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Operating and Installation Manual

DIRECT DRIVE TORQUE MOTORS

SKA DDR

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1 Introduction

This manual contains instructions for using and installing SKA DDR motors. They should be considered part of the equipment and as such must be kept in a safe place and handled with care.

All our products are manufactured and checked thoroughly at the factory so as to guarantee their performance and the characteristics indicated on the label and in our marketing literature. Proper use and proper installation are essential in order to safeguard correct operation.

Motor Power Company Srl is not liable in case of negligence or failure to comply with the standards and requirements described in this manual. It is also not liable for any damage caused by improper use of the product.

At the time of purchase, check the equipment supplied is complete with all its parts. All complaints must be submitted in writing within eight days after taking delivery of the motor.

1.1 Guarantee

Motor Power Company Srl guarantees its products for a period of 12 (twelve) months from the date of purchase. This guarantee consists exclusively of the repair or replacement without charge of any parts that our Service Department has examined and has deemed faulty.

Barring any liability for direct and/or indirect damages, this guarantee only covers material faults and will be null and void should parts have been removed, in case of tampering or repairs that were not undertaken at our premises and/or by unauthorised personnel.

All equipment returned must be sent carriage paid, even during the guarantee period.

1.2 Description of SKA DDR torque motors

You have purchased a product from Motor Power Company's SKA Direct Drive range.

The SKA range is another step forward in the technological development of motion control, thanks to torque technology offering benefits both in terms of performance and energy savings.

The linear and rotary technology of this series of motors represents a considerable improvement in performance combined with significant energy savings. An intrinsic feature of SKA Direct Drive products is their ability to directly couple the motor with the load: SKA Direct Drive torque motors have autonomous axes, capable of handling the mechanics associated with them directly without the need for other components for the transmission of motion. The result is genuine integration on board the machine and allows complex kinematic chains to be eliminated.

Thank you for choosing a SKA Direct Drive product.

For more details of the full range of our products and of the best in motion control, visit www.motorpowergroup.com.

1.3 Specifications of SKA DDR motors

All the motor's specifications are indicated on the label attached to its casing as well as in the technical and marketing documents. It is important to comply with the information provided in order to safeguard correct use and duration of the motor.

All specifications have a tolerance of $\pm 5\%$, unless specified otherwise.

1.4 Copyright

Motor Power Company Srl owns the copyright of this manual, which was designed for machine operators and maintenance personnel.

The instructions and specifications it contains may be neither completely nor partially copied, distributed or examined by unauthorised persons for the benefit of our competitors, or disclosed to third parties.

Motor Power Company Srl reserves the right to take legal action against anyone breaching this condition.

2 General instructions for safety

SKA DDR torque motors are designed and certified according to European Economic Community standards as set out in the 93/68/EEC Directive and in accordance with the 89/336 Directive and subsequent amendments. This means they are suitable for incorporation into a machine that must be declared compliant with the safety standards in the countries where this is to be used (European countries: 98/37/EC - 89/336/EC – 98/68/EC directives).

It may only be put into operation if national EMC requirements for the application are met. The supplier of the system/machine is responsible for ensuring the limits set by national standards are met.

The safety of people is the main goal pursued by our designers. We strive to envisage all possible hazardous situations when we design our equipment and naturally incorporate appropriate safety devices. Nevertheless, the number of accidents caused by imprudent and inept use of the various machines and / or equipment remains very high.

The implementation of appropriate safety precautions is, therefore, essential in order to reduce the risk of fire, electric shocks and injury. The safety instructions provided below must be read with due care and attention and understood before the equipment is used. After reading this manual, keep it in a safe place. Motor Power Company Srl is not liable in case of failure to observe the safety and accident prevention instructions provided in this manual.

- Before starting installation, check the SKA DDR motor is intact, without any damaged and / or broken parts. Any broken or damaged parts must be repaired or replaced exclusively by personnel authorised by Motor Power Company Srl. Any repairs undertaken by unauthorised personnel will render the guarantee null and void and increases the risk of operating unsafe and potentially hazardous equipment.
- Keep the area where you are working clean and tidy. Untidy areas and environments promote the possibility of accidents.
- Any form of inspection, control, cleaning, maintenance, exchange and replacement of parts must be done with the equipment turned off and the power disconnected.
- Before starting work, take time to become familiar with the control devices and how they work.

