BERGER LAHR

Catalogue

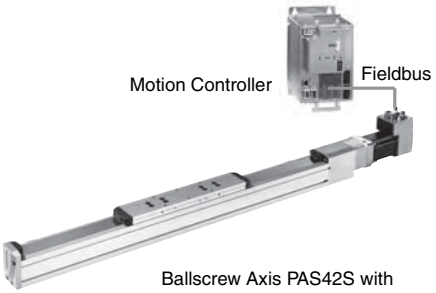
Portal Axes PAS

a company of Schneider Electric

Toothed Belt Axis PAS42B

Toothed Belt Axis PAS42SB with motor

Ballscrew Axis PAS42S



Ballscrew Axis PAS42S with Compact Drive IclA

Product Description

Berger Lahr has added the PAS portal axes to the well-known linear range. PAS portal axes are available in ballscrew and toothed-belt models to meet different requirements.

The portal axes are designed to be extremely user-friendly and can be supplied with various Berger Lahr drives and controllers. The maximum power of the axis can be reached only if axis, motor and electronics are optimally matched. Our field sales representatives will be pleased to advise you.

Flexible drive interface

The coupling modules make it easy to attach motors and gearing.

The drive and end blocks are identical on the toothed-belt axes. Additional drive and output components can be attached with one coupling or a shaft journal at both ends.

Consistency

The sizes of the axes are optimally matched to customer requirements. Axes of the same size are compatible regardless of axis type (ballscrew or toothed belt). All carriages are fitted with lubrication adapters on both sides for optimum lubrication.

Flexible adapters

There are side and bottom ITEM-compatible T-slots for flexible attachment of the axis on the axial sections. The limit stop sensors can be moved along a T-slot. The carriage holes are prepared to accept the centring rings.

Wide variety of options

Axes are available with a metal cover strip to protect the interior against dirt. All axes can be fitted with up to three carriages and any desired carriage separation. Toothed-belt axes are available as ball guide or roller guide version, ballscrew axes as ball guide version. Corrosion-resistant and antistatic versions of the toothed-belt axes are also available.

Applications

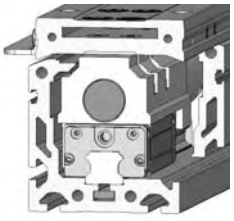
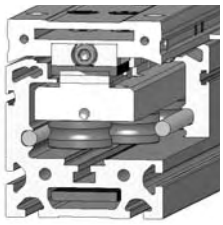
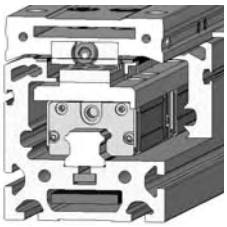
Ballscrew axes are recommended for precise positioning of loads at low speeds and high feed forces. Toothed-belt axes are preferred when dynamic response, high positioning speed and long strokes are required. The following table shows a comparison of the most important technical data of the two types of axis.

Product offer

Portal axes		Ballscrew axes			Toothed-belt axes					
										
Size		2	3	4	1	2		3		4
Type designation		PAS42SB	PAS43SB	PAS44SB	PAS41BR	PAS42BR	PAS42BB	PAS43BR	PAS43BB	PAS44BB
Type of guides		Ball guide			Roller	Roller	Ball guide	Roller	Ball guide	Ball guide
Typical payload [1]	kg	24	60	100	6	12	24	30	60	100
Max. feed force	N	2070	2360	3950	300	800	800	1100	1100	2600
Max. speed	m/s	0.80	1.00	1.25	8	8	5	8	5	5
Max. acceleration	m/s^2	10	10	10	20	20	20	20	20	20
Max. stroke length	mm	1500	3000	3000	3000	5500	5500	5500	5500	5500
Repeat accuracy	mm	±0.02	±0.02	±0.02	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05
Section cross-section	mm x mm	60 x 60	80 x 80	110 x 110	40 x 40	60 x 60	60 x 60	80 x 80	80 x 80	110 x 110

[1] The typical payload is the load for which the axis is normally used. This payload may be considerably exceeded if the corresponding prerequisites are given or considered. Refer to the influence of the forces and torques on the service life of the axis in km in the section Technical data, Calculations, Calculation of service life.

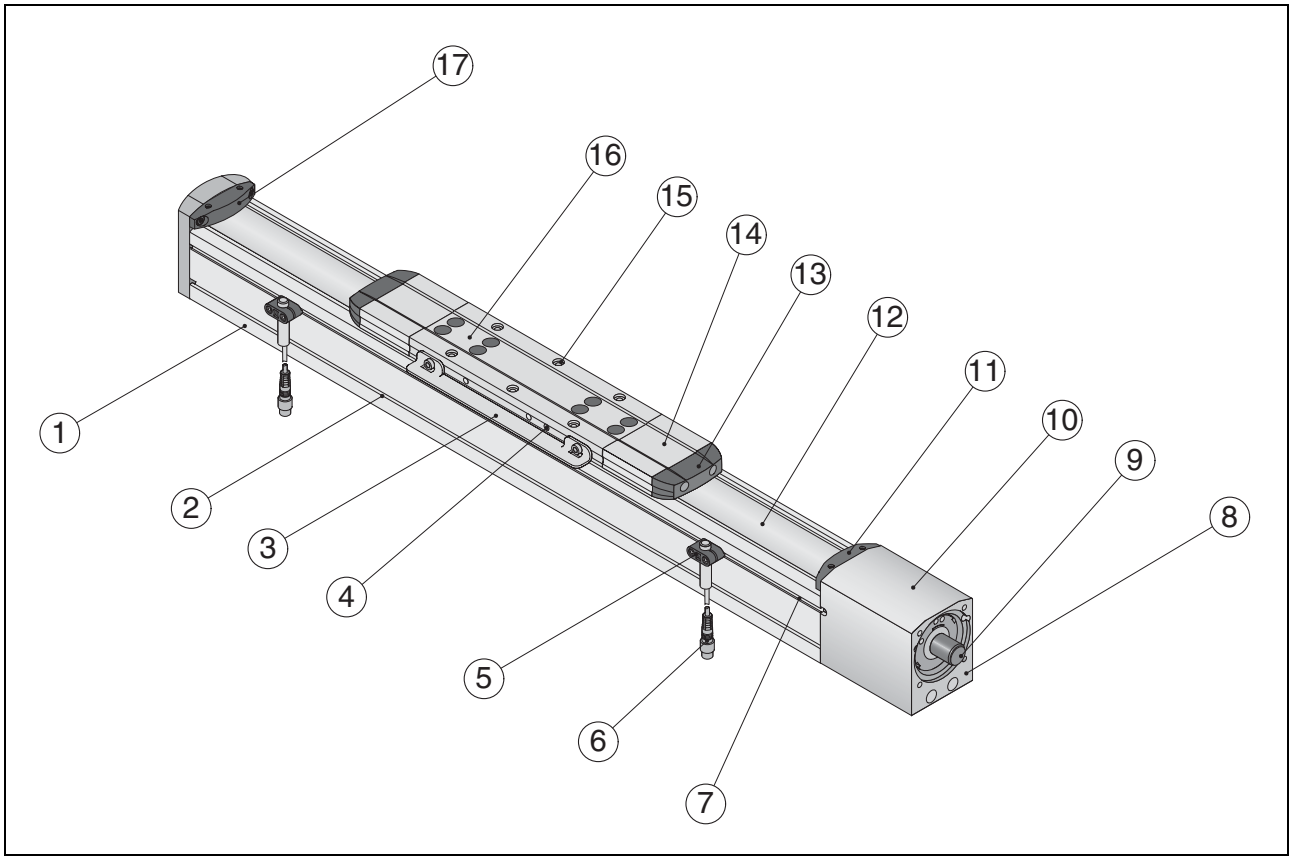
Guide types

Ballscrew axis with ball guide	Toothed-belt axis with roller guide	Toothed-belt axis with ball guide
		

Ballscrew axes

Product Description

Structure



Components of a ballscrew axis

(1) Axis body
(2) T-slot fastening
(3) Sensor damper plate
(4) Lubrication nipple
(5) Sensor retainer
(6) Sensor with connector cable
(7) T-slot for fastening the sensor retainer
(8) Flange for drive mount
(9) Drive shaft
(10) Drive block
(11) Metal cover strip fastening
(12) Metal cover strip
(13) Buffer
(14) Metal cover strip deflector
(15) Threaded holes for mounting the load
(16) Carriage
(17) End block with ballscrew bearing

Introduction

The ballscrew axes are based on specially developed and particularly distortion-resistant aluminium sections. A special feature is their ability to position heavy loads with a ballscrew drive and ball guides accurately and repeatedly with high feed force.

The ballscrew axes can be fitted with up to three carriages for moving large loads and higher torques. A support axis running parallel can also be installed by the customer.

Features and options

- High positioning accuracy
- High feed force
- High stiffness
- User-friendly structure
  - Easy system integration with section technology (ITEM-compatible T-section slots)
  - Carriage with holes and locating dowels for easy load mounting
  - Lubrication at lubrication nipples on both carriage sides
  - Easy motor attachment with quick-coupling system
  - Stroke length available with millimetre accuracy
  - Sensors can be moved anywhere in T-section slots
- Many options:
  - Various ballscrew pitches
  - Cover strip
  - Sensor limit switches in various designs
  - Carriage (type, number, distance)
  - Ballscrew support running parallel (ballscrew stabilisation at high speeds and strokes)

Property-related application examples

- Accurate and backlash-free advance movements, even under variable loads and torques, for cutting, separating, labelling and precise positioning of loads in workstations
- High feed forces for joining, cutting and machining processes
- Exact and repeatable positioning of parts, vision and measurement systems

Product offer

Size		**2**	**3**	**4**
Type designation		**PAS42SB**	**PAS43SB**	**PAS44SB**
Type of guide		Ball guide		
Typical payload [1)]	kg	24	60	100
Max. feed force	N	2070	2360	3950
Max. speed	m/s	0.80	1.00	1.25
Max. acceleration	m/s^2	10	10	10
Max. stroke length	mm	1500	3000	3000
Repeat accuracy	mm	±0.02	±0.02	±0.02
Section cross-section	mm x mm	60 x 60	80 x 80	110 x 110
Ballscrew diameter	mm	16	20	25
Ballscrew pitch	mm/rev	5 / 10 / 16	5 / 10 / 20	5 / 10 / 25

[1)] The typical payload is the load for which the axis is normally used. This payload may be considerably exceeded if the corresponding prerequisites are given or considered. Refer to the influence of the forces and torques on the service life of the axis in km in the section Technical data, Calculations, Calculation of service life.

Motors and drives

We offer complete solutions from our comprehensive range of products comprising: axis, motor, gearing, drive and motion controller.
Depending on the requirements for forces, torques and dynamic response for the application, the ballscrew axes are fitted with Berger Lahr three-phase stepper motors, AC servomotors or compact drives. Other motors are also available as specified by the customer.

The following table shows the standard motorisation recommended by Berger Lahr.

Recommended motors and drives			Ballscrew axes		
Type	**Size**	**Max. torque (Nm)**	**PAS42SB**	**PAS43SB**	**PAS44SB**
VRDM three-phase stepper motors	VRDM 366	0.9	x		
	VRDM 368	1.5	x		
	VRDM 397	2	x	x	x
	VRDM 3910	4	x	x	x
	VRDM 3913	6	x	x	x
	VRDM 31117	12	x	x	x
	VRDM 31122	16.5	x	x	x
Intelligent compact drives IcIA IFS/IDS with stepper motors	I•S 62	0.9	x		
	I•S 63	1.5	x		
	I•S 91	2	x	x	x
	I•S 92	4	x	x	x
	I•S 93	6	x	x	x
Intelligent compact drives IcIA IFE with brushless DC motors (with gearing)	IFE71 V-018	3.5	x		
	IFE71 V-038	6	x		
	IFE71 V-054	10	x		
	IFE71 V-115	14	x		
SER servomotors	SER 3610	3.6	x		
	SER 397	4	x	x	
	SER 3910	8	x	x	
	SER 3913	11.5	x	x	x
	SER 3916	14.5	x	x	x
	SER 31112	16.8		x	x
	SER 31117	25		x	x
	SER 31122	38		x	x
	SER 31127	48		x	x
RIG servomotors I = 4:1	RIG 379	15.5	x	x	x
	RIG 3910	22	x	x	x
	RIG 3913	22	x	x	x
	RIG 31112	70			x
	RIG 31117	76			x
	RIG 31122	76			x
BSH servomotors	BSH 0701	3.5	x		
	BSH 0702	7.6	x		
	BSH 0703	11.3	x		
	BSH 1001	9.6	x	x	x
	BSH 1002	18.3	x	x	x
	BSH 1003	28.3	x	x	x
	BSH 1004	40.5		x	x
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	5	x		
	PLE 60 / WPLE 60	15	x	x	x
	PLE 80 / WPLE 80	50		x	x
	PLS 70	110	x	x	x
	PLS 90	220		x	x

Motors and gearings

Depending on the requirements, different gearings can be attached to the Berger Lahr motors.

The following table shows the standard motor-gearing combinations recommended by Berger Lahr:

Recommended motors and gearings							
Type	**Size**	**PLE 40 / WPLE 40**	**PLE 60 / WPLE 60**	**PLE 80 / WPLE 80**	**PLE 120 / WPLE 120**	**PLE 70**	**PLE 90**
VRDM three-phase stepper motors	VRDM 366	x	x			x	
	VRDM 368	x	x			x	
	VRDM 397			x			x
	VRDM 3910			x			x
	VRDM 3913			x			x
	VRDM 31117			x	x		x
	VRDM 31122			x	x		x
Intelligent compact drives IclA IFS/IDS with stepper motors	I•S 62	x	x			x	
	I•S 63	x	x			x	
	I•S 91			x			x
	I•S 92			x			x
	I•S 93			x			x
SER servomotors	SER 3610	x	x	x		x	
	SER 397	x	x	x		x	
	SER 3910		x	x		x	x
	SER 3913		x	x		x	x
	SER 3916		x	x		x	x
	SER 31112			x	x		x
	SER 31117			x	x		x
	SER 31122			x	x		x
	SER 31127			x	x		x
BSH servomotors	BSH 070•		x	x	x		
	BSH 100•			x	x		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For detailed information on the various motors and drives see the catalogues below:

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS42S

Technical Data

Ballscrew pitch	**mm**	**5**	**10**	**16**
Type designation		PAS42SB		
Guide type		Ball guide SHS 15		
Typical payload	kg	24		
Max. stroke length [1) 2)]	mm	1500		
Min. stroke length [3)]	mm	9		
Max. speed [4)]	m/s	0.25	0.50	0.80
Max. acceleration[4)]	m/s^2	10		
Max. drive force Fx [5)]	N	2070	1365	1775
Max. force Fy_{dynmax} [5)]	N	3535		
Max. force Fz_{dynmax} [5)]	N	3535		
Load ratings guide system C_0/C_{dyn}	N	24200 / 14200		
Max. torque Mx_{dynmax} [5)]	Nm	24		
Max. initialising driving torque M_{max} [5)]	Nm	2.20	2.80	4.90
No-load torque 0-stroke axis (without carriage) [6)]	Nm	0.40		
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	1.05		
Moment of inertia per m stroke	$kgcm^2/m$	0.35	0.45	0.50
Moment of inertia per kg payload	$kgcm^2/kg$	0.006	0.025	0.065
Moment of inertia of motor attachment	$kgcm^2$	0.3		
Mass 0-stroke axis (without carriage)	kg	1.80		
Mass of stroke per m stroke (incl. ballscrew and profile)	kg/m	6.9		
Mass of motor attachment	kg	0.55		
Repeat accuracy[4)]	mm	±0.02		
Internal diameter of clutch	mm	6 ... 20		
External diameter of driveshaft	mm	16 g6		
Profile cross section (W x H)	mm	60 x 60		
Axial planar moment of inertia ly/lz	mm^4	461963 / 598338		
Elasticity module (aluminium)	N/mm^2	0.72×10^5		
Max. ambient temperature	°C	0 ... 50		
Ballscrew				
Ballscrew diameter	mm	16		
Ballscrew accuracy		P7 in accordance with DIN 69051 Part 3		
Max. ballscrew speed	1/min	3000		
Ballscrew axial play	mm	0.04		

Carriage		**Type 1**			**Type 4**		
Ballscrew pitch		**5**	**10**	**16**	**5**	**10**	**16**
Max. torque of carriage My_{dynmax} [5)]	Nm	265			585		
Max. torque of carriage Mz_{dynmax} [5)]	Nm	265			585		
No-load torque of carriage[6)]	Nm	0.01	0.02	0.04	0.01	0.02	0.04
Moment of inertia of carriage with/without strip redirection (incl. ballscrew component)	$kgcm^2$	0.15 / 0,10	0.20 / 0.15	0.25 / 0.20	0.25 / 0,20	0.30 / 0.25	0.35 / 0.30
Mass of carriage with/without stripstrip redirection (incl. ballscrew and profile component)	kg	3.7 / 3,0			5.4 / 4.7		
Moving mass of carriage with/without strip redirection	kg	1.4 / 1.3			1.9 / 1.8		
Max. stroke length with/without cover stripstrip [7)]	mm	1785 / 1880			1605 / 1700		

1) Greater stroke length on request

2) Carriage-dependent

3) Guaranteed lubrication of guide and drive elements, shorter stroke length on request

4) Load and stroke-dependent

5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page

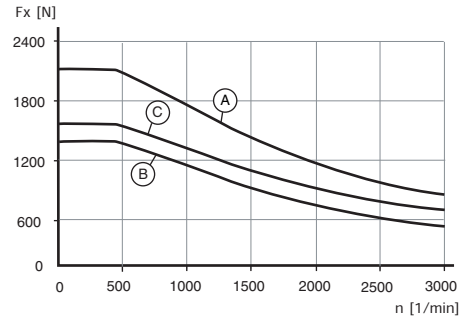
6) Measured at 0.1 m/s

7) Stroke greater than 1500 mm with reduced ballscrew speed is available on request

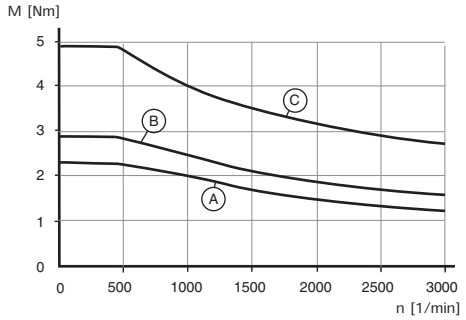
Note: The listed torques and forces are based on an operational life of 15000 km.

Characteristic curves

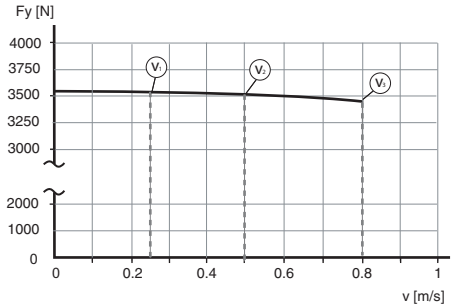
Max. feed force Fx



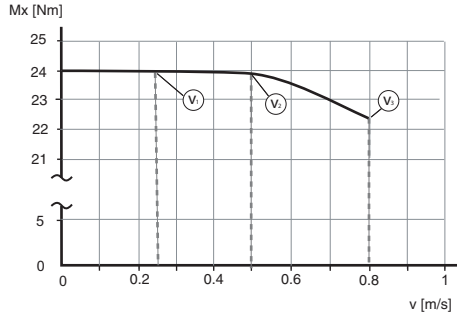
Max. driving torque M_{max}



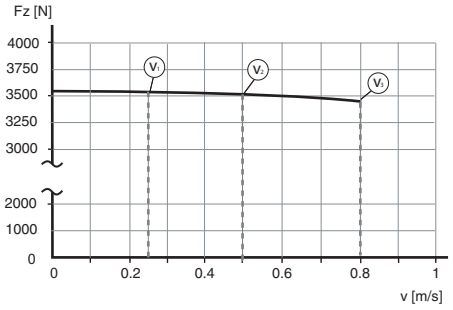
Max. force Fy_{dynmax}



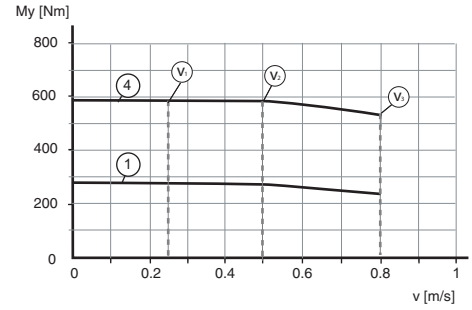
Max. torque Mx_{dynmax}



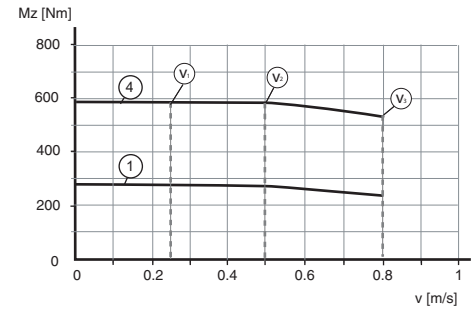
Max. force Fz_{dynmax}



Max. torque My_{dynmax}



Max. torque Mz_{dynmax}

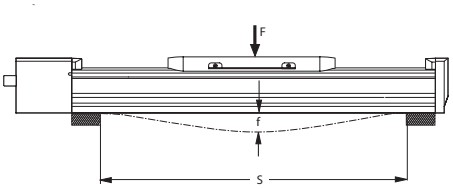


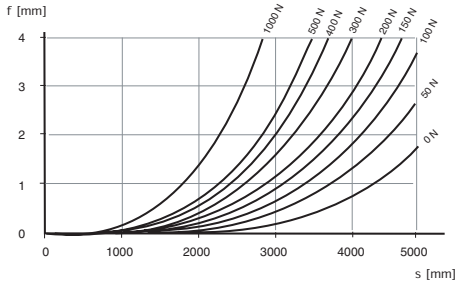
(1) Carriage type 1
(4) Carriage type 4
(A) Ballscrew pitch 5 mm
(B) Ballscrew pitch 10 mm
(C) Ballscrew pitch 16 mm

(v_1) Max. speed for ballscrew pitch 5 mm
(v_2) Max. speed for ballscrew pitch 10 mm
(v_3) Max. speed for ballscrew pitch 16 mm

Deflection

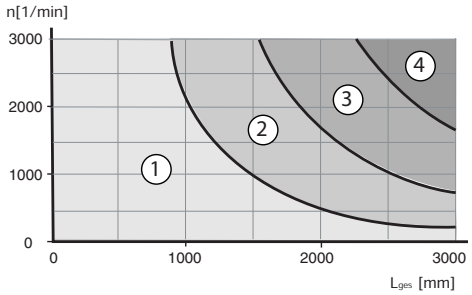
In order to limit deflection of the linear axis with long strokes, the axis must have additional support.
The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.





Ballscrew critical speed

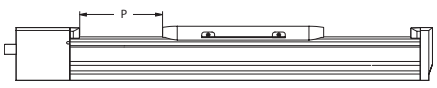
Up to two optional, sliding ballscrew supports can be integrated in PAS ballscrew axes. This allows for high ballscrew speeds even with large strokes.
The diagram shows the permissible working strokes with respect to the total axis length and the ballscrew speed with and without sliding ballscrew supports.

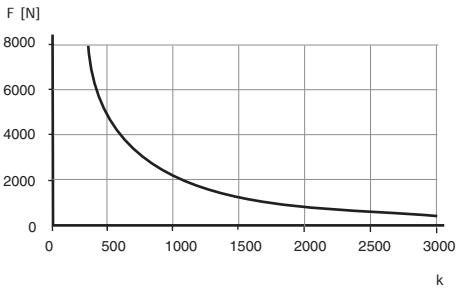


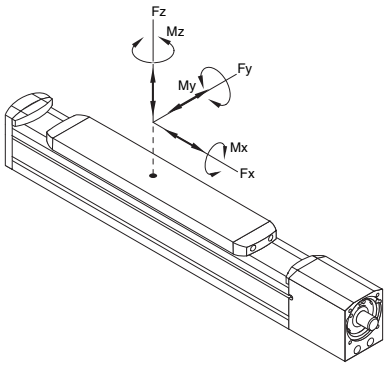
(1) without ballscrew support
(2) one ballscrew support
(3) two ballscrew supports
(4) working stroke not permissible

Buckling load

Another limiting factor to be considered in ballscrew axis applications is the buckling load of the ballscrew to pressure loads.
The diagram shows the permissible buckling load F (N) with respect to the carriage position P (mm).







