

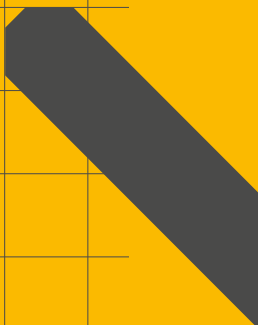
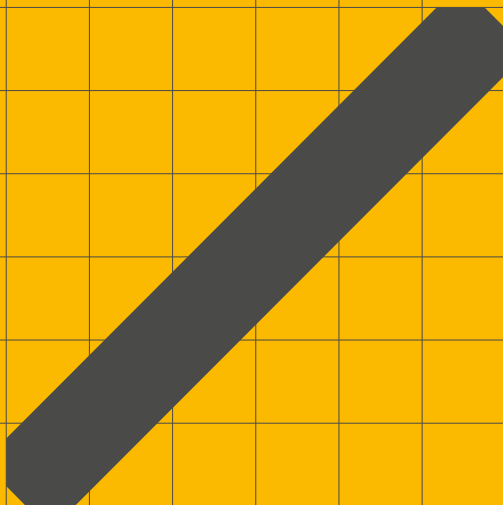
**EWELLIX**

MAKERS IN MOTION

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

# Electro mechanical cylinder - LEMC





# Contents

<b>1.0 General information</b> .....	<b>4</b>
1.1 Information on this manual.....	4
1.2 Explanation of symbols and signal words.....	4
1.3 Limitation of liability .....	5
1.4 Copyright.....	5
1.5 Warranty terms.....	5
1.6 Customer service.....	5
1.7 General safety instructions .....	5
1.8 Future changes to user manual .....	5
1.9 Responsibility of the owner and processor.....	6
1.10 Personnel requirements .....	6
1.10.1 Qualifications.....	6
1.11 Specific dangers.....	7
1.12 Modifications of device .....	7
<b>2.0 General notes</b> .....	<b>8</b>
2.1 General description of system components.....	8
2.2 Operating principle .....	9
2.2.1 Relationships to be known .....	10
2.3 Detailed description of supplied product.....	10
2.4 Designation .....	11
2.5 Product label.....	13
2.6 Performances, operation limits and operation environment .....	13
2.7 Storage conditions.....	13
2.8 Disposal .....	13
2.9 Warranty.....	13
<b>3.0 Installation – general recommendations</b> .....	<b>14</b>
3.1 Important notes.....	14
3.2 Mechanical installation .....	14
3.2.1 Cylinder dimensions – Cylinder drawing.....	14
3.2.2 Visual cylinder position – $L_{t0}$ and $L_t$ definition.....	14
3.2.3 Handling – Transportation.....	15
3.2.4 General recommendations for installation.....	15
3.3 Electrical installation.....	16
3.3.1 Motor.....	16
3.3.2 Cables for motor.....	16
3.4 End & home switch instructions .....	16
3.4.1 Function and features .....	16
3.4.2 Installation .....	17
3.4.3 Electrical connection.....	17
3.4.4 End limit switch – adjustment/operation.....	17
3.4.5 Home position – adjustment/operation .....	17
3.4.6 Note .....	17
3.4.7 Servoamplifier.....	22
<b>4.0 LEMC motor assembly instructions</b> .....	<b>23</b>
4.1 Standard motor interface list .....	23
In-line motor interface.....	24
4.2.1 Dimensional information.....	24
4.2.2 Screws and tightening torque $M_A$ .....	24
4.2.3 Coupling installation on motor shaft .....	25
4.2.4 Motor installation on the motor interface.....	25
4.3 Parallel motor interface.....	26
4.3.1 Dimensional information.....	26
4.3.2 Screws and tightening torque $M_A$ .....	27
4.3.3 Pulley installation on motor shaft.....	27
4.3.4 Belt and motor installation on the mounting plate interface.....	29
4.4 SER-SIT taper lock bushing .....	29
4.4.1 Assembly and dismantling of SER-SIT .....	31
conical bushing .....	31
<b>5.0 Commissioning</b> .....	<b>32</b>
5.1 General procedure for commissioning .....	32
5.2 General recommendations for use.....	33
5.3 How to define zero reference .....	33
5.4 How to check position control behaviour – first approach.....	34
5.4.1 Principle of evaluation method .....	35
5.4.2 Detailed description of method.....	35
5.5 Position control parameters to be known .....	37
<b>6.0 Maintenance, upkeep and routine checks</b> .....	<b>38</b>
6.1 Lubrication – detailed description .....	38
6.1.1 Lubricant information .....	38
6.1.2 Roller screw .....	39
6.1.3 Front guide (Anti-rotation – Option).....	40
6.1.4 Bearings .....	40
6.1.5 Rod end.....	40
6.2 Procedure .....	40
6.3 Routine checks .....	40
6.3.1 Belt.....	40
6.4 Maintenance kits.....	41
<b>7.0 Malfunctions</b> .....	<b>42</b>
7.1 Mechanical malfunctions .....	42
7.2 Electrical malfunctions.....	42
7.3 Before requiring Ewellix assistance.....	43



## NOTE

In the electronic document, hypertext links have been created to allow faster browsing inside the manual. To use these, please press CTRL key and while CTRL key is pressed, click on the hypertext link. To come back, please press ALT key and while ALT key is pressed, press on “left arrow” key. Generally, all titles from table of contents are hypertext links. All other hypertext links are pointed out in yellow.

# 1.0 General information

## 1.1 Information on this manual

This manual provides important information on how to work with the actuator (also called the device) safely and efficiently. The Manual is part of the device, must always be kept and should be available for personnel to read at any time. All personnel working with the device must read and understand this manual before starting any work. Strict compliance with all specified safety notes and instructions is a basic requirement for safety at work.

Moreover, the accident prevention guidelines and general safety regulations applicable at the place of use of the device must also be complied with.

For better representation of circumstances, the illustrations in this manual are not necessarily to scale and may vary from the actual design of the device.

All information and notes in this manual were compiled with due consideration given to applicable standards and regulations, the present status of technology and our years of knowledge and experience.

## 1.2 Explanation of symbols and signal words

Safety precautions are identified by symbols and signal words defined on the right hand side of this page. These signal words indicate the severity of the hazard.

Adhere to these safety precautions and take caution in order to avoid accidents that may result in personal injuries or damage to property.

### DANGER

Indicates a dangerous situation, which will lead to death or serious personal injury, if the precautionary measures are ignored.

### WARNING

Indicates a dangerous situation, which can lead to minor or moderate injury or property damage, if the precautionary measures are ignored.

### CAUTION

Indicates a dangerous situation, which can lead to minor or moderate injury, if the precautionary measures are ignored.

### NOTICE

Indicates information considered important, but not hazard-related (e.g. messages relating to property damage).



### NOTE

Emphasizes useful hints and recommendations as well as information for efficient and trouble-free operation.

## 1.3 Limitation of liability

All information and notes in this manual were compiled under due consideration of valid standards and regulations, the present status of technology and our years of knowledge and experience.

The manufacturer will not be liable for damage resulting from:

- disregarding this manual
- unintended use
- employment of untrained personnel
- unauthorized conversions
- unauthorized technical modifications
- manipulation or removal of the screws on the device

Where the device has been customized, the actual product delivered maybe different from what is described in this manual. In this case, ask Ewellix for any additional instructions or safety precautions relevant to these actuators.

We reserve the right to make technical modifications in order to improve usability.

## 1.4 Copyright

This manual is protected by copyright law and to be used exclusively by Ewellix customers internal purpose.

Passing this manual on to third parties, duplication of any kind – even in the form of excerpts – as well as the use and/or disclosure of the contents without the written consent of the manufacturer is not permitted, except for internal purposes.

Violation of Ewellix's copyright may become the subject of a future claim for damages.

## 1.5 Warranty terms

The applicable and effective warranty terms are those contained in the manufacturer's terms and conditions of sale contained in the Ewellix sales contract that governs this sale.

## 1.6 Customer service

Ewellix Customer Service is always available to provide technical information and to answer questions.

The contact information for Ewellix Customer Service can be found on [www.skfmotiontechnologies.com](http://www.skfmotiontechnologies.com).

### WARNING

**Risk of injury through the use of incorrect replacement parts**  
Installation or use of incorrect replacement parts may result in safety risks for personnel and may also cause damage, malfunction or complete failure of the drive.  
Therefore:

- Defective original parts for the actuator must only be replaced by the manufacturer.



### NOTE

All warranty and service claims become void without notice if any screws on the linear actuator have been manipulated.

## 1.7 General safety instructions

### DANGER

In operation, Ewellix cylinders could make parts move and could have hot surfaces or parts fed by electrical current, depending on the situation. Serious or fatal injuries or property damage will occur if the information or precautionary measures given in this manual aren't followed.

Generally, all works related to transportation, setup/mounting (mechanical and electrical), startup, maintenance or storage have to be carried out by qualified personnel in full compliance with relevant regulations.

## 1.8 Future changes to user manual

To constantly improve the quality of its products, Ewellix reserves the right to modify this manual without informing its customers. It is the responsibility of the customer to have the current release of the manual so that the user will benefit from the latest information and advice. For more details, please contact your Ewellix sales representative.

In any event, Ewellix won't be liable for any adverse consequences to the Ewellix product user or any property because of user manual modification.

## 1.9 Responsibility of the owner and processor

The device is designed for commercial applications by its owner or processor. The processor is the contracting partner of the reseller or the manufacturer. The processor installs the device in a complete system (application).

The owner or processor of the system is therefore subject to the requirements of the Occupational Health and Safety Act.

In addition to the safety instructions in this manual, the owner or processor must do the following concerning these safety and accident prevention guidelines and environmental protection regulations applicable to the site of the system's installation:

- Inform themselves of applicable industrial safety regulations. They must also determine additional hazards that arise due to the specific working conditions prevailing at the site where the device is installed using risk assessment. The risk assessment must be implemented in the form of work instructions for device operation.
- Confirm that the work instructions created for the system, including the device satisfy current legal requirements and must alter the instructions accordingly.
- Clearly regulate and specify the responsibilities for installation, operation, maintenance, and cleaning.
- Ensure that all employees who deal with the device have read and understood this manual.
- Provide personnel with the required protective equipment.
- Provide training for personnel at regular intervals and inform personnel of the hazards

In addition, the owner or processors must ensure that the device is in adequate working condition. They must do the following:

- Ensure that the maintenance intervals described in these instructions are complied with.
- Have all safety devices inspected regularly for function and completeness.

## 1.10 Personnel requirements

### ⚠ WARNING

Improper installation, operation and maintenance can result in serious injury death or property damage. Use only qualified, instructed, or trained personnel (as described below) who have read, understand and follow these instructions.

### 1.10.1 Qualifications

The following qualifications are specified for different areas of activity listed in this manual:

- **An instructed person (operator):** Instructed by the customer in an orientation session on the assigned tasks and possible dangers arising from in case of improper behaviour.
- **Qualified personnel:** Based on their professional training, know-how and experience as well as knowledge of the applicable standards and regulations are able to independently perform assigned work activities and to detect and avoid possible dangers
- **Professional electrician:** Based on his/her professional training, know-how and experience as well as knowledge of the applicable standards and regulations is able to independently perform work on electrical systems and to detect and avoid possible dangers.  
In addition, the professional electrician has been trained for the special location where he/she works and knows the relevant standards and regulations.

Only persons who can be expected to perform their tasks reliably are permitted as personnel. Persons whose reaction capabilities are impaired, e.g. through the use of drugs, alcohol or medication for example, are not permitted.

## 1.11 Specific dangers

The following section lists the residual risks that have been determined by a risk assessment.

The manufacturer has constructively, and with protective measures, minimized the effects of existing hazards. Pay attention to the residual hazards and potential countermeasures described and the warnings in the following chapters

### WARNING

#### **Danger of injury caused by moving components**

Rotating and/or linearly moving components can cause serious injuries.

Therefore:

- Do not work on, or place, hand, arms or any other parts of the body, close to moving components.

## 1.12 Modifications of device

### WARNING

To avoid hazardous situations and to ensure optimal performance, do not make changes or modifications to the device unless they have been specifically authorized by Ewellix.

