Compact Modules CKL
Instructions

R320103263
03.2015
The data specified only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. Catalog specifications do not constitute assured characteristics. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

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Original instruction manual.
Contents

1 About this documentation
  1.1 Scope and purpose of the documentation
  1.2 Required and supplementary documentation
  1.3 Presentation of information

2 Safety instructions
  2.1 Protection against mechanical hazards
  2.2 Protection against electric shocks
  2.3 Warning against magnetic and electromagnetic fields
  2.4 Protection against burns
  2.5 Parts susceptible to ESD damage

3 Scope of supply
  3.1 Delivery
  3.2 Accessories

4 Product description
  4.1 Features
  4.2 Equipment Description
  4.3 Identification

5 Transport and storage
  5.1 Transporting the product
  5.2 Storing the product

6 Installation
  6.1 Mounting orientation
  6.2 Fastening the product to the adjoining structure
  6.3 Mounting the cable chain
  6.4 Mounting the switching system
  6.5 Installing the socket
  6.6 Mounting the cable duct
  6.7 Slot cover
  6.8 Electrical connections

7 Commissioning and operation
  7.1 Checking the operating conditions
  7.2 Start-up with start-up instructions
  7.3 Trial run, running in
  7.4 Operation

8 Maintenance and repair
  8.1 Visual inspection and cleaning
  8.2 Lubrication
  8.3 Repairs

9 Removal and replacement
  9.1 Removing the slot cover
  9.2 Removing the cable duct
  9.3 Removing the socket
  9.4 Removing the switching system
  9.5 Removing the cable chain

10 Environmental protection and disposal

11 Technical data

12 General conditions of use
  12.1 Tightening torques

13 Service and support
  13.1 Troubleshooting and fault clearance
1 About this documentation

1.1 Scope and purpose of the documentation
This documentation applies to the following products:
• Compact Modules CKL as described in the “Compact Modules CKL” catalog.
This documentation is intended for assembly/installation personnel, line operators and
machinery/plant users or manufacturers.
This documentation contains important information for proper and safe installation,
operation, maintenance and deinstallation of the product and for troubleshooting simple
errors oneself.
▷ Before commencing any work with the product, be sure to read these Instructions and the
“Safety Instructions for Linear Motion Systems” and the “Safety Notes and Instructions on
Use for Rexroth IndraDyn Motors” carefully and completely.

1.2 Required and supplementary documentation
Documentation which is indicated by the book symbol must be obtained before handling
the product and must be adhered to. Documentation is available for download at http://www.
boschrexroth.com/en/us/products/product-groups/linear-motion-technology/documentation-
and-resources/index in the category listed in the table below.

Table 1: Required documentation

<table>
<thead>
<tr>
<th>Title</th>
<th>Document number</th>
<th>Document type</th>
<th>Documentation and Resources Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Instructions for Linear Motion Systems</td>
<td>R320103152</td>
<td>Safety instructions</td>
<td>Manuals &amp; Product Updates</td>
</tr>
<tr>
<td>Safety Notes and Instructions on Use for Rexroth IndraDyn Motors</td>
<td>R911340694</td>
<td>Safety instructions</td>
<td>Manuals &amp; Product Updates</td>
</tr>
<tr>
<td>Compact module CKL</td>
<td>R310EN2617</td>
<td>Catalog</td>
<td>Catalogs &amp; Brochures</td>
</tr>
<tr>
<td>Rexroth IndraDyn L – Ironless Linear Motors MCL</td>
<td>R911336969</td>
<td>Instructions</td>
<td>Man. &amp; Prod. Updates</td>
</tr>
<tr>
<td>Rexroth IndraDrive Cs – Drive Systems with HCS01</td>
<td>R911339011</td>
<td>Instructions</td>
<td>Manuals &amp; Product Updates</td>
</tr>
<tr>
<td>CKL – IndraDrive Cs Start-up instructions</td>
<td></td>
<td>Instructions</td>
<td>Man. &amp; Prod. Updates</td>
</tr>
<tr>
<td>System documentation of the machinery/system</td>
<td></td>
<td>Instructions</td>
<td></td>
</tr>
<tr>
<td>manufacturer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manuals for the other machine/system components</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.3 Presentation of information
To enable users to work rapidly and safely with the product while following these Instruc-
tions, this documentation uses standardized safety instructions, symbols, terms and defini-
tions, and abbreviations. These are explained in the following sub-sections.

1.3.1 Safety instructions in these Instructions
These Instructions contain safety instructions preceding any actions that involve a risk of
personal injury or damage to property. The safety precautions described must be adhered to.
Safety instructions are structured as follows:

⚠️ SIGNAL WORD
Type and source of hazard!!
Consequences if ignored.
▷ Hazard avoidance precautions.
• **Safety alert symbol**: draws attention to the hazard
• **Signal word**: indicates the severity of the hazard
• **Type and source of hazard**: indicates the type or source of the hazard
• **Consequences**: describes the consequences that may occur if the hazard avoidance precautions are ignored
• **Hazard avoidance precautions**: indicates how to avoid the hazard

The safety instructions cover the following hazard levels. The hazard level describes the risks involved if the safety instruction is ignored.

### Table 2: Hazard levels as per ANSI Z535.6 - 2006

<table>
<thead>
<tr>
<th>Safety alert symbol, Signal word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DANGER</strong></td>
<td>Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.</td>
</tr>
<tr>
<td><strong>WARNING</strong></td>
<td>Indicates an hazardous situation which, if not avoided, could result in death or serious injury.</td>
</tr>
<tr>
<td><strong>CAUTION</strong></td>
<td>Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.</td>
</tr>
<tr>
<td><strong>NOTICE</strong></td>
<td>Damage to property: Risk of damaging the product or the surrounding environment.</td>
</tr>
</tbody>
</table>

#### 1.3.2 Symbols

The following symbols designate notes or cross-references that are not safety-relevant but increase the clarity of the documentation.

### Table 3: Meaning of the symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="i" /></td>
<td>If this information is not observed, the product will not be used optimally.</td>
</tr>
<tr>
<td>![.]</td>
<td>Single, independent work step</td>
</tr>
<tr>
<td>1.</td>
<td>Numbered work steps</td>
</tr>
<tr>
<td>2.</td>
<td>The sequence of the work steps is indicated by the numbers.</td>
</tr>
<tr>
<td>3.</td>
<td><img src="image" alt="7" /> See section 7</td>
</tr>
<tr>
<td><img src="image" alt="fig" /></td>
<td><img src="image" alt="7" /> See figure 7.1</td>
</tr>
</tbody>
</table>
| ![screw](image) | Screw with strength class ...
| ![torque](image) | Tightening torque |
| ![friction](image) | Friction factor for screws |
| ![magnetic](image) | Hazard symbol warning of dangerous magnetic and electromagnetic fields |
| ![hot](image) | Hazard symbol warning of hot surfaces |

#### 1.3.3 Abbreviations

The following abbreviations are used in this document:

### Table 4: Abbreviations and definitions

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKL</td>
<td>Compact Modules with Ball Rail Systems and ironless linear motor</td>
</tr>
</tbody>
</table>
2 Safety instructions

The general safety instructions for this product can be found in the documentation “Safety Instructions for Linear Motion Systems” and in “Safety Notes and Instructions on Use for Rexroth IndraDyn Motors”. You must have read and understood these before handling the product.

