

# PAS4xS

## Ball screw axis

### Product manual

V2.05, 03.2015



MNA1MLSDM00EN, V2.05, 03.2015

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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## Safety Information



Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

## Hazard categories

Safety instructions to the user are highlighted by safety alert symbols in the manual. In addition, labels with symbols and/or instructions are attached to the product that alert you to potential hazards.

Depending on the seriousness of the hazard, the safety instructions are divided into 4 hazard categories.

### **DANGER**

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

### **WARNING**

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

### **CAUTION**

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

### **NOTICE**

NOTICE indicates a potentially hazardous situation, which, if not avoided, **can result** in equipment damage.

### Qualification of personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used.

All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

### Intended use

This product is a linear axis and intended for industrial use according to this manual.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented.

Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design).

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

<b>⚠ DANGER</b>
<b>POTENTIAL FOR EXPLOSION</b>
Install and use this equipment in non-hazardous locations only.
<b>Failure to follow these instructions will result in death or serious injury.</b>

Any use other than the use explicitly permitted is prohibited and can result in hazards.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.



## Basic information

High voltages may be present at the motor connection. The motor itself generates voltage when the motor shaft is rotated. AC voltage can couple voltage to unused conductors in the motor cable.

### **DANGER**

#### **ELECTRIC SHOCK**

- Verify that no voltage is present (this includes the DC bus capacitors) prior to performing any type of work on the drive system.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable.
- Supplement the motor cable grounding conductor with an additional protective ground conductor to the motor housing.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

**Failure to follow these instructions will result in death or serious injury.**

### **WARNING**

#### **GREAT MASS OR FALLING PARTS**

- Use a suitable crane or other suitable lifting gear for mounting the product if this is required by the mass of the product.
- Use the necessary personal protective equipment (for example, safety shoes, safety glasses and protective gloves).
- Mount the product in such a way (tightening torque, securing screws) that parts cannot come loose, even in the case of shocks and vibration.
- Take all necessary measures to avoid unanticipated movements of linear axes mounted in vertical or tilted positions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**⚠ WARNING**

**LOSS OF CONTROL**

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical functions.
- System control paths may include communication links. Consideration must be given to the implication of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines. <sup>1)</sup>
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems".

## Standards and terminology

Technical terms, terminology and the corresponding descriptions in this manual are intended to use the terms or definitions of the pertinent standards.

In the area of drive systems, this includes, but is not limited to, terms such as "safety function", "safe state", "fault", "fault reset", "failure", "error", "error message", "warning", etc.

Among others, these standards include:

- IEC 61800 series: "Adjustable speed electrical power drive systems"
- IEC 61158 series: "Digital data communications for measurement and control – Fieldbus for use in industrial control systems"
- IEC 61784 series: "Industrial communication networks – Profiles"
- IEC 61508 series: "Functional safety of electrical/electronic/programmable electronic safety-related systems"

In addition, the term "zone of operation" is used in conjunction with the description of specific hazards, and is defined as it is for a "hazard zone" or "danger zone" in the EC Machinery Directive (2006/42/EC) and in ISO 12100-1.

Also see the glossary at the end of this manual.

## About the book



This manual is valid for PAS4xS standard products. Chapter "1 Introduction" lists the type code for this product. The type code allows you to identify whether your product is a standard product or a customized version.

*Source manuals* The latest versions of the manuals can be downloaded from the Internet at:

<http://www.schneider-electric.com>

*Source CAD data* For easier engineering, CAD data (drawings or EPLAN macros) are available for download from the Internet at:

<http://www.schneider-electric.com>

*Work steps* If work steps must be performed consecutively, this sequence of steps is represented as follows:

- Special prerequisites for the following work steps
- ▶ Step 1
- ◁ Specific response to this work step
- ▶ Step 2

If a response to a work step is indicated, this allows you to verify that the work step has been performed correctly.

Unless otherwise stated, the individual steps must be performed in the specified sequence.

*Making work easier* Information on making work easier is highlighted by this symbol:



*Sections highlighted this way provide supplementary information on making work easier.*

*SI units* Technical data are specified in SI units. Converted units are shown in parentheses behind the SI unit; they may be rounded.

Example:

Minimum conductor cross section: 1.5 mm<sup>2</sup> (AWG 14)

*Glossary* Explanations of special technical terms and abbreviations.

*Index* List of keywords with references to the corresponding page numbers.



# 1 Introduction

---

## 1.1 Overview of product properties

The ball screw axes are based on specially developed and particularly torsion-resistant aluminum profiles. They excel with their ability to position heavy loads at changing torques with high feed forces and high accuracy.

### 1.1.1 Product family

The linear axes product family consists of the following sizes:

- PAS42S - cross section axis body 60 x 60 mm (2.36 x 2.36 in)
- PAS43S - cross section axis body 80 x 80 mm (3.15 x 3.15 in)
- PAS44S - cross section axis body 110 x 110 mm (4.33 x 4.33 in)

The sizes differ in terms of outer dimensions, drive data, payload capacities and maximum stroke.

### 1.1.2 Features and options of the linear axis

The linear axis provides the following features and options:

- High positioning accuracy even at great ballscrew lengths due to several moving ball screw supports
- Different stroke lengths available
- Mounting threads with counterbores for locating dowels at the carriage for reproducible mounting of the payload
- Grease nipples at the side of the carriage for external lubrication
- Easy integration into systems and machines due to axis bodies with T slots
- Sensors adjustable in T slots
- Motor mounting via compact coupling system
- The cover strip and the wiper in the carriage further help to keep pollution, chips, dust and foreign objects away from the linear guide inside the axis
- Options
  - With ball screw support at greater ball screw lengths
  - Cover strip and wiper in the carriage
  - Distribution of the payload to up to 3 carriages
  - Carriage available in various lengths
  - Sensors as normally open contacts / normally closed contacts and NPN/ PNP version

### 1.1.3 Characteristics of the linear guide

*Recirculating ball bearing guide*

- High acceleration
- High payload
- High torque load
- High accuracy
- Long service life

### 1.1.4 Motor mounting

The motor or the gearbox are coupled by means of a preloaded elastomer coupling.

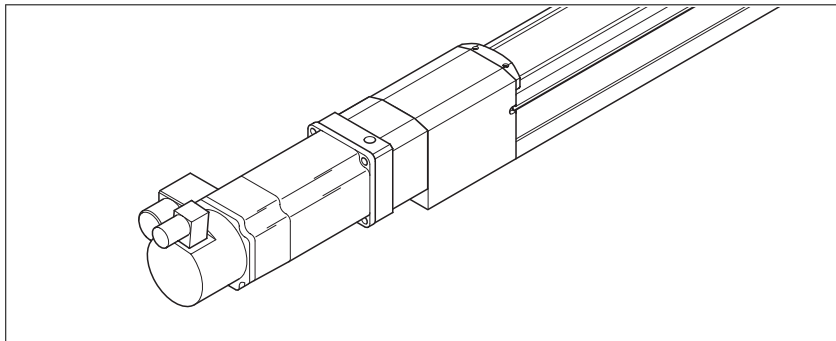


Figure 1: Motor mounting straight

## 1.2 Product overview

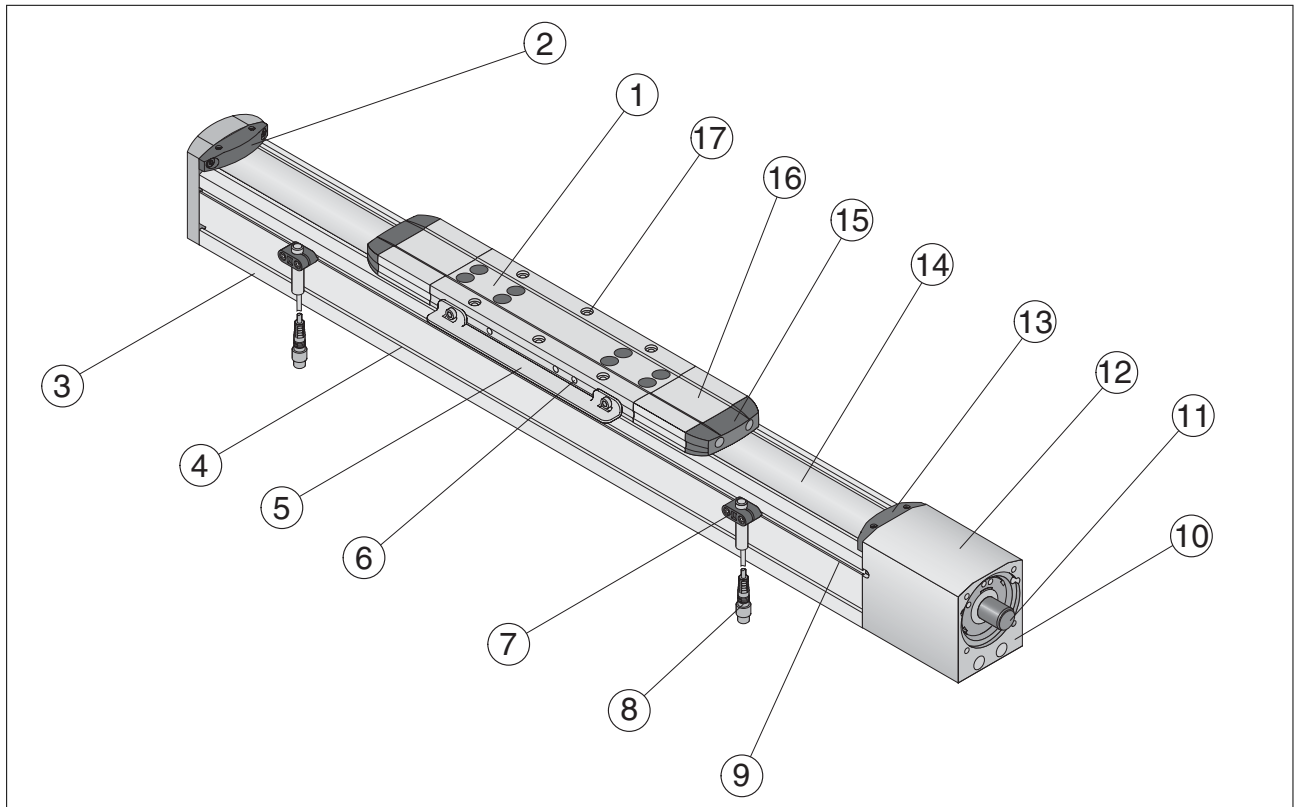


Figure 2: Product overview ball screw axis

- (1) Carriage
- (2) End plate with bearing with ball screw drive
- (3) Axis body
- (4) T slot for fastening the axis body
- (5) Contact plate sensor
- (6) Grease nipples, 3 pieces
- (7) Sensor holder
- (8) Sensor with cable and connector
- (9) T slot for fastening the sensor holder
- (10) Flange for motor mounting
- (11) Shaft extension
- (12) Drive block
- (13) Clamp fastener for cover strip
- (14) Cover strip
- (15) Rubber buffer
- (16) Strip deflection
- (17) Threads for fastening the payload

## 1.3 Nameplate

The nameplate contains the following data:

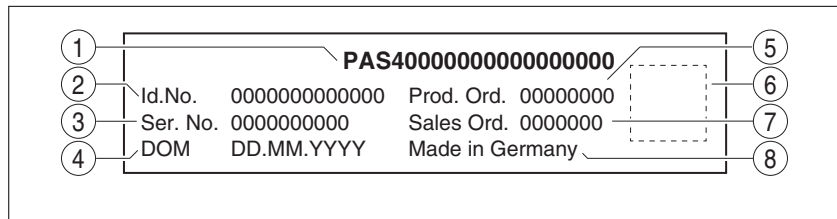


Figure 3: Nameplate

- (1) Axis type, see type code
- (2) Identification number
- (3) Serial number
- (4) Date of manufacture
- (5) Production number
- (6) Data matrix code
- (7) Order number
- (8) Country of manufacture



## 1.4 Type code

	PAS4	2	S	B	F	1000	A	1	B	A	XXX	S
<b>Product designation</b> PAS4 = Portal axis												
<b>Size - cross section axis body</b> 2 = 60 x 60 mm (2.36 x 2.36 in) 3 = 80 x 80 mm (3.15 x 3.15 in) 4 = 110 x 110 mm (4.33 x 4.33 in)												
<b>Drive element</b> S = Ball screw drive A = Support axis (without ball screw drive)												
<b>Guide type</b> B = Recirculating ball bearing guide												
<b>Feed per revolution</b> B = 5 mm (0.20 in) - sizes 2, 3, 4 D = 10 mm (0.39 in) - sizes 2, 3, 4 F = 16 mm (0.63 in) - size 2 G = 20 mm (0.79 in) - size 3 H = 25 mm (0.98 in) - size 4 N = Support axis												
<b>Stroke</b> xxxx = in mm (maximum stroke per size see Technical Data)												
<b>Limit switch</b> <sup>1)</sup> A = 2 x PNP sensors as normally closed contacts, not wired C = 2 x PNP sensors as normally open contacts, not wired E = 2 x NPN sensors as normally closed contacts, not wired G = 2 x NPN sensors as normally open contacts, not wired N = No sensors, no contact plate												
<b>Carriage</b> 1 = Type 1 4 = Type 4												
<b>Options</b> B = With cover strip / without ball screw support C = With cover strip / one ball screw support D = Without cover strip / one ball screw support E = With cover strip / two ball screw supports F = Without cover strip / without ball screw support D = Without cover strip / without ball screw support												
<b>Number of carriages</b> <sup>2)</sup> A = One carriage B = Two carriages C = Three carriages												
<b>Distance between carriages</b> Minimum distance between 2 carriages: see table dimensional drawings 000 to 999 in mm XXX = With a single carriage												
<b>Drive interface</b> (see Figure 4) S = With motor mounting or motor adapter mounting D = With shaft extension N = Support axis												

1) Cable length 100 mm (3.94 in), connector at one cable end, other versions and extension cables as accessories.

2) Only carriages of the same type can be used. Only one carriage is driven. Only the carriage closest to the motor is driven. Inquire for more carriages.

PAS4 2 S B F 1000 A 1 B A XXX S /	1	XX	X	H7	0
<p><b>Motor / gearbox interface</b>                      1 = Motor only                      2 = Motor and gearbox                      3 = Gearbox only                      4 = Without motor, without gearbox, with adaptation material (select motor/gearbox type)                      X = Without motor, without gearbox</p>					
<p><b>Gearbox interface</b>                      0G = Planetary gear - PLE 40                      1G = Planetary gear - PLE 60                      3G = Planetary gear - PLE 80                      5G = Planetary gear - PLE 120                      0A = Planetary gear - WPLE 40                      1A = Planetary gear - WPLE 60                      3A = Planetary gear - WPLE 80                      5A = Planetary gear - WPLE 120                      YY = Third-party gearbox without mounting by Schneider Electric (gearbox drawing required)                      ZZ = Third-party gearbox with mounting by Schneider Electric (gearbox must be provided)                      XX = No gearbox</p>					
<p><b>Mounting direction gearbox</b>                      (with clamping hub mounting screw of adapter plate)                      3 = 0°                      0 = 90°                      9 = 180°                      6 = 270°                      X = No gearbox</p>					
<p><b>Motor interface</b>                      V8 = Stepper motors BRS 368                      V9 = Stepper motors BRS 397, 39A                      V0 = Stepper motors BRS 39B                      V1 = Stepper motors BRS 3AC, 3AD                      I6 = Integrated drive with stepper motor ILS•• 571, 572                      I7 = Integrated drive with stepper motor ILS•• 573                      I9 = Integrated drive with stepper motor ILS•• 851, 852                      I8 = Integrated drive with stepper motor ILS•• 853                      E7 = Integrated drive with brushless DC motor ILE•• 66 with spur wheel gear                      A6 = Integrated drive with servo motor ILA•• 57                      H5 = Servo motors BSH/SH3 055                      H7 = Servo motors BSH/BMH/MH3/SH3/ILM 0701, 0702                      H8 = Servo motors BSH/BMH/MH3/SH3/ILM 0703                      H1 = Servo motors BSH/BMH/MH3/SH3/ILM 1001, 1002, 1003                      H4 = Servo motors BSH 10040.63                      H2 = Servo motors BSH/BMH/MH3/SH3/ILM 1401, 1402, 1403                      YY = Third-party motor without mounting by Schneider Electric (motor drawing required)                      ZZ = Third-party motor with mounting by Schneider Electric (motor drawing required; motor must be provided)                      XX = No motor</p>					
<p><b>Mounting direction motor</b> with reference to motor connection                      (with clamping hub mounting screw of adapter plate)                      3 = 0°                      0 = 90°                      9 = 180°                      6 = 270°                      X = No motor</p>					

If you have questions concerning the type code, contact your Schneider Electric sales office.