# 2.0 General notes

## 2.1 General description of system components

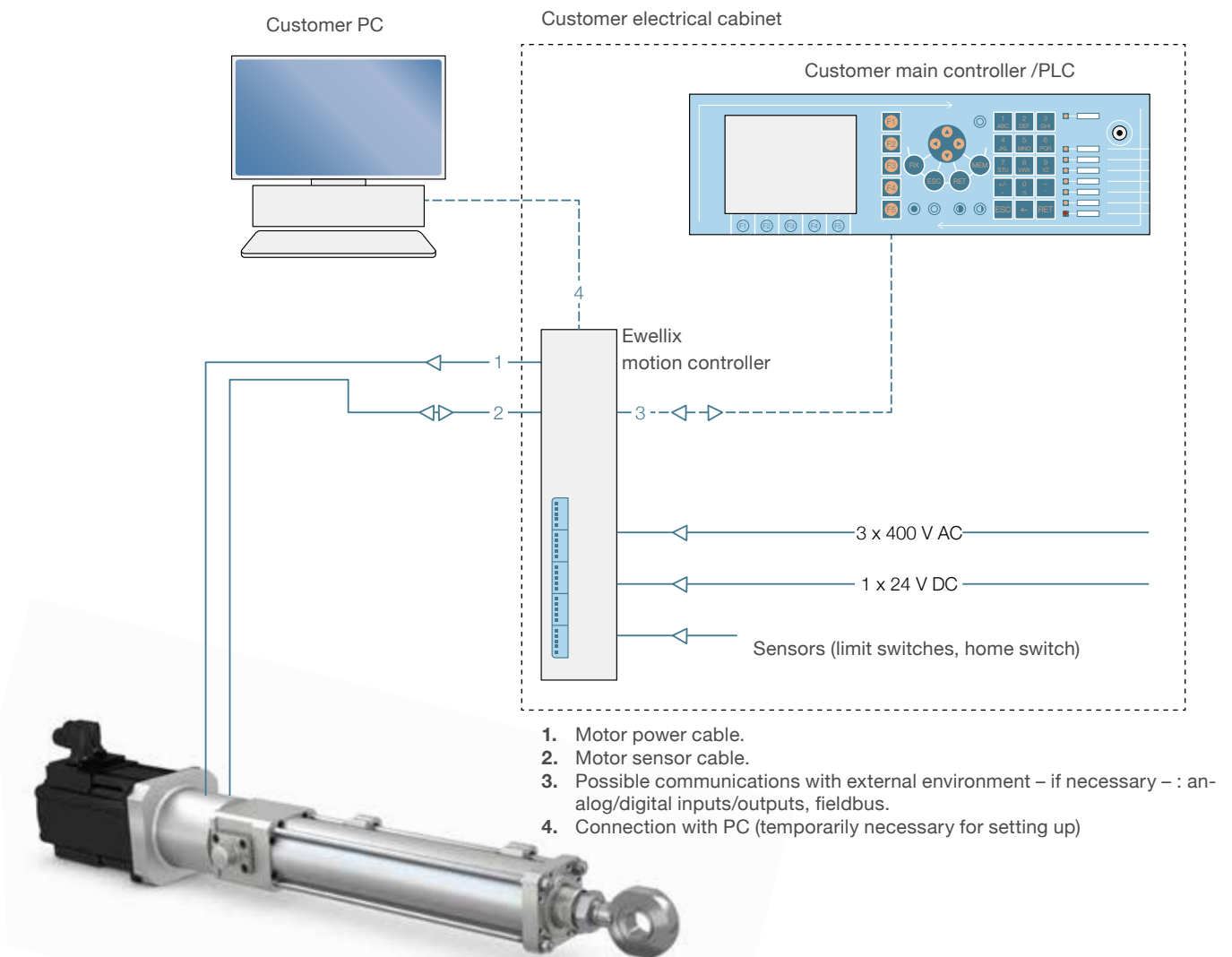
Generally, the scope of supply of Ewellix cylinders includes:

- Cylinder
- Motor power cable
- Motor sensor cable
- Motion controller
- Electronic interface to make connection between PC and motion controller.

To know the exact definition of Ewellix supply, please read paragraph **2.3 Detailed description of supplied product**, [↪ page 10](#).

The general drawing in **fig 1**, [↪ page 8](#) illustrates the Ewellix electromechanical cylinder's relationship with the user's environment.

Fig. 1



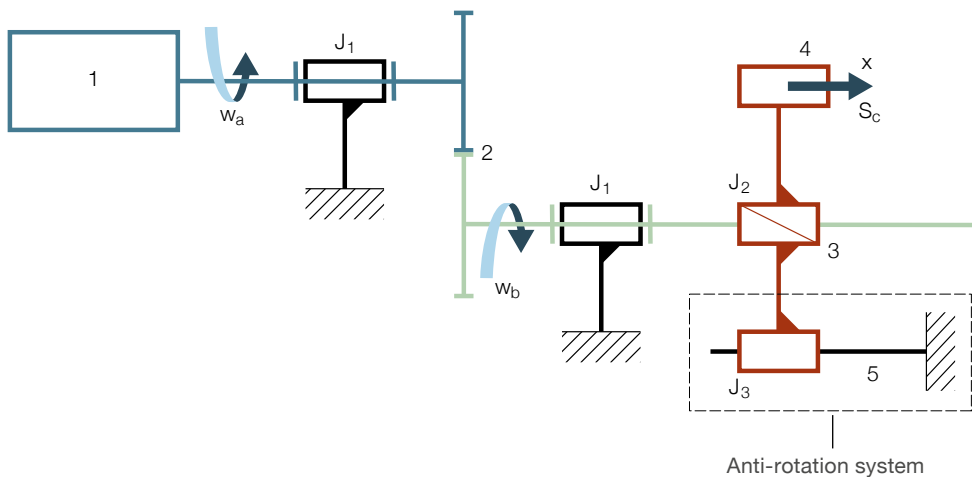


## 2.2 Operating principle

The operating principle of Ewellix electromechanical cylinders is described by the cinematic drawing in **fig. 2** (established in accordance with NF EN ISO 3952-1 standard).

Fig. 2

The operating principle of Ewellix electromechanical cylinders



### Comments

- 1** Motor rotor
  - $\omega_a$  Rotating speed of motor shaft
  - $\omega_b$  Rotating speed of roller screw or ball screw
  - 2** Gear system between motor shaft and roller screw (or ball screw) shaft.  $\rho$  is gear ratio.
- $$\rho = \frac{\omega_a}{\omega_b}$$
- 3** Roller screw or ball screw = screw gear changing rotation of screw (green color) into translation of nut and pushing tube of cylinder (red color).
  - 4** Pushing tube of cylinder
  - Sc** Translation speed of pushing tube
  - x** Translation move of pushing tube
  - 5** Anti-rotation of pushing tube. Depending on cylinder definition, this system is integrated into the cylinder or located on the customer's machine.



### Description of kinematic joints

- $J_1$  Revolute joint
- $J_2$  Screw joint
- $J_3$  Prismatic joint

## 2.2.1 Relationships to be known

For each motor revolution cylinder moves x millimetres, x defined as follows:

$$x = \frac{P_h}{\rho}$$

where:

x: Cylinder move  
 $\rho_h$ : Roller or ball screw lead

Depending on case,  $\rho$  definition can change:

- Cylinder with motor in line without gear  
 $\rho = 1$
- Cylinder with motor in line and gear  
 $\rho = \rho_g$  with  $\rho_g$  gear ratio
- Cylinder with motor in parallel without gear  
 $\rho = \rho_b$  with  $\rho_b$  belt system ratio
- Cylinder with motor in parallel and gear  
 $\rho = \rho_b \cdot \rho_g$

## 2.3 Detailed description of supplied product

Generally, detailed description of supplied product is found in High Performance Actuator Catalogue reference **PUB NUM IL-05001-EN-October 2019**. If Ewellix provide LEMC version fitting completely catalogue reference, corresponding file number will be part of the serial number :

- for a LEMC21xx : serial number = AR36860-xxxx
- for a LEMC30xx : serial number = AR36870-xxxx

If serial number is not starting with these values, and if actuator definition is not described in High Performance Actuator catalogue, detailed description of the supplied product is given by the two following documents (called “documents for approval”):

- Technical description
- Cylinder drawing

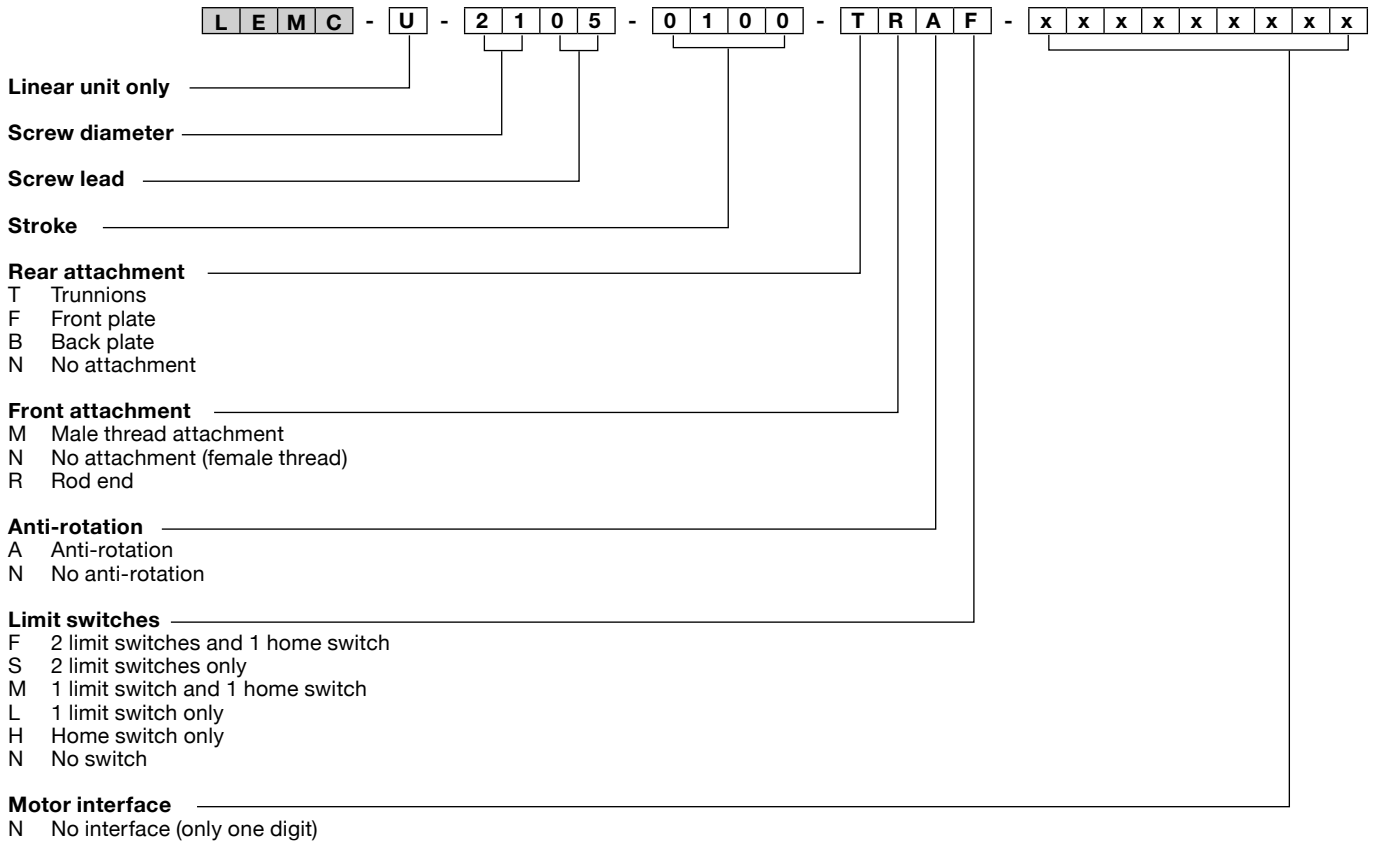
**IMPORTANT:** Before starting cylinder commissioning, actuator description data (actuator performances and dimensions) given in High Performance Actuator catalogue or in these two documents must be read. If there is a problem, please make contact with your local Ewellix representative.

## 2.4 Designation

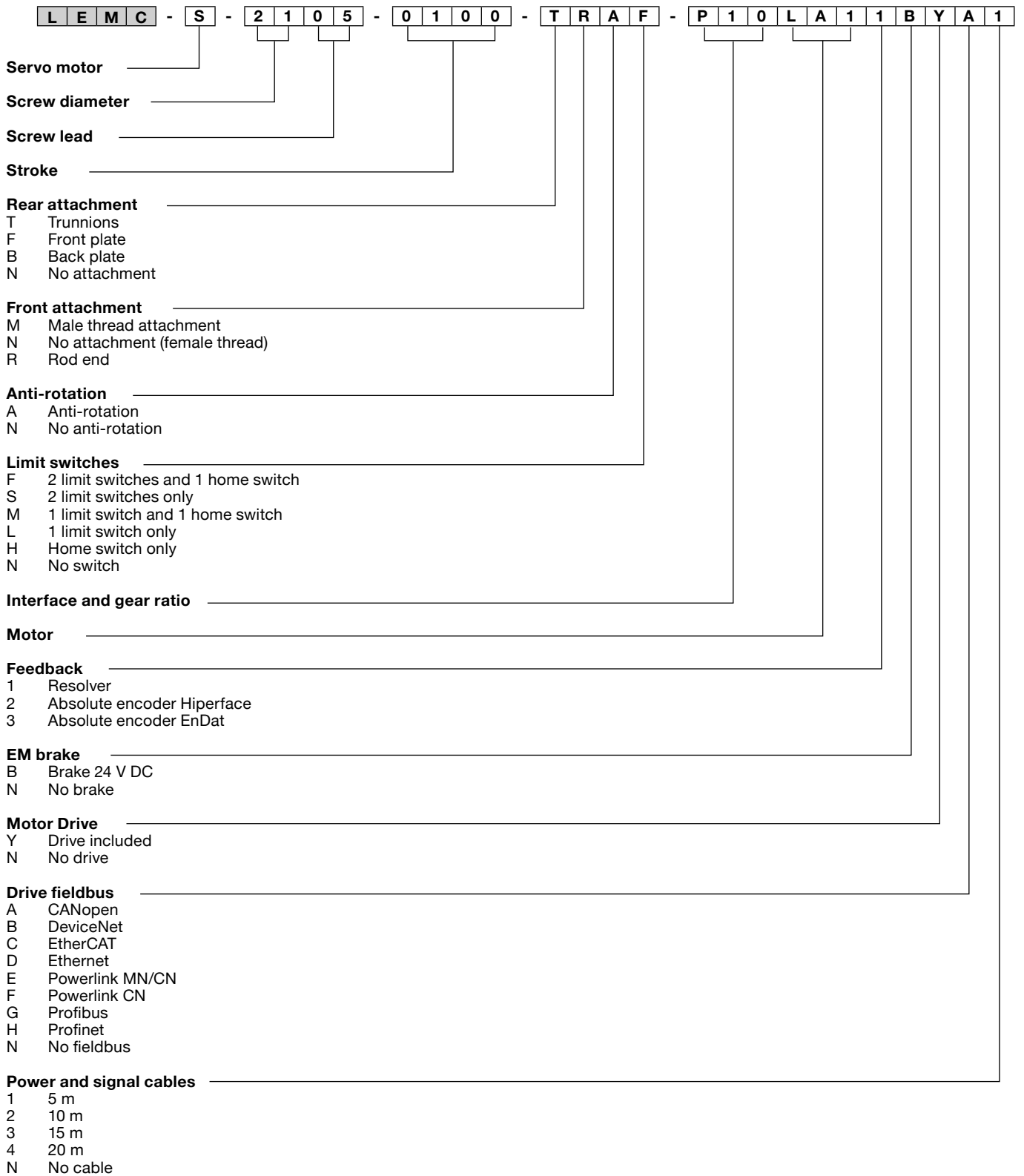
Three designations:

- Designation for linear unit only.  
**Example: LEMC-U-2105-0100-TRAF-N**
- Designation for linear unit with motor interface.  
**Example: LEMC-U-2105-0100-TRAF-L1019110L**
- Designation for complete actuator (actuator with motor and servoamplifier).  
**Example: LEMC-S-2105-0100-TRAF-P10LA11BYA1**

The meaning of linear unit designation is:



The meaning of complete actuator designation



## 2.5 Product label

The product label contains the following information:

- EWELIX** MAKERS IN MOTION
- Type : LEMC-U-3010-0500-TRAF-AR37127 (Callout 1)
- S/N : AR37127-0023 (Callout 3)
- Stroke: 500 mm
- MM: 06/19 (Callout 2)
- IP54S
- Weight including Motor and/or Gear: 31 kg (Callout 4)
- Ewellix  
7300 CHAMBERY – FRANCE
- Product of FRANCE

Legend for callouts:

1. Cylinder reference
2. Manufacturing month (month/year)
3. Cylinder serial number
4. Cylinder weight with possibly motor and/or gear when supplied

## 2.6 Performances, operation limits and operation environment

For more details, please find actuator reference in High Performance Actuator catalogue reference **PUB NUM IL-05001-EN-October 2019** and read related technical data.

