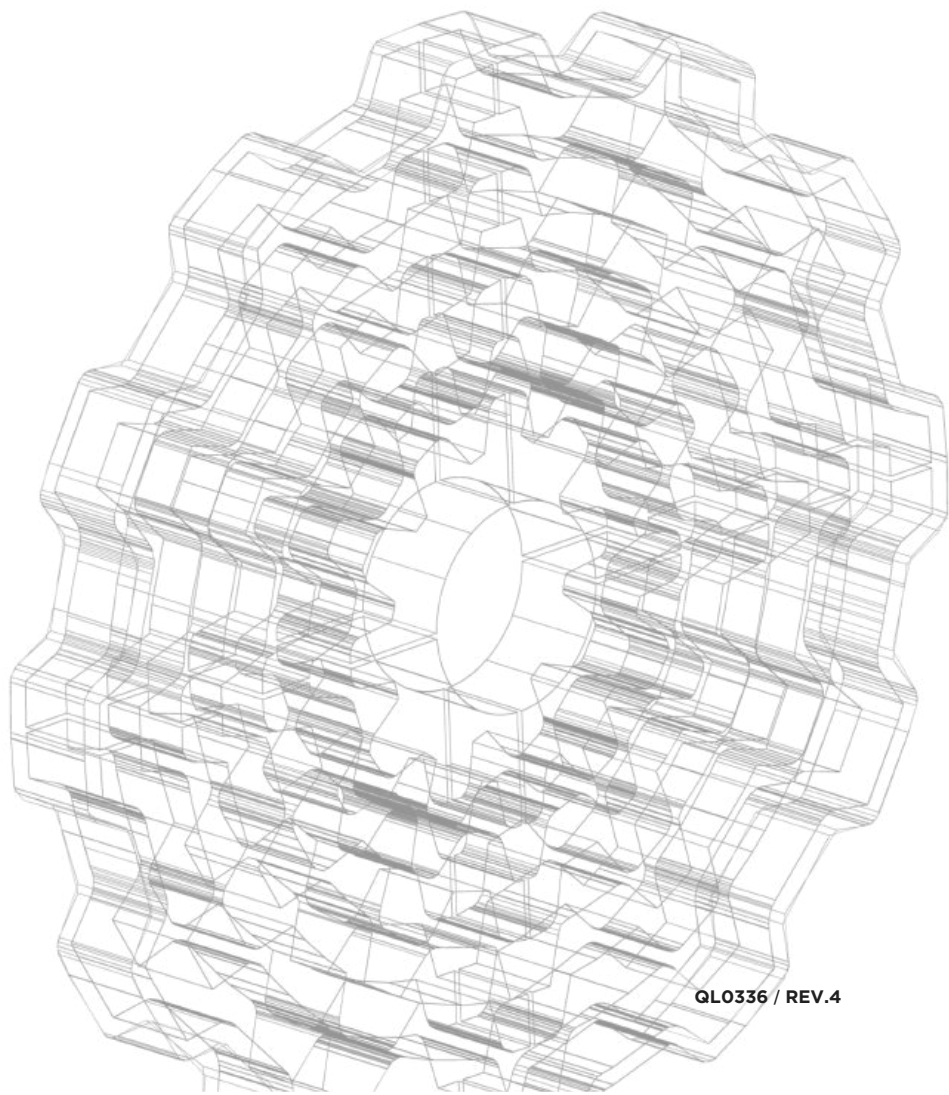


Instructions for installation, use and maintenance MHD reducers



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 Motovario 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 Motovario web site.

1. INTENDED USE OF THE MANUAL

1.1 INTENDED USE OF THE MANUAL 4

2. GENERAL INFORMATION

2.1 PURPOSE 5

2.2 SYMBOLS 5

2.3 PRODUCT IDENTIFICATION 6

2.4 SERVICE 6

3. COMPLIANCE

3.1 COMPLIANCE 7

4. TECHNICAL INFORMATION

4.1 PRODUCT DESCRIPTION 8

4.2 CRITICAL APPLICATIONS 8

5. SAFETY INFORMATION

5.1 SAFETY INFORMATION 10

6. HANDLING AND STORAGE

6.1 RECEIPT 11

6.2 HANDLING 11

6.3 STORAGE 12

7. INSTALLATION

7.1 INSTALLATION 13

8. SPECIFIC ASSEMBLING

8.1 OUTPUT SHAFT CONNECTIONS 15

8.1.1 Solid shaft 15

8.1.2 Hollow shaft with key series PBZ 17

8.1.3 Mounting with shrink disc series PBZ, PBH 18

8.2 INPUT SHAFT CONNECTIONS 20

8.2.1 Motor mounting flanges - PBZ, PBH 20

8.3 ACCESSORIES 21

8.3.1 Backstop device 21

8.3.2 Assembly of connecting parts 21

8.3.3 Shaft mounting with reaction bolt series PBH 22

8.3.4 Oil seals for input-output shafts 22

8.3.5 Other Accessories and Options 22

8.4 DEVICES 23

8.4.1 Cooling and heating systems 23

8.4.2 Lubrication and monitoring systems 25

9. STARTUP

9.1 STARTUP 27

10. MAINTENANCE

10.1 MAINTENANCE 29

10.1.1 Oil change procedure 30

10.1.2 Replacement procedure of external sealing rings 32

10.1.3 Bearings 33

10.1.4 Checks and maintenance table 33

11. PROBLEMS DURING OPERATION

11.1 PROBLEMS DURING OPERATION 34

12. LUBRICATION

12.1 LUBRICATION 35

12.1.1 Lubricants 37

12.2 QUANTITY 38

13. MOUNTING POSITIONS

13.1 MOUNTING POSITIONS 41

13.1.1 PBZ 42

13.1.2 PBH 44

14. SPARE PARTS TABLES

14.1 SPARE PARTS TABLES 45

15. UNIT DISPOSAL

15.1 UNIT DISPOSAL 46

16. RESPONSIBILITY

16.1 RESPONSIBILITY 47

17. DECLARATION OF PARTLY COMPLETED MACHINERY INCORPORATION

17.1 DECLARATION OF PARTLY COMPLETED MACHINERY INCORPORATION 48

1. INTENDED USE OF THE MANUAL

INSTALLATION, USE AND MAINTENANCE INSTRUCTIONS FOR MOTOVARIO PBZ, PBH PRODUCTS:

STANDARD

"ORIGINAL VERSION IN ITALIAN"

IMPORTANT!

The data and updated information given in this technical catalogue substitute those given in previous editions, which are thus to be considered obsolete; periodically consult the technical documentation available on Motovario website for up-to-date performance information and specifications.

2. GENERAL INFORMATION

2.1 PURPOSE

This manual has been provided by Motovario 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 Motovario.

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.

PBZ, PBH STANDARD LABEL

STANDARD	Type	(1)	M.P.	(2)
	N°	(3)	i	(4)
	Pn1	(5) kW	n1	(6) rpm
	Mn2	(7) Nm	n2	(8) rpm
	(9)	Weight	(10)	kg
			Date	
	MOTOVARIO [®]		(11)	
	HEART OF MOTION			
	TECO GROUP COMPANY		Via Quattro Fonti 1/5	
			41043 Montebelluna (TV) - ITALY	
			www.motovario.com	

Information contained on the nameplate:

- 1. Type: Unit abbreviation.
- 2. Mounting position.
- 3. Serial number.
- 4. i: reduction ratio.
- 5. Pn1: input nominal power [kW].
- 6. n1: number of input revolutions [rpm].
- 7. Mn2: output nominal torque [Nm].
- 8. n2: Number of output revolutions [rpm];
- 9. Identification field (Production order-Job order progressive number).
- 10. Unit weight with no load.
- 11. Year of manufacture.

