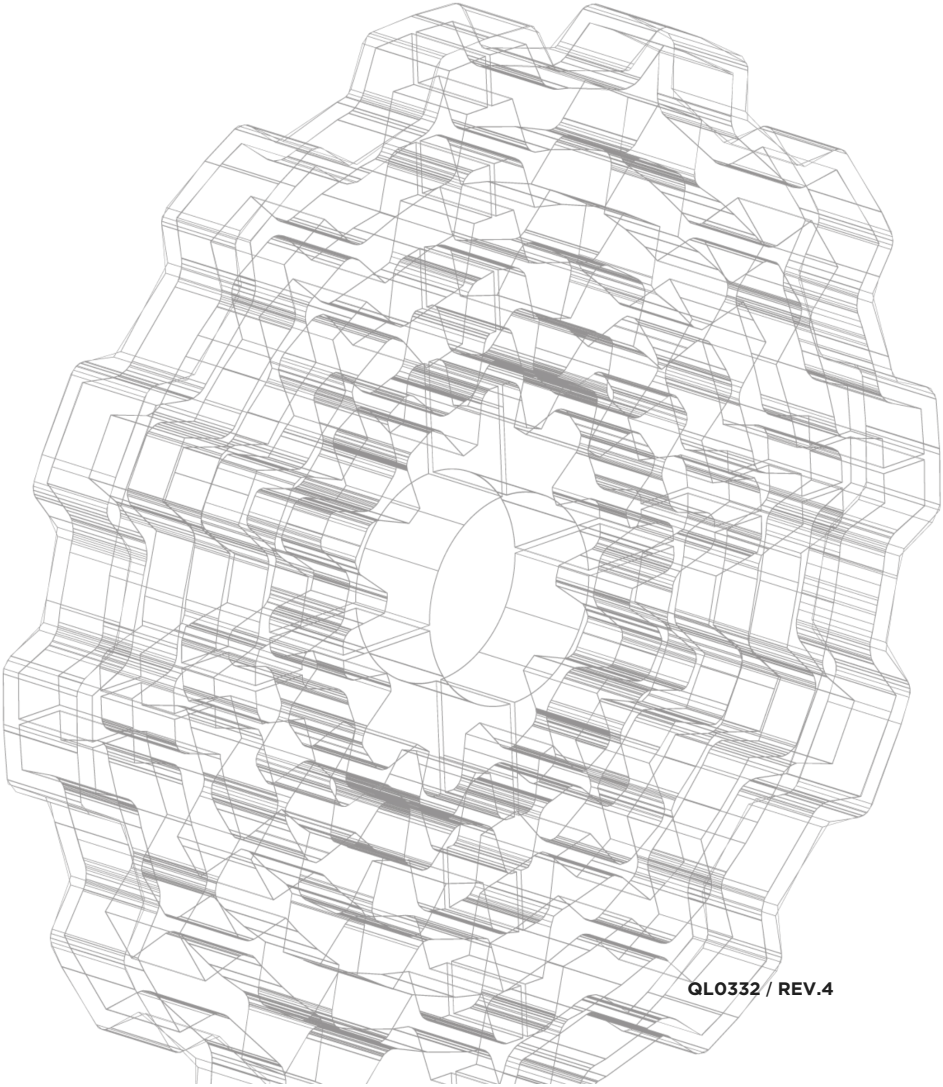
PUJOL
a TECO Group company

EN

Instructions for installation, use and maintenance Gear reducers



QL0332 / REV.4

ENGLISH TRANSLATION OF
THE ORIGINAL ITALIAN VERSION

IMPORTANT! The data and information given in this document substitute those given in previous editions which are thus to be considered obsolete; periodically consult the technical documentation available on Pujol web site for up-to-date performance information and specifications. For the motor section relating to motorvariators and geared motors, consult the motors manual available on Pujol web site.

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1. INTENDED USE OF THE MANUAL

INSTALLATION, USE AND MAINTENANCE INSTRUCTIONS FOR PUJOL PRODUCTS:

STANDARD

GEAR REDUCERS SERIES SXH, KXB, DXS, L, I

2. GENERAL INFORMATION

2.1 PURPOSE

This manual has been provided by Pujol to give information to authorized persons regarding transport, handling, installation, maintenance, repair, disassembly and scrapping of the unit.
Information regarding the electric motor can be found in the motor's "Use and maintenance instructions".
Failure to follow the instructions is a health and safety hazard and can result in economic damages.
The information must be kept carefully by the person charged with doing so and be available at all times for reference in good condition.
In case of damage or loss, the documentation can be requested directly from Pujol.

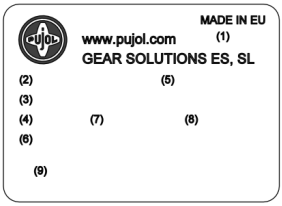
2.2 SYMBOLS

	CAUTION - DANGER Indicates a serious personal health and safety hazard.
	CAUTION - HOT PARTS Indicates a serious thermal hazard which may endanger personal health and safety.
	CAUTION - HIGH VOLTAGE Indicates a serious personal health and safety hazard due to the presence of dangerous voltage.
	IMPORTANT INFORMATION Indicates important technical information.

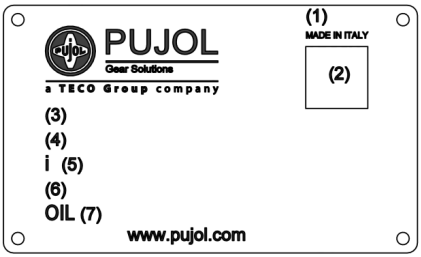
2.3 PRODUCT IDENTIFICATION

In order to identify the product, the unit bears a label of the following model.
The nameplate must not be removed and must be kept intact and readable. In case you need a copy of it just contact TECHNICAL SERVICE.

Gear reducer label
Information contained on the nameplate:
1. Mounters team.
2. Serial number (Order number-Job order progressive number-Manufacturing year).
3. Unit abbreviation.
4. i: reduction ratio.
5. Material/customer record.
6. Oil type.
7. Output rpm (available only for GEARMOTOR).
8. Nominal output torque (available only for GEARMOTOR).
9. CE marking (available only for GEARMOTOR).



Heavy duty reducer label
Information contained on the nameplate.
1. Mounters team
2. QR CODE
3. Serial number (Order number-Job order progressive number-Manufacturing year)
4. Symbol of the gear reducer/variator
5. i: reduction ratio
6. Operating position
7. Oil type



2.4 SERVICE

For any service request please contact the Pujol sales network directly indicating the data on the nameplate.

3. COMPLIANCE

Gearmotors, motovariators and motovariator-gear reducers are designed in compliance with the safety requirements of the Machinery Directive 2006/42/EC and are supplied with a Declaration of Incorporation. We recommend considering the Machinery Directive 2006/42/EC on the entire system where the PUJOL product is installed.

Pujol electric motors comply with the Low Voltage Directive 2014/35/EU and the Directive EMC 2014/30/EU regarding the intrinsic characteristics concerning emissions and immunity levels.

4. TECHNICAL INFORMATION

4.1 PRODUCT DESCRIPTION

The unit has been designed to be used in specific applications and, to satisfy particular requirements, it may be supplied in several mounting arrangements and configurations, including accessories and optional variants.
The user is responsible for using it appropriately and in line with the warnings given in this manual and the instructions on the product identification labels.

4.2 CRITICAL APPLICATIONS

The performance specified in the catalogue corresponds to position B3 or similar. For different mounting positions and/or particular input speeds, refer to the tables that highlight any critical situations for each size of the unit. Also bear in mind the following applications, and contact TECHNICAL SERVICE for further information:

- Use in conditions which could lead to injury if the unit fails;
- Applications with especially high inertia;
- Use as a lifting hoist;
- Applications with high dynamic loading of the unit casing;
- Use in conditions with T° lower than -5°C or higher than 40°C;
- Use in environment with presence of aggressive chemical agents;
- Use in a salty environment;
- Mounting positions not provided by the catalogue;
- Use in a radioactive environment;
- Use in ambient with pressure other than the atmospheric one;
- Applications providing immersion, even partial, of the unit;
- Use as multiplier.

Note: The maximum torque bearable by the unit can get twice the Mn2 stated on the label, but only intended for momentary, non-repetitive overload due to starting at full load, braking, impacts and other dynamic causes.

