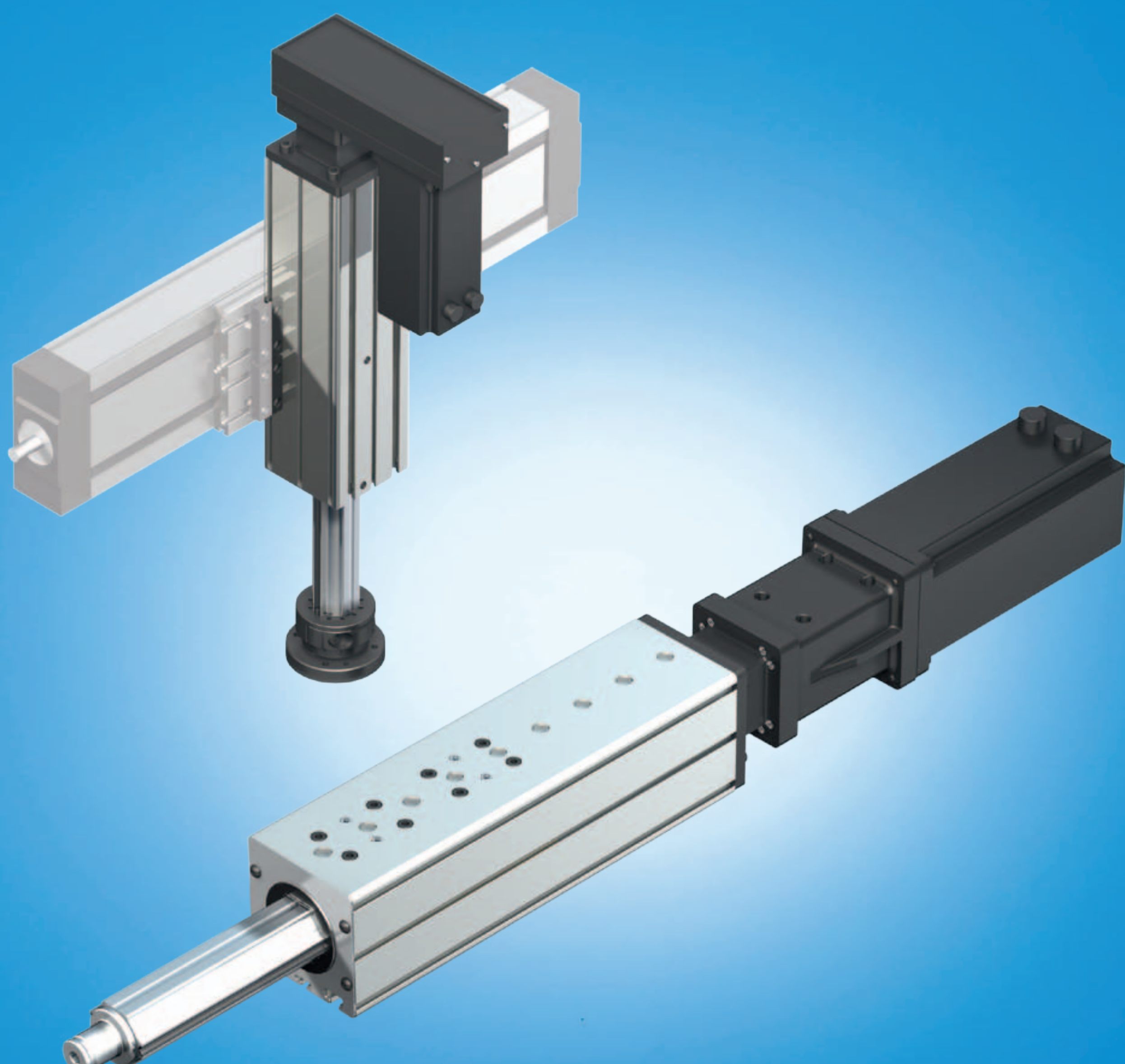
Rexroth
Bosch Group

Feed Modules VKK

R310EN 2403 (2012-11)

The Drive & Control Company



Rexroth
Bosch Group

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Katalog "Vorschubmodule VKK" R310XX 2403 (2012-11)

Sehr geehrte Damen und Herren,
Die Ausgabe 2012-11 ersetzt die Ausgabe 2008-09.
Die Druckversion der Ausgabe 2012-11 ist ab ca. Ende Juli 2013 (nach Umstellung auf das neue *Corporate Design)* verfügbar.

Änderungen/Ergänzungen:

- Easy Handling integriert
- Neuer, zweigeteilter Anbauflansch
- Faltenbalgabdeckung für die Pinole
- Überarbeitung der technischen- und Antriebsdaten
- Überarbeitung der Kapitel: Berechnung, Komponenten und Bestellung (Optionstabellen), Motoren, Anbauelemente, Schmierung
- Überarbeitung Maßbilder
- Neues Kapitel „Weiterführende Informationen“

Catalog " Feed Modules VKK" R310XX 2403 (2012-11)

Dear Ladies and Gentlemen,
The edition 2012-11 replaces the 2008-09 edition.
The print version of the 2012-11 edition is from around the end of July 2013 (after the switch to the new corporate design) available.

Changes / additions:

- Easy Handling integrated
- New, two-piece adapter flange
- Protective bellows for Thrust rod
- Revision of technical and drive data
- Revision of the chapters: Calculation, Components and Ordering Data (Option tables), Motors, Connection Elements, Lubrication
- Revision of Dimension drawings
- New chapter „Further Information“

Mit freundlichen Grüßen/ best regards
Bosch Rexroth AG
25.04.2013 / DC-IA / MKT43 Peter Gary

Firmensitz / Headquarters: Stuttgart, Registrierung / Registration: Amtsgericht Stuttgart HRB 23192
Vorstand / Executive Board: Vorstand: Dr. Karl Tragl (Vorsitzender), Vorsitzender / President; Dr. Georg Hanen; Reiner Leipold-Büttner; Dr. Stefan Spindler
Vorsitzender des Aufsichtsrats / Chairman of the Supervisory Board: Vorsitzender des Aufsichtsrats: Dr. Siegfried Dais

The ideal system solution for the ideal application

EasyHandling

Basic

Mechanical and pneumatic components, grippers, rotary compact modules, motors, sensors, single and multi-axis linear motion systems

Comfort

Mechanical and pneumatic components, grippers, rotary compact modules, motors, sensors, single and multi-axis linear motion systems

+ pre-parameterized servo drives and start-up assistant

Advanced

Mechanical and pneumatic components, grippers, rotary compact modules, motors, sensors, single and multi-axis linear motion systems

+ pre-parameterized servo drives and start-up assistant

+ preconfigured, scalable control units

Mechanics → Drives → Controls

With EasyHandling, Rexroth is making the automation of handling systems significantly easier, faster and more economical. EasyHandling is more than just a modular collection of mechanical components – it takes an evolutionary step forward by providing all-inclusive building systems. Its drive and control technologies, standardized interfaces, and the novel start-up assistant are all precisely matched. The perfect interaction of all these elements reduces project planning, installation and start-up times by up to 80 percent.

EASY HANDLING basic

Basic – made-to-measure mechatronics

EasyHandling Basic includes single and multi-axis linear motion systems for all mechanical drive types. The modules are delivered complete with the matching motors or pneumatic drives. Grippers, Rotary Compact Modules and sensors ideally complement the range.

EASY HANDLING comfort

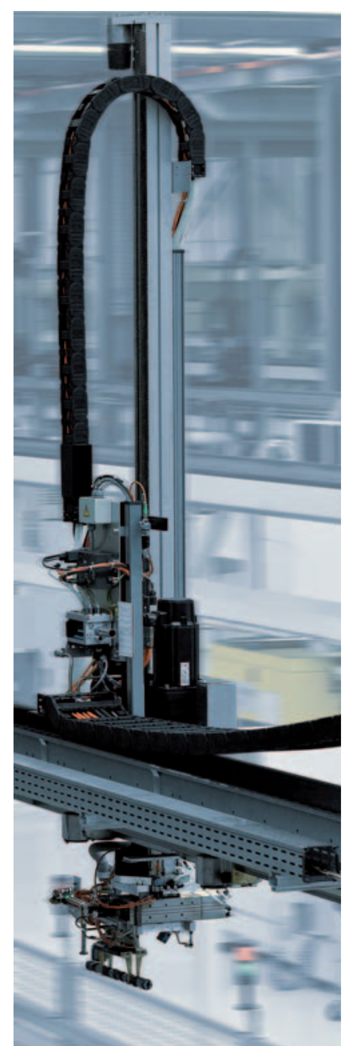
Comfort – getting started even faster

EasyHandling Comfort expands the Basic component range by adding pre-parameterized servo drives with multiple protocol capability. It also features the uniquely convenient start-up assistant EasyWizard, so that the system is ready to use after entering the data for just a few application-specific details.

EASY HANDLING advanced

Advanced – for demanding requirements

With the scalable, preconfigured Motion Logic control system, EasyHandling Advanced makes configuration and handling even easier. Predefined functions covering more than 90 percent of all handling applications eliminate the need for lengthy programming.



Feed Modules VKK

EasyHandling basic

Product Description

Outstanding features

Rexroth Feed Modules VKK are precise, ready-to-install linear motion systems that combine high performance with compact dimensions. They are especially suitable for handling tasks requiring high precision as well as high thrust and torque transfer capabilities. Because of their low moved mass, Feed Modules VKK are ideal for vertical motion in Z-axes.

Structural design

- Extremely compact extruded aluminum profile (frame) with zero-clearance Ball Rail System
- Integrated Precision Ball Screw Drive in tolerance grade 7 with zero-backlash nut system
- Fixed bearing end block made of aluminum

Attachments

- Maintenance-free servo drives with or without brake
- Motor mount and coupling or timing belt side drive for motor attachment
- Switches
- Rotary Compact Modules and Grippers
- Bellows

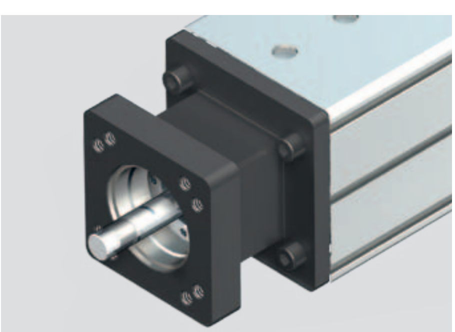
Drive controllers and control systems

Further highlights

- Optimal travel performance, high load capacities and high rigidity due to integrated, zero-clearance ball rail system
- Compact design
- Ball screw drive with zero-backlash nut system assures high positioning accuracy and repeatability
- Low-cost maintenance provided by one-point lubrication (grease) of the ball rail system and the ball screw drive
- Easy motor attachment due to locating feature and fastening threads
- Encapsulated guideway
- Switches positionable over the entire travel range
- Switch activation via internal magnets
- Allows easy installation of various attachments
- Fully compatible with the EasyHandling system
- Positive-locking connection technology with centering rings

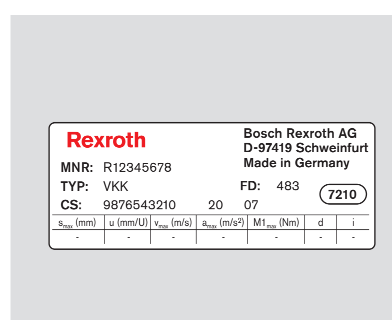
Advantages of the two-piece adapter flange:

- Form-fitting engagement in the groove on the mounting interface of the thrust rod, provides especially secure mounting as well as protection against falling in vertical installations.
- Locating pins ensure reproducible alignment with the running tracks on the thrust rod.
- Optimal fixing through clamping by means of half-shell

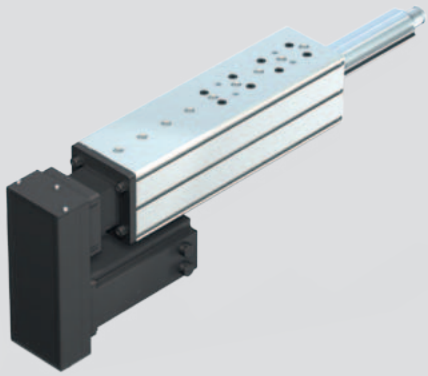


End block with threads and locating feature for motor attachment

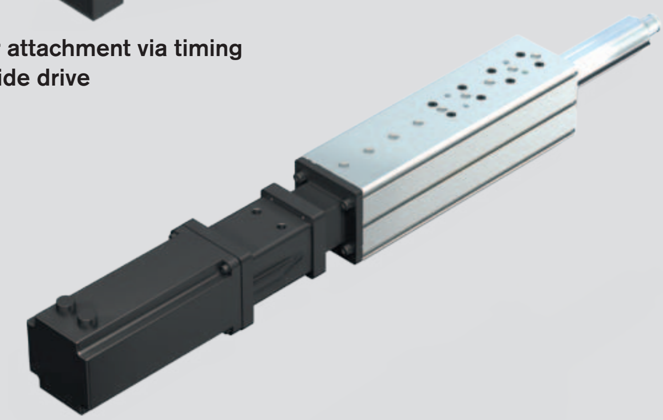
Thrust rod with mounting interface for adapter flange



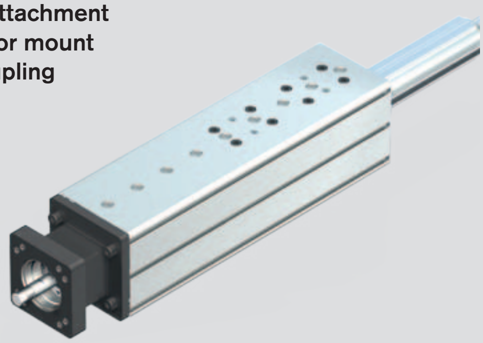
On the nameplate you will find technical data for start-up. With these technical data and the EasyWizard software, starting up linear systems becomes easier, faster and more effective than ever before.



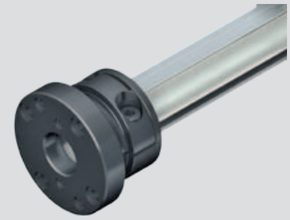
Motor attachment via timing belt side drive



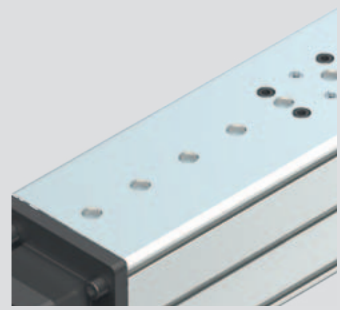
Motor attachment via motor mount and coupling



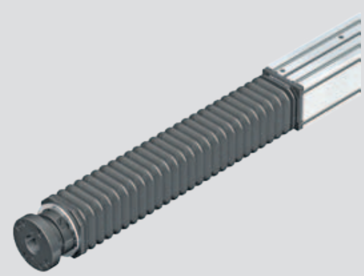
Without attached motor



Thrust rod with adapter flange for a variety of attachments



Centering holes for positive-locking connections with good reproducibility to simplify installation (EasyHandling Cartesian Motion building system)



Protective bellows

Type designation (size)

Feed Modules VKK are identified by the type designation and size.

Description		Type			Size
	Example: Feed Module	**V**	**K**	**K**	**25-100**
System	Feed Module **(V)**				
Guideway	Integrated Ball Rail System **(K)**				
Drive unit	Ball Screw **(K)**				
Frame size	Width of frame (mm) Example: B = 100 mm				

EasyHandling basic

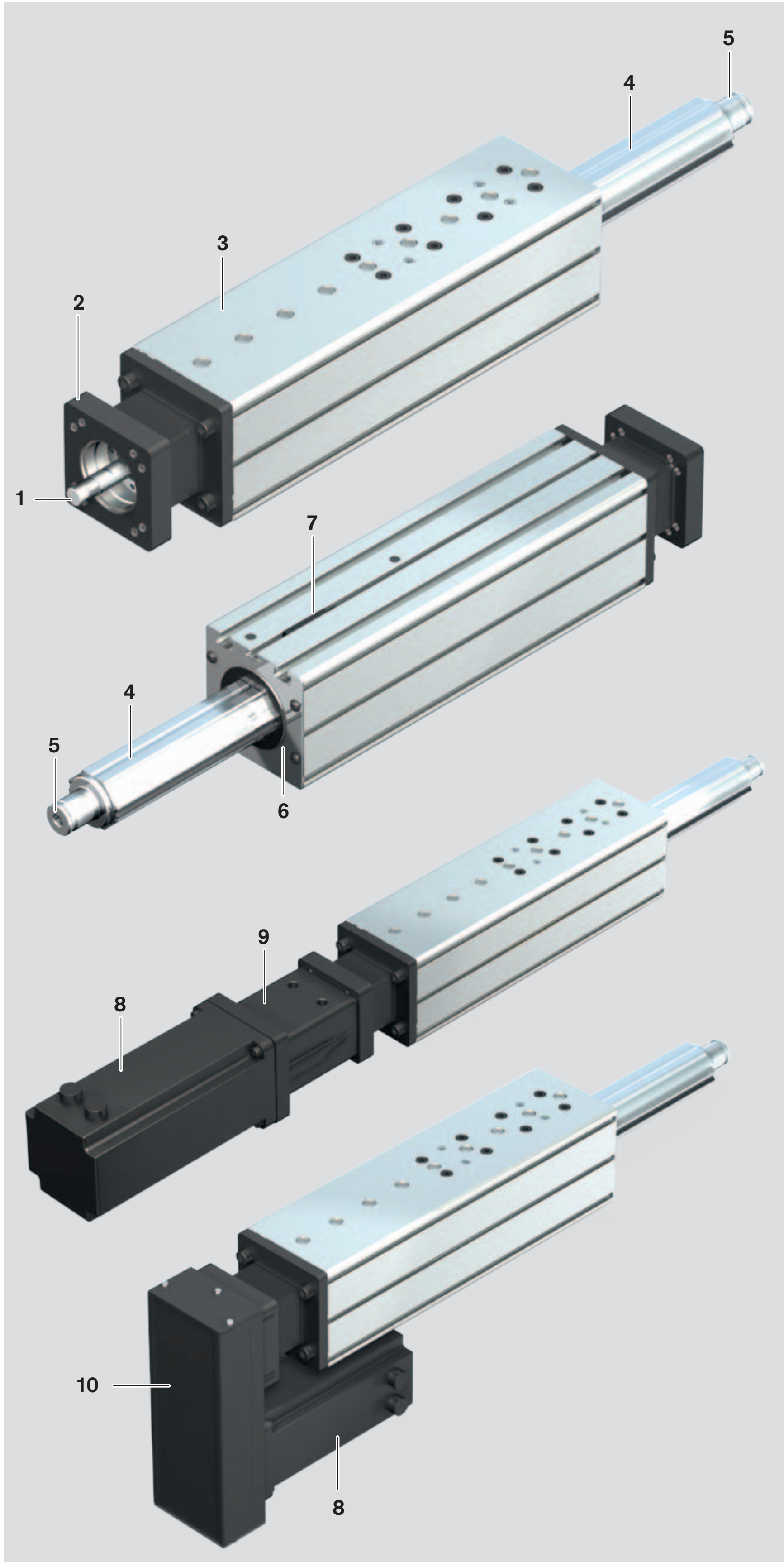
Structural Design

Feed Module VKK

1 Ball screw with zero-backlash cylindrical single nut
2 Fixed bearing end block
3 Frame
4 Thrust rod
5 Mounting interface for adapter flange
6 End seal

Attachments

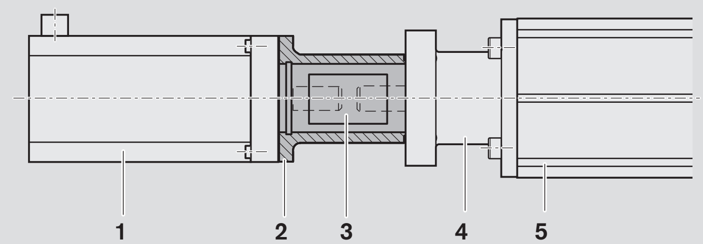
7 Magnetic field sensor
8 Motor
9 Motor mount and coupling
10 Timing belt side drive



Motor mount and coupling

A motor can be attached to all Feed Modules by means of a motor mount and coupling.

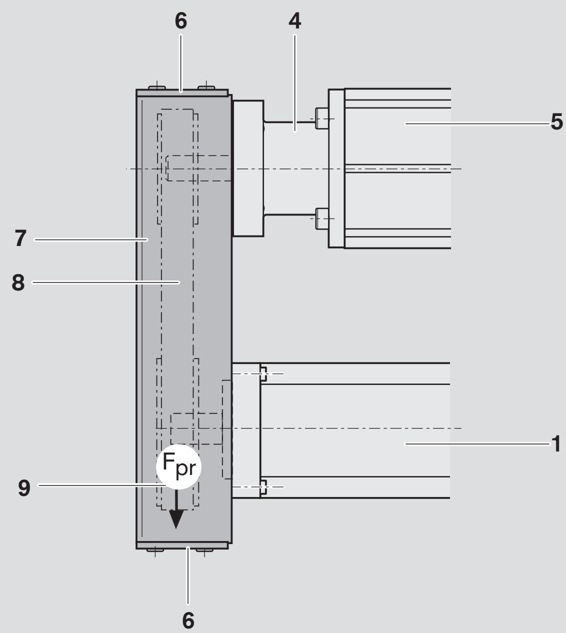
The motor mount serves to fasten the motor to the Feed Module and acts as a closed housing for the coupling. The motor's drive torque is transmitted stress-free through the coupling to the Feed Module's screw shaft.

