

**Manuale Installazione Uso e Manutenzione
Riduttori Epicicloidali**

**Installation, Operation and Service Manual
Planetary Gearboxes**

**Handbuch für installation, betrieb und
wartung**

Planetengetriebe



ATEX included



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Revisions

The revision index of this manual can be found on the last page (p. 135).

The most up-to-date versions of Dinamic Oil S.p.A. catalogues and manuals are available at www.dinamicoil.com

1 GENERAL INFORMATION

The instructions contained in this manual are an integral part of the planetary gearboxes range.

All required information for purchasers and engineers is included on the dimensional drawings and data sheets provided in the proposal. In the absence of such information, the data provided in the catalogue should be considered correct.

In addition to adhering to rules of best practice in construction, this information should be carefully read and stringently applied. If in any doubt, contact the DINAMIC OIL S.p.A. technical assistance service.

These installation instructions have been designed for the safety of all persons carrying out assembly, transport, handling, installation, start-up and support on planetary gearboxes, however any other technical or specific documentation from the order must also be followed.

There may be attachments to this manual.

The manual is relevant to the following units:

- Planetary gearboxes

To comply with their "intended use", they must be operated as described in this manual, and in accordance with the other technical documents (data sheets, catalogues, etc.).

The manufacturer has designed these units for industrial uses. Any use, application and/or installation beyond those described in this manual and other technical documents (data sheets, catalogues etc.) must be agreed/approved by the DINAMIC OIL S.p.A. technical assistance service.

For the purposes of Directive 2006/42/EC on machinery, the gearbox is considered partly completed machinery which will be fitted onto other machines and/or installations. The gearbox must not be incorporated into them and used until all safety issues have been resolved, and it is not permitted to start up the final product (for its intended use) until it has been verified as compliant with Directive 2006/42/EC on machinery.

The customer must accept responsibility for compliance with the Directive 2006/42/EC on machinery and any other community directive relating to safety of machinery.

Planetary gearboxes can pose hazards to persons, animals and material goods. For this reason, all handling, transport, fitting, installation, start-up and support operations must only be carried out by personnel who are trained, qualified and authorised to carry out the task, and who are aware of the potential hazards.

Personnel must have the required qualifications for the task to be carried out, and have attested experience in handling, transporting, fitting, installing, starting up and supporting planetary gearboxes (see point 2).

1.1 TERMS AND SYMBOLS



Warning

Precautionary measures to be followed to ensure the safety of the operator and persons present in the working area, animals and objects.



Specialist, authorised personnel

Operations which must only be performed by specialist, authorised personnel.



Information

Important information or procedures.

Customer = Manufacturer of final machinery

Manufacturer of final machinery = Person fitting the "partly completed machinery" (gearbox) onto the final machinery

Manufacturer/Constructor = DINAMIC OIL S.p.A.



Oil fill / breather



Oil level



Oil drain



Instructions given next to the Ex symbol only apply to equipment compliant with the 94/9/EC "ATEX" directive.

Activities referenced by this symbol must only be performed by professionally qualified and authorised personnel with specific training on safety issues relating to areas with potentially explosive atmospheres.



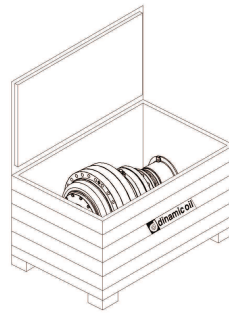
Failure to adhere to these instructions can pose serious risks to the safety of persons, animals and objects.

Instructions given next to the Ex symbol should be interpreted as additional instructions to those provided for installation, use and servicing of standard gearboxes, and not as a replacement.

1.2 SUPPLY



Upon receipt of the gearbox, check that it has not been damaged and that the item supplied matches the one ordered. If any of these conditions is not fulfilled, contact the DINAMIC OIL S.p.A. sales technical assistance service immediately.



DINAMIC OIL S.p.A. gearboxes are delivered in cases, pallets, carton pallets or simple cardboard boxes, which are carefully organised to prevent movement. The packaging material should be disposed of according to the national and international environmental standards in force.



Take the utmost care when unpacking.

The gearboxes are supplied as follows:

- Arranged for installation in the assembly position stated when the order was placed.
- **Without lubrication oil, unless otherwise provided for by contractual arrangement.**
- Painted externally with a red, water-based, anti-oxidising undercoat, unless otherwise provided for by contract. This protective coating is suitable for normal industrial environments, even outdoors, and allows further finishing coats of synthetic paint to be applied.
- The external machined parts of the gearbox, such as the outside of the shafts, the resting surfaces and centring units, as well as the internal kinematic mechanisms, require protection with anti-oxidising oil.

2 SAFETY INFORMATION



Follow the simple instructions given in the relevant parts of the manual to reduce or eliminate risk situations.

2.1 GENERAL SAFETY WARNINGS

- These safety warnings apply to all types of gearbox, gears and other Dinamic Oil S.p.A. products
- Safety warnings contained in the other chapters of this manual must also be adhered to
- The safety warnings must be adhered to at every stage of the product life cycles described in this manual (transport, handling, packaging, storage, installation/fitting, start-up/operation, servicing, dismantling/disposal)
- Failure to adhere to the safety warnings can pose serious health risks and harm to objects and animals
- If in any doubt about the safety warnings, contact the Dinamic Oil technical assistance service
- The personnel that this manual is addressed to must have attested experience and be authorised to carry out the operations
- While performing the various operations, personnel must also adhere to national and international standards on safety and safe working practices
- Installing and operating damaged units can pose serious safety risks
- Serious harm can be caused to persons, animals or objects as a result of:
 - Improper use
 - Incorrect installation or use
 - Unauthorised removal of protection systems
- The following risks arise during and after gearbox operation:
 - Overheated parts
 - Moving parts
 - Parts under pressure



Before carrying out any task, personnel responsible for installation, use and servicing in areas with potentially explosive atmospheres must carry out all necessary environmental safety measures (e.g. degassing or removal of residual dust, etc.).

2.2 SAFETY WARNINGS FOR HANDLING WHEN UNPACKING AND TRANSPORTING

See point 4, "Transport, handling and storage".

2.3 SAFETY WARNINGS FOR USE AND OPERATION

Adhere to the information in the data sheet.

2.4 SAFETY WARNINGS FOR INSTALLATION AND ASSEMBLY

Adhere to the information in the data sheet.

2.5 SAFETY WARNINGS REGARDING ENVIRONMENTAL IMPACT

Units must be disposed of according to the environmental standards in force.

2.6 SAFETY AND INFORMATION NOTICES

Manufacturers carrying the CE mark are responsible for applying safety and information notices.

2.7 CONSTRUCTOR LIABILITY

The constructor will not be held liable in the event of:

- Gearbox being used contrary to national laws on safety and safe working practices
- Incorrect installation, inadequate or incorrect observance of the instructions given in this manual
- Electrical or hydraulic power supply failure (for motor gears)
- Alteration or tampering
- Operations performed by untrained, unqualified or unauthorised personnel
- Use, applications or installations beyond the instructions given the data sheets or this manual that have not been approved by DINAMIC OIL S.p.A.

The safety of the gearbox also relies upon strict observance of the instructions given in this manual, and in particular:

- The gearbox must only be operated within its limitations of use (see data sheets, catalogues etc.)
- Diligent routine servicing must always be carried out
- Operators assigned to inspection and servicing must be sufficiently trained
- Only original spare parts must be used
- The configurations shown on the dimensional drawings and their instructions in the catalogue are the only ones permitted
- Do not attempt to use the gearbox in any other way than indicated by the provided instructions
- The instructions given in this manual are supplementary to, and do not replace, obligations in legislation on safety standards in force

2.8 RESIDUAL RISKS

Residual risks are potential hazards which cannot be eliminated or can only be partially eliminated, and which can harm the operator if incorrect methods or working practices are used.

Note	Directive 2006/42/EC Annex I	Description	Remarks
19	1.3.4	Risks posed by surfaces, edges or angles	Correct and non-hazardous positioning is the responsibility of the customer
22	1.3.7	Risks related to moving parts	Protection of the operator from potential risks related to moving parts is the responsibility of the customer
23	1.3.8	Choice of protection against risks arising from moving parts	Protection of the operator from potential risks related to moving parts is the responsibility of the customer
25	1.4.1	General requirements for guards and protective devices	The choice of requirements for guards and protective devices is the responsibility of the customer
26	1.4.2.1	Fixed guards	Fitting any fixed guards is the responsibility of the customer
28	1.4.2.3	Adjustable guards restricting access	Fitting any adjustable guards restricting access is the responsibility of the customer
29	1.4.3	Special requirements for protective devices	The choice of special requirements for protective devices is the responsibility of the customer

2.9 REASONABLY EXPECTED INCORRECT USES

Incorrect use of the partly completed machinery is defined as a use different from that described in the instructions of this manual and the data sheets, but which is reasonably expected human behaviour:

- Negligence on the part of the operator to follow the instructions in this manual
- Instinctive reactions of the operator
- Lack of concentration or carelessness during installation or servicing
- Behaviour resulting from the pressure to keep the machine running under any circumstance



3 TECHNICAL INFORMATION

3.1 GENERAL DESCRIPTION OF THE MACHINE

DINAMIC OIL S.p.A. gearboxes have been designed and built to be incorporated into and powered by an electric or hydraulic motor, in finished devices or systems for use in industrial sectors such as construction, chemical, mechanical, agri-foodstuff, transport, naval, etc., once the constructor has resolved all problems relating to the safety of final regulations in accordance with Directive 2006/42/EC on machinery and other community directives (e.g. ATEX).

For certain applications and to satisfy specific requirements, the gearbox may be supplied in various structural forms and configurations, including a range of accessories and optional modifications. For all the technical and information and descriptions about these, see the relevant sales catalogue.

It is the user's responsibility to use the gearbox in a correct manner, adhering to the warnings given in this manual.

 	<p>Gearboxes approved for use in a potentially explosive atmosphere must be labelled with the appropriate identification plate, and are protected and manufactured to comply with the Essential Safety Requirements (ESR) in Annex II of the 94/9/EC "ATEX" directive. They comply with the following:</p> <ul style="list-style-type: none">• Equipment group: II.• Category: Gas 2G – Dust 2D.• Zone: Gas 1 – Dust 21.• Maximum surface temperature: temperature class T4 for 2G and 130 °C for 2D.
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3.2 CONDITIONS AND RESTRICTIONS OF USE





The gearbox may only be installed in the position indicated on the identification plate. Any change to its installation position must be authorised by DINAMIC OIL S.p.A.

The recommended ambient temperature for use of standard gearboxes is: min. -15 °C; max. +40 °C

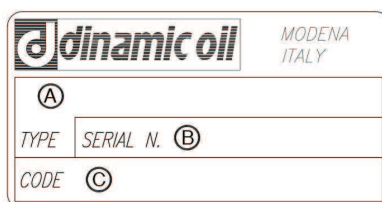
Using the gearbox in aggressive environments, in water or other liquids is not permitted unless agreed during the planning stage.

Unless duly marked (ATEX plate), it is not permitted to use the gearbox in potentially explosive atmospheres or where explosion-proof equipment is required.