Bosch Rexroth Corporation will not accept any liability for damage resulting from failure to comply with these safety instructions.

Compact Modules CKL may only be installed, put into service and maintained as specified in these Instructions and by expert personnel with appropriate qualifications, e.g. mechatronics engineers and technicians.

2.1 Protection against mechanical hazards

**WARNING**

Hazardous movements! Danger to life and limb; risk of serious injury or damage to property!

Do not stand anywhere within the movement zone of the machine.

Take preventative measures so that no persons can accidentally enter the danger zone.

Never carry out any maintenance work on a machine while it is in service.

Secure the machine/system against restart and unauthorized use for the duration of the maintenance work.

The CKL system must be securely fastened in the machine or system.

Secure vertically installed or slanting axes against dropping or lowering of the frame or carriage, for example through

- Mechanical locking of the vertical axis
- External braking / arrestor / clamping device or
- Adequate counterweight to stabilize the axis

The axis system contains an incremental linear measuring system. As a result, in order to prevent dropping or lowering of the frame or carriage of a vertical or slanting axis when the motor is commuted, a Hall unit must be provided.

For vertical and slanting installations, please note the following additional points.

- When using a digital Hall unit, only 86% of the motor force will be available before performing a homing cycle.
- The available motor force will depend on the drive power of the selected drive controller.
### 2.2 Protection against electric shocks

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger to life and limb due to electric shocks!</td>
</tr>
</tbody>
</table>

When the equipment is in service, cable sheaths can wear out due to mechanical loads and expose live conductors. Defective connection cables must be replaced, and the system must be taken out of service immediately. Do not attempt to carry out any temporary repairs on connection cables.

Work on the electrical system may only be carried out by qualified electricians.

It is essential to use only electricians’ tools (as approved by VDE or a similar professional association).

Before beginning the work:
- 1. De-energize the system.
- 2. Secure the machine or system against reactivation.
- 3. Check that the system is completely de-energized.
- 4. Ground and short-circuit the unit.
- 5. Lay covers over or put up guards around neighboring pieces of equipment that are energized.

After completing the work, proceed in the reverse order until all precautions have been removed.

Before switching the equipment on again, make sure the protective earth conductor is firmly attached to the ground connection point provided (including the end plate and carriage).

The Ball Rail System does not function as a protective earth conductor.

Any operation, even for brief measuring and testing purposes, is only permitted when a protective earth conductor has been firmly attached to the system’s specified ground connection points.

When the carriage is moved manually, dangerous voltage levels can occur at the connection pins for the power cable! This is due to the generator principle of a synchronous motor: conversion of mechanical energy to electrical energy.
2.3 Warning against magnetic and electromagnetic fields

Magnetic and electromagnetic fields are always generated in the immediate surroundings of current-carrying conductors or the permanent magnets of electric motors. They can constitute a serious hazard to humans. The machine user must take appropriate measures (e.g. warning signs, protective equipment, identification of hazard zones) to protect the personnel operating in these areas against any injury or damage.

**WARNING**

Health hazard for people with pacemakers, metal implants, and hearing aids due to the effect of strong magnetic and electromagnetic fields when standing near motor components!

- Persons with pacemakers or metal implants must not come close to these motor parts or handle them.

Risk of destroying sensitive objects!

- Watches, credit or check cards, ID cards with a magnetic stripe, and all ferromagnetic metal parts made of iron, nickel or cobalt must be kept away from permanent magnets.

Risk of crushing fingers and hands due to the strong attractive force of magnets!

- Keep movable ferromagnetic objects (e.g. tools) away from the equipment.

To help assess EMC problems (e.g. effects on proximity switches or inductive measuring systems), the attractive force on ferromagnetic parts, and for protection of persons, the values for magnetic induction in relation to the distance from the secondary part of the motor are given below. The limits for active physical aids and for transport by air are defined in the worker’s compensation insurance rule BGR B11 or in IATA 953.

The highest flux densities (induction) occur in the secondary part of the motor size MCS070 (installed in CKL 200). Regarding the regulatory provisions which came into force in April 2011, Table 5 “Magnetic field strengths of the MCS070 secondary part” shows the distances or induction values for the secondary part MCS070-3S-0300-NNNN. According to IATA 953, no precautions are required when shipping secondary parts MCS by air.

Magnetic field strength values or induction as a function of distance from the secondary parts.

**Table 5: Magnetic field strengths**

<table>
<thead>
<tr>
<th>Size</th>
<th>Distance 0 mm</th>
<th>Distance 2100 mm</th>
<th>Distance for up to ≤ 0.5 mT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS070</td>
<td>≤ 150 mT</td>
<td>0.04 μT</td>
<td>35 mm</td>
</tr>
</tbody>
</table>

When installing the product, do not use ferromagnetic tools.
### 2.4 Protection against burns

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk of burns due to contact with hot surfaces! Temperatures over 70°C are possible.</strong></td>
</tr>
<tr>
<td>▶ Avoid touching the hot surface of the carriage subassembly.</td>
</tr>
<tr>
<td>▶ After switching off, allow hot surfaces to cool before touching them.</td>
</tr>
<tr>
<td>▶ Temperature-sensitive parts should not be allowed to come into contact with the surface of the carriage subassembly.</td>
</tr>
<tr>
<td>▶ Make sure the connection cables are installed at a sufficient distance from other components.</td>
</tr>
</tbody>
</table>

### 2.5 Parts susceptible to ESD damage

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The CKL contains parts that are susceptible to ESD damage. These parts, e.g. the temperature sensors of the motor winding, can be easily destroyed if not handled properly.</strong></td>
</tr>
<tr>
<td>▶ Avoid direct contact with the exposed contact pins in the electrical connection area of the carriage subassembly until you have electrostatically discharged yourself or been grounded.</td>
</tr>
<tr>
<td>▶ Take precautions before handling the ESD-susceptible parts (ESD protective clothing, armband, conductive flooring, grounded cabinets and work surfaces) in order to avoid damage.</td>
</tr>
</tbody>
</table>

### 3 Scope of supply

The scope of supply includes:
- Compact module CKL
- Additional accessories according to the configured options
- Instructions for Compact Modules CKL
- Safety Instructions for Linear Motion Systems
- Safety Notes and Instructions on Use for Rexroth IndraDyn Motors
- Immediately upon receipt of the delivery, check the shipment for completeness against the delivery note.

#### 3.1 Delivery
- Compact Modules CKL are delivered completely assembled and pre-lubricated.
- Switches and the associated mechanical or magnetic switching cam included in the delivery, must be installed and adjusted before putting the CKL into service.
- Additional accessories (e.g. cable drag chains) must be attached by the customer.

#### 3.2 Accessories
For accessories, please refer to the Compact Modules CKL catalog.

Dimensions and part numbers of the accessories ➔ “Compact Modules CKL” catalog.
4 Product description

4.1 Features
Please take note of the information, technical data, dimensions and descriptions given in the Compact Modules CKL catalog.

4.2 Equipment Description

Fig. 1: Components of the CKL

1. End plate
2. Protective earth connection (screw not included in scope of supply)
3. Ball guide rail
4. Sensor bracket with sensor unit
5. Connections for power cable, measuring system, Hall sensor adapter box
6. Cable chain (accessory)
7. Carriage
8. Scale with reference mark
9. Linear motor (secondary part)
10. Socket-plug
11. Proximity switch
12. Main body
13. Ball runner block
14. Switching cam for proximity switch
15. Cable duct
16. Switching cam for magnetic switches
17. Linear motor (primary part)
18. Magnetic switch
4.3 Identification

4.3.1 Nameplate on CKL

When ordering replacement parts, please always state all data given on the nameplate.

