# Bridge Modules

## with Ball Screw Drive and Toothed Belt Drive

R310EN 2435 (2009.02)

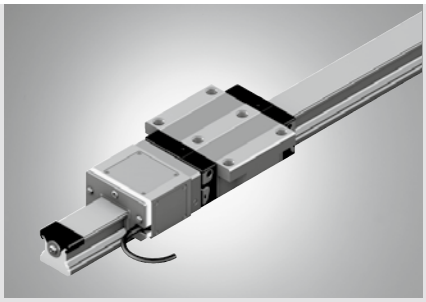
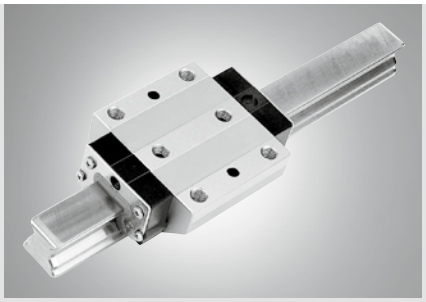
The Drive & Control Company

# Linear Motion and Assembly Technologies

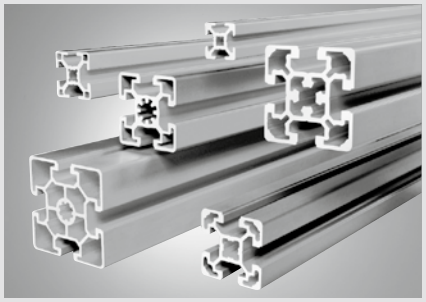
Ball Rail Systems
Roller Rail Systems
Linear Bushings and Shafts

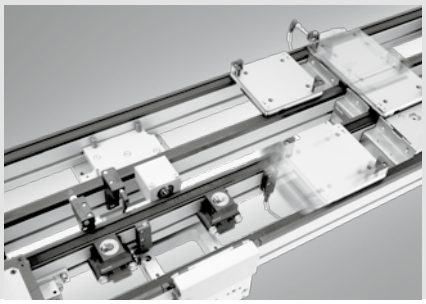
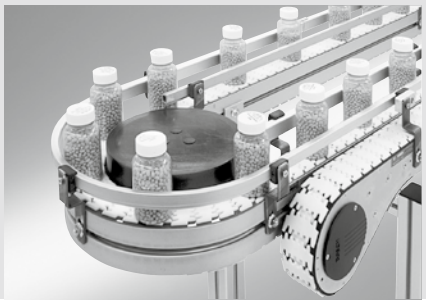
Ball Screw Drives
Linear Motion Systems

Basic Mechanical Elements
Manual Production Systems
Transfer Systems





**www.boschrexroth.com/brl**

# Bridge Modules

Product Overview

## Bridge Modules provide neat solutions for applications that could previously only be served by costly custom designs.

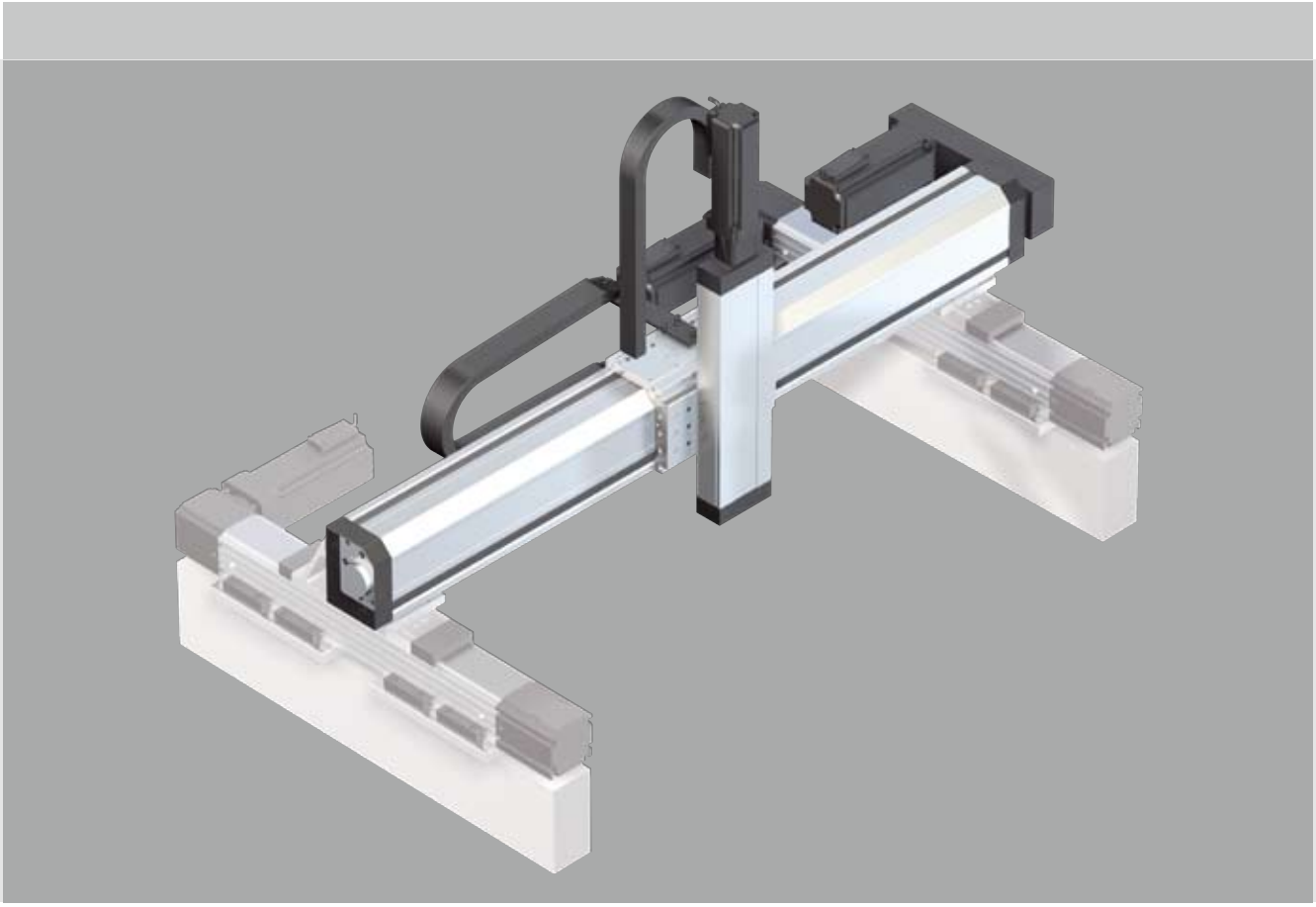
The Bridge Modules line adds still another dimension to Rexroth's extensive range of linear motion systems. With their exceptionally rigid design and angled carriage, these modules allow optimal combination of multiple axes spaced wide apart. They are also ideal as single axes to bridge large distances.

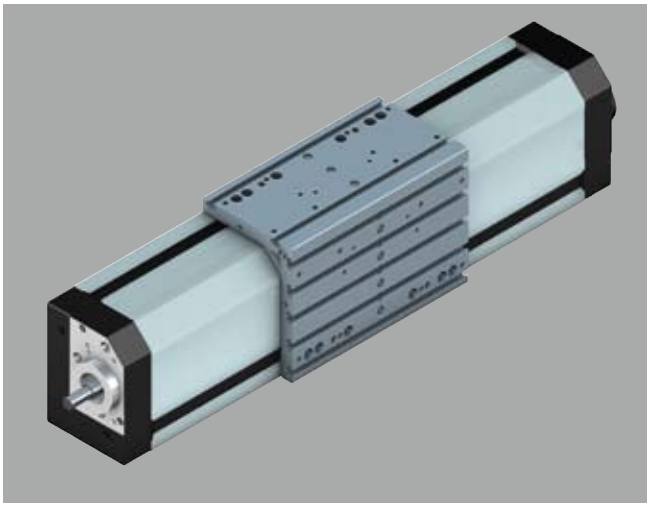
## Ball screw or toothed belt drive

No need to do without with tried and tested equipment: Bridge Modules come in versions with ball screw (BKK) or toothed belt (BKR) and can thus be combined with the most commonly used drive configurations.

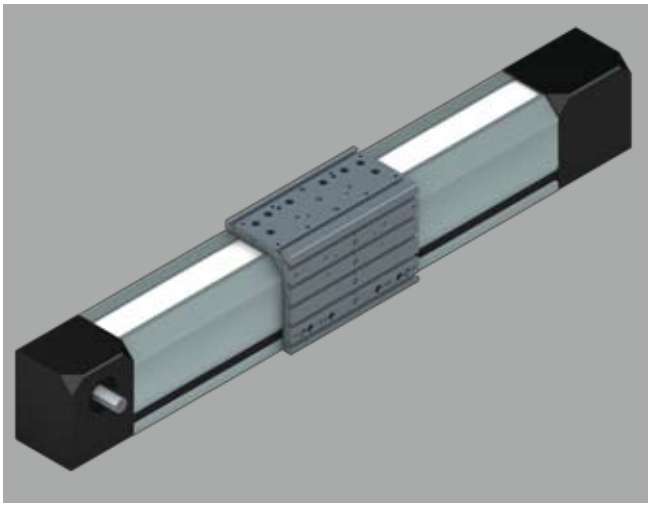
## Further highlights

- Aluminum profile frame with optimized geometry for high torsional stiffness and load carrying capacity.
- Power transmission through appropriate pairing of the drive type and the Ball Rail Systems used.
- Two Ball Rail Systems arranged at a 90° angle, with latest-generation runner blocks made of steel and featuring a ball chain.
- The two Ball Rail Systems are integrated in the profiled frame, which is fully encapsulated for additional protection.
- Torsionally stiff angled aluminum carriage with T-slots and threads offering multiple fastening possibilities.
- Precise alignment and secure mounting (positive-locking) of attachments thanks to Easy-2-Combine technology in the carriage.
- One-point lubrication via either side of the carriage.
- Screw supports allow maximum permissible travel speed to be achieved even over long distances.
- T-slots for fastening existing switches.
- Existing motor mounts, timing belt side drives and gear reducers can be attached.
- Available as complete drive units with motor, controller and control unit.





Bridge Module with ball screw drive



Bridge Module with toothed belt drive

Product Overview

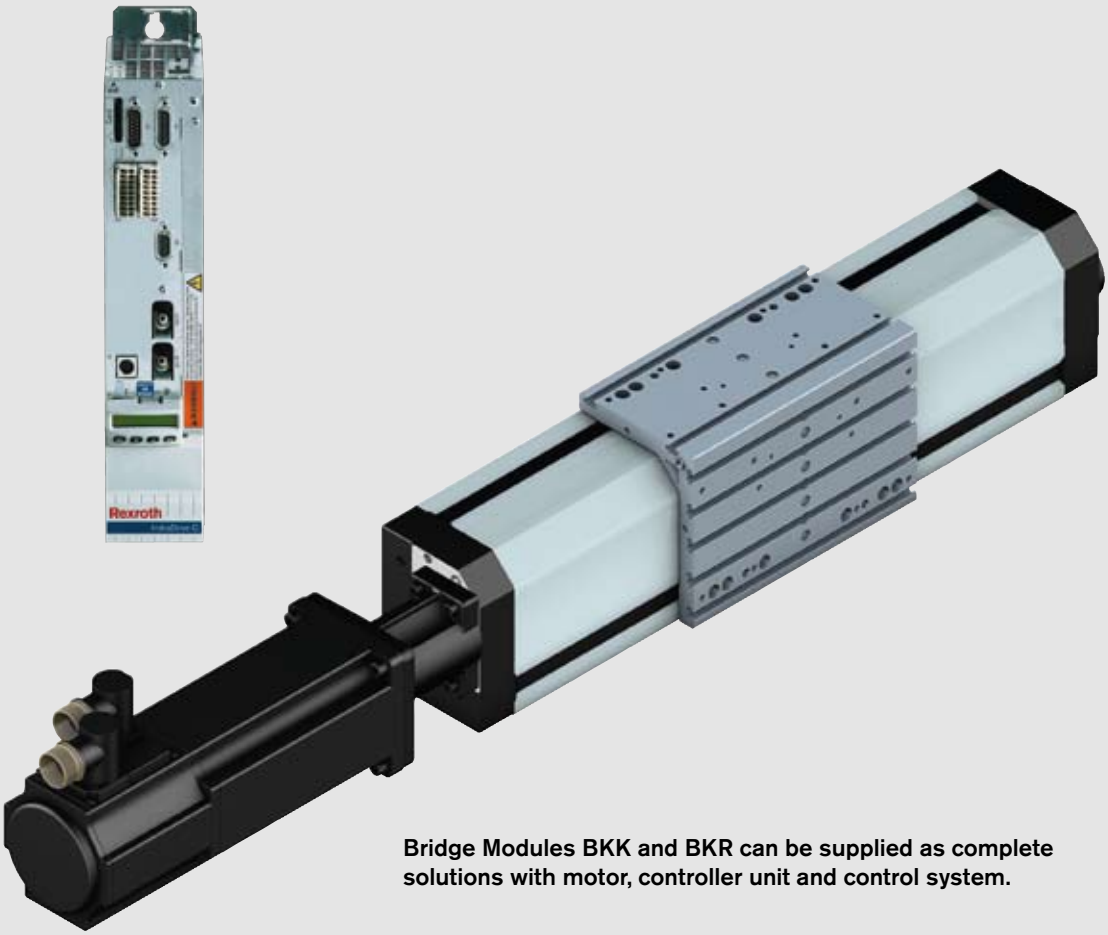
# Motor Selection

## Motor selection based on drive controllers and control system

Several motor-controller combinations are available in order to provide the most cost-effective solution for every customer application.
When dimensioning the drive unit, always consider the motor-controller combination.
Refer to the “IndraDrive for Linear Motion Systems” catalog for more information about motors and control systems.

**Digital AC servo motor MSK**

**Digital IndraDrive controllers**

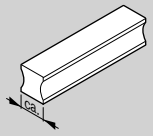
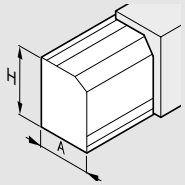



**Bridge Modules BKK and BKR can be supplied as complete solutions with motor, controller unit and control system.**

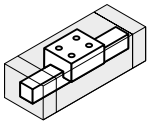
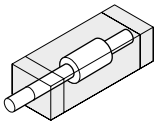
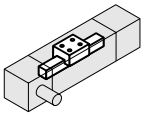
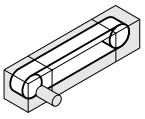
Product Overview

## Type designation (size)

Bridge Modules are designated according to type and size.

| | | | Type | | | Size | |
|---|---|---|---|---|---|---|---|
| Bridge Modules (example) = | | | B | K | K | 20 | - 135 |
| System | = | Bridge Modules **(B)** | | | | | |
| Guideway | = | Ball Rail System **(K)** | | | | | |
| Drive type | = | Ball Screw **(K)** or Toothed Belt **(R)** | | | | | |
| Guideway size | = |  | | | | | |
| Frame size | = |  | | | | | |

## Type overview

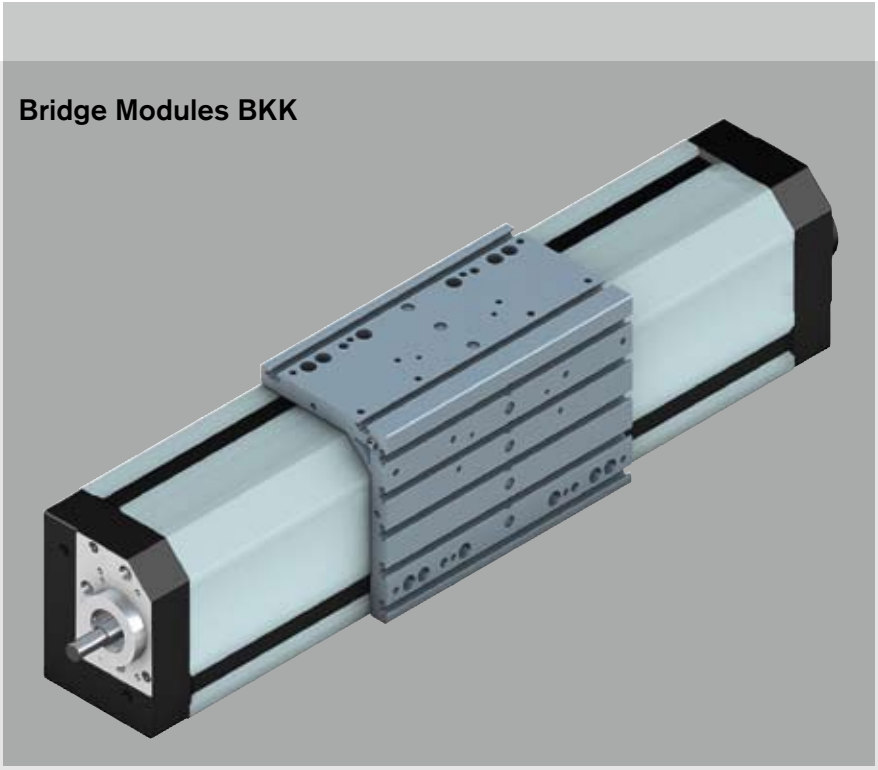
| Type | Guideway | Drive unit | Dimensions A x H (mm) | $L_{max}$ (mm) | Dynamic load capacity C (N) |
|---|---|---|---|---|---|
| **BKK** |  Ball rail system |  Ball screw drive | 115 x 145 | 5000 | 21900 |
| | | | 135 x 180 | 5000 | 56200 |
| **BKR** |  Ball rail system |  Toothed belt drive | 115 x 145 | 5800 | 21900 |
| | | | 135 x 180 | 5800 | 56200 |

Bridge Modules with Ball Screw Drive BKK

# Product Overview

Bridge Modules are ready-to-install precision linear motion systems for high-performance applications. They can be supplied in any desired length. Excellent price/performance ratio and fast delivery.

**Bridge Modules BKK**



## Structural design

- Highly rigid precision-extruded aluminum profile (frame) with two integrated ball rail systems
- Precision ball screw drive in tolerance grade 7 with zero-backlash nut system
- Fixed bearing end block made of aluminum with two-row, preloaded angular-contact thrust ball bearing
- Floating bearing end block made of aluminum with double ball bearings
- Torsionally stiff angled aluminum carriage with T-slots and threads offering multiple fastening possibilities

## Attachments

- Maintenance-free digital AC servo drives with integrated brake and attached feedback, or stepping motors
- Motor mount and coupling or timing belt side drive for motor attachment
- Switches
- Socket with mating plug for the switches
- Cable duct made of profiled aluminum

## Other distinguishing features

- Optimal travel performance, high load capacities and high rigidity due to two zero-clearance Ball Rail Systems arranged at a 90° angle to each other.
- Power transmission through appropriate pairing of the drive type and the ball rail systems used.
- Screw supports allow maximum permissible travel speeds to be achieved even over long distances.
- High positioning accuracy and repeatability due to ball screw assembly with zero-backlash nut system.
- Internal components protected by a rigid aluminum enclosure and by two gap seals made of polyurethane tape reinforced with steel wires.
- Precise alignment and secure mounting (positive-locking) of attachments thanks to Easy-2-Combine technology in the carriage.
- Adjustable switches over the entire travel range.
- Easy motor attachment via locating feature and fastening threads.
- Low-cost maintenance provided by one-point lubrication (grease) of the ball rail systems and the ball screw drive from either side of the carriage.

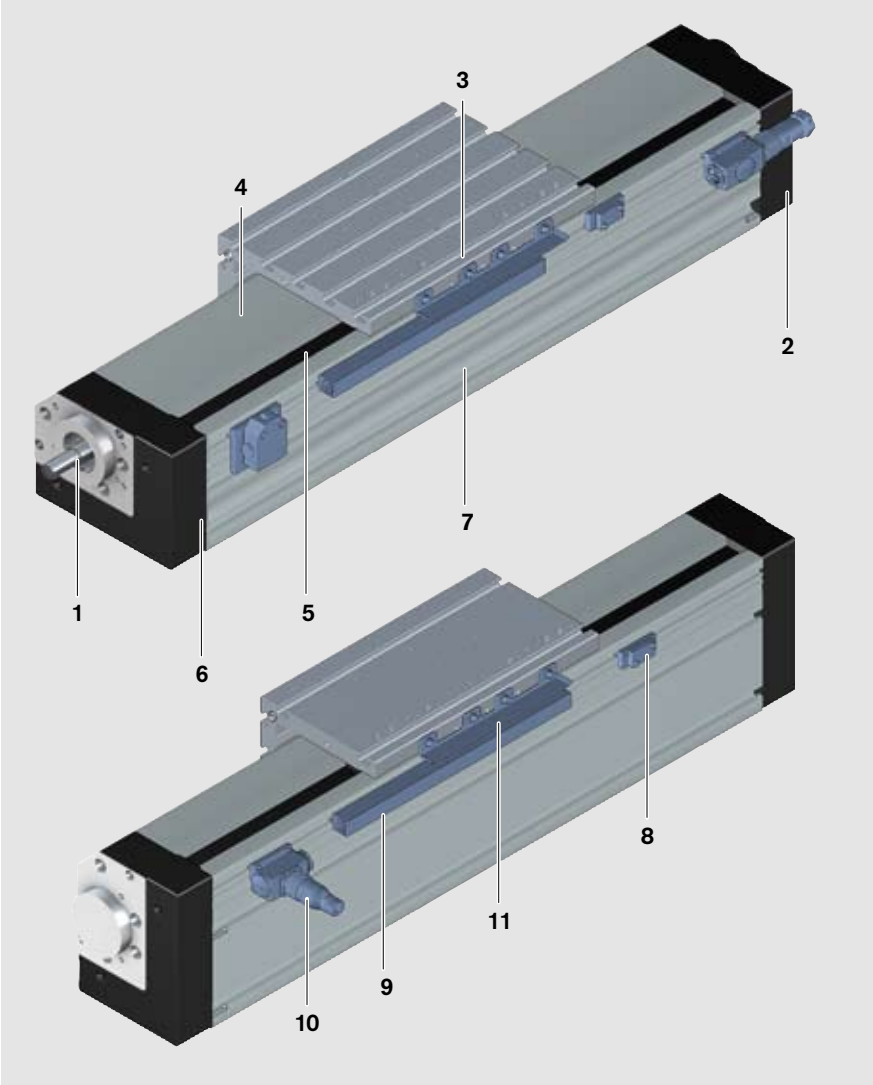
**Drive controllers and control systems**

Bridge Modules with Ball Screw Drive BKK

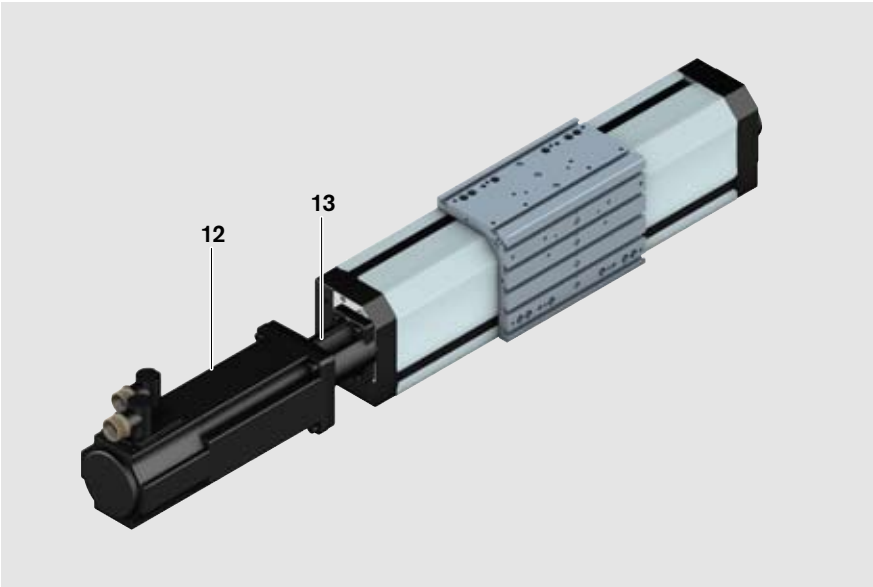
# Structural Design

**1** Ball screw with zero-backlash cylindrical single nut
**2** Floating bearing end block
**3** Carriage with runner blocks
**4** Aluminum cover
**5** Gap-type seal made of PU tape (recirculating)
**6** Fixed bearing end block
**7** Frame

**Attachments:**
**8** Switch
**9** Mounting duct
**10** Socket/plug
**11** Switching cam




**12** Motor
**13** Motor mount and coupling



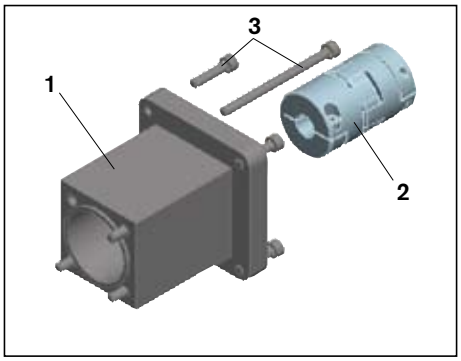
# Motor Attachment

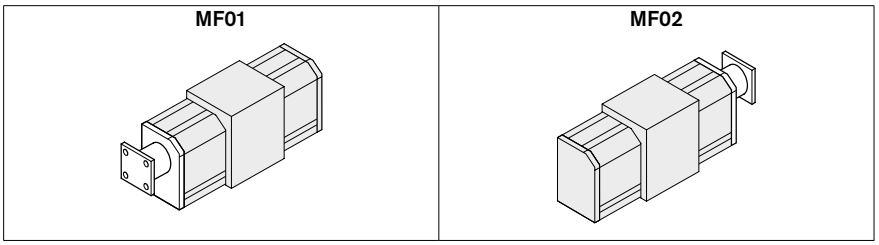
## Motor attachment with motor mount and coupling

The motor mount serves to fasten the motor to the Bridge Module and acts as a closed housing for the coupling.