If actuator reference is not in High Performance Actuator catalogue (meaning customized product), please read the Ewellix sales offer and other documents for approval. The cylinder's performance and operational limits and operating environment are described in the technical requirements that define the cylinder selection.

## 2.7 Storage conditions

If the cylinder has to be stored for a long time (example: cylinder as a spare part), the following conditions must be observed:

- Cylinder has to be stored in horizontal position indoors with an ambient temperature between 15 and 40 °C.
- Cylinder has to be packed in the retracted position inside a plastic film with desiccant to protect the cylinder from humidity and condensation.

A cylinder that has been stored under the conditions described above for less than one year could be used by following the general recommendations for use (**5.2 General recommendations for use**, ↪ page 33).

If storage time exceeds one year, re-lubricate the cylinder before it is first started (please read paragraph 6 Maintenance – upkeep – routine checks, to know which parts are to be lubricated and how they are to be lubricated).

Then, cylinder can be used by following general recommendations for use (**5.2 General recommendations for use**, ↪ page 33).

## 2.8 Disposal

Dispose of cylinders in accordance with applicable regulations and considering the different requirements for each material:

- Iron
- Aluminium
- Copper
- Plastic
- Electronic components
- Oil and grease (not mixed with solvents)

To know the exact definition of Ewellix supply, please read paragraph **2.3 Detailed description of supplied product**, ↪ page 10.

## 2.9 Warranty

**IMPORTANT:** Manufacturer's warranty is null and void if the cylinder is disassembled by end-user.

For any other information concerning warranty, please contact your local Ewellix representative.

## 3.0 Installation – general recommendations

### 3.1 Important notes

#### ⚠ DANGER

Some components integrated into the Ewellix scope of supply are “products bought on catalogue”. This means that the design and manufacturing of these components haven’t been done by Ewellix. For all these “products bought on catalogue”, it’s the user’s responsibility to read the associated manufacturer’s user manual before starting to install or to use the product.

#### ⚠ WARNING

Risk of serious or fatal injuries by crushing because of vertical load fall.

Do not use the brake (of the motor or an additional brake) to hold a vertical load while an operator is under the load. Generally, the holding torque of the brake is created by means of friction discs and does not provide a positive lock. In any event, lock the vertical load in position by another means or move and stop the vertical load at the bottom position which is safe.

#### ⚠ WARNING

Risk of serious or fatal injuries by crushing because of unintentional cylinder start-up.

Before starting any work on actuator, isolate the motor, brake and fan (if installed) from the power supply and safeguard them using lockout/tagout procedures against unintentional re-start.

#### ⚠ WARNING

During operation, the cylinder surface temperature can reach high values. There is a risk of burns or fire. Before any work on the actuator, let it cool down.

## 3.2 Mechanical installation

### 3.2.1 Cylinder dimensions – Cylinder drawing

To know the cylinder dimensions and the definition of its attachments, please look at cylinder drawing. The definition of drawing cylinder is given in paragraph 2.3 Detailed description of supplied product.

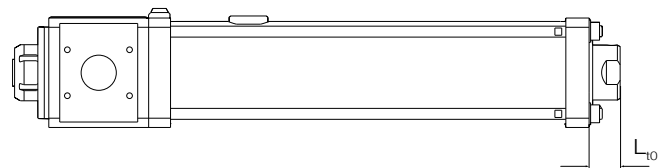
### 3.2.2 Visual cylinder position – $L_{t0}$ and $L_t$ definition

During mechanical installation or cylinder operation, it is

sometimes required to know the cylinder position in relation to the “zero” position given in the cylinder drawing.

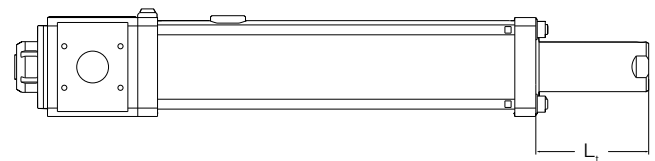
To do this, it’s first required to know  $L_{t0}$  (=length of pushing tube which is visible when cylinder is in the “zero” position on the cylinder drawing – please have a look at the cylinder drawing) – as examples, see **fig.3** some drawing illustrating  $L_{t0}$  definition.

Fig. 3



Then, it’s required to measure  $L_t$ : equivalent dimension of  $L_{t0}$  when cylinder is in any position (→ **fig. 4**).

Fig. 4



Then, cylinder position in relation to the “zero” position given in the cylinder drawing is equal to  $L_t - L_{t0}$ .

### 3.2.3 Handling – Transportation

Observe relevant transport regulations during transportation.

When the shipment is received, immediately check that no damage has been done during transportation. If not, immediately inform the shipping company and Ewellix. If the shipment has been damaged, do not commission it.

Use suitable load suspension devices for transport and assembly.

Weights of cylinder and any gear and motor are indicated on corresponding nameplates. If not, please read the technical documentation of the corresponding manufacturer.

In case of a problem, please contact your local Ewellix representative.

### 3.2.4 General recommendations for installation

1. If LEMC has been supplied without motor, please see **Chapter 4** giving corresponding information and advices for motor assembly.
2. When mounting the cylinder, check that all parts to which it is fixed are correctly aligned. This should be done throughout the complete stroke.  
**Note:** Poor alignment will reduce the life of the cylinder.
3. Radial load or bending torque must not be applied to the cylinder pushing tube. Otherwise cylinder lifetime might be drastically reduced.
4. Avoid shocks on the pushing tube. Do not hit it with a hammer.
5. Check that cylinder can move freely and there is no obstruction over the full stroke.
6. Do not modify any part of cylinder
7. Do not add any part/component on cylinder



#### NOTE

During actuator handling, please take care not to damage the limit switches and home switch (if these options have been taken).



#### NOTE

If actuator has no anti-rotation on the force tube, it is possible to extend or retract by turning force tube by hand.

### 3.3 Electrical installation

#### 3.3.1 Motor

Generally, please read the technical documentation from the motor manufacturer to know how to properly install the motor. The details concerning the motor can be found on its nameplate.

If the motor manufacturer doesn't supply paper documentation or documentation CD-ROM, it means that a user manual can be downloaded from the manufacturer's web site.

In case of a problem and if motor has been sold by Ewellix, please contact your local Ewellix representative. Otherwise, please contact motor supplier.

#### 3.3.2 Cables for motor

If motor cables are included in Ewellix supply, please read the motor technical documentation or servoamplifier technical documentation to find the technical description and connection drawing of supplied cables. Cable reference is written on the cable itself or on its packaging.

In case of a problem, please contact your Ewellix local representative.

**⚠ DANGER**

During and after operation, some parts of the cylinder carry dangerous voltages. Electric shock hazard. Risk of serious or fatal injuries. Strictly observe the safety instructions in this manual and the safety instructions of manuals associated with each commissioned equipment (motor, servoamplifier, etc). Do not unplug motor connectors before switching off the power supply of the corresponding servoamplifier. First unplug the signal connector and then the power connector. Motor rotation can create voltage. Do not touch connector pins.

**⚠ WARNING**

All technical data given here have been extracted from manufacturer's catalogue when this manual was edited. They are given for information only. If limit switch manufacturer changes this data, Ewellix is not responsible for any problem arising from such changes. Please check with limit switch manufacturer just before installing limit switch.

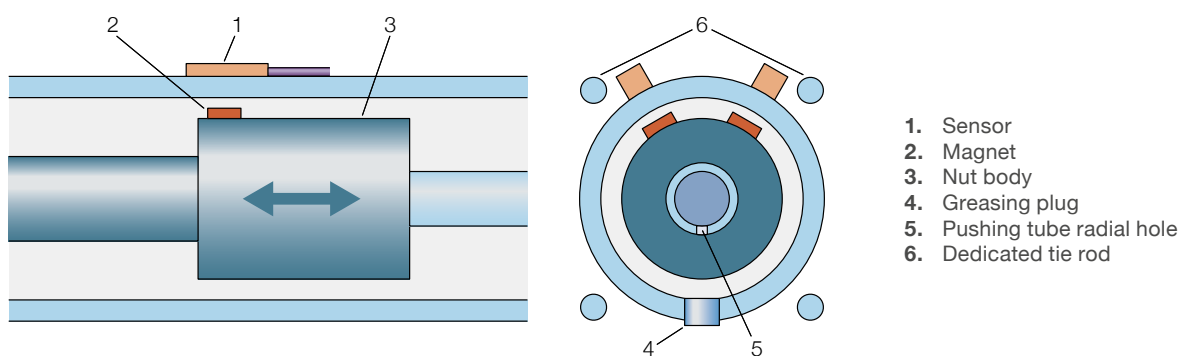
### 3.4 End & home switch instructions

#### 3.4.1 Function and features

The sensor signals the position of the nut body in the actuator. It detects a magnet located on the moving part when it passes the sensor and signals this by means of an output signal. Those sensors must be positioned on a dedicated area to ensure detection: all limit switches have to be located on the opposite side of the greasing plug (→ fig. 5).

Fig. 5

End switch





### 3.4.2 Installation

The radial hole on the end of the pushing tube must be aligned with the greasing plug to achieve the correct angular position of the magnetic field.

Assemble the sensor into its adaptor, tighten the clamp screw and affix the sub-assembly (sensor + adaptor) on the dedicated tie rod. Position the sensor where you want to detect the position of the nut body.

### 3.4.3 Electrical connection

Disconnect power before connecting the sensor. Connect strictly to the indications on the type label. Core colors for units with cable connect:

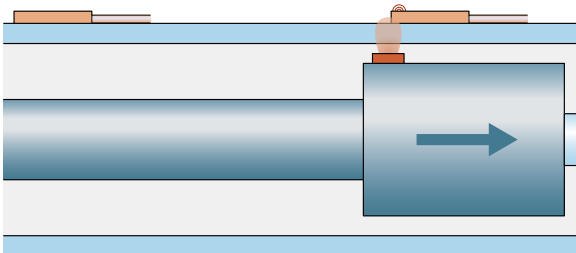
BN = brown, BU = blue, BK = black, WH = white.

### 3.4.4 End limit switch – adjustment/operation

- Adjust the actuator stroke in the detection position.
- Precisely align the sensor by means of the LED indication: The LED is lit when the output is switched. Be careful with the position of the magnetic field and the sensor (→ **fig. 6**).
- Tighten the grub screw to secure the adaptor on the tie rod.

Fig. 6

Retracted position



### 3.4.5 Home position – adjustment/operation

- Adjust the actuator stroke in the detection position.
- Precisely align the sensor by means of the LED indication: the LED is lit when the output is switched. Be careful with the position of the magnetic field and the sensor.
- Tighten the grub screw to secure the adaptor on the tie rod.

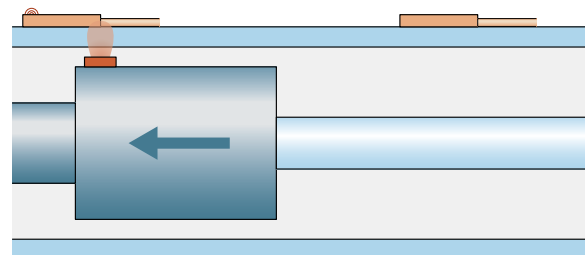
Searching for the home position sensor must be performed using always same method.

For instance, use following method:

- Drive in and retract the actuator to retracted position (up to limit switch sensor) (→ **fig. 7**)
- Than drive out the actuator up to home position sensor

Fig. 7

Extended position



### 3.4.6 Note

If the cylinder is mounted in the immediate vicinity of magnetisable components, the switching characteristics of the sensor may change.

