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

Rexroth
Bosch Group

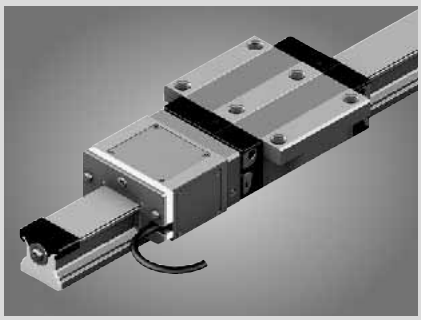
Precision Modules PSK

The Drive & Control Company

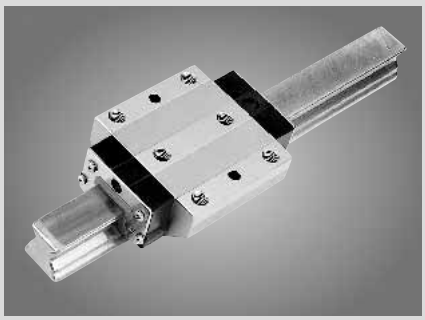
Linear Motion and Assembly Technologies

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

Ball Rail Systems



Roller Rail Systems

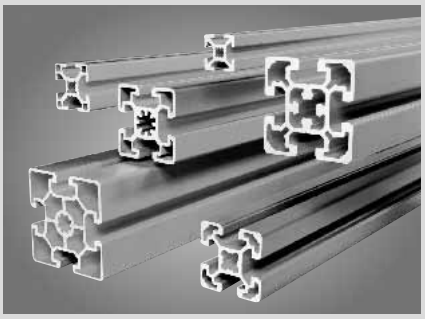


Linear Bushings and Shafts

Ball Screw Drives

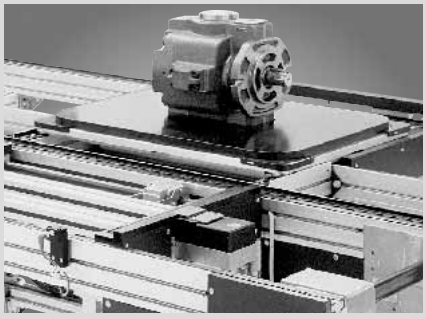
Linear Motion Systems

Basic Mechanical Elements

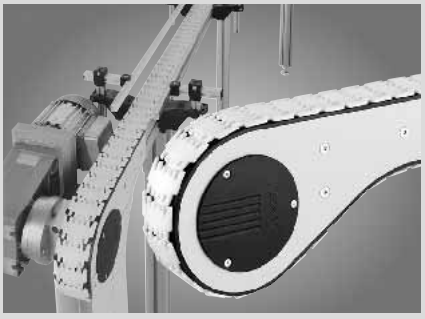


Manual Production Systems

Assembly Conveyors



VarioFlow Conveyors



Precision Modules PSK

Product Description

Outstanding features

Rexroth Precision Modules are precise, ready-to-install linear motion systems that combine high performance with compact dimensions.
Rexroth offers favorable price/performance ratios and fast delivery.

Structural design
- Extremely compact and rigid precision steel profile (frame) with reference edge and integrated Rexroth guideway geometry
- Precision ball screw drive in tolerance grade 7 with zero-backlash nut system
- Aluminum fixed bearing end block with preloaded ball bearings and ball screw journal
- Floating bearing end block with double ball bearings
- One or two steel carriages, standard length or long, for PSK without cover or with cover plate
- One aluminum carriage, standard length or long, for PSK with sealing strip

Attachments
- Maintenance-free digital AC servo drives with integrated brake and attached feedback, or stepper motors
- Motor mount and coupling or timing belt side drive for motor attachment
- Adjustable switches over the entire travel range
- Aluminum profile cable duct

Drive controllers and control systems

Further highlights

- Extremely stiff and precise miniature drive unit
- Optimal travel performance, high load capacities, high precision and high rigidity due to integrated Rexroth Ball Rail System
- High positioning accuracy and repeatability due to Precision Ball Screw Assembly with zero-backlash nut system
- Repeatability up to 0.005 mm
  Positioning accuracy up to 0.01 mm
  Travel accuracy up to 0.005 mm
- High travel speeds combined with high precision due to Ball Rail Systems, large screw diameters and leads, and double floating bearing
- Rapid mounting and easy axis alignment thanks to machined reference edge on the frame
- Precise alignment and secure mounting of attachments thanks to tapped bores and pin holes in the carriage
- Easy motor attachment via locating feature and fastening threads
- Low-cost maintenance provided by one-point lubrication (grease) for Ball Rail System and Precision Ball Screw Assembly
- Precision Modules in standard lengths for fast delivery

Fixed bearing end block with ball screw journal

Fixed bearing end block with integrated motor mount

For mounting, maintenance and start-up, see
“Instructions for Precision Modules PSK.”

PSK without cover

Internal elements protected by cover plate
One or two steel carriages, standard length or long

Internal elements protected by stainless steel sealing strip
Aluminum carriage, standard length or long

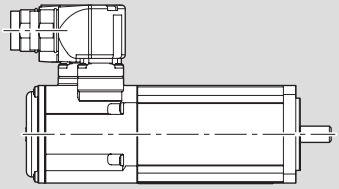
Product Overview

Motor selection

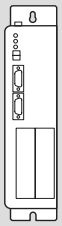
Based on drive controllers and control system

A choice can be made between several different motor/controller combinations to achieve the most cost-efficient solution for each customer application. When sizing the drive, always consider the motor-controller combination.
For more information about motors and control systems, see the following Rexroth catalog:
– IndraDrive for Linear Motion Systems

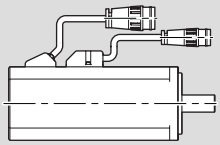
Digital AC servo motors MSK



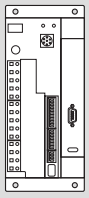
Digital controllers
IndraDrive



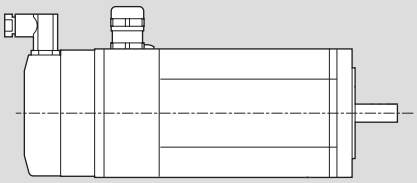
Digital AC servo motors MSM



Digital controllers
ECODRIVE Cs

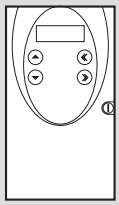


3-phase stepping motors VRDM

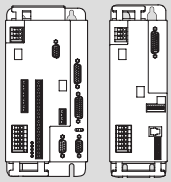


Power electronics

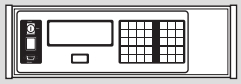
SD326
SD328



Twin Line



Profi Step
control unit



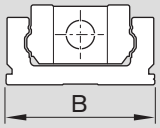
Precision Modules PSK can be supplied complete with motor, drive and control unit.

Product Overview

Type designation (size)

Precision Modules are designated according to type and size.
Types also cover the equivalent designs without drive systems.

Description		Type			Size
	Example: Precision Module	**P**	**S**	**K**	**60**
System	Precision Module **(P)**				
Guideway	Integrated Ball Rail System **(S)**				
Drive unit	Precision Ball Screw Assembly **(K)**				
Frame size	Approx. width of frame (mm) Example: B = 60 mm				



Overview of types with load capacities

Type	System	Guideway	Drive unit [1]	Size	Cover	Carriage (carr.)		Load capacities
							Number	C (N)
PSK	Precision Module	Rail System	Precision Ball Screw Assembly	**PSK 40**	Without / cover plate	Standard	1 carr.	3 065
							2 carr.	4 980
				PSK 50	Without / cover plate	Standard	1 carr.	7 300
							2 carr.	11 850
					Sealing strip	Standard	1 carr.	7 300
						Long	1 carr.	11 850
				PSK 60	Without / cover plate	Standard	1 carr.	7 300
							2 carr.	11 850
						Long	1 carr.	9 000
							2 carr.	14 620
					Sealing strip	Standard	1 carr.	9 000
						Long	1 carr.	14 620
				PSK 90	Without / cover plate	Standard	1 carr.	21 300
							2 carr.	34 600
						Long	1 carr.	27 500
							2 carr.	44 670
					Sealing strip	Standard	1 carr.	21 300
						Long	1 carr.	34 600

1) All Precision Modules can also be supplied without drive unit.

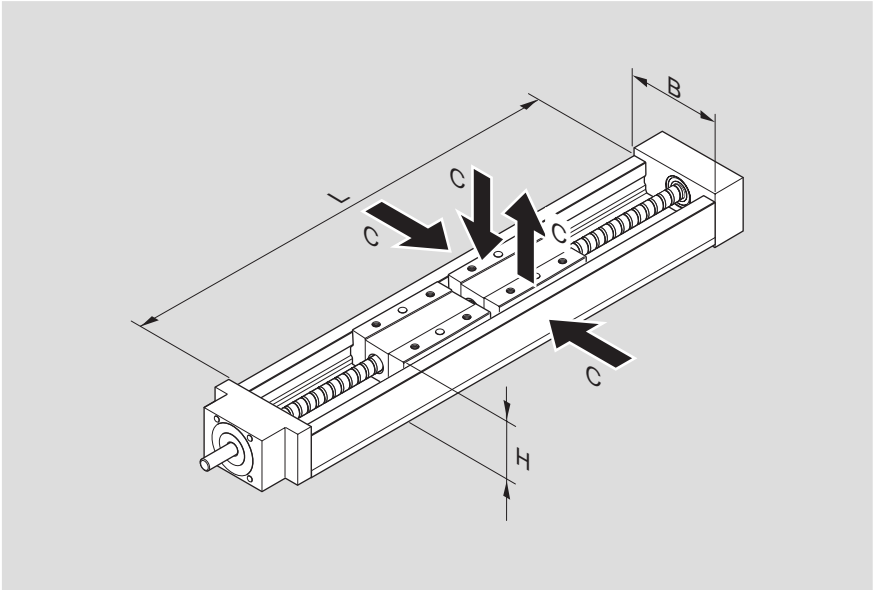
Permissible loads

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

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

For permissible values, see the “Technical Data” section.

Dimensions



Standard lengths L

Precision Module		PSK 40	PSK 50	PSK 60	PSK 90
B	(mm)	40	50	60	86
H	(mm)	20	26	33	46
L	(mm)	100	100	150	340
		150	150	200	440
		200	200	250	540
		250	250	300	640
		300	300	400	740
		350	350	500	840
			400	600	940
			450	700	
			500	800	
			550	900	
			600	940	

Structural Design

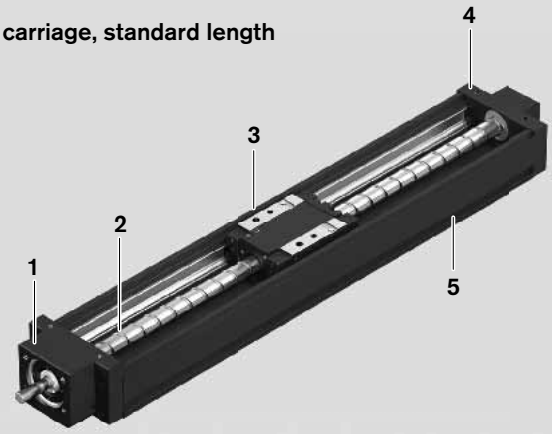
PSK without cover

1 Fixed bearing end block
2 Ball screw with zero-backlash cylindrical single nut
3 One or two steel carriages, standard length or long
4 Floating bearing end block
5 Frame with reference edge and integrated guideway geometry

PSK with cover plate

6 Cover plate
7 One or two carriages, standard length or long
8 Carriage plate, aluminum
9 Carriage, steel

1 carriage, standard length

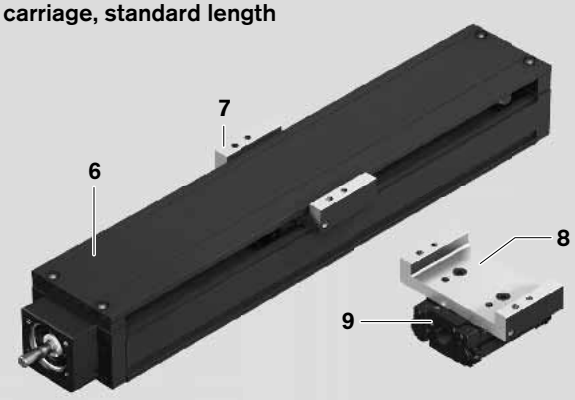


2 carriages, standard length

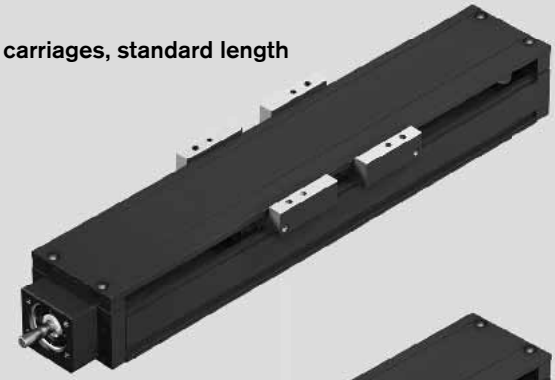
1 carriage, long

2 carriages, long

1 carriage, standard length



2 carriages, standard length



1 carriage, long

2 carriages, long

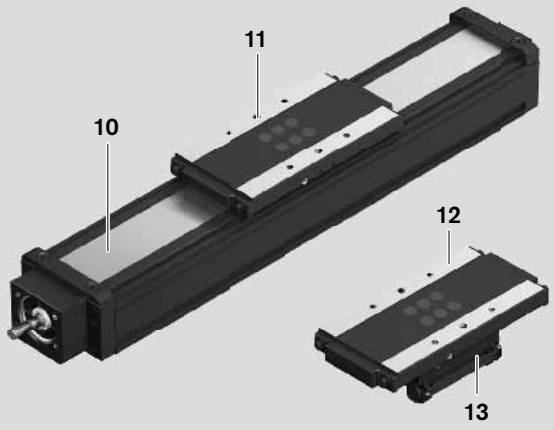
PSK with sealing strip

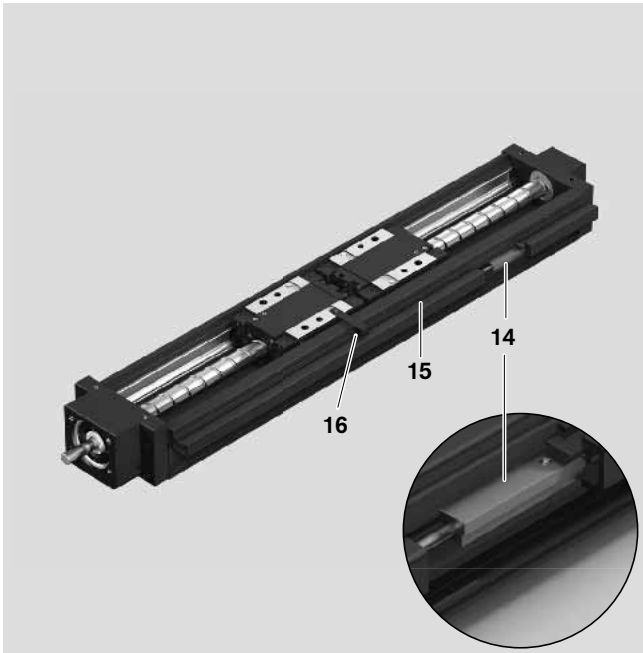
10 Sealing strip, stainless steel
11 One carriage, standard length or long
12 Carriage plate, aluminum
13 Carriage, aluminum

Attachments for all PSK modules

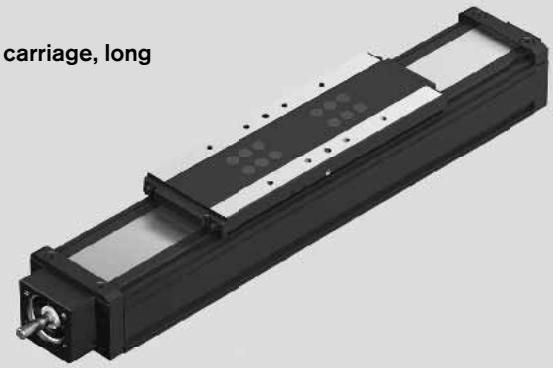
14 Switches
15 Cable duct
16 Switching cam

1 carriage, standard length



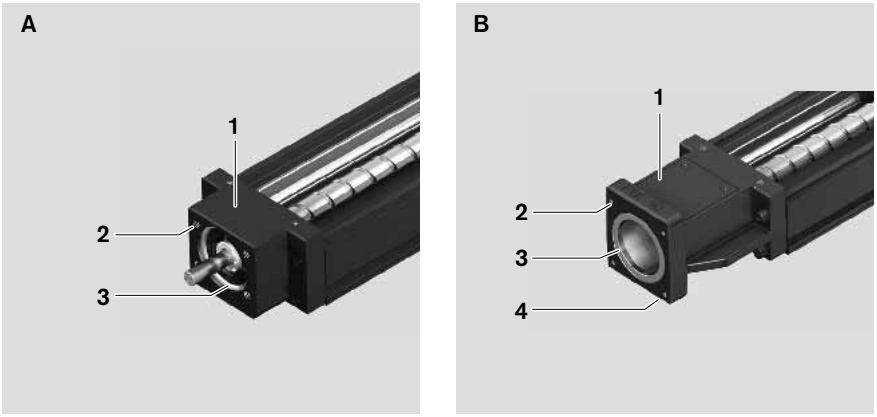


1 carriage, long



Structural Design

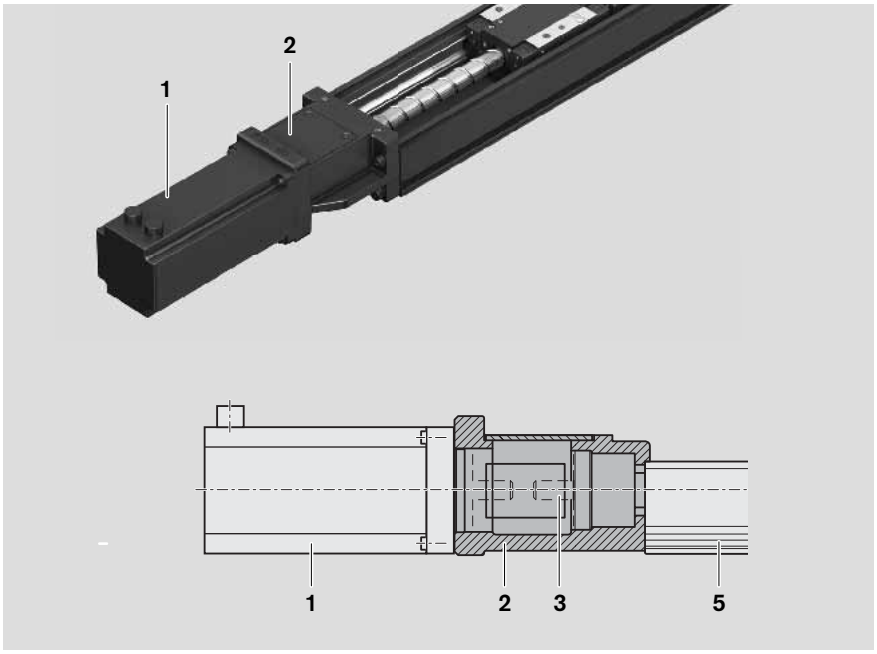
Fixed bearing end block



Version with ball screw journal (A)
1 End block with preloaded bearing
2 Tapped mounting hole
3 Centering feature

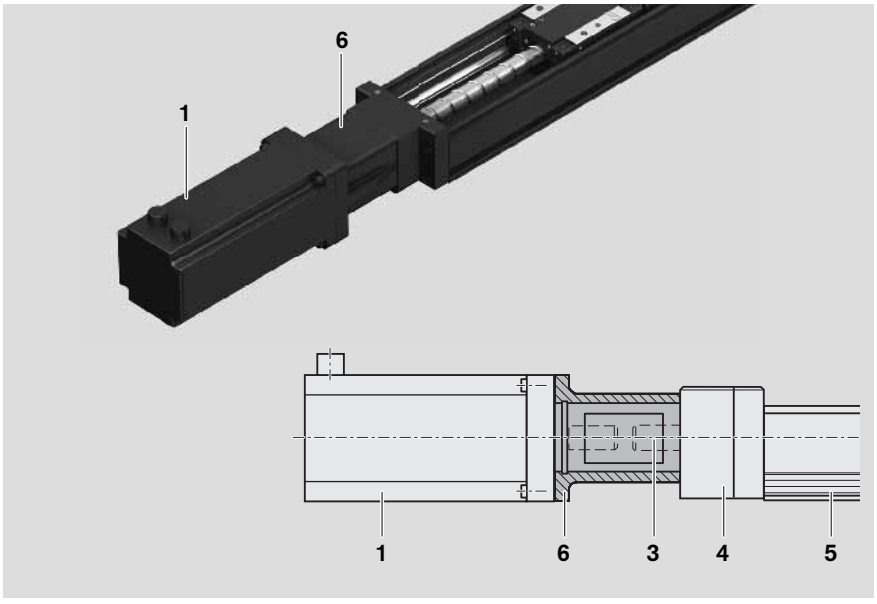
Version with integrated motor mount (B)
1 End block with integrated motor mount and preloaded bearing
2 Tapped mounting hole
3 Centering feature
4 Flange for motor attachment

Motor attachment



Motor attachment with motor mount and coupling
A motor can be attached to all Precision Modules by means of a motor mount and coupling.
The motor mount serves to fasten the motor to the Precision Module and acts as a closed housing for the coupling.
The coupling transmits the motor drive torque free of distortive stresses to the Precision Module's ball screw journal.

Fixed bearing end block with integrated motor mount and coupling
1 Motor
2 Fixed bearing end block with integrated motor mount
3 Coupling
5 Precision module



Fixed bearing end block with attached motor mount and coupling
1 Motor
3 Coupling
4 Fixed bearing end block
5 Precision module
6 Motor mount

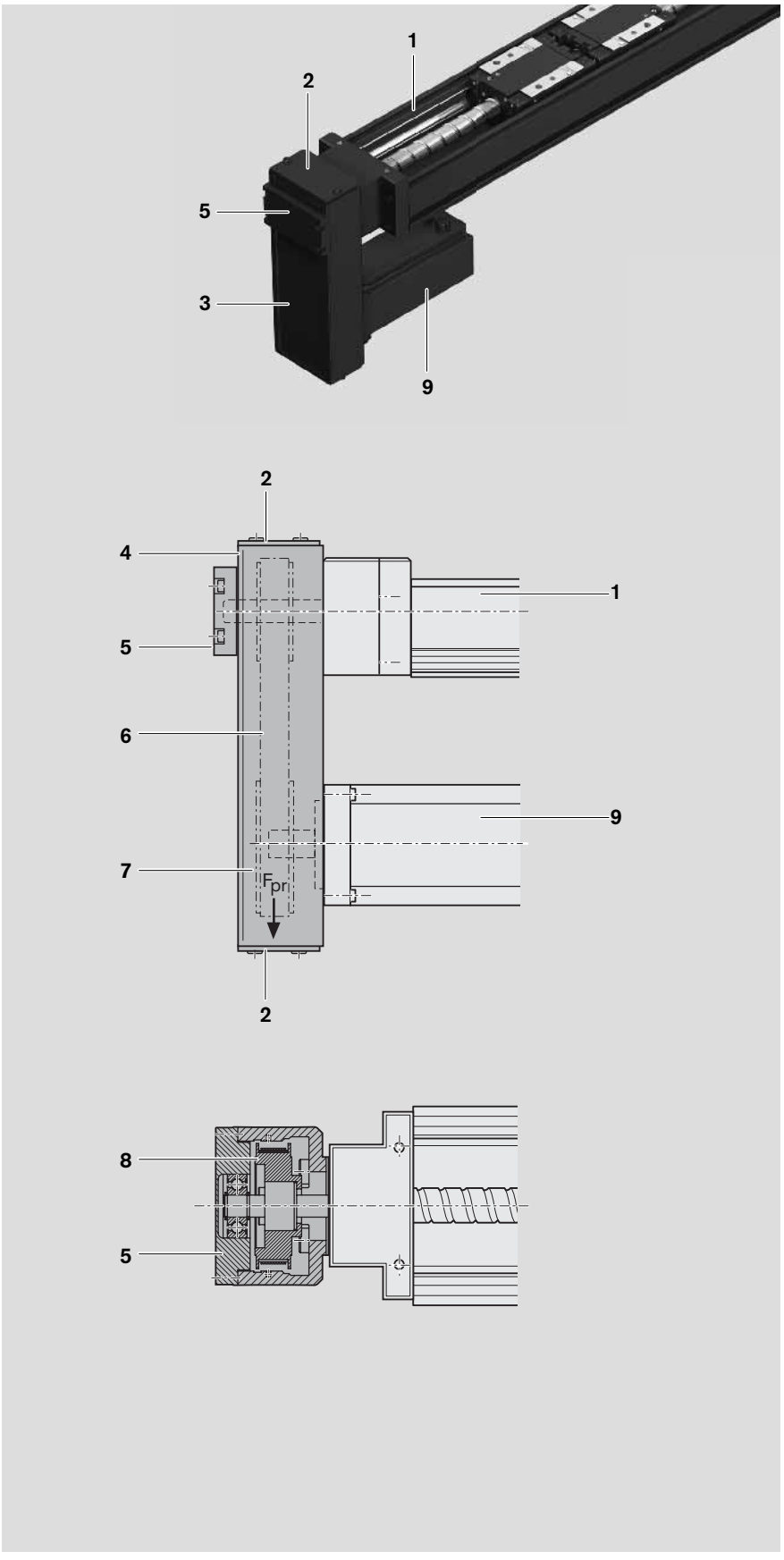
Motor attachment with timing belt side drive

On Precision Modules PSK 60 and PSK 90 the motor (9) 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 protects the belt and secures the motor.