- It is advisable that there are no children, other people or animals close to you during installation: make sure they are at a safe distance.
- It is essential to employ the services of specialized personnel to carry out installation.
- Do not subject the equipment to unreasonable strain.
- Do not allow children or any inexperienced persons or anyone not in good health to touch or use the equipment. Always comply with the current legislation in your country relating to the minimum working age.
- Always install the equipment in places that are adequately lit and in a safe and stable position.
- Use suitable lifting equipment to move the equipment and wear safety gloves and footwear.

2.1 Explanations of symbols and references



This symbol is placed next to instructions which will result in injury, death or long-term risks to health if they are not carried out properly.



This symbol is placed next to instructions, which may result in injury, death or long-term risks to health if they are not carried out properly.



This symbol is placed next to instructions, which may result in injury or damage to the product if they are not carried out properly.



This symbol indicates operations that must be carried out by the machine operator or maintenance engineer.

DEFINITION OF THE MACHINE OPERATOR OR MAINTENANCE ENGINEER

The machine operator or maintenance engineer is a person with a sufficient degree of technical preparation in order to operate the equipment. He or she has perfect knowledge of the contents of this manual. He or she has been properly informed and trained and has clearly defined duties that are classified at company level. MOTOR POWER COMPANY Srl is not liable should persons work on our equipment who fail to meet the above requisites.

2.2 Designated use and applications



Motor Power Company SKA DDR torque motors are intended for use as servomotors.

Additional sensors (e.g. rotation measuring systems) are necessary for Frameless versions to provide control of the motor's speed and position.

Before any drive is operated, for the supply of the motors, it must be programmed with the correct specifications according to the application and the type of motor.

The units are manufactured for installation in machines used in commercial applications or light industry.

Note: SKA motors are not designed for direct connection to mains electricity.

"Inappropriate use" includes using the motor in any field of application that is not included in the above description or in circumstances other than those described in this document or with different specifications.

Special security applications are not allowed unless expressly specified in detail in the operating instructions. For example, the following types of application are not included: cranes, passenger lifts, passenger vehicles and equipment, medical equipment, refineries, transportation of hazardous items, nuclear areas, use in areas with fields of high frequency, mining, contact with food, control of safety devices and any other environment that is not commercial or light industrial.

2.3 Specific instructions for electrical safety



Note: this section concerns drive units and components with a voltage above 50V. Touching parts with a voltage above 50V may be dangerous and result in an electric shock. When using electrical devices, some of its parts will inevitably have a dangerous voltage.

High voltage! Risk of death or serious injury caused by electric shocks.

- Only personnel who are qualified and trained to work with electrical appliances are allowed to operate and / or repair the unit
- Observe the general rules and safety instructions during installation
- Before switching on the system, the earth connection on all electric units must be connected using the connection points provided. Failure to complete this connection could lead to dangerous voltages on the metal casings of electrical appliances.
- The leakage current is higher than 3.5 mA.
- Use copper wires with minimum 10 mm diameter for the entire length of the earth circuit

2.4 Hazardous movements



Hazardous malfunctions may be caused by failure to control a connected motor correctly. This may be caused by various reasons:

- Improper or incorrect wiring
- Incorrect use of components
- Sensor and transducer faults
- Faulty components
- Software faults

Such malfunctions may occur immediately after switching on or during operation.

Monitoring driven components excludes any predictable malfunction but is not sufficient in order to safeguard safety, especially as regards the prevention of damage or injury. It is, therefore, necessary to provide safety systems that are triggered should the motor fail to start and / or taking into account possible uncontrolled movements of the motor.