✔ Verified application.
A- Application not recommended.
B-Check the application and/or call TECHNICAL SERVICE.

The shrink disc is designed only to transmit the output torque. In case of mounting position with radial and/or axial loads, please contact TECHNICAL SERVICE.

	SXA				
	141	202-203	191-252-253	241-302-303	281-402-403
V5 - V1: 1500 < n1 < 3000	✔	✔	✔	✔	✔
n1 > 3000	B	B	B	B	B
V3 - V6	B	B	B	B	B

	SXH							
	252-253	191 302-303	241 352-353	281 402-403	381 502-503	481 602-603	551 702-703	902-903
V5 - V1: 1500 < n1 < 3000	✔	✔	✔	✔	✔	✔	B	B
n1 > 3000	B	B	B	B	B	B	A	A
V3 - V6	B	B	B	B	B	B	B	B

	KXA		
	202	252-253	352-353
2000 < n1 < 3000	✔	✔	✔
V6	B	B	B
n1 > 3000	B	B	B
...L : B6 - B7	B	B	B

	KXB						
	353	403	503	603	703	903	1003
2000 < n1 < 3000	✔	✔	✔	B	B	B	B
V6	B	B	B	B	B	B	B
n1 > 3000	B	B	B	B	A	A	A
...L : B6 - B7	B	B	B	B	B	B	B

	DXS						
	302-303	352-353	402-403	502-503	602-603	702-703	802-803
2000 < n1 < 3000	✔	✔	✔	✔	✔	B	B
V6	B	B	B	B	B	B	B
n1 > 3000	B	B	B	B	B	A	A
...L : V5 - V6	B	B	B	B	B	B	B
(*) ...L	B	B	B	B	B	B	B

	LA					
	30X	40X	50X	63X	75X	90X
V5: 1500 < n1 < 3000	✔	✔	✔	B	B	B
n1 > 3000	B	B	B	B	B	A
V6	B	B	B	B	B	B

	LW			LXW		
	40	50	63	90	110	130
V5: 1500 < n1 < 3000	✔	✔	✔	B	B	B
n1 > 3000	B	B	B	A	A	A
V6	B	B	B	B	B	B

	I				
	84	102	128	142	162
V5 - V1: 1500 < n1 < 3000	✔	✔	✔	✔	✔
n1 > 3000	B	B	B	B	B
V3 - V6	B	B	B	B	B

5. SAFETY INFORMATION

Carefully read the manual and any instructions marked directly on the nameplates fixed to the unit.
The personnel operating on the unit itself must have precise technical skills, experience and abilities, in addition to possessing the necessary tools and the necessary PPE (according to the current laws). Failure to comply with these requirements may result in problems to the safety and health of people.
Use the unit only for the purposes specified by Pujol. Improper use is a health and safety hazard and may cause economic damages. Keep the unit in good running order with programmed maintenance operations. The unit can reach high temperatures in operation. Do not touch the casings with bare hands - use appropriate safety equipment.
For proper maintenance ensure full safety precautions have been applied, including the use of safety clothing and equipment, as required by current workplace safety legislation.
Use only original Pujol spare parts. Use only oils and greases recommended by Pujol. Do not disperse polluting materials in the environment, dispose of them according to environmental regulations. After changing the lubricant, clean the unit casing as well as the work area.

6. HANDLING AND STORAGE

6.1 HANDLING

For unit receipt and unload, arrange:

1. A suitable and well ventilated area with flat ground:
2. Handling equipment, taking into account the overall dimensions, weight and gripping points, data present on the unit to be handled (crane, forklifts, eyelets, sling ropes, snap hooks, etc.) in order to avoid personal injury and/or property damage.

Upon receipt of the unit check, consulting the identification nameplate of the product, that it corresponds to the purchase order specifications, and that the application limits mentioned comply with the intended conditions of use. Check that the unit is not damaged and/or malfunctioning. If so please contact the Pujol store. Check that the paint is intact and, if not, provide for its restoration. Dispose of the packaging material in accordance with current rules. Those in charge of the handling of the unit will be required to ensure all necessary safety conditions.

	It is not always possible to move the unit manually due to its shape and/or weight; use appropriate handling equipment to avoid personal injury and/or property damage. The weight to be handled is listed in the catalogue and written on the nameplate. Proceed carrying out all handling operations with extreme caution. The precautions to be taken during handling are appropriate to ensure the safety of the operator and protect from breakage or damage the external parts due to shocks or accidental falls.

	Locate unit gripping points (grommets on the KXB-series reducer, hole on the DXS-series reducer, solid shaft threaded hole on the SXH, I , foot holes for LA-series, LXW110-130 reducer). For handling of the LW, LXW90 series gear reducer use the belts, securing it in the pam connection area. Never use only the motor grommet. Different accessories (flanges, pumps, control motors) can modify the centre of gravity. In this case, an additional anchoring point could be necessary. During lifting, do not exceed 15° of load swaying; should this happen, stop and repeat the operation. **Do not use pipes or threads, protruding accessories or shaft ends as anchoring points, and take special care with any lubrication and cooling systems.**

6.2 STORAGE

The units must be stored according to the following requirements:

- Be placed as per specified mounting position of the label;
- Be free from vibration and protected from accidental impacts
- Be kept at relative humidity <60%, with no intense temperature change, no ultraviolet light and no direct sunlight, and in case of low temperatures (Tam < -5°C) take special care to avoid shocks and vibration that could damage the structure.

In the event of prolonged storage/downtime periods (4/6 months) and/or environmental conditions other than those listed:

- Completely fill the unit with oil. The appropriate level should be restored at the time of commissioning of the unit;
- We suggest replacing any sealing ring not submerged in lubricant;
- Apply plenty of grease and/or suitable protective and waterproofing products in order to prevent deterioration of shafts and rubber parts;
- Periodically rotate the shafts to prevent gluing of the oil seals.

7. INSTALLATION

Pay special attention to the installation conditions as these are the main cause of damage and downtime. When choosing the motor, consider the mounting position and presence, below the motor itself, of parts, things or materials which may be damaged by oil leaks, however limited in amount. Choosing the right mounting position can eliminate many problems. It is often sufficient to place a guard under the motor to ensure operation in optimal safety.

	The unit can only be mounted in the mounting position indicated on the nameplate: a different mounting position must be authorized by Pujol. Changes in angle or inclination with respect to the horizontal are allowed by +/-5°.

Before the commissioning of the unit, carry out the following operations:

- Check the nameplate data of the unit and/or electric motor;
- Check that the supply corresponds to what was required by the order;
- Fixing to the structure of the machine must be stable, vibration-free. The structure shall not be subject to torsional movements, must ensure a continuity of transmission of any electrical and electrostatic charges. Otherwise provide a grounding system, via a cable securely attached to the mounting areas, making sure to remove any paint in the contact area and using conductors of adequate cross section;
- For fixing use fixing screws of minimum 8.8 quality and be sure not to buckle the casings due to improper fixing, making sure that the support surface is coplanar to the fixing surface (refer to FIXING SCREW TIGHTENING TORQUE table);
- Do not install the unit in mounting positions other than those stated in the order, since different positions require different positions of the loading, unloading and oil level caps, in addition to a different amount of lubricant, if indicated/present;
- Check the position of the level cap. If the casing is provided with a hole closed with a cap symmetric with respect to the level cap itself, if necessary, for level visibility, reverse their positions. Check the accessibility to oil loading/unloading caps.
- Check, if possible, the correct quantity of oil, according to the mounting position required. If the oil level of the unit is restored, do it according to the cap diagram and use oil of the same type indicated on the label.
- Replace any closing cap with the vent cap provided in the supplied kit;
- Check for any leakage of lubricant;
- If possible, remove any traces of dirt from the shafts and from the areas around the sealing rings;
- Lubricate the contact surfaces to prevent oxidation or seizure;
- Check the static seals and the bolted joints;
- Do not install the unit in an environment with fumes or abrasive and/or corrosive dust;
- Install all the protections designed for the rotating parts so as to ensure the system safety according to the current rules;
- Check for the correct rotation direction of the output shaft of the unit;
- In case of shaft-mounted configuration it is recommended to use the torque arms that can be supplied by Pujol, specially designed;
- Ensure proper cooling of the motor through a good flow of air from the fan side;
- Avoid solar radiation or other heat sources, the cooling air temperature must never exceed 40°C;
- Check that the assembly of the various parts (pulleys, sprockets, couplings, etc.) on shafts is performed by using the proper threaded holes or any other systems able to ensure a correct operation without risking damage to the bearings or the outer parts of the units.