The following gear ratios are available:
i = 1 : 1
i = 1 : 1.5

The timing belt side drive can be mounted in four different directions:
– top, bottom
– left, right

1 Precision module
2 End cover
3 Cover plate
4 Drawn, anodized aluminum profile
5 Ball screw journal with support bearing
6 Toothed belt
7 Pre-tensioning of the toothed belt: Apply pretensioning force F_{pr} to motor (F_{pr} will be indicated on delivery)
8 Belt pulleys
9 AC servo motor



Technical Data

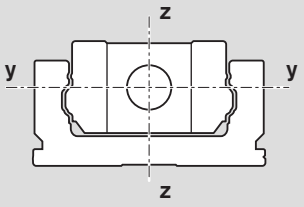
Dynamic characteristics

Precision Module	Type of cover	Carriage (carr.)		Guideway			Ball screw		Fixed bearing
			Number	Dynamic load capacity C (N)	Dynamic load moments M_t (Nm)	M_L (Nm)	Size d_0 x P	Dynamic load capacity C (N)	Dynamic load capacity C (N)
PSK 40	W/o and w/plate	Standard	1 carr.	3 065	43.1	14.8	6 x 1	900	820
			2 carr.	4 980	70.0	2.49 x l_m	6 x 2	890	820
PSK 50	W/o and w/plate	Standard	1 carr.	7 300	150.0	35	8 x 2.5	2 200	1 600
			2 carr.	11 850	244.0	5.93 x l_m	8 x 2.5	2 200	1 600
	Strip	Standard	1 carr.	7 300	150.0	35	8 x 2.5	2 200	1 600
		Long	1 carr.	11 850	244.0	356	8 x 2.5	2 200	1 600
PSK 60	W/o and w/plate	Standard	1 carr.	7 300	170.0	35	12 x 2	2 240	4 000
			2 carr.	11 850	276.0	5.93 x l_m	12 x 2	2 240	4 000
		Long	1 carr.	9 000	210.0	60	12 x 5	3 800	4 000
			2 carr.	14 620	341.0	7.31 x l_m	12 x 5	3 800	4 000
	Strip	Standard	1 carr.	9 000	210.0	60	12 x 10	2 500	4 000
		Long	1 carr.	14 620	341.0	541	12 x 10	2 500	4 000
PSK 90	W/o and w/plate	Standard	1 carr.	21 300	710.0	150	16 x 5	12 300	13 400
			2 carr.	34 600	1153.0	17.3 x l_m	16 x 5	12 300	13 400
		Long	1 carr.	27 500	910.0	270	16 x 10	9 600	13 400
			2 carr.	44 670	1478.0	22.34 x l_m	16 x 10	9 600	13 400
	Strip	Standard	1 carr.	21 300	710.0	150	16 x 16	6 300	13 400
		Long	1 carr.	34 600	1153.0	1557	16 x 16	6 300	13 400

l_m = center-to-center distance between carriages (mm)
d_0 = screw diameter (mm)
P = screw lead (mm)
carr. = carriage(s) (mm)
m_{ca} = moved mass of system (kg)

General technical data

Precision Module	Planar moment of inertia		Minimum center-to-center distance $l_{m\,min}$		Mass of the linear motion system m_s (kg)			
	I_y (cm⁴)	I_z (cm⁴)	Standard carr. (mm)	Long carr. (mm)	Without cover, without drive	Without cover, with drive	With cover plate	With sealing strip
PSK 40	0.892	6.65	50	–	0.0026 · L + m_{ca}	0.0028 · L + 0.075 + m_{ca}	0.0030 · L + 0.089 + m_{ca}	–
PSK 50	1.690	13.50	60	–	0.0035 · L + m_{ca}	0.0038 · L + 0.179 + m_{ca}	0.0041 · L + 0.204 + m_{ca}	0.0042 · L + 0.208 + m_{ca}
PSK 60	5.380	34.48	60	75	0.0062 · L + m_{ca}	0.0069 · L + 0.254 + m_{ca}	0.0072 · L + 0.281 + m_{ca}	0.0073 · L + 0.272 + m_{ca}
PSK 90	22.340	145.80	90	110	0.0125 · L + m_{ca}	0.0138 · L + 0.638 + m_{ca}	0.0146 · L + 0.726 + m_{ca}	0.0147 · L + 0.736 + m_{ca}



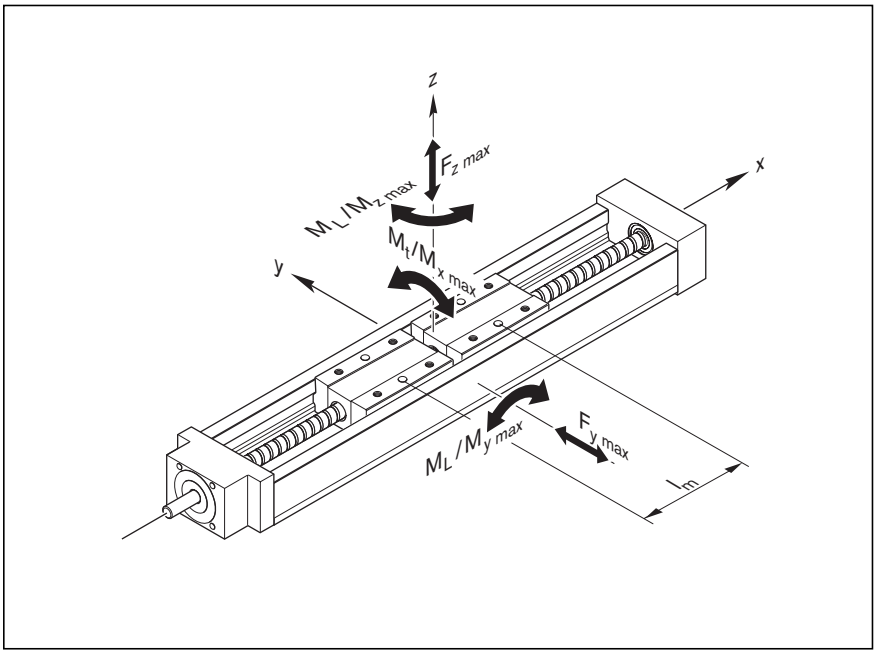
Mass
Mass calculation without motor and switches.
Mass formula:
Mass factor (kg/mm) · length L (mm) + mass of all parts of fixed length (kg) + moved mass of system m_{ca} (kg)

Modulus of elasticity E E = 210,000 N/mm²

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.

Maximum permissible loads
The maximum permissible forces ($F_{y\,max}$, $F_{z\,max}$) and moments ($M_{x\,max}$, $M_{y\,max}$, $M_{z\,max}$) are equal to half the dynamic characteristics (**C, M_t, M_L**).

Suitable loads (recommended values)
With respect to the desired service life, loads up to about 20% of the characteristic dynamic values (**C, M_t, M_L**) have proven acceptable.
At the same time, the following may not be exceeded:
– maximum permissible loads
– permissible drive torque
– permissible travel speed



l_m = center-to-center distance between carriages (mm)

Moved mass of system m_{ca}

Precision Module	Carriage	Moved mass of system m_{ca} (kg)						
		Without cover, without drive		Without cover, with drive		With cover plate		With sealing strip
		1 carr.	2 carr.	1 carr.	2 carr.	1 carr.	2 carr.	1 carr.
PSK 40	Standard	0.08	0.17	0.09	0.18	0.14	0.28	–
PSK 50	Standard	0.20	0.40	0.22	0.42	0.29	0.56	0.20
	Long	–	–	–	–	–	–	0.37
PSK 60	Standard	0.25	0.49	0.27	0.52	0.38	0.73	0.33
	Long	0.34	0.69	0.37	0.71	0.51	1.00	0.58
PSK 90	Standard	0.77	1.54	0.85	1.62	1.09	2.10	0.80
	Long	1.04	2.08	1.11	2.15	1.43	2.79	1.40

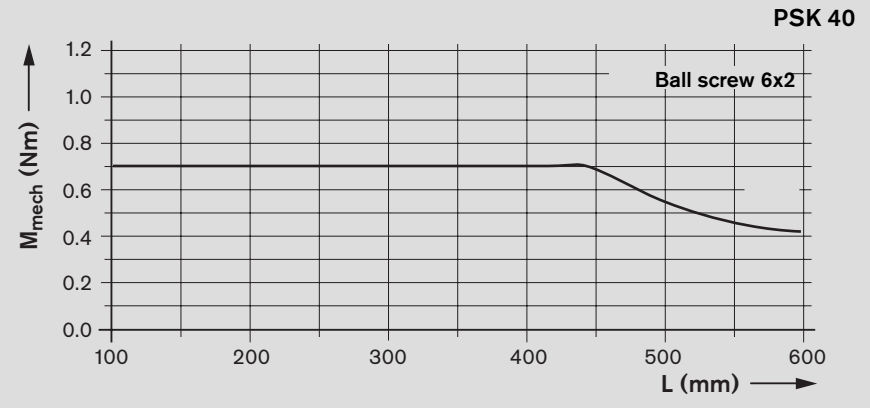
carr. = carriage(s) (mm)

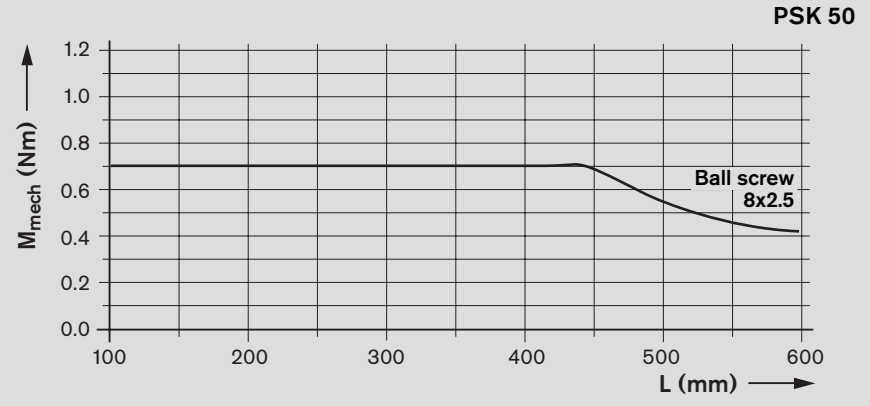
Technical Data

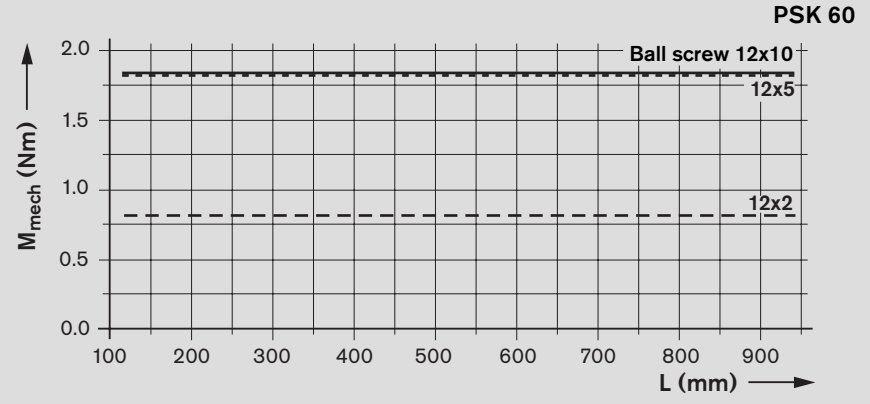
Maximum permissible drive torque for mechanical system M_{mech}

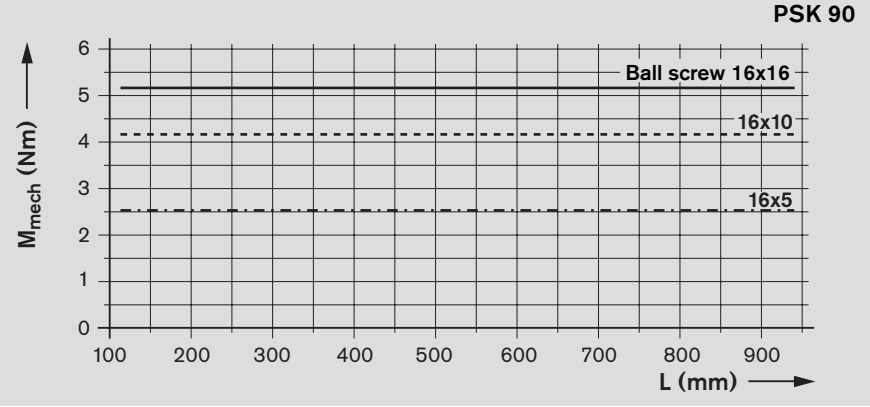
The values shown for M_{mech} are applicable under the following conditions:
- Horizontal operation
- Ball screw journal without keyway
- No radial load on ball screw shaft

Consider the rated torque of the coupling used!









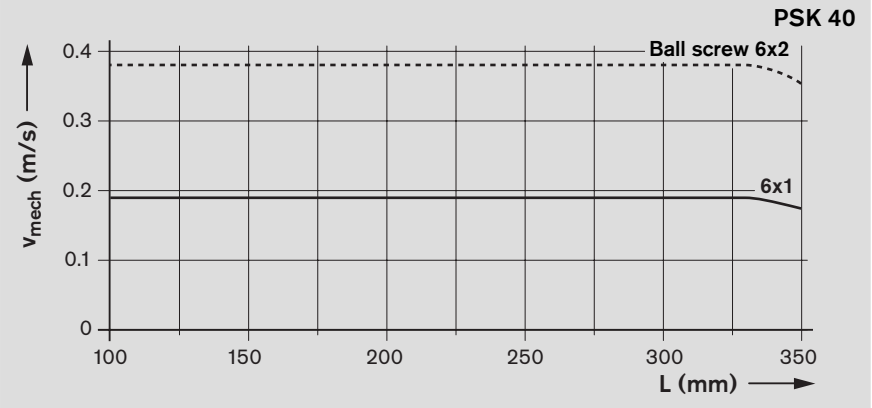
Ball screw journal with keyway
For PSK 90:
If a keyway is used, when comparing the chart against the table, the lower of the two values will always apply!

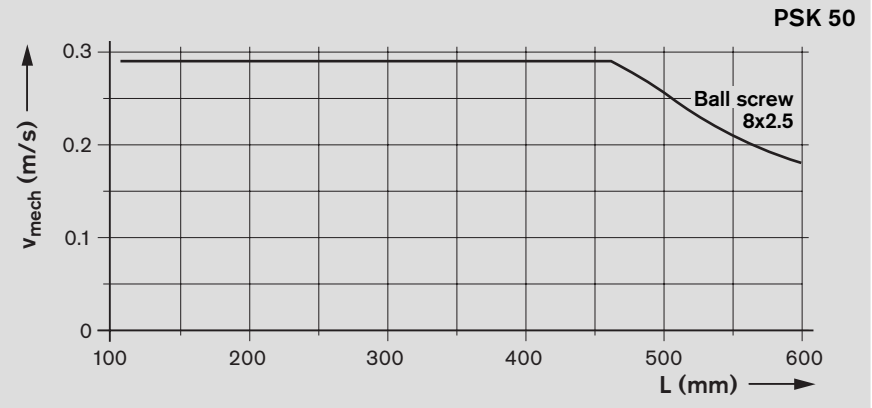
Precision Module	M_{mech} (Nm)
PSK 90	3.2

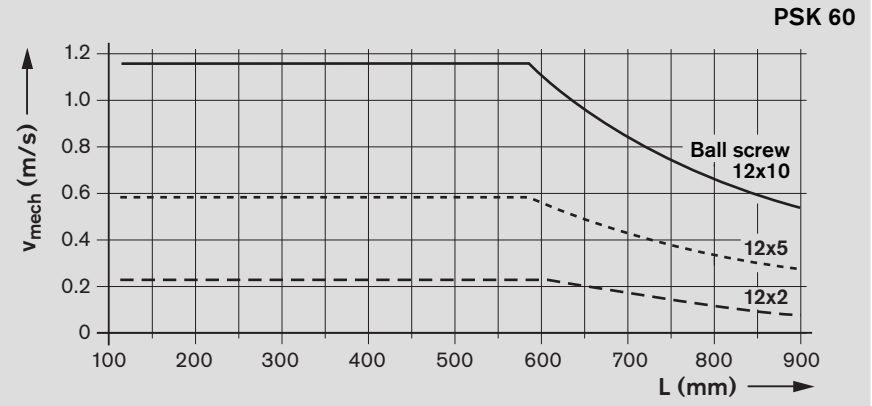
M_{mech}	=	maximum permissible drive torque for mechanical system	(N)
L	=	PSK length	(mm)
Ball screw	=	ball screw size: d_0 x P	
d_0	=	screw diameter	(mm)
P	=	lead	(mm)

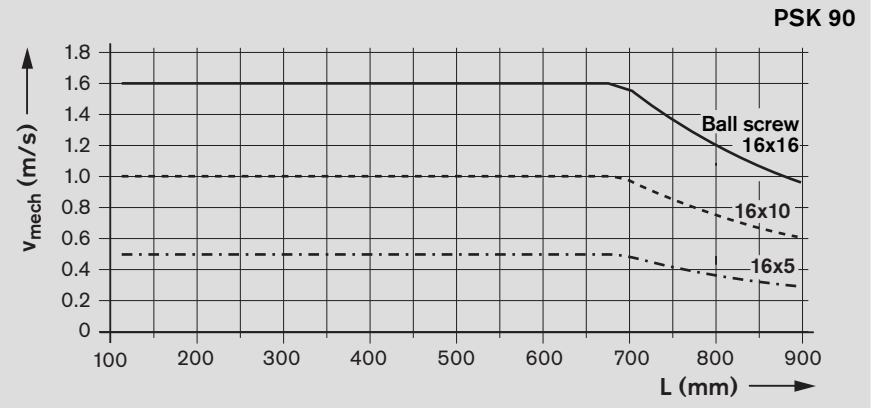
Maximum permissible linear speed of mechanical system v_{mech}

Consider the motor speed!









v_{mech}	=	maximum permissible linear speed of mechanical system	(m/s)
L	=	PSK length	(mm)
Ball screw	=	ball screw size: d_0 x P	
d_0	=	screw diameter	(mm)
P	=	lead	(mm)

Technical Data

Drive data of timing belt side drive, fixed bearing end for motor attachment via timing belt side drive

Motor type		MSM 030B / MSM 030C / MSK 030C					MSM 040B / MSK 040C				
Frictional torque M_{Rsd} (Nm)		0.35					0.4				
		Permissible torque up to length L = ... at			Reduced mass moment of inertia at		Permissible torque up to length L = ... at			Reduced mass moment of inertia at	
Gear ratio			i = 1	i = 1.5	i = 1	i = 1.5		i = 1	i = 1.5	i = 1	i = 1.5
Precision Module	Ball screw size d_0 x P	L (mm)	M_{sd} (Nm)	M_{sd} (Nm)	J_{sd} (10^{-6} kgm^2)	J_{sd} (10^{-6} kgm^2)	L (mm)	M_{sd} (Nm)	M_{sd} (Nm)	J_{sd} (10^{-6} kgm^2)	J_{sd} (10^{-6} kgm^2)
PSK 60	12 x 2	940	0.80	0.50	45.6	17.7	–	–	–	–	–
	12 x 5	940	1.60	1.10	45.6	17.7	–	–	–	–	–
	12 x 10	940	1.60	1.10	45.6	17.7	–	–	–	–	–
PSK 90	16 x 5	940	2.40	1.60	40.0	14.0	940	2.40	1.60	234	98.9
	16 x 10	940	2.50	1.70	40.0	14.0	940	3.90	2.60	234	98.9
	16 x 16	940	2.50	1.70	40.0	14.0	940	4.80	3.20	234	98.9

M_{Rsd} = frictional torque of timing belt side drive at motor journal (Nm)
M_{sd} = maximum permissible drive torque of the timing belt side drive (Nm); consider the maximum torque of the motor M_{max}
J_{sd} = mass moment of inertia of timing belt side drive (kgm^2)
i = timing belt side drive reduction
d_0 = screw diameter (mm)
P = screw lead (mm)

Frictional torque of the linear motion system M_{Rs}

Precision Module	Ball screw size d_0 x P	Frictional torque of the linear motion system M_{Rs} (Nm) for carriage version			
		Without cover or with cover plate 1 carr. or 2 carr.		With sealing strip 1 carr. or 2 carr.	
		Standard	Long	Standard	Long
PSK 40	6 x 1	0.033	–	–	–
	6 x 2	0.034	–	–	–
PSK 50	8 x 2.5	0.10	–	0.10	0.11
PSK 60	12 x 2	0.12	0.12	0.12	0.13
	12 x 5	0.13	0.14	0.14	0.15
	12 x 10	0.15	0.16	0.16	0.18
PSK 90	16 x 5	0.30	0.31	0.30	0.31
	16 x 10	0.30	0.33	0.32	0.35
	16 x 16	0.31	0.37	0.34	0.39

carr. = carriage(s) (mm)
d_0 = screw diameter (mm)
P = screw lead (mm)

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

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

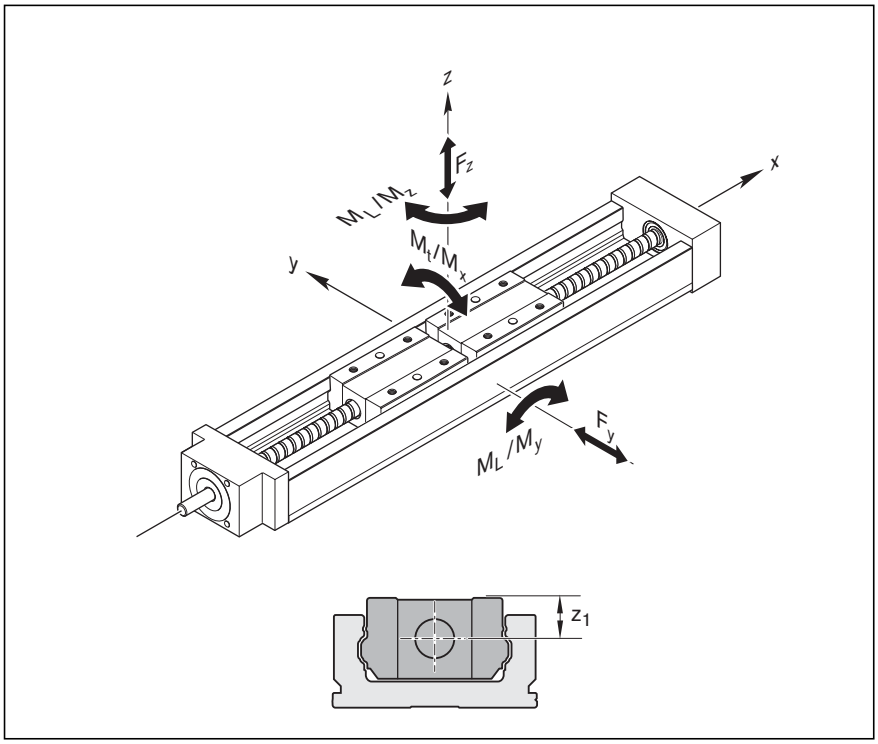
J_s = mass moment of inertia of linear motion system (without external load) (kgm^2)
$k_{J\,fix}$ = constant for fixed-length portion of mass moment of inertia ($10^6\ kgm^2$)
$k_{J\,m}$ = constant for mass-specific portion of mass moment of inertia ($10^6\ kgm^2$)
$k_{J\,var}$ = constant for variable-length portion of mass moment of inertia (10^9 kgm)
L = length (mm)