Calculations

Calculation of service life

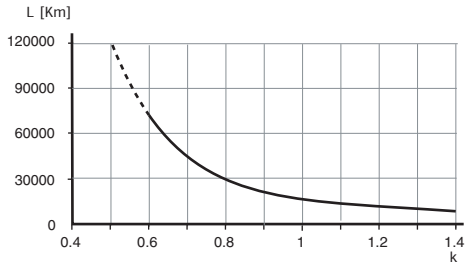
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speed. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••SB (ball guide)



No-load torque of ballscrew axis [Nm]

	No-load torque 0-stroke axis (without carriage)	0.40
+	No-load torque per carriage x number of carriages	
=	**No-load torque of ballscrew axis**	

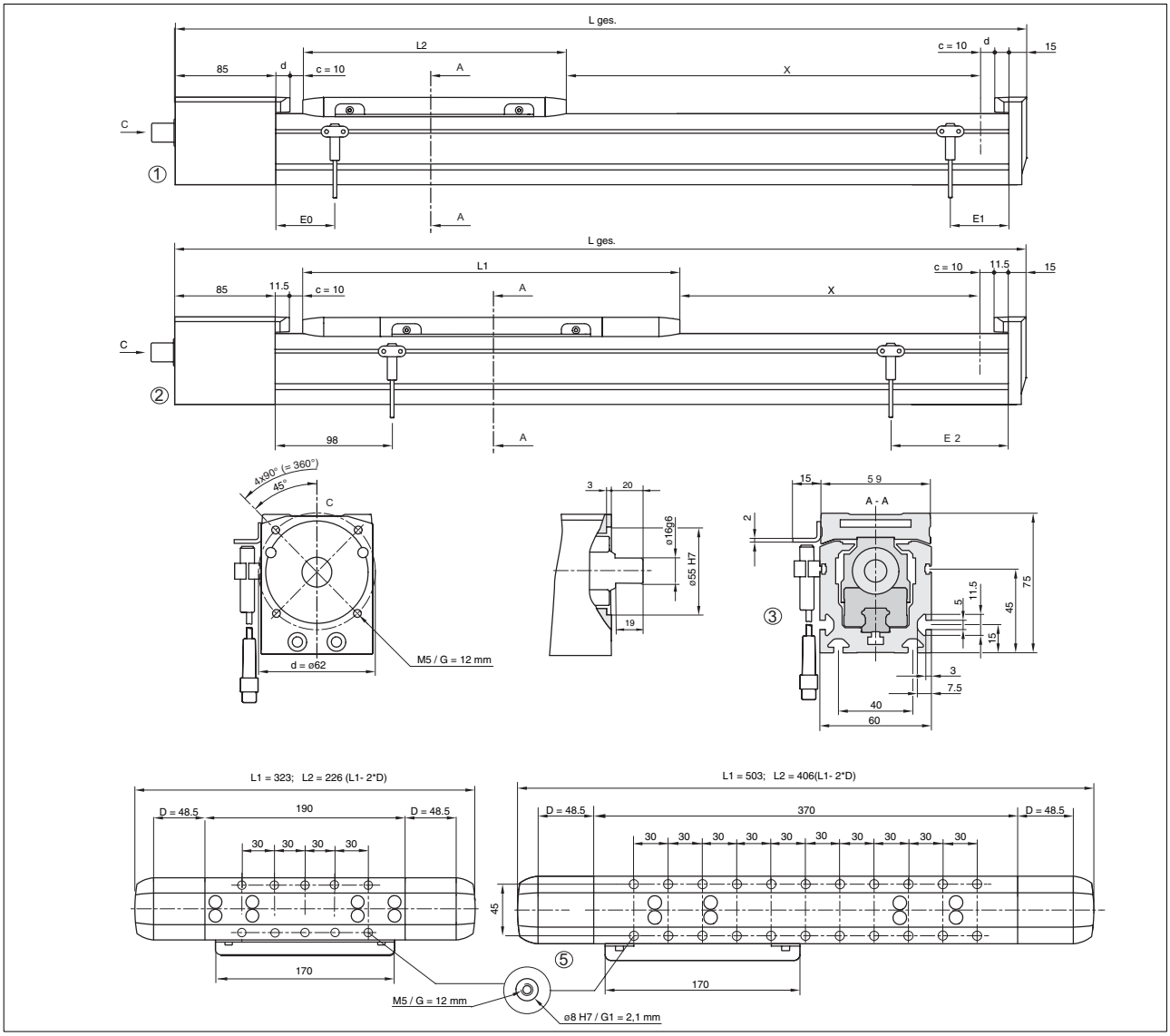
Total moment of inertia of ballscrew axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis	1.05
+	Moment of inertia m stroke x m stroke	
+	Moment of inertia per kg payload x kg payload	
+	Moment of inertia motor attachment	0.3
+	Moment of inertia per carriage with/without cover strip x number of carriages	
=	**Total moment of inertia of ballscrew axis without drive**	

Total mass of ballscrew axis [kg]

	Mass of 0-stroke axis		1.80
+	Mass per m stroke x m stroke	(6.90 kg/m)	
+	Mass motor attachment		0.55
+	Mass per carriage (with/without strip diverter) x number of carriages		
+	Mass of motor/gearing (see motor catalogue)		
+	Mass of payload		
=	**Total mass of ballscrew axis**		

Dimensional drawings

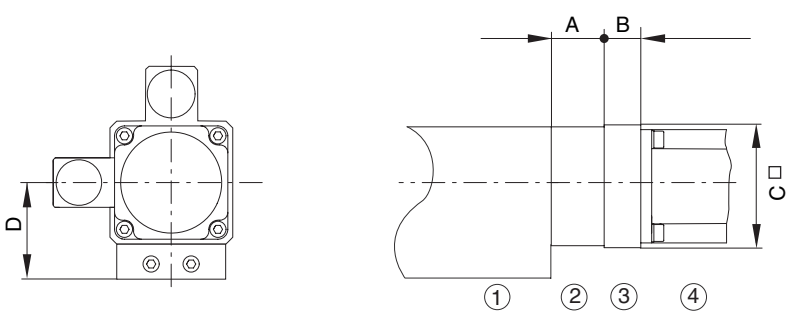


Dimensional drawing PAS 42S

(1) Axis without cover strip	Lges	Without cover strip without ballscrew support = 143 + L2 + X (add L2 + m for each additional carriage)			
(2) Axis with cover strip		one ballscrew support = 173 + L2 + X (add L2 + m for each additional carriage)			
(3) Cross section		two ballscrew supports = 203 + L2 + X (add L2 + m for each additional carriage)			
(4) Carriage type 1		With cover strip 0,1,2 ballscrew supports =143 + L1 + X (add L1 + m for each additional carriage)			
(5) Carriage type 4	L1	Carriage length with cover strip			
	L2	Carriage length without cover strip			
	X	Working stroke			
	m [1]	Minimum distance between two carriages:	without cover strip 35 mm	with cover strip 90 mm	
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.			
	D	Cover strip turning block			
	d		without cover strip 11.5 mm	one ballscrew support 26.5 mm	two ballscrew supports 41.5 mm
	E0	Carriage type 1/4:	without ballscrew support 50 mm	one ballscrew support 65 mm	two ballscrew supports 80 mm
	E1	Carriage type 1:	without ballscrew support 50 mm	one ballscrew support 65.0 mm	two ballscrew supports 80 mm
		Carriage type 4:	without ballscrew support 230 mm	one ballscrew support 245.0 mm	two ballscrew supports 260 mm
(G) Thread depth (G1) Countersink depth	E2	Carriage type 1: Carriage type 4:	support-independent 98 mm support-independent 278 mm		

[1] Maximum of two carriages of the same type on request

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: The motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length			
			A	B	C	D
		mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 366	8	36	19	62	44
	VRDM 368					
	VRDM 397	12		26	85	
	VRDM 3910					
	VRDM 3913	14				
	VRDM 31117	19		38	110	
	VRDM 31122					
Intelligent compact drives IclA IDS/IFS with stepper motor	I•S 62	6.35		19	62	
	I•S 63	8				
	I•S 91	12		26	85	
	I•S 92					
	I•S 93	14				
Intelligent compact drives IclA IFE with brushless DC motors (with gearing)	IFE71 V-018	10		21	76/66	
	IFE71 V-038					
	IFE71 V-054					
	IFE71 V-115					
SER servomotors	SER 3610	9		19	62	
	SER 397	14		26	85	
	SER 3910					
	SER 3913					
	SER 3916					
RIG servomotorsl =4:1	RIG 397	20		38		
	RIG 3910					
	RIG 3913					
BSH servomotors	BSH 0701	11		19	62	
	BSH 0702					
	BSH 0703	14				
	BSH 1001	19		38	110	
	BSH 1002					
	BSH 1003					
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	10		29.5	62	
	PLE 60 / WPLE 60	14		30.5		
	PLS 70	19		29	70	

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS43S

Technical Data

Ballscrew pitch	**mm**	**5**	**10**	**20**
Type designation		PAS43SB		
Guide type		Ball guide SHS 20		
Typical payload	kg	60		
Max. stroke length [1) 2)]	mm	3000		
Min. stroke length [3)]	mm	11		
Max. speed [4)]	m/s	0.25	0.50	1.00
Max. acceleration[4)]	m/s^2	10		
Max. drive force Fx [5)]	N	2360	2360	1895
Max. force Fy_{dynmax} [5)]	N	5550		
Max. force Fz_{dynmax} [5)]	N	5550		
Load ratings guide system C_0/C_{dyn}	N	38400 / 22300		
Max. torque Mx_{dynmax} [5)]	Nm	52		
Max. initialising driving torque M_{max} [5)]	Nm	2.7	4.6	7.3
No-load torque 0-stroke axis (without carriage) [6)]	Nm	0.60		
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	2.30		
Moment of inertia per m stroke	$kgcm^2/m$	0.95	1.10	1.15
Moment of inertia per kg payload	$kgcm^2/kg$	0.006	0.025	0.101
Moment of inertia of motor attachment	$kgcm^2$	1.15		
Mass 0-stroke axis (without carriage)	kg	3.35		
Mass of stroke per m stroke (incl. ballscrew and profile)	kg/m	11.7		
Mass of motor attachment	kg	1.10		
Repeat accuracy[4)]	mm	±0.02		
Internal diameter of clutch	mm	9 ... 30		
External diameter of driveshaft	mm	20 g6		
Profile cross section (W x H)	mm	80 x 80		
Axial planar moment of inertia ly/lz	mm^4	1480068 / 1851166		
Elasticity module (aluminium)	N/mm^2	0.72×10^5		
Max. ambient temperature	°C	0 ... 50		
Ballscrew				
Ballscrew diameter	mm	20		
Ballscrew accuracy		P7 in accordance with DIN 69051 Part 3		
Max. ballscrew speed	1/min	3000		
Ballscrew axial play	mm	0.04		

Carriage		**Type 1**			**Type 4**		
Ballscrew pitch		**5**	**10**	**20**	**5**	**10**	**20**
Max. torque of carriage My_{dynmax} [5)]	Nm	485			1070		
Max. torque of carriage Mz_{dynmax} [5)]	Nm	485			1070		
No-load torque of carriage[6)]	Nm	0.01	0.05	0.10	0.01	0.05	0.10
Moment of inertia of carriage with/without strip redirection (incl. ballscrew component)	$kgcm^2$	0.50 / 0.35	0.5 / 0.40	0.75 / 0.55	0.7 / 0.6	0.8 / 0.65	1.10 / 0.90
Mass of carriage with/without strip redirection (incl. ballscrew and profile component)	kg	7.5 / 6.1			11 / 10		
Moving mass of carriage with/without strip redirection	kg	3 / 2.6			3.75 / 3.50		
Max. total stroke with/without cover strip [7)]	mm	3070 / 3190			2860 / 2980		

1) Greater stroke length on request

2) Carriage-dependent

3) Guaranteed lubrication of guide and drive elements, shorter stroke length on request

4) Load and stroke-dependent

5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page

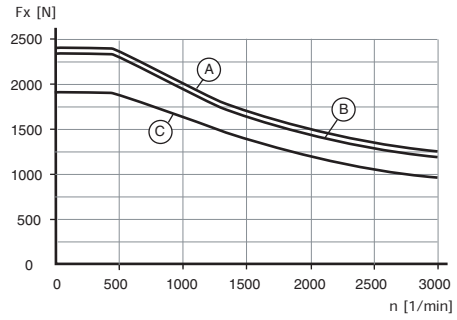
6) Measured at 0.1 m/s

7) Stroke greater than 3000 mm with reduced ballscrew speed is available on request

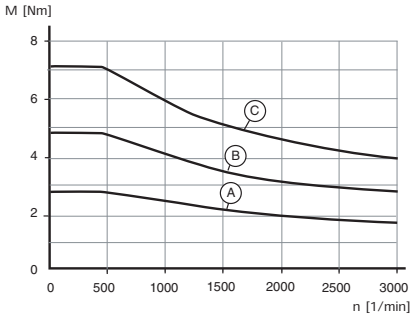
Note: The listed torques and forces are based on an operational life of 15000 km.

Characteristic curves

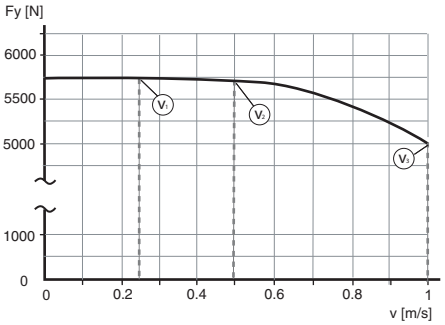
Max. feed force Fx



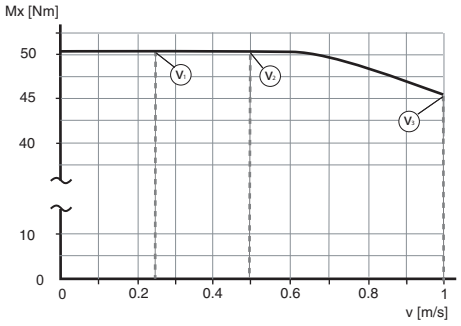
Max. driving torque M_{max}



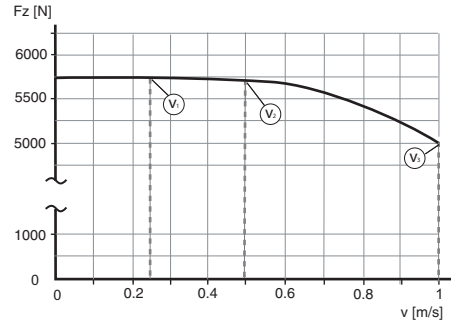
Max. force Fy_{dynmax}



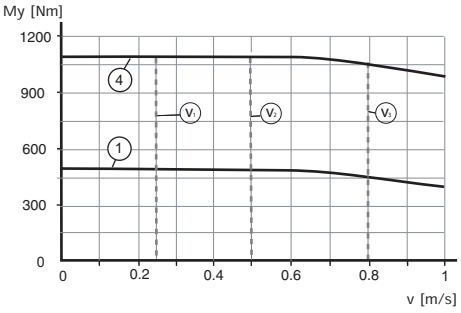
Max. torque Mx_{dynmax}



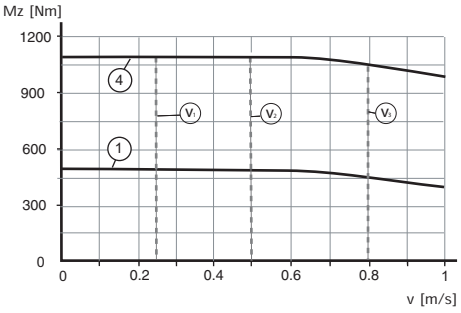
Max. force Fz_{dynmax}



Max. torque My_{dynmax}



Max. torque Mz_{dynmax}

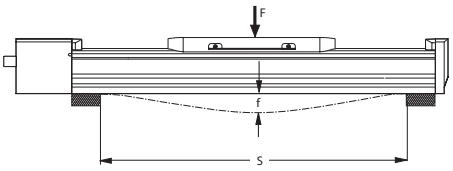


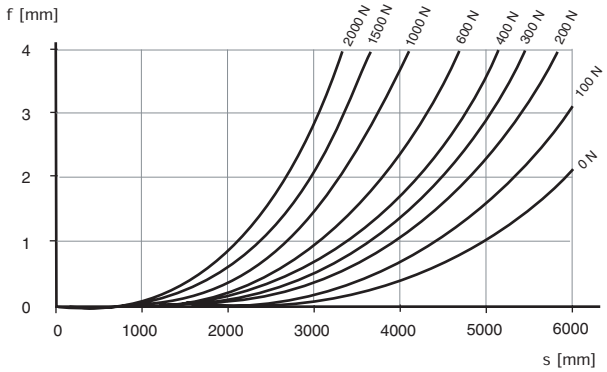
(1) Carriage type 1
(4) Carriage type 4
(A) Ballscrew pitch 5 mm
(B) Ballscrew pitch 10 mm
(C) Ballscrew pitch 20 mm

(v_1) Max. speed for ballscrew pitch 5 mm
(v_2) Max. speed for ballscrew pitch 10 mm
(v_3) Max. speed for ballscrew pitch 20 mm

Deflection

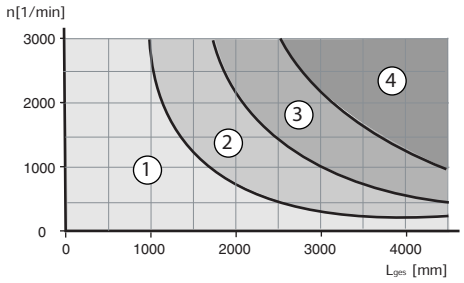
In order to limit deflection of the linear axis with long strokes, the axis must have additional support.
The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.





Ballscrew critical speed

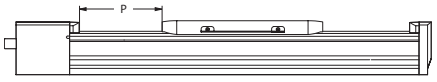
Up to two optional, sliding ballscrew supports can be integrated in PAS ballscrew axes. This allows for high ballscrew speeds even with large strokes.
The diagram shows the permissible work strokes with respect to the total axis length and the ballscrew speed with and without sliding ballscrew supports.

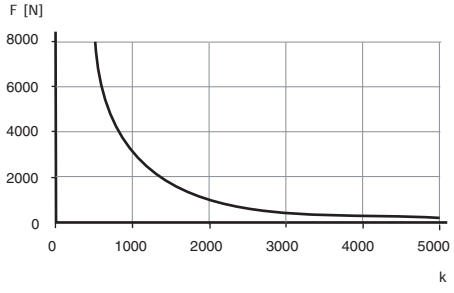


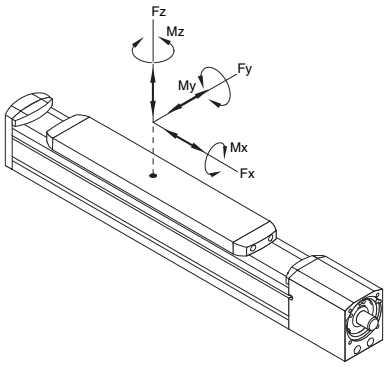
(1) without ballscrew support
(2) one ballscrew support
(3) two ballscrew supports
(4) working stroke not permissible

Buckling load

Another limiting factor to be considered in ballscrew axis applications is the Buckling load of the ballscrew to pressure loads.
The diagram shows the permissible buckling load F (N) with respect to the carriage position P (mm).







Calculations

Calculation of service life

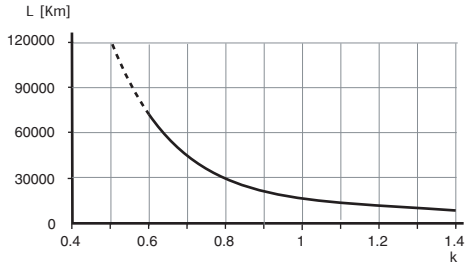
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speed. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••SB (ball guide)



No-load torque of ballscrew axis [Nm]

	No-load torque 0-stroke axis (without carriage)	0.60
+	No-load torque per carriage x number of carriages	
=	**No-load torque of ballscrew axis**	

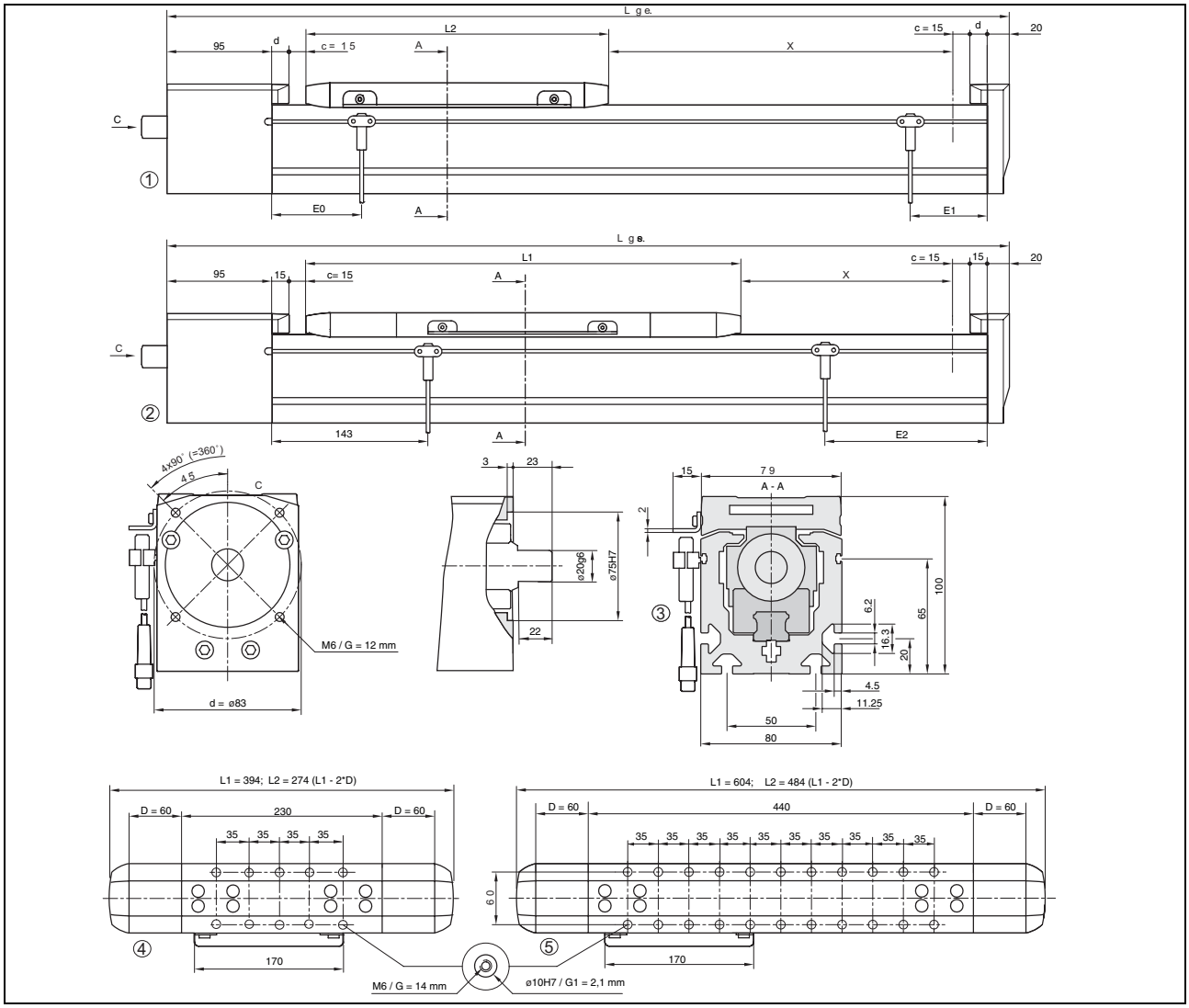
Total moment of inertia of ballscrew axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis (without carriage)	2.30
+	Moment of inertia m stroke x m stroke	
+	Moment of inertia per kg payload x kg payload	
+	Moment of inertia motor attachment	1.15
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages	
=	**Total moment of inertia of ballscrew axis without drive**	