The nameplate must not be removed and must be kept intact and readable. In case you need a copy of it just contact MOTOVARIO TECHNICAL SERVICE.

2.4 SERVICE

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

3. COMPLIANCE

Gearmotors 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 MOTOVARIO product is installed.

Motovario 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 MOTOVARIO TECHNICAL SERVICE for further information:

- Use in conditions which could lead to injury if the unit fails;
- Applications with especially high inertia;
- 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 M_{n2} stated on the label, but only intended for momentary, non-repetitive overload due to starting at full load, braking, impacts and other dynamic causes.

The value of maximum input speed n_1 max shown in the table reflects continuous duty S1 (operation under steady loading for a period long enough to achieve thermal balance) and B3 mounting position.

Continuous speeds above 1800 rpm are nevertheless not recommended since they could cause overheating and early deterioration of seals, bearings and lubricant.

Mounting positions other than B3 could make it necessary to use dedicated pressure-fed lubrication systems, while the transmission ratio could in some cases originate a further limitation of the permissible maximum input speed n_1 max, contact MOTOVARIO TECHNICAL SERVICE.

For intermittent duty, please contact MOTOVARIO TECHNICAL SERVICE.

Table of MAXIMUM PERMISSIBLE INPUT SPEED n_1 max

n_1 max [rpm]							
PH - BH	P1H	P2H	P3H	P4H	B2H	B3H	B4H
180	2800	2800	2800	2800	2800	2800	2800
200	2400	2800	2800	2800	2400	2800	2800
225	2240	2800	2800	2800	2240	2800	2800
250	2000	2400	2800	2800	2000	2400	2800
280	1800	2240	2800	2800	1800	2000	2800
355	1400	1800	2400	2800	1400	1800	2400

n_1 max [rpm]							
PZ - BZ	P1Z	P2Z	P3Z	P4Z	B2Z	B3Z	B4Z
139	2400	2800	2800	-	2800	2800	-
149	-	2800	2800	-	-	2800	-
179	2240	2800	2800	-	2400	2800	-
199	-	2800	2800	-	-	2400	-
219	1800	2800	2800	2800	2240	2400	2800
249	-	2400	2800	2800	-	2240	2800
269	1800	2240	2800	2800	2000	2240	2800
279	-	2240	2800	2800	-	2000	2800
319	1400	1800	2400	2800	1800	2000	2400
349	-	1800	2400	2800	-	1800	2400
399	-	1800	2000	2400	-	1800	2240
409	-	1400	1800	2400	-	1400	2000

5. SAFETY INFORMATION

Carefully read the content of this manual and any instructions reported directly on the plates applied to the gear reducer. The personnel working on the gear reducer must have specific technical expertise, experience and skills, as well both the necessary work tools and PPE (in accordance with current applicable laws). Failure to comply with these requirements may affect the health and safety of people.

Only use the gear reducer for the purposes permitted by Motovario. Incorrect use poses a risk to the health and safety of people, as well economic damage. Always keep the gear reducer in good working order by carrying out the required maintenance. The gear reducer is can become very hot. Avoid touching the surface with bare hands and ensure the necessary safety protections are in place.

Ensure maintenance is carried out in safe conditions, with the help of protective clothing and/or equipment, in accordance with current laws on safety in the workplace.

Only use original Motovario spare parts for replacements. Only use oils and greases recommended by Motovario. Do not discard polluting material into the environment and ensure disposal is carried out in compliance with current applicable laws. After replacing the lubricant, clean the surface of the gear reducer, as well as the area where the work was carried out.

6. HANDLING AND STORAGE

6.1 RECEIPT

Upon receipt, immediately check that the gear reducer matches the order and has not undergone any damage during transport. Any discrepancy of the product from the specifications ordered must be reported to Motovario.

Always make sure the paintwork is intact. If it isn't, contact Motovario to have it fixed.

Do not start gear reducers that have undergone damage, including minor damage, or that are not considered suitable for their intended use: in these cases, contact Motovario.

Dispose of packaging material in accordance with current applicable standards.

6.2 HANDLING

Provide for the following to receive and unload the gear reducer:

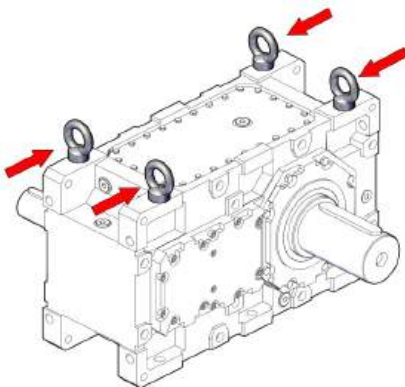
1. A suitable and well-defined area with a flat bottom
2. Handling equipment, taking into account the overall dimensions, weight and gripping points, data on the gear reducer to be handled (cranes, forklifts, eyebolts, ropes, slings, snap links, hooks, etc.) to avoid injury to people and/or damage to property. The weight to be handled can be found on the related sales catalogue.

Those authorised to handle the gear reducer must ensure all the necessary safety conditions.

Carry out all handling operations with extreme caution. The precautions to be taken during handling are measures suitable to ensure the safety of the operator and avoid failures or damage due to accidental shocks or falls.



Identify the gripping points on the gear reducer and go ahead with handling by using straps/slings. Accessories such as flanges, pumps, driving motors can change the centre of gravity, in which case an additional anchoring point may be required. Do not exceed 15° of oscillation for the load during the lifting phases; should this happen, stop and repeat the operation.
Do not use piping, threads or protrusions of accessory or shaft ends as anchoring points and pay attention to any lubrication and cooling systems.
Use the through or threaded holes in place on the fixing feet of the gear reducer's case. These points are designed to only withstand the weight of the gear reducer. Do not add more weight during the lifting and handling phases.



6.3 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 <50%, with no intense temperature change, no ultraviolet light and no direct sunlight;
- In case of low temperatures ($T_{amb} < -5^{\circ}\text{C}$) take special care to avoid shocks and vibration that could damage the structure.

In the event of storage for 6 months or more, or in environmental conditions other than those specified:

- Fill up the gear reducer with oil. Restore the suitable level when commissioning the transmission;
- Every six months, rotate the shafts by a few turns to avoid damage to the bearings and prevent the sealing rings from being glued.
- Apply plenty of grease or suitable protective and water-repellent products on the shafts and surfaces processed in order to prevent metal oxidation or deterioration of rubber parts;

Caution! The formation of oxide on metal surfaces considerably reduces the energy required for the spark in the event of a collision, thereby increasing the chances of ignition. Always make sure processed surfaces are free from oxide and protected.

In case of units featuring a drywell or for other types of storage, contact MOTOVARIO TECHNICAL SERVICE.

