Italy Headquarters

Installation, use
and maintenance
manual

dinamic oil

Manuale Installazione Uso e Manutenzione
Riduttori Epicicloidali / Ruote Epicicloidali

Installation, Operation and Service Manual
Planetary Gearboxes / Wheel Drives

Handbuch für installation, betrieb und wartung
Planetengetriebe / Radnabengetriebe

INDEX

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.
- Wheel drives.

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.

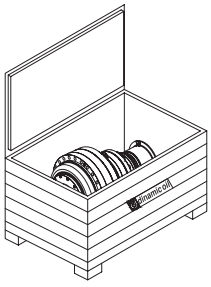
Information
Important information or procedures.

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*

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

2.2 SAFETY WARNINGS FOR HANDLING WHEN UNPACKING AND TRANSPORTING

See point 4, “Transport, handing 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.

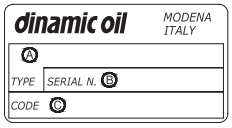
3.2 CONDITIONS AND RESTRICTIONS OF USE

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. -20 °C; max. +40 °C. Other temperature ranges will be indicated in the product data sheet. For temperatures below 0 °C, please contact the DINAMIC OIL S.p.A. technical sales department. 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.

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

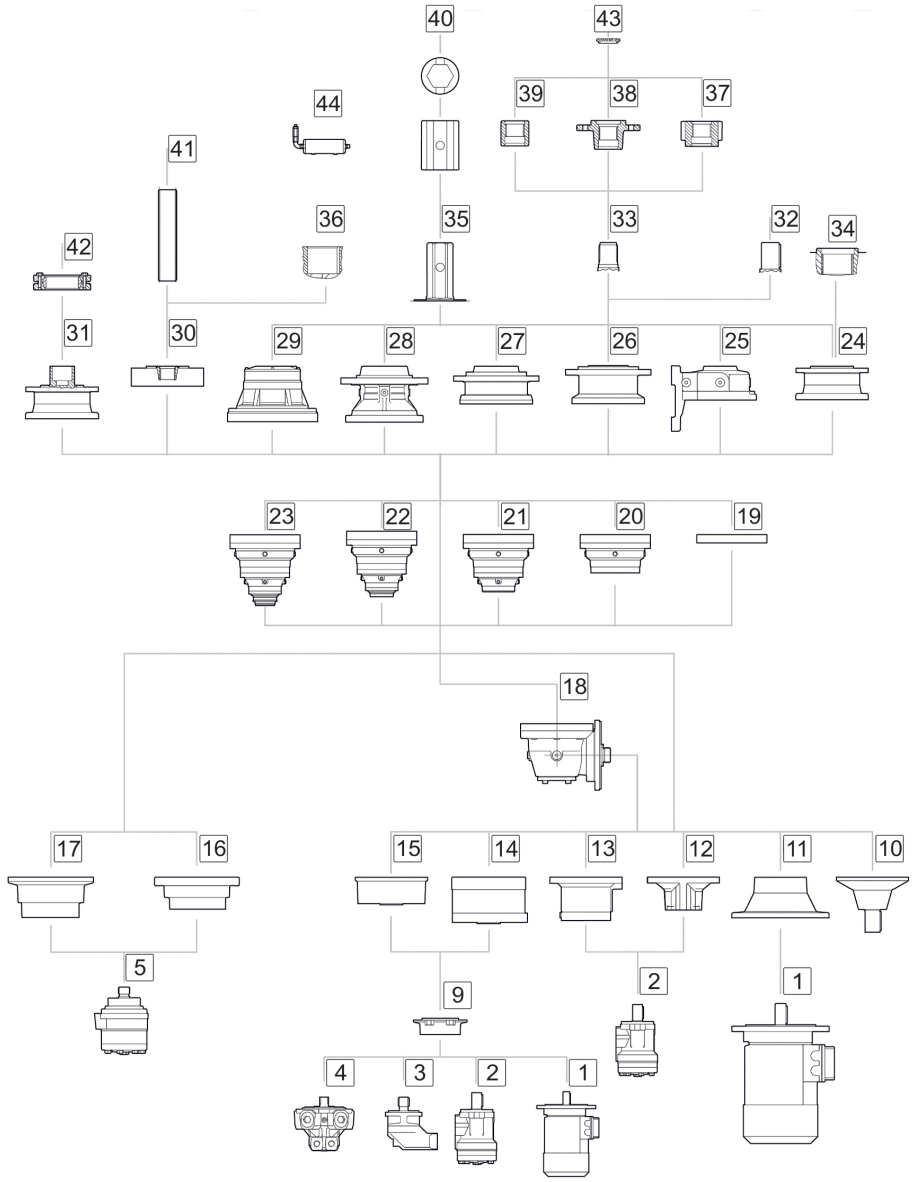
*The product description may be replaced by a code supplied by the customer.

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

3.4.1 Gearboxes structural forms

MOTORS	INPUTS	REDUCTION STAGES
1 Electric motor 2 Orbital motor 3 Axial piston motor 4 Radial piston motor 5 Orbital motor “MLR”	9 Motor connection adapter 10 Fast shaft 11 Direct electric motor adapter 12 Direct orbital motor adapter 13 Negative brake “F1../F2..” 14 Negative brake “F5../F6../ F8../F9” 15 Standard flange 16 “MZ” flange adapter 17 “MD” flange adapter	18 Direct mount bevel gear 19 Single stage reduction 20 Double stage reduction 21 Three stage reduction 22 Four stage reduction 23 Five stage reduction
SUPPORTS AND OUTPUT SHAFTS	**ACCESSORIES**	
24 Output support “N” 25 Output support “P” 26 Output support “T” 27 Output support “TR” 28 Output support “TL” 29 Output support “H” 30 Output support “F” 31 Output support “NQ” 32 Cylindrical output shaft 33 Grooved output shaft 34 Female grooved output shaft 35 Hexagonal output shaft 36 Female cylindrical output shaft	37 Pinion “P” 38 Flange “FL” 39 Grooved bush “BS” 40 Hexagonal bushing “ES” 41 Grooved bar “BF” 42 Shrink disk “GA” 43 End plate “EP” 44 Expansion chamber “VE”	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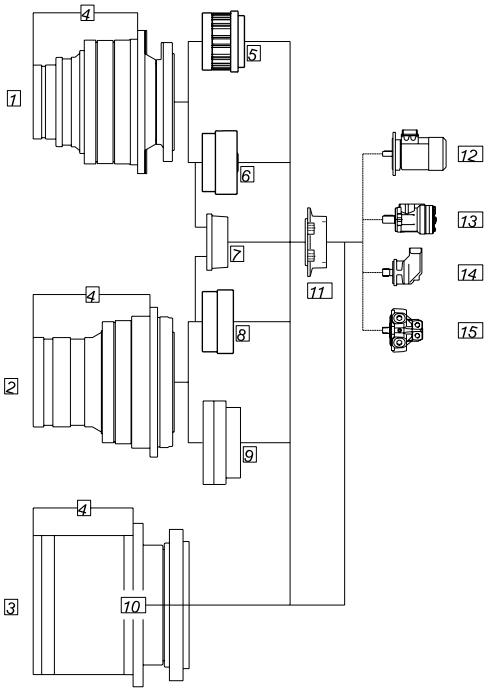
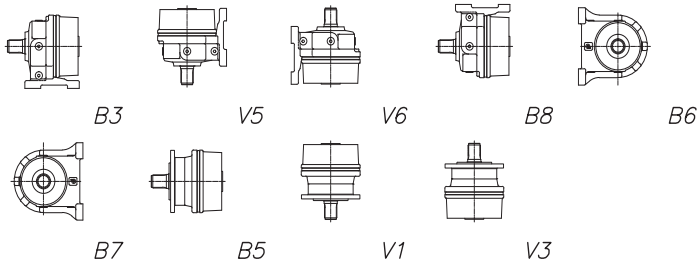
3.4.2 Wheel drive structural forms

GEARBOX TYPE	REDUCTION STAGES	TYPES OF INPUT
1 RW 2 WD 3 EH	4 2; 3; 4	5 Negative brake F5 6 Negative brake F9 7 FStandard flange 8 Negative brake FX 9 Negative brake FY 10 Negative brake EH 11 Preparation for motor connection
USABLE MOTORS		
12 Electric motor 13 Orbital hydraulic motor 14 Hydraulic motor with axial pistons 15 Hydraulic motor with radial pistons		

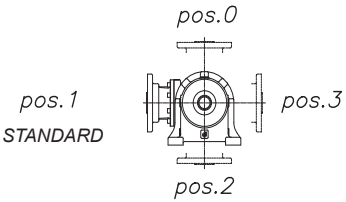


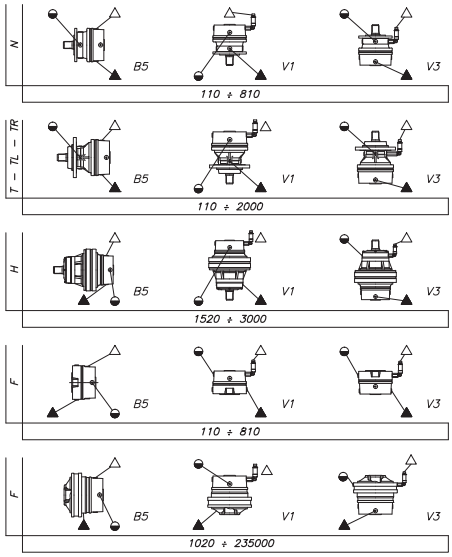
3.5 DESIGN FORMS

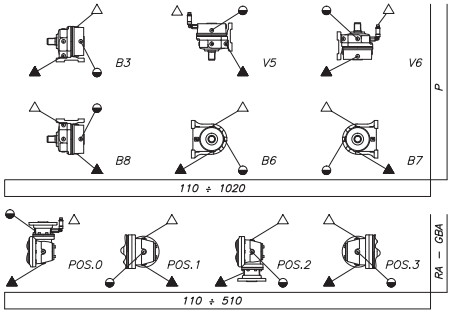
INLINE GEARBOXES



RIGHT ANGLE GEARBOXES







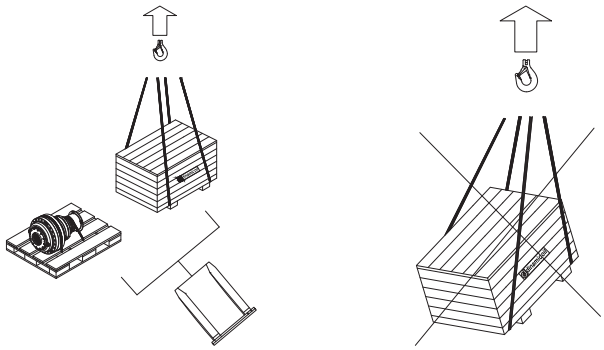
4 TRANSPORT, HANDLING AND STORAGE

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.

