SPA
SOCIETÀ ITALIANA TRASMISSIONI INDUSTRIALI ®

K-MK

EN

MECHANICAL VARIATORS INSTRUCTION AND SPARE PARTS MANUAL

02.2025

Abstract

1. Introduction

1.1. Foreword

SITI S.p.A. thanks you for the trust granted and reminds you that your product is the result of a work of improvement our engineers are continuously pursuing, due to a constant research in the section.
Reading and understanding the present publication is an essential condition for a correct set up and following installation.
The Assistance network is anyway at your disposal in order to help you to settle all possible doubts that might arise.

1.2. Manufacturer's identification data

SOCIETÀ ITALIANA TRASMISSIONI INDUSTRIALI®

GEARBOXES
GEARED MOTORS
MECHANICAL VARIATORS
ELECTRIC MOTORS A.C./D.C.

HEADQUARTER and FACTORY

Via G. Di Vittorio, 4
40053 VALSAMOGGIA Loc. Monteveglio (Bo) - Italy
Tel. +39/051/6714811
Fax. +39/051/6714858
E-mail: info@sitiriduttori.it
WebSite: www.sitiriduttori.it

1.3. Communications with the technical assistance

For whatever communication with the Technical Assistance Center, please always mention the variator technical data appearing on the name plate, always located on the unit. These data will allow a whole identification of the variator (⇒ Identification name plate, 11).

1.4. List of contents of the manual

The present manual provides the installation, use and maintenance instructions of the product and refers to its use in the conditions as it will be clearly described in the following sections (⇒ Expected use, 10).
The present manual has been written in Italian as original language and thereafter translated into other languages. Therefore, the italian language constitutes the "ORIGINAL INSTRUCTIONS MANUAL", while the versions drawn up in other languages are to be considered "TRANSLATIONS OF THE ORIGINAL INSTRUCTIONS". Should you be convinced that the translation is wrong or missing a few parts, you are kindly requested to get in touch with the SITI S.p.A., who will provide to supply all the convenient clarifications and possibly to amend the translation where necessary.

1.5. Purpose and validity of the manual

The present manual offers the instructions for set up, use and maintenance related to variators of the series K-MK and complies with all the law dispositions, to the directives and to the rules which are in force at the time of the sale. The copy of the manual delivered along with the variator cannot be considered inadequate simply because it has been subsequently updated due to new experiences. Should any possible changes, adjustments etc.. be carried out to the marketed units in a following moment, they neither will force the manufacturer to come in action retrospectively on products previously supplied nor to consider the same products and the related manual as missing or unsuitable.
Possible further inclusions to the manual that the manufacturer will feel convenient to send to customers will have to be saved along with the manual, which they will represent integral part of.
The warranty related to the good running and performance and full compliance of the variator with the expected service is strictly dependent on the correct application of of instructions held in the present manual.

1.6. Addressees of the manual

The present manual is addressed to:
- the manager of the plant;
- the personnel in charge of set ups;
- the personnel in charge of the maintenance.

The manual has to be guarded by a responsible person and kept, in the best status of preservation, in a place suitable to be always available for the consultation by the persons it is addressed to.
In case of loss or deterioration, the replacing documentation is to be requested to the manufacturer, indicating the reference data given on the identification plate (⇒ Identification name plate, 11).

1.7. Choice and qualification of the personnel

For the operations of handling, set up and maintenance, the user will have to commit the task to operators who have at their disposal the following features:
- Degree of education and training are adequate in view of the operation to be carried out.
- Knowledge of what is illustrated in the present manual in relation to the operation to be carried out.
- Knowledge of the accident prevention rules which are in force at the moment of use.
- Physical conditions suitable to the operation to be carried out.
- Equipment and use of certified individual protection devices.

1.8. Symbology used

Instructions are tied to symbols aimed at making the reading easier, by clarifying the kind of information supplied.

 Generalized danger for the safety of human beings.

 Important remarks in view of a correct usage without causing damages to the equipments.

 Instructions related to variators expected for set up in environments having a potentially explosive atmosphere, complying with the directive 2014/34/UE (ATEX).

1.9. Glossary

P.P.E.
Acronym of Personal Protective Equipment.

1.10. Warranty

- Our warranty has a validity of one year, starting from the date of invoice of the product. It is limited exclusively to the free of charge repair or to the free replacement of the parts we recognize defective; checks intended to ascertain whether warranty can apply will be always carried out in the plant of the Seller or by one of the authorized branches. The claim can neither give rise to the cancellation of orders and not even to a high reduction of deliveries nor to the suspension of payments by the Buyer; not even the payment of a compensation in money of any kind effected by the Seller can be acceptable.
  Our warranty will expire if the pieces sent back as defective ones will prove to have been in any way altered or repaired without our previous written authorization; moreover, it will expire in case the Buyer fails in anyone of his contractual obligations, especially in reference to the payment conditions.
- Our warranty does not cover any damage or failure due to external factors, a missing maintenance, overloads, unsuitable lubrication, wrong choice of the type of unit, assembling error, caused by external components and by components subject to wear and deterioration as well as damages arising as a consequence of the transport carried out on account of the customer or through a transporter designed by the customer, considering that the shipment is always carried out on account and at risk afforded by the Buyer.
- Expenses (like for instance disassembling, labour, re-assembling, transport, board and lodging), which are undertaken due to the outer service of personnel of the Seller, even after acknowledgment of the warranty, are always on charge of the Buyer. On charge of the Seller, there are to be considered the components acknowledged under warranty and the time necessary for the replacement of the same.
- Any sort of compensation is not included and not even direct or indirect damages can be claimed (even towards thirds).
- The requests for repair under warranty and/or out of warranty are to be communicated by written through the suitable module to SITI S.p.A. in view of the acceptance of the repair.
  Material to be repaired either under warranty or anyway subject to troubles, will be withdrawn by our Company only if it is sent back at free port following up a written request, and it will be sent back with transport freights covered by the customer.

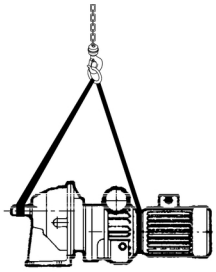
2. Accident prevention advices

2.1. General warnings

- It is prohibited to bring any kind of modification to the variator, without a previous authorization granted by the manufacturer.
- It is prohibited to use the variator in a potentially explosive atmosphere, unless the unit has been purposely pre-arranged for the use in such kind of atmosphere.
- The surface of the variator while operating might reach high ranges of temperature, such to cause skin burns. It is strictly recommended to check the temperature value of the outer surfaces of the variator, prior to enforcing any kind of service on the unit (⇒ Measure of the running temperature, 19).
- Whenever one is operating near the variator, it is recommeded to wear a protection equipment, suitable for the operation to be carried out. All clothes worn while operating near a unit are to be close-fitting to the body. It is strongly recommendable to refrain from wearing ties, necklaces or belts, which might get caught by or squeeze in the rotating parts of the unit. It is necessary to always wear individual own protection devices, as called for by the manual in view of carrying out some kinds of service on the units.

2.2. Residual risks

In the stage of design and calculation of the variators,an accurate analysis has been carried out about the risks, which the operators in charge of maintenance might be subject to, while they effect the maneuvres and other kinds of maintenance and, due to this, all possible precautions have been taken, in order to make the variator safer and more reliable.
There are anyway a few conditions of risk depending on the installation type and on the operating conditions, which may be removed just by using simple precautions, as indicated on the manual in the related paragraphs.

Risk: crushing **Eventuality / risk location** Fall / crash of the variator during transport / set up stages. **Protections / precautions** Wear all P.P.E. called for. Comply with the instructions given in the manual (⇒ Handling and transport, 12).	

Risk: burns **Eventuality / risk location** By touching the variator during the use and maintenance. **Protections / precautions** Wear all the P.P.E. called for. Comply with the instructions given in the manual (⇒ Measure of the running temperature, 19) and (⇒ Oil replacement, 23).	

Risk: irritation of skin / eyes **Eventuality / risk location** Replacing / re-filling oil during the maintenance. **Protections / precautions** Wear all the P.P.E. called for. Comply with the instructions given in the manual (⇒ Oil replacement, 23).	

2.3. Advices for the use in a potentially explosive atmosphere

	 **Danger!** **Mixtures of explosive gases or high powder concentrations may cause serious damages especially when they get in touch with hot rotating parts of the variator.** Set up, connection, start up, maintenance or repair works on variators are to be accomplished only by specialized and qualified techniciens, who have to comply with the following prescriptions: • Follow all manufacturer's instructions. • Take care and comply with all notice marks and information signs applied on the variators. • Strictly follow the specific rules related to the installation on which the variator is operating. • Strictly follow all rules which are in force in the country of manufacture (protection against explosions, safety, risk prevention).

2.4. Installation of parts on account of the customer

 **Caution!**
Prior to being set in motion, the variator must be provided with a few parts, essential in view of a full safety in the use and operations.

After set up, the user is requested to equip the variator with adapted repairs, suitable to protect rotating parts connecting input shafts and output shafts. On the protections, the following pictographs are to be applied:

 Do not remove the protections.

 Obligation to keep protections effective.

 **Caution!**
The SITI S.p.A. declines any responsibility in case of damages occurring to things or persons, caused by the use of the variator without taking all the due protections as mentioned here above.

