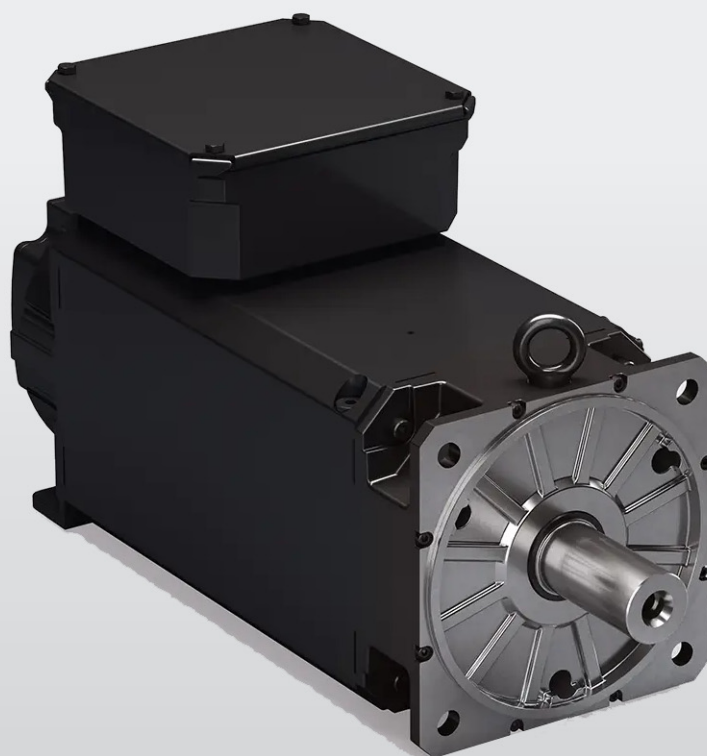




DS4-132

Instruction handbook
Three-phase synchronous motor

E

5.25016.02

**Read the Instruction handbook
before starting any work!**

Language: **English** (Translation)
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Ostendstr. 80 - 90
90482 Nuremberg
Germany

Tel. +49 9 11 54 32 - 0
Fax: +49 9 11 54 32 - 1 30

Email : mail@baumueller.com
Internet: www.baumueller.com



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GENERAL

1.1 Safety

This electric motor was built referring to the current state of the art of safety technology and was checked on its operational safety before it left the company.

Please, consider the following to ensure a proper commissioning as well as the safe use:

- The present commissioning and maintenance instruction and its enclosed additional parts
- The enclosed safety and commissioning instructions
- The technical documents of the product
- The commissioning and safety notes of the manufacturer of the converter
- The national, local and plant-specific regulations related to the finished product
- The technical instruction TAM 00697 when using the safety-related applications

When using this product the following dangers must be considered:

Dangers due to

- Lifting and transport processes
- Electrical current
- Moving parts
- Hot surfaces
- EMC interferences
- Mechanical overload
- Thermal overload

1.2 Key to symbols

In order to avoid dangers against persons and material assets or to minimize existing risks please regard all safety notes especially those which are marked by symbols.

**DANGER!**

....points out an immediately dangerous situation that will lead to severe injuries or death if not avoided.

**DANGER due to electrical current!**

....points out a directly dangerous situation caused by electrical current that will lead to severe injuries or death, if not avoided.

**Prohibition of action likely to increase or cause danger!**

...failure to comply can cause serious injuries.

**WARNING!**

....points out a potentially dangerous situation that could lead to severe injuries or death if not avoided.

**CAUTION!**

....points out a potentially dangerous situation that can lead to minor or slight injuries, if not avoided.

**NOTICE!**

....points out a potentially dangerous situation, that can lead to material damage, if not avoided.

**Hot surface warning!**

Failure to observe can lead to severe injuries.

**Magnetic field warning!**

Failure to observe can lead to severe injuries or damage to property.

**Electrostatically sensitive components!**

Failure to observe can lead to damage to the system or peripheral equipment.

Recommendations**NOTE!**

....highlights useful hints and recommendations, as well as information for the efficient and trouble-free use.

1.3 Appropriate use

The motor must only be used appropriately. In this context, the motor must only be used for the applications described in the technical documentation under strict observance of all the notes in these instruction handbook.

All assembly, commissioning, maintenance, and operating tasks must be carried out by **qualified personnel** only.

Within the context of these safety instructions, qualified personnel refers to persons who are trained and authorized in the specialized area, who are authorized to set up, assemble, commission, and operate units, systems, and circuits under application of the applicable safety standards (EN 50110-1).

Inappropriate behavior can result in **serious injury** and **damage** to property.

The **motor** is designed to be **used for industrial applications** and is subject to a number of **standards** and **directives**, including the following:

Standards	EN 60034-1, EN 60034-5, EN 60034-6, EN 60034-9, EN 60034-14, EN 61800-5 EN 60204-1
EU Low Voltage Directive	The motors in this series fully comply with the requirements of the Low Voltage Directive EU 2014/35/EU (conformity).
EU Machinery Directive	Motors are components which are intended to be installed in machines as described in the Machinery Directive. Commissioning is not permitted until such time as the conformity of the finished product with this directive has been established (see EN 60204-1 „Electrical Equipment of Machines“).
EU EMC Directive	When the motor is used as intended, its operation must comply with the safety requirements laid down in the EMC Directive 2014/30/EU. Proper installation (e. g. physical isolation of signal and power cables, shielded wiring and cable etc.) is the responsibility of the system installer and system vendor. With systems which have converters, the EMC notes from the manufacturers of the converter-, encoder- and brake-manufacturer must be observed.

Furthermore, all the national, local, and system-specific regulations must be observed!

Motor design with rare earth magnets:



Please be aware of the following risks in the vicinity of a retracted or exposed rotor with a strong magnetic field:

- People with electronic or metallic implants (such as cardiac pacemakers, hearing aids, plates or pins) are at risk, if the distance between the implant and the magnetic pin is less than 0.5 m.
- Due to the strong attraction forces exerted on ferromagnetic parts there is a risk of:
 - Bruises
 - Damage to measuring and assembly tools, credit cards, watches etc.
 - Contamination of the Rotor assembly due to attracting metal debris or powder.



Beware of risk of burns!

The surface temperatures on the motors can exceed 70 °C. If necessary, provide guards!

Temperature-sensitive parts, such as normal cables or electronic components, must not be placed on or fixed to the hot surfaces.

Thermal overloading can destroy the winding and the bearing and can cause demagnetization of the rare-earth magnets. A thermal sensor should be used to monitor the temperature.

1.4 Prohibition of unauthorized modifications and changes



For safety reasons, unauthorized modifications and changes to the motor are not permitted. If such modifications/changes are necessary, please contact the motor manufacturer.

No safety devices may be dismantled or decommissioned when operating the motor.

1.5 Signs and labels



WARNING!

Risk of injury due to illegible symbols!

- Over the course of time, stickers and symbols on the device can become dirty or otherwise unrecognizable.

Therefore:

Maintain all safety, warning and operating labels on the device in easily readable condition.



CAUTION!

Risk of injury due to hot surface!

When in operation, the top of the device can heat up to temperatures $> 70\text{ °C}$!

Therefore:

- Wear safety gloves



- It is not allowed that temperature sensitive parts, e. g. standard cables or electronic parts are touch or be mounted to hot surfaces.
- A thermal overload of the motors can lead to damage of the winding, the bearing and to the demagnetization of the rare-earth magnets.



Electrical voltage

Only qualified personnel may work in work areas that identified with this.

Unauthorized persons may not touch working materials marked correspondingly.

1.6 Limitation of liability

All specifications and notes in these instruction handbook were compiled taking into account the applicable standards and regulations, the state of the art and our knowledge and experience of many years.

The manufacturer assumes no liability for damages due to:

- noncompliance with the instruction handbook
- usage for other than the intended purpose
- usage by untrained personnel

The actual scope of delivery can vary in case of optional equipment, laying claim to additional order options, or on account of the latest technical changes to the explanations and representations described herein.

The user bears the responsibility for performing service and initial operation in accordance with the safety regulations of the applicable standards and all other relevant governmental or local regulations concerning the dimensioning and protection of conductors, grounding, disconnectors, overcurrent protection, etc.

The person who carried out the mounting or installation is liable for any damage incurred when assembling or connecting the device.

1.7 Copyright protection

The instruction handbook must be treated confidentially. It is to be used exclusively by personnel who work with the device. The consignment of the instruction handbook to third persons without the written permission of the manufacturer is prohibited.



NOTE!

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NOTE!

Please note, that BAUMÜLLER is not responsible to examine whether any (industrial property) rights of third parties are infringed by the application-specific use of the BAUMÜLLER products/components or the execution.

1.8 Spare parts



WARNING!

False or flawed spare parts can lead to damage, malfunction or complete failure, thus endangering safety.

Therefore:

- Only use original spare parts of the manufacturer.

Procure spare parts through an authorized dealer or directly from the manufacturer.

1.9 Disposal

Insofar as no take-back or disposal agreement has been made, please disassemble units correctly and properly recycle the constituent parts.

Refer to [► Demounting and Disposal ◀](#) on page 77.

1.10 Guarantee provisions

The guarantee provisions are stated in a separate document of the sales documents. The devices described herein may only be operated in accordance with the stipulated methods, procedures and conditions. Anything else not presented here, including the operation in other mounted positions, is not permitted and must be cleared. If the devices are operated in any other manner than as described within these instruction handbook, then all guarantee and warranty rights are rendered null and void.

1.11 Customer service

Our customer service is available to provide you with information. Info on the responsible contact persons is available at all times via telephone, fax, mail or the Internet.

TECHNICAL DATA



NOTICE!

If the delivered motor does not correspond to the standard version according to the technical list or if special agreements have been made in the contract, technical deviations may occur.

In this case, request the corresponding technical additions.

Construction type B3 Foot-mounted design
B5 Flange-mounted design

Type of protection IP 54
(EN 60034-5)



NOTICE!

All mentioned degrees of protection are reached only, if the plug connectors are mounted completely and the terminal box is completely closed.

Methods of cooling IC3W7
(EN 60034-6)

Coolant inlet temperature 10°C to 25 °C max. 5 K lower than ambient temperature
Observe derating for higher coolant inlet temperatures.

Terminal box NDE Top

Water connection DE Side

Main connection Terminal box: U V W + temperature sensor

Encoder connection Connector socket 12- or 17-pin
Plug Endat 2.2 9-pin

Thermal motor protection (EN 60034-11)	Temperature sensor 2 x PT1000 (1 x active + 1 x substitute) in stator winding		
Winding insulation (EN 60034-1)	Insulation class F (9 = 155 °C)		
Surface	Matte black		RAL 9005
Bearings	DE:	Standard:	Floating bearing: Ball bearing
		Option :	Roller bearing
	NDE:		Fixed bearing: Ball bearing
Service life of bearing	L10H 20.000 h, guide value, rolling bearings with long-term grease lubrication		
Vibration resistance (EN 60034-14)	A	Standard	
	B	Option, ball bearing only	
Concentricity (DIN 42955)	N	Standard	
	R	Option, ball bearing only	
Vibration resistance	See ► Vibrations and resistance to vibrations		
Flange	FF flange according IEC standard		
Shaft end	Cylindrical	According DIN 748, centering with inside thread, according to DIN 332 form D, option: with featherkey according to DIN 6885	
Weight	Standard types: 82 - 160 kg		
Approvals	CE, cURus		

2.1 Winding insulation

The motors are designed for operation with converters with a DC link voltage of up to 640 V. The motors can be operated at higher DC link voltages.

At higher DC link voltages, ensure that voltage peaks of >1200 V at the motor terminals are prevented by taking appropriate measures. This can be achieved, for example, by installing suitable filters in the motor supply cable. When operating braked applications, it must also be ensured during the braking process that the voltage at the motor terminals never exceeds 1200 V.

This ensures that the winding insulation is not damaged, thus preventing short circuits.

2.2 Installation conditions

Environment



WARNING!

The use in hazardous areas is forbidden, unless explicitly provided for this purpose (regard additional notes). Furthermore, there may not be flammable gas mixes and dangerous dust concentrations in the vicinity of the electric motor. Voltage-carrying and hot motor parts could cause fire and severe injuries and material damages.

If there should be the special case of the use in systems which are not industrial, higher demands are required (e.g. protection against children's fingers), these conditions must be ensured at installation of the system.



NOTE!

Please, take note of any deviating details specified on the type plate or in the technical documentation. The conditions at the place of use must correspond to the details on the rating plate.

The motor can be installed in roofed rooms complying with the degree of protection in dusty or damp environment and under normal climatic conditions.

Unless different arrangements have been made, the motor is designed by default for the following climatic conditions:

- Ambient temperature 0 °C bis 40 °C
- Installation height ≤ 1000 m above sea level
- Relative humidity 5 % to 85 %
- Absolute humidity from 1 g/m³ to 25 g/m³

All other allowed application conditions have to correspond to DIN EN 60721-3-3 (class 3K3/3Z12).

It is absolutely imperative to comply with these climatic conditions when installing the motor.

Aggressive, corrosive, abrasive and plastic-dissolving solutions should be kept well away from the motor and the air that is used to cool it.

Consultation with the motor manufacturer is essential in the case of installation outdoors.

2.3 Specifications for water-cooling



The safety regulations of the accordant corrosion and nucleation protection manufacturer must be observed.

Coolants from operating processes may not be used to cool the motor!

In view of harmful deposits the filling of a closed cooling system should be made in the cooling channels or cables using filtering at all times (filtering resolution < 0,1 mm). At the open cooling system in any case a filtering must be provided.

Only closed and semi-open cooling circuits are permitted for engines.



NOTE!

The system manufacturer is responsible for the engineering of the entire cooling system.

Condensation of water must be avoided in any case.



Parts of the cooling system (e.g. sealing) can be overloaded by water surge pressure. The maximal pressure values shown in [► Specifications referring to the required cooling flows ◀](#) on page 15 must not be exceeded.

To avoid water surge pressure or reduce their effects, it is recommended:

- Control valve in water supply, placed as far away as possible from the motor
- Use of suitable pressure relief valves (bypass)

2.3.1 Specifications referring to the required cooling flows

Motor type	Volume current [l/min]	Pressure drop $\pm 15\%$ [bar]	Heating [K]	Max. coolant pressure [bar]	Connection (G—inside thread)
DS4-132AA	9	0.25	5	6	2 x G ½" 1x inlet 1x outlet
DS4-132BB			6		
DS4-132CC			7		
DS4-132DD			8		
DS4-132EE			9		
DS4-132FF			10		

2.3.2 Media-contacting materials in the motor

The following media-contacting materials are used in the motor:

- Cooling system: Aluminum, KTL coated
- Connection: Steel zinc-plated
- Seals: NBR

2.3.3 Motor cooling

Additions of corrosion and nucleation protections may be used in closed cooling systems performed accordingly to the coolant's characteristic complying with [► Specification of cooling water ◄](#) on page 18). Type and quantity is based upon the accordant recommendations of the manufacturer and of the prevailing environmental conditions.

2.3.4 Cooling circuits

Reduction factors for water as a coolant, refer to [► Definition of performance for water-cooled machines ◄](#) on page 21.

Closed cooling circuit

In the closed cooling circuit (see figure below), the cooling water tank is closed and thus no oxygen can enter the circuit.

This ensures very low water consumption and stable water quality.

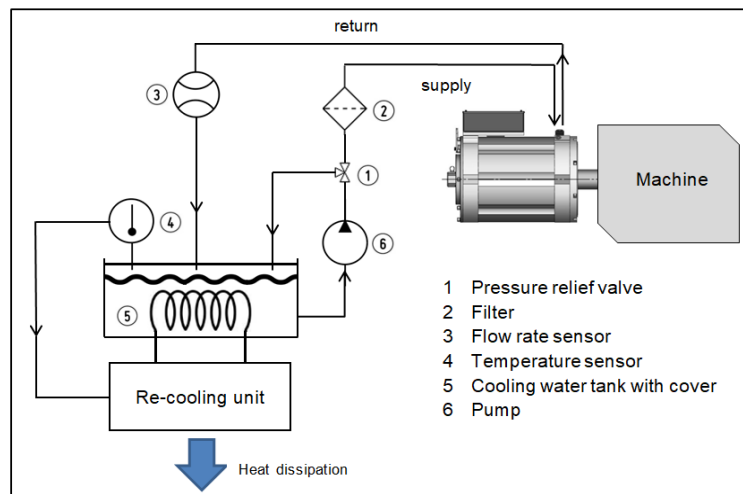


Figure 1: Example of a closed cooling circuit

Semi-open cooling circuit

The semi-open cooling circuit (see figure below) has an open cooling water tank and is otherwise constructed like the closed cooling circuit.

This prevents the accumulation of corrosion products in the circuit.

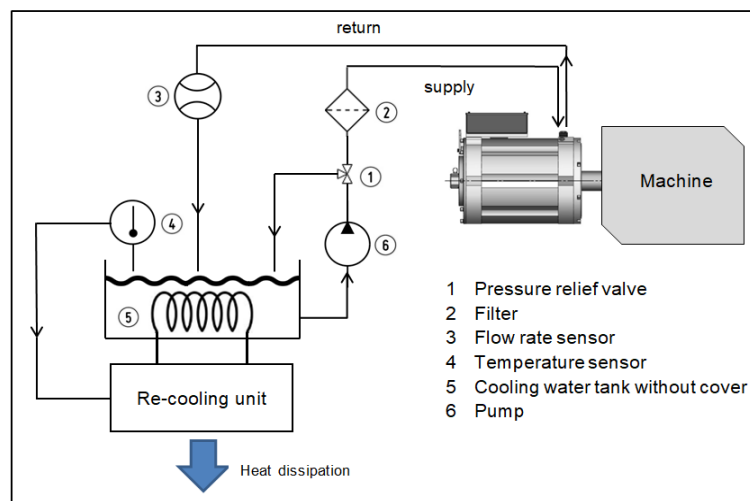


Figure 2: Example of a semi-open cooling circuit

Overview of refrigeration unit manufacturers

- | | |
|---|--|
| ▶ ait-deutschland GmbH | www.kkt-chillers.com |
| ▶ BKW Kälte-Wärme-Versorgungstechnik GmbH | www.bkw-kuema.de |
| ▶ DELTATRHERM Hirmer GmbH | www.deltatherm.de |
| ▶ Glen Dimplex Deutschland GmbH | www.riedel-cooling.com |
| ▶ Helmut Schimpke und Team Industriekühlanlagen | www.schimpke.org |
| ▶ Hydac System GmbH | www.hydac.com |
| ▶ Hyfra Industriekühlanlagen GmbH | www.hyfra.de |
| ▶ Parker Hannifin GmbH | www.ph.parker.com |
| ▶ Pfannenberg GmbH | www.pfannenberg.com |
| ▶ Technotrans SE | www.technotrans.de |



NOTE!

You can also use equivalent cooling units from other manufacturers.
The responsibility for the quality of third-party products lies with the plant manufacturer.

2.3.5 Specification of cooling water

The cooling water must comply with the following requirements:

	Unit	Value
Permitted system pressure at maximum	bar	6
Temperature of 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
Permissible particle size, solid bodies, particles (e.g. sand)	mm	< 0.1

Clear water free of suspended particles and dirt must be used as the coolant.

Sufficient additives must be added for corrosion protection and germ protection. The type and amount of additives to be added depends on the respective recommendations of the manufacturers of these additives and the respective environmental conditions.

