

General specifications | EN

AM8300 and AL8000

Synchronous servomotors with water cooling

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1 Documentation notes

1.1 Disclaimer

Beckhoff products are subject to continuous further development. We reserve the right to revise the documentation at any time and without notice. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams, and descriptions in this documentation.

1.1.1 Trademarks

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The use by third parties of other brand names or trademarks contained in this documentation may lead to an infringement of the rights of the respective trademark owner.

1.1.2 Patents

The EtherCAT technology is protected by patent rights through the following registrations and patents with the relevant applications and registrations in various other countries:

- EP1590927
- EP1789857
- EP1456722
- EP2137893
- DE102015105702



EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH.

1.1.3 Limitation of liability

All components of this product described in the original operating instructions are delivered in a hardware and software configuration, depending on the application requirements. Modifications and changes to the hardware or software configuration that go beyond the documented options are prohibited and nullify the liability of Beckhoff Automation GmbH & Co. KG.

The following is excluded from the liability:

- Failure to comply with this documentation
- Improper use
- Use of untrained personnel
- Use of unauthorized spare parts

1.1.4 Copyright

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The copying, distribution and utilization of this document as well as the communication of its contents to others without express authorization is prohibited. Offenders will be held liable for the payment of damages.

We reserve all rights in the event of registration of patents, utility models and designs.

1.2 Version numbers

On request we can send you a list of revision levels for changes to the documentation. Please send your request to:

✉ motion-documentation@beckhoff.com

Origin of the document

This documentation was originally written in German. All other languages are derived from the German original.

Product features

The valid product features are always those specified in the current documentation. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

1.3 Staff qualification

This documentation is aimed at trained specialists working in control technology and automation who have knowledge of the applicable and required standards and directives.

Specialists must have knowledge of drive technology and electrical equipment as well as knowledge of safe working on electrical systems and machines. This includes knowledge of proper setup and preparation of the workplace as well as securing the working environment for other persons.

The documentation published at the time must be used for each installation and commissioning. The products must be used in compliance with all safety requirements, including all applicable laws, regulations, provisions and standards.

Instructed person

Instructed persons have a clearly defined task area and have been informed about the work to be carried out. Instructed persons are familiar with:

- the necessary protective measures and protective devices
- the intended use and risks that can arise from use other than for the intended purpose

Trained person

Trained persons meet the requirements for instructed persons. Trained persons have additionally received training from the machine builder or vendor:

- machine-specific or
- plant-specific

Trained specialists

Trained specialists have received specific technical training and have specific technical knowledge and experience. Trained specialists can:

- apply relevant standards and directives
- assess tasks that they have been assigned
- recognize possible hazards
- prepare and set up workplaces

Qualified electricians

Qualified electricians have comprehensive technical knowledge gained from a course of study, an apprenticeship or technical training. They have an understanding of control technology and automation. They are familiar with relevant standards and directives. Qualified electricians can:

- independently recognize, avoid and eliminate sources of danger
- implement specifications from the accident prevention regulations
- assess the work environment
- independently optimize and carry out their work

1.4 Safety and instruction

Read the contents that are related to the activities you will perform with the product. Always read the For your safety chapter in the documentation. Observe the warning notes in the chapters so that you can handle the product and work with it properly and safely.

1.5 Explanation of symbols

Various symbols are used for a clear arrangement:

- ▶ The triangle indicates instructions that you should execute.
- The bullet point indicates an enumeration.
- [...] The square brackets indicate cross-references to other text passages in the document.
- [1] The number in the square brackets refers to the position in the adjacent figure.
- [+] The plus sign in square brackets indicates ordering options and accessories.

In order to make it easier for you to find text passages, pictograms and signal words are used in warning notices:

DANGER

Failure to comply will result in serious or fatal injuries.

WARNING

Failure to comply may result in serious or fatal injuries.

CAUTION

Failure to comply may result in minor or moderate injuries.

NOTICE

Notes are used for important information on the product. The possible consequences of failure to observe these include:

- product malfunctions
- damage to the product
- damage to the environment



Information

This symbol indicates information, tips, and notes for handling the product or the software.



Examples

This symbol shows examples of how to use the product or software.



Required tool

This symbol indicates a tool that is required for the following steps.



