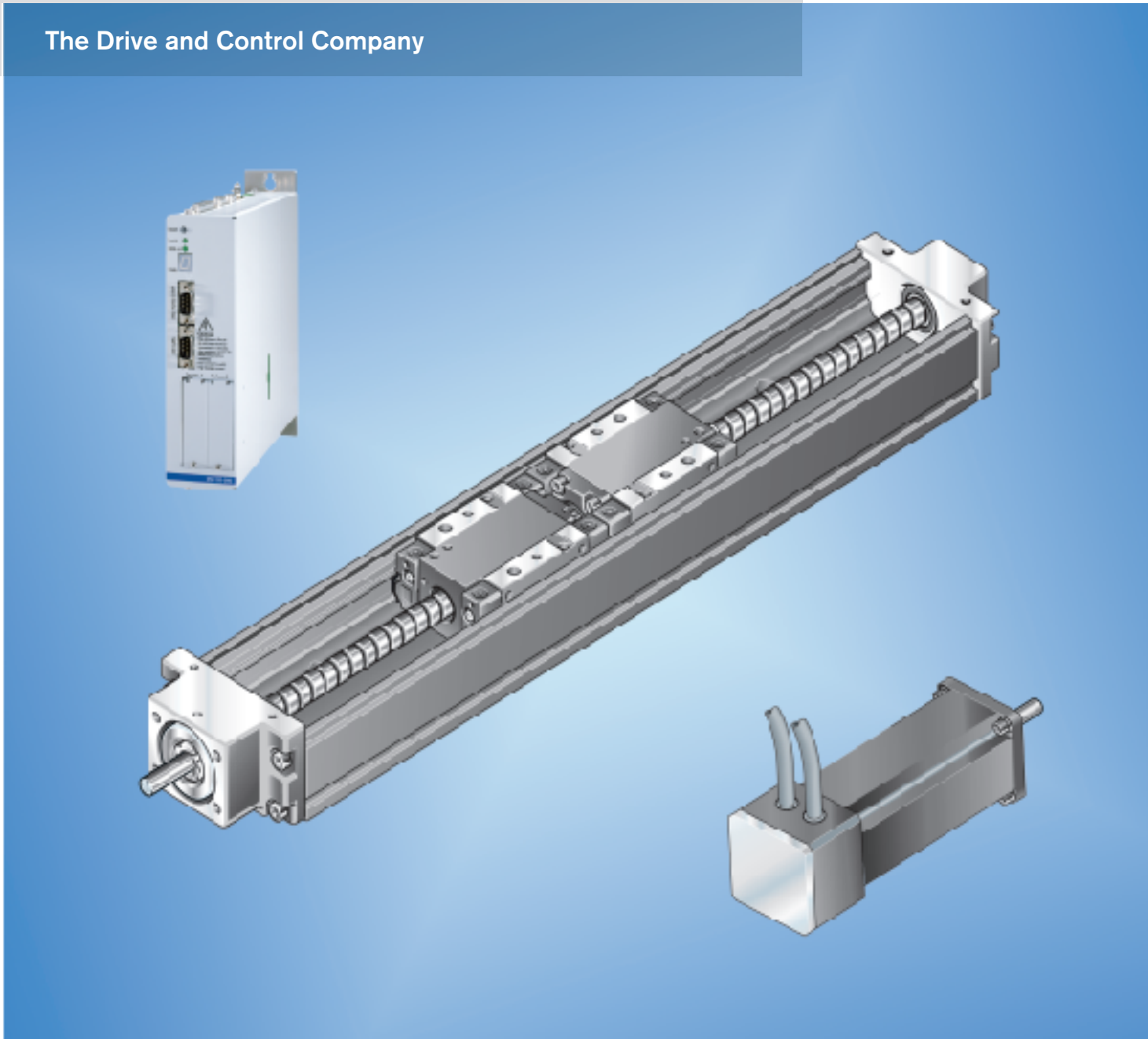
Rexroth
Bosch Group

Precision Modules PSK

The Drive and Control Company



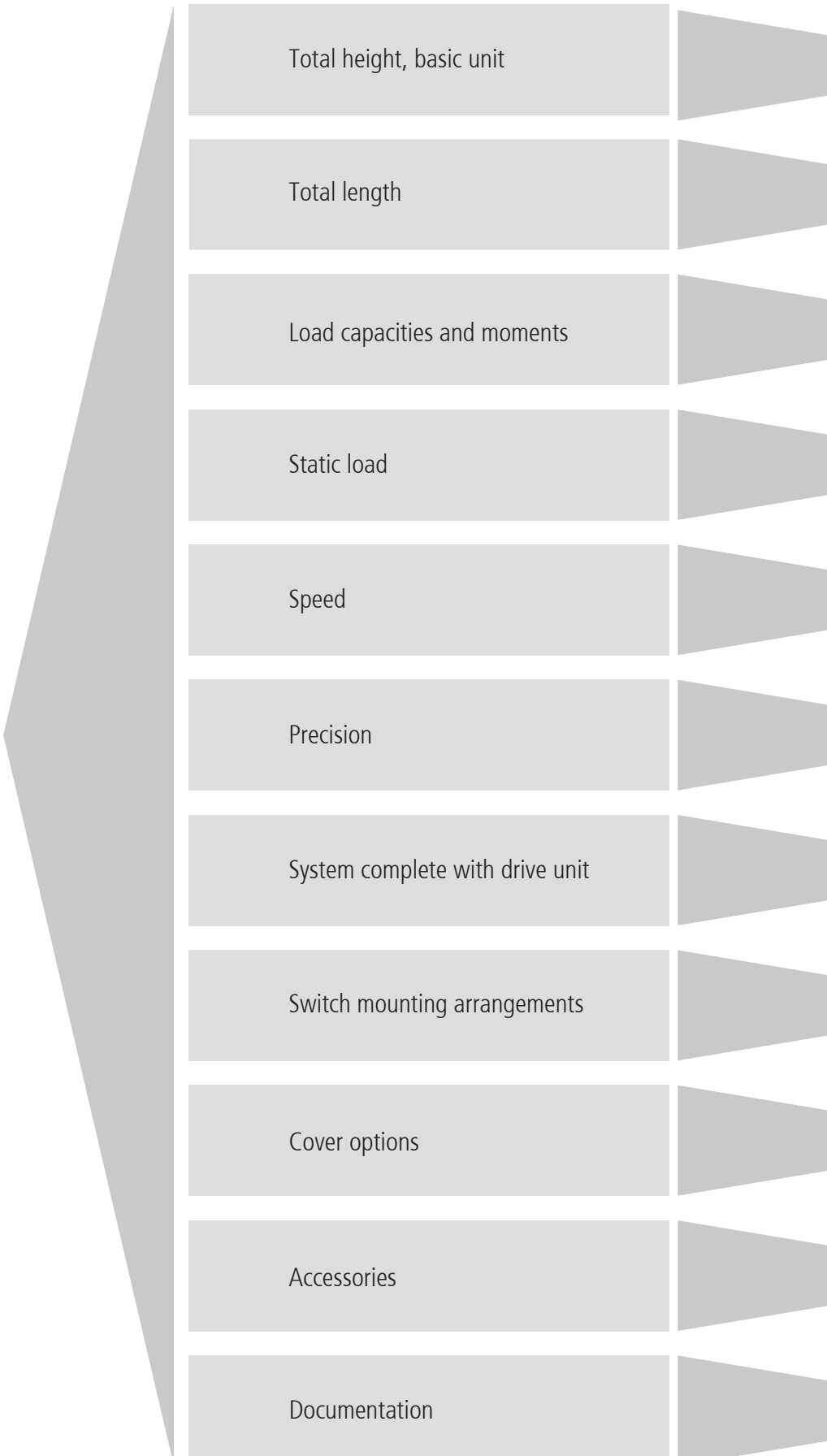
Rexroth – Linear Motion Technology

Precision Modules PSK

Rexroth – Precision Modules PSK
A Solution to Many Problems

The tasks

- Driving
- Transporting
- Positioning



26 mm to 46 mm

Up to 940 mm, or any intermediate length

Load capacity C up to 44670 N
Longitudinal moment M_L up to 1557 Nm
Torsional moment M_t up to 1478 Nm

Up to 800 kg

Up to 96 m/min

Repeatability up to 0.005 mm
Positioning accuracy up to 0.01 mm
Straightness accuracy up to 0.005 mm

AC servomotor or stepping motor with
mount, coupling or timing belt side drive;
complete with controller and control system

Switches over total travel range

Without cover
Cover plate
Sealing strip

Clamping fixtures, motor mounts

Moment of friction measurement, lead deviation
Running accuracy, positioning accuracy

The solution

**Rexroth –
Precision Modules**

Rexroth – Precision Modules PSK
Product Overview

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

Structure

- Extremely compact and rigid precision steel profile (frame) with reference edge and integrated Rexroth rail system geometry
- Rexroth Precision Ball Screw Assemblies to tolerance grade 7 with zero-clearance nut systems
- Aluminum fixed bearing end block with preloaded bearing
- Floating bearing end block with double bearings
- Carriages in various designs:
  Steel (St) or aluminum (Al), standard length or long, one or two carriages

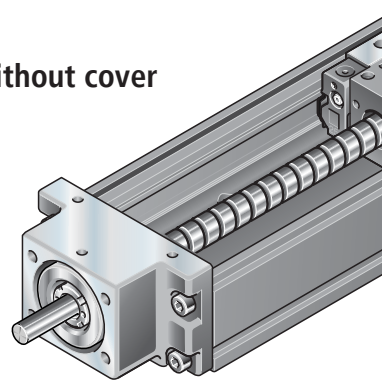
▶ Rapid mounting and easy axis alignment thanks to machined reference edge on the frame

▶ One or two steel or aluminum carriages in standard length or long

Attachments

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

PSK without cover

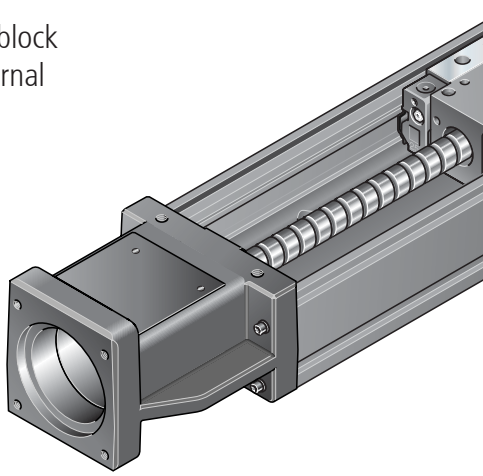


▶ Extremely stiff and precise miniature drive unit

Drive Controllers and Control Systems

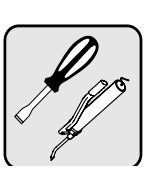
▶ High positioning accuracy and repeatability due to Precision Ball Screw Assembly with zero-clearance nut system

▶ Fixed bearing end block with ball screw journal



▶ High travel speeds combined with high precision due to Ball Rail Systems, large screw diameters and leads, and double floating bearing

▶ Simple motor attachment due to locating feature and tapped mounting hole

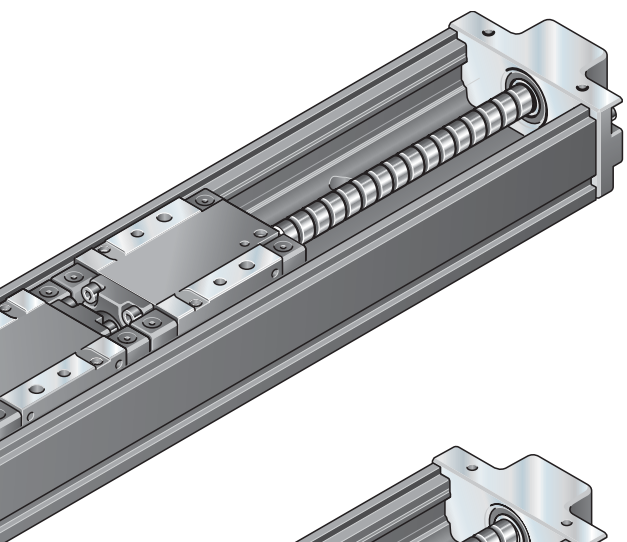


For mounting, maintenance and start-up, see "Instructions for PSK Precision Modules" RE 82 475

▶ Fixed bearing end block with integrated motor mount

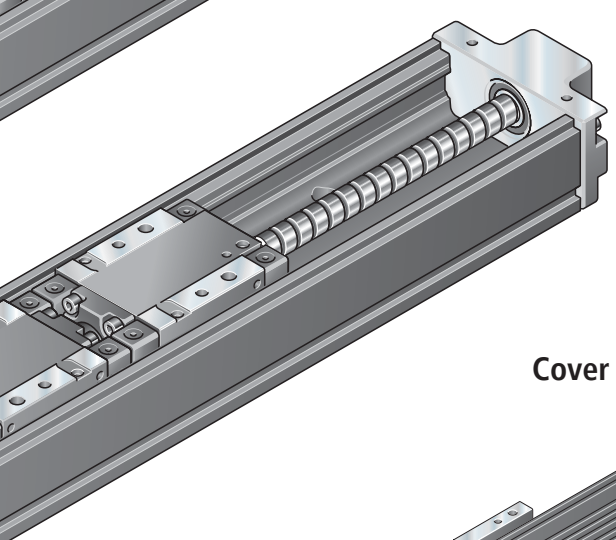
- Optimum running properties, high load capacities, high precision and high rigidity due to integrated Rexroth Ball Rail System

- Length:
  - Preferred lengths for even shorter delivery times
  - Customer specific (variable length, non-standard length increments)



- Precise alignment and secure mounting of attachments thanks to tapped bores and pin holes in the carriage

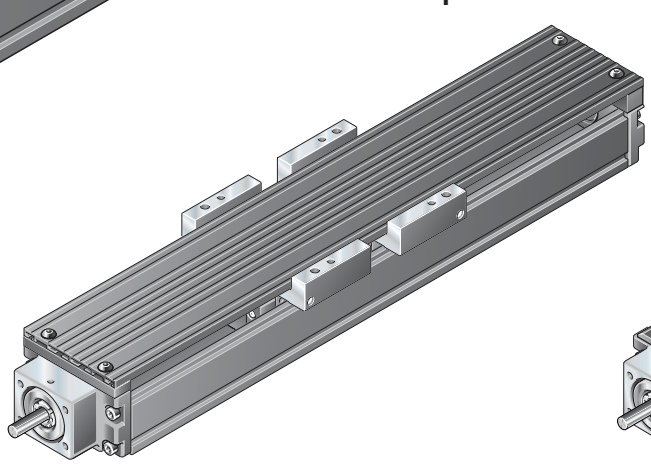
- Adjustable switches over the entire travel range



- Low-cost maintenance provided by one-point lubrication (grease) for Ball Rail System and Precision Ball Screw Assembly

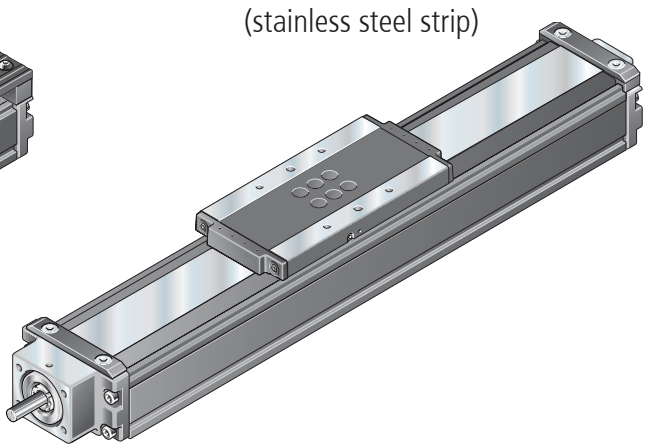
Internal elements protected by

Cover plate



- One or two steel or aluminum carriages in standard length or long

Sealing strip
(stainless steel strip)



- Aluminum carriage in standard length or long

Rexroth – Precision Modules PSK
Product Overview

Motor selection

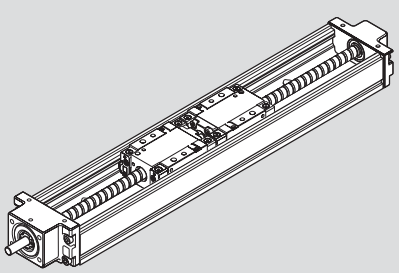
in accordance with controllers and control systems

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

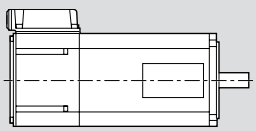
The motor/controller combination must always be taken into account when sizing the drive.

For more detailed information about motors and controllers, see the following catalogs:

- Servomotors: 82 710
- Stepping motors: 82 720



Servo motor MKD

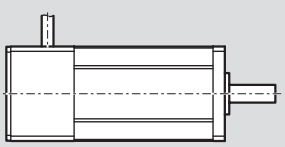


MKD 25B-144-KG1
MKD 41B-144 KG1

Digital controllers ECODRIVE

DKC

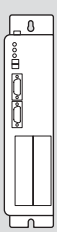
Servo motor MSI



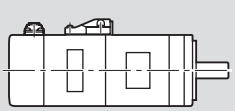
MSI 032
MSI 040
MSI 055

Digital controllers DSC

DSC



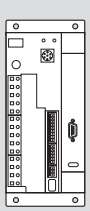
Servo motor MSM



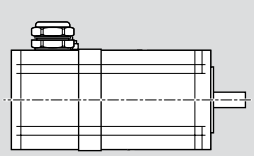
MSM 020B
MSM 030B
MSM 030C
MSM 040B

Digital controllers ECODRIVE Cs

DKC



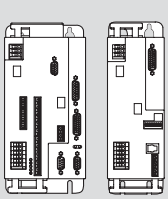
3-phase stepping motor



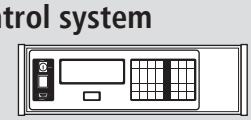
VRDM 368
VRDM 397
VRDM 3910

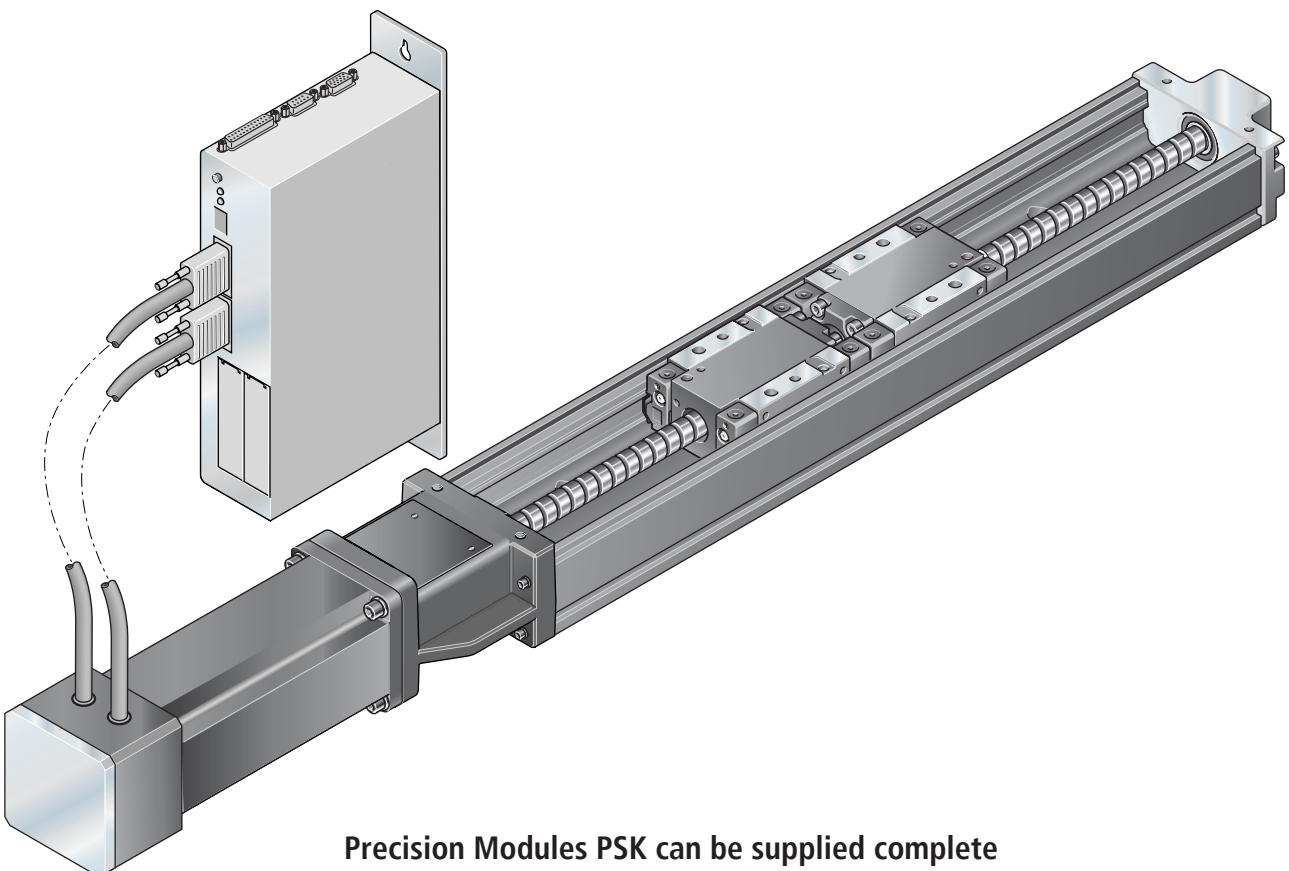
Power electronics

Twin Line



STEP control system





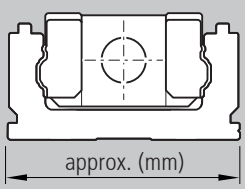
Precision Modules PSK can be supplied complete with motor, controller and control system.

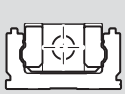
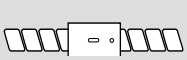
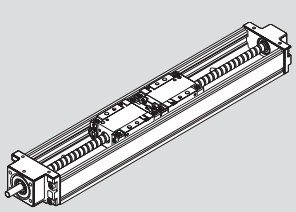
Rexroth – Precision Modules PSK
Types Available, Load Capacities

Type designation (size)

Precision Modules are designated according to **type** and **size**.

Types also cover the equivalent designs without drive systems.

Precision Module (example) =	Type			Size
	P	**S**	K	**90**
System = Precision Module **(P)**				
Guideway = Rail System **(S)**				
Drive unit = Precision Ball Screw Assembly **(K)**				
Frame dimensions = 				

	Type	Guideway	Drive Unit	Precision Module	
Rexroth – Precision Modules	**PSK**	 **Rail System**	 **Precision Ball Screw Assembly**		

Overview of Precision Modules with permissible loads

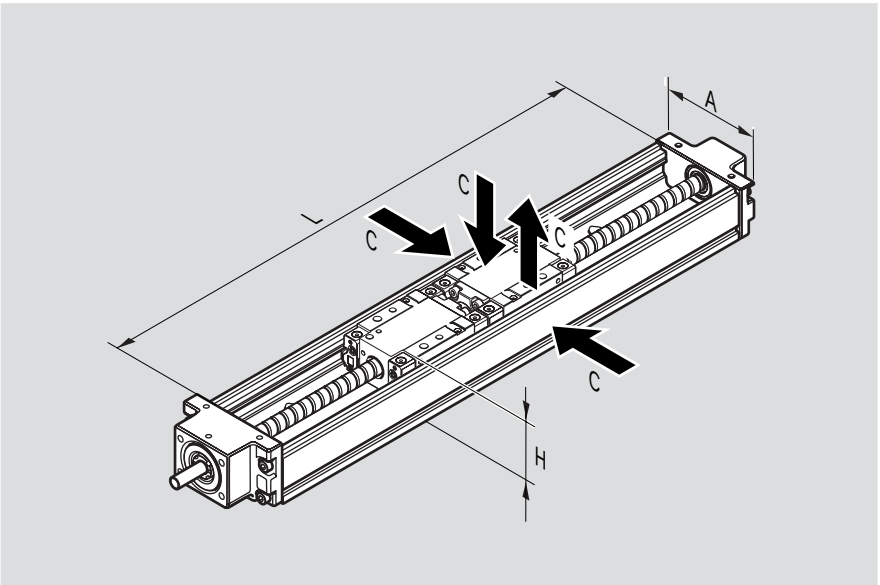
Suitable Loads

(recommended value on the basis of past experience)

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

The following values may not be exceeded:

– the maximum permissible loads
– the maximum permissible drive torque
– the maximum permissible speed.



Available lengths

Preferred lengths with reduced delivery times

PSK 50	PSK 60	PSK 90
L (mm)	L (mm)	L (mm)
150	150	340
200	200	440
250	250	540
300	300	640
-	400	740
	500	840
	600	940
	700	

Variable length (customer specific)

Any desired length up to L_{max} can still be supplied on request.

