BERGER LAHR

# AC-SYNCHRON SERVO MOTOR

# SER 36x

Document: 100000086
Edition: b218, 11.02

## Features common to all motor types

- 6-pole synchronous motors
- High power density
- Integral winding temperature monitor with NTC thermistor
- Test voltage to DIN EN 60034 part 1
- Insulation class F
- Vibration severity grade R to DIN EN 60034 part 14
- Run-out and perpendicularity to DIN 42955 N
- Paint: black RAL 9005

## Security

Please observe before installation, set up, maintenance and repairs of the motors our security tips.

Shouldn’t you know these sheets, please ask for the data sheet "*Security tips of the motors*".

## Motor specifications

A breakdown of the individual motors is given under the type code on page 14.

### *Data specific to motor type*

| Motor type | | | SER 364 | SER 366 | SER 368 | SER 3610 |
|---|---|---|---|---|---|---|
| **Ratings** | | | | | | |
| Rated power | $P_N$ | kW | 0,35 | 0,55 | 0,6 | 0,63 |
| Rated speed [1] | $n_N$ | $min^{-1}$ | 12000 | 12000 | 12000 | 12000 |
| Rated continuous torque | $M_{dN}$ | Nm | 0,28 | 0,44 | 0,48 | 0,5 |
| Continuous stall torque | $M_{d0}$ | Nm | 0,32 | 0,54 | 0,75 | 0,9 |
| **Maximum values** | | | | | | |
| Max. voltage | $U_{max}$ | $V_{AC}$ | 230 | | | |
| | | $V_{DC}$ | 325 | | | |
| Max. torque | $M_{max}$ | Nm | 1,3 | 2,15 | 3,0 | 3,6 |
| Max. admissible speed | $n_{max}$ | $min^{-1}$ | 12000 | 12000 | 12000 | 12000 |
| **Mechanical values** | | | | | | |
| Rotor inertia | $J_R$ | $kgcm^2$ | 0,1 | 0,18 | 0,26 | 0,34 |
| Overall length [2] | L | mm | 126 | 144 | 163 | 181 |
| Weight [2] | m | kg | 1,1 | 1,4 | 1,7 | 2,0 |

Values measured with flange-mounted motors (300 x 300 x 10 mm steel plate); ambient temperature 25° C; without rotary shaft seal

[1] max. performance
[2] without brake

### *Data specific to winding*

| Motor type | Winding | Continuous stall torque | Continuous stall current | Rated continuous torque | Rated continuous current | Rated speed | Rated power | Torque at max. cont. rating | Speed at max. cont. rating | Max. cont. rating | Max. torque | Max. current [2] | Voltage constant [3] | Winding resistance | Winding inductance | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $M_{d0}$ | $I_{d0}$ | $M_{dN}$ | $I_{dN}$ | $n_N$ | $P_N$ | $M_{Pd\_max}$ | $n_{Pd\_max}$ | $P_{d\_max}$ | $M_{max}$ | $I_{max}$ | $k_{E\ U\_V}$ | $R_{U\_V}$ | $L_{qU\_V}$ | $L_{dU\_V}$ |
| | | | | $U_Z$ = 325 $V_{DC}$ | | | | | | | | | | | | |
| | | Nm | A | Nm | A | $min^{-1}$ | kW | Nm | $min^{-1}$ | kW | Nm | A | V | Ω | mH | mH |
| SER364 | **3S** | 0,32 | 2,3 | 0,28 | 1,95 | 12000 | 0,352 | 0,28 | 12000 | 0,352 | 1,3 | 11,5 | 9,1 | 4,7 | 9,2 | 7,9 |
| | **5S** | 0,32 | 1,45 | 0,29 | 1,3 | 10000 | 0,304 | | | | 1,3 | 7,3 | 13,5 | 11,1 | 21,8 | 19,2 |
| | **7S** | 0,32 | 1,15 | 0,3 | 1,1 | 8000 | 0,251 | | | | 1,3 | 5,7 | 18,0 | 18,9 | 37,9 | 33,4 |
| SER366 | **3S** | 0,54 | 2,75 | 0,44 | 2,3 | 12000 | 0,553 | 0,44 | 12000 | 0,553 | 2,15 | 13,5 | 12,0 | 3,7 | 7,9 | 7,1 |
| | **5S** | 0,54 | 1,8 | 0,46 | 1,5 | 9000 | 0,434 | | | | 2,15 | 8,5 | 18,2 | 9,1 | 21,0 | 18,6 |
| | **7S** | 0,54 | 1,25 | 0,49 | 1,15 | 6000 | 0,308 | | | | 2,15 | 6 | 26,4 | 17,4 | 37,5 | 32,9 |
| SER368 | **3S** | 0,75 | 3,05 | 0,48 | 1,95 | 12000 | 0,603 | 0,48 | 12000 | 0,603 | 3 | 15,3 | 14,9 | 3,4 | 7,6 | 6,7 |
| | **5S** | 0,75 | 2,1 | 0,54 | 1,5 | 9000 | 0,509 | | | | 3 | 10,5 | 21,7 | 7,3 | 15,9 | 14,0 |
| | **7S** | 0,75 | 1,15 | 0,64 | 1 | 4500 | 0,302 | | | | 3 | 6 | 39,0 | 23,7 | 53,0 | 46,7 |
| SER3610 | **3S** | 0,9 | 3,53 | 0,5 | 2,1 | 12000 | 0,628 | 0,5 | 12000 | 0,628 | 3,6 | 17,5 | 15,4 | 2,7 | 6,0 | 5,2 |
| | **5S** | 0,9 | 2,3 | 0,62 | 1,6 | 8000 | 0,519 | | | | 3,6 | 11,5 | 23,8 | 6,1 | 14,0 | 12,5 |
| | **7S** | 0,9 | 1,2 | 0,75 | 1 | 4000 | 0,314 | | | | 3,6 | 6 | 46,4 | 23,0 | 54,0 | 47,0 |

[1] for a definition of the winding see the type code on page 14
[2] max. 2,5 sec.
[3] effective values at 1000 rpm

