OPERATION MANUAL FOR ELECTRIC ACTUATORS DRIVESPIN®

SPINEA BY TIMKEN

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1 General Instructions

- Information and instructions contained in this document apply to DriveSpin® electric actuators. The user of the electric actuator is fully responsible for their correct use. Any other information, recommendations and procedures not listed in this manual must be consulted and confirmed in advance by the equipment manufacturer SPINEA, s.r.o. (in the following SPINEA), otherwise company SPINEA bears any liability for the consequences of their application. SPINEA is not legally liable for errors and modification of the documentation taken over from the manufacturers of electric actuator components.
- SPINEA reserves the right to modify this document without notice.

1.1 Documentation use

- The documentation is part of the product and contains important information on basic safety rules and principles for handling, operation, assembly, testing, maintenance, packaging and transport of DriveSpin® electric actuators.
- The documentation must be available to a user in a properly legible condition. Make sure that the persons responsible for the equipment and its operation, and persons working with the equipment have read and understood the entire documentation. In case of any ambiguity or the need for further information, please contact SPINEA.
- The original operating instructions were prepared in the Slovak language; other language versions represent a translation thereof. In case of any inaccuracies or ambiguities in the translated document, please contact SPINEA.

1.2 Structure of safety symbols

1.2.1 Interpretation of graphical symbols and marks in the document

- Be sure to observe the safety instructions and warnings in this manual!
- The following information illustrates the meaning of safety symbols and instructions to alert you to personal injury and property damage.

DANGER!
Immediate danger with potential of serious injury or fatality!
WARNING!
Potential occurrence of dangerous situation that could cause serious injury or fatality!
CAUTION!
Information indicating threat of property damage!

1.2.2 Safety symbols

General danger

Potential of environmental threat

Dangerously hot surface

Danger of drag-in

Magnetic field effects

Risk electric shock

Risk of mechanical damage

Risk of injury – falling or movement at vertical/ horizontal load

1.2.3 Structure of inserted safety instructions

- The inserted safety instructions are given directly in the document before the potentially dangerous action in the following form:

	**DANGER!** • **Type and source of danger!** • **Possible consequences in case of ignored danger**
	- Measure to avoid risk

1.3 Claims resulting from defects and warranty

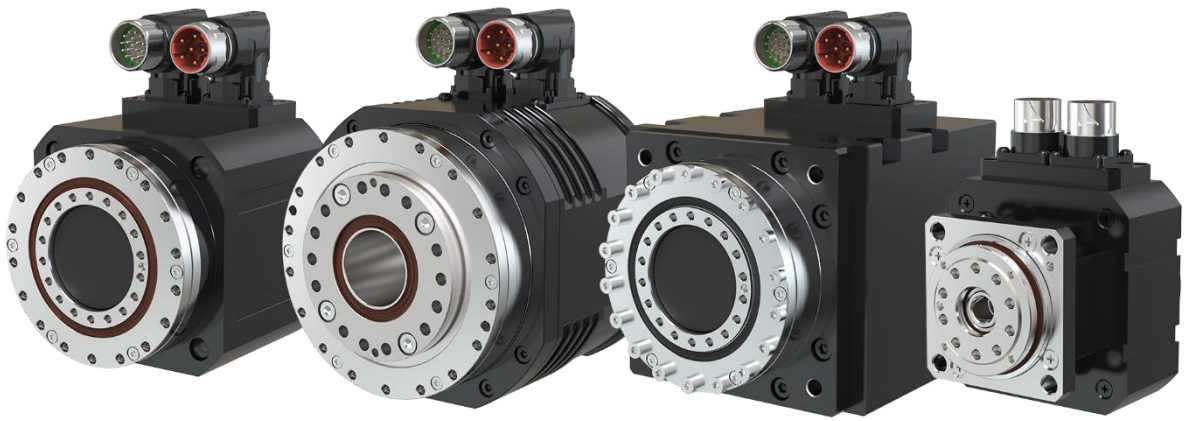
- Unconditional and complete compliance with the instructions stated herein is a precondition for the trouble-free equipment operation and a fundamental legal precondition for the assertion of any potential claims arising from defects or from the warranty. SPINEA shall not be legally liable for the equipment defects that have occurred, in whole or in part, as a result of a breach or non-compliance with the instructions given in this manual.
- Please read the documentation before you start working with the equipment.

1.4 Exclusion of liability for damage

- Unconditional and complete compliance with the instructions stated herein is a precondition of safe operation of DriveSpin® electric actuators and for achieving the required properties and performance parameters of the equipment. SPINEA shall not be legally liable for damages to the health and life of persons, material and other damages that have occurred, in whole or in part, as a result of a breach or non-compliance with the instructions given in this manual.

1.5 Copyrights

- SPINEA an author of this document, reserves all copyrights to this document and its parts. Any reproduction, publication, modification, alteration, distribution, in whole or in part, or any other infringement of copyright is prohibited.