7. INSTALLATION

Before installing and setting up the gear reducer, proceed by following all the items of the following checklist:

- Check the nameplate data of the gear reducer and, if needed, of the electric motor;
- Make sure the equipment supplied corresponds to the equipment ordered;
- Make sure that the category of the equipment is suitable for the environmental classification in which it will be installed and subsequently operated;
- The fastening of the machine to the structure must be stable and without any vibrations. The structure must not be subject to torsional movements;
- For the fastening use screws with a minimum resistance class of 8.8, without deforming the case due to incorrect fastening (see the table with the TIGHTENING TORQUES FOR FIXING SCREWS). In threaded joints we recommend using thread locking liquids to prevent loosening due to vibrations. Always check the correct tightening after the first hours of operation.
- Make sure the supporting surface is flat and large enough to fit the whole gear reducer;
- Make sure the operating position matches the mounting position reported on the nameplate;
- Check the position of the oil level plug, which must always be clearly visible for periodic inspections even after fitting the gear reducer on the machine. Make sure the oil drain/filler plugs are accessible.
- Make sure the gear reducer has been filled with the right amount of oil according to the required mounting position;
- Replace the closing plug, if present, with the breather plug in the kit provided with the gear reducer;
- Check for any lubricant leakages. If there are any, interrupt the installation, identify the leak and contact MOTOVARIO's TECHNICAL SERVICE;
- Remove any traces of dirt or dust from the shafts and from the areas around the sealing rings;
- Lubricate 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, or in environments with ionising radiation;
- Install all the protections designed for the rotary parts to ensure the system is safe, in accordance with current regulations;
- Check the correct direction of rotation of the output shaft of the unit;
- In case of shaft mounting, it is recommended to use Motovario torque arms;
- Ensure proper cooling of the motor through a good flow of air from the fan side;
- Avoid solar radiation or irradiation from other heat sources. The cooling air temperature must never exceed 40°C or drop below -20°C;
- Check that the assembly of the various parts (pulleys, sprockets, couplings, etc.) on shafts is performed by using the relevant threaded holes or any other system able to ensure a correct operation without damaging the bearings or the outer parts of the gear reducer, see paragraph 8 for details. SPECIFIC ASSEMBLIES.



Ensure an equipotential bond (earthing) of the gear reducer case by using one of the free holes previously cleaned to remove oxides or paint. The electrical connection must be carried out in accordance with EN standard 60079-0 "Paragraph 15 – Connection facilities for earthing or bonding conductors". The cable section must comply with Table 10 and in any case must not be less than 4 mm².

In case of ambient temperature not listed in the table LUBRICANTS RECOMMENDED BY MOTOVARIO, please contact MOTOVARIO 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 exceeding the temperature limits set by standard EN ISO 13732-1 are suitably marked with the symbol of standard EN ISO 7010, CAUTION – HOT PARTS.

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.

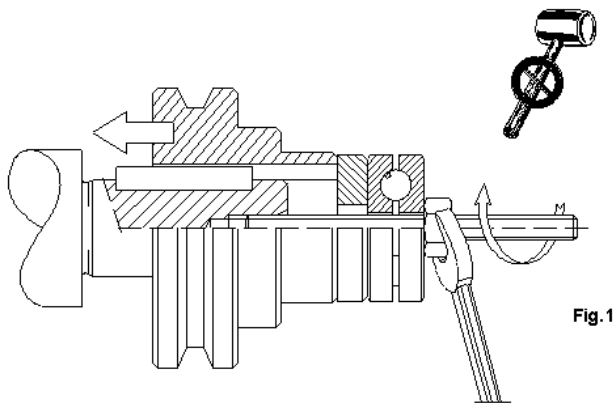
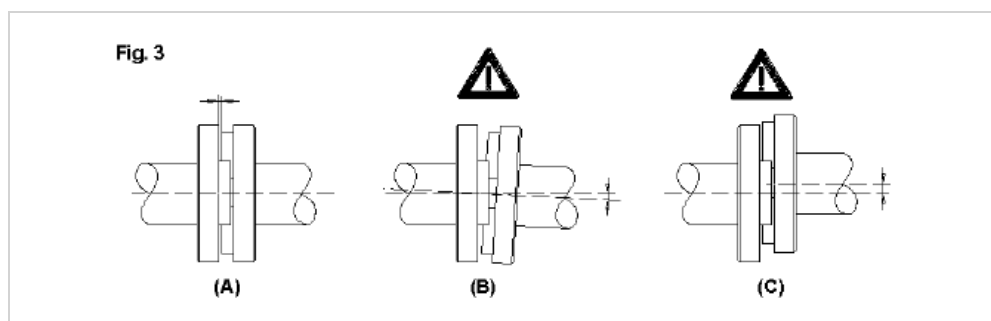
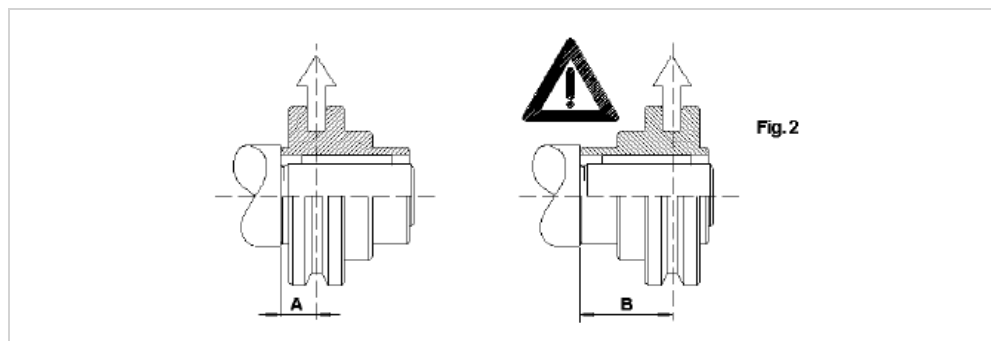


Fig.1

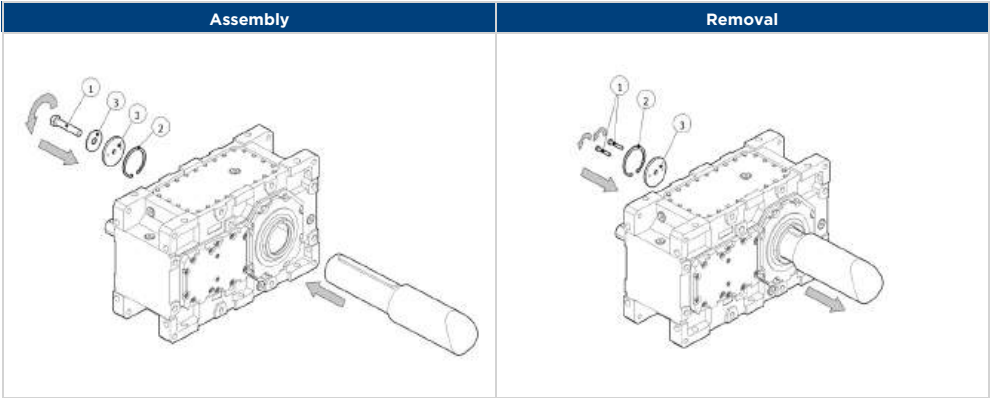
- Fig. 2, 3: Examples of correct and incorrect installation () on the output shaft of the gear reducer.



8.1.2 Hollow shaft with key series PBZ

Series PBZ gear reducers may be supplied with the optional Motovario installation/removal kit for the driven shaft. Upon request the supply includes:

- 1. Screw;
- 2. Safety ring;
- 3. Axial washer.



