

Operating instructions | EN

AMI8100

Compact integrated Servo Drives



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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 Scope of the documentation

In addition to this documentation, the following documents are part of the complete documentation:

1.4 Scope of the documentation

Apart from these operating instructions, the following documents are part of the overall documentation:

Documentation	Definition
Short information	Accompanying document with general notes on handling the product

1.5 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

1.6 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.

1.6.1 Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our <https://www.beckhoff.com/secguide>.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

To stay informed about information security for Beckhoff products, subscribe to the RSS feed at <https://www.beckhoff.com/secinfo>.

1.7 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.

**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.

1.8 Beckhoff Services

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

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

1.8.1 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/

1.8.2 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

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

1.8.3 Service offerings

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

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 service@beckhoff.com

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1.8.4 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/

1.8.5 Downloadfinder

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

🌐 www.beckhoff.com/documentations

2 For your safety

Read this chapter containing general safety information. The chapters in these operating instructions also contain warning notices. Always observe the safety instructions for your own safety, the safety of other persons and the safety of the product.

When working with control and automation products, many dangers can result from careless or incorrect use. Work particularly thoroughly, not under time pressure and responsibly towards other people.

2.1 Safety pictograms

You will find safety symbols on Beckhoff products and packaging. The symbols may be glued, printed, or lasered on and may vary depending on the product. They serve to protect people and to prevent damage to the products. Safety pictograms may not be removed and must be legible for the user.

**Warning of a hot surface**

During and after operation there is a risk of burns at the housing due to hot surfaces over 60 °C. Allow the housing to cool down for the specified time, at least 15 minutes.

**Avoid shocks to the shaft**

Impacts on the shaft may cause the maximum permissible axial and radial values to be exceeded. Encoder systems can thus be destroyed.

2.2 General safety instructions

This chapter provides you with instructions on safety when handling the product. This product is not capable of stand-alone operation and is therefore categorized as an incomplete machine. The product must be installed in a machine or plant by the machine manufacturer. Read the documentation prepared by the machine manufacturer.

2.2.1 Before operation

Protective equipment

Do not remove or bypass any protective devices. Check all protective devices before operation. Make sure that all emergency switches are present at all times and can be reached by you and other people. People could be seriously or fatally injured by unprotected machine parts.

Shut down and secure the machine or plant

Shut down the machine or plant. Secure the machine or plant against being inadvertently started up.

Correctly ground electrical components or modules

Avoid electric shocks due to improper grounding of electrical components or modules. Ground all conductive components according to the specifications in the chapters "Electrical Installation" and "Mechanical Installation".

Keep the immediate environment clean

Keep your workplace and the surrounding area clean. Ensure safe working.

Check safety pictograms

Check whether the designated pictograms are on the product. Replace missing or illegible stickers.

Observe tightening torques

Mount and repeatedly check connections and components, complying with the prescribed tightening torques.

Use the original packaging only

When shipping, transporting, storing and packing, use the original packaging or non-conductive materials.

2.2.2 During operation

Do not work on live electrical parts

Do not open any motors while they are live. Ensure that the protective conductor is properly connected. Never loosen electrical connections when live. Only work on motors when the device is switched off. Disconnect all components from the mains and protect them against unintentional reconnection.

Do not touch hot surfaces

Check the cooling of the surfaces with a thermometer. Do not touch the components during and immediately after operation. Allow the components to cool sufficiently after switching off.

Avoid overheating

Operate the servo drive according to the technically foreseen specifications. Refer here to the chapter: "Technical data". Activate and monitor the temperature contact of the servo drive. Provide for sufficient cooling. Switch off the servo drive immediately if the temperature is too high.

Do not touch any moving or rotating components

Do not touch any moving or rotating components. Fasten all parts or components on the machine or plant.

2.2.3 After operation

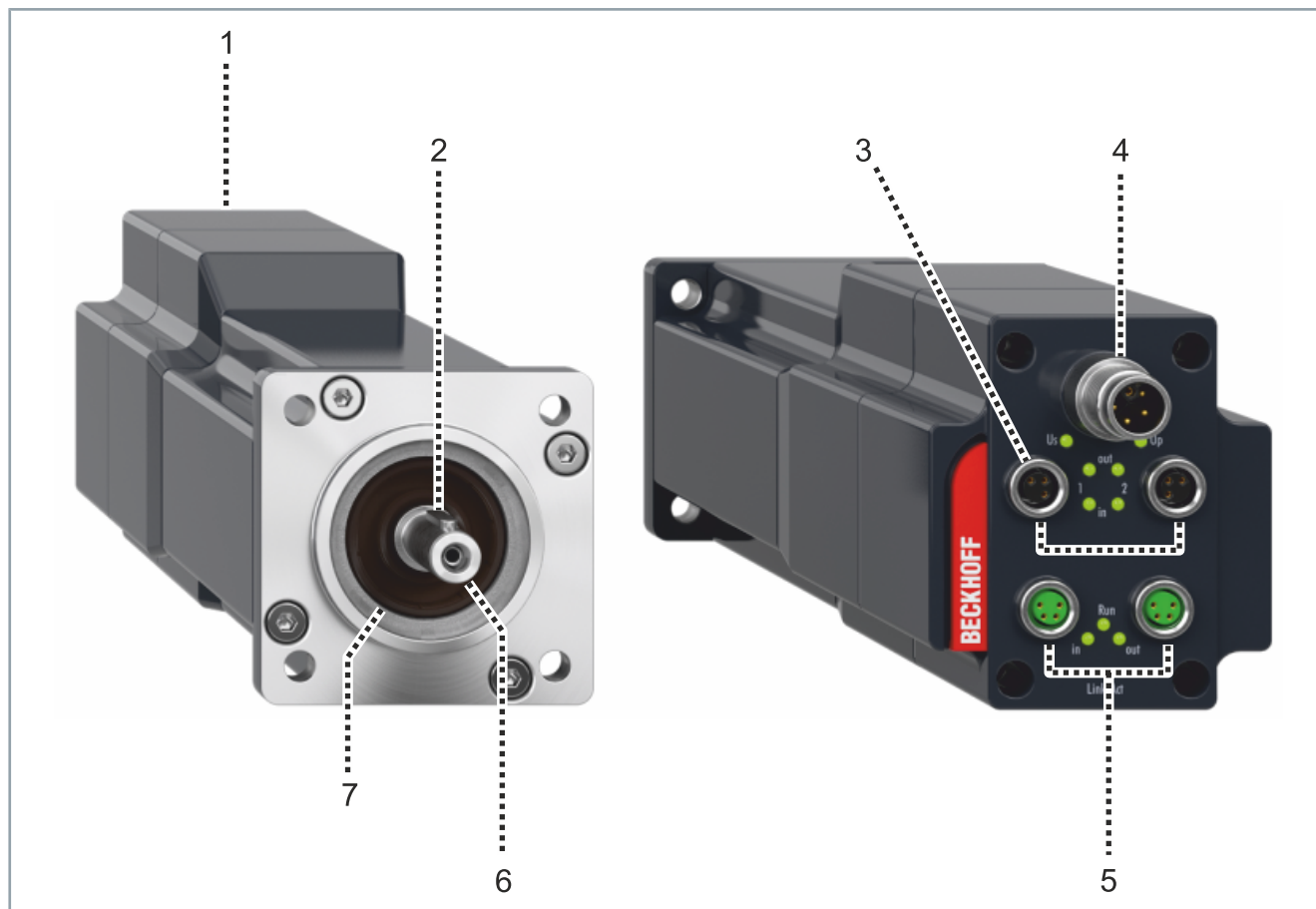
De-energize and switch off components before working on them

Check the functionality of all safety-relevant devices. Secure the working environment. Secure the machine or plant against being inadvertently started up. Observe and comply with the chapter: De-commissioning.

No direct skin contact with solvents or lubricants

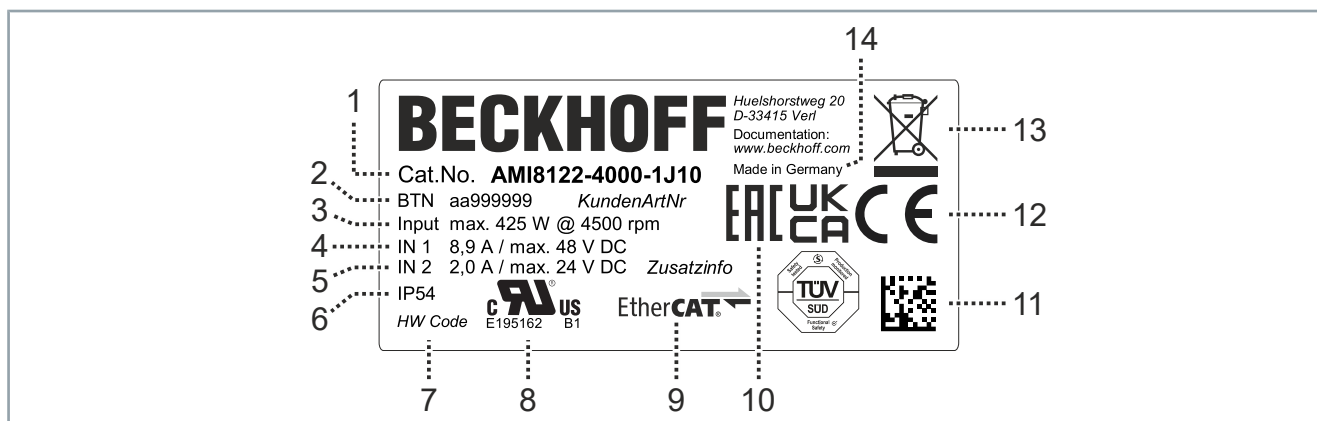
In case of improper use, the solvents or lubricants used can lead to skin irritations. Avoid direct skin contact.