 	<p>If it does not have a plate, the gearbox is not permitted to be used on machinery operated in potentially explosive atmospheres. If it is, liability for improper use or any harm to persons, objects or animals rests with the customer.</p> <p>Values for maximum surface temperatures relate to measurements in standard environmental conditions and a standard installation. Variations to these conditions, however small, including narrowed openings, external heat sources, areas exposed to solar radiation etc., can have considerable effects on the build-up of heat.</p> <p>Any modification to the structural form or installation position can pose potentially serious hazards to the safety of persons, animals or objects. If these modifications are not approved and authorised by Dinamic Oil S.p.A. the ATEX certification is rendered void and all liability rests with the customer.</p>
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3.3 TECHNICAL DATA

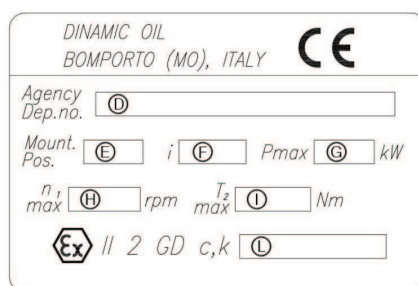
The gearboxes are equipped with identification plates containing the unit's main technical and manufacturing information. To interpret the product description (A), refer to the sales catalogue.



- A) Product description/customer code*
- B) Serial number (week, year, identifying number)
- C) Product code

*The product description may be replaced by a code supplied by the customer.

Gearbox plate with ATEX option:

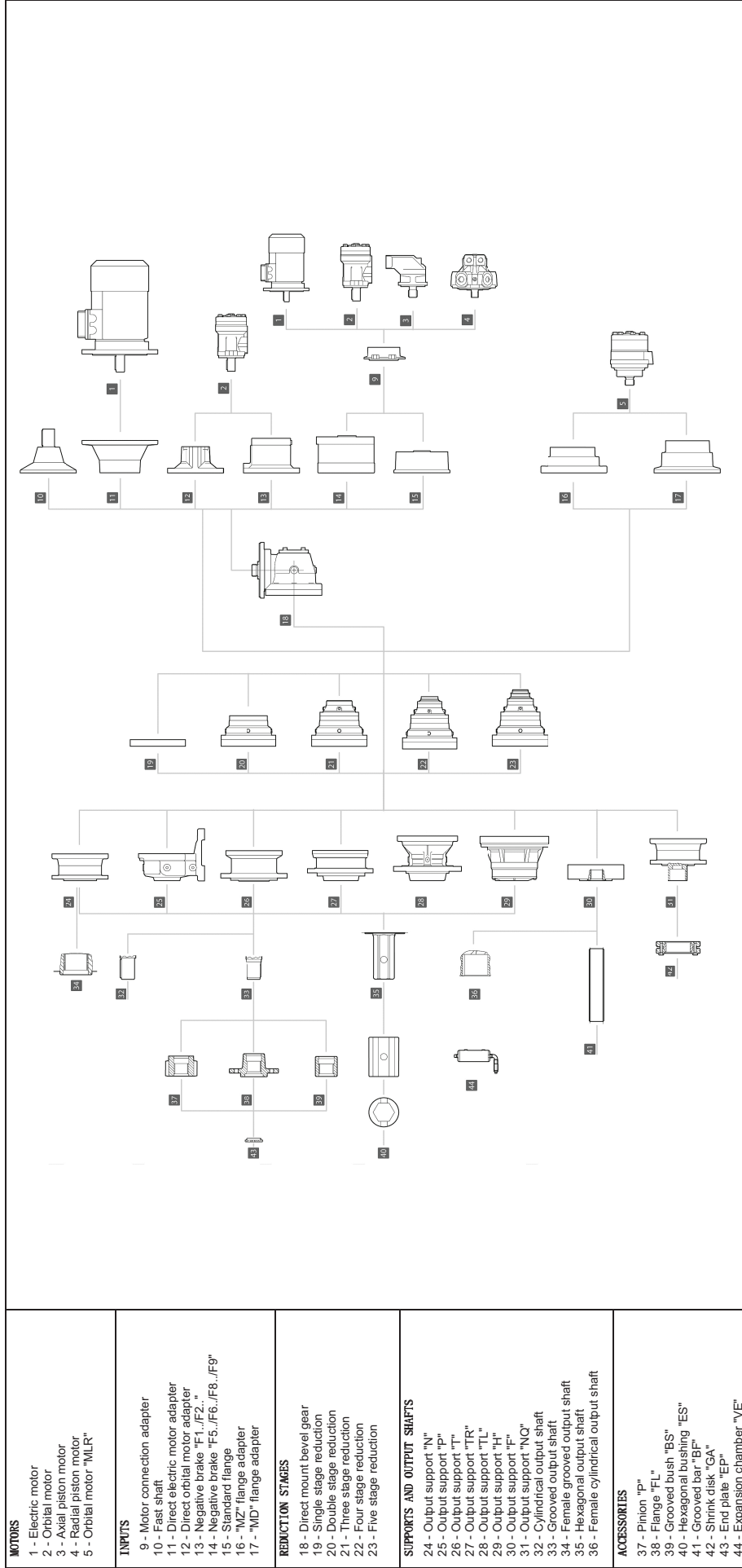


- D) Number/registration body
- E) Permitted assembly position
- F) Reduction ratio
- G) Maximum applicable power in kW with mechanical yield = 0.97 for each reduction stage, input speed = 1500 rpm, ambient temperature = 20 °C, altitude = 0/500 m
- H) Maximum input revolutions allowed for the connected electric motor in revs/minute
- I) Maximum transmissible applicable output torque in Nm
- L) Mark of conformity according to Directive 94/9/EC

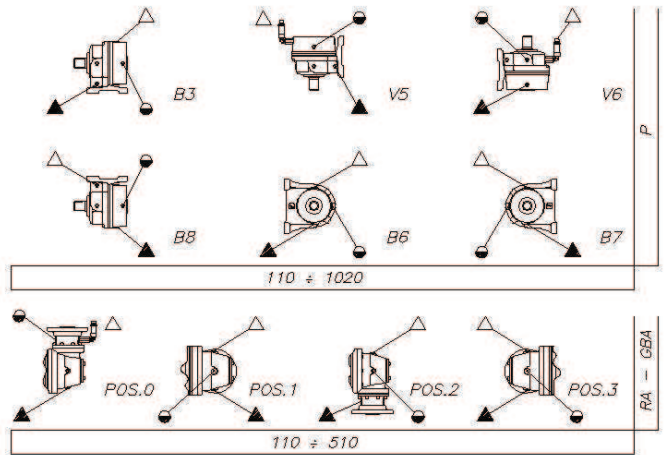
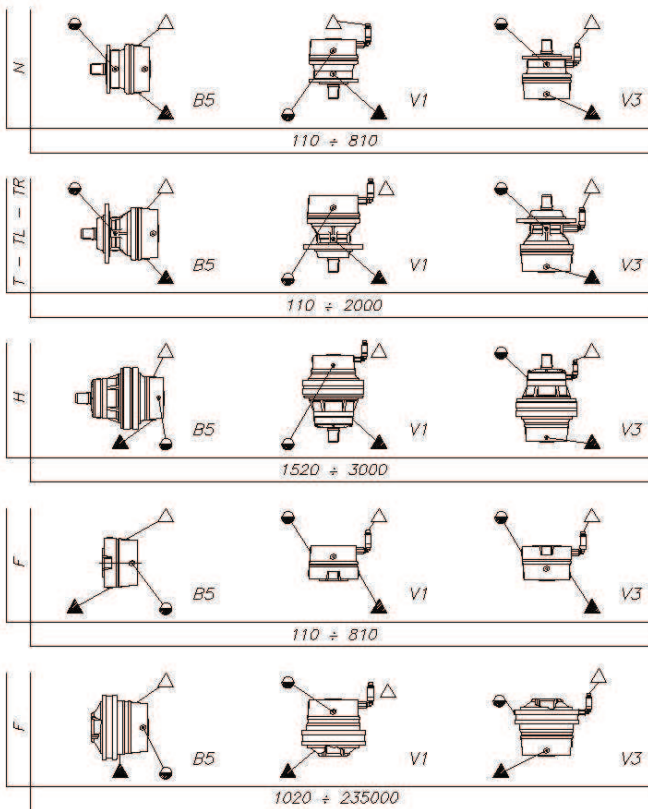
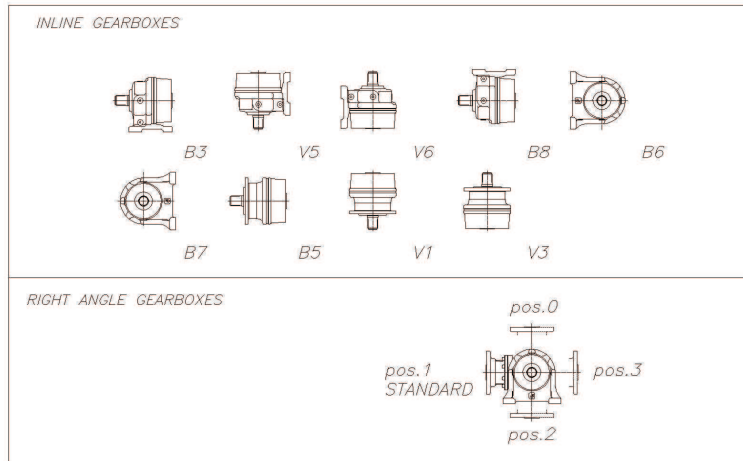


Ensure the identification plate is kept clean and clearly visible. If even one item of information on it is no longer legible, request a copy from the manufacturer and replace it.

3.4 STRUCTURAL FORMS



3.5 DESIGN FORMS



4 TRANSPORT, HANDLING AND STORAGE



Handling-trained personnel trained must ensure the required safety conditions are enforced for themselves and for persons in the vicinity.

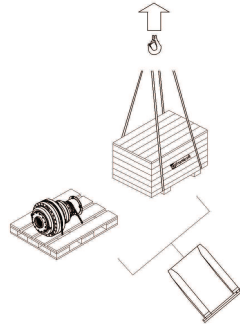


The cases only have load-bearing structure on the bottom, with the other sides for coverage only. Those structures must therefore not be loaded.

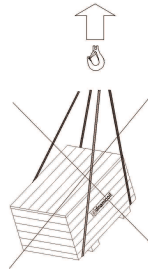
4.1 HANDLING OF PACKAGING

Before handling the packaging, prepare an appropriate, marked out area with paving and a flat surface for unloading and placing the packages on the ground.

When moving the package, use appropriate methods (e.g. forklift trucks, cranes or transpallets) for the type of packaging, all in perfect working order, taking into consideration the packaging's size, weight and centre of gravity.



Keep the packages level to prevent them from tipping over during handling.



Use accessories that comply with the directive on machinery, and which are suitable for the weight to be lifted.



The weight, gripping points and centre of gravity of the package to be handled are shown on the package.

4.2 HANDLING OF EQUIPMENT

Before taking the gearbox out of its packaging, prepare the relevant lifting accessories (e.g. chains, bands, grills, eyebolts etc.), or handle it using a pallet as a resting platform.



Take the utmost care when unpacking.

Use accessories that comply with the directive on machinery, and which are suitable for the weight to be lifted.

Lift the gearbox, taking care not to unbalance the load while moving.



Refrain from making abrupt movements and perform an initial slow manoeuvre to ensure that the load is balanced.

Move and lay down the gearbox in the area prepared for unloading.

Examples are given below of the lifting points for the main DINAMIC OIL S.p.A. gearbox designs.



The weight of the equipment to be lifted can be found in **Annex 1**.