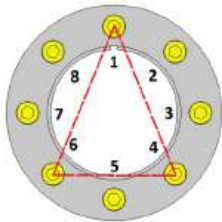
8.1.3 Mounting with shrink disc series PBZ, PBH

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 torque (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"

PH-BH	M _T 12.9 [Nm]
180	70
200	117
225	117
250	117
280	293
355	293

PZ-BZ	M _T 10.9 [Nm]
139	30
149	30
179	59
199	100
219	100
249	100
269	100
279	100
319	250
349	490
399	490
409	490

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 - PBZ, PBH

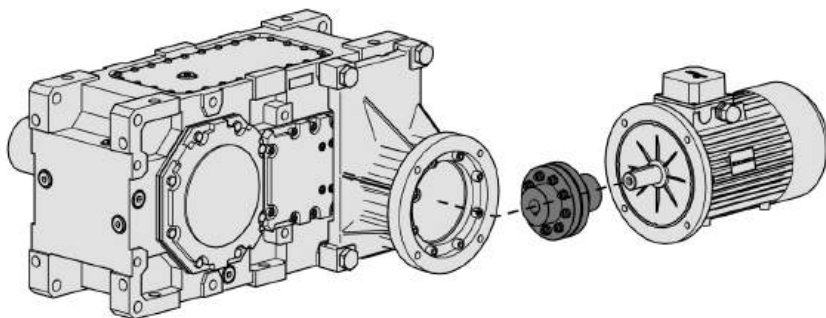
When the gear reducer is supplied without the motor, follow the recommendations below to ensure correct assembly of the drive unit on the transmission:

- First of all make sure, by checking the nameplate data of the motor and gear reducer, that the dimensions of the transmission are suitable to install the motor's rated power. Also ensure the motor is suitable for the class of the environment where it will operate;
- Check that the tolerances of the shaft and motor flange comply with the provisions of standard IEC 60072-1;
- Carefully clean the shaft, spigot and surface of the flange from traces of paint or dirt;
- Lubricate the motor shaft with grease to facilitate the assembly of the coupling joint and avoid surface oxidation;
- Go ahead with the assembly of the half coupling (see figure) on the motor shaft, without forcing it in and therefore damaging the motor bearings;
- Go ahead with the mechanical connection with the gear reducer by engaging the teeth of the half coupling on the motor side with the grooves in the elastic element fixed on the half coupling on the gear reducer side;

If the connecting joint was not supplied by Motovario, make sure that:

- The axial overall dimensions ensure the gear reducer and motor keys are engaged correctly and completely;
- The axial overall dimensions ensure the gear reducer and motor flanges can be coupled easily without remaining apart. An axial preload of the bearings due to the subsequent tightening of the motor fixing screws would lead to premature damage to the bearings.

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

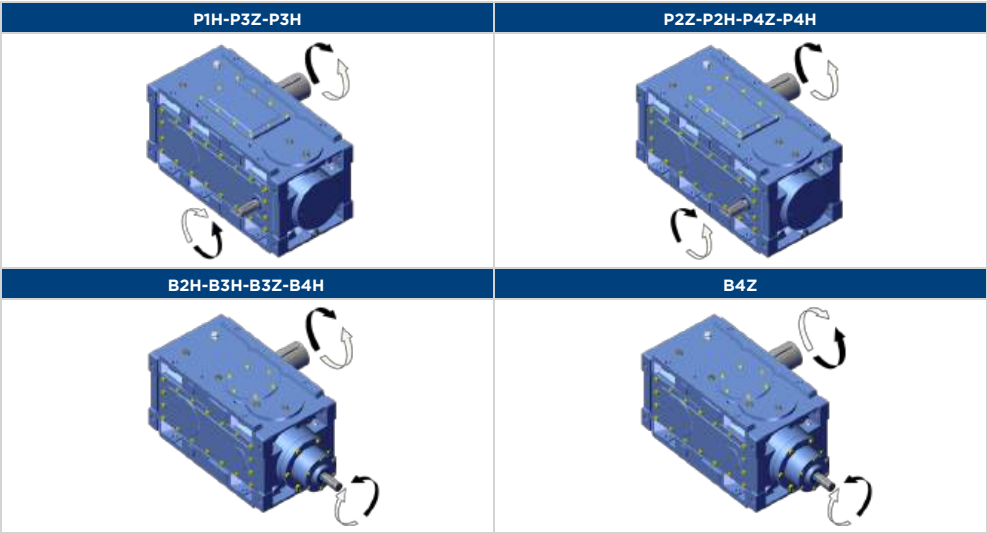


8.3 ACCESSORIES

8.3.1 Backstop device

Gear reducers may be equipped with backstop (on the input shaft for PZ, PH and on bevel gear shaft for BZ, BH). The backstop allows shafts to rotate in one direction only. It is essential that while ordering you specify the direction of free rotation, according to the white or black arrow.

A nameplate showing the free direction of rotation of the unit is applied. Check that the free direction of rotation corresponds to what is required. Questa operazione è fondamentale, così come accertarsi che il motore ruoti nella direzione corretta. Avviare una o più volte nel senso bloccato può danneggiare irrimediabilmente il dispositivo antiretro, portandolo a malfunzionamenti, rotture e possibili surriscaldamenti oltre i valori termici limite di certificazione. For PBZ, PBH please contact MOTOVARIO TECHNICAL SERVICE to verify overall dimensions of backstop.



8.3.2 Assembly of connecting parts

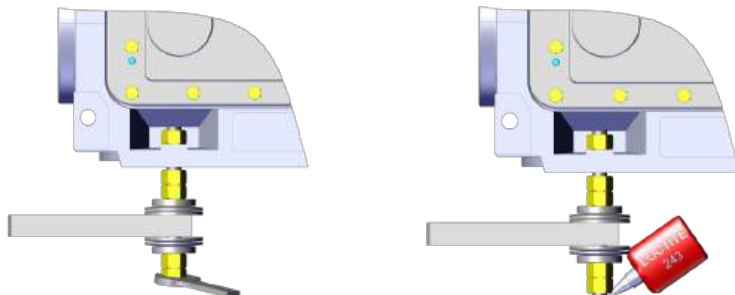
When installing the components, make sure the gear reducer (gears, bearings, sealing rings, coupling surfaces) does not suffer any damage. Before assembly, it is necessary to carefully clean the shaft surfaces and then lubricate them to avoid seizure. Again in order to make assembly easier, it is advisable to install the connecting parts by heating them to a temperature between 80 and 100 °C (see the manual of the part to be assembled). During assembly, it is necessary to protect the sealing rings and avoid transmitting to the shafts (and to the gear reducer in general) external loads (whether static and/or dynamic) not envisaged when the product was selected. Also provide for retaining devices if the part keyed onto the shaft is not axially blocked and ensure they prevent it from sliding axially.



CAUTION - HOT PARTS
If connecting parts are heated, pay special attention to hot parts, which represent a serious thermal hazard which may endanger personal health and safety.

8.3.3 Shaft mounting with reaction bolt series PBH

PBH series gear reducers can be equipped with anti-vibration reaction bolt. Make sure, upon mounting completed, that the axial pre-load of the anti-vibration anchor is absent (on both sides). Check the absence of abnormal vibration, during the start-up, on both the unit and the support structure.



8.3.4 Oil seals for input-output shafts

Upon request, the gear reducer can be supplied with the following seals for the output shaft in the standard version with an NBR ring, or upon request:

- Sealing ring in a FKM fluorinated compound, Viton[®]
- Reinforced seal, which is made with a double ring in a FKM fluorinated compound and a cavity filled with grease;
- Taconite labyrinth seals. Used with grease lubrication, their effectiveness must be maintained by periodically reaching the paths of the grease labyrinth by using a special conduit;

For the input shaft, as an alternative to the standard seal which in this case is a FKM (Viton[®]) compound, it is possible to request:

- A sealing ring made with an NBR compound;
- A cassette oil seal.

During the installation and start-up of the machine, check operation making sure that there is no damage on surfaces or lubricant leaks from the seal. The check must also be repeated after the first hours of operation.

8.3.5 Other Accessories and Options

As an option, the gear reducer can be supplied with:

- Loading cap with filter;
- Special paint coating with C3, C4 and C5 classes in accordance with UNI EN ISO 12944;
- NEMA motor adapter flange (PBH only).

It is not necessary to pay special attention during the installation of the above-listed accessories, only make sure that the machine is running at start-up.

