

# LM lean motors Operating manual

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**STÖBER**

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# 1 User information

This documentation is a part of the product. It applies to products in the standard design according to the corresponding STOBER catalog.

## 1.1 Formatting conventions

Orientation guides in the form of signal words are used to emphasize specific information so that you are able identify it in this documentation quickly.

Safety notes indicate special risks when handling the product and are accompanied by relevant signal words that express the extent of the risk. In addition, warning notes for possible property damage and useful information are also indicated by signal words.

---

### **DANGER!**

#### **Danger**

This word with a warning triangle indicates that there is a considerable risk of fatal injury

- if the stated precautionary measures are not taken.
- 

---

### **WARNING!**

#### **Warning**

This word with a warning triangle means there may be a considerable risk of fatal injury

- if the stated precautionary measures are not taken.
- 

---

### **CAUTION!**

#### **Caution**

This word with a warning triangle indicates that minor personal injury may occur

- if the stated precautionary measures are not taken.
- 

---

### **ATTENTION!**

#### **Notice**

This indicates that damage to property may occur

- if the stated precautionary measures are not taken.
- 

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### **Information**

Information indicates important information about the product or serves to emphasize a section in the documentation that deserves special attention from the reader.

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### Embedded warning information

Embedded warning information is integrated directly into the instruction manual and is structured as follows:

**SIGNAL WORD! Type of hazard, its cause and possible consequences of disregarding it!** Measures for avoiding the hazard.

Signal words in embedded warning information have the same meaning as in the normal warning information described previously.

## 1.2 Limitation of liability

This documentation was created taking into account the applicable standards and regulations as well as the current state of technology.

STOBER shall assume no responsibility for damage resulting from failure to comply with the documentation or from use that deviates from the intended use of the product. This is especially true for damage caused by individual technical modifications to the product or projecting and operation of the product by unqualified personnel.

## 1.3 Product names and brands

Product names that are registered as brands are not specifically identified in this documentation. Existing property rights (patents, trademarks, protection of utility models) are to be observed.

## 1.4 Additional documentation

You can find supporting technical documents for this product when you enter the serial number of the product at <https://id.stober.com> or scan the QR code on the product's nameplate.

You will find more information about the product at <http://www.stoeber.de/en/download>. Enter the ID of the documentation in the Search... field.

Documentation	ID
Lean motors catalog	443016_en
Manual for SI6 drive controllers	442728
Manual for SC6 drive controllers	442790

## 1.5 Copyright notice

Copyright © STOBER. All rights reserved.

## 2 Safety instructions

Hazards may arise through the use of the product described in this documentation. Read and always observe the safety instructions in this chapter. Doing so allows you to prevent hazards to people and property.

### 2.1 Intended use

The motors / geared motors described in this documentation are intended for installation and operation in commercial and industrial machines or systems.

The following are considered non-intended use:

- Any overloading of the motors / geared motors
- Use in ambient conditions that deviate from those described in this documentation
- Modifying or refitting the motors / geared motors
- Using the motors / geared motors for an application other than that defined during project configuration
- Direct operation on a three-phase network
- Operation in potentially explosive atmospheres

Commissioning the machine in which the motors / geared motors are installed is prohibited until it has been determined that the machine corresponds to regional laws and guidelines. In the EU, the following guidelines in particular are to be observed in their respective scope:

- (Machinery) Directive 2006/42/EC
- (Low Voltage) Directive 2014/35/EU
- (EMC) Directive 2014/30/EU

### 2.2 Requirements for personnel

All mechanical tasks that arise during the assembly, commissioning, maintenance and removal of the product may be performed only by specialized personnel who hold a corresponding qualification in the field of metal technology.

All electrical tasks that arise during the assembly, commissioning, maintenance and removal of the product may be performed only by electricians who hold a corresponding qualification in the field of electrical engineering.

Tasks that arise during transport, storage and disposal may be performed by personnel who have been instructed in the suitable method for doing so.

Furthermore, personnel who handle the product must carefully read, understand and observe the valid regulations, legal requirements and applicable basic rules as well as this documentation and the safety instructions it contains.

## 2.3 Prevention of personal injury

### 2.3.1 Electrical hazards

The motor can be operated safely if handled correctly and while observing the safety instructions. Despite this, the electrical voltage that powers or is generated by the motor can pose a danger to persons. Therefore, observe the following safety instructions.

#### **WARNING!**

##### **The motor is powered by high electrical voltage!**

Touching live parts is extremely dangerous and potentially fatal!

- The electrical connection of the motor may be carried out only by an electrician.
- Before performing the electrical connection, switch off the power supply of the machine with the main switch and secure it from being turned on again.
- Only connect the motor using power connection cables recommended by STOBBER.
- Do not open the housing of the power plug connector.

#### **WARNING!**

##### **Due to integrated permanent magnets, the rotating motor shaft generates high voltage that is present on the pin contacts of the plug connector.**

Touching live parts is extremely dangerous and potentially fatal!

- Only perform work on the motor with the motor shaft at a standstill.
- Do not touch the pin contacts of the plug connector.

### 2.3.2 Mechanical hazards

The motor converts electrical energy into kinetic energy during operation. Machine parts that are set in motion by this pose a possible danger to persons. Therefore, observe the following safety instructions.

#### **WARNING!**

##### **Dangerous movements of machine parts!**

Moving machine parts can cause serious injuries or even death!

- ✓ Before starting the motor or drive:
  - Install all protective devices necessary for operation.
  - Make sure that no one is standing in the danger area or able to enter it unchecked.
  - Leave the danger area.

#### **WARNING!**

##### **Unsecured feather keys or power transmission elements can be thrown off by rotation of the input shaft!**

Flying metal parts can cause serious injuries!