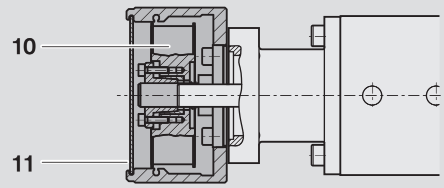


Timing belt side drive

All Feed Modules offer the option of attaching the motor via a side drive with timing belt.
This results in a shorter overall length compared to a motor attachment via motor mount and coupling.
The compact, closed housing protects the belt and secures the motor. Various gear ratios are also available:
- i = 1 : 1
- i = 1 : 1.5
- i = 1 : 2

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





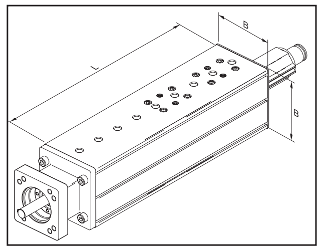
1 Motor
2 Motor mount
3 Coupling
4 Fixed bearing end block
5 Feed Module
6 End cover
7 Drawn, anodized aluminum profile
8 Toothed belt
9 Pre-tensioning of the toothed belt: apply pretensioning force F_{pr} to motor (F_{pr} will be indicated on delivery)
10 Belt pulleys
11 Cover plate

General Technical Data

Take note of the Calculations section!

Dimensions

VKK		VKK 15-50	VKK 15-70	VKK 25-100
B	(mm)	50	70	100
$L^{1)}$	(mm)	240	280	360
		280	320	400
		360	400	480
		480	520	600
		–	600	680
$s_{max}^{2)}$	(mm)	378	452	476



1) Length
2) Max. travel (without bellows) at maximum length. For further travel distances, see dimension drawings.

Load capacities and moments

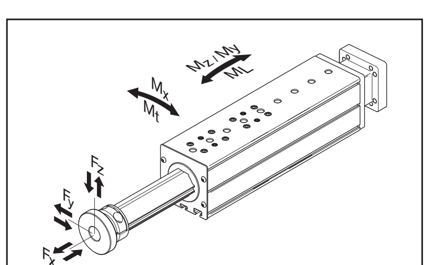
VKK	Ball screw d_0 x P (mm)	Dynamic load capacity C (N) Guideway	Ball screw	Fixed bearing	Dynamic moments (Nm) M_t	M_L	Max. perm. load $F_{x\,max}$ (N)	Maximum permissible moments (Nm) M_t	M_L	Planar moment of inertia Thrust rod I_y (cm^4)	I_z (cm^4)
VKK 15-50	12 x 2	6 950	2 240	4 000	97	61	2 234	48	30	2.6	2.3
	12 x 5		3 800				2 827				
	12 x 10		2 500				1 810				
VKK 15-70	16 x 5	8 120	12 300	13 400	160	280	5 202	55	110	5.7	6.7
	16 x 10		9 600				3 449				
	16 x 16		6 300				2 403				
VKK 25-100	20 x 5	26 000	14 300	17 900	670	1 300	14 296	100	360	12.9	16.2
	20 x 20		13 300				11 592				
	25 x 10		15 700				7 238				

Acceptable loads
(recommended from experience)

As far as the desired service life is con-cerned, loads of up to approximately 20% of the dynamic load and moment values (C, M_t, M_L) have proved acceptable.
At the same time, the following may not be exceeded:
- maximum permissible loads
- permissible drive torque
- permissible travel speed
- the maximum permissible acceleration

Note on dynamic load capacities and moments

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



d_0 = screw diameter (mm)
P = screw lead (mm)

Maximum permissible drive torque M_p at the screw journal
Requirement:
No radial load on screw journal.
Consider the rated torque of the coupling used!
Maximum permissible linear speed v_{max}
Consider the motor speed!
Maximum permissible acceleratio a_{max}

VKK	Ball screw d_0 x P	M_p (Nm)	M_p with key (Nm)	Frictional torque M_{Rs} (Nm)	v_{max} [1] (m/s)	a_{max} (m/s^2)
VKK 15-50	12 x 2	0.79	–	0.22	0.23	27
	12 x 5	1.74		0.22	0.58	
	12 x 10	1.74		0.23	1.16	
VKK 15-70	16 x 5	2.2	2.2	0.33	0.4	27
	16 x 10	3.7	3.2	0.34	0.8	
	16 x 16	4.7	3.2	0.37	1.2	
VKK 25-100	20 x 5	10.8	10.8	0.52	0.3	22
	25 x 10	12.3	11.3	0.67	0.6	27
	20 x 20	25.5	11.3	0.69	1.2	27

1) For all lengths

Mass of VKK
(without motor attachment, motor, switching system).

VKK	Length L (mm)	Mass of VKK (kg) Adapter flange without	with	with bellows[2]	Moved mass of system (kg) Adapter flange without	with	with bellows[2]
VKK 15-50	240	1.32	1.72	2.02	0.37	0.77	1.07
	280	1.47	1.87	2.17	0.42	0.82	1.12
	360	1.78	2.18	2.48	0.51	0.91	1.21
	480	2.24	2.64	2.94	0.64	1.04	1.34
VKK 15-70	280	2.99	3.39	3.69	0.73	1.13	1.43
	320	3.28	3.68	3.98	0.80	1.20	1.50
	400	3.88	4.28	4.58	0.92	1.32	1.62
	520	4.77	5.17	5.47	1.11	1.51	1.81
	600	5.37	5.77	6.07	1.23	1.63	1.93
VKK 25-100	360	8.26	8.66	9.26	1.67	2.07	2.57
	400	8.83	9.23	9.83	1.76	2.16	2.66
	480	9.98	10.38	10.98	1.93	2.33	2.83
	600	11.70	12.10	12.70	2.19	2.59	3.09
	680	12.84	13.24	13.84	2.36	2.76	3.26

2) With adapter flange

Constants $k_{j\,fix}$, $k_{j\,var}$, $k_{j\,m}$
Frictional torque M_{Rs}

The constants are required to determine the mass moment of inertia of the system J_s.

VKK	Ball screw d_0 x P	Constants $k_{j\,fix}$	$k_{j\,var}$	$k_{j\,m}$
VKK 15-50	12 x 2	1.193	0.013	0.101
	12 x 5	1.212	0.012	0.633
	12 x 10	1.824	0.034	2.533
VKK 15-70	16 x 5	4.035	0.032	0.633
	16 x 10	4.350	0.039	2.533
	16 x 16	4.958	0.047	6.485
VKK 25-100	20 x 5	39.342	0.086	0.633
	20 x 20	44.273	0.244	10.132
	25 x 10	46.551	0.122	2.533

Drive data for motor attachment via motor mount and coupling

VKK	Motor	Coupling data Rated torque M_{cN} (Nm)	Mass moment of inertia J_c (10^{-6} kgm^2)	Mass of motor mount and coupling m_c (kg)
VKK 15-50	MSM 019B	1.9	2.1	0.2
	MSM 031B	3.7	7.0	0.3
	MSM 031C			
VKK 15-70	MSM 031C	19	60	0.4
	MSM 041B			0.5
	MSK 030C			0.6
	MSK 040C			
VKK 25-100	MSM 041B	19	64	0.6
	MSK 050C	50	200	1.0

EasyHandling basic

General Technical Data

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

		MSM 019B								MSM 031B							
		M_{sd} (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t	M_{sd} (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t
VKK	**KGT**	**i**		**i**						**i**		**i**					
	d_0 x P	**1**	**1,5**	**1**	**1,5**					**1**	**1,5**	**1**	**1,5**				
15-50	12 x 2	0,79	0,53							0,79	0,53						
	12 x 5	1,31	0,87	10,7	4,1	0,10	0,28	48	6 AT3	2,48	1,65	34,8	13,0	0,15	0,63	64,5	10 AT3
	12 x 10	1,31	0,87							2,70	1,80						

		MSM 031C								MSM 041B							
		M_{sd} (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t	M_{sd} (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t
VKK	**KGT**	**i**		**i**						**i**		**i**					
	d_0 x P	**1**	**1,5**	**1**	**1,5**					**1**	**1,5**	**1**	**1,5**				
15-70	16 x 5	3,17	2,11							4,31	2,87						
	16 x 10	3,17	2,11	41,5	13,3	0,35	0,28	64,5	10 AT3	5,85	3,90	233,9	79,1				
	16 x 16	3,17	2,11							6,42	4,28						
25-100	20 x 5									8,01	5,34			0,4	1,45	88	16 AT5
	20 x 20	–	–	–	–	–	–	–	–	8,01	5,34	240	84				
	25 x 10									8,01	5,34						

		MSK 030C								MSK 040C							
		M_{sd} (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t	M_{sd} (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t
VKK	**KGT**	**i**		**i**						**i**		**i**					
	d_0 x P	**1**	**1,5**	**1**	**1,5**					**1**	**1,5**	**1**	**1,5**				
15-50	12 x 2	0,79	0,53														
	12 x 5	2,48	1,65	34,3	12,5					–	–	–	–	–	–	–	–
	12 x 10	2,70	1,80														
15-70	16 x 5	3,17	2,11			0,35	0,65	64,5	10 AT3	4,31	2,87						
	16 x 10	3,17	2,11	37,3	13,4					5,85	3,90	234,4	83,6	0,4	1,42	88	16 AT5
	16 x 16	3,17	2,11							6,42	4,28						

		MSK 050C							
		M_{sd} (Nm)		J_{sd} (10^{-6} kgm²)		M_{Rsd} (Nm)	m_{sd} (kg)	F (mm)	B_t
VKK	**KGT**	**i**		**i**					
	d_0 x P	**1**	**2**	**1**	**2**				
25-100	20 x 5	10,20	5,10						
	20 x 20	14,30	7,15	1 420	230	0,45	3,2	116	25 AT5
	25 x 10	13,10	6,55						

B_t = belt type
F = width of timing belt side drive
i = gear ratio of timing belt side drive
J_{sd} = reduced mass moment of inertia of timing belt side drive (kgm²)
M_{Rsd} = frictional torque of timing belt side drive at motor journal (Nm)
M_{sd} = permissible torque for system with timing belt side drive at motor journal (Nm); consider max. permissible motor torque M_{max}
m_{sd} = mass of timing belt side drive

Rigidity of thrust rod Feed Module VKK 15-50

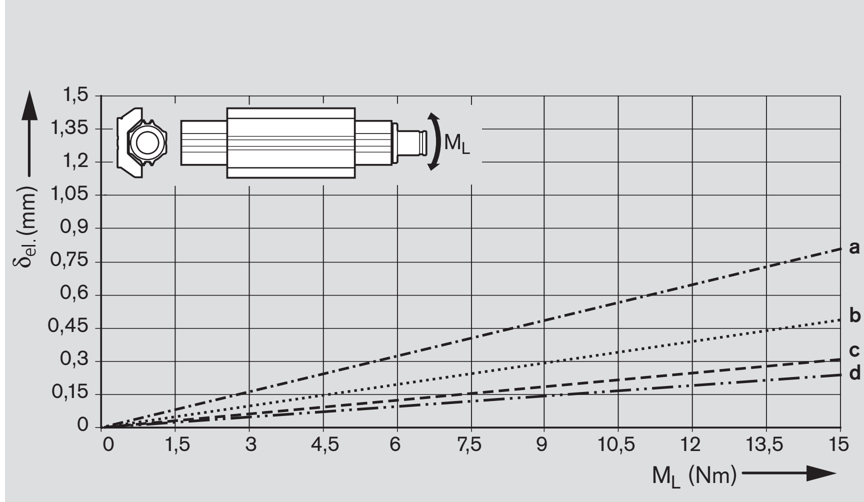
Measured values

Key to graph

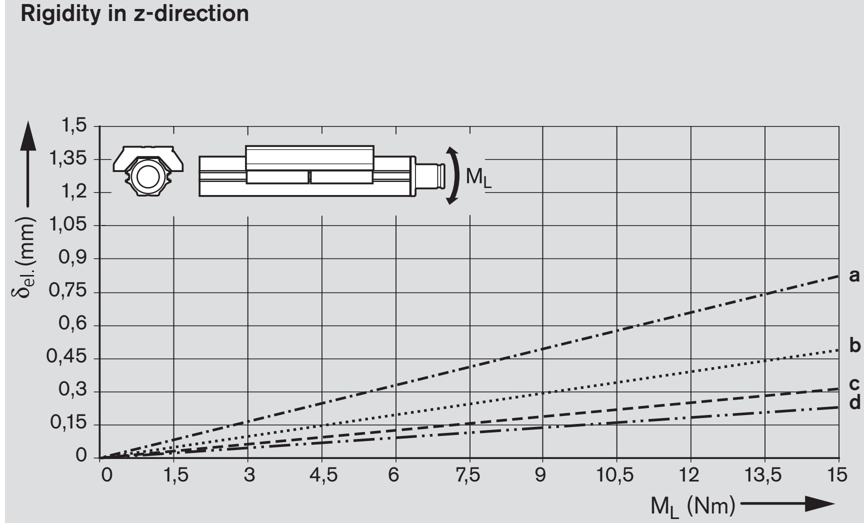
a Length = 480 mm
b Length = 360 mm
c Length = 280 mm
d Length = 240 mm

δ_{el} = elastic deflection (mm)
M_L = dynamic longitudinal moment load capacity (Nm)

Rigidity in y-direction



Rigidity in z-direction



EasyHandling basic

Technical Data

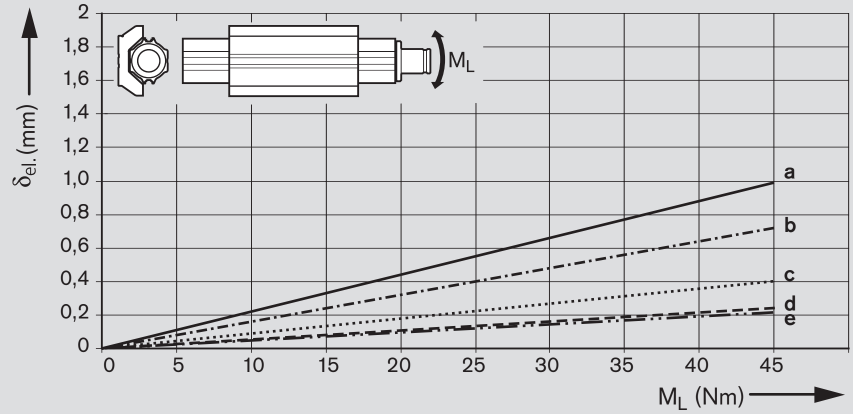
Rigidity of thrust rod Feed Module VKK 15-70

Measured values

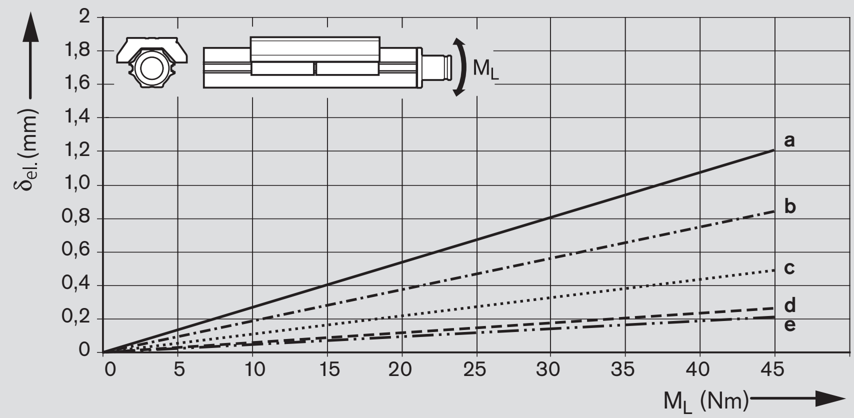
Key to graph
a Length = 600 mm
b Length = 520 mm
c Length = 400 mm
d Length = 320 mm
e Length = 280 mm

δ_{el} = elastic deflection (mm)
M_L = dynamic longitudinal moment load capacity (Nm)

Rigidity in y-direction



Rigidity in z-direction



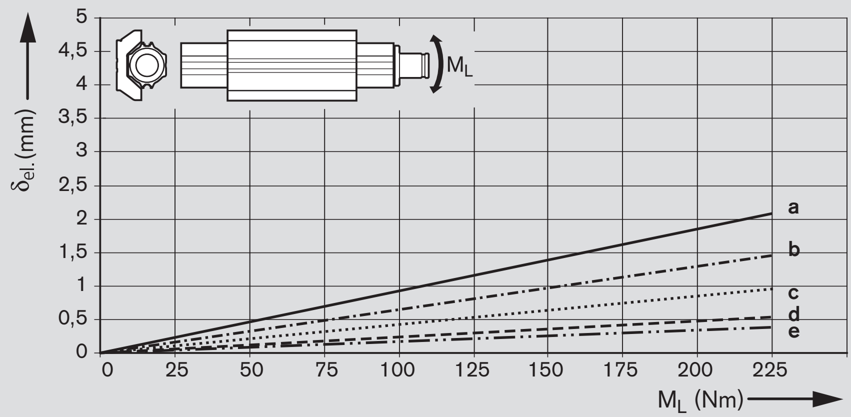
Rigidity of thrust rod
Feed Module VKK 25-100

Measured values

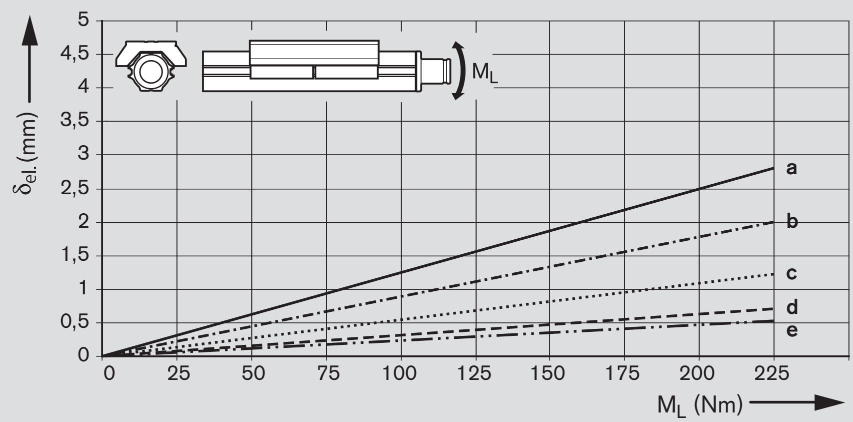
Key to graph
- **a** Length = 680 mm
- **b** Length = 600 mm
- **c** Length = 480 mm
- **d** Length = 400 mm
- **e** Length = 360 mm

δ_{el} = elastic deflection (mm)
M_L = dynamic longitudinal moment load capacity (Nm)

Rigidity in y-direction



Rigidity in z-direction

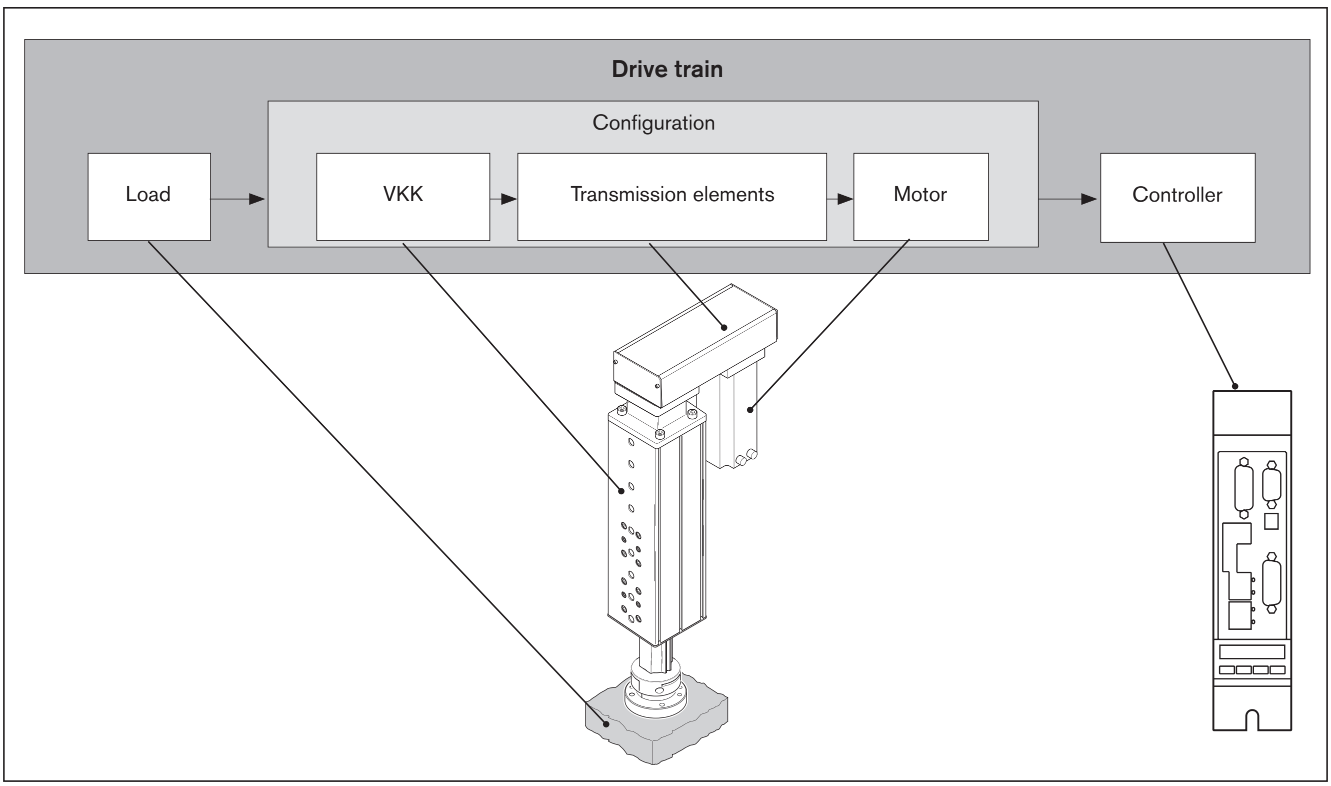


EasyHandling basic

Calculations

Calculation Principles

Drive train



The correct dimensioning and assessment of an application requires structured consideration of the drive train as a whole. The basic element of the drive train is the configuration – made up of the linear system, the transmission element (coupling or timing belt side drive) and the motor – which can be ordered in that constellation in the catalog.