*Designation customized version*

In the case of a customized version, the type code contains one or several dollar signs "\$". Example: PAS42SR\$1200C1NB100R/23G0V90

Contact your machine vendor if you have questions concerning customized versions.



Figure 4: Drive interface

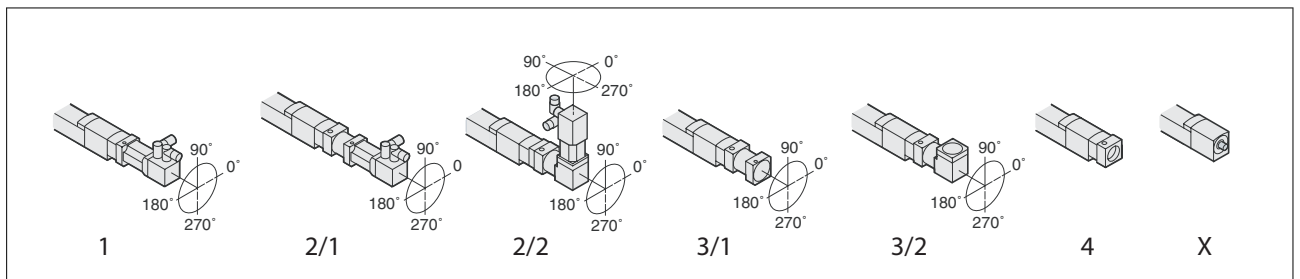


Figure 5: Mounting direction motor and gearbox

1.5 Declaration of Incorporation

**Declaration of Incorporation**

according to EC directive 2006/42/EC on machinery (Annex II part B)  
- Translation -



Document number / Month.Year: 100000142\_02 / 03.2013

**We: Schneider Electric industries SA**  
**35, rue Joseph Monier / 92506 Rueil Malmaison , France**

herewith declare that the partly completed machinery described below

<b>Trademark</b>	<b>Schneider Electric</b>
<b>Product denomination</b>	<b>Portal axis with toothed belt, Portal axis with spindle</b>
<b>Model / type</b>	<b>PAS41x, PAS42x, PAS43x, PAS44x</b>
<b>Machinery serial number</b>	<b>73xx xxxx xxx</b>

combination of axis model and motor model complies with all essential requirements of the Machinery Directive 2006/42/EC (Annex II part B), as far as the scope of delivery allows. Additional we declare that the relevant technical documentation has been compiled in accordance with Annex VII part B.

Directive	Fulfilled requirements	Standards:
<b>DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL</b> of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)	1.1.1, 1.1.2, 1.1.3 1.1.5, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.5.4, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.5.11, 1.5.13, 1.7.1.1, 1.7.3, 1.7.4, 1.7.4.2, 1.7.4.3, 4.1.1, 4.1.2.3, 4.1.2.4, 4.1.2.5	<b>EN ISO 12100:2010</b> Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010);

In addition, the partly completed machinery or parts of it are in conformity with other Directive(s) shown in separate Declarations.

We undertake to transmit, in response to a request by the national authorities, relevant information on the partly completed machinery identified above. The method of transmission shall be electronic; the relevant information shall be transmitted by our documentation department.

Person in charge of documentation:  
Klaus-Dieter Schmitt, Schneider Electric, Gewerbestraße 9, 77749 Hohberg-Niederschopfheim / Germany

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Directive 2006/42/EC on Machinery, where appropriate, by the EC Declaration of Conformity according to Annex II part A.

France -Rueil Malmaison, March 2013

**Peter Spitzfaden**  
**Certification Manager**

## 2 Technical Data

See chapter " Glossary" for definitions and explanations of terms.

### 2.1 Ambient conditions

*Ambient temperature during operation*

Temperature	°C (°F)	0 ... 50 (32 ... 122)
-------------	------------	--------------------------

The following relative humidity is permissible during operation:

Relative humidity		As per IEC 60721-3-3, class 3K3, no condensation
-------------------	--	--

*Climatic environmental conditions transportation and storage*

The environment during transportation and storage must be dry and free from dust.

Temperature	°C (°F)	-25 ... +70 (-13 ... 158)
-------------	------------	------------------------------

*Installation altitude*

Installation altitude above sea level for linear axis without motor	m (ft)	<1500 (<4921.26)
---	-----------	---------------------

*Degree of protection*

Degree of protection		IP 20 <sup>1)</sup>
----------------------	--	---------------------

1) Without cover strip IP00.

*Vacuum*

Operation in vacuum is not permissible.

*Lubricants and lubrication*

See chapters "7.4.2 Lubrication" and "7.4.3 Lubricating the linear guide and the drive elements".

*Compatibility with foreign substances*

See See chapter "3.2 Compatibility with foreign substances".

2.2 PAS42

2.2.1 Technical data PAS42SB

Value pairs with / without cover strip are separated by "/".

Technical data portal axis		PAS42SB					
Drive element		Ball screw drive (P7 as per DIN 69051 part 3)					
Guide type		Recirculating ball bearing guide size 15					
Payload	kg (lb)	25 (55.12)					
Carriage type		Type 1			Type 4		
Carriage length	mm (in)	323 / 226 (12.72 / 8.90)			503 / 406 (19.80 / 15.98)		
Ball screw pitch	mm (in)	5 (0.20)	10 (0.39)	16 (0.63)	5 (0.20)	10 (0.39)	16 (0.63)
Diameter ball screw shaft	mm (in)	16 (0.63)					
Backlash of the ball screw drive	mm (in)	0.04 (0.0016)					
Maximum feed force $F_{X_{max}}$ <sup>1)</sup>	N (lbf)	2980 (669.93)	1560 (350.70)	1540 (346.21)	2980 (669.93)	1560 (350.70)	1540 (346.21)
Maximum speed of rotation of ball screw shaft	min <sup>-1</sup>	3000					
Maximum velocity <sup>2)</sup>	m/s (ft/s)	0.25 (0.82)	0.50 (1.64)	0.80 (2.62)	0.25 (0.82)	0.50 (1.64)	0.80 (2.62)
Maximum acceleration <sup>3)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	2 (6.56)	4 (13.12)	6.4 (21.00)	2 (6.56)	4 (13.12)	6.4 (21.00)
Maximum driving torque $M_{max}$ <sup>1)</sup>	Nm (lb-in)	3.2 (28.32)	3.3 (29.21)	4.9 (43.37)	3.2 (28.32)	3.3 (29.21)	4.9 (43.37)
Breakaway torque 0 stroke axis <sup>3)</sup>	Nm (lb-in)	0.53 (4.69)	0.56 (4.96)	0.59 (5.22)	0.53 (4.69)	0.56 (4.96)	0.59 (5.22)
Breakaway torque per additional carriage <sup>3)</sup>	Nm (lb-in)	0.03 (0.27)	0.06 (0.53)	0.09 (0.80)	0.03 (0.27)	0.06 (0.53)	0.09 (0.80)
Moment of inertia 0 stroke axis	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	1.21 / 1.16 (0.17 / 0.16)	1.24 / 1.19 (0.18 / 0.17)	1.3 / 1.24 (0.18 / 0.18)	1.29 / 1.25 (0.18 / 0.18)	1.33 / 1.28 (0.19 / 0.18)	1.41 / 1.35 (0.20 / 0.19)
Moment of inertia per additional carriage <sup>3)</sup>	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	0.16 / 0.11 (0.02 / 0.02)	0.19 / 0.14 (0.03 / 0.02)	0.25 / 0.19 (0.04 / 0.03)	0.24 / 0.2 (0.03 / 0.03)	0.28 / 0.23 (0.04 / 0.03)	0.36 / 0.3 (0.05 / 0.04)
Moment of inertia per 1 m of stroke	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	0.35 (0.05)	0.45 (0.06)	0.50 (0.07)	0.35 (0.05)	0.45 (0.06)	0.50 (0.07)
Moment of inertia per 1 kg of payload	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	0.006 (0.0008)	0.025 (0.0035)	0.065 (0.0092)	0.006 (0.0008)	0.025 (0.0035)	0.065 (0.0092)

- 1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves)
- 2) Load- and stroke-dependent
- 3) The carriage closest to the motor is driven.

Technical data portal axis		PAS42SB					
Maximum force $F_{Y_{dynmax}}$ <sup>1)</sup>	N (lbf)	4050 (910.48)					

Technical data portal axis		PAS42SB					
Maximum force $F_{z_{dynmax}}^{1)}$	N (lbf)	4050 (910.48)					
Maximum torque $M_{y_{dynmax}}^{1)}$	Nm (lb-in)	304 (2690.63)			668 (5912.30)		
Maximum torque $M_{z_{dynmax}}^{1)}$	Nm (lb-in)	304 (2690.63)			668 (5912.30)		
Max. torque $M_{x_{dynmax}}^{1)}$	Nm (lb-in)	27 (238.97)					
Mass 0 stroke axis	kg (lb)	6.1 / 5.2 (13.45 / 11.46)			7.8 / 6.9 (17.20 / 15.21)		
Mass per additional carriage (with axis body and ball screw drive)	kg (lb)	3.7 / 2.9 (8.16 / 6.39)			5.5 / 4.6 (12.13 / 10.14)		
Mass per 1 m of stroke	kg (lb)	6.9 (15.21)					
Moving mass carriage	kg (lb)	1.5 / 1.3 (3.31 / 2.87)			2.0 / 1.8 (4.41 / 3.97)		
Maximum stroke <sup>2)</sup>	mm (in)	1770 / 1870 (69.69 / 73.62)			1590 / 1690 (62.60 / 66.54)		
Minimum stroke <sup>3)</sup>	mm (in)	9 (0.35)					
Repeatability <sup>4)</sup>	mm (in)	$\pm 0.02$ (0.35) $\pm 0.00079$					
Diameter motor shaft	mm (in)	6.35 ... 20 (0.25 ... 0.79)					
Cross section axis body (W x H)	mm (in)	60 x 60 (2.36 x 2.36)					
Axial area moment of inertia $I_x$ $I_y$	mm <sup>4</sup>	461960 598330					
Modulus of elasticity (alumi- num) E	N/mm <sup>2</sup>	72000					
Load rating linear guide $C_{stat}$	N (lbf)	24200 (5440.38)					
Load rating linear guide $C_{dyn}$	N (lbf)	14200 (3192.29)					
Load rating ball screw drive $C_{stat}$	N (lbf)	19900 (4473.70)	9100 (2045.76)	9200 (2068.24)	19900 (4473.70)	9100 (2045.76)	9200 (2068.24)
Load rating ball screw drive $C_{dyn}$	N (lbf)	14900 (3349.65)	7800 (1753.51)	7700 (1731.03)	14900 (3349.65)	7800 (1753.51)	7700 (1731.03)
Service life <sup>5)</sup>	km (mi)	10000 (6214)					

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves).

2) Inquire for greater stroke

3) Minimum stroke required for lubrication of the linear guide

4) Load- and stroke-dependent

5) The service life depends on the forces and torques, see chapter "2.5 Service life".

Technical data support axis		PAS42AB	
Carriage type		Type 1	Type 4
Breakaway force 0 stroke axis	N (lbf)	30 (6.74)	
Breakaway force per additional carriage	N (lbf)	30 (6.74)	
Mass 0 stroke axis	kg (lb)	4.4 / 3.5 (9.70 / 7.72)	6.1 / 5.2 (13.45 / 11.46)
For further data (if applicable) see:		PAS42SB	

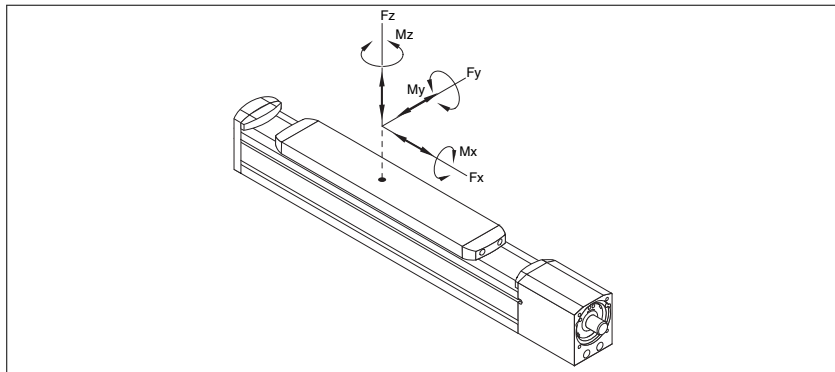


Figure 6: Forces and torques



2.2.2 Characteristic curves PAS42SB

Maximum feed force  $F_x$

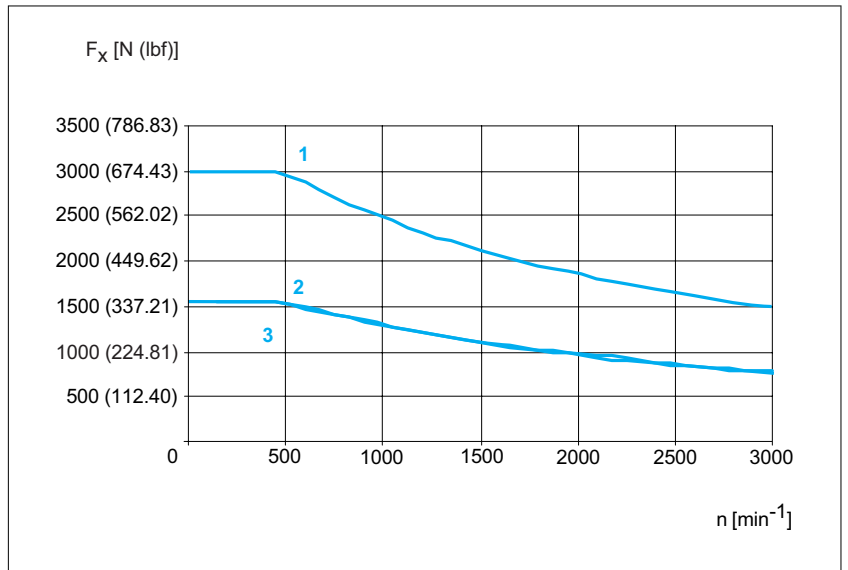


Figure 7: PAS42SB Maximum feed force  $F_x$

Ball screw pitch:

- (1) 5 mm (0.20 in)
- (2) 10 mm (0.39 in)
- (3) 16 mm (0.63 in)

Maximum force  $F_{y\text{dyn}}$

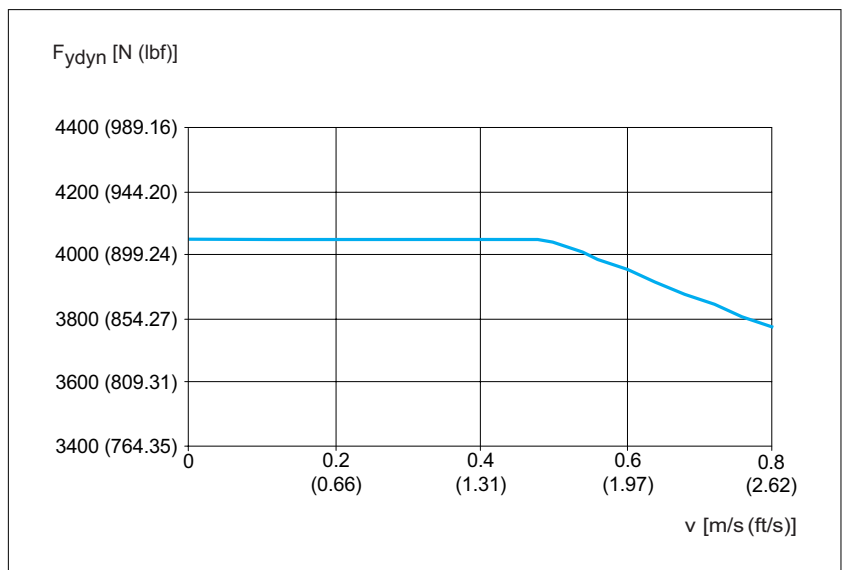


Figure 8: PAS42SB Maximum force  $F_{y\text{dyn}}$

Maximum force  $F_{zdyn}$

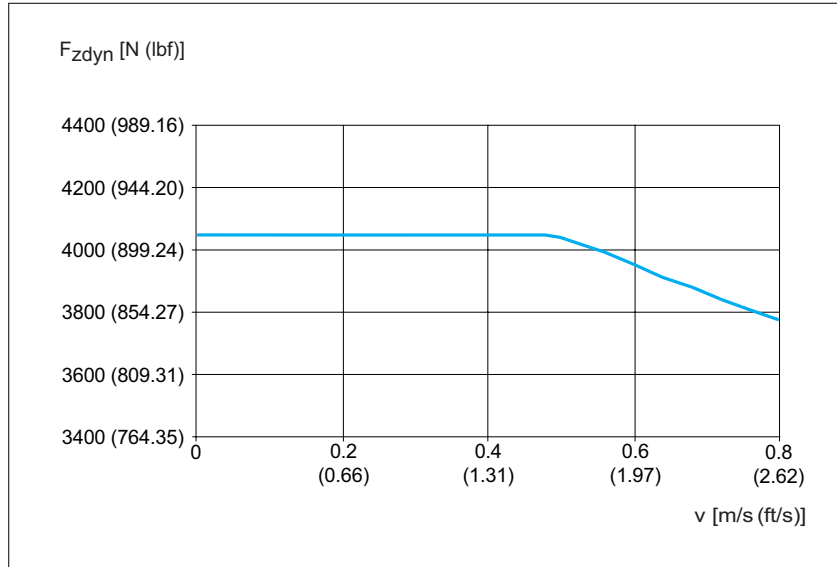


Figure 9: PAS42SB Maximum force  $F_{zdyn}$

Maximum driving torque  $M_{max}$

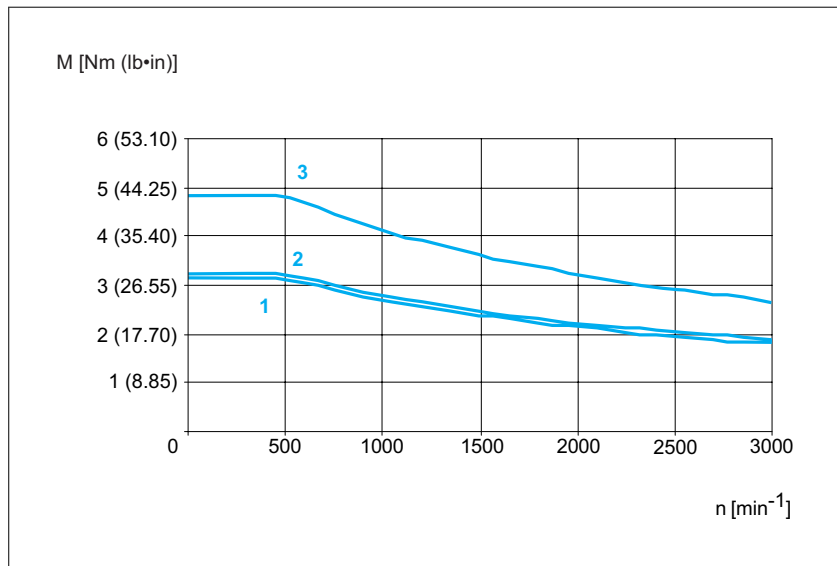


Figure 10: PAS42SB Maximum driving torque  $M_{max}$

Ball screw pitch:

- (1) 5 mm (0.20 in)
- (2) 10 mm (0.39 in)
- (3) 16 mm (0.63 in)

Maximum torque carriage  $M_{xdyn}$

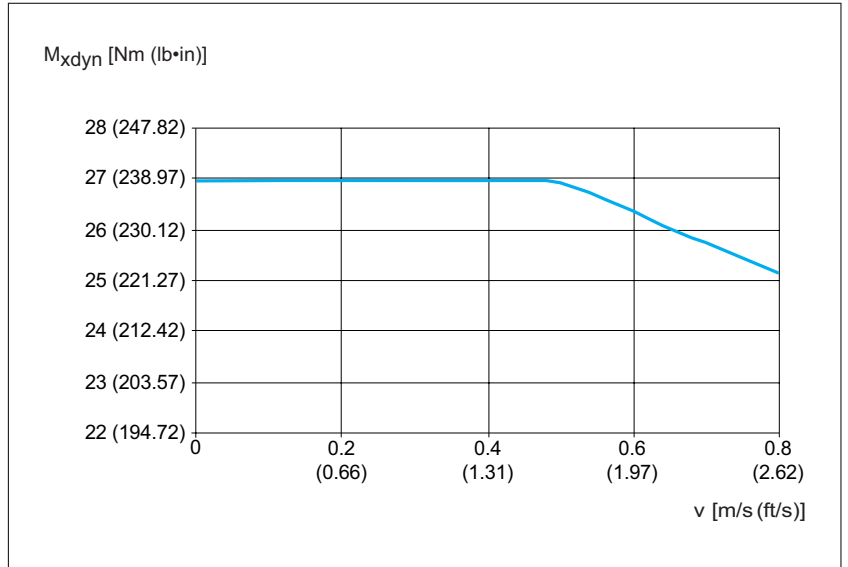


Figure 11: PAS42SB Maximum torque carriage  $M_{xdyn}$

Maximum torque carriage  $M_{ydyn}$

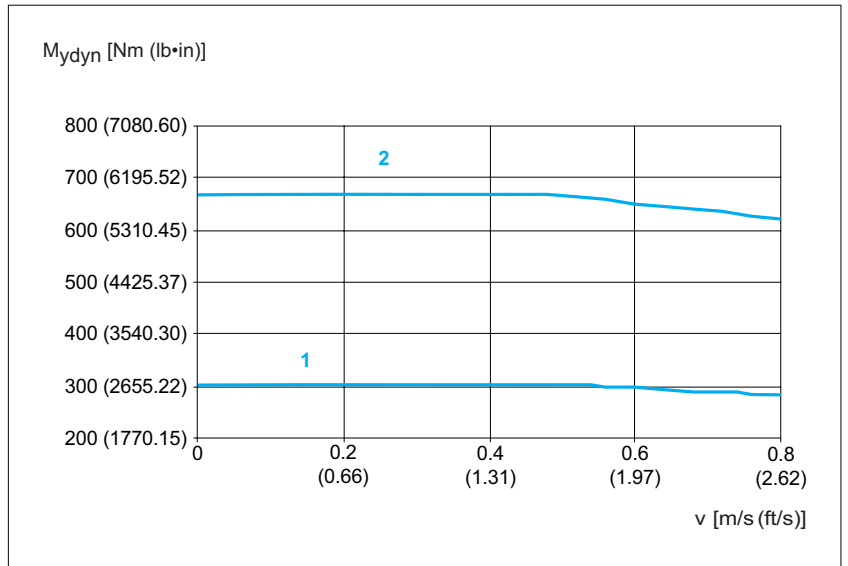


Figure 12: PAS42SB Maximum torque carriage  $M_{ydyn}$

- (1) Carriage type 1
- (2) Carriage type 4

Maximum torque carriage  $M_{zdyn}$

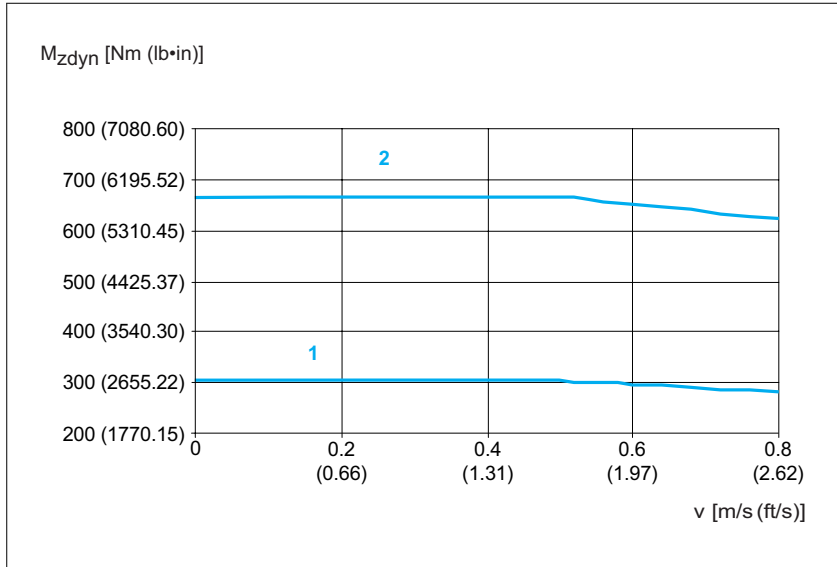


Figure 13: PAS42SB Maximum torque carriage  $M_{zdyn}$

- (1) Carriage type 1
- (2) Carriage type 4

Service life load curve

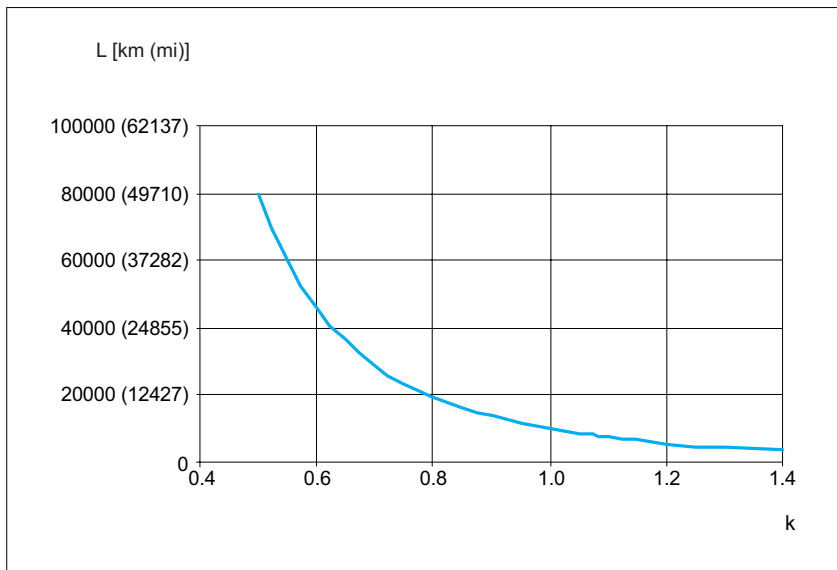


Figure 14: PAS42SB Service life load curve

Speed of rotation ball screw shaft

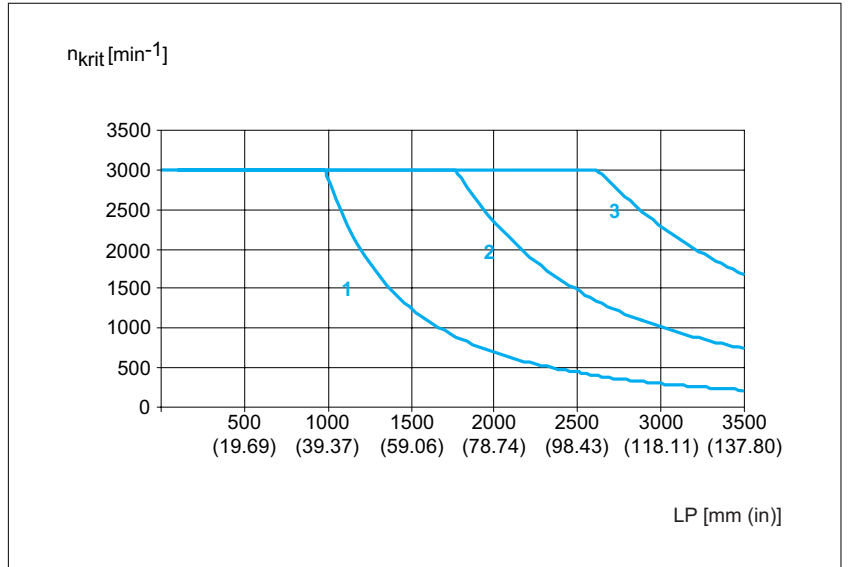


Figure 15: PAS42SB Speed of rotation ball screw shaft

- (1) Without ball screw support
- (2) 1 ball screw support
- (3) 2 ball screw supports

Maximum deflection

In order to limit deflection of the linear axis at long strokes, the axis must be supported. The diagram below shows the deflection  $f$  [mm (in)] of the linear axis with respect to the support distance  $S$  [mm (in)] and the acting force  $F$  [N (lbf)]. Excessive deflection reduces the service life of the linear axis.

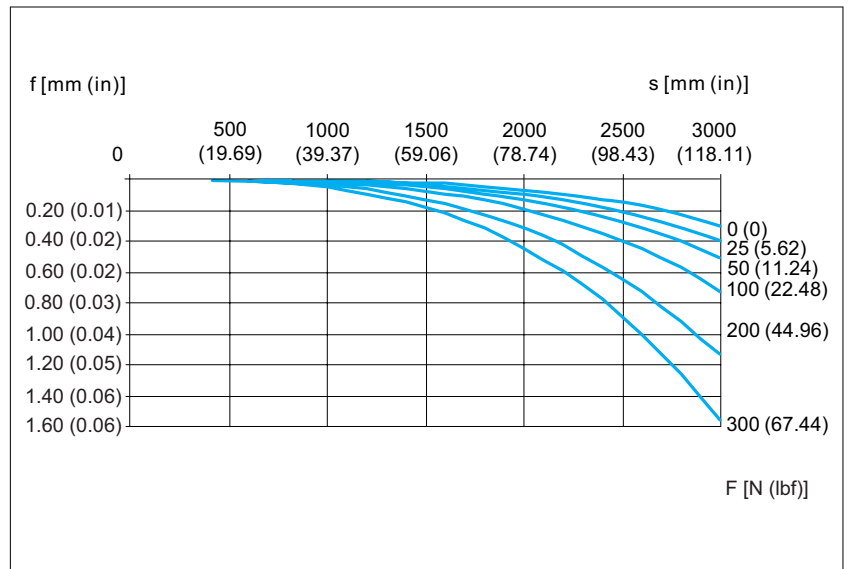


Figure 16: PAS42SB Maximum deflection

*Buckling strength*

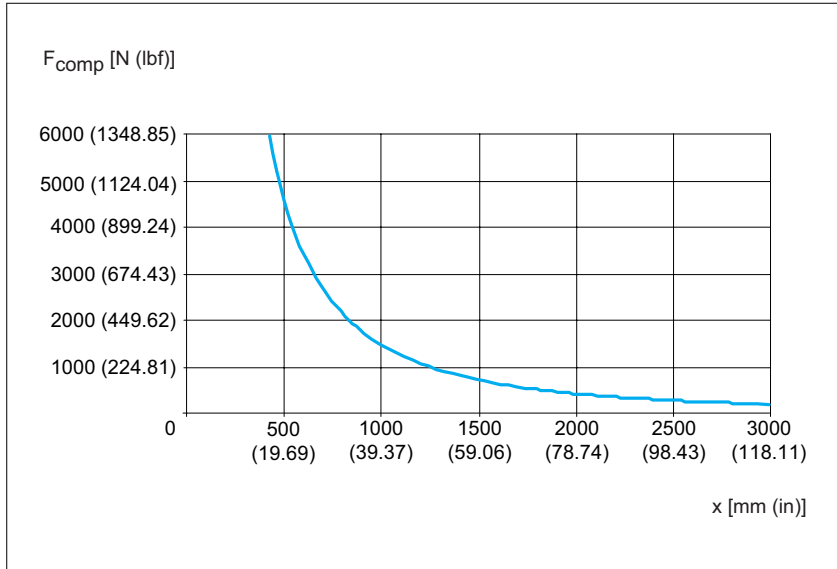


Figure 17: PAS42SB Buckling strength

2.2.3 Dimensional drawings PAS42SB

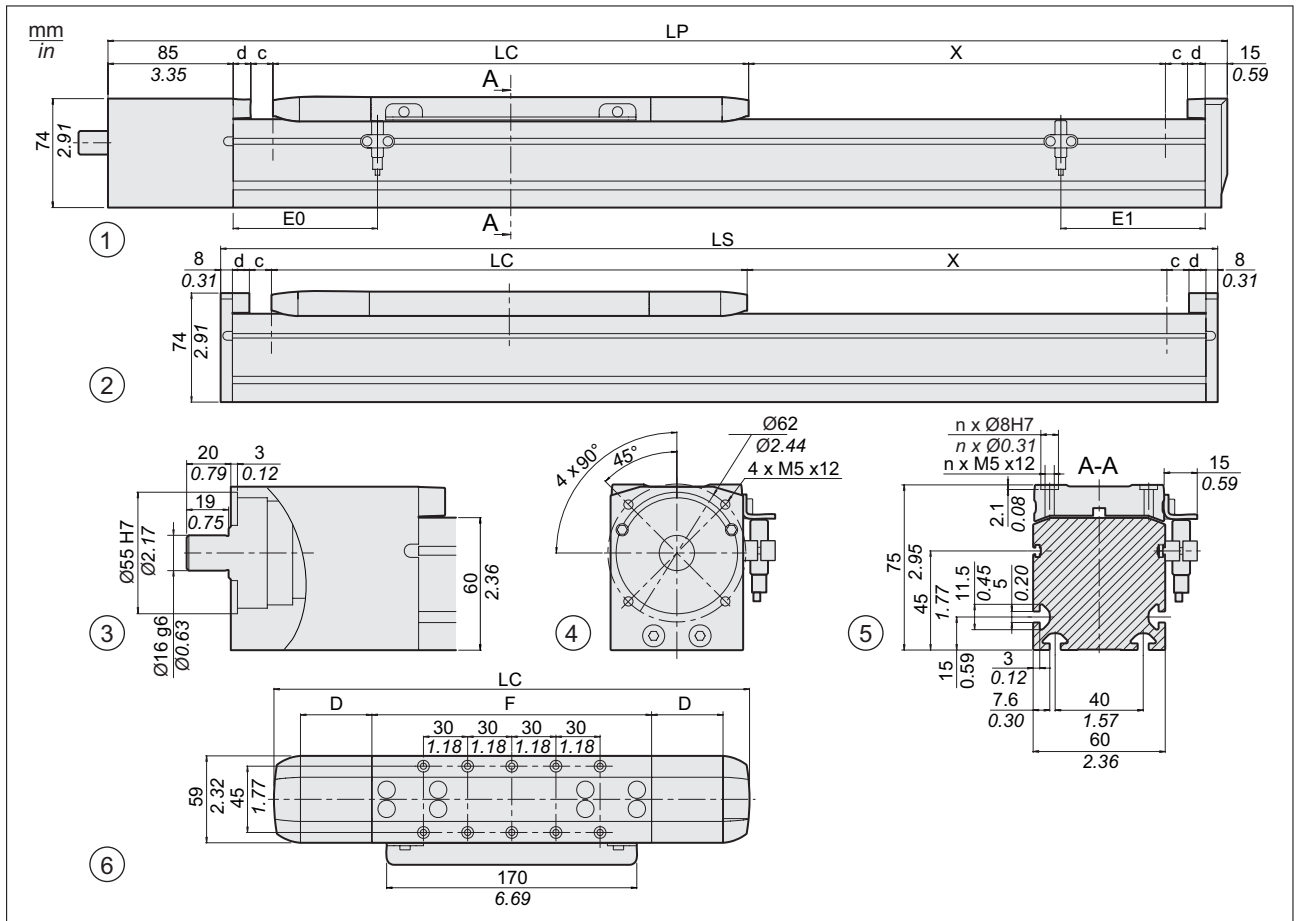


Figure 18: Dimensional drawing PAS42SB

- (1) Portal axis
- (2) Support axis
- (3) Shaft extension
- (4) Drive block
- (5) Section of axis
- (6) Carriage type 1 (type 4 has more tapped holes for mounting)

