WITTENSTEIN | alpha

axenia

Rotary stainless steel servo actuator in "Hygienic Design"

Operating Manual

4022-D040735

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Table of Contents

1 About this manual 3
1.1 Signal words 3
1.2 Safety symbols 3
1.3 Structure of the safety instructions 4
1.4 Information symbols 4
2 Safety 5
2.1 EC/EU Low Voltage Directive 5
2.2 Dangers 5
2.3 Personnel 5
2.4 Intended use 5
2.5 Reasonably foreseeable misuse 5
2.6 Guarantee and liability 6
2.7 General safety instructions 6
2.8 Safety signs 7
3 Description of the servo actuator 8
3.1 Overview of servo actuator components 8
3.2 Identification plate 9
3.3 Ordering code 10
3.4 Performance data 10
3.5 Weight 10
4 Transport and storage 11
4.1 Scope of delivery 11
4.2 Packaging 11
4.3 Transport 11
4.4 Storage 11
5 Assembly 12
5.1 Preparations 12
5.2 Mounting the servo actuator onto a machine 13
5.3 Components mounted on the output side 14
5.4 Installing electrical connections 15
6 Startup and operation 16
6.1 Safety instructions and operating conditions 16
6.2 Cleaning agents and cleaning process 16
6.2.1 Recommended cleaning agents 17
6.2.2 Cleaning schedule 17
6.3 Data for the electrical startup 18
7 Maintenance and disposal 19
7.1 Maintenance work 19
7.1.1 Visual inspection 19
7.1.2 Checking the tightening torques 19
7.2 Startup after maintenance work 19
7.3 Maintenance schedule 20
7.4 Information on the lubricant used 20
7.5 Disposal 20
8 Malfunctions 21

9 Appendix 23
9.1 Specifications for mounting on a machine 23
9.2 Tightening torques for common thread sizes in general mechanical engineering 23
9.3 Tightening torques for common thread sizes with corrosion-resistant screw connections 23
9.4 Technical specifications 24
9.4.1 Moments of inertia 24
9.4.2 General servo actuator data 24
9.4.3 Technical specifications for resolver 25
9.4.4 Technical specifications of Stegmann Hiperface absolute encoder 25
9.4.5 Technical specifications for Stegmann Hiperface absolute encoder, Rockwell option 26
9.4.6 Technical specifications for Heidenhain EnDat absolute encoder 26
9.4.7 Technical specifications of PTC temperature sensor 27
9.4.8 Technical specifications of KTY and NTC temperature sensors 27
9.4.9 Technical specifications of brake 28
9.4.10 Pin assignment 28
9.4.11 Cable setup / Cable cross-section 28

1 About this manual

These instructions contain information necessary for the safe operation of the axenia servo actuator, referred to as the servo actuator in the following.

If this manual is supplied with an amendment (e.g. for special applications), the information in the amendment is valid. Contradictory specifications in this manual thereby become obsolete.

If you have any questions about special applications, please contact **WITTENSTEIN alpha GmbH**.

The operator must ensure that this operating manual is read and fully understood by all persons assigned to install, operate, or maintain the motor.

Store the manual within reach of the motor.

Inform your colleagues working in the area around the machine about the **safety instructions**, so that no one is hurt.

The original manual was created in German; all other language versions are translations of these instructions.

1.1 Signal words

The following signal words are used to indicate possible hazards, prohibitions, and important information:

	⚠ DANGER **This signal word indicates an imminent danger that could cause serious injuries and even death.**
	⚠ WARNING **This signal word indicates a potential hazard that could cause serious injuries and even death.**
	⚠ CAUTION **This signal word indicates a potential hazard that could cause minor or serious injuries.**
	NOTICE **This signal word indicates a potential hazard that could lead to property damage.**
	A note without a signal word indicates application hints or especially important information for handling the servo actuator.

1.2 Safety symbols

The following safety symbols are used to indicate possible hazards, prohibitions, and important information:


General danger


Hot surface


Suspended loads


Entanglement

Electric voltage

Flammable

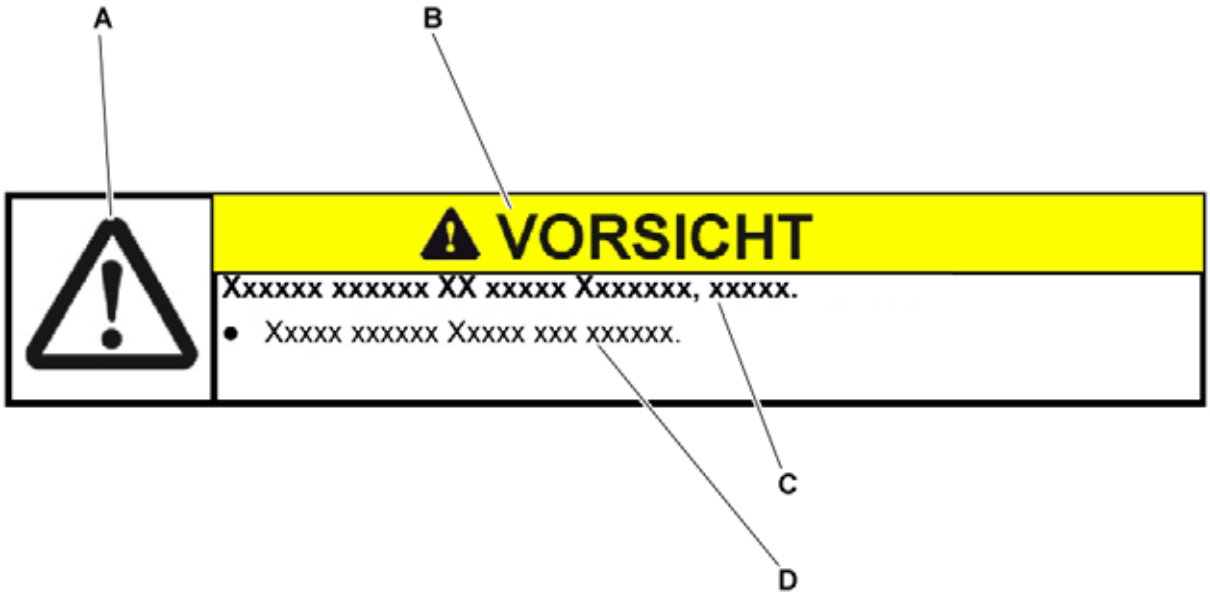
Harmful to the environment

Information

Component sensitive to electrostatic discharge

1.3 Structure of the safety instructions

The safety instructions in this manual are designed according to the following pattern:



A = Safety symbol (see Chapter 1.2 "Safety symbols")
B = Signal word (see Chapter 1.1 "Signal words")
C = Type and consequence of the danger
D = Avoiding danger

1.4 Information symbols

The following information symbols are used:

- Indicates an action to be performed
  - ➲ Indicates the results of an action

ⓘ Provides additional information on handling

2 Safety

This operating manual, especially the safety instructions and the rules and regulations valid for the operating site, must be observed by all persons working with the servo actuator.