Precision Module	Ball screw size d_0 x P	Carriage	$k_{J\,fix}$ Without cover		$k_{J\,fix}$ Cover plate		$k_{J\,fix}$ Sealing strip	$k_{J\,var}$	$k_{J\,m}$
			1 carr.	2 carr.	1 carr.	2 carr.	1 carr.		
PSK 40	6 x 1	Standard	0.115	0.117	0.116	0.120	–	0.002	0.025
	6 x 2	Standard	0.122	0.131	0.127	0.141	–	0.002	0.101
PSK 50	8 x 2.5	Standard	0.533	0.565	0.544	0.587	0.530	0.004	0.158
		Long	–	–	–	–	0.557		
PSK 60	12 x 2	Standard	0.999	1.024	1.010	1.045	1.005	0.013	0.101
		Long	1.009	1.043	1.023	1.073	1.030		
	12 x 5	Standard	1.130	1.289	1.200	1.422	1.168	0.011	0.633
		Long	1.194	1.409	1.282	1.593	1.327		
	12 x 10	Standard	1.643	2.277	1.922	2.808	1.795	0.011	2.533
		Long	1.897	2.758	2.251	3.492	2.492		
PSK 90	16 x 5	Standard	4.216	4.703	4.368	5.007	4.184	0.031	0.633
		Long	4.216	4.703	4.368	5.007	4.184		
	16 x 10	Standard	5.831	7.781	6.439	8.997	5.704	0.031	2.533
		Long	6.489	9.124	7.300	10.745	7.224		
	16 x 16	Standard	9.213	14.207	10.770	17.319	8.889	0.034	6.485
		Long	10.899	17.643	12.974	21.793	12.780		

Coupling data

Precision Module	for motor attachment	Coupling data Rated torque M_{cN} (Nm)	Mass moment of inertia J_c ($10^{-6}\ kgm^2$)	Weight m_c (kg)
PSK 40	MSM 020B	0.70	0.12	0.015
PSK 50	MSM 020B	1.90	2.10	0.040
	MSM 030B	3.70	7.00	0.075
	MSK 030C	3.70	7.00	0.075
	VRDM 368	3.70	7.00	0.075
PSK 60	MSM 030B	3.70	7.00	0.075
	MSK 030C	1.90	2.10	0.040
	VRDM 368	5.50	20.00	0.040
PSK 90	MSM 030C	10.00	35.00	0.170
	MSM 040B	9.00	60.00	0.260
	MSK 030C	10.00	35.00	0.170
	MSK 040C	9.00	60.00	0.260
	VRDM 3910	9.00	60.00	0.260
	VRDM 397	9.00	60.00	0.260

Technical Data, Calculations



Combined equivalent load on bearing of the linear guide

$$(1) \qquad F_{comb} = |F_y| + |F_z| + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$

F_{comb}	=	combined equivalent load on bearing	(N)
F_y	=	force in y-direction	(N)
F_z	=	force in z-direction	(N)
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)
C	=	dynamic load capacity	(N)
M_t	=	dynamic torsional moment load capacity	(Nm)
M_L	=	dynamic longitudinal moment load capacity	(Nm)

	z_1 (mm)		
	Without cover	**Cover plate**	**Sealing strip**
PSK 40	11	23	–
PSK 50	13	27	27
PSK 60	17	32	32
PSK 90	22	44	44

z_1 = distance between guideway centerline and top edge of carriage (mm)

Nominal life

Nominal life of the guideway in meters:

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

Nominal life of the guideway in hours:

(3) $$L_h = \frac{L}{3600 \cdot v_m}$$

Frictional torque

Frictional torque for motor attachment via motor mount and coupling:

(4) $$M_R = M_{Rs}$$

Frictional torque for motor attachment via timing belt side drive:

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

Mass moment of inertia

for motor attachment via motor mount and coupling:

(6) $$J_{ex} = J_s + J_t + J_c$$

for motor attachment via timing belt side drive:

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

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

(8) $$J_t = m_{ex} \cdot k_{Jm} \cdot 10^{-6}$$

C	=	dynamic load capacity	(N)
F_{comb}	=	combined equivalent load on bearing	(N)
i	=	timing belt side drive reduction	(–)
J_c	=	mass moment of inertia, coupling	(kgm^2)
J_{ex}	=	mass moment of inertia of mechanical system	(kgm^2)
J_s	=	mass moment of inertia of linear motion system (without external load)	(kgm^2)
J_t	=	translatory mass moment of inertia of external load referred to the drive journal	(kgm^2)
k_{Jm}	=	constant for mass-specific portion of mass moment of inertia	($10^6\ m^2$)
L	=	nominal life	(m)
L_h	=	nominal life	(h)
m_{ex}	=	moved external load	(kg)
M_R	=	frictional torque at motor journal	(Nm)
$M_{R\,sd}$	=	frictional torque of timing belt side drive	(Nm)
M_{Rs}	=	frictional torque of linear motion system	(Nm)
v_m	=	average speed	(m/s)

Technical Data, Calculations

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

(8) $$J_{dc} = J_{ex} + J_{br}$$

Mass moment of inertia ratio

(9) $$V = \frac{J_{dc}}{J_m}$$

Application area	V
Handling	≤ 6.0
Machining	≤ 1.5

Total mass moment of inertia referred to the motor journal

(10) $$J_{tot} = J_{dc} + J_m$$

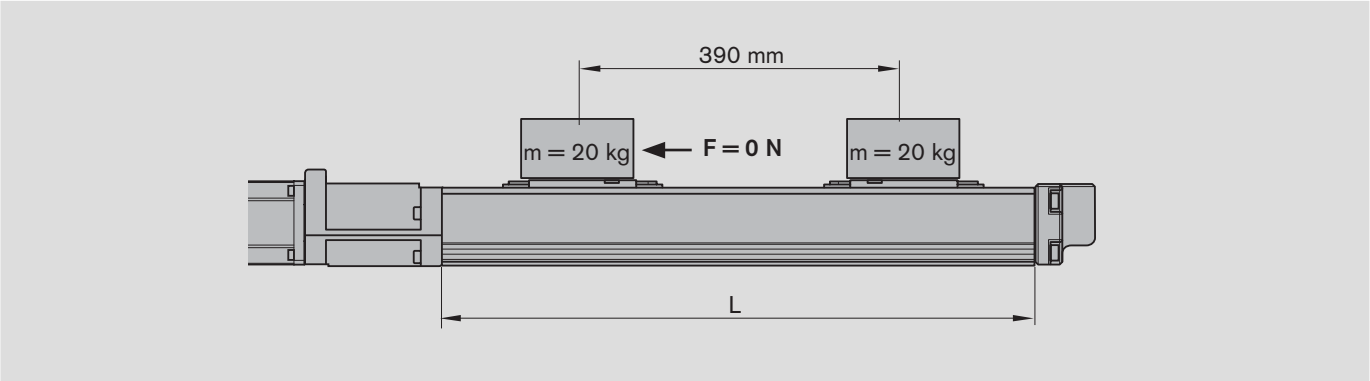
Maximum permissible rotary speed for mechanical system

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

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

i	=	timing belt side drive reduction	(–)
J_{br}	=	mass moment of inertia, motor brake	(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_{tot}	=	total mass moment of inertia	(kgm^2)
$n_{m\,max}$	=	maximum permissible rotary speed of motor 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 linear speed of mechanical system	(m/s)

Calculation example



Given data

A mass of 20 kg is to be moved 390 mm at a maximum travel speed of 0.6 m/s.

Module selected based on the technical data and the connection dimensions:

- PSK 90 without cover and with a standard length steel carriage; motor attachment via integrated motor mount and coupling
- Motor type MSK 030C

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.

Estimation of the PSK module length L

Excess travel	=	2 · P = 2 · 16 mm = 32 mm (in accordance with the formula given in "PSK 90 Components and Ordering Data")

Selection of ball screw:
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} = 0.6 m/s: Ball screw 16x10 and 16x16;
Ball screw selected:
Ball screw 16x10 with v_{mech} = 1 m/s
M_{mech} = 4.1 Nm with ball screw 16x10
(according to the chart "Maximum permissible drive torque")

Calculation of PSK length L

Excess travel	=	2 · P = 2 · 10 mm = 20 mm
Length L	=	(effective stroke + 2 · excess travel) + 100 mm = (390 mm + 2 · 20 mm) + 100 mm = 530 mm
Selected:		Standard length L = 540 mm; hole spacing in frame: 70 mm / 4 · 100 mm / 70 mm

Frictional torque M_R

M_R	=	M_{Rs}
M_R	=	0.30 Nm (see "Technical Data")

Calculation example (continued)

Mass moment of inertia of mechanical system:

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

$J_s = (k_{J\,fix} + k_{J\,var} \cdot L)$
$= (5.831 + 0.031 \cdot 540\ mm) \cdot 10^{-6}$
$= 22.57 \cdot 10^{-6}\ kgm^2$ (see “Technical Data”)

$J_t = m_{ex} \cdot k_{J\,m} \cdot 10^{-6}$
$= 20\ kg \cdot 2.533 \cdot 10^{-6}\ kgm^2$
$= 50.66 \cdot 10^{-6}\ kgm^2$ (see “Technical Data”)

$J_c = 60 \cdot 10^{-6}\ kgm^2$ (see “Technical Data”)
$J_{ex} = (22.57 + 50.66 + 60) \cdot 10^{-6}\ kgm^2$
$= 133.23 \cdot 10^{-6}\ kgm^2$

$J_{dc} = J_{ex} + J_{br}$
$J_{br} = 7.0 \cdot 10^{-6}\ kgm^2$ (see “Motors”)
$J_{dc} = (133.23 + 7.0) \cdot 10^{-6}\ kgm^2$
$= 140.23 \cdot 10^{-6}\ kgm^2$

Mass moment of inertia for handling ($V \leq 6$):

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

$$V = \frac{140.23 \cdot 10^{-6}\ kgm^2}{30 \cdot 10^{-6}\ kgm^2} = 4.67 < 6$$

Rotary speed n:

$$n_{mech} = \frac{v \cdot i \cdot 1000 \cdot 60}{10} = \frac{0.6\ m/s \cdot 1 \cdot 1000}{\cdot 60} = 3600\ min^{-1}$$

Result

Precision Module PSK 90 without cover and with one standard-length steel carriage; Motor MSK 030C, attached via integrated mount and coupling:

Standard length	L	=	540 mm;
Hole spacing in frame:			70 mm / 40 · 100 mm / 70 mm
Ball screw 16 x 10 with	v_{mech}	=	1 m/s > 0.6 m/s
	M_{mech}	=	4.1 Nm
Frictional torque	M_R	=	0.30 Nm
Motor MSK 030C:			
Mass moment of inertia	J_m	=	$30 \cdot 10^{-6}\ kgm^2$; V = 4.67 < 6
Rotary speed	$n_{m\,max}$	=	$9000\ min^{-1} > 3600\ min^{-1}$
Torque	M_{max}	=	4.0 Nm < 4.1 Nm

For final motor selection, the drive and performance data must be recalculated as specified in the Rexroth catalog “Control Systems, Electrical Accessories, ...”

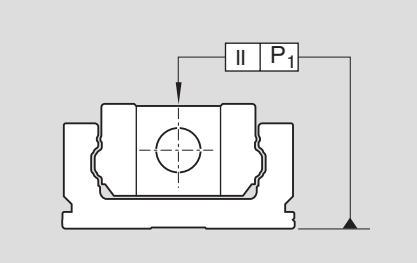
Accuracy

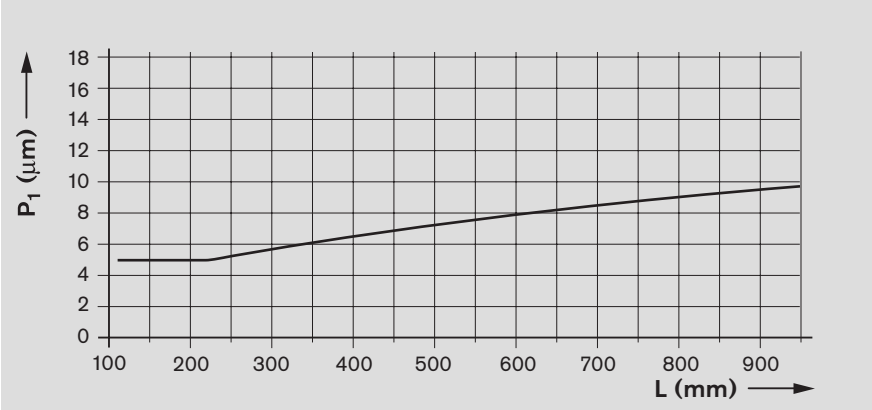
General note

All accuracy figures apply to the module when screwed down and assume an ideally flat mounting base. The values given do not take account of any shape deviations in the mounting base surface.

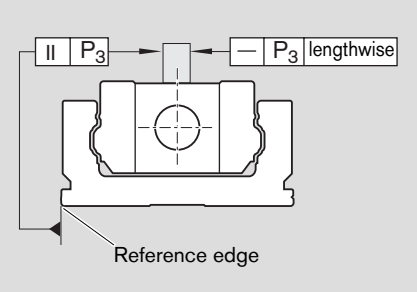
Accuracy P_1

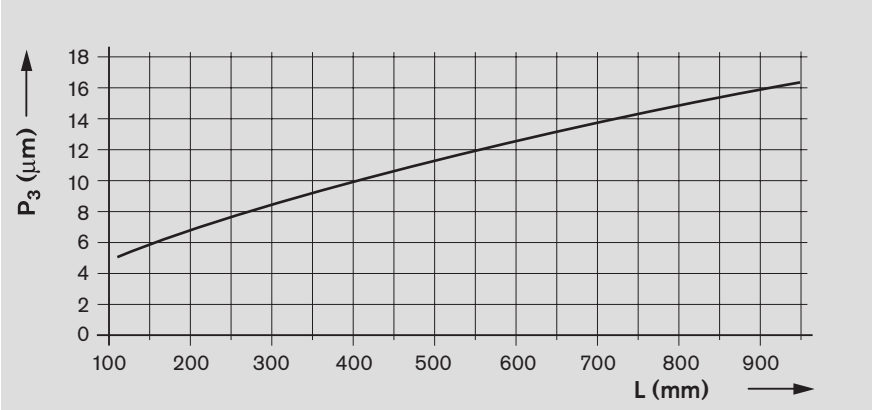
Measured at the carriage center





Accuracy P_3





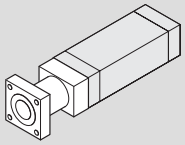
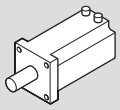
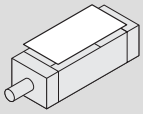
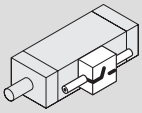
Precision Module PSK 40 Components and Ordering Data

Part number, length R1465 100 00, ... mm				Guideway	Drive unit			Carriage version Steel				
Reference edge (RE)					Screw journal	Ball screw size d_0 x P		Without cover		Cover plate		
Version	RE left	RE right				6 x 1	6 x 2	Standard 1 carr.	Standard 2 carr.	Standard 1 carr.	Standard 2 carr.	
Without drive	OA01		OA01	L = 100 mm 10 L = 150 mm 12	without	50		01	02	–	–	
With ball screw, w/o motor mount	OF01	OF02	OF01 OF02	L = 200 mm 14 L = 250 mm 16	Ø4	01	02	01	02	21	22	
With ball screw and integrated mount	MF10	MF11	MF10 MF11	L = 300 mm 18 L = 350 mm 20	Ø4	30	31	01	02	21	22	

Ordering example: See “Inquiry/Order” form

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

d_0 = screw diameter (mm)
P = screw lead (mm)
carr. = carriage(s)
L = length

	Motor attachment		Motor		Type of cover		Switches / Cable duct / Socket-plug	Documentation	
									
	Attachment kit [1]	for motor	with brake	without brake	without	cover plate		Standard report	Measure-ment report
	00	–	00		00	–	**Without switch and cable duct** 00	01	02 Friction moment 03 Lead deviation 04 Travel accuracy 05 Positioning accuracy
	00	–	00		00	01	**Switches:** – Reed sensor 21-...[3] – Hall sensor 22-...[3] **Cable duct** 27 **Switching cam for PSK:** – Without cover or with cover plate 35		
	30	**NEMA 14-C**[2]	00		00	01			
	31	**NEMA 17-C**[2]	00						
	32	**NEMA 17-D**[2]	00						
	34	**MSM 020B**	69	68					

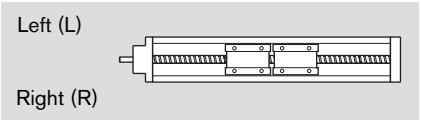
1) Attachment kit also available without motor (when ordering: enter “00” for motor).
2) Use motors complying with the appropriate NEMA specification.
Because of the varying shaft dimensions for NEMA-specification motors, the attachment kit does not include a coupling.
3) Mounting side for switches: left (L) or right (R)

Switch mounting arrangements

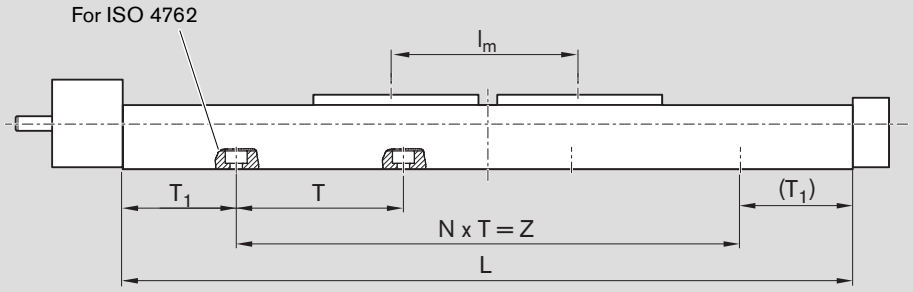
A cable duct is required for installation of the switches.

Refer to “Switch mounting arrangements” for more information on switch types and switch mounting.

Switches may only be mounted to one side of the Precision Module (left or right).



Precision Module PSK 40 Lengths and Hole Spacing



Length L

Type of cover	Number of carriages (carr.)	Carriage version Standard length
Without cover or with cover plate	1	L = (stroke + 2 · excess travel) + 55 mm
	2	L = (stroke + 2 · excess travel) + l_m + 55 mm $l_{m\,min}$ = 50 mm

l_m = center-to-center distance between carriages (consider $l_{m\,min}$)

Stroke = maximum travel of carriage center between the outermost switch activation points

In most cases the recommended limit for excess travel (braking path) is:
Excess travel = 2 · screw lead P

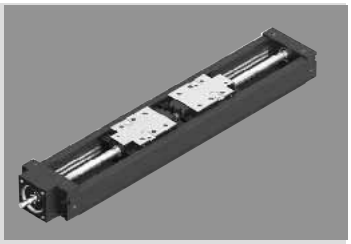
Example
Ball screw 6 x 2
(Ball screw size = d_0 x P):
Excess travel = 2 · 2 = 4 mm

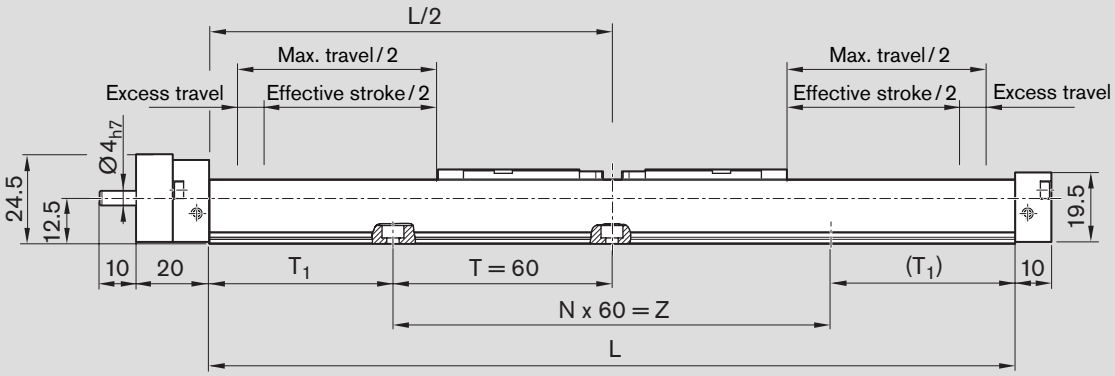
Standard lengths of frame

Length L (mm)	T (mm)	T_1 (mm)	N	Z (mm)	Mounting holes for ISO 4762 screws
100	60	20	1	60	M3
150	60	15	2	120	
200	60	40	2	120	
250	60	35	3	180	
300	60	30	4	240	
350	60	25	5	300	

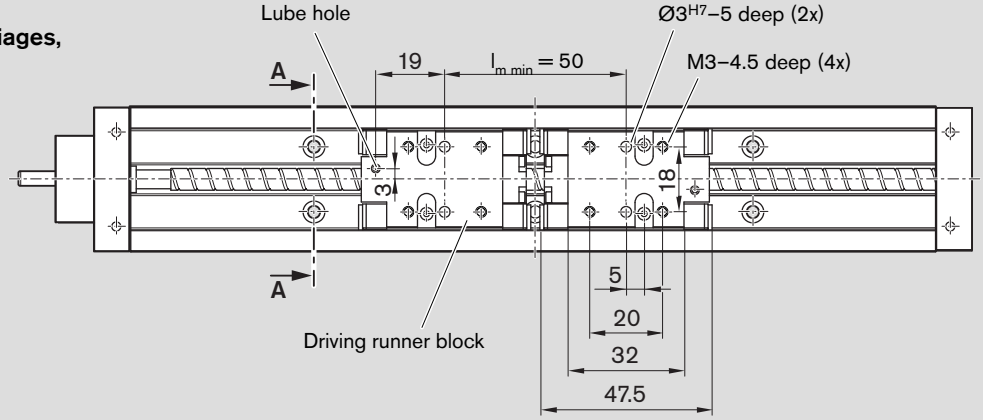
Precision Module PSK 40 Dimension Drawings without Cover

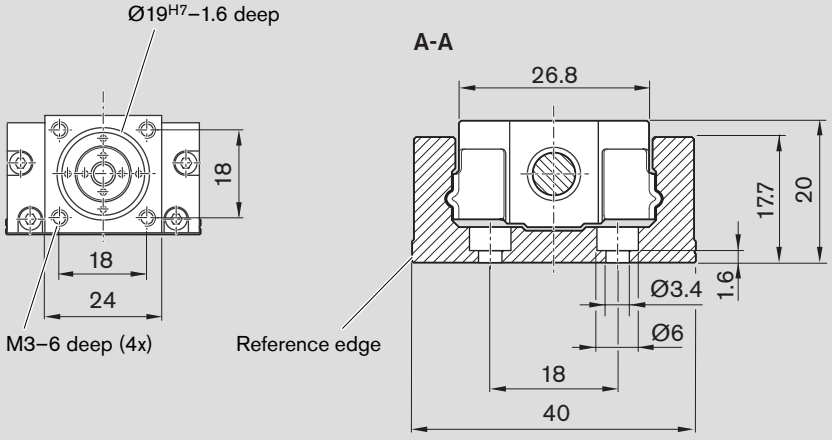
All dimensions in mm
Drawings not to scale





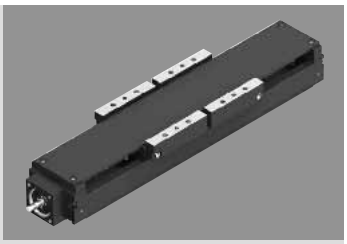
Version:
One or two carriages, standard length