Total mass of ballscrew axis [kg]

	Mass of 0-stroke axis		3.35
+	Mass per m stroke x m stroke	(11.7 kg/m)	
+	Mass motor attachment		1.10
+	Mass per carriage (with/without strip diversion) x number of carriages		
+	Mass of motor/gearing (see motor catalogue)		
+	Mass of payload		
=	**Total mass of ballscrew axis**		

Dimensional drawings

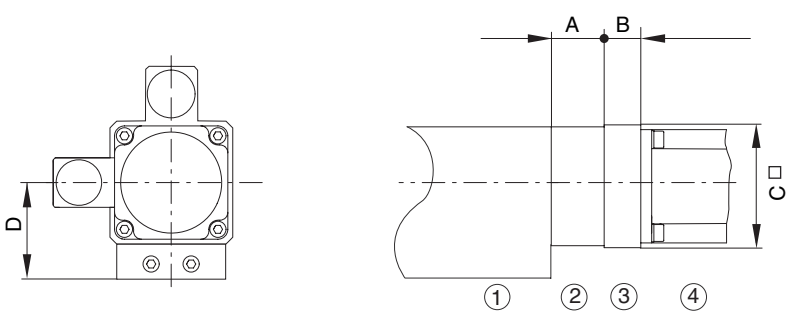


Dimensional drawing PAS 43 S

(1) Axis without cover strip	Lges	Without cover strip	without ballscrew support	= 175 + L2 + X (add L2 + m for each additional carriage)	
(2) Axis with cover strip			one ballscrew support	= 205 + L2 + X (add L2 + m for each additional carriage)	
(3) Cross section			two ballscrew supports	= 245 + L2 + X (add L2 + m for each additional carriage)	
(4) Carriage type 1		With cover strip	0, 1, 2 two ballscrew supports	= 175 + L1 + X (add L1 + m for each additional carriage)	
(5) Carriage type 4	L1	Carriage length with cover strip			
	L2	Carriage length without cover strip			
	X	Working stroke			
	m [1)]	Minimum distance between two carriages:		without cover strip 35 mm	with cover strip 90 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.			
	D	Cover strip turning block			
	d		without ballscrew support 15 mm	one ballscrew support 35 mm	two ballscrew supports 55 mm
	E0	Carriage type 1/4:	without ballscrew support 83 mm	one ballscrew support 103 mm	two ballscrew supports 123 mm
	E1	Carriage type 1:	without ballscrew support 83 mm	one ballscrew support 103 mm	two ballscrew supports 123 mm
		Carriage type 4:	without ballscrew support 293 mm	one ballscrew support 313 mm	two ballscrew supports 330 mm
(G) Thread depth	E2	Carriage type 1:	support-independent 143 mm		
(G1) Countersink depth		Carriage type 4:	support-independent 353 mm		

[1)] Maximum of two carriages of the same type on request

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length			
			A	B	C	D
		mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 397	12	42.5	21	85	60
	VRDM 3910					
	VRDM 3913	14				
	VRDM 31117	19		26	110	
	VRDM 31122					
Intelligent compact drives IclA IDS/IFS with stepper motor	I•S 91	12		21	85	
	I•S 92					
	I•S 93	14				
SER servomotors	SER 397					
	SER 3910					
	SER 3913					
	SER 3916					
	SER 31112	19		26	110	
	SER 31117					
	SER 31122					
	SER 31127					
RIG servomotors I = 4:1	RIG 397	20		31	85	
	RIG 3910					
	RIG 3913					
BSH servomotors	BSH 1001	19		26	110	
	BSH 1002					
	BSH 1003					
	BSH 1004	24		40		
Planetary gears, single-stage (Neugart)	PLE 60 / WPLE 60	14		30.5	85	
	PLE 80 / WPLE 80	20		33		
	PLS 70	19		21		
	PLS 90	22		31		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS44S

Technical Data

Ballscrew pitch	**mm**	**5**	**10**	**25**
Type designation		PAS44SB		
Guide type		Ball guide SHS 25		
Typical payload	kg	100		
Max. stroke length [1) 2)]	mm	3000		
Min. stroke length [3)]	mm	13		
Max. speed [4)]	m/s	0.25	0.50	1.25
Max. acceleration	m/s^2	10		
Max. drive force Fx [5)]	N	2565	3950	3560
Max. force Fy_{dynmax} [5)]	N	7890		
Max. force Fz_{dynmax} [5)]	N	7890		
Load ratings guide system C_0/C_{dyn}	N	52400 / 31700		
Max. torque Mx_{dynmax} [5)]	Nm	85		
Max. initialising driving torque M_{max}	Nm	3.1	7.8	16.5
No-load torque 0-stroke axis (without carriage) [6)]	Nm	0.80		
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	5.65		
Moment of inertia per m stroke	$kgcm^2/m$	2.00	2.30	2.40
Moment of inertia per kg payload	$kgcm^2/kg$	0.006	0.025	0.158
Moment of inertia of motor attachment	$kgcm^2$	2.44		
Mass 0-stroke axis (without carriage)	kg	7.40		
Mass of stroke per m stroke (incl. ballscrew and profile)	kg/m	19		
Mass of motor attachment	kg	2.50		
Repeat accuracy [4)]	mm	±0.02		
Internal diameter of clutch	mm	12 ... 25		
External diameter of driveshaft	mm	25 g6		
Profile cross section (W x H)	mm	110 x 110		
Axial planar moment of inertia ly/lz	mm^4	5024548 / 6354771		
Elasticity module (aluminium)	N/mm^2	0.72×10^5		
Max. ambient temperature	°C	0 ... 50		
Ballscrew				
Ballscrew diameter	mm	24		
Ballscrew accuracy		P7 in accordance with DIN 69051 Part 3		
Max. ballscrew speed	1/min	3000		
Ballscrew axial play	mm	0.04		

Carriage-dependent values		**Type 1**			**Type 4**		
Ballscrew pitch		**5**	**10**	**25**	**5**	**10**	**25**
Max. torque of carriage My_{dynmax} [5)]	Nm	820			1885		
Max. torque of carriage Mz_{dynmax} [5)]	Nm	820			1885		
No-load torque of carriage [6)]	Nm	0.03	0.06	0.14	0.03	0.06	0.14
Moment of inertia of carriage with/without strip redirection (incl. ballscrew component)	$kgcm^2$	1.2 / 0.8	1.2 / 0.9	2.1 / 1.6	1.9 / 1.5	2 / 1.6	2 / 2.5
Mass of carriage with/without strip redirection (incl. ballscrew and profile component)	kg	15 / 12			22 / 19		
Moving mass of carriage with/without strip redirection	kg	5.7 / 5,0			7.8 / 7,0		
Max. total stroke with/without cover strip [7)]	mm	2950 / 3110			2680 / 2840		

1) Greater stroke length on request

2) Carriage-dependent

3) Guaranteed lubrication of guide and drive elements, shorter stroke length on request

4) Load and stroke-dependent

5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page

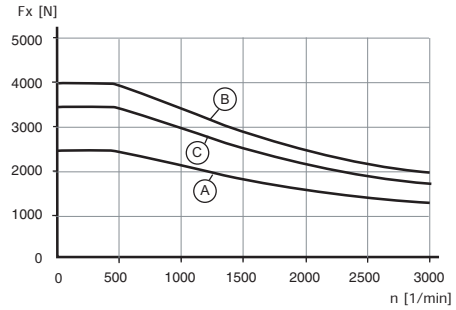
6) Measured at 0.1 m/s

7) Stroke greater than 3000 mm with reduced ballscrew speed is available on request

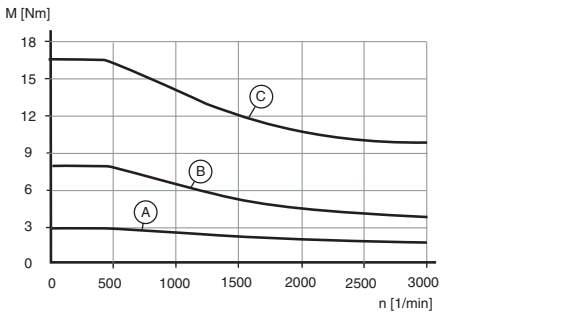
Note: The listed torques and forces are based on an operational life of 15000 km.

Characteristic curves

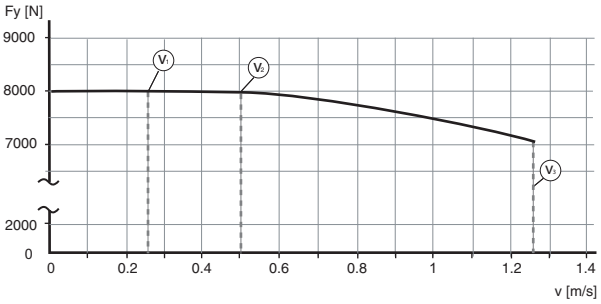
Max. feed force Fx



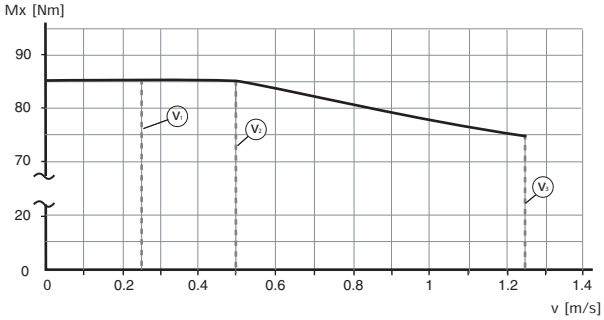
Max. driving torque M_{max}



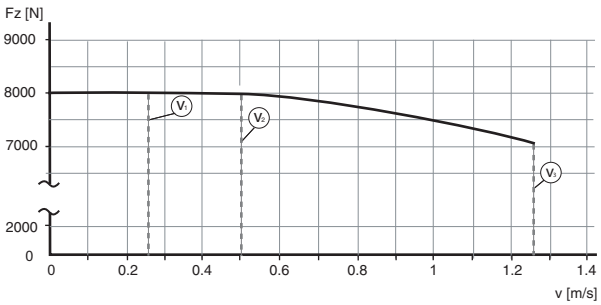
Max. force Fy_{dynmax}



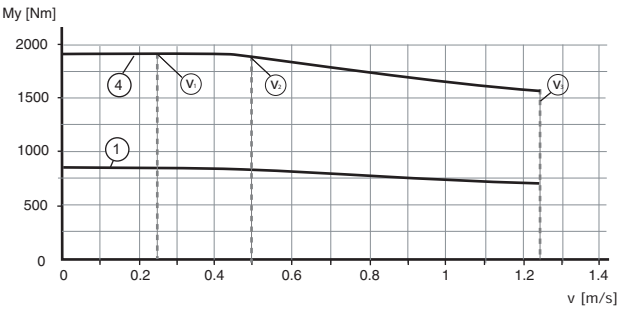
Max. torque Mx_{dynmax}



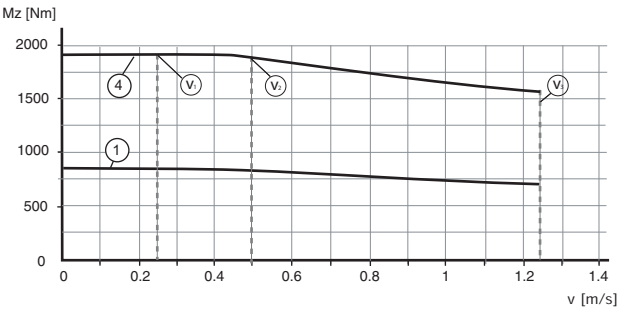
Max. force Fz_{dynmax}



Max. torque My_{dynmax}



Max. torque Mz_{dynmax}

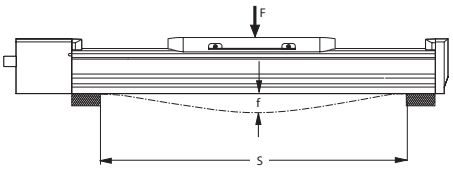


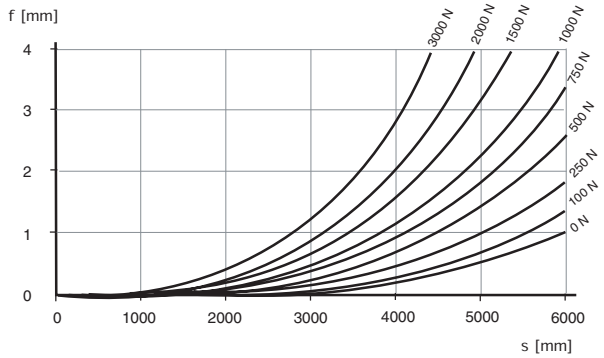
(1) Carriage type 1
(4) Carriage type 4
(A) Ballscrew pitch 5 mm
(B) Ballscrew pitch 10 mm
(C) Ballscrew pitch 25 mm

(v_1) Max. speed for ballscrew pitch 5 mm
(v_2) Max. speed for ballscrew pitch 10 mm
(v_3) Max. speed for ballscrew pitch 25 mm

Deflection

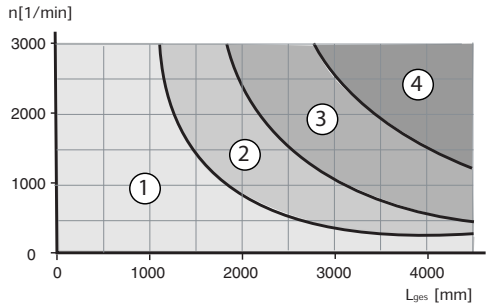
In order to limit deflection of the linear axis with long strokes, the axis must have additional support.
The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.





Ballscrew critical speed

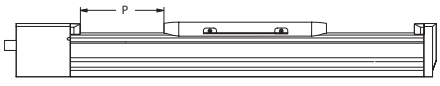
Up to two optional, sliding ballscrew supports can be integrated in PAS ballscrew axes. This allows for high ballscrew speeds even with large strokes.
The diagram shows the permissible working strokes with respect to the total axis length and the ballscrew speed with and without sliding ballscrew supports.

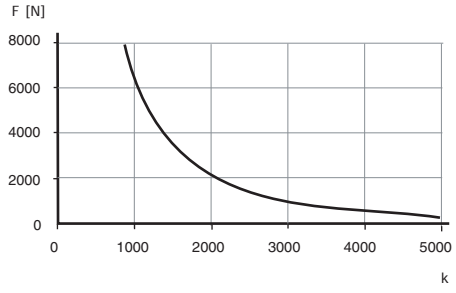


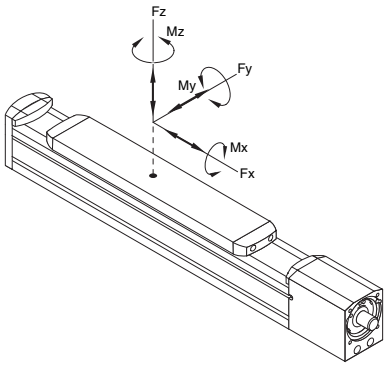
(1) without ballscrew support
(2) one ballscrew support
(3) two ballscrew supports
(4) working stroke not permissible

Buckling load

Another limiting factor to be considered in ballscrew axis applications is the buckling load of the ballscrew to pressure loads.
The diagram shows the permissible buckling load F (N) with respect to the carriage position P (mm).







Calculations

Calculation of service life

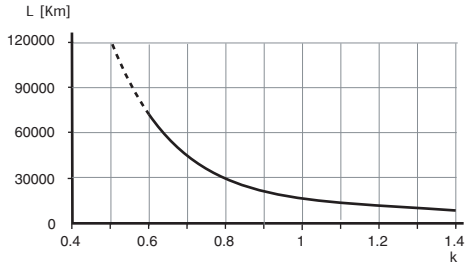
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speed. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••SB (ball guide)



No-load torque of ballscrew axis [Nm]

	No-load torque 0-stroke axis (without carriage)	0.80
+	No-load torque per carriage x number of carriages	
=	**No-load torque of ballscrew axis**	

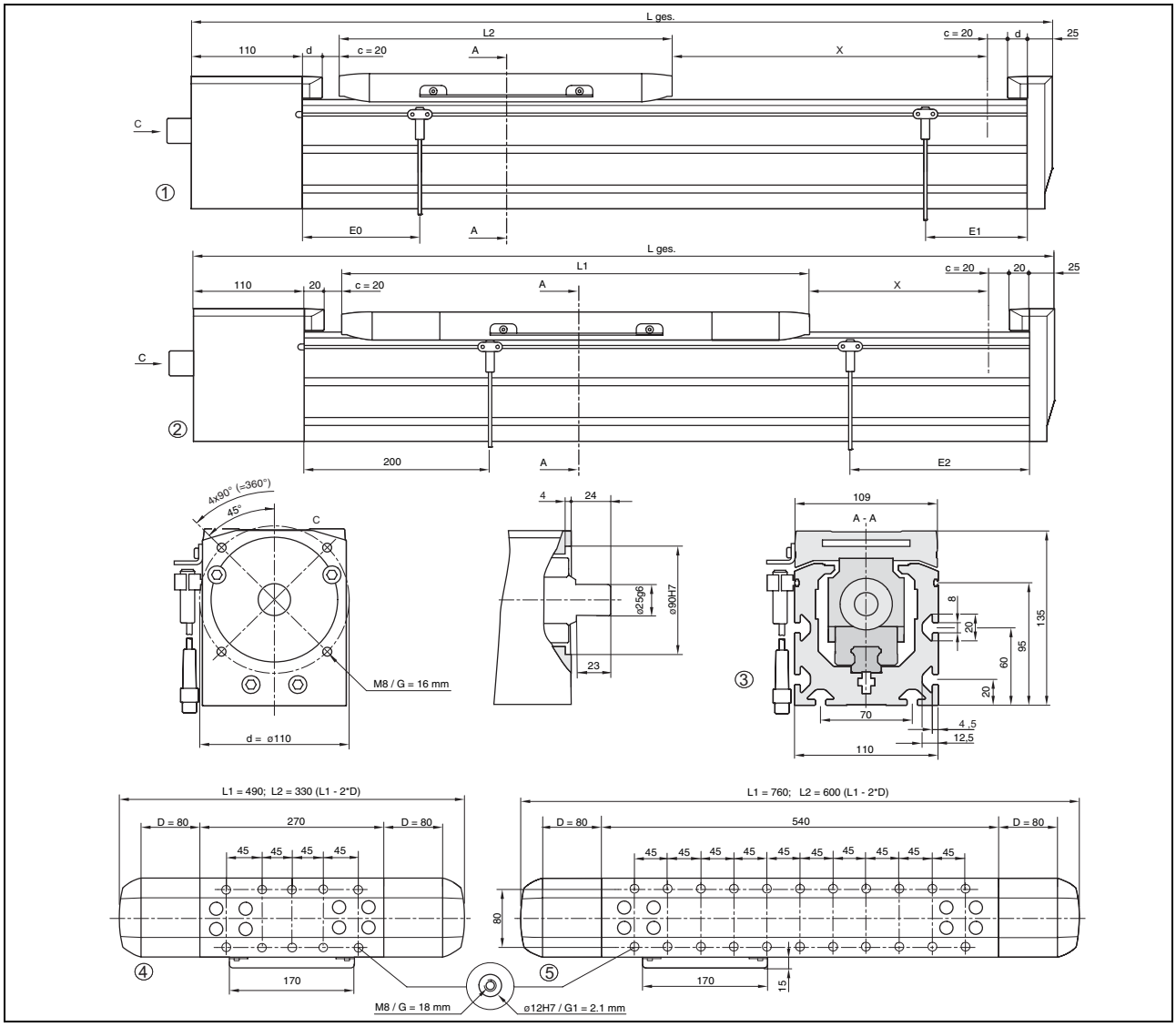
Total moment of inertia of ballscrew axis without drive [kgcm2]

	Moment of inertia of 0-stroke axis (without carriage)	5.65
+	Moment of inertia m stroke x m stroke	
+	Moment of inertia per kg payload x kg payload	
+	Moment of inertia motor attachment	2.44
+	Moment of inertia per carriage (with/without strip diversion x) number of carriages	
=	**Total moment of inertia of ballscrew axis without drive**	

Total mass of ballscrew axis [kg]

	Mass of 0-stroke axis		7.40
+	Mass per m stroke x m stroke	(19 kg/m)	
+	Mass motor attachment		2.50
+	Mass per carriage (with/without strip diversion) x number of carriages		
+	Mass of motor/gearing (see motor catalogue)		
+	Mass of payload		
=	**Total mass of ballscrew axis**		

Dimensional drawings

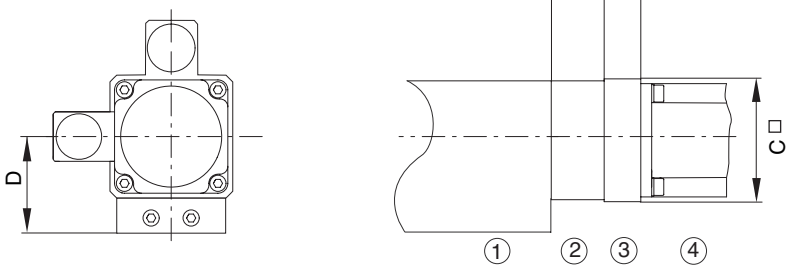


Dimensional drawing PAS44S

(1) Axis without cover strip	Lges	Without cover strip	without ballscrew support	= 215 + L2 + X (add L2 + m for each additional carriage)	
(2) Axis with cover strip			one ballscrew support	= 265 + L2 + X (add L2 + m for each additional carriage)	
(3) Cross section			two ballscrew supports	= 315 + L2 + X (add L2 + m for each additional carriage)	
(4) Carriage type 1		With cover strip	0, 1, 2 two ballscrew supports	= 215 + L1 + X (add L1 + m for each additional carriage)	
(5) Carriage type 4	L1	Carriage length with cover strip			
	L2	Carriage length without cover strip			
	X	Working stroke			
	m [1]	Minimum distance between two carriages:		without cover strip 35 mm	with cover strip 90 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.			
	D	Cover strip turning block			
	d		without ballscrew support 20 mm	one ballscrew support 45 mm	two ballscrew supports 70 mm
	E0	Carriage type 1/4:	without ballscrew support 120 mm	one ballscrew support 145 mm	two ballscrew supports 170 mm
	E1	Carriage type 1:	without ballscrew support 120 mm	one ballscrew support 145 mm	two ballscrew supports 170 mm
		Carriage type 4:	without ballscrew support 390 mm	one ballscrew support 415 mm	two ballscrew supports 440 mm
(G) Thread depth (G1) Countersink depth	E2	Carriage type 1: Carriage type 4:	support-independent 200 mm support-independent 470 mm		

[1] Maximum of two carriages of the same type on request

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length			
			A	B	C	D
		mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 397	12	46	24	110	78.5
	VRDM 3910					
	VRDM 3913	14				
	VRDM 31117	19				
	VRDM 31122					
Intelligent compact drives	I•S 91	12				
IclA IDS/IFS with stepper motor	I•S 92					
	I•S 93	14				
SER servomotors	SER 3913			24		
	SER 3916					
	SER 31112	19		32		
	SER 31117					
	SER 31122					
	SER 31127					
RIG servomotors I = 4:1	RIG 397	20		24		
	RIG 3910					
	RIG 3913					
	RIG 31112	25		32		
	RIG 31117					
	RIG 31122					
BSH servomotors	BSH 1001	19				
	BSH 1002					
	BSH 1003					
	BSH 1004	24				
Planetary gears, single-stage (Neugart)	PLE 60 / WPLE 60	14		33.5		
	PLE 80 / WPLE 80	20		36		
	PLS 70	19		28		
	PLS 90	22		24		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Type code

Example (continued next page):	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Product PAS = portal axis	**PAS**	4	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Product family 4 = basic line	PAS	**4**	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Size (cross-section of section) 2 = 60; (60 x 60 mm) 3 = 80; (80 x 80 mm) 4 = 110; (110 x 110 mm)	PAS	4	**2**	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Carriage drive element S = ballscrew A = support axis (without ballscrew, guide element only)	PAS	4	2	**S**	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Type of guide B = Ball guide	PAS	4	2	S	**B**	D	1200	C	1	B	A	xxx	S	N	/	I6
Feed per revolution B = 5 mm (sizes 60, 80 and 110) D = 10 mm (sizes 60, 80 and 110) F = 16 mm (size 60) G = 20 mm (size 80) H = 25 mm (size 110) N = support axis	PAS	4	2	S	B	**D**	1200	C	1	B	A	xxx	S	N	/	I6
Stroke length XXXX = in mm	PAS	4	2	S	B	D	**1200**	C	1	B	A	xxx	S	N	/	I6
Limit switch [1] A = 2 x PNP sensors as normally closed contacts, not wired [1] B = 2 x PNP sensors as normally closed contacts, plugged into IclA C = 2 x PNP sensors as normally open contacts, not wired [1] D = 2 x PNP sensors as normally open contacts, plugged into IclA E = 2 x NPN sensors as normally closed contacts, not wired [1] F = 2 x NPN sensors as normally closed contacts, plugged into IclA G = 2 x NPN sensors as normally open contacts, not wired [1] H = 2 x NPN sensors as normally open contacts, plugged into IclA N = no sensors	PAS	4	2	S	B	D	1200	**C**	1	B	A	xxx	S	N	/	I6
Carriage 1 = type 1 4 = type 4	PAS	4	2	S	B	D	1200	C	**1**	B	A	xxx	S	N	/	I6
Options [2] B = with cover strip / without ballscrew support N = without cover strip / without ballscrew support C = with cover strip / one ballscrew support D = without cover strip / one ballscrew support E = with cover strip / two ballscrew supports F = without cover strip / two ballscrew supports	PAS	4	2	S	B	D	1200	C	1	**B**	A	xxx	S	N	/	I6
Number of carriages [3] A = one B = two (on request) C = three (on request)	PAS	4	2	S	B	D	1200	C	1	B	**A**	xxx	S	N	/	I6
Distance between carriages [4] 1 .. 999 = distance in mm xxx = with only one carriage	PAS	4	2	S	B	D	1200	C	1	B	A	**xxx**	S	N	/	I6
Axis drive interface S = with motor or motor adapter attachment D = with shaft journal	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	**S**	N	/	I6
Toothed-belt drive gear N = without toothed-belt drive gear	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	S	**N**	/	I6

[1] With 100 mm cable with plug wired at one end, additional versions as accessories,extension cable as accessories

[2] See dimensional drawings and the dependence on "total axis length"

[3] Only carriages of the same type are possible. The carriage closest to the motor is driven.

