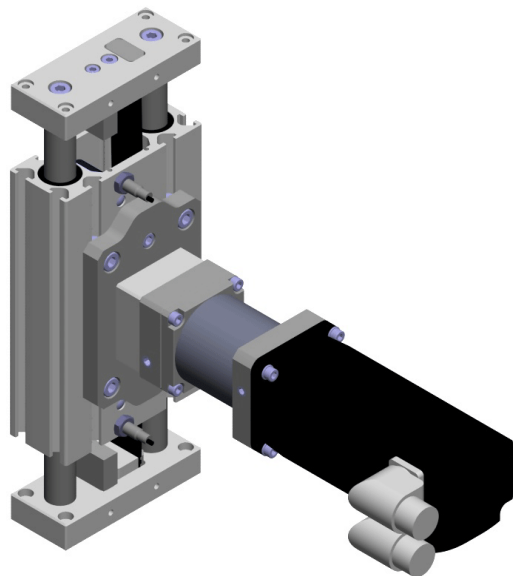


# Lexium CAR4-Series

## Cantilever Axes with Rod Guide and Toothed Belt or Gear Rack Hardware Guide

Original instructions

09/2019



EIO0000003043.01

[www.schneider-electric.com](http://www.schneider-electric.com)

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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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# Table of Contents

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	<b>Safety Information</b> . . . . .	<b>7</b>
	<b>About the Book</b> . . . . .	<b>9</b>
<b>Chapter 1</b>	<b>Specific Safety Information</b> . . . . .	<b>15</b>
	Proper Use . . . . .	<b>16</b>
	Qualification of Personnel . . . . .	<b>19</b>
	Residual Risks . . . . .	<b>20</b>
<b>Chapter 2</b>	<b>System Overview</b> . . . . .	<b>29</b>
	System Architecture . . . . .	<b>30</b>
	Product Overview . . . . .	<b>32</b>
	Type Code . . . . .	<b>35</b>
	Type Plate . . . . .	<b>38</b>
<b>Chapter 3</b>	<b>Technical Data</b> . . . . .	<b>39</b>
3.1	Ambient Conditions . . . . .	<b>40</b>
	Ambient Conditions . . . . .	<b>40</b>
3.2	Mechanical Data . . . . .	<b>44</b>
	Lexium CAR40RC . . . . .	<b>45</b>
	Lexium CAR41BC . . . . .	<b>52</b>
	Lexium CAR42BC . . . . .	<b>59</b>
	Lexium CAR43BC . . . . .	<b>66</b>
	Lexium CAR44BC . . . . .	<b>73</b>
3.3	Design of the Axis Frame . . . . .	<b>80</b>
	Design of the Axis Frame . . . . .	<b>80</b>
3.4	Service Life . . . . .	<b>82</b>
	Service Life . . . . .	<b>82</b>
<b>Chapter 4</b>	<b>Transport and Commissioning</b> . . . . .	<b>83</b>
4.1	Transport and Unpacking . . . . .	<b>84</b>
	Transport and Storage . . . . .	<b>85</b>
	Unpacking . . . . .	<b>86</b>
4.2	Mechanical Installation . . . . .	<b>88</b>
	Information About Installation . . . . .	<b>89</b>
	Mounting the Axis . . . . .	<b>90</b>
4.3	Electrical Installation . . . . .	<b>95</b>
	Electrical Installation . . . . .	<b>95</b>

4.4	Initial Start-Up . . . . .	97
	Verifying the Installation . . . . .	98
	Start-Up . . . . .	100
4.5	Mounting the Payload . . . . .	102
	Mounting the Payload . . . . .	102
<b>Chapter 5</b>	<b>Optional Equipment . . . . .</b>	<b>105</b>
5.1	Motor and Gearbox . . . . .	106
	Technical Data of the Motor and the Gearbox . . . . .	107
	Mounting the Motor and/or Gearbox . . . . .	108
5.2	Sensors . . . . .	120
	Technical Data of the Sensors . . . . .	121
	Mounting the Sensors . . . . .	123
5.3	Shaft Extension . . . . .	125
	Mounting the Shaft Extension . . . . .	125
<b>Chapter 6</b>	<b>Maintenance and Repair . . . . .</b>	<b>127</b>
6.1	Maintenance, Repair, and Cleaning . . . . .	128
	General Information About Maintenance, Repair, and Cleaning . . . . .	129
	Maintenance Plan . . . . .	131
	Maintaining the Toothed Belt . . . . .	133
	Maintaining the Motor (Optional Equipment) . . . . .	134
	Maintaining the Gearbox (Optional Equipment) . . . . .	134
	Cleaning . . . . .	135
	Repairing After Collisions . . . . .	136
6.2	Replacing Parts . . . . .	138
	Information About Replacing Parts . . . . .	139
	Replacing the Entire Axis . . . . .	141
	Replacing the Sensors (Optional Equipment) . . . . .	142
	Replacing the Motor and/or Gearbox (Optional Equipment) . . . . .	143
	Replacing the Elastomer Coupling (Optional Equipment) . . . . .	149
	Replacing the Shaft Extension (Optional Equipment) . . . . .	153
	Replacing the Toothed Belt . . . . .	155
	Replacing the Toothed Belt Pulley . . . . .	164
	Replacing the Deflection Pulleys . . . . .	169
6.3	Lubrication . . . . .	174
	Information About Lubrication . . . . .	175
	Lubricating the Lexium CAR4-Series . . . . .	176

---

<b>Chapter 7</b>	<b>Replacement Equipment and Accessories</b> .....	<b>177</b>
	Replacement Equipment and Accessories Inventory .....	<b>178</b>
	Replacement Equipment and Accessories of the Lexium CAR4-Series .....	<b>179</b>
<b>Chapter 8</b>	<b>Troubleshooting</b> .....	<b>191</b>
	Troubleshooting .....	<b>191</b>
<b>Appendices</b>	.....	<b>193</b>
<b>Appendix A</b>	<b>Further Information About the Manufacturer</b> .....	<b>195</b>
	Contact Addresses .....	<b>196</b>
	Product Training Courses .....	<b>197</b>
<b>Appendix B</b>	<b>Disposal</b> .....	<b>199</b>
	Disposal .....	<b>199</b>
<b>Appendix C</b>	<b>Declaration of Incorporation</b> .....	<b>201</b>
	Declaration of Incorporation .....	<b>202</b>
<b>Glossary</b>	.....	<b>203</b>
<b>Index</b>	.....	<b>205</b>



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# Safety Information

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## Important Information

### NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

### **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

### **NOTICE**

**NOTICE** is used to address practices not related to physical injury.

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## PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

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# About the Book

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## At a Glance

### Document Scope

This manual is to help you use the capabilities of the axis safely and properly.

Follow the instructions within this manual to help:

- Reduce risks
- Reduce repair costs and downtime of the axis
- Increase the service life of the axis
- Increase the reliability of the axis

### Validity Note

This document has been updated for the release of EcoStruxure™ Machine Expert V1.1 SP1.

The technical characteristics of the devices described in the present document also appear online.

To access the information online:

Step	Action
1	Go to the Schneider Electric home page <a href="http://www.schneider-electric.com">www.schneider-electric.com</a> .
2	In the <b>Search</b> box type the reference of a product or the name of a product range. <ul style="list-style-type: none"><li>• Do not include blank spaces in the reference or product range.</li><li>• To get information on grouping similar modules, use asterisks ( * ).</li></ul>
3	If you entered a reference, go to the <b>Product Datasheets</b> search results and click on the reference that interests you. If you entered the name of a product range, go to the <b>Product Ranges</b> search results and click on the product range that interests you.
4	If more than one reference appears in the <b>Products</b> search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the datasheet.
6	To save or print a datasheet as a .pdf file, click <b>Download XXX product datasheet</b> .

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

For product compliance and environmental information (RoHS, REACH, PEP, EOL, etc.), go to [www.schneider-electric.com/green-premium](http://www.schneider-electric.com/green-premium).

## Product Related Information

The equipment described herein must be used in accordance with the application-specific risk analysis that you are to perform along with verification of all applicable standards. Pay attention in conforming to any safety information, different electrical requirements, and normative standards that would apply to your application of the information contained in the present manual and the manuals for associated equipment.

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers, or installing or removing any accessories, hardware, cables, or wires.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
- Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42.4 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the end plates to prevent rotation of the drive system prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating the axis and any associated equipment.

**Failure to follow these instructions will result in death or serious injury.**

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

- Perform a hazard and risk analysis to determine the appropriate safety integrity level, and any other safety requirements, for your specific application based on all the applicable standards.
- Ensure that the hazard and risk analysis is conducted and respected according to EN/ISO 12100 during the design of your machine.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## WARNING

### LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.<sup>1</sup>
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

<sup>(1)</sup> for additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems" or their equivalent governing your particular location.

### Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Standard	Description
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive (2006/42/EC)* and *ISO 12100:2010*.

**NOTE:** The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

## Figures

Unless otherwise stated, the different sizes of the Lexium CAR4-Series are represented in the figures by the Lexium CAR43 axis.

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### Dual Dimensions

Dimensions are indicated in metric system and U.S. customary units system. The U.S. dimensions are given in parentheses, for example 8.4 mm (0.33 in).

**NOTE:** The given values in parentheses are rounded and for reference only.



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# Chapter 1

## Specific Safety Information

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**What Is in This Chapter?**

This chapter contains the following topics:

Topic	Page
Proper Use	16
Qualification of Personnel	19
Residual Risks	20

## Proper Use

### Overview

This section contains information regarding the operation of the Lexium CAR4-Series. Qualified personnel (*see page 19*) working with the axis must read and observe this information. The axis was built in compliance with the recognized technical safety regulations.

### Installation

The axis is intended to be installed in a machine or assembled with other components to build up a machine or system.

### Provide for Protective Measures

Before installing the axis, provide appropriate protective devices in compliance with local and national standards. Do not commission components without appropriate protective devices. After installation, commissioning, or repair, test the protective devices used.

Perform a risk evaluation concerning the specific use before operating the axis and take appropriate security measures.



## WARNING

### UNINTENDED EQUIPMENT OPERATION

Ensure that a risk assessment is conducted and respected according to EN/ISO 12100 during the design of your machine.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

If circumstances occur that affect the safety or cause changes to the operating behavior of the axis, then immediately shut down the axis and contact your local Schneider Electric service representative.

### Use Original Equipment Only

Use only the accessories and mounting parts specified in the documentation and only third-party devices or components that have been expressly approved by Schneider Electric. Only modify the axis in the manner intended and described in this documentation, and other documentation concerning any other associated equipment.

## WARNING

### UNINTENDED EQUIPMENT OPERATION

- Only use software and hardware components approved by Schneider Electric for use with the axis.
- Update your application program every time you change the physical hardware configuration.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Misuse

The axis is not suitable for the manipulation of living organisms or explosive materials, nor is it suitable for impact movement.

### Incompatible Environments

The components must not be used in the following environments:

- Hazardous (explosive) atmospheres
- Mobile, movable, or floating systems
- Life support systems
- Domestic appliances
- Underground
- Highly saline environments (refer to *Technical Data* ([see page 39](#)) for materials used)
- Environments with increased radioactive radiation
- Wash-down areas (food or pharmaceutical industry)
- High-hygienic areas
- Oily surroundings
- Vacuum

The axis has been designed to operate outside of any hazardous location. Only install the axis in zones known to be free of a hazardous atmosphere.

## DANGER

### POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

**Failure to follow these instructions will result in death or serious injury.**

## Installation and Operating Conditions

Only use the components in accordance with the installation and operating conditions described in this documentation. The operating conditions at the installation location must be inspected and maintained in accordance with the required technical data (performance data and ambient conditions). Commissioning is prohibited until the usable machine or system in which the axis is installed is in accordance to the applicable local regulations and standards.

## Service Life

The forces and torques ( $F_y$ ,  $F_z$ ,  $M_x$ ,  $M_z$ ,  $M_y$ ) are calculated for an expected service life of 15,000 km (9,321 mi). This period

- shortens with increasing load and dynamic or
- extends with decreasing load and dynamic.

For an application-specific calculation of the service life of the axis, refer to *Service Life* (*see page 82*).

## Compatibility with Foreign Substances

It is impossible to follow up on all further developments of all substances such as lubricants, cleaning agents, or solvents. Therefore, you must perform a compatibility test before using new substances.

## Qualification of Personnel

### Target Audience for This Manual

This documentation is intended for users having the following knowledge:

- Advanced knowledge in mechanical engineering
- Advanced knowledge in electrical engineering
- Qualified person
- System engineer
- Knowledge of the axis control system, its installation and operation, as well as the construction of the machine/application in which it is intended

### Qualified Person

Electrical and mechanical equipment must be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

The qualified personnel must be able to detect possible hazards that may arise from parametrization, changing parameter values and generally from mechanical, electrical, or electronic equipment. The qualified personnel must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when working on the drive system.

## Residual Risks

### Overview

Risks arising from the axis have been reduced. However a residual risk remains since the axis is moved and operated with electrical voltage and electrical currents.

If activities involve residual risks, a safety message is made at the appropriate points. This includes potential hazards that may arise, their possible consequences, and describes preventive measures to avoid the hazards.

### Electrical Parts

To operate the axis described herein automated, you must have a drive and motor connected. As a system, residual risks exist and you must account for them in your risk analysis of your application. For more information, consult your drive and motor documentation.



#### **ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact (EN 50178).
- Insulate any unused conductors on both ends of the motor cable.

**Failure to follow these instructions will result in death or serious injury.**

### Emergency Stop

The axis is not supplied with external brakes nor an emergency stop switch to engage any external brakes. However, the motor can be supplied with an internal holding brake (as an option depending on the motor reference).

For more information about the motor, record the motor reference on the type plate and refer to the corresponding motor manual.

## WARNING

### ENTRAPMENT BY AXIS

- Provide means for ensuring that the motors can be put into a voltage-free state with any internal holding brake or external service brake released.
- Make available those means to allow one person to manually move the axis within reach of the zone of operation.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The opening of the motor holding brake may cause the axis to move.

Mounted in vertical or tilted position, the axis can move unexpectedly.

## WARNING

### MOVING PARTS OF THE EQUIPMENT

Ensure that releasing the brake poses no subsequent risks in the zone of operation.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**NOTE:** Provide separation devices for all infeed energies. It must be possible to secure the separation devices in de-energized position, for example, by locking.

## Assembly and Handling

## WARNING

### CRUSHING, SHEARING, CUTTING AND HITTING DURING HANDLING

- Observe the general construction and safety regulations for handling and assembly.
- Use appropriate mounting and transport equipment and use appropriate tools.
- Prevent clamping and crushing by taking appropriate precautions.
- Cover edges and angles to protect against cutting damage.
- Wear suitable protective clothing (for example, protective goggles, protective boots, protective gloves).

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Axis Motion

Parts of the axis can move at high speeds. In such cases, the payload weight, additionally installed tools, and shifts in the center of gravity of the moving parts contribute to the total energy of the forces generated.

Motion sequences can occur when operating with the axis, which allow operational staff to make misjudgments. For safety considerations (according to EN ISO 13849-1), consider the controller and the brake as non-safety-related elements. Ensure that necessary protective measures are implemented.

The safety standards and directives for the respective country where the axis is in use define which protective measures are appropriate. Additionally, the system engineer who is responsible for the integration of the axis must evaluate which measures have to be taken.

**NOTE:** The configuration of the axis, the Tool Center Point (TCP) velocity, as well as the additional payload have an effect on the total energy, which can potentially be a source of damage and injury.

## **WARNING**

### **CRUSHING, SHEARING, CUTTING AND IMPACT INJURY**

- The axis must be operated only within an enclosure.
- Open or enter the enclosure for cleaning and maintenance purposes only.
- Design the enclosure to withstand an impact from the axis and to resist ejected parts from escaping the zone of operation.
- Design the enclosure to safely deactivate the axis as soon as a person enters the zone of operation of the axis.
- All barriers, protective doors, contact mats, light barriers, and other protective equipment, must be configured correctly and enabled whenever the axis is under power.
- Define the clearance distance to the zone of operation of the axis so that operational staff do not have access to, nor can be enclosed in, the axis zone of operation.
- Design the enclosure to account for the maximum possible travel paths of the axis; that is, the maximum path until the hardware safety system limits as well as the additional run-on paths, in case of a power interruption.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## **WARNING**

### **BREAKDOWN OF THE INTERNAL MOTOR HOLDING BRAKE**

- Do not consider the internal motor holding brake to be a functional safety device.
- Take into account a possible breakdown of the internal motor holding brake during your safety analysis.
- Take into account that the internal motor holding brake of the axis only withstands a limited number of brake operations.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## ⚠ WARNING

### DEVIATION FROM THE SPECIFIED MOVEMENT

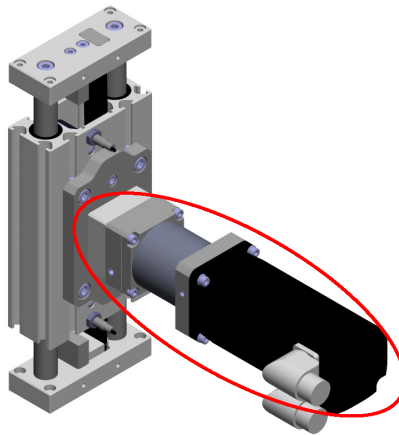
- Use the buffering of the 24 Vdc supply (UPS) in order to enable a controlled stop of the axis, in accordance with stop category 1, by making use of the stored residual mechanical and electrical energy.
- If the power supply of the control system fails, the axis deviates from the specified movement in an uncontrolled manner whether the motor has a brake or not.
- Ideally use a synchronous stop on the path to avoid collisions with obstacles.
- Observe the extension of the run-on path during the safety considerations.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Hot Surfaces

The motor, the gearbox, and the adaptation materials of the axis may exceed 70 °C (158 °F) when subjected to heavy loads and/or high performance during operation.

The following figure presents the hot surfaces of the axis.



## WARNING

### **HOT SURFACES**

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### **Hazardous Movements**

There can be different sources of hazardous movements:

- No or incorrect calibration of the drive
- Wiring or cabling errors
- Errors in the application program
- Component errors
- Error in the measured value and signal transmitter

**NOTE:** Provide for personal safety by primary equipment monitoring or measures. Do not rely only on the internal monitoring of the drive components. Adapt the monitoring or other arrangements and measures to the specific conditions of the installation in accordance with a hazard and risk analysis.

## DANGER

### UNAVAILABLE OR INADEQUATE PROTECTION DEVICE(S)

- Prevent entry to a zone of operation with, for example, protective fencing, mesh guards, protective coverings, or light barriers.
- Dimension the protective devices properly and do not remove or modify them.
- Do not make any modifications that can degrade, incapacitate, or in any way invalidate protection devices.
- Bring the drives and the motors they control to a stop before accessing the drives or entering the zone of operation.
- Protect existing workstations and operating terminals against unauthorized operation.
- Position emergency stop switches so that they are easily accessible and can be reached quickly.
- Validate the functionality of emergency stop equipment before start-up and during maintenance periods.
- Prevent unintentional start-up by disconnecting the power connection of the drives using the emergency stop circuit or using an appropriate lock-out tag-out sequence.
- Validate the system and installation before the initial start-up.
- Avoid operating high-frequency, remote control, and radio devices close to the system electronics and their feed lines.
- Perform, if necessary, a special electromagnetic compatibility (EMC) verification of the system.

**Failure to follow these instructions will result in death or serious injury.**

Drive systems may perform unanticipated movements because of incorrect wiring, incorrect settings, incorrect data, or other errors.

## WARNING

### UNINTENDED MOVEMENT OR AXIS OPERATION

- Carefully install the wiring in accordance with EMC standards.
- Do not operate the axis with undetermined settings and data.
- Perform comprehensive commissioning tests that include verification of configuration settings and data that determine position and movement.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Noise Protection

The noise level of the axis depends on the basic cycle and the payload, as well as on further application-specific accessory parts. Be aware of the fact that noise emissions multiply when several axes are in use at the same time. If noise emissions reach a value of more than 70 dBA, wear a hearing protection.

## CAUTION

### NOISE EMISSIONS OF THE AXIS

- Wear hearing protection in accordance with the locally applicable regulations.
- Attach a sign on the axis if the noise emissions reach an excessive value.

**Failure to follow these instructions can result in injury or equipment damage.**

**NOTE:** Attach the following symbol where it can easily be seen on the axis.



### Emissions

Some small amount of oil emissions are to be expected over time. However, excessive oil emissions on or at the gearbox may be an indication of a damaged axis.

## *NOTICE*

### INOPERABLE EQUIPMENT INDICATED BY GEARBOX OIL EMISSIONS

- Verify the axis before, during, and after use.
- Shut down the axis immediately if oil emissions appear on the axis.

**Failure to follow these instructions can result in equipment damage.**

### Hanging Loads

The axis is capable of suspending heavy loads.

## WARNING

### FALLING LOADS

Keep away from loads that are suspended.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Attachments or Modifications

If different products are transported by the axis, then the product pickup must be modified accordingly. For this reason, the end plates allow you to mount different product pickups (tool mounting). In doing so, ensure that the movement is not restricted and/or that no motion errors can result from the modifications. Attachments and rebuilds must not influence the operation of the protective devices in any way and all EMERGENCY STOP buttons must be accessible and operational at all times.

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

- Do not drill into or modify the axis.
- Do not modify the cable set.
- Do not modify the components of movable mechanics.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Options for Moving the Axis Without Drive Energy

The axis is not equipped with an enclosure (see UL 1740).

**NOTE:** Take appropriate security measures concerning the specific use before operating the axis.

### WARNING

#### MOVING PARTS OF THE EQUIPMENT

Ensure that releasing the brake poses no subsequent risks in the zone of operation.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

If you have to move the end plates manually, perform the following steps:

Step	Action
1	If the axis is mounted tilted or vertically, remove the payload or support the payload and the end plates to keep it from falling.
2	Put the axis into a torque-free state.
3	Manually hold the end plates in position.
4	Open the motor brake. <b>NOTE:</b> The function for opening the brake as well as for torque-free switching of the motor is not controlled by the equipment delivered with the product reference, but must be addressed by the application.
5	Manually move the end plates. <b>NOTE:</b> A greater force could be necessary because the motor and gearbox may pose resistance to movement.

Specific Safety Information

---

Step	Action
6	Close the motor brake.

---

# Chapter 2

## System Overview

---

**What Is in This Chapter?**

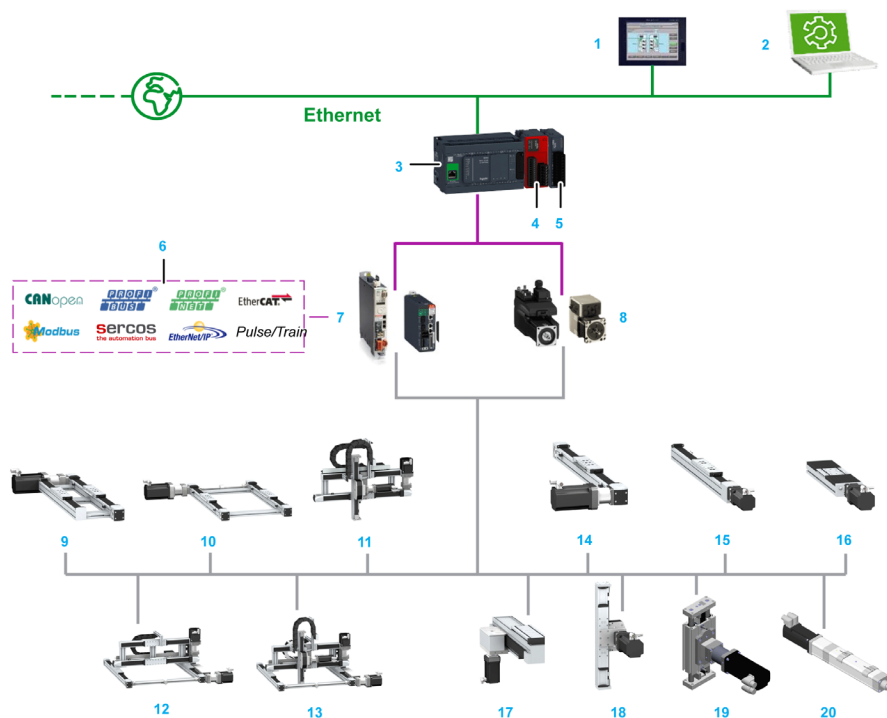
This chapter contains the following topics:

Topic	Page
System Architecture	30
Product Overview	32
Type Code	35
Type Plate	38

## System Architecture

### Overview

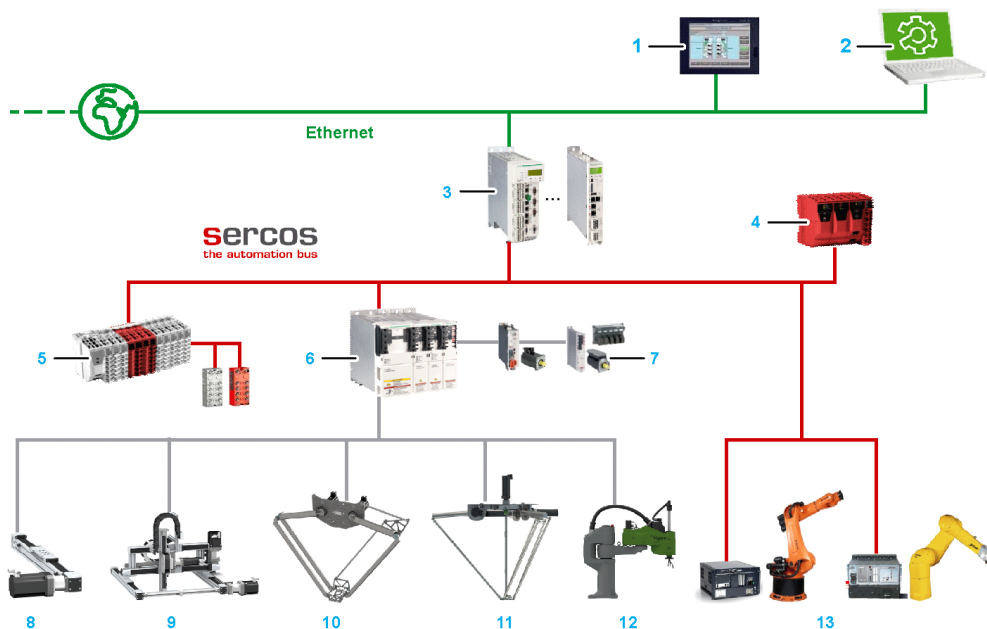
The control system consists of several components, depending on its application. The following figure presents an example of a control system.



- |  |                         |                         |
|--|-------------------------|-------------------------|
| 1 Magelis HMI                                      | 7 Drives                | 14 Lexium PAS4•B-Series |
| 2 SoMachine Motion /<br>EcoStruxure Machine Expert | 8 Integrated Drives     | 15 Lexium PAS4•S-Series |
| 3 Logic/Motion Controller                          | 9 Lexium MAXH-Series    | 16 Lexium TAS4-Series   |
| 4 Safety Module                                    | 10 Lexium MAXS-Series   | 17 Lexium CAS2-Series   |
| 5 I/O Module                                       | 11 Lexium MAXP-Series   | 18 Lexium CAS4-Series   |
| 6 Communication Interfaces                         | 12 Lexium MAXR•2-Series | 19 Lexium CAR4-Series   |
|  | 13 Lexium MAXR•3-Series | 20 Lexium EAC1-Series   |

For more information about the several components, refer to the corresponding documentation at [www.schneider-electric.com](http://www.schneider-electric.com).

The following graphic presents an example of a PacDrive 3 system.



- |   |   |
|---|---|
| 1 Magelis HMI                                   | 8 Single Axes (PAS, TAS, CAS, CAR, EAC)       |
| 2 SoMachine Motion / EcoStruxure Machine Expert | 9 Multi-Axis Systems (MAXH, MAXS, MAXP, MAXR) |
| 3 Motion Controller                             | 10 Delta-2 Robots (T-Series)                  |
| 4 Safety Controller                             | 11 Delta-3 Robots (P-Series)                  |
| 5 I/O   | 12 SCARA Robots (S-Series)                    |
| 6 Drives  | 13 Articulated Robots                         |
| 7 Motors  |   |

For more information about the several components, refer to the corresponding documentation at [www.schneider-electric.com](http://www.schneider-electric.com).

## Product Overview

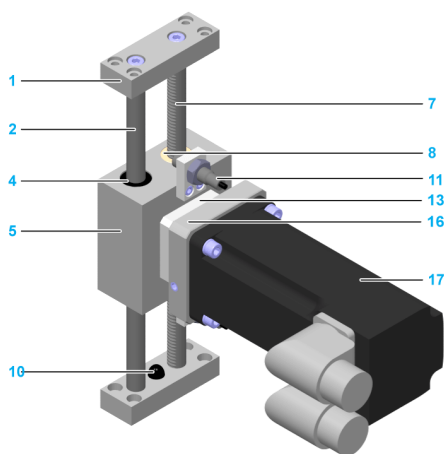
### General Description of the Lexium CAR4-Series

The Lexium CAR4-Series is a cantilever axis, which can operate forward and backward in one dimension. The axis with rod design is based on an axis body and a guide with linear ball bearings.

Depending on the size of the particular axis, a Lexium CAR4-Series is driven by a gear rack or a toothed belt.

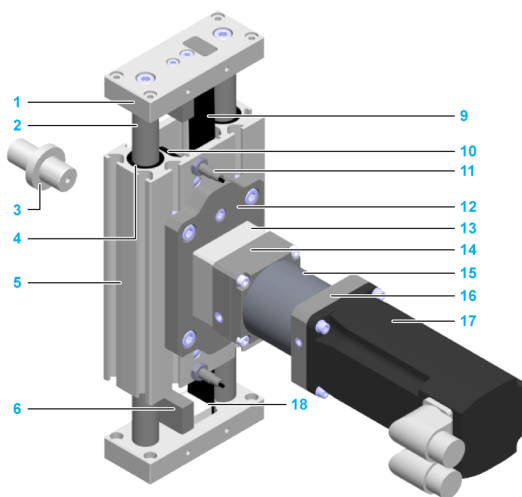
### Components Overview

Axis with gear rack mechanical drive



- 1 End plate
- 2 Guide rod
- 3 Shaft extension
- 4 Linear ball bearing
- 5 Axis body
- 6 Contact block
- 7 Gear rack
- 8 Slide bearing
- 9 Toothed belt
- 10 Rubber buffer

Axis with toothed belt mechanical drive



- 11 Sensor (optional equipment)
- 12 Axis body adapter plate
- 13 Coupling housing including coupling (optional equipment)
- 14 Gearbox adaptation (optional equipment)
- 15 Gearbox (optional equipment)
- 16 Motor adaptation (optional equipment)
- 17 Motor (optional equipment)
- 18 Toothed belt tensioner

## Characteristics of the Lexium CAR4-Series

The axis provides the following features and options:

- High rigidity for short strokes
- Low moving mass
- Compact installation space
- Different stroke lengths available
- Lubricated for life
- Easy integration into machines and systems
- Motor and gearbox mounting via compact coupling systems
- Fastening threads with counterbores for locating dowels at the end plates for reproducible mounting of the payload
- Options
  - Antistatic toothed belt
  - Increased corrosion resistance (*see page 42*)
  - Sensors as normally open contacts / normally closed contacts and NPN/PNP version
  - Different motors and gearboxes

## Types of Mechanical Drive Elements

Two elements to drive the axis are available for the Lexium CAR4-Series. The following table presents the particular axis and the corresponding mechanical drive element. For a detailed name description of the Lexium CAR4-Series, refer to *Type Code* (*see page 35*).