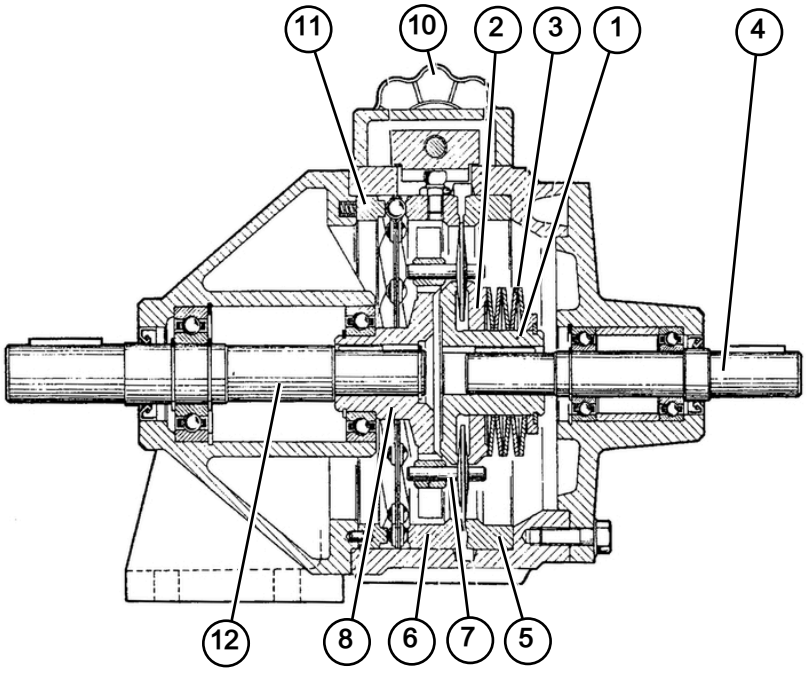
3. General information

3.1. Description and running principles of the variator

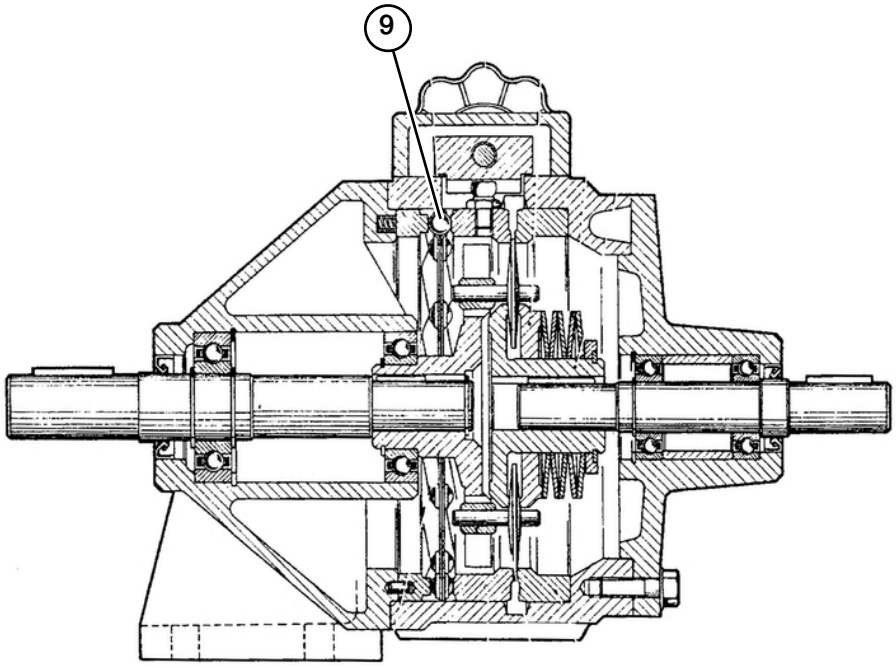
The functional heart of a variator consists of the following components:
- planets **7**, in number from 3 to 6 depending on sizes;
- the two inner tracks, one of which is fix **1** and one moving **2**;
- the two outer tracks, one fix **5** and one moving **6**, plus the fix outer ajustment track **11**;
- the spider **8**, a piece mutually connecting the several planets, keeps them spaced one from the other, while enabling them to move in the axial direction during the adjustment phase, and receives their revolution motion around the variator rotational axis.

Remark:
In the following description, with the term fix track and moving track it is meant: fix or moving in the axial direction.

Planets are disks with a variable thickness, proportionally decreasing from the center to the periphery. They are kept clawed from tracks in two positions: the two inner tracks tighten themselves on the planets on the inner side and exert this action under the effect of an axial force, transmitted by the cup springs **3** which, on their turn, exert a thrust on the inner moving track. The two outer tracks shut the planet on the outer side, anyway without exerting any force.
In this way,when the variator is set in motion and the inner tracks turn at the same angular speed of the input shaft **4**, planets get the motion from the inner tracks in the contact point and, due to the force exerted by cup springs as well as to the friction coefficient, turn freely without rubbing at the same peripheral speed of the inner tracks in the contact point.
Planets are in contact even with the outer tracks at one point but, occurring said contact there without action of any force, roll on the throat vacated between tracks, moving substantially as a wheel on rails.
As things are like that, planets are subject to a double movement: a rotation around their own axis and, at the same time, a revolution motion around the variator axis. The revolution motion is wholly transmitted to the spider, which planets are connected to. In its turn, the motion of the spider is transmitted to the variator output shaft **12**.
When changing the radial position of planets (which is obtained by manually rotating the handwheel **10**), the point of contact with the tracks changes and thus even the peripheral speed planets get from the inner tracks changes as well.
In this way, both rotation and revolution speeds change anf thus even the variator output speed, being input speed the same.



What has been described here above represents the ideal situation, since in the practice some little creepings of planets with respect the tracks cannot be fully removed. Said creepings can be however reduced to the smallest possible amount, taking care as much as possible of dimensional tolerances and of surface finishing of planets and tracks.
The connection between planets and spider occurs by means of bushings sliding in a radial sense. This enables to be able to modify the radial position of planets, during the speed adjustment phase, while arranging that the spider integrally receives the revolution motion from the planets.
In addition to the two outer tracks, the inner and the outer one, there is on the outer portion of the housing the fix outer adjustment track, the task of which is the one to enable the perfect accomplishment of the ajustment phase, with a smoothly matching of planets in their new position.
Both the fix outer adjustment track and the outer moving track are equipped with cams on their rear surface.
Between the two tracks, a ball ring **9** is interjected.
This allows that, when the outer moving track moves axially during the adjustment , this arrangement is mantained steady, without adversely affecting the settlement of the components in their new operating position.
The inner tracks rotate at the variator input speed, while the outer tracks are fix inside the housing.
The axial mobility of the inner moving track and of the outer moving track plays a major role in the mechanism of motion transmission and speed adjustment.

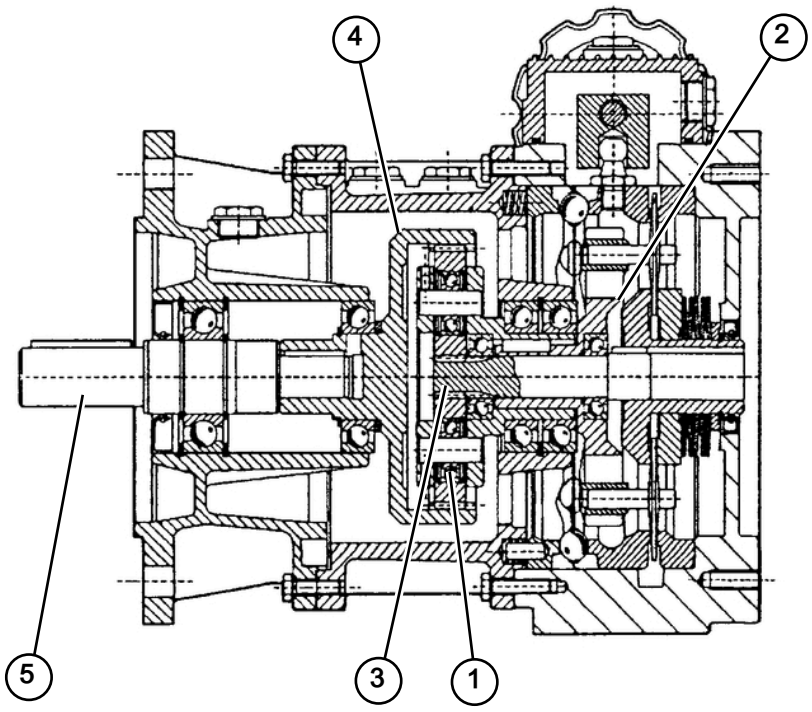


3.2. Description and running principles of the differential equipment

Variators may be equipped, upon request, with a device called differential equipment, which enables to achieve an output speed equal zero, although the variator is regularly operating.
Specifically, the differential equipment consists of a planetary gearbox fitted immediately downstream of the variator, consisting of two input connections and a single motion output.
The two input connections are respectivelly: one at a fix speed, corresponding to the one of the variator input shaft and located on the central pinion; the second one at a variable speed, located on the spider of the differential equipment and fed at the same speed of the spider of the variator.
The essential components of the differential equipment are:

- The planets **1**, rotating around their own axis and effecting at the same time a revolution around the axis of the differential equipment, while they match and slide on the toothing of the central pinion and on the one of the crown wheel with inner toothing.
- The spider **2**, a piece connecting the planets one with the other and rotating at their same revolution speed; the spider of the differential equipment is connected with the spider of the variator and is driven by this one.
- A pinion with outer toothing **3**, rotating at the same input speed of the variator.
- A crown wheel with inner toothing **4**, put in rotation through its mating with the planets, the motion of which is then transmiited to the differential equipment output shaft **5**.

The availability of zero speed is useful for effecting maintenance operations on the installation, without needing to electrically disconnect the variator feeding.
A variator with differential equipment cannot be used to operate at particularly low speeds, because in these operating conditions the torque actually available is practically nothing.
Variators with differential equipment can be further equipped with a gearbox with one or two reduction stages, in order to further reduce the max. operating speed.



3.3. Expected use

The variator has been designed and manufactured in order to directly transmit the rotational motion, operating a rotation speed reduction between input and output shafts and, at the same time, accomplishing a continuous variation of the output speed between a maximum and a minimum value. Output speed may be changed manually by means of an outer drive through the handwheel. Performance and limitation of use are clearly specified in the technical/commercial catalogue, which is available upon request or may be downloaded from the site www.sitiriduttori.it

	 Only in case ATEX mounting is purposely requested, the variator can be used for operating in environments meeting the following requirements: Group: **II** Category **2 G / 2 D** Protection mode (not electrical): **Ex h** Modes of protection used: **"c" constructive safety - "k" immersion in liquid** Gas / Dust Group: **IIC / IIIC** Zone: **1 / 21** EPL: **Gb / Db** Maximum surface temperature: **T4 / T135 °C** **II 2G Ex h IIC T4 Gb** **II 2D E xh IIIC T135 °C Db** **-20 °C ≤ Ta ≤ + 60 °C** Ambient temperature: - 20°C min., +60°C max. Different ambient temperatures from the mentioned ones are to be evaluaded along with our Engineering Dept. Marking according to rules IEC EN 80079-36, IEC EN-80079-37.

3.4. Prohibited uses

The variator cannot be used for purposes different from the expected ones.
The standard variator cannot be used in environments characterized by a potentially explosive atmosphere. For such a use, it is necessary to require the special version fulfilling the directive 2014/34/UE (ATEX).

3.5. Declaration of incorporation

In compliance with the Machinery Directive 2006/42/CE, the variator, being intended to be built in and/or fitted on other machines or machine components,is considered a "component", therefore it cannot be put in service as long as the machine, on which it will be built in, has not been declared in conformance with the Machinery Directive 2006/42/CE.

 **Remark:**
The subject product complies with the above mentioned features and with the ones given on the catalogue which is in force at the production date. SITI S.p.A. reserves the right to change them, in order to adapt them to the technology or material variations occurred.

3.6. Variator identification data

3.6.1. Identification name plate

The variators are equipped with an identification name plate, showing the following pieces of information:

• Variator code • Type of variator - Transmission ratio - PAM - Version • Additional description • Serial number • Bar code and or QR Code for internal traceability	

	In case of variators fulfilling the directive 2014/34/UE (ATEX), the specific name plate ATEX is applied, on which the following information is given: • Variator code • Type of variator - Transmission ratio - PAM - Version • Additional description • Serial number • Bar code and/or QR Code for internal traceability • Compliance with ATEX classification	

 **Remark:**

The name plate must be always preserved in a way to be readable in relation to all data shown on it, providing periodically to its cleaning.

Should a name plate deteriorate and/or result to be not readable any longer, even in one only of the data appearing on it, it is recommended to require a new name plate to the manufacturer, mentioning the data which are still readable, and then provide to replace the name plate.

3.7. Technical specifications

Dimensions and performance

Features, dimensions and performance of variators are given in the related technical/commercial catalogue available on request or they can be downloaded from the website www.sitiriduttori.it.