- Assemble the provided power transmission elements properly or remove them before a test run.

 **WARNING!**

**Sinking or falling of gravity-loaded axes or vertical axes after switching off the motor due to gravity!**

Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!

- Be aware that the holding brake of the motor does not offer sufficient safety for persons that are in the hazard area of gravity-loaded axes or vertical axes.
  - Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before persons are allowed to enter the hazard area.
- 

### 2.3.3 Thermal hazards

 **CAUTION!**

**The surface of the motor / geared motor can reach temperatures over 100 °C during operation!**

Touching the hot surface of the motor / geared motor can cause severe skin burns!

- Do not touch the motor / geared motor during or immediately after operation.
  - Allow the motor / geared motor to cool sufficiently before carrying out work on the motor / geared motor.
  - Wear protective gloves when working on the motor / geared motor.
- 

### 2.3.4 Hazards due to magnetic or electromagnetic fields

 **WARNING!**

**Strong magnetic and electromagnetic fields in the immediate vicinity of the motor!**

Magnetic and electromagnetic fields can impair the function of sensitive electronic devices such as pacemakers and can cause serious health-related harm as a result!

- Take suitable protective and instructive measures so that persons with pacemakers do not enter the immediate vicinity of or work with the motor.
- 

## 2.4 Prevention of property damage



**ATTENTION! The surface of the motor can reach temperatures over 100 °C during operation!** Take suitable measures so that temperature-sensitive components such as connection cables do not come into contact with the motor housing.

**ATTENTION! Strong magnetic and electromagnetic fields in the immediate vicinity of the motor!** Keep sensitive electronic devices and magnetic data carriers away from the motor.



## 2.5 Warning labels on the motor

Warning labels are attached to the motor. Over time, these warning labels can become dirty or illegible for other reasons. Keep the warning labels in good, legible condition. Replace damaged warning labels.

Warning label	Meaning
 A yellow triangular warning sign with a black border and a black lightning bolt symbol in the center.	Warning of high electrical voltage. Do not connect or disconnect the plug connectors until after the motor is de-energized. Only perform work on the motor when the motor shaft is at a standstill.
 A yellow triangular warning sign with a black border and three black wavy lines representing heat in the center.	The surface of the motor can reach high temperatures during operation. Do not touch the motor during operation or immediately afterward.

## 3 Product description

In this chapter, you can find product details that are relevant for assembly, commissioning and maintenance. Additional product details can be found in the catalog (see the chapter Additional documentation).

### 3.1 Basic structure

The basic structure of the Lean motors is explained in this chapter using an example.

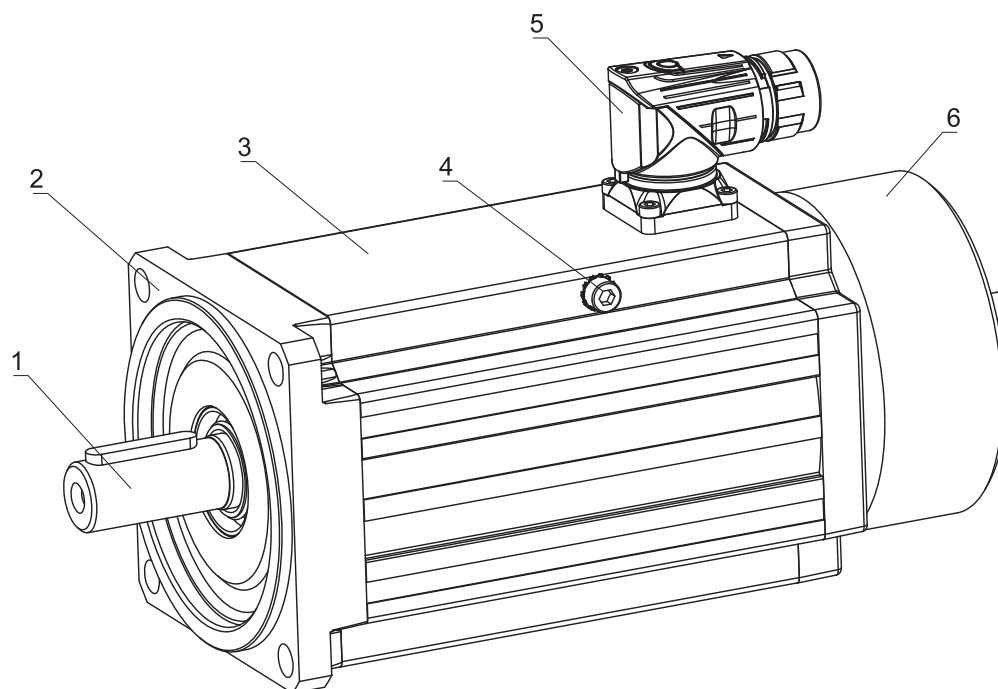


Fig. 1: Structure of an LM502 motor with holding brake

1	Output shaft	2	Output flange
3	Motor housing	4	Grounding conductor connection
5	Power plug connector	6	Holding brake (optional)

## 3.2 Type designation

### Sample code

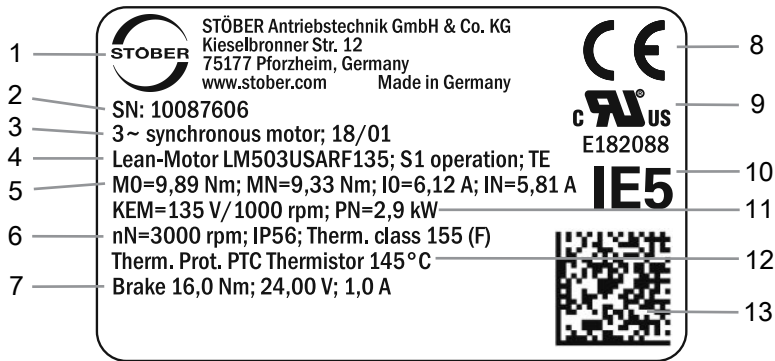
LM	4	0	1	U	S	AR	O	110
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### Explanation