# MK5155

## MKT3020BAPKG/A/0.3M/ZH/AS

Supplier: IFM ELECTRONIC

### Products characteristics

Cylinder sensor with AMR cell  
 Plastic housing for T-slot cylinders  
 Cable with connector  
 [f] flush mountable  
 Magnetic sensitivity 2.0 mT  
 Travel speed > 10 m/s

### Electrical data

Electrical design	DC PNP
Operating voltage [V]	10...30 DC
Current consumption [mA]	< 10
Protection class	III
Reverse polarity protection	Yes
Power-on delay time [ms]	< 30

### Outputs

Output function	Normally closed
Voltage drop [V]	< 2.5
Current rating [mA]	100
Short-circuit protection	yes
Overload protection	yes
Switching frequency [Hz]	6 000

### Range

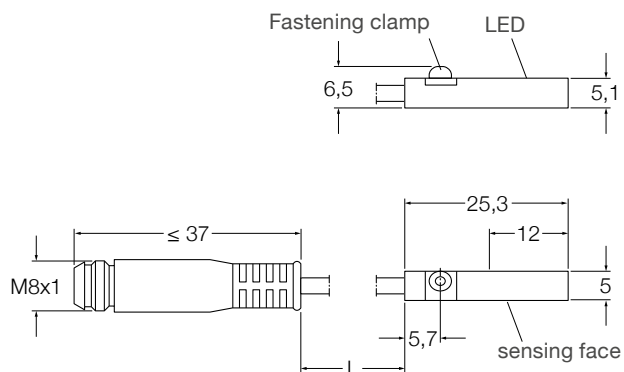
Magnetic sensitivity [mT]	2.0
Travel speed [m/s]	>10

### Accuracy/deviations

Hysteresis [mm]	1,0
Repeatability [mm]	<0,2

### Environment

Ambient temperature [°C]	-25...85
Protection	IP 65 / IP 67



**Tests/approvals**

EMC	EN 61000-4-2 ESD:	-CD / 8 kV AD
	EN 61000-4-3 HF radiated:	10 V/m (80...2000 MHz)
	EN 61000-4-4 Burst:	2 kV
	EN 61000-4-6 HF conducted:	10 V (0.15...80 MHz)
	EN 55011:	class B

MTTF [Years] 2076

**Mechanical data**

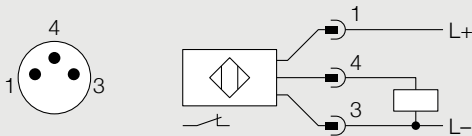
Mounting	Flush mountable
Housing materials	Housing: PA (polyamide); Fastening clamp: stainless steel
Weight [kg]	0,012

**Displays/operating elements**

Output status indication LED Yellow

**Electrical connection**

Connection PUR cable/0,3 m: with M8 connector (snap-fit)

**Accessories**

Accessories (included) Rubber placeholder: cable clip

**Remarks**

Remarks	cULus – Class 2 source required Clamping screw with combined slot/hexagon socket head AF 1.5
Pack quantity [piece]	1

# MK5159

## MKT3020BBPKG/A/0.3/ZH/ASR

Supplier: IFM ELECTRONIC

### Products characteristics

Cylinder sensor with AMR cell  
 Plastic housing for T-slot cylinders  
 Cable with connector  
 [f] flush mountable  
 Magnetic sensitivity 2.0 mT  
 Travel speed > 10 m/s

### Electrical data

Electrical design	DC PNP
Operating voltage [V]	10...30 DC
Current consumption [mA]	< 10
Protection class	III
Reverse polarity protection	Yes
Power-on delay time [ms]	< 30

### Outputs

Output function	Normally open
Voltage drop [V]	< 2.5
Current rating [mA]	100
Short-circuit protection	yes
Overload protection	yes
Switching frequency [Hz]	6 000

### Range

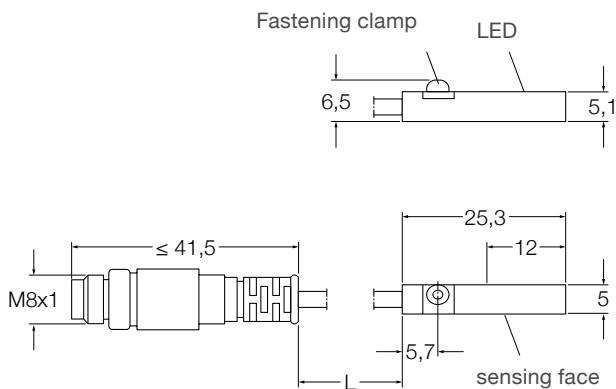
Magnetic sensitivity [mT]	2.0
Travel speed [m/s]	>10

### Accuracy/deviations

Hysteresis [mm]	1,0
Repeatability [mm]	<0,2

### Environment

Ambient temperature [°C]	-25...85
Protection	IP 65 / IP 67



**Tests/approvals**

EMC	EN 61000-4-2 ESD:	-CD / 8 kV AD
	EN 61000-4-3 HF radiated:	10 V/m (80...2 000 MHz)
	EN 61000-4-4 Burst:	2 kV
	EN 61000-4-6 HF conducted:	10 V (0.15...80 MHz)
	EN 55011:	class B

MTTF [Years] 2064

**Mechanical data**

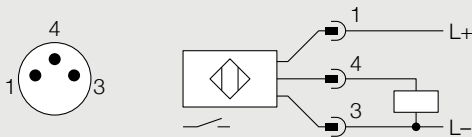
Mounting	Flush mountable
Housing materials	Housing: PA (polyamide); Fastening clamp: stainless steel
Weight [kg]	0,015

**Displays/operating elements**

Output status indication LED Yellow

**Electrical connection**

Connection PUR cable/0,3 m: with M8 connector, with tumbable coupling ring

**Accessories**

Accessories (included) Rubber placeholder: cable clip

**Remarks**

Remarks	cULus – Class 2 source required Clamping screw with combined slot/hexagon socket head AF 1.5
Pack quantity [piece]	1

E12231

## Adapt tie rod/profile

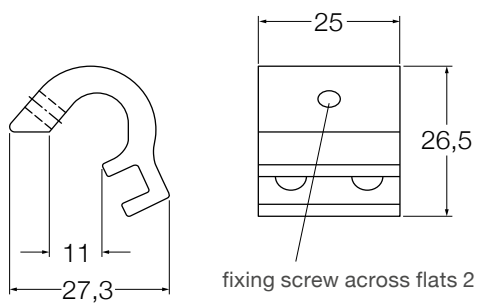
Supplier: IFM ELECTRONIC

**Products characteristics**Adapter for tie rod / integrated profile cylinders  
for type MKT**Mechanical data**

Design	For types MKT (T-slot cylinder sensors)
Housing materials	Aluminium; screw: stainless steel
Clamping range	5...11
Weight [kg]	0,017

**Remarks**

Pack quantity [piece] 1

**3.4.7 Servoamplifier**

If the servoamplifier is supplied by Ewellix, please read the manufacturer's technical documentation for the servoamplifier in order to know how to properly install it.

The exact servoamplifier reference can be found on the nameplate located on the servoamplifier.

If the servoamplifier manufacturer doesn't supply paper documentation or a documentation CD-ROM, it means that a user manual should be downloaded from the manufacturer's web site.

In case of a problem, please contact your local Ewellix representative.

# 4.0 LEMC motor assembly instructions

The purpose of the following document is to give basic information and advice for motor assembly on the LEMC actuator range, based on standard motor interfaces given in the LEMC catalogue **PUB IL-06012-EN-October 2019**. Either for in line or parallel interfaces.

If another brand of motor has to be assembled, please refer to the dedicated drawing if it exists, or contact Ewellix.

## 4.1 Standard motor interface list

### Standard Motor interface

Layout LEMC size Ratio	Inline		Parallel			30		
	21 1:1	30 1:1	21 1:1	3:2	2:1	1:1	3:2	2:1
<b>Lenze</b>								
MCS12	L1019110L	L1019110L	P1019110L	P1519110L	P2019110L	P1019110L	P1519110L	P2019110L
	-	-	-	-	-	-	-	P2019110H
MCS14	-	L1024130L	-	-	-	P1024130L	-	-
	-	-	-	-	-	P1024130H	P1524130H	P2024130H
<b>Siemens</b>								
1FK706x	L1024110L	L1024110L	P1024110L	P1524110L	P2024110L	P1024110L	P1524110L	P2024110L
	-	-	-	-	-	-	-	P2024110H
1FK708x	-	L1032130L	-	-	-	P1032130L	-	-
	-	-	-	-	-	P1032130H	P1532130H	P2032130H
<b>Parker</b>								
NX6	L1024110L	L1024110L	P1024110L	P1524110L	P2024110L	P1024110L	P1524110L	P2024110L
	-	-	-	-	-	-	-	P2024110H
NX8	-	L1032130L	-	-	-	P1032130L	-	-
	-	-	-	-	-	P1032130H	P1532130H	P2032130H
<b>Kollmorgen</b>								
AKM5x	L1019110L	L1019110L	P1019110L	P1519110L	P2019110L	P1019110L	P1519110L	P2019110L
	-	-	-	-	-	-	-	P2019110H
	L1024110L	L1024110L	P1024110L	P1524110L	P2024110L	P1024110L	P1524110L	P2024110L
	-	-	-	-	-	-	-	P2024110H
AKM6x	-	L1024130L	-	-	-	P1024130L	-	-
	-	-	-	-	-	P1024130H	P1524130H	P2024130H
	-	L1032130L	-	-	-	P1032130L	-	-
	-	-	-	-	-	P1032130H	P1532130H	P2032130H
<b>Rockwell / Allen Bradley</b>								
MPL-A/B45x	L1024110L	L1024110L	P1024110L	P1524110L	P2024110L	P1024110L	P1524110L	P2024110L
	-	-	-	-	-	-	-	P2024110H
MPL-A/B52x	-	L1028130L	-	-	-	P1028130L	-	-
MPL-A/B52x & 54x & 56x	-	L1028130L	-	-	-	P1028130H	P1528130H	P2028130H

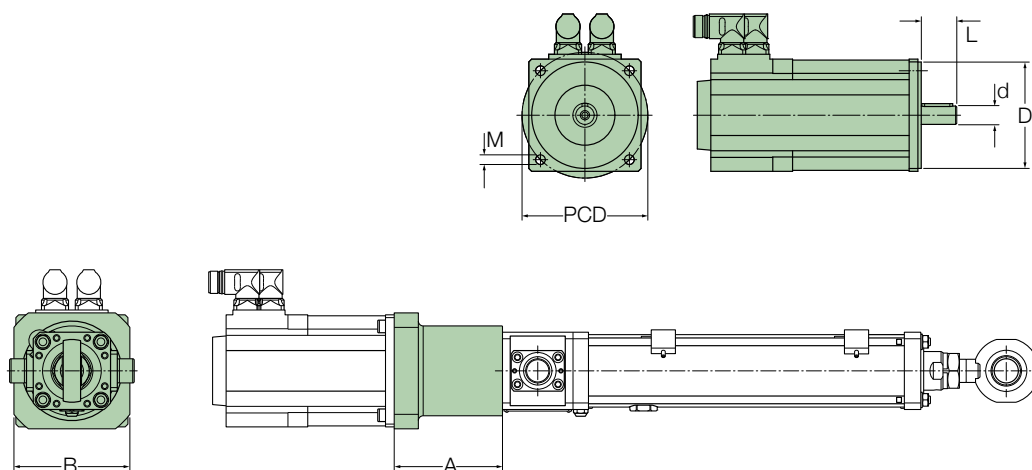
For other motors, please contact Ewellix

# In-line motor interface

This chapter gives basic information and instructions for motor assembly with coupling transmission.

## 4.2.1 Dimensional information

Inline interface



LEMC	Interface	d mm	D	L	PCD	M	A mm	B	Torque max Nm	Inertia 10 <sup>-4</sup> kgm <sup>2</sup>	Weight kg
21	L1019110L	19	110 H8 <sup>0</sup> <sub>+0,054</sub>	40 ... 50	130	M8	112	120	60	1,6	1,7
21	L1024110L	24	110 H8 <sup>0</sup> <sub>+0,054</sub>	40 ... 50	130	M8	112	120	60	1,6	1,7
30	L1019110L	19	110 H8 <sup>0</sup> <sub>+0,054</sub>	40 ... 50	130	M8	106	120	60	1,6	2,9
30	L1024110L	24	110 H8 <sup>0</sup> <sub>+0,054</sub>	40 ... 50	130	M8	106	120	60	1,6	2,9
30	L1024130L	24	130 H8 <sup>0</sup> <sub>+0,063</sub>	50 ... 58	165	M10	118	150	120	3	2,6
30	L1028130L	28	130 H8 <sup>0</sup> <sub>+0,063</sub>	50 ... 60	165	M10	126,5	150	120	3	2,6
30	L1032130L	32	130 H8 <sup>0</sup> <sub>+0,063</sub>	50 ... 58	165	M10	118	150	120	3	2,6

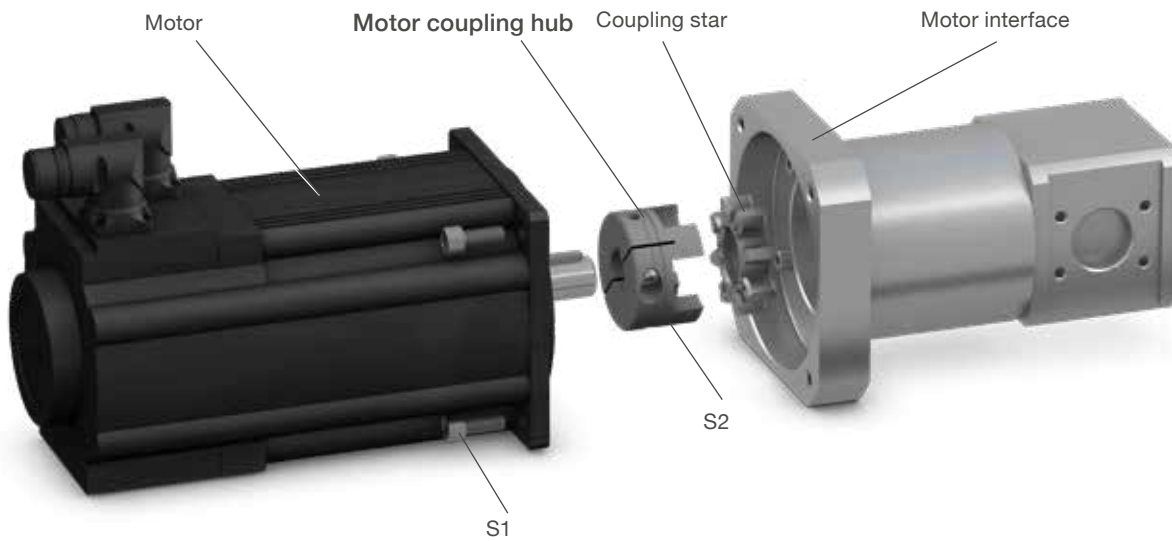
## 4.2.2 Screws and tightening torque M<sub>A</sub>

Table 1

LEMC	Interface	Screws and tightening torque M <sub>A</sub>			
		S1 Motor screw	M <sub>A</sub> Nm	S2 Coupling screw	M <sub>A</sub> Nm
21	L1019110L	M8×20	25	M6	10
21	L1024110L	M8×20	25	M6	10
30	L1019110L	M8×20	25	M6	10
30	L1024110L	M8×20	25	M6	10
30	L1024130L	M10×30	49	M8	25
30	L1028130L	M10×30	49	M8	25
30	L1032130L	M10×30	49	M8	25

Note: Ewellix advise a light thread locking glue on all screws, except S2 on the coupling.