Gear rack	Toothed belt
Lexium CAR40RC	–
–	Lexium CAR41BC
–	Lexium CAR42BC
–	Lexium CAR43BC
–	Lexium CAR44BC

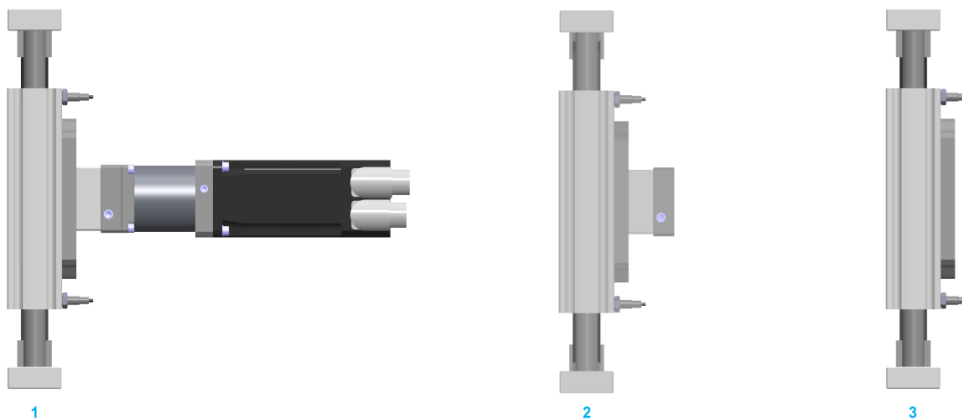
## Types of Linear Guides

All sizes of the Lexium CAR4-Series are equipped with linear ball bearings, except the Lexium CAR40 which has both linear ball bearings and slide bearings. For a detailed name description of the Lexium CAR4-Series, refer to *Type Code* (*see page 35*).

Gear rack	Toothed belt
Lexium CAR40RC	–
–	Lexium CAR41BC
–	Lexium CAR42BC
–	Lexium CAR43BC
–	Lexium CAR44BC

## Mounting Options for the Motor and/or Gearbox

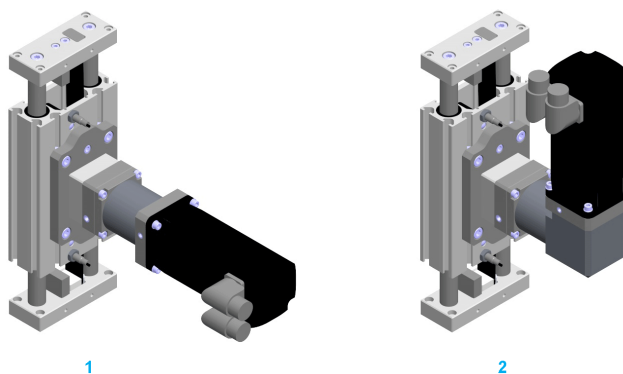
The following figure presents the mounting options for the motor and/or gearbox for the Lexium CAR4-Series.



- 1 Motor and/or gearbox mounted on right-hand side
- 2 Adaptation material mounted on right-hand side
- 3 Without motor or gearbox

## Mounting Direction of the Motor and Gearbox

The following figure presents the possible mounting direction of the motor and gearbox combinations. The motor or the gearbox is coupled by using a preloaded elastomer coupling.



- 1 Straight mounted
- 2 Mounted with angle gearbox, rotatable 4 x 90°

## Type Code

### Presentation

To find your appropriate axis information, refer to the type plate located at the axis (*see page 38*).

	Type				Size	Characteristics											
Digit:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	...
Example:	C	A	R	4	2	B	C	M	0	1	5	0	A	1	N	R	/ ...
<b>Product designation</b>																	
CA Cantilever axis																	
<b>Variant</b>																	
R Rod																	
<b>Model range</b>																	
4 Series 4																	
<b>Size (axis body cross-section)</b>																	
0 66 x 30 mm (2.6 x 1.18 in)																	
1 80 x 30 mm (3.15 x 1.18 in)																	
2 100 x 40 mm (3.9 x 1.57 in)																	
3 120 x 50 mm (4.7 x 1.97 in)																	
4 160 x 50 mm (6.3 x 1.97 in)																	
<b>Type of mechanical drive element</b>																	
R Gear rack (for size 0)																	
B Toothed belt (for size 1, 2, 3, 4)																	
<b>Type of guide</b>																	
C Linear ball bearing guide																	
<b>Feed per revolution</b>																	
M 50 mm/rev (1.97 in/rev) (for size 0)																	
M 75 mm/rev (2.95 in/rev) (for size 1)																	
M 100 mm/rev (3.9 in/rev) (for size 2, 3, 4)																	
<b>Stroke<sup>(1)</sup></b>																	
.... State the length in mm																	
<b>Sensors<sup>(2)</sup></b>																	
A Two PNP sensors as normally closed contacts, not connected																	
C Two PNP sensors as normally open contacts, not connected																	
E Two NPN sensors as normally closed contacts, not connected																	
G Two NPN sensors as normally open contacts, not connected																	
N Without sensors, without contact block																	
<b>Type of axis body<sup>(3)</sup></b>																	
1 Type 1																	
<b>Axis options</b>																	
A Antistatic toothed belt (for size 2, 3, 4)																	
C Increased corrosion resistance (for size 1, 2, 3, 4)																	
E Increased corrosion resistance, antistatic toothed belt (for size 2, 3, 4)																	
N Without																	
<b>Mounting options for motor and/or gearbox<sup>(4)</sup></b>																	
R With mounted motor and/or gearbox or adaptation material on right-hand side																	
H Without mounted motor or gearbox																	
See next page																	

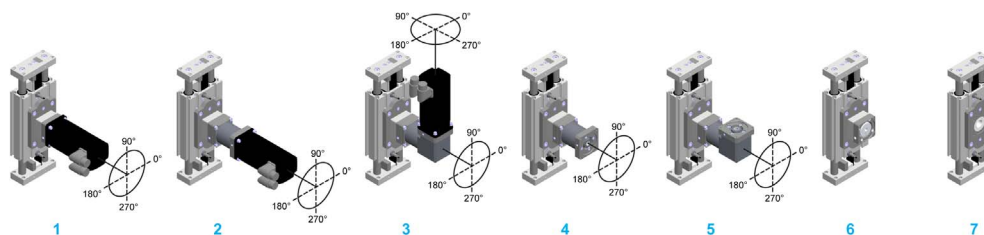
- (1) For the minimum and maximum stroke per size, refer to the mechanical data of the axis (*see page 44*).
- (2) Supplied with a 0.1 m (3.9 in) cable which is equipped with an M8 connector. For other sensor extension cable lengths, refer to *Sensor Extension Cables* (*see page 185*).
- (3) For information about the dimensions, refer to *Mechanical Data* (*see page 44*).
- (4) For further information, refer to *Mounting Options for Motor and/or Gearbox* (*see page 34*).

										Characteristics								
										Digit:	17	18	19	20	21	22	23	...
Example: CAR4 2 B C M 0150 A 1 N R /										2	1	G	9	H	5	9	+	...
<b>Motor and/or gearbox configuration<sup>(5)</sup></b>																		
1 Motor only																		
2 Motor and gearbox																		
3 Gearbox only																		
4 Without motor, without gearbox, with adaptation material (select motor/gearbox type)																		
X Without motor, without gearbox																		
<b>Gearbox interface</b>																		
0G Straight planetary gearbox – PLE 40																		
1G Straight planetary gearbox – PLE 60																		
3G Straight planetary gearbox – PLE 80																		
5G Straight planetary gearbox – PLE 120																		
0A Angular planetary gearbox – WPLE 40																		
1A Angular planetary gearbox – WPLE 60																		
3A Angular planetary gearbox – WPLE 80																		
5A Angular planetary gearbox – WPLE 120																		
YY Third-party gearbox without mounting by Schneider Electric (gearbox drawing required)																		
ZZ Third-party gearbox with mounting by Schneider Electric (gearbox must be provided)																		
XX Without gearbox																		
<b>Gearbox orientation<sup>(5) (6)</sup></b>																		
0 90°																		
3 0°																		
6 270°																		
9 180°																		
X Without gearbox																		
<b>Motor interface</b>																		
V8 Stepper motors BRS 368																		
V9 Stepper motors BRS 397, 39A																		
V0 Stepper motors BRS 39B																		
V1 Stepper motors BRS 3AC, 3AD																		
I6 Integrated drive with stepper motor ILS• 571, 572																		
I7 Integrated drive with stepper motor ILS• 573																		
I9 Integrated drive with stepper motor ILS• 851, 852																		
I8 Integrated drive with stepper motor ILS• 853																		
E7 Integrated drive with brushless DC motor ILE• 66 with spur wheel gear																		
A6 Integrated drive with servo motor ILA• 57																		
H0 Servo motors BSH/SH3 0401, 0402																		
H5 Servo motors BSH/SH3 055																		
H7 Servo motors BSH/BMH/BMI/MH3/SH3/ILM 0701, 0702																		
H8 Servo motors BSH/BMH/BMI/MH3/SH3/ILM 0703																		
H1 Servo motors BSH/BMH/BMI/MH3/SH3/ILM 1001, 1002, 1003																		
H4 Servo motors BSH 1004																		
H2 Servo motors BSH/BMH/MH3/SH3/ILM 1401, 1402, 1403, 1404																		
C1 Servo motors BCH2-B A5, 01																		
C2 Servo motors BCH2-D 02, 04																		
C3 Servo motors BCH2-F 04																		
C4 Servo motors BCH2-F 07																		
C5 Servo motors BCH2-H 10, 20																		
C6 Servo motors BCH2-M 08																		
C7 Servo motors BCH2-M 03, 05, 06, 10, 09, 15, 20																		
C8 Servo motors BCH2-R 20, 30, 35, 45																		
YY Third-party motor without mounting by Schneider Electric (motor drawing required)																		
ZZ Third-party motor with mounting by Schneider Electric (motor drawing required; motor must be provided)																		
XX Without motor																		
<b>Motor orientation<sup>(5) (7)</sup></b>																		
0 90°																		
3 0°																		
6 270°																		
9 180°																		
X Without motor																		
<b>Planetary gearbox gear ratio and motor reference</b>																		
State the planetary gearbox gear ratio and the complete motor reference at the end of the reference, in plain text.																		
Example: PLE60 3:1 + BMH 0702P01A2A																		

- (5) For further information, refer to *Motor and/or Gearbox Orientation and Configuration* (see page 37).
- (6) In case of a straight planetary gearbox, the orientation references to the setscrew of the motor adapter plate.
- (7) With reference to the motor connection.

## Motor and/or Gearbox Orientation and Configuration

The following figure presents the possible motor and/or gearbox orientation and configuration for the Lexium CAR4-Series.



- 1 CAR4•C.....R/1XXX•••
- 2 CAR4•C.....R/2•G•••
- 3 CAR4•C.....R/2•A•••
- 4 CAR4•C.....R/3•G••X
- 5 CAR4•C.....R/3•A••X
- 6 CAR4•C.....R/4•X•X
- 7 CAR4•C.....H/XXXXXXX

For a detailed name description of the Lexium CAR4-Series, refer to *Type Code* ([see page 35](#)).

## Designation of Customized Versions

In the case of a customized version, the type code contains one or several dollar signs "\$".

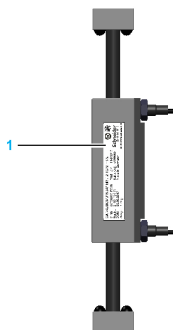
Example: CAR42\$CM0150A1NR / 2 1G 9 H5 9

If you have questions concerning customized versions, contact your local Schneider Electric service representative.

## Type Plate

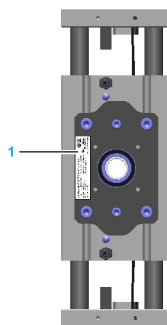
### Position of the Type Plate

Representation for CAR40 / CAR41:



1 Type plate

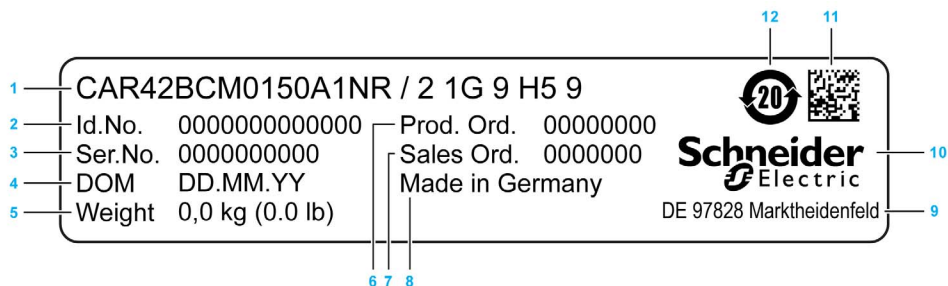
Representation for CAR42 / CAR43 / CAR44:



1 Type plate

### Description of the Type Plate

The type plate contains the following data:



- |                         |                            |
|-------------------------|----------------------------|
| 1 Product name*         | 7 Sales order number       |
| 2 Identification number | 8 Country of origin        |
| 3 Serial number         | 9 Production site          |
| 4 Date of manufacture   | 10 Schneider Electric logo |
| 5 Weight of the axis    | 11 Data matrix code        |
| 6 Product order number  | 12 RoHS mark               |

\* For detailed information about the meaning of the particular digits, refer to *Type Code* (see page 35).

---

# Chapter 3

## Technical Data

---

**What Is in This Chapter?**

This chapter contains the following sections:

Section	Topic	Page
3.1	Ambient Conditions	40
3.2	Mechanical Data	44
3.3	Design of the Axis Frame	80
3.4	Service Life	82

## Section 3.1

### Ambient Conditions

#### Ambient Conditions

##### Overview

Procedure	Parameter	Unit	Value
Operation	<b>Class 3K3, 3Z12, 3Z2, 3B2, 3C1, 3M6</b> (according to IEC/EN 60721-3-3) <sup>(1)</sup>		
	Ambient temperature	°C (°F)	+5...+55 (+41...+131) <sup>(2)</sup>
	Condensation	–	prohibited
	Formation of ice	–	prohibited
	Relative humidity	%	5...85
Transport	<b>Set of class combinations IE21</b> (according to IEC/EN 60721-3-2) <sup>(3)</sup>		
	Ambient temperature	°C (°F)	-25...+60 (-13...+140)
	Condensation	–	prohibited
	Precipitation	–	prohibited
	Formation of ice	–	prohibited
	Other liquid	–	prohibited
	Wetness	–	prohibited
	Relative humidity	%	< 75
<p>(1) All parameters conform to the specified class except for the ambient temperature which is limited by other components of the system.</p> <p>(2) Power reduction with motors at ambient temperatures exceeding +40 °C (104 °F). For more information, contact your local Schneider Electric service representative.</p> <p>(3) All parameters conform to the specified class except for the relative humidity which is limited by other components of the system.</p> <p>(4) Higher temperatures can cause damage to the superficial structure. Lower temperatures increase the stiffness and reduce the service life of the toothed belt.</p> <p>(5) Storing the toothed belt at a relative humidity of maximum 50% helps to avoid a reduced service life of the toothed belt.</p>			

Procedure	Parameter	Unit	Value
Long-term storage in transport packaging	<b>Class 1K3</b> (according to IEC/EN 60721-3-1)		
	Ambient temperature	°C (°F)	+5...+30 (+41...+86) <sup>(4)</sup>
	Condensation	–	prohibited
	Precipitation	–	prohibited
	Formation of ice	–	prohibited
	Other liquid	–	prohibited
	Wetness	–	prohibited
	Relative humidity	%	5...95 <sup>(5)</sup>
	Maximum storage period	years	2
<p>(1) All parameters conform to the specified class except for the ambient temperature which is limited by other components of the system.</p> <p>(2) Power reduction with motors at ambient temperatures exceeding +40 °C (104 °F). For more information, contact your local Schneider Electric service representative.</p> <p>(3) All parameters conform to the specified class except for the relative humidity which is limited by other components of the system.</p> <p>(4) Higher temperatures can cause damage to the superficial structure. Lower temperatures increase the stiffness and reduce the service life of the toothed belt.</p> <p>(5) Storing the toothed belt at a relative humidity of maximum 50% helps to avoid a reduced service life of the toothed belt.</p>			

Ambient conditions apply with motor and gearbox. For further information, refer to the corresponding motor or gearbox manual.

For further information about storage conditions, refer to *Transport and Storage* ([see page 85](#)).

## Information About Increased Corrosion Resistance

Increased corrosion resistance does not imply corrosion resistance under any ambient condition. For further information, refer to *Incompatible Environments* (see page 17).

**NOTE:** Coated materials lose their increased corrosion resistance if the coating is damaged or worn.

Component	Without an increased corrosion resistance	With an increased corrosion resistance
Axis body	Aluminum, anodized	
Axis body adapter plate	Aluminum, anodized	
Ball bearings	Steel	Stainless steel
Ball bearing seals	Nitrile Butadiene Rubber (NBR)	
Bearing bolts	Aluminum, not anodized	
Circlips	Steel, galvanized	
Clamping hub	Aluminum, not anodized	
Contact blocks	Aluminum, anodized	
Deflection pulleys	Aluminum, not anodized	
Dowel pins	Steel	
Elastomer spider	Polyurethane (PUR)	
End plates	Aluminum, anodized	
Expanding hub	Aluminum, not anodized; cone stainless steel	
Guide rods	Steel	Stainless steel
Gear rack	Steel	
Linear ball bearings	Steel, Polyoxymethylene (POM)	Stainless steel, Polyoxymethylene (POM)
Locating dowels	Stainless steel	
Motor and gearbox adaptations	Aluminum, not anodized	
Rack pinion	Steel	
Rubber buffers	Styrene Butadiene Rubber (SBR)	
Screws	Steel, galvanized	
Sensors	Brass, nickel-plated	
Sensor cables	Polyurethane (PUR)	
Sensor holding plates	Aluminum, anodized	
Sensor nuts	Steel, galvanized	
Shaft extension	Aluminum, not anodized; cone stainless steel	
Slide bearings	Brass alloy	
Slot nuts	Steel, galvanized	

Component		Without an increased corrosion resistance	With an increased corrosion resistance
Toothed belt pulley		Aluminum, not anodized	
Toothed belt tensioners		Aluminum, anodized	
Toothed belt	Belt	Polyurethane (PUR)	
	Tension members	Steel, galvanized	
Toothed belt, antistatic	Belt	Polyurethane (PUR)	
	Fibers	Polyamide (PA), conductive	
	Tension members	Steel, galvanized	

# Section 3.2

## Mechanical Data

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
Lexium CAR40RC	45
Lexium CAR41BC	52
Lexium CAR42BC	59
Lexium CAR43BC	66
Lexium CAR44BC	73

## Lexium CAR40RC

### Overview

Here you will find the following information:

- Mechanical data of Lexium CAR40RC ([see page 45](#))
- Characteristic curves of Lexium CAR40RC ([see page 47](#))
- Dimensional drawing of Lexium CAR40RC ([see page 51](#))

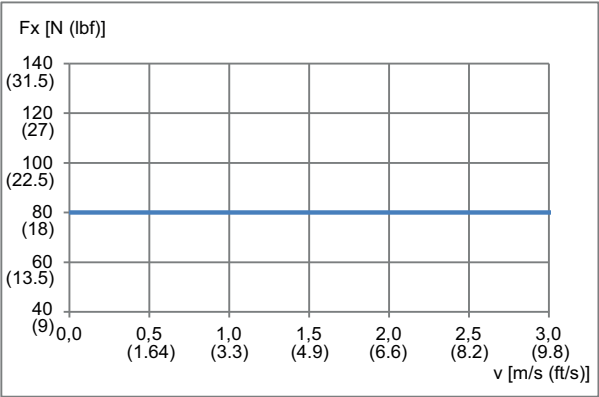
### Mechanical Data of Lexium CAR40RC

Category	Parameter	Unit	Value for CAR40RC with axis body type 1
General data	Type of mechanical drive element	–	Gear rack Module, size 0.636
	Type of guide	–	Linear ball bearing guide, slide bearing guide
	Minimum stroke <sup>(1)</sup>	mm (in)	8 (0.315)
	Maximum stroke <sup>(2)</sup>	mm (in)	150 (5.9)
	Maximum velocity <sup>(3)</sup>	m/s (ft/s)	3 (9.8)
	Maximum acceleration <sup>(3)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	20 (66)
	Feed constant	mm/rev (in/rev)	50 (1.97)
	Effective diameter rack pinion	mm (in)	15.92 (0.63)
	Repeatability <sup>(3)</sup>	mm (in)	+/- 0.05 (+/- 0.00197)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

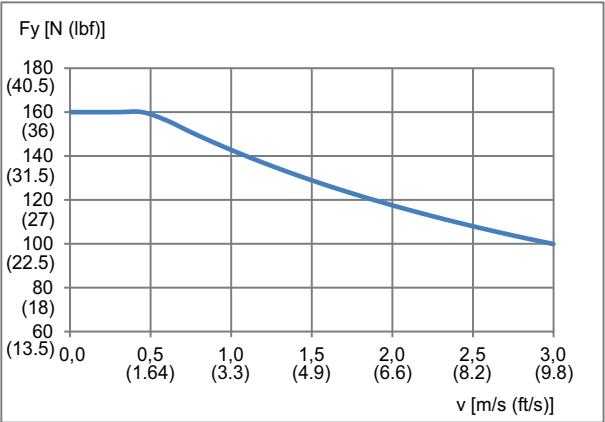
Category	Parameter	Unit	Value for CAR40RC with axis body type 1
Forces and torques	Maximum drive torque $M_{\max}$	Nm (lbf-in)	0.6 (5.3)
	Breakaway torque for axis with 0 stroke	Nm (lbf-in)	0.1 (0.89)
	Maximum feed force $F_{x\max}$	N (lbf)	80 (18)
	Maximum force $F_y^{(4)}$	N (lbf)	160 (36)
	Maximum force $F_z^{(4)}$	N (lbf)	130 (29)
	Maximum torque end plate $M_x^{(4)}$	Nm (lbf-in)	1.9 (16.8)
	Maximum torque end plate $M_y^{(4)}$	Nm (lbf-in)	2.8 (25)
	Maximum torque end plate $M_z^{(4)}$	Nm (lbf-in)	3.5 (31)
Weights	Mass for axis with 0 stroke	kg (lb)	0.6 (1.32)
	Mass per 1 m (39 in) of stroke	kg/m (lb/in)	1.3 (0.073)
	Moving mass of the cantilever	kg (lb)	0.4 (0.88)
Moments of inertias	Moment of inertia for axis with 0 stroke	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	0.3 (0.103)
	Moment of inertia per 1 m (39 in) stroke	kg·cm <sup>2</sup> /m (lb·in <sup>2</sup> /in)	0.8 (0.007)
	Moment of inertia per 1 kg (2.2 lb) payload	kg·cm <sup>2</sup> /kg (lb·in <sup>2</sup> /lb)	0.65 (0.1)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

Characteristic Curves of Lexium CAR40RC

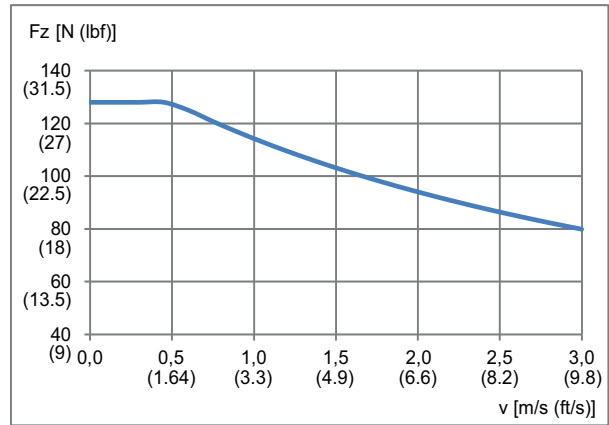
Maximum feed force  $F_{x_{max}}$



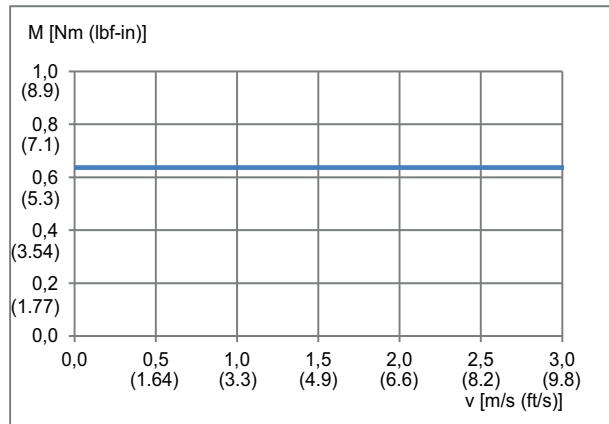
Maximum force  $F_y$



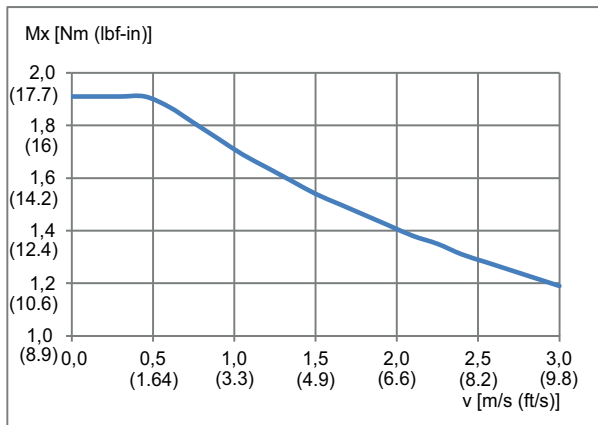
Maximum force  $F_z$



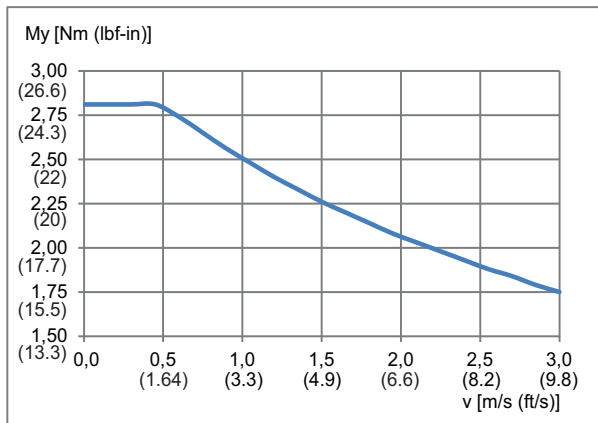
Maximum drive torque  $M_{\max}$



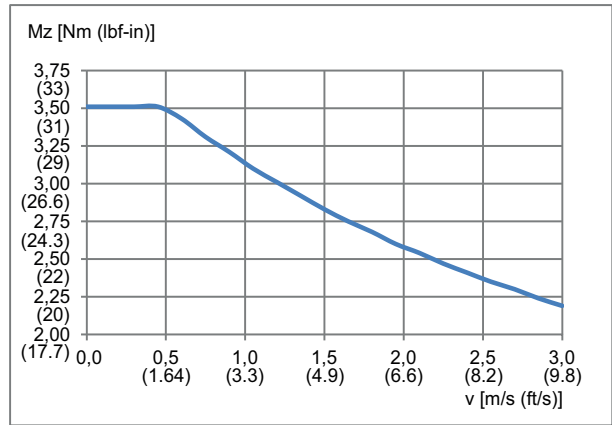
### Maximum torque end plate Mx



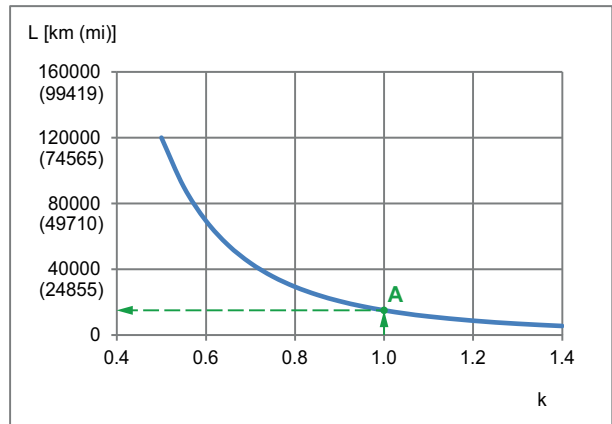
### Maximum torque end plate My



Maximum torque end plate  $M_z$

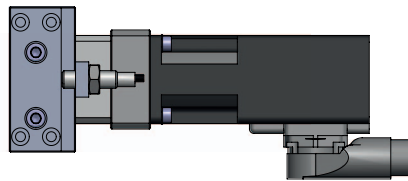
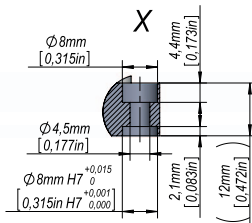
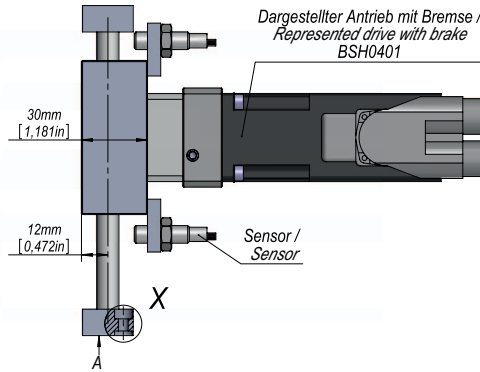
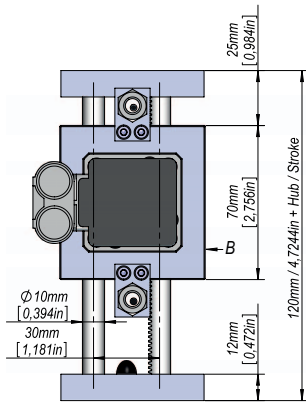


Service Life

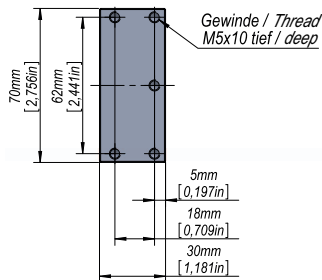


**A** The forces and torques ( $F_y$ ,  $F_z$ ,  $M_x$ ,  $M_z$ ,  $M_y$ ) are calculated for an expected service life of 15,000 km (9,321 mi). This is shown with  $k$  factor equal 1.0 in the figure.