Maximum permissible loads
When selecting linear systems, it is essential to consider the upper limits for permissible loads and forces, as specified in the section “Technical Data”. The values given there are system-related. In other words, the upper limits are determined not only by the load ratings of the bearing points but also include structural design and material-related considerations.

Service life

The service life of the rolling bearing points contained in a linear system can be calculated using the formulas given below. In a linear system with ball screw drive, the rolling bearing points that are relevant for the service life are the linear guide, the ball screw drive (ball nut), and the fixed bearing.

⚠ **The value to be indicated for the calculated service life of linear system is determined by the lowest of the separately calculated service life values for the linear guide, the ball screw drive or the fixed bearing.**

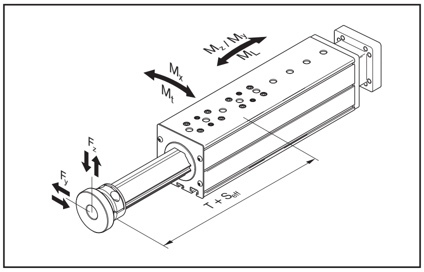
Service life of the linear guide

The linear guide of a linear system must bear the load and any processing forces.

Combined equivalent load on bearing of the linear guide

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

VKK	T (mm)
VKK 15-50	101,5
VKK 15-70	125,0
VKK 25-100	167,5



Nominal life

Nominal life in meters

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

Nominal life in hours

$$L_{10h} = \frac{L_{10}}{3600 \cdot v_m}$$

C	= dynamic load capacity	(N)
F_{comb}	= combined equivalent load on bearing	(N)
F_y	= load due to a resulting force in the y-direction	(N)
F_z	= load due to a resulting force in the z-direction	(N)
L_{10}	= nominal life	(m)
L_{10h}	= nominal life	(h)
M_L	= dynamic longitudinal moment load	(Nm)
M_t	= dynamic torsional moment load	(Nm)
M_x	= dynamic torsional moment about the X-axis	(Nm)
M_y	= dynamic torsional moment about the Y-axis	(Nm)
M_z	= dynamic torsional moment about the Z-axis	(Nm)
v_m	= average travel speed	(m/s)
s_{eff}	= effective stroke	(mm)

$T + s_{eff}$ = center-to-center distance between runner block and mounting interface

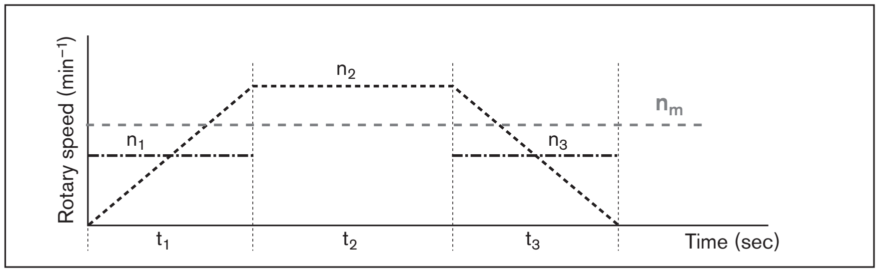
EasyHandling basic

Calculations

Service life of ball screw or the fixed bearing

Where the rotary speed and load fluctuate, the service life must be calculated using the averages $\mathbf{F_m}$ and $\mathbf{n_m}$.

Where the rotary speed fluctuates, the average speed $\mathbf{n_m}$ is calculated as follows:



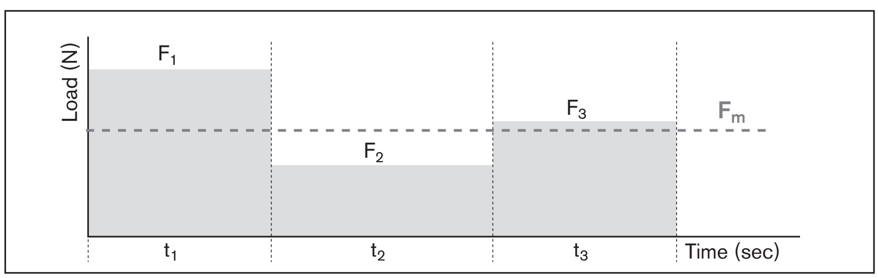
$$n_m = \frac{|n_1| \cdot t_1 + |n_2| \cdot t_2 + \ldots + |n_n| \cdot t_n}{t_{ges}}$$

$$t_{ges} = t_1 + t_2 + \ldots + t_n$$

Rotary speed in acceleration and braking phases $\mathbf{n_{1\ldots n}}$:

$$n_{1\ldots n} = \frac{n_{A1..n} + n_{E1..n}}{2}$$

Where both the load and the speed fluctuate, the average load $\mathbf{F_m}$ is calculated as follows:



$$F_m = \sqrt[3]{|F_1|^3 \cdot \frac{|n_1|}{n_m} \cdot \frac{t_1}{t_{tot}} + |F_2|^3 \cdot \frac{|n_2|}{n_m} \cdot \frac{t_2}{t_{tot}} + \ldots + |F_n|^3 \cdot \frac{|n_n|}{n_m} \cdot \frac{t_n}{t_{tot}}}$$

Nominal life

Service life in revolutions:

$$L_{10} = \left(\frac{C}{F_m}\right)^3 \cdot 10^6$$

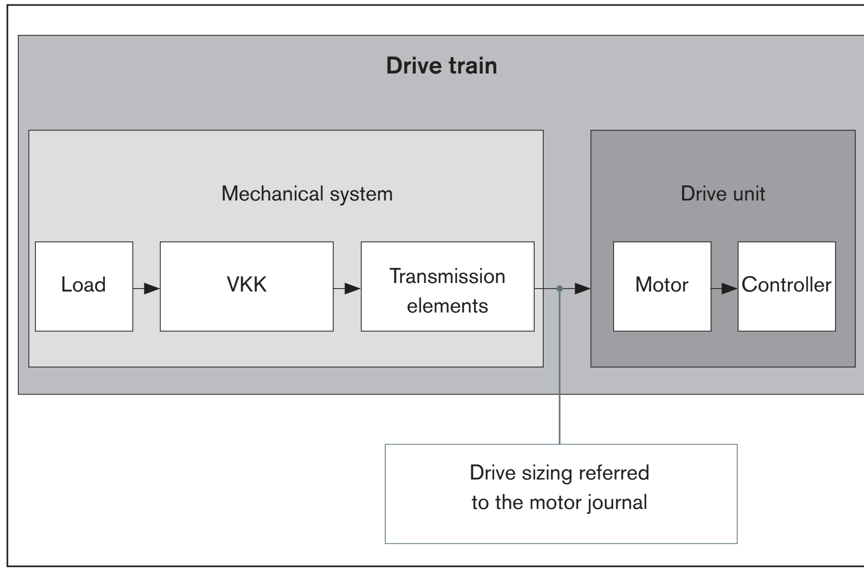
Service life in hours:

$$L_{10h} = \frac{L}{n_m \cdot 60}$$

C	=	dynamic load rating	(N)
$F_1, F_2, \ldots F_n$	=	axial load during phases 1 … n	(N)
F_m	=	equivalent dynamic axial load	(N)
L_{10}	=	nominal life	(–)
L_{10h}	=	nominal life	(h)
$n_1, n_2, \ldots n_n$	=	rotary speed in phases 1 … n	(min⁻¹)
n_m	=	average rotary speed	(min⁻¹)
$n_{A1..n}$	=	speed at start in phase 1 … n	(min⁻¹)
$n_{E1..n}$	=	speed at finish in phase 1 … n	(min⁻¹)
$t_1, t_2, \ldots t_n$	=	discrete time step in phases 1 … n	(sec)
t_{tot}	=	sum of the discrete time steps	(sec)

Sizing the Drive Unit

Basic principles
When calculating the required size of drive, the drive train can be subdivided into the mechanical system and the drive itself.
The **mechanical system** includes the physical components – linear system and the transmission elements (timing belt side drive, coupling) – and the load to be carried.
The electric **drive** is a motor-controller combination with the appropriate performance data. The sizing or dimensioning of the electric drive is done taking the motor shaft as a reference point.
When sizing the drive, limit values must be taken into account as well as basic values. The limit (i.e. maximum) values must not be exceeded, in order to avoid damaging the mechanical components.



Technical data and symbols for the mechanical system
For each component (linear system, coupling, timing belt side drive), the relevant maximum permissible values must be identified for the drive torque and travel speed, as well as the basic values for frictional torque and mass moment of inertia ➟ “Drive Data” in the section “General Technical Data“.
The following technical data with the associated symbols are used when considering the basic mechanical system requirements in the design calculations for sizing the drive. The data listed in the table below can be found in the “General Technical Data” section or they are determined using the formulas described on the following pages.

		Mechanical system			
				Transmission elements	
		Load	Linear system	Coupling	Timing belt side drive
Weight moment	(Nm)	M_g 5)	–	–	–
Frictional torque	(Nm)	– 4)	M_{Rs} 3)	–	M_{Rsd} 3)
Mass moment of inertia	(kgm^2)	J_t 1)	J_S 2)	J_c 3)	J_{sd} 3)
Max. permissible linear speed	(m/s)	–	v_{max} 3)	–	–
Max. permissible drive torque	(Nm)	–	M_P 3)	M_{cN} 3)	M_{sd} 3)

1) Determine the value using the appropriate formula
2) Length-dependent value, determined using the appropriate formula
3) Value as per table
4) Any additional process forces are to be taken into consideration as load moments
5) For vertical mounting orientation: determine the value using the appropriate formula

EasyHandling basic

Calculations

Sizing the Drive Unit

Drive sizing referred to the motor shaft
For drive sizing, all the relevant design calculation values for the mechanical components contained in the drive train must be determined as they relate to – and be expressed in terms of or reduced to – the motor shaft. For a combination of mechanical components within the drive train, this will result in one value for each of the following:
– Frictional torque M_R
– Massenträgheitsmoment J_{ex}
– Max. permissible linear speed v_{mech} (max. permissible rotary speed n_{mech})
– Max. permissible drive torque M_{mech}

Determination of the values for the individual mechanical components in the drive train, referred to the motor shaft

Frictional torque M_R

For motor attachment via motor mount and coupling

$$M_R = M_{Rs}$$

For motor attachment via timing belt side drive

$$M_R = M_{Rsd} + \frac{M_{Rs}}{i}$$

Mass moment of inertia J_{ex}

For motor attachment via motor mount and coupling

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

For motor attachment via timing belt side drive

$$J_{ex} = J_{sd} + \frac{1}{i^2} \cdot (J_s + J_t)$$

Determination of mass moment of inertia of the linear system components

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

Determination of translatory mass moment of inertia of the external load

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

i	= gear ratio of timing belt side drive	(–)
J_c	= mass moment of inertia, coupling	(kgm^2)
J_{ex}	= mass moment of inertia of mechanical system	(kgm^2)
J_s	= mass moment of inertia of the linear system	(kgm^2)
J_{sd}	= mass moment of inertia of timing belt side drive at motor journal	(kgm^2)
J_t	= translatory mass moment of inertia of external load referred to the linear system screw journal	(kgm^2)
$k_{j\,fix}$	= constant for fixed-length portion of mass moment of inertia	(–)
$k_{j\,m}$	= constant for mass-specific portion of mass moment of inertia	(–)
$k_{j\,var}$	= constant for variable-length portion of mass moment of inertia	(–)
L	= length of linear system	(mm)
m_{ex}	= moved external load	(kg)
M_R	= frictional torque at motor journal	(Nm)
M_{Rs}	= frictional torque of system	(Nm)
M_{Rsd}	= frictional torque of timing belt side drive at motor journal	(Nm)

Maximum permissible linear speed v_{mech}

The lowest of all the values for max. permissible linear speed of all mechanical components contained in the drive train determines the maximum permissible linear speed of the mechanical system which has to be taken into consideration as the upper limit for the drive when sizing the motor. Because it is a system in itself, a linear system with ball screw drive will always have a maximum permissible linear or rotary speed that is lower than the maximum values for the other components in the mechanical system, such as coupling or timing belt side drive, and therefore determines the max. permissible linear speed of the overall mechanical system.

Maximum permissible linear speed

$$v_{mech} = v_{max}$$

Maximum permissible rotary speed

For motor attachment via motor mount and coupling

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

For motor attachment via timing belt side drive

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

i	=	gear ratio of timing belt side drive	(–)
n_{mech}	=	maximum permissible rotary speed of mechanical system	(min^{-1})
P	=	screw lead	(mm)
v_{max}	=	maximum permissible linear speed of linear system	(m/s)
v_{mech}	=	maximum permissible linear speed of mechanical system	(m/s)

Max. permissible drive torque M_{mech}

The lowest (minimum) of all the values for permissible drive torque of all mechanical components contained in the drive train determines the maximum permissible drive torque of the mechanical system which has to be taken into consideration as the upper limit for the drive when sizing the motor.

For motor attachment via motor mount and coupling

$$M_{mech} = \text{Minimum}\ (M_{cN};\ M_p)$$

For motor attachment via timing belt side drive

$$M_{mech} = \text{Minimum}\ (M_{sd};\ \frac{M_p}{i})$$

i	=	gear ratio of timing belt side drive	(–)
M_p	=	maximum permissible drive torque of the linear system	(Nm)
M_{cN}	=	Nennmoment der Kupplung	(Nm)
M_{sd}	=	maximum permissible drive torque of the timing belt side drive	(Nm)
M_{mech}	=	maximum permissible drive torque for mechanical system	(Nm)

⚠ **When considering the complete drive train (mechanical system + motor/controller), the maximum torque of the motor can lie below the maximum value for the mechanical system (M_{mech}) and thus limit the maximum permissible drive torque of the overall drive train. If the maximum torque of the motor lies above the upper limit for the mechanical system (M_{mech}), the maximum motor torque must be limited to the permitted value for the mechanical system.**

EasyHandling basic

Calculations

Sizing the Drive Unit

Rough guide for motor selection

The following conditions can be used as a rough guide for preselecting the motor.

Condition 1:

The speed of the motor must be the same as or higher than the speed required for the mechanical system (but not exceeding the maximum permissible value):

$$n_{max} \geq n_{mech}$$

n_{max} = maximum speed of the motor (min^{-1})

n_{mech} = maximum permissible rotary speed of mechanical system (min^{-1})

Condition 2:

Consideration of the ratio of mass moments of inertia of the mechanical system and the motor. The ratio of the mass moments of inertia serves as an indicator for the control performance of a motor-controller combination. The mass moment of inertia of the motor is directly related to the motor size.

Mass moment of inertia ratio:

$$V = \frac{J_{ex}}{J_m + J_{br}}$$

For preselection, experience has shown that the following ratios will result in high control performance. These are not rigid limits, but values exceeding them will require closer consideration of the specific application.

Application area	V
Handling	≤ 6.0
Processing	≤ 1.5

J_{br} = mass moment of inertia of the motor brake (kgm^2)

J_{ex} = mass moment of inertia of mechanical system (kgm^2)

J_m = mass moment of inertia, motor (kgm^2)

V = ratio of mass moments of inertia of drive train and motor (–)

Condition 3:
Estimation of the ratio of the static load moment to the continuous torque of the motor. The torque ratio must be smaller than or equal to the empirical value of 0.6. By looking at the required motor torque levels, this estimation roughly covers the dynamic characteristics which still have be determined by plotting an exact motion profile.

Torque ratio:

$$\frac{M_{stat}}{M_0} \leq 0{,}6$$

Static load moment:

$$M_{stat} = M_R + M_g$$

Weight moment:
For vertical mounting orientation only!
For motor attachment via motor mount and coupling: i = 1

$$M_g = \frac{P \cdot (m_{ex} + m_{ca}) \cdot g}{2000 \cdot \pi \cdot i}$$

g	=	gravitational acceleration (= 9.81)	(m/s^2)
i	=	gear ratio of timing belt side drive	(–)
m_{ca}	=	moved mass of carriage	(kg)
m_{ex}	=	moved external load	(kg)
M_g	=	weight moment at motor journal	(Nm)
M_0	=	continuous motor torque	(Nm)
M_R	=	frictional torque at motor journal	(Nm)
M_{stat}	=	static longitudinal moment load	(Nm)
P	=	screw lead	(mm)
π	=	pi	(–)

In the section ➠ “Components and Ordering” users can put together standard configurations, including motor attachment and motor, for the various linear system sizes by selecting the appropriate options. By checking the above conditions it is possible to see whether a standard motor selected in a particular configuration will generally be of a suitable size for the specific application.

Precise sizing of the drive unit
Preselecting the motor according to this rough guide is no substitute for the required precise design calculations for the drive, taking all moments/torques and speed levels into account. For precise calculation of the electric drive, including consideration of the specific motion profile, please refer to the performance data in the catalogs “IndraDrive Cs” and “IndraDrive C”.
When sizing the drive, the maximum permitted values for linear speed, drive torque and acceleration must not be exceeded, in order to avoid damaging the mechanical system.

EasyHandling basic

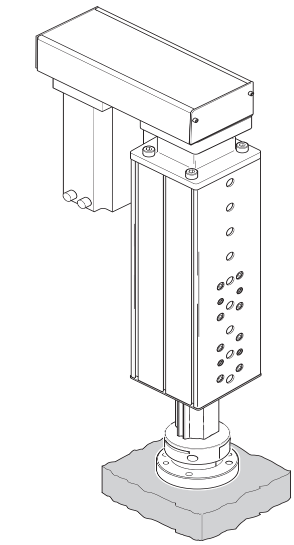
Calculations

Calculation Example for Sizing the Drive Unit

Given data:

In a handling task, a mass (m_{ex}) of 15 kg is to be moved vertically by 300 mm at a travel speed of 0.5 m/s. The following was selected based on the technical data and the installation space:

Feed Module VKK 15-70:
- With adapter flange
- Without protective bellows
- Motor attachment via timing belt side drive, i = 1.5
- With servo motor MSM 031C with brake



Selection of ball screw:

(Always choose the lowest lead as this is favorable in terms of resolution, braking distance, length)

Permitted ball screw assemblies from "Permissible speed" table at v = 0.5 m/s:

Ball screw 16 x 10 and Ball screw 16 x 16

Ball screw selected (lower lead): Ball screw 16 x 10

Maximum permissible linear speed for ball screw 16 x 10 as shown in table: $v_{max} = 0.77$ m/s

Calculation of the slide length L:

(for selected ball screw)

Excess travel (per side): $s_e = 2 \cdot P = 2 \cdot 10 = 20$ mm

Max. travel: $s_{max} = s_{eff} + 2 \cdot s_e = 300 + 2 \cdot 20 = 340$ mm

Next highest available max. travel from table: $s_{max} = 374$ mm

Corresponding length from table: L = 520 mm

Friction moment M_R:

(motor attachment via timing belt side drive)

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

VKK:	M_{Rs}	=	0.34 Nm
Timing belt side drive:	$M_{R\,sd}$	=	0.35 Nm
Frictional torque:	M_R	=	$0.35\text{ Nm} + \frac{0.34\text{ Nm}}{1.5} = 0.57\text{ Nm}$

Mass moment of inertia J_{ex}:

(motor attachment via timing belt siderive)

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

Timing belt side drive: $J_{sd} = 13.3 \cdot 10^{-6}\ kgm^2$

VKK: $J_S = (k_{J\ fix} + k_{J\ var} \cdot L) \cdot 10^{-6} = (4.35 + 0.039 \cdot 520) \cdot 10^{-6} = 24.63 \cdot 10^{-6}\ kgm^2$

External load: $J_t = m_{ex} \cdot k_{J\ m} \cdot 10^{-6} = 15 \cdot 2.533 \cdot 10^{-6} = 37.995 \cdot 10^{-6}\ kgm^2$

Mass moment of inertia: $J_{ex} = 13.3 \cdot 10^{-6} + = \frac{(24.63 \cdot 10\text{-}6 + 37.995 \cdot 10^{-6})}{1.5^2} = 41.133 \cdot 10^{-6}\ kgm^2$

Maximum permissible rotary speed n_{mech}:

(motor attachment via timing belt side drive)
Limit for mechanical system

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

Max. permissible linear speed: $v_{mech} = v_{max} = 0{,}77\ m/s$

Max. permissible rotary speed: $n_{mech} = \frac{(0.77 \cdot 1.5 \cdot 1000 \cdot 60)}{10} = 6930\ min^{-1}$

Rotary speed of application n_{mech}:

(motor attachment via timing belt side drive)

Travel speed: $v_{mech} = 0.5\ m/s$

Rotary speed: $n_{mech} = \frac{0.5 \cdot 1.5 \cdot 1000 \cdot 60}{10} = 4500\ min^{-1}$

Maximum permissible drive torque M_{mech}:

(motor attachment via timing belt side drive)
Limit for mechanical system

$$M_{mech} = \text{minimum}\ (M_{sd}, \frac{M_P}{i})$$

Timing belt side drive: $M_{sd} = 2.11$ Nm (gear ratio i = 1.5 for MSM 031C)

VKK: $M_P = 6.1$ Nm

Drive torque: $M_{mech} = \text{minimum}\ (2.11;\ \frac{6.1}{1.5}) = \text{minimum}\ (2.11;\ 4.06) = 2.11$ Nm

Calculations

Calculation Example for Sizing the Drive Unit

Checking the motor preselection:

Selected motor: MSM 031C with brake

Condition 1:

Rotary speed: $n_{max} \geq n_{mech}$

$5000 \geq 4500$; Condition met – motor size OK

Condition 2:

Mass moment of inertia ratio: $V = \dfrac{J_{ex}}{J_m + J_{br}}$

Motor moment of inertia: $J_m = 26 \cdot 10^{-6}\ kgm^2$

Brake moment of inertia: $J_{br} = 1.8 \cdot 10^{-6}\ kgm^2$

Mass moment of inertia ratio: $V = \dfrac{41{,}133 \cdot 10^{-6}}{(26 \cdot 10^{-6} + 1{,}8 \cdot 10^{-6})} = 1.48$

Condition for handling: $V \leq 6$; $1.48 \leq 6$; Condition met – motor size OK

Condition 3:

Torque ratio: $M_{stat} / M_0 \leq 0.6$

Static load moment: $M_{stat} = M_R + M_g$

Weight moment: $M_g = P \cdot (m_{ex} + m_{ca}) \cdot g / 2000 \cdot \pi \cdot i = 10 \cdot (15 + 1.51) \cdot 9.81 / 2000 \cdot \pi \cdot 1.5 = 0.17$ Nm

Static load moment: $M_{stat} = 0.57 + 0.17 = 0.74$ Nm

Continuous motor torque: $M_0 = 1.3$ Nm

Torque ratio: $0.74 / 1.3 = 0.57$; $0.57 \leq 0.6$; Condition met – motor size OK

Result:

VKK:	VKK 15-70
Length:	$L = 520$ mm
Max. travel:	$s_{max} = 374$ mm

With adapter flange
Ball screw 16 x 10
Without protective bellows
Motor attachment via timing belt side drive, gear ratio i =1.5
Preselected motor: MSM 031C with brake

For precise sizing of the electric drive, the motor-controller combination must always be considered, as the performance data (e.g. maximum useful speed and maximum torque) will depend on the controller used.