The L_{max} dimensions for the individual types are given in the appropriate sections.

Precision Module	Dimensions A x H (mm)	Dynamic load capacity C (N)			
		Carriage			
		Standard length		Long	
		1 carr.*	2 carr.	1 carr.	2 carr.
PSK 50	50 x 26	7 300	11 850	–	–
PSK 60	60 x 33	7 300	11 850	9 000	14 620
PSK 90	86 x 46	21 300	34 600	27 500	44 670

Note: All Precision Modules can also be supplied without drive unit.

* carr. = carriage

Rexroth – Precision Modules PSK
Structure

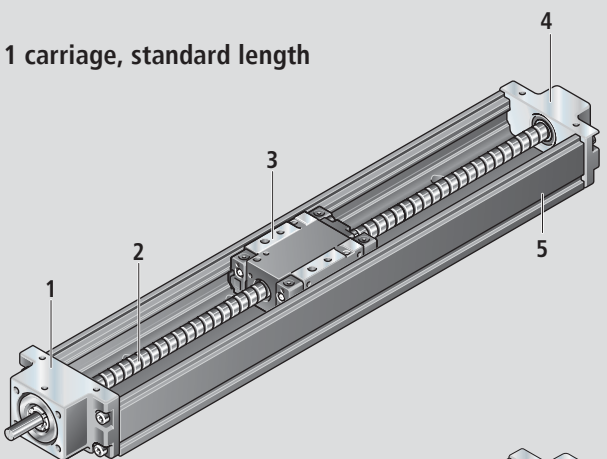
PSK without cover

1 Fixed bearing end block
2 Precision ball screw assembly with zero-clearance cylindrical single nut
3 One or two carriages in standard length or long, in steel or aluminum
4 Floating bearing end block
5 Frame with reference edge and integrated guideway running tracks

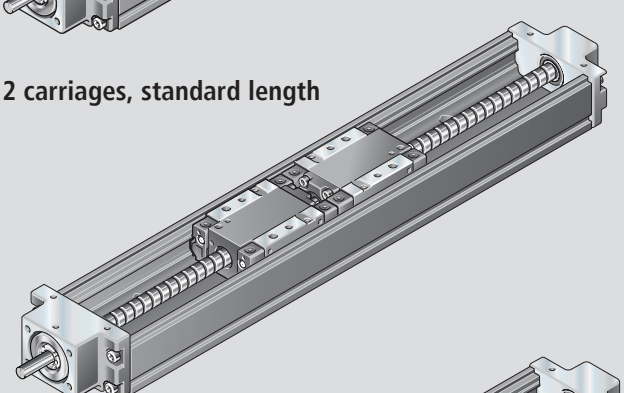
PSK with cover plate

9 Cover plate
10 One or two carriages in standard length or long
10a Carriage plate, aluminum
10b Carriage plate guide unit, in steel or aluminum

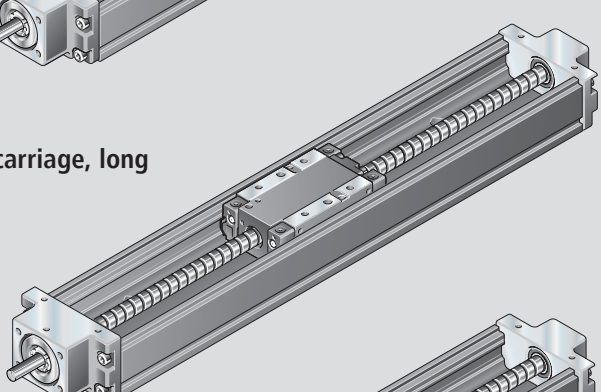
1 carriage, standard length



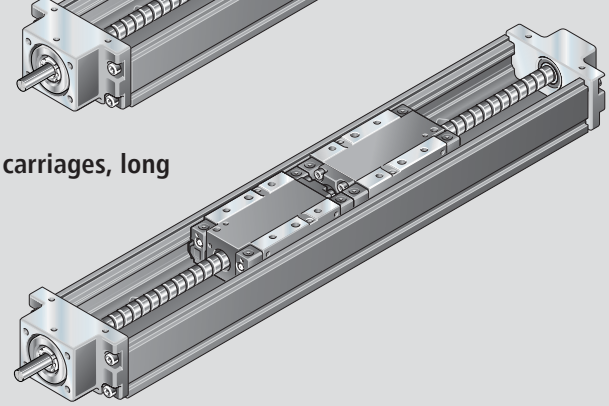
2 carriages, standard length



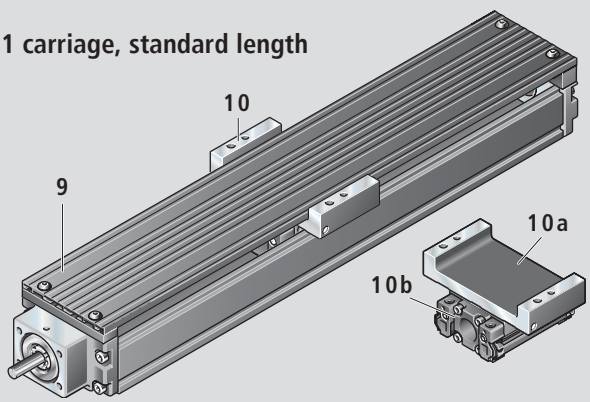
1 carriage, long



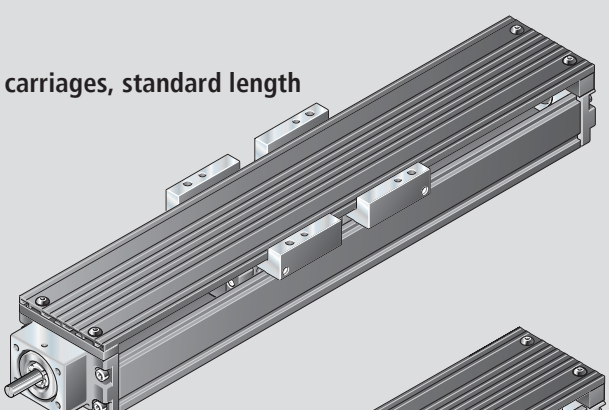
2 carriages, long



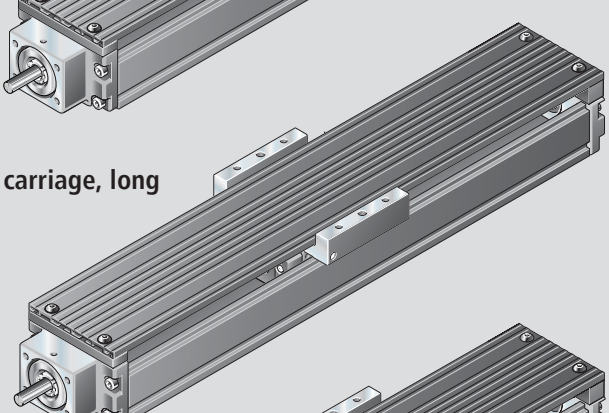
1 carriage, standard length



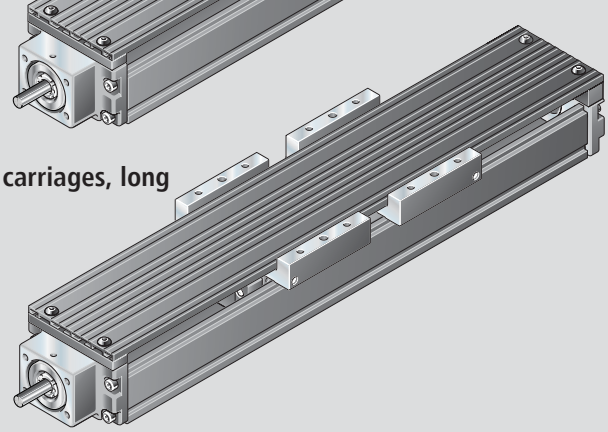
2 carriages, standard length



1 carriage, long



2 carriages, long



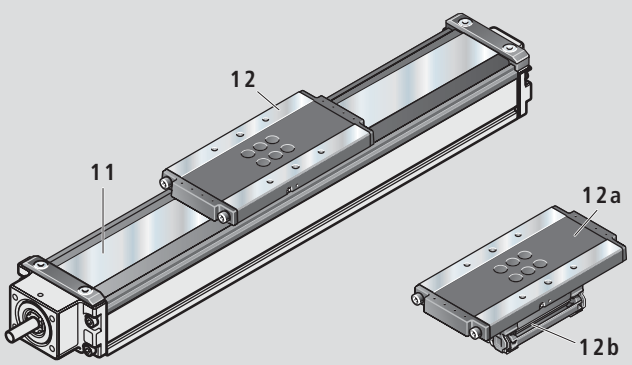
PSK with sealing strip

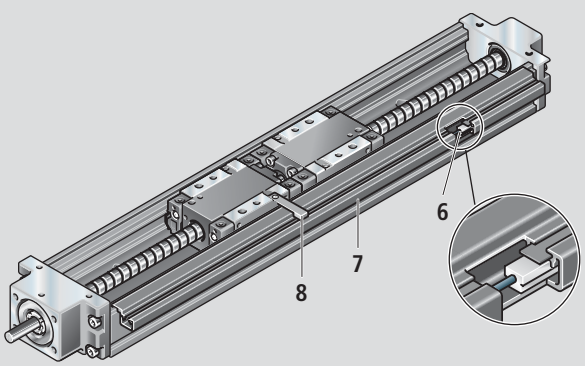
11 Sealing strip, stainless steel
12 Carriage, standard length or long
12a Carriage plate, aluminum
12b Carriage plate guide unit, aluminum

Attachments for all PSK modules

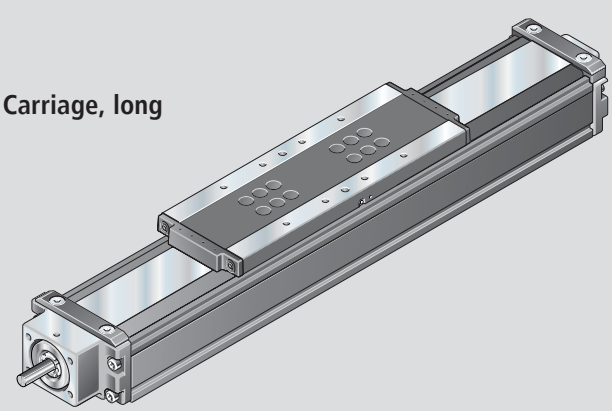
6 Switch
7 Cable duct
8 Switching cam

Carriage, standard length





Carriage, long



Rexroth – Precision Modules PSK
Structure

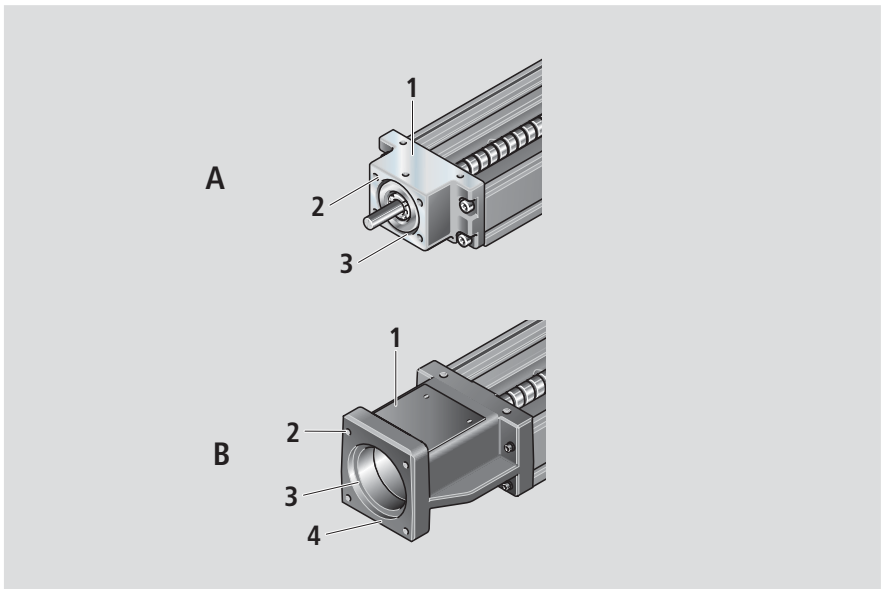
Fixed bearing end block

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 Mount type D, for motor attachment in accordance with NEMA



Motor attachment

Motor attachment with mount and coupling

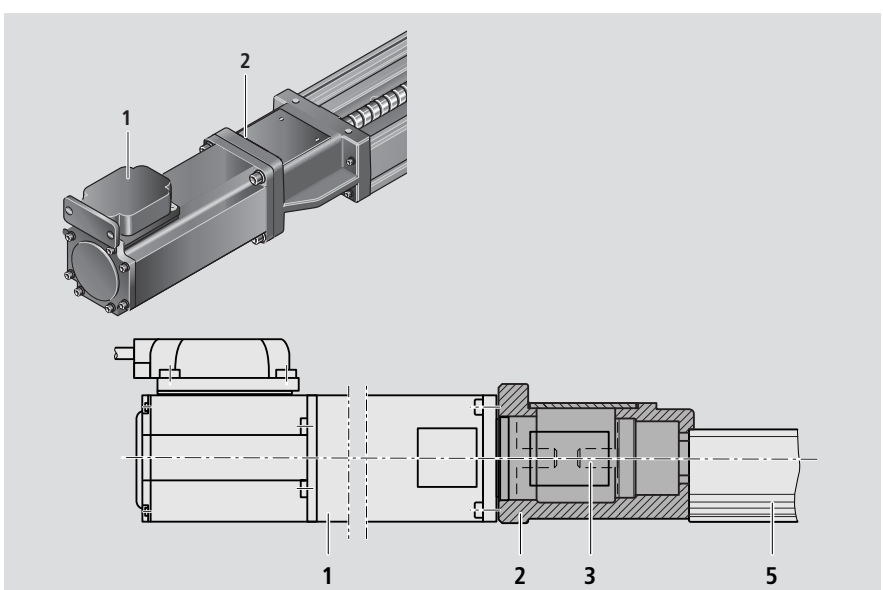
A motor can be attached with a mount and coupling to all Precision Modules equipped with Precision Ball Screw Assemblies.

The motor mount serves both to attach the motor to the Precision Module and as an enclosed housing for the coupling.

The coupling transmits the motor drive torque free of stresses to the Precision Module's ball screw journal.

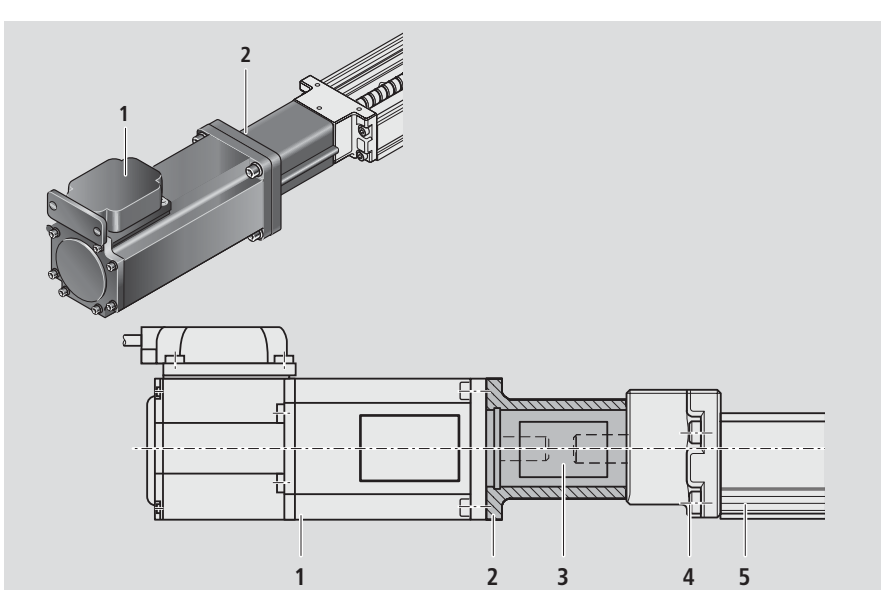
Fixed bearing end block with integrated motor mount and coupling

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
2 Motor mount
3 Coupling
4 Fixed bearing end block
5 Precision module



Motor attachment with timing belt

As an alternative, the motor (4) can be attached to the Precision Modules PSK 60 and PSK 90 as a side drive with timing belt (2).

In this case, the overall length is shorter than when a mount and coupling are used to attach the motor.

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

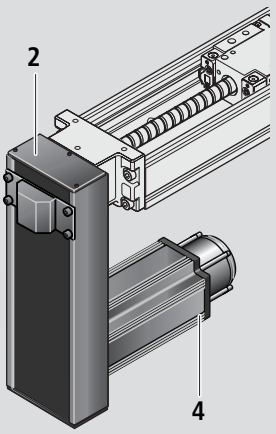
The following gear ratios are available:

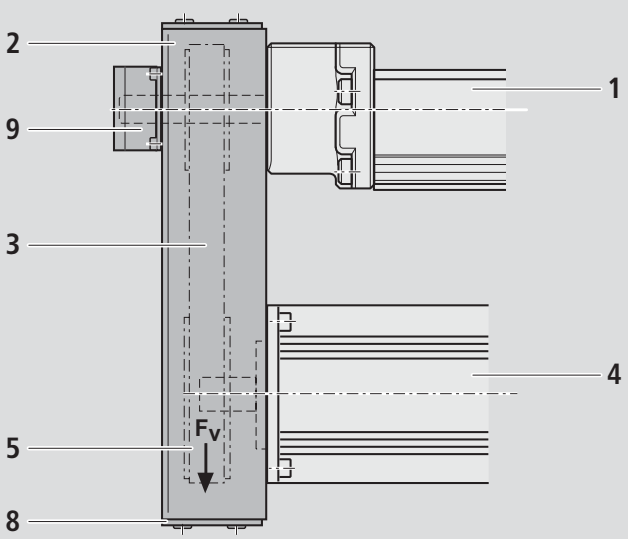
i = 1 : 1
i = 1 : 1.5

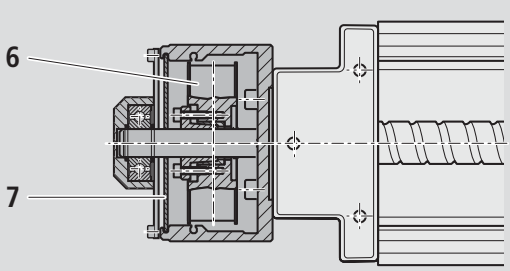
The timing belt side drive can be mounted in four directions:

– top, bottom
– left, right

1 Precision module
2 Extruded anodized aluminum profile
3 Toothed belt
4 AC servomotor
5 Pre-tensioning of the toothed belt: Apply pre-tensioning force F_v to the motor (F_v will be specified on delivery).
6 Pulleys
7 Cover plate
8 Cover
9 Ball screw journal with support bearing







Rexroth – Precision Modules PSK
Technical Data

Dynamic characteristics

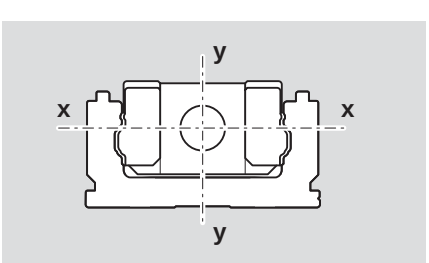
Precision module	Type of cover	Carriage length	No. of carriages	Guideway			Ballscrew		Fixed bearing
				Dynamic load capacity C (N)	Dynamic moments		d_0 x P	Dynamic load capacity C (N)	Dynamic load capacity C (N)
					M_t (Nm)	M_L (Nm)			
PSK50	w/o and plate	standard	1 carr.*	7 300	150	35	8 x 2.5	2 200	1 600
			2 carr.	11 850	244	5.93 · l_m			
	strip	standard	1 carr.	7 300	150	35			
		long	1 carr.	11 850	244	356			
PSK60	w/o and plate	standard	1 carr.	7 300	170	35	12 x 2	2 240	4 000
			2 carr.	11 850	276	5.93 · l_m			
		long	1 carr.	9 000	210	60	12 x 5	3 800	
			2 carr.	14 620	341	7.31 · l_m			
	strip	standard	1 carr.	9 000	210	60	12 x 10	2 500	
		long	1 carr.	14 620	341	541			
PSK90	w/o and plate	standard	1 carr.	21 300	710	150	16 x 5	12 300	13 400
			2 carr.	34 600	1 153	17.3 · l_m			
		long	1 carr.	27 500	910	270	16 x 10	9 600	
			2 carr.	44 670	1 478	22.34 · l_m			
	strip	standard	1 carr.	21 300	710	150	16 x 16	6 300	
		long	1 carr.	34 600	1 153	1 557			

* carr. = carriage

l_m = center-to-center distance between carriages in mm

General technical data

Precision module	Planar moment of inertia		Max. length	Min. c-to-c distance $l_{m\,min}$ (mm)		Mass (kg)			
	I_x (cm⁴)	I_y (cm⁴)	L_{max} (mm)	standard length	long	without cover without drive	without cover with drive	with cover plate	with sealing strip
PSK50	1.69	13.5	600	60	-	0.0035 · L + m_b	0.0038 · L +0.179+m_b	0.0041 · L +0.204+m_b	0.0042 · L +0.208+m_b
PSK60	5.38	34.48	940	60	75	0.0062 · L + m_b	0.0069 · L +0.254+m_b	0.0072 · L +0.281+m_b	0.0073 · L +0.272+m_b
PSK90	22.34	145.8	940	90	110	0.0125 · L + m_b	0.0138 · L + 0.638+m_b	0.0146 · L + 0.726+m_b	0.0147 · L +0.736+m_b



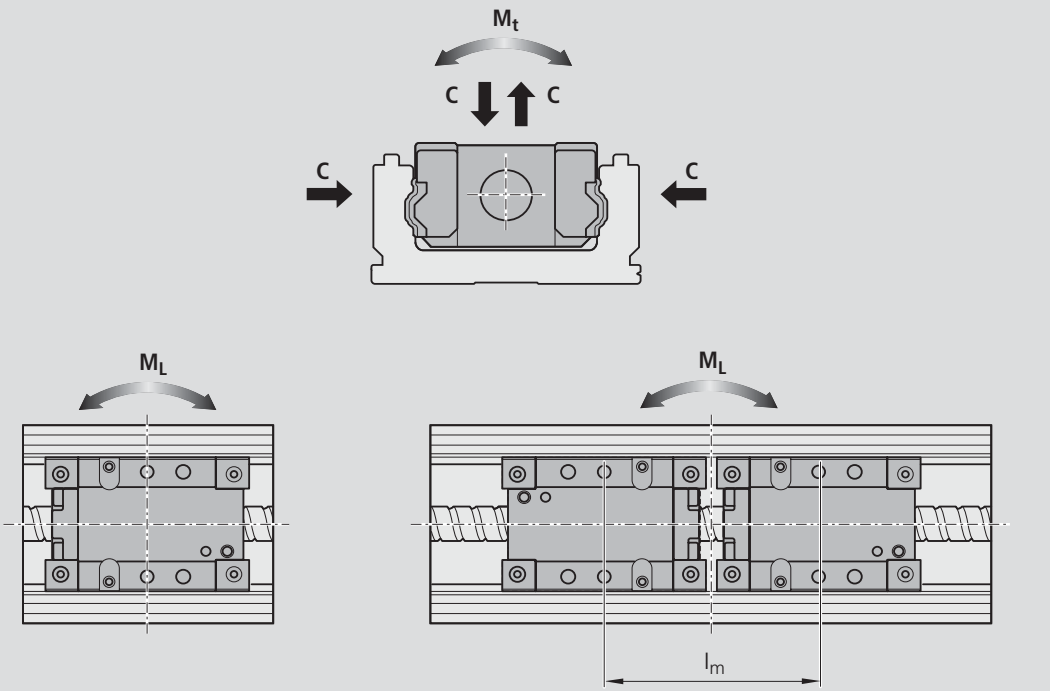
Mass

Mass calculation does not include motor or switches.

Mass formula:

Mass (kg/mm) x length L (mm) + mass of all parts of fixed length (kg) + moved mass m_b (kg)

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



with one carriage

with two carriages

l_m = center-to-center distance between carriages

Notes on dynamic load capacities and moments

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

Maximum permissible loads

The maximum permissible forces and moments are equal to half the dynamic characteristics (**C**, $\mathbf{M_t}$, $\mathbf{M_L}$).

