Compact Modules CKK

The Drive & Control Company
Linear Motion and Assembly Technologies

Ball Rail Systems
Roller Rail Systems
Linear Bushings and Shafts

Ball Screw Drives
Linear Motion Systems
Basic Mechanical Elements

Manual Production Systems
Assembly Conveyors
VarioFlow Conveyors
## Compact Modules

A Solution to Many Problems 4  
Product Overview 6  
Types Available, Load Capacities 10  

### Compact Module CKK (with Ball Rail System and Ball Screw Assembly)
- Structure 12  
- Technical Data 14  
- Calculations 20  
- Calculation Example 22  
  - CKK 12-90
    - Components and Ordering Data 24  
    - Dimension Drawings 26  
  - CKK 15-110
    - Components and Ordering Data 28  
    - Dimension Drawings 30  
  - CKK 20-145
    - Components and Ordering Data 32  
    - Dimension Drawings 34  

### Attachments and Mounting
- Switch Mounting Arrangements 36  
- Motors 38  
- Mounting 40  
- Connection Plate 41  

Connectors 42  

Documentation 48  

Inquiry/Order Form 51
A Solution to Many Problems

The tasks

- Driving
- Transporting
- Positioning

Total height
Total length
Load capacities and moments
Static load
Speed
Precision
System complete with drive unit
Switch mounting arrangements
Multiple axis unit
Accessories
Documentation
The solution

Compact Modules

- Repeatability up to 0.005 mm
- Accuracy up to 0.01 mm
- AC servo motor, MiniDrive or stepping motor with mount, coupling or side drive with timing belt (plus control unit)
- Switch without switching cam over total travel range
- Combination option provided by connectors
- Clamping fixtures, motor mounts, connecting plate, connectors
- Moment of friction measurement
- Lead deviation
- Positioning accuracy

40 mm to 65 mm

Up to 1800 mm

Load capacity C up to 61080 N
Longitudinal moment $M_L$ up to 3050 Nm
Torsional moment $M_T$ up to 2685 Nm

Up to 200 kg

Up to 76 m/min

Load capacity C up to 61080 N
Longitudinal moment $M_L$ up to 3050 Nm
Torsional moment $M_T$ up to 2685 Nm
Product Overview

Compact Modules are ready-to-mount precision guide systems offering outstanding performance within a compact envelope. Excellent price/performance ratio. Available at short notice.

Structure
- Low profile precision aluminium frame (main structure) with two integrated Ball Rail Systems
- Precision Ball Screw Assemblies to tolerance grade 7 with zero-clearance nut systems
- Aluminum fixed bearing end block with two-row preloaded angular contact bearing
- Floating bearing end block with double bearings
- One or two aluminum carriages with integrated runner blocks

Attachments
- Maintenance-free digital AC servo drives with integrated brake and attached feedback, or stepping motors
- Motor mount and coupling or side drive with timing belt
- Switches
- Socket and plug for switches
- Aluminum profile cable duct

Drive Controllers and Control Systems

For mounting and maintenance see "Instructions for Compact Modules CKK" RE 82 615

Exceptionally low profile due to centrally arranged ball screw drive

High positioning accuracy and repeatability due to Precision Ball Screw Assembly with zero-clearance nut system

High travel speeds combined with high precision over long travel ranges due to Ball Rail Systems, large screw diameters and leads, and double floating bearing
- Internal elements protected by aluminum cover strip mounted for optimum resistance to deflection and by polyurethane side strips with integrated steel cords providing gap-type sealing

- Optimum running properties, high load capacities, high rigidity due to two integrated zero-clearance Ball Rail Systems

- Precise alignment and secure mounting of attachments thanks to threaded bores and pin holes on one or two carriages

- Low-cost maintenance provided by one-point lubrication with lubrication points accessible from both sides

- Adjustable switches over the entire travel range; switch activation without switching cam

- Simple motor attachment due to locating feature and tapped mounting holes
Product Overview

Motor Selection
in accordance with controllers and control systems

A choice can be made between several different motor/controller combinations to achieve the most cost-efficient solution for each customer application.

The motor/controller combination must always be taken into account when sizing the drive.

For more detailed information on motors and control systems, please refer to catalog RE 82 701 "Controllers, Motors, Electrical Accessories".

* Analog AC servo motor Type MAC and analog controllers Type TDM are still available.
Digital Controller
The low-cost solution for single-axis and multi-axis systems

Compact Modules can be supplied complete with motor, controller and control system.
Types Available, Load Capacities

**Type designation (size)**
Compact Modules are designated according to **type** and **size**.

Types also cover the equivalent designs without drive systems.

<table>
<thead>
<tr>
<th>Compact Module (example)</th>
<th>Type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CKK</td>
<td>20-145</td>
</tr>
</tbody>
</table>

- **System** = Compact Module (C)
- **Guideway** = Ball Rail System (K)
- **Drive unit** = Precision Ball Screw Assembly (K)

**Dimensions of guideway**

**Frame dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Guideway</th>
<th>Drive Unit</th>
<th>Compact Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK</td>
<td>Ball Rail System</td>
<td>Precision Ball Screw Assembly</td>
<td></td>
</tr>
</tbody>
</table>
Overview of Compact Modules with permissible loads

As far as the desired service life is concerned, loads of up to approximately 20% of the dynamic load and moment values \((C, M_r, M_L)\) have proved acceptable.

Suitable Loads
(recommended value on the basis of past experience)

The following values may not be exceeded:
- the maximum permissible loads
- the maximum permissible drive torque
- the maximum permissible speed.

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>Dimensions (A \times H) (mm)</th>
<th>Dyn. load capacity (C) (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90</td>
<td>90 \times 40</td>
<td>one carriage 4 620, two carriages 7 500</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>110 \times 50</td>
<td>15 600, 25 340</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>145 \times 65</td>
<td>37 600, 61 080</td>
</tr>
</tbody>
</table>

Note: All modules are also available without drive unit.
Structure

1. Precision ball screw assembly with zero-clearance cylindrical single nut
2. Floating bearing end block
3. Carriage with two integrated runner blocks
3a. Two carriages, each with two integrated runner blocks
4. Aluminum cover plate
5. Polyurethane sealing strip (moving)
6. Fixed bearing end block
7. Main structure

Accessories
8. Switches
9. Cable duct
10. Socket/plug
11. Connecting plate
12. Motor
13. Motor mount and coupling
14. Side drive with timing belt
Motor attachment with mount and coupling

A motor can be attached via a mount and coupling to all Compact Modules equipped with Precision Ball Screw Assemblies. The motor mount serves both to attach the motor to the Compact Module and as an enclosed housing for the coupling. The coupling transmits the motor drive torque free of stresses to the Compact Module drive shaft.

Our standard couplings compensate for the thermal expansion of the system. If other makes of couplings are used, thermal expansion must be taken into account.

1 Motor
2 Motor mount
3 Coupling
4 Compact Module

Motor attachment via side drive with timing belt

On all Compact Modules the motor can be attached via a side drive with timing belt. This results in a shorter overall length compared to a motor attachment with motor mount and coupling.

The compact, enclosed housing provides belt protection and secures the motor.