## System specifications

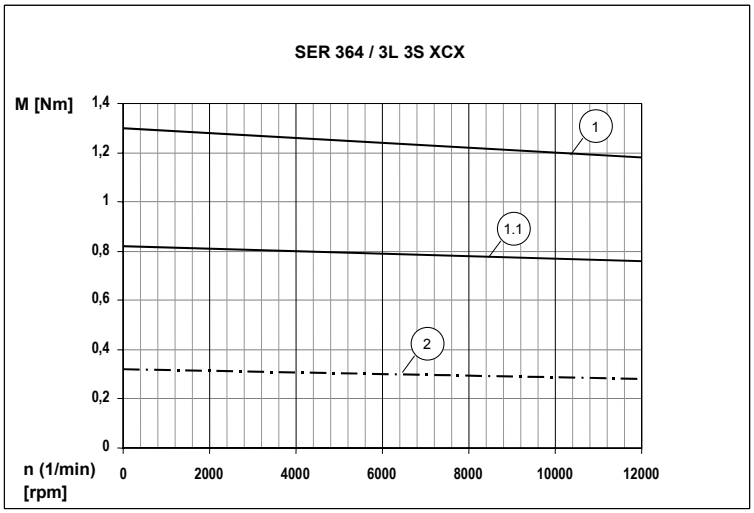
The table comprises the resulting motor data between motor and servo amplifier. In the column "matching" you can find a support, which can make it easier to find a preselection of your system.

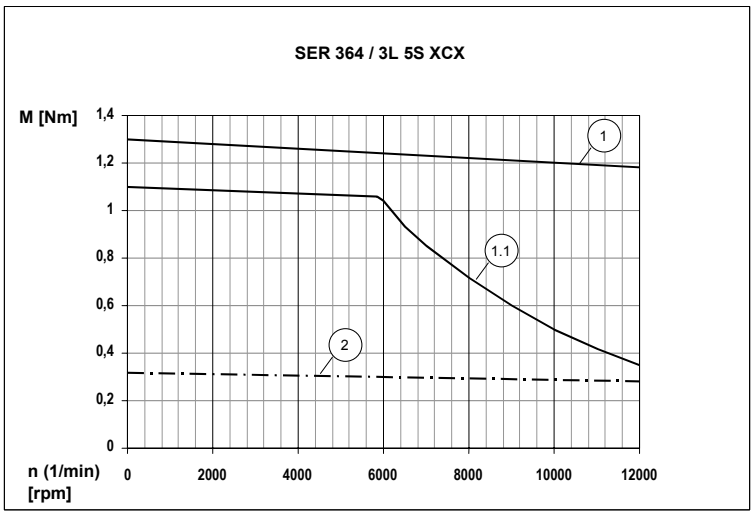
**A** = In this combination the motor is **accelerator optimized**.
**P** = In this combination the motor is **power optimized**.
**V** = In this combination the motor is **speed optimized**.

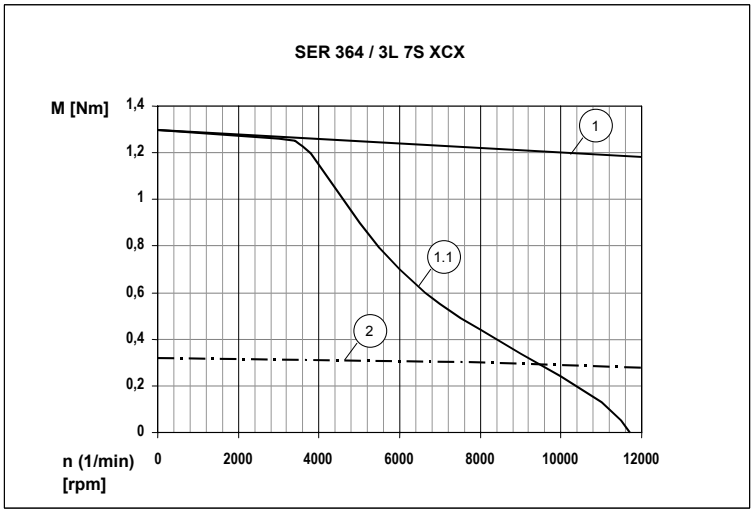
| Servo amplifier | Motor type | Winding [1] | Matching | Rated speed | Rated continuous torque | Rated power | Rated continuous current | Continuous stall torque | Continuous stall current | Max. torque | Max. current [2] | Voltage constant [3] | Winding resistance [4] | Winding inductance [4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $n_N$ | $M_{dN}$ | $P_N$ | $I_{dN}$ | $M_{d0}$ | $I_{d0}$ | $M_{max}$ | $I_{max}$ | $k_{E\ U\_V}$ | $R_{U\_V}$ | $L_{U\_V}$ |
| | | | | $min^{-1}$ | Nm | kW | A | Nm | A | Nm | A | V | Ω | mH |
| **TLX X32** (3/6 $A_{rms}$ / $U_z$ = 325 $V_{DC}$) | SER 364 | 3S | V+P | 12000 | 0,28 | 0,35 | 1,95 | 0,32 | 2,30 | 0,80 | 6,0 | 9,1 | 4,7 | 9,2 |
| | | 5S | | 10000 | 0,29 | 0,30 | 1,30 | 0,32 | 1,45 | 1,10 | 6,0 | 13,5 | 11,1 | 21,8 |
| | | 7S | A | 8000 | 0,30 | 0,25 | 1,10 | 0,32 | 1,15 | 1,30 | 5,7 | 18,0 | 18,9 | 37,9 |
| **TLX X32** (3/6 $A_{rms}$ / $U_z$ = 325 $V_{DC}$) | SER 366 | 3S | V+P | 12000 | 0,44 | 0,55 | 2,30 | 0,54 | 2,75 | 1,15 | 6,0 | 12,0 | 3,7 | 7,9 |
| | | 5S | | 9000 | 0,46 | 0,43 | 1,50 | 0,54 | 1,80 | 1,60 | 6,0 | 18,2 | 9,1 | 21,0 |
| | | 7S | A | 6000 | 0,49 | 0,31 | 1,15 | 0,54 | 1,25 | 2,15 | 6,0 | 26,4 | 17,4 | 37,5 |
| **TLX X32** (3/6 $A_{rms}$ / $U_z$ = 325 $V_{DC}$) | SER 368 | 3S | V+P | 12000 | 0,48 | 0,60 | 1,95 | 0,73 | 3,00 | 1,50 | 6,0 | 14,9 | 3,4 | 7,6 |
| | | 5S | | 9000 | 0,54 | 0,50 | 1,50 | 0,75 | 2,10 | 1,90 | 6,0 | 21,7 | 7,3 | 15,9 |
| | | 7S | A | 4500 | 0,64 | 0,30 | 1,00 | 0,75 | 1,15 | 3,00 | 6,0 | 39,0 | 23,7 | 53,0 |
| **TLX X32** (3/6 $A_{rms}$ / $U_z$ = 325 $V_{DC}$) | SER 3610 | 3S | V+P | 12000 | 0,50 | 0,63 | 2,10 | 0,76 | 3,00 | 1,50 | 6,0 | 15,4 | 2,7 | 4,6 |
| | | 5S | | 8000 | 0,62 | 0,52 | 1,60 | 0,90 | 2,30 | 2,10 | 6,0 | 23,8 | 6,1 | 14,0 |
| | | 7S | A | 4000 | 0,75 | 0,32 | 1,00 | 0,90 | 1,20 | 3,60 | 6,0 | 46,4 | 23,0 | 54,0 |