Noise

The level of noise emitted by a variator during a running period at full load in the worst operating conditions is always remarkably below the value of 70 dB (A).

3.8. Stocking

If, prior to set up, a period of stocking is expected, it is necessary to adhere to the following rules:

- Avoid to stock outdoor, in areas exposed to the bad weather and with excessive humidity.
- Always avoid the direct contact with the floor; for instance, use pallets or materials of another nature which anyway are such to insulate the product.
- For times of stocking longer than 60 days, it is recommended to coat with anti-oxidation products shafts, flanges and anyway all not painted surfaces.
- For times of stocking longer than 6 months, it is necessary to coat with grease all non machined parts, in order to prevent oxidation. Completely fill in the variators with oil, keeping attention that the fill-in/breather plug is placed in the upper zone; of course, at the time of setting the unit up, it will be necessary to recover the proper oil amounts (⇒ Oil amount, 21).

4. Handling and transport

4.1. Handling and transport

Caution!
Read carefully and comply with the following instructions prior to handling the variator.

P.P.E. Helmet, safety shoes and protection gloves

- Usually the variator is delivered in the condition of assembled and packed unit. Should the product be delivered packed in cardboard containers, handle the packed product with suitable means of weight-lifting in compliance with the law rules.
- Do not stop or move below suspended loads during lifting and transport operations.

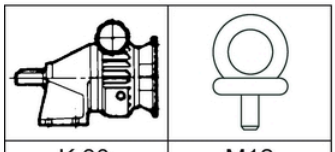
The packages which include more variators are to be lifted and handled with appropriate and suitable means, adequate to the dimensions and weights involved, like transpallets, lift trucks, overhead travelling cranes using ropes, cables, belts or suspension chains.

Single variators or motor variators packed or deprived of the package must be lifted with the following operational modes:

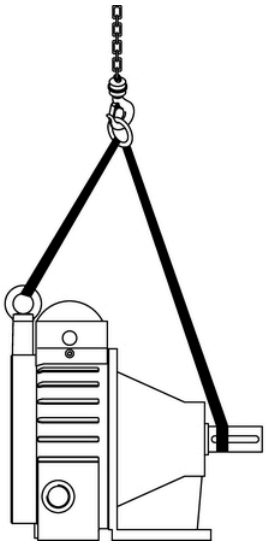
- if their weight is equal to or lower than 15 kg they can be moved by hand;
- if their weight is higher than 15 kg, they must be moved with suitable lifting and transport means,as indicated above. Especially, the unpacked variators are to be hooked and secured with a sling, as it has been described as an example, arranging ropes or chains as it is requested by the product conformation.

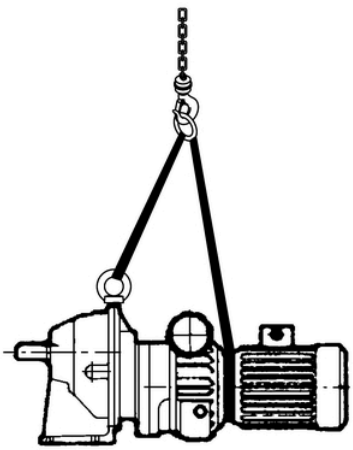
On the variators K-MK 30/50/100 there is a tapped hole conceived for fitting a golfare (not supplied), by means of which it is possible a safe hook (see table of dimensions). In the case of motor variators, a second belt has to be arranged, in order to distribute and correctly balance the weight.

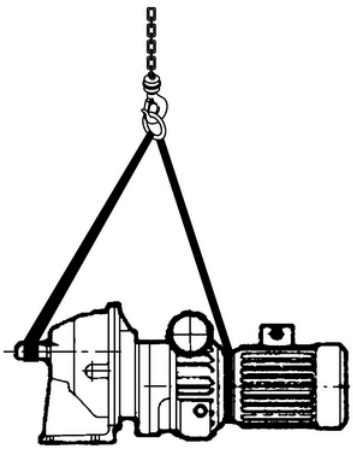
Caution!
- **Make sure that the grip of the load is steady and safe, even in case of oscillations.**
- **The golfare is suitable for lifting a single variator or a motor variator and not for lifting the whole complex of components which it will be fitted on.**



K 30	M12
K 50	M12
K 100	M12







5. Set up

5.1. Set up

Caution!

All actions of set up, assembling and setting on account and on behalf of the buyer must be accomplished by qualified personnel. A wrong set up might lead to dangerous situations for the safety of the personnel and could give rise to serious or even irreparable damages to the product itself and to the connected machine.

Variators are supplied already assembled in their main parts. Therefore, set up consists in placing and then fixing the variator in the place where it will operate, connecting input and output shafts to their matching parts, and carrying out the electric connections of the electric motor, whenever needed.
While setting a variator up, it is requested to adhere to a few strictly severe prescriptions:

- Make sure that the environment, where the variator will operate, does not highlight any unexpected conditions, like:
  - potentially explosive atmosphere;
  - immersion in water or corrosive solution;
  - vapours, radiations.
  For applications in peculiar environmental conditions, please consult the SITI S.p.A.
- It is necessary to avoid, or at least to reduce as much as possible narrowings and throttlings in the air passages and especially the presence of heat sources located nearby variators and such to be able to remarkably affect the temperature of the refrigerating air. Furthermore, its is necessary to prevent from an insufficient air circulation, which might compromise the regular heat removal from hot variator parts.
- Prior to setting the variator up, make sure that fill-in, unloading and level inspection plugs have been placed in the correct location in relation to the requested mounting position of the variator (⇒ Mounting positions, 15) and that the recommended oil has been used for filling the unit (⇒ Lubrication, 20).
- It is essential to fit the variator in a way such to avoid that it is subject to vibrations while operating. In fact, vibrations, in addition to causing noise, give rise to other kinds of problems, like the possible progressive unscrewing of the connection screws as well as an increase of loads acting on the inner parts submitted to fatigue stresses.
- Fixing surfaces are to be clean and are to have a sufficient microfinish in order to arrange that a good friction coefficient is available. In the screws and in the connection plains it is strictly necessary to use self-locking stickers.
- It is recommended to avoid as much as possible the fact of assembling cantilever mounted pinions and to reduce to the highest possible extent the stress of chains and belts. Should outer loads be there, it is suggested to use pins and positive stops.
- Prior to going ahead with the assembling, it is necessary to take particular care to clean accurately and lubricate the mating surfaces, in order to avoid possible oxidations and seizures.
- Never use the hammer for assembling and disassembling fitted parts, but use the tapped holes provided on the shaft heads for suitable removal implements.
- It is of prior importance, in view of a good performance of the variator in operating conditions, to take care with the greatest attention of a good alignment of the variator with respect to the motor and to the machine to be driven. Whenever it is possible, it is recommended to fit elastic or self-aligning couplings. It is even suggested to proceed with a particular accuracy whenever an outrigger bearing is fitted, because possible errors in the alignment of this component would unavoidably involve the rise-up of overloads which would consequently destroy a bearing or break the shaft.
- When three-phase asyncronous electric motors are used and their start-up occurs in no load conditions or anyway under very restricted loads, it is necessary to accomplish very smooth starting times, very limited starting currents, even very restricted stresses and, whenever necessary, use the star/delta starting system.
- Whenever the application involves overloads of long duration, frequent shocks and danger of lock off, it is imperative to fit a motor saving system, electronic torque limiters, hydraulic couplings, safety couplings or control units.
- In case of use with a service factor involving several startings under load, it is recommended to make use of a motor protection by means of thermal sensors, in order to prevent the rise-up of dangerous overloading conditions for the motor, which might lead motor windings to overheat and thus to melt and fail.
- During the possible painting of the machine on which the variator is fitted, it is strictly recommended to protect the outer edge of shaft seals, aiming at preventing paint to make rubber dry, thus compromising the sealing effect.

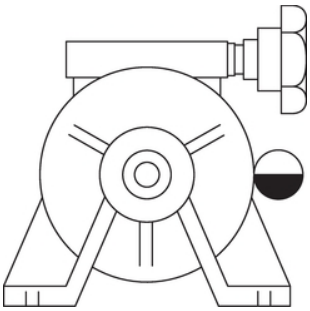
	It is advisable to use plastic inserts whenever there is a risk of elecro-chemical corrosion between variator and actuator unit (due to the connection of different metals). Moreover, please provide all bolts with plastic washers! The plastic material used is to have an electric loss resistance < 10^9 W. Provide the outer structure with earth connection, furthermore use bolts with earth connection of the motor for the motor variators. Assure a convenient and sufficient cooling air flow and make sure that there is no return of heated air, coming from other devices.

5.2. Check and predisposition

Prior to proceeding with the variator mounting, the folllowing checks are to be carried out:

- After unpacking the gearbox, it is recommended to carry out a visual check, intended to realize whether there is full compliance with the order, whether the product integrity is assured and whether there is absence of defects on all gearbox parts. Should it be found out that there is no compliance with the order and/or presence of failures or damages, this will have to be promptly communicated to the SITI S.p.A.
- Make sure that the product is suitable to the requested use.
- Check the appropriateness of the structures on which the unit will be mounted, in relation to the actions and reactions due to the load application.
- Check the conformance of the mounting position indicated in the order acknowledgment with the wished one (⇒ Mounting positions, 15). A possible change of the mounting position can be accomplished only after having consulted the SITI S.p.A. and after having received their authorization, otherwise warranty and the possible conformity with the directive 2014/34/UE (ATEX) will expire.
- Make sure that the spaces available for set up and mounting can comply with the need of providing an easy assembling, maintenance, access to the plugs (⇒ Mounting positions, 15), air circulation, etc.
- Check whether the unit has been supplied complete with lubricant.
  Units without plugs are filled in by SITI S.p.A. and are provided with lifetime lubrication.
  Units with plugs might be delivered with or without lubrication oil, depending on the type and size (⇒ Oil amount, 21).

Therefore, it is strictly necessary to check whether there is actually lubricant inside the gearbox and, for certainty, inside the variator too, by watching through the suitable inspection plug, firstly providing to directing the gearbox in conformance with the actual expected mounting position (⇒ Mounting positions, 15). In the opposite case, please proceed with oil filling in (⇒ First filling in of the variator, 16).