Code	Designation	Design
LM	Type	Lean motor
4	Size	4 (example)
0	Generation	0
1	Length	1 (example)
U	Cooling	Convection cooling
S	Design	Standard
AR	Drive controller	SC6
AT		SI6
O	Brake	Without holding brake
F		Spring-loaded holding brake
110	Voltage constant $K_{EM}$	100 V/1000 rpm (example)

### 3.3 Nameplate

An example nameplate of an LM503 Lean motor is explained in the figure below.



Line	Value	Description
1	STÖBER	Logo and address of the manufacturer
2	SN: 10087606	Serial number of the motor
3	3~ synchronous motor; 18/01	Motor type: three-phase synchronous motor Date of manufacture (year/calendar week)
4	Lean motor LM503USARF135 S1 operation TE	Type designation Operating mode Protection class in accordance with UL1004
5	M0=9.89 Nm MN=9.33 Nm IO=6.12 A IN=5.81 A	Stall torque Nominal torque Stall current Nominal current
6	nN=3000 rpm IP56 Therm. class 155 (F)	Nominal speed Protection class Thermal class
7	Brake 16.0 Nm 24.00 V 1.0 A	Holding brake (optional) Static braking torque at 100 °C Nominal voltage of the holding brake Nominal current of the holding brake at 20 °C
8	CE	CE marking
9	cURus	cURus test symbol
10	IE5	IE5 efficiency class
11	KEM=135 V/1000 rpm PN=2.9 kW	Voltage constant Nominal power
12	Th. Prot. PTC thermistor 145 °C	Type of temperature sensor
13	QR code	Link to product information

## 3.4 General features

Feature	Description
Design	Sensorless synchronous motor with interior permanent magnets
Design	IM B5, IM V1, IM V3 in accordance with EN 60034-7
Protection class	IP56 / IP66 (option)
Thermal class	155 (F) in accordance with EN 60034-1 (155 °C, heating $\Delta\vartheta = 100$ K)
Surface	Matte black as per RAL 9005
Cooling	IC 410 convection cooling
Bearing	Rolling bearing with lifetime lubrication and non-contact sealing
Sealing	Radial shaft seal rings made of FKM (A side)
Shaft	Shaft with feather key, diameter quality k6
Radial runout	Normal tolerance class in accordance with IEC 60072-1
Concentricity	Normal tolerance class in accordance with IEC 60072-1
Axial runout	Normal tolerance class in accordance with IEC 60072-1
Vibration intensity	A in accordance with EN 60034-14
Noise level	Limit values in accordance with EN 60034-9

### Note

Repainting the motor changes its thermal properties. This lowers the performance limit of the motor.

## 3.5 Electrical features

Feature	Description
DC link voltage	DC 540 V (max. 620 V) on STOBER drive controllers
Winding	Three-phase
Circuit	Star, center not led through
Protection class	I (protective grounding) in accordance with EN 61140
Number of pole pairs	3

### 3.5.1 Temperature sensor

A PTC thermistor is installed in STOBER Lean motors as a standard temperature sensor for implementing thermal winding protection. The PTC thermistor is a triple thermistor in accordance with DIN 44082 that can be used for monitoring the temperature of each winding phase.

Information about connecting the temperature sensor can be found in the chapter Electrical connection.

### 3.5.2 Holding brake

STOBER Lean motors can be optionally equipped with a spring-loaded holding brake in order to secure the motor shaft when the motor is at a standstill. The holding brake engages automatically if the voltage drops. The nominal voltage of the spring-loaded holding brake is DC 24 V  $\pm$  10%, any polarity.

Information about connecting the holding brake can be found in the chapter Electrical connection.

## 3.6 Ambient conditions

Feature	Description
Surrounding temperature for transport/storage	-30 °C to +85 °C
Surrounding temperature for operation	-15 °C to +40 °C
Installation altitude	≤ 1000 m above sea level
Shock load	≤ 50 m/s <sup>2</sup> (5 g), 6 ms in accordance with EN 60068-2-27

### Notes

- STOBBER Lean motors are not suitable for potentially explosive atmospheres in accordance with (ATEX) Directive 2014/34/EU.
- Secure the power cable close to the motor so that vibrations of the cable do not place impermissible loads on the motor plug connector.
- Note that the braking torques of the holding brake (optional) may be reduced by shock loading.
- Also take into consideration the shock load of the motor due to output units (such as gear units and pumps) which are coupled with the motor.

To prevent damage, protect the motor from the following influences:

- Environments with harmful oils, acids, gases, vapors, dust or radiation
- Extreme temperature fluctuations with high humidity
- Thawing or icing
- Strong UV radiation (e.g. direct sunlight)
- Presence of salt spray
- Shaking, impacts, vibrations and high acceleration
- Sparks or heat

## 4 Transport and storage

STOBER products are packaged carefully and delivered ready for installation. The type of packaging depends on the product size and the transport method.

Observe the following information during transport and storage:

- Inspect the delivery for any transport damage immediately upon receiving it and report any transport damage immediately. Do not put damaged products into operation.
- Check your delivery for completeness using the delivery note and report any missing parts to the supplier.
- Transport and store the product in the original packaging in order to protect it from damage. Remove the original packaging and transport safety devices shortly before assembly.