2 Safety instructions

2.1 Introductory notes

- This operating manual contains, in particular, the safety instructions, rules, and procedures to prevent injuries and damages caused by improper handling, handling, use, and transport. Persons responsible for the equipment and its operation, and persons working with the equipment must observe all safety instructions stated in this document.
- Please follow the safety instructions stated in particular document chapters! Take into account the contents of respective documents and follow the stated instructions bellow:
  - **Read the operating instructions and diagrams supplied with equipment as accessories,**
  - **observe the warning and safety labels on the electric actuator,**
  - **observe the provisions, regulations and requirements specific to the particular equipment.**

2.1.1 Burning hazard

	**WARNING!**
	• **Potential high surface temperature of the electric actuator during its operation in compliance with intended use.** • **Risk of burns upon contact with surface!**
	- Don´t touch the electric actuator during operation and after switch-off during cooling stage.

2.1.2 Electric shock hazard

	**DANGER!**
	• **Incorrect connection method or contact with parts under voltage of the device can result in damage to the device, serious injury or dead.**
	- The connection of the electric actuator may only be carried out by a qualified person.
	**DANGER!**
	• **Electric shock hazard**
	- Before removing any connector (power or signal connector), all circuits must be disconnected from the power supply of the individual circuits.

2.1.3 Danger of being pulled in

	**WARNING!**
	• **Rotating components of electric actuator connected to the device can lead to the danger of being pulled in.**
	- Stay in safe distance from the rotating machine parts. - Secure the machine against unintentional switch-on and movement during assembly and maintenance.

2.1.4 Environmental contamination hazard

	**CAUTION!**
	• **Solvents and lubricants can contaminate soil and water!**
	- Avoid dispersal of spilled material and runoff and contact with soil, water flows, drains and sewers. Dispose of leaked medium in cooperation with a professional waste disposal company.

2.1.5 Mechanical damage hazard

	**WARNING!**
	• **Mechanical damage hazard**
	- Do not use brute force or blows when assembling or disassembling the electric actuator. There may be irreversible damage to the device and a dangerous situation or. material damage.

2.1.6 Threatening injury by fall or movement at vertical or horizontal load

	**WARNING!**	**DANGER!**
	• **The electromagnetic brakes installed in the electric actuator are not designed for the emergency stop of electric actuator!** • **The use of integrated electromagnetic brake for emergency stopping of the electric actuator poses a risk of hazardous situation or injury!**	
	- Electromagnetic brake installed in the electric actuator is designed as a parking brake. - To achieve an emergency braking torque with a vertical or horizontal load, an additional external brake with sufficient braking power must be installed.	

2.1.7 Health damage hazard for persons with built-in cardio stimulator

	**WARNING!** • **Permanent magnets of the rotor emanate strong magnetic field and related ferromagnetic forces are present even after the electric actuator switch off. These forces could pose a risk of direct damage of health, especially for people with built- in cardio stimulator (pacemaker).** - People with built- in cardio stimulator should not perform maintenance, nor work with and operate the electric actuators.

- In case of any ambiguities or the need for further information, please contact company SPINEA, s.r.o.

2.2 Transport and principles of correct and safe storage

- Transport and principles of correct and safe storage are defined in the General Terms of Actuators Packaging and Storage, available at: https://www.spinea.com/en/downloads
- General Terms of Actuators Packaging and Storage (hereinafter "VPBSA") set forth the terms of packaging, transport and storage of electric actuators DriveSpin®. VPBSA are binding for all electric actuators´ customers and represent an integral part of every contractual document, the subject of which is the supply of electric actuators. Failure to comply with the conditions set out in the VPBSA is a reason for rejecting a claim for defects in the supplied electric actuators.
- Check the supply immediately upon the receipt. Make sure that the supply has not been damaged during transport. Notify the carrier company immediately upon identification of eventual damage.

	**WARNING!**	**DANGER!**
	• **Damaged shipment must not be put into operation! It poses a risk of hazardous situation in the terms of injury and material damages!**	
	- Check the supply immediately upon the delivery. In case of identified damage, immediately notify the carrier!	

- We recommend using the system FIFO (First in – First out) for the warehouse logistics.
- Except otherwise agreed, the standard packaging is not waterproof sealed. It is intended for transport by land, not by sea in an enclosed dry and not humid space.

	**CAUTION!** • **When taking over the electric actuator, check the product properties for compliance with the requirements agreed during the purchasing stage, and for eventual damages or defects.** - Notify the vendor SPINEA, s.r.o. on eventual defects.

- Dispose the packaging material in compliance with applicable regulations!

2.2.1 Packing specification

- One-piece electric actuator packing consists of the following parts:
  - Outer packing – cardboard box is made of ecological material and is recyclable (size according to the type size of the electric actuator)
  - Inner packing (LDPE sack, ductile stretch foil protecting the conserved functional surfaces)
  - Fixating material – PUR foam/stretch foil/paper
  - Test report
  - Identification label (located on the outer packing side).