Different gear ratios are available:

- \[ i = 1 : 1 \]
- \[ i = 1 : 1.5 \]
- \[ i = 1 : 2 \]

The side drive with timing belt can be mounted in four different directions:

- bottom, top (RV01 and RV02)
- left, right (RV03 and RV04)

1 Compact Module
2 Drawn, anodized aluminum frame
3 Toothed belt
4 AC servo motor
5 Pre-tensioning of the toothed belt: Apply pre-tensioning force \( F_v \) to the motor (\( F_v \) will be indicated on delivery)
6 Attachment of belt pulleys with clamping assemblies
7 Cover plate
8 End cover
Technical Data

General technical data

Load capacities and moments

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>No. of carriages</th>
<th>Ball screw</th>
<th>Dynamic load capacity C</th>
<th>Dynamic moments</th>
<th>Planar moment of inertia</th>
<th>Maximum length</th>
<th>Moved mass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>d x P</td>
<td>Guideway</td>
<td>Ball screw</td>
<td>Fixed bearing</td>
<td>M_t</td>
<td>M_L</td>
<td>m_b</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(Nm)</td>
<td>(Nm)</td>
<td>(kg)</td>
</tr>
<tr>
<td>CKK 12-90</td>
<td>1 12 x 5, 12 x 10</td>
<td>4 620</td>
<td>3 800</td>
<td>6 900</td>
<td>125</td>
<td>16</td>
<td>14.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 12 x 5, 12 x 10</td>
<td>7 500</td>
<td>3 800</td>
<td>6 900</td>
<td>200</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>(l_m = 65 mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>1 16 x 5, 16 x 10</td>
<td>15 600</td>
<td>9 600</td>
<td>6 300</td>
<td>515</td>
<td>80</td>
<td>37.74</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 16 x 5, 16 x 10</td>
<td>25 340</td>
<td>9 600</td>
<td>6 300</td>
<td>835</td>
<td>1075</td>
</tr>
<tr>
<td></td>
<td>(l_m = 85 mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>1 20 x 5, 20 x 10</td>
<td>37 600</td>
<td>9 100</td>
<td>15 700</td>
<td>1 650</td>
<td>255</td>
<td>114.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 20 x 5, 20 x 10</td>
<td>61 080</td>
<td>9 100</td>
<td>15 700</td>
<td>2 685</td>
<td>3 050</td>
</tr>
<tr>
<td></td>
<td>(l_m = 100 mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Maximum permissible loads

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>No. of carriages</th>
<th>Maximum permissible forces</th>
<th>Maximum permissible moments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F_y1 (N)</td>
<td>F_y2 (N)</td>
</tr>
<tr>
<td>CKK 12-90</td>
<td>1 4 620</td>
<td>4 620</td>
<td>2 490</td>
</tr>
<tr>
<td></td>
<td>2 7 500</td>
<td>7 500</td>
<td>4 050</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>1 12 000</td>
<td>6 000</td>
<td>3 480</td>
</tr>
<tr>
<td></td>
<td>2 19 490</td>
<td>9 740</td>
<td>5 650</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>1 29 000</td>
<td>14 500</td>
<td>8 410</td>
</tr>
<tr>
<td></td>
<td>2 47 110</td>
<td>23 550</td>
<td>13 660</td>
</tr>
</tbody>
</table>

Modulus of elasticity E

E = 70 000 N/mm²

Mass

Mass calculation does not include motor or switches.

Mass formula:
Mass (kg/mm) = length L (mm) + mass of all parts of fixed length (carriage, end blocks, etc.) (kg)

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>Ball screw</th>
<th>No. of carriages</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90</td>
<td>with</td>
<td>1</td>
<td>0.0055 : L + 0.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0055 : L + 1.2</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>with</td>
<td>1</td>
<td>0.0092 : L + 1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0092 : L + 2.0</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>with</td>
<td>1</td>
<td>0.0178 : L + 3.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>0.0178 : L + 3.9</td>
</tr>
</tbody>
</table>
Notes on dynamic load capacities and moments

The dynamic load capacities and moments are based on 100,000 m travel.
However, a travel of just 50,000 m is often taken as a basis.
If this is the case, for comparison purposes:
Multiply value $C$, $M_t$ and $M_L$ from the table by 1.26.
Technical Data

**Maximum permissible drive torque** $M_{\text{per}}$

The $M_{\text{per}}$ values shown apply in the following conditions:

- horizontal operation
- ball screw journal without keyway
- no radial load on ball screw journal

Observe the rated torque of coupling used!

### Ball screw journal with keyway

Due to the notch effect and the reduction of the effective diameter, observe the following maximum values for the drive torque!

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>$M_{\text{per}}$ (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90</td>
<td>–</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>5.0</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>11.5</td>
</tr>
</tbody>
</table>
**Maximum velocity v**
Observe the motor speed!

![Graph 1](image1.png)

**CKK 12-90**

- 12x10
- 12x5

![Graph 2](image2.png)

**CKK 15-110**

- 16x16
- 16x10
- 16x5

![Graph 3](image3.png)

**CKK 20-145**

- 20x20
- 25x10
- 20x5
# Technical Data

## Data for side drive with timing belt, floating bearing side

<table>
<thead>
<tr>
<th>Motor type</th>
<th>MKD 25B / MSM 030C</th>
<th>MKD 41B / MSM 040B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moment of friction $M_{RRv}$ (Nm)</td>
<td>0.35</td>
<td>0.4</td>
</tr>
<tr>
<td>permissible torque for lengths up to $L^{(1)} = \ldots$ for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>reduced mass moment of inertia for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gear ratio $i = \ldots$</td>
<td>$i = 1$</td>
<td>$i = 1.5$</td>
</tr>
<tr>
<td>Compact Module</td>
<td>ball screw</td>
<td>$d_0 \times P$</td>
</tr>
<tr>
<td>CKK 12-90</td>
<td></td>
<td>12 x 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 x 10</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td></td>
<td>16 x 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 x 10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 x 16</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td></td>
<td>20 x 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 x 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 x 10</td>
</tr>
</tbody>
</table>

$M_{Rv}$ = permissible torque of system with side drive with timing belt at motor journal (observe max. motor torque of $M_{max}$)

$M_{RRv}$ = moment of friction of side drive with timing belt at motor journal

$J_{Rv}$ = reduced mass moment of inertia of side drive with timing belt

$i$ = gear ratio of side drive with timing belt

$^{(1)}$ permissible torques for other lengths available upon request

---

## AC servo motor data

![See "Controllers, Motors, Electrical Accessories" catalog RE 82 701](image-url)

<table>
<thead>
<tr>
<th>Motor type</th>
<th>MKD 25B-144 KG1</th>
<th>MKD 41B-144 KG1</th>
<th>MDD 71A-N-060-N2S-095 GB1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum effective speed $n_{max}$ (min$^{-1}$)</td>
<td>$\frac{1}{4}$</td>
<td>$\frac{1}{4}$</td>
<td>$\frac{1}{4}$</td>
</tr>
<tr>
<td>Rated torque $M_N$ (Nm)</td>
<td>0.9</td>
<td>2.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Maximum torque $M_{max}$ (Nm)</td>
<td>$\frac{1}{4}$</td>
<td>$\frac{1}{4}$</td>
<td>$\frac{1}{4}$</td>
</tr>
<tr>
<td>Mass moment of inertia $J_{M} + J_{Br}$ (10$^{-6}$ kgm$^2$)</td>
<td>$30 + 8$</td>
<td>$170 + 16$</td>
<td>$440 + 38$</td>
</tr>
<tr>
<td>Braking torque $M_{BR}$ (Nm)</td>
<td>1.0</td>
<td>2.2</td>
<td>3</td>
</tr>
<tr>
<td>Mass with brake $m_{Br}$ (kg)</td>
<td>2.25</td>
<td>4.65</td>
<td>6.88</td>
</tr>
</tbody>
</table>
### Motor Data Servomotors Type MSM