To avoid accidents, injuries and / or damage:

- Do not allow personnel to approach the machinery or any moving parts.
Possible methods to prevent unauthorised access include:
 - safety rails
 - safety gate
 - safety cover
- Rails and barriers must be designed to counter the maximum kinetic energy possible

-
- Ensure emergency switches are easily accessible and are in the immediate vicinity. Test the switches work properly before switching on the machine for the first time. Do not use the unit if the emergency switches do not work properly
 - Provide protection against unforeseen switch-on by isolating the drive power connection through the emergency switch or using a safety switch
 - Disable the drives before entering the dangerous area
 - Turn off electrical equipment before:
 - Repair work
 - Cleaning
 - Prolonged interruptions of the driven application
 - Avoid using high-frequency equipment, control units and radios in the vicinity of electrical equipment and cables. If it is not possible to avoid using these devices, test the system in all modes to verify any possible malfunction before starting it up for the first time.

2.5 Magnetic or electromagnetic fields



Health hazard for wearers of pacemakers, metal implants or hearing aids in the immediate vicinity of electrical equipment.

- Access to the following areas is prohibited for wearers of pacemakers and / or with metal implants:
 - Areas where electrical units or parts are assembled
 - Areas where motor parts with permanent magnets are stored, repaired or assembled
- A doctor's note is required before a person with a pacemaker is allowed to access such areas. The immunity to electromagnetic fields of pacemakers that have been or are to be implanted varies greatly: there are therefore no set rules.
- People with metal implants in their body or people with hearing aids should consult their doctor before entering these areas. Their health may be at risk.

2.6 The rotary part of Frameless SKA DDR motors



The rotating part of SKA DDR motors is fitted with permanent magnets. These permanent magnets produce a static magnetic field with the associated forces of attraction to electromagnetic objects (such as parts of the machine or steel tools). Risk of injuries caused by inexperienced use of the rotating part of torque motors!

- People with pacemakers, metal implants or hearing aids should not approach such parts or handle them. Call a doctor should they approach such parts
- The rotating part should not remain in the vicinity of objects that may be affected or damaged by magnetic fields (e.g. watches, computer media, credit cards etc)
- The rotating part attracts ferromagnetic objects (e.g. iron, nickel or cobalt), whose movements may cause serious injury and / or damage to the structure, therefore the following safety rules must be complied with:
 - Use non-magnetic tools, if possible, and always wear safety gloves (for protection against crushing)
 - Only trained personnel may carry, store and install SKA DDR torque motors
 - Do not use cranes or lifting systems with ropes or other flexible and / or extending connections for handling parts as the attraction of the parts may lead to sudden movements the load. Use systems with a non-flexing connection if possible.

2.7 Overheated parts



CAUTION

- Surfaces may be hot. Risk of injury! Risk of burns!
- Do not touch the surface of the SKA DDR motor after it has been operating.
Risk of burns!

3 Handling



Some SKA DDR motor versions weigh over 30 kg. Therefore, they must be handled with caution and moved with assistance of several people, preferably using lifting equipment.

Always use lifting equipment with an appropriate capacity to cater for the weight of the motor and use proper coupling systems (straps, hooks, chains, etc. ..) for the weight to be lifted.

Some motors are designed with special threads for the use of eyebolts for handling purposes.

