals to ensure the correct functioning of the gearbox and the effectiveness of the explosion protection.
- Allow the gearbox to cool down completely before servicing or repairing internal components in order to avoid burns from hot internal parts.
- On completion of maintenance work, make sure that all safety devices have been applied and reset.
- Clean the gearbox thoroughly after maintenance or repair.
- On completion of maintenance, tighten all vent, filler and level plugs to the torque values specified in the "INSTALLING THE GEARBOX" section of this manual.
- Apply fresh Loctite 510 paste (or a product with similar properties and application range) to all disassembled threads.
- On completion of any maintenance work, renew all seals and re-apply sealing compound as specified. On gearboxes with double seal rings, the space between the two rings must be packed with synthetic grease such as Fluorocarbon 880 ITP gel (or a product with similar properties and application range).
- Regardless of the type of gearbox, whenever a seal ring is replaced, its lips should be smeared with a thin layer of grease such as Fluorocarbon 880 ITP gel (or a product with similar properties and application range) before it is fitted.
- Use only original spare parts for repairs.

6.1 CHECKING OPERATIONAL EFFICIENCY

- Periodically remove any dust from the gearbox and motor casings.
- Check that the noise generated at constant load does not vary. Excessive vibration or noise can indicate wear of the gear train or failure of a bearing.
- Check power absorption and voltage against the nominal values given on the motor's nameplate.
- On brake motors, check the friction surfaces and friction material for wear and adjust the gap if necessary.
- Check for lubricant leaks from the gaskets/seals, plugs, casings and pipes.
- Check that temperature does not rise above normal operating levels (refer to chapter "ALLOWED TEMPERATURE LIMITS") unless this is justified by a corresponding increase in the applied load, rotation speed, ambient temperature or other factor. If temperature rises, stop the gearbox immediately and identify the cause of the fault.
- Check all bolt couplings for wear, deformation and corrosion and tighten the bolts correctly, without exceeding the torque values specified in the "INSTALLING THE GEARBOX" section in this manual.

6.2 ROUTINE MAINTENANCE



Respect the manufacturer's routine maintenance schedule to keep the gearbox at peak efficiency. Good maintenance ensures maximum gearbox performance, extended service life and continued compliance with safety regulations.

List of routine checks

We recommend keeping a checklist of inspections so that any changes in individual control parameters can be identified rapidly and easily.



The times indicated in the following tables vary significantly in relation to the conditions of use of the gearbox and must be construed as valid in the absence of other types of problems.

Depending on the temperature reached by the lubricant, it should be replaced at the intervals indicated in the table below.

(tab 20)

Average oil operating temperature [C°]	Interval replacement [h]		
	mineral oil EP(*)	synthetic oil	
		PAO	PAG
$t_o < 65$	8000	25000	25000
$65 < t_o < 80$	4000	15000	15000
$80 < t_o < 95$	2000 (@) (#)	12500	12500

(*) = Replacement within 1 year

(@) = It is not advised continuous operation in this range of oil temperature: 80°C to 95 °C

(#) = Recommended checking every 6 months



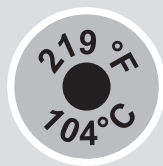
Frequency	Inspection parameter
300 h	First oil change after putting into service (excluding gearboxes that are lubricated "for life")
see table	Subsequent oil changes
24 h	Oil temperature
24 h	Bearing temperature
24 h	Oil pressure
24 h	Noise, vibration
170 h ... 720 h	External condition of gearbox (fouling, oil deposits)
720 h	Oil leaks, external seals and gaskets
720 h	Oil level
720 h	Oil filter contamination indicator
2200 h	Vent filter
2000 h ... 4000 h	Tightness of fixing bolts, connecting flanges and torque transmission components
2000 h ... 4000 h	Check the elastic elements in all joints for wear
2000 h ... 4000 h	Regrease the Drywell device, bearings and seals (where required)
3000 h	Check cup springs for wear and adjust the torque arm
3000 h	Condition of torque arm polymer bushes (aging, cracking)
2000 h ... 9000 h	Condition of oil in gearbox (possible presence of contaminants, especially water)
9000 h ... 18000 h	Internal cleanliness of the cooling coil and water/oil heat exchanger; possible presence of deposits
9000 h ... 18000 h	Alignment of gearbox shafts with respect to coupled machine shafts
at each oil change	General internal functioning conditions of gear unit, lubrication devices and/or oil cooling devices, and control devices
at each oil change	Condition of gear tooth flank
at each oil change	Cleanliness of electric motor fan and fan cowling (if present) and cleanliness of gearbox body

