Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

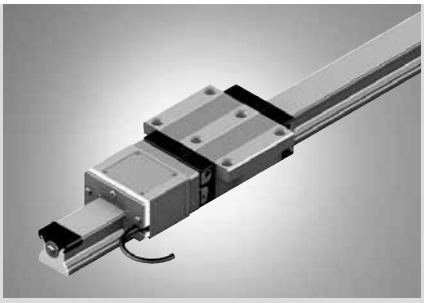
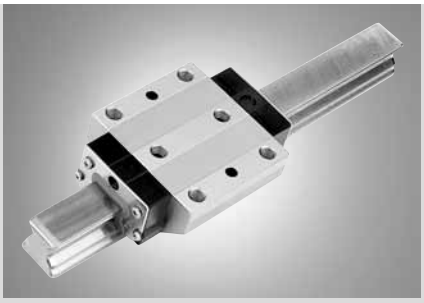
Bridge Modules

with Ball Screw Drive and Toothed Belt Drive

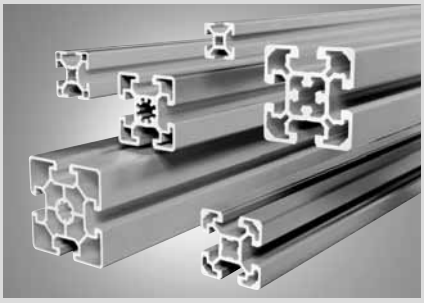
The Drive & Control Company

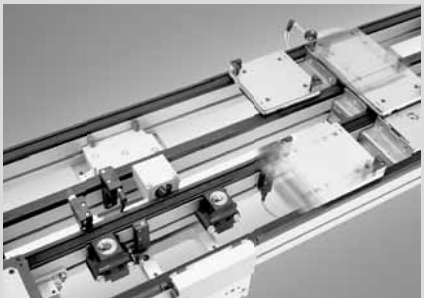
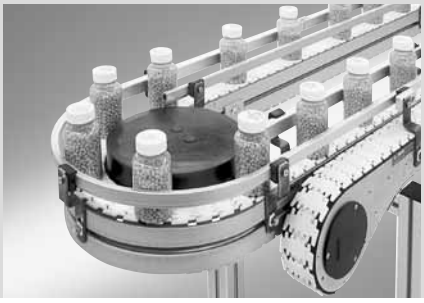
Linear Motion and Assembly Technologies

Ball Rail Systems
Roller Rail Systems
Linear Bushings and Shafts
Ball Screw Drives
Linear Motion Systems
Basic Mechanical Elements
Manual Production Systems
Transfer Systems





Bridge Modules

Product Overview

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

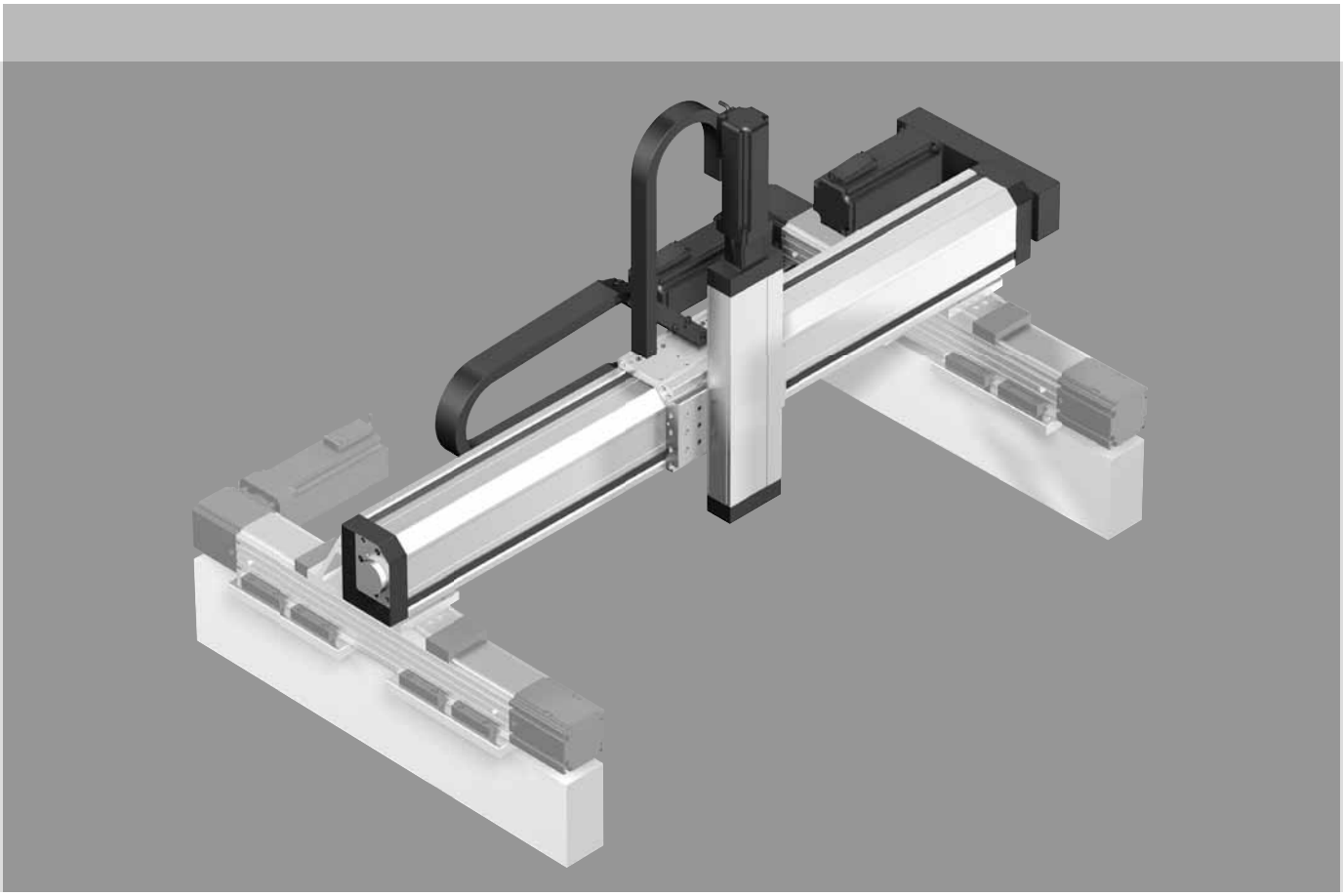
The Bridge Modules Series adds still another dimension to Rexroth's extensive range of linear motion systems. With their exceptionally rigid design and angled carriage, these modules are ideal as "y" axes in gantry configuration and as single axes to spane large unsupported lengths.

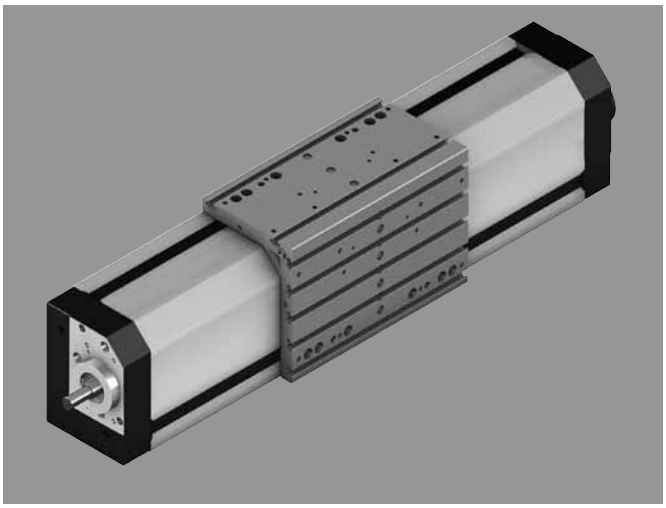
Ball screw or toothed belt drive

Bridge Modules come in versions with ball screw (BKK) or toothed belt (BKR) and can be combined with the most commonly used drive configurations.

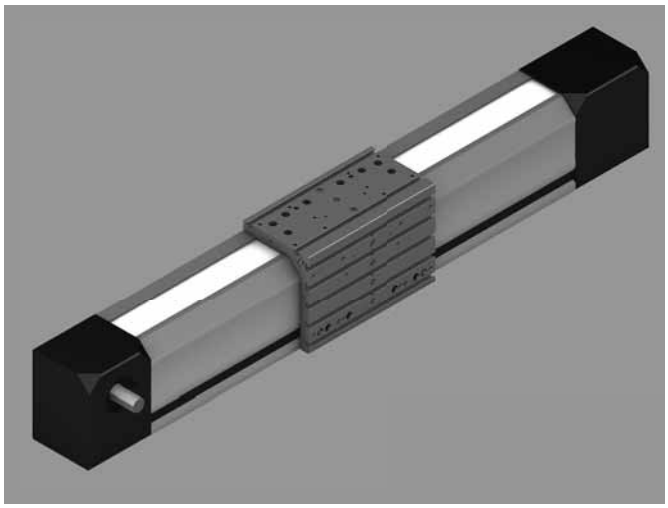
Further highlights

- Aluminum profile frame with optimized geometry for high torsional stiffness and load carrying capacity
- Available with steel-reinforced toothed belt drive or ball screw drive
- Two Ball Rail Systems arranged at a 90° angle, with steel runner blocks with ball chain
- Fully enclosed frame with aluminum cover and polyurethane sealing strips
- Torsionally stiff angled aluminum carriage with T-slots and threaded holes offering multiple mounting possibilities
- Precise connection and alignment of attachments thanks to camoLINE technology in the carriage
- One-point lubrication via either side of the carriage
- Screw supports allow high travel speeds for ball screw version, even for long strokes
- T-slots for mounting switches
- Motor mounts, timing belt side drives and gear reducers available
- Available as complete drive units with motor, controller and control unit





Bridge Module with ball screw drive



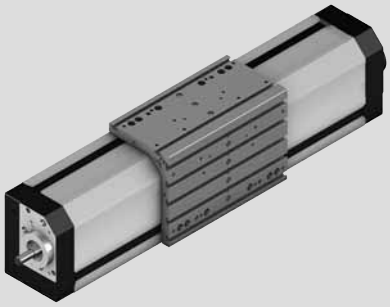
Bridge Module with toothed belt drive

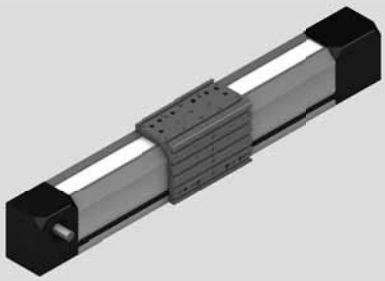
Product Overview

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 sizing 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

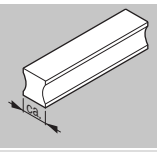
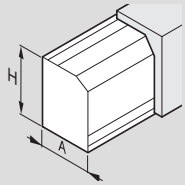
Digital IndraDrive controllers

Bridge Modules BKK and BKR are available as complete solutions with motor and controller.

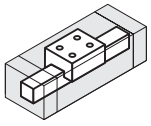
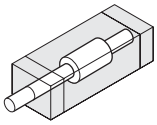
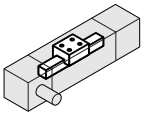
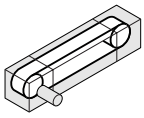
Product Overview

Type designation (size)

Bridge Modules are designated according to type and size.

Bridge Modules (example) =			Type		Size	
			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

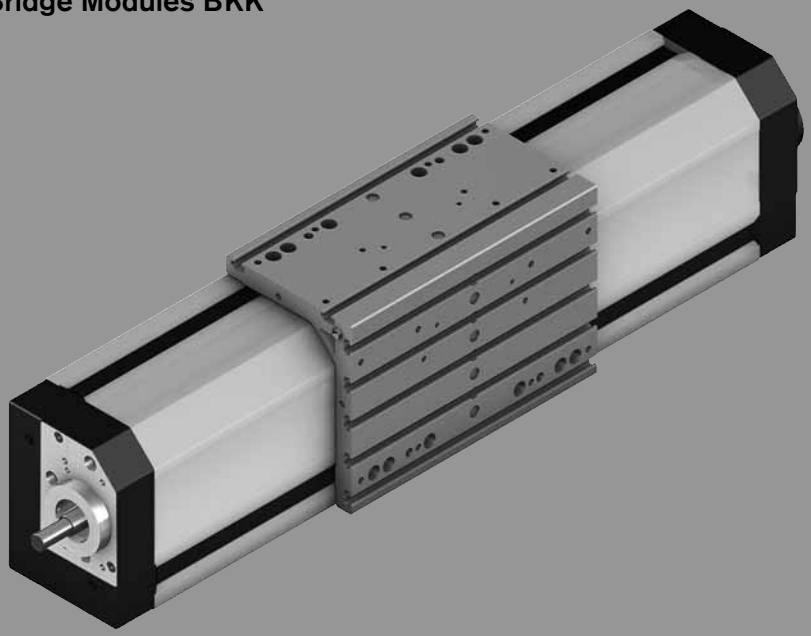
Type	Guideway	Drive unit	Dimensions A x H mm	L_{max} mm	Dynamic load capacity C N
BKK	 Ball rail system	 Ball screw drive	115 x 145	5000	21900
			135 x 180	5000	56200
BKR	 Ball rail system	 Toothed belt drive	115 x 145	5800	21900
			135 x 180	5800	56200

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 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 with double ball bearings
- Torsionally stiff angled aluminum carriage with T-slots and threaded holes offering multiple mounting possibilities

Attachments

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

Other distinguishing features

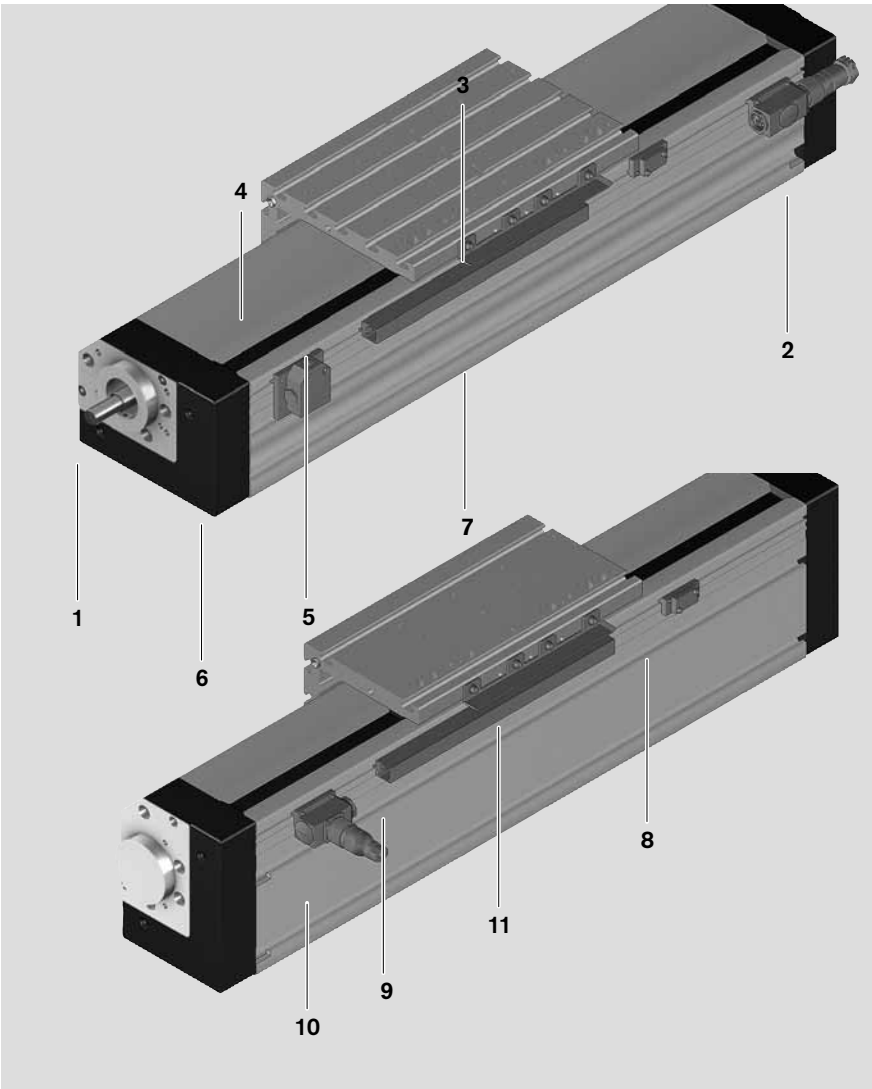
- Optimal travel performance, high load capacities and high rigidity due to two zero-clearance Ball Rail Systems arranged at a 90° angle to each other
- Screw supports allow high travel speeds to be achieved for long strokes
- High positioning accuracy and repeatability due to ball screw assembly with zero-backlash nut system
- Internal components protected by an aluminum cover and two polyurethane sealing strips
- Precise alignment and secure mounting (positive-locking) of attachments thanks to camoLINE 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

Bridge Modules with Ball Screw Drive BKK

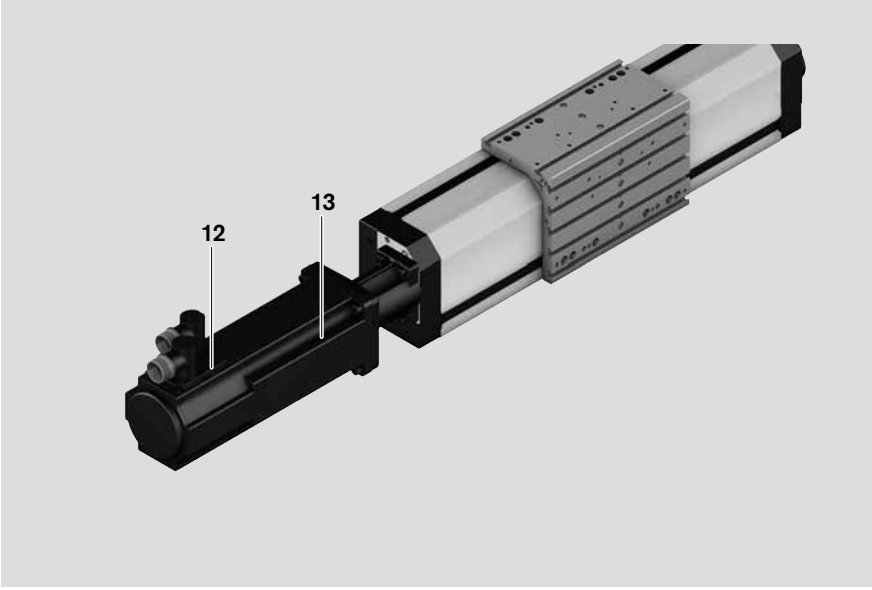
Structural Design

1 Ball screw with zero-backlash cylindrical single nut
2 Floating bearing end block
3 Carriage with runner blocks
4 Aluminum cover
5 Recirculating polyurethane sealing strips
6 Aluminum extrusion