[4] Minimum distance between two carriages: see dimensional drawings

Example (continued from previous page):	PAS	4	2	S	B	D	1200	C	1	B	A	xxx	S	N	/	I6
Motor/gearing interface [1]	PAS	4	2	S	B	D	1200	C	1	N	B	xxx	S	N	/	**I6**

V6 = stepper motors VRDM 364 / VRDM 366
V8 = stepper motors VRDM 368
V9 = stepper motors VRDM 397 / VRDM 3910
V0 = stepper motors VRDM 3913
V1 = stepper motors VRDM 311•
I6 = IclA IFS/IDS 61 / IFS/IDS 62 with stepper motor
I7 = IclA IFS/IDS 63 with stepper motor
I9 = IFS/IDS 91 / IFS/IDS 92 with stepper motor
I8 = IclA IFS/IDS 93 with stepper motor
S6 = servomotors SER 36•
S9 = servomotors SER 39•
S1 = servomotors SER 311•
A6 = IclA IFA 6• with servomotor
G9 = servomotors RIG 39•
G1 = servomotors RIG 311••
H5 = servomotors BSH 055•
H7 = servomotors BSH 0701 / BSH 0702
H8 = servomotors BSH 0703
H1 = servomotors BSH 1001 / BSH 1002 / BSH 1003
H4 = servomotors BSH 1004
XX = third-party motor / third-party gearing without attachment by Berger Lahr (drawing required)
XY = third-party motor / third-party gearing with attachment by Berger Lahr (drawing required; provide motor/gearing)

[1] Attachment of motor coupling assembly and motor adapter plate:
In case of selection V6 to XX, the corresponding motor coupling with coupling housing as well as the motor plate without motor are attached to the axis.
Motor attachment:
If the axis is to be delivered with attached motor, specify the complete motor identification (see type codes in the motor catalogues) instead of the motor/gearing interface or select XY.

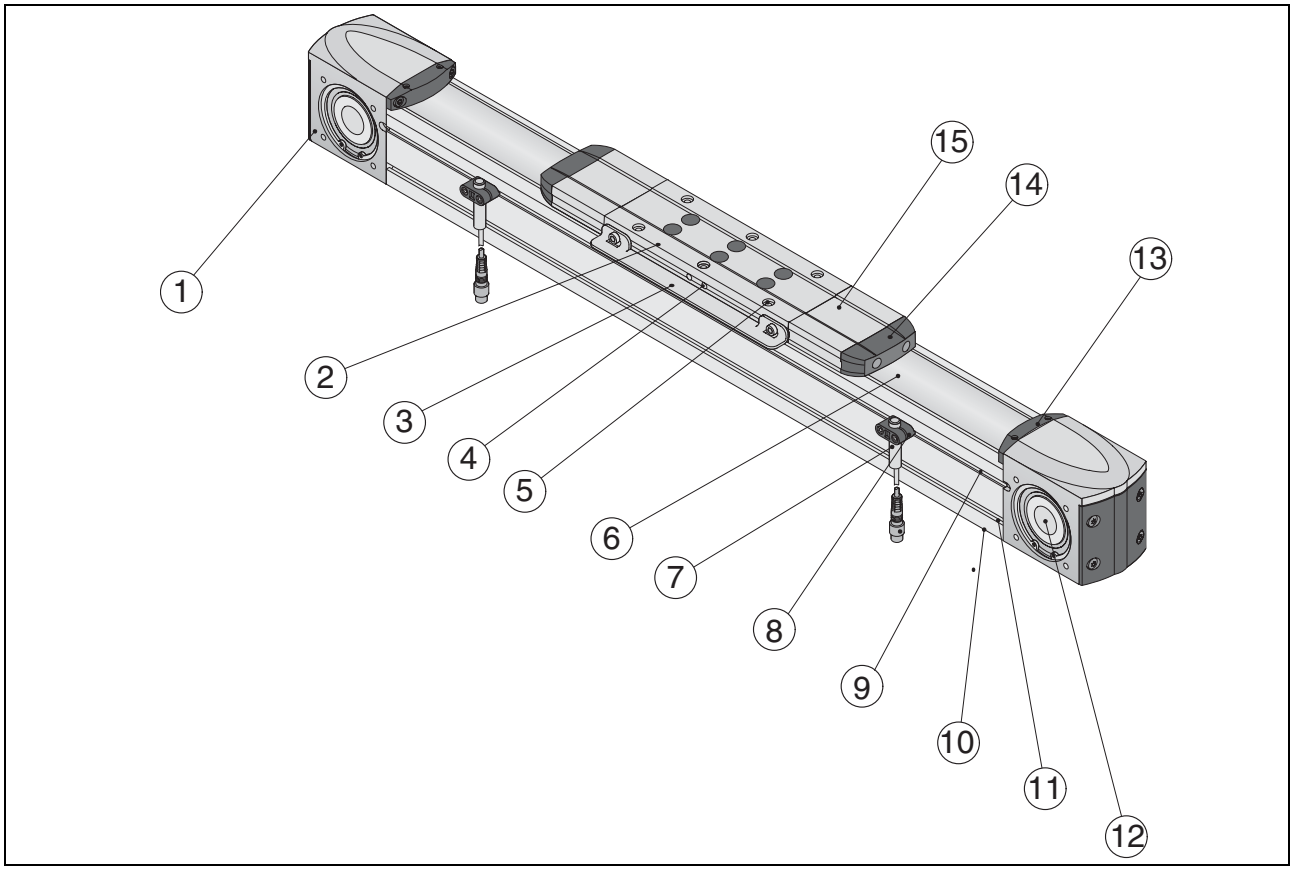
The type codes for the motors are in the following catalogues.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Toothed-belt axes

Product Description

Structure



Components of a toothed-belt axis

(1) End block
(2) Carriage
(3) Sensor damper plate
(4) Lubrication nipple
(5) Threaded holes for mounting the load
(6) Metal cover strip
(7) Sensor with connector cable
(8) Sensor retainer
(9) T-slot for fastening the sensor retainer
(10) Axis body
(11) T-slot fastening
(12) Hollow shaft for motor coupling or shaft journal
(13) Metal cover strip fastening
(14) Buffer
(15) Coverstrip deflector

Introduction

The new toothed-belt portal axes are available with roller guides and ball guides for positioning heavy loads. Toothed-belt axes are characterised by long strokes, high dynamic response and high positioning speed. The toothed-belt axes can be fitted with up to three carriages for moving large loads and higher torques. A support axis running parallel can also be used.

Special features and options

- High positioning speed
- High dynamic response
- Large stroke lengths
  - User-friendly structure:
  - Easy system integration with section technology (ITEM-compatible T-section slots)
  - Carriage with holes and locating dowels for easy support of the load
  - Lubrication at lubrication nipples on both carriage sides
  - Easy motor attachment with quick-coupling system
  - Stroke length available to millimetre accuracy
  - Sensors can be moved anywhere in T-section slots
- Many options:
  - Roller or ball guidance
  - Corrosion-resistant
  - Cover strip
  - Sensors in various designs
  - Carriage (type, number, distance)
  - Antistatic toothed belts

Property-related application examples

- Positioning over long distances, e.g. pick&place applications
- Positioning of parts, vision and measurement systems with high speed

Product offer

Size		**1**	**2**		**3**		**4**
Type designation		**PAS41BR**	**PAS42BR**	**PAS42BB**	**PAS43BR**	**PAS43BB**	**PAS44BB**
Type of guide		Roller	Roller	Ball guide	Roller	Ball guide	Ball guide
Typical payload [1)]	kg	6	12	24	30	60	100
Max. feed force	N	300	800	800	1100	1100	2600
Max. speed	m/s	8	8	5	8	5	5
Max. acceleration	m/s^2	20	20	20	20	20	20
Max. stroke length	mm	3000	5500	5500	5500	5500	5500
Repeat accuracy	mm	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05
Section cross-section	mm x mm	40 x 40	60 x 60	60 x 60	80 x 80	80 x 80	110 x 110

[1)] The typical payload is the load for which the axis is normally used. This payload may be considerably exceeded if the corresponding prerequisites are given or considered. Refer to the influence of the forces and torques on the service life of the axis in km in the section Technical data, Calculations, Calculation of service life.

Motors and gearings

We offer complete solutions from our comprehensive range of products including: axis, motor, drive amplifier and motion controller.
Depending on the requirements for forces, torques and dynamic response for the application, the toothed-belt axes are fitted with Berger Lahr three-phase stepper motors, AC servomotors or compact drives. Other motors are also available as specified by the customer.

A selection of motors and drives recommended by Berger Lahr is listed below:

Recommended motors and drives			**Toothed-belt axis**			
Type	**Size**	**Max. torque (Nm)**	**PAS41B**	**PAS42B**	**PAS43B**	**PAS44B**
VRDM three-phase stepper motors	VRDM 366	0.9	x			
	VRDM 368	1.5	x			
	VRDM 397	2	x	x		
	VRDM 3910	4	x	x	x	
	VRDM 3913	6	x	x	x	
	VRDM 31117	12		x	x	x
	VRDM 31122	16.5		x	x	x
IcIA IFS/IDS intelligent compact drives	I•S 62	0.9	x			
with stepper motors	I•S 63	1.5	x			
	I•S 91	2	x	x		
	I•S 92	4	x	x	x	
	I•S 93	6	x	x	x	
IcIA IFE intelligent compact drives	IFE V-018	3.5	x	x		
with brushless DC motors and spur wheel gear	IFE V-038	6	x	x		
	IFE V-054	10	x	x		
	IFE V-115	14	x	x		
SER servomotors	SER 368	3	x			
	SER 3610	3.6	x			
	SER 397	4	x			
	SER 3910	8	x	x		
	SER 3913	11.5	x	x		
	SER 3916	14.5	x	x		
	SER 31112	16.8		x	x	
	SER 31117	25		x	x	
	SER 31122	38		x	x	
	SER 31127	48		x		
RIG servomotors with integrated gearing I = 4:1	RIG 397	15.5		x	x	x
	RIG 3910	22		x	x	x
	RIG 3913	22		x	x	x
	RIG 31112	70			x	x
	RIG 31117	76			x	x
	RIG 31122	76			x	x
BSH servomotors	BSH 0701	3.5	x			
	BSH 0702	7.6	x			
	BSH 0703	12.3	x			
	BSH 1001	9.6		x		
	BSH 1002	18.3		x		
	BSH 1003	28.3		x		
	BSH 1004	40.5				
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	5	x	x		
	PLE 60 / WPLE 60	15	x	x	x	
	PLE 80 / WPLE 80	50		x	x	x
	PLE 120 / WPLE 120	120			x	x
	PLS 70	110		x	x	x
	PLS 90	220			x	x

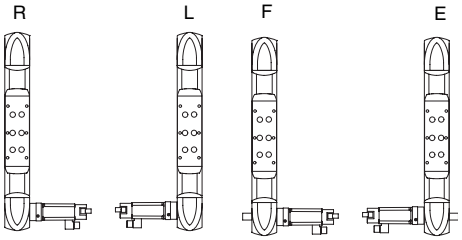
Recommended motors and gearings							
Type	**Size**	**PLE 40 / WPLE 40**	**PLE 60 / WPLE 60**	**PLE 80 / WPLE 80**	**PLE 120 / WPLE 120**	**PLE 70**	**PLE 90**
VRDM three-phase stepper motors	VRDM 366	x	x			x	
	VRDM 368	x	x			x	
	VRDM 397			x			x
	VRDM 3910			x			x
	VRDM 3913			x			x
	VRDM 31117			x	x		x
	VRDM 31122			x	x		x
Intelligent compact drives IcIA IFS/IDS with stepper motors	I•S 62	x	x			x	
	I•S 63	x	x			x	
	I•S 91			x			x
	I•S 92			x			x
	I•S 93			x			x
SER servomotors	SER 3610	x	x	x		x	
	SER 397	x	x	x		x	x
	SER 3910		x	x		x	x
	SER 3913		x	x		x	x
	SER 3916		x	x		x	x
	SER 31112			x	x		x
	SER 31117			x	x		x
	SER 31122			x	x		x
	SER 31127			x	x		x
BSH servomotors	BSH 070•		x	x	x		
	BSH 100•			x	x		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

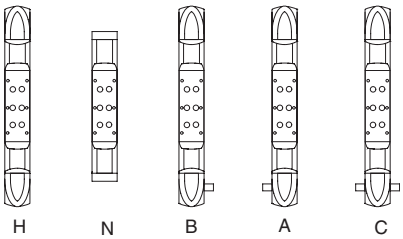
For detailed information on the various motors and drives see the catalogues below:

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IcIA	0059941201002

Motor attachment types



(R) Motor right
(L) Motor left
(F) Motor right, shaft journal left
(E) Motor left, shaft journal right



(H) Hollow shaft with bearings at both ends. Prepared for flexible layout of drive and output components
(N) Support axis without drive interface
(B) Shaft journal right
(A) Shaft journal left
(C) Shaft journal left and right

PAS41B

Technical Data

Type designation		**PAS41BR**	
Guide type		Roller W06	
Typical payload	kg	6	
Max. stroke length [1) 2)]	mm	3000	
Min. stroke length [3)]	mm	125	
Max. speed [4)]	m/s	8	
Max. acceleration[4)]	m/s^2	20	
Max. drive force Fx [5)]	N	300	
Max. force Fy_{dynmax} [5)]	N	810	
Max. force Fz_{dynmax} [5)]	N	520	
Max. torque Mx_{dynmax} [5)]	Nm	6	
Load ratings guide system C_0/C_{dyn}	N	2230 / 3950	
Max. driving torque M_{max} [5)]	Nm	4	
No-load torque 0-stroke axis (without carriage) [6)]	Nm	0.1	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	0.12	
Moment of inertia per m stroke	$kgcm^2/m$	0.11	
Moment of inertia per kg payload	$kgcm^2/kg$	1.79	
Moment of inertia of motor attachment	$kgcm^2$	0.03	
Moment of inertia of shaft extension	$kgcm^2$	0.002	
Mass of 0-stroke axis (without motor, without carriage)	kg	0.55	
Mass stroke per m stroke	kg/m	2.25	
Mass of motor attachment	kg	0.2	
Mass of shaft extension	kg	0.013	
Repeat accuracy[4)]	mm	±0.05	
Internal diameter of clutch	mm	4 ... 14	
Profile cross section (W x H)	mm	40 x 40	
Diameter of shaft extension	mm	12 h7	
Axial planar moment of inertia ly/lz	mm^4	76647 / 108936	
Elasticity module (aluminium)	N/mm^2	0.72×10^5	
Max. ambient temperature	°C	0 ... +50	
Toothed belt / toothed belt pulley			
Drive constant	mm/rotat.	84	
Toothed belt width/pitch		15 / HTD3	
Effective diameter toothed belt wheel (both sides equal)	mm	26.738	
Width toothed belt wheel	mm	35	
Material density toothed belt wheel	kg/cm^3	0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	0.02	
Carriage		**Type 2**	**Type 4**
Max. torque of carriage My_{dynmax} [5)]	Nm	15	35
Max. torque of carriage Mz_{dynmax} [5)]	Nm	20	55
No-load torque of carriage[6)]	Nm	0.05	0.05
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	0.95 / 0.80	1.20 / 1.00
Mass of carriage with/without strip turning block (incl. toothed belt and profile section)	kg	1.2 / 1.00	1.50 / 1.30
Moving mass of carriage with/without strip redirection	kg	0.53 / 0.45	0.65 / 0.60
Max. total stroke with/without cover strip	mm	2910 / 3000	2830 / 2920

1) Greater stroke length on request

2) Carriage-dependent

3) Guaranteed lubrication of guide elements, shorter stroke length on request

4) Load and stroke-dependent

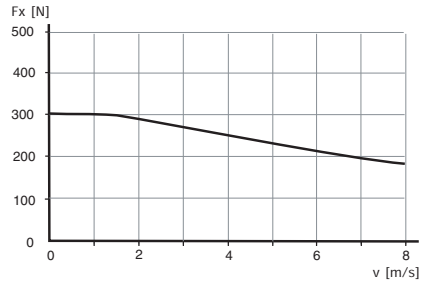
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page

6) Measured at 0.1 m/s

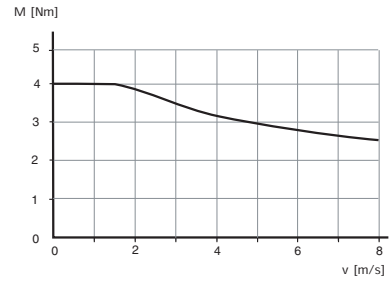
Note: The listed torques and forces refer to a service life of 20000 km.

PAS41BR characteristic curves (Ball guides)

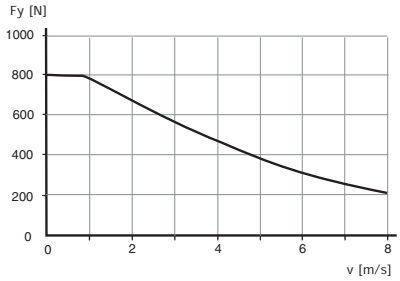
Max. feed force Fx



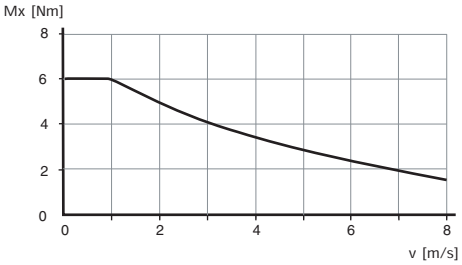
Max. driving torque M_{max}



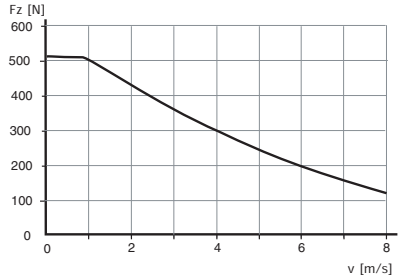
Max. force Fy_{dynmax}



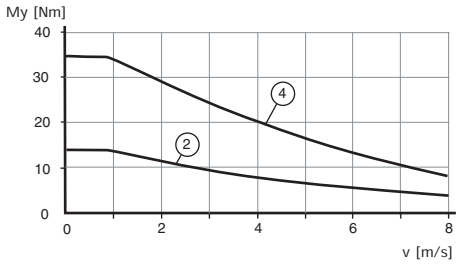
Max. torque of carriage Mx_{dynmax}



Max. force Fz_{dynmax}



Max. torque of carriage My_{dynmax}

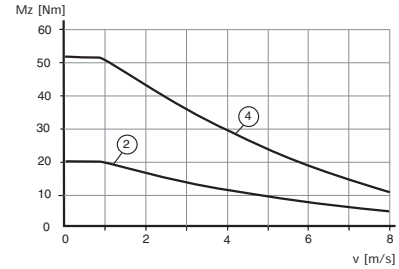


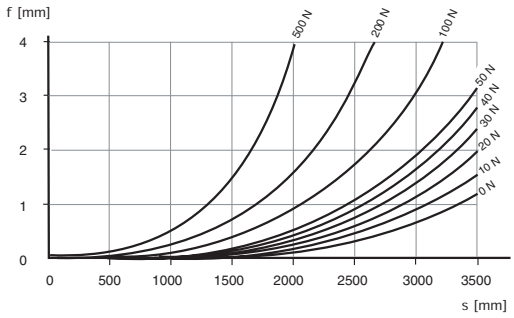
Deflection

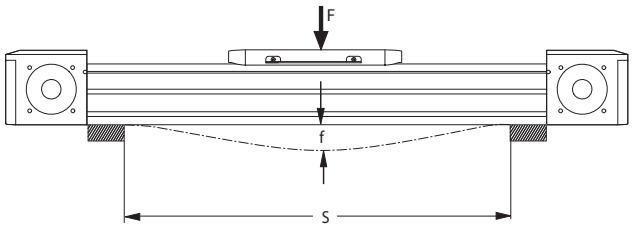
In order to limit deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.