For installations in zones 21 and 22, the user must schedule and implement a regular cleaning programme for all surfaces and recesses to avoid dust build-ups of more than 5 mm in depth. In the presence of an auxiliary cooling device (FAN) a frequent and accurate monitorings of the casing of the rotor should be scheduled to avoid the creation of bridges of powders.

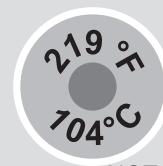
Every 100 hours of operation or every 2 weeks:

- Measure the surface temperature at the coupling between the gearbox and motor, and at the points most shielded from the forced ventilation provided by the motor's fan. Maximum surface temperature measured at these points must not exceed ambient temperature by more than 75 °K, and this temperature differential must not have been exceeded in service. Check the condition of the heat sensor installed previously.

Example:



Limit temperature exceeded



Limit temperature NOT exceeded



Also check that high temperatures are not being generated at the gearbox bearings.



Every 1000 hours of operation or every 6 months:

- Check the oil level according to the tables provided in the "LUBRICATION" section of this manual and according to the figures below.
- Check that there are no signs of lubricant leaks near the gearbox.
- **If any anomalies are found, identify their cause, make the necessary repairs, and top up the lubricant level before putting the gearbox back into service.**

Every 3000 hours of operation:

- On gearboxes with reaction arms, check that the polymer bushes are not aged or damaged. If the bushes show any sign of fatigue or damage, replace them with original spare parts.

Every 5000 hours of operation:

- Change the synthetic oil and bearing grease if the gearbox is not lubricated for life.
- Replace all externally accessible seal rings unless this has already been done as a result of problems occurring before the scheduled maintenance was due.

Every 5000 hours of operation at rated torque

(The minimum overhaul interval specified here may increase considerably, depending on actual service cycles. See the table below).

- General overhaul of the gearbox, if not performed earlier as a result of malfunctioning (*Overhaul consists of the replacement of all bearings and/or other mechanical components showing signs of wear that might compromise the functioning of the gearbox*).



6.2.1 MAINTENANCE OF AUTONOMOUS COOLING UNITS (OPTIONAL VARIANTS MCRW... , MCRA...)

For ATEX component, consult catalogue and manual of the manufacturer.

If the gear unit is equipped with an autonomous control unit, also follow the instructions given below.



Before commencing any cleaning and/or maintenance:

- activate all necessary safety devices to prevent the accidental start-up of the gear unit and control unit
- wait for the gear unit and all parts of the control unit to cool down
- drain the gear unit or lower the oil level so that no oil flows out during work to replace components

In particular, perform the following periodical checks:

- check the blockage indicator, always when the oil is hot, and clean or replace the filter element with another of the same characteristics if the pressure gauge, depending on the type installed:
 - displays a pressure above 6 bar or 1.5 bar above the value displayed with a new filter element or,
 - is in the red area.

- the cross section of water passages (**MCRW...**), to check that they are free from sediment and/or blockages that might impair the efficiency of the auxiliary cooling system: If necessary, clean the circuit by flushing with a suitable chemical agent, checking with the manufacturer that the cleaning agent is compatible with the construction material of the heat exchanger.

The interval for checking the condition of the heat exchanger and any maintenance work depends on the characteristics of the cooling water used.

Any defects in the heat exchanger water supply circuit can be identified by observing the condition of the lubrication oil in the gear unit, which will display a high degree of foaming if it has become contaminated with water.

- the condition of the radiator (**MCRA...**), to verify that it is free from sediment and/or blockages that might impair the efficiency of the heat exchange process: if necessary, blow the fins clean with compressed air (max. pressure 6 bar), taking care to direct the air jet parallel to the fins to avoid damaging them, and protecting any electrical components. Only if absolutely necessary, spray a detergent product compatible with the material from which the heat exchanger is made before blowing clean.