<table>
<thead>
<tr>
<th>Motor</th>
<th>MSM 030 C</th>
<th>MSM 040 B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>with Absolute Encoder</td>
<td>with Absolute Encoder</td>
</tr>
<tr>
<td></td>
<td>Without Brake</td>
<td>With Brake</td>
</tr>
<tr>
<td>Maximum Effective Speed RPM $n_{\text{max}}$ (min$^{-1}$)</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Rated Torque$^{1)} M_g$ (Nm)</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Maximum Torque $M_{\text{max}}$ (Nm)</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Mass Moment of Inertia $J_M + J_{Br}$ (10$^{-6}$ kgm$^2$)</td>
<td>17</td>
<td>17+3</td>
</tr>
<tr>
<td>Braking Torque $M_{Br}$ (Nm)</td>
<td>-</td>
<td>1.27</td>
</tr>
<tr>
<td>Mass with Brake $m_{Br}$ (kg)</td>
<td>1.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

$^{1)}$ Continuous torque at standstill, natural convention cooling at (at 60° K over temperature at motor housing)

**NOTE:** Motors are available complete with controls.
Technical Data, Calculations

Formulas

Nominal life

Nominal life in meters:
\[ L_{10} = \frac{C}{F_m} \cdot 10^5 \]

Nominal life in hours:
\[ L_{10h} = \frac{L_{10}}{60 \cdot v} \]

Nominal life in meters (m)
\[ L_{10} \]

Nominal life in hours (h)
\[ L_{10h} \]

Dynamic load capacity (N)
\[ C \]

Mean equivalent dynamic load (N)
\[ F_m \]

Velocity (from "permissible velocity" chart) (m/min)
\[ v \]

Moment of friction

for motor attachment via mount and coupling:

\[ M_R = M_{RS} \]

for motor attachment via side drive with timing belt:

\[ M_R = \frac{M_{RS}}{i} + M_{RRV} \]

Moment of friction at motor journal (Nm)
\[ M_R \]

Moment of friction of system (Nm)
\[ M_R \]

Moment of friction of side drive with timing belt at motor journal (Nm)
\[ M_{RRV} \]

Gear ratio
\[ i \]

Constants \( k_1, k_2, k_3 \)

Moment of friction \( M_R \)

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>Ball screw ( d_x \times P )</th>
<th>1 carriage</th>
<th>2 carriages</th>
<th>( k_1 )</th>
<th>( k_2 )</th>
<th>( k_3 )</th>
<th>( M_R ) (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90</td>
<td>12 x 5</td>
<td>1.454</td>
<td>1.600</td>
<td>0.011</td>
<td>0.633</td>
<td>0.15</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>12 x 10</td>
<td>2.138</td>
<td>2.750</td>
<td>0.011</td>
<td>2.553</td>
<td></td>
<td>0.47</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>16 x 5</td>
<td>5.088</td>
<td>5.303</td>
<td>0.029</td>
<td>0.633</td>
<td>0.44</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>16 x 10</td>
<td>6.076</td>
<td>6.937</td>
<td>0.029</td>
<td>2.533</td>
<td></td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>16 x 16</td>
<td>8.161</td>
<td>10.365</td>
<td>0.033</td>
<td>6.485</td>
<td></td>
<td>0.50</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>20 x 5</td>
<td>22.516</td>
<td>23.054</td>
<td>0.079</td>
<td>0.633</td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>20 x 20</td>
<td>33.962</td>
<td>42.575</td>
<td>0.074</td>
<td>10.132</td>
<td>0.77</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>25 x 10</td>
<td>26.278</td>
<td>28.431</td>
<td>0.233</td>
<td>2.533</td>
<td></td>
<td>0.78</td>
</tr>
</tbody>
</table>
### Mass moment of inertia

- **For handling:**
  \[ 6 \cdot J_M \geq J_{fr} \]
- **For machining:**
  \[ 1.5 \cdot J_M \geq J_{fr} \]

\[ J_{fr} = \text{mass moment of inertia of additional load} \quad (\text{kgm}^2) \]
\[ J_M = \text{mass moment of inertia of motor} \quad (\text{kgm}^2) \]

**For motor attachment via mount and coupling**

\[ J_{fr} = J_S + J_K + J_{Br} \]
\[ J_S = (k_1 + k_2 \cdot L + k_3 \cdot m_{fr}) \cdot 10^{-6} \]
\[ J_{tot} = J_{fr} + J_M = J_S + J_K + J_{Br} + J_M \]

### Speed

When a gear motor is attached the mass moment of inertia of the gear and the gear ratio also have to be included in the calculation.

\[ n_1 = \frac{i \cdot v \cdot 1000}{P} \]
\[ n_1 < n_{max} \]
\[ v < \text{permissible velocity from chart} \]

\[ v = \text{permissible velocity} \quad (\text{m/min}) \]
\[ n_1 = \text{speed} \quad (\text{1/min}) \]
\[ n_{max} = \text{maximum effective motor speed} \quad (\text{1/min}) \]
\[ P = \text{screw lead} \quad (\text{mm}) \]
\[ i = \text{gear ratio} \]

### Coupling data

Couplings with data as indicated in the table opposite are used to connect standard servo motors to Compact Modules CKK.

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>Rated torque of coupling ( M_K ) (Nm)</th>
<th>Mass moment of inertia ( J_K ) ( (10^{-6} \text{kgm}^2) )</th>
<th>Coupling mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90</td>
<td>14</td>
<td>12.13</td>
<td>0.092</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>14</td>
<td>12.13</td>
<td>0.092</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>26</td>
<td>42.30</td>
<td>0.140</td>
</tr>
</tbody>
</table>
Calculation Example

When dimensioning the drive, always take the motor/controller combination into consideration as the motor type and performance data (e.g. effective speed and maximum torque) depend on the controller or control system used.

Starting data
A mass of 25 kg is to be moved 500 mm at a maximum velocity of 40 m/min.

Based on its technical data and its installation dimensions, the following unit was selected:

Compact Module CKK 15-110
- one carriage
- 2% preload
- with gap-type polyurethane sealing strip
- with size 41 AC servo motor attachment via motor mount and coupling

Estimation of Compact Module length L

Excess travel = 2 × P = 2 × 16 mm = 32 mm
Max. travel = stroke有效 + 2 × excess travel
= 500 mm + 2 × 32 mm
= 564 mm
Compact Module length L = (stroke + 2 × excess travel) + 90 (according to formula under "Components and Ordering Data" for CKK 15-110)
= 564 + 90
= 654 mm

Selection of the ball screw drive
See "Technical Data" section for graphs.
General recommendation:
Wherever possible, always select the smallest lead (resolution, braking path, length).

