

**Operating manual  
including the safety  
instructions**

**be in motion be in motion**

**TAM 00746**

**DSP1 045 - 100**

Three phase synchronous motor

**Version: 11/2019**

**English**

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# 1 General Safety Notes

## 1.1 Safety

This electric motor has been built in accordance with the current state of safety technology and its operational safety has been checked before leaving the factory.

For proper commissioning and safe use, please observe the following:

- The commissioning and maintenance instructions and the supplementary parts enclosed with them
- The enclosed safety and commissioning instructions
- The technical documentation of the product
- The commissioning and safety notes of the manufacturer of the converters
- The national, local and system-specific regulations for your end product
- The technical instruction TAM 00697 during the use in safety-related applications

Refer to the following danger sources during the use of this product:

Danger due to

- Lifting and transport operations
- Electric current
- Moving parts
- Hot surfaces
- EMC disturbances
- Mechanical overload
- Thermal overload

In order to avoid endangering persons and property or to minimize any residual risks, please observe all safety instructions, in particular those marked with symbols.



### **Danger to life from electric current**

Nonobservance may result in death or serious injury.



### **Warning of general dangers**

Nonobservance may result in serious injury or property damage.



### **Warning of a dangerous situation**

Nonobservance may result in damage to the system or the environment



### **Prohibition of contact**

Nonobservance may result in serious injury.



### **Prohibition of an improper action**

Nonobservance may result in serious injury.



### **Warning of hot surface**

Nonobservance may result in serious injury.



### **Warning of magnetic field**

Nonobservance may result in serious injury or property damage.



### **Electrostatically sensitive parts**

Nonobservance may result in damage to the system or the environment.

## 1.2 Intended use

The use of the electric motor is permitted only within its intended use. In this context, the electric motor may only be used for the applications specified in the technical documentation, observing all instructions in these commissioning and maintenance instructions.

All work relating to installation, commissioning, maintenance and during operation may only be carried out by qualified personnel.

In the sense of the safety information given here, qualified personnel means a person trained and authorized in the field who is authorized to install, assemble, commission and operate devices, systems and circuits in accordance with the applicable safety standards (EN 50110-1).

Improper behaviour can cause serious **personal injury and damage to property**.

This **electric motor** is intended for the use in **commercial systems** and is subject to the following **standards** and **guidelines**:

### 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 meet the requirements of the Low Voltage Directive (2014/35/EU (conformity)).

### EU Machinery Directive

Electric motors are components for installation in machines within the meaning of the Machinery Directive. Commissioning is prohibited until the conformity of the end product with this directive has been established (observe EN 60204-1 "Electrical equipment of machines").

### EU EMC Directive

The operation of the electric motor in its intended use must meet the protection requirements of the EMC Directive 2014/30/EU. Proper installation (e.g. spatial separation of signal lines and power cables, shielded lines and cables, etc.) is the responsibility of the installer of the system and the system provider. In converter operation, the EMC instructions of the converter, encoder and brake manufacturer must also be observed.

**In addition, observe the binding national, local and plant-specific regulations!**

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

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


Observe any deviating information on the type plate or in the technical documentation. The conditions on site must comply with all specifications on the type plate.




The use in hazardous areas is **prohibited** unless expressly provided for. (Observe additional instructions) There must also be no combustible gas mixtures or dangerous dust concentrations in the vicinity of the electric motor. Live and hot motor parts could inflame itself and cause serious injuries and material damage.

If in special cases - in use in non-commercial systems - increased requirements are placed (e.g. protection against contact with children's fingers), these conditions must be ensured by the system during installation.


### Motor version with rare earth magnet:

	<p>In the vicinity of an attracted drawn or open rotor with a strong magnetic field, the following dangers should be noted:</p> <ul style="list-style-type: none"><li>• Persons with electronic or metallic implants (e.g. pacemakers, hearing aids, plates or nails) are at risk if the distance between the implant and the magnetic pole is less than 0.5 m.</li><li>• Due to strong forces of attraction to ferromagnetic parts:<ul style="list-style-type: none"><li>○ Risk of injury due to crushing</li><li>○ Risk of destruction of measuring and assembly tools, credit cards, watches, etc.</li><li>○ Contamination of the rotor package by attracted metal chips or powder</li></ul></li></ul>
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### Thermal danger:

	<p>Caution – Danger of burns!</p> <p><b>Surface temperatures</b> of over <b>70 °C</b> can occur on the motors. If necessary, protective measures against accidental contact must be provided.</p> <p>No temperature-sensitive parts, such as normal cables or electronic components, may touch or be attached to hot surfaces.</p> <p>Thermal overload of the motors can lead to destruction of the winding, the bearings and to demagnetization of the rare earth magnets. Use the temperature sensor for temperature control.</p>
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## 1.3 Prohibition of unauthorized modifications and alterations

	<p>For safety reasons, any unauthorized modifications and alterations to the electric motor are not permitted. If necessary, please contact the motor manufacturer.</p> <p>In general, safety devices may not be disassembled or put out of operation to operate the electric motor</p>
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## 2 Operating conditions

### 2.1 Product description

Baumüller completes the existing DSC range by the new DSP1-series 045-100 used for applications with high speed requirements up to 6.000 min<sup>-1</sup>.

By an increased speed range and a good acceleration and overload capability at the same time this DSP motor series is especially well suited for applications in handling axes, processing machines and servo pump drives.

## 2.2 Scope of delivery

The delivery is arranged according to the order.

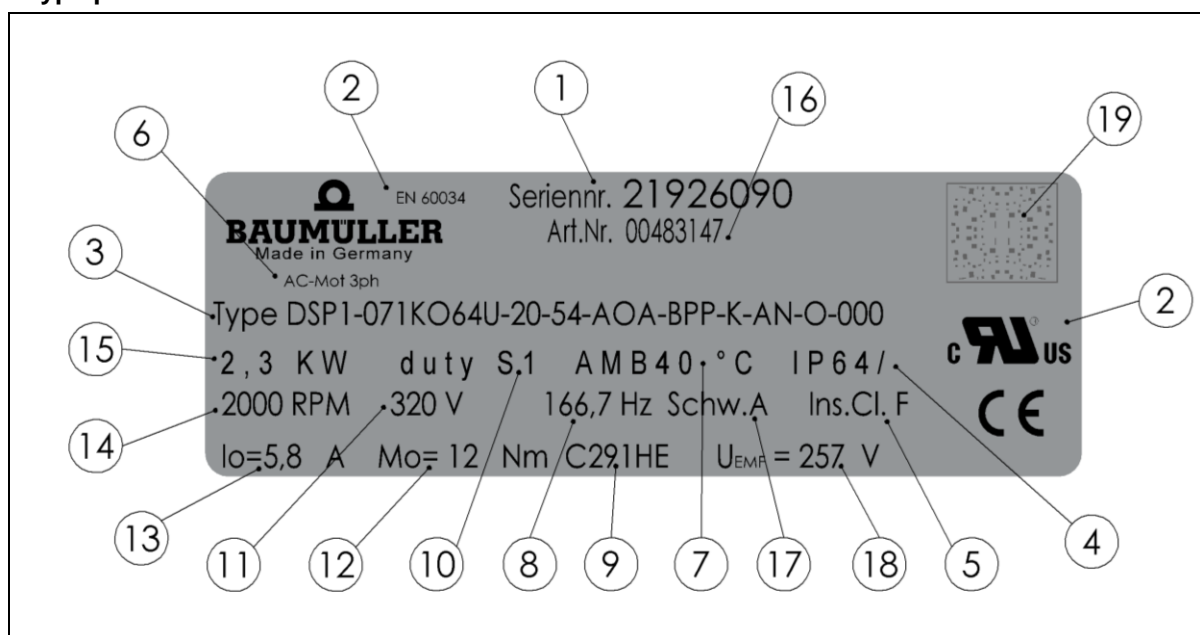
- If transport damage is found on delivery, this must be reported directly to the transport company.
- Upon receipt of the delivery, immediately compare the performance data and designs of the motor supplied with your order data. If recognisable defects or an incomplete delivery are found, the responsible regional office of Baumüller or the main plant in Nuremberg are to be informed.