The interval for checking the condition of the heat exchanger and any maintenance work depends on the characteristics of the installation environment.



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

- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they may be fatal if swallowed.

Handle them with care using suitable personal protection equipment. Do not dump them into the environment and dispose of in accordance with applicable legislation.

Pay the maximum attention when using hazardous chemical detergents and take all the necessary precautions to ensure they are disposed of in compliance with the law.

Before re-starting the gear unit or the control unit, fill the gear unit and any relevant accessories with oil to the correct level.

Never run the control unit without the necessary guards in place. Always replace the guards before starting the unit.

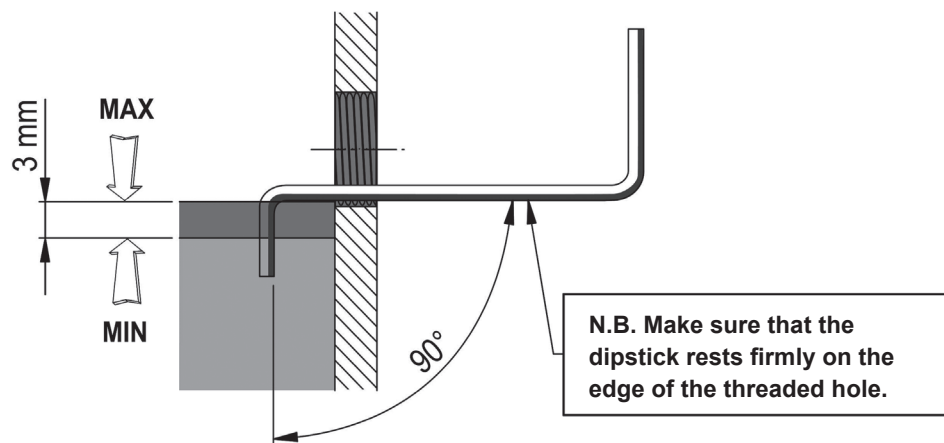
6.3 CHECKING THE OIL LEVEL

Oil level sight glass:

To check the correct level of oil refer to the mid point of the sight glass or to the marks on the dipstick. If the oil level is lower than the lower edge of the sight glass or the dipstick minimum mark, replenish the oil and locate the cause for the fall in level.

Overflow level plug:

Gear units equipped with certain options (e.g. Drywell device), may also be equipped with a yellow plug for use as an overflow level check. To check the oil level, first identify the yellow level cap on the gear unit. Remove the plug and insert a bar of the right size in the hole and of the shape shown in the figure. If the level is more than 3 mm below the spill level, top up and check the reason for the drop in oil level.



Gearboxes are normally fitted with yellow oil level plugs. Level plugs may be of the spill type or may require a dipstick (not supplied) to be inserted. In other cases, yellow level plugs have dipsticks incorporated.

To check the oil level using a spill type level plug, first identify the yellow level plug. Remove the plug and insert into the hole a rod of suitable size and of the shape shown in the above figure.

If the level is more than 3 mm below the spill level, top up and check the reason for the drop in oil level.

If the level plug has a dipstick incorporated, simply identify it by its yellow colour, remove it, and check that the level lies between the MIN. and MAX. markings.

If the level lies outside these marks, restore the correct level and identify the causes of the incorrect level.



6.4 OIL CHANGES

1. Place a suitable container under the drain plug.
2. Remove the filler and drain plugs and allow the oil to drain out.
3. Wait for a few minutes to ensure all the oil has drained out. Thoroughly clean the drain plug magnet (if fitted), fit a new seal and refit the drain plug.
4. With the gearbox installed in its final mounting position, fill it with oil to the mid point of the sight glass, or to the reference notch on the dipstick, or until oil starts to flow out of the level hole. Restore the type of oil indicated on the nameplate. Refer to chapter "Lubrication" for further details.
5. Fit a new seal, replace and tighten the filler plug.



Apply Loctite 510 to the thread of the plugs (or a product with similar properties and application range).



See the "Lubrication" section in this manual for details of the quantity of oil required. Specified quantities are only approximate. Gearboxes must be filled to the mid point of the sight glass, or to the reference notch on the dipstick, or until oil starts to flow out of the oil level hole, according to the mounting position specified on order.



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

- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they may be fatal if swallowed.

