

**CONTACTING OUR SERVICE DEPARTMENT**

When contacting our customer service department always quote the data indicated on the speed variator's identification plate.

Our service department is located at:

**SITI** SPA  
SOCIETÀ ITALIANA TRASMISSIONI INDUSTRIALI

**GEARBOXES  
MOTORIZED GEARBOXES  
SPEED VARIATORS  
ELECTRIC C.A./C.C. MOTORS  
COUPLINGS**

**HEADQUARTER**  
Via G. Di Vittorio, 4  
40050 Monteveglio - BO - Italy  
Tel. +39/051/6714811  
Fax. +39/051/6714858  
E-mail: info@sitriduttori.it  
WebSite: www.sitriduttori.it

**1 GENERAL INFORMATION**

We, at Siti S.p.A., would like to thank you for choosing our products. Our dedication to quality and innovation have allowed us to develop highly efficient gearboxes capable of satisfying even the most demanding requirements. Installation personnel must thoroughly read and familiarize themselves with the contents of this entire manual. If in doubt, please do not hesitate to contact our Customer Service Department or Service centers for more detailed information.

**1.1 Contents of the manual**

This manual contains a description of the gearbox, information about "intended use" and performance along with the specifications and installation, operation and maintenance instructions.

**1.2 Users of the manual**

This publication is aimed at:

- the factory supervisor/installation personnel
- operators
- maintenance personnel

The person performing the job must keep the manual nearby where it can be easily consulted and kept in good condition. If the manual is lost or ruined, contact the MANUFACTURER to obtain another copy quoting the serial number of the gearbox.

**1.3 How to consult the manual**

The instructions are accompanied by icons that aid in reading the manual. In fact, these icons indicate the type of information provided, more precisely:

**Danger!**  
This icon indicates: **failure to heed the safety standards and follow the instructions given may cause accidents. Carefully read and follow the instructions provided with this icon, exercising extreme caution at all times.**

This icon indicates important information on how to properly handle, install, use and maintain the gearbox.

This icon indicates the order given must be followed. When necessary the text includes the numbers of the figures that identify the illustrations provided in the manual. The parts of the gearbox described in the text are identified with numbers. E.g.: - 1 - (fig. 1) means part of component 1 in figure 1.

In reference to ATEX standards.

**1.4 Working with the user**

The manufacturer is at the customer's disposal to answer any questions and provide any additional information needed. In addition we gladly accept any suggestions to improve this manual to make it more comprehensible and better satisfy the purposes it is designed for. If the equipment changes hands, please send the manufacturer the new owner's address so that he can receive any information, supplements and/or updates.

**1.5 Updated versions of the manual**

This manual deals with the state-of-the-art condition of the gearbox it is in at the time it is put on the market. The manual is to be considered a fundamental part of the gearbox and complies with all laws, directives and standards currently in force. It cannot be considered inadequate only because updated later on based on new information. If any modifications, changes, etc. are made to gearboxes sold later on the manufacturer shall not be held liable for modifying equipment previously supplied nor shall the gearbox and relative manual be considered incomplete and inadequate. Any supplements the manufacturer sends to the users should be kept along with the manual that is part of the gearbox.

Proper operation and top performance of the gearbox is obtained only if all the instructions given in this manual are carefully and completely followed.

**1.6 Selecting personnel and personnel qualification levels**

The operators responsible for handling, installing and servicing the gearboxes on their own must meet the requirements given below:

- minimum work age as specified by laws in force at the time of use
- well-educated and trained on how to properly and safely perform the jobs
- have completely read and become familiar with the contents of this manual
- have been instructed and fully understand the accident prevention laws in force at the time of use
- be physically able to carry out the jobs
- always wear certified personal safety gear

**1.7 Residual risks**

Assessment of the risks the operators responsible for operating and maintenance may face was carried out during the design stage. All the necessary precautions have been taken to make the machine safe and reliable. Risk assessment has not shown any particular residual risks.

**1.8 Sales conditions and warranty**

As regards all the commercial and legal aspects, consult the catalogue for the gearbox in question.