In both cases, commissioning of the motor is prohibited until the defect has been professionally removed.

## 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 absolutely necessary for the traceability in our company. The type plate must therefore be legible at all times. Never remove the type plate from your motor.

**Type plate data:**



**Bild1: Typenschild**

<b>1</b>	Motor number	<b>10</b>	Motor operating type
<b>2</b>	Standards and approvals	<b>11</b>	Rated voltage $U_N$
<b>3</b>	Motor type / designation	<b>12</b>	Standstill torque $M_0$
<b>4</b>	Motor protection type	<b>13</b>	Standstill current $I_0$
<b>5</b>	Thermal class (insulation material class designation VDE)	<b>14</b>	Rated speed $n_N$
<b>6</b>	Motor type: AC motor	<b>15</b>	Rated power $P_N$
<b>7</b>	Permissible ambient temperature	<b>16</b>	Order number
<b>8</b>	Rated frequency	<b>17</b>	Vibration quality factor
<b>9</b>	Insulation system UL	<b>18</b>	Synchronous generated voltage
		<b>19</b>	Barcode

## 2.4 Technical data

Types (EN 60034-7)	IM B5	Mounting position horizontal
	IM V1	Mounting position vertical, shaft end downwards
	IM V3	Mounting position vertical, shaft end upwards

**Note:** For mounting position IM V3 in conjunction with protection class IP 64, the shaft passage must be protected against ingress of water and dirt.

Protection class (EN 60034-5)	<b>In consideration of the shaft feedthrough</b>	
	IP 64	Standard: Without a shaft sealing ring
	IP 65	Option: With a shaft sealing ring

### **Without consideration of the shaft feedthrough**

IP 67	for the self-cooled version (IC 410 and IC 3W7); not for motors with terminal box
IP 65	for surface-cooled version (IC 416)
IP 65	for version with terminal box

**Attention:** All listed protection types are only achieved with completely assembled plug connections (main and control connection) and by a completely closed terminal box.

Cooling method (EN 60034-6)	IC 410	Standard: completely closed motor version, self-cooled <b>without</b> fan
	IC 416	Option: From an axis height of 56 completely closed motor, surface-cooled <b>with</b> fan, Air flow direction from B to A side of the motor
	IC 3W7	Option: completely closed motor, water-cooled, Cooling circuit connections in direction

Electrical connections (see appendix) via angled (3x90°) rotatable installation boxes

**Attention:** For standstill currents  $I_0 > 36$  A, the main connection is made via terminal boxes

Main connection	8-pole mounting box / terminal box	
	Standard:	U V W + Temperature sensor
	Option:	Brake
Control connection	12-pole	Standard: Resolver
Fan (optional)	6-pole	

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

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

Ambient temperature 0 °C... +40 °C (standard)

Altitude (EN 60034-1)  $\leq 1000$  m above sea level (standard)

Rolling bearings with permanent grease

lubrication	Standard:	Deep groove ball bearing
	Option (from size 56):	Cylindrical roller bearing (A-side)

Calculated bearing operating life  $L_{H10}$  20.000 h (approximate value)



Vibration quality (EN 60034-14)	Standard: A Special: B (with deep groove ball bearing)
Concentricity (DIN 42955)	Standard: N Special: R (reduced)
Vibrations and resistance to vibrations	radial 3 g / axial 0,5 g 10 Hz to 100 Hz (refer to point 3.3)
Holding brake	Option
Actual speed encoder	Standard: 2-pole resolver (high-quality version on request)


Further characteristics can be found in our technical product list on the website: [www.baumueller.de](http://www.baumueller.de) in the download area under Technical documentations. If necessary, request the corresponding documents.

**Attention!**


If the electric motor supplied does not correspond to the standard version according to the technical list or if special contractual agreements have been made, technical deviations from these commissioning and maintenance instructions may exist. In this case, ask for the corresponding technical supplements.

**2.5 Transport, shaft lock, temporary storage**

**Water-cooled motors:**

	<p>To avoid frost damage, ensure that no coolant is present in the engine during transport or temporary storage at ambient temperatures &lt; 3 °C.</p>
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**Transport:**

	<p>The permissible environmental conditions which may affect the motor during transport can be found in DIN EN 60721-3-2 (class 2K2/2M1).. Contrary to DIN, the permissible temperature range is reduced to - 15 °C to + 60 °C.</p> <p>Appropriate load handling equipment must be used, such as webbing, loop lifting straps, etc. The lifting lugs of the motor can also be used for lifting, if provided.</p> <p>During transport, the respective country-specific regulations must be observed.</p> <p>Lifting equipment, transport and load handling devices must comply with the regulations.</p>
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Please refer to the product's technical documentation for the weight specifications of the individual electric motors.

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

### Shaft protection: (only for motors with cylindrical roller bearings)

	<p>In order to avoid transport damages the motors with cylindrical roller bearings of the rotors are blocked at the shaft end by a transport lock.</p> <p>This transport lock <b>must</b> be reused for further transports.</p> <p>If this safety device can no longer be used due to an output element, other suitable measures for axial fixation of the rotor must be taken during transport</p>
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### Temporary storage:


If an engine is not commissioned directly after delivery, it must be stored in a dry, low-dust, low-vibration interior space ( $V_{eff} \leq 0.2 \text{ mm/s}$ ).

The electric motors should not be stored for longer than max. 2 years at a preferably even temperature, not outside the temperature range of  $-15$  to  $+60$  °C. Higher storage temperatures within the operating temperature range accelerate the ageing process of the seals and bearing greases and thus have a negative effect on the service life even before commissioning. Direct sunlight, UV light and ozone also contribute to ageing of the sealing elements and must therefore be avoided under all circumstances!

Please note that the warranty periods are guaranteed from the date of delivery. Therefore we recommend to limit the storage time to a minimum.

Should a longer storage period nevertheless be unavoidable, the environmental conditions listed in DIN EN 60721-3-1 (Class 1K2/1M1) must be observed. Contrary to the DIN, the temperature range may be extended to  $-15$  °C to  $+60$  °C.

## 2.6 Installation conditions, cooling data

	<p><b>For motors with water cooling, please also refer to chapter 9.</b></p>
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### Environment:

The motor can be installed in roofed rooms according to its degree of protection (refer to motor rating plate) in a dusty or humid environment.

If no special agreements have been made, the drive is designed for the following climatic operating conditions as a standard:

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

All other permissible operating conditions can be found in DIN EN 60721-3-3 (class 3K3/3Z12).

These climatic conditions must be observed during installation.

It is generally necessary to keep aggressive, corrosive, abrasive as well as plastic dissolving media away from the motor and its cooling air.

For outdoor installation, always consult the motor manufacturer.

### Air cooling:

Also refer to **chapter 2.4** and technical documents referring to the product.

Cooling process IC 410 – Self-cooling without fan

Cooling process IC 416 – Surface-cooling with fan

In general please observe the following:

- Thermal convection and radiation must not be affected by the installation conditions.
- The cooling air with forced air cooling must be able to flow in unhindered and the warm air must be able to flow out freely. The heated exhaust air must not be drawn in again.
- The distance to the neighboring machine parts should not be less than 100 mm.
- In case of heavy dirt accumulation, the housing surface and the air passages must be cleaned regularly.

### Flange connection:

By coupling the motor to the mounting surface, part of the motor power loss is dissipated via the flange.


The table 1 below lists the dimensions of the mounting surfaces, depending on the axis height. These specifications are minimum values for a reliable heat dissipation via the motor flange surfaces.

Axis height	Steel plate: Width x Height x Thickness in mm	Mounting area in m <sup>2</sup>
45	250 x 250 x 10	0,06
56 – 100	450 x 400 x 30	0,18

**Table 1: Mounting area**

The heat dissipation conditions improve with larger mounting areas. An insulated mounting of the motors is not permitted.