2.3 Handling

- When moving the packaged units, follow general OSH principles applicable to handling with loads, as well as instructions stated on the packing. Since the weight and dimensions don´t always allow manual handling, use special handling devices to prevent injuries and material damages. Workers assigned with handling with equipment shall be properly trained and skilled so that they don´t endanger their own safety or that of others present at work.
- Workers in charge of relocating equipment must take all necessary measures to ensure their own safety as well as the safety of other persons involved.

	CAUTION!
	• Check the electric actuator weight and dimensions.
	- Choose a proper method of handling in compliance with the principles of ergonomics, based on the equipment weight and dimensions. - Wear all prescribed PPE when handling.

2.4 Storage

Follow the General Terms of Actuators Packaging and Storage.

	CAUTION!
	• **SAFETY MEASURES** applicable to electric actuator restoration to original condition after the storage period!
	- Follow instructions stated in the General Terms of Actuators Packaging and Storage available at: www.spinea.com. - Perform these operations in an environment where there is no risk of explosion. The solvent must not come into contact with the sealing rings in order not to damage the material from which they are made and thus to impair their functionality! When period of storage exceeds 1 year, lubricant durability in the bearing units might be shorter than usual.

2.5 Compliance with legislation requirements

- Electric actuator has been constructed in compliance with the EU Parliament and EU Council Directive No. 2014/35/EU, dated Feb 26, 2014 on Harmonization of EU Member Countries´ Legal Regulations on Accessibility on the Market of Electric Equipment Intended for Use Within Certain Voltage Limits, and requirements of technical standard EN 60204-1:2006/A1:2009/Corr. Feb.:2010 or. EN 60204-1:2018 respectively.
- Electric actuator has been constructed in compliance with the EU Parliament and EU Council Directive No. 2014/30/EU, dated Feb 26, 2014 on Harmonization of EU Member Countries´ Legal Regulations on Electromagnetic Compatibility, and requirements of technical standard EN 61000-6-2:2005/Corr.Sept.:2005,EN 61000-6-3:2007/A1:2011/ AC:2012 resp. EN IEC 61000-6-4:2019.
- Electric actuator has been constructed in compliance with the EU Parliament and EU Council Directive No. 2006/42/EC, dated May 17, 2006 on Machine Equipment as amended in the Directive No. 95/16/EC, and requirements of technical standard EN ISO 12100.

2.6 Installation and assembly

- See chapter No. 5.

2.7 Commissioning

- See clause 5.2.3, chapter No. 5.

3 Product characteristics

- Electric actuator DriveSpin® represents a combination of high precision bearing reduction gear TwinSpin® with implemented axial – radial bearing with high loading ability by tilting momentum at the output, optimized servomotor (permanent magnet synchronous motor), motor feedback position sensor, and brake option – see the figure No. 1. High tilting loading ability of the output bearing allows the electric actuator loading within the bearing limits without the need of additional installation of a supporting bearing. In order to meet all customer requirements, electric actuators DriveSpin® offer a broad range of standard combinations of windings, various types of electric connections, and motor system feedback position sensors, as well as optional integration of the brake and other specific requirements.
- Electric actuator DriveSpin® represents a combination of high precision bearing reduction gear TwinSpin® and a servomotor; i.e., a combination of machinery and electrical equipment.