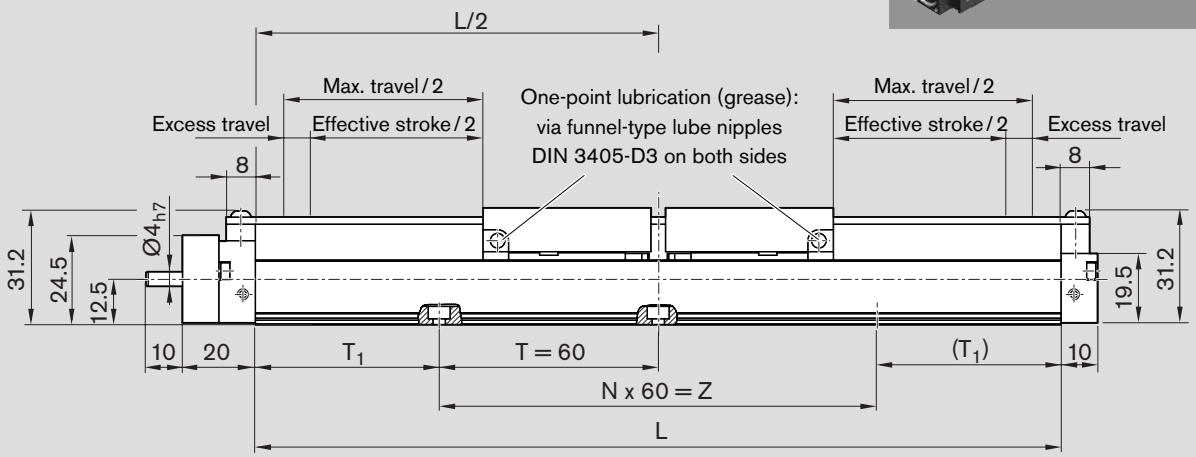




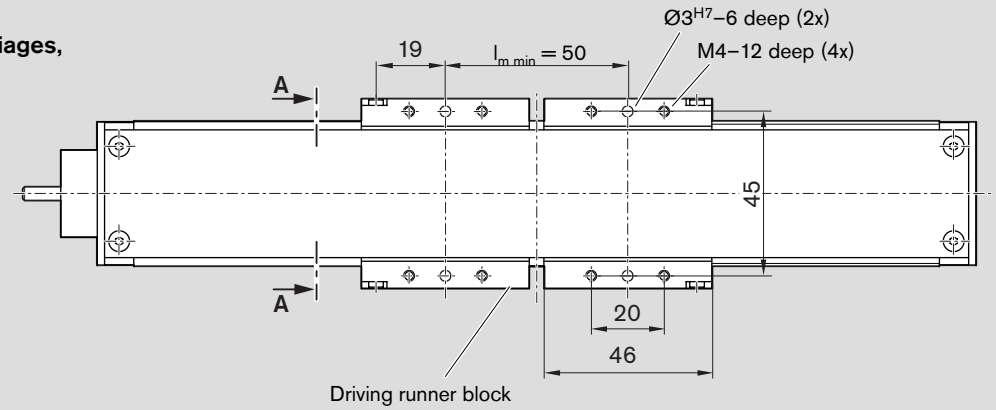
Precision Module PSK 40 Dimension Drawings with Cover Plate

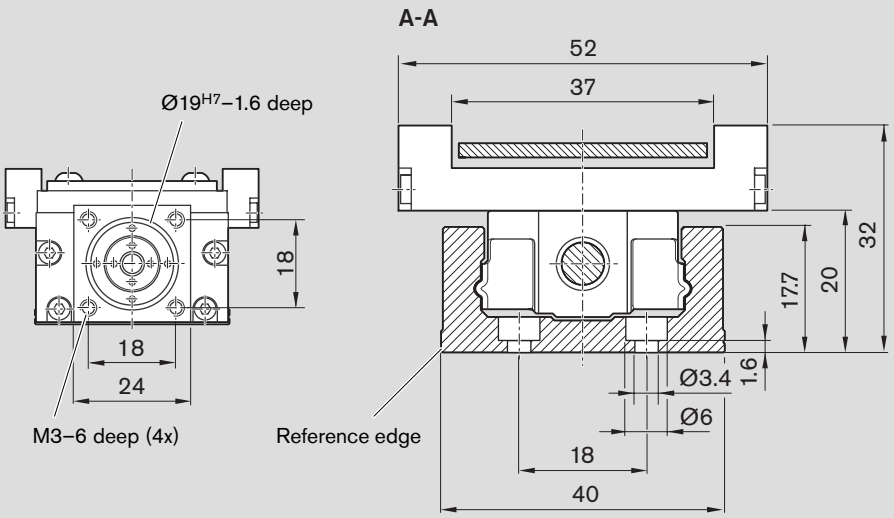
All dimensions in mm
Drawings not to scale





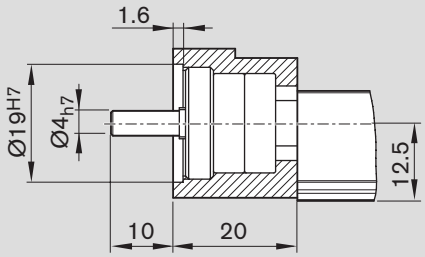
Version:
One or two carriages, standard length





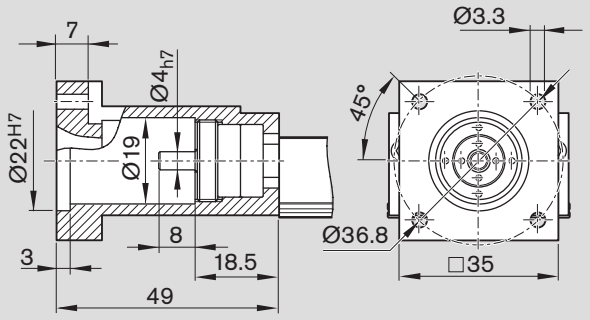
Precision Module PSK 40 Dimension Drawings, Motor Attachment

OF01, OF02



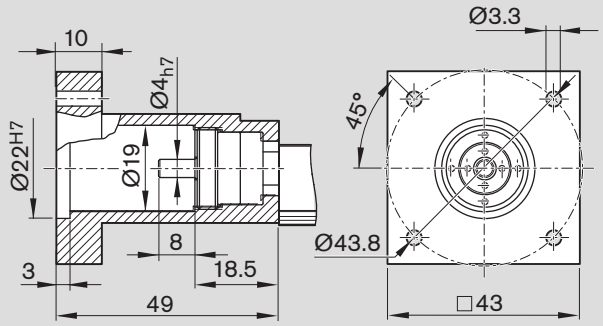
MF10, MF11

Integrated motor mount (NEMA 14 – Form C)



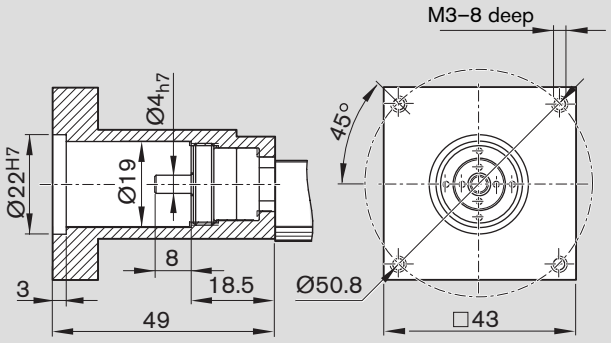
MF10, MF11

Integrated motor mount (NEMA 17 – Form C)



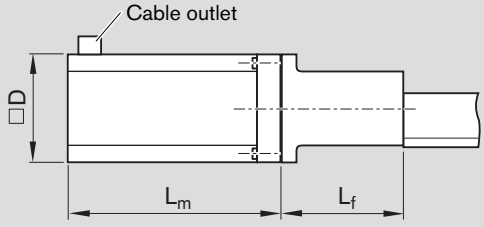
MF10, MF11

Integrated motor mount (NEMA 17 – Form D)



MF10, MF11

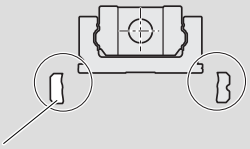
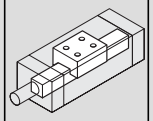
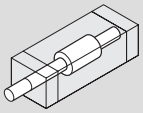
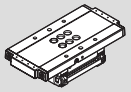
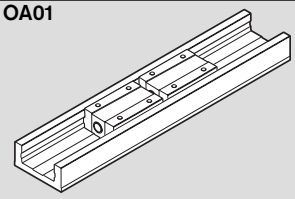
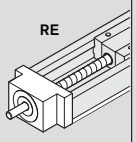
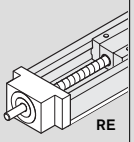
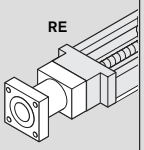
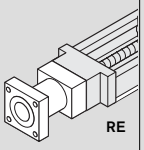
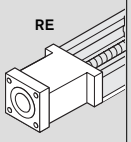
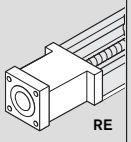
Motor with integrated motor mount and coupling



Motor type	Dimensions (mm)			
	D	L_f	L_m	
			without brake	with brake
MSM 020B	42	54	109	140.5

Drawings not to scale!
For further information and dimensions, see “Motors.”

Precision Module PSK 50 Components and Ordering Data

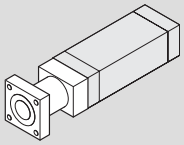
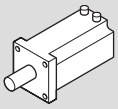
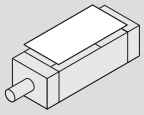
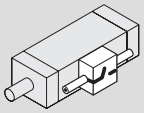
Part number, length R1465 200 00, ... mm  Reference edge (RE)			Guideway 	Drive unit 	Carriage version Steel   Aluminum 						
Version				Screw journal	Ball screw size d_0 x P	Without cover		Cover plate		Sealing strip	
						Standard		Standard		Stan-dard	Long
	RE left	RE right			8 x 2.5	1 carr.	2 carr.	1 carr.	2 carr.	1 carr.	1 carr.
Without drive	OA01 		OA01	without	50	01	02	–	–	–	–
With ball screw, w/o motor mount	OF01 	OF02 	OF01 OF02	Ø5	01	01	02	21	22	40	41
With ball screw and motor mount	MF01 	MF02 	MF01 MF02	Ø5	01	01	02	21	22	40	41
With ball screw and integrated mount	MF10 	MF11 	MF10 MF11	Ø5	30	01	02	21	22	40	41

L = 100 mm 09
L = 150 mm 10
L = 200 mm 11
L = 250 mm 12
L = 300 mm 13
L = 350 mm 14
L = 400 mm 15
L = 450 mm 16
L = 500 mm 17
L = 550 mm 18
L = 600 mm 19

Ordering example: See “Inquiry/Order” form

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

d_0 = screw diameter (mm)
P = screw lead (mm)
carr. = carriage(s)
L = length

Motor attachment		Motor		Type of cover			Switches / Cable duct / Socket-plug	Documentation	
									
Attachment kit [1]	for motor	with brake	without brake	without	cover plate	strip		Standard report	Measurement report
00	–	00		00	–	–	**Without switch and cable duct** 00	01	02 Friction moment
00	–	00		00	01	02	**Switches:** – Reed sensor 21-...[3] – Hall sensor 22-...[3]		03 Lead deviation
01	**MSM 030B**	71	70	00	01	02	**Cable duct** 26		04 Travel accuracy
03	**MSK 030C**	85	84				**Switching cam for PSK:** – Without cover or with cover plate 32 – With sealing strip 34		05 Positioning accuracy
02	**VRDM 368**	36	35						
31	**NEMA 17-D**[2]	00		00	01	02			
35	**NEMA 17-C**[2]	00							
34	**MSM 020B**	69	68						

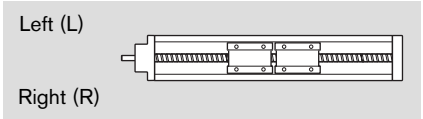
1) Attachment kit also available without motor (when ordering: enter “00” for motor).
2) Use motors complying with the appropriate NEMA specification.
Because of the varying shaft dimensions for NEMA-specification motors, the attachment kit does not include a coupling.
3) Mounting side for switches: left (L) or right (R)

Switch mounting arrangements

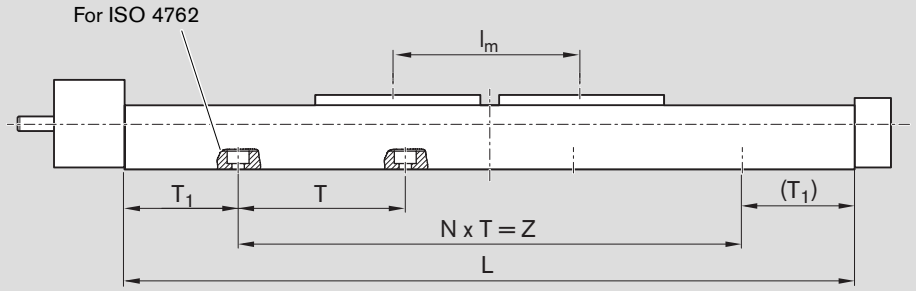
A cable duct is required for installation of the switches.

Refer to “Switch mounting arrangements” for more information on switch types and switch mounting.

Switches may only be mounted to one side of the Precision Module (left or right).



Precision Module PSK 50 Lengths and Hole Spacing



Length L

Type of cover	Number of carriages (carr.)	Carriage version	
		Standard length	Long
Without cover or with cover plate	1	L = (stroke + 2 · excess travel) + 70 mm	–
	2	L = (stroke + 2 · excess travel) + l_m + 70 mm $l_{m\,min}$ = 75 mm	–
With sealing strip	1	L = (stroke + 2 · excess travel) + 127 mm	L = (stroke + 2 · excess travel) + 187 mm

l_m = center-to-center distance between carriages (consider $l_{m\,min}$)

Stroke = maximum travel of carriage center between the outermost switch activation points

In most cases the recommended limit for excess travel (braking path) is:
Excess travel = 2 · screw lead P

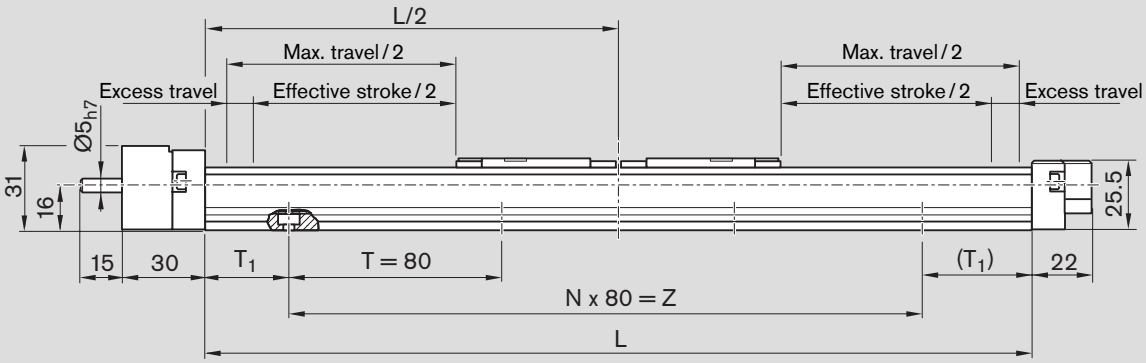
Example
Ball screw 8 x 2.5
(Ball screw size = d_0 x P):
Excess travel = 2 · 2.5 = 5 mm

Standard lengths of frame

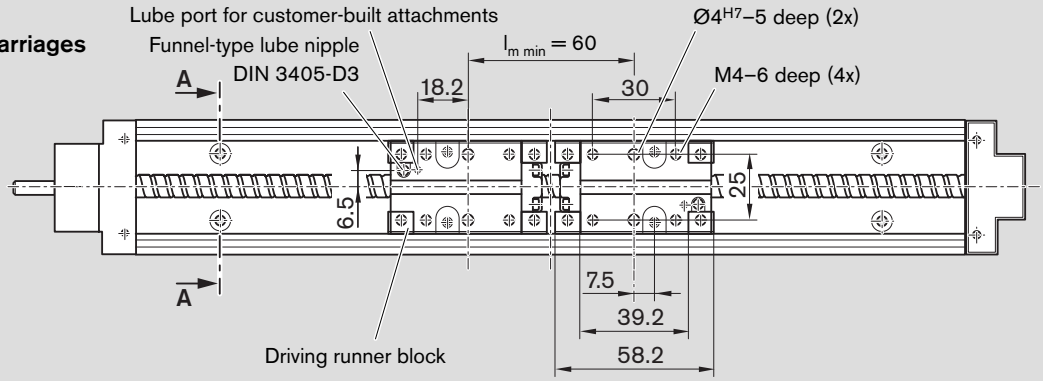
Length L (mm)	T (mm)	T_1 (mm)	N	Z (mm)	Mounting holes for ISO 4762 screws
100	80	10	1	80	M4
150	80	35	1	80	
200	80	20	2	160	
250	80	45	2	160	
300	80	30	3	240	
350	80	15	4	320	
400	80	40	4	320	
450	80	25	5	400	
500	80	50	5	400	
550	80	35	6	480	
600	80	20	7	560	

Precision Module PSK 50 Dimension Drawings without Cover

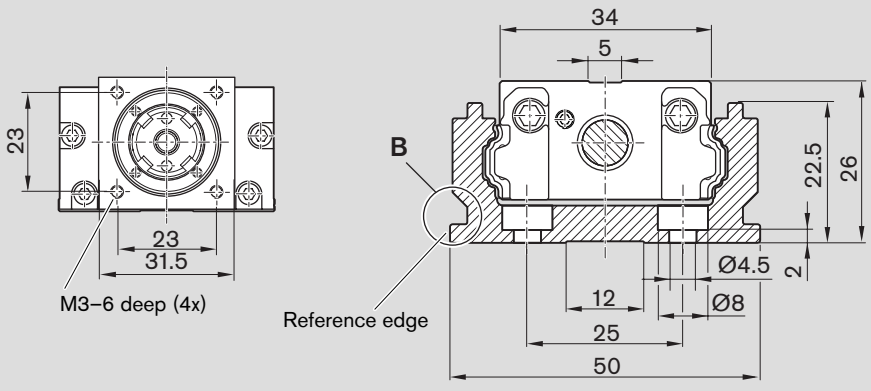
All dimensions in mm
Drawings not to scale

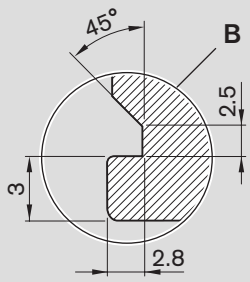


Version:
One or two carriages



A-A

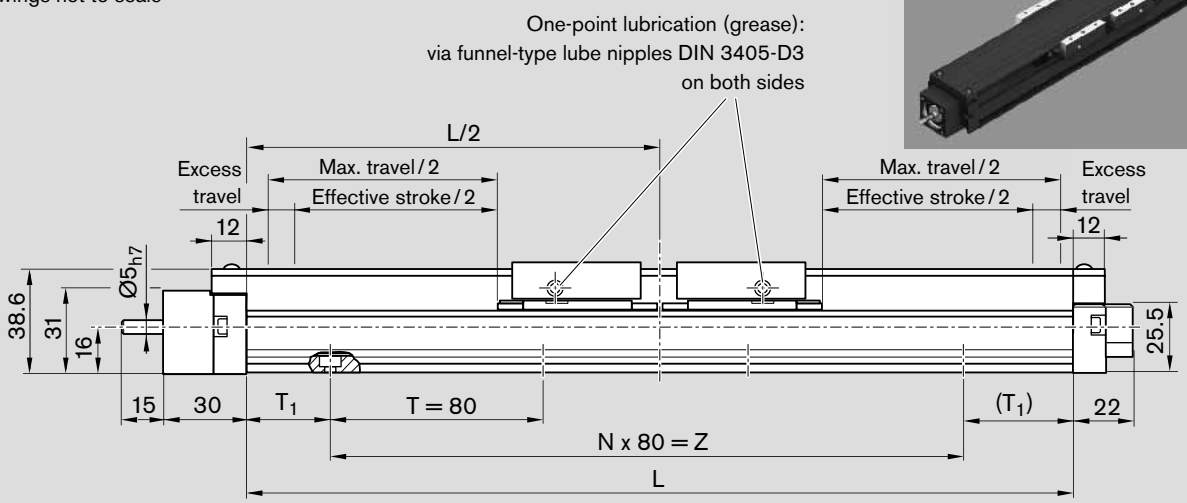




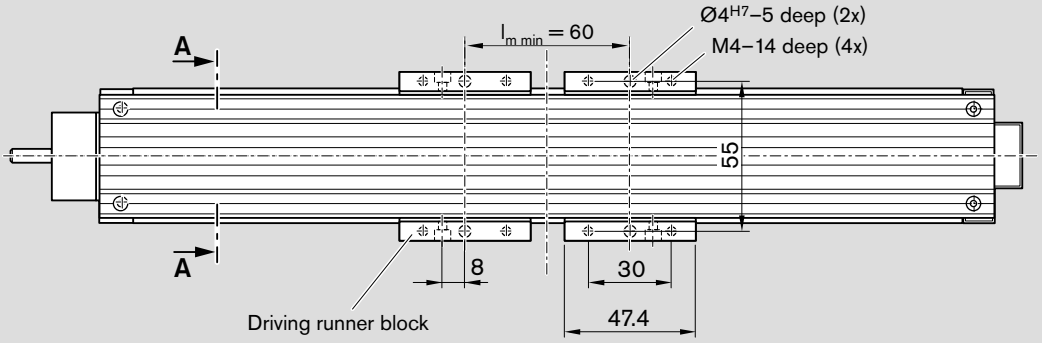
For fastening with clamping fixtures

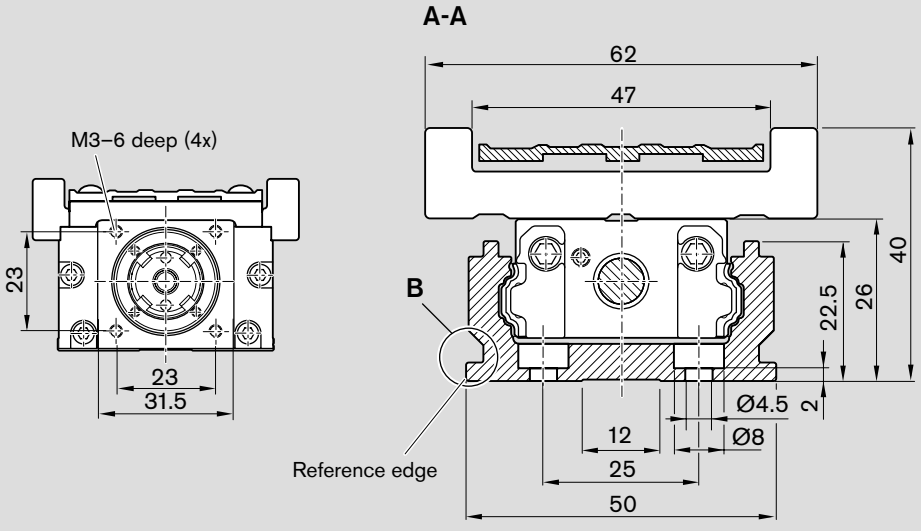
Precision Module PSK 50 Dimension Drawings with Cover Plate

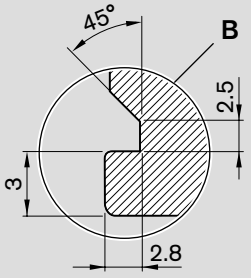
All dimensions in mm
Drawings not to scale



Version:



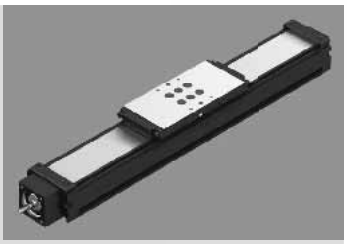


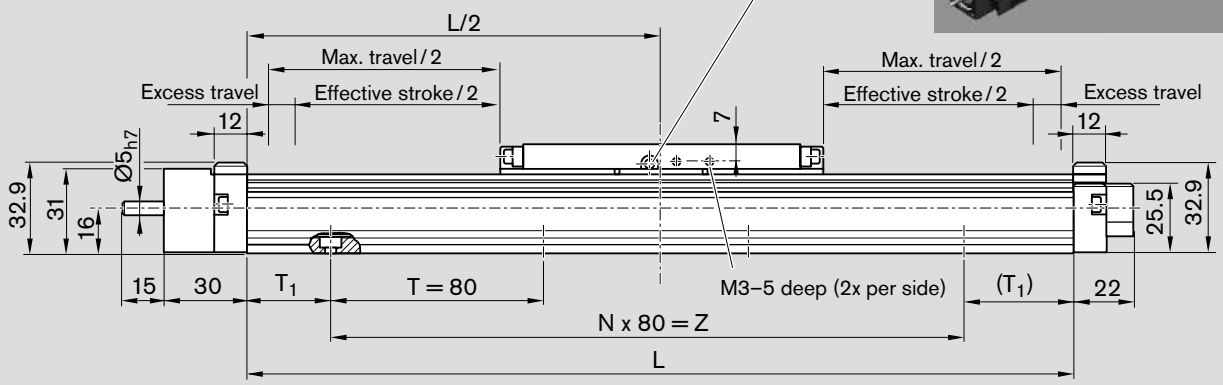


For fastening with clamping fixtures

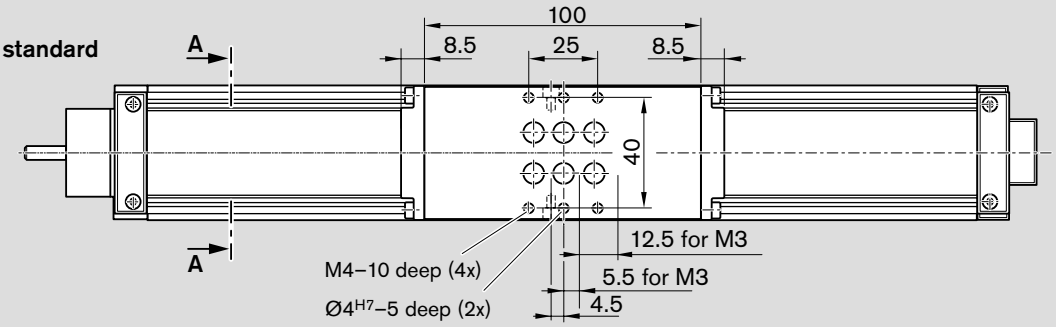
Precision Module PSK 50 Dimension Drawings with Sealing Strip

All dimensions in mm
Drawings not to scale

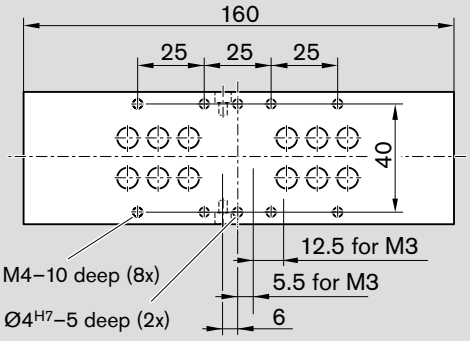


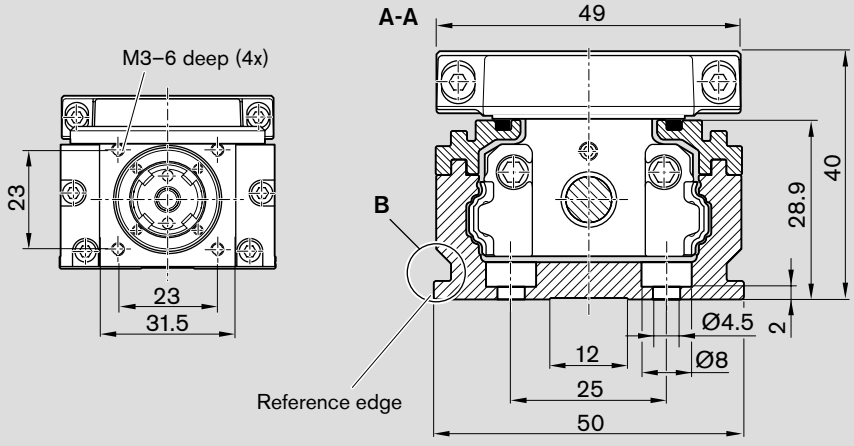


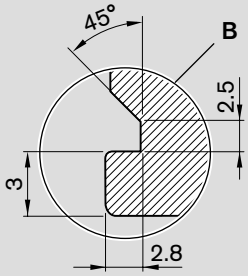
Version:
Carriage, standard length



Version:
Carriage, long





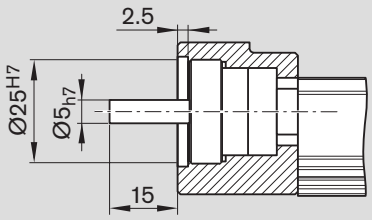


For fastening with clamping fixtures

Precision Module PSK 50

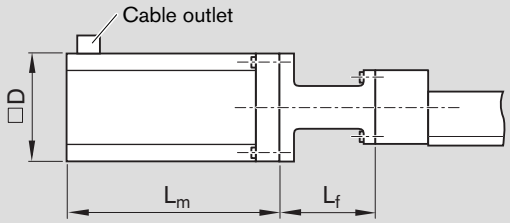
Dimension Drawings, Motor Attachment

OF01, OF02



MF01, MF02

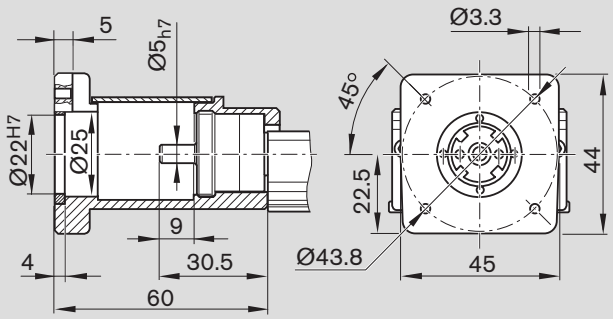
Motor with motor mount and coupling



Motor type	Dimensions (mm)			
	D	L_f	L_m without brake	L_m with brake
MSM 030B	60.0	53.0	111	144
MSK 030C	54.0	53.0	188	213
VRDM 368	57.2	53.0	116	157

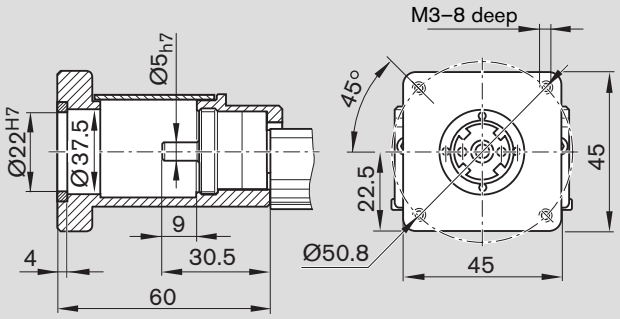
MF10, MF11

Integrated motor mount (NEMA 17 – Form C)



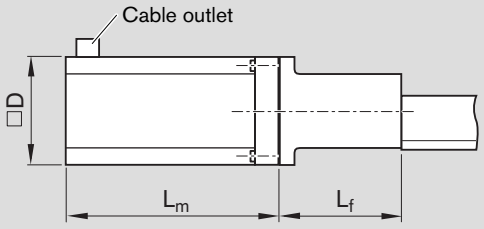
MF10, MF11

Integrated motor mount (NEMA 17 – Form D)



MF10, MF11

Motor with integrated motor mount and coupling



Motor type	Dimensions (mm)			
	D	L_f	L_m without brake	L_m with brake
MSM 020B	42	60	109	140.5

Drawings not to scale!
For further information and dimensions, see “Motors.”

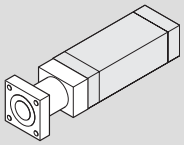
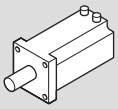
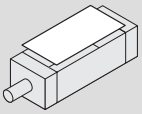
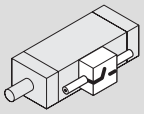
Precision Module PSK 60 Components and Ordering Data

Part number, length R1465 300 00, ... mm Reference edge (RE) Version				Guideway	Drive unit				Carriage version									
									Steel								Aluminum	
									Without cover				Cover plate				Sealing strip	
					Screw journal	Ball screw size d_0 x P			Standard		Long		Standard		Long		Standard	Long
	RE left	RE right				12x2	12x5	12x10	1carr.	2carr.	1carr.	2carr.	1carr.	2carr.	1carr.	2carr.	1carr.	1carr.
Without drive	OA01		OA01	L = 150 mm 10 L = 200 mm 11 L = 250 mm 12 L = 300 mm 13 L = 400 mm 15 L = 500 mm 17 L = 600 mm 19 L = 700 mm 21 L = 800 mm 23 L = 900 mm 25 L = 940 mm 26	without	50			01	02	03	04	–	–	–	–	–	–
With ball screw, w/o motor mount	OF01	OF02	OF01 OF02		Ø6	03	01	02	01	02	03	04	21	22	23	24	40	41
With ball screw and motor mount	MF01	MF02	MF01 MF02		Ø6	01	02	03	01	02	03	04	21	22	23	24	40	41
W/ball screw and integrated mount	MF10	MF11	MF10 MF11		Ø6	30	31	32	01	02	03	04	21	22	23	24	40	41
With ball screw and timing belt side drive	RV01	RV02	RV01 to RV08		for MSK 030C	53	51	52	01	02	03	04	21	22	23	24	40	41
	RV03	RV04																
	RV05	RV06			for MSM 030B	53	51	52	01	02	03	04	21	22	23	24	40	41
	RV07	RV08																

Ordering example: See “Inquiry/Order” form

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

d_0 = screw diameter (mm)
P = screw lead (mm)
carr. = carriage(s)
L = length

Motor attachment			Motor		Type of cover			Switches / Cable duct / Socket-plug	Documentation	
										
Gear ratio i =	Attachment kit[1]	for motor	with brake	without brake	without	cover plate	strip		Standard report	Measurement report
–	00	–	00		00	–	–			
–	00	–	00		00	01	02			
–	02	**VRDM 368**	36	35	00	01	02	**Without switch and cable duct** 00	01	02 Friction moment
	03	**MSM 030B**	71	70				**Switches:**		03 Lead deviation
	04	**MSM 020B**	69	68				– Reed sensor 21-...[3] – Hall sensor 22-...[3]		
–	31	**NEMA 23-D[2]**	00		00	01	02	**Cable duct** 25		04 Travel accuracy
	34	**NEMA 23-C[2]**	00							
	32	**MSK 030C**	85	84						
i = 1	11	**MSK 030C**	85	84	00	01	02	**Switching cam for PSK:** – Without cover or with cover plate 30 – With sealing strip 31		05 Positioning accuracy
i = 1.5	12									
i = 1	13	**MSM 030B**	71	70						
i = 1.5	14									

1) Attachment kit also available without motor (when ordering: enter “00” for motor).
2) Use motors complying with the appropriate NEMA specification.
Because of the varying shaft dimensions for NEMA-specification motors, the attachment kit does not include a coupling.
3) Mounting side for switches: left (L) or right (R)

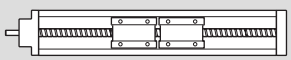
Switch mounting arrangements

A cable duct is required for installation of the switches.

Refer to “Switch mounting arrangements” for more information on switch types and switch mounting.

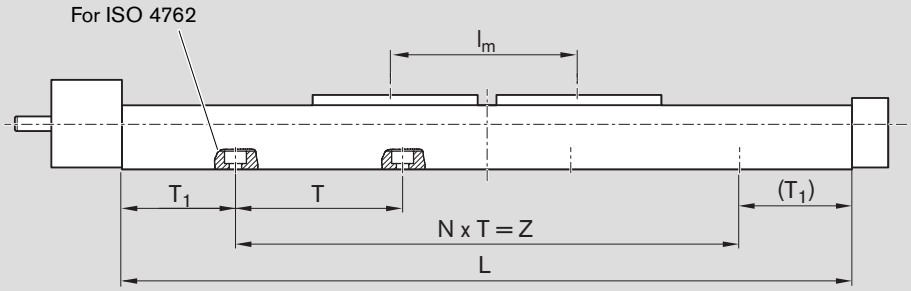
Switches may only be mounted to one side of the Precision Module (left or

Left (L)



Right (R)

Precision Module PSK 60 Lengths and Hole Spacing



Length L

Type of cover	Number of carriages (carr.)	Carriage version	
		Standard length	Long
Without cover or with cover plate	1	L = (stroke + 2 · excess travel) + 70 mm	L = (stroke + 2 · excess travel) + 85 mm
	2	L = (stroke + 2 · excess travel) + l_m + 70 mm $l_{m\,min}$ = 60 mm	L = (stroke + 2 · excess travel) + l_m + 85 mm $l_{m\,min}$ = 75 mm
With sealing strip	1	L = (stroke + 2 · excess travel) + 160 mm	L = (stroke + 2 · excess travel) + 215 mm

l_m = center-to-center distance between carriages (consider $l_{m\,min}$)
Stroke = maximum travel of carriage center between the outermost switch activation points

In most cases the recommended limit for excess travel (braking path) is:
Excess travel = 2 · screw lead P

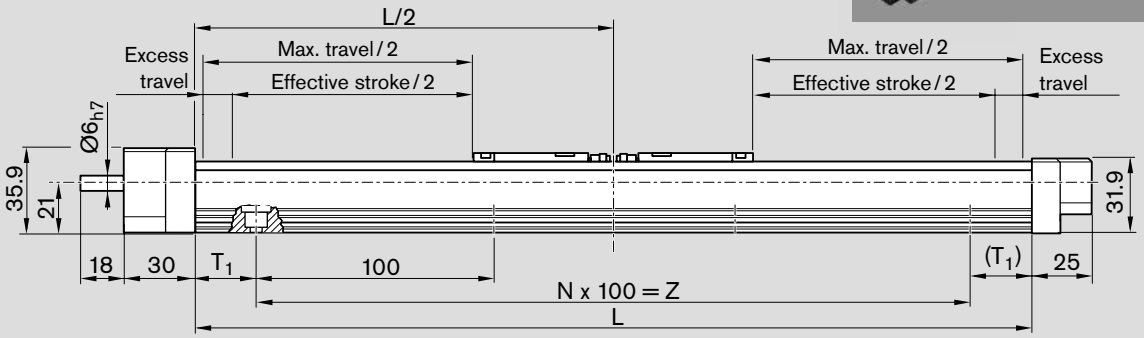
Example
Ball screw 12 x 10
(Ball screw size = d_0 x P):
Excess travel = 2 · 10 = 20 mm

Standard lengths of frame

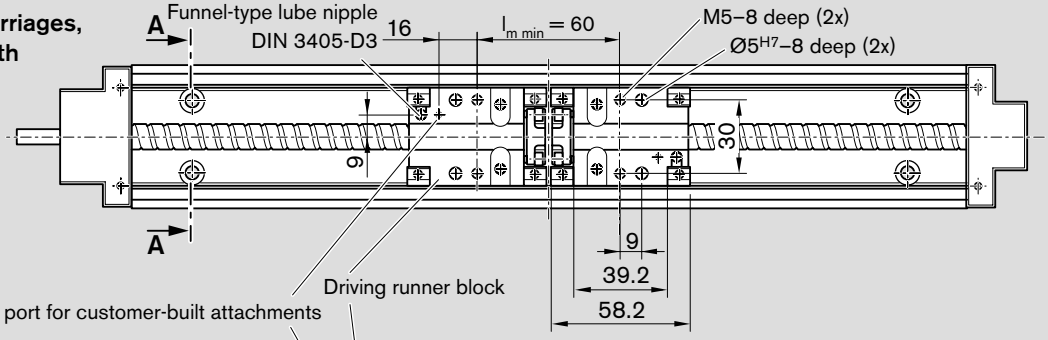
Length L (mm)	T (mm)	T_1 (mm)	N	Z (mm)	Mounting holes for ISO 4762 screws
150	100	25	1	100	M5
200	100	50	1	100	
250	100	25	2	200	
300	100	50	2	200	
400	100	50	3	300	
500	100	50	4	400	
600	100	50	5	500	
700	100	50	6	600	
800	100	50	7	700	
900	100	50	8	800	
940	100	20	9	900	

Precision Module PSK 60 Dimension Drawings without Cover

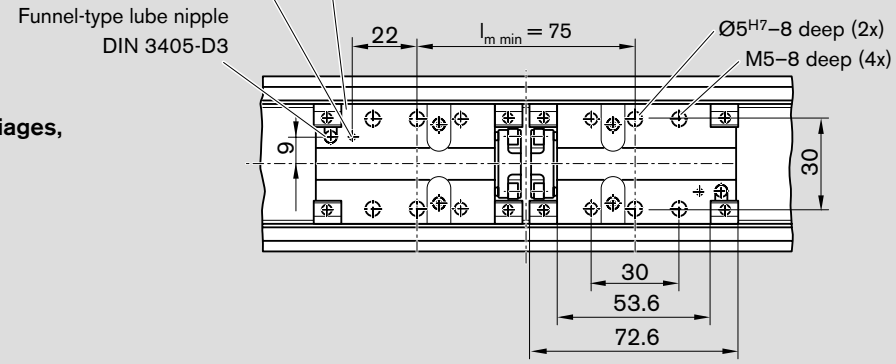
All dimensions in mm
Drawings not to scale

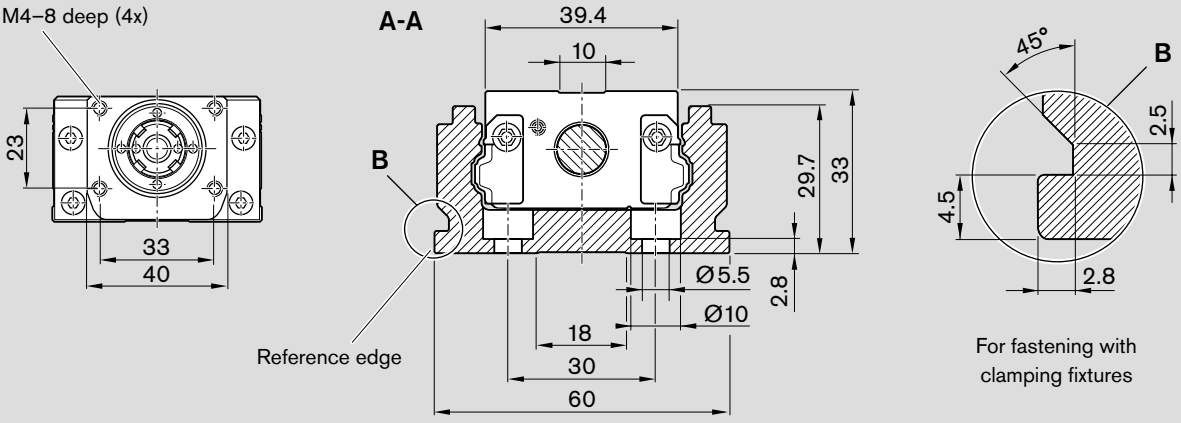


Version:
One or two carriages, standard length



Version:
One or two carriages, long

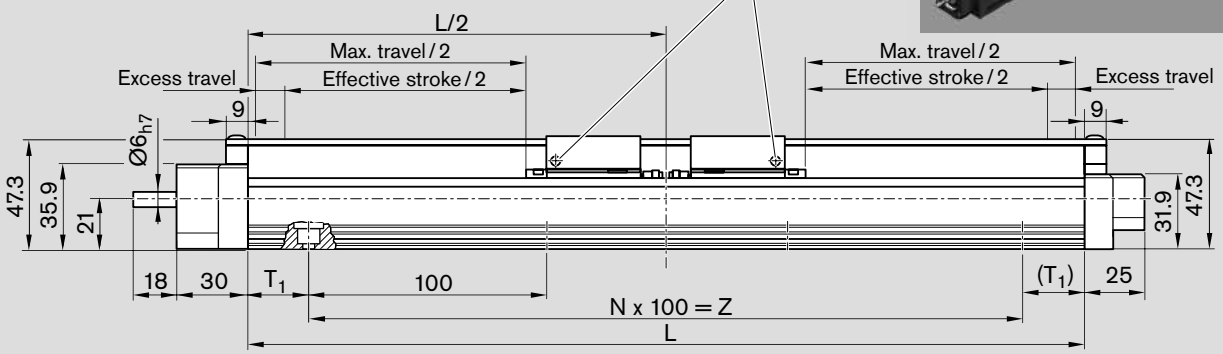




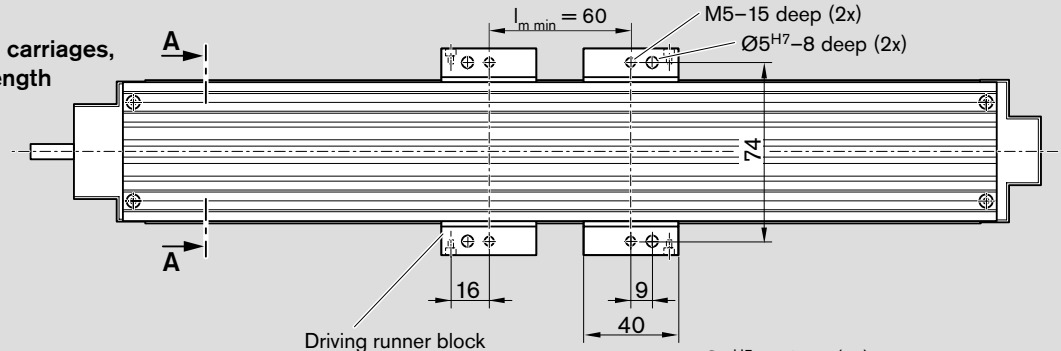
Precision Module PSK 60

Dimension Drawings with Cover Plate

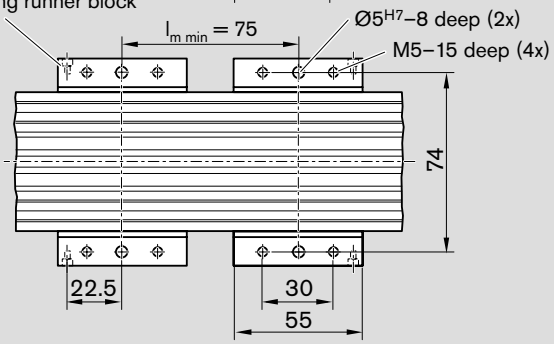
All dimensions in mm
Drawings not to scale

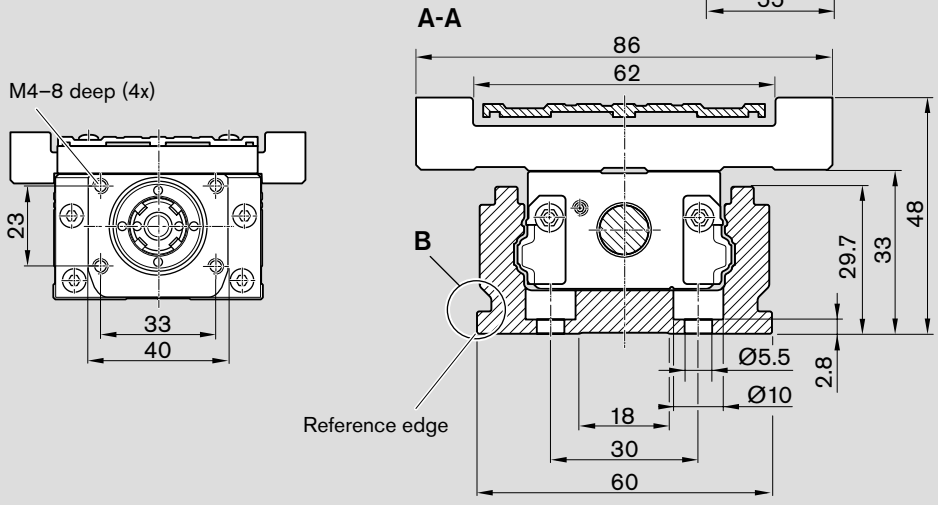


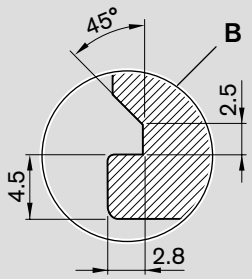
Version:
One or two carriages, standard length