[1] for a definition of the winding see the type code on page 14
[2] max. 2,5 sec.
[3] effective values at 1000 rpm

## Torque characteristic curves SER 364



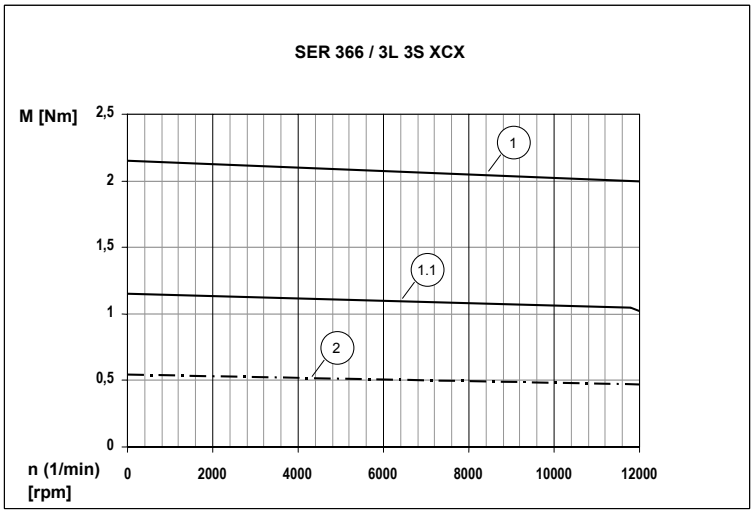



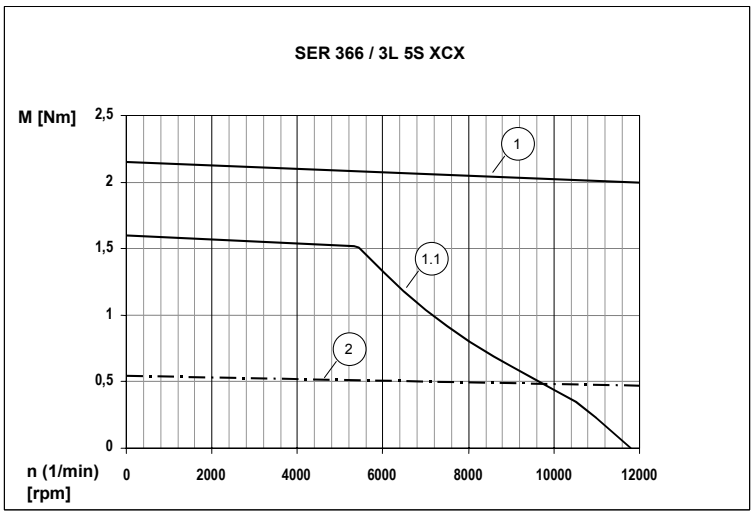

**1** Motor peak torque

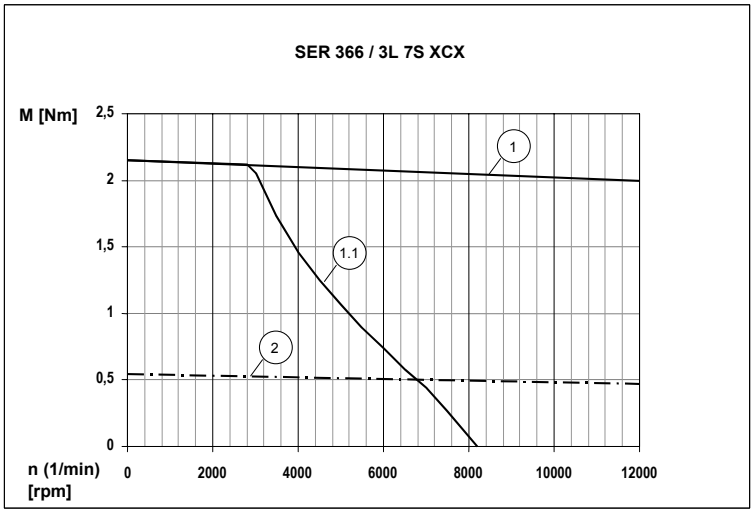
**2** Continuous torque

**1.1** Peak torque with TLXx32

## Torque characteristic curves SER 366



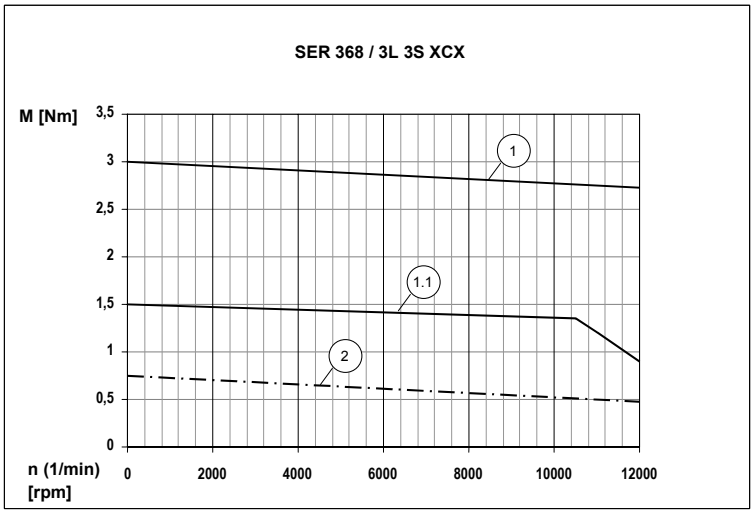



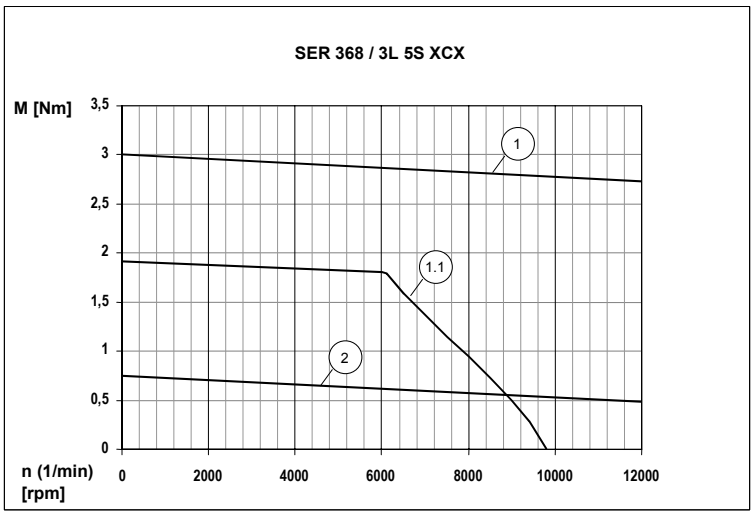

**1** Motor peak torque

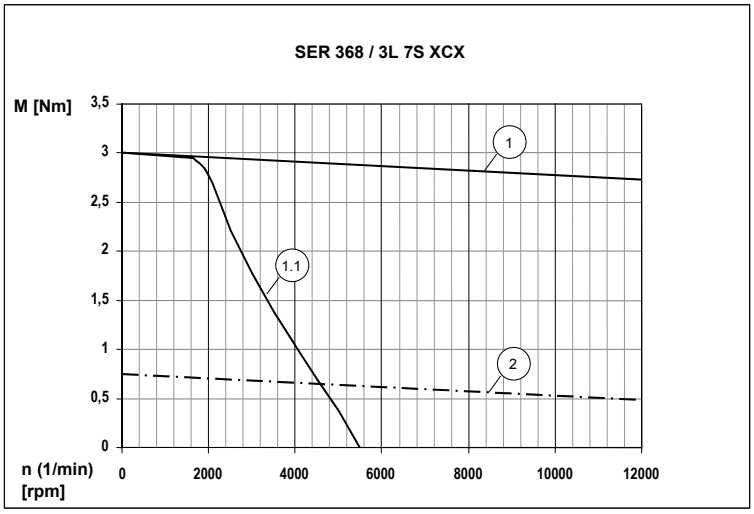
**2** Continuous torque

**1.1** Peak torque with TLXx32

## Torque characteristic curves SER 368



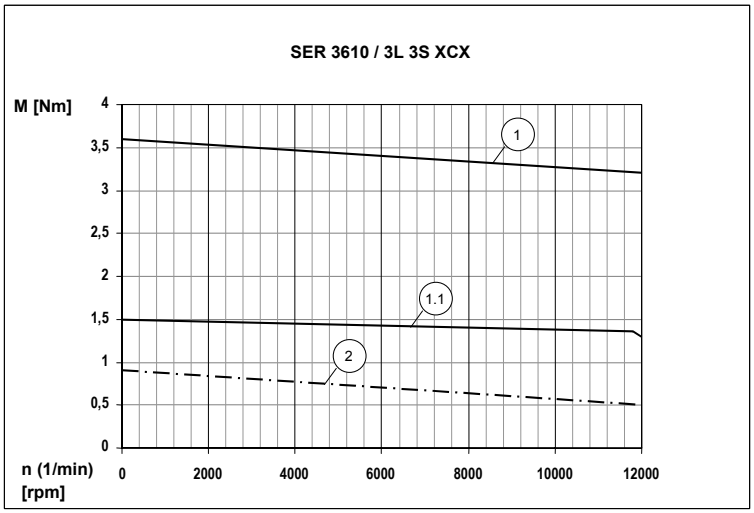



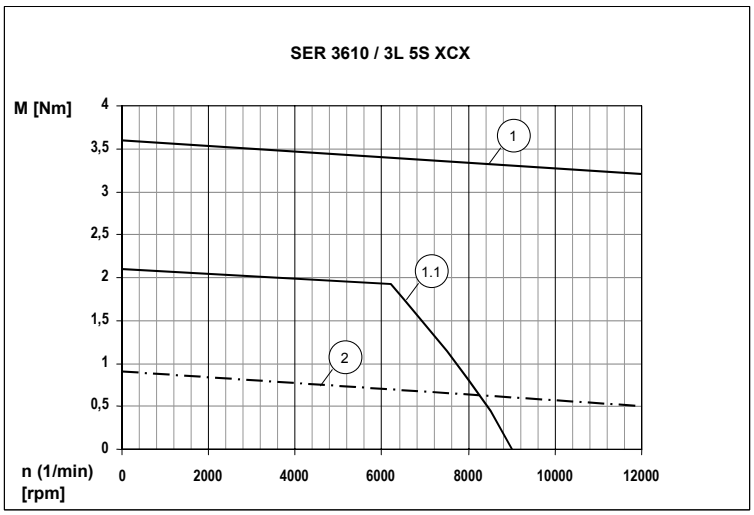

**1** Motor peak torque

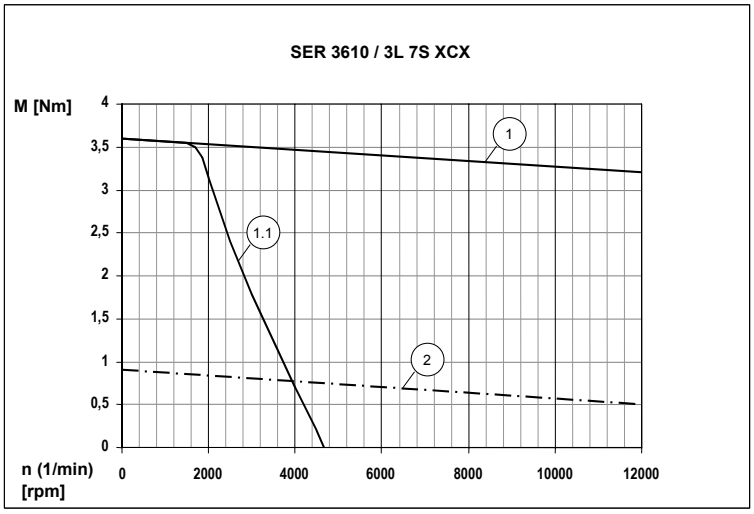
**2** Continuous torque

**1.1** Peak torque with TLXx32

## Torque characteristic curves SER 3610



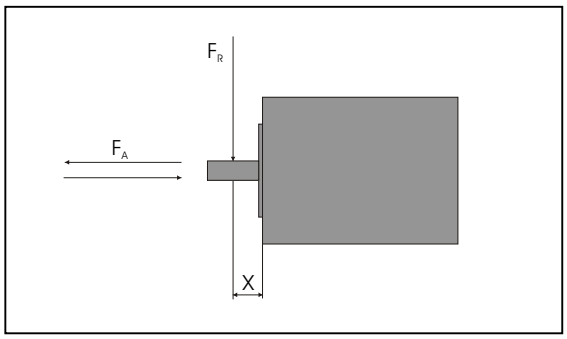

**1** Motor peak torque

**2** Continuous torque

**1.1** Peak torque with TLXx32

## Shaft load

Even when the motors are used perfectly correctly, their service life is still limited by the service life of the bearing. The bearing must not be changed by the customer because the measuring systems integrated into the motor have to be reinitialised.




Conditions:

- Nominal bearing life [1] $L_{10h}$ = 20.000 h
- Speed n = 4000 rpm