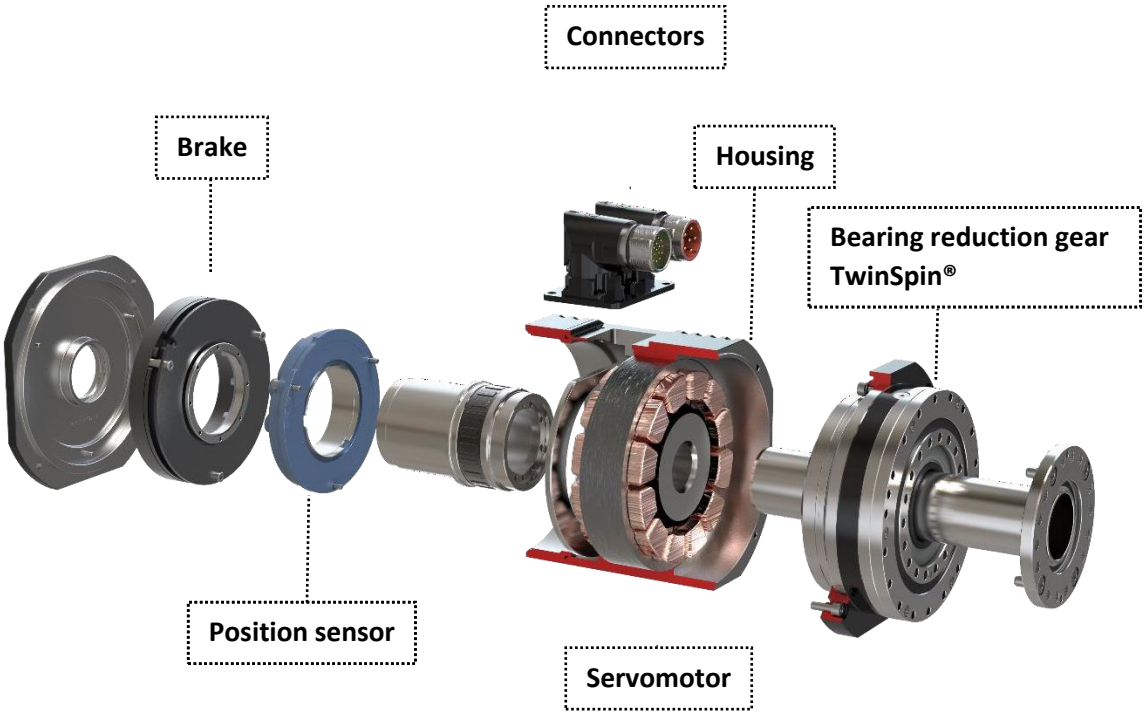


Figure1 Axial breakdown of electric actuator DriveSpin®

Utilization of electric actuators in the following areas requires risk assessment and approval by company SPINEA:

- Environment with increased explosion risk,
- Equipment specially constructed for the use in nuclear power plants or premises with increased radiation,
- Vacuum,
- Household appliances,
- Medical equipment,
- Equipment intended for direct contact with human body,
- Equipment intended for space applications and aviation industry,
- Defense industry,
- Equipment intended for marine applications,
- Equipment intended for food processing industry.

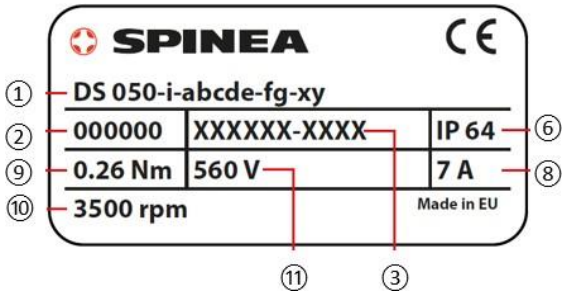
- Operating manual applicable to electric actuators DriveSpin® contains important information on the equipment operation, maintenance and servicing. This part of the manual is intended primarily for persons performing equipment maintenance, commissioning, and servicing.
- Before starting the work and using the electric actuators DriveSpin® the manufacturer recommends becoming familiar with the below stated documents (if available):
  - The latest catalogue DriveSpin® available for downloading on the website: www.spinea.com,
  - Operating Manual – Electric Actuators DriveSpin® (this manual),
  - Testing protocol / test report (an integral part of the electric actuator DriveSpin® supply),
  - Installation and User Manual – Digital Servo- Amplifier,
  - User Manual of digital servo amplifier commissioning and setup SW, supplied by the amplifier manufacturer,
  - Installation and User Manual for Extension Cards, supplied by the amplifier manufacturer,
  - User and Setup Manual for further accessories.

3.1 Production label

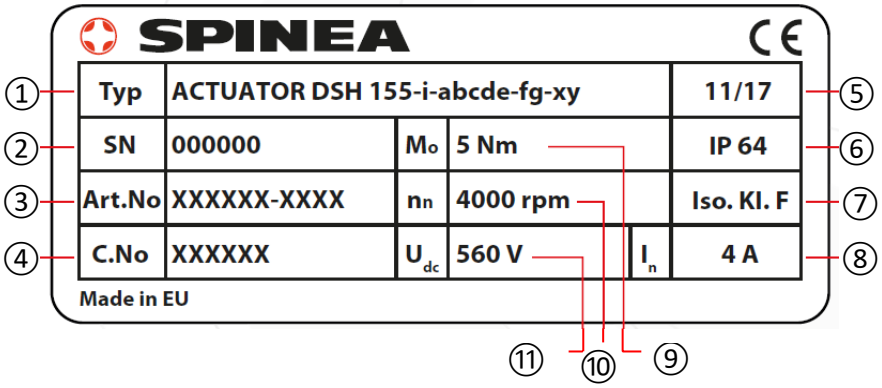
Manufacturer´s product label is attached on a visible place on the DriveSpin® electric actuator body. Another identification label is located on the outer package side (one- piece packing).

Type designation represents also an ordering code for particular DriveSpin® electric actuator specification, it is described in detail in the DriveSpin® catalogue or on the websites http://www.spinea.com.

3.2 Identification label of electric actuator DS, DSH, DSM, DSF for size 050



3.3 Identification label of other electric actuators DriveSpin®



where:

1. **Type** ordering code
2. **SN** Serial number of electric actuator DriveSpin®
3. **Art.No** Article number
4. **C.No** Customer number
5. **11/17** Week /year of electric actuator manufacturing
6. **IP** Electric actuator coverage
7. **IsoKl.** Motor isolation class
8. **I_n:** Rated motor current
9. **Mo** Rated stall torque
10. **n_n** Rated motor speed
11. **U_{DC}** DC bus voltage

4 Electric actuators dimensions

- Dimensions of electric actuators are stated in the DriveSpin® electric actuators catalogue, section Drawings, or in actual offer documentation.

5 Installation and Operation

5.1 Mechanical installation

During installation follow the safety instructions stated in chapter 2.