According to the chart for "maximum permissible velocity", the permissible screw drives for v = 40 m/min and L = 654 mm are:

KGT 16 x 10 and KGT 16 x 16

Selected ball screw drive (smaller lead):
KGT 16 x 10
with a maximum permissible drive torque of 9 Nm as per "permissible drive torque" chart

Calculating the Compact Module length L

Excess travel = 2 × P = 2 × 10 mm = 20 mm
Max. travel = stroke有效 + 2 × excess travel
= 500 mm + 2 × 20 mm
= 540 mm
Compact Module length L = (stroke + 2 × excess travel) + 90 mm
= 540 mm + 90 mm
= 630 mm

Moment of friction M_R

\[ M_R = M_{Rc} \text{ (see "Technical Data")} \]
\[ M_R = 0.47 \text{ Nm} \]
Mass moment of inertia $J$

\[
J_S = (k_1 + k_2 \cdot L + k_3 \cdot m_f) \cdot 10^{-6} \text{ kgm}^2
\]

\[
= (6.076 + 0.029 \cdot 630 \text{ mm} + 2.533 \cdot 25 \text{ kg}) \cdot 10^{-6} \text{ kgm}^2
\]

\[
= 87.67 \cdot 10^{-6} \text{ kgm}^2
\]

\[
J_K = 12.13 \cdot 10^{-6} \text{ kgm}^2
\]

\[
J_{Br} = 16 \cdot 10^{-6} \text{ kgm}^2
\]

\[
J_{fr} = J_S + J_K + J_{Br}
\]

\[
= 115.8 \cdot 10^{-6} \text{ kgm}^2
\]

For handling:

\[
J_M > \frac{J_{fr}}{6}
\]

\[
J_M > 19.3 \cdot 10^{-6} \text{ kgm}^2
\]

Speed $n$

at $v = 40 \text{ m/min}$

\[
n_1 = \frac{i \cdot v \cdot 1000}{P} = \frac{1 \cdot 40 \text{ m/min} \cdot 1000}{10 \text{ mm}} = 4000 \text{ min}^{-1} < n_{M_{\text{max}}}
\]

\[
v = 40 \text{ m/min}
\]

Result

Compact Module CKK 15-110

Length $L = 630 \text{ mm}$

Ball screw drive:

Diameter $16 \text{ mm}$

Lead $10 \text{ mm}$

No. of carriages: 1

Preload: 2%

Motor attachment via motor mount and coupling

Motor with:

- a maximum effective speed $n_{\text{max}} > 4000 \text{ min}^{-1}$
- a mass moment of inertia $J_M > 19.3 \cdot 10^{-6} \text{ kgm}^2$
- a maximum permissible drive torque $M_{\text{per}} < 9 \text{ Nm}$

Observe coupling torque $M_K$ and moment of friction $M_R$

($M_K = 14 \text{ Nm}; R_R = 0.47 \text{ Nm}$)

These conditions are satisfied by all the permissible AC servo motors listed in the "Components and Ordering Data" tables for CKK 15-110.

The specific motor is selected:

- according to the selection criteria in the "AC servo motor data" table
- and by cross checking the drive unit calculation using the performance data given in the "Controllers, Motors, Electrical Accessories", catalog RE 82 701.
## Compact Module CKK 12-90 Components and Ordering Data

<table>
<thead>
<tr>
<th>Part number, length</th>
<th>Type</th>
<th>Guideway</th>
<th>Drive unit</th>
<th>Carriage</th>
<th>Screw journal</th>
<th>Ball screw size ( d_0 \times P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0360-300-00, ( \ldots ) mm</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots \times 5 )</td>
</tr>
<tr>
<td>( 12 \times 5 )</td>
<td>1 ( \ldots )</td>
<td>( 08 )</td>
<td>( 01 )</td>
<td>( 02 )</td>
<td>( \ldots )</td>
<td>( 01 )</td>
</tr>
<tr>
<td>( 12 \times 10 )</td>
<td>01</td>
<td>( 08 )</td>
<td>( 01 )</td>
<td>( 02 )</td>
<td>( \ldots )</td>
<td>( 01 )</td>
</tr>
<tr>
<td>( \ldots \times 5 )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
</tr>
<tr>
<td>( \ldots \times 10 )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
<td>( \ldots )</td>
</tr>
</tbody>
</table>

### Calculating the Compact Module length

With one carriage:
\[ L = (\text{stroke} + 2 \times \text{excess travel}) + 85 \text{ mm} \]

With two carriages \((l_m = 65 \text{ mm})\):
\[ L = (\text{stroke} + 2 \times \text{excess travel}) + 150 \text{ mm} \]

**Example:**
- **KGT 12 \( \times \) 10 \( (d_0 \times P), \)
- **Excess travel = 2 \; 10 = 20 \text{ mm}**

---

**For order example see “Inquiry/Order Form” section.**
<table>
<thead>
<tr>
<th>Gear ratio [i]</th>
<th>Attachment kit$^1$</th>
<th>for motor</th>
<th>without polyurethane gap-type seal</th>
<th>Cable duct</th>
<th>Standard report</th>
<th>Measurement report</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>01</td>
<td>MKD 25B</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>05</td>
<td>MSM 030C</td>
<td>73</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>MKD 25B</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1.5</td>
<td>MSM 030C</td>
<td>73</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

$^1$ Attachment kit can also be supplied without motor (enter "00" for motor on order form).

Please check whether the selected combination is a permissible one (load capacities, moments, maximum speed, motor data, etc.)!

**Switch mounting arrangements**

A cable duct is required to mount the switches. Switches may only be mounted on one side (left or right) of the Compact Module. For more information on switch mounting and switch types, see the section on "Switch Mounting Arrangements".
Compact Module CKK 12-90 Dimension Drawings

All dimensions in mm

Diagrams to different scales

One-point lubrication (grease) at either of the two funnel-type lube nipples DIN 3405-D3 (location of lube nipples: center of carriage)

For 2 carriages: 2 lube holes per side (lube position for L/2)

For further information and dimensions, see "Motors"

**03.36.00**
Type OF01

**03.36.13**
Type MF01
Motor MSM 030C with mount and coupling
M4-9 deep (4 x)

Type MF01
Motor MKD 25B with mount and coupling

Type RV01, RV02
Motor MKD 25B and MSM 030C with side drive with timing belt

Type RV03, RV04
Motor MKD 25B and MSM 030C with side drive with timing belt
## Compact Module CKK 15-110 Components and Ordering Data

| Part number, length          | Type =  
(and dimension drawing) | Guideway =  | Drive unit =  | Carriage =  |
|-----------------------------|-----------------------------|-------------|--------------|-------------|
| 0360-400-00,  
... mm                 |                             |             |              |             |

### Screw journal

<table>
<thead>
<tr>
<th>Ball screw size</th>
<th>one carriage</th>
<th>two carriages</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 x 5</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>16 x 10</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>16 x 16</td>
<td>03</td>
<td>04</td>
</tr>
</tbody>
</table>

### Ball screw size (OF)

<table>
<thead>
<tr>
<th>Keyway</th>
<th>01</th>
<th>02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(03.46.00)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ball screw size (MF)

