

Instruction handbook
with safety instructions

be in motion be in motion

TAM 00729

DSC1 045 - 135
Three-phase current
synchronous motor

Version: 10/2019
English

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1 General safety instructions

1.1 Safety

This electric motor has been built to current safety standards and was tested for its operating safety and reliability before leaving the factory.

For proper commissioning and safe use, please note and follow:

- these commissioning and maintenance instructions and their enclosed additional parts
- the enclosed safety and commissioning instructions
- the technical documents of the product
- the commissioning and safety instructions of the converter manufacturer
- the national, local and system-specific regulations for your end product
- the technical instruction TAM 00697 for use in safety-related applications

Note the following hazards when handling this product:

Hazards due to

- lifting and transportation processes
- electrical current
- moving parts
- hot surfaces
- EMC faults
- mechanical overload
- thermal overload

To avoid hazards for persons and property and to minimize any existing residual risks, please note and follow all safety instructions, in particular those marked by symbols.



Danger due to electric shock

Failure to comply can cause fatal or serious injuries.



Warning of general hazards

Failure to comply can cause serious injuries or damage to property.



Warning of dangerous situation

Failure to comply can cause damage to the system or the surroundings.



Do not touch

Failure to comply can cause serious injuries.



Prohibition of action likely to increase or cause danger

Failure to comply can cause serious injuries.



Caution. Hot surface

Failure to comply can cause serious injuries.



Caution. Magnetic field

Failure to comply can cause serious injuries or damage to property.



Electrostatically sensitive devices

Failure to comply can cause damage to the system or the surroundings.

1.2 Intended use

Use of the electric motor is only allowed within its intended use. In this context, the electric motor must only be used for the use cases provided for in the technical documents and only in compliance with all notes and instructions in these commissioning and maintenance instructions.

All assembly, installation, commissioning and maintenance work and work during operation must only be carried out by qualified personnel.

Qualified personnel for the purpose of the safety instructions listed here means a person who has been trained and authorized in the subject, who is authorized to install, assemble, start up and to operate devices, systems and electric circuits in compliance with the relevant safety standards (EN 50110-1).

Improper behavior can cause serious **personal injuries** and **damage to property**.

This **electric motor** is intended for **use in industrial systems** and is subject, among other things, to the following **standards** and **directives**:

Standards

EN 60034-1, EN 60034-5, EN 60034-6, EN 60034-7, EN 60034-9, EN 60034-11, EN 60034-14
EN 60204-1

EU Low Voltage Directive

Electric motors of this series fulfill the requirements of the Low Voltage Directive (2014/35/EU (conformity).

EU Machinery Directive

Electric motors are components for incorporation in machinery as defined in the Machinery Directive. Commissioning is prohibited until the conformity of the end product to this directive has been determined (note EN 60204-1 "Electrical equipment of machinery").

EU EMC Directive

Operation of the electric motor in its intended use must satisfy the protection requirements of the EMC Directive 2014/30/EU. Proper installation (e.g. spatial separation of signal cables and power cables, shielded cables, etc.) is the responsibility of the system installer and the system supplier. In converter mode the EMC information and instructions of the converter, encoder and brake manufacturer must be followed.

Also note and comply with all binding national, local and system-specific regulations!

The electric motor is **designed** for the following ambient conditions:

- Ambient temperature: 0 °C to +40 °C
- Installation altitude: ≤1000 m above sea level
- Relative humidity: 5 % to 85 %


Note any possible differing information on the type plate or in the technical documents. The conditions in the place of use must correspond to all information on the rating plate.




Use in Ex-zones is **prohibited**, unless explicitly planned for this. (Note additional instructions and information) In addition, there must be no flammable gas mixtures and dangerous dust concentrations in the area surrounding the electric motor. Live (energized) and hot motor parts can ignite and cause serious injuries and damage to property.

If increased requirements are set in a special case – in use in non-industrial systems (e.g. contact protection against children's fingers), these conditions must be ensured in the system on installation.


Motor type with rare earth:

	<p>The following hazards exist near a removed or exposed rotor with a strong magnetic field:</p> <ul style="list-style-type: none">• Persons with electronic or metallic implants (e.g. pacemakers, hearing aids, plates or pins) are at risk if the distance between the implant and the magnetic pole is less than 0.5 m.• Strong attraction forces to ferromagnetic parts causes:<ul style="list-style-type: none">○ Risk of injury due to crushing○ Risk of irreparable damage to measurement and installation tools, check cards, watches/clocks, etc.○ Contamination of the rotor core due to attracted metal chips or powder.
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Thermal hazard:

	<p>Caution! Risk of burns!</p> <p>Surface temperatures of over 70 °C can occur on the motors. If necessary, take protective measures to prevent contact.</p> <p>Temperature-sensitive parts, e.g. normal cables or electronic components, must not touch or be fixed on hot surfaces.</p> <p>Thermal overloading of the motors can cause irreparable damage to the winding, the bearings and demagnetizing of the rare earth magnets. Use the temperature sensor for temperature control.</p>
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1.3 Ban on unauthorized modifications and changes

	<p>Any unauthorized modifications and changes to the electric motor are not permitted for safety reasons. If necessary, please contact the motor manufacturer.</p> <p>Do not dismantle or disable any safety devices or guards to operate the electric motor.</p>
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2 Operating conditions

2.1 Product description

With the new DSC1 series 045-135, Baumüller makes the torque motor suitable for servo operation.

The development work focused on increasing the performance data to the benefit of a higher torque density with simultaneous radical reduction in the overall installed size. Despite this, the usual servo speed range of up to 4000 rpm is covered. Compared to conventional servomotors, the new DSCs are up to 30 percent more compact.

The motors of the DSC1 045 - 135 series have a smooth housing surface to protect them against dirt. They are particularly easy to install and have a high degree of protection.

2.2 Scope of delivery

They are delivered assembled, based on the order.

- If transport damage is found on delivery, it must be reported to the transport company immediately.
- After receiving the delivery, compare the performance data and models of the delivered motor against your purchase order data. If identifiable defects or an incomplete delivery are determined, the responsible Baumüller field office or the main Baumüller factory in Nuremberg must be notified directly.

In both cases it is prohibited to commission the motor until the defect has been corrected properly.

2.3 Type plate

The type plate is the identifier for each electric motor. In particular, the respective motor number is unique for each electric motor and is always required for tracking in our company. The type plate must therefore always be legible. You must therefore never remove the type plate from your motor.

Type plate data:

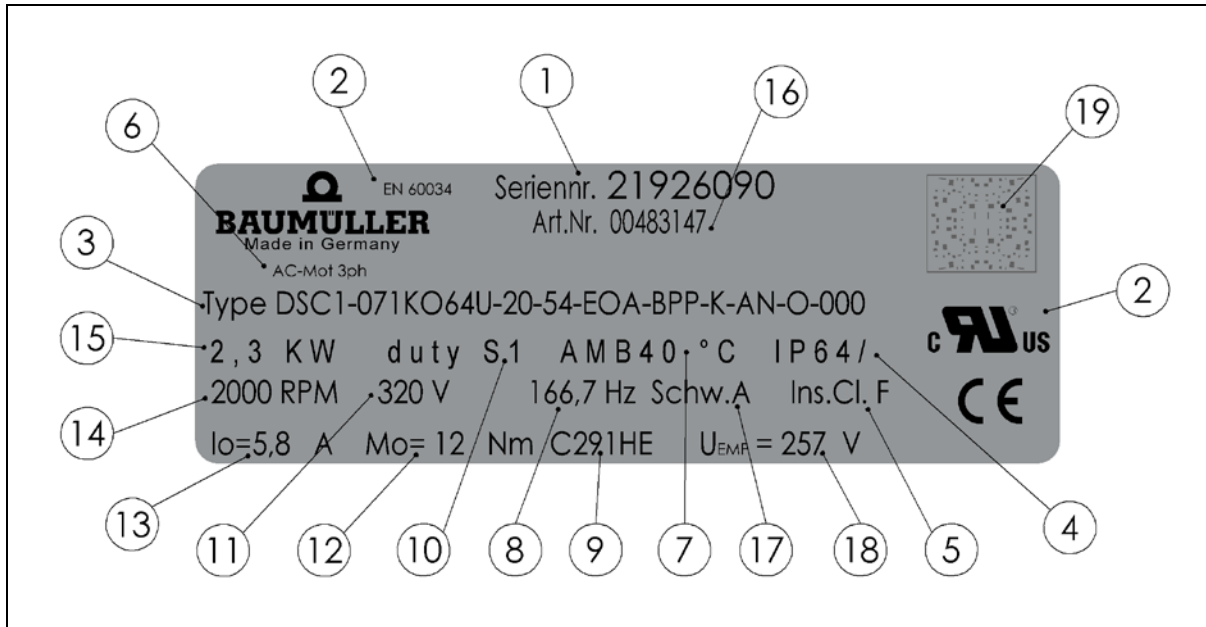


Figure 1: Type plate

- | | | | |
|----|--|----|------------------------------|
| 1 | Motor number | 11 | Rated voltage U_N |
| 2 | Standards and approvals | 12 | Stall torque M_0 |
| 3 | Motor type/designation | 13 | Stall current I_0 |
| 4 | Motor degree of protection | 14 | Rated speed n_N |
| 5 | Heat class (VDE insulation material class designation) | 15 | Rated power P_N |
| 6 | Motor type: 3-phase a.c. motor | 16 | Part number |
| 7 | Allowable ambient temperature | 17 | Vibration class |
| 8 | Rated frequency | 18 | Synchronous internal voltage |
| 9 | UL insulation system | 19 | Barcode |
| 10 | Motor mode | | |

2.4 Technical data

Types of construction (EN 60034-7)	IM B5	Horizontal installed position
	IM V1	Vertical installed position, shaft end facing downwards
	IM V3	Vertical installed position, shaft end facing upwards
	IM B34	Horizontal installed position (pump drives)

Note: In the installed position IM V3 in conjunction with degree of protection IP 64 the shaft feedthrough must be protected against the ingress of water and dirt.