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



12 Motor
13 Motor mount and coupling



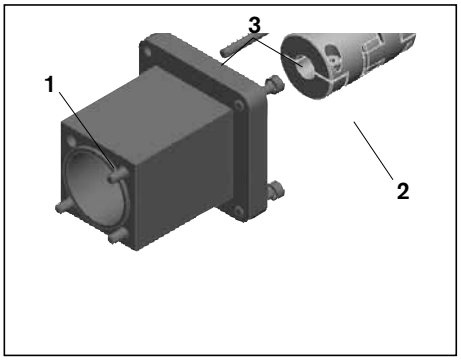
Motor Attachment

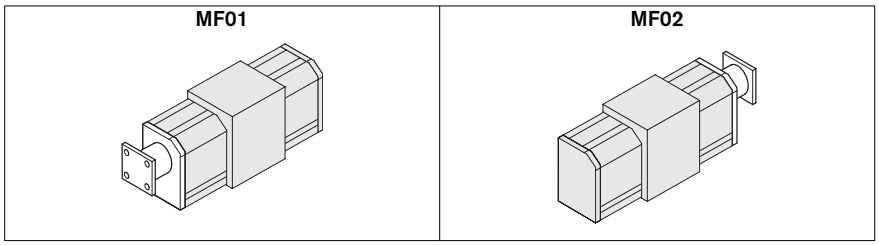
Motor attachment with motor mount and coupling

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

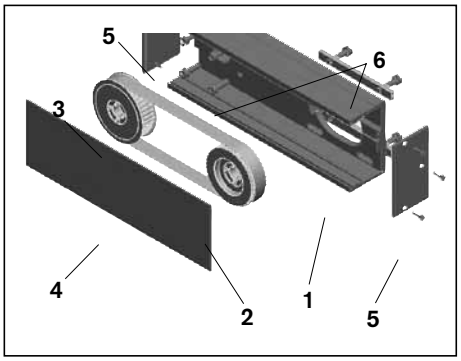




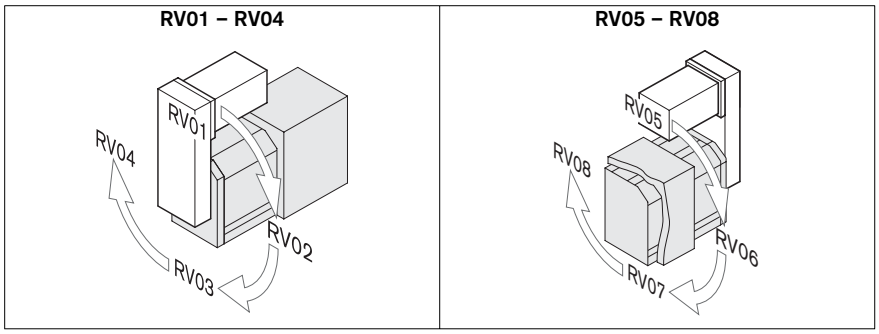
Motor attachment with timing belt side drive

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 specify the mounting orientation when ordering.



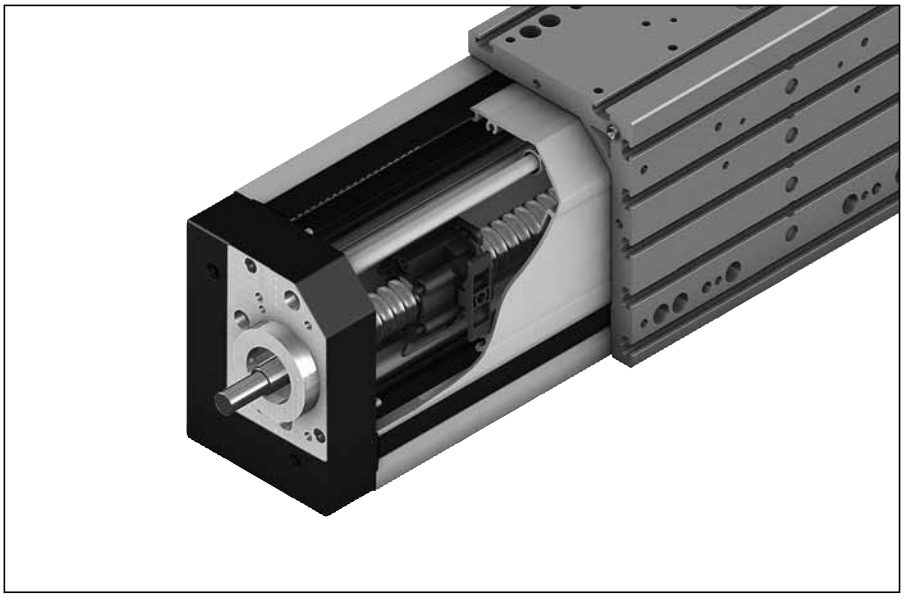
Bridge Modules with Ball Screw Drive BKK

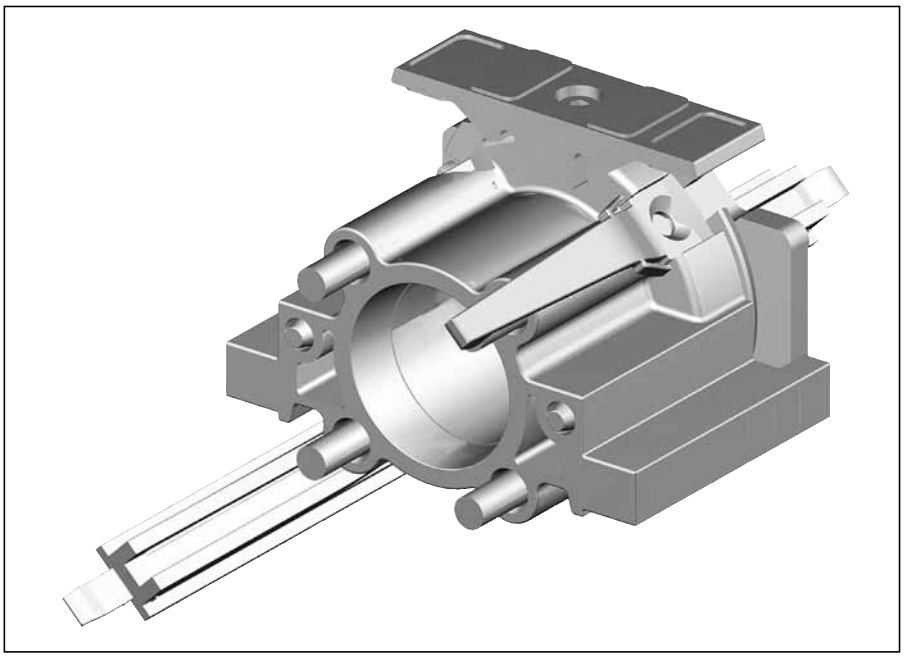
Screw Support for Bridge Module BKK

⚠ **For horizontal operation only**

The Screw Support (SPU) offers the following advantages:

- Screw Support selectable as a standard option
- High travel speeds over long lengths 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 aluminum cover and polyurethane sealing strips
- The Screw Supports prevent any sagging of the aluminum cover in all directions





Technical Data

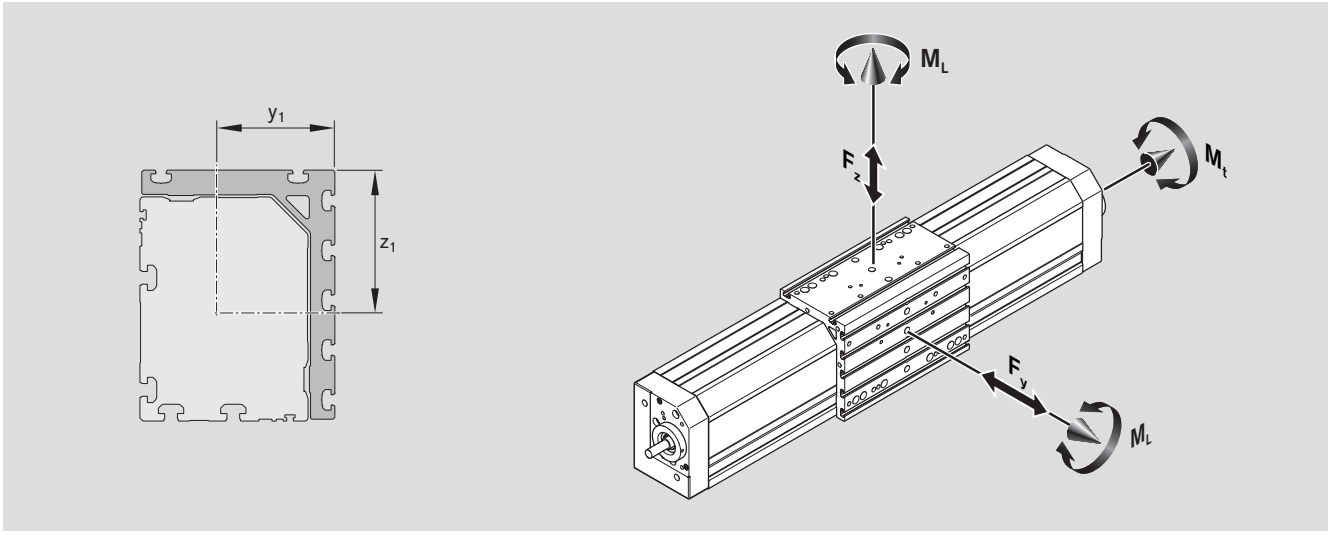
Load capacities and moments

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	approx. 1080	approx. 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	approx. 1570	approx. 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 page 14.

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**, M_t and 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

= 70,000 N/mm²

Bridge Modules with Ball Screw Drive BKK

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 = 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)	Coupling J_c (10^{-6} kgm²)	Weight m_c (kg)
BKK 15-115	**MSK 40C**	19	60	0.26
	MSK 60C	50	200	0.70
BKK 20-135	**MSK 60C**	50	200	0.70
	MSK 76C	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

Accuracy

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

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

Motor		MSK 040C					MSK 060C				
Frictional torque M_{Rsd} (Nm)		0.4					0.4				
		M_{sd} up to length $L^{1)}$ = … at i (Nm)			J_{sd} (10^{-6} kgm²)		M_{sd} up to length $L^{1)}$ = … at i (Nm)			J_{sd} (10^{-6} kgm²)	
BKK	Ball screw d_0 x P	L (mm)	i = 1	i = 1.5	i = 1	i = 1.5	L (mm)	i = 1	i = 2	i = 1	i = 2
15-115	25 x 5	2320	9.6	6.4	260	89	1960	14	7	1420	230
	25 x 10	2860					2320	19.6	9.8		
	25 x 25	2860					2860	19.6	9.8		
20-135	32 x 5						3000	12	6	1450	280
	32 x 10							19	11		
	32 x 20							19	13		
	32 x 32							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

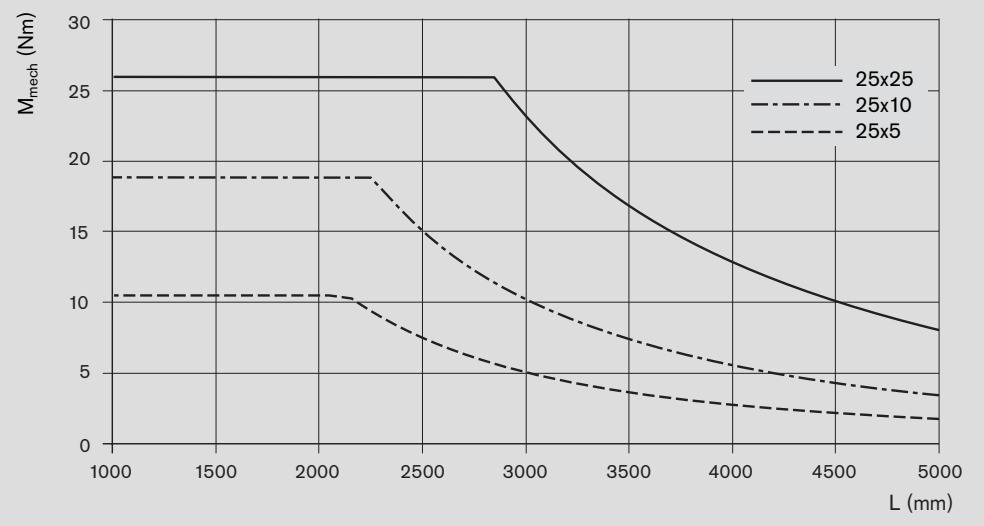
Bridge Modules with Ball Screw Drive BKK

Technical Data

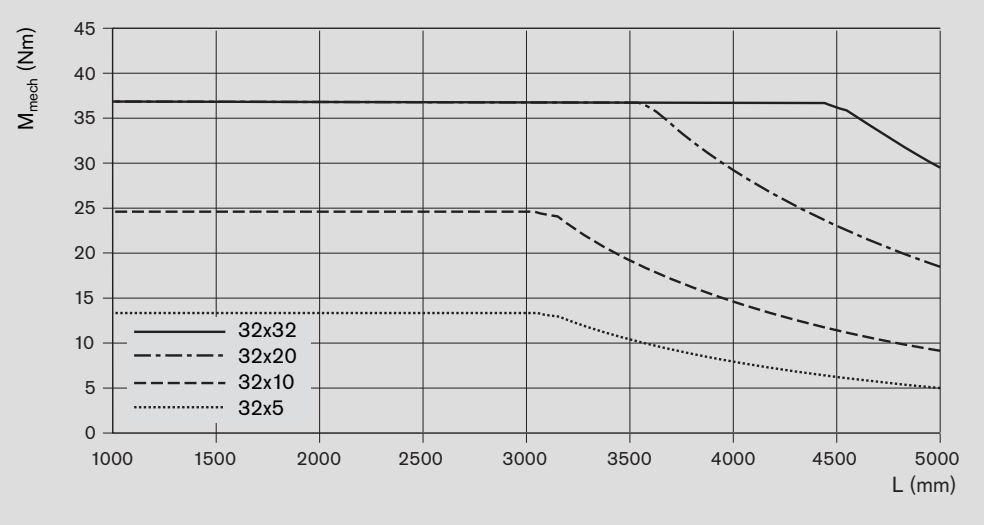
Maximum permissible drive torque for mechanical system M_{mech}

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

BKK 15-115



BKK 20-135



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

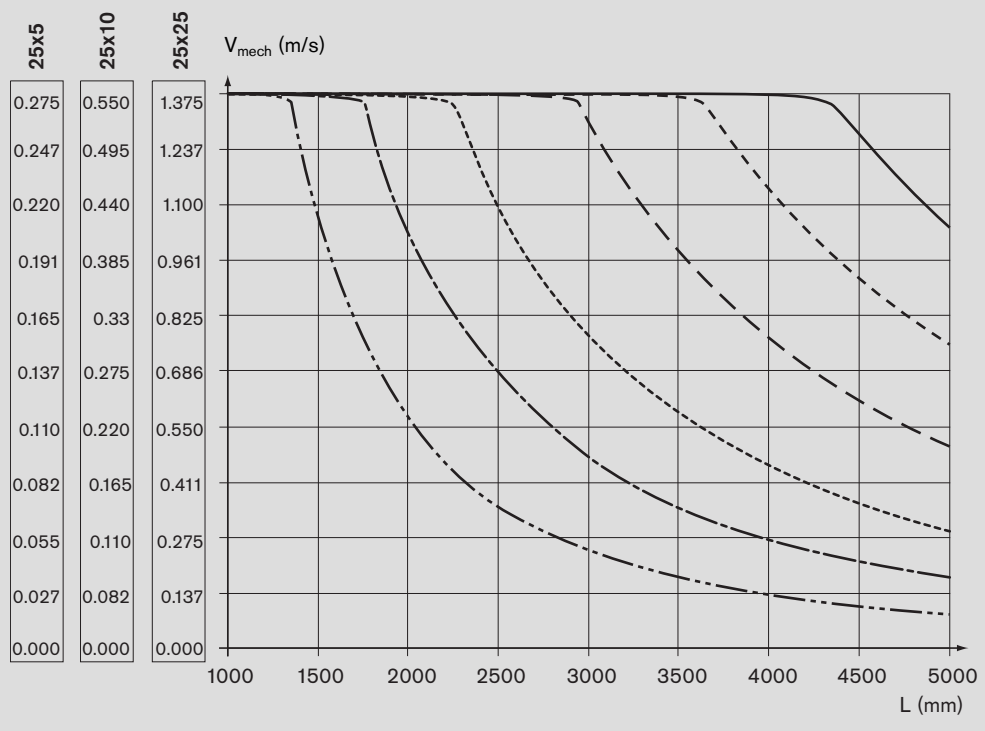
The values shown for M_{mech} are applicable under the following conditions:
- Horizontal operation
- Ball screw journal without keyway
- No radial load on ball screw shaft

Consider the rated torque of the coupling used!