8.4 DEVICES

8.4.1 Cooling and heating systems

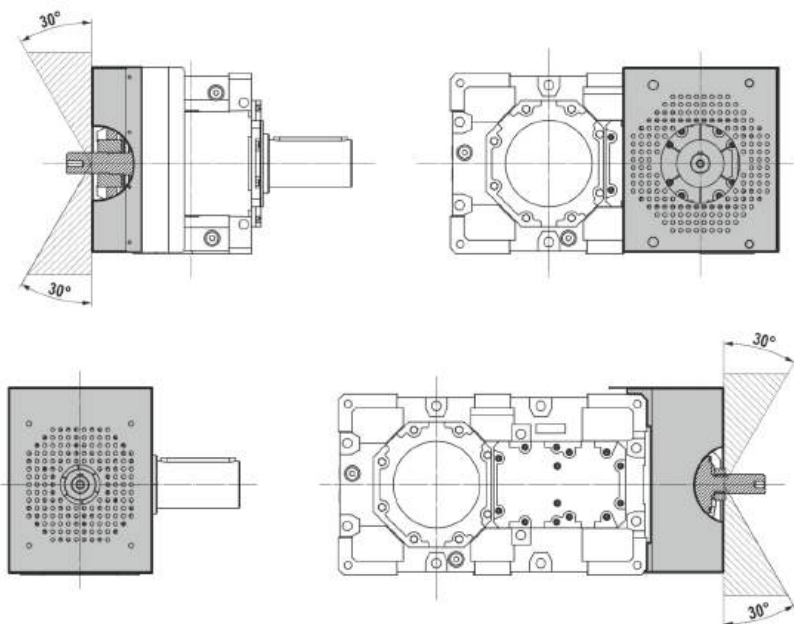
Cooling fan:

The fan draws air through the grille of the protective guard which conveys it into the gear reducer to increase the heat exchange and hence the heat loss. The fan is keyed onto the fast shaft and is always fitted with a protective guard. Periodically remove the dust that settles on the fan blades and in the openings of the guard grille.

When installing the gear reducer, make sure the area in front of the guard's grille is clear and the flow of air drawn in does not have any obstructions. Refer to the conical volume around the input shaft, as shown in the figure below.

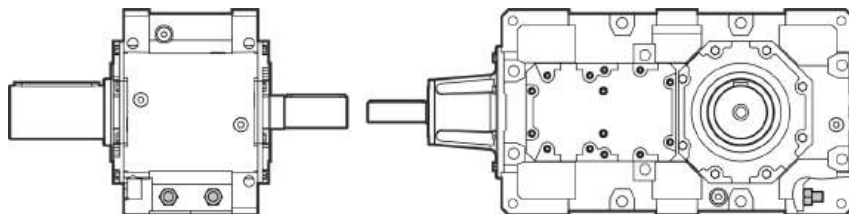


Never use the unit without protective guard! As well as avoiding contact with the rotating blades and therefore preventing accidents, the guard is essential to convey the airflow correctly on the gear reducer's casing. Consequently, the removal reduces dissipation and therefore potential overheating of the gear reducer.



Cooling coil with or without thermostatic valve:

The cooling coil is fitted inside the gear reducer. It cannot be removed and it must be integrated in a cooling circuit put in place by the customer. Water circulates in both directions. In case of very hard water, use a descaler to obtain a hardness value equal to or lower than 12 °F (French degrees). We recommend fitting the system with a thermostatic valve that lets water flow only when the oil of the gear reducer reaches a temperature of 70°C. If not used for long periods of time or in the event of frost, use compressed air to empty the system from residues in order to prevent damage to the coil due to water freezing inside it.



***Before starting the gear reducer, make sure that the system is in perfect conditions and with no obstructions; should this not be the case, clean it with suitable means and detergents compatible with the system.
When using chemical detergents, take all the necessary measures to protect people's health and to dispose of them in compliance with the applicable standards!***

Periodically clean the system using suitable means and detergents compatible with the system itself. For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.

Air/oil or water/oil cooling unit:

1. Water/oil cooling unit. Gear reducer oil circulates, through a circuit of the system, thanks to a motor pump and, before being returned inside the gear reducer, it passes through a filter - if any - (purifying the oil and thus ensuring gear reducer reliability and duration over time) and the water/oil heat exchanger (with bundle of copper tubes removing the exceeding heat). The unit features a minimum pressure switch, a maximum thermostat and a water shut-off solenoid valve.
2. Air/oil cooling unit. Gear reducer oil circulates, through a circuit of the system, thanks to a motor pump and, before being returned inside the gear reducer, it passes through a filter - if any - (purifying the oil and thus ensuring gear reducer reliability and duration over time) and the air/oil heat exchanger (with aluminium pack with electric fan and thermostat removing the exceeding heat). The unit features a minimum pressure switch, a maximum pressure switch and an adjustable thermostat.

For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.

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



***Before starting the gear reducer, make sure that the system is in perfect conditions and with no obstructions; should this not be the case, clean it with suitable means and detergents compatible with the system.
When using chemical detergents, take all the necessary measures to protect people's health and to dispose of them in compliance with the applicable standards!***

Periodically clean the system using suitable means and detergents compatible with the system itself.

Oil heater:

In case of low temperatures and/or pressure-fed lubrication systems, the oil heater must be used. This is a resistor that, through temperature sensor and PLC (to be provided by the customer) pre-heats the oil and takes it to a suitable temperature for start-up.
T start-up = T oil = 18 °C
T stop = T oil = 40 °C
If possible, start the oil heater 4 hours before starting the gear reducer.
For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.
In any case, refer to the installation manual of the part to be assembled.

	<i>Danger due to electric voltage!</i> <i>Have the operations carried out only by specialised personnel.</i> <i>Before starting the operations, make sure that the oil heater is connected to the power supply and take measures against unexpected triggering!</i> <i>Take special care when installing the oil heater. Its wrong installation can damage the gear reducer; to avoid damage, make sure that the heating elements are immersed inside oil.</i> <i>A wrong change of the mounting position, or a wrong or unsuitable wiring, can damage the oil heater.</i>
---	--

Periodically check the correct operation.

8.4.2 Lubrication and monitoring systems

Bearing lubrication pump:

The mechanical pump is used in case of gear and bearing pressure-fed lubrication. It is mechanically driven by a gear reducer shaft. It can feature monitoring and operating devices.
For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.
In any case, refer to the installation manual of the part to be assembled.

	<i>Pay special attention to oil viscosity, mainly during start-up; if necessary, pre-heat the oil</i>
---	---

Periodically check the correct operation.

Bearing lubrication motor pump:

The motor pump is used in case of gear and bearing pressure-fed lubrication. It is independently powered and can feature monitoring and operating devices. All connections must be implemented by the customer.
For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.
For PBZ, the motor pump is supplied already assembled on the gear reducer. For the overall dimensions, contact MOTOVARIO TECHNICAL SERVICE.
In any case, refer to the installation manual of the part to be assembled.

	<i>Pay special attention to oil viscosity, mainly during start-up; if necessary, pre-heat the oil. Activate the motor pump first and activate the gear reducer only after a few minutes of operation of the motor pump.</i>
---	---

Periodically check the correct operation.

Pressure switch:

It signals, through an alarm, when the pressure drops under the minimum permissible value (0.5 bar). All connections must be implemented by the customer.

For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.

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



Never change the pressure switch triggering value!

Periodically check the correct operation.

Oil level probe with float (PBH only):

It is used for the remote reading of oil level. It is supplied already calibrated and triggers as soon as the level is below the set threshold.

For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.

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



Before filling up, check probe correct operation.

Periodically check the correct operation.