### Ambient conditions

The ambient conditions for transport and storage can be found in the chapter [Ambient conditions](#).

## 4.1 Transport

Lifting and transporting the motor or geared motor may require lifting gear (e.g. a crane), depending on the weight. The weight of your motor or geared motor is specified in the accompanying delivery documents.



### Suspended loads!

Loads that become loose and fall during the lifting process can cause serious injuries or even death!

- Observe the following instructions.
- Cordon off the danger zone and ensure that no one stands under the suspended loads.
- Wear safety shoes.

Lift and transport the motor as follows:

- Use lifting gear with a sufficient lifting capacity for the weight of the motor and attached loads.
- On motors without eyebolts, run hoist slings directly around the motor housing and secure the hoist slings from slipping.
- On motors with eyebolts, fasten the motor at the eyebolts. Fasten loads attached to the motor such as gear units or output units as well and make sure that there is no diagonal pull.

In order to prevent falling or damage to the motor during transport, observe the following:

- Do not lift or fasten the motor on the output shaft or the plug connector.
- Fasten loads attached to the motor separately, as the eyebolts of the motor are designed only for the weight of the motor.

## 4.2 Storage

Store the motor in its original packaging in closed, dry spaces.

If long-term storage is expected and the corrosion protection applied at the plant has been removed, protect uncoated parts of the motor with a suitable corrosion protection agent.

Over the course of a prolonged storage period, moisture can collect on the inside of the motor. Therefore, have the insulation resistance of the motor winding checked by an electrician before commissioning.

## 5 Installation

In this chapter, you can find information on the safe and correct assembly of the motor.

Inspect the motor before assembly for damage due to transport or storage. If the motor is damaged, do not install it and contact the STOBBER Service department. Check whether the requirements for ambient conditions at the assembly location are satisfied.

You will need the following tools for assembly:

- If necessary due to the overall weight, lifting gear with appropriate fastening elements and sufficient lifting capacity
- Standard tools
- Torque wrench
- Mounting device for power transmission elements

### 5.1 Cleaning agent and solvent

Upon delivery, uncoated surfaces of the gear unit or the motor are protected by a corrosion protection agent. The corrosion protection agent must be removed from contact surfaces such as shaft ends and flange contact surfaces before assembly. STOBBER recommends removing the corrosion protection with a suitable cold cleaner (e.g. Carlofon Autocleaner) which, in contrast to volatile solvents, is almost odorless and does not weaken the sealing lips of the shaft seal rings. Otherwise, you can use commercially available solvents.

Be aware that all surfaces that come into contact with each other in a clamp connection must be degreased with a cold cleaner or solvent for error-free torque transmission. Additional information can be found in the following chapters.

**ATTENTION! Shaft seal rings can be damaged by solvents!** Prevent shaft seal rings from coming into contact with solvents when cleaning and degreasing the components.

### 5.2 Assembly tolerances

In this chapter, you can find tolerances that must be observed during the assembly of the motor.

#### Tolerances for shafts in accordance with DIN 748-1

Diameter [mm]	Tolerance
≤ 50	ISO k6
> 50	ISO m6

#### Tolerances for centering diameter on the motor flange in accordance with EN 50347

Centering diameter [mm]	Flange size [mm]	Tolerance
≤ 230	65 – 300	ISO j6
> 230	350 – 500	ISO h6

### 5.3 Mounting power transmission elements on the motor shaft

This chapter describes the assembly of power transmission elements such as hubs, belt drives, couplings, pinions or sprockets on the motor shaft.



## Prerequisites

- The power transmission element does not cause impermissible shaft loads (e.g. by tensioning the belt on a belt drive). Information for permissible shaft loads can be found in the catalog (see the chapter Additional documentation).
- The power transmission element is balanced.
- Dimensional tolerances of the inner hole of the power transmission element correspond to the requirements in the chapter [Assembly tolerances](#).
- The keyway of the power transmission element corresponds to DIN 6885-1 (if not otherwise specified).

## Procedure

**ATTENTION! Damage to bearings and shafts due to improper assembly!** Never use force when installing machine elements with fittings, e.g. hitting power transmission elements, shafts or the motor or gear unit housing with a hammer, but rather install them in accordance with the following instructions.

1. Remove the corrosion protection from the solid shaft.
  2. Degrease the inner hole of the power transmission element.
  3. Mount the power transmission element onto the solid shaft with the aid of a mounting device positioned on the centering hole of the solid shaft. Details can be found in the following figure and table.
  4. If the force transmission element is difficult to hoist, do not use force and instead heat it to about 80 °C beforehand.
  5. If the length of the solid shaft is greater than the length of the force transmission element, use an appropriate spacer bushing that you position between the plate (1) and the power transmission element (5).
- ⇒ You have mounted the power transmission element.

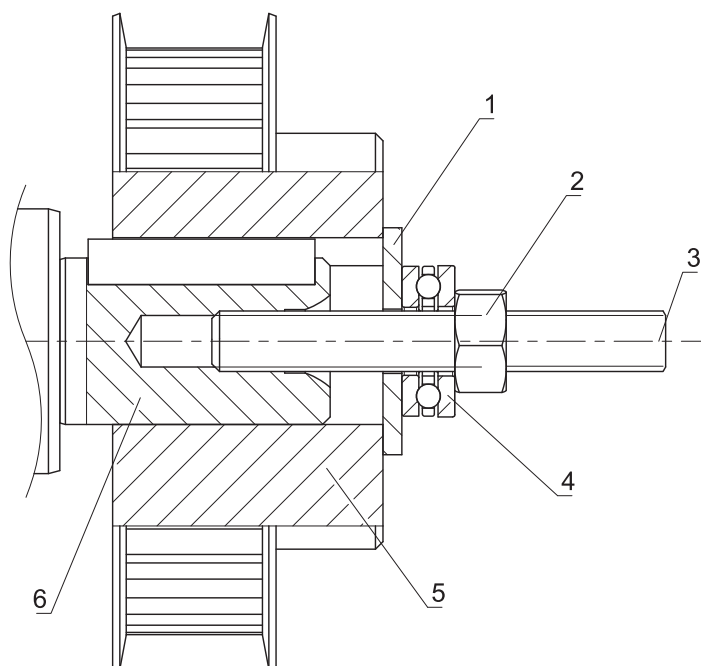


Fig. 2: Mounting device for a belt drive (example)