## 2.7 Balancing, output elements, vibrations

	<p>Do not impact the shaft and bearing!</p> <p>When mounting or dismounting output elements, axial forces on the motor are not permitted.</p> <p>The general measures required to protect the output elements against contact must be observed.</p> <p>If a motor is commissioned without an output element, the feather key must be secured against ejection.</p>
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### Balancing:

In the optional version with feather key, the rotors are dynamically balanced as standard with half feather key. (according to EN 60034-14 / ISO 8821 / ISO 1940)

**NOTE:** Observe the marking of the balancing type on the shaft end face and type plate!

H = Balancing with half key (standard)

F = Balancing with full key (special version)

N = Balancing without feather key (special version)

**Output elements:**

When mounting the output element, pay attention to the corresponding type of balancing.

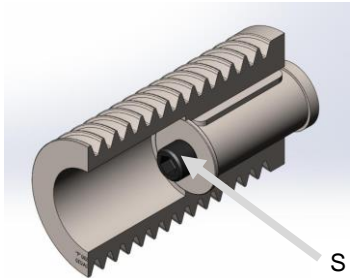
The output elements themselves must be balanced according to ISO 1940.

When mounting or dismounting output elements (e.g. clutch disc, gear wheel, pulley), appropriate devices must always be used.

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

**Attention!**


- For shaft versions without feather key, the output elements must be fastened to the output shaft **using suitable clamping sets**.
- For shaft versions with feather key, make sure that the output elements are in **contact with the shaft shoulder**. *Note:* Chamfer or radius at the output element and the shaft radius to the shoulder must be matched to one another.
- If the threaded hole in the shaft end is used for axial securing of output elements (such as belt pulleys), the tightening torques listed in Table 2 below must not be exceeded:

	Threads	Tightening torque in Nm
	M5	2,2
	M8	10,0
	M10	19,0
	M12	33,0

*Table 2: Tightening torques shown with a safet bolt S of a pulley*

**Appropriate measures for screw locking are to be applied!**


**Vibrations:**

	<p>The system vibration behavior at the place of use, due to output elements, mounting conditions, alignment and installation as well as by influences of external vibrations, can lead to an increase in the vibration values at the motor.</p> <p>In order to ensure proper functioning of the motor and a long bearing life, the permissible vibration values according to EN 60034-14 must not be exceeded. Under certain circumstances, it may be necessary to completely balance the rotor with the output element (according to ISO 1940).</p> <p>The limited vibration loads and accelerations after mounting must not be exceeded, refer to <b>chapter 3.3</b>.</p> <p>In case of changes compared to the normal operation, such as increased temperatures, noises, vibrations, the motor must be switched off in case of doubt, the cause must be determined and, if necessary, the manufacturer must be consulted.</p>
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## 3 Mounting

### 3.1 Safety notes

#### Before mounting:

	<p>Never mount or operate a damaged electric motor.</p> <p>Never install an electric motor in a damaged machine.</p> <p>Before installing, make sure that the electric motor for your machine is appropriate.</p>
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#### During mounting:

	<p>Mount the motor only at the mounting points provided for this purpose.</p> <p>Avoid strokes with a hammer or impermissible shock loads during installation.</p> <p>Install all covers and safety devices. All safety devices must comply with the applicable regulations (e.g. EN 60204).</p> <p><b>Air cooling:</b></p> <p>Protective devices must be fitted to the air inlet and outlet openings if there is a possibility that foreign particles could fall into the fan during operation.</p>
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### 3.2 Setting up and fixing

#### Check before and during mounting whether

- the motor is undamaged (e.g. the shaft seal must not be damaged in any way by sharp or pointed objects).
- the motor is not installed in the danger area of other equipment.
- the intended use is observed (see **chapter 1.2**, **chapter 2.4**)  
*Observe type plate specifications, warning and information signs.*
- the corrosion protection agent at the shaft end has been removed residue-free.  
*If commercial solvents such as acetone or benzine are used, the shaft sealing ring must not be wetted!*
- the motor is suitable for the ambient conditions and environmental influences on site (compare **chapter 2.4**).
- the installation space in the machine is suitable for the type of cooling of the electric motor  
*The motor must be mounted in such a way that sufficient heat dissipation is ensured via the housing surface and the motor flange surface (compare **chapter 2.6**).*
- the motor can be mounted and operated with the available mounting options and connection data.  
*The installation dimensions of the motor with tolerance specifications can be found in the technical documentation for the product. When flange-fixing the motor, care must be taken to ensure that the flange surface is well and evenly supported. The mounting seats and contact surfaces must be undamaged and clean. They should be positioned exactly to the connecting shafts in order to avoid damaging loads in the overall system due to misalignment for bearings, shafts and housing. When tightening the flange fixing screws (**at least in strength class 8.8**), twistings on the flange connection must be avoided.*
- when installed vertically with the shaft end pointing upwards, it is ensured that no liquid can enter the upper bearing.
- the permissible radial forces are not exceeded in accordance with the operating characteristics of the technical documentation for the product (clarification via the Baumüller-

subsidiary, if required).  
*In the case of axial forces, clarification with the motor manufacturer is always required.*

- the brake (optional) can be released after the operating voltage has been applied (audible switching noise).
- the rotor can be rotated evenly and without any streaking noises.  
*If the motor has an integrated brake, first release the brake.*
- the design of the motor, encoder and fan lines, if any, comply with the requirements of the technical documentation for the product.
- The output or drive elements are protected.
- the complete cooling system is functional and protected against any foreign particles falling into it.

### 3.3 Vibrations and vibration resistance

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

Under certain circumstances it may be necessary to completely balance the rotor with the output element.

In order to be able to guarantee perfect function and service life, the vibration values specified in accordance with DIN ISO 10816 must not be exceeded at the specified measuring points of the motor (see Figure 1).

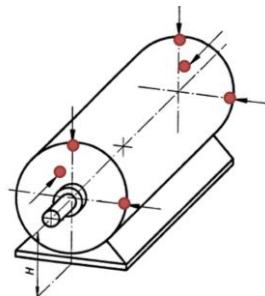


Figure 1: Measuring points for vibration measurement

The specified maximum radial and axial vibration values must be complied to simultaneously. They apply to substructures that can be described as elastic. An elastic substructure is present if the lowest natural frequency of the overall system (machine and foundation) in the measuring direction is at least 25% below the essential excitation frequency. All other structures can be described as rigid. In the case of rigid substructures, the manufacturer must be consulted.

**Maximum radial vibration load:**

Peak vibration acceleration 1 g > 250 Hz  
Peak vibration displacement  $\leq 0,16$  mm < 6,3 Hz  
Effekt. Vibration speed:  $\leq 4,5$  mm/s 6,3 Hz – 250 Hz

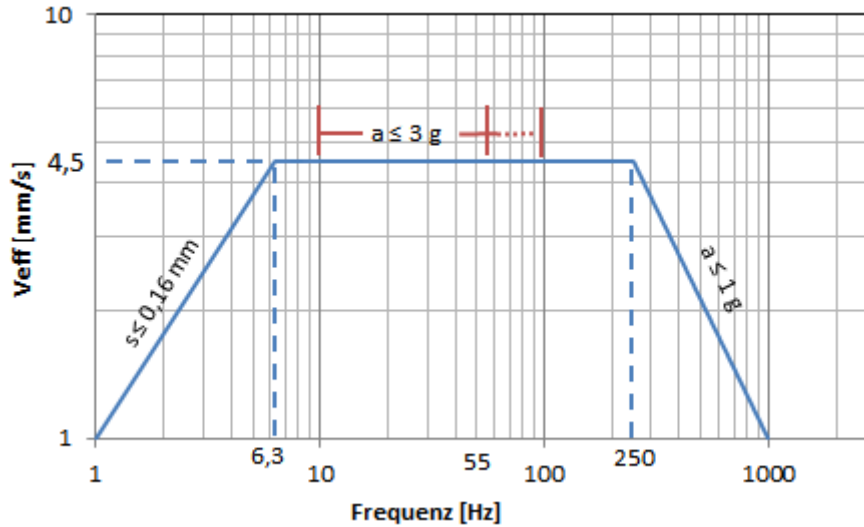


Figure 2: Permitted radial vibration load

**Maximum axial vibration load:**

Peak vibration acceleration 0,225 g > 55 Hz  
Peak vibration displacement  $\leq 0,16$  mm < 6,3 Hz  
Effect. Vibration speed  $\leq 4,5$  mm/s 6,3 Hz – 55 Hz