Handle them with care using suitable personal protection equipment. Do not dump them into the environment and dispose of in accordance with applicable legislation.



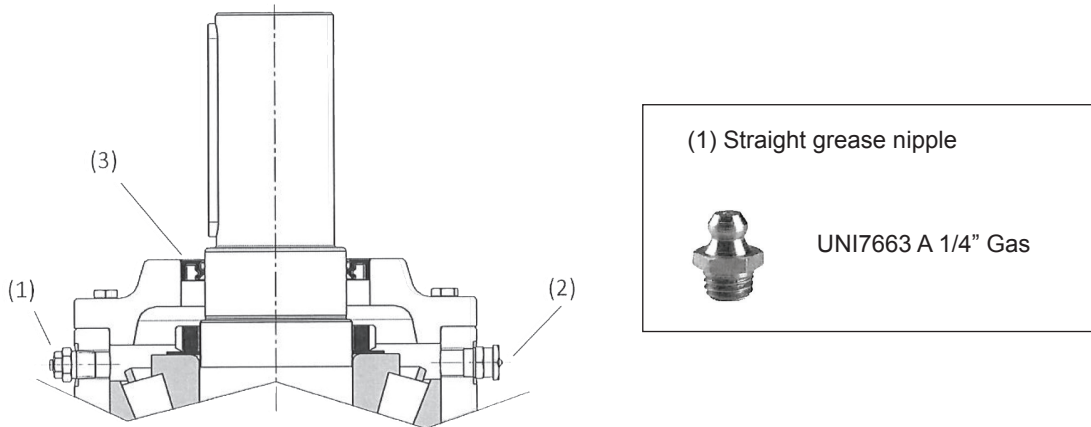
If a leak is found, identify the cause of the fault and repair it before topping up the lubricant and operating the unit.

6.5 RESTORATION OF BEARING GREASE FOR MOUNTING POSITIONS B6 OR B3 (INPUT J)

Gearboxes of sizes HDO 71... HDO 95 are supplied with the upper bearings lubricated with grease (not immersed in oil) and require periodic maintenance. The initial filling of the grease chamber of the bearings is foreseen directly in the company before supplying the gearbox. The grease must then be restored at regular intervals. The type of grease to be used is indicated in the "Lubrication" paragraph.

To restore the grease proceed as follows:

- Use the special grease nipple (1) to introduce the grease into the chamber containing the bearings.
- The vent valve (2) ensures that no overpressure is generated inside the chamber in order to avoid damage or movement of the lip of the sealing ring (3).



The quantities of grease shown in the table are of reference for its restoration.

Quantity of grease (Kg)			
HDO 71 2	0.030	HDO 91 2	0.060
HDO 71 3	0.030	HDO 91 3	0.045
HDO 71 4	0.015	HDO 91 4	0.030
HDO 81 2	0.050	HDO 95 3	0.045
HDO 81 3	0.030	HDO 95 4	0.030
HDO 81 4	0.025		

Depending on type of application and rotating speed of the input shaft, the restoration of the bearing grease must be carried out indicatively at the intervals shown in the following table:

Application	Grease interval of restoration [h]			
	Input shaft speed [min ⁻¹]			
	1000	1200	1500	1800
≤ 10 hour/day	4000	3000	2500	2000
> 10 hour/day	3000	2000	1500	1000

6.6 CLEANING

To clean dust, dirt and process residues off the gearbox, do not use solvents or other products that might be incompatible with the materials from which it is made, and do not direct high pressure jets of water on to the gearbox.