3 Product overview



Item number	Explanation
1	Housing
2	Parallel key [+]
3	Sensor connection M8; 3-pin
4	Power connection M12; 5-pin, L-coded
5	EtherCAT connection M8; 4-pin
6	Shaft
7	Radial shaft-sealing ring [+]

3.1 Name plate



Item number	Explanation
1	Motor type
2	Beckhoff Traceability Number, BTN
3	Nominal output
4	max. current consumption for power supply 48 V DC
5	max. current consumption for control voltage 24 V DC
6	Protection rating
7	Hardware code
8	UL approval for USA / CAN
9	Bus system
10	EAC approval / UKCA approval
11	Data-Matrix Code; BIC = Beckhoff Identification Code
12	CE conformity
13	Note on proper disposal

3.2 Type key

AMI81 u v - a b 00 - w x y z	Explanation
AMI81	Product area Compact integrated servo drive
u	Flange size 2 = F2 (58 mm) 3 = F3 (72 mm)
v	Overall length 1 2 3
a	Feedback system 3 = Single-turn absolute encoder, absolute position within one revolution, 17-bit resolution 4 = Multi-turn absolute encoder, absolute position within 65536 revolutions, 17-bit resolution
b	Drive-integrated safety technology 0 = Without TwinSAFE 1 = With TwinSAFE: STO, integrated TwinSAFE Logic
00	Not defined
w	Shaft version 0 = Smooth shaft 1 = Shaft with groove and parallel key in accordance with DIN 6885 2 = Shaft with IP65 radial shaft sealing ring and smooth shaft 3 = Shaft with IP65 radial shaft sealing ring, groove, and parallel key
x	Winding type
y	Communication interface 1 = EtherCAT, MDP profile 2 = EtherCAT, DS402 profile
z	Holding brake 0 = Without holding brake 1 = With 24 V DC holding brake

3.3 Product characteristics

Compact design

The integrated servo drives of the AMI81xx series combine servomotor, servo drive and fieldbus connection in a space-saving design for all motion requirements in the power range up to 400 W.

Machines without control cabinet

You can place the integrated servo drives of the AMI81xx series as EtherCAT slave directly at the machine without control cabinet and without upstream I/O level. This allows compact machines to be realized without a control cabinet.

Neodymium permanent magnets

The magnets installed in the servo drives are permanent magnets. Neodymium is a hard magnetic material that enables the precise and highly dynamic positioning of the servo drives.

Three-phase stator winding

The three-phase winding in the stator reduces the amount of material required while maintaining the same electrical output. All phase angles are 120°.

Electronic commutation in the power section

The servo drives are commutated electronically. The three coil turns are supplied from a bridge circuit.

Thermal contacts

A thermal contact LPTC-600 is installed to monitor and measure the winding temperature and to protect the servo drive against overheating. This can be read out by the user.

Temperature warning and switch-off:

- Warning temperature at 120 °C
- Switch-off temperature at 140 °C

Holding brake [+]

The servo drives can be equipped as an option with permanent magnet holding brakes. These operate according to the quiescent current principle and open at a voltage of $24 V_{DC} +6/-10 \%$ with $> 10,000,000$ switching cycles.

The installed holding brake is not suitable for service braking, since there is no monitoring for wear and functionality by the servo drive and the configuration. This applies in particular to vertical axes.



Safety measures for vertical axes must be applied

When operating vertical axes, appropriate additional measures must be taken; for example, including but not only:

- additional redundant brake units
- mechanical safeguards or interlocks
- attachment of a weight counterbalance

Permanent magnet holding brakes alone are not approved for the protection of persons. In consideration of ISO 13849-1 and 13849-2, additional precautions must be taken for personal protection.

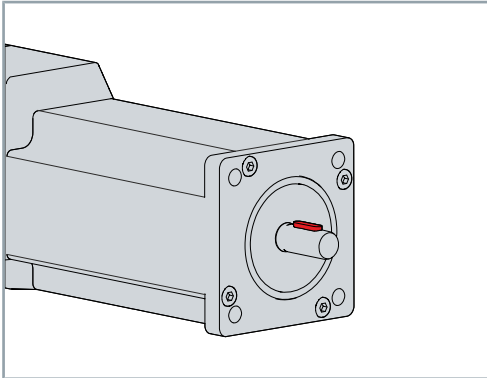
If the voltage is interrupted by emergency stop or power failure, the holding brake is conditionally permissible as a service brake. You can perform a maximum of 2000 emergency stops from a maximum of 3000 rpm with a maximum of three times the intrinsic inertia of the motor. These maximum values may vary due to increased load inertia.

The function of the holding brake can be checked with a torque wrench or with TwinCAT Scope.

3.4 Ordering options

Ordering options are defined via the type key and must be ordered separately. It is not possible to fit one at a later date.

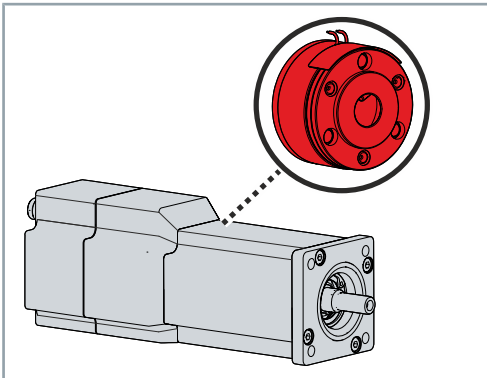
3.4.1 Feather key



A parallel key transmits torque to an output element.

The servo drives are available with parallel key groove and inserted parallel key according to DIN 6885/ISO 2491. The rotor is balanced with half a parallel key according to DIN ISO 21940-32:2012-08.

3.4.2 Holding brake



A holding brake blocks the rotor in the de-energized state. The holding brake increases the motor length and the rotor moment of inertia. The holding brake cannot be retrofitted and is mounted on the B bearing side of the servo drive.

3.4.3 Drive-integrated safety technology



Use Beckhoff connection cables

Original Beckhoff connection cables are mandatory for the operation of servo drives with integrated safety technology. This is part of the safety certification.

Observe the TwinSAFE documentation

Before putting the servo drives with integrated safety technology into operation, read the documentation:

- [AMI8911 TwinSAFE card for AMI81xx servo drive](#)

The servo drives are optionally available with integrated safety functions. These conform to IEC 61800-5-2 and fulfill the following safety standards:

- DIN EN ISO 13849-1:2015, Cat 4, PL e
- IEC 61508:2010 and IEC 62061:2015, SIL 3

Communication is carried out via the Safety over EtherCAT (FSoE) protocol according to IEC 61784-3-12. The STO safety function can be activated via FSoE.

Order identifier	Safety functions	
AMI812x-a100	STO	Safe Torque Off
	SS1	Safe Stop 1
AMI813x-a100	STO	Safe Torque Off
	SS1	Safe Stop 1

3.5 Intended use

The compact integrated servo drives of the AMI8100 series may only be operated for the purposes as defined in this documentation and under the specified ambient conditions.

The components are installed in electrical plants or machines. Stand-alone operation of the components is not permitted.

The thermal protection contact incorporated in the motor windings must be analyzed and monitored on a regular basis.



Read the entire drive system documentation:

- This translation of the original instructions
- Complete machine documentation provided by the machine manufacturer

3.5.1 Improper use

Any type of use that exceeds the permissible values from the technical data is regarded as inappropriate and is thus prohibited.

The compact integrated servo drives of the AMI8100 series are not suitable for use in the following areas:

- ATEX zones without suitable housing
- Areas with aggressive environments, for example aggressive gases or chemicals

The relevant standards and directives for EMC interference emissions must be complied with in residential areas.

4 Technical data

4.1 Definitions



Characteristic torque and speed curves

Detailed information on characteristic curves can be found under:

 [TE5910 | TwinCAT 3 Motion Designer](#)

All data, with the exception of the voltage constant and the ph-ph resistance, are based on an ambient temperature of 40 °C and a 100 K overtemperature of the winding. The data may have a tolerance of $\pm 10\%$.

If a gear unit is attached to the A-side motor flange, the power may be reduced.

4.1.1 Technical terms

This chapter provides information on various technical terms and their meaning.

Standstill torque M_0 [Nm]

Torque, also referred to as starting torque, that the servo drive can generate at standstill. It can be maintained indefinitely at a speed $n < 100 \text{ min}^{-1}$ and nominal ambient conditions.

Nominal torque M_n [Nm]

The torque that the servo drive delivers when it is operated at nominal speed and nominal current. Can be output in continuous operation S1 for an unlimited period of time.

Standstill current $I_{0\text{rms}}$ [A]

Sinusoidal current RMS value. This is consumed at a speed of $n < 100 \text{ min}^{-1}$ in order to generate the standstill torque.

Peak current / pulse current $I_{0\text{max}}$ [A]

Sinusoidal peak current RMS value. The configured peak current of the servo drive used must be less or equal.

Torque constant K_{Trms} [Nm/A]

Indication of the torque in Nm generated by the servo drive per ampere of standstill current. The following applies: $M_0 = I_0 \times K_T$

Voltage constant $K_{E_{rms}}$ [mVmin]

Indication of the induced servo drive EMK at 20 °C, based on 1000 rpm. This is specified as the sine RMS value between two terminals.