In addition to the safety instructions in this manual, also observe any legal and otherwise applicable environmental and accident prevention rules and regulations (e.g. personal safety equipment).

2.1 EC/EU Low Voltage Directive

The servo actuator has been constructed in accordance with the following EC/EU directive:

- 2006/95/EG valid until 19.04.2016 [time of production]
- 2014/35/EU valid starting on 20.04.2016 [time of production]

Observe applicable regulations for electrical installation (e.g. wire gauge, fuses).

It is the responsibility of the manufacturer of the plant to ensure all requirements for the entire system are fulfilled.

2.2 Dangers

The servo actuator has been constructed according to current technological standards and accepted safety regulations.

To avoid danger to the operator or damage to the machine, the servo actuator may be put to use only for its intended usage (see Chapter 2.4 "Intended use") and in a technically flawless and safe state.

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

2.3 Personnel

Only technicians who have read and understood this operating manual may perform work on the servo actuator. Based on their training and experience, technicians must be able to evaluate the tasks assigned to them, in order to recognize and avoid risks.

2.4 Intended use

The servo actuator is suitable for all industrial applications.

- The servo actuator may not be operated in areas with explosion hazards.
- The servo actuator can be cleaned easily and is corrosion-resistant. In food processing it can only be used in the splash zone (according to DIN EN 1672-2).
  - When used in food processing, it must be ensured that product parts which can reach or stick to the actuator do not return to the processing cycle.
  - Note the special information on mounting (Chapter 5 "Assembly") and on cleaning (Chapter 6 "Startup and operation").
- For risk-free operation, required safety devices have to be present, properly installed, and fully functional. They may not be removed, changed, bridged, or rendered ineffective.
- In case of an emergency shutdown, power failure and or damage to the electrical equipment, the servo actuator must be
  - switched off immediately,
  - secured against uncontrolled re-activation,
  - secured against uncontrolled after-running.
- The optionally installed brake is simply a holding brake and may not be utilized for braking the running servo actuator.

2.5 Reasonably foreseeable misuse

Any use that deviates from the approved technical data (e.g. speed, force, torque, temperature) is not use as intended and is therefore not permitted.

In particular the following applications are not permitted:

- Operation of the servo actuator, without properly installing it in or connecting it to other machines or other partly completed machines or equipment.
- Operation of the servo actuators in a defective state
- Operation of the servo actuator, without determining that the machine in which it is to be installed complies with the provisions of the Machinery Directive 2006/42/EC.
- Operation of the servo actuator in a potentially explosive environment
- Assembly of the servo actuator without prior acknowledgment of the operating / assembly manual
- Operation of the servo actuator without legible warning and information signs
- Use of improper lubricants
- Use of unsuitable servo controllers
- Use in improper installation, operating, performance and ambient conditions
- Assembly of the servo actuator by insufficiently competent personnel

2.6 Guarantee and liability

Any of the following will render void guarantee and liability claims for personal injury or material damage:

- Ignoring the information on transport and storage
- Improper use (misuse)
- Improper or neglected maintenance and repair
- Improper assembly/disassembly or improper operation (e.g. test run without secure attachment)
- Operation of the servo actuator when safety devices and equipment are defective
- Operation of the servo actuator without lubricant
- Operation of a heavily soiled servo actuator
- Modifications or reconstructions that have been carried out without the written approval of **WITTENSTEIN alpha GmbH**

2.7 General safety instructions

⚠ DANGER

Faulty electrical connections or unapproved, current-carrying components can cause serious injuries and even death.

- Have all electrical connection work performed by qualified technicians only.
- Immediately replace damaged cables or plugs.

⚠ WARNING

During generator operation, voltage is induced. This can lead to lethal current surges.

- Ensure that no plugs and connections are exposed during generator operation.

⚠ WARNING

Objects flung out by rotating components can cause serious injuries.

- Remove objects and tools from the servo actuator before putting it into operation.

⚠ WARNING

Rotating components on the servo actuator can pull in parts of the body and cause serious injuries and even death.

- Keep a sufficient distance to rotating machinery while the servo actuator is running.
- Secure the machine against restarting and unintentional movements during assembly and maintenance work (e.g. uncontrolled lowering of lifting axes).

⚠ WARNING

A wrong direction of rotation or direction of movement may result in serious injury or death.

The direction of rotation or movement may differ from the standard IEC 60034–8.

- Before and during startup, ensure that the servo actuator has the correct direction of rotation or movement.
- Be sure to avoid collision (caused e.g. by crashing against an end stop).
- With the danger area secured, check the direction of rotation or movement in a slow motion, ideally by limiting the current and torque.

⚠ WARNING

A damaged servo actuator can cause accidents with the risk of injury.

- Never operate a drive that has been overloaded due to misuse or a machine crash (see Chapter 2.5 "Reasonably foreseeable misuse").
- Replace the affected servo actuators, even if no external damage is visible.

⚠ CAUTION

Hot servo actuator housing can cause serious burns.

- Touch the servo actuator housing only when wearing protective gloves or after the servo actuator has been idle for some time.

NOTICE

Loose or overloaded screw connections can damage the servo actuator.

- Always use a calibrated torque wrench to tighten and check all screw connections for which a tightening torque has been specified.

⚠ WARNING

Lubricants are flammable.

- Do not spray with water to extinguish.
- Suitable extinguishing agents are powder, foam, water mist, and carbon dioxide.
- Observe the safety instructions of the lubricant manufacturer (see Chapter 7.4 "Information on the lubricant used").

⚠ CAUTION

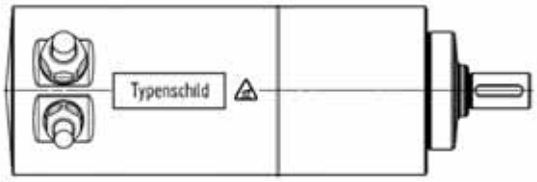
Solvents and lubricants can cause skin irritations.

- Avoid direct skin contact.

Solvents and lubricants can pollute soil and water.

- Use and dispose of cleaning solvents and lubricants properly.