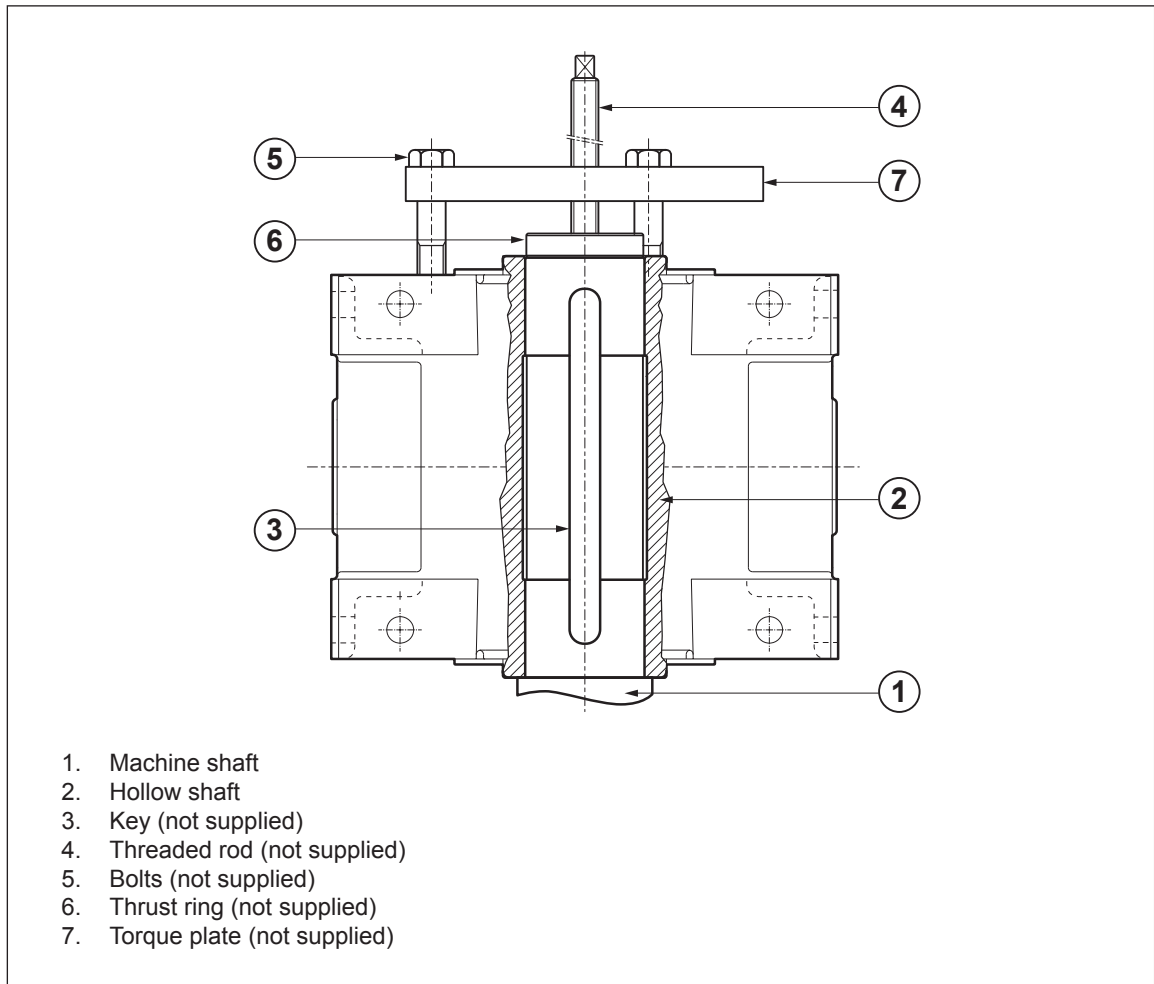


7 REMOVAL

7.1 REMOVING A GEARBOX WITH HOLLOW OUTPUT SHAFT AND KEYWAY

- Remove the device that secures the gearbox axially.

The machine shaft can be extracted in-situ using a hydraulic puller or the device shown in the figure below.



During the extraction process observe the maximum thrust values specified in the table below and take care to avoid knocks or misalignment.

(tab 22)