Moved mass m_b

* carr. = carriage

Precision module	Moved mass m_b (kg)								
	Carriage version	Carriage length	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 50	Steel version	standard	0.20	0.40	0.22	0.42	0.29	0.56	-
	Al version	standard	0.11	0.21	0.12	0.23	0.19	0.37	0.20
		long	-	-	-	-	-	-	0.37
PSK 60	Steel version	standard	0.25	0.49	0.27	0.52	0.38	0.73	-
		long	0.34	0.69	0.37	0.71	0.51	1.00	-
	Al version	standard	0.12	0.24	0.15	0.27	0.25	0.48	0.33
		long	0.17	0.33	0.19	0.36	0.33	0.64	0.58
PSK 90	Steel version	standard	0.77	1.54	0.85	1.62	1.09	2.10	-
		long	1.04	2.08	1.11	2.15	1.43	2.79	-
	Al version	standard	0.38	0.76	0.46	0.84	0.70	1.32	0.80
		long	0.49	0.98	0.57	1.06	0.89	1.70	1.40

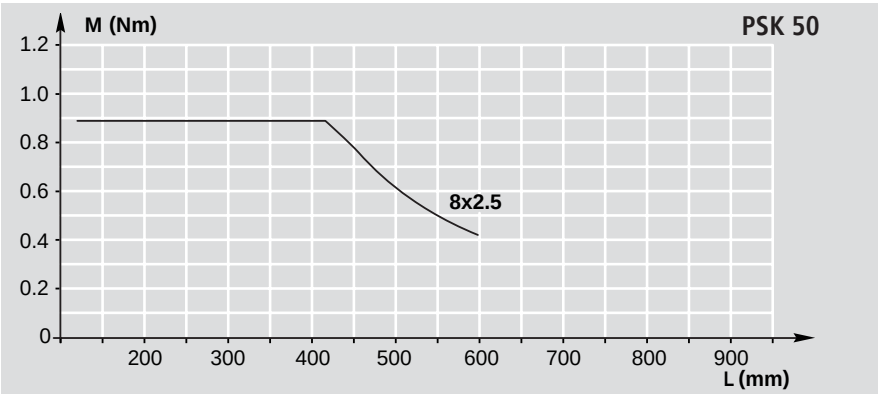
Rexroth – Precision Modules PSK
Technical Data

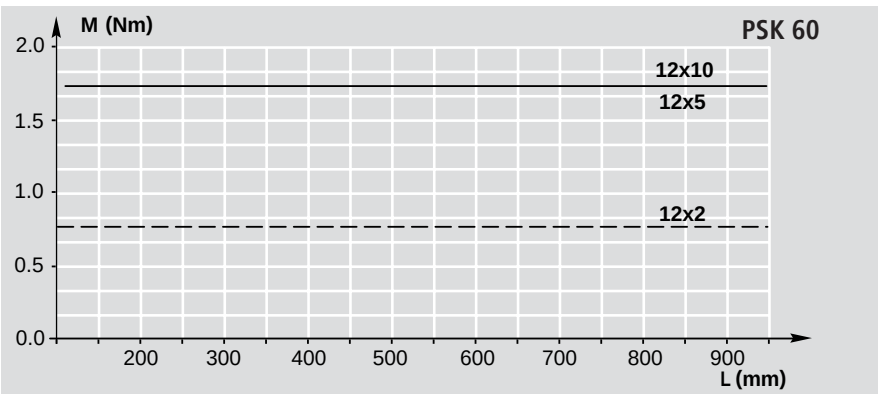
Maximum permissible drive torque M_{per}

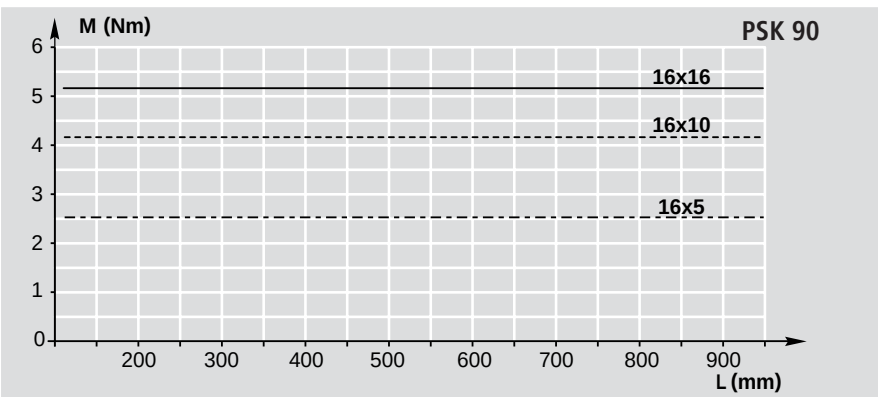
The M_{per} values shown apply in the following conditions:

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

Observe the rated torque of coupling used!







Ball screw journal with keyway

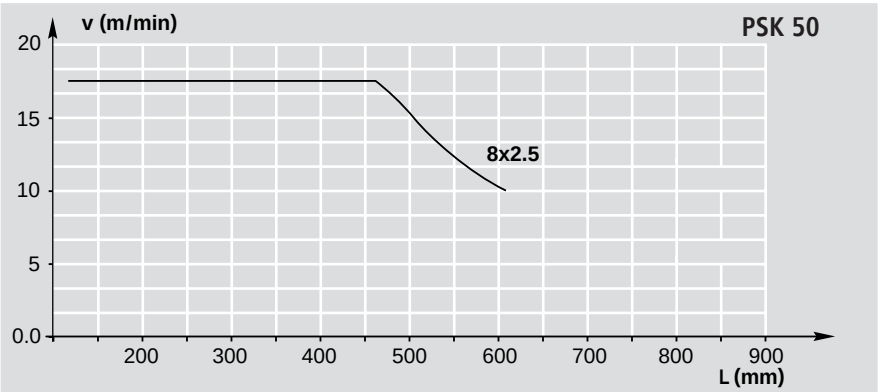
Due to the notch effect and the reduction of the effective diameter, observe the maximum values for the drive torque given in the graphs!

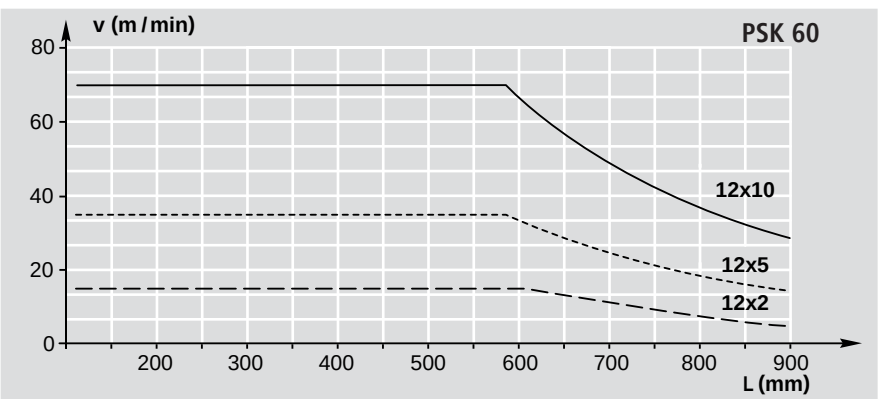
For PSK 90:
If a keyway is used, the applicable value will be the lower figure when comparing the graph and the table!

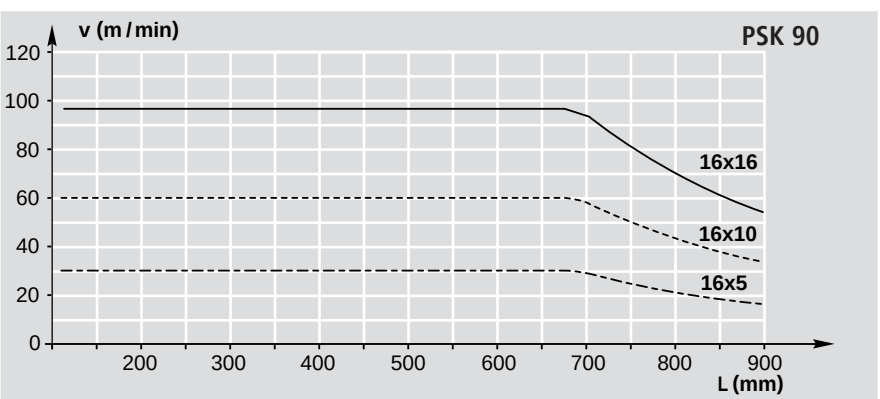
Precision Module	M_{per} (Nm)
PSK 90	3.2

Permissible velocity v

Observe the motor speed!







Rexroth – Precision Modules PSK
Technical data
Drive data of side drive with timing belt, fixed bearing end
for motor attachment via timing belt side drive

Motor type		MKD 25B / MSM 030B / MSM 030C					MKD 41B / MSM 040B				
Friction moment M_{RRV} (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	
Reduction i = ...			i = 1	i = 1.5	i = 1	i = 1.5		i = 1	i = 1.5	i = 1	i = 1.5
Precision module	Ball screw d_0 x P	L (mm)	M_{Rv} (Nm)	M_{Rv} (Nm)	J_{Rv} (10^{-6} kgm²)	J_{Rv} (10^{-6} kgm²)	L (mm)	M_{Rv} (Nm)	M_{Rv} (Nm)	J_{Rv} (10^{-6} kgm²)	J_{Rv} (10^{-6} kgm²)
PSK 60	12 x 2	940	0.80	0.50	45.6	17.7					
	12 x 5	940	1.60	1.10							
	12 x 10	940	1.60	1.10							
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			940	3.90	2.60		
	16 x 16	940	2.50	1.70			940	4.80	3.20		

M_{Rv} = Permissible system torque for side drive with timing belt on the motor journal (observe max. motor torque M_{max})

M_{RRv} = Friction moment, side drive with timing belt on motor journal

J_{Rv} = Reduced mass moment of inertia, side drive with timing belt

i = Reduction, side drive with timing belt

Technical data, AC servomotors

Motor type		MKD 25B-144 KG1	MKD 41B-144 KG1
Maximum effective speed n_{max}	(min^{-1})	ϟ	ϟ
Rated torque M_N	(Nm)	0.9	2.7
Maximum torque M_{max}	(Nm)	ϟ	ϟ
Mass moment of inertia $J_M + J_{Br}$	(10^{-6} kgm²)	30 + 8	170 + 16
Braking torque M_{Br}	(Nm)	1.0	2.2
Mass with brake m_{Br}	(kg)	2.25	4.65

ϟ See catalog "Controllers, Motors, Electrical Accessories, Servomotors" 82 710.

Technical data, ECODRIVE Cs motors

Motor type		MSM 030 B	MSM 030 C	MSM 040 B
Maximum effective speed n_{max}	(min^{-1})	3 000	3 000	3 000
Rated torque M_N	(Nm)	0.64	1.30	2.40
Maximum torque M_{max}	(Nm)	1.91	3.80	7.10
Mass moment of inertia $J_M + J_{Br}$	(10^{-6} kgm²)	10 + 3	17 + 3	67 + 8
Braking torque M_{Br}	(Nm)	1.27	1.27	2.45
Mass, motor + brake $m_M + m_{Br}$	(kg)	0.96 + 0.4	1.5 + 0.4	3.1 + 0.7

Friction moment M_R at motor journal

Precision module	Ball screw d_0 x P	Friction moment M_R (Nm) for carriage version			
		without cover or with cover plate 1 or 2 carriages		with sealing strip 1 carriage	
		Standard length	Long	Standard length	Long
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

Mass moment of inertia J_S for system with external load

$$J_s = [k_1 + k_2 \cdot L + k_3 (m_b + m_{fr})] \cdot 10^{-6}$$

J_s .... mass moment of inertia for system with external load (kgm^2)

k_1, k_2, k_3 .... Constants, (see table)

m_b .... Moved mass (kg) (see "Technical Data")

m_{fr} .... External load (kg)

L .... Length of PSK module (mm)

Precision module	Ball screw d_0 x P	Constants		
		k_1	k_2	k_3
PSK 50	8 x 2.5	0.485	0.002	0.158
PSK 60	12 x 2	0.971	0.013	0.101
	12 x 5	0.959	0.011	0.633
	12 x 10	0.959	0.011	2.533
PSK 90	16 x 5	3.678	0.031	0.633
	16 x 10	3.678	0.031	2.533
	16 x 16	3.702	0.034	6.485

Coupling data

Precision module	for motor attach-ment	Coupling data		
		Rated torque M_K (Nm)	Mass moment of inertia J_k (10^{-6} kgm^2)	Weight (kg)
PSK 50	MSM 030B	3.70	7.00	0.075
	MSI 032 MSM 020B	1.90	1.20	0.014
PSK 60	MSM 030B	3.70	7.00	0.075
	MKD 25 MSI 040	1.90	1.20	0.014
PSK 90	MKD 41 MSM 040B	9.00	61.00	0.260
	MKD 25 MSM 030C MSI 055	10.00	35.00	0.170

Rexroth – Precision Modules PSK
Technical Data, Design Calculations

Nominal Service Life

Nominal service life in meters:

$$L_{10} = \left(\frac{C}{F_m}\right)^3 \cdot 10^5$$

Nominal service life in hours:

$$L_{10h} = \frac{L_{10}}{60 \cdot v}$$

L_{10}	=	Nominal service life in meters	(m)
L_{10h}	=	Nominal service life in hours	(h)
C	=	Dynamic load capacity	(N)
F_m	=	Mean equivalent dynamic load	(N)
v	=	Velocity (from "Permissible velocity" graph)	(m/min)

Friction moment

Motor attachment via mount and coupling

$$M_R = M_{RS}$$

Motor attachment via side drive with timing belt

$$M_R = \frac{M_{RS}}{i} + M_{RRv}$$

M_R	=	Friction moment at motor journal	(Nm)
M_{RS}	=	Friction moment, system	(Nm)
M_{RRv}	=	Friction moment, side drive with timing belt at motor journal	(Nm)
i	=	Reduction	

Mass moment of inertia

For handling:

$$6 \cdot J_M \geq J_{fr}$$

For processing:

$$1.5 \cdot J_M \geq J_{fr}$$

J_{fr}	=	External mass moment of inertia	(kgm^2)
J_M	=	Mass moment of inertia of motor	(kgm^2)

Motor attachment via mount and coupling

$$J_{fr} = J_S + J_K + J_{Br}$$

$$J_{tot} = J_{fr} + J_M = J_S + J_K + J_{Br} + J_M$$

Motor attachment via side drive with timing belt

$$J_{fr} = \frac{J_S}{i^2} + J_{Rv} + J_{Br}$$

$$J_{tot} = J_{fr} + J_M = \frac{J_S}{i^2} + J_{Rv} + J_M + J_{Br}$$

J_{tot}	=	Total mass moment of inertia	(kgm^2)
J_{fr}	=	External mass moment of inertia	(kgm^2)
J_S	=	Mass moment of inertia of system with external load	(kgm^2)
J_K	=	Mass moment of inertia of coupling	(kgm^2)
J_{Br}	=	Mass moment of inertia of motor brake	(kgm^2)
J_M	=	Mass moment of inertia of motor	(kgm^2)
J_{Rv}	=	Reduced mass moment of inertia of side drive with timing belt at motor journal	(kgm^2)
L	=	Length of PSK module	(mm)
i	=	Reduction	

Speed

If a geared motor is attached, the moment of inertia of the gears and the gear transmission ratio must be included in the design calculation.

$$n_1 = \frac{i \cdot v \cdot 1000}{P}$$

$n_1 < n_{max}$

v < permissible velocity from graph

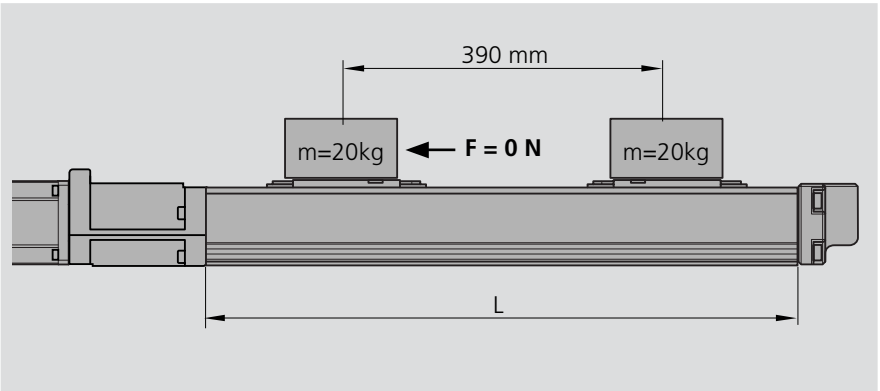
v	=	Permissible velocity	(m/min)
n_1	=	Speed	(1/min)
n_{max}	=	Maximum effective motor speed	(1/min)
P	=	Screw lead	(mm)
i	=	Reduction	

Rexroth – Precision Modules PSK
Calculation Example

Starting data

A mass of 20 kg is to be moved 390 mm at a maximum velocity of 40 m/min.

Module selected on the basis of the technical data and mounting dimensions:
PSK 90 without cover and with a standard length steel carriage; motor attachment via integrated mount and coupling; motor type MSI 055 with brake.



When dimensioning the drive, the motor-controller combination must always be considered, because the motor type and the performance data (e.g. max. effective speed and maximum torque) depend on the controller or the control system used.

Estimation of 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 assembly:

Permissible ball screw assemblies according to "permissible velocity" graph at v = 40 m/min: ball screw 16 x 10 and 16 x 16
Ball screw assembly selected: **ball screw 16 x 10** with v_{max} = 60 m/min
Generally, the smallest lead should be preferred (resolution, braking path, length).
Permissible drive torque of ball screw 16 x 10: M_{per} = 4.1 Nm (according to "permissible drive torque" graph)

Calculating the PSK module length L:

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

Friction moment M_R: $M_R = M_{RS}$ = 0.30 Nm (see "Technical Data")

Mass moment of inertia J: $J_{fr} = J_S + J_K + J_{Br}$

$J_K = 35 \cdot 10^{-6}$ kgm^2 ; $J_{Br} = 3 \cdot 10^{-6}$ kgm^2 (see "Technical Data" and "Motors")
$J_S = [\, k_1 + k_2 \cdot L + k_3 \cdot (m_b + m_{fr}) \,] \cdot 10^{-6}$; m_b = 0.77 kg (see "Technical Data")
$J_S = [\, 3.678 + 0.031 \cdot 540 \text{ mm} + 2.533 \cdot (0.77 \text{ kg} + 20 \text{ kg}) \,] = 73.03 \cdot 10^{-6}$ kgm^2
$J_{fr} = (73.03 + 35 + 3) \cdot 10^{-6}$ kgm^2 = $111.03 \cdot 10^{-6}$ kgm^2

For handling: $J_M \bullet \frac{J_{fr}}{6} = \frac{111.03 \cdot 10^{-6} \text{ kgm}^2}{6} = 18.5 \cdot 10^{-6}$ kgm^2

Speed: $n = \frac{i \cdot v \cdot 1000}{P} = \frac{1 \cdot 40 \text{ m/min} \cdot 1000}{10 \text{ mm}} = 4000 \text{ min}^{-1}$

Result:

PSK 90 without cover with one steel carriage in standard length:
Motor MSI 055, attachment via integrated mount and coupling

Preferred length L = 540 mm; hole spacing in frame: 70 mm / 40 x 100 mm / 70 mm
Ball screw 16 x 10 with v_{max} = 60 m/min and M_{per} = 4.1 Nm
Friction moment M_R = 0.30 Nm
Motor data: Mass moment of inertia: $J_M = 29 \cdot 10^{-6}$ kgm^2 > $18.5 \cdot 10^{-6}$ kgm^2
Speed: n_M = 7000 min^{-1} > 4000 min^{-1}
Torque: M_M = 3.0 Nm < 4.1 Nm

For final motor selection, the drive and performance data have to be recalculated as specified in the catalogs "Controls, Motors, Electrical Accessories, …" 82 710 and 82 720.

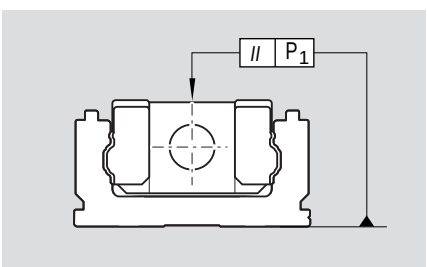
Rexroth – Precision Modules PSK
Accuracy

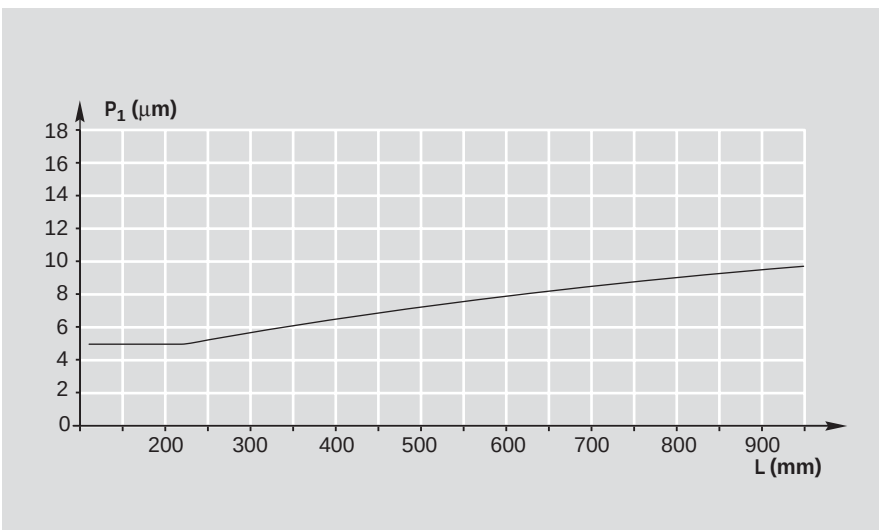
General Note

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

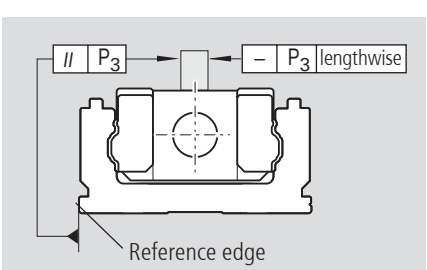
Accuracy P_1

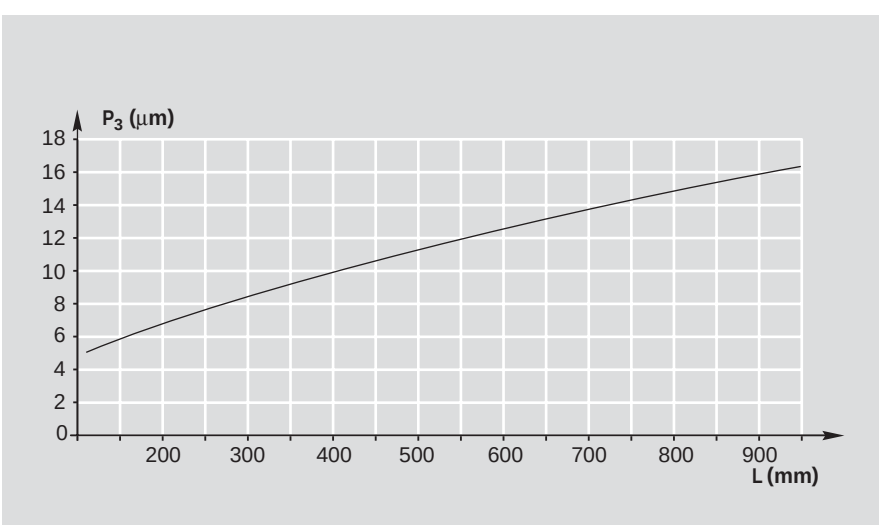
Measured at the carriage center





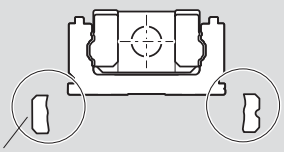
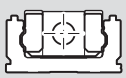
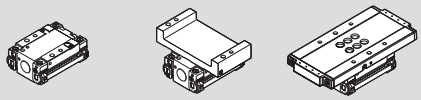
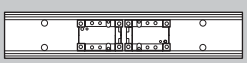
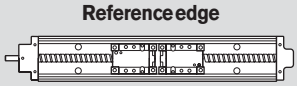
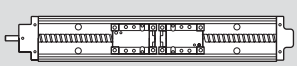
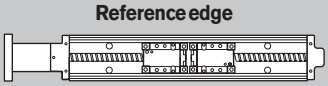
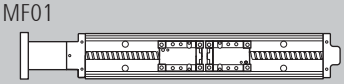
Accuracy P_3





Notes

Rexroth – Precision Module PSK 50
Components and Ordering Data

Part number, length 1465-200-00, (....) mm  Reference edge	(....) Type (and dimension drawing)	Guide-way = (..) 	Drive unit = (..) 	Carriage = (..) 						
			Screw journal	Ball screw size d_0 x P 8 x 2.5	For cover option	Steel		Aluminum		
						Standard length		Standard length		Long
						1 carr.*	2 carr.	1 carr.	2 carr.	1 carr.
without drive (OA)  OA01	OA01	Length = L 01 L = 150 mm 10 L = 200 mm 11 L = 250 mm 12 L = 300 mm 13	without screw journal	50	without cover	01	02	11	12	--
with ball screw, without motor mount (OF) Reference edge  OF01  OF02 Reference edge	OF01 OF02 (14.26.00)		dia. 5	01	without cover	01	02	11	12	--
					cover plate	21	22	31	32	--
					sealing strip	--	--	40	--	41
with ball screw and motor mount (MF) Reference edge  MF01  MF02 Reference edge	MF01 MF02 (14.26.11) (14.26.12)		dia. 5	01	without cover	01	02	11	12	--
					cover plate	21	22	31	32	--
					sealing strip	--	--	40	--	41
with ball screw and integrated motor mount (MF) MF10 MF11 Reference edge   Reference edge	MF10 MF11 (14.26.16) (14.26.17) (14.26.18)		dia. 5	30	without cover	01	02	11	12	--
					cover plate	21	22	31	32	--
					sealing strip	--	--	40	--	41

For order example see "Inquiry/Order Form" section.