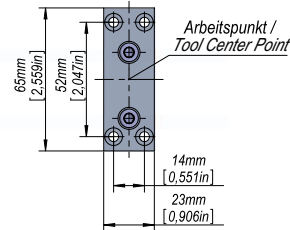
# Dimensional Drawing of Lexium CAR40RC



Adaptionsfläche Achskörper /  
Interface axis body  
Ansicht B / View B



Endplatte / End plate  
Ansicht A / View A



Projektionsmethode / Projection method



## Lexium CAR41BC

### Overview

Here you will find the following information:

- Mechanical data of Lexium CAR41BC (*see page 52*)
- Characteristic curves of Lexium CAR41BC (*see page 54*)
- Dimensional drawing of Lexium CAR41BC (*see page 58*)

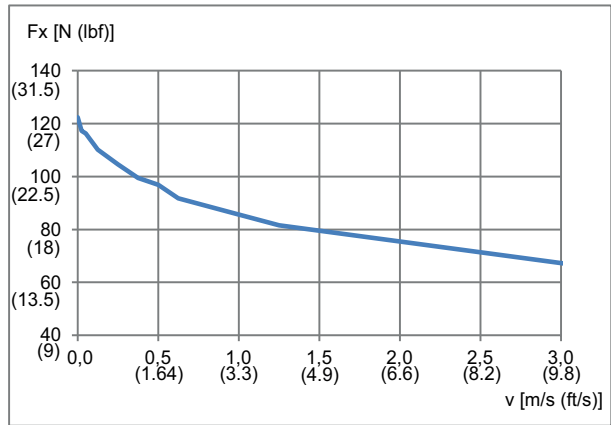
### Mechanical Data of Lexium CAR41BC

Category	Parameter	Unit	Value for CAR41BC with axis body type 1
General data	Type of mechanical drive element	–	Toothed belt 10T5 Width: 10 mm (0.39 in) Profile: T Pitch: 5 mm (0.197 in)
	Type of guide	–	Linear ball bearing guide
	Minimum stroke <sup>(1)</sup>	mm (in)	8 (0.315)
	Maximum stroke <sup>(2)</sup>	mm (in)	200 (7.9)
	Maximum velocity <sup>(3)</sup>	m/s (ft/s)	3 (9.8)
	Maximum acceleration <sup>(3)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	20 (66)
	Feed constant	mm/rev (in/rev)	75 (2.95)
	Effective diameter toothed belt	mm (in)	23.87 (0.94)
	Repeatability <sup>(3)</sup>	mm (in)	+/- 0.05 (+/- 0.00197)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

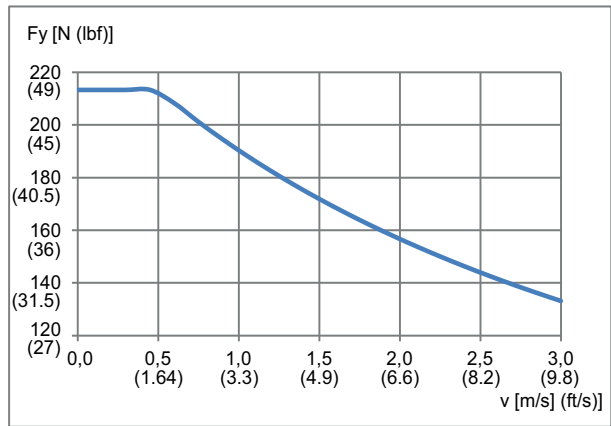
Category	Parameter	Unit	Value for CAR41BC with axis body type 1
Forces and torques	Maximum drive torque $M_{\max}^{(4)}$	Nm (lbf-in)	1.5 (13.3)
	Breakaway torque for axis with 0 stroke	Nm (lbf-in)	0.15 (1.33)
	Maximum feed force $F_{x\max}^{(4)}$	N (lbf)	125 (28)
	Maximum force $F_y^{(4)}$	N (lbf)	210 (47)
	Maximum force $F_z^{(4)}$	N (lbf)	180 (40.5)
	Maximum torque end plate $M_x^{(4)}$	Nm (lbf-in)	5.1 (45)
	Maximum torque end plate $M_y^{(4)}$	Nm (lbf-in)	6.8 (60)
	Maximum torque end plate $M_z^{(4)}$	Nm (lbf-in)	7.9 (70)
Weights	Mass for axis with 0 stroke	kg (lb)	1 (2.2)
	Mass per 1 m (39 in) of stroke	kg/m (lb/in)	1.3 (0.073)
	Moving mass of the cantilever	kg (lb)	0.6 (1.32)
Moments of inertias	Moment of inertia for axis with 0 stroke	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	0.9 (0.31)
	Moment of inertia per 1 m (39 in) stroke	kg·cm <sup>2</sup> /m (lb·in <sup>2</sup> /in)	1.8 (0.016)
	Moment of inertia per 1 kg (2.2 lb) payload	kg·cm <sup>2</sup> /kg (lb·in <sup>2</sup> /lb)	1.45 (0.22)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

# Characteristic Curves of Lexium CAR41BC

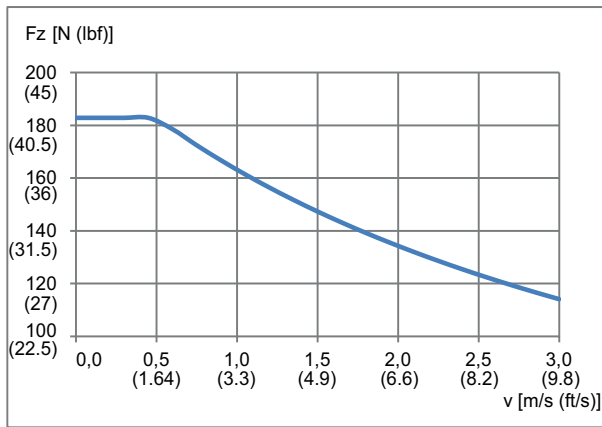
Maximum feed force  $F_{x_{\max}}$



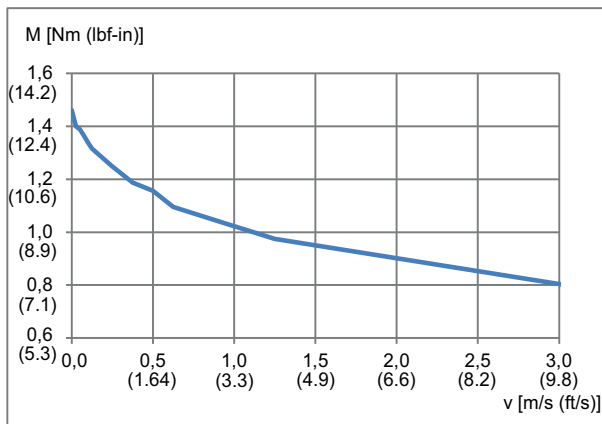
Maximum force  $F_y$



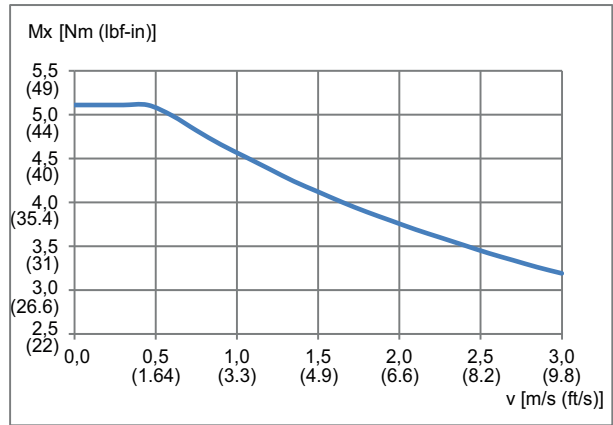
### Maximum force $F_z$



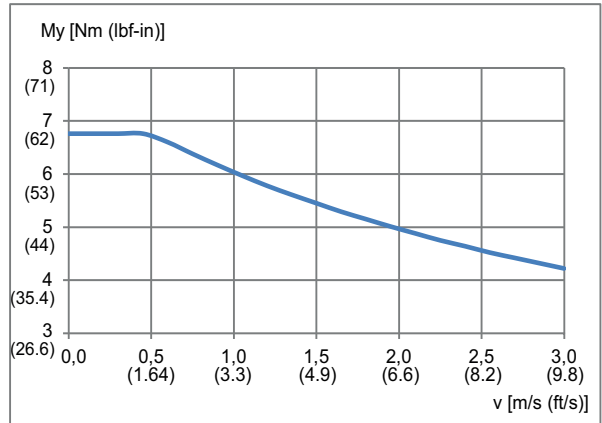
### Maximum drive torque $M_{\max}$



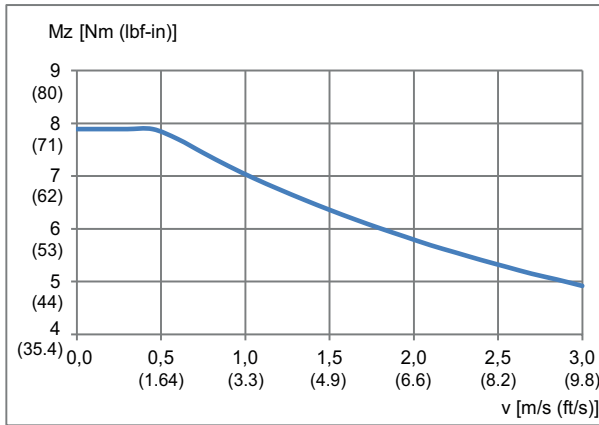
Maximum torque end plate Mx



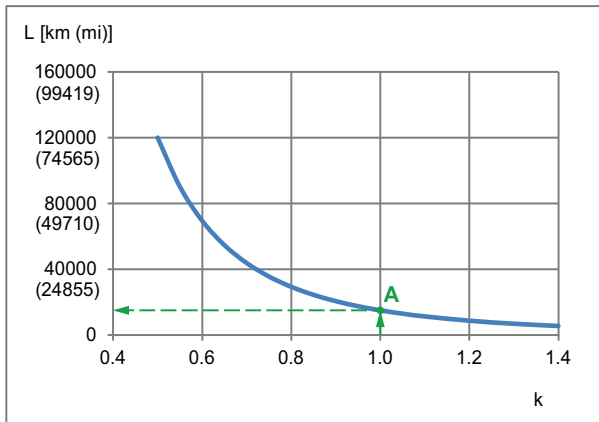
Maximum torque end plate My



### Maximum torque end plate $M_z$

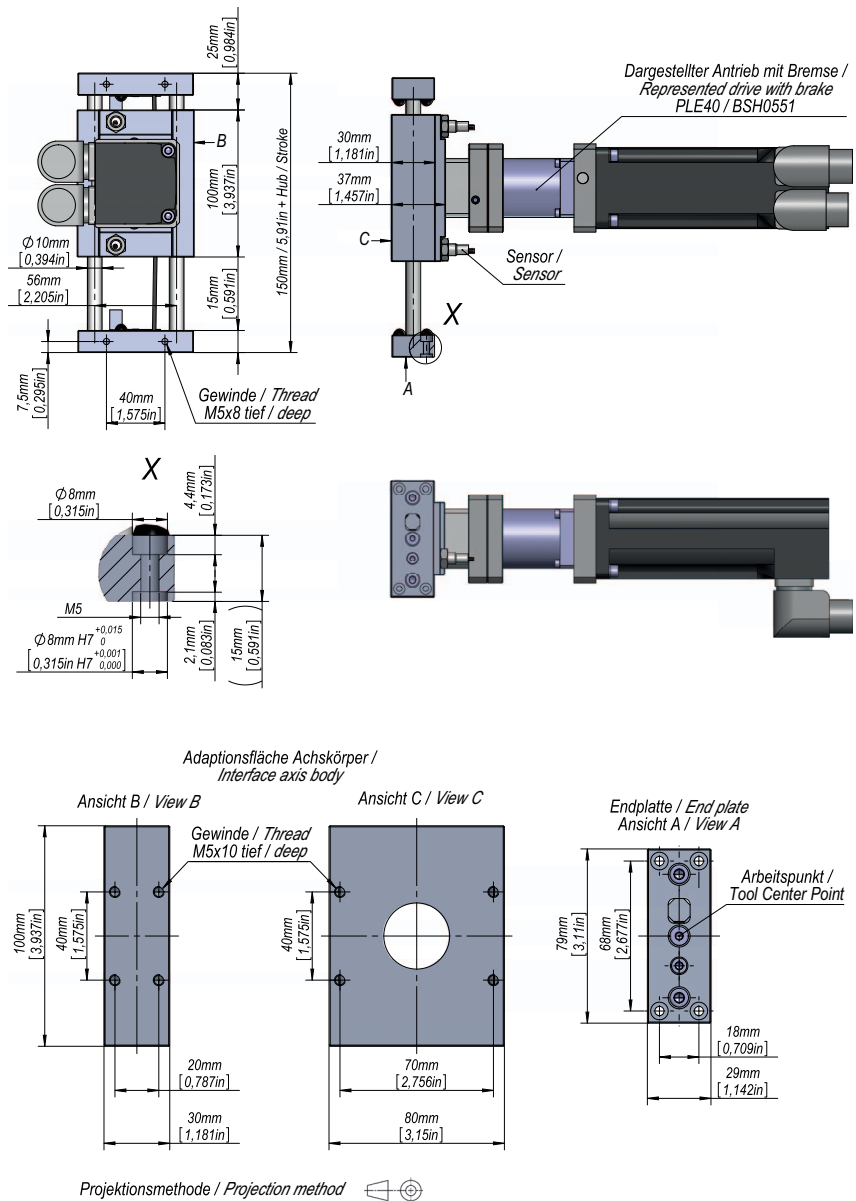


### Service Life



**A** The forces and torques ( $F_y$ ,  $F_z$ ,  $M_x$ ,  $M_z$ ,  $M_y$ ) are calculated for an expected service life of 15,000 km (9,321 mi). This is shown with  $k$  factor equal 1.0 in the figure.

## Dimensional Drawing of Lexium CAR41BC



## Lexium CAR42BC

### Overview

Here you will find the following information:

- Mechanical data of Lexium CAR42BC (*see page 59*)
- Characteristic curves of Lexium CAR42BC (*see page 61*)
- Dimensional drawing of Lexium CAR42BC (*see page 65*)

### Mechanical Data of Lexium CAR42BC

Category	Parameter	Unit	Value for CAR42BC with axis body type 1
General data	Type of mechanical drive element	–	Toothed belt 20AT5 Width: 20 mm (0.79 in) Profile: AT Pitch: 5 mm (0.197 in)
	Type of guide	–	Linear ball bearing guide
	Minimum stroke <sup>(1)</sup>	mm (in)	10 (0.39)
	Maximum stroke <sup>(2)</sup>	mm (in)	300 (11.8)
	Maximum velocity <sup>(3)</sup>	m/s (ft/s)	3 (9.8)
	Maximum acceleration <sup>(3)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	20 (66)
	Feed constant	mm/rev (in/rev)	100 (3.9)
	Effective diameter toothed belt	mm (in)	31.83 (1.25)
	Repeatability <sup>(3)</sup>	mm (in)	+/- 0.05 (+/- 0.00197)

**(1)** Required for lubrication of the linear ball bearing guide.

**(2)** For information about greater strokes, contact your local Schneider Electric representative.

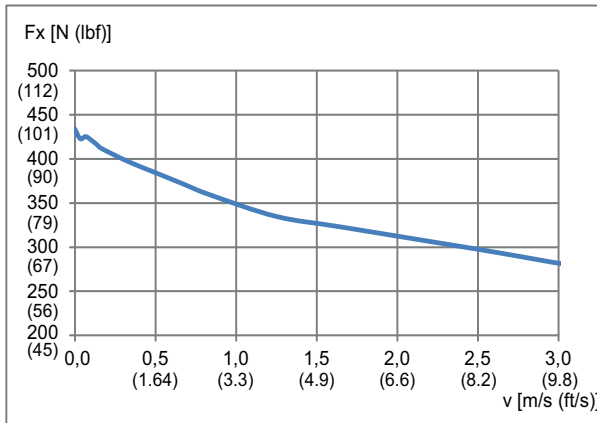
**(3)** Depending on load and stroke.

**(4)** Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.

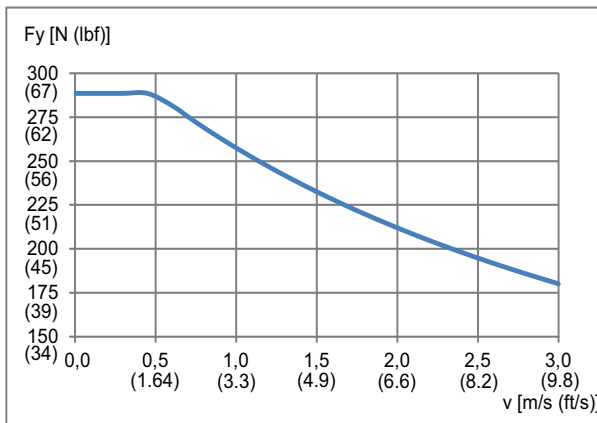
Category	Parameter	Unit	Value for CAR42BC with axis body type 1
Forces and torques	Maximum drive torque $M_{\max}^{(4)}$	Nm (lbf-in)	7 (62)
	Breakaway torque for axis with 0 stroke	Nm (lbf-in)	0.3 (2.66)
	Maximum feed force $F_{x_{\max}}^{(4)}$	N (lbf)	435 (98)
	Maximum force $F_y^{(4)}$	N (lbf)	290 (65)
	Maximum force $F_z^{(4)}$	N (lbf)	250 (56)
	Maximum torque end plate $M_x^{(4)}$	Nm (lbf-in)	9 (80)
	Maximum torque end plate $M_y^{(4)}$	Nm (lbf-in)	21 (186)
	Maximum torque end plate $M_z^{(4)}$	Nm (lbf-in)	25 (221)
Weights	Mass for axis with 0 stroke	kg (lb)	2.8 (6.2)
	Mass per 1 m (39 in) of stroke	kg/m (lb/in)	2.5 (0.14)
	Moving mass of the cantilever	kg (lb)	1.7 (3.75)
Moments of inertia	Moment of inertia for axis with 0 stroke	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	4.8 (1.64)
	Moment of inertia per 1 m (39 in) stroke	kg·cm <sup>2</sup> /m (lb·in <sup>2</sup> /in)	6.3 (0.054)
	Moment of inertia per 1 kg (2.2 lb) payload	kg·cm <sup>2</sup> /kg (lb·in <sup>2</sup> /lb)	2.55 (0.38)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

## Characteristic Curves of Lexium CAR42BC

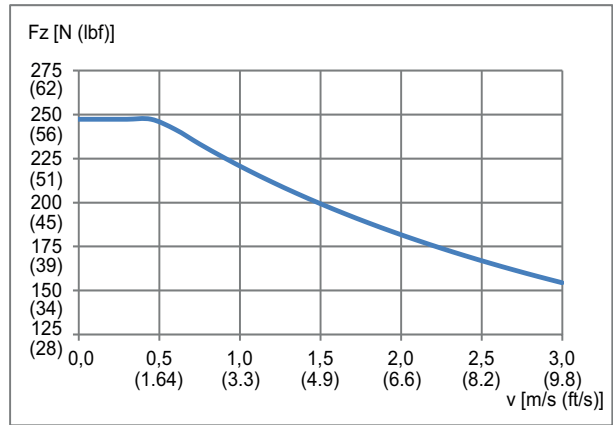
Maximum feed force  $F_{x_{\max}}$



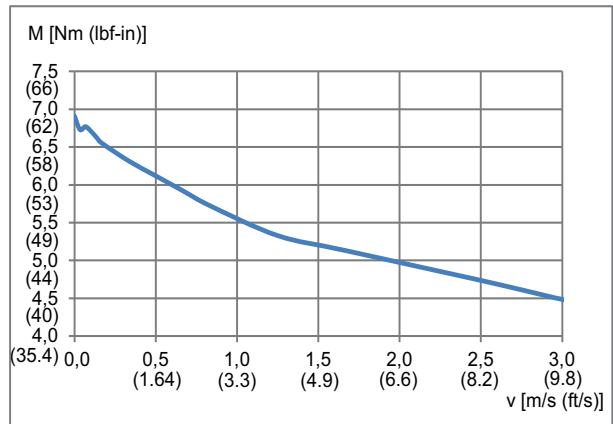
Maximum force  $F_y$



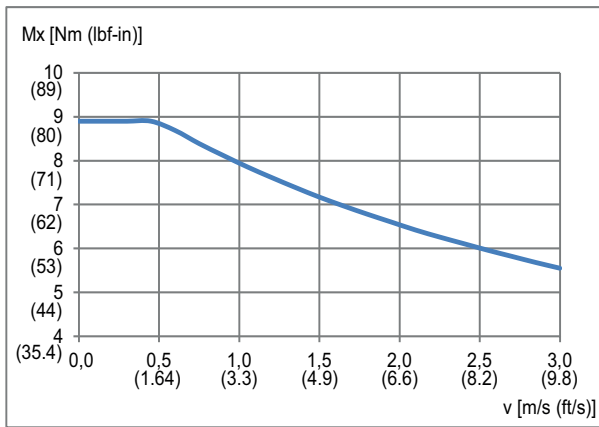
Maximum force  $F_z$



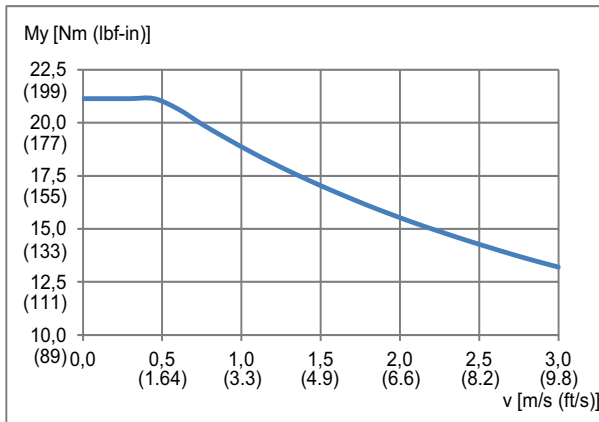
Maximum drive torque  $M_{\max}$



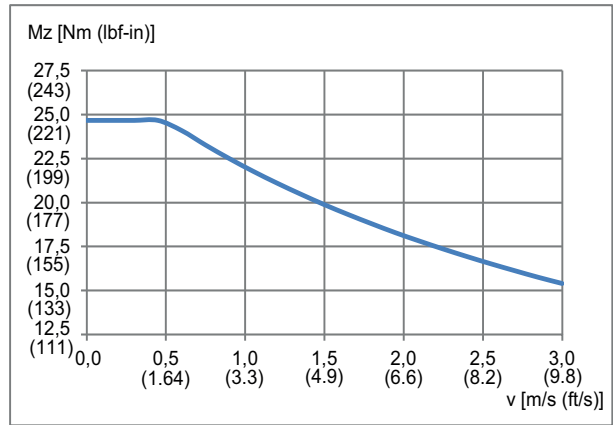
### Maximum torque end plate Mx



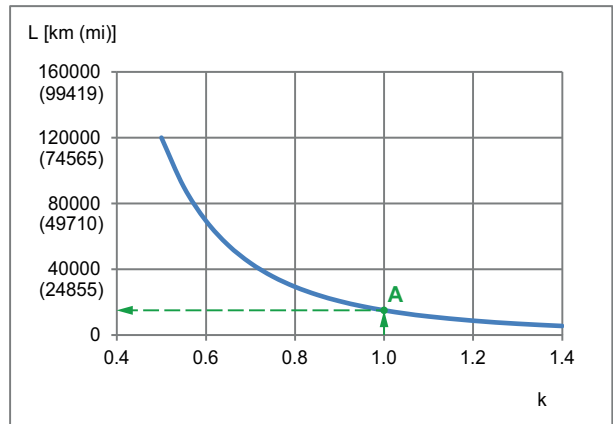
### Maximum torque end plate My



Maximum torque end plate  $M_z$



Service Life



**A** The forces and torques ( $F_y$ ,  $F_z$ ,  $M_x$ ,  $M_z$ ,  $M_y$ ) are calculated for an expected service life of 15,000 km (9,321 mi). This is shown with  $k$  factor equal 1.0 in the figure.



## Lexium CAR43BC

### Overview

Here you will find the following information:

- Mechanical data of Lexium CAR43BC (*see page 66*)
- Characteristic curves of Lexium CAR43BC (*see page 68*)
- Dimensional drawing of Lexium CAR43BC (*see page 72*)

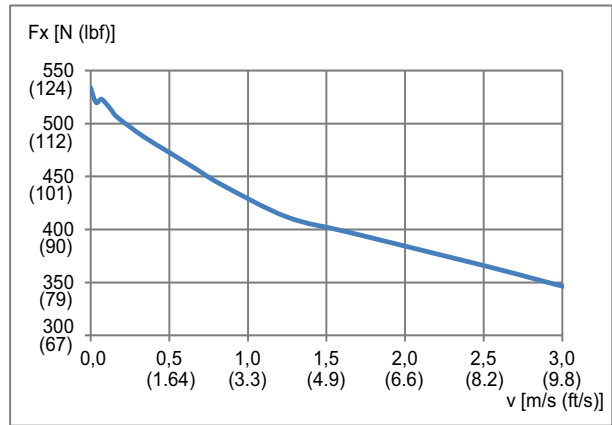
### Mechanical Data of Lexium CAR43BC

Category	Parameter	Unit	Value for CAR43BC with axis body type 1
General data	Type of mechanical drive element	–	Toothed belt 25AT5 Width: 25 mm (0.98 in) Profile: AT Pitch: 5 mm (0.197 in)
	Type of guide	–	Linear ball bearing guide
	Minimum stroke <sup>(1)</sup>	mm (in)	12 (0.47)
	Maximum stroke <sup>(2)</sup>	mm (in)	400 (15.7)
	Maximum velocity <sup>(3)</sup>	m/s (ft/s)	3 (9.8)
	Maximum acceleration <sup>(3)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	20 (66)
	Feed constant	mm/rev (in/rev)	100 (3.9)
	Effective diameter toothed belt	mm (in)	31.83 (1.25)
	Repeatability <sup>(3)</sup>	mm (in)	+/- 0.05 (+/- 0.00197)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

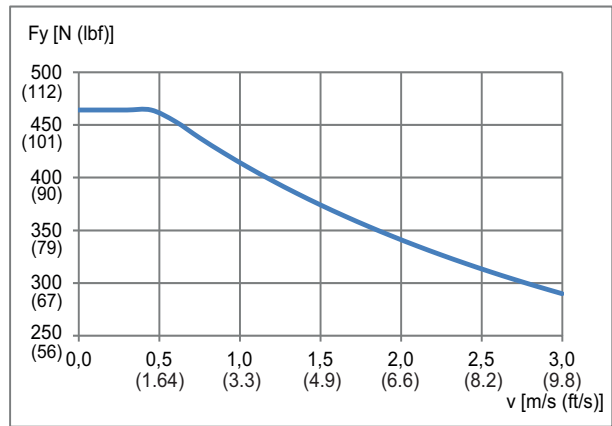
Category	Parameter	Unit	Value for CAR43BC with axis body type 1
Forces and torques	Maximum drive torque $M_{\max}^{(4)}$	Nm (lbf-in)	8.5 (75)
	Breakaway torque for axis with 0 stroke	Nm (lbf-in)	0.45 (4)
	Maximum feed force $F_{x\max}^{(4)}$	N (lbf)	535 (120)
	Maximum force $F_y^{(4)}$	N (lbf)	460 (103)
	Maximum force $F_z^{(4)}$	N (lbf)	400 (90)
	Maximum torque end plate $M_x^{(4)}$	Nm (lbf-in)	16 (142)
	Maximum torque end plate $M_y^{(4)}$	Nm (lbf-in)	34 (301)
	Maximum torque end plate $M_z^{(4)}$	Nm (lbf-in)	39 (345)
Weights	Mass for axis with 0 stroke	kg (lb)	4.4 (9.7)
	Mass per 1 m (39 in) of stroke	kg/m (lb/ft)	5 (0.28)
	Moving mass of the cantilever	kg (lb)	3.2 (7)
Moments of inertia	Moment of inertia for axis with 0 stroke	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	9.1 (3.11)
	Moment of inertia per 1 m (39 in) stroke	kg·cm <sup>2</sup> /m (lb·in <sup>2</sup> /in)	12.6 (0.109)
	Moment of inertia per 1 kg (2.2 lb) payload	kg·cm <sup>2</sup> /kg (lb·in <sup>2</sup> /lb)	2.55 (0.395)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

# Characteristic Curves of Lexium CAR43BC

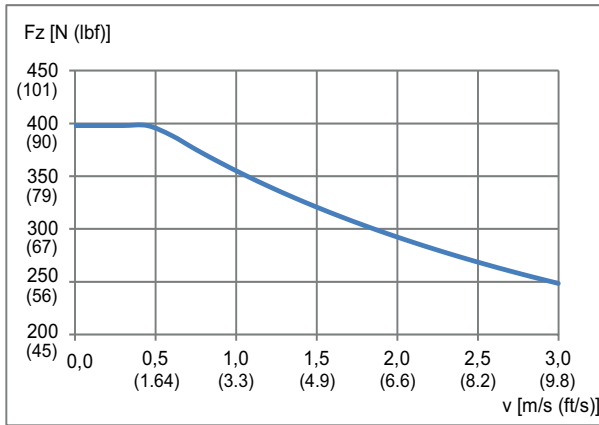
Maximum feed force  $F_{x_{\max}}$



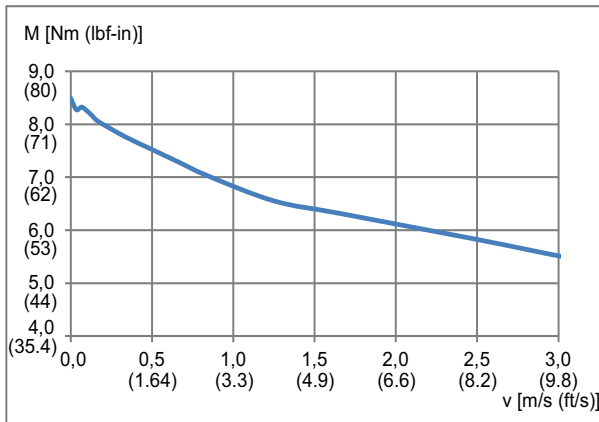
Maximum force  $F_y$



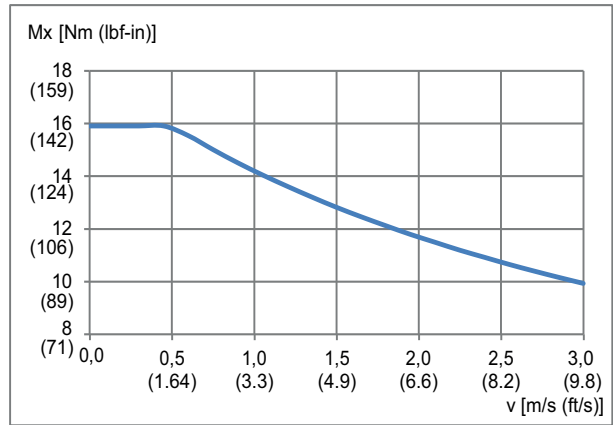
### Maximum force $F_z$



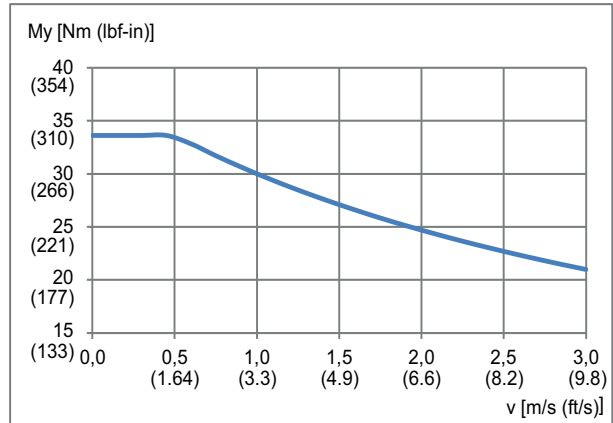
### Maximum drive torque $M_{\max}$



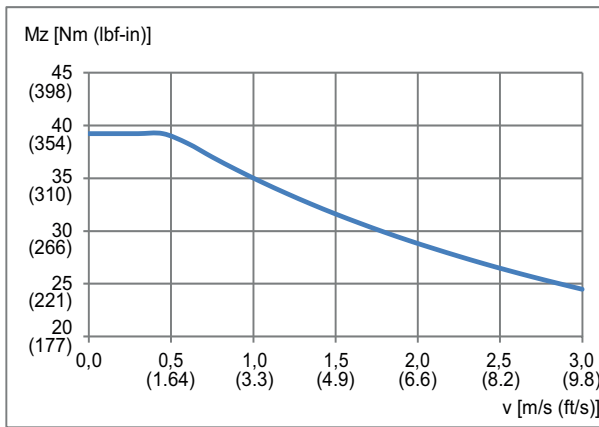
Maximum torque end plate Mx



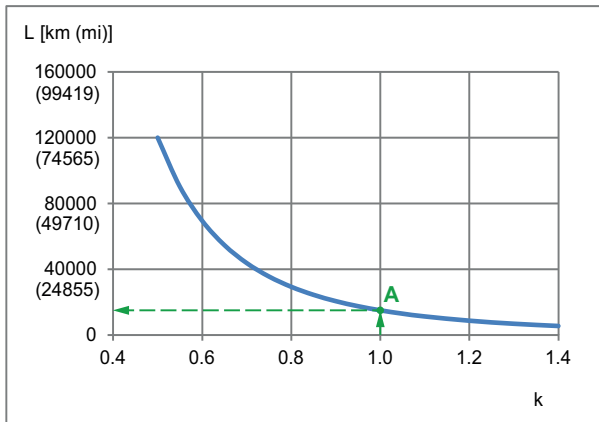
Maximum torque end plate My



### Maximum torque end plate Mz

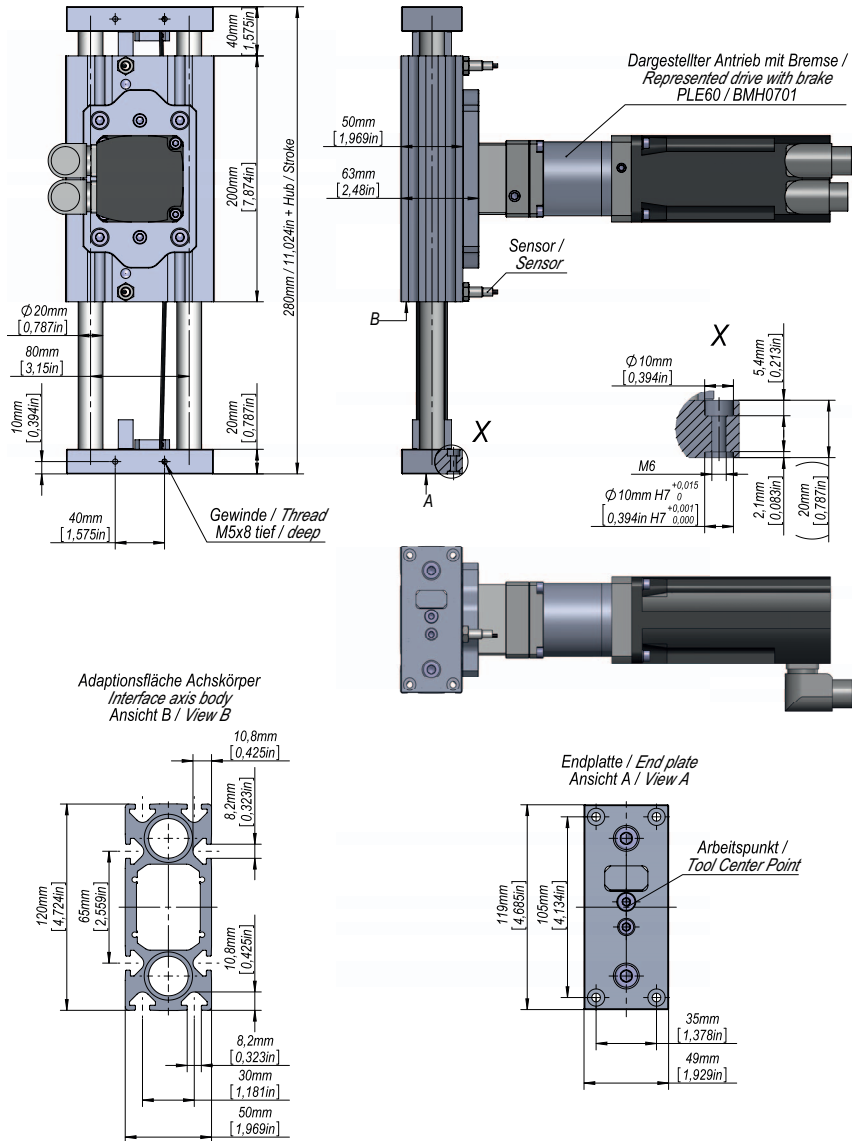


### Service Life



**A** The forces and torques ( $F_y$ ,  $F_z$ ,  $M_x$ ,  $M_z$ ,  $M_y$ ) are calculated for an expected service life of 15,000 km (9,321 mi). This is shown with  $k$  factor equal 1.0 in the figure.