- Ambient temperature = 40°C
  (≈ 100°C Bearing temperature)
- Peak torque = 10 % c.d.f
- Rated torque = 100 % c.d.f
- Point of application of forces X = 10 mm

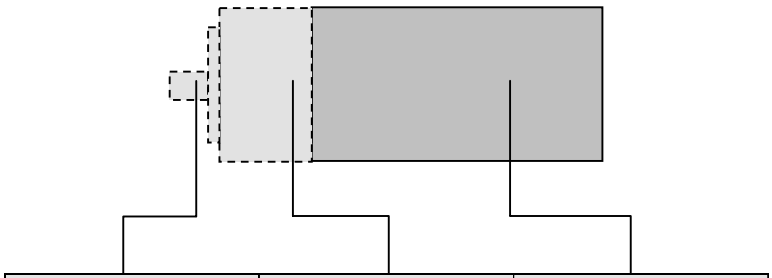
[1] In operating hours with a 10% probability of failure

| Motor | | | SER 364 | SER 366 | SER 368 | SER 3610 |
|---|---|---|---|---|---|---|
| **Max. radial force** Front **$F_R$** | N | 10 % c.d.f. | 231 | 275 | 302 | 320 |
| | | 100 % c.d.f. | 89 | 107 | 117 | 124 |
| **Max. axial force** Pull / push **$F_A$** | N | 10 % c.d.f. | 299 | | | |
| | | 100 % c.d.f. | 104 | | | |

- Axial and radial loading must not occur simultaneously.
- The maximum admissible pressing force on the shaft end is 1800 N.
- Shaft exit with rust protection

## Degree of protection

The degree of protection of your motor version is shown in the diagram below:



| Gearbox | | Front shaft exit | | Motor housing |
|---|---|---|---|---|
| PLE | PLS | | | |
| IP 54 | IP 65 | IP 41 | IP 56 [1] | IP 56 |

[1] Option IP56; speed limited by rotary shaft seal $n_{max}$ = 6000 rpm

- The radial rotary shaft seal is initial lubricated.
  Dry run of packing will reduce life span considerably!
- The seal at shaft exit will reduce the motor torque.

## Ambient conditions

**Climate:**
**(with reference to DIN 50019 R14)**

Temperature (t): -25°C ... +40°C
Atmospheric humidity (U): ≤ 75 % RH annual average / 95 % RH on 30 days without condensation