1	Washer	2	Nut
3	Threaded pin	4	Axial bearing
5	Belt drive (example)	6	Solid shaft

### Centering holes in solid shafts in accordance with DIN 332-2, DR shape

Thread size	M4	M5	M6	M8	M10	M12	M16	M20	M24
Thread depth [mm]	10	12.5	16	19	22	28	36	42	50

## 5.4 Mounting the motor on the machine

This chapter describes the mounting of the motor onto the machine. If you would like to mount the motor on a gear unit, observe the documentation from the gear unit manufacturer.

### Prerequisites

- The dimensional tolerances for the mounting point in the machine correspond to the requirements in the chapter [Tolerances for motor assembly](#).
- There is sufficient distance between the side surfaces of the motor and neighboring machine components for air heated by the motor to rise up unobstructed.

### Procedure

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

**ATTENTION! Damage to bearings and shafts due to improper assembly!** Never use force when installing machine elements with fittings, e.g. hitting power transmission elements, shafts or the motor or gear unit housing with a hammer, but rather install them in accordance with the following instructions.

1. Completely remove the corrosion protection from the flange contact surfaces of the motor and degrease the mounting point in the machine.
2. Transport the motor to the mounting point.
3. Fit the output flange of the motor onto the mounting point and fasten the motor using 4 screws of **strength class 8.8**.
4. Carefully align the motor to the output units.
5. Ensure even contact of the output flange at the mounting point.
6. Tighten the screws using tightening torques in accordance with the following table without torsional stress.

Thread	Tightening torque $M_A$ [Nm]		
	Strength class 8.8	Strength class 10.9	Strength class 12.9
M4	3	4.4	5.1
M5	5.9	8.7	10
M6	10	15	18
M8	25	36	43
M10	49	72	84
M12	85	125	145

Tab. 1: Tightening torques for screws with metric standard thread in accordance with DIN 13-1 (coefficient of friction  $\mu_{ges} = 0.14$ ).

## 6 Electrical connection

Before carrying out the electrical connection of the motor, check whether the following prerequisites are fulfilled:

- The appropriate cable for connecting the motor to the drive controller is at the ready.
- The mechanical assembly of the motor is completed.
- The plug connectors have no internal contamination or moisture.

### WARNING!

#### The motor is powered by high electrical voltage!

Touching live parts is extremely dangerous and potentially fatal!

- The electrical connection of the motor may be carried out only by an electrician.
- Before performing the electrical connection, switch off the power supply of the machine with the main switch and secure it from being turned on again.
- Only connect the motor using power connection cables recommended by STÖBER.
- Do not open the housing of the power plug connector.

#### **ATTENTION! Directly connecting the motor to a three-phase network will cause damage to the motor!**

Connect the motor as described in this documentation.

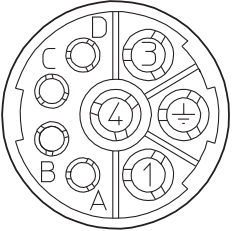

### 6.1 Terminal assignment

The terminal assignment of Lean motors in the standard version is described in this chapter. For more information, refer to the connection plan included in the delivery of every motor.

The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

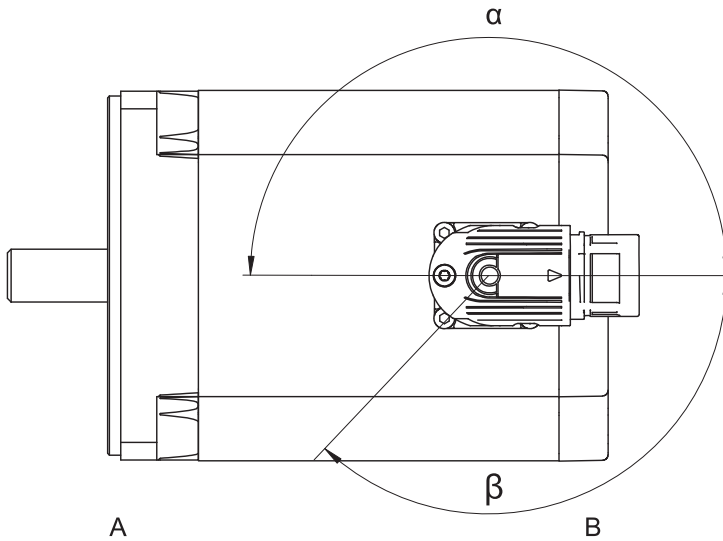
#### Power connection

##### Plug connector size con.23 (1)

Connection diagram	Pin	Connection	Color
	1	U phase	black
	3	V phase	blue
	4	W phase	red
	A	Brake +	
	B	Brake –	
	C	Temperature sensor +	
	D	Temperature sensor –	
		Grounding conductor	green-yellow

## 6.2 Turning the plug connector

For optimal routing and connection of the connection cable, you can turn the plug connector of the motor within a certain range. The following image presents the position of the plug connector upon delivery and the turning range.