The motor's drive torque is transmitted stress-free through the coupling to the Bridge Module's drive shaft.

**Motor mount assembly (kit)**
consisting of:
**1** Motor mount
**2** Coupling
**3** Mounting screws

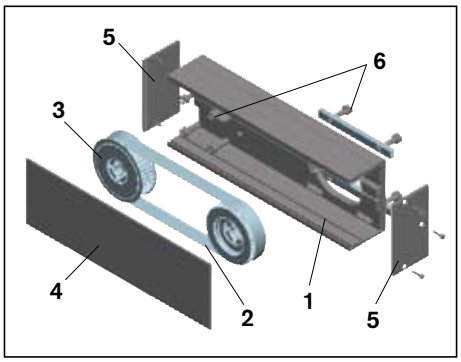


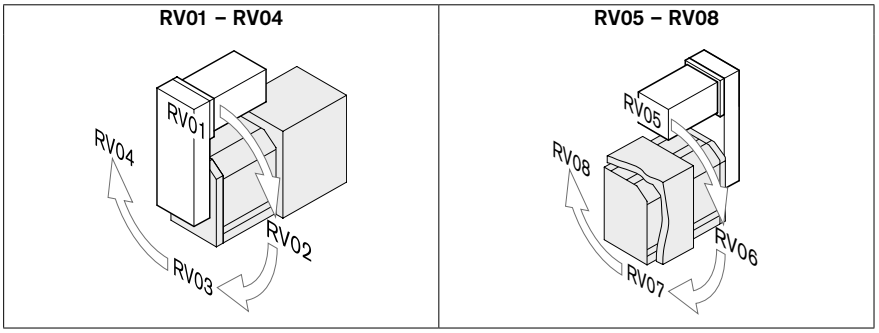

## Motor attachment with timing belt side drive

On Bridge Modules BKK the motor can be attached via a side drive with timing belt. This makes the overall length shorter than when attaching the motor with a motor mount and coupling. The compact, closed housing serves as protection for the belt and as a motor bracket.

**Timing belt side drive assembly (kit)**
consisting of:
**1** Pulley housing (aluminum)
**2** Toothed belt
**3** Belt pulleys with tensioning units
**4** Cover plate
**5** End covers with screws
**6** Mounting screws




The timing belt side drive can be installed in four directions at either end: Please state the mounting orientation when ordering.



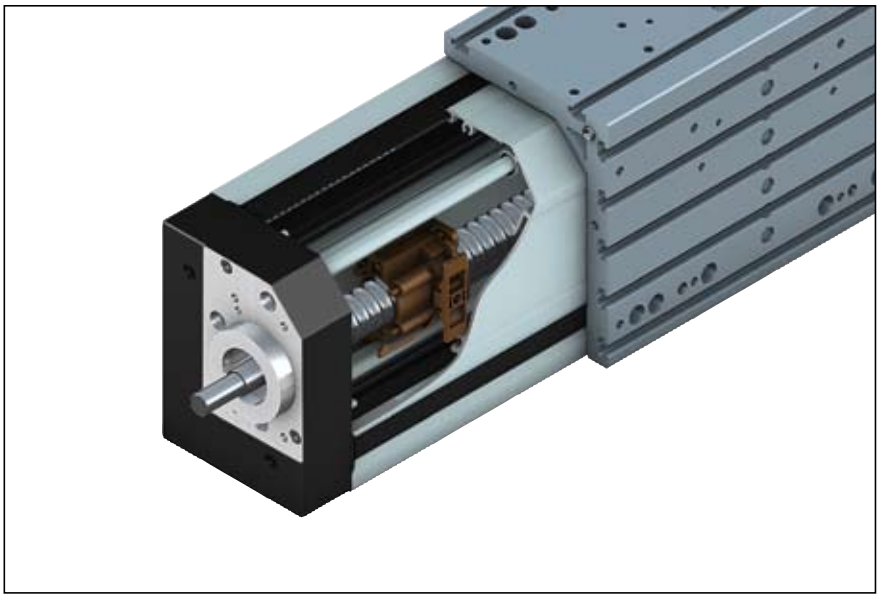
Bridge Modules with Ball Screw Drive BKK

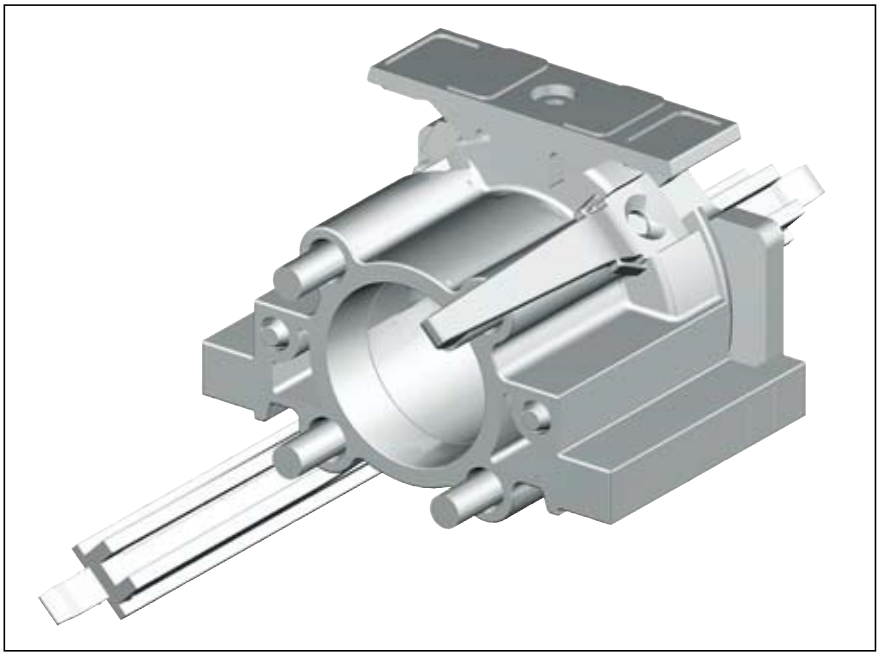
# Screw Support for Bridge Module BKK

⚠ **For horizontal operation only**

**The Screw Support (SPU) offers the following advantages:**

- Screw Support selectable as a standard option by stating the option number.
- High travel speeds over long distances up to 5000 mm.
- Screw Supports are guided within the module frame.
- Elastomer buffers provide cushioning between the carriage and the Screw Supports.
- Integration of up to 5 Screw Supports.
- Screw Supports are maintenance-free.
- Screw Supports protected by module cover and gap seals.
- The Screw Supports prevent any sagging of the aluminum cover in all directions.





# Technical Data

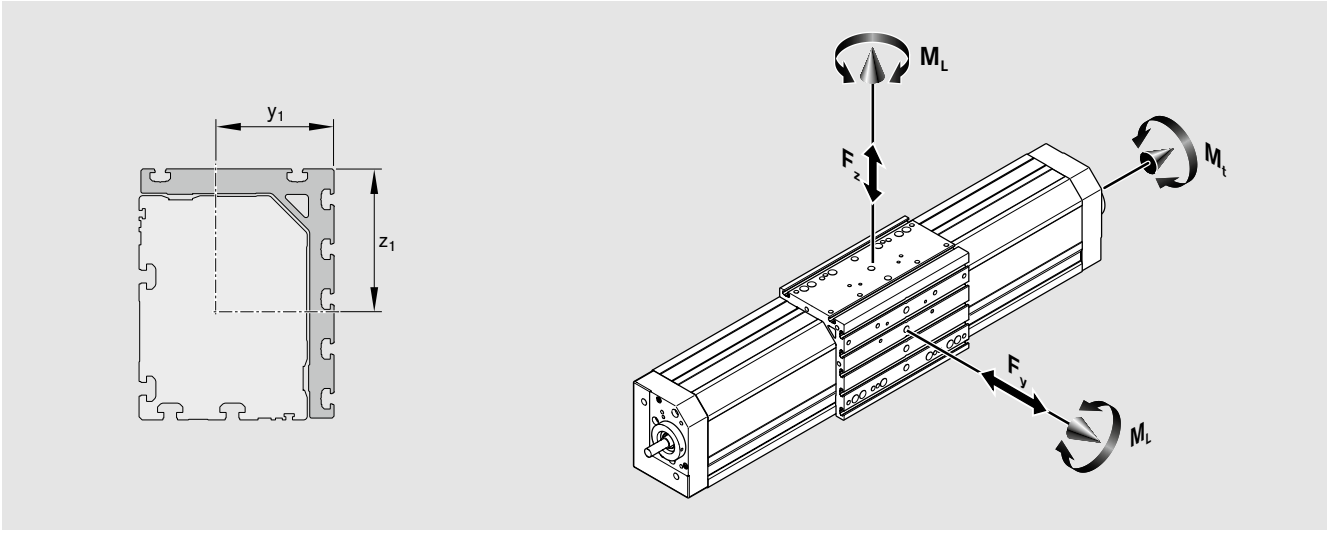
## Load capacities and moments

| Size | Ball screw | Dynamic load capacity C (N) | | | Dynamic load moments (Nm) | | Planar moment of inertia ($cm^4$) | | Maximum length[1] | Moved mass of system | Dimensions (mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Torsional load moment | Longitudinal load moment | | | | | | |
| | $d_0$ x P | Guide-way | Ball screw | Fixed bearing | $M_t$ | $M_L$ | $I_y$ | $I_z$ | $L_{max}$ (mm) | $m_{ac}$ (kg) | $y_1$ | $z_1$ |
| **BKK 15-115** | 25 x 5 | 21900 | 15900 | 18800 | 890 | 1460 | 1080 | 500 | 5000 | 6.35 | 91.5 | 99.2 |
| | 25 x 10 | | 15700 | | | | | | | | | |
| | 25 x 25 | | 14700 | | | | | | | | | |
| **BKK 20-135** | 32 x 5 | 56200 | 21600 | 26000 | 3040 | 4570 | 1570 | 720 | 5000 | 10.10 | 109.3 | 130.6 |
| | 32 x 10 | | 31700 | | | | | | | | | |
| | 32 x 20 | | 19700 | | | | | | | | | |
| | 32 x 32 | | 19500 | | | | | | | | | |

1) The maximum length will vary when one or more Screw Supports are used. See section on Screw Supports.

## Maximum permissible loads

| Size | Maximum permissible forces (N) | | Maximum permissible moments (Nm) | |
|---|---|---|---|---|
| | $F_{y\,max}$ | $F_{z\,max}$ | $M_{t\,max}$ | $M_{L\,max}$ |
| **BKK 15-115** | 15700 | 15700 | 640 | 880 |
| **BKK 20-135** | 26100 | 26100 | 1410 | 1830 |




**Note on dynamic load capacities and moments**

Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m. Often only 50,000 m are actually stipulated.
For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

**Acceptable loads**
(recommended from experience)

With respect to the desired service life, loads up to about 20% of the characteristic dynamic values (C, $M_t$, $M_L$) have proved acceptable.

At the same time, the following may not be exceeded:
- maximum permissible loads,
- permissible drive torque,
- permissible travel speed.

**The nominal life and the combined equivalent load on the bearing must be checked.**

## Modulus of elasticity E

E = 70,000 N/mm²

Bridge Modules BKK

# Technical Data

## Mass of the linear motion system $m_s$

Weight calculation without motor and switches.

**Weight formula:**

Weight factor (kg/mm) · length L (mm) + weight of all parts of fixed length (carriage, end blocks, etc.) (kg)

| Size | $m_s$ (kg) |
|---|---|
| **BKK 15-115** | 0.02027 · L + 9.088 |
| **BKK 20-135** | 0.028758 · L + 14.229 |

☞ The weight increases by 0.2 kg for each Screw Support used.

## Length

☞ When using Bridge Modules with SPUs, the following values will apply for horizontal operation only.

L = stroke + 2 · excess travel + X

X = value as per table

| Size | Option | Option number | Max. length (mm) | X (mm) |
|---|---|---|---|---|
| **BKK 15-115** | without SPU | 01 | 2200 | 300 |
| | 1 SPU | 02 | 3500 | 340 |
| | 2 SPU | 03 | 4600 | 465 |
| | 3 SPU | 04 | 5000 | 590 |
| | 4 SPU | 05 | 5000 | 715 |
| | 5 SPU | 06 | 5000 | 840 |
| **BKK 20-135** | without SPU | 01 | 2200 | 340 |
| | 1 SPU | 02 | 3500 | 380 |
| | 2 SPU | 03 | 4600 | 505 |
| | 3 SPU | 04 | 5000 | 630 |
| | 4 SPU | 05 | 5000 | 755 |
| | 5 SPU | 06 | 5000 | 880 |

## Frictional torque of the linear motion system $M_{Rs}$

| Size | Ball screw $d_0$ x P | $M_{Rs}$ (Nm) without SPU | with 1 SPU | with 2 SPU | with 3 SPU | with 4 SPU | with 5 SPU |
|---|---|---|---|---|---|---|---|
| **BKK 15-115** | **25 x 5** | 0.7 | 0.9 | 1.1 | 1.4 | 1.6 | 1.8 |
| | **25 x 10** | 0.8 | 1.0 | 1.3 | 1.5 | 1.7 | 2.0 |
| | **25 x 25** | 1.2 | 1.5 | 1.7 | 2.0 | 2.2 | 2.5 |
| **BKK 20-135** | **32 x 5** | 0.9 | 1.1 | 1.3 | 1.6 | 1.8 | 2.0 |
| | **32 x 10** | 1.1 | 1.3 | 1.6 | 1.8 | 2.0 | 2.3 |
| | **32 x 20** | 1.2 | 1.5 | 1.7 | 2.0 | 2.2 | 2.5 |
| | **32 x 32** | 1.5 | 1.8 | 2.1 | 2.3 | 2.6 | 2.9 |

## Coupling data

| Size | for motor | Coupling $M_{cN}$ (Nm) | $J_c$ ($10^{-6}$ kgm²) | Weight $m_c$ (kg) |
|---|---|---|---|---|
| **BKK 15-115** | **MSK 040C** | 19 | 60 | 0.26 |
| | **MSK 050C** | 50 | 200 | 0.70 |
| | **MSK 060C** | 50 | 200 | 0.70 |
| **BKK 20-135** | **MSK 060C** | 50 | 200 | 0.70 |
| | **MSK 076C** | 98 | 390 | 0.90 |

$M_{cN}$ = rated torque of coupling
$J_c$ = mass moment of inertia of coupling

## Mass moment of inertia of the linear motion system $J_s$ referred to the drive journal

| Size | Ball screw $d_0$ x P | Constants $k_{J\,fix}$ | $k_{J\,var}$ | $k_{J\,m}$ |
|---|---|---|---|---|
| **BKK 15-115** | 25 x 5 | 43.145 | 0.222 | 0.633 |
| | 25 x 10 | 55.495 | 0.239 | 2.533 |
| | 25 x 25 | 139.375 | 0.215 | 15.831 |
| **BKK 20-135** | 32 x 5 | 73.846 | 0.605 | 0.633 |
| | 32 x 10 | 93.960 | 0.640 | 2.533 |
| | 32 x 20 | 170.607 | 0.639 | 10.132 |
| | 32 x 32 | 329.497 | 0.617 | 25.938 |

## Specifications of timing belt side drive for motor attachment via timing belt side drive

| Motor | | MSK 040C | | | | | MSK 050C | | | | | MSK 060C | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frictional torque $M_{Rsd}$ (Nm) | | 0.4 | | | | | 0.4 | | | | | 0.4 | | | | |
| | | $M_{sd}$ up to length $L^{1)}$ = … at i (Nm) | | | $J_{sd}$ ($10^{-6}$ kgm$^2$) | | $M_{sd}$ up to length $L^{1)}$ = … at i (Nm) | | | $J_{sd}$ ($10^{-6}$ kgm$^2$) | | $M_{sd}$ up to length $L^{1)}$ = … at i (Nm) | | | $J_{sd}$ ($10^{-6}$ kgm$^2$) | |
| | | | i = 1 | i = 1.5 | i = 1 | i = 1.5 | | i = 1 | i = 2 | i = 1 | i = 2 | | i = 1 | i = 2 | i = 1 | i = 2 |
| BKK | Ball screw $d_0$ x P | L (mm) | | | | | L (mm) | | | | | L (mm) | | | | |
| 15-115 | 25 x 5 | 2320 | 9.6 | 6.4 | 260 | 89 | 1960 | 14 | 7 | 1420 | 230 | 1960 | 14 | 7 | 1420 | 230 |
| | 25 x 10 | 2860 | | | | | 2320 | 19,6 | 9,8 | | | 2320 | 19.6 | 9.8 | | |
| | 25 x 25 | 2860 | | | | | 2860 | 19,6 | 9,8 | | | 2860 | 19.6 | 9.8 | | |
| 20-135 | 32 x 5 | | | | | | 3000 | 12 | 6 | 1450 | 280 | 3000 | 12 | 6 | 1450 | 280 |
| | 32 x 10 | | | | | | | 19 | 11 | | | | 19 | 11 | | |
| | 32 x 20 | | | | | | | 19 | 13 | | | | 19 | 13 | | |
| | 32 x 32 | | | | | | | 19 | 13 | | | | 19 | 13 | | |

1) Permissible torque for greater lengths available upon request.

$M_{Rsd}$ = frictional torque of timing belt side drive at motor journal

$M_{sd}$ = maximum permissible drive torque of the timing belt side drive

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

i = timing belt side drive reduction

## Accuracy

The accuracy of the extrusion profile used for the frame is 0.7 mm per meter.

Bridge Modules with Ball Screw Drive BKK

# Technical Data

## Maximum permissible drive torque for mechanical system $M_{mech}$

| Bridge Module | $d_0$ x P | Max. permissible drive torque $M_{mech}$ (Nm) | |
|---|---|---|---|
| | | without key | with key |
| **BKK 15-115** | 25 x 5 | 10.5 | 10.5 |
| | 25 x 10 | 18.8 | 11.5 |
| | 25 x 25 | 25.9 | 11.5 |
| **BKK 20-135** | 32 x 5 | 13.2 | 13.2 |
| | 32 x 10 | 24.6 | 18.0 |
| | 32 x 20 | 36.7 | 18.0 |
| | 32 x 32 | 36.7 | 18.0 |

## Permissible drive torque $M_{perm}$

⚠ **When comparing the chart against the maximum value, the lower of the two values will always apply.**

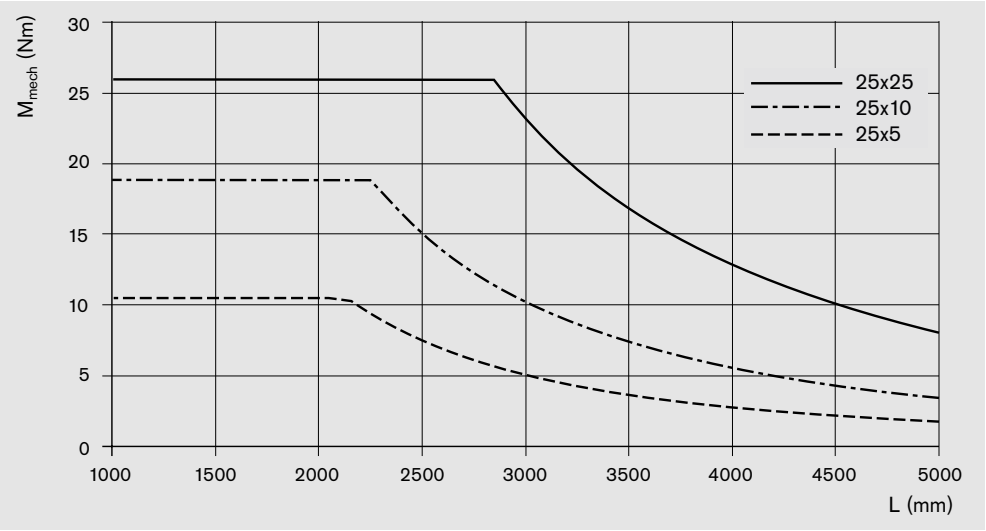
The values shown for $M_{mech}$ are applicable under the following conditions:
- Horizontal operation
- Ball screw journal without keyway
- No radial load on ball screw shaft

Consider the rated torque of the coupling used!

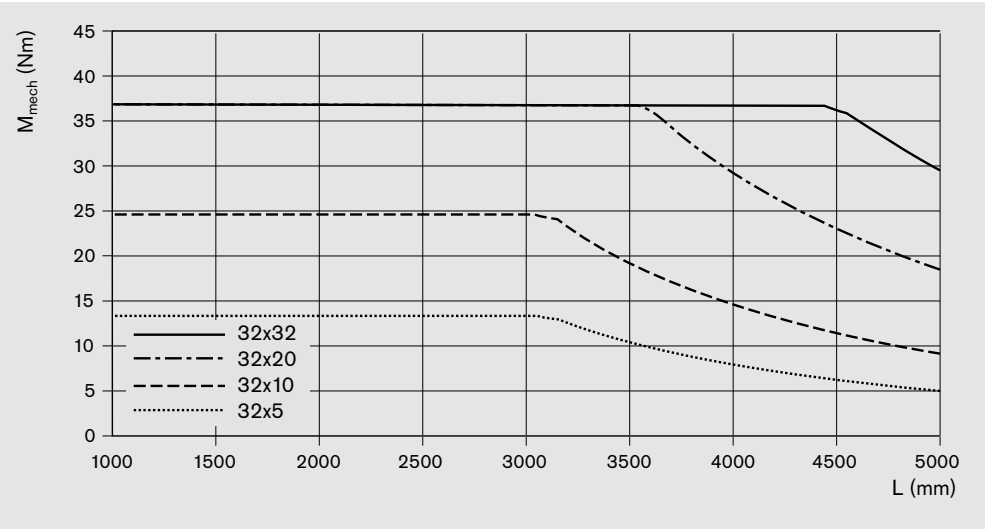
**Ball screw journal with keyway**
For reasons of stress concentration and a reduction of the effective diameter, consider the maximum values for drive torque!