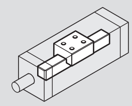
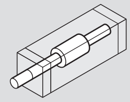
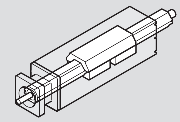
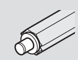
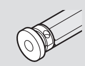
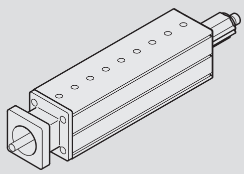
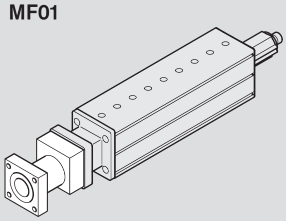
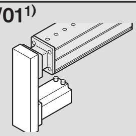
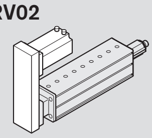
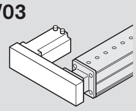
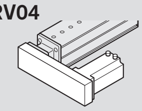
When doing this, the following data must be considered.

Frictional torque: $M_R = 0.57$ Nm
Mass moment of inertia: $J_{ex} = 41.133 \cdot 10^{-6}$ kgm^2
Travel speed: $v_{mech} = 0.5$ m/s ($n_{mech} = 4500$ min^{-1})
Limit for drive torque: $M_{mech} = 2.11$ Nm
=> The motor torque must be limited to 2.11 Nm on the drive side!
Limit for acceleration: $a_{max} = 27$ m/s^2
Limit for travel speed: $v_{mech} = 0.77$ m/s ($n_{mech} = 6930$ min^{-1})

Besides the preferred type MSM 031C 040C, other motors with identical connection dimension can be adapted while taking care not to exceed the calculated limits.

EasyHandling basic

Feed Module VKK 15-50 Components and Ordering Data

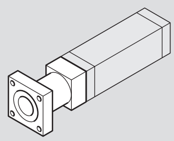
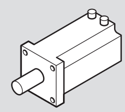
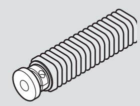
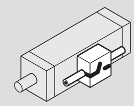
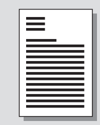
Part number, length R1462 200 00, ... mm Type			Guideway 	Drive unit  Screw journal	Ball screw size d_0 x P			Carriage (internal)  without adapter flange 	with adapter flange 
					12x2	12x5	12x10		
With ball screw, without motor mount	OF01 	OF01	L = 240 mm 12 L = 280 mm 13 L = 360 mm 15 L = 480 mm 18	Ø 6	01	02	03	03	04
With ball screw and motor mount	MF01 	MF01		Ø 6	01	02	03	03	04
With ball screw and timing belt side drive	RV01[1]  RV02  RV03  RV04 	RV01 to RV04		Ø 6	01	02	03	03	04

Order example: See “Inquiry/Order Form”

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

1) Consider the position of the lube ports! Please refer to the “Lubrication” section.

d_0 = screw diameter (mm)
P = screw lead (mm)

Motor attachment 			Motor 		Cover 		Switch 	Documentation 	
Gear ratio i =	Attachment kit[2]	for motor	without brake	with brake	without bellows	with bellows		Standard report	Measurement report[5]
	00	–	00		00	01[4]		01	02
1	04	MSM 019B[3]	104	105					03
	02	MSK 030C[3]	84	85					05
	03	MSM 031B[3]	106	107					
1	27	MSM 019B[3]	104	105					
1,5	28								
1	23	MSM 031B[3]	106	107					
1,5	24								
1	21	MSK 030C[3]	84	85					
1,5	22								

Switch	
Without switch	00
Magnetic field sensor:	
– Reed sensor	21
– Hall sensor (PNP NC)	22
Magnetic field sensor with connector:	
– Reed sensor	58
– Hall sensor (PNP NC)	59

2) Attachment kit also available without motor (when ordering: enter "00" for motor).
3) Recommended motor (motor data and type designation ➠ „Motors" section)
4 Can only be selected in combination with adapter flange (carriage option 04)
5) "02" = Frictional torque; "03" = Lead deviation; "05" = Positioning accuracy ➠ "Documentation" section.

Switch Mounting Arrangements

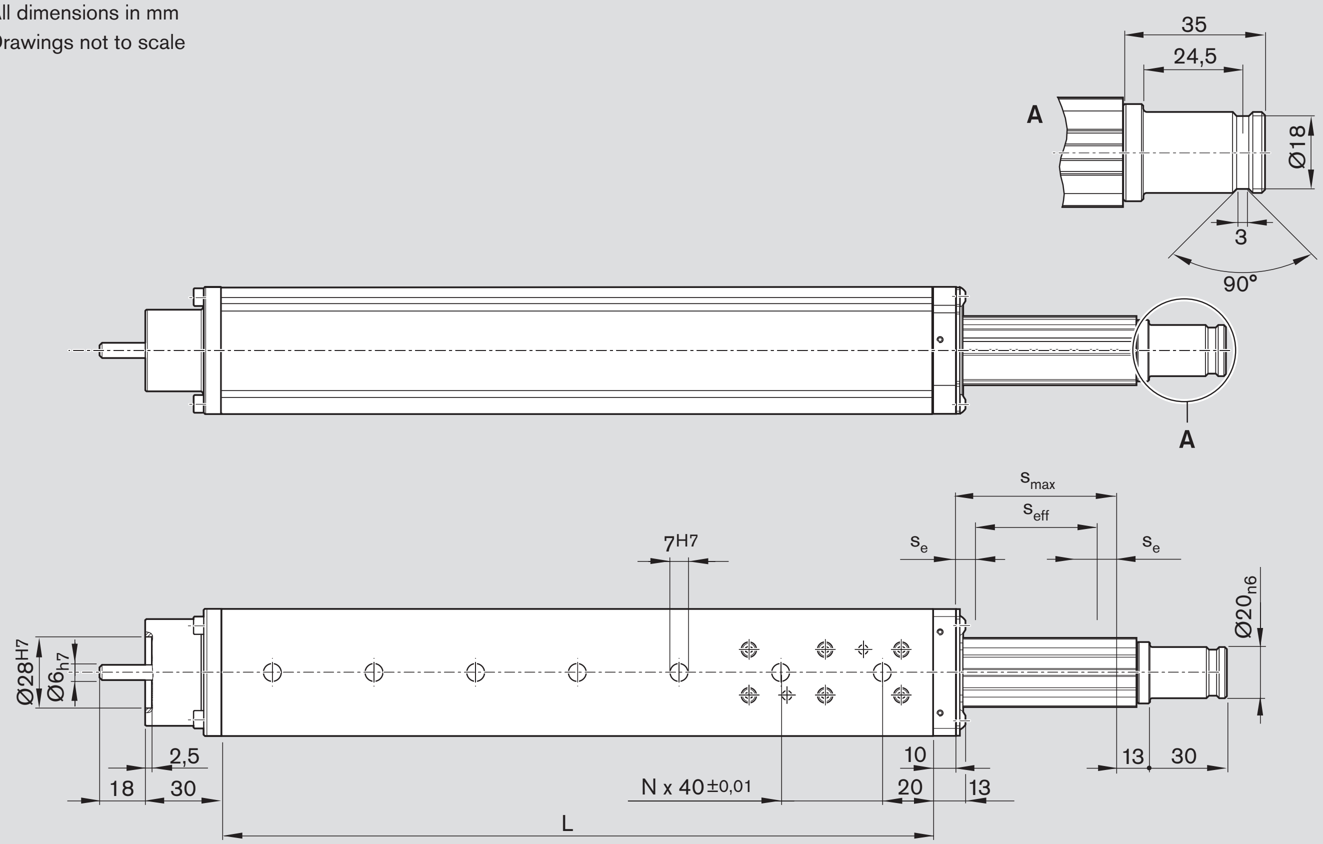
Refer to "Switch mounting arrangements" for more information on switch types and switch mounting.

EasyHandling basic

Feed Module VKK 15-50

Dimension drawings

All dimensions in mm
Drawings not to scale



L	s_{max} [1]	
	without bellows	with bellows
(mm)	(mm)	(mm)
240	138	97
280	178	131
360	258	199
480	378	301

1) Consider excess travel!

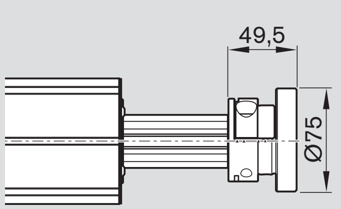
s_e = excess travel
s_{eff} = effective stroke
s_{max} = maximum travel

$s_{eff} = s_{max} - 2 \cdot s_e$

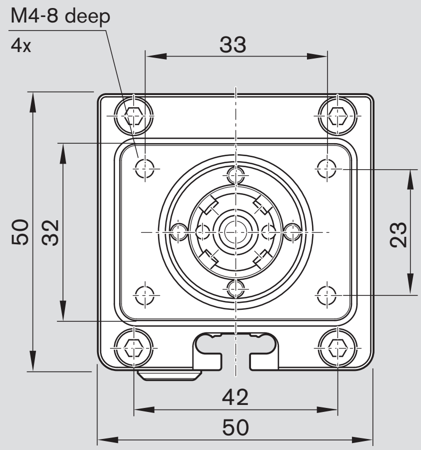
Maximum travel = effective stroke + 2 x excess travel
For safe operation the excess travel must be longer than the braking distance.

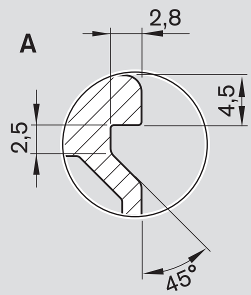
In most cases the recommended limit for excess travel (braking distance) is:
Excess travel = 2 · screw lead P
Example: Ball screw 12 x 5 (d_0 x P)
Excess travel = 2 · P = 2 · 5 mm = 10 mm

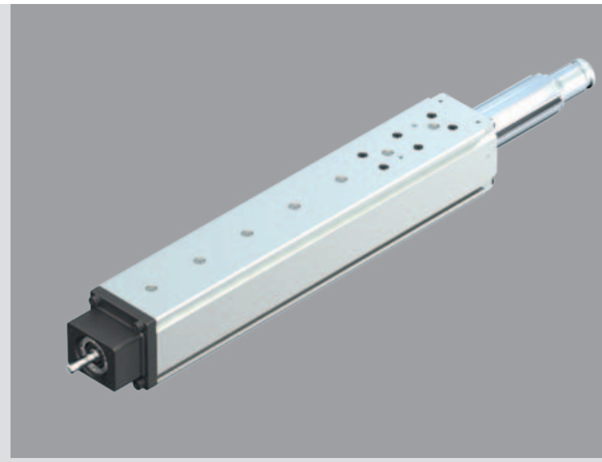
Option with adapter flange

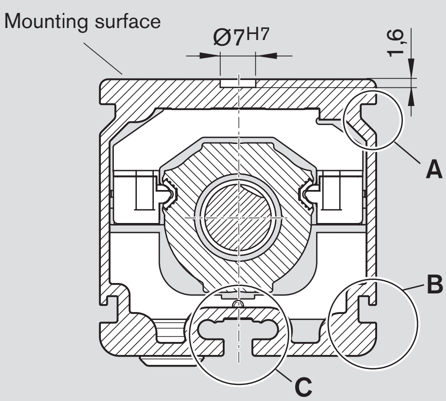


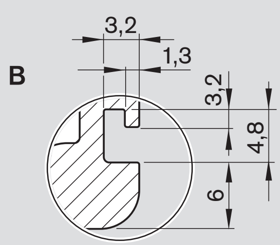
For details of adapter flange ☞ 50.

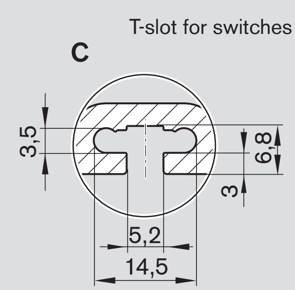






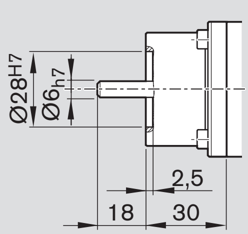




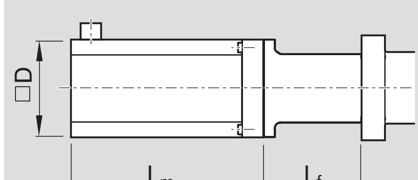


Type	Motor	Dimensions (mm) D	E		F	G	G_1	K	L_f	L_m		L_{sd}	
			i = 1	i = 1.5						without brake	with brake	i = 1	i = 1.5
RV01 to RV04	MSM 019B	42	76.5	76.5	48.0	27	29.0	27.5	–	92	122.0	139	139
	MSM 031B	60	78	75	64.5	37	43.5	33.5	–	79	115.5	157	157
	MSK 030C	54	78	75	64.5	37	43.5	33.5	–	188	213.0	154	154
MF01	MSM 019B	42	–	–	–	–	–	–	44	92	122.0	–	–
	MSM 031B	60	–	–	–	–	–	–	50	79	115.5	–	–
	MSK 030C	54	–	–	–	–	–	–	50	188	213.0	–	–

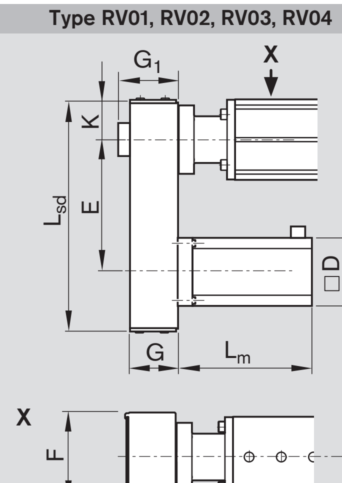
Type OF01



Type MF01

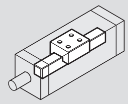
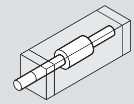
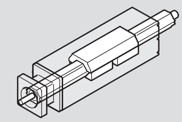
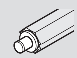
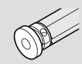
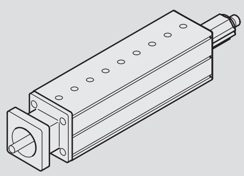
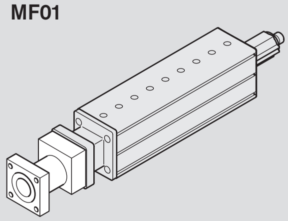
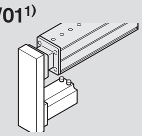
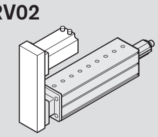
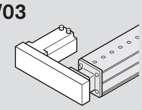
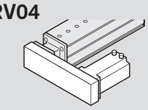


Type RV01, RV02, RV03, RV04



EasyHandling basic

Feed Module VKK 15-70 Components and Ordering Data

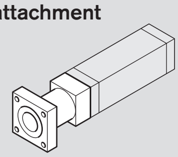
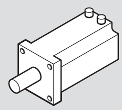
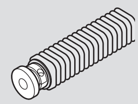
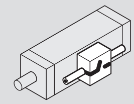
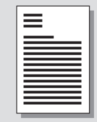
Part number, length R1462 300 00, ... mm Type			Guideway 	Drive unit 				Carriage (internal) 	
				Screw journal	Ball screw size d_0 x P			without adapter flange 	with adapter flange 
					16x5	16x10	16x16		
With ball screw, without motor mount	OF01 	OF01	L = 280 mm 12 L = 320 mm 13 L = 400 mm 15 L = 520 mm 18 L = 600 mm 20	Ø 9	01	02	03	03	04
				Ø 9 PF-Nut	11	12	13		
With ball screw and motor mount	MF01 	MF01		Ø 9	01	02	03	03	04
With ball screw and timing belt side drive	RV01[1)]  RV02  RV03  RV04 	RV01 to RV04		Ø 9	01	02	03	03	04

Order example: See "Inquiry/Order Form"

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

1) Consider the position of the lube ports! Please refer to the "Lubrication" section.

d_0 = screw diameter (mm)
P = screw lead (mm)

Motor attachment			Motor		Cover		Switch		Documentation	
										
Gear ratio i =	Attachment kit [2]	for motor	without brake	with brake	without bellows	with bellows			Standard report	Measurement report[5]
	00	–	00							
1	01	**MSM 031C**[3]	108	109						
	02	**MSK 030C**[3]	84	85			**Without switch**	00		02
	03	**MSM 041B**[3]	110	111			**Magnetic field sensor:** – Reed sensor	21		
	04	**MSK 040C**[3]	86	87	00	01[4]	– Hall sensor (PNP NC)	22	01	03
1	33	**MSM 031C**[3]	108	109						
1,5	34						**Magnetic field sensor with connector:** – Reed sensor	58		05
1	31	**MSK 030C**[3]	84	85						
1,5	32						– Hall sensor (PNP NC)	59		
1	37	**MSM 041B**[3]	110	111						
1,5	38									
1	35	**MSK 040C**[3]	86	87						
1,5	36									

2) Attachment kit also available without motor (when ordering: enter “00” for motor).
3) Recommended motor (motor data and type designation ➠ „Motors“ section)
4 Can only be selected in combination with adapter flange (carriage option 04)
5) “02” = Frictional torque; “03” = Lead deviation; “05” = Positioning accuracy ➠ “Documentation” section.

Switch Mounting Arrangements

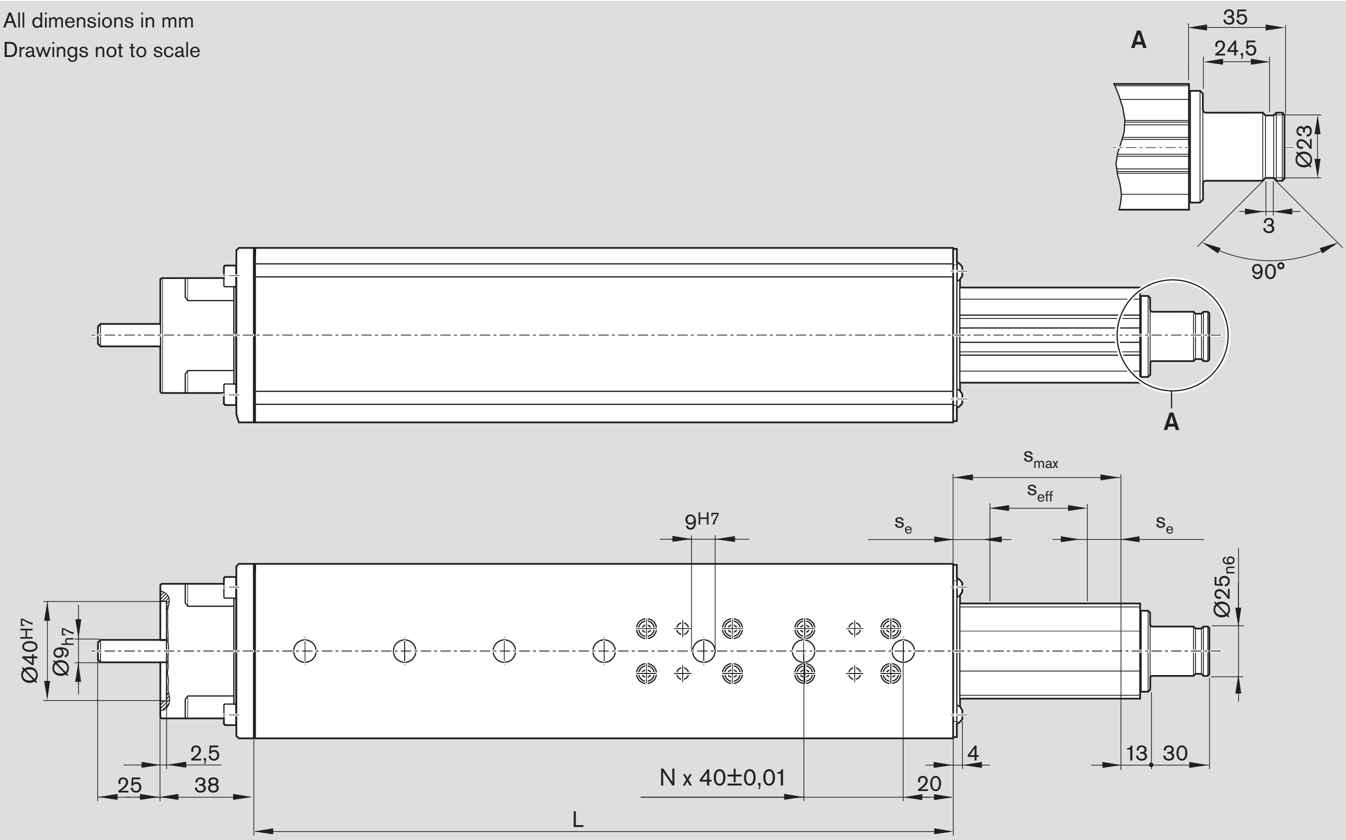
Refer to “Switch mounting arrangements” for more information on switch types and switch mounting.