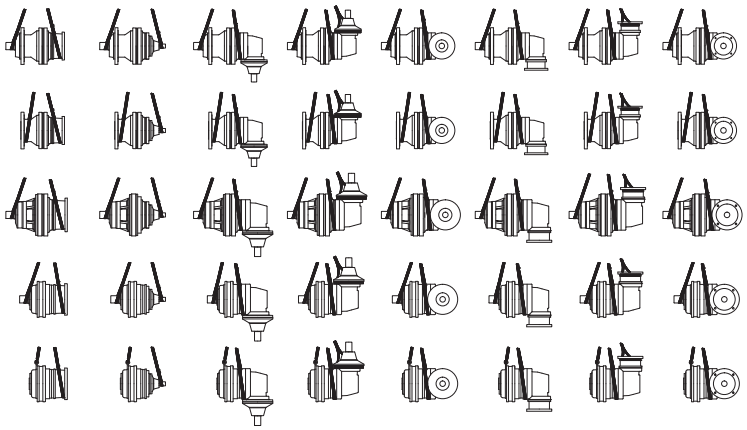
Take the utmost care when unpacking.
Use accessories that comply with the directive on machinery, and which are suitable for the weight to be lifted.

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.

Some examples are given below of the lifting points for the main DINAMIC OIL S.p.A. gearbox designs.
These examples are intended only as guidelines and are not exhaustive of all configurations
If needed, please contact the DINAMIC OIL S.p.A technical sales department.



For more detailed information contact the DINAMIC OIL S.p.A. technical sales office.

An indication of the weight of the equipment to be lifted can be found in **Annex 1** or in the dimensional data sheet.

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.

5 INSTALLATION AND ASSEMBLY

Gearboxes must be installed carefully and professionally, by suitably 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.

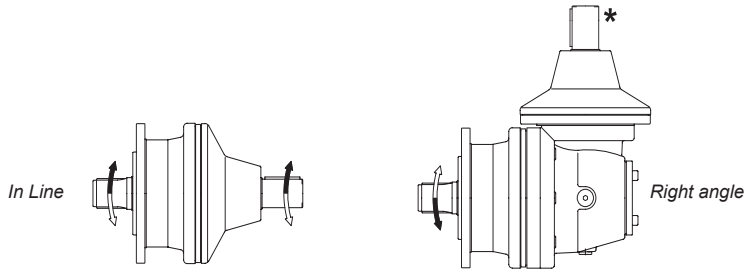
General information unless otherwise indicated on the relevant data sheets.

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 SERIES RE/GB GEARBOXES

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



*It depends on the type of bevel gear. Contact the DINAMIC OIL S.p.A. technical sales office.

5.2 SERIES RE/GB GEARBOX DESIGNS

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

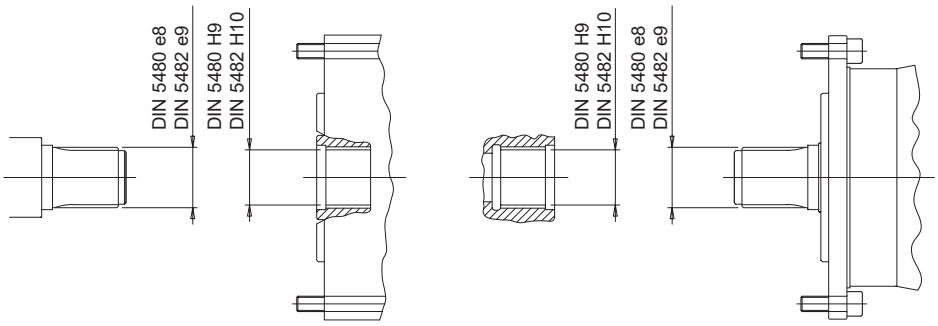
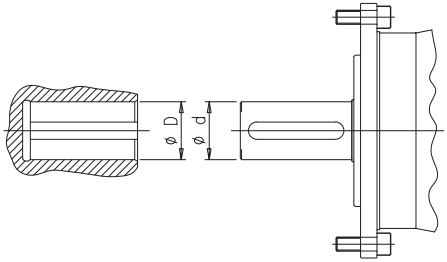


Fig. 2



Recommended tolerances			
Loose coupling		Coupling with interference	
Solid shaft	Hollow shaft	Solid shaft	Hollow shaft
Ø d h7	Ø D G7	Ø d h7	Ø D K7
Ø d h7	Ø D F7	Ø d h7	Ø D M7
		Ø d h7	Ø D N7

Fig. 3

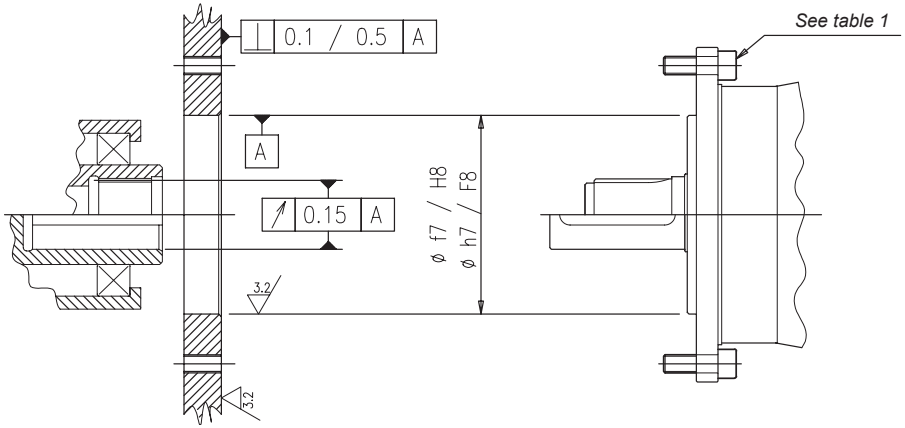


Table 1									
Sizes		110N	110T	110TR	110T1	110TR1	210N	210T	210TR
Screw		M10	M10	M10	M12	M12	M10	M10	M10
Quantity	N°	8	10	10	10	10	8	10	10
Class		12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
Tightening torque	Nm	74	74	74	130	130	74	74	74
Maximum torque tolerated by screws	Nm	4 052	5 955	5 955	8 699	8 699	4 052	5 955	5 955

Sizes		210T1	210TR1	240T	240TR	310N	310T	310TL	510/610N
Screw		M12	M12	M12	M10	M12	M12	M12	M12
Quantity	N°	10	10	10	10	10	10	10	10
Class		12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
Tightening torque	Nm	130	130	130	74	130	130	130	130
Maximum torque tolerated by screws	Nm	8 699	8 699	8 699	5 955	8 699	10 930	10 930	8 699

Sizes		510/610T	510/610TL	810N	810T	1020T	1520T	2000T
Screw		M12	M12	M14	M14	M16	M16	M16
Quantity	N°	10	10	12	12	10	10	10
Class		12.9	12.9	12.9	12.9	12.9	12.9	12.9
Tightening torque	Nm	130	130	207	207	323	323	323
Maximum torque tolerated by screws	Nm	10 930	10 930	18 257	18 257	24 510	24 510	24 510

Fig. 4

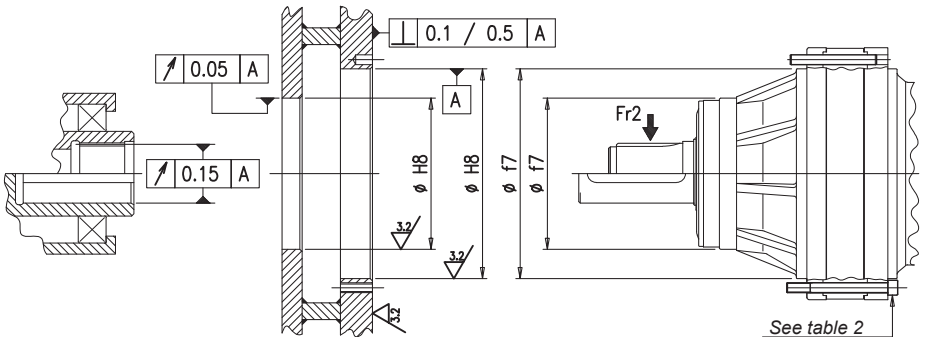


Table 2

Sizes		1520H	2000H	2520H	3000H	3510H	4800H	6000H	8000H	12010H	16000H
Screw		M16	M16	M16	M16	M16	M16	M18	M18	M24	M24
Quantity	N°	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	10.9	10.9
Tightening torque	Nm	323	323	323	323	323	323	444	444	907	907
Maximum torque tolerated by screws	Nm	41 742	41 742	64 557	64 557	84 547	84 547	162 773	162 773	313 837	313 837