2.3.6 Minimum coolant temperature in dependence of the environmental conditions.

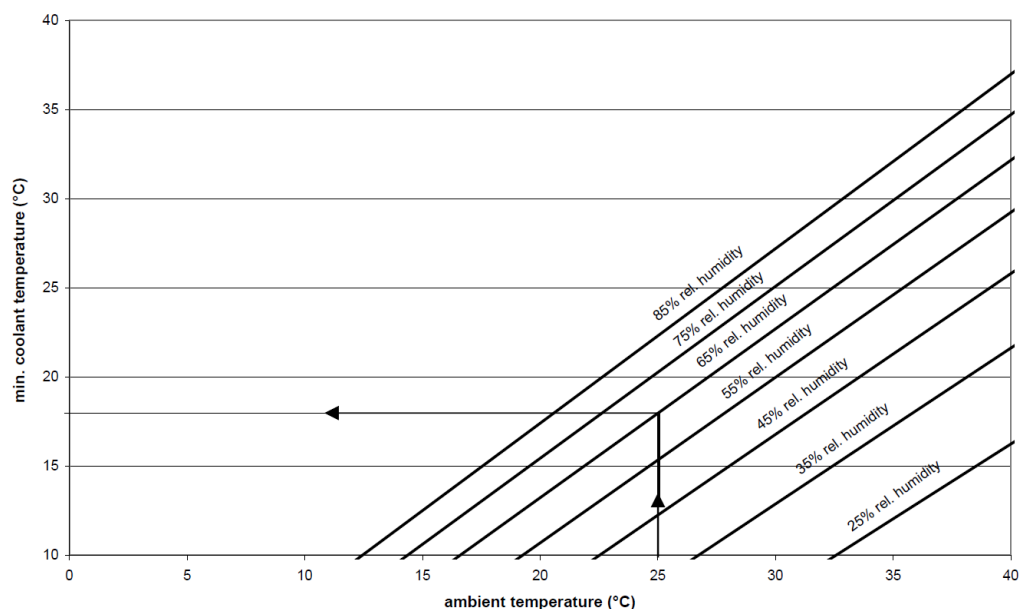


Figure 3: Evaluation of coolant temperature

The permitted temperature of the coolant is dependent of the relative humidity during the operation and the ambient temperature. For example a minimum coolant inlet tempera-

ture of 18 °C is permitted at an ambient temperature of 25°C and a relative humidity of 65 %. The presented characteristics in the diagrams are limit characteristics. Therefore, in the example a coolant inlet temperature of greater 18°C should be selected.

If the minimum permitted coolant entry temperature is fallen below, the 2-point controller of the Baumüller drive electronics must be used, to avoid condensation



NOTE!

At a longer standstill of the motor the coolant supply must be interrupted (avoidance of condensation).

At a longer standstill ambient temperatures <3 °C can occur, the coolant is to be drained as a precautionary measure (Avoidance of frost damage).

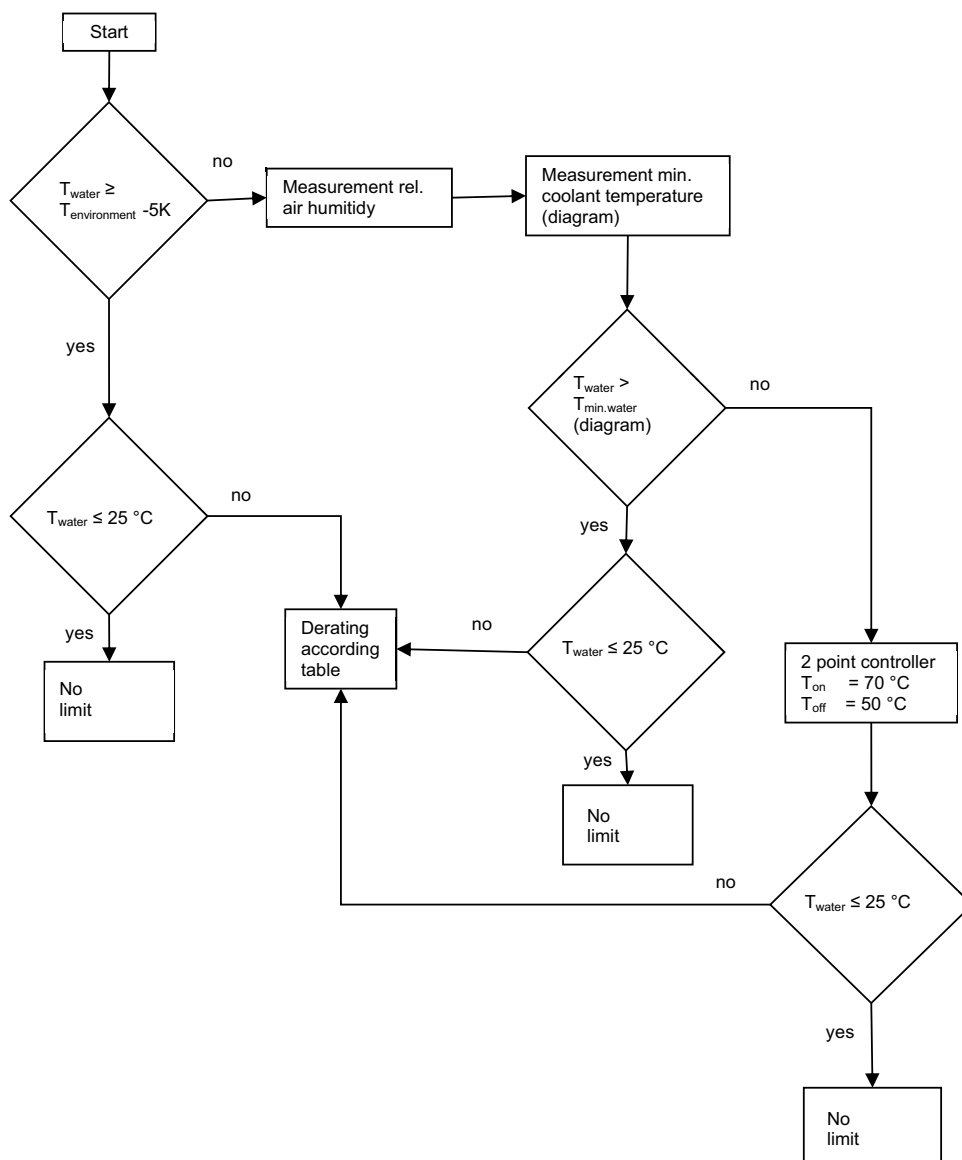


Figure 4: Function chart coolant entry temperature

2.4 Definition of performance for water-cooled machines

The mentioned performances (torques) apply to the continuous operation S1 with rated speed as long as the demands to the cooling system for water-cooled motors are complied with!

During the operation of the motors with higher coolant inlet temperatures the reduction factors below must be considered:

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

2.5 Motor data

Explanation of motor data

n_N	Rated speed [min^{-1}]
M_0	Standstill torque [Nm] at speed $\geq 1 \text{ min}^{-1}$ for an unlimited period of time
I_0	Standstill rms current [A] at M_0
$M_{0,\text{max}}$	Maximum standstill torque [Nm] at maximum current [A] and speed = 0, for a short time
$I_{0,\text{max}}$	Standstill current [A] at $M_{0,\text{max}}$; $I_{0,\text{max}}$ is rms value
P_N	Rated power [kW] at M_N and n_N (see power definition)
M_N	Rated torque [Nm]
I_N	Rated rms current [A]
$K_{E/\text{KALT}}$	Voltage constant (EMK) [$\text{V}/1000 \text{ min}^{-1}$]
f_N	Rated frequency [Hz]
J	Rotor moment of inertia [kgcm^2]
m	Motor mass [kg]

The specified rated power and torque at rated speed are achieved during converter operation with a clock frequency in the power section of $\geq 4 \text{ kHz}$.

A clock frequency of $> 6 \text{ kHz}$ is recommended.

The possibility of field weakening is assumed for the converters to be used.

The **size maXX** drive configurator at www.baumueller.com is available for designing the motors and the entire drive system.

DS4-132..54W Mains voltage 3 x 400V_{AC} for converters with unregulated supply

Motor	n min ⁻¹	M ₀ Nm	I ₀ A	M _{0,max} Nm	I _{0,max} A	P _N kW	M _N Nm	I _N A	K _{E/cold} V/1000 min ⁻¹	f _N Hz	J kgm ²	m kg	KSK
DS4-132AA54W-10	1000	190	39,3	350	79	19,3	185	38,6	282	50	0.041	86	24
DS4-132BB54W-10		250	51	465	103	26	245	50	287		0.053	103	24
DS4-132CC54W-10		315	61	585	122	32	305	60	301		0.065	119	24
DS4-132DD54W-10		380	74	700	147	39	370	73	301		0.077	136	24
DS4-132EE54W-10		435	85	815	170	44	425	83	303		0.089	150	24
DS4-132FF54W-10		495	98	935	200	51	485	96	299		0.101	165	24
DS4-132AA54W-15	1500	190	57	350	115	28	180	55	193	75	0.041	86	24
DS4-132BB54W-15		250	74	465	147	38	240	71	201		0.053	103	24
DS4-132CC54W-15		315	89	585	175	47	300	86	207		0.065	119	24
DS4-132DD54W-15		380	113	700	225	57	365	108	197		0.077	136	24
DS4-132EE54W-15		435	128	815	260	65	415	122	201		0.089	150	24
DS4-132FF54W-15		495	142	935	285	74	470	136	206		0.101	165	24
DS4-132AA54W-20	2000	190	73	350	147	37	175	69	152	100	0.041	86	24
DS4-132BB54W-20		250	89	465	175	47	225	83	166		0.053	103	24
DS4-132CC54W-20		315	118	585	235	61	290	111	157		0.065	119	24
DS4-132DD54W-20		380	145	700	285	74	350	136	154		0.077	136	24
DS4-132EE54W-20		445	165	820	325	85	410	155	160		0.089	150	24
DS4-132FF54W-20		505	185	935	370	98	465	175	160		0.101	165	24
DS4-132AA54W-25	2500	190	88	350	175	44	170	80	125	125	0.041	86	24
DS4-132BB54W-25		250	112	465	225	58	220	102	131		0.053	103	24
DS4-132CC54W-25		315	144	585	285	73	280	131	128		0.065	119	24
DS4-132DD54W-25		380	175	700	345	88	340	160	128		0.077	136	26
DS4-132EE54W-25		445	200	820	400	102	390	180	130		0.089	150	26
DS4-132FF54W-25		505	240	935	475	118	450	215	125		0.101	165	26
DS4-132AA54W-30	3000	190	99	350	200	49	155	86	112	150	0.041	86	24
DS4-132BB54W-30		250	129	465	260	65	210	113	114		0.053	103	24
DS4-132CC54W-30		315	175	585	345	85	270	150	106		0.065	119	26
DS4-132DD54W-30		380	200	700	400	101	320	175	110		0.077	136	26
DS4-132EE54W-30		445	240	820	475	116	370	205	109		0.089	150	26
DS4-132FF54W-30		505	265	935	525	130	415	225	113		0.101	165	27
DS4-132AA54W-35	3500	190	123	350	245	56	155	102	90.5	175	0.041	86	24
DS4-132BB54W-35		250	155	465	305	73	200	126	96.7		0.053	103	24
DS4-132CC54W-35		315	200	585	400	94	255	165	92		0.065	119	26
DS4-132DD54W-35		380	240	700	475	113	310	200	93.1		0.077	136	26
DS4-132EE54W-35		445	265	820	525	123	335	210	99.2		0.089	150	27
DS4-132FF54W-35		505	330	935	660	145	395	260	90.1		0.101	165	28

Motor	n min ⁻¹	M ₀ Nm	I ₀ A	M _{0,max} Nm	I _{0,max} A	P _N kW	M _N Nm	I _N A	K _{E/cold} V/1000 min ⁻¹	f _N Hz	J kgm ²	m kg	KSK
DS4-132AA54W-40	4000	190	143	350	285	61	145	112	77.4	200	0.041	86	24
DS4-132BB54W-40		250	175	465	345	79	190	135	85.1		0.053	103	26
DS4-132CC54W-40		315	220	585	435	99	235	170	84.8		0.065	119	26
DS4-132DD54W-40		380	265	700	525	119	285	205	84.4		0.077	136	27
DS4-132EE54W-40		445	295	820	585	127	305	215	89		0.089	150	27
DS4-132AA54W-45	4500	190	150	350	305	62	130	110	73	225	0.041	86	24
DS4-132BB54W-45		250	200	465	400	84	175	145	73.6		0.053	103	26
DS4-132CC54W-45		315	265	585	525	105	225	190	70.3		0.065	119	27
DS4-132DD54W-45		380	295	700	585	125	265	215	75.7		0.077	136	27
DS4-132EE54W-45		445	330	820	660	130	275	220	78.9		0.089	150	28
DS4-132AA54W-50	5000	190	160	350	325	62	120	107	68.7	250	0.041	86	24
DS4-132BB54W-50		250	220	465	435	85	160	145	67.8		0.053	103	26
DS4-132CC54W-50		315	295	585	585	105	200	190	63.1		0.065	119	27
DS4-132DD54W-50		380	330	700	660	124	235	215	67.1		0.077	136	28

2.6 Temperature sensor

The motors are equipped with a temperature sensor in the stator winding as standard. This allows the motor controller to monitor the temperature. The sensor is connected via the terminal box.

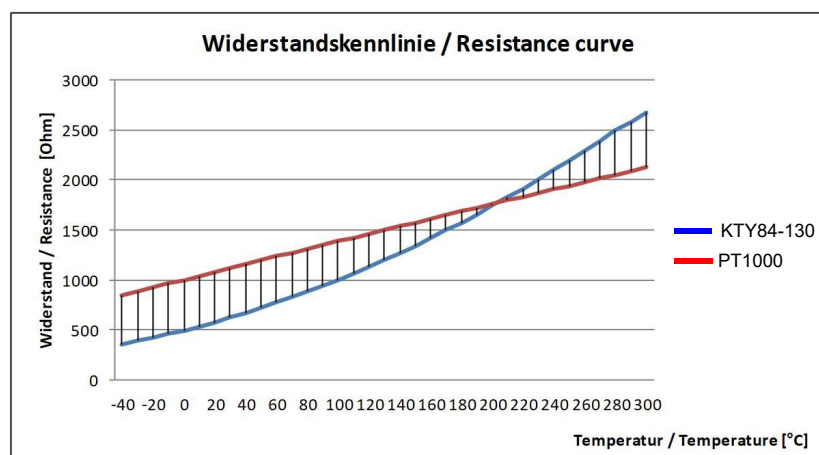


Figure 5: Resistance curve temperature sensor

The temperature sensor PT1000 continuously monitors the motor temperature. If the sensor is supplied with a measured current of 2 mA the above shown resistance curve results.

Additional PTCs or thermal switches can be installed upon request.

2.7 Balancing, output elements and vibrations



Don't stress the shaft and the bearings with shocks.
Axial forces aren't permitted during the mounting and demounting of output elements.
The required measures referring to the contact protection of the output elements in general must be regarded.
If a motor is put into operation without output elements then the featherkey must be protected against being ejected.



NOTE!

Regard the identification of the balancing type at the shaft end face:

H = Balancing with half the featherkey Standard type

F = Balancing with the complete featherkey Special type

Balancing

In the standard version with featherkey the rotor is dynamically balanced with a half featherkey (accordant to EN 60034-14 / ISO 8821 / ISO 21940).

Output elements

When mounting the output elements the accordant balancing must be considered. The output elements must be balanced complying with ISO 21940.

When fitting and removing the output elements (e.g. coupling disks, rack-wheels, pulley wheels) adequate facilities must be used.

- Use thread hole in the end of the shaft.
- During removal use spacing washers to mechanically protect the shaft.
- If required before fitting warm up the output elements (max. permitted temperature at the shaft end is 150 °C for a short time).

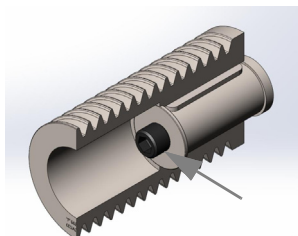


NOTICE!

- At the shaft version without featherkey the drive elements are to be fixed on the output shaft **by means of appropriate clamping sets**.
- At shaft versions with featherkey it must be considered that the **output elements are applied to the shaft shoulder**.

Note: The bevel and the radius at the output element and the shaft radius towards the shoulder (accordant to DIN748-1) must be compatible.

- If the threaded hole in the shaft end is used to protect the output elements axially (e.g. pulley wheels), the tightening torques in following table may not be exceeded:



Thread	Tightening torque in Nm
M3	1,1
M4	2,6
M5	5,0
M6	9,0
M8	22,0
M10	44,0

Figure 6: Tightening torques using the example of a locking bolt S of a pulley wheel



NOTE!

Appropriate measures are to be used to protect the screws!

Vibrations



Notice!

The system's vibration response at the location caused by output elements, installation options, alignment and setup as well as influences of external vibrations can cause an increase of vibration values at the motor.

Considering a correct functioning of the motor and a long bearing service life the permitted vibration values accordant to EN 60034-14 may not be exceeded. It may be necessary to balance the complete rotor with the drive element (according to ISO 21940).

The limited vibration loads and accelerations after mounting are not to be exceeded, see [► Vibrations and resistance to vibrations ◄](#).

At changes compared with the normal operation – e.g. increased temperatures, noises, vibrations – the motor is to be switched off in case of doubt, the cause is to be evaluated and the manufacturer is to be contacted if required.

2.8 Bearing and shaft load

All machines are equipped with rolling bearings. Normally, the drive end DE is fitted with a loose bearing (ball bearing) and the non-drive end NDE with a fixed bearing (ball bearing).

For applications where increased radial forces may occur—for example, when using pulleys—the machines are available with roller bearings on the DE.

Please specify the radial forces when ordering.

Bearing standard:

Size	DE	NDE
132	6312 2ZRC3	6310 2ZRC3

Bearing option roller bearing DE:

Size	DE
132	NU 312E



NOTE!

For the “Roller bearing DE” option, the rotor is secured with a transport lock by default. The transport lock must remain in place during transport and may not be removed until immediately before an output element is mounted.

If the machine is transported after an output element has been mounted, appropriate measures must be taken to secure the rotor axially and radially.

Calculation of radial forces F_R

When using pulleys, the radial load is calculated as follows:

$$F_R = k \frac{2 \cdot 10^7 \cdot P_N}{n \cdot D}$$

P_N = Nominal power in kW
 n = Nominal speed in min^{-1}
 D = Disc diameter in mm

The belt tension factor k is approximately:

$k = 1.8 \dots 2.5$ for V-belts

$k = 2.2 \dots 3.5$ for flat belts

$k = 1.1 \dots 1.5$ for tooth belts

(Follow the belt manufacturers' specifications!)

To ensure reliable torque transmission, it is necessary to utilize the entire effective length of the key. Failure to do so may result in excessive contact pressure on the key, which could cause the motor to fail. The pulley must be mounted all the way onto the shaft collar and may be axially secured using the following maximum tightening torques.

Screw	M5	M6	M8	M10	M12	M16	M20
Tightening torque	2,2 Nm	4 Nm	10 Nm	19 Nm	33 Nm	80 Nm	160 Nm

2.9 Radial force diagrams

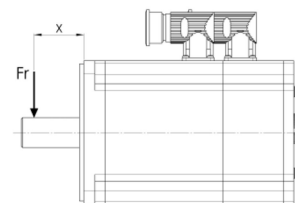
All bearings are designed for a service life of 20,000 h L_{10h} . The load values specified below may thereby not be exceeded. The permissible radial forces F_r are valid only for the horizontal installation of the motor without additional axial forces.

Furthermore, the specified average speeds must be adhered to reach the grease consumption period of 20,000 h under the following conditions:

- Low-vibration applications
- Horizontal installation
- Oscillatory bearing motion in which at least one pivot angle of 180° is performed
- Continuous bearing temperatures $<120^\circ \text{ C}$.

Axial loading on the motor shaft is generally not permitted. No axial forces may develop when mounting clutches, pulleys, etc. on the motor shaft!

Sample diagram



Force application $x = 30 \text{ mm}$ from the shaft shoulder
Bearing service life 20000 h

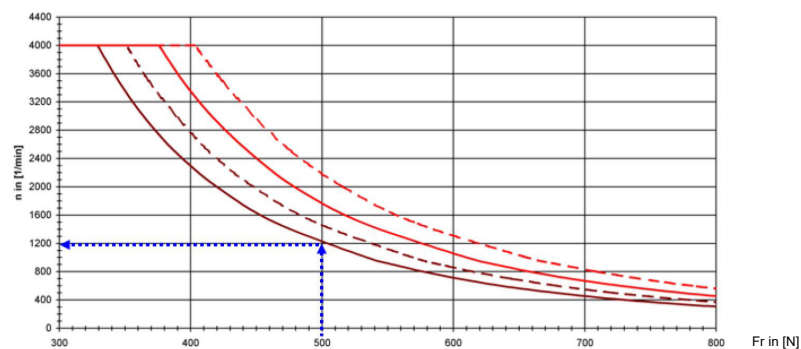


Figure 7: Sample diagram radial force ball bearing

The potential maximum speed of the bearing can be calculated via radial force F_r of the application in characteristic "ball bearing".

At a radial force of 500 N with a force application point of $x = 30 \text{ mm}$ from the shaft shoulder, a maximum speed of 1200 rpm results.