For the operating ranges with temperatures below 0°C, please consider the following:

- For the gear reducers, please contact TECHNICAL SERVICE beforehand;
- The motors must be suitable for operation with the expected ambient temperature;
- The electric motor power must be adjusted when exceeding the higher starting torques required.

In case of ambient temperature not listed in the table LUBRICANTS RECOMMENDED BY PUJOL, please contact TECHNICAL SERVICE. If the temperature is lower than -30°C or higher than 60°C use special mixture sealing rings.

Check that all accessible surfaces do not exceed the temperature limits established by EN ISO 13732-1. Should these temperatures be reached or exceeded, arrange suitable protective systems (insulation or guards) or signs, clearly visible to the operator, carrying the symbol CAUTION HOT PARTS according to EN ISO 7010 standard.

Table of FIXING SCREW TIGHTENING TORQUE with resistance class 8.8 - 10.8 - 12.9

	Mn [Nm] +5% / -10%		
	8.8	10.8	12.9
M 3	1,3	1,9	2,3
M 4	3,0	4,4	5,1
M 5	5,9	8,7	10,2
M 6	10,3	15,1	17,7
M 8	25	36	43
M 10	49	72	85
M 12	85	126	147
M 14	133	202	237
M 16	215	316	370
M 18	306	435	560
M 20	436	618	724
M 22	600	851	997
M 24	750	1064	1245
M 27	1111	1579	1848
M 30	1507	2139	2504
M 33	2049	2911	3407
M 36	2628	3735	4370
M 39	3417	4858	5685
M 42	4212	5999	7070
M 45	5278	7518	8847
M 48	6366	9067	10609
M 52	8210	11693	13684
M 56	10232	14572	17053
M 60	12726	18125	21210
M 64	15303	21795	25505

8. SPECIFIC ASSEMBLING

8.1 OUTPUT SHAFT CONNECTIONS

8.1.1 Solid shaft

Before going ahead with the assembly of the elements, carefully clean the contact surfaces and grease them to reduce the risk of seizure and contact oxidation.
It is essential to assemble and disassemble the connecting parts to the shafts with the help of tie rods and extractors, using the threaded hole at the top of the shaft end and avoiding shocks and blows that may damage bearings, spring rings or other components, please refer to Fig. 1, 2 and 3.
Rotating elements with an external peripheral speed greater than 20 m/s must be dynamically balanced.
In all cases where the ingoing and/or outgoing movement is operated by external transmissions (belt and pulley, chains, gears...), ensure that:

- The resulting radial and axial loads do not exceed the limit values indicated on the gear reducer's plate. Loads beyond those allowed result in premature wear and failures, as well as overheating of the gear reducer and bearings;
- The chain transmissions, in particular, are not preloaded and that in case of linear speeds exceeding 1 m/s, they are kept at the right tension by special tensioners;

See the information supplied by the following figures 1-2-3.

- Fig. 1 **Example of correct installation of a part to the output shaft of a gear reducer.** We recommend to avoid using inadequate tools.

  Always follow the instructions reported in the installation manual of the part to be mounted. Also make sure that it is compatible with the environmental class in which it will be installed.

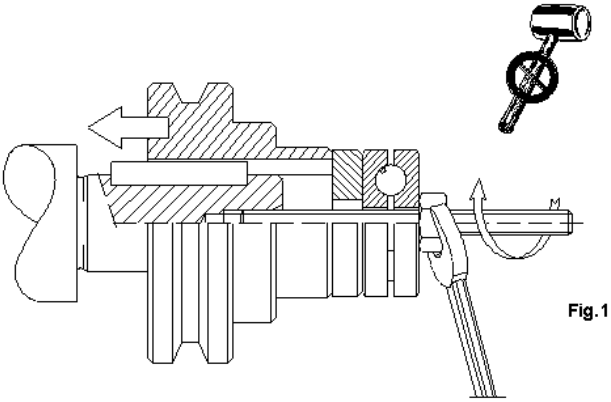


Fig.1

- Fig. 2, 3: Examples of correct and incorrect installation (⚠) on the output shaft of the gear reducer.

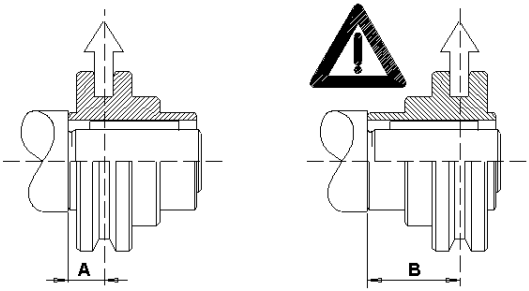
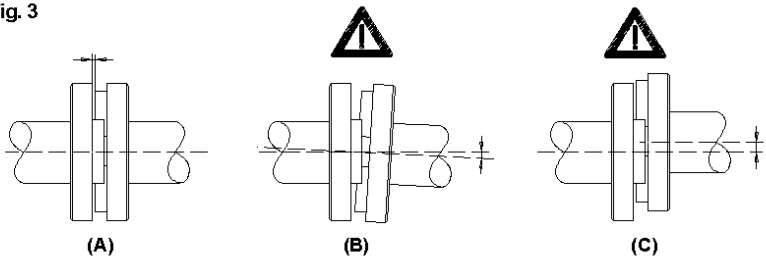


Fig. 2

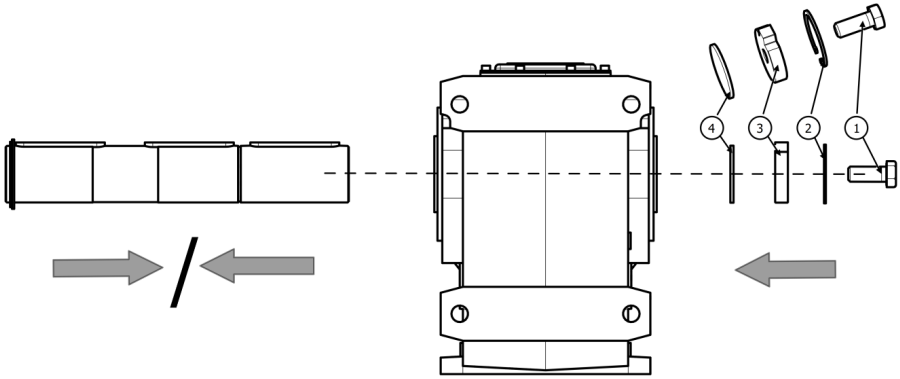
Fig. 3

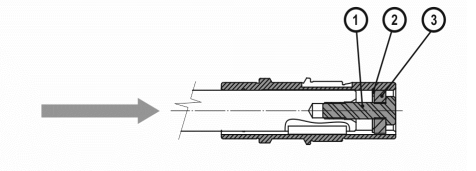
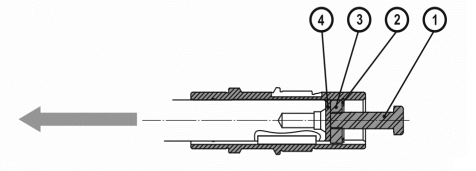


8.1.2 Hollow shaft with key series KXB, DXS

KXB and DXS series gear reducers (except sizes DXS702/3 and DXS802/3) may be supplied with an optional Pujol installation/removal kit for the driven shaft. Upon request the supply includes:

1. Fixing screw;
2. Safety ring;
3. Lug nut;
4. Thrust disk.



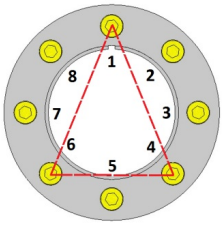
	***Assembly*** Install the safety ring (2), insert the lug nut/washer(3), tighten the fixing screw (1) of the Pujol installation kit on the shaft end of the driven machine
	***Removal*** Fit the thrust disk (4) and lug nut/washer (3) from the Pujol removal kit between the driven machine's shaft and the safety ring (2). Insert the safety ring (2), and tighten the fixing screw (1). You can now extract the gear reducer from the shaft.