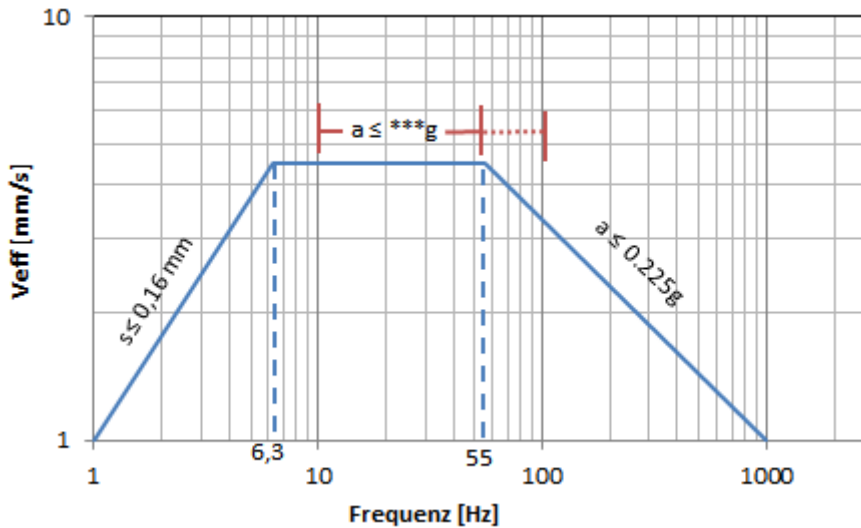


Figure 3: Permitted axial vibration load

**Additional vibration resistance:**

Vibration acceleration 3 g radial and 0.5 \*\*\* g axial 10 Hz to 100 Hz  
The specified vibrations are additionally tolerated by the motor. However, the service life of wear parts (such as bearings) can be reduced.

**Shock stress:**

If there are increased vibration loads in the form of shocks, measurements on the installed machine are necessary.


Based on this, design revisions or evaluations are carried out with the company Baumüller.

To evaluate the vibration speed, the measuring equipment shall meet the requirements of ISO 2954. The vibration acceleration shall be evaluated in the time range in the frequency band from 10 Hz to 2 kHz.

If significant vibration excitations above 2 kHz, e.g. meshing frequencies, are to be expected, the measuring range must be adapted accordingly. The permissible maximum values do not change as a result.



## 4 Electric connection

### Important notes:

	<p>All work must be carried out by qualified personnel, only!</p> <p>All work must only be carried out with the system disconnected from the power supply and secured against reconnection! (also auxiliary circuits).</p> <p>Carry out all work only when the motor is at a standstill!</p> <p><i>With three-phase synchronous motors with permanent magnet excitation, voltages &gt; 60 V may occur at the motor contacts when the rotor is rotating.</i></p> <p>Observe the regulations for work in electrical systems!!</p>
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**Attention!** The safety regulations for work in electrical systems according to EN 50110-1 must be observed.

- Enabling
- Protect against restarting
- Determine the safe isolation from supply
- Grounding and short-circuiting
- Cover or safeguard live parts

	<p>The operation of the electric motor is only possible in conjunction with an appropriate configured converter. Direct connection to the three-phase mains can lead to destruction of the motor.</p> <p>The correct phase sequence and terminal assignment must be observed.</p>
	<p>The electrical connections, protective conductor connections and shield connections (when using shielded cables) must be permanently safe</p> <p>Never touch the contacts of the encoder and the temperature sensors with the hands or with tools that are or may be electrostatically charged! Encoders and temperature sensors are electrostatically sensitive components.</p>

### Elektrische Installation:

- Proper installation is the responsibility of the installer of the system.
- The motor data of the type plate must be considered.
- Connecting cables and plug connections must be correctly dimensioned for the voltages and currents occurring and suitable for the type of installation.
- The connection of the motor including its modules (brake, encoder, fan etc.) must be connected according to the wiring diagrams (refer **to enclosed wiring diagrams or chapter 8**).
- Shielded power and encoder cables must be used to avoid electromagnetic EMC interference of motor supplies and their consequences for encoders and control systems. Observe the EMC instructions of the converter manufacturer.
- For reasons of operational safety, we recommend the use of connection lines assembled by Baumüller (see Technical Product List)



- Before connecting, check the installation boxes, plugs and, if present, the terminal box for possible damage, corrosion, dirt and moisture.
- To ensure the degree of protection, ensure that the plug screw connections, the seals and sealing surfaces of the plugs and the terminal box are seated correctly and protected.  
**Note!** To maintain the degree of protection, the turnable connection boxes should not be changed more than 5 times by turning the knob.
- Plug-in and terminal box connections must not be subjected to mechanical stress. If required provide torsional, tensile and thrust loads as well as a bend protection.


**In the case of main connection via the terminal box additionally the following must be considered:**

- The cable ends must only be stripped to such an extent that the insulation is close to the cable lugs or terminals. Absolutely avoid protruding wire ends.
- The cable lugs used must correspond to the dimensions and cross-sections of the terminals and cables.
- The screw connections of the electrical connections are tightened by the specified tightening torque (refer to **9.2 table 4 / 9.3 table 5**).
- The protection degree remains..  
**Note!** All entries that are not required are closed with metal locking elements. The sealing elements must be functional and undamaged.



## 5 Commissioning, operation

### 5.1 Safety notes


#### Working on the electric motor:

	<p>Perform all works on the electric motor only when the motor is standing still, is deenergized and is cooled down. All connections loosened during the work on the electric motor such as screws etc. must be tightened before commissioning.</p> <p>When carrying out the work it is essential to observe the technical notes in the respective chapters of this commissioning and maintenance manual.</p> <p><b>Attention!</b> If the holding brake is installed as an option, it must not take any safety function during work on the motor (e.g. holding loads).</p>
---	--



#### Danger to life from electric current:

	<p>Make sure that the electric motor is disconnected and without voltage.</p> <p>Never disconnect the connections on the motor during operation.</p> <p>Only connect measuring instruments when they are currentless and de-energized.</p> <p>Do not start work on the motor connections until you have ensured that neither potential nor voltage is present.</p>
	<p>During operation, electrical potential is present at the motor contacts and at the motor windings. Never touch these components/elements during operation.</p>

#### Assembly and disassembly of safety devices

	<p>The electric motor must not be operated without mounted safety devices.</p> <p>For the assembly and disassembly of components and systems intended to monitor safe motor operation, the motor must be taken out of operation</p>
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#### Danger of contact:


	<p>Make sure that the electric motor is stationary and protected against being switched on again before touching it.</p> <p>Touch the output shaft only when the motor is not energized and stopped. Otherwise, there is a danger from the rotating rotors</p>
	<p><b>Risk of burns!</b> Never touch the motor housing during rated load operation. Surface temperatures of <b>over 70 °C</b> can occur on the motors.</p>

### 5.2 Tests before commissioning

- The drive is undamaged and is not in the danger zone of other equipment.
- The motor is properly aligned and secured. Screw connections are correctly tightened.
- All associated protective devices (mechanical, thermal, electrical) are mounted.
- The motor connections are properly made.
- The cables do not touch the motor surface.
- - The protective conductor system is correctly implemented and tested for function
- - The drive does not block (release brake, if present).
- - Emergency stop functions are checked.
- - The fan is properly connected, the functionality has been checked.

### 5.3 Commissioning, operation

#### Note on the function of the brake (if available):

	The brake is designed as a holding brake with emergency stop function. (power failure, emergency stop) The use as a working brake is not permitted..
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Commissioning must only be carried out by qualified personnel.