Required accessories [+]

This symbol shows the accessories required for the following steps. The accessories are not included in the scope of delivery and can be ordered from Beckhoff.



Assembly material required

This symbol shows the assembly material required for the following steps. The assembly material is not included in the scope of delivery and must be purchased separately.



Permitted cleaning agents

This symbol indicates the permitted cleaning agents that the components may be cleaned with. The permitted cleaning agents are not included in the scope of delivery and must be purchased separately.




QR codes

This symbol shows a QR code that you can scan to watch videos or animations. Internet access is required in order to use it.

1.6 Beckhoff Services

Beckhoff and its international partner companies offer comprehensive support and service.

 www.beckhoff.com/en-en/support/global-availability/

1.6.1 Support services

The Beckhoff Support offers technical advice on the use of individual Beckhoff products and system planning. The support engineers offer you competent assistance, for comprehension questions as well as for commissioning.

 +49 5246 963-157

 support@beckhoff.com

 www.beckhoff.com/en-en/support/our-support-services/

1.6.2 Training offerings

Training in Germany takes place at the Beckhoff branches or, after consultation, at the customer's premises. Beckhoff offers both face-to-face and online training courses.


 +49 5246 963-5000

 training@beckhoff.com

 www.beckhoff.com/en-en/support/training-offerings/

1.6.3 Service offerings

The Beckhoff service experts support you worldwide in all areas of after-sales service.


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 www.beckhoff.com/en-en/support/our-service-offerings/

1.6.4 Headquarters Germany


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 www.beckhoff.com/en-en/

A detailed overview of the Beckhoff locations worldwide can be found at:

 www.beckhoff.com/en-en/company/global-presence/

1.6.5 Downloadfinder

In the Download finder you will find configuration files, technical documentation and application reports to download.

 www.beckhoff.com/documentations

2 Technical terms

Flow rate
 Q_{\min} [l/min]

Coolant flow rate required for nominal operation or continuous operation of the component to be cooled. This information is contained in the documentation of the respective product.

Pressure drop
 Δp [bar]

Necessary pressure difference of the coolant between the coolant inlet and coolant outlet in order to achieve the minimum flow rate in the component to be cooled. This information is contained in the documentation of the respective product.

Power loss
 P_L [W]

Power loss occurring during nominal operation or continuous operation that must be dissipated by the cooling system. The cooling unit can be dimensioned based on the sum of the power losses of all components in the cooling circuit. This information is contained in the documentation of the respective product.

Operating pressure
 p_{\max} [bar]

Permanently permissible maximum pressure in the cooling system during operation.

Coolant inlet temperature
 T_i [°C]

Inlet temperature of the coolant to operate the component to be cooled with the data specified in the respective documentation in nominal operation or continuous operation. A higher coolant inlet temperature may cause a reduction in the performance of the product in nominal operation or continuous operation. A coolant inlet temperature below the dew point temperature promotes the formation of condensation on and in the cooled component, which must be avoided.

Dew point temperature
 T_D [°C]

Temperature at which the humidity contained in the ambient air condenses and precipitates on solid surfaces.

Coolant temperature increase
 ΔT_{\max} [bar]

Permissible increase in coolant temperature during nominal operation or continuous operation with power loss P_L . This information can be found in the documentation of the respective product.

Relative air humidity
 φ [%]

Relative air humidity is the ratio of the current amount of water vapor in the air to the maximum amount of water vapor possible at a given temperature, expressed as a percentage. 100 % indicates full saturation, lower values indicate that the air can still absorb more humidity.

3 Requirements for the coolant

NOTICE

Motor damage due to impermissible coolant

The use of an unsuitable coolant (e.g. tap water) can cause irreversible damage to the motor, for which the manufacturer cannot be held liable.

- Only operate the motor with suitable coolant

The following criteria must be observed when determining and using the appropriate coolant for operating the product:

- Coolants are not available from Beckhoff.
- Appropriate ready-made cooling mixtures are available from various manufacturers. Consult the chiller unit manufacturer to ensure that the right coolant is selected.