8.1.3 Mounting with shrink disc series KXB, DXS

Only standard reducers and ATEX 3G/3D. Gear reducers may be fitted with a shrink disc to lock the hollow shaft on the driven shaft.
It is essential not to tighten the locking unit on the hollow shaft before inserting the machine pin to avoid deforming it.
For the correct dimensioning of the machine shaft, refer to the paragraph "Hollow low speed shaft with shrink disc" in the LOW SPEED SHAFTS section of the technical catalogue.

Mounting
For fitting the locking unit proceed as follows:

- Undo the shrink disc screws, in sequence and gradually;
- Degrease with care the surfaces of the hollow shaft and of the machine pin to couple;
- Check that the locking shaft diameter is correct (refer to the paragraph of the catalogue mentioned earlier);
- Mount the locking unit on the gear reducer hollow shaft, lubricating beforehand the outer surface of the hollow shaft;
- Tighten slightly a first set of three screws placed at approx. 120° as shown in the figure;



- Tighten the locking unit gradually and uniformly with a torque wrench up to the toque indicated in the table below, with continuous sequence (not crossed) making ¼ of a turn at a time until reaching the prescribed tightening torque;
- Keep applying the torque for 1 or 2 further steps and at the end check the bolt tightening torque;
- In case of stressful working cycles with frequent motion inversions, check again, after a few hours of operation, the screws' tightening torque.

- Tighten the locking unit gradually and uniformly with a torque wrench up to the toque (indicated in the table TIGHTENING TORQUE SCREW below), with continuous sequence (not crossed) making ¼ of a turn at a time until reaching the prescribed tightening torque;
- Keep applying the torque for 1 or 2 further steps and at the end check the bolt tightening torque;
- In case of stressful working cycles with frequent motion inversions, check again, after a few hours of operation, the screws' tightening torque. In any case, the tightening must be checked at each maintenance interval of the gear reducer.

Table "TIGHTENING TORQUE SCREW"

	MT 12.9 (Nm)
KXA 202-252/3-352/3 KXB 353-403-503 DXS 302/3-352/3-402/3-502/3	15
KXB603 - DXS602/3	40
KXB703	50
KXB 903-1003 DXS702/3	70
DXS802/3	103

Disassembling

For disassembling the locking unit proceed as follows:

- Clean all the oxidized areas;
- Loosen one fixing screw after the other only by rotating them by ½ a turn at a time, with continuous sequence (not crossed), until the locking unit can be moved on the hollow shaft
- Remove the gear reducer from the machine's shaft.

In any case, refer to the installation manual of the part to be assembled.

	In case of safety problems, unfavourable mounting positions (shaft pointing down), vibration or external axial loads, arrange suitable devices to prevent the shaft from sliding out! **Do not remove completely the fixing screws before releasing the locking rings. Risk of serious injury!**

If the shrink disc was not supplied by Motovario, follow the manufacturer's instructions and in any case never tighten the locking unit on the hollow shaft without first inserting the machine pin.

8.2 INPUT SHAFT CONNECTIONS

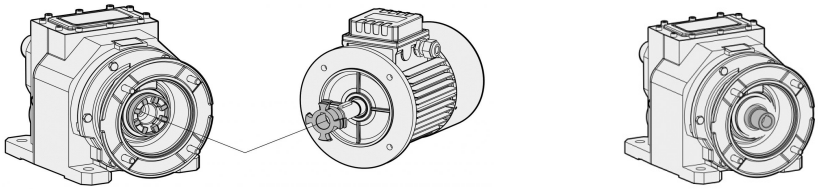
8.2.1 Motor mounting flanges

When the unit is supplied without motor, observe the following recommendations to ensure proper installation of the electric motor:

- Check that the tolerances of the shaft and motor flange correspond to at least "normal" quality;
- Thoroughly clean the shaft, centering pin and flange surface from any traces of dirt and paint;
- For a better coupling and to prevent oxidation, apply protective paste on the motor shaft (recommended MACONGREASE TBL SPECIAL 2 antifretting grease);
- Place the proper gasket (supplied by Pujol on request) on the motor flange **(or spread a layer of sealant)** and proceed to the mechanical connection to the gear reducer.

For input version with elastic coupling

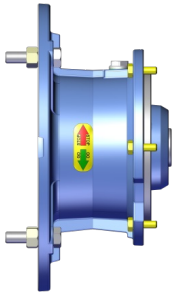
Before the mechanical connection to the gear reducer, proceed mounting the coupling half (see figure) on the shaft of the electric motor that must be done without applying excessive force to avoid damaging the motor bearings. Otherwise check the correct position and the tolerance of the motor key. Then mount the motor complete with coupling half, timing the motor side coupling half drive teeth with those of the elastic element on the gear reducer side coupling half.

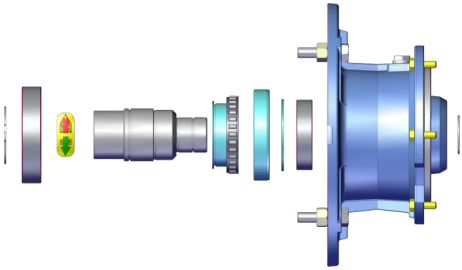


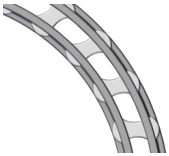
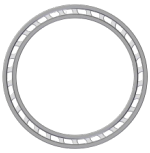
8.3 ACCESSORIES

8.3.1 Backstop device (SXH, KXB, DXS)

Only standard groups and ATEX 3G/3D. The gear reducer may be supplied with a backstop device on the fast axis. The backstop device allows the rotation of the shafts in one direction only; depending on the size is available in the PAM flange or in the motor, without additional space (with the exception of the PAM configurations for SXH/KXB/DXS configurations, flange type PAM 100/112). In the DXS series the device is not available for sizes DXS 702/3-802/3. It is essential to specify the input side direction of rotation (clockwise/counter-clockwise) in the order. On the PAM flange is applied a nameplate showing the free direction of rotation of the unit. Check that the free direction of rotation corresponds to what is required.

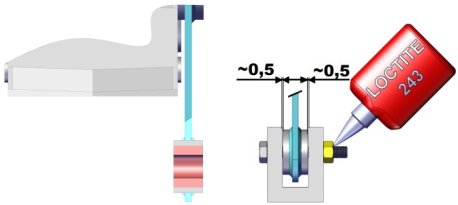
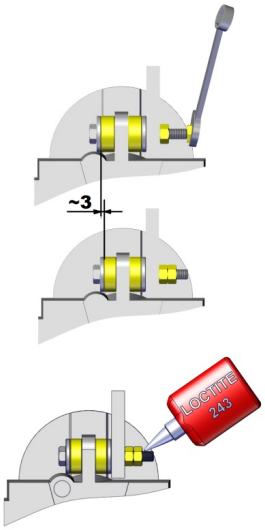




COUNTER-CLOCKWISE ROTATION	CLOCKWISE ROTATION
	

8.3.2 Shaft mounting with reaction arm (KXB, DXS, L)

The KXB, DXS 702/3-802/3, L series gear reducers can be equipped with anti-vibration torque arm; the DXS-series gear reducers (of remaining sizes) can only be equipped with anti-vibration anchors. Make sure, upon mounting completed, that the axial pre-load of the anti-vibration anchor is absent (for KXB, L series gear reducers, with anchor to support on both sides) or moderate (for DXS series gear reducers). Check the absence of abnormal vibrations, during the start-up, on both the unit and the support structure.

KXB - DXS 702/3-802/3 - L	DXS 302/3-352/3-402/3-502/3-602/3
	

8.3.3 Reinforced seals

SXH-KXB-DXS series gear reducers may be equipped with reinforced seals. Reinforced seals, depending on the size of the unit, will be composed of two sealing rings or a standard sealing ring + VRM ring. Coaxial gear reducers, sizes 402 to 903 (excluding single stage units) in mounting positions V1/V5 already have 2 sealing rings as standard supply. It is not necessary to pay special attention during installation, only make sure that the machine is running at start-up.

9. STARTUP

Before starting up the machine incorporating the unit make sure that:

- The machine is compliant with Machinery Directive 2006/42/EC, in addition to other safety regulations in force;
- It is compliant with regulations EN60204-1;
- That all the supply voltages, motor and auxiliary services match the required ones for that component;
- The facility complies with all applicable standards on safety and health of people at the workplace;
- Remove all the installed safety devices used for handling;
- Check that all the installed devices and accessories are working properly during operation.