# Dimensional Drawing of Lexium CAR43BC



Projektionsmethode / Projection method



## Lexium CAR44BC

### Overview

Here you will find the following information:

- Mechanical data of Lexium CAR44BC (*see page 73*)
- Characteristic curves of Lexium CAR44BC (*see page 75*)
- Dimensional drawing of Lexium CAR44BC (*see page 79*)

### Mechanical Data of Lexium CAR44BC

Category	Parameter	Unit	Value for CAR44BC with axis body type 1
General data	Type of mechanical drive element	–	Toothed belt 32AT5 Width: 32 mm (1.26 in) Profile: AT Pitch: 5 mm (0.197 in)
	Type of guide	–	Linear ball bearing guide
	Minimum stroke <sup>(1)</sup>	mm (in)	14 (0.55)
	Maximum stroke <sup>(2)</sup>	mm (in)	500 (19.7)
	Maximum velocity <sup>(3)</sup>	m/s (ft/s)	3 (9.8)
	Maximum acceleration <sup>(3)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	20 (66)
	Feed constant	mm/rev (in/rev)	100 (3.9)
	Effective diameter toothed belt	mm (in)	31.83 (1.25)
	Repeatability <sup>(3)</sup>	mm (in)	+/- 0.05 (+/- 0.00197)

(1) Required for lubrication of the linear ball bearing guide.

(2) For information about greater strokes, contact your local Schneider Electric representative.

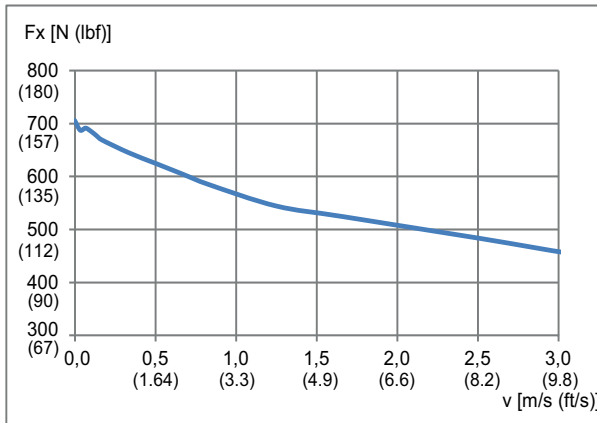
(3) Depending on load and stroke.

(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.

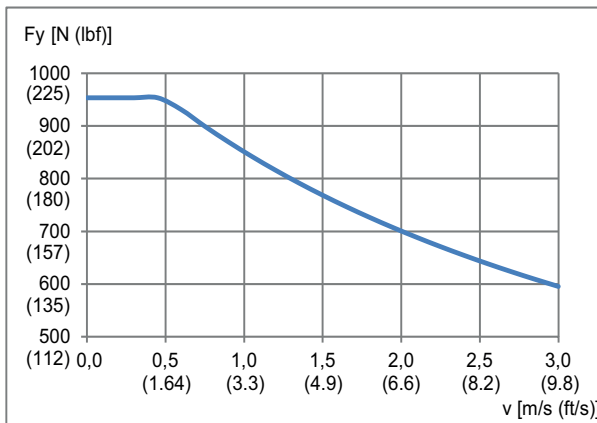
Category	Parameter	Unit	Value for CAR44BC with axis body type 1
Forces and torques	Maximum drive torque $M_{\max}^{(4)}$	Nm (lbf-in)	11.5 (102)
	Breakaway torque for axis with 0 stroke	Nm (lbf-in)	0.60 (5.3)
	Maximum feed force $F_{x_{\max}}^{(4)}$	N (lbf)	705 (158)
	Maximum force $F_y^{(4)}$	N (lbf)	950 (214)
	Maximum force $F_z^{(4)}$	N (lbf)	820 (184)
	Maximum torque end plate $M_x^{(4)}$	Nm (lbf-in)	45 (398)
	Maximum torque end plate $M_y^{(4)}$	Nm (lbf-in)	85 (752)
	Maximum torque end plate $M_z^{(4)}$	Nm (lbf-in)	100 (885)
Weights	Mass for axis with 0 stroke	kg (lb)	5.9 (13)
	Mass per 1 m (39 in) of stroke	kg/m (lb/in)	4.8 (0.27)
	Moving mass of the cantilever	kg (lb)	4 (8.8)
Inertias	Moment of inertia for axis with 0 stroke	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	11.4 (3.89)
	Moment of inertia per 1 m (39 in) stroke	kg·cm <sup>2</sup> /m (lb·in <sup>2</sup> /in)	12.2 (0.106)
	Moment of inertia per 1 kg (2.2 lb) payload	kg·cm <sup>2</sup> /kg (lb·in <sup>2</sup> /lb)	2.55 (0.395)
<p>(1) Required for lubrication of the linear ball bearing guide.</p> <p>(2) For information about greater strokes, contact your local Schneider Electric representative.</p> <p>(3) Depending on load and stroke.</p> <p>(4) Maximum permissible forces and torques decrease at increasing velocities. Refer to the characteristic curves following this table.</p>			

## Characteristic Curves of Lexium CAR44BC

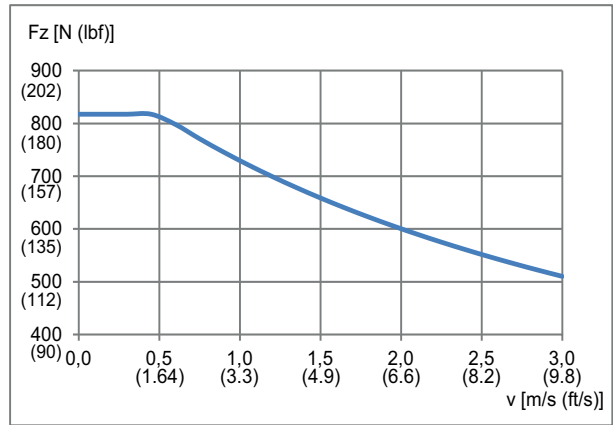
Maximum feed force  $F_{x_{\max}}$



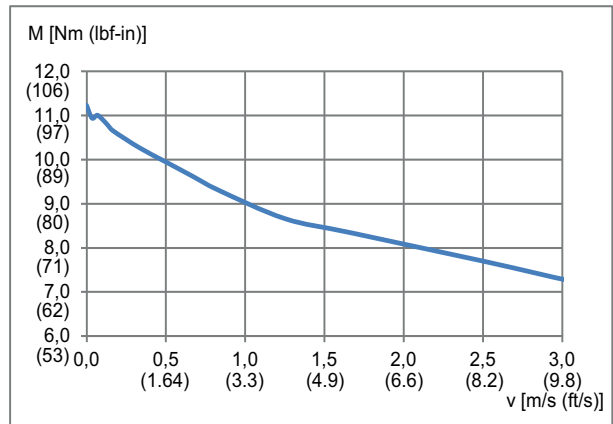
Maximum force  $F_y$



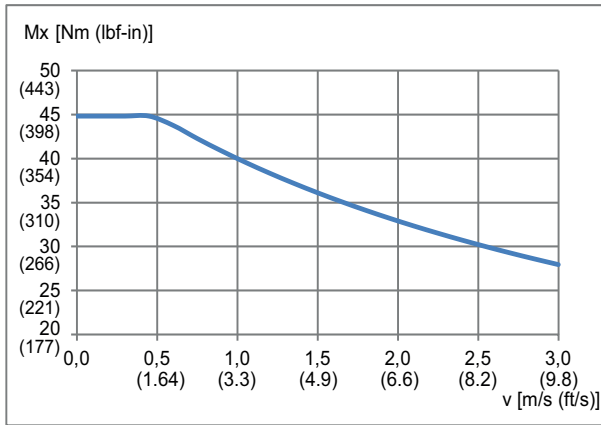
Maximum force  $F_z$



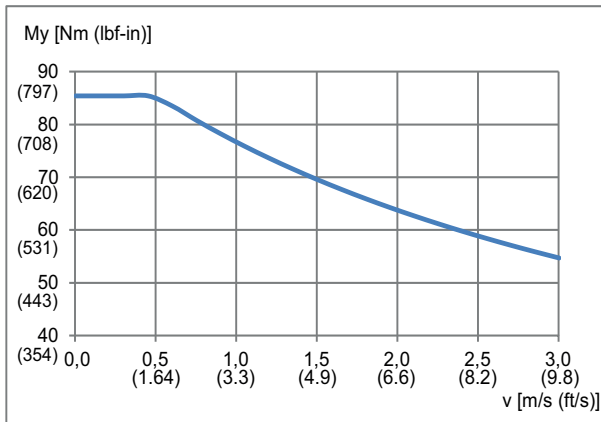
Maximum drive torque  $M_{\max}$



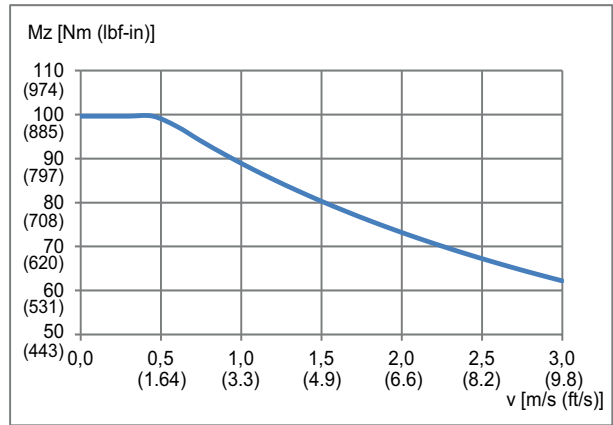
### Maximum torque end plate Mx



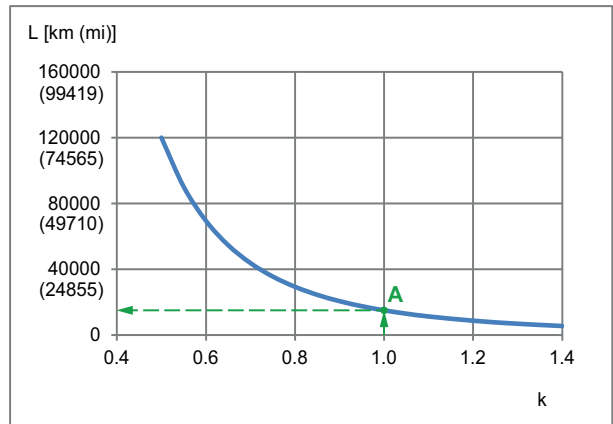
### Maximum torque end plate My



Maximum torque end plate  $M_z$

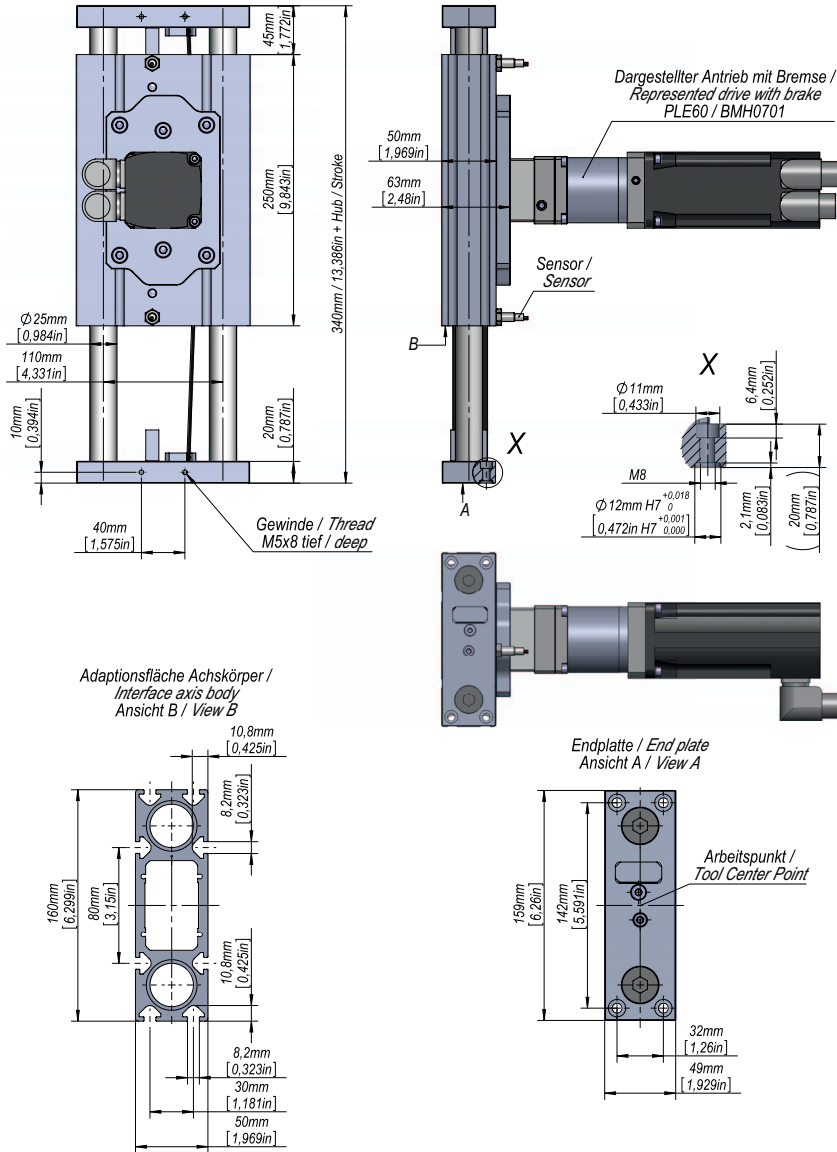


Service Life



**A** The forces and torques ( $F_y$ ,  $F_z$ ,  $M_x$ ,  $M_z$ ,  $M_y$ ) are calculated for an expected service life of 15,000 km (9,321 mi). This is shown with  $k$  factor equal 1.0 in the figure.

# Dimensional Drawing of Lexium CAR44BC



Projektionsmethode / Projection method

## Section 3.3

### Design of the Axis Frame

---

#### Design of the Axis Frame

##### System Requirements

The axis is designed for vertical installation particularly, but can also be mounted in other orientations. For special applications, contact your local Schneider Electric service representative.

- Take into account the mass of the axis that may act as a load, depending on the mounting position (vertical / tilted).
- For the design of the axis frame, take into account the varying height of the z-axis.
- Use only the axis body to mount the axis to the frame and ensure that the end plates and the attachments do not interfere with the operation of the machine.

The precision of the axis in the application is also determined by the frame. Deformations of the frame cause imprecisions on the Tool Center Point (TCP).

##### General Requirements Regarding the Frame

The frame must not only withstand permanently the forces and torques described below, but also have sufficient stiffness so that the deformations and vibrations which occur do not lead to any major deviations on the TCP. Ensure a sufficient transverse bracing in the frame.

Note the forces and torques to be taken up by the frame during normal operation:

- Consider that forces and torques operating the frame change when you modify the stroke length or the payload.
- The mounting position, the speed, and the acceleration of the axis, as well as the mounted payload, affect the total energy and may cause damage.

**NOTE:** Fasten the axis with screws of property class 8.8 or greater. For more information, refer to the respective dimensional drawing in *Mechanical Data* ([see page 44](#)).

## WARNING

### CRUSHING, SHEARING, CUTTING AND IMPACT INJURY

- The axis must be operated only within an enclosure.
- Open or enter the enclosure for cleaning and maintenance purposes only.
- Design the enclosure to withstand an impact from the axis and to resist ejected parts from escaping the zone of operation.
- Design the enclosure to safely deactivate the axis as soon as a person enters the zone of operation of the axis.
- All barriers, protective doors, contact mats, light barriers, and other protective equipment, must be configured correctly and enabled whenever the axis is under power.
- Define the clearance distance to the zone of operation of the axis so that operational staff do not have access to, nor can be enclosed in, the axis zone of operation.
- Design the enclosure to account for the maximum possible travel paths of the axis; that is, the maximum path until the hardware safety system limits as well as the additional run-on paths, in case of a power interruption.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Interference Contours in the Enclosure

When designing the enclosure, ensure that the moving parts of the axis will have sufficient freedom of movement. Take into account the required space for the movement of the respective axis type and associated equipment. For more information, refer to the respective dimensional drawing in *Mechanical Data* ([see page 44](#)).

For detailed information about the interference areas caused by axis motions, the dimensions, or the strokes, refer to the 3D-CAD data on the Schneider Electric homepage ([www.schneider-electric.com](http://www.schneider-electric.com)) or contact your local Schneider Electric service representative.

## Section 3.4

### Service Life

#### Service Life

##### Presentation

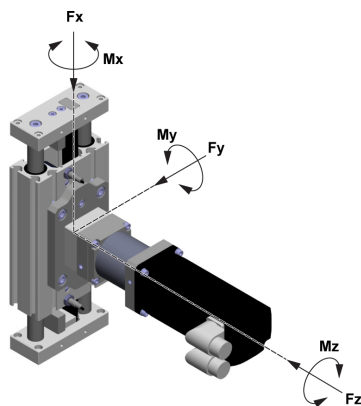
The service life of the linear guides of the axis is a function of the mean forces and torques that act in the system. If they act simultaneously, the load factor  $k$  can be calculated with the following formula:

$$\frac{F_y}{F_{y\max}} + \frac{F_z}{F_{z\max}} + \frac{M_x}{M_{x\max}} + \frac{M_y}{M_{y\max}} + \frac{M_z}{M_{z\max}} = k$$

The application-specific load values are entered in the numerator.

The denominator contains the maximum forces and torques of the axis. These forces and torques decrease at increasing velocities. For more information, refer to the respective characteristic curves of the forces and torques for the axis in *Mechanical Data* ([see page 44](#)).

The following figure presents the acting forces and torques on the axis.



The service life of the axis can be approximated by using the respective service life characteristic curve and the load factor  $k$ . Refer to *Mechanical Data* ([see page 44](#)) for the respective characteristic curve.

---

# Chapter 4

## Transport and Commissioning

---

### What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	Transport and Unpacking	84
4.2	Mechanical Installation	88
4.3	Electrical Installation	95
4.4	Initial Start-Up	97
4.5	Mounting the Payload	102

# Section 4.1

## Transport and Unpacking

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
Transport and Storage	85
Unpacking	86

## Transport and Storage

### Transport

The Lexium CAR4-Series must be handled with care. Shocks and impacts may damage the axis. Damage may lead to reduced running accuracy, reduced service life, or to an inoperable axis.

The axis is preassembled before transport.

The axis is transported in a wooden box or a cardboard box. The respective box dimensions vary according to the dimensions of the axis and the order quantity.

For detailed information about transport conditions, refer to *Ambient Conditions* ([see page 40](#)).

### Storage

The Lexium CAR4-Series can be stored inside the packaging or unpacked. In both cases, ensure that it is stored in a sheltered and dry place. Avoid humidity which can have corrosive effects on the axis.

**NOTE:** When stored, the axis needs to be on a level surface.

For detailed information about storage conditions, refer to *Ambient Conditions* ([see page 40](#)).

## Unpacking

### Overview

Before you start to unpack and position the axis, pay special attention to the accident prevention regulations and the safety regulations.

### WARNING

#### **CRUSHING, SHEARING, CUTTING AND HITTING DURING HANDLING**

- Observe the general construction and safety regulations for handling and assembly.
- Use appropriate mounting and transport equipment and use appropriate tools.
- Prevent clamping and crushing by taking appropriate precautions.
- Cover edges and angles to protect against cutting damage.
- Wear suitable protective clothing (for example, protective goggles, protective boots, protective gloves).

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### CAUTION

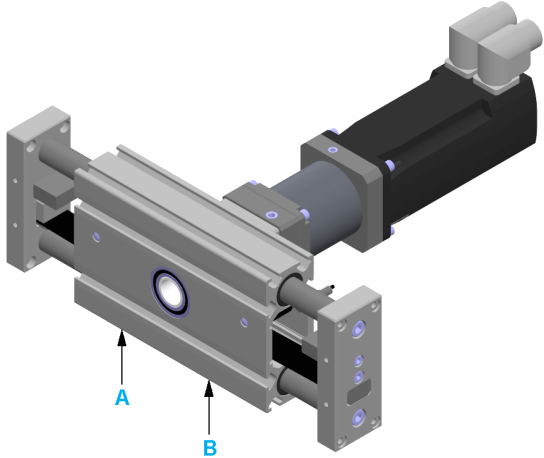
#### **FALLING HEAVY LOAD**

- If a motor and/or gearbox is mounted to the axis, simultaneously lift with one hand the axis and with the other hand the motor.
- Do not lift the axis only at the motor and/or gearbox.
- Use a suitable crane or other suitable lifting gear to lift the axis if this is required by the mass of the axis.

**Failure to follow these instructions can result in injury or equipment damage.**

## Unpacking

Step	Action
1	Transport the axis in its packaging as close as possible to the installation site.
2	In case of a wooden box, unscrew the bolts on the lid of the box. In case of a cardboard box, open the box with appropriate tools.
3	Verify the axis for transport damage.

Step	Action
4	<p>Lift up the axis at points A and B and remove the cardboard box or wooden box. Ideally, the distance between the end plate and point A and between the end plate and point B is one fourth of the total length of the axis body.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"><li>• Support the motor and/or gearbox when lifting the axis.</li><li>• Do not lift the axis at the motor and/or gearbox only.</li></ul> 

**NOTE:** In case of any transport damages, contact your local Schneider Electric service representative.

# Section 4.2

## Mechanical Installation

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
Information About Installation	89
Mounting the Axis	90

## Information About Installation

### Overview

Proceed with care during the following steps in order to help to prevent the following points:

- Injuries and material damage
- Incorrect installation and programming of components
- Incorrect operation of components
- Use of non-authorized cables or modified components

For further Information, refer to *Specific Safety Information* ([see page 15](#)).

### Accessibility for Servicing

When installing the axis, the motor, the gearbox, and the sensors, consider that these components may have to be accessed for servicing. Allow for such accessibility in your mechanical design.

### Standard Tightening Torques

The following tightening torques apply to mounting the payload and fastening slot nuts, clamping claws, contact plate, motor, gearbox, and adaptation material with hex socket screws.

Thread	Hex key size in mm (in)	Maximum tightening torque in Nm (lbf-in)
M3	2.5 (0.098)	1.1 (9.7)
M4	3 (0.118)	2.5 (22)
M5	4 (0.157)	5 (44)
M6	5 (0.197)	8.5 (75)
M8	6 (0.236)	21 (186)
M10	8 (0.315)	42 (372)
M12	10 (0.39)	70 (620)

Special tightening torques apply, for example, for mounting sensors or elastomer couplings. These special tightening torques are stated at the respective steps.

# Mounting the Axis

## Overview

To mount the axis to the installation surface, either use screws (for CAR40 / CAR41) or slot nuts (for CAR42 / CAR43 / CAR44).

For information about appropriate slot nuts, refer to *Replacement Equipment and Accessories* (see page 177).

### WARNING

#### **GREAT MASS OR FALLING PARTS**

- Use a suitable crane or other suitable lifting gear to lift the axis if this is required by the mass of the axis.
- Use the necessary personal protective equipment (for example, safety shoes, safety glasses and protective gloves).
- Mount the axis in such a way (tightening torque, securing screws) that parts cannot come loose, even in the case of shocks and vibration.
- Take all necessary measures to avoid unanticipated movements of the axis mounted in vertical or tilted positions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### ***NOTICE***

#### **INCORRECT INSTALLATION**

- If motors with a cross section greater than the cross section of the axis body are used, the axis must be supported or the installation surface must be cut out as required.
- The greater the load or the demands on the running accuracy, the shorter the distance that must be between the slot nuts.
- Do not mount the axis at the end plates.

**Failure to follow these instructions can result in equipment damage.**

## Running Accuracy

The length of the axis can have an impact on the running accuracy. A long axis may bend more easily, which can cause a reduced running accuracy. When mounting the axis, ensure that there is no gap between the axis and the installation surface so that the installation surface is in full contact with the mounting surface of the axis.

## Dimensions for Mounting

The axis body of the Lexium CAR40 and CAR41 axis is an aluminum block.

The axis can be mounted to a frame by using several threads that are located on:

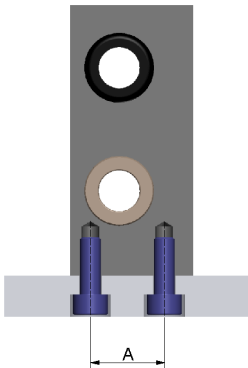
- The narrow side at the CAR40 axis
- The narrow side and the wide side at the CAR41 axis

The axis body of the CAR42, CAR43, and CAR44 axis is an extruded aluminum profile. The axis can be mounted to a frame by using appropriate slot nuts for the T-slots at the axis body.

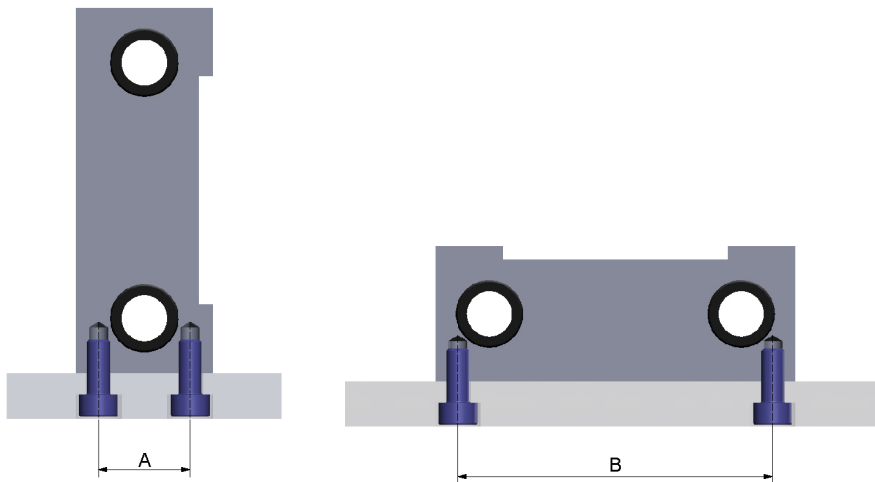
The T-slots are located on:

- Narrow sides of the axis body
- Wide sides of the axis body

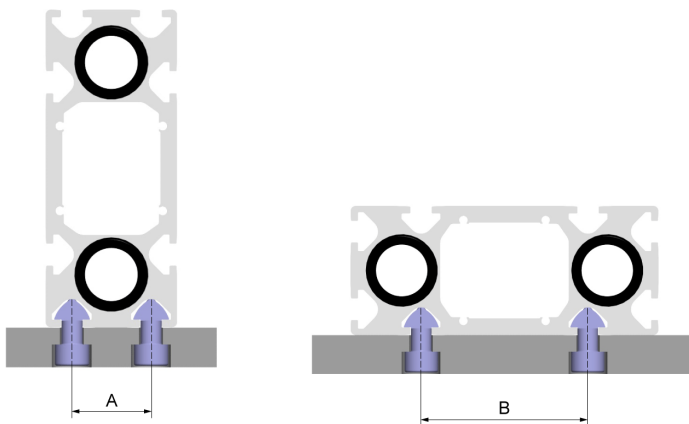
CAR40:



CAR41:



CAR42, CAR43, and CAR44:



When mounting the axis, take into account the distance between the tapped holes for the slot nuts or screws stated below.

The following table presents the distance between the tapped holes and the appropriate screws:

Description	Dimension	Unit	Value	
			CAR40	CAR41
Distance between tapped holes <sup>(1)</sup>	A	mm (in)	18 (0.71)	20 (0.79)
	B		–	70 (2.76)
Screw – ISO 4762	–	–	M5	M5
<b>(1)</b> For further information, refer to the respective dimensional drawing in <i>Mechanical Data</i> (see page 44).				

The following table presents the distance between the slots and the appropriate slot nuts and screws:

Description	Dimension	Unit	Value		
			CAR42	CAR43	CAR44
Distance between slots <sup>(1)</sup>	A	mm (in)	25 (0.98)	30 (1.18)	30 (1.18)
	B		52 (2.05)	65 (2.56)	80 (3.15)
Slot nut type	A		5 (0.197)	8 (0.315)	8 (0.315)
	B		8 (0.315)	8 (0.315)	8 (0.315)
Screw – ISO 4762	A	–	M5	M6 / M8	M6 / M8
	B	–	M6 / M8	M6 / M8	M6 / M8
<b>(1)</b> For further information, refer to the respective dimensional drawing in <i>Mechanical Data</i> (see page 44).					

**NOTE:**

- For CAR40 / CAR41: Use at least four mounting points at the installation surface.
- For CAR42 / CAR43 / CAR44: Use at least six mounting points at the installation surface.

## Mounting the Axis

**NOTE:** When mounting the axis, keep in mind that it may have to be accessed for maintenance.

Step	Action
1	Ensure that the planarity of the installation surface does not exceed 0.1 mm/m (0.0012 in/ft).
2	Carefully position the axis on its installation surface.
3	For CAR40 / CAR41: Tighten the fastening screws with a low tightening torque. For CAR42 / CAR43 / CAR44: Tighten the fastening screws of the slot nut with a low tightening torque.
4	Provide a reference plane alongside the axis body.
5	Place a dial gauge onto the end plate.
6	Move the end plate and record the deviation regarding the reference plane over the entire stroke.

Step	Action
7	Correct the deviations by lateral alignment of the axis and by tightening the screws appropriately. <b>NOTE:</b> Observe the standard tightening torques ( <i>see page 89</i> ).

## Section 4.3

### Electrical Installation

#### Electrical Installation

##### Cabling the Axis

Step	Action
1	Connect the motor. For details about connecting the motor, refer to the corresponding motor manual.
2	If applicable, connect the sensors. For details about sensor connections, refer to <i>Technical Data of the Sensors</i> ( <a href="#">see page 121</a> ).
3	Verify the correct routing and fastening of the cables to help prevent any collision of cables and moving parts.