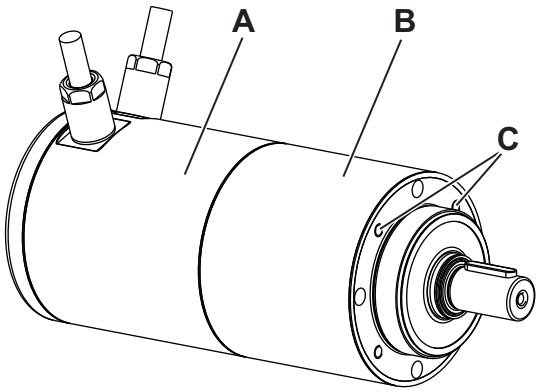
2.8 Safety signs



On the servo actuator, the identification plate is lasered provided with a safety sign which warns about hot surfaces.

Make sure that the identification plate is legible.

3 Description of the servo actuator

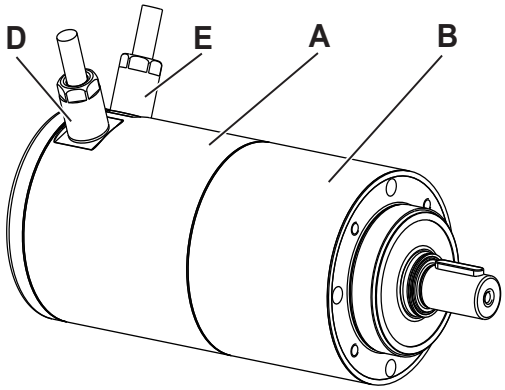


The servo actuator is a combination of a low-backlash planetary gearhead (B) and an AC servomotor (A).

It is mounted on the machine by means of drive-side threaded bores (C).

The servo actuator can be cleaned easily and is corrosion-resistant. It may be generally used in food processing.

3.1 Overview of servo actuator components

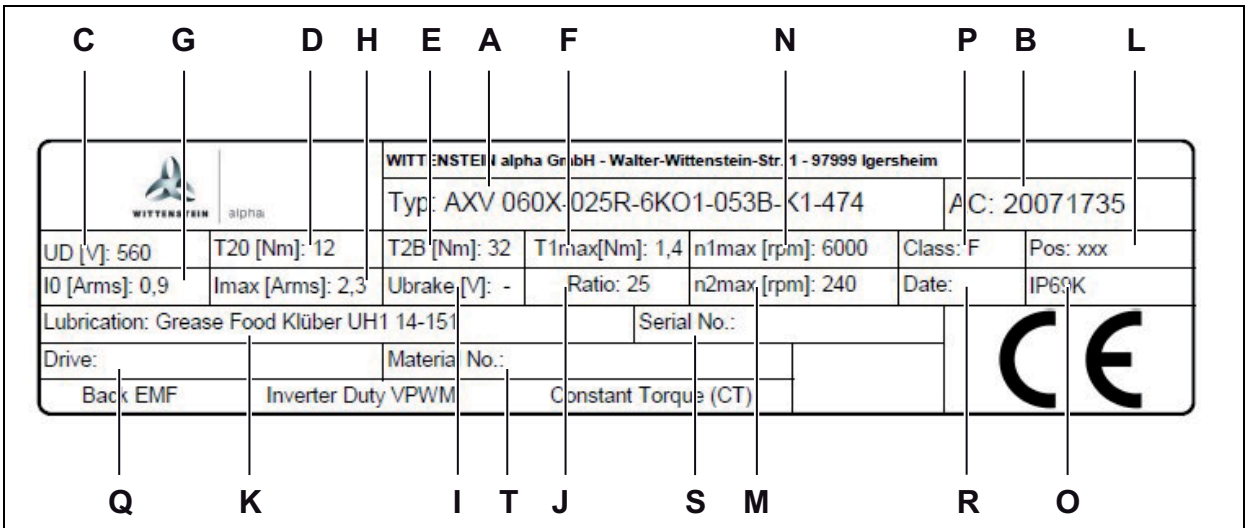


	Servo actuator components
A	AC servo motor
B	Planetary gearhead
D	Motor feedback connection
E	Power connection

Tbl-1: Overview of servo actuator components

3.2 Identification plate

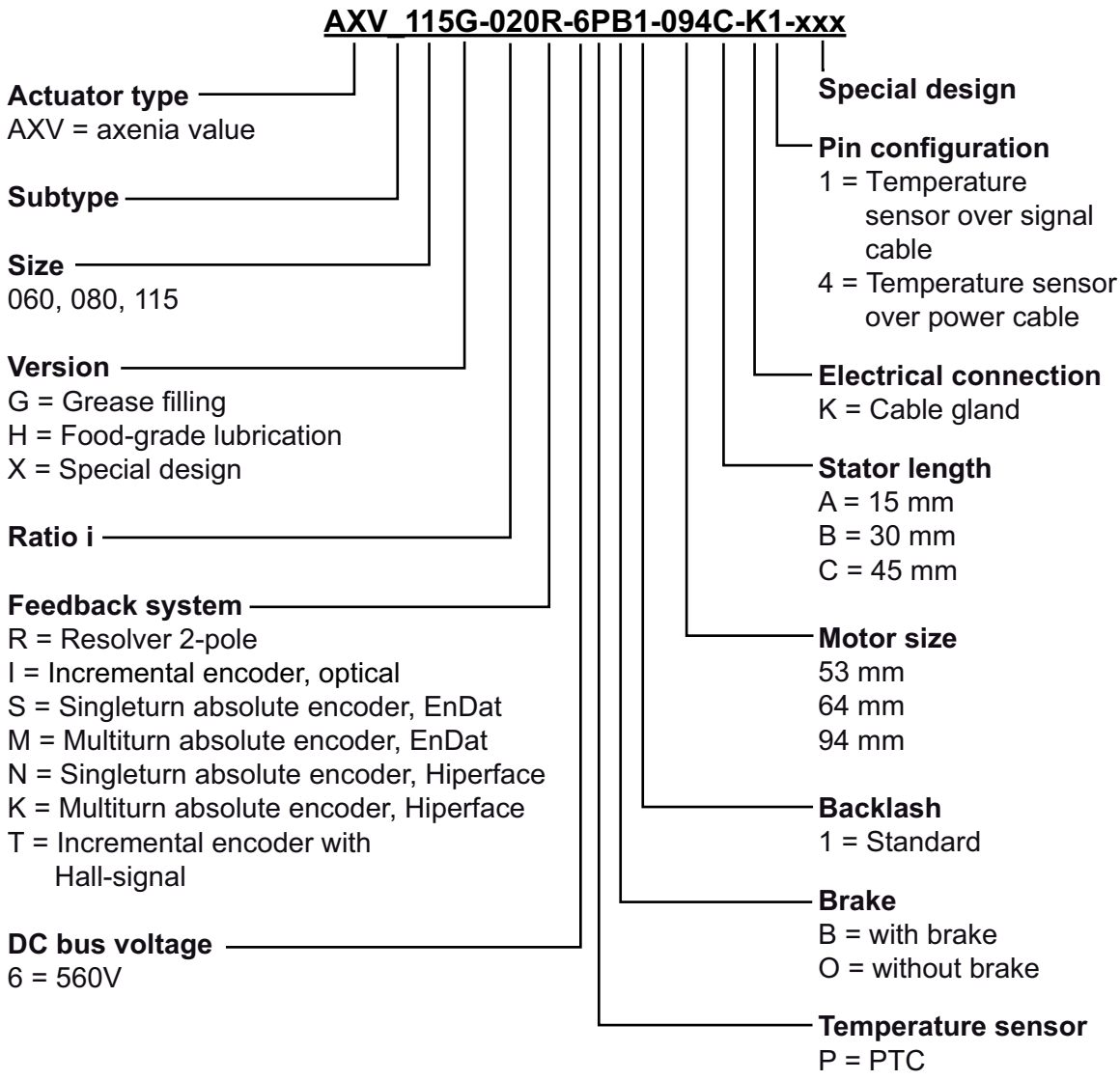
The type plate is lasered on the servo actuator housing.