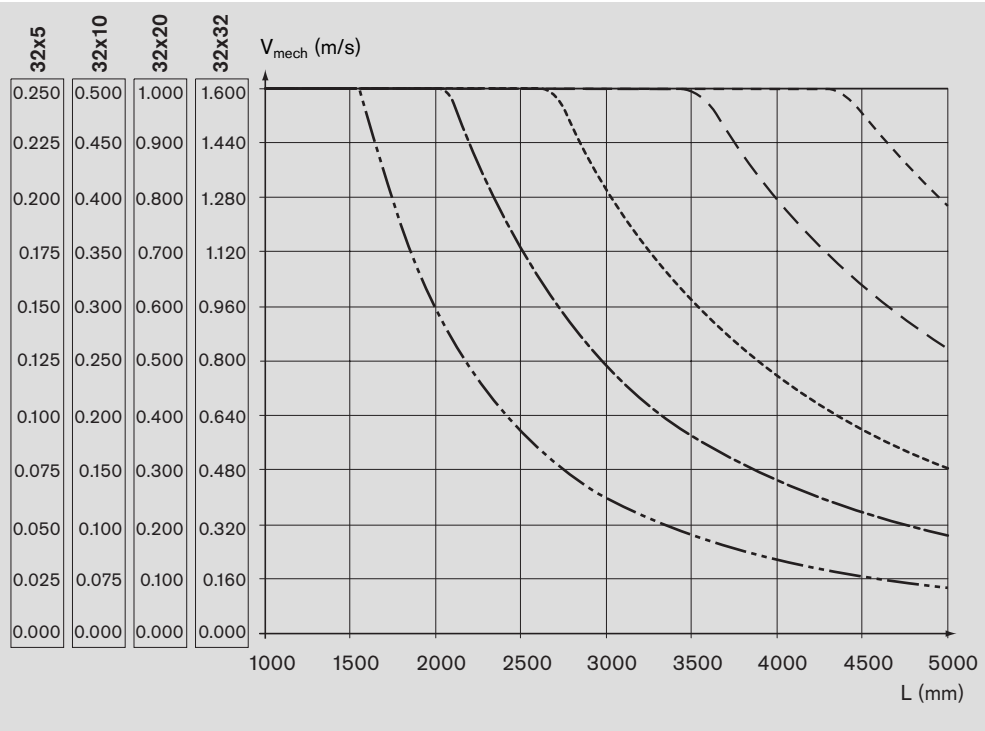
Ball screw journal with keyway
For reasons of stress concentration and a reduction of the effective diameter, consider the maximum values for drive torque!

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

BKK 15-115



BKK 20-135

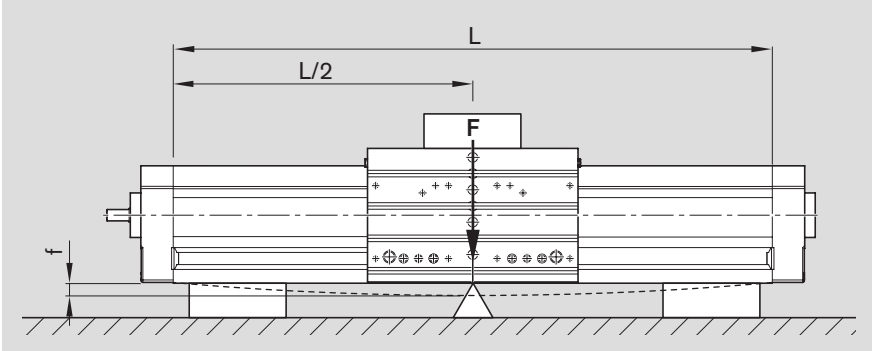


without SPU
with 1 SPU
with 2 SPU
with 3 SPU
with 4 SPU
with 5 SPU

Bridge Modules with Ball Screw Drive BKK

Technical Data

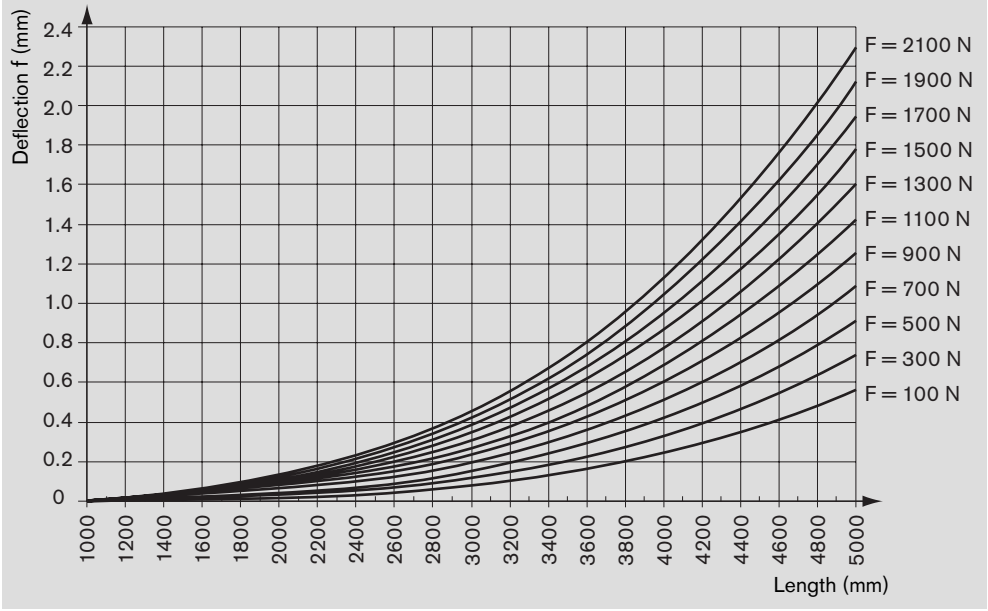
Deflection



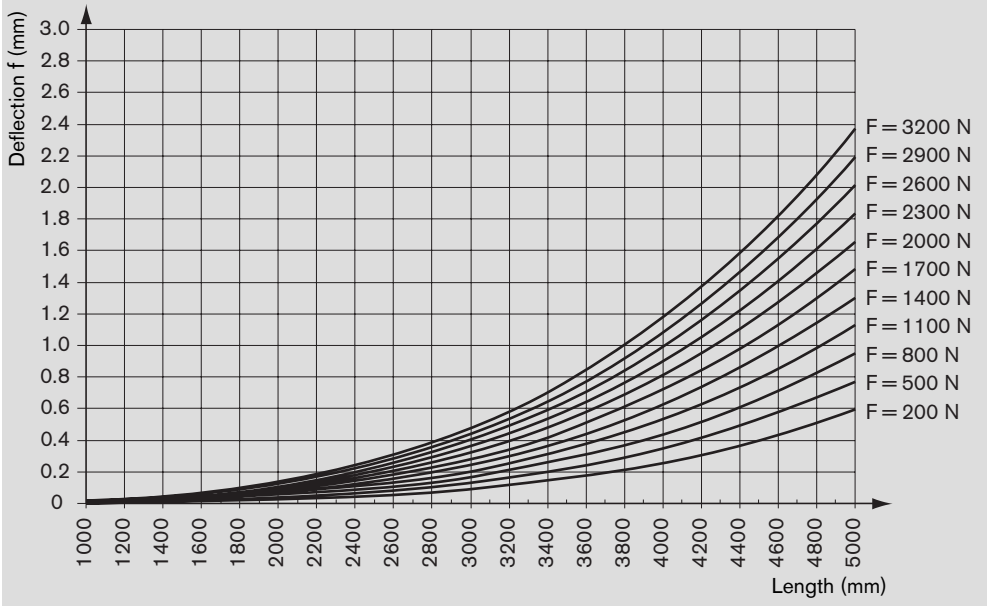
A particular feature of Bridge Modules is that they can be installed as cantilevered axes.
Deflection must, however, be taken into consideration, because it limits the possible load.

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

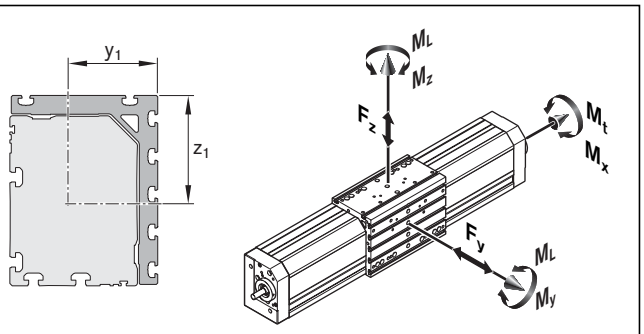
Calculation principles

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	(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)
$M_{R\,sd}$	=	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

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

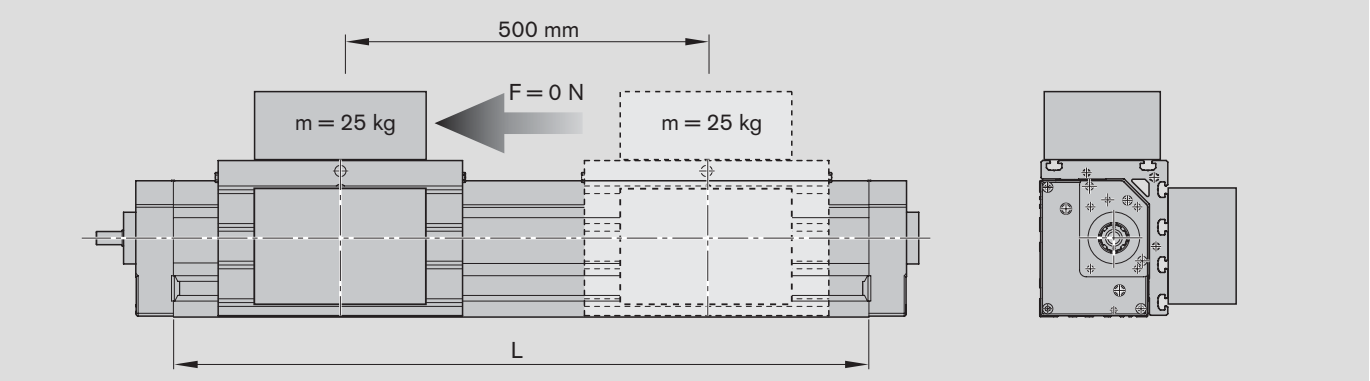
Maximum permissible rotary speed for mechanical system

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

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

J_{br} = mass moment of inertia, motor brake (kgm^2)
J_c = mass moment of inertia, coupling (kgm^2)
J_{dc} = mass moment of inertia, drive train (kgm^2)
J_{ex} = mass moment of inertia of mechanical system (kgm^2)
J_m = mass moment of inertia, motor (kgm^2)
J_s = mass moment of inertia of linear motion system (without external load) (kgm^2)
J_{sd} = reduced mass moment of inertia of timing belt side drive at motor journal (kgm^2)
J_t = translatory mass moment of inertia of external load referred to the drive journal (kgm^2)
J_{tot} = total mass moment of inertia (kgm^2)
i = gear ratio of timing belt side drive (-)
$k_{J\,m}$ = constant for mass-specific portion of mass moment of inertia ($10^6\ m^{2)}$
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 polyurethane sealing strips
- With AC servomotor type MSK mounted via motor mount and coupling

Estimation of the Bridge Module length L

Excess travel	=	$2 \cdot P = 2 \cdot 25\ mm = 50\ mm$
Max. travel	=	$stroke_{eff} + 2 \cdot$ excess travel
	=	$500\ mm + 2 \cdot 50$
	=	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	=	$2 \cdot P = 2 \cdot 10\ mm = 20\ mm$
Max. travel	=	$stroke_{eff} + 2 \cdot$ excess travel
	=	$500\ mm + 2 \cdot 20\ mm$
	=	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

Bridge Modules with Ball Screw Drive BKK

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

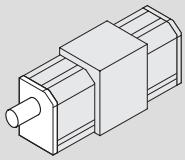
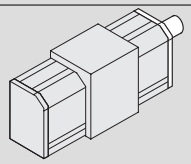
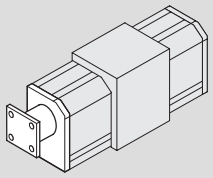
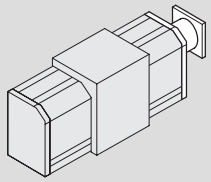
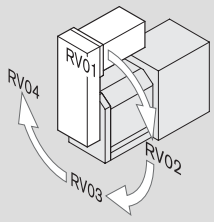
Result

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 “Control Systems, Electrical Accessories” 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				Carriage						
				Screw journal	Ball screw size d_0 x P			One carriage						
					25 x 5	25 x 10	25 x 25	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	Sealing strips without	with		Standard report	Measurement report
	00		00		01	02		01	02 Frictional torque 03 Lead deviation 05 Positioning accuracy
	02	MSK 040C	86	87					
	03	MSK 060C	90	91					
1	21	MSK 040C	86	87					
	23	MSK 060C	90	91					
1.5	22	MSK 040C	86	87					
2	24	MSK 060C	90	91					

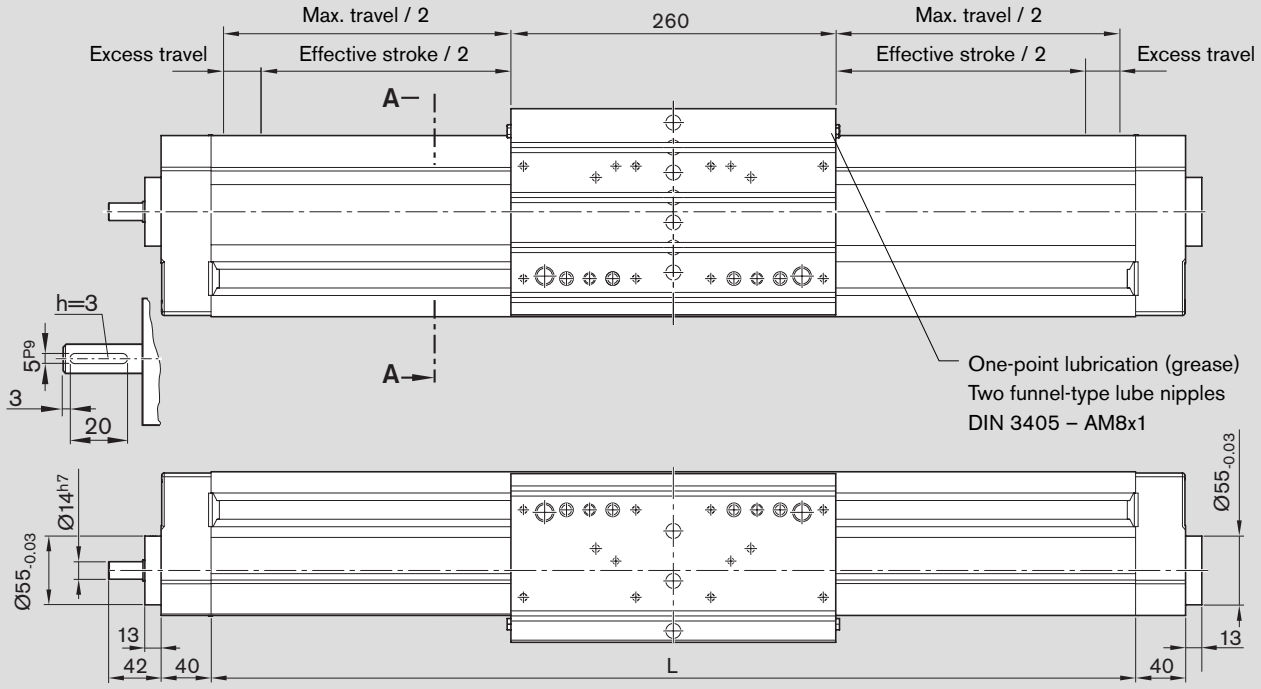
Without switch Without cable duct	**00**

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		

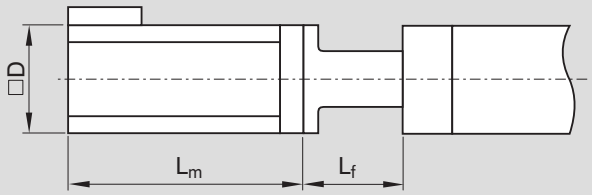
Bridge Modules with Ball Screw Drive BKK

BKK 15 -115 Dimensions

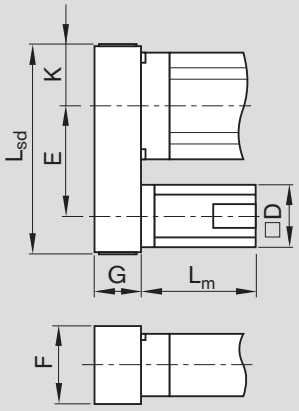
All dimensions in mm
Drawings not to scale