The converter commissioning instructions must be observed.

#### Tests during commissioning:




- Release the brake if necessary.
- Have all motor components such as brake, encoder, fan, etc. been checked for function and are your operating conditions being adhered to?
- Have all electrical connections and connections been made and fixed in accordance with the regulations (**observe wiring diagrams, see section 8 or enclosed wiring diagrams**)?
- Have all protective measures been taken and are they working properly to prevent contact with live parts, hot surfaces, rotating and moving parts and assemblies?
- Are all output elements assembled and adjusted according to the manufacturer's specifications?
- - Is it ensured that the max. permissible speed  $n_{max}$  of the motor cannot be exceeded? The max. permissible speed  $n_{max}$  is the highest short-term permissible operating speed

#### Tests during operation:

- -Pay attention to unusual noises.
- If there are streaking or scratching noises, grinding noises or similar, shut down the drive immediately and determine the causes.
- Check motor surface and connecting cables for dirt (such as dust deposits, oil contamination, moisture, etc.).
- Check maintenance intervals.
- Check air inlet and outlet openings for dirt.

## 5.4 Failures

### Safety notes:

  	<p>Only qualified personnel should carry out troubleshooting.</p> <p>Do not disable protective devices - not even during test operation.</p> <p>Disconnect and reinstall connecting cables only in a voltage-free and protected condition.</p> <p>Observe the 5 safety rules for the "Enabling" (see <b>chapter 4</b>)</p> <p>Pay attention to hot surfaces!</p>
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In case of operational failures:

- - Observe the operating instructions of the machine / system.
- - Observe the operating instructions of the converter.
- - If necessary, contact the motor or converter manufacturer.

**You should have the following parameters ready:**

- 
- Type plate data
- The type and extent of the disturbance; circumstances of the error
- Application data (cycle of torque, speed and forces over time; ambient conditions)

The following selection of error causes can provide useful assistance for troubleshooting in the event of a fault:


Error	Error cause	Troubleshooting
Motor does not start	Controller enable is missing Controller error, encoder error  Brake does not release  Brake defective Voltage supply is missing  Rotating field	Activate controller enable Read out error listing on converter or controller, troubleshooting Check control, connection and power supply Repair by manufacturer Check connection and power supply Check phase sequence, replace connecting cables if necessary
Uneven runningf	Insufficient shielding in the connecting cables Controller parameter too high	Check shield connection and earthing Optimize controller parameters

<b>Error</b>	<b>Error cause</b>	<b>Troubleshooting</b>
Vibrations	The coupling elements or the working machine is badly balanced Nonconformity of the drive train Loose fixing screws	Balancing  Re-aligning the machine set  Check and secure the screw connections
Running noises	Foreign particles in the motor  Bearing damage	Repair by motor manufacturer  Repair by motor manufacturer
Motor gets too warm Motor temperature monitoring responds	Drive overload  Contamination of the motor surface or air channels Constricted mounting conditions  Brake does not release sufficiently- grinding brake	Check motor load and compare with the type plate data  Clean motor surface or air channels  Check motor installation according to <b>chapter 2.6 or 3</b>  Repair by motor manufacturer
Current consumption too high, motor torque too low	Incorrect notch position	Check notch position and adjust if necessary

**Table 3: Failures**

## 6 Inspection and maintenance

### Working on the electric motor:

	<p>Carry out all work on the electric motor only when the motor is stationary, de-energized and cooled down. After inspection or maintenance, retighten all connections loosened during work on the motor, such as screws, etc.</p> <p>It is imperative that you observe the technical instructions in the respective chapters of these commissioning and maintenance instructions when carrying out the work.</p> <p>During maintenance work, it is essential to observe the safety instructions as they also apply to the commissioning of the motor (see <b>chapter 5.1</b>)</p> <p><b>Attention!</b> If the optional holding brake is installed, it may not perform any safety function during work on the motor (such as holding loads)</p>
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### 6.1 Inspection

Depending on the local degree of soiling, regular cleaning must be carried out in order to ensure sufficient dissipation of the heat loss in the long term.

If a brake is optionally installed, wear limits are specified. (Such as maximum permissible operating air gap, limited number of emergency braking operations) The current wear degree of the brake is to be checked regularly. When permissible wear limits have been reached, the brake must be replaced (see **chapter 6.2**).

If a shaft sealing ring is optionally used, this must be checked regularly for proper functioning (leakage).

### 6.2 Maintenance

Depending on the operating conditions (such as operating mode, temperature, speed and load), the service life of the bearings and sealing elements can vary considerably.

For a failure-free operation, we recommend general maintenance guidelines:

- The bearing must be changed after approx. 20,000 operating hours. (The bearing arrangement is designed for a calculated bearing service life of 20,000 operating hours).
- Replacement of the shaft sealing ring, if present and if no leakage could be detected during previous inspections, after approx. 5,000 operating hours.

If a brake is installed as an option, it must be replaced when its wear limit is reached.

The maintenance work is to be carried out by Baumüller itself or by one of the assigned companies

#### **Attention!**

**For motors which are used in safety-related applications, it is imperative that the specifications of the technical instruction TAM 00697 are observed during maintenance and service.**

## 7 Disposal

The motor is to be disposed of in the normal recycling process in accordance with national and local regulations.

## 8 Appendix 1: Pole assignments (power and control connections)

### 8.1 Main connection via the plug

The standstill current  $I_0$  specifies the mounting socket size.

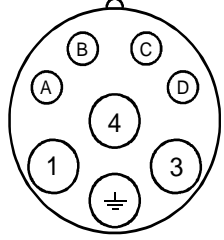

		Pin	Signal	Color / Labeling
Size 1 $I_0 \leq 20$ A	 <p>View on the contact side of the mounting socket</p>	1  3 4 A B C D	Phase U Protective conductor Phase V Phase W B+ B- K+ K-	U green / yellow V V W W W red black white yellow

Image 2A: Main connection with temperature sensor and brake

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

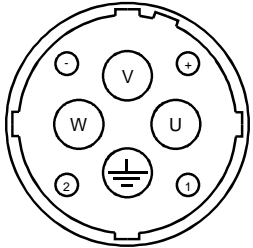

		Pin	Signal	Color / Labeling
Size 1,5 $I_0 \leq 36$ A	 <p>Ansicht auf Kontaktseite Einbaudose</p>	U V W  + - 1 2	Phase U Phase V Phase W Protective conductor B+ B- K- K+	U V V W W W green / yellow red black white yellow

Image 2B: Main connection with temperature sensor and brake

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

### 8.2 Main connection via terminal box (standard version according to the catalogue)

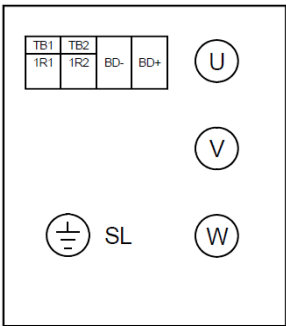
	Connection image U V W Power connection 1R1 / 1R2 Temperature sensor BD+ / BD- Brake SL Protective conductor
---	--

Image 3: Terminal assignment with temperature sensor and brake

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

**Table 4** summarizes the cable entries of the terminal boxes and the main connection terminals with the permissible tightening torques.