Degree of protection (EN 60034-5)	with consideration of the shaft feedthrough	
	IP 64	standard: without radial shaft seal
	IP 65	Option: with radial shaft seal
	without consideration of the shaft feedthrough	
	IP 67	for self-cooled model (IC 410 and IC 3W7); not for motors with terminal box
	IP 65	for surface cooled model (IC 416)

Attention: All listed degrees of protection are only achieved with completely installed plug-in connections (main and control connection) and completely closed terminal box.

Cooling method (EN 60034-6)	IC 410	Standard: Shaft height 45 to 100 completely closed motor type, self-cooled without fan
	IC 416	Option: Shaft height 56 to 100 completely closed motor, surface cooled with fan, Air direction from N- to D-side of the motor
	IC 3W7	Option: Shaft height 45 to 100 Standard: Shaft height 135 completely closed motor, water-cooled, cooling circuit connections in NDE direction

Electrical connections (**see appendix**) via angled (3x90°) rotatable built-in boxes.

Attention: In case of stall currents $I_0 > 36$ A the main connection is made via terminal boxes

Main connection	Built-in box 8-pin/terminal box	
	Standard:	U V W + temperature sensor
Control connection	Option:	Brake
	12-pin	Standard: Resolver
	12 /17-pin	Option: Absolute encoder
		Option: Encoder + temperature sensor
	12-pin	Option: Hiperface interface
	17-pin	Option: Endat 2.1 interface
Fan (optional)	9-pin	Option: Endat 2.2 interface
	6-pin	

Thermal motor protection (EN 60034-11) Temperature sensor PT1000 in the stator winding

Winding insulation (EN 60034-1) Heat class F ($\Delta\theta = 105$ K)

Ambient temperature	0 °C... +40 °C (standard)
Installation altitude (EN 60034-1)	≤ 1000 m above sea level (standard)
Rolling bearings with lifetime grease lubrication	<p>Standard:</p> <p>(Shaft height 45 to 100) Deep groove ball bearing</p> <p>(Shaft height 135) Angular contact ball bearing (N-side)</p> <p>Option:</p> <p>(Shaft height 56 to 100): Cylindrical roller bearing (D-side)</p>
Rolling bearings with grease relubrication	<p>Standard:</p> <p>(Shaft height 135) Four point contact bearing (D-side)</p>
Calculated bearing service life	<p>L_{H10} 20,000 h (guide value)</p> <p>(Four-point bearings on the number of cycles according to the application)</p>
Vibration class (EN 60034-14)	<p>Standard: A</p> <p>Special: B (for deep groove ball bearing)</p>
Runout (DIN 42955)	<p>Standard: N</p> <p>Special: R (reduced)</p>
Vibrations and vibration resistance	<p>radial 3g / axial 0.5g 10 Hz to 100 Hz (Shaft height 45-100)</p> <p>radial 3g / axial 1g 10 Hz to 55 Hz (Shaft height 135) (see Point 3.3)</p>
Stopping brake	Option (not for shaft height 135)
Actual speed sensor	<p>Standard: 2-pole resolver (high-quality model on request)</p> <p>Option: Absolute encoder with Hiperface interface</p> <p>Option: Absolute encoder with Endat interface</p>


Further characteristic values can be found in our technical product list on our website: www.baumueller.de in the download area under "Technical docs". If necessary, request the relevant documents.

Attention!


Technical differences to these commissioning and maintenance instructions can exist if the delivered electric motor does not correspond to the standard model as described in the technical list, or special contractual arrangements have been made. In this case, request the relevant technical additions.

2.5 Transport, bearing restraint, temporary storage

Water-cooled motors:

	To avoid frost damage, it must be ensured that there is no coolant in the motor during transport or in case of temporary storage in ambient temperatures $< 3\text{ °C}$.
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Transport:

	<p>The allowable environmental conditions that the motor may be exposed to during transport are given in EN 60721-3-2 (class 2K2/2M1). The allowable temperature range, contrary to the DIN, is reduced to -15 °C to $+60\text{ °C}$.</p> <p>Suitable load carrying devices must be used, e.g. webbing, loop straps, etc. Where provided, the lifting eyes of the motor can also be used for lifting.</p> <p>The motor plugs must not be used as transport restraint or lifting eyes.</p> <p>The respective specific national transport regulations must be complied with. Lifting gear, means of transport and load carrying devices must comply with the regulations.</p>
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For information on the weights of the individual electric motors, please refer to the technical documents of the product.

The motor shaft and the connection areas must be protected against corrosion. The motor may only be transported with the shaft protection cover. Damage to the motor shaft must be avoided.

Bearing restraint: (only for motors with cylindrical roller bearings)

	<p>To avoid transport damage, in case of motors with cylindrical roller bearings the rotor is blocked with the help of a transport restraint on the shaft end.</p> <p>This transport restraint must be used again for further transport movements.</p> <p>If this restraint can no longer be used after mounting an output element, other suitable measures for axial fixing of the rotor must be taken for transport.</p>
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Temporary storage:

If a motor is not put into service soon after delivery, it must be stored in a dry, low dust and low vibration indoor room ($V_{\text{eff}} \leq 0.2\text{ mm/s}$).

The electric motors should not be stored for longer than max. 2 years at a temperature as uniform as possible, not outside the temperature range from -15 to $+60\text{ °C}$. Higher storage temperatures within the scope of the use temperature accelerate the aging process of the seals and the bearing greases and thus already have a negative effect on the service life even before commissioning. Direct sunlight, UV light and ozone also facilitate the aging of the sealing elements and are therefore always to be avoided!

Please note that the warranty periods are assured from delivery. We therefore recommend limiting the storage period to a minimum.

If a longer storage period is nonetheless unavoidable, the environmental conditions listed in EN 60721-3-1 (class 1K2/1M1) must be complied with. Contrary to the DIN, the temperature range can be extended to -15 °C to $+60\text{ °C}$.

2.6 Installation conditions, cooling information



Please additionally note chapter 9 for motors with water cooling.

Environment:

The motor can be installed in covered rooms (with roofs) according to its degree of protection (see motor rating plate) in case of a dusty or damp environment.

If no special arrangements have been agreed, the standard drive is designed for the following climatic use conditions:

- Ambient temperature 0 °C to 40 °C
- Installation altitude ≤1000 m above sea level
- Relative humidity 5 % to 85 %

All other allowable use conditions are given in EN 60721-3-3 (class 3K3/3Z12).

These climatic conditions must always be noted for the installation.

It is generally necessary to keep aggressive, caustic, abrasive and other plastic-dissolving media away from the motor and its cooling air.

The motor manufacturer must always be consulted in case of outdoor installation.

Air cooling:

See also **Section 2.4** and the technical documents for the product.

Cooling method IC 410 - self-cooling without fan

Cooling method IC 416 - surface cooling with fan

The following must be noted and complied with:

- Heat convection and radiation must not be impaired by the installation conditions.
- The cooling air for forced air cooling flowing to the motor and the hot air flowing away from the motor must be able to flow freely. The heated exhaust air must not be drawn back in.
- The distance from adjacent machine parts should not be less than 100 mm.
- In case of heavy soiling, the surface of the housing and the air routes must be cleaned regularly.

Flanged joint:

Due to the coupling of the motor on the mounting surface, part of the motor power dissipation is removed via the flange.


The dimensions of the mounting surfaces are listed in the following table 1, depending on the shaft height. This information gives minimum values for reliable heat dissipation via the motor flange surfaces.

Shaft height	Steel plate: Width x height x thickness in mm	Mounting surface in m ²
45	250 x 250 x 10	0.06
56 – 100	450 x 400 x 30	0.18

Table 1: Mounting surface

The heat dissipation conditions improve in case of larger mounting surfaces. Insulated mounting of the motors is not permitted.

2.7 Balancing, output elements, vibrations

	<p>Do not load the shaft and bearings with impacts!</p> <p>Axial forces on the motor are not permitted when installing or disassembling output elements.</p> <p>The generally required measures for contact protection of the output elements must be noted and complied with.</p> <p>If a motor is put into service without an output element, the feather key must be secured against ejection.</p>
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Balancing:

In the optional model with feather key the rotors are counterbalanced dynamically with a half featherkey as a standard feature. (to EN 60034-14 / ISO 8821 / ISO 1940)

NOTE: Note the identification of the balancing type on the shaft mounting face and type plate!

- H = balancing with half featherkey (standard)
- F = balancing with full featherkey (special model)
- N = balancing without featherkey (special model)

Output elements:

When installing the output element, attention must be paid to the relevant balance type. The output elements in turn must be balanced according to ISO 1940.

Always use suitable jigs when mounting or removing drive elements (e.g. coupling disc, gear, belt pulley).

- Use threaded hole in the end of the shaft.
- Use intermediate washers for mechanical protection of the shaft when removing.
- If necessary, heat output elements before mounting them (max. all. temperature at the shaft end, short-term 150 °C).

Attention!

- In the shaft version without a featherkey the output elements must be fastened on the output shaft **with the help of suitable clamping sets**.
- In shaft versions with feather key, ensure that **the output elements are in contact with the shaft shoulder**. *Note:* The bevel or radius on the output element and the shaft radius at the shoulder must be matched with each other.
- If the threaded hole in the shaft end is used for axial securing of output elements (e.g. belt pulley), the tightening torques listed in the following Table 2 must not be exceeded:

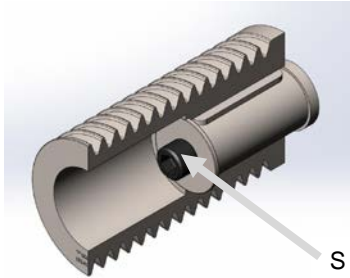
	Thread	Tightening torque in Nm
	M5	2.2
	M8	10.0
	M10	19.0
	M12	33.0

Table 2: Tightening torque using the example of a lock screw S of a belt pulley

Suitable threadlocking measures must be used!