4.3 STORAGE

For correct storage of the units, the following steps must be taken:

- For storage for over **2 months**, protect the coupling surfaces, such as the flanges, shafts and joints, with a very thin layer of grease and/or protective anti-corrosion fluids.
- Store in a dry place with temperatures of between -5 °C and +30 °C.
- Always place wooden planks or a platform made of other materials between the unit and the floor, to prevent direct contact.
- Do not stack the packages.
- Check the internal gears regularly by rotating the input shaft manually.

If the unit is fitted with negative lamellar brakes, release the brake with a hydraulic pump or suchlike.

- Before starting up the unit, we recommend you replace the washers of the static and rotary seals.
- For storage for over **6 months**, fill the gearbox with the same type of oil as the oil that is planned to be used when operational, placing the vent cap in the upper part of the gearbox.

Before starting up, fill the gearbox with the right amount of oil.

The static and rotary seals will begin to deteriorate after 6 months.

SAFETY PRECAUTIONS WHEN RESTORING THE GEARBOX AFTER STORAGE

All surfaces contaminated with lubricants, protection, solvents, dust or other potentially flammable material must be carefully cleaned (commercial solvents).

This operation must be performed away from the area with the explosion hazard.

The solvent must not come into contact with the seal rings, avoiding damage to the equipment and compromising its functionality.

Grease used for the bearings must strictly be synthetic in nature.

When filling with lubricating oil, check the amount of oil required for each gearbox size (Annex 1 of this manual).

Place the gearbox in the assembly position indicated on the plate and check the right amount of oil using the level caps. Once filled, wait 15-30 minutes for the oil to stabilise and top up if necessary.

When testing, check that the oil level in the gearbox is correct and top up if necessary.

When topping up, ensure the gearbox is taken out of service and take care with hot surfaces to avoid serious harm to persons, animals or objects.

Filling and topping up must be performed by expert and authorised personnel, away from the area at risk of explosion.

For the initial oil filling and any top ups, only the recommended oils should be used.



5 INSTALLATION AND ASSEMBLY



Gearboxes must be installed carefully and professionally, by suitably trained and technically skilled authorised personnel.



All the installation operations must be performed to ensure maximum safety levels are guaranteed for both workers and third parties and that the gearbox operates correctly and safely.

Before installing the gearbox, check that it is in the correct assembly position.

- Tampering with the gearbox and any of the accessories fitted during production is strictly prohibited
- When any lifting and handling manoeuvres are carried out, care must be taken to ensure the end of the shaft does not hit anything. The relative hoisting straps and/or eyebolts must be used, suitably arranged, and with hoisting means whose capacity is sufficient for the job
- Welding operations on gearboxes are strictly prohibited without suitable protection
- Any installation work or servicing must be carried out with the gearbox stationary, therefore it is recommended that you ensure the gearbox cannot be switched on accidentally
- In the event of connections involving the use of rotary parts such as shafts, joint or pulleys with belts, suitable accident prevention gear must be provided

5.1 DIRECTION OF ROTATION

When making the connection, check the direction of the shafts depending on the input attached and using the figures below for reference.



Installing gearboxes compliant with Directive 94/9/EC

- Category 2D gearboxes must be installed according to EN 1127-1 and EN 50281-1-2 standards, and the installer must therefore have complete mastery of these.
- The installer must know the ATEX classification of the installation zone, as well as the risks of a potentially explosive atmosphere in the environment, with particular emphasis on explosion and fire hazards, so that the relevant protection measures are taken.
- All servicing, fitting and dismantling must be performed **away from the area at risk of explosion** by qualified and authorised personnel.
- Check that accessory parts (cables, joints, cable glands, heat exchangers etc.) are also compliant with the essential safety requirements of the ATEX directive. They must be handled with extreme care so they are not altered in any way.
- Remove the screws from the threaded seat if they are required to fasten the gearbox. Do not damage the coupling surfaces.
- When installing gearboxes equipped with a reaction arm, prevent friction from being produced between the moving metal parts when operational. If required, install non-metal anti-friction parts compliant with 94/9/EC.
- Do not attach any object to the unit with electrical resistance greater than 10 Ω .
- Take relevant measures to prevent hazardous dust/liquid from accumulating near the seals of the protruding shafts and to protect the machinery.
- If the gearbox motor is installed vertically downwards, the electric motor must be equipped with a protective cover.
- The axes between the output shaft and any pulleys or other transmission units must be completely parallel.
- The gearbox must only be installed in the structural form and assembly position specified in the order.
- If the gearbox was originally supplied without lubricant it must be installed as such, and only filled with lubricant afterwards.
- Secure the gearbox to a flat, vibration-damping surface which is sufficiently resistant to torsion.
- Take care not to deform the contact surfaces, feet and/or assembly flanges by over-tightening the screws.
- When fastening gearboxes, screws of at least grade 8.8 quality must be used.
- Ensure that no loads are placed on the gearbox greater than those given in the data sheets.
- The vent caps and level check caps for the oil must be freely accessible and readily serviceable.
- Arrange for the gearbox to be cleaned once the installation phase is complete.
- Arrange for the gearbox to be earthed to avoid a build-up of static charge.



5.2 SERIES RE/GB GEARBOX DESIGNS



General information unless otherwise indicated on the relevant data sheets.

5.2.1. Flanged design

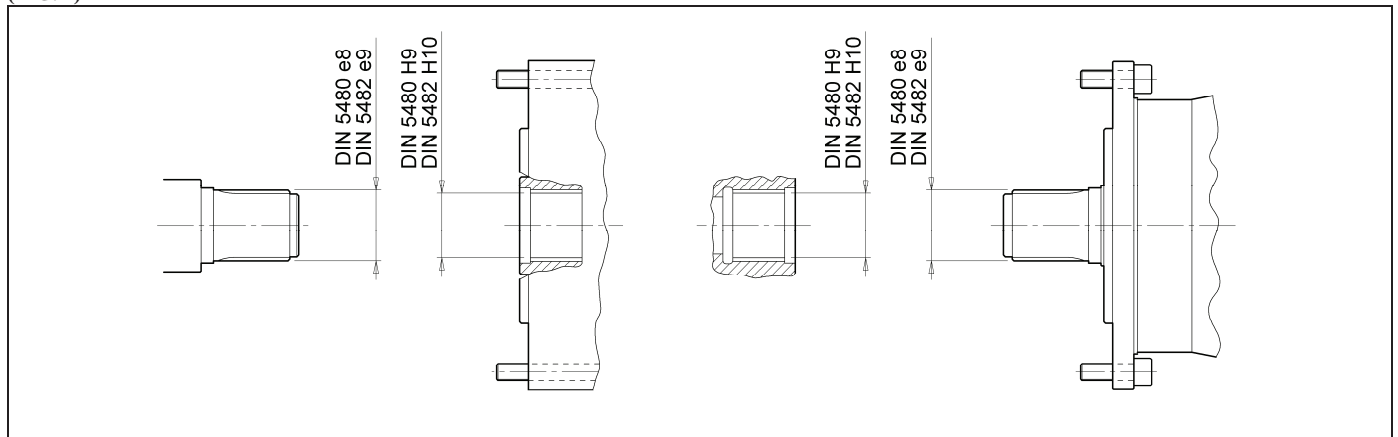
SIZES UP TO RE2000:

Prepare the coupling counterflanges on the unit or system on which they are to be installed.

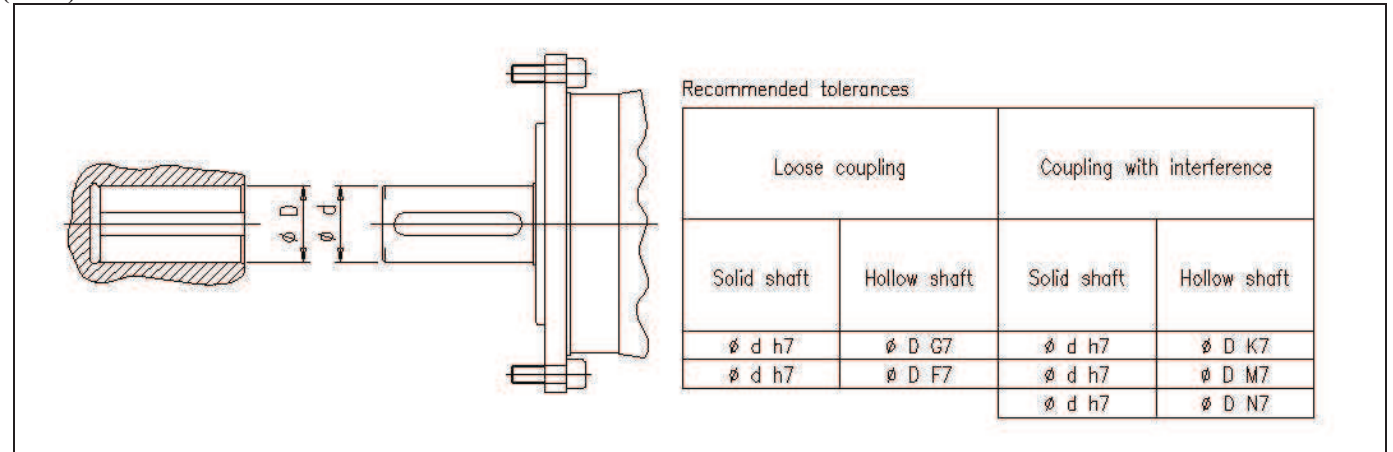
The surfaces where the gearboxes will be coupled with the flange must be flat and worked with a machine tool.

Connect the output shaft to the mechanism to be controlled following the instructions given in the drawings below (FIG. 1), (FIG. 2) and (FIG. 3).

(FIG. 1)



(FIG. 2)



(FIG. 3)

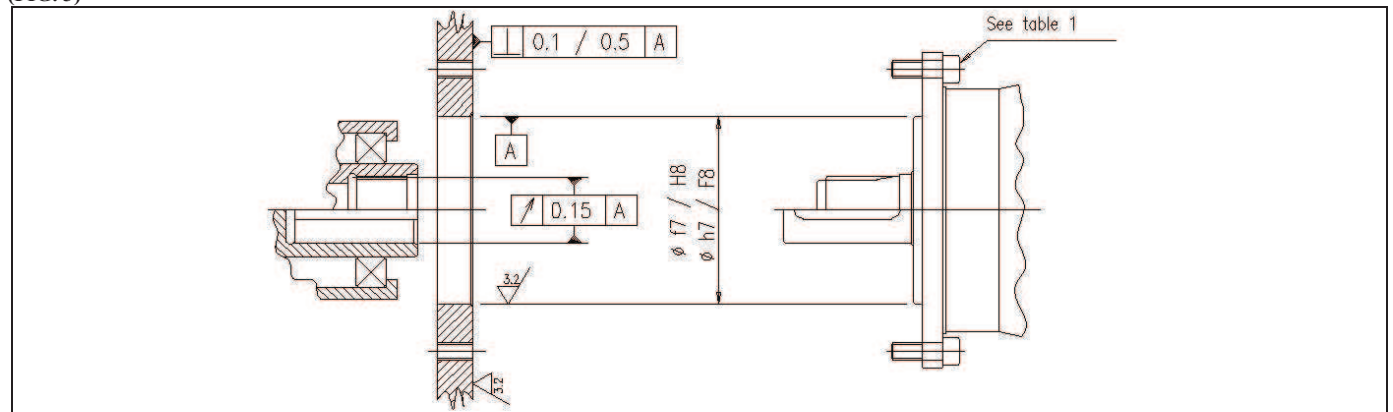


Table 1

Sizes		110N	110T	110TR	110T1	110TR1	210N	210T	210TR
Screw		M10	M10	M10	M12	M12	M10	M10	M10
Quantity	No.	8	10	10	10	10	8	10	10
Class		8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Tightening torque	Nm	44	44	44	77	77	44	44	44
Maximum torque tolerated by screws	Nm	2,400	3,528	5,153	3,528	5,153	2,400	3,528	5,153

Sizes		210T1	210TR1	240T	240TR	310N	310T	310TL	510/610N
Screw		M12	M12	M12	M10	M12	M12	M12	M12
Quantity	No.	10	10	10	10	10	10	10	10
Class		8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Tightening torque	Nm	77	77	77	44	77	77	77	77
Maximum torque tolerated by screws	Nm	3,528	5,153	5,153	5,126	5,153	6,474	6,474	5,153

Sizes		510/610T	510/610TL	810N	810T	1020T	1520T	2000T
Screw		M12	M12	M14	M14	M16	M16	M16
Quantity	No.	10	10	12	12	10	10	10
Class		8.8	8.8	8.8	8.8	8.8	8.8	8.8
Tightening torque	Nm	77	77	122	122	191	191	191
Maximum torque tolerated by screws	Nm	6,474	6,474	10,860	10,860	14,493	14,493	14,493

For transmission torques greater or equal to those given in the table and with frequent motion inversions, use screws with a resistance class of at least 10.9.