<table>
<thead>
<tr>
<th>Keyway</th>
<th>01</th>
<th>02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(03.46.11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(03.46.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(03.46.13)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ball screw size (RV)

<table>
<thead>
<tr>
<th>Keyway</th>
<th>01</th>
<th>02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(03.46.21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(03.46.22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(03.46.23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(03.46.24)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ball screw size (RV)

<table>
<thead>
<tr>
<th>Keyway</th>
<th>01</th>
<th>02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(03.46.30)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Calculating the Compact Module length

**With one carriage:**

\[ L = (\text{stroke} + 2 \times \text{excess travel}) + 90 \text{ mm} \]

**With two carriages (l_m = 85 mm):**

\[ L = (\text{stroke} + 2 \times \text{excess travel}) + 175 \text{ mm} \]

**Stroke** = maximum distance from carriage center to the outer-most switch activation points.

**In most cases the recommended limit for excess travel (braking path) is:**

\[ \text{excess travel} = 2 \times d_b \times P \]

**Example:**

KGT 16 x 10 (d_b \times P),

**Excess travel = 2 \times 10 = 20 \text{ mm}**

For order example see "Inquiry/Order Form" section.
Switch mounting arrangements

A cable duct is required to mount the switches. Switches may only be mounted on one side (left or right) of the Compact Module. For more information on switch mounting and switch types, see the section on "Switch Mounting Arrangements".

Please check whether the selected combination is a permissible one (load capacities, moments, maximum speed, motor data, etc.).

1) Attachment kit can also be supplied without motor (enter "00" for motor on order form).
## Compact Module CKK 15-110 Dimension Drawings

All dimensions in mm

Diagrams to different scales

---

### Diagram 1

- L/2: Max. travel
- Effective stroke: 2
- Excess travel

---

### Diagram 2

- Ø 5 H7-8 deep
- l_m = 85

---

### Diagram 3

- Drive runner block
- Second carriage (connecting plate for two carriages - see "Mounting")

---

For further information and dimensions, see "Motors".

<table>
<thead>
<tr>
<th>03.46.00</th>
<th>03.46.12</th>
<th>03.46.13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type OF01</td>
<td>Type MF01</td>
<td>Type MF01</td>
</tr>
<tr>
<td>Motor MKD 41B and MSM 040B with mount and coupling</td>
<td>Motor MKD 25B and MSM 030C with mount and coupling</td>
<td>Motor MKD 25B and MSM 030C with mount and coupling</td>
</tr>
</tbody>
</table>

---

- For two carriages: 2 lube holes per side (lube position for L/2)
**03.46.21**
Type RV01, RV02
Motor MKD 41B and MSM 040B with side drive with timing belt

**03.46.22**
Type RV01, RV02
Motor MKD 25B and MSM 030C with side drive with timing belt

**03.46.23**
Type RV03, RV04
Motor MKD 41B and MSM 040B with side drive with timing belt

**03.46.24**
Type RV03, RV04
Motor MKD 25B and MSM 030C with side drive with timing belt

**For cable duct, socket**

**For mounting with clamping fixtures**
## Compact Module CKK 20-145 Components and Ordering Data

<table>
<thead>
<tr>
<th>Part number</th>
<th>Type = ... (and dimension drawing)</th>
<th>Guideway = ...</th>
<th>Drive unit = ...</th>
<th>Carriage = ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>0360-500-00, mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Screw journal

- **Ball screw size**: 20 x 5, 20 x 20, 25 x 10
- **One carriage**: 01, 02, 03
- **Two carriages**: 01, 02

### Ball screw size

- **With ball screw, without motor mount**: Ø 14
- **With ball screw and motor mount (MF)**: Ø 14
- **With ball screw and side drive with timing belt**: Ø 14

### Calculating the Compact Module length

**With one carriage:**

\[ L = (\text{stroke} + 2 \times \text{excess travel}) + 110 \text{ mm} \]

**With two carriages \( l_m = 100 \text{ mm} \):**

\[ L = (\text{stroke} + 2 \times \text{excess travel}) + 210 \text{ mm} \]

**Stroke** = maximum distance from carriage center to the outermost switch activation points.

**Excess travel** = 2 \( \times \) screw lead \( P \)

**Example:**

- **KGT 25 x 10 \((d_0 \times P)\)**,
  - **Excess travel** = 2 \( \times \) 10 = 20 mm

For order example see "Inquiry/Order Form" section.
Please check whether the selected combination is a permissible one (load capacities, moments, maximum speed, motor data, etc.)!

### Switch mounting arrangements

A cable duct is required to mount the switches. Switches may only be mounted on one side (left or right) of the Compact Module. For more information on switch mounting and switch types, see the section on "Switch Mounting Arrangements".

<table>
<thead>
<tr>
<th>Gear ratio</th>
<th>Attachment kit for motor</th>
<th>without polyurethane gap-type seal</th>
<th>Cable duct Socket/plug</th>
<th>Standard report</th>
<th>Measurement report</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MKD 41B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>MKD 41B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>MDD 71A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2, 3rd switch</td>
<td></td>
<td>without switch and cable duct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch:</td>
<td>Reed contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hall sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable duct</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External socket/plug, loose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Attachment kit can also be supplied without motor (enter "00" for motor on order form)
Compact Module CKK 20-145 Dimension Drawings

All dimensions in mm
Diagrams to different scales

For further information and dimensions, see "Motors"
**03.56.21**
Type RV01, RV02
Motor MKD 41B and MSM 040B with side drive with timing belt

**03.56.23**
Type RV03, RV04
Motor MKD 41B and MSM 040B with side drive with timing belt

**03.56.24**
Type RV01, RV02, RV03, RV04
Motor MDD 71A with side drive with timing belt
Switch Mounting Arrangements

Overview of the switching system
1. Socket and plug
2. Switch
3. Cable duct

(aluminum alloy, black anodized)

⚠️ Short stroke: take the length of switch and socket into consideration!

For two-carriages versions: switch actuation by the carriage on the motor side.

Switches
Miniature switches with potted cable.

Type:
- Hall sensor (NC) or
- Reed contact (changeover)

Mounting instructions:
Switches may only be mounted on one side (left or right) of the Compact Module and should not be installed until the Compact Module has been mounted on its base.

A cable duct is required to mount the switches.

Insert the switches into the upper T-slot in the cable duct and fix them in place using set screws.

**Hall sensor**

| Type of contact | PNP NC |
| Service voltage | 3.8–30 V DC |
| Power consumption | max. 10 mA |
| Output current | max. 20 mA |
| Cable length | 2000 mm |
| Housing protection | IP 66 |
| Short-circuit protection | no |

**Reed contact**

| Type of contact | changeover |
| Switching voltage | max. 100 V DC |
| Switching current | max. 0.5 A |
| Cable length | 2000 mm |
| Housing protection | IP 66 |

**Pin allocation**

Hall sensor
- white: +3.8 to 30 VDC
- green: output
- brown: 0V GND

Reed contact
- brown
- white
- green

IMPORTANT: 2 Switching points!
Cable duct

Function:
- to secure switches
- to house cables

Mounting instructions:
Snap the cable duct into the T-slots on the main structure and fix it in place using set screws (supplied along with the duct).

Socket and plug

- Fit the socket to the side with the switches.