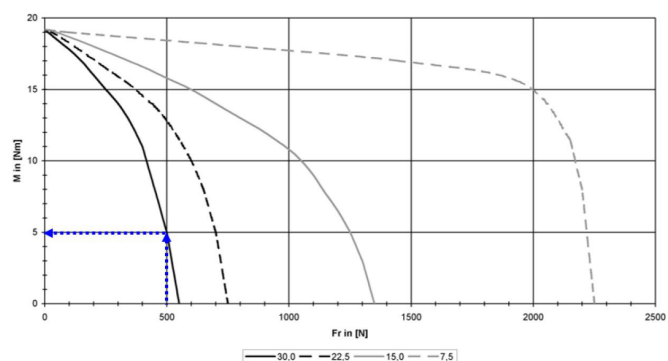


Figure 8: Sample diagram radial force shaft

The maximum torque to be still transmitted results from the characteristic "shaft". At a centrifugal force of 500 N with a driving force point of $x = 30$ mm from the shaft shoulder, a torque to be still transmitted of 5 Nm results.

Ball bearing

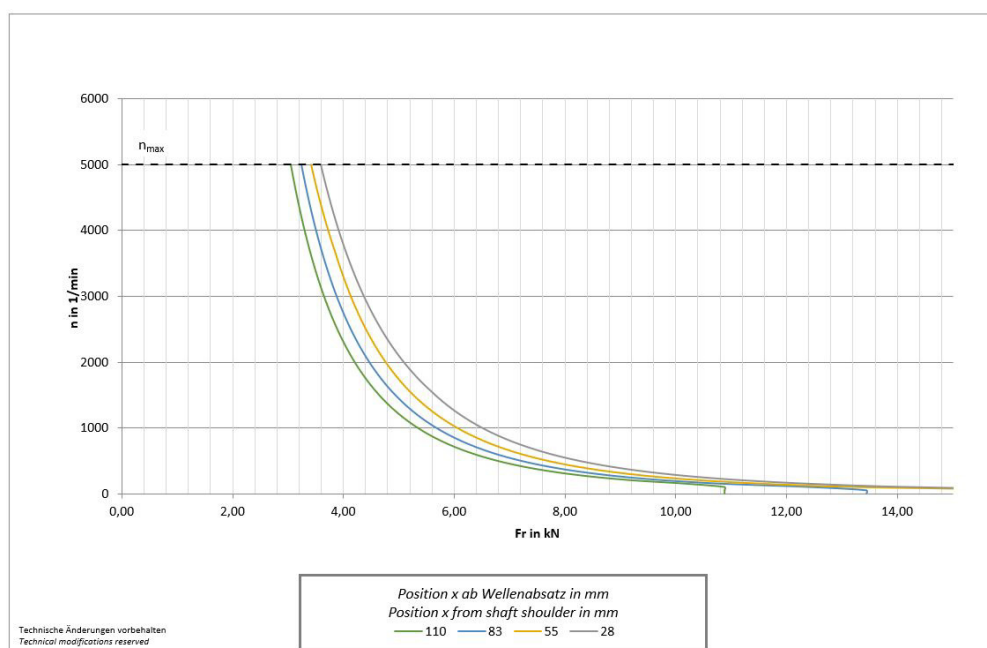


Figure 9: Radial force diagram ball bearing

Roller bearing

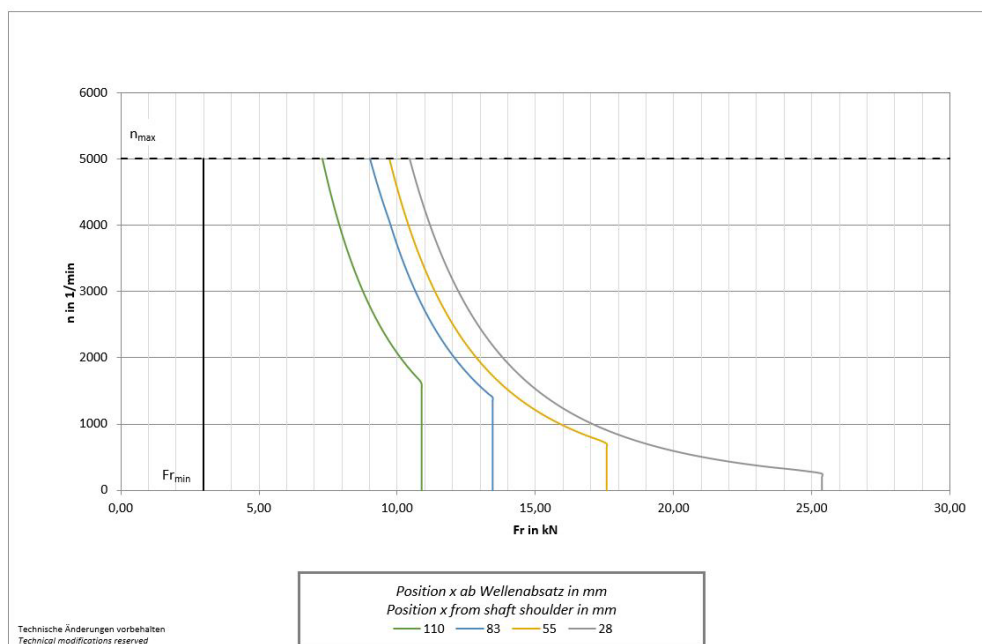


Figure 10: Radial force diagram roller bearing

Shaft

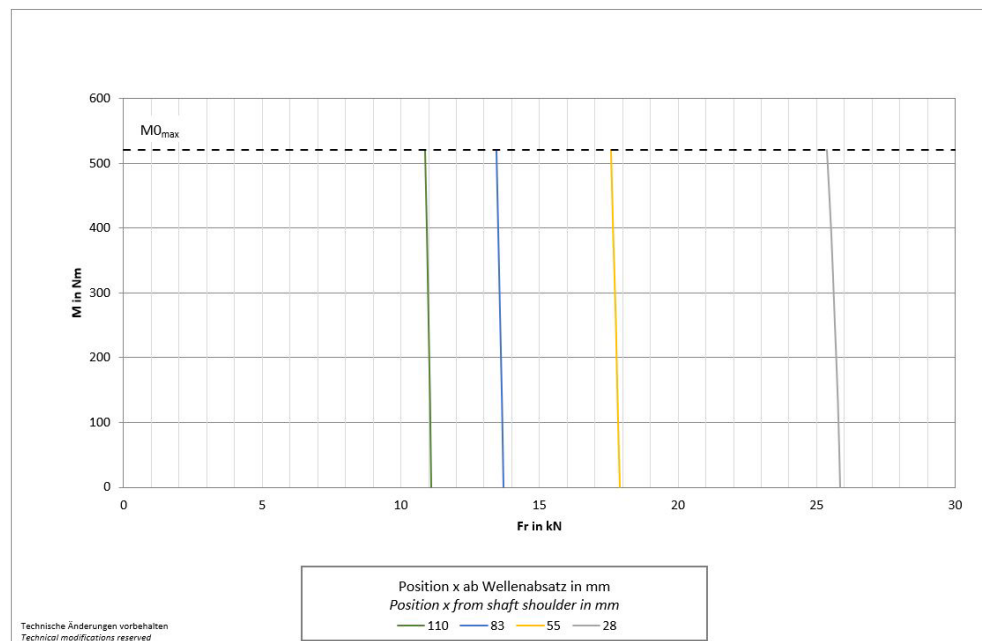


Figure 11: Radial force diagram shaft

2.10 Holding brake

The motors can be optionally equipped with a holding brake. The holding brake is a backlash-free permanent magnetic brake. The brakes work according to the closed current principle, i.e. the brake is applied when switched off (or at a failure of the operating voltage). The brakes are designed for an operating voltage of 24 V_{DC}. The specifications by the brake manufacturer apply at room temperature.

The motors are available with the following holding brakes:

Motor	Brake type	Brake torque M_B	Input power	Current at 24 V _{DC}	Max. perm. switching work per switch W_{per}	Applying time	Release time	Moment of inertia	Max. perm. speed	Weight
		[Nm]	[W]	[A]	[kJ]	[s]	[s]	[kgm ²]	[min ⁻¹]	[kg]
DS4-132	SB 200	200	170	6.5	20	0.225	0.3	0.0040	3000	13

When using the **holding brake**, please note the following:

- A maximum of **3 emergency stops** (individual braking operations) per hour are possible when evenly distributed
- The values for the switching times apply to AC-side switching, in a cold state, with the standard air gap and holding brake
- Applying time - time until the braking torque is reached
- Release time - time until the brake is fully released (brake without torque)
- All specifications apply to installation on a horizontal shaft
- For vertical operation, consult the supplier
- Requirements differing from this overview are available upon request

Braking time/ switching work

It is necessary to check the brake for its intended application. To do this, the shift effort must be determined.

Calculation of braking time [t_B]

t_B	Braking time
ΣJ	Total moment of inertia in kgm ² = $J_{mot} + J_{zus}$ (referred to the motor shaft)
J_{mot}	Motor moment of inertia in kgm ²
J_{zus}	Additional moment of inertia in kgm ² (referred to the motor shaft)
Δn	Motor speed in min ⁻¹
M_B	Braking torque in Nm
M_L	Torque in Nm (calculated as positive if it has a braking effect, and as negative if it has an accelerating effect)
t_0	Time in s from the moment the brake is applied until the braking torque is fully developed (response time)
I	Number of work cycles per hour
W_{zul}	Max. permitted switching work

$$t_B = \frac{\sum J \cdot \Delta n}{9,55 \cdot (M_B \pm M_L)} + t_0 \quad \text{in s}$$

Calculation of
switching work
[W_R]

$$W_R = \frac{\sum J \cdot \Delta n^2}{182,4} \cdot \frac{M_B}{(M_B \pm M_L)} \quad \text{in } \frac{\text{Joule}}{\text{Switching}}$$

Calculation of
switching power
[P_R]

$$P_R = \frac{W_R \cdot i}{1000} \quad \text{in } \frac{\text{kJ}}{\text{h}}$$

$$W_{\text{permitted}} \leq \text{Value from table } \textcolor{blue}{\triangleright \text{Motor} \triangleleft}$$

In most cases, t_0 is negligibly small. If this is not the case and the time t_0 needs to be reduced, this can be achieved by interrupting the magnetic circuit on the DC side. However, this measure must be known before the braking motor is designed.

DESIGN AND OPERATION

This chapter describes the **DS4-132** motors and explains the type code of this motor.

3.1 Description of the product

The three-phase synchronous motors type **DS4-132** are water-cooled with permanent magnets.

Because of a very high power density, a very high power factor and high dynamic movement, the motors are developed for high level machines. Additionally a high overload is provided. The robust and compact motors are almost maintenance-free, this is an advantage for a economic operation.

The water-cooling provides a very compact construction and reduces the noise emission.

3.2 Type plate

The type plate is the identifier for each Baumüller motor. Especially, the accordant motor number is distinctive for each electric motor – this number is essential to make a back-tracking in our company possible. Therefore the type plate always must be readable. Never remove the type plate from your motor.

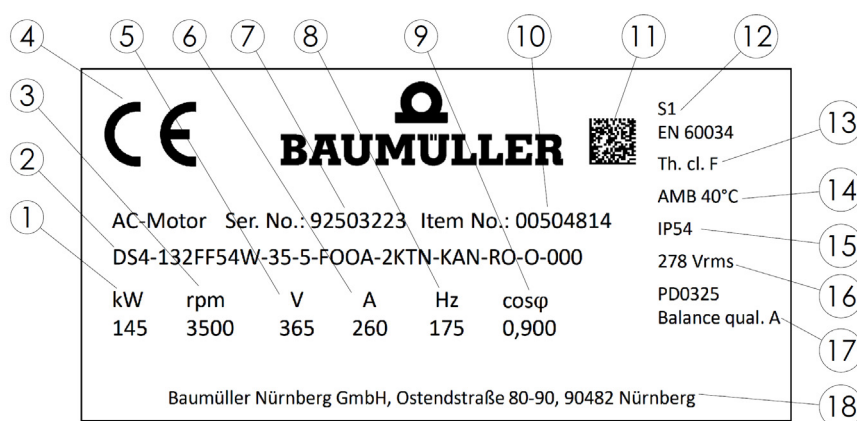


Figure 12: Type plate

1	Rated power P_N
2	Motor type
3	Rated speed n_N
4	Standards and approvals
5	Rated voltage U_N
6	Rated current I_N
7	Motor number
8	Rated frequency
9	Power factor
10	Part No.
11	2D code
12	Motor operation mode
13	Temperature class
14	Ambient temperature
15	Type of protection
16	Induced voltage at nominal speed
17	Vibration resistance
18	Manufacturer address

3.3 Type code

DS4-XXXXXXXX-XX-X-XXXX-XXXX-XXX-XX-X-XXX	Type
DS4- <u>XXX</u> XXXXX-XX-X-XXXX-XXXX-XXX-XX-X-XXX	Size 132
DS4-XXX <u>XX</u> XXX-XX-X-XXXX-XXXX-XXX-XX-X-XXX	Length AA BB CC DD EE FF
DS4-XXXXXX <u>XX</u> X-XX-X-XXXX-XXXX-XXX-XX-X-XXX	Type of protection 54 - IP54
DS4-XXXXXXXX <u>X</u> -XX-X-XXXX-XXXX-XXX-XX-X-XXX	Cooling W - Water-cooling
DS4-XXXXXXXX- <u>XX</u> -X-XXXX-XXXX-XXX-XX-X-XXX	Nominal speed class 10 - 1000 min ⁻¹ 15 1500 min ⁻¹ 20 2000 min ⁻¹ 25 - 2500 min ⁻¹ 30 3000 min ⁻¹ 35 3500 min ⁻¹ 40 4000 min ⁻¹ 45 4500 min ⁻¹ 50 5000 min ⁻¹
DS4-XXXXXXXX-XX- <u>X</u> -XXXX-XXXX-XXX-XX-X-XXX	U _{DC link} - DC 5 - 540 V

DS4-XXXXXXXX-XX-X- <u>X</u> XXX-XXXX-XXX-XX-X-XXX	Encoder type O - Without encoder * A - Resolver D - SRS50 E - SRM50 F - ECN1313 G - EQN1325 H - ECN1325 I - EQN1337 L - SEK37 M - SEL37 Y - ECI1319 X - EQI1331 * On request
DS4-XXXXXXXX-XX-X- <u>X</u> XX-XXXX-XXX-XX-X-XXX	Encoder option O - Without Option E - With electronic Baumüller type plate S - Safety T - With electronic Baumüller type plate + safety
DS4-XXXXXXXX-XX-X- <u>X</u> XX-XXXX-XXX-XX-X-XXX	Brake O - Without brake B - With spring brake
DS4-XXXXXXXX-XX-X- <u>X</u> XX-XXXX-XXX-XX-X-XXX	Shaft option A - Smooth shaft B - With featherkey
DS4-XXXXXXXX-XX-X- <u>X</u> XXX-XXXX-XXX-XX-X-XXX	Construction type 1 - IM B3 2 - IM B5
DS4-XXXXXXXX-XX-X- <u>X</u> XXX-XXXX-XXX-XX-X-XXX	Type of main connection K - Terminal box (with PT1000) N - Terminal box (PT1000 on encoder connector)
DS4-XXXXXXXX-XX-X- <u>X</u> XXX-XXXX-XXX-XX-X-XXX	Position main connection T - Top
DS4-XXXXXXXX-XX-X- <u>X</u> XXX-XXXX-XXX-XX-X-XXX	Outlet main connection T - Top L - Left with view DE to shaft end R - Right with view DE to shaft end N - NDE
DS4-XXXXXXXX-XX-X- <u>X</u> XXX-XXXX-XXX-XX-X-XXX	Bearing K - Ball bearings A/B (standard: single-row deep groove ball bearings) R - Roller bearings on DE

DS4-XXXXXXXX-XX-X-XXXX-XXXX- <u>X</u> X-XX-X-XXX	Vibration resistance A - Vibration resistance A B - Vibration resistance B
DS4-XXXXXXXX-XX-X-XXXX-XXXX- <u>X</u> X-XX-X-XXX	Concentricity N - Normal R - Reduced
DS4-XXXXXXXX-XX-X-XXXX-XXXX-XXX- <u>X</u> X-X-XXX	Position cooling T - Top B - Bottom L - Left with view DE, foot bottom R - Right with view DE, foot bottom
DS4-XXXXXXXX-XX-X-XXXX-XXXX-XXX- <u>X</u> X-X-XXX	Option cooling O - Without cooling option
DS4-XXXXXXXX-XX-X-XXXX-XXXX-XXX- <u>X</u> -XXX	Gear / pump mounting O - Without gear and without pump mounting
DS4-XXXXXXXX-XX-X-XXXX-XXXX-XXX-XX-X- <u>XXX</u>	Special version 000 - No special version

TRANSPORT AND PACKAGING

4.1 Safety notes for transport

**NOTICE!****Damage due to unauthorized transport!**

Transport handled by untrained personnel can lead to a substantial amount of material damage.

Therefore:

- The unloading of the packages upon delivery as well as the in-house transport should only be done by trained personnel.
- Contact Baumüller Nürnberg GmbH sales office if necessary.

**WARNING!****Danger of mechanical hazard!**

Secure devices against falling down.

Therefore:

- Take suitable measures, such as supports, hoists, straps, etc., to ensure that devices cannot fall down.
- Use appropriate handling material.

**NOTICE!****Water-cooled motor!**

In order to avoid frost damage it must be ensured that there is no coolant in the motor during the transport or at a temporary storage at environmental temperatures $< 3\text{ }^{\circ}\text{C}$. The coolant can be purged with compressed air.

4.2 Scope of supply

The supply is compiled order-related.

- Damage that incurred during transit must immediately be reported to the transport company.
- Immediately after receiving the delivery compare the performance data of the delivered motor with your ordering data. If visible defects or insufficient delivery is determined then immediately contact the responsible Baumüller subsidiary or the main Baumüller company in Nuremberg.



WARNING!

The motor must not be commissioned in case of a visible transport damage.

4.3 Transport notes



The permitted environmental conditions that may act on the motor during the transport is to be taken of DIN EN 60721-3-2 (class 2K2/2M1). The permitted temperature range was contrary to the DIN reduced to -15 °C to $+60\text{ °C}$.

Suitable load carrying devices are to be used as for example belt straps, single slings etc. If the motor provides lifting lugs they must be used for lifting.

The terminal boxes and motor connectors may not be used as transport safety or as lifting lugs.

During transport the correspondent country-specific regulations must be complied with. Lifting devices, transport and load bearing devices must comply with the regulations.

The connection areas must be protected against corrosion. The motor have to be transported with the provided protection. Avoid damage of the connection areas.

Bearing lock



NOTICE!

Bearing lock!

On motors with cylinder roller bearings, the runner must be blocked at the end of the shaft in order to prevent damage during transit.

The transport protector **must** be used every time the machine is moved.

If this lock no longer can be used due to mounting of a drive element, other suitable means must be employed for axial fixing of the rotor for transport.

4.4 Intermediate storage

If a motor is not to be commissioned immediately after delivery, it should be stored inside a building in a dry, dust-free and low-vibration room ($V_{\text{eff}} \leq 0.2 \text{ mm/s}$).

The motors should not be stored longer than 2 years at a consistent temperature which is within the temperature range of -15 to $+60 \text{ }^{\circ}\text{C}$. Elevated storage temperatures within the framework of the working temperature accelerate the rate at which seals and bearing grease deteriorate and therefore have a negative impact on the service life even before the unit has been commissioned. Direct exposure to incident solar radiation, UV light and ozone also lead to an aging of the gaskets and must be avoided!

Please note that the warranty periods commence from the date of delivery. For this reason, we recommend that storage periods are kept to a minimum.

Should nevertheless a longer storage be necessary, the environmental conditions according to DIN EN 60721-3-1 (class 1K2/1M1) have to be observed. Contrary to the DIN, an extended temperature range of $-15 \text{ }^{\circ}\text{C}$ to $+60 \text{ }^{\circ}\text{C}$ is permitted.



NOTE!

Water-cooled motor

At a transport or intermediate storage temperature $< 3 \text{ }^{\circ}\text{C}$, the coolant has to be drained as a precautionary measure to avoid of frost damage. The cooling water can be blown out with compressed air.

4.5 Unpacking

After having received the still packaged device:

- Avoid transport shocks and hard jolts, e.g. when putting an item down.

If no transport damage is visible:

- Open the packaging of the device.
- Verify the delivery scope based on the delivery note.