(FIG. 4)

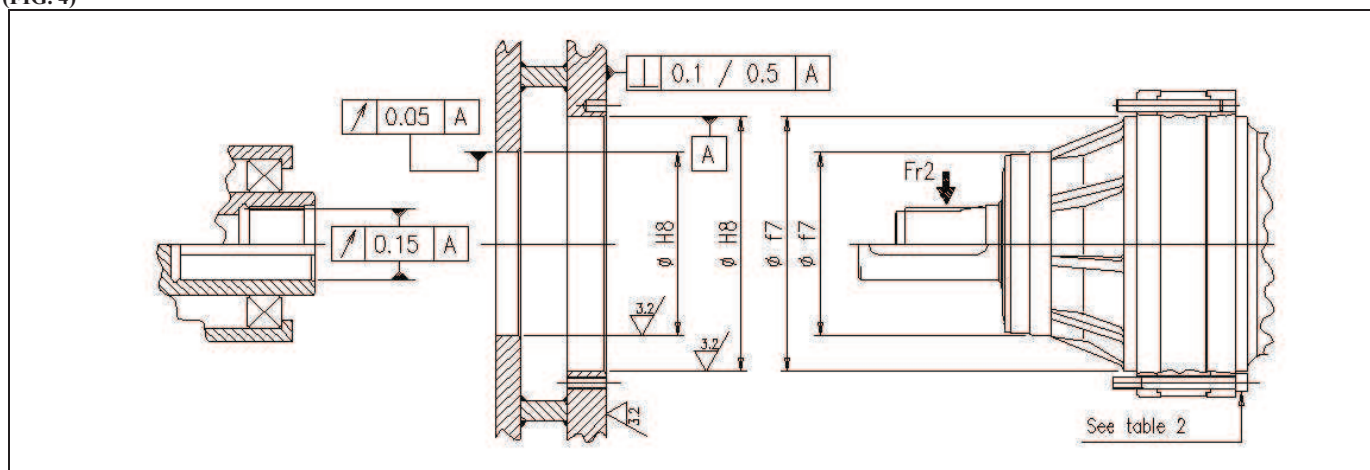


Table 2

Sizes		1520H	2000H	2520H	3000H	3510H	4800H	6000H	8000H	12010H	16000H
Screw		M16	M16	M16	M16	M16	M16	M18	M18	M24	M24
Quantity	No.	16	16	21	21	24	24	36	36	36	36
Class		12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	8.8	8.8
Tightening torque	Nm	323	323	323	323	323	323	444	444	645	645
Maximum torque tolerated by screws	Nm	31,240	31,240	46,014	46,014	63,276	63,276	108,782	108,782	148,572	148,572

Sizes		21000H	26000H	31000H	40000H	45000H	53000H	61000H	85000H
Screw		M27	M27	M30	M30	M30	M36	M36	M36
Quantity	No.	36	36	36	36	36	36	36	36
Class		8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Tightening torque	Nm	944	944	1,282	1,282	1,282	2,240	2,240	2,240
Maximum torque tolerated by screws	Nm	342,309	342,309	512,633	512,633	512,633	940,487	940,487	940,487

Sizes		110000H	130000H	150000H	205000H	235000H
Screw		M42	M42	M42	M42	M42
Quantity	No.	40	40	40	48	48
Class		8.8	8.8	8.8	8.8	8.8
Tightening torque	Nm	3,582	3,582	3,582	3,582	3,582
Maximum torque tolerated by screws	Nm	2,038,800	2,038,800	2,038,800	2,038,800	2,038,800

For transmission torques greater or equal to those given in the table and with frequent motion inversions, use screws with a resistance class of at least 10.9.

5.2.2. Female grooved shaft design

Ensure that the gearbox and the driven shaft are aligned and that the latter is not exposed to bending during operation. See drawing (FIG. 5).

(FIG. 5)

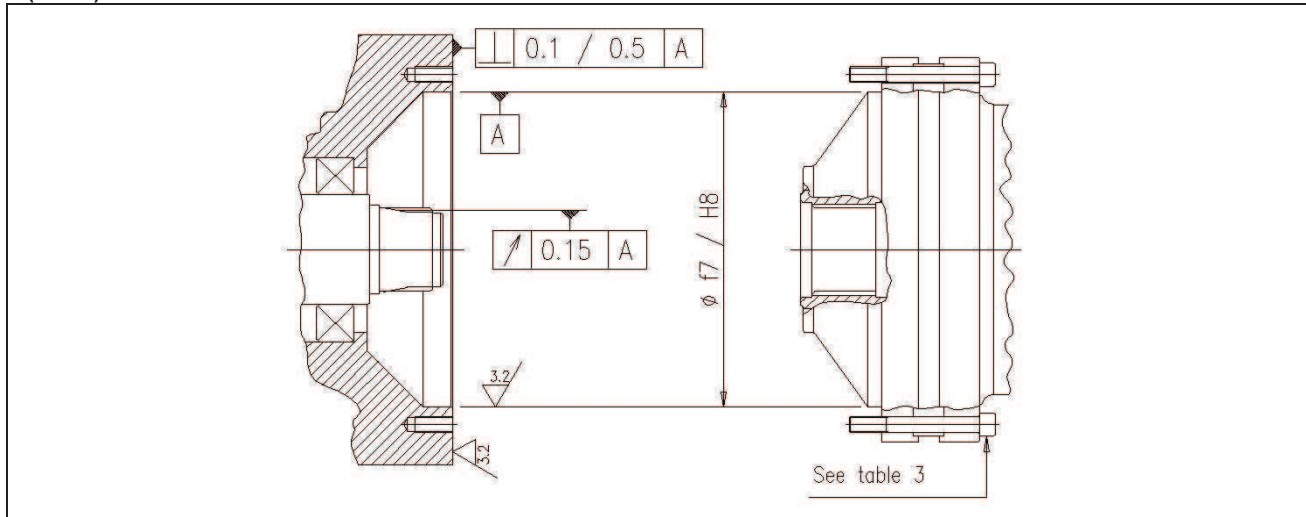


Table 3

Sizes		110FS	210FS	240FS	310FS	510FS	810FS	1020FS	1520FS	2000FS
Screw		M10	M10	M10	M10	M10	M12	M12	M16	M16
Quantity	No.	8	8	8	12	12	12	16	16	16
Class		12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
Tightening torque	Nm	75	75	75	75	75	130	130	323	323
Maximum torque tolerated by screws	Nm	4,050	4,050	4,050	8,175	8,175	14,180	18,907	31,240	31,240

Sizes		26000FS	31000FS	40000FS	45000FS	53000FS	61000FS	85000FS
Screw		M27	M30	M30	M30	M36	M36	M36
Quantity	No.	36	36	36	36	36	36	36
Class		8.8	8.8	8.8	8.8	8.8	8.8	8.8
Tightening torque	Nm	944	1,282	1,282	1,282	2,240	2,240	2,240
Maximum torque tolerated by screws	Nm	342,309	512,633	512,633	512,633	940,487	940,487	940,487

Sizes		110000FS	130000FS	150000FS	205000FS	235000FS
Screw		M42	M42	M42	M42	M42
Quantity	No.	40	40	40	48	48
Class		8.8	8.8	8.8	8.8	8.8
Tightening torque	Nm	3,580	3,580	3,580	3,580	3,580
Maximum torque tolerated by screws	Nm	2,038,800	2,038,800	2,038,800	2,038,800	2,038,800

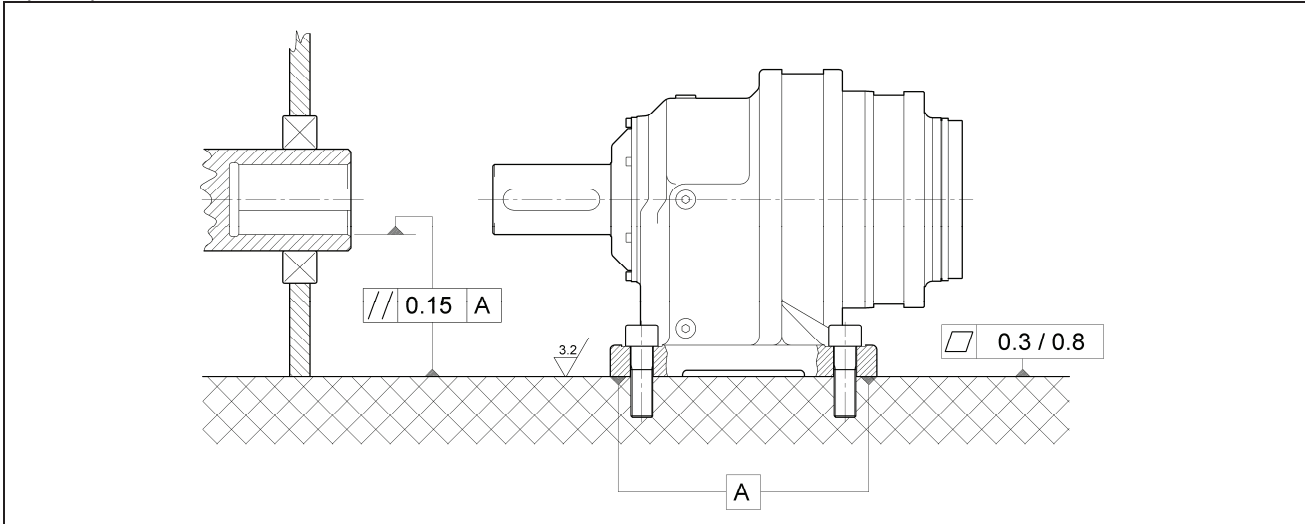
For transmission torques greater or equal to those given in the table and with frequent motion inversions, use screws with at least class 10.9 resistance.

5.2.3. Design with feet

These gearboxes must be fastened to a suitably sturdy base worked with a machine tool and with a maximum planarity error of 0.3 mm/0.8 mm.