5.1.1 Before you begin

- Before beginning with mechanical installation, we recommend checking the following:
  - Data on the electric actuator identification label, data and parameters stated in the test report and parameters of digital servo- amplifier (especially output voltage of the servo- amplifier and its DC bus should correspond to the parameters of electric actuator).
  - Electric actuator mustn't be damaged (apparent damage caused by transport, storage or handling).
  - Ambient temperature should fall within -10°C and +40°C (if these limits are exceeded, consult it with the manufacturer).
  - The altitude of the installation should reach max. 1,000 m a.s.l., otherwise the drive should be adjusted to fit the surrounding conditions. In such case contact the electric actuator manufacturer.
  - Clean the reduction gear output flange and body from the conservation substances and eventual contamination with a non-molting cloth soaked in a non-aggressive detergent LOS 1100.
  - Wipe dry all cleaned mounting surfaces in order to ensure required friction values of the screwed joints.

CAUTION!
• **Cleaning with pressurized air can damage the electric actuator sealing units!**
- Don´t use pressurized air for electric actuator cleaning.

5.1.2 Centering of electric actuator DriveSpin®

- Electric actuator DriveSpin® should be properly centered to ensure that its output flange isn´t loaded above limits. Follow the permitted axial and radial load stated in the catalogue DriveSpin® on website www.spinea.com. Avoid strokes and hitting of the electric actuator body.

5.1.3 Output flange face and circumferential jerking values

- The values of electric actuators DriveSpin® face and circumferential jerking are stated in the catalogue DriveSpin® on the website www.spinea.com.

5.1.4 Installation of components on electric actuator output flange

	**CAUTION!**
	• **Unreasonable loading of electric actuator during its mounting could cause its irreversible damage!**
	- Don´t attempt to connect the components to the electric actuator output flange with excessive force or hitting. - Use only suitable mounting tools.

- Safe transfer of external load applied on the electric actuator DriveSpin® requires the use of connection screws of grade at least 10K and degreasing of the friction joints contact surfaces before mounting. Screw tightening torque is stated in the table 1.

Table 1 Screw tightening torque

Screw	Tightening torque [Nm]	Tightening strength [N]	Screw material grade and specification
M3	1,9	3100	ISO 898 T1 10.9K or 12.9K
M4	4,3	5300	
M5	8,4	8800	
M6	14	12400	
M8	35	22750	

- Permitted torque transferred by the connection screws on the output flange and bearing body is stated in the catalogue DriveSpin® on the website www.spinea.com.

5.2 Electric wiring

	**DANGER!**
	• **Incorrect method of connection or touching the live parts of the device can result in equipment damage or serious injury or dead.**
	- Electric actuator shall be connected only by qualified person.

Obligatorily follow the safety instructions stated in chapter No. 2 when commissioning the equipment.

- Prior to starting the work with electric actuator, read the applicable manuals and technical documentation of the equipment (especially of the electric actuator and digital servo- amplifier).
- Electric actuator shouldn´t be connected directly to the main power grid! Use the original cabling and suitable servo – amplifier (or a servo – amplifier recommended by the vendor that is compatible with the electric actuator) for the proper connection of electric actuator.

- Prior to the equipment commissioning, ensure the compliance with EU directives applicable to machines and equipment with built – in electric actuators DriveSpin®.
- Equipment and machines with servo- amplifier driven motors should meet the protection
- requirements in accordance with EMC EU directives.

5.2.1 Instructions for connection

- Prior to connection of electric actuator to the servo – amplifier, check for correct connection of power and signal parts of the electric actuator according to the wiring diagram available in the catalogue DriveSpin®, on the website www.spinea.com, or in the Test Report of the electric actuator; in order to avoid injury or eventual damage of the equipment electric parts.
- Choose the connection cabling and other components routing so as their potential damage during operation is avoided, especially:
    - Mechanical damage caused by moving machine parts,
    - Thermal damage,
    - Damage caused by other destructive effects of the surrounding environment.
- In case of longer storage (exceeding 1 year), measure the isolation resistance of the electric actuator winding.
- If you use the electric actuator with cable outlet and cabling location in the energy chains, take in account the cabling installation technical requirements set forth by the cable manufacturer, and installation instructions of the energy chain manufacturer, especially:
    - Energy chain choice must comply with the requirements of particular used cables. Bending radius should correspond to the minimum cable bending radius.
    - Ambient temperature shouldn´t drop below 5°C during the cable installation.
    - The cables should be installed in the energy chain without any twisting. If cables are twisted inside the energy chain, premature damage to the cable may occur. The effect can be accentuated up to potential cable structure damage, which could further cause malfunctions.
    - The cables should be laid freely next to one another inside the energy chain segments.
    - If possible, arrange the cables independently and mutually separated from one another by spacers, or in separate openings of the energy chain neutral zone.
    - Free space of the cables inside the energy chain segments must comprise at least 10% of the cable diameter.
    - The cables should be installed symmetrically, taking in account their weight and size. The cables with bigger diameter and weight should be laid on the outer side, while those with smaller size and diameter should be laid on the inner side. Avoid the cables arrangement one above another without the use of horizontal spacer.
    - In case of vertical arrangement of the energy chain, create more free space inside the inner energy chain segment clearance since the operation is associated with certain cable prolongation. After a short period of operation, it is necessary to check and, if necessary, correct this cable length setting. Affix the cable on both ends in case of used self-contained energy chains. Use the recommended affixation by the cable chain manufacturer. In case of high acceleration values, binding strap solution has limited durability. Avoid binding the cables together.
    - The cables shouldn´t be secured or bound within the moving section of the energy chain in any way. The distance from the end point of the bend to the cable affixation must be as large as possible. In case of sliding chains, we recommend affixing the cables only on the moving end. A small cable reserve should be made at the fixed end.
    - Ensure location of the cables in the neutral zone of the energy chain, i.e. avoid forced cable placement along the inner or outer bending and allow for relative cable movement between