### 4.2.3 Coupling installation on motor shaft

Actuator is delivered with the motor interface mounted and the coupling hub installed on screw shaft.

The coupling hub on the motor shaft has to be installed by the customer.

Note that all couplings used are for assembly to motor shafts with a keyway.

- **Step 1:** Separate the motor coupling hub from the rest of the coupling (the coupling star has to remain on the actuator coupling hub).
- **Step 2:** Push the coupling hub onto the motor shaft (do not tighten the radial fixing screw (S2)).
- **Step 3:** Align the coupling hub on the motor shaft as per information in **table 2**.
- **Step 4:** Tighten the radial fixing screw (S2) as specified in **table 1**.

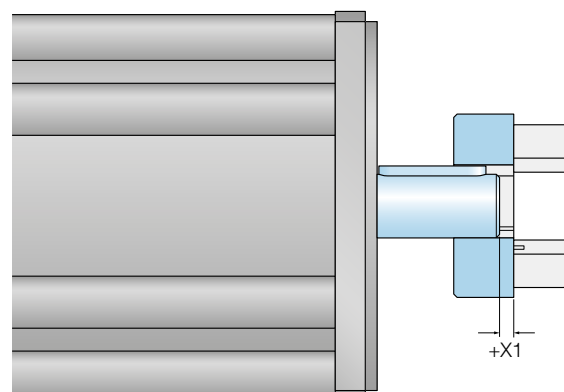
### 4.2.4 Motor installation on the motor interface

- **Step 1:** Fit the motor on the motor interface. When assembling, make sure that the coupling is properly seated and each coupling hub aligned.
- **Step 2:** Tighten the fixing screws (S1) to the torque specified in **table 1**, [↳ page 24](#).

Table 2

LEMC	Interface	Motor brand	Motor X1 mm
21	L1019110L	Lenze / MCS12 Kollmorgen / AKM5x	+1,5 +1,5
21	L1024110L	Siemens / 1FK706 Parker / NX6 Kollmorgen / AKM5x Rockwell – AB / MPL-A/B45x	-4,5 -4,5 -4,5 -4,5
30	L1019110L	Lenze / MCS12 Kollmorgen / AKM5x	+1,8 +1,8
30	L1024110L	Siemens / 1FK706 Parker / NX6 Kollmorgen / AKM5x Rockwell – AB / MPL-A/B45x	-4,2 -4,2 -4,2 -4,2
30	L1024130L	Lenze / MCS14 Kollmorgen / AKM6x	+1,5 +1,5
30	L1028130L	Rockwell–AB / MPL–A/B52x & 54x & 56x	0
30	L1032130L	Siemens / 1FK708 Parker / NX8 Kollmorgen / AKM6x	-1 -1 -1

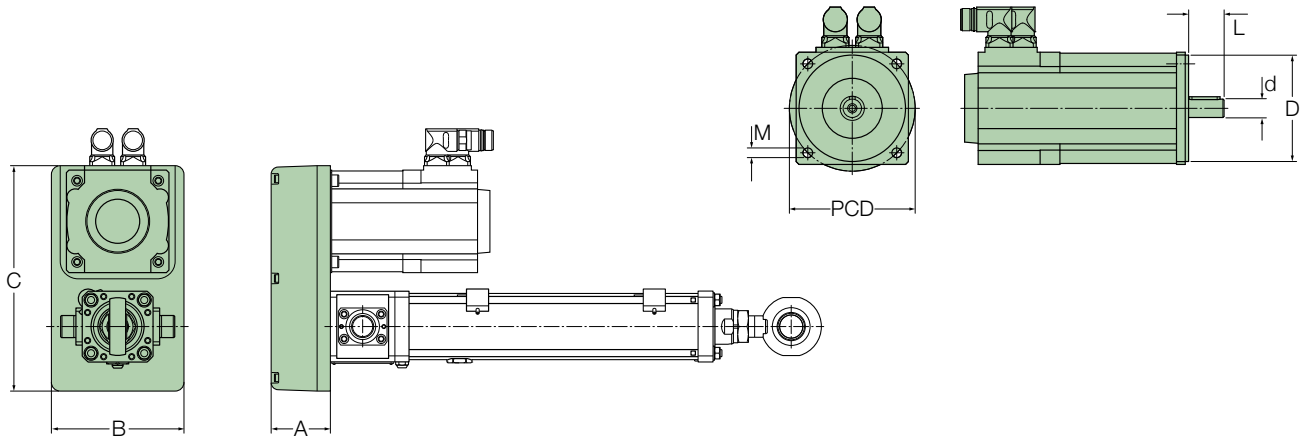
Fig. 8



## 4.3 Parallel motor interface

This chapter gives basic information and instructions for motor assembly with belt transmission.

### 4.3.1 Dimensional information

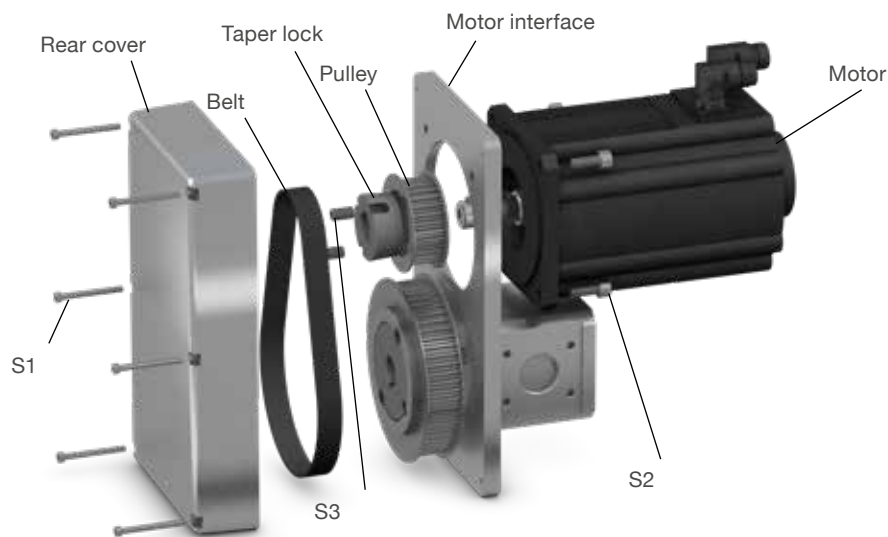


LEMC	Interface	d mm	D	L	PCD	M	A mm	B	C	Torque max Nm	Inertia 10 <sup>-4</sup> kgm <sup>2</sup>	Weight kg
21	P1019110L	19	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	67	150	255	40	14,4	3,5
21	P1024110L	24	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	67	150	255	40	14,4	3,5
21	P1519110L	19	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	67	150	255	25	7,55	3,4
21	P1524110L	24	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	67	150	255	25	7,55	3,4
21	P2019110L	19	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	67	150	255	20	9,55	4,3
21	P2024110L	24	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	67	150	255	20	9,55	4,3
30	P1019110L	19	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	72	180	325	55	37,6	5,8
30	P1024110L	24	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	72	180	325	55	37,6	5,8
30	P1024130L	24	130 G8 <sup>+0.014/+0.077</sup>	50 ... 58	165	M10	72	180	325	55	37,6	5,6
30	P1024130H	24	130 G8 <sup>+0.014/+0.077</sup>	50 ... 58	165	M10	72	180	325	90	37,6	5,6
30	P1028130L	28	130 G8 <sup>+0.014/+0.077</sup>	50 ... 60	165	M10	72	180	325	55	37,6	5,6
30	P1028130H	28	130 G8 <sup>+0.014/+0.077</sup>	50 ... 60	165	M10	72	180	325	99	37,6	5,6
30	P1032130L	32	130 G8 <sup>+0.014/+0.077</sup>	50 ... 58	165	M10	72	180	325	55	37,6	5,6
30	P1032130H	32	130 G8 <sup>+0.014/+0.077</sup>	50 ... 58	165	M10	72	180	325	90	37,6	5,6
30	P1519110L	19	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	72	180	325	40	27,5	6,3
30	P1524110L	24	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	72	180	325	40	27,5	6,3
30	P1524130H	24	110 G8 <sup>+0.012/+0.066</sup>	50 ... 58	165	M10	72	180	325	100	70,3	9
30	P1528130H	28	130 G8 <sup>+0.014/+0.077</sup>	50 ... 60	165	M10	72	180	325	100	70,3	9
30	P1532130H	32	130 G8 <sup>+0.014/+0.077</sup>	50 ... 58	165	M10	72	180	325	100	70,3	9
30	P2019110L	19	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	72	180	325	35	25	7
30	P2019110H	19	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	72	180	325	70	34,5	8,5
30	P2024110L	24	110 G8 <sup>+0.012/+0.066</sup>	40 ... 50	130	M8	72	180	325	35	25	7
30	P2024130H	24	130 G8 <sup>+0.014/+0.077</sup>	50 ... 58	165	M10	72	180	325	70	34,5	8,3
30	P2028130H	28	130 G8 <sup>+0.014/+0.077</sup>	50 ... 60	165	M10	72	180	325	70	34,5	8,3
30	P2032130H	32	130 G8 <sup>+0.014/+0.077</sup>	50 ... 58	165	M10	72	180	325	70	34,5	8,3

### 4.3.2 Screws and tightening torque $M_A$

Tab. 3

LEMC	Interface	S1 Rear cover screw	$M_A$ Nm	S2 Motor screw	$M_A$ Nm
-	-	-		-	
21	Pxx19110L	M5x50	6	M8x20	25
21	Pxx24110L	M5x50	6	M8x20	25
30	Pxx19110L	M5x50	6	M8x20	25
30	Pxx19110H	M5x50	6	M8x20	25
30	Pxx24110L	M5x50	6	M8x20	25
30	Pxx24110H	M5x50	6	M8x20	25
30	Pxx24130L	M5x50	6	M10x25	49
30	Pxx24130H	M5x50	6	M10x25	49
30	Pxx28130L	M5x50	6	M10x25	49
30	Pxx28130H	M5x50	6	M10x25	49
30	Pxx32130L	M5x50	6	M10x25	49
30	Pxx32130H	M5x50	6	M10x25	49



### 4.3.3 Pulley installation on motor shaft

Actuator is delivered with the motor interface mounted and the pulley installed on screw shaft. The pulley on the motor shaft has to be installed by the customer.

Belt is assembled with a fixed axis distance between the pulleys. In consequence there is no need to adjust the tension of the belt. Note that all taper locks used are for assembly to motor shafts with a keyway.

- **Step 1:** Dismount the rear cover from the actuator.
- **Step 2:** Insert the taper lock on the pulley and screw by hand the fixing screws (S3) of the taper lock (do not tighten the screws). For more instructions see taper lock installation manual delivered with the parts.
- **Step 3:** Push the pulley + taper lock onto the motor shaft, aligning the keyway with the groove.

- **Step 4:** Align the coupling hub on the motor shaft as per as per information in **table 4**.
- **Step 5:** Tighten the screws (S3) as specified in **table 4**, [↳ page 28](#).