Vibrations:



The system vibration behavior in the place of use, due to output elements, mounting conditions, alignment and installation as well as the influences of external vibrations can lead to an increase in the vibration values at the motor.

Considering perfect functioning of the motor and a long bearing life, the allowable vibration values to EN 60034-14 must not be exceeded. Under certain circumstances, complete balancing of the rotor with the output element may be required (to ISO 1940).


The limited vibration loads and accelerations after installation, see **section 3.3** must not be exceeded.

In the event of changes compared to normal operation, e.g. increased temperatures, noises, vibrations, in case of doubt the motor must be switched off, the cause determined and if necessary the manufacturer must be contacted.


3 Assembly

3.1 Safety instructions

Before assembly:

	<p>Never install or start up a damaged electric motor.</p> <p>Never install the electric motor in a damaged machine.</p> <p>Before installing the electric motor, ensure that it is suitable for your machine.</p>
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For the installation:

	<p>Mount the motor only at the fastening options provided for this purpose.</p> <p>Avoid hammer knocks or undue shock loads during installation.</p> <p>Attach all covers and safety devices. All guards must comply with the relevant regulations (e.g. EN 60204).</p> <p>Air cooling:</p> <p>Protective devices must be attached to the air inlet and outlet openings if it is possible for foreign bodies to fall into the fan during operation.</p>
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3.2 Installation, fastening

Check before and during installation that:

- the motor is undamaged (e.g. the radial shaft seal must not become at all damaged by sharp or pointed objects).
- the motor is not mounted within the danger zone of other equipment.
- the intended use is complied with (see **section 1.2**, **section 2.4**).
type plate information, warnings and information signs.
- the anti-corrosion agent on the end of the shaft has been completely removed with no residues.
If using commercially available solvents such as acetone or cleaning solvent, the radial shaft seal must not be wetted!
- the motor is designed appropriately for the ambient conditions and environmental influences on site (see **section 2.4**).
- the installation space in the machine is suitable for the type of electric motor cooling
*The motor must be attached so that the removal of sufficient heat loss via the surface of the housing and the motor flange surfaces is ensured (see **section 2.6**).*
- the motor can be mounted and operated with the available fastening options and connection data.
*The installed dimensions of the motor including tolerances are given in the technical documents for the product. When flange mounting the motor, ensure good and uniform contact of the flange surface. The retaining seats and contact surfaces must be undamaged and clean. They should be in exact positional accuracy relative to the shafts to be connected, in order to avoid harmful loads within the overall system due to offset for bearing, shafts and housing. When tightening the flange fastening screws (**strength class at least 8.8**), avoid stresses and strains in the flanged joint.*
- installing vertically with shaft end facing upwards ensures that liquid cannot penetrate the upper bearing.

- the allowable radial forces according to the operating characteristics given in the product's technical documents are not exceeded (if necessary, clarify with Baumüller branch office).
Axial forces must always be clarified with the motor manufacturer.
- the brake (optional) can be bled after applying the operating voltage (audible switching noise).
- the rotor can be turned uniformly and without dragging noises.
In case of a motor with integrated brake, release the brake beforehand.
- the version of the motor, encoder and, if installed, the fan cable, correspond to the specifications in the technical documents for the product.
- the output and drive elements are secured.
- the complete cooling system is fully functional and is protected to prevent foreign bodies from falling into it.

Special features of the spindle drive DSC1-135:

- **Attention:** The spindle drives do not allow any radial loading.
- Refer to the product's technical documents for details of the allowable axial forces.
- It must be clarified in advance with the motor manufacturer whether the spindle used is suitable for the motor.
- The maximum insertion length of the spindle in the motor shaft is given in the technical documents for the product.
Attention: Exceeding the maximum insertion length leads to damage or irreparable damage to the encoder shaft which in turn makes the motor unusable!!!
- Note the following when mounting the spindle on the motor shaft:
 - The retaining seats in the shaft and on the spindle nut must be undamaged and clean.
 - The flange surfaces of the spindle nut and the motor shaft must lie on each other uniformly and flat.
 - No stresses or strains must occur on tightening the fastening screws (**strength class at least 8.8**) (tighten the screws alternately)

Special features of the pump drives with internal toothings:

- **Attention:** These pump drives do not allow any radial loading. They are pure torque transfer elements.
- Before installing, check that the pump interface fits the motor. (centering; gear tooth system; fastening)
- Note the following when mounting the servopump on the motor:
 - The retaining seats (end face and centering on the pump and motor, as well as both gear tooth systems must be undamaged and clean.
 - Before inserting both gear tooth systems they must be lubricated with suitable grease.
 - The flange surfaces of both units (pump and motor) must lie on each other uniformly and flat.
 - No stresses or strains must occur on tightening the fastening screws (**strength class at least 8.8**).

3.3 Vibrations and vibration resistance

The system vibration behavior in the place of use, due to output elements, mounting conditions, alignment and installation as well as the influences of external vibrations can lead to an increase in the vibration values on the motor.

Under certain circumstances, complete balancing of the rotor with the output element may be necessary.

To ensure faultless function and a long life, the named vibration values based on ISO 10816 must not be exceeded in the given measuring points of the motor (see Figure 1).

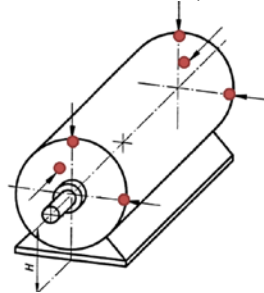


Figure 1: Measuring points for vibration measurement

The given maximum radial and axial vibration values must be complied with at the same time. They apply to substructures that can be described as being resilient. A resilient substructure exists if the lowest natural frequency of the overall system (machine and foundation) in the measurement direction is at least 25% below the main excitation frequency. All other substructures can be described as rigid. Contact the manufacturer in case of rigid substructures.

Maximum radial vibration load:

Peak vibration acceleration	1 g	> 250 Hz	
Peak vibration displacement	≤ 0.16 mm		< 6.3 Hz
Effective Vibration velocity	≤ 4.5 mm/s	6.3 Hz – 250 Hz	

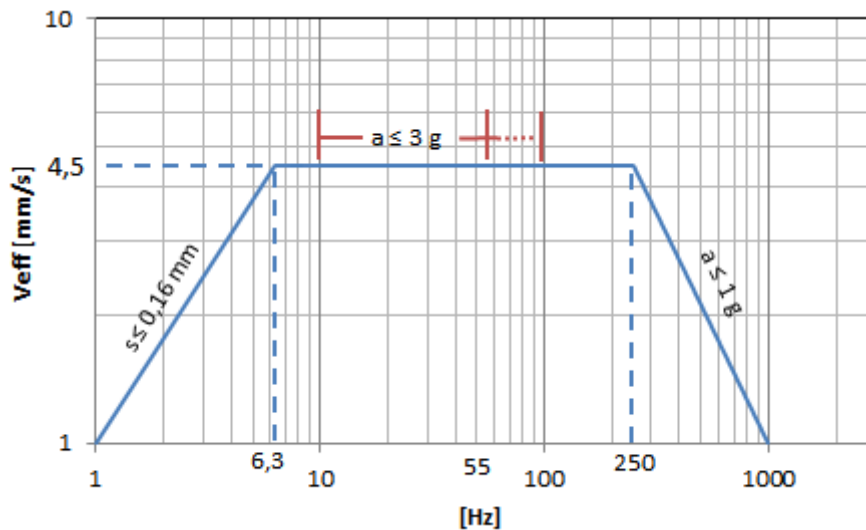


Figure 2: Allowable radial vibration load

Maximum axial vibration load:

peak vibration acceleration 0.225 g > 55 Hz < 6.3 Hz
Peak vibration displacement ≤ 0.16 mm 6.3 Hz – 55 Hz
Effective vibration velocity ≤ 4.5 mm/s

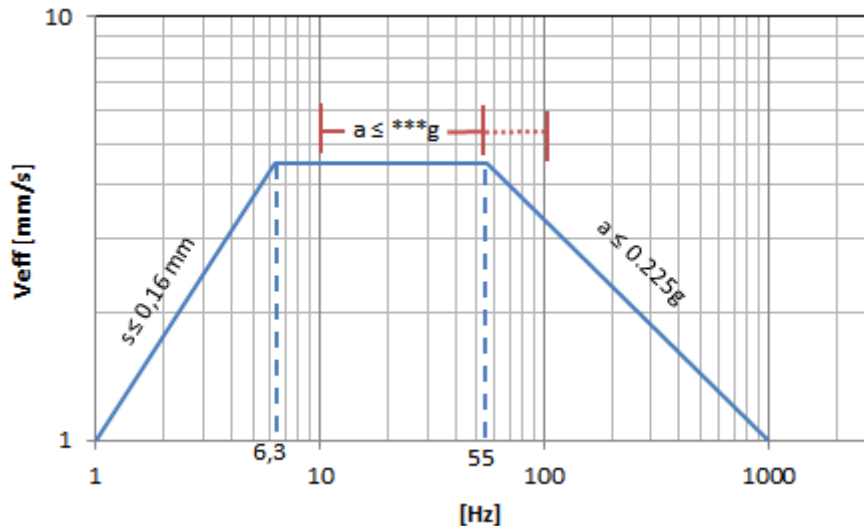


Figure 3: Allowable axial vibration load

Additional vibration resistance:

Vibration acceleration
Shaft height 45 to 100 3 g radial and 0.5 *** g axial 10 Hz to 100 Hz
Shaft height 135 3 g radial and 1g *** g axial 10 Hz to 55 Hz

The given vibrations are additionally withstood by the motor. However, the lives (time to failure) of the wearing parts (for example, the bearings) can reduce.