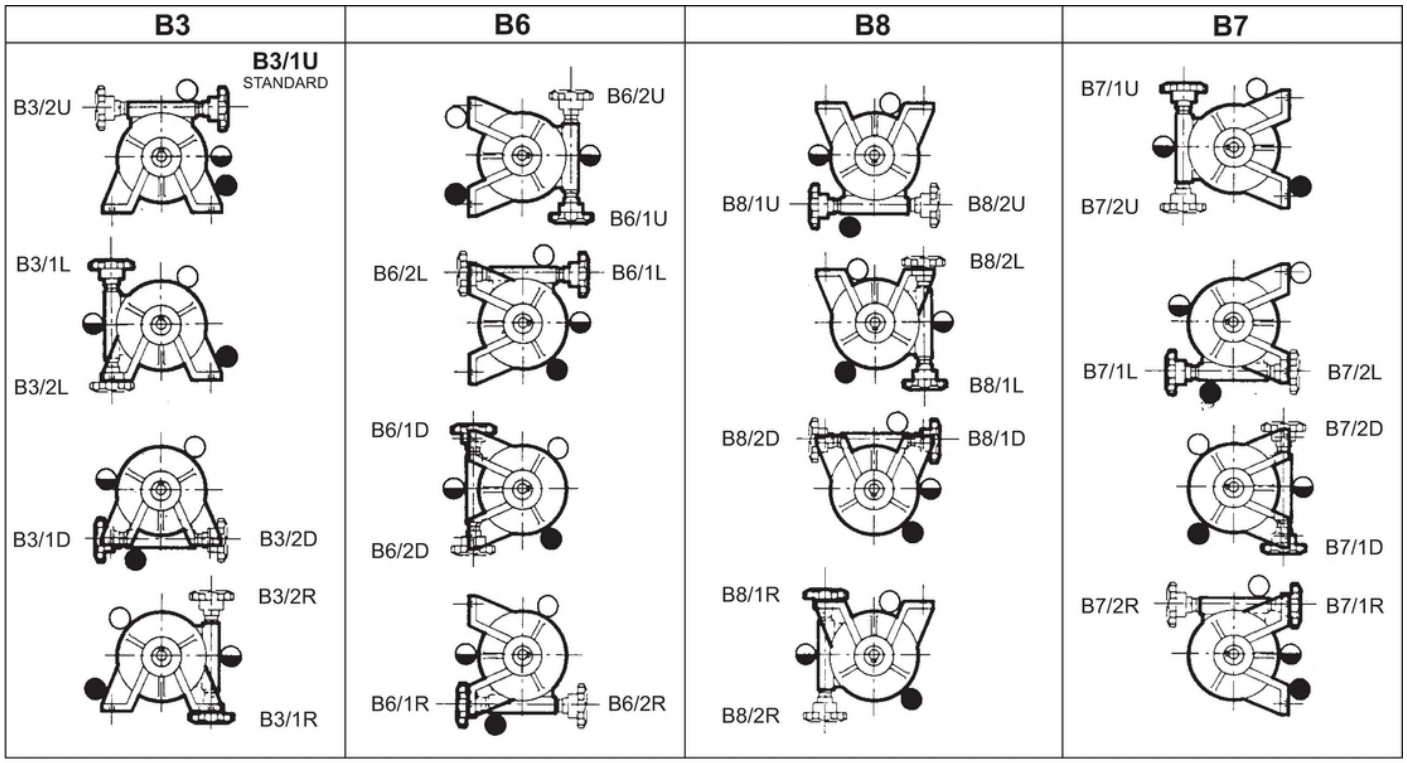
5.3. Mounting positions

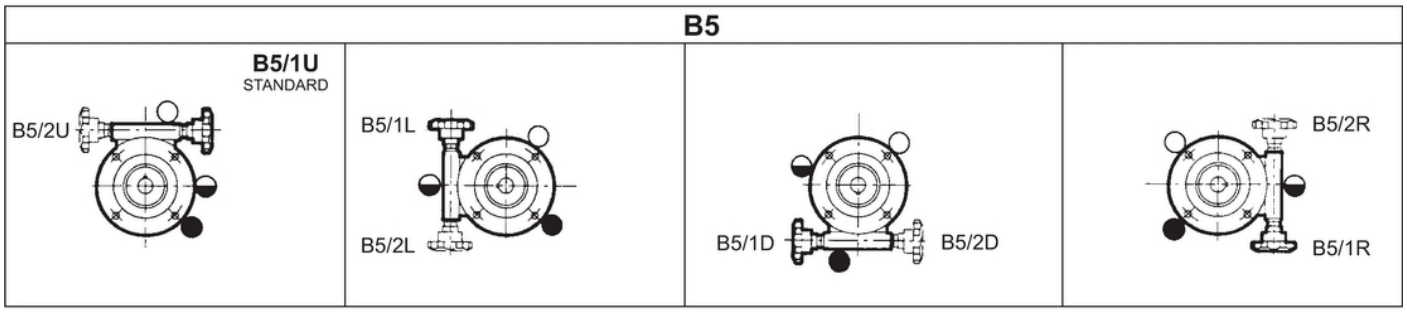
The following sketches show the typical mounting positions of a variator with the corresponding identification abbreviations. On a side of the variators, the positions of fill-in and breather plug, inspection and unloading plugs are even shown with circular symbols.

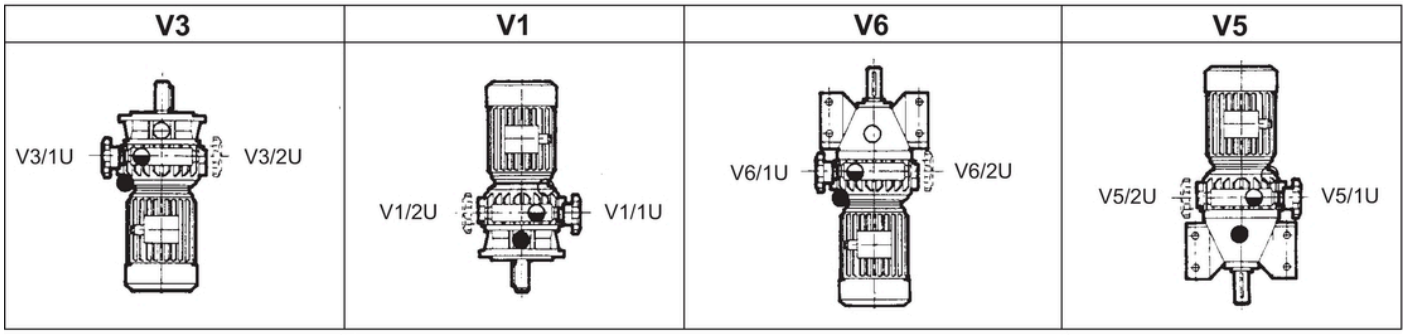
○ Fill-in and breather plug

◒ Level plug

● Unloading plug







5.4. First filling in of the variator

P.P.E. Protection gloves and mask glasses

- Check that the unloading plug, located in the lowest position, and the level plug have been corrrectly fastened.
- For filling oil in, use the fill-in/breather plug, located in the upper gearbox portion. Oil amount to be filled in is given in the table (⇒ Oil amount, 21), but we point out that said amounts have a merely indicative value; the user will have in any case to fill oil in, until the oil level visible at sight on the level plug has been reached, once the variator has been already mounted in the correct mounting position (⇒ Mounting positions, 15).

6. Instructions for the use of the variator

6.1. Preliminary checks

Prior to the start up, a few very important checks are to be carried out:

- Make sure that the set up has been accomplished in a correct way, complying with all the prescriptions given on the chapter devoted to set up.
- Find out the temperature of the environment where the variator is mounted and pre-arrange a thermometer suitable to register the surface temperature (⇒ Measure of the running temperature, 19).

	**Prior to starting a variator mounted in an environment with potentially explosive atmosphere, according to the ATEX 100a directive, the following checks are to be carried out.**	✓
Inspect the packing, in order to check the status of goods at the moment of delivery.		
The following pieces of nformation given on the variator name plate correspond to the kind of explosive atmosphere approved: group, category, anti-deflagration zone, class of maximum allowed surface temperature.		
Do you feel sure that we are not in presence of a potentially explosive atmosphere, consisting of oils, gases, acids, vapours, radiations active during the variator set up?		
Does the ambient temperature meet the values given on paragraph (⇒ Check of running temperature, 18)?		
Make sure that variators are sufficiently ventilated and that there are no outer sources of heat inlet (e.g. through connectors).		
Does mounting position correspond to the expected one? (⇒ Mounting positions, 15).  **Caution!** **Any change of the mounting position can be carried out only if authorized by the manufacturer. ATEX compliance will expire in case of a missing consultation with the manufacturer.**		
Is oil level correct? (with the variator located exactly in the requested mounting position) (⇒ Check of oil level, 22)		
Are unloading and inspection plugs (whenever expected), as well as breather valves all easily accessible?		
Have input and output parts been mounted according to the ATEX rules?		
In case of motors driven by a frequency converter: make sure that the motor is regularly certified in view of its usage in combination with a frequency converter.		

6.2. Running in

All variators are imperatively to be submitted to a running in time, which is strictly necessary in order to allow that the contact surfaces subject to friction between planets and tracks may mutually match, thus reducing the heat amount originated due to the sliding friction.
During the first running hours, all variators, but especialy the larger ones, trend to achieve levels of temperature particularly high. Only during running in time, the operating temperatures trend to go down progressively, due to the reduced heat generation, up to becoming steady on standard levels. The ideal running in time has to last at leat 300 hours. The ideal condition on which to effect the running in is the one to modify the variator speed, in order to modify the contact surface between planets and tracks, thus preventing from originating the first wear marks on the same contact zone.
During running in, it must be made sure that the torque applied does not exceed in any condition the max. value allowed (see General catalogue- Peformance tables). Should it be impossible to modify the variator speed during running in, it is convenient to apply, at the beginning, values of torque lower than the max. allowed one (at least 20% lower), for then progressively stabilizing on higher values, up to reaching the max. torque allowed.
This kind of running in is to be applied both to single variators K-MK and to variators with one stage gearbox (K-MK../1) or to vaiators with two stages gearbox (K-MK../2). In these two last cases, running in refers even to the gearbox connected to the variator.
At the conclusion of the running in of 300 hours, it is strictly necessary to provide to the oil replacement and it is recommended even to change the oil of the connected gearbox, in case it is filled in with a mineral oil (⇒ Oil replacement, 23).

6.3. Checks during running

6.3.1. Check of running temperature

P.P.E. Heat insulated gloves

The speed variator is a device transmitting power through friction and its running is, for this reason, associated to a heat generation. Therefore, during running in, it is necessary to mantain the operating temperature controlled.
The temperature achieved inside the variator depends on several factors:

1. variator size.
2. input speed.
3. output speed.
4. mounting position.
5. ambient temperature.
6. type of coupled gearbox.

The actual operating temperature is achieved by the variator only after completion of the imperative running in time of at least 300 hours. During running in, due to the progressive adaptation of planets and tracks, there is a progressive sliding friction, generating temperatures remarably higher than the ones at which a variator will stabilize at the end of running in time. The variator achieves a max. temperature, which then gradually goes down, up to reaching the one defined as the operating temperature (which is to be intended as the temperature after running in).The table shown here below gives the average value of the running temperature increase Δt (intended in the above mentioned meaning) compared to the ambient temperature and related to the mounting position B3/1U, use of a 4 poles motor and with the variator adjusted at its maximum speed.
The temperature check can be effected by measuring the surface value, by making sure that the differential value Δt, given on the table, is not exceeded. If this occurs during the period following the running in and in standard conditions, it is necessary to stop immediately the variator and apply to SITI S.p.A.

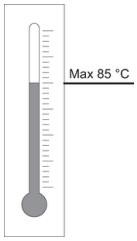
	Δt
MK 2	20 °C
MK 5	20 °C
MK 10	25 °C
MK 20	25 °C
MK 30	40 °C
MK 50	40 °C
MK 100	50 °C

 **Remark:**
Please keep in mind that this value, like many other values of the max. admissible temperature mentioned in this manual, refers to environmental conditions characterized by an ambient temperature of + 20 °C, poor conditions of ventilation (air speed ≤ 0.5 m/s) and applies when running in time has been completed and in case of use of the variator at its maximum allowed speed as well as with the highest allowed load applied (as given on the catalogue in reference with the performance data of the unit).