## Maximum permissible drive torque $M_{mech}$

**BKK 15-115**

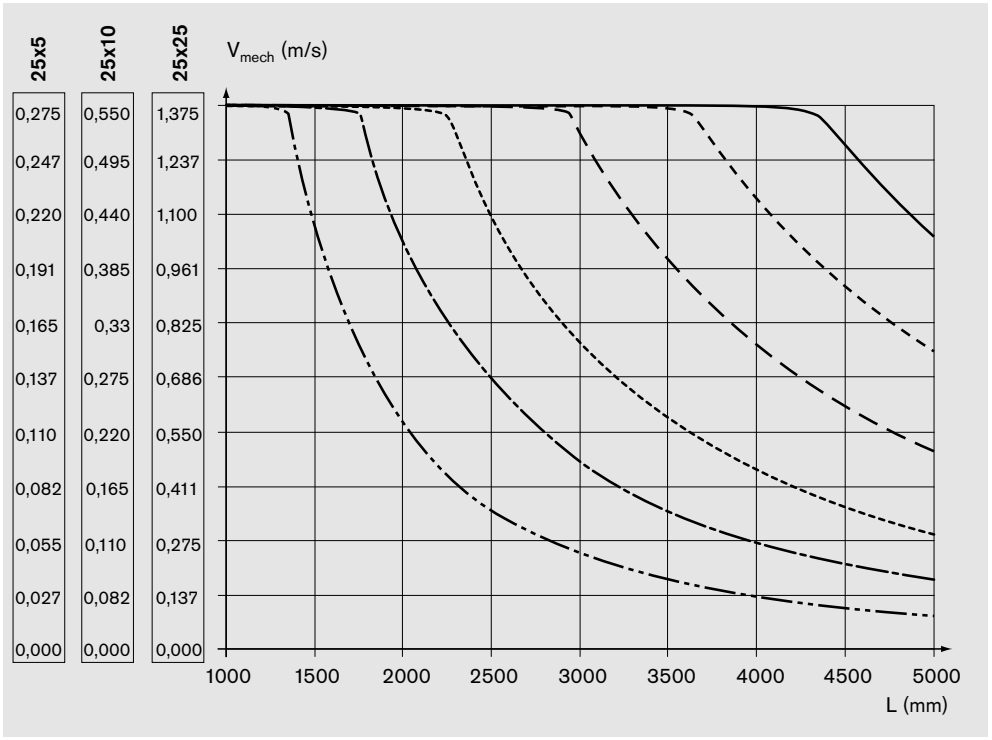



**BKK 20-135**

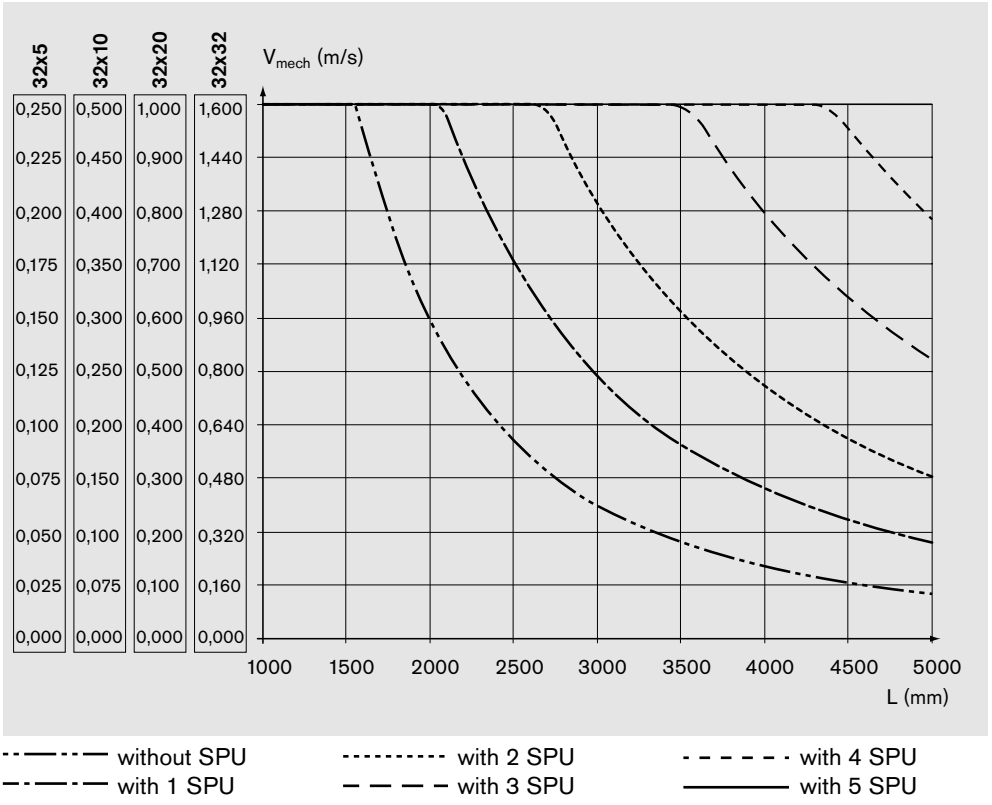


**Maximum permissible travel speed for mechanical system $v_{mech}$**
(consider the motor speed)

**BKK 15-115**




**BKK 20-135**



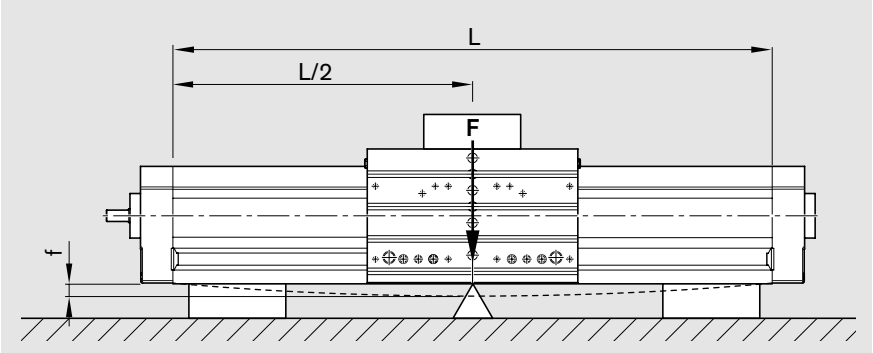
Bridge Modules with Ball Screw Drive BKK

# Technical Data

## Deflection

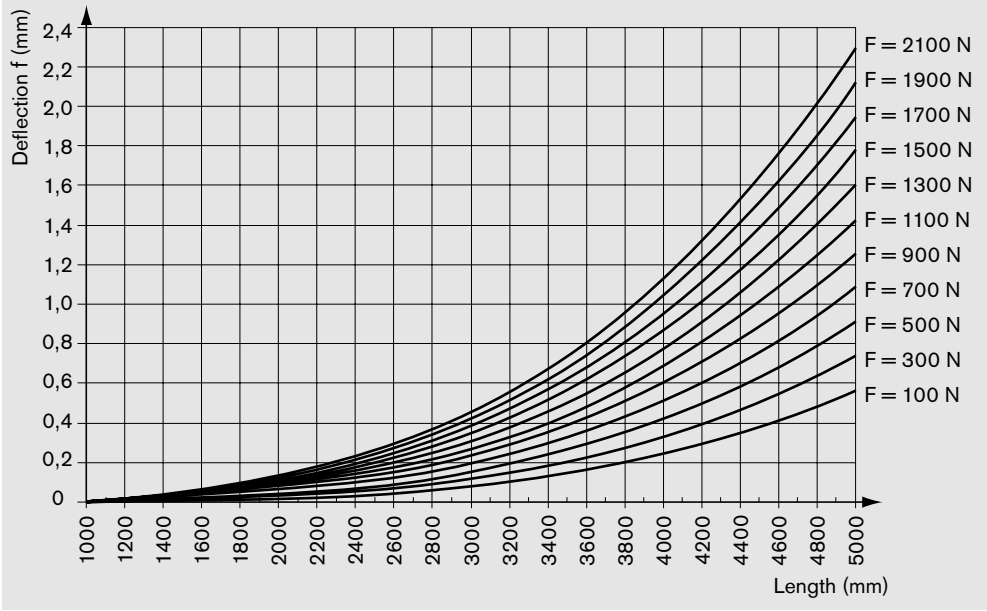
A particular feature of Bridge Modules is that they can be installed as cantilevered axes.
Deflection must, however, be taken into consideration, because it limits the possible load.

**If high system dynamics are required, supports must be provided every 300 to 600 mm.**

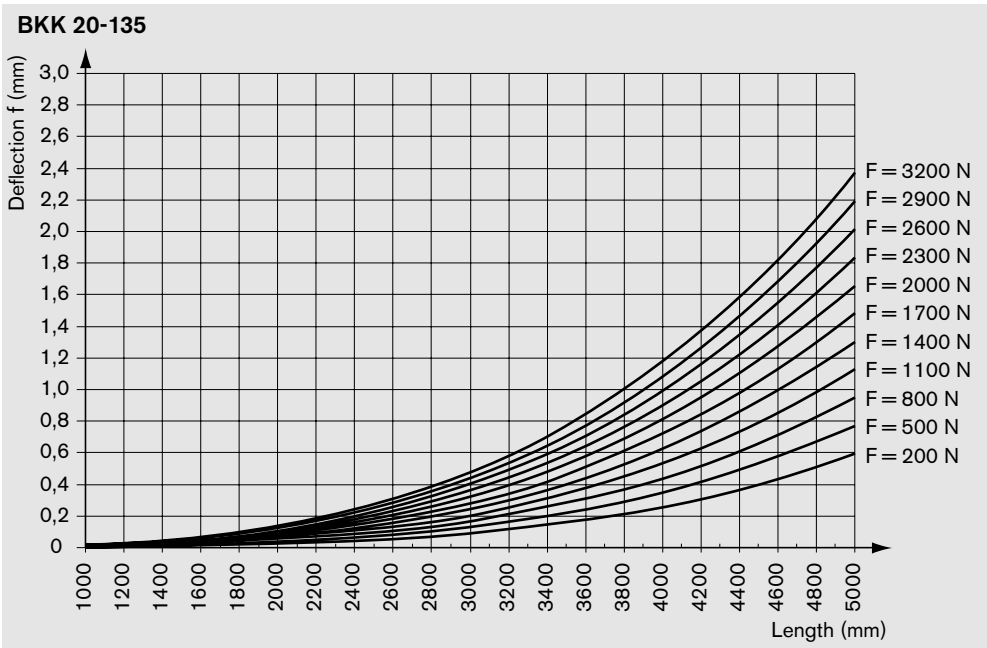



**The charts are applicable under the following conditions:**
- Both ends firmly fixed (200 to 250 mm per end)
- 8 screws per side
- Solid mounting base

**BKK 15-115**




**BKK 20-135**



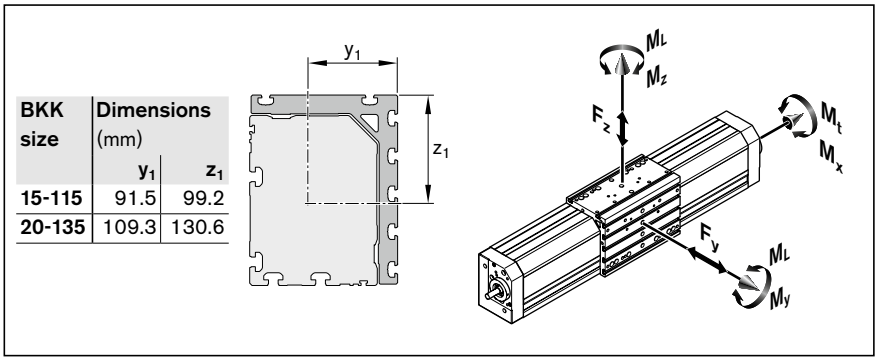
# Calculations

## Calculation principles

**Combined equivalent load on bearing of the linear guide**

$$F_{comb} = |F_y| + |F_z| + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$

| BKK size | Dimensions (mm) | |
|---|---|---|
| | $y_1$ | $z_1$ |
| 15-115 | 91.5 | 99.2 |
| 20-135 | 109.3 | 130.6 |




**Nominal life**
Nominal life of the guideway in meters:

$$L = \left(\frac{C}{F_{comb}}\right)^3 \cdot 10^5 \text{ m}$$

Nominal life of the guideway in hours:

$$L_h = \frac{L}{3600 \cdot v_m}$$

**Frictional torque**
for motor attachment via motor mount and coupling:

$$M_R = M_{RS}$$

for motor attachment via timing belt side drive:

$$M_R = \frac{M_{Rs}}{i} + M_{R\,sd}$$

**Mass moment of inertia of the linear motion system $J_s$ referred to the drive journal**

$$J_s = (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6}$$

| | | | |
|---|---|---|---|
| C | = | dynamic load capacity | (N) |
| $F_{comb}$ | = | combined equivalent load on bearing | (N) |
| $F_y$ | = | force in y-direction | (N) |
| $F_z$ | = | force in z-direction | (N) |
| i | = | gear ratio | |
| $J_s$ | = | mass moment of inertia of the linear motion system (without external load) | ($kgm^2$) |
| $k_{J\,fix}$ | = | constant for fixed-length portion of mass moment of inertia | ($10^6$ $kgm^2$) |
| $k_{J\,var}$ | = | constant for variable-length portion of mass moment of inertia | ($10^6$ $kgm^2$) |
| L | = | nominal life in meters | (m) |
| L | = | length of Bridge Module | (mm) |
| $L_h$ | = | nominal life in hours | (h) |
| $M_L$ | = | dynamic longitudinal moment load capacity | (Nm) |
| $M_R$ | = | frictional torque at motor journal | (Nm) |
| $M_{RS}$ | = | frictional torque of the system | (Nm) |
| $M_{R\,sd}$ | = | frictional torque of timing belt side drive at motor journal | (Nm) |
| $M_t$ | = | dynamic torsional moment load capacity | (Nm) |
| $M_x$ | = | torsional moment (about the x-axis) | (Nm) |
| $M_y$ | = | torsional moment (about the y-axis) | (Nm) |
| $M_z$ | = | torsional moment (about the z-axis) | (Nm) |
| $v_m$ | = | average speed | (m/s) |
| $y_1$, $z_1$ | = | application point of the effective force | (mm) |

Bridge Modules with Ball Screw Drive BKK

# Calculations

**Mass moment of inertia of the mechanical system referred to the drive journal**

Motor attachment via motor mount and coupling

$$J_{ex} = J_s + J_t + J_c$$

Motor attachment via timing belt side drive

$$J_{ex} = \frac{J_s + J_t}{i^2} + J_{sd}$$

**Translatory mass moment of inertia of external load referred to the drive journal**

$$J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$$

**Mass moment of inertia of the drive train referred to the motor journal**

$$J_{dc} = J_{ex} + J_{br}$$

**Mass moment of inertia ratio**

$$V = \frac{J_{dc}}{J_m}$$

| Application area | V |
|---|---|
| Handling | ≤ 6.0 |
| Machining | ≤ 1.5 |

**Total mass moment of inertia referred to the motor journal**

$$J_{tot} = J_{dc} + J_m$$

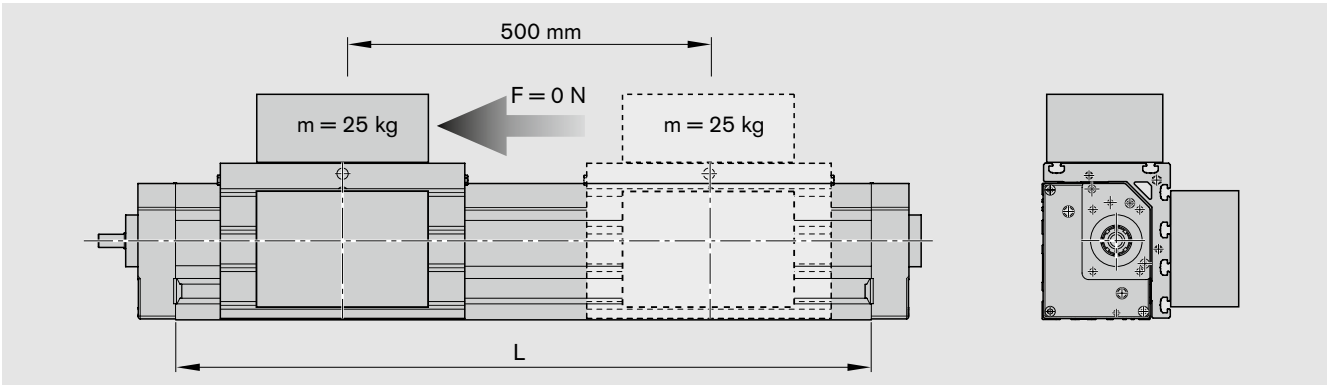
**Maximum permissible rotary speed for mechanical system**

$$n_{mech} = \frac{v_{mech} \cdot i \cdot 1000 \cdot 60}{P}$$

$$n_{mech} < n_{m\,max}$$

$J_{br}$ = mass moment of inertia, motor brake (kgm²)
$J_c$ = mass moment of inertia, coupling (kgm²)
$J_{dc}$ = mass moment of inertia, drive train (kgm²)
$J_{ex}$ = mass moment of inertia of mechanical system (kgm²)
$J_m$ = mass moment of inertia, motor (kgm²)
$J_s$ = mass moment of inertia of linear motion system (without external load) (kgm²)
$J_{sd}$ = reduced mass moment of inertia of timing belt side drive at motor journal (kgm²)
$J_t$ = translatory mass moment of inertia of external load referred to the drive journal (kgm²)
$J_{tot}$ = total mass moment of inertia (kgm²)
i = gear ratio of timing belt side drive (-)
$k_{J\,m}$ = constant for mass-specific portion of mass moment of inertia ($10^6$ m²)
$m_{ex}$ = moved external load (kgm)
$n_{m\,max}$ = maximum permissible rotary speed of motors with controller ($min^{-1}$)
$n_{mech}$ = maximum permissible rotary speed of mechanical system ($min^{-1}$)
P = screw lead (mm)
V = ratio of mass moments of inertia of drive train and motor (–)
$v_{mech}$ = maximum permissible rotary speed of mechanical system (m/s)

When sizing the drive, the motor-controller combination must always be considered, as the motor type and performance data (e.g. maximum useful speed and maximum torque) will depend on the controller or control system used.




**Given data**

A mass of 25 kg is to be moved 500 mm at a maximum travel speed of 0.66 m/s. The following was selected based on the technical data and the connection dimensions:

Bridge Module BKK 15-115
- Carriage length 260 mm
- 2 % preload
- With gap seal made of PU tape
- With AC servomotor type MSK mounted via motor mount and coupling

**Estimation of the Bridge Module length L**

| | | |
|---|---|---|
| Excess travel | = | $2 \cdot P = 2 \cdot 25 \text{ mm} = 50 \text{ mm}$ |
| Max. travel | = | $\text{stroke}_{\text{eff}} + 2 \cdot \text{excess travel}$ |
| | = | $500 \text{ mm} + 2 \cdot 50$ |
| | = | 600 mm |
| Bridge Module length L | = | (stroke + 2 · excess travel) + 300 (according to values given under “Components and Ordering Data” for BKK 15-115) |
| | = | 600 + 300 |
| | = | 900 mm |

**Selection of ball screw**
See charts in “Technical Data” section.
As a general rule:
Always choose the lowest lead (resolution, braking distance, length).

Permissible ball screws according to the “Permissible travel speed” chart at $v_{mech} = 0.66$ m/s and L = 900 mm:
Ball screw 25 x 10 (0.55 m/s) and ball screw 25 x 25 (1.375 m/s)
Ball screw selected (lower lead), since $v_{mech}$ still sufficient:
Ball screw 25 x 10
With $M_{mech}$ of 18.8 Nm
according to the chart “Maximum permissible drive torque for mechanical system”

**Calculation of the Bridge Module length L**

| | | |
|---|---|---|
| Excess travel | = | $2 \cdot P = 2 \cdot 10 \text{ mm} = 20 \text{ mm}$ |
| Max. travel | = | $\text{stroke}_{\text{eff}} + 2 \cdot \text{excess travel}$ |
| | = | $500 \text{ mm} + 2 \cdot 20 \text{ mm}$ |
| | = | 540 mm |
| Bridge Module length L | = | (stroke + 2 · excess travel) + 300 mm |
| | = | 540 mm + 300 mm |
| | = | 840 mm |

**Frictional torque $M_R$**

$M_R = M_{RS}$ (see “Technical Data”)
$M_R = 0.8$ Nm

# Calculation Example

**Mass moment of inertia of mechanical system**

$J_{ex} = J_S + J_t + J_C$

$J_S = (k_{J\,fix} + k_{J\,var} \cdot L) \cdot 10^{-6}\ kgm^2$
$= (55.495 + 0.239 \cdot 840\ mm) \cdot 10^{-6}\ kgm^2$
$= 256.255 \cdot 10^{-6}\ kgm^2$ (see “Technical Data”)

$J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}\ kgm^2$
$= 25 \cdot 2.533 \cdot 10^{-6}\ kgm^2$
$= 63.325 \cdot 10^{-6}\ kgm^2$ (see “Technical Data”)

$J_C = 60 \cdot 10^{-6}\ kgm^2$ (see “Technical Data”)

$J_{ex} = (256.255 + 63.325 + 60) \cdot 10^{-6}\ kgm^2$
$= 379.58 \cdot 10^{-6}\ kgm^2$

$J_{dc} = J_{ex} + J_{br}$

$J_{br} = 23 \cdot 10^{-6}\ kgm^2$ (see “Motors”)

$J_{dc} = (379.58 + 23) \cdot 10^{-6}\ kgm^2$
$= 402.58 \cdot 10^{-6}\ kgm^2$

**Mass moment of inertia for handling (V ≤6)**

$V = \frac{J_{dc}}{J_m}$

$J_m = \frac{J_{dc}}{6}$

$= \frac{402.58}{6} \cdot 10^{-6}\ kgm^2$
$= 67.096 \cdot 10^{-6}\ kgm^2$

**Rotary speed n**

$n_{mech} = \frac{v_{mech} \cdot i \cdot 1000 \cdot 60}{P} = \frac{0.55\ m/s \cdot 1 \cdot 1000 \cdot 60}{10\ mm} = 3300\ min^{-1}$

$v_{mech} = 0.55\ m/s$

If the permissible travel speed of 0.55 m/s is not sufficient, switch to size 25 x 25 and repeat the calculation.

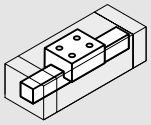
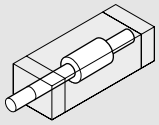
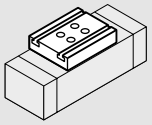
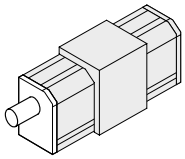
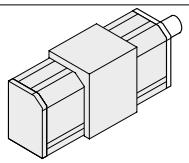
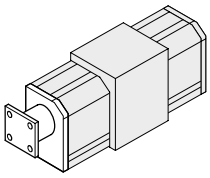
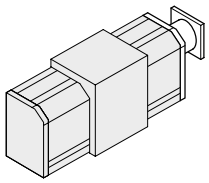
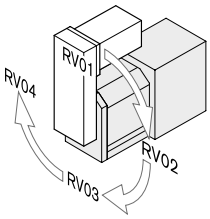
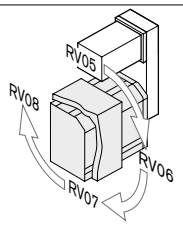
**Result**

Bridge Module BKK 15-115
Length: L = 840 mm
Ball screw:
Diameter: 25 mm
Lead: 10 mm
Number of carriages: 1
Preload: 2%
Motor attachment via motor mount and coupling
Motor with:
- a maximum usable speed $n_{m\ max} = 3300\ min^{-1}$
- mass moment of inertia $J_m > 67.09 \cdot 10^{-6}\ kgm^2$
- maximum permissible drive torque $M_{max} < 18.8$ Nm Consider the rated coupling torque $M_{cN}$ and the frictional torque $M_R$ ($M_{cN} = 50$ Nm; $M_R = 0.8$ Nm)

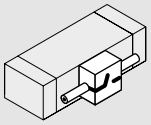
These requirements are fulfilled by all AC servo motors approved for BKK 15-115 in the “Components and Ordering Data” table.
The specific motor is selected:
- according to criteria from the “AC servo motor data” table
- by recalculating the drive unit with performance data from the “IndraDrive for Linear Motion Systems” catalog.