Table 4

LEMC	Interface	Motor Brand	Motor X1	Taper Lock	S3 (on taper lock)	MA
-	-	-	mm	-	n°	Nm
21	P1019110L	Lenze / MCS12	+2,9	1610 D19	2	20
		Kollmorgen / AKM5x	+2,9	1610 D19	2	20
21	P1024110L	Siemens / 1FK706	-7,1	1610 D24	2	20
		Parker / NX6	-7,1	1610 D24	2	20
		Kollmorgen / AKM5x	-7,1	1610 D24	2	20
		Rockwell – AB / MPL-A/B45x	-7,1	1610 D24	2	20
21	P1519110L	Lenze / MCS12	+2,9	1108 D19	2	5,5
		Kollmorgen / AKM5x	+2,9	1108 D19	2	5,5
21	P1524110L	Siemens / 1FK706	-7,1	1108 D24	2	5,5
		Parker / NX6	-7,1	1108 D24	2	5,5
		Kollmorgen / AKM5x	-7,1	1108 D24	2	5,5
		Rockwell – AB / MPL-A/B45x	-7,1	1108 D24	2	5,5
21	P2019110L	Lenze / MCS12	+5,3	1008 D19	2	5,5
		Kollmorgen / AKM5x	+5,3	1008 D19	2	5,5
21	P2024110L	Siemens / 1FK706	-4,7	1008 D24 <sup>1)</sup>	2	5,5
		Parker / NX6	-4,7	1008 D24 <sup>1)</sup>	2	5,5
		Kollmorgen / AKM5x	-4,7	1008 D24 <sup>1)</sup>	2	5,5
		Rockwell – AB / MPL-A/B45x	-4,7	1008 D24 <sup>1)</sup>	2	5,5
30	P1019110L	Lenze / MCS12	0	1610 D19	2	20
		Kollmorgen / AKM5x	0	1610 D19	2	20
30	P1024110L	Siemens / 1FK706	-10	1610 D24	2	20
		Parker / NX6	-10	1610 D24	2	20
		Kollmorgen / AKM5x	-10	1610 D24	2	20
		Rockwell – AB / MPL-A/B45x	-10	1610 D24	2	20
30	P1024130L	Lenze / MCS14	-7	1610 D24	2	20
		Kollmorgen / AKM6x	-7	1610 D24	2	20
30	P1024130H	Lenze / MCS14	-7	1610 D24	2	20
		Kollmorgen / AKM6x	-7	1610 D24	2	20
30	P1028130L	Rockwell – AB / MPL-A/B52x	-12	1610 D28	2	20
	P1028130H	Rockwell – AB / MPL-A/B52x & 45x & 56x	-12	1610 D28	2	20
30	P1032130L	Siemens / 1FK708	-15	1610 D32	2	20
		Parker / NX8	-15	1610 D32	2	20
		Kollmorgen / AKM6x	-15	1610 D32	2	20
30	P1032130H	Siemens / 1FK708	-15	1610 D32	2	20
		Parker / NX8	-15	1610 D32	2	20
		Kollmorgen / AKM6x	-15	1610 D32	2	20
30	P1519110L	Lenze / MCS12	0	1610 D19	2	20
		Kollmorgen / AKM5x	0	1610 D19	2	20
30	P1524110L	Siemens / 1FK706	-10	1610 D24	2	20
		Parker / NX6	-10	1610 D24	2	20
		Kollmorgen / AKM5x	-10	1610 D24	2	20
		Rockwell – AB / MPL-A/B45x	-10	1610 D24	2	20
30	P1524130H	Lenze / MCS14	0	1610 D24	2	20
		Kollmorgen / AKM6x	0	1610 D24	2	20
30	P1528130H	Rockwell – AB / MPL-A/B52x & 45x & 56x	-5	1610 D28	2	20
30	P1532130H	Siemens / 1FK708	-8	1610 D32	2	20
		Parker / NX8	-8	1610 D32	2	20
		Kollmorgen / AKM6x	-8	1610 D32	2	20
30	P2019110L	Lenze / MCS12	0	1108 D19	2	5,5
		Kollmorgen / AKM5x	0	1108 D19	2	5,5
30	P2019110H	Lenze / MCS12	+7	1610 D19	2	20
		Kollmorgen / AKM5x	+7	1610 D19	2	20
30	P2024110L	Siemens / 1FK706	-10	1108 D24	2	5,5
		Parker / NX6	-10	1108 D24	2	5,5
		Kollmorgen / AKM5x	-10	1108 D24	2	5,5
		Rockwell – AB / MPL-A/B45x	-10	1108 D24	2	5,5
30	P2024110H	Siemens / 1FK706	-3	1610 D24	2	20
		Parker / NX6	-3	1610 D24	2	20
		Kollmorgen / AKM5x	-3	1610 D24	2	20
		Rockwell – AB / MPL-A/B45x	-3	1610 D24	2	20
30	P2024130H	Lenze / MCS14	0	1610 D24	2	20
		Kollmorgen / AKM6x	0	1610 D24	2	20
30	P2028130H	Rockwell – AB / MPL-A/B52x & 45x & 56x	-5	1610 D28	2	20
30	P2032130H	Siemens / 1FK708	-8	1610 D32	2	20
		Parker / NX8	-8	1610 D32	2	20
		Kollmorgen / AKM6x	-8	1610 D32	2	20

<sup>1)</sup> Taper lock with reduced keyway – see appendix

Note: Ewellix advise a light thread locking glue on all screws, including S3 on taper lock.

### 4.3.4 Belt and motor installation on the mounting plate interface

- **Step 1:** Fit the belt on the pulley that is already mounted on the actuator shaft (belt has to be placed in the middle of the pulley).
- **Step 2:** Fit the motor on the motor interface. When assembling, be sure to tilt the motor to insert the pulley + motor on the belt.
- **Step 3:** Tighten the fixing screws (S2) to the torque specified in **table 3**.
- **Step 4:** Check that the belt has not moved and is still in the middle of the pulleys. If not adjust the position.
- **Step 5:** Remount the rear cover, and tighten the screws (S1) to the torque specified in **table 3**.

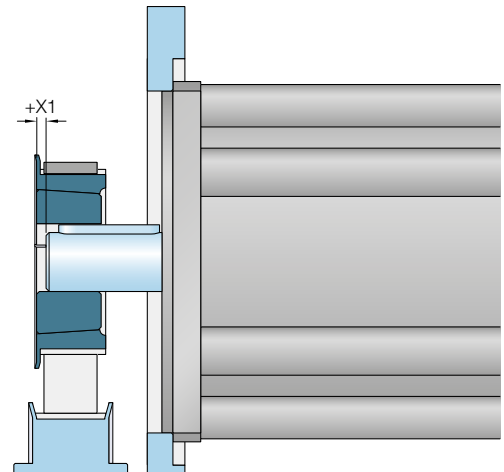
## 4.4 SER-SIT taper lock bushing

SER-SIT taper lock bush is designed to give the following:

1. Perfect assembly;
2. Rapid dismantling of the pulley and other transmission equipment;
3. No special tools requirement except hexagonal key.

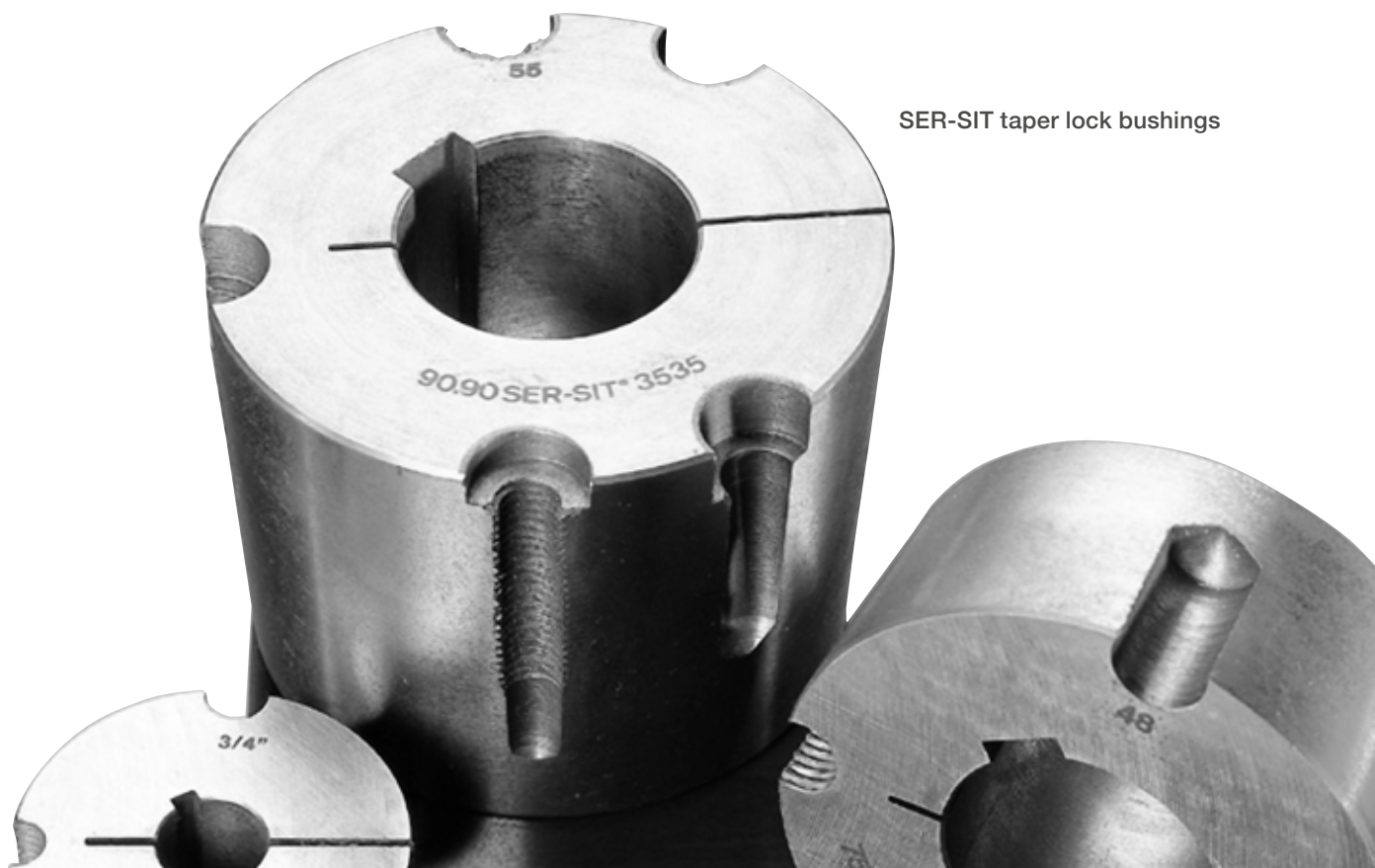
The large range of finished bores available ensures that an immediate assembly can be made thus avoiding costly factory down-time.

Fig. 9



The bushes are machined with keyways in accordance with UNI and DIN specifications. This is in addition to clamping screws which, in many cases, are sufficient to meet the required torque.

Fastening by SER-SIT bushes allows the removal of any clearance between hub and bore so that fretting corrosion is positively eliminated. SER-SIT bushes are interchangeable with all similar types sold throughout the world.



SER-SIT taper lock bushings

Taper lock bushings

Type	Diameter of the bore		Bush		Screws			Ms Nm	
	mm /in	mm /in	Length	max. diameter	amount	withworth	length mm		set screw wrenchtype
<b>1008</b> (25.20)	9, 10, 11, 12, 14, 15, 16, 18, 19, 20, 22, <b>24<sup>1)</sup></b> , <b>25<sup>1)</sup></b>	<i>3/8, 1/2, 5/8, 3/4, 7/8, 1<sup>1)</sup></i>	22,3	35	2	1/4	13	3	5,5
<b>1108</b> (28.20)	9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 22, 24, 25, 26, <b>27, 28<sup>1)</sup></b>	<i>3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/8</i>	22,3	38	2	1/4	13	3	5,5
<b>1210</b> (28.20)	11, 12, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 28, <b>30, 32</b>	<i>1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 1/2</i>	25,4	47	2	3/8	16	5	20
<b>1215</b> (30.40)	11, 12, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 28, <b>30, 32</b>	<i>1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4</i>	38,1	47	2	3/8	16	5	20
<b>1310</b> (35.25)	12, 14, 15, 16, 18, 19, 20, 22, 24, 25, 28, 30,32, <b>35<sup>1)</sup></b>	<i>1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8</i>	25,4	52	2	3/8	16	5	20
<b>1610</b> (40.25)	12, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 35, 38, <b>40, 42</b>	<i>3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 5/8</i>	25,4	57	2	3/8	16	5	20
<b>1615</b> (40.40)	12, 14, 15, 16, 18, 19, 20, 22, 24, 25, 28, 30, 32, 35, 38, <b>40, 42<sup>1)</sup></b>	<i>1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 5/8<sup>1)</sup>, 1 3/4<sup>1)</sup></i>	38,1	57	2	3/8	16	5	20
<b>2012</b> (50.30)	14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 35, 38, 40, 42, 45, 48, <b>50</b>	<i>5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 5/8, 1 3/4, 1 7/8, 2</i>	31,8	70	2	7/16	22	5	30
<b>2517</b> (65.45)	16, 18, 19, 20, 22, 24, 25, 28, 30, 32, 35, 38, 40, 42, 45, 48, 50,55, 60, <b>65<sup>1)</sup></b>	<i>3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 5/8, 1 3/4, 1 7/8, 2, 2 1/8, 2 1/4, 2 3/8, 2 1/2</i>	44,5	85	2	1/2	25	6	50
<b>3020</b> (75.50)	22, 25, 28, 30,32 ,35, 38, 40, 42, 45, 48, 50, 55, 57, 60, 65, 70, <b>75</b>	<i>1 1/4, 1 3/8, 1 1/2, 1 5/8, 1 3/4, 1 7/8, 2, 2 1/8, 2 1/4, 2 3/8, 2 1/2, 2 5/8, 2 3/4, 2 7/8, 3</i>	50,8	108	2	5/8	32	8	90
<b>3030</b> (75.75)	25, 28, 30, 32, 35, 38, 40, 42, 45, 47, 48, 50, 55, 60, 65, 70, <b>75</b>	<i>1 1/4, 1 3/8, 1 1/2, 1 5/8, 1 3/4, 1 7/8, 2, 2 1/8, 2 1/4, 2 3/8, 2 1/2, 2 5/8, 2 3/4, 2 7/8, 3</i>							
<b>3535</b> (90.90)	25, 28, 30, 32, 35, 38, 40, 42, 45, 48, 50, 55, 60, 65, 70, 75, 80, 85, 90	<i>1 1/2, 1 5/8, 1 3/4, 1 7/8, 2, 2 1/8, 2 1/4, 2 3/8, 2 1/2, 2 5/8, 2 3/4, 2 7/8, 3, 3 1/8, 3 1/4, 3 3/8, 3 1/2<sup>1)</sup></i>	88,9	127	3	1/2	38	10	115
<b>4040</b> (100.100)	40, 42, 45, 48, 50, 55, 60, 65, 70,75, 80, 85, 90, 95, 100	<i>1 3/4, 2, 2 1/2, 2 3/4, 3 1/2, 3 3/4<sup>1)</sup>, 4<sup>1)</sup></i>	101,6	146	3	5/8	44	14	170
<b>4545</b> (115.115)	55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110	<i>3, 3 1/2, 4</i>	114,3	162	3	3/4	51	14	195
<b>5050</b> (125.125)	50, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125	<i>3 1/2, 4</i>	127	178	3	7/8	57	17	275

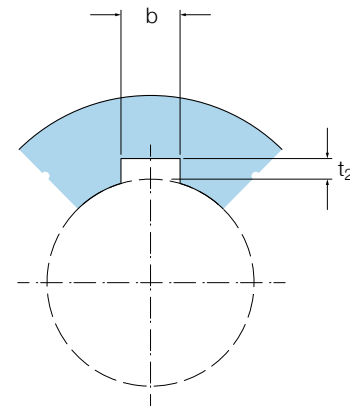
The first group of numbers indicates maximum bore, the second conventional length in mm.  
Bore diameter marked in blue are made in steel instead of cast iron  
Ms = screw tightening torque