Fig. 2: CKL nameplate

The nameplate of the CKL carries the following information:

Table 6: Details given on nameplate

<table>
<thead>
<tr>
<th>Nameplate details</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNR</td>
<td>Part number</td>
</tr>
<tr>
<td>TYP</td>
<td>Type designation and size</td>
</tr>
<tr>
<td>CS</td>
<td>Customer order number</td>
</tr>
<tr>
<td>FD</td>
<td>Date of manufacture</td>
</tr>
</tbody>
</table>

7873 Manufacturing location

On the nameplate you will find additional technical data for start-up. With these parameters, starting up linear systems is easy, fast and effective.

4.3.2 Nameplate on linear motor MCL

The technical data given here refer to the primary part and may differ from those for the overall CKL. The data on the CKL nameplate are the definitive figures.

Fig. 3: Linear motor (primary part) nameplate
5  Transport and storage

**WARNING**

Risk of product crashing down due to inadequate load hoisting equipment!
Severe personal injury or even death.
▶ Use only safety-inspected and suitable load hoisting equipment.
▶ Attach load hoisting equipment only at the designated points and fasten with care.
▶ Do not stand under hoisted loads.
▶ Before hoisting the product, take note of the weight ◀ “CKL” catalog.
▶ Secure the movable carriage against dropping, lowering or sliding.

**WARNING**

Danger to life and limb due to electric shocks!
When the carriage is moved manually, dangerous voltage levels can occur at the connection pins for the power cable! This is due to the generator principle of a synchronous motor: conversion of mechanical energy to electrical energy.

**WARNING**

Health hazard for people with pacemakers, metal implants, and hearing aids due to the effect of strong magnetic and electromagnetic fields when standing near motor components!
▶ Persons with pacemakers or metal implants must not come close to these motor parts or handle them.

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**NOTICE**

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▶ Avoid direct contact with the exposed contact pins in the electrical connection area of the carriage subassembly until you have electrostatically discharged yourself or been grounded.
▶ Take precautions before handling the ESD-susceptible parts (ESD protective clothing, armband, conductive flooring, grounded cabinets and work surfaces) in order to avoid damage.
5.1 Transporting the product

**NOTICE**

Risk of damage due to transport under wrong environmental conditions!
Potential corrosion of product parts.
- Transport only in undamaged, unopened original packaging.
- Protect the product against humidity and corrosive agents

Hoisting the product
1. Before hoisting the product, take note of the weight “CKL” catalog.
2. Hoist the product as shown in the illustration, using suitable load hoisting equipment.

![Fig. 4: Hoisting the CKL](image)

5.2 Storing the product

**NOTICE**

Risk of damage due to storage under wrong environmental conditions!
Potential corrosion of product parts.
- Store only in undamaged, unopened original packaging.
- Store the product only in dry, roofed areas.
- Protect the product against humidity and corrosive agents.

Transport conditions: \[13\] General conditions of use

Storage times:
- < 12 months: no action required
- > 12 months: check that electrical contacts are free of corrosion.
- > 24 months: consult Bosch Rexroth.
6 Installation

Dimensions and part numbers of the individual components ⇒ “CKL” catalog.

⚠️ WARNING

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Severe personal injury or even death.
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▶ Attach load hoisting equipment only at the designated points and fasten with care.
▶ Do not stand under hoisted loads.
▶ Before hoisting the product, take note of the weight ⇒ “CKL” catalog.
▶ Secure the movable carriage against dropping, lowering or sliding.

⚠️ WARNING

Hazardous movements! Danger to life and limb; risk of serious injury or damage to property!
The CKL system must be securely fastened in the machine or system.
Secure vertically installed or slanting axes against dropping or lowering of the frame or carriage, for example through
▶ Mechanical locking of the vertical axis
▶ External braking / arrestor / clamping device or
▶ Adequate counterweight to stabilize the axis
The axis system contains an incremental linear measuring system. As a result, in order to prevent dropping or lowering of the frame or carriage of a vertical or slanting axis when the motor is commuted, a Hall unit must be provided.

⚠️ WARNING

Danger to life and limb due to electric shocks!
Work on the electrical system may only be carried out by qualified electricians.
It is essential to use only electricians’ tools (as approved by VDE or a similar professional association).
Before switching the equipment on again, make sure the protective earth conductor is firmly attached to the ground connection point provided (including the end plate and carriage).
The Ball Rail System does not function as a protective earth conductor.
When the carriage is moved manually, dangerous voltage levels can occur at the connection pins for the power cable! This is due to the generator principle of a synchronous motor: conversion of mechanical energy to electrical energy.
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- Keep movable ferromagnetic objects (e.g. tools) away from the equipment.

NOTICE

The CKL contains parts that are susceptible to ESD damage. These parts, e.g. the temperature sensors of the motor winding, can be easily destroyed if not handled properly.

- Avoid direct contact with the exposed contact pins in the electrical connection area of the carriage subassembly until you have electrostatically discharged yourself or been grounded.

- Take precautions before handling the ESD-susceptible parts (ESD protective clothing, armband, conductive flooring, grounded cabinets and work surfaces) in order to avoid damage.

6.1 Mounting orientation

6.1.1 Sideways orientation

If mounting sideways, electrical connections have to be located on the top-side of the carriage/module. The orientation shown in Fig. 5 is not permissible.

![Incorrect sideways orientation](image)

Fig. 5: Incorrect sideways orientation (electrical connections at the bottom).

6.1.2 Vertical mounting orientation

For vertical or slanting mounting orientations it should be remembered that the linear motor is not self-locking and the carriage or frame must therefore be secured to stop it from dropping or sinking down.
6.2 Fastening the product to the adjoining structure

**NOTICE**

Incorrect fastening may cause product to work loose or become distorted!

Damage to the product.

- Fasten the product with the recommended fastening elements.
- Never secure or support the product by the end plates. The main body is the main load-bearing part!
- Take note of the tightening torques ➔ 12.1

- Fasten the frame to the mounting base using clamping fixtures or sliding blocks ➔ Fig. 6.
- Recommended number of clamping fixtures:
  - Type 1: 6 per meter and side
  - Type 2: 4 per meter and side
  - Type 3: 3 per meter and side
- Recommended number of sliding blocks:
  - 6 per meter and side
- When mounting with clamping fixtures, maintain a minimum distance of 10 mm from the end face of the frame.
- Take note of the tightening torques ➔ 12.1.