Sizes		21000H	26000H	31000H	40000H	45000H	53000H	61000H	85000H
Screw		M27	M27	M30	M30	M30	M36	M36	M36
Quantity	N°	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	1 327	1 327	1 802	1 802	1 802	3 150	3 150	3 150
Maximum torque tolerated by screws	Nm	480 948	480 948	721 421	721 421	721 421	1 323 010	1 323 010	1 323 010

Sizes		110000H	130000H	150000H	205000H	235000H
Screw		M42	M42	M42	M42	M42
Quantity	N°	40	40	40	48	48
Class		10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	5 038	5 038	5 038	5 038	5 038
Maximum torque tolerated by screws	Nm	2 864 730	2 864 730	2 864 730	3 516 710	3 516 710

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

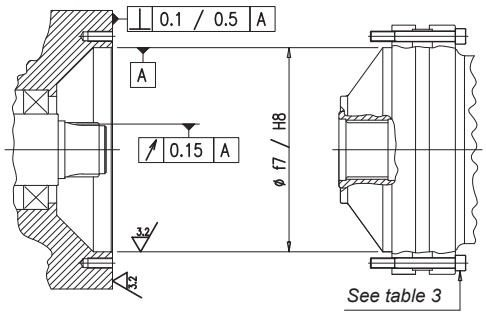


Table 3										
Sizes		110FS	210FS	240FS	310FS	510FS	810FS	1020FS	1520FS	2000FS
Screw		M10	M10	M10	M10	M10	M12	M12	M16	M16
Quantity	N°	8	8	8	12	12	12	16	16	16
Class		12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
Tightening torque	Nm	75	75	75	75	75	130	130	323	323
Max torque tolerated by screws	Nm	4 050	4 050	4 050	8 175	8 175	14 180	18 915	41 742	41 742

Sizes		2520FS	3000FS	3510FS	4800FS	6000FS	8000FS	12010FS	16000FS	21000FS
Screw		M16	M16	M16	M16	M18	M18	M24	M24	M27
Quantity	N°	21	21	24	24	36	36	36	36	36
Class		12.9	12.9	12.9	12.9	12.9	12.9	10.9	10.9	10.9
Tightening torque	Nm	323	323	323	323	444	444	907	907	1 327
Max torque tolerated by screws	Nm	64 557	64 557	84 547	84 547	162 773	162 773	313 837	313 837	480 948

Sizes		26000FS	31000FS	40000FS	45000FS	53000FS	61000FS	85000FS
Screw		M27	M30	M30	M30	M36	M36	M36
Quantity	N°	36	36	36	36	36	36	36
Class		10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	1 327	1 802	1 802	1 802	3 150	3 150	3 150

Max torque tolerated by screws	Nm	480 948	721 421	721 421	721 421	1 323 010	1 323 010	1 323 010

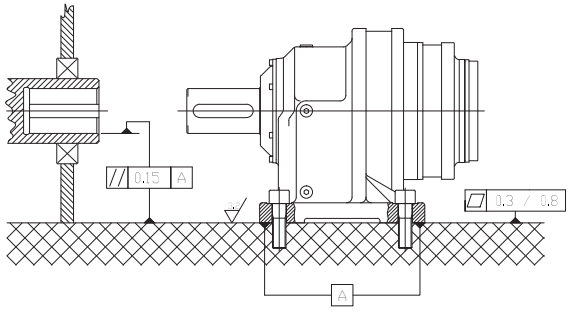
Sizes		110000FS	130000FS	150000FS	205000FS	235000FS
Screw		M42	M42	M42	M42	M42
Quantity	N°	40	40	40	48	48
Class		10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	5 038	5 038	5 038	5 038	5 038
Max torque tolerated by screws	Nm	2 864 730	2 864 730	2 864 730	3 516 710	3 516 710

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

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.

Vedi disegno (FIG. 7).

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

Fig. 7

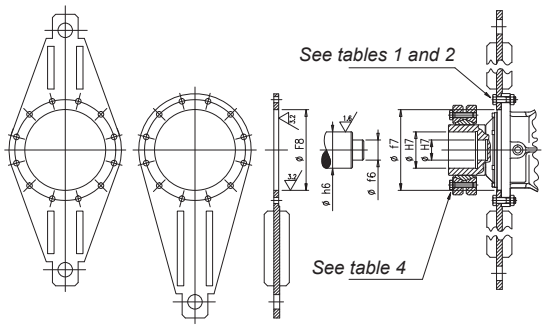
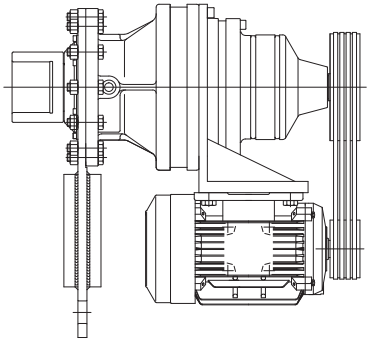


Table 4										
Sizes		110	210	240	310	510/610	810	1020	1520	2000
Screw		M6	M6	M8	M8	M8	M10	M16	M16	M16
Quantity	N°	10	10	12	12	12	12	8	8	8
Class		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	12	12	30	30	30	60	250	250	250

Sizes		2520	3000	3510	4800	6000	8000	12010	16000
Screw		M16	M16	M16	M16	M16	M16	M20	M20
Quantity	N°	10	10	10	10	15	15	15	15
Class		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	250	250	250	250	250	250	490	490

Sizes		21000	26000	31000	40000	45000	53000	61000	85000
Screw		M20	M20	M24	M24	M24	M24	M24	M27
Quantity	N°	20	20	20	20	20	24	24	28
Class		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque	Nm	490	490	840	840	840	840	840	1250

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

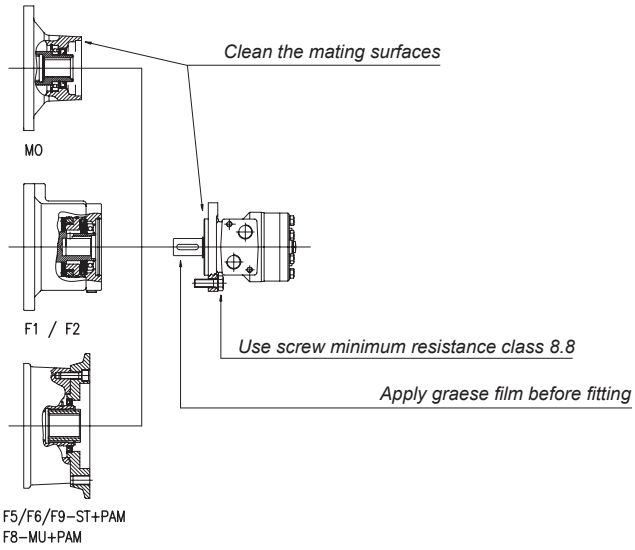
Fasten the input and output mechanisms connecting to the gearbox without striking them with hammers or suchlike.
Use the service screws and the threaded holes on the shafts for inserting the mechanisms.
Before fitting the connecting mechanisms, remember to clean the shafts to remove any traces of grease and/or protective treatments.

5.4 INPUT CONNECTIONS

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



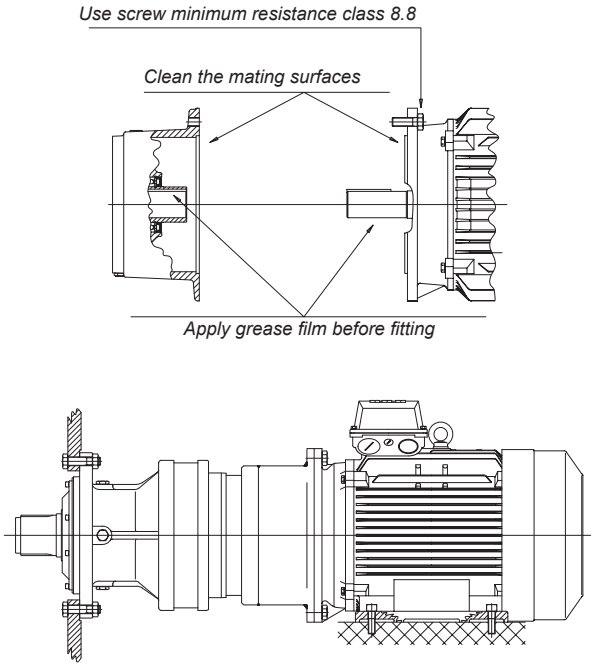
5.4.2 Connection to electric motor

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.

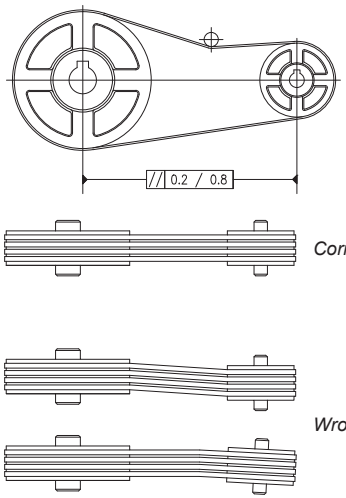
In the event that pulleys for belt drives or toothed pinions for chain gearing are fitted, the shafts must be parallel and the pulleys aligned.

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).

