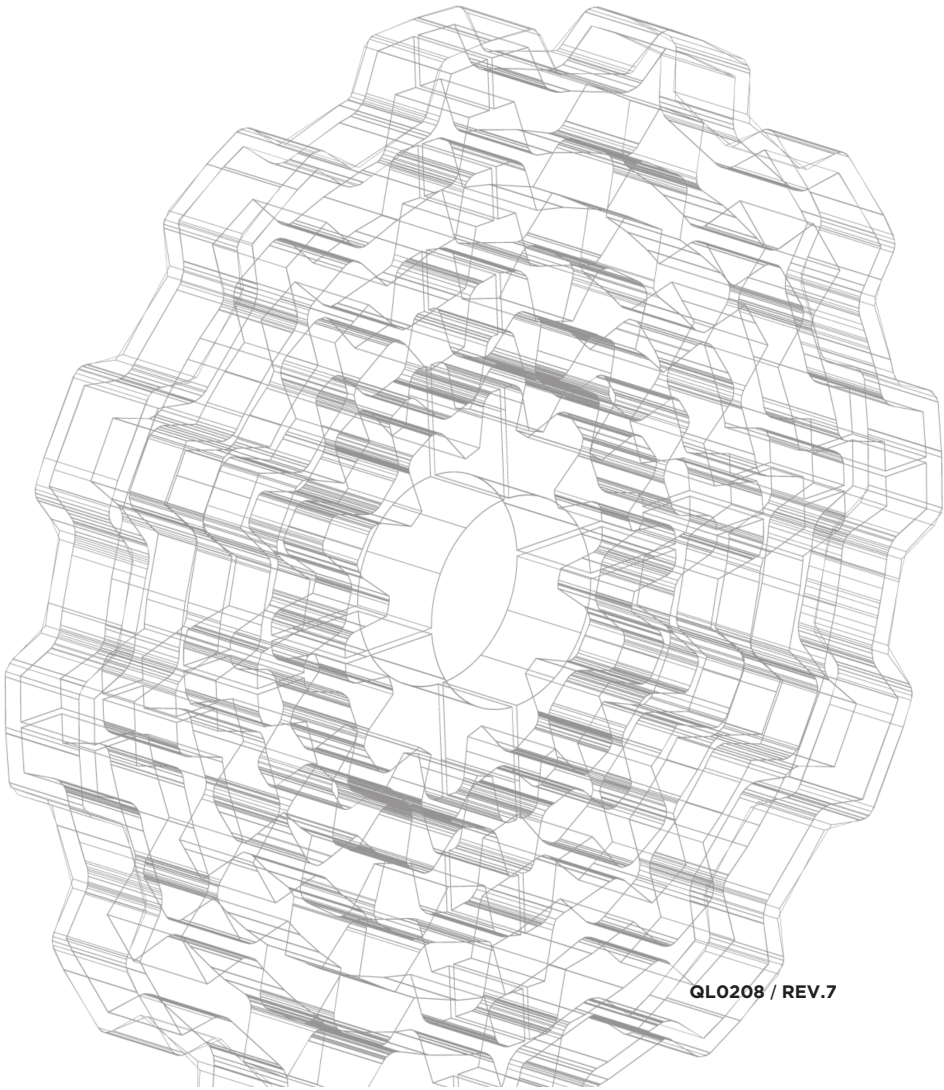


# Instructions for installation, use and maintenance

## Gear reducers and variators



## **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.

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## 1. INTENDED USE OF THE MANUAL

INSTALLATION, USE AND MAINTENANCE INSTRUCTIONS FOR MOTOVARIO-SPAGGIARI PRODUCTS:

STANDARD

ATEX



2G/2D  
3G/3D

GEAR REDUCERS, GEARMOTORS, VARIATORS, MOTOVARIATORS, VARIATOR-GEAR REDUCERS AND MOTOVARIATOR-GEAR REDUCERS SERIES H, B, S, NMRV, NMRX, SW, SWX, SWFX, R, TX, S, VH, SR

## 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

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



## 2.3 ATEX SYMBOLS



**ATEX 2014/34/EU DIRECTIVE REFERENCE**  
Requirements for equipment in conformity with ATEX 2014/34/EU.

## 2.4 PRODUCT IDENTIFICATION

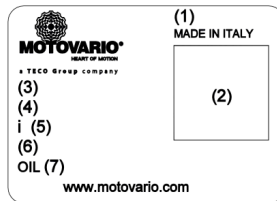
In order to identify the product, the unit bears a label of the following model. The nameplate must not be removed and must be kept intact and readable. In case you need a copy of it just contact MOTOVARIO TECHNICAL SERVICE.

### 2.4.1 Product identification

#### Gear reducer label

Information contained on the nameplate:

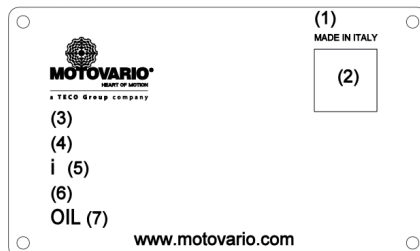
1. Mounters team.
2. QR CODE.
3. Serial number (Order number-Job order progressive number-Manufacturing year).
4. Unit abbreviation.
5. i: reduction ratio.
6. Mounting position.
7. Oil type



#### Heavy duty reducer label

Information contained on the nameplate:

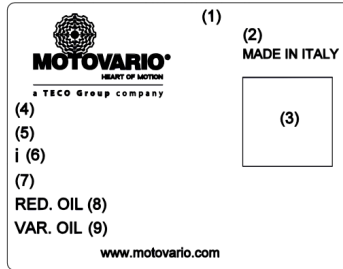
1. Mounters team
2. QR CODE
3. Serial number (Order number-Job order progressive number-Manufacturing year)
4. Symbol of the gear reducer/variator
5. i: reduction ratio
6. Operating position
7. Oil type



**S series variator label**

Information contained on the nameplate:

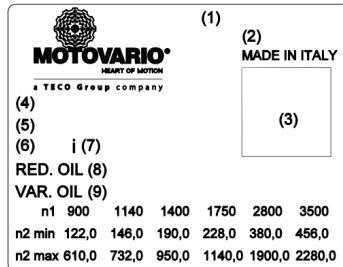
1. Pump (not present if not installed).
2. Mounters team.
3. QR CODE.
4. Serial number (Order number-Job order progressive number-Manufacturing year).
5. Unit abbreviation.
6. i: reduction ratio.
7. Mounting position.
8. Gear reducer oil type.
9. Variator oil type.



**TX series variator label**

Information contained on the nameplate:

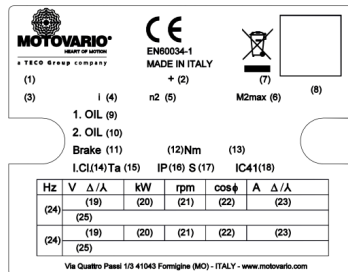
1. Special features (if any).
2. Mounters team.
3. QR CODE.
4. Serial number (Order number-Job order progressive number-Manufacturing year).
5. Unit abbreviation.
6. Mounting position.
7. i: reduction ratio.
8. Gear reducer oil type.
9. Variator oil type.



**Gearmotor nameplate (located on the motor)**

Information contained on the nameplate:

1. Gearmotor symbol.
2. Motor type identification symbol (series/size/no. of poles).
3. Mounting position.
4. i: reduction ratio.
5. n<sub>2</sub>: Number of output revolutions [rpm].
6. M<sub>2max</sub>: maximum transmissible torque [Nm].
7. Order number-Job order-Manufacturing year.
8. Mounters team.
- 9.OIL: gear reducer oil.
10. OIL: variator oil.
11. Brake type.
12. Nominal braking torque [Nm].
13. Brake supply voltage.
14. Insulation class.
15. Maximum ambient operating temperature.
16. Protection rating.
17. Duty.
18. Cooling method.
19. Motor voltage (depending on connection).
20. Nominal power output [kW].
21. Nominal speed [rpm].
22. Nominal power factor.
23. Nominal current (depending on connection) [A].
24. Supply frequency [Hz].
25. Code IE1, IE2 or IE3 (depending on the type of motor and whether applicable) followed by efficiency values at 4/4, 3/4 and 2/4 of nominal power (self-braking motors only).

**2.4.2 Product identification****ATEX gear reducer/variator label**

Information contained on the nameplate:

1. Mounters team.
2. QR CODE (if any).
3. Serial number (Order number-Job order progressive number-Manufacturing year).
4. Type: Unit abbreviation.
5. i: reduction ratio;
  - For variator-gear reducers it refers only to the gear reducer.
6. n<sub>2</sub>: Number of output revolutions [rpm];
  - For min./ max. rpm variator. If provided without motor, they refer to n<sub>1</sub>=1400 rpm.
7. Mounting position.
8. Presence of thermal protector = TP
9. P<sub>lmax</sub>: maximum input power [kW].
10. n<sub>1max</sub>: number of maximum input revolutions [rpm].
11. M<sub>2max</sub>: maximum transmissible torque [Nm].
12. Red. OIL: gear reducer oil.
13. Var. OIL: variator oil.
14. AteX identification field

- For area 1,2 II 2G Ex h IIB Tn Gb
- For area 21 II 2D Ex h IIIB Tc Db
- For area 2 II 3G Ex h IIB Tn Gc
- For area 22 II 3D Ex h IIIB Tc Dc

Tc: maximum surface temperature [°C]

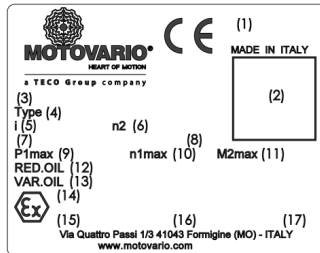
Tn: class of temperature: T4 or T3

15. Min./max. working place temperature [°C].

16. Tech. File: No. of technical file registration (only 2GD).

17. Special conditions of use.

The nameplate must not be removed and must be kept intact and readable. In case you need a copy of it just contact the Motovario technical service.




## 2.5 SERVICE

For any service request please contact the Motovario 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 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.

|   |  |
|---|--|
|  | <p>If used in accordance with the instructions enclosed the units in question can be used in the following environments:</p> <p><b>Group II</b><br/> <b>Category 2G and 2D</b><br/> <b>Zone 1/21 for gases and dusts (gas group IIB) with the following protection methods</b><br/> EN13463-5 (c) constructional safety<br/> EN13463-8 (k) liquid immersion</p> <p><b>Group II</b><br/> <b>Category 3G and 3D</b><br/> <b>Zone 2/22 for gases and dusts with the following protection methods</b><br/> EN13463-5 (c) constructional safety</p> <p>The units so classified are part of standard manufacture, and are marked to comply with the provisions of Directive ATEX 2014/34/EU.</p> |
|---|--|

#### 3.2 USE CONDITIONS AND LIMITS

|  |   |
|--|---|
| <br> | <p>Never:</p> <ul style="list-style-type: none"> <li>• Use outside of the ranges indicated on the nameplate;</li> <li>• Use the unit in an area classified (explosive atmosphere) as more dangerous than the level stated on the label;</li> <li>• Use the unit in an area with equipment class I (mines subject to risks arising from firedamp);</li> <li>• Connect the unit to sources of energy other than those quoted or with values other than those provided by the manufacturer;</li> <li>• Modify the mounting position or arrangement.</li> </ul> <p><b>Without authorization, the ATEX approval is void.</b></p> |
|--|---|

## 4. TECHNICAL INFORMATION

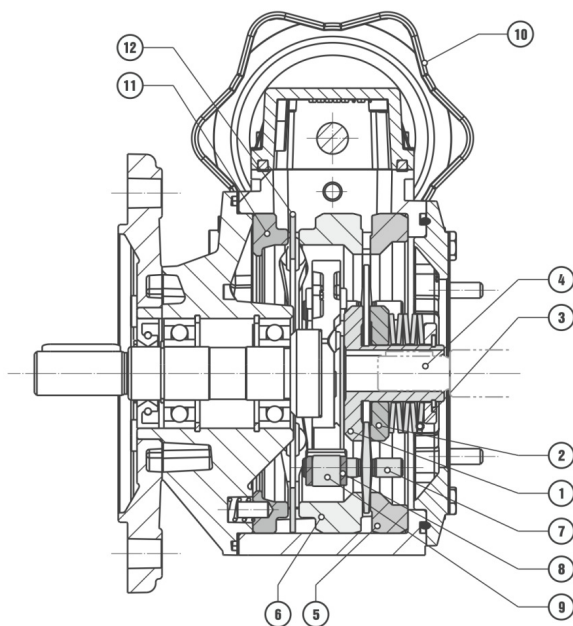
### 4.1 PRODUCT DESCRIPTION

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 VARIATOR

#### 4.2.1 Operation of the variator



| N° | Description         |
|----|---------------------|
| 1  | Fixed sun race      |
| 2  | Adjustable sun race |
| 3  | Belleville spring   |
| 4  | Shaft               |

| N° | Description                  |
|----|------------------------------|
| 5  | Fixed annulus race           |
| 6  | Adjustable annulus race      |
| 7  | Planet disk                  |
| 8  | Planet disk friction bearing |

| N° | Description       |
|----|-------------------|
| 9  | Planet carrier    |
| 10 | Control Handwheel |
| 11 | Cam ring          |
| 12 | Ball ring         |

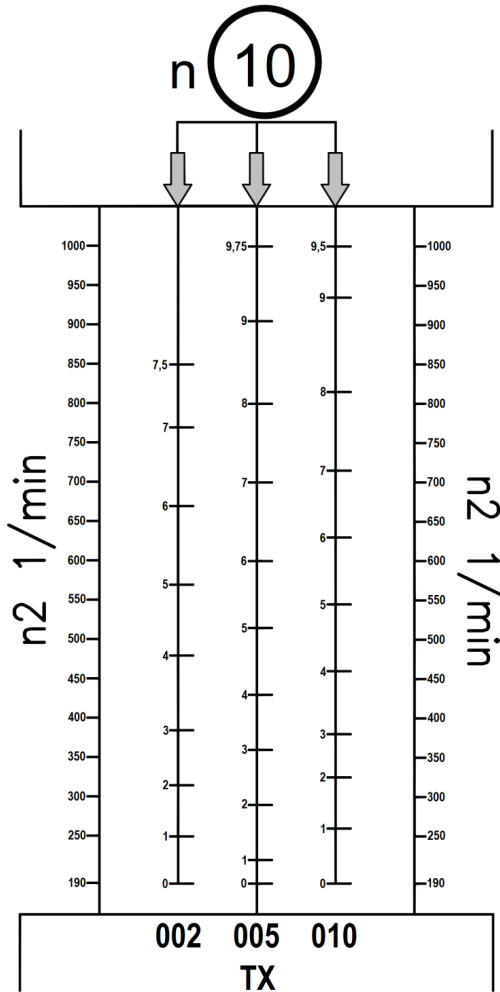
The motor variator is composed of two internal tracks (1 and 2) secured by Belleville washers (3) locked to the motor shaft (4), two external tracks (5 and 6) secured to the casing and a certain number of planets (7) mounted on bushes (8) which run radially on the planet carrier (9) which transmits the drive. The planets in contact with the internal tracks that drive them, and with the fixed external tracks, have a double motion: rotation around their own axes, and rotation around the external tracks which drives the planet carrier, itself mounted to the output shaft. The speed is changed by operating the handwheel (10), which moves track (6), supported on a ball bearing race (12), angularly on the counter track with cams

(11). This movement modifies the space between the tracks (5 and 6) and thus varies the radial displacement of the planets and hence the drive transmitted to the planet carrier.

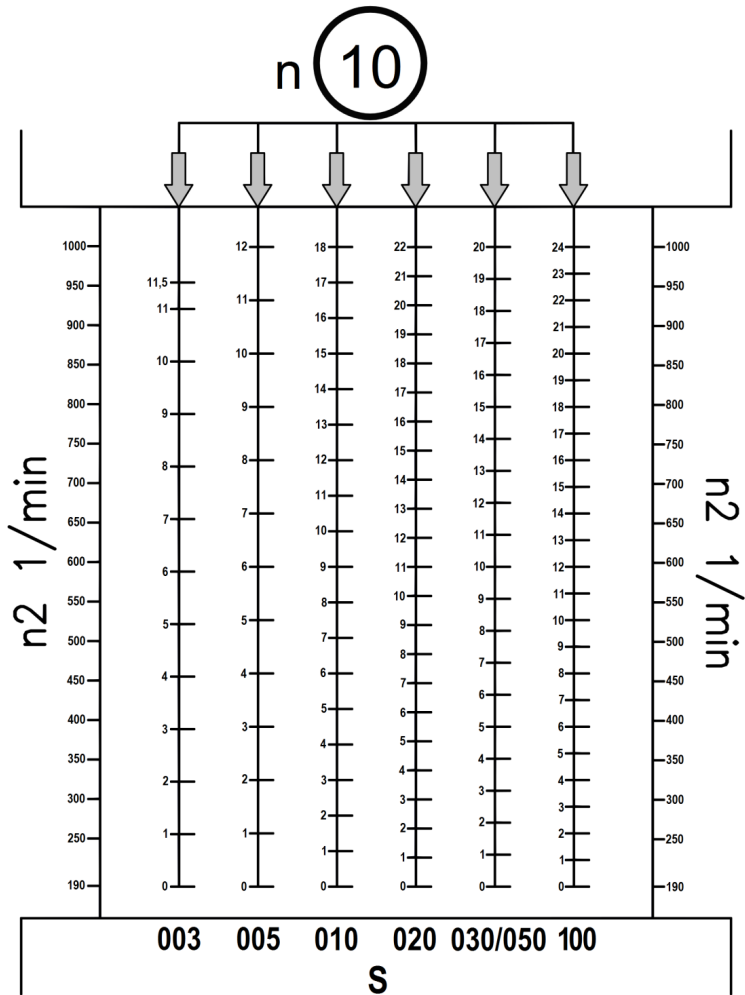
**N.B.: This adjustment may only be made with the unit running.**



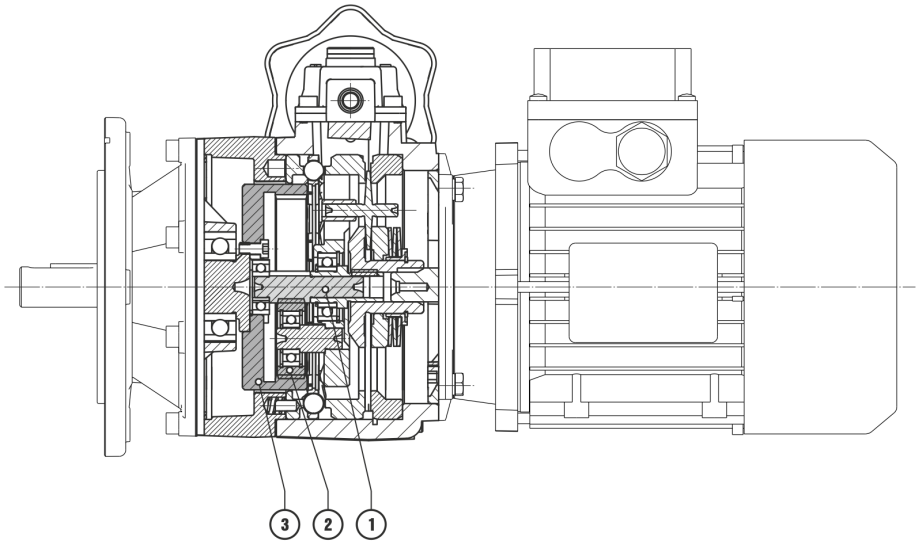
Comparison of control handwheel revolutions with TX series variator output revolutions:



Comparison of control handwheel revolutions with S series variator output revolutions:



#### 4.2.2 Differential



The motovariator can be supplied complete with planetary unit/differential which allows for variations of the output speed from zero to the maximum allowed speed. This is possible because the constant input speed is also transmitted to the drive pinion (1) of the planetary variator/gear reducer. The constant input speed is transformed into variable variator speed and retransmitted to the planets (2) of the planetary gear reducer/variator. This makes the speed of the planets (2) equal to that of the drive pinion (1); in these conditions the speed of the outer crown is zero and hence the output shaft rpm is zero.