Carriage type			Type 1				Type 4			
Cover strip			Yes	No			Yes	No		
Number of ball screw supports			0, 1 or 2	0	1	2	0, 1 or 2	0	1	2
Total length of portal axis <sup>1)</sup>	LP	mm (in)	466 + X (18.35 + X)	369 + X (14.53 + X)	399 + X (15.71 + X)	429 + X (16.89 + X)	646 + X (25.43 + X)	549 + X (21.61 + X)	579 + X (22.80 + X)	609 + X (23.98 + X)
Total length of support axis	LS	mm (in)	382 + X (15.04 + X)	285 + X (11.22 + X)	315 + X (12.40 + X)	345 + X (13.58 + X)	562 + X (22.13 + X)	465 + X (18.31 + X)	495 + X (19.49 + X)	525 + X (20.67 + X)
Stroke	X	mm	See technical data							
Carriage length	LC	mm (in)	323 (12.72)	226 (8.90)			503 (19.80)	406 (15.98)		
Profile length of carriage	F	mm (in)	190 (7.48)				370 (14.57)			
Number of tapped holes for mounting <sup>2)</sup>	n		10 (0.39)				22 (0.87)			
Distance between tapped holes		mm (in)	30 ±0.03 (1.18 ±0.0012)				30 ±0.03 (1.18 ±0.0012)			
Limit switch position at drive end	E0	mm (in)	98 (3.86)	50 (1.97)	65 (2.56)	80 (3.15)	98 (3.86)	50 (1.97)	65 (2.56)	80 (3.15)
Limit switch position opposite drive end	E1	mm (in)	98 (3.86)	50 (1.97)	65 (2.56)	80 (3.15)	278 (10.94)	230 (9.06)	245 (9.65)	260 (10.24)
Stroke reserve up to mechanical stop	c	mm (in)	10 (0.39)				10 (0.39)			
Length of cover strip clamp	d	mm (in)	11.5 (0.45)				11.5 (0.45)			
Deflection of cover strip	D	mm (in)	48.5 (1.91)	-			48.5 (1.91)	-		
Minimum distance between 2 carriages		mm (in)	90 (3.54)	35 (1.38)			90 (3.54)	35 (1.38)		

- 1) In the case of axes with more than one carriage, you must add the carriage length (LC) and the distance between the carriages for each additional carriage.  
 2) Prepared for locating rings (see Accessories)



## 2.3 PAS43

## 2.3.1 Technical data PAS43SB

Value pairs with / without cover strip are separated by "/".

Technical data portal axis		PAS43SB					
Drive element		Ball screw drive (P7 as per DIN 69051 part 3)					
Guide type		Recirculating ball bearing guide size 20					
Payload	kg (lb)	60 (132.28)					
Carriage type		Type 1			Type 4		
Carriage length	mm (in)	394 / 274 (15.51 / 10.79)			604 / 484 (23.78 / 19.06)		
Ball screw pitch	mm (in)	5 (0.20)	10 (0.39)	20 (0.79)	5 (0.20)	10 (0.39)	20 (0.79)
Diameter ball screw shaft	mm (in)	20 (0.79)					
Backlash of the ball screw drive	mm (in)	0.04 (0.0016)					
Maximum feed force $F_{x_{max}}$ <sup>1)</sup>	N (lbf)	3400 (764.35)	2600 (584.50)	1720 (386.67)	3400 (764.35)	2600 (584.50)	1720 (386.67)
Maximum speed of rotation of ball screw shaft	min <sup>-1</sup>	3000					
Maximum velocity <sup>2)</sup>	m/s (ft/s)	0.25 (0.82)	0.50 (1.64)	1.00 (3.28)	0.25 (0.82)	0.50 (1.64)	1.00 (3.28)
Maximum acceleration <sup>2)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	2 (6.56)	4 (13.12)	8 (26.25)	2 (6.56)	4 (13.12)	8 (26.25)
Maximum driving torque $M_{max}$ <sup>1)</sup>	Nm (lb-in)	3.7 (32.75)	5.3 (46.91)	6.8 (60.19)	3.7 (32.75)	5.3 (46.91)	6.8 (60.19)
Breakaway torque 0 stroke axis <sup>3)</sup>	Nm (lb-in)	0.7 (6.20)	0.7 (6.20)	0.8 (7.08)	0.7 (6.20)	0.7 (6.20)	0.8 (7.08)
Breakaway torque per additional carriage <sup>3)</sup>	Nm (lb-in)	0.04 (0.35)	0.08 (7.08)	0.15 (1.33)	0.04 (0.35)	0.08 (7.08)	0.15 (1.33)
Moment of inertia 0 stroke axis	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	2.76 / 2.62 (0.39 / 0.37)	2.82 / 2.67 (0.40 / 0.38)	3.05 / 2.87 (0.43 / 0.41)	2.99 / 2.86 (0.42 / 0.41)	3.07 / 2.93 (0.43 / 0.41)	3.36 / 3.19 (0.48 / 0.45)
Moment of inertia per additional carriage <sup>3)</sup>	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	0.46 / 0.32 (0.07 / 0.05)	0.52 / 0.37 (0.07 / 0.37)	0.75 / 0.57 (0.11 / 0.08)	0.69 / 0.56 (0.10 / 0.08)	0.77 / 0.63 (0.11 / 0.09)	1.06 / 0.89 (0.15 / 0.13)
Moment of inertia per 1 m of stroke	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	0.95 (0.13)	1.10 (0.16)	1.15 (0.16)	0.95 (0.13)	1.10 (0.16)	1.15 (0.16)
Moment of inertia per 1 kg of payload	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	0.006 (0.0008)	0.025 (0.0035)	0.101 (0.0143)	0.006 (0.0008)	0.025 (0.0035)	0.101 (0.0143)

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves)

2) Load- and stroke-dependent

3) The carriage closest to the motor is driven.

Technical data portal axis		PAS43SB	
Maximum force $F_{y_{dynmax}}$ <sup>1)</sup>	N (lbf)	6360 (1429.78)	

Technical data portal axis		PAS43SB					
Maximum force $F_{z_{dynmax}}^{1)}$	N (lbf)	6360 (1429.78)					
Maximum torque $M_{y_{dynmax}}^{1)}$	Nm (lb-in)	556 (4921.01)			1224 (10833.31)		
Maximum torque $M_{z_{dynmax}}^{1)}$	Nm (lb-in)	556 (4921.01)			1224 (10833.31)		
Max. torque $M_{x_{dynmax}}^{1)}$	Nm (lb-in)	60 (531.04)					
Mass 0 stroke axis	kg (lb)	12.1 / 10.3 (26.68 / 22.71)			15.4 / 13.6 (33.95 / 29.98)		
Mass per additional carriage (with axis body and ball screw drive)	kg (lb)	7.7 / 5.9 (16.98 / 13.01)			11.0 / 9.2 (24.25 / 20.28)		
Mass per 1 m of stroke	kg (lb)	11.70 (25.79)					
Moving mass carriage	kg (lb)	3.0 / 2.6 (6.61 / 5.73)			3.9 / 3.5 (8.60 / 7.72)		
Maximum stroke <sup>2)</sup>	mm (in)	3070 / 3190 (120.87 / 125.59)			2860 / 2980 (112.60 / 117.32)		
Minimum stroke <sup>3)</sup>	mm (in)	11 (0.43)					
Repeatability <sup>4)</sup>	mm (in)	± 0.02 (± 0.00079)					
Diameter motor shaft	mm (in)	9 ... 20 (0.35 ... 0.79)					
Cross section axis body (W x H)	mm (in)	80 x 80 (3.15 x 3.15)					
Axial area moment of inertia $I_x$ $I_y$	mm <sup>4</sup>	1480060 1851160					
Modulus of elasticity (alumi- num) E	N/mm <sup>2</sup>	72000					
Load rating linear guide $C_{stat}$	N (lbf)	38400 (8632.66)					
Load rating linear guide $C_{dyn}$	N (lbf)	22300 (5013.24)					
Load rating ball screw drive $C_{stat}$	N (lbf)	25300 (5687.67)	18400 (4136.48)	11600 (2607.78)	25300 (5687.67)	18400 (4136.48)	11600 (2607.78)
Load rating ball screw drive $C_{dyn}$	N (lbf)	17000 (3821.75)	13000 (2922.52)	8600 (1933.36)	17000 (3821.75)	13000 (2922.52)	8600 (1933.36)
Service life <sup>5)</sup>	km (mi)	10000 (6214)					

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves).

2) Inquire for greater stroke

3) Minimum stroke required for lubrication of the linear guide

4) Load- and stroke-dependent

5) The service life depends on the forces and torques, see chapter "2.5 Service life".

Technical data support axis		PAS43AB	
Carriage type		Type 1	Type 4
Breakaway force 0 stroke axis	N (lbf)	40	
Breakaway force per additional carriage	N (lbf)	40	
Mass 0 stroke axis	kg (lb)	9.1 / 7.3 (20.06 / 16.09)	12.4 / 10.6 (27.34 / 23.37)
For further data (if applicable) see:		PAS43SB	

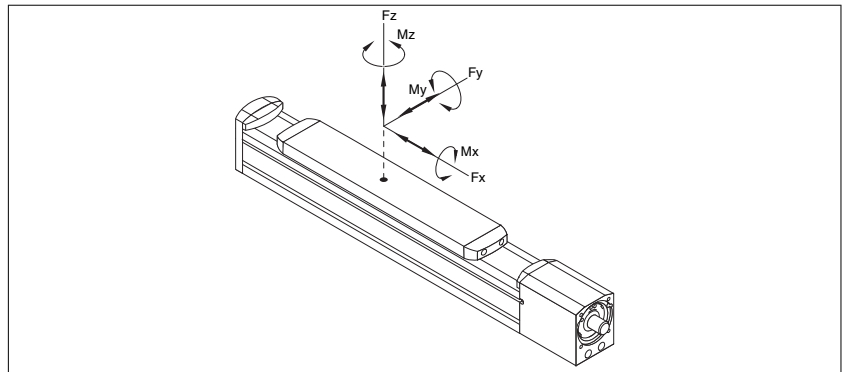


Figure 19: Forces and torques

2.3.2 Characteristic curves PAS43SB

Maximum feed force  $F_x$

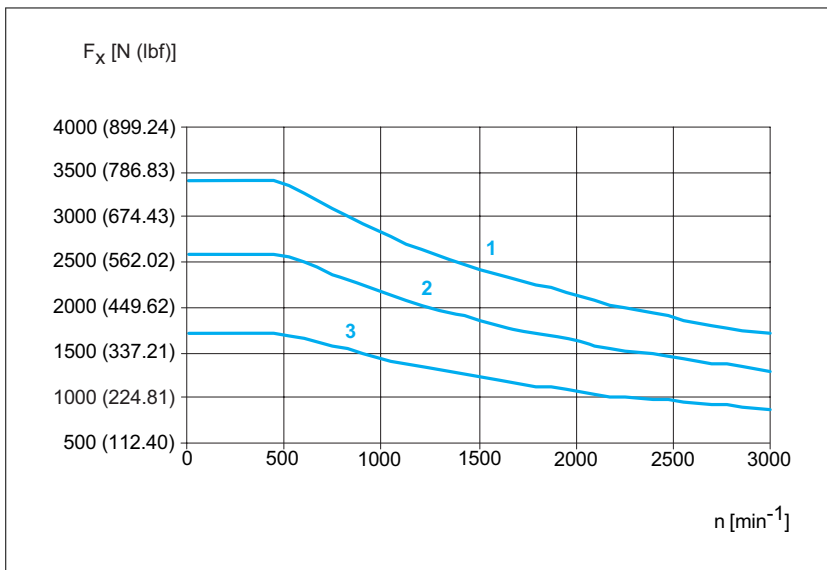


Figure 20: PAS43SB Maximum feed force  $F_x$

Ball screw pitch:

- (1) 5 mm (0.20 in)
- (2) 10 mm (0.39 in)
- (3) 16 mm (0.63 in)

Maximum force  $F_{y\text{dyn}}$

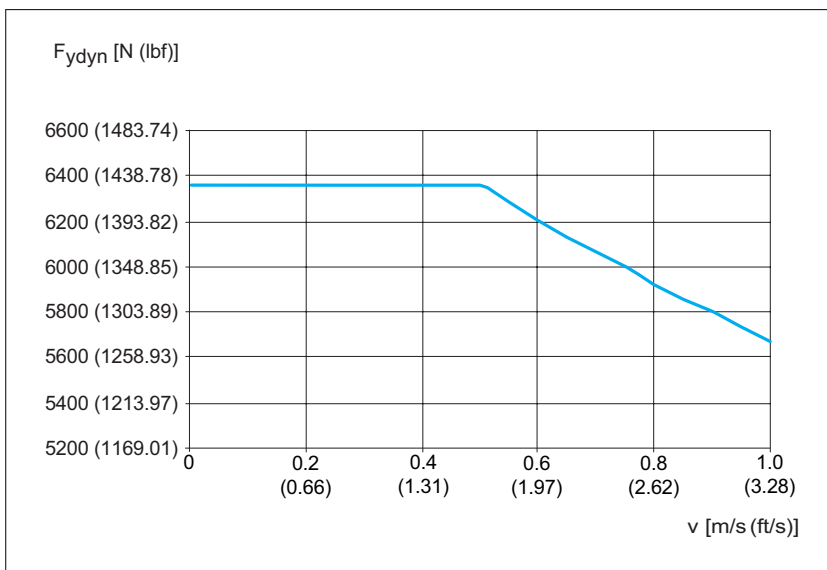


Figure 21: PAS43SB Maximum force  $F_{y\text{dyn}}$

Maximum force  $F_{zdyn}$

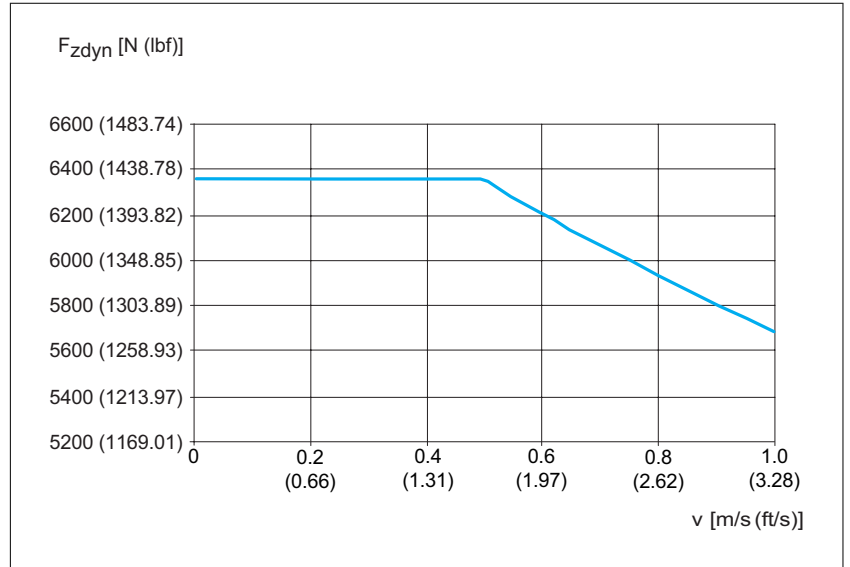


Figure 22: PAS43SB Maximum force  $F_{zdyn}$

Maximum driving torque  $M_{max}$

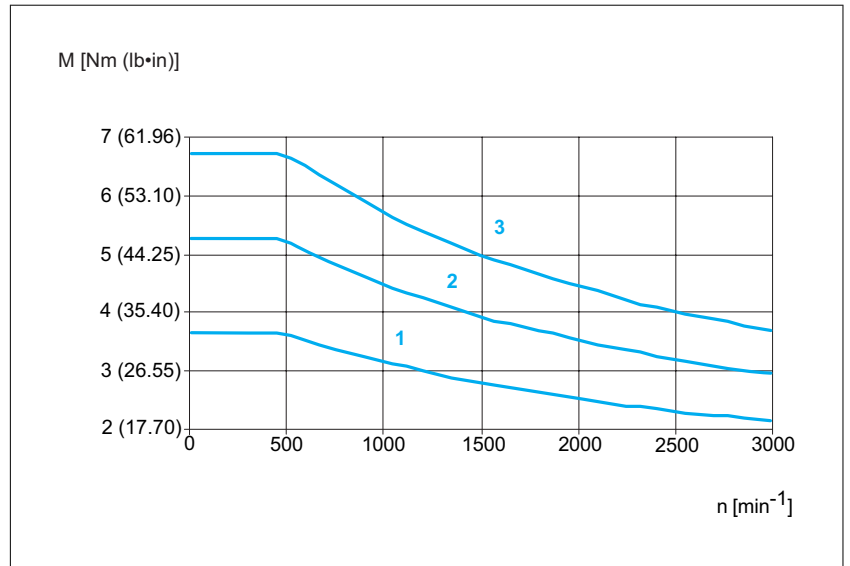


Figure 23: PAS43SB Maximum driving torque  $M_{max}$

Ball screw pitch:

- (1) 5 mm (0.20 in)
- (2) 10 mm (0.39 in)
- (3) 16 mm (0.63 in)

Maximum torque carriage  $M_{xdyn}$

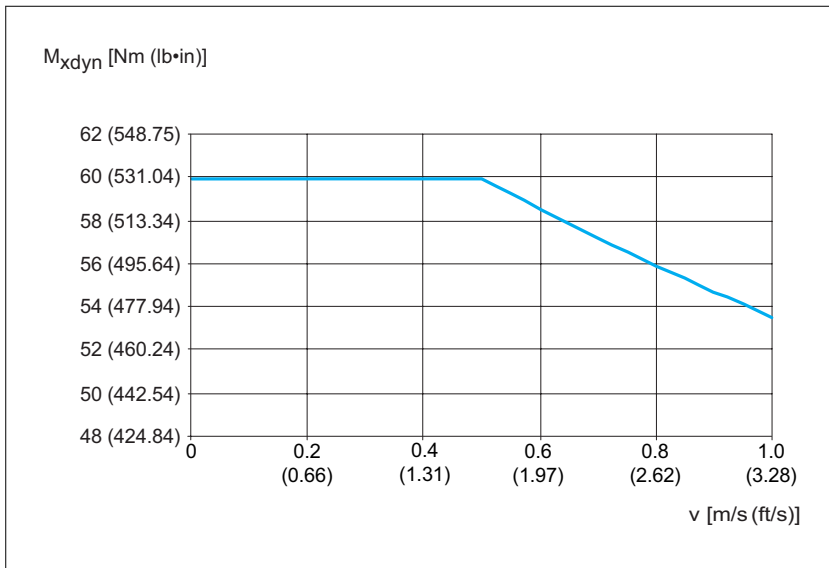


Figure 24: PAS43SB Maximum torque carriage  $M_{xdyn}$

Maximum torque carriage  $M_{ydyn}$

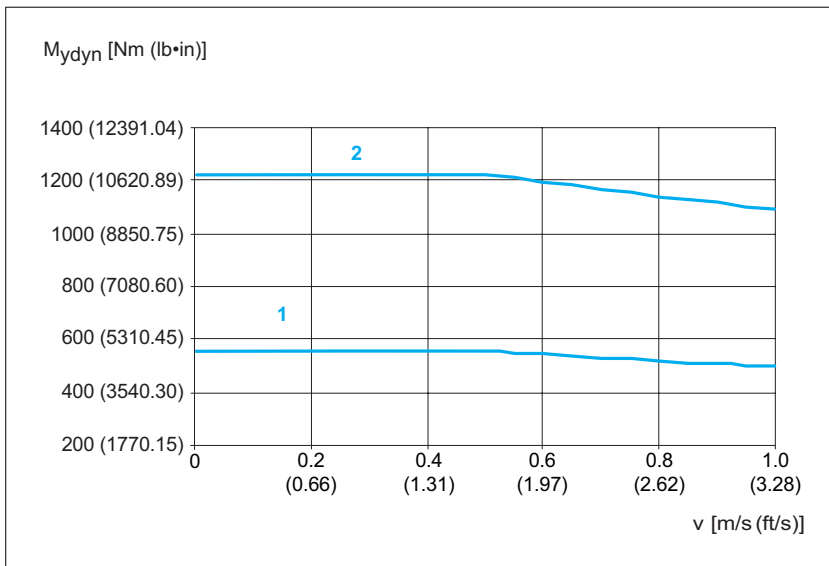


Figure 25: PAS43SB Maximum torque carriage  $M_{ydyn}$

- (1) Carriage type 1
- (2) Carriage type 4

Maximum torque carriage  $M_{zdyn}$

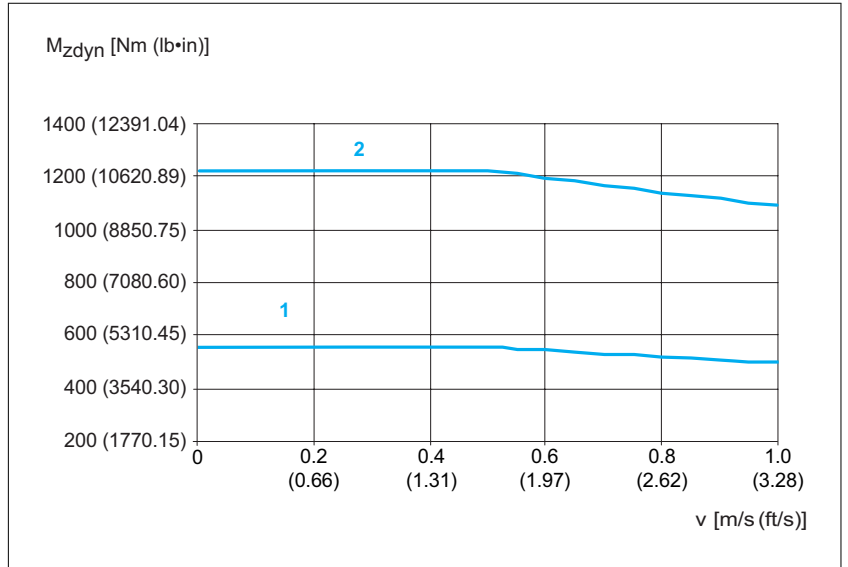


Figure 26: PAS43SB Maximum torque carriage  $M_{zdyn}$

- (1) Carriage type 1
- (2) Carriage type 4

Service life load curve

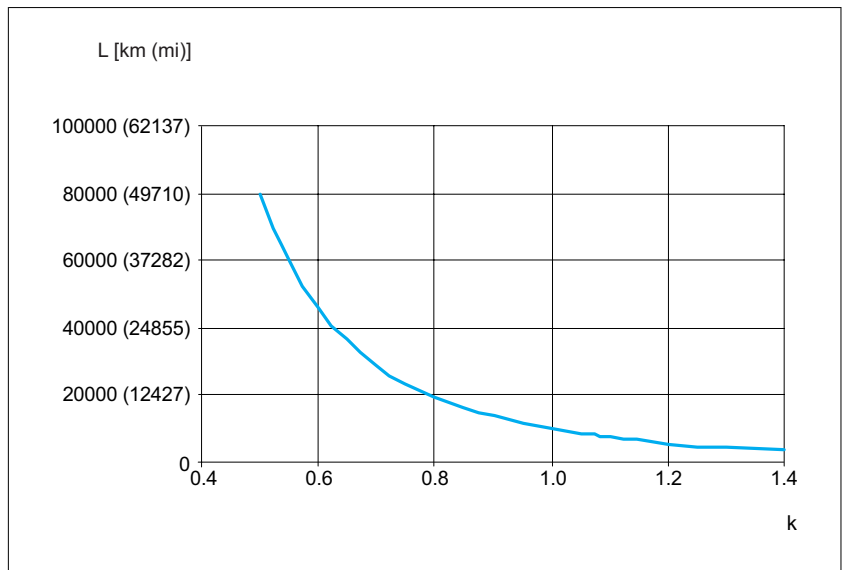


Figure 27: PAS43SB Service life load curve

Speed of rotation ball screw shaft

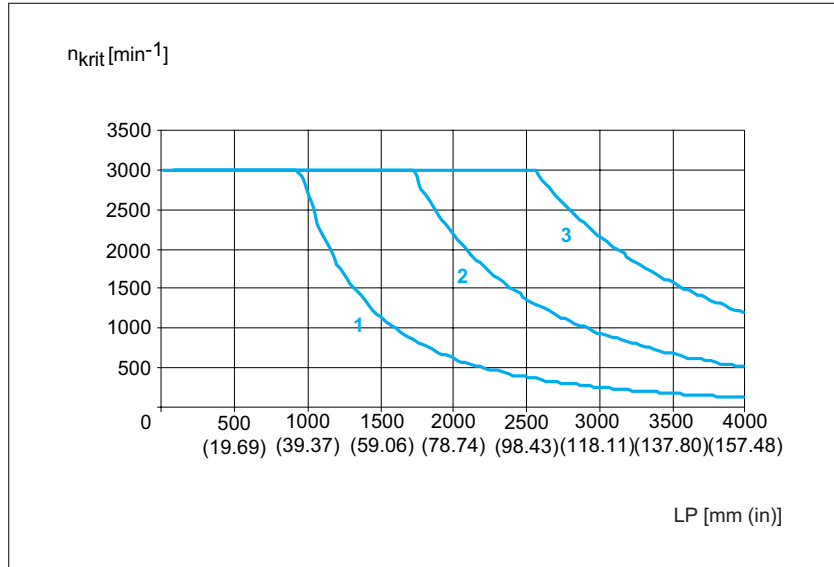


Figure 28: PAS43SB Speed of rotation ball screw shaft

- (1) Without ball screw support
- (2) 1 ball screw support
- (3) 2 ball screw supports

Maximum deflection

In order to limit deflection of the linear axis at long strokes, the axis must be supported. The diagram below shows the deflection  $f$  [mm (in)] of the linear axis with respect to the support distance  $S$  [mm (in)] and the acting force  $F$  [N (lbf)]. Excessive deflection reduces the service life of the linear axis.

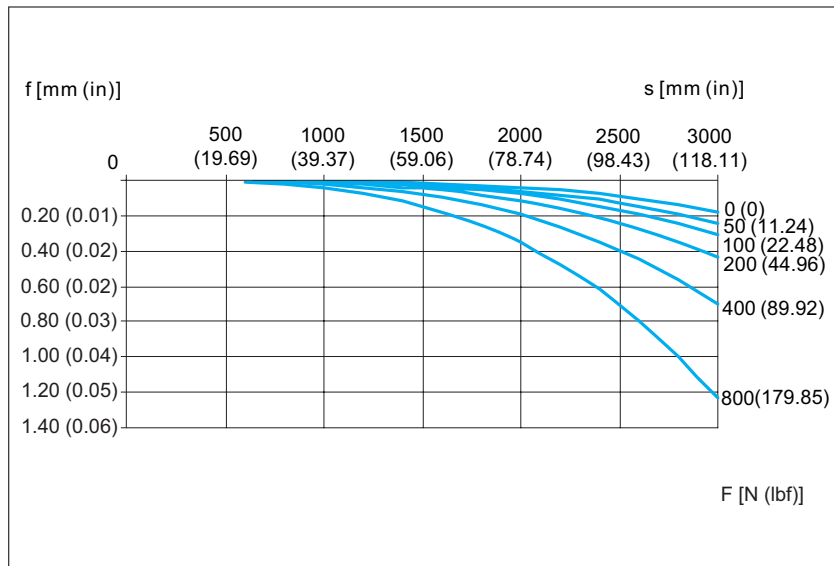


Figure 29: PAS43SB Maximum deflection



Buckling strength

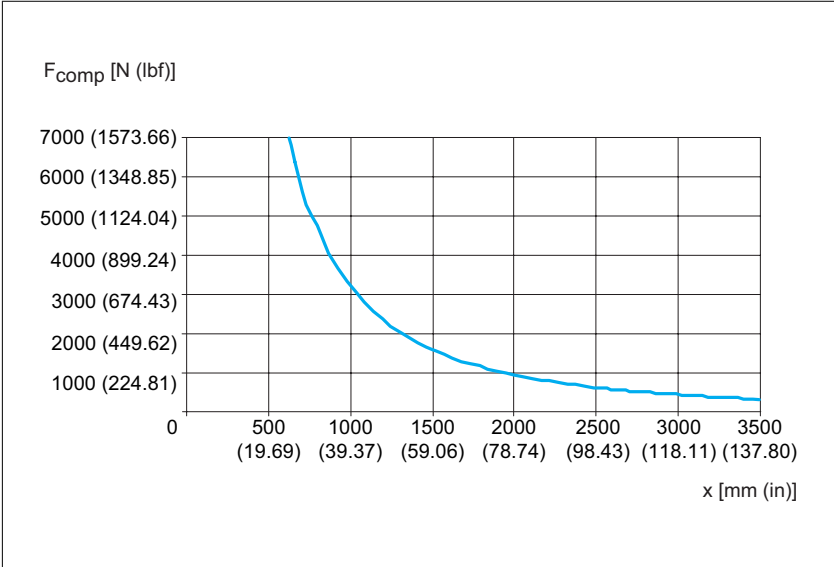


Figure 30: PAS43SB Buckling strength

2.3.3 Dimensional drawings PAS43SB

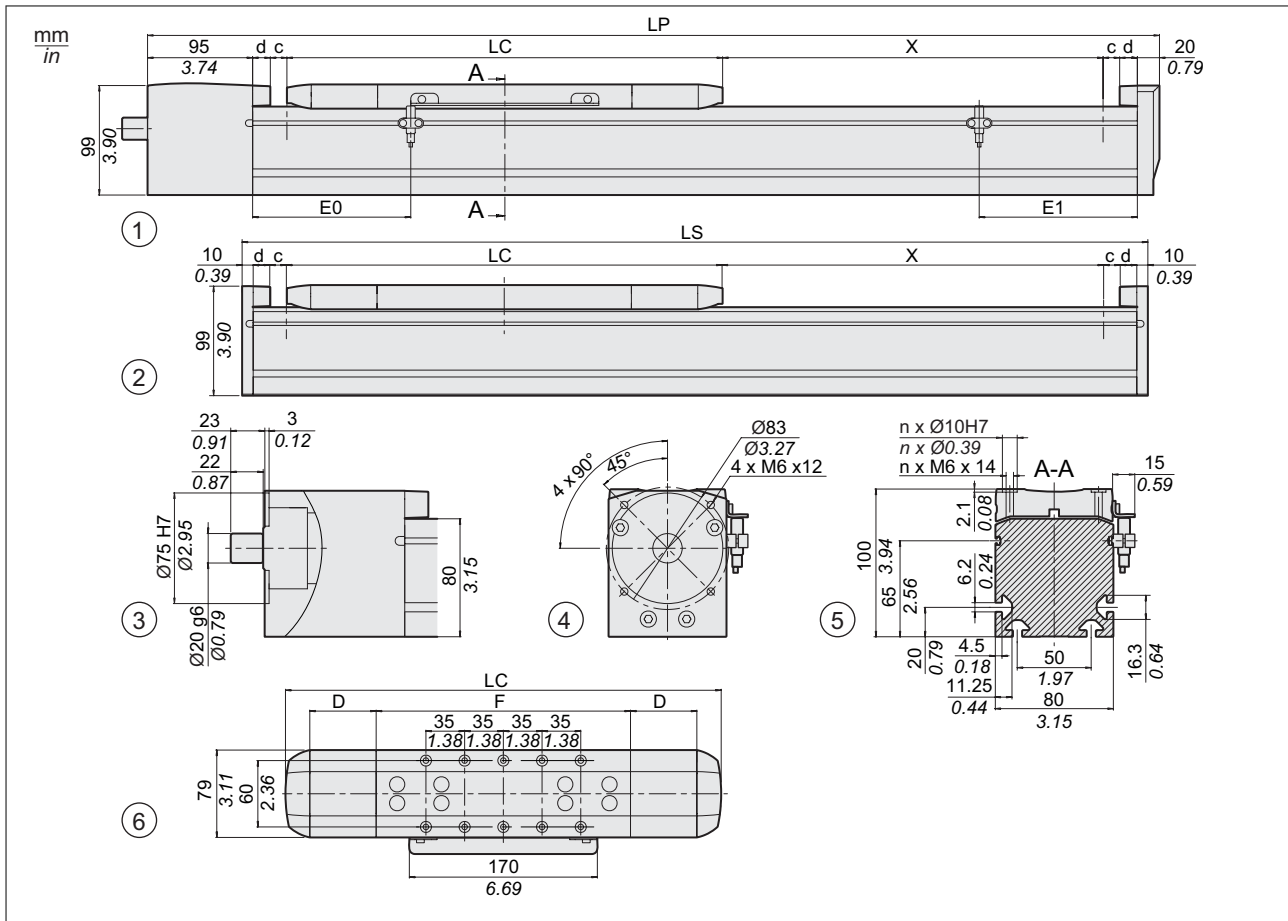


Figure 31: Dimensional drawing PAS43SB

- (1) Portal axis
- (2) Support axis
- (3) Shaft extension
- (4) Drive block
- (5) Section of axis
- (6) Carriage type 1 (type 4 has more tapped holes for mounting)