The socket and plug have 16 pins each. They are not prewired, thus allowing the switch activation points to be optimized during start-up.

A plug is provided.
The plug can be mounted in three directions (see illustration).

Ordering data for switches and mounting components

The part numbers are listed in the table below.

Mounting components can also be ordered individually.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part numbers for mounting to: CKK 12-90, CKK 15-110, CKK 20-145</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Socket/plug</td>
<td>0375-400-00</td>
</tr>
<tr>
<td>2</td>
<td>Switch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Reed contact</td>
<td>R987146948</td>
</tr>
<tr>
<td></td>
<td>– Hall sensor</td>
<td>R987146123</td>
</tr>
<tr>
<td>3</td>
<td>Cable duct</td>
<td>R012CKDUCT</td>
</tr>
</tbody>
</table>
Motors

AC servo motor dimensions

<table>
<thead>
<tr>
<th>Motor</th>
<th>Part number 8611-050-03</th>
<th>Part number 8611-010-03</th>
<th>Part number 8611-015-03</th>
</tr>
</thead>
<tbody>
<tr>
<td>MKD 25B-144 KG1</td>
<td><img src="image1" alt="MKD 25B-144 KG1" /></td>
<td><img src="image2" alt="MKD 25B-144 KG1" /></td>
<td><img src="image3" alt="MKD 25B-144 KG1" /></td>
</tr>
<tr>
<td>MKD 41B-144 KG1</td>
<td><img src="image4" alt="MKD 41B-144 KG1" /></td>
<td><img src="image5" alt="MKD 41B-144 KG1" /></td>
<td><img src="image6" alt="MKD 41B-144 KG1" /></td>
</tr>
<tr>
<td>MDD 71A-N-060-N2S-095 GB1</td>
<td><img src="image7" alt="MDD 71A-N-060-N2S-095 GB1" /></td>
<td><img src="image8" alt="MDD 71A-N-060-N2S-095 GB1" /></td>
<td><img src="image9" alt="MDD 71A-N-060-N2S-095 GB1" /></td>
</tr>
</tbody>
</table>

AC servo motor data

<table>
<thead>
<tr>
<th>Motor</th>
<th>MKD 25B</th>
<th>MKD 41B</th>
<th>MDD 71A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum effective speed $n_{\text{max}}$ (min⁻¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated torque $M_n$ (Nm)</td>
<td>0.9</td>
<td>2.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Maximum torque $M_{\text{max}}$ (Nm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass moment of inertia $J_{\text{ax} + J_{\text{br}}}$ ($10^{-6}$ kgm²)</td>
<td>30 + 8</td>
<td>170 + 16</td>
<td>440 + 38</td>
</tr>
<tr>
<td>Braking torque $M_{\text{br}}$ (Nm)</td>
<td>1.0</td>
<td>2.2</td>
<td>3.0</td>
</tr>
<tr>
<td>Mass with brake $m_{\text{br}}$ (kg)</td>
<td>2.25</td>
<td>4.65</td>
<td>6.88</td>
</tr>
</tbody>
</table>

See "Controllers, Motors, Electrical Accessories" catalog RE 82 701
**Type MSM**

Drawings not to scale

<table>
<thead>
<tr>
<th>Motor Servomotors Type MSM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motor</strong></td>
</tr>
<tr>
<td><strong>Maximum Effective Speed RPM n_{max} (min^{-1})</strong></td>
</tr>
<tr>
<td><strong>Rated Torque M_{N} (Nm)</strong></td>
</tr>
<tr>
<td><strong>Maximum Torque M_{max} (Nm)</strong></td>
</tr>
<tr>
<td><strong>Mass Moment of Inertia J_{M} + J_{Br} (10^{-6} kgm^2)</strong></td>
</tr>
<tr>
<td><strong>Braking Torque M_{Br} (Nm)</strong></td>
</tr>
<tr>
<td><strong>Mass with Brake m_{Br} (kg)</strong></td>
</tr>
</tbody>
</table>

1) Continuous torque at standstill, natural convention cooling at (at 60° K over temperature at motor housing)

**NOTE:** Motors are available complete with controls.
Mounting

General information
The Compact Modules are mounted using clamping fixtures.

⚠️ Do not mount the Compact Module by the end blocks! The frame is the main stress-bearing structure!

When mounting the Compact Modules, observe the maximum tightening torque values as indicated in the table.

<table>
<thead>
<tr>
<th>Size</th>
<th>A (mm)</th>
<th>B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-90</td>
<td>102</td>
<td>112</td>
</tr>
<tr>
<td>15-110</td>
<td>126</td>
<td>140</td>
</tr>
<tr>
<td>20-145</td>
<td>161</td>
<td>175</td>
</tr>
</tbody>
</table>

Clamping fixtures

Recommended number of clamping fixtures: with 1 hole, 6 per meter and side with 4 holes, 3 per meter and side

<table>
<thead>
<tr>
<th>Size 12-90</th>
<th>Recess for M4 DIN 912</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>14.5</td>
</tr>
<tr>
<td>4.6</td>
<td>9</td>
</tr>
<tr>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size 15-110</th>
<th>Recess for M5 DIN 912</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>19.3</td>
</tr>
<tr>
<td>5.5</td>
<td>11</td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recess for M6 DIN 912</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size 20-145</th>
<th>Recess for M6 DIN 912</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>142</td>
<td></td>
</tr>
</tbody>
</table>

Tightening torques of the mounting screws

with friction factor 0.125
Tensile class 8.8

<table>
<thead>
<tr>
<th>8.8</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nm</td>
<td>2.7</td>
<td>5.5</td>
<td>9.5</td>
</tr>
</tbody>
</table>
Connection plate

Function:
- Mounting base (with T nuts) for attachments
- Connects two carriages on one Compact Module.

The kit consists of:
- Connecting plate
- Fasteners for mounting to carriages.
T nuts are not provided.

<table>
<thead>
<tr>
<th>Size</th>
<th>Carriages</th>
<th>Part number Kit</th>
<th>I_m</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K_H7</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-90</td>
<td>1</td>
<td>0375-300-02</td>
<td>–</td>
<td>89</td>
<td>12</td>
<td>50</td>
<td>25</td>
<td>54</td>
<td>5</td>
<td>9.6</td>
<td>4.5</td>
<td>3.3</td>
<td>8.3</td>
<td>4</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0375-300-01</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>15-110</td>
<td>1</td>
<td>0375-400-02</td>
<td>–</td>
<td>109</td>
<td>15</td>
<td>60</td>
<td>30</td>
<td>66</td>
<td>6</td>
<td>11.0</td>
<td>5.0</td>
<td>4.3</td>
<td>9.9</td>
<td>5</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0375-400-01</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.60</td>
</tr>
<tr>
<td>20-145</td>
<td>1</td>
<td>0375-500-02</td>
<td>–</td>
<td>144</td>
<td>18</td>
<td>80</td>
<td>40</td>
<td>88</td>
<td>8</td>
<td>14.5</td>
<td>4.9</td>
<td>6.2</td>
<td>11.8</td>
<td>6</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0375-500-01</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.10</td>
</tr>
</tbody>
</table>

T nuts (DIN 508)

For fastening attachments to the connecting plate.