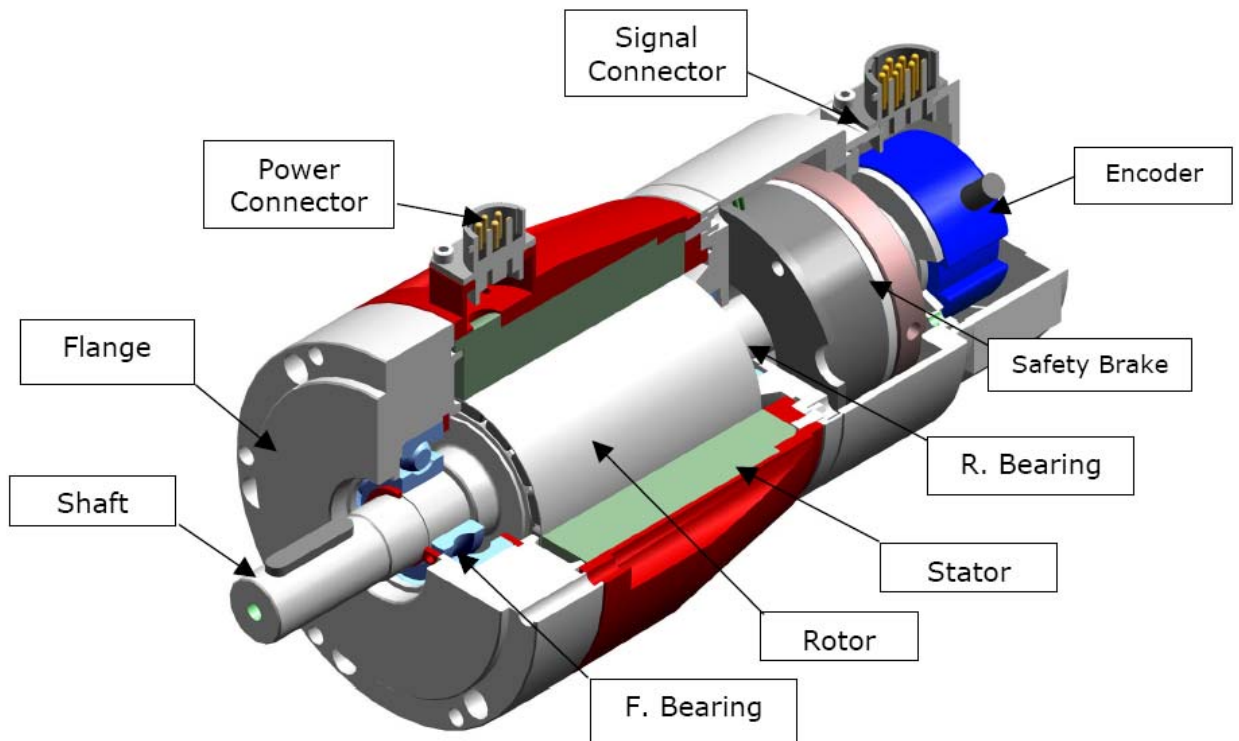
Before lifting, secure these into the threaded holes on the outer casing; always use all the coupling points provided.

If the motors are not installed immediately, they must be stored in their original crate in a dry, clean area that is not subject to vibration and is protected against sudden shifts in temperature that could cause condensation.

4 Installing the SKA DDR Power Pack



POWER PACK MOTOR PARTS



SUPPORTING SURFACE

The motor must be supported by an adequately prepared surface to accommodate the SKA DDR motor. The size of this surface must be calculated to cater for the weight of the motor and the parts that will be assembled on it and precision machined to ensure perfect coupling with the motor (maximum error of flatness 0.5 mm).

The engine may be placed in any position and at any angle provided the identification label is visible and the SKA DDR motor is not directly in the flow of hot air coming from other parts of the machine and does not sit on top of hot surfaces.

The position chosen for the motor must respect the specifications given for the temperature and for protection against dust and humidity when the motor was ordered. In case of doubt, contact the technical department at Motor Power Company with the motor's reference code on its label. SKA DDR motors are not suitable for use in environments where there is a danger of explosion, for underwater applications or for safety equipment.

INSTALLATION

After unpacking the SKA DDR Power Pack motor, put in on its surface, as described the paragraph above, and secure it to the surface using the holes provided on the front flange. Coupling the SKA DDR motor is a very delicate operation and must be done with extreme care by qualified personnel. Pay due care and attention to the following points:

- Use all the fixing holes provided and suitable steel screws blocked with strong threadlock

- Use balanced transmission bodies with mechanical tolerances to safeguard proper coupling
- Prevent violent impact on the shaft and comply with the envisaged axial and / or radial torques, also during installation
- Fit an oil seal on the shaft when mounting directly with an oil bath or in contact with grease

Now complete the electric wiring of the motor: refer to the documents provided with the motor for the wiring diagram and check you comply with the following points:

- All metal parts of the motor must be connected to earth
- The supply line must be sized so that current will not be supplied at any stage of operation above the maximum current stated in the catalogue or on the label
- Power supplies must be sized according to the rated current for the SKA DDR motor as stated on the label; use suitable cables for the application in accordance with current regulations
- Fit protection devices against overloads and short circuits as the motor is not fitted with such protection
- Protect the power supply against possible voltage backfeed to the heads of the motor should it stop by inertia
- Use shielded cables when cabling the cable braid to safeguard continuity with the body of the connectors or the cable clamp on the terminal block boxes
- Refer to the wiring diagram provided with the motor to ensure correct connection of the wires

After completing the above steps for installation, an unloaded test cycle may be conducted by feeding the SKA DDR motor by means of an appropriate electronic drive: calibrate to 15% of the nominal current operation projected for nominal cycle of operation and perform a test cycle: the shaft should move regularly in both directions.