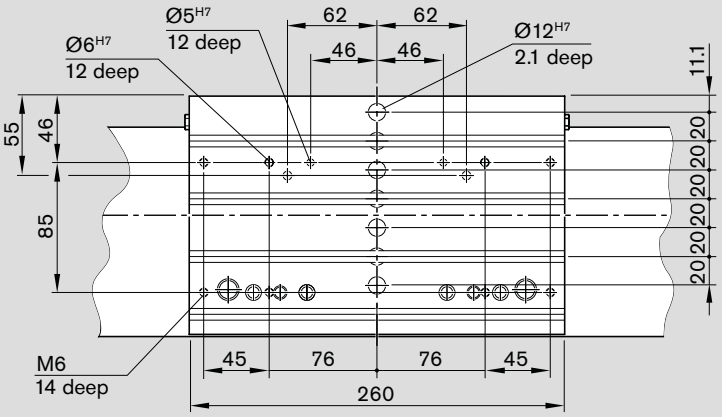
Type MF01, MF02

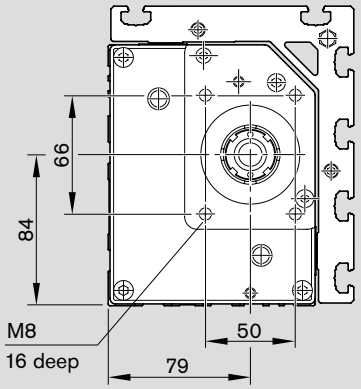


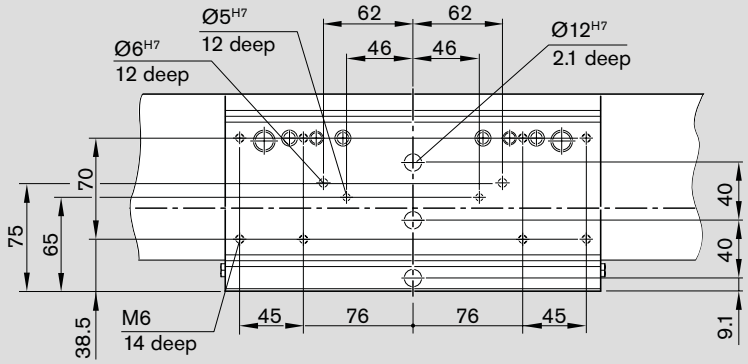
Type RV01 - RV08

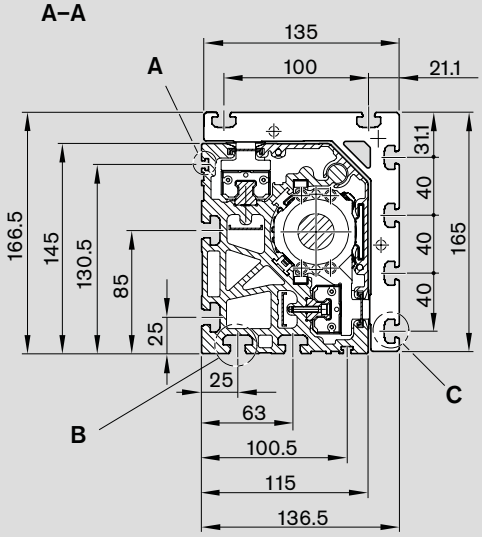


Type	Motor	Dimensions (mm)												
		D	E			F	G	K	L_f	L_m		L_{sd}		
			i = 1	i = 1.5	i = 2					without brake	with brake	i = 1	i =1.5	i = 2
RV01 - RV08	MSK 040C	82	210	213.5	–	88	51	47.5		185.5	215.5	322	322	–
	MSK 060C	116	230	–	235	116	66	56.0		226.0	259.0	367	–	367
MF01. MF02	MSK 040C	82	–	–	–	–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

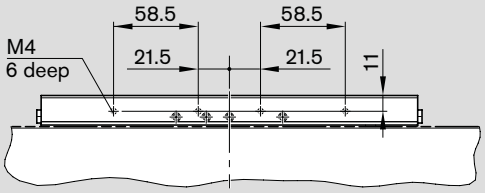


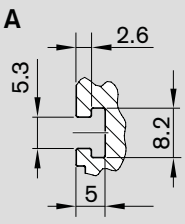


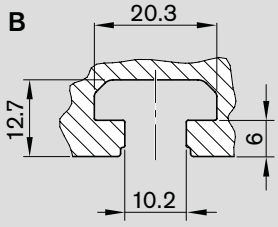


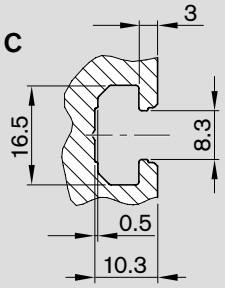


Mounting hole pattern for switching cam



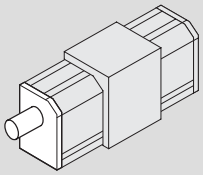
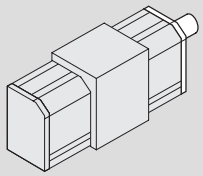
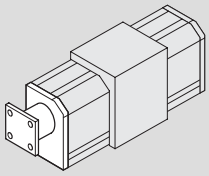
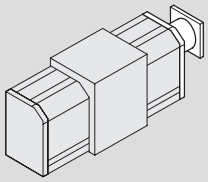
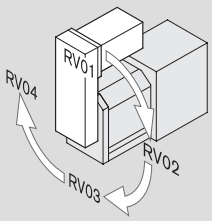
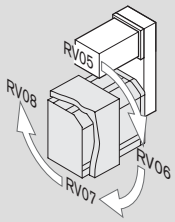






Bridge Modules with Ball Screw Drive BKK

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				One carriage						
					32 x 5	32 x 10	32 x 20	32 x 32	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	Sealing strips without	with		Standard report	Measurement report
		00		00		01	02		01	02 Frictional torque 03 Lead deviation 05 Positioning accuracy
		03	MSK 060C	90	91					
		02	MSK 076C	92	93					
	1	23	MSK 060C	90	91					
	2	24	MSK 060C	90	91					

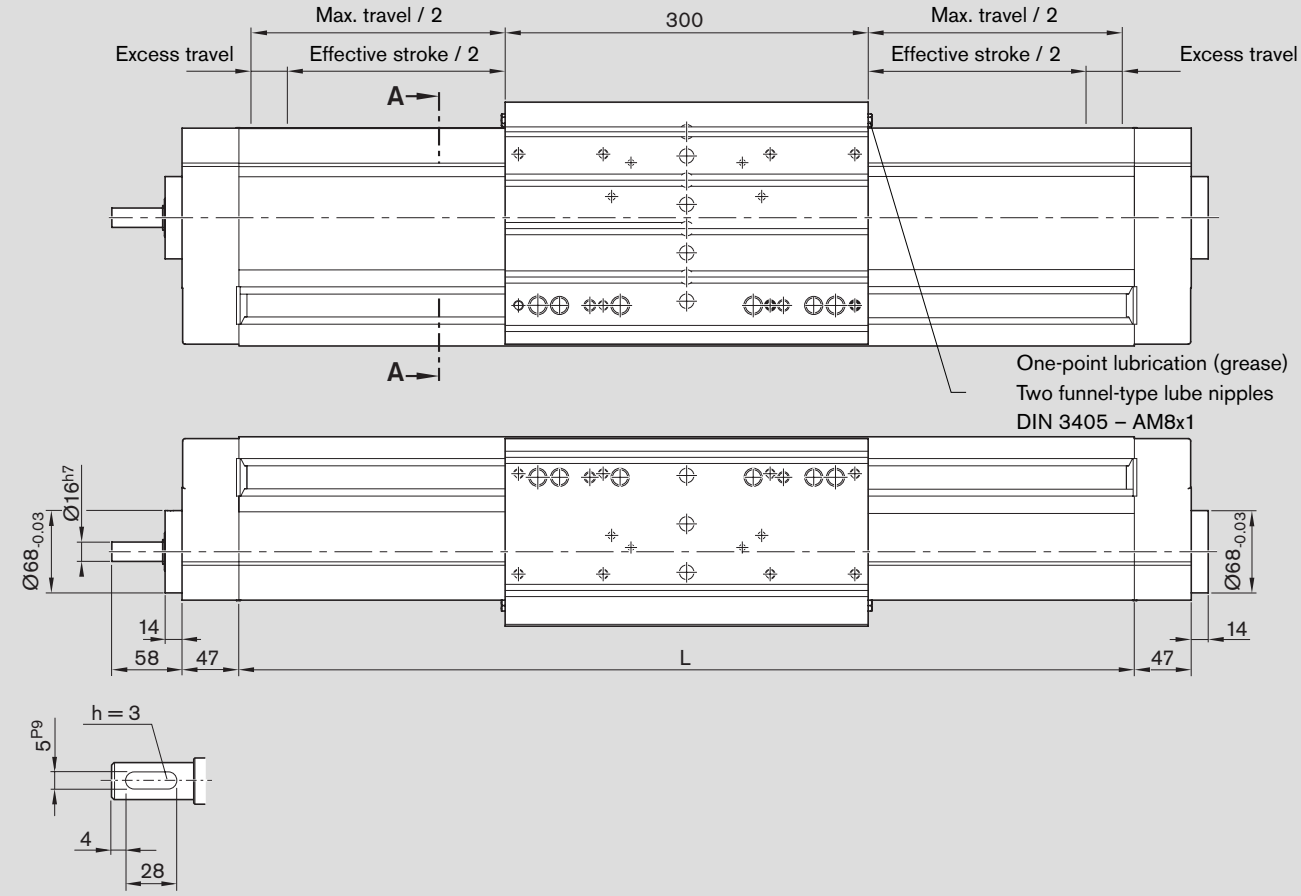
Switches

Without switch Without cable duct		**00**	
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		

Bridge Modules with Ball Screw Drive BKK

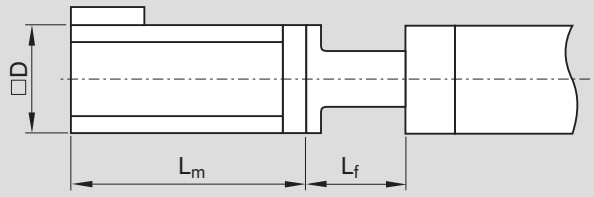
BKK 20-135 Dimensions

All dimensions in mm
Drawings not to scale

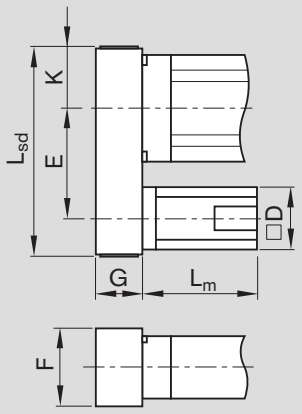


Refer to “Motors” for more information and dimensions.

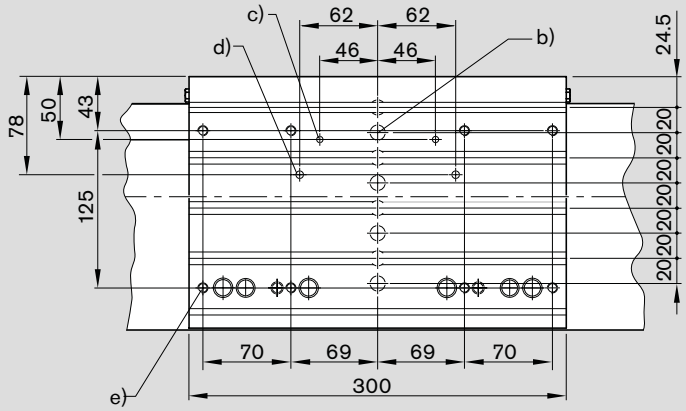
Type MF01, MF02

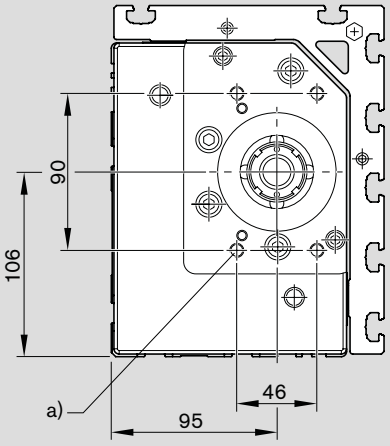


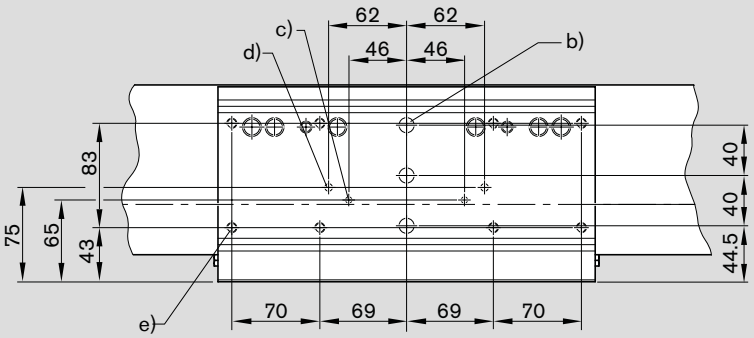
Type RV01 - RV08

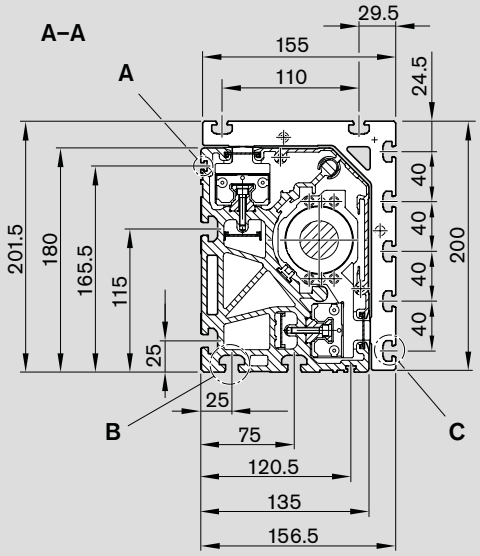


Type	Motor	Dimensions (mm)										
		D	E		F	G	K	L_f	L_m		L_{sd}	
			i=1	i=2					without brake	with brake	i=1	i=2
RV01 - RV08	**MSK 060C**	116	267.5	265	116	66	59	–	226.0	259.0	403	403
MF01, MF02	**MSK 060C**	116	–	–	–	–	–	125	226.0	259.0	–	–
	MSK 076C	140	–	–	–	–	–	133	292.5	292.5	–	–

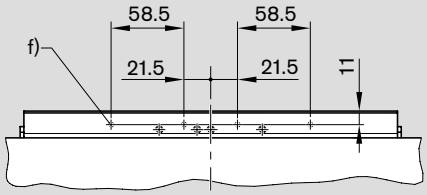


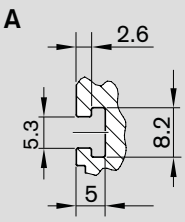


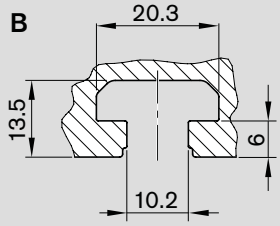


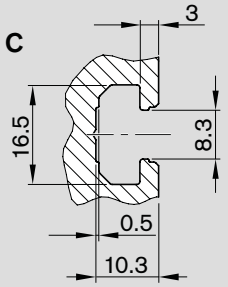


Mounting hole pattern for switching cam









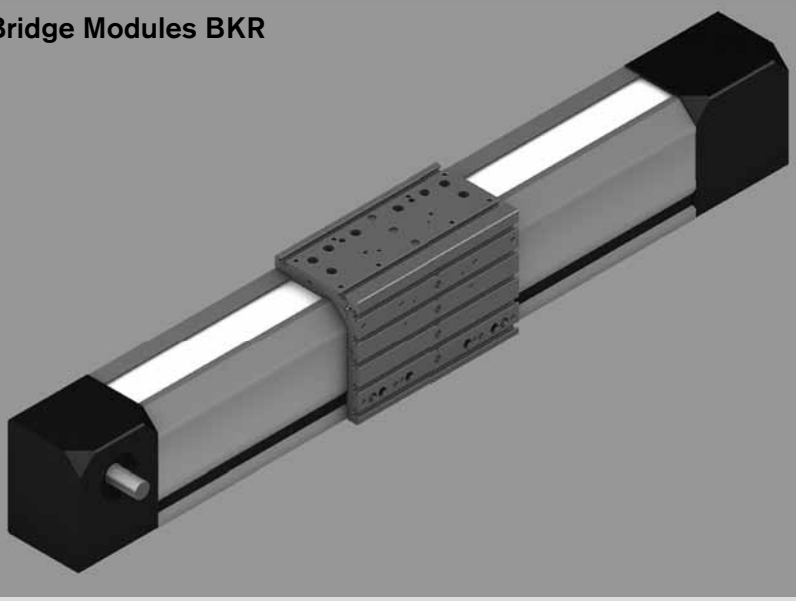
a) M8 – 16 deep
b) Ø12^{H7} – 2.1 deep
c) Ø5^{H7} – 12 deep
d) Ø6^{H7} – 12 deep
e) M8 – 14 deep
f) M4 – 6 deep

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-driven) end enclosure with integrated belt-tensioning system
- Torsionally stiff angled aluminum carriage with T-slots and threaded holes offering multiple mounting possibilities
- Driven by a pre-tensioned, steel reinforced toothed belt

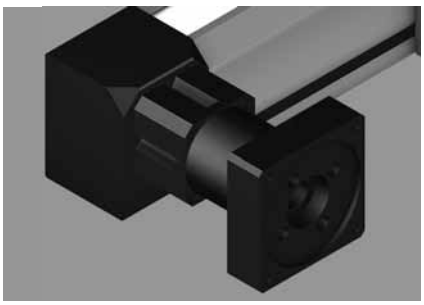
Attachments

- Maintenance-free digital AC servo drives with integrated brake and feedback
- Gear reducer type LP
- Switches
- Socket with mating plug for 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
- High travel speeds combined with high precision and smooth running over long travel ranges
- Polyurethane seals and guides for the toothed belt in the aluminum profile
- Internal components protected by two polyurethane sealing strips
- Precise alignment and secure mounting (positive-locking) of attachments thanks to camoLINE 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

BKR 15-115 in preparation

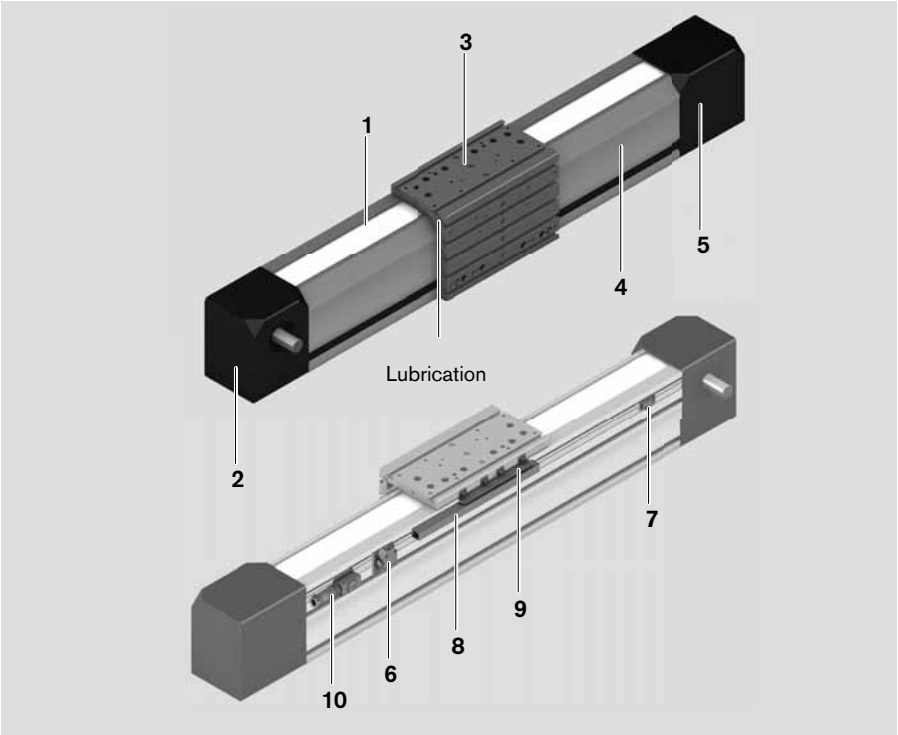


Gear reducer
Different gear ratios allow optimum matching of the external load and the motor's inertia.