Shocks:

If increased vibration loads exist in the form of shocks, measurements must be taken on the installed machine.

Based on these, design revisions and assessments are undertaken with Baumüller.


To assess the vibration velocity, the measuring equipment must meet the requirements of ISO 2954.

The vibration acceleration is assessed in the time range within the frequency band from 10 Hz to 2 kHz.

If noteworthy vibrations above 2kHz, e.g. Tooth engagement frequencies are to be expected, the measurement range must be adjusted accordingly. This does not change the allowable maximum values.

4 Electrical connection



Important notes:

	<p>Have all work carried out by qualified skilled personnel only!</p> <p>All work must only be carried out after the plant/system has been disconnected from the power supply and secured against switching on! (including auxiliary circuits)</p> <p>All work must only be carried out if the motor is at a standstill! <i>In case of three-phase synchronous motors with permanent magnet excitation, voltages > 60 V can occur at the motor contacts if the rotor is rotating.</i></p> <p>Comply with the regulations for working on electrical installations!</p>
---	--

Attention!

The safety regulations for working on electrical installations to EN 50110-1 must be complied with.

- Disconnect from the power supply
- Secure against switching on
- Determine safe disconnection from the power supply
- Ground and short-circuit
- Cover or cordon off adjacent live parts

	<p>The electric motor must only be operated in conjunction with an appropriately planned converter. Direct connection to the three-phase system can cause irreparable damage to the motor.</p> <p>Ensure correct phase sequence and pin assignment.</p> <p>The electrical connections, protective conductor connections and shield connections (if using shielded cables) must be made so that they are permanently safe.</p>
	<p>Never touch the contacts of encoders and temperature sensors with your hands or with tools that are or can be electrostatically charged! Encoders and temperature sensors are electrostatically sensitive components.</p>

Electrical installation:

- Proper installation is the responsibility of the plant or system installer.
- Note the motor data on the type plate.
- Connection cables and plug-in connections must be correctly designed for the voltages and currents that occur and must be suitable for the type of laying.
- The connection of the motor, including its assemblies (brake, encoders, fan, etc.) must be as indicated in the circuit diagrams (see **enclosed circuit diagrams** or **section 8**).
- Shielded power and encoder cables must be used to prevent electromagnetic EMC interferences of motor supply cables and their consequences for encoders and control systems. To this end, follow the EMC instructions of the converter manufacturer.
- For operating safety reasons, we recommend use of connection cables preassembled by Baumüller (see technical product list).
- Before connecting, check the built-in boxes, connectors and, if installed, the terminal box for possible damage, corrosion, dirt, and moisture.
- To ensure the degree of protection, ensure correct and tight fit of the connector threaded fastenings, the seals and sealing faces of the connectors and the terminal box.
Note! To ensure the degree of protection, the connection direction of the rotatable connection boxes should also not be changed by turning more than 5x in total.
- Plug-in and terminal box connections must not be exposed to mechanical loads. If necessary, provide protection against twisting, tension and shear relief devices as well as anti-kink protection.

In case of main connection via terminal box, also ensure that:

- The cable ends are only stripped minimally, so that the insulation extends close to the cable lug or terminals. Always avoid protruding wire ends.
- the cable lugs used are adjusted to the dimensions and cross-sections of the terminals and cables.
- the threaded fasteners of the electrical connections are securely tightened with the specified torque (see **9.2 Table 4 / 9.3 Table 5**).
- the degree of protection is maintained.


Note! All entries not required must be closed off using metallic closure elements.

The sealing elements must be functional and undamaged when closing the terminal box.



5 Commissioning, operation

5.1 Safety instructions


Working on the electric motor:

	<p>Do not carry out any work on the electric unless the motor is stopped, de-energized and cooled. All connections such as screws, etc. loosened during the work on the motor must be refastened before starting up.</p> <p>When working, always comply with the technical notes and instructions in the respective chapters of these commissioning and maintenance instructions.</p> <p>Attention! If the optional stopping brake is installed it must not be assigned a locking function during the work on the motor (e.g. stopping loads).</p>
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Danger due to electric shock:

	<p>Ensure that the electric motor is disconnected from the power supply and is de-energized.</p> <p>Never undo the connections at the motor during operation.</p> <p>Connect measuring equipment only if the motor is de-energized and disconnected from the power supply.</p>
	<p>Do not start the work on the motor connections until you have ensured that there is no potential or voltage present.</p> <p>During operation, electrical potential is applied to the motor contacts and the motor windings. Never touch these assemblies/elements during operation.</p>

Installation and disassembling of safety devices and guards:

	<p>The electric motor must not be operated without mounted safety devices.</p> <p>The motor must be shut down to installed and disassemble components and systems provided to monitor safe operation of the motor.</p>
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Risk in case of contact:

	<p>Ensure that the electric motor is stopped and is secured against switching on before touching it.</p> <p>Only touch the output shaft if it is de-energized and the motor is stopped. Otherwise the rotating rotor poses a hazard.</p>
	<p>Risk of burns! Never touch the motor housing in nominal load mode. Surface temperatures of above 70 °C can occur on the motors.</p>


5.2 Tests before commissioning

- The drive is undamaged and is not within the danger zone of other equipment.
- The motor is properly aligned and fastened. Threaded fasteners are tightened correctly.
- All corresponding protective devices and guards (mechanical, thermal, electrical) are mounted.
- The motor connections have been made properly.
- The cables do not touch the surface of the motor.
- The protective conductor system is installed correctly and its function has been tested.

- The drive does not lock (release brake if installed).
- Emergency stop functions have been checked.
- The fan is connected properly, its function has been checked.

5.3 Commissioning, operation

Note on the function of the brake (if present):

	<p>The brake is designed as a stopping brake with emergency stop function. (power failure, emergency stop)</p> <p>Use as an operating brake is not permitted.</p>
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The commissioning must be carried out by qualified personnel only

The commissioning instructions of the converter must always be followed.

Tests during commissioning:




- Release the brake if necessary.
- Has the function of all the motor's assemblies been checked, such as brake, encoder, fan, etc. and are their use conditions complied with?
- Are all electrical connections made and fastened in accordance with the regulations (**note circuit diagrams, see section 8 or enclosed circuit diagrams**)?
- Have all protective measures that prevent touching of live parts, hot surfaces, rotating and moving parts and assemblies been taken and are they fully functional?
- Are all drive elements installed and set as specified by the manufacturer?
- Is it ensured that the max. all. speed n_{max} of the motor cannot be exceeded? The max. all. speed n_{max} is the highest allowable short-term operating speed.

Tests during operation:

- Listen out for unusual noises.
- If dragging or scratching noises, grinding noises or similar occur, stop the drive immediately and determine the causes.
- Check the motor surface and connection cables for dirt (e.g. dust deposits, oil contamination, moisture, etc.).
- Check the maintenance intervals.
- Check the air inlet and outlet openings for dirt.

5.4 Operating faults

Safety instructions:

	Allow qualified personnel only to carry out troubleshooting. Do not disable protective devices – not even in trial operations.
	Only undo and re-connect connection cables if they are disconnected from the power supply and fused. Follow the 5 “disconnection” safety rules (see section 4).
	Watch out for hot surfaces!

In case of operating faults, always

- Note and follow the instruction handbook of the machine / plant.
- Note and follow the instruction handbook of the converter.
- If necessary, contact the motor or converter manufacturer for advice.

You should have the following parameters ready:

- Type plate data
- Type and extent of the fault; attendant circumstances of the fault
- Application data (cycle of torque, speed and forces over time; ambient conditions)

The following selection of causes of faults or errors can provide useful troubleshooting help:


Fault	Cause of fault	Remedy
Motor does not start up	Controller release is missing Controller error, encoder error Brake does not release Brake is defective Power supply is missing Phase sequence	Activate the controller release Read out the error listing at the converter or controller, correct the error Test the actuation, connection and voltage supply Repair by manufacturer Test the connection and voltage supply Test the phase sequence, replace the connection cables if necessary
Irregular running	Inadequate shielding in the connection cables Controller parameters are too high	Check the shield link and grounding Optimize the controller parameters

Fault	Cause of fault	Remedy
Vibrations	<p>Coupling elements or the working machine are badly balanced</p> <p>Poor alignment of the drive train</p> <p>Fastening screws are loose</p>	<p>Rebalance</p> <p>Realign the set of machines</p> <p>Check and secure the screw connections</p>
Running noises	<p>Foreign matter in the motor</p> <p>Bearing damage</p>	<p>Repair by the motor manufacturer</p> <p>Repair by the motor manufacturer</p>
<p>Motor becomes too hot</p> <p>Motor temperature monitoring responds</p>	<p>Overloading of the drive</p> <p>Dirt on the surface of the motor or air ducts</p> <p>Confined installation conditions</p> <p>Brake releases inadequately - dragging brake</p>	<p>Test motor load and compare with the type plate data</p> <p>Clean the surface of the motor and/or air ducts</p> <p>Check for motor installation according to section 2.6 or 3</p> <p>Repair by the motor manufacturer</p>
Power consumption is too high, motor torque is too low	Dwell angle is incorrect	Check dwell angle and adjust if necessary

Table 3: Operating faults

6 Inspection and maintenance

Working on the electric motor:

	<p>Do not carry out any work on the electric unless the motor is stopped, de-energized and cooled. All connections such as screws, etc. loosened during the work on the motor must be refastened after the inspection or maintenance.</p> <p>When working, always comply with the technical notes and instructions in the respective chapters of these commissioning and maintenance instructions.</p> <p>When carrying out maintenance work, always follow the safety instructions such as those that also apply to the commissioning of the motor (see section 5.1).</p> <p>Attention! If the optional stopping brake is installed it must not be assigned a locking function during the work on the motor (e.g. stopping loads).</p>
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6.1 Inspection

Depending on the local degree of contamination, cleaning must be carried out regularly to ensure permanently adequate removal of the heat losses.