one another and towards the energy chain.

- If uneven movement occurs as a result of longitudinal twisting during operation, it is necessary to turn the cables on either affixation point so as the cables could be straightened and enable smooth movement.
- Changes at cable and energy chain length significantly differ in the terms of absolute values. Natural prolongation of the cables usually occurs within the first few hours of the operation.

5.2.2 Protection against overloading

- There is a temperature sensor integrated in the winding to provide protection of all electric actuator types against undesirable thermal overloading resulting from excessive effective current. The temperature sensor integrated in the electric actuator winding doesn´t guarantee complete protection against overloading.

CAUTION!
• **Exceeded maximum permitted temperature on the electric actuator gear body, stated in the catalogue DriveSpin® on the website www.spinea.com, can irreversibly damage the electric actuator!**
- Monitor the temperature and the heating rate of electric actuator reduction gear surface, depending on the loading. - Ensure removal of excessive heat in order to avoid exceeded maximum permitted temperature on the electric actuator reduction gear surface - Reduce loading. - Use the electric actuator with higher output power.

CAUTION!
• **Exceeded maximum permitted temperature of the electric actuator motor, defined by the isolation class and stated in the catalogue DriveSpin® and on the website www.spinea.com; can irreversibly damage the electric actuator!**
- Monitor the temperature and the rate of motor heating with integrated temperature sensor. - Ensure removal of excessive heat in order to avoid exceeding maximum permitted temperature of the electric actuator motor. - Reduce loading. - Use the electric actuator with higher output power.

- Technical parameters of particular temperature sensors are specified in the chapter 8 of this document.

5.2.3 Commissioning

- Commissioning of the electric actuator shall comply with the terms described herein in the chapters 1 and 2.

Electric actuator shouldn´t be used as a lifting device!

- Check the following terms prior to equipment commissioning:
  - Electric actuator shouldn't be damaged or locked.
  - Measure the winding isolation resistance after long time storage.
  - All cable joints must be correctly interconnected and without mechanical damage.
  - Check the rotary seals of the electric actuator which must not be damaged No signs or sources of eventual danger are permissible.
  - Ensure thorough connection of the electric actuator cable shielding (power and signal cables) to the ground pursuant to servo- amplifier manual.
- In the following step, set up the limits of following parameters on the servo- amplifier (along with other necessary parameters): maximum current, torque, and speed of servomotor to equal to or lower than maximum permitted values of the electric actuator. Particular instructions are contained in the manual related to particular servo- amplifier. In case of further information required, please contact the vendor. Ensure that the following requirements are met during the electric actuator operation:

	DANGER!
	• **Control and protective devices must be in operation in all conditions (also during trial operation).** • **Electric actuator must be connected to PE bus in the electric machine distributor in a reliable way; electric safety depends on the lowest possible earth connection resistance. Electric actuator contains a separate pin in case of connector type, or a green- yellow conductor in case of cable outlet type, intended for connection with PE bus.** • **Incorrect disconnection of the connectors during operation or under voltage, can cause equipment damage or serious injury or dead.** • **Cables or other parts of the electric actuator and digital servo- amplifier can remain under residual voltage shortly after switching off.**
	- Don´t disconnect the connectors during the electric actuator operation. - Never disconnect the cables on the electric actuator or servo- amplifier side during the equipment (or servo- amplifier) being under supply voltage. - Before touching or disconnecting the conductive joints and „live parts" of the circuit (contacts, screwed joints), wait a few minutes after disconnection of the servo – amplifier from the main power (the time is usually specified by the servo – amplifier manufacturer).

■ Note: When commissioning the electric actuator for the first time, do it outside the equipment that the actuator is to be built in. This way, the user has an opportunity to become familiar with the electric actuator operation and properties before its initial installation in the equipment.

6 Maintenance and disposal

- Follow all instructions stated in chapter 1 and 2 hereof before starting the work with the equipment.

6.1 Maintenance

6.1.1 Visual check

- Visually check the whole electric actuator and all cable joints with focus on external damage.
- Radial sealing bearings are subject to wear. Therefore, check the electric actuator during a visual inspection for seal leaks and grease leakage. Check for legibility of identification label and pictograms if located on the electric actuator body.
- In case of electric actuator type with cable outlet located inside the energy chain, check the position of installed cable inside the chain.