A	Attachment or output side of the motor	B	Rear side of the motor
---	--	---	------------------------

Motor type	Size	Connection	Turning range	
			$\alpha$	$\beta$
LM4 – LM7	con.23	Quick lock	180°	135°

The number in the designation of the plug connector size indicates approximately the external thread diameter of the plug connector in mm (for example con.23 designates a plug connector with an external thread diameter of about 23 mm).

Turn the plug connector as follows:

1. Make sure that the machine is de-energized and the motor shaft is at a standstill.
2. Connect an appropriate mating connector (with or without connection cable) to the motor plug connector to be turned (see the chapter [Connecting the power cable](#)).
3. Turn the plug connector of the motor by moving the mating connector by hand in the desired direction. When doing so, be aware of the respective limit stop and turning range of the plug connector.

⇒ You have turned the plug connector.

**ATTENTION! Improper handling of the plug connector may damage it.** Do not use force or additional tools such as pliers when turning the plug connector. Instead, follow the instructions in the documentation. Please note: The plug connector is not designed for constant turning movements, only for changing the alignment during installation.

## 6.3 Connecting the power cable to the motor

For connecting the motor to STOBBER drive controllers, STOBBER offers high-quality and tested cables. Information on this can be found in the catalog (see the chapter [Additional documentation](#)).

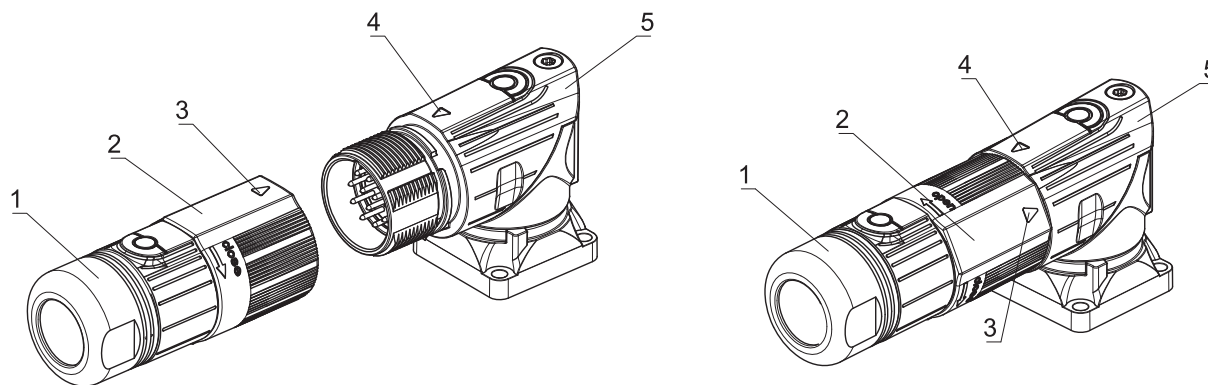
**ATTENTION! Unsuitable cables can damage the motor due to voltage peaks and cause thermal damage to plug connectors! Furthermore, they may fail to meet legal requirements for electromagnetic compatibility and may void any warranty claims!** Use appropriate cables from STOBBER.

A plug connector is installed in the Lean motor with the following characteristics:

Size	Intercontec series	Connection technology
con.23	923	speedtec quick lock

Detailed information on plug connectors can be found at <http://www.intercontec.biz>

### Connecting mating connector with speedtec quick lock



- |   |                             |   |                     |
|---|-----------------------------|---|---------------------|
| 1 | Mating connector            | 2 | speedtec quick lock |
| 3 | Arrow                       | 4 | Arrow               |
| 5 | Plug connector of the motor |   |                     |

Connect the mating connector with speedtec quick lock as follows:

1. Make sure that the machine is de-energized and the motor shaft is at a standstill.
  2. Align the mating connector so that the arrow on the quick lock and on the plug connector of the motor are across from each other.
  3. Push the mating connector onto the plug connector of the motor as far as it will go.
  4. Tighten the quick lock by hand by turning it clockwise approximately 30°.
- ⇒ You have connected the mating connector.

### Disconnecting the mating connector with speedtec quick lock

In order to disconnect the mating connector from the plug connector of the motor, unscrew the quick lock by turning it counterclockwise approximately 30° so that the arrows on the quick lock and on the plug connector of the motor are facing each other. Then, pull the mating connector off of the plug connector of the motor.

**ATTENTION! Improper handling of the plug connector may damage it!** Do not use force when connecting or detaching the plug connector! Do not tighten the quick lock using pliers or similar tools. Only tighten it by hand.

### Cable routing

Route the connection cable to the machine so that it does not touch the motor housing during operation, as this gets hotter than 80 °C and can damage the insulation.

Secure the connection cable in the area of the motor plug connector so that connection cable vibrations do not put more load on the motor plug connector than is permitted.

## 6.4 Connecting the power cable to the drive controller

Lean motors can only be operated on STOBBER SI6 and SC6 drive controllers. Power cables supplied by STOBBER are ready-made so that they can be attached to the connections of the drive controller without additional effort.

### Connection of the temperature sensor

The temperature sensor of the Lean motor is connected using the power cable. Connect the temperature sensor to the drive controller and activate thermal winding protection in the drive controller so that the motor switches off automatically if the maximum permitted winding temperature is exceeded.

**ATTENTION! Failure to connect and monitor the temperature sensor may lead to damage to the motor and may void any warranty claims!** Always connect the temperature sensor and activate the thermal winding protection in the drive controller.


### Connection of the holding brake

The optional holding brake for the Lean motor is connected using the power cable. Connect the holding brake to the drive controller and activate it in the drive controller.

Further information can be found in the manual of the drive controller (see the chapter [Additional documentation \[► 5\]](#)).