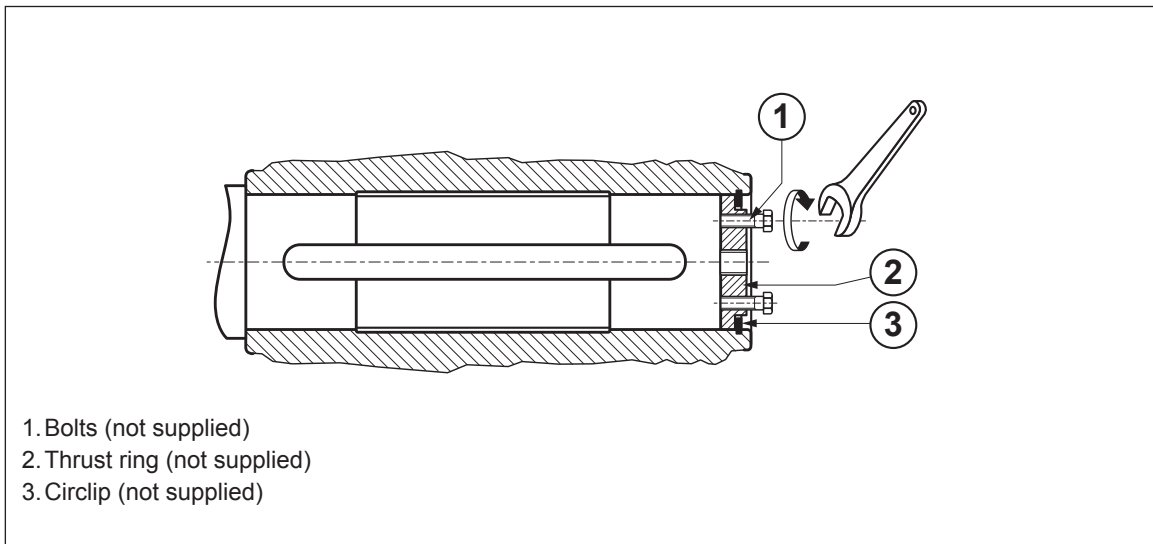
	HDP 60	HDP 70	HDP 80	HDP 90	HDP 100	HDP 110	HDP 120	HDP 125
Maximum thrust force [N]	25000	25000	40000	59000	59000	59000	76000	Contact the Manufacturer's Technical Service
	HDP 130	HDP 140	HDP 150	HDP 160	HDP 170	HDP 180		
Maximum thrust force [N]	122000	122000	122000	122000	Contact the Manufacturer's Technical Service			

(tab 23)



	HDO 71	HDO 81	HDO 91	HDO 95	HDO 100	HDO 110	HDO 120	HDO 125
Maximum thrust force [N]	25000	40000	59000	59000	59000	59000	76000	Contact the Manufacturer's Technical Service.
	HDO 130	HDO 140	HDO 150	HDO 160	HDO 170 - HDO 180			
Maximum thrust force [N]	122000	122000	122000	122000	Contact the Manufacturer's Technical Service.			

Alternatively proceed as shown in the figure below by turning the bolts one at a time.



7.2 REMOVING A GEARBOX WITH HOLLOW OUTPUT SHAFT AND SHRINK DISC

- Unscrew the fixing bolts gradually one at a time and then remove the shrink disc coupling.
- Extract the machine shaft as instructed in the section "DISASSEMBLING A GEAR UNIT WITH HOLLOW OUTPUT SHAFT WITH KEYWAY".



8 TROUBLESHOOTING

The following information is intended to serve as an aid in locating and eliminating defects and faults. In some cases, such problems may be caused by the plant or machine to which the gearbox is assembled and hence, the cause and remedy will be described in the Manufacturer's technical documentation for the machine/plant in question.

If any components fail or require replacement as a result of levels of wear likely to compromise the functioning of the gearbox, contact the Manufacturer's sales network.

8.1 Gear units:

FAULT	CAUSE	REMEDY
Bearing temperature too high.	Oil level too low.	Top up oil level.
	Oil too old.	Change oil.
	Bearings faulty.	Contact authorised workshop.
Operating temperature too high.	Oil level too high.	Check oil level.
	Oil too old.	Change oil.
	Oil contaminated.	Change oil.
Abnormal running noise.	Gears damaged.	Contact authorised workshop.
	Excessive axial play in bearings.	Contact authorised workshop.
	Bearings faulty or worn.	Contact authorised workshop.
	Excessive load applied.	Bring external loads into conformity with rated values specified in sales catalogue.
	Oil contaminated.	Change oil.
Abnormal noise at gearbox mounting.	Mounting bolts loose.	Tighten bolts to specified torque.
	Mounting bolts worn.	Replace mounting bolts.
Oil leaks.	Oil level too high.	Check oil level.
	Casing/coupling seals inadequate.	Contact authorised workshop.
	Gaskets worn.	Contact authorised workshop.
Gearbox does not run or runs with difficulty.	Oil viscosity too high.	Change oil (see recommended lubricant table).
	Oil level too high.	Check oil level.
	Excessive load applied.	Redesign transmission system to suit actual load.
Output shaft does not turn with motor running.	Gears damaged.	Contact authorised workshop.