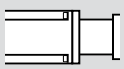
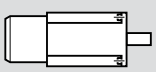
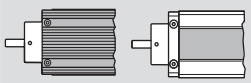
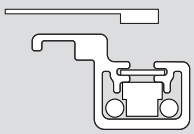
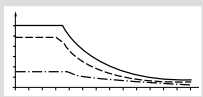
* carr. = carriage

Switch mounting arrangements

A cable duct is required to mount the switches.

For more information on switch mounting and switch types, see the section on "Switch Mounting Arrangements".

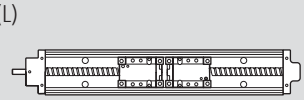
Please check whether the selected combination is a permissible one (load capacities, moments, maximum speed, motor data, etc.)!

	Motor attachment = ..		Motor = ..		Cover = ..			1st, 2nd, 3rd switch = ..	Documentation = ..	
										
	Gear ratio i =	**Attachment kit[1)]**	**for motor**	**Motor type**	**without cover**	**with cover plate**	**with sealing strip**	**Cable duct = .. Switching cam = ..**	**Standard report**	**Measurement report**
		00	--	00	00					
		00	--	00	00	--	--	**without switch and cable duct** 00		02 Friction moment
					00	01	--	**Switch:** **Reed contact** 21 - ... **Hall sensor** 22 - ...		03 Lead deviation
					00	--	02			
		01	**MSM 030B**	71 70[2)]	00	--	--	**Switch type** **Mounting side**	01	04 Running accuracy
					00	01	--	**Cable duct** 26		
		02	**VRDM 368**	27	00	--	02	**Switching cam for: - without cover - with cover plate** 32		05 Positioning accuracy
		31	**NEMA 17-D**	00	00	--	--	**Switching cam for sealing strip** 34		
		35	**NEMA17-C**	00						
		33	**MSI 032**	77 76[2)]	00	01	--			
		34	**MSM 020B**	69 68[2)]	00	--	02			

[1)] Attachment kit can also be supplied without motor (enter "00" for motor on order form).
[2)] Motor without brake

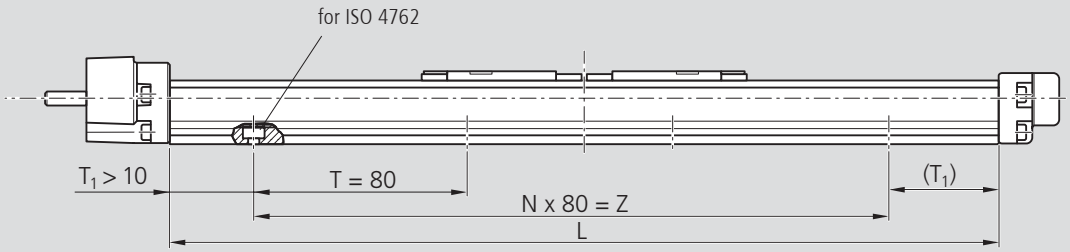
Mounting side for switches:
Switches may be mounted on the left (L) or right (R) side of the Precision Module.

Left (L)



Right (R)

Rexroth – Precision Module PSK 50
Lengths and Hole Spacing



Length L

	Number of carriages	Carriage version	
		Standard length	Long
without cover and with cover plate	one carriage	L = (stroke + 2 · excess travel) + 70 mm	
	two carriages	L = (stroke + 2 · excess travel) + l_m + 70 mm $l_{m\ min}$ = 60 mm	
with sealing strip	one carriage	L = (stroke + 2 · excess travel) + 127 mm	L = (stroke + 2 · excess travel) + 187 mm

l_m = center-to-center distance between carriages (observe $l_{m\ min}$)
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 (d_0 x P),
Excess travel = 2 · 2.5 = 5 mm

Preferred lengths of frame

Length L	T_1	T	N	Z	for ISO 4762 screws
150	35	80	1	80	M4
200	20	80	2	160	
250	45	80	2	160	
300	30	80	3	240	

Variable length

$$N_1 = \frac{L}{T} = \frac{L}{80}$$

N = INT (N_1) (whole number of N_1)

$$T_1 = \frac{L - T \cdot N}{2} = \frac{L - 80 \cdot N}{2}$$

$T_1 > T_{1\ min}$ ---> N, T_1

$T_1 - T_{1\ min}$ ---> N = N – 1
$T_1 = T_1 + 40$ mm

Result:
Hole pattern: T_1 / N · 80 / T_1

Example:
L = 260 mm

$$N_1 = \frac{L}{T} = \frac{260}{80} = 3.25$$

N = 3

$$T_1 = \frac{260 - 80 \cdot 3}{2} = 10$$

$T_1 - T_{1\ min}$ ---> N = 3 – 1 = 2
T_1 = 10 + 40 = 50

50 mm / 2 · 80 mm / 50 mm

Calculating the hole pattern for the frame

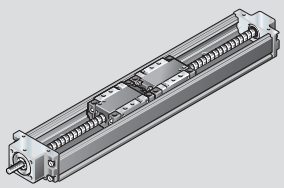
Applies to all cover options

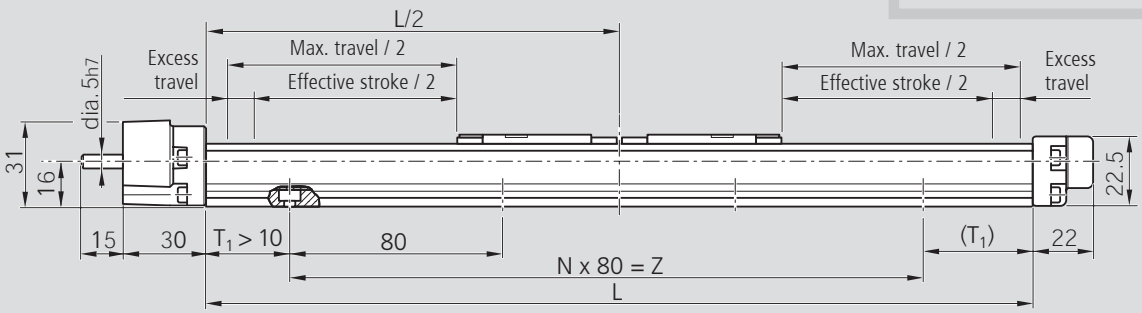
Precision module length	L (mm)
Hole spacing	T = 80 mm
Minimum end space	$T_{1\ min}$ = 10 mm

Rexroth – Precision Module PSK 50
Dimension Drawings without Cover

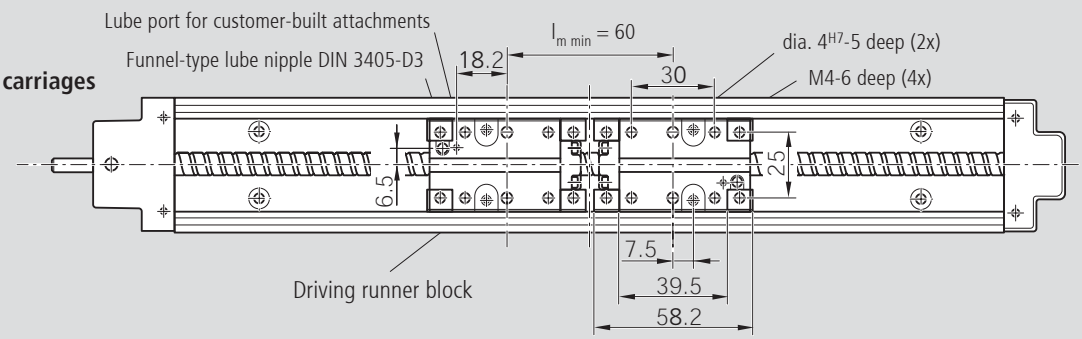
All dimensions in mm

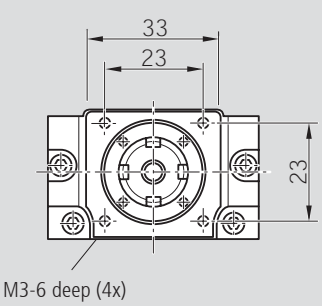
Diagrams to
different scales

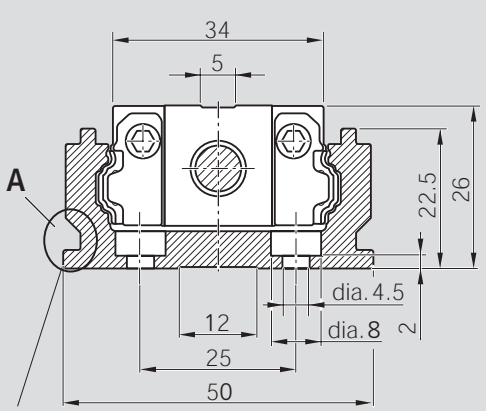


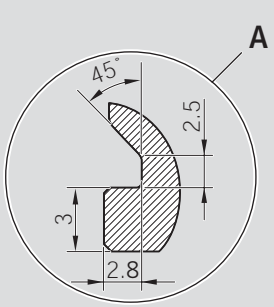


Version:
one or two carriages







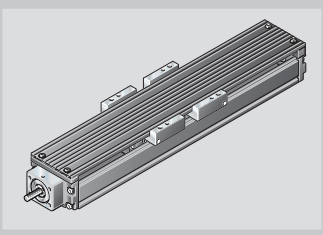


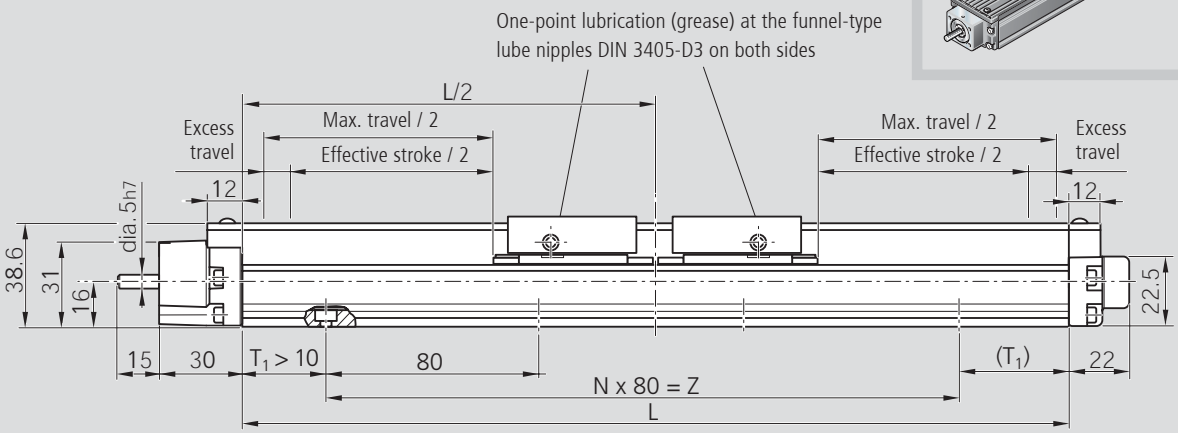
For mounting with
clamping fixtures

Rexroth – Precision Module PSK 50
Dimension Drawings with Cover Plate

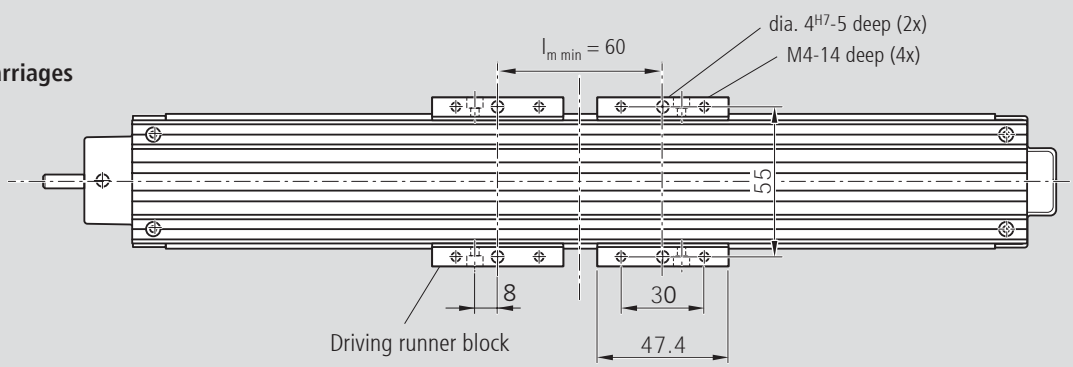
All dimensions in mm

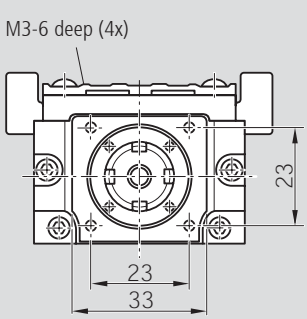
Diagrams to
different scales

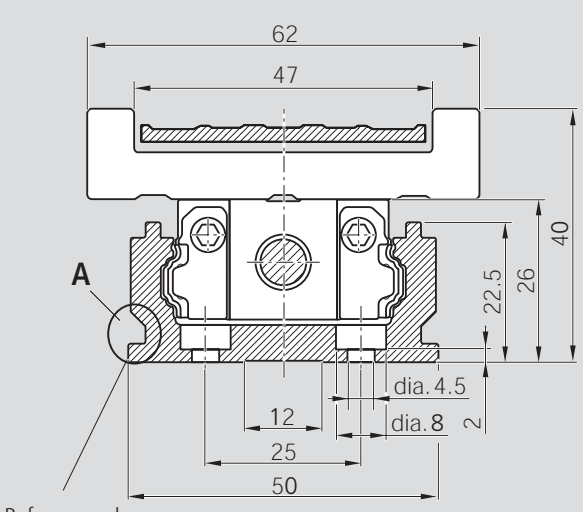


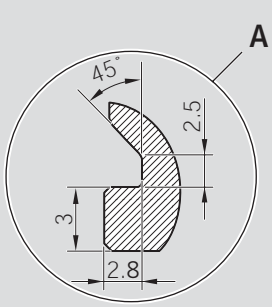


Version:
one or two carriages







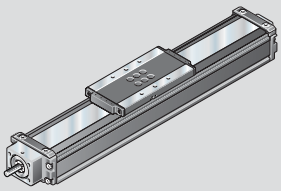


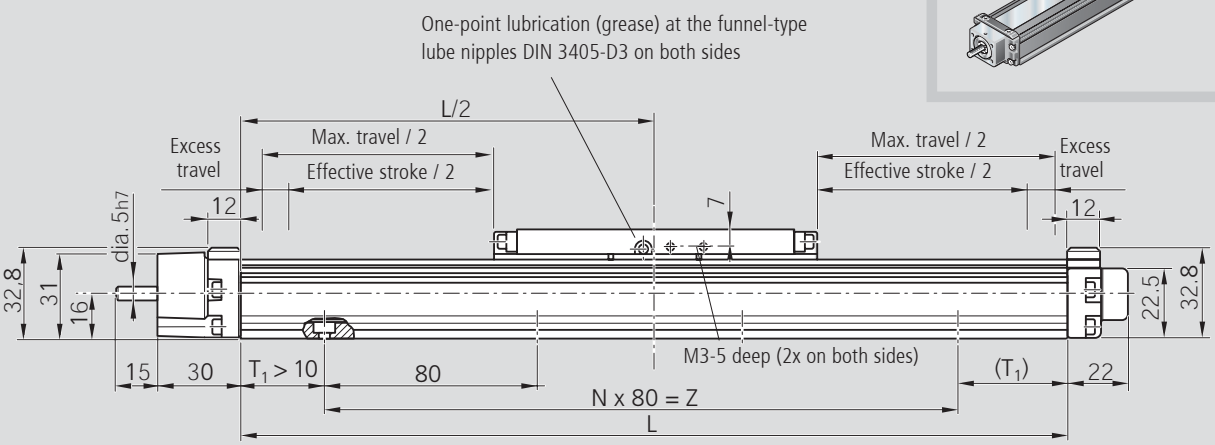
For mounting with
clamping fixtures

Rexroth – Precision Module PSK 50
Dimension Drawings with Sealing Strip

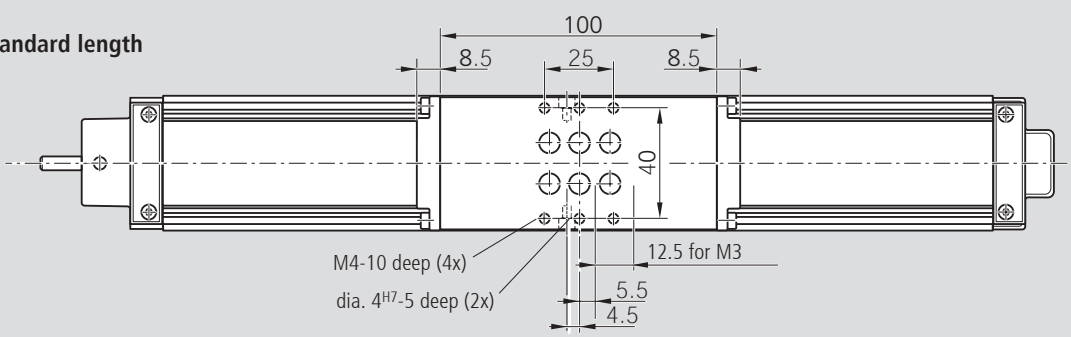
All dimensions in mm

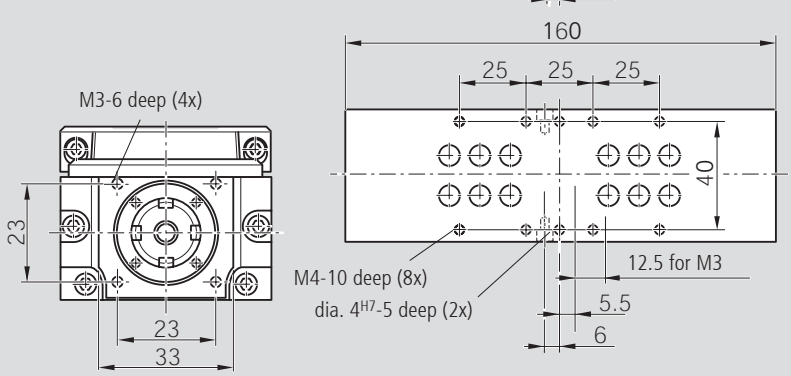
Diagrams to
different scales



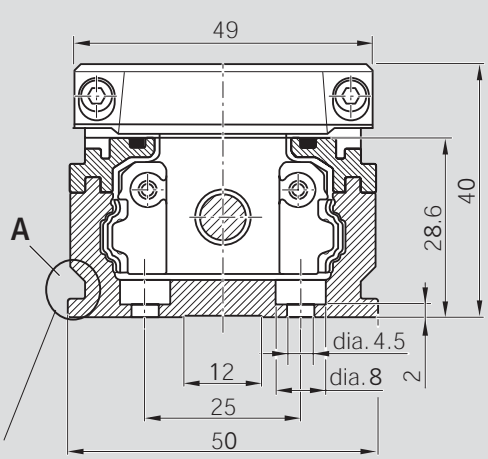


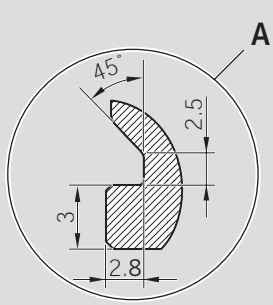
Version:
carriage, standard length





Version:
carriage, long



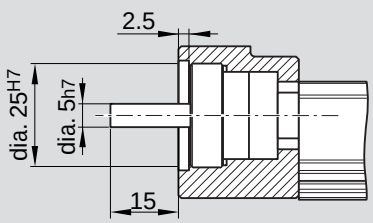


For mounting with
clamping fixtures

Rexroth – Precision Module PSK 50
Dimension Drawings

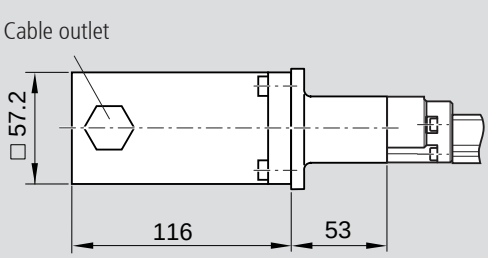
14.26.00

Type OF01 and OF02



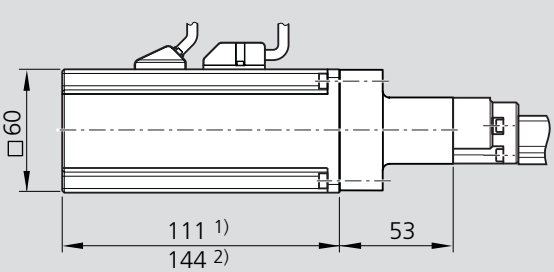
14.26.11

Type MF01 and MF02
Motor VRDM 368 with mount and coupling



14.26.12

Type MF01 and MF02
Motor MSM 030B with mount and coupling



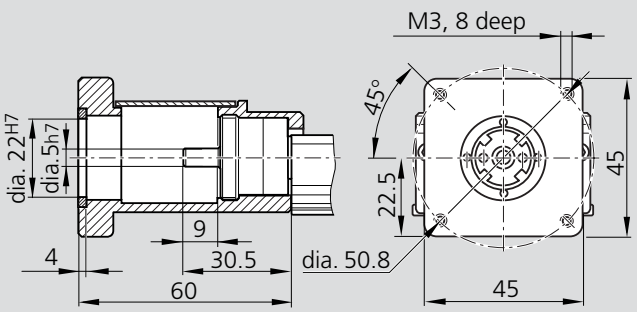
For further information and dimensions, see "Motors".

1) without brake 2) with brake

14.26.16

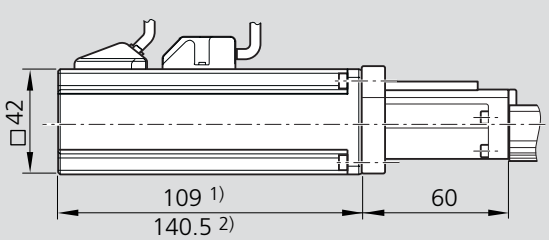
Type MF10 and MF11
Integrated motor mount (NEMA 17 - type C or D)

Type D - Motor has flange with through holes for mounting
Type C - Motor has threaded holes in face for mounting



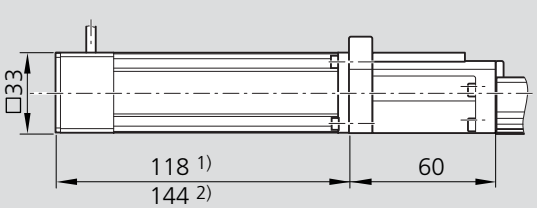
14.26.17

Type MF10 and MF11
Motor MSM 020B with integrated mount and coupling



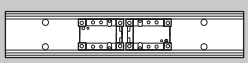
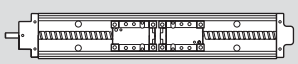
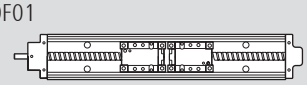
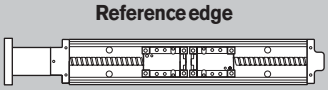
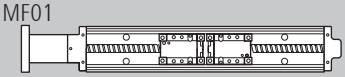
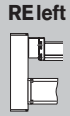
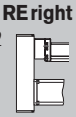
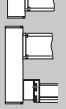
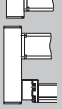
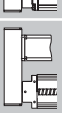
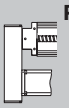
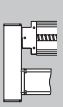
14.26.18

Type MF10 and MF11
Motor MSI 032 with integrated mount and coupling



1) without brake 2) with brake

Rexroth – Precision Module PSK 60
Components and Ordering Data

Part number, length	(....) Type (and dimension drawing)	Guide-way = (..)	Drive unit = (..)	Carriage = (..)	Screw journal	Ball screw size d_0 x P	For cover option	Steel				Aluminum			
								Standard		Long		Standard		Long	
								1 carr.*	2 carr.	1 carr.	2 carr.	1 carr.	2 carr.	1 carr.	2 carr.
without drive (OA)  OA01	**OA01**	Length = L (01) 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)			without screw journal	12 x 2 / 12 x 5 / 12 x 10 (50)	without cover	01	02	03	04	11	12	13	14
with ball screw, without motor mount (OF) Reference edge  OF01  OF02 Reference edge	**OF01** **OF02** **(14.36.00)**				dia. 6	03 01 02	without cover	01	02	03	04	11	12	13	14
							cover plate	21	22	23	24	31	32	33	34
							sealing strip	--	--	--	--	40	--	41	--
with ball screw and motor mount (MF) Reference edge  MF01  MF02 Reference edge	**MF01** **MF02** **(14.36.11)** **(14.36.13)**				dia. 6	03 01 02	without cover	01	02	03	04	11	12	13	14
							cover plate	21	22	23	24	31	32	33	34
							sealing strip	--	--	--	--	40	--	41	--
with ball screw and integrated motor mount (MF) MF10 Reference edge  MF11  Reference edge	**MF10** **MF11** **(14.36.16)** **(14.36.17)** **(14.36.18)**				dia. 6	30 31 32	without cover	01	02	03	04	11	12	13	14
							cover plate	21	22	23	24	31	32	33	34
							sealing strip	--	--	--	--	40	--	41	--
with ball screw and timing belt side drive (RV) RE left / RE right RV01  RV02  RV03  RV04  RV05  RE RV06  RE RV07  RE RV08  RE	**RV01** to **RV08** **(14.36.20)**				for MKD 25	53 51 52	without cover	01	02	03	04	11	12	13	14
							cover plate	21	22	23	24	31	32	33	31
					for MSM 030B	53 51 52	sealing strip	--	--	--	--	40	--	41	--

For order example see "Inquiry/Order Form" section.