**Storage and transportation temperature:**

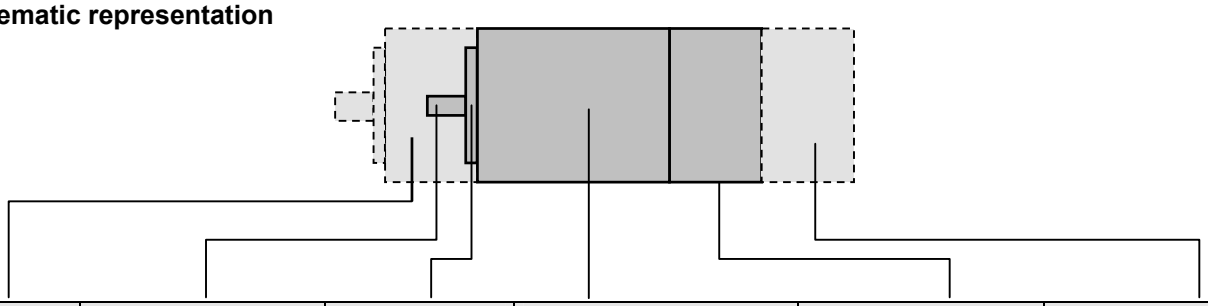
-25°C to 70°C

## Motor versions

Our flexible modular system and the latest version management system enable us to supply the following versions. The dimensions and a detailed information are shown in the variants section on page 15.

Please also note the type code on page 14.

**Schematic representation**



| Gearbox | Shaft version | Centring collar | Motor type SER 3xx Size | Length | Connection Voltage | Type | Options |
|---|---|---|---|---|---|---|---|
| 3:1<br>5:1<br>8:1 | ∅ 9 mm [1] | ∅ 50 mm<br>∅ 40 mm | 6 | 4<br>6<br>8<br>10 | 325 V | Plug | Holding brake<br>Position detection [2]<br>Plug version [3] |

[1] Degree of protection: Standard: IP 41
Option: IP 56

[2] Position detection method: Standard: Singleturn Encoder SinCos (SRS),
(System of measurement) Options: Multiturn Encoder SinCos (SRM),
Resolver,
Digital Encoder DiCoder

[3] Plug version: Standard: unbown version,
Option: right-angled; rotatable through 310°

## Position detection

All our servomotors are equipped with a system of measurement for position detection. This is normally an encoder-system SinCos Singleturn, a combination of incremental and absolute encoder.
This position detection method is specifically tailored for our power drives (Twin Line-Devices TLXxxx).