See drawing (FIG. 6).

(FIG. 6)



5.2.4. Pendular design

Fasten the reaction arm to the gearbox with screws with a minimum resistance class of 8.8 tightened to a torque corresponding to 70 % of their yielding load.

Clean and degrease the shafts' coupling surfaces.

Apply a thin layer of lubrication to the outer surface of the joint, then fit it on the gearbox shaft. Tighten an initial group of 3 screws. Couple the gearbox with the shaft to be controlled. Tighten the screws gradually, proceeding in a circular direction and tightening several times to ensure all the screws are tightened to the torque stated in table 4, depending on the type of joint/gearbox.

See drawing (FIG. 7).

Note: Do not tighten diametrically opposed screws in a row.

(FIG. 7)

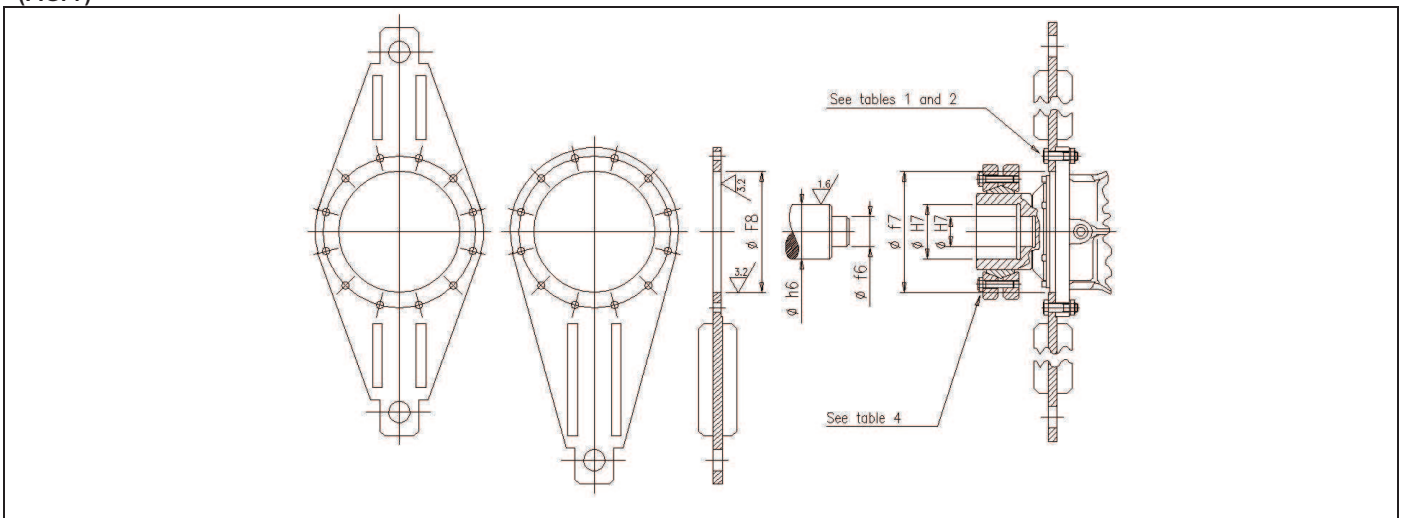


Table 4

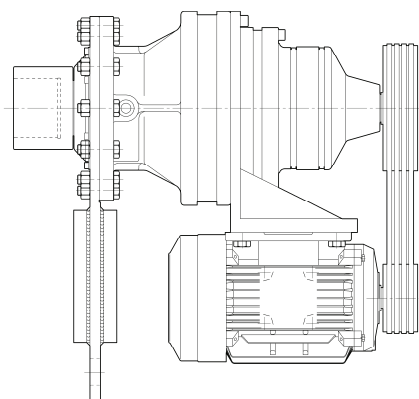
Sizes		110	210	240	310	510/610	810	1020	1520	2000
Screw		M6	M6	M8	M8	M8	M8	M16	M16	M16
Quantity	No.	10	10	12	12	12	12	10	16	16
Class		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	13	13	31	31	31	31	270	270	270

Sizes		2520	3000	3510	4800	6000	8000	12010	16000
Screw		M16	M16	M16	M16	M16	M16	M20	M20
Quantity	No.	21	21	24	24	36	36	36	36
Class		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	270	270	270	270	270	270	525	525

Sizes		21000	26000	31000	40000	45000	53000	61000	85000
Screw		M20	M20	M20	M24	M24	M24	M24	M24
Quantity	No.	36	36	36	36	36	36	36	36
Class		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	525	525	525	907	907	907	907	907



To prevent abnormal loads on the gearbox bearings if the motor is coupled directly, it must be integral to and therefore pendulate with the gearbox.



5.3 CONNECTIONS

Fasten the input and output mechanisms connecting to the gearbox without striking them with hammers or suchlike. Use the service screws and the threaded holes on the shafts for inserting the mechanisms.

Before fitting the connecting mechanisms, remember to clean the shafts to remove any traces of grease and/or protective treatments.



To meet the requirements of areas at risk of explosion between coupled areas with friction hazards and therefore flashing hazards, material must be used to avoid this (rubber pastes, rubber or teflon inserts, sealant). It is the responsibility of the customer to apply such measures.

Use a suitable quantity of sealant as Loctite 510 or suchlike for the gearbox input couplings with the motor and the output drivers to the customer's machine. This sealant must be compatible with the ATEX installation area to avoid dust and foreign bodies from entering.

5.4 INPUT CONNECTIONS



After verification that all the instructions in the following manual and specified above have been correctly observed, if a gearbox motor compliant with Directive 94/9/EC is desired, the motor to be fitted must have equal or greater ATEX protection to that of the gearbox.



Dinamic OilS.p.A. will not be held liable for any risks in fitting the gearbox-motor unless the entirety is directly supplied.

5.4.1. Connection to hydraulic motor

Remove the protective cap (version F1/F2 only).

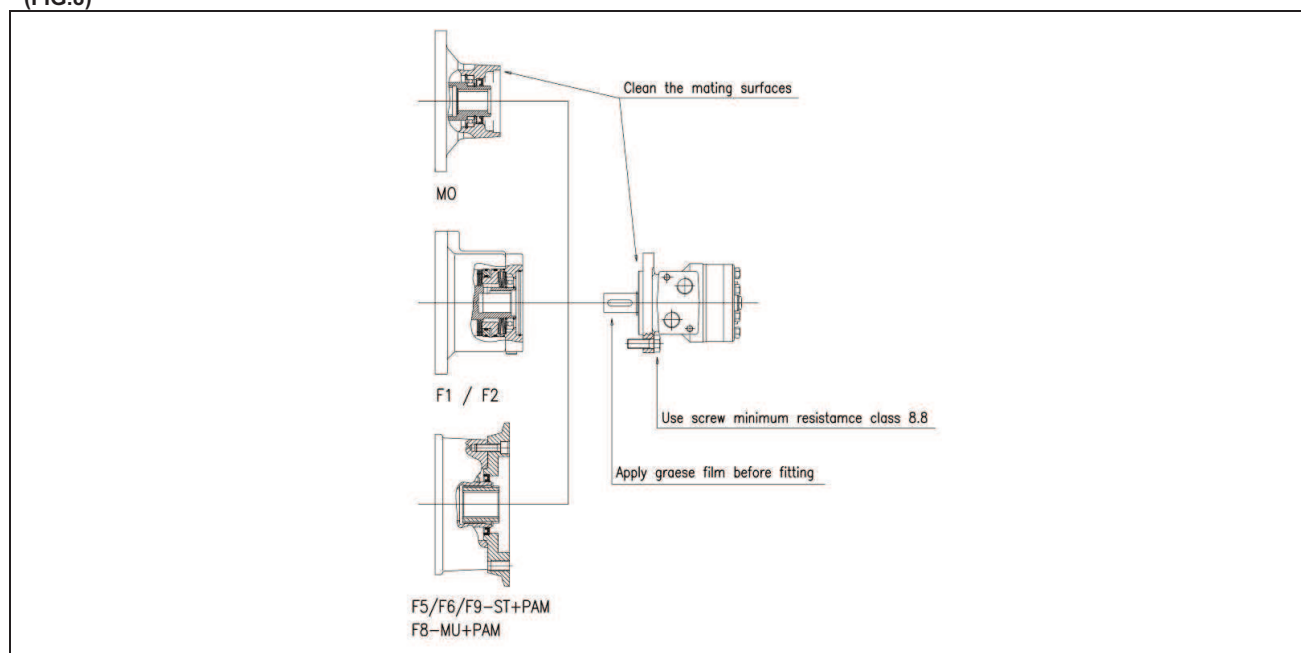
There are two types of set-up for hydraulic motors:

1 MO, F5/F6/F8/F9 and ST/MU+PAM versions: the oil seal is guaranteed by the ring fitted on the joint on the motor; you will simply need to apply a thin layer of oil to the driving shaft.

2 F1/F2 version: fit the O-Ring which guarantees the seal between the motor and the brake, taking care to fit it correctly in its seat without damaging it.

See drawing (FIG. 8).

(FIG.8)



5.4.2.Connection to electric motor

If the motor in question is a particularly high power motor (ME-225 and above), use B3-B5 motors with suitable supports.

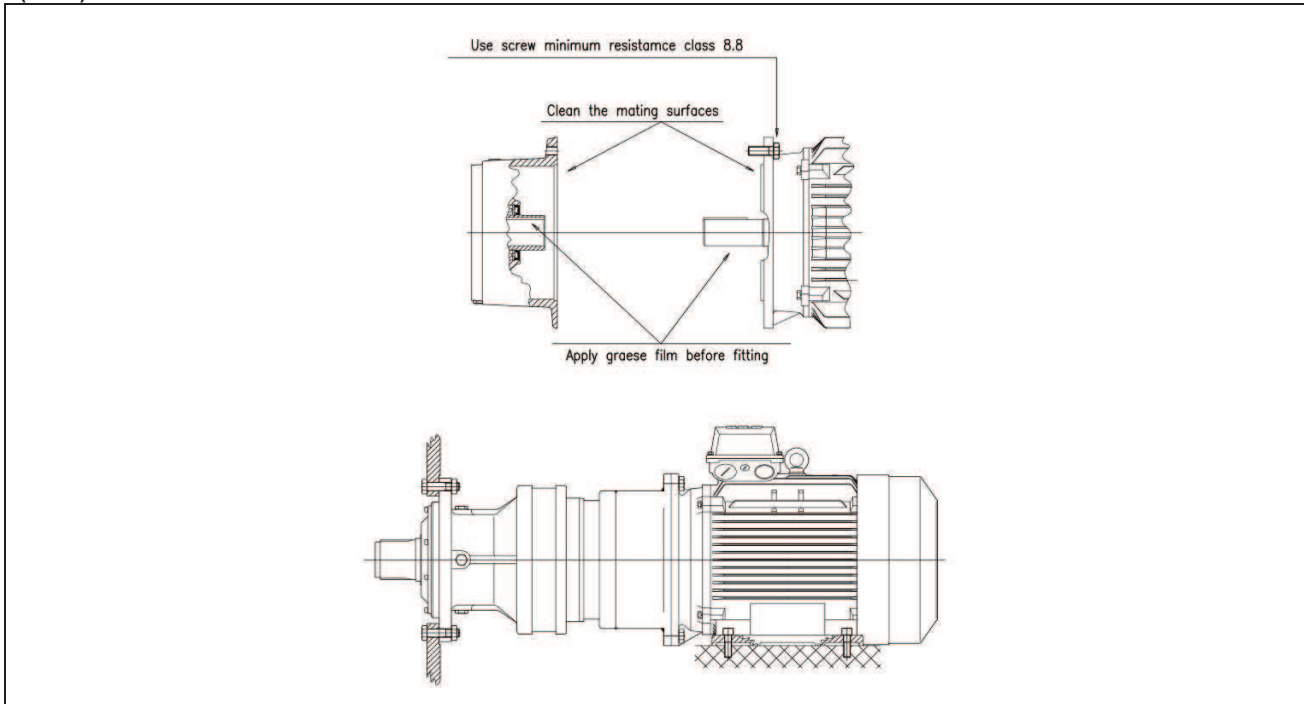
See drawing (FIG. 9).