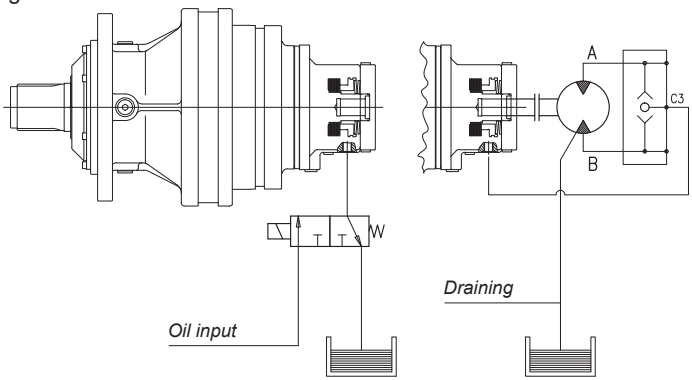
Fig. 10



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



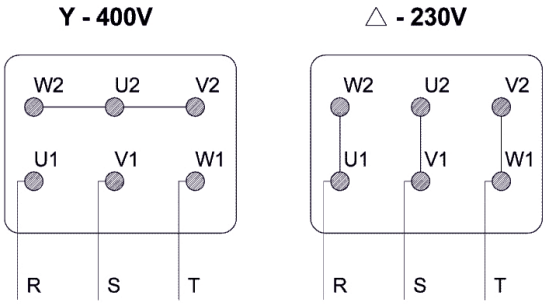
For further information about Dinamic Oil brakes please refer to annex 3 of this manual.

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



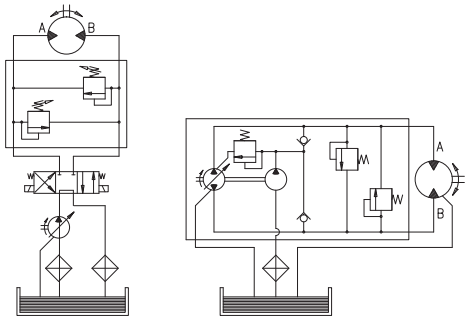
5.5.2 With hydraulic motor

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 pint (internal pressure) admitted for the hydraulic motor.
See drawing (FIG. 13).

Fig. 13



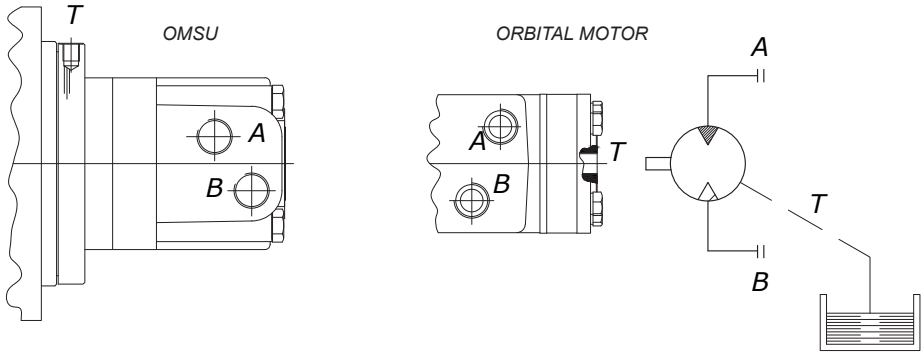
Open loop circuit *Closed loop circuit*

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:

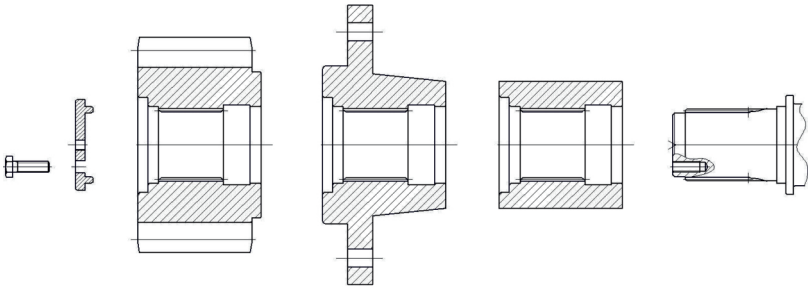
Grade 9 NAS 1638
Grade 6 SAE
Grade 18/15 SO DIS 4406

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.

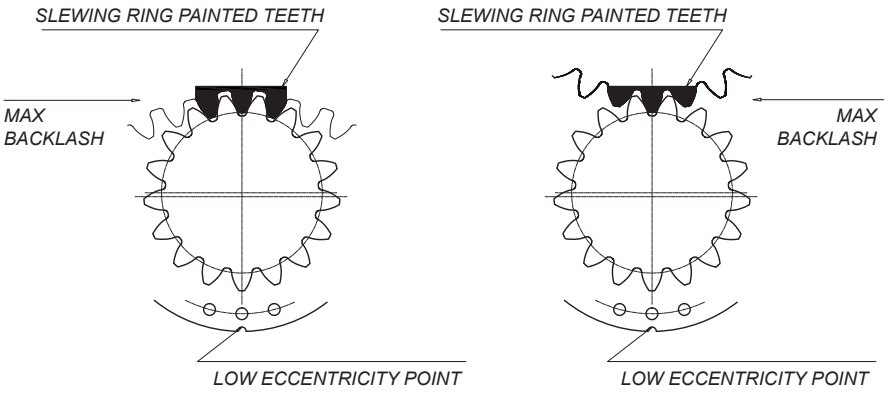


5.7 SLEWING GEARBOX INSTALLATION

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 Ø, 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	0.01-0.02
m6÷m10	0.03-0.04
>m10	0.04-0.08

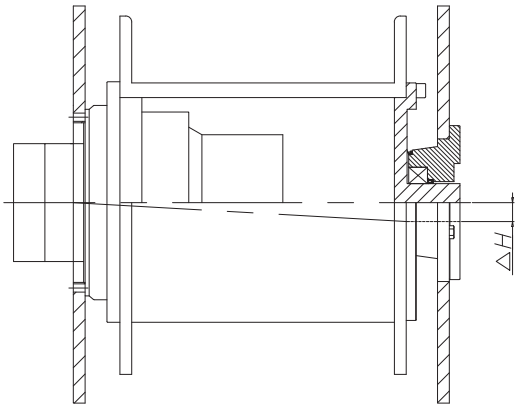
The resulting values provide a range that the clearance between the teeth must lie within to allow perfect meshing.

Grease the teeth before use.

5.8 WHEEL DRIVES INSTALLATION

5.8.1 Installation WD-RW

Make sure that the gearbox and the rigid structure to which it will be anchored are aligned and at right angles, and that the surfaces to be joined are clean and not dented.
Create slits in the structure aligned with the oil holes and the oil level kit of the gearbox, if present, to ensure that it can be accessed and used.
After completing installation, check that the bending angle “ΔH” does not exceed 0.3 mm.



On the side opposite to the gearbox on the winch structure, there must be an axially free bearing to prevent the winch and the gearbox from being abnormally overloaded.

Anchor the gearbox to the structure with class 12.9 screws, applying the tightening torque shown in **Annex 2**.

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

5.8.2 Installation EH

Make sure that the gearbox and the rigid structure to which it will be anchored are aligned and

at right angles, and that the surfaces to be joined are clean and not dented.

Anchor the gearbox to the structure of the machine with class 8.8 screws, applying the tightening torque shown in **Annex 2**.

Use class 10.9 or 12.9 screws when the applications will involve strong shocks, frequent stopping and start-up and/or inversion of the direction of motion and when 70 % of maximum admissible torque will be exceeded.

In the case of gearboxes prepared for hydraulic motors and complete with brakes, at the time of installation, use an appropriate tube to connect the hydraulic circuit with the command opening on the body of the brake, identifiable by its red cap.

5.8.3 Brake connection

In the case of gearboxes prepared for hydraulic motors and complete with brakes, at the time of installation, use an appropriate tube to connect the hydraulic circuit with the command opening on the body of the brake, identifiable by its red cap.

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-upe:

- 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.

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.

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 gearbox is supplied without oil, it is the customer's responsibility to check the correct filling and lubrication of all parts of the gearbox.
If any problems arise, please contact the DINAMIC OIL S.p.A. technical sales department. If the customer of DINAMIC OIL S.p.A. fills the gearbox themselves, the company declines all liability for damage due to improper filling and/or lubrication.

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	Enersyn EPX	Enersyn 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 GEM 1	Klubersynt EG4	Klubersynt GH6
MOBIL	Mobilgear XMP	Mobilgear SHC	Glygoile
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	Klüberoil 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

For the oil level refer to the mounting position.

Ensure the power supply is disconnected when filling.

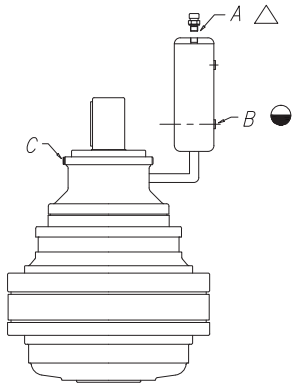
7.5.1 Filling procedure series RE/GB gearboxes

- 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).

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.

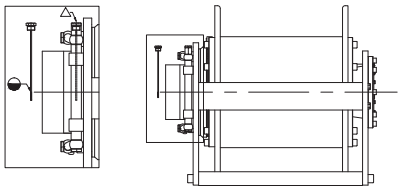
- Unscrew cap “C”, located on the upper part of the gearbox, to prevent an air bubble from forming at the upper rotary seal.
- Unscrew loading cap “A” and start filling. When the oil flows out of the hole in cap “C”, close it using the appropriate tightening torques (see Annex 2) and fill up to level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

- Refit cap “A” using the appropriate tightening torques (see Annex 2).