Moreover:

- Go ahead with the filling stage according to the amount and type of oil reported on the relevant label on the gear reducer. If lubricant top-ups are required, use the same brand and type of oil already in place. Use lubricants type-approved by Motovario (see table). Check the correct amount of oil by using the relevant indicator or dipstick. In case of pressure-fed lubrication, or if a cooling system is present, make sure that oil is in contact with the system at suitable level;
- Make sure the breather plug is mounted and free from obstructions;
- Check that all the devices and accessories installed parts operate efficiently;
- Make sure the gear reducer is clean on the outside, especially the areas most involved in cooling;
- For cleaning purposes, use materials that do not generate electrostatic charges;
- Check for any lubricant leaks, especially in the sealing ring areas;
- During start-up we recommend running the equipment with 'no load' for a few minutes to ensure the oil is distributed and reaches an optimal temperature and viscosity. Some air pockets trapped between the gears and the case may be released downstream of this operation, so check the lubricant level again and top up if necessary;
- During the first hour of operation, check for any abnormal vibrations and noise or overheating. If necessary, stop the motor immediately and contact MOTOVARIO's TECHNICAL SERVICE.
- After stopping the motor drive, before proceeding with disassembly, wait until the temperature of the gear reducer has dropped below 40 °C;
- The equipment must be started gradually, without immediately applying the maximum load required by the machine, in order to make sure there are no operating anomalies or residual application issues;
- Carry out a run-in (at about 40% of the nominal limit of the gear reducer) for about 300 hours to reach the maximum level of reliability of the gear reducer. During this period, monitor the gear reducer to promptly detect potential problems as reported in the table in Paragraph 11. For category II equipment, perform this check every day for the first week of service and then every week during the following month. Check all the tightening points after the first week of operation.
- During start-up at full machine load, monitor the gear reducer's surface temperature according to the procedures reported in the SURFACE TEMPERATURE paragraph. If the condition indicated in the paragraph is not observed, stop the gear reducer immediately and contact Motovario's Technical Service.

	Do not use the unit: • In an environment with fumes or abrasive and/or corrosive dust; • In direct contact with food products in bulk. ***Dangerous area*** The dangerous area of the unit is the rotating shaft extension where any person could be subject to mechanical risks from direct contact (cutting, dragging, crushing). Make the machine compliant with DIRECTIVE 2006/42/EC providing a safety guard when the unit works in accessible zones.

- For KBS, DXS series gear reducers the units can be fitted with protective covers if so required;
- For the variator/variator-gear reducer the change in revolutions, using the appropriate command, must be done when the unit is running.

10. MAINTENANCE

10.1.1 General maintenance

	Maintenance must be done by a technician familiar with workplace safety legislation and environmental issues. Do not dump polluting fluids, replaced parts or maintenance waste into the environment. ***Never improvise repairs!***

	Before working on the unit disconnect its power supply, being careful to be protected against inadvertent reactivation, and in any case against the mobility of the components of the unit itself. Wait until the unit reaches the ambient temperature. Inform staff working in the area or nearby, by duly signalling the areas nearby and preventing access. Put in place all necessary measures for environmental safety (dust, gas...).

The precise machining of the unit's internal components ensures correct operation with minimum maintenance. In general the following rules are valid: periodic check of the unit external cleanliness, especially in the areas more involved in the cooling process; periodic check for any leaks of lubricant, especially in the areas of the sealing rings; check and cleaning of the vent cap hole. For the products not lubricated for life, check periodically by means of the specific level indicators the correct quantity of lubricant. If topping up is necessary, use the same brand and type of lubricant as the one already used, or in any case compatible with it. Use oils and greases recommended by Pujol. During an oil change (products not lubricated for life) follow the above mentioned recommendations.
Do not hesitate to replace unreliable components. Replace worn parts only with original spare parts. Using non-original spare parts can compromise the operation of the unit, and also voids the warranty. For the request of the components, follow the instructions given in the spare parts section of the specific unit.

1. Keep the unit in good running order with periodic checks of vibration and noise, absorption and voltage, wear of friction surfaces, lubricant leaks, gaskets, bolted gaskets for wear, deformation and corrosion and restore replace as necessary;
2. Keep the unit clean of dust and process residues (do not use solvents or other products incompatible with the materials of construction, and do not aim high pressure jets of water directly at the unit).

For the units used in AGGRESSIVE ENVIRONMENTS AND FOOD INDUSTRIES:
In the event of accidental damage to the paint, restore it as soon as possible by using the repair kit available on request.

Following the above mentioned rules ensures the operation of the unit and the required safety level.

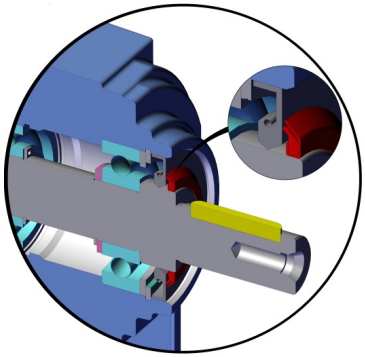
ROUTINE MAINTENANCE table:

Frequency	*Object*	*Check*	*Intervention*
Daily	Whole unit.	Check temperature and noise level.	Stop and check.
Weekly	Vent plug.	Obstruction due to the presence of dust. For the positions of the caps please refer to the MOUNTING POSITIONS.	Release the vent cap.
1,000 h / 5 months	Oil.	Level.	Topping up.
	Sealing rings, gaskets and caps	Oil leaks and ageing.	Replacement.
	Torque arms (polymer bushings).	Ageing.	Replacement.
Yearly or, anyway, at variable intervals (based on the external conditions)	Whole unit.	Check and inspection of tightening and of the operating conditions of the installed devices.	Tightening. Clean and restore operation of devices (if necessary, replace).
4,000 h / 3 years (T=80°C)	Mineral oil.	None.	Replacement.
8,000 h / 6 years (T=80°C)	Synthetic oil.	None.	Replacement.

Note, in case of presence of external VRM ring (see the figure below):

- Proceed to the installation of oil sealing rings, following the directions above, after having disassembled the VRM. While disassembling be careful not to damage the shaft;
- After the installation of the oil sealing rings, fit the outer VRM ring with the following precautions;
- Fill with grease the volume between the oil sealing ring and the VRM;
- Make sure that the rubber lip of the VRM enters, uniformly, in contact with the sealing ring;

Ensure that the metal ring of the VRM does not touch the oil sealing ring.



	Additional procedures for ATEX units: • Clean the surface of the gear reducer with materials that do not generate electrostatic discharges; • After 24-hour check for leaks, in the case of oil leakage contact a Motovario Technical Service centre authorised for ATEX maintenance.

10.2 OIL CHANGE PROCEDURE

Bring the gear reducer to a surface temperature below 40 °C before changing the oil: with moderately warm oil, the emptying procedure and the removal of deposits is easier. Take all necessary precautions to avoid burns due to high temperature of the gear reducer and/or oil.

CAUTION – HOTPARTS
Indicates a serious thermal hazard which may endanger personal health and safety.

- In the case of life lubricated units (see section LUBRICATION) do not perform any oil change;
- The oil must be of the same type as the one replaced (see table "Characteristics" and "amount" in section LUBRICATION and check if there is the lubricant nameplate affixed to the unit); use lubricants approved by Pujol. If you want to change the family is required to run a wash with the same type of oil you are going to use;
- Locate the loading and unloading plugs (the loading plug can match the vent plug or the dipstick); place a container of suitable capacity under the gear reducer at the unloading plug (for amounts see the relevant tables in section LUBRICATION);
- Unscrew the loading and unloading caps paying attention to progressively reduce any internal overpressure;
- Completely drain the oil and collect it in the underlying container;
- Replace the seal of the unloading cap and tighten it again by applying the appropriate tightening torque (see table "OIL PLUGS TIGHTENING TORQUE");
- Fill the gear reducer with new oil until the level reaches the centre line of the indicator plug or the top notch on the dipstick;
- Replace the seal of the loading cap and tighten it again by applying the appropriate tightening torque (see table "OIL PLUGS TIGHTENING TORQUE");
- After about 30 minutes check the correctness of the level (if necessary, restore it) and any oil leaks. Clean the surface of the gear reducer with materials that do not generate electrostatic discharges;
- Dispose of used oil in accordance with current regulations.
- Change the oil as specified in table ROUTINE MAINTENANCE.