	Designation		Designation
A	Ordering code (see 3.3 "Ordering code")	**K**	Lubrication
B	Article code	**L**	Mounting position
C	Intermediate voltage	**M**	Max. speed
D	Continuous stall torque at gear output	**N**	Max. speed of the motor
E	Maximum acceleration torque at the gear output	**O**	Protection class
F	Max. acceleration torque of the motor	**P**	Insulation class
G	Continuous stall current of the motor	**Q**	Servo converter
H	Max. acceleration current of the motor	**R**	Production date
I	Brake voltage	**S**	Serial number
J	Gearhead ratio	**T**	Material number

Tbl-2: Identification plate

3.3 Ordering code



3.4 Performance data

For the maximum permitted speeds and torques, refer to Chapter 9.4 "Technical specifications".

3.5 Weight

The standard weights of the servo actuators (with resolver, without brake) are specified in the Table "Tbl-3". Depending on the design, the actual dimension can deviate by up to 20%.

Size of axenia	AXV 60	AXV 80	AXV 115
Weight [kg]	6	11.5	21

Tbl-3: Weight

4 Transport and storage

4.1 Scope of delivery

- Check the completeness of the delivery against the delivery note.

  ⓘ Missing parts or damage must be notified immediately in writing to the carrier, the insurance, or **WITTENSTEIN alpha GmbH**

4.2 Packaging

The servo actuator is delivered packed in foil and cardboard boxes.

- Dispose of the packaging materials at the recycling sites intended for this purpose. Observe the applicable national regulations concerning disposal.

4.3 Transport

⚠ WARNING

Suspended loads can fall and can cause serious injuries and even death.

- Do not stand under suspended loads.
- Secure the servo actuator with suitable fasteners (e.g. belts) before transport.

NOTICE

Hard knocks, e.g. due to falling or hard dropping, can damage the servo actuator.

- Only use hoisting equipment and lifting accessories with sufficient capacity.
- The maximum permissible load of a hoist may not be exceeded.
- Lower the servo actuator slowly.

NOTICE

Improper lifting can damage the cable screw connections on the servo actuator.

- Never lift the servo actuator by the cable.

For information on the weights, see Chapter 3.5 "Weight".

4.4 Storage

Store the servo actuator in horizontal position and dry surroundings at a temperature of 0°C to + 30°C in the original packaging. Store the servo actuator for a maximum of 2 years.

For storage logistics, we recommend the "first in - first out" method.

5 Assembly

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

NOTICE

Only a sealed mount guarantees the fault-free functioning of the servo actuator.

- Seal potential gaps when mounting on the machine and when mounting on the output side.

  ⓘ **WITTENSTEIN alpha GmbH** provides suitable mounting kits for this (see Chapter 5.2 "Mounting the servo actuator onto a machine")

The servo actuator can be cleaned easily and is corrosion-resistant. In food processing it can only be used in the splash zone (according to DIN EN 1672-2).

- Note the special information on mounting (Chapter 5.2 "Mounting the servo actuator onto a machine").

5.1 Preparations

The bolts for mounting are not included in the scope of delivery and must be provided by the customer. Information can be found in the individual assembly steps.

NOTICE

Many electronic components are sensitive to electrostatic discharge (ESD). This particularly concerns integrated circuits (IC), semiconductors, resistors with a tolerance of less than one percent as well as transistors and other components such as encoders.

- Work only at ESD-compliant work sites.
- Always wear a tested anti-static wrist band, a protective coat and suitable shoes or overshoes.
- Never touch the components by their connectors or feed lines.
- Avoid the use of plastic tools and plastic component parts.

NOTICE

Pressurized air can damage the servo actuator seals.

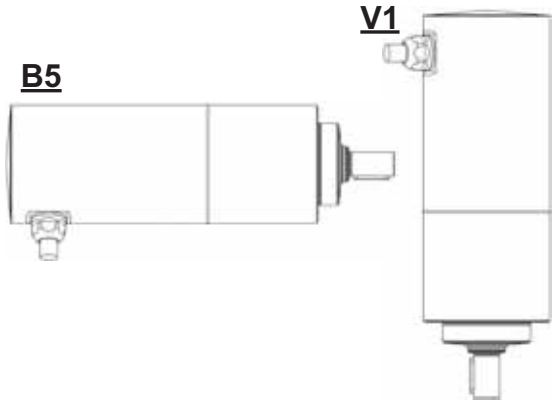
- Do not use pressurized air to clean the servo actuator.

- Clean/De-grease the output shaft, centering and fitting surface of the servo actuator with a clean, lint-free cloth moistened with a suitable grease-dissolving but non-aggressive cleaning agent.
- Dry all fitting surfaces to neighboring components in order to achieve the proper friction values of the screw connections.
- Check the fitting surfaces additionally for damage and impurities.
- Only use a tool that is suitable for working with stainless steel.

5.2 Mounting the servo actuator onto a machine

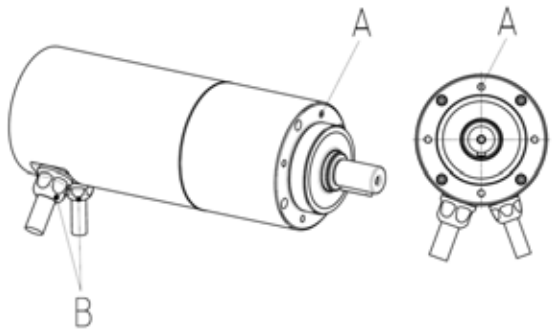
Only certain mounting positions are permitted for servo actuator (see "Tbl-4"). The mounting position is indicated on the identification plate (see Chapter 3.2 "Identification plate").