**2 SAFETY INFORMATION**

In compliance with Machinery Directive EEC 89/392 article 4.2 and annex 11/sub B, as the gearboxes dealt with in this certificate are incorporated and/or assembled in other machines they are considered "components" therefore:

They cannot be started up until the machine they are installed in has been certified that it complies with machinery directives 89/392/CEE, 91/368/CEE, 93/44/CEE and 93/68/CEE.

**Note:**  
The product included in this certificate meets the essential requirements given above and those of the catalogue in force as of the date of production. Siti S.p.A. reserves the right to modify them according to changes in technology and materials.

- The gearbox must not be modified unless duly authorized by the manufacturer.
- Carefully read the instructions given in this manual before attempting to move the gearbox, especially when it weighs more than 25 kg.

**Warning!**  
Some gearboxes may be supplied without oil; they must be filled with oil immediately. Consult paragraph "6.7 Lubrication" for more specific information regarding the type and amount of lubricant required.



**2.1 Guidelines for use in potentially explosive atmospheres (only for ATEX products)**

Ignition can occur when mixes of flammable gases or dusts come into contact with hot parts of the gearboxes.

**Danger!**  
Only specially trained operators are authorized to install, connect, start up, carry out maintenance or repair the gearboxes. In any case, the steps below must be closely followed:

- Follow the instructions provided by the manufacturer.
- Observe the warning and alert symbols given on the gearboxes.
- Read and become familiar with the contents of the User's Manuals.
- Observe the specific standards for the plant.
- Observe the all standards currently in force (explosion protection, safety, risk prevention).

**3 DESCRIPTION**

**3.1 Intended use**

The machine is designed for industrial use under normal environmental conditions specified by directive 94/9/EC (ATEX).

**3.2 Forbidden and erroneous use (only for ATEX products)**

The gearbox must not be used in areas whose environmental conditions are different from those specified below.

Group II                      Category 2 G1/G2                      Zone D 21-22

**3.3 Gearbox identification data**

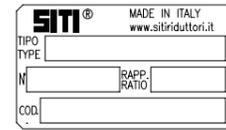
All our gearboxes come with one or more plates that have the identification data stamped on them.

**3.3.1 How to read and maintain the plates**

The data given on the plates must be legible at all times. Clean them on a regular basis. If a plate is worn and/or no longer legible, even if just one item, contact the manufacturer to obtain a replacement plate. When ordering, always quote the data given on the original plate.

Data contained on the nameplate:

- Type: Logo of the Gearbox.
- N° : Number
- RATIO: Reduction Ratio
- COD: Gearbox code-description



Data contained on the nameplate:

- Type: Logo of the Gearbox.
- N° : Number
- RATIO: Reduction Ratio
- COD: Gearbox code-description
- ATEX Area
- File: Technical File Number



For ATEX production

**Warning!**  
The plates must never be removed.

**3.4 FEATURES**

The new primary reduction gears P63, P71, P80 and P90 have a modern design and are made of die-cast aluminum. The mating flanges are of the B14 type in order to take up little space. The transmission ratios available are 3 and 4. The advantage of this new reduction unit is that it can be supplied separately (kit) so that it can be directly installed on the worm-gear reducer by using the pre-arranged motor mounting.

**Gearbox dimensions and performance**  
See the relative manual.

**Airborne noise level**  
The airborne noise level when running under full load under the most adverse operating conditions is still considerably lower than 85 dB.

REDUCTION UNIT WEIGHT	
SIZE	Kg
P63	1.3
P71	2.2
P80	5.5
P90	5.2

**4 INSTALLATION INSTRUCTION**

The worm gearboxes are delivered entirely factory assembled. Only specially trained personnel are authorized to install, assemble and start them up.

**4.1 Operations to be performed before installing the gearboxes (by the customer)**

**Preparation**  
In order to install the gearbox, carry out the operations given on the confirmation before hand:

- Make sure the structures are adequate in relation to the actions and reactions deriving from use of the gearbox.
- Make sure the installation site is adequate and enough space is available.
- Make sure that the mounting position indicated in the order confirmation corresponds to the requested one.