Carriage type			Type 1				Type 4			
			Yes	No			Yes	No		
Number of ball screw supports			0, 1 or 2	0	1	2	0, 1 or 2	0	1	2
Total length of portal axis <sup>1)</sup>	LP	mm (in)	569 + X (22.40 + X)	449 + X (17.68 + X)	489 + X (19.25 + X)	529 + X (20.83 + X)	779 + X (30.67 + X)	659 + X (25.94 + X)	699 + X (27.52 + X)	739 + X (29.09 + X)
Total length of support axis	LS	mm (in)	474 + X (18.66 + X)	354 + X (13.94 + X)	394 + X (15.51 + X)	434 + X (17.09 + X)	684 + X (26.93 + X)	564 + X (22.20 + X)	604 + X (23.78 + X)	644 + X (25.35 + X)
Stroke	X	mm	See technical data							
Carriage length	LC	mm (in)	394 (15.51)	274 (10.79)			604 (23.78)	484 (19.06)		
Profile length of carriage	F	mm (in)	230 (9.06)				440 (17.32)			
Number of tapped holes for mounting <sup>2)</sup>	n		10				22			
Distance between tapped holes		mm (in)	35 ±0.03 (1.38 ±0.0012)				35 ±0.03 (1.38 ±0.0012)			
Limit switch position at drive end	E0	mm (in)	143 (5.63)	83 (3.27)	103 (4.06)	123 (4.84)	143 (5.63)	83 (3.27)	103 (4.06)	123 (4.84)
Limit switch position opposite drive end	E1	mm (in)	143 (5.63)	83 (3.27)	103 (4.06)	123 (4.84)	353 (13.90)	293 (11.54)	313 (12.32)	333 (13.11)
Stroke reserve up to mechanical stop	c	mm (in)	15 (0.59)				15 (0.59)			
Length of cover strip clamp	d	mm (in)	15 (0.59)				15 (0.59)			
Deflection of cover strip	D	mm (in)	60 (2.36)	-			60 (2.36)	-		
Minimum distance between 2 carriages		mm (in)	90 (3.54)	35 (1.38)			90 (3.54)	35 (1.38)		

1) In the case of axes with more than one carriage, you must add the carriage length (LC) and the distance between the carriages for each additional carriage.

2) Prepared for locating rings (see Accessories)

2.4 PAS44

2.4.1 Technical data PAS44SB

Value pairs with / without cover strip are separated by "/".

Technical data portal axis		PAS44SB					
Drive element		Ball screw drive (P7 as per DIN 69051 part 3)					
Guide type		Recirculating ball bearing guide size 25					
Payload	kg (lb)	100 (220.46)					
Carriage type		Type 1			Type 4		
Carriage length	mm (in)	490 / 330 (19.29 / 12.99)			760 / 600 (29.92 / 23.62)		
Ball screw pitch	mm (in)	5 (0.20)	10 (0.39)	25 (0.98)	5 (0.20)	10 (0.39)	25 (0.98)
Diameter ball screw shaft	mm (in)	24					
Backlash of the ball screw drive	mm (in)	0.04					
Maximum feed force $F_{X_{max}}$ <sup>1)</sup>	N (in)	3700 (831.79)	4520 (1016.14)	3000 (674.43)	3700 (831.79)	4520 (1016.14)	3000 (674.43)
Maximum speed of rotation of ball screw shaft	min <sup>-1</sup>	3000					
Maximum velocity <sup>2)</sup>	m/s (ft/s)	0.25 (0.82)	0.5 (1.64)	1.25 (4.10)	0.25 (0.82)	0.5 (1.64)	1.25 (4.10)
Maximum acceleration <sup>2)</sup>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	2 (6.56)	4 (13.12)	10 (32.81)	2 (6.56)	4 (13.12)	10 (32.81)
Maximum driving torque $M_{max}$ <sup>1)</sup>	Nm (lb-in)	4.3 (38.06)	9.0 (79.66)	14.3 (126.57)	4.3 (38.06)	9.0 (79.66)	14.3 (126.57)
Breakaway torque 0 stroke axis <sup>3)</sup>	Nm (lb-in)	1.05 (9.29)	1.09 (9.65)	1.23 (10.89)	1.05 (9.29)	1.09 (9.65)	1.23 (10.89)
Breakaway torque per additional carriage <sup>3)</sup>	Nm (lb-in)	0.05 (0.44)	0.09 (0.80)	0.23 (2.04)	0.05 (0.44)	0.09 (0.80)	0.23 (2.04)
Moment of inertia 0 stroke axis	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	6.86 / 6.47 (0.97 / 0.92)	6.97 / 6.57 (0.99 / 0.93)	7.75 / 7.23 (1.10 / 1.02)	7.51 / 7.13 (1.06 / 1.01)	7.66 / 7.26 (1.08 / 1.03)	8.72 / 8.2 (1.23 / 1.16)
Moment of inertia per additional carriage <sup>3)</sup>	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	1.21 / 0.82 (0.17 / 0.12)	1.32 / 0.92 (0.19 / 0.13)	2.1 / 1.58 (0.30 / 0.22)	1.86 / 1.48 (0.26 / 0.21)	2.01 / 1.61 (0.28 / 0.23)	3.07 / 2.55 (0.43 / 0.36)
Moment of inertia per 1 m of stroke	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	2.00 (0.28)	2.30 (0.33)	2.40 (0.34)	2.00 (0.28)	2.30 (0.33)	2.40 (0.34)
Moment of inertia per 1 kg of payload	kgcm <sup>2</sup> (oz-in-s <sup>2</sup> )	0.006 (0.0008)	0.025 (0.0035)	0.158 (0.0224)	0.006 (0.0008)	0.025 (0.0035)	0.158 (0.0224)

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves)

2) Load- and stroke-dependent

3) The carriage closest to the motor is driven.

Technical data portal axis		PAS44SB					
Maximum force $F_{y_{dynmax}}^{1)}$	N (lbf)	9040 (2032.27)					
Maximum force $F_{z_{dynmax}}^{1)}$	N (lbf)	9040 (2032.27)					
Maximum torque $M_{y_{dynmax}}^{1)}$	Nm (lb-in)	935 (8275.45)			2155 (19073.36)		
Maximum torque $M_{z_{dynmax}}^{1)}$	Nm (lb-in)	935 (8275.45)			2155 (19073.36)		
Max. torque $M_{x_{dynmax}}^{1)}$	Nm (lb-in)	89 (787.72)					
Mass 0 stroke axis	kg (lb)	25.1 / 21.2 (55.34 / 46.74)			32.3 / 28.4 (71.21 / 62.61)		
Mass per additional carriage (with axis body and ball screw drive)	kg (lb)	15.2 / 11.3 (33.51 / 24.91)			22.4 / 18.5 (49.38 / 40.79)		
Mass per 1 m of stroke	kg (lb)	19.00 (41.89)					
Moving mass carriage	kg (lb)	5.9 / 5.0 (13.01 / 11.02)			8.0 / 7.1 (17.64 / 15.65)		
Maximum stroke <sup>2)</sup>	mm (in)	2940 / 3100 (115.75 / 122.05)			2670 / 2830 (105.12 / 111.42)		
Minimum stroke <sup>3)</sup>	mm (in)	13 (0.51)					
Repeatability <sup>4)</sup>	mm (in)	± 0.02 (± 0,0,00079)					
Diameter motor shaft	mm (in)	12 ... 25 (0.47 ... 0.98)					
Cross section axis body (W x H)	mm	110 x 110 (4.33 x 4.33)					
Axial area moment of inertia $I_x$ $I_y$	mm <sup>4</sup>	50245408 6354770					
Modulus of elasticity (aluminum) E	N/mm <sup>2</sup>	72000					
Load rating linear guide $C_{stat}$	N (lbf)	52400 (11779.99)					
Load rating linear guide $C_{dyn}$	N (lbf)	31700 (7126.44)					
Load rating ball screw drive $C_{stat}$	N (lbf)	30400 (6834.19)	31400 (7059.00)	19900 (4473.70)	30400 (6834.19)	31400 (7059.00)	19900 (4473.70)
Load rating ball screw drive $C_{dyn}$	N (lbf)	18500 (4158.96)	22600 (5080.68)	15000 (3372.13)	18500 (4158.96)	22600 (5080.68)	15000 (3372.13)
Service life <sup>5)</sup>	km (mi)	10000 (6214)					

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves).

2) Inquire for greater stroke

3) Minimum stroke required for lubrication of the linear guide

4) Load- and stroke-dependent

5) The service life depends on the forces and torques, see chapter "2.5 Service life".

Technical data support axis		PAS44AB	
Carriage type		Type 1	Type 4
Breakaway force 0 stroke axis	N (lbf)	50 (11.24)	
Breakaway force per additional carriage	N (lbf)	50 (11.24)	
Mass 0 stroke axis	kg (lb)	18.7 / 14.8 (41.23 / 32.63)	25.9 / 22.0 (57.10 / 48.50)
For further data (if applicable) see:		PAS44SB	

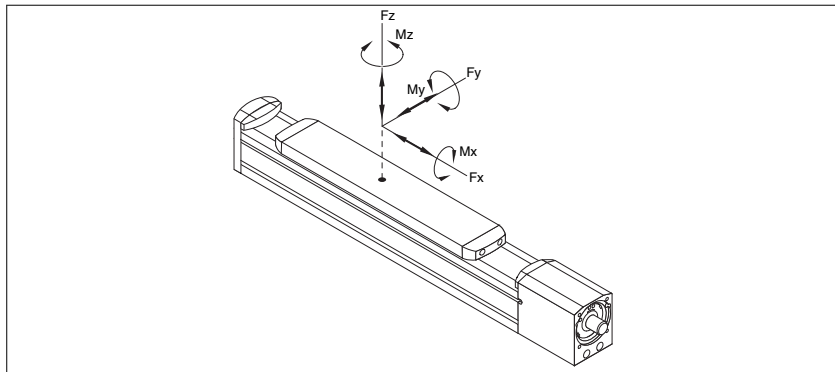


Figure 32: Forces and torques

2.4.2 Characteristic curves PAS44SB

Maximum feed force  $F_x$

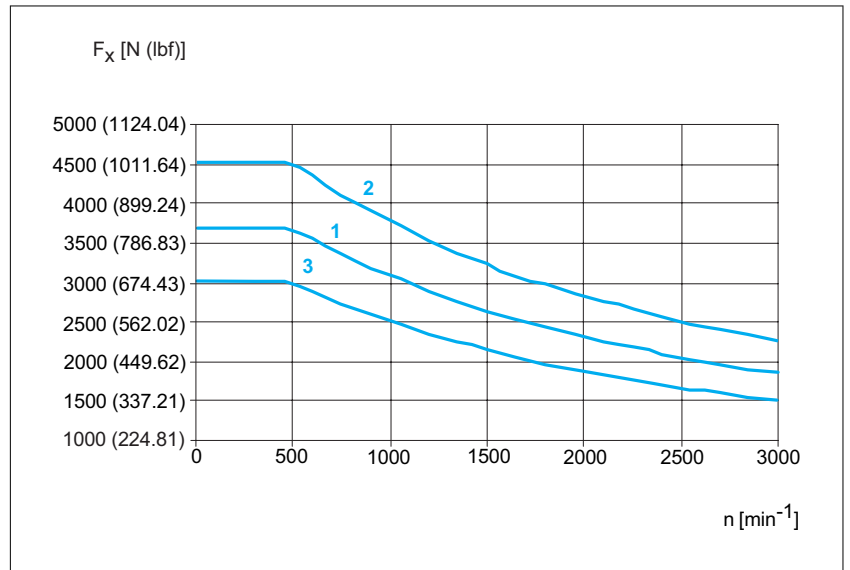


Figure 33: PAS44SB Maximum feed force  $F_x$

Ball screw pitch:

- (1) 5 mm (0.20 in)
- (2) 10 mm (0.39 in)
- (3) 16 mm (0.63 in)

Maximum force  $F_{y\text{dyn}}$

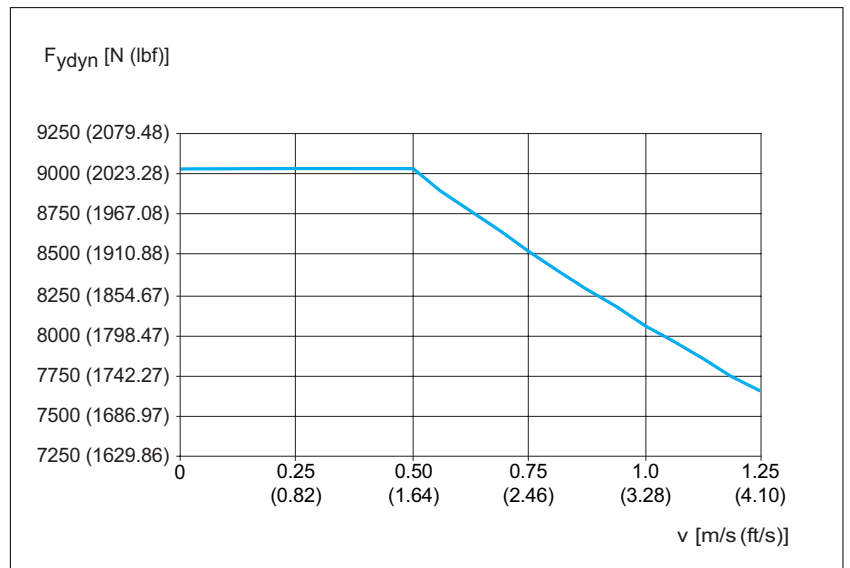


Figure 34: PAS44SB Maximum force  $F_{y\text{dyn}}$

Maximum force  $F_{zdyn}$

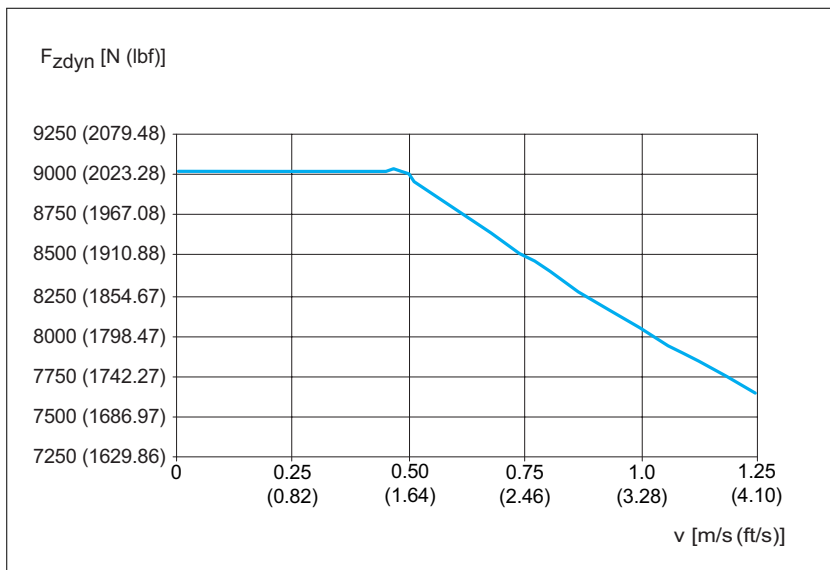


Figure 35: PAS44SB Maximum force  $F_{zdyn}$

Maximum driving torque  $M_{max}$

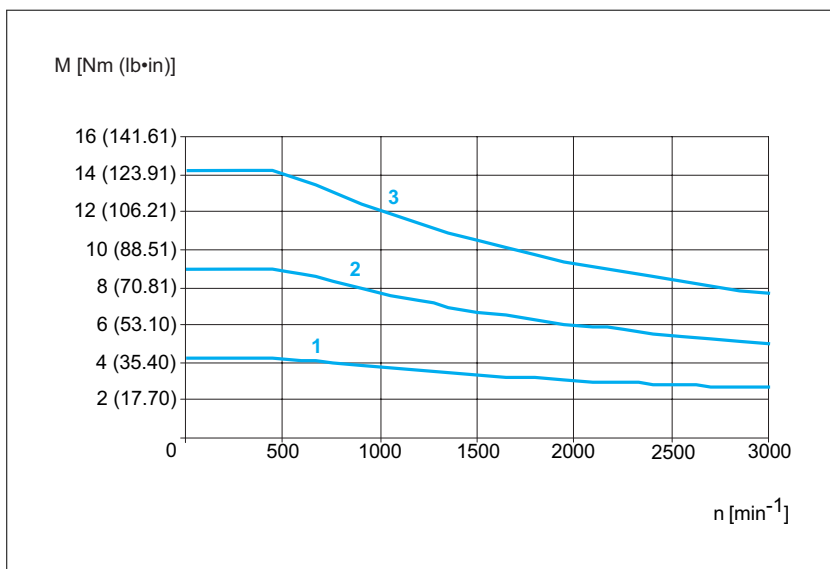


Figure 36: PAS44SB Maximum driving torque  $M_{max}$

Ball screw pitch:

- (1) 5 mm (0.20 in)
- (2) 10 mm (0.39 in)
- (3) 16 mm (0.63 in)



Maximum torque carriage  $M_{xdyn}$

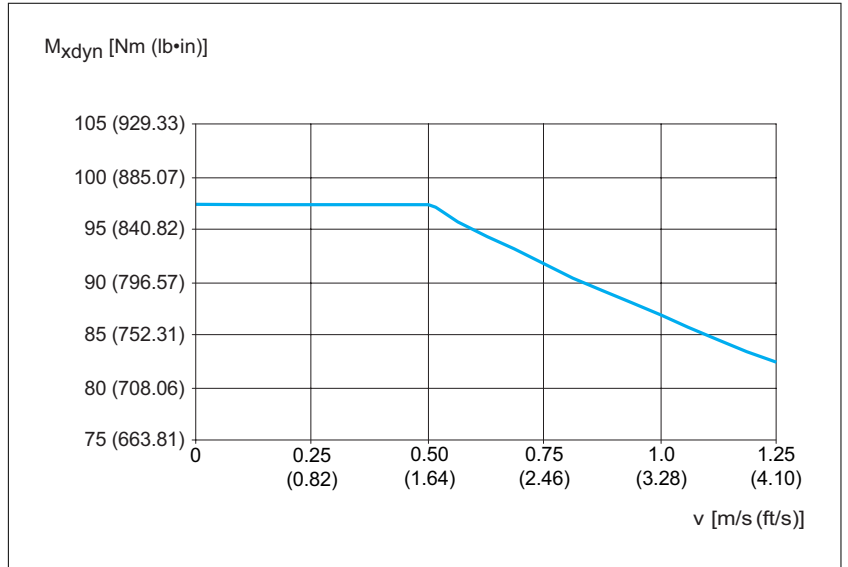


Figure 37: PAS44SB Maximum torque carriage  $M_{xdyn}$

Maximum torque carriage  $M_{ydyn}$

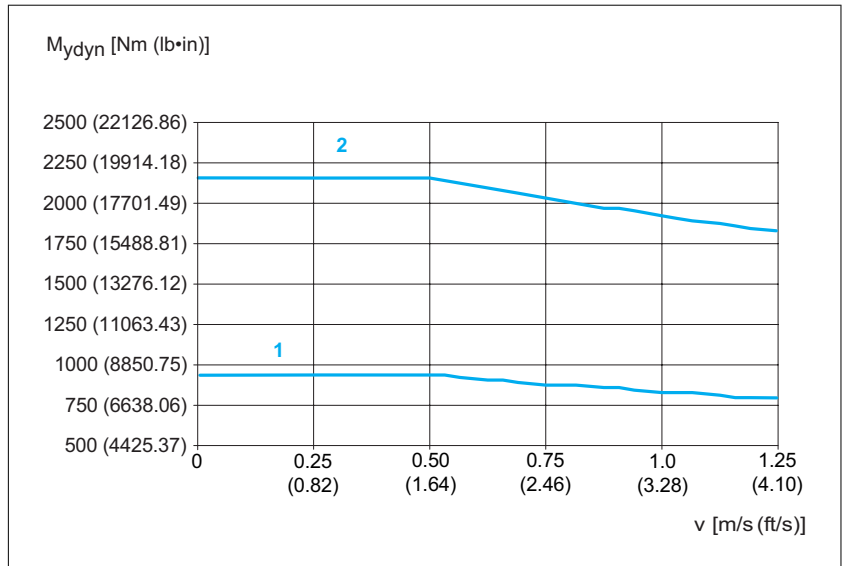


Figure 38: PAS44SB Maximum torque carriage  $M_{ydyn}$

- (1) Carriage type 1
- (2) Carriage type 4

Maximum torque carriage  $M_{zdyn}$

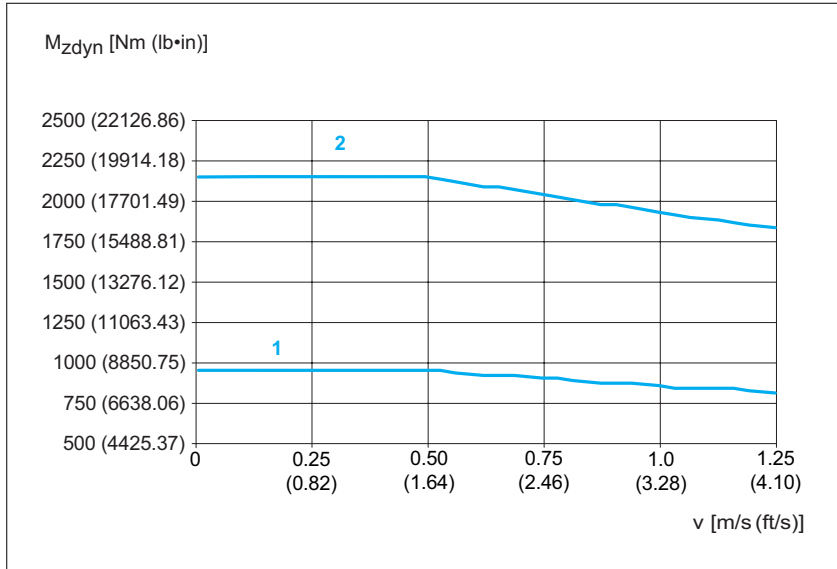


Figure 39: PAS44SB Maximum torque carriage  $M_{zdyn}$

- (1) Carriage type 1
- (2) Carriage type 4

Service life load curve

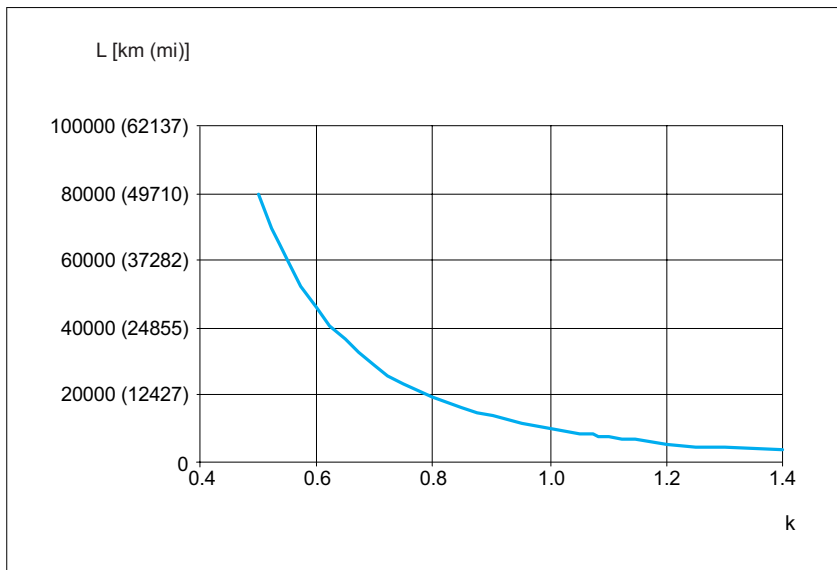


Figure 40: PAS44SB Service life load curve

Speed of rotation ball screw shaft

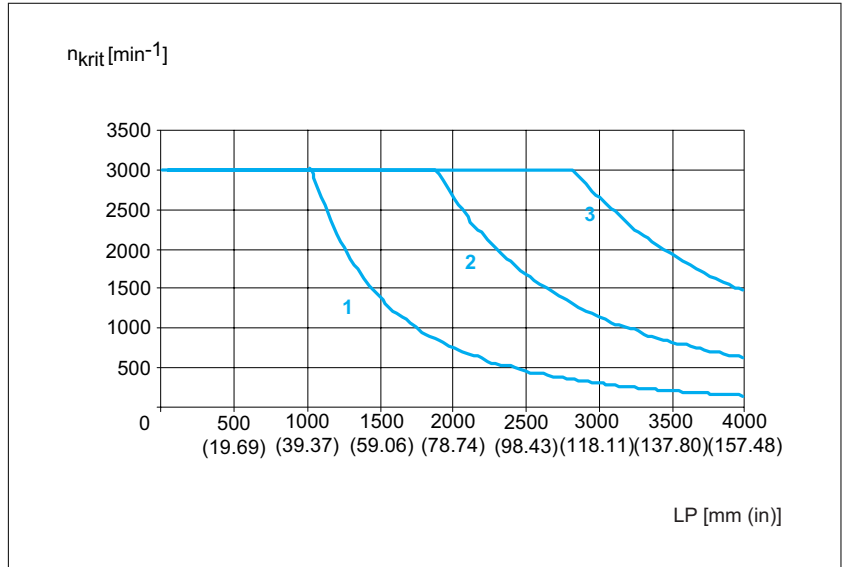


Figure 41: PAS44SB Speed of rotation ball screw shaft

- (1) Without ball screw support
- (2) 1 ball screw support
- (3) 2 ball screw supports

Maximum deflection

In order to limit deflection of the linear axis at long strokes, the axis must be supported. The diagram below shows the deflection  $f$  [mm (in)] of the linear axis with respect to the support distance  $S$  [mm (in)] and the acting force  $F$  [N (lbf)]. Excessive deflection reduces the service life of the linear axis.

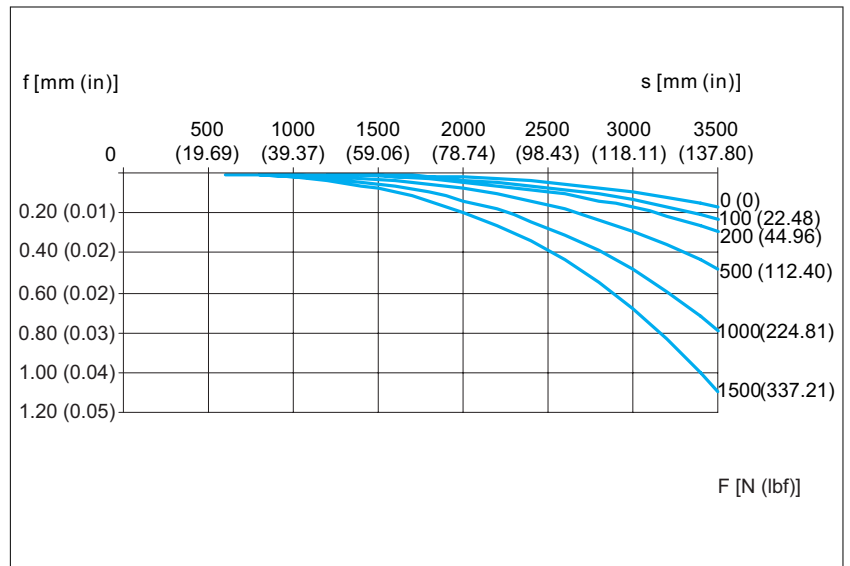


Figure 42: PAS44SB Maximum deflection

*Buckling strength*

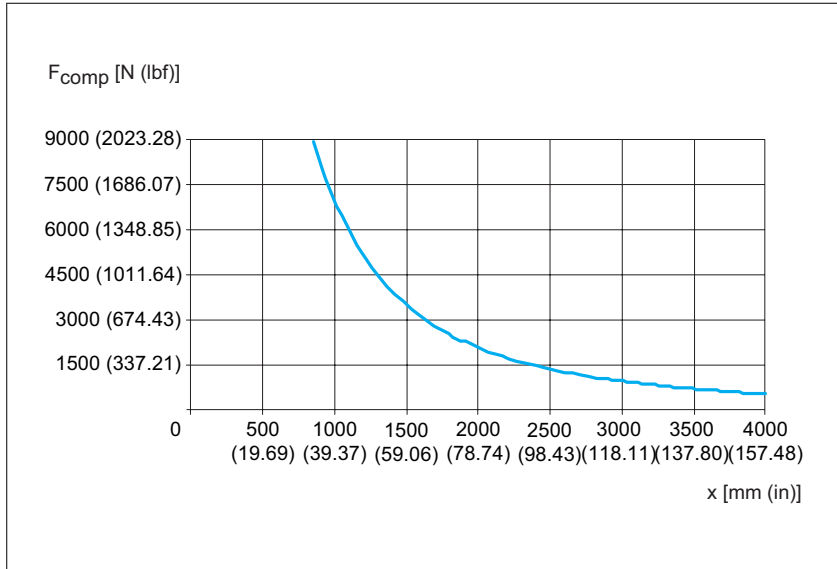


Figure 43: PAS44SB Buckling strength

2.4.3 Dimensional drawings PAS44SB

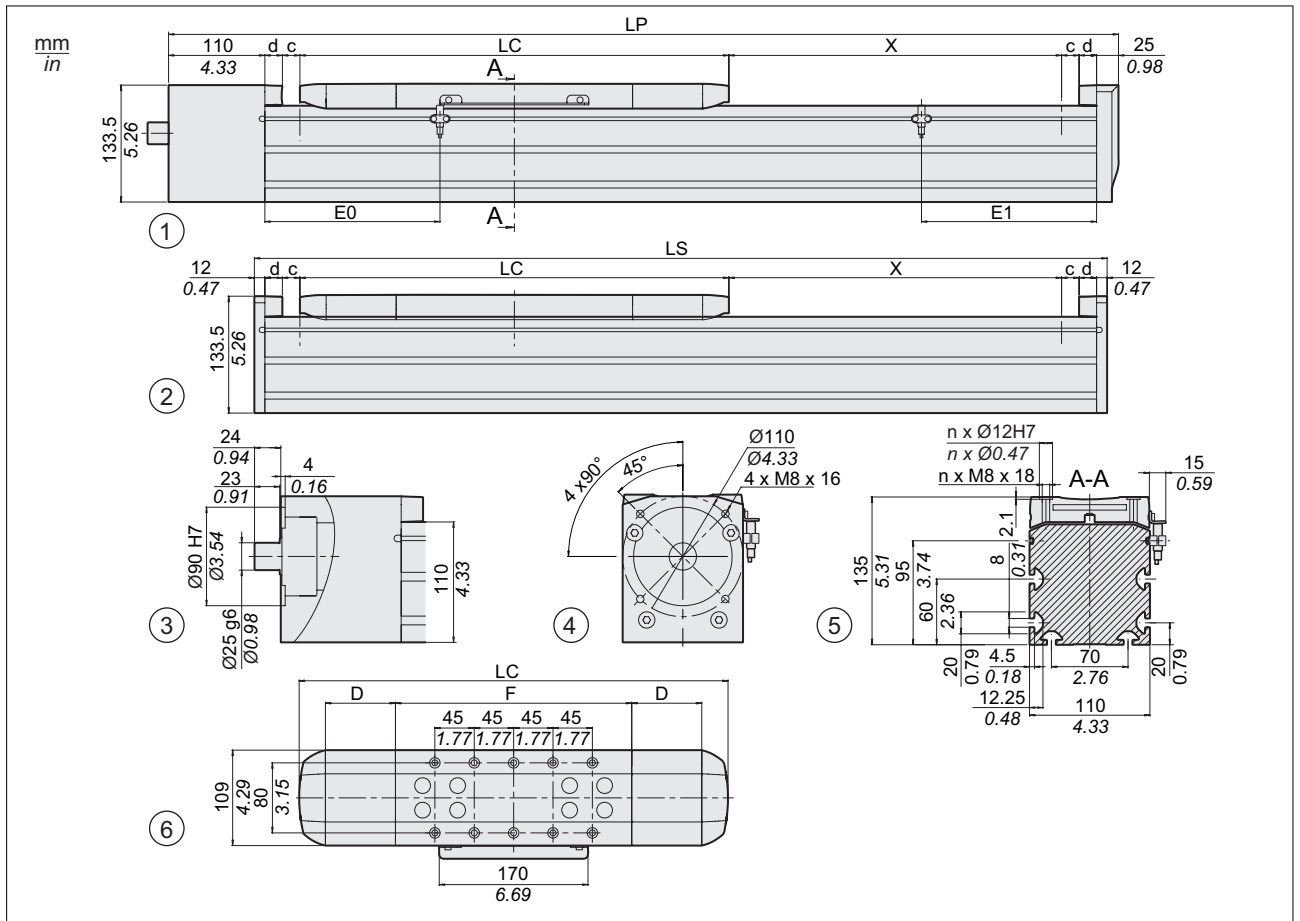


Figure 44: Dimensional drawings PAS44SB

- (1) Portal axis
- (2) Support axis
- (3) Shaft extension
- (4) Drive block
- (5) Section of axis
- (6) Carriage type 1 (type 4 has more tapped holes for mounting)