- Mount the servo actuator only in the specified mounting position.

	Mounting position	Description
	B5	Horizontal output shaft (with cable outlet downward)
	V1	Output shaft downward

Tbl-4: Permitted mounting positions

- Observe the safety and processing instructions for the threadlocker to be used.



The servo actuator housing has threaded bores (A) for bolting the gearhead to a machine.

- Thoroughly clean the output shaft, centering and fitting surface.

The bolts must be provided by the customer. The should preferably have hygienically designed surfaces in order to be easily cleanable. **WITTENSTEIN alpha GmbH** provides corresponding mounting kits for this (see Table "Tbl-5"). The prescribed screw sizes and tightening torques can be found in Chapter 9.1 "Specifications for mounting on a machine", Table "Tbl-10".

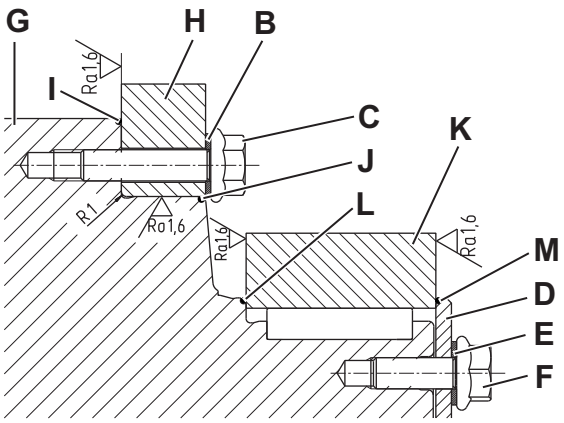
- Smear the fastening screws with a threadlocker (e.g. Loctite® 243).
- Fasten the servo actuator to the machine with the fastening screws through the threaded bores (A).
  - ⓘ Note that the surface of the machine exhibits little roughness. This makes cleaning easier.
  - ⓘ Install the servo actuator on the machine in a way which ensures the accessibility of all sides during cleaning. Difficult to reach areas can negatively affect both the cleaning result and its assessment.
  - ⓘ Install the servo actuator so that the connections (B) face downward. Avoiding horizontal surfaces assists with the automatic removal of media during cleaning.
  - ⓘ Use the screw head seals and O-rings for sealing.
  - ⓘ Observe the incorporation of contoured sealing surfaces on the attachment parts so that O-rings are firmly fitted.

The following mounting kits are available:

Size of axenia	AXV 060	AXV 080	AXV 115
Article code for mounting kit	20058220	20058222	20058221

Tbl-5: Mounting kit

The mounting kits contain the following individual parts:



	Designation
B	Screw head seal
C	Screw (machine mounting)
D	Disk (output mounting)
E	Screw head seals
F	Screw (output mounting)
G *	axenia servo actuator
H *	Machine (mountable flange for gearhead)
I	O-ring
J	O-ring
K *	Mounting part, drive side (e.g. gear)
L	O-ring
M	O-ring

* not contained in mounting kit

Tbl-6: Individual parts in the mounting kit

5.3 Components mounted on the output side

NOTICE

Distortions during mounting operations can damage the servo actuator.

- Do not use force when mounting gearwheels and toothed belt pulleys onto the output shaft.
- Never attempt to assemble by force or hammering!
- Only use suitable tools and devices for assembly.
- Make sure not to exceed the maximum permissible static axial forces on the output bearing (see Table "Tbl-7") when pulling or shrink-fitting a gear onto the output shaft.

Size of axenia	AXV 060	AXV 080	AXV 115
Fa max [N]	1000	1500	3000

Tbl-7: Maximum permissible static axial forces at static load rating (s0) = 1.8 and radial force (Fr) = 0

- Seal potential gaps when mounting on the output side.
  - ⓘ Ensure that the surface of the mounting parts exhibits little roughness. This makes cleaning easier.
  - ⓘ Use the screw head seals and O-rings for sealing.

    WITTENSTEIN alpha GmbH provides corresponding mounting kits for this (see Chapter 5.2 "Mounting the servo actuator onto a machine", Table "Tbl-5").

5.4 Installing electrical connections

⚠ DANGER

Electrically live components may result in electric shocks if touched and can cause serious injuries and even death.

- Observe the five safety rules of electrical engineering before starting electrical installation work:
  - Switch off the voltage supply.
  - Secure it against being switched on again.
  - Ensure there is no voltage.
  - Ground and short-circuit.
  - Cover adjacent live parts.
- Check whether there are protective caps on the plugs. If protective caps are missing, check the plugs for damage and soiling.

⚠ DANGER

Electrical work performed in damp areas may result in electric shocks and can cause serious injuries and even death.

- Perform electrical installation work only in dry areas.

The cables of all servo actuators need to be laid out in such a way that a minimum bending radius of 10 x diameter is upheld. Torsional load of the cables should be avoided.

6 Startup and operation

6.1 Safety instructions and operating conditions

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

ⓘ Wearing hearing protection in the vicinity of the servo actuator is recommended.

Improper use can cause damage to the servo actuator.

- Ensure that
  - the **ambient temperature** does not drop below -0 °C or exceed +40 °C and
  - the **operating temperature** does not exceed +90 °C.
- For other conditions of use, consult our Customer Service department.
- Avoid icing, which can damage the seals.
- Use the servo actuator only up to its maximum limit values, see Chapter 9.4 "Technical specifications".
- Operate the servo actuator only in the mounting position that is specified on the identification plate.

The servo actuator can be cleaned easily and is corrosion-resistant. In food processing it can only be used in the splash zone (according to DIN EN 1672-2).

- Note the special information on cleaning (Chapter 6.2 "Cleaning agents and cleaning process").

6.2 Cleaning agents and cleaning process

NOTICE

The pump effect of a running servo actuator can suck cleaning agents into the servo actuator.

- Clean the servo actuator only when it is at a standstill.

Aggressive cleaning agents can cause corrosion.

- Use only conventional cleaning agents that are grease-dissolving, but not aggressive. For additional information, please contact our sales department.

A high-pressure water jet or applied medium can damage the seals of the servo actuator.

- Use a water jet with a pressure of **maximum** 25 bar.
- Remove applied media within 30 minutes of the sealing.

A roughened surface cannot be cleaned without leaving traces.