### 4.3 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;
- 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 (recommended use of gear reducers/gearmotors NMRX, SWX);
- Mounting positions not provided by the catalogue;
- Use in a radioactive environment;
- Use in ambient with pressure other than the atmospheric one;
- Use of self-braking motors coupled to variators/variator- gear reducers;
- 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 MOTOVARIO 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 MOTOVARIO TECHNICAL SERVICE.

| H                         | A31 | A30 | A40 | A50 | A60 |
|---------------------------|-----|-----|-----|-----|-----|
| V5 - V1: 1500 < n1 < 3000 | ✓   | ✓   | ✓   | ✓   | ✓   |
| n1 > 3000                 | B   | B   | B   | B   | B   |
| V3 - V6                   | B   | B   | B   | B   | B   |

| H                         | 030 | 040 | 050 | 060 | 080 | 100 | 125 | 140 |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| 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   |

| HR                        | 041 | 051 | 061 | 081 | 101 | 121 |
|---------------------------|-----|-----|-----|-----|-----|-----|
| V5 - V1: 1500 < n1 < 3000 | ✓   | ✓   | ✓   | ✓   | ✓   | B   |
| n1 > 3000                 | B   | B   | B   | B   | B   | A   |
| V3 - V6                   | B   | B   | B   | B   | B   | B   |

|                      |                |            |                |            |            |                |            |                |            |            |
|----------------------|----------------|------------|----------------|------------|------------|----------------|------------|----------------|------------|------------|
| <b>B</b>             | <b>A40</b>     |            |                | <b>A50</b> |            |                | <b>A70</b> |                |            |            |
| 2000 < n1 < 3000     | ✓              |            |                | ✓          |            |                | ✓          |                |            |            |
| V6                   | B              |            |                | B          |            |                | B          |                |            |            |
| n1 > 3000            | B              |            |                | B          |            |                | B          |                |            |            |
| ...L : B6 - B7       | B              |            |                | B          |            |                | B          |                |            |            |
| <b>B</b>             | <b>060</b>     | <b>080</b> | <b>100</b>     | <b>125</b> | <b>140</b> | <b>150</b>     | <b>160</b> |                |            |            |
| 2000 < n1 < 3000     | ✓              | ✓          | ✓              | B          | B          | B              | B          | B              | B          |            |
| V6                   | B              | B          | B              | B          | B          | B              | B          | B              | B          |            |
| n1 > 3000            | B              | B          | B              | B          | A          | A              | A          | A              | A          |            |
| ...L : B6- B7        | B              | B          | B              | B          | B          | B              | B          | B              | B          |            |
| <b>S</b>             | <b>050</b>     | <b>060</b> | <b>080</b>     | <b>100</b> | <b>125</b> | <b>140</b>     | <b>150</b> |                |            |            |
| 2000 < n1 < 3000     | ✓              | ✓          | ✓              | ✓          | ✓          | B              | B          | B              | B          |            |
| V6                   | B              | B          | B              | B          | B          | B              | B          | B              | B          |            |
| n1 > 3000            | B              | B          | B              | B          | B          | A              | A          | A              | A          |            |
| ...L : V5 - V6       | B              | B          | B              | B          | B          | B              | B          | B              | B          |            |
| ...L                 | B              | B          | B              | B          | B          | B              | B          | B              | B          |            |
| <b>NMRV</b>          | <b>025</b>     | <b>030</b> | <b>040</b>     | <b>050</b> | <b>063</b> | <b>075</b>     | <b>090</b> | <b>110</b>     | <b>130</b> | <b>150</b> |
| V5: 1500 < n1 < 3000 | ✓              | ✓          | ✓              | ✓          | B          | B              | B          | B              | B          | B          |
| n1 > 3000            | B              | B          | B              | B          | B          | A              | A          | A              | A          | A          |
| V6                   | B              | B          | B              | B          | B          | B              | B          | B              | B          | B          |
| <b>NMRX</b>          | <b>040</b>     |            | <b>050</b>     |            | <b>063</b> |                | <b>075</b> |                | <b>090</b> |            |
| V5: 1500 < n1 < 3000 | ✓              |            | ✓              |            | B          |                | B          |                | B          |            |
| n1 > 3000            | B              |            | B              |            | B          |                | B          |                | B          |            |
| V6                   | B              |            | B              |            | B          |                | B          |                | B          |            |
| <b>NMRV-P</b>        | <b>063</b>     |            |                | <b>075</b> |            |                | <b>090</b> |                | <b>110</b> |            |
| V5: 1500 < n1 < 3000 | B              |            |                | B          |            |                | B          |                | B          |            |
| n1 > 3000            | B              |            |                | B          |            |                | A          |                | A          |            |
| V6                   | B              |            |                | B          |            |                | B          |                | B          |            |
| <b>HW+NMRV-P</b>     | <b>030+063</b> |            | <b>030+075</b> |            |            | <b>040+090</b> |            | <b>040+110</b> |            |            |
| 1500 < n1 < 3000     | B              |            | B              |            |            | B              |            | B              |            |            |
| n1 > 3000            | A              |            | A              |            |            | A              |            | A              |            |            |
| V5 - V6              | B              |            | B              |            |            | B              |            | B              |            |            |
| <b>SW-SWX-SWFX</b>   | <b>030</b>     | <b>040</b> | <b>050</b>     | <b>063</b> | <b>075</b> | <b>090</b>     | <b>105</b> |                |            |            |
| V5: 1500 < n1 < 3000 | ✓              | ✓          | ✓              | ✓          | B          | B              | B          | B              | B          |            |
| n1 > 3000            | B              | B          | B              | B          | A          | A              | A          | A              | A          |            |
| V6                   | B              | B          | B              | B          | B          | B              | B          | B              | B          |            |
| <b>TXF - SF</b>      | <b>002-003</b> |            | <b>005</b>     | <b>010</b> | <b>020</b> | <b>030</b>     | <b>050</b> | <b>100</b>     |            |            |
| 2000 < n1 < 3000     | ✓              |            | ✓              | ✓          | B          | A              | A          | A              | A          |            |
| n1 > 3000            | B              |            | B              | B          | A          | A              | A          | A              | A          |            |
| V3 - V6              | B              |            | B              | B          | B          | B              | B          | B              | B          |            |
| <b>R</b>             | <b>040</b>     |            | <b>050</b>     | <b>063</b> | <b>080</b> | <b>100</b>     | <b>125</b> |                |            |            |
| 1500 < n1 < 3000     | ✓              |            | ✓              | ✓          | B          | B              | B          | B              | B          |            |
| n1 > 3000            | A              |            | A              | A          | A          | A              | A          | A              | A          |            |
| V3 - V6              | B              |            | B              | B          | 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 Motovario. Improper use poses 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 Motovario spare parts. Use only oils and greases recommended by Motovario. 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.



**In environments with potentially explosive atmospheres, only ATEX units are allowed, after verifying their certification limits.**

**In case of non-ATEX units, or ATEX units with certification non-compliant with environmental conditions, it is compulsory to disconnect the unit power supply.**

**Adopt all the necessary environmental safety measures.**

## 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 Motovario 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 B-series reducer, hole on the S-series reducer, solid shaft threaded hole on the H, R series reducer and variators, foot holes for NMRV-series reducer). For handling of the SW series gear reducer use the belts, securing it in the pam connection area. The SWX-SWFX series gearmotors must be handled by securing the gearmotor with belts in the pam connection area and motor eyelet (for motors from 100 to 132). 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.



During storage, the units must:  
Have the unpainted and machined surfaces protected with oil: the ATEX certification would no longer be valid in case of surface oxidation.  
Once storage operations are completed, units must be cleaned from any residues of dust, rust or other impurities.



## 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 Motovario. Changes in angle or inclination with respect to the horizontal are allowed by  $\pm 5^\circ$ .

### 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;
- Do not install the unit in direct contact with food products in bulk. Occasional contact with foodstuff is allowed only with series SWFX gearmotors;
- 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 Motovario, 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 MOTOVARIO 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 addition for variators:

- The change in revolutions, using the appropriate command, must be executed solely when the unit is running;
- There must be an oil seal in the coupling area between the variator and the motor.

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 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]<br>+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 |



## Additional procedures for ATEX units:

- Check all nameplate data to ensure they are consistent with the application: unit, category, area, maximum surface temperature, P1, n1 and M2 maximum limits, mounting position, ambient temperature;
- Check for the absence of solar radiation or other heat sources;
- In case of expected ambient temperatures  $<-20^{\circ}\text{C}$  or  $>40^{\circ}\text{C}$  contact in advance MOTOVARIO TECHNICAL SERVICE;
- Check there are no fumes or abrasive and/or corrosive dust;
- Make sure not to be in close proximity to sources of ultrasound and/or ionizing radiation;
- Check that the facility has adequate protection against lightning;
- Check for any leakage of lubricant (if detected, stop the installation and consult MOTOVARIO TECHNICAL SERVICE);
- Eliminate any traces of dirt from the shafts and from the areas around the sealing rings, using materials that do not generate electrostatic charges;
- Check that the environment has been cleared from the presence of a potentially explosive atmosphere, and that such condition is maintained for the whole duration of the installation;
- Check that the components connected to the unit both on input and output side are ATEX approved;
- Use the torque arms that can be supplied;
- Ensure proper cooling of the motor through a suitable air flow from the fan side; check that there are no obstructions or covers preventing the cooling of the unit;
- Check that the warning light (or dipstick) for oil level check can be easily reached;
- Install the unit and connect any sensor thermal protection- to be supplied separately and when provided for - to adequate activation system. Specific instructions are given in the Annex to the manual.
-  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. Apply the adhesive label, coming with the unit, in the installation area of the earthing.

## 8. SPECIFIC ASSEMBLING

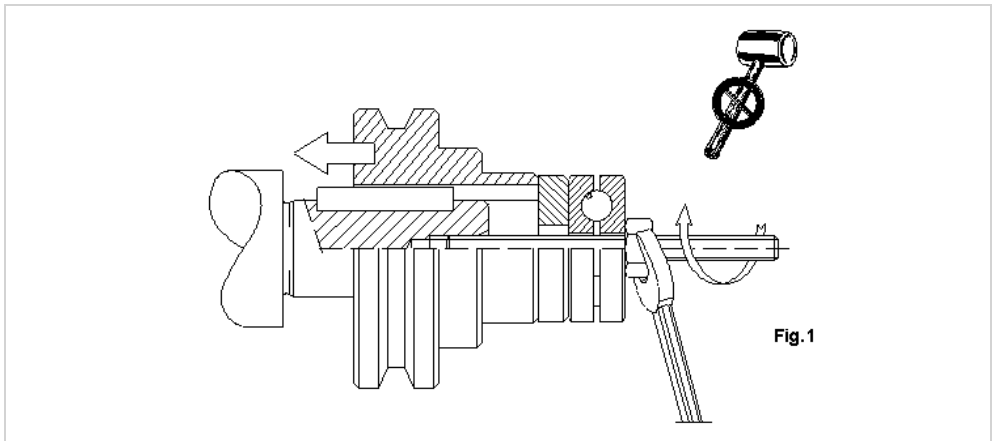
### 8.1 OUTPUT SHAFT CONNECTIONS


#### 8.1.1 Solid shaft

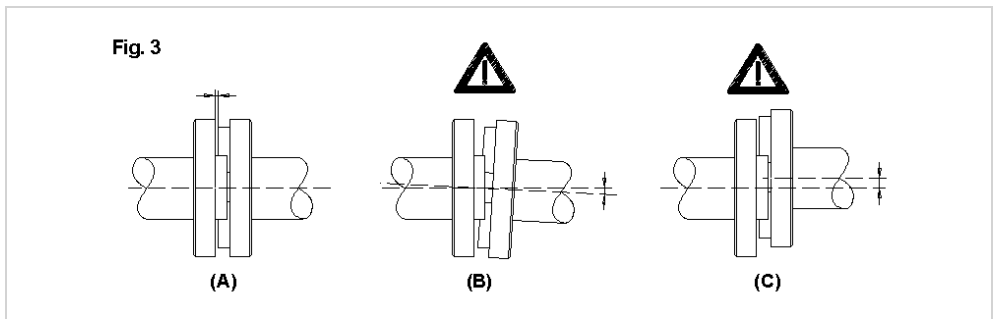
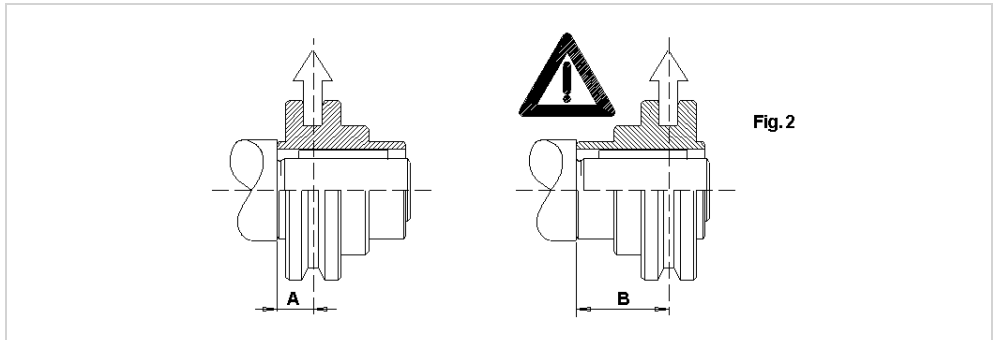
See the information supplied by the following figures 1-2-3.

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

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



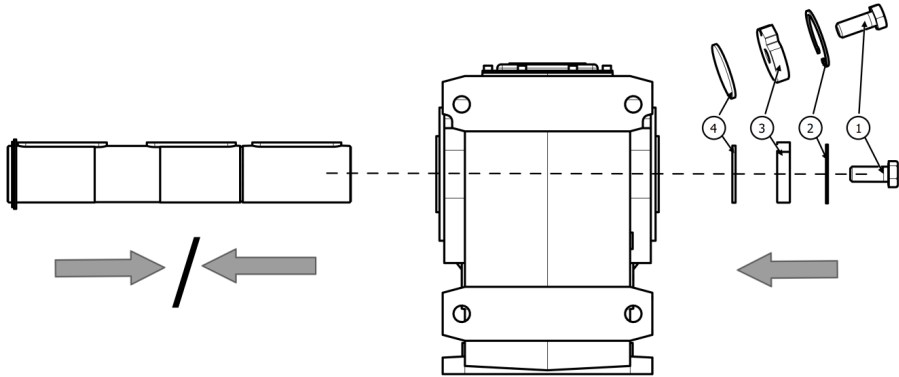
- Fig. 2, 3: Examples of correct and incorrect installation (  ) on the output shaft of the gear reducer.



### 8.1.2 Hollow shaft with key series B, S

B and S series gear reducers (except sizes S140 and S150) may be supplied with an optional Motovario installation/removal kit for the driven shaft. Upon request the supply includes:

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

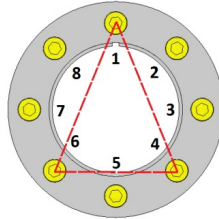


|  |  |
|--|--|
|  | <p><b>Assembly</b><br/>Install the safety ring (2), insert the lug nut/washer(3), tighten the fixing screw (1) of the Motovario installation kit on the shaft end of the driven machine</p>  |
|  | <p><b>Removal</b><br/>Fit the thrust disk (4) and lug nut/washer (3) from the Motovario 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.</p> |

### 8.1.3 Mounting with shrink disc series B, S

Only standard groups and ATEX 3G/3D. Gear reducers may be fitted with a shrink disc to lock the hollow shaft on the driven shaft. 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 (h7);
- 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 below, with continuous sequence (not crossed) making  $\frac{1}{4}$  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.

|  | MT 12.9 (Nm) |
|--|--------------|
| BA40-50-70<br>B063-083-103<br>S050-060-080-100 | 15           |
| B123 - S125                                    | 40           |
| B143   | 50           |
| B153-163<br>S140                               | 70           |
| S150   | 103          |

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  $\frac{1}{2}$  a turn at a time, with continuous sequence (not crossed), until the locking unit can be moved on the hollow shaft. Remove the customer's shaft or gear reducer.