Wear limits are predefined if an optional brake is installed. (e.g. max. all. Operating air gap, limited number of emergency braking operations) The current degree of wear of the brake must be checked regularly. The brake must be replaced on reaching allowable wear limits (see **section 6.2**).

If an optional radial shaft seal is used, it must be checked regularly for its proper function (leakage).

6.2 Maintenance

Depending on the operating conditions (such as the mode, temperature, speed and load) some very different service lives can occur for the bearing points and sealing elements.

For fault-free operation, we recommend the following general reference values for maintenance:

- Change the bearings after around 20,000 operating hours. (The bearing is designed for a calculated bearing useful life of 20,000 operating hours).
Exceptions from this (e.g. re-lubrication) must be defined separately.
- Change the radial shaft seal, if installed and if no leak was found by previously undertaken inspections, after around 5,000 operating hours.
- For pump drives, we recommend re-greasing the inserted toothing after 5000 h maximum.

If an optional brake is installed it must always be replaced on reaching its wear limit.

The maintenance work must be carried out by Baumüller or by a specialist firm contracted by Baumüller.

Attention!

In case of motors used in safety applications, the requirements of technical instructions TAM 00697 must always be complied with for the maintenance and servicing.

6.3 Relubrication (DSC1-135)

- **Attention: Re-lubricate only if grease discharge is open.**

Before re-lubricating, always unscrew the two screw plugs G1/2 for the grease discharge openings.

Re-grease bearings with re-lubricating equipment only when the motor is running.

After re-lubricating, 2-4 hours of motor operation is necessary (the rotation of the bearings causes the used bearing grease to be discharged through the grease discharge opening), the grease discharge opening must then be closed off again using the screw plugs.

The calculated useful life of the bearings, as well as the given degree of protection of the motor can only be achieved if the grease discharge opening is closed off during operation using the screw plug supplied.

- The re-lubrication intervals and grease quantities are given on the separate plate on the motor.

7 Disposal

The motor must be disposed of in compliance with the national and local regulations as part of the normal recoverable material process.

The encoder electronics (if an optional absolute encoder has been installed) must be disposed of properly as electronic scrap.

8 Appendix 1: Pin assignments (power and control connections)

8.1 Main connection via plug

The stall current I_0 of the motor determines the built-in box size.

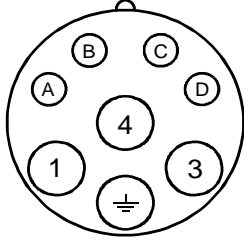
		Pin	Signal	Color/lettering
Size 1 $I_0 \leq 20$ A	 <p>View of the contact side of the built-in box</p>	1 \perp 3 4 A B C D	Phase U Protective conductor Phase V Phase W B+ B- K+ K-	U green/yellow V V W W W red black white yellow

Figure 2A: Main connection with temperature sensor and brake

Note: If the **temperature sensor** is alternatively routed via the transducer cable, signals **K+** and **K-** are omitted in the above circuit diagrams.

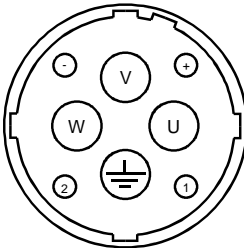
		Pin	Signal	Color/lettering
Size 1.5 $I_0 \leq 36$ A	 <p>View of the contact side of the built-in box</p>	U V W \perp + - 1 2	Phase U Phase V Phase W Protective conductor B+ B- K- K+	U V V W W W green/yellow red black white yellow

Figure 2B: Main connection with temperature sensor and brake

Note: If the **temperature sensor** is alternatively routed via the transducer cable, signals **K+** and **K-** are omitted in the above circuit diagrams.

8.2 Main connection via terminal box (standard version in accord. with catalog)

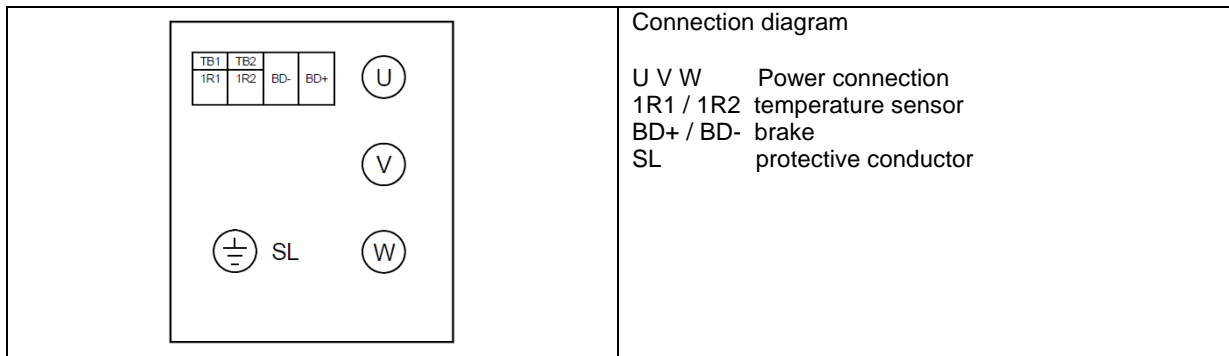


Figure 3: Terminal assignment with temperature sensor and brake

Note: If the **temperature sensor** is alternatively routed via the transducer cable, signals **K+** and **K-** are omitted in the above circuit diagrams.

The cable entries of the terminal boxes and the main connection terminals with the allowable tightening torques are summarized in **Table 4**.

We recommend use of EMC fittings for the cable entry fittings.

When tightening the terminal nuts it is advisable to hold the conductor in place to keep the terminal board free from torsional forces.

Terminal box size	Cable entry	Number of main connection terminals	Tightening torque for the terminals in Nm
□156	1 x M40 + 1 x M25	3 x M6	3.0
□196	1 x M50 + 1 x M25	3 x M8	6.0
□196	1 x M40 + 1 x M25	3 x M8	6.0

Table 4: Terminal box models * for model DSC1-135

8.3 Main connection via terminal box (customized version acc. to EN 60034; not UL-approved)

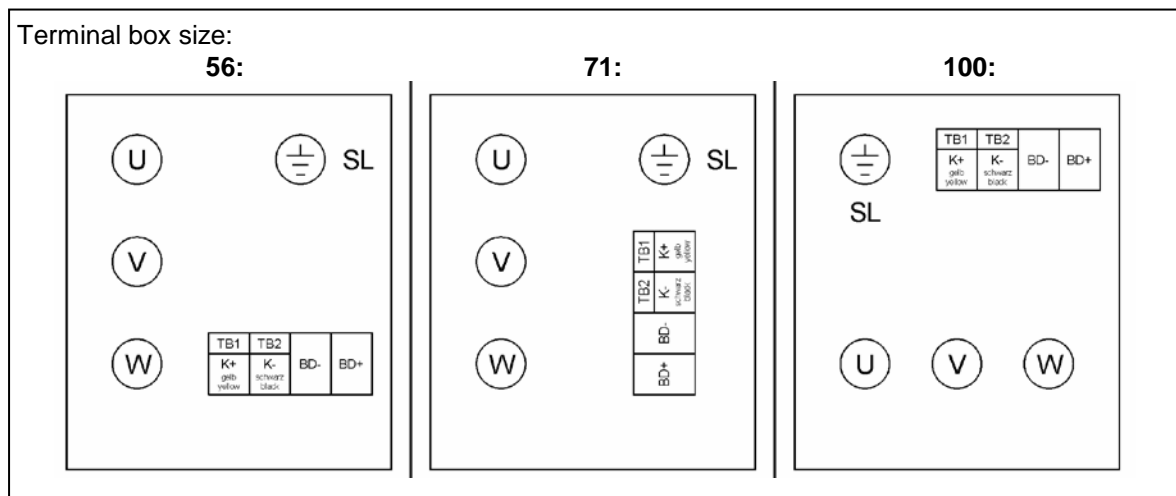


Figure 4: Terminal assignment, special model

The cable entries of the terminal boxes and the main connection terminals with the allowable tightening torques are summarized in **Table 5**.

We recommend use of EMC fittings for the cable entry fittings.

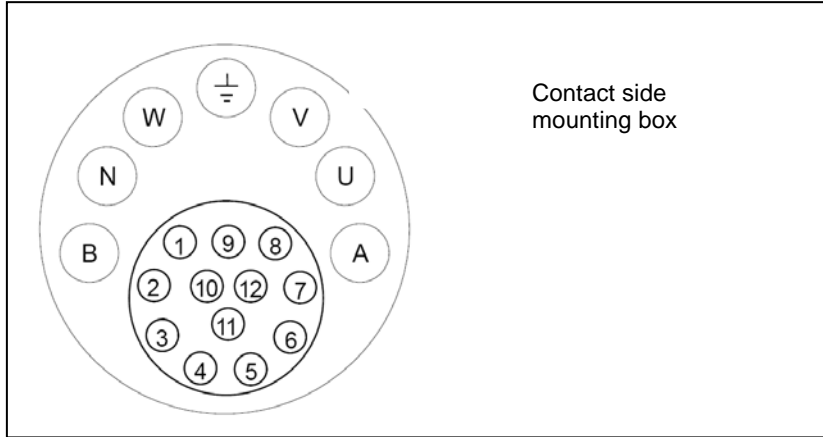
When tightening the terminal nuts it is advisable to hold the conductor in place to keep the terminal board free from torsional forces.