- For cleaning, do not use scouring agent, sponges or wire mesh which directly affect the surface. This may scratch the servo actuator.

6.2.1 Recommended cleaning agents

- For actuator cleaning, the following cleaning agents from ECOLAB Deutschland GmbH (www.ecolab.eu) were laboratory-tested with regard to surface resistance and sealing materials.
  - Topactive 200 (alkaline foam cleanser), 5% in demineralized water
  - Topactive 500 (acidic foam cleanser), 5% in demineralized water
  - P3-topax 66 (chlorine-alkaline foam disinfectant), 5% in demineralized water
  - P3-topax 990 (mildly alkaline disinfectant cleaner), 3% in demineralized water
  - P3-topactive OKTO (foam disinfectant peracid)), 1% in demineralized water

To check the resistance, test samples were placed for 28 days in the indicated test concentration of the respective cleanser without mechanical influence in accordance with the soaking procedure of test method F&E-P3-E no. 40-1.

6.2.2 Cleaning schedule

The servo actuator may only be cleaned when it is in the installed state.

- Observe the specifications in Chapter 5.2 "Mounting the servo actuator onto a machine".
  - ⓘ We recommend the use of a mounting kit. Our Customer Service department is available to answer any questions.

NOTICE

Fulfillment of the possible service life cannot be guaranteed if the recommended cleaning agents, reaction times and concentrations are deviated from.

- If necessary, individual cases of differing cleaning procedures can be checked and approved. For information, please contact our sales department.
- Carefully observe the technical specification sheets and safety instructions of the cleaning agent manufacturer.

For the cleaning procedure, the following cleaning schedule is designated according to the recommendations of ECOLAB GmbH:

	Preparation and pre-rinse at a temperature of approx. 50 °C ● Remove coarse processing residues. ● Rinse the servo actuator at low pressure and with the spray jet pointing downwards, and remove the rinsed-off residues. **Foam cleaning and intermediate rinsing** ● Foam all surfaces thoroughly using a foam cleaner specified in Chapter 6.2.1 "Recommended cleaning agents" in a 2-5% solution. ⓘ A reaction time of 15 minutes is recommended. ● Then perform an intermediate rinsing with warm water up to 50 °C. ● Check the cleaning results, especially at critical points. **Disinfection and rinsing** ● After every cleaning, perform a neutral disinfection using a selection from the foam disinfectants/disinfectant cleaners specified in Chapter 6.2.1 "Recommended cleaning agents" in a 1-2% solution. Pay special attention to ensure that the surfaces to be cleaned are completely wetted. ⓘ Reaction time 15-30 minutes (depending on degree of contamination). ● Rinse the servo actuator from top to bottom with water (drinking water quality). ⓘ We recommend a subsequent swab or adhesive film test for a microbiological surface analysis.

6.3 Data for the electrical startup

The specified data is intended for the electrical startup.

NOTICE

The servo controllers of the different manufacturers generally have their own proprietary data specifications.

If the data is disregarded, the drive and/or the servo controller may be damaged.

- Observe **carefully** the listed units precisely and make sure they conform with the units of the servo controller.
- If the units differ, make adjustments accordingly.

ⓘ In some servo controllers, there are interdependencies between individual parameters. We would be glad to assist you in finding the correct entries.

ⓘ We provide adjusted and certified quick start guides for several servo controllers.

- For further information, please visit our website at http://wittenstein-alpha.de or contact our Customer Service: service@wittenstein.de

This data reflects the technical characteristics and the limit values of the standard combinations of the servo actuator series in regard to the gearhead ratio and the stator length in general units.

- Select the data for the servo actuator version you are using.
  - Chapter 9.4.2 "General servo actuator data"
- Select the appropriate product size of the desired servo controller in regard to the application data.

7 Maintenance and disposal

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

⚠ WARNING

The permanent magnets of the stator send a strong magnetic field, which becomes active during the disassembling of the servo actuator.

- Observe the general safety instructions (e.g. for pacemaker patients) for working in strong magnetic fields.

7.1 Maintenance work

7.1.1 Visual inspection

- Check the entire servo actuator and all cables for exterior damage.
- The seals are subject to wear. Therefore, also check the servo actuator for leakage during each visual inspection (lubricant leaks).
  - ⓘ Check in the mounting position that no foreign medium (e.g. oil) has collected on the output shaft.
- Also check the entire servo actuator for corrosion.
- Check whether the type plate is mounted and legible (see Chapter 3.2 "Identification plate").

ⓘ For special information on maintenance-related issues, contact our Customer Service department.

7.1.2 Checking the tightening torques

- Check the tightening torque of the fastening screws on the servo actuator housing.
  - ⓘ For the prescribed tightening torque, refer to Chapter 9.1 "Specifications for mounting on a machine", Table "Tbl-10".
- If, while checking the tightening torque, you discover that a screw can be further tightened, follow the instructions in "Remounting the screw".

Remounting the screw

- Make sure that it is possible to remount the screw on the servo actuator without the risk of damage to the entire machine.

- Loosen the screw.
- Remove the residue glue from the threaded bore and from the screw.
- De-grease the screw.
- Coat the screw with a threadlocker (e.g. Loctite® 243).
- Screw in the screw and tighten it with the prescribed tightening torque.

7.2 Startup after maintenance work

- Clean the servo actuator from outside.
- Attach all safety devices.
- Perform a trial run before releasing the servo actuator again for operation.

7.3 Maintenance schedule

Maintenance work	At startup	After 500 operating hours or 3 months	Yearly
Visual inspection and cleaning	X	X	X
Checking the tightening torques	X	X	X

Tbl-8: Maintenance schedule

7.4 Information on the lubricant used

A change of lubricant in servo actuators of this design is not necessary. All bearings are lubricated for life at the factory.

The manufacturer listed below will provide any further information on the lubricants:

Castrol Industrie GmbH, Mönchengladbach

Tel.: + 49 2161 909-30

www.castrol.com

7.5 Disposal

Consult our Customer Service department for supplementary information on decommissioning, disassembly and disposal of the servo actuator.

- Dispose of the servo actuator at the recycling sites intended for this purpose.
  ⓘ Observe the applicable national regulations concerning disposal.

8 Malfunctions

NOTICE

Changed operational behavior can be an indication of existing damage to the servo actuator, or cause damage to the servo actuator.

- Do not put the servo actuator back into operation until the cause of the malfunction has been rectified.

Rectifying of malfunctions may only be done by specially trained technicians.

To facilitate troubleshooting and the optimization of controller settings, it is useful to record the current over a full cycle (a servo controller function) and make it available as a file.