N.B.: The motors must always be perfectly aligned whether the motor and the gearbox shaft are coupled with a joint or (and especially) if they are coupled directly.

Incorrect positioning can cause damage to the bearings on both the motor and the motor set-up.

See drawing (FIG. 9).

(FIG.9)



5.4.3. Connection to fast shaft

Clean all the mechanisms before connection.

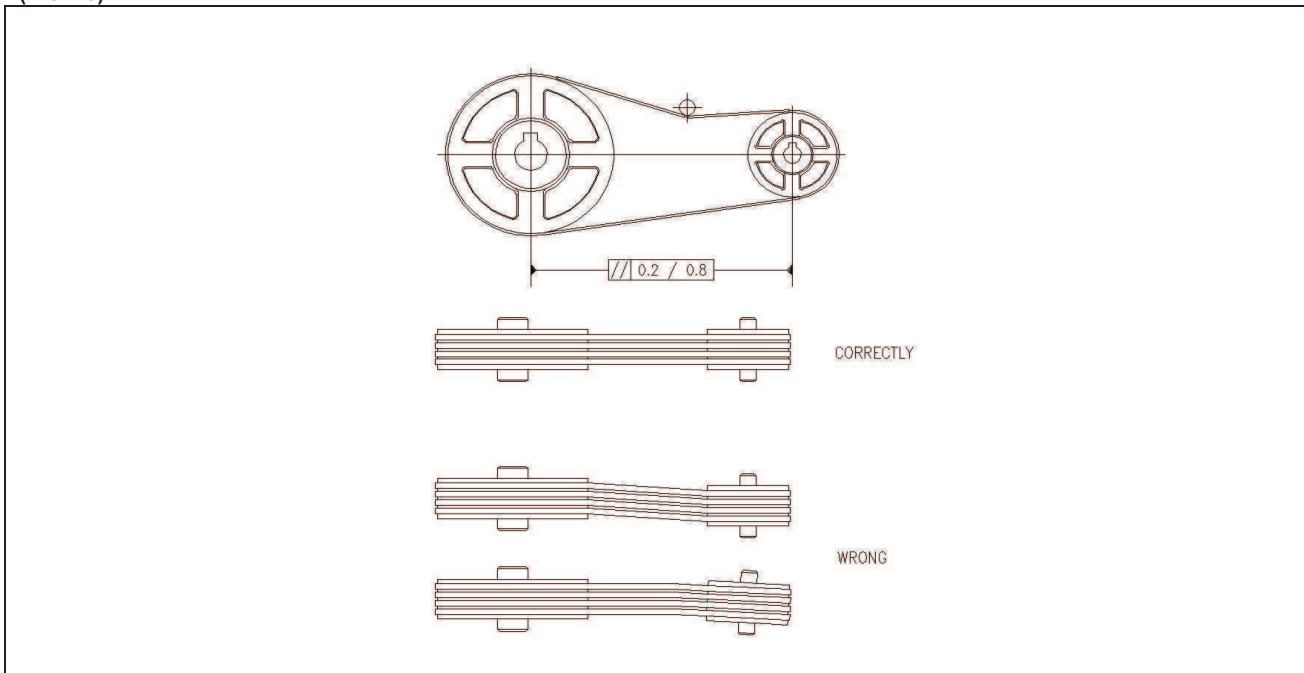
In the event that pulleys for belt drives or toothed pinions for chain gearing are fitted, the shafts must be parallel and the pulleys aligned.

Do not tighten the belts more than necessary as excessive tension could damage the bearings.

If the connection is made with a rigid joint, a compensation system must be added to recover any phase displacement between the fast shaft and the gearbox fastening.

See drawing (FIG. 10)

(FIG. 10)

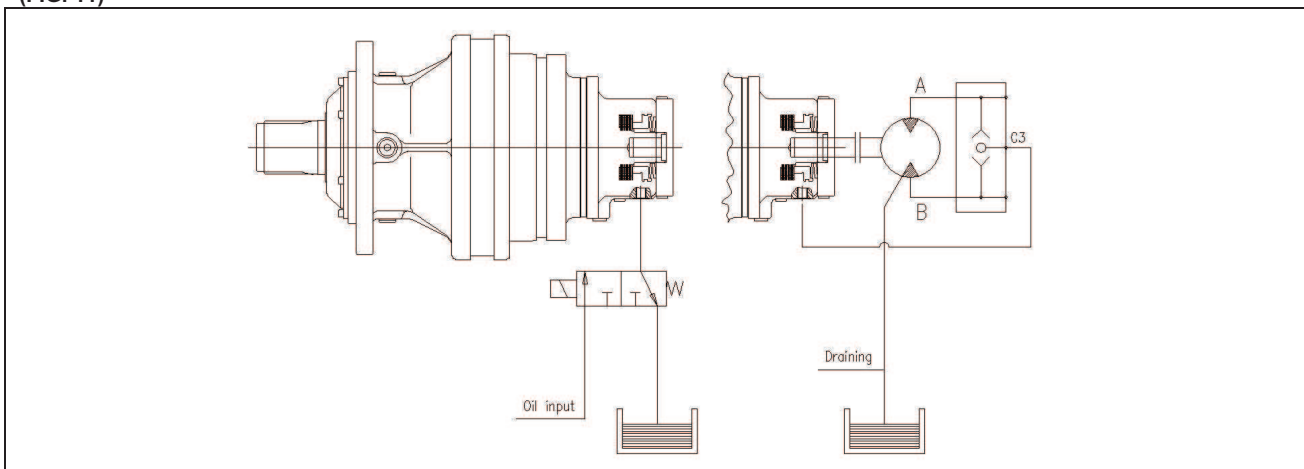


5.4.4. Connection to brake

For gearboxes arranged for hydraulic motors and complete with brakes, when installing, connect to the hydraulic control hole on the brake body with a suitable hydraulic circuit pipe.

See drawing (FIG. 11).

(FIG. 11)



For further information about Dinamic Oil brakes please refer to annex 3 of this manual

5.5 GEARBOX MOTOR INSTALLATION

5.5.1. With an electric motor.

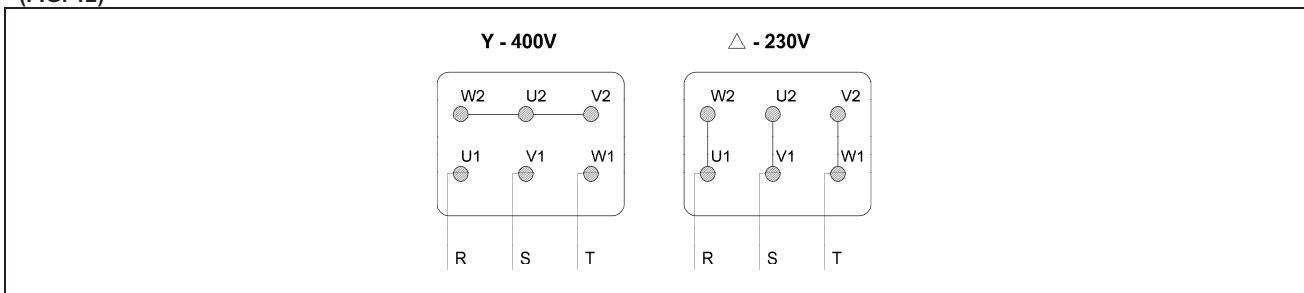
If the complete gearbox motor set is supplied, follow the instructions given previously for its installation.

The electrical connection types are stamped inside the terminal cover.

The conventional clockwise rotation direction is obtained by connecting terminals U1-V1-W1 respectively to the direct power mains supply triplet R-S-T.

See drawing (FIG. 12)

(FIG. 12)



5.5.2. With hydraulic motor

In addition to the regulations concerning the installation of the gearbox, it is recommended that you follow the rules below for the installation of the hydraulic motor.

a) Connection to the hydraulic circuit

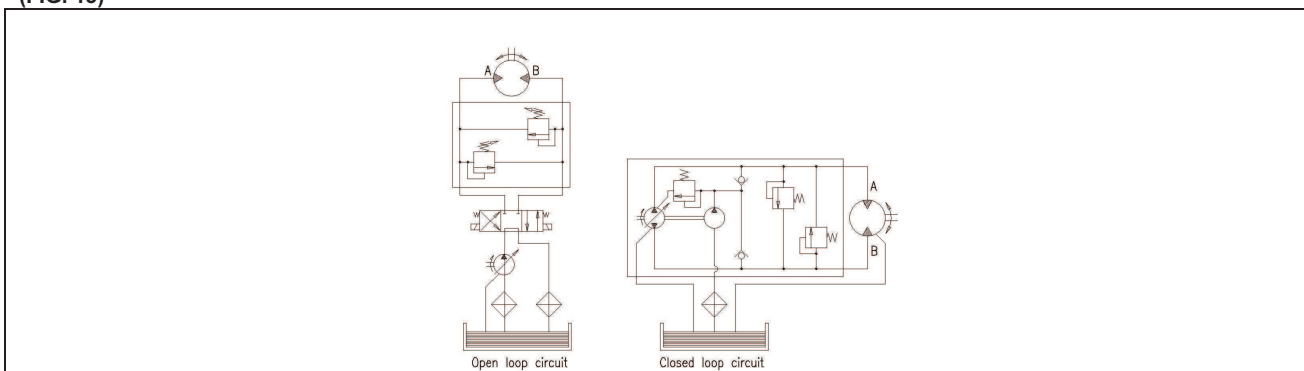
The motors can be connected in either open or closed loop circuits.

If it is an open loop circuit, the solenoid valve or control distributor can be of either a closed- or open-centre type.

The branch of the circuit corresponding to the hydraulic motor delivery side or the flanged side of the motor must always have a maximum pressure valve fitted calibrated to a value not exceeding the value p_{int} (internal pressure) admitted for the hydraulic motor.

See drawing (FIG. 13).