Bridge Modules with Ball Screw Drive BKK

# BKK 15-115 Components and Ordering Data

| Part number, length R0320 400 00, … mm | | Type | Guideway  | Drive unit  Screw journal | Ball screw size $d_0$ x P 25 x 5 | 25 x 10 | 25 x 25 | Carriage  One carriage w/o SPU | with 1 SPU | with 2 SPU | with 3 SPU | with 4 SPU | with 5 SPU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| with ball screw, without motor mount |  | **OF01** | 01 | Ø14 | 01 | 02 | 03 | 01 | 02 | 03 | 04 | 05 | 06 |
| | | | | Ø14 with keyway | 11 | 12 | 13 | | | | | | |
| |  | **OF02** | 01 | Ø14 | 06 | 07 | 08 | | | | | | |
| | | | | Ø14 with keyway | 16 | 17 | 18 | | | | | | |
| with ball screw and motor mount |  | **MF01** | 01 | Ø14 | 01 | 02 | 03 | 01 | 02 | 03 | 04 | 05 | 06 |
| |  | **MF02** | 01 | Ø14 | 06 | 07 | 08 | | | | | | |
| with ball screw and timing belt side drive |   | **RV01 to RV04** | 01 | Ø14 | 01 | 02 | 03 | 01 | 02 | 03 | 04 | 05 | 06 |
| |   | **RV05 to RV08** | 01 | Ø14 | 06 | 07 | 08 | | | | | | |

1) Attachment kit also available without motor (when ordering: enter “00” for motor)

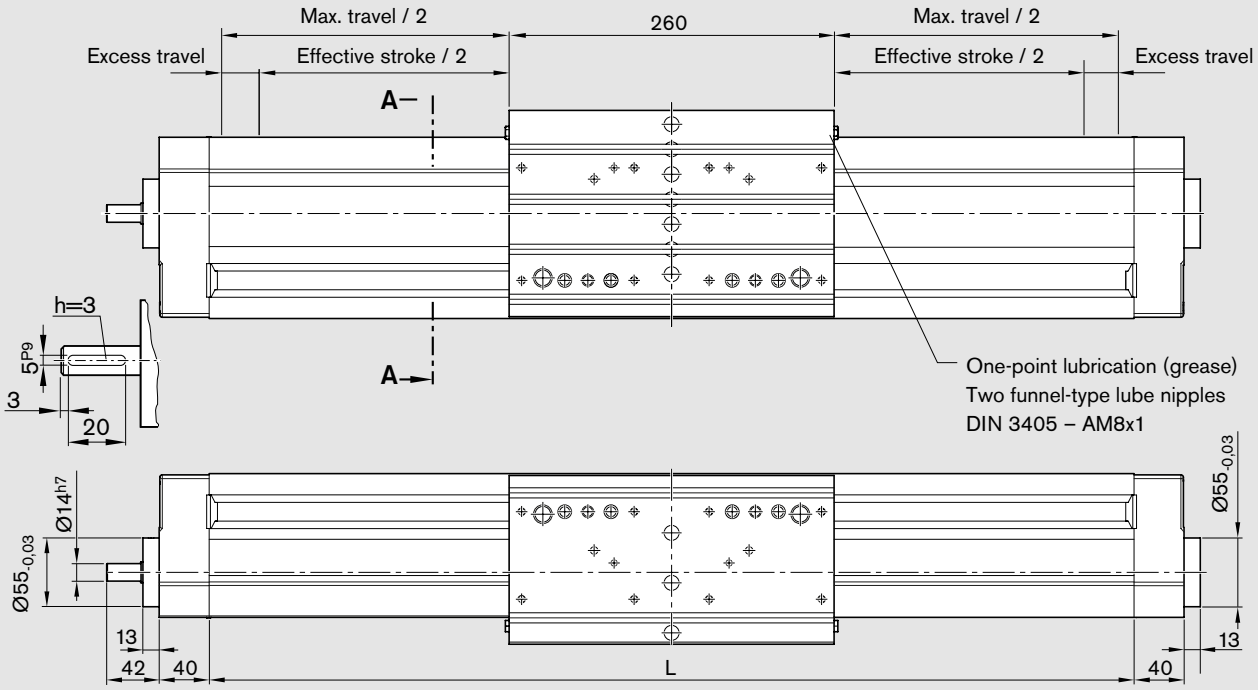
| | Motor attachment | | | Motor | | Cover | | Switches Switching cam, socket, plug, cable duct  | Documentation  | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Gear ratio i = | Attachment kit [1] | for motor | Motor type without brake | with brake | Gap-type seals without- out | with | | Standard report | Measurement report |
| | | 00 | | 00 | | | | | | |
| | | 02 | MSK 040C | 86 | 87 | | | | | |
| | | 03 | MSK 060C | 90 | 91 | | | | | |
| | 1 | 21 | MSK 040C | 86 | 87 | | | | | |
| | | 23 | MSK 060C | 90 | 91 | | | | | |
| | | 25 | MSK 050C | 88 | 89 | | | | | |
| | 1.5 | 22 | MSK 040C | 86 | 87 | | | | | |
| | 2 | 24 | MSK 060C | 90 | 91 | | | | | |
| | | 26 | MSK 050C | 88 | 89 | | | | | |
| | | | | | | 01 | 02 | | 01 | 02 Frictional torque<br>03 Lead deviation<br>05 Positioning accuracy |

| | | | |
|---|---|---|---|
| **Without switch Without cable duct** | | **00** | |
| **Proximity/mechanical switches** | | | |
| PNP NC | 11 | **One switching cam** 16 | **Socket/ plug** 17 |
| PNP NO | 13 | **Two switching cams** 26 | |
| Mechanical switch | 15 | | |
| **Cable duct** Length = L | 20 | | |

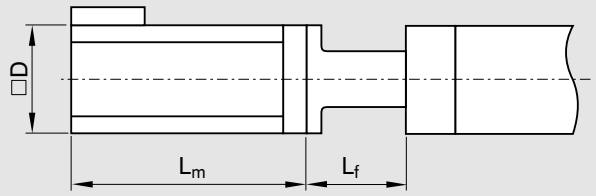
Bridge Modules with Ball Screw Drive BKK

# BKK 15-115 Dimensions

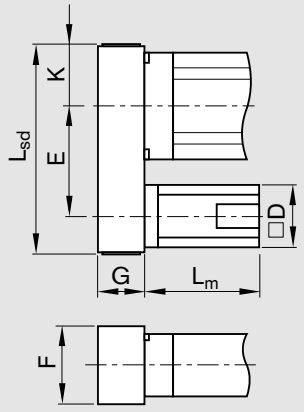
All dimensions in mm
Drawings not to scale



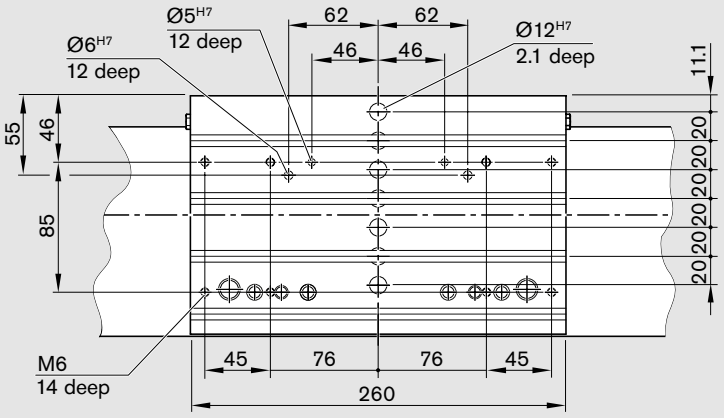

**Type MF01, MF02**

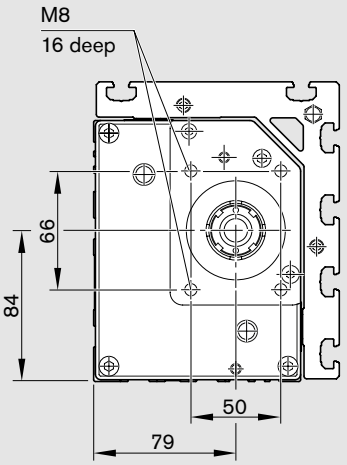


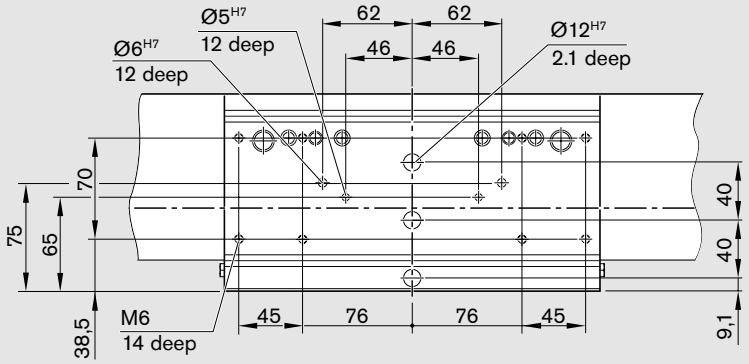

**Type RV01 - RV08**

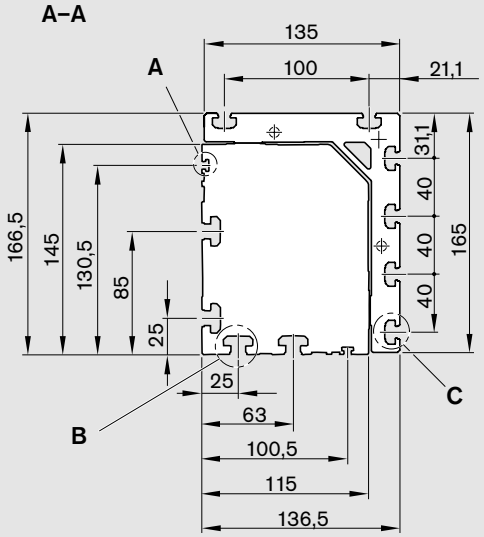



| Type | Motor | Dimensions (mm) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | E | | | F | G | K | $L_f$ | $L_m$ | | $L_{sd}$ | | |
| | | | i = 1 | i = 1.5 | i = 2 | | | | | without brake | with brake | i = 1 | i =1.5 | i = 2 |
| RV01 - RV08 | MSK 040C | 82 | 210 | 213.5 | – | 88 | 51 | 47.5 | – | 185.5 | 215.5 | 322 | 322 | – |
| | MSK 050C | 98 | 230 | – | 235 | 116 | 66 | 56.0 | – | 203.0 | 233.0 | 367 | – | 367 |
| | MSK 060C | 116 | 230 | – | 235 | 116 | 66 | 56.0 | – | 226.0 | 259.0 | 367 | – | 367 |
| MF01, MF02 | MSK 040C | 82 | – | – | – | – | – | – | 90 | 185.5 | 215.5 | – | – | – |
| | MSK 050C | 98 | – | – | – | – | – | – | 115 | 203.0 | 233.0 | – | – | – |
| | MSK 060C | 116 | – | – | – | – | – | – | 115 | 226.0 | 259.0 | – | – | – |

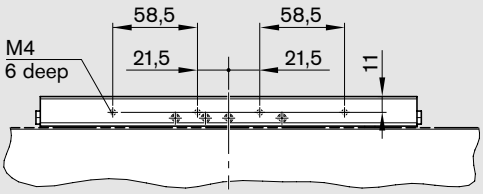


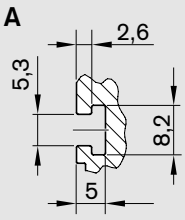



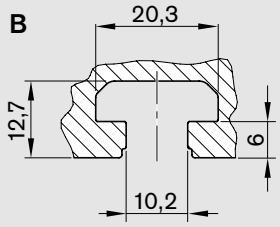



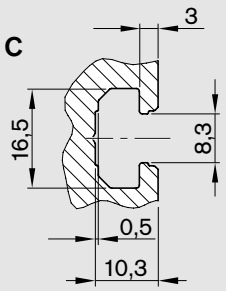




Mounting hole pattern for switching cam



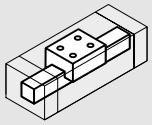
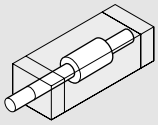
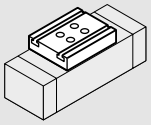
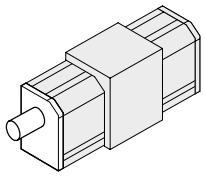
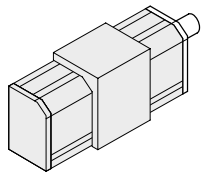
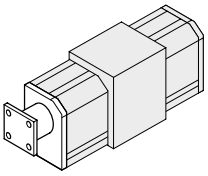
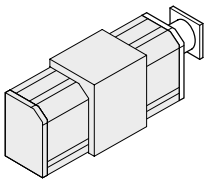
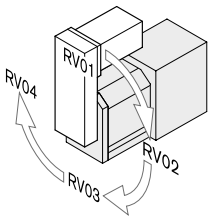
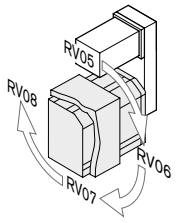



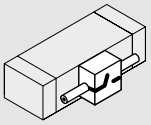
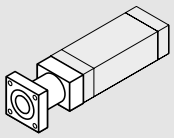
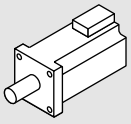
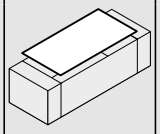



Bridge Modules with Ball Screw Drive BKK

# BKK 20-135 Components and Ordering Data

| Part number, length R0320 500 00, … mm | | Type | Guideway  | Drive unit  | | | | | Carriage  | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Screw journal | Ball screw size $d_0$ x P 32 x 5 | 32 x 10 | 32 x 20 | 32 x 32 | One carriage w/o SPU | with 1 SPU | with 2 SPU | with 3 SPU | with 4 SPU | with 5 SPU | |
| with ball screw, without motor mount |  | **OF01** | 01 | Ø16 | 01 | 02 | 03 | 04 | 01 | 02 | 03 | 04 | 05 | 06 | |
| | | | | Ø16 with key-way | 11 | 12 | 13 | 14 | | | | | | | |
| |  | **OF02** | 01 | Ø16 | 06 | 07 | 08 | 09 | | | | | | | |
| | | | | Ø16 with key-way | 16 | 17 | 18 | 19 | | | | | | | |
| with ball screw and motor mount |  | **MF01** | 01 | Ø16 | 01 | 02 | 03 | 04 | 01 | 02 | 03 | 04 | 05 | 06 | |
| |  | **MF02** | 01 | Ø16 | 06 | 07 | 08 | 09 | | | | | | | |
| with ball screw and timing belt side drive |   | **RV01 to RV04** | 01 | Ø16 | 01 | 02 | 03 | 04 | 01 | 02 | 03 | 04 | 05 | 06 | |
| |   | **RV05 to RV08** | 01 | Ø16 | 06 | 07 | 08 | 09 | | | | | | | |

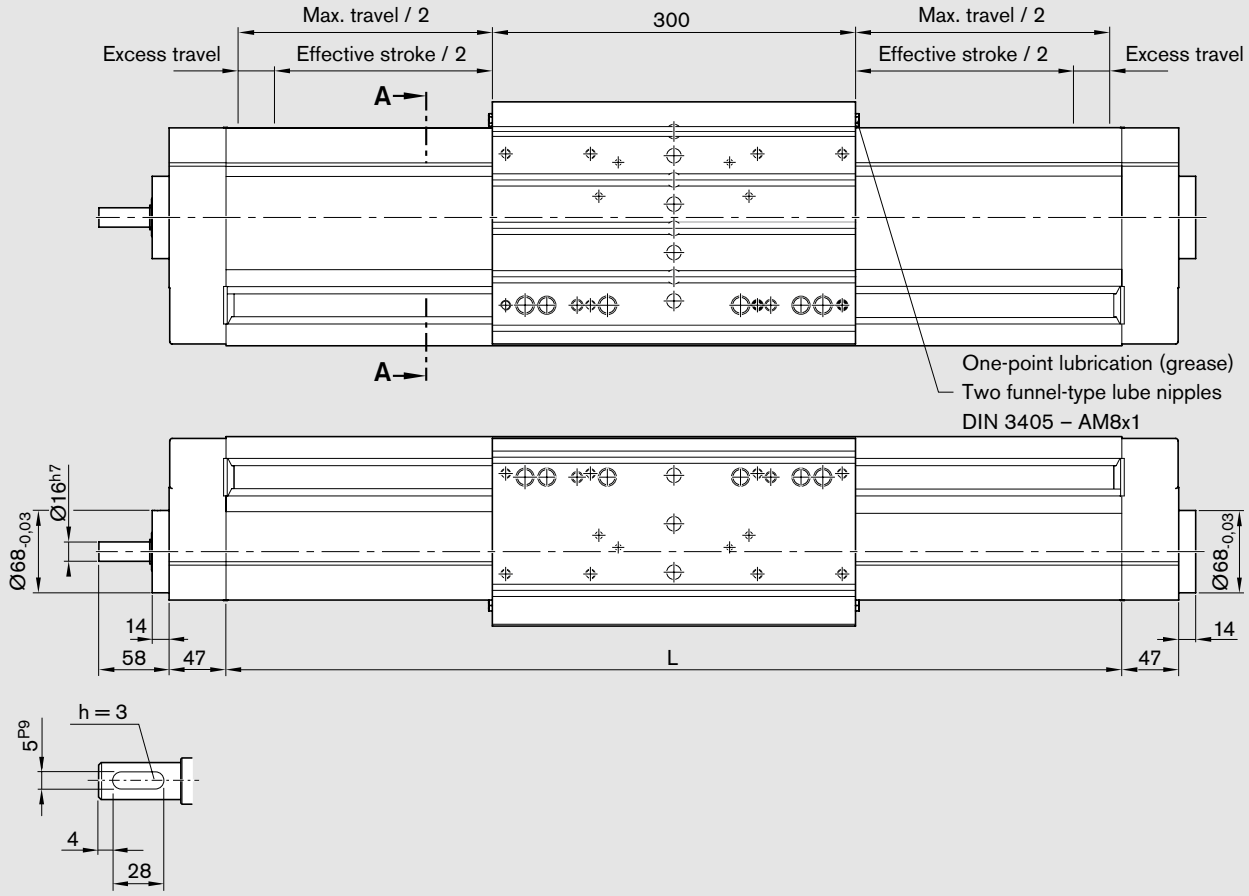
1) Attachment kit also available without motor (when ordering: enter “00” for motor)

| Motor attachment | | | Motor | | Cover | | Switches Switching cam, socket, plug, cable duct  | Documentation | |
|---|---|---|---|---|---|---|---|---|---|
|  | | |  | |  | | |  | |
| Gear ratio i = | Attachment kit[1)] | for motor | Motor type without brake | with brake | Gap-type seals without | with | | Standard report | Measurement report |
| | 00 | | 00 | | | | | | |
| | 03 | MSK 060C | 90 | 91 | 01 | 02 | Without switch Without cable duct **00**<br>**Proximity/mechanical switches**<br>PNP NC 11 — **One switching cam** 16 — **Socket/plug** 17<br>PNP NO 13 — **Two switching cams** 26 — **Socket/plug** 17<br>Mechanical switch 15 — **Socket/plug** 17<br>**Cable duct** Length = L 20 | 01 | 02 Frictional torque<br>03 Lead deviation<br>05 Positioning accuracy |
| | 02 | MSK 076C | 92 | 93 | | | | | |
| 1 | 23 | MSK 060C | 90 | 91 | | | | | |
| 2 | 24 | MSK 060C | 90 | 91 | | | | | |

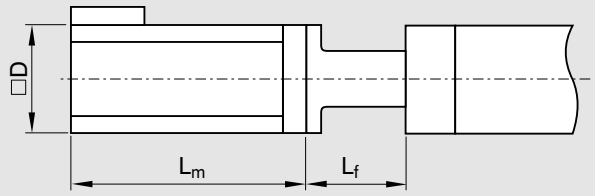
Bridge Modules with Ball Screw Drive BKK

# BKK 20-135 Dimensions

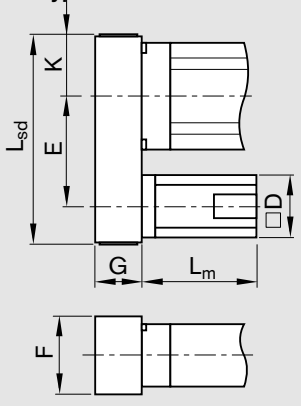
All dimensions in mm
Drawings not to scale



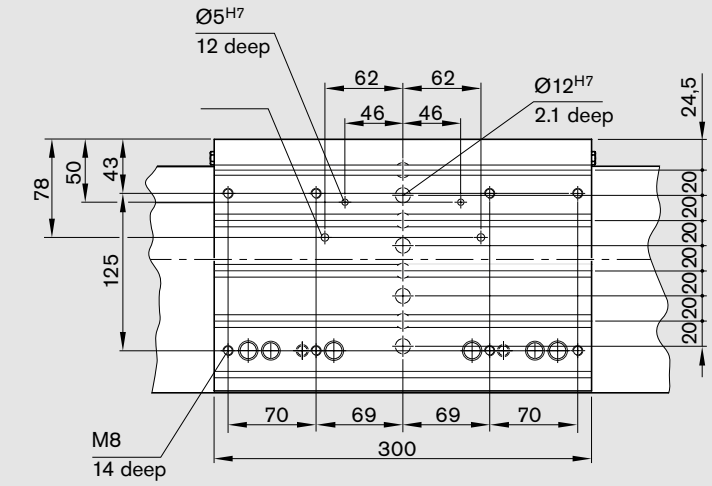

**Type MF01, MF02**

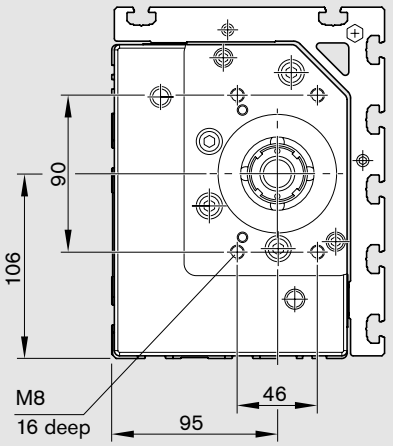


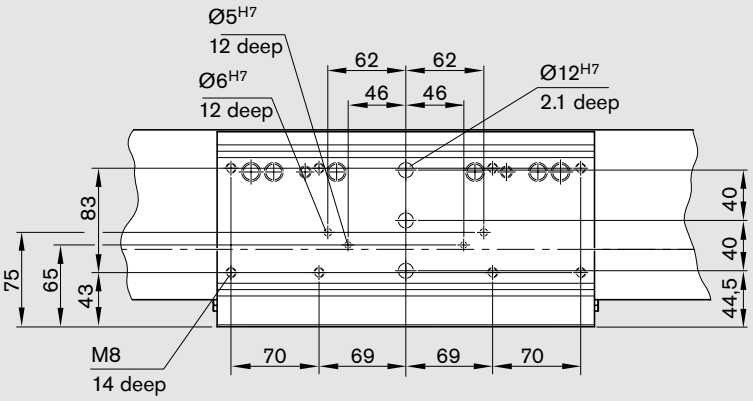

**Type RV01 - RV08**

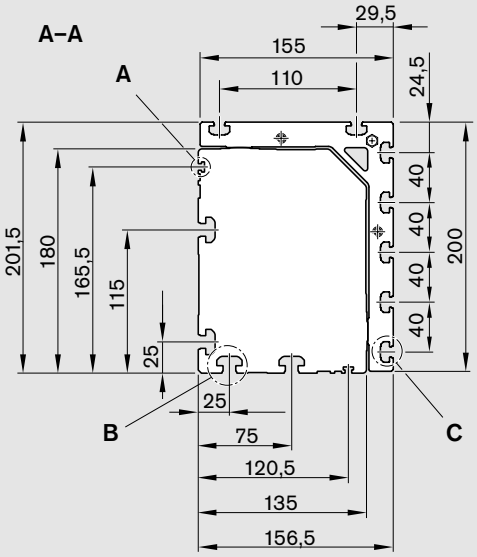



| Type | Motor | Dimensions (mm) D | E i=1 | E i=2 | F | G | K | $L_f$ | $L_m$ without brake | $L_m$ with brake | $L_{sd}$ i=1 | $L_{sd}$ i=2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RV01 - RV08** | **MSK 060C** | 116 | 267.5 | 265 | 116 | 66 | 59 | – | 226.0 | 259.0 | 403 | 403 |
| **MF01, MF02** | **MSK 060C** | 116 | – | – | – | – | – | 125 | 226.0 | 259.0 | – | – |
| | **MSK 076C** | 140 | – | – | – | – | – | 133 | 292.5 | 292.5 | – | – |

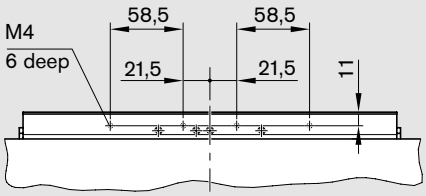


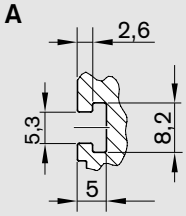



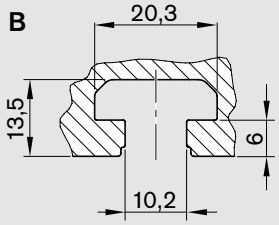



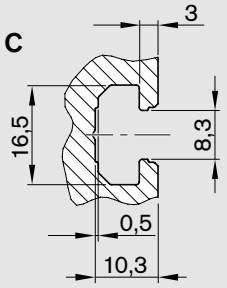




Mounting hole pattern for switching cam



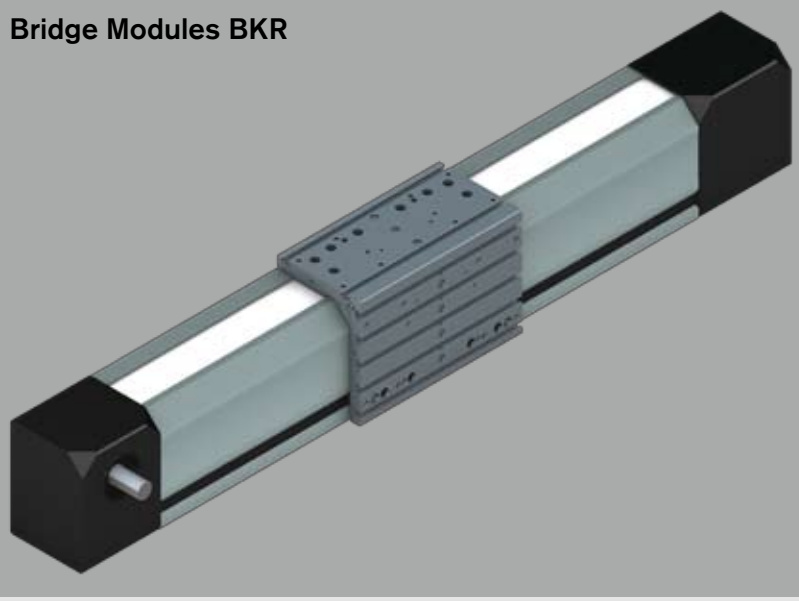



Bridge Modules with Toothed Belt Drive BKR

# Product Overview

Bridge Modules are ready-to-install precision linear motion systems for high-performance applications. They can be supplied in any desired length. Excellent price/performance ratio and fast delivery.

