SITI SPA

SOCIETÀ ITALIANA TRASMISSIONI INDUSTRIALI ®

R

INSTALLATION, OPERATION and MAINTENANCE MANUAL

09.2008

We, at SITI S.p.A., would like to thank you for the confidence shown in 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.

Carefully reading and becoming familiar with the contents of this manual is of prime importance for trouble-free operation.

If, after thoroughly reading this manual, some topics are not clear please do not hesitate to contact our Customer Service Department or Service centers for more detailed information.

MANUFACTURER'S DATA

SITI SPA
SOCIETÀ ITALIANA TRASMISSIONI INDUSTRIALI
®

RIDUTTORI
MOTORIDUTTORI
VARIATORI CONTINUI
MOTORI ELETTRICI C.A./C.C.
GIUNTI ELASTICI

SEDE e STABILIMENTO

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CONTACTING THE SERVICE CENTER

Whenever contacting the service center always quote the specifications stamped on the plate attached to the gearbox that allow it to be accurately identified.

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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 useful information and recommendations 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.

 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 89/392/CEE 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 SpA 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.

2.1 GUIDELINES FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES


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

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**

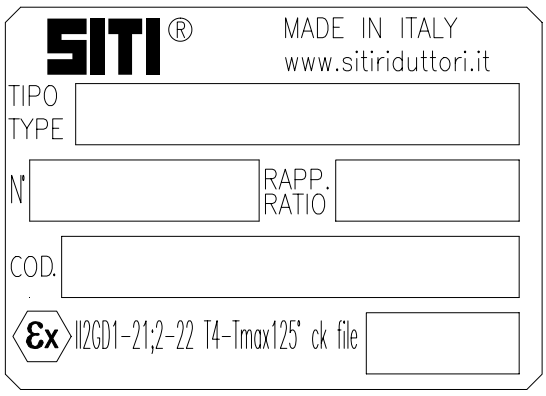
3.3 GEARBOX IDENTIFICATION DATA

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.

Information given on the plate
- TYPE: gearbox number.
- N°: number.
- RATIO: reduction ratio.
- COD: gearbox code-description
- Atex field.
- File: number of technical file.



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

3.4 SPECIFICATIONS

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.

4 INSTALLATION INSTRUCTIONS

The 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.

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.

4.2 DECOMMISSIONING AND DISPOSAL

When the gearbox has reached the end of its expected service life, it should be disassembled and disposed of. Drain the lubricant from the gearbox. Remember that oil greatly pollutes the environment. To drain it, take off the gasket as instructed in paragraph “Replacing the gaskets”.

Once decommissioned, dispose of the materials and oil in compliance with current environmental protection laws and standards.
Specialised companies should be contacted when disposing of materials. The user is responsible for assuring the company contracted is authorized and certified to handle toxic materials.

4.3 INSTALLATION INSTRUCTIONS

The position in which the gearbox is to be installed is given in the commercial catalogue.

5 GEARBOX OPERATING INSTRUCTIONS

5.1 IMPORTANT SAFETY INFORMATION

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

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 < 10^9W 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.
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.

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

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 considerable 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 highest allowable surface temperature is reached after approximately three hours of operation. The difference between the surface and room temperature must not exceed 50 °C.
If this difference in temperature 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.

Before starting up	**CHECK**
Once you have received the gearbox, careful inspection for shipping damage must be made.	
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 lubricant chart?	
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 one given in the gearbox manual? ☞ **Attention!** **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.**	
Have the parts at the inlet and outlet been installed in compliance with the ATEX directive?	

5.3 DURING OPERATION

Checks to be made

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

During operation	**CHECK**
Measure the surface temperature after approximately three hours of operation. The difference between the surface and room temperature must not exceed 50 °C. If this difference in temperature is exceeded, immediately stop the gearbox and contact the manufacturer.	

6 MAINTENANCE

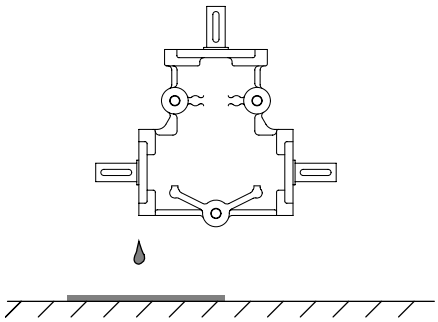
The maintenance schedule includes routine and periodic operations. Routine maintenance refers to operations during which the operator and/or specially trained maintenance workers have to inspect and check the parts. When performing periodic maintenance the operators have to replace, adjust and lubricate 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

Check the outside surfaces and air passages for ventilation on a regular basis to make sure they are clean. In addition, make sure no lubricant leaks from the gaskets, flanges, connections and screws of the covers, caps, etc... frequently.