**4.1.1 Gearbox shipment, unloading and handling**

Always check the goods to make sure they were not broken or damaged during shipment before handling the gearbox.

**Danger!**  
The gearbox is delivered factory assembled and packed. If the product is packed in cardboard cases, use lift equipment that complies with safety regulations to handle the product.

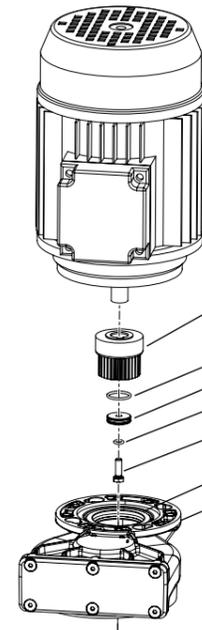
To handle unpacked products, use lift equipment suitable for weights heavier than 30 kg. In any case, pay careful attention not to accidentally bang surfaces and coupling parts. Use the eyebolt when needed (parts heavier than 30 kg).



The eyebolt can lift just the gearbox and not the parts it will be attached to. Regarding gearboxes that weigh more than 30 kg not equipped with an eyebolt, a suitable eyebolt should be used to lift them in complete safety. Otherwise exercise extreme caution and use slings to lift the gearboxes. The types of eyebolts are given in the chart.

EYEBOLTS	
l 130	M10
l 150	M12
l 175	M12

**4.2 Assembling instruction**



- Gear
- OR
- Ring plate
- OR
- Screw
- Primary reduction unit
- Seal

When the motor assembly is made by the customer, please proceed as per the drawing:

- fit the gear 1 into the motor shaft
- put the OR 2 into the gear;
- assemble the ring plate 3 fixing the entire group with the screw 5 fitted with the OR 4;
- fill the primary reduction unit with the relevant quantity of oil as per paragraph 6.7;
- finally assemble the motor to the primary reduction unit 6 taking care to avoid any damage to the oil seal 7.

**Note:**  
Keep the same position of the drawing.

## 5 GEARBOX OPERATING INSTRUCTION

### 5.1 Important safety information

Make certain the following requirements are observed when installing the gearbox:

(Only for ATEX products)

During installation the following must NOT be present: potentially explosive atmosphere, oils, acids, vapors, radiation.



**The position in which the gearbox is installed can be changed only after contacting the manufacturer. The gearbox shall not be considered in compliance with the ATEX directive if the manufacturer is not contacted.**

Plastic inserts should be placed between the gearbox and drive (connection between different metals) if there is risk of chemical corrosion.

In addition, use plastic washers with the bolts! The plastic used should have a < 10<sup>6</sup>W capacity to withstand electric loss. Effectively ground the external structure. In addition use screws with motor earth for geared motors. Make sure enough air flows to cool down the gearbox and that warm air does not flow back from other devices. The temperature of the cooling air should not exceed 40 °C.



**Danger!**  
Only specially-trained personnel are authorized to install and start up the gearboxes. Incorrect installation may put the operator's safety at jeopardy and seriously or irreparably damage the equipment and machine it is connected to.

Carefully follow the precautions given below:

Before attempting to carry out any operations, make certain the plant or drive motor is disconnected from the supply mains and that the machine is not energized.

Remember that the gearbox should never be operated without oil or when its parts are disconnected. In addition, do not put the gearbox in water or corrosive solutions.

Make sure the amount of lubricant, its viscosity index and position of the filler and drain plugs are adequate for the position in which the gearbox is installed and operating conditions present.

In addition, do not use toxic oils and never mix two different types of oils together.

When installing the gearbox, always leave enough room free so that it can be periodically checked and maintenance can be conveniently performed. It is also important that air is able to flow freely to assure good ventilation and heat dispersion.

The product should be installed in the position indicated on the order.

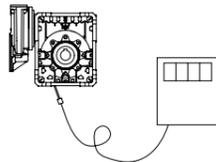


**Danger!**  
Make sure the gearbox is well-secured to the framework to assure vibration-free operation. In addition, it should be mounted on machined surfaces. Use systems that prevent the clamp screws from coming loose.