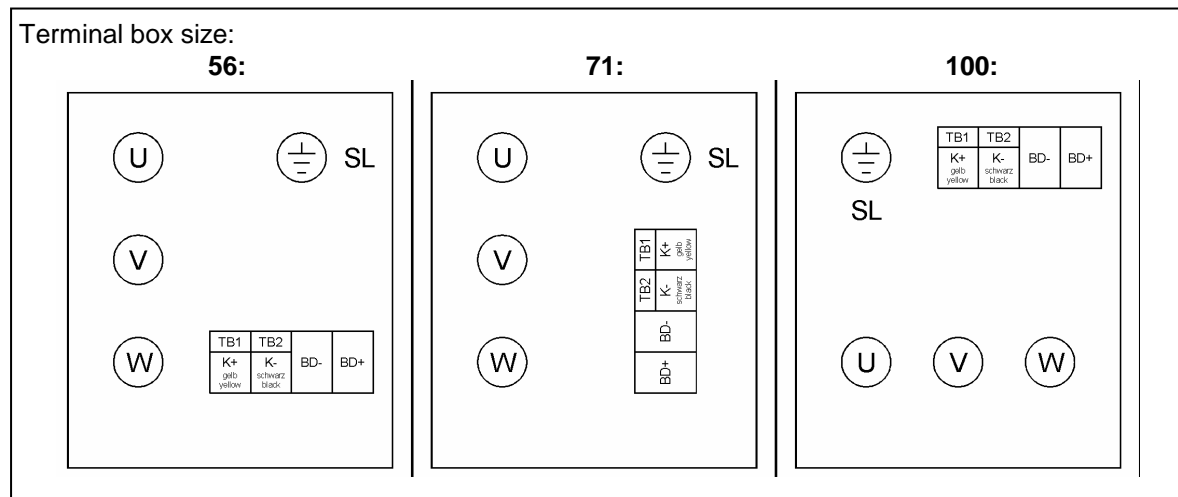
We recommend using EMC cable screwings for the cable glands.

When tightening the terminal nuts, it is advisable to hold the conductor against it in order to keep the terminal board free of torsion forces.

Terminal box size	Cable gland	Number of main connection terminals	Tightening torques 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

**Table 4: Terminal box versions**

### 8.3 Main connection via terminal box (customer-specific version according to EN 60034; not UL-approved)



**Image 4: Terminal assignment special version**

**Table 5** summarizes the cable entries of the terminal boxes and the main connection terminals with the permissible tightening torques.

We recommend the use of EMC cable screwings for the cable glands.

When tightening the terminal nuts, it is recommended to hold the conductor in place in order to keep the terminal board free of torsion forces.

Terminal box size	Cable gland	Number of main connection terminals	Tightening torques 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

**Tabelle 5: Klemmenkastenausführungen**



## 8.4 Main and control connection via combination mounting socket (customer-specific version)

The combination mounting box is generally mounted on the B end plate of the drive. The box is angled at 90° and, contrary to the standard design of the motors, cannot be rotated.

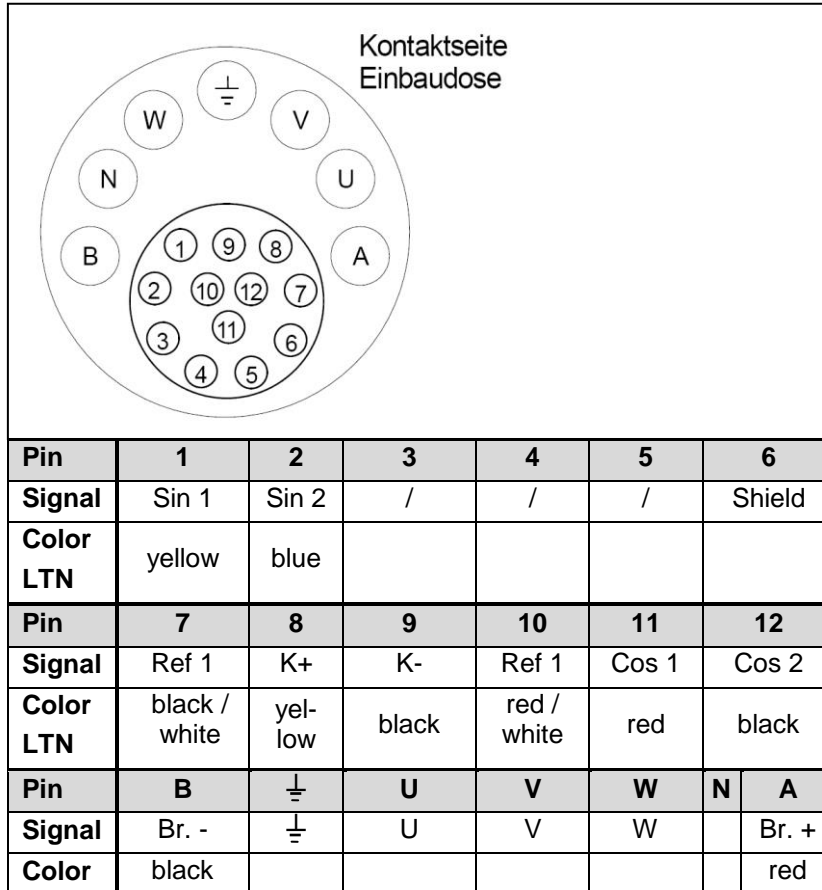


Image 5: Pin assignment of the combination mounting box

**Outdoor area:** Pin "B to A" shows the pole assignment for power connection and PE brake.

**Indoor area:** Pin "1 to 12" shows the pole assignment for resolver and temperature sensor..

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

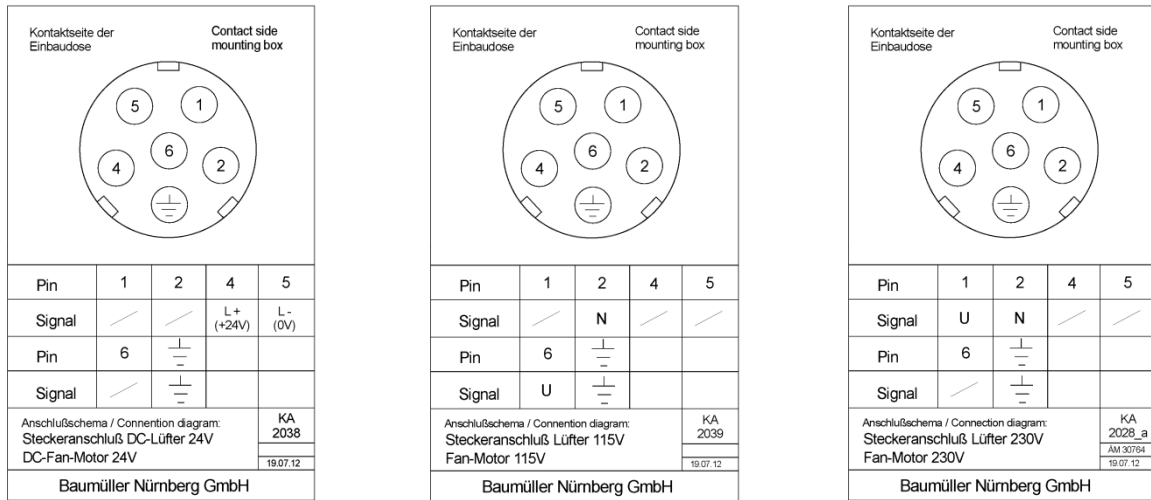
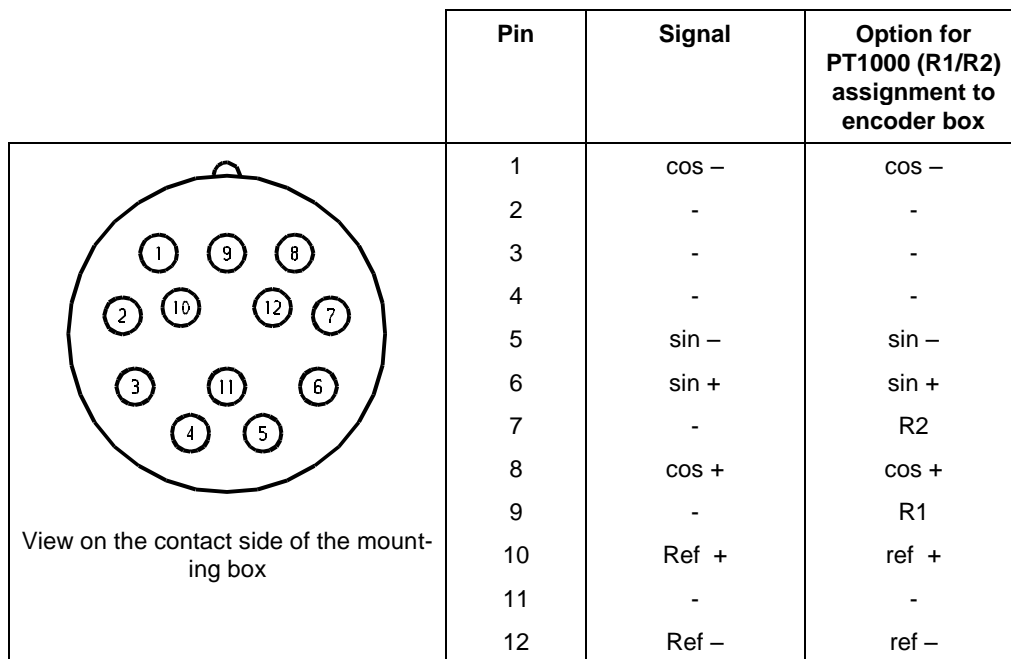