Version:
One or two carriages, long



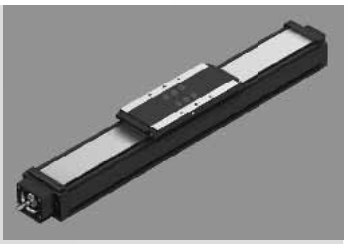


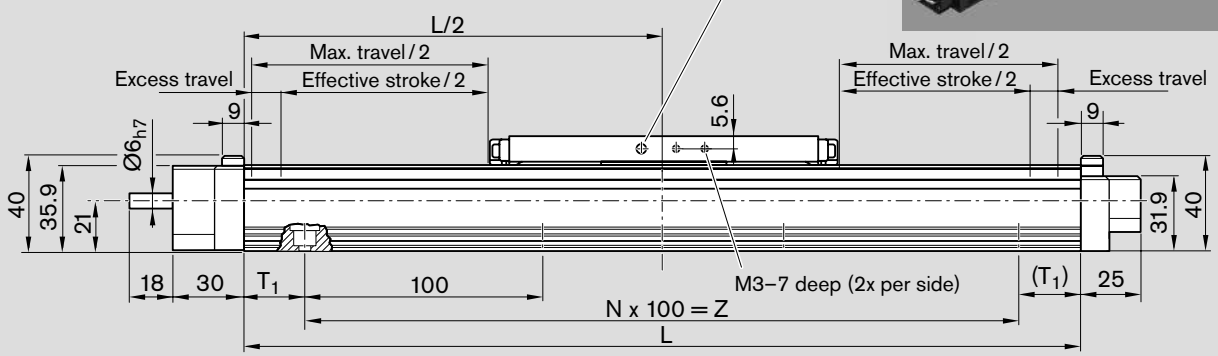


For fastening with clamping fixtures

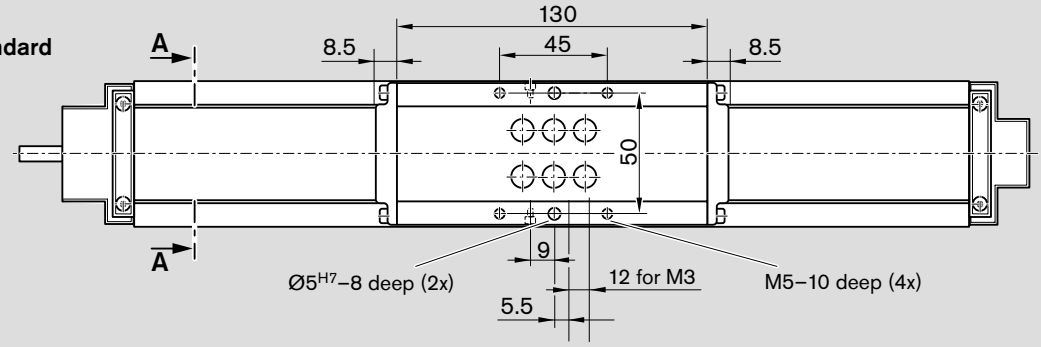
Precision Module PSK 60 Dimension Drawings with Sealing Strip

All dimensions in mm
Drawings not to scale

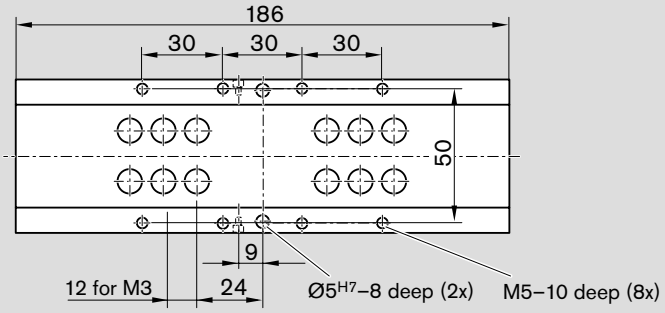


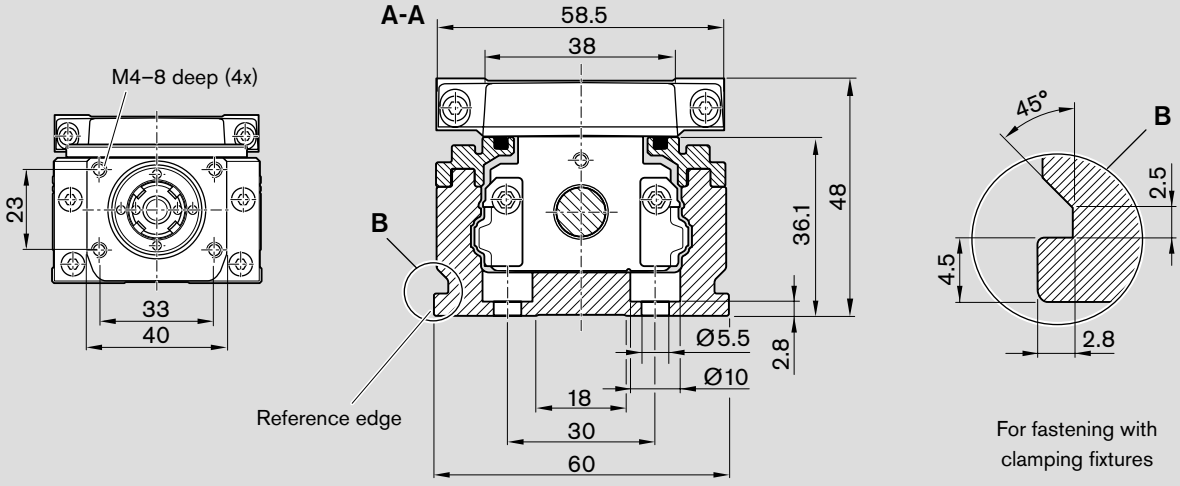


Version:
Carriage, standard length



Version:
Carriage, long

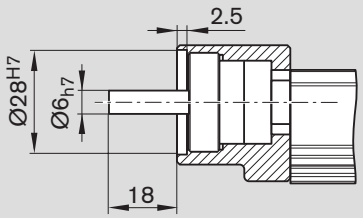




For fastening with clamping fixtures

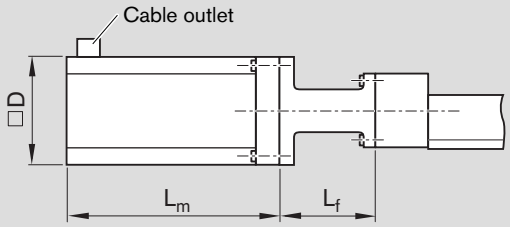
Precision Module PSK 60 Dimension Drawings, Motor Attachment

OF01, OF02



MF01, MF02

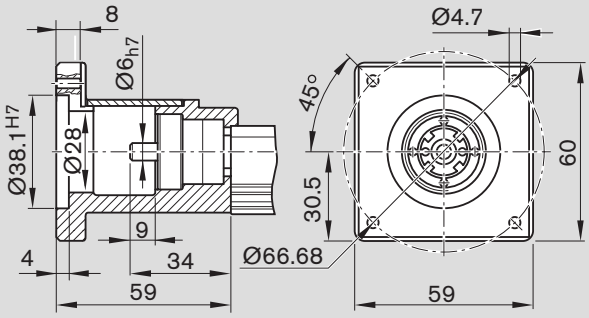
Motor with motor mount and coupling



Motor type	Dimensions (mm)			
	D	L_f	L_m	
			without brake	with brake
MSM 030B	60.0	50	111	144
MSK 030C	54.0	50	188	213
VRDM 368	57.2	50	116	157
MSM 020B	42.0	44	109	140

MF10, MF11

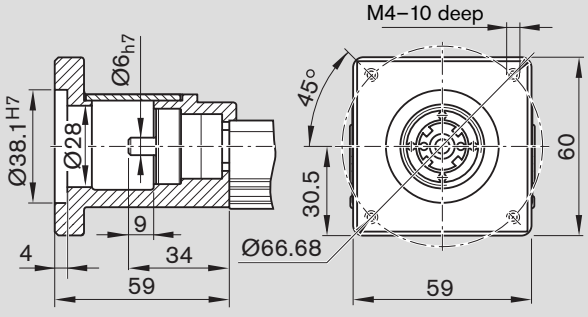
Integrated motor mount (NEMA 23 – Form C)



Drawings not to scale!
For further information and dimensions, see “Motors.”

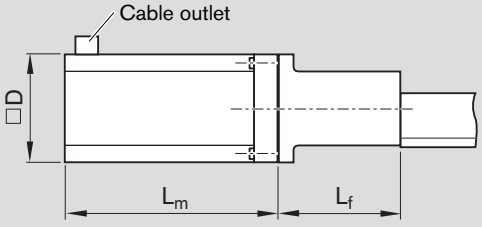
MF10, MF11

Integrated motor mount (NEMA 23 – Form D)



MF10, MF11

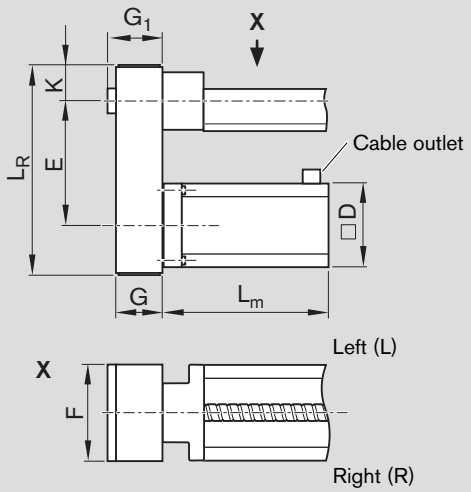
Motor with integrated motor mount and coupling



Motor type	Dimensions (mm)			
	D	L_f	L_m	
			without brake	with brake
MSK 030C	54	59	188	213

RV01 – RV08

Motor with timing belt side drive



View **X** shown without motor

Version	Motor type	Dimensions (mm)									
		D	E		F	G	G_1	K	L_m		L_R
			i = 1	i = 1.5					without brake	with brake	
RV01 to RV08	MSM 030B	60	78	75	64.5	37	43.5	33.5	111	144	157
	MSK 030C	54	78	75	64.5	37	43.5	33.5	188	213	154

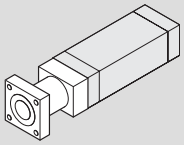
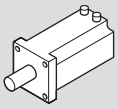
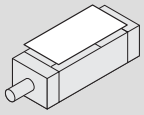
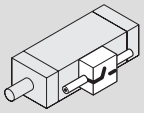
Precision Module PSK 90 Components and Ordering Data

Part number, length R1465 400 00, ... mm Reference edge (RE) Version				Guideway	Drive unit				Carriage version									
									Steel								Aluminum	
									Without cover				Cover plate				Sealing strip	
									Stan-dard		Long		Stan-dard		Long		Stan-dard	Long
	RE left	RE right			Screw journal	Ball screw size d_0 x P												
						16x5	16x10	16x16	1carr.	2carr.	1carr.	2carr.	1carr.	2carr.	1carr.	2carr.	1carr.	1carr.
Without drive	OA01		OA01	L = 340 mm 10 L = 440 mm 12 L = 540 mm 14 L = 640 mm 16 L = 740 mm 18 L = 840 mm 20 L = 940 mm 22	without	50			01	02	03	04	–	–	–	–	–	–
With ball screw, w/o motor mount	OF01 RE	OF02 RE	OF01 OF02		Ø9	01	02	03	01	02	03	04	21	22	23	24	40	41
					Ø9 with keyway	11	12	13										
With ball screw and motor mount	MF01 RE	MF02 RE	MF01 MF02		Ø9	01	02	03	01	02	03	04	21	22	23	24	40	41
W/ball screw and integrated mount	MF10 RE	MF11 RE	MF10 MF11		Ø9	30	31	32	01	02	03	04	21	22	23	24	40	41
With ball screw and timing belt side drive	RV01 RE	RV02 RE	RV01 to RV08		Ø9	61	62	63	01	02	03	04	21	22	23	24	40	41
	RV03 RE	RV04 RE																
	RV05 RE	RV06 RE			Ø9	51	52	53	01	02	03	04	21	22	23	24	40	41
	RV07 RE	RV08 RE																

Ordering example: See “Inquiry/Order” form

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

d_0 = screw diameter (mm)
P = screw lead (mm)
carr. = carriage(s)
L = length

Motor attachment			Motor		Type of cover			Switches / Cable duct / Socket-plug	Documentation	
										
Gear ratio i =	Attachment kit[1]	for motor	with brake	without brake	without	cover plate	strip		Standard report	Measurement report
–	00	–	00		00	–	–			
–	00	–	00		00	01	02			
–	03	**MSK 040C**	87	86	00	01	02	**Without switch and cable duct** 00	01	02 Friction moment
	04	**VRDM 397**	38	37				**Switches:**		03 Lead deviation
		VRDM 3910	40	39				– Reed sensor 21-...[3]		
	06	**MSM 040B**	75	74				– Hall sensor 22-...[3]		
–	31	**NEA 23-D[2]**	00		00	01	02	**Cable duct** 25		04 Travel accuracy
	32	**MSK 030C**	85	84						
	33	**MSM 030C**	73	72						
i = 1	24	**MSK 030C**	85	84	00	01	02	**Switching cam for PSK:**		05 Positioning accuracy
i = 1.5	26							– Without cover or with cover plate 30		
i = 1	25	**MSM 030C**	73	72				– With sealing strip 31		
i = 1.5	27									
i = 1	14	**MSK 040C**	87	86						
i = 1.5	16									
i = 1	15	**MSM 040B**	75	74						
i = 1.5	17									

1) Attachment kit also available without motor (when ordering: enter “00” for motor).
2) Use motors complying with the appropriate NEMA specification.
Because of the varying shaft dimensions for NEMA-specification motors, the attachment kit does not include a coupling.
3) Mounting side for switches: left (L) or right (R)

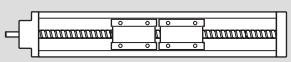
Switch mounting arrangements

A cable duct is required for installation of the switches.

Refer to “Switch mounting arrangements” for more information on switch types and switch mounting.

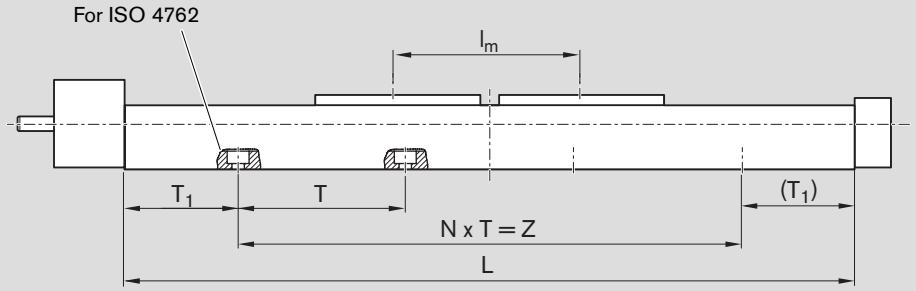
Switches may only be mounted to one side of the Precision Module (left or right).

Left (L)



Right (R)

Precision Module PSK 90 Lengths and Hole Spacing



Length L

Type of cover	Number of carriages (carr.)	Carriage version Standard length	Long
Without cover or with cover plate	1	L = (stroke + 2 · excess travel) + 100 mm	L = (stroke + 2 · excess travel) + 120 mm
	2	L = (stroke + 2 · excess travel) + l_m + 100 mm $l_{m\,min}$ = 90 mm	L = (stroke + 2 · excess travel) + l_m + 120 mm $l_{m\,min}$ = 110 mm
With sealing strip	1	L = (stroke + 2 · excess travel) + 190 mm	L = (stroke + 2 · excess travel) + 265 mm

l_m = center-to-center distance between carriages (consider $l_{m\,min}$)

Stroke = maximum travel of carriage center between the outermost switch activation points

In most cases the recommended limit for excess travel (braking path) is:
Excess travel = 2 · screw lead P

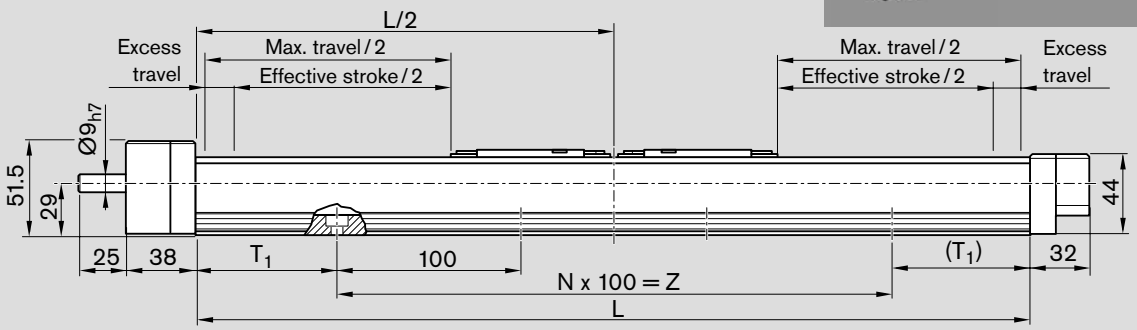
Example
Ball screw 16 x 10
(Ball screw size = d_0 x P):
Excess travel = 2 · 10 = 20 mm

Standard lengths of frame

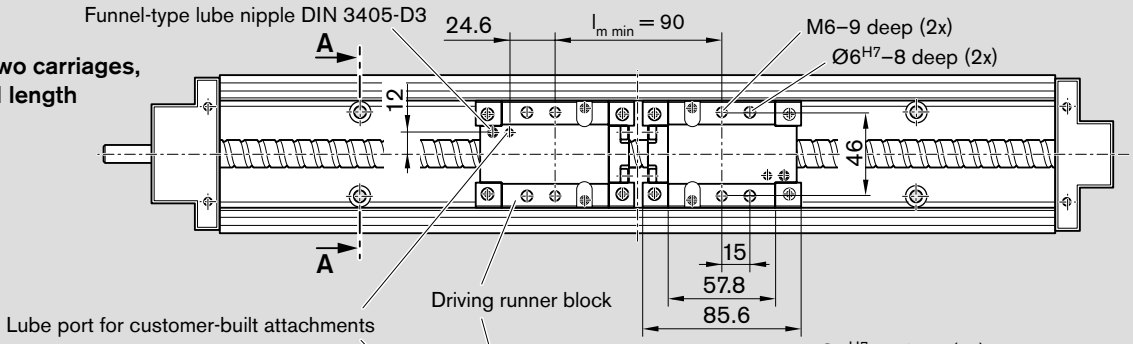
Length L (mm)	T (mm)	T_1 (mm)	N	Z (mm)	Mounting holes for ISO 4762 screws
340	100	70	2	200	M6
440	100	70	3	300	
540	100	70	4	400	
640	100	70	5	500	
740	100	70	6	600	
840	100	70	7	700	
940	100	70	8	800	

Precision Module PSK 90 Dimension Drawings without Cover

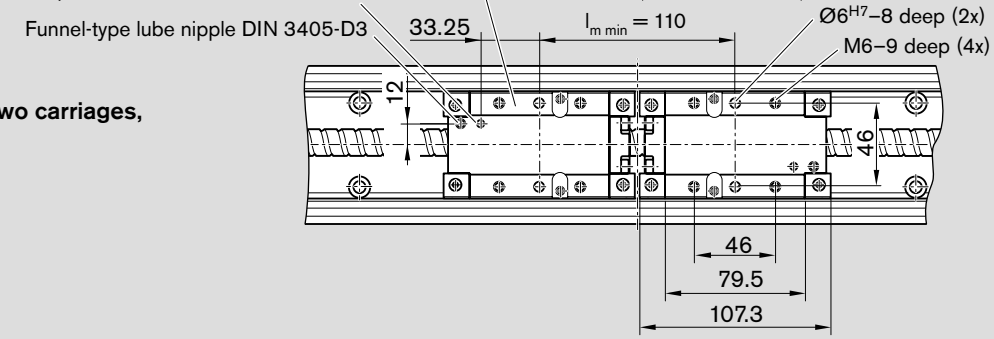
All dimensions in mm
Drawings not to scale

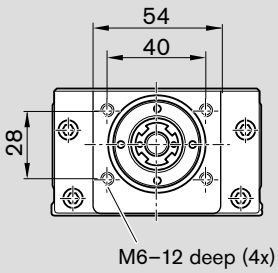


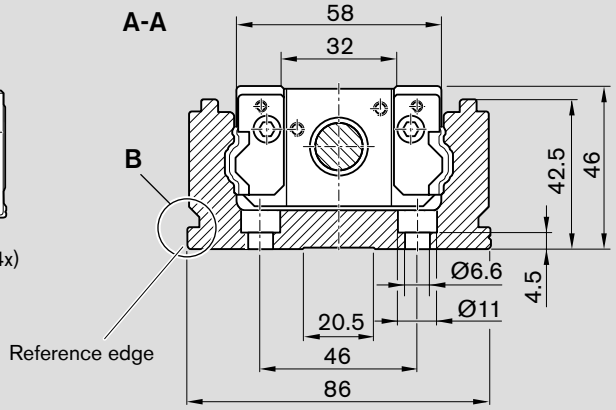
Version:
One or two carriages, standard length

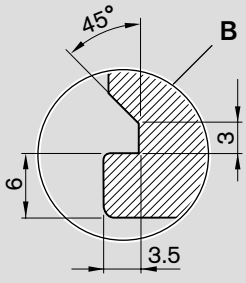


Version:
One or two carriages, long







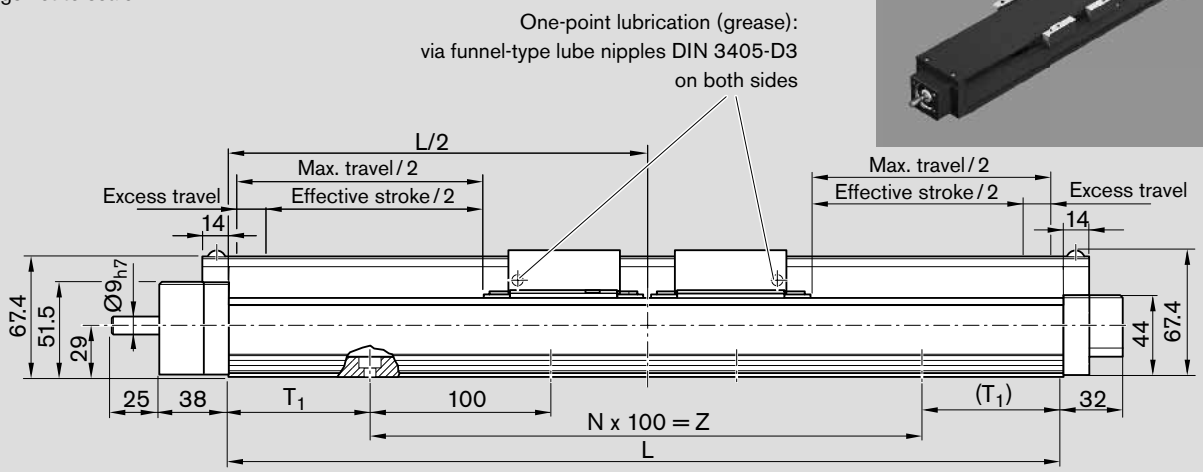


For fastening with clamping fixtures

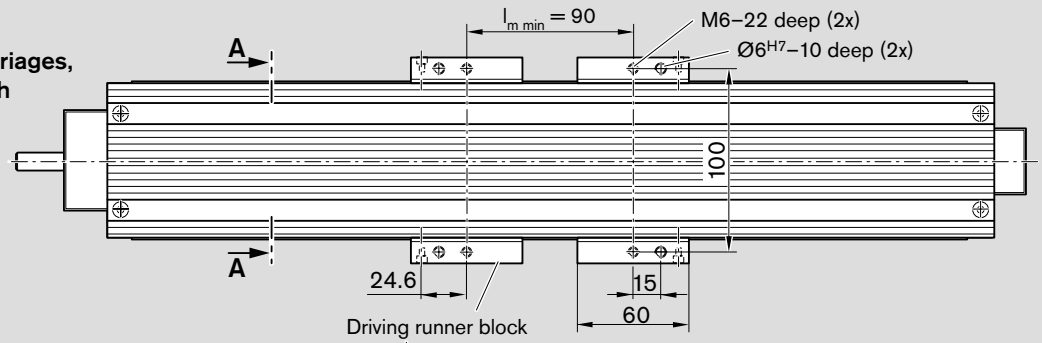
Precision Module PSK 90

Dimension Drawings with Cover Plate

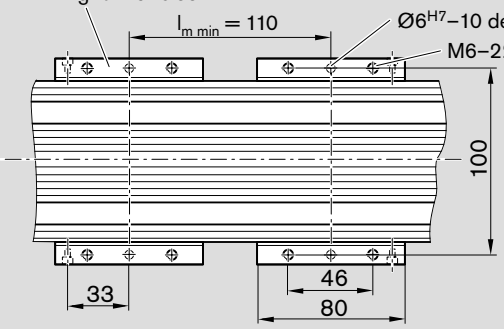
All dimensions in mm
Drawings not to scale