3.1 Production of your own coolant

When producing your own coolant, we recommend:

- Water-based coolant
- Use of distilled water

Parameter	Unit	Measured value
pH	-	6.5...7.5
Water hardness	mmol/l	1.2...2.5
Chloride concentration	ppm	< 100
Sulfate concentration	ppm	< 100
Conductivity	μS/cm	< 500
Particle size	μm	≤ 100

- The addition of suitable biocides is recommended to prevent biological deposits.
- To prevent corrosion in the cooling circuit, the addition of a suitable corrosion inhibitor is strongly recommended. If the inhibitor content is higher, the performance of the component to be cooled may be reduced.
 - **Recommendation:** Concentration of corrosion inhibitor 25 %
- The mode of action of a corrosion inhibitor is based on the formation of a protective layer on the chiller unit surface. If components are replaced, e.g. in the event of a repair, there is a risk that the corrosion inhibitor still contained in the cooling circuit cannot build up a sufficient protective layer.
 - **Recommendation:** When replacing the motor in the cooling system, we recommend renewing the coolant.

4 Requirements for the cooling circuit



It is recommended that the chiller unit manufacturer is consulted regarding the design of the cooling system and the selection of components in the cooling circuit.

4.1 Mechanical structure / installation

NOTICE

Damage caused by open systems

Open cooling circuits can lead to contamination and germs. This can result in damage to the machine or system and loss of performance.

- Install cooling circuits as closed systems

NOTICE

Motor damage due to electrolysis

Depending on the product, water coolers are made of different, sometimes corrosive metals (e.g. untreated aluminum). Metals of different nobility can be electrically connected through contact with the coolant. In this case, there is a risk of electrolysis, in which the less noble metal can decompose in the circuit.

- Refer to the product data sheet for the materials used that come in contact with the coolant.
 - Electrochemical processes occurring in the cooling system must be minimized by selecting suitable materials in the cooling circuit. Avoid a combination of different materials, such as aluminum, copper, brass, zinc, iron and halogen-containing plastics (e.g. hoses and seals made of PVC).
 - Connect all components in the cooling circuit (e.g. motor, chiller unit, pump, pipe system) with a potential equalization. This must be done with a copper rail or stranded copper wire with an appropriate conductor cross-section.
 - Coolant lines must not touch live parts. Ensure sufficient insulation and proper fixing of the cables.
- Too little coolant and too slow coolant flow in the cooling circuit can cause the motor to overheat and reduce performance.
 - **Recommendation:** Flow rate monitoring and pressure monitoring are recommended in the cooling circuit
 - The cooling connections may only be sealed via the end faces of the water connections using suitable screw connections. Do not use conical screw connections or sealants in the thread (liquid sealant, Teflon tape, hemp, etc.) for sealing. The usable thread depth and the maximum tightening torque in aluminum must be taken into account.
 - The use of opaque hoses is recommended to prevent biological deposits.
 - The coolant supply must be interrupted if the motor is not used for a longer period of time.

4.2 Dimensioning the cooling capacity

- When designing the chiller unit, care must be taken to ensure that the entire power loss of the components in the chiller circuit is dissipated via the cooling unit.
- The machine manufacturer is responsible for dimensioning the cooling system.

5 Requirements in operation

- Operating pressure p_{\max} : 6 bar

5.1 Design of the coolant inlet temperature

- In order to operate the component with the data specified in the relevant documentation in rated operation or continuous operation, a coolant inlet temperature below the maximum coolant inlet temperature and above the dew point temperature must be selected.

NOTICE

Performance reduction if coolant inlet temperatures are too high

At coolant inlet temperatures above the maximum coolant inlet temperature, the performance of the motor is reduced.

- Refer to the technical data in the respective product data sheet for the maximum coolant inlet temperatures.

NOTICE

Damage due to condensation

Condensation on the motor must be avoided. Low coolant inlet temperatures promote the formation of condensation on and in the cooled component.