Even light chances compared to these conditions might meaningsfully affect the variator temperature.

- During the running in phase (first 300 - 400 operating hours), the temperature increase Δt might be even 25% higher than in rated conditions.
- For the V1 - V5 mounting positions (vertical positions with the output shaft directed downwards), the values of temperature might be even 10% higher compared to the ones found for the B3/1U mounting position, due to the increased oil amount held inside the unit and due to the different shaking condition of the refrigerating fluid.
- When using a 2 poles motor (allowed only up to size 20), the temperature increase values Δt might grow up to a percentage of 25% compared to the values given on the table.
- At the decrease of the variator output speed, oil temperature trends to remarkably decrease as well.

Standard shaft seals are made in nitrile rubber compounds NBR and are suitable to operate in the range of standard operating temperatures included between about -15 °C and +85 °C. Should temperature inside the variator reach and keep for meaningful time intervals some values out of this range, it is necessary to require a special version of the variator, which is to be equipped with shaft seals made in fluorinated compounds FKM (trademark: Viton) for temperatures higher than +85 °C or in sylicon rubber compound called VMQ, for temperatures lower than -15 °C.



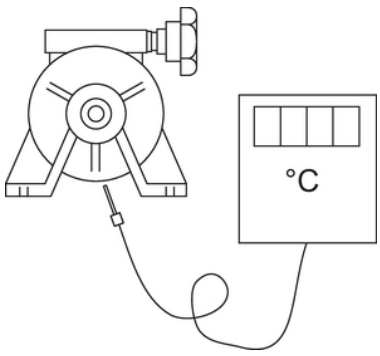
	During the running of a variator mounted in a potentially explosive atmosphere, according to the directive ATEX 100a, the following check operations are to be carried out.	✓
Measure the surface temperature after about 3 hours of continuous service. The temperature differential in comparison with the ambient temperature has not to overcome a value of 50 °C.		
Should said temperature differential be higher, stop the variator immediately and consult the manufacturer.		

6.3.2. Measure of the running temperature

P.P.E. Heat insulated gloves

Caution!
Do not touch the variator prior to providing to the detection of the actual temperature with a thermometer.

For measuring the outer temperature of the housing, it is necessary to equip oneself with a thermometer provided with a temperature detection sensor. Any evalution effected by touching the variator with a hand might be dangerous and additionally not reliable at all. In optimal conditions of use, the temperature of the housing rises up of at least 15-20 °C compared with the environment and the values of temperature usually reached by the housing during the running conditions are mostly too high to be born by the human skin. The fact of believing that a variator warms up too much because it is not possible to keep the hand on its housing is a statement missing any rational foundation. In fact, as soon as the temperature is even slighlty above the value of 50 °C, the most of people are unable to keep their hand over the variator housing, although this is still a completely acceptable running temperature of an unit. It is important to make sure that the running temperature at which a variator stabilizes in rated operating conditions, when there are the same modes of use, is more or less a constant value, considering that this a signal that the unit is operating without the possible rise up of adverse effects.
The variator surface temperature must be detected in the area of transition from variator to motor, where the location of the electric motor clamp hinders a correct ventilation.



7. Lubrication

7.1. Lubrication of variators

The lubrication of the variator occurs through oil shaking and projection.
All variators are supplied already lubricated from SITI S.p.A. For the filling in of variator, SITI S.p.A. usally employs the oil type SHELL ATF Dexron III, a fluid on mineral base for automated transmissions specifically suitable for transmissions of high quality, which can be used for several automated transmissions of motor cars and hevy vehicles, servo-steering systems and hydraulic applications, and generally for components showing a motion transmission through friction.
This lubricant is provided with a great refrigeration capacity, which is definitely needed for a variator in order to remove heat generated especially in the contact between planets and tracks, where there is always a component of sliding friction which, even in optimal conditions, unavoidably gives rise to rubbings and heat generation.
Generally speaking, it is strictly necessary that, for the lubrication of variators, an oil type ATF is used or an equivalent fluid for mechanical transmissions, of whatever manufacturer, as shown on the table (⇒ Type of oil, 21).

 **Remark:**
It is recommended never to mix mineral oils with synthetic oils.

7.2. Lubrication of gearboxes combined with variators

The variators combined with a one reduction stage gearbox (MK../1) or with a two reduction stages gearbox (MK../2), are provided downstream of the variator with a built-in inline helical gearbox belonging to the family MC.
On the table (⇒ Oil amount, 21), even the combinations between variator and gearbox are indicated.

The Company SITI S.p.A. supplies already pre-lubricated, using synthetic oil, the gearboxes up to the sixe MC 135, i.e. the ones combined with variators up to size MK 10.
Gearboxes type MC 170/210/260, i.e. the ones combined with the variators MK 30/50/100, on the contrary, are supplied without oil and the customer is requested to provide to fill them in, using synthetic or mineral oil. As far as the type of oil is concerned, it is recommended to strictly adhere to the tables of lubricants (see General Catalogue - section “general information”).
It is to be always taken into consideration that the synthetic oils can allow a lifetime endurance, while the mineral ones require periodical intervals of oil replacement.

 **Remark:**
In order to assure the best possible whole performace, it is anyway recommended (in case of gearboxes combined with variators) to possibly use synthetic oils instead if mineral oils.

7.3. Type of oil

MAKE	TYPE	
	Mineral oils (non lifetime lubrication)	Synthetic oils (lifetime lubrication)
AGIP	ATF DEXRON	ATF II E
BP	BP AUTRAN DX	-
CHEVRON	AUTOMATIC TRANSMISSION FLUID (DEXRON)	-
ESSO	AUTOMATIC TRANSMISSION FLUID (DEXRON)	-
FINA	ATF DEXRON	-
IP	IP DEXRON FLUID	TRANSMISSION FLUID III
MOBIL	ATF 220	-
SHELL	ATF DEXRON III	DONAX TX

7.4. Oil amount

Variator				Gearbox		
MK	B3 - B5 - B6 - B8	V1 - V5	V3 - V6	MC	B3	
MK 2	0.12	0.26	0.13			Filled with lifetime lubricant
MK 2/1	0.12	0.26	0.13	MC 105/1	0.08	
MK 2/2	0.12	0.26	0.13	MC 105/2	0.20	
MK 5	0.20	0.30	0.20			
MK 5/1	0.20	0.30	0.20	MC 115/1	0.12	
MK 5/2	0.20	0.30	0.20	MC 115/2	0.40	
MK 10	0.27	0.90	0.45			
MK 10/1	0.27	0.90	0.45	MC 135/1	0.18	
MK 10/2	0.27	0.90	0.45	MC 135/2	0.75	
MK 20	0.40	1.60	0.95			Without oil
MK 20/1	0.40	1.20	0.40	MC 170/1	0.40	
MK 20/2	0.40	1.20	0.95	MC 170/2	1.10	
MK 30 - 50	0.80	5.50	-			
MK 30/1 - 50/1	0.80	2.20	2.10	MC 210/1	1.00	
MK 30/2 - 50/2	0.80	2.20	-	MC 210/2	3.10	
MK 100	1.40	9.00	9.00			
MK 100/1	1.40	4.00	4.00	MC 260/1	1.60	
MK 100/2	1.40	4.00	4.00	MC 260/2	6.50	

8. Maintenance

8.1. Maintenance

The program of maintenance includes the service actions of ordinary type, providing inspections, checks and audits effected directly by the operator and/or by qualified personnel committed to the usual maintenance and service actions of periodical type, including replacement of parts or recording, developed by personnel, who has been purposely trained on behalf of the manufacturer through specific courses or special issues.

8.2. Ordinary maintenance

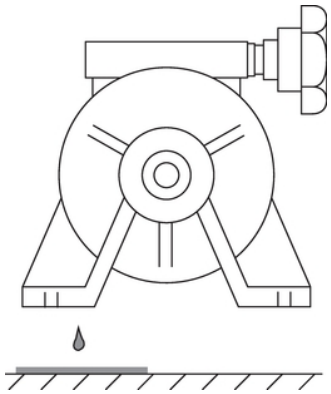
8.2.1. Cleaning

Carry out periodically the cleaning of the outer surface of the variator and of the air channels for the ventilation, in order to assure a satisfactory thermal exchange coefficient towards outside.

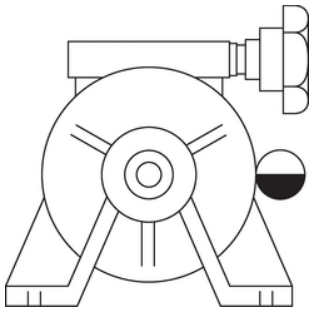
8.2.2. Check of oil level

Caution!
The damages a varisotr might be subject to, should it operate with a poor oil amount, are extremely serious and quick, and many times are fully irreparable!

A poor amount of lubricant, in addition to the fact of not allowing the proper lubrication of all inner parts, might adversely affect the thermal exchange conditions and, due to the highly reduced refrigerating and heat removal power, gives rise to the inner running temperature increase, especially on the mating surfaces of teeth flanks.
It is suggested to often make sure, through quick visual checks, that no oil leakages are occurring through shaft seals, gaskets, connecting flanges, attaching hardware of covers, end caps etc....



A more careful check of oil level has to be carried out at sufficiently frequenl time intervals. This check is to be effected through the level plug when the variator is standing still and is sufficiently cool.
Should it be ascertained, through the same level plug, that an inner dirt sedimentation has occurred, it is strictly necessary to make sure that no foreign material, such as powder, sand, water or anything else has penetrated into the variator housing and anyway replace oil (⇒ Oil replacement, 23).
Should oil level have sunk down and shallowed below the recommended values, it is necessary to fill oil in, up to restoring the correct level.



8.3. Periodical maintenance operations

8.3.1. Oil replacement

K-MK variators

It is strictly necessary that, at the end of the running in time of 300 hours, the oil replacement of the variator is effected.
The following oil changes are recommended at any 3000 operating hours, but they are to be effected with higher frequency, if it is ascertained a trend of the oil level to decrease or of the variator operating temperature to increase, being operating conditions the same.
For filling in the units, the customer may use the same oil used by SITI S.p.A. or a kind of equivalent oil, as it is indicated on the table (⇒ Type of oil, 21).
If the customer wishes to use a lifetime oil, he has to use, after completion of the running in time, a synthetic-base oil, imperatively for automated transmissions, as the ones indicated in the table (⇒ Type of oil, 21).
These are fluids of superior quality suitable to automated transmissions subject to heavy operating loads and enable to extend the time intervals between oil changes even in extreme application conditions and which, in standard applications, allow a lifetime lubrication.

MC gearboxes

At the end of the running in time of about 300 hours, it is recommended to change even the oil of the gearbox, in case it is a mineral oil. The following oil changes are to be effected with a frequency of about 3000 operating hours, if it is a mineral oil.
We recommend to replace oil to the gearbox whenever oil is replaced to the variator, unless the oil change of the variator has been made necessary with a closer frequency due to oil level reduction or overheatings.
Synthetic oils are usually to be considered as lifetime lubricants, such not to require any oil replacement during the entire gearbox life, after the change requested at the end of the running in time. In case of very heavy applications, it is anyway recommended to check oil level of gearbox whenever oil of the variator is replaced and, in case of any doubt, to replace the gearbox oil, even if synthetic.