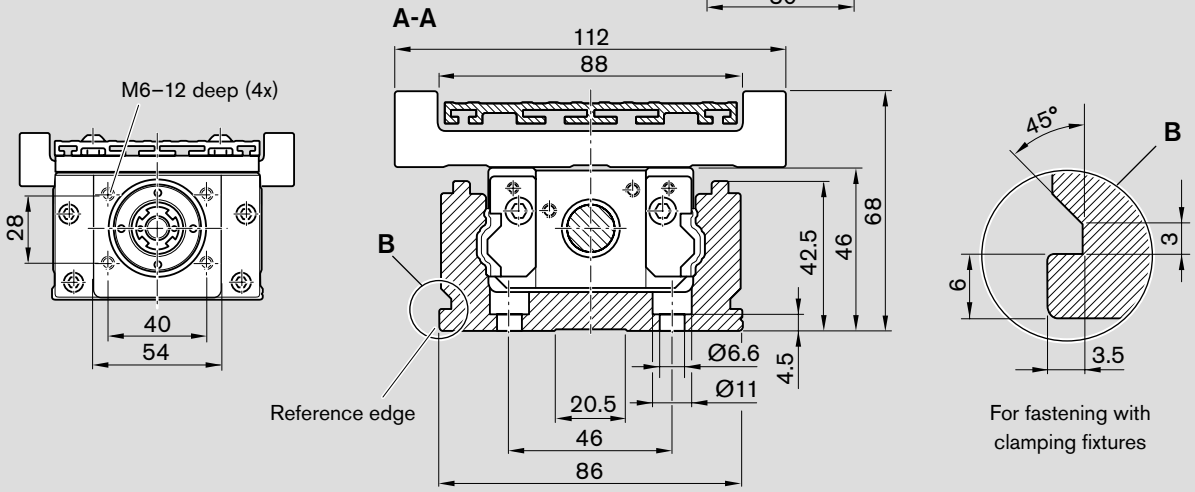


Version:
One or two carriages, standard length



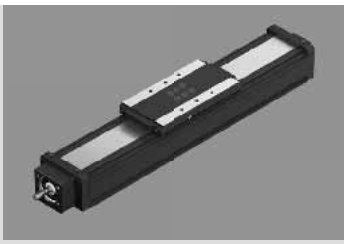
Version:
One or two carriages, long

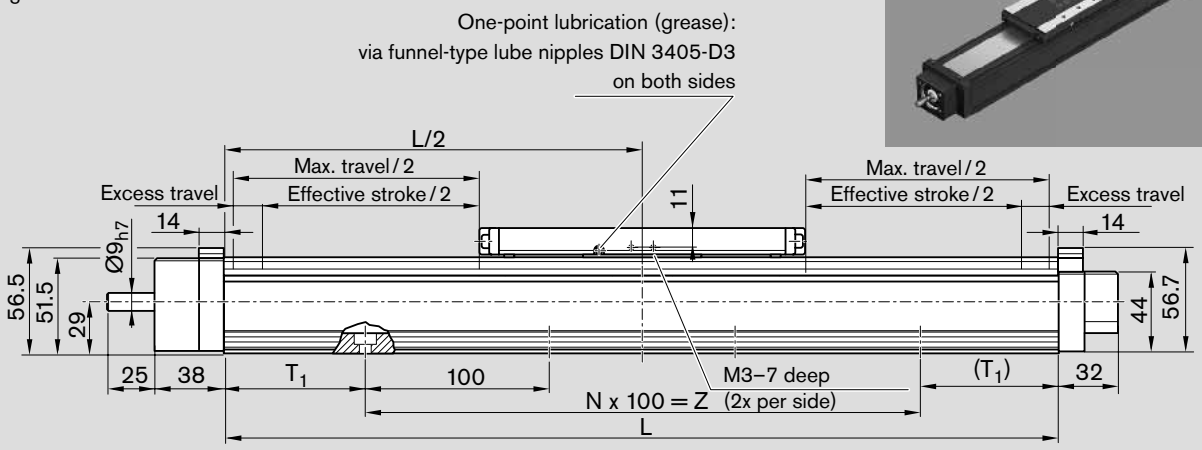




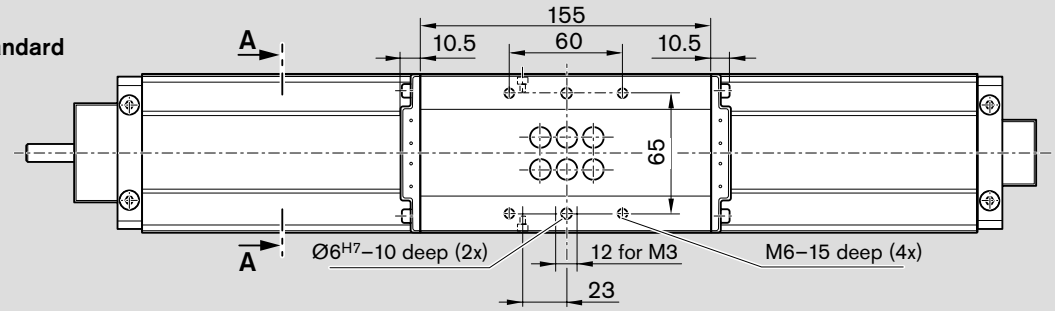
Precision Module PSK 90 Dimension Drawings with Sealing Strip

All dimensions in mm
Drawings not to scale

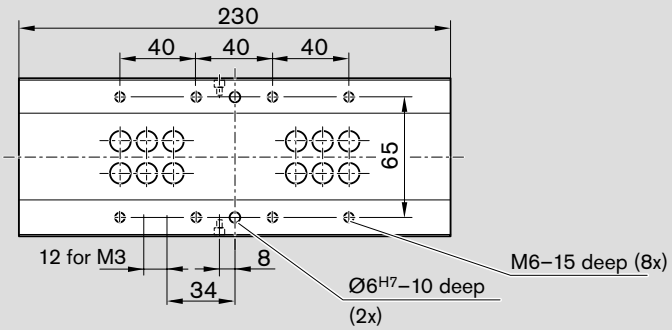


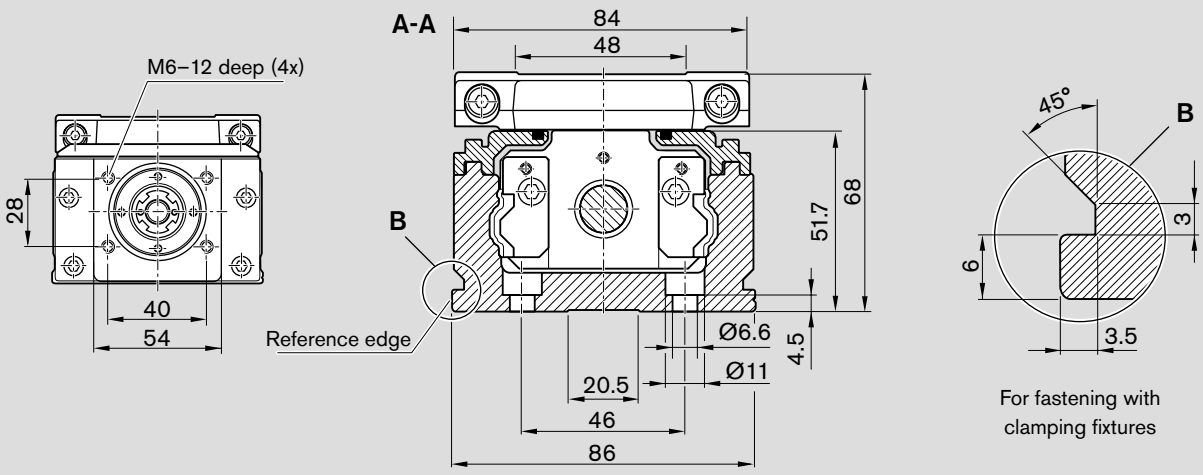


Version:
Carriage, standard length



Version:
Carriage, long

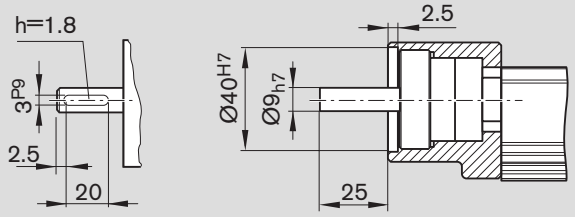




For fastening with clamping fixtures

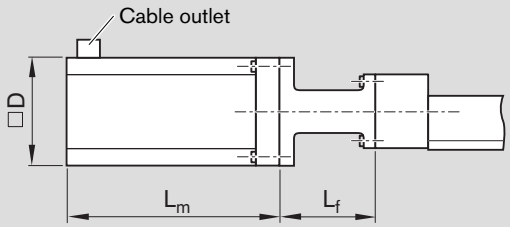
Precision Module PSK 90 Dimension Drawings, Motor Attachment

OF01, OF02



MF01, MF02

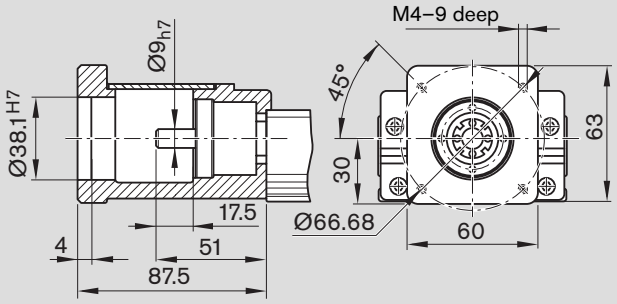
Motor with motor mount and coupling



Motor type	Dimensions (mm)			
	D	L_f	L_m without brake	L_m with brake
MSM 030C	60.0	72.0	138.5	171.5
MSM 040B	80.0	81.0	157.5	191.5
MSK 030C	54.0	75.0	188.0	213.0
MSK 040C	82.0	77.5	185.5	215.5
VRDM 397	85.0	77.5	110.0	156.5
VRDM 3910	85.0	77.5	140.0	186.5

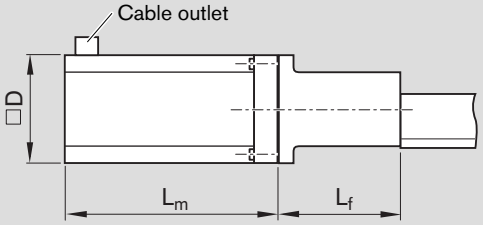
MF10, MF11

Integrated motor mount (NEMA 23 – Form D)



MF10, MF11

Motor with integrated motor mount and coupling

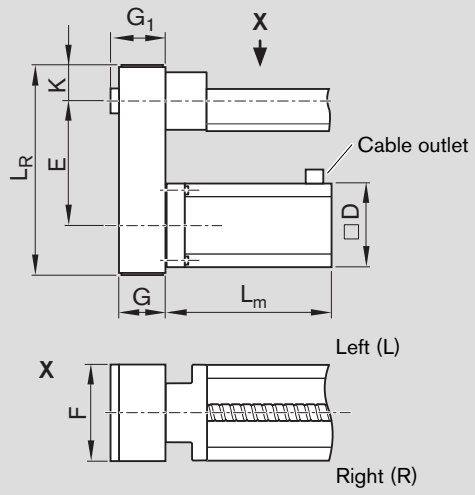


Motor type	Dimensions (mm)			
	D	L_f	L_m without brake	L_m with brake
MSM 030C	60	87.5	138.5	171.5
MSK 030C	54	87.5	188.0	213.0

Drawings not to scale!
For further information and dimensions, see “Motors.”

RV01–RV08

Motor with timing belt side drive



View **X** shown without motor

Version	Motor type	Dimensions (mm)										
		D	E		F	G	G_1	K	L_m		L_R	
			i = 1	i = 1.5					without brake	with brake	i = 1	i = 1.5
RV01 to RV08	**MSM 030C**	60	103.5	115.0	64.5	37	43.5	33.5	138.5	171.5	180.0	191.5
	MSM 040B	80	122.0	122.0	88.0	51	57.0	45.5	157.5	191.5	231.0	231.0
	MSK 030C	54	103.5	115.0	64.5	37	43.5	33.5	188.0	213.0	180.0	191.5
	MSK 040C	80	122.0	122.0	88.0	51	57.0	45.5	185.5	215.5	231.0	231.0

Switch Mounting Arrangements

Overview of switching system

1 Switch
2 Switching cam
3 Cable duct (aluminum alloy, black anodized)
4 Socket head cap screw with washer

Notes for mounting
A cable duct is required for installation of the switches.

⚠ **Short stroke:**
Consider the length of the switch!

Mounting side:
Switches may be mounted on the left (L) or right (R) side of the module.

For two-carriage versions:
Switch actuation by the driven runner block (on the motor side).

Ordering the switches and accessories

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

Switching system

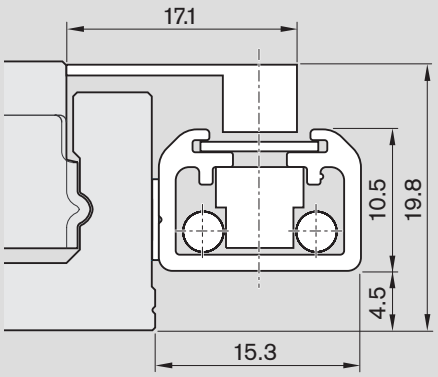
Item		Part numbers		
		PSK 40	PSK 50	PSK 60 and PSK 90
1	**Switches**			
	– Reed sensor	R9871 469 49	R9871 469 49	R9871 469 49
	– Hall sensor	R9871 461 25	R9871 461 25	R9871 461 25
2	**Cable duct**	R0399 800 97	R021KDUCT 5	R021KDUCT 6
3	**Switching cam**			
	– For PSK without cover or with cover plate	R1419 000 12	R1419 000 10	R1419 000 04
	– For PSK with sealing strip	–	R1419 000 11	R1419 000 05

Cable duct

Function
- To accommodate and secure switches
- To house cables

Mounting instructions for PSK 40
The cable duct is fastened to the same side as the switches and fixed to the end blocks of the Precision Module with socket head cap screws and washers (included in delivery).

Cable duct PSK 40
Arrangement of switching cam and cable duct



Mounting instructions for PSK 50 to PSK 90
The cable duct is mounted to the same side as the switches by snapping it into the T-slots on the frame of the Precision Module and securing it with set screws. The set screws (M) are supplied along with the duct.

Dimensions for cable duct

Dimensions		PSK 50	PSK 60	PSK 90
A	(mm)	21.7	25.2	25.2
B	(mm)	15.0	15.0	15.0
C	(mm)	11.5	11.5	11.5
D	(mm)	16.5	16.5	16.5
M	(mm)	M2.0	M2.5	M2.5

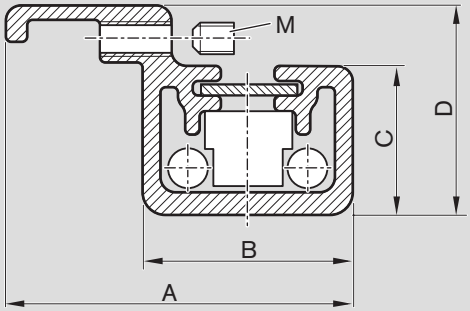
Installation dimensions for versions without cover or with cover plate

Dimensions		PSK 50	PSK 60	PSK 90
E	(mm)	15.2	15.8	15.4
F	(mm)	25.8	32.8	45.8
G	(mm)	19.7	22.6	25.8
H	(mm)	6.0	6.0	6.0

Installation dimensions for version with sealing strip

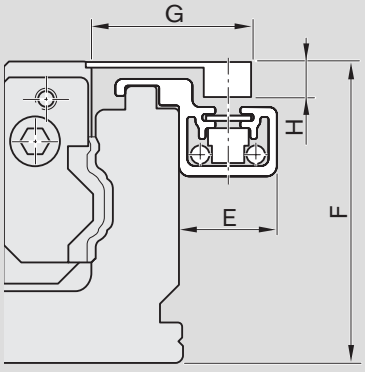
Dimensions		PSK 50	PSK 60	PSK 90
E	(mm)	15.2	15.8	15.2
F	(mm)	28.2	35.7	50.2
G	(mm)	12.2	13.0	13.0
H	(mm)	12.5	14.0	14.0
I	(mm)	3.3	1.9	7.4

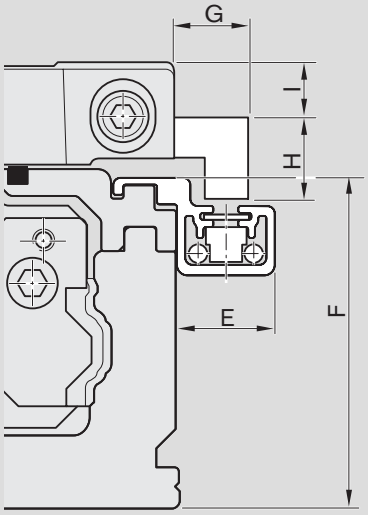
Cable duct PSK 50 to PSK 90



Arrangement of switching cam and cable duct

- PSK without cover or with cover plate
- PSK with sealing strip





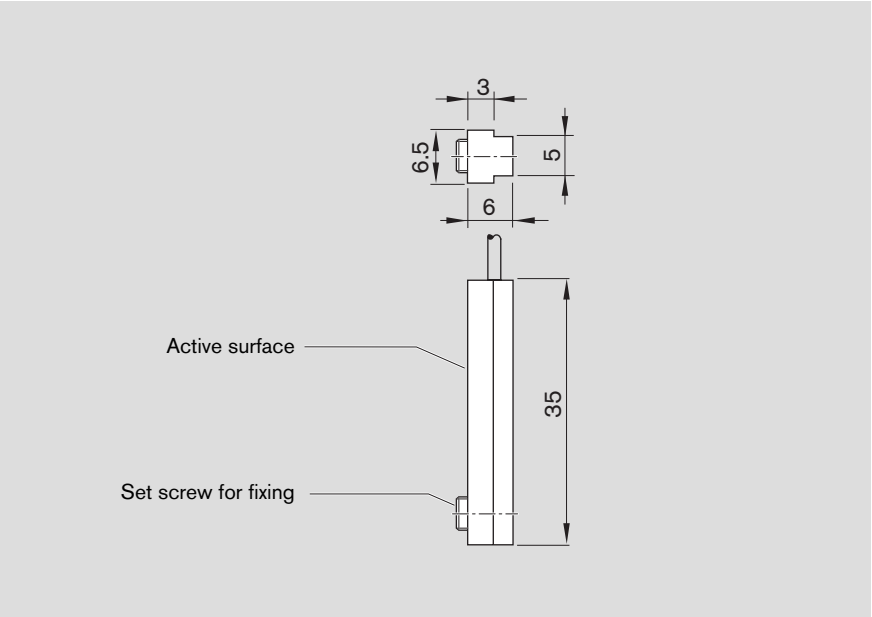
Switch Mounting Arrangements

Switches

The switches for Precision Modules PSK are magnetic field sensors with potted cable.

Versions
- Hall sensor, PNP NC
- Reed sensor (changeover)

Notes for mounting
Switches may only be mounted to one side of the Precision Module (left or right).
A cable duct is required for installation of the switches.
The switches are pushed into the slots of the cable duct and fixed with set screws.

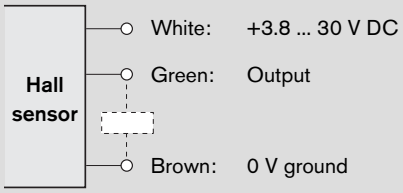


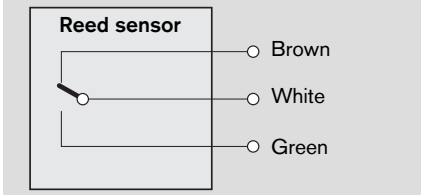
Technical data

Hall sensor	
Contact type	PNP NC
Operating voltage	3.8–30 V DC
Current consumption	max. 10 mA
Output current	max. 20 mA
Cable length	2000 mm
Protection class	IP 66
Short-circuit protection	No

Reed sensor	
Contact type	Changeover
Switching voltage	max. 100 V DC
Switching current	max. 500 mA
Cable length	2000 mm
Protection class	IP 66
Caution: 2 switching points	

Pin assignment





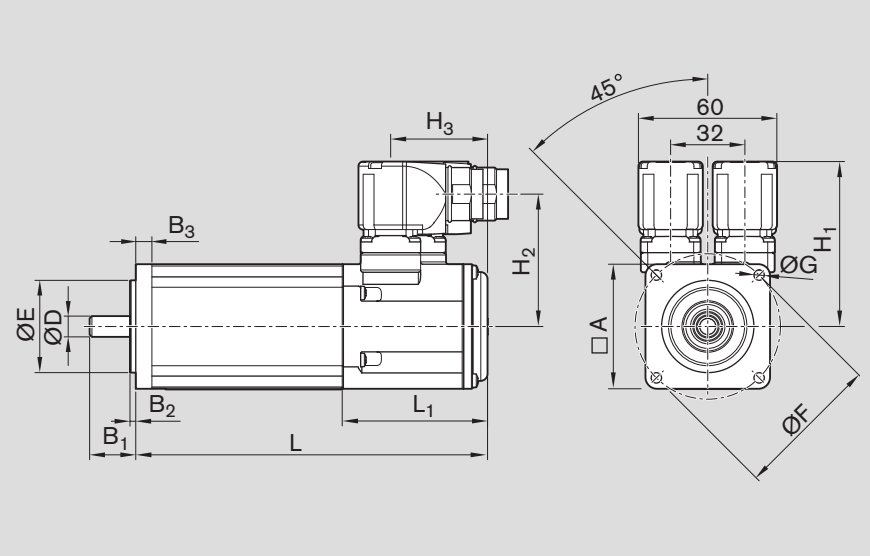
Motors

AC Servo Motors MSK

Notes

All MSK motors have an absolute multi-turn encoder (Hyperface, 128 increments with 4096 revolutions).

The motors can be supplied complete with controller and control unit. For more information on motors, controllers and control systems, see Rexroth catalog “Controllers .... Servo Motors.”



Dimensions

Motor type	Dimensions (mm)													
	A	B_1	B_2	B_3	ØD k6	ØE j6	ØF	ØG	H_1	H_2	H_3	L_1	L without brake	L with brake
MSK 030C	54	20	2.5	7	9	40	63	4.5	71.5	57.4	42	–	188.0	213.0
MSK 040C	82	30	2.5	8	14	50	95	6.6	83.5	69.0	31	42.5	185.5	215.5

Motor data

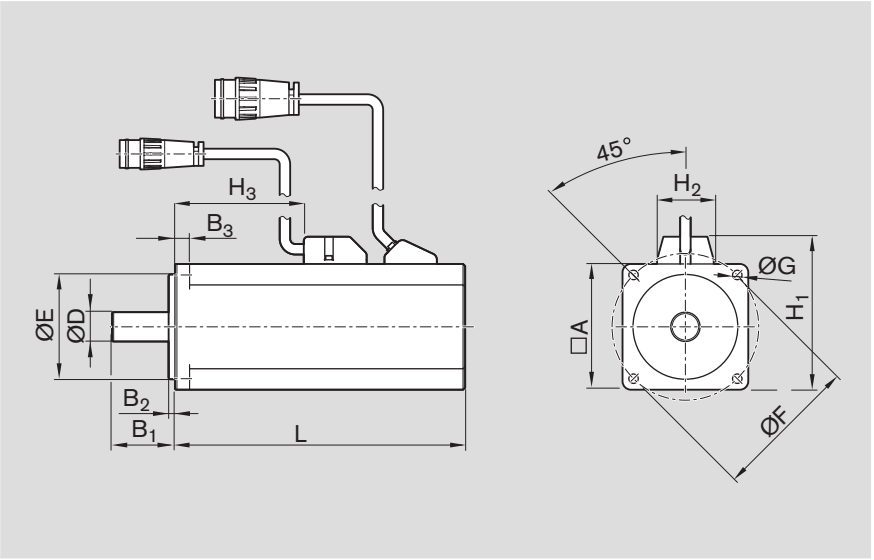
Motor type		Unit	MSK030C-0900	MSK040C-0600
Maximum rotary speed	n_{max}	(min^{-1})	9000	6000
Maximum permissible torque	M_{max}	(Nm)	4	8.1
Rated torque	M_N	(Nm)	0.8	2.7
Motor mass moment of inertia	J_m	(10^{-6} kgm²)	30	140
Mass without brake	m_m	(kg)	2.1	3.6
Holding brake				
Holding torque	M_{br}	(Nm)	1.0	4.0
Brake mass moment of inertia	J_{br}	(10^{-6} kgm²)	7	23
Mass of brake	m_{br}	(kg)	0.25	0.32

Motors

AC Servo Motors MSM

Notes
All MSM motors have an absolute multi-turn encoder.