Fault	Possible cause	Solution
Increased operating temperature	Selected construction too weak for task, nominal operating exceeded.	Check the technical specifications.
	Motor is heating the gearhead.	Check the controller's settings.
	Ambient temperature too high.	Ensure adequate cooling.
Increased operating noises	Damaged bearings	Consult our Customer Service department.
	Damaged gear teeth	
Loss of lubricant	Lubricant quantity too high	Wipe off discharged lubricant and continue to watch the gearhead. Lubricant discharge should stop after a short time.
	Seals not tight	Consult our Customer Service department.
Motor does not start	Power supply interrupted	Check the connections
	Wiring of motor and / or encoder not correct	Check the wiring of the motor phases and the motor encoder
	Blown fuse	Check for errors and replace the fuse
	Incorrect controller parameters	Check that the motor parameters are suitable for the implemented servo actuator
	Motor protection has been triggered	Check for errors. Check whether the motor protection setting is correct.
Wrong direction of rotation	Wrong set value specification for the servo controller	Check servo controller/converter. Check the set value specifications and the polarities

Fault	Possible cause	Solution
Motor is droning and has a high power consumption	Drive is blocked	Check the drive
	Error in the encoder line	Check the encoder line
	Incorrect controller parameters	Check that the motor parameters are suitable for the implemented servo actuator
	Brake does not release	(see fault "Brake does not release")
Brake does not release	Voltage drop along the supply line > 10%	Ensure that the supply voltage is correct. Check the cable cross-section.
	Incorrect brake connection	Check the connection for correct polarity and voltage
	Short circuit in the coil or at body of brake coil	Consult our Customer Service department.
Holding brake slips	Stopping torque of the brake exceeded	Check the dimensioning
Acceleration times are not met	Load is too high	Check the dimensioning
	Power limiting active	Check the controller parameters
Position error	Shielding of the encoder line insufficient	Inspect the shielding of the connection cables
	Disturbing pulse from the brake, protective circuit of the brake missing or defective	Check the protective circuit (e.g. Varistor) of the brake on the converter
	Mechanical coupling between the motor shaft and encoder defective	Consult our Customer Service department.

Tbl-9: Malfunctions

9 Appendix

If you have any questions about special applications, please contact **WITTENSTEIN alpha GmbH**.

9.1 Specifications for mounting on a machine

Type / size of axenia	Hole circle Ø [mm]	Screw size / property class	Tightening torque * [Nm]
AXV 060	62	M5 / Ax–80	4.7
AXV 080	80	M6 / Ax–80	8.0
AXV 115	108	M10 / Ax–80	43
* Total friction value μ = 12			

Tbl-10: Threaded bores in servo actuator housing

9.2 Tightening torques for common thread sizes in general mechanical engineering

The specified tightening torques for headless screws and nuts are calculated values and are based on the following conditions:

- Calculation in accordance with VDI 2230 (February 2003 version)
- Friction value for thread and contact surfaces μ=0.10
- Utilization of the yield stress 90 %
- Torque tools type II classes A and D in accordance with ISO 6789

The settings are values rounded to usual commercial scale gradations or setting possibilities.

- Set these values on the scale **precisely** .

	Tightening torque [Nm] with thread												
Property class Screw / nut	**M3**	**M4**	**M5**	**M6**	**M8**	**M10**	**M12**	**M14**	**M16**	**M18**	**M20**	**M22**	**M24**
8.8 / 8	1.15	2.64	5.2	9.0	21.5	42.5	73.5	118	180	258	362	495	625
10.9 / 10	1.68	3.88	7.6	13.2	32.0	62.5	108	173	264	368	520	700	890
12.9 / 12	1.97	4.55	9.0	15.4	37.5	73.5	126	202	310	430	605	820	1040

Tbl-11: Tightening torques for headless screws and nuts

9.3 Tightening torques for common thread sizes with corrosion-resistant screw connections

The specified tightening torques for screws and nuts are calculated values and are based on the following conditions:

- Calculation based on VDI 2230 (February 2003 issue)
- Friction value for thread and contact surfaces μ=0.10
- Utilization of the yield stress 90 %
- Only valid for:
  - Screws according to ISO 4762, ISO 4014, ISO 4017
  - Nuts according to ISO 4032, ISO 4033

The settings are values rounded to usual commercial scale gradations or setting possibilities.

- Set these values on the scale **precisely**.

	Tightening torque [Nm] with thread												
Property class Screw / nut	**M3**	**M4**	**M5**	**M6**	**M8**	**M10**	**M12**	**M14**	**M16**	**M18**	**M20**	**M22**	**M24**
Ax-50	0.376	0.868	1.72	2.95	7.2	14.0	24.0	38.5	59.0	82.0	115	157	199
Ax-70	0.806	1.86	3.68	6.4	15.2	30.0	51.5	83.0	127	176	248	336	425
Ax-80	1.07	2.48	4.91	8.4	20.5	40.0	69.0	111	169	234	330	450	570

Tbl-12: Tightening torques for screws and nuts made from austenitic steel

9.4 Technical specifications

9.4.1 Moments of inertia

(Total moment of inertia in relation to the motor shaft)

Ratio	AXV 060	AXV 080	AXV 115
16, 20, 25	0.35	0.98	3.73
50, 70, 100	0.28	0.7	2.51

Tbl-13: Moments of inertia without brake with resolver [kgcm²]

9.4.2 General servo actuator data

	Unit	AXV 060		AXV 080		AXV 115	
Stator length	mm	15	30	15	45	15	45
Pole pair number	p	4	4	4	4	6	6
Maximum torque	Nm	0.7	1.41	1.24	3.38	3.53	9.55
Maximum current *	Aeff	1.7	2.28	1.77	4.43	4.82	12.9
Maximum speed	rpm	6000	6000	6000	6000	4800	4800
Continuous stall torque	Nm	0.27	0.57	0.58	1.59	1.33	4.03
Continuous stall current *	Aeff	0.6	0.9	0.78	1.98	1.36	4.75
Torque constant	Nm/Aeff	0.41	0.62	0.75	0.81	1.01	0.99
Voltage constant	Veff/krpm	24.6	37.3	45.1	46.7	60.7	59.5
Winding resistance at 20 °C terminal-terminal	ohm	35.6	27.10	45.5	8.85	15.62	2.60
Winding inductance terminal-terminal	mH	28.2	26.1	42.6	15.1	18.9	6.0
Electrical time constant	msec	0.8	1.0	1.0	1.7	1.2	2.3

* Depending on the static and dynamic loads as well as the lambda factor, the continuous stall current and the maximum current of the motor must be limited if necessary.

ⓘ Use our cymex® specification software to determine the dimensioning for each application scenario.