Rotor moment of inertia J [kgcm²]

Measure of the acceleration capacity of the servo drive. For example, at J_0 the acceleration time t_b from 0 to 3000 rpm can be calculated based on the following formula:

$$t_b[s] = \frac{3000 \cdot 2\pi}{M_0 \cdot 60 \text{ s}} \cdot \frac{m^2}{10^4 \text{ cm}^2} \cdot J$$

with M_0 in Nm and J in kgcm²

Thermal time constant t_{TH} [min]

Specification of the heating time of the cold servo drive under load with I_0 until an overtemperature of 0.63 x 100 Kelvin is reached. This temperature rise happens in a much shorter time when the motor is loaded with the peak current.

Release delay time / application delay time of the brake t_{BRH} [ms]/ t_{BRL} [ms]

Specification of the response times of the holding brake [+] when operated with the nominal voltage

Winding inductance L [mH]

Specification of the servo drive inductance. It is the average value for one revolution, with two energized phases, at 1 kHz. Saturation of the servo drive must be taken into account.

4.2 Data for operation and environment

Beckhoff products are designed for operation under certain environmental conditions, which vary according to the product. The following specifications must be observed for operation and environment in order to achieve the optimum service life of the products.



Operate servo drives only under the specified environmental conditions

Operate the servo drives only in accordance with the specifications for operation and the environment listed in this chapter. This ensures a long service life and proper operation.

Temperatures above 40 °C and encapsulated installation can shorten the service life of the servomotor.

Environmental requirements	
Climate category – operation	2K3 according to EN 60721
Ambient temperature during operation	0 °C to +40 °C, extended temperature range
Ambient temperature during transport	-25 °C to +70 °C, maximum fluctuation 20 K/hour
Ambient temperature during storage	-25 °C to +70 °C, maximum fluctuation 20 K/hour
Permissible humidity in operation	5 % to 95 % relative humidity, no condensation
Permissible humidity during transport and storage	5 % to 95 % relative humidity, no condensation

Specifications for intended use	
Cooling	Convection
Protection rating	Housing: IP54 Shaft feedthrough: IP54 / IP20 in mounting position V3 Shaft feedthrough with double-lipped FKM shaft seal ring: IP65
Feedback system	Absolute encoder, single-turn and multi-turn encoder
Vibration resistance	conforms to EN 60068-2-6
Shock resistance	conforms to EN 60068-2-27
EMC requirements	Conforms to EN 61000-6-2 and EN 61000-6-4
Approvals	CE, cURus EAC See chapter: Guidelines and Standards

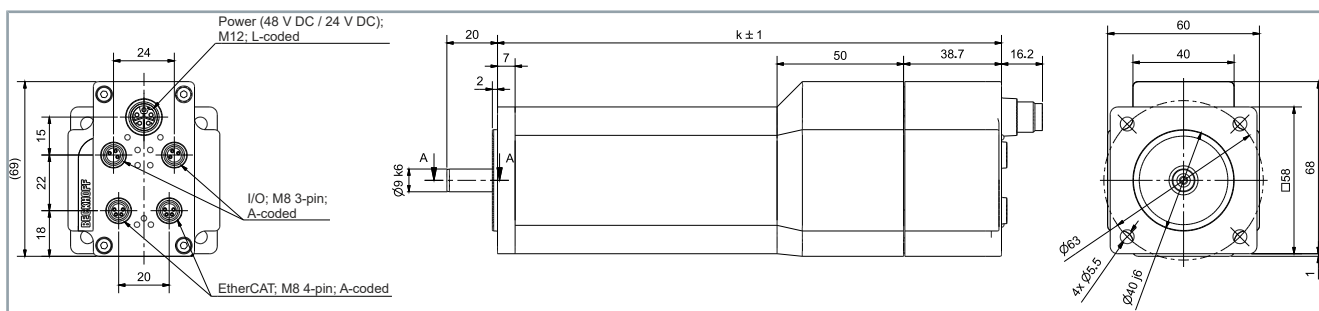
4.3 Size AMI812x

Electrical data	AMI81xx			
	21F	22F	22J	23J
Standstill torque M ₀ [Nm]	0.48	0.78	0.78	1.0
Standstill current I _{orms} [A]	4	4	8	8
Maximum mechanical speed n _{max} [min ⁻¹]	12000			
Maximum nominal mains voltage U _N [V _{DC}]	50	50	50	50
Peak current I _{0max} [A]	18	18	18	18
Peak torque M _{0max} [Nm]	1.88	3.12	1.60	2.22
Torque constant K _{Trms} [Nm/A]	0.120	0.195	0.098	0.125
Voltage constant K _{Erms} [mVmin]	7.5	11.9	5.6	7.8
Winding resistance Ph-Ph R ₂₀ [Ω]	1.650	1.580	0.355	0.410
Winding inductance Ph-Ph, measured at 1 kHz L [mH]	2.80	3.30	0.70	0.92
Power supply U _N = 24 V DC				
Nominal speed n _N [min ⁻¹]	1000	600	2000	1500
Nominal torque M _N [Nm]	0.48	0.78	0.78	1.0
Nominal output P _N [W]	50	49	163	157
Power supply U _N = 48 V DC				
Nominal speed Nn [min ⁻¹]	3000	2000	4500	3500
Nominal torque M _N [Nm]	0.45	0.78	0.75	0.97
Nominal output P _N [W]	141	163	353	355
Nominal current I _n [A]	4.0	4.0	8.0	8.0
Aluminum reference flange, 230 mm x 130 mm x 10 mm Installation of a shaft sealing ring leads to a reduction in the nominal values.				
Mechanical data	AMI81xx			
	21	22	23	
Rotor moment of inertia J [kgcm ²]	0.134	0.253	0.376	
Rotor moment of inertia with brake J [kgcm ²]	0.208	0.328	0.448	
Number of poles	6			
Static friction torque M _R [Nm]	0.02	0.04	0.06	
Without shaft sealing ring Without holding brake				
Thermal time constant t _{TH} [min]	10	13	16	
Weight [kg]	1.35	1.65	2.05	
Weight with brake [kg]	1.51	2.01	2.31	
Flange				
Fit	j6			
Tolerance class	N			
Protection rating				
Standard housing version	IP65			
Standard shaft feedthrough version	IP54 / IP20 in mounting position V3			
Paint finishes				
Properties	Acrylic powder-coated			
Color	Anthracite gray; RAL 7016			
Optional holding brake [+]				
AMI812x				
Holding torque at 120 °C M _{RR} [Nm]	2.0			

Optional holding brake [+]	AMI812x
Supply voltage U_{BR} [V _{DC}]	24; +6% to -10%
Electrical power P_{BR} [W]	10
Current at 120 °C I_{on} [A]	0.3
Release delay time t_{BRH} [ms]	25
Application delay time t_{BRL} [ms]	8

4.3.1 Dimensional drawing AMI812x

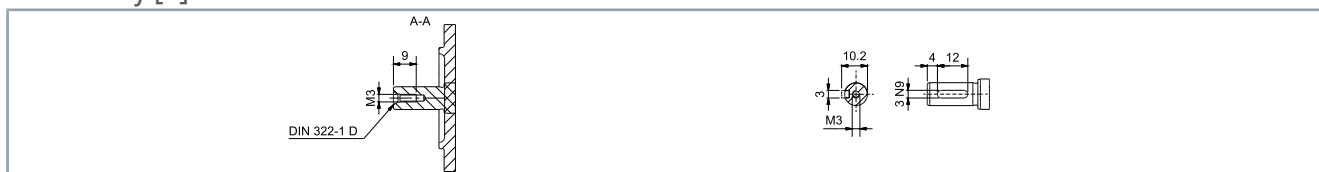
- All figures in millimeters



Motor	k (without brake)	k (with brake)
AMI8121	155	190
AMI8122	177	212
AMI8123	199	234

Parallel key [±]

- Center bore according to DIN 332-D



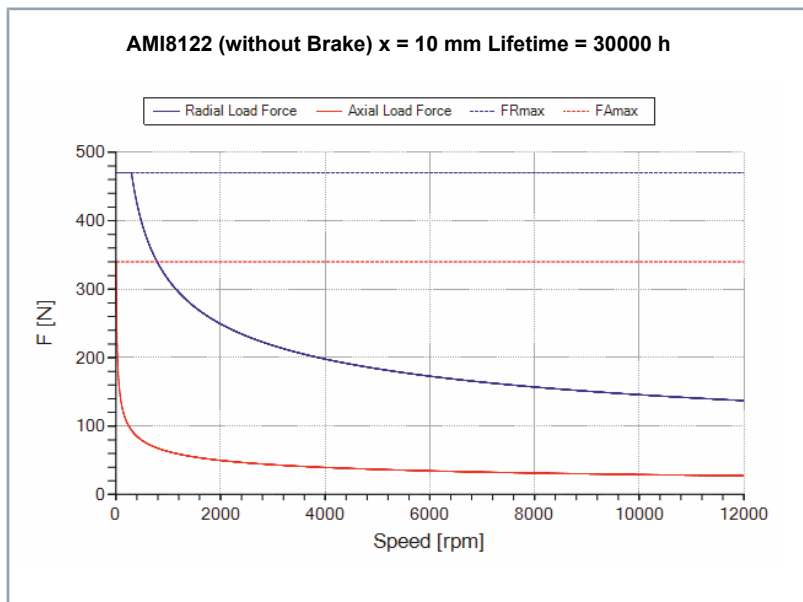
4.3.2 Force diagram AMI812x



Beckhoff load/force calculator

The software represents axial and radial forces on the servo drive shaft. The following example shows an AMI8122 without a holding brake.