If you would prefer a different position detection method, the following measuring systems can also be supplied:

- SinCos (SRM50) Multiturn
- Resolver

**The following measuring systems data are taken from the specific product data sheets. Please do not hesitate to contact us if you require any further information.**

### *Standard:*

## SinCos (SRS50) Singleturn

This system of measurement establishes an absolute value within one revolution of being turned on and then counts on incrementally from it.

**Technical data**

| | |
|---|---|
| Resolution with Twin Line-devices | 16384 increments / revolution |
| Accuracy of absolute position of Twin Line-devices | $\frac{1}{16384}$ rev |
| Accuracy of incremental position | ± 0.75 minutes of arc |
| Output | See separate datasheet |
| Signals | See separate datasheet |
| Pulse waveshape | Sinusoidal |
| Supply voltage | 7 – 12 V (8 V is recommended) |
| Current | Up to 130 mA (no-load) |

## *Options:*

### SinCos (SRM50) Multiturn

This system of measurement establishes an absolute value within 4096 revolutions of being turned on, and then counts on incrementally from it.

**Technical data**

| | |
|---|---|
| Resolution with Twin Line-devices | 16384 increments / revolution |
| Absolute measurement range | 0 ... 4096 revolutions |
| Accuracy of absolute position of Twin Line-devices | $\frac{1}{16384}$ rev |
| Accuracy of incremental position | ± 0.75 minutes of arc |
| Output | See separate datasheet |
| Signals | See separate datasheet |
| Pulse waveshape | Sinusoidal |
| Supply voltage | 7 – 12 V (8 V is recommended) |
| Current | Up to 130 mA (no-load) |

For more information, please go to www.stegmann.de

### Resolver

This system of measurement is a very robust, absolute system. It can detect the absolute position within one revolution.

**Technical data**

| | |
|---|---|
| Resolution with Twin Line-devices | 4096 increments / revolution |
| Accuracy | ± 6 minutes of arc |
| Input voltage | 7 $V_{eff}$ |
| Input current | Up to 38 mA |

## Holding brake

The holding brake is a permanent magnet brake which holds the motor shaft in position when there is no current to the motor (e.g. in the event of a power failure or emergency stop). This holding function is needed for applications in which weight on the shaft can cause excessive torque, e.g. the Z axes of handling equipment.

***ATTENTION!***
***Do not use the holding brake as operating brake.***

### Technical data

| | | |
|---|---|---|
| Rated voltage | 24 | V |
| Holding torque | 1,2 | Nm |
| Power consumption | 10 | W |
| Moment of inertia | 0,07 | $kgcm^2$ |
| ON time (disengage brake) | 14 | ms |
| OFF time (engage brake) | 13 | ms |
| Weight | approx. 0,3 | kg |

### Power drive

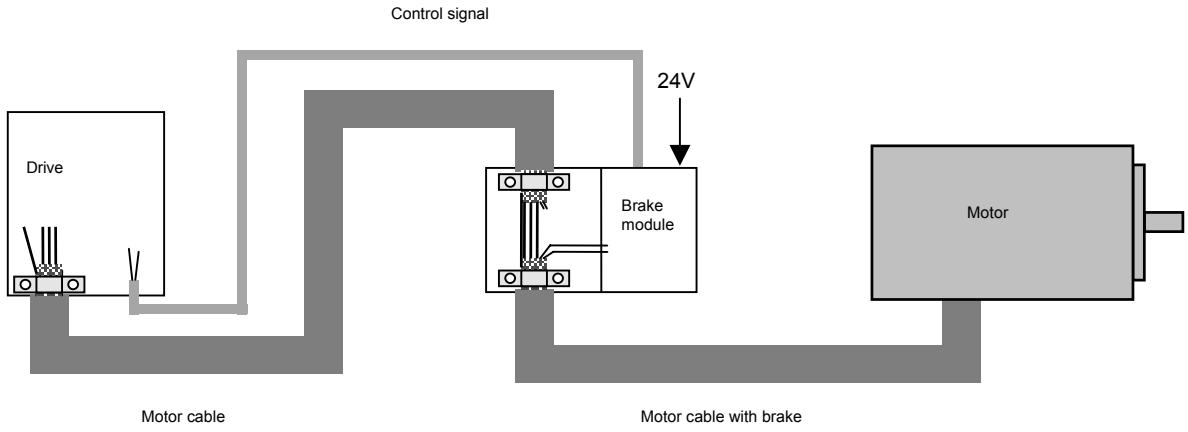
Please use the holding brake controller TL HBC and activate the current reduction.This will reduce the warm up of motors by brake and therefore makes shure to keep the published torque characteristic curves. The use of holding brake controller TL HBC makes also shure a safe electrical isolation of brake supply voltage and supports to follow the german DIN EN standard of EMC DIN EN 618008-3.

The holding brake controller TL HBC is designed as a separate unit and can be mounted on a top-hat rail in the switch cabinet.

In this module, the motor cable is split, connected to an internal distributor terminal and routed to our power drive by means of a further (shielded) cable.

The brake cables are connected to a DC-DC converter via two screw terminals. Two terminals for the 24 VDC supply and two for the control cables (BRAKE_CON and BRAKE_GND) can be accessed from outside the module. An LED lights up when the brake is disengaged (standby). The brakes can be controlled with a single button during start-up. The metal housing provides additional shielding (EMC protection).

### Wiring diagram



## Gearbox options

For all your applications, our servomotors can be combined with gearboxes which we have selected as standard. In the following tables we show you what combinations of motor and gearbox are available.

The measurements listed were determined by delivering the maximum continuous motor torque to your application through the gearbox (maximum speed and shortest possible cycle times at maximum torque).

In normal operation it is not possible to deliver peak torque on a continuous basis without overheating the motor. If you select your gearbox according to the values specified here, you will be absolutely on the safe side.