Max. torque of carriage Mz_{dynmax}

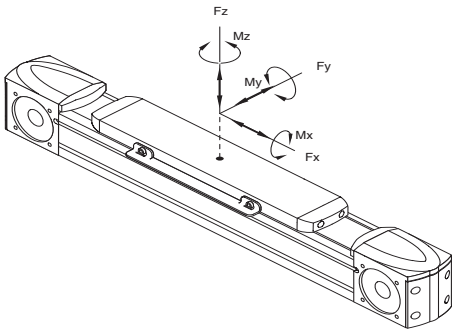






(2) Carriage type 2

(4) Carriage type 4



Calculations

Calculation of service life

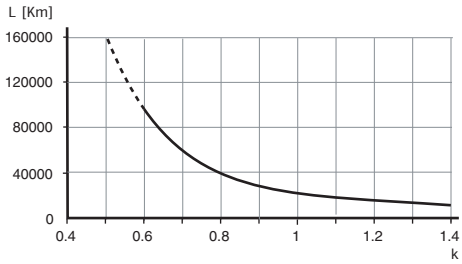
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BR (roller guides)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)		0.1
+	No-load torque per carriage x number of carriages		
=	**No-load torque of toothed belt axis**		

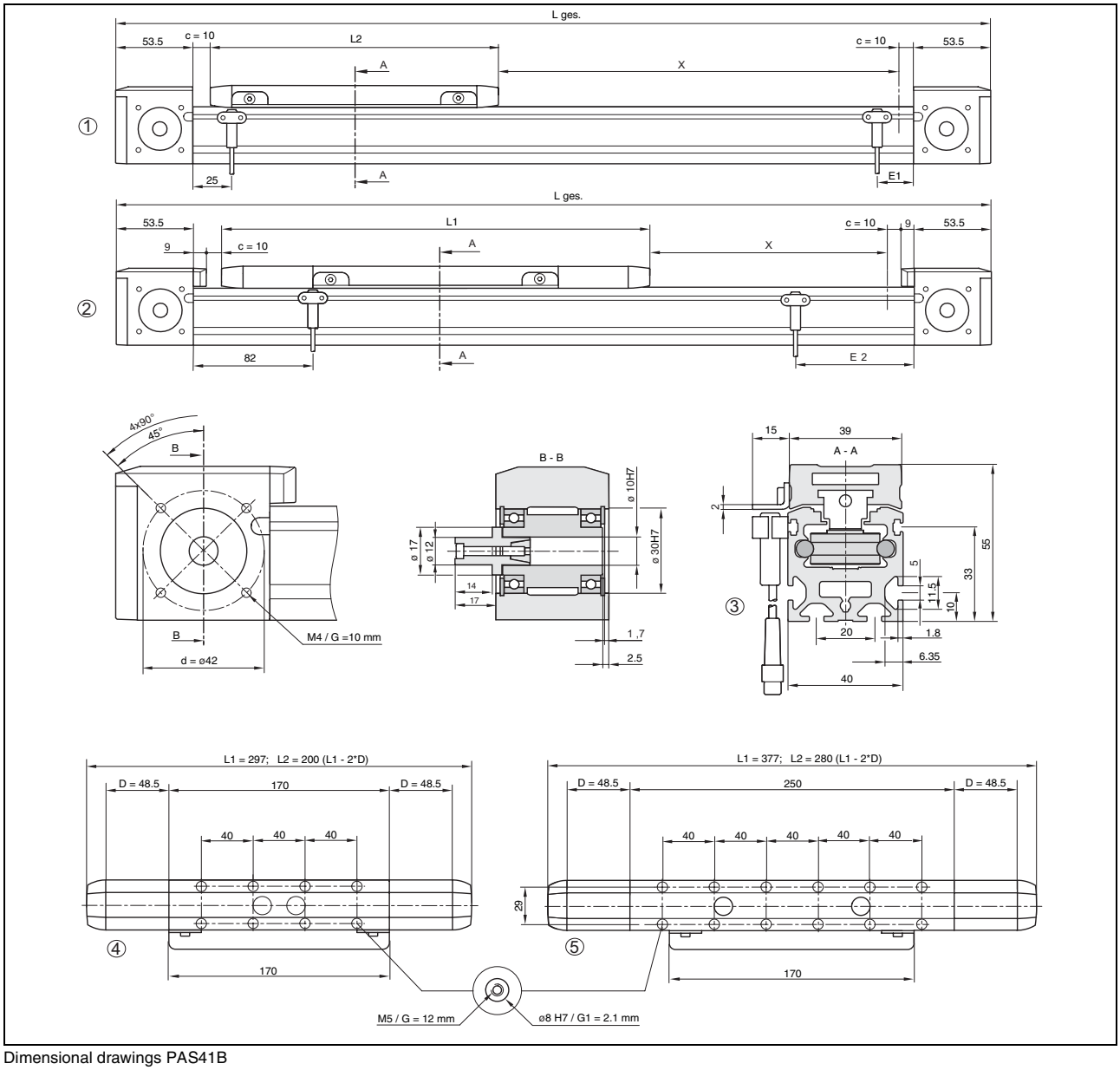
Total moment of inertia of toothed belt axis without drive [kgcm²]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(0.11) kgcm²/m)	
+	Moment of inertia per kg payload x kg payload	(1.79 kgcm²/kg)	
+	Moment of inertia motor attachment		0.03
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis		0.55
+	Mass per m stroke x m stroke	(2.25 kg/m)	
+	Mass motor attachment		0.2
+	Mass shaft journal		0.013
+	Mass per carriage (with/without strip diversion) x number of carriages		
+	Mass of motor/gearing (see motor catalogue)		
+	Mass of payload		
=	**Total mass of toothed belt axis**		

Dimensional drawings



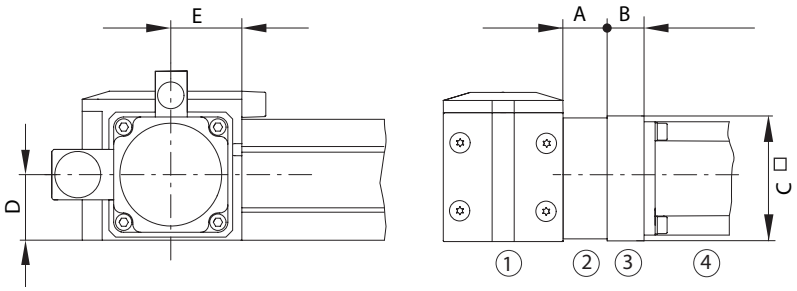
Dimensional drawings PAS41B

(1) = axis without cover strip	Lges	Total length without cover strip = 127 + L2 + X (add L2 + m for each additional carriage)
(2) = axis with cover strip		Total length with cover strip = 145 + L1 + X (add L1 + m for each additional carriage)
(3) = cross section		
(4) = carriage type 2	L1	Carriage length with cover strip
(5) = carriage type 4	L2	Carriage length without cover strip
(B-B) shaft journal as option	X	Working stroke
	m [1]	Minimum distance between two carriages: with cover strip 90 mm, without cover strip 35 mm
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
	D	Cover strip turning block
G = thread depth	E1 [2]	Carriage: type 2 = 25 mm; type 4 = 105 mm
G1 = countertsink depth	E2 [2]	Carriage: type 2 = 82 mm; type 4 = 162 mm

[1] Maximum of two carriages of the same type on request

[2] E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length				
			A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 366	6.35	16	13	60	24.5	23
	VRDM 368	8					
	VRDM 397	12		28.5	85		
	VRDM 3910						
	VRDM 3913	14					
Intelligent compact drives IcIA IDS/IFS with stepper motor	I•S 62	6.35		13	60		
	I•S 63	8					
	I•S 91	12		28.5	85		
	I•S 92						
	I•S 93	14					
Intelligent compact drives IcIA IFE with brushless DC motors (with gearing)	IFE 71 V-018	10		23.5	77/68		
	IFE 71 V-038						
	IFE 71 V-054						
	IFE 71 V-115						
BSH servomotors	BSH 701	11		22	62		
	BSH 702						
	BSH 703	14		28.5			
SER servomotors	SER 368	9		13			
	SER 3610						
	SER 397	14		28.5	85		
	SER 3910						
	SER 3913						
	SER 3916						
Planetary gears, single-stage (Neugart)	PLE 40	10		23.5	60		
	PLE 60	14		33.5	62		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IcIA	0059941201002

PAS42B

Technical Data

Type designation		**PAS42BR**		**PAS42BB**	
Guide type		Roller W06		Ball guide SHS 15	
Typical payload	kg	12		24	
Max. stroke length [1) 2)]	mm	5500		5500	
Min. stroke length [3)]	mm	130		9	
Max. speed [4)]	m/s	8		5	
Max. acceleration[4)]	m/s^2	20		20	
Max. drive force Fx [5)]	N	800		800	
Max. force Fy_{dynmax} [5)]	N	810		2805	
Max. force Fz_{dynmax} [5)]	N	520		2805	
Max. torque Mx_{dynmax} [5)]	Nm	11		19	
Load ratings guide system C_0/C_{dyn}	N	2230 / 3950		24200 / 14200	
Max. driving torque M_{max} [5)]	Nm	20		20	
No-load torque 0-stroke axis (without carriage) [6)]	Nm	0.64		0.64	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	1.90		1.90	
Moment of inertia per m stroke	$kgcm^2/m$	1.20		1.20	
Moment of inertia per kg payload	$kgcm^2/kg$	6.10		6.10	
Moment of inertia of motor attachment	$kgcm^2$	0.24		0.24	
Moment of inertia of shaft extension	$kgcm^2$	0.05		0.05	
Mass of 0-stroke axis (without motor, without carriage)	kg	1.70		1.75	
Mass stroke per m stroke	kg/m	4.55		5.60	
Mass of motor attachment	kg	0.50		0.50	
Mass of shaft extension	kg	0.075		0.075	
Repeat accuracy[4)]	mm	±0.05		±0.05	
Internal diameter of clutch	mm	6.35 ... 20		6.35 ... 20	
Profile cross section (W x H)	mm	60 x 60		60 x 60	
Diameter of shaft extension	mm	20 h7		20 h7	
Elasticity module (aluminium)	N/mm^2	0.72×10^5		0.72×10^5	
Axial planar moment of inertia ly/lz	mm^4	435394 / 651612		435394 / 651612	
Max. ambient temperature	°C	0 ... +50		0 ... +50	
Toothed belt / toothed belt pulley					
Drive constant	mm/rotat.	155		155	
Toothed belt width/pitch		25 / HTD5		25 / HTD5	
Effective diameter toothed belt wheel (both sides equal)	mm	49.338		49.338	
Width toothed belt wheel	mm	52		52	
Material density toothed belt wheel	kg/cm^3	0.003		0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	0.50		0.50	
Carriage		**Type 1**	**Type 4**	**Type 1**	**Type 4**
Max. torque of carriage My_{dynmax} [5)]	Nm	23	70	75	365
Max. torque of carriage Mz_{dynmax} [5)]	Nm	35	110	75	365
No-load torque of carriage[6)]	Nm	0.08	0.08	0.35	0.35
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	6.10 / 5.50	10.15 / 9.60	6.90 / 6.30	10.20 / 9.55
Mass of carriage with/without strip redirection (incl. toothed belt and profile component)	kg	2.40 / 1.90	3.90 / 3.40	2.8 / 2.30	4.35 / 3.80
Moving mass of carriage with/without strip redirection	kg	1.0 / 0.9	1.7 / 1.6	1.2 / 1.0	1.7 / 1.6
Max. total stroke with/without cover strip	mm	5380 / 5500	5200 / 5320	5380 / 5500	5200 / 5320

1) Greater stroke length on request

2) Carriage-dependent

3) Guaranteed lubrication of guide elements, shorter stroke length on request

4) Load and stroke-dependent

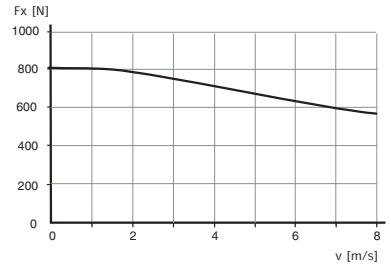
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page

6) Measured at 0.1 m/s

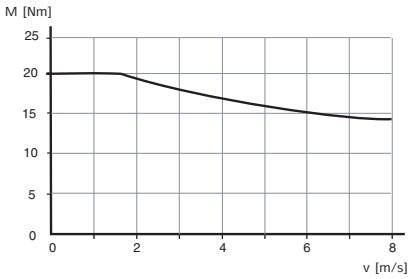
Note: the listed forces and torques refer to a service life of 20000 km with ball guide guides and 30000 km with roller guides

PAS42BR characteristic curves (Ball guides)

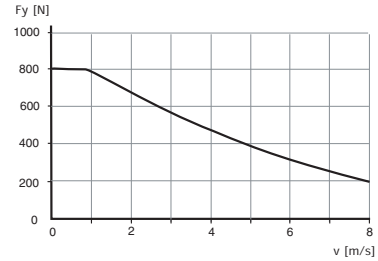
Max. feed force Fx



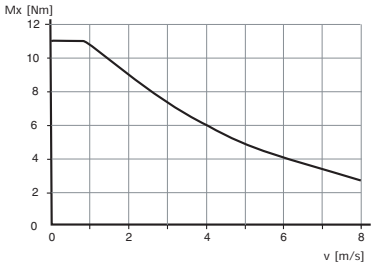
Max. driving torque M_{max}



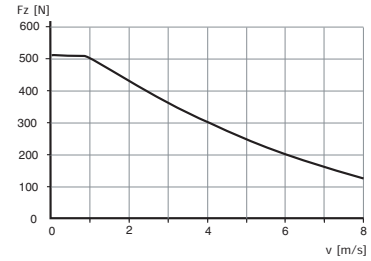
Max. force Fy_{dynmax}



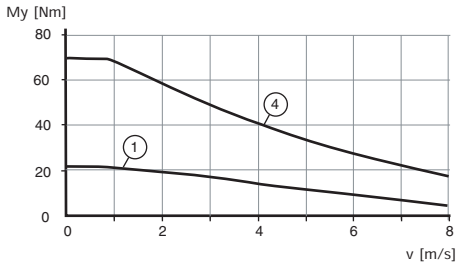
Max. torque of carriage Mx_{dynmax}



Max. force Fz_{dynmax}



Max. torque of carriage My_{dynmax}

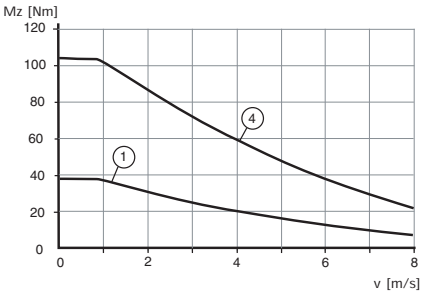


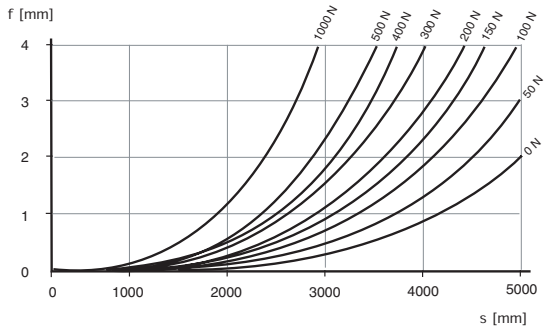
Deflection PAS42BR and PAS42BB

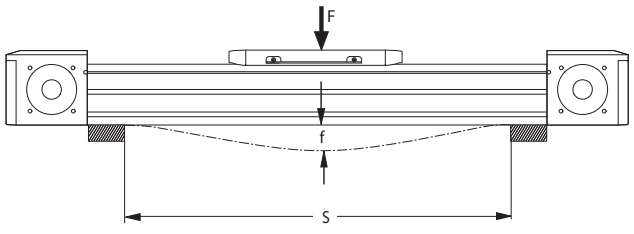
In order to limit the deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.

Max. torque of carriage Mz_{dynmax}





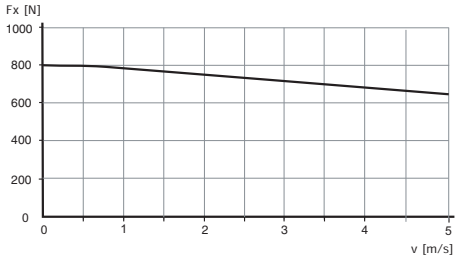


(1) Carriage type 1

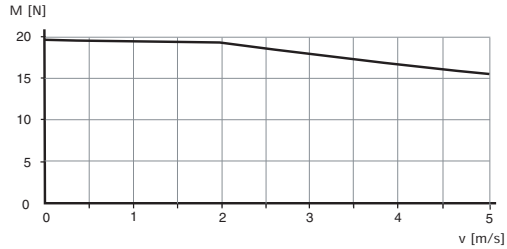
(4) Carriage type 4

PAS42BB characteristic curves (Ball guides)

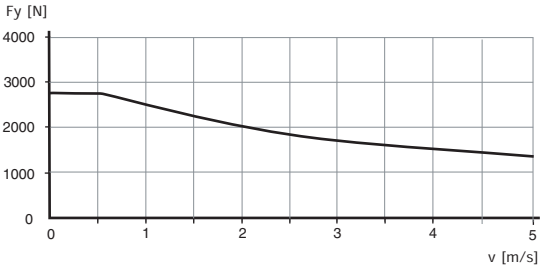
Max. feed force Fx



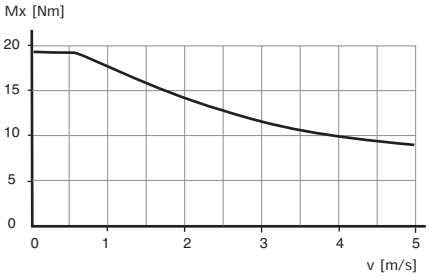
Max. driving torque M_{max}



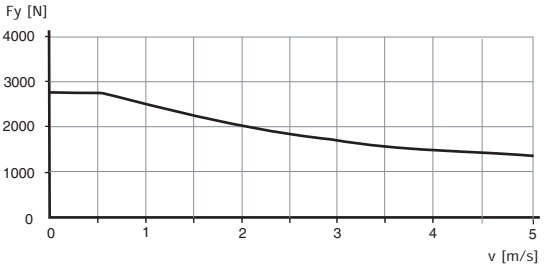
Max. force Fy_{dynmax}



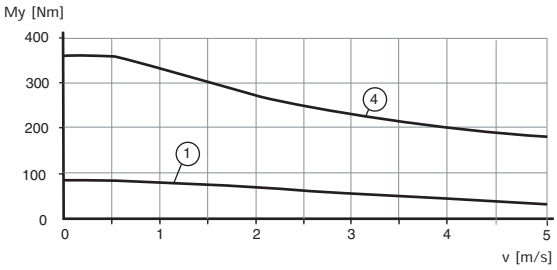
Max. torque of carriage Mx_{dynmax}



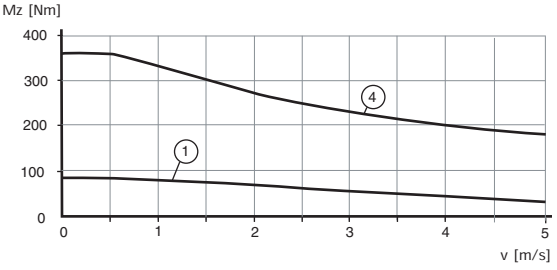
Max. force Fz_{dynmax}



Max. torque of carriage My_{dynmax}

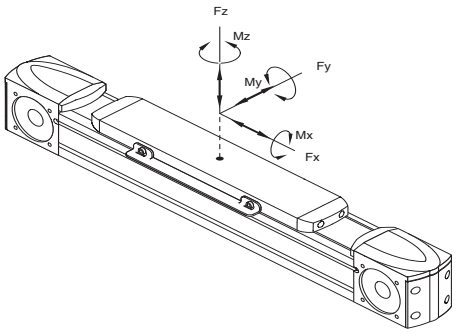


Max. torque of carriage Mz_{dynmax}



(1) Carriage type 1

(4) Carriage type 4



Calculations

Calculation of service life

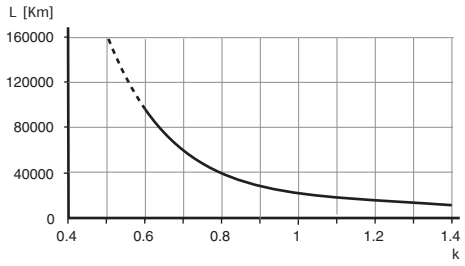
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

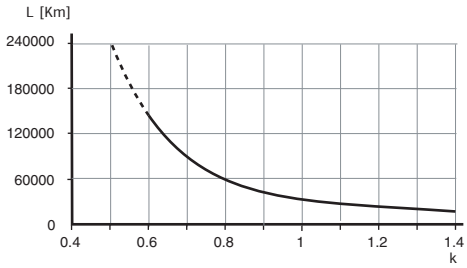
The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BR (roller guides)



Service life load curve PAS••BB (ball guide)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)	0.64
+	No-load torque per carriage x number of carriages	
=	**No-load torque of toothed belt axis**	

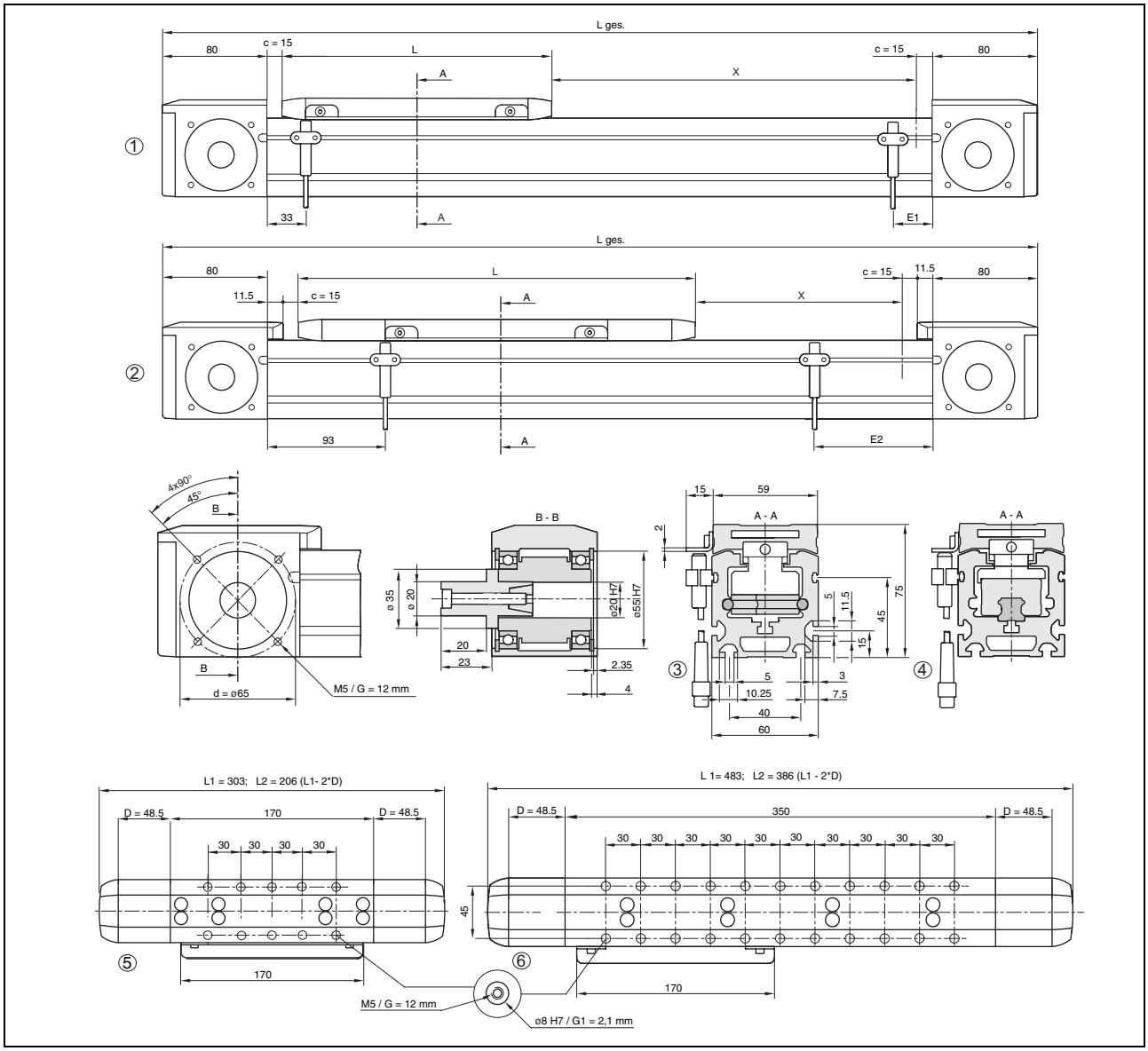
Total moment of inertia of toothed belt axis without drive [kgcm²]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(1.20 kgcm²/m)	
+	Moment of inertia per kg payload x kg payload	(6.10 kgcm²/kg)	
+	Moment of inertia motor attachment		0.24
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis	
+	Mass per m stroke x m stroke	
+	Mass motor attachment	0.5
+	Mass shaft journal	0.24
+	Mass per carriage (with/without strip diversion) x number of carriages	
+	Mass of motor/gearing (see motor catalogue)	
+	Mass of payload	
=	**Total mass of toothed belt axis**	