- [Download load/force calculator](#)



4.4 Size AMI813x

Electrical data	AMI81xx		
	31J	32J	33J
Standstill torque M ₀ [Nm]	1.20	2.18	2.85
Standstill current I _{orms} [A]	7.1	6.6	7.3
Maximum mechanical speed N _{max} [min ⁻¹]	10,000		
Maximum nominal mains voltage U _N [V _{AC}]	50		
Peak current I _{0max} [A]	18.0		
Peak torque M _{0max} [Nm]	3.24	5.93	7.26
Torque constant K _{Trms} [Nm/A]	0.169	0.311	0.356
Voltage constant K _{Erms} [mV/min]	12	21	26
Winding resistance Ph-Ph R ₂₀ [Ω]	0.73	0.96	0.93
Winding inductance Ph-Ph, measured at 1 kHz L [mH]	2.00	3.40	2.9
Power supply U _N = 24 V DC			
Nominal speed N _n [min-1]	600	300	250
Nominal torque M _n [Nm]	1.25	2.18	2.85
Nominal output P _n [W]	0.08	0.16	0.07
Power supply U _N = 48 V DC			
Nominal speed N _n [min-1]	1800	1000	800
Nominal torque M _n [Nm]	1.2	2.05	2.6
Nominal output P _n [kW]	0.226	0.215	0.218
Aluminum reference flange, 230 mm x 130 mm x 10 mm Installation of a shaft sealing ring leads to a reduction in the nominal values.			
Mechanical data	AMI81xx		
	31	32	33
Rotor moment of inertia J [kgcm ²]	0.462	0.842	1.23
Rotor moment of inertia with brake J [kgcm ²]	0.541	0.921	1.46
Number of poles	8		
Static friction torque M _R [Nm], Without shaft sealing ring Without holding brake	0.01	0.01	0.02
Thermal time constant t _{TH} [min]	24	24	28
Weight [kg]	2.15	2.75	3.35
Weight with brake [kg]	2.55	3.15	3.95
Flange			
Fit	j6		
Tolerance class	N		
Protection rating			
Standard housing version	IP65		
Standard shaft feedthrough version	IP54 / IP20 in mounting position V3		
Paint finishes			
Properties	Acrylic powder-coated		
Color	Anthracite gray; RAL 7016		
Optional holding brake [+]	AMI8131, AMI8132		AMI8133
Holding torque at 120 °C M _{BR} [Nm]	2.0		3.5

Optional holding brake [+]	AMI8131, AMI8132	AMI8133
Supply voltage U_{BR} [V _{DC}]	24; +6% to -10%	
Electrical power P_{BR} [W]	10	12
Current at 120 °C I_{on} [A]	0.3	0.36
Release delay time t_{BRH} [ms]	25	35
Application delay time t_{BRL} [ms]	8	15

5 Scope of supply



Check the scope of supply for missing or damaged parts

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately.

Check the shipment for the following contents:

- Servo drive of the AMI81xx series with yellow protective cap
- Short information

5.1 Packaging

Instructions for handling are printed on the packaging:

Symbol	Explanation
	These are the permitted maximum and minimum temperatures at which the device may be stored and transported.
	This is the correct position for the packaging.
	Protect the packaging against wetness.
	The contents are fragile.

6 Transport and storage

NOTICE

Avoid damage to the servo drives and loss of warranty

Observe the conditions and the following chapters on transport and storage.

Failure to observe the conditions may result in damage to the servo drives and void the warranty.

NOTICE

Damage due to removal of the protective cap

The yellow protective cap on the shaft protects against mechanical damage and environmental influences. If you remove the protective cap, the shaft may be damaged.

- Do not remove the yellow protective cap on the drive shaft

6.1 Conditions

During transport and storage, ensure that the servo drives and individual components are not damaged. Observe the specifications in the following chapters and comply with the following conditions:

- Climate class: 2K3 in accordance with EN 60721
- Temperature: -25 °C to +70 °C, maximum fluctuation 20 K per hour
- Humidity: relative humidity 5% to 95%, no condensation
- Use of suitable means of transport
- The device should be transported and stored in a horizontal position
- Use the vendor's original packaging

The table shows the maximum stacking height at which you may store and transport the servo drives, which must also be on a pallet in the original packaging:

Motor type	Stacking height [pieces]
AMI812x	10
AMI813x	6

6.2 Transport

WARNING

Do not move under suspended loads

Use suitable means of transport and secure components of the distributed servo drive system against falling down.

If the motor falls down, this can lead to serious or even fatal accidents.

NOTICE

Avoid high mechanical stresses

Use suitable means of transport and secure components of the distributed servo drive system against high mechanical stress.

High mechanical stresses will damage the distributed servo drive system and individual components.

Transport of the compact integrated servo drives of the AMI81xx series without auxiliary means.

6.3 Long-term storage

NOTICE

Observe the maximum storage time

Do not exceed the maximum storage time of two years.

Exceeding the specified maximum storage time can lead to changes in the properties of the lubricant used and damage the servo drive during subsequent operation.

NOTICE

Perform recurring inspections

Check the servo drive every six months to ensure it is in good condition.

Damage to the servo drive or maintenance work not carried out will affect the service life of the installed components and parts.

NOTICE

Prevent the formation of condensation

Keep the ambient temperature constant. Avoid solar radiation and high air humidity.

Condensation water can lead to damage during subsequent operation or to rust formation.

The servo drives can be stored for shorter or longer periods. For storage we always recommend the original packaging. Adhere to the conditions specified in the chapter: "Transport and storage", [Page 39].

The servo drives are protected against chemical and aggressive substances through the classes 1C2, chemical substances and 1B2, biological conditions.

Ensure the storage space is vibration-free.

7 Technical description

7.1 Mounting position

NOTICE

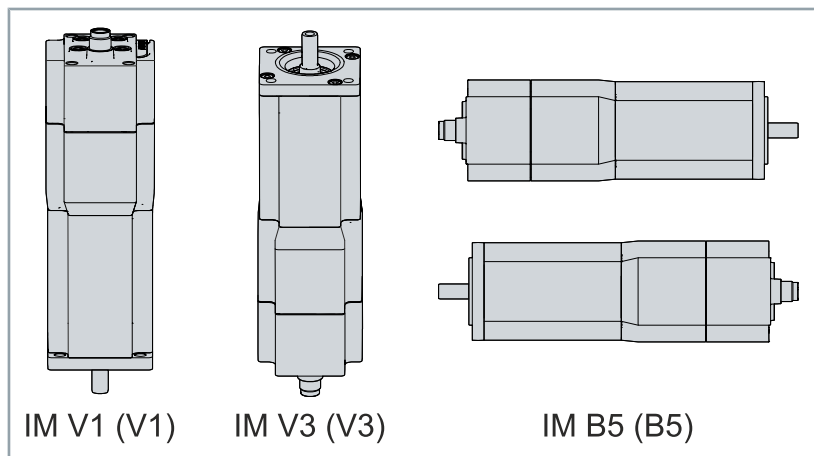
Observe the maintenance intervals and installation positions

Carry out maintenance at regular intervals.

In the vertical installation position IM V3, liquid which has been left on the flange for a longer period can penetrate the servo drive through capillary action. In installation position IM V1 liquid can escape.

If you do not observe the maintenance intervals, the servo drive may overheat depending on the installation position. Ingress and leakage of liquids may damage the servo drive.

The standard installation position of the servo drives is the design IM B5 according to DIN EN 60034-7.



7.2 Feedback



Feedback exchange

The installed feedback system can only be replaced with an identical system. The feedback system cannot be changed retrospectively.

The table below provides information on system accuracies and resolutions of the servo drive feedback systems:

Feedback	Resolution	System accuracy	Comment
Encoder, single-turn	17-bit	± 316 arcseconds	Standard:
Encoder, multi-turn			AMI812x
Encoder, single-turn	17-bit	± 316 arcseconds	Standard:
Encoder, multi-turn			AMI813x

7.3 Protection equipment

The temperature sensor LPTC-600 is installed in all servo drives of the AMI81xx series.

The LPTC-600 is integrated into the monitoring system of the servo drive when using the pre-assembled cable. Configure the servo drive according to the temperature warning at 120 °C and the switch-off temperature at 140 °C.

The LPTC-600 is identical to the KTY 84,130 used previously.