**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!**

## 8.2 INPUT SHAFT CONNECTIONS

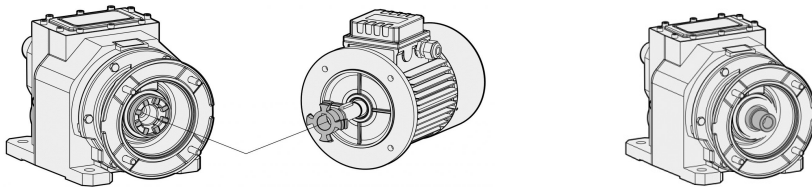
### 8.2.1 Motor mounting flanges

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 Motovario on request) on the motor flange **(or spread a layer of sealant)** and proceed to the mechanical connection to the gear reducer.

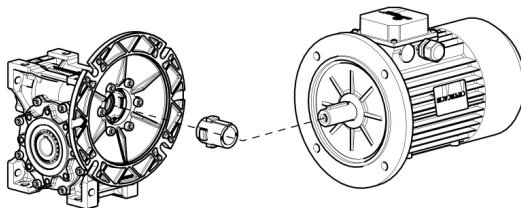
#### For input version with elastic coupling

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.



#### For version with input bushing (NMRV-P)

Before the mechanical connection to the gear reducer, proceed checking the mounting of the bushing (see figure) on the shaft of the electric motor, that must take place without applying excessive force, to avoid damaging the motor bearings. Otherwise check the correct position and the tolerance of the motor key. Then reassemble the bushing on the gear reducer, timing the teeth of the bushing with those of the screw. Then mechanically connect the motor to the gear reducer. Check the direction of rotation of the output shaft of the unit before installing the unit on the machine.

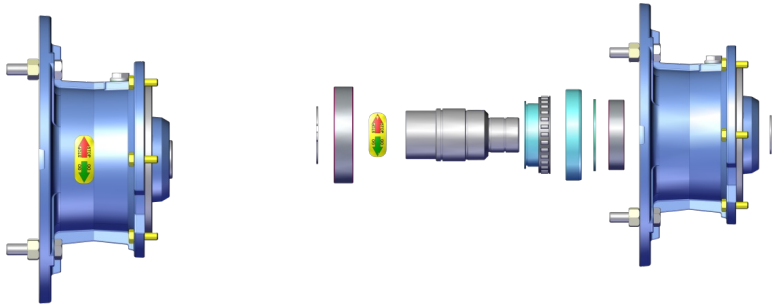








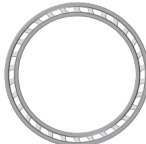



### 8.3 ACCESSORIES

#### 8.3.1 Backstop device (H, B, S)

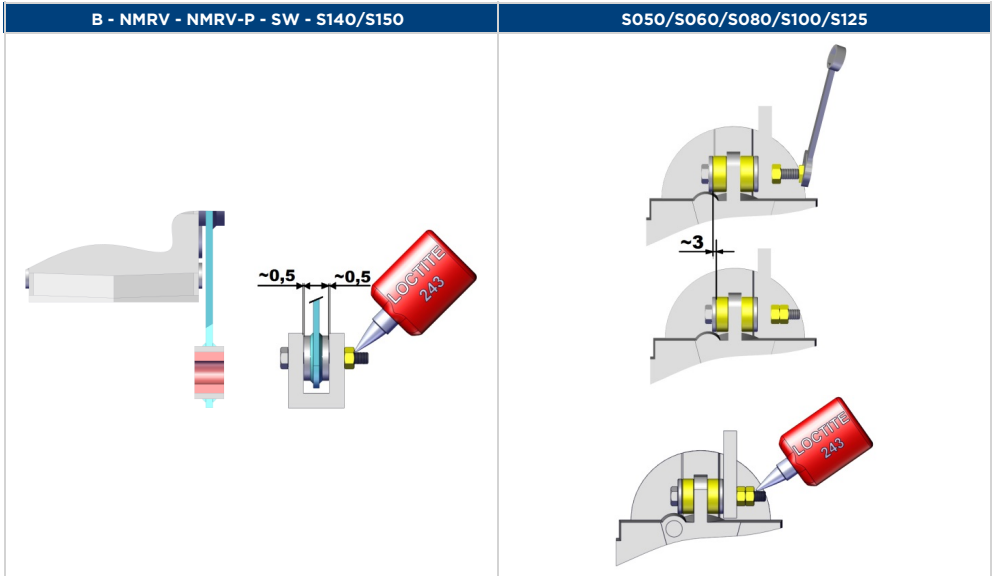
Only standard groups and ATEX 3G/3D. The gear reducer may be supplied with a backstop device on the fast axis. The backstop device allows the rotation of the shafts in one direction only; depending on the size is available in the PAM flange or in the motor, without additional space (with the exception of the PAM configurations for H/B/S configurations, flange type PAM 100/112). In the S series the device is not available for sizes S140-150. 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 (B, S, NMRV, NMRV-P, SW)

The B, NMRV, NMRV-P, SW, S140-150 series gear reducers can be equipped with anti-vibration torque arm; the S-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 B, NMRV, NMRV-P, SW series gear reducers, with anchor to support on both sides) or moderate (for S series gear reducers). Check the absence of abnormal vibrations, during the start-up, on both the unit and the support structure.



### 8.3.3 Reinforced seals

H-B-S-NMRX-SWX-SWFX 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 060 to 140 (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.

### 8.3.4 Torque limiter

The torque limiter is a mechanical device designed to protect the transmission from movement caused by accidental overloads or irregularities. It is applied to the output of the worm gear reducers and it works as an internal friction applied on the output shaft, which can be adjusted manually through an external locking ring nut. Compared to electronic or external mechanical devices, this solution presents the following advantages:

- Limited additional dimensions compared to the version without the torque limiter;
- Hollow output shaft without changes in terms of diameter compared to the standard version;
- Quick action directly on the transmission that must be protected;
- It has been designed for oil-bath operation, therefore wear-free and reliable;
- Manual adjustment of the slip torque;
- Over the slip torque, the torque limiter is still "on hold", ensuring the automatic machine restart without external intervention;
- Using the torque limiter, it 's possible also to rotate the gearbox shaft by loosening the external locking ring nut, for example in case of mechanical locks due to worm irreversibility.

**The torque limiter device must to be installed as a protection system for accidental events and not as protection of wrong gearbox selection** (for example after selecting a gearbox with a low service factor compared with the real needs of the application).

The torque limiter is available for worm gear reducers type NMRL050 / NMRL-P063-075-090 / SWL040-050-063-075-090 and it is applicable in all combined unit configurations provided in the catalogue, usually on the last gearbox. The torque limiter is supplied on the gearbox output shaft in J or K position.



**For safety reasons its use is highly discouraged in lifting mechanisms since, if due to overloads or anomalies the output shaft and the crown wheel slip, the weight might not be sustained.**

### Slip torque setting

A slip torque setting is easily adjustable from the outside through the rotation of the locking ring nut, characterized by 4 marks to define the number of turns (each mark is equivalent to  $\frac{1}{4}$  of a turn). The device is preliminary set during the assembly phase. The following factors may affect the setting: temperature and period of adjustment. It is therefore recommended, during the installation, to actually verify the slip torque limit, in accordance to the real needs of the application.

**The standard direction of rotation for the registration of the ring nut is clockwise. Looking frontally from the ring nut side, the torque limiter is in J position when the motor position is on the right side; with the motor on left side the torque limiter is in K position.**

The torque limiter is available for worm gearbox type NMRL050, SWL040, SWL050, SWL063, SWL075, SWL090 in J position only.

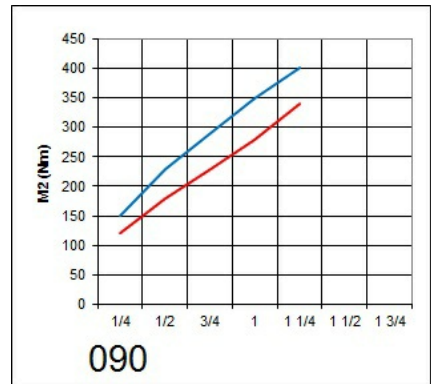
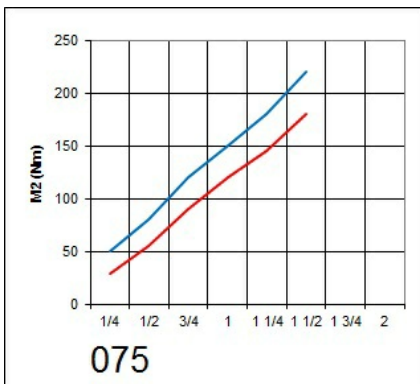
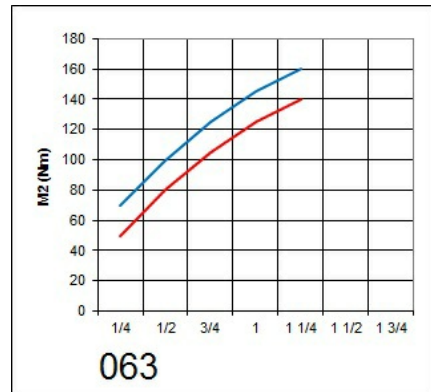
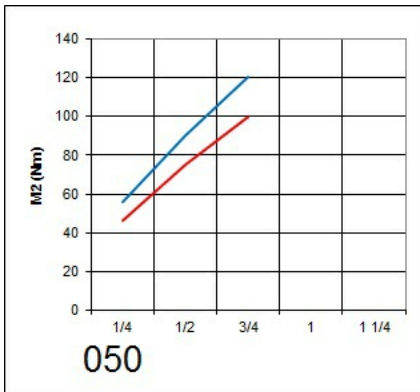
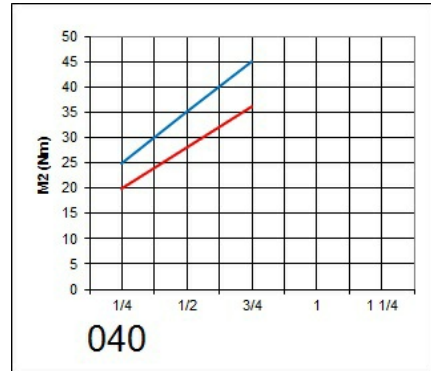
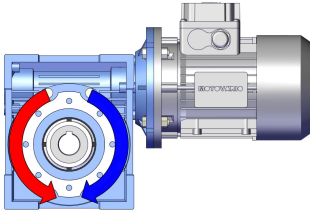
*It's recommended for long stops, even if the machine restarts automatically, to return the ring nut to its original position and to set it again.*

As previously mentioned, for each reducers size (040-050-063-075-090) the slip torque range depends by the ratio and the direction of rotation of the gearbox, which affects the tolerances between the two conical components that generate the slip (there is an axial component which tends to approach or move their away). Therefore in the setting diagrams are shown two lines which represent the approximate limits within the provided slip torque could change. The slip torque setting must be always checked afterward to determine if the number of turns of the ring nut guarantees the desired slip torque value.

|            | Ring nut rotation |
|------------|-------------------|
| <b>040</b> | 1/2 (turn)        |
| <b>050</b> | 1/2 (turn)        |
| <b>063</b> | 3/4 (turn)        |
| <b>075</b> | 1 (turn)          |
| <b>090</b> | 1 (turn)          |

**Adjustment graphs**

**IMP:** the values (1/4, 1/2, 3/4, 1, 1 1/4 ...) correspond to the center of the column.



### 8.4 VARIATOR ACCESSORIES

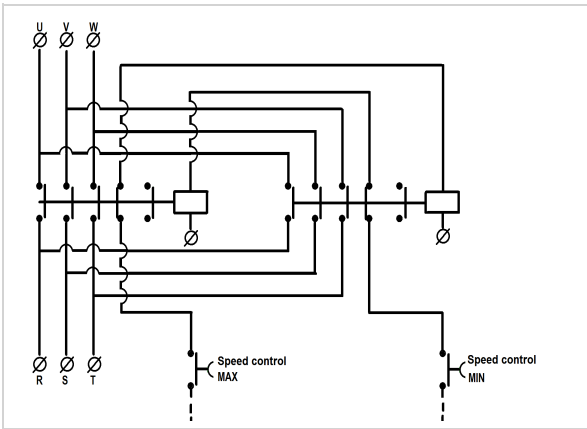
In order to know exactly the number of revolutions of the variator, it is possible to fit directly on the variator casing (or on the differential casing) a NAMUR-compliant inductive sensor -1mm distant from a crown wheel (9 or 18 teeth).

For reading the number of revolutions it is possible to use a digital tachometer, connected to the probe that reads on the wheel (9/18 teeth) the speed of the motovariator (both powered by voltage in direct or alternating current 24V/110V/220V; for the calibration refer to the relevant instructions in the box).

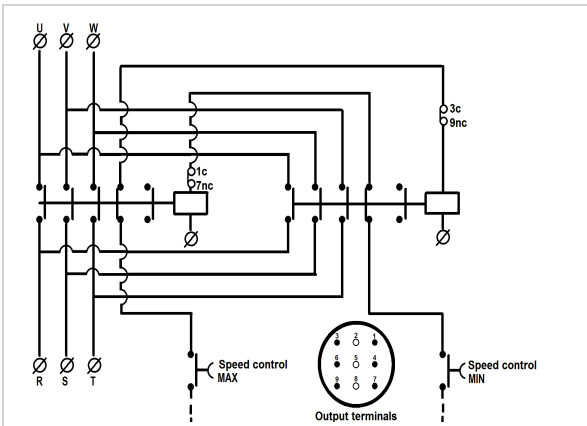
Instead the gravitational indicator is enclosed (installed by the customer) and it is used for showing the variator adjusting position.

If the handwheel is in position 1, the gravitational indicator reading scale is counter-clockwise, in position 2 it is clockwise. For the calibration bring the two hands to position "0".

Three-phase connection diagram of variator electrical servo-control



Three-phase connection diagram of variator electrical limit switch



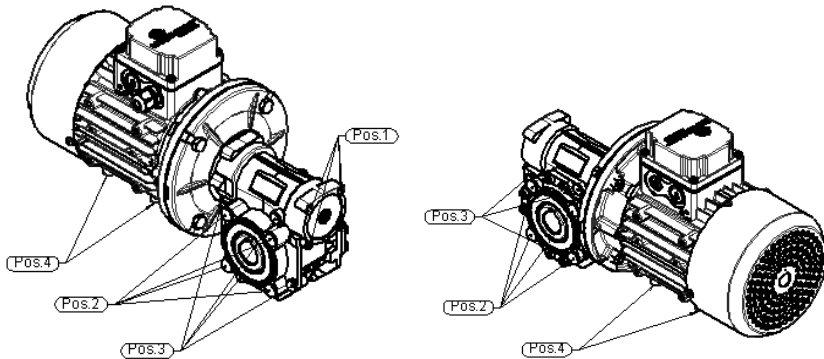
## 8.5 UNITS FOR DIFFICULT ENVIRONMENTS AND FOOD INDUSTRY

In the event of accidental damage to the paint, restore it as soon as possible by using the repair kit available on request.

Close unused mounting holes with the provided plugs as shown in the enclosed diagram.

- The screw shaft hole plugs pos. 1 must always be installed.
- The output flange hole plugs pos. 2 must be installed in relation to which accessories are installed.
- The mounting foot hole plugs pos. 3 must be installed if the mounting feet are not installed.
- The feet hole plugs pos. 4 must always be installed.
- The screw shaft hole plugs pos. 5 must always be installed.
- The output axis hole plugs pos. 6 must always be installed.

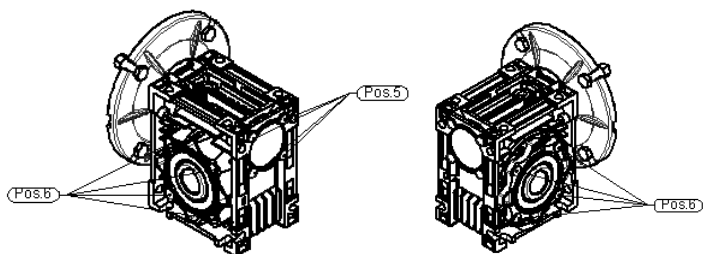
### SWX - SWFX



| SWX - SWFX | Pos.1 |    | Pos.2 |    | Pos.3 |    |
|------------|-------|----|-------|----|-------|----|
|            | Ø     | N° | Ø     | N° | Ø     | N° |
| 030        | 4,7   | 4  | 5     | 8  | -     | no |
| 040        | 4,7   | 4  | 5     | 8  | 5     | 8  |
| 050        | 6     | 4  | 7     | 8  | 5     | 8  |
| 063        | 6     | 4  | 7     | 16 | 7     | 8  |
| 075        | 6     | 4  | 7     | 16 | 7     | 8  |
| 090        | 6     | 4  | 8,8   | 16 | 8,8   | 8  |
| 105        | 6     | 4  | 9,3   | 16 | 7,3   | 16 |

| Mot. | Pos.4 |    |
|------|-------|----|
|      | Ø     | N° |
| 63   | 6     | 4  |
| 71   | 6     | 4  |
| 80   | 6     | 4  |
| 90   | 8     | 4  |
| 100  | 8     | 4  |
| 112  | 8     | 4  |

## NMRX



| NMRX | Pos.5 |    | Pos.6 |    |
|------|-------|----|-------|----|
|      | Ø     | N° | Ø     | N° |
| 40   | 6     | 3  | 5     | 8  |
| 50   | 6     | 4  | 7     | 8  |
| 63   | 8     | 4  | 7     | 16 |
| 75   | 8     | 4  | 7     | 16 |
| 90   | 8     | 4  | 8,8   | 16 |



## 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 and EN50014;
- The voltage corresponds to the expected one;
- The facility complies with all applicable standards on safety and health of people at the workplace;

Moreover:

- Remove all the installed safety devices used for handling;
- Fill up with the quantity and type of oil indicated on the proper label on the gear reducer. Fill in the label. If topping up is necessary, use the same brand and type of lubricant as the one already used. Use Motovario approved lubricants (see table). Check for correct amount of oil through the appropriate level indicator, or dipstick, if any. 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 that the vent cap is free from obstructions;
- The start-up should be done in a gradual manner, avoiding the immediate application of the maximum load the machine can withstand, in order to check for the absence of operating failures or residual application criticality;
- During start-up, to allow the oil to spread and reach optimum temperature and therefore viscosity, it is advisable to make the unit run with no load for some minutes;
- Check that all the installed devices and accessories are working properly during operation;
- For the variator/variator-gear reducer the change in revolutions, using the appropriate command, must be done when the unit is running;
- During the first hour of operation check for any anomalous vibration and noises or overheating. If necessary stop immediately the motor and contact the MOTOVARIO TECHNICAL SERVICE. After stopping the motor, wait 30' before disassembly.