8.2 Autonomous control units (MCRW... , MCRA...):

FAULT	CAUSE	REMEDY
Operating temperature too high.	No or insufficient oil circulation.	Check the speed and direction of rotation of the electric pump. Check that the filter is clean. Check that the control thermostat is functioning correctly. Check that the pressure switch is functioning correctly.
	Water/oil heat exchanger not working correctly (MCRW...).	Check the water supply circuit. Check that the solenoid valve is functioning correctly. Check that the heat exchanger is clean. Check that the control thermostat is functioning correctly.
	Air/oil heat exchanger not working correctly (MCRA...).	Check the speed and direction of rotation of the electric fan. Check that the heat exchanger is clean. Check that the control thermostat is functioning correctly.
Bearing temperature too high.	No or insufficient oil circulation.	Contact authorised workshop.
Unusual noise during functioning (in general) caused by no or insufficient pressure in the circuit.	No or insufficient oil circulation.	Check oil level. Check the used lubricant. Check that all components are correctly secured and sealed. Check that the electric pump is functioning correctly. Check that the filter is clean.
	Electric pump damaged or worn. Bypass circuit valve damaged or worn. Pressure switch damaged or incorrectly calibrated.	Contact authorised workshop.
	Suction pipe blocked.	Check that the pipe is clean.
	Operating temperature too high.	See relevant section.
Unusual noise during functioning (in general) caused by excess pressure in the circuit.	Oil too viscous.	Check the used lubricant. Wait for the gear unit to reach its normal operating temperature.
	Delivery pipes or components blocked.	Check that the pipes are clean. Check that the filter is clean. Check that the heat exchanger is clean.
Abnormal running noise (air/oil heat exchanger).	Electric fan damaged or worn.	Check that the electric fan is functioning correctly. Check that the heat exchanger is clean.
Oil leaks or excessive oil consumption.	Fittings loose.	Check correct tightness.
	Damaged seals.	Check correct tightness. Contact authorised workshop.
	Filter seals damaged.	Check correct tightness. Replace the filter element.
	Leaks in heat exchanger.	Contact authorised workshop.



FAULT	CAUSE	REMEDY
Water leaks (MCRW...).	Heat exchanger damaged or fittings loose.	Check the condition of the water heat exchanger. Check the water supply circuit.
Filters frequently become clogged with metal particles.	Oil too old or high level of impurities.	Replace oil.
	Electric pump damaged or worn.	Contact authorised workshop.
	Pipes or components blocked.	Check that the pipes are clean. Check that the heat exchanger is clean.
	Unusual wear of gear unit components.	Check the condition of internal components (gears, bearings, etc.).

9 DISPOSING OF THE GEARBOX



Make sure that the gearbox cannot function accidentally while it is being taken out of service.

The gearbox/gearmotor must be disposed of in compliance with environmental legislation, and the various materials used in its manufacture must be delivered to an authorised disposal/recycling centre.




The gearbox must only be taken out of service by operators trained in the observance of applicable laws on health and safety at work.

Do not dump non-biodegradable products, lubricants and non-ferrous materials (rubber, PVC, resins, etc.) into the environment. Dispose of all such materials as stipulated by current environment protection laws.

Do not re-use parts or components which appear to be in good condition after they have been checked and/or replaced by qualified personnel and declared unsuitable for use.



INDEX OF REVISIONS (R)

	BR_IOM_HDPO_ATX_ENG_R04_2
34	Added paragraph 5.4.2.2 "Grease lubrication".
39, 40	Updated tables 10 and 11.
48...58	Updated chapter "Lubrication".
58	Added mounting position definition "B3 flip over" for HDO 71... HDO 95 gearboxes.
76, 77	Added chapter "Bearing grease restoration for mounting positions B6 or B3".

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We have a relentless commitment to excellence, innovation & sustainability. Our team creates, distributes and services world-class power transmission & drive solutions to keep the world in motion.

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