Terminal box size	Cable entry	Number of main connection terminals	Tightening torque for the terminals in Nm
56	1 x M 20 + 1 x M 16	3 x M4	1.2
	1 x M 25 + 1 x M 16	3 x M4	1.2
71	1 x M 20 + 1 x M 16	3 x M 6	3.0
	1 x M 25 + 1 x M 16	3 x M 6	3.0
100	1 x M 40 + 1 x M 16	3 x M 8	6.0

Table 5: Terminal box versions

8.4 Main and control connection via combination surface-mounted box (customized model)

The combination surface-mounted box is generally mounted on the N-end shield of the drive. The box is 90° angled and, contrary to the standard version of the motors, is not rotatable.



Pin	1	2	3	4	5	6
Signal	Sin 1	Sin 2	/	/	/	Shield
Color LTN	yellow	blue				
Pin	7	8	9	10	11	12
Signal	Ref 1	K+	K-	Ref 1	Cos 1	Cos 2
Color LTN	black / white	yellow	black	red / white	red	black
Pin	B	⏏	U	V	W	N A
Signal	Br. -	⏏	U	V	W	
Color	black					

Figure 5: Pin assignment of the combination surface-mounted box

Outside area: Pin “B to A” shows the pin assignment for power connection and PE brake.

Inside area: Pin “1 to 12” shows the pin assignment for the resolver and temperature sensor.

8.5 Fan connection 24 V DC / 115 V AC / 230 V AC

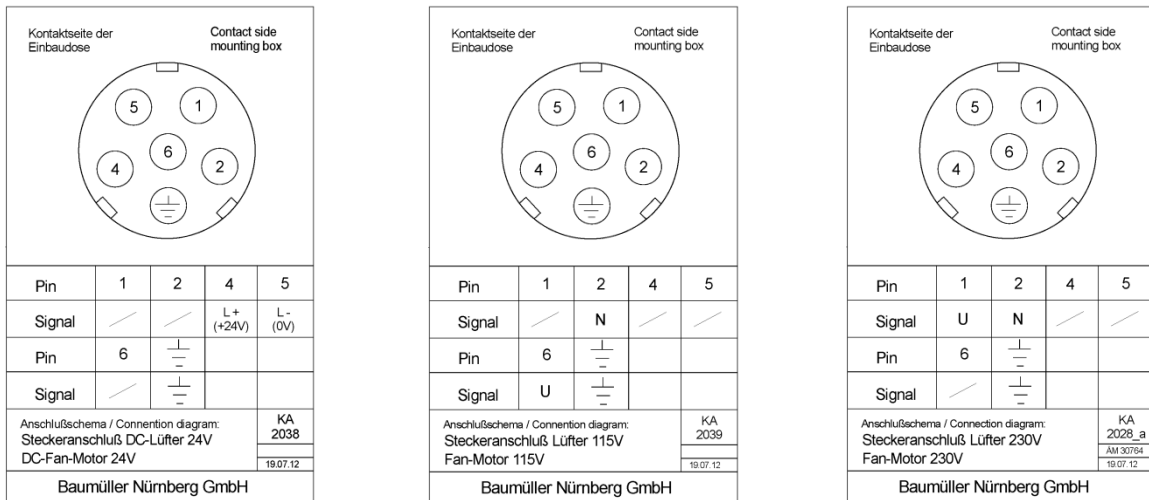


Figure 6 : Pin assignment, fan connection

8.6 Control connection: Resolver

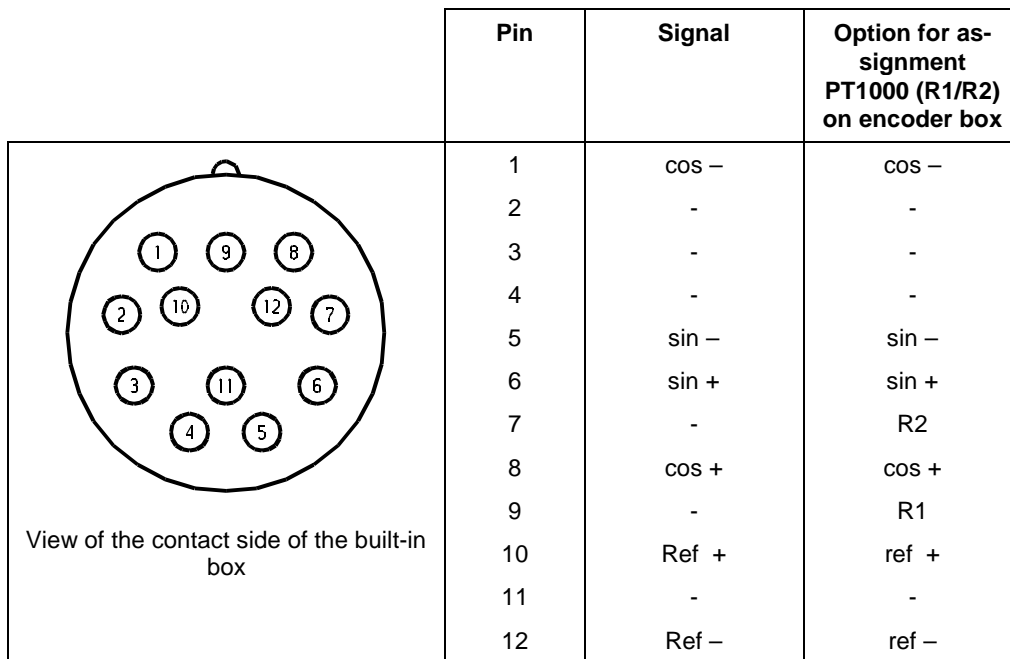


Figure 7: Resolver pin assignment

8.7 Control connection: SEK / SEL 37

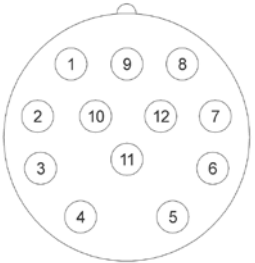
	Pin	Signal	Option for assignment PT1000 (R1/R2) on encoder box
 <p>View on contact side of built-in box</p>	1	cos -	cos -
	2	+ 485	+ 485
	3	-	R1
	4	-	R2
	5	sin +	sin +
	6	sin -	sin -
	7	- 485	- 485
	8	cos +	cos +
	9	-	-
	10	GND	GND
	11	-	-
	12	+ U	+ U

Figure 8: SEK/SEL 37 pin assignment

8.8 Control connection: SRS / SRM 50

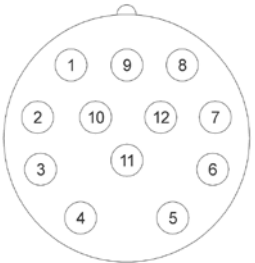
	Pin	Signal	Option for assignment PT1000 (R1/R2) on encoder box
 <p>View on contact side of built-in box</p>	1	cos -	cos -
	2	+ 485	+ 485
	3	-	R1
	4	-	R2
	5	sin +	sin +
	6	sin -	sin -
	7	- 485	- 485
	8	cos +	cos +
	9	-	-
	10	GND	GND
	11	-	-
	12	+ U	+ U

Figure 9: SRS / SRM 50 pin assignment

8.9 Control connection: SRS / SRM 50-S

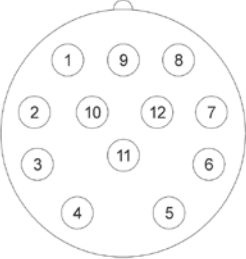
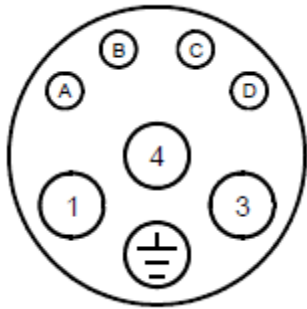
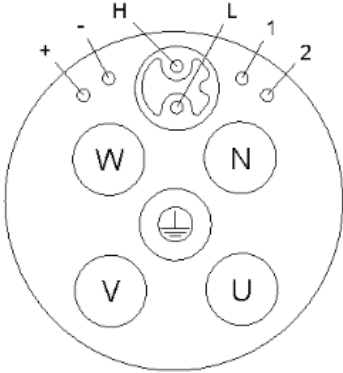
	Pin	Signal	Option for assignment PT1000 (R1/R2) on encod- er box
 <p>View on contact side of built-in box</p>	1	cos -	cos -
	2	+ 485	+ 485
	3	-	R1
	4	-	R2
	5	sin +	sin +
	6	sin -	sin -
	7	- 485	- 485
	8	cos +	cos +
	9	-	-
	10	GND	GND
	11	-	-
	12	+ U	+ U

Figure 10: SRS / SRM 50-S pin assignment

8.10 Control connection: EES37/EEM37 DSL Hiperface

	Pin	Signal
	1	U
	3	V
	4	W
	⊕	GN / GE
	A	B+
	B	B-
	C	DSL+
	D	DSL-

View of contact side of the device connector socket, size 1

	Pin	Signal
	U	U
	V	V
	W	W
	N	/
	⊕	GN/GE
	+	blue
	-	white
	1	Internal shield
	2	/
	H	+U / DSL+
	L	GND / DSL-

View of contact side of the device connector socket, size 1.5

Figure 11: EES37/EEM37 DSL Hiperface pin assignment

8.11 Control connection: EFS50/EFM50 Hiperface DSL

	Pin	Signal
	1	U
	3	V
	4	W
	⊥	GN / GE
	A	B+
	B	B-
	C	DSL+
	D	DSL-

View of contact side of the device connector socket, size 1

	Pin	Signal
	U	U
	V	V
	W	W
	N	/
	⊥	GN/GE
	+	B+
	-	B-
	1	/
	2	/
	H	DSL+
	L	DSL-

View of contact side of the device connector socket, size 1

Figure 12: EFS50/EFM50 Hiperface DSL pin assignment

8.12 Control connection: ECN 1313 / EQN 1325

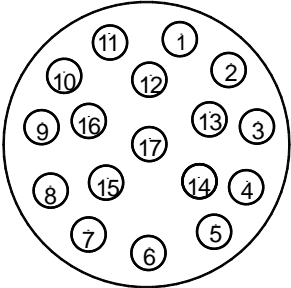
	Pin	Signal	Option for assignment PT1000 (R1/R2) on encoder box
 <p>View of the contact side of the built-in box</p>	1	U_p	U_p
	2	-	-
	3	-	-
	4	0 V	0V
	5	-	R1
	6	-	R2
	7	U_p	U_p
	8	Clock	Clock
	9	Clock inv.	Clock inv.
	10	0 V	0V
	11	-	-
	12	B +	B +
	13	B -	B -
	14	Data	Data
	15	A +	A +
	16	A -	A -
	17	Data inv.	Data inv.