6.1.2 Cleaning

	**CAUTION!**
	• **Cleaning of electric actuator with pressurized air can cause its damage!**
	- Don´t apply pressurized air to electric actuator cleaning.

- Strong contamination and dust could affect the electric actuator functionality. Insufficient heat removal caused by contamination could affect the durability of particular electric actuator components.
- Remove eventual contamination from the electric actuator gear with a non-molting cloth soaked in a non-aggressive detergent complying with VPBSA.

6.1.3 Maintenance schedule

Table 2 Maintenance schedule

Maintenance type	At initial startup	After the first 400 hours/ 3 months	Annually
Visual check and cleaning	Yes	Yes	Yes

6.1.4 Lubricant exchange

- Exchange of lubricant in electric actuator with the standard construction is not required at standard operating conditions. All components are permanently lubricated and filled with lubricant by the manufacturer. In case of special lubrication and durability requirements, contact the manufacturer!

6.1.5 Disposal

- Upon the operating life expiration, dispose the electric actuator in compliance with local regulations and waste/ oil product liquidation legislation in order to avoid endangering of persons, animals and environment.

	**CAUTION!**
	• **Solvents and lubricants can contaminate soil and water!**
	- Avoid spreading and spilling of leaked medium in the soil, water flows drains and sewers. Dispose the leaked medium in compliance with waste disposal company.

7 Malfunction during operation

	CAUTION!
	• **Change at standard electric actuator behavior during operation can indicate the electric actuator damage or destruction!** - Immediately stop the drive and disconnect the electric actuator or servo – amplifier from the power supply. - Don´t attempt to restart the electric actuator unless the damage or non-standard behavior cause has been removed. - Notify the vendor about the electric actuator issues and changed behavior during operation. - Never intervene in the electric actuator structure without prior consultations with the manufacturer.

Table 3 List of a few electric actuator malfunction statuses

Problem description	Possible cause	Solution
Failed electric actuator start	Incorrectly connected or damaged cabling, shielding, incorrect phase sequence	Check the cabling connection or eventual damage. Connect the cabling or ask the manufacturer for replacement. Check the shielding connection based on servo – amplifier requirements.
	Activated thermal protection of electric actuator	Check the parameters set up in the servo – amplifier, eventually the electric wiring diagram.
	Incorrectly set up servo – amplifier parameters	Check the parameters set up in the servo – amplifier and their compliance with the installed electric actuator. Check setup of commutation and commutation angle.
	Damaged winding	Measure the winding resistance between the phases U-V, V-W, W-U and resistance between particular phases and PE. Contact the manufacturer with measured values.

Electric actuator turns in the opposite direction	Output flange of electric actuator turns in the opposite direction towards the electric actuator servomotor rotation direction, referring to the LR operation principle	Change the servo – amplifier setup.

	Electric actuator is incorrectly connected; incorrect setup of servo- amplifier speed loop	Check the servo – amplifier setup or its electric wiring diagram.
Increased electric actuator noise during operation	Damaged bearing unit	Bearing unit replacement at the manufacturer is necessary.
	Damaged gearing mechanism	Contact the vendor.
	Incorrect setup of servo-amplifier regulation loops	Adjust the servo- amplifier parameters (current, speed and position control loop).
Lubricant leakage	Electric actuator overfilled with lubricant	Wipe dry the lubricant and monitor the electric actuator for continued lubricant leakage. Following the pressure balance reached, lubricant leakage should soon disappear.
	Damaged sealing	Contact the vendor.
	Increased pressure in the gear caused by high temperature	Follow the permissible temperature range. Measure the load connected to electric actuator, use more powerful electric actuator or reduce load torque; check the working cycle.
Excessive heating of electric actuator (reduction gear body temperature exceeds 65°C).	Overloaded electric actuator	Measure the load connected to electric actuator, use more powerful electric actuator or reduce the load; check the working cycle.
	Too high ambient temperature	Follow the permissible temperature range. Ensure electric actuator cooling.
	Incorrectly set up parameters of servo- amplifier regulation	Adjust the servo- amplifier parameters (current, speed and position steering loop).

- If you need the assistance of our technical department, please contact company SPINEA and state the following information:
  - complete data from the identification label;

- type and extent of malfunction;
- time and circumstances of malfunction;
- probable cause; and
- filled in so called „Claim Protocol" that can be downloaded on the website: https://www.spinea.com/en/company/quality/downloads

8 Technical parameters of electric actuators DriveSpin®

- Since the technical information and parameters of electric actuators are too extensive, you can find them in the DriveSpin® catalogue on the website www.spinea.com.
- Pursuant to standard EN 50178, electric actuators can be operated in climatic conditions of category 3K3.
  - Ambient temperature -10°C through +40 °C applicable to altitude above sea level up to 1,000 m a. s.
  - Accepted relative humidity up to 95% without condensation.