7.3.1 LPTC-600 sensor

The following table shows the resistance values of the temperature sensor:

Temperature [°C]	T/°C [%/K]	LPTC-600 Resistance [Ω]			Temperature error [K]
		minimum	Nominal value	maximum	
-40	0.84	340	359	379	± 6.48
-30	0.83	370	391	411	± 6.36
-20	0.82	403	424	446	± 6.26
-10	0.80	437	460	483	± 6.16
0	0.79	474	498	522	± 6.07
10	0.77	514	538	563	± 5.98
20	0.75	555	581	607	± 5.89
25	0.74	577	603	629	± 5.84
30	0.73	599	626	652	± 5.79
40	0.71	645	672	700	± 5.69
50	0.70	694	722	750	± 5.59
60	0.68	744	773	801	± 5.47
70	0.66	797	826	855	± 5.34
80	0.64	852	882	912	± 5.21
90	0.63	910	940	970	± 5.06
100	0.61	970	1000	1030	± 4.90
110	0.60	1029	1062	1096	± 5.31
120	0.58	1089	1127	1164	± 5.73
130	0.57	1152	1194	1235	± 6.17
140	0.55	1216	1262	1309	± 6.63
150	0.54	1282	1334	1385	± 7.10
160	0.53	1350	1407	1463	± 7.59
170	0.52	1420	1482	1544	± 8.10
180	0.51	1492	1560	1628	± 8.62

7.4 Shaft end A

The A-side is used for force transmission via a backlash-free and frictional connection. This is achieved by means of a coupling and a cylindrical shaft end according to DIN 748-3 with a center bore at the front according to DIN 332-2. Alternatively, forces can be transmitted via a frictional connection and a feather key groove according to DIN 6885/ISO 2491.

Radial forces

- Motors driven via pinion/toothed belt
- Permissible values depend on the speed

Axial forces

- Pinion or pulley mounted on the shaft
- For example, when operating right-angle gear units

7.5 Power derating

Derating may be necessary at high ambient temperature or when operating at a great height above sea level. In addition, some servo drives may experience power reductions depending on the feedback system installed or the holding brake [+]. The reduction affects the standstill current and the standstill torque.

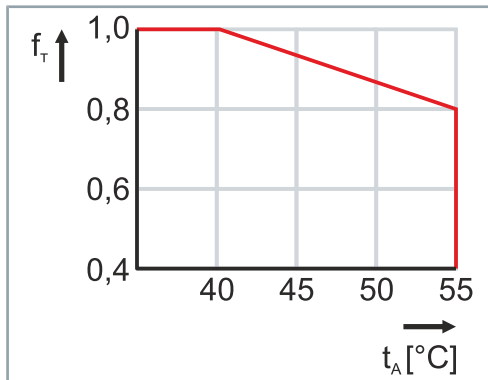
Ambient temperature

f_T = Temperature utilization factor

t_A = Ambient temperature in °C

Calculation of the performance data if the specified temperature limit > 40 °C to 55 °C is exceeded:

$$M0_{red} = M0 \times f_T$$



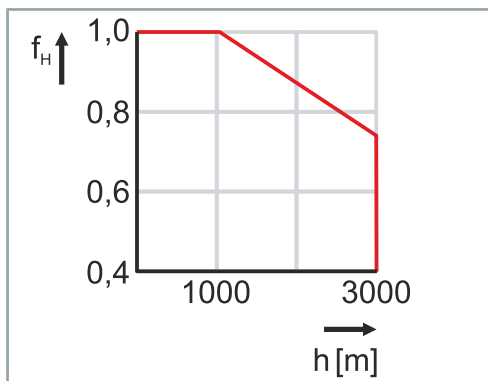
Installation altitude

f_H = Altitude utilization factor

h = Altitude in meters

Calculation of the performance data if the specified installation altitude is exceeded > 1000 m to 3000 m:

$$M0_{red} = M0 \times f_H$$



Ambient temperature and installation altitude

Calculation of the power data when exceeding the specified limits:

Ambient temperature > 40 °C, altitude > 1000 m and < 3000 m:

$$M0_{red} = M0 \times f_T \times f_H$$

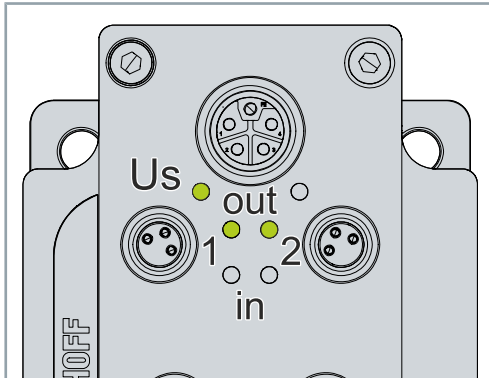
7.6 Display

The LEDs of the AMI81xx compact integrated servo drive provide you with information about the operating state. There are different light sequences for each operating state.

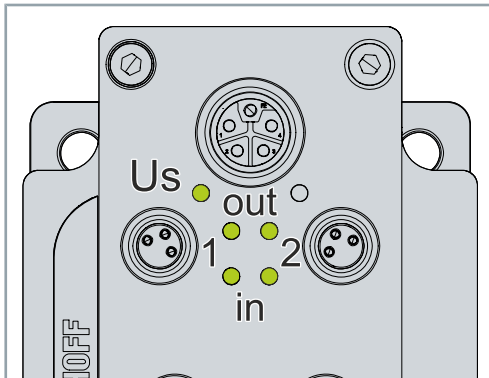
7.6.1 Status LEDs

This section provides information about the meaning of the different status LEDs on the AMI81xx compact integrated servo drive.

7.6.1.1 Supply voltage

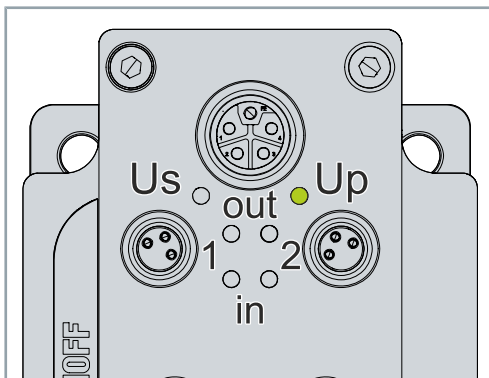


Us out 1 and 2 = status display of the supply voltage	
LED	Status
lit	Supply voltage present at outputs 1 and 2
Off	No supply voltage present at outputs 1 and 2



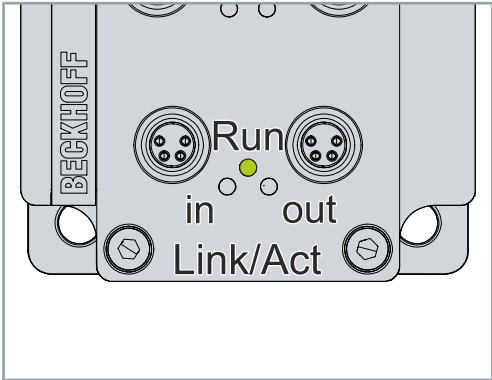
Us in 1 and 2 = status display of the supply voltage	
LED	Status
lit	Supply voltage present at inputs 1 and 2
Off	No supply voltage present at inputs 1 and 2

7.6.1.2 Motor voltage



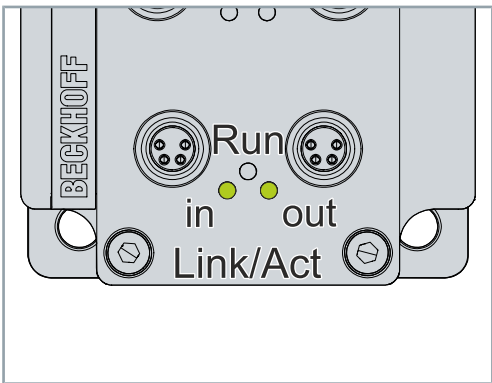
Up = status display of the power supply of the servo drive	
LED	Status
lit	Peripheral voltage present
Off	No peripheral voltage present

7.6.1.3 Operation



Run = display of the EtherCAT operating states	
LED	Status
lit	Operational; Op
Flashes uniformly	Pre-Operational; Pre-Op
Flashes sporadically	Safe-Operational: Safe-Op
Flashes very quickly	BOOT
Off	INIT

7.6.1.4 EtherCAT



Link/Act with in and out = display of the communication state	
LED	Status
lit	Link: connection to the connected EtherCAT module; no communication
Flashes	Act: communication with connected EtherCAT module
Off	No connection to the connected EtherCAT module

8 Mechanical installation

Carry out all work with great care and without time pressure.

8.1 Flange mounting

The following table provides information on components for mounting the servo drive on the machine or plant:

Quality of the hexagon socket head cap screw DIN EN ISO 4762 = 8.8				
Motor	Bore diameter [mm]	Screw size	Tightening torque [Nm]	DIN washer
AMI812x	5.5	M5x16	5.5	5.3
AMI813x	6.0	M5x16	5.5	5.3

8.2 Output elements

WARNING

Secure moving parts against ejection

Make sure there are no moving parts on or in the machine during operation. Feather keys [+] are only secured during transport. *Unsecured parts can be ejected from the machine during operation and cause serious or fatal injuries.*

NOTICE

Protect servo drive from impermissible stresses

Avoid bending components during transport or handling and do not change any insulation distances. Avoid hard shocks to the shaft end, the ball bearings or the feedback system. Furthermore, note vibration qualities and vibration resistance. If necessary, provide additional support for the servo drive.

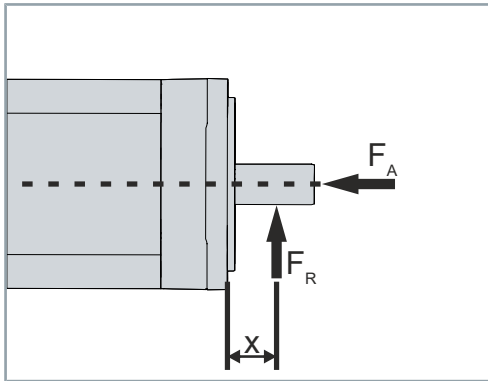
An impermissible load on the components can have a negative effect on the performance of the servo drive. Impacts on the shaft impair the concentricity of the servo drive.