<table>
<thead>
<tr>
<th>Size</th>
<th>Part number</th>
<th>Part number</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-90</td>
<td>8447-007-01</td>
<td>M4: 8447-004-01</td>
<td>M5: 8447-005-01</td>
</tr>
<tr>
<td>15-110</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-145</td>
<td></td>
<td></td>
<td>8447-001-01</td>
</tr>
</tbody>
</table>
Connectors

Overview

Connectors facilitate the assembly of multi-axis systems (X-Y axes, X-Z axes)
The connection system allows a Compact Module to be combined with another of the same size or one size smaller.
The connectors are supplied as complete kits (connection plate, angle bracket, clamping fixture, screws, pins) required to connect two axes.

Connection of 2 Compact Modules using a connection plate

Connection of 2 Compact Modules using angle brackets
Connection of 2 Compact Modules using a connection plate (X-Y axes)

Y axis attached to the main structure (carriage travels along the Y axis)

A = total height  
B = connection plate width  
C = connection plate length

**X axis**  
Type:  
Compact Module with  
2 carriages  
(center-to-center distance \( l_m \))

**Y axis**  
Type:  
Compact Module with  
1 or 2 carriages,  
carriage travels

<table>
<thead>
<tr>
<th>Part number of connection plate kits (consisting of connection plate, clamping fixture, screws, pins)</th>
</tr>
</thead>
</table>
| X axis  
2 carriages | Y axis  
1 or 2 carriages |
| CKK 12-90  
\( l_m = 65 \text{ mm} \) | CKK 15-110 | CKK 20-145 |
| 0391-200-28 | \[ \text{Kit (mm) Dimensions (mm) Mass (kg)} \] |
| CKK 15-110  
\( l_m = 85 \text{ mm} \) | 0391-200-29 | 0391-200-30 |
| CKK 20-145  
\( l_m = 100 \text{ mm} \) | | 0391-200-31 | 0391-200-33 |

<table>
<thead>
<tr>
<th>Part number Kit</th>
<th>X axis Dimensions (mm)</th>
<th>Mass (kg)</th>
</tr>
</thead>
</table>
| CKK 10-50  
\( l_m = 65 \text{ mm} \) | | |
| CKK 15-110  
\( l_m = 85 \text{ mm} \) | | |
| CKK 20-145  
\( l_m = 100 \text{ mm} \) | | |

**Note:**  
In motor attachments via side drive with timing belt, the motor may possibly extend into the work zone of adjacent axes. Make sure it will not obstruct any motion!
Connectors

Connection of 2 Compact Modules using angle brackets (X-Y axes)

Y axis attached to the main structure (carriage travels along the Y axis)

<table>
<thead>
<tr>
<th>X axis 2 carriages</th>
<th>Y axis 1 or 2 carriages</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90</td>
<td>CKK 15-110</td>
</tr>
<tr>
<td>( l_m = 65 \text{ mm} )</td>
<td></td>
</tr>
<tr>
<td>0391-100-21</td>
<td>0391-100-23</td>
</tr>
<tr>
<td>CKK 15-110</td>
<td></td>
</tr>
<tr>
<td>( l_m = 85 \text{ mm} )</td>
<td></td>
</tr>
<tr>
<td>0391-100-25</td>
<td>0391-100-23</td>
</tr>
<tr>
<td>CKK 20-145</td>
<td></td>
</tr>
<tr>
<td>( l_m = 100 \text{ mm} )</td>
<td></td>
</tr>
<tr>
<td>0391-100-29</td>
<td>0391-100-27</td>
</tr>
</tbody>
</table>

Part number of angle bracket kits (consisting of angle bracket, clamping fixtures, screws, pins)

<table>
<thead>
<tr>
<th>Part number Kit</th>
<th>Dimensions (mm)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0391-100-21</td>
<td>A = 130, B = 110, C = 110, D = 170, E = 11.5, F = 8, G = 72</td>
<td>0.81</td>
</tr>
<tr>
<td>0391-100-23</td>
<td>A = 161, B = 155, C = 142, D = 211, E = 19, F = 10, G = 89</td>
<td>1.80</td>
</tr>
<tr>
<td>0391-100-25</td>
<td>A = 135, B = 143, C = 142, D = 185, E = 19, F = 10, G = 75</td>
<td>1.51</td>
</tr>
<tr>
<td>0391-100-27</td>
<td>A = 202, B = 145, C = 155, D = 267, E = 22, F = 14, G = 111.5</td>
<td>2.71</td>
</tr>
<tr>
<td>0391-100-29</td>
<td>A = 168, B = 180, C = 155, D = 232, E = 22, F = 14, G = 96</td>
<td>3.10</td>
</tr>
</tbody>
</table>
Connection of 2 Compact Modules using angle brackets (X-Y axes)

Y axis attached to the carriage (main structure travels along the Y axis)

**X axis**
Type:
Compact Module with 2 carriages
(center-to-center distance $l_m$)

**Y axis**
Type:
Compact Module with 2 carriages
(center-to-center distance $l_m$), main structure travels

---

**Part number of angle bracket kits**
(consisting of angle bracket, clamping fixtures, screws, pins)

<table>
<thead>
<tr>
<th><strong>X axis</strong> 2 carriages</th>
<th><strong>Y axis</strong> 2 carriages</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90 $l_m = 65$ mm</td>
<td>CKK 15-110 $l_m = 85$ mm</td>
</tr>
<tr>
<td>CKK 12-90 $l_m = 65$ mm</td>
<td>0391-100-22</td>
</tr>
<tr>
<td>CKK 15-110 $l_m = 85$ mm</td>
<td>0391-100-26</td>
</tr>
<tr>
<td>CKK 20-145 $l_m = 100$ mm</td>
<td>0391-100-30</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th><strong>Part number</strong> Kit</th>
<th><strong>Dimensions</strong> (mm)</th>
<th><strong>Mass</strong> (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0391-100-22</td>
<td>110</td>
<td>115</td>
</tr>
<tr>
<td>0391-100-24</td>
<td>135</td>
<td>143</td>
</tr>
<tr>
<td>0391-100-26</td>
<td>120</td>
<td>110</td>
</tr>
<tr>
<td>0391-100-28</td>
<td>168</td>
<td>180</td>
</tr>
<tr>
<td>0391-100-30</td>
<td>150</td>
<td>145</td>
</tr>
</tbody>
</table>
Connectors

Connection of 2 Compact Modules using angle brackets (X-Z axes)

Z axis attached to the main structure (carriage travels along the Z axis)

<table>
<thead>
<tr>
<th>Part number of angle bracket kits (consisting of angle bracket, clamping fixtures, screws, pins)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>X axis</strong> 2 carriages</td>
</tr>
</tbody>
</table>
| **CKK 12-90**  
\(l_m = 65\) mm | 0391-100-31 |
| **CKK 15-110**  
\(l_m = 85\) mm | 0391-100-33
0391-100-34 |
| **CKK 20-145**  
\(l_m = 100\) mm | 0391-100-36
0391-100-37 |