EasyHandling basic

Feed Module VKK 15-70

Dimension drawings

All dimensions in mm
Drawings not to scale



L	s_{max} [1]	
	without bellows	with bellows
(mm)	(mm)	(mm)
280	132	95
320	172	129
400	252	197
520	372	299
600	452	367

1) Consider excess travel!

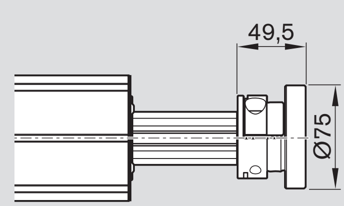
s_e = excess travel
s_{eff} = effective stroke
s_{max} = maximum travel

$$s_{eff} = s_{max} - 2 \cdot s_e$$

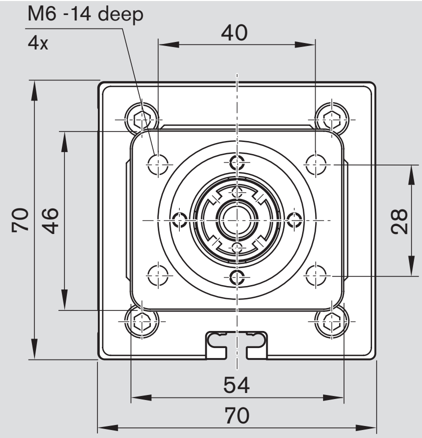
Maximum travel = effective stroke + 2 x excess travel
For safe operation the excess travel must be longer than the braking distance.

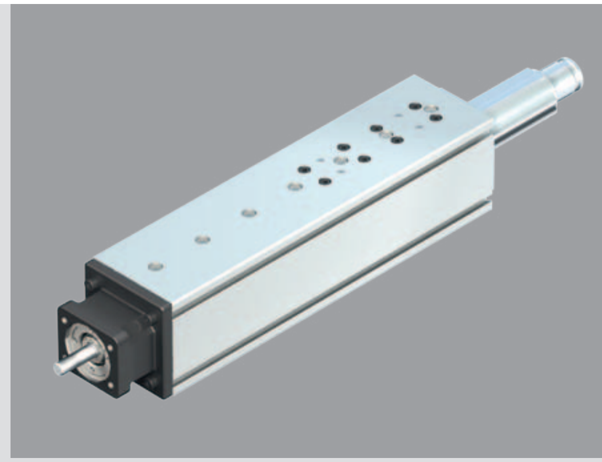
In most cases the recommended limit for excess travel (braking distance) is:
Excess travel = 2 · screw lead P
Example: Ball screw 12 x 5 (d_0 x P)
Excess travel = 2 · P = 2 · 5 mm = 10 mm

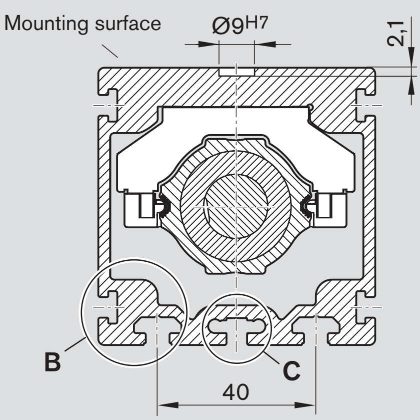
Option with adapter flange

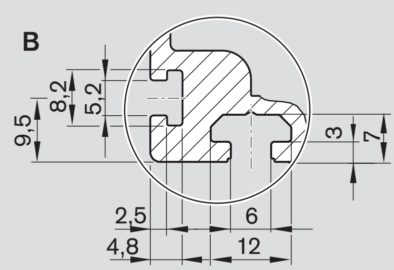


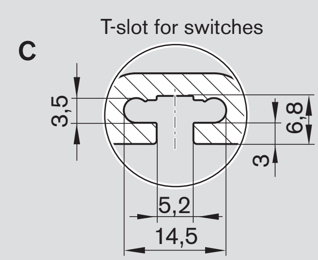
For details of adapter flange ☞ 50.





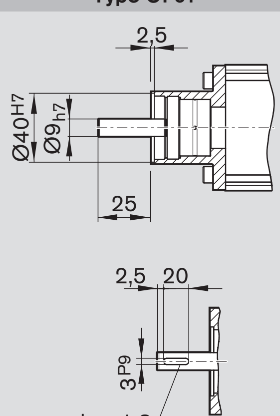




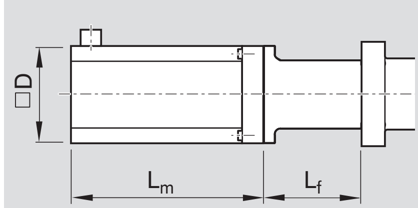


Type	Motor	Dimensions (mm)											
		D	E		F	G	G1	K	L_f	L_m		L_{sd}	
			i = 1	i = 1.5						without brake	with brake	i = 1	i = 1.5
RV01 to RV04	MSM 031C	60	103.5	115	64.5	37	43.5	33.5	–	98.5	135.0	179	191
	MSM 041B	80	122.0	122	88.0	51	57.0	45.5	–	112.0	149.0	220	220
	MSK 030C	54	103.5	115	64.5	37	43.5	33.5	–	188.0	213.0	179	191
	MSK 040C	82	122.0	122	88.0	51	57.0	45.5	–	185.5	215.5	220	220
MF01	MSM 031C	60	–	–	–	–		–	72	98.5	135.0	–	–
	MSM 041B	80	–	–	–	–		–	83	112.0	149.0	–	–
	MSK 030C	54	–	–	–	–		–	75.5	188.0	213.0	–	–
	MSK 040C	82	–	–	–	–		–	77.5	185.5	215.5	–	–

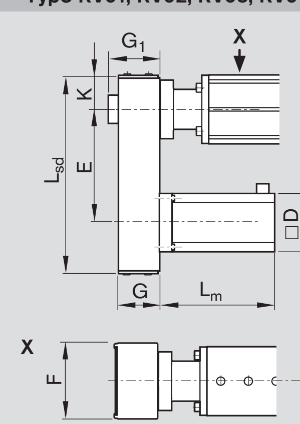
Type OF01



Type MF01

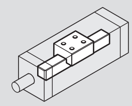
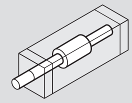
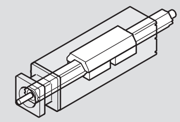
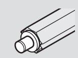
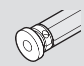
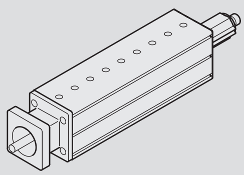
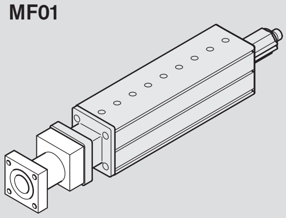
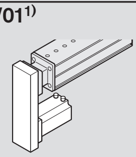
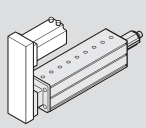
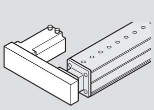
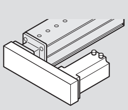


Type RV01, RV02, RV03, RV04



EasyHandling basic

Feed Module VKK 25-100 Components and Ordering Data

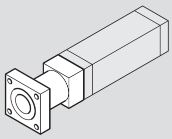
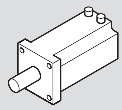
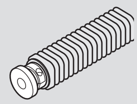
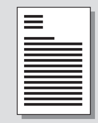
Part number, length R1462 400 00, ... mm — Type			Guideway 	Drive unit  Screw journal	Ball screw size d_0 x P: 20x5	25x10	20x20	Carriage (internal)  without adapter flange 	with adapter flange 
With ball screw, without motor mount	OF01 	OF01	L = 360 mm 12 L = 400 mm 13 L = 480 mm 15 L = 600 mm 18 L = 680 mm 20	Ø 14	01	02	03	03	04
				Ø 14 PF-Nut	11	12	13		
With ball screw and motor mount	MF01 	MF01		Ø 14	01	02	03	03	04
With ball screw and timing belt side drive	RV01[1]  RV02  RV03  RV04 	RV01 to RV04		Ø 14	01	02	03	03	04

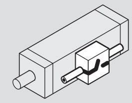
Order example: See “Inquiry/Order Form”

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

1) Consider the position of the lube ports! Please refer to the “Lubrication” section.

d_0 = screw diameter (mm)
P = screw lead (mm)

Motor attachment 			Motor 		Cover 		Documentation 	
Gear ratio i =	Attachment kit [2]	for motor	without brake	with brake	without bellows	with bellows	Standard report	Measurement report[5]
	00	–	00		00	01[4]	01	02, 03, 05
1	03	**MSM 041B**[3]	110	111				
1	05	**MSK 050C**[3]	88	89				
1	27	**MSM 041B**[3]	110	111				
1,5	28	**MSM 041B**[3]	110	111				
1	29	**MSK 050C**[3]	88	89				
2	30	**MSK 050C**[3]	88	89				

Switch 	
Without switch	00
Magnetic field sensor:	
– Reed sensor	21
– Hall sensor (PNP NC)	22
Magnetic field sensor with connector:	
– Reed sensor	58
– Hall sensor (PNP NC)	59

2) Attachment kit also available without motor (when ordering: enter "00" for motor).
3) Recommended motor (motor data and type designation ➠ „Motors" section)
4 Can only be selected in combination with adapter flange (carriage option 04)
5) "02" = Frictional torque; "03" = Lead deviation; "05" = Positioning accuracy ➠ "Documentation" section.

Switch Mounting Arrangements

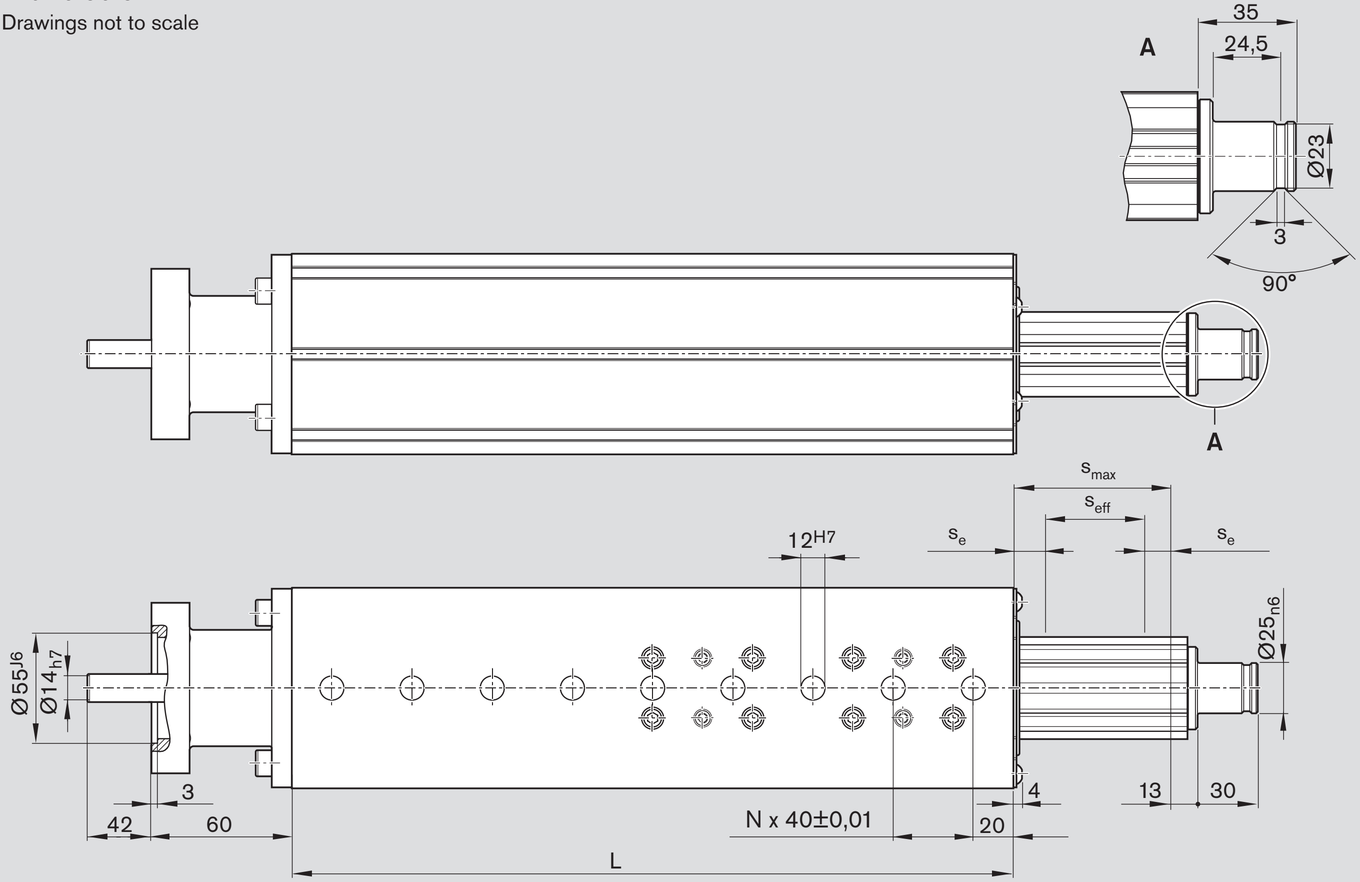
Refer to "Switch mounting arrangements" for more information on switch types and switch mounting.

EasyHandling basic

Feed Module VKK 25-100

Dimension drawings

All dimensions in mm
Drawings not to scale



L	s_{max} [1]	
	without bellows	with bellows
(mm)	(mm)	(mm)
360	156	119
400	197	154
480	276	224
600	396	330
680	476	400

1) Consider excess travel!

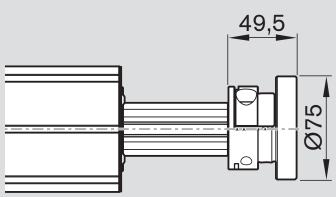
s_e = excess travel
s_{eff} = effective stroke
s_{max} = maximum travel

$$s_{eff} = s_{max} - 2 \cdot s_e$$

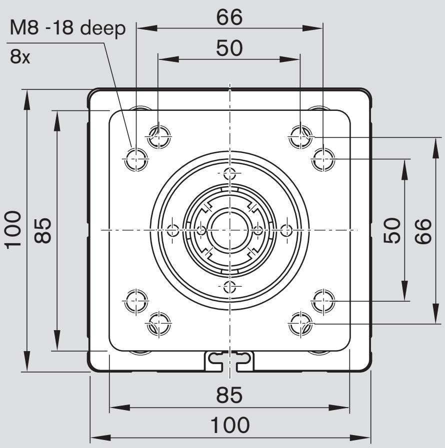
Maximum travel = effective stroke + 2 · excess travel
For safe operation the excess travel must be longer than the braking distance.

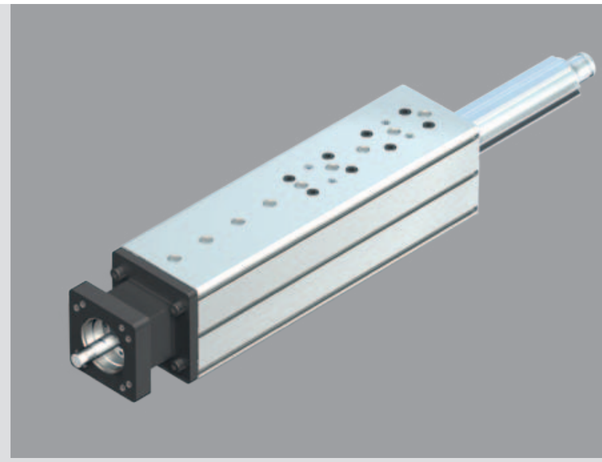
In most cases the recommended limit for excess travel (braking distance) is:
Excess travel = 2 · screw lead P
Example: Ball screw 12 x 5 (d_0 x P)
Excess travel = 2 · P = 2 · 5 mm = 10 mm

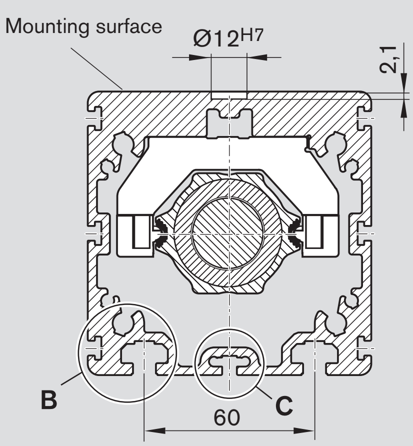
Option with adapter flange

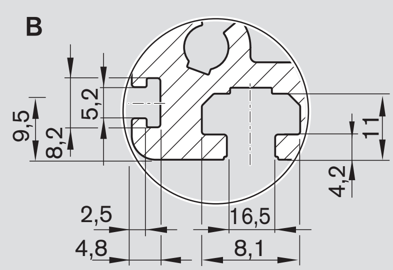


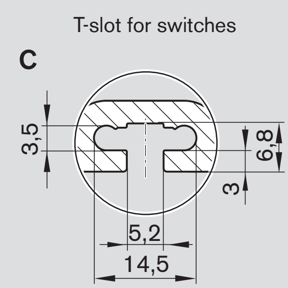
For details of adapter flange ☞ 50.





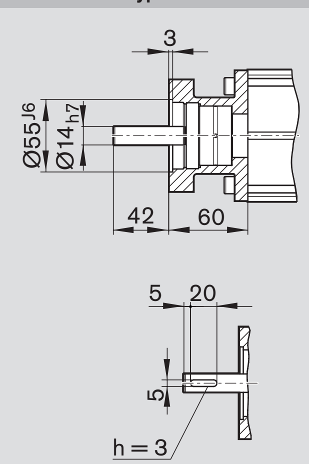




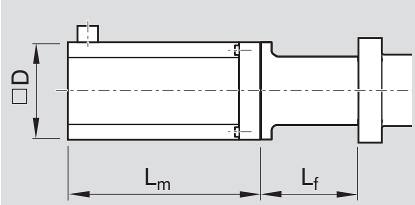


Type	Motor	Dimensions (mm) D	E i = 1	E i = 1.5	E i = 2	F	G	K	L_f	L_m without brake	L_m with brake	L_{sd} i = 1	L_{sd} i = 1.5	L_{sd} i = 2
RV01 to RV04	MSM 041B	80	122	122	–	88	51	45.5	–	112	149	231	231	–
	MSK 050C	98	154	–	154	116	66	57	–	203	233	280	–	280
MF01	MSM 041B	80	–	–	–	–	–	–	90	112	149	–	–	–
	MSK 050C	98	–	–	–	–	–	–	115	203	233	–	–	–

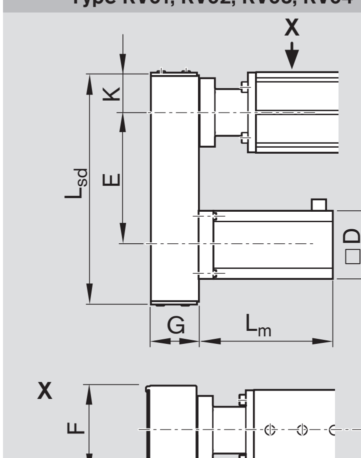
Type OF01



Type MF01



Type RV01, RV02, RV03, RV04



Switch Mounting Arrangements

Overview of switching system

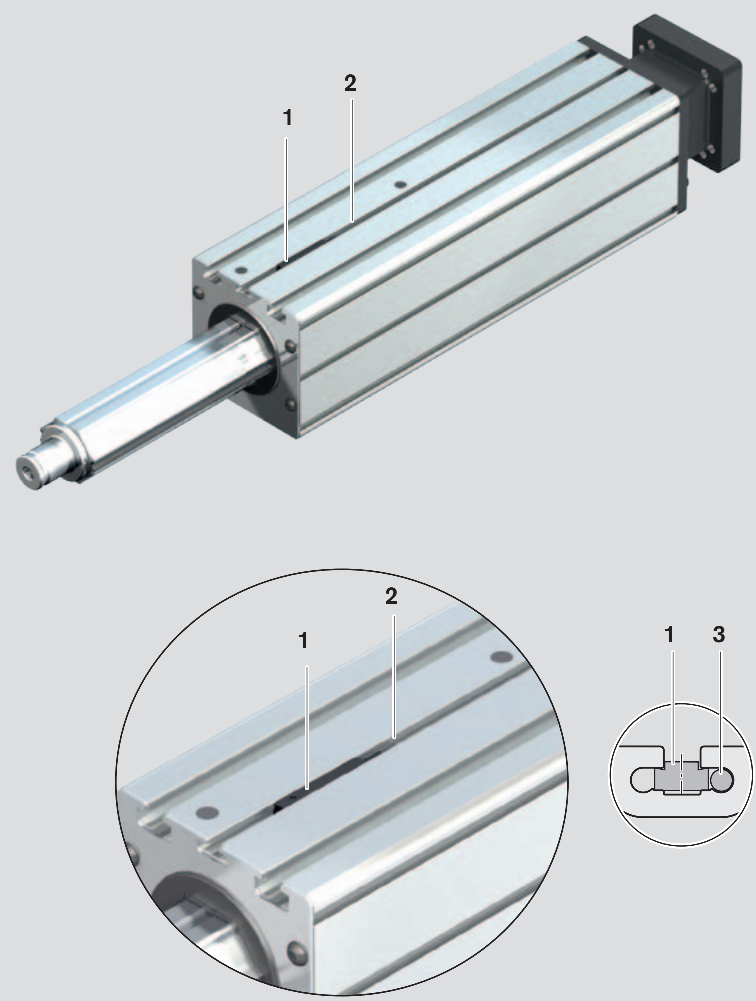
1 Switch (magnetic field sensor)
2 T-slot for switch
3 Cable
The switch activator is a magnet integrated in the thrust rod.