File a claim with the responsible Baumüller representative if the delivery is incomplete.



NOTE!

Claim each individual deficiency as soon as it has been detected. Damage claims can only be validly asserted within the claim registration period.

4.6 Disposal of the packaging

The packaging consists of cardboard, plastic, metal parts, corrugated cardboard and/or wood.

- When disposing of the packaging, comply with the national regulations.

MOUNTING



NOTE!

Mounting shall only be performed by employees of the manufacturer or by other qualified personnel.

Qualified personnel are persons who – on account of their occupational training, experience, instruction and knowledge of relevant standards and stipulations, accident prevention regulations and operating conditions – are authorized by the persons responsible for the safety of the facilities to perform the respective activities that are necessary, while at the same time recognizing and preventing any potential risks. The qualifications necessary for working with the device are, for example:

- Occupational training or instruction in accordance with the standards of safety engineering for the care and use of appropriate safety equipment.



WARNING!

Danger as a result of incorrect mounting!

The mounting requires qualified personnel with adequate experience. Incorrect mounting can lead to life-threatening situations or substantial material damage.

Therefore:

- Only allow mounting to be performed by employees of the manufacturer or by other qualified personnel.



WARNING!

Danger of mechanical impact!

Secure devices against falling down.

- Before mounting

**WARNING!**

Never mount or commission a damaged motor.
Never install the motor in a damaged machine.
Before mounting the motor, make sure it is suitable for your machine.

- During mounting

**WARNING!**

Only mount the motor using the fastening features provided.
The motor should not be exposed to knocks, e. g., with a hammer, or shocks when mounting.
Make sure that all covers and safety devices are mounted. All safety devices must comply with the latest regulations (e. g. EN 60204).

Water-cooling:

In order to avoid damages of the housing screw-in glands with cylindrical internal thread may be used for the water connections (inlet / outlet), only.
From cooling pipes tensile loads, compression loads and torsional loads may not be applied to the motor connections.
The connection may only be executed by specialists. Thereby, the motor must be without current and voltage.
It must be considered that the cooling liquid doesn't reach the motor terminal box when coupling and uncoupling the cooling cables.

Bauform IM B5
Type of construction IM B5



5.1.1 Terminal box

Terminal box sizes may vary depending on the motor's rated currents.
EMC-compliant screw connections must be used.

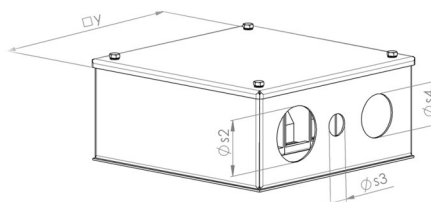


Figure 14: Terminal box

No.	Cable entry		Connection	Drilling	
	y [mm]	g1 [mm]		s2 [mm]	s3 [mm]
24	258	250	3 x M8	2 x M63x1.5	1 x M25x1.5
26	258	250	3 x M10	2 x M63x1.5	1 x M25x1.5
27	318	302	3 x M10	2 x M75x1.5	1 x M25x1.5
28	318	302	3 x M12	2 x M75x1.5	1 x M25x1.5

5.1.2 Location of terminal box and cable outlet directions

The terminal box is located on the NDE.

The terminal box can be installed in the following orientations::

- Terminal box, top
- Terminal box, left (when viewing the shaft end from the DE)
- Terminal box, right (when viewing the shaft end from the DE)

The following output directions for the main terminal connection can be configured depending on the location of the terminal box (see also the product configurator).

Size 132

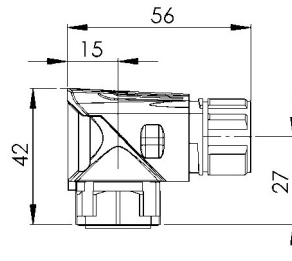
Cooling type	Position terminal box	Output direction main connection				
		top	bottom	left ²⁾	right ²⁾	NDE
Water cooling	top	-	-	☒	☒ ¹⁾	☒

¹⁾ Preferred option

²⁾ View from DE to shaft end

5.1.3 Dimension of encoder connection

Speedtec - Rotary angle socket



Speedtec - Mating connector

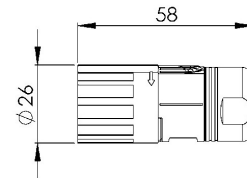


Figure 15: Dimensions of encoder connector

Rotary angle socket for ECN1325/EQN1337

(Mating connector not available separately)

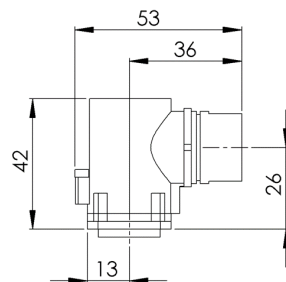


Figure 16: Dimensions of encoder connector ECN1325/EQN1337

5.2 Installation, mounting

Prior to and during mounting, check that:

- The motor is not damaged (e. g. the shaft sealing ring must not have sustained any damage at all from sharp or pointed objects).
- The motor is not mounted in the danger zone of other equipment.
- The motor is used in accordance with its intended purpose:
Observe type plate details, warning labels, and signs.
- Anti-corrosion agents have been fully removed from the shaft ends.
If a common solvent such as acetone or a cleaning solvent is used, it must not be allowed to wet the shaft sealing ring.
- The motor is designed for the ambient conditions and environmental influences on site (see ► [Installation conditions](#) ◄ on page 14).
- The mounting space in the machine is suitable for the cooling method employed for the motor. The space for installing of the cooling connections must be provided.

- In order to connect the motor and to execute inspection and maintenance workings there must be enough space in the machine.
The mounting dimensions of the motor including the tolerance specifications can be taken from [► Dimensions ◄](#) on page 43.
- The motor can be mounted and operated with the available fastening options.
When flanging to the motor a good and even contact area must be regarded. The guide fittings and contact areas must be undamaged and clean. They should be in the exact position to the shafts to be connected, to avoid harmfully loads due to offset of the bearings, shafts and housings in the entire system. When tightening the flange screws (at least strength class 8.8) avoid distortions at the flange connection.
- At a vertical assembly with the shaft end to the top assure that there is a protection against ingress of liquids onto the upper bearings.
- The permitted radial forces may not exceed the accordant performance characteristics of the technical documents of the product (if required clarify by a Baumüller subsidiary). If there are axial forces this must be approved by the motor manufacturer.
- The rotor must be able to turn uniformly and without chafing noise. The brake must be released beforehand if the motor has an integrated brake.
- The installation and type of the motor and encoder cables must comply with the operation handbook.
- The output elements as well as the drive elements must be protected.
- The complete cooling system must be sealed and functionally as well as protected against objects which fall into.
- The surface of the motor is unpolluted.

5.3 Mounting notes water-cooling



Cooling system connection:

On the motor connections from the coolant pipes no tensile loads, thrust loads or torsional stress may be applied.

The connection may be executed by qualified personnel only. Thereby the motor must be without current or voltage.

When coupling or decoupling the coolant pipes it must be observed that no cooling liquid gets into the motor terminal box.



Sealing test according EN 50178:

The sealing of the cooling system must be tested before commissioning by a pressure-test with the coolant (water). The testing pressure must be twice the operating pressure (minimum test pressure 1 bar). The used coolant must thereby not be at operating temperature. The pressure must be maintained (minimum testing time 10 minutes).

5.4 Special aspects using pump drives with internal teeth



NOTICE!

Pump drives allow no radial load. Pump drives are for torque transmission.

- Check before mounting, whether the interface between pump and motor is suitable (centering; tothing; fastening).
- During assembly of the servo pump to the motor, it should be noted that:
 - The contact surfaces (plane surface and centering as well as tothing on pump and on motor) must be undamaged and clean.
 - The tothing of servo pump and motor must be lubricated with the appropriate grease before connection.
 - The flange areas of pump and motor must lie flat on each other.
 - When tightening the mounting screws (at least strength class 8.8 or higher) care must be taken to avoid tensions in tothing.

5.5 Vibrations and resistance to vibrations

The vibration response of the entire system at the installation site, caused by 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 a complete balancing of the rotor with the output element becomes necessary.

In order to be able to guarantee perfect function and service life the specified vibration values based on DIN ISO 10816 must not be exceeded at the specified measuring points of the motor (see figure below).

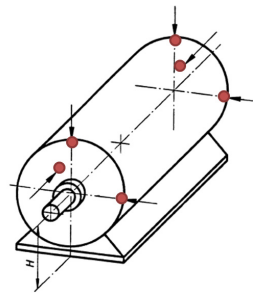


Figure 17: Measuring points for vibration

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

Mechanical conditions at the installation site:

Class 3M12 according DIN EN IEC 60721-3-3:2020

Maximum radial vibration load:

Peak vibration acceleration 1 g	> 250 Hz
Peak vibration displacement ≤ 0.16 mm	< 6.3 Hz
Effective vibration speed ≤ 4.5 mm/s	6.3 Hz - 250 Hz

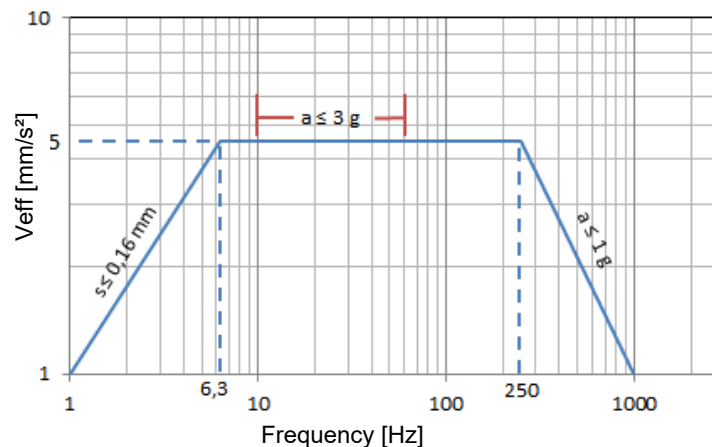


Figure 18: Permitted radial vibration load

Maximum axial vibration load:

Peak vibration acceleration 0.225 g	$> 55\text{ Hz}$
Peak vibration displacement $\leq 0.16\text{ mm}$	$< 6.3\text{ Hz}$
Effective vibration speed $\leq 4.5\text{ mm/s}$	$6.3\text{ Hz} - 55\text{ Hz}$

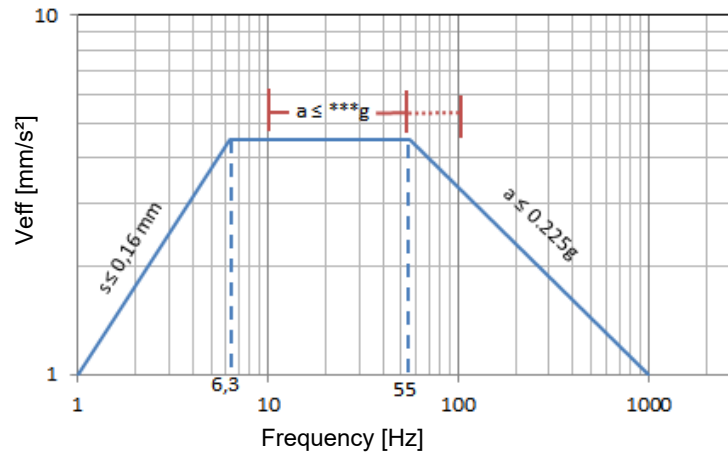


Figure 19: Permitted axial vibration load

Additional vibration resistance:

3 g radial and 2 g axial 10 Hz to 100 Hz

The specified vibrations are additionally endured by the motor. However, the service life of wear parts (such as bearings) can be reduced.

Shock load:

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

Based on this, constructive revisions and 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 are to be expected, such as meshing frequencies, the measuring range must be adapted accordingly. The permissible maximum values thereby do not change.

5.6 Tightening torques



NOTE!

The tightening torques mentioned below are general specification. Single specifications, e.g. tightening torques in motor specific dimension sheets or data sheets, have to be complied with first.

Tightening torques in Nm, tolerance +/- 10 %

	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30	M36	M42	M48	M56
Torque in Nm ¹⁾	1.3	2.6	4.5	11	22	38	92	180	310	620	1080	1700	2600	4200
Torque in Nm ²⁾	3	5	8	20	40	70	170	340	600	1200	2000	3100	4700	7500

¹⁾ For screws of strength category 8.8 acc. to ISO 898-1 in components with lower strength (e. g. aluminum).

²⁾ For screws of strength category 8.8 or A4-70 according to ISO 898-1 in components with higher strength (e.g. steel, gray cast iron).

INSTALLATION

6.1 Safety notes



All work must be carried out by specially trained personnel.

Work must only be carried out when the system is electrically isolated and secured against unintentional restarting (also auxiliary circuits).

Work must only be carried out once the motor has come to a standstill.

In the case of three-phase synchronous motors with permanent magnet excitation, voltages of $> 60\text{ V}$ can occur at the motor contacts with the rotor running.

Regulations for working in electrical plants must be observed!

The safety regulations for work on electro technical systems in accordance with EN 50110-1 must be followed:

- ☐ Isolate
- ☐ Secure against unintentional restarting
- ☐ Verify safe isolation from the supply
- ☐ Grounding and short-circuiting
- ☐ Safeguard or cover adjacent live parts



The motor must be operated by a correspondingly designed converter. A direct connection to the three-phase power system can destroy the motor.

Ensure that the phase sequence and the pin assignment are correct!

Electrical connections, protective conductor connections, and screen connections (when using screened cables) must be permanently secure!

6.2 Electrical installation

- The person setting up the system is responsible for the correct electrical installation.
- The motor data on the type plate must be observed.
- Connection cables and connectors must be correctly rated for the voltages and currents and must be suitable for the method of installation.
- The motor and its modules (encoder etc.) must be connected in accordance with the details on the wiring diagrams (see enclosed **wiring diagrams** and ► [Pin assignment encoders](#) ◄ from page 56).
- Screened power and encoder cables must be used to protect against electromagnetic EMC interference from motor cables and their effects on the encoder and control systems.
Please refer to the EMC notes provided by the supplier of the converter.
- In the interest of ensuring operational safety, we recommend that you use connecting cables assembled by Baumüller.
- Before connection, the plugs, sockets and the terminal boxes must be checked for damage, corrosion, dirt and dampness.
- Connectors and terminal box connections must not be exposed to mechanical stress. If necessary, protect against strain, shearing, twisting and kinking.
- Ensure the connections are made correctly and are tight. Seals and sealing faces on the connectors and the terminal boxes maintain the type of protection.



NOTE!

The turnable connection box should be turned not more than 5 times to ensure the type of protection.

Please, pay attention to the following at the main connection via the terminal box:

- The cable ends must be stripped so far as the isolation nearly reaches the cable lugs and terminals. Protruding wiring ends must be avoided.
- The cable lugs must be matched to the dimension and cross sections of the terminals and cables.
- The screw connections of the electrical connection must be tightened by the specified tightening torque to ensure the type of protection.



NOTE!

All inlets which are not required must be closed with metallic fastening elements. The sealing elements of the terminal box must be fully functional and undamaged.

6.3 Electrical connections

6.3.1 Motor cables

The motor cables are highly flexible trailing cables with overall shielding. They comply with VDE, UL, and CSA regulations. The control cables are integrated in star quad formation. The connector for brake control and the temperature sensor is available via main connection.

The cables are particularly suitable for the optimum use of cable racks thanks to their low cross-section, low weight and non-impeding surface. It also allows for an efficient use of the cables in drag chains. It is an EMC uncritical cable because of the overall shielding with > 85 % optical covering.

Technical data	• Cable sheath resists to mediums as for coolants and lubricants, machine or gear box oil • Abrasion resistant surface for cable chains and drag chains • Cable highly flexible, trailing cable, min. bending radius 12 x D at flexible use • Sheath surface not blocking, silk mat • Overall shielding of Cu copper braid > 85 % optical covering • TPE or polyester wire insulation, sheath PUR - non-halogen cable • Cable no FCKW and no silicone • Halogen-free and flame-resistant • Cable color RAL 1028, melon yellow • Labeled with Baumüller company logo, VDE, UL and CSA
Nominal voltage	• U_o/U 600 / 1000 V (power wires) • 24 V_{DC} (control wires)
Wire labeling	• Power wires U, VV, WWW • Colored control cable pairs as star quads in red, white, black, yellow
Assignments of the pairs	Note polarity! • red - black (brake) • white - yellow (temperature sensor)

6.3.2 Main connection via terminal box

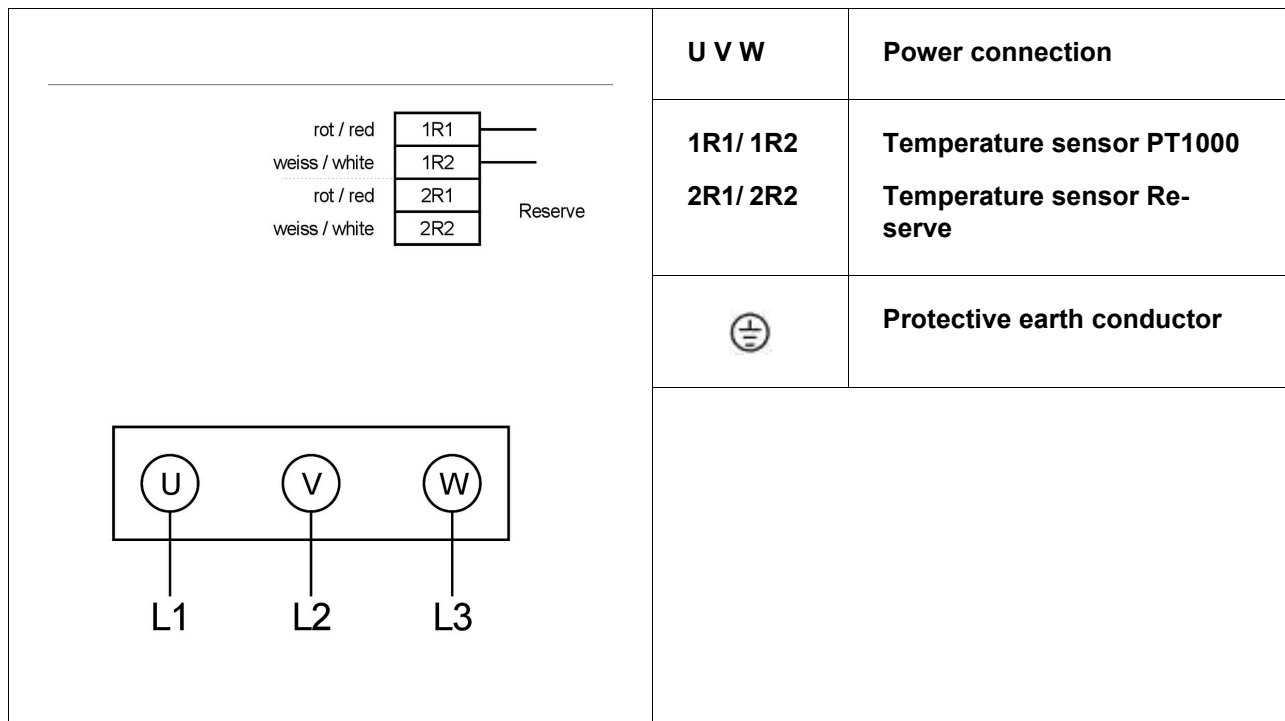


Figure 20: Main connection with terminal box

We recommend to use EMC screw connections at the fittings for the cable entries.

While tightening the clamping screw we recommend to hold up at the conductor to avoid a deformation of the mounting rail and to keep the base of the terminal free of torsional forces.

The following terminal box versions for the terminals are available including the tightening torques which are to be complied with

Cable entry	Main connection terminals	Tightening torques of main connection terminals [Nm]		Protective conductor in the terminal box ¹⁾	Protective conductor on the housing ¹⁾
		min.	max.		
2 x Ø40,5 + 1 x Ø25.5	3 x M6	3	6	1 x M6	1 x M12
2 x Ø64 + 1 x Ø25.5	3 x M10	10	20	1 x M10	1 x M12
2 x Ø76 + 1 x Ø25.5	3 x M12	14	31	2 x M12	1 x M12

¹⁾ For protective conductor connections in the terminal box and on the housing, the values for aluminum apply, see Instruction handbook chapter [► Tightening torques ◄](#).