**DANGER**

#### **LOOSE WIRING OR CABLING CAUSES ELECTRIC SHOCK**

Tighten wiring or cabling connections in conformance with the torque specifications.

**Failure to follow these instructions will result in death or serious injury.**

##### Grounding the Axis

The following components of the axis have to be grounded:

- Motor (for more information about grounding the motor, refer to the corresponding motor manual)
- All costumer attachments

Bolt ground cables to the ground connections at the axis (symbol IEC 60417 - 5019).

**NOTE:** When grounding the various equipment, use cables that respect the local standards that are in vigor.

## **DANGER**

### **ELECTRIC SHOCK DUE TO IMPROPER GROUNDING**

- Ground axis components in accordance with local, regional and/or national standards and regulations at a single, central point.
- Verify that the motor is connected to the central ground.

**Failure to follow these instructions will result in death or serious injury.**

Multipoint grounding is permissible if connections are made to an equipotential ground plane-dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

---

# Section 4.4

## Initial Start-Up

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
Verifying the Installation	98
Start-Up	100

## Verifying the Installation

### Overview

Verify that the axis is installed correctly. For more information, refer to *Specific Safety Information* (see page 15).

Pay special attention to:

- Properly bolted mechanical parts.
- Installation and wiring of the axis. Make sure that the mains connection and the 24 V connection are wired correctly.
- Connection of all protective ground (earth) cables.
- Use of correct fuses.
- Isolation of all unused cable ends.
- Installation and connection of all cables and connectors.
- Installation of sensors.
- Function of sensors as required.
- Unobstructed movement of the axis along the entire stroke.

### DANGER

#### ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact (EN 50178).
- Insulate any unused conductors on both ends of the motor cable.

**Failure to follow these instructions will result in death or serious injury.**

### DANGER

#### LOOSE WIRING OR CABLING CAUSES ELECTRIC SHOCK

Tighten wiring or cabling connections in conformance with the torque specifications.

**Failure to follow these instructions will result in death or serious injury.**

**ELECTRIC SHOCK DUE TO IMPROPER GROUNDING**

- Ground axis components in accordance with local, regional and/or national standards and regulations at a single, central point.
- Verify that the motor is connected to the central ground.

**Failure to follow these instructions will result in death or serious injury.**

Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

## Start-Up

### Overview

When the axis is operated for the first time, there is a risk of unintended equipment operation caused by possible wiring errors or unsuitable parameters.

#### WARNING

##### UNINTENDED EQUIPMENT OPERATION

- Verify that the axis is properly fastened so it cannot come loose even in the case of fast acceleration.
- Take all necessary measures to ensure that the moving parts of the axis cannot move in an unanticipated way.
- Verify that emergency stop equipment is operational and within reach of the zone of operation.
- Verify that the system is free and ready for the movement before starting the system.
- Run initial tests at reduced velocity.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

If the motor power supply is disabled unintentionally, for example as a result of power outage, errors or functions, the motor is no longer decelerated in a controlled way.

#### WARNING

##### UNINTENDED EQUIPMENT OPERATION

Verify that movements without braking effect cannot cause injuries or equipment damage.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The motor, the gearbox, and the adaptation materials of the axis may exceed 70 °C (158 °F) when subjected to heavy loads and/or high performance during operation.

#### WARNING

##### HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

For further information, refer to *Hot Surfaces* ([see page 23](#)).

**NOTE:** Perform a start-up in case of an already configured axis when it is used under modified operating conditions. For more information, refer to *Specific Safety Information* ([see page 15](#)).

### Commissioning Procedure

Step	Action
1	Verify the installation. For more information, refer to <i>Verifying the Installation</i> ( <a href="#">see page 98</a> ).
2	Comply with the instructions provided in the manual of the motor and/or gearbox used and in the manual of the drives used.
3	Verify that the loads conform to the appropriate specified forces and torques for the axis and the machine it contains before operating the axis.
4	Limit the maximum torque of the motor in accordance with the maximum drive torque of the axis.
5	Verify the function of the sensors. The integrated LED must indicate the switching state correctly.
6	Verify the distance between the sensors and the mechanical stops. The movement must be stopped by the sensors before reaching a mechanical stop.
7	<p>Perform initial tests at reduced velocity. During these tests, verify that the controller responds without any error or warning message to the signals of the sensors in both directions of movement.</p> <p><b>NOTE:</b> Consider that the forward movement is stopped on a trigger signal of the forward overtravelling sensor as does a backward movement.</p>
8	Verify that the ambient conditions conform to the appropriate specified environments for the axis and the machine it contains. For details, refer to <i>Ambient Conditions</i> ( <a href="#">see page 40</a> ).

**NOTE:** The maximum permissible dynamic forces and torques decrease with increasing velocities. For more information, refer to the respective characteristic curves in *Mechanical Data* ([see page 44](#)).

## Section 4.5

### Mounting the Payload

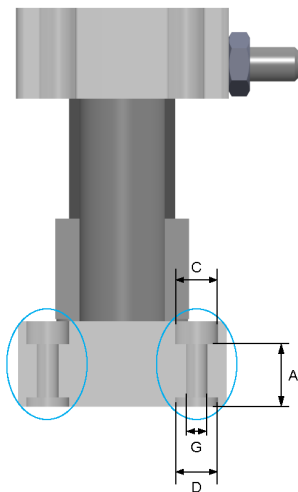
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#### Mounting the Payload

##### Overview

To fasten the payload, fastening threads and counterbores for screws with cylinder heads (counterbores according to DIN 974-1) are provided at the end plates.

Each thread has a counterbore for a locating dowel for reproducible mounting of the payload. For a section view of the end plate, refer to the dimensional drawing of the corresponding axis in *Mechanical Data* ([see page 44](#)).



For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

## Mounting Dimensions

The following table presents the dimensions for mounting the payload to the end plates:

Description	Parameter	Unit	Value				
			CAR40	CAR41	CAR42	CAR43	CAR44
Counterbore for screws with cylinder heads	C	–	M4	M4	M5	M5	M6
Thread size	G	–	–	M5	M6	M6	M8
Total depth (thread and counterbore for locating dowel)	A	mm (in)	–	10.6 (0.42)	14.6 (0.57)	14.6 (0.57)	13.6 (0.54)
Counterbore diameter for locating dowel	D	mm (in)	8 H7 (0.315)	8 H7 (0.315)	10 H7 (0.39)	10 H7 (0.39)	12 H7 (0.47)
<b>NOTE:</b> For more information, refer to the respective dimensional drawing in <i>Mechanical Data</i> ( <a href="#">see page 44</a> ).							



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# Chapter 5

## Optional Equipment

---

**What Is in This Chapter?**

This chapter contains the following sections:

Section	Topic	Page
5.1	Motor and Gearbox	106
5.2	Sensors	120
5.3	Shaft Extension	125

# Section 5.1

## Motor and Gearbox

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
Technical Data of the Motor and the Gearbox	107
Mounting the Motor and/or Gearbox	108

## Technical Data of the Motor and the Gearbox

### Overview

For further information about the motor, record the motor reference on the type plate and refer to the corresponding motor manual.

For further information about the gearbox, record the gearbox reference on the type plate and refer to the corresponding gearbox manual.

## Mounting the Motor and/or Gearbox

### Overview

Optionally, the axis is supplied with a pre-installed Schneider Electric motor and/or a gearbox.

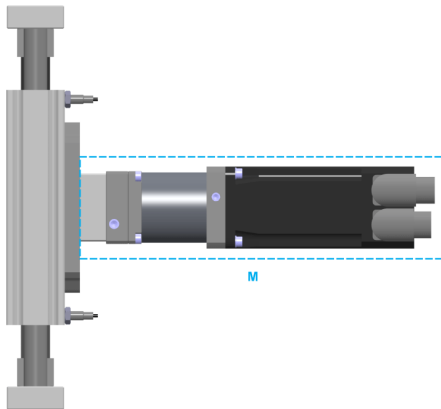
### Mounting Position of the Motor and Gearbox

In case of a new motor or gearbox, you can mount the new motor or gearbox to the side of the axis body on the axis. The motor and the gearbox can be mounted in different arrangements (turned in increments of  $4 \times 90^\circ$ ). For further information, refer to *Motor and/or Gearbox Orientation and Configuration* ([see page 37](#))

**NOTE:** The maximum mass of the installed parts is limited by the torque at the axis body.

### Maximum Mass

The mass of the motor and/or gearbox which can be mounted to the axis body is limited.



**M** Mass at axis body

The maximum mass of a motor and/or gearbox which can be mounted to the axis body depends on the size of the corresponding axis. The following table presents the maximum permissible masses of a mounted motor and/or gearbox:

Parameter	Unit	Value	
		CAR40 CAR41	CAR42 CAR43 CAR44
Maximum permissible mass	kg (lb)	3.5 (7.72)	11 (24.25)

**⚠ WARNING**

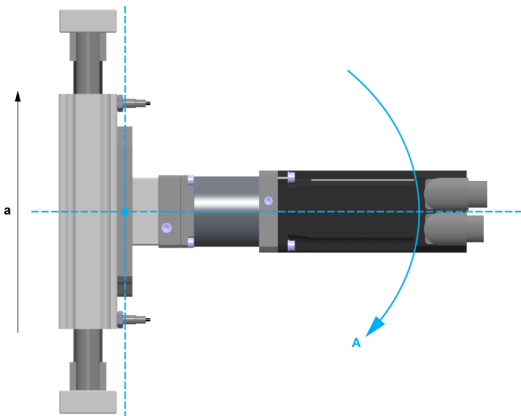
**UNINTENDED EQUIPMENT OPERATION**

Do not exceed the maximum permissible mass at the axis body.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**Maximum Torque**

A mounted motor and/or gearbox causes a static overturning torque at the axis body. In case of a lateral acceleration of the complete axis, the mounted motor and/or gearbox cause an additional dynamic overturning torque. The total of the static and dynamic overturning torque is limited by the maximum overturning torque of the axis body adapter plate.



- T** Torque at the end block  
**a** Lateral acceleration of the axis

The following table presents the maximum permissible torques of the mounted motor and/or gearbox at the axis body adapter plate:

Parameter	Unit	Value	
		CAR40 CAR41	CAR42 CAR43 CAR44
Maximum permissible torque (total of static and dynamic)	Nm (lbf-in)	22 (195)	150 (1328)

**NOTE:** The total of the static and dynamic torques must not exceed the maximum permissible torque at the end block.

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed the maximum permissible torque at the axis body.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Third-Party Motors and Gearboxes

When choosing a third-party motor, take special care that the maximum drive torque is not exceeded. Otherwise the axis could be damaged or destroyed.

## WARNING

### UNINTENDED MOVEMENTS

Observe the maximum permissible drive torque of the corresponding motor.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## WARNING

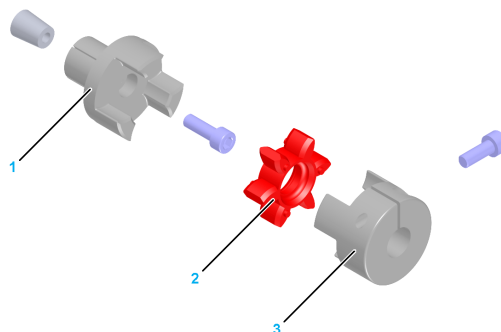
### FALLING HEAVY LOAD

Observe the limitations for the maximum permissible mass and the maximum permissible torque of the mounted motor and/or gearbox.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Coupling Assemblies for Motor and Gearbox Mounting

A coupling assembly is required to mount a motor or a gearbox to the axis. It consists of the following components:



- 1 Expanding hub
- 2 Elastomer spider
- 3 Clamping hub

## Prerequisites

You need the following tools to mount the motor and/or the gearbox:

- Torque wrench with a set of hexagon sockets
- Caliper gauge (for distance measurement)

**NOTE:** Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

## Procedure Overview

Perform the following procedures to mount the motor and/or the gearbox:

- Preparing the mounting of motor and gearbox ([see page 111](#))
- Mounting the elastomer coupling ([see page 112](#))
- Mounting the motor only ([see page 115](#))
- Mounting the gearbox only ([see page 117](#))
- Mounting the motor to the gearbox ([see page 119](#))

## Preparing the Mounting of Motor and Gearbox

Step	Action
1	Clean all parts.
2	Inspect all parts for damage.

**NOTE:** Polluted or damaged parts may cause run-out which has an adverse effect on the service life of the axis.

## ***NOTICE***

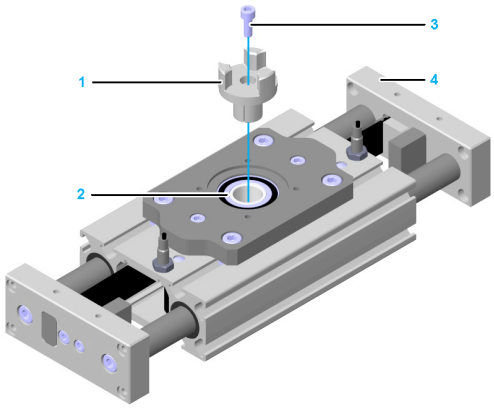
### **UNINTENDED EQUIPMENT OPERATION**

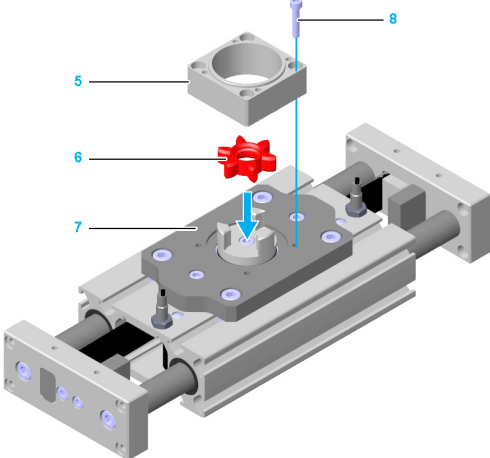
- Replace any damaged parts immediately.
- Clean all parts before assembly and use.

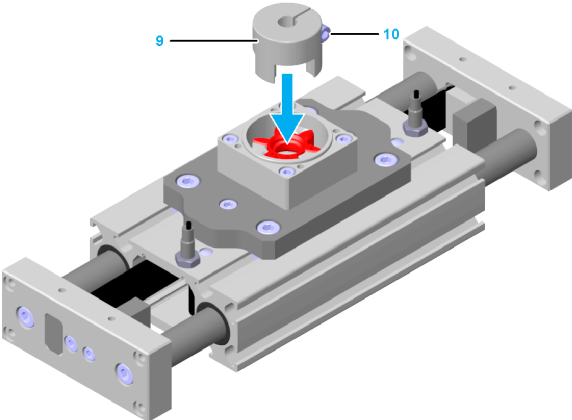
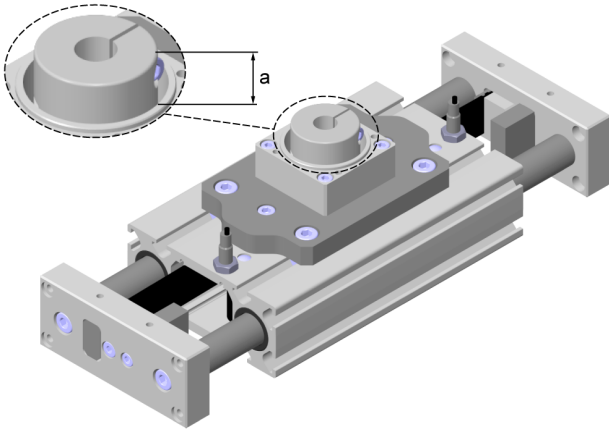
**Failure to follow these instructions can result in equipment damage.**

### **Mounting the Elastomer Coupling**

If possible, position the axis so that the elastomer coupling points upwards during installation.

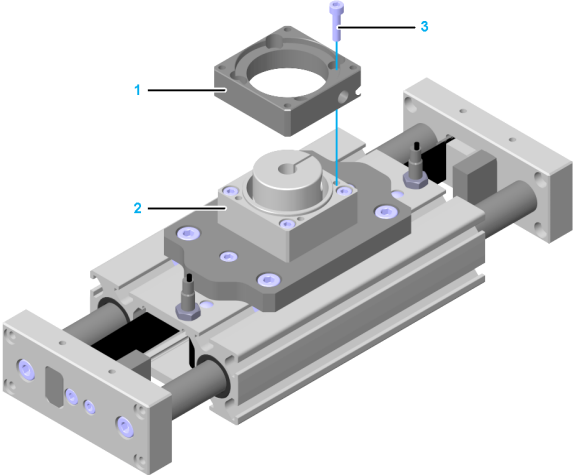
Step	Action
1	<p>For CAR40: Insert the expanding hub into the hollow shaft of the rack pinion. Verify that there is no gap between the expanding hub and the rack pinion so that the installation surface is in full contact with the mounting surface of the axis.</p> <p>For CAR41 / CAR42 / CAR43 / CAR44: Insert the expanding hub (1) into the hollow shaft of the toothed belt pulley (2). Verify that there is no gap between the expanding hub and the toothed belt pulley so that the installation surface is in full contact with the mounting surface of the axis.</p>
	
2	Manually move one end plate (4) into end position.

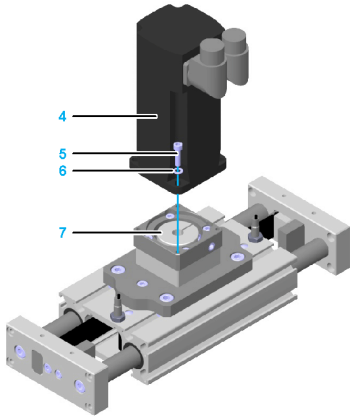
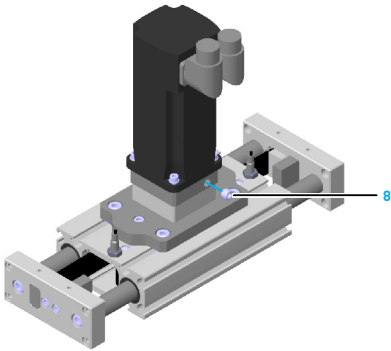
Step	Action
3	<p>Tighten the screw (3) of the expanding hub. Tightening torque:</p> <ul style="list-style-type: none"> <li>● For CAR40 / CAR41: 2.9 Nm (25.7 lbf-in)</li> <li>● For CAR42 / CAR43 / CAR44: 10 Nm (89 lbf-in)</li> </ul> <p><b>NOTE:</b> As long as the toothed belt is installed correctly and the end plate is at the end position, the toothed belt pulley does not rotate further. For detailed information about toothed belt installation, refer to <i>Mounting the Toothed Belt</i> (<a href="#">see page 160</a>).</p>
4	<p>Insert the elastomer spider (6) into the expanding hub.</p>  <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>● If the elastomer spider can be inserted too easily (without preloading), it must be replaced.</li> <li>● Slightly greasing the elastomer spider or the clamping hub facilitates the fitting process. Use mineral oil-based lubricants without additives, or use silicon-based lubricants.</li> </ul>
5	<p>Fasten the coupling housing (5) to the axis body adapter plate (7) with the four screws (8). Use the standard tightening torque (<a href="#">see page 89</a>). Verify that there is no gap between the coupling housing and the axis body adapter plate so that the installation surface is in full contact with the mounting surface of the axis.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>● At CAR40, the coupling housing is mounted to the axis body.</li> <li>● Greasing every centering collar provides easier dismounting. Use mineral oil-based lubricants without additives, or use silicon-based lubricants.</li> </ul>

Step	Action
6	<p>Insert the clamping hub (9) into the elastomer spider.</p> 
7	<p>Verify that the orientation of the clamping screw (10) is the same as the orientation of the motor or gearbox. For further information, refer to <i>Motor and/or Gearbox Orientation and Configuration</i> (<a href="#">see page 37</a>).</p>
8	<p>Verify dimension <i>a</i> of the clamping hub. Measure the dimension from the top of the clamping hub to the collar of the coupling housing.</p> <p>Dimension <i>a</i>:</p> <ul style="list-style-type: none"><li>● For CAR40 / CAR41: 8 mm (0.315 in)</li><li>● For CAR42 / CAR43 / CAR44: 13 mm (0.51 in)</li></ul> 

Mounting the Motor Only

If possible, position the axis so that the back side of the motor pointing upwards during installation.

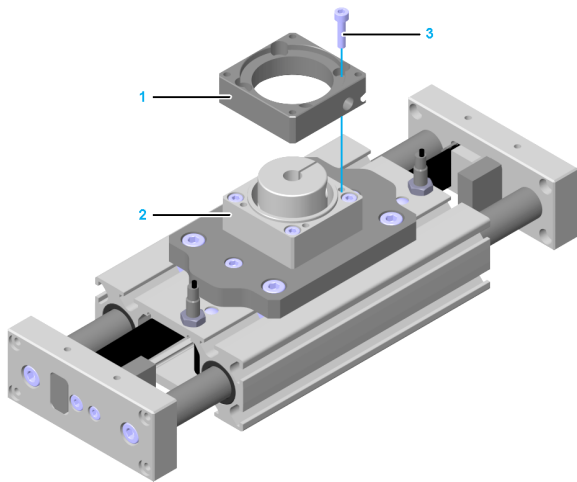
Step	Action
1	<p>Fasten the motor adapter plate (1) to the coupling housing (2) with the four screws (3). Use the standard tightening torque (<a href="#">see page 89</a>).</p> <p>Verify that:</p> <ul style="list-style-type: none"><li>• There is no gap between the motor adapter plate and the coupling housing so that the installation surface is in full contact with the mounting surface of the axis.</li><li>• The standard orientation of the setscrew is the same as shown in the following figure. For further information, refer to <i>Motor and/or Gearbox Orientation and Configuration</i> (<a href="#">see page 37</a>).</li><li>• The clamping screw is accessible through the hole in the motor adapter plate.</li></ul>  <p><b>NOTE:</b> Greasing every centering collar provides easier dismounting. Use mineral oil-based lubricants without additives, or use silicon-based lubricants.</p>

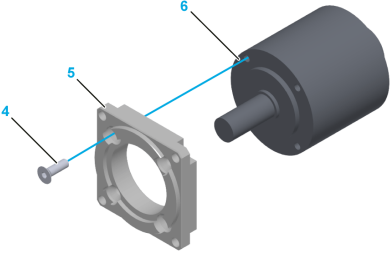
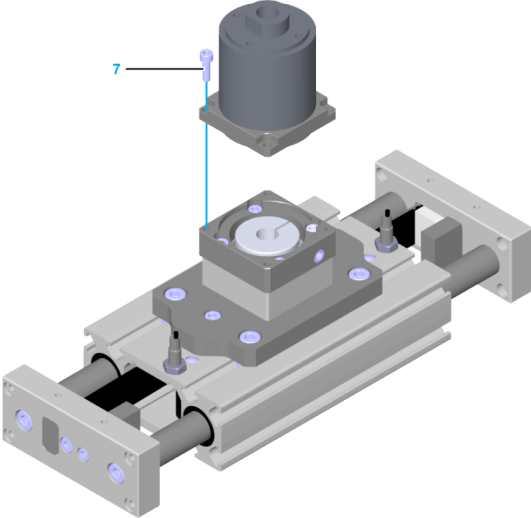
Step	Action
2	<p>Insert the motor (4) into the clamping hub (7) and onto the motor adapter plate and secure the motor from falling. Verify that there is no gap between the motor and the motor adapter plate so that the installation surface is in full contact with the mounting surface of the axis.</p>  <p><b>NOTE:</b> Greasing every centering collar provides easier dismounting. Use mineral oil-based lubricants without additives, or use silicon-based lubricants.</p>
3	<p>Fasten the motor with the four screws (5) and washers (6). Use the standard tightening torque (<a href="#">see page 89</a>).</p>
4	<p>Remove the setscrew (8) at the motor adapter plate.</p> 
5	<p>Tighten the screw of the clamping hub through the hole.</p> <p>Tightening torque:</p> <ul style="list-style-type: none"> <li>● For CAR40 / CAR41: 1.9 Nm (16.8 lbf-in)</li> <li>● For CAR42 / CAR43 / CAR44: 14 Nm (124 lbf-in)</li> </ul>

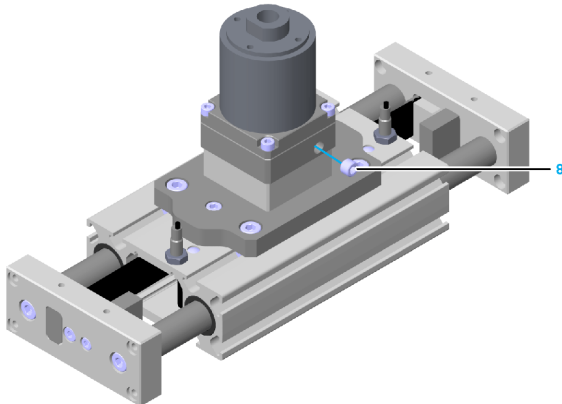
Step	Action
6	Insert the setscrew into the motor adapter plate and tighten it. Tightening torque: 4 Nm (35.4 lbf-in)

### Mounting the Gearbox Only

A flange plate is required if the gearbox does not have its own flange. If possible, position the axis so that the motor mounting side of the gearbox points upwards during installation.

Step	Action
1	<p>Fasten the motor adapter plate (1) to the coupling housing (2) with the four screws (3). Use the standard tightening torque (<i>see page 89</i>).</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• There is no gap between the motor adapter plate and the coupling housing so that the installation surface is in full contact with the mounting surface of the axis.</li> <li>• The standard orientation of the setscrews is upwards. For further information, refer to <i>Motor and/or Gearbox Orientation and Configuration</i> (<i>see page 37</i>).</li> <li>• The clamping screw is accessible through the hole in the motor adapter plate.</li> </ul>  <p><b>NOTE:</b> Greasing every centering collar provides easier dismounting. Use mineral oil-based lubricants without additives, or use silicon-based lubricants.</p>

Step	Action
2	<p>Fasten the flange plate (5) to the gearbox (6) with the four screws (4). Use the standard tightening torque (<a href="#">see page 89</a>). Verify that there is no gap between the flange plate and the gearbox so that the installation surface is in full contact with the mounting surface of the axis.</p>  <p><b>NOTE:</b> Greasing every centering collar provides easier dismounting. Use mineral oil-based lubricants without additives, or use silicon-based lubricants.</p>
3	<p>Insert the flange plate, complete with the gearbox, into the clamping hub and to the motor adapter plate and secure the gearbox from falling. Verify that there is no gap between the gearbox and the motor adapter plate so that the installation surface is in full contact with the mounting surface of the axis.</p>  <p><b>NOTE:</b> Greasing every centering collar provides easier dismounting. Use mineral oil-based lubricants without additives, or use silicon-based lubricants.</p>
4	<p>Fasten the flange plate, complete with the gearbox, with the four screws (7). Use the standard tightening torque (<a href="#">see page 89</a>).</p>

Step	Action
5	Remove the setscrew (8) at the motor adapter plate. 
6	Tighten the screw of the clamping hub through the hole. Tightening torque: <ul style="list-style-type: none"> <li>• For CAR40 / CAR41: 1.9 Nm (16.8 lbf-in)</li> <li>• For CAR42 / CAR43 / CAR44: 14 Nm (124 lbf-in)</li> </ul>
7	Insert the setscrew into the motor adapter plate and tighten it. Tightening torque: 4 Nm (35.4 lbf-in)

### Mounting the Motor to the Gearbox

## NOTICE

### DISTORTION OF MOTOR AND GEARBOX

Only fasten motor and gearbox with all components at the same ambient temperature.

**Failure to follow these instructions can result in equipment damage.**

**NOTE:** If possible, fasten the motor to the gearbox in vertical position for easier mounting.

For more information about mounting the motor to the gearbox, refer to the corresponding gearbox manual.

# Section 5.2

## Sensors

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**What Is in This Section?**

This section contains the following topics:

Topic	Page
Technical Data of the Sensors	121
Mounting the Sensors	123

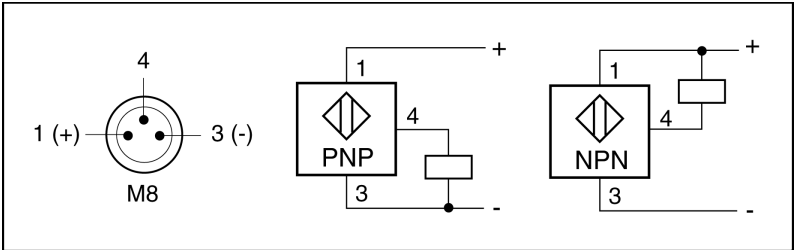
## Technical Data of the Sensors

### Technical Data of the Sensors

Parameter	Unit	Description
Model	–	Cylindrical thread M8 x 1
Actuation type	–	Inductive
Approvals	–	CE
Electrical connection (Polyurethane cable with M8 connector)	mm (in)	100 (3.9)
Nominal switching distance $s_n$ (in the case of aluminum)	mm (in)	0.5 (0.0197)
Hysteresis	–	1 to 15% of the real switching distance
Degree of protection as per IEC 60529	–	IP67
Temperature for storage	°C (°F)	-40...+85 (-40...+185)
Temperature for operation	°C (°F)	-25...+70 (-13...+158)
Housing material	–	Nickel-plates brass
Cable material	–	PUR, 3 x 0.12 mm <sup>2</sup>
Function indicator output	–	Yellow LED
Function indicator supply voltage	–	No
Supply voltage (PELV)	Vdc	12...24 with reverse polarity protection
Supply voltage (including residual ripple)	Vdc	10...36
Switching current (overload and short-circuit protection)	mA	< 200
Voltage drop, output conducting	V	< 2
No-load current	mA	< 10
Maximum switching frequency	Hz	5,000
Switch-on time	ms	< 0.1
Switch-off time	ms	< 0.1

Connection Details – Sensors

The optional sensors are equipped with an M8 x 1 connector. The following graphic presents the connection assignment of the sensors.



Pin	Description	Color
1	PELV supply voltage (+)	BN (brown)
3	PELV supply voltage (-)	BU (blue)
4	Output	BK (black)

The maximum cable length is 100 mm (3.9 in). For suitable extension cables with various lengths, refer to *Replacement Equipment and Accessories* ([see page 177](#)).

# Mounting the Sensors

## Overview

The use of sensors can provide some protection against hazards (for example, collision with mechanical stop caused by incorrect reference values).

Fastening threads for sensors mounting are located at:

- Sensor holding plate (CAR40)
- Axis body adapter plate (CAR41)
- Axis body (CAR42 / CAR43 / CAR44)

## WARNING

### LOSS OF CONTROL

- Ensure that sensors are installed if your application, based on your risk assessment, requires sensors.
- Verify correct connection of the sensors.
- Verify that the sensors are sufficiently distant from the mechanical stop to allow an adequate stopping distance.
- Verify correct parameterization and function of the sensors.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Prerequisites

You need the following tools to mount the sensors:

- Feeler gauge
- Open-end torque wrench SW 13 (1/2 AF)

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

## Procedure Overview

Perform the following procedures to mount the sensors:

- Preparing the mounting of the sensors ([see page 123](#))
- Mounting the sensors ([see page 124](#))

## Preparing the Mounting of the Sensors

Step	Action
1	Verify the sensors for correct type and function.
2	Verify that your controller and your interface are suitable for the sensors.
3	Clean all parts.
4	Inspect all parts for damage.

# NOTICE

## UNINTENDED EQUIPMENT OPERATION

- Replace any damaged parts immediately.
- Clean all parts before assembly and use.

**Failure to follow these instructions can result in equipment damage.**

## Mounting the Sensors

Before you mount the sensors, be aware of the switching distance:

**NOTE:** Since the sensors operate inductively, the switching surface must have a specific distance from the end plate (CAR40) or from the contact block (CAR41 / CAR42 / CAR43 / CAR44). This *switching distance* is 0.5 +/- 0.1 mm (0.0197 +/- 0.0039 in).