![Mounting with clamping fixtures]

<table>
<thead>
<tr>
<th>CKL</th>
<th>A (mm)</th>
<th>B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>126</td>
<td>140</td>
</tr>
<tr>
<td>145</td>
<td>161</td>
<td>175</td>
</tr>
<tr>
<td>200</td>
<td>222</td>
<td>240</td>
</tr>
</tbody>
</table>

**Fig. 6: Mounting the CKL by the main body**
Fig. 7: Clamping fixtures / sliding blocks

Table 7: Clamping fixtures

<table>
<thead>
<tr>
<th>CKL</th>
<th>for thread</th>
<th>Type 1</th>
<th>Number of holes N</th>
<th>Dimensions (mm)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>110</td>
<td>M5</td>
<td>3</td>
<td>4</td>
<td>107</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td>77</td>
<td>8.5</td>
</tr>
<tr>
<td>145</td>
<td>M6</td>
<td>1</td>
<td>2</td>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td>72</td>
<td>11</td>
</tr>
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<td></td>
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<td>2</td>
<td>2</td>
<td>62</td>
<td>11</td>
</tr>
<tr>
<td>200</td>
<td>M8</td>
<td>2</td>
<td>2</td>
<td>47</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td>108</td>
<td>19</td>
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<tr>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td>88</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 8: Sliding blocks for CKL 200

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>for thread</th>
<th>Part number Sliding block</th>
<th>Part number Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>10</td>
<td>19.5</td>
<td>10.5</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>20</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>20</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>90</td>
<td>70</td>
<td>M8</td>
<td>–</td>
</tr>
</tbody>
</table>
6.3 Mounting the cable chain

**NOTICE**

The cable chain requires more space than the axis. Make sure to keep the required space clear. Can be installed unsupported up to an axis length of 2 m; length of the upper chain run is 1 m. Payload: Rexroth power cables, encoder cable, Hall cables of ~ 0.13 kg/m each.

Damage to the product.

- Support the lower chain run with a guide channel.
- Protect the cable chain from dirt. No dirt must be allowed to collect even in the space in which the cable chain moves.

---

**Fig. 8**  Space requirement

Mounting to the main body:

1. Insert the mounting profile (1) into the T-slot in the main body and fix in place with setscrews. Fasten the cable chain (2) using sliding blocks in the T-slots of the mounting profiles.

---

**Fig. 9**  Mounting example
6.4 Mounting the switching system

6.4.1 Overview of the switching system

**NOTICE**

Damage to product, adjoining structure and workpieces.

- Mount the entire switching system on the side opposite the electrical connections.
- Move the carriage slowly by hand over the entire working space in order to avoid any potential collisions with workpieces or adjoining structures.

The switching system with magnetic or proximity switches comprises the following components:

1. Magnetic switches
2. Proximity switches
3. Switching cam for magnetic switches
4. Cable duct
5. Switching cam for proximity switch
6. Socket-plug
6.4.2 Mounting the proximity switching system

1. Fasten the switching cam (1) to the carriage.

![Fig. 11: Mounting the switching cam](image)

2. Fasten the proximity switches (2) to the switch mounting plate.
3. Insert the switch mounting plates with the switches into the T-slot of the module main body and secure them with set screws.
4. Slide the switches to the desired position – secure them with a screw.

![Fig. 12: Mounting the proximity switches](image)

5. Set the switching distances by adjusting the switching cam.

![Fig. 13: Mounting the proximity switches](image)
6.4.3 Mounting the magnetic switching system

1. Fasten the switching cam (3) to the carriage.
2. Insert the magnetic switch (1) into the C-slot on the main body profile from above.
3. Slide the switch to the desired position – secure with a screw.

Fig. 14: Mounting the magnetic switching cam and magnetic switches

6.4.4 Cable routing:

Cable routing for switches with open cable ends:
- The cable can be routed in one of the frame’s slots and fixed in place with a slot cover. See section 6.7 “Mounting the slot cover”.
- The cable can be routed in an attachable cable duct. See section 6.6 “Mounting the cable duct”.

Cable routing for switches with a M8x1 plug connection:
- Plugs and cables can be positioned or laid in the attachable cable duct. See section 6.6 “Mounting the cable duct”.
6.5 Installing the socket

The scope of delivery includes two glands for cable entry into the socket. One gland is predrilled to accommodate the cables of up to three switches. The socket can be mounted in any cavity in the socket body as required.

1. For glands which have not been predrilled, drill holes for the cables.
2. Thread all cables through the compression screw (1), the gland (2), socket body (6), and the cork seal (8). When doing so, arrange the parts as required for the desired connection orientation (7) of the plug.
3. Close the unused opening (5) in the socket body (6) using the O-ring (4) and the screw plug (3).
4. Connect up/solder the wires to the terminals in the flanged socket (9). Make a pin assignment diagram.
5. Fasten the flanged socket (9) to the socket body (6) with the screws (10).
6. Press in the gland (2) using the compression screw (1).
7. Insert the socket into the upper T-slot of the module frame and secure it with set screws.
8. Solder the wires to the terminals in the plug (11).
9. Perform a function check. When doing so, take note of the instructions in section 7.

Fig. 15: Socket and socket body
10. Fasten the socket (12) directly to the main body without an adapter plate.
6.6 Mounting the cable duct

The cable duct can accommodate M8x1 plug connectors as well as a maximum of three cables.

1. Measure off the required length of cable duct.
2. Cut the cable duct to size and deburr the edges.
3. Measure out the required cable exit positions, mark them, and drill the holes.
4. If there are too few pre-drilled mounting holes, drill additional holes in the base of the cable duct (2.5 deep, ø 3.1).
5. Clip the duct into the T-slot on the Linear Motion Slide and fix it in place with the mounting screws. Mounting screws M3, 8 mm long are provided. If more space is required in the cable duct, set screws M3, 8 mm long can be used.
6. Cut the cable grommets (1) to size to suit the cable diameter and insert them. Five cable grommets are provided.
7. Route the cables and wire them up.

Fig. 17: Mounting the cable duct
Mounting the cover strip to the cable duct end without an end closer

1. Measure out the cable duct cover strip, cut to size and deburr.
2. Clip in the cover strip.

![Fig. 18: Measuring out the cable duct cover strip with an end closer](image)

Mounting the cover strip to the cable duct end with an end closer

1. Measure out the cable duct cover strip.
2. Add 18 mm for each cable duct end closer.
3. Cut the cover strip to size and deburr.
4. Remove any webs at bending zones and the ends.
5. Bend the cover strip into shape and clip in.

6.7 Slot cover

1. Cut the slot cover to the required length and deburr the edges.
2. Insert the cables sideways into the T-slot or lay them in the slot cover.
3. Press the slot cover into the T-slot

![Fig. 19: Mounting the slot cover](image)
6.8  Electrical connections

6.8.1  External protective earth conductor connection at the grounding point on the end plate and the carriage

Grounding point, end plate:
Both end plates of the Compact Module CKL feature a grounding point (the contact is made via a thread in the end plate). The grounding screw is fastened by driving it from the outside into the end plate. The grounding points at the end plates on the frame serve as earthing protection to equalize potential in the case of leakage current (the Ball Rail System does not function as a protective conductor). The protective conductor connection must be established as specified in EN 60204. National and regional regulations must also be complied with.

Grounding point, carriage:
Under normal operating conditions, a leakage current of > 3.5 mA can flow through components of the carriage. For this reason, an additional protective conductor must be attached to the carriage or to its electrically connected attachments. The Ball Rail System does not function as a protective conductor. The protective conductor connection must be established as specified in EN 60204. National and regional regulations must also be complied with.