6.3.3 Brake supply

Standard:	Standard voltage 24 V _{DC} ; Power supply with transformer and rectifier
Option:	Standard voltage 104 V _{DC} and 176 V _{DC} ; Supply with brake supply unit. The brake power unit must be ordered separately.

The brakes are equipped with microswitches (normally open). The silver contacts are coated with a layer of gold, allowing for two applications. The gold coating can be irreversibly burned off if the maximum load capacity of the gold coating is exceeded. In this case, the “gold coating” contact material can no longer be used.

Electrical specifications of the switches

Contact material	Minimum load	Ideal application range		Max. load
Gold coating	0 mA; 0 V up to 3 million cycles	0 mA; 0 V up to 3 million cycles	10 mA; 12 V up to 1 million cycles	0,1 A; 12 V up to 100.000 cycles
Silver	10 mA; 12 V up to 3 million cycles	100 mA; 12 V up to 3 million cycles	5 A; 30 V up to 50.000 cycles	5 A; 30 V up to 50.000 cycles

The brakes can be equipped with a manual release and lock as an option.

Brake connection DS4-132 with water cooling

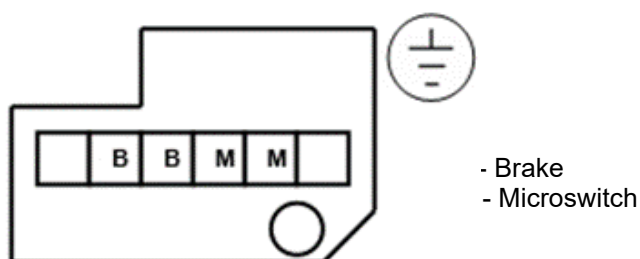


Figure 21: Brake connection

6.4 Pin assignment encoders



CAUTION!

Encoders are sensitive to electrostatic charges.



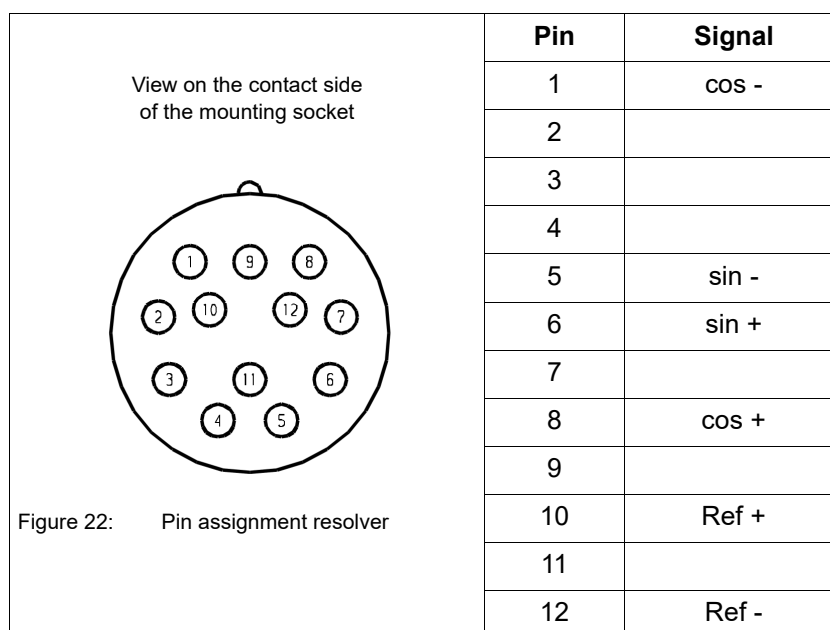
NOTE!

Please, take the pole assignment from the accordingly enclosed connection diagrams or from the technical documents concerning encoder types which were not mentioned here.

The specifications of the technical data were provided by the encoder manufacturer and we assume no liability for its correctness.

6.4.1 Resolver

Pole pair number	1
Transmission ratio	0,5 ±0,05
Frequency	5 kHz
Nominal input voltage	7 V _{rms}
Effective input power at no-load speed	112 mW
Current consumption at no-load speed	50 mA
Max. output voltage at no-load speed	3,5 V ±10 %
Stator impedance with short circuit and maximum coupling	61 mV/°
Phase shift	0° ±3°
Zero voltage	30 mV
Angle error in relation to $(\Delta\varphi_{\max} + \Delta\varphi_{\min})/2$	±6'
Shock according to DIN EN 60068-2-27 (11ms)	≤ 101 g
Vibration according to DIN EN 60068-2-6 (55 – 2000Hz)	≤ 50 g



6.4.2 SEK/SEL 37 (SICK)

	SEK 37	SEL 37
Number of sine, cosine periods per revolution	16	
Measuring step for the interpolation of the sine, cosine periods such as 12 bit	20"	
Number of absolute completed revolutions	1	4096
Code type for the absolute value	Binary	
Error limits for evaluating the sine, cosine periods, integral non-linearity	±288"	
Non-linearity within a sine, cosine, differential non-linearity at nominal position ±0.1 mm	±144"	
Maximum speed at which the absolute position can be defined	6000 min ⁻¹	
Maximum operating speed	12000 min ⁻¹	
Output signal	Serial RS 485 asynchronous, half duplex	
Power supply range	7 - 12 V	
Max. operating current without Last	50 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	100 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	50 g	
SEK/SEL37 – with mechanical adaption	The notch position is 0° (identical to SEK/SEL52 encoder)	

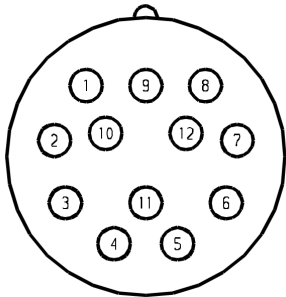
View on the contact side of the mounting socket 	Pin	Signal	Option with PT1000 (R1/R2) on encoder socket
	1	cos -	cos -
	2	+ 485	+ 485
	3		R1
	4		R2
	5	sin +	sin +
	6	sin -	sin -
	7	- 485	- 485
	8	cos +	cos +
	9		
	10	GND	GND
	11		
	12	- U	- U

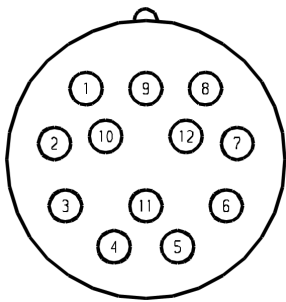
Figure 23: Pin assignment SEK/SEL 37

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer.

6.4.3 SRS/SRM 50 (SICK)

	SRS 50	SRM 50
Number of sine, cosine periods per revolution	1024	
Number of increments per revolution	32768	
Number of absolute completed revolutions	1	4096
Code type for the absolute value	Binary	
Output frequency of the sine, cosine signals	0 - 200 kHz	
Fault limits in evaluation of the sine, cosine signals; Integral non-linearity	±45"	
Non-linearity within a sine or cosine period. Differential non-linearity ±0,1mm	±7"	
Maximum speed at which the absolute position can be defined	6000 min ⁻¹	
Maximum operating speed	12000 min ⁻¹	
Output signals; 2x90° offset sinusoidal signals	1 V _{SS}	
Output signal	Serial RS 485 asynchronous, half duplex	
Power supply range	7 - 12 V	
Max. operating current without load	80 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	100 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	50 g	

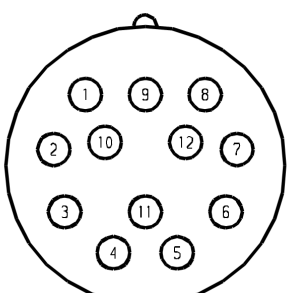
View on the contact side of the mounting socket		Pin	Signal	Option with PT1000 (R1/R2) on encoder socket
		1	cos -	cos -
		2	+ 485	+ 485
		3		R1
		4		R2
		5	sin +	sin +
		6	sin -	sin -
		7	- 485	- 485
		8	cos +	cos +
		9		
		10	GND	GND
		11		
		12	- U	- U

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer.

6.4.4 SRS/SRM 50 Safety (SICK)

	SRS 50-S	SRM 50-S
Safety integrity level	SIL2 (IEC 61508), SILCL2 (IEC 62061)	
Category	3 (EN ISO 13849)	
Performance Level	PL d (EN ISO 13849)	
Maximum angular acceleration	200.000 rad/s ²	
Number of sine, cosine periods per revolution	1024	
Number of increments per revolution	32768	
Number of absolute completed revolutions	1	4096
Code type for the absolute value	Binary	
Output frequency of the sine, cosine signals	0-200 kHz	
Fault limits in evaluation of the sine, cosine signals; Integral non-linearity	±45"	
Non-linearity within a sine or cosine period. Differential non-linearity ±0,1mm	±7"	
Maximum speed at which the absolute position can be defined	6000 min ⁻¹	
Maximum operating speed	12000 min ⁻¹	
Output signals; 2x90° offset sinusoidal signals	1 V _{SS}	
Output signal	Serial RS 485 asynchronous, half duplex	
Power supply range	7 - 12 V	
Max. operating current without load	80 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	100 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	20 g	

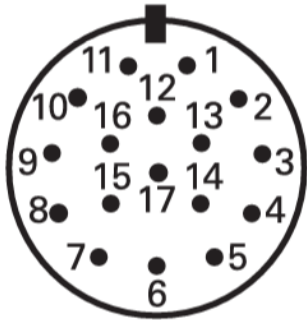
View on the contact side of the mounting socket 	Pin	Signal	Option with PT1000 (R1/R2) on encoder socket
	1	cos -	cos -
	2	+ 485	+ 485
	3		R1
	4		R2
	5	sin +	sin +
	6	sin -	sin -
	7	- 485	- 485
	8	cos +	cos +
	9		
	10	GND	GND
	11		
	12	- U	- U

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer. The technical data is the specifications of the encoder manufacturer. The configuration options for the safety encoders with different engine versions can be found in the product configurator. The combination SRS/SRM50-S with add-on gearbox is available by request.

6.4.5 ECN 1313 / EQN 1325 (Heidenhain)

	ECN 1313	EQN 1325
Number of sine, cosine periods per revolution	2048	
System accuracy	±20"	
Number of absolute completed revolutions	1	4096 (12 bit)
Code type for the absolute value	EnDat 2.1	
Sampling limit frequency or limit frequency	0 - 200 kHz	
Position values / revolution	8192 (13 bit)	
Maximum speed at which the absolute position can be defined	12000 min ⁻¹	
Maximum operating speed	12000 min ⁻¹	
Power supply	3,6 - 14 V	
Current consumption without load	≤160 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	≤204 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	≤31 g	

View on the contact side of the mounting socket 	Pin	Signal	Option with PT1000 (R1/R2) on encoder socket
	1	U _P	U _P
	2		
	3		
	4	0V	0V
	5		R1
	6		R2
	7	U _P	U _P
	8	Clock	Clock
	9	Clock inv.	Clock inv.
	10	0V	0V
	11		
	12	B+	B+
	13	B-	B-
	14	Data	Data
	15	A+	A+
	16	A-	A-
	17	Data inv.	Data inv.

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer.

6.4.6 ECI 1319 / EQI 1331 (Heidenhain)

	ECI 1319	EQI 1331
No. of increments	-	
System accuracy	$\pm 65''$	
Number of absolute completed revolutions	1	4096 (12 bit)
Code type for the absolute value	EnDat 2.2	
Position values / revolution	524 2882 (19 bit)	
Maximum speed at which the absolute position can be defined	15000 min ⁻¹	
Maximum operating speed	15000 min ⁻¹	12000 min ⁻¹
Power supply	3,6 - 14 V	
Current consumption at 5 V typical, without load	95 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	≤ 203 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	≤ 40 g	

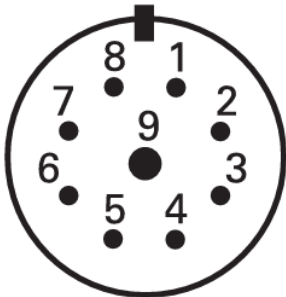
View on the contact side of the mounting socket (M23) 	Pin	Signal
	1	Clock
	2	Clock inv.
	3	Up
	4	0 V
	5	Data
	6	Data inv.
	7	Sensor Up
	8	Sensor 0 V
	9	-

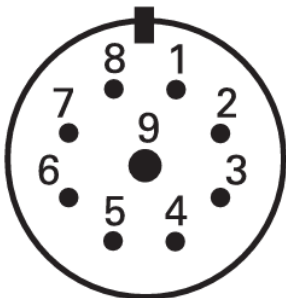
Figure 27: Pin assignment ECI 1319 / EQI 1331

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer.

6.4.7 ECI 1319 / EQI 1331 Safety (Heidenhain)

	ECN 1319-S	EQN 1331-S
Safety integrity level	SIL 2 according to EN 61508	
Category	3 (EN ISO 13849)	
Performance Level	PL d (EN ISO 13849)	
Maximum angular acceleration	100.000 rad/s ²	
System accuracy	±65"	
Number of absolute completed revolutions	1	4096 (12 Bit)
Code type for the absolute value	EnDat 2.2	
Position values / revolution	524.288 (19 Bit)	
Maximum speed at which the absolute position can be defined	12000 min ⁻¹	
Maximum operating speed	15 000 min ⁻¹	
Power supply	3,6 - 14 V	
Current consumption without load	95 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	≤203 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	≤40 g	

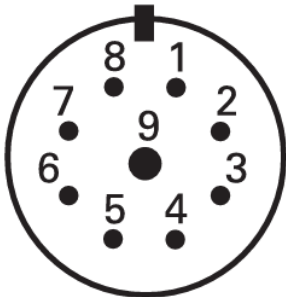
View on the contact side of the mounting socket (M23)  Figure 28: Pin assignment ECN 1325-S / EQN 1337-S	Pin	Signal
	1	Clock
	2	Clock inv.
	3	Up
	4	0 V
	5	Data
	6	Data inv.
	7	Sensor Up
	8	Sensor 0 V
	9	-

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer. Die The configuration options for the safety encoders with different engine versions can be found in the product configurator.

6.4.8 ECN 1325 / EQN 1337 (Heidenhain)

	ECN 1325	EQN 1337
Number of sine, cosine periods per revolution	2048	
System accuracy	±20"	
Number of absolute completed revolutions	1	4096 (12 bit)
Code type for the absolute value	EnDat 2.2	
Position values / revolution	33.554.432 (25 bit)	
Maximum speed at which the absolute position can be defined	12000 min ⁻¹	
Maximum operating speed	12000 min ⁻¹	
Power supply	3,6 - 14 V	
Current consumption without load	≤160 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	≤203 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	≤30 g	

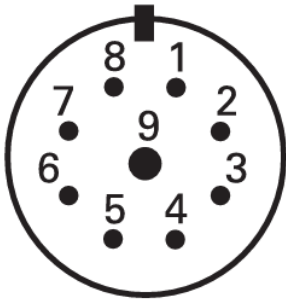
View on the contact side of the mounting socket (M23)		Pin	Signal
		1	Clock
		2	Clock inv.
		3	Up
		4	0 V
		5	Data
		6	Data inv.
		7	Sensor Up
		8	Sensor 0 V
		9	-

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer.

6.4.9 ECN 1325/EQN 1337 Safety (Heidenhain)

	ECN 1325-S	EQN 1337-S
Safety integrity level	SIL 2 according to EN 61508	
Category	3 (EN ISO 13849)	
Performance Level	PL d (EN ISO 13849)	
Maximum angular acceleration	50.000 rad/s ²	
Number of sine, cosine periods per revolution	2048	
System accuracy	±20"	
Number of absolute completed revolutions	1	4096 (12 bit)
Code type for the absolute value	EnDat 2.2	
Position values / revolution	33.554.432 (25 bit)	
Maximum speed at which the absolute position can be defined	12000 min ⁻¹	
Maximum operating speed	12000 min ⁻¹	
Power supply	3,6 - 14 V	
Current consumption without load	≤160 mA	
Shock according to DIN EN 60068-2-27 (10 ms)	≤203 g	
Vibration according to DIN EN 60068-2-6 (10-2000 Hz)	≤30 g	

View on the contact side of the mounting socket (M23)  Figure 30: Pin assignment ECN 1325-S / EQN 1337-S	Pin	Signal
	1	Clock
	2	Clock inv.
	3	Up
	4	0 V
	5	Data
	6	Data inv.
	7	Sensor Up
	8	Sensor 0 V
	9	-

NOTE

Encoders are ESD sensitive devices. The technical data is specification from the encoder manufacturer. Die The configuration options for the safety encoders with different engine versions can be found in the product configurator.



NOTE!

Refer to the details on the wiring diagrams and technical documentation in case the encoder used is not described above or the temperature sensor is provided at the encoder cable.

COMMISSIONING, OPERATION

7.1 Safety notes

Working on the motor



Work must not be carried out on the electric motor until the motor has come to a standstill, is electrically isolated and cooled down. All connections, such as screw connections, that were loosened when working on the motor must be tightened again prior to commissioning.

When carrying out work on the motor, please observe the technical instructions and notes in the respective sections in this Instruction handbook.



DANGER!

The (optional) integrated brake functions only as a parking brake, during work on the motor it **must not** have a protective function (e.g. holding loads).

Danger of life due to electric shock



Make sure that the motor is disconnected and electrically isolated.

Never disconnect the motor connections during operation.

Only connect measuring instruments when the motor is disconnected from the power supply and electrically isolated.

Only commence work on the motor connections when you are sure the motor is electrically isolated and there is no potential.



When in operation, electric potential can be found at the motor terminals / contacts and at the motor windings. Never touch these modules / elements while the motor is in operation.

Installing and uninstalling safety devices



The motor may not be commissioned without mounted the safety devices.

The motor must be put out of operation when installing and dismantling components and systems which are provided for monitoring the motor for safe operation.

Danger on physical contact



Make sure that the electric motor has come to a standstill and is secured against accidental restarting before you touch it.

Only touch the output shaft when the motor is electrically isolated and it has come to a standstill. Otherwise there is a risk due to the rotating rotor.



Danger of burns!

Never touch the motor housing when the motor is running at rated load. The surface temperatures on the motors may exceed 70 °C.



NOTICE!

Environmental conditions that do not meet the requirements.

Environmental conditions that are non-compliant can lead to property damage.

Therefore:

- Ensure that the environmental conditions are kept compliant during operation (see [► Installation conditions ◄](#) on page 14, [► Specifications for water-cooling ◄](#) from page 15).



WARNING!

Risk of injury due to insufficient qualifications!

Inevitably, when operating this electrical device, certain parts of this device are energized with hazardous voltage. Improper handling can lead to significant personal injury and material damage.

Therefore:

- Only qualified personnel may work on this device!

7.2 Checks prior to commissioning

- The motor is not damaged and is not within the danger area of another installation.
- The motor has been properly installed and aligned.
All fixing screws, connection elements, and electrical connections have been tightened to the specified tightening torques.
Not used threads are closed.
- All safety devices (mechanic, thermal, electric) are installed.
- The motor connections are installed.
- The cables do not touch the motor surface.
- The protective system is installed and function-checked.
- The drive is not blocked.
- Emergency stop function is checked.
- The cooling lines are installed, the water-cooling is function-checked.

7.3 Commissioning

The commissioning must be done by qualified personnel. The technical documentation of the converter and of the cooling system have to be observed.



WARNING!

- The brake is a holding brake with emergency stop function (Voltage failure → emergency stop).
- Use as a working brake is prohibited!

Checks during commissioning

- Have all modules of the motor such as the encoder, the cooling and so on been tested on functioning and are all application conditions observed.
- Have all electrical connections and terminals been properly completed and fastened. (refer also to ► [Installation](#) ◀ from page 51 and enclosed connection diagrams)
- Have all protective measures been met and operating correctly preventing the touching of energized parts, hot surfaces, rotating and moving parts and modules.
- Were all output elements mounted and set complying with the specifications of the manufacturer.
- Is ensured that the maximum permitted speed $n_{\max}$ of the motor cannot be exceeded. The maximum permitted speed $n_{\max}$ is the highest short-term permissible operating speed.

7.4 Operation

Checks during operation

- Pay attention to unusual noises.
- If scratching and scraping noises, grinding noises or the like occur shut down the drive immediately and find out the causes.
- Check the motor surface and connection lines for pollutions for example dust deposits, oil pollution, humidity, leakage etc.
- Check the maintenance intervals
- The flow rate and the pressure ratios of the cooling system must be checked at regular cleaning intervals.

7.5 Malfunction



The error detection and the troubleshooting made be executed by qualified personnel only.

Don't take the protective equipment out of operation – neither in the testing operation. Demount the cooling lines in the unpressurized state.