Oil temperature probe PT100:

It is used for the remote reading of oil temperature. It is fitted instead of the draining cap or the pre-drilled hole. All connections must be implemented by the customer.

For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.

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

Periodically check the correct operation.

Bearing oil temperature probe PT100:

It is used for the remote reading of bearing temperature. It is assembled inside the special hole present on the bearing to be monitored. Make sure that probe tip is in contact with the outer surface of the bearing. All connections have to be made by the customer.

For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.

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

Periodically check the correct operation.

Bimetal thermal fuses (PBH only):

Thermal fuses are calibrated for a fixed triggering temperature, based on the accessory (or device) and on their function. They can be assembled on the gear reducer or supplied as an outfit (in this case, replace the closing caps, marked and used for transport, with thermostats). All connections must be implemented by the customer.

For any technical information, please contact MOTOVARIO TECHNICAL SERVICE.

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

Periodically check the correct operation.

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.



Surface temperature:
The temperature data on the nameplate indicate maximum admissible values on the unit, referring to the ambient temperature between -20 °C and +40 °C. Operation is not allowed at different ambient temperatures. In case of need, contact MOTOVARIO TECHNICAL SERVICE.
The thermal limits reported on the plate indicate the maximum admissible values on the gear reducer in relation to the maximum power that can be installed and the ambient temperature range allowed for the gear reducer (normally -20 to +40 °C and in any case refer to rated values). The gear reducer cannot, under any circumstances, be operated at environmental power values and temperatures other than those on the plate.

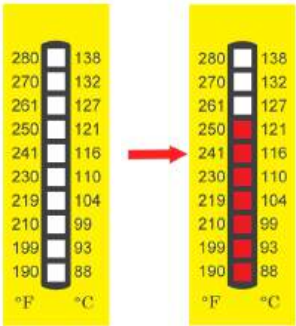
Measuring the surface temperature:

- During start-up it is important to measure the surface temperature of the unit under the conditions provided by the application. The detection is to be repeated periodically as shown in table CHECKS AND MAINTENANCE.
- The surface temperature must be measured in the vicinity of the input shaft (for gear reducers) or in the connection area between the motor and the unit (for gearmotor) and in any case in the less favourable points of the air flow.
- The measured surface temperature (Ts) plus the difference between the maximum ambient temperature (Tam) allowed and the measured ambient temperature (Ta) must be at least 10 °C lower than the maximum surface temperature allowed (Tc, indicated on the label):
$$Ts + (Tam - Ta) < Tc - 10 \text{ } ^\circ\text{C}$$

If the temperature is not suitable, stop the unit immediately and contact MOTOVARIO's TECHNICAL SERVICE.



Using irreversible thermosensitive adhesive detectors:
We recommend using irreversible thermosensitive adhesive indicators to monitor the surface temperature. These may be provided for special gear reducers or upon specific request from the customer.



10. MAINTENANCE

	Maintenance must be carried out by expert operators and in accordance with current regulations concerning safety in the workplace and matters relating to environmental risks. Do not discard polluting liquids like lubricants, replaced parts and maintenance residues into the environment. <i>Never improvise repairs!</i>
	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. 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 Motovario. During an oil change 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.

10.1.1 Oil change procedure

The lubricant must be replaced in all of the following cases:

- One of the oil replacement intervals has been reached, in this case see the “Checks and Maintenance Table” and the “OIL REPLACEMENT INTERVAL”;
- Significant oil leakage;
- Suspected external contamination of the lubricant.

Bring the gear reducer to a surface temperature below 30 °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.

- Put in place a system to collect the lubricant that is proportional to the gear reducer on which maintenance is to be carried out;
- Identify the filler and drain plugs of the gear reducer (the filler plug may be the drain plug); First unscrew the filler plug and then the drain plug, paying attention to gradually reducing any internal overpressure;
- Bleed out all the oil and collect it with the system put in place;
- Wash the inside of the gear reducer’s casing with the same type of oil required for operation and empty it again;
- Replace the gasket of the drain plug and tighten it again by applying the appropriate tightening torque (see the table with the “TIGHTENING TORQUE FOR OIL PLUGS”);
- Pour the new lubricant into the gear reducer until you reach the required level, which corresponds to the centre line of the indicator plug or to the upper notch of the dipstick; see the LUBRICATION paragraph for overflow levels. Refer to the tables in the LUBRICATION paragraph for the type of oil and the recommended viscosity.
- Replace the gasket of the filler plug and tighten it again by applying the adequate tightening torque (see the table with the “TIGHTENING TORQUE FOR OIL PLUGS”);
- After about 30 minutes verify whether the level is correct (top up as required) and check for any oil leaks. Clean the gear reducer’s surface with antistatic materials. As in the case of first commissioning, there may be air pockets trapped between the gears and the casing, which would prevent the filling process from being completed. After the first minutes of operation, stop the gear reducer, check the oil level and top up if necessary;
- Dispose of used oil in accordance with current local regulations.

Table “OIL CHANGE INTERVAL”

Oil type	Oil temperature		
	< 65°	80°	95°
Mineral oil	8000 h	4000 h	2000 h
Synthetic oil	25000 h	18000 h	12500 h

Table of "OIL PLUGS TIGHTENING TORQUE"

Cap	Tightening torque Nm	
	Hex key	Allen key
1/4"	20	14
3/8"	30	20
1/2"	60	30
3/4"	70	40
1"	80	50
1" 1/4	80	50
M24	60	30

PBZ	Plug	Quantity	Drain plug	Indicator plug	Plug on top cover
PZ139-1	1/4"	13	1/4"	1/4"	1/4"
PZ139-2 BZ139	3/8"	13	3/8"	3/8"	1/4"
149	1/2"	13	1/2"	1/2"	3/8"
179	1/2"	14	1/2"	1/2"	3/8"
199	1/2"	13	1/2"	1/2"	3/8"
PZ219-1 BZ219-2	3/4"	11	3/4"	3/4"	3/4"
219	1"	14	3/4"	1"	1"
249	1"	14	3/4"	1"	1"
269	1"	14	1"	1"	1"
279	1"	14	1"	1"	1"
319	1"	14	1"	1"	1"
349	1"	14	1"	1"	1"
399	1" 1/4'	14	1" 1/4'	1" 1/4'	1" 1/4'
409	1" 1/4'	14	1" 1/4'	1" 1/4'	1" 1/4'

10.1.2 Replacement procedure of external sealing rings

The service life of the rotating seals depends on many factors:

- Sliding speed;
- Temperature;
- Operating environment;
- Level of dust;
- Ageing of the compounds.

It is therefore impossible to establish a minimum duration of the component, which must be checked periodically to ensure correct operation.

As well as in the case of leaks, we recommend replacing the rings during the periodic overhauls of the gear reducer, when replacing the lubricant and in general at least every 4 years.

Locate the seal to be replaced and proceed as follows:

- Drain oil (refer to section **OIL CHANGE PROCEDURE**);
- Remove the sealing ring taking the utmost care not to cause any kind of damage to the seat and to the shaft (scratches, dents, etc.);
- Always use new seals of the same brand of those removed.

Proceed as follows when fitting the new ring:

- Grease the rotating housing on the shaft with plenty of lubricant, as well as the sealing lip of the ring. The recommended grease to be used is **ENI-MU EP 2** (for sealing rings with double lip in **FKM** use the special grease **TECNOLUBE BC 101**);
- Fit the ring by taking care not to damage the sealing lip during insertion, especially with the sharp edges of the key housings, with excessive shocks and deformations. In this case, it is recommended to use a lubricated plastic cover for cover sharp parts to ensure easy assembly;
- When positioning the ring axially, make sure the sealing lip does not coincide with the groove generated by the previous ring.