Tbl-14: General data for 560V servo actuator

9.4.3 Technical specifications for resolver

Ordering code: AXVxxxxx-xxxR-xxxx-xxxx-xx-xxx	
	AXV 060 / 080 / 115
Size	Size 15
Type	TS2620 N21 E11
Pole pair number	1
Input voltage	7Veff 10kHz
Transmission ratio	0.5+ -5%
Fault	+- 10'max
Zero voltage	20mVeff max
Phase shift	0° nominal
Impedance ZR0	70 + j 100 ohm
Impedance ZS0	180 + j 300 ohm
Impedance ZSS	175 + j 257 ohm
Max. operating temperature	155 °C

Tbl-15: Technical specifications for resolver

9.4.4 Technical specifications of Stegmann Hiperface absolute encoder

Singleturn	
Ordering code: AXVxxxxx-xxxN-xxxx-xxxx-xx-xxx	
	AXV 060 / 080 / 115
Type	SKS36
Operating voltage	7-12 V
Protocol	Hiperface
Number of SinCos periods per revolution	128
Multiturn	
Ordering code: AXVxxxxx-xxxK-xxxx-xxxx-xx-xxx	
	AXV 060 / 080 / 115
Type	SKM36
Operating voltage	7-12 V
Protocol	Hiperface
Number of SinCos periods per revolution	128
Number of Multiturn revolutions	4096

Tbl-16: Technical specifications for Stegmann Hiperface

9.4.5 Technical specifications for Stegmann Hiperface absolute encoder, Rockwell option

Singleturn	
Ordering code: AXV xxxx-xxxE-xxxx-xxxx-x5-xxx	
	AXV 060 / 080 / 115
Type	SKS36
Operating voltage	7-12 V
Protocol	Hiperface
Number of SinCos periods per revolution	128
Multiturn	
Ordering code: AXV xxxx-xxxV-xxxx-xxxx-x5-xxx	
	AXV 060 / 080 / 115
Type	SKM36
Operating voltage	7-12 V
Protocol	Hiperface
Number of SinCos periods per revolution	128
Number of Multiturn revolutions	4096

Tbl-17: Technical specifications for Stegmann Hiperface

9.4.6 Technical specifications for Heidenhain EnDat absolute encoder

Singleturn EnDat	
Ordering code: AXVxxxxx-xxxS-xxxx-xxxx-xx-xxx	
	AXV 060 / 080 / 115
Type	ECN 1113
Operating voltage	5 V
Protocol	EnDat 2.1
Distinguishable positions via EnDat protocol/revolutions	8192
Number of SinCos periods per revolution	512
Multiturn EnDat	
Ordering code: AXVxxxxx-xxxM-xxxx-xxxx-xx-xxx	
	AXV 060 / 080 / 115
Type	EQN 1125
Operating voltage	5 V
Protocol	EnDat 2.1
Distinguishable positions via EnDat protocol/revolutions	8192
Number of SinCos periods per revolution	512
Number of Multiturn revolutions	4096

Tbl-18: Technical specifications Heidenhain EnDat

9.4.7 Technical specifications of PTC temperature sensor

PTC STM 160	
Ordering code: AXVxxxxx-xxxx-xPxx-xxxx-xx-xxx	
Deactivation in case of fault	
Characteristic line in accordance with DIN 44081/44082	
Temperature [°C]	**Resistance [ohm]**
< 140	20 - 250
140 - 155	250 - 550
155 - 165	550 - 1330
165 - 175	1330 - 4000
> 175	> 4000

Tbl-19: Technical specifications of PTC temperature sensor

9.4.8 Technical specifications of KTY and NTC temperature sensors

Type	**KTY 84-130**	**NTC P1H104**
Ordering code:	**AXVxxxxx-xxxx-xKxx-xxxx-xx-xxx**	**AXVxxxxx-xxxx-xNxx-xxxx-xx-xxx**
Temperature [°C]	**Resistance, type [kohm]**	**Resistance, type [kohm]**
-30	0.391	1770
-20	0.424	971
-10	0.460	553
0	0.498	327
10	0.538	199
20	0.581	125
25	0.603	100
30	0.626	81
40	0.672	53
50	0.722	36
60	0.773	25
70	0.826	18
80	0.882	13
90	0.940	9.2
100	1.000	6.8
110	1.062	5.2
120	1.127	3.9
130	1.194	3
140	1.262	2.4
150	1.334	1.9
160	1.407	1.5

Type	KTY 84-130	NTC P1H104
Ordering code:	AXVxxxxx-xxxx-xKxx-xxxx-xx-xxx	AXVxxxxx-xxxx-xNxx-xxxx-xx-xxx
Temperature [°C]	Resistance, type [kohm]	Resistance, type [kohm]
170	1.482	1.2
180	1.560	1
190	1.640	0.8
200	1.722	0.7

Tbl-20: Technical specifications of KTY and NTC temperature sensors

9.4.9 Technical specifications of brake

Ordering code: AXV xxxx-xxxx-xxBx-xxxx-xx-xxx				
	Unit	AXV 060	AXV 080	AXV 115
Voltage	V DC	24		24
Power consumption	A DC	0.42		0.58
Holding torque at 120°C	Nm	1.1		4.5
Opening time	msec	11		30
Closing time	msec	10		20

Tbl-21: Technical specifications of brake

The listed opening and closing times are noted without the use of an additional brake wiring.

ⓘ To avoid interfering signals from the switching of the brake, in general an additional wiring should be added, e.g. in the form of a varistor. Observe the requirements of the manufacturer of the servo controller.

9.4.10 Pin assignment

The servo actuator is designed as standard with open cable ends. On request from the customer, the cable outlets can be designed as pre-assembled. The pin assignment can be found in the corresponding signal lists.

9.4.11 Cable setup / Cable cross-section

For ambient temperatures up to +30°C, the following applies for cables acc. to DIN EN 60204:

Continuous stall current	Cable
0 –15 Aeff	4 x 1.5 mm^2 & 2 x 0.75 mm^2
15 –21 Aeff	4 x 2.5 mm^2 & 2 x 1 mm^2
21 –36 Aeff	4 x 6 mm^2 & 2 x 1.5 mm^2
36 –50 Aeff	4 x 10 mm^2 & 2 x 1.5 mm^2
50 –66 Aeff	4 x 16 mm^2 & 2 x 1.5 mm^2

Tbl-22: Cable setup / Cable cross-section

Revision history

Revision	Date	Comment	Chapter
01	27.10.16	New version	All
02	15.03.17	W-alpha	All
03	12.05.17	Safety	2.4, 5, 6.1
04	06.04.18	Safety instruction, Identification plate	2.7 3.1

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