- 9 -

### 6.4 Measuring the operating temperature

Wherever possible, suitable instruments should be used to measure the external temperature of the gearbox housing. As, under regular operating conditions the temperature inside the gearbox increases 15 - 20 °C compared to the outside temperature, the housing normally becomes too hot to touch. It is important to check that once the gearbox has reached the normal speed the operating temperature remains more or less constant under the same work conditions. This indicates that the gearbox is running in a trouble-free manner.



### 6.5 Checking the lubricant level (applicable only in case of gearbox with optional oil level plug)

Regularly check that the oil level is correct when the gearbox has stopped and cooled down sufficiently. To do this, use the sight-glass provided. This should be kept clean and be seen through at all times. If the gearbox is run without enough lubricant, it may be seriously and often irreparably damaged.

Efficiency of the heat exchange process is notably affected if the oil inside the gearbox is too low. As heat dissipation and the cooling capacity are considerably reduced, the inside operating temperature increases above all at the points where the sides of the teeth come into contact.

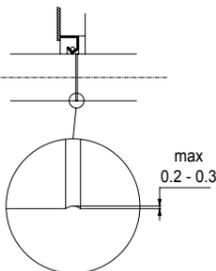
### 6.6 Replacing the seals

The efficiency and service life of the ring seals largely depends on the operating temperature in the contact zone, any chemical reactions which may occur between the rubber compound and the lubricant and, finally, its wear condition.

The ring seals need to be replaced when:

- the seal is no longer efficient and, as a result, oil is leaking out;
- the entire machine or system is overhauled.

Whenever a seal is no longer efficient, it must be replaced immediately to avoid any further leakage and prevent any other parts from being damaged.



When installing the new ring seal, follow the instructions below:

- take great care when handling the seal and make sure it is in good condition (do not leave it in stock for too long as this could cause premature wear especially if it is stored in a damp environment);

- 13 -

Be extremely careful to perfectly align the gearbox with the motor and machine to be driven. Use flexible or self-aligning couplings where possible. If the gearbox risks being hit, overloaded for a prolonged time or blocked, install overload cut-outs, torque limiters, hydraulic couplings or other similar devices.

### 5.2 Before starting the gearboxes (only for ATEX products)



#### Measure the oil and surface temperature

The highest allowable surface temperature given in this manual was determined under normal environmental conditions.

Even slight changes in these conditions (example: with service factors = 1) may considerably affect the temperature. When starting the gearbox, the surface temperature must be measured under maximum load.

Off-shelf thermometers may be used to measure the temperature.

The surface temperature must be measured in the area between the gearbox and motor where the clamps do not allow adequate air flow to cool down the motor fan.

The highest allowable surface temperature is reached after approximately three hours of operation and must not exceed 50 °C (differential value) in relation to the room temperature.

If this temperature (differential value) is exceeded, immediately stop the gearbox and contact the manufacturer.

#### Checks to be performed

The chart given below lists all the checks to be made before attempting to start the gearbox in potentially explosive atmospheres as specified by the ATEX100a directive.

	CHECK
Inspect the packaging to check the goods upon delivery.	
Make sure the following information given on the gearbox identification plate matches the approved values for use in an explosive atmosphere: anti-explosion category, anti-explosion zone, maximum surface temperature class.	
Are you sure no oil, gas, acids, vapors, radiation will be present in the potentially explosive atmosphere when the gearbox is installed?	
Does the environmental temperature correspond to the value given in the "Operating temperature" paragraph?	