NOTICE

Ensure adequate grounding via the protective conductor

The thermal connection of the flange determines the power loss. *Ensure adequate grounding via the protective conductor or the flange.*

8.2.1 Bearing load during installation



Storage

Avoid mechanically overdetermined support of the shaft through rigid coupling and additional external support.

When assembling output elements, care must be taken to minimize the load on the shafts and bearing due to shear forces such as radial force F_R and axial force F_A . Axial loads shorten the service life and can lead to malfunctions of the holding brake [+].

Special features when using toothed belt drives:

When using a toothed belt drive, the radial and axial loads on the shaft may not be exceeded. Excessive load can lead to fatigue fracture of the shaft. Be sure to read and observe the Technical data chapter.

The servo drives are equipped with sealed grooved ball bearings. The fixed bearing is located on the B-side of the servo drive servo-motor and the floating bearing on the A-side; shaft output side of the servo drive. Oscillatory bearing movements $< 180^\circ$ shaft rotation are not permissible. Use the [Beckhoff load/force calculator](#) for a detailed calculation of the bearing forces on the shaft.

Servo drive	A-bearing sizes	B-bearing sizes
AMI812x	6001	609
AMI813x	6203	6201

8.2.2 Mounting

⚠ WARNING

Do not touch hot output elements without personal protective equipment

Only handle hot output elements, such as couplings or pulleys, with special thermal gloves. Avoid prolonged contact with hot components.

Hot components can cause severe burns to body parts and limbs.

NOTICE

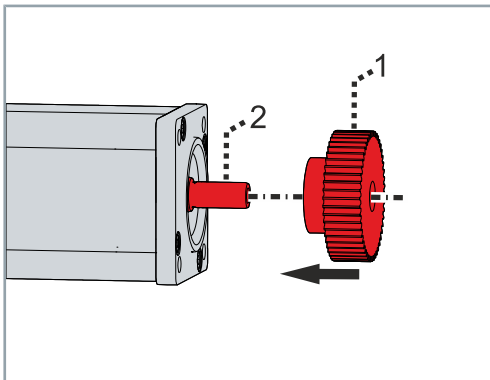
Do not mount the drive element offset

Place the drive element centered and straight on the shaft.

An offset will cause unacceptable vibration and the destruction of the ball bearings and the coupling.

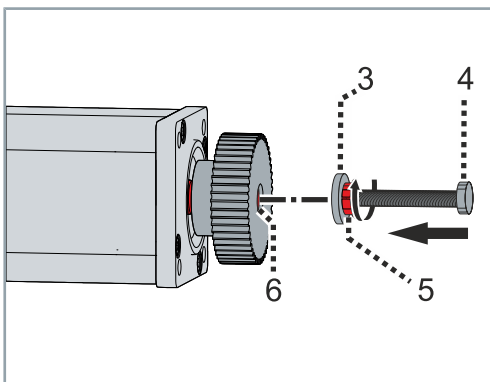
- ▶ Warm up the output elements according to manufacturer's instructions
- ▶ Remove the protective cap
- ▶ Degrease and clean shaft
- ▶ Remove the output element from the oven and transport it to the workstation

- ▶ Place output element [1] centered and straight on the shaft [2]



- ▶ Insert washer [3] with bolt [4] of strength class 8.8 and nut [5] into the locking thread [6] of the shaft
- ▶ Tighten nut [5]

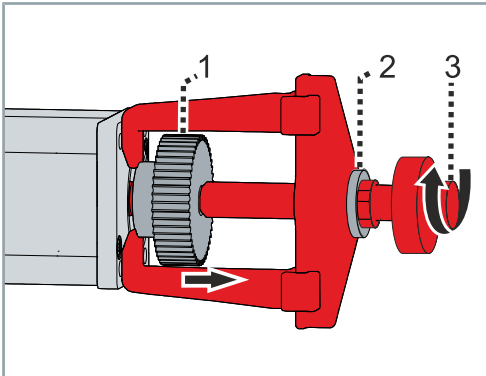
The output element is pulled onto the shaft by the nut.



8.2.3 Dismantling

Use only backlash-free and friction-locked collets, gear pullers or suitable couplings to dismount the output elements.

► Degrease shaft



- Screw puller [3] and intermediate disc [2] into the locking thread of the shaft
- Place the puller fully on the drive element [1]
- Pull the output element [1] with the puller [3] from the shaft

9 Electrical installation

9.1 Load voltage supply

NOTICE

Fuse protection of the load voltage

The electrical fuse protection of the load voltage must be selected in such a way that the maximum current flowing is limited to 3 times the nominal current (max. 1 second)!

⚠ WARNING

Load voltage supply

The device requires an additional load voltage of e.g. 48 V DC for operation.

In order to avoid equalizing currents on the protective conductor during operation, EN 60204-1:2018 provides for the possibility that the negative pole of the load voltage does not necessarily have to be connected to the protective conductor system (SELV). For this reason, the load voltage supply should be designed as a SELV supply.

Control voltage U_s

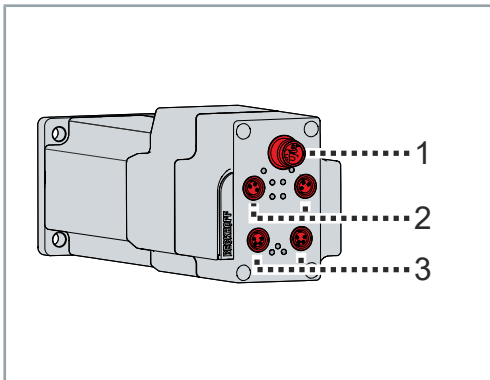
The following sub-functions are supplied from control voltage U_s :

- the fieldbus
- the processor logic
- typically, the inputs and the sensors if the EtherCAT device has inputs

Peripheral voltage U_p

For EtherCAT devices with load connection and digital inputs and outputs, the load connection and digital outputs are typically supplied from the peripheral voltage U_p . U_p must be provided separately. If U_p is switched off, the fieldbus function, the function of the inputs, and the supply of the sensors are maintained.

9.2 Connection technology



The AMI8100 integrated servomotor drive has an M12 connection [1] for feeding in the supply voltage.

The AMI8100 has additional I/Os on two black M8 sockets [2] for drive-related functions such as limit switches or external sensors.

The AMI8100 is an independent EtherCAT slave and can be connected to other EtherCAT slaves directly via daisy chain. The AMI8100 has two green M8 sockets [3] for the incoming and downstream EtherCAT connections.

Beckhoff offers the corresponding accessories for this product. All connectors have an IP65 protection rating. A protective conductor connection in line with VDE 0627 is provided on the housing.

9.2.1 Pin assignment

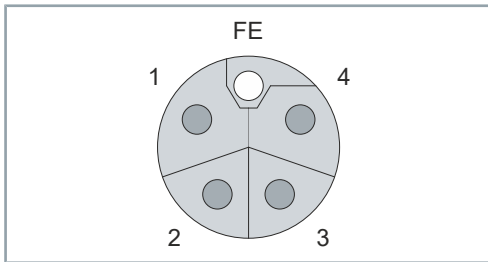


Illustration: Pinout M12 power connection

5-pole L-coded M12

- X5 | Power connection

Contact	Function	Core color/ Core identification
1	U_{p+} ; +8...48 V DC	Brown
2	U_{p-} , GND	White
3	U_{s+} , +24 V DC	Blue
4	U_{s-} , GND	Black
5	FE	Gray

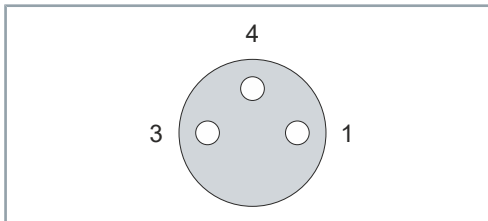


Illustration: Pinout M8 I/O connection

3-pin A-coded M8

- X3 | DIO1 sensor connection
- X4 | DIO2 sensor connection

Contact	Function	Core color/ Core identification
1	+24 V DC	Brown
3	GND	Blue
4	Input	Black

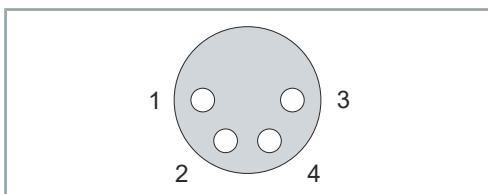


Illustration: Pinout M8 EtherCAT connection

4-pin A-coded M8

- X1/IN | EtherCAT connection IN
- X2/OUT | EtherCAT connection OUT

Contact	Function	Core color/ Core identification
1	Tx+	Yellow
2	Rx+	White
3	Rx-	Blue
4	Tx-	Orange

9.3 Cables

Beckhoff offers pre-assembled cables for faster and flawless installation of the servo drives. These cables are tested with regard to the material used, shielding and connection type. Perfect functioning and compliance with legal regulations, such as EMC and UL, are guaranteed. The use of other cables can cause unexpected faults and result in exclusion of warranty.

Beckhoff supplies pre-assembled connection cables. Mating connectors are not included in the scope of supply. For the selection of the necessary cables, refer to the Beckhoff documentation for the connecting cables [+]. In the documentation you will find a complete overview of the available cables and information on the technical data.