If the motors are not used in their maximum torque range, you can select other gearboxes as shown in our alternative combinations.

If you have special demands which go beyond what the standard product range has to offer, please contact our technical support.

Refer to gearbox datasheet for further information.

## Gearbox type PLE

Economic precision planetary gearbox (single-stage gearbox)

### Configuration options

| | |
|---|---|
| **Bold highlighted** | Limiter of torque by gear box or motor |
| x | gearbox over or under-sized or uneconomic |

| $M_{d0}$ [Nm] | Motor | Gearbox | 3:1 | | | 5:1 | | | 8:1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $M_{d0G}$ [1] [Nm] | $M_{dG}$ [2] [Nm] | $M_{maxG}$ [3] [Nm] | $M_{d0G}$ [1] [Nm] | $M_{dG}$ [2] [Nm] | $M_{maxG}$ [3] [Nm] | $M_{d0G}$ [1] [Nm] | $M_{dG}$ [2] [Nm] | $M_{maxG}$ [3] [Nm] |
| 0,32 | **SER 364** | with **PLE 60** | 0,96 | 12 | **3,9** | 1,6 | 16 | **6,5** | 2,56 | 15 | **10,4** |
| 0,54 | **SER 366** | | 1,62 | 12 | **6,45** | 2,7 | 16 | **10,75** | 4,32 | **15** | 17,2 |
| 0,75 | **SER 368** | | 2,25 | 12 | **9** | 3,75 | 16 | **15** | 6 | **15** | 24 |
| 0,9 | **SER 3610** | | 2,7 | 12 | **10,8** | 4,5 | **16** | 18 | 7,2 | **15** | 28,8 |

Index G ($M_{xx}$**G** ) -> in relation to gearbox output shaft

[1] $M_{d0G}$ nominal torque at low speed = guide for selection of gearbox
(*continuous stall torque $M_{d0}$ x gear ratio)*

[2] $M_{dG}$ gearbox output torque (continuous)

[3] $M_{maxG}$ max. output torque with this motor
(*theoretical value calculated from: max. motor torque $M_{max}$ x gear ratio)*

*The continuous gearbox output torque $M_{dG}$ may not be continuously exceeded.*
*For a short period, e.g. in an emergency shutdown situation, twice this torque is permitted. The motor may have to have a governor installed as otherwise there is a danger that the gearbox could be destroyed at peak torques.*

## Gearbox type PLS

High-quality, low-backlash, planetary gearbox (single-stage gearbox)

### Configuration options

For higher accuracy you can mount the type PLS 70. This gearbox is with a reduction ratio of 8:1 an economic alternative at high torques.

BERGER LAHR

## Type code

**Example:** SER 3 6 13 / 3 L 3 S S 0 C B IP 41

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SER** | X | X | X | / | 3 | L | X | X | X | X | X | X | IP X |

**Number of phases**

3

**Size**

6 (approx.57,2 mm)

**Length**

4 overall approx. 126 mm
6 overall approx. 144,5 mm
8 overall approx. 163 mm
10 overall approx. 181,5 mm

**Number of pairs of poles**

3

**Winding identification**

3
5
7

**Winding cicuit**

S star connection
D delta connection

**System of mesurement**

**/ Resolution**

| | | | |
|---|---|---|---|
| S | SinCos (SRS) Singleturn | / 0 | 1024 no. of sine/cosine cycles per revolution |
| M | SinCos (SRM) Multiturn | / 0 | 1024 no. of sine/cosine cycles per revolution |
| R | Resolver | / 0 | 1 polepairs |