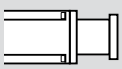
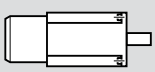
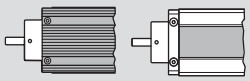
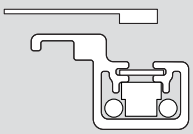
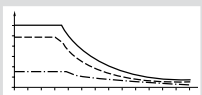
* carr. = carriage

Switch mounting arrangements

A cable duct is required to mount the switches.

For more information on switch mounting and switch types, see the section on "Switch Mounting Arrangements".

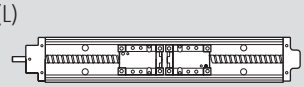
Please check whether the selected combination is a permissible one (load capacities, moments, maximum speed, motor data, etc.)!

	Motor attachment = ..			Motor = ..	Cover = ..			1st, 2nd, 3rd switch = ..	Documentation = ..	
										
	Gear ratio i =	**Attachment kit[1)]**	**for motor**	**Motor type**	**without cover**	**with cover plate**	**with sealing strip**	**Cable duct = ..** **Switching cam = ..**	**Standard report**	**Measurement report**
		00	--	00	00					
		00	--	00	00	--	--	**without switch and cable duct** 00		02 Friction moment
					00	01	--	**Switch:** **Reed contact** 21 - ... **Hall sensor** 22 - ...		03 Lead deviation
					00	--	02			
		02	VRDM 368	27	00	--	--	**Switch type** / **Mounting side**	01	04 Running accuracy
					00	01	--	**Cable duct** 25		
		03	MSM 030B	71 / 70[2)]	00	--	02	**Switching cam for:** **- without cover** **- with cover plate** 30		05 Positioning accuracy
		31	NEMA 23-D	00	00	--	--			
		32	MKD 25B	50	00	01	--	**Switching cam for sealing strip** 31		
		33	MSI 040	79 / 78[2)]	00	--	02			
	i=1	11	MKD 25B	50	00	--	--			
	i=1.5	12								
	i=1	13	MSM 030B	71 / 70[2)]	00	01	--			
	i=1.5	14								

[1)] Attachment kit can also be supplied without motor (enter "00" for motor on order form).
[2)] Motor without brake

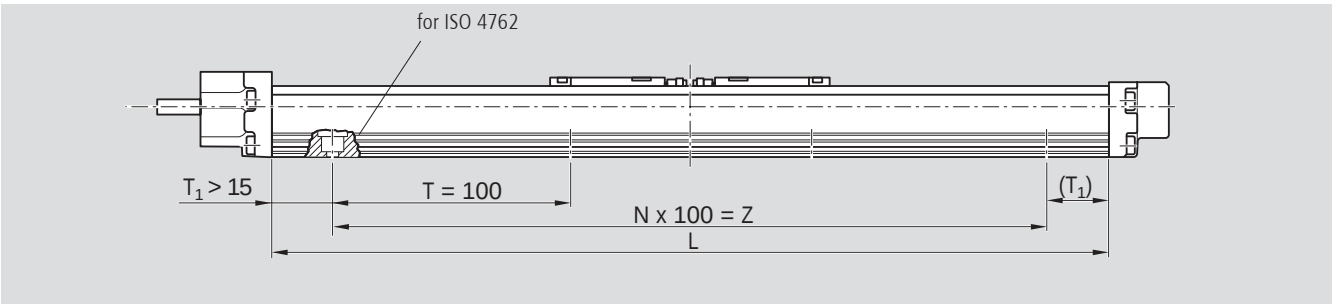
Mounting side for switches:
Switches may be mounted on the left (L) or right (R) side of the Precision Module.

Left (L)



Right (R)

Rexroth – Precision Module PSK 60
Lengths and Hole Spacing



Length L

	Number of carriages	Carriage version	
		Standard length	Long
without cover and with cover plate	one carriage	L = (stroke + 2 · excess travel) + 70 mm	L = (stroke + 2 · excess travel) + 85 mm
	two carriages	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	one carriage	L = (stroke + 2 · excess travel) + 160 mm	L = (stroke + 2 · excess travel) + 215 mm

l_m = center-to-center distance between carriages (observe $l_{m\ min}$)
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 (d_0 x P),
Excess travel = 2 · 10 = 20 mm

Preferred lengths of frame

Length L	T_1	T	N	Z	for ISO 4762 screws
150	25	100	1	100	M5
200	50	100	1	100	
250	25	100	2	200	
300	50	100	2	200	
400	50	100	3	300	
500	50	100	4	400	
600	50	100	5	500	
700	50	100	6	600	

Variable length

$$N_1 = \frac{L}{T} = \frac{L}{100}$$

N = INT (N_1) (whole number of N_1)

$$T_1 = \frac{L - T \cdot N}{2} = \frac{L - 100 \cdot N}{2}$$

$T_1 > T_{1\ min}$ ---> N, T_1

$T_1 - T_{1\ min}$ ---> N = N – 1
$T_1 = T_1 + 50$ mm

Result:
Hole pattern: T_1 / N · 100 / T_1

Example:
L = 430 mm

$$N_1 = \frac{L}{T} = \frac{430}{100} = 4.3$$

N = 4

$$T_1 = \frac{430 - 100 \cdot 4}{2} = 15$$

$T_1 - T_{1\ min}$ ---> N = 4 – 1 = 3
$T_1 = 15 + 50 = 65$

65 mm / 3 · 100 mm / 65 mm

Calculating the hole pattern for the frame

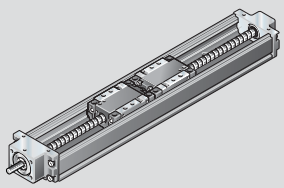
Applies to all cover options

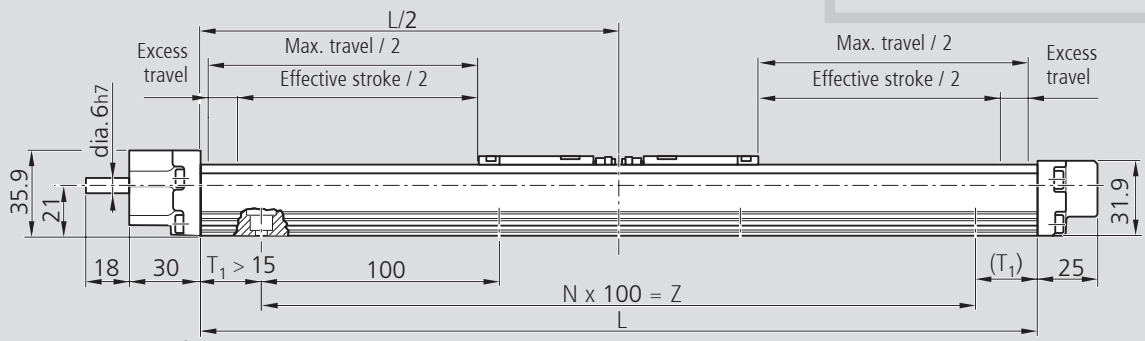
Precision module length	L (mm)
Hole spacing	T = 100 mm
Minimum end space	$T_{1\ min}$ = 15 mm

Rexroth – Precision Module PSK 60
Dimension Drawings without Cover

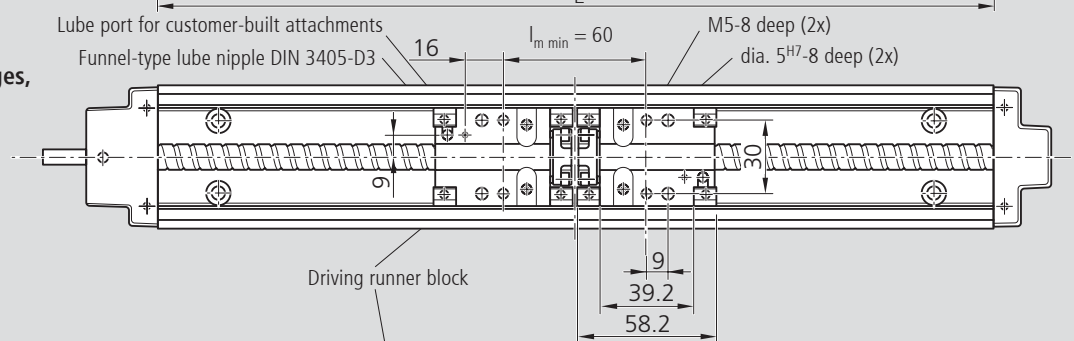
All dimensions in mm

Diagrams to
different scales

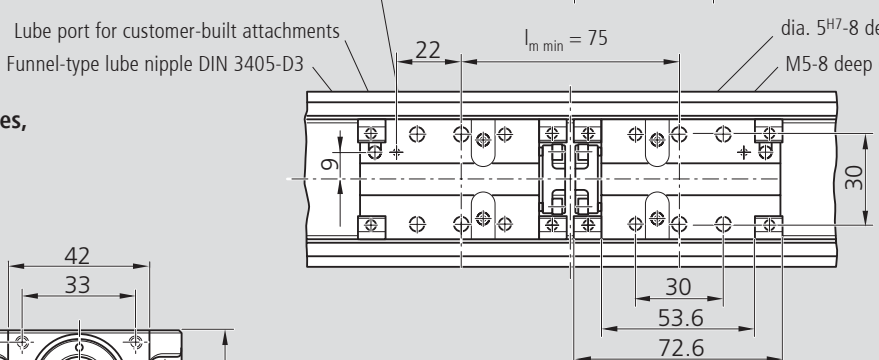


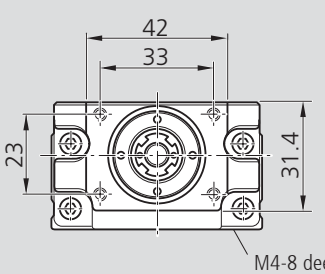


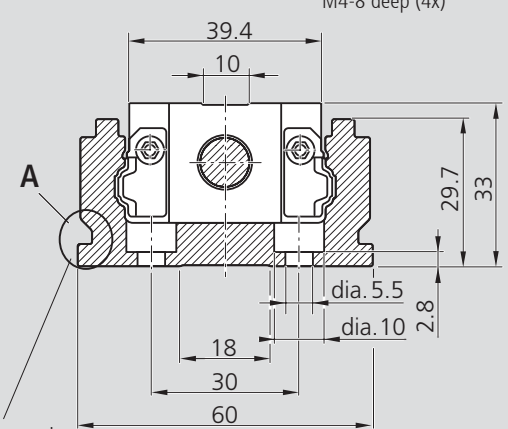
Version:
one or two carriages,
standard length

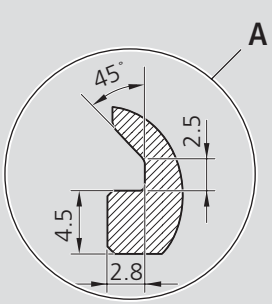


Version:
one or two carriages,
long







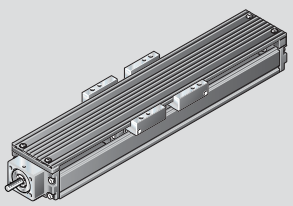


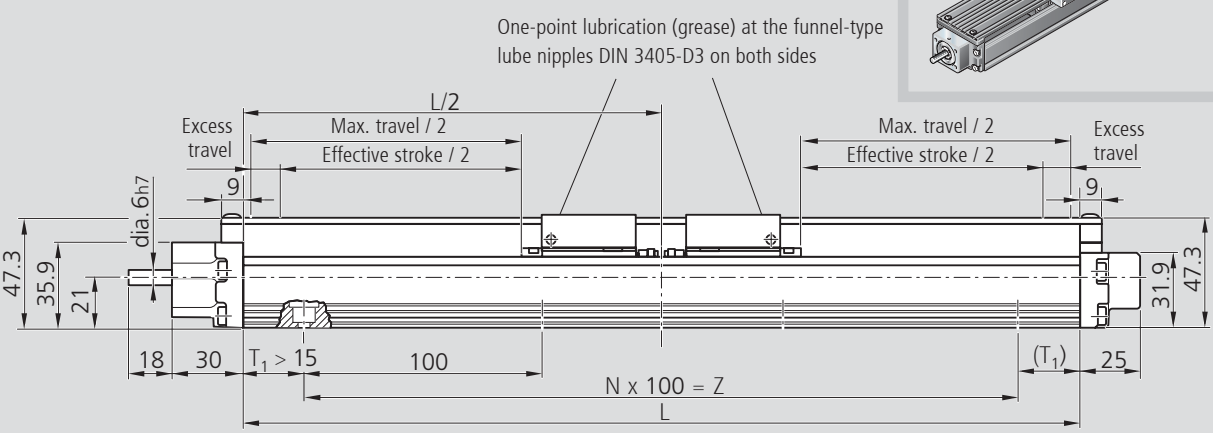
For mounting with
clamping fixtures

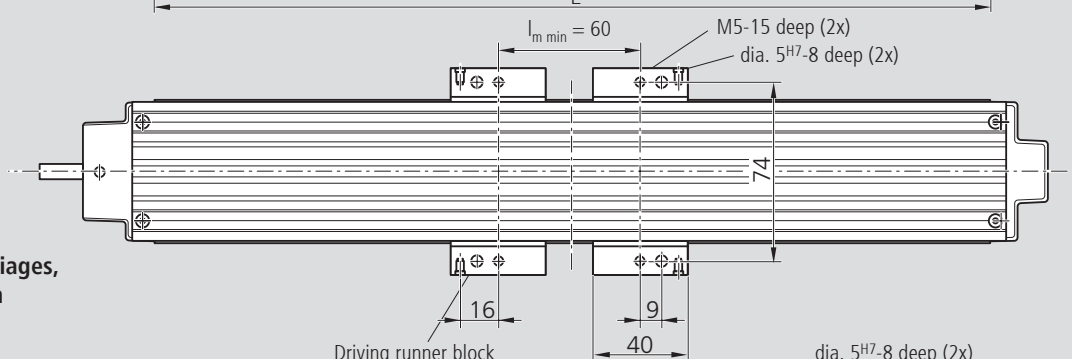
Rexroth – Precision Module PSK 60
Dimension Drawings with Cover Plate

All dimensions in mm

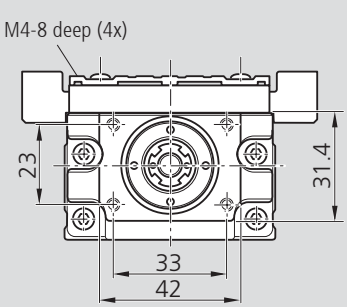
Diagrams to
different scales

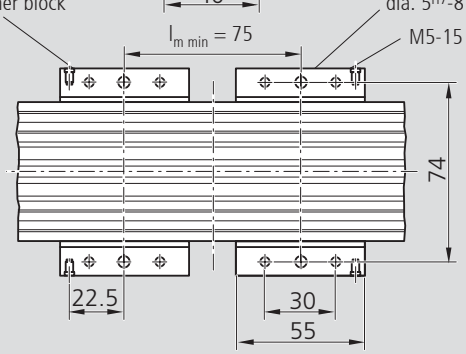




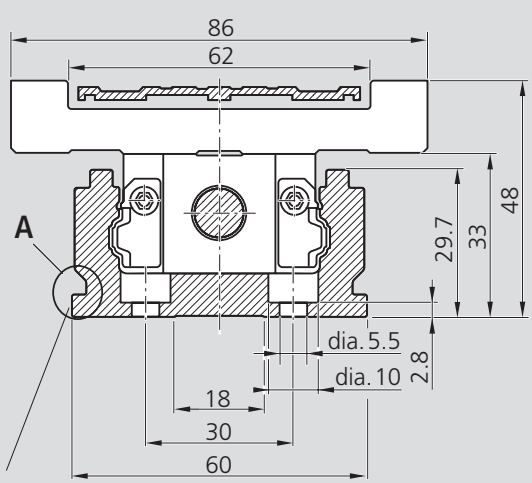


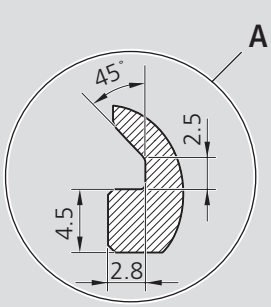
Version:
one or two carriages,
standard length





Version:
one or two carriages,
long



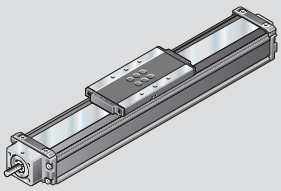


For mounting with
clamping fixtures

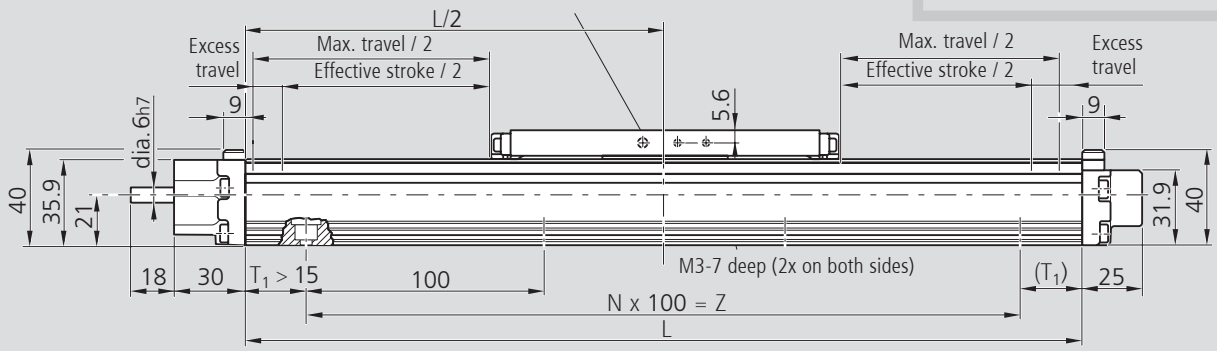
Rexroth – Precision Module PSK 60
Dimension Drawings with Sealing Strip

All dimensions in mm

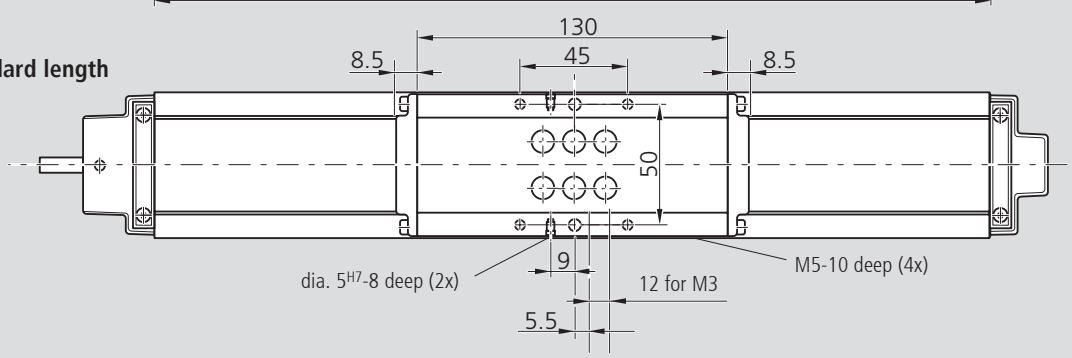
Diagrams to
different scales

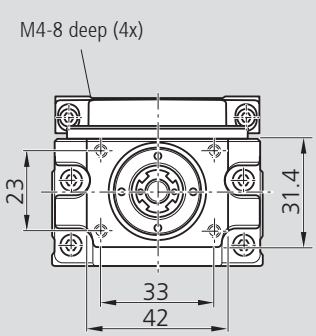


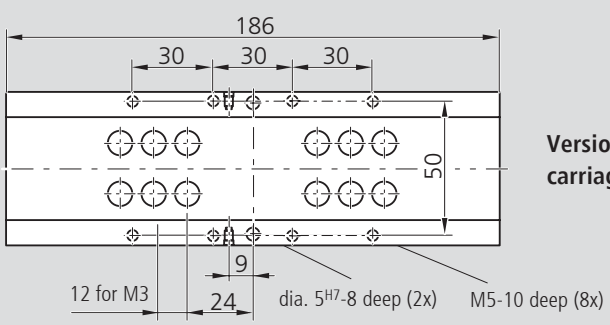
One-point lubrication (grease) at the funnel-type lube nipples DIN 3405-D3 on both sides



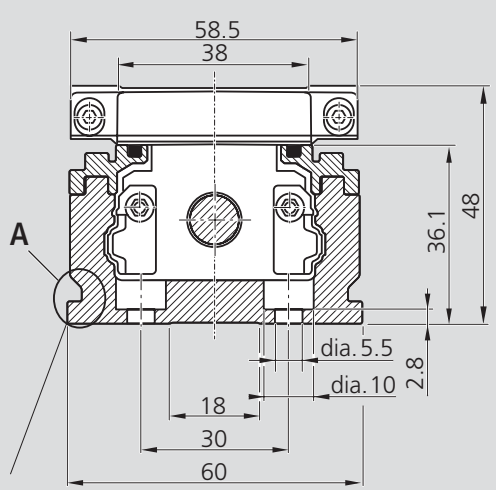
Version:
carriage, standard length

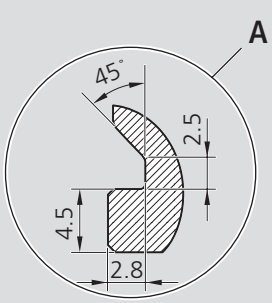






Version:
carriage, long



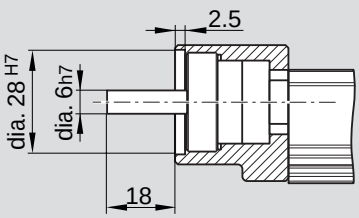


For mounting with
clamping fixtures

Rexroth – Precision Module PSK 60
Dimension Drawings

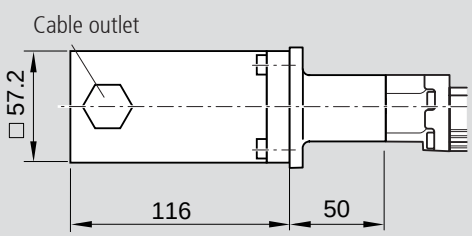
14.36.00

Type OF01 and OF02



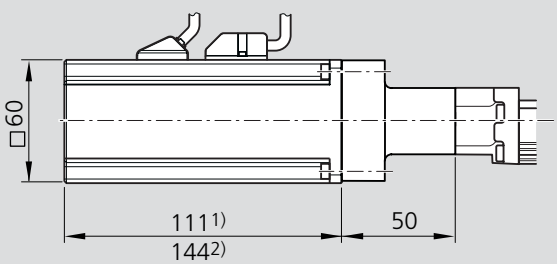
14.36.11

Type MF01 and MF02
Motor VRDM 368 with mount and coupling



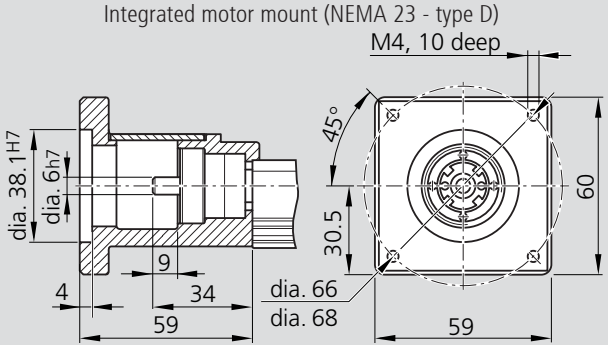
14.36.13

Type MF01 and MF02
Motor MSM 030B with mount and coupling



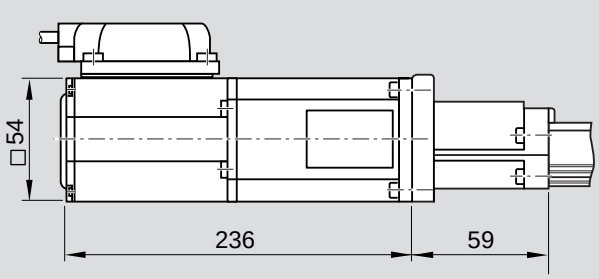
14.36.16

Type MF10 and MF11
Integrated motor mount (NEMA 23 - type D)



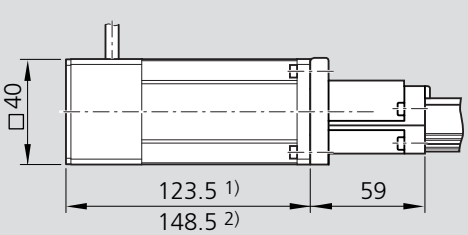
14.36.17

Type MF10 and MF11
Motor MKD with integrated mount and coupling



14.36.18

Type MF10 and MF11
Motor MSI 040 with integrated mount and coupling

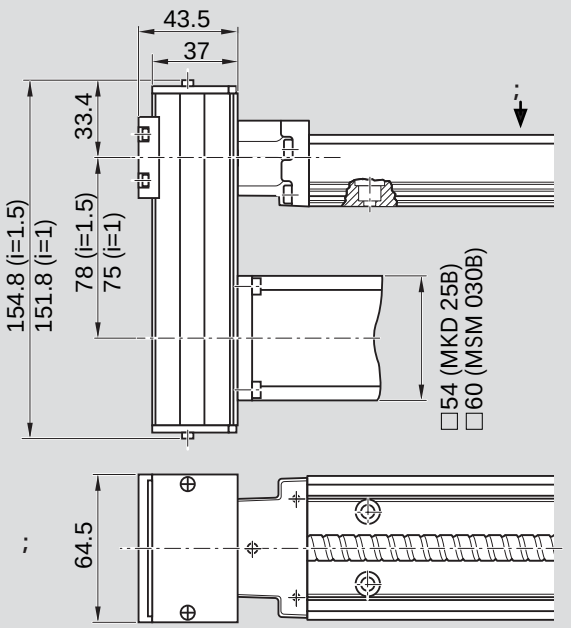


For further information and dimensions, see "Motors".