Hint for trouble-free application and assembly:

- Wiring in accordance with applicable regulations and standards
- Pre-assembled and shielded Beckhoff cables

9.3.1 Choice of cable

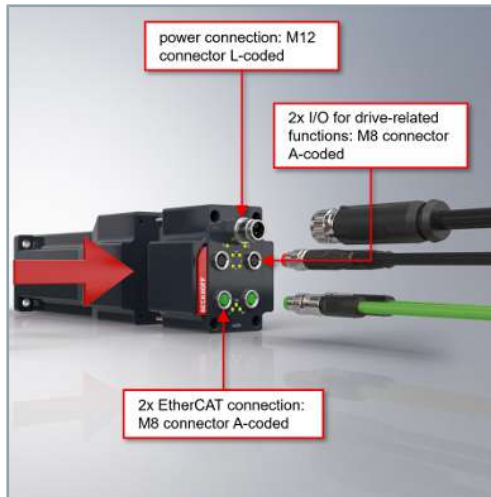


Illustration: AMI8100 Overview of connections

Connection cables for AMI81xx

You need three different types of cable to connect the AMI8100:

1. Power cable for power supply
2. Sensor cable for I/O connection
3. EtherCAT cable for communication connection

NOTICE

Observe the maximum permissible cable length

Use a maximum of 20 m cable length.

In the event of non-observance, compliance with legal requirements is not guaranteed. Faults and malfunctions along with exclusion from warranty can be the result.



Define cable length via order specifications

The last four digits of the order code correspond to the cable length in decimeters: A ZK4xxx-xxxx-0020 cable is 2.00 m long.

Beckhoff connection cables differ from one another in terms of their routing methods, type of connection, and the core cross-section. The various connection cables are listed in the following tables.

9.3.1.1 Power cable

Ordering information	Description
ZK2050-5200-0xxx	Power cable, 1.5 mm ² , PUR, flex, M12, socket, straight, female, 5-pin, L-coded – open end
ZK2050-5400-0xxx	Power cable, 1.5 mm ² , PUR, flex, M12, socket, angled, female, 5-pin, L-coded – open end
ZK2051-5200-0xxx	Power cable, 2.5 mm ² , PUR, flex, M12, socket, straight, female, 5-pin, L-coded – open end
ZK2051-5400-0xxx	Power cable, 2.5 mm ² , PUR, flex, M12, socket, angled, female, 5-pin, L-coded – open end
ZK2053-5200-0xxx	Power cable, 0.75 mm ² , PUR, flex, M12, socket, straight, female, 5-pin, L-coded – open end
ZK2053-5400-0xxx	Power cable, 0.75 mm ² , PUR, flex, M12, socket, angled, female, 5-pin, L-coded – open end
ZS2030-4812	M12, T splitter, 1 x M12 (male) – 2 x M12 (female), pin assignment 1:1, L-coded

9.3.1.2 Sensor cable

Ordering information	Description
ZK2000-2100-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, straight, male, 3-pin – 3-pin, open end (3 x 0.25 mm ²)

Ordering information	Description
ZK2000-2122-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, straight, male, 3-pin, A-coded – M8, socket, straight, female, 3-pin, A-coded
ZK2000-2124-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, straight, male, 3-pin, A-coded – M8, socket, angled, female, 3-pin, A-coded
ZK2000-2162-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, straight, male, 3-pin, A-coded – M12, socket, straight, female, 4-pin, A-coded
ZK2000-2300-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, angled, male, 3-pin, A-coded – 3-pin, open end (3 x 0.25 mm ²)
ZK2000-2322-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, angled, male, 3-pin, A-coded – M8, plug, angled, male, 3-pin A-coded
ZK2000-2324-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, angled, male, 3-pin, A-coded – M8, socket, angled, female, 3-pin, A-coded
ZK2000-2362-0xxx	Sensor cable, PUR, 3 x 0.25 mm ² , drag-chain suitable M8, plug, angled, male, 3-pin, A-coded – M12, socket, straight, female, 4-pin, A-coded

9.3.1.3 EtherCAT cable

- X1/IN | EtherCAT connection IN
- X2/OUT | EtherCAT connection OUT

Ordering information	Description
ZK1090-3131-0xxx	EtherCAT cable, PUR, AWG26, drag-chain suitable, M8, plug, straight, male, 4-pin, A-coded – M8, plug, straight, male, 4-pin, A-coded
ZK1090-3131-3xxx	EtherCAT cable, PVC, AWG26, fixed installation, M8, plug, straight, male, 4-pin, A-coded – M8, plug, straight, male, 4-pin, A-coded
ZK1090-3131-6xxx	EtherCAT cable, PUR, 1 x 4 x AWG22, capable of torsion M8, plug, straight, male, 4-pin, A-coded – M8, plug, straight, male, 4-pin, A-coded
ZK1090-3191-0xxx	EtherCAT cable, PUR, AWG26, drag-chain suitable, M8, plug, straight, male, 4-pin, A-coded – RJ45, plug, straight, male, 8-pin
ZK1090-3191-3xxx	EtherCAT cable, PVC, AWG26, fixed installation, M8, plug, straight, male, 4-pin, A-coded – RJ45, plug, straight, male, 8-pin
ZK1090-3191-6xxx	EtherCAT cable, PUR, 1 x 4 x AWG22, capable of torsion, M8, plug, straight, male, 4-pin, A-coded – RJ45, plug, straight, male, 8-pin

9.3.2 Establishing the rotary joint



Available tool

For the assembly of the rotary joints you can purchase the following tool:

- Torque wrench ZB8801-0000



For interference-free data transmission, please note:

- Maximum number of mating cycles for the connectors: 500
- Maximum number of rotations of the power box: 10

If the maximum number of mating cycles or rotations is exceeded, clean data transmission can no longer be guaranteed. This results in signs of wear.

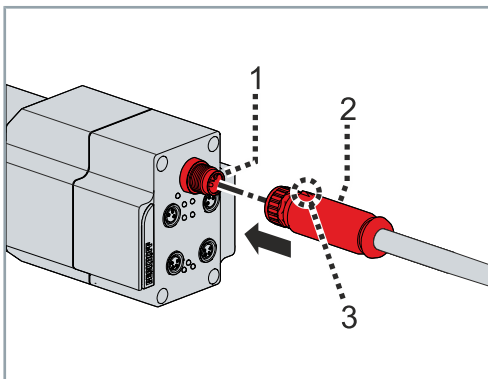
NOTICE

Avoid soiling and damage

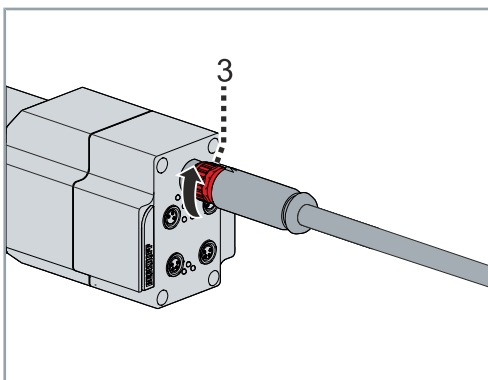
When connecting the socket and connector, make sure that the poles and the inside of the component are not soiled or damaged.

Failure to do so may adversely affect the function of the connections.

9.3.2.1 Power

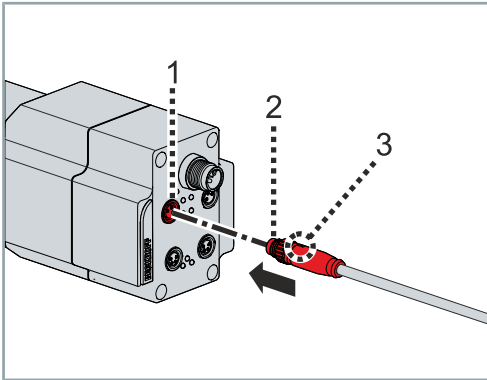


- ▶ Make sure that the poles and the interior of the socket as well as the threads on the connector are not dirty or damaged
- ▶ Push the connector [1] straight onto the socket [2]
- ▶ Make sure that the marking point [3] is pointing upwards



- ▶ Screw thread [3] into the socket

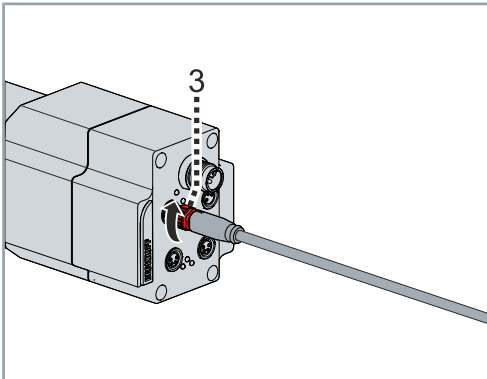
9.3.2.2 I/O and EtherCAT



- Make sure that the poles and the interior of the socket as well as the threads on the connector are not dirty or damaged
- Push the connector [1] straight onto the socket [2]

If present:

- Make sure that the marking point [3] is pointing upwards



- Screw thread [3] into the socket

10 Commissioning



Exemplary commissioning

The procedure for commissioning is described as an example. A different method may be appropriate or necessary, depending on the application of the components.