 **Remark:**
Unloading of oil is to be carried out in hot conditions, with the variator at a temperature of about 40-45 °C, but not beyond this range, in order to prevent from possible burnings.

 **Caution!**
Please be very careful in order to avoid to spill oil on the ground and pay attention to behave in full conformance with the environmental rules in force in the country of usage.

P.P.E. Protection gloves and mask glasses

- Unscrew the fill-in/breather plug.
- Unscrew the unloading plug located down and let oil completely flow out (this is particularly important in case of changing lubricant from a mineral to a synthetic oil or the opposite).
- Check whether the level plug is clean and transparent. In case it is not, unscrew and clean it.
- Screw again the unloading plug.
- Fill in the variator from the upper hole. The oil amount to be filled in is indicated in the table (⇒ Oil amount, 21), but we point out that the mentioned amounts do have a simply indicative value; the user has to fill oil in, until the oil level visible at sight through the transparent level plug has been achieved (having already mounted the variator in the expected mounting position).
- Screw again the fill-in breather plug located above.

8.3.2. Possible replacement of shaft seals

The running time and thus the endurance time of a shaft seal is affected in a conclusive way by the operating temperature in the mating area, by the possible chemical reactions which might occur between rubber compound and lubrication fluid and by the status of preservation of the shaft seal.
Replacement of the shaft seal is necessary if:

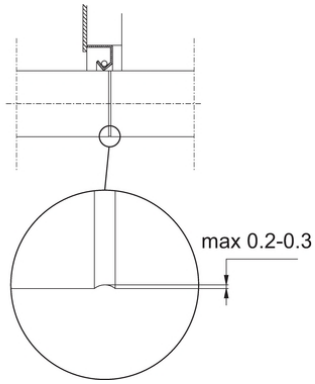
- a good serviceability of the sealing function is missing, and due to this an oil leakage towards outside of the unit is occurring;
- it is being effected a revision of the machine or of the installation.

Whenever a shaft seal is not developing its sealing function any longer, it is necessary to provide as soon as possible to its replacement, in order to prevent a leakage extending along the time, as well as a damage possibly extended to other components.

At the time of fitting a new shaft seal, it is needed:

- to take a particular care while handling the shaft seal and make sure of the intactness of the product (possibly avoid too long times of storage, which might give rise to a premature aging, especially if there is an excessive level of humidity);
- always check that the shaft seal seat is in a perfect status, in other words it is free of longitudinal or oriented scores, fingerprints, engravings, cuttings, marks or surface failures;
- take care to prevent that the shaft seal lip of the new seal operates exactly over the same trace left clearly by the previous one;

- whenever it is made sure that a deterioration of the shaft seal mating area has occurred, involving a depth greater than 0.2-0.3 mm, we strongly advise not to fit the new shaft seal and to get in touch with a workshop of our Assistance, which will provide to check whether there is any chance of recovering the shaft, and in any case will issue a diagnosis about the possible reasons of the damage occurred;



- fit the shaft seal in a way to be perpendicular to the axis and with the lip completely free and not overturned or pinched;
- position the shaft seal in a way that the sealing lip is oriented towards the fluid which is to be sealed, or on the side where a higher pressure is exerted;
- on shaft seals without a dust lip, spread grease in the outer area of the lip;
- fill in with grease the interspace between sealing and dust lip;
- coat with grease the shaft seal seat on the shaft;
- never use sealants, otherwise shaft seal lip or shaft surface would get smirched and thus would quickly deteriorate;
- exert the fitting force as close as possible to the shaft seal outer diameter;
- neither lock axially the seal nor submit it to a strong force;
- always use suitable toolings, in order to prevent possible damages to the shaft seal lip, due to the presence of threads, outlet chamfers, sharp edges, keyways;
- always protect the lip and its seat on the shaft, whenever one provides to repaint the variator or the machine on which it is fitted.

All above mentioned precautions do have the objective to avoid that a shaft seal might operate in dry conditions, especially during the first shaft turns, because otherwise too high temperatures might be achieved in the contact areas, which would immediately cause a deterioration of the materials shaft seal is made of: shaft seal getting harder, scorings, change of colorfulness.

8.4. Table of tightening torques of attaching hardware

For all variators and possible accessories, please strictly adhere to the following values of the tightening torques.

Screw threads Class 8.8	Tightening torque for steel and cast iron (Nm)	Tightening torque for aluminium (Nm)
M4	2.9	2.3
M5	6	4.8
M6	10	8
M8	25	20
M10	49	39
M12	86	69
M14	135	108
M16	210	168
M18	290	232
M20	410	328

8.5. Troubles, causes, corrective actions

The conditions of malfunctioning, which might be reasonably expected, related to the single operating conditions of the variator, are reported; in the columns of the following table, the kind of trouble, the operating function and the component which might be the reason of the faillure are accurately described.

TROUBLE	POSSIBLE CAUSES	CORRECTIVE ACTIONS
Motor does not start.	Faulty electric motor connection.	Check the connection.
	Faulty motor.	Replace the motor.
	Wrong motor sizing.	Replace the motor.
Motor and variator reach a too high temperature.	Mechanical overloading.	Check the mechanical parts driven by the motor-variator.
	Sizing of the motor-variator group wrong.	Replace the motor-variator group.
Variator reaches a too high temperature.	Faulty motor.	Replace the motor.
	Wrong motor sizing.	Replace the motor.
Variator reaches a too high temperature.	Faulty variator.	Repair or replace the variator.
	Wrong sizing of the variator.	Replace the variator.
	Mounting position not complying with the one for which the variator has been arranged.	Make sure that the variator is in compliance with the order.
	Insufficient amount of lubricant.	Re-fill new lubricant in, until the oil level corresponding to the level plug has been reached.
Oil leakages through the shafts.	Worn or faulty shaft seals.	Replace shaft seals.
	Worn shaft seal seat on shafts.	Replace shaft seals and fit the new ones in a slightly shifted position or otherwise replace shafts.
Oil leakages through the mating surfaces between flanges/covers and housing.	Flanges not sufficiently tightened.	Tighten flanges.
	(only for .../1, ...2 and for differential equipment)	Replace gaskets, making sure that the sealing surfaces are perfectly machined.
The variator emits a noise similar to a beat.	Faulty gear teeth. (only for .../1, ...2 and for differential equipment)	Apply to the Technical Assistance Service.
The variator emits a noise similar to a whisle.	Insufficient amount of lubricant.	Re-fill new lubricant in, until the oil level corresponding to the level plug has been reached.
	Faulty or worn gears. (only for .../1, ...2 and for differential equipment)	Apply to the Technical Assistance Service.
	Faulty or uncorrectly fitted bearings.	Apply to the Technical Assistance Service.

9. Scrapping and material disposal

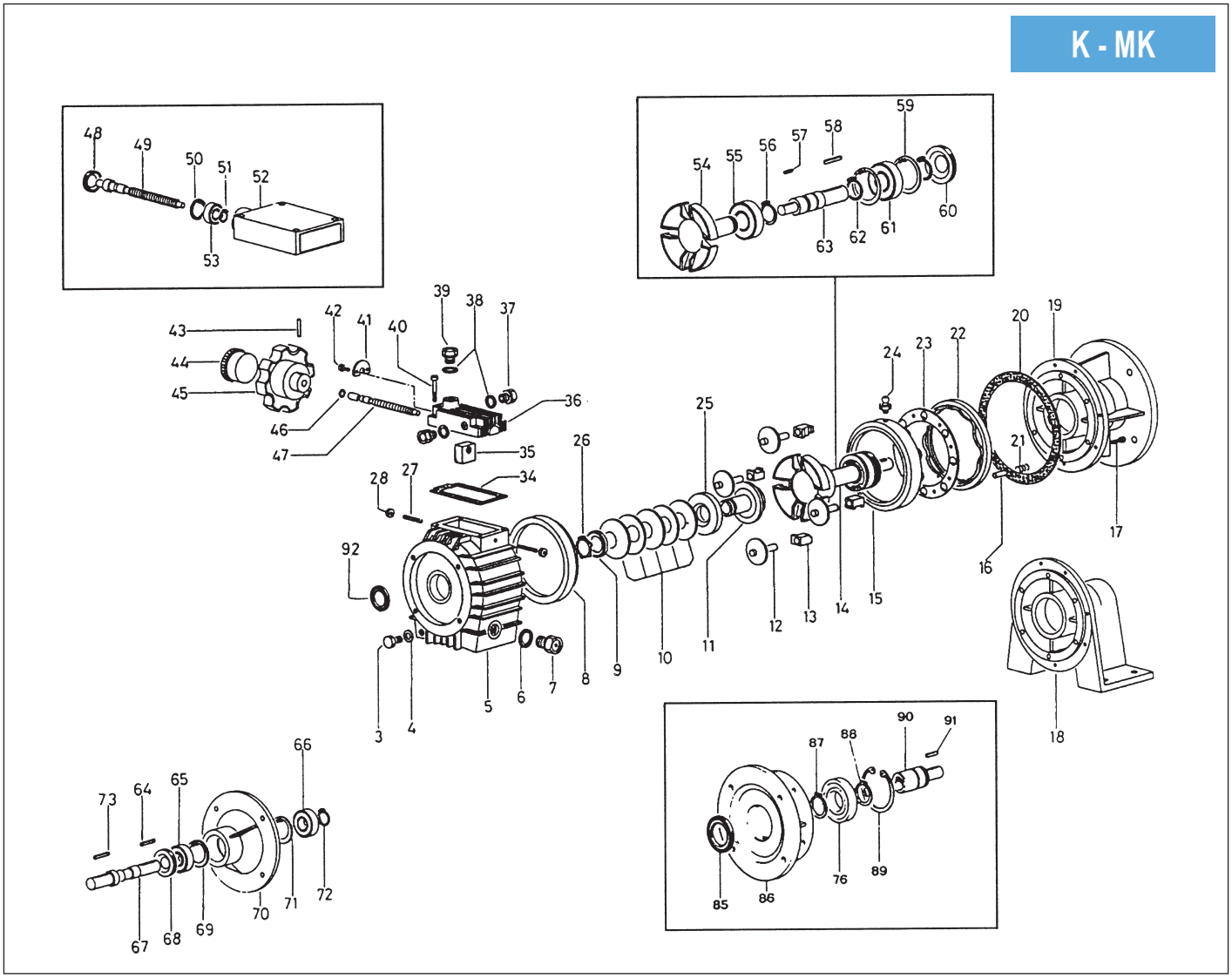
9.1. Scrapping and material disposal

As soon as the variator has achieved its maximum limit of usage, it will have to be diamantled and scrapped.
Remove all oil from the variator, keeping in mind that exhaused oil has a strong adverse effect on the environment.
After scrapping, the operation of getting rid of the materials and of the lubricant will have to be accomplished in full compliance with all rules and law dispositions which are in force at the moment in the country of usage.
All operations related to getting rid of materials will have to be effected by qualified and authorized Companies; it is a task of the Company that is in charge of getting rid of materials to make sure that said Companies are complying with the requested National and Interrnational Directives.