If the outcome of the test cycle is successful, gradually increase the current of the driven application to both the nominal and peak values as envisaged in the cycle of operation.

4.1 Brake motors



All the intrinsically safe hand brakes (optional) fitted on the motors (the brake stops the motor without voltage) may only be used to block the motor after it has stopped running and not for dynamic braking. The supply values are stipulated on the label with the relative tolerance for the accepted voltage; failure to comply with these may result in the partial or non-opening of the brake.

5 Installing the SKA DDR Frameless

**WARNING****ATTENTION**

The SKA DDR Frameless motor is a type of torque motor whose basic parts were designed for assembly on the final appliance as an integral part of the application.

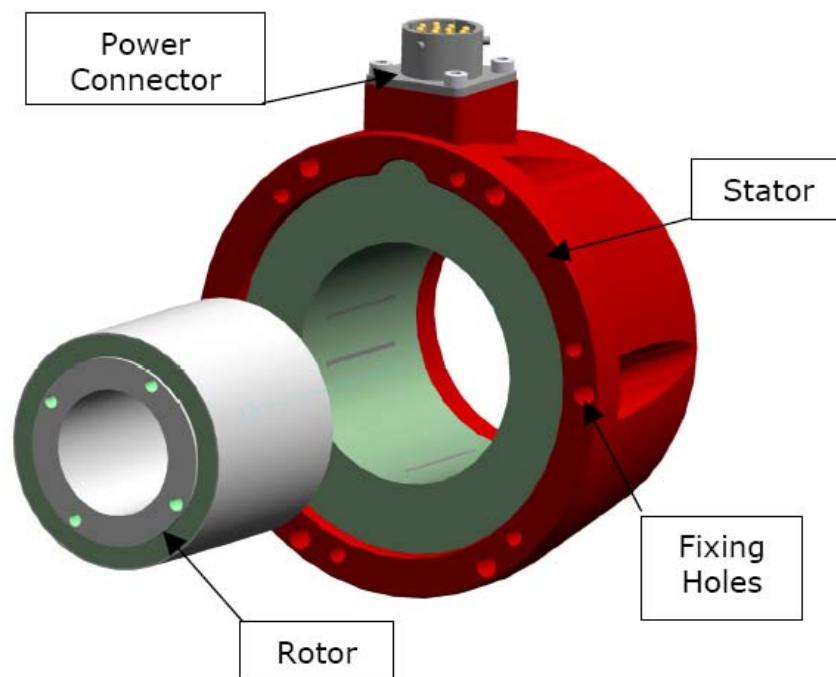
As a result, the parts needed to ensure the motor runs properly will be integral parts of the final appliance and are not supplied with the SKA DDR motor.

The list below indicates the parts whose choice, installation and purchase are organised by the end fitter and are not built-in SKA DDR motor parts. The list is provided by way of example and the types of components and possible technical solutions may differ.

- motor shaft: structure where the rotor is locked according to special couplings as per requirements below
- Support for the stator: the stator containing the windings must be secured on a metal, heat-sinking surface, working as per requirements below

- Feedback system: this is an optical or magnetic system providing information to the electronic driven application, used for the power supply, relating to the angular position of the rotor. The specifications of this system must be compatible with the electronics used and the degree of precision required
- Wiring system: consisting of wires and connectors for the supply to the stator and the feedback system. The wires must be chosen based on the power required and the type of application.