<sup>1)</sup> Reduced keyway

## Keyway, UNI 6604-69 / DIN 6885

Fig. 10

Bore diameter mm	b	t <sub>2</sub>	Bore diameter in	b	t <sub>2</sub>
9 – 10	3	1,4	3/8 – 1/2	1/8	1/16
11 – 12	4	1,8	9/16 – 3/4	3/16	3/32
13 – 17	5	2,3	13/16 – 1	1/4	1/8
18 – 22	6	2,8	1 1/16 – 1 1/4	5/16	1/8
23 – 30	8	3,3	1 5/16 – 1 1/2	3/8	1/8
31 – 38	10	3,3	1 5/8 – 1 3/4	7/16	5/32
39 – 44	12	3,3	1 7/8 – 2	1/2	5/32
45 – 50	14	3,8	2 1/8 – 2 1/2	5/8	7/32
51 – 58	16	4,3	2 5/8 – 3	3/4	1/4
59 – 65	18	4,4	3 1/8 – 3 1/2	7/8	5/16
66 – 75	20	4,9	3 3/4 – 4	1	3/8
76 – 85	22	5,4	4 1/4 – 5	1 1/4	7/16
86 – 95	25	5,4			
96 – 110	28	6,4			
111 – 130	32	7,4			



Reduced keyway only when the undermentioned bores are

Bore diameter mm	Bushing type	b mm	t <sub>2</sub>
24 – 25	1008	8	1,3
28	1108	8	1,3
35	1310	10	1,3
42	1615	12	2,2
65	2517	18	3,3

Bore diameter in	Bushing type	b in	t <sub>2</sub>
1	1008	1/4	1/16
1 1/8	1108	5/16	5/64
1 5/8 – 1 3/4	1615	7/16	1/8
3 1/2	3535	7/8	1/4
3 3/4 – 4	4040	1	1/4

the maximum bores and only in the bushing types shown in table

#### 4.4.1 Assembly and dismantling of SER-SIT conical bushing

- Before fitting the bushing, carefully clean the bore and conical parts.
- Fit the bushing into the pulley, taking care to let threaded half-holes of the pulley coincide with the unthreaded holes of the bushing.
- Hand tighten the screws
- Fit the pulley to the hub after carefully cleaning it. Position it and tighten the screws alternately.
- Dismantling: remove screws and replace one screw in the jacking hole provided and tighten until hub is released.

**NOTE:** Ensure that the key does not bottom in the keyway. Clearance in recommended in the keyway bottom.

# 5.0 Commissioning

## ⚠ DANGER

During and after operation, some parts of the cylinder carry dangerous voltages. Electric shock hazard. Risk of serious or fatal injuries.

Strictly observe the safety instructions in this manual and the safety instructions of manuals associated with each commissioned equipment (motor, servoamplifier, etc).

Do not unplug motor connectors before switching off the power supply of the corresponding servoamplifier. First unplug the signal connector and then the power connector.

Motor rotation can create voltage. Do not touch connector pins.

## 5.1 General procedure for commissioning

To perform the very first commissioning of a cylinder, the general principle is as follows:

1. On the computer, ensure installation of the software required for defining servoamplifier parameters – installation of hardware connection between computer and servoamplifier.
2. Switch on the servoamplifier (only auxiliary supply or low-level supply) to allow servoamplifier parameters definition.
3. Launch the software required for servoamplifier parameters definition. Operation checking of connection between computer and servoamplifier.
4. Definition of servoamplifier parameters. At the very least, the following information has to be entered:
  - 4.1. Cylinder motor choice (if necessary, choice of resolver or encoder associated) and associated brake choice if necessary.
  - 4.2. Fill in the following data:
    - 4.2.1. Cylinder move for each motor revolution (please read paragraph 2.2 Operating principle for definition).
    - 4.2.2. Cylinder speed defined for application.
    - 4.2.3. Cylinder acceleration defined for application.
    - 4.2.4. Definition of starting control parameters (see servo-amplifier's technical documentation).
  - 4.3. Save modifications in non-volatile memory.

## ⚠ WARNING

During operation, the cylinder surface temperature can reach high values. There's a risk of burns or fire. Before any work on the actuator, let it cool down.

## ⚠ DANGER

Customer should make sure that the commissioning steps suggested in the general procedure can't create any problems.

The described procedure assumes that mechanical and electrical installation have been done correctly.



## NOTE

Actuator is greased supplied.



**NOTE**

Before going on to step 5, please check that the parameters given in steps 1–4 have been correctly saved in the non-volatile memory. To do that, switch off and on the servo-amplifier. Then check that the parameter modifications have been correctly taken into account in the servoamplifier.

5. Switch on the power supply of the servoamplifier. Check the cylinder motor brake operation (for example: when the cylinder motor torque comes on, a brake clap has to be heard. Same thing when the cylinder motor torque turns off).
6. Make a small cylinder move (smaller than overstroke value which is written on cylinder drawing) in a positive direction to see the actual direction of pushing tube move. Generally, the pushing tube extends when a positive move is ordered. Otherwise, please reverse the motor rotation direction.
7. Check the limit switch in the retracted position by moving the cylinder slowly and gradually to that position.
8. Check the limit switch in the extended position by moving the cylinder slowly and gradually to that position.
9. If a home switch has been installed, check its operation by moving the cylinder slowly and gradually to a position where the home switch status changes.
10. Make a program for defining the zero reference and check that this program works correctly, whatever the cylinder starting position (please read paragraph 5.3 How to define zero reference before beginning to make a program).
11. Measure the two extreme positions (pushing the tube in the extended position and in the retracted position) within which the cylinder could move without activating the limit switches (these two positions will be defined in relation with zero reference defined just above).

For more detailed information about how to check the position control behaviour, please read paragraph 5.4 How to check position control behaviour – first approach

**NOTE**

Once all these steps have been achieved, it's advisable to make the cylinder move several times forward-backward slowly on the complete stroke and to check the position control behaviour while the cylinder speed and acceleration are gradually increased.

## 5.2 General recommendations for use

Cylinders include two internal mechanical stops: one in the retracted and one in the extended position. In all cases, these stops are only to be used manually at slow speed and under small loads. They are not designed for the cylinder to push into them with significant loads and speeds.

For initial operation, it is advised that the user slowly increases the cycle rate of the cylinder without overheating. As a general rule, the stabilized temperature of the cylinder should not exceed 80°C (whatever surface where measure is made). For more detailed information on that subject, please read paragraph 6.1 Lubrication – detailed description.

Depending on the cycle rate, working cycle definition (load, speed, acceleration/deceleration profiles) and environmental conditions, the cylinder can heat more or less. For more detailed information on that subject, please read paragraph 6.1 Lubrication – detailed description.

### **WARNING**

For whatever reason, the cylinder move must not be stopped by a stiff mechanical stop except if the speed of the motor is low (value below or equal to a few percent of the maximum speed value) and the cylinder force is limited to a low value (by defining a limitation on motor current). Otherwise, the kinetic energy stored within the internal rotating parts of the cylinder will be stopped in a very short time. This will create very high loads (inside the cylinder and in the cylinder pushing tube) which might seriously damage the cylinder and its external environment.

## 5.3 How to define zero reference

To define zero reference by using the home switch, there are two ways to do it:

The home switch is integrated in the Ewellix cylinder.

or:

The home switch is fixed to the machine driven by the Ewellix cylinder.

### **WARNING**

It is required to enable the limit switches in the servoamplifier, so that a zero reference search using the home switch can be done from any starting cylinder position.

## Case “home switch is integrated in the Ewellix cylinder”

Two ways are possible to define the zero reference (choice will depend on actual opportunities offered by customer application):

- Search for the zero reference always has to begin in a direction where the pushing tube is going towards the retracted position. In that case, write the following program:
  - Make the cylinder pushing tube move up to reach the limit switch in the retracted position.
  - Then, make the cylinder pushing tube go out until the home switch detects the roller screw nut.
  - Then, launch a search for the first zero of the encoder (or resolver). Define the zero reference once the encoder (or resolver) zero has been found.
- Search for the zero reference always has to begin in a direction where the pushing tube is going towards the extended position. In that case, write the following program:
  - Make the cylinder pushing tube move up to reach the limit switch in the extended position.
  - Then, make the cylinder pushing tube go in until the home switch detects the roller screw nut.

Then, launch a search for the first zero of the encoder (or resolver). Define the zero reference once the encoder (or resolver) zero has been found.

## Case “home switch is fixed on the machine driven by the Ewellix cylinder”

In this case, depending on the servoamplifier definition (read servoamplifier user manual to get corresponding information), it might be necessary to make sure that the length of cam detected by the home switch will be longer than the stroke achieved by the cylinder for one motor revolution. Once this precaution has been taken, the zero reference definition opportunities offered by the servoamplifier are enough to answer all possible cases.

# 5.4 How to check position control behaviour – first approach

Depending on the servoamplifier manufacturer, it’s possible that tracking error fault or overspeed fault switch off torque on the cylinder motor (read servoamplifier documentation for more information). If this is the case and if this occurs when the cylinder is at maximum speed, the cylinder will keep mov-

### NOTE

As a general rule, there isn’t necessarily a link between the zero defined by a zero reference search and the zero position given in the cylinder drawing. Very often these two zeros correspond to two different cylinder positions.

### WARNING

The zero reference defined by searching for the home switch will be reproducible for one cylinder but won’t be identical between different cylinders. Consequently, when an old cylinder is replaced by a new one, it is required to redefine all actuator positions to be reached during machine operation (in function of new cylinder zero reference). Otherwise it may occur unexpected actuator position with risk of heavy property damage.

### NOTE

To define a zero reference which will always stay the same, even when the cylinder is replaced by a new one, it is required to write a program which makes the pushing cylinder meet a mechanical stop and which defines the zero reference in relation to the reached position.

### WARNING

At the time of first cylinder commissioning, it’s advised as a first approach to check that the position control operates correctly without risk to generate a tracking error fault or overspeed fault (see the servoamplifier manufacturer’s technical documentation to get more details on these two faults). These faults might generate heavy property damages (see explanation

ing because of the kinetic energy of the cylinders internal rotating parts. Consequently, it is very likely that the cylinder will stop suddenly against its internal mechanical stop or the machine's mechanical stop. In both cases, this might generate heavy property damage.

To avoid this from happening, it's advisable to check the behaviour of the position control.

As a first step, please read the servoamplifier technical documentation to see if there's an existing method or if specific tools have been developed by the servoamplifier manufacturer to make this check.

Otherwise, use the following method which is a simplified evaluation of position control behaviour.

### 5.4.1 Principle of evaluation method

Position control behaviour is estimated through measurements made with the servoamplifier scope tool (see servoamplifier technical documentation for more details) while the cylinder is making forward and backward moves. The scope tool allows the user to see a value evolution of the control variables in the function of time. In this way it is, for example, possible to see in one graph the evolution of cylinder speed and the evolution of motor current in the function of time.

To make an estimation of position control behaviour, it's required to see the speed set point, actual speed, tracking error and motor current of the cylinder (see servoamplifier technical documentation to know the corresponding variables name). Depending on observations made on the shape of acquired curves, it will be possible to estimate the risk of generating a tracking error fault or over speed fault on a scale ranging from zero to very high.

### 5.4.2 Detailed description of method

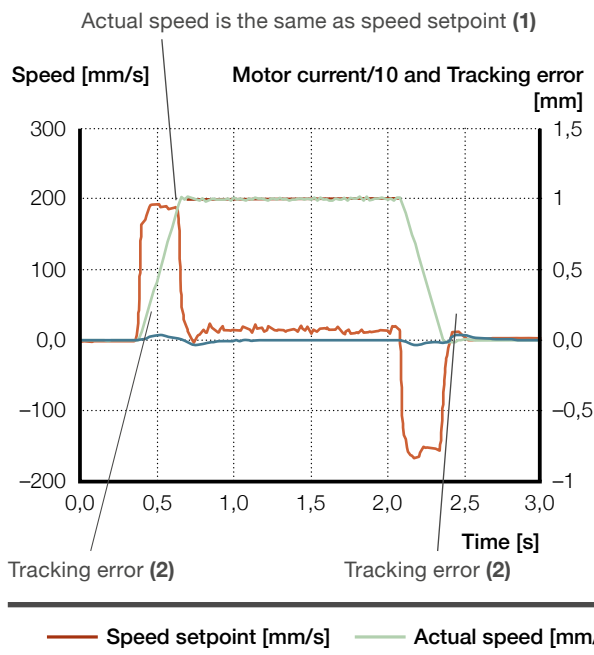
- Put the cylinder into the final use conditions (cylinder has to be installed inside a machine and has to be able to achieve the work for which it has been designed) and decrease the maximum moving speed value (take maximum speed equal to 1/10th of maximum speed defined for the application) and acceleration/deceleration values (take value equal to 1/10th of acceleration/deceleration values defined for application).
- First, start a cylinder forward movement and then a backward movement and make scope record at the same time. Look at the acquired graph and compare it with the two example graphs given below. Conclude about risk level to generate tracking error fault and/or over speed fault.
- If the risk is low, increase speed value and acceleration/

#### DANGER

Customer should be sure that the commissioning steps suggested in method described to the left can't create any problems.