Dimensional drawings



Dimensional drawings PAS42B

(1) = axis without cover strip
(2) = axis with cover strip
(3) = cross section with roller guide
(4) = cross section with ball guide
(5) = carriage type 1
(6) = carriage type 4
(B-B) = shaft journal as option

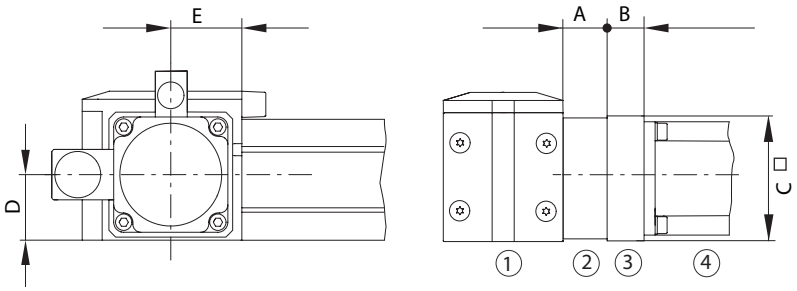
G = thread depth
G1 = countersink depth

Lges	Total length without cover strip = 190 + L2 + X (add L2 + m for each additional carriage)
	Total length with cover strip = 213 + L1 + X (add L1 + m for each additional carriage)
L1	Carriage length with cover strip
L2	Carriage length without cover strip
X	Working stroke
m [1)]	Minimum distance between two carriages: with cover strip: 90 mm, without cover strip: 40 mm
C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
D	Cover strip turning block
E1 [2)]	Carriage: type 1 = 33 mm; type 4 = 213 mm
E2	Carriage: type 1 = 93 mm; type 4 = 273 mm

1) Maximum of two carriages of the same type on request

2) E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length				
			A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 397	12	22	26	85	32	35
	VRDM 3910						
	VRDM 3913	14					
	VRDM 31117	19		38	110		
	VRDM 31122						
Intelligent compact drives	I•S 91	12		26	85		
IclA IDS/IFS with stepper motor	I•S 92						
	I•S 93	14					
Intelligent compact drives	IFE 71 V-018	10		21	76/66		
IclA IFE with brushless DC motors (with gearing)	IFE 71 V-038						
	IFE 71 V-054						
	IFE 71 V-115						
SER servomotors	SER 3910	14		26	85		
	SER 3913						
	SER 3916						
	SER 31112	19		38	110		
	SER 31117						
	SER 31122						
	SER 31127						
RIG servomotors I = 4:1	RIG 397	20			85		
	RIG 3910						
	RIG 3913						
BSH servomotors	BSH 1001	19			110		
	BSH 1002						
	BSH 1003						
Planetary gears, single-stage (Neugart)	PLE 40 / WPLE 40	10		29.5	62		
	PLE 60 / WPLE 60	14		30.5			
	PLE 80 / WPLE 80	20		38	85		
	PLS 70	19		29	70		

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

PAS43B

Technical Data

Type designation		PAS43BR		PAS43BB	
Guide type		Roller W10		Ball guide SHS20	
Typical payload	kg	30		60	
Max. stroke length [1) 2)]	mm	5500		5500	
Min. stroke length [3)]	mm	175		11	
Max. speed [4)]	m/s	8		5	
Max. acceleration[4)]	m/s^2	20		20	
Max. drive force Fx [5)]	N	1100		1100	
Max. force Fy_{dynmax} [5)]	N	2130		4410	
Max. force Fz_{dynmax} [5)]	N	1255		4410	
Load ratings guide system C_0/C_{dyn}	N	4850 / 8500		38400 / 22300	
Max. torque Mx_{dynmax} [5)]	Nm	36		42	
Max. driving torque M_{max} [5)]	Nm	36		36	
No-load torque 0-stroke axis (without carriage) [6)]	Nm	0.75		0.75	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	8.10		8.10	
Moment of inertia per m stroke	$kgcm^2/m$	2.50		2.50	
Moment of inertia per kg payload	$kgcm^2/kg$	10.65		10.65	
Moment of inertia of motor attachment	$kgcm^2$	0.90		0.90	
Moment of inertia of shaft extension	$kgcm^2$	0.16		0.16	
Mass of 0-stroke axis (without motor, without carriage)	kg	4.40		4.50	
Mass stroke per m stroke	kg/m	8.00		9.50	
Mass of motor attachment	kg	1.0		1.0	
Mass of shaft extension	kg	0.154		0.154	
Repeat accuracy[4)]	mm	±0.05		±0.05	
Internal diameter of clutch	mm	12 ... 25		9 ... 32	
Profile cross section (W x H)	mm	80 x 80		80 x 80	
Diameter of shaft extension	mm	25 h7		25 h7	
Axial planar moment of inertia ly/lz	mm^4	1285262 / 1867213		1285262 / 1867213	
Elasticity module (aluminium)	N/mm^2	0.72×10^5		0.72×10^5	
Max. ambient temperature	°C	0 ... +50		0 ... +50	
Toothed belt / toothed belt pulley					
Drive constant	mm/rotat.	205		205	
Toothed belt width/pitch		30 / HTD5		30 / HTD5	
Effective diameter toothed belt wheel (both sides equal)	mm	65.254		65.254	
Width toothed belt wheel	mm	71		71	
Material density toothed belt wheel	kg/cm^3	0.003		0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	2.04		2	
Carriage		**Type 1**	**Type 4**	**Type 1**	**Type 4**
Max. torque of carriage My_{dynmax} [5)]	Nm	62	195	165	690
Max. torque of carriage Mz_{dynmax} [5)]	Nm	105	330	165	690
No-load torque of carriage[6)]	Nm	0.25	0.25	0.82	0.82
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	23.20 / 20.00	38.00 / 34.50	25.00 / 21.80	37.35 / 34.20
Mass of carriage with/without strip redirection (incl. toothed belt and profile component)	kg	5.10 / 4.10	8.20 / 7.10	5.80 / 4.65	8.90 / 7.80
Moving mass of carriage with/without strip redirection	kg	2.20 / 1.90	3.55 / 3.30	2.50 / 2.10	3.55 / 3.30
Max. total stroke with/without cover strip	mm	5350 / 5500	5140 / 5290	5350 / 5500	5140 / 5290

1) Greater stroke length on request

2) Carriage-dependent

3) Guaranteed lubrication of guide elements, shorter stroke length on request

4) Load and stroke-dependent

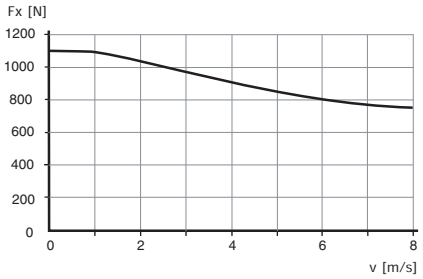
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page

6) Measured at 0.1 m/s

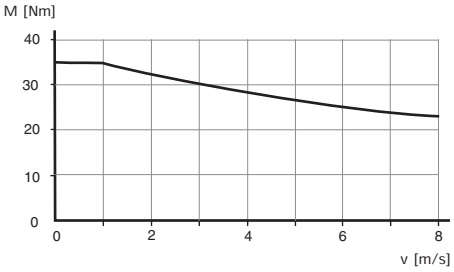
Note: the listed forces and torques refer to a service life of 20000 km with ball guide guides and 30000 km with roller guides

PAS43BR characteristic curves (Ball guides)

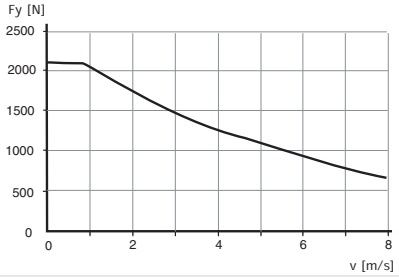
Max. feed force Fx



Max. driving torque M_{max}



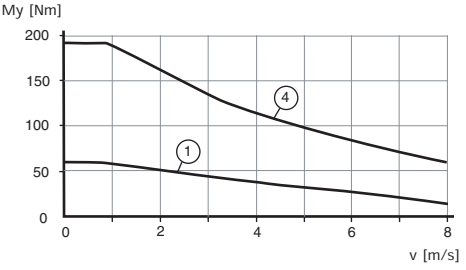
Max. force Fy



Max. torque of carriage Mx_{dynmax}

Max. force Fz_{dynmax}

Max. torque of carriage My_{dynmax}

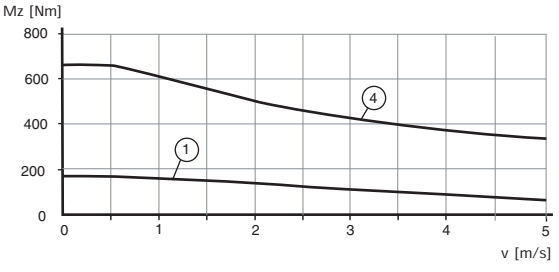


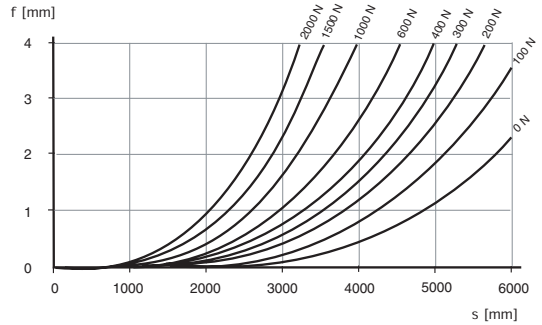
Deflection PAS43BR and PAS43BB

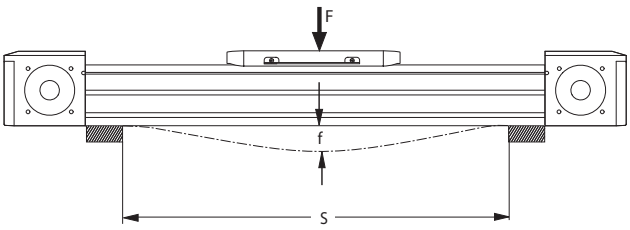
In order to limit deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.

Max. torque of carriage Mz_{dynmax}





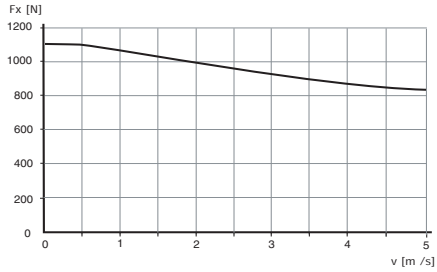


(1) Carriage type 1

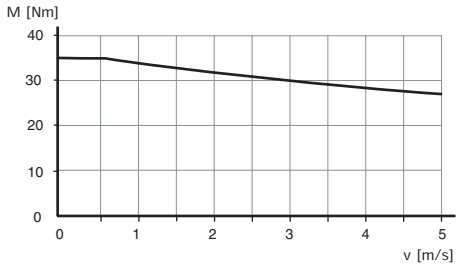
(4) Carriage type 4

PAS43BB characteristic curves (Ball guides)

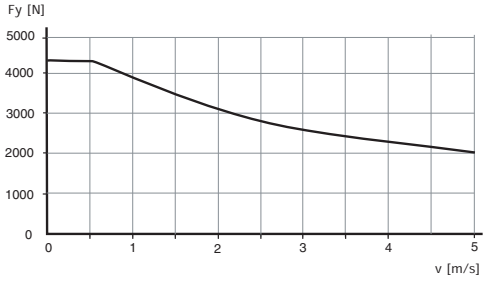
Max. feed force Fx



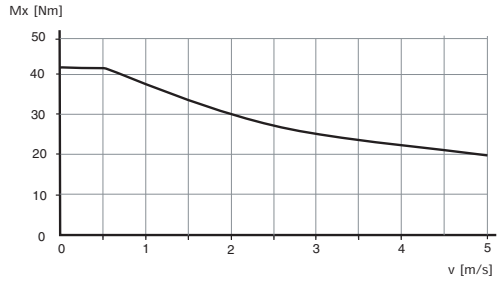
Max. driving torque M_{max}



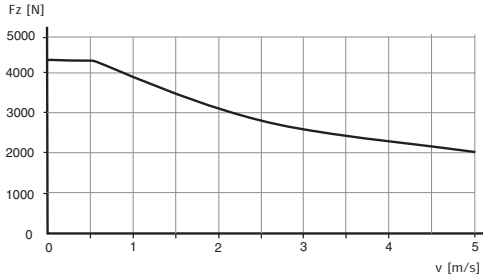
Max. force Fy_{dynmax}



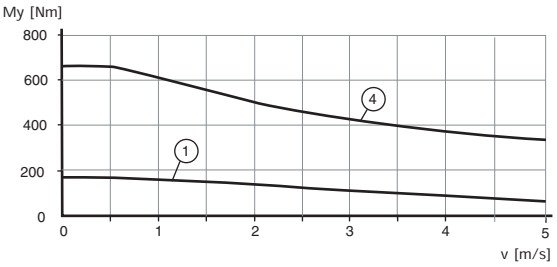
Max. torque of carriage Mx_{dynmax}



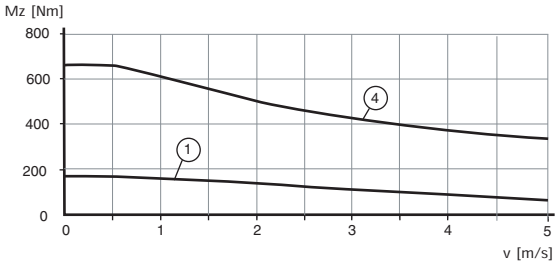
Max. force Fz_{dynmax}



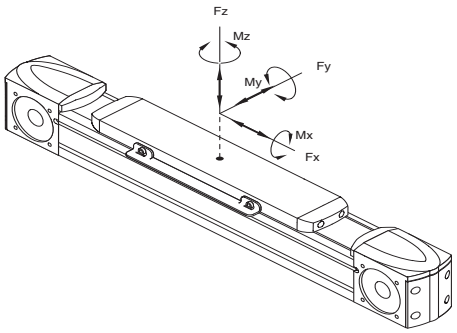
Max. torque of carriage My_{dynmax}



Max. torque of carriage Mz_{dynmax}



(1) Carriage type 1
(4) Carriage type 4



Calculations

Calculation of service life

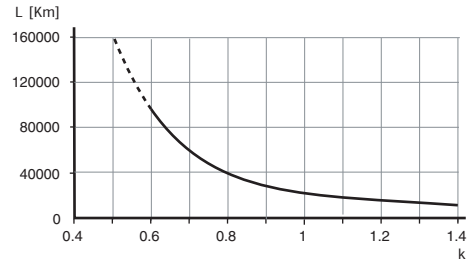
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

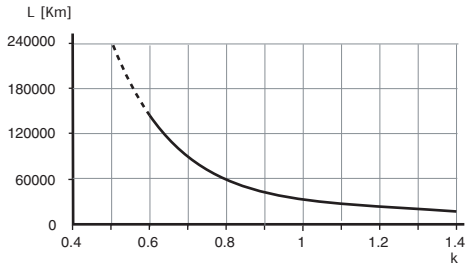
The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BR (roller guides)



Service life load curve PAS••BB (ball guide)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)	0.75
+	No-load torque per carriage x number of carriages	
=	**No-load torque of toothed belt axis**	

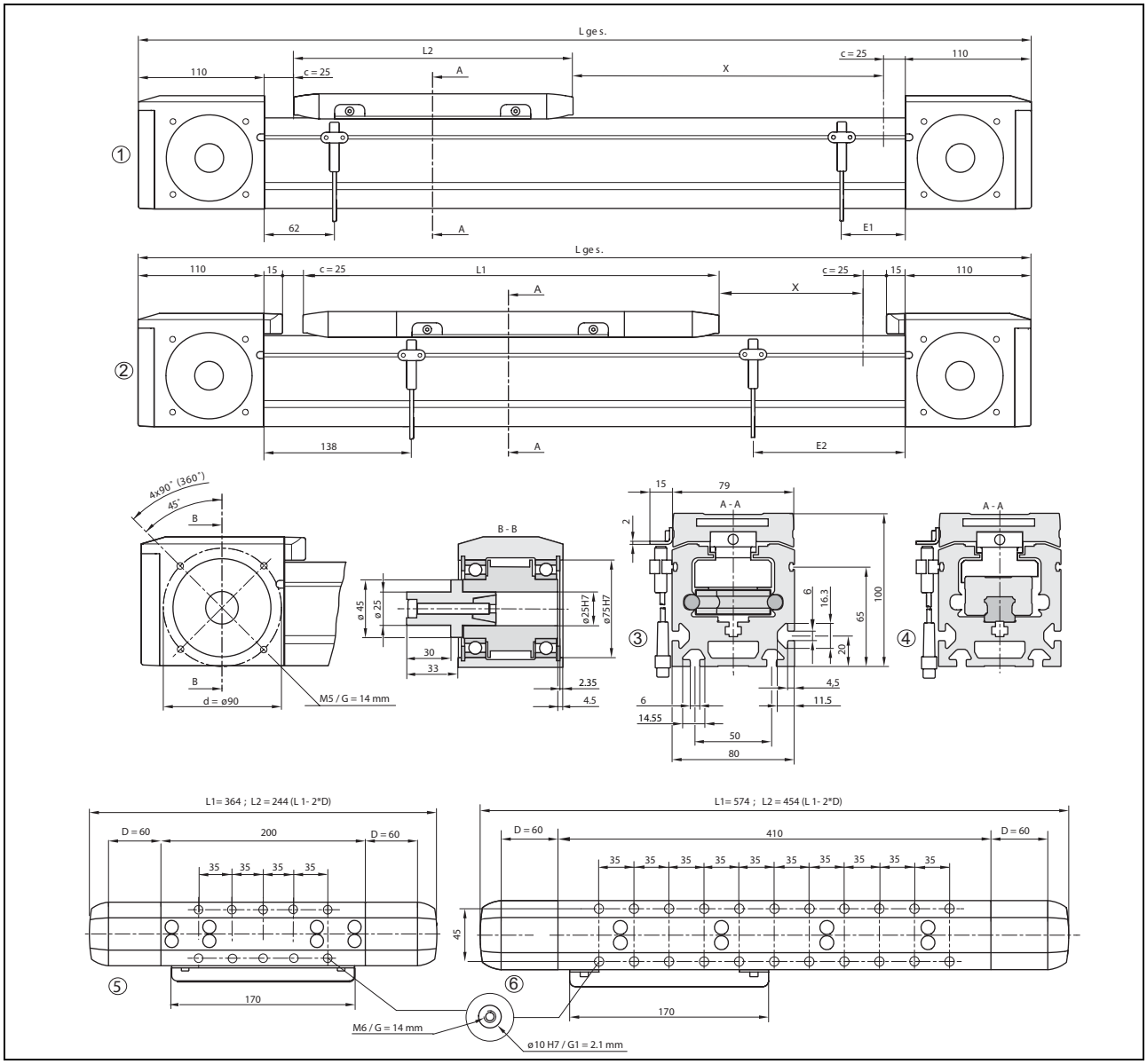
Total moment of inertia of toothed belt axis without drive [kgcm²]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(2.50 kgcm²/m)	
+	Moment of inertia per kg payload x kg payload	(10.65 kgcm²/kg)	
+	Moment of inertia motor attachment		0.90
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis	4.40
+	Mass per m stroke x m stroke	
+	Mass motor attachment	1.0
+	Mass shaft journal	0.154
+	Mass per carriage (with/without strip diversion) x number of carriages	
+	Mass of motor/gearing (see motor catalogue)	
+	Mass of payload	
=	**Total mass of toothed belt axis**	

Dimensional drawings



Dimensional drawings PAS43B

(1) = axis without cover strip
(2) = axis with cover strip
(3) = cross section with roller guide
(4) = cross section with ball guide
(5) = carriage type 1
(6) = carriage type 4
(B-B) = shaft journal as option

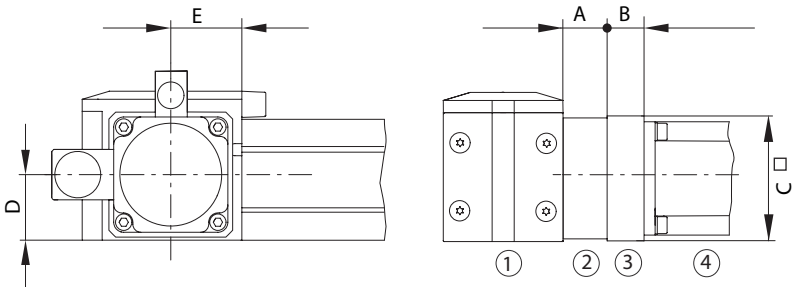
G = thread depth
G1 = countersink depth

Lges	Total length without cover strip = 270 + L2 + X (add L2 + m for each additional carriage) Total length with cover strip: = 300 + L1 + X (add L1 + m for each additional carriage)
L1	Carriage length with cover strip
L2	D Carriage length without cover strip
X	Working stroke
m [1)]	Minimum distance between two carriages: with cover strip: 110 mm, without cover strip: 45 mm)
C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
D	Cover strip turning block
E1 [2)]	Carriage: type 1 = 62 mm; type 4 = 272 mm
E2 [2)]	Carriage: type 1 = 138 mm; type 4 = 348 mm

[1)] Maximum of two carriages of the same type on request

[2)] E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length				
			A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 3910	12	25	21	85	44.5	48
	VRDM 3913	14					
	VRDM 31117	19		26	110		
	VRDM 31122						
Intelligent compact drives IcIA IDS/IFS with stepper motor	I•S 92	12		21	85		
	I•S 93						
SER servomotors	SER 31112	19		26	110		
	SER 31117						
	SER 31122						
	SER 31127						
RIG servomotors	RIG 397	20		31	85		
	RIG 3910						
	RIG 3913						
	RIG 31112	25		40	110		
	RIG 31117						
	RIG 31122						
Planetary gears, single-stage (Neugart)	PLE 60 / WPLE 60	14		30.5	85		
	PLE 80 / WPLE 80	20		33			
	PLE120/WPLE 120	25		45	115		
	PLS 70	19		21	85		
	PLS 90	22		31			

Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For dimensional drawings of the motors and drives see the catalogues below.