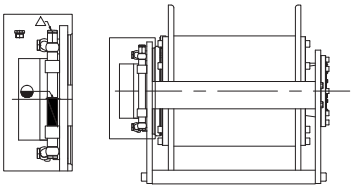


7.5.2 Filling series WD wheel drive

- Horizontal position and level with rod:
  - Unscrew the cap with the rod in the top part of the level kit.
  - Pour the appropriate amount of oil through the corresponding hole (see point 7.6).
  - Use the cap with the rod to check when the level reaches the mid-point.
  - Replace the cap with the rod, tightening it to the recommended torque (see Annex 2).

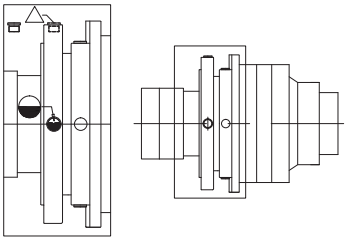


- Horizontal position with visual level:
  - Unscrew the cap in the upper part of the level kit.
  - Pour the appropriate amount of oil through the corresponding hole (see point 7.6).
  - Use the clear tube mounted on this kit to check when the level reaches the mid-point.
  - Replace the cap, tightening it to the recommended torque (**see Annex 2**).



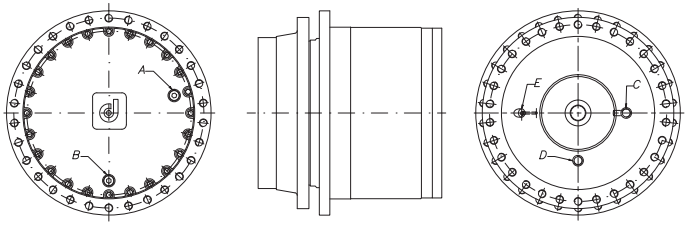
7.5.3 Filling series RW wheel drive

- Horizontal position:
  - Unscrew the cap in the upper part of the flange.
  - Pour the appropriate amount of oil through the corresponding hole (see point 7.6).
  - Use the visual cap to check when the level reaches the mid-point.
  - Replace the cap, tightening it to the recommended torque (see **Annex 2**).



7.5.4 Filling series EH wheel drive

- Horizontal position:
  - Position the gearbox as shown in the figure below:



  - Unscrew caps “A” and “B”.
  - Fill with the appropriate amount of oil through the hole in cap “B” (see point 7.6), adding oil until it comes out of the hole in cap “A”.

- Tighten the caps again to the recommended torque (see **Annex 2**).

In the case of a cooling system oil enters and exits through caps C and D, while cap E is used to open the brake.

For information on filling in other assembly positions, contact the Dinamic Oil Sales Technical Assistance Service.

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.
The dimensional data sheets show the quantities of oil required for filling. However, these values should be used for reference purposes only and exact lubrication should be verified by means of visual checks.

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.

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 8.3).
- Check the screws are all tight, and tighten them where required.

After every 3 months of operation (or sooner if applicable) and for the entire service life of the gearbox, it is necessary to check:
- The oil level with the appropriate caps.
- Absence of oil leaks.
- Absence of contamination from dirt, metal residues and other contaminants and deposits of water or other contaminating liquids in the areas of the input or output shafts, in particular close to the seals or in other areas, which may compromise the proper operation of the gearbox.
- Absence of oxidation on the input and output shafts and near the sealing areas.
- Absence of abnormal clearance on the output/input shafts, pinions, joints and other accessories.
- Absence of contact wear on input/output shafts, joints, and other accessories; absence of cracks and damage on supports, shaft flanges, and other parts of the gearbox.
- No breakage or extension of the flange and fixing screws.
- Absence of damage and vibrations or abnormal noise.
- Absence of abnormal heating or abnormal temperatures.

If one or more of these negative aspects is detected, please contact the DINAMIC OIL S.p.A. technical sales department.

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.

The probability of failure in case of lack of or poorly performed maintenance and / or checks can increase considerably.
The customer must therefore ensure that, if the gearboxes cannot be properly maintained and / or checked, they run a careful and thorough analysis of the risks in order to avoid any harm to people, animals or objects in the case of any damage that may occur.
DINAMIC OIL S.p.A. declines all responsibility for harm incurred to people, animals or objects deriving from the lack of maintenance and product checks.

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 temperture	Oil type		
	Mineral oil	Synthetic oil	
		Polyalphaolefins (PAO)	Polyglycols (PG)
70° C	7000 hours	15000 hours	16000 hours
80° C	5000 hours	10000 hours	12000 hours
90° C	3000 hours	7500 hours	9000 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.
- Wash internal parts with a suitable liquid.
- 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
5000 hours	10000 hours

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

8.5 LIFETIME INFORMATION

8.5.1 Service life

The service life indicated on the dimensions, sheets, catalogues and calculation reports is a theoretical value calculated from the fatigue limits of the weakest component of the gearbox and on the basis of a theoretical load cycle.
Each application may vary based on usage and/or environmental conditions.

The calculated theoretical life value is also dependent on the calculation method used and on the safety coefficients used and, in reality, even small variations in the usage parameters can shorten the life of the components.
The theoretical life is also calculated with a 90% reliability (see bearings).
However, the probability of failure long before the calculated theoretical life is reasonably low, but it does exist so we advise customers to make a careful assessment of the risks for those gearboxes whose breakage can cause damage to property or people and animals, and for these we recommend that customers request increased safety coefficients and to carry out, in addition to the checks indicated in Chapter 8.1, checks on critical components at intervals of about 1/3 of the calculated theoretical life or more often.

8.5.2 End of life

At the end of the life of the component, it makes sense for the probability of breakage of critical components to be reasonably high.
For this reason, it is particularly important for the customer to evaluate the risks that a breakdown may cause from the point of view of damage to property or people and animals. In this case, we recommend the replacement and complete overhaul of the gearbox/wheel.

8.5.3 Service life of seals

When the theoretical life of the gearbox is calculated, the life of the seals is not taken into account as it cannot be calculated.
In reality, the life span of the seals is considerably lower than the theoretical life of the gearboxes/wheels.
It is therefore necessary to replace any worn seals, as oil leaks may cause serious damage and breakage to gearboxes/wheels.
It is therefore necessary for customers to carefully check the state of the seals in gearboxes/wheels whose damage caused by oil leaks may cause serious harm to property or people and animals (see also Chapter 8.1).

8.5.4 Warranty

The warranty is void if the instructions in the manual are not followed.
For further information please refer to our “General Conditions of Sale”.

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 Council and by committee decision 2014/955/UE, directive 2008/98/CE modified by regulation UE n.1357/2014 and by regulation UE n. 997/2017.

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.

ANNEX 1 - AMOUNTS OF OIL AND WEIGHTS

(Liters) OIL ℓ	B3	V5	V6	B6	B7	B8	B5	V1	V3
RE 111	0,7	1,4	1,4	0,7	0,7	0,7	0,4	0,8	0,8
RE 112	0,9	1,8	1,8	0,9	0,9	0,9	0,5	1	1
RE 113	1,1	2,2	2.2	1,1	1,1	1,1	0,7	1,4	1,4
RE 114	1,3	2,6	2,6	1,3	1,3	1,3	0,8	1,6	1,6
RE 211	0,8	1,6	1,6	0,8	0,8	0,8	0,5	1	1
RE 212	1	2	2	1	1	1	0,6	1,2	1,2
RE 213	1,2	2,4	2,4	1,2	1,2	1,2	0,7	1,4	1,4
RE 214	1,4	2,8	2,8	1,4	1,4	1,4	0,9	1,8	1,8
RE 241	0,8	1,6	1,6	0,8	0,8	0,8	0,5	1	1
RE 242	1	2	2	1	1	1	0,6	1,2	1,2
RE 243	1,2	2,4	2,4	1,2	1,2	1,2	0,7	1,4	1,4
RE 244	1,4	2,8	2,8	1,4	1,4	1,4	0,9	1,8	1,8
RE 311	1,4	2,8	2,8	1,4	1,4	1,4	1	2	2
RE 312	1,6	3,2	3,2	1,6	1,6	1,6	1,2	2,4	2,4
RE 313	1,7	3,4	3,4	1,7	1,7	1,7	1,3	2,6	2,6
RE 314	1,8	3,6	3,6	1,8	1,8	1,8	1,4	2,8	2,8
RE 511	1,5	3	3	1,5	1,5	1,5	1,1	2,2	2,2
RE 512	1,7	3,4	3,4	1,7	1,7	1,7	1,3	2,6	2,6
RE 513	1,8	3,6	3,6	1,8	1,8	1,8	1,5	3	3
RE 514	1,9	3,8	3,8	1,9	1,9	1,9	1,6	3,2	3,2
RE 611	1,6	3,2	3,2	1,6	1,6	1,6	1,2	2,4	2,4
RE 612	1,8	3,6	3,6	1,8	1,8	1,8	1,4	2,8	2,8
RE 613	1,9	3,8	3,8	1,9	1,9	1,9	1,6	3,2	3,2
RE 614	20	40	40	20	20	20	1,7	3,4	3,4
RE 811	1,8	3,6	3,6	1,8	1,8	1,8	1,5	3	3
RE 812	2	4	4	2	2	2	1,7	3,4	3,4
RE 813	2,2	4,4	4,4	2,2	2,2	2,2	1,9	3,8	3,8
RE 814	2,3	4,6	4,6	2,3	2,3	2,3	2	4	4
RE 1021	2,4	4,8	4,8	2,4	2,4	2,4	2,1	4,2	4,2
RE 1022	2,6	5,2	5,2	2,6	2,6	2,6	2,3	4,6	4,6
RE 1023	2,7	5,4	5,4	2,7	2,7	2,7	2,4	4,8	4,8
RE 1024	2,9	5,8	5,8	2,9	2,9	2,9	2,6	5,2	5,2