**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 B, S, NMRV and SW series gear reducers the units can be fitted with protective covers if so required.




**Additional procedures for ATEX units:**

- Check the level of external cleaning of the units, especially in the areas most affected by cooling;
- Check for leaks of lubricant, especially in areas of the sealing rings;
- To clean, use materials that do not generate electrostatic discharges.
- Check for correct amount of oil through the appropriate level indicator, or dipstick, if any. Should it be necessary to top up with lubricant follow the instructions on section 9. LUBRICATION;
- In case of any abnormal noise and vibration, or high overheating, immediately stop the motor and contact MOTOVARIO TECHNICAL SERVICE.
- It is recommended to run in the unit at reduced load (approx. max. 40% of nominal load) for 24 hours. In the running-in phase the unit is subject, for a short time, to condition of internal friction, and therefore to temperatures than the usual ones, but still compatible with the specified limits. It is normal during this phase to detect a small release of grease from the oil seals.

**PLEASE NOTE:** In the event of prolonged storage at low temperature it is necessary to bring the oil to the normal fluidity with a gradual dry start. Only after bringing the surface of the unit to at least 10°C, proceed, necessarily, to the above-mentioned running-in phase.

- After about 3 hours of operation at full load, it is necessary to measure the surface temperature as indicated in section SURFACE TEMPERATURE. In the event that the rating value is exceeded, immediately shut off the motor and contact MOTOVARIO TECHNICAL SERVICE.

In case of need, after stopping the motor, wait 30' before removal.




**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.

**Measuring the surface temperature:**

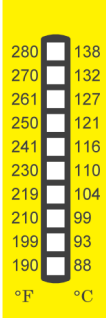

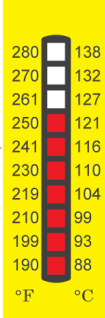
- During start-up it is important to measure the surface temperature of the unit under the conditions provided by the application. The detection is to be repeated periodically as shown in table CHECKS AND MAINTENANCE.
- The surface temperature must be measured in the vicinity of the input shaft (for 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):

$$Ts + (T_{am} - T_a) < T_c - 10 \text{ °C}$$

In the case of unsuitable temperature stop the unit and contact MOTOVARIO TECHNICAL SERVICE.



**Using adhesive thermo-sensitive detectors (if any):**  
The surface temperature can also be detected through the use of adhesive indicators. These can be provided for special units or upon request.

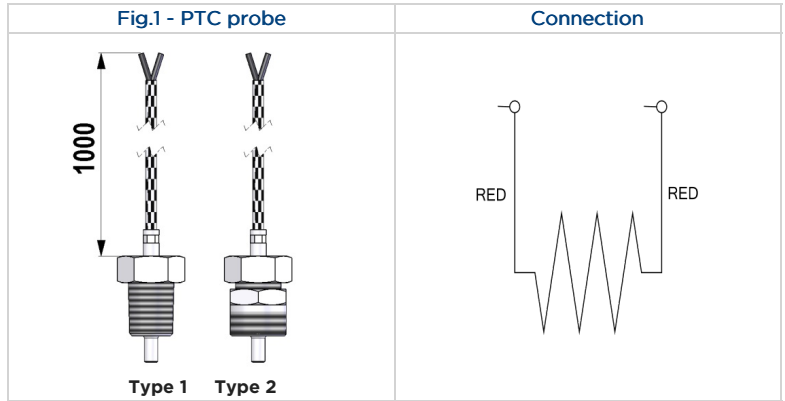






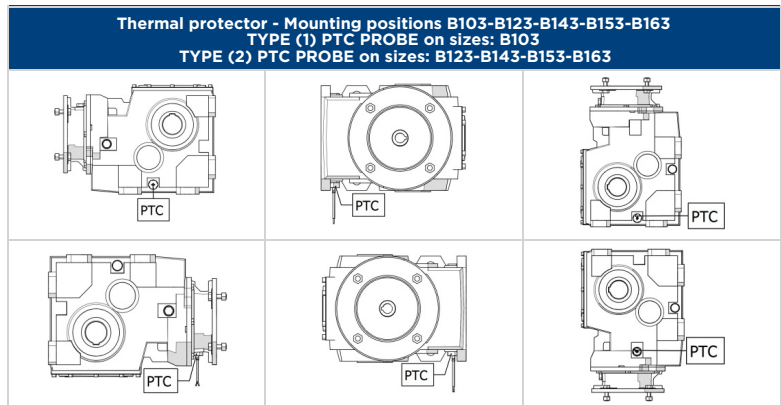
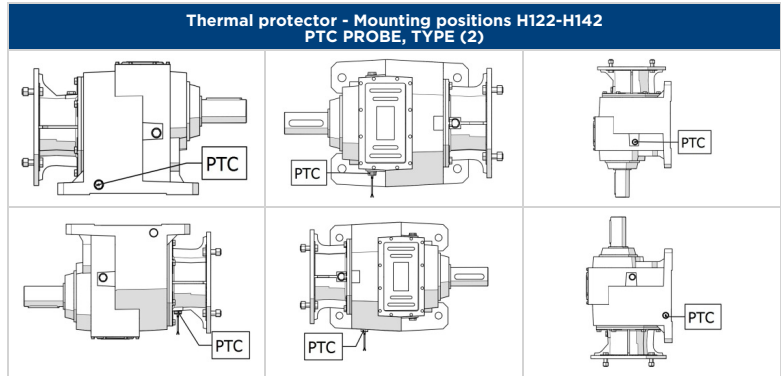
**Thermal protector**

The reducers of the sizes and ratios in the tables below are provided with a thermal protector (supplied as a standard, must be installed by the customer). It is a PTC probe (see Fig. 1) with a trigger temperature of 120 °C. The customer shall perform the electric connection to the main electric panel to ensure the its correct operation regardless of the connections necessary for the system operation. The connection must apply the positive safety logic. Main powerboard, connections and logic must, taken together, provide a locking system to prevent, in the event of a shutdown, the unwanted start-up of the device. In case of intervention of the PTC probe, wait about 10 min. before resetting the main powerboard.  
For assembly, refer to "RESISTOR ASSEMBLY INSTRUCTIONS" in (QL0253).

Unit electric characteristics:  
 Power to sensor <280 mW  
 Voltage to sensor <30 Vdc  
 Current to sensor <8 mA



When supplied in the kit, replace the closing plug with the PTC probe in the position highlighted in the relevant drawings.



## 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 Motovario. 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:

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

### 10.1.2 Replacement procedure of external sealing rings

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;

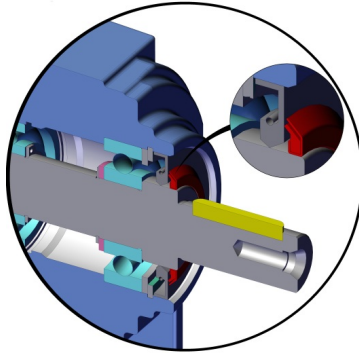
Before assembly, the new ring should be greased on the lip (also in the space between the two sealing lips in case of TC double lip ring); this lip must slide always on a protection if on the shaft there are slots for keys and/or grooves for elastic rings (e.g., spinner, ...); the grease used must be clean and free of dust, shavings and other impurities, the recommended grease to be used is **AGIP-MU EP 2** (for sealing rings with double lip in **FPM** use the special grease **TECNOLUBE BC 101**);

- Be careful not to match the position of the lip in the same position of the seal lip just removed;
- Never insert any kind of lubricant in the outer area of the oil seal as it would facilitate its release, and make sure that the housing is clean and free of grease.

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 ATEX - CERTIFIED PRODUCTS

### 10.2.1 Atex certified products



Frequency, type of checks and related operations are shown in Table MAINTENANCE CHECKS AND OPERATIONS. Observing them is essential to maintain the ATEX certification. All operations involving replacement of components must be reported in the "GEAR REDUCER MAINTENANCE SHEET" (enclosed with the gear reducer), filling in all the fields provided.

Observe the following precautions:

- Do not remove the closing cover for any reason;
- **All operations involving the removal of covers and/or flanges should be made by experts from the Motovario Technical Centres authorised to Atex maintenance;**
- Always use official Motovario spare parts. For the request of the components, follow the instructions given in the spare parts section of the specific unit.
- In case you need to replace the oil seals be sure to replace only those externally accessible without removing covers and/or flanges. For other oil seals, contact a Motovario Technical Service centre authorised for ATEX maintenance.



## 10.2.2 Checks and maintenance table

| a) CHECKS   |  |   |   |
|---|--|---|---|
| Frequency (hours of operation / installation time)                      | Object   | Check   | Possible intervention   |
| A responsibility of the user, depending on the environmental conditions | Whole unit   | Thickness of deposits of dust < 2 mm  | Eliminating the dust  |
|   | Vent cap   | Obstruction due to the presence of dust. For the positions of the caps please refer to the mounting positions.                        | Release the vent  |
| 1 week  | Whole unit   | Noise and/or mechanical vibration   | Change the oil (if not lubricated "for life"), and if the problem persists, stop immediately the unit for general overhaul (5)  |
|   | Unit surface   | Protection status (painting/treatment)  | Restore the missing or damaged protection   |
| 1 month   | Adhesive thermal sensors (if any) (2)  | Surface temperature (colour of the adhesive)  | If excessive, compared to what is stated on the label, change the oil (products non-lubricated "for life"), and apply a new sensor. If the problem persists, immediately stop the unit for general overhaul (5) |
|   | Oil level (products not permanently lubricated)  | Level: use the appropriate indicator or dipstick/measuring rod. For the positions of the caps please refer to the mounting positions. | Topping up the oil.   |
|   | Oil level cap indicator (if any)   | Functions   | Replacement   |
| 1,000 hours / 3 months  | Unit surface   | Operating temperature. For value and check position see 11 SURFACE TEMPERATURE  | If excessive, compared to what is stated on the label, change the oil (if non-lubricated "for life"). If the problem persists, immediately stop the unit for general overhaul (5)                               |
|   | Sealing rings and caps externally accessible   | Oil leaks and ageing  | Replacement (see "12.2 Procedure for the replacement of external oil sealing rings")  |
|   | Sealing rings not externally accessible, seals   | Oil leaks   | Replace seals and gaskets (1)   |
|   | Torque arms (polymer bushings)   | Ageing / cracking   | Replace the bushings  |
| 6 months  | Thermal protections (if any)   | Operation of the protection circuit   | Restore operation (2)   |
| 1 year  | Product data labels  | Readability   | Request a copy from Motovario S.p.A. Technical Service  |
| b) ORDINARY MAINTENANCE   |  |   |   |
| 4,000 hours / 3 years   | Oil (if mineral and/or Tam <-5°C, and/or sudden changes in temperature) gear reducers not permanently lubricated |   | Replacement   |
| 8,000 hours / 6 years   | Oil, sealing rings, gaskets and plugs  |   | Replacement (1)   |
| c) OVERHAUL (1a)  |  |   |   |
| (8000 . F . N . K) hours (3) (4)  | Whole unit   |   | General overhaul  |



## Notes:

(1) At Motovario S.p.A. or at an authorised Motovario Atex certified Technical Service centre..

(1a) At Motovario S.p.A. or Motovario Corporation (USA).

(2) The user is responsible for the correct installation and maintenance of the power supply circuit and panel the resistance thermometer is connected to.

(3) -  $F = (M2_{max}/Mr2)3$ , with:

$M2_{max}$  = maximum transmissible torque, on the product label.

$Mr2$  = required torque to the output shaft; if not known, use the nominal torque of the motor installed.

-  $N = 1500 / n1$ , in the case of the variable reducer, for the gear reducer (second element):  $n1 = n2_{max}$  variator.

-  $k = 1$  in case of application areas 1.21 (category 2)

-  $k = 1.5$  in case of application areas 2.22 (category 3)

(4) in case of coupled products, consider, for the assembly, the closest overhaul date.

(5) Unit extraordinary maintenance.

### 10.3 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 Motovario. 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  |
|---|---|---|---|
| The motor does not start.   | Power supply problems.<br>Faulty motor.<br>Incorrect dimensioning of the motor.       | Check power supply.   | Replace the electric motor.<br>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.<br>Incorrect dimensioning of the motor.                                 | Check application.  | Replace the electric motor and if necessary also the gear reducer/variator.       |
| 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.<br>Cooling system failure.                  | Check oil and change/top-up.<br>Check application.                                | Contact MOTOVARIO TECHNICAL SERVICE.  |
| Bearing temperature is high.  | Damaged, worn out bearings.<br>Insufficient oil quantity, old or dirty oil.           | Check and, if necessary, replace bearings.<br>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 during shipping.   | 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.   |   |   |
| 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 MOTOVARIO TECHNICAL SERVICE. For possible use of different oil (after checking with MOTOVARIO 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 MOTOVARIO 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.

12.1.1 Lubricants


Table ALTERNATIVES TO FIRST SUPPLY LUBRICANTS

|                                 | H A30 ÷ A60<br>H 030 ÷ 140<br>HR 041 ÷ 121<br>B 060 ÷ 160<br>S 050 ÷ 150<br>R 040 ÷ 125 |                            | B A40 ÷ A70                    |  | NMRV 025 ÷ 150<br>NMRV-P 063 ÷ 110<br>HW 030 ÷ 040<br>SW 030 ÷ 105<br>NMRX 040 ÷ 090<br>SWX 030 ÷ 105 | SWXF 030 ÷ 105             | TX002 ÷ 010<br>S003 ÷ 100 |
|---------------------------------|---|----------------------------|--------------------------------|--|---|----------------------------|---------------------------|
|                                 | Mineral oil   |                            | Mineral oil                    |  | Synthetic oil   | Synthetic oil              | Mineral oil               |
| *T <sub>amb</sub> °C<br>ISO/SAE | (-5) ÷ (+40)<br>ISO VG220   | (-15) ÷ (+25)<br>ISO VG150 | (-5) ÷ (+40)<br>SAE 85W-140    |  | (-25) ÷ (+50)<br>ISO VG320  | (-15) ÷ (+40)<br>ISO VG320 | (-10) ÷ (+40)<br>ISO VG32 |
| ENI                             | BLASIA 220  | BLASIA 150                 | ROTRA MP (85W-140)             |  | TELUM VSF320  | -                          | BLASIA 32                 |
| SHELL                           | OMALA S2 G 220  | OMALA S2 G 150             | SPIRAX S2 A 85W-140            |  | OMALA S4 WE320  | -                          | SPIRAX S3 ATF MD3         |
| KLUBER                          | Kluberoil GEM 1-220N  | Kluberoil GEM 1-150N       | Kluberoil GEM 1-460N           |  | Klubersynth GH 6-320  | Klubersynth UHI-6 320      | -                         |
| MOBIL                           | MOBILGEAR 600 XP220   | MOBILGEAR 600 XP150        | -                              |  | -   | -                          | ATF 220                   |
| CASTROL                         | ALPHA SP 220  | ALPHA SP 150               | -                              |  | ALPHASYN PG320  | -                          | DEXRON II                 |
| BP                              | ENERGOL GR-XP220  | ENERGOL GR-XP150           | -                              |  | ENERGOL SG-XP320  | -                          | AUTRAN DX III             |
| PETRONAS                        | GEAR MEP 220  | GEAR MEP 150               | TUTELA TRANSMISSION W 140/M-DA |  | GEAR SYN PAG 320  | -                          | TUTELA TRANSMISSION GI/A  |

Standard supply


- T<sub>amb</sub>°C - Ambient operating temperature.
- Units belonging to the H series 125-140 size, B series 140-150-160 size and S series 125 size are supplied with no oil. All remaining units are supplied with ENI oil, unless otherwise specified by the customer.

12.1.2 Lubricants - ATEX



Check the oil level before starting up the unit, operation that 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 as the one supplied by the Manufacturer (see the table in FIRST SUPPLY LUBRICANTS, ATEX CERTIFIED FOR USE BY MOTOVARIO) shown on the nameplate. In case of unavailability, contact MOTOVARIO TECHNICAL SERVICE.

Table of FIRST SUPPLY LUBRICANTS, ATEX CERTIFIED FOR USE BY MOTOVARIO



|               |         | H A30 ÷ A60<br>H 030 ÷ 140<br>HR 041 ÷ 121<br>B 060 ÷ 160<br>S 050 ÷ 150<br>R 041 ÷ 121 |                       | B A40 ÷ A70        |                       | NMRV 025 ÷ 150<br>NMRV-P 063 ÷ 110<br>HW 030 ÷ 040 | S003 ÷ 030<br>S100 |               |
|---------------|---------|---|-----------------------|--------------------|-----------------------|--|--------------------|---------------|
|               |         | Mineral oil   | Synthetic oil         | Mineral oil        | Synthetic oil         | Synthetic oil                                      | Mineral oil        | Synthetic oil |
|               | ISO/SAE | ISO VG220   |                       | SAE 85W-140        | ISO VG460             | ISO VG320  | ISO VG32           |               |
| Standard      | ENI     | BLASIA 220  | -                     | ROTRA MP (85W-140) | -                     | TELUM VSF320                                       | ROTRA ATF II D     | -             |
| Food Industry | KLUBER  | -   | KLUBERSYNTH UHI-6 220 | -                  | KLUBERSYNTH UHI-6 460 | KLUBERSYNTH UHI-6 320                              | -                  | -             |

Note: products in special versions may be operated with a different oil. Always check the name of the oil on the product nameplate.