The connection cables must be de-energized and in a safe state before connection or disconnection.

Note the 5 safety regulations for work on electro technical systems (see ► [Safety notes](#) ◄ on page 51).



Pay attention to hot surfaces!

Observe to the following at failures

- Observe the operation instruction of the machine/installation
- Observe the operation instruction of the converter
- If required contact the manufacturer of the motor or converter

Keep the following parameters ready:

- Type plate data
- Type and extent of the failure
- Surrounding circumstances of the failure
- Application data (cycle of torque; speed and forces via the time, environmental conditions)

The following list could help in case of failures:

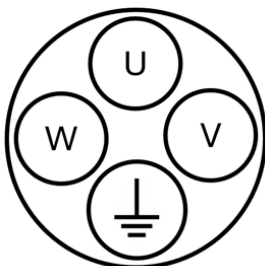
Failure	Error cause	Troubleshooting
Motor does not turn	Controller release is missing	Activate controller release
	Controller generates message encoder error	Read error list of converter or controller, correct error
	Voltage supply is missing	Check connection and voltage supply
	Rotating field	Check phase sequence and exchange mains connection if needed
Irregular running	Shielding in the connection lines is insufficient	Check shield connection and grounding
	Controller parameter too high	Optimize controller parameters
Vibrations	Coupling elements or driven machines were incorrectly balanced	Balancing
	Incorrect alignment of the powertrain control	Realign machine set
	Fastening screws are loose	Check screw connections and fasten them
Running noises	Foreign particles in the motor	Repair by manufacturer
	Bearing damage	
Motor warms up too much Motor temperature monitoring responds	Drive overload	Check motor load and compare it with the type plate data
	Water-cooling inactive	Check and switch on if required
	Cooling supply insufficient - Filter is very dirty - Deposits in the cooling channels - Failures in the external cooling system	Check water circuit
	Small space	Check ► Installation conditions ◄ from page 14
	Brake does not release - grinding brake	Repair at motor manufacturer
Overpressure in the cooling system	Strongly polluted coolant	Filter coolant
	Cooling channels blocked	Check and clean if required
	Failures in the external cooling system	Refer to notes of the plant manufacturer
Current input too high, motor torque too low	Notch position incorrect	Check notch position and set if required

SPARE PARTS

8.1 Main connection cables for terminal box

The terminal boxes on our motors are designed for use with asymmetrical connection cables.

Asymmetric connection cable:



Symmetric connection cable:

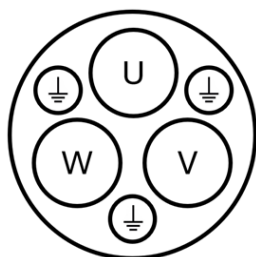


Figure 31: Asymmetric/symmetric connection cable

Symmetrical connection cables are possible on request.

8.2 Encoder cables for b maXX 5000/6000

A prefabricated encoder cable is used for all encoder systems.

The connection at the motor end consists of a 12-pole circular signal connector on resolvers and Hiperface® encoder, a 17-pole circular signal connector on ECN1313/EQN1325.

The connection at the controller side consists of a 26-pole D-Sub connector. Alternatively, the signal connector on the motor side is available in a Speedtec version.

Technical data

Dragable for resolver

- Li9YC, 1x(2x0.25)+Li9Y, 2x(2x0.25)+Li9YC11Y, 1x(2x0.34), copper strand, twisted pairs
- PUR sheat, green; inscription with Baumüller Nürnberg and encoder cable resolver
- 1st side: 12-pole circular signal plug connector with 12 socket contacts
- 2nd side: 26-pole Sub-D plug connector with pin contacts and locking screws 4-40UNC
- Outer diameter 7.3 mm (+/- 0.3 mm)
- Bending radius: $r \geq 4 \times D$ (fixed routing), $r \geq 10 \times D$ (flexible use)

Dragable for SinCos Hiperface® interface and SinCos - and TTL incremental encoders

- Li9YC, 3x(2x0.25)+Li9Y, 3x(2x0.25)+Li9YC11Y, 1x(2x0.34), copper strand, twisted pairs
- PUR sheat, green; inscription with Baumüller Nürnberg and encoder cable Hiperface or Incremental
- 1st side: 12-pole circular signal plug connector with 12 socket contacts
- 2nd side: 26-pole Sub-D plug connector with pin contacts and locking screws 4-40UNC
- Outer diameter 9.6 mm (+/- 0.3 mm)
- Bending radius: $r \geq 4 \times D$ (fixed routing), $r \geq 10 \times D$ (flexible use)

Dragable for EnDat® 2.1 interface

- Li9YC, 3x(2x0.25)+Li9Y, 3x(2x0.25)+Li9YC11Y, 1x(2x0.34), copper strand, twisted pairs
- PUR sheat, green; inscription with Baumüller Nürnberg and encoder cable Endat 2.1
- 1st side: 17-pole circular signal plug connector with 17 socket contacts
- 2nd side: 26-pole Sub-D plug connector with pin contacts and locking screws 4-40UNC
- Outer diameter 9.6 mm (+/- 0.3mm)
- Bending radius: $r \geq 4 \times D$ (fixed routing), $r \geq 10 \times D$ (flexible use)

Dragable hybrid cable for Hiperface DSL®

- Hybrid cable
- Shielding braid Copper wires, tinned
- PUR sheath, orange, flame-retardant, self-extinguishing
- 1st side:
 - metal round plug Speedtec M23 hybrid socket 8-pole for wire with 4G1.5 and 4G2.5
 - metal round plug Speedtec M40 hybrid socket 5+4-pole + 2 -pole insulating body for wire with 4G2.5, 4G4 and 4G6
- 2nd side: Metal 45°-D-Sub plug, 26-pole with electronics

Application references

- Operating temperature of encoder cable resolver; SinCos Hiperface[®] interface; EnDat[®] 2.1 interface and SinCos- and TTL incremental encoders

Limit temperature	on the surface
Storage temperature	- 40 °C to + 80 °C
Permanent movement	- 20 °C to + 60 °C

- Routing of cable on motor

The cables must not touch the surface of the motor.

Order information for encoder cables Encoder cable - prefabricated with plug

For Resolver	
Length [m]	Part No. (Speedtec)
1	448746
2	448747
3	448748
5	448749
7	448750
10	448751
15	448752
20	448753
25	448754
30	448755
35	448756
40	448757
50	448758
75	448759

For SinCos Hiperface [®] interface	
Length [m]	Part No. (Speedtec)
1	448761
2	448762
3	448763
5	448764
7	448765
10	448766
15	448767
20	448768
25	448769
30	448770
35	448772
40	448773
50	448774
75	448775

For SinCos - and TTL- incremental encoders	
Length [m]	Part No. (Speedtec)
1	448777
2	448778
3	448779
5	448780
7	448781
10	448782
15	448783
20	448784
25	448785
30	448786
35	448787
40	448788
50	448789
75	448790

For SinCos EnDat [®] 2.1 interface	
Length [m]	Part No. (Speedtec)
1	448796
2	448797
3	448798
5	448799
7	448800
10	448801
15	448802
20	448803
25	448804
30	448805
35	448806
40	448807
50	448808
75	448809

MAINTENANCE



WARNING!

Risk of injury due to improperly performed maintenance work!

Improper maintenance can lead to severe personal injury and material damage.

Therefore:

- Before beginning work, make sure that there is enough space for mounting.
- Make sure that the mounting area is kept clean and orderly. Parts and tools that are loosely stacked or lying around are a potential accident source.

Working at the motor



Execute the works at the motor only if the motor is at standstill, de-energized and has cooled off. Fasten all loose connections such as screws, cables etc. after the inspection or maintenance again.

Observe the technical notes in the accordant chapters of this commissioning and maintenance instruction (see ► [Safety notes](#) ◄ from page 51).

DANGER!

The (optional) integrated brake functions only as a parking brake, during work on the motor it **must not** have a protective function (e.g. holding loads).

9.1 Inspection

Accordant to the local degree of pollution regular cleaning must be made to ensure a permanent adequate dissipation of the heat loss. Thereby, the volume rate and the pressure ratio of the cooling system must be checked.

If, optionally a shaft sealing ring is used check it regularly for its proper functioning (leakage).

9.2 Maintenance

Dependent of the operating conditions (such as operation mode, temperature, speed load, mounting position) very different times of service life can be referring to the lubricants and sealing elements.

We recommend the following maintenance guide values at a fault-free operation:

- Change the **bearing** after the bearing service life, see ► [Technical Data](#) ◄ from page 12.
- Check the proper function of the shaft seal regularly because the shaft seal is a wear part.

Brake

The optional brake must be replaced as soon as the wear limit is reached.

Relubrication

Relubrication at opened grease leakage only.

- The service life of bearing and the type of protection can only be guaranteed if the grease leakage is closed with the supplied screw plugs.
- For Relubrication interval and grease quantity see an extra label on the motor.



NOTICE!

- Unscrew the two screw plugs G1/2 of the grease discharge opening before starting relubrication.
- Relubricate the bearing when motor is rotating only.
- After relubrication the motor must be operated 2-4 hours (while bearing rotation the used grease is discharged via the grease discharge opening).
- The grease discharge opening must be closed by the screw plugs again.

The maintenance work the operator is responsible for, includes:

- The cleaning of the motor surface and the air ducts. Do not use aggressive cleaning products or high-pressure cleaner in order to avoid damage of surface coating and sealing.
- The replacing or cleaning of filter mats when using dust filter:
 - Dust filter should normally be cleaned or replaced after 100 operating hours. In case of a heavy air pollution the maintenance intervals are to be shortened.
 - Filters with dry dirt can be cleaned by beating, vacuum-cleaning or blowing compressed air through.
 - Filters with wet dirt can be washed in hand-hot water with commercial scouring agents and then dried.



NOTE!

- It is recommended to use original replacement filters from the motor manufacturer. The original filters can be ordered from Baumüller (motor No. and part No. required).

The maintenance work should be done by Baumüller or a specialized company authorized by Baumüller.



DANGER!

The specifications of the technical instructions TAM 00697 must be followed during maintenance and servicing on motors which are used for safety-oriented applications.

9.3 Repairs

In case of device damage, please inform your sales office or:

Baumüller Nürnberg GmbH

Ostendstr. 80 - 90
90482 Nuremberg
Germany

Tel. +49 9 11 54 32 - 0
Fax: +49 9 11 54 32 - 1 30

Mail: mail@baumueller.com
Internet: www.baumueller.com

DEMOUNTING AND DISPOSAL

10.1 Demounting

Refer to safety notes in chapter mounting (from [►Page 41◀](#)) and installation (from [►Page 51◀](#)).

10.2 Disposal

**NOTE!**

Baumüller products are not subject to the scope of application of the EU's Waste Electrical and Electronic Equipment Directive (WEEE, 2012/19/EU). Hence, Baumüller is not obligated to bear any costs for taking back and disposing of old devices.

The motor must be disposed in the normal recyclable material process by complying with the national and local regulations.

The encoder electronics (if an absolute value encoder is built-in) must be disposed as electronic waste.

Disposal facilities/ authorities Ensure that the disposal is handled in compliance with the disposal policies of your company, as well as with all national regulations of the responsible disposal facilities and authorities. In case of doubt, consult the bureau of commerce or environmental protection authority responsible for your company.



APPENDIX A - MOTOR CHARACTERISTIC CURVES

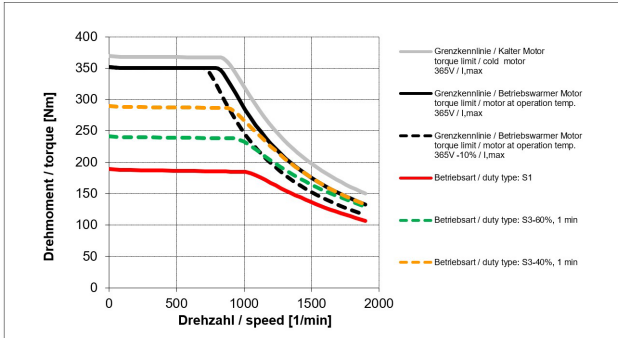
Definition Cold motor = Environmental temperature (0 °C bis 40 °C)

Motor at operating
temperature = Continuous operation (S1) with nominal data of the motor or cyclical operation with corresponding effective output

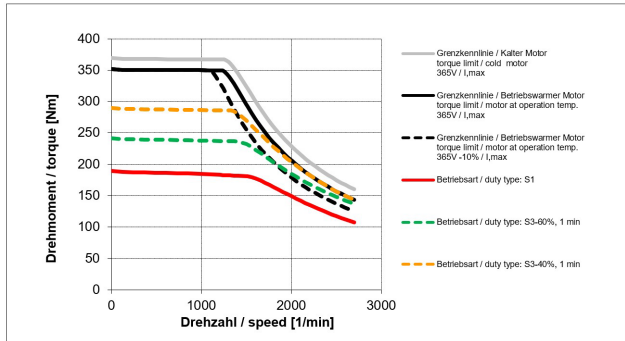
⇒ Environmental temperature + Delta temperature rise (105 K)

A.1 Characteristic curve DS4-132AA

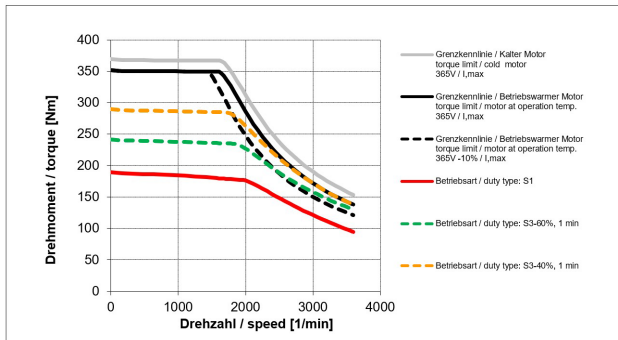
DS4-132AA54W-10-5



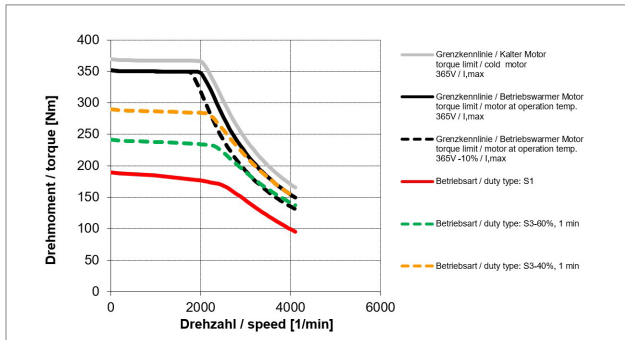
DS4-132AA54W-15-5



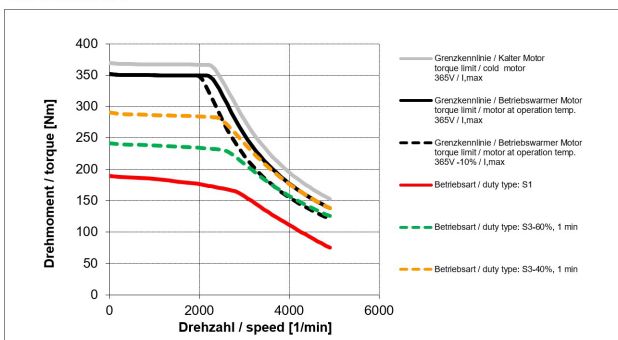
DS4-132AA54W-20-5



DS4-132AA54W-25-5



DS4-132AA54W-30-5



DS4-132AA54W-35-5

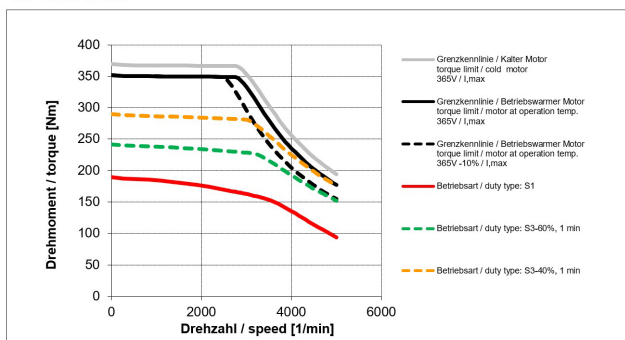


Figure 32: Motor characteristic curve DS4-132AA54W-10 ... DS4-132AA54W-35

Motor Characteristic Curves

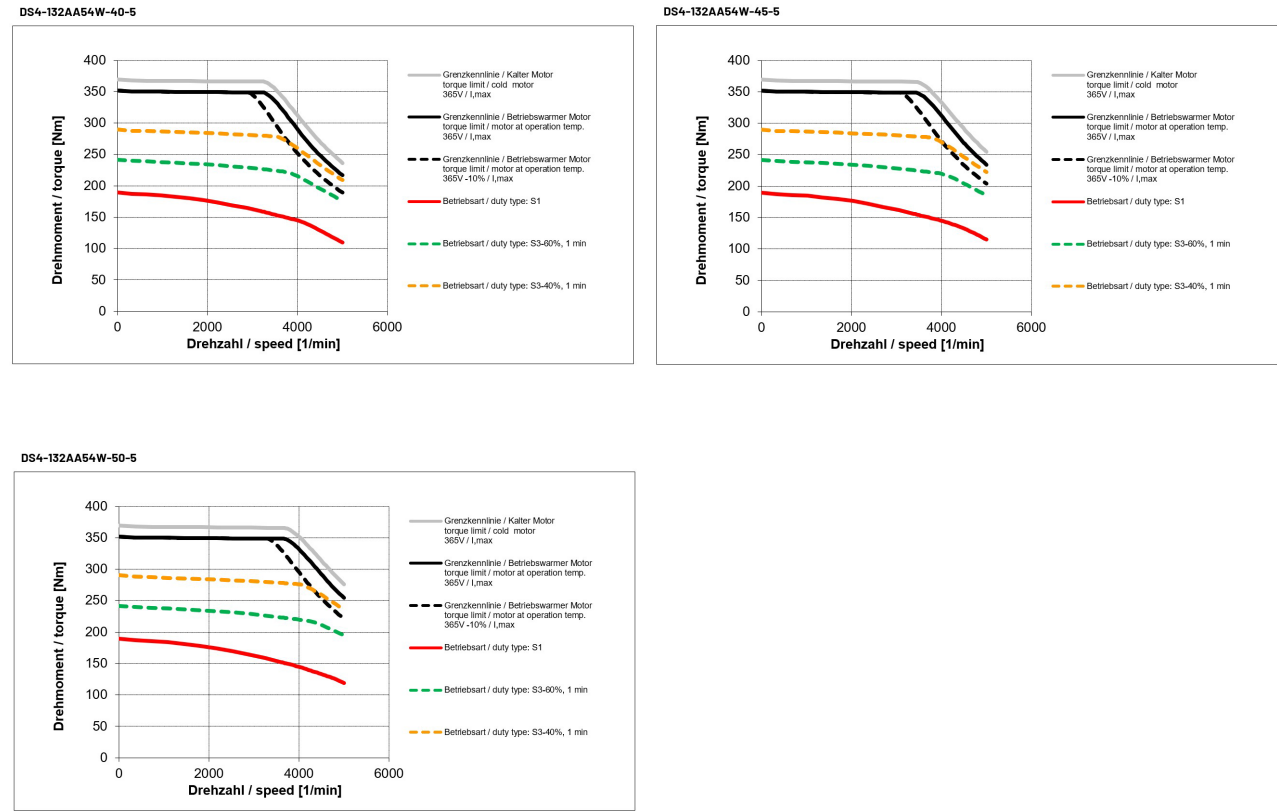
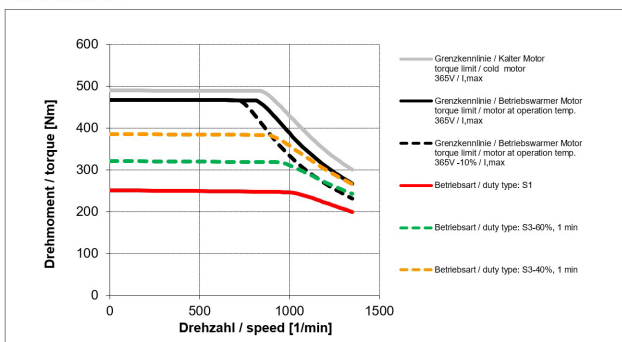