Step	Action
1	<p>For CAR40: Move the end plate until it is under the fastening thread in the sensor holding plate.</p> <p>For CAR41: Move the end plate (4) with the contact block (3) until the contact block is under the fastening thread in the axis body adapter plate.</p> <p>For CAR42 / CAR43 / CAR44: Move the end plate (4) with the contact block (3) until the contact block is under the fastening thread in the axis body.</p>
2	<p>Bolt the sensor (1) into the fastening thread until the switching distance <i>s</i> is obtained. Use a feeler gauge to measure the switching distance.</p> <p>Switching distance <i>s</i>: 0.5 +/- 0.1 mm (0.0197 +/- 0.00394 in)</p>
3	<p>Tighten the sensor nut (2) to fasten the sensor.</p> <p>Tightening torque: 2 Nm (17.7 lbf-in)</p>
4	<p>Verify the correct switching distance with the feeler gauge.</p>

# Section 5.3

## Shaft Extension

### Mounting the Shaft Extension

#### Overview

The shaft extension can be used, for example, to couple an external encoder.

#### Prerequisites

You need the following tools to mount the shaft extension:

- Soft-faced hammer
- Torque wrench with a set of hexagon sockets

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

#### Procedure Overview

Perform the following procedures to mount the shaft extension:

- Preparing the mounting of the shaft extension ([see page 125](#))
- Mounting the shaft extension ([see page 126](#))

#### Preparing the Mounting of the Shaft Extension

Step	Action
1	Clean all parts.
2	Inspect all parts for damage.

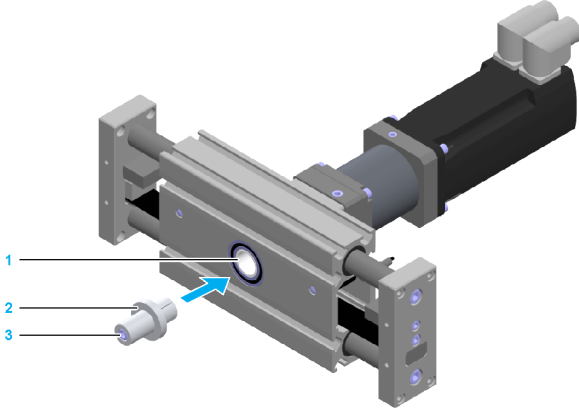
### NOTICE

#### UNINTENDED EQUIPMENT OPERATION

- Replace any damaged parts immediately.
- Clean all parts before assembly and use.

**Failure to follow these instructions can result in equipment damage.**

## Mounting the Shaft Extension

Step	Action
1	<p>For CAR40: Insert the shaft extension into the hollow shaft of the rack pinion. Verify that there is no gap between the shaft extension and the rack pinion so that the installation surface is in full contact with the mounting surface of the axis.</p> <p>For CAR41 / CAR42 / CAR43 / CAR44: Insert the shaft extension (2) into the hollow shaft of the toothed belt pulley (1). Verify that there is no gap between the shaft extension and the toothed belt pulley so that the installation surface is in full contact with the mounting surface of the axis.</p>
	
	<p><b>NOTE:</b> To insert the shaft extension completely, you may have to tap the shaft extension at the last 2 mm (0.079 in) slightly with a soft-faced hammer (<b>not</b> on the screw head).</p>
2	<p>Tighten the screw (3) of the shaft extension.</p> <p>Tightening torque:</p> <ul style="list-style-type: none"><li>● For CAR40 / CAR41: 2.9 Nm (25.7 lbf-in)</li><li>● For CAR42 / CAR43 / CAR44: 10 Nm (89 lbf-in)</li></ul> <p><b>NOTE:</b> As long as the toothed belt is installed correctly and the end plate is at the end position, the toothed belt pulley does not rotate further. For detailed information about toothed belt installation, refer to <i>Mounting the Toothed Belt</i> (<a href="#">see page 160</a>).</p>

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# Chapter 6

## Maintenance and Repair

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**What Is in This Chapter?**

This chapter contains the following sections:

Section	Topic	Page
6.1	Maintenance, Repair, and Cleaning	128
6.2	Replacing Parts	138
6.3	Lubrication	174

# Section 6.1

## Maintenance, Repair, and Cleaning

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
General Information About Maintenance, Repair, and Cleaning	129
Maintenance Plan	131
Maintaining the Toothed Belt	133
Maintaining the Motor (Optional Equipment)	134
Maintaining the Gearbox (Optional Equipment)	134
Cleaning	135
Repairing After Collisions	136

## General Information About Maintenance, Repair, and Cleaning

### Overview

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair, and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers, or installing or removing any accessories, hardware, cables, or wires.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
- Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42.4 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the end plates to prevent rotation of the drive system prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating the axis and any associated equipment.

**Failure to follow these instructions will result in death or serious injury.**

Poor maintenance can lead to premature wear, or even present potential safety hazards for production or maintenance operators.

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Develop and follow a maintenance plan and associated protocols adapted to the requirements of your application and equipment.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**NOTE:** Remove the part or the tool mounted on the axis during maintenance operations if necessary.

### Servicing

In case of issues which cannot be resolved, contact your local Schneider Electric service representative with the following information:

- Type plate information (type, identification number, serial number, DOM)
- Detailed description of the issue
- Previous and associated circumstances

## Maintenance Plan

### Overview

The maintenance intervals may have to be adapted to the greatly varying operational hours depending on the application.

For procedures to replace the different parts, refer to *Replacing Parts* ([see page 138](#)).

### Maintenance Schedule

Perform the following maintenance tasks after delivery:

Date	Action
After two months of service life	<ul style="list-style-type: none"> <li>Verify the axis by visual inspection (<a href="#">see page 98</a>) for any damage or missing parts, especially for moving parts and parts at risk for collisions such as end plate, toothed belt tensioner, ball bearing of the toothed belt pulley/rack pinion, linear ball bearing, sliding bearing, guide rods, gear rack, or mounting elements.</li> <li>Verify the tension of toothed belt and adjust it (<a href="#">see page 133</a>) if necessary.</li> </ul>

Perform the following maintenance tasks within the stated intervals:

Interval	Action
Every 400 hours of operation or every month	<ul style="list-style-type: none"> <li>Clean the axis (<a href="#">see page 135</a>) if necessary.</li> <li>Verify the lubrication of the guide rods and, if necessary, lubricate the guide rods to avoid corrosion.</li> <li>Verify the lubrication of the gear rack and lubricate the gear rack (<a href="#">see page 174</a>) if necessary (only CAR40).</li> </ul>
Every 2,000 hours of operation or every six months	<ul style="list-style-type: none"> <li>Clean the axis (<a href="#">see page 135</a>).</li> <li>Verify the toothed belt abrasion (<a href="#">see page 136</a>) and replace the toothed belt (<a href="#">see page 155</a>) if necessary.</li> <li>Verify the tension of toothed belt and adjust it (<a href="#">see page 133</a>) if necessary.</li> <li>Verify the axis by visual inspection for any damage or missing parts (<a href="#">see page 136</a>). Especially moving parts and parts at risk for collisions such as end plate, toothed belt tensioner, ball bearing of the toothed belt pulley/rack pinion, linear ball bearing, sliding bearing, guide rods, gear rack, or mounting elements.</li> <li>Verify the sensors for functionality.</li> <li>Verify all parts for bolted connections.</li> <li>Lubricate the guide rods slightly to avoid corrosion (<a href="#">see page 174</a>).</li> <li>Lubricate the gear rack (only CAR40) (<a href="#">see page 174</a>).</li> </ul>

Interval	Action
Annually or after an uncontrolled stop (stop category 0)	<ul style="list-style-type: none"> <li>Verify the brake function during operations. For further information, refer to the corresponding motor manual of the optionally pre-installed Schneider Electric motor.</li> </ul>
Every 20,000 hours of operation	<ul style="list-style-type: none"> <li>Replace the optionally pre-installed Schneider Electric motor (<i>see page 143</i>).</li> </ul>
Every 30,000 hours of operation	<ul style="list-style-type: none"> <li>Replace the optionally pre-installed Schneider Electric gearbox (<i>see page 143</i>).</li> </ul>
Every four years after the date of manufacturing (DOM)	<ul style="list-style-type: none"> <li>Replace the toothed belt as a precautionary measure (<i>see page 155</i>).</li> <li>Suggestion: Replace the toothed belt pulley (<i>see page 164</i>) and deflection pulleys (<i>see page 169</i>) when replacing the toothed belt.</li> </ul>

**NOTE:** The gearbox (optional equipment), ball bearings, and linear ball bearings are lubricated for life.

## Maintaining the Toothed Belt

### Overview

Verify and replace the toothed belt periodically.

Replace the toothed belt according to the maintenance schedule (*see page 131*) or earlier if it shows signs of excessive wear.

When maintaining the toothed belt, note the following facts:

- If the axis is mounted tilted or vertically, verify that the toothed belt is unloaded (payload is removed) in order to verify the correct toothed belt tension. While the toothed belt is installed, you can measure the toothed belt tension only by vibration measurement (*see page 155*).
- The toothed belt tension must be so high that the toothed belt is tensioned even under maximum operating load.
- If the toothed belt tension is not high enough, this may lead to skipping. If the toothed belt tension is too high, this increases the load on the bearings and reduces the service life of the toothed belt.
- Due to pitch and rigidity tolerances of the toothed belt, the newly adjusted toothed belt tension may differ from the originally adjusted toothed belt tension.

## Maintaining the Motor (Optional Equipment)

### Overview

For information about maintaining the motor, record the motor reference on the type plate and refer to the corresponding motor manual.

## Maintaining the Gearbox (Optional Equipment)

### Overview

For information about maintaining the gearbox, record the gearbox reference on the type plate and refer to the corresponding gearbox manual.

## Cleaning

### Overview

Care must be taken with cleaning products as some active agents may have harmful effects on the material of the axis.

### ***NOTICE***

#### **CORROSION CAUSED BY CLEANING AGENTS**

- Perform a compatibility test in relation to the cleaning agent and the component affected before using a cleaning agent.
- Do not use alkaline detergent in the interior of the mechanics.
- Do not use any chloride-containing cleaning agents.
- Do not use any sulphuric acid containing detergent.

**Failure to follow these instructions can result in equipment damage.**

For more information about the material properties of the axis, refer to *Information About Increased Corrosion Resistance* ([see page 42](#)) or contact your local Schneider Electric service representative.

### Cleaning the Axis

The axis must be inspected, large particles and dirt must be removed from the surface, and the axis must be cleaned at regular intervals ([see page 131](#)). When cleaning the axis, note the following:

- Do not use compressed air for cleaning.
- The anodized surface only has a limited resistance to alkaline cleaning agents. Therefore, use only neutral cleaning agents for cleaning.
- Use only damp, soft, and lint-free cleaning cloths to wipe the surface.

**NOTE:** Depending on the operating conditions and requirements, verifying and cleaning may be necessary on a more frequent basis.

## Repairing After Collisions

### Overview

Components of the axis may be damaged or destroyed as a result of a collision.

**NOTE:** After a collision, inspect the mechanical drive elements, the linear ball bearing guide, and the elastomer coupling for damage according to the instructions in the following sections.

### WARNING

#### FALLING OR EJECTED PARTS

- Thoroughly inspect all components of the axis and all components attached to the axis, including the motor and the gearbox, for damage after a collision.
- Do not use the axis if any of the components are damaged or suspected to be damaged.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Verifying the Components

Step	Action
1	Verify the components for completeness. If any components are missing, locate the same and remove them from the surrounding machinery.
2	Replace damaged or missing components.

### Verifying the Gear Rack (CAR40)

Step	Action
1	Verify the gear rack by a visual inspection for damaged teeth.

**NOTE:** A damaged gear rack must be replaced. Contact your local Schneider Electric service representative.

### Verifying the Toothed Belt (CAR41 / CAR42 / CAR43 / CAR44)

Step	Action
1	Verify the toothed belt by a visual inspection for damaged teeth and abrasion. To perform a visual inspection, maybe it is necessary to <i>remove the toothed belt (see page 157)</i> .

**NOTE:** A damaged toothed belt must be replaced. For detailed information, refer to *Replacing the Toothed Belt (see page 155)*.

### Verifying the Guide Rods, Linear Ball Bearings and Slide Bearings (CAR40)

Step	Action
1	Inspect the guide rods, linear ball bearings, and slide bearings for backlash. If the guide rods, linear ball bearings and slide bearings have backlash, they are appreciably worn.
2	Manually move the end plate and inspect for irregular noise or vibration. Irregular noise or vibration indicates damage of the linear guide. Damage causes rapid wear.

**NOTE:** Worn-out parts or a damaged linear guide must be replaced. Contact your local Schneider Electric service representative.

### Verifying the Guide Rods and Linear Ball Bearings (CAR41, CAR42, CAR43, CAR44)

Step	Action
1	Inspect the guide rods and linear ball bearings for backlash. If the guide rods or linear ball bearings have backlash, they are appreciably worn.
2	Remove the toothed belt. ( <i>see page 157</i> )
3	Manually move the end plate (without toothed belt) and inspect for irregular noise or vibration. Irregular noise or vibration indicates a deformation in the linear guide. Deformation causes rapid wear.

**NOTE:** Worn-out parts or a damaged linear guide must be replaced. Contact your local Schneider Electric service representative.

### Verifying the Elastomer Coupling (Optional Equipment)

Step	Action
1	Remove the motor and/or the gearbox as described in <i>Replacing the Motor and/or Gearbox (see page 143)</i> .
2	Verify the elastomer coupling by a visual inspection for damage.

**NOTE:** A damaged elastomer coupling must be replaced. For detailed information, refer to *Replacing the Elastomer Coupling (see page 149)*.

### Other Repairs

In case of other repairs beyond those described in the present document, contact your local Schneider Electric service representative.

# Section 6.2

## Replacing Parts

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
Information About Replacing Parts	139
Replacing the Entire Axis	141
Replacing the Sensors (Optional Equipment)	142
Replacing the Motor and/or Gearbox (Optional Equipment)	143
Replacing the Elastomer Coupling (Optional Equipment)	149
Replacing the Shaft Extension (Optional Equipment)	153
Replacing the Toothed Belt	155
Replacing the Toothed Belt Pulley	164
Replacing the Deflection Pulleys	169

## Information About Replacing Parts

### Overview

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair, and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers, or installing or removing any accessories, hardware, cables, or wires.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
- Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42.4 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the end plates to prevent rotation of the drive system prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating the axis and any associated equipment.

**Failure to follow these instructions will result in death or serious injury.**

The motor, the gearbox, and the adaptation materials of the axis may exceed 70 °C (158 °F) when subjected to heavy loads and/or high performance during operation.

### WARNING

#### HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

For further information, refer to *Hot Surfaces* ([see page 23](#)).

## Replacing the Entire Axis

### Replacing the Entire Axis

Step	Action
1	Remove the axis from the frame.
2	Mount the new axis as described in <i>Mounting the Axis</i> ( <a href="#">see page 90</a> ).
3	Verify the installation ( <a href="#">see page 98</a> ) and start up ( <a href="#">see page 100</a> ).

## Replacing the Sensors (Optional Equipment)

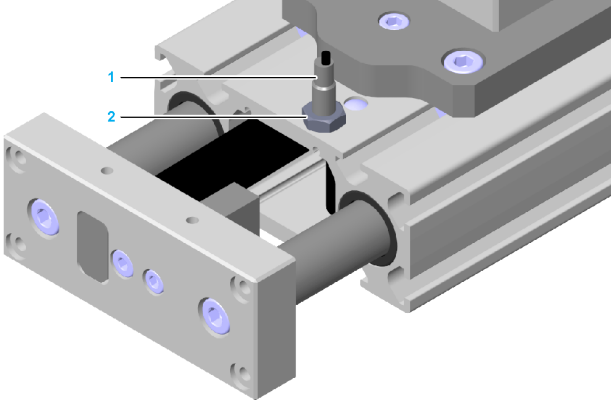
### Prerequisites

You need the following tools to remove the sensors:

- Open-end wrench SW 13 (1/2 AF)

For suitable parts, refer to *Replacement Equipment and Accessories* (see page 179).

### Replacing the Sensors

Step	Action
1	Disconnect the sensor (1). 
2	Loosen the sensor nut (2).
3	Remove the sensor from the fastening thread.
4	Mount the new sensor as described in <i>Mounting the Sensors</i> (see page 123).
5	Connect the new sensor. For further information, refer to <i>Technical Data of the Sensors</i> (see page 121).

## Replacing the Motor and/or Gearbox (Optional Equipment)

### Overview

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair, and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

The optional motor or gearbox of the Lexium CAR4-Series is coupled by using a preloaded elastomer coupling.

**NOTE:** Before dismounting, note the mounting orientation of the motor and/or gearbox to remount the motor and/or gearbox in the same orientation.

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers, or installing or removing any accessories, hardware, cables, or wires.
- Place a "Do Not Turn On" or equivalent hazard label on all power switches and lock them in the non-energized position.
- Wait 15 minutes to allow the residual energy of the DC bus capacitors to discharge.
- Measure the voltage on the DC bus with a properly rated voltage sensing device and verify that the voltage is less than 42.4 Vdc.
- Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Block the end plates to prevent rotation of the drive system prior to performing any type of work on the drive system.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating the axis and any associated equipment.

**Failure to follow these instructions will result in death or serious injury.**

### WARNING

#### UNINTENDED MOVEMENTS DUE TO DISMOUNTING

Secure the moving parts of the axis mounted in a vertical or tilted position against unexpected movements.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Prerequisites

You need the following tools to remove the motor and/or gearbox:

- Set of hex keys

**NOTE:** Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

### Procedure Overview

Perform the following procedures to replace the motor and/or gearbox:

- Preparing the replacement of the motor and/or gearbox ([see page 144](#))
- Replacing the motor only ([see page 144](#))
- Replacing the gearbox only ([see page 146](#))
- Removing the motor from the gearbox ([see page 148](#))

### Preparing the Replacement of the Motor and/or Gearbox

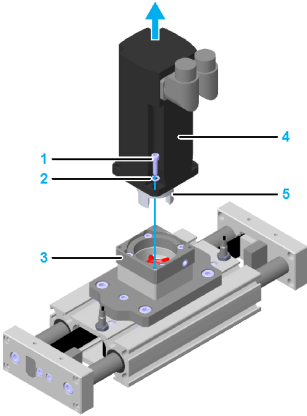
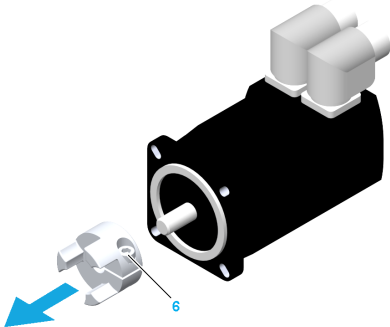
Step	Action
1	If the axis is mounted tilted or vertically, remove the payload or support the payload and the end plates to keep it from falling.

### Replacing the Motor Only

If possible, position the axis so that the back side of the motor points upwards during replacement.

**NOTE:** If the axis is mounted vertically or tilted, secure the end plates and the guide rods to keep them from falling.

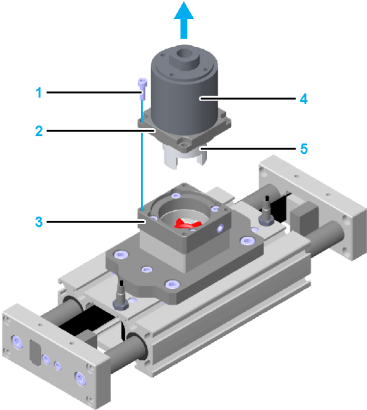
Step	Action
1	Remove the cables of the motor.

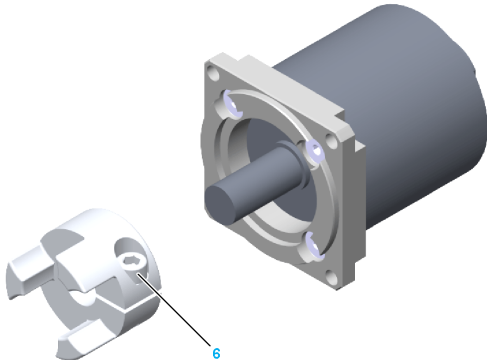
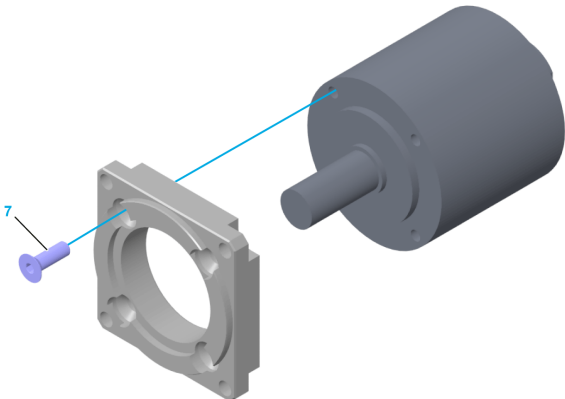
Step	Action
2	<p>Secure the motor (4) to keep it from falling and remove the four screws (1) and the washers (2) by means of which the motor is mounted to the motor adapter plate (3).</p> 
3	<p>Pull the gearbox with the mounted flange plate and clamping hub (5) carefully upwards off the motor adapter plate.</p> <p><b>NOTE:</b> This requires a greater force of up to 450 N (101.16 lbf).</p>
4	<p>Loosen the clamping screw (6) on the clamping hub and remove the clamping hub carefully from the motor.</p> 
5	<p>Mount the new motor as described in <i>Mounting the Motor and/or Gearbox</i> (<a href="#">see page 108</a>).</p> <p><b>NOTE:</b> If the shaft dimensions of the new motor differ from the shaft dimensions of the previous motor, use a new appropriate clamping hub. For further information about appropriate clamping hubs, refer to <i>Replacement Equipment and Accessories</i> (<a href="#">see page 177</a>).</p>

### Replacing the Gearbox Only

If possible, position the axis so that the motor mounting side of the gearbox points upwards during replacement.

**NOTE:** If the axis is mounted vertically or tilted, secure the end plates and the guide rods to keep them from falling.

Step	Action
1	If a motor is mounted, remove the motor from the gearbox. For further information about removing the motor, refer to the corresponding gearbox manual.
2	Secure the gearbox (4) to keep it from falling and remove the four screws (1) by means of which the flange plate (2) is mounted to the motor adapter plate (3). 
3	Pull the flange plate with mounted gearbox and clamping hub (5) carefully upwards off the motor adapter plate. <b>NOTE:</b> This requires a greater force of up to 450 N (101.16 lbf).

Step	Action
4	<p>Loosen the clamping screw (6) on the clamping hub and remove the clamping hub carefully from the gearbox.</p> 
5	<p>If the new gearbox does not have its own flange, remove the four screws (7) on the flange plate and then remove the flange plate.</p> 
6	<p>Mount the new gearbox as described in <i>Mounting the Motor and/or Gearbox</i> (<a href="#">see page 108</a>).</p> <p><b>NOTE:</b> If the shaft dimensions of the new gearbox differ from the shaft dimensions of the previous gearbox, use a new appropriate clamping hub. For further information about appropriate clamping hubs, refer to <i>Replacement Equipment and Accessories</i> (<a href="#">see page 177</a>).</p>

### Removing the Motor from the Gearbox

For information about removing the motor from the gearbox, refer to the corresponding gearbox manual.

## Replacing the Elastomer Coupling (Optional Equipment)

### Overview

Replacing the elastomer coupling can cause unintended movements.

### WARNING

#### UNINTENDED MOVEMENTS DUE TO DISMOUNTING

Secure the moving parts of the axis mounted in a vertical or tilted position against unintended movements.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Prerequisites

You need the following tools to remove the elastomer coupling:

- Set of hex keys
- Soft-faced hammer

**NOTE:** Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

### Procedure Overview

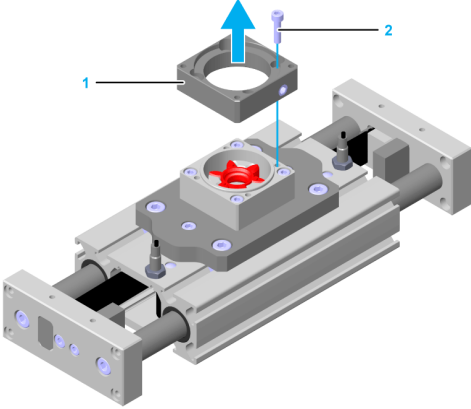
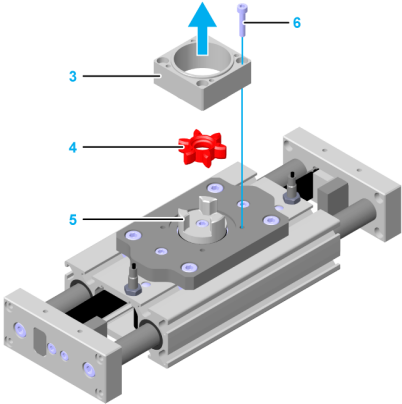
Perform the following procedures to replace the motor and/or gearbox:

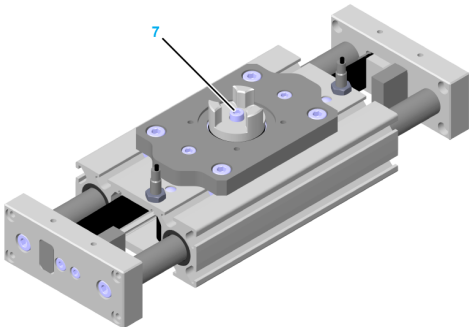
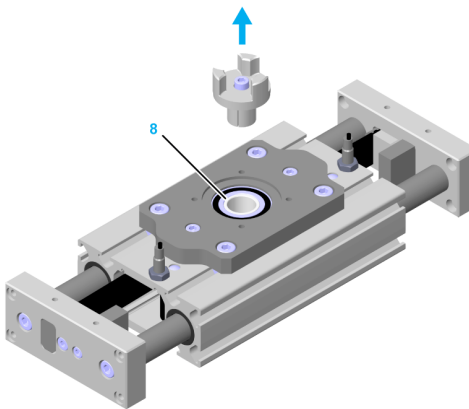
- Preparing the replacement of the elastomer coupling ([see page 149](#))
- Replacing the elastomer coupling ([see page 150](#))

### Preparing the Replacement of the Elastomer Coupling

Step	Action
1	If the axis is mounted tilted or vertically, remove the payload or support the payload and the end plates to keep it from falling.
2	Remove the motor and/or the gearbox as described under <i>Replacing the Motor and/or Gearbox</i> ( <a href="#">see page 143</a> ).

Replacing the Elastomer Coupling

Step	Action
1	Remove the four screws (2) at the motor adapter plate (1). 
2	Remove the motor adapter plate.
3	Remove the four screws (6) at the coupling housing (3). 
4	Remove the coupling housing.
5	Remove the elastomer spider (4) from the expanding hub (5).

Step	Action
6	<p>Loosen the screw (7) on the expanding hub.</p>  <p><b>NOTE:</b> As long as the toothed belt is installed correctly and the end plate is at the end position, the toothed belt pulley does not rotate further. For detailed information about toothed belt installation, refer to <i>Mounting the Toothed Belt</i> (<a href="#">see page 160</a>).</p>
7	<p>Carefully tap on the screw head with a soft-faced hammer to loosen the cone of the expanding hub.</p> <p><b>NOTE:</b> If you cannot reach the screw head, use a hex key as extension and tap carefully on the hex key.</p>
8	<p>For CAR40: Pull the expanding hub carefully out of the hollow shaft of the gear rack pulley. For CAR41 / CAR42 / CAR43 / CAR44: Pull the expanding hub carefully out of the hollow shaft of the toothed belt pulley (8).</p>  <p><b>NOTE:</b> This may require a considerable force.</p>

Step	Action
9	Mount the new elastomer coupling as well as the motor or and/or gearbox as described in <i>Mounting the Motor and/or Gearbox (see page 108)</i> .

## Replacing the Shaft Extension (Optional Equipment)

### Prerequisites

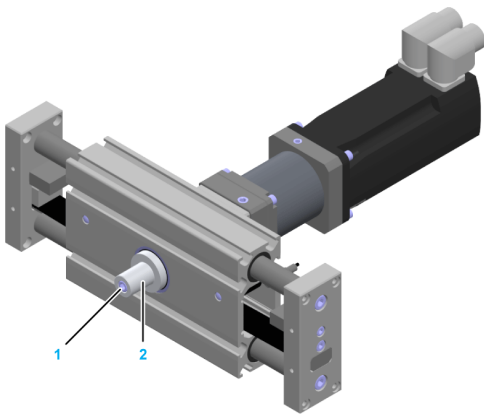
You need the following tools to remove the shaft extension:

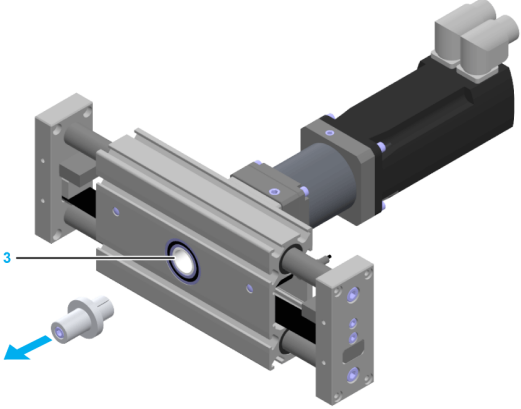
- Set of hex keys
- Soft-faced hammer

**NOTE:** Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

### Replacing the Shaft Extension

Step	Action
1	<p>Loosen the screw (1) at the shaft extension (2).</p>  <p><b>NOTE:</b> As long as the toothed belt is installed correctly and the end plate is at the end position, the toothed belt pulley does not rotate further. For detailed information about toothed belt installation, refer to <i>Mounting the Toothed Belt</i> (<a href="#">see page 160</a>).</p>
2	<p>Carefully tap on the screw head with a soft-faced hammer to loosen the cone of the expanding hub.</p> <p><b>NOTE:</b> If you cannot reach the screw head, use a hex key as extension and tap carefully on the hex key.</p>

Step	Action
3	<p>For CAR40: Pull the shaft extension carefully out of the hollow shaft of the gear rack pulley. For CAR41 / CAR42 / CAR43 / CAR44: Pull the shaft extension carefully out of the hollow shaft of the toothed belt pulley (3).</p> <p><b>NOTE:</b> This may require a considerable force.</p> 
4	<p>Mount the new shaft extension (<i>see page 125</i>).</p>

## Replacing the Toothed Belt

### Overview

Replacing the toothed belt can cause unintended movements.

### WARNING

#### UNINTENDED MOVEMENTS DUE TO DISMOUNTING

Secure the moving parts of the axis mounted in a vertical or tilted position against unintended movements.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Prerequisites

You need the following tools to replace the toothed belt:

- Set of hex keys
- Soft-faced hammer
- Torque wrench with a set of hexagon sockets
- Medium strength securing adhesive

**NOTE:** Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

To adjust the toothed belt tension, you need a:

- Caliper gauge (for distance measurement) or
- Belt tension meter (for vibration measurement)

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

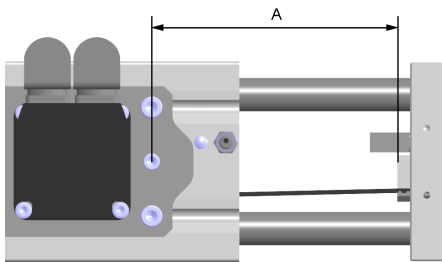
### Distance and Vibration Measurement

For adjusting the toothed belt tension, you can use either distance measurement or vibration measurement:

- Distance measurement  
The position of the toothed belt tensioner is measured with a caliper gauge. The position of the toothed belt tensioner is used to preload the toothed belt.
- Vibration measurement  
To restore the precise factory-adjusted toothed belt tension, use a belt tension meter for vibration measurement. The factory-adjusted toothed belt tension is presented in the following table. The measured preload values  $F_V$  depend on the selectable measuring distance A and the weight of the respective toothed belt.

The measuring distance A is measured:

- From the outlet of the toothed belt at the toothed belt tensioner
- To the middle of the next deflection pulley



Description	Parameter	Unit	Value			
			CAR41	CAR42	CAR43	CAR44
Toothed belt type	–	–	T5	AT5	AT5	AT5
Width	–	mm (in)	10 (0.39)	20 (0.79)	25 (0.98)	32 (1.26)
Pitch	–	mm (in)	5 (0.197)	5 (0.197)	5 (0.197)	5 (0.197)
Weight	–	g/m (lb/ft)	20 (0.0134)	64 (0.043)	80 (0.054)	105 (0.07)
Toothed belt tension	$F_v$	N (lbf)	105...115 (23.6...26)	325...360 (73...81)	420...465 (94...105)	525...580 (118...130)

For any questions concerning the vibration measurement, contact your local Schneider Electric service representative.