Figure 13: ECN 1313 / EQN 1325 pin assignment

8.13 Control connection: ECI 1319 / EQI 1331

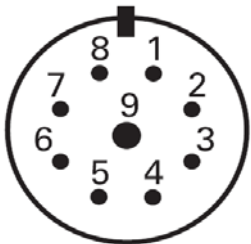
	Pin	Signal
 <p>View of the contact side of the built-in box</p>	1	Clock
	2	Clock inv.
	3	U_p
	4	0V
	5	Data
	6	Data inv.
	7	Sensor U_p
	8	Sensor 0V
	9	-

Figure 14: ECI 1319 / EQI 1331 pin assignment

8.14 Control connection: ECN 1325 / EQN 1337

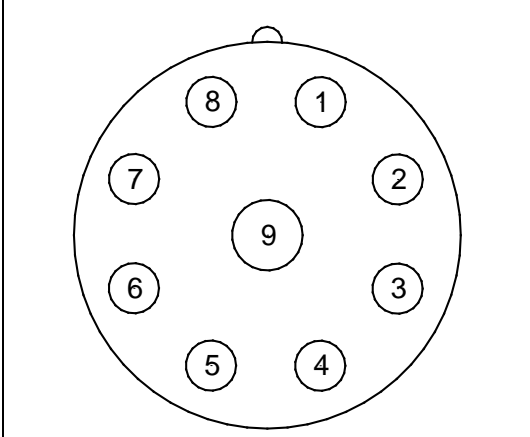
	Pin	Signal
 <p>View of the contact side of the built-in box</p>	1	Clock
	2	Clock inv.
	3	Up
	4	0 V
	5	Data
	6	Data inv.
	7	Sensor Up
	8	Sensor 0 V
	9	-

Figure 15: ECN 1325 / EQN 1337 pin assignment

8.15 Control connection: ECN 1325-S / EQN 1337-S

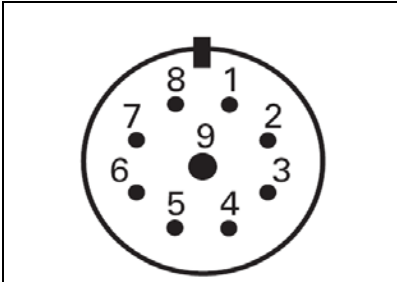
	Pin	Signal
 <p>View of the contact side of the built-in box</p>	1	Clock
	2	Clock inv.
	3	U _p
	4	0V
	5	Data
	6	Data inv.
	7	Sensor U _p
	8	Sensor 0V
	9	-

Figure 16: ECN 1325-S / EQN 1337-S pin assignment

Note:

- For encoder types not listed and for optional wiring of the temperature sensor via the encoder cable, please refer to the pin assignment of the corresponding enclosed circuit diagrams and technical documents.
- The encoders in section 8.12 to 8.15 are ESD sensitive components.

9 Appendix 2: Version with water cooling

In addition to the sections named above, the following must also be noted for water-cooled motors (EN 60034-6; IC 3W7):

9.1 Output definition for water-cooled machines

The outputs (torques) listed in the table apply to continuous operation S1 with nominal speed, provided the requirements for the cooling circuit for water-cooled motors are met!

The reduction factors in the following table must be taken into consideration if the motors are operated with higher coolant inlet temperatures:

Coolant inlet temperature	25 °C	30 °C	35 °C	40 °C	45 °C
Percent of the list performance (torque)	100 %	97 %	95 %	92 %	89 %


Table 6: Reduction factors

9.2 Motor cooling

The cooling system of the water-cooled motors is made of stainless steel.

The two water connections (inlet and outlet) on the N-side of the motors are supplied with a standard stainless steel pipe Ø8 x 1 without additional connection method.

Addition of anti-corrosion and antibacterial additives to the coolant (executed according to the cooling quality as described in **section 9.6**) is permitted in closed cooling circuits. The type and quantity of these additives depends on the respective recommendations of the manufacturers and the prevailing ambient conditions.


	<p>The safety regulations of the relevant anti-corrosion and antibacterial agent manufacturers for their products must always be followed.</p> <p>Metalworking fluids from machining processes must not be used to cool the motor!</p>
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Note: The planning for the entire cooling system is the responsibility of the plant manufacturer. Always avoid the formation of condensation

9.3 Installation instructions

The coolant inlet and outlet is provided in the form of smooth stainless steel pipes $\text{Ø}8 \times 1$ ($\text{Ø}10 \times 1$ for DSC1-135) on the N-side of the motors.

A suitable connection to the external cooling circuit can be made, for example, for stainless steel pipes $\text{Ø}8 \times 1$ by using John Guest speedfit fittings 040808 S ($\text{Ø}8$ to $\text{Ø}8$). Any other connection approved for connection to smooth stainless steel pipe ends and which withstands the operating and test conditions can also be used.

	<p>Cooling circuit connection:</p> <p>Coolant lines must not apply any tensile, compressive or torsional loads on the motor connections.</p> <p>The connection must only be made by skilled personnel. The motor must be disconnected from the power supply and de-energized.</p> <p>When coupling or uncoupling the cooling lines, ensure that no cooling liquid gets into the motor terminal box</p>
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	<p>Leak test to EN 50178:</p> <p>The leaktightness of the cooling system must be tested with the coolant (water) before commissioning. The test pressure applied must be twice the operating pressure. (Minimum test pressure 1 bar) The coolant used does not have to be warmed to operating temperature. The pressure must be maintained until the leaktightness has been tested in all places. (Minimum test time 10 minutes)</p>
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9.4 Electrical connection

The power connection for water-cooled motors is made as shown in the dimensioned drawings included in the technical documentation.

9.5 Information on the coolant flow rates required

Motor type	Flow rate [l/min]	Pressure drop $\pm 15\%$ [bar]	Heating [K]	Max. coolant pressure [bar]	Connection (2x) [mm]
DSC1-045KO64W	5	1.0	2	6	Quick-release coupling for hose connection ($\varnothing 8$ mm)
DSC1-045SO64W	5	1.1	2	6	Quick-release coupling for hose connection ($\varnothing 8$ mm)
DSC1-045MO64W	5	1.2	2	6	Quick-release coupling for hose connection ($\varnothing 8$ mm)

Motor type	Flow rate [l/min]	Pressure drop $\pm 15\%$ [bar]	Heating [K]	Max. coolant pressure [bar]	Connection (2x) [mm]
DSC1-056KO64W	5	0.5	2	6	Quick-release coupling for hose connection ($\varnothing 8$ mm)
DSC1-056SO64W	5	0.5	2	6	Quick-release coupling for hose connection ($\varnothing 8$ mm)
DSC1-056MO64W	5	0.6	2	6	Quick-release coupling for hose connection ($\varnothing 8$ mm)

Motor type	Flow rate [l/min]	Pressure drop $\pm 15\%$ [bar]	Heating [K]	Max. coolant pressure [bar]	Connection (2x) [mm]
DSC1-071KO64W	5	0.33	3	6	Stainless steel pipe $\varnothing 8 \times 1$
DSC1-071SO64W	5	0.4	5	6	Stainless steel pipe $\varnothing 8 \times 1$
DSC1-071MO64W	5	0.5	6	6	Stainless steel pipe $\varnothing 8 \times 1$

Motor type	Flow rate [l/min]	Pressure drop $\pm 15\%$ [bar]	Heating [K]	Max. coolant pressure [bar]	Connection (2x) [mm]
DSC1-100KO64W	5	0.34	3	6	Stainless steel pipe $\varnothing 8 \times 1$
DSC1-100SO64W	5	0.4	5	6	Stainless steel pipe $\varnothing 8 \times 1$
DSC1-100MO64W	5	0.46	7	6	Stainless steel pipe $\varnothing 8 \times 1$

Motor type	Flow rate [l/min]	Pressure drop $\pm 15\%$ [bar]	Heating [K]	Max. coolant pressure [bar]	Connection [mm]
DSC1-135SO64W	9	0.72	3.1	6	Stainless steel pipe $\varnothing 10 \times 1$
DSC1-135LO64W	9	0.88	4.5	6	Stainless steel pipe $\varnothing 10 \times 1$

Table 7: Coolant flow rates

9.6 Coolant quality

The cooling water must meet the following requirements:

Conditions	Unit	Value
Maximum allowable system pressure	bar	6
Temperature of the coolant for motor	°C	10 to 25
pH value (at 20 °C)	---	6.5 to 9
Total hardness	mmol / l	1.43 to 2.5
Chloride - Cl	mg / l	< 200
Sulfate - SO ₄ ²	mg / l	< 200
Oil	mg / l	< 1
Allowable particle size of solid foreign bodies, particles (e.g. sand)	mm	< 0.1

Table 8: Coolant quality

Clear, suspended solids and dirt-free water must be used as the coolant.