**Bridge Modules BKR**



## Structural design

- Highly rigid precision-extruded aluminum profile with two integrated Ball Rail Systems
- Idler (non-drive) end enclosure with integrated belt-tensioning system
- Torsionally stiff angled aluminum carriage with T-slots and threads offering multiple fastening possibilities
- Driven by a pre-tensioned toothed belt

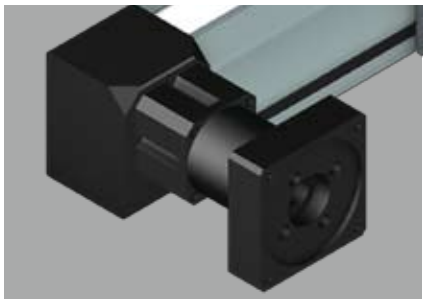
## Attachments

- Maintenance-free digital AC servo drives with integrated brake and attached feedback
- Gear reducer type LP
- Switches
- Socket with mating plug for the switches
- Cable duct made of profiled aluminum

## Other distinguishing features

- Optimal travel performance, high load capacities and high rigidity due to two zero-clearance Ball Rail Systems arranged at a 90° angle to each other.
- Power transmission through appropriate pairing of the drive type and the ball rail systems used.
- High travel speeds combined with high precision and smooth running over long travel ranges.
- Gap-type seals and side-mounted rails for guiding the toothed belt in the aluminum profile.
- Internal components protected by gap seals made of polyurethane tape reinforced with steel wires.
- Precise alignment and secure mounting (positive-locking) of attachments thanks to Easy-2-Combine technology in the carriage.
- Adjustable switches over the entire travel range.
- Easy motor attachment via locating feature and fastening threads.
- Low-cost maintenance provided by one-point lubrication (grease) of the ball rail systems from either side.
- Pulley ball bearings are lubricated for life.

**Drive controllers and control systems**

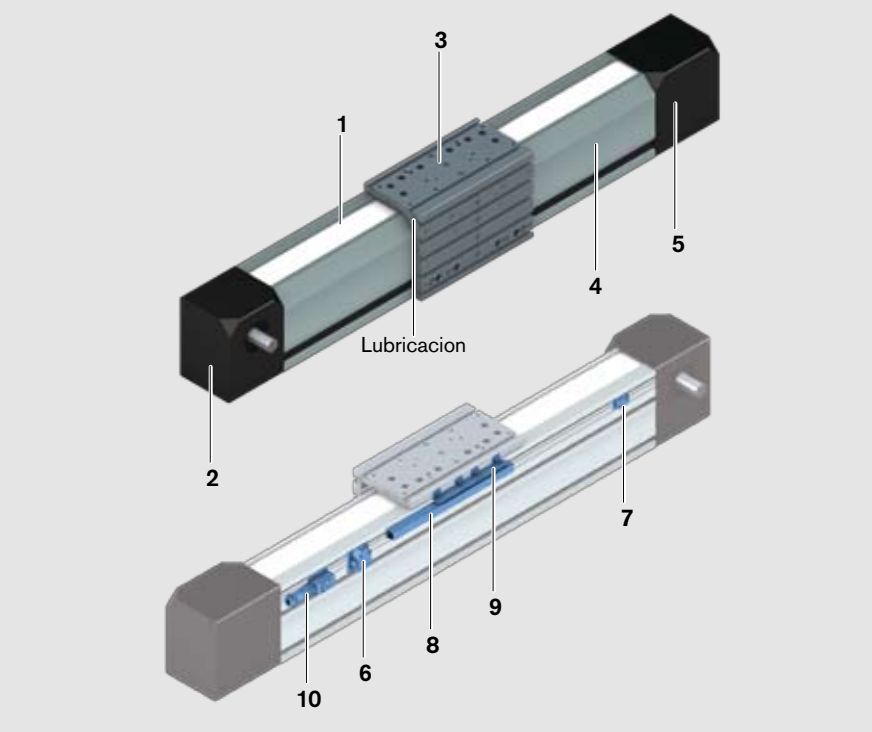


**Gear reducer**
Different gear ratios allow optimum matching of the external load and the motor's inertia.

# Structural Design

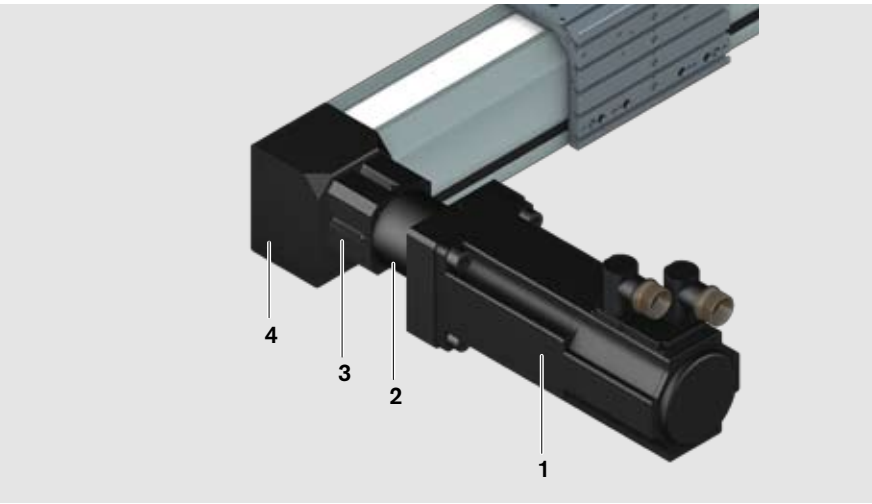
**1** Toothed belt
**2** Drive end enclosure
**3** Carriage
**4** Frame
**5** Idler (non-drive) end enclosure

**Attachments:**
**6** Mechanical switch
**7** Proximity switch
**8** Cable duct
**9** Switching cam
**10** Socket/plug



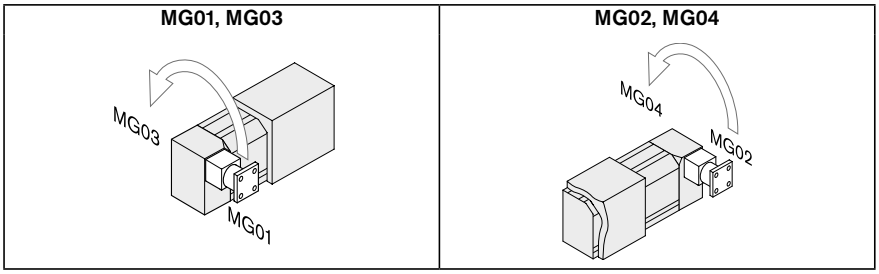

## Structural design of the gear reducer

For all Bridge Modules, a planetary gearbox can be installed via a flange. The flange serves as a mounting point for the gearbox to the Bridge Module. This direct connection eliminates the need for a coupling, thereby minimizing torsional deflection.
Different gear ratios are available:
i = 3, 5, 10




**1** Servo motor
**2** Gear reducer
**3** Flange
**4** Drive end enclosure

## Direct motor attachment with gear reducer



Bridge Modules with Toothed Belt Drive BKR

# Technical Data

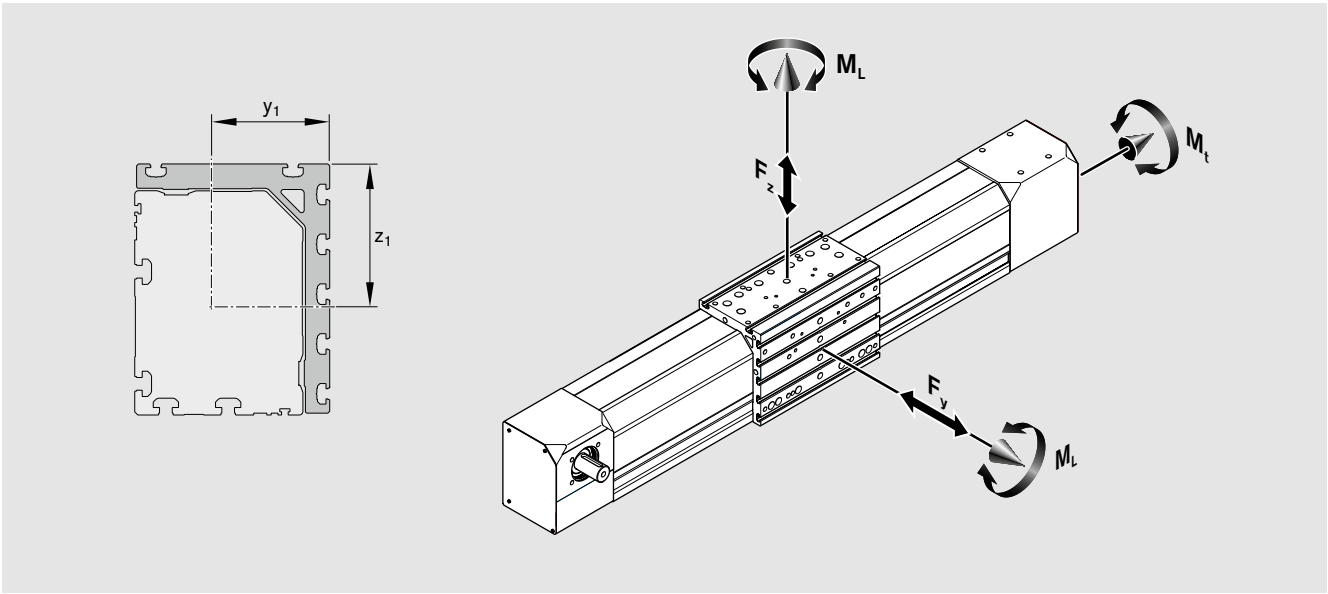
## Load capacities and moments

| Size | Belt type | Dynamic load capacity C | Dynamic load moments (Nm) | | Planar moment of inertia ($cm^4$) | | Maximum length | Moved mass of system | Specific spring rate | Dimensions (mm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Torsional load moment | Longitudinal load moment | | | | | | | |
| | | Guideway (N) | $M_t$ | $M_L$ | $I_y$ | $I_z$ | $L_{max}$ (mm) | $m_{ac}$ (kg) | $c_{spec}$ (N/mm · m) | $y_1$ | $z_1$ |
| **BKR 15-115** | AT 10 | 21900 | 850 | 1260 | 1050 | 760 | 5800 | 4.75 | $2.12 \cdot 10^6$ | 88.1 | 104.2 |
| **BKR 20-135** | AT 10 | 56200 | 2960 | 4130 | 1960 | 1380 | 5800 | 7.48 | $2.97 \cdot 10^6$ | 99.0 | 125.6 |

Toothed belt stretch $\Delta_L = (F \cdot L)/c_{spec}$

## Maximum permissible loads

| Size | Maximum permissible forces (N) | | Maximum permissible moments (Nm) | |
|---|---|---|---|---|
| | $F_{y\,max}$ | $F_{z\,max}$ | $M_{t\,max}$ | $M_{L\,max}$ |
| **BKR 15-115** | 15700 | 15700 | 610 | 770 |
| **BKR 20-135** | 26100 | 26100 | 1370 | 1690 |




**Note on dynamic load capacities and moments**

Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m. Often only 50,000 m are actually stipulated.
For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

**Acceptable loads**
(recommended from experience)

With respect to the desired service life, loads up to about 20% of the characteristic dynamic values (C, $M_t$, $M_L$) have proved acceptable.

At the same time, the following may not be exceeded:
- maximum permissible loads,
- permissible drive torque,
- permissible travel speed.

**The nominal life and the combined equivalent load on the bearing must be checked.**

## Modulus of elasticity E

E = 70,000 N/mm²

## Mass of the linear motion system $m_s$

Calculation without motor and switches

Weight factor (kg/mm) · length L (mm) + weight of all parts of fixed length (carriage, drive end, idler end, etc. (kg) + additional mass (kg))

| | Size | Weight (kg) | | |
|---|---|---|---|---|
| | | | Additional mass of gear reducer | |
| **i = 1** | **BKR 15-115** | 0.01962 · L + 13.26 | – | – |
| **i = 1** | **BKR 20-135** | 0.02771 · L + 21.58 | – | – |
| **i = 3, 5, 10** | **BKR 15-115** | 0.01962 · L + 14.19 | LP90 | 4.0 |
| **i = 3, 5, 10** | **BKR 20-135** | 0.02771 · L + 23.99 | LP120 | 8.6 |

## Accuracy

The accuracy of the extrusion profile used for the frame is 1.0 mm per meter.

## Length

| Size | Length of Bridge Module (mm) |
|---|---|
| **BKR 15-115** | L = stroke (mm) + 2 · excess travel (mm) + 300 (mm) |
| **BKR 20-135** | L = stroke (mm) + 2 · excess travel (mm) + 340 (mm) |

## Drive data

| Size | Drive type | Gear reducer ratio i | Maximum perm. drive torque $M_{mech}$ (Nm) | Lead constant u (mm/rev) | Belt type | Width b (mm) | Tooth pitch T (mm) | Max. belt drive transmission force F (N) | Belt elasticity limit $F_{perm}$ (N) |
|---|---|---|---|---|---|---|---|---|---|
| **BKR 15-115** | i=1 | 1 | 72.2 | 260.0 | AT 10 | 50 | 10 | 1740 | 7500 |
| | Gear reducer LP90 | 3 | 24.1 | 86.6 | | | | | |
| | | 5 | 14.4 | 52.0 | | | | | |
| | | 10 | 7.2 | 26.0 | | | | | |
| **BKR 20-135** | i=1 | 1 | 150.6 | 340.0 | AT 10 | 70 | 10 | 2783 | 11900 |
| | Gear reducer LP120 | 3 | 50.2 | 113.3 | | | | | |
| | | 5 | 30.1 | 68.0 | | | | | |
| | | 10 | 15.0 | 34.0 | | | | | |

## Drive data without motor (i = 1)

| Size | Drive unit diameter (mm) | Lead constant u (mm/rev) | Travel speed $v_{mech}$ (m/s) | Belt type | Reduced mass moment of inertia $J_s$ ($kgm^2$) |
|---|---|---|---|---|---|
| **BKR 15-115** | 82.76 | 260 | up to 5 | AT 10, width 50 | (170.4 + L (mm) · 0.009931) · $10^{-4}$ ($kgm^2$) |
| **BKR 20-135** | 108.23 | 340.0 | up to 5 | AT 10, width 70 | (416.9 + L (mm) · 0.02384) · $10^{-4}$ ($kgm^2$) |

## Frictional torque

| Size | Motor | Gear reducer type | Gear ratio i | Frictional torque of system $M_{RS}$ (Nm) | Frictional torque of gear reducer $M_{Rge}$ (Nm) |
|---|---|---|---|---|---|
| **BKR 15-115** | MSK 076C-450 | Gear reducer LP90 | 3, 5, 10 | 4.12 | 0.38 |
| | MSK 060C-600 | Gear reducer LP90 | | 4.12 | 0.38 |
| **BKR 20-135** | MSK 076C-450 | Gear reducer LP120 | | 5.31 | 0.80 |

Bridge Modules with Toothed Belt Drive BKR

# Technical Data

## BKR 15-115

**Performance data of gear reducer LP90**
**Performance values for horizontal operation with servo motor MSK 060C-600 and IndraDrive controller[1)]**
**Connection voltage: 3 x 400 V**

| Gear reducer ratio | | i = 3 | | | | | i = 5 | | | | | i = 10 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mass** | (kg) | 2 | 4 | 6 | 8 | 10 | 5 | 10 | 15 | 20 | 25 | 20 | 40 | 60 | 80 | 100 |
| **Acceleration time t** | (ms) | 78 | 86 | 94 | 102 | 109 | 123 | 142 | 161 | 179 | 198 | 188 | 228 | 268 | 309 | 349 |
| **Acceleration distance s** | (mm) | 196 | 215 | 235 | 254 | 273 | 308 | 355 | 402 | 448 | 495 | 244 | 297 | 349 | 401 | 453 |
| **Acceleration a** | ($m/s^2$) | 63.7 | 58.0 | 53.3 | 49.2 | 45.8 | 40.6 | 35.2 | 31.1 | 27.9 | 25.3 | 40.6 | 35.2 | 31.1 | 27.9 | 25.3 |
| **Travel speed $v_{mech}$** | (m/s) | 5.00 | | | | | 5.00 | | | | | 2.60 | | | | |
| **Repeatability ±** | (mm) | 0.1 | | | | | | | | | | | | | | |

**Performance data of gear reducer LP90**
**Performance values for horizontal operation with servo motor MSK 076C-0450 and IndraDrive controller[1)]**
**Connection voltage: 3 x 400 V**

| Gear reducer ratio | | i = 3 | | | | | i = 5 | | | | | i = 10 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mass** | (kg) | 3 | 6 | 9 | 12 | 15 | 15 | 30 | 45 | 60 | 75 | 40 | 80 | 120 | 160 | 200 |
| **Acceleration time t** | (ms) | 152 | 163 | 175 | 186 | 197 | 221 | 251 | 288 | 322 | 355 | 389 | 436 | 482 | 528 | 572 |
| **Acceleration distance s** | (mm) | 381 | 409 | 436 | 464 | 492 | 331 | 382 | 432 | 482 | 533 | 292 | 327 | 361 | 396 | 431 |
| **Acceleration a** | ($m/s^2$) | 32.8 | 30.6 | 28.7 | 26.9 | 25.4 | 13.6 | 11.8 | 10.4 | 9.3 | 8.4 | 3.9 | 3.4 | 3.1 | 2.8 | 2.6 |
| **Travel speed $v_{mech}$** | (m/s) | 5.00 | | | | | 3.00 | | | | | 1.50 | | | | |
| **Repeatability ±** | (mm) | 0.1 | | | | | | | | | | | | | | |

## BKR 20-135

**Performance data of gear reducer LP120**
**Performance values for horizontal operation with servo motor MSK 076C-0450 and IndraDrive controller[1)]**
**Connection voltage: 3 x 400 V**

| Gear reducer ratio | | i = 3 | | | | | i = 5 | | | | | i = 10 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mass** | (kg) | 6 | 14 | 22 | 30 | 38 | 10 | 30 | 50 | 90 | 130 | 100 | 150 | 200 | 250 | 300 |
| **Acceleration time t** | (ms) | 112 | 134 | 156 | 179 | 201 | 111 | 141 | 172 | 373 | 471 | 22.4 | 26. | 301 | 339 | 377 |
| **Acceleration distance s** | (mm) | 280 | 335 | 391 | 446 | 499 | 177 | 226 | 275 | 233 | 294 | 17.9 | 210 | 240 | 271 | 301 |
| **Acceleration a** | ($m/s^2$) | 44.7 | 37.3 | 32.0 | 28.0 | 24.9 | 28.9 | 22.7 | 18.6 | 13.7 | 10.9 | 7.1 | 6.1 | 5.3 | 4.7 | 4.2 |
| **Travel speed $v_{mech}$** | (m/s) | 5.0 | | | | | 3.2 | | | | | 1.6 | | | | |
| **Repeatability ±** | (mm) | 0.1 | | | | | | | | | | | | | | |

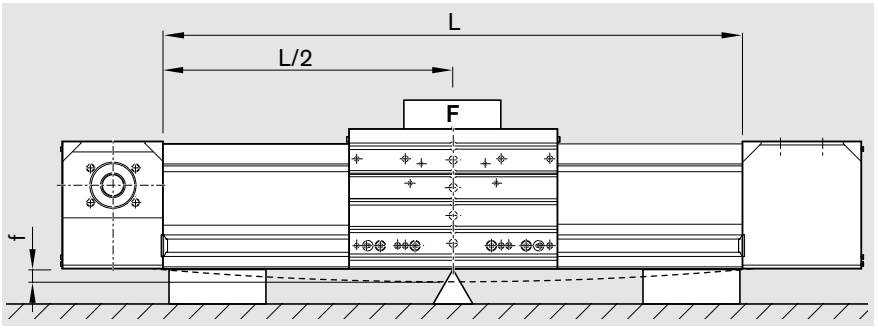
1) For more information, see “IndraDrive for Linear Motion Systems” catalog.

The tables contain performance data examples for different gearbox-motor-controller combinations. They are intended to serve as a guide for selection; exact values must be calculated based on individual cases.
Please check whether the selected combination is a permissible one (load capacities, moments, maximum speeds, motor data, etc.)!

## Deflection

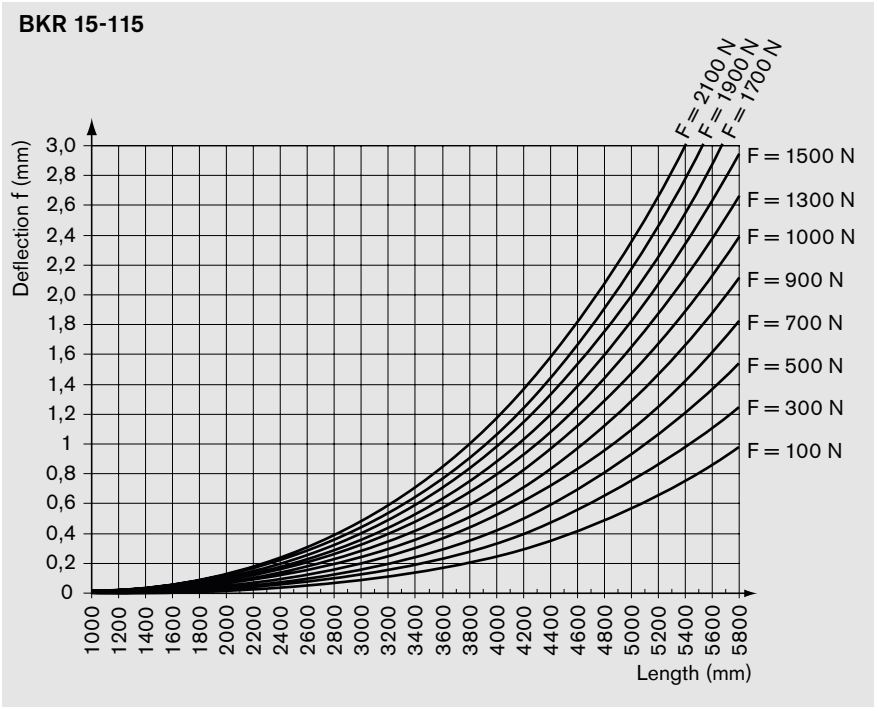
A particular feature of Bridge Modules is that they can be installed as cantilevered axes.
Deflection must, however, be taken into consideration, because it limits the possible load.