(Liters) OIL ℓ	B5	V1	V3
RE 1521	2,7	5,4	5,4
RE 1522	3	6	6
RE 1523	3,2	6,4	6,4
RE 1524	3,4	6,8	6,8
RE 2001	2,7	5,4	5,4
RE 2002	3	6	6
RE 2003	3,3	6,6	6,6
RE 2004	3,4	6,8	6,8
RE 2002L	3	6	6
RE 2003L	3,1	6,2	6,2
RE 2004L	3,2	6,4	6,4
RE 2521	3,5	7	7
RE 2522	4	8	8
RE 2523	4,2	8,4	8,4
RE 2524	4,5	9	9
RE 3001	3,4	6,8	6,8
RE 3002	4,5	9	9
RE 3003	4,7	9,4	9,4
RE 3004	5	10	10
RE 3511	4,9	9,8	9,8
RE 3512	5,7	11,4	11,4
RE 3513	6	12	12
RE 3514	6,2	12,4	12,4
RE 4801	4,7	9,4	9,4
RE 4802	6,8	13,6	13,6
RE 4803	7,2	14,4	14,4
RE 4804	7,4	14,8	14,8
RE 6001	7,5	15	15
RE 6002	8,5	17	17
RE 6003	9	18	18
RE 6004	9,3	18,6	18,6
RE 6002L	8,5	17	17
RE 6003L	9	18	18
RE 6004L	9,2	18,4	18,4

(Liters)	B5	V1	V3
RE 8001	8,3	16,6	16,6
RE 8002	10,2	20,4	20,4
RE 8003	11	22	22
RE 8004	11,5	23	23
RE 8005	11,7	23,4	23,4
RE 8002L	10,2	20,4	20,4
RE 8003L	10,8	21,6	21,6
RE 8004L	11,4	22,8	22,8
RE 8005L	11,6	23,2	23,2

(Liters)	B5	V1	V3
GB 12011	13,5	27	27
GB 12012	15,5	31	31
GB 12013	16,5	33	33
GB 12014	16,8	33,6	33,6
GB 12015	17	34	34
GB 12012L	15,5	31	31
GB 12013L	16,3	32,6	32,6
GB 12014L	16,7	33,4	33,4
GB 12015L	17	34	34
GB 16001	14,5	29	29
GB 16002	18	36	36
GB 16003	19,2	38,4	38,4
GB 16004	19,6	39,2	39,2
GB 16005	19,8	39,6	39,6
GB 16002L	17	34	34
GB 16003L	18	36	36
GB 16004L	18,5	37	37
GB 16005L	18,7	37,4	37,4
GB 21001	20	40	40
GB 21002	23,5	47	47

(Liters)	B5	V1	V3
GB 53001	70	140	140
GB 53002	80	160	160
GB 53003	85	170	170
GB 53004	86,5	173	173
GB 53005	87	174	174
GB 61001	70	140	140
GB 61002	80	160	160
GB 61003	85	170	170
GB 61004	86,5	173	173
GB 61005	87	174	174
GB 85001	75	150	150
GB 85002	87,5	175	175
GB 85003	93	186	186
GB 85004	95	190	190
GB 85005	95,5	191	191
GB 110001	145	290	290
GB 110002	170	340	340
GB 110003	180	360	360
GB 110004	183	366	366
GB 110005	185	370	370

(Liters) OIL ℓ	B5	V1	V3
GB 21003	24,5	49	49
GB 21004	25	50	50
GB 21005	25,5	51	51
GB 26001	20	40	40
GB 26002	25,5	51	51
GB 26003	27,5	55	55
GB 26004	28,5	57	57
GB 26005	29	58	58
GB 31001	38	76	76
GB 31002	46,5	93	93
GB 31003	48,5	97	97
GB 31004	49,5	99	99
GB 31005	50	100	100
GB 40001	41	82	82
GB 40002	49	98	98
GB 40003	51	102	102
GB 40004	52	104	104
GB 40005	52	104	104
GB 45001	41	82	82
GB 45002	50	100	100
GB 45003	53,5	107	107
GB 45004	55	110	110
GB 45005	55,5	111	111

(Liters) OIL ℓ	B5	V1	V3
GB 130001	144	288	288
GB 130002	172	344	344
GB 130003	181	362	362
GB 130004	185	370	370
GB 130005	186	372	372
GB 150001	143	286	286
GB 150002	172	344	344
GB 150003	185	370	370
GB 150004	187	374	374
GB 150005	188	376	376
GB 205001	255	510	510
GB 205002	300	600	600
GB 205003	318	636	636
GB 205004	326	652	652
GB 205005	329	658	658
GB 235001	255	510	510
GB 235002	300	600	600
GB 235003	335	670	670
GB 235004	345	690	690
GB 235005	247	494	494

(Liters) OIL ℓ	B3-1	V5	V6	B6-1	B7	B8	B5-1	V1	V3
RA 112	1,5	3	3	1,5	3	3	1,2	2,4	2,4
RA 113	1,7	3,4	3,4	1,7	3,4	3,4	1,3	2,6	2,6
RA 114	1,9	3,8	3,8	1,9	3,8	3,8	1,5	3	3
RA 212	1,6	3,2	3,2	1,6	3,2	3,2	1,3	2,6	2,6
RA 213	1,8	3,6	3,6	1,8	3,6	3,6	1,4	2,8	2,8
RA 214	2	4	4	2	4	4	1,5	3	3

(Liters) OIL ℓ	B5-1	V1	V3
RA 1522	5,7	11,4	11,4
RA 1523	4,1	8,2	8,2
RA 1524	4	8	8
RA 2002	5,7	11,4	11,4
RA 2003	4,1	8,2	8,2
RA 2004	4,1	8,2	8,2

(Liters) OIL ℓ	B3-1	V5	V6	B6-1	B7	B8	B5-1	V1	V3
RA 242	1,6	3,2	3,2	1,6	3,2	3,2	1,3	2,6	2,6
RA 243	1,8	3,6	3,6	1,8	3,6	3,6	1,4	2,8	2,8
RA 244	2	4	4	2	4	4	1,5	3	3
RA 312	2,5	5	5	2,5	5	5	2,1	4,2	4,2
RA 313	2,4	4,8	4,8	2,4	4,8	4,8	2	4	4
RA 314	2,5	5	5	2,5	5	5	2,1	4,2	4,2
RA 512	2,6	5,2	5,2	2,6	5,2	5,2	2,2	4,4	4,4
RA 513	2,5	5	5	2,5	5	5	2,1	4,2	4,2
RA 514	2,6	5,2	5,2	2,6	5,2	5,2	2,3	4,6	4,6
RA 612	2,7	5,4	5,4	2,7	5,4	5,4	2,3	4,6	4,6
RA 613	2,9	5,8	5,8	2,9	5,8	5,8	2,5	5	5
RA 614	2,7	5,4	5,4	2,7	5,4	5,4	2,4	4,8	4,8
RA 812	3,8	7,6	7,6	3,8	7,6	7,6	3,5	7	7
RA 813	3,1	6,2	6,2	3,1	6,2	6,2	2,8	5,6	5,6
RA 814	3	6	6	3	6	6	2,7	5,4	5,4
RA 1022	4,4	8,8	8,8	4,4	8,8	8,8	4,1	8,2	8,2
RA 1023	3,7	7,4	7,4	3,7	7,4	7,4	3,4	6,8	6,8
RA 1024	3,5	7	7	3,5	7	7	3,2	6,4	6,4

(Liters) OIL ℓ	B5-1	V1	V3
RA 2003L	4,1	8,2	8,2
RA 2004L	3,9	7,8	7,8
RA 2522	10,7	21,4	21,4
RA 2523	11	22	22
RA 2524	10,5	21	21
RA 3002	10,6	21,2	21,2
RA 3003	11,1	22,2	22,2
RA 3004	10,6	21,2	21,2
RA 3512	14,9	29,8	29,8
RA 3513	7,7	15,4	15,4
RA 3514	7,1	14,2	14,2
RA 4802	14,7	29,4	29,4
RA 4803	9,8	19,6	19,6
RA 4804	8,3	16,6	16,6
RA 6002	17,5	35	35
RA 6003	11,5	23	23
RA 6004	10,1	20,2	20,2
RA 6003L	11,5	23	23
RA 6004L	10,1	20,2	20,2
RA 8002	18,3	36,6	36,6
RA 8003	13,2	26,4	26,4
RA 8004	13	26	26
RA 8003L	13,2	26,4	26,4
RA 8004L	12,8	25,6	25,6

(Liters) OIL ℓ	B5	V1	V3
GBA 12013	18,5	37	37
GBA 12014	18,5	37	37
GBA 12015	17,9	35,8	35,8
GBA 12013L	18,5	37	37
GBA 12014L	18,3	36,6	36,6