Structural Design

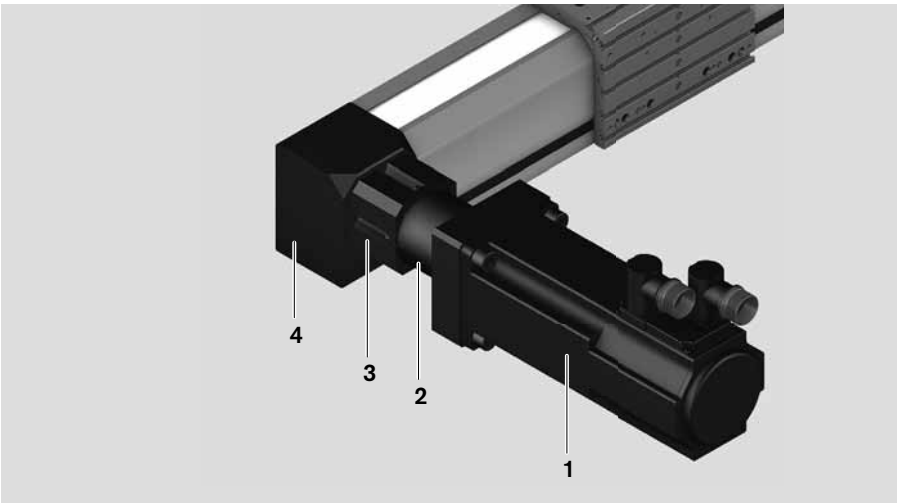
1 Toothed belt
2 Drive end enclosure
3 Carriage
4 Aluminum extrusion
5 Idler (non-driven) end enclosure

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



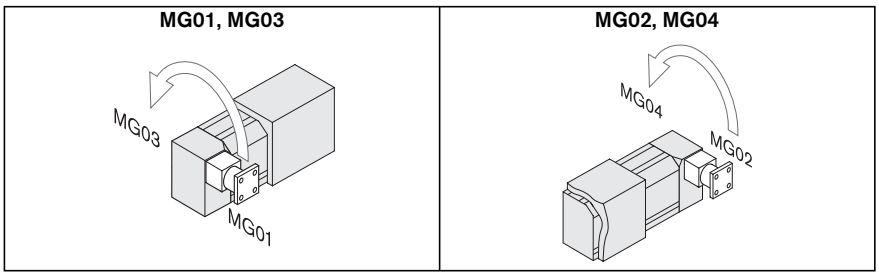
Structural design of the gear reducer

For all BKR 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

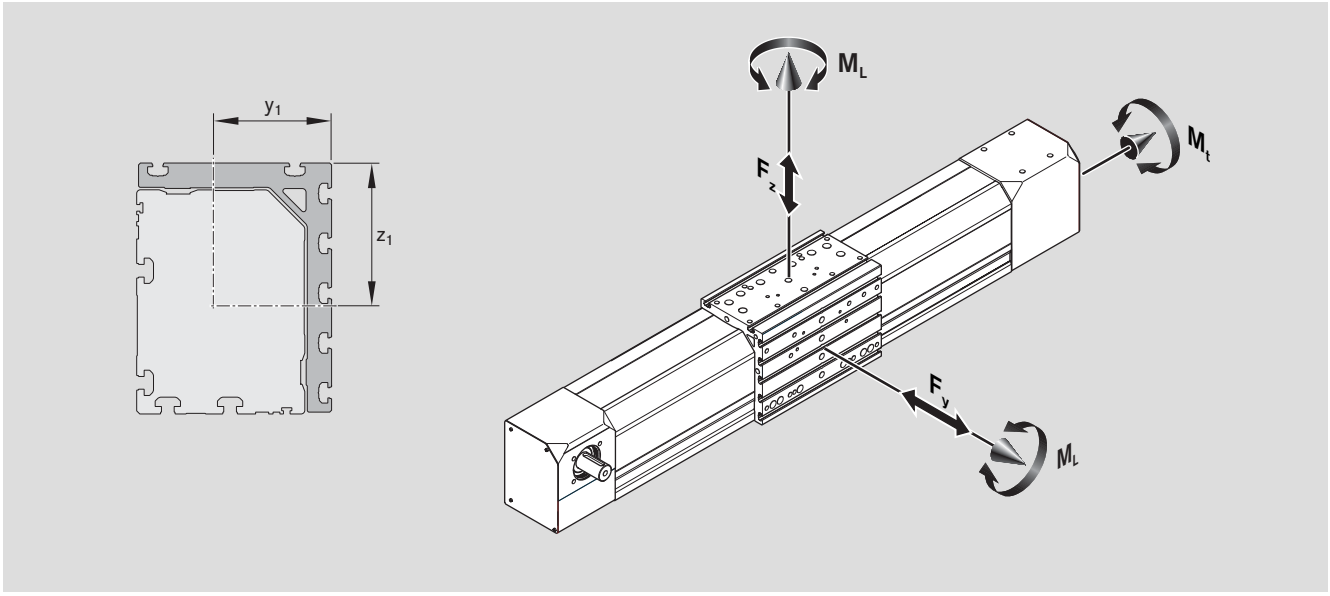
Load capacities and moments

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 constant	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

= 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 + 13.26	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	75	260.0	AT 10	50	10	1740	7500
	Gear reducer LP90	3	25	86.6					
		5	15	52.0					
		10	7.5	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	260.0	up to 5	AT 10, width 50	$(170.4 + L\ (mm) \cdot 0.009931) \cdot 10^{-4}\ (kgm^2)$
BKR 20-135	108.23	340.0	up to 5	AT 10, width 70	$(416.9 + L\ (mm) \cdot 0.02384) \cdot 10^{-4}\ (kgm^2)$

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														

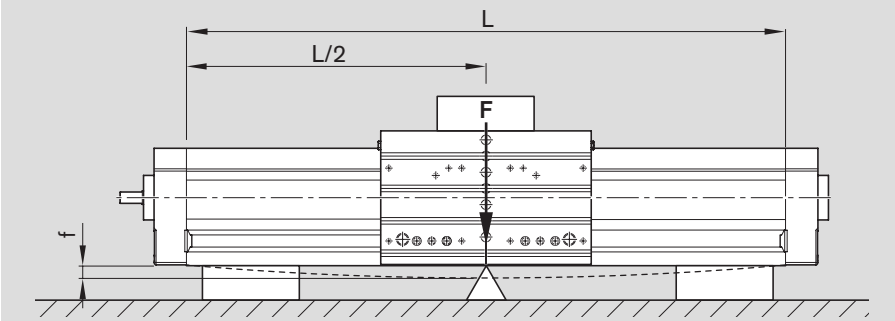
1) For additional information, refer to the catalogs “Controllers, Motors, Electrical Accessories, Servo motors” and “DSC, ECODRIVE Cs”.

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.)!

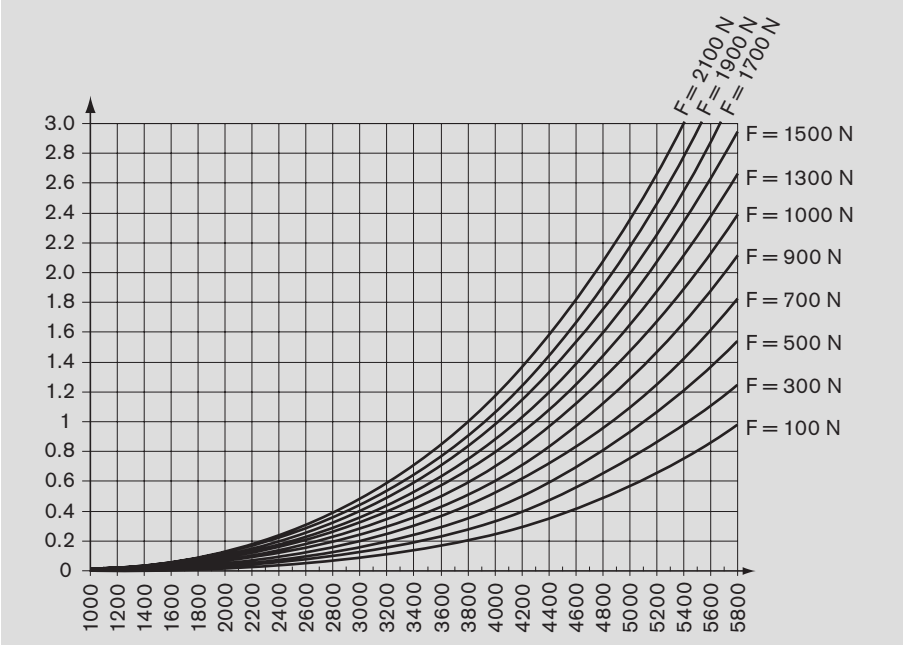
Deflection

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.

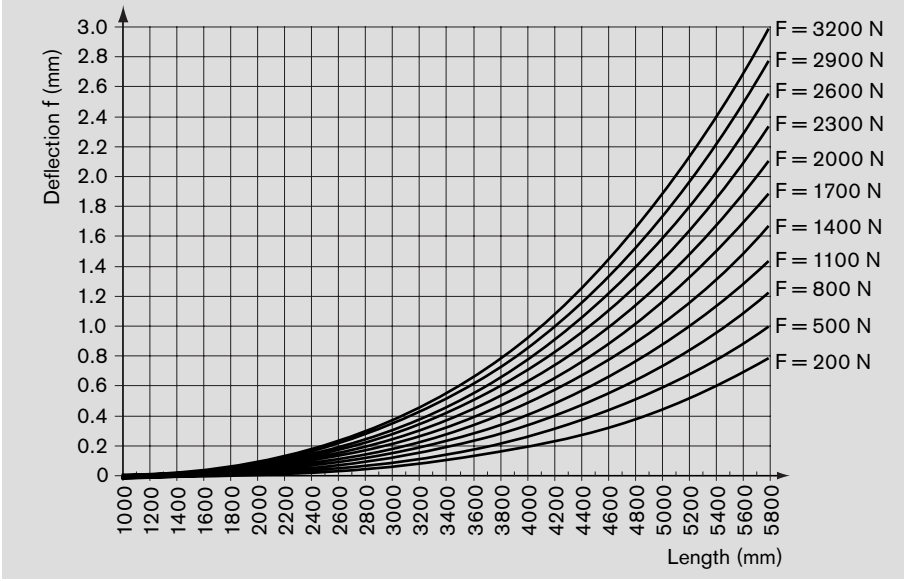
If high system dynamics are required, supports must be provided every 300 to 600 mm.



BKR 15-115



BKR 20-135



Bridge Modules with Toothed Belt Drive BKR

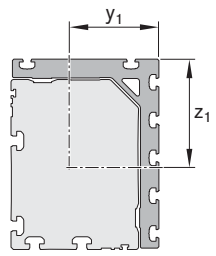
Calculations

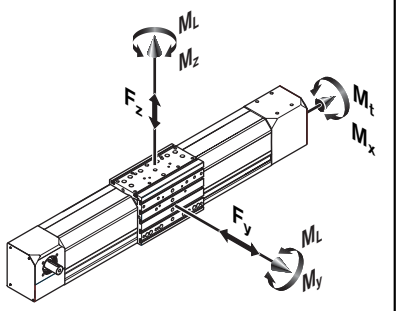
Calculation principles

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:

$$M_R = M_{RS}$$

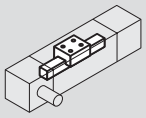
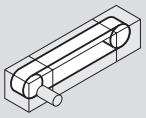
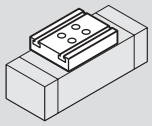
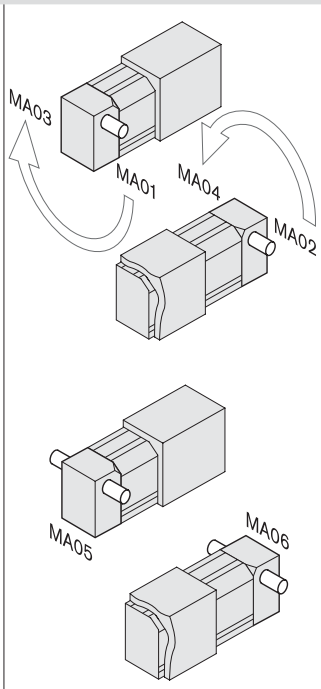
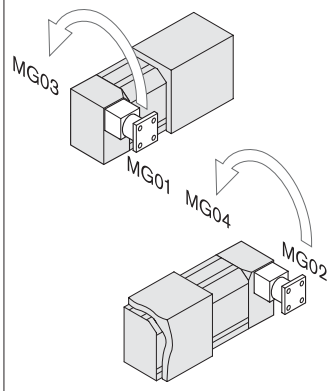
for motor attachment via gear reducer:

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

Notes

Bridge Modules with Toothed Belt Drive BKR

BKR 15-115 Components and Ordering Data

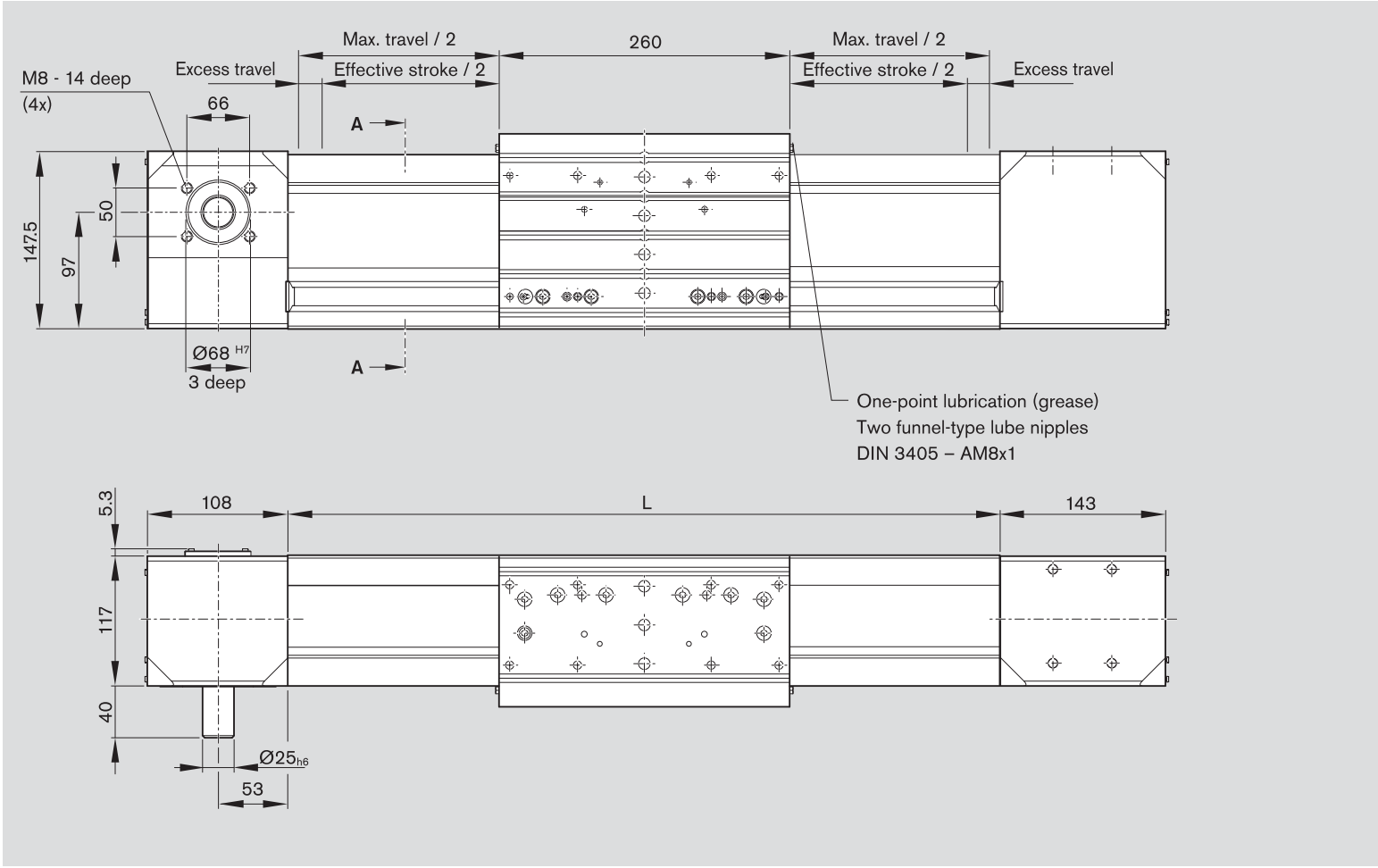
Part number, length R0324 400 00, ... mm		Type	Guideway 	Drive unit  Shaft without keyway i = 1	Drive unit Gear reducer i = 5, 10	Carriage  One carriage
with drive		**MA01**	01	01		01
		MA02				
		MA03		02		
		MA04				
		MA05		03		
		MA06				
with gear reducer LP90		**MG01** **MG02**	01		10	01
		MG03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