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IcIA	0059941201002

PAS44B

Technical Data

Type designation		**PAS44BB**	
Guide type		Ball guide SHS25	
Typical payload	kg	100	
Max. stroke length [1) 2)]	mm	5500	
Min. stroke length [3)]	mm	13	
Max. speed [4)]	m/s	5	
Max. acceleration	m/s^2	20	
Max. drive force Fx [5)]	N	2600	
Max. force Fy_{dynmax} [5)]	N	6250	
Max. force Fz_{dynmax} [5)]	N	6250	
Max. torque Mx_{dynmax} [5)]	Nm	67	
Load ratings guide system C_0/C_{dyn}	N	52400 / 31700	
Max. driving torque M_{max} [5)]	Nm	110	
No-load torque 0-stroke axis (without carriage) [6)]	Nm	2.50	
Moment of inertia 0-stroke axis (without carriage)	$kgcm^2$	28.00 / 25.85	
Moment of inertia per m stroke	$kgcm^2/m$	11.00	
Moment of inertia per kg payload	$kgcm^2/kg$	17.70	
Moment of inertia of motor attachment	$kgcm^2$	2.10	
Moment of inertia of shaft extension	$kgcm^2$	0.54	
Mass of 0-stroke axis (without motor, without carriage)	kg	10.5	
Mass stroke per m stroke	kg/m	16.85	
Mass of motor attachment	kg	2.0	
Mass of shaft extension	kg	0.323	
Repeat accuracy [4)]	mm	±0.05	
Internal diameter of clutch	mm	10 ... 32	
Profile cross section (W x H)	mm	110 x 110	
Diameter of shaft extension	mm	32 h7	
Axial planar moment of inertia ly/lz	mm^4	4713499 / 6624690	
Elasticity module (aluminium)	N/mm^2	0.72×10^5	
Max. ambient temperature	°C	0 ... +50	
Toothed belt / toothed belt pulley			
Drive constant	mm/rotat.	264	
Toothed belt width/pitch		50 / HTD8	
Effective diameter toothed belt wheel (both sides equal)	mm	84.034	
Width toothed belt wheel	mm	98	
Material density toothed belt wheel	kg/cm^3	0.003	
Moment of inertia toothed belt wheel	$kgcm^2$	7.03	
Carriage		**Type 1**	**Type 4**
Max. torque of carriage My_{dynmax} [5)]	Nm	260	1210
Max. torque of carriage Mz_{dynmax} [5)]	Nm	260	1210
No-load torque of carriage [6)]	Nm	1.35	1.35
Moment of inertia of carriage (with/without strip redirection)	$kgcm^2$	84.90 / 72.90	133.00 / 121.00
Mass of carriage with/without strip redirection (incl. toothed belt and profile component)	kg	12.7 / 10.0	20.0 / 17.0
Moving mass of carriage with/without strip redirection	kg	5.0 / 4.2	7.5 / 7.0
Max. total stroke with/without cover strip	mm	5300 / 5500	5030 / 5230

1) Greater stroke length on request

2) Carriage-dependent

3) Guaranteed lubrication of guide elements, shorter stroke length on request

4) Load and stroke-dependent

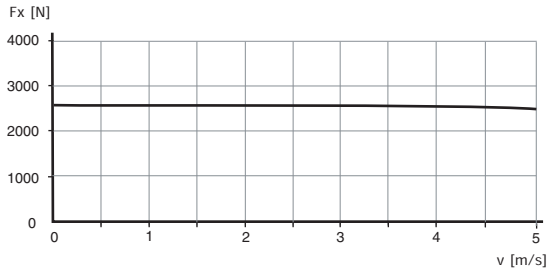
5) The maximum permissible dynamic forces and torques decrease with increasing speed, see characteristic curves on the next page

6) Measured at 0.1 m/s

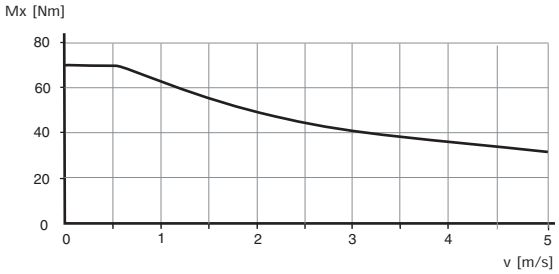
Note: The listed torques and forces refer to a service life of 20000 km.

PAS44BB characteristic curves (Ball guides)

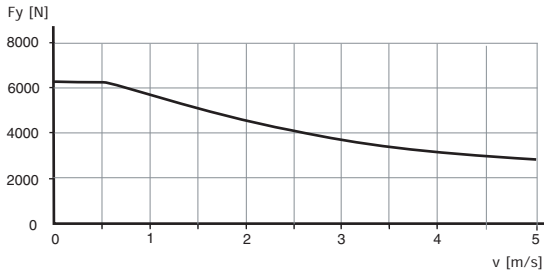
Max. feed force Fx_{dynmax}



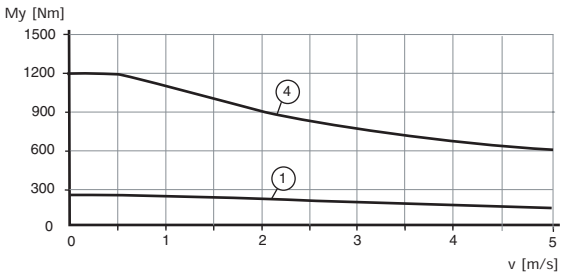
Max. torque Mx_{dynmax}



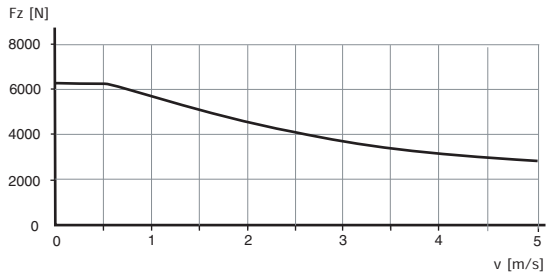
Max. force Fy_{dynmax}



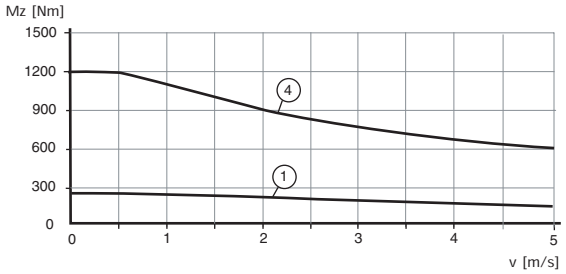
Max. torque of carriage My_{dynmax}



Max. force Fz_{dynmax}



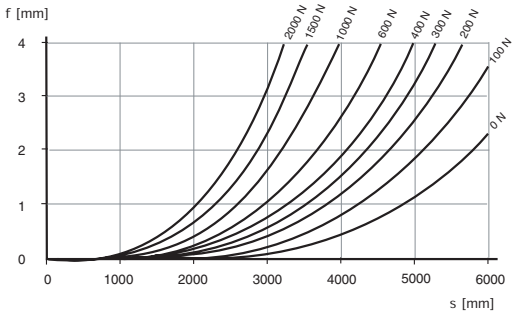
Max. torque of carriage Mz_{dynmax}



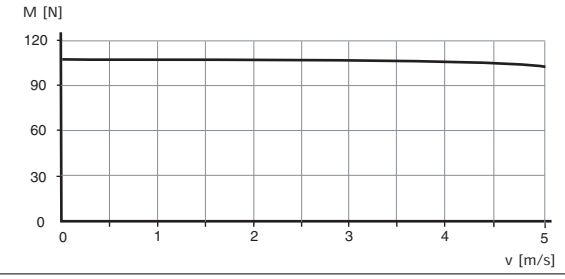
Deflection PAS44BB

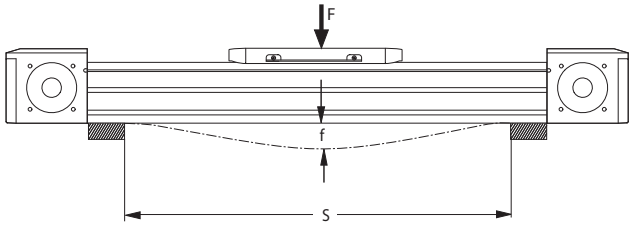
In order to limit deflection of the linear axis in case of long strokes, the axis must have additional support.

The diagram below shows the deflection f (mm) of the linear axis with respect to the support distance S (mm) and the acting force F (N). The maximum deflection of f = 4 mm should not be exceeded. Excessive deflection reduces the service life of the linear axis.



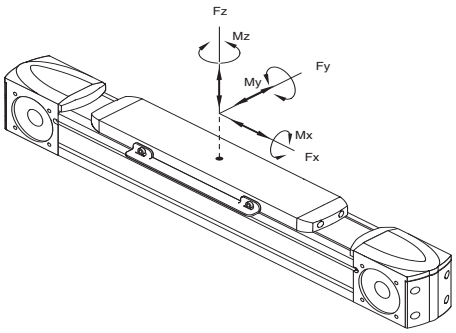
Max. torque of carriage Mz_{dynmax}





(1) Carriage type 1

(4) Carriage type 4



Calculations

Calculation of service life

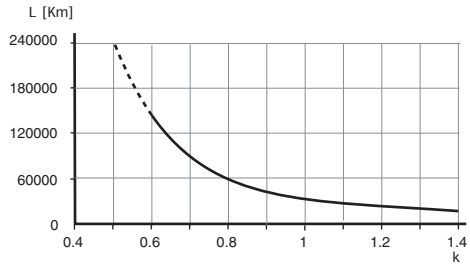
The service life of the linear axes is a function of the mean forces and torques that act in the system. If multiple forces and torques act simultaneously, use the following formula to calculate the load factor k.

$$\frac{Fy}{Fy_{dynmax}} + \frac{Fz}{Fz_{dynmax}} + \frac{Mx}{Mx_{dynmax}} + \frac{My}{My_{dynmax}} + \frac{Mz}{Mz_{dynmax}} = k = Loadfactor$$

The service life of the axis (in km) can be approximated using the load factor and the service life - load characteristic curve.

Please note that the maximum permissible dynamic forces and torques (in the denominator) decrease with increasing speeds. Refer to the characteristic curves on the previous page.
The application-specific load values appear in the numerator.

Service life load curve PAS••BB (ball guide)



No-load torque of toothed belt axis [Nm]

	No-load torque 0-stroke axis (without carriage)	2.50
+	No-load torque per carriage x number of carriages	
=	**No-load torque of toothed belt axis**	

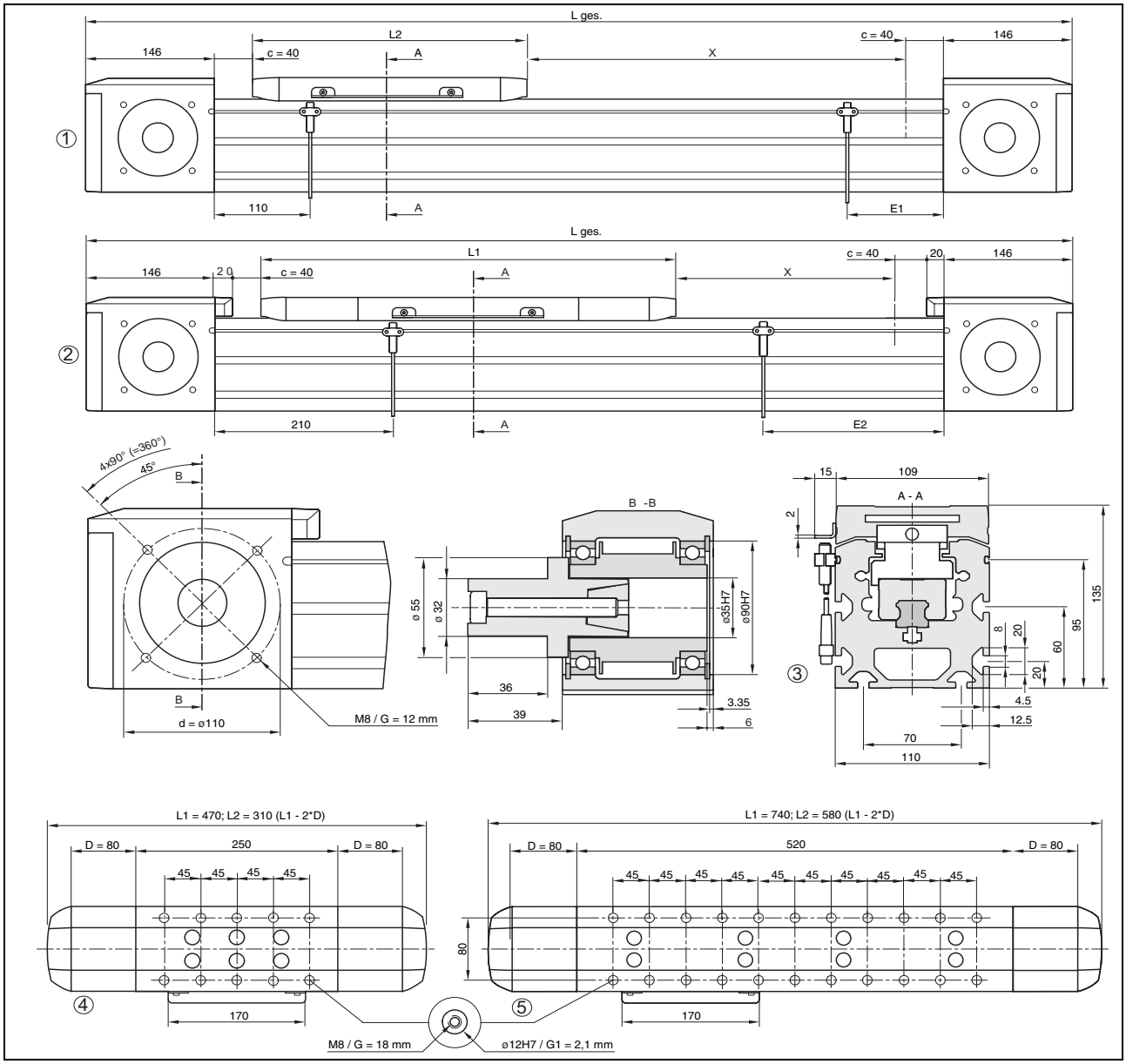
Total moment of inertia of toothed belt axis without drive [kgcm^2]

	Moment of inertia of 0-stroke axis (without carriage)		
+	Moment of inertia per m stroke x m stroke	(11.00 kgcm^2/m)	
+	Moment of inertia per kg payload x kg payload	(17.70 kgcm^2/kg)	
+	Moment of inertia motor attachment		2.10
+	Moment of inertia per carriage (with/without strip diversion) x number of carriages		
=	**Total moment of inertia of toothed belt axis without drive**		

Total mass of toothed belt axis [kg]

	Mass of 0-stroke axis	10.50
+	Mass per m stroke x m stroke	16.85
+	Mass motor attachment	2.0
+	Mass shaft journal	0.325
+	Mass per carriage (with/without strip diversion) x number of carriages	
+	Mass of motor/gearing (see motor catalogue)	
+	Mass of payload	
=	**Total mass of toothed belt axis**	

Dimensional drawings



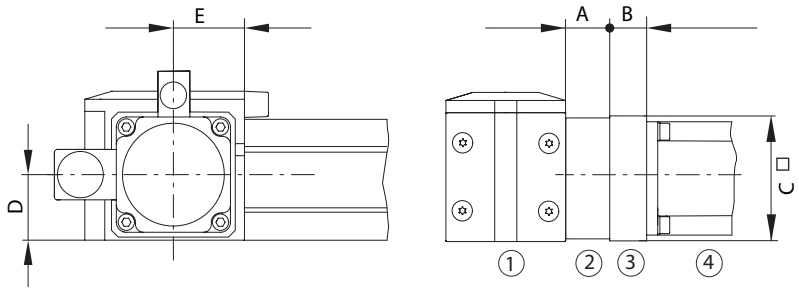
Dimensional drawings PAS44B

(1) = axis without cover strip	Lges	Total length without cover strip = 372 + L2 + X (add L2 + m for each additional carriage)
(2) = axis with cover strip		Total length with cover strip = 412 + L1 + X (add L1 + m for each additional carriage)
(3) = cross section with ball guide		
(4) = carriage type 1	L1	Carriage length with cover strip
(5) = carriage type 4	L2	Carriage length without cover strip
(B-B) = shaft journal as option	X	Working stroke
	m [1)]	Minimum distance between two carriages: with cover strip: 135 mm, without cover strip: 55 mm)
	C	Limit switch safety distance to mechanical stop. CAUTION: Depending on the payload, the acceleration and the positioning velocity, a greater distance is required. This is obtained by moving the limit switch position. The total axis length changes by this value.
	D	Cover strip turning block
G = thread depth	E1 [2)]	Carriage: type 1 = 110 mm; type 4 = 380 mm
G1 = countersink depth	E2 [2)]	Carriage: type 1 = 210 mm; type 4 = 480 mm

1) Maximum of two carriages of the same type on request

2) E1/E2: limit switch position opposite drive side

Motor attachment dimensions



(1) Axial section
(2) Coupling
(3) Motor adapter plate
(4) Motor or gearing

Note: Depending on C, the motor adapter plate or the motor may protrude over the axial section and may act as an obstruction if elements are above the carriage.

Drive type	Size	Shaft diameter	Length				
			A	B	C	D	E
		mm	mm	mm	mm	mm	mm
VRDM stepper motors	VRDM 31117	19	26	24	110	64	64
	VRDM 31122						
RIG servomotors	RIG 397	20		24			
	RIG 3910						
	RIG 3913						
	RIG 31112	25		32			
	RIG 31117						
	RIG 31122						
Planetary gears, single-stage (Neugart)	PLE 80 / WPLE 80	20		36			
	PLE120/WPLE 120	25		51	115		
	PLS 70	19		28	110		
	PLS 90	22		24			

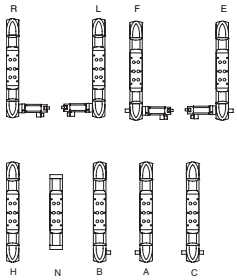
Note: The maximum driving torque of the motors / gearings must not exceed the maximum permissible driving torque of the axis.

For detailed information on the various motors and drives see the catalogues below:

Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Type code

Example (continued next page):	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Product PAS = portal axis	**PAS**	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Product family 4 = basic line	PAS	**4**	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Size(cross-section of section) 1 = 40; (40 x 40 mm) 2 = 60; (60 x 60 mm) 3 = 80; (80 x 80 mm) 4 = 110; (110 x 110 mm)	PAS	4	**2**	B	R	M	1200	C	1	N	B	100	R	N	/	V9
Carriage drive B = toothed belt H = support axis (without drive, guide element only)	PAS	4	2	**B**	R	M	1200	C	1	N	B	100	R	N	/	V9
Guide type R = roller guide B = ball guide	PAS	4	2	B	**R**	M	1200	C	1	N	B	100	R	N	/	V9
Feed per revolution M = 84 mm with size 40; 155 mm with size 60; 205 mm with size 80; 264 mm with size 110 N = support axis	PAS	4	2	B	R	**M**	1200	C	1	N	B	100	R	N	/	V9
Stroke length XXXX = in mm	PAS	4	2	B	R	M	**1200**	C	1	N	B	100	R	N	/	V9
Limit switch [1] A = 2 x PNP sensors as normally closed contacts, not wired [1] B = 2 x PNP sensors as normally closed contacts, plugged into IclA C = 2 x PNP sensors as normally open contacts, not wired [1] D = 2 x PNP sensors as normally open contacts, plugged into IclA E = 2 x NPN sensors as normally closed contacts, not wired [1] F = 2 x NPN sensors as normally closed contacts, plugged into IclA G = 2 x NPN sensors as normally open contacts, not wired [1] H = 2 x NPN sensors as normally open contacts, plugged into IclA N = no sensors	PAS	4	2	B	R	M	1200	**C**	1	N	B	100	R	N	/	V9
Carriage (all carriages driven) 1 = type 1 (size 60, 80, 110) 2 = type 2 (size 40) 4 = type 4 (size 40, 60, 80, 110)	PAS	4	2	B	R	M	1200	C	**1**	N	B	100	R	N	/	V9
Options N = without options B = with cover strip C = corrosion-resistant, without cover strip A = antistatic toothed belt, without cover strip E = corrosion-resistant, antistatic toothed belt, without cover strip L = antistatic toothed belt, with cover strip	PAS	4	2	B	R	M	1200	C	1	**N**	B	100	R	N	/	V9
Number of carriages [2] A = one B = two C = three	PAS	4	2	B	R	M	1200	C	1	N	**B**	100	R	N	/	V9
Distance between carriages [3] 1 ... 999 = distance in mm xxx with only one carriage	PAS	4	2	B	R	M	1200	C	1	N	B	**100**	R	N	/	V9
Axis drive interface H = without (hollow shaft both sides) L = with motor, attachment left R = with motor, attachment right A = with shaft journal, attachment left B = with shaft journal, attachment right C = with shaft journal, attachment both sides E = with motor, attachment left; shaft journal, attachment right F = with motor, attachment right; shaft journal, attachment left N = support axis	PAS	4	2	B	R	M	1200	C	1	N	B	100	**R**	N	/	V9
Toothed belt drive gear N = without	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	**N**	/	V9



[1] With 100 mm cable with plug wired at one end, additional versions as accessories,extension cable as accessories

[2] Only carriages of the same type can be used, all carriages are driven.

[3] Minimum distance between two carriages: see dimensional drawings

Example (continued from previous page):	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	XX
Motor/gearing interface [1]	PAS	4	2	B	R	M	1200	C	1	N	B	100	R	N	/	V9

V6 = stepper motors VRDM 364 / VRDM 366
V8 = stepper motors VRDM 368
V9 = stepper motors VRDM 397 / VRDM 3910
V0 = stepper motors VRDM 3913
V1 = stepper motors VRDM 311•
I6 = IclA IFS/IDS 61 / IFS/IDS 62 with stepper motor
I7 = IclA IFS/IDS 63 with stepper motor
I9 = IFS/IDS 91 / IFS/IDS 92 with stepper motor
I8 = IclA IFS/IDS 93 with stepper motor
S6 = servomotors SER 36•
S9 = servomotors SER 39•
S1 = servomotors SER 311•
A6 = IclA IFA 6• with servomotor
G9 = servomotors RIG 39•
G1 = servomotors RIG 311••
H5 = servomotors BSH 055•
H7 = servomotors BSH 0701 / BSH 0702
H8 = servomotors BSH 0703
H1 = servomotors BSH 1001 / BSH 1002 / BSH 1003
H4 = servomotors BSH 1004
0G = planetary gear (Neugart) - PLE 40
1G = planetary gear (Neugart) - PLE/WPLE 60
3G = planetary gear (Neugart) - PLE/WPLE 80
5G = planetary gear (Neugart) - PLE/WPLE 120
7G = planetary gear (Neugart) - PLS 70
8G = planetary gear (Neugart) - PLS 90
XX = third-party motor / third-party gearing without attachment by Berger Lahr (drawing required)
XY = third-party motor / third-party gearing with attachment by Berger Lahr (drawing required; provide motor/gearing)

[1] Attachment of motor coupling assembly and motor adapter plate:In case of selection V6 to XX, the corresponding motor coupling with coupling housing as well as the motor adapter are attached to the axis. Not the motor.Motor attachment:If the axis is to be delivered with attached motor, specify the complete motor identification (see type codes in the motor catalogues) instead of the motor/gearing interface or select XY.

The type codes for the motors are in the following catalogues.