☞ **Attention!**
The gearbox may be quickly and seriously damaged, often irreparably, if it is run without enough lubricant.

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.

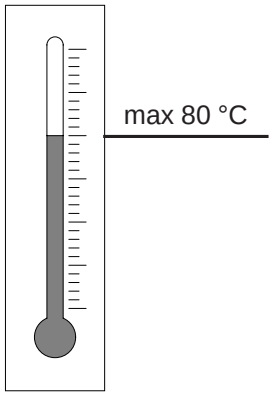


6.2 CLEANING THE GEARBOX

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

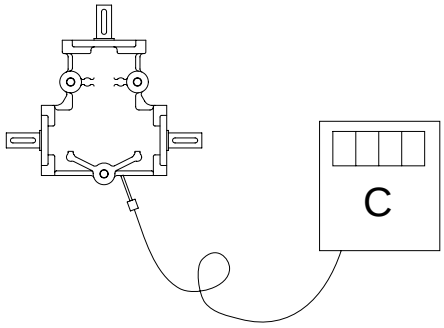
6.3 ACCEPTABLE OPERATING TEMPERATURE

The operating temperature is affected by several factors, such as the type of mechanism employed for transmission, type and quantity of lubricant used, gearbox specifications and structure, speed and power output and ambient in which the gearbox is used.
When gearboxes are employed, the allowable temperature may range up to 50 °C 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 have to withstand. When standard gearboxes are used, the maximum allowable inside temperature is 80 °C as higher temperatures may damage above all the gaskets.



6.4 CHECKING THE OPERATING TEMPERATURE

Adequate instruments should be used to measure the temperature outside the casing. Under regular work conditions, differences in temperature of at least 15-20 °C compared to the outdoor temperature are reached. The casing normally reaches temperatures that make it too hot to touch. Assuming the gearbox overheats just because it is too hot to touch has no foundations. In fact, the gearbox casing is too hot to be touched when its temperature is just over 50 °C. It is important to verify that the operating temperature at which the gearbox runs normally, under similar work conditions, remains constant. This factor is a sure sign that the gearbox is running with no problems.

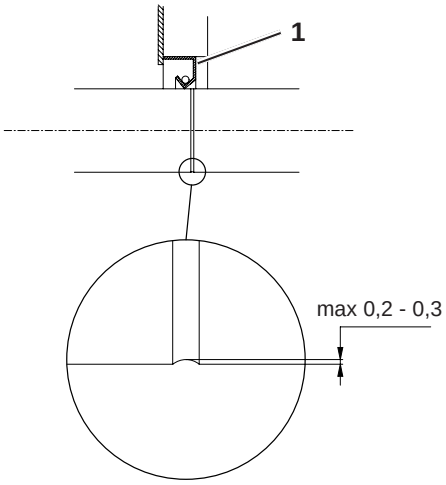


6.5 REPLACING THE GASKETS

Operation and the service life of a gasket are affected considerably by the operating temperature in the mating zone, chemical reactions that may occur between the mix and lubricant and its wear and tear condition.
The gasket should be replaced when:

- it does not seal efficiently and oil leaks out;
- the machine or plant is overhauled.

Whenever the gasket is no longer efficient, replace it immediately to prevent oil from leaking out any further and damage to other components.



The gaskets should be taken out by inserting the tip of a screw driver in point **1** and prying it up. Be careful not to ruin the surface of the shaft, particularly in the sealed area. Once the gasket has been removed, it must be replaced without delay as it is damaged when taken out. Do not reuse a gasket that has been removed. When installing a new gasket, follow the precautions listed below:

- check the condition and handle the product with care (avoid storing it for long periods as it may wear down prematurely, above all in humid environments);
- verify that the gasket's seat is perfect, i.e. free of longitudinal or inclined scratches, imprints, cuts, bends of surface defects;
- avoid allowing the lip of the new gasket to work on the same exact track as the previous one;
- if the mating zone of the gasket is found to be worn down a depth greater than 0.2 - 0.3 mm, do not install a new gasket under any circumstances. Contact our service center who will try to recover the shaft or in any case, locate the troubles that caused the damage;
- install the gasket perpendicularly to the axis with the lip free and not turned over or pinched;
- direct the gasket so that the lip faces the fluid to be sealed or the side in which pressure is exerted;
- grease the outside of the lip when gaskets with out dust covers are used;
- fill the jacket between the gasket and dust cover with grease when gaskets with dust covers are used;
- lubricate the gasket's seat on the shaft;
- do not use sealants as, if they dirty the lip or the shaft surface, they deteriorate rapidly;
- exert pressure to install the gasket as close as possible to the outside diameter;
- do not block the gasket axially or force it;
- always use suitable equipment to avoid damaging the gasket due to the presence of threads, drains, sharps edges, cables for tabs;
- always protect the gasket and its seat on the shaft whenever the gearbox is painted.

The aim of the precautions listed above is to prevent the gasket from running dry, above all when the shaft is first used. On the contrary, the mating zone will reach temperatures that are too high causing the gasket to wear down immediately: hardening of the lip, cracks, change in color.

6.6 LUBRICATION

All the gearboxes are delivered factory lubricated by SITI. They do not come with oil plugs as synthetic oil is used. This is considered a “life-long” lubricant, i.e. the gearbox does not require any maintenance. Use of oil rather than grease assures considerable improvements regarding application. Above all efficiency and performance are improved with layered lubrication conditions or when operation is intermittent, i.e. operation is mostly transitory, hardly ever reaching normal operating conditions. In addition, oil assures a much wider operating temperature range, regarding both low and high temperatures. When synthetic oil is used, the maximum and minimum operating temperatures are not determined by the characteristics of the lubricant but by the properties of the materials and heat dilation of aluminium.
The operator must fill the gearboxes with synthetic **ISO VG 320** oil as recommended by SITI.

Lubricating the gearboxes with synthetic oil guarantees optimal operation without having to perform maintenance and an unlimited life. In this case, maintenance includes only cleaning the outside of the gearboxes. Mild solvents should be used to avoid ruining the paint.

☞ Attention!
When changing the lubricant, observe the safety precautions given below:
- **The lubricant must not be mixed with mineral oils and is not compatible with nitro-cellulose paints and latex gaskets.**
- **Before changing the lubricant, make sure the gearbox has come to a full stop and wait until the lubricant has cooled down to a temperature at which the operator does not risk getting burnt.**

☞ Note
Dispose of the oil in compliance with current environmental protection laws and standards.

LUBRICANT CHARTS

Series R	**Factory lubricated with ISO VG 320**			
Gearbox size	R 9	R 14	R 19	R 24
Amount of lubricant (grams)	30	110	200	200

6.7 TIGHTENING TORQUE

For gearboxes and accessories

Screw threading Class 8.8	**Cast iron or steel twisting moment (Nm)**	**Aluminium twisting moment (Nm)**
M 4	2.9	2.3
M 5	6	4.8
M 6	10	8
M 8	25	20
M 10	49	39
M 12	86	69
M 14	135	108
M 16	210	168
M 18	290	232
M 20	410	328

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.

TROUBLE	CAUSE	REMEDY
Gearbox temperature too high	a) Gearbox faulty. b) Gearbox size incorrect. c) Gearbox installed in wrong position. d) Not enough lubricant present.	a) Repair or replace the gearbox. b) Replace the gearbox. c) Make sure the gearbox is the one you ordered. d) Contact the Service Center.
Oil leaks from shafts	a) Gaskets worn down or defective. b) Gasket seat on shafts worn down.	a) Replace gaskets. b) Replace gaskets and install them in a slightly different position or replace the shafts.
Oil leaks from gaskets	a) Gaskets defective.	a) Replace the gaskets making sure the sealing surfaces are perfectly machined.
Gearbox makes noise similar to a beat	a) Gear teeth defective.	a) Contact the Service Center.
Gearbox whistles.	a) Lubricant too low. b) Gears defective or worn down. c) Bearings defective or incorrectly installed.	a) Contact the Service Center. b) Contact the Service Center. c) Contact the Service Center.

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 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.

NOTES

NOTES

SITI SPA

SOCIETÀ ITALIANA TRASMISSIONI INDUSTRIALI

®

RIDUTTORI	GEARBOXES
MOTORIDUTTORI	GEARED MOTORS
VARIATORI CONTINUI	SPEED VARIATORS
MOTORI ELETTRICI C.A./C.C.	A.C./D.C. ELECTRIC MOTORS
GIUNTI ELASTICI	FLEXIBLE COUPLINGS

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