## 12.1.3 Special lubricants

Table SPECIAL LUBRICANTS

|        | $T_{amb}^{\circ C}$ | Polyglycol 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)        |
|        | $T_{amb}^{\circ C}$ | Polyglycol 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)       |

$T_{amb}^{\circ C}$  - Ambient operating temperature.

If 'special' lubricant is required please contact MOTOVARIO TECHNICAL SERVICE.

\*NO VSF

## 12.2 AMOUNT

### 12.2.1 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 - [I]

| H - CH | HA41 | CHA41 | A51  | A61  | A52  | A42 | A52 | A62 | A33 | A43  | A53 | A63 |
|--------|------|-------|------|------|------|-----|-----|-----|-----|------|-----|-----|
| B3-B5  | 0,23 | 0,13  | 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  |      |       |      |      |      |     |     |     |     |      |     |     |
| V6-V3  |      |       |      |      |      |     | 1,6 | 2,1 | 2,5 | 3,1  |     |     |

| HR - CHR | 041 | 051 | 061 | 081  | 101 | 121 | 041M | 051M | 061M | 081M | 101M | 121M |
|----------|-----|-----|-----|------|-----|-----|------|------|------|------|------|------|
| 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  |

| H - CH | 041 | 051 | 061 | 081  | 101 | 121 | 041M | 051M | 061M | 081M | 101M | 121M |
|--------|-----|-----|-----|------|-----|-----|------|------|------|------|------|------|
| 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  |
| 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  |

| H - CH | 032/033 | 042/043 | 052/053 | 062/063 | 082/083 | 102/103 | 122/123 | 142/143 |
|--------|---------|---------|---------|---------|---------|---------|---------|---------|
| 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      |

| B     | A42  | A52  | A53  | A72 | A73  |
|-------|------|------|------|-----|------|
| B3    | 0,33 | 0,42 | 0,63 | 1   | 1,21 |
| B8    |      |      |      |     |      |
| B6-B7 |      |      |      |     |      |
| V5    |      |      |      |     |      |
| V6    |      |      |      |     |      |

| CB    | A42  | A52  | A53  | A72 | A73  |
|-------|------|------|------|-----|------|
| B3    | 0,33 | 0,42 | 0,55 | 1   | 1,21 |
| B8    |      |      |      |     |      |
| B6-B7 |      |      |      |     |      |
| V5    |      |      |      |     |      |
| V6    |      |      |      |     |      |

| B - CB | 063 | 083 | 103 | 123 | 143  | 153  | 163  |
|--------|-----|-----|-----|-----|------|------|------|
| 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 |





| S - CS | 052/053 | 062/063 | 082/083 | 102/103 | 122/123 | 142        | 143          | 152          | 153        |
|--------|---------|---------|---------|---------|---------|------------|--------------|--------------|------------|
| 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<br>(25) | 18<br>(24,5) | 29,3<br>(42) | 24<br>(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         |

(...) 142-143-152-153 quantity of oil [l] for gearbox with backstop device

| NMRV  | 025  | 030  | 040  | 050  | 130 | 150 |
|-------|------|------|------|------|-----|-----|
| B3    |      |      |      |      | 4,5 | 7   |
| B8    |      |      |      |      | 3,3 | 5,1 |
| B6-B7 | 0,02 | 0,04 | 0,08 | 0,15 | 3,5 | 5,4 |
| V5    |      |      |      |      | 4,5 | 7   |
| V6    |      |      |      |      | 3,3 | 5,1 |

The gear reducers NMRV040 and NMRV050 may be supplied with reduction pre-stage unit and may be mounted with gear reducer HA31, for the corresponding oil quantity refer to the relevant table.

| NMRV-P | 063  | 075  | 090  | 110 |
|--------|------|------|------|-----|
| B3     |      |      |      |     |
| B8     |      |      |      |     |
| B6-B7  | 0,33 | 0,55 | 1,15 | 1,6 |
| V5     |      |      |      |     |
| V6     |      |      |      |     |

| HW                | HW030     |           | HW040     |           |
|-------------------|-----------|-----------|-----------|-----------|
|                   | NMRV-P063 | NMRV-P075 | NMRV-P090 | NMRV-P110 |
| B3-B6-B7-B8-V5-V6 | 0,06      | 0,09      | 0,11      | 0,12      |

| H     | A31  |
|-------|------|
| B3-B5 | 0,07 |

| SW - SWX - SWFX | 030  | 040  | 050  | 063 | 075  | 090 | 105 |
|-----------------|------|------|------|-----|------|-----|-----|
| B3              |      |      |      |     |      |     |     |
| B8              |      |      |      |     |      |     |     |
| B6-B7           | 0,04 | 0,08 | 0,15 | 0,3 | 0,55 | 1   | 1,6 |
| V5              |      |      |      |     |      |     |     |
| V6              |      |      |      |     |      |     |     |

| NMRX  | 040  | 050  | 063 | 075  | 090 |
|-------|------|------|-----|------|-----|
| B3    |      |      |     |      |     |
| B8    |      |      |     |      |     |
| B6-B7 | 0,08 | 0,15 | 0,3 | 0,55 | 1   |
| V5    |      |      |     |      |     |
| V6    |      |      |     |      |     |

| TX           | 002  | 005  | 010 |
|--------------|------|------|-----|
| B5 - B6 - B7 | 0,11 | 0,15 | 0,4 |
| B8 - V1 - V5 | 0,3  | 0,5  | 0,9 |
| V3 - V6      | 0,3  | 0,5  | 0,9 |

| Var S             | 003  | 005  | 010 | 020 | 030/050 | 100 |
|-------------------|------|------|-----|-----|---------|-----|
| B3 - B5 - B6 - B8 | 0,17 | 0,24 | 0,4 | 0,7 | 1,4     | 2,3 |
| V1 - V5           | 0,24 | 0,4  | 0,8 | 1,2 | 2,5     | 4,1 |
| V3 - V6           | 0,26 | 0,4  | 0,4 | 0,7 | 2,5     | 3,7 |

| RM    | 40/1 | 50/1 | 63/1 | 80/1 | 100/1 | 125/1 |
|-------|------|------|------|------|-------|-------|
| B3    | 0,18 | 0,3  | 0,55 | 1,1  | 1,6   | 3,7   |
| B8    | 0,18 | 0,35 | 0,68 | 1,67 | 3,6   | 5,4   |
| B6-B7 | 0,2  | 0,3  | 0,68 | 1,1  | 2,7   | 3,7   |
| V5    | 0,16 | 0,3  | 0,6  | 1,2  | 1,45  | 2,8   |
| V6    | 0,21 | 0,3  | 0,68 | 1,75 | 3,6   | 4,9   |

| RT - RF/1 | 40/1 | 50/1 | 63/1 | 80/1 | 100/1 | 125/1 |
|-----------|------|------|------|------|-------|-------|
| B3-B5     | 0,18 | 0,35 | 0,68 | 1,67 | 3,6   | 5,4   |
| B8        | 0,18 | 0,3  | 0,55 | 1,1  | 1,6   | 3,7   |
| B6-B7     | 0,2  | 0,3  | 0,68 | 1,1  | 2,7   | 3,7   |
| V5-V1     | 0,16 | 0,3  | 0,6  | 1,2  | 1,45  | 2,8   |
| V6-V3     | 0,21 | 0,3  | 0,68 | 1,75 | 3,6   | 4,9   |

| RT - RF/2 | 40/1 | 50/1 | 63/1 | 80/1 | 100/1 | 125/1 |
|-----------|------|------|------|------|-------|-------|
| B3        | 0,42 | 0,8  | 1,5  | 3,6  | 6,8   | 13    |
| B8        | 0,42 | 0,8  | 1,4  | 3,6  | 6,2   | 13    |
| B6-B7     | 0,42 | 0,8  | 1,5  | 3,2  | 6,8   | 11    |
| V5        | 0,42 | 0,86 | 1,6  | 3,45 | 7     | 12    |
| V6        | 0,63 | 1,1  | 2,2  | 4,2  | 10,6  | 17    |

| RT - RF/3 | 40/1 | 50/1 | 63/1 | 80/1 | 100/1 | 125/1 |
|-----------|------|------|------|------|-------|-------|
| B5        | 0,42 | 0,8  | 1,5  | 3,6  | 6,8   | 13    |
| B8        | 0,42 | 0,8  | 1,4  | 3,6  | 6,2   | 13    |
| B6-B7     | 0,42 | 0,8  | 1,5  | 3,2  | 6,8   | 11    |
| V5        | 0,63 | 1,1  | 2,2  | 4,7  | 9,2   | 16,2  |
| V6        | 0,7  | 1,25 | 2,4  | 4,9  | 11,4  | 18    |

| SRM/1   | 003-40/1 | 005-50/1 | 010-63/1 | 020-80/1 | 030/050-100/1 | 100-125/1 |
|---------|----------|----------|----------|----------|---------------|-----------|
| B3      | 0,16     | 0,32     | 0,55     | 1,1      | 1,8           | 2,8       |
| B8      | 0,18     | 0,35     | 0,6      | 1,3      | 2,7           | 4,2       |
| B6D-B6S | 0,18     | 0,32     | 0,6      | 1,1      | 2,7           | 3,7       |
| V5      | 0,18     | 0,35     | 0,65     | 1,2      | 1,45          | 2,8       |
| V6      | 0,2      | 0,32     | 0,65     | 1,5      | 3,4           | 4,5       |

| SRT - SRF/1 | 003-40/1 | 005-50/1 | 010-63/1 | 020-80/1 | 030/050-100/1 | 100-125/1 |
|-------------|----------|----------|----------|----------|---------------|-----------|
| B3-B5       | 0,18     | 0,35     | 0,6      | 1,3      | 2,7           | 4,2       |
| B8          | 0,16     | 0,32     | 0,55     | 1,1      | 1,8           | 2,8       |
| B6D-B6S     | 0,18     | 0,32     | 0,6      | 1,1      | 2,7           | 3,7       |
| V5-V1       | 0,18     | 0,35     | 0,65     | 1,2      | 1,45          | 2,8       |
| V6-V3       | 0,2      | 0,32     | 0,65     | 1,5      | 3,4           | 4,5       |

| SRT-SRF/2-3 | 003-40/2-3 | 005-50/2-3 | 010-63/2-3 | 020-80/2-3 | 030/050-100/2-3 | 100-125/2-3 |
|-------------|------------|------------|------------|------------|-----------------|-------------|
| B3-B5       | 0,42       | 0,8        | 1,6        | 3,8        | 6,8             | 14          |
| B8          | 0,42       | 0,8        | 1,4        | 3,6        | 6,2             | 13          |
| B6D-B6S     | 0,42       | 0,8        | 1,2        | 3,2        | 6,2             | 12          |
| V5-V1       | 0,6        | 1          | 2,2        | 4,7        | 9,2             | 16,2        |
| V6-V3       | 0,5        | 1,1        | 2,2        | 4,7        | 9,2             | 17          |

For VHA-VHFA-VHUA for the gear reducers part consult the values in table HA, for the variator part consult the values in table TX.

For VH-VHF-VHU-VHR-VHRR-VHRM for the gear reducers part consult the values in table H-HR, for the variator part consult the values in table Var S.

For SRT-SRF-SRM units the quantity indicated in the table applies only to the gear reducers, for the variator part consult the values in table Var S.

### 13. 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                         |
| Rotor and stator  | Copper                        |
| 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 wheeled 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.

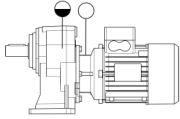
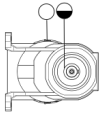
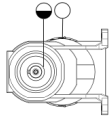
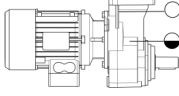
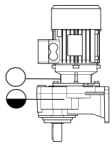
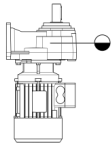
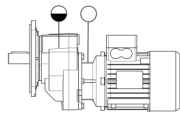
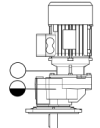
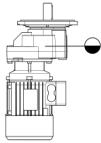
## 14. MOUNTING POSITIONS

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 |

14.1.1 HA - H - HR / 1

| HA - H / 1 - STANDARD - ATEX 3G/3D |   |   |   |
|------------------------------------|---|---|---|
| <b>T</b>                           | <b>B3</b>   | <b>B6</b>   | <b>B7</b>   |
|                                    |    |    |    |
| <b>M</b>                           | <b>B8</b>   | <b>V5</b>   | <b>V6</b>   |
|                                    |    |    |    |
| <b>F</b>                           | <b>B5</b>   | <b>V1</b>   | <b>V3</b>   |
|                                    |  |  |  |

Plugs only on sizes: H081/101/121. Closing plugs on all other holes.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |



| HA - H / 1 - ATEX 2G/2D |    |    |    |
|-------------------------|----|----|----|
| T                       | B3 | B6 | B7 |
|                         | B8 | V5 | V6 |
| M                       | B3 | B6 | B7 |
|                         | B8 | V5 | V6 |
| F                       | B5 | V1 | V3 |

Vent plug with valve present only on sizes: H081/101/121. Closing plugs on all other holes.  
ATEX 2G/2D: Vent plug with valve.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

| HR / 1 - STANDARD - ATEX 3G/3D |    |     |    |    |
|--------------------------------|----|-----|----|----|
| T                              | B3 | B6  | B7 |    |
|                                | B8 | V5  | V6 |    |
| M                              | B3 | B6  | B7 |    |
|                                | B8 | V5  | V6 |    |
| F                              | B5 | B5R | V1 | V3 |

Plugs only on sizes: HR081/101/121. Closing plugs on all other holes.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

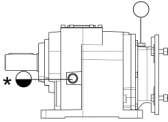
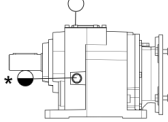
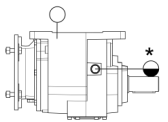
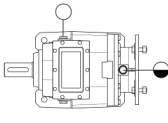
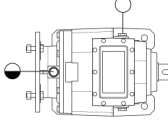
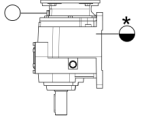
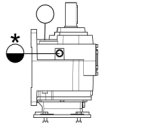
| HR / 1 - ATEX 2G/2D |    |     |    |    |
|---------------------|----|-----|----|----|
| T                   | B3 | B6  | B7 |    |
|                     | B8 | V5  | V6 |    |
| M                   | B3 | B6  | B7 |    |
|                     | B8 | V5  | V6 |    |
| F                   | B5 | B5R | V1 | V3 |

Vent plug with valve present only on sizes: HR081/101/121. Closing plugs on all other holes.  
ATEX 2G/2D: Vent plug with valve.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |



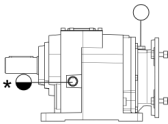
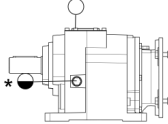
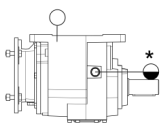
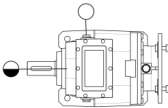
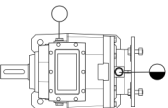
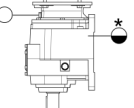
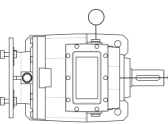
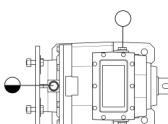
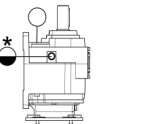
14.1.2 HA - H / 2-3

| HA - H / 2-3 - STANDARD - ATEX 3G/3D  |   |   |
|---|---|---|
| <b>B3 - B5<br/>(HA - H030:H100)</b>   | <b>B3 - B5<br/>(H125:H140)</b>  | <b>B8</b>   |
|  |  |  |
| <b>B6</b>   | <b>B7</b>   | <b>V5 - V1</b>  |
|  |  |  |
|   |   | <b>V6 - V3</b>  |
|   |   |  |

Plugs only on sizes: H060/080/100/125/140. Closing plugs on all other holes.

\*Plug on the opposite side.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

| H / 2-3 - ATEX 2G/2D  |   |  |
|---|---|--|
| <b>B3 - B5 (H030:H100)</b>  | <b>B3 - B5 (H125:H140)</b>  | <b>B8</b>  |
|  |  |   |
| <b>B6 (H030:H050)</b>   | <b>B6 (H060:H140)</b>   | <b>V5 - V1</b>   |
|  |  |   |
| <b>B7 (H030:H050)</b>   | <b>B7 (H060:H140)</b>   | <b>V6 - V3</b>   |
|  |  |  |

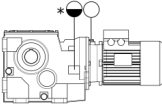
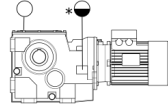

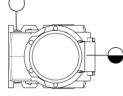
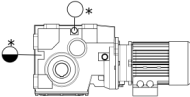
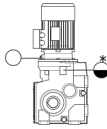
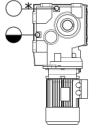
Vent plug with valve present only on sizes: H060/080/100/125/140. Closing plugs on all other holes.

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

\*Plug on the opposite side.

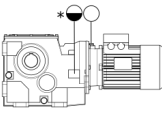
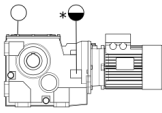
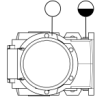
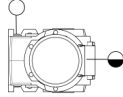
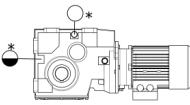
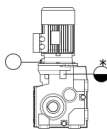
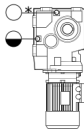
|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

14.1.3 BA - B

| BA - B - STANDARD - ATEX 3G/3D  |   |   |  |
|---|---|---|--|
| B3<br>(BA - B060:B125)  | B3<br>(B140:B160)   | B6  | B7   |
|  |  |  |  |
| B8  |   | V5  | V6   |
|  |   |  |   |

Plugs only on sizes: B080/100/125/140/150/160. Closing plugs on all other holes.  
 \*Plug on the opposite side.