(FIG. 13)



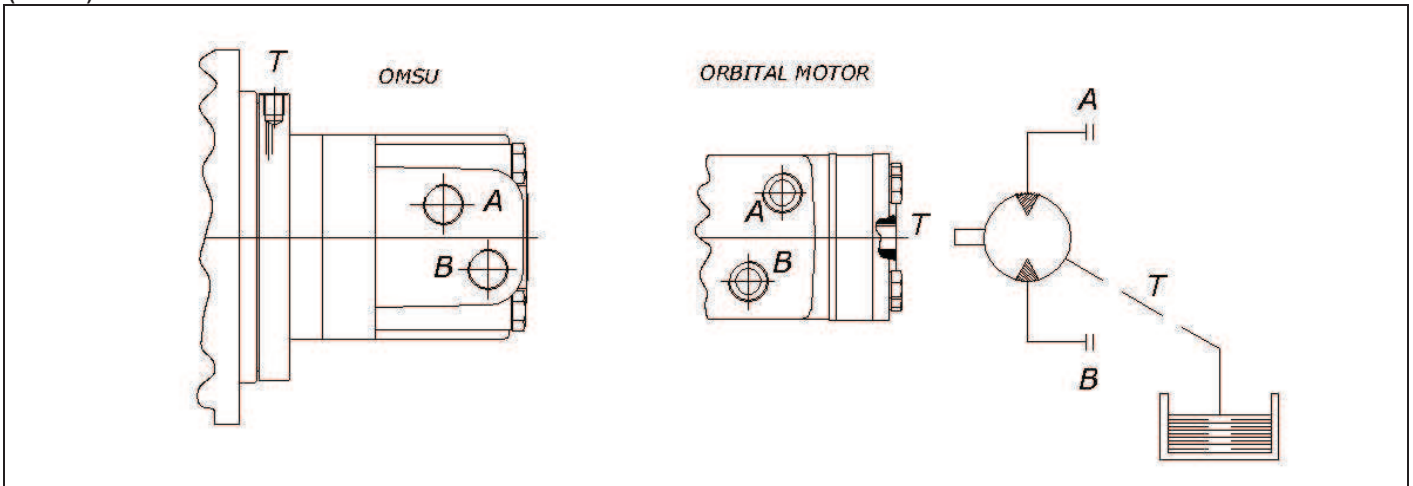
b) Connection to drainage hole

For counter-pressure > 15 bar with continuous operation and > 30 bar with intermittent operation, the drain must always be connected unless the the hydraulic motor has reinforced seals for operating without drainage.

If the motor connected to the F1 and F2 brakes is an OMSU motor, the drain is machined into the brake body and must always be connected.

See drawing (FIG. 14)

(FIG. 14)



c) Hydraulic oil type

Mineral hydraulic oil with viscosity level ISO VG 46 (46 cSt at 40 °C) is recommended.

d) Filtering

To guarantee reliable motor operation and a long working life for the unit, it is extremely important that the hydraulic circuit is equipped with a filtering capacity that is able to ensure a degree of oil cleanliness that complies with the following standards:

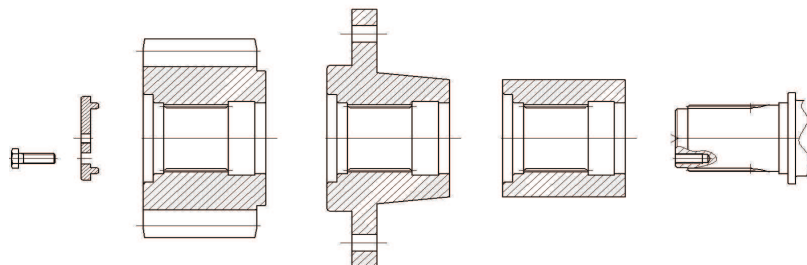
- Grade 9 NAS 1638
- Grade 6 SAE
- Grade 18/15 SO DIS 4406

5.6 FITTING ACCESSORIES

5.6.1. Pinion, flange, smooth bushing

To fit accessories onto the grooved shaft, proceed as follows:

- Apply a thin layer of anti-seize lubricant or grease to the groove.
- Push the accessory into the output shaft until the stopping point on the shaft is reached.
- Insert the retainer plate and tighten the fastening screws.

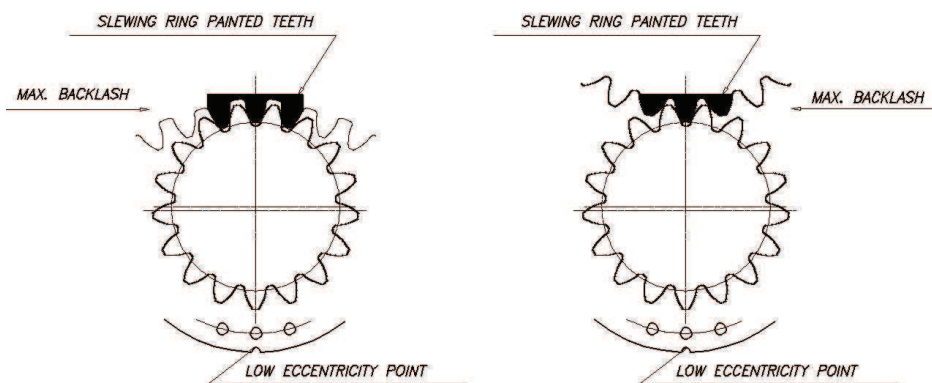


5.7 SLEWING GEARBOX INSTALLATION:

To carry out the installation correctly, check that the centerings and support surfaces on the reducer, and the structure to which it must be fastened, are clean and free of dents. Also make sure that the structure is rigid and perpendicular to the axis of operation. These checks are important in order to obtain a correct meshing between the reducer pinion and the fifth wheel. The latter generally has a mark (with three coloured teeth) on the point of greatest (for slewing bearing with external gear) or least (for slewing bearing with external gear) ovalisation of the pitch \emptyset , which is the point in which the reducer pinion will be positioned. If it is not indicated, contact the manufacturer.

5.7.1. Eccentric support:

If the gearbox has an eccentric support, to adjust the clearance between the fifth wheel and the pinion, the support will have a notch at the minimum point of eccentricity indicating the minimum obtainable meshing clearance between the fifth wheel and the pinion. This applies to gearboxes positioned both inside or outside of the fifth wheel. This applies to gearboxes positioned both inside or outside of the fifth wheel.



The amount of clearance between the sides of the teeth between the pinion and the fifth wheel is obtained by multiplying the module (m) of the toothing by two fixed values given in the table below.

$m5$	0.1-0.2
$m6\div m10$	0.3-0.4
$>m10$	0.4-0.8

The resulting values provide a range that the clearance between the teeth must lie within to allow perfect meshing.



Grease the teeth before use

6 START-UP AND TESTING



Improper start-up can damage the gearbox.

At the factory the gearbox's seals are checked for leaks and a vacuum test is performed. Check the following before start-up:

- That the machinery incorporating the gearbox is compliant with Directive 2006/42/EC on machinery and any other applicable safety standards in force
- That all rotating parts are sufficiently protected in compliance with Directive 2006/42/EC on machinery
- That any risks to the safety of persons, animals or objects are resolved
- That the assembly position is the same as the one shown and required on the identification plate
- That the oil level is correct (see point 7.4)
- That there is no leakage of lubricant from the caps or washers
- That the vent cap is not obstructed by dirt or paint
- That, once the gearbox is installed, the fastening screws are seated correctly and the preload is as shown in the table (see Annex 2)
- That appropriate supply systems are used and that they are in good working order
- That accessories are correctly fitted

The following must be verified and guaranteed before start-up:

- The gearbox must not be fitted in an atmosphere at risk of explosion (oils, acids, gases, vapours or radiation) and dust must not accumulate to a depth of than more than 3-5 mm.
- When in operation, the gearbox must be adequately ventilated, and there must be no significant heat radiation from outside.
- When in operation, the temperature of the cooling air must not exceed 40 °C.
- The caps for checking and draining oil and the vent valves must all be freely accessible.
- Any accessories of any type fitted onto the gearbox must be ATEX certified.
- Gearboxes with a hollow shaft, with or without an attraction joint, must be correctly fitted.
- Arrange for the gearbox to be cleaned once the installation phase is complete.
- Check the effectiveness of all devices made to prevent accidental contact between operators and the rotating units and/or the gearbox seal rings.



Further important operational information is given in the dimensional drawings, data sheets or in any specific documentation for the order.

Before start-up, the machinery must undergo a functional, documented test, checking the following: Temperature, noise, any abnormal events, braking torque, working order of accessories.



DINAMIC OIL S.p.A. will not be held liable for damage caused to persons, animals or objects if these tests are not carried out.

Measuring the surface temperature of the gearbox

- The maximum temperature of the gearbox surfaces varies depending on the number of revolutions, the gear ratio and the structural form, but must never exceed 108 °C for temperature class T4.
- Values on the plate for maximum surface temperatures relate to measurements in standard environmental conditions and a correct installation. Variations to these conditions, however small, including narrowed openings, can have considerable effects on the build-up of heat.
- When starting up, the surface temperature of the gearbox must be measured in the same operating conditions as those planned for operation. The surface temperature must be measured in the connecting area between the gearbox and motor in the parts that are most shielded from ventilation generated by the motor.



IMPORTANT:



Perform a test in operating conditions for a sufficient time period to reach thermal equilibrium and measure the temperature reached. If the temperature exceeds the limits, stop the gearbox immediately and do not use the machine. Notify the Dinamic Oil S.p.A. technical assistance service immediately.

Dinamic Oil will not be held liable for damage to persons, animals or objects if these tests are not carried out and documented.

Provided that the gearbox has passed all the checks specified above, and any other instructions supplied in this manual have been followed correctly and precisely, the gearbox will be ready to be incorporated in the customer's machinery.

Any other accessory fitted onto the gearbox, and consequently any drives, must be ATEX certified to at least the same degree of protection in order for the customer's machinery to be compliant with Directive 94/9/EC. The customer's complete system and/or machinery, including the gearbox itself, is only compliant with the directive on machinery once risk analysis has been carried out and any resulting risks are resolved, and once the technical dossier and any other documentation required by Directive 2006/42/EC on machinery has been submitted (see the General Information section of this manual).

7 LUBRICATION

All DINAMIC OIL S.p.A. gearboxes are supplied without lubricating oil.

The user is required to ensure the units are filled with the correct lubricants before putting the machine to use.

7.1 TYPE OF LUBRICATION

Gearboxes are oil bath lubricated. Before putting the gearbox to use, fill it with oil, looking through the level cap to see if it is at the correct level. This operation requires special attention, and the level must be checked again after a few minutes of operation.

7.2 SELECTING AN OIL

Any mechanical transmission oil with EP additives in viscosity classes ISO VG220 to ISO VG320 under ISO 3448 can be used. In special cases oils with different viscosities may be used. In this case, contact the DINAMIC OIL S.p.A. technical assistance service. The oil viscosity must be chosen to suit the room temperature and the gearbox's real operating temperature. If the gearboxes must operate at very high ambient temperatures or with very large temperature excursions, synthetic oil is recommended. In gearboxes with vertical fitting and continuous operation, oil may suddenly overheat. In these cases it is necessary to provide an external tank (which DINAMIC OIL S.p.A. can supply) to allow the oil to expand as it heats up.



If the delivered gearbox is already filled with oil, the lock cap used for delivery needs to be replaced with the vent cap supplied.



Lubricants are potentially harmful/toxic substances to health: always refer to the manufacturer's safety data sheets.



Do not release used oil into the environment. Collect it and send it to authorised bodies for disposal in accordance with legislative provisions in force.