**If high system dynamics are required, supports must be provided every 300 to 600 mm.**

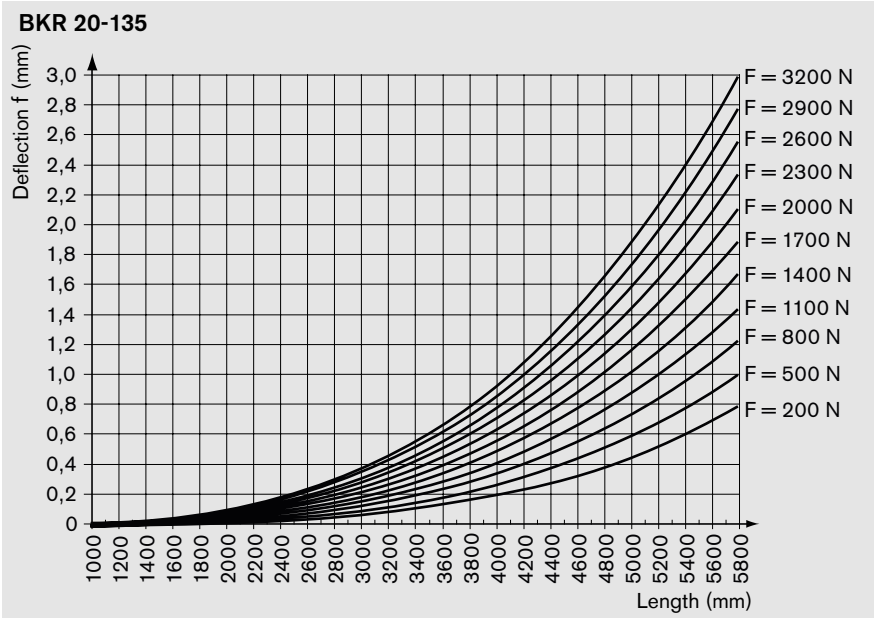



**The charts are applicable under the following conditions:**
- Both ends firmly fixed (200 to 250 mm per end)
- 8 screws per side
- Solid mounting base

**BKR 15-115**




**BKR 20-135**



Bridge Modules with Toothed Belt Drive BKR

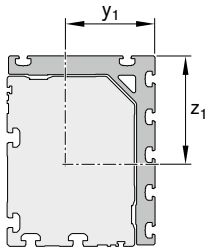
# Calculations

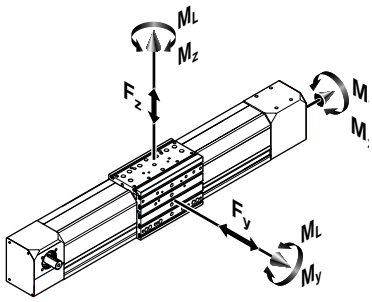
## Calculation principles

**Combined equivalent load on bearing of the linear guide**

$$F_{comb} = |F_y| + |F_z| + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$

| BKR size | Dimensions (mm) | |
|---|---|---|
| | $y_1$ | $z_1$ |
| 15-115 | 88.1 | 104.2 |
| 20-135 | 99.0 | 125.6 |




| | | | |
|---|---|---|---|
| C | = | dynamic load capacity | (N) |
| $F_{comb}$ | = | combined equivalent load on bearing | (N) |
| $F_y$ | = | force in y-direction | (N) |
| $F_z$ | = | force in z-direction | (N) |
| i | = | gear ratio | |
| L | = | nominal life in meters | (m) |
| $L_h$ | = | nominal life in hours | (h) |
| $M_L$ | = | dynamic longitudinal moment load capacity | (Nm) |
| $M_R$ | = | frictional torque at motor journal | (Nm) |
| $M_{RS}$ | = | frictional torque of the system | (Nm) |
| $M_{Rge}$ | = | frictional torque of gear reducer | (Nm) |
| $M_t$ | = | dynamic torsional moment load capacity | (Nm) |
| $M_x$ | = | torsional moment (about the x-axis) | (Nm) |
| $M_y$ | = | torsional moment (about the y-axis) | (Nm) |
| $M_z$ | = | torsional moment (about the z-axis) | (Nm) |
| $v_m$ | = | average speed | (m/s) |
| $y_1$, $z_1$ | = | application point of the effective force | (mm) |

**Nominal life**

Nominal life of the guideway in meters:

$$L = \left(\frac{C}{F_{comb}}\right)^3 \cdot 10^5 \text{ m}$$

Nominal life of the guideway in hours:

$$L_h = \frac{L}{3600 \cdot v_m}$$

**Frictional torque**

for motor attachment via motor mount and coupling:

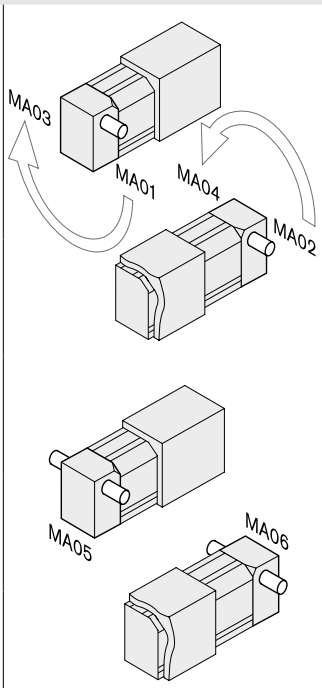
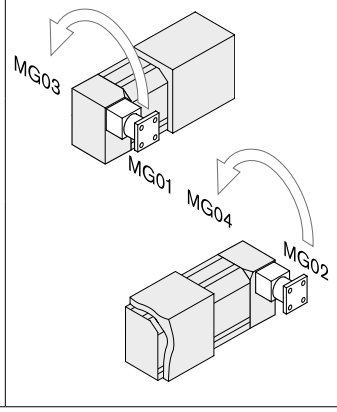
$$M_R = M_{RS}$$

for motor attachment via gear reducer:

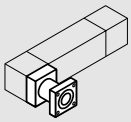
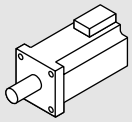
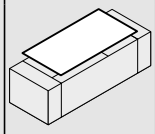
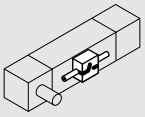
$$M_R = \frac{M_{RS}}{i} + M_{R\,ge}$$

Bridge Modules with Toothed Belt Drive BKR

# BKR 15-115 Components and Ordering Data

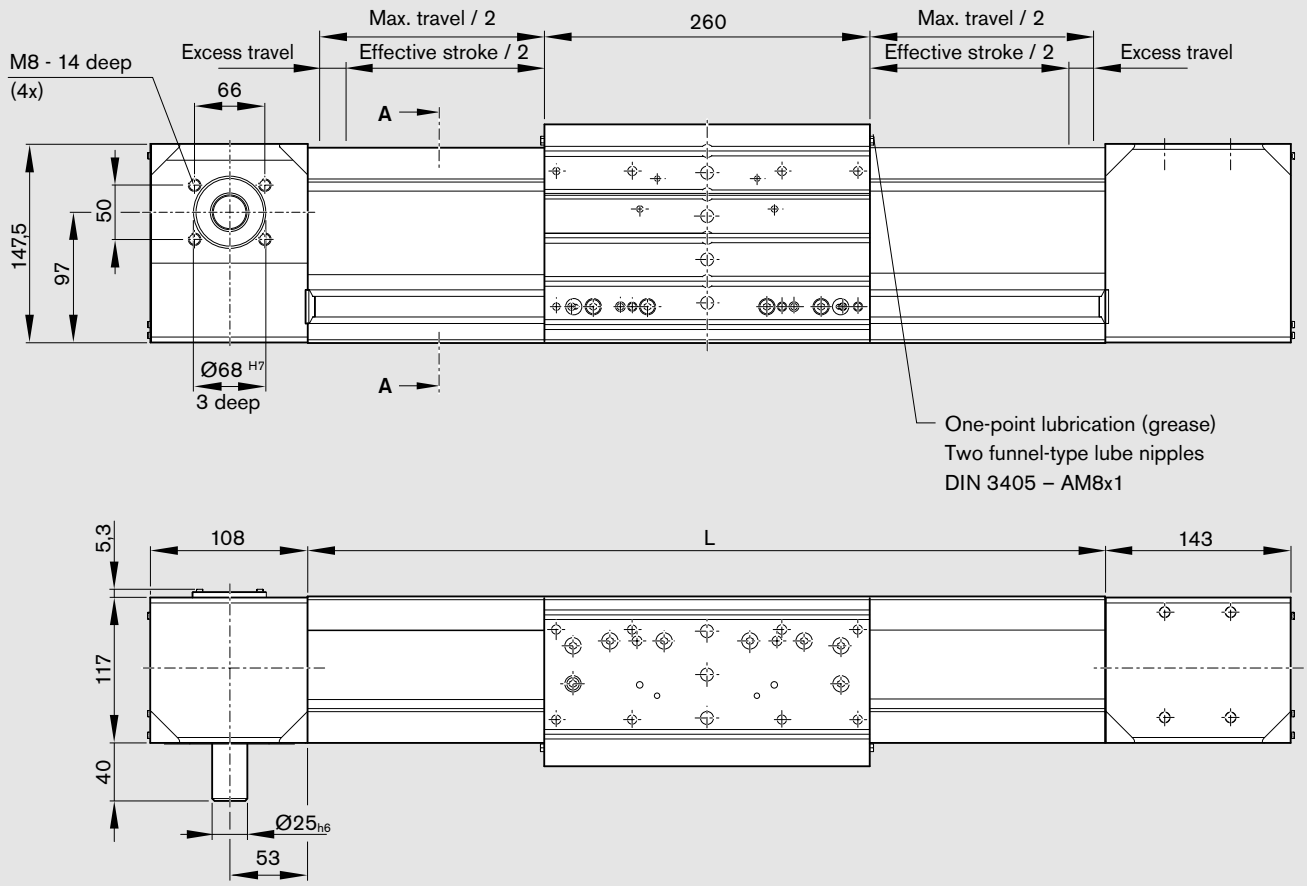
| Part number, length<br>R0324 400 00, ... mm | | Type | Guideway | Drive unit<br>Shaft without keyway<br>i = 1 | Drive unit<br>Gear reducer<br>i = 5, 10 | Carriage<br>One carriage |
|---|---|---|---|---|---|---|
| with drive |  | **MA01** | 01 | 01 | | 01 |
| | | **MA02** | | | | |
| | | **MA03** | | 02 | | |
| | | **MA04** | | | | |
| | | **MA05** | | 03 | | |
| | | **MA06** | | | | |
| with gear reducer LP90 |  | **MG01**<br>**MG02** | 01 | | 10 | 01 |
| | | **MG03**<br>**MG04** | | | 11 | |

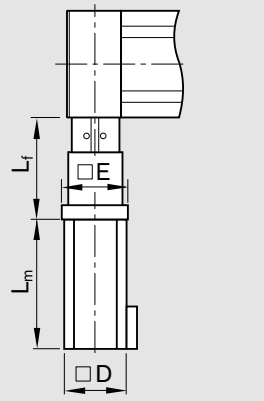
1) Attachment kit also available without motor (when ordering: enter “00” for motor)

| | Motor attachment[1)] | | | Motor | | | Cover | | Switches Switching cam, socket, plug, cable duct | | | | Documentation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | | |  | | |  | |  | | | |  | |
| | Gear reducer | | | Motor type | | | Gap seal made of PU tape | | | | | | Standard report | Measure-ment report |
| | i = 3 | i = 5 | i = 10 | | without brake | with brake | w/o | with | | | | | | |
| | | | | without | 00 | | | | **Without switch Without cable duct** | | **00** | | | 02 Frictional torque |
| | | | | | | | | | **Proximity/mechanical switches** | | | | | |
| | | | | | | | | | PNP NC | 11 | **One switching cam** 16 | **Socket/ plug** 17 | | |
| | | | | | | | | | PNP NO | 13 | | | | |
| | | | | | | | | | Mechanical switch | 15 | **Two switching cams** 26 | | | |
| | | | | | | | | | **Cable duct** Length = L | 20 | | | | |
| | 40 | 41 | 42 | MSK 060C | 90 | 91 | 01 | 02 | | | | | 01 | 05 Positioning accuracy |
| | 20 | 21 | 22 | MSK 076C | 92 | 93 | | | | | | | | |
| | 40 | 41 | 42 | MSK 060C | 90 | 91 | | | | | | | | |
| | 20 | 21 | 22 | MSK 076C | 92 | 93 | | | | | | | | |

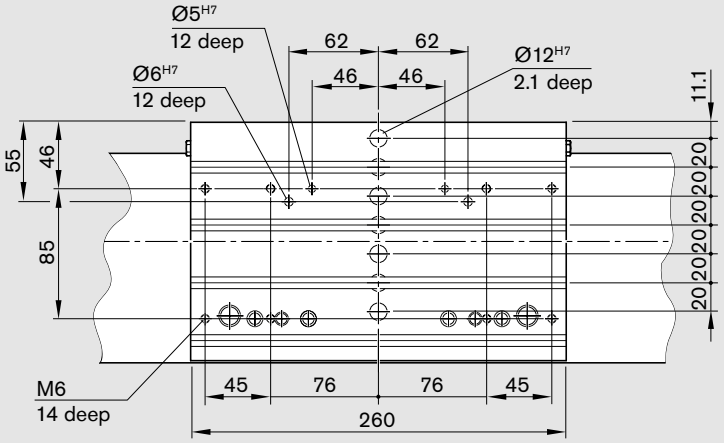
Bridge Modules with Toothed Belt Drive BKR

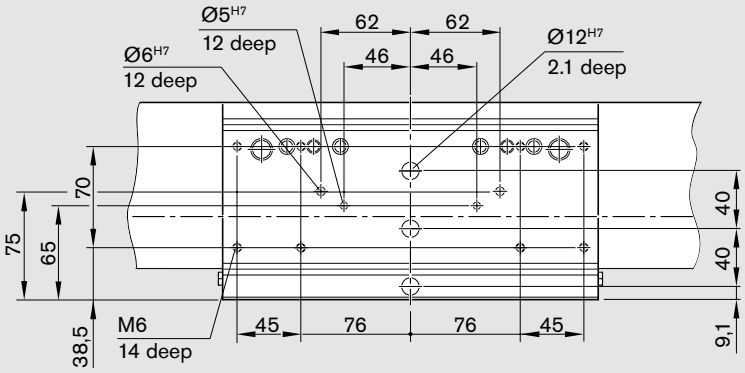
# BKR 15-115 Dimensions

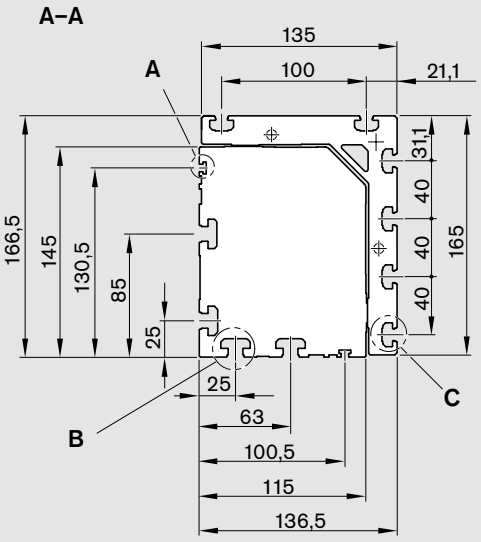


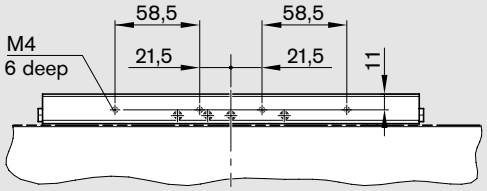

| Motor | Gear reducer | Dimensions (mm) D | E | $L_f$ | $L_m$ without brake | $L_m$ with brake |
|---|---|---|---|---|---|---|
| **MSK 060C** | LP90 | 116 | 120 | 157 | 226.0 | 259.0 |
| **MSK 076C** | | 140 | 140 | | 292.5 | 292.5 |

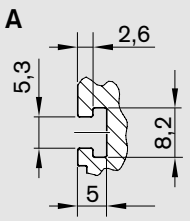


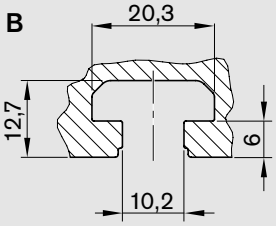



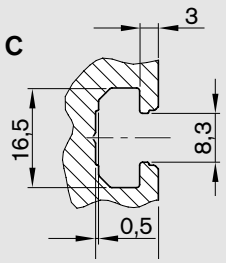




Mounting hole pattern for switching cam



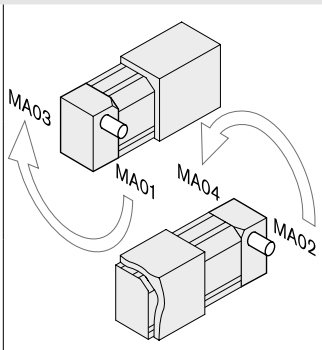
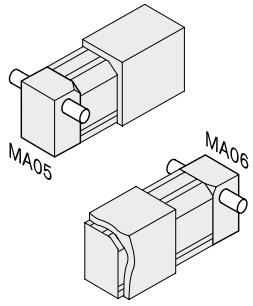
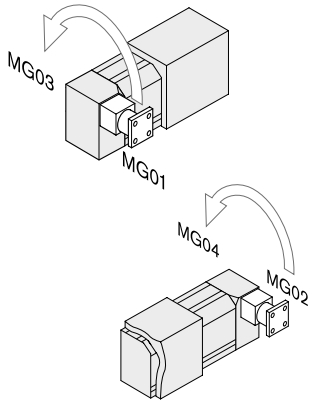



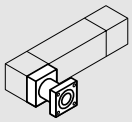
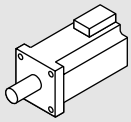
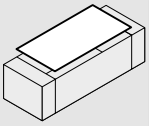
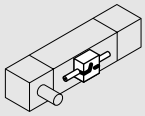



Bridge Modules with Toothed Belt Drive BKR

# BKR 20-135 Components and Ordering Data

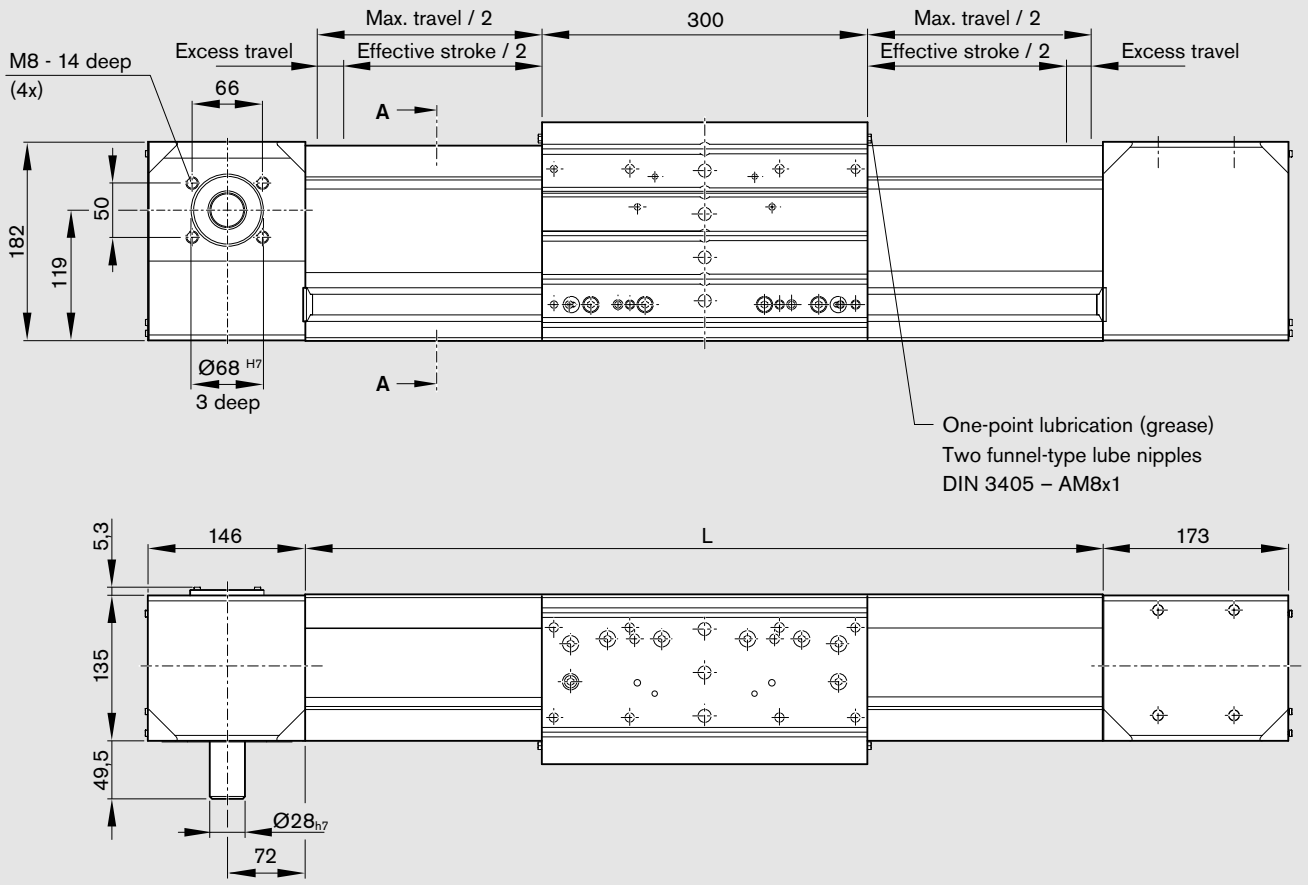
| Part number, length<br>R0324 500 00, … mm | | Type | Guideway | Drive unit<br>Shaft without keyway<br>i = 1 | Drive unit<br>Gear reducer<br>i = 3, 5, 10 | Carriage<br>One carriage |
|---|---|---|---|---|---|---|
| with drive |  | **MA01** | 01 | 01 | | 01 |
| | | **MA02** | | | | |
| | | **MA03** | | 02 | | |
| |  | **MA04** | | | | |
| | | **MA05** | | 03 | | |
| | | **MA06** | | | | |
| with gear reducer LP120 |  | **MG01**<br>**MG02** | 01 | | 10 | 01 |
| | | **MG03**<br>**MG04** | | | 11 | |

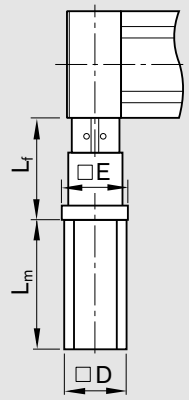
1) Attachment kit also available without motor (when ordering: enter “00” for motor)

| | Motor attachment[1)] | | | Motor | | | Cover | | Switches<br>Switching cam, socket, plug, cable duct | | | | Documentation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | | |  | | |  | |  | | | |  | |
| | Gear reducer | | | Motor type | without brake | with brake | Gap seal made of PU tape | | | | | | Standard report | Measure-ment report |
| | i = 3 | i = 5 | i = 10 | | | | w/o | with | | | | | | |
| | | | | without | 00 | | 01 | 02 | **Without switch<br>Without cable duct** | **00** | | | 01 | 02<br>Frictional torque |
| | | | | | | | | | **Proximity/mechanical switches** | | | | | |
| | | | | | | | | | PNP NC | 11 | **One switching cam** 16 | **Socket/ plug** 17 | | |
| | | | | | | | | | PNP NO | 13 | **Two switching cams** 26 | | | |
| | | | | | | | | | Mechanical switch | 15 | | | | |
| | | | | | | | | | **Cable duct**<br>Length = L | 20 | | | | |
| | 30 | 31 | 32 | MSK 076C | 92 | 93 | | | | | | | | 05<br>Positioning accuracy |

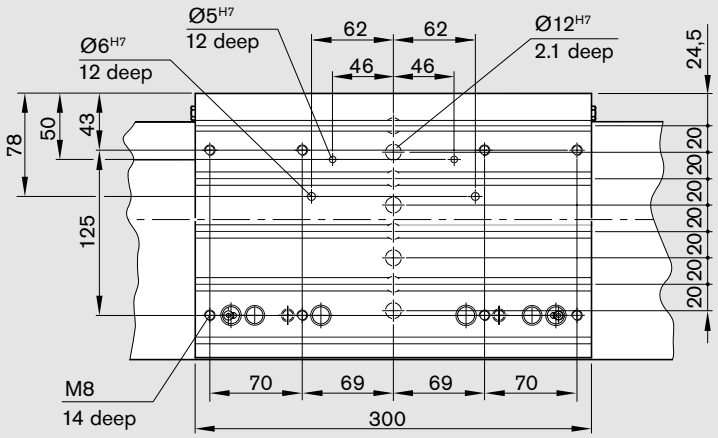
Bridge Modules with Toothed Belt Drive BKR

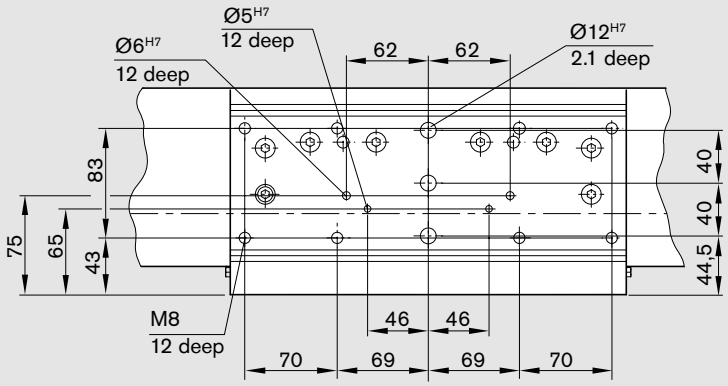
# BKR 20-135 Dimensions

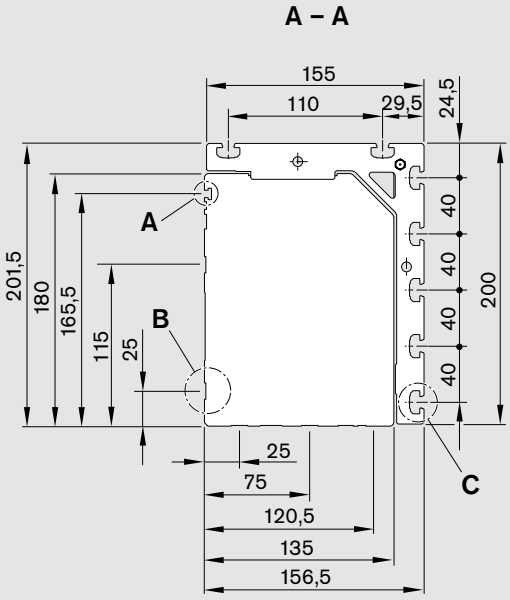


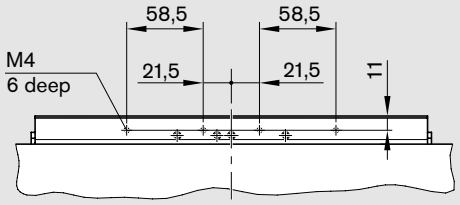

| Motor | Gear reducer | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|
| | | D | E | $L_f$ | $L_m$ | |
| | | | | | without brake | with brake |
| **MSK 076C** | LP120 | 140 | 140 | 165 | 216.5 | 292.5 |