![Diagram of grounding connection]

1. End plate / carriage
2. Toothed washer
3. Washer
4. Screw
5. Circlip
6. Cable lug

Fig. 20: Example of a grounding connection
6.8.2 Pin assignment

Motor connection / power cable
(M17 plug connector)

<table>
<thead>
<tr>
<th>Pin assignment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protective earth</td>
</tr>
<tr>
<td>U1</td>
<td>Motor phase U</td>
</tr>
<tr>
<td>V1</td>
<td>Motor phase V</td>
</tr>
<tr>
<td>W1</td>
<td>Motor phase W</td>
</tr>
<tr>
<td>5</td>
<td>Temperature sensor +</td>
</tr>
<tr>
<td>6</td>
<td>Temperature sensor -</td>
</tr>
<tr>
<td>9</td>
<td>Internal shield, temperature sensor</td>
</tr>
</tbody>
</table>

Mating plug (connector kit) for customer-specific cable:
RLS1701 / R911337759

Hall sensor connection
Connector D-SUB, 9-pin (male), with threaded jack UNC4-40

<table>
<thead>
<tr>
<th>Pin assignment</th>
<th>Digital Hall-Sensor</th>
<th>Analog Hall sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12V</td>
<td>12V</td>
</tr>
<tr>
<td>2</td>
<td>S1</td>
<td>A+</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>A-</td>
</tr>
<tr>
<td>4</td>
<td>S2</td>
<td>0V</td>
</tr>
<tr>
<td>5</td>
<td>0V</td>
<td>B+</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>B-</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>S3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Measuring system connection (analog 1Vpp)
Connector D-SUB, 15-pin (male), with threaded jack UNC4-40

<table>
<thead>
<tr>
<th>Pin assignment</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SIN -</td>
</tr>
<tr>
<td>2</td>
<td>COS -</td>
</tr>
<tr>
<td>3</td>
<td>REF +</td>
</tr>
<tr>
<td>4/5</td>
<td>5 V</td>
</tr>
<tr>
<td>6/7/8</td>
<td>Reserved (do not connect)</td>
</tr>
<tr>
<td>9</td>
<td>SIN +</td>
</tr>
<tr>
<td>10</td>
<td>COS +</td>
</tr>
<tr>
<td>11</td>
<td>REF -</td>
</tr>
<tr>
<td>12/13</td>
<td>GND</td>
</tr>
<tr>
<td>14</td>
<td>Reserved (do not connect)</td>
</tr>
<tr>
<td>15</td>
<td>Reserved (do not connect)</td>
</tr>
</tbody>
</table>
6.8.3 Connection of power cable, analog measuring system and analog Hall unit

Using the analog Hall unit means that the full motor force is available before homing.

**Fig. 21: Connection example**

RKL480x = Motor power cable (max. cable length 75 m)
RKG0052 = analog Hall unit \(\leftrightarrow\) encoder evaluation at the drive controller
(max. cable length 20 m)
RKG0053 = linear encoder (max. cable length 20 m)
⚠️ The total distance between drive controller and the head of the linear encoder may not exceed a length of 20 m!
⚠️ For the pin assignment for the drive controller, see the IndraDrive Cs (HCS01) project planning manual

**Connection components in combination with drive controllers IndraDrive Cs (HCS01)**

**Table 9: Signal and power cables**

<table>
<thead>
<tr>
<th>Use</th>
<th>Designation</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection cable for analog measuring system</td>
<td>RKG0053</td>
<td>R911338110 length ... mm</td>
</tr>
<tr>
<td>Connection cable for analog Hall unit</td>
<td>RKG0052</td>
<td>R911337569 length ... mm</td>
</tr>
<tr>
<td>Power cable for drive controller (HCS01)</td>
<td>RKL480x</td>
<td>See table 11</td>
</tr>
</tbody>
</table>
6.8.4 Connection of power cable, analog measuring system and digital Hall unit

The adapter box SHL03.1 can be used to connect a digital Hall unit with an incremental linear encoder system to a controller from the IndraDrive Cs (HCS01) family. The SHL03.1 combines the two incoming signal cables from the digital Hall unit and the analog linear encoder system and feeds their signals via one single connection cable to the encoder input in the drive controller.

Using the digital Hall unit means that at least 86% of the motor force will be available before homing. After homing, the full motor force is available.

Fig. 22: Connection example

RKL480x = Motor power cable (max. cable length 75 m)
RKG0049 = adapter box ↔ encoder evaluation at the drive controller (max. cable length 20 m)
RKG0050 = digital Hall unit ↔ adapter box (max. cable length 20 m)
RKG0053 = linear encoder ↔ adapter box (max. cable length 20 m)

The total distance between drive controller and the head of the linear encoder and/or the Hall unit may not exceed a length of 20 m!

For the pin assignment for the drive controller and notes on the adapter box SHL03.1, see the IndraDrive Cs (HCS01) project planning manual.

Table 10: Signal and power cables

<table>
<thead>
<tr>
<th>Use</th>
<th>Designation</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection cable for analog measuring system</td>
<td>RKG0053</td>
<td>R911338110 length ... mm</td>
</tr>
<tr>
<td>Connection cable for digital Hall unit</td>
<td>RKG0050</td>
<td>R911335711 length ... mm</td>
</tr>
<tr>
<td>Connection cable adapter box SHL03.1 with multiple encoder interface HCS01</td>
<td>RKG0049</td>
<td>R911335723 length ... mm</td>
</tr>
<tr>
<td>Power cable for drive controller (HCS01)</td>
<td>RKL480x</td>
<td>See table 11</td>
</tr>
<tr>
<td>Adapter box</td>
<td>SHL03.1-NNN-S-NNN</td>
<td>R911335257</td>
</tr>
<tr>
<td>CKL</td>
<td>Motor</td>
<td>Drive controller</td>
</tr>
<tr>
<td>-----</td>
<td>----------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IndraDrive Cs</td>
</tr>
<tr>
<td>110</td>
<td>MCP030B-V180</td>
<td>HCS01.1E-W0003-A-02-...</td>
</tr>
<tr>
<td></td>
<td>MCP030C-V180</td>
<td>HCS01.1E-W0006-A-02-...</td>
</tr>
<tr>
<td></td>
<td>MCP030D-V180</td>
<td>HCS01.1E-W0009-A-02-...</td>
</tr>
<tr>
<td>145</td>
<td>MCP040C-V300</td>
<td>HCS01.1E-W0013</td>
</tr>
<tr>
<td></td>
<td>MCP040E-V300</td>
<td>HCS01.1E-W0028</td>
</tr>
<tr>
<td></td>
<td>MCP040G-V300</td>
<td>HCS01.1E-W0028</td>
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<tr>
<td>200</td>
<td>MCP070C-V300</td>
<td>HCS01.1E-W0028</td>
</tr>
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<td></td>
<td>MCP070D-V300</td>
<td>HCS01.1E-W0054</td>
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<tr>
<td></td>
<td>MCP070F-V300</td>
<td>HCS01.1E-W0054</td>
</tr>
</tbody>
</table>


7 Commissioning and operation

⚠️ WARNING

Hazardous movements! Danger to life and limb; risk of serious injury or damage to property!

Do not stand anywhere within the movement zone of the machine.

Take preventative measures so that no persons can accidentally enter the danger zone.

The CKL system must be securely fastened in the machine or system.

Secure vertically installed or slanting axes against dropping or lowering of the frame or carriage, for example through

▶ Mechanical locking of the vertical axis
▶ External braking / arrester / clamping device or
▶ Adequate counterweight to stabilize the axis

The axis system contains an incremental linear measuring system. As a result, in order to prevent dropping or lowering of the frame or carriage of a vertical or slanting axis when the motor is commuted, a Hall unit must be provided in addition to the holding device.

For vertical and slanting installations, please note the following additional points.