Recommended viscosity

ISO VG 3448	OPERATING TEMPERATURE [°C]													
	AMBIENT TEMPERATURE [°C]													
	-20°	-10°	0	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	
220														
320														

Lubricants for general use

Manufacturer	Mineral oil	Synthetic oil	
		Polyalphaolefins (PAO)	Polyglycols (PG)
AGIP	Blasia	Blasia SX	Blasia S
ARAL	Degol BG		Degol GS
BP	Energol GR-XP	Energol EPX	Energol HTX
CASTROL	Alpha SP	Alphasyn EP	Alphasyn PG
CHEVRON	Ultra Gear	Tegra Synthetic	HiPerSYN
DEA	Falcon CLP		
ELF	Reductelf	Elf Syntherma	Elf Syntherma
ESSO	Spartan EP	Spartan S EP	Glycolube
FINA	Giran		
IP	Mellana		Telesia Oil
KLÜBER	Kluberoil GEM1	Klubersynt EG4	Klubersynt GH6
MOBIL	Mobilgear XMP	Mobilgear SHC	Glygoyle
OPTIMOL	Ultra		
Q8	Goya	El Greco	El Greco
SHELL	Omala S2 G	Omala S4 GX	Omala S4 WE
TOTAL	Carter EP	Carter SH	Carter SY

Lubricants for the food industry

Manufacturer	Gear oil
AGIP	Rocol Foodlube Hi-Torque
ESSO	Gear Oil FM
KLÜBER	Kluberoil 4 HU1 N
MOBIL	DTE FM
SHELL	Cassida Fluid GL

7.3 BRAKE LUBRICATION

Negative hydraulic brakes with multiple discs and a lubrication chamber are already lubricated.

7.4 OIL FILLING AND LEVEL CHECKING

Every gearbox is equipped with level, vent, filling and draining caps for oil in a configuration that varies depending on the structural form (see point 3).

7.4.1. Horizontal fitting:

For horizontal fitting, the lubricating oil level is located on the middle section of the gearbox.

7.4.2. Vertical fitting:

For vertical fitting (both linear and at right angle), the lubricating oil level is located on the "top" section of the gearbox, to ensure the upper bearing is lubricated.

7.5 FILLING PROCEDURE



When being filled, the gearbox must be in the exact position that it will be in when operating.



Ensure the power supply is disconnected when filling.

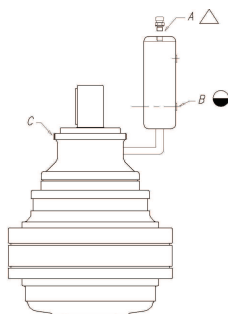
- Unscrew and remove the loading and level caps (see point 3.5)
- Feed the oil through the loading hole until it flows out of the level hole
- Refit the caps using the appropriate tightening torques (see Annex 2)

7.5.1. Filling procedure with expansion chamber

In vertical fitting and cases where the gearbox needs to be completely filled, use of an expansion chamber is recommended.

This accessory ensures that all the gearbox's components are lubricated, as well as serving as a reservoir for the oil, which increases in volume as the temperature rises.

- Unscrew cap "C", located on the upper part of the gearbox, to prevent an air bubble from forming at the upper rotary seal.
- Unscrew loading cap "A" and start filling. When the oil flows out of the hole in cap "C", close it using the appropriate tightening torques (see Annex 2) and fill up to level "B".
- Refit cap "A" using the appropriate tightening torques (see Annex 2).



7.6 AMOUNT OF OIL

Indicative oil amounts are given in **Annex 1** of this manual. These values are only indicative, and the level cap on the middle section of the gearbox itself must therefore be referred to.

8 SUPPORT AND SERVICING



Servicing must be performed by expert, authorised personnel adhering to the work and environmental safety standards in force.



Servicing on the gearbox must be performed with the power supply disconnected and the gearbox taken "out of service" to prevent it from being switched on accidentally. The oil temperature must be at a safe level so as not to burn the operators.

The instructions given in this paragraph must be followed, ensuring the gearbox is operational and that required levels of safety are met.

- Only use original spare parts (refer to the Spare Parts List for the gearbox in question)
- Use lubricants that are recommended by the manufacturer
- After any servicing work, always replace the seal washers and any lubricating oil
- Carry out the routine servicing work as set out by the manufacturer
- Use additional lighting if carrying out servicing work in dimly lit areas, to ensure that it is performed safely
- Take relevant precautions if carrying out servicing work in enclosed spaces, to ensure that it is performed safely



DINAMIC OIL S.p.A. will not be held liable for damage caused to persons, animals or objects if non-original spare parts are used.

SERVICING

- Adhere to the routine inspection and servicing intervals to ensure correct working order and explosion proofing are maintained.
- Before carrying out servicing or repair on any part of the gearbox, wait for it to cool completely to avoid a risk of burns from parts that are still hot.
- After servicing, ensure that all safety measures are fully and correctly reinstated.
- Arrange for the gearbox to be cleaned once the servicing/repair phase is complete.
- After servicing, refit the vent, loading and level caps using the appropriate tightening torques (see Annex 1).
- At the end of any servicing operation, the original state of the seals must be restored using the appropriate sealant. In gearboxes where double ring seals are supplied, the chamber must be filled between the two rings with Fluorocarbon gel 880 ITP synthetic grease or similar in terms of properties and field of use.
- When replacing a seal ring in any type of gearbox, a thin layer of Fluorocarbon gel 880 ITP synthetic grease or similar in terms of its properties and field of use must be applied to the lip of the gearbox before fitting.
- Only use original spare parts for repairs.



8.1 ROUTINE SERVICING

Scheduled routine servicing work is carried out on DINAMIC OIL S.p.A. gearboxes by the operator:



Proper servicing improves performance, longevity and safety.

After the first 150 hours of operation:

- Check there are no metal residues of abnormal size in the magnetic caps on the gearboxes.
- Clean the surfaces of the gearbox body and the air ventilation pathways to ensure correct heat dispersal.
- Change the lubricating oil (see point 8.2).
- Check the screws are all tight, and tighten them where required.

After every 500 hours of operation:

- Check the oil levels with the relevant caps.
- Check for any leaks in the seals.
- Check the screws are all tight, and tighten them where required.

After every 2000 hours of operation or at least every 12 months:

- Clean the surfaces of the gearbox body and the air ventilation pathways to ensure correct heat dispersal.
- Check the screws are all tight, and tighten them where required.

It is worth checking for the vibration, noise and temperature of the gearbox while it is in operation.

When repaired, the right amount of oil must be restored.

For installations in zone 21 and 22, a scheduled routine cleaning plan must be provided and implemented by the customer for surfaces and areas of accumulation to prevent dust deposits from exceeding a thickness of 3-5 mm.

After every 1000 hours of operation, or after 6 months:

- Check the surface temperature of the gearbox. The maximum temperature must not exceed the value shown on the plate.
- Check the lubricating oil levels with the relevant caps.
- Check for any leaks in the seals.



After every 5000 hours of operation:

- Replace the lubricating oil.
- Replace the seal rings.
- General inspection of the gearbox:
Replace the seals, bearings and any worn mechanical parts.

**If anomalies are found, identify the cause and commence repairs.
Restore the correct level of lubrication before putting the gearbox back into operation.**

8.2 SUPPLEMENTARY SERVICING

If agreed with the customer, DINAMIC OIL S.p.A. can supply suitable servicing procedures on a case by case basis.

DINAMIC OIL S.p.A. prohibits the gearbox from being opened for any operations which are not defined as "routine" servicing.

DINAMIC OIL S.p.A. will accept no liability for harm to objects or persons caused by operations carried out which do not fall within routine servicing and have not been agreed with the customer.



If in need of assistance, contact the DINAMIC OIL S.p.A. technical sales office.

8.3 OIL REPLACEMENT

Replace the lubricating oil according to the schedule set out in the following table, or at least every 2 years.

Average operating duration according to oil type

Operating temperature	Oil type		
	Mineral oil	Synthetic oil	
		Polyalphaolefins (PAO)	Polyglycols (PG)
70 °C	7 000 hours	15 000 hours	16 000 hours
80 °C	5 000 hours	10 000 hours	12 000 hours
90 °C	3 000 hours	7 500 hours	9 000 hours

To make it easier to empty the gearbox, it is recommended that oil be changed when the gearbox is warm. Internal parts must be washed with a suitable liquid before filling with new oil. **Oils with different viscosity or different brands of oil should not be mixed. In particular, synthetic and mineral oils must never be mixed together.** Once the machine is in operation, periodically check lubricant level and top up if necessary.



Do not release used oil into the environment. Collect it and send it to authorised bodies for disposal in accordance with legislative provisions in force.



Empty the oil when the gearbox is warm, but at a temperature not exceeding 40-45 °C to prevent the risk of burns.

8.3.1. Oil replacement procedure

- Place a receptacle of sufficient size underneath the draining cap.
- Unscrew the gearbox's loading and draining caps and allow the oil to completely drain.
- Die inneren Teile des Getriebes mit geeigneten Flüssigkeiten spülen.
- Refill the gearbox with oil (see point 7.5).

8.4 GREASE REPLACEMENT

The bearings of some gearboxes are lubricated with grease (performed in the factory). Replace the lubricating grease according to the schedule set out in the following table:

Average operating duration according to grease type

Grease type	
Mineral	Synthetic
5 000 hours	10 000 hours



DINAMIC OIL S.p.A. recommends replacement at every oil change.
For the type and quantity, refer to the gearbox data sheet.

9 BREAKDOWNS AND SOLUTIONS

PROBLEM	POSSIBLE CAUSE	SOLUTION
Excessive and/or abnormal noise	Internal problem	Contact the DINAMIC OIL S.p.A. technical assistance service.
Excessive vibration	Gearbox not installed correctly	Check the fastening
	Weak coupling structure	Strengthen the structure
	Internal problem	Contact the DINAMIC OIL S.p.A. technical assistance service.
Seeping of lubricant from seals	Seals worn or damaged	Contact the DINAMIC OIL S.p.A. technical assistance service.
	Seals stiffened after prolonged time in storage	Clean the area and check for seeping after a few hours of operation
	Damaged seats	Restore the seats
Excessive heat	Lack of lubricating oil	Apply lubricating oil
	High thermal power	Contact the DINAMIC OIL S.p.A. technical assistance service.
	Insufficient lubrication	Contact the DINAMIC OIL S.p.A. technical assistance service.
With the motor switched on, the slow shaft of the gearbox does not turn	Motor not fitted correctly	Check the coupling between the motor and the gearbox
	Jammed brake	Check the hydraulic circuit
	Internal problem	Contact the DINAMIC OIL S.p.A. technical assistance service.
Parking brake will not release	Lack of pressure	Check the hydraulic circuit
	Internal problem	Contact the DINAMIC OIL S.p.A. technical assistance service.
Parking brake will not apply	Residual pressure in brake	Check the hydraulic circuit
	Worn plate	Contact the DINAMIC OIL S.p.A. technical assistance service.

10 DISMANTLING AND DISPOSAL

Before scrapping the gearbox, it needs to be rendered unusable and emptied of lubricant, remembering that used oil has a serious impact on the environment.

The gearbox must be dismantled by expert operators, adhering to the applicable laws on occupational health and safety and environmental protection.

Non-biodegradable products must not be disposed of into the environment under any circumstances.

Disassembled and disused gearboxes produce the following waste: iron, aluminium, cast iron, lubricant, plastic, copper and bronze.

The gearbox parts must be disposed of according to the selective sorting standards in force in the country where the disposal takes place.

For countries in the European Community, with the issue of Commission decision 2000/532/EC, subsequently amended by decisions 2001/118/EC and 2001/19/EC from the Commission and 2001/573/EC from the Council, new community provisions have been introduced regarding waste classification.



Do not attempt to reuse parts or components which may seem to be complete after they have undergone checks and tests and/or replacements by specialist personnel and declared no longer fit for use.