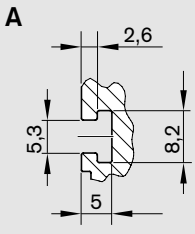


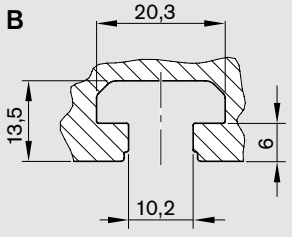



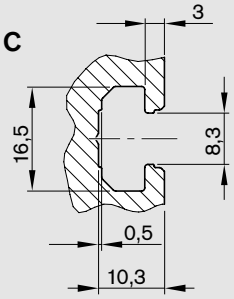




Mounting hole pattern for switching cam



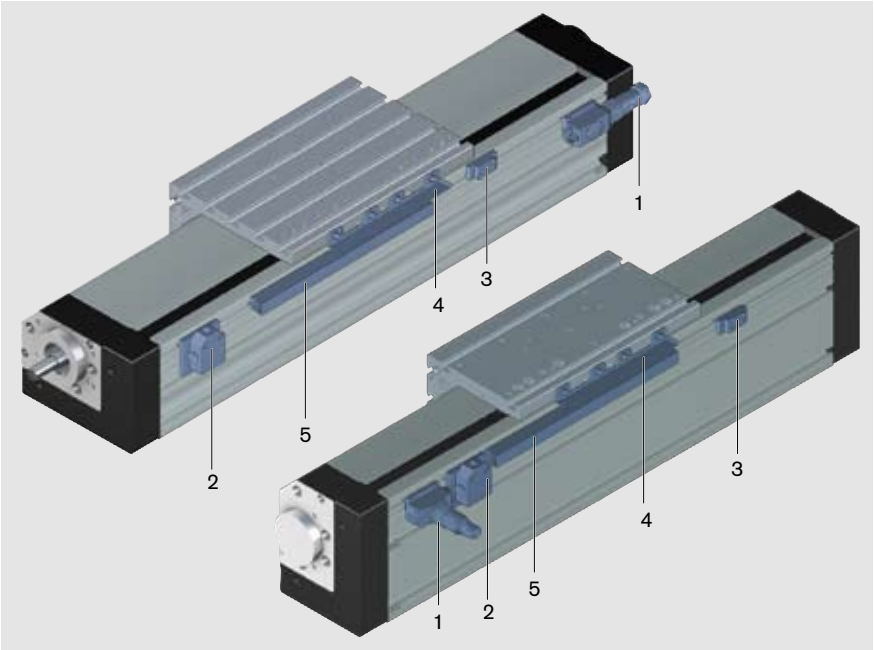



Switch Mounting Arrangements

# Mechanical and Proximity Switches

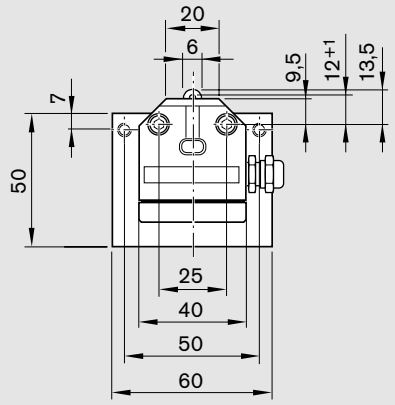
**1** Socket and plug
**2** Mechanical switch
(with mounting accessories)
**3** Proximity switch
(with mounting accessories)
**4** Cable duct (aluminum alloy)
**5** Switching cam




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

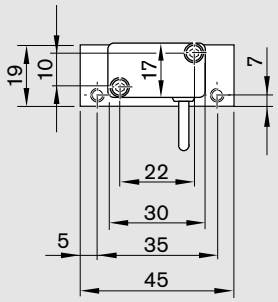
| Mechanical switch (technical data) | |
|---|---|
| **Repeatability** | ± 0.05 mm |
| **Permissible ambient temperature** | –5 °C to +80 °C |
| **Protection class** | DIN 40050 IP 67 |
| **Bounce time** | < 2 ms |
| **Insulation class** | Group C per VDE 0110 |
| **Rated voltage** | 250 V AC |
| **Continuous current** | 5 A |
| **Switching capacity at 220 V, 40-60 Hz** | cosφ = 0.8 at 2 A |
| **Contact resistance when new** | < 240 mΩ |
| **Connector** | Screw connector |
| **Contact system** | Single-pole changeover |
| **Switching system** | Snap-action |

Mechanical switch
(with mount)

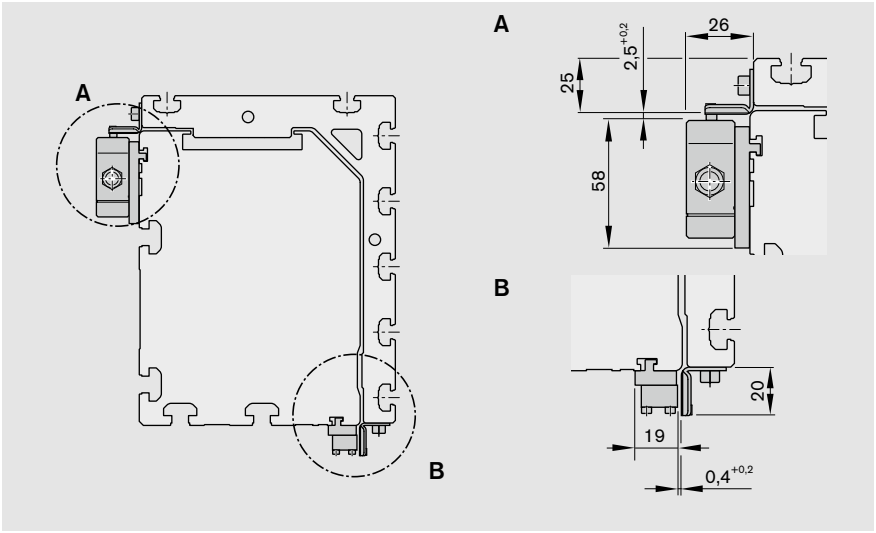



| Proximity switch (technical data)<br>Proximity switch with potted cable<br>(3 x 0.14 mm² Unitronic) | |
|---|---|
| **Housing form** | NO |
| **Minisensor** | Form A DIN 41635 |
| **Operating voltage** | 10 ... 30 V DC |
| **Residual ripple** | ≤ 10% |
| **Load** | 200 mA |
| **No-load current** | ≤ 20 mA |
| **Switching frequency** | max. 1500 Hz |
| **Temperature-related shift in make point** | ≤ 4 µm/K |
| **Output signal steepness** | ≥ 1 V/µs |
| **Repeatability of make point per EN 50008** | ≤ 0.1 mm |
| **Cable length** | 3 m (10 m on request) |

Proximity switch
(with mount)



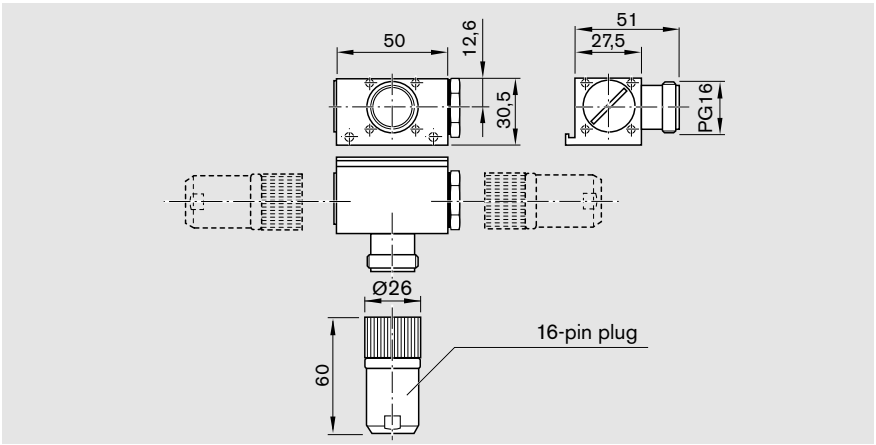
### Switch mounting example




### Socket and plug

- Attach the socket on the side with the most switches.

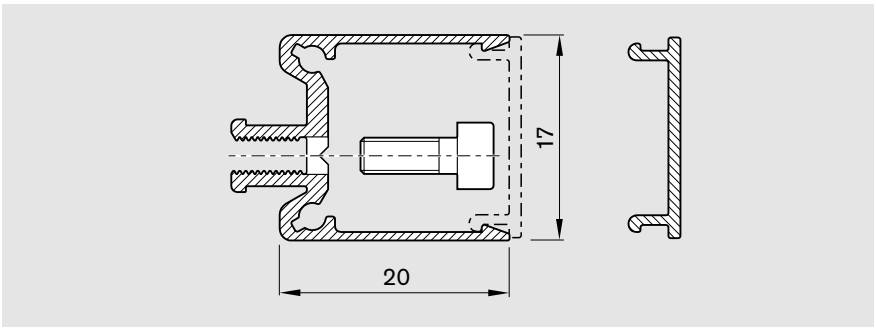
The socket and plug have 16 pins
The socket and switch are not pre-wired.
The switch activation points can thus be optimized during start-up.
A plug is provided.
The plug can be mounted in three directions.




### Cable duct

- The cable duct is fastened in the T-slots on the side of the frame. Fastening screws widen the profile and give the cable duct a secure hold.

The cable duct will accommodate up to two cables for mechanical switches and three cables for proximity switches.
Fastening screws and cable grommets are included.




### Ordering the switches and accessories

Refer to the following table for part numbers.
Accessories can also be ordered separately.

| Item | | Part number |
|---|---|---|
| 1 | Socket/plug | R1175 001 53 |
| 2 | Mechanical switch with accessories | R1175 001 51 |
| | Mechanical switch alone | R3453 040 16 |
| 3 | Proximity switch | |
| | – Accessories without switch | R1175 001 52 |
| | – PNP NC | R3453 040 01 |
| | – PNP NO | R3453 040 03 |
| 4 | Switching cam | R1175 001 50 |
| 5 | Cable duct | R0399 800 06 |

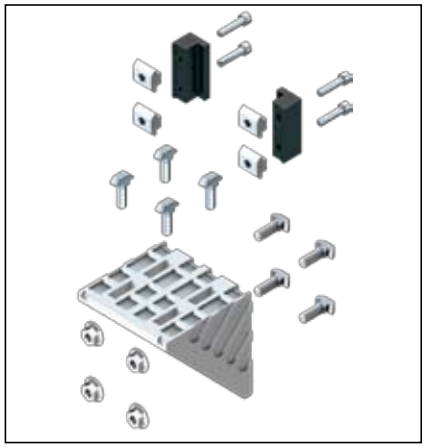
# Mounting and Fastening Options

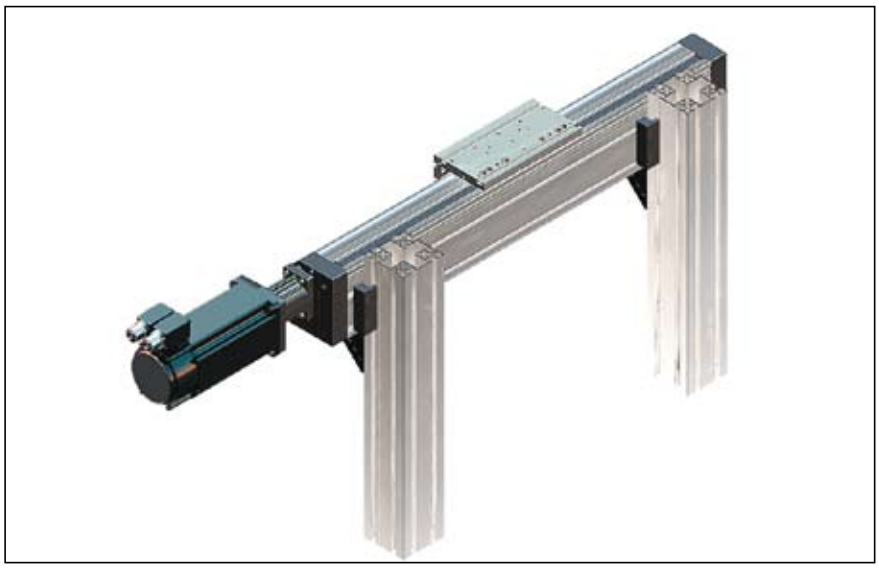
## General notes

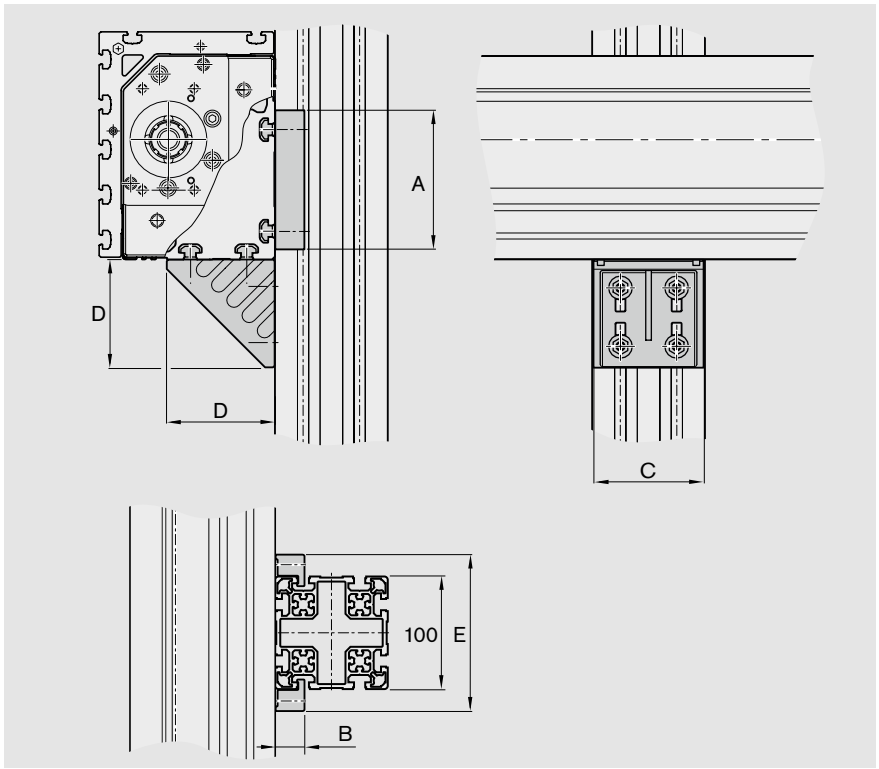
⚠ **Do not secure or support the Bridge Module at the end enclosures!**
**The frame is the main load-bearing part! When mounting Bridge Modules, please note the maximum tightening torques listed in the table.**
**Select an appropriate number of supports to meet the requirements on system dynamics.**
**Take note of the minimum spacing between the clamping fixtures and the end of the module frame. (see section “Mounting”, “Sliding blocks and springs”)**

## Mounting with angle bracket

**Angle bracket for mounting to MGE profiles (100 x 100)**





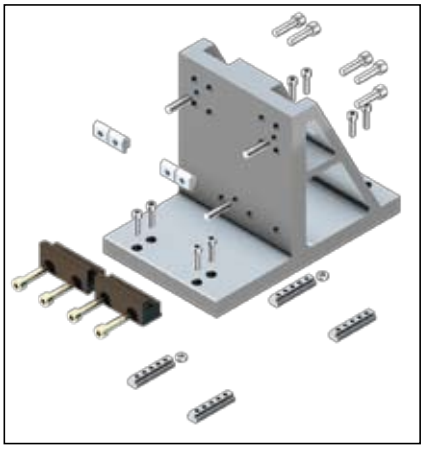


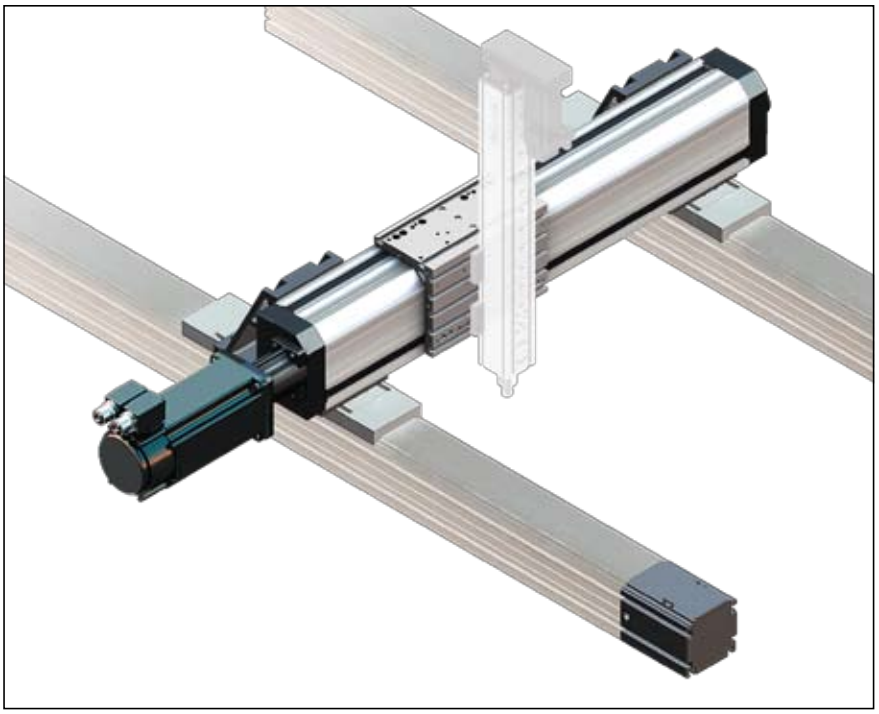

**Tightening torque for the fastening screws**
at friction factor 0.125
Strength class 8.8

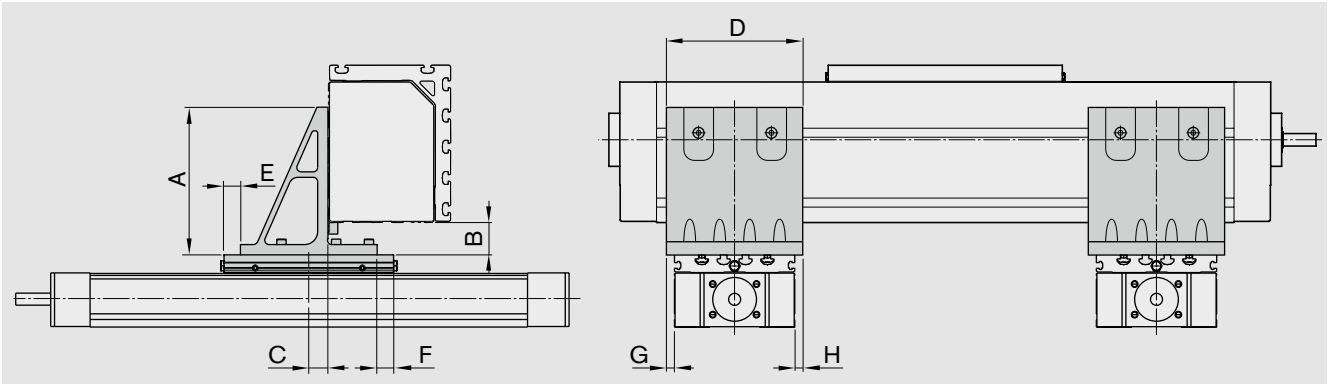
| 8.8 | M8 |
|---|---|
| (Nm) | 23 |

| BKK / BKR size | Part number | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|
| | | A | B | C | D | E |
| **15-115** | R0391 102 00 | 68 | 27.5 | 98 | 96 | 140 |
| **20-135** | R0391 102 01 | 98 | | | | |

**Angle bracket for mounting BKK/BKR, MKK/MKR and CKK/CKR**







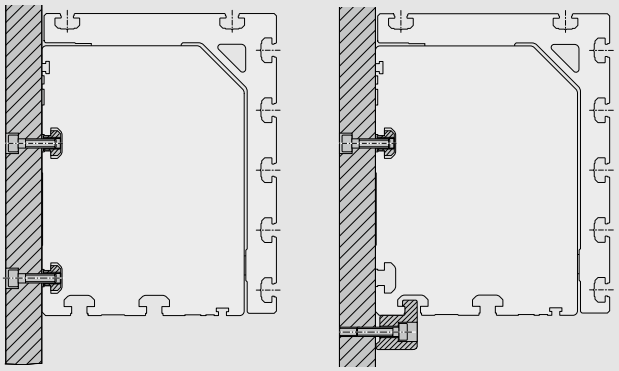

| | System | | Y-axis BKK / BKR 15-115 | Y-axis BKK / BKR 20-135 |
|---|---|---|---|---|
| X-axis | CKK / CKR 25-200 | Part number | R0391 101 60 | R0391 101 60 |
| | CKK / CKR 20-145 | Part number | R0391 101 61 | – |
| | MKK / MKR 25-110 | Part number | R0391 101 63 | R0391 101 63 |
| | MKK / MKR 20-80 | Part number | R0391 101 64 | – |
| | BKK / BKR 20-135 | Part number | R0391 101 65 | – |
| | BKK / BKR 15-115 | Part number | R0391 101 66 | – |

| Part number | R0391 101 60 | R0391 101 61 | R0391 101 63 | R0391 101 64 | R0391 101 65 | R0391 101 66 |
|---|---|---|---|---|---|---|
| **A** (mm) | 194.0 | 166.0 | 194.0 | 166.0 | 166.0 | 166.0 |
| **B** (mm) | 55.0 | 55.0 | 55.0 | 55.0 | 55.0 | 55.0 |
| **C** (mm) | 1.0 | 30.0 | 23.0 | 31.0 | 43.5 | 41.0 |
| **D** (mm) | 200.0 | 160.0 | 160.0 | 160.0 | 160.0 | 160.0 |
| **E** (mm) | 0.0 | 0.0 | 25.0 | 10.0 | 17.5 | 0.0 |
| **F** (mm) | 45.0 | 0.0 | 25.0 | 10.0 | 17.5 | 0.0 |
| **G** (mm) | 0.0 | –7.5 | –26.0 | –4.1 | –9.5 | –16.1 / –8.9 |
| **H** (mm) | 0.0 | –7.5 | –26.0 | –4.1 | 4.5 | –8.9 / –16.1 |
| **Weight** (kg) | 6.7 | 3.7 | 5.4 | 4.0 | 4.2 | 4.2 |

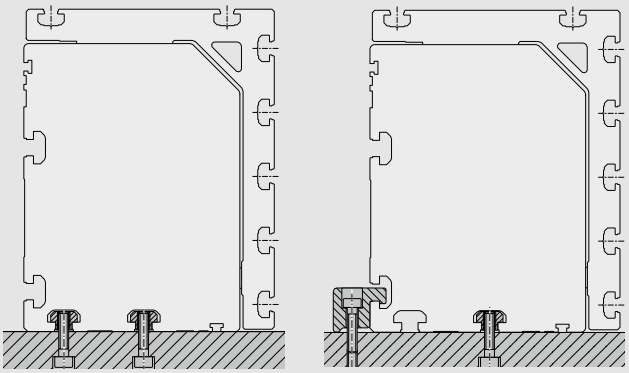
# Mounting and Fastening Options

## Fastening with clamping fixtures and sliding blocks

**Recommended fastening arrangement**



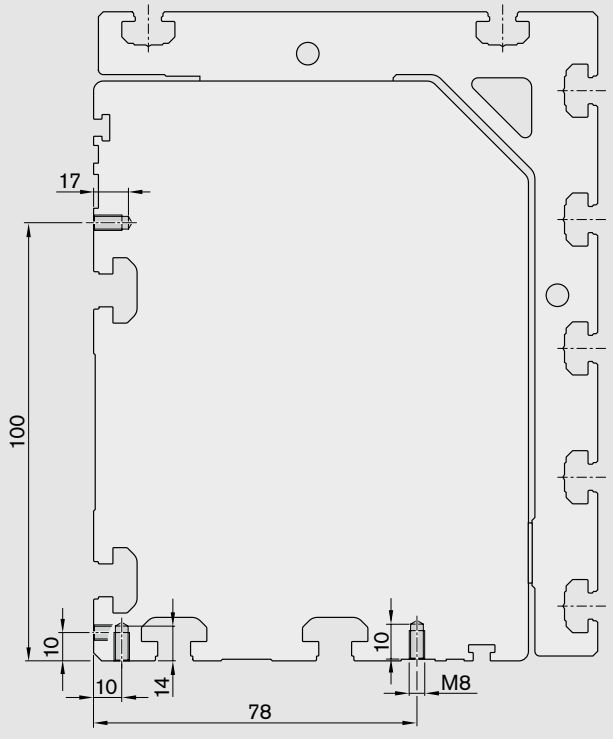
**For light loads only**



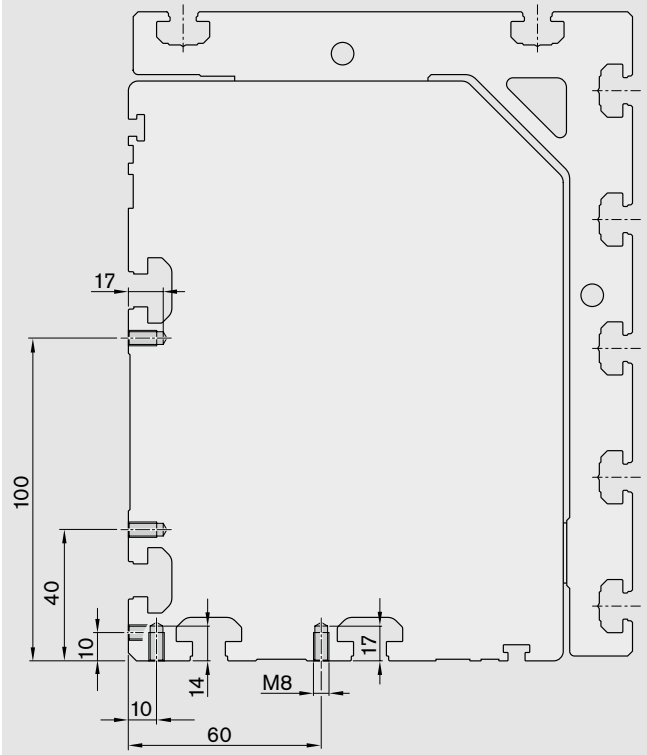
## Special modification in the base surface of the frame

Mounting by means of special modification in the base surface of the frame is possible.