NOTE	NOTES	ANMERKUNG
NOTES	NOTAS	NOTAS

10. Spare parts

To check the spare parts catalogue, contact the SITI S.p.A. Technical Service Department and require a hard copy of the documentation.

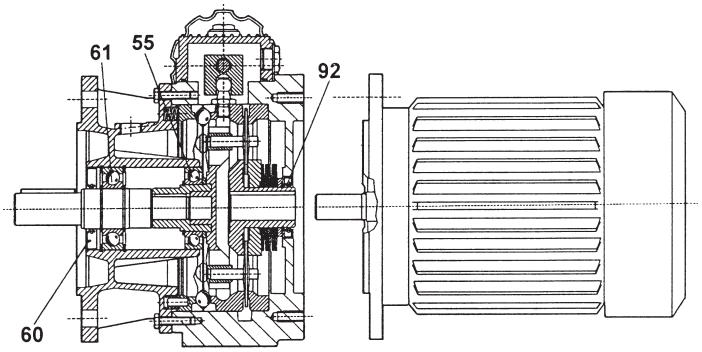


POS.	DESCRIZIONE	DESCRIPTION	BESCHREIBUNG
3	Tappo scarico olio	Unloading plug	Ölablaßschraube
4	Rondella tappo scarico olio	Washer	Scheibe für Ölablaßschraube
5	Carcassa	Housing	Gehäuse
6	Guarnizione tappo (spia) livello olio	Oil level plug gasket	Sichtschraubendichtung
7	Tappo (spia) livello olio	Oil level plug	Ölstandsichtschraube
8	Pista planetaria esterna fissa	Fixed outer planetary track	Feststehender Außendruckring
9	Boccola di ritegno molle a tazza	Cup spring retaining washer	Federklemmring
10	Molle a tazza	Cup springs	Tellerfedern
11	Pista planetaria interna fissa	Fix inner track	Feststehende innensonne
12	Satellite	Planet	Planeten
13	Boccola portasatellite	Spider bushes	Planetengleitsteine
14	Gruppo portasatellite	Spider	Planetenträger
15	Pista planetaria esterna mobile	Outer moving track	Beweglischer Außendruckring
16	Spina di riferimento	Stop dowel	Gewindestift
17	Vite di fissaggio	Screw	Befestigungsschrauben
18	Piedi (Serie MK.../K...)	Foot casing (Type MK…/K...)	Füßgehäuse (Typ MK…/K...)
19	Flangia base (Serie MKF…/KF...)	Flange casing (Type MKF…/KF...)	Flanschgehäuse (Typ MKF…/KF...)
20	Guarnizione	Gasket	Garnitur
21	Molla cilindrica	Coil spring	Zylindrische Schraubenfeder
22	Pista di registro	Outer track	Fesfstehender Einstellbaraußendruckring
23	Anello sfere	Ball ring	Kugelkäfig
24	Snodo sferico	Ball joint	Kugelschraube
25	Pista planetarica interna mobile	Inner track	Beweglische innensonne
26	Anello elastico (Seeger tipo K)	Snap ring (Seeger type K)	Seegerring (“K” Typ)
27	Grano di fermo regolazione	Adjustment stop dowel	Einstellstift
28	Dado bloccaggio grano di fermo regolazione	Adjustment nut	Stiftmutter
34	Guarnizione	Gasket	Garnitur
35	Blocchetto di comando	Control block	Verstellblock
36	Coperchio vite di comando	Lead screw cover	Verstellregelungsdeckel
37	Tappo chiuso	Closed plug	Geschlossene Ölschraube
38	Guarnizione	Gasket	Garnitur
39	Tappo sfiato	Breather plug	Entlüftungsschraube
40	Vite fissaggio coperchio vite di comando	Cover securing screw	Deckelverbindungsschrauben
41	Rondella ritegno vite di comando	Stop dowel washer	Verstellspindelscheibe
42	Vite di fissaggio rondella ritegno vite di comando	Securing screw	Schraube fur Verstellspindelscheibe
43	Spina di fissaggio volantino di comando	Control handwheel pin	Handradstift
44	Indicatore gravitazionale	Gravitational indicator	Schwerkraftanzeige
45	Volantino di comando	Control handwheel	Handrad
46	Anello OR	OR ring	O Ring
47	Vite di comando	Lead screw	Verstellspindel
48	Anello di tenuta	Shaft seal	Wellendichtung
49	Vite di comando	Lead screw	Verstellspindel
50	Anello elastico (Seeger)	Snap ring	Seegerring
51	Anello elastico (Seeger)	Snap ring	Seegerring
52	Coperchio vite di comando	Lead screw cover	Verstelldeckel
53	Cuscinetto a sfere	Ball bearing	Kugellager
54	Portasatelliti	Spider	Planetenträger
55	Cuscinetto a sfere	Ball bearing	Kugellager
56	Anello (Seeger)	Snap ring	Seegerring
57	Linguetta	Key	Keil
58	Linguetta	Key	Keil
59	Anello elastico (Seeger)	Snap ring	Seegerring
60	Anello di tenuta	Shaft seal	Wellendichtung
61	Cuscinetto a sfere	Ball bearing	Kugellager
62	Anello elastico (Seeger)	Snap ring	Seegerring
63	Albero uscita	Output shaft	Abtriebswelle
64	Linguetta	Key	Passfeder
65	Cuscinetto a sfere	Ball bearing	Kugellager
66	Cuscinetto a sfere	Ball bearing	Kugellager
67	Albero entrata (Serie K.../KF...)	Input shaft (Type K../KF...)	Antriebswelle (Typ K../KF...)
68	Anello di tenuta	Shaft seal	Wellendichtung
69	Anello elastico (Seeger)	Snap ring	Seegerring
70	Coperchio entrata (Serie K.../KF...)	Input cover (Type K.../KF...)	Eingangsdeckel (Typ K.../KF...)
71	Anello elastico (Seeger)	Snap ring	Seegerring
72	Anello elastico (Seeger)	Snap ring	Seegerring
73	Linguetta	Key	Keil
76	Cuscinetto a sfere	Ball bearing	Kugellager
85	Anello di tenuta	Shaft seal	Wellendichtung
86	Coperchio entrata	Input cover	Deckel fur Motoranbau
87	Anello elastico (Seeger)	Snap ring	Seegerring
88	Anello elastico (Seeger)	Snap ring	Seegerring
89	Anello elastico	Snap ring	Seegerring
90	Albero entrata	Input shaft	Antriebswelle
91	Linguetta	Key	Keil
92	Anello tenuta entrata	Input shaft seal	Antriebswellendichtung

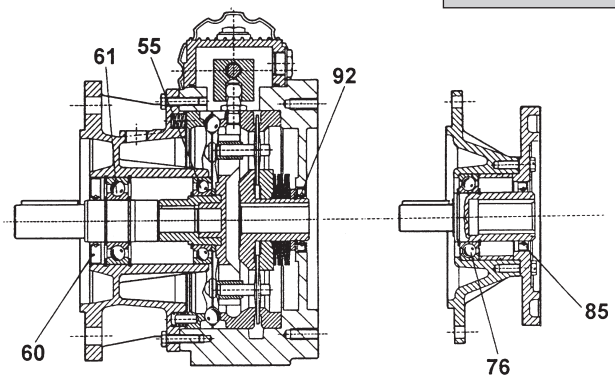
POS.	DESCRIPTION	DESCRIPCIÓN	DESCRIÇÃO
3	Bouchon vidange huile	Tapón de descarga de aceite	Dreno de óleo
4	Rondelle bouchon vidange huile	Arandela del tapón de descarga de aceite	Anilha tampa descarga óleo
5	Carcasse	Carcasa	Carcaça
6	Garniture bouchon (voyant) niveau huile	Junta del tapón (visor) de nivel de aceite	Vedação tampa (indicador) nível do óleo
7	Bouchon (voyant) niveau huile	Tapón (visor) de nivel de aceite	Tampa (indicador) nível do óleo
8	Piste planétaire extérieure fixe	Pista planetaria externa fija	Pista planetária externa fixa
9	Bague de retenue rondelles sphériques	Casquillo de retención de la arandela elástica	Bucha de retenção molas de Prato
10	Rondelles sphériques	Arandelas elásticas	Molas Prato
11	Piste planétaire intérieure fixe	Pista planetaria interna fija	Pista planetária interna fixa
12	Satellite	Satélite	Satélite
13	Manchon porte-satellites	Casquillo portasatélite	Bucha porta-satélite
14	Groupe porte-satellites	Grupo portasatélite	Grupo porta-satélite
15	Piste planétaire extérieure mobile	Pista planetaria externa móvil	Pista planetária externa móvel
16	Goupille de référence	Enchufe de referencia	Ficha de referência
17	Vis de fixation	Tornillo de fijación	Parafusos de fixação
18	Pieds (Série MK.../K...)	Pies (serie MK.../K...)	Pés (Série MK.../K...)
19	Bride base (Série MKF…/KF...)	Brida base (serie MKF…/KF...)	Flange base (Série MKF…/KF...)
20	Garniture	Junta	Vedação
21	Ressort cylindrique	Resorte cilíndrico	Mola cilíndrica
22	Piste de réglage	Pista de regulación	Pista de registo
23	Anneau billes	Anillo de bolas	Anel de esferas
24	Articulation à rotule	Articulación esférica	Articulação esférica
25	Piste planétaire intérieure mobile	Pista planetaria interna móvil	Pista planetária interna móvel
26	Anneau élastique (Seeger type K)	Anillo elástico (Seeger tipo K)	Anel elástico (Seeger tipo K)
27	Grain d'arrêt réglage	Tornillo prisionero de tope de regulación	Espigão de bloqueio regulação
28	Écrou blocage grain d'arrêt réglage	Tuerca de bloqueo de tornillo de prisionero de tope de regulación	Porca de bloqueio espigão de bloqueio regulação
34	Garniture	Junta	Vedação
35	Bloc de commande	Bloque de mando	Bloco de comando
36	Couvercle vis de commande	Cubierta tornillo de transmisión	Tampa parafuso de comando
37	Bouchon fermé	Tapón cerrado	Tampa fechada
38	Garniture	Junta	Vedação
39	Bouchon vidange	Tapón de ventilación	Tampa respiradora
40	Vis fixation couvercle vis de commande	Tornillo fijación cubierta tornillo de transmisión	Parafuso de fixação tampa de comando
41	Rondelle retenue vis de commande	Arandela de retención tornillo de transmisión	Anilha de retenção parafuso de comando
42	Vis de fixation rondelle retenue vis de commande	Tornillo de fijación arandela de retención tornillo de transmisión	Parafuso de fixação anilha retenção parafuso de comando
43	Goupille de fixation volant de commande	Enchufe de fijación del volante de comando	Ficha de fixação colante de comando
44	Indicateur gravitationnel	Indicador gravitacional	Indicador gravitacional
45	Volant de commande	Volante de mando	Volante de comando
46	Joint torique	Junta tórica	Anel OR
47	Vis de commande	Tornillo de transmisión	Parafusos de comando
48	Joint d'etanchéité	Anillo de retención	Anel de retenção
49	Vis de commande	Tornillo de transmisión	Parafusos de comando
50	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
51	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
52	Couvercle vis de commande	Cubierta tornillo de transmisión	Tampa parafuso de comando
53	Roulement à billes	Cojinete de bolas	Rolamento de esferas
54	Porte-satellites	Portasatélites	Porta-satélites
55	Roulement à billes	Cojinete de bolas	Rolamento de esferas
56	Anneau d'arrêt	Anillo (Seeger)	Anel (Seeger)
57	Languette	Lengüeta	Chaveta
58	Languette	Lengüeta	Chaveta
59	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
60	Joint d'étanchéité	Anillo de retención	Retentor
61	Roulement à billes	Cojinete de bolas	Rolamento de esferas
62	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
63	Arbre sortie	Eje de salida	Eixo saída
64	Languette	Lengüeta	Chaveta
65	Roulement à billes	Cojinete de bolas	Rolamento de esferas
66	Roulement à billes	Cojinete de bolas	Rolamento de esferas
67	Arbre entrée (Série K.../KF...)	Eje de entrada (serie K.../KF...)	Eixo de entrada (Série K.../KF...)
68	Joint d'étanchéité	Anillo de retención	Retentor
69	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
70	Couvercle entrée (Série K.../KF...)	Cubierta de entrada (serie K.../KF...)	Tampa de entrada (Série K.../KF...)
71	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
72	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
73	Languette	Lengüeta	Chaveta
76	Roulement à billes	Cojinete de bolas	Rolamento de esferas
85	Joint d'etanchéité	Anillo de retención	Retentor
86	Couvercle entrée	Cubierta de entrada	Tampa de entrada
87	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
88	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
89	Anneau d'arrêt	Anillo elástico (Seeger)	Anel elástico (Seeger)
90	Arbre entrée	Eje de entrada	Eixo entrada
91	Languette	Lengüeta	Chaveta
92	Joint d'étanchéité arbre entrée	Anillo de retención entrada	Retentor entrada