1) without brake 2) with brake

14.36.20

Type RV01 to RV08
Motors MKD 25B and MSM 030B with side drive and timing belt



Motor not shown in drawing

Rexroth – Precision Module PSK 90
Components and Ordering Data

Part number, length 1465-400-00, (....) mm Reference edge (RE)	(....) Type (and dimension drawing)	Guide-way = (..)	Drive unit = (..)	Carriage = (..)	Screw journal	Ball screw size d_0 x P	For cover option	Steel				Aluminum			
								Standard		Long		Standard		Long	
								1 carr.*	2 carr.	1 carr.	2 carr.	1 carr.	2 carr.	1 carr.	2 carr.
without drive (OA) OA01	OA01	Length = L 01 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 screw journal	16 x 5 16 x 10 16 x 16 50	without cover	01	02	03	04	11	12	13	14
with ball screw, without motor mount (OF) Reference edge OF01 OF02 Reference edge	OF01 OF02 (14.46.00)				dia. 9	01 02 03	without cover	01	02	03	04	11	12	13	14
							cover plate	21	22	23	24	31	32	33	34
					dia. 9 with keyway	11 12 13	sealing strip	--	--	--	--	40	--	41	--
with ball screw and motor mount (MF) Reference edge MF01 MF02 Reference edge	MF01 MF02 (14.46.11) (14.46.12)				dia. 9	01 02 03	without cover	01	02	03	04	11	12	13	14
							cover plate	21	22	23	24	31	32	33	34
							sealing strip	--	--	--	--	40	--	41	--
with ball screw and integrated motor mount (MF) MF10 MF11 Reference edge Reference edge	MF10 MF11 (14.46.16) (14.46.17) (14.46.18)				dia. 9	30 31 32	without cover	01	02	03	04	11	12	13	14
							cover plate	21	22	23	24	31	32	33	34
							sealing strip	--	--	--	--	40	--	41	--
with ball screw and timing belt side drive (RV) RE left RE right RV01 RV02 RV03 RV04 RV05 RV06 RE RE RV07 RV08 RE RE	RV01 to RV04 (14.46.20) RV05 to RV08 (14.46.21) RV01 to RV04 (14.46.30) RV05 to RV08 (14.46.31)				for MKD 25, MSM 030C	61 62 63	without cover	01	02	03	04	11	12	13	14
					for MKD 25, MSM 030C	61 62 63	cover plate	21	22	23	24	31	32	33	34
					for MKD 41, MSM 040B	51 52 53									
					for MKD 41, MSM 040B	51 52 53	sealing strip	--	--	--	--	40	--	41	--

For order example see "Inquiry/Order Form" section.

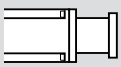
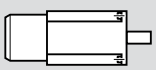
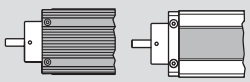
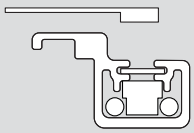
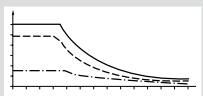
* carr. = carriage

Switch mounting arrangements

A cable duct is required to mount the switches.

For more information on switch mounting and switch types, see the section on "Switch Mounting Arrangements".

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

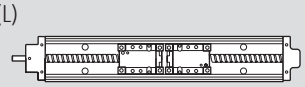
	Motor attachment = ..	Motor = ..	Cover = ..	1st, 2nd, 3rd switch = ..	Documentation = ..
					

Gear ratio i =	Attachment kit[1]	for motor	Motor type	without cover	with cover plate	with sealing strip	Cable duct = .. / Switching cam = ..	Standard report	Measurement report
	00	--	00	00					
	00	--	00	00	--	--	without switch and cable duct 00	01	02 Friction moment
				00	01	--	Switch: Reed contact 21 - ... Hall sensor 22 - ...		03 Lead deviation
				00	--	02			
	03	MKD 41B	10	00	--	--	Switch type / Mounting side		04 Running accuracy
	04	VRDM 397	28	00	01	--	Cable duct 25		
		VRDM 3910	29						
	06	MSM 40B	75 / 74[2]	00	--	02	Switching cam for: - without cover - with cover plate 30		05 Positioning accuracy
	31	NEMA 23-D	00	00	--	--	Switching cam for sealing strip 31		
	32	MKD 25B	50	00	01				
	33	MSM 030C	73 / 72[2]						
	34	MSI 055	81 / 80[2]	00	--	02			
i = 1.0	20	MKD 25B	50	00	--	--			
i = 1.5	22								
i = 1.0	21	MSM 030C	73 / 72[2]						
i = 1.5	23								
i = 1.0	24	MKD 25B	50	00	01	--			
i = 1.5	26								
i = 1.0	25	MSM 030C	73 / 72[2]						
i = 1.5	27								
i = 1.0	10	MKD 41B	10						
i = 1.5	12								
i = 1.0	11	MSM 040B	75 / 74[2]						
i = 1.5	13								
i = 1.0	14	MKD 41B	10	00	--	02			
i = 1.5	16								
i = 1.0	15	MSM 040B	75 / 74[2]						
i = 1.5	17								

[1] Attachment kit can also be supplied without motor (enter "00" for motor on order form).
[2] Motor without brake

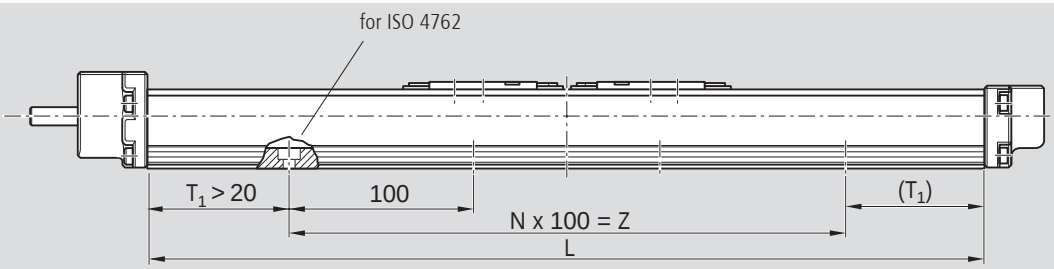
Mounting side for switches:
Switches may be mounted on the left (L) or right (R) side of the Precision Module.

Left (L)



Right (R)

Rexroth – Precision Module PSK 90
Lengths and Hole Spacing



Length L

	Number of carriages	Carriage version	
		Standard length	Long
without cover and with cover plate	one carriage	L = (stroke + 2 · excess travel) + 100 mm	L = (stroke + 2 · excess travel) + 120 mm
	two carriages	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	one carriage	L = (stroke + 2 · excess travel) + 190 mm	L = (stroke + 2 · excess travel) + 265 mm

l_m = center-to-center distance between carriages (observe $l_{m\ min}$)
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 (d_0 x P),
Excess travel = 2 · 10 = 20 mm

Preferred lengths of frame

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

Variable length

$$N_1 = \frac{L}{T} = \frac{L}{100}$$

N = INT (N_1) (whole number of N_1)

$$T_1 = \frac{L - T \cdot N}{2} = \frac{L - 100 \cdot N}{2}$$

$T_1 > T_{1\ min}$ ---> N, T_1

$T_1 - T_{1\ min}$ ---> N = N – 1
$T_1 = T_1 + 50$ mm

Result:
Hole pattern: T_1 / N · 100 / T_1

Example:
L = 440 mm

$$N_1 = \frac{L}{T} = \frac{440}{100} = 4.4$$

N = 4

$$T_1 = \frac{440 - 100 \cdot 4}{2} = 20$$

$T_1 - T_{1\ min}$ ---> N = 4 – 1 = 3
$T_1 = 20 + 50 = 70$

70 mm / 3 · 100 mm / 70 mm

Calculating the hole pattern for the frame

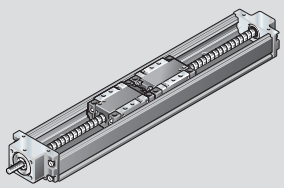
Applies to all cover options

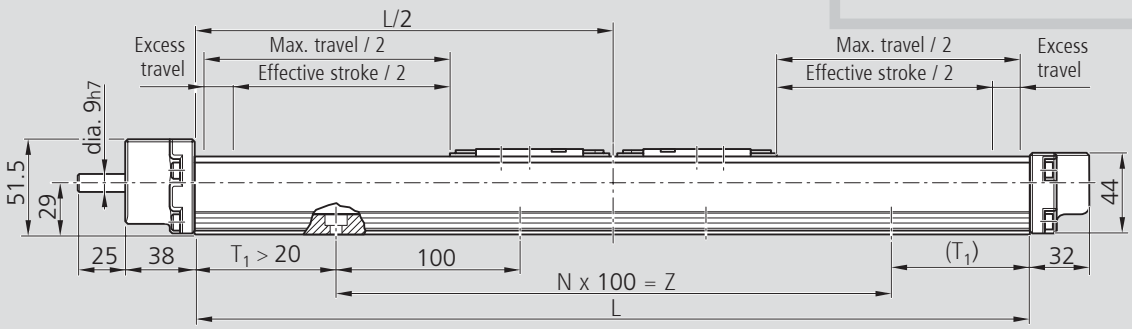
Precision module length	L (mm)
Hole spacing	T = 100 mm
Minimum end space	$T_{1\ min}$ = 20 mm

Rexroth – Precision Module PSK 90
Dimension Drawings without Cover

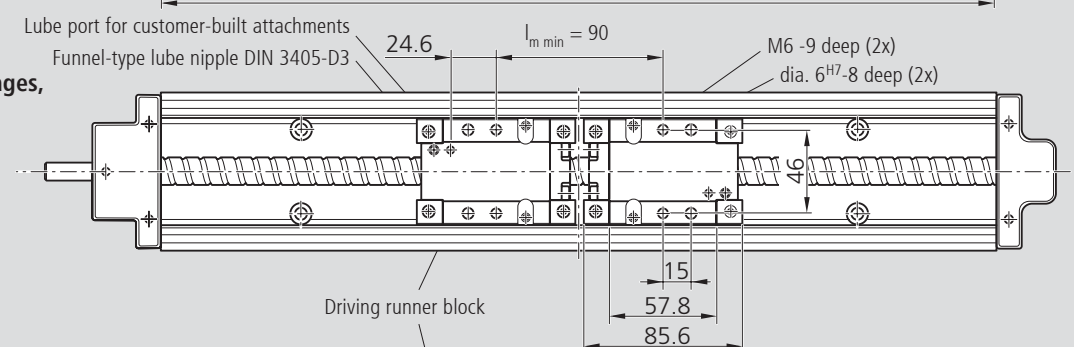
All dimensions in mm

Diagrams to
different scales

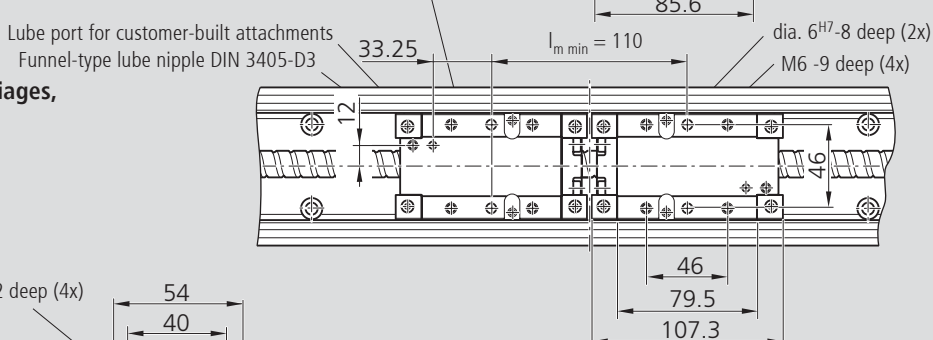


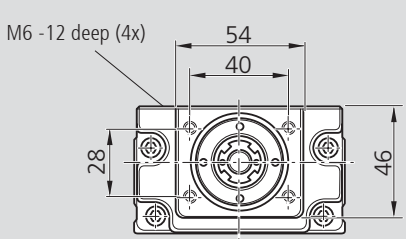


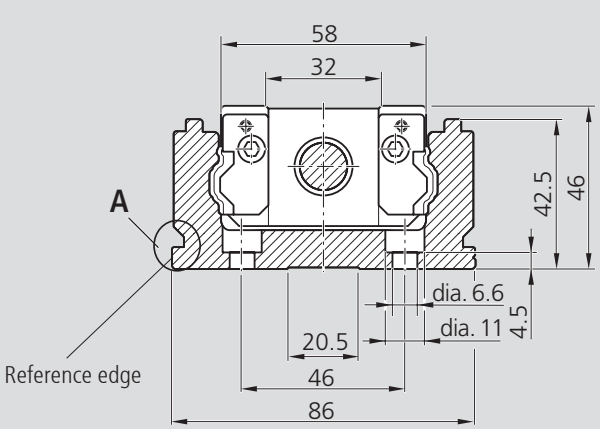
Version:
one or two carriages,
standard length

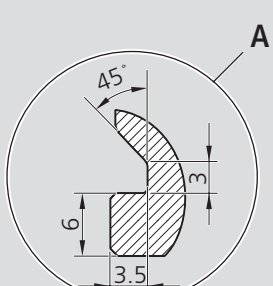


Version:
one or two carriages,
long







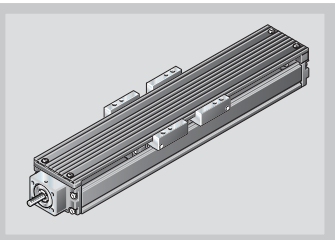


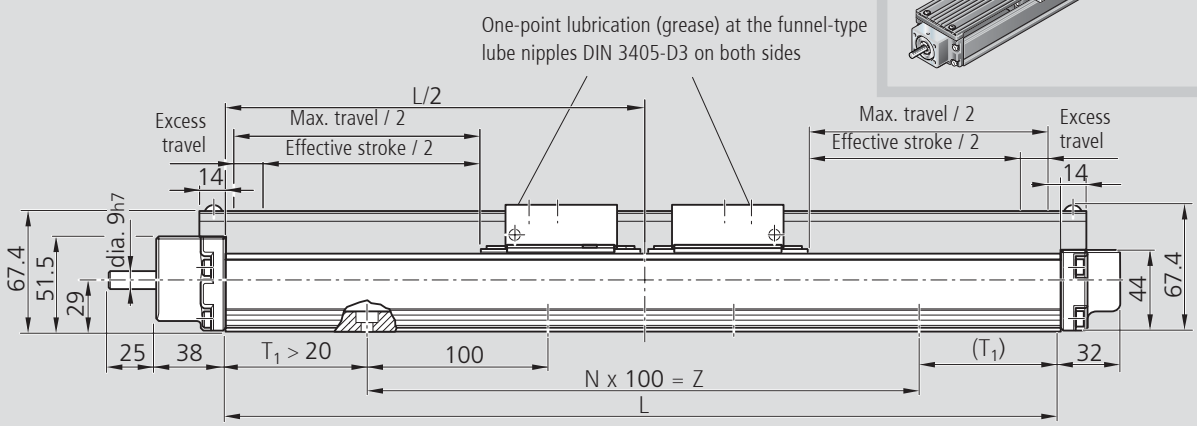
For mounting with
clamping fixtures

Rexroth – Precision Module PSK 90
Dimension Drawings with Cover Plate

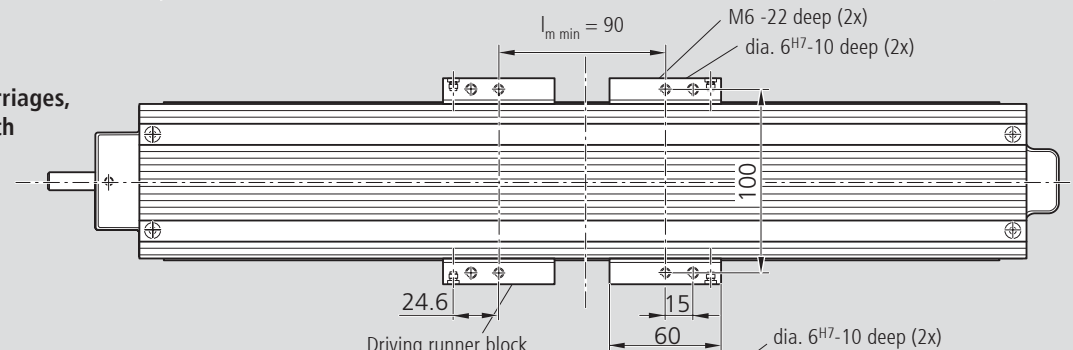
All dimensions in mm

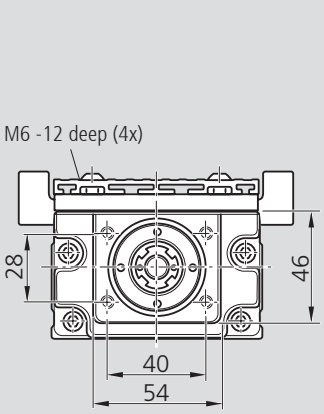
Diagrams to
different scales

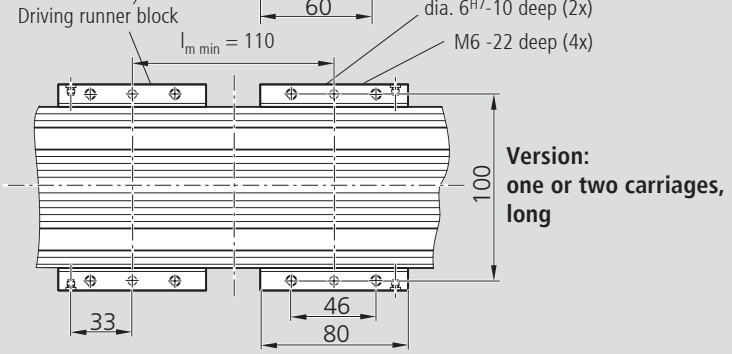




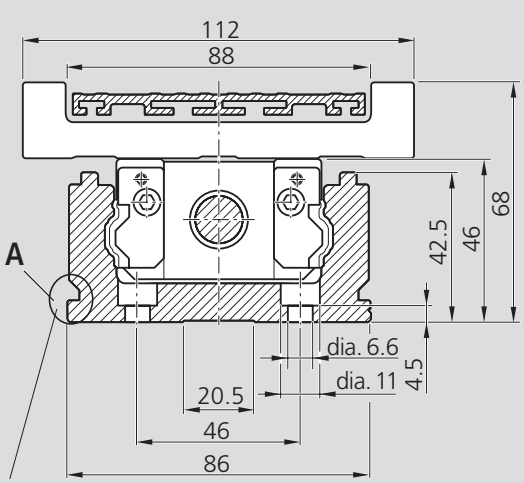
Version:
one or two carriages,
standard length