Table of "OIL PLUGS TIGHTENING TORQUE"

Cap	Tightening torque Nm	
	Hex key	Allen key
3/8"	30	20
1/2"	60	30
3/4"	70	40
1"	90	50
M24	60	30

11. PROBLEMS DURING OPERATION

If during start-up or the first running hours there are problems of any kind, please contact MOTOVARIO TECHNICAL SERVICE. The "TROUBLESHOOTING" table lists a series of problems with the description of possible remedies. The descriptions below are merely indicative and are only for information purposes.
Any tampering with the unit without Motovario authorisation voids the warranty.

TROUBLESHOOTING table

PROBLEM	CAUSE	SOLUTION	INTERVENTION
Noise in the mounting area.	Vibration in the mounting area.	Check and correct fasteners and, if necessary, tighten them.	Contact MOTOVARIO TECHNICAL SERVICE.
The measured temperature on the gear reducer/variator casing is high.	Incorrect dimensioning of the gear reducer/variator. Non-compliant mounting position.	Check application.	Restore the correct work conditions: mounting position and/or lubricant level.
The operating temperature is high.	Excessive oil quantity, old or dirty oil. Cooling system failure.	Check oil and change/top-up. Check application.	Contact MOTOVARIO TECHNICAL SERVICE.
Bearing temperature is high.	Damaged, worn out bearings. Insufficient oil quantity, old or dirty oil.	Check and, if necessary, replace bearings. Check oil and change/top-up.	Contact MOTOVARIO TECHNICAL SERVICE.
The output shaft revolutions of the gear reducer/variator are different from the ones expected.	Gear reducer/variator ratio different than the one expected.	Check the ratio of the gear reducer/ variator.	Replace the gear reducer/variator and/or the electric motor.
	Motor with polarity different from the one expected.	Check the polarity of the motor.	
Oil leaks from the sealing ring.	Faulty sealing ring.	Replace the ring	Replace the component or contact MOTOVARIO TECHNICAL SERVICE.
	Sealing ring damaged .	If the shaft seat is damaged restore it (if possible).	
	Damaged shaft seat.		
Oil leaks from surfaces.	Flat gasket or O-ring damaged.	Replace the gasket or the O-ring.	Replace the component or contact MOTOVARIO TECHNICAL SERVICE.
The output shaft of the gear reducer/ variator turns in the opposite direction.	Incorrect connection of the electric motor.	Invert two phases of the power supply of the electric motor.	
Cyclic noise of the kinematic motion.	Dents on the gears.	No practical problem if the noise is not determinant in the specific application.	Ship the unit to Motovario if the noise is important in the specific application.
Non-cyclic noise of the kinematic motion.	Dirt inside the gear reducer/variator.	No practical problem if the noise is not determinant in the specific application.	Ship the unit to Motovario if the noise is important in the specific application.
Noise (whistle) coming from the kinematic motion.	Incorrectly adjusted bearings.	Check the correct quantity of lubricant.	Contact MOTOVARIO TECHNICAL SERVICE.
	Gears with meshing errors.		
	Insufficient quantity of lubricant.		

PROBLEM	CAUSE	SOLUTION	INTERVENTION
The motor does not start.	Power supply problems. Faulty motor. Incorrect dimensioning of the motor.	Check power supply.	Replace the electric motor. Check application.
Noise in the mounting area.	Vibration in the mounting area.	Check and correct fasteners and, if necessary, tighten them.	Contact MOTOVARIO TECHNICAL SERVICE.
Motor electric absorption greater than nameplate values.	Incorrect dimensioning of the motor.	Check application.	Replace the electric motor and if necessary also the gear reducer/variator.
The measured temperature on the motor casing is high.	Faulty motor. Incorrect dimensioning of the motor.	Check application.	Replace the electric motor and if necessary also the gear reducer/variator.
Vibrations on the electric motor.	Geometrical errors on the coupling motor/gear reducer/variator.	Check the geometric tolerances of the flange of the electric motor.	Replace the electric motor.
		Check the tolerance and the geometry of the key of the motor shaft.	

12. LUBRICATION

Proper lubrication makes for:

- Lower friction;
- Less heating;
- Increased efficiency;
- Lower oil temperature;
- Less wear.

	Check the oil level before starting up the unit; this operation must be carried out when the unit is arranged in the predetermined mounting position, if necessary restore the level with oil of the same type shown on the nameplate (see the table ALTERNATIVES TO FIRST SUPPLY LUBRICANTS). In case of unavailability, please contact TECHNICAL SERVICE. For possible use of different oil (after checking with TECHNICAL SERVICE), change completely and in case of synthetic oil, only after washing the inside of the reducer. Fill the oil through the special holes or the inspection cap using a filling filter, then restore the gasket (to be replaced) or the sealant. **PLEASE NOTE: For units supplied without oil, check, in the specific additional nameplate, the oil that may be used and the required quantity according to the mounting position and specify the indications required on the same nameplate. Fill the unit with oil following the plug diagram.**

	If there is an oil leak, find the cause before restoring the lubricant level. Do not dump the lubricant in the environment, adopt all the necessary environmental safety measures, dispose of the lubricant in compliance with the current regulations.

In case of ambient temperature not listed in the table, contact TECHNICAL SERVICE. If the temperature is lower than -30 °C or higher than 60 °C use special mixture sealing rings.
For oil changes follow what indicated in the “ORDINARY MAINTENANCE Table”.

	Periodically check that oil level is never below the minimum level; this operation has to be carried out with stopped gear reducer and after cooling.

Table ALTERNATIVES TO FIRST SUPPLY LUBRICANTS

	SXA 141 ÷ 403 SXH 252 ÷ 903 SXH 191 ÷ 551 KXB 353 ÷ 1003 DXS 302 ÷ 803 I 84 ÷ 162		KXA 202 ÷ 353	LA 30X ÷ 90X LW 40 ÷ 63 LXW 90 ÷ 130
	Mineral oil		Mineral oil	Synthetic oil
*T_{amb}°C ISO/SAE	(-5) ÷ (+40) ISO VG220	(-15) ÷ (+25) ISO VG150	(-5) ÷ (+40) SAE 85W-140	(-25) ÷ (+50) ISO VG320
LAND OIL	GEAR POWER 220	-	-	GEAR SINT 320
ENI	BLASIA 220	BLASIA 150	ROTRA MP (85W-140)	TELIUM VSF320
SHELL	OMALA S2 G 220	OMALA S2 G 150	SPIRAX S2 A 85W-140	OMALA S4 WE320
KLUBER	Kluberoil GEM 1-220N	Kluberoil GEM 1-150N	Kluberoil GEM 1-460N	Klubersynth GH 6-320
MOBIL	MOBILGEAR 600 XP220	MOBILGEAR 600 XP150	-	SHC 632
CASTROL	ALPHA SP 220	ALPHA SP 150	-	ALPHASYN PG320
BP	ENERGOL GR-XP220	ENERGOL GR-XP150	-	ENERGOL SG-XP320
PETRONAS	GEAR MEP 220	GEAR MEP 150	TUTELA TRANSMISSION W 140/M-DA	GEAR SYN PAG 320

Standard supply

- **T_{amb}°C -** Ambient operating temperature.
- Units belonging to the SXH series 702/3-902/3 size, KXB series 703-903-1003 size and DXS series 802/3 size are supplied with no oil. All remaining units are supplied with ENI oil, unless otherwise specified by the customer.