Image 6 : Pin assignment fan connection

## 8.6 Control connection: Resolver



I 7 : Pin assignment resolver

## 9 Appendix 2: Version with water cooling

In addition to the previous chapters, the following must also be observed for water-cooled motors (EN 60034-6; IC 3W7):

### 9.1 Performance definition for water-cooled machines

The power ratings (torques) listed in the table apply to continuous operation S1 at rated speed as long as the cooling circuit requirements for water-cooled motors are met!

When operating the motors with higher coolant inlet temperatures, the reduction factors in the following table must be taken into account:

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

Table 6: Reduction factors

### 9.2 Motor cooling

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

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

In the coolant (designed according to the coolant composition according to chapter 9.6), admixtures of corrosion and germ protection additives are permitted in closed cooling circuits. Type and quantity of these additives depend on the respective recommendations of the manufacturer and the prevailing ambient conditions..



The safety regulations of the corresponding corrosion and germ protection agent manufacturers for the product must be strictly observed.


Cooling lubricants from machining processes must not be used to cool the motor!


Note: The project planning of the entire cooling system is the responsibility of the plant constructor. Condensation must always be avoided.

### 9.3 Mounting notes

The coolant inlet and outlet is carried out via smooth stainless steel tubes  $\varnothing 8 \times 1$  ( $\varnothing 10 \times 1$  for DSC1-135) on the B-side of the motors.

A suitable connection to the external cooling circuit can be established, for example, by using John Guest SM 040808 S quick connectors ( $\varnothing 8$  to  $\varnothing 8$ ). Any other connection that is approved for the connection to smooth stainless steel pipe ends and can withstand operating and test conditions can also be used.

	<p><b>Cooling circuit connection:</b></p> <p>No tensile, compressive or torsional loads may be applied to the motor connections from coolant lines.</p> <p>The connection may only be carried out by qualified personnel. Thereby, the motor must be disconnected from current and voltage.</p> <p>When connecting or disconnecting the cooling lines, make sure that no coolant enters the motor terminal box.</p>
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	<p><b>Sealing test according to EN 50178:</b></p> <p>The sealing of the cooling system must be checked before commissioning by pressing the coolant (water). The test pressure must be twice the operating pressure (minimum test pressure 1 bar). The coolant used does not need to be brought to operating temperature here. The pressure must be maintained until the sealing has been checked at all points (minimum test time 10 minutes)</p>
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### 9.4 Electric connection

The power connection with the water-cooled motors is executed in accordance with the dimensional drawings in the technical documentation.

## 9.5 Information on the required coolant volume rate of flow

Motor type	Volume rate of flow [l/min]	Pressure drop $\pm 15\%$ [bar]	Temperature increase [K]	Max. coolant pressure [bar]	Coconnection (2x) [mm]
DSP1-045KO64W	5	1,0	2	6	Quick coupling for hose connection (Ø8 mm)
DSP1-045SO64W	5	1,1	2	6	Quick coupling for hose connection (Ø8 mm)
DSP1-045MO64W	5	1,2	2	6	Quick coupling for hose connection (Ø8 mm)

Motor type	Volume rate of flow [l/min]	Pressure drop $\pm 15\%$ [bar]	Temperature increase [K]	Max. coolant pressure [bar]	Coconnection (2x) [mm]
DSP1-056KO64W	5	0,5	2	6	Quick coupling for hose connection (Ø8 mm)
DSP1-056SO64W	5	0,5	2	6	Quick coupling for hose connection (Ø8 mm)
DSP1-056MO64W	5	0,6	2	6	Quick coupling for hose connection (Ø8 mm)

Motor type	Volume rate of flow [l/min]	Pressure drop $\pm 15\%$ [bar]	Temperature increase [K]	Max. coolant pressure [bar]	Coconnection (2x) [mm]
DSP1-071KO64W	5	0,33	3	6	Edelstahlrohr Ø8x1
DSP1-071SO64W	5	0,4	5	6	Edelstahlrohr Ø8x1
DSP1-071MO64W	5	0,5	6	6	Edelstahlrohr Ø8x1

Motor type	Volume rate of flow [l/min]	Pressure drop $\pm 15\%$ [bar]	Temperature increase [K]	Max. coolant pressure [bar]	Coconnection (2x) [mm]
DSP1-100KO64W	5	0,34	3	6	Stainless steel pipe Ø8x1
DSP1-100SO64W	5	0,4	5	6	Stainless steel pipe Ø8x1
DSP1-100MO64W	5	0,46	7	6	Stainless steel pipe Ø8x1
DSP1-100LO64W	5	0,52	9	6	Stainless steel pipe Ø8x1

Table 7: Coolant volume rate of flow

## 9.6 Cooling water quality

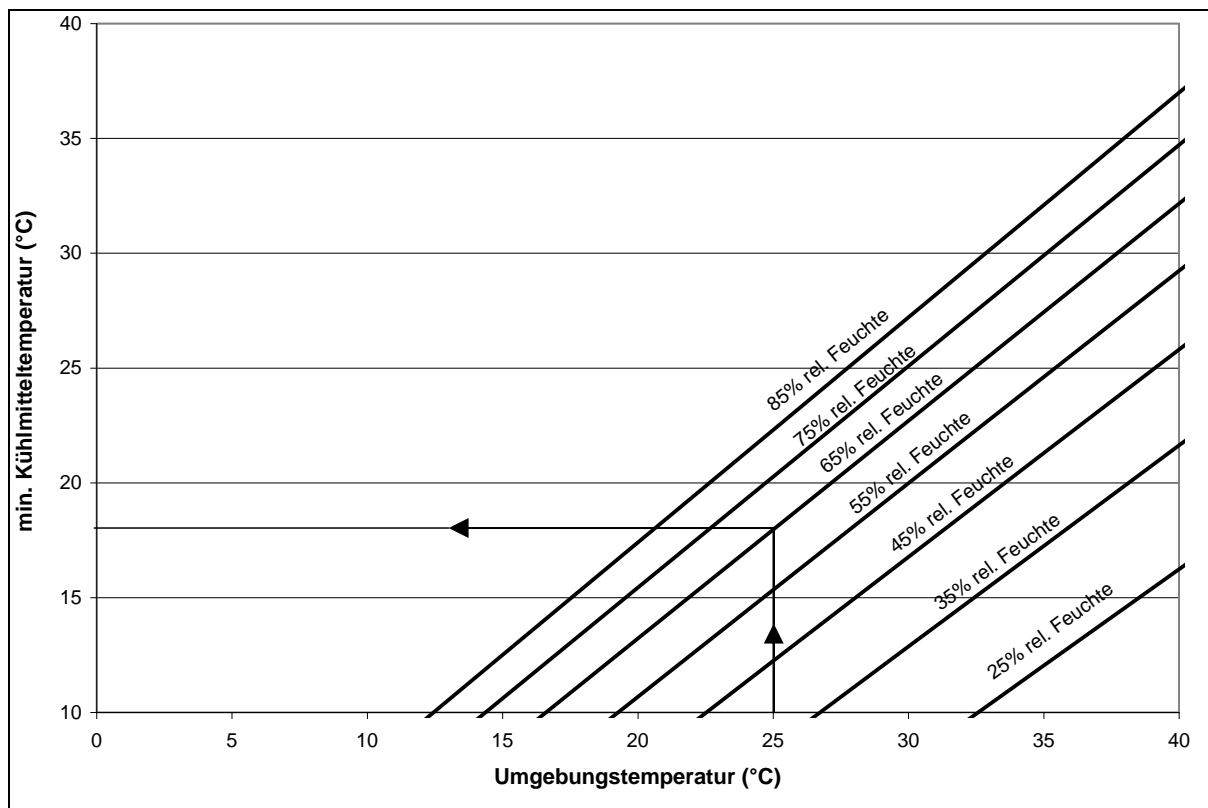
The cooling water must meet the following requirements:

Conditions	Unit	Value
Maximum permissible system pressure	bar	6
Temperature of the coolant for the motor	°C	10 to 25
pH-value (at 20 °C)	---	6,5 to 9
Water hardness	mmol / l	1,43 to 2,5
Chlorid - Cl	mg / l	< 200
Sulfat - SO <sub>4</sub> <sup>2-</sup>	mg / l	< 200
Oil	mg / l	< 1
Permissible particle size of solid foreign bodies, particles (such as sand)	mm	< 0,1

**Table 8: Cooling water quality**

Water free of suspended matter and dirt must be used as coolant.

## 9.7 Minimum coolant temperature in dependance of the ambient conditions



**Image 17: Determination of the coolant temperature**

The permissible temperature of the coolant depends on the relative humidity during operation and the ambient temperature. For example, a minimum coolant inlet temperature of 18 °C is permissible

at an ambient temperature of 25 °C and a relative humidity of 65 %. The characteristic curves shown in the diagram are limit curves. In the example, a coolant inlet temperature greater than 18 °C should therefore be selected.

If the temperature falls below the minimum permissible coolant inlet temperature, the 2-point controller of the Baumüller drive electronic is to be used to avoid humidity (refer to the function diagram shown below).

**Note:**

The coolant supply must be interrupted if the engine is not used for a longer period of time (avoid condensation).

If ambient temperatures <3 °C may occur during prolonged standstill of the motor, the coolant must be drained as a precautionary measure. (avoidance of frost damage)

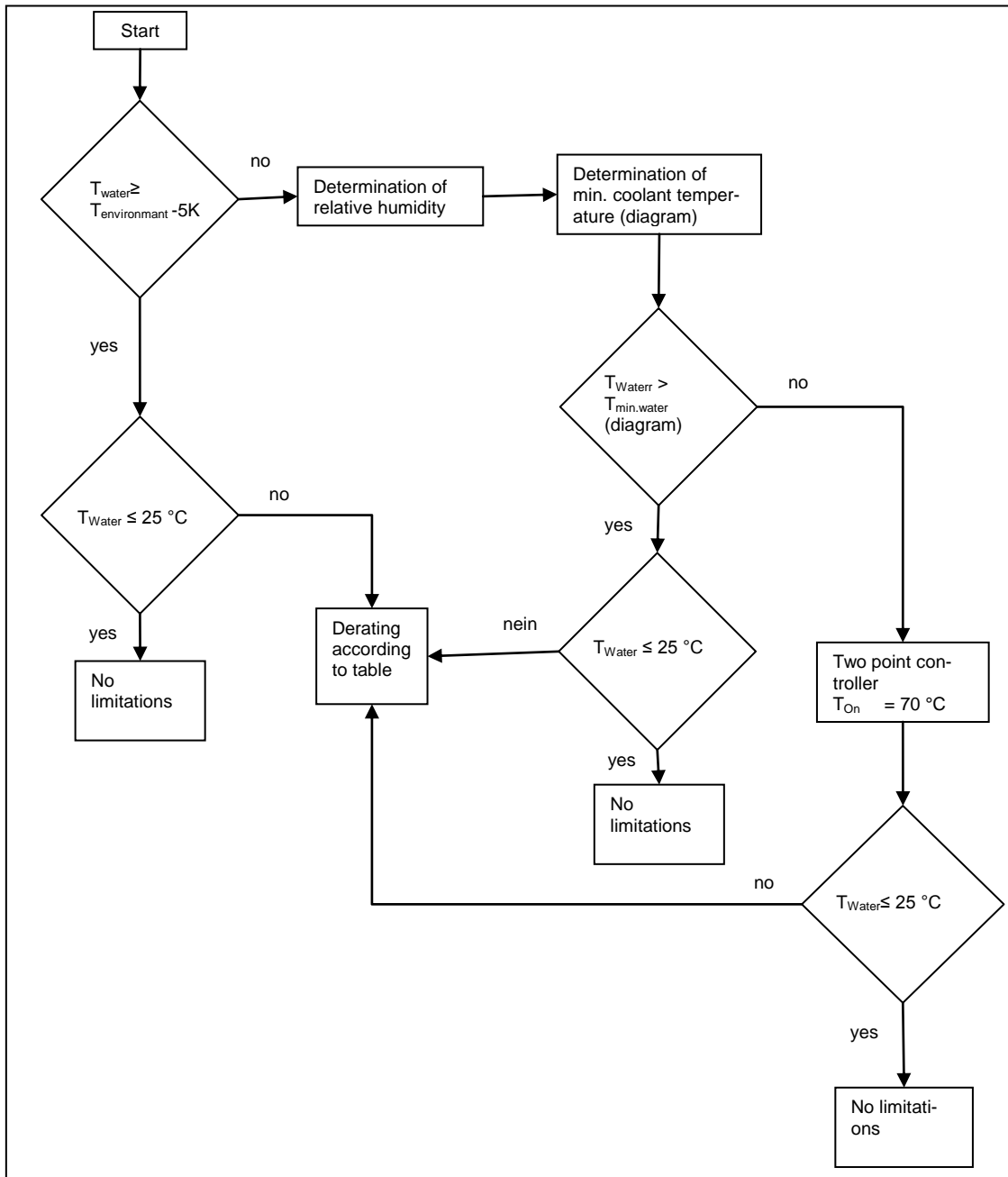


Image 18: Function diagram coolant inlet temperature

## 9.8 Operating malfunctions

Error	Error cause	Troubleshooting
Overtemperature in the motor Motor temperature monitoring responds	Water cooling is not active Coolant supply is insufficient - Deposits in the cooling channels - Errors in the external cooling system	Check and switch on if required Check water circulation  - Check and clean if necessary  - Notes from the system manufacturer
Overpressure in the cooling system	Badly contaminated coolant Cooling channels are blocked up Malfunction in the external cooling system	Filter the coolant Check and clean if required Notes from the system manufacturer

*Table 9: Operating malfunctions – water cooling*

## 9.9 Inspection

During regular cleaning, the volume flow and the pressure conditions of the cooling system must be checked.



### *Warranty and liability*

All details in this documentation are non-binding customer information, are subject to a continuous further development and are continuously updated by our permanent change service. Warranty and liability claims against Baumüller Nürnberg GmbH are excluded if, in particular, one or more of the causes listed below have caused the damage:

- You have not adhered to the notes in this documentation.
- You have not used the system as intended.
- The system was
  - Improperly mounted, connected, commissioned, operated or maintained
  - mounted, connected, commissioned, operated and/or maintained by not or not sufficiently qualified personnel
  - overloaded,
  - operated with
    - defect safety equipment
    - incorrectly installed or without safety devices
    - non-functional safety and protective devices
  - is not operated within the specified ambient conditions
- You have rebuilt the system without having an approval in written form of the company Baumüller Nürnberg GmbH
- You have not followed the maintenance instructions in the component descriptions
- You have badly monitored the parts subject to wear.
- You have carried out a repair incorrectly.
- You have combined the system incorrectly with products of other manufacturers.
- You have combined the drive system with faulty and/or faulty documented products of other manufacturers

Generally, the "General Terms and Conditions of Sale and Delivery" of the latest version of the company Baumüller Nürnberg GmbH shall.

These are available since the conclusion of the contract, at the latest.