▶ When using a digital Hall unit, only 86% of the motor force will be available before performing a homing cycle.
▶ The available motor force will depend on the drive power of the selected drive controller.
WARNING

Danger to life and limb due to electric shocks!

When the equipment is in service, cable sheaths can wear out due to mechanical loads and expose live conductors. Defective connection cables must be replaced, and the system must be taken out of service immediately. Do not attempt to carry out any temporary repairs on connection cables.

Work on the electrical system may only be carried out by qualified electricians.

It is essential to use only electricians’ tools (as approved by VDE or a similar professional association).

Before beginning the work:

▶ 1. De-energize the system.
▶ 2. Secure the machine or system against reactivation.
▶ 3. Check that the system is completely de-energized.
▶ 4. Ground and short-circuit the unit.
▶ 5. Lay covers over or put up guards around neighboring pieces of equipment that are energized.

After completing the work, proceed in the reverse order until all precautions have been removed.

Any operation, even for brief measuring and testing purposes, is only permitted when a protective earth conductor has been firmly attached to the system’s specified ground connection points.

WARNING

Health hazard for people with pacemakers, metal implants, and hearing aids due to the effect of strong magnetic and electromagnetic fields when standing near motor components!

▶ Persons with pacemakers or metal implants must not come close to these motor parts or handle them.

Risk of destroying sensitive objects!

▶ Watches, credit or check cards, ID cards with a magnetic stripe, and all ferromagnetic metal parts made of iron, nickel or cobalt must be kept away from permanent magnets.

Risk of crushing fingers and hands due to the strong attractive force of magnets!

▶ Keep movable ferromagnetic objects (e.g. tools) away from the equipment.
WARNING

Risk of burns due to contact with hot surfaces! Temperatures over 70°C are possible.
▶ Avoid touching the hot surface of the carriage subassembly.
▶ After switching off, allow hot surfaces to cool before touching them.
▶ Temperature-sensitive parts should not be allowed to come into contact with the surface of the carriage subassembly.
▶ Make sure the connection cables are installed at a sufficient distance from other components.
7.1 Checking the operating conditions

Operating conditions: ➔ 12 General conditions of use

7.2 Start-up with start-up instructions

Available for download at www.boschrexroth.com/mediadirectory

7.3 Trial run, running in

➤ Before starting the first trial run, take account of any interferences in the overall machine or system. When homing with a reference mark, take note of its position. For further information, please refer to the dimension drawings in the product catalog.
➤ During the first trial run, traverse the unit at low speed over the entire stroke. While doing so, take care to check especially the setting and function of the reference switch, the reference mark and the limit switches (if any).
➤ If necessary, optimize the interaction of the mechanical system and the electronics.

Fig. 23: Traversing the carriage
7.4 Operation

During operation, the specified conditions of use and the technical data must be complied with.

Checks to be performed during operation:
- Listen for any unusual noises.
- Watch out for excessive vibration.
- Check that the optical measuring system is clean
- Check that the CKL is clean.
- Check the monitoring devices and diagnostics/error messages of the controllers.
- Check the wiring regularly for signs of wear.
- Check vertically installed CKL systems for any emerging lubricant.

**NOTICE**

If the conditions begin to deviate from normal operation, take the drive out of service immediately!

Damage to the product.

▷ Proceed further as described in section 13 “Service and Support”
8 Maintenance and repair

**WARNING**

**Hazardous movements! Danger to life and limb; risk of serious injury or damage to property!**

Do not stand anywhere within the movement zone of the machine.

Take preventative measures so that no persons can accidentally enter the danger zone.

Never carry out any maintenance work on a machine while it is in service.

Secure the machine/system against restart and unauthorized use for the duration of the maintenance work.

Secure vertically installed or slanting axes against dropping or lowering of the frame or carriage, for example through:

- Mechanical locking of the vertical axis
- External braking / arrestor / clamping device or
- Adequate counterweight to stabilize the axis

**WARNING**

**Danger to life and limb due to electric shocks!**

When the equipment is in service, cable sheaths can wear out due to mechanical loads and expose live conductors. Defective connection cables must be replaced, and the system must be taken out of service immediately. Do not attempt to carry out any temporary repairs on connection cables.

Work on the electrical system may only be carried out by qualified electricians.

It is essential to use only electricians’ tools (as approved by VDE or a similar professional association).

Before beginning the work:

- 1. De-energize the system.
- 2. Secure the machine or system against reactivation.
- 3. Check that the system is completely de-energized.
- 4. Ground and short-circuit the unit.
- 5. Lay covers over or put up guards around neighboring pieces of equipment that are energized.

After completing the work, proceed in the reverse order until all precautions have been removed.

Any operation, even for brief measuring and testing purposes, is only permitted when a protective earth conductor has been firmly attached to the system’s specified ground connection points.

**When the carriage is moved manually, dangerous voltage levels can occur at the connection pins for the power cable!** This is due to the generator principle of a synchronous motor: conversion of mechanical energy to electrical energy.
**WARNING**

Health hazard for people with pacemakers, metal implants, and hearing aids due to the effect of strong magnetic and electromagnetic fields when standing near motor components!

- Persons with pacemakers or metal implants must not come close to these motor parts or handle them.

Risk of destroying sensitive objects!

- Watches, credit or check cards, ID cards with a magnetic stripe, and all ferromagnetic metal parts made of iron, nickel or cobalt must be kept away from permanent magnets.

Risk of crushing fingers and hands due to the strong attractive force of magnets!

- Keep movable ferromagnetic objects (e.g. tools) away from the equipment.

**WARNING**

Risk of burns due to contact with hot surfaces! Temperatures over 70°C are possible.

- Avoid touching the hot surface of the carriage subassembly.
- After switching off, allow hot surfaces to cool before touching them.
- Temperature-sensitive parts should not be allowed to come into contact with the surface of the carriage subassembly.
- Make sure the connection cables are installed at a sufficient distance from other components.

**NOTICE**

The CKL contains parts that are susceptible to ESD damage. These parts, e.g. the temperature sensors of the motor winding, can be easily destroyed if not handled properly.

- Avoid direct contact with the exposed contact pins in the electrical connection area of the carriage subassembly until you have electrostatically discharged yourself or been grounded.
- Take precautions before handling the ESD-susceptible parts (ESD protective clothing, armband, conductive flooring, grounded cabinets and work surfaces) in order to avoid damage.
8.1 Visual inspection and cleaning

▶ Excessive contamination, dust or shavings can have a negative effect on the function of the motors and, in extreme cases, even cause them to fail. At regular intervals (but no longer than one year), you should therefore clean the motor in order to maintain a sufficiently large surface area for heat dissipation. If the cooling fins are partly covered with dirt, the motor will no longer be able to dissipate the heat adequately to the surrounding air.
▶ Check the connection cables for damage at regular intervals and replace them if necessary.
▶ Check any optional cable drag chains (cable management chains) for defects.
▶ Check connected protective earth conductors at regular intervals to see that they are in proper condition and firmly attached. Replace if necessary.
▶ We recommend cleaning the optical scale with a cloth made of non-linting fabric after each relubrication procedure, if not more frequently.

8.2 Lubrication

▶ Before using lubricants, read and take note of the corresponding material safety data sheets!
▶ When lubricating the ball runner blocks, use a commercially available manual grease gun.
▶ Basic lubrication is carried out by the manufacturer.