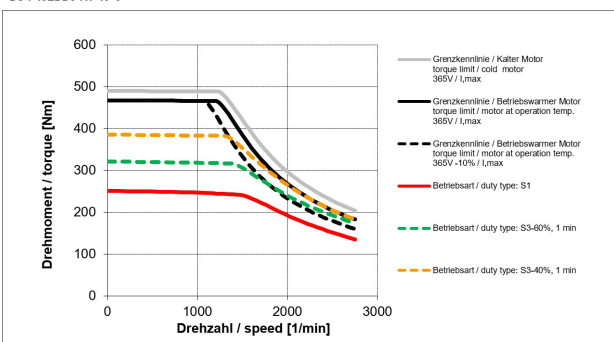
Figure 33: Motor characteristic curve DS4-132AA54W-40 ... DS4-132AA54W-50

A.1 Characteristic curve DS4-132BB

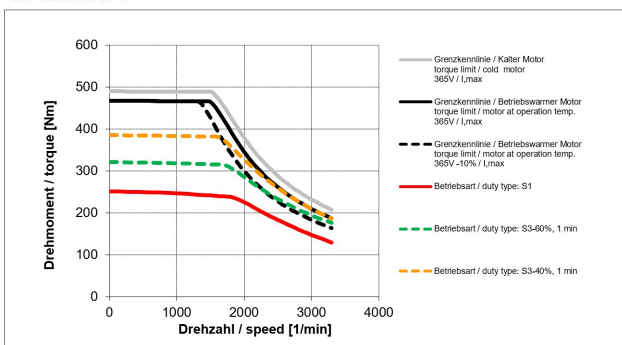
DS4-132BB54W-10-5



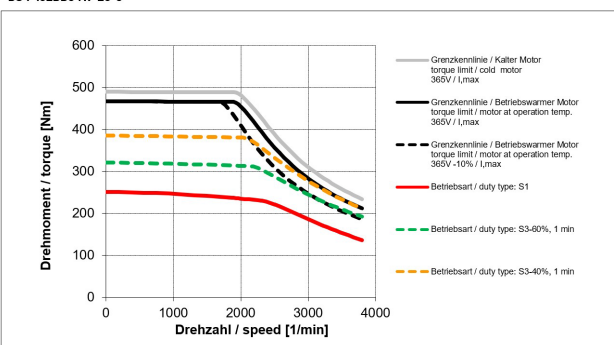
DS4-132BB54W-15-5



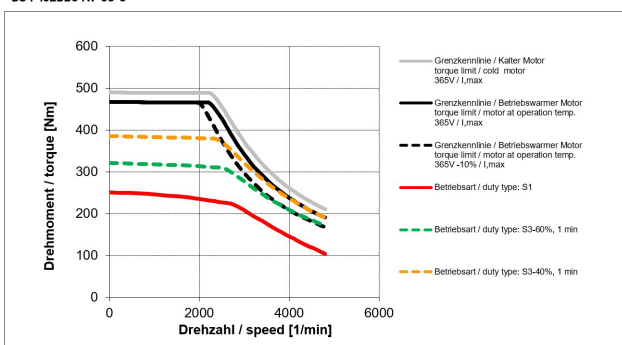
DS4-132BB54W-20-5



DS4-132BB54W-25-5



DS4-132BB54W-30-5



DS4-132BB54W-35-5

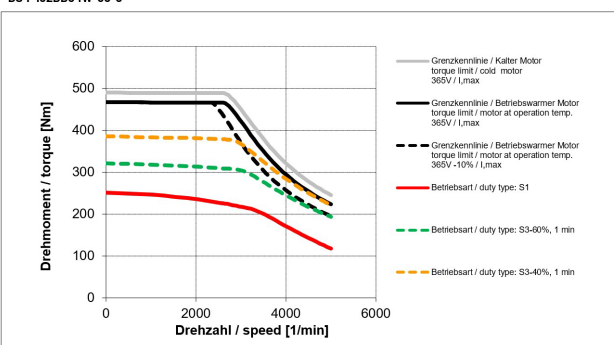


Figure 34: Motor characteristic curve DS4-132BB54W-10 ... DS4-132BB54W-35

Motor Characteristic Curves

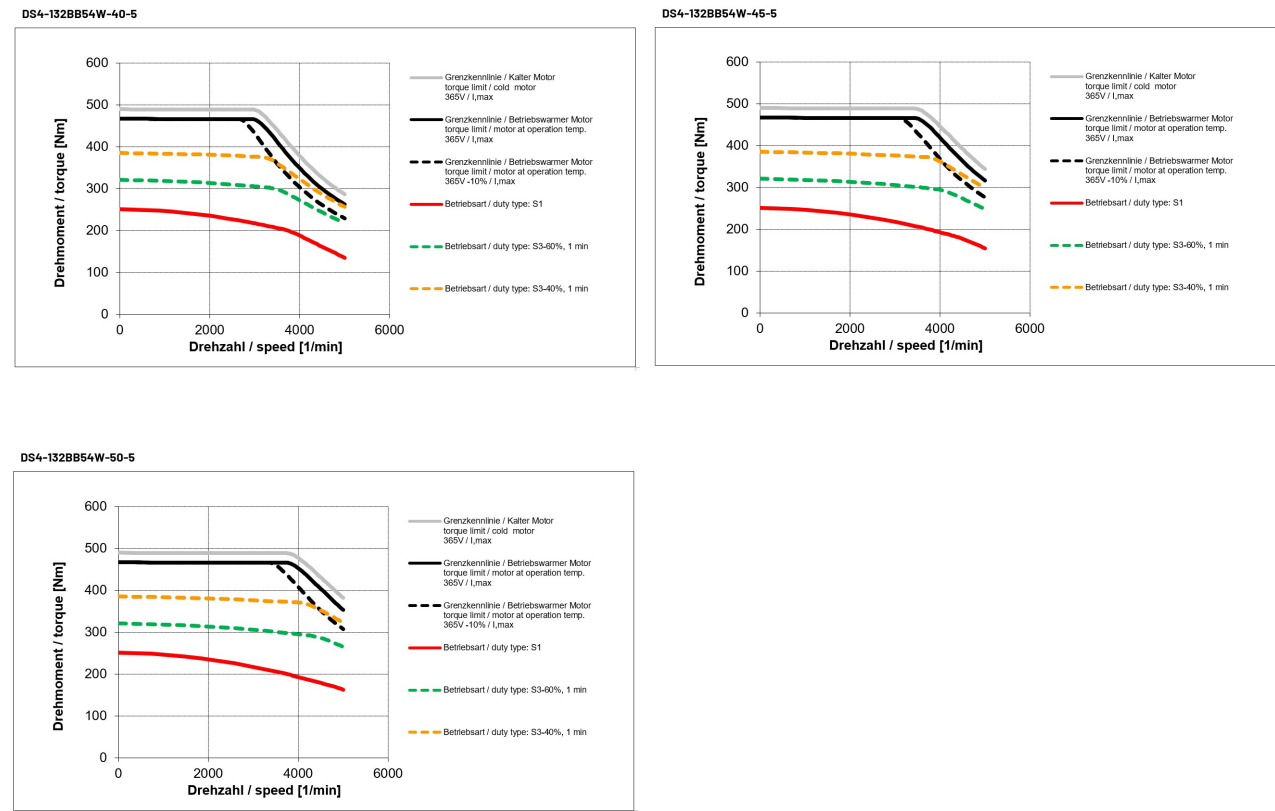
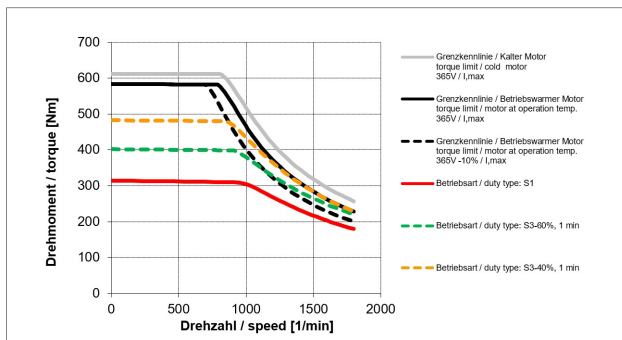


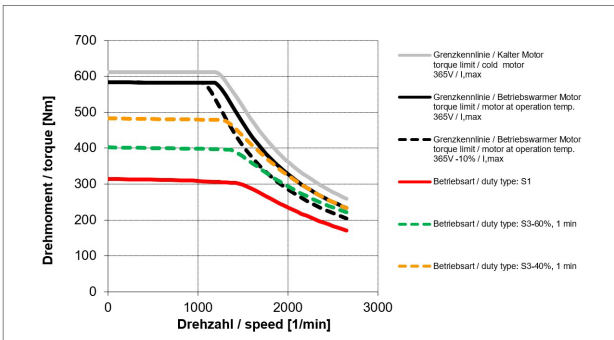
Figure 35: Motor characteristic curve DS4-132BB54W-40 ... DS4-132BB54W-50

A.2 Characteristic curve DS4-132CC

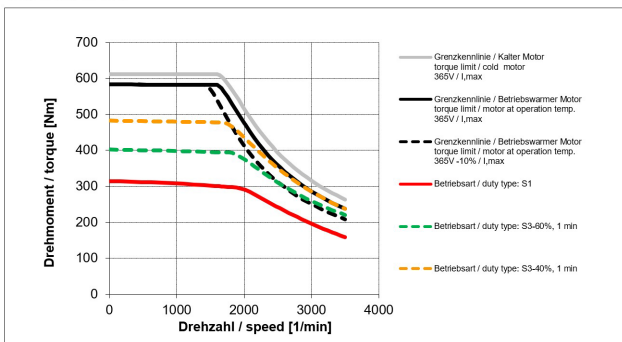
DS4-132CC54W-10-5



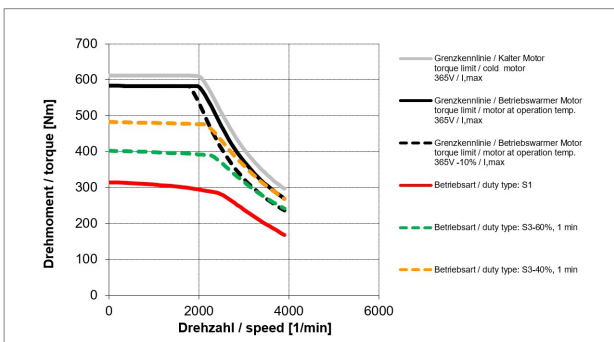
DS4-132CC54W-15-5



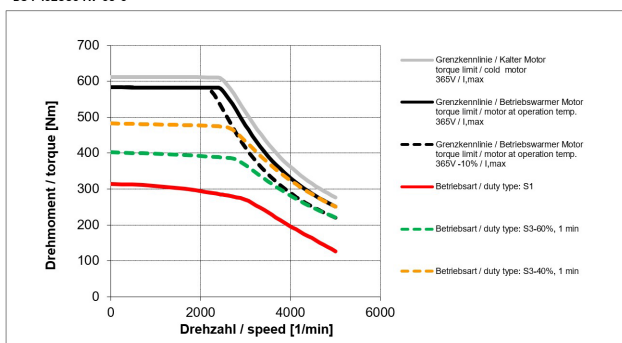
DS4-132CC54W-20-5



DS4-132CC54W-25-5



DS4-132CC54W-30-5



DS4-132CC54W-35-5

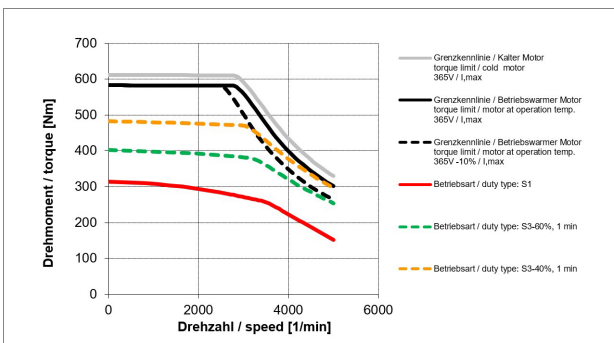
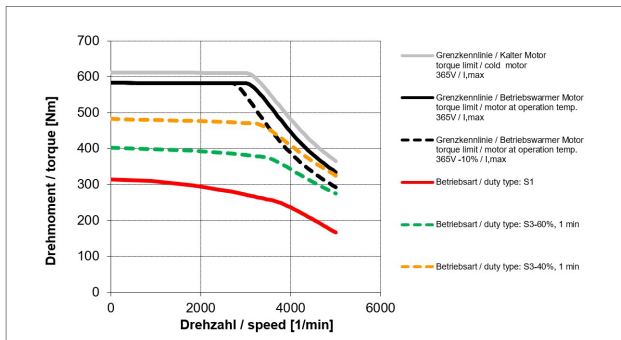


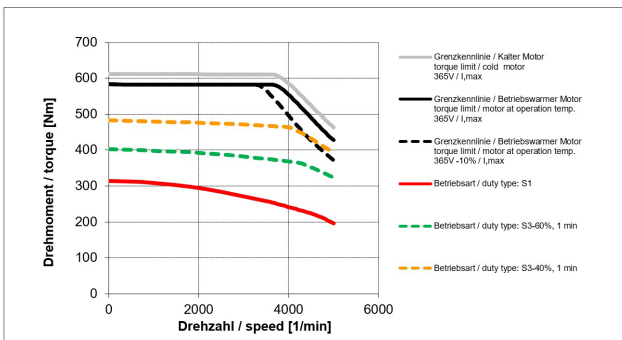
Figure 36: Motor characteristic curve DS4-132CC54W-10 ... DS4-132CC54W-35

Motor Characteristic Curves

DS4-132CC54W-40-5



DS4-132CC54W-45-5



DS4-132CC54W-50-5

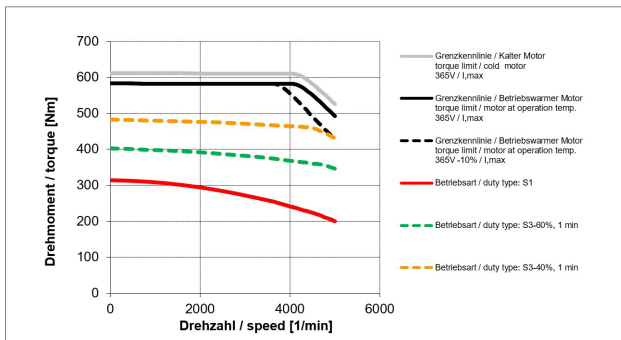
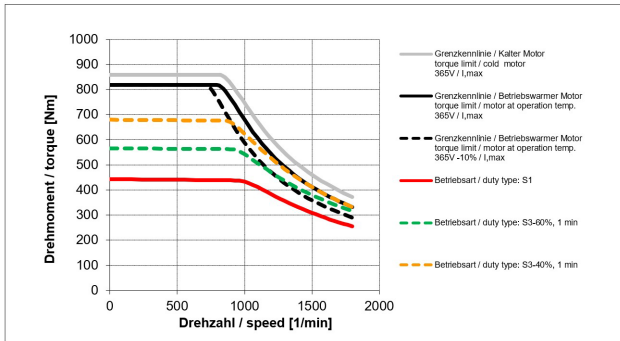


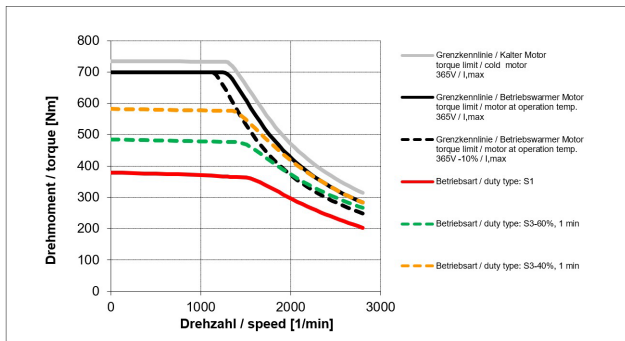
Figure 37: Motor characteristic curve DS4-132CC54W-40 ... DS4-132CC54W-50

A.3 Characteristic curve DS4-132DD

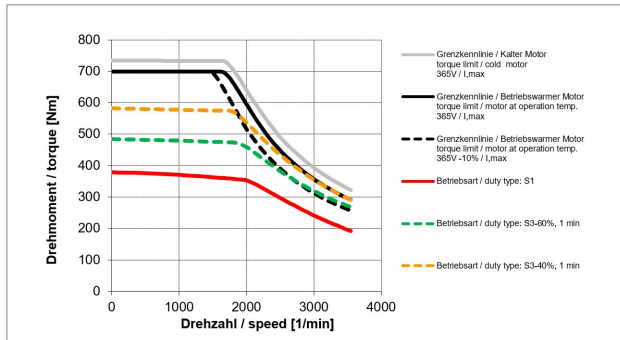
DS4-132DD54W-10-5



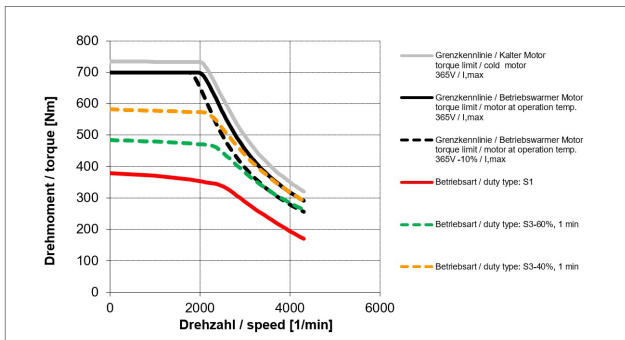
DS4-132DD54W-15-5



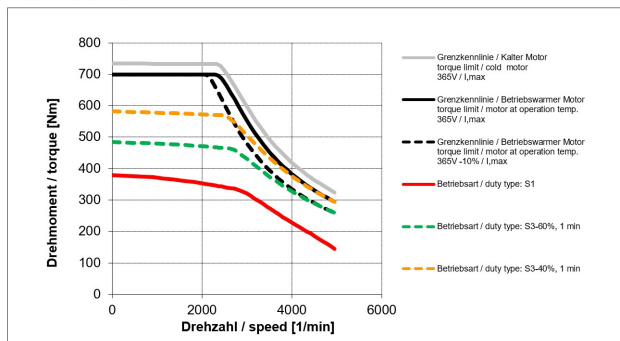
DS4-132DD54W-20-5



DS4-132DD54W-25-5



DS4-132DD54W-30-5



DS4-132DD54W-35-5

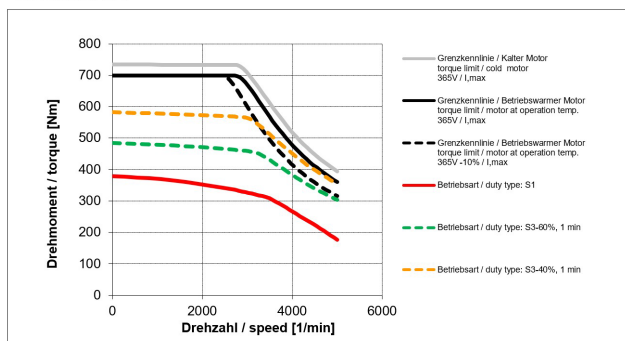


Figure 38: Motor characteristic curve DS4-132DD54W-10 ... DS4-132DD54W-35

Motor Characteristic Curves

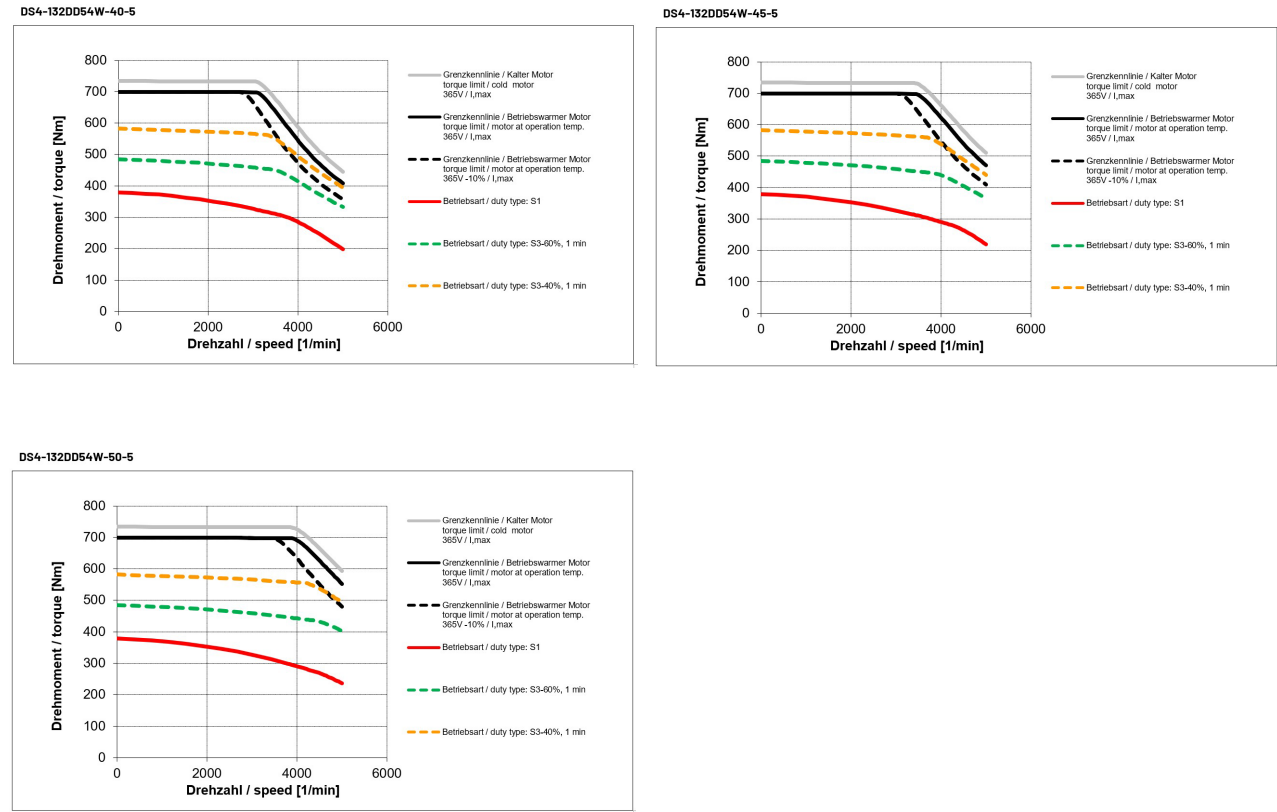
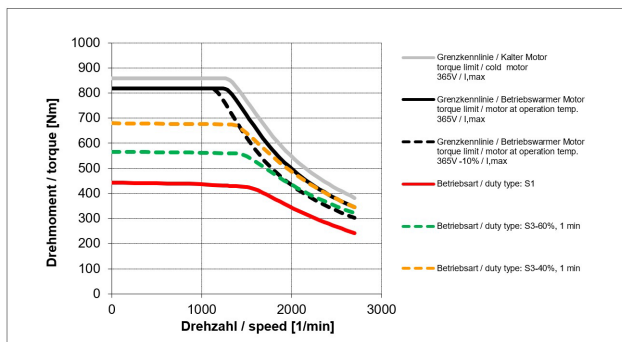