- 10 -

- always check that the seat where the seal is to be fitted is perfect i.e. without scoring, marks, nicks, dents or surface defects of any kind;
- make sure the lip of the new seal is not fitted at exactly the same point as the previous one;
- if the area where the ring seal comes into contact with the shaft has worn down by more than 0.2-0.3 mm, do not, under any circumstances, install a new seal but contact our local service centre where the staff will see whether the shaft can still be used and identify the cause of the damage;
- install the ring seal perpendicularly to the shaft, with the lip absolutely free and not curled under or pinched;
- install the ring seal so that the lip faces the oil that must be kept in or the side from where the pressure is exerted;
- for ring seals without a dust-tight lip, coat the outside of the lip with grease;
- for ring seals provided with a dust-tight lip, fill the gap between the seal lip and the dust-tight lip with grease;
- lubricate the seal seat on the shaft;
- do not use sealants because, if they get on the seal lip or shaft surface they can cause rapid wear;
- when installing the seal, press down as near as possible to the outside edge;
- do not block the ring seal axially or apply too much load;
- always use suitable tools to avoid damaging the seal lip with threads, grooves, sharp edges or keyways;
- always cover the seal lip and the seat on the shaft when repainting the gearbox.

All the precautions mentioned above need to be taken in order to prevent the ring seal from becoming dry especially when the shaft first starts to rotate. If the seal becomes dry, the temperatures in the area where it comes into contact with the shaft become too high immediately damaging the seal material and causing the lip to harden, crack and discolour.

### 6.7 Lubrication

Primary reductions supplied either with motor or with solid input shaft are filled with lubricant by SITI. In all the other cases, the primary reduction units are supplied without lubricant, which is on customer's account.

All the wormgearboxes series U-MU, and series I-MI up to size I 90 included, are supplied already pre-lubricated by SITI, and are missing the oil plugs, since the lubricant used is "lifetime", in other words it does not require any maintenance during the wormgearboxes life.

If required, wormgearboxes are supplied with plugs for loading, discharging and checking level of the oil.

#### 6.7.1 Amount of lubricant

I-MI Series	Pre-lubricated with synthetic oil ISO VG 320									To be added by client	
Size of gearbox	I 25	I 30	I 40	I 50	I 60	I 70	I 80	I 90	I 110	I 130	
Amount of lubricant (litres)	0.035	0.035	0.160	0.240	0.190	0.500	0.950	1.925	3.600	3	

- 14 -

Make sure the gearboxes are well-ventilated and that there are no external heat sources (example through fittings). The temperature of the cooling air must never exceed 40 °C.	
Does the installation position match the value given in the gearbox manual?	
<b>Warning!</b> The position in which the gearbox is installed can be changed only after contacting the manufacturer. The gearbox shall not be considered in compliance with the ATEX directive if the manufacturer is not contacted.	
Does the correct oil level in the installation position correspond to the amount of oil stated in the gearbox manual?	
Can the oil drain (where provided) and inspection plugs along with the release valves be easily reached?	
Have the parts at the inlet and outlet been installed in compliance with the ATEX directive?	
For motors driven by inverters: make certain the motor is certified for use with an inverter.	
The inverter parameters must be set to prevent the gearbox from overloading.	

### 5.3 During operation (only for ATEX products)

#### Checks to be made

The charts given below list all the operations that have to be checked while a gearbox is running in potentially explosive atmospheres as specified by the ATEX100a directive.

	CHECK
<b>During operation</b> Measure the surface temperature after approximately three hours of operation. It must not exceed 50 °C (differential value) in relation to the room temperature.	
If this temperature (differential value) is exceeded, immediately stop the gearbox and contact the manufacturer.	

- 11 -

U-MU Series	Pre-lubricated with synthetic oil ISO VG 320					
Size of gearbox	U 40	U 50	U 63	U 75	U 90	U 110
Amount of lubricant (litres)	0.160	0.190	0.500	0.500	0.900	1.660

Primary reduction P Series	Pre-lubricated with synthetic oil ISO VG 320				
Size of gearbox	P 63	P 71	P 80	P 90	P 110
Amount of lubricant (litres)	0.075	0.100	0.150	0.150	0.450

#### Recommended lubricant

SHELL TIVELA S 320:

Volumic mass	1.069 (kg/cu.dm)
Kinematic viscosity at 40°C	321 cSt
Pour point	-39 °C
Viscosity index	230
Flash point (c.o.c)	286 °C
FZG test overcomes stage	>12

#### NOTE

It cannot be mixed with mineral oils and is incompatible with nitrocellulosic paints and with seals in natural rubber.