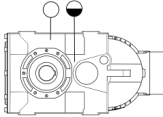
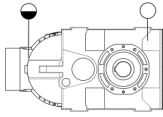
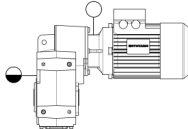
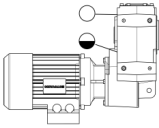
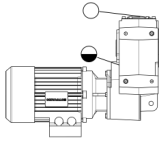
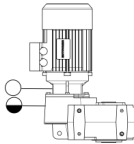
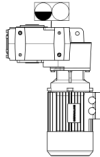
|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

| BA - B - ATEX 2G/2D   |   |   |  |
|---|---|---|--|
| B3<br>(B060:B125)   | B3<br>(B140:B160)   | B6<br>(B080:B160)   | B7<br>(B080:B160)  |
|  |  |  |  |
| B8  |   | V5  | V6   |
|  |   |  |   |

Vent plug with valve present only on sizes: B080/100/125/140/150/160. Closing plugs on all other holes.  
 ATEX 2G/2D: Vent plug with valve.  
 \*Plug on the opposite side.

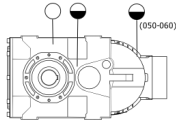
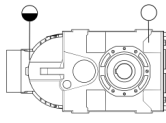
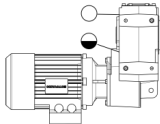
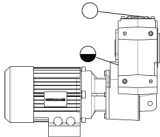
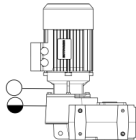
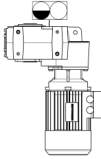
|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

14.1.4 S




| S - STANDARD - ATEX 3G/3D (S052/3:S122/3)   |   |   |  |
|---|---|---|--|
| B3  |   | B8  | B6   |
|  |   |  |  |
| B7 (S052/3:S102/3)  | B7 (S122/3)   | V5  | V6   |
|  |  |  |   |

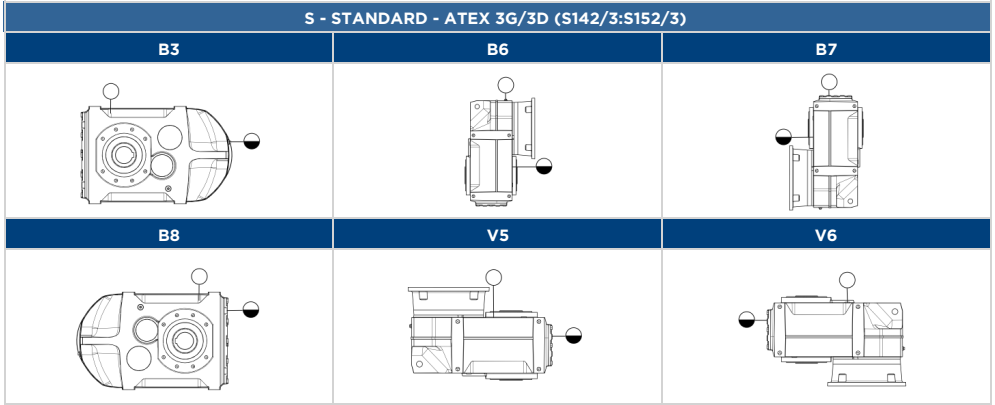
Plugs only on sizes: S080/100/125. Closing plugs on all other holes.

|   |                         |
|---|-------------------------|
|  | VENT PLUG               |
|  | LEVEL PLUG              |
|  | VENT PLUG WITH DIPSTICK |

| S - ATEX 2G/2D (S052/3:S122/3)  |  |   |  |
|---|--|---|--|
| B3  |  | B8  |  |
|  |  |  |  |
| B7 (S052/3:S102/3)  |  | B7 (S122/3)   |  |
|  |  |  |  |
| V5  |  | V6  |  |
|  |  |  |  |

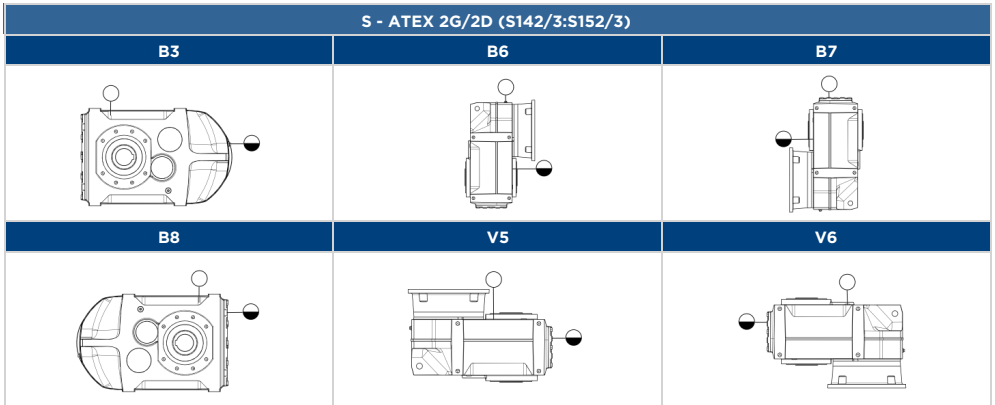
Vent plug with valve present only on sizes: S080/100/125. Closing plugs on all other holes.  
 ATEX 2G/2D: Vent plug with valve.  
 \*Plug on the opposite side.

|   |                         |
|---|-------------------------|
|  | VENT PLUG               |
|  | LEVEL PLUG              |
|  | VENT PLUG WITH DIPSTICK |




Closing plugs on all other holes.

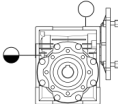
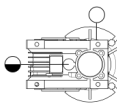
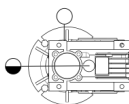
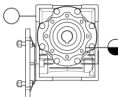
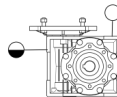
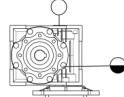
|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |




Closing plugs on all other holes.  
ATEX 2G/2D: Vent plug with valve.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

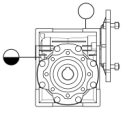
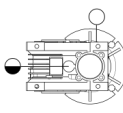
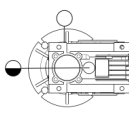
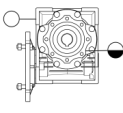
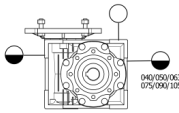
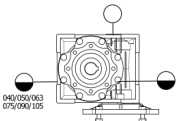
14.1.5 VSF

| NMRV - NMRV-P - SW - NMRV+HA31 - NMRV-P/HW - NMRX - SWX - SWFX - STANDARD         |   |   |
|---|---|---|
| NMRV - NMRV-P - NMRV+HA31 - NMRV-P/HW - ATEX 3G/3D                                |   |   |
| B3  | B6  | B7  |
|  |  |  |
| B8  | V5  | V6  |
|  |  |  |

Plugs only on sizes: NMRV110/130/150. Closing plugs on all other holes.

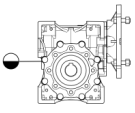
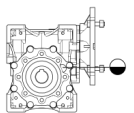
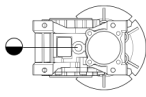
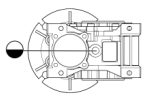
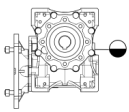
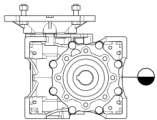
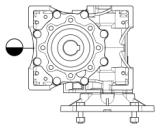
|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |



| NMRV - ATEX 2G/2D   |   |   |
|---|---|---|
| B3  | B6  | B7  |
|  |  |  |
| B8  | V5 (NMRV040:NMRV150)  | V6 (NMRV040:NMRV150)  |
|  |  |  |

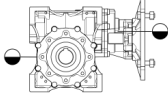
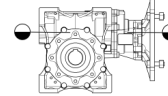
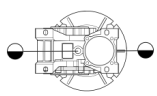
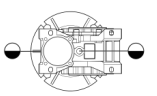
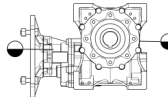
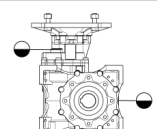
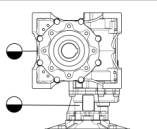
Vent plug with valve present only on sizes: NMRV110/130/150. Closing plugs on all other holes.  
 ATEX 2G/2D: Vent plug with valve.  
 \*Plug on the opposite side.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

| NMRV-P - ATEX 2G/2D   |   |  |   |
|---|---|--|---|
| B3 (NMRV-P063:NMRV-P075)  | B3 (NMRV-P090:NMRV-P110)  | B6   | B7  |
|   |   |    |  |
| B8  | V5  | V6   |   |
|  |  |  |   |

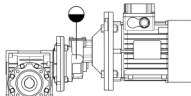
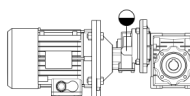
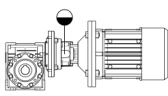
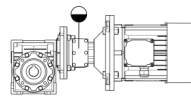
Closing plugs on all other holes.

|   |            |
|---|------------|
|  | LEVEL PLUG |
|---|------------|

| NMRV-P/HW - ATEX 2G/2D  |   |   |  |
|---|---|---|--|
| B3<br>(NMRV-<br>PO63:075/HW030)   | B3<br>(NMRV-<br>PO90:110/HW040)   | B6  | B7   |
|  |  |  |  |
| B8  |   | V5  | V6   |
|  |   |  |  |

Closing plugs on all other holes.

|   |            |
|---|------------|
|  | LEVEL PLUG |
|---|------------|

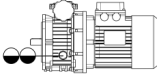
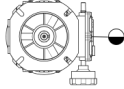
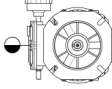
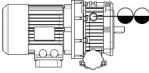
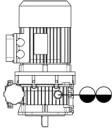
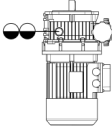
| HA31+NMRV - ATEX 2G/2D   |   |   |  |
|--|---|---|--|
| BS   | AS  | VS  | PS   |
|  |  |  |  |

Closing plugs on all other holes.

For the position of the plugs on the NMRV gear reducer, see the relevant positioning page.

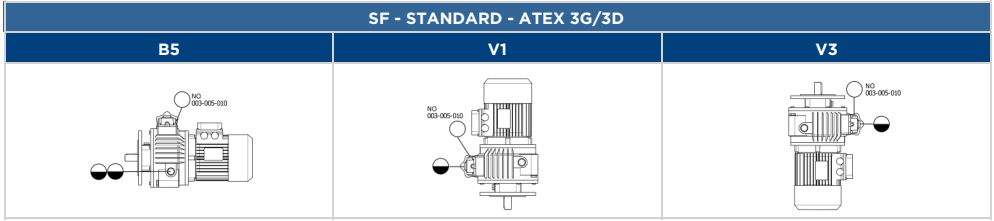
|   |            |
|---|------------|
|  | LEVEL PLUG |
|---|------------|

14.1.6 VAR

| TXF - STANDARD  |   |   |
|---|---|---|
| B5  | B6  | B7  |
|  |  |  |
| B8  | V1  | V3  |
|  |  |  |

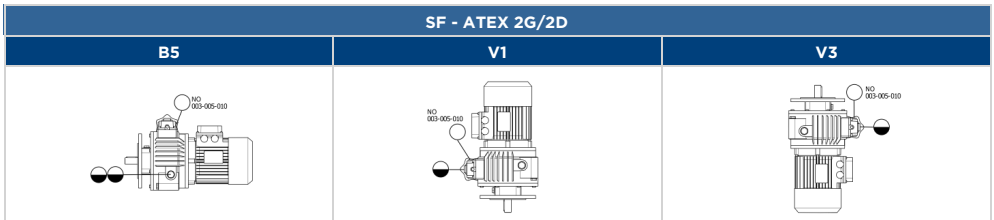
Closing plugs on all other holes.

|   |            |
|---|------------|
|  | LEVEL PLUG |
|---|------------|



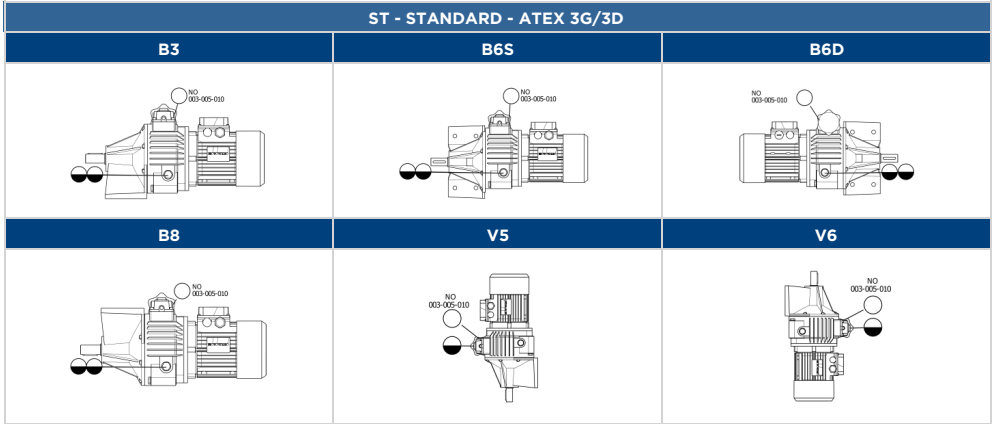
Closing plugs on all other holes.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |



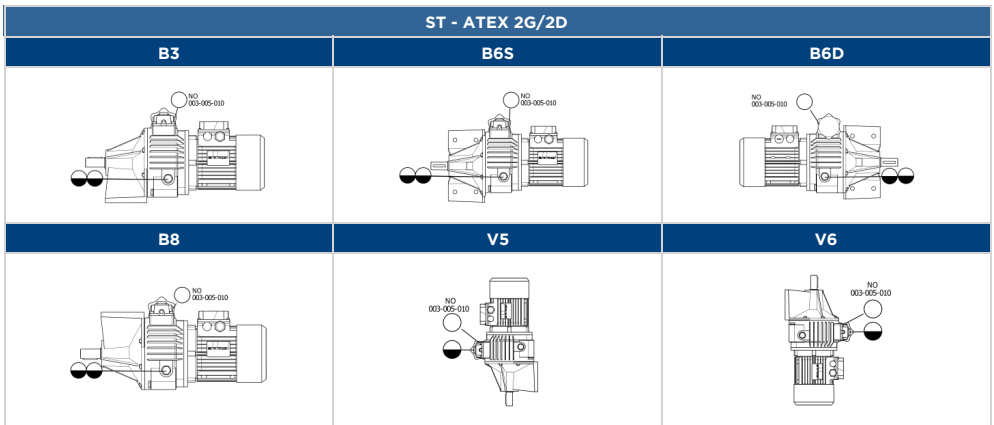
Closing plugs on all other holes.  
ATEX 2G/2D: Vent plug with valve.

|  |            |
|--|------------|
|   | VENT PLUG  |
|  | LEVEL PLUG |




Closing plugs on all other holes.

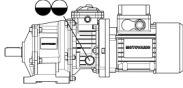
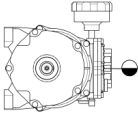
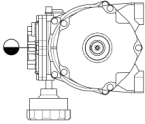
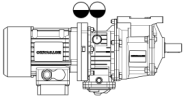
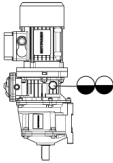
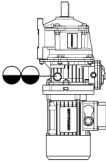
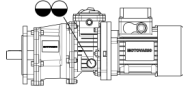
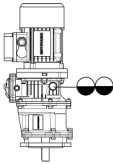
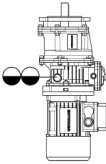
|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |



Closing plugs on all other holes.  
ATEX 2G/2D: Vent plug with valve.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

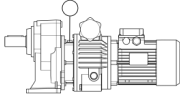
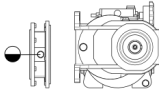
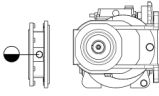
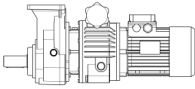
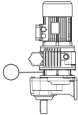
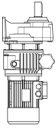
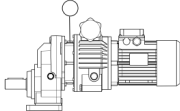
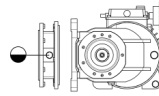
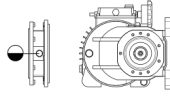
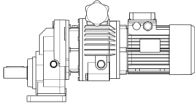
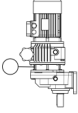
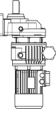

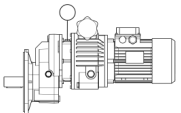
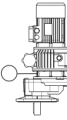
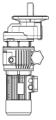
14.1.7 VHA

| VHA - VHFA - STANDARD   |   |   |
|---|---|---|
| B3  | B6  | B7  |
|  |  |  |
| B8  | V5  | V6  |
|  |  |  |
| B5  | V1  | V3  |
|  |  |  |

Closing plugs on all other holes.

|   |            |
|---|------------|
|  | LEVEL PLUG |
|---|------------|

14.1.8 VH - VHR / 1

| VH - VHR / 1 - STANDARD - ATEX 3G/3D  |   |   |   |   |
|---|---|---|---|---|
| T   | B3  | B6  | B7  |   |
|   |    |    |    |   |
|   | B8  | V5  | V6  |   |
|  |    |    |   |   |
| M   | B3  | B6  | B7  |   |
|   |    |    |    |   |
|   | B8  | V5  | V6  |   |
|  |    |    |   |   |
| F   | B5  | B5R   | V1  | V3  |
|   |  |  |  |  |

Plugs on connecting covers only on sizes VH020/081-VH030/081-VH030/101-VH030/121-VH050/101-VH050/121-VH100/101-VH100/121. Closing plugs on all other holes.