10.1.3 Bearings

As in the case of the sealing rings, also the bearings are influenced by the operating conditions of the gear reducer, such as the input speed, loads, operating temperatures, type of load applied and lubrication used, etc. Therefore, it is not possible to provide an intervention interval and it is necessary to check the gear reducer on a monthly basis to detect anomalous noise and/or vibrations. If even a slight deterioration in the noise or vibration levels is detected, stop the gear reducer and contact Motovario.

10.1.4 Checks and maintenance table

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.
18,000 h / 6 years (T=80°C)	Synthetic oil.	None.	Replacement.

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
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

	Check the oil level before starting up the gear reducer; this operation must be carried out when the gear reducer is arranged in the predetermined mounting position, if necessary restore the level with oil of the same type shown on the nameplate. In case of unavailability, please contact MOTOVARIO TECHNICAL SERVICE.
---	--

Proper lubrication makes for:

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

Motovario gear reducers of the PBZ, PBH series have been designed for splash lubrication. Unless expressly requested, the gear reducers are supplied without lubricant (for any requests, see the table with LUBRICANTS RECOMMENDED BY MOTOVARIO). If unavailable, please contact MOTOVARIO's TECHNICAL SERVICE. To extend lubrication intervals and the ambient temperature range, or reduce the oil temperature, we recommend using polyglycol or polyalphaolefin-based synthetic oil.

Polyglycol-based synthetic oils mix with water and are not compatible with other oils, as their lubricating properties degrade very quickly and therefore they must be used with great care.

Unless specifically requested at the time of order, gear reducers are supplied without lubricant. This means they need to be filled up for the first time by choosing the type of oil and right viscosity according to the following tables.

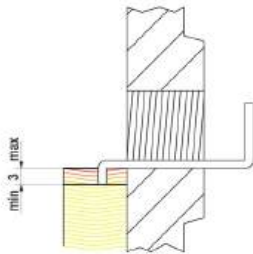
Fill the gear reducer by following the plug diagram indicated in paragraph 14. If the gear reducer is supplied already filled with oil (special version), the installer will be responsible for replacing the closure plugs with the breather and filler plugs provided separately.

Check the level of oil before starting the gear reducer. This must be done with the latter in the set mounting position reported on the nameplate. If needed, top up using the same type of oil indicated on the label.

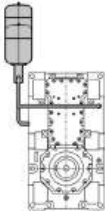
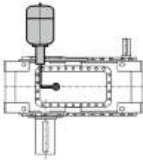
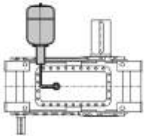
In the case of a closed level plug, for the check use a dipstick as in the image below, with the level that must be within 3 mm from the hole in the plug.

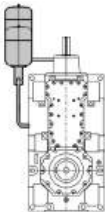
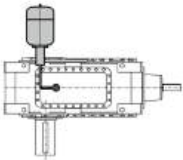
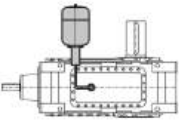
If none of the recommended lubricants is available locally, contact MOTOVARIO's TECHNICAL SERVICE. If it is necessary to use a different type of oil (after checking with MOTOVARIO's TECHNICAL SERVICE), go ahead with a full replacement by also washing the inside of the gear reducer, as recommended in the paragraph **Changing the oil**. Pour the oil through the filling holes or the inspection cover by using a filler filter and then restoring the seal (to be replaced) or gasket.

	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.
--	--



For some designs, as indicated in the catalogue, it is necessary to install an oil expansion tank in order to ensure the correct lubrication of all gear reducer parts and allow the natural thermal expansion of the lubricant.

PZ		
B6	V5	V6
		

BZ		
B6	V5	V6
		

12.1.1 Lubricants

Specifications of LUBRICANTS RECOMMENDED BY MOTOVARIO

	Mineral oil	Polyalphaolefin (PAO) oil	Polyglycol (PG) oil
ENI	BLASIA FMP	BLASIA FSX	-
SHELL	OMALA S2 GX	OMALA S4 GXV	OMALA S4 WE
KLUBER	Kluberoil GEM 1-...N	Klubersynth GEM 4-...N	Klubersynth GH 6
MOBIL	MOBILGEAR XMP	SHC GEAR	GLYGOYLE
CASTROL	ALPHA SP	ALPHASYN T	ALPHASYN PG
BP	ENERGOL GR-XP	ENERSYN EP-XF	ENERSYN SG-XP
TOTAL	CARTER EP	CARTER SH	CARTER SY

Based on the output speed n_2 , check the oil type to be used in table ISO VISCOSITY GRADES, that provides the average kinematic speed value [cSt] at 40 °C.

Table ISO VISCOSITY GRADES

Speed n_2 (rpm)	T_{amb} °C	
	Mineral oil	Synthetic oil
	(0) ÷ (+40)	(-10) ÷ (+50)
> 210	150	150
210 ÷ 20	150	220
20 ÷ 5	220	320
<5	320	460

12.2 QUANTITY



For the gear reducers of the PBH-PBZ series, the expected mounting position must be always specified. 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 on the unit or by 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.

Table OIL CAPACITIES IN LITRES - [I]

	PIH						P2H					
	180	200	225	250	280	355	180	200	225	250	280	355
B3	12	18	26	39	56	127	11	16	23	35	50	114
B3R	12	18	26	39	56	127	11	16	23	35	50	114
B6	15	21	31	47	64	149	22	30	42	64	89	201
B7	21	28	37	56	94	169	19	26	33	51	85	152
V5	15	19	29	47	68	137	14	17	26	43	61	123
V6	15	19	29	47	68	137	14	17	26	43	61	123

	P3H						P4H					
	180	200	225	250	280	355	180	200	225	250	280	355
B3	15	21	33	49	60	147	13	19	29	44	54	133
B3R	15	21	33	49	60	147	13	19	29	44	54	133
B6	31	42	60	88	126	273	28	38	54	80	113	246
B7	27	33	49	74	99	216	24	30	44	66	89	195
V5	17	21	34	56	73	158	15	19	30	50	65	143
V6	17	21	34	56	73	158	15	19	30	50		

	P1Z				
	139	179	219	269	319
B3	4	15	28	44	86
B3R	4	13	28	44	86
B6	7,5	20	40	62	108
B7	6	18	35	55	100
V5	9	16	34	53	91
V6	9	17	36	56	96

	P2Z											
	139	149	179	199	219	249	269	279	319	349	399	409
B3	7,5	10	13	16	21	30	35	45	58	85	128	135
B3R	8	10	13	16	24	30	35	45	58	85	128	135
B6	12	13	20	26	40	48	62	79	108	150	190	234
B7	10	13	18	23	30	41	55	73	100	125	180	215
V5	10	11	16	20	34	41	53	67	91	134	165	198
V6	11	12	17	21	36	43	56	70	96	140	173	208

	P3Z											
	139	149	179	199	219	249	269	279	319	349	399	409
B3	7,5	11	14	19	23	32	40	55	62	95	145	150
B3R	8	10	14	19	23	32	40	55	62	95	145	150
B6	14	15	21	27	46	52	67	87	115	165	205	245
B7	10	15	19	26	34	46	57	85	100	150	230	225
V5	10	12	17	23	38	44	58	70	100	141	178	209
V6	11	13	18	24	40	46	61	74	104	148	187	219

	B2Z				
	139	179	219	269	319
B3	5,5	15	30	35	58
B3R	5,5	15	30	35	58
B6	12	20	46	62	108
B7	11	18	42	55	100
V5	10	17	38	53	91
V6	11	18	40	56	96