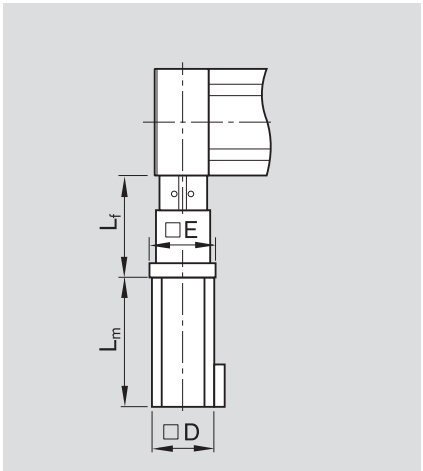
1) Attachment kit also available without motor (when ordering: enter “00” for motor)

	Motor attachment[1)]			Motor			Cover		Switches Switching cam, socket, plug, cable duct				Documentation	
	Gear reducer			Motor type	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 Without cable duct**	**00**			01	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								05 Positioning accuracy
	20	21	22	MSK 076C	92	93								
	40	41	42	MSK 060C	90	91								
	20	21	22	MSK 076C	92	93								

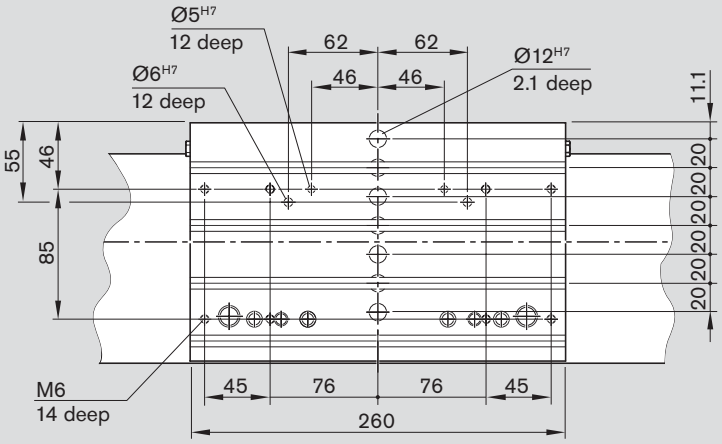
Bridge Modules with Toothed Belt Drive BKR

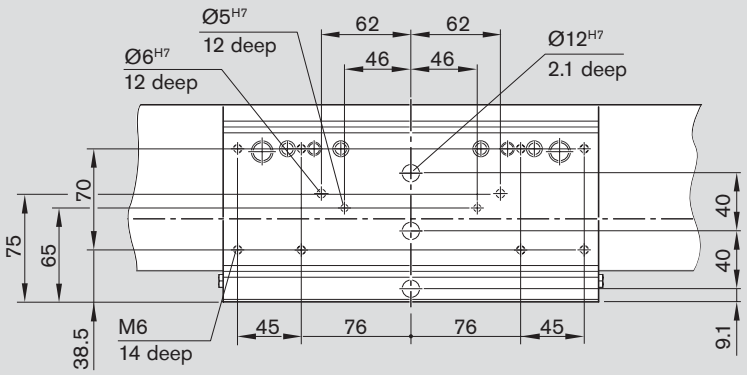
BKR 15-115 Components and Ordering Data

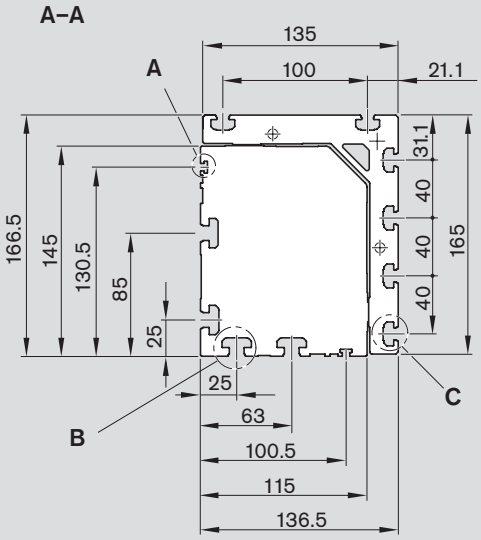




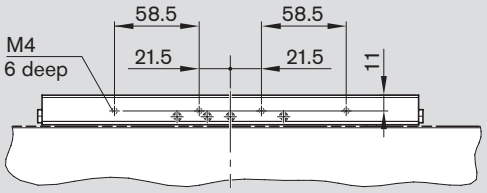
Motor	Gear reducer	Dimensions (mm)				
		D	E	L_f	L_m without brake	L_m with brake
MSK 060C	LP90	116	120	157	226.0	259.0
MSK 076C		140	140		292.5	292.5

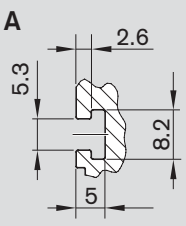


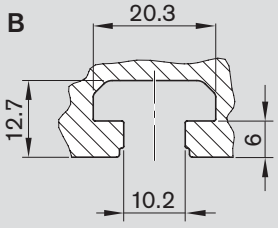


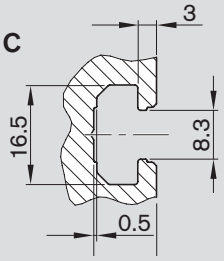


Mounting hole pattern for switching cam



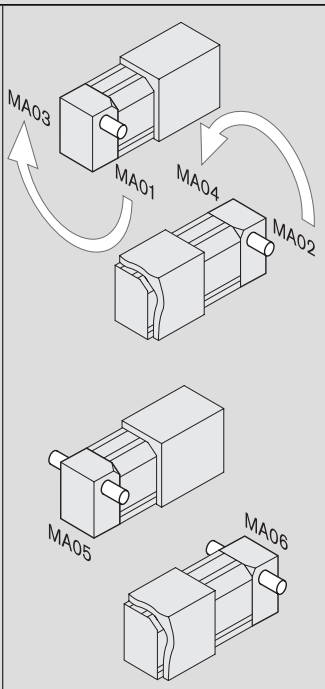
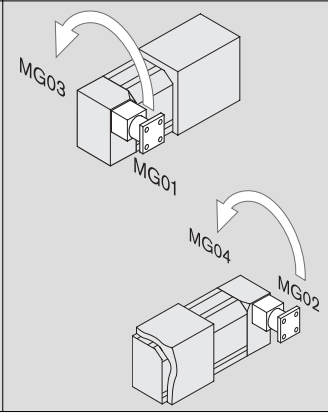






Bridge Modules with Toothed Belt Drive BKR

BKR 20-135 Components and Ordering Data

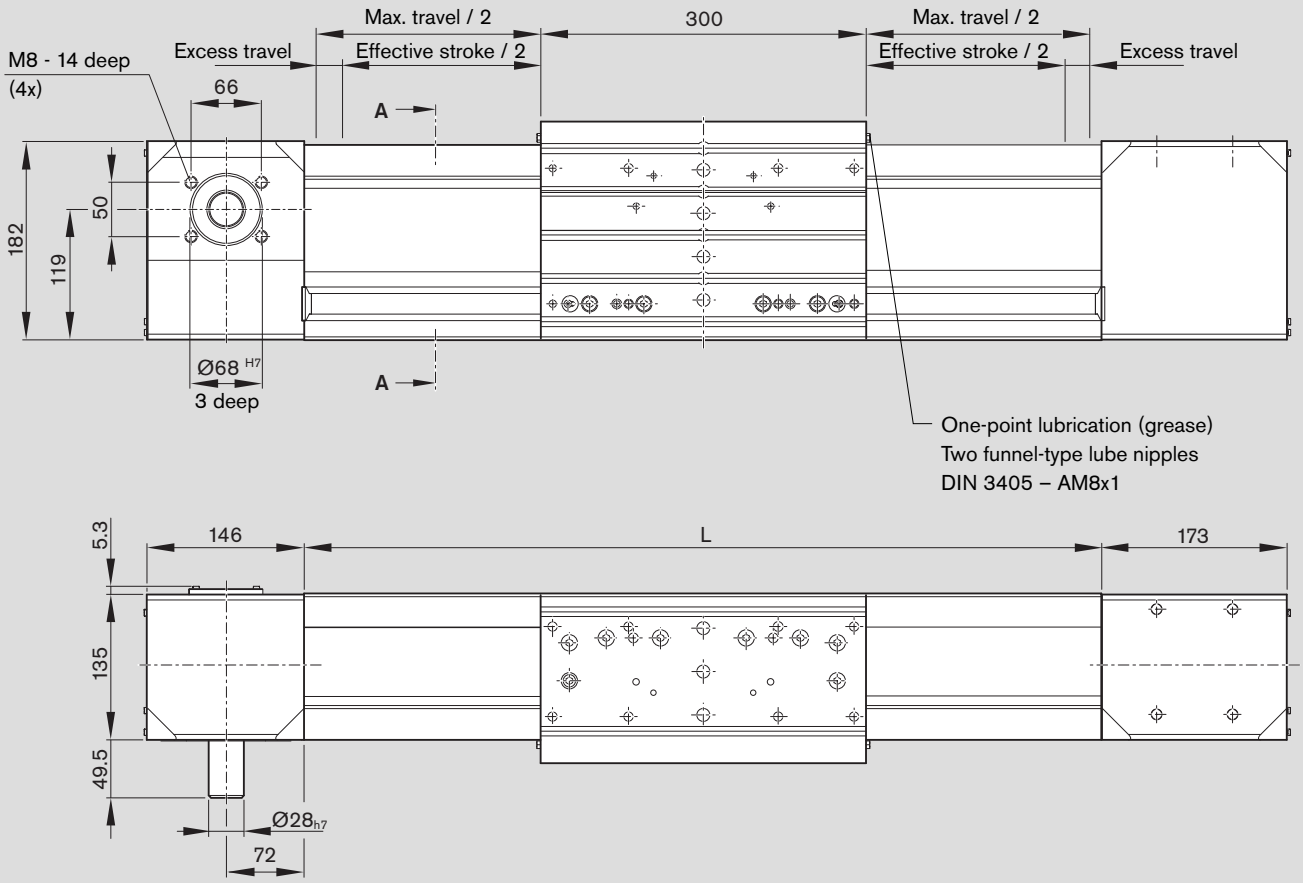
Part number, length R0324 500 00, … mm		Type	Guideway	Drive unit		Carriage	
				Shaft without keyway i = 1	Gear reducer i = 3, 5, 10	One carriage	
with drive		MA01	01	01		01	
		MA02					
		MA03		02			
		MA04					
		MA05		03			
		MA06					
with gear reducer LP120		MG01 MG02	01		10	01	
		MG03 MG04			11		

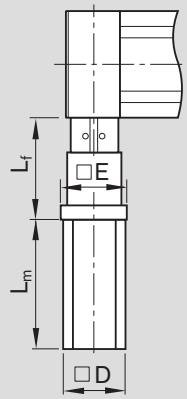
1) Attachment kit also available without motor (when ordering: enter “00” for motor)

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

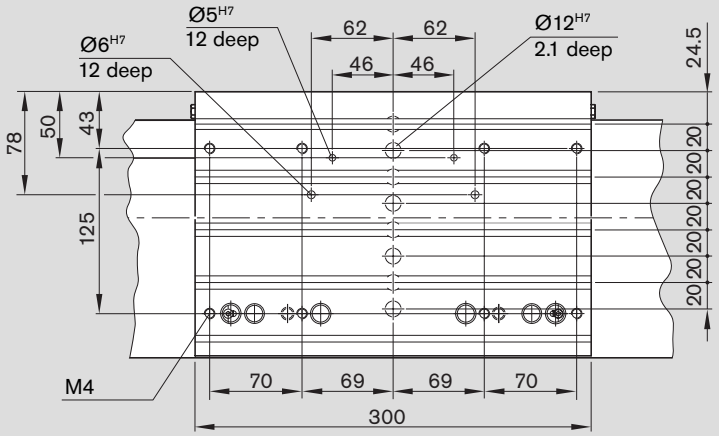
Bridge Modules with Toothed Belt Drive BKR

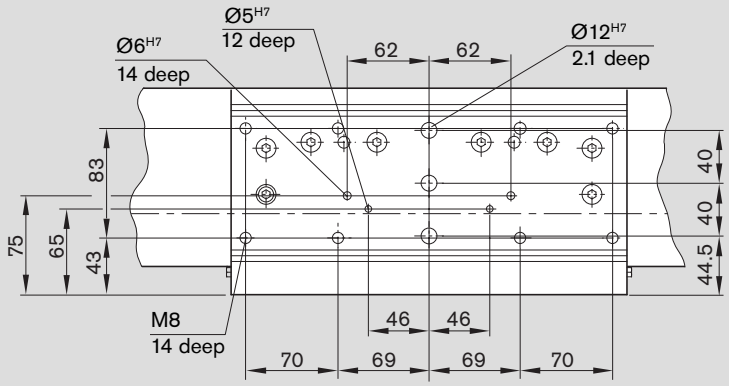
BKR 20-135 Dimensions

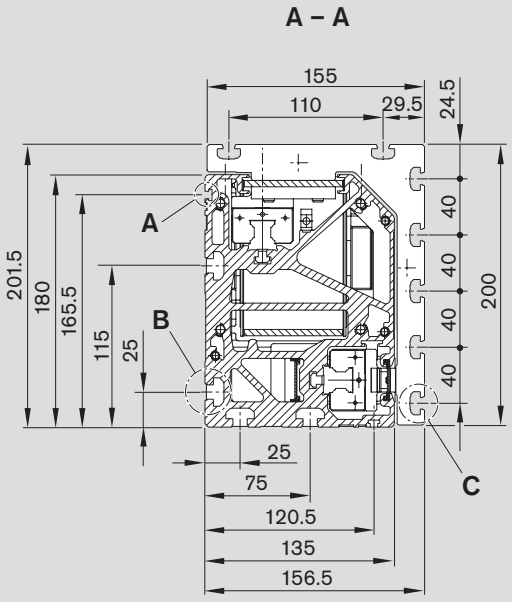




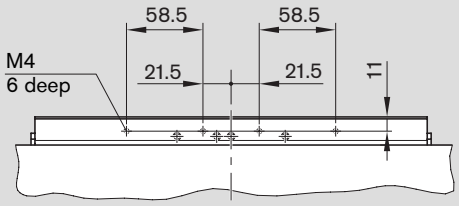
Motor	Gear reducer	Dimensions (mm)				
		D	E	L_f	L_m	
					without brake	with brake
MSK 076C	LP120	140	140	165	216.5	292.5

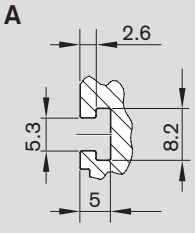


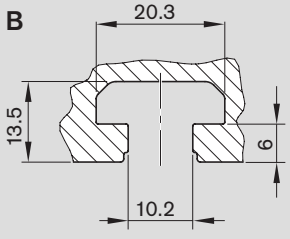


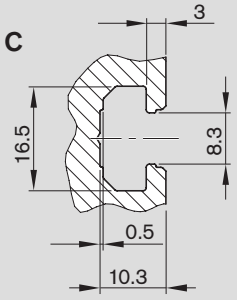


Mounting hole pattern for switching cam





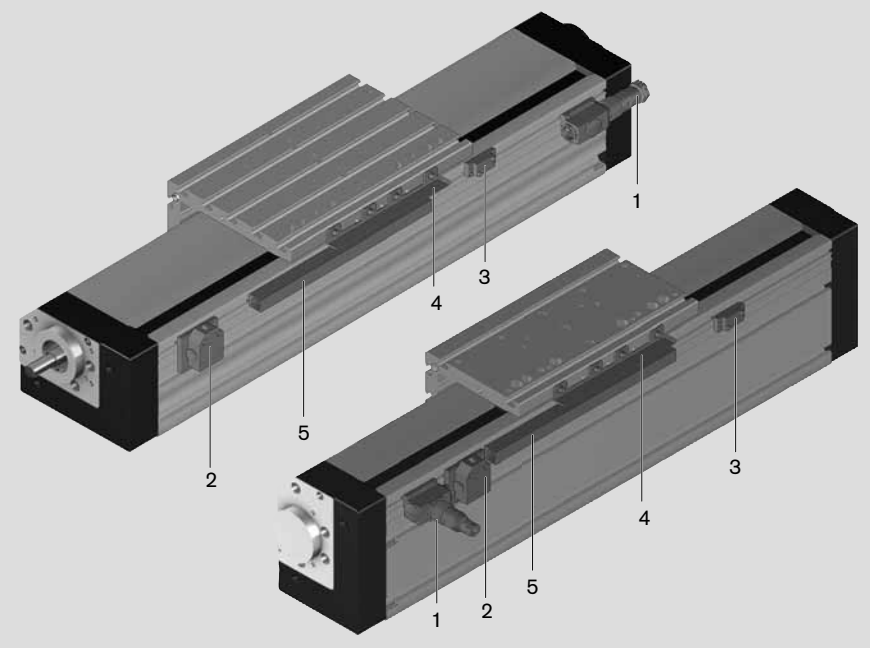




Switch Mounting Arrangements

Mechanical and Proximity Switches

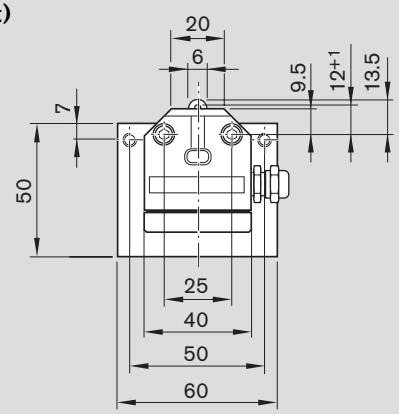
1 Socket and plug
2 Mechanical switch
(with mounting accessories)
3 Proximity switch
(with mounting accessories)
4 Cable duct
5 Switching cam



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

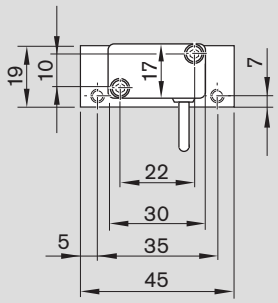
Mechanical switch (technical data)	
Repeatability	± 0.05 mm
Permissible ambient temperature	–5 °C to +80 °C
Protection class	DIN 40050 IP 67
Bounce time	< 2 ms
Insulation class	Group C per VDE 0110
Rated voltage	250 V AC
Continuous current	5 A
Switching capacity at 220 V, 40-60 Hz	cosφ = 0.8 at 2 A
Contact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