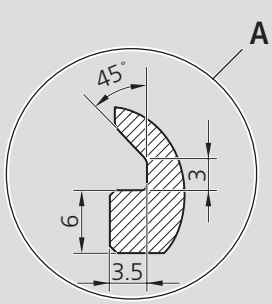






Version:
one or two carriages,
long



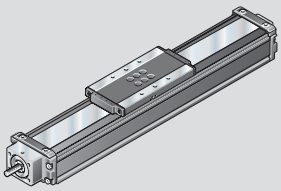


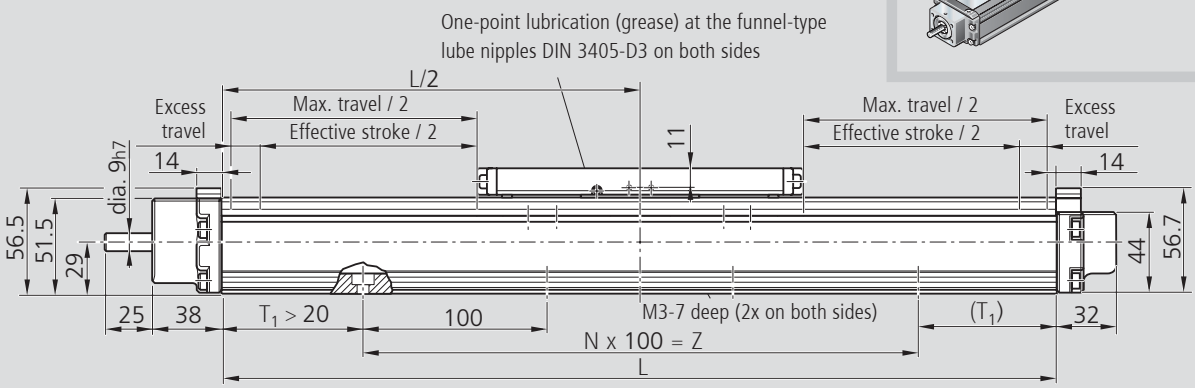
For mounting with
clamping fixtures

Rexroth – Precision Module PSK 90
Dimension Drawings with Sealing Strip

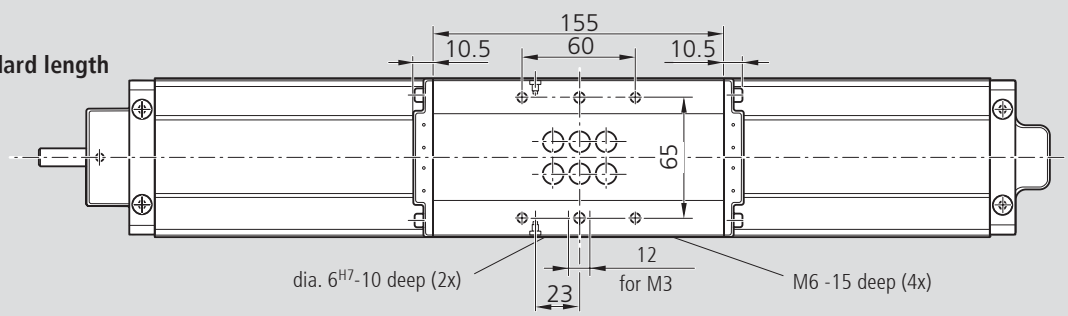
All dimensions in mm

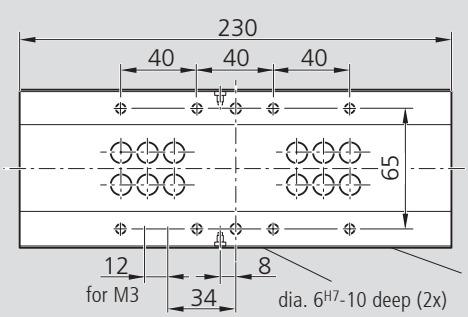
Diagrams to
different scales



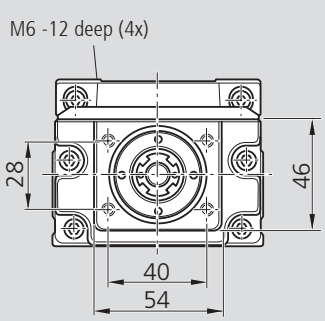


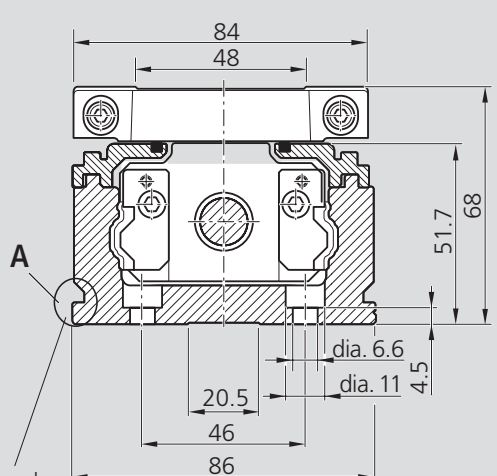
Version:
carriage, standard length

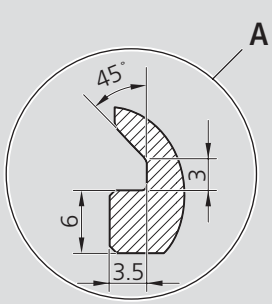




Version:
carriage, long





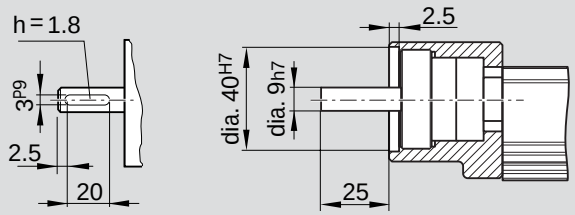


For mounting with
clamping fixtures

Rexroth – Precision Module PSK 90
Dimension Drawings

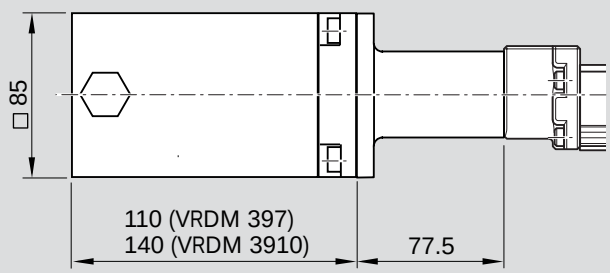
14.46.00

Type OF01 and OF02



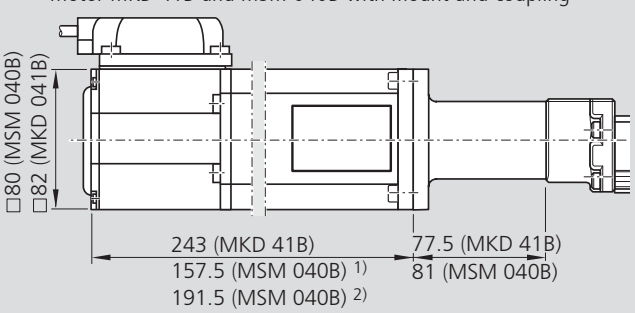
14.46.11

Type MF01 and MF02
Motor VRDM 39... with mount and coupling



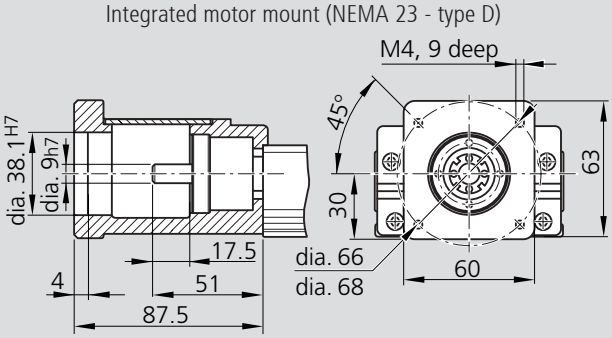
14.46.12

Type MF01 and MF02
Motor MKD 41B and MSM 040B with mount and coupling



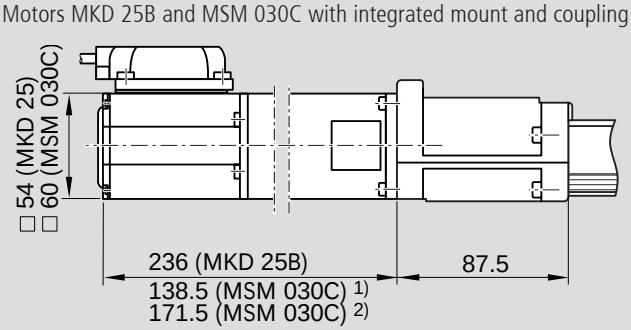
14.46.16

Type MF10 and MF11
Integrated motor mount (NEMA 23 - type D)



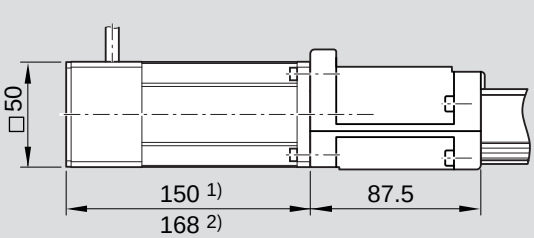
14.46.17

Type MF10 and MF11
Motors MKD 25B and MSM 030C with integrated mount and coupling



14.46.18

Type MF01 and MF02
Motor MSI 055 with integrated mount and coupling

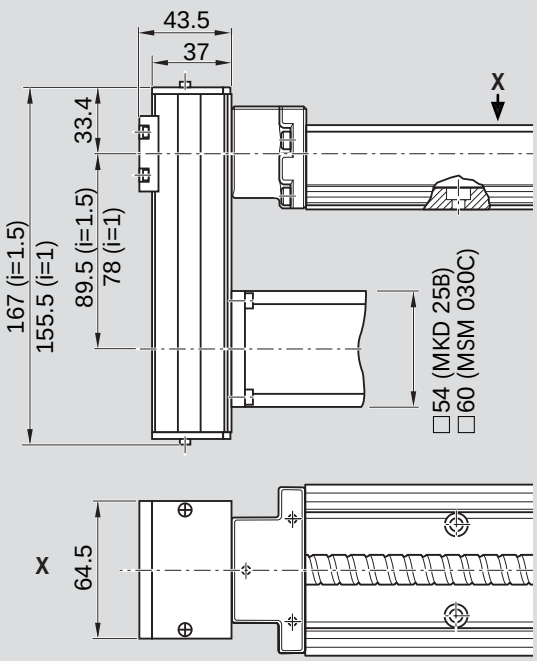


For further information and dimensions, see "Motors".

1) without brake 2) with brake

14.46.20

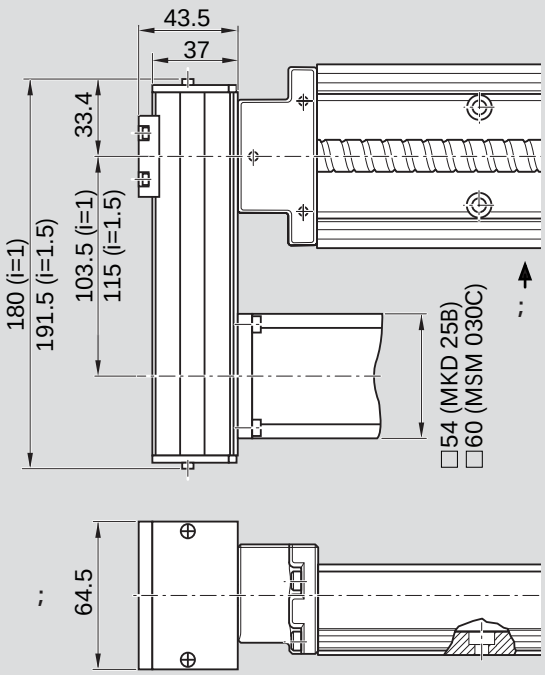
Type RV01 and RV04
Motors MKD 25B and MSM 030C with side drive and timing belt



Motor not shown in drawing

14.46.21

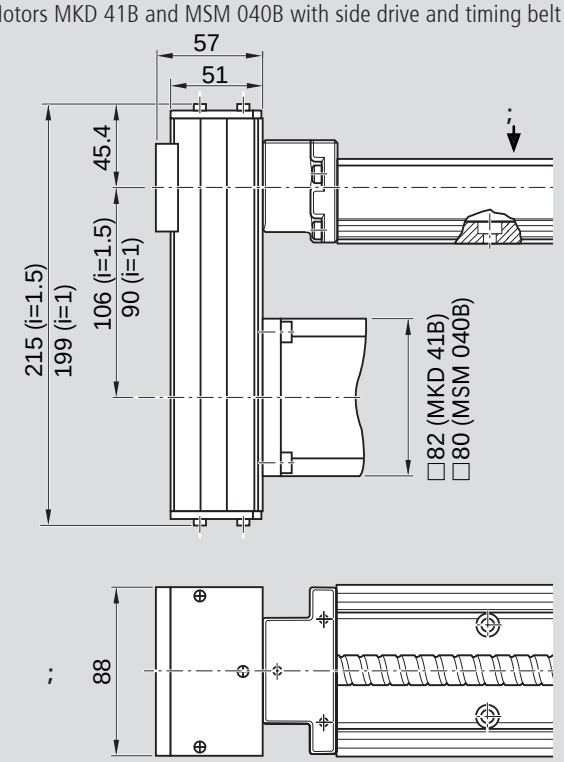
Type RV05 and RV08
Motors MKD 25B and MSM 030C with side drive and timing belt



Motor not shown in drawing

14.46.30

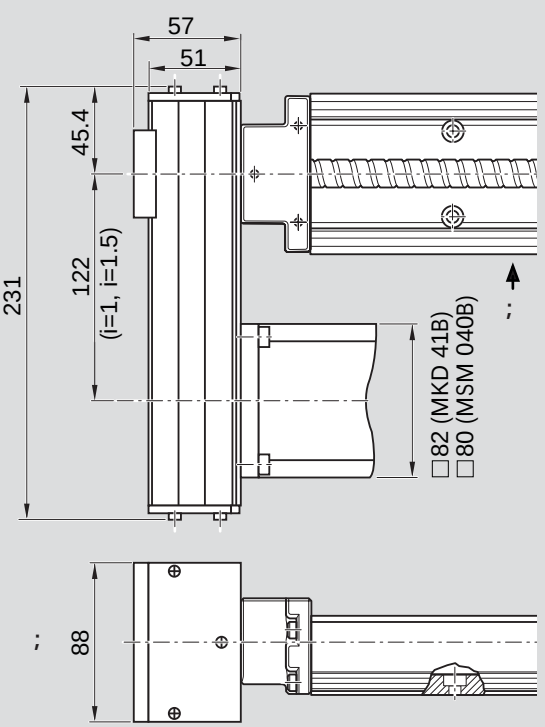
Type RV01 and RV04
Motors MKD 41B and MSM 040B with side drive and timing belt



Motor not shown in drawing

14.46.31

Type RV05 and RV08
Motors MKD 41B and MSM 040C with side drive and timing belt



Motor not shown in drawing

Rexroth – Precision Modules PSK
Switch Mounting Arrangements

Overview of the switching system

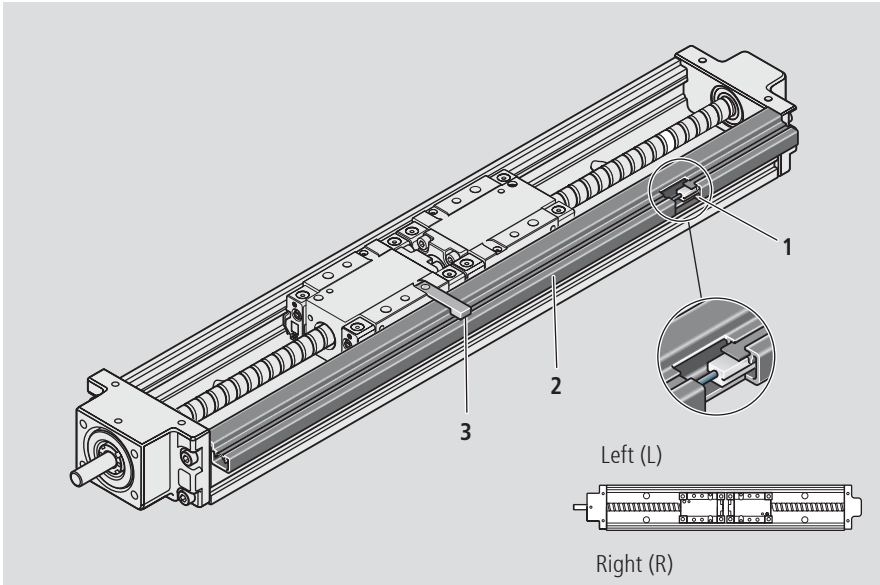
1 Switch
2 Cable duct
(aluminum alloy, black anodized)
3 Switching cam

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

For two-carriages versions:
switch actuation by the driving runner block on the motor side.

Mounting side for switches:

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



Switches

Miniature switches with potted cable.

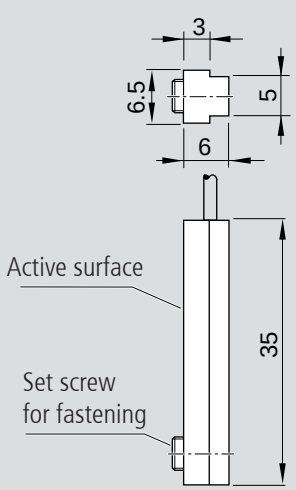
Type:
– Hall sensor PNP NC or
– Reed contact (changeover)

On request:
– Hall sensor PNP NO
– Hall sensor NPN NC
– Hall sensor NPN NO

Mounting instructions:

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

A cable duct is required to mount the switches. Insert the switches into the T-slot in the cable duct and fix them in place using set screws.

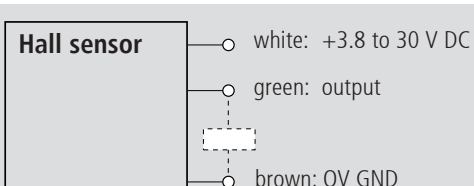


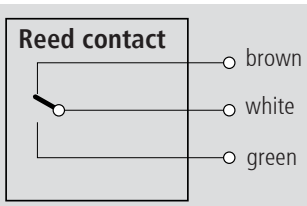
Important: 2 switching points!

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

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

Pin allocation





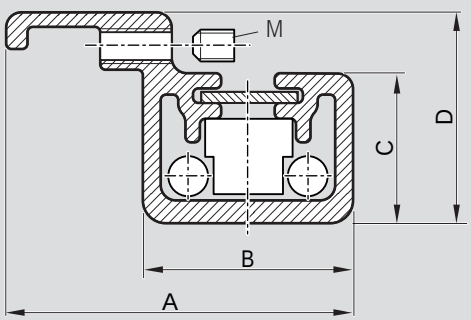
Rexroth – Precision Modules PSK
Switch Mounting Arrangements

Cable duct

Function:

– to accommodate and secure switches
– to house cables

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



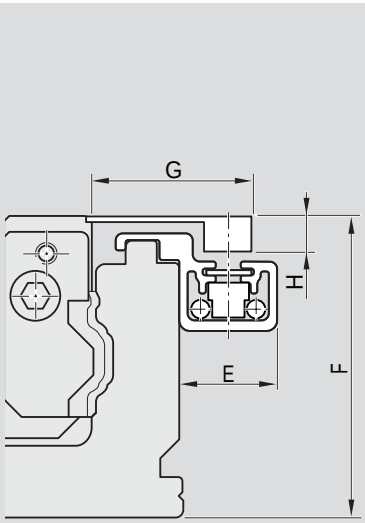
	PSK50 (mm)	PSK60 (mm)	PSK90 (mm)
A	21.7	25.2	25.2
B	15.0	15.0	15.0
C	11.5	11.5	11.5
D	16.5	16.5	16.5
M	M2	M2.5	M2.5

Installation dimensions for versions without cover and with cover plate

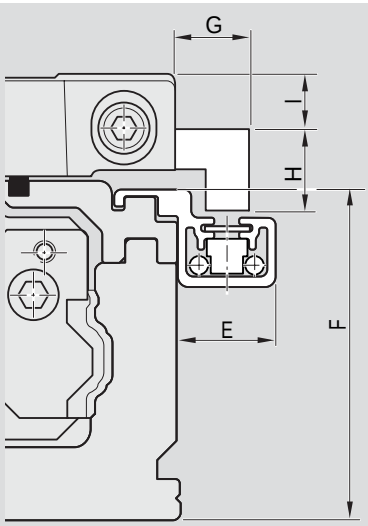
	PSK50 (mm)	PSK60 (mm)	PSK90 (mm)
E	15.2	18.5	15.4
F	25.8	33.0	45.8
G	18.6	21.6	21.6
H	6.0	6.0	6.0

Install. dim. for version with sealing strip

	PSK50 (mm)	PSK60 (mm)	PSK90 (mm)
E	15.2	15.8	15.2
F	28.1	35.7	50.2
G	11.2	12.0	12.0
H	12.5	14.0	14.0
I	4.3	1.9	7.1



Without cover/with cover plate



With sealing strip

Ordering data for switches and mounting components

The part numbers are listed in the table below.

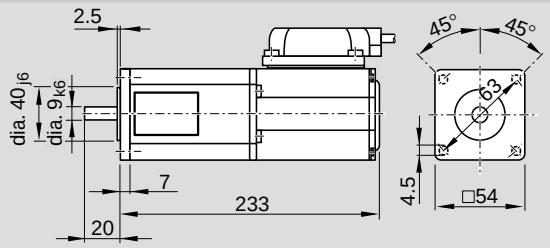
Mounting components can also be ordered individually.

Item		Part numbers		
		PSK50	PSK60	PSK90
1	**Switch**			
	– Reed contact	8616-018-03	8616-018-03	
	– Hall sensor	8616-019-03	8616-019-03	
2	**Cable duct**	0396-620-20	0396-620-19	
3	**Switching cam**			
	– for without cover and with cover plate	1419-000-10	1419-000-04	
	– for sealing strip	1419-000-11	1419-000-05	

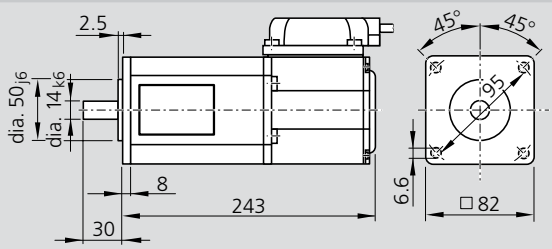
Rexroth – Precision Modules PSK
Motors

MKD servomotors
Dimensions and part numbers

MKD 25B-144 KG1
Part number 8611-050-03



MKD 41B-144 KG1
Part number 8611-010-03



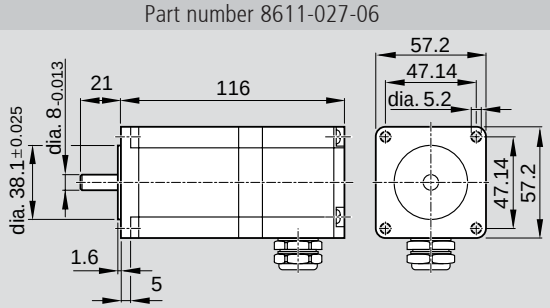
Motor data

Motor	MKD 25B	MKD 41B
Maximum effective speed n_{max} (min^{-1})	ϟ	ϟ
Rated torque M_N (Nm)	0.9	2.7
Maximum torque M_{max} (Nm)	ϟ	ϟ
Mass moment of inertia $J_M + J_{Br}$ (10^{-6} kgm^2)	30 + 8	170 + 16
Braking torque M_{Br} (Nm)	1.0	2.2
Mass with brake m_{Br} (kg)	2.25	4.65

ϟ See "Controllers – Servomotors" and "Controllers – Stepping Motors" catalogs.

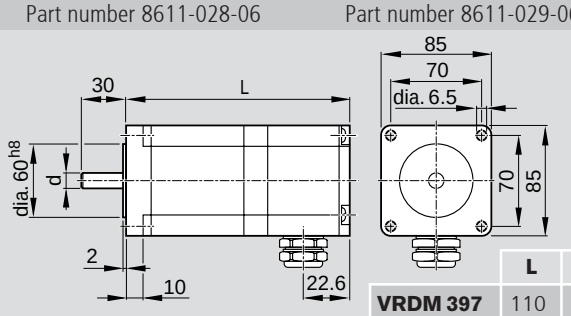
VRDM three-phase stepping motors
Dimensions and part numbers

VRDM 368
Part number 8611-027-06



VRDM 397
Part number 8611-028-06

VRDM 3910
Part number 8611-029-06



	L	d_{h6}
VRDM 397	110	12
VRDM 3910	140	12

Motor data

Motor	VRDM 368 50 LWB	VRDM 397 50 LWB	VRDM 3910 50 LWB
Number of steps	200 / 400 / 500 / 1000		
Stepping angle (°)	1.8 / 0.9 / 0.72 / 0.36		
Maximum torque (Nm)	1.5	2.0	4.0
Mass moment of inertia (kgcm^2)	0.38	1.1	2.2
Braking torque (Nm)	1.74	2.26	4.52
Mass (kg)	1.1	2.05	3.1

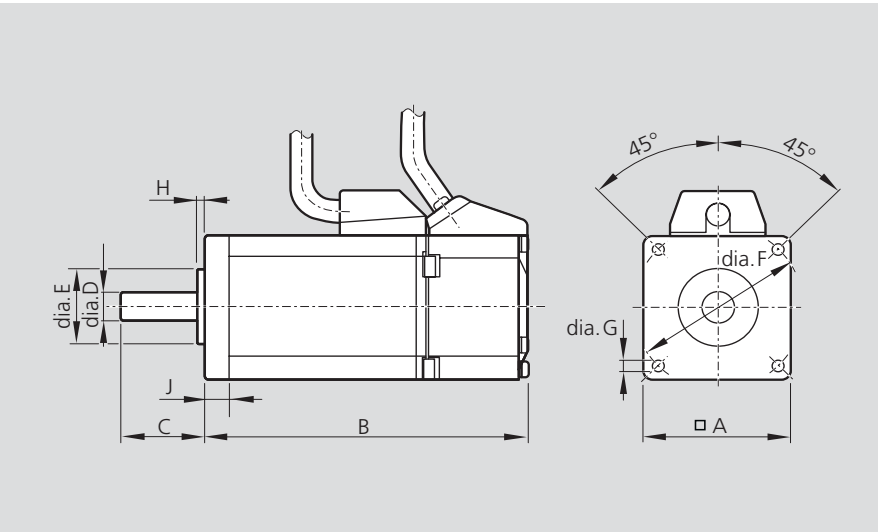
Notes

The motors are available complete with controllers and control systems. More detailed information about motors, controllers and control systems can be found in the catalogs "Controllers – Servomotors" and "Controllers – Stepping Motors".