9.7 Min. coolant temperature depending on the ambient conditions

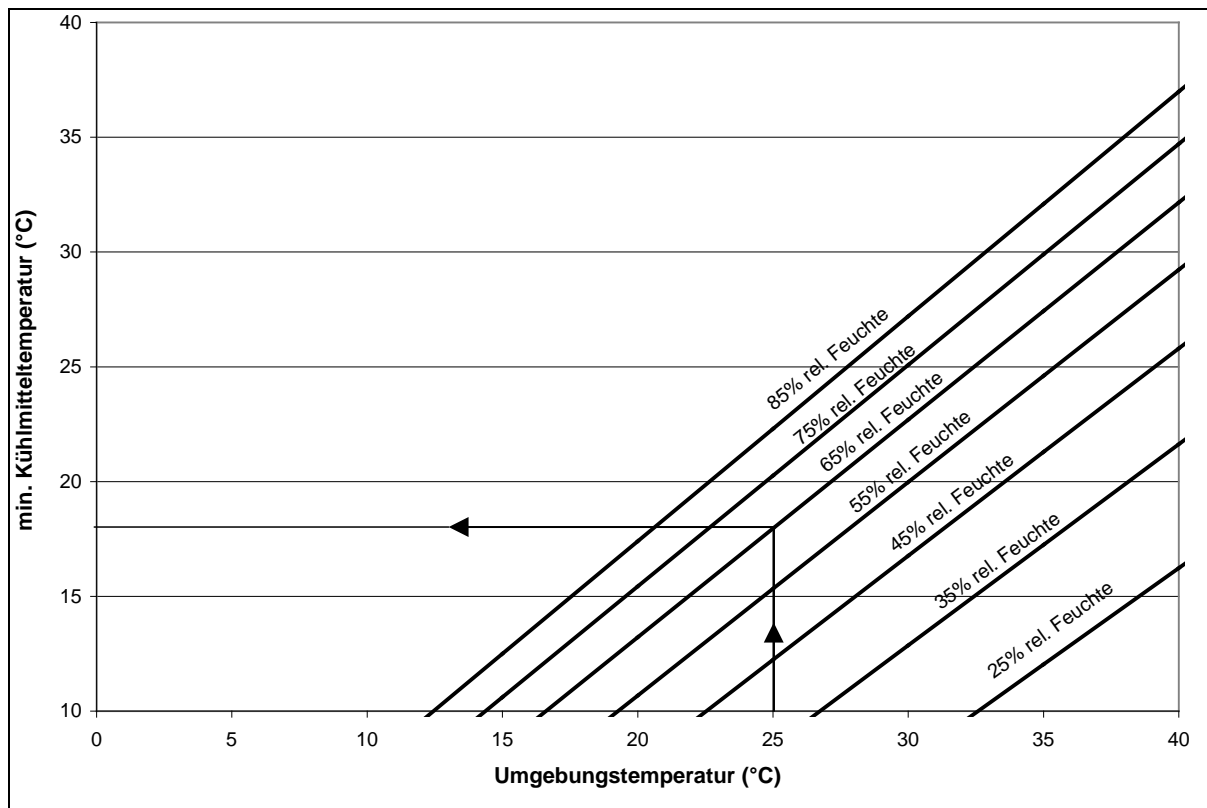


Figure 17: Determination of the coolant temperature

The allowable temperature of the coolant depends on the relative humidity during operation and on the ambient temperature. For example, at an ambient temperature of 25 °C and a relative humidity of 65 %, a minimum coolant inlet temperature of 18 °C is allowed. The characteristics shown in the diagram are limit characteristics. Therefore, in the example, a coolant inlet temperature higher than 18 °C should be selected.

If the temperature does not reach the minimum allowable coolant inlet temperature, the 2-point controller of Baumüller Antriebselektronik must be used to prevent condensation (see functional diagram shown below).

Note:

In the event of a lengthy standstill of the motor, the coolant supply must be interrupted (prevention of condensation).

If ambient temperatures <3 C can occur during a lengthy motor stoppage, the coolant must be drained as a precaution. (Prevention of frost damage)

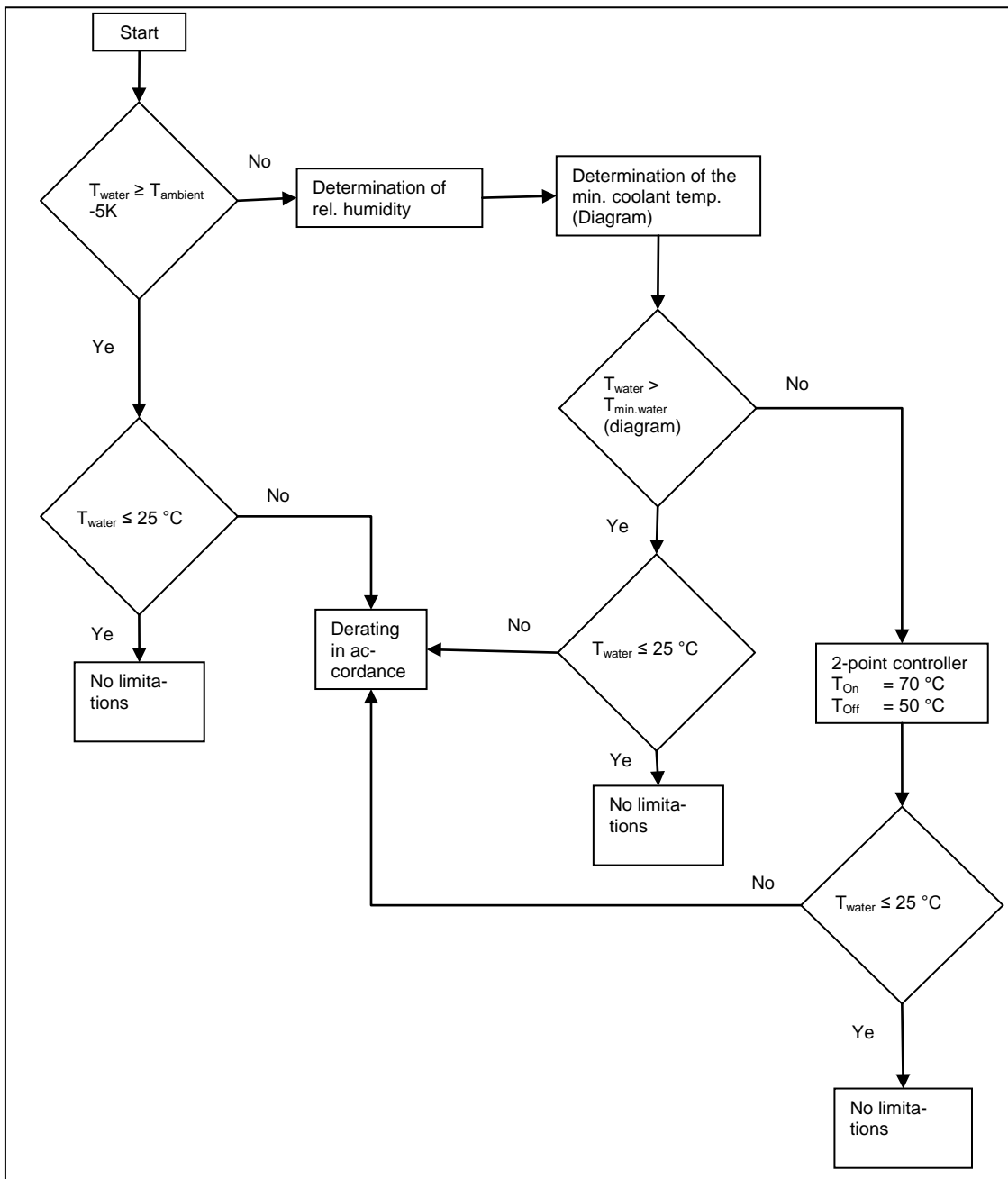


Figure 18: Functional diagram of coolant inlet temperature

9.8 Operating faults

Fault	Cause of fault	Remedy
Overtemperature in the motor Motor temperature monitoring responds	Water cooling not active. Coolant supply is inadequate - deposits in the cooling ducts - faults in the external cooling system	test and switch on if necessary Check the water circuit - test and clean if necessary - plant manufacturer's notes/instructions
Overpressure in the cooling system	Highly contaminated coolant Cooling ducts are blocked Faults in the external cooling system	Filter the coolant test and clean if necessary Plant manufacturer's notes/instructions

Table 9: Operating faults, water cooling

9.9 Inspection

During regular cleaning, the flow rate and the pressure conditions of the cooling system must be tested.

Warranty and liability

All data provided in this documentation are non-binding customer information that is subject to continuous further development and is updated continuously by our permanent revision service. Warranty and liability claims against Baumüller Nürnberg GmbH are excluded, in particular if one or several of the causes listed by us in the following caused the damage:

- You have disregarded notes and instructions in this documentation.
- You have used the system for a purpose for which it is not intended to be used.
- You have
 - improperly installed, connected, commissioned/started up, operated or not maintained the system
 - had it installed, connected, commissioned/started up, operated and/or maintained by unqualified or insufficiently qualified personnel,
 - overloaded,
 - operated with
 - defective safety devices,
 - guards not attached or not attached properly,
 - Non-functional safety devices and guards.
 - Operation not within the specified ambient conditions.
- You have modified the system without the written approval of Baumüller Nürnberg GmbH.
- You have not followed the instructions regarding maintenance in the component descriptions.
- You have poorly monitored the parts subject to wear.
- You have carried out a repair improperly.
- You have combined the system improperly with the products of other manufacturers.
- You have combined the drive system with faulty and/or faultily documented products of other manufacturers.

The latest version of the “General Terms and Conditions of Sale and Delivery” (“Allgemeinen Verkaufs- und Lieferbedingungen”) of Baumüller Nürnberg GmbH always apply.

These have been available to you since the signing of the contract at the latest.