⚠ **For short-stroke applications:Consider the length of the switch!**

Magnetic field sensors with potted cables can be used in the Feed Module.

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

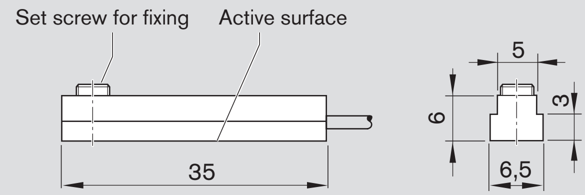
Mounting instructions
The magnetic field sensors (MFS) are pushed into the T-slot and fixed with set screws.
The MFS cables are routed along the side of the T-slot (3).
For details regarding the switching position, see “Instructions for Feed Modules.”



Magnetic field sensor

Magnetic field sensor with potted cable and with flying leads.
Cable length 2 m.

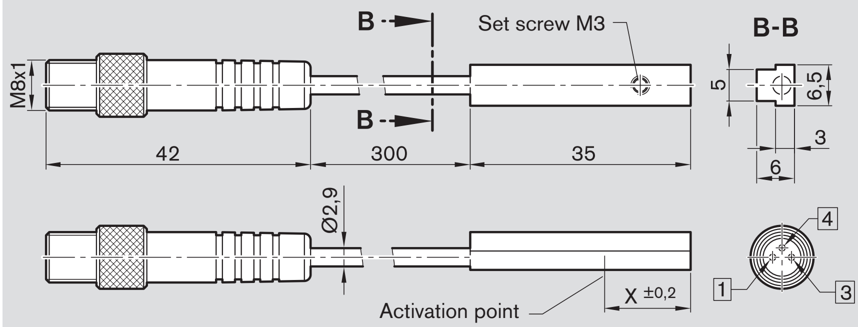
	Part number
Hall sensor	R3476 010 03
Reed sensor	R3476 009 03



Magnetic field sensor with connector

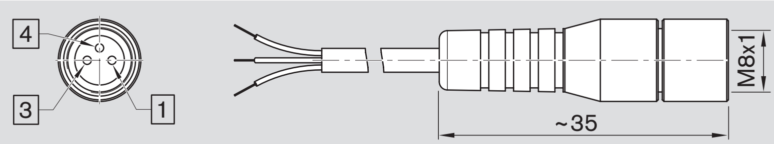
Magnetic field sensor with potted cable and connector.
Cable length 0.3 m.

	Part number
Hall sensor	R3476 024 03
Reed sensor	R3476 023 03



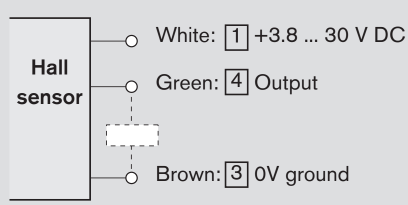
Extension cable for sensor (Hall / Reed) with connector

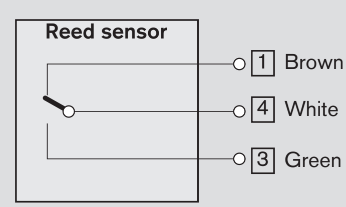
The extension cable (approx. 5 m) is supplied complete with a female connector M8x1 for connection to the sensor.



Extension cable					
Part number	**Connector contact**	**1**	**3**	**4**	**Protection class**
R3476 025 03	to core	brown	blue	black	IP 66 when connected

Pin assignment





Technical data

For magnetic field sensors with and without connector.

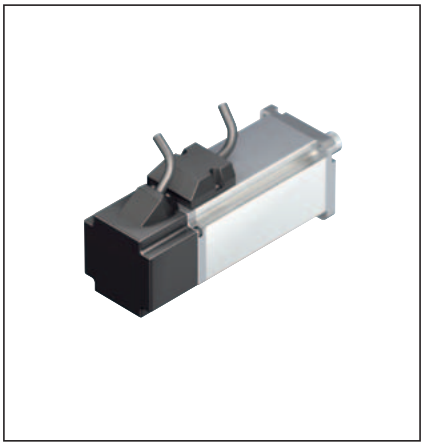
Hall sensor	
Contact type	PNP NC
Operating voltage	3.8–30 V DC
Current consumption	max. 10 mA
Output current	max. 20 mA
Protection class	IP 66
Short-circuit protection	No
Max. travel speed	2 m/s
Activation point Dimension X	13.65 mm

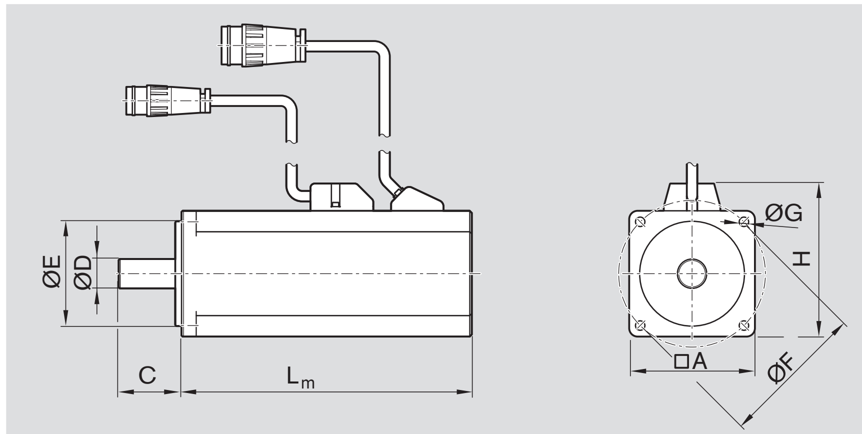
Reed sensor	
Contact type	Changeover
Switching voltage	max. 30 V DC
Switching current	max. 500 mA
Protection class	IP 66
Max. travel speed	2 m/s
Switching points	2
Activation point Dimension X	9 mm

EasyHandling basic

Motors

IndraDyn S - servo motors MSM





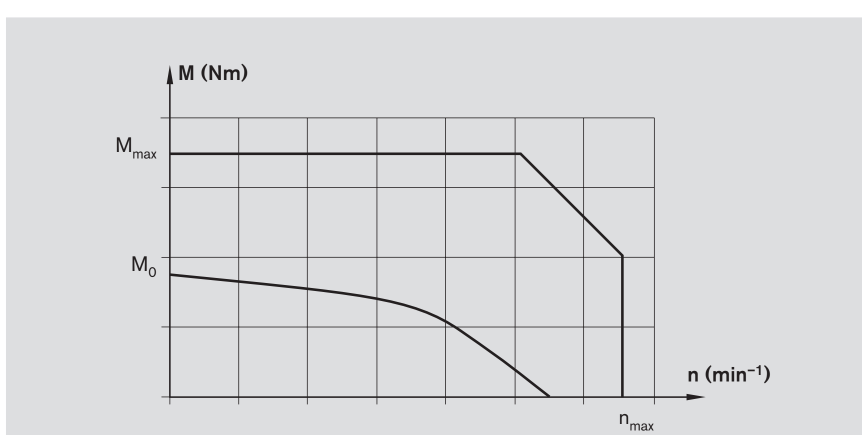
Motor	Dimensions (mm)								
	A	C	ØD	ØE	ØF	ØG	H	L_m Without holding brake	L_m With holding brake
MSM 019B-0300	38	25	8	30	45	3.4	51	92.0	122.0
MSM 031B-0300	60	30	11	50	70	4.5	73	79.0	115.5
MSM 031C-0300	60	30	14	50	70	4.5	73	98.5	135.0
MSM 041B-0300	80	35	19	70	90	6.0	93	112.0	149.0

Motor data

Motor	n_{max} (min^{-1})	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MSM 019B-0300	5 000	0.32	0.95	0.29	0.0000050	0.0000020	0.47	0.21
MSM 031B-0300	5 000	0.64	1.91	1.27	0.0000140	0.0000018	0.82	0.48
MSM 031C-0300	5 000	1.30	3.80	1.27	0.0000260	0.0000018	1.20	0.50
MSM 041B-0300	4 500	2.40	7.10	2.45	0.0000870	0.0000075	2.30	0.80

J_{br} = mass moment of inertia of the holding brake
J_m = mass moment of inertia, motor
L_m = length of the motor
M_0 = standstill torque
M_{br} = holding torque of holding brake when switched off
M_{max} = maximum possible motor torque
n_{max} = maximum motor speed

Motor torque speed curve (schematic)



Option number[1)]	Motor	Part number	Version Holding brake		Type designation
			without	with	
104	**MSM019B-0300**	R911325131	X		MSM019B-0300-NN-M0-CH0
105		R911325132		X	MSM019B-0300-NN-M0-CH1
106	**MSM 031B-0300**	R911325135	X		MSM031B-0300-NN-M0-CH0
107		R911325136		X	MSM031B-0300-NN-M0-CH1
108	**MSM 031C-0300**	R911325139	X		MSM031C-0300-NN-M0-CH0
109		R911325140		X	MSM031C-0300-NN-M0-CH1
110	**MSM 041B-0300**	R911325143	X		MSM041B-0300-NN-M0-CH0
111		R911325144		X	MSM041B-0300-NN-M0-CH1

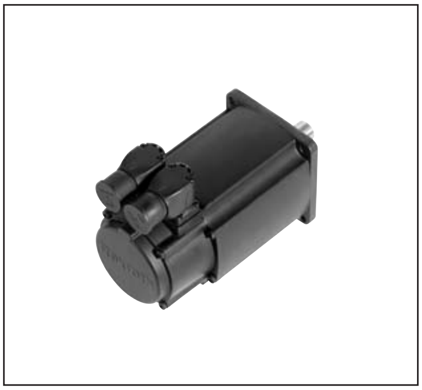
1) From the “Components and Ordering” table“

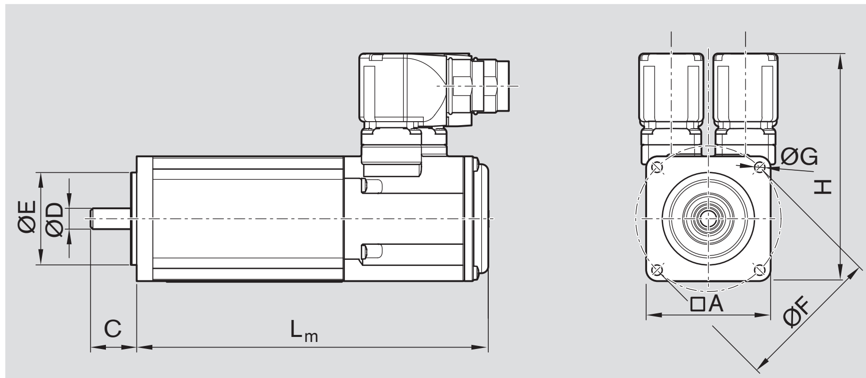
Specification:
- Plain shaft without shaft seal ring
- Multiturn absolute encoder M0 (absolute encoder functionality only possible with back-up battery)
- Cooling system: natural convection
- Protection class IP54 (casing)
- With or without holding brake

Note:
- The motors can be supplied complete with controllers and control units. See section on Motor-Controller combinations.
- The performance data given for the motors applies for ambient temperatures of 0 ... 40 °C. If the stated limits are exceeded the performance data of the motors must be reduced.
  For more information, refer to the Rexroth catalog R911329337.

Motors

IndraDyn S - servo motors MSK





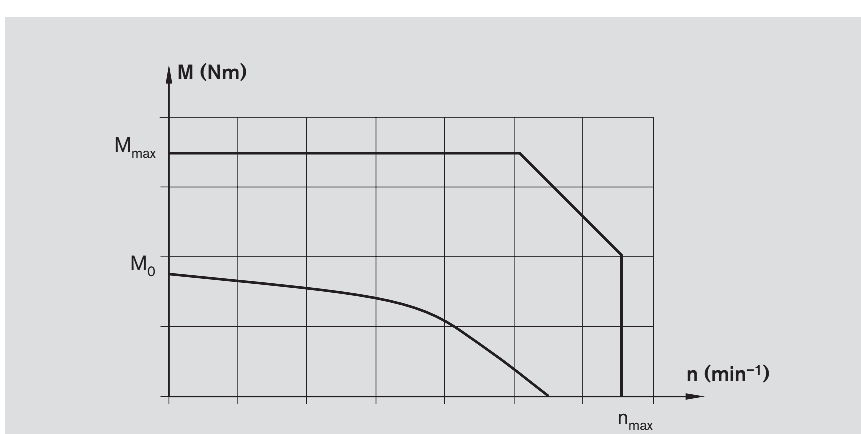
Motor	Dimensions (mm)								
	A	C	ØD h6	ØE h7	ØF	ØG	H	L_m Without holding brake	With holding brake
MSK 030C-0900	54	20	9	40	63	4.5	98.5	180.0	213.0
MSK 040C-0600	82	30	14	50	95	6.6	124.5	185.5	215.5
MSK 050C-0600	98	40	19	95	115	9.0	134.5	203.0	233.0

Motor data

Motor	n_{max} (min^{-1})	M_0 (Nm)	M_{max} (Nm)	M_{br} (Nm)	J_m (kgm^2)	J_{br} (kgm^2)	m_m (kg)	m_{br} (kg)
MSK 030C-0900	9 000	0.8	4.0	1	0.000030	0.000007	1.9	0.2
MSK 040C-0600	7 500	2.7	8.1	4	0.000140	0.000023	3.6	0.3
MSK 050C-0600	6 000	5.0	15.0	5	0.000330	0.000107	5.4	0.7

J_{br} = mass moment of inertia of the holding brake
J_m = mass moment of inertia, motor
L_m = length of the motor
M_0 = standstill torque
M_{br} = holding torque of holding brake when switched off
M_{max} = maximum possible motor torque
n_{max} = maximum motor speed

Motor torque speed curve (schematic)



Option number[1]	Motor	Part number	Version Holding brake without	 with	Type designation
84	**MSK 030C-0900**	R911308683	X		MSK030C-0900-NN-M1-UG0-NNNN
85		R911308684		X	MSK030C-0900-NN-M1-UG1-NNNN
86	**MSK 040C-0600**	R911306060	X		MSK040C-0600-NN-M1-UG0-NNNN
87		R911306061		X	MSK040C-0600-NN-M1-UG1-NNNN
88	**MSK 050C-0600**	R911298354	X		MSK050C-0600-NN-M1-UG0-NNNN
89		R911298355		X	MSK050C-0600-NN-M1-UG1-NNNN

1) From the “Components and Ordering” table“

Specification:
- Plain shaft with shaft seal ring
- Multiturn absolute encoder M1 (Hiperface)
- Cooling system: natural convection
- Protection class IP65 (casing)
- With or without holding brake

Note:
- The motors can be supplied complete with controllers and control units. See section on Motor-Controller combinations.
- The performance data given for the motors applies for ambient temperatures of 0 ... 40 °C. If the stated limits are exceeded the performance data of the motors must be reduced.
  For more information, refer to the Rexroth catalog R911296288.

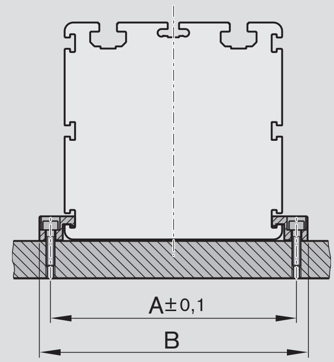
EasyHandling basic

Mounting

General notes

The modules are mounted using clamping fixtures which engage in the T-slots on the side of the frame.

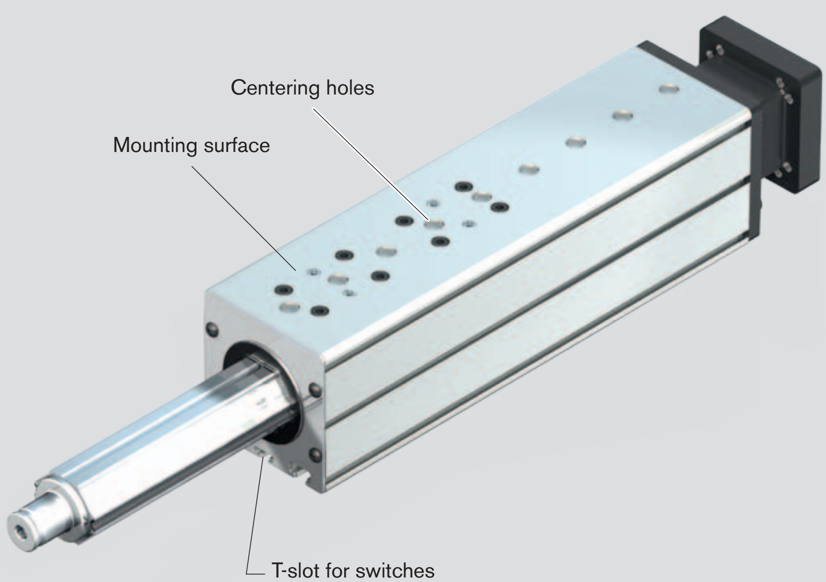
Fastening with clamping fixtures



Clamping fixtures

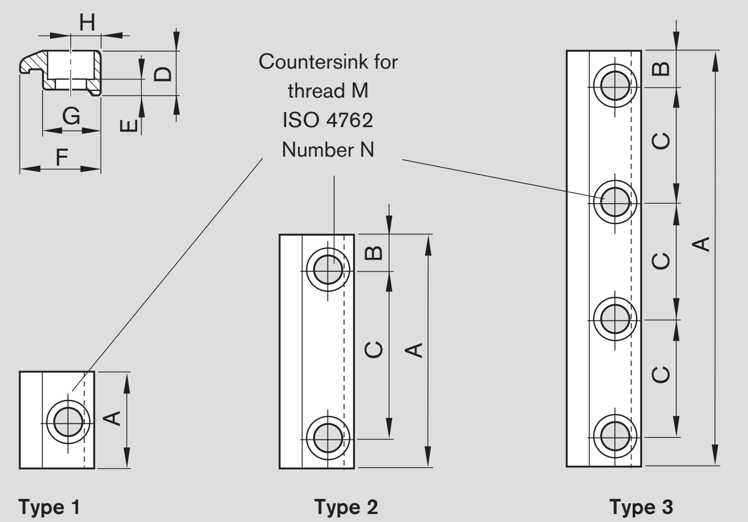
VKK	Dimensions (mm)	
	A	B
VKK 15-50	62.5	75.5
VKK 15-70	86.0	100.0
VKK 25-100	116.0	130.0

Mounting surface
The Feed Module may only be installed/ connected to other modules by the mounting surface with the centering holes.



Clamping fixtures

Recommended number of clamping fixtures:
– Type 1: 4 pieces per side/per 300mm
– Type 2: 2 pieces per side/per 300 mm
– Type 3: 1 piece per side/per 300 mm



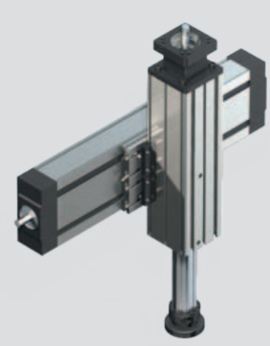
VKK	For thread	Type	Number of holes	Dimensions (mm)								Part number
			N	A	B	C	D	E	F	G	H	
VKK 15-50	M5	1	1	22	–	–	10	4.8	15.1	12.2	6.5	R1419 010 01
		2	2	57	8.5	40						R1419 010 43
		3	4	77	8.5	20						R1419 010 44
VKK 15-70	M5	3	4	107	8.5	30	11.5	4.8	19.3	14	7	R0375 410 02
		3	4	77	8.5	20						R0375 410 26
VKK 15-70	M6	1	1	25	–	–	11.5	5.3	19.3	14	7	R0375 510 00
VKK 25-100		3	4	142	11	40						R0375 510 02
		2	2	72	11	50						R0375 510 33
		2	2	62	11	40						R0375 510 34
		2	2	47	8.5	30						R0375 510 23

Mounting to Installed Modules

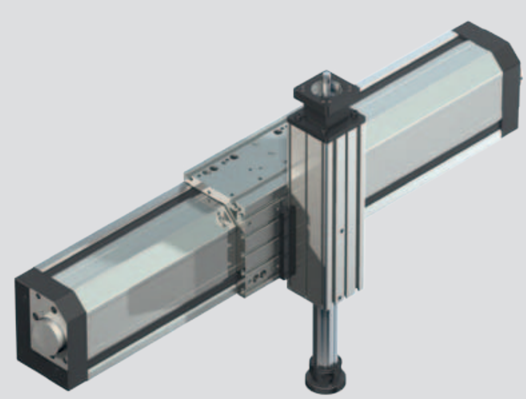
– No intermediate plates required
– Positive locking via centering rings (EasyHandling compatible)
– Easy mounting with clamping fixtures

For detailed information, please refer to the catalog “EasyHandling Connection Technology” (R310 EN 2606), and the brochure “Easy-Handling, The system solution at a glance” (R999000062).