(Liters) OIL ℓ	Complete filling
CC30	1.6
CC120	2.2
CC350	4
CC600	6
CC1000	16

(Liters) 	B5	V1	V3
GBA 12015L	18	36	36
GBA 16003	28	56	56
GBA 16004	22,2	44,4	44,4
GBA 16005	20,7	41,4	41,4
GBA 16003L	27	54	54
GBA 16004L	21	42	42
GBA 16005L	19,6	39,2	39,2
GBA 21003	33,5	67	67
GBA 21004	27,5	55	55
GBA 21005	26,1	52,2	52,2
GBA 26003	35,5	71	71
GBA 26004	30,5	61	61
GBA 26005	30,5	61	61
GBA 31004	51,5	103	103
GBA 31005	51,5	103	103
GBA 40004	54	108	108
GBA 40005	54	108	108
GBA 45004	63,5	127	127
GBA 45005	58,5	117	117
GBA 53004	96,5	193	193
GBA 53005	90	180	180
GBA 61004	95	190	190
GBA 61005	89,5	179	179
GBA 61006	88	176	176
GBA 85004	103	206	206
GBA 85005	98	196	196
GBA 85006	97	194	194
GBA 110005	186	372	372
GBA 110006	187	374	374
GBA 130005	194	388	388
GBA 130006	189	378	378

kg	P	T	TL	TR	F	N	H
RE 111	23	20	-	20	14	17	-
RE 112	29,5	26,5	-	26,5	21	24	-
RE 113	36,5	33,5	-	33,5	27,5	30,5	-
RE 114	43	40	-	40	34	37	-
RE 211	25	22	-	22	16	19	-
RE 212	32	29	-	29	23	26	-
RE 213	38	35	-	35	30	32	-
RE 214	45	42	-	42	37	39	-
RE 241	25	-	-	22	16	-	-
RE 242	32	-	-	29	23	-	-
RE 243	38	-	-	35	30	-	-
RE 244	45	-	-	42	37	-	-
RE 311	52	47	47	-	24	-	-
RE 312	59	54	54	-	31	42	-
RE 313	66	61	61	-	38	49	-
RE 314	72	67	66	-	45	56	-
RE 511	57	52	52	-	29	40	-
RE 512	66	61	61	-	38	49	-
RE 513	73	68	68	-	45	56	-
RE 514	80	75	75	-	52	63	-
RE 611	58	53	53	-	30	41	-
RE 612	72	67	67	-	44	55	-
RE 613	79	74	74	-	51	62	-
RE 614	86	81	81	-	58	69	-
RE 811	80	70	-	-	58	67	-
RE 812	94	84	-	-	71	80	-
RE 813	100	90	-	-	78	87	-
RE 814	107	97	-	-	85	94	-
RE 1021	100	90	-	-	60	-	-
RE 1022	117	107	-	-	77	-	-
RE 1023	126	116	-	-	86	-	-
RE 1024	133	123	-	-	93	-	-
RE 1521	-	123	-	-	84	-	130
RE 1522	-	141	-	-	102	-	148
RE 1523	-	149	-	-	110	-	156
RE 1524	-	156	-	-	117	-	163
RE 2001	-	124	-	-	85	-	131
RE 2002	-	142	-	-	104	-	150

kg	H	F
RE 6002L	365	340
RE 6003L	375	350
E 6004L	382	357
RE 6001	315	290
RE 6002	370	345
RE 6003	390	365
RE 6004	395	370
RE 8001	410	380
RE 8002	500	470
RE 8003	540	510
RE 8004	555	525
RE 8005	560	530
RE 8002L	485	455
RE 8003L	520	490
RE 8004L	530	500
RE 8005L	535	505
GB 12011	650	615
GB 12012	750	715
GB 12013	785	750
GB 12014	800	765
GB 12015	810	775
GB 12012L	700	665
GB 12013L	745	710
GB 12014L	750	715
GB 12015L	757	722
GB 16001	690	655
GB 16002	860	825
GB 16003	915	880
GB 16004	935	900
GB 16005	940	905
GB 16002L	860	825
GB 16003L	865	830
GB 16004L	885	850
GB 16005L	890	855
GB 21001	930	880
GB 21002	1115	1065
GB 21003	1165	1115
GB 21004	1190	1140

kg	P	T	TL	TR	F	N	H
RE 2003	-	156	-	-	118	-	163
RE 2004	-	163	-	-	125	-	170
RE 2002L	-	137	-	-	99	-	145
RE 2003L	-	149	-	-	111	-	156
RE 2004L	-	153	-	-	115	-	160
RE 2521	-	-	-	-	151	-	185
RE 2522	-	-	-	-	180	-	214
RE 2523	-	-	-	-	194	-	228
RE 2524	-	-	-	-	201	-	235
RE 3001	-	-	-	-	152	-	186
RE 3002	-	-	-	-	199	-	233
RE 3003	-	-	-	-	207	-	241
RE 3004	-	-	-	-	216	-	250
RE 3511	-	-	-	-	225	-	239
RE 3512	-	-	-	-	260	-	274
RE 3513	-	-	-	-	278	-	292
RE 3514	-	-	-	-	287	-	301
RE 4801	-	-	-	-	226	-	240
RE 4802	-	-	-	-	311	-	325
RE 4803	-	-	-	-	330	-	344
RE 4804	-	-	-	-	339	-	353

kg	H	F
GB 21005	1205	1155
GB 26001	980	920
GB 26002	1230	1170
GB 26003	1330	1270
GB 26004	1360	1300
GB 26005	1380	1320
GB 31001	1900	1750
GB 31002	2280	2130
GB 31003	2375	2225
GB 31004	2410	2260
GB 31005	2425	2275
GB 40001	2030	1880
GB 40002	2400	2250
GB 40003	2500	2350
GB 40004	2530	2380
GB 40005	2540	2390
GB 45001	2030	1880
GB 45002	2435	2285
GB 45003	2610	2460
GB 45004	2665	2515
GB 45005	2682	2532

kg	H	F
GB 53001	3550	3200
GB 53002	4060	3710
GB 53003	4250	3900
GB 53004	4350	4000
GB 53005	4370	4020
GB 61001	3550	3200
GB 61002	4060	3710
GB 61003	4250	3900
GB 61004	4350	4000
GB 61005	4370	4020
GB 85001	3850	3450

kg	H	F
GB 85002	4410	4010
GB 85003	4650	4250
GB 85004	4750	4350
GB 85005	4785	4385
GB 110001	7520	6620
GB 110002	8780	7880
GB 110003	9155	8255
GB 110004	9250	8350
GB 110005	9285	8385
GB 130001	7535	6635
GB 130002	8800	7900
GB 130003	9210	8310
GB 130004	9380	8480
GB 130005	9430	8530
GB 150001	7550	6650
GB 150002	8795	7895
GB 150003	9280	8380
GB 150004	9460	8560
GB 150005	9500	8600
GB 205001	12240	11790
GB 205002	14330	13880
GB 205003	15040	14590
GB 205004	15410	14960
GB 205005	15500	15050
GB 235001	12250	11800
GB 235002	14580	14130
GB 235003	15830	15380
GB 235004	16200	15750
GB 235005	16300	15850

kg	P	T	TL	TR	F	N	H
RA 112	43	40	-	40	34	37	-
RA 113	49,5	46,5	-	46,5	41	44	-

kg	H	F
RA 6002	665	640
RA 6003	505	480

kg	P	T	TL	TR	F	N	H
RA 114	56,5	53,5	-	53,5	47,5	50,5	-
RA 212	45	42	-	42	36	39	-
RA 213	52	49	-	49	43	46	-
RA 214	58	55	-	55	50	52	-
RA 242	45	-	-	42	-	-	-
RA 243	52	-	-	49	-	-	-
RA 244	58	-	-	55	-	-	-
RA 312	102	97	97	-	74	85	-
RA 313	79	74	74	-	51	62	-
RA 314	86	81	81	-	58	69	-
RA 512	107	102	102	-	79	90	-
RA 513	86	81	81	-	58	69	-
RA 514	93	88	88	-	65	76	-
RA 612	108	103	103	-	80	91	-
RA 613	122	117	117	-	94	105	-
RA 614	99	94	94	-	71	82	-
RA 812	170	160	-	-	-	157	-
RA 813	144	134	-	-	-	130	-
RA 814	120	110	-	-	-	107	-
RA 1022	190	180	-	-	150	-	-
RA 1023	167	157	-	-	127	-	-
RA 1024	146	136	-	-	106	-	-
RA 1522	-	258	-	-	219	-	265
RA 1523	-	191	-	-	152	-	198
RA 1524	-	169	-	-	130	-	176
RA 2002	-	259	-	-	220	-	266
RA 2003	-	192	-	-	154	-	200
RA 2004	-	176	-	-	138	-	183
RA 2003L	-	187	-	-	149	-	195
RA 2004L	-	169	-	-	131	-	176
RA 2522	-	-	-	-	286	-	320
RA 2523	-	-	-	-	270	-	304
RA 2524	-	-	-	-	214	-	248
RA 3002	-	-	-	-	287	-	321
RA 3003	-	-	-	-	289	-	323
RA 3004	-	-	-	-	257	-	291
RA 3512	-	-	-	-	575	-	589
RA 3513	-	-	-	-	350	-	364
RA 3514	-	-	-	-	398	-	412

kg	H	F
RA 6004	440	415
RA 6003L	500	475
RA 6004L	425	400
RA 8002	760	730
RA 8003	635	605
RA 8004	630	600
RA 8003L	620	590
RA 8004L	610	580
GBA 12013	885	850
GBA 12014	875	840
GBA 12015	850	815
GBA 12013L	835	800
GBA 12014L	835	800
GBA 12015L	800	765
GBA 16003	1210	1175
GBA 16004	1050	1015
GBA 16005	985	950
GBA 16003L	1210	1175
GBA 16004L	1000	965
GBA 16005L	935	900
GBA 21003	1465	1415
GBA 21004	1300	1250
GBA 21005	1240	1190
GBA 26003	1580	1520
GBA 26004	1465	1405
GBA 26005	1450	1390
GBA 31004	2510	2360
GBA 31005	2500	2350
GBA 40004	2635	2485
GBA 40005	2620	2470
GBA 45004	2960	2810
GBA 45005	2800	2650
GBA 53004	4600	4250
GBA 53005	4485	4135
GBA 61004	4600	4250
GBA 61005	4485	4135
GBA 61006	4420	4070
GBA 85004	5000	4600
GBA 85005	4885	4485

kg	P	T	TL	TR	F	N	H
RA 4802	-	-	-	-	576	-	590
RA 4803	-	-	-	-	446	-	460
RA 4804	-	-	-	-	380	-	394

kg	H	F
GBA 85006	4875	4475
GBA 110005	9385	8485
GBA 130005	9730	8830

kg	
CC30	35
CC120	50
CC350	90
CC600	135
CC1000	350

WD:	kg	(Liters) OIL
WD 1023	150	3.5
WD 1523	200	4.5
WD 2003	225	5
WD 2523	275	6
WD 3003	350	8
WD 4803	455	10
WD 8003	660	15
WD16004	1100	30