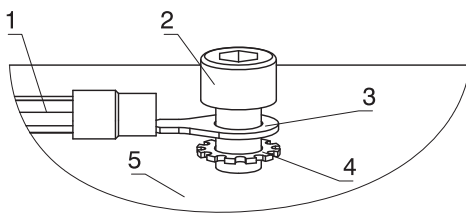
## 6.5 Connecting the motor housing to the grounding conductor system

During proper operation of motors on drive controllers, leakage currents greater than 10 mA can occur. Connect the motor housing to the grounding conductor system of the machine in order to protect persons from electric shock in case of contact with the motor housing.

All attachment parts required for the connection of the grounding conductor to the motor housing are delivered with the motor. The grounding screw of the motor is identified with the symbol  in accordance with IEC 60417-DB. The cross-section of the grounding conductor has to be at least as large as the cross-section of the lines in the power connection.

Make sure that the machine is de-energized and the motor shaft is at a standstill.

Connect the grounding conductor according to the following image.



- |   |                     |   |                   |
|---|---------------------|---|-------------------|
| 1 | Grounding conductor | 2 | Grounding screw   |
| 3 | Cable lug           | 4 | Tooth lock washer |
| 5 | Motor housing       |   |                   |

Tighten the grounding screw with the tightening torque according to the following table.

Motor size	Thread	Tightening torque [Nm]
LM4	M5	4.3
LM5	M5	4.3
LM7	M6	7.3

## 7 Commissioning

### 7.1 Before commissioning

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

Before commissioning the motor, make sure that the following prerequisites are met:

- The motor is undamaged.
- The mechanical assembly and electrical connection of the motor has been completed.
- The drive controller is ready for operation.
- The drive is not blocked.
- The feather key of the motor shaft has been secured from sliding off.
- All protective devices have been assembled properly.
- Heat-sensitive components (e.g. cables) have been routed so that they do not touch the motor surface.
- The motor surface is not covered with any heat-insulating materials.
- No persons are in the danger area.

### 7.2 Parameterizing the motor

In STOBBER SI6 and SC6 drive controllers, all required limit values for currents and torques of the Lean motors are stored so that only a few parameters need to be adjusted. Make sure that thermal winding protection is activated. Additional information can be found in the manual of the drive controller (see the chapter [Additional documentation \[► 5\]](#)).

### 7.3 During commissioning

**WARNING! Moving machine parts can cause serious injuries or even death!** Make sure that no one is standing in the danger area or able to enter it unchecked.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**WARNING! If the motor is in operation while plug connectors are being disconnected, electric arcs can cause severe injury or even death.** Do not connect or disconnect the plug connectors until after the motor is de-energized.

**WARNING! Flying metal parts can cause serious injuries!** Assemble the provided power transmission elements properly or remove the feather key before a test run.

**CAUTION! The surface of the motor can reach temperatures over 100 °C during operation!** Allow the motor to cool sufficiently before working on it. Wear gloves.

During commissioning, check the following:

- Is the direction of rotation of the motor or drive correct?
- When the motor is running, does any overloading, unwanted speed fluctuations or unusual noises occur?

If the motor is equipped with a holding brake, perform a brake test (see the chapter [Testing the holding brake](#)).

In case of faults, observe the chapter [Remedying faults](#).

## 8 Servicing

### 8.1 Maintenance

The maintenance tasks described in this chapter are necessary in order to maintain the functionality of the motor. The rolling bearings of the motor are maintenance-free.

#### 8.1.1 Cleaning

If the motor surface is dirty, sufficient heat dissipation through the surrounding air is no longer possible. As a result, the lifespan of the motor bearings may be reduced since the motor bearing lubricant breaks down in the event of impermissibly high temperatures. Furthermore, the thermal winding protection may force a shut-down of the motor before the motor has reached its nominal values.

Determine the cleaning intervals according to the expected operating conditions, but every 12 months at the latest. Clean the motor according to the following instructions.

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**CAUTION! The surface of the motor can reach temperatures over 100 °C during operation!** Allow the motor to cool sufficiently before working on it. Wear gloves.

**ATTENTION! Improper cleaning can cause damage to the motor!** Do not use steam jet cleaners, high-pressure cleaners or compressed air to clean the motor, as this can result in water and dirt entering the interior of the motor through the seals and can damage it. In addition, do not use solvents, as these can damage the seals and the nameplate. Comply with the following instructions.

- Remove dust and chips with a suitable industrial vacuum.
- Remove contamination from the motor surface with a suitable industrial cleaner.

#### 8.1.2 Visual inspection

Perform regular visual inspections for damage to the motor, connection cable and grounding conductor according to the following checklist. Determine the inspection interval according to the expected operating conditions of the motor, but every 12 months at the latest. Clean the motor before the visual inspection.

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**CAUTION! The surface of the motor can reach temperatures over 100 °C during operation!** Allow the motor to cool sufficiently before working on it. Wear gloves.

##### Checklist

- Is the connection cable damaged? If it is, do not perform any temporary repairs. Instead, replace the connection cable.
- Is the mating connector of the connection cable connected to the motor plug connector correctly?
- Is the grounding conductor damaged? If it is, do not perform any temporary repairs. Instead, replace the grounding conductor.



- Is the grounding screw tightened correctly?
- Is the coating of the motor damaged? If it is damaged, repair the coating damage.

If the motor, connection cable or grounding conductor are damaged, decommission the machine and replace the damaged component.