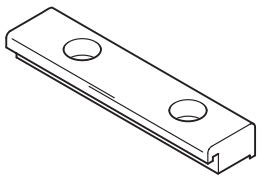
Catalogue	Order number
VRDM stepper motors	0059914201002
SER/RIG servomotors	0059917201002
Lexium 05 amplifier and BSH servomotors	0059923200002
Intelligent compact drive IclA	0059941201002

Accessories

Accessories

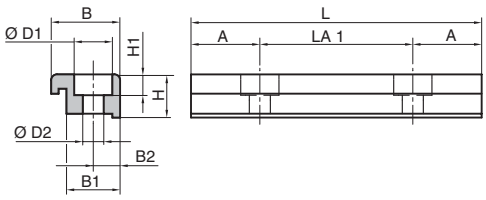
Clamping claws for linear axes

Order data



Description	Order number
For mounting the linear axes on a fastening base. Contents: 10 units	
For linear axis ...	
PAS41	**MNA3MF10/5/11**
PAS42	**MNA3MF10/5/12**
PAS43	**MNA3MF10/6/13**
PAS44	**MNA3MF10/8/14**

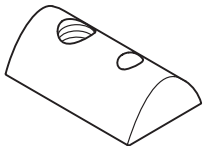
Dimensional drawings



For linear axis ...	A	B	B1	B2	D1	D2	H	H1	L	LA1
PAS41	18	18	14	7	10	5.5	11.2	5.4	76	40
PAS42		19	14	7	10	5.5	16.2	5.4		
PAS43		24	16	8	11	6.6	21.5	6.4		
PAS44		28	20	10	15	9	22	12		

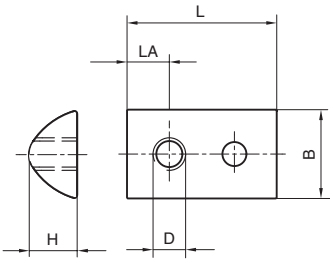
T-slot nuts

Order data



Description	T-slot nut type	Order number
The T-slot nuts are swivelled into the T-slots of the axial section to fasten the axis or parts of the axis. Contents: 10 units		
For linear axis...		
PAS41 / PAS42	5 x M5	**MNA3MF010T5N5**
PAS43	6 x M6	**MNA3MF010T6N6**
PAS44	8 x M6	**MNA3MF010T8N6**
	8 x M8	**MNA3MF010T8N8**

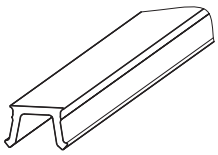
Dimensional drawings



Linear axis ...	T-slot nut type	B	D	H	L	LA
PAS41 / PAS42	5 x M5	8	5	4	11.5	4
PAS43	6 x M6	10.6	6	6.4	17	5.5
PAS44	8 x M6	13.8	8	7.3	23	6.5
	8 x M8	13.8	8	7.3	23	7.5

T-slot covers

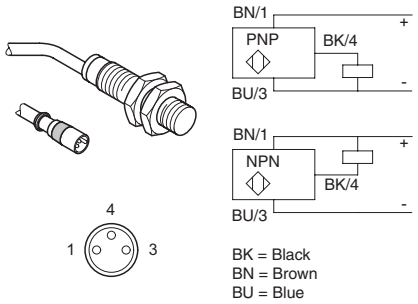
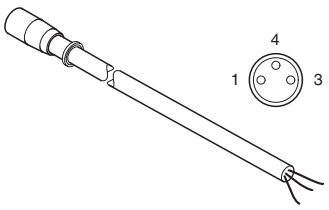
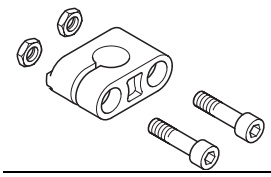
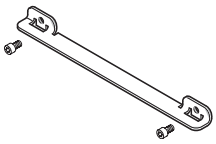
Order data



Description			Order number
length 2 m Contents: 5 units	**For linear axis ...**	**T-slot size**	
	PAS41	5	**MNA3MC05A05**
	PAS42	5	**MNA3MC05B05**
	PAS43	6	**MNA3MC05A06**
	PAS44	8	**MNA3MC05A08**

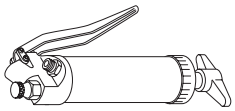
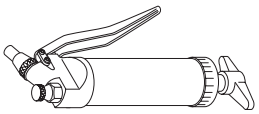
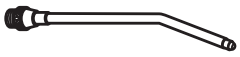
Sensors

Order data

Designation	Description			Order number
Sensor 	With signal display, 100 mm cable and 3-pin M8 circular plug-in connector; fits all linear axes	PNP, normally closed contact	1 units	**XS508B1PBP01M8**
		PNP, normally open contact	1 units	**XS508B1PAP01M8**
		NPN, normally closed contact	1 units	**XS508B1NBP01M8**
		NPN, normally open contact	1 units	**XS508B1NAP01M8**
Sensor extension cable 	Fits trailing cable; sensor side with 3-pin M8 circular plug-in connector socket, second cable end open Contents: 1 units		5 m	**MNA2SBCBGA050**
			10 m	**MNA2SBCBGA100**
			20 m	**MNA2SBCBGA200**
Sensor retainer 	To take a standard limit switch with 8 mm diameter; movable; fits all linear axes		10 units	**MNA3MF010M8**
Sensor damper plate 	For attachment to the carriage of the PAS axes. Contents: Sensor damper plate and screw kit		1 units	**MNA3MASP1**

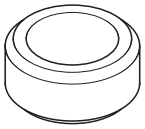
Grease guns

Order data

Designation	Description	Order number
Single-hand high-pressure oil gun 	With nozzle for the lubrication of the linear axes with roller guides. This takes type D nozzles. Volume: 120 cm³; delivery: 0.5 cm³/stroke	**MNA3MAP01**
Single-hand high-pressure grease gun 	With nozzle for the lubrication of the linear axes with guide. This takes type D nozzles. Volume: 120 cm³; delivery: 0.5 cm³/stroke	**MNA3MAP02**
Nozzle type D6 90° 	For type D6 lubrication nipple; nipple 90°, Ø 6 mm; length 20 mm; with M4 pointed end 90° to side	**MNA3MAT01**
Nozzle type D6 20° 	For type D6 lubrication nipple; nipple 20°, Ø 6 mm; length 20 mm; with M4 pointed end 20° angled	**MNA3MAT02**

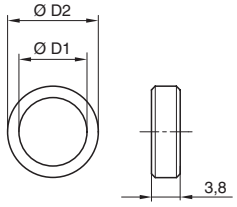
Locating dowels

Order data



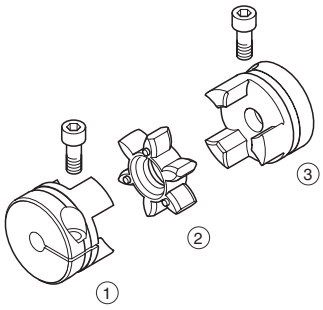
Description	Order number
For exact and reproducible load bearing the locating dowels are inserted into the holes provided in the carriages. Contents: 20 units	
For carriages of linear axes ...	
PAS41 / PAS42	**MNA3MF020LD01**
PAS43	**MNA3MF020LD02**
PAS44	**MNA3MF020LD03**

Dimensional drawings

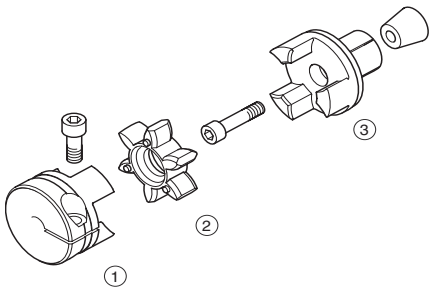


For carriages of linear axis ...	D1	D2
PAS41 / PAS42	5.5	8 h6
PAS43	6.6	10 h6
PAS44	9	12 h6

Coupling modules



Coupling module for ballscrew axes
(1) Clamping hub
(2) Ring gear
(3) Clamping hub



Coupling module for toothed-belt axes
(1) Clamping hub
(2) Ring gear
(3) Expanding hub

Coupling modules are required to attach motors.

A coupling module for ballscrew axes has the following components:

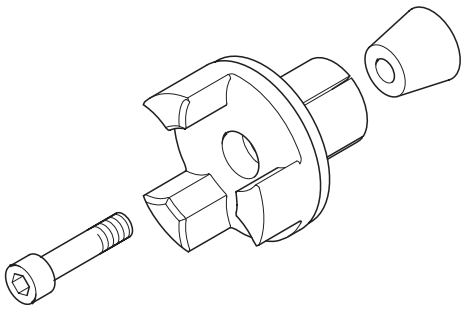
- 2 clamping hubs, one each for ballscrew end and motor end
- 1 ring gear, as a decoupling component between the hubs
- 2 screws

A coupling module for toothed-belt axes has the following components:

- 1 expanding hub for the axis end
- 1 clamping hub for the motor end
- 1 ring gear, as a decoupling component between the hubs
- 2 screws

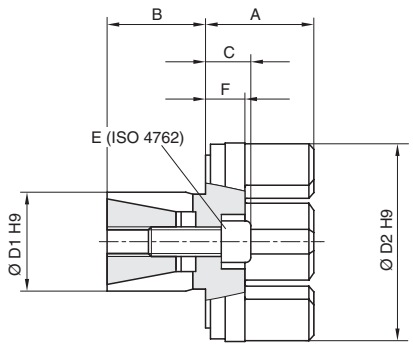
Expanding hubs

Order data



Description	Order number
Coupling components for mounting the coupling module to the toothed-belt axis. Contents: 1 unit	
For toothed-belt axis...	
PAS41B•	**MNA3MFSC10A14**
PAS42B•	**MNA3MFSC20A20**
PAS43B•	**MNA3MFSC25A30**
PAS44B•	**MNA3MFSC35A36**

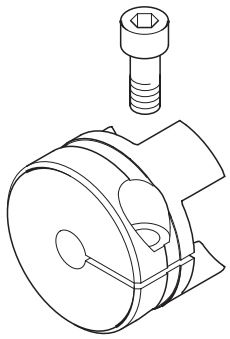
Dimensional drawings



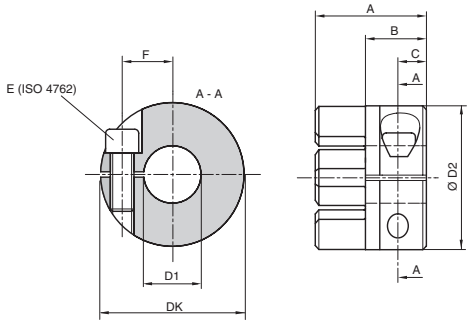
For toothed belt axis ...	Rotationmoment of inertia	Retainingscrew	Wrench size	Tightening torque						
	J	**E**			**A**	**B**	**C**	**D1**	**D2**	**F**
	kgcm²		mm	Nm	mm					
PAS41B•	0.009	M4	3	2.9	16	14	7	10	25	5
PAS42B•	0.09	M6	5	10	22	20	8	20	40	8
PAS43B•	0.32	M8	6	25	24	30	12	25	55	8
PAS44B•	0.77	M10	8	49	25.5	36	13	35	65	8

Clamping hubs

Order data



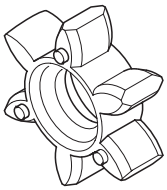
Description			Order number
Motor end clamping hub for toothed-belt axes, axis and motor end clamping hub for ballscrew axes. Contents: 1 unit			
For axis...	**D1 (mm)** Additional diameters on enquiry	**M_{Rmax} (Nm)** Max. transferable torque	
PAS41	6.35	6.8	**MNA3MFCC06A06**
	8	7.4	**MNA3MFCC08A06**
	9	7.8	**MNA3MFCC09A06**
	10	9.7	**MNA3MFCC10A06**
	11	10.7	**MNA3MFCC11A06**
	12	11.6	**MNA3MFCC12A06**
	14	12.2	**MNA3MFCC14A06**
PAS42	6.35	32.5	**MNA3MFCC06A07**
	8	35	**MNA3MFCC08A07**
	9	36	**MNA3MFCC09A07**
	10	41	**MNA3MFCC10A07**
	11	45	**MNA3MFCC11A07**
	12	50	**MNA3MFCC12A07**
	14	53	**MNA3MFCC14A07**
	16	55	**MNA3MFCC16A07**
	19	58	**MNA3MFCC19A07**
	20	60	**MNA3MFCC20A07**
PAS43	12	49	**MNA3MFCC12A08**
	14	54	**MNA3MFCC14A08**
	19	75	**MNA3MFCC19A08**
	20	76	**MNA3MFCC20A08**
	22	78	**MNA3MFCC22A08**
	24	85	**MNA3MFCC24A08**
	25	98	**MNA3MFCC25A08**
PAS44	12	108	**MNA3MFCC12A09**
	14	111	**MNA3MFCC14A09**
	19	128	**MNA3MFCC19A09**
	20	138	**MNA3MFCC20A09**
	22	154	**MNA3MFCC22A09**
	24	158	**MNA3MFCC24A09**
	25	160	**MNA3MFCC25A09**



	Rotationmoment of inertia	Retainingscrew	Wrench size	Tightening torque	Centre distance	Hub length	Fit length		Inside diameter		External diameter
	J	**E**			**B**	**A**	**C**	**F**	**D1**	**D2**	**Dk**
For linear axis ...	kgcm²		mm	Nm	mm						
PAS41	0.015	M3	2.5	1.9	8.1	12	5.5	14	see order data	25	25.8
PAS42	0.15	M6	5	14	14	27	7	20		40	45
PAS43	0.55	M6	5	14	20	32	7.5	30		55	57.5
PAS44	1.22	M8	6	35	25	37	9	36		65	73

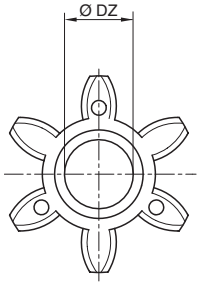
Ring gear

Order data



Description	Order number
The elastomer ring gear is a decoupling component between the hubs of a coupling module. Contents: 1 unit	
For axis...	
PAS41	**MNA3MFR09A018**
PAS42	**MNA3MFR14A034**
PAS43	**MNA3MFR20A120**
PAS44	**MNA3MFR25A320**

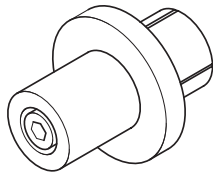
Dimensional drawings



	Shore hardness	Max. torque	Nominal torque	Rotationmoment of inertia	Diameter
		M_{max}	M_N	J	DZ
For axis ...		Nm	Nm	kgcm²	mm
PAS41	98 Sh A	18	7	0.001	9
PAS42	98 Sh A	34	17	0.013	14
PAS43	98 Sh A	120	60	0.067	20
PAS44	98 Sh A	320	160	0.150	25

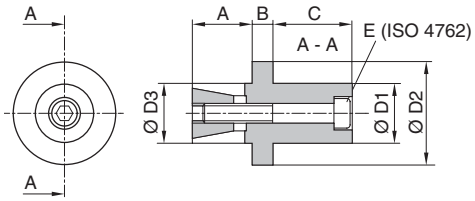
Shaft journal

Order data



Description	Order number
The shaft journal can be mounted at both ends of the toothed-belt axis end blocks. Contents: 1 unit	
For toothed-belt axis ...	
PAS41B•	**MNA3MF1S12A12**
PAS42B•	**MNA3MF1S27A20**
PAS43B•	**MNA3MF1S32A25**
PAS44B•	**MNA3MF1S37A32**

Dimensional drawings



	Max. radial force	Rotationmoment of inertia	Retainingscrew	Wrench size	Tightening torque	Fit length	Joining length	Installed length	Journal diameter	Diameter	Expanding hub
	F_R	J	E			A	B	C	D1	D2	D3
For toothed-belt axis ...	N	kgcm²		mm	Nm	mm					
PAS41B•	230	0.002	M4	3	2.9	12	5.5	14	12	17	10
PAS42B•	400	0.05	M6	5	10	27	7	20	20	35	20
PAS43B•	700	0.16	M8	6	25	32	7.5	30	25	45	25
PAS44B•	1300	0.54	M10	8	49	37	9	36	32	55	35

Definitions and technical terms

Axial section
The linear axis is based on a high-rigidity precision aluminium section.

Ballscrew drive
The ballscrew drive converts a rotary movement into a linear movement. It consists of the ballscrew, the nut system with circulating ball components and the balls as roller components. The ballscrew drive has a very high efficiency. This enables it to execute precise and rigid advance movements and apply high feed forces with high positioning and repeat accuracy.

Bending-critical ballscrew speed
If the bending-critical ballscrew speed is exceeded, ballscrew deviations will occur with resulting oscillations. This will seriously affect the service life of the ballscrew drive. ballscrew supports are installed with longer ballscrew axes to increase the bending-critical ballscrew speed and the output.

Drive constant
The drive constant shows the path of the carriage that is covered by one revolution of the axis drive.

Dynamic load rating C_{dyn}
The dynamic load rating C_{dyn} (in accordance with DIN ISO 281) is the constant equivalent dynamic load P at which a larger number of equivalent rolling bearings or roller guides have 90% probability of reaching the following calculated or nominal service life under standard operating conditions:

- 106 revolutions with deep-groove ball bearings, profile running blocks, ballscrew drives
- 50 km with profile rail guideways

If the load in operation is less than the dynamic load rating C_{dyn}, the nominal service life L10 is correspondingly greater. The service life for ball roller bodies can be calculated as follows:

- L10 = $(C_{dyn}/P)3$ x 106 revolutions for deep-groove ball bearings, profile running blocks, ball-screw drives
- L10 = $(C_{dyn}/P)3$ x 50 km profile rail guideways

The service life of rolling bearings or roller guides also depends on the ambient conditions as well as the equivalent dynamic load P. Shock loads, increased component temperatures (t > 100°C) and the penetration of dirt particles will reduce the calculated service life. The influence of ambient conditions can be taken into account with various factors when calculating the service life.

Limit switch safety distance
The limit switch safety distance is the distance between the limit switches and the mechanical end stop.

Modulus of elasticity
The modulus of elasticity is a material quantity that describes the connection between tension and extension during deformation. The higher the values the stiffer the material.

Mounting position
The linear axes can be installed in any desired position. However, note that all forces and torques must be below the maximum values of the axes.

Positioning accuracy
Positioning accuracy is the tolerance between a specified position and actual end position. The positioning accuracy is influenced by changes in temperature, load and speed and the accuracy of the switching point of the reference sensors.

Repeat accuracy
The repeat accuracy is the capacity to reach a previously reached position again under the same conditions. The repeat accuracy is influenced by changes in temperature, load and speed and the accuracy of the switching point of the reference sensors.

Ball guide
The axial section receives the forces and torques applied to the carriage via the ball guide. High forces and torques can be received with section rail guides.

Self-locking
The axes are not self-locking. This means that motors with a holding brake, a separate holding brake or suitable weight compensation for the linear axis is required, particularly when axes are vertically mounted.

Sequence accuracy
The aluminium sections are extruded sections that have deviations in straightness and torsion because of the manufacturing process. The tolerance of this variation is specified in EN 12020-2. The linear unit must be tensioned on an appropriately accurately machined base to achieve the desired guideway accuracy.

Sensors
Inductive proximity switches are used as sensors for limit switches or reference switches. These switches are small safety limit switches as specified by EN60204-1.

Service life The service life is the path travelled by a linear axis before the first signs of material fatigue can be seen on the guideways, the drive components and the bearings. Service life specifications (kilometres covered) are based on the nominal values in the data sheet. If these nominal values are exceeded, the service life will be reduced according to the service life curve.

Ballscrew axial play Axial play between ballscrew nut and ballscrew.

Static load rating C_0 The static load rating of rolling bearings, rolling guides and ballscrew drives is the static load that causes a lasting deformation at the point of contact with the contact surface but which does not yet degrade the function. Practical experience has shown that the static load rating C0 (according to DIN ISO 76) may amount to a value that causes the roller diameter to deform by a factor of 0.0001. Greater loads cause increased noise and lead to premature failure.

Stiffness The stiffness shows information on the capacity of part that is to be positioned to move and stop at the correct position, even under load variations.

Stroke The stroke is the path covered by the carriage between the switching points of the limit switches.

Conversion tables

Rotor inertia

	lb·in²	lb·ft²	lb·in·s²	lb·ft·s² slug·ft²	kg·cm²	kg·cm·s²	g·cm²	g·cm·s²	oz·in²	oz·in·s²
lb·in²	–	6.94 x 10^{-3}	2.59 x 10^{-3}	2.15 x 10^{-4}	2.926	2.98 x 10^{-3}	2.92 x 10^{3}	2.984	16	4.14 x 10^{-2}
lb·ft²	144	–	0.3729	3.10 x 10^{-2}	421.40	0.4297	4.21 x 10^{5}	429.71	2304	5.967
lb·in·s²	386.08	2.681	–	8.33 x 10^{-2}	1.129 x 10^{3}	1.152	1.129 x 10^{6}	1.152 x 10^{3}	6.177 x 10^{3}	16
lb·ft·s² slug·ft²	4.63 x 10^{3}	32.17	12	–	1.35 x 10^{4}	13.825	1.355 x 10^{7}	1.38 x 10^{4}	7.41 x 10^{4}	192
kg·cm²	0.3417	2.37 x 10^{-3}	8.85 x 10^{-4}	7.37 x 10^{-6}	–	1.019 x 10^{-3}	1000	1.019	5.46	1.41 x 10^{-2}
kg·cm·s²	335.1	2.327	0.8679	7.23 x 10^{-2}	980.66	–	9.8 x 10^{5}	1000	5.36 x 10^{3}	13.887
g·cm²	3.417 x 10^{-4}	2.37 x 10^{-6}	8.85 x 10^{-7}	7.37 x 10^{-8}	1 x 10^{-3}	1.01 x 10^{-6}	–	1.01 x 10^{-3}	5.46 x 10^{-3}	1.41 x 10^{-6}
g·cm·s²	0.335	2.32 x 10^{-3}	8.67 x 10^{-4}	7.23 x 10^{-5}	0.9806	1 x 10^{-3}	980.6	–	5.36	1.38 x 10^{-2}
oz·in²	0.0625	4.3 x 10^{-4}	1.61 x 10^{-6}	1.34 x 10^{-6}	0.182	1.86 x 10^{-4}	182.9	0.186	–	2.59 x 10^{-3}
oz·in·s²	24.3	0.1675	6.25 x 10^{-2}	5.20 x 10^{-3}	70.615	7.20 x 10^{-2}	7.06 x 10^{4}	72	386.08	–

Torque

	lb·in	lb·ft	oz·in	Nm	kg·m	kg·cm	g·cm	dyne·cm
lb·in	–	8.333 x 10^{-2}	16	0.113	1.152 x 10^{-2}	1.152	1.152 x 10^{3}	1.129 x 10^{6}
lb·ft	12	–	192	1.355	0.138	13.825	1.382 x 10^{4}	1.355 x 10^{7}
oz·in	6.25 x 10^{-2}	5.208 x 10^{-3}	–	7.061 x 10^{-3}	7.200 x 10^{-4}	7.200 x 10^{-2}	72.007	7.061 x 10^{4}
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019 x 10^{4}	1 x 10^{7}
kg·m	86.796	7.233	1.388 x 10^{3}	9.806	–	100	1 x 10^{5}	9.806 x 10^{7}
kg·cm	0.8679	7.233 x 10^{-2}	13.877	9.806 x 10^{-2}	10^{-2}	–	1000	9.806 x 10^{5}
g·cm	8.679 x 10^{-4}	7.233 x 10^{-5}	1.388 x 10^{-2}	9.806 x 10^{-5}	1 x 10^{-5}	1 x 10^{-3}	–	980.665
dyne·cm	8.850 x 10^{-7}	7.375 x 10^{-8}	1.416 x 10^{-5}	10^{-7}	1.019 x 10^{-8}	1.0197 x 10^{-6}	1.019 x 10^{-6}	–

Power

	H.P.	W
H.P.	–	745.7
W	1.31 x 10^{-3}	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10^{-2}	0.01	–	10
mm	0.03937	0.00328	1.09 x 10^{-3}	0.001	0.1	–

Speed

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745 x 10^{-2}	–

Mass

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35 x 10^{-2}	–	1.93 x 10^{-3}	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459 x 10^{4}
kg	2.20462	35.274	0.0685218	–	1000
g	2.205 x 10^{-3}	3.527 x 10^{-3}	6.852 x 10^{-5}	0.001	–

Temperature

	°F	°C
°F	–	$(\vartheta - 32) \times {}^{5}/_{9}$
°C	ϑ ¾ $^{9}/_{5} + 32$	–

Force

	lb	oz	gf	dyne	N
lb	–	16	453.592	4.448 x 10^{5}	4.4482
oz	0.0625	–	28.35	2.780 x 10^{4}	0.27801
gf	2.205 x 10^{-3}	0.03527	–	980.665	N.A.
dyne	2.248 x 10^{-6}	3.59 x 10^{-6}	1.02 x 10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of 10 inches to metres. Search for "in" (inches) in the left column of the "length" table and "m" (metres) in the header row. The table cell at the intersection of column and row shows the conversion factor: "0.0254". Multiply 10 inches by 0.0254 and the answer is the value in metres: 10 in x 0.0254 = 0.254 m.

BERGER LAHR

Berger Lahr offers you the positioning and automation solutions you need, based on our technology and proven series of products. Our comprehensive engineering and consulting service is ready to support and advise you every step of the way.
Berger Lahr is a member company of the Schneider Electric Group. With its Merlin Gerlin, Square D and Telemecanique brands, Schneider Electric is one of the leading providers of electrical and automation-engineering solutions.

Berger Lahr GmbH & Co. KG
Breslauer Str. 7, D-77933 Lahr
www.berger-lahr.com

a company of Schneider Electric

35.202 GB05.07 reinisch AG · Technische Änderungen vorbehalten · Printed in Germany