RW:	kg	(Liters) OIL
RW 512	75	2
RW 513	85	2.3
RW 612	90	2.3
RW 613	100	2.5
RW 812	130	3
RW 813	140	3.5
RW 1022	145	4
RW 1023	155	4.2
RW 1532	195	5
RW 2522	275	7

EH:	kg	(Liters) OIL
EH 10000 SC	410	6.5
EH 13000 SC	440	7.5
EH 16000 SC	680	11.5
EH 22000 SC	880	15
EH 26000 SC	980	18
EH 33000 SC	1280	21
EH 33000 W	1280	25
EH 45000 SC	1560	24
EH 60000 SC	3120	50
EH 70000 SC	3120	50

ANNEX 2 - TIGHTENING TORQUES FOR LARGE PITCH SCREWS AND CAPS

Screw thread	Class 8.8	Class 10.9	Class 12.9
	Torque [Nm]	Torque [Nm]	Torque [Nm]
M10	44	62	74
M12	77	108	130
M14	122	172	207
M16	191	269	323
M18	263	370	444
M20	373	525	630
M22	507	714	857
M24	645	908	1090
M27	944	1330	1590
M30	1280	1800	2160
M33	1740	2460	2940
M36	2240	3150	3780
M39	2900	4080	4890
M42	3580	5040	6050

Cap thread	Torque [Nm]
1/8”	5
1/4”	7
3/8”	7
1/2”	14
3/4”	14
1”	25

ANNEX 3 - NEGATIVE HYDRAULIC MULTI DISK BRAKES

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

DINAMIC OIL S.p.A gearboxes may have a static negative multi disk brakes and hydraulic control.
Braking is generated by springs which compress fixed tempered steel disks alternating with bronze disks; friction transforms this thrust into a braking torque.
The brakes open when hydraulic oil (ISO VG32/46) pressurizes the brake release port; the pressure acts on a piston which compresses the spring so that the disks can turn freely. These are parking brakes which act by creating static braking torque when hydraulic release pressure is zero. The action stops when hydraulic pressure reaches the minimum release value.

Symbol

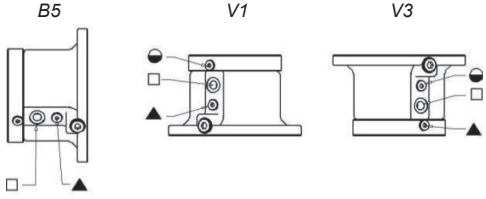
◒	Oil level
□	Brake releasing plug
▲	Oil drain/Oil fill

The brake release plug is the one with the protective cap in red.
Visual level and breather plug on demand

F1/F2

The brakes on models F1 through F2 are designed for direct assembly of orbital hydraulic motors with flanging, compliant with the SAE A Standard.

Lubrication	Separate lubrication chamber	
Oil type	Mineral ISO VG32/46	
Oil quantity (liters)	B5 0.04	V 0.08

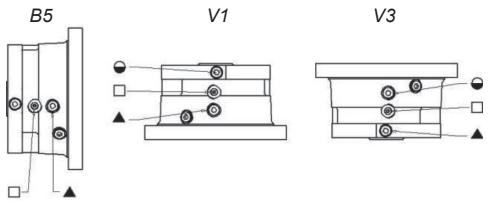


Brake type		F 01 / F 02	F 10 / F 20	F 11 / F 21	F 12 / F 22	F 13 / F 23	F 14 / F 24	F 05 / F 25	F 16 / F 26
Static braking torque	Tb (Nm)	132	133	182	235	332	468	530	608
Total release pressure	pb (bar)	23	29	34	26	30	36	39	42
Maximum pressure	p max (bar)	300							
Maximum speed	n1 max (RPM)	700							

F5/F6

The brakes on models F5 through F6 reach greater braking torques and have an ST universal for connection to wide range of motors available on the market.

Lubrication	Separate lubrication chamber	
Oil type	Mineral ISO VG32/46	
Oil quantity (liters)	B5 0.1	V 0.2

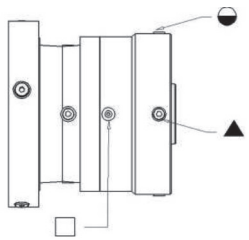


Brake type		F 501 / F 601	F 502 / F 602	F 503 / F 603	F 504 / F 604	F 505 / F 605	F 506 / F 606	F 508 / F 608	F 610	F 612
Static braking torque	Tb (Nm)	110	215	325	405	500	630	818	1.005	1.150
Total release pressure	pb (bar)	10	20	30	38	28	35	33	40	40
Maximum pressure	p max (bar)	300								
Maximum speed	n1 max (RPM)	1500 (standard)								
		3500 (special)								

F8

The brakes on model F8 reach braking torques of up to 3000 Nm and have an MU input for connection to a wide range of motors available on the market.

Lubrication	Dry disk lubrication in inlet side	
Oil type	Mineral ISO VG32/46	
Oil quantity (liters)	B5 0.1	V 0.2



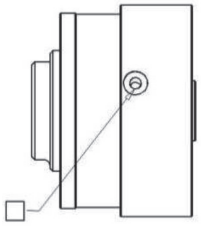
Brake type		**F 813**	**F 815**	**F818**	**F 820**	**F 823**	**F 827**	**F 830**
Static braking torque	**Tb (Nm)**	1.272	1.526	1.781	2.035	2.289	2.671	3.052
Total release pressure	**pb (bar)**	55	66	77	59	66	77	88
Maximum pressure	**p max (bar)**	300						
Maximum speed	**n1 max (RPM)**	1500 (standard)						
		3500 (special)						

F9

The brakes on model **F9** reach braking torques of up to 1500 Nm. An optional sprag clutch mechanism with a torque of up to 1200 Nm can also be mounted.

The freewheel allows rotation in one direction only. It overruns continuously during operation. The freewheel prevents reverse rotation if the drive is disconnected.

Lubrication	Lubricated with the same oil of the gearbox	
Oil type	-	
Oil quantity (liters)	-	-



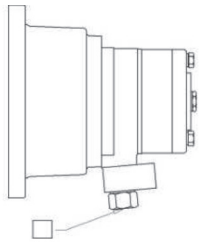
Brake type		**F 902**	**F 903**	**F 904**	**F 905**	**F 906**	**F 908**	**F 910**	**F 912**	**F915**
Static braking torque	**Tb (Nm)**	200	300	400	485	620	780	990	1.160	1.330

Total release pressure	**pb (bar)**	14	22	19	17	22	22	29	33	38
Maximum pressure	**p max (bar)**	300								
Maximum speed	**n1 max (RPM)**	1500 (standard)								
		3500 (special)								

MD

The MD brake is assembled with a direct flange connection for OMRS motors on reduction stage RE 110/RE 240.

Lubrication	Lubricated with the same oil of the gearbox	
Oil type	-	
Oil quantity (liters)	-	-



Brake type		**MD20**	**MD30**	**MD40**	**MD45**
Static braking torque	**Tb (Nm)**	220	308	396	459
Total release pressure	**pb (bar)**	24	24	24	26
Maximum pressure	**p max (bar)**	150			
Maximum speed	**n1 max (RPM)**	700			

FW/FY

The brakes on model FW/FY reach braking torques of up to 3600 Nm and have an ST/MU input for connection to a wide range of motors available on the market. An optional sprag clutch mechanism with a torque of up to 3000 Nm can also be mounted.

The freewheel allows rotation in one direction only. It overruns continuously during operation. The freewheel prevents reverse rotation if the drive is disconnected.

	WITHOUT SPRAG CLUTCH	WITH SPRAG CLUTCH
Lubrication	Dry disk	Separate lubrication chamber
Oil type	-	ISO VG32
Oil quantity (liters)	-	FW 0.4 FY 0.8

Filling procedure

For horizontal positions (B):
unscrew the filler plug.
Pour the required amount of oil as shown in the table of the corresponding brake.
Screw plug using the appropriate tightening torques (see Annex 2).
For vertical position (A):
unscrew filler and level plug.
Pour the required amount of oil as shown in the table of the corresponding brake
The oil should flow out of the level hole.
Screw plugs using the appropriate tightening torques (see Annex 2).

DINAMIC OIL S.p.A. recommends replacement at every gearbox oil change.

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

Diagnostics

PROBLEM	POSSIBLE CAUSE	SOLUTION
Multi-disk brake does not release	-No pressure to the brake -Internal malfunction -No pressure in circuit	-Check connection to hydraulic circuit -Contact the DINAMIC OIL S.p.A. -Check hydraulic circuit
Multi-disk brake does not jam	-Pressure delivered to brake	- Check hydraulic circuit
Disk brake does not brake	-No pressure to the brake -Worn brake pads	- Check hydraulic circuit - Contact the DINAMIC OIL S.p.A.

NOTES

This manual is also available in digital format on our website:
www.dinamicoil.it

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INSTALLATION OPERATION AND SERVICE MANUAL FOR PLANETARY GEARBOXES / WHEEL DRIVES

MIUM REV_01/19