Mechanical switch (with mount)

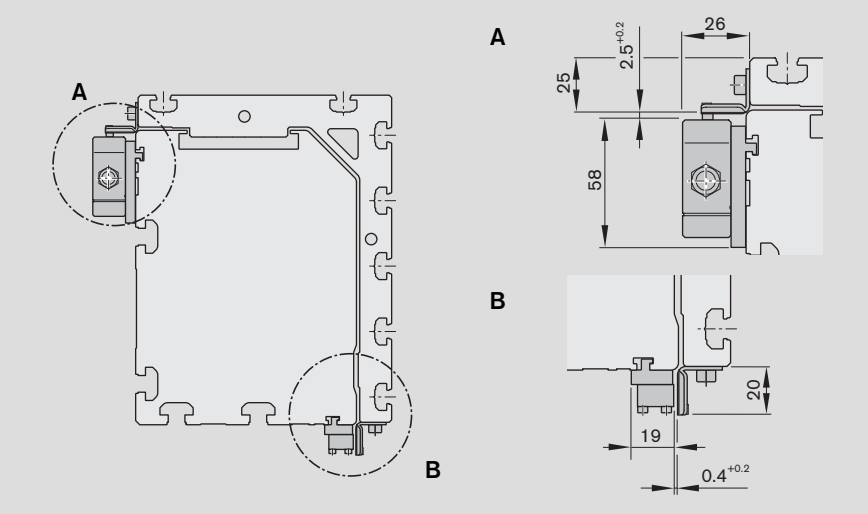


Proximity switch (technical data) Proximity switch with potted cable (3 x 0.14 mm² Unitronic)	
Housing form	NO
Minisensor	Form A DIN 41635
Operating voltage	10 ... 30 V DC
Residual ripple	≤ 10%
Load	200 mA
No-load current	≤ 20 mA
Switching frequency	max. 1500 Hz
Temperature-related shift in make point	≤ 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)



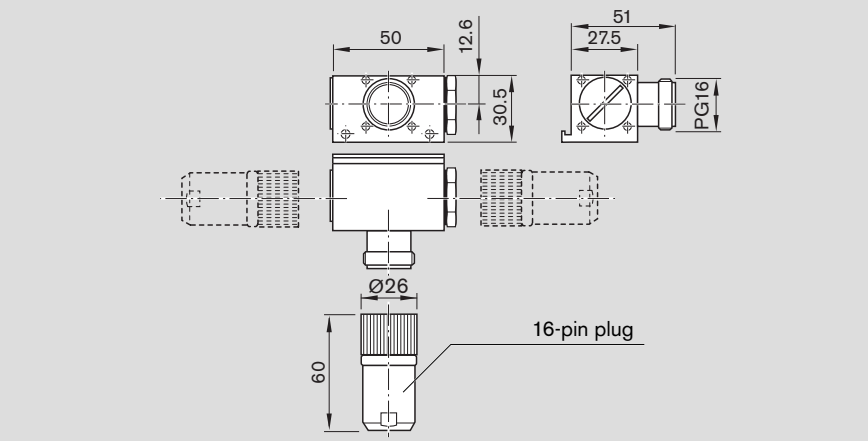
Switch mounting example



Socket and plug

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

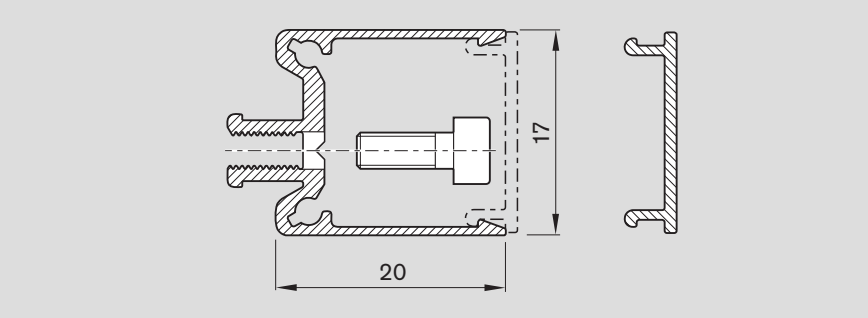
The socket and plug have 16 pins
The socket and switch are not pre-wired.
The switch activation points can thus be optimized during start-up.
A plug is provided.
The plug can be mounted in three directions.



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 numbers
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**	R021JDUCTL

Mounting

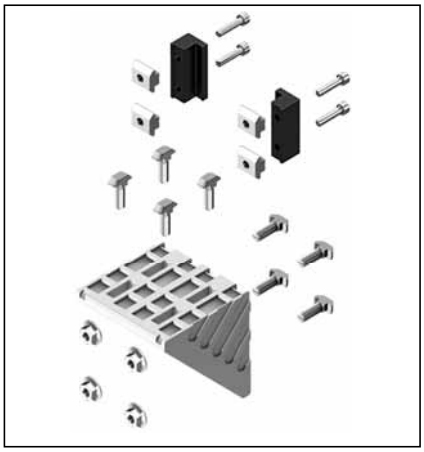
Mounting and Fastening Options

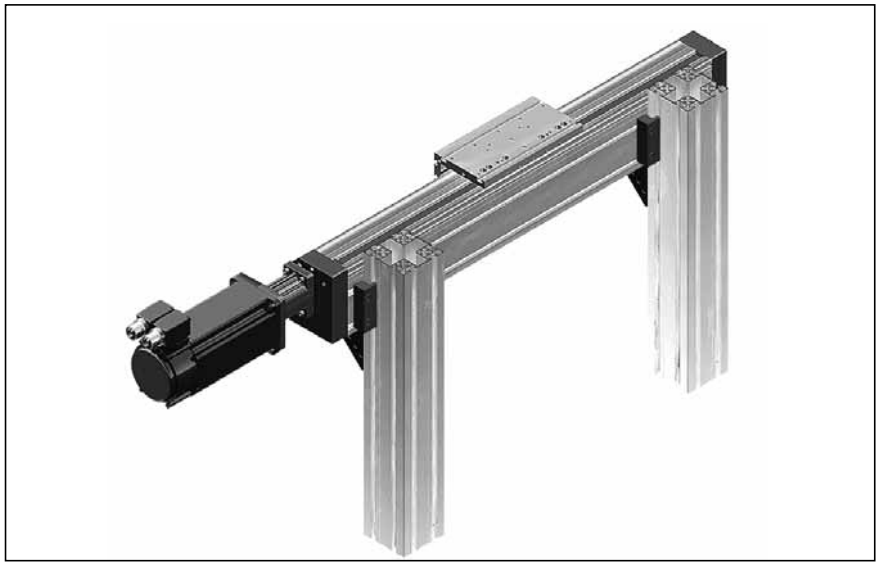
General notes

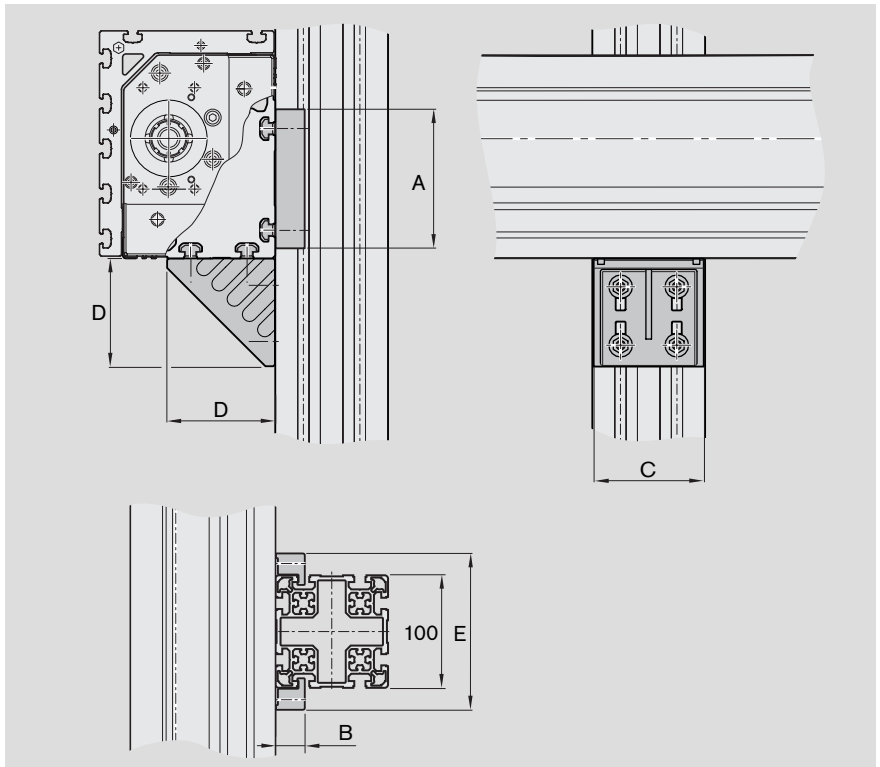
⚠ **Do not secure or support the Bridge Module on the end enclosures!**
The frame is the main load-bearing part! When mounting Bridge Modules, please note the maximum tightening torques listed in the table.
Select an appropriate number of supports to meet the requirements of the system dynamics.
Take 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)





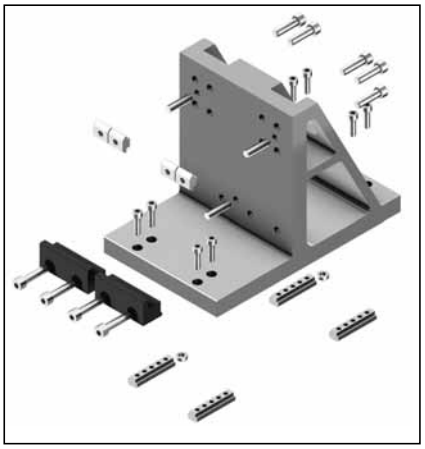


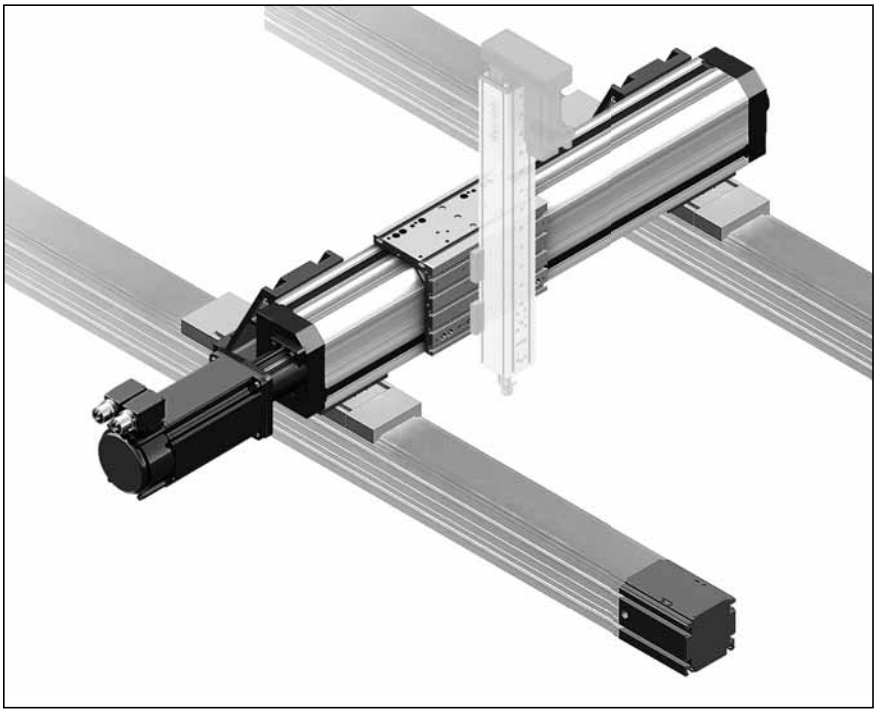
Tightening torque for the fastening screws
at friction factor 0.125
Strength class 8.8

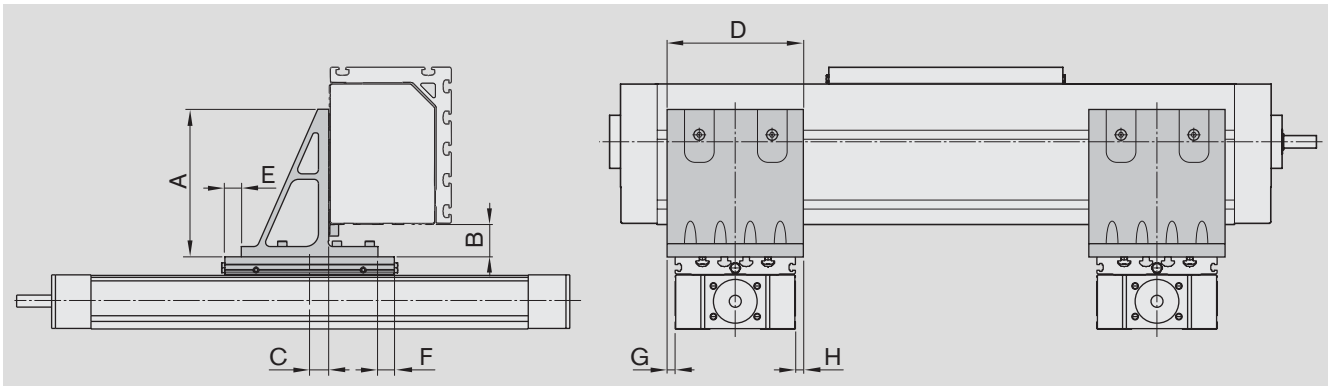
	8.8	M8
	(Nm)	23

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	–

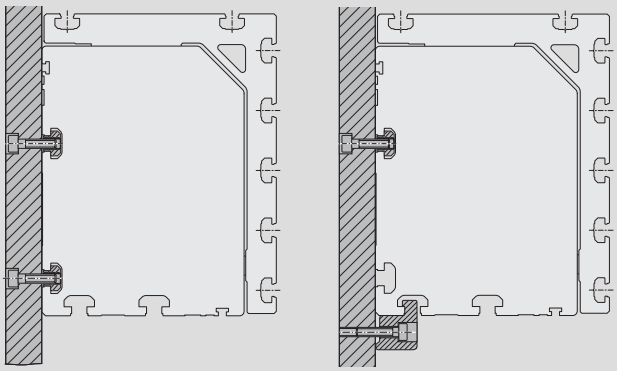
Part number	R0391 101 60	R0391 101 61	R0391 101 63	R0391 101 64	R0391 101 65	R0391 101 66
A (mm)	194.0	166.0	194.0	166.0	166.0	166.0
B (mm)	55.0	55.0	55.0	55.0	55.0	55.0
C (mm)	1.0	30.0	23.0	31.0	43.5	41.0
D (mm)	200.0	160.0	160.0	160.0	160.0	160.0
E (mm)	0.0	0.0	25.0	10.0	17.5	0.0
F (mm)	45.0	0.0	25.0	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

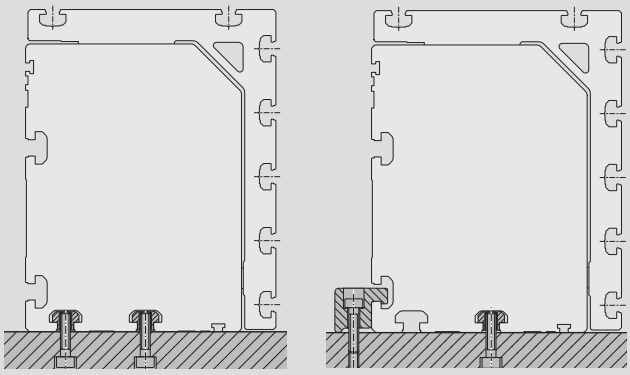
Mounting and Fastening Options

Fastening with clamping fixtures and sliding blocks

Recommended fastening arrangement



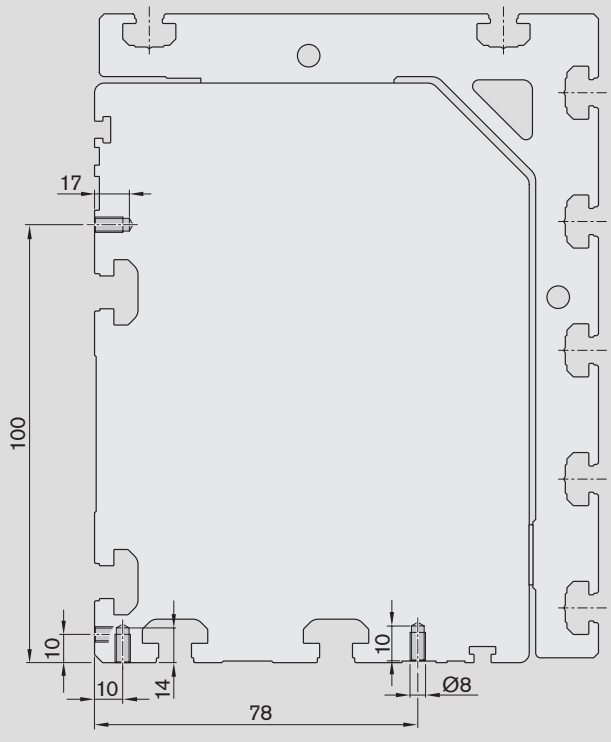
For light loads only



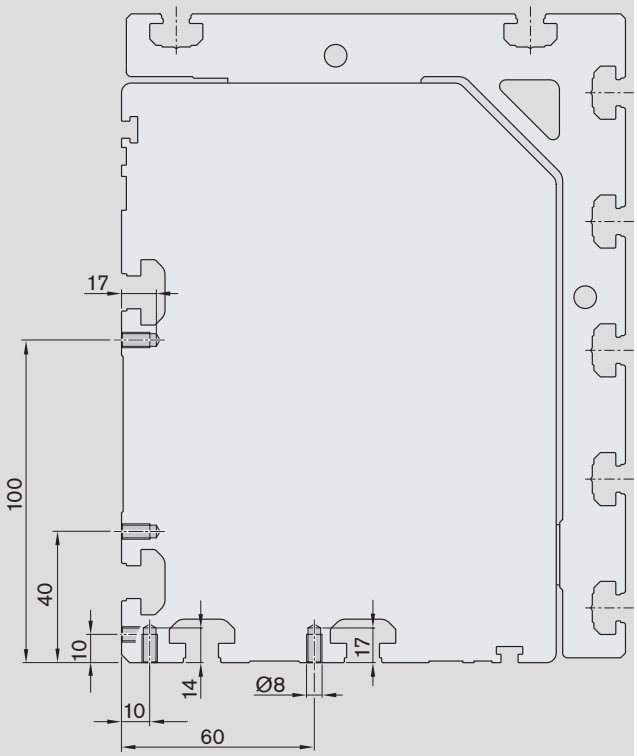
Special modification in the base surface of the frame

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

BKK/BKR 15-115



BKK/BKR 20-135

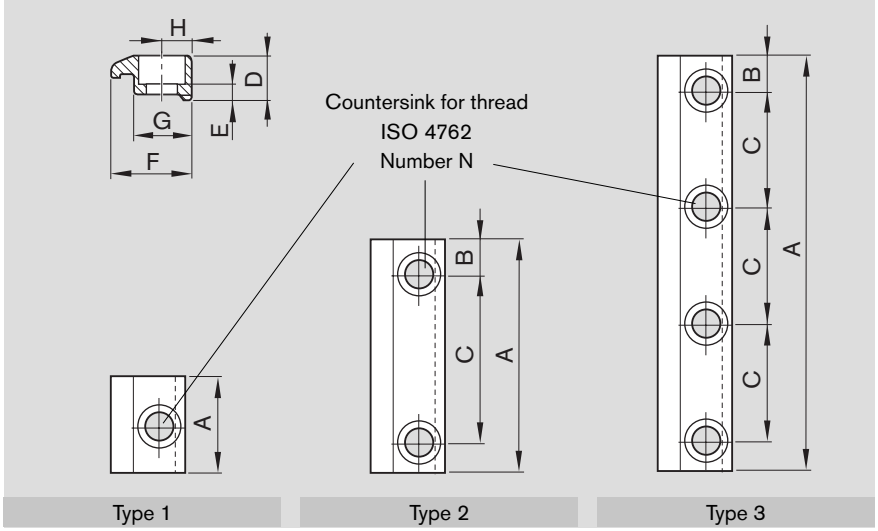


The mounting holes must be spaced at a distance of at least 30 mm from the frame ends.