Feed Module VKK mounted to Compact Module CKK



Feed Module VKK mounted to Bridge Module BKK

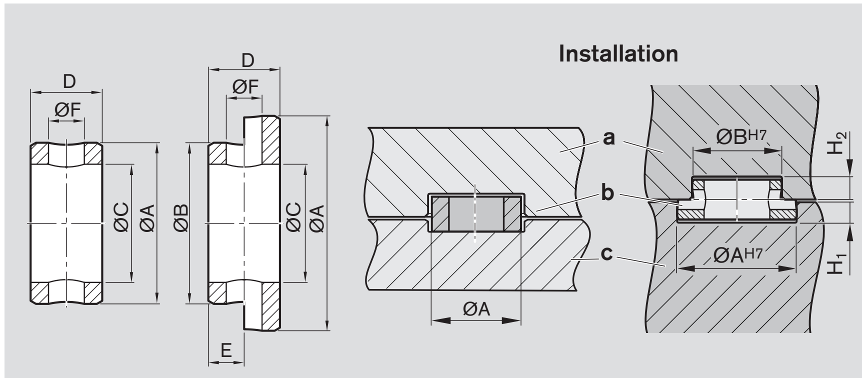


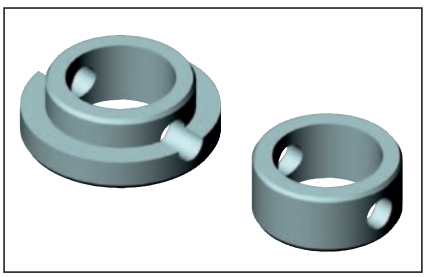
EasyHandling basic

Mounting Accessories

Centering ring

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





a) Customer's attachment
b) Centering ring
a) Mounting surface VKK

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

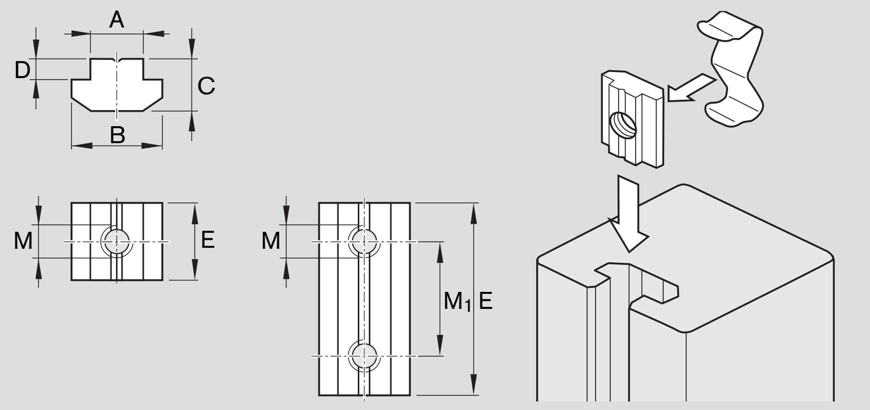
Extraction tool for centering rings

The tool is used to grip the centering ring through the cross-holes for easy extraction.

Part number: R3305 259 16

Sliding blocks and springs

For mounting attachments using the T-slots



VKK	For thread	Dimensions (mm)						Part number	
		A	B	C	D	E	M_1	Sliding block	Spring
VKK 15-50	M4	–	–	–	–	–	–	–	–
VKK 15-70	M4	6	11.5	4	1	12	–	R3447 014 01	R3412 010 02
	M4					45	30	R0391 710 09	–
	M5					12	–	R3447 015 01	R3412 010 02
VKK 25-100	M5	8	16	6	2	16	–	R3447 017 01	R3412 010 02
	M5					16	–	R3447 018 01	R3412 010 02
	M6					16	–	R3447 019 01	R3412 010 02
	M6					50	36	R0391 710 08	–

EasyHandling basic

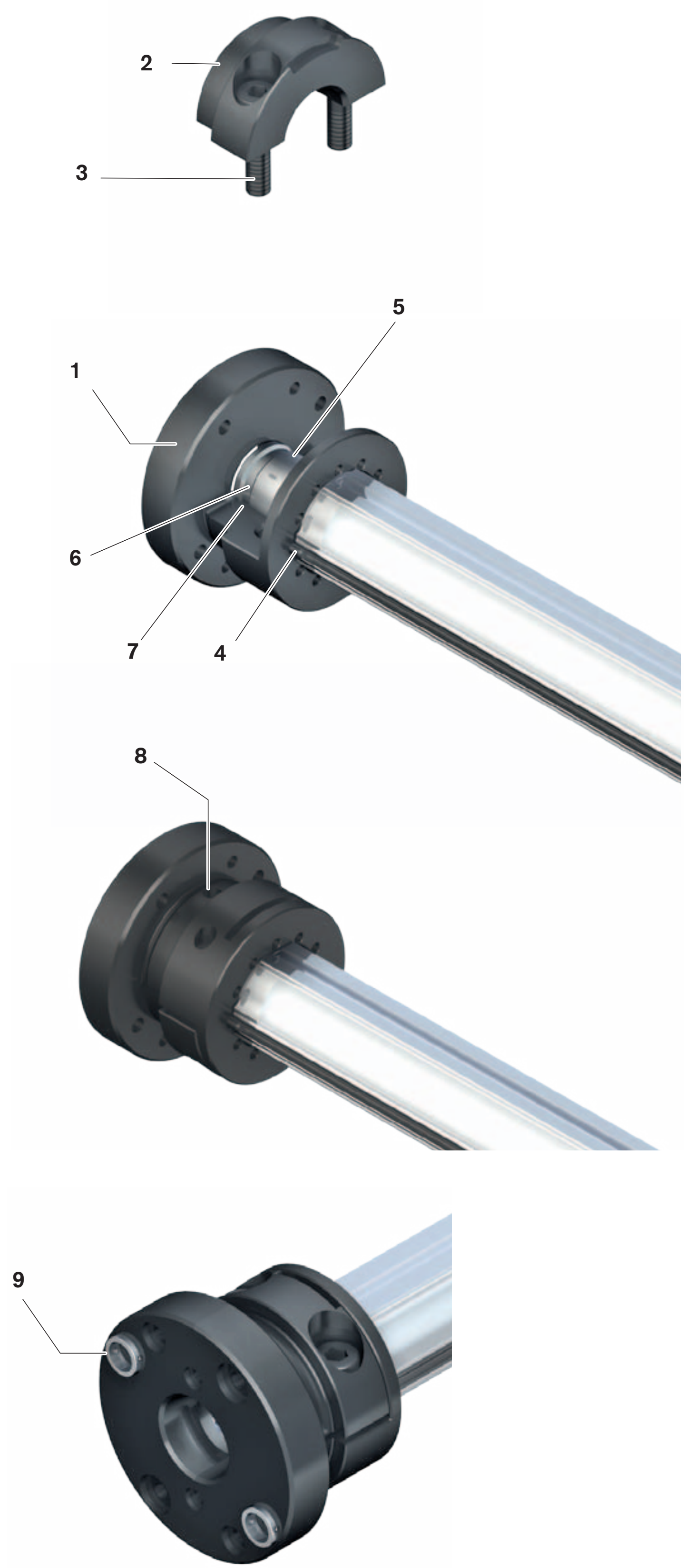
Connection Elements

Two-piece adapter flange

Straight pin with internal thread (8), centering rings Ø 12^{H7} (9) and locating pins (4) are provided.

Advantages of the new two-piece adapter flange:

- The main part (1) engages in a form fit with the groove (6) on the mounting interface (5) of the thrust rod. This provides especially secure mounting as well as protection against falling in vertical installations.
- Locating pins (4) ensure optimized alignment with the running tracks thus allowing reproducible flange alignment.
- Clamping via half-shell (2) with socket head cap screws (3) instead of the previous set screws improves retention.
- If the application requires additional retention, or if the adapter flange has to be mounted in an intermediate position, making it impossible to use the hole pattern for the locating pins, the adapter flange can be fixed in place using the pre-drilled pin hole (8).
- Four M6 threads, instead of the previous two, ensure even more secure fastening of attachments.



Adapter flange

Function

- Attachment of Grippers and Rotary Compact Modules or customer-built equipment

The assembly kit consists of:

1 Adapter flange
2 Half shell (for clamping)
3 Socket head cap screws (2x ISO 4762)
4 Locating pin
5 Mounting interface
6 Groove for locating feature
7 Locating feature
8 Straight pin with internal thread
9 Centering rings

Note for ordering

The adapter flange can be ordered either by selecting the carriage option 04 (carriage with adapter flange) or by stating the following part numbers.

VKK	Adapter flange Part number
15-50	R1419 000 35
15-70	R1419 000 36
25-100	R1419 000 37

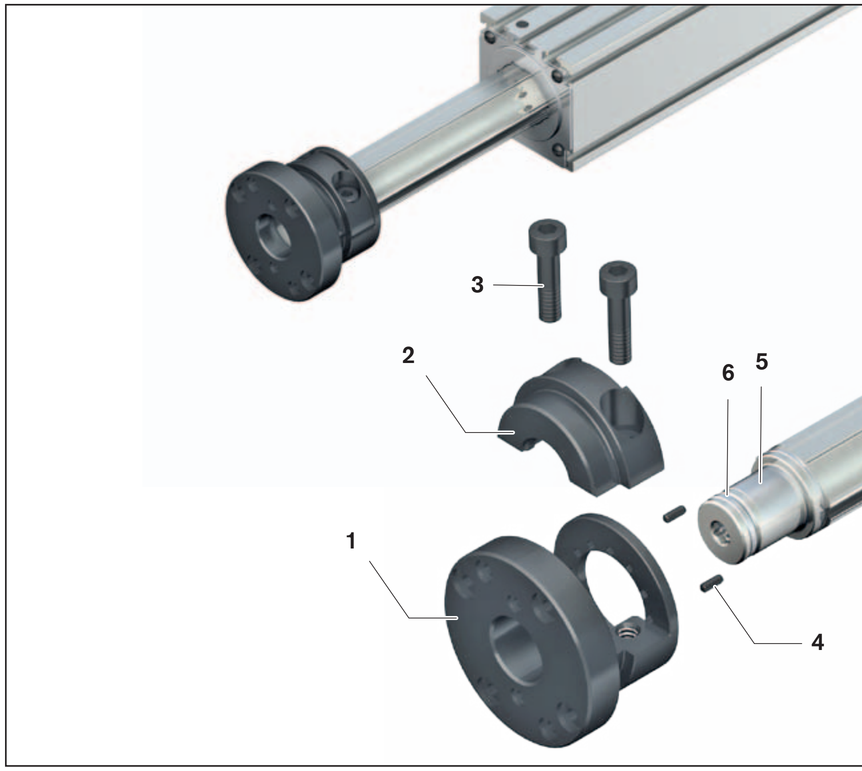
Notes for mounting

The adapter flange is fastened to the mounting interface on the thrust rod of the Feed Module using the clamping half-shell and two socket head cap screws.

- Position the main part (1) so that it engages with the groove (6) on the mounting interface (5) and use the locating pins (4) to align it with the running tracks.
- Position the (clamping) half-shell (2) so that it also engages with the groove (6) of the mounting interface ((5). Tighten the socket head cap screws (3) to the tightening torque specified in the table.

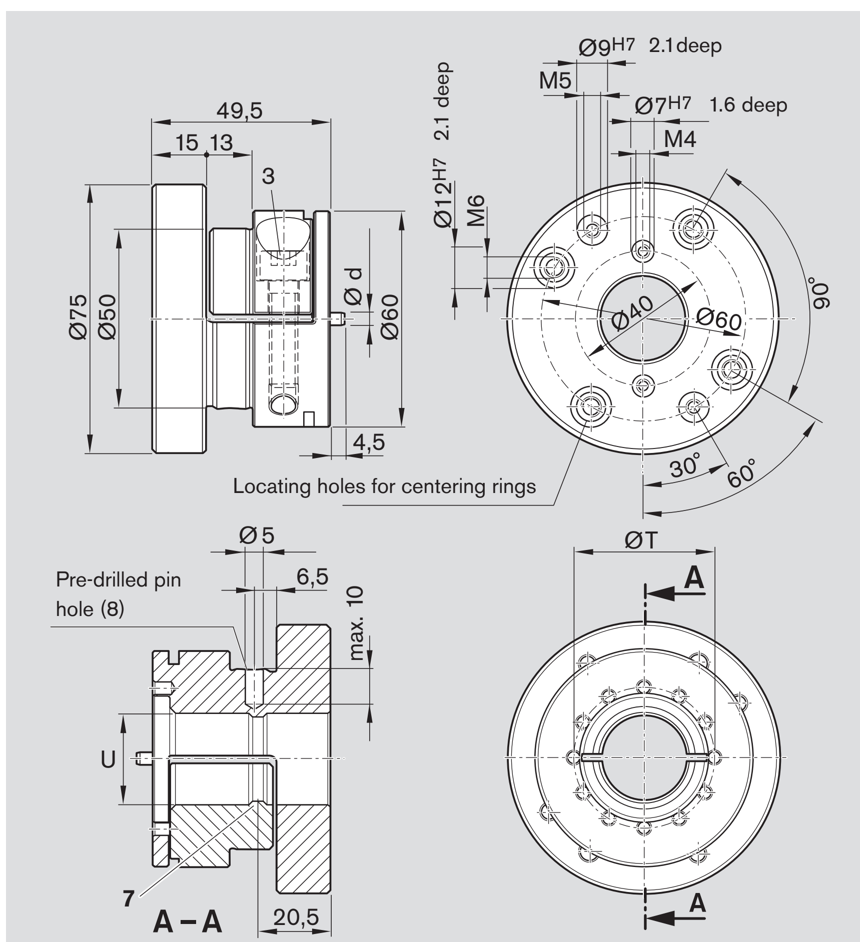
On leaving the factory, the adapter flange is assembled so that the (clamping) half-shell is oriented toward the T-slot for switches on the module frame.

The pin hole (8) is pre-drilled only and can be enlarged and deepened by the customer after alignment on the mounting interface (5).
A straight pin Ø6x20 with internal thread is provided.



⚠ The new mounting interface has a different design than the preceding version. The new adapter flange can therefore not be mounted on a Feed Module with an older mounting interface!

⚠ If the adapter flange is removed, the socket head cap screws must be secured again when it is re-installed! (For example with liquid medium-strength threadlocker adhesive.)



VKK	(3) ISO4762	12.9 (Nm)	Ø U H7 (mm)	Ø d m6 (mm)	Ø T (mm)
15-50	M6x25	14	20	3.5	29.0
15-70	M8x30	35	25	3.5	38.7
25-100	M8x30		25	5.5	51.5

Connection Elements

Protective bellows

Function
– Protects the thrust rod and guide from contamination

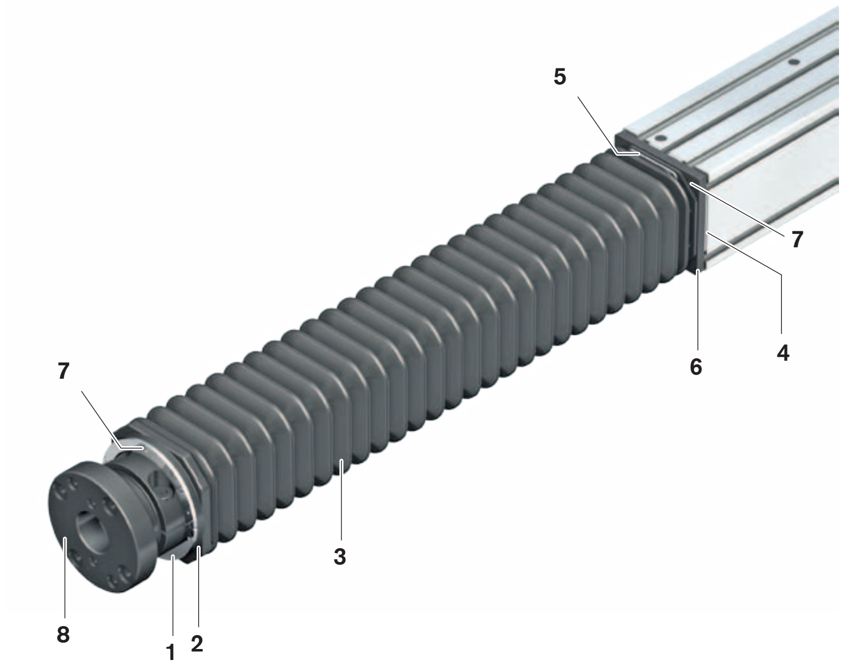
Sealed bellows-type protective cover of polyester fabric, coated with polyurethane inside and out. Oil- and moisture-resistant.

The assembly kit consists of:
1 Retaining plate (2x)
2 Lower mounting flange
3 Polyurethane bellows
4 Outside clamping plate (8x)
5 Inside clamping plate (2x)
6 Upper mounting flange
7 Fastening screws (22x)
8 Adapter flange

Note for ordering
The bellows can be ordered by selecting the Cover option 01.

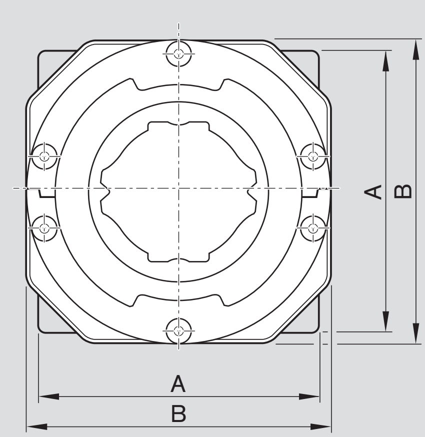
Notes for mounting
The adapter flange is required for mounting of the bellows.

⚠ **If the protective bellows or the adapter flange are removed, the fastening screws must be secured again upon re-installation! (For example with liquid medium-strength threadlocker adhesive.)**



VKK	(mm)	
	A	B
15-50	50	75
15-70	70	75
25-100	100	100

A = VKK
B = Bellows



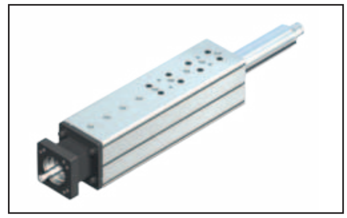
Further attachments
Examples:

- Grippers
- Rotary modules
- Cable drag chains

For detailed information, please refer to the catalog “EasyHandling Connection Technology” (R310 EN 2606), and the brochure “EasyHandling, The system solution at a glance” (R999000062).

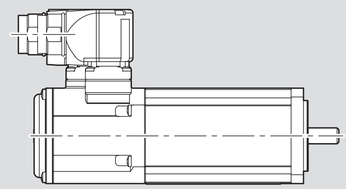
EasyHandling comfort

Motor-Controller Combinations

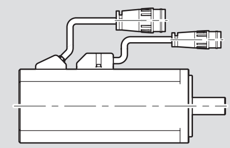


A choice can be made between several different motor-controller combinations to achieve the best solution for each customer application. When sizing the drive, always consider the motor-controller combination.

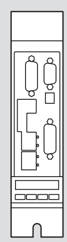
Note
The motors can be supplied complete with controllers and control units. For further motor types and more information on motors, controllers and control systems, please refer to the following Rexroth catalogs on drive technology:
- Drive System Rexroth IndraDrive, R999000018
- Rexroth IndraDyn S Synchronous motors MSK, R911296288
- Rexroth IndraDrive Cs Drive Systems with HCS01, R911322209.



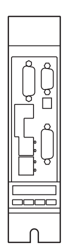
IndraDyn S servo motor MSK



IndraDyn S servo motor MSM



IndraDrive Cs
compact drive system with multiple protocol capability



Feed Modules can be supplied complete with motor, controller and control unit.

Recommended motor controller combinations

Motor	Controller
MSK 030C-0900	HCS 01.1E-W0005
MSK 030C-0900	HCS 01.1E-W0008
MSK 040C-0600	
MSK 040C-0600	HCS 01.1E-W0018
MSK 050C-0600	
MSK 050C-0600	HCS 01.1E-W0028 with HNL01.1E

Motor	Controller
MSM 019B-0300	HCS 01.1E-W0003
MSM 031B-0300	HCS 01.1E-W0006
MSM 031C-0300	HCS 01.1E-W0009
MSM 041B-0300	HCS 01.1E-W0013

Safety on Board – integrated, certified and consistent

Whatever branch of industry you call your own, the protection of man, machine and tool has absolute priority!
Modern safety concepts are needed to meet the most exacting requirements such as “Safe Motion”, “Safe Processing of Peripheral Signals” and “Safe Communication”. Safety on Board by Rexroth satisfies all these requirements and is synonymous with intelligent and well thought-out safety solutions.

SAFETY ON BOARD

SafeMotion

the drive-based safety solution from Rexroth, means much more than just the “safe stop” of machinery. In fact, SafeMotion is the first step in the realization of safe machine concepts.
It allows the operator to have access to the process without danger, increases availability by reducing downtimes and therefore increases productivity.

Safety on Board: functional safety from Control City – your control technology capital.

Integrated

Maximum protection for personnel, reduced idle times, increased availability and simplified start-up and validation – these are just some of the advantages of integrated safety technology from Rexroth. By integrating safety functions in standard components, we upgrade them to full-fledged safety components. These can be used as stand-alone units or as part of our system solutions.

Certified

Safety on Board provides the machine manufacturer with a guarantee of maximum safety and reliability, on the basis of components and system solutions which are tested and certified in accordance with the latest safety standards. This minimizes the cost and effort involved in the validation of plant and machinery and gives the manufacturer assurance – both in functional and legal terms.

Safety on Board – from the drive to the control system, Rexroth offers safety solutions that can be optimally scaled.

Normal operating conditions

- Ambient temperature 0 °C ... 50 °C
  (Temperature must not fall below dew point)
- Enclosure protection class IP 54
- Consider the motor temperature limits.

Design notes

⚠ **Moved parts: Safety devices and guards necessary**

⚠ **For vertical installations: Arresting devices necessary to protect against falling loads**

Intended use

The product is an assembly.
The product may be used in accordance with the technical documentation (product catalog) for the following purposes:
- for precise positioning in space.

The product is intended exclusively for professional use and not for private use. Use for the intended purpose also includes the requirement that you must have read and understood the product documentation completely, in particular these “Safety instructions”.
The product is exclusively intended for incorporation into a final machine or a system or for assembly to other components for the purpose of building a final machine or a system.