### 8.1.3 Review during operation

Check the motor for deviations regularly during operation. Determine the inspection interval according to the expected operating conditions of the motor. Before commissioning, make sure that no persons are put at risk and no property damage occurs as a result. Pay attention in particular to the following deviations from normal operation:

- Increased motor vibrations
- Unusual motor noises
- Burning odors in the vicinity of the motor
- Diagnostic and error messages from the drive controller

In case of deviations from normal operation or in case of faults, proceed according to the instructions in the chapter [Remedying faults](#).

### 8.1.4 Testing the holding brake

This chapter applies to motors that are equipped with a holding brake.

#### Gravity-loaded axes / vertical axes

If you use the motor for driving gravity-loaded axes or vertical axes, you must take measures to minimize the risk of unwanted lowering of the axis. One of these measures can be a cyclical brake test. Additional information on the cyclical brake test can be found in the DGUV information sheet No. 005 Gravity-loaded axes (vertical axes) at [www.dguv.de](http://www.dguv.de).

When dimensioning the motor current for the cyclical brake test, be aware that, even at a standstill, the load of the vertical axis exerts torque on the motor and the holding brake.

#### Other applications

Test the holding brake regularly by measuring the braking torque and comparing it to the nominal braking torque. Determine the inspection interval according to the expected operating conditions of the motor, however every 12 months at the latest.

Test the holding brake as follows:

1. Make sure that no persons are put at risk and no property damage occurs due to this process.
2. Stop the motor.
3. Close the holding brake.
4. Allow the motor to work against the holding brake with a torque corresponding to the nominal braking torque.
5. Check whether the holding brake holds the motor shaft in place or whether the motor shaft also turns.
6. Condition the holding brake is the nominal braking torque if not reached (see the chapter [Conditioning the holding brake](#)).

Technical data of the holding brake can be found on the nameplate of the motor and in the catalog (see the chapter Additional documentation).

## 8.1.5 Conditioning the holding brake

This chapter applies to motors that are equipped with a holding brake. Although the holding brake is largely maintenance-free, the braking torque might gradually decrease depending on the operating conditions. This can be caused by initial deposits of rust on the friction surfaces or slight material warpage due to large temperature fluctuations.

If you determine that the nominal braking torque is no longer reached during a brake test, condition the holding brake as follows.

1. Make sure that no persons are put at risk and no property damage occurs due to this process.
2. Lift the holding brake.
3. Allow to motor to run at 250 rpm and with a torque that is greater than the nominal braking torque.
4. Close the holding brake for 5 sec.
5. Stop the motor for 20 sec.
6. Change the direction of rotation of the motor.
7. Repeat steps 2 through 6 a total of three times.
8. Carry out a brake test.
9. If the nominal braking torque is now reached, the conditioning of the holding brake is complete. Otherwise, contact the STOBBER Service department.

## 8.2 Remediating faults

In the following table, you can find information for remediating motor faults.

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

Faults	Possible causes	Measures for remediating
Motor does not start	Enable from drive controller not present	Activate enable in the drive controller
	Error in the drive controller	Remedy error according to the drive controller documentation
	Power supply missing	Check connection and power supply
	Connection cable connected incorrectly	Connect the connection cable correctly
	Drive blocked mechanically	Remedy the block
	Holding brake (if present) not released	Check connection and actuation of the holding brake
	Motor defective	Contact the STOBBER Service department
Increased operating temperature or activation of thermal winding protection	Motor housing heavily contaminated	Clean motor housing
	Intake or discharge of cooling air blocked by foreign object	Ensure unimpeded intake and discharge of cooling air
	Motor overloaded by the application	Reduce load or check layout
	Holding brake (if present) does not lift entirely	Contact the STOBBER Service department
Increased vibrations during operation	Motor or geared motor assembled tightly	Check the assembly of the motor or geared motor
	Fastening screws loose	Tighten the fastening screws correctly
Running noises	Revolving parts dragging	Determine and remedy cause
	Bearing damage	Contact the STOBBER Service department
Sporadic failure of the motor	Cable break	Replace connection cable
Holding brake does not build up nominal braking torque or slips	Wear of friction surfaces	Condition the holding brake

## 8.3 Servicing

Have the necessary servicing work carried out on the motor by the STOBBER Service department or by STOBBER service partners. Be aware that improper servicing may cause material damage and may void the manufacturer's warranty.

Only use replacement parts delivered by STOBBER. Specify the type designation and serial number of the motor when ordering replacement parts. These can be found on the nameplate of the motor.

The contact data from the STOBBER Service department can be found on the last page of this documentation.

## 9 Removal and disposal

### 9.1 Removal

Remove the motor as follows:

**WARNING! Moving machine parts can cause serious injuries or even death!** Before performing work, switch off the machine with the main switch and secure the switch from being turned on again.

**WARNING! Falling gravity-loaded axes or vertical axes can cause serious injuries or even death!** Move gravity-loaded axes or vertical axes to their lowest position and lock or brace them mechanically before entering the danger area.

**CAUTION! The surface of the motor can reach temperatures over 100 °C during operation!** Allow the motor to cool sufficiently before working on it. Wear gloves.

1. Disconnect the connection cable and the grounding conductor from the motor (see the chapter [Electrical connection](#)).
2. Remove the power transmission elements connected to the motor shaft such as belts, chains, couplings.
3. Fasten the motor with suitable fastening elements (see the chapter [Transport and storage](#)).
4. Unscrew the screws used to mount the motor to the machine or gear unit.
5. Pull the output flange of the motor off of the machine.
6. Transport the motor according to the chapter [Transport and storage](#).

### 9.2 Disposal

Dispose of the component parts of the motor according to applicable regulations and when doing so, observe the following information:

- The motor predominantly consists of steel, aluminum, copper, brass, plastic and permanent magnets (rare earth metal).
- The motor does not contain any hazardous materials.
- Permanent magnets must be properly demagnetized before disposal.



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