<table>
<thead>
<tr>
<th>Part number Kit</th>
<th>Dimensions (mm)</th>
<th>Mass (kg)</th>
</tr>
</thead>
</table>
| **CKK 12-90**  
\(l_m = 65\) mm | | |
| 0391-100-31 | A: 110  B: 115  C: 110  D: 106.5  E: 27  F: 8 | 0.80 |
| 0391-100-33 | A: 110  B: 130  C: 130  D: 116.5  E: 30  F: 8 | 0.95 |
| 0391-100-34 | A: 142  B: 143  C: 135  D: 140  E: 34  F: 10 | 1.62 |
| 0391-100-36 | A: 142  B: 155  C: 161  D: 155  E: 31  F: 10 | 1.80 |
| 0391-100-37 | A: 155  B: 180  C: 168  D: 164.5  E: 35  F: 14 | 3.10 |
Connection of 2 Compact Modules using angle brackets (X-Z axes)
Z axis attached to the carriage (main structure travels along the Z axis)

Part number of angle bracket kits
(consisting of angle bracket, clamping fixtures, screws, pins)

<table>
<thead>
<tr>
<th>X axis 2 carriages</th>
<th>Z axis 2 carriages</th>
</tr>
</thead>
<tbody>
<tr>
<td>CKK 12-90</td>
<td>CKK 15-110</td>
</tr>
<tr>
<td>$l_m = 65$ mm</td>
<td>$l_m = 85$ mm</td>
</tr>
<tr>
<td>CKK 12-90</td>
<td>0391-100-22</td>
</tr>
<tr>
<td>$l_m = 65$ mm</td>
<td></td>
</tr>
<tr>
<td>CKK 15-110</td>
<td>0391-100-32</td>
</tr>
<tr>
<td>$l_m = 85$ mm</td>
<td></td>
</tr>
<tr>
<td>CKK 20-145</td>
<td>0391-100-35</td>
</tr>
<tr>
<td>$l_m = 100$ mm</td>
<td></td>
</tr>
</tbody>
</table>

Part number Kit | Dimensions (mm) | Mass (kg)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0391-100-22</td>
<td>110 115 110 106.5 27 8</td>
<td>0.75</td>
</tr>
<tr>
<td>0391-100-24</td>
<td>142 143 135 140 34 10</td>
<td>1.50</td>
</tr>
<tr>
<td>0391-100-28</td>
<td>155 180 168 164.5 39 14</td>
<td>2.95</td>
</tr>
<tr>
<td>0391-100-32</td>
<td>110 130 130 116.5 30 8</td>
<td>0.90</td>
</tr>
<tr>
<td>0391-100-35</td>
<td>142 155 161 155 31 10</td>
<td>1.66</td>
</tr>
</tbody>
</table>
Documentation

**Standard report**
**Option 01**

The standard report serves to confirm that the checks listed in the report have been carried out and that the measured values lie within the permissible tolerances.

Checks listed in the standard report:
- Functional checks of mechanical components
- Functional checks of electrical components
- Design is in accordance with order confirmation.

---

**Moment of friction measurement of complete system**
**Option 02**

The moment of friction is measured along the entire travel range.

---

**Lead deviation of ball screw**
**Option 03**

A measurement report in table form is provided in addition to the graph (see diagram).
Positioning accuracy

to VDI/DGQ 3441
Option 05

Measurement points are selected at irregular intervals along the travel. This allows even periodical deviations to be detected during positioning.
Each measurement point is approached several times from both sides.
This gives the following parameters:

Positioning accuracy $P$
The positioning accuracy corresponds to the total deviation.
It encompasses all the systematic and random deviations during positioning.

Position deviation $P_a$
The position deviation corresponds to the maximum difference arising in the mean values of all the measurement points. It describes systematic deviations.

Reversal range $U$
The reversal range corresponds to the difference in mean values of the two approach directions.
The reversal range is determined at every measurement point.
It describes systematic deviations.

Position variation range $P_s$
The position variation range describes the effects of random deviations. It is determined at every measurement point.
Notes
Inquiry/Order Form

Bosch Rexroth Corporation
14001 South Lakes Drive
Charlotte, NC 28273

Phone: 704-583-4338
Fax: 704-583-0523

Compact Modules

Ordering example: Compact Module with Ball Rail System CKK 20-145

<table>
<thead>
<tr>
<th>Compact Module</th>
<th>CKK 20-145</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Part number)</td>
<td>0360-500-00, 1400 mm</td>
</tr>
<tr>
<td>Type</td>
<td>M01</td>
</tr>
<tr>
<td>Guideway</td>
<td>01</td>
</tr>
<tr>
<td>Drive unit</td>
<td>03</td>
</tr>
<tr>
<td>Carriage</td>
<td>01</td>
</tr>
<tr>
<td>Motor attachment</td>
<td>03</td>
</tr>
<tr>
<td>Motor</td>
<td>10</td>
</tr>
<tr>
<td>Cover</td>
<td>02</td>
</tr>
<tr>
<td>1st switch</td>
<td>22</td>
</tr>
<tr>
<td>2nd switch</td>
<td>21</td>
</tr>
<tr>
<td>3rd switch</td>
<td>22</td>
</tr>
<tr>
<td>Cable duct</td>
<td>25</td>
</tr>
<tr>
<td>Socket/plug</td>
<td>17</td>
</tr>
<tr>
<td>Documentation</td>
<td>03</td>
</tr>
</tbody>
</table>

Designation CKK 20-145, length = 1400 mm

Ball Rail System with motor mount, assembled per diagram M01

Drive unit ball screw 25 x 10

Carriage one carriage

Motor attachment with motor mount for motor MKD 41B

Motor MKD 41B aluminum cover and polyurethane gap-type sealing strip

1st switch Hall sensor

2nd switch Reed contact

3rd switch Hall sensor

cable duct supplied loose

socket/plug supplied loose

measurement report: lead deviation of ball screw

---

To be completed by customer: Inquiry □ / Order □

Compact Module

(Part number): ______-______-______, length __________mm

Type =

Guideway =

Drive unit =

Carriage =

Motor attachment =

Motor =

Cover =

1st switch = ± mm

2nd switch = ± mm

3rd switch = ± mm

Cable duct =

Socket/plug =

Documentation =

Quantity: ______ pcs., ______ per month, ______ per year, per order, or ____________________

Remarks:

Sender

Company: ________________________________________
Address: ________________________________________

Phone: _______________ Fax: _______________

________________________

Designation

CKK 20-145, length = 1400 mm

with motor mount, assembled per diagram M01

Ball Rail System

Drive unit ball screw 25 x 10

Carriage one carriage

Motor attachment with motor mount for motor MKD 41B

Motor MKD 41B aluminum cover and polyurethane gap-type sealing strip

1st switch Hall sensor

2nd switch Reed contact

3rd switch Hall sensor

cable duct supplied loose

socket/plug supplied loose

measurement report: lead deviation of ball screw

---

To be completed by customer: Inquiry □ / Order □

Compact Module

(Part number): ______-______-______, length __________mm

Type =

Guideway =

Drive unit =

Carriage =

Motor attachment =

Motor =

Cover =

1st switch = ± mm

2nd switch = ± mm

3rd switch = ± mm

Cable duct =

Socket/plug =

Documentation =

Quantity: ______ pcs., ______ per month, ______ per year, per order, or ____________________

Remarks:

Sender

Company: ________________________________________
Address: ________________________________________

Phone: _______________ Fax: _______________

________________________

Designation

CKK 20-145, length = 1400 mm

with motor mount, assembled per diagram M01