12.1.1 Special lubricants

Table SPECIAL LUBRICANTS

	T_{amb}°C	Polyglicol synthetic oil
ENI	(-30) ÷ (+30)	Blasia S 150 (ISO VG150)
	(-20) ÷ (+40)	Blasia S 220 (ISO VG220)
MOBIL	(-45) ÷ (+0)	SHC 624 (ISO VG32)
	(-40) ÷ (+5)	SHC 626 (ISO VG68)
KLUBER	(-40) ÷ (+5)	Klubersynth GH 6-32 (ISO VG32)
	(-35) ÷ 10)	Klubersynth GH 6-80 (ISO VG80)
	(-30) ÷ (+40)	Klubersynth GH 6-150 (ISO VG150)
	(-25) ÷ (+40)	Klubersynth GH 6-220 (ISO VG220)
	(-15) ÷ (+50)	Klubersynth GH 6-460 (ISO VG460)
	(-10) ÷ (+70)	Klubersynth GH 6-680 (ISO VG680)

	T_{amb}°C	Polyglicol synthetic oil for food grade
KLUBER	(-30) ÷ (+15)	Klubersynth UH1-6 100 (ISO VG100)
	(-25) ÷ (+40)	Klubersynth UH1-6 220 (ISO VG220)
	(-15) ÷ (+40)	Klubersynth UH1-6 320 (ISO VG320)
	(-15) ÷ (+50)	Klubersynth UH1-6 460 (ISO VG460)
	(-10) ÷ (+50)	Klubersynth UH1-6 680 (ISO VG680)

T_{amb}°C - Ambient operating temperature.
If 'special' lubricant is required please contact TECHNICAL SERVICE.

12.2 QUANTITY

The amount of oil in the table are indicative only and for the proper topping up you will have to refer to the level cap or the dipstick, if any. Any deviations in level can depend on construction tolerances, transmission ratio but also on the placement of the unit or on the mounting surface at the customers' premises. For this reason it is appropriate that the customer checks and, if necessary, restores the level when the unit is installed. Once the unit is installed, make sure to replace the closed plug used for shipping with the breather plug supplied with the reducer. For the plug positions, refer to the mounting positions.

Table OIL CAPACITIES IN LITRES ~ [l]

SXA	141	191	241	281	202	252	302	402	203	253	303	403
B3-B5	0,07	0,23	0,25	0,62	0,68	0,7	1,2	1,9	1,1	1,16	1,9	2,4
B8												
B6-B7												
V5-V1							1,6	2,1			2,5	3,1
V6-V3												

SXH	191	241	281	381	481	551	191M	241M	281M	381M	481M	551M
B3-B5	0,5	0,7	0,7	1,45	3,5	4,7	0,5	0,5	0,5	1,5	3,5	3,9
B5R	0,5	0,5	0,5	1,5	3,5	3,9	-	-	-	-	-	-
B8	0,5	0,5	0,5	1,5	3,5	3,9	0,5	0,7	0,7	1,45	3,5	4,7
B6-B7	0,5	0,7	0,7	1,5	3,5	4,1	0,5	0,7	0,7	1,5	3,5	4,1
V5-V1	0,5	0,7	0,9	1,5	3,5	4,7	0,5	0,7	0,9	1,5	3,5	4,7
V6-V3	0,5	0,7	0,7	1,5	3,5	4,1	0,5	0,7	0,7	1,5	3,5	4,1

SXH	252/253	302/303	352/353	402/403	502/503	602/603	702/703	902/903
B3-B5	0,8	1,2	1,4	2,4	4,5	8,1	12,5	22,5
B8	0,85	1,2	1,4	3,1	5	8,9	12,5	20
B6-B7	1	1,2	1,8	3	4,6	8,4	12,1	22,5
V5-V1	1,3	1,75	2,15	3,9	7,6	12,7	20,5	30,5
V6-V3	1,2	1,7	2,1	4,4	7,5	14,2	21	38

KXA	202	252	253	352	353
B3	0,33	0,42	0,63	1	1,21
B8					
B6-B7					
V5					
V6					

KXB	353	403	503	603	703	903	1003
B3	1,2	2,5	3,7	5,7	11,1	19	33
B8	1,5	2,8	4,2	7,9	13	17,5	42,8
B6	1,5	3,5	6	8,5	14,5	26	43
B7	1,5	2,8	3,9	7,3	11,8	19	30
V5	2,1	3,7	7	9,9	18,5	32,5	54,5
V6	1,3	2,6	4,5	6,7	10,8	16,5	37,3

DXS	302/303	352/353	402/403	502/503	602/603	702	703	802	803
B3	2,05	2,4	6	9	14,7	22	20	29,7	27
B8	1,8	2,3	4	6	11,8	20	20	31	31
B6	2,4	2,9	5,7	8	16	22 (25)	18 (24,5)	29,3 (42)	24 (40)
B7	2,1	2,6	4,5	6,8	11,3	17,5	14	22,5	18
V5	2,8	3,5	6,8	10,3	19	24,5	23,5	34,4	33
V6	2,4	2,9	6,4	9,9	18	20,8	20	33,3	32

(...) 702-703-802-803 quantity of oil [l] for gearbox with backstop device

	LA						LW			LXW		
	30X	40X	50X	63X	75X	90X	40	50	63	90	110	130
B3											3	4,5
B8											2,2	3,3
B6-B7	0,04	0,08	0,15	0,3	0,55	1	0,21	0,32	0,64	1,6	2,5	3,5
V5											3	4,5
V6											2,2	3,3

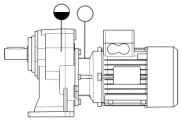
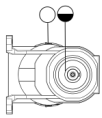
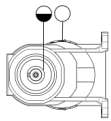
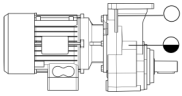
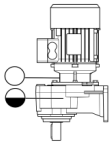
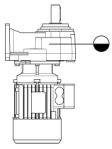
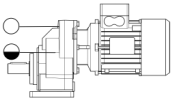
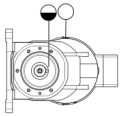
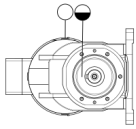
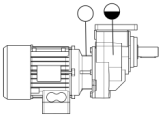
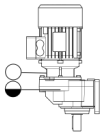
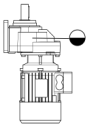
	IP - IB - IPC - IBC				
	84	102	128	142	162
B3-B5					
B8					
B6-B7	0,35	0,5	1	1,25	2
V5-V1					
V6-V3					

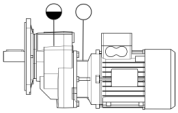
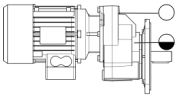
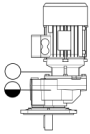
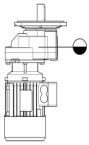
13. MOUNTING POSITIONS

Install the unit in the intended mounting position. Otherwise, please contact TECHNICAL SERVICE.

○	VENT PLUG
◒	LEVEL PLUG

13.1.1 SXA - SXH / 1

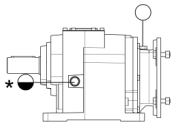
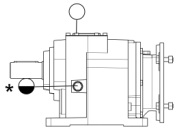
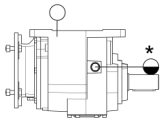
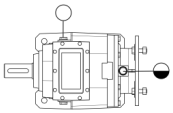
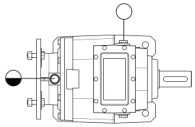
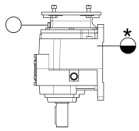
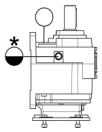
SXA - SXH / 1 - STANDARD			
T	B3	B6	B7
			
	B8	V5	V6
			
M	B3	B6	B7
			
	B8	V5	V6
			

F	B5	B5R	V1	V3
				

Plugs only on sizes: SXH 381/481/551. Closing plugs on all other holes.

○	VENT PLUG
◒	LEVEL PLUG

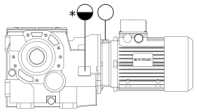
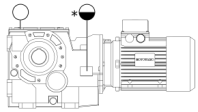
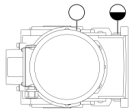
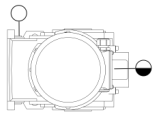
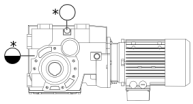
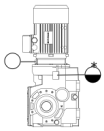
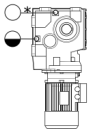
13.1.2 SXA - SXH / 2-3

SXA - SH / 2-3 - STANDARD		
B3 - B5 (SXA - SXH 252/3:602/3)	B3 - B5 (SXH 702/3:902/3)	B8
		
B6	B7	V5 - V1
		
		V6 - V3
		

Plugs only on sizes: SXH 402/3-502/3-602/3-702/3-902/3. Closing plugs on all other holes.
*Plug on the opposite side.