Surface treatment, corrosion resistance

- Considering ambient corrosion aggressiveness, electric actuator is intended for operation in the environment with low aggressiveness category (C2) pursuant to standard ISO 12944-2. This doesn´t apply to unprotected functional end of the bearing body and to output flange and shaft that are not protected against corrosion in excess of regular conservation.
- Higher degree of electric actuator anti-corrosion protection can be ordered.

8.1 Specification of sensors for electric actuators DriveSpin®

- Specification of sensors can be found in the DriveSpin® catalogue on the website: www.spinea.com or in the test report being an integral part of every electric actuator packing.

8.2 Type of connection and wiring diagram of electric actuator

- Specification of electric actuators connection options can be found in the DriveSpin® catalogue on the website: www.spinea.com. Detail wiring diagram including the description of particular pins and color marking of cable outlet conductors is described in the catalogue of electric actuators DriveSpin® on the websites: www.spinea.com, or in the test report being an integral part of every electric actuator packing.

8.3 Moments of inertia and weight of electric actuator

- Values of moment of inertia at the electric actuator input can be found in the DriveSpin® catalogue on the website: www.spinea.com, in the related technical documentation.

8.4 Performance characteristics

- Performance characteristics of electric actuators can be found in the catalogue DriveSpin® on the websites: www.spinea.com.

8.5 Technical specification of temperature sensor

8.5.1 Temperature sensor PTC 111-K13

- Because of high non- linear thermal characteristics, PTC sensor can be used only to monitor the temperature of electric actuator DriveSpin® winding.

Table 6 Table of PTC thermal resistor electric resistance values depending on temperature

PTC 111-K13	
T_{NAT} = 140 °C	
Resistance value pursuant to DIN 44081 and DIN 44082	
Temperature range	**Resistance (Ω)**
-20 °C up to 120 °C	R≤250 Ω
120 °C up to 135 °C	R≤550 Ω
135 °C up to 145 °C	R≥1330 Ω
>155 °C	R>4000 Ω

8.5.2 Temperature sensor PT 1000

- Typical characteristics of temperature sensor type PT 1000 are stated in the table No. 7 and its graphical interpretation is on the picture No. 1.

Table No. 7 Table of PT1000 thermal resistor electric resistance values depending on temperature

Temperature [°C]	Resistance [Ω]
-40	843
-30	882
-20	922
-10	961
0	1000
10	1039
20	1078
30	1117
40	1155
50	1194
60	1232
70	1271
80	1309
90	1347
100	1385
110	1423
120	1461
130	1498
140	1536
150	1573
160	1611
170	1648
180	1685
190	1722
200	1759
210	1795
220	1832
230	1868
240	1905

250	1941

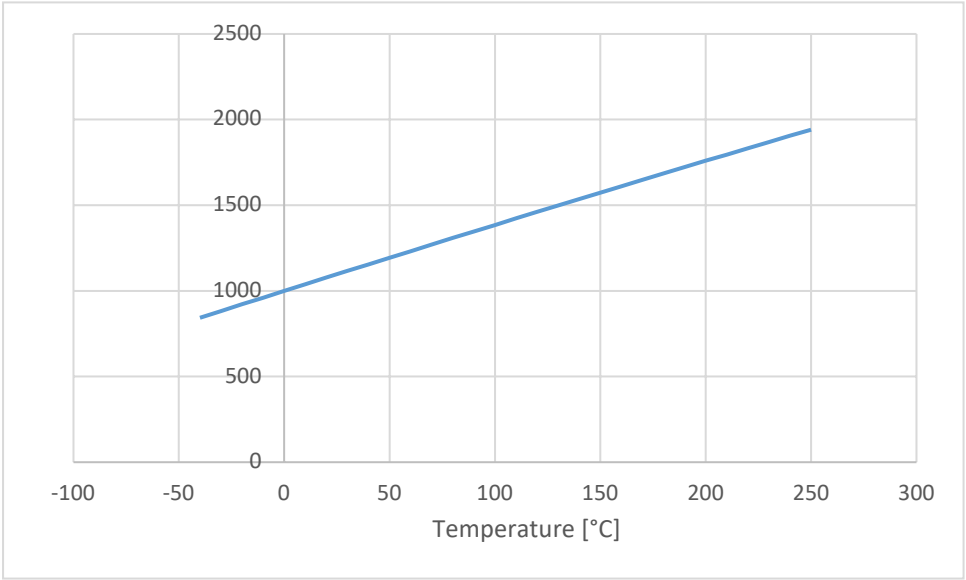


Figure 2 Thermal dependence of PT1000

9 Certificates, regulations and directives

REACH (Registration, Evaluation, Authorization and Restriction of Chemicals)

- Regulation of European Parliament on Registration, Evaluation, Authorization and Restriction of Chemical Substances.

RoHS (Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment)

- Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

EMC (Electromagnetic Compatibility)

- The electric actuator has been designed in accordance with Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility - see chapter 2.5 of this manual.

LVD (Low Voltage Directive)

- The electric actuator has been designed in accordance with Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits - see chapter 2.5 of this manual. service.

Note:
DriveSpin® - trademark registered in selected countries

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