Mounting Accessories

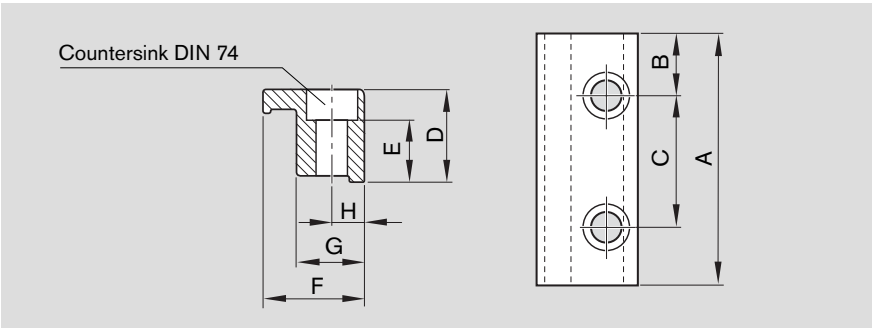
Clamping fixtures

Clamping fixtures for attachment to the carriage
Recommended number of clamping fixtures:
Wherever possible, use all T-slots to distribute the load.



Attachment of	Part number	For thread	Type	No. of holes	Dimensions (mm)							
				N	A	B	C	D	E	F	G	H
CKK / CKR 12-90	R0375 310 00	M4	1	1	25	–	–	9	4.6	14.5	10.5	4
	R0375 310 15		2	2	62	11	40		3.2			
CKK / CKR 15-110	R0375 510 00	M6	1	1	25	–	–	11.5	5.3	19.3	14	7
CKK / CKR 20-145	R0375 510 02		3	4	142	11	40					
VKK 15-70 / 25-100	R0375 510 11		2	2	62	11	40		3.2			

Clamping fixtures for fastening the Bridge Module to the mounting base



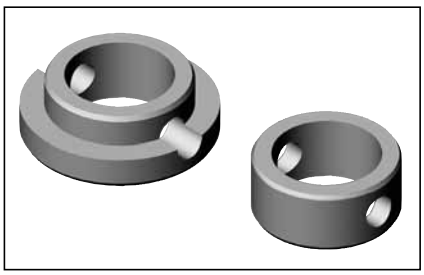
Part number	Dimensions (mm)								For thread	Number of holes
	A	B	C	D	E	F	G	H		N
R0375 410 50	88	19	50	27.5	18	30	19	9	M8	2
R0375 410 51	128	19	90	27.5	18	30	19	9	M8	2
R0375 410 52	68	15	38	27.5	18	30	19	9	M8	2
R0375 410 53	98	19	60	27.5	18	30	19	9	M8	2

Mounting

Mounting Accessories

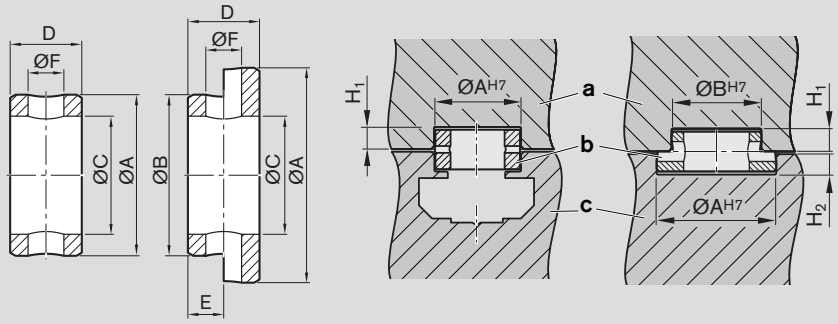
Centering ring

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

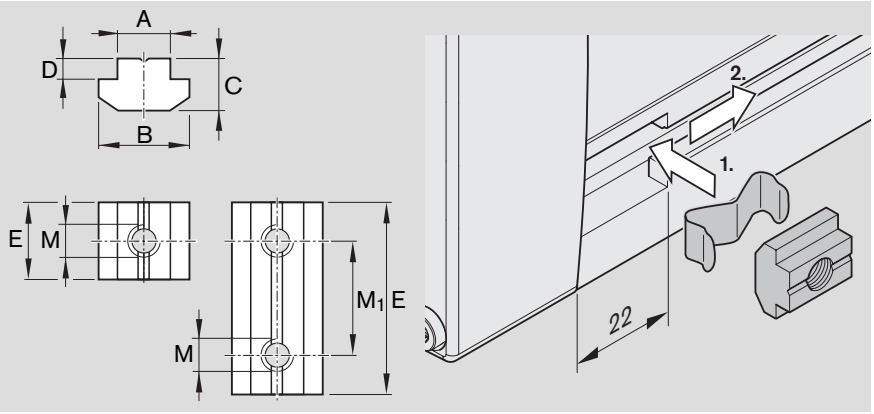
Installation



Ø size	Dimensions (mm)								Part number
(mm)	A k6	B k6	C ±0.1	D −0.2	E +0.2	ØF	H_1 +0.2	H_2 +0.2	
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)						Part number Sliding block	Part number Spring
		A	B	C	D	E	M_1		
Carriage	M4	8	16	6	2	16	-	3 842 514 928	3 842 516 685
	M5	8	16	6	2	16	-	3 842 514 929	3 842 516 685
	M6	8	16	6	2	16	-	3 842 514 930	3 842 516 685
	M6	8	16	6	2	50	36	R0391 710 08	-
	M8	8	16	6	2	16	-	3 842 514 931	3 842 516 685
Frame	M4	10	19.5	10.5	5	20	-	R3447 012 01	3 842 516 669
	M5	10	19.5	10.5	5	20	-	3 842 528 741	3 842 516 669
	M6	10	19.5	10.5	5	20	-	3 842 528 738	3 842 516 669
	M8	10	19.5	10.5	5	20	-	3 842 528 735	3 842 516 669

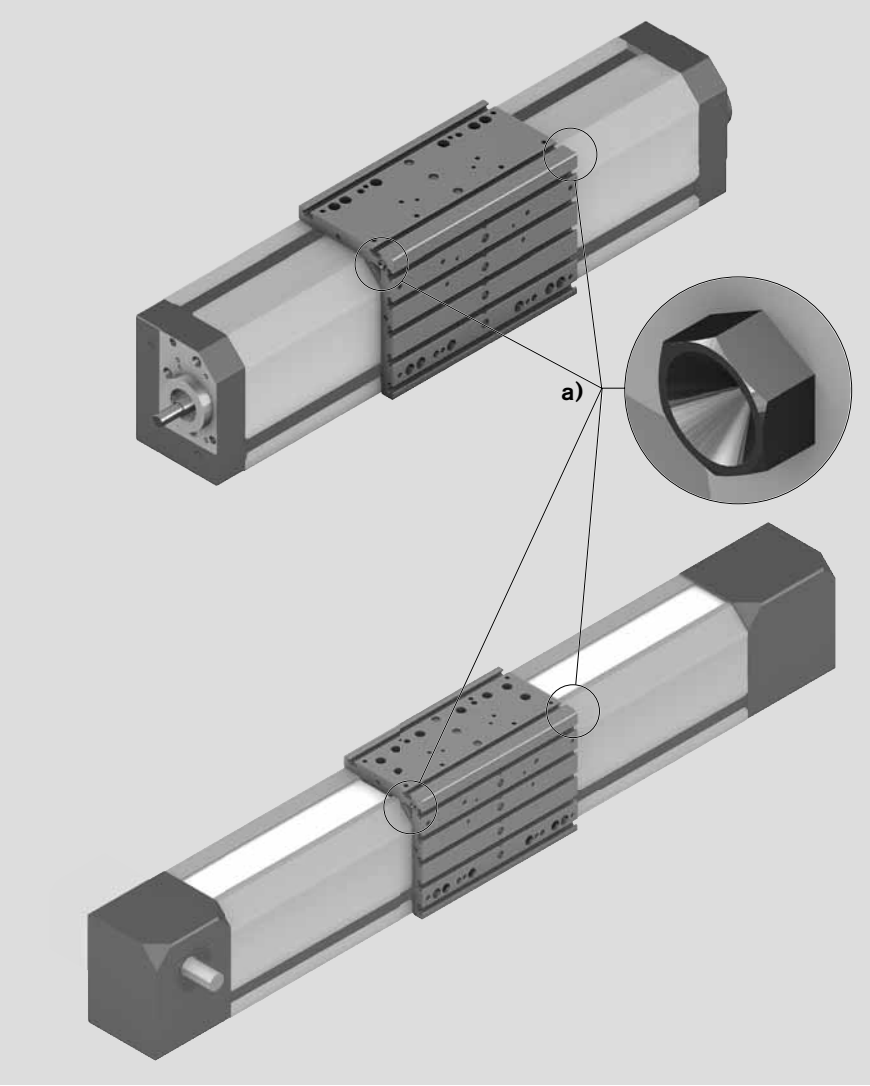
Tightening torques for the fastening screws
at friction factor 0.125
Strength class 8.8

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

Lubrication

Lube nipples in carriage

Initial lubrication is applied in the factory before shipment.
Bridge Modules are designed for grease lubrication (using a manual grease gun with an extension tube and nozzle).
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 grease containing solid particles (e.g. graphite or MoS_2).



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

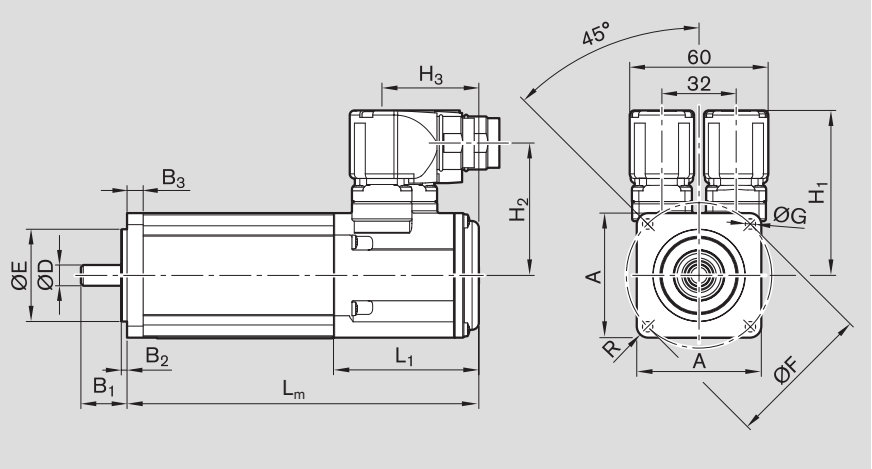
For short-stroke applications, please consult us.
BKK/R 15-115 stroke < 50
BKK/R 20-135 stroke < 60

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 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
Rotor moment of inertia	J_{rot}	($10^{-6}kgm^2$)	140	800	4300
Mass without brake	m	(kg)	3.6	8.4	13.8
Holding brake					
Holding torque	M_{Br}	(Nm)	4.0	10.0	11.0
Brake 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 are available complete with control system.
Please refer to the catalogs for more information about motors and control systems.

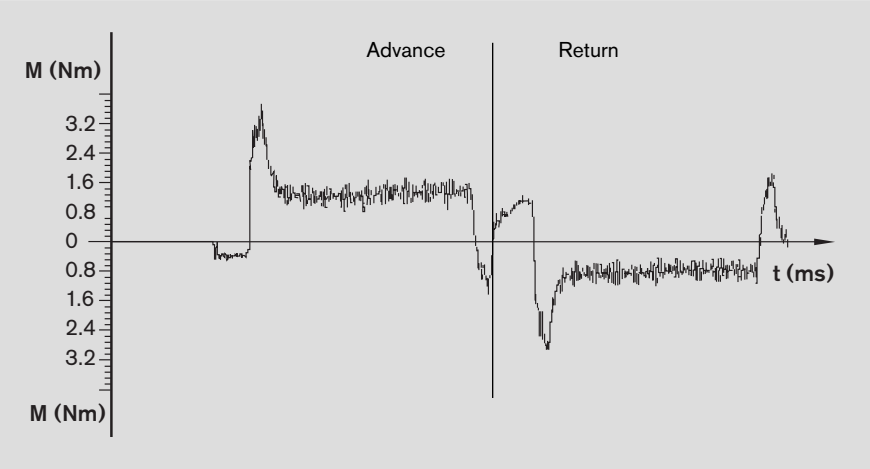
Documentation

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.

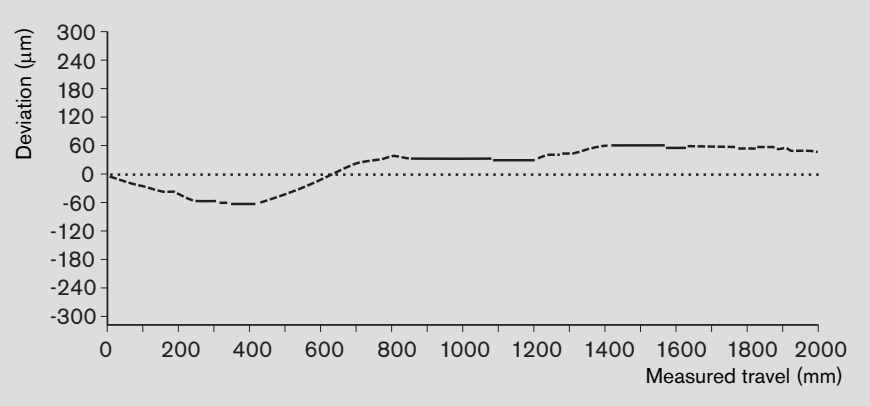
Frictional torque of complete system
Option no. 02

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



Lead deviation of ball screw drive for Bridge Module BKK
Option no. 03

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

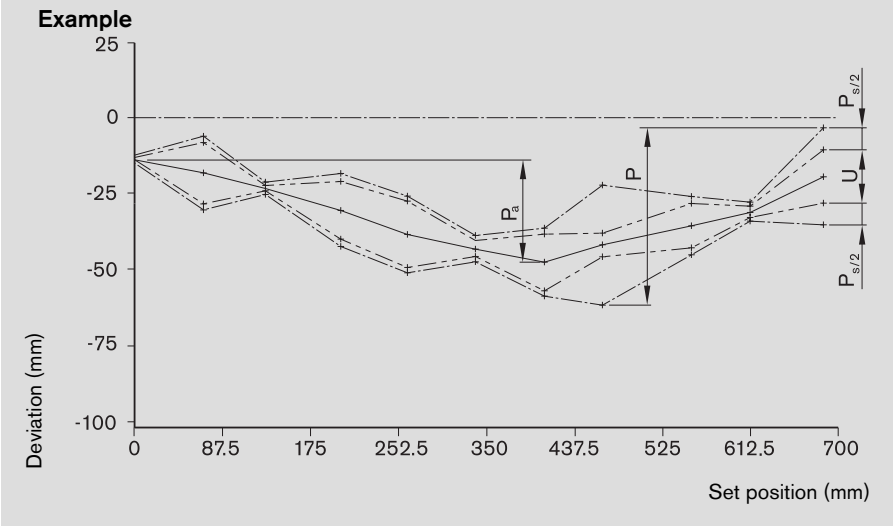


Documentation

Positioning accuracy to VDI/DGQ 3441

Option no. 05

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



Positioning accuracy P

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

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

Bosch Rexroth Corporation
14001 South Lakes Drive
Charlotte, NC 28273

Phone: (704) 583-4338 / 800-438-5983
Fax: (704) 583-0523

www.boschrexroth-us.com

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	= ☐☐
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:** _____

Rexroth
Bosch Group

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