**Motor and sensor connections**

C straight connector
T right-angled connector, rotatable through 310°

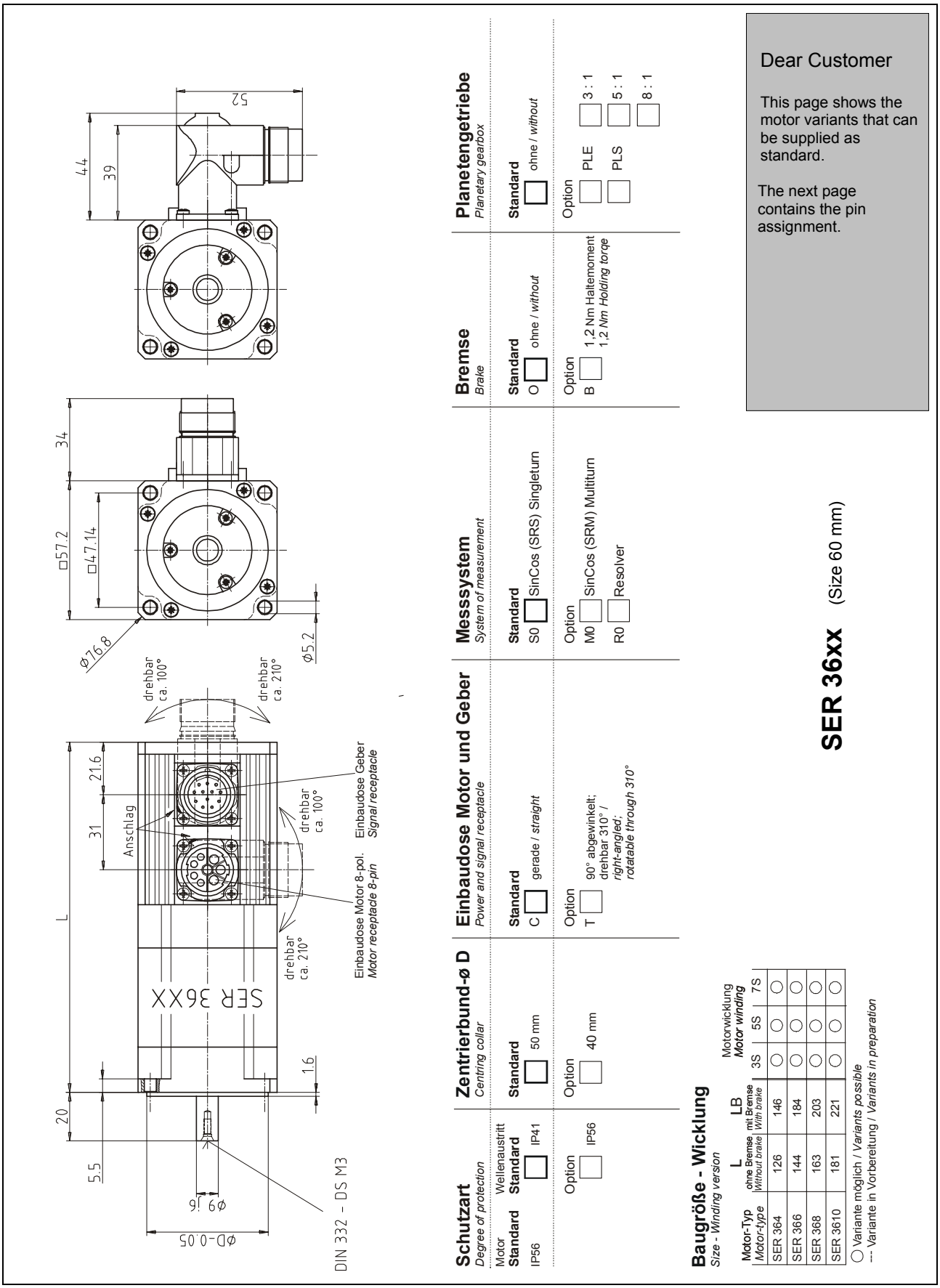
**Holding brake**

B with brake
O without brake

**Degree of protection**

IP56 with rotary shaft seal
IP41 without rotary shaft seal

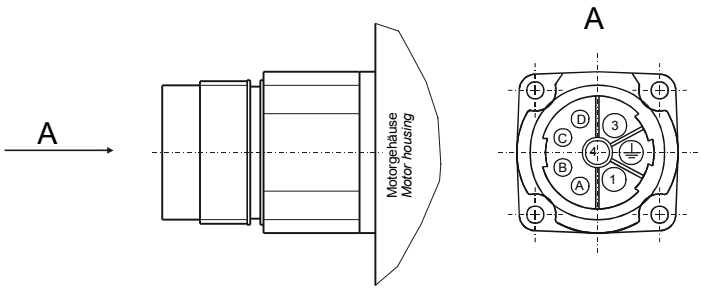
## Variants


SER 36XX
SER 36xx (Size 60 mm)
Dear Customer
This page shows the motor variants that can be supplied as standard.
The next page contains the pin assignment.
Schutzart
Degree of protection
Motor
Standard
IP56
Wellenaustritt
Standard
IP41
Option
IP56
Zentrierbund-ø D
Centring collar
Standard
50 mm
Option
40 mm
Einbaudose Motor und Geber
Power and signal receptacle
Standard
C gerade / straight
Option
T 90° abgewinkelt; drehbar 310° / right-angled; rotatable through 310°
Messsystem
System of measurement
Standard
S0 SinCos (SRS) Singleturn
Option
M0 SinCos (SRM) Multiturn
R0 Resolver
Bremse
Brake
Standard
O ohne / without
Option
B 1,2 Nm Haltemoment
1,2 Nm Holding torqe
Planetengetriebe
Planetary gearbox
Standard
ohne / without
Option
PLE 3 : 1
PLS 5 : 1
8 : 1
Baugröße - Wicklung
Size - Winding version
Motor-Typ / Motor-type
L ohne Bremse / Without brake
LB mit Bremse / With brake
Motorwicklung / Motor winding
3S 5S 7S
SER 364 126 146
SER 366 144 184
SER 368 163 203
SER 3610 181 221
○ Variante möglich / Variants possible
--- Variante in Vorbereitung / Variants in preparation
DIN 332 - DS M3
Einbaudose Motor 8-pol. Motor receptacle 8-pin
Einbaudose Geber Signal receptacle
drehbar ca. 100°
drehbar ca. 210°
Anschlag
L
20
5.5
31
21.6
34
□57.2
□47.14
Ø76.8
Ø5.2
1.6
44
39
52

## Pin assignment

### *Motor plug*

| PIN | Assignment |
|---|---|
| 1 | U |
| 2 | PE |
| 3 | W |
| 4 | V |
| A | Brake |
| B | Brake |
| C | Not assigned |
| D | Not assigned |

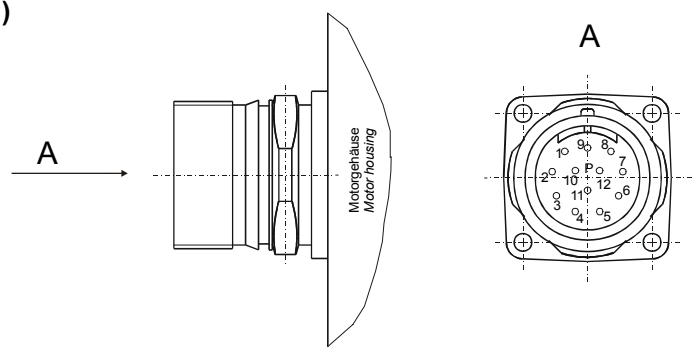



8-pin power receptacle
BEGA089NN0000 0002 000
from Intercontec

### *Position detection plug*

**SinCos Encoder (SINGLE-TURN & MULTI-TURN)**

| PIN | Assignment |
|---|---|
| 1 | Temperature sensor * |
| 2 | Temperature sensor * |
| 3 | Not assigned |
| 4 | REF SIN |
| 5 | REF COS |
| 6 | Data+ RS485 |
| 7 | Data- RS485 |
| 8 | + SIN |
| 9 | + COS |
| 10 | Us 7-12 V |
| 11 | GND |
| 12 | Not assigned |




12-pin signal receptacle
AEGA052NN0000 1250 000
from Intercontec

**Resolver**

| PIN | Assignment |
|---|---|
| 1 | Temperature sensor * |
| 2 | Temperature sensor * |
| 3 | Not assigned |
| 4 | SIN - |
| 5 | COS - |
| 6 | REF + |
| 7 | REF - |
| 8 | SIN + |
| 9 | COS + |
| 10 | Not assigned |
| 11 | Not assigned |
| 12 | Not assigned |

* Fa. S+M, Typ B57227

*Please notice addition data sheets:*
*- Security tips of the motors*
*- Mounting instruction for motor- and encoder connection*