10.1 Before commissioning

Observe the following points before commissioning:

- Make sure that an emergency stop switch complying with the valid regulations is fitted to the control station
- Check servo drive for damage
- Check mounting and alignment
- Tighten screw connections correctly
- Installing mechanical, thermal and electrical protective devices
- Check wiring, connection and proper grounding on servo drive

In case of motors with holding brake [+]

- Check the function of the holding brake [+]
- Check emergency stop functions

10.2 During commissioning

Pay attention to the following points during commissioning:

- Check function and adjustment of attachments
- Observe information for environment and operation
- Check protective measures against moving and live parts

Configuration

Beckhoff recommends the configuration of integrated servo drives of the AMI81xx series in Beckhoff TwinCAT 3 Drive Manager 2:

- Build Project and Choose Target System
- Implement devices by scanning or manually
- Configure devices, determine and set servo drive
- Create axis configuration
- Drive Manager 2 create project and scan drive or select manually
- Set scaling factor and speeds
- Check status and activate control system
- Adjust controller parameters if necessary

10.3 Prerequisites during operation

Pay attention to the following points during operation:

- Listen for atypical noises
- Check for unusual smoke formation
- Always check drive surfaces and cables for dirt, leaks, moisture or dust
- Check temperature development
- Check for lubricant leakage
- Observe recommended maintenance intervals
- Check function of safety devices

10.4 After operation

WARNING

Place the machine or plant in a safe state

Make sure that the rotor comes to a complete stop.

When the holding brake [+] is released, the rotor moves without remanent torque. Rotating components can lead to serious injuries.

11 Maintenance and cleaning

⚠ WARNING

Ensure safe condition for cleaning work

Basically, electronic devices are not fail-safe. The condition is always safe when the unit is switched off and not energized. For cleaning work, place the connected servo drives and the machine in a safe state.

Carrying cleaning work during operation can lead to serious or fatal injuries.

NOTICE

Do not immerse or spray the servo drive

Wipe off the servo drive only with a cleaning agent and a cloth.

Due to impermissible solutions, cleaning by immersion can lead to damage to the surface and the servo drive as well as to leak-tightness problems.

Contamination, dust or chips can have a negative effect on the function of the components. In the worst case, contamination can lead to failure. Therefore, clean and service the components at regular intervals.

11.1 Cleaning materials

Carefully clean the components with a damp cloth or brush.

Use grease-dissolving and non-aggressive cleaning agents such as isopropanol for cleaning. You will also receive information about non-approved cleaning agents.

Not applicable

Cleaning agents	Chemical formula
Aniline hydrochloride	$\text{C}_6\text{H}_5\text{NH}_2\text{HCl}$
Bromine	Br_2
Sodium hypochlorite; bleaching solution	NaClO
Mercury (II) chloride	HgCl_2
Hydrochloric acid	HCl

11.2 Intervals

Under nominal conditions, the motor components have different operating hours. We have provided you with a list of maintenance work and intervals for the associated components below:

Component	Interval	Maintenance
Ball bearing	30000 operating hours	Replace bearing
Servo drive	2500 operating hours/annually	Check servo drive for bearing noises If noises are detected: • Do not continue to operate the servo drive; replace bearing
Shaft sealing ring	5000 operating hours	Perform visual inspection Lubricate the shaft sealing ring Recommended lubricants: • „MobilgreaseTM FM22“ from Mobil In case of damage and pressure drop: • Replace shaft sealing ring
Cables	Regular intervals	Perform visual inspection and check for damage If required: • Replace cables
	5 million bending cycles	Replace cables
Sockets	500 cycles	In case of damage: • Contact Beckhoff Service

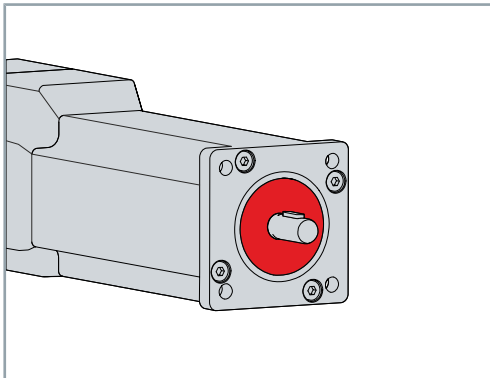
12 Accessories

12.1 Connection cables



For the connection from the servo drive to the machine or plant, there are different connection cables. For information on connecting a servo drive to a machine or system, refer to the chapter: Electrical installation.

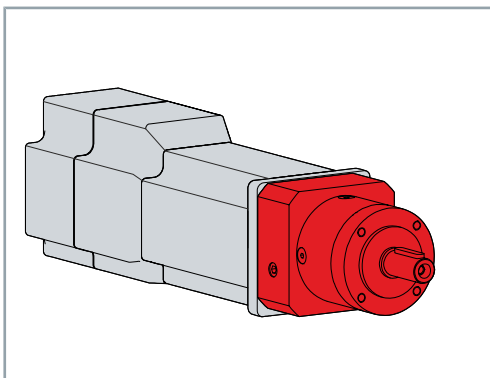
12.2 Shaft sealing ring



The FKM radial shaft sealing ring serves to seal against splash water and to protect the servo drive shaft against the ingress of dust or dirt. This increases the degree of protection of the shaft feedthrough to IP65.

The radial shaft-sealing ring can be replaced at any time. Please note, however, that the exchange may lead to a reduction in the nominal values.

12.3 Gear unit



A gear unit serves to transmit a moment of force or a torque and is used on the servo drive as an output element. Information on flange sizes for combinations of servo drive and gear unit can be found in the chapter: Type key.

13 Decommissioning

Disassembly may only be carried out by qualified and trained personnel.

Read the chapter Documentation notes.

When disposing of electronic waste, make sure that you dispose of it in accordance with the regulations applicable in your country. Read and follow the instructions for proper disposal.

13.1 Disassembly

WARNING

Risk of injury from leaking oil

Prevent oil from leaking. Let it cool down before starting work. Soak up any leaked oil with approved binding agents. Mark the danger spot.

Leaking oil can cause slips and falls, resulting in serious or fatal injury. Hot oil can cause severe burns.



Do not remove components from the products

Only Beckhoff Automation GmbH & Co. KG is permitted to remove components.

Contact Beckhoff Service for further information.

Removal of the servo drive from the machine

- ▶ Remove cables and electrical connections
- ▶ Cool and drain liquids, then remove
- ▶ Remove supply lines and water hoses
- ▶ Loosen and remove the servo drive fixing screws
- ▶ Transport the servo drive to the workplace or put it into storage

13.2 Disposal

Depending on your application and the products used, ensure the professional disposal of the respective components:

Cast iron and metal

Dispose of cast and metal parts as scrap metal for recycling.

Cardboard, wood and foam polystyrene

Dispose of packaging materials made of cardboard, wood or foam polystyrene in accordance with the regulations.

Plastics and hard plastics

You can recycle parts made of plastic and hard plastic via the recycling depot or re-use them depending on the component designations and markings.

Oils and lubricants

Dispose of oils and lubricants in separate containers. Hand over the containers at the used oil collection station.

Batteries and rechargeable batteries

Batteries and rechargeable batteries may also be marked with the crossed-out trash can symbol. You must separate these components from the waste and are legally obliged to return used batteries and rechargeable batteries within the EU. Observe the relevant provisions outside the area of validity of the EU Directive 2006/66/EC.



Electronic components

Products marked with a crossed-out waste bin must not be disposed of with general waste. Electronic components and device are considered as waste electrical and electronic equipment for disposal. Observe the national regulations for the disposal of old electrical and electronic equipment.

13.2.1 Returning to the vendor

In accordance with the WEEE-2012/19/EU directives, you can return used devices and accessories for professional disposal. The transport costs are borne by the sender.

Send the used devices with the note "For disposal" to:

Beckhoff Automation GmbH & Co. KG
"Service" Building
Stahlstrasse 31
D-33415 Verl

In addition, you have the option to contact a local certified specialist company for the disposal of used electrical and electronic appliances. Dispose of the old components in accordance with the regulations applicable in your country.

14 Guidelines and Standards

14.1 Standards

Product standard EN IEC 61800-3

"Adjustable speed electrical power drive systems. EMC requirements and specific test methods"

EN 60034-1:2010+Corr.:2010

"Rotating electrical machines – Rating and performance"

EN IEC 63000

"Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances"

14.2 Guidelines

2014/35/EU

Low Voltage Directive

2014/30/EU

EMC Directive

2011/65/EU

RoHS Directive

14.3 Notified bodies



The distributed drive system AMI8100 product does not fall within the scope of the Machinery Directive. However, Beckhoff products are designed and evaluated for personal safety and use in a machine or system in full compliance with all relevant regulations.



The product distributed drive system AMI8100 meets all the requirements of the Eurasian Economic Union. These include Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia. The EAC logo can be found on the nameplate.



The distributed drive system AMI8100 product complies with UL requirements and is certified as a cURus component for the US and Canadian markets in accordance with the standards applicable in the USA and Canada. The cURus logo can be found on the nameplate.

14.4 EU conformity



Provision

Beckhoff Automation GmbH & Co KG will be pleased to provide you with EU declarations of conformity and manufacturer's declarations for all products on request.

Send your request to:

✉ info@beckhoff.com

14.5 CCC conformity



Export to Chinese Economic Area

Beckhoff compact integrated servo drives of the AMI81xx series are not subject to the **C**hina **C**ompulsory **C**ertificate (CCC). The products are exempt from this certification and can be exported to the Chinese economic area.

14.6 UL conformity



Certification for USA and Canada

Beckhoff compact integrated servo drives from the AMI81xx series are approved as certified cURus components, E195162, for the American and Canadian economic area. The motors may be used as components in a system with UL-Listing test mark.

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