Rexroth – Precision Modules PSK
Motors

MSM Servomotors

Dimensions, motor data and part numbers



Dimensions of MSM servomotors

Values in parentheses apply to motor with holding brake

		MSM 020B	MSM 030B	MSM 030C	MSM 040B
A	[mm]	42	60	60	80
B	[mm]	109.0 (140.5)	111.0 (144.0)	138.5 (171.5)	157.5 (191.5)
C	[mm]	24	30	30	35
D_{h6}	[mm]	8	11	14	19
E_{h7}	[mm]	22	50	50	70
F	[mm]	48	70	70	90
G	[mm]	3.4	4.5	4.5	6.0
H	[mm]	2	3	3	3
J	[mm]	7	7	7	8

MSM servomotor data

Values in parentheses apply to motor with holding brake

		MSM 020B	MSM 030B	MSM 030C	MSM 040B
n_{max}	[min^{-1}]	3 000	3 000	3 000	3 000
M_N	[Nm]	0.32	0.64	1.30	2.40
M_{max}	[Nm]	0.95	1.91	3.80	7.10
$J_M + J_{Br}$	[10^{-6} kgm^2]	3.2 + 0.4	10.0 + 3.0	17.0 + 3.0	67.0 + 8.0
M_{Br}	[Nm]	0.29	1.27	1.27	2.45
m	[kg]	0.5 (0.7)	0.96 (1.36)	1.5 (1.9)	3.1 (3.8)

n_{max} Maximum effective speed
M_N Rated torque
M_{max} Maximum torque
J_M Mass moment of inertia, motor
J_{Br} Mass moment of inertia, brake
M_{Br} Braking torque
m Motor mass

Motor types and part numbers MSM servomotors

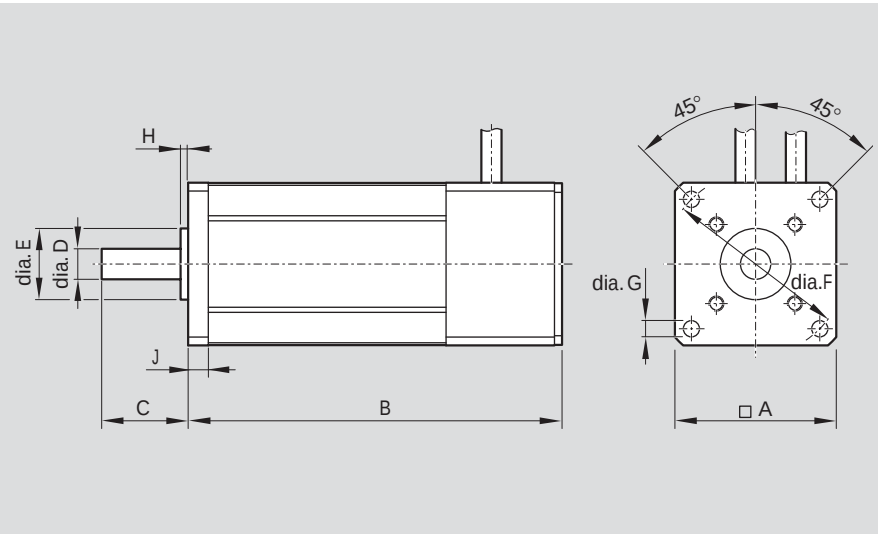
Motor type		Part number
MSM 020B-0300-NN-M0-CG0	without holding brake	8611-068-03
MSM 020B-0300-NN-M0-CG1	with holding brake	8611-069-03
MSM 030B-0300-NN-M0-CG0	without holding brake	8611-070-03
MSM 030B-0300-NN-M0-CG1	with holding brake	8611-071-03
MSM 030C-0300-NN-M0-CG0	without holding brake	8611-072-03
MSM 030C-0300-NN-M0-CG1	with holding brake	8611-073-03
MSM 040B-0300-NN-M0-CG0	without holding brake	8611-074-03
MSM 040B-0300-NN-M0-CG1	with holding brake	8611-075-03

All motors with absolute rotary encoder

Rexroth – Precision Modules PSK
Motors

MSI Servomotors

Dimensions, motor data and part numbers



Dimensions of MSI servomotors

Values in parentheses apply to motor with holding brake

		MSI 032	MSI 040	MSI 055
A	[mm]	32	40	55
B	[mm]	118 (144.1)	123.5 (148.5)	150 (168)
C	[mm]	20	20	25
D	[mm]	6	6	9
E	[mm]	14	18	40
F	[mm]	36	48	65
G	[mm]	3.2	3.2	5.5
H	[mm]	1.5	2.5	2.5
J	[mm]	4	4	9

MSI servomotor data

Values in parentheses apply to motor with holding brake

n_{max}	Maximum effective speed
M_N	Rated torque
M_{max}	Maximum torque
J_M	Mass moment of inertia, motor
J_{Br}	Mass moment of inertia, brake
M_{Br}	Braking torque
m	Motor mass

		MSI 032	MSI 040	MSI 055
n_{max}	[min^{-1}]	19 800	11 550	5 800
M_N	[Nm]	0.17	0.40	0.88
M_{max}	[Nm]	1.00	1.50	3.00
$J_M + J_{Br}$	[10^{-6} kgm^2]	2.5 + 1.0	6.2 + 1.0	32 + 2.2
M_{Br}	[Nm]	0.4	0.4	0.7
m	[kg]	0.48	0.82	1.41

Motor types and part numbers MSI servomotors

Motor type		Part number
MSI-032H	without holding brake	8611-076-03
MSI-032H	with holding brake	8611-077-03
MSI-040H	without holding brake	8611-078-03
MSI-040H	with holding brake	8611-079-03
MSI-055H	without holding brake	8611-080-03
MSI-055H	with holding brake	8611-081-03

All motors with absolute rotary encoder

Rexroth – Precision Modules PSK
Mounting

General information

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

Precision Modules can be mounted either by screwing the frame directly onto the base or by using clamping fixtures.
When mounting the Precision Modules, observe the maximum tightening torque values as indicated in the table.

Mounting with screws in the frame

The reference edge on the frame facilitates alignment of the Precision Modules.

Suitable for cover options:
- without cover
- with cover plate (remove cover plate before mounting the module).
  For installation dimensions, refer to the respective dimension drawings.

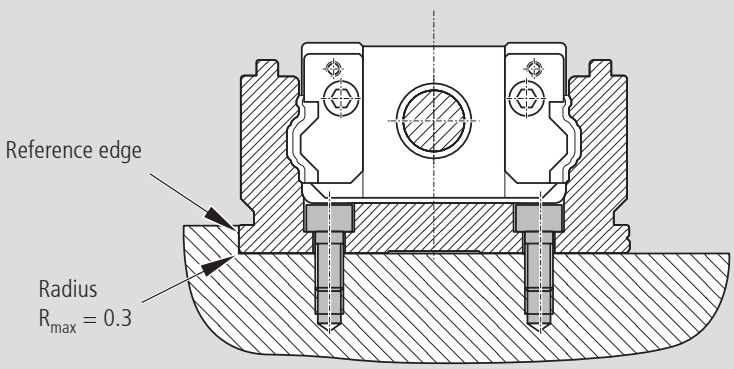
Mounting with clamping fixtures

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

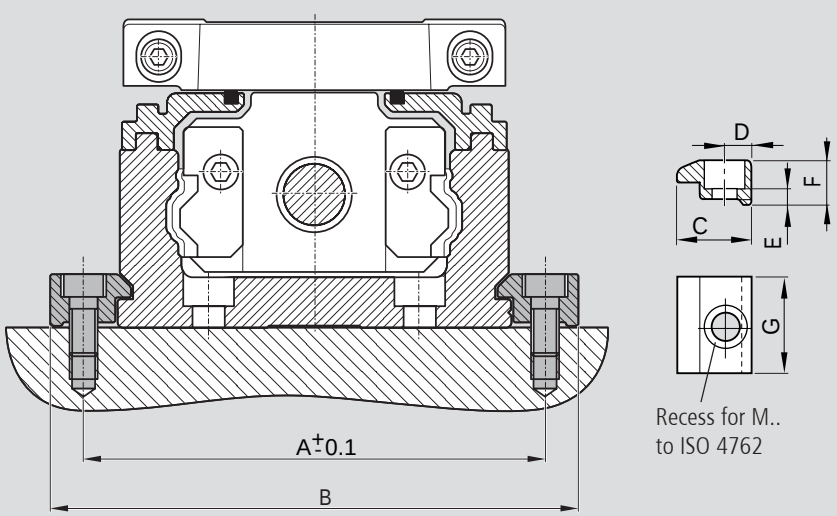
Clamping fixtures

Recommended number of clamping fixtures: 3 per 500 mm and side

Mounting with screws in the frame



Mounting with clamping fixtures



	Part numbers	Dimensions (mm)							
		A	B	C	D	E	F	G	M
PSK50	1419-010-02	60	70	12.5	5.0	4.0	8.5	20.0	M4
PSK60	1419-010-01	72	85	15.0	6.5	4.8	10.0	22.0	M5
PSK90	1419-010-00	100	115	17.50	7.5	5.8	12.0	25.0	M6

Tightening torques of the mounting screws

with friction factor 0.125
Strength class 8.8

	8.8	M3	M4	M5	M6
	Nm	1.3	2.7	5.5	9.5

Rexroth – Precision Modules PSK
Lubrication Ports

General notes

The lubrication system on Precision Modules has been designed for grease lubrication. 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.

Without cover

– One-point lubrication at either of the two funnel-type lube nipples DIN 3405-D3 per carriage.
– Lubrication through customer-built attachment:
One-point lubrication through the customer-built attachment can be achieved by using the lube port in the carriage. The modules are shipped with the lube ports closed with set screws. Before using the lube ports, the set screws must be removed and O-rings inserted to seal off the customer-built attachment.

	PSK50	PSK60	PSK90
A	–	16.0	24.6
B	18.2	22.0	33.3
C	6.5	9.0	12.0
dia. D	2.5	2.5	4.0
dia. E	5.0	5.0	8.0
F	$0.6^{+0.1}$	$0.7^{+0.1}$	$0.5^{+0.1}$
M	M2.5	M3	M4

	O-ring DIN 3771	Part number
PSK50	3 x 1	8411-118-01
PSK60	3 x 1	8411-118-01
PSK90	5 x 1.5	8411-108-01

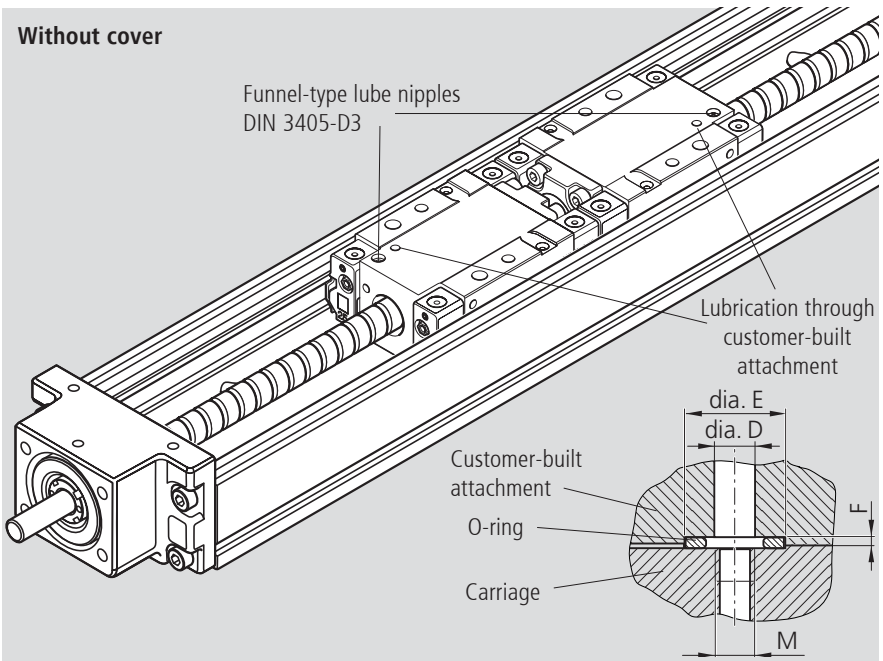
Cover plate, sealing strip

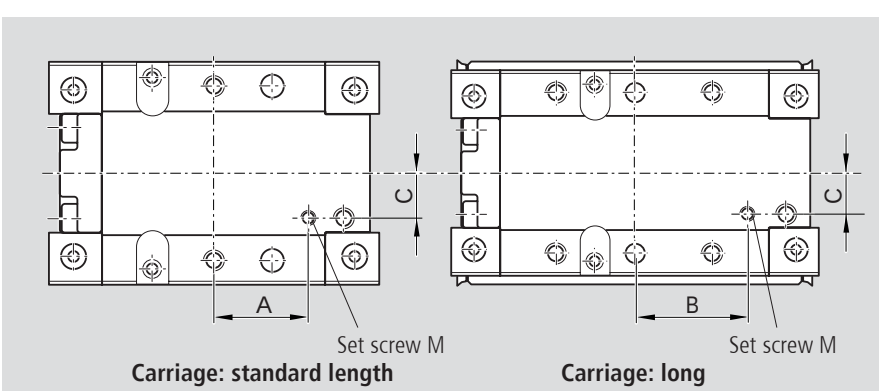
One-point lubrication at either of the two funnel-type lube nipples DIN 3405-D3 per carriage.

Please contact us regarding the lubrication for short stroke applications:

PSK 50: stroke < 70 mm
PSK 60: stroke < 95 mm
PSK 90: stroke < 135 mm

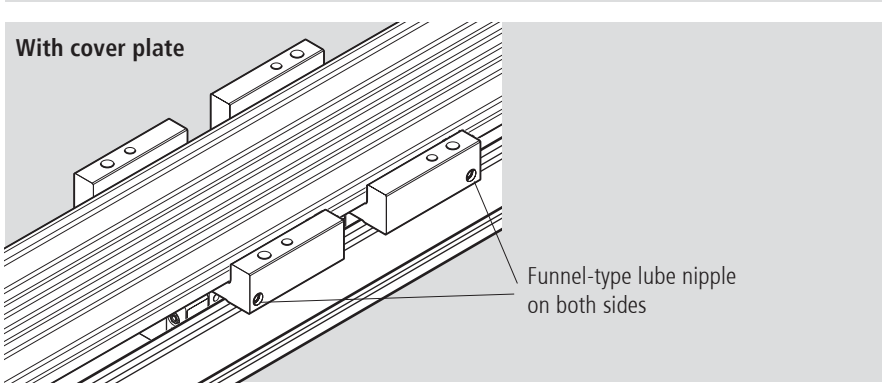
Without cover



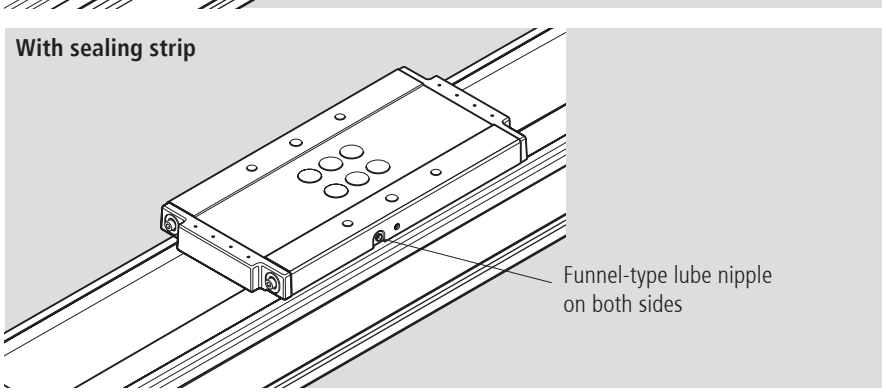


Carriage: standard length **Carriage: long**

With cover plate



With sealing strip



Rexroth – Precision Modules PSK
Documentation

Standard report

Option 01

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

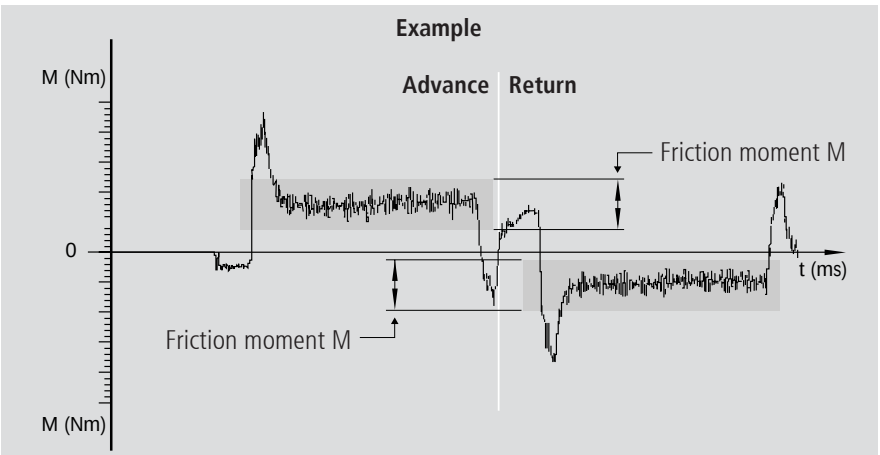
Checks listed in the standard report:

- Functional checks of mechanical components
- Functional checks of electrical components
- Design is in accordance with order confirmation.

Moment of friction measurement of complete system

Option 02

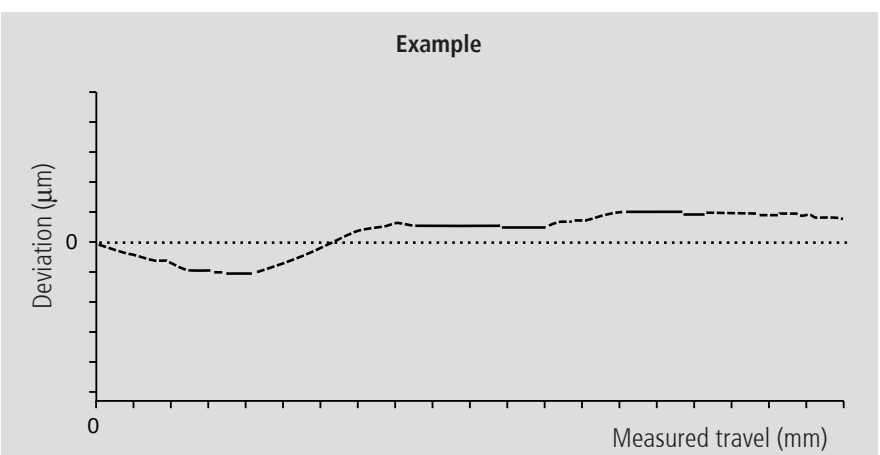
The moment of friction is measured along the entire travel range.



Lead deviation of ball screw

Option 03

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



Running accuracy

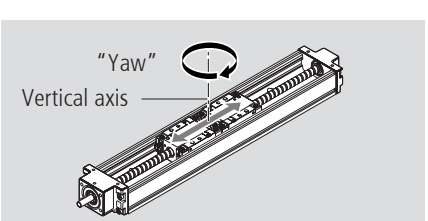
Option 04

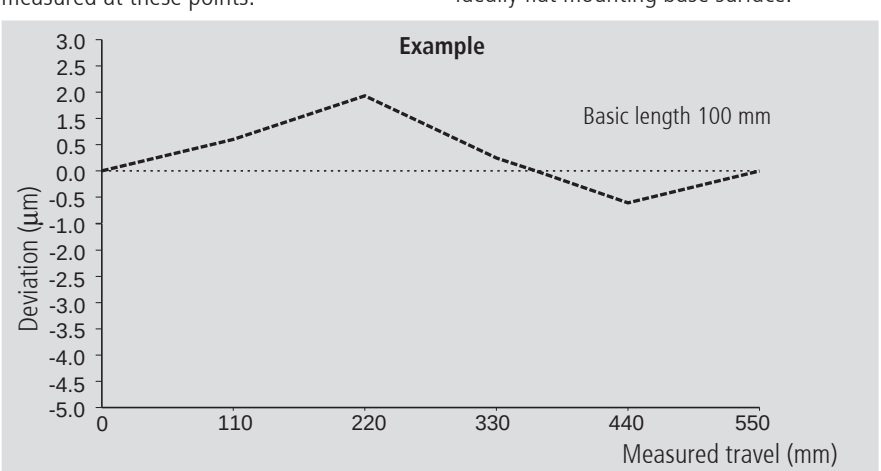
Several measurement points are approached along the travel and the yawing and pitching deviations are measured at these points.

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

Yawing

Yawing describes the angular deviation about the vertical axis. This angular deviation is converted to a deviation in mm for a basic length and plotted in a graph. The basic length is indicated in the graph.

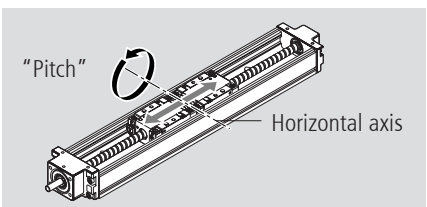


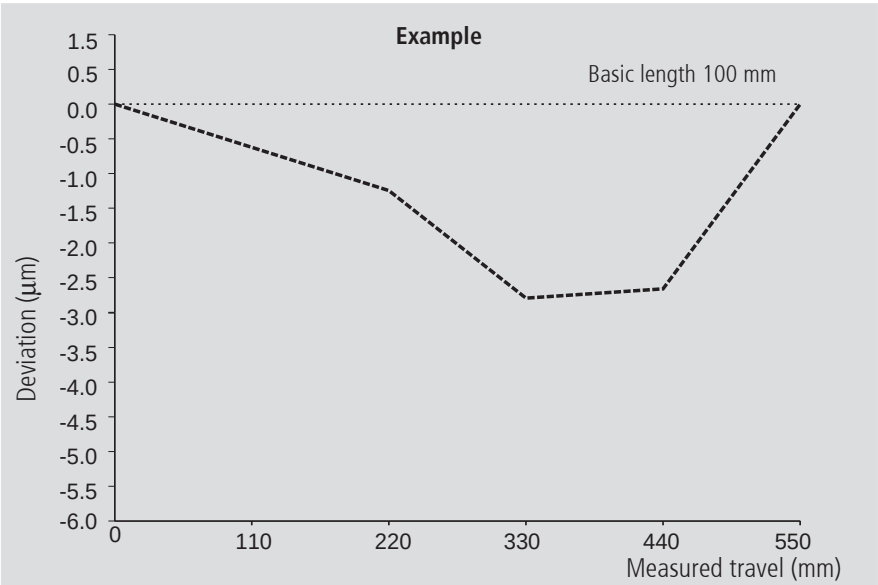


Pitching

Pitching describes the angular deviation about the horizontal axis. This angular deviation is converted to a deviation in mm for a basic length and plotted in a graph. The basic length is indicated in the graph.

A measurement report in table form is provided in addition to the graphs (see yawing and pitching curves).





Positioning accuracy

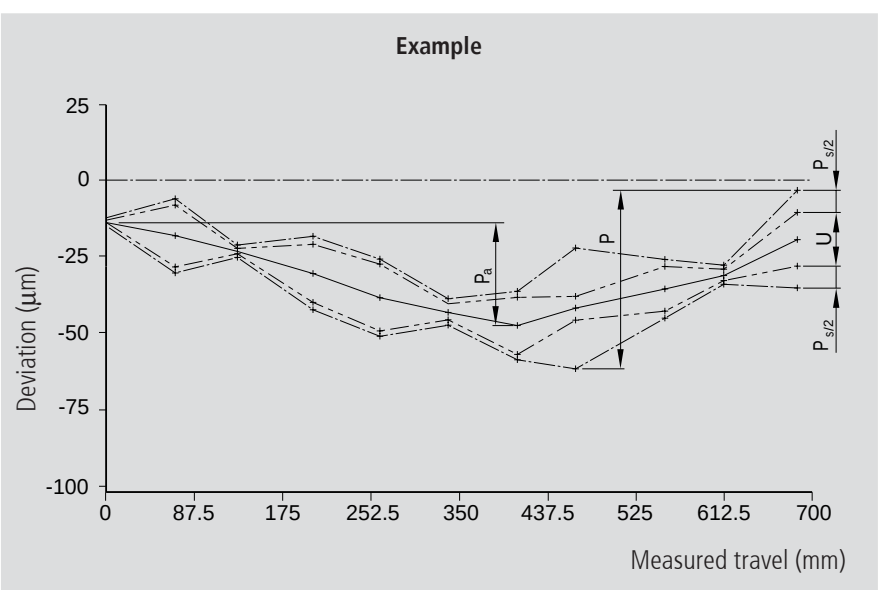
to VDI/DGQ 3441

Option 05

Measurement points are selected at irregular intervals along the travel. This allows even periodical deviations to be detected during positioning.

Each measurement point is approached several times from both sides.

This gives the following parameters:



Positioning accuracy P

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

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.

Position variation range P_s

The position variation range describes the effects of random deviations. It is determined at every measurement point.

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.

Inquiry/Order Form

Bosch Rexroth Corporation
14001 South Lakes Drive
Charlotte, NC 28273

Phone: (704) 583-4338
Fax: (704) 583-0523
www.boschrexroth-us.com

Rexroth – Precision Module PSK

Ordering example: Precision Module PSK

Ordering Data			Description
Precision Module		PSK 90	Designation
(Part number): 1465-400-00, 740 mm			PSK 90, preferred length = 740 mm
Type	=	MF01	with motor mount and motor, assembled as per diagram MF01
Guideway	=	18	rail system L= 740mm standard length
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 MKD 41B
Motor	=	10	motor MKD 41B
Cover	=	01	with cover plate
1st switch	=	22-L	Hall sensor, for mounting on the left side
2nd switch	=	21-L	Reed contact, for mounting on the left side
3rd switch	=	22-L	Hall sensor, for mounting on the left side
Cable duct	=	25	cable duct supplied loose
Switching cam	=	30	switching cam for version without cover and with cover plate
Documentation	=	01	standard report

To be completed by customer: Inquiry ☐ / Order ☐

Precision Module PSK _____

(Part number): _____-_____-_____, length _____mm

Type = ☐☐☐☐
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): _____-_____-_____
_____-_____-_____
_____-_____-_____
_____-_____-_____

Quantity: ____ pcs., _____ per month, _____ per year, per order, or _____

Remarks:

Sender

Company: _____
Address: _____
_____
_____

Name: _____
Department: _____
Phone: _____
Fax: _____

Rexroth
Bosch Group

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