For the positions of the plugs on the variator, see the respective mounting position page.

For the positions of the plugs on the gear reducer, see the respective mounting position page.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |



| VH - VHR / 1 - ATEX 2G/2D |    |     |    |    |
|---------------------------|----|-----|----|----|
| T                         | B3 | B6  | B7 |    |
|                           | B8 | V5  | V6 |    |
| M                         | B3 | B6  | B7 |    |
|                           | B8 | V5  | V6 |    |
| F                         | B5 | B5R | V1 | V3 |

Vent plug with valve present only on sizes VH020/081-VH030/081-VH030/101-VH030/121-VH050/101-VH050/121-VH100/101-VH100/121. Closing plugs on all other holes.

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

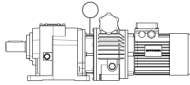
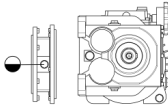
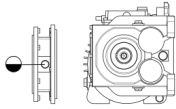
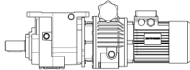
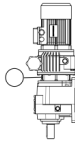
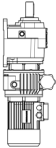
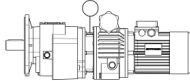
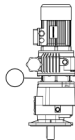
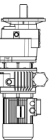
For the positions of the plugs on the variator, see the respective mounting position page.

For the positions of the plugs on the gear reducer, see the respective mounting position page.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

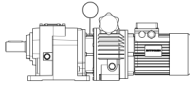
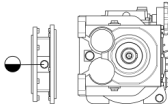
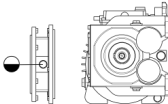
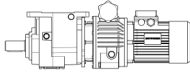
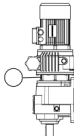
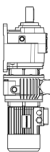
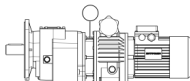
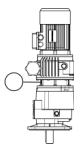
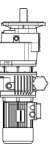


14.1.9 VH / 2-3

| VH / 2-3 - STANDARD - ATEX 3G/3D  |   |   |
|---|---|---|
| B3  | B6  | B7  |
|  |  |  |
| B8  | V5  | V6  |
|  |  |  |
| B5  | V1  | V3  |
|  |  |  |

Plugs on connecting covers only on sizes VH010/060-VH010/080-VH020/060-VH020/080-VH030/060-VH030/080-VH030/100-VH030/125-VH050/100-VH050/125-VH100/100-VH100/125. Closing plugs on all other holes.  
 For the positions of the plugs on the variator, see the respective mounting position page.  
 For the positions of the plugs on the gear reducer, see the respective mounting position page.

|   |            |
|---|------------|
|   | VENT PLUG  |
|  | LEVEL PLUG |

| VH / 2-3 - ATEX 2G/2D   |   |   |
|---|---|---|
| <b>B3</b>   | <b>B6</b>   | <b>B7</b>   |
|  |  |  |
| <b>B8</b>   | <b>V5</b>   | <b>V6</b>   |
|  |  |  |
| <b>B5</b>   | <b>V1</b>   | <b>V3</b>   |
|  |  |  |

Vent plug with valve present only on sizes VH010/060-VH010/080-VH020/060-VH020/080-VH030/060-VH030/080-VH030/100-VH030/125-VH050/100-VH050/125-VH100/100-VH100/125. Closing plugs on all other holes.

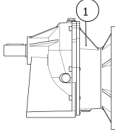

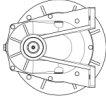
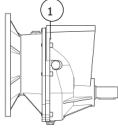
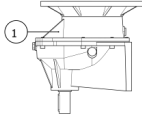
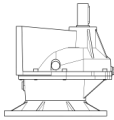
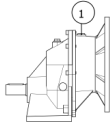
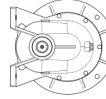
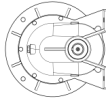
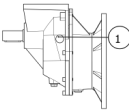
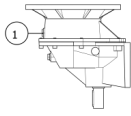
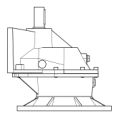
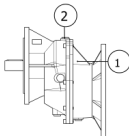
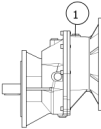
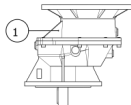
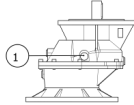
ATEX 2G/2D: Vent plug with valve.

For the positions of the plugs on the variator, see the respective mounting position page.

For the positions of the plugs on the gear reducer, see the respective mounting position page.

|   |            |
|---|------------|
|    | VENT PLUG  |
|  | LEVEL PLUG |

14.1.10 R / 1


| R / 1 - STANDARD - ATEX 3G/3D |   |   |   |   |
|-------------------------------|---|---|---|---|
| T                             | B3  | B6  | B7  |   |
|                               |    |    |    |   |
|                               | B8  | V5  | V6  |   |
|                               |    |    |    |   |
| M                             | B3  | B6  | B7  |   |
|                               |    |    |    |   |
|                               | B8  | V5  | V6  |   |
|                               |    |    |    |   |
| F                             | B5  | B5R   | V1  | V3  |
|                               |  |  |  |  |

| RT          |   |    |    |    |    |    |    |
|-------------|---|----|----|----|----|----|----|
|             |   | B3 | B6 | B7 | B8 | V5 | V6 |
| 041         | 1 | -  | -  | -  | -  | -  | -  |
| 051         | 1 | ○  | -  | -  | -  | -  | -  |
| 061         | 1 | -  | -  | -  | -  | -  | -  |
| 081-101-121 | 1 | ○  | -  | -  | ○  | ○  | -  |

| RM          |   |    |    |    |    |    |    |
|-------------|---|----|----|----|----|----|----|
|             |   | B3 | B6 | B7 | B8 | V5 | V6 |
| 041-051-061 | 1 | -  | -  | -  | -  | -  | -  |
| 081         | 1 | ○  | -  | -  | -  | ○  | -  |
| 101-121     | 1 | ○  | -  | -  | ○  | ○  | -  |

| RF          |   |    |     |    |    |
|-------------|---|----|-----|----|----|
|             |   | B5 | B5R | V1 | V3 |
| 041-051-061 | 1 | -  | -   | -  | -  |
|             | 2 | -  | -   | -  | -  |
| 081         | 1 | ○  | ○   | ○  | ◐  |
|             | 2 | -  | -   | -  | -  |
| 101         | 1 | -  | ○   | ○  | -  |
|             | 2 | ○  | -   | -  | -  |
| 121         | 1 | ○  | ○   | ○  | -  |
|             | 2 | -  | -   | -  | -  |

Closing plugs on all other holes.

|   |            |
|---|------------|
|   | VENT PLUG  |
|  | LEVEL PLUG |

| R / 1 - ATEX 2G/2D |            |           |           |
|--------------------|------------|-----------|-----------|
| T                  | <b>B3</b>  | <b>B6</b> | <b>B7</b> |
|                    | <b>B8</b>  | <b>V5</b> | <b>V6</b> |
| M                  | <b>B3</b>  | <b>B6</b> | <b>B7</b> |
|                    | <b>B8</b>  | <b>V5</b> | <b>V6</b> |
| F                  | <b>B5</b>  | <b>B6</b> | <b>B7</b> |
|                    | <b>B5R</b> | <b>V1</b> | <b>V3</b> |

| RT  |   |    |    |    |    |    |    |
|-----|---|----|----|----|----|----|----|
|     |   | B3 | B6 | B7 | B8 | V5 | V6 |
| 041 | 1 | -  | ●  | ●  | -  | ●  | -  |
|     | 2 | ●  | -  | -  | ●  | -  | ●  |
| 051 | 1 | -  | ●  | ●  | -  | ●  | -  |
|     | 2 | ●  | -  | -  | ●  | -  | ●  |
| 061 | 1 | -  | ●  | ●  | -  | ●  | -  |
|     | 2 | ●  | -  | -  | ●  | -  | ●  |
| 081 | 1 | ○  | ●  | ●  | ○  | ○  | -  |
|     | 2 | ●  | ○  | ○  | ●  | ●  | -  |
| 101 | 1 | ○  | ●  | ●  | ○  | ○  | -  |
|     | 2 | ●  | ○  | ○  | ●  | ●  | -  |
| 121 | 1 | ○  | ●  | ●  | ○  | ○  | -  |
|     | 2 | ●  | ○  | ○  | ●  | ●  | -  |

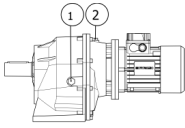
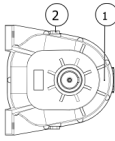
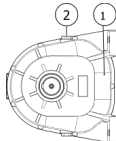
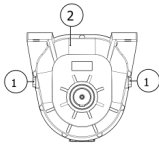
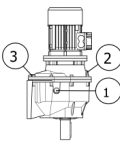
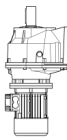
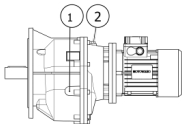
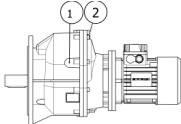
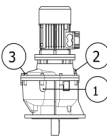
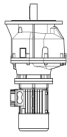
| RM  |   |    |    |    |    |    |    |
|-----|---|----|----|----|----|----|----|
|     |   | B3 | B6 | B7 | B8 | V5 | V6 |
| 041 | 1 | -  | ●  | ●  | -  | ●  | ●  |
|     | 2 | ●  | -  | -  | ●  | -  | -  |
| 051 | 1 | -  | ●  | ●  | -  | -  | ●  |
|     | 2 | ●  | -  | -  | ●  | ●  | -  |
| 061 | 1 | -  | ●  | ●  | -  | -  | ●  |
|     | 2 | ●  | -  | -  | ●  | ●  | -  |
| 081 | 1 | ○  | ●  | ●  | -  | -  | -  |
|     | 2 | ●  | ○  | ○  | ●  | ●  | -  |
|     | 3 | -  | -  | -  | ○  | ○  | -  |
| 101 | 1 | ○  | ●  | ●  | -  | -  | -  |
|     | 2 | ●  | ○  | ○  | ●  | ●  | -  |
|     | 3 | -  | -  | -  | ○  | ○  | -  |
| 121 | 1 | ○  | ●  | ●  | -  | -  | -  |
|     | 2 | ●  | ○  | ○  | ●  | ●  | -  |
|     | 3 | -  | -  | -  | ○  | ○  | -  |

|     |   | RF |    |    |     |    |    |
|-----|---|----|----|----|-----|----|----|
|     |   | B5 | B6 | B7 | B5R | V1 | V3 |
| 041 | 1 | -  | ●  | ●  | -   | ●  | ●  |
|     | 2 | ●  | -  | -  | ●   | -  | -  |
| 051 | 1 | -  | ●  | ●  | -   | ●  | ●  |
|     | 2 | ●  | -  | -  | ●   | -  | -  |
| 061 | 1 | -  | ●  | ●  | -   | ●  | ●  |
|     | 2 | ●  | -  | -  | ●   | -  | -  |
| 081 | 1 | ○  | ●  | ●  | ○   | ●  | -  |
|     | 2 | ●  | ○  | ○  | ●   | ○  | -  |
| 101 | 1 | ○  | ●  | ●  | ○   | ●  | -  |
|     | 2 | ●  | ○  | ○  | ●   | ○  | -  |
| 121 | 1 | ○  | ●  | ●  | ○   | ●  | -  |
|     | 2 | ●  | ○  | ○  | ●   | ○  | -  |

Closing plugs on all other holes.  
ATEX 2G/2D: Vent plug with valve.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

14.1.11 R / 2-3

| R / 2-3 - STANDARD |   |   |   |
|--------------------|---|---|---|
| T                  | <b>B3</b>   | <b>B6</b>   | <b>B7</b>   |
|                    |  |  |  |
| F                  | <b>B8</b>   | <b>V5</b>   | <b>V6</b>   |
|                    |  |  |  |
| F                  | <b>B5</b>   | <b>B5R</b>  | <b>V1</b>   |
|                    |  |  |  |
|                    |   |   | <b>V3</b>   |
|                    |   |   |  |



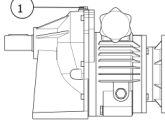
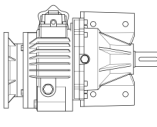
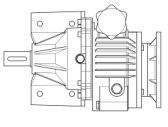
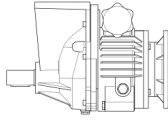
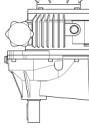
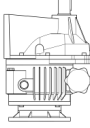
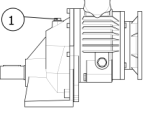
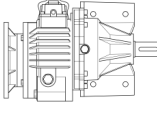
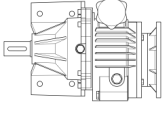
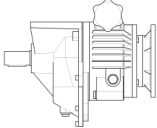
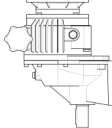
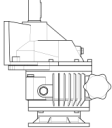
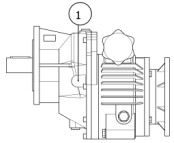
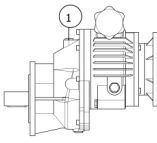
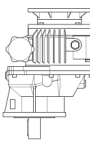
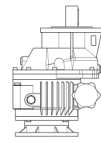
|             |   | RT |    |    |    |    |    |
|-------------|---|----|----|----|----|----|----|
|             |   | B5 | B6 | B7 | B8 | V5 | V6 |
| 042/3-052/3 | 1 | -  | -  | -  | -  | -  | -  |
|             | 2 | -  | -  | -  | -  | ○  | -  |
| 062/3       | 1 | -  | -  | -  | -  | -  | -  |
|             | 2 | -  | -  | -  | -  | -  | -  |
| 082/3-102/3 | 1 | ◐  | ◐  | ◐  | ◐  | ◐  | -  |
|             | 2 | ○  | ○  | ○  | ○  | ○  | -  |
| 122/3       | 1 | ◐  | -  | -  | ◐  | ◐  | -  |
|             | 2 | -  | ○  | ○  | ○  | -  | -  |
|             | 3 | -  | -  | -  | -  | ○  | -  |

|             |   | RF |     |    |    |
|-------------|---|----|-----|----|----|
|             |   | B5 | B5R | V1 | V3 |
| 042/3-052/3 | 1 | -  | -   | -  | -  |
|             | 2 | -  | -   | ○  | -  |
| 062/3       | 1 | -  | -   | -  | -  |
|             | 2 | -  | -   | -  | -  |
| 082/3-102/3 | 1 | ◐  | ◐   | ◐  | -  |
|             | 2 | ○  | ○   | ○  | -  |
| 122/3       | 1 | ◐  | ◐   | ◐  | -  |
|             | 2 | -  | ○   | -  | -  |
|             | 3 | -  | -   | ○  | -  |

Closing plugs on all other holes.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

14.1.12 SR / 1

| SR / 1 - STANDARD - ATEX 3G/3D |   |   |   |   |
|--------------------------------|---|---|---|---|
| T                              | B3  | B6D   | B6S   |   |
|                                |    |    |    |   |
|                                | B8  | V5  | V6  |   |
|                                |    |    |    |   |
| M                              | B3  | B6D   | B6S   |   |
|                                |    |    |    |   |
|                                | B8  | V5  | V6  |   |
|                                |    |    |    |   |
| F                              | B5  | B5R   | V1  | V3  |
|                                |  |  |  |  |

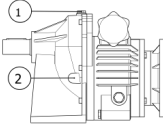
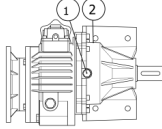
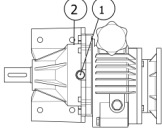
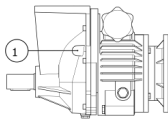
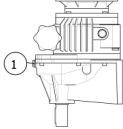
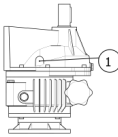
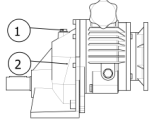
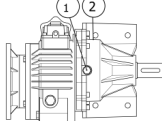
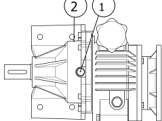
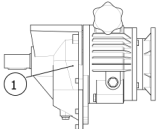
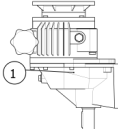
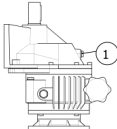
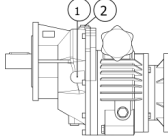
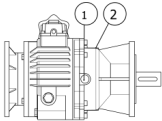
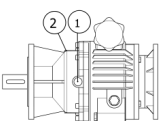
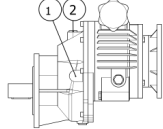
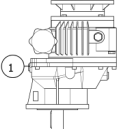
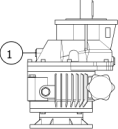
| SRT-SRM                          |   |    |     |     |    |    |    |
|----------------------------------|---|----|-----|-----|----|----|----|
|                                  |   | B3 | B6D | B6S | B8 | V5 | V6 |
| <b>003/041</b>                   | 1 | -  | -   | -   | -  | -  | -  |
| <b>005/051</b>                   | 1 | -  | -   | -   | -  | -  | -  |
| <b>010/061</b>                   | 1 | -  | -   | -   | -  | -  | -  |
| <b>020/081</b>                   | 1 | ○  | -   | -   | -  | -  | -  |
| <b>030/101</b><br><b>050/101</b> | 1 | ○  | -   | -   | -  | -  | -  |
| <b>100/121</b>                   | 1 | ○  | -   | -   | -  | -  | -  |



































| SRF                              |   |    |     |    |    |
|----------------------------------|---|----|-----|----|----|
|                                  |   | B5 | B5R | V1 | V3 |
| <b>003/041</b>                   | 1 | -  | -   | -  | -  |
| <b>005/051</b>                   | 1 | -  | -   | -  | -  |
| <b>010/061</b>                   | 1 | -  | -   | -  | -  |
| <b>020/081</b>                   | 1 | ○  | ○   | -  | -  |
| <b>030/101</b><br><b>050/101</b> | 1 | ○  | ○   | -  | -  |
| <b>100/121</b>                   | 1 | ○  | ○   | -  | -  |











































Closing plugs on all other holes.