### Procedure Overview

Perform the following procedures to replace the toothed belt:

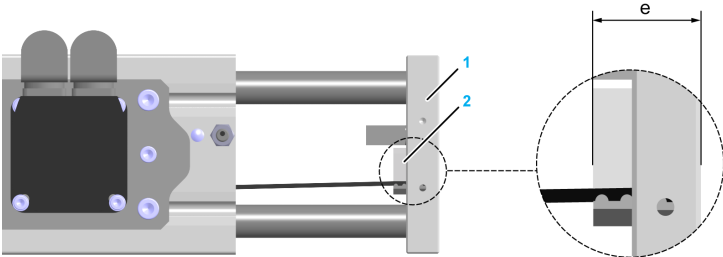
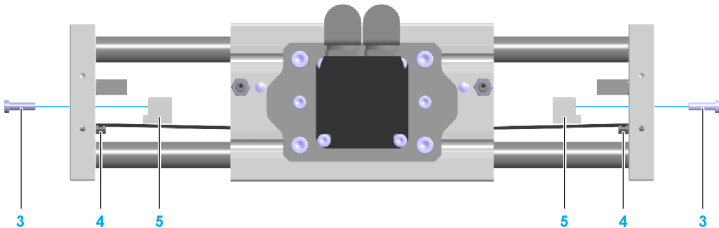
- Preparing the replacement of the toothed belt ([see page 156](#))
- Removing the toothed belt ([see page 157](#))
- Cutting the new toothed belt to length ([see page 158](#))
- Preparing the mounting of the toothed belt ([see page 159](#))
- Mounting the toothed belt ([see page 160](#))
- Mounting the toothed belt tensioners ([see page 163](#))
- Testing movements ([see page 163](#))

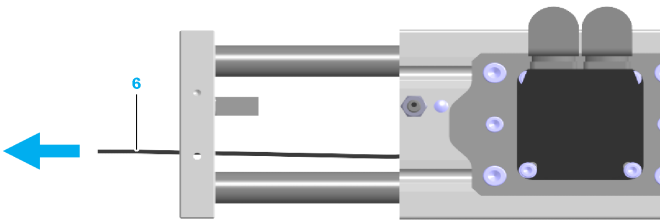
### Preparing the Replacement of the Toothed Belt

Step	Action
1	If the axis is mounted tilted or vertically, remove the payload or support the payload and the end plates to keep it from falling.

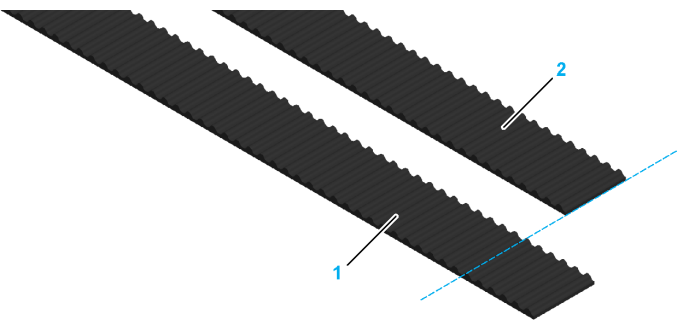
Removing the Toothed Belt

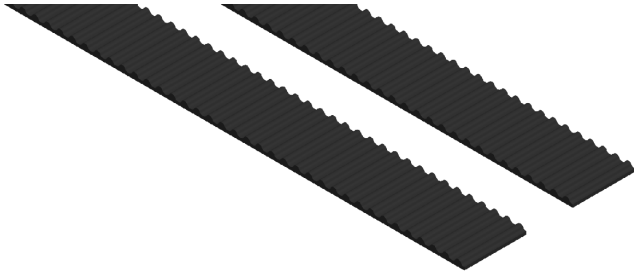
To remove the toothed belt, perform the tasks described below at both end plates.

Step	Action
1	Move the axis body into the center position.
2	<p>When using vibration measurement, proceed with step 3.</p> <p>When using distance measurement, perform the following step:</p> <p>Measure the position of the toothed belt tensioner (2) with a caliper gauge at both end plates (1) and note the values. The distance <math>e</math> has to be measured from the top of the toothed belt tensioner to the surface of the end plate.</p> 
3	<p>Remove the tensioning screws (3) and the toothed belt tensioners. Each toothed belt tensioner consists of a counter clamp (5) and a clamp profile (4).</p>  <p><b>NOTE:</b> Removing the toothed belt tensioners may require slight taps on the clamp profiles with a soft-faced hammer.</p>

Step	Action
4	<p>Remove the toothed belt (6).</p>  <p><b>NOTE:</b> If you want to replace the deflection pulleys only, omit the following step.</p>
5	<p>For CAR41: Remove the axis body adapter plate as described in <i>Removing the Toothed Belt Pulley</i> (<a href="#">see page 165</a>).</p> <p>For CAR42 / CAR43 / CAR44: Remove the toothed belt pulley (<a href="#">see page 165</a>).</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"><li>• For an easier replacement of the toothed belt, dismount the motor and/or the gearbox.</li><li>• When replacing the toothed belt only, you do not have to remove the shaft extension.</li></ul>

Cutting the New Toothed Belt to Length

Step	Action
1	<p>Place the new toothed belt (1) and the previous toothed belt (2) next to each other. Align the teeth with each other.</p> 

Step	Action
2	<p>Cut the new toothed belt to the same length as the previous toothed belt.</p>  <p><b>NOTE:</b> The number of teeth must be the same.</p>

### Preparing the Mounting of the Toothed Belt

Step	Action
1	Clean all parts.
2	Inspect all parts for damage.

**NOTE:** Polluted or damaged parts may cause run-out which has an adverse effect on the service life of the axis.

## ***NOTICE***

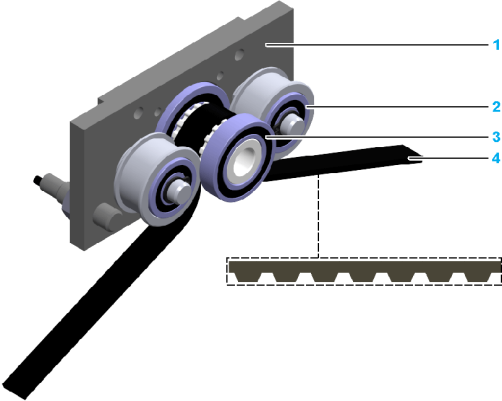
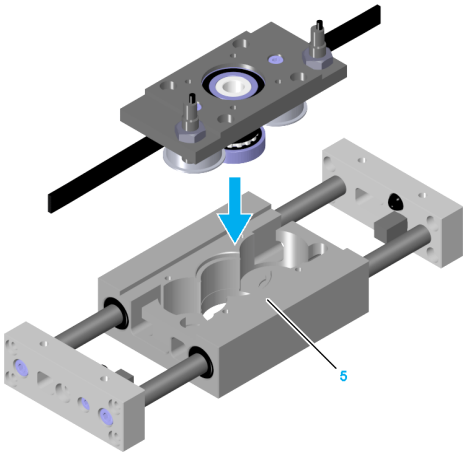
### **UNINTENDED EQUIPMENT OPERATION**

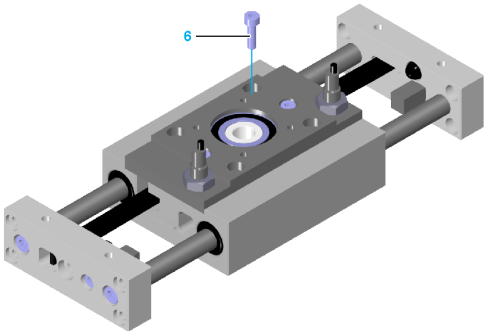
- Replace any damaged parts immediately.
- Clean all parts before assembly and use.

**Failure to follow these instructions can result in equipment damage.**

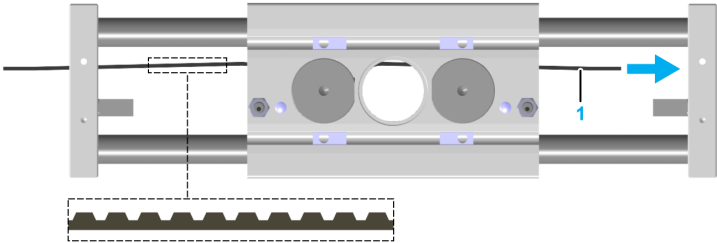
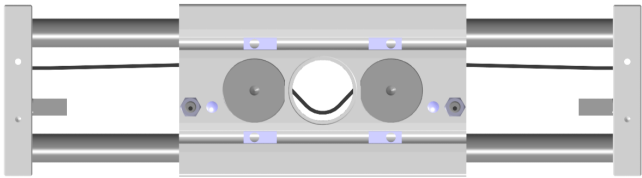
**Mounting the Toothed Belt**

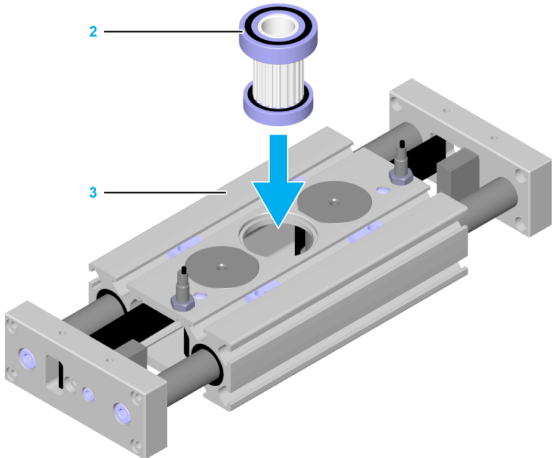
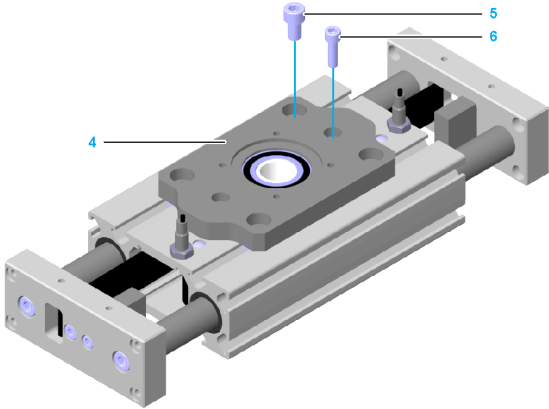
Perform the following steps to mount the toothed belt for CAR41:

Step	Action
1	<p>Insert the toothed belt (4) to the premounted toothed belt pulley (3) and deflection pulleys (2) at the axis body adapter plate (1). Verify the orientation of the teeth.</p> 
2	<p>Insert the axis body adapter plate, complete with the toothed belt, the toothed belt pulley, and the deflection pulleys carefully onto the axis body (5). Verify that the bearing bolts fit.</p> 
3	<p>Align the axis body adapter plate parallel to the axis body. Verify that there is no gap between the axis body adapter plate and the axis body so that the installation surface is in full contact with the mounting surface of the axis.</p>

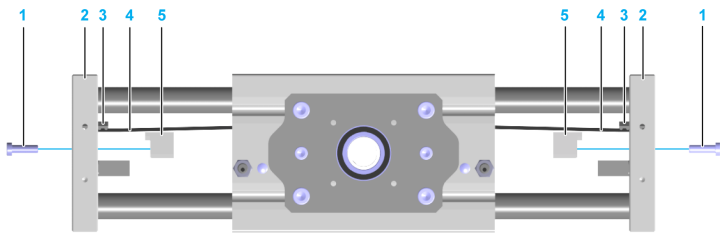
Step	Action
4	<p>Mount the axis body adapter plate to the axis body with the four outer screws (6). Use the standard tightening torque (<i>see page 89</i>).</p> 

Perform the following steps to mount the toothed belt for CAR42 / CAR43 / CAR44:

Step	Action
1	<p>Insert the toothed belt (1). Verify the orientation of the teeth.</p> 
2	<p>Compress the toothed belt so that the toothed belt pulley can be inserted.</p> 

Step	Action
3	<p>Insert the toothed belt pulley (2) carefully into the axis body (3).</p> 
4	<p>Align the axis body adapter plate (4) parallel to the axis body. Verify that there is no gap between the axis body adapter plate and the axis body so that the installation surface is in full contact with the mounting surface of the axis.</p> 
5	<p>Mount the axis body adapter plate to the axis body with the four outer screws (5). Use the standard tightening torque (<i>see page 89</i>).</p>
6	<p>Insert and tighten the two screws in the middle (6) to fasten the deflection pulleys. Use the standard tightening torque (<i>see page 89</i>).</p>

## Mounting the Toothed Belt Tensioners

Step	Action
1	<p>Insert the ends of the toothed belt (4) succinctly into the clamp profiles (3).</p> 
2	Insert both clamp profiles and the counter clamps (5) into the end plates (2).
3	Apply a thin layer of medium strength securing adhesive on the tensioning screws (1) and insert the screws through the end plates into the toothed belt clamps.
4	<p>Tension the toothed belt by adjusting the tensioning screws at both end plates. Use either distance or vibration measurement:</p> <ul style="list-style-type: none"> <li>• With distance measurement: tighten the tensioning screws with the values noted in <i>Removing the Toothed Belt</i> (<a href="#">see page 157</a>).</li> <li>• With vibration measurement: alternate the tightening of the tensioning screws until the respective toothed belt tension is reached (<a href="#">see page 155</a>).</li> </ul>
5	If applicable, mount the elastomer coupling ( <a href="#">see page 112</a> ).
6	If applicable, mount the motor and/or gearbox ( <a href="#">see page 108</a> ).

## Testing Movements

Step	Action
1	Run initial tests at reduced velocity.
2	<p>Verify the toothed belt tension.</p> <p>For details, refer to <i>Maintaining the Toothed Belt</i> (<a href="#">see page 133</a>).</p>
3	Mount the payload.

# Replacing the Toothed Belt Pulley

## Overview

Replacing the toothed belt pulley can cause unintended movements.



## WARNING

### UNINTENDED MOVEMENTS DUE TO DISMOUNTING

Secure the moving parts of the axis mounted in a vertical or tilted position against unintended movements.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Prerequisites

You need the following tools to replace the toothed belt pulley:

- Set of hex keys

**NOTE:** Do not use ball head hex keys. Excessive torque may cause, the ball head to tear off. A torn off ball head is difficult to remove from the screw.

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

## Procedure Overview

Perform the following procedures to replace the toothed belt pulley:

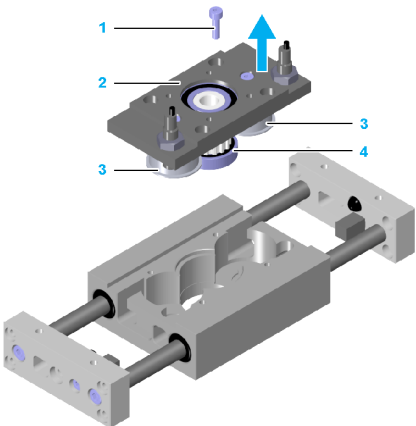
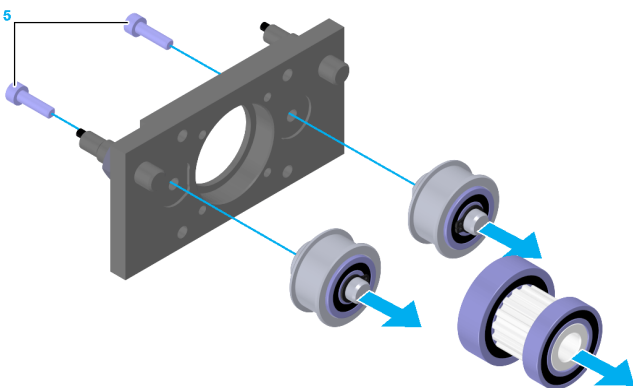
- Preparing the replacement of the toothed belt pulley ([see page 164](#))
- Removing the toothed belt pulley ([see page 165](#))
- Preparing the mounting of the toothed belt pulley ([see page 167](#))
- Mounting the toothed belt pulley ([see page 167](#))

## Preparing the Replacement of the Toothed Belt Pulley

Step	Action
1	Remove the following components depending on the axis configuration: <ul style="list-style-type: none"><li>● Shaft extension (<a href="#">see page 153</a>)</li><li>● Motor and/or gearbox (<a href="#">see page 143</a>)</li><li>● Elastomer coupling (<a href="#">see page 149</a>)</li></ul>
2	Remove the toothed belt ( <a href="#">see page 157</a> ).

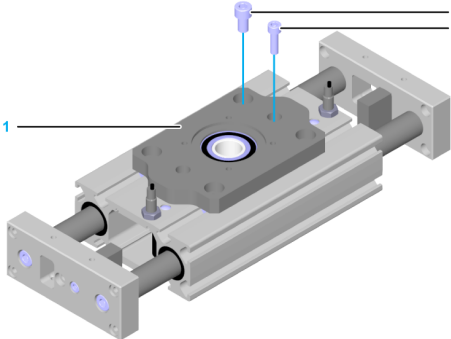
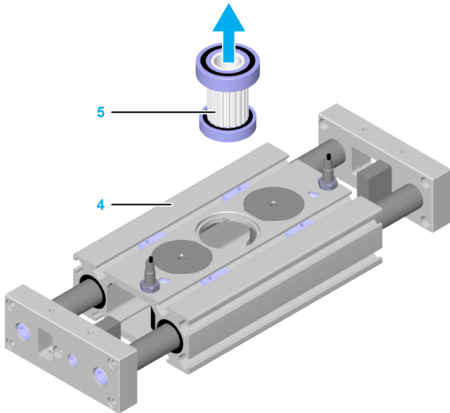
Removing the Toothed Belt Pulley

Perform the following steps to replace the toothed belt pulley of CAR41:

Step	Action
1	<p>Remove the four outer screws (1) at the axis body adapter plate (2).</p> 
2	<p>Remove the axis body adapter plate complete with the toothed belt pulley (4) and the two deflection pulleys (3) as a unit.</p> <p><b>NOTE:</b> If you want to replace the toothed belt only, omit the following steps.</p>
3	<p>Secure the deflection pulleys and the toothed belt pulley to keep it from falling and remove the two screws (5) in the middle at the axis body adapter plate.</p> 
4	<p>Remove the deflection pulleys.</p>

Step	Action
5	Remove the toothed belt pulley.

Perform the following steps to replace the toothed belt pulley of CAR42 / CAR43 / CAR44:

Step	Action
1	Remove the four outer screws (2) and the two screws in the middle (3) from the axis body adapter plate (1). 
2	Remove the axis body adapter plate.
3	Remove the toothed belt pulley with bearings (5) carefully from the axis body (4). 

Preparing the Mounting of the Toothed Belt Pulley

Step	Action
1	Clean all parts.
2	Inspect all parts for damage.

**NOTE:** Polluted or damaged parts may cause run-out which has an adverse effect on the service life of the axis.

***NOTICE***

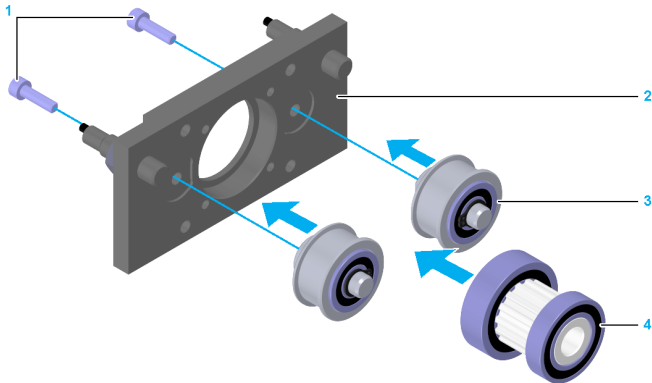
**UNINTENDED EQUIPMENT OPERATION**

- Replace any damaged parts immediately.
- Clean all parts before assembly and use.

**Failure to follow these instructions can result in equipment damage.**

Mounting the Toothed Belt Pulley

Perform the following steps to replace the toothed belt pulley of CAR41:

Step	Action
1	Clean both bearing seats in the axis body and, if necessary, clean the axis body.
2	Insert the new toothed belt pulley (4) carefully into the axis body adapter plate (2).
	
3	Fasten the deflection pulleys (3) to the axis body adapter plate with the two screws (1) in the middle. Use a low tightening torque to allow the pulleys to move easily.
4	Mount the toothed belt and the axis body adapter plate ( <a href="#">see page 160</a> ).

Step	Action
5	Fasten the two deflection pulleys to the axis body adapter plate with the two screws in the middle. Use the standard tightening torque ( <i>see page 89</i> ).
6	Mount the toothed belt tensioners ( <i>see page 163</i> ).
7	If applicable, mount the shaft extension ( <i>see page 125</i> ).

Perform the following steps to replace the toothed belt pulley of CAR42 / CAR43 / CAR44:

Step	Action
1	Clean both bearing seats in the axis body and, if necessary, clean the axis body.
2	Mount the toothed belt, the new toothed belt pulley and the axis body adapter plate ( <i>see page 160</i> ).
3	If applicable, mount the shaft extension ( <i>see page 125</i> ).
4	Mount the toothed belt tensioners ( <i>see page 163</i> ).
5	If applicable, mount the motor and/or gearbox ( <i>see page 108</i> ).

## Replacing the Deflection Pulleys

### Overview

Replacing the deflection pulleys can cause unintended movements.

### WARNING

#### UNINTENDED MOVEMENTS DUE TO DISMOUNTING

Secure the moving parts of the axis mounted in a vertical or tilted position against unintended movements.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Prerequisites

You need the following tools to replace the deflection pulleys:

- Set of hex keys
- Torque wrench with a set of hexagon sockets

**NOTE:** Do not use ball head hex keys. Excessive torque may cause, the ball head to tear off. A torn off ball head is difficult to remove from the screw.

For suitable parts, refer to *Replacement Equipment and Accessories* ([see page 179](#)).

### Procedure Overview

Perform the following procedures to replace the deflection pulleys:

- Preparing the replacement of the deflections pulleys ([see page 169](#))
- Replacing the deflection pulleys ([see page 170](#))

### Preparing the Replacement of the Deflection Pulleys

Step	Action
1	Remove the toothed belt ( <a href="#">see page 157</a> ). <b>NOTE:</b> When replacing the deflection pulleys only, you do not have to remove the shaft extension.
2	Remove the motor and/or gearbox as described in <i>Replacing the Motor and/or Gearbox</i> ( <a href="#">see page 143</a> ).
3	Clean all parts.
4	Inspect all parts for damage.

**NOTE:** Polluted or damaged parts may cause run-out which has an adverse effect on the service life of the axis.

**NOTICE**

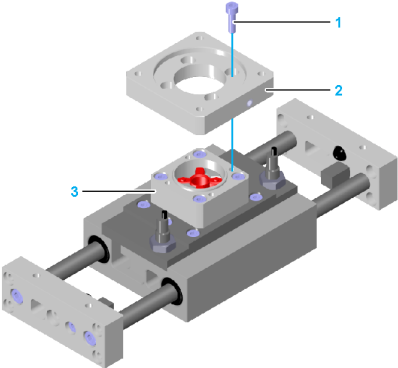
**UNINTENDED EQUIPMENT OPERATION**

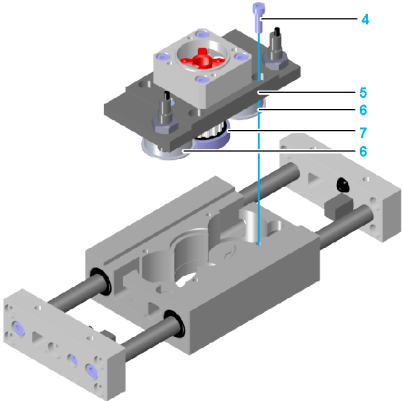
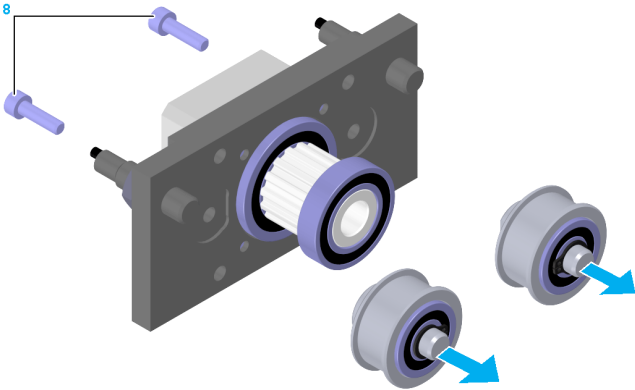
- Replace any damaged parts immediately.
- Clean all parts before assembly and use.

**Failure to follow these instructions can result in equipment damage.**

**Replacing the Deflection Pulleys**

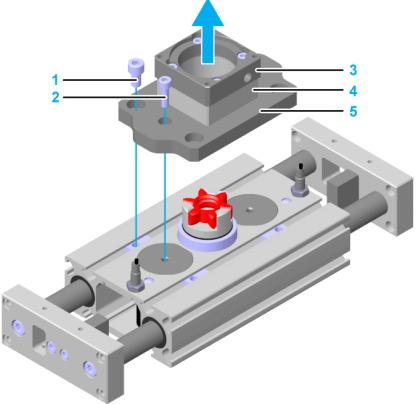
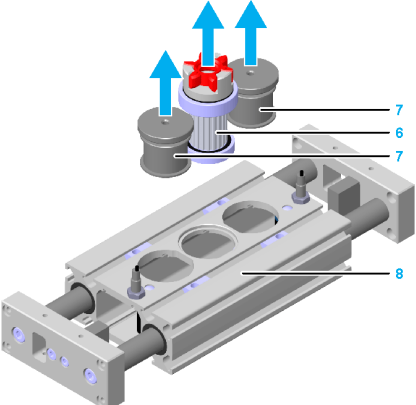
Perform the following steps to replace the deflection pulley of the CAR41:

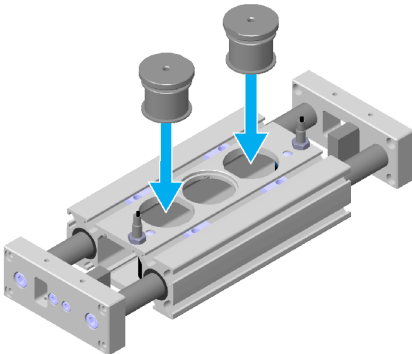
Step	Action
1	Remove the four outer screws (1) on the motor adapter plate (2).
	
2	Remove the motor adapter plate (2) from the coupling housing (3).

Step	Action
3	<p>Remove the four outer screws (4) on the axis body adapter plate (5).</p> 
4	<p>Remove the axis body adapter plate complete with the toothed belt pulley (7), the two deflection pulleys (6) and the coupling housing as a unit.</p>
5	<p>Remove the two screws (8) in the middle at the axis body adapter plate.</p> <p><b>NOTE:</b> Secure the deflection pulleys and the toothed belt pulley to keep it from falling.</p> 
6	<p>Remove the deflection pulleys.</p>
7	<p>Insert the new deflection pulleys carefully into the axis body adapter plate.</p>
8	<p>Mount the deflection pulleys to the axis body adapter plate with the two screws in the middle. Use a low tightening torque to allow the pulleys to move easily.</p>

Step	Action
9	Mount the toothed belt and the axis body adapter plate ( <i>see page 160</i> ).
10	If applicable, mount the motor and/or gearbox ( <i>see page 108</i> ).

Perform the following steps to replace the deflection pulleys of CAR42 / CAR43 / CAR44:

Step	Action
1	<p>Remove the four outer screws (1) and the two screws in the middle (2) at the axis body adapter plate (5).</p> 
2	<p>Remove the axis body adapter plate with the coupling housing (4) and the motor adapter plate (3) as a unit.</p>
3	<p>Remove the toothed belt pulley (6) and the two deflection pulleys (7).</p> 

Step	Action
4	Clean all bearing seats in the axis body (8) and, if necessary, clean the axis body.
5	Insert the two new deflection pulleys into the axis body. Verify that the deflection pulleys and the axis body are plane. 
6	Mount the toothed belt and the axis body adapter plate ( <i>see page 160</i> ).
7	If applicable, mount the motor or gearbox ( <i>see page 108</i> ).

# Section 6.3

## Lubrication

---

**What Is in This Section?**

This section contains the following topics:

Topic	Page
Information About Lubrication	175
Lubricating the Lexium CAR4-Series	176

## Information About Lubrication

### Overview

Lubricant is consumed continuously during operation of the axis. The axis must be lubricated at regular intervals. Incorrect lubricants may damage the axis.

The linear ball bearings of the Lexium CAR41, CAR42, CAR43, and CAR44 axis are lubricated for life. However, the guide rods must be lubricated slightly for freer movement and to avoid corrosion.

Insufficient lubrication or incorrect lubricants increase wear and reduce the service life.

### ***NOTICE***

#### **INOPERABLE AXIS**

Only use the specified type and amount of lubricant.

**Failure to follow these instructions can result in equipment damage.**

For lubricating the guide rods or the gear rack, only use Microlube GL 261 or alternative lubricants with label K1N-30 according to DIN 51825.

Note that a small amount of lubricants may leak. For further information, refer to *Emissions* ([see page 26](#)).

**NOTE:** Always wear protective clothing when working on the system. Repeated and prolonged exposure to the product can cause skin irritation, or sickness if ingested.

### **CAUTION**

#### **EYE OR SKIN CONTACT WITH, OR INGESTION OF, LUBRICANTS**

- In the event of contact with the eyes or the skin, wash the affected areas with plenty of water; if irritation persists, consult a doctor.
- In the event of swallowing, do not provoke vomiting or administer any products orally; consult a doctor as soon as possible.

**Failure to follow these instructions can result in injury or equipment damage.**

## Lubricating the Lexium CAR4-Series

### Lubricating the Linear Ball Bearings

The linear ball bearings are lubricated for life.

### Lubricating the Guide Rods

The guide rods must be lubricated slightly to avoid corrosion.

The maintenance intervals at normal ambient conditions (*see page 40*) are indicated in maintenance plan (*see page 131*). In severe conditions, for example, high velocity or adverse ambient conditions, shorten the indicated intervals accordingly.

For lubricating the guide rods, only use Microlube GL 261 or alternative lubricants with label K1N-30 according to DIN 51825.

**NOTE:** Clean the guide rods before lubrication.

### Lubricating the Gear Rack (CAR40)

The gear rack must be lubricated.

The maintenance intervals at normal ambient conditions (*see page 40*) are indicated in the maintenance plan (*see page 131*). Shorten the indicated intervals accordingly in severe conditions or at the following influencing factors:

- Dust and dirt particles
- High operating temperatures
- Heavy loads
- Heavy vibration
- Permanent short-distance positioning

For lubricating the gear rack, only use Microlube GL 261 or alternative lubricants with label K1N-30 according to DIN 51825.

**NOTE:** Clean the gear rack before lubrication.

### Lubricating the Slide Bearings (CAR40)

The slide bearings are lubricated for life.

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# Chapter 7

## Replacement Equipment and Accessories

---

**What Is in This Chapter?**

This chapter contains the following topics:

Topic	Page
Replacement Equipment and Accessories Inventory	178
Replacement Equipment and Accessories of the Lexium CAR4-Series	179

## Replacement Equipment and Accessories Inventory

### Overview

Keeping a stock of important components helps ensure the availability of your machine. Only replace the equipment and the accessories of the axis with identical types to help ensure compatibility.

Indicate the following information on the replacement equipment order, which can be found on the logistic type plate (*see page 38*):

Parameter	Example value	Position on type plate
Axis type	CAR42BCM0150A1NR / 2 1G 9 H5 9	First line
Identification number	0073000016016	Id.No.
Serial number	2700410441	Ser.No.