- A temperature above the dew point temperature must be ensured as the minimum coolant inlet temperature

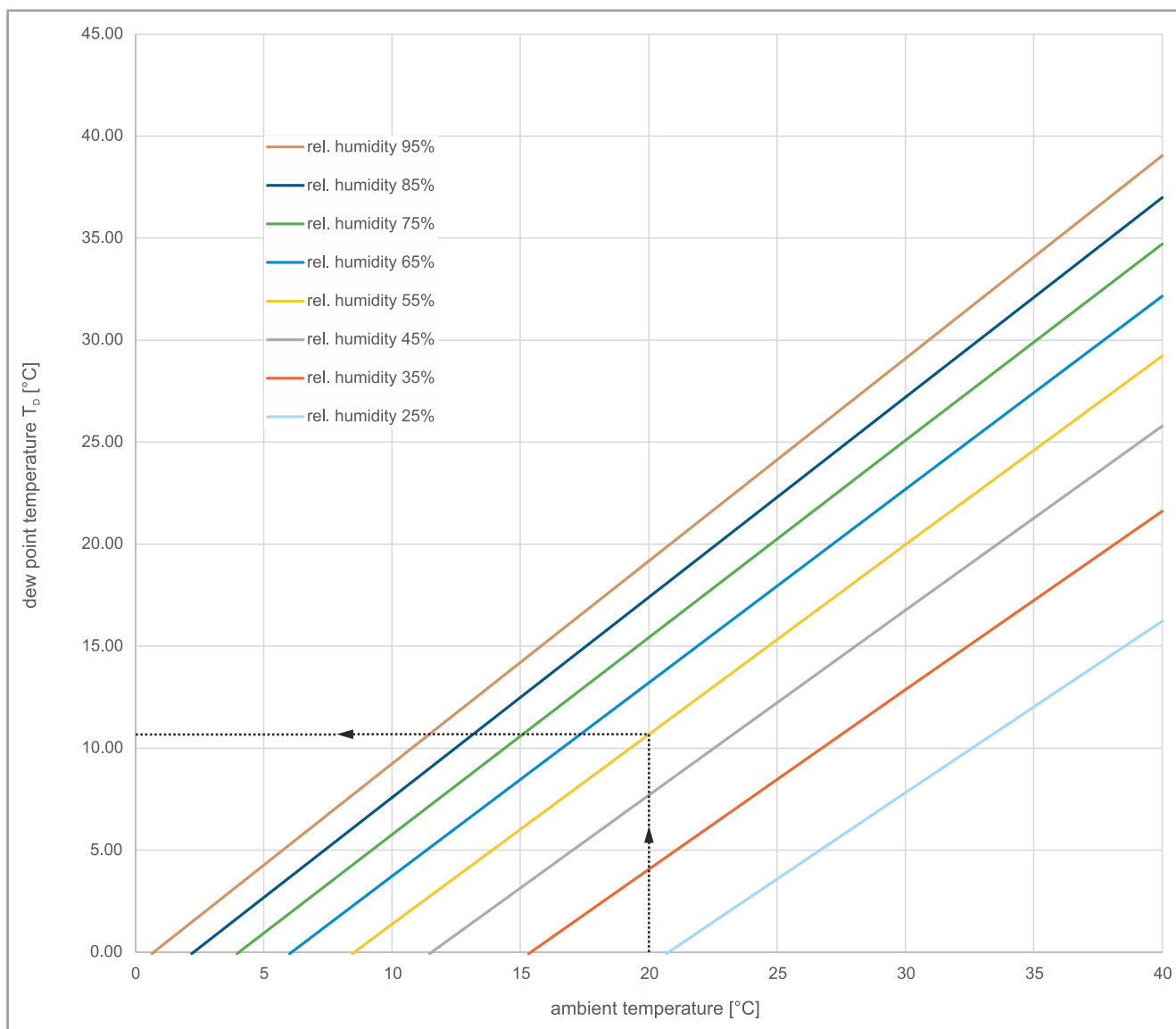


Illustration: Dew point T_D as a function of ambient temperature and relative air humidity ϕ



Example: Determining the inlet temperature of the coolant

Dew point as a function of ambient temperature and relative air humidity.

- Ambient temperature: 20 °C
- Relative air humidity ϕ : 55 %
- Dew point temperature T_D : approx. 11 °C

5.2 Transport and storage

NOTICE

Motor damage due to frost

If coolant remains in the motor's cooling system, it can expand when it freezes and cause damage to the cooling channels, housing or seals.

- All water-cooled products must be stored, transported and operated frost-free
- If frost-free storage cannot be ensured, the coolant must be drained off

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