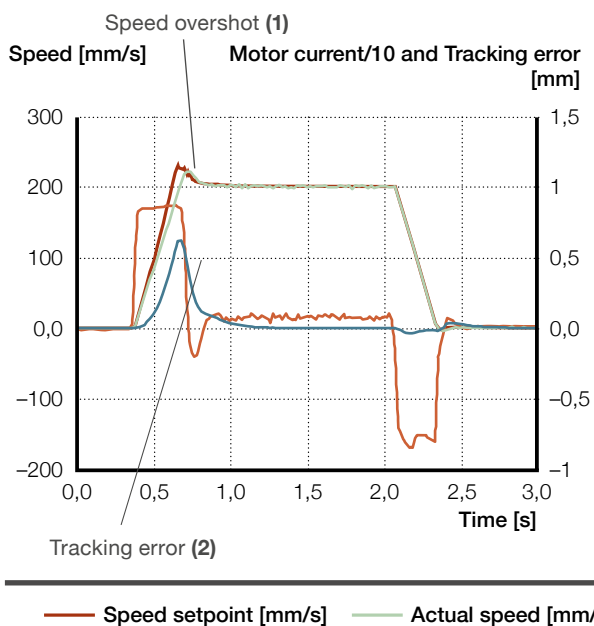
deceleration values and remake measurements with the scope tool during a forward-backward cylinder movement. Remake an estimation of risk level to generate a fault. As long as the risk stays low, repeat this step until to values of speed, acceleration and deceleration defined for application are reached.

- If the risk is becoming significant, do not keep increasing speed and/or acceleration/deceleration but try to reduce the speed overshoot value and/or tracking error value. To do that, study the servoamplifier technical documentation to identify actions to perform to reduce the risk level to
- Example: Low risk of generating over speed or tracking error faults



1. In this example, there is no difference between the speed setpoint and the actual speed. If a level triggering over-speed fault is established at 230 mm/s, for example, and if this graph stays identical on several forward-backward movements, then the risk of generating an overspeed fault is very low.
2. The value of tracking error is low (max ~40 μm). If the level triggering a tracking error fault is established at 0,7 mm, for example, and if this graph stays identical on several forward-backward moves, then the risk to generate a tracking error fault is very low.

Example: High risk to generate overspeed or tracking error faults



1. In this example, there is a big difference between the speed setpoint and the actual speed, which causes a speed overshoot phenomena (max speed near 230 mm/s) necessary to decrease tracking error. If the level triggering overspeed fault is established at 230 mm/s, for example, then the risk to generate an overspeed fault is very high.
2. The value of tracking error is significant (max ~0,6 mm). If the level triggering a tracking error is established at 0,7 mm, for example, then the risk to generate a tracking error fault is very high.

## 5.5 Position control parameters to be known

Position control parameters determine the dynamic/stiffness of control but also its stability.

### WARNING

In most cases, software for parameters setup and/or technical documentation supplied with the servoamplifier allow calculation or evaluation of control parameters value for current loop, speed loop and position loop. As a general rule, these parameters are adapted well enough so that the cylinder can correctly complete the tasks requested by the user. But it is the user's responsibility to confirm that it is effective in the context of its application.

For more details, please read technical documentation of the servoamplifier manufacturer.



### NOTE

A position control that is too dynamic/stiff could generate vibrations (=control instability) which would make noise and would be damaging for the system lifetime.

# 6.0 Maintenance, upkeep and routine checks

## **⚠ DANGER**

During and after operation, some parts of the cylinder carry dangerous voltages. Electric shock hazard. Risk of serious or fatal injuries.

Strictly observe the safety instructions in this manual and the safety instructions of manuals associated with each commissioned equipment (motor, servoamplifier, etc).

Do not unplug motor connectors before switching off the power supply of the corresponding servoamplifier. First unplug the signal connector and then the power connector.

Motor rotation can create voltage. Do not touch connector pins.

## 6.1 Lubrication – detailed description

### **⚠ WARNING**

In the following paragraphs, recommendations are given (type, frequency and grease quantity) for cylinder parts that need to be re-lubricated regularly. These recommendations have to be taken as a guide. In most need cases, these recommendations result in good lubrication conditions during the cylinders lifetime.

But it may occur, depending on the ambient temperature, on cylinder working cycle definition (speed, acceleration, load, cycle rate) and on the way the cylinder can dissipate its heat, that it's required to adapt the grease definition to the specific conditions of the application. As most of these parameters are known only by the user, it's the responsibility of the user to check that lubrication recommendations suggested in this manual create good lubrication conditions.

As a general rule, the stabilized temperature of the cylinder has not to exceed 80°C (whatever surface is measured). If it's not the case, please contact your local Ewellix representative in order to get technical support.

### 6.1.1 Lubricant information

For grease reference to be used, if actuator serial number is not starting with AR36860 for LEMC21xx and with AR36870 for LEMC30xx, and if actuator definition is not described in High Performance Actuator catalogue, please refer to the two following documents (called "documents for approval"):

- Drawing for approval
- Technical description

### **⚠ WARNING**

During operation, the cylinder surface temperature can reach high values. There's a risk of burns or fire. Before any work on the actuator, let it cool down.



### **NOTE**

In the case of very dynamic applications, it's advisable to regularly check cylinder operation and its lubrication conditions.

For catalogue and standard item, with serial number AR36860-xxxx and AR36870-xxxx, use standard grease:

<b>Grease type:</b>	Klüberplex BEM34-132
<b>Viscosity:</b>	130 cSt at 40 °C 15,5 cSt at 100 °C
<b>NLGI classification:</b>	2
<b>Base oil type:</b>	Mixed (mineral and synthetic oils)
<b>Soap:</b>	Special calcium soap
<b>Supplier:</b>	Klüber

For special request (such as food industry, extreme pressure additives,...) please contact Ewellix

**NOTE**

During re-lubrication actions, please take the following indications into account:

Work cleanly. Do not inject grease polluted by other products or particles.

Too much grease generates heat inside the actuator.

Avoid injecting air into lubrication paths.

## 6.1.2 Roller screw

The recommended lubrication interval is every 4 000 hours (6 months) for duty cycles under 20% (interval of re-lubrication is function of several parameters and could be adjusted case by case). At a minimum, LEMCs should be lubricated every year.

The recommended lubricant quantity to be added is defined for each stroke length in cm<sup>3</sup> ( see table).

For different duty cycles (XX%), the recommended lubrication interval is calculated by the formula:  $4\ 000 \times 20\% / XX\%$ .

Preferably, the recommended lubricant quantity can be applied in smaller doses throughout the same period.

### Recommended lubricant quantity

	Stroke [mm]							
	100	200	300	400	500	600	700	800
	cm <sup>3</sup>							
<b>LEMC21xx</b>	7	8	9	10	11	12	NA	NA
<b>LEMC30xx</b>	17	18,5	20	21,5	23	24,5	26	27,5

Fig. 11

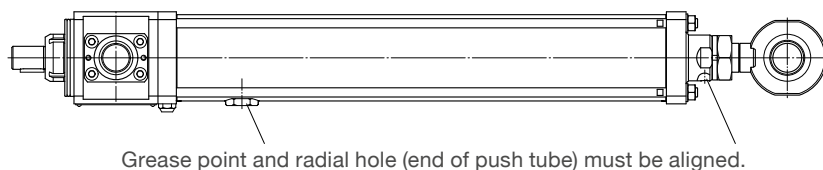
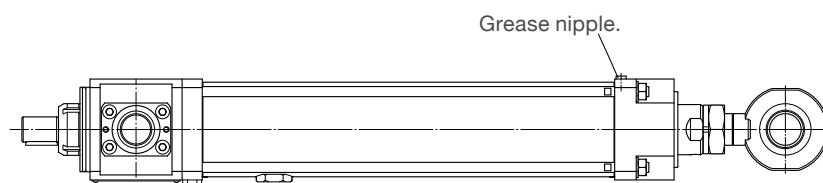


Fig. 12



### 6.1.3 Front guide (Anti-rotation – Option)

The recommended lubrication interval is every 4 000 hours (6 months) for duty cycles under 20%. At a minimum, LEMCs should be lubricated every year.

The recommended lubricant quantity to be added is 2 cm<sup>3</sup>.

For different duty cycles (XX%), the recommended lubrication interval is calculated by the formula:  $4\,000 \times 20\% / XX\%$ .

### 6.1.4 Bearings

The bearings are greased for life.

### 6.1.5 Rod end

Type of Ewellix rod end is SAxxC, in consequence maintenance free.

For more details, please refer to the technical documentation of the rod end manufacturer.

## 6.2 Procedure

Position the cylinder at the greasing position (Stroke 0 mm – check greasing position on drawing, see LEMC catalogue **PUB IL-06012-EN-October 2019**).

1. Be sure that the radial hole on the end of the pushing tube is aligned with the greasing plug.
2. Remove the greasing plug to gain access to the roller screw grease nipple.
3. Inject half the required amount of grease through the roller screw grease nipple and front guide grease nipple (anti-rotation option).
4. Make ten double strokes slowly along the whole stroke to spread the grease along the screw shaft.

5. Repeat steps 1, 2 and 4.

6. Replace the greasing plug.

7. Monitor the actuator temperature level to be sure it does not overheat, especially if it is used under high speed.

The state of the old grease can be seen and the quantity and interval for re-lubrication modified to suit the real operating conditions (temperature, speed, load, ...).

This is a closed system. When re-lubricating, the old grease takes up free space in the cylinder. If the free space is filled, the cylinder will overheat.

## 6.3 Routine checks

### 6.3.1 Belt

If the cylinder is equipped with a belt and pulleys, visually check the condition of the belt teeth during standard maintenance operations; no surface degradation should be seen.

For more details, please read the technical documentation of the belt manufacturer.



## 6.4 Maintenance kits

Ewellix offers kits for service & maintenance, as spare units.

Here is a non exhaustive list :

Name	Description	Ordering reference
<b>KIT LEMC HOME SWITCH</b>	Home switch + adapter for tie rod	116 4927
<b>KIT LEMC END SWITCH</b>	Limit switch + adapter for tie rod	116 4926
<b>KIT LEMC21 ROD END</b>	Rod end SA25C from SKF + adapter for direct assembly on push rod	116 6528
<b>KIT LEMC30 ROD END</b>	Rod end SA30C from SKF + adapter for direct assembly on push rod	116 4795
<b>KIT LEMC21 MALE THREAD</b>	Standard male thread attachment + adapter for direct assembly on push rod	116 6530
<b>KIT LEMC30 MALE THREAD</b>	Standard male thread attachment + adapter for direct assembly on push rod	116 6531
<b>KIT LEMC21 TRUNNIONS</b>	Set of trunnions + bolts	116 6532
<b>KIT LEMC30 TRUNNIONS</b>	Set of trunnions + bolts	116 6533
<b>KIT LEMC21 FRONT PLATE</b>	Catalogue front plate + bolts	116 6534
<b>KIT LEMC30 FRONT PLATE</b>	Catalogue front plate + bolts	116 6535

Please refer to **table 1** for kit assembly instructions, giving size of screws and corresponding tightening torque.



Table 1

LEMC	Screw and tightening torque $M_A$		S2 front plate	
	S1 trunnions Screw	$M_A$ Nm	Screw	$M_A$ Nm
-	-	-	-	-
21	(8x) M6 x 12	16,4	(8x) M6 x 16	16,4
30	(8x) M8 x 16	40	(8x) M8 x 20	40

Note: Ewellix advise a light thread locking glue on all screws

For more information about spare kits list and availability, please contact your local Ewellix representative.

# 7.0 Malfunctions

 **NOTE**

When a malfunction occurs, it isn't always obvious if the problem is mechanical or electrical. For example, for a given fault (for example; cylinder doesn't move), the root cause may be mechanical (for example; motor brake blocked) or electrical (for example: electrical power not validated in the servoamplifier). Consequently, in case of malfunction, please consider all possible causes (mechanical and electrical) to identify all possible solutions.

## 7.1 Mechanical malfunctions

Malfunction	Possible cause(s)	Possible solution(s)
<b>Cylinder doesn't move</b>	Motor brake blocked	Check brake connection and supply voltage
	System moved by cylinder blocked	Check mobility of system moved by cylinder
<b>Cylinder uses a lot of current and/or makes a noise when moving</b>	Motor brake blocked	Check brake connection and supply voltage
	System moved by cylinder blocked	Check mobility of system moved by cylinder
<b>Cylinder is too hot</b>	Overloading	Measure RMS torque value on one complete cycle (including pause time before starting a new cycle). Send this information to Ewellix for analysis.
	Ambient temperature too high	Comply with permitted temperature range

## 7.2 Electrical malfunctions

Malfunction	Possible cause(s)	Possible solution(s)
<b>Cylinder doesn't move</b>	Incorrect motor connection	Check motor connections
	Incorrect resolver connection	Check motor connections
	No electrical power on cylinder motor	Check voltage, main switch status and fuses status above the servoamplifier. Check that the servoamplifier authorizes cylinder move and cylinder motor torque on
	Incorrect definition of cylinder move	Check that all move parameters (target position, speed and acceleration) are correctly defined in servoamplifier
	Servoamplifier fault	Read the technical documentation of the servoamplifier. In function of fault number, possible causes are suggested with associated solutions.
<b>Cylinder moves a little and stops immediately with fault servoamplifier</b>	Incorrect motor connection	Check motor connections
	Incorrect resolver connection	Check motor connections
	Servoamplifier fault	Read the technical documentation of the servo-amplifier. In function of fault number, possible causes are suggested with associated solutions.
<b>Cylinder doesn't move in correct direction</b>	Incorrect motor/resolver connection or incorrect servoamplifier parameter	Check motor connections or change direction of movement in the servoamplifier parameters
<b>Cylinder vibrates in stop position</b>	Position control parameters not adapted to application	Optimize the position control parameters definition in relation with the application

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## 7.3 Before requiring Ewellix assistance

If the problem hasn't been resolved, although all the solutions given in the previous two paragraphs have been considered and implemented, get in touch with your local Ewellix representative for information on contacting technical support.

Before requiring Ewellix assistance, please have the following information:

- Serial number of the cylinder (e.g. ARxxxxx-yyyy. Ex: AR33543-0223 corresponds to cylinder no 223 with 33543 design file number).
- Malfunction nature and duration (continuous? sometimes? (estimated frequency?), malfunction occurs only one time?).
- When and in what conditions the malfunction occurs (a detailed description is required).
- If possible, take pictures or screen captures to illustrate malfunction description.



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