**NOTICE**

**Risk of property damage due to insufficient lubrication!**

Loss of performance and corrosion, in addition to premature failure of the guides.

▶ Lubricate the product every 500 operating hours or when the specified travel distance has been covered – whichever limit is reached first ➞ Table 14.

**Risk of insufficient lubrication due to use of wrong lubricants!**

Damage to the product, reduction in relubrication intervals, loss of performance in short-stroke applications and under load; possible chemical interactions between plastic materials and lubricants.

▶ Do not use lubricants containing solid particles (e.g. graphite or MoS₂)!
▶ Use only the recommended lubricants ➞ Table 13.

**Reduced lubrication intervals in special environmental conditions (dirt, vibrations, impacts, etc.)!**

Inadequate lubrication.

▶ Reduce the recommended relubrication intervals to suit the given environmental conditions.
▶ Even under normal operating conditions, the system must be relubricated at the latest after 2 years due to aging of the grease.

**Performance altered by special operating conditions!**

Damage to the product.

▶ Before putting the product into service under special operating conditions (➔ 12) please consult Bosch Rexroth AG. This applies especially to environments with glass fiber or wood dust, solvents, extreme temperatures, and for short-stroke applications.
Table 12: Recommended lubricants

<table>
<thead>
<tr>
<th>CKL</th>
<th>Grease DIN 51825</th>
<th>Consistency class DIN 51818</th>
<th>Recommend grease</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>KP00K</td>
<td>NLGI 00</td>
<td>Castrol Longtime PD 00</td>
</tr>
<tr>
<td>145 / 200</td>
<td>KP2K</td>
<td>NLGI 2</td>
<td>Castrol Longtime PD 2</td>
</tr>
</tbody>
</table>

Table 13: Lubricant quantities Dynalub 510 / 520

<table>
<thead>
<tr>
<th>CKL</th>
<th>Travel (km)</th>
<th>Relubrication quantity (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>5000</td>
<td>0.6</td>
</tr>
<tr>
<td>145</td>
<td>5000</td>
<td>3.2</td>
</tr>
<tr>
<td>200</td>
<td>5000</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Table 14: Lubrication in short-stroke applications

- If the stroke is less than shown below, the application is a short-stroke one. Please contact Bosch Rexroth.

<table>
<thead>
<tr>
<th>CKL</th>
<th>Stroke (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>72</td>
</tr>
<tr>
<td>145</td>
<td>62 (82*)</td>
</tr>
<tr>
<td>200</td>
<td>89</td>
</tr>
</tbody>
</table>

* for a carriage length Lca 484 mm

8.2.1 Lubricating the Compact Module CKL via the carriage

There are lube nipples on both sides of the carriage. Lubricating from one side only is sufficient.

1. Check that the operating conditions are normal.  ➔ 12.
2. Lubricate Compact Modules using a manual grease gun. Weigh out the quantity of grease per stroke. ➔ Table 14.
3. Traverse the carriage for at least the specified minimum stroke to ensure uniform greasing of the runner blocks.

Fig. 24: Lubricating the Compact Module
8.3 Repairs
Repairs to the product may only be carried out by Bosch Rexroth.

⚠️ WARNING

Risk of product crashing down due to inadequate load hoisting equipment!
Severe personal injury or even death.

- Use only safety-inspected and suitable load hoisting equipment.
- Attach load hoisting equipment only at the designated points and fasten with care.
- Do not stand under hoisted loads.
- Before hoisting the product, take note of the weight ➤ “CKL” catalog.
- Secure the movable carriage against dropping, lowering or sliding.

Sending the product back to:
BOSCH REXROTH USA

Fig. 25: Sending the product back to Bosch Rexroth

9 Removal and replacement

To assure the accuracy of the product after removal and replacement of assemblies (e.g. linear motor, Ball Rail Systems, carriage, frame, etc.), sub-assemblies may only be dismantled and replaced by Rexroth. The only exceptions to this rule are the work steps described in this section.

⚠️ WARNING

Hazardous movements! Danger to life and limb; risk of serious injury or damage to property!
Do not stand anywhere within the movement zone of the machine.
Take preventative measures so that no persons can accidentally enter the danger zone.
Never carry out any maintenance work on a machine while it is in service.
Secure the machine/system against restart and unauthorized use for the duration of the maintenance work.
Secure vertically installed or slanting axes against dropping or lowering of the frame or carriage, for example through
- Mechanical locking of the vertical axis
- External braking / arrester / clamping device
- Adequate counterweight to stabilize the axis
**WARNING**

**Danger to life and limb due to electric shocks!**

When the equipment is in service, cable sheaths can wear out due to mechanical loads and expose live conductors. Defective connection cables must be replaced, and the system must be taken out of service immediately. Do not attempt to carry out any temporary repairs on connection cables.

Work on the electrical system may only be carried out by qualified electricians.

It is essential to use only electricians' tools (as approved by VDE or a similar professional association).

Before beginning the work:

1. De-energize the system.
2. Secure the machine or system against reactivation.
3. Check that the system is completely de-energized.
4. Ground and short-circuit the unit.
5. Lay covers over or put up guards around neighboring pieces of equipment that are energized.

After completing the work, proceed in the reverse order until all precautions have been removed.

Any operation, even for brief measuring and testing purposes, is only permitted when a protective earth conductor has been firmly attached to the system's specified ground connection points.

When the carriage is moved manually, dangerous voltage levels can occur at the connection pins for the power cable! This is due to the generator principle of a synchronous motor: conversion of mechanical energy to electrical energy.

---

**WARNING**

**Health hazard for people with pacemakers, metal implants, and hearing aids due to the effect of strong magnetic and electromagnetic fields when standing near motor components!**

- Persons with pacemakers or metal implants must not come close to these motor parts or handle them.

**Risk of destroying sensitive objects!**

- Watches, credit or check cards, ID cards with a magnetic stripe, and all ferromagnetic metal parts made of iron, nickel or cobalt must be kept away from permanent magnets.

**Risk of crushing fingers and hands due to the strong attractive force of magnets!**

- Keep movable ferromagnetic objects (e.g. tools) away from the equipment.


**WARNING**

Risk of burns due to contact with hot surfaces! Temperatures over 70°C are possible.
- Avoid touching the hot surface of the carriage subassembly.
- After switching off, allow hot surfaces to cool before touching them.
- Temperature-sensitive parts should not be allowed to come into contact with the surface of the carriage subassembly.
- Make sure the connection cables are installed at a sufficient distance from other components.

**NOTICE**

The CKL contains parts that are susceptible to ESD damage. These parts, e.g. the temperature sensors of the motor winding, can be easily destroyed if not handled properly.
- Avoid direct contact with the exposed contact pins in the electrical connection area of the carriage subassembly until you have electrostatically discharged yourself or been grounded.
- Take precautions before handling the ESD-susceptible parts (ESD protective clothing, armband, conductive flooring, grounded cabinets and work surfaces) in order to avoid damage.

9.1 Removing the slot cover
- To remove slot cover, follow the same procedure as for installing, but in reverse order.  ➔ 6.7

9.2 Removing the cable duct
- To remove the cable duct, follow the same procedure as for installing, but in reverse order.  ➔ 6.6

9.3 Removing the socket
- To remove the socket, follow the same procedure as for installing, but in reverse order.  ➔ 6.5

9.4 Removing the switching system
- To remove the switching system, follow the same procedure as for installing, but in reverse order.  ➔ 6.4

9.5 Removing the cable chain
- To remove the cable chain, follow the same procedure as for installing, but in reverse order.  ➔ 6.3
10 Environmental protection and disposal

⚠️ WARNING

Health hazard for people with pacemakers, metal implants, and hearing aids due to the effect of strong magnetic and electromagnetic fields when standing near motor components!