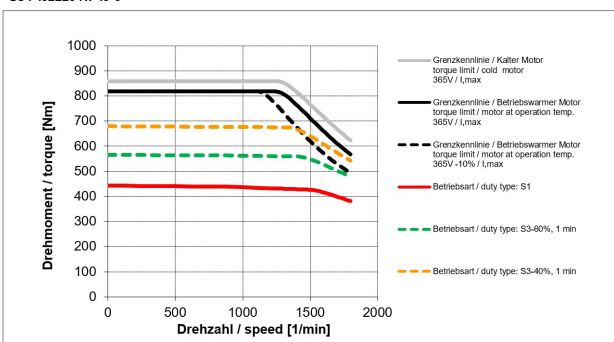
Figure 39: Motor characteristic curve DS4-132DD54W-40 ... DS4-132DD54W-50

A.2 Characteristic curve DS4-132EE

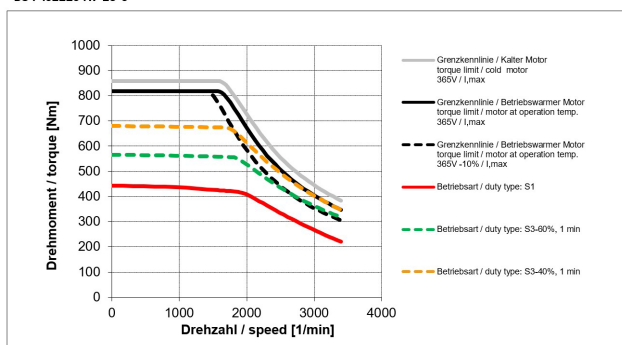
DS4-132EE54W-10-5



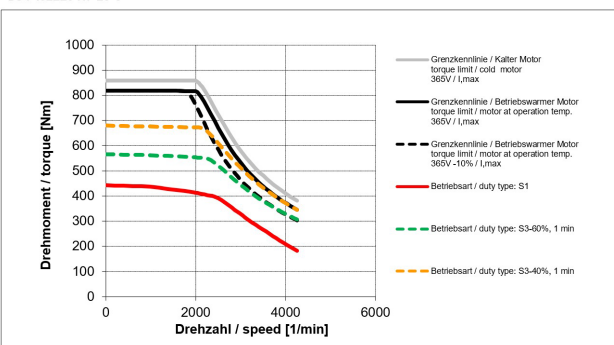
DS4-132EE54W-15-5



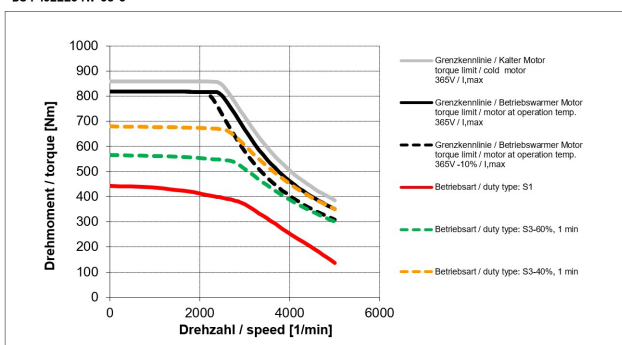
DS4-132EE54W-20-5



DS4-132EE54W-25-5



DS4-132EE54W-30-5



DS4-132EE54W-35-5

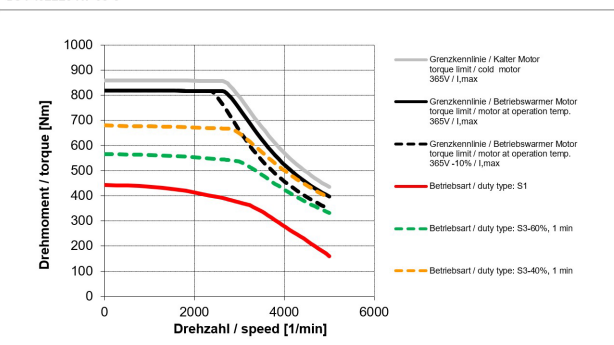


Figure 40: Motor characteristic curve DS4-132EE54W-10 ... DS4-132EE54W-35

Motor Characteristic Curves

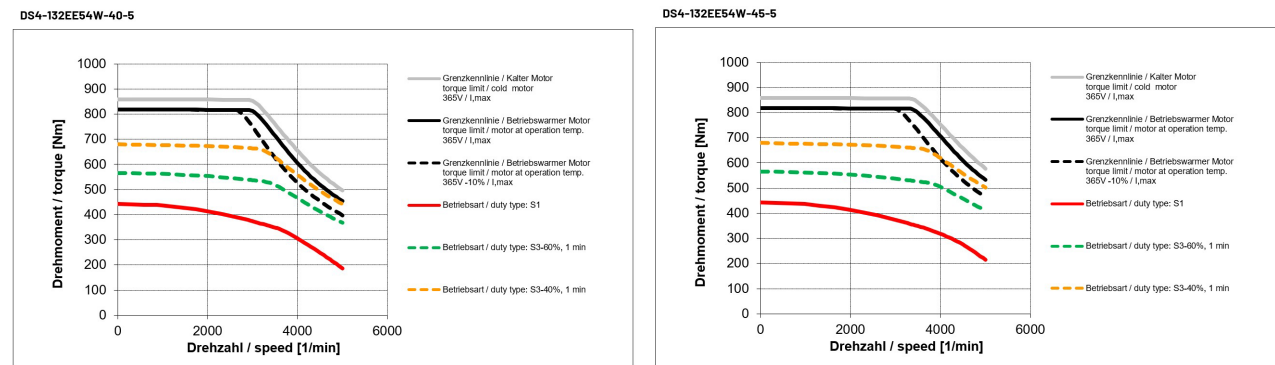
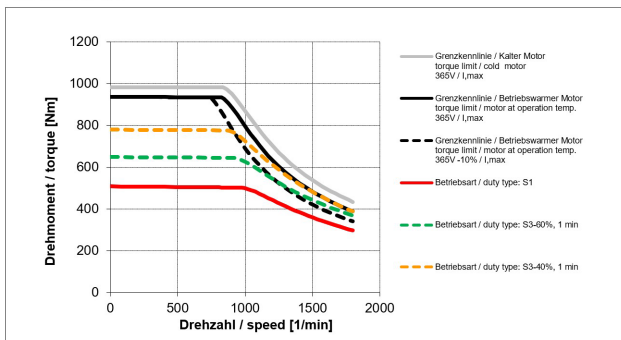


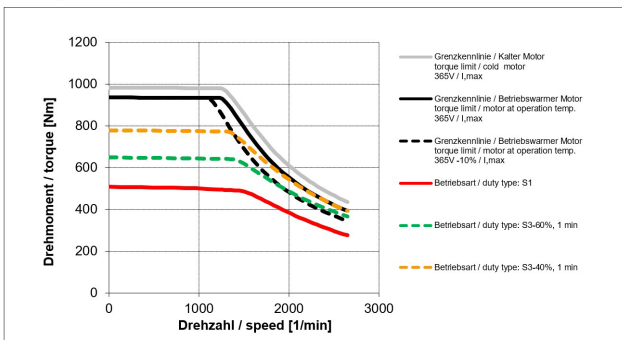
Figure 41: Motor characteristic curve DS4-132DD54W-40 ... DS4-132DD54W-45

A.4 Characteristic curve DS4-132FF

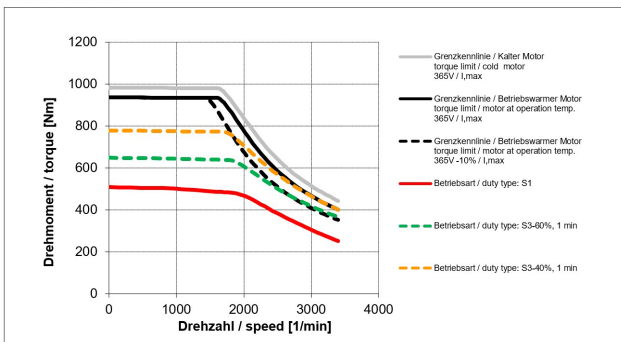
DS4-132FF54W-10-5



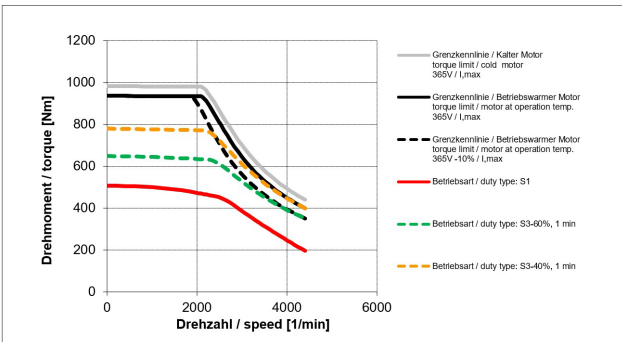
DS4-132FF54W-15-5



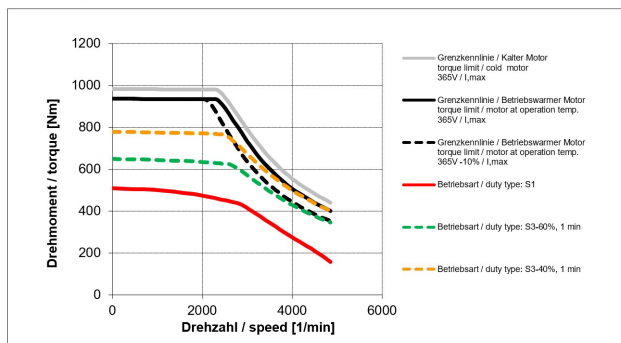
DS4-132FF54W-20-5



DS4-132FF54W-25-5



DS4-132FF54W-30-5



DS4-132FF54W-35-5

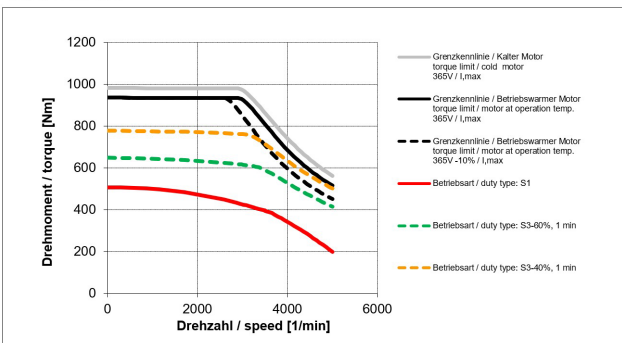


Figure 42: Motor characteristic curve DS4-132FF



APPENDIX B - DECLARATION OF CONFORMITY



Baumüller Nürnberg GmbH
Ostendstraße 80-90, 90482 Nürnberg, Phone: +49(0)911 5432-0, Fax: +49(0)911 5432-130, www.baumuller.com

EU-Konformitätserklärung

gemäß

- Richtlinie 2014/35/EU
(Niederspannungsrichtlinie)

Richtlinie 2014/30/EU
(EMV-Richtlinie)

Hersteller

Baumüller Nürnberg GmbH
Ostendstr. 80 - 90
90482 Nürnberg
Deutschland

Hiermit erklären wir, dass die nachfolgend genannten Produkte aufgrund ihrer Konzeption, Konstruktion und Bauart in der von uns in Verkehr gebrachten Ausführung den Anforderungen der oben genannten Richtlinien einschließlich der zum Zeitpunkt der Erklärung geltenden Änderungen entsprechen.

Hinweise:

1. Bei Umbau oder Änderungen am Produkt verliert diese Erklärung mit sofortiger Wirkung ihre Gültigkeit.
2. Diese Erklärung bescheinigt die Übereinstimmung mit der genannten Richtlinie, stellt aber keine Zusicherung von darüber hinaus gehenden Produkteigenschaften dar.
3. Die alleinige Verantwortung für die Erstellung der Konformitätserklärung trägt der Hersteller.
4. Diese Motorbaureihe fällt nicht in den Geltungsbereich der Richtlinie 2009/125/EG

Angewandte harmonisierte Normen:

- EN 60034-1:2011-02
Drehende elektrische Maschinen – Teil 1:
Bemessung und Betriebsverhalten
- EN 60034-5:2021-05 + AC:2024-06
Drehende elektrische Maschinen – Teil 5:
Schutzarten aufgrund der Gesamtkonstruktion von
drehenden elektrischen Maschinen (IP-Code) –
Einteilung
- EN 60034-6:1996
Drehende elektrische Maschinen – Teil 6:
Einteilung der Kühlverfahren (IC-Code)
- EN 60034-9:2021-04
Drehende elektrische Maschinen – Teil 9:
Geräuschgrenzwerte

(Wird fortgesetzt auf der nächsten Seite ...)

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EU Declaration of Conformity

according

- Directive 2014/35/EU
(Low Voltage Directive)

Directive 2014/30/EU
(EMC Directive)

Manufacturer

Baumüller Nürnberg GmbH
Ostendstr. 80 - 90
90482 Nürnberg
Germany

We declare, that the products referred to in the following conform in their concept, construction and design as launched by us to the above mentioned directives and their respective changes which were valid at the point of declaration.

Notes:

1. By modifying or alternating the device(s) this declaration immediately becomes invalid.
2. This declaration confirms the compliance with the directive listed, but it is no covenant of any further product properties.
3. This declaration of conformity is issued under the sole responsibility of the manufacturer.
4. responsibility of the manufacturer This motor series isn't in scope of guideline 2009/125/EG

Applied harmonized standards:

- EN 60034-1:2011-02
Rotating electrical machines – Part 1:
Rating and performance
- EN 60034-5:2021-05 + AC:2024-06
Rotating electrical machines – Part 5:
Degree of protection provided by the integral design
of rotating electrical machines (IP-Code) –
Classification
- EN 60034-6:1996
Rotating electrical machines – Part 6:
Methods of cooling (IC-Code)
- EN 60034-9:2021-04
Rotating electrical machines – Part 9:
Noise limits

(To be continued on the next page ...)

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Baumüller Nürnberg GmbH

Ostendstraße 80-90, 90482 Nürnberg, Phone: +49(0)911 5432-0, Fax: +49(0)911 5432-130, www.baumuller.com

(... Fortsetzung von der vorherigen Seite)

- EN IEC 60034-14:2019-04
Drehende elektrische Maschinen – Teil 14:
Mechanische Schwingungen von bestimmten
Maschinen mit einer Achshöhe von 56 mm und höher –
Messung, Bewertung und Grenzwerte der
Schwingstärke. Für Rollenlagermotoren gelten:
In Anlehnung an EN 60034-14 oder Angaben gemäß
Kundenvereinbarung.
- EN 61800-5-1:2024-11
Elektrische Antriebssysteme mit einstell-
barer Drehzahl – Teil 5-1:
Anforderungen an die Sicherheit – Elektrische,
thermische und energetische Anforderungen
- EN 60204-1:2019-06
Sicherheit von Maschinen - Elektrische Ausrüstung
von Maschinen - Teil 1: Allgemeine Anforderungen

Markenname: Baumüller

Produktbezeichnung: Drehstrommotor

(... continued from the previous page)

- EN IEC 60034-14:2019-04
Rotating electrical machines – Part 14:
Mechanical vibration of certain machines with shaft
heights 56 mm and higher – Measurement,
evaluation and limits of vibration severity. The
following applies to roller bearing motors:
Based on EN 60034-14 or requirements according
to customer agreement.
- EN 61800-5-1:2024-11
Adjustable speed electrical power drive systems –
Part 5-1:
Safety requirements – Electrical, thermal and
energy
- EN 60204-1:2019-06
Safety of machinery - Electrical equipment of
machines - Part 1: General requirements

Brand name: Baumüller

Product name: AC motor

Produkt / Product	Jahr der erstmaligen CE-Kennzeichnung / Year of first CE marking
DS4-132XXXX-XX-XX-XXXX-XXX-XXX-X-XXX	2025

Nürnberg, 27. Oktober 2025

Dr.-Ing. Michael Wengler
Geschäftsführer
COO Technology/Production

I.A. Michael Veeh
Entwicklungsleiter Motoren
Manager R&D Motors



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Revision survey

Version	Status	Changing
5.25016.01	13-Apr-2026	First release
5.25016.01a	18-May-2026	Type code changes
5.25016.02	23-Jun-2026	Instruction handbook and Technical documentation from shared files



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All data/information in this documentation are non-binding customer information, subject to constant further development and are constantly updated by our permanent modification service. Warranty and liability claims against the company Baumüller Nürnberg GmbH are excluded if in particular one or more of the following causes have caused the damage:

- You disregarded instructions in this documentation.
- The system wasn't used for the intended use.
- The system
 - was incorrectly mounted, connected, put into operation, operated as well as not maintained,
 - was mounted, connected, put into operation, and operated and / or maintained by unqualified personnel,
 - is overloaded,
 - is operated with
 - defective safety equipment,
 - not properly fixed or without safety equipment,
 - not functioning safety and protective equipment,
 - is not operated within the specified environmental conditions.
- You modified the system without having a written approval of the company Baumüller Nuremberg.
- You disregarded the instructions referring to the maintenance in the component descriptions.
- You monitored the parts, which are subject to wear, inadequately.
- You performed a repair incorrectly.
- You combined the system incorrectly with products of other manufacturers.
- You combined the drive system with faulty and / or incorrect documented products of other manufacturers.

The latest version of the "Terms and Conditions of Sale and Delivery" of the company Baumüller Nürnberg GmbH applies.

These were provided at the latest upon conclusion of contract.

HOUSE OF AUTOMATION



Baumüller Nürnberg GmbH

Ostendstraße 80-90 · 90482 Nürnberg · Germany
 Phone: +49 (0) 911 5432-0 · Fax: +49 (0) 911 5432-130
www.baumueller.com

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