MK (F) 2 / 5 / 10 / 20 / 30 /50

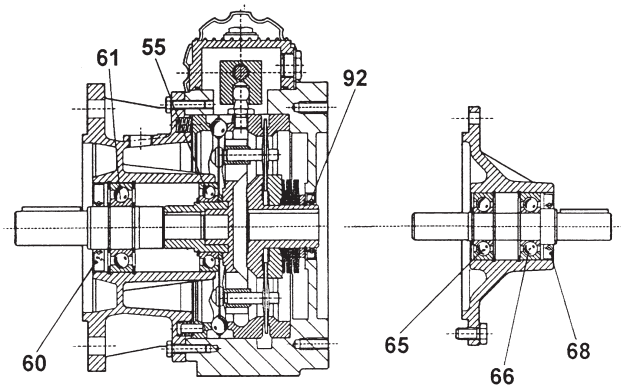
MK...B5



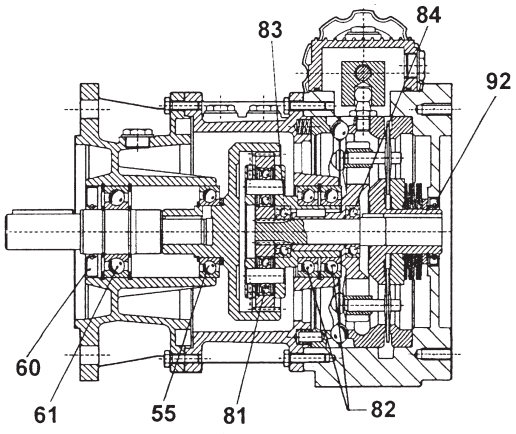
MK...PAM (B14)

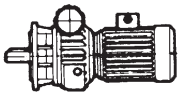


K...

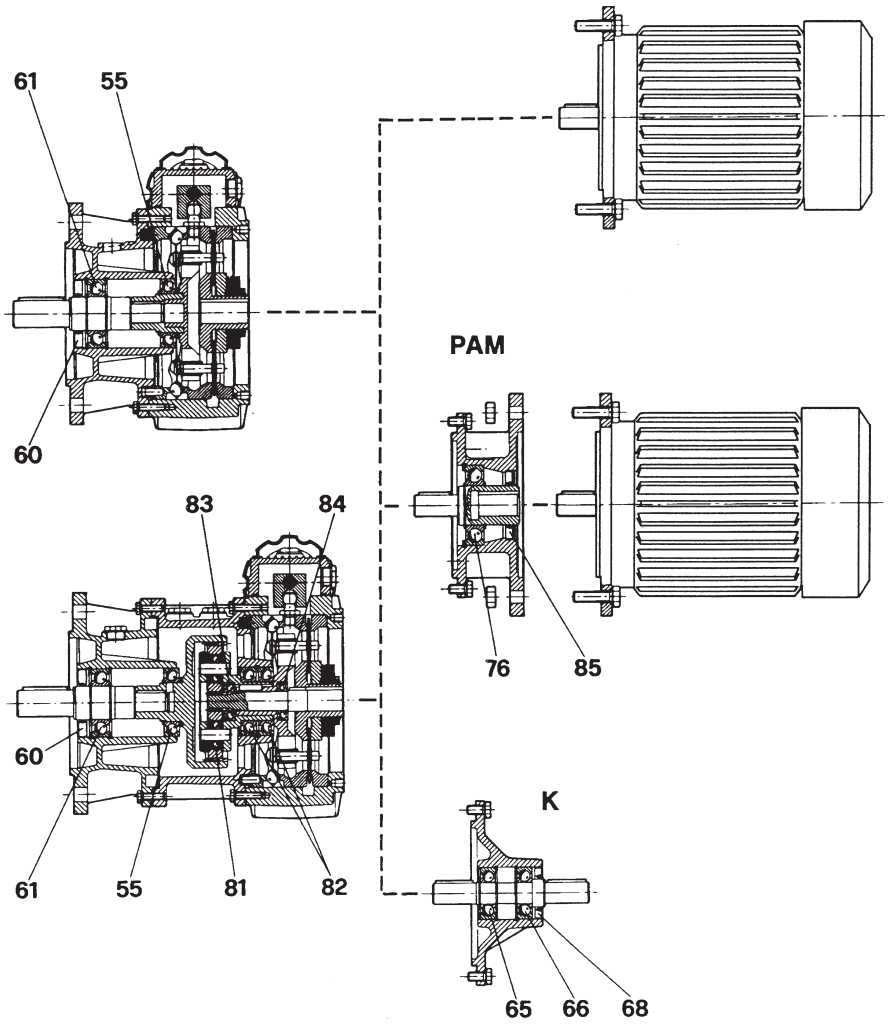


MKD...



	Cuscinetto / Bearing / Lager Roulement / Cojinete /Rolamento								Anello di tenuta / Shaft seal Wellendichtung / Joint d'étanchéité Anillo de retención / Retentor			
	65-66	**76**	**81**	**82**	**83**	**84**	**55**	**61**	**68**	**85**	**60**	**92**
2	**6303** 17/47/14	**6005** 25/47/12	-	-	-	-	**6004** 20/42/12	**6004 2RS** 20/42/12	17/35/7	25/40/7	20/42/7	18/40/7
5	**6304** 2RS20/52/15	**6205** 25/52/15	**6000** 10/26/8	**6006** 30/55/13	**6002** 15/32/9	**6002** 15/32/9	**6205** 25/52/15	**6205** 2RS25/52/15	20/35/7	30/40/7	25/52/7	25/40/7
10	**6206 2RS** 30/62/16	**6007** 35/62/16	**6000** 10/26/8	**6007** 35/62/16	**6003** 17/35/10	**6003** 17/35/10	**6206** 30/62/16	**6206** 2RS30/62/16	30/47/7	35/50/7	30/62/8	30/47/7
							6007* 35/62/14					
20	**6206 2RS** 30/62/16	**6007** 35/62/16	**6202** 15/35/11	**6009** 45/75/16	**6004** 20/42/12	**6004** 20/42/12	**6207** 35/72/17	**6207 2RS** 35/72/17	30/47/7	35/72/10	35/72/10	45/65/8
30-50	**6206 2RS** 30/62/16	**6010** 50/80/16	**6304** 20/52/15	**6011** 55/90/18	**6006** 30/55/13	**6006** 30/55/13	**6210** 50/90/20	**6210 2RS** 50/90/20	40/62/10	50/80/10	50/90/10	55/80/8

MK (F) 100



	Cuscinetto / Bearing / Lager Roulement / Cojinete /Rolamento								Anello di tenuta / Shaft seal Wellendichtung / Joint d'étanchéité Anillo de retención / Retentor		
	65-66	**76**	**81**	**82**	**83**	**84**	**55**	**61**	**68**	**85**	**60**
100	**6208** 40/68/15	**6011** 55/90/18	**6304** 20/52/15	**6013** 65/100/18	**6008** 40/68/15	**6008** 40/68/15	**6211** 55/100/21	**6211** 2RS55/100/21	50/80/10	55/90/10	55/90/10

NOTE	NOTES	ANMERKUNG
NOTES	NOTAS	NOTAS

SITI SPA
SOCIETÀ ITALIANA TRASMISSIONI INDUSTRIALI ®

RIDUTTORI	*GEARBOXES*
MOTORIDUTTORI	*GEARED MOTORS*
VARIATORI MECCANICI	*MECHANICAL VARIATORS*
MOTORI ELETTRICI C.A./C.C.	*A.C./D.C. ELECTRIC MOTORS*

ITALIA *ITALY*
SEDE e STABILIMENTO *HEADQUARTERS*

Via G. Di Vittorio, 4
40053 VALSAMOGGIA Loc. Monteveglio (Bo) - Italy
Tel. +39/051/6714811 - Fax. +39/051/6714858
E-mail: info@sitiriduttori.it
commitalia@sitiriduttori.it
export@sitiriduttori.it
WebSite: www.sitiriduttori.it

USA

SITI Power Transmission USA, Inc.
37 Ayer Rd, Littleton, MA 01460
Tel.: 978-339-4500 - Fax: 978-338-0800
E-mail: sales@sitipowertransmission.com
WebSite: www.sitipowertransmission.com

POLONIA *POLAND*

SITI-TECH Sp. z o.o.
Milejowice, ul. Napêdowa 4
26-652 Zakrzew POLAND
E-mail: sititech@sititech.pl
WebSite: www.sititech.pl

ROMANIA *ROMANIA*

S.C. SITI BALKANIA SRL
Piatra Craiului, 7 (Zona Ind. La Dibo) - Hala4 Comp.7 - Jud Prahova - Romania
Tel. +40-244434243 - Fax. +40-244434243
E-mail: office@sitibalkania.ro
WebSite: www.sitibalkania.ro

CINA *CHINA*

Shanghai SITI Power Transmission Co., Ltd.
Block A, No.558 Xuan Qiu Rd. Sanzao Industrial Park,
Pudong New Area, Shanghai, P.R.China P.C.:201300
Tel: +86-21-68060500 - Fax: +86-21-68122539
E-mail: service@sh-siti.com
WebSite: www.sh-siti.com