For the positions of the plugs on the variator, see the respective mounting position page.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

| SR / 1 - ATEX 2G/2D |   |   |   |
|---------------------|---|---|---|
| T                   | <b>B3</b>   | <b>B6D</b>  | <b>B6S</b>  |
|                     |    |    |    |
|                     | <b>B8</b>   | <b>V5</b>   | <b>V6</b>   |
|                     |    |    |    |
| M                   | <b>B3</b>   | <b>B6D</b>  | <b>B6S</b>  |
|                     |    |    |    |
|                     | <b>B8</b>   | <b>V5</b>   | <b>V6</b>   |
|                     |    |    |    |
| F                   | <b>B5</b>   | <b>B6D</b>  | <b>B6S</b>  |
|                     |  |  |  |
|                     | <b>B5R</b>  | <b>V1</b>   | <b>V3</b>   |
|                     |  |  |  |

| SRT-SRM            |   |   |   |   |   |   |  |
|--------------------|---|---|---|---|---|---|--|
|                    |   | B3  | B6D   | B6S   | B8  | V5  | V6   |
| 003/041            | 1 |  |  |  |  |  |  |
|                    | 2 | -   | -   | -   | -   | -   | -  |
| 005/051            | 1 |  |  |  |  |  |  |
|                    | 2 | -   | -   | -   | -   | -   | -  |
| 010/061            | 1 |  |  |  |  |  |  |
|                    | 2 | -   | -   | -   | -   | -   | -  |
| 020/081            | 1 |  |  |  | -   | -   | -  |
|                    | 2 |  |  |  | -   | -   | -  |
| 030/101<br>050/101 | 1 |  |  |  | -   | -   | -  |
|                    | 2 |  |  |  | -   | -   | -  |
| 100/121            | 1 |  |  |  | -   | -   | -  |
|                    | 2 |  |   |   |   |   |  |

| SRF                |   |   |   |   |   |   |  |
|--------------------|---|---|---|---|---|---|--|
|                    |   | B5  | B6D   | B6S   | B5R   | V1  | V3   |
| 003/041            | 1 |    |    |    |    |  |  |
|                    | 2 | -   | -   | -   | -   | -   | -  |
| 005/051            | 1 |    |    |    |    |  |  |
|                    | 2 | -   | -   | -   | -   | -   | -  |
| 010/061            | 1 |    |    |    |    |  |  |
|                    | 2 | -   | -   | -   | -   | -   | -  |
| 020/081            | 1 |   |   |   |   | -   | -  |
|                    | 2 |  |  |  |  | -   | -  |
| 030/101<br>050/101 | 1 |  |  |  |  | -   | -  |
|                    | 2 |  |  |  |  | -   | -  |
| 100/121            | 1 |  |  |  |  | -   | -  |
|                    | 2 |  |  |  |  | -   | -  |

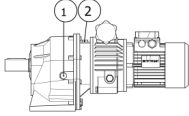
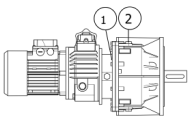
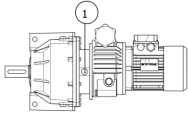
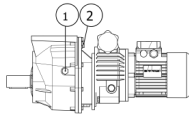
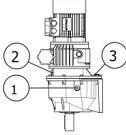
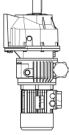
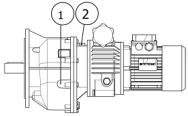
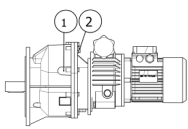
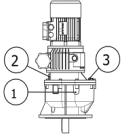
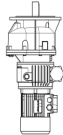
Closing plugs on all other holes.

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

For the positions of the plugs on the variator, see the respective mounting position page.

|   |            |
|---|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

14.1.13 SR / 2-3

| SR / 2-3 - STANDARD |   |   |   |   |
|---------------------|---|---|---|---|
| T                   | <b>B3</b>   | <b>B6D</b>  | <b>B6S</b>  |   |
|                     |  |  |  |   |
|                     | <b>B8</b>   | <b>V5</b>   | <b>V6</b>   |   |
|                     |  |  |  |   |
| F                   | <b>B5</b>   | <b>B5R</b>  | <b>V1</b>   | <b>V3</b>   |
|                     |  |  |  |  |

| SRT  |   |    |     |     |    |    |    |
|--|---|----|-----|-----|----|----|----|
|  |   | B3 | B6D | B6S | B8 | V5 | V6 |
| 003/042-3<br>003/052-3<br>003/063<br>005/042<br>005/052-3<br>005/062-3<br>010/052<br>010/062-3<br>020/062              | 1 | -  | -   | -   | -  | -  | -  |
|  | 2 | -  | -   | -   | -  | -  | -  |
|  | 3 | -  | -   | -   | -  | -  | -  |
| 005/083<br>010/082-3<br>010/103<br>020/082-3<br>020/102-3<br>030/082<br>030/102-3<br>050/082<br>050/102-3<br>100/102-3 | 1 | ●  | ●   | ●   | ●  | ●  | -  |
|  | 2 | ○  | ○   | -   | ○  | ○  | -  |
|  | 3 | -  | -   | -   | -  | -  | -  |
| 010/123<br>020/123<br>030/122-3<br>050/122-3<br>100/122-3  | 1 | ●  | ○   | -   | ●  | ●  | -  |
|  | 2 | -  | -   | -   | ○  | -  | -  |
|  | 3 | -  | -   | -   | -  | ○  | -  |

| SRF  |   |    |     |    |    |
|--|---|----|-----|----|----|
|  |   | B5 | B5R | V1 | V3 |
| 003/042-3<br>003/052-3<br>003/063<br>005/042<br>005/052-3<br>005/062-3<br>010/052<br>010/062-3<br>020/062              | 1 | -  | -   | -  | -  |
|  | 2 | -  | -   | -  | -  |
|  | 3 | -  | -   | -  | -  |
| 005/083<br>010/082-3<br>010/103<br>020/082-3<br>020/102-3<br>030/082<br>030/102-3<br>050/082<br>050/102-3<br>100/102-3 | 1 | ●  | ●   | ●  | -  |
|  | 2 | ○  | ○   | ○  | -  |
|  | 3 | -  | -   | -  | -  |
| 010/123<br>020/123<br>030/122-3<br>050/122-3<br>100/122-3  | 1 | ●  | ●   | ●  | -  |
|  | 2 | -  | ○   | -  | -  |
|  | 3 | -  | -   | -  | -  |

Closing plugs on all other holes.

For the positions of the plugs on the variator, see the respective mounting position page.

|  |            |
|--|------------|
|  | VENT PLUG  |
|  | LEVEL PLUG |

## 15. SPARE PARTS TABLES

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



## 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 / motovariators / motovariator-gear reducers** composed alternately by:
  - gear unit series: H, B, S, NMRV, NMRV-P, NMRX, SW, SWX, SWFX, R, PBH, NMRV-CD, SW-CD (this declaration is valid also for the compact gear units series)
  - speed variators series: S - TX
  - variator-gear reducers: SR - VH

fitted alternately with:

- MOTOVARIO or DR drives motor series: TPX, TB, TBS, TBH, TBP, TBSX, TBHX, TBPX, D, DB, S, HSE or Teco series: AERV, AEQV, AESU, AESU
- motor inverter DRIVON series: DV340 - DV 123 or SMARTDRIVE series: SD1PH - SD3PH in any of catalogue combinations

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, 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.

- The undersigned Company hereby DECLARES under its exclusive responsibility that the partly completed machinery to which this declaration relates, where electrical equipment are set, meets the requirements of the 2014/35/UE Directive (Low Voltage Directive) and the 2014/30/UE (ECM Directive).
- The undersigned Company is committed to provide, in response to a reasoned request by the national authorities, relevant information about the partly completed machinery covered by this declaration, except for the intellectual property rights of the partly completed machinery manufacturer. The information will be transmitted directly to the national authority who have requested them.

Formigine, / /

**General Manager**  
 Franco Pacini

La presente dichiarazione di incorporazione è stata redatta secondo quanto indicato nell'allegato II, punto B, della Direttiva 2006/42/CE  
 VERSIONE ORIGINALE IN LINGUA ITALIANA, VERSIONE TRADOTTA IN LINGUA INGLESE

Motovario SpA - Società con socio unico  
 Società soggetta all'attività di direzione e coordinamento della TECO Electric & Machinery Co.Ltd.  
 Sede legale: Via Quattro passi, 1/3, 41043 Formigine (MO) - Italia - Cap. Sociale: Euro 16.010.000 i.v. R.E.A. di Modena n.350898 - P.IVA e C.F. 02596981204



## 18. ATEX CERTIFICATION

### 18.1.1 ATEX Certification

**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 Ubersotto (MO) Italia  
 Tel. +39 0536 843702  
 Fax +39 0536 920672  
 spedizioni@motovario.it

### Dichiarazione di Conformità UE EU Declaration of Conformity



Noi con la presente dichiariamo, sotto la nostra responsabilità, che i prodotti seguenti: **riduttori coassiali serie R, variatori meccanici serie S, variariduttori serie SR e VH**

contrassegnati con le seguenti marcature:

 II 2GD ck IIB 135°C (T4)  
 II 2GD ck IIB 200°C (T3)

nei limiti meccanici e termici indicati in etichetta sono conformi alle disposizioni della:

**Direttiva 2014/34/UE**

e che sono state altresì applicate le seguenti norme armonizzate:

EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011  
 EN 13463-8 : 2004

Motovario ha depositato la documentazione tecnica con **deposito registrato numero:**

**8000310248**  
 presso l'Ente Notificato:  
**TÜV NORD CERT**


**TÜV Hannover/ Sachsen-Anhalt e.V.**  
 30519 Hannover

**Firma Direzione Generale Motovario S.p.A.:**

We hereby declare, in sole responsibility, that the following products:

**helical gear units R series, speed variators S series, variator-gear/reducers SR and VH series**

identified with the following alternative markings:

 II 2GD ck IIB 135°C (T4)  
 II 2GD ck IIB 200°C (T3)

within the mechanical and thermal limits specified on the label are in conformity with the provisions of:

**Directive 2014/34/EU**

and furthermore the following harmonised standards have been applied:

EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011  
 EN 13463-8 : 2004

Motovario archived the technical documents in the **recorded location:**

**8000310248**  
 at the Certification Body:  
**TÜV NORD CERT**

**TÜV Hannover/ Sachsen-Anhalt e.V.**  
 30519 Hannover

**Signed by General Manager Motovario S.p.A.:**

**Data:**

**Date:**

QL0194 REV.10

Motovario SpA - Società con socio unico  
 Società soggetta all'attività di direzione e coordinamento della TECO Electric & Machinery Co.Ltd.  
 Sede legale: Via Quattro passi 1/3, 41043 Formigine (MO) - Italia - Cap. Sociale: Euro 18.010.000 I.v. R.E.A. di Modena n.350985 - P.IVA e C.F. 02569681204



**MOTOVARIO S.p.a.**  
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 Tel. +39 059 579700  
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 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

## Dichiarazione di Conformità UE EU Declaration of Conformity



Noi con la presente dichiariamo, sotto la nostra responsabilità, che i prodotti seguenti:  
**riduttori coassiali serie H e HR, riduttori ortogonali a coppia conica serie B, riduttori pendolari serie S**  
 contrassegnati con le seguenti marcature alternative:

Il 2GD ck IIB 135°C (T4)  
 Il 2GD ck IIB 200°C (T3)

nei limiti meccanici e termici indicati in etichetta sono conformi alle disposizioni della:

**Direttiva 2014/34/UE**

e che sono state altresì applicate le seguenti norme armonizzate:

EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011  
 EN 13463-8 : 2004

Motovario ha depositato la documentazione tecnica con deposito registrato codice:

8000309275

presso l'Ente Notificato:

**TÜV NORD CERT**

TÜV Hannover/Sachsen-Anhalt e.V. 30519 Hannover  
 (valido per riduttori coassiali serie H monostadio)

**TUVIT17ATEX017AR**

presso l'Ente Notificato:

**TÜV Italia - Gruppo TÜV SÜD**

Via Isonzo, 61 40033

Casalecchio Di Reno (BO)

(valido per riduttori coassiali serie H 2 e 3 stadi e HR monostadio, riduttori ortogonali a coppia conica serie B, riduttori pendolari serie S)

Firma Direzione Generale Motovario S.p.A.:

We hereby declare, in sole responsibility, that the following products:

**helical gear units H and HR series, helical bevel gear units B series, shaft mounted gear units S series**

identified with the following alternative markings:

Il 2GD ck IIB 135°C (T4)  
 Il 2GD ck IIB 200°C (T3)

within the mechanical and thermal limits specified on the label are in conformity with the provisions of:

**Directive 2014/34/EU**

and furthermore the following harmonised standards have been applied:

EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011  
 EN 13463-8 : 2004

Motovario archived the technical documents in the recorded location:

8000309275

at the Certification Body:

**TÜV NORD CERT**

TÜV Hannover/Sachsen-Anhalt e.V. 30519 Hannover  
 (applicable for helical gear units H single stage)

**TUVIT17ATEX017AR**

at the Certification Body:

**TÜV Italia - TÜV SÜD Group**

Via Isonzo, 61 40033

Casalecchio Di Reno (BO)

(applicable for helical gear units H 2 and 3 stages and HR single stage series, helical bevel gear units B series, shaft mounted gear units S series)

Signed by General Manager Motovario S.p.A.:

**Data:**

Motovario SpA - Società con socio unico  
 Società soggetta all'attività di direzione e coordinamento della TECO Electric & Machinery Co.Ltd.  
 Sede legale: Via Quattro passi 1/3, 41043 Formigine (MO) - Italia - Cap. Sociale: Euro 18.010.000 i.r. R.E.A. di Modena n.350898 - P.IVA e C.F. 02569581204

**Date:**

QL0195.REV.12



**MOTOVARIO S.p.a.**  
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 Fax +39 0536 920672  
 spedizioni@motovario.it

## Dichiarazione di Conformità UE EU Declaration of Conformity



Noi con la presente dichiariamo, sotto la nostra responsabilità, che i prodotti seguenti:  
**riduttori a vite senza fine serie NMRV, NMRV-P**

contrassegnati con la marcatura:

II 2GD ck IIB 135°C (T4)

nei limiti meccanici e termici indicati in etichetta sono conformi alle disposizioni della:

**Direttiva 2014/34/UE**

e che sono state altresì applicate le seguenti norme armonizzate:

EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011  
 EN 13463-8 : 2004

Motovario ha depositato la documentazione tecnica con deposito registrato numero:

8000310249  
 per le serie NMRV  
 8000388097

per le serie NMRV-P  
 presso l'Ente Notificato:  
 TÜV NORD CERT

TÜV Hannover/ Sachsen-Anhalt e.V.  
 30519 Hannover

Firma Direzione Generale Motovario S.p.A.:

We hereby declare, in sole responsibility, that the following products:

**worm gear units NMRV, NMRV-P**

identified with the marking:

II 2GD ck IIB 135°C (T4)

within the mechanical and thermal limits specified on the label are in conformity with the provisions of:

**Directive 2014/34/UE**

and furthermore the following harmonised standards have been applied:

EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011  
 EN 13463-8 : 2004

Motovario archived the technical documents in the recorded location:

8000310249  
 for the series NMRV  
 8000388097

for the series NMRV-P  
 at the Certification Body:  
 TÜV NORD CERT

TÜV Hannover/ Sachsen-Anhalt e.V.  
 30519 Hannover

Signed by General Manager Motovario S.p.A.:

**Data:**

Motovario S.p.A. – Società con socio unico  
 Società soggetta all'attività di direzione e coordinamento della TECO Electric & Machinery Co.Ltd.  
 Sede legale: Via Quattro passi 1/2, 41043 Formigine (MO) - Italia - Cap. Sociale: Euro 18.010.000 i.v. R.E.A. di Modena n.300998 - P.IVA e C.F. 02599691204

**Date:**

QL0196 REV.10



**MOTOVARIO S.p.a.**  
 Sede operativa ed amm.va:  
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 Fax +39 0536 920672  
 spedizioni@motovario.it

## Dichiarazione di Conformità UE EU Declaration of Conformity



Noi con la presente dichiariamo, sotto la nostra responsabilità, che i prodotti seguenti: **riduttori coassiali serie H e R, riduttori ortogonali a coppia conica serie B, riduttori pendolari serie S, riduttori a vite senza fine serie NMRV e NMRV-P, variatori meccanici serie S, variariduttori serie SR e VH**

contrassegnati con la marcatura:

 **II 3GD c IIB 135°C (T4)**

nei limiti meccanici e termici indicati in etichetta sono conformi alle disposizioni della:

**Direttiva 2014/34/UE**

e che sono state altresì applicate le seguenti norme armonizzate:

**EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011**

Motovario conserva la documentazione tecnica di progetto, mantenendola a disposizione per ispezioni.

Firma Direzione Generale Motovario S.p.A.:

We hereby declare, in sole responsibility, that the following products:

**helical gear units H and R series, helical bevel gear units B series, shaft-mounted gear units S series, worm gear units NMRV and NMRV-P series, speed variators S, variator-gear/reducer SR and VH series**

identified with the marking:

 **II 3GD c IIB 135°C (T4)**

within the mechanical and thermal limits specified on the label are in conformity with the provisions of:

**Directive 2014/34/EU**

and furthermore the following harmonised standards have been applied:

**EN 1127-1 : 2011  
 EN 13463-1 : 2009  
 EN 13463-5 : 2011**

Motovario filed the technical design documentation, which is kept available for inspection.

Signed by General Manager Motovario S.p.A.:

Date:

Date:

QL0197 REV.11

Motovario SpA – Società con socio unico  
 Società soggetta all'attività di direzione e coordinamento della TECO Electric & Machinery Co.Ltd.  
 Sede legale: Via Quattro passi 1/3, 41043 Formigine (MO) - Italia - Cap. Sociale: Euro 18.010.000 I.v. R.E.A. di Modena n.3502698 - P.IVA e C.F. 02569681204