Misuse

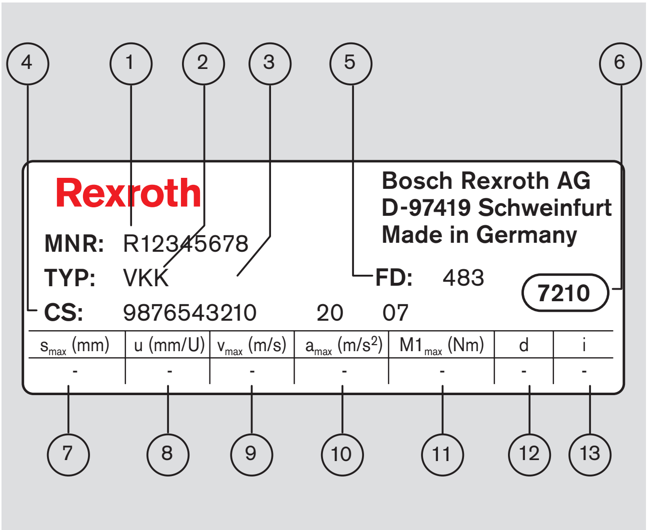
Use of the product in any other way than as described under “Intended use” is considered to be misuse and is therefore not permitted. If unsuitable products are installed or used in safety-relevant applications, this may lead to uncontrolled operating statuses in the application which can cause personal injury and/or damage to property.
The product may only be used in safety-relevant applications if this use has been expressly specified in the product documentation and is permitted, e.g. in zones with potentially explosive atmospheres or in safety-critical parts of a control system (functional safety).
Bosch Rexroth AG will not accept any liability for injury or damage caused by misuse of the product. The risks associated with any misuse of the product shall be borne by the user alone. Misuse of the product includes:
- the transport of persons

Parameterization (start-up)

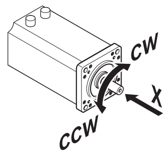
Easy start-up thanks to integrated assistant

EasyWizard is an assistant that is integrated as a standard feature of Rexroth's engineering framework IndraWorks DS. It was designed to help users start-up linear systems easily, rapidly and safely. Starting up electromechanical axes often used to be a complicated, time-consuming and error-prone procedure. EasyWizard has changed all that – preconfigured data sets and component nameplates designed to dovetail with the assistant take the hassle out of getting your linear systems up and running.

Advantages
- Fast, simple and intuitive start-up
- Online help texts and supporting graphics guide you through the input fields
- Plausibility checks for free data input
- Suitable for all Rexroth linear systems
- Parameter input errors are minimized by having the data on the nameplate and in the Wizard input mask arranged in a similar order.
- For system optimization after parameter input, the axis can be run in the test mode.



1 Part number
2 Type designation
3 Size
4 Customer information
5 Date of manufacture
6 Manufacturing location
7 s_{max} = max. travel range (mm)
8 u = feed/lead constant without gear unit (mm/U)
9 v_{max} = max. linear speed without gear unit (m/s)
10 a_{max} = max. acceleration without gear unit (m/s²)
11 $M1_{max}$ = max. drive torque at motor journal (Nm)
12 d = motor direction of rotation for travel in positive direction



CW = Clockwise
CCW = Counter Clockwise

13 i = gear ratio

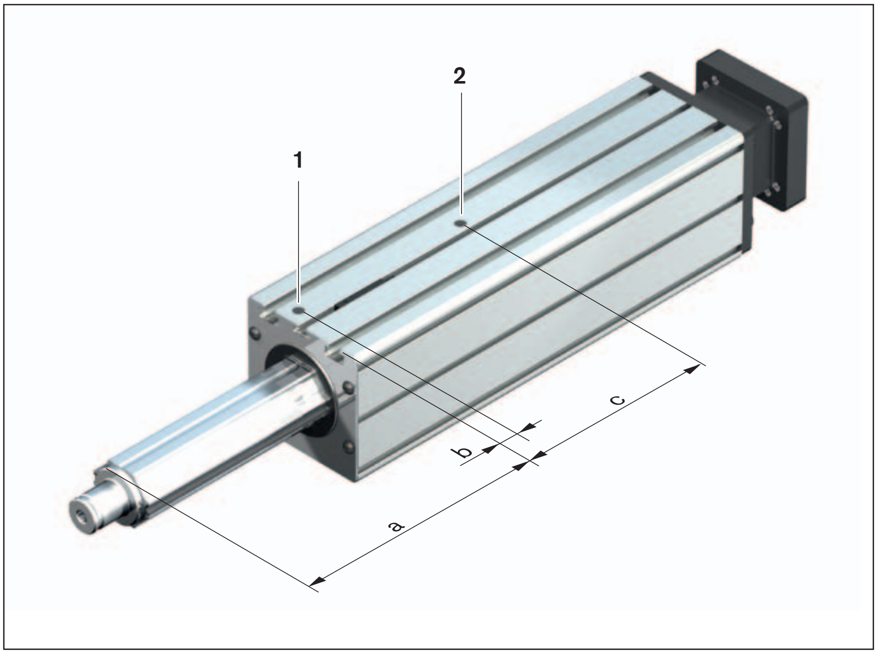
Fast start-up with mechanical data input

Further Information

Lubrication

Lubrication notes
Basic lubrication is applied in-factory before shipment.
Feed Modules are designed for grease lubrication (using a manual grease gun with an extension tube and nozzle).
The only maintenance required is lubrication of the guideway and the ball screw via the two lube ports.
Lubricant must be applied to both of the lube ports.
The thrust rod must be fully extended before applying lubricant.
When designing the adjoining structure, make sure that the maximum stroke may be attained.

Lube ports for:
1 Runner blocks
2 Ball screw



Recommended lubricants

⚠ **Do not uses greases containing solid particles (e.g., graphite or MoS_2)!**

VKK	Grease DIN 51825	Consistency class DIN 51818	Recommended grease	Part number (400 g cartridge)
VKK 15-50	KP2K	NLGI 2	Dynalub 510	R3416 037 00
VKK 15-70				
VKK 25-100				

Dimensions of lube ports
- To access the lube ports, extend the thrust rod to the lubricating position a.

VKK	Length (mm)	a (mm)	b (mm)	c (mm)
VKK 15-50	240	138	-5.75[1)]	85.0
	280	178		
	360	258		
	480	378		
VKK 15-70	280	120	7.50	123.5
	320	160		
	400	240		
	520	360		
	600	440		
VKK 25-100	360	130	10.00	154.0
	400	170		
	480	250		
	600	370		
	680	450		

1) The lube port is in a front-mounted lube plate

Lubrication intervals and lubricant quantities, Ball Screw

VKK	Ball screw (d_0 x P)	Travel (km)	Grease relube quantity (cm^3)
VKK 15-50	12x2	100	0.2
	12x5	250	0.3
	12x10	500	0.3
VKK 15-70	16x5	250	0.7
	16x10	500	0.9
	16x16	800	1.0
VKK 25-100	20x5	250	1.0
	25x10	500	1.9
	20x20	1000	2.4

Lubrication intervals and lubricant quantities, Guide

VKK	Travel (km)	Grease partial relube quantity (cm^3)
VKK 15-50	4000	0.4 (2x)
VKK 15-70	4000	0.6 (2x)
VKK 25-100	4000	2.2 (2x)

For more information on lubrication, see the “Instructions for Feed Modules”.

Documentation

Standard report

Option no. 01

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

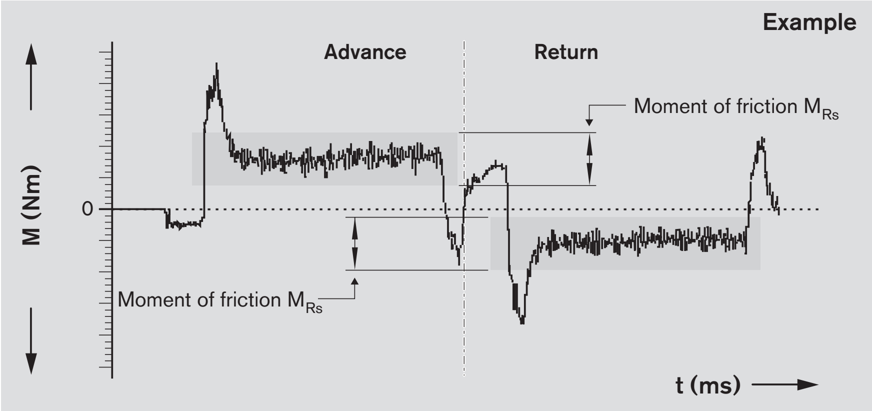
Checks listed in the standard report:
- functional checks of mechanical components
- functional checks of electrical components
- design is in accordance with order confirmation

Frictional torque of complete system

Option no. 02

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

M_{Rs} = moment of friction (N)
t = travel time (ms)

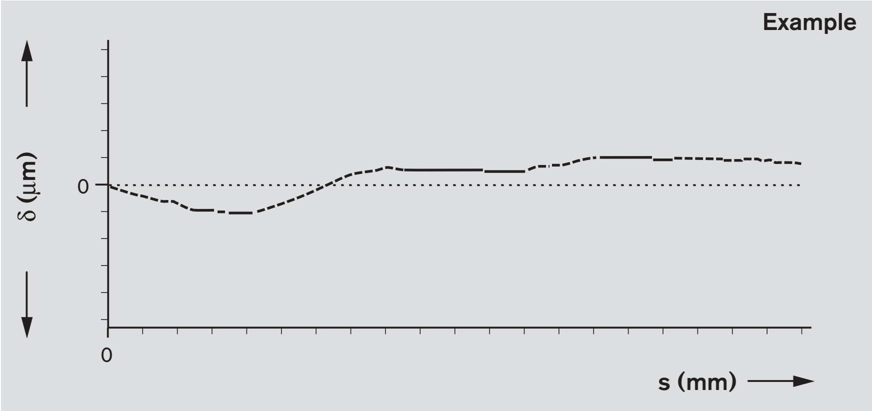


Lead deviation of the ball screw

Option no. 03

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

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

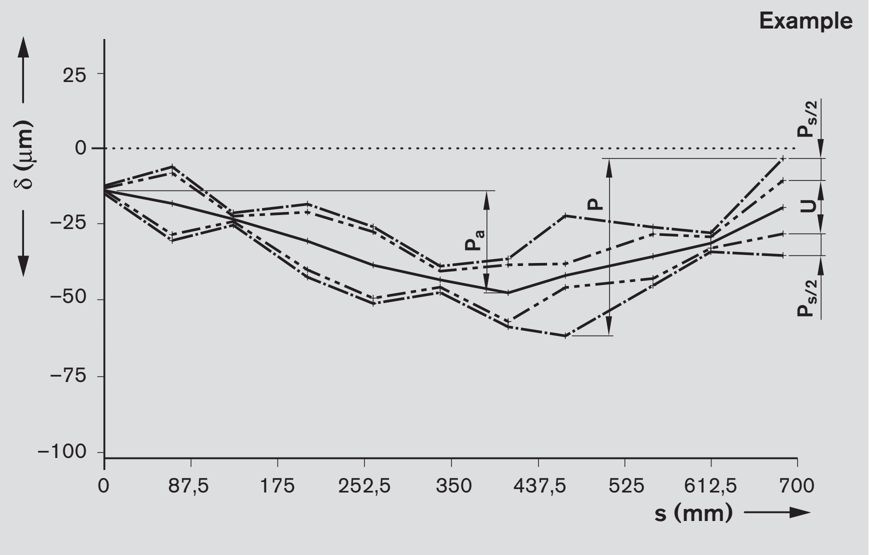


Documentation

Positioning accuracy per VDI/DGQ 3441

Option no. 05

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



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

Positioning accuracy P

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

The positioning accuracy takes the following characteristic values into consideration:
– position deviation
– reversal range
– position variation range

Position deviation P_a

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

Reversal range U

The reversal range corresponds to the difference in mean values of the two approach directions.

The reversal range is determined at every measurement point. It describes systematic deviations.

Position variation range P_s

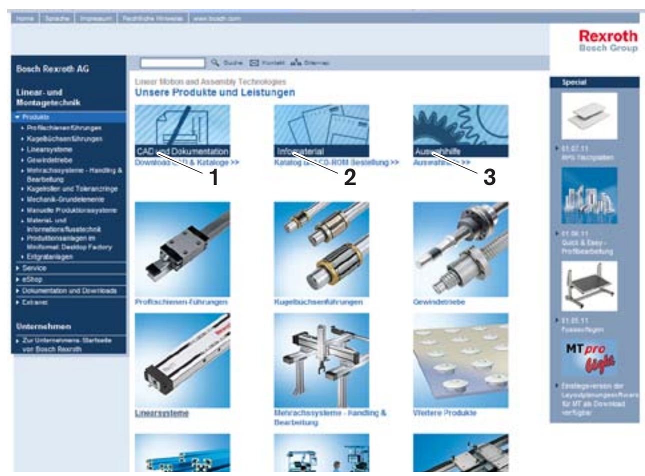
The position variation range describes the effects of random deviations. It is determined at every measurement point.

Further Information

Internet pages, Linear Motion and Assembly Technologies

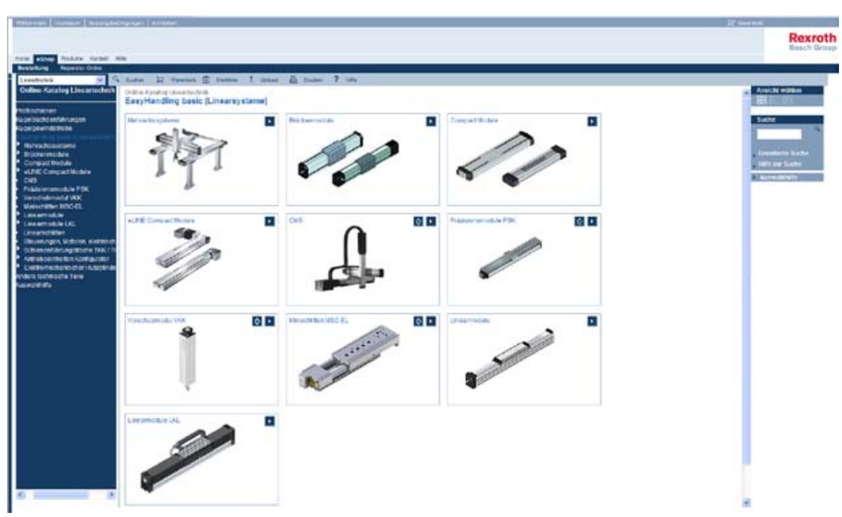
Here you will find extensive information.

Product information:
http://www.boschrexroth.com/dcl

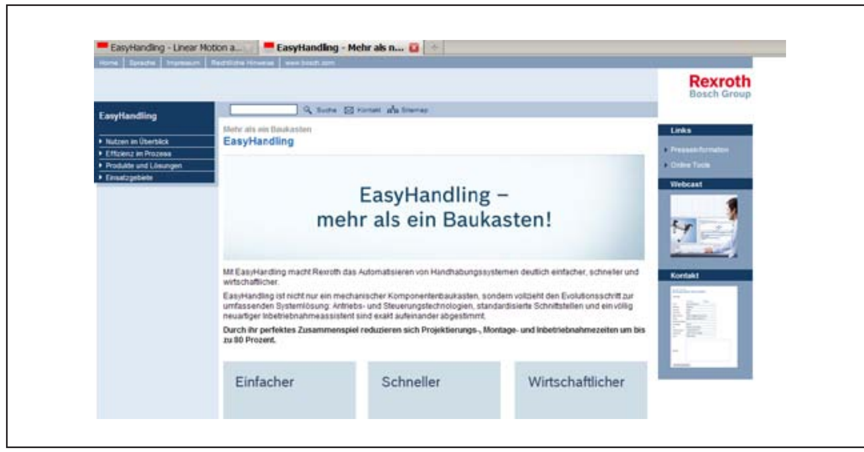


1 Instructions and catalogs in PDF format and 3D CAD generator
2 Printed catalogs and other publications
3 Configurator

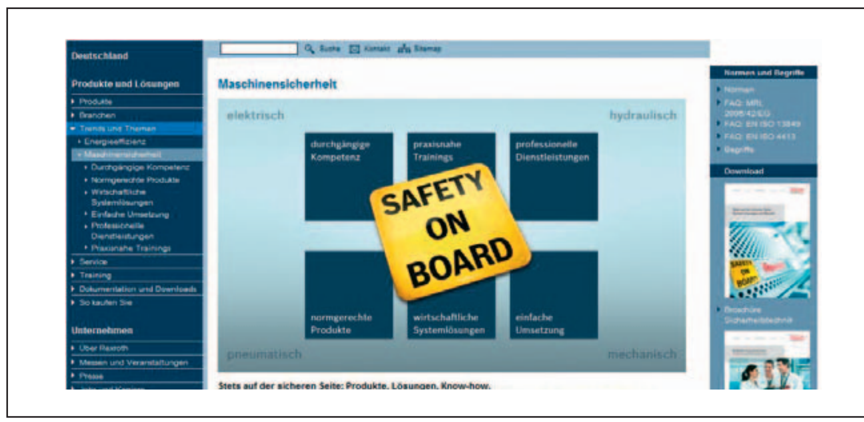
eShop:
https://www.boschrexroth.com/eshop



EasyHandling:
http://www.easy-handling.com



Safety engineering
http://www.boschrexroth.com/Maschinensicherheit

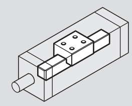
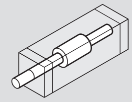
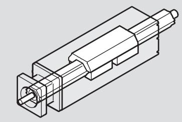
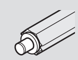
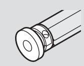
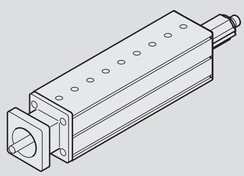
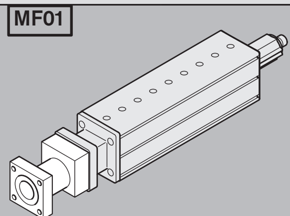
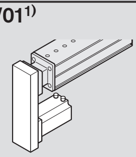
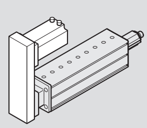
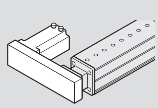
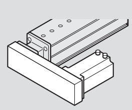


Training:
http://www.boschrexroth.com/training

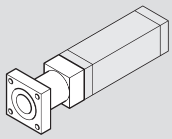
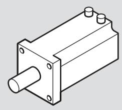
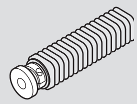
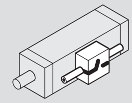
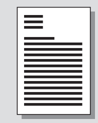
Service:
http://www.boschrexroth.com/service

Further Information

Selection and Ordering Example using the Components and Ordering Data Table

Part number, length R1462 400 00, ... mm Type			Guideway 	Drive unit  Screw journal	Ball screw size d_0 x P 20x5	 25x10	 20x20	Carriage (internal)  without adapter flange 	 with adapter flange 
With ball screw, without motor mount	OF01 	OF01	L = 360 mm 12 L = 400 mm 13 L = 480 mm 15 L = 600 mm 18 L = 680 mm 20	Ø 14	01	02	03	03	04
				Ø 14 PF-Nut	11	12	13		
With ball screw and motor mount	MF01 	MF01		Ø 14	01	02	03	03	04
With ball screw and timing belt side drive	RV01[1]  RV02  RV03  RV04 	RV01 to RV04		Ø 14	01	02	03	03	04

Ordering data Option	 Option code	Explanation
Feed Module	VKK 25-100	Feed Module, length 480 mm
Part number, length	R1462 400 00, 480 mm	
Type	MF01	With motor mount for motor attachment
Guideway	15	Integrated ball rail system; L = 480 mm
Drive unit	02	Ball screw, size d_0 x P = 25 x 10
Carriage	04	Carriage (internal) with adapter flange
Motor attachment	05	For motor MSK 050C
Motor	89	Motor MSK 050C with brake
Cover	01	With bellows
1st switch	21	Reed sensor
2nd switch	22	Hall sensor, PNP NC
3rd switch	21	Reed sensor
Documentation	01	Standard report

Motor attachment			Motor		Cover		Switch	Documentation	
									
Gear ratio i =	Attachment kit [2]	for motor	without brake	with brake	without bellows	with bellows		Standard report	Measurement report[5]
	00	–	00						
1	03	MSM 041B[3]	110	111			Without switch 00		02
1	05	MSK 050C[3]	88	89	00	01[4]	Magnetic field sensor: – Reed sensor 21 – Hall sensor (PNP NC) 22	01	03
1	27	MSM 041B[3]	110	111			Magnetic field sensor with connector: – Reed sensor 58		05
1,5	28	MSM 041B[3]	110	111			– Hall sensor (PNP NC) 59		
1	29	MSK 050C[3]	88	89					
2	30	MSK 050C[3]	88	89					

(grey box) = Highlighting of the selection area after deciding on the specific version

(framed box) = Selected option to be entered into the “Inquiry/Order Form” at the end of this catalog

Further Information

Inquiry/Order Form

Bosch Rexroth AG
Linear Motion and Assembly Technologies
97419 Schweinfurt
Germany

Rexroth – Feed Module VKK

Order Example

Ordering data Option	 Option code	Explanation
Feed Module	VKK 25-100	Feed Module, length 480 mm
Part number, length	R1462 400 00, 480 mm	
Type	MF01	With motor mount for motor attachment
Guideway	15	Integrated ball rail system; L = 480 mm
Drive unit	02	Ball screw, size d_0 x P = 25 x 10
Carriage	04	Carriage (internal) with adapter flange
Motor attachment	05	For motor MSK 050C
Motor	89	Motor MSK 050C with brake
Cover	01	With bellows
1st switch	21	Reed sensor
2nd switch	22	Hall sensor, PNP NC
3rd switch	21	Reed sensor
Documentation	01	Standard report

To be completed by customer: Inquiry ☐ / Order ☐

Feed Module VKK ____________________

Part number: R____ ____ ____, length ______mm

Type =
Guideway =
Drive unit =
Carriage =
Motor attachment =
Motor =
Cover =
1st switch =
2nd switch =
3rd switch =
Documentation =

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

From
Company: ____________________ **Name:** ____________________

Address: ____________________ **Department:** ____________________

Telephone: ____________________

Telefax: ____________________

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