### 6.8 Troubleshooting guide

This chart contains malfunctions that may arise during operation. They are listed according to the individual functions of the gearbox. The trouble, causes and part that may have caused the fault are indicated in the chart.

PROBLEM	POSSIBLE CAUSES	REMEDY
The motor does not start	a) The motor's electrical wiring is faulty b) The motor is faulty c) Wrong size motor	a) Check the connections b) Replace the motor c) Replace the motor
The motor and gearbox reach temperatures which are too high	a) Mechanical overload b) Wrong size geared motor assembly	a) Check the mechanical parts driven by the geared motor assembly b) Replace the geared motor assembly
The current absorbed and/or the temperature of the motor are too high	a) Motor faulty b) Wrong size motor	a) Replace the motor b) Replace the motor

- 15 -

## 6 MAINTENANCE

The maintenance schedule includes routine and periodic operations. Routine maintenance refers to operations during which the operator and/or specially trained maintenance workers have to inspect and check the parts. When performing periodic maintenance the operators have to replace, adjust and lubricate parts. The manufacturer holds specific training courses and provides publications to fully instruct the maintenance staff on how to perform the jobs correctly and in complete safety.

### 6.1 Routine and scheduled maintenance

Periodically check the outer surfaces of the gearbox and the cooling air passages for cleanliness. Regularly make sure that no lubricant leaks through the seals, mounting flanges, mounting screws of the covers, caps etc..

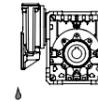
#### Warning!

**If the gearbox is run without enough lubricant, it may be seriously and often irreparably damaged.**

Efficiency of the heat exchange process is notably affected if the oil inside the gearbox is too low. As heat dissipation and the cooling capacity are considerably reduced, the inside operating temperature increases above all at the points where the sides of the teeth come into contact.

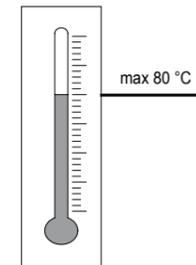
### 6.2 Cleaning

Clean the gearbox casing on a regular basis to assure good heat exchange with the outside.



### 6.3 Operating temperature

The operating temperature depends on a number of factors such as the type of power transmission, the type and quantity of lubricant, the characteristics and structure of the gearbox, the speed and power applied and the environment in which the gearbox is operating. When worm gearboxes are employed, the allowable temperature may range up to 50° higher than the room temperature considering that today all manufacturers are tending to make more and more compact gearboxes. This means that as the gearboxes are smaller, they hold less lubricant which results in higher temperatures that they are not designed to withstand. With a standard worm gearbox, the maximum allowable inside temperature is 80 °C. Higher temperatures than this could cause damage, particularly to the ring seals.



- 12 -

PROBLEM	POSSIBLE CAUSES	REMEDY
The gearbox reaches a temperature which is too high	a) Gearbox faulty b) Wrong size gearbox c) Wrong mounting position d) Not enough lubricant	a) Repair or replace the gearbox b) Replace the gearbox c) Check that the gearbox supplied is that ordered d) Add lubricant until the level indicated is reached
Oil leaks from the shafts	a) Ring seals worn down or defective b) Seal seat on the shaft worn	a) Replace the ring seals b) Replace the ring seals and install them in a very slightly different position or replace the shafts
Oil leaks from the seals	a) Flanges not tightened properly b) Seals defective	a) Tighten the flanges b) Replace the seals and check that the surfaces are properly machined
The gearbox is making a banging noise.	a) Gear teeth defective	a) Contact our customer service department
The gearbox is whistling.	a) Not enough lubricant b) Gears defective or worn down c) Bearings defective or not installed properly	a) Add lubricant until the level indicated is reached b) Contact our customer service department c) Contact our customer service department

## 7 REPLACEMENT PARTS

If used properly and the scheduled maintenance is regularly performed as specified in this manual the gearboxes are designed and engineered not to require spare parts due to faults or break downs.

If some parts need to be replaced, use only original spare parts. The parts are to be removed and re-installed only by specially-trained authorized personnel.

**Along with voiding the warranty, use of non-original spare parts may also affect proper operation of the gearbox.**

- 16 -