### Replacement Equipment and Accessories Stock for Lexium CAR4-Series

When using the axis in a production environment, consider keeping the following replacement equipment packages in stock:

Replacement equipment	Order number	Quantity for axis				
		CAR40	CAR41	CAR42	CAR43	CAR44
Sensor (optional equipment)	(1)	1	1	1	1	1
Expanding hub (optional equipment)	SPM3MFSC10A14	1	1	0	0	0
	SPM3MFSC20A20	0	0	1	1	1
Elastomer spider (optional equipment)	SPM3MFR09A018	1	1	0	0	0
	SPM3MFR14A034	0	0	1	1	1
Clamping hub (optional equipment)	(2)	1	1	1	1	1
Toothed belt	(3)	0	1	1	1	1
<p>(1) Depending on the contact. Refer to <i>Sensors</i> (<i>see page 185</i>) for the appropriate order number.</p> <p>(2) Depending on the axis type. Refer to <i>Clamping Hubs</i> (<i>see page 180</i>) for the appropriate order number and to the corresponding motor or gearbox manual for the proper diameter (ØD).</p> <p>(3) Depending on the axis type and the characteristic feature. For the appropriate order number, refer to <i>Toothed Belt</i> (<i>see page 187</i>).</p>						

**NOTE:** If there is an increased requirement on the availability of the axis, keep also an appropriate motor and/or gearbox in stock.

## Replacement Equipment and Accessories of the Lexium CAR4-Series


### Overview

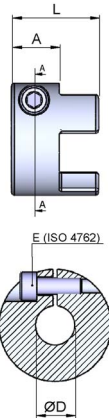
The following replacement equipment and accessories are listed:

- Clamping hubs (*see page 180*)
- Deflection pulleys (*see page 181*)
- Elastomer spiders (*see page 182*)
- Expanding hubs (*see page 183*)
- Gearboxes (*see page 183*)
- Locating dowels (*see page 184*)
- Motors (*see page 184*)
- Sensors (*see page 185*)
- Sensor extension cables (*see page 185*)
- Shaft extensions (*see page 186*)
- Slot nuts (*see page 186*)
- T-Slot covers (*see page 187*)
- Toothed belts (*see page 187*)
- Toothed belt pulleys (*see page 189*)

## Clamping Hubs


Order data

Representation	Description	Axis	ØD in mm (in) <sup>(1)</sup>	Order number
	For mounting attachments to the shaft of the motor or gearbox: <ul style="list-style-type: none"><li>1x clamping hub with tensioning screw</li></ul>	CAR40 CAR41	6.35 (0.25)	SPM3MFCC06A06
			8 (0.315)	SPM3MFCC08A06
			9 (0.354)	SPM3MFCC09A06
			10 (0.39)	SPM3MFCC10A06
			11 (0.43)	SPM3MFCC11A06
			12 (0.47)	SPM3MFCC12A06
			14 (0.55)	SPM3MFCC14A06
		CAR42 CAR43 CAR44	6.35 (0.25)	SPM3MFCC06A07
			8 (0.315)	SPM3MFCC08A07
			9 (0.354)	SPM3MFCC09A07
			10 (0.39)	SPM3MFCC10A07
			11 (0.43)	SPM3MFCC11A07
			12 (0.47)	SPM3MFCC12A07
			14 (0.55)	SPM3MFCC14A07
			16 (0.63)	SPM3MFCC16A07
			19 (0.75)	SPM3MFCC19A07
			20 (0.79)	SPM3MFCC20A07
(1) Refer to dimensional drawing (following table).				

Dimensional drawing	Parameter	Symbol	Unit	Axis	
				CAR40 CAR41	CAR42 CAR43 CAR44
	Moment of inertia	J	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	0.015 (0.0051)	0.15 (0.051)
	Tightening torque	–	Nm (lbf-in)	1.9 (16.8)	14 (14)
	Screw ISO 4762	E	–	M3	M6
	Dimension	A	mm (in)	11 (0.43)	17 (0.67)
		ØD		(1)	(1)
		L		22 (0.87)	31 (1.22)


## Deflection Pulleys

### Order data

Representation	Description	Axis	Characteristic feature	Order number
	For deflecting the toothed belt: • 2x deflection pulleys with bearing bolts, ball bearings, and circlips	CAR41	Standard	SPM3MDPR41S
			Increased corrosion resistance	SPM3MDPR41C
		CAR42	Standard	SPM3MDPR42S
			Increased corrosion resistance	SPM3MDPR42C
		CAR43	Standard	SPM3MDPR43S
			Increased corrosion resistance	SPM3MDPR43C
		CAR44	Standard	SPM3MDPR44S
			Increased corrosion resistance	SPM3MDPR44C

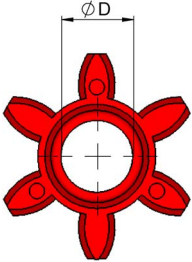
# Elastomer Spiders

## Order data

Representation	Description	Axis	Order number
	For decoupling the expanding hub and the clamping hub: • 1x elastomer spider, red	CAR40 CAR41	SPM3MFR09A018
		CAR42 CAR43 CAR44	SPM3MFR14A034

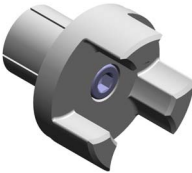
**NOTE:** Observe the maximum permissible drive torque of the axis. The elastomer spider can transmit a greater torque than the axis can accept.

## Dimensions

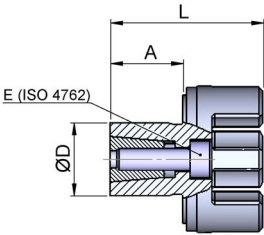
Dimensional drawing	Definition	Symbol	Unit	Axis	
				CAR40 CAR41	CAR42 CAR43 CAR44
	Moment of inertia	J	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	0.001 (0.00034)	0.013 (0.0044)
	Shore hardness	–	SH A	98	98
	Color	–	–	Red	Red
	Dimension	ØD	mm (in)	9 (0.354)	14 (0.55)

## Expanding Hubs

### Order data

Representation	Description	Axis	Order number
	For mounting the motor or gearbox: • 1x expanding hub with cone and tensioning screw	CAR40 CAR41	SPM3MFSC10A14
		CAR42 CAR43 CAR44	SPM3MFSC20A20

### Dimensions

Dimensional drawing	Definition	Symbol	Unit	Axis	
				CAR40 CAR41	CAR42 CAR43 CAR44
	Moment of inertia	J	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	0.009 (0.0031)	0.09 (0.031)
	Tightening torque	M <sub>t</sub>	Nm (lbf-in)	2.9 (25.7)	10 (89)
	Screw ISO 4762	E	–	M4	M6
	Dimension	A	mm (in)	14 (0.55)	20 (0.79)
		ØD		10 (0.39)	20 (0.79)
		L		30 (1.18)	42 (1.65)

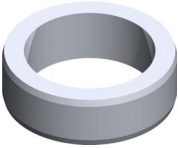
## Gearboxes

For detailed information about appropriate gearboxes for the axis, contact your local Schneider Electric service representative.

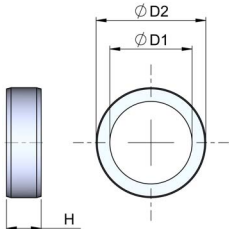
**NOTE:** If adaptation materials are necessary, they must be ordered with the gearbox.

Locating Dowels

Order data

Representation	Description	Axis	Order number
	For precise and reproducible mounting of the payload at the end plates: <ul style="list-style-type: none"><li>• 20x locating dowel</li></ul>	CAR40 CAR41	VW33MF020LD01
		CAR42 CAR43	VW33MF020LD02
		CAR44	VW33MF020LD03

Dimensions

Dimensional drawing	Definition	Symbol	Unit	Axis		
				CAR40 CAR41	CAR42 CAR43	CAR44
	Dimension	ØD1	mm (in)	5.5 (0.217)	6.6 (0.26)	9 (0.354)
		ØD2		8 h6 (0.315)	10 h6 (0.39)	12 h6 (0.47)
		H		3.8 (0.15)		


Motors

For detailed information about appropriate motors for the axis, contact your local Schneider Electric service representative.

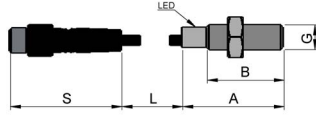
**NOTE:** If adaptation materials are necessary, they must be ordered with the motor.

## Sensors

### Order data

Representation	Description	Axis	Sensor contact type	Order number
	For detecting the end position of the axis: <ul style="list-style-type: none"> <li>1x sensor</li> <li>1x sensor nut</li> </ul>	All	PNP, normally closed	VW32SPBP01M8
			PNP, normally open	VW32SPAP01M8
			NPN, normally closed	VW32SNBP01M8
			NPN, normally open	VW32SNAP01M8

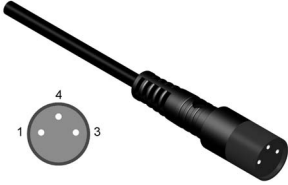
### Dimensions

Dimensional drawing	Definition	Symbol	Unit	Axis
				All
	Thread	G	–	M8
	Dimension	A	mm (in)	33 (1.3)
		B		25 (0.98)
		L		100 (3.9)
		S		36.5 (1.44)

**NOTE:** For the connection assignment, refer to *Technical Data of the Sensors* ([see page 121](#)).

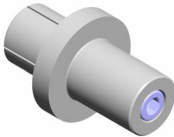
## Sensor Extension Cables

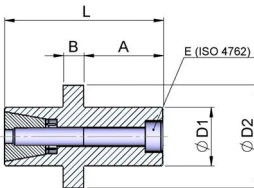
### Order data

Representation	Description	For sensor contact type	Length in m (ft)	Order number
	For extending the sensor cable: <ul style="list-style-type: none"> <li>1x sensor extension cable</li> </ul> Suitable for energy chain applications; sensor side end 3-pin M8 circular connector, second cable end is open.	PNP and NPN normally closed / PNP and NPN normally open	5 (16.4)	VW32SBCBGA050
			10 (33)	VW32SBCBGA100
			20 (66)	VW32SBCBGA200

## Shaft Extensions

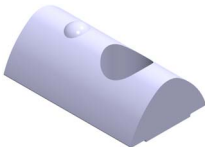
Order data

Representation	Description	Axis	Order number
	For coupling external components, for example, an external encoder: <ul style="list-style-type: none"> <li>1x shaft extension with cone and tensioning screw</li> </ul>	CAR40 CAR41	VW33MF1S12A12
		CAR42 CAR43 CAR44	VW33MF1S27A20

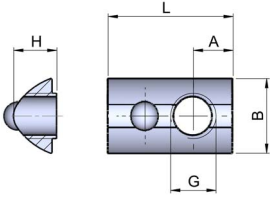
Dimensional drawing	Parameter	Symbol	Unit	Axis	
				CAR40 CAR41	CAR42 CAR43 CAR44
	Moment of inertia	J	kg·cm <sup>2</sup> (lb·in <sup>2</sup> )	0.002 (0.000683)	0.05 (0.017)
	Tightening torque	M <sub>t</sub>	Nm (lbf·in)	2.9 (16.8)	10 (89)
	Screw ISO 4762	E	–	M4	M6
	Maximum radial force	F <sub>R</sub>	N (lbf)	230 (52)	400 (90)
	Dimension	A	mm (in)	12 (0.47)	27 (1.06)
		B		5.5 (0.217)	7 (0.276)
		ØD		12 (0.47)	20 (0.79)
		D2		17 (0.67)	35 (1.38)
		L		31.5 (1.24)	54 (2.13)

## Slot Nuts

Order data


Representation	Description	Axis	Slot nut type	Order number
	For mounting the axis body to a mounting surface or for mounting other parts to the axis: <ul style="list-style-type: none"> <li>10x slot nut</li> </ul>	CAR42	5 St M5	VW33MF010T5N5
			8 St M6	VW33MF010T8N6
			8 St M8	VW33MF010T8N8
		CAR43 CAR44	8 St M6	VW33MF010T8N6
			8 St M8	VW33MF010T8N8

## Dimensions

Dimensional drawing	Definition	Symbol	Unit	Axis		
				CAR42	CAR42 CAR43 CAR44	
				5 St M5	8 St M6	8 St M8
	Thread	G	–	M5	M6	M8
	Dimension	A	mm (in)	4 (0.157)	7 (0.276)	7 (0.276)
		B		7.7 (0.303)	13.2 (0.52)	13.2 (0.52)
		H		4.6 (0.18)	7.6 (0.3)	7.6 (0.3)
		L		12 (0.47)	22 (0.87)	22 (0.87)

## T-Slot Covers

## Order data

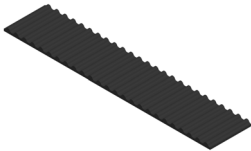
Representation	Description	Axis	T-slot cover size	Order number
	For covering the T-slot at the axis body: • 5x T-slot cover, 2 m (79 in) each	CAR42	5	VW33MC05B05
		CAR42 CAR43 CAR44	8	VW33MC05A08

## Toothed Belts

Calculation of the required toothed belt length:  $L = \text{stroke} + X$

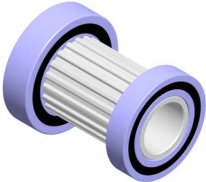
Parameter	Unit	Axis			
		CAR41	CAR42	CAR43	CAR44
X	mm (in)	180 (7.1)	320 (12.6)	330 (13)	400 (15.7)

Order data

Representation	Description	Axis	Characteristic feature	Order number
	For performing a linear movement of the axis: <ul style="list-style-type: none"><li>• 1x toothed belt</li></ul>	CAR41	Standard Length 1 m (3.3 ft)	SPM3MTS10L010
			Standard Length 5 m (16.4 ft)	SPM3MTS10L050
		CAR42	Standard Length 1 m (3.3 ft)	SPM3MTS20L010
			Antistatic Length 1 m (3.3 ft)	SPM3MTA20L010
			Standard Length 5 m (16.4 ft)	SPM3MTS20L050
			Antistatic Length 5 m (16.4 ft)	SPM3MTA20L050
		CAR43	Standard Length 1 m (3.3 ft)	SPM3MTS25L010
			Antistatic, Length 1 m (3.3 ft)	SPM3MTS25L010
			Standard, Length 5 m (16.4 ft)	SPM3MTS25L050
			Antistatic Length 5 m (16.4 ft)	SPM3MTA25L050
		CAR44	Standard Length 1 m (3.3 ft)	SPM3MTS32L010
			Antistatic Length 1 m (3.3 ft)	SPM3MTA32L010
			Standard Length 5 m (16.4 ft)	SPM3MTS32L050
			Antistatic Length 5 m (16.4 ft)	SPM3MTA32L050

Toothed Belt Pulleys

Order data

Representation	Description	Axis	Characteristic feature	Order number
	For transmissioning the drive torque to the toothed belt: <ul style="list-style-type: none"><li>• 1x toothed belt pulley with ball bearings</li></ul>	CAR41	Standard	SPM3MAW9S075
			Increased corrosion resistance	SPM3MAW9C075
		CAR42	Standard	SPM3MAW10S100
			Increased corrosion resistance	SPM3MAW10C100
		CAR43 CAR44	Standard	SPM3MAW11S100
			Increased corrosion resistance	SPM3MAW11C100



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# Chapter 8

## Troubleshooting

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### Troubleshooting

#### Overview

Malfunction	Probable cause	Solution
Sensor overtravelled.	Detected sensor error.	Adjust or replace the sensors. For more information, refer to <i>Replacing the Sensors</i> ( <a href="#">see page 142</a> ).
	Detected controller error.	Verify the controller.
Motor load increases, controller switches off because of overload.	Guide rods, gear rack, ball bearings, or deflection pulleys under mechanical tension.	Contact your local Schneider Electric service representative.
Noise and vibrations.	Velocity too high.	Reduce velocity.
	Poor lubrication at CAR40 (in the case of noise).	Lubricate, for more information, refer to <i>Lubrication</i> ( <a href="#">see page 174</a> ).
	Linear ball bearings and/or ball bearings are worn out or have backlash.	Verify the linear ball bearings and the ball bearings ( <a href="#">see page 136</a> ).
	Toothed belt tension.	Verify the toothed belt tension and, if necessary, use PTFE-spray on the toothed belt. For further information about the toothed belt tension, refer to <i>Distance and Vibration Measurement</i> ( <a href="#">see page 155</a> ).
	Ambient conditions.	Verify ambient conditions ( <a href="#">see page 40</a> ).
Running inaccuracy and noise of the guides.	Poor lubrication at CAR40.	Lubricate, for more information, refer to <i>Lubrication</i> ( <a href="#">see page 174</a> ).
	Damage to the guide rods or gear rack, for example by shock or impact on the end plates.	The guide rod or gear rack must be replaced. Contact your local Schneider Electric service representative.

Malfunction	Probable cause	Solution
The end plate has backlash and positions inaccurately.	Backlash in guides.	Contact your local Schneider Electric service representative.
	Worn out or damaged toothed belt or elastomer coupling.	Replace the toothed belt ( <i>see page 155</i> ) and/or replace the elastomer coupling ( <i>see page 149</i> ).

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# Appendices

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**What Is in This Appendix?**

The appendix contains the following chapters:

Chapter	Chapter Name	Page
A	Further Information About the Manufacturer	195
B	Disposal	199
C	Declaration of Incorporation	201



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# Appendix A

## Further Information About the Manufacturer

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**What Is in This Chapter?**

This chapter contains the following topics:

Topic	Page
Contact Addresses	196
Product Training Courses	197

## Contact Addresses

### Schneider Electric Automation GmbH

Schneiderplatz 1  
97828 Marktheidenfeld, Germany  
Phone: +49 (0) 9391 / 606 - 0  
Fax: +49 (0) 9391 / 606 - 4000  
Email: [info-marktheidenfeld@schneider-electric.com](mailto:info-marktheidenfeld@schneider-electric.com)  
Internet: [www.schneider-electric.com](http://www.schneider-electric.com)

### Machine Solution Service

Schneiderplatz 1  
97828 Marktheidenfeld, Germany  
Phone: +49 (0) 9391 / 606 - 0  
Fax: +49 (0) 9391 / 606 - 4000  
Email: [automation.support.de@schneider-electric.com](mailto:automation.support.de@schneider-electric.com)  
Internet: [www.schneider-electric.com](http://www.schneider-electric.com)

### Additional Contact Addresses

See the homepage for additional contact addresses:  
[www.schneider-electric.com](http://www.schneider-electric.com)

## Product Training Courses

### Product Training Courses

Schneider Electric offers a number of product training courses.

The Schneider Electric training instructors will help you take advantage of the extensive possibilities offered by the system.

See the website ([www.schneider-electric.com](http://www.schneider-electric.com)) for further information and the seminar schedule.



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# Appendix B

## Disposal

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### Disposal

#### Information About the Disposal of Schneider Electric Products

The Lexium CAR4-Series is delivered in a cardboard box or a wooden box. The wooden box is treated according to IPPC-Standard. The cardboard box also comprises films.

**NOTE:** The components consist of different materials, which cannot be reused and must be disposed of separately. The packaging cannot be returned to the manufacturer.

- Dispose of the packaging in accordance with the relevant local, regional or national regulations.
- Dispose of the packaging at the disposal sites provided for this purpose.
- Dispose of the axis in accordance with the applicable local, regional or national regulations.

**NOTE:** The axis, motor, and gearbox contain lubricants whose disposal may be subject to local, regional, or national regulations apart from the packaging.



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## Appendix C

### Declaration of Incorporation

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# Declaration of Incorporation

## Overview


### Declaration of Incorporation

According to EC directive 2006/42/EC on machinery (Annex II B)  
Document number / Month.Year: RBA2017004.00 / 11.2017  
- Original Language -



We: Schneider Electric Automation GmbH  
Subsidiary of Schneider Electric SE (FR 92500 Rueil-Malmaison)  
  
Schneiderplatz 1  
97828 Marktheidenfeld  
Germany

Hereby declare in our sole responsibility as manufacturer, that the partly completed machinery described below:

Trademark:	Schneider Electric 
Product, Type, Function:	Cantilever axes with rod design and toothed belt or gear rack drive equipped with or without motor / gearbox and with or without limit switch.
Models:	CAR40 – series, CAR41 – series, CAR42 – series, CAR43 – series, CAR44 – series,
Serial Number:	YYZZXXXXX (YY: Year+10, e.g. 25 = 2015; ZZ: Supplier Code; XXXXXX = cont. number)

with the following references

Reference	Description
CAR40RCM***** / ***** + ...	Cantilever axis gear rack drive / axis body 66x30 mm
CAR41BCM***** / ***** + ...	Cantilever axis toothed belt drive / axis body 80x30 mm
CAR42BCM***** / ***** + ...	Cantilever axis toothed belt drive / axis body 100x40 mm
CAR43BCM***** / ***** + ...	Cantilever axis toothed belt drive / axis body 120x50 mm
CAR44BCM***** / ***** + ...	Cantilever axis toothed belt drive / axis body 160x50 mm

\* are any letters or numbers not affecting the conformity of the product  
... is the planetary gearbox gear ratio and the complete motor reference  
\$ on any position indicates a customer specific adaptation

is complying with all essential requirements of the Machinery Directive 2006/42/EC, as far as the scope of delivery allows. Additional we declare that the relevant technical documentation is compiled in accordance with part B of Annex VII.

Directive	Fulfilled Requirements	Harmonized Standard
DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC	1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.5.1, 1.5.4, 1.5.5, 1.5.6, 1.5.7, 1.5.8, 1.5.10, 1.5.13, 1.6.1, 1.7.1, 1.7.2, 1.7.3, 1.7.4	EN ISO 10218-1:2011 Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots

We commit to transmit, in response to a reasoned request by the market surveillance authorities, relevant documents on the partly completed machinery by our responsible department. The method of transmission shall be electronic.

Name and address of the person authorised to compile the technical documentation:  
Bernhard Kreitler, Schneider Electric Automation GmbH, Breslauer Straße 7, 77933 Lahr / Schwarzwald - Germany

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Directive 2006/42/EC on Machinery, where appropriate, and until the EC Declaration of Conformity according to Annex II A is issued.

Issued at: Marktheidenfeld - Germany, 29<sup>th</sup> November 2017

  
i.A. Michael Schweizer  
Machine Solutions Certification Manager  
  
Schneider Electric Automation GmbH  
Schneiderplatz 1  
97828 Marktheidenfeld  
Telefon: 03391 606-0



## A

### **Axis body**

The axis body is a precision aluminum profile.

## B

### **Breakaway torque**

The breakaway torque describes the drive torque required to overcome the static friction and that initiates the transition to sliding friction.

## C

### **Cantilever axis**

In the case of a cantilever axis, the axis body is stationary while the end plates are moving.

## F

### **Feed constant**

The feed constant (feed per revolution) is the distance which the end plates move per toothed belt pulley revolution.

## M

### **Mechanical drive element**

Depending on the axis, the mechanical drive element of the axis consists of the toothed belt and the toothed belt pulley or gear rack and rack pinion.

### **Mounting position**

The axis can be installed in any desired mounting position. However, all external forces and torques must be within the ranges of permissible values.

## R

### **Repeatability**

Repeatability is the accuracy with which it is possible to move to a previous position again under the same conditions. To determine this value, the end plates are moved to the end position from the same direction.

## S

### **Sensor**

Inductive proximity sensors are used as sensors for limit switches or reference switches. These sensors have not a safety function.

### **Service life**

The service life is the distance in kilometers (miles) before the first signs of material fatigue can be seen on the guides, the mechanical drive elements and the bearings. Service life specifications (kilometers covered) relate to the nominal values specified in the data sheet. If the nominal values are exceeded, the service life decreases accordingly.

### **Stroke**

Stroke is the maximum travel of the end plates between the switching points of the sensors.



## A

- accessibility for servicing, *89*
- ambient conditions, *40*
- attachments, *27*
- axis
  - cabling, *95*
  - characteristics, *33*
  - cleaning, *135*
  - components overview, *32*
  - forces, *82*
  - grounding, *95*
  - linear guide, *33*
  - lubricating, *176*
  - mechanical drive element types, *33*
  - mounting, *90*
  - mounting options, *34*
  - replacing, *141*
  - T-slots, *90*
  - torque, *82*
- axis body, *32, 203*
- axis body adapter plate, *32*
- axis frame design, *80*

## B

- brake release, *20*
- breakaway torque, *203*

## C

- cabling, *95*
- calculation
  - service life, *82*
- cantilever axis, *203*
- characteristic curves, *44*
- clamping hubs, *180*
- cleaning, *135*
- climatic classes, *40*
- collisions
  - repairing, *136*

- commissioning, *100*
- components
  - corrosion resistance, *42*
  - materials, *42*
  - overview, *32*
- conditions
  - installation, *18*
  - operation, *40*
  - storage, *40, 85*
  - transport, *40, 85*
- configuration
  - gearbox, *37*
  - motor, *37*
- contact addresses, *196*
- contact block, *32*
- corrosion resistance, *42*
- coupling assemblies, *111*
- coupling housing, *32*
- customized version
  - designation, *37*

## D

- declaration of incorporation, *202*
- deflection pulleys, *181*
  - replacing, *169*
- description
  - product, *32*
  - type plate, *38*
- design of axis frame, *80*
- detail drawings, *44*
- diagnostics, *191*
- dimensional drawings, *44*
- dimensions
  - mounting, *90*
- distance measurement, *155*
- domestic appliances, *17*

## E

- elastomer couplings
  - inspection, *137*
  - mounting, *112*
  - replacing, *149*
- elastomer spiders, *182*
- electrical connections, *121*
  - sensors, *122*
- electrical installation, *95, 95*
- emergency stop switch, *20*
- emissions, *26*
- end block
  - mass, *108*
  - torque, *109*
- end plates, *32*
  - mounting dimensions, *103*
- environment
  - radioactive, *17*
  - saline, *17*
- expanding hubs, *183*

## F

- features, *33*
- feed per revolution, *203*
- floating systems, *17*
- forbidden environments, *17*
- forces
  - axis, *82*
  - frame, *80*
- foreign substances
  - compatibility, *18*
- formula
  - service life, *82*
- frame, *80*
  - forces, *80*
  - general requirements, *80*
  - interference contours, *81*
  - space, *81*
  - system requirements, *80*
  - torques, *80*

## G

- gear rack, *32*
  - inspection, *136*
  - lubricating, *176*
- gearbox, *32*
  - configuration, *37*
  - coupling assemblies, *111*
  - maintenance, *134*
  - mounting, *108*
  - mounting direction, *34*
  - mounting options, *34*
  - orientation, *37*
  - replacing, *143*
  - technical data, *107*
  - third-party, *110*
- gearboxes
  - replacement equipment, *183*
- greasing, *175*
- grounding
  - axis, *95*
- guide rods, *32*
  - lubricating, *176*

## H

- hazardous, explosive atmospheres, *17*
- hazards, *20*
- help
  - troubleshooting, *191*
- homepage, *196*
- hot surfaces, *23*

## I

- incompatible environments, *17*
- increased corrosion resistance, *42*
- inspection
  - elastomer coupling, *137*
  - gear rack, *136*
  - linear guide, *137*
  - toothed belt, *136*
- inspection after collisions, *136*

installation, *16*  
     conditions, *18*  
     electrical, *95, 95*  
     general information, *89*  
     verification, *98*  
 installation surface, *90*  
 interference contours  
     frame, *81*

## L

leakiness, *26*  
 life support systems, *17*  
 lifetime, *18, 82*  
 linear ball bearings, *32*  
     lubricating, *176*  
 linear guide, *32*  
     inspection, *137*  
     types, *33*  
 locating dowels, *184*  
 lubricating  
     axis, *176*  
     gear rack, *176*  
     general information, *175*  
     guide rods, *176*  
     linear ball bearings, *176*  
     slide bearings, *176*  
 lubrication, *174*  
     leakiness, *26*

## M

maintenance, *127*  
     gearbox, *134*  
     general information, *129*  
     motor, *134*  
     plan, *131*  
     schedule, *131*  
     toothed belt, *133*  
 manual movement, *27*  
 mass  
     end block, *108*  
 materials  
     components, *42*  
 mechanical data, *44*

mechanical drive element, *203*  
 mechanical drive elements  
     types, *33*  
 misuse, *17*  
 mobile systems, *17*  
 modifications, *27*  
 motion  
     testing, *163*  
 motor, *32*  
     configuration, *37*  
     coupling assemblies, *111*  
     maintenance, *134*  
     mounting, *108*  
     mounting direction, *34*  
     mounting options, *34*  
     orientation, *37*  
     replacing, *143*  
     technical data, *107*  
     third-party, *110*  
 motors  
     replacement equipment, *184*  
 mounting  
     axis, *90*  
     coupling assemblies, *111*  
     dimensions, *90*  
     elastomer couplings, *112*  
     gearbox, *108*  
     general information, *89*  
     motor, *108*  
     payload, *102, 102*  
     sensors, *123*  
     shaft extensions, *125*  
     toothed belt, *160*  
     toothed belt pulleys, *167*  
     toothed belt tensioners, *163*  
     verification, *98*  
 mounting dimensions  
     end plates, *103*  
 mounting direction  
     gearbox, *34*  
     motor, *34*  
 mounting position, *203*  
 movements  
     testing, *163*  
 moving without drive energy, *27*

## N

noise protection, 25

## O

operating conditions, 18, 40

operating life, 18, 82

orientation

    gearbox, 37

    motor, 37

original equipment, 16

## P

partially completed machinery, 202

partly completed machinery, 16

payload

    mounting, 102, 102

portable systems, 17

product

    characteristics, 33

    components, 32

    description, 32

product overview, 32

proper use, 16

protective measures, 16

## Q

qualification of personnel, 19

qualified person, 19

## R

radioactive environment, 17

remaining risks, 20

removing

    shaft extension, 153

    toothed belt, 157

    toothed belt pulleys, 165

repair, 127

repairing after collisions, 136

repeatability, 203

replacement, 139

replacement equipment

    clamping hubs, 180

    deflection pulleys, 181

    elastomer spiders, 182

    expanding hubs, 183

    gearboxes, 183

    locating dowels, 184

    motors, 184

    sensor extension cables, 185

    sensors, 185

    shaft extensions, 186

    slot nuts, 186

    stock, 178

    T-Slot covers, 187

    toothed belt pulleys, 189

    toothed belts, 187

replacing

    axis, 141

    deflection pulleys, 169

    elastomer couplings, 149

    gearbox, 143

    motor, 143

    sensors, 142

    shaft extensions, 153

    toothed belt, 155

    toothed belt pulleys, 164

residual risks, 20

rubber buffer, 32

running accuracy, 90

## S

saline environment, 17

seminars, 196

sensor, 204

sensor extension cables, 185

sensors, 32

    connection details, 122

    mounting, 123

    replacement equipment, 185

    replacing, 142

    technical data, 121

service addresses, 196

service life, 18, 82, 204

service schedule, 131

- servicing, *130*
- shaft extensions
  - mounting, *125*
  - replacement equipment, *186*
  - replacing, *153*
- slide bearings, *32*
  - lubricating, *176*
- slot distance, *93*
- slot nuts, *186*
- solutions, *191*
- standard tightening torques, *89*
- start-up, *100*
- storage, *85*
  - conditions, *40*
- storage conditions, *85*
- stroke, *204*
- system architecture, *30*
- system requirements
  - frame, *80*
- systems
  - floating, *17*
  - life support, *17*
  - mobile, *17*
  - portable, *17*

## T

- T-slot covers, *187*
- tapped hole distance, *93*
- technical data
  - axis, *44*
  - sensors, *121*
- testing
  - movements, *163*
- third-party devices, *16, 110*
- tightening torques
  - standard, *89*

- toothed belt, *32*
  - cutting to length, *158*
  - inspection, *136*
  - maintenance, *133*
  - mounting, *160*
  - removing, *157*
  - replacement equipment, *187*
  - replacing, *155*
  - toothed belt tension, *133*
- toothed belt pulleys
  - replacement equipment, *189*
  - replacing, *164*
- toothed belt tension, *133*
- toothed belt tensioners, *32*
  - mounting, *163*
- torques
  - axis, *82*
  - end block, *109*
  - frame, *80*
- training, *19*
- training courses, *196*
- transport, *85*
  - conditions, *40*
- transport conditions, *85*
- troubleshooting, *191*
- type plate
  - description, *38*
  - position, *38*

## U

- underground, *17*
- unpacking, *86*

## V

- verification
  - installation, *98*
  - mounting, *98*
- vibration measurement, *155*

## W

- wiring, *95*
- working life, *18, 82*