**BKK/BKR 15-115**




**BKK/BKR 20-135**

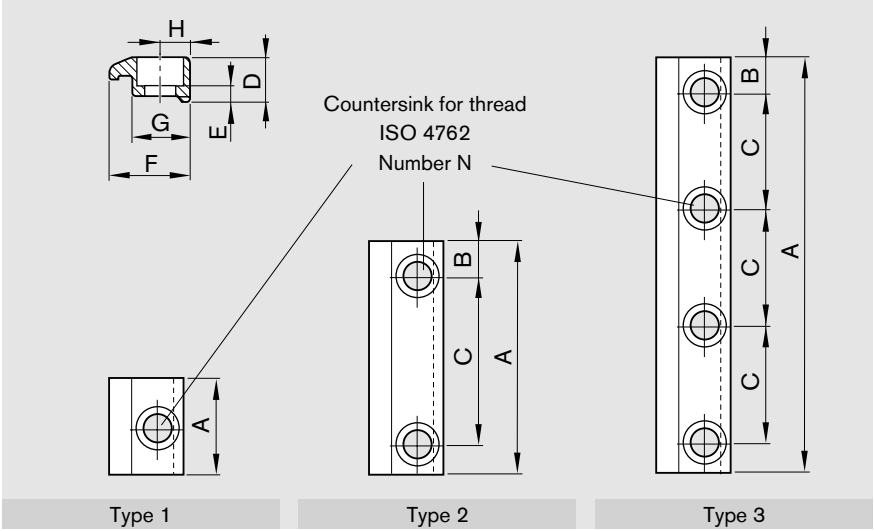



The mounting holes must be spaced at a distance of at least 30 mm from the frame ends.

# Mounting Accessories

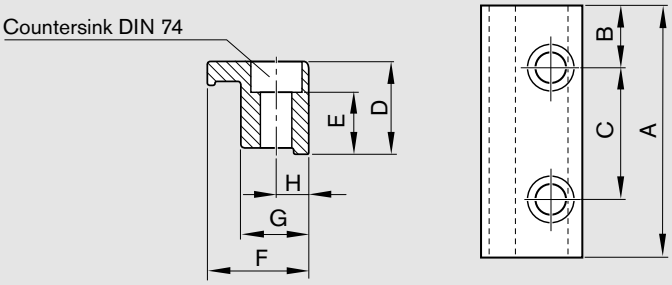
## Clamping fixtures

**Clamping fixtures for attachment to the carriage**
Wherever possible, use all T-slots to distribute the load.




| Attachment of | Part number | For thread | Type | No. of holes N | Dimensions (mm) A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CKK / CKR 12-90** | R0375 310 00 | M4 | 1 | 1 | 25 | – | – | 9.0 | 4.6 | 14.5 | 10.5 | 4 |
| | R0375 310 33 | | 2 | 2 | 62 | 11 | 40 | | | | | |
| **CKK / CKR 15-110** | R0375 510 00 | M6 | 1 | 1 | 25 | – | – | 11.5 | 5.3 | 19.3 | 14.0 | 7 |
| **CKK / CKR 20-145** | R0375 510 02 | | 3 | 4 | 142 | 11 | 40 | | | | | |
| **VKK 15-70 / 25-100** | R0375 510 34 | | 2 | 2 | 62 | 11 | 40 | | | | | |

**Clamping fixtures for fastening the Bridge Module to the mounting base**



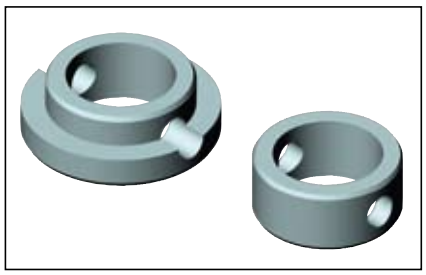

| Part number | Dimensions (mm) A | B | C | D | E | F | G | H | For thread | Number of holes N |
|---|---|---|---|---|---|---|---|---|---|---|
| R0375 410 50 | 88 | 19 | 50 | 27.5 | 18 | 30 | 19 | 9 | M8 | 2 |
| R0375 410 51 | 128 | 19 | 90 | 27.5 | 18 | 30 | 19 | 9 | M8 | 2 |
| R0375 410 52 | 68 | 15 | 38 | 27.5 | 18 | 30 | 19 | 9 | M8 | 2 |
| R0375 410 53 | 98 | 19 | 60 | 27.5 | 18 | 30 | 19 | 9 | M8 | 2 |

Mounting

# Mounting Accessories

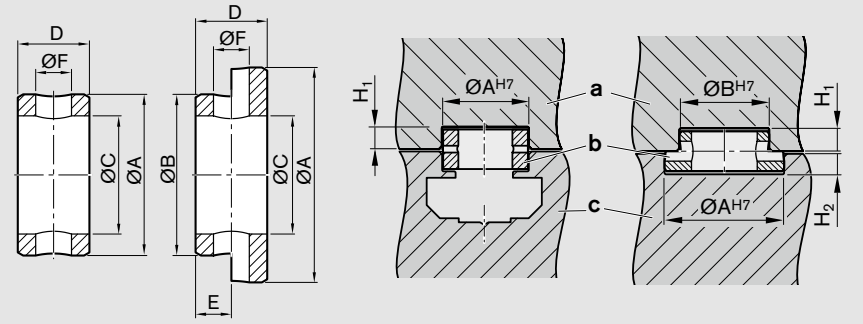
## Centering ring

The centering ring serves as a positioning aid and for positive locking when mounting customer attachments to the carriage.
It creates a positive-locking connection with good reproducibility.
Material: steel (stainless)



**a)** Customer attachment
**b)** Centering ring
**c)** Carriage

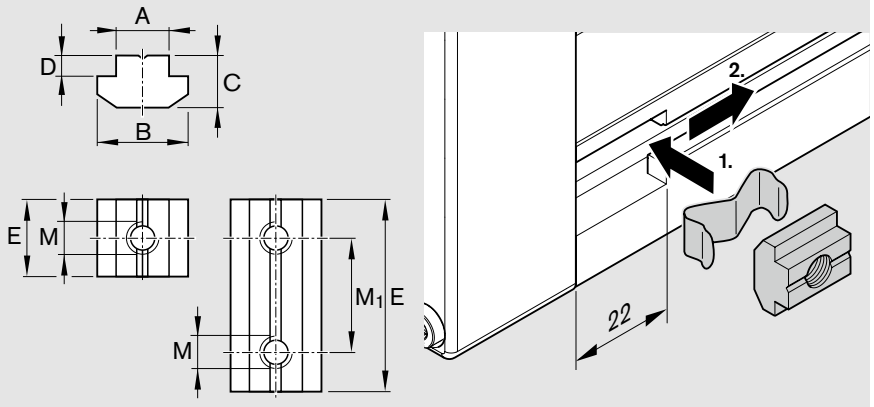
**Installation**




| Ø size (mm) | Dimensions (mm) A k6 | B k6 | C ±0.1 | D −0.2 | E +0.2 | ØF | $H_1$ +0.2 | $H_2$ +0.2 | Part number |
|---|---|---|---|---|---|---|---|---|---|
| **5** | 5 | – | 3.4 | 3.0 | – | 1.6 | 1.6 | – | R0396 605 42 |
| **7** | 7 | – | 5.5 | 3.0 | – | 1.6 | 1.6 | – | R0396 605 43 |
| **9** | 9 | – | 6.6 | 4.0 | – | 2.0 | 2.1 | – | R0396 605 44 |
| **12** | 12 | – | 9.0 | 4.0 | – | 2.0 | 2.1 | – | R0396 605 45 |
| **16** | 16 | – | 11.0 | 6.0 | – | 3.0 | 3.1 | – | R0396 605 46 |
| **7 - 5** | 7 | 5 | 3.4 | 3.0 | 1.5 | 1.6 | 1.6 | 1.6 | R0396 605 47 |
| **9 - 5** | 9 | 5 | 3.4 | 3.5 | 1.5 | 1.6 | 2.1 | 1.6 | R0396 605 48 |
| **9 - 7** | 9 | 7 | 5.5 | 3.5 | 1.5 | 1.6 | 2.1 | 1.6 | R0396 605 49 |
| **12 - 9** | 12 | 9 | 6.6 | 4.0 | 2.0 | 2.0 | 2.1 | 2.1 | R0396 605 50 |
| **16 - 12** | 16 | 12 | 9.0 | 5.0 | 2.0 | 2.0 | 3.1 | 2.1 | R0396 605 51 |

## Sliding blocks and springs

For fastening attachments to the carriage, and the frame to the mounting base.
The spring serves as a mounting and positioning aid.




| Fastening to | For thread | Dimensions (mm) A | B | C | D | E | $M_1$ | Part number Sliding block | Part number Spring |
|---|---|---|---|---|---|---|---|---|---|
| **Carriage** | M4 | 8 | 16 | 6 | 2 | 16 | - | R3447 017 01 | R3412 011 02 |
| | M5 | 8 | 16 | 6 | 2 | 16 | - | R3447 018 01 | R3412 011 02 |
| | M6 | 8 | 16 | 6 | 2 | 16 | - | R3447 019 01 | R3412 011 02 |
| | M6 | 8 | 16 | 6 | 2 | 50 | 36 | R0391 710 08 | - |
| | M8 | 8 | 16 | 6 | 2 | 16 | - | R3447 020 01 | R3412 011 02 |
| **Frame** | M4 | 10 | 19.5 | 10.5 | 5 | 20 | - | R3447 012 01 | R3412 009 02 |
| | M5 | 10 | 19.5 | 10.5 | 5 | 20 | - | R3447 011 01 | R3412 009 02 |
| | M6 | 10 | 19.5 | 10.5 | 5 | 20 | - | R3447 010 01 | R3412 009 02 |
| | M8 | 10 | 19.5 | 10.5 | 5 | 20 | - | R3447 009 01 | R3412 009 02 |

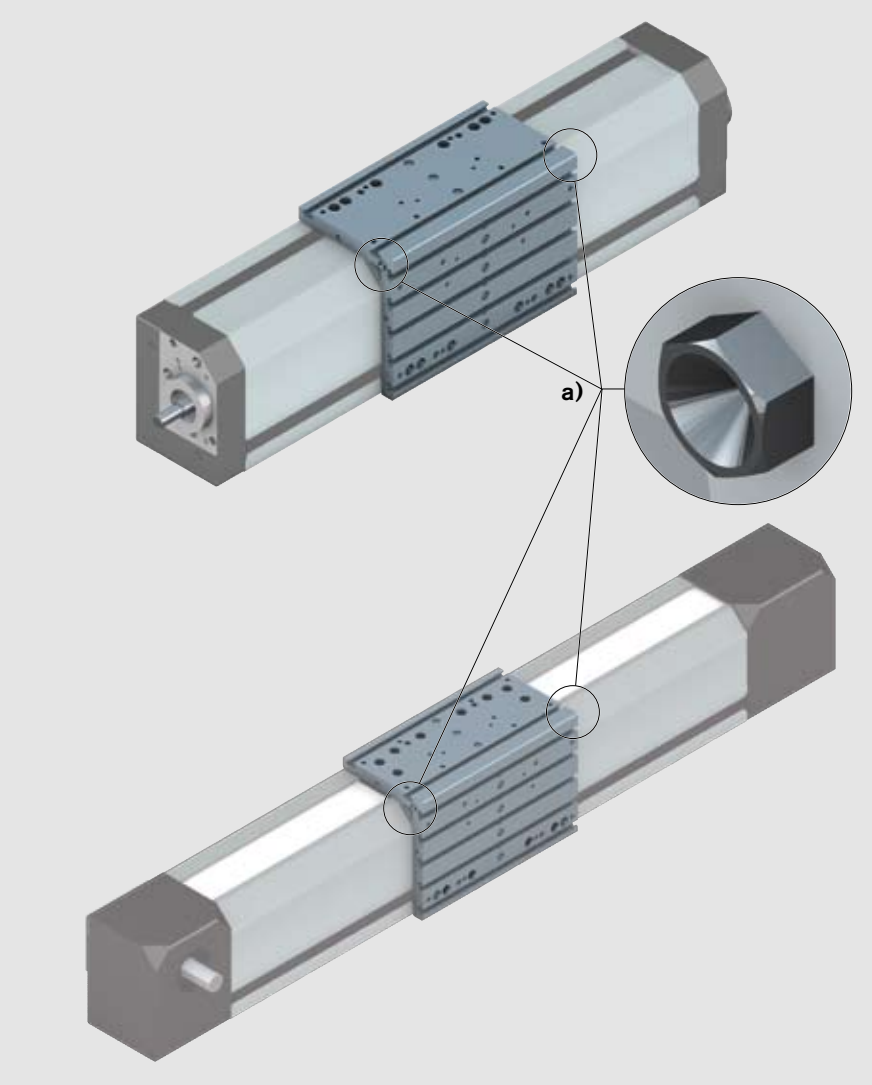
**Tightening torques for the fastening screws**
at friction factor 0.125
Strength class 8.8

| 8.8 | M4 | M5 | M6 | M8 |
|---|---|---|---|---|
| (Nm) | 2.7 | 5.5 | 9.5 | 23 |

Lubrication

## Lube nipples in carriage

Basic lubrication is carried out by the manufacturer.
Bridge Modules are designed for grease lubrication (with a manual grease gun).
The only maintenance required is relubrication via the lube nipples on the end faces of the carriage.
Each carriage has two funnel-type lube nipples (a) per DIN 3405 AM8x1.
Lubrication via only one of the two lube nipples is sufficient.
Never use greases with solid lubricant components (e.g. graphite or $MoS_2$).




**Recommended lithium soap greases:**
For lubricant quantities and intervals, see “Mounting Instructions for Bridge Modules.”

| Grease DIN 51825 | Consistency class DIN 51818 | Recommended grease | Part number (400 g cartridge) |
|---|---|---|---|
| KP2K | NLGI 2 | Dynalub 510 | R3416 037 00 |

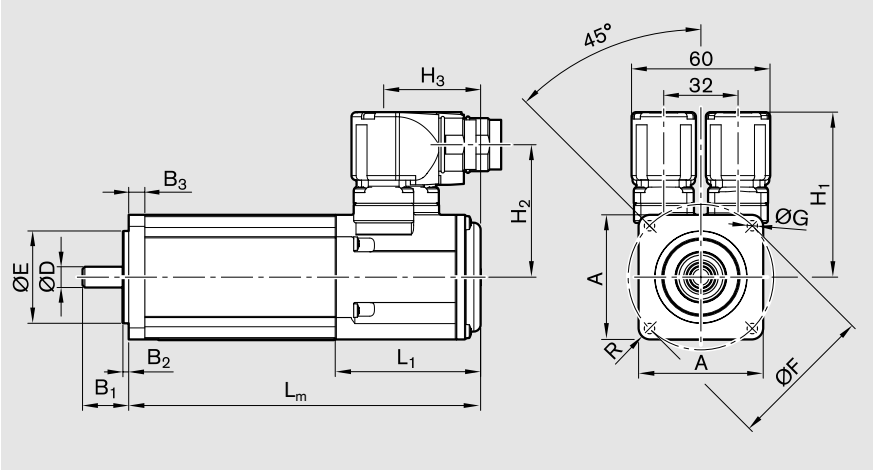
For short-stroke applications, please consult us.
BKK/R 15-115 stroke < 50
BKK/R 20-135 stroke < 60

Motors

# Servo Motors

## AC servo motors MSK

### Dimensions




| | Dimensions (mm) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | $B_1$ | $B_2$ | $B_3$ | ØD k6 | ØE j6 | ØF | ØG | $H_1$ | $H_2$ | $H_3$ | $L_m$ w/o brake | $L_m$ with brake | $L_1$ | R |
| **MSK 040C** | 82 | 30 | 2.5 | 8.0 | 14 | 50 | 95 | 6.6 | 83.5 | 69.0 | 31.0 | 185.5 | 215.5 | 42.5 | R8 |
| **MSK 050C** | 98 | 40 | 3.0 | 9.0 | 19 | 95 | 115 | 9.0 | 85.5 | 71.0 | 43.5 | 203.0 | 233.0 | 55.5 | R8 |
| **MSK 060C** | 116 | 50 | 3.0 | 9.5 | 24 | 95 | 130 | 9.0 | 98.0 | 84.0 | 37.0 | 226.0 | 259.0 | 48.0 | R9 |
| **MSK 076C** | 140 | 50 | 4.0 | 10.0 | 24 | 110 | 165 | 11.0 | 110.0 | 95.6 | 57.5 | 292.5 | 292.5 | 79.0 | R12 |

### Motor data

| Description | Symbol | Unit | MSK040C-0600 | MSK060C-0600 | MSK076C-0450 |
|---|---|---|---|---|---|
| Maximum usable speed | $n_{max}$ | ($min^{-1}$) | 5600 | 5200 | 5000 |
| Maximum torque | $M_{max}$ | (Nm) | 8.1 | 24 | 43.5 |
| Rated torque | $M_N$ | (Nm) | 2.7 | 8.0 | 12.0 |
| Motor mass moment of inertia | $J_m$ | ($10^{-6}kgm^2$) | 140 | 800 | 4300 |
| Mass without brake | $m_m$ | (kg) | 3.6 | 8.4 | 13.8 |
| **Holding brake** | | | | | |
| Holding torque | $M_{br}$ | (Nm) | 4.0 | 10.0 | 11.0 |
| Brake mass moment of inertia | $J_{br}$ | ($10^{-6}kgm^2$) | 23 | 55 | 360 |
| Mass of brake | $m_{br}$ | (kg) | 0.32 | 0.45 | 1.1 |

### Notes

The motors can be supplied complete with control system.
Please refer to the catalogs for more information about motors and control systems.

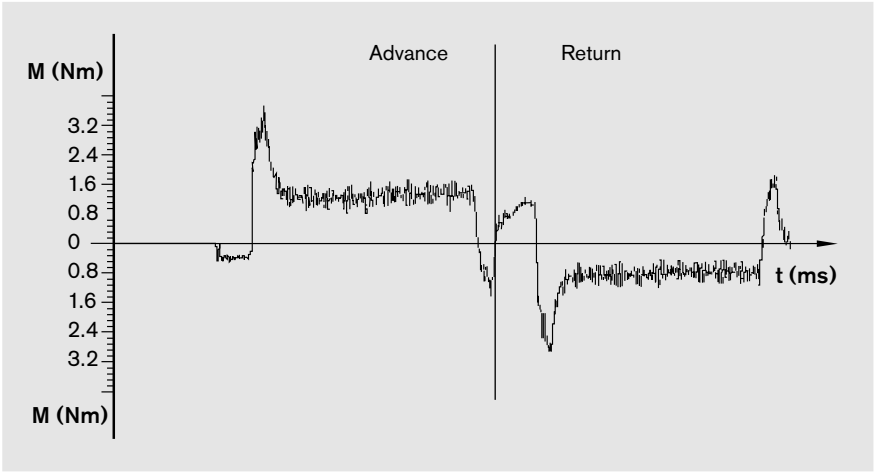
Documentation

## Standard report
**Option no. 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.

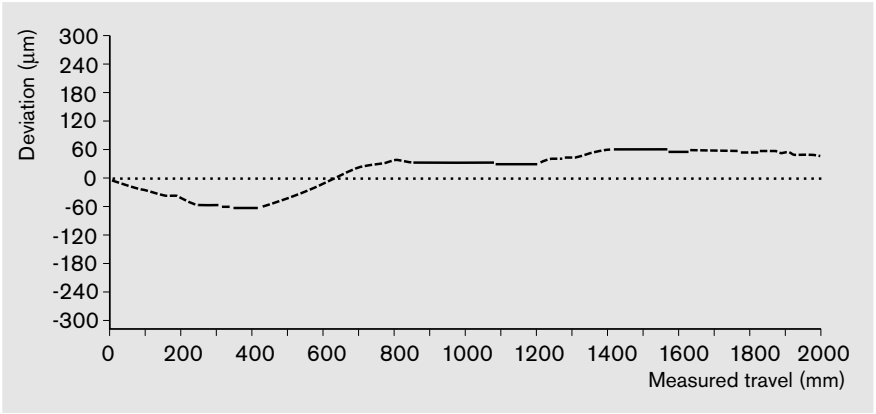
## Frictional torque of complete system
**Option no. 02**

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




## Lead deviation of the ball screw in Bridge Modules BKK
**Option no. 03**

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

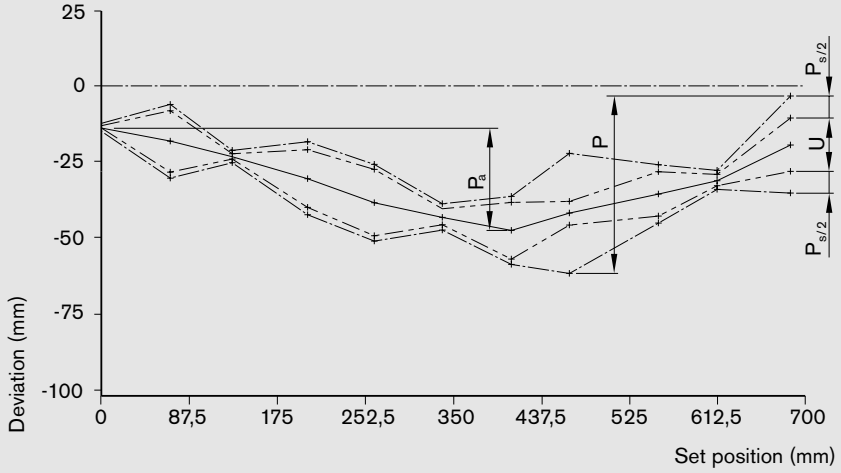


Documentation

## Positioning accuracy per VDI/DGQ 3441
**Option no. 05**

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

**Example**




### Positioning accuracy P

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

The positioning accuracy takes the following characteristic values into consideration:
- Position deviation
- Reversal range
- Position variation range

### 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.

Inquiry / Order Form

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Linear Motion and Assembly Technologies
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Telephone +49 9721 937-0

Telefax (direct) +49 9721 937-350

**Rexroth Bridge Modules**

To be completed by customer: Inquiry ☐ / Order ☐

Bridge Module _____

**(Part number): R____ _____ _____, Length _____mm**

| | |
|---|---|
| **Type** | = ☐☐☐☐ |
| **Guideway** | = ☐☐ |
| **Drive unit** | = ☐☐ |
| **Carriage** | = ☐☐ |
| **Motor attachment** | = ☐☐ |
| **Motor** | = ☐☐ |
| **Cover** | = ☐☐ |
| **1st switch** | = ☐☐ |
| **2nd switch** | = ☐☐ |
| **3rd switch** | = ☐☐ |
| **Mounting duct / cable duct** | = ☐☐ , ☐☐☐☐ **mm** |
| **Socket / plug** | = ☐☐ |
| **Documentation** | = ☐☐ |

Individual parts:

**(Part number):** **R**_____ _____ _____

**R**_____ _____ _____

**R**_____ _____ _____

**R**_____ _____ _____

Quantity _____ **pcs,** _____ **per month,** _____ **per year, per order, or** _____

**Comments:**

From

**Company:** _____ **Name:** _____

**Address:** _____ **Department:** _____

_____ **Telephone:** _____

_____ **Telefax:** _____

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Bosch Group

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