▶ Persons with pacemakers or metal implants must not come close to these motor parts or handle them.

Risk of destroying sensitive objects!

▶ Watches, credit or check cards, ID cards with a magnetic stripe, and all ferromagnetic metal parts made of iron, nickel or cobalt must be kept away from permanent magnets.

Risk of crushing fingers and hands due to the strong attractive force of magnets!

▶ Keep movable ferromagnetic objects (e.g. tools) away from the equipment

NOTICE

Environmentally hazardous materials can pollute the environment if not disposed of properly!

Environmental pollution.

▶ Collect any escaping lubricant and dispose of it correctly.

▶ The product and its components must be disposed of correctly and in compliance with all applicable national and international guidelines and regulations.

▶ The permanent magnets in the secondary part must be demagnetized before disposal in order to avoid injuries or damage to property.
11 Technical data

Recycling:
- Because of their high metal content in the products, most of the materials can be recovered. To achieve an optimal metal recovery rate, the products must be dismantled into their individual subassemblies. Metals contained in the electrical and electronic assemblies can also be recovered with the help of special separation processes.

The CKL mainly comprises the following constituents:
- Steel, aluminum, copper, brass
- Plastics, insulating materials and composites
- Electronic parts
- Permanent magnets
- Lubricants

Demagnetizing the magnets:
- A special thermal treatment is required to demagnetize the magnets in the secondary part. The length of time the treatment takes depends on the size. The secondary part must remain in the furnace for at least 30 min, beginning from the time at which the surface of the magnet has reached a temperature of 300 °C. Once the magnets have been successfully demagnetized and have cooled down, they can be removed from the carrier plate without requiring any force.

Packaging:
- Our packaging materials contain no substances of concern and can therefore be recycled without problems. The packaging materials used are the following: Wood, cardboard, and plastics.

Disposal through the manufacturer:
- The products we manufacture can be returned to us for disposal. Please ensure that they contain no foreign objects/substances or components that were not made by Bosch Rexroth. Regarding the secondary part, please consult the hazardous goods transport rules (IATA) if you intend to use air freight.

The products are to be delivered freight prepaid to the following address:
- BOSCH REXROTH US
  Charlotte, NC  USA
12 General conditions of use

Table 15: Conditions of use

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>-20 °C ... 60 °C</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-20 °C ... 60 °C</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>10 °C ... 40 °C</td>
<td></td>
</tr>
<tr>
<td>Max. rate of temperature change</td>
<td>0.5 K/min</td>
<td></td>
</tr>
<tr>
<td>Humidity (relative)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>max. 75% (at + 30 °C)</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>10 ... 90 %</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>10 ... 90 %</td>
<td></td>
</tr>
<tr>
<td>Altitude</td>
<td>0 ... 1000 m</td>
<td></td>
</tr>
<tr>
<td>Load $F_{comb}$</td>
<td>$&lt; 0.1$ C</td>
<td></td>
</tr>
<tr>
<td>Travel speed</td>
<td>up to 5 m/s</td>
<td></td>
</tr>
<tr>
<td>Acceleration</td>
<td>up to 100 m/s²</td>
<td></td>
</tr>
<tr>
<td>Minimal stroke</td>
<td>CKL 145</td>
<td>62 - 82 mm</td>
</tr>
<tr>
<td></td>
<td>CKL 200</td>
<td>89 mm</td>
</tr>
<tr>
<td>Protection class</td>
<td>Motor</td>
<td>IP 20</td>
</tr>
<tr>
<td></td>
<td>Measuring system</td>
<td>IP 40</td>
</tr>
</tbody>
</table>

If the conditions of use deviate in any way from the data given here, please contact your local REXROTH sales partner.

12.1 Tightening torques

We use screws of strength class 8.8 as standard. If other screws are used, this is indicated.

Table 16: Tightening torques

<table>
<thead>
<tr>
<th>8.8</th>
<th>M2</th>
<th>M2.5</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M14</th>
<th>M16</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_{\phi \text{max}}$ (Nm)</td>
<td>0.4</td>
<td>0.7</td>
<td>1.3</td>
<td>2.7</td>
<td>5.5</td>
<td>9.5</td>
<td>23</td>
<td>46</td>
<td>80</td>
<td>123</td>
<td>194</td>
</tr>
</tbody>
</table>
13 Service and support

The Service Helpdesk & Hotline can be reached at:
- Phone: (800) 438-5983
- Web: www.boschrexroth-us.com/service
- E-Mail: appengreq.brl@boschrexroth-us.com

Service around the world.
If you are located outside Germany, please always contact your local sales partner first.
You will find the hotline numbers in the sales network addresses posted on our website.
- Internet: http://www.boschrexroth.com

Preparing the information.
We will be able to help you fastest and most effectively if you have the following information ready at hand.
- Detailed description of the fault and the circumstances under which it occurred.
- Information given on the nameplates of the products concerned.
  - Part number, type designation, customer order number of the CKL.
  - Part number, type designation, serial number of the drive controller HCS01.
- As much additional information as possible concerning the control environment and peripherals (e.g. control type, firmware, bus system).
- Your contact details (name of contact, phone number and e-mail address)

13.1 Troubleshooting and fault clearance

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor not running</td>
<td>Controller enable signal missing</td>
<td>Activate the controller enable signal</td>
</tr>
<tr>
<td></td>
<td>Control error</td>
<td>Clear the fault as described in the controller documentation</td>
</tr>
<tr>
<td></td>
<td>No power supply</td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>Fastening screws loosened</td>
<td>Check the screw connections</td>
</tr>
<tr>
<td>Running noises</td>
<td>Foreign body in the motor</td>
<td>Take motor out of service → Repair by manufacturer</td>
</tr>
<tr>
<td></td>
<td>Ball Rail Systems</td>
<td>Take ball rail system out of service → Repair by manufacturer</td>
</tr>
<tr>
<td>High motor temperature, motor</td>
<td>Operation out of spec</td>
<td>Reduce the load, if necessary check design calculations</td>
</tr>
<tr>
<td>monitoring device responds</td>
<td>monitoring device responds</td>
<td></td>
</tr>
<tr>
<td>CKL is not moving freely or is</td>
<td>Improper mounting, distortion due to fastening, end of life, etc.</td>
<td>Check the mechanics</td>
</tr>
<tr>
<td>jammed</td>
<td>Wrong or faulty temperature</td>
<td></td>
</tr>
<tr>
<td>indication</td>
<td>indication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature sensor is not</td>
<td>Connect up the temperature sensor</td>
</tr>
<tr>
<td></td>
<td>connected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature sensor defective</td>
<td>Take motor out of service → Repair by manufacturer</td>
</tr>
<tr>
<td>Encoder signals disturbed or</td>
<td>Dirty optical scale</td>
<td>Clean the optical scale</td>
</tr>
<tr>
<td>erroneous, failure to detect</td>
<td>Defective optical scale</td>
<td>→ Repair by manufacturer</td>
</tr>
<tr>
<td>reference mark</td>
<td>Defective encoder cable</td>
<td>Check the encoder cable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.