○	VENT PLUG
◒	LEVEL PLUG

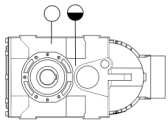
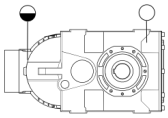
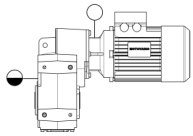
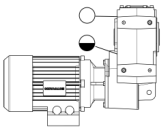
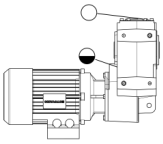
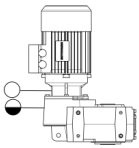
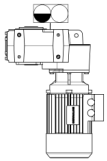
13.1.3 KXA - KXB

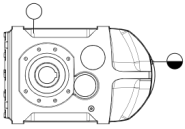
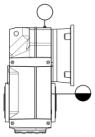
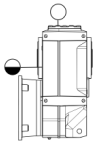
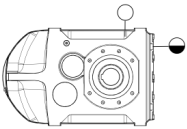
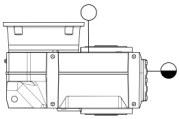
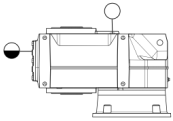
KXA - KXB - STANDARD			
B3 (KXA - KXB 353:603)	B3 (KXB 703:1003)	B6	B7
			
B8		V5	V6
			

Plugs only on sizes: KXB 403/503/603/703/903/1003. Closing plugs on all other holes.
*Plug on the opposite side.

◯	VENT PLUG
◒	LEVEL PLUG

13.1.4 DXS

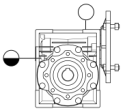
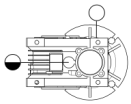
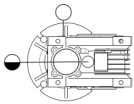
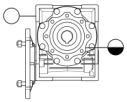
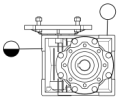
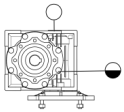
DXS - STANDARD (DXS 302/3:602/3)			
B3		B8	B6
			
B7 (DXS 302/3:502/3)	B7 (DXS 602/3)	V5	V6
			

DXS - STANDARD (DXS 702/3:802/3)		
B3	B6	B7
		
B8	V5	V6
		

Plugs only on sizes: DXS 402/3-502/3-602-3-702/3-802/3. Closing plugs on all other holes.

○	VENT PLUG
◒	LEVEL PLUG
◒○	VENT PLUG WITH DIPSTICK

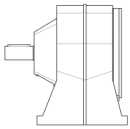
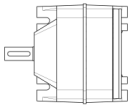
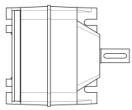
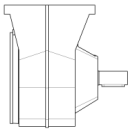
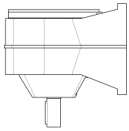
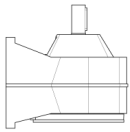
13.1.5 LA - LW - LXW

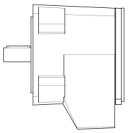
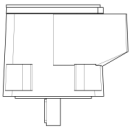
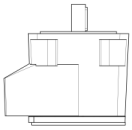
LA - LW - LXW - LAC+SXA141 - STANDARD		
B3	B6	B7
		
B8	V5	V6
		

Plugs only on sizes: LXW110/130. Closing plugs on all other holes. Closing plugs on LXW90.

○	VENT PLUG
◒	LEVEL PLUG

13.1.6 I

IP - IB - IPC - IBC / 2 - STANDARD			
IP	B3	B6	B7
			
	B8	V5	V6
			

IB	B5	V1	V3
			

Plugs not presents.

14. SPARE PARTS TABLES

The spare parts tables of the products are available on Pujol website. For spare parts tables of mentioned ATEX products please contact TECHNICAL SERVICE. For spare parts orders please refer to the data reported on the product nameplate.

15. UNIT DISPOSAL

During unit disassembling the plastic material must be separated from the metal or the electric material.
The operation may be performed only by skilled operators and in compliance with the current regulations concerning health and safety at the workplace.
For determining the consecutive and interconnected stages of the company products (life cycle), from the acquisition of raw materials up to final disposal, the different parts of the products that must be sent to recycling / disposal in compliance with the current environmental laws are listed here below:

Parts of the gear reducer/motor	Material
Gear wheels, shafts, bearings, connecting keys, safety rings, ...	Steel
Casing, parts of the casing	Cast iron
Light alloy casing, parts of the light alloy casing,....	Aluminium
Crowns, bushings,....	Bronze
Sealing rings, covers, rubber parts,...	Elastomers with steel springs
Coupling elements, protection covers, variator knobs, motor terminals....	Plastic
Flat gaskets	Sealing material
Motor terminals, variator screw blocks,...	Brass
Winding	Copper
Stator and rotor	Magnetic steel
Gear reducer oil	Mineral oil
Gear reducer oil	Synthetic oil
Sealants	Resins
Packaging materials	Paper, cardboard

	Do not dump in the environment non-biodegradable material, oils, non-ferrous components (PVC, rubber, resins, etc.).
	Do not reuse components which may appear in good order on inspection, have them replaced by specialised personnel only.

	The crossed out wheelie bin symbol on the nameplate or label indicates that the motor must be collected separately from other waste at the end of its useful life. The separate collection for the delivery of the motor to recycling, to treatment and environmentally compatible disposal helps avoiding possible negative effects on the environment and health and promotes the reuse and/or recycling of materials that make up the motor.

16. RESPONSIBILITY

Pujol declines any responsibility in case of:

- Use of the gear reducer not compliant with national laws on safety and accident prevention;
- Work done by unqualified personnel;
- Incorrect installation;
- Tampering with the product;
- Incorrect or failure to follow the instructions in the manual;
- Incorrect or failure to follow the indications marked on the identification labels fixed on the units;
- For gearmotors, wrong delivery of power supply;
- Incorrect connections and/or use of temperature sensors (when present).

The products supplied by Pujol are intended to be incorporated into "complete machines", so it is prohibited to put them into service until the entire machine has not been declared compliant.

⚠	The configurations provided in the catalogue of the unit are the only ones allowed. Do not use the product in contrast with the indications provided in it. The instructions provided in this manual do not replace but compensate the obligations of current laws concerning safety regulations

This manual refers to PUJOL products on sale when it is issued. Pujol reserves the right to modify in the future the data of this manual without prior communication.

PUJOL

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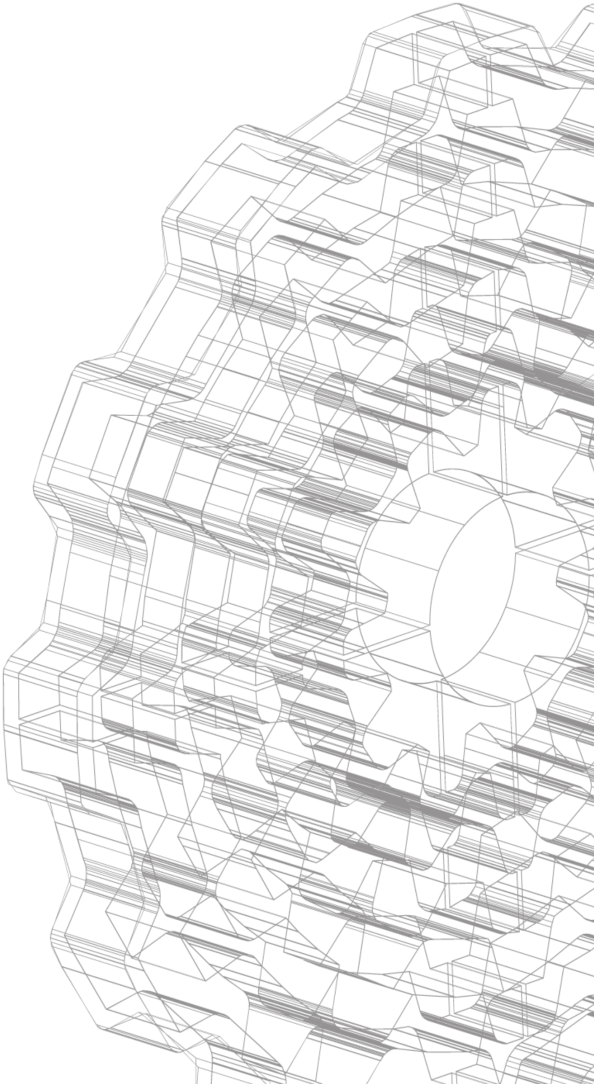

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