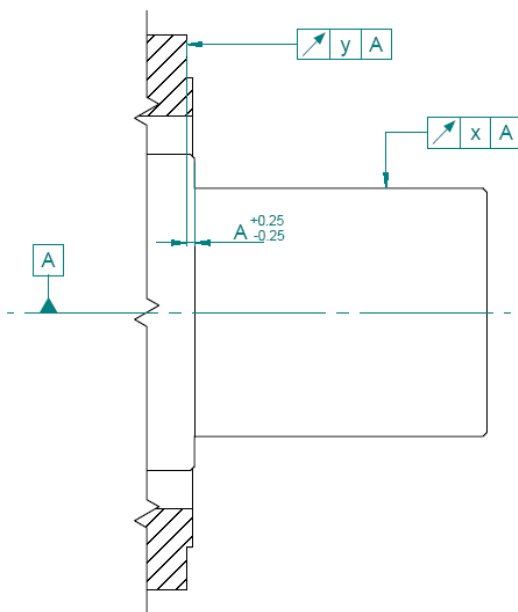
FRAMELESS MOTOR PARTS



SUPPORTING SURFACE

The motor must be supported by a surface adequately prepared to accommodate the SKA DDR Frameless motor. This surface must be made of heat-sinking metal whose surface area is at least the same as that of the motor stator itself: it must be properly sized to cater for the weight of the motor and the parts that will be mounted on it.

The assembly surface must be precision machined to provide perfect coupling with the motor according to the drawings provided in the technical documentation and must comply with the following general geometric tolerances:



	A±0.25	↗ x	↗ y
SKA ddr 90	4	0.05	0.05
SKA ddr 148	4	0.05	0.05
SKA ddr 245	4	0.08	0.08
SKA ddr 335	6	0.08	0.08
SKA ddr 430	6	0.1	0.1

Any additional parts used in the final application may require further machining or more restrictive tolerances: verify these specifications according to the parts used in the application.

The motor may be placed in any position and at any angle provided the identification label is visible and the SKA DDR motor is not directly in the flow of hot air coming from other parts of the machine or sits on top of hot surfaces.

The stator winding is made with IP65 degree of protection, while the degree of protection for the general protection of the complete and installed motor depends on the structure and other electrical parts (sensors, connections, etc.) used.

SKA DDR motors are not suitable for use in environments where there is a danger of explosion, for underwater applications or for safety equipment.

INSTALLATION

After unpacking the SKA DDR FRAMELESS motor, separate the stator and the rotor: the latter is supported on an internal side of the stator and is retained by magnetic force.

Place the rotor on its mounting surface and secure it using threaded ring nuts or tapered locking systems, or other systems that provide perfect coupling and locking for the operating torque.

Never carry out assembly when hot. For coupling under pressure, increase the pressure gradually and uniformly (do not use the hammer!) on the internal steel rotor cylinder and never on the external magnetic part.

Once the rotor is blocked in position, put the stator part into its housing, centring it on its support and securing it with the correct screws: always use steel screws for all fixing points and tighten them firmly using strong threadlock.

At this stage, the motor should be completed with the final parts required for the application such as a rear bearing, position transducer and any necessary covers.

Now complete the electric wiring for the motor: refer to the documents provided with the motor for the wiring diagram and check you comply with the following points:

- All metal parts of the motor must be connected to earth
- The supply line must be sized so that current will not be supplied at any stage of operation that is above the maximum current stated in the catalogue or on the label
- Power supplies must be sized according to the rated current for the SKA DDR motor as stated on the label; use suitable cables for the application in accordance with current regulations
- Fit protection devices against overloads and short circuits as the motor is not fitted with such protection
- Protect the power supply against possible voltage backfeed to the heads of the motor should it stop by inertia

After completing the above steps for installation, an unloaded test cycle may be conducted by feeding the SKA DDR motor by means of an appropriate electronic drive: calibrate to 15% of the nominal current operation projected for nominal cycle of operation and perform a test cycle: the shaft should move regularly in both directions.

If the outcome of the test cycle is successful, gradually increase the current of the driven application to both the nominal and peak values as envisaged for the cycle of operation.

6 Decommissioning and disposal



It is essential you comply with the current legislation in the country of use for the decommissioning and disposal of SKA DDR motors.

Motor Power Company S.r.l.
Via Leonardo Da Vinci, 4
42024 Castelnovo di Sotto (Reggio Emilia)
Tel. + 39 0522 682710
Fax +39 0522 683552
info@motorpowerco.it