	B3Z											
	139	149	179	199	219	249	269	279	319	349	399	409
B3	8	10	13	16	21	32	35	45	60	95	130	135
B3R	8	10	13	16	21	32	35	45	60	95	130	135
B6	10	14	19	27	33	48	56	79	108	150	190	234
B7	10	16	18	23	37	50	55	73	100	125	180	215
V5	9	11	16	20	34	41	53	67	91	134	165	198
V6	9	12	17	21	36	43	56	70	96	140	173	208

	B4Z							
	219	249	269	279	319	349	399	409
B3	23	32	42	52	66	95	150	160
B3R	23	32	42	52	66	95	150	160
B6	46	52	67	87	115	165	205	245
B7	42	46	63	85	112	150	190	225
V5	38	44	58	70	100	141	178	209
V6	40	46	61	74	104	148	187	219

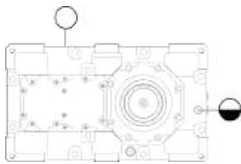
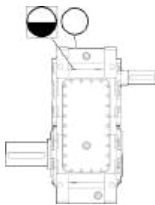
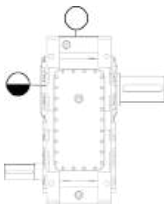
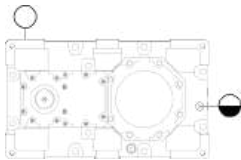
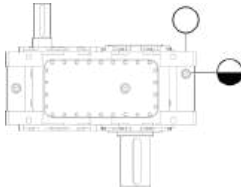
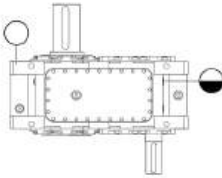
13. MOUNTING POSITIONS

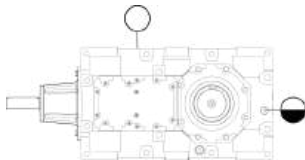
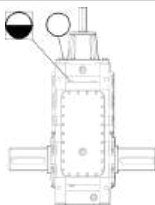
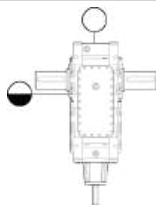
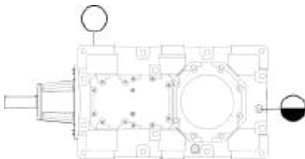
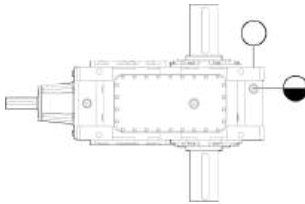
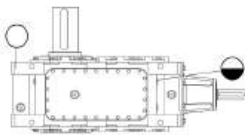
Install the unit in the intended mounting position. Otherwise, please contact MOTOVARIO TECHNICAL SERVICE.

ATEX 2G/2D: Vent plug with valve.

	VENT PLUG
	LEVEL PLUG

13.1.1 PBZ

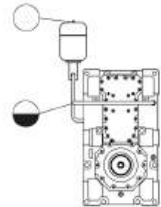
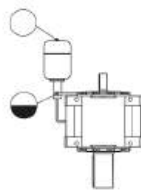
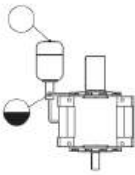
PZ		
B3	B6	B7
		
B3R	V5	V6
		

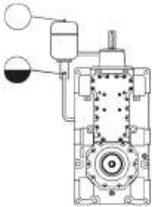
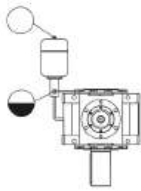
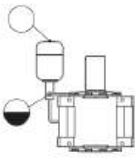
BZ		
B3	B6	B7
		
B3R	V5	V6
		

Closing plugs on all other holes.

	VENT PLUG		
	LEVEL PLUG		LEVEL PLUG WITH ROD

PBZ - Expansion tank

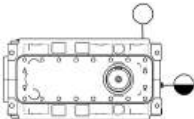
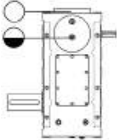
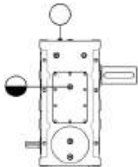
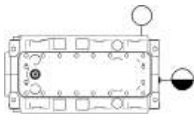
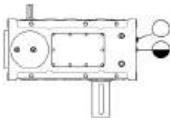
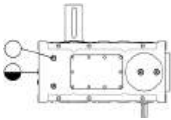
PZ		
B6	V5	V6
		

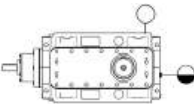
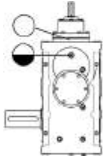
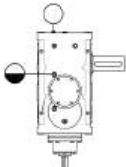
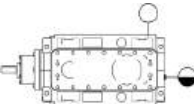
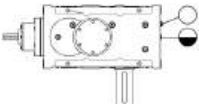
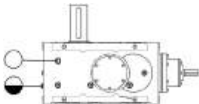
BZ		
B6	V5	V6
		

Closing plugs on all other holes.

	VENT PLUG		
	LEVEL PLUG		LEVEL PLUG WITH ROD

13.1.2 PBH

PH - STANDARD		
B3	B6	B7
		
B3R	V5	V6
		

BH - STANDARD		
B3	B6	B7
		
B3R	V5	V6
		

Closing plugs on all other holes.

	VENT PLUG
	LEVEL PLUG

14. SPARE PARTS TABLES

The spare parts tables of the products are available on Motovario website. 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

Motovario 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 Motovario 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 MOTOVARIO products on sale when it is issued. Motovario reserves the right to modify in the future the data of this manual without prior communication.

17. DECLARATION OF PARTLY COMPLETED MACHINERY INCORPORATION

MOTOVARIO S.p.A.
Sede operativa ed amm.va:
 Via Quattro Passi 1/3
 41043 Formigine (MO) Italia
 Tel. +39 059 579700
 Fax +39 059 579710
 info@motovario.it
 www.motovario.com



Logistica e spedizioni:
 Via Giardini 45
 41042 Ubersetto (MO) Italia
 Tel. +39 0536 843702
 Fax +39 0536 920672
 spedizioni@motovario.it

Declaration of partly completed machinery incorporation MOTOVARIO S.p.A

Via Quattro Passi 1/3, 41043 Formigine (MO) Italy

Hereby declares under its exclusive responsibility that in the design and manufacture of the following products:

geared motor units composed alternately by:

• **gear** unit series PBH –PBZ fitted alternately with:

• **MOTOVARIO or DRdrives motor** series: T-TS–TH-TP-TSX-THX-TPX-TB-TBS-TBX-TBP-TBSX-TBHX-TBPX-D-DB-S-HSE or **TECO motors** series: AESV3E-AESU3E-AERV-AEQV

• **motoinverter DRIVON** series: DV340

in any combination until the production order n°

Intended use: plants/equipments for civil or industrial use.

The following essential safety and health care requirements from enclosure I of the 2006/42/CE Directive, were applied and respected: 1.1.2, 1.1.3, 1.1.5, 1.2.6 (where electronic control systems are set), 1.3.1, 1.3.2, 1.3.4, 1.3.7, 1.3.8, 1.4.1, 1.4.2, 1.4.3, 1.5.1, 1.5.2, 1.5.4, 1.5.6, 1.5.7, 1.5.8, 1.5.9, 1.5.11 (only for compliance with the 2004/108/CE Directive below, where provided), 1.6.1, 1.6.4, 1.7.1, 1.7.2, 1.7.3, 1.7.4, 2.1.1

The partly completed machinery of the present declaration is forbidden from being started until the machine in which it will be incorporated or which will be assembled, has been declared in conformity with the 2006/42/CE Directive.