The motors can be supplied complete with controller and control unit. For more information on motors, controllers and control systems, see Rexroth catalog “Controllers .... Servo Motors.”



Dimensions

Motor type	Dimensions (mm)												
	A	B_1	B_2	B_3	ØD h6	ØE h7	ØF	ØG	H_1	H_2	H_3	L without brake	L with brake
MSM 020B	42	24	2	7	8	22	48	3.4	55	27	38.8	109.0	140.0
MSM 030B	60	30	3	7	11	50	70	4.5	73	27	34.0	111.0	144.0
MSM 030C	60	30	3	7	14	50	70	4.5	73	27	61.5	138.5	171.5
MSM 040B	80	35	3	8	19	70	90	6.0	93	27	76.0	157.5	191.5

Motor data

Motor type		Unit	MSM 020B	MSM 030B	MSM 030C	MSM 040B
Maximum rotary speed	n_{max}	(min^{-1})	3000	3000	3000	3000
Maximum permissible torque	M_{max}	(Nm)	0.95	1.91	3.80	7.10
Rated torque	M_N	(Nm)	0.32	0.64	1.20	2.40
Motor mass moment of inertia	J_m	(10^{-6} kgm^2)	3.2	10.0	17.0	67.0
Mass without brake	m_m	(kg)	0.5	0.96	1.5	3.1
Holding brake						
Holding torque	M_{br}	(Nm)	0.29	1.27	1.27	2.45
Brake mass moment of inertia	J_{br}	(10^{-6} kgm^2)	0.4	3.0	3.0	8.0
Mass of brake	m_{br}	(kg)	0.2	0.4	0.4	0.7

3-phase Stepping Motors VRDM

Notes

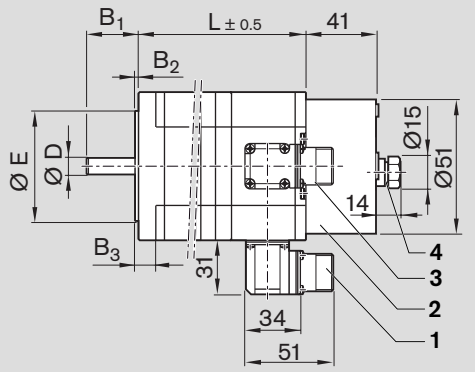
All VRDM motors are equipped with an encoder for rotation monitoring.

The motors can be supplied complete with controller and control unit. For more information on motors, controllers and control systems, see Rexroth catalog "Controllers .... Servo Motors."

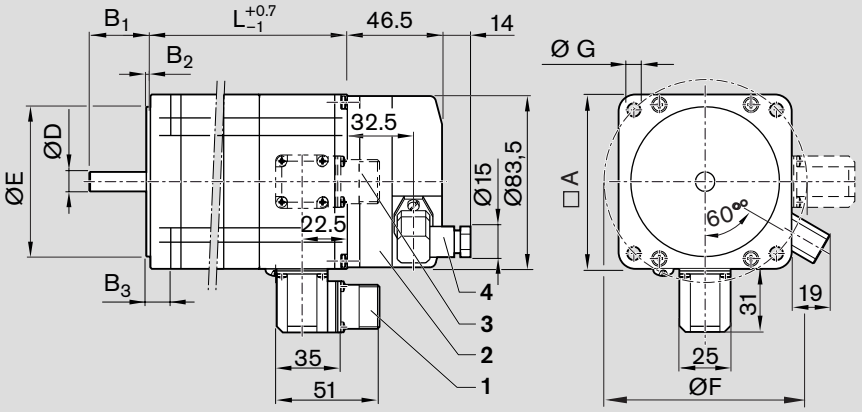
Key to illustration

1 Motor connector
2 Brake
3 Encoder connector

VRDM 368



VRDM 397
VRDM 3910



Dimensions

Motor type	Dimensions (mm)										
	A	B_1	B_2	B_3	ØD	ØE		ØF	ØG	L without brake	L with brake
VRDM 368	57.2	21	1.6	5	8	−0.013 h6	38.1	±0.025 h8	66.7	5.2	116.0	157.0
VRDM 397	85.0	30	2.0	10	12	h6	60.0	h8	99.0	6.5	110.0	156.5
VRDM 3910	85.0	30	2.0	10	12	h6	60.0	h8	99.0	6.5	140.0	186.5

Motor data

Motor type		Unit	VRDM 368	VRDM 397	VRDM 3910
Maximum permissible torque	M_{max}	(Nm)	1.50	2.00	4.00
Motor mass moment of inertia	J_m	(10^{-6} kgm²)	38	110	220
Motor holding torque	M_m	(Nm)	1.74	2.26	4.52
Mass without brake	m_m	(kg)	1.1	2.5	3.1
Step count	z	(–)	200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000		
Stepping angle per step	α	(°)	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036		
Encoder resolution			1000 increments/revolution		
Holding brake					
Brake holding torque	M_{br}	(Nm)	1	6	6
Brake mass moment of inertia	J_{br}	(10^{-6} kgm²)	1.6	20	20
Mass of brake	m_{br}	(kg)	0.5	1.5	1.5

Mounting

General notes

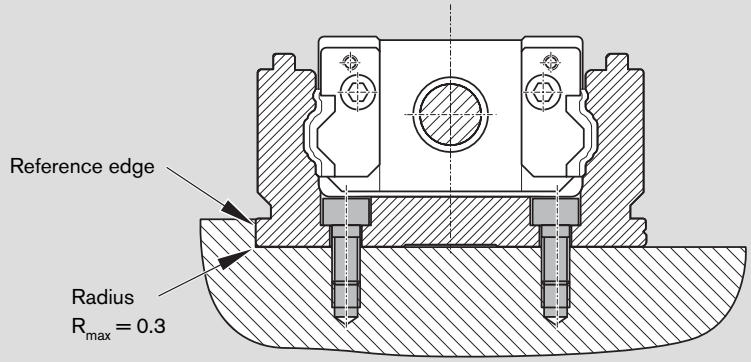
⚠ **Do not mount or support the Precision Module by the end blocks! The frame is the main load-bearing part!**

Precision Modules can be mounted either by screws in the frame itself or by external clamping fixtures.
When mounting Precision Modules, please note the maximum tightening torques listed in the table.

Mounting with screws in the frame

The reference edge on the frame facilitates alignment of the Precision Module.
Suitable for cover options:
– Without cover
– With cover plate (remove cover plate before mounting the module). For installation dimensions, see the relevant dimension drawings.

Mounting with screws in the frame

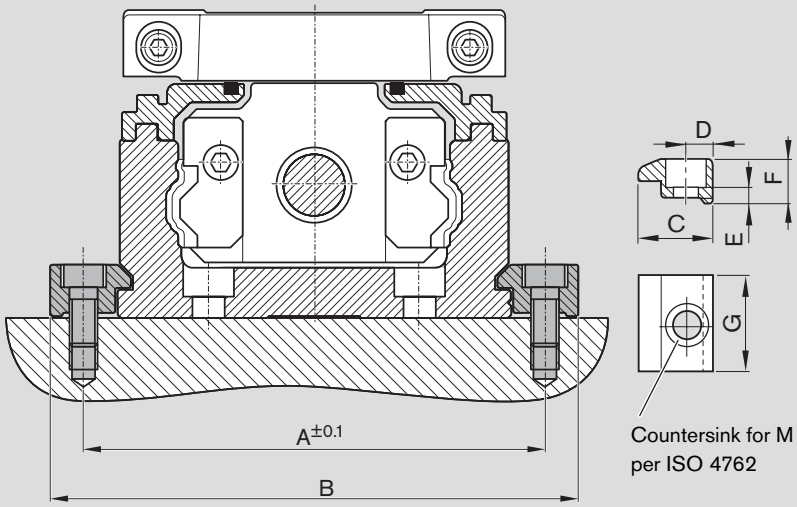


Mounting with clamping fixtures, PSK 50 to PSK 90

The reference edge cannot be used in the region of the clamping fixtures.
Suitable for all cover options.

Clamping fixtures
Recommended number:
– 3 per 500 mm and side

Mounting with clamping fixtures, PSK 50 to PSK 90



Precision Module	Part numbers Clamping fixtures	Dimensions (mm) A	B	C	D	E	F	G	M
PSK 50	R1419 010 02	60	70	12.5	5.0	4.0	8.5	20	M4
PSK 60	R1419 010 01	72	85	15.0	6.5	4.8	10.0	22	M5
PSK 90	R1419 010 00	100	115	17.5	7.5	5.8	12.0	25	M6

Tightening torques for the mounting screws
– At friction factor 0.125
– Strength class 8.8

			M3	M4	M5	M6
8.8		(Nm) max.	1.3	2.7	5.5	9.5

Lube Ports

General notes

The lubrication system on Precision Modules has been designed for grease lubricants (grease gun). The lube port supplies lubricant to both the Rail System guideway and the Precision Ball Screw Assembly. If the module has two carriages, **both** of these must be lubricated.

Lubricant

Lithium soap grease	PSK 40	PSK 50 to PSK 90
DIN 51825	KP00K	KP2K
DIN 51818	NLGI 00	NLGI 2

PSK without cover

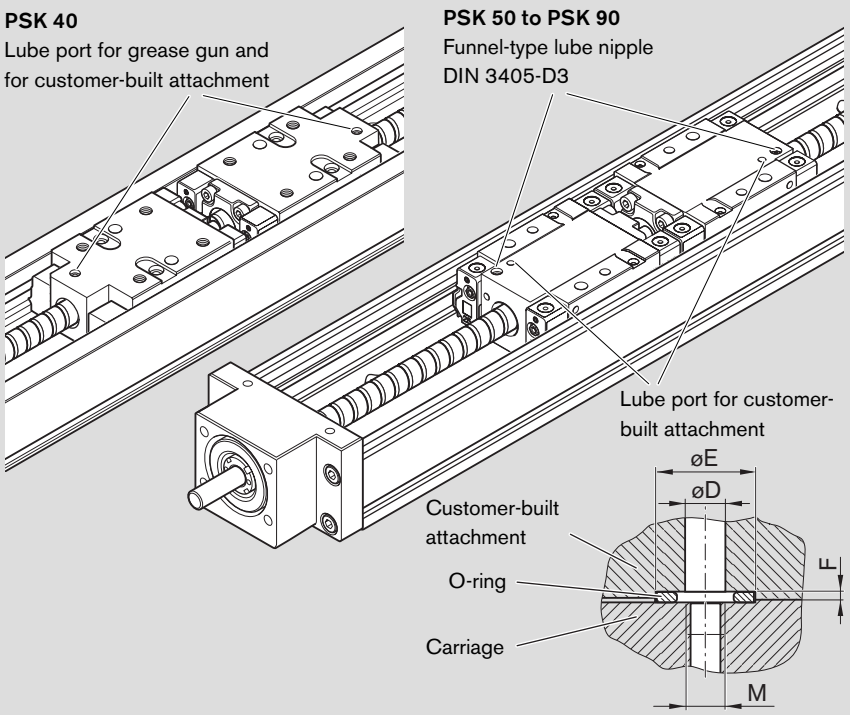
- PSK 40: One-point lubrication is possible via the lube port for grease gun on each carriage. Remove the set screw from the lube hole, apply lubricant, then drive the set screw in again.
- PSK 50, PSK 60, PSK 90: One-point lubrication at either of the two funnel-type lube nipples DIN 3405-D3 per carriage.
- One-point lubrication through customer-built attachment: This can be achieved in all PSK types by using the lube port in the carriage. The lube ports are closed with set screws for shipment. Before using the lube ports, the set screws must be removed and O-rings inserted to seal off the customer-built attachment.

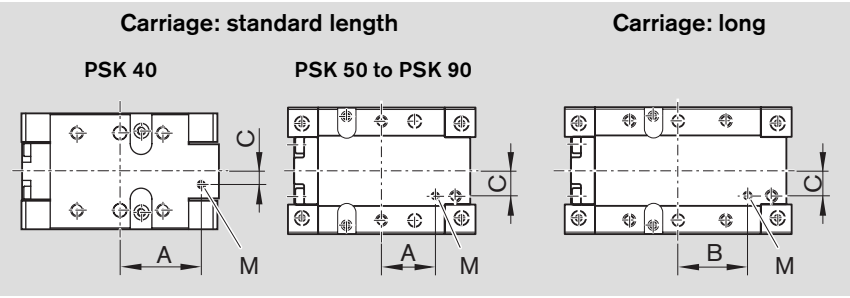
Precision Module	O-ring DIN 3771	Part numbers
PSK 40 to PSK 60	3 x 1	R3411 118 01
PSK 90	5 x 1.5	R3411 108 01

PSK with cover plate or sealing strip
One-point lubrication at either of the two funnel-type lube nipples (1) DIN 3405-D3 per carriage.

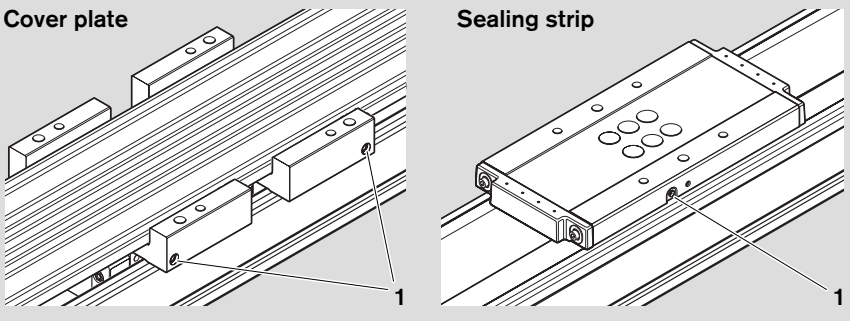
For short-stroke applications, please contact us regarding the lubrication arrangements:
PSK 40: stroke < 50 mm
PSK 50: stroke < 70 mm
PSK 60: stroke < 95 mm
PSK 90: stroke < 135 mm

Without cover





Precision Module		PSK 40	PSK 50	PSK 60	PSK 90
A	(mm)	19.0	18.2	16.0	24.6
B	(mm)	–	–	22.0	33.3
C	(mm)	3.0	6.5	9.0	12.0
D	(mm)	2.5	2.5	2.5	4.0
E	(mm)	5.0	5.0	5.0	8.0
F	(mm)	0.6 +0.1	0.6 +0.1	0.7 +0.1	0.5 +0.1
M	(mm)	M2	M2.5	M3	M4



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.

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

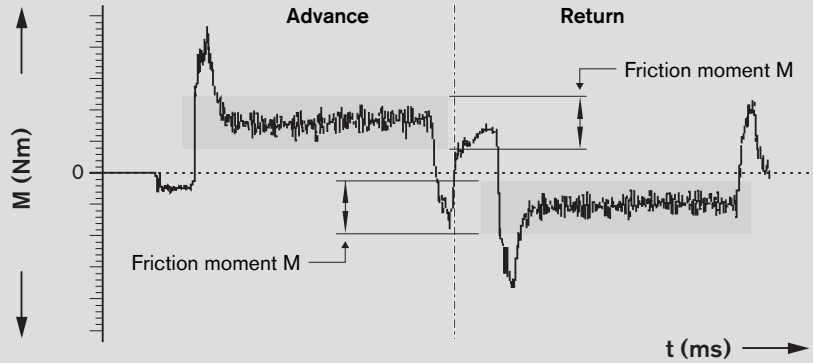
Frictional moment of complete system

Option no. 02

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

M = friction moment (N)
t = travel time (ms)

Example



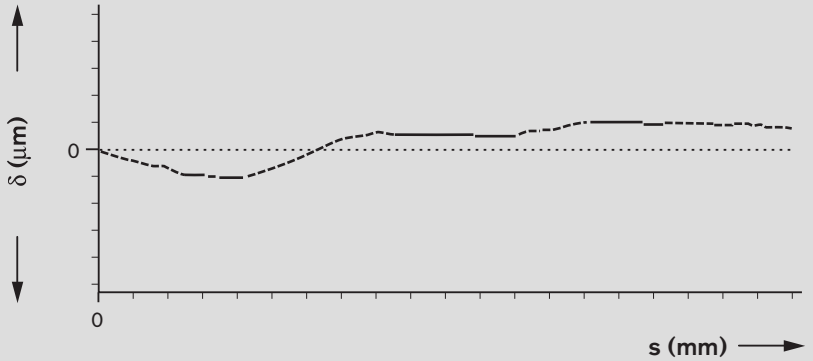
Lead deviation of ball screw

Option no. 03

A measurement report of the lead deviation δ over the measured travel s (see illustration) is provided in table form in addition to the graph.

δ = deviation (µm)
s = measured travel (mm)

Example



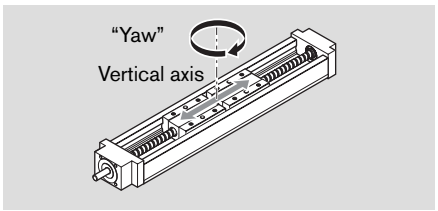
Travel accuracy

Option no. 04

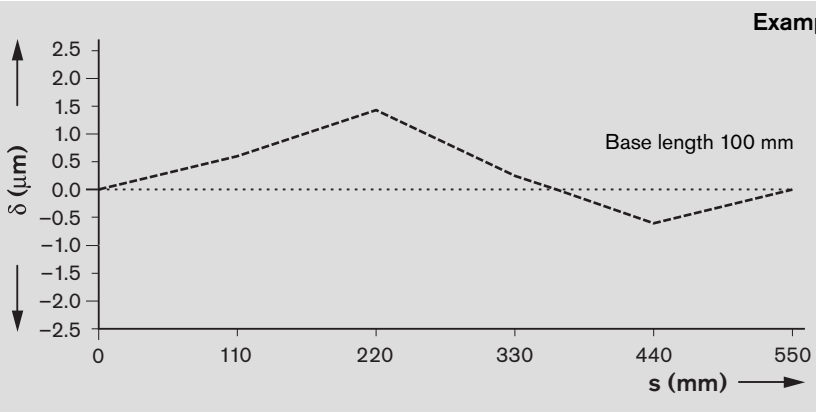
Several measuring points are passed during the total travel. The yawing and pitching deviations are measured at these points.

Note
The measurements are taken with the module screwed down and assuming an ideally flat mounting base surface.

Yawing
Yawing is angular deviation about the vertical axis. This angular deviation is converted to a linear deviation δ in µm on the basis of a standard length and is plotted on the graph. The base length is given in the graph.

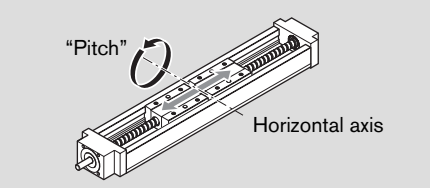


Example

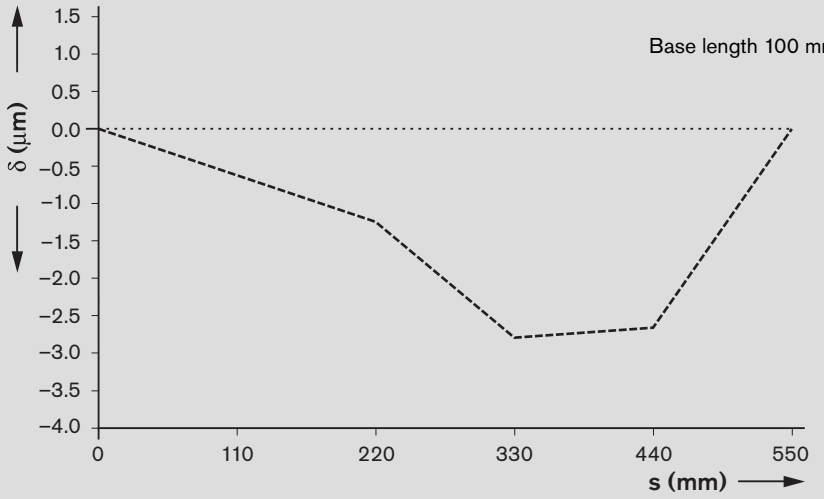


Documentation

Pitching
Pitching means angular deviation about the horizontal axis. This angular deviation is converted to a linear deviation δ in µm on the basis of a standard length and is plotted on the graph. The base length is given in the graph.
In addition to graphical representation (see illustrations), a measurement report is supplied in table form.



Example

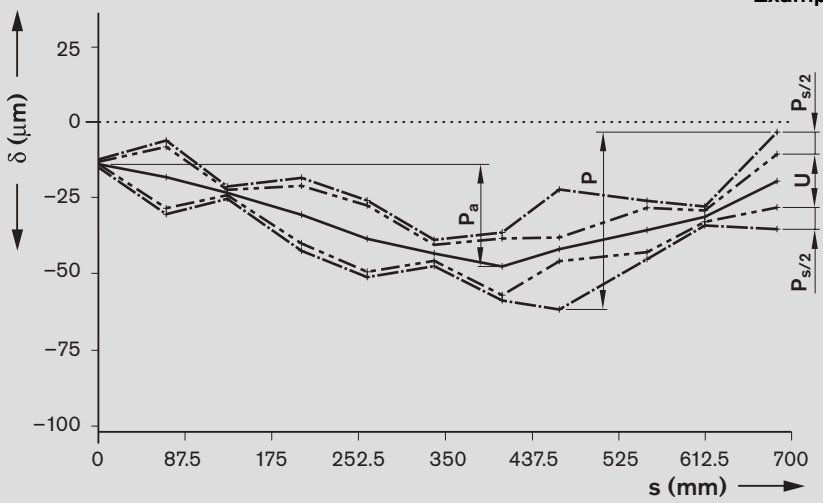


Positioning accuracy per VDI/DGQ 3441

Option no. 05

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

Example



δ = deviation (µm)
s = measured travel (mm)

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.

Notes

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 Precision Module PSK

Ordering example

Ordering data			Description
Precision Module PSK 90			Designation
Part number: R1465 400 00, 740 mm			PSK 90, length = 740 mm
Version	=	MF01	With motor mount and motor, as shown in diagram MF01
Guideway	=	18	Rail system, 740 mm long
Drive unit	=	03	Ball screw 16 x 16
Carriage	=	24	Two carriages, long, steel version for cover plate
Motor attachment	=	03	With motor mount for motor MSK 040C
Motor	=	87	Motor MSK 040C with brake
Cover	=	01	With cover plate
1st switch	=	21	Reed sensor
2nd switch	=	22	Hall sensor
3rd switch	=	21	Reed sensor
Cable duct	=	25	Cable duct supplied loose
Switching cam	=	30	Switching cam for version without cover or with cover plate
Documentation	=	01	Standard report

To be completed by customer: Inquiry ☐ / Order ☐

Precision Module PSK _____

Part number: R_____ _____ _____**, length** _____**mm**

Version = ☐☐☐☐
Guideway = ☐☐
Drive unit = ☐☐
Carriage = ☐☐
Motor attachment = ☐☐
Motor = ☐☐
Cover = ☐☐
1st switch = ☐☐ - ☐ + ☐☐☐☐ **mm**
2nd switch = ☐☐ - ☐ ± ☐☐☐☐ **mm**
3rd switch = ☐☐ - ☐ – ☐☐☐☐ **mm**
Cable duct = ☐☐ , ☐☐☐☐ **mm**
Switching cam = ☐☐
Documentation = ☐☐

Single parts:
(Part number): **R**_____ _____ _____
R_____ _____ _____
R_____ _____ _____
R_____ _____ _____

Quantity **Order of:** ____ **pcs,** _____ **per month,** _____ **per year, per order, or** _____
Comments:

From
Company: _____ **Name:** _____

Address: _____ **Department:** _____

_____ **Telephone:** _____

_____ **Telefax:** _____

Rexroth
Bosch Group

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Assembly Technologies
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