## 2 Technical Data

## PAS4xS

Carriage type			Type 1				Type 4			
			Yes	No			Yes	No		
Number of ball screw supports			0, 1 or 2	0	1	2	0, 1 or 2	0	1	2
Total length of portal axis <sup>1)</sup>	LP	mm (in)	705 + X (27.76 + X)	545 + X (21.46 + X)	595 + X (23.43 + X)	645 + X (25.39 + X)	975 + X (38.39 + X)	815 + X (32.09 + X)	865 + X (34.06 + X)	915 + X (36.02 + X)
Total length of support axis	LS	mm (in)	594 + X (23.39 + X)	434 + X (17.09 + X)	484 + X (19.06 + X)	534 + X (21.02 + X)	864 + X (34.02 + X)	704 + X (27.72 + X)	754 + X (29.69 + X)	804 + X (31.65 + X)
Stroke	X	mm (in)	See technical data							
Carriage length	LC	mm (in)	490 (19.29)	330 (12.99)			760 (29.92)	600 (23.62)		
Profile length of carriage	F	mm (in)	270 (10.63)				540 (21.26)			
Number of tapped holes for mounting <sup>2)</sup>	n		10 (0.39)				22 (0.87)			
Distance between tapped holes		mm (in)	45 ±0.03 (45 ±0.0018)				45 ±0.03 (45 ±0.0018)			
Limit switch position at drive end	E0	mm (in)	200 (7.87)	120 (4.72)	145 (5.71)	170 (6.69)	200 (7.87)	120 (4.72)	145 (5.71)	170 (6.69)
Limit switch position opposite drive end	E1	mm (in)	200 (7.87)	120 (4.72)	145 (5.71)	170 (6.69)	470 (18.50)	390 (15.35)	415 (16.34)	440 (17.32)
Stroke reserve up to mechanical stop	c	mm (in)	20 (0.79)				20 (0.79)			
Length of cover strip clamp	d	mm (in)	20 (0.79)				20 (0.79)			
Deflection of cover strip	D	mm (in)	80 (3.15)	-			80 (3.15)	-		
Minimum distance between 2 carriages		mm (in)	90 (3.54)	40 (1.57)			90 (3.54)	40 (1.57)		

- 1) In the case of axes with more than one carriage, you must add the carriage length (LC) and the distance between the carriages for each additional carriage.  
 2) Prepared for locating rings (see Accessories)

## 2.5 Service life

The service life of the product 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  $k$ .

$$\frac{F_y}{F_{y\max}} + \frac{F_z}{F_{z\max}} + \frac{M_x}{M_{x\max}} + \frac{M_y}{M_{y\max}} + \frac{M_z}{M_{z\max}} = k$$

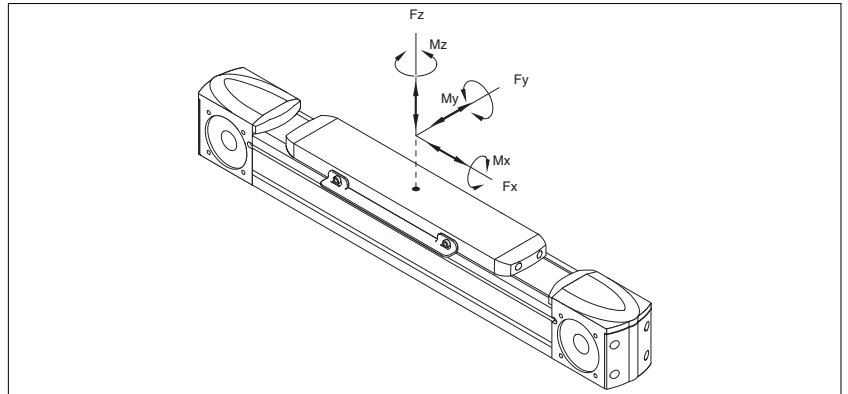


Figure 45: Forces and torques

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

The application-specific load values appear in the numerator.

The numerator contains the maximum permissible forces and torques. These forces and torques decrease at increasing velocities, see characteristic curves in chapter "2 Technical Data".

## 2.6 Positioning accuracy and repeatability

Positioning accuracy is the tolerance between the specified position and end position reached, measured at the carriage. To determine this value, the carriage is moved to the end position from different directions at different velocities.

Repeatability is the accuracy with which it is possible to move to a previous position again under the same conditions. To determine this value, the carriage is moved to the end position from the same direction at the same velocity.

Positioning accuracy and repeatability depend on various factors such as:

- Temperature
- Load changes
- Different velocities
- Different accelerations
- Accuracy of the ball screw drive
- Accuracy of the switching point of the sensors
- Backlash of various components (for example, gearbox)
- Friction (for example, ball bearings, guide carriage, rollers, ball screw drive, cover strip)

## 2.7 Motor

See the motor manual for information on the motor.



### 3 Installation

#### **⚠ WARNING**

##### **GREAT MASS OR FALLING PARTS**

- Use a suitable crane or other suitable lifting gear for mounting the product if this is required by the mass of the product.
- Use the necessary personal protective equipment (for example, safety shoes, safety glasses and protective gloves).
- Mount the product in such a way (tightening torque, securing screws) that parts cannot come loose, even in the case of shocks and vibration.
- Take all necessary measures to avoid unanticipated movements of linear axes mounted in vertical or tilted positions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

If the power stage is disabled unintentionally, for example as a result of power outage, errors or functions, the motor is no longer decelerated in a controlled way.

#### **⚠ WARNING**

##### **UNINTENDED EQUIPMENT OPERATION**

Verify that movements without braking effect cannot cause injuries or equipment damage.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The metal surfaces of the product may exceed 100 °C (212 °F) during operation.

#### **⚠ WARNING**

##### **HOT SURFACES**

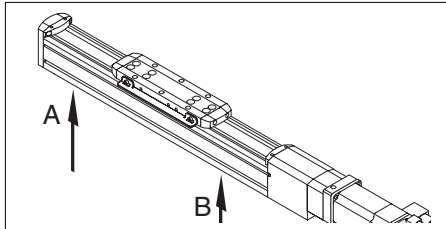
- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### 3.1 Preparing installation

The linear axis is a precision product and must be handled with care. Shocks and impacts may damage the guides and the ball screw drive. They may lead to reduced running accuracy and reduced service life.

Transport the product in its packaging as close as possible to the installation site.



The linear axis may only be lifted at points A and B (see figure). The distance between the end block and point A and between the end block and point B must be one fourth of the total length of the linear axis. If an axis with a mounted motor is lifted, points A and B are to be moved to balance the load. The axis must not be lifted via the motor. Support the motor when lifting the axis.

### 3.2 Compatibility with foreign substances

The axis has been tested for compatibility with foreign substances according to the latest knowledge. However, it is impossible to follow up on all further developments of all substances such as lubricants, cleaning agents or solvents. Therefore, you must perform a compatibility test prior to using new substances.

The magnetic strips for fastening the cover strips (optional) are glued. The glue is not resistant to environments containing oil or solvents.

#### **NOTICE**

##### **INOPERABLE EQUIPMENT**

Do not install axes with cover strips in environments containing oil or solvents.

**Failure to follow these instructions can result in equipment damage.**

### 3.3 Mechanical installation

*Accessibility for servicing* When mounting the linear axis, the motor and the sensors, keep in mind that they may have to be accessed for servicing.

*Mounting position* The linear axis can be installed in any position. However, all external forces and torques must be within the permissible value ranges. Take into account the mass of the linear axis that may act as a load, depending on the mounting position.

If a linear axis with a mounted motor is mounted in a vertical or tilted position, the motor should be at the top. This way, tensile force is applied to the ball screw and there is no buckling stress.

#### 3.3.1 Standard tightening torques

Special tightening torques are applicable for mounting sensors and elastomer couplings; these tightening torques are listed in the appropriate chapters.

The following, generally applicable tightening torques apply to mounting the payload and fastening slot nuts, clamping claws, motor and contact plate with hex socket screws.

Thread	Wrench size in mm	Maximum tightening torque in Nm (lb-in)
M3	2.5	1.1 (9.74)
M4	3	2.5 (22.13)
M5	4	5 (44.25)
M6	5	8.5 (75.23)
M8	6	21 (185.87)
M10	8	42 (371.73)
M12	10	70 (619.55)

3.3.2 Mounting the linear axis

Only mount the linear axis using the T slots at the axis body. To do so, use clamping claws (lateral fastening) or slot nuts (bottom or lateral fastening).

A selection of suitable clamping claws and slot nuts can be found in chapter "6 Accessories and spare parts".

Take into account the following:

- If motors with a cross section greater than the cross section of the axis body are used, the axis must be supported or the mounting surface must be cut out as required.
- The end blocks protrude beyond the axis body at the ends. The end blocks must not be the only parts supported by the mounting surface.
- If the lateral T slots are used for mounting, the sensor cable cannot be completely routed in the T slots.

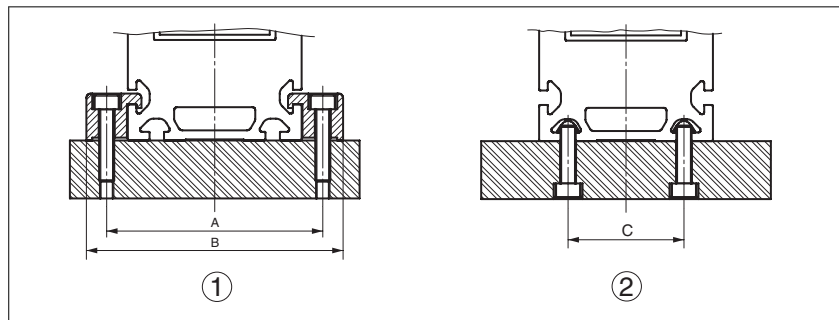


Figure 46: Fastening by means of clamping claws (1) and slot nuts from the bottom (2)

Tapped hole distance		PAS42	PAS43	PAS44
A	mm (in)	74 (2.91)	96 (3.78)	130 (5.12)
B	mm (in)	88 (3.46)	112 (4.41)	150 (5.91)
C	mm (in)	40 (1.57)	50 (1.97)	70 (2.76)

Maximum distance <sup>1)</sup>		PAS42	PAS43	PAS44
Clamping claws	mm (in)	600 (23.62)	800 (31.50)	1000 (39.37)
Slot nuts	mm (in)	600 (23.62)	800 (31.50)	1000 (39.37)

1) Recommended values per side at medium loads

The greater the load or the demands on the running accuracy, the shorter the distance that must be between the slot nuts or the clamping claws.

*Improving the lateral running accuracy*

Perform the following lateral alignment procedure for running accuracy.

- The mounting surface must be machined smooth and flat.
- ▶ Start by tightening the fastening screws of the slot nut or clamping claws with a low tightening torque.
- ▶ Provide a reference plane alongside the linear axis.
- ▶ Place a dial gauge onto the carriage.
- ▶ Move the carriage and record the deviation with reference to the reference plane over the entire stroke.
- ▶ Correct the deviations by lateral alignment of the linear axis and by tightening the screws appropriately. Respect the standard tightening torques 59.

### 3.3.3 Mounting the contact plate

A contact plate must be mounted to the carriage for the inductive sensors. Fastening threads are located at both sides of the carriage.



*Unless otherwise specified, the standard tightening torques indicated on page 59 apply.*

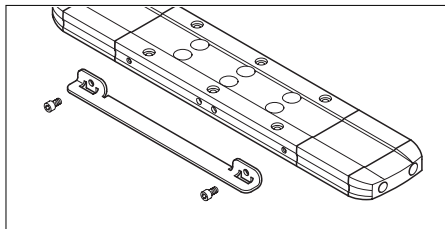
*Before mounting*

See chapter "6 Accessories and spare parts", subchapter "6.5 Sensors and additional parts" for suitable contact plates.

You need a set of hex keys.

- ▶ Clean all parts.
- ▶ Inspect all parts for damage.

*Procedure*



- ▶ For mounting, select the side of the carriage that will be easily accessible for service.
- ▶ Screw the contact plate to the carriage with M4 screws.
- ▶ Align the contact plate in parallel with the carriage so as to have the same switching distance on both sides.

3.3.4 Mounting the sensors

The use of limit switches can provide some protection against hazards (for example, collision with mechanical stop caused by incorrect reference values).

<b>⚠ WARNING</b>
<b>LOSS OF CONTROL</b>
<ul style="list-style-type: none"> <li>• Ensure that limit switches are installed if your application, based on your risk assessment, requires limit switches.</li> <li>• Verify correct connection of the limit switches.</li> <li>• Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for an adequate stopping distance.</li> <li>• Verify correct parameterization and function of the limit switches.</li> </ul>
<b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b>



*If possible, use normally closed contacts as limit switches so that a wire break can be signaled as an error.*

A sensor is mounted to the axis body by means of a sensor holder. The axis body provides a T slot for the sensor holder. This T slot has a cutout at the drive side end block for inserting the fastening nuts.



*Unless otherwise specified, the standard tightening torques indicated on page 59 apply.*

*Before mounting*

See chapter "6 Accessories and spare parts" for suitable sensors.

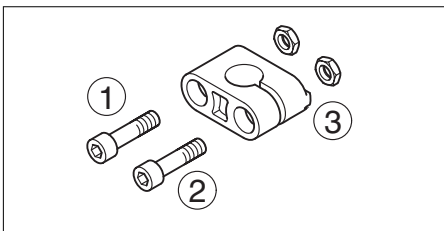
You need a set of hex keys and a feeler gauge.

- ▶ Clean all parts.
- ▶ Inspect all parts for damage.

See the dimensional drawings in chapter "2 Technical Data" for initial information on the position of the sensors.

- ▶ Verify the sensor for correct type and function.
- ▶ Verify that your controller and your interface are suitable for the sensor.

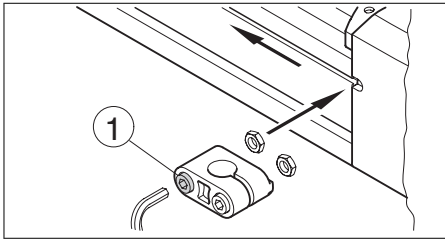
*Procedure*



2 M3 hex socket screw with hex nuts are located at the sensor.

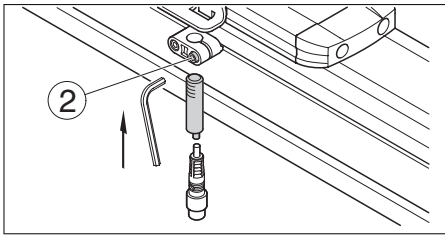
- Screw (1) is used to fasten the sensor holder in the T slot.
- Screw (2) is used to fasten the sensor in the sensor holder.

In addition, the sensor holder features cams (3) at both sides to keep the sensor from turning in the T slot.

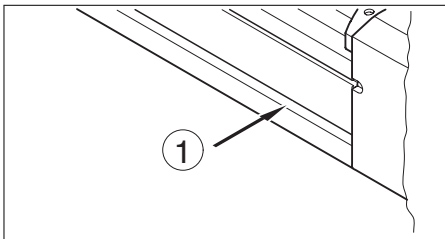


- ▶ Slide each nut into the T slot at the cutout.
- ▶ Place the the sensor holder with the two screws into position. Leave the two screws loose at first.
- ▶ Slide the sensor holder to the desired position and tighten screw (1) with a tightening torque of 0.3 Nm (2.66 lb·in).

Since the sensor operates inductively, the switching surface must have a specific distance from the contact plate. This so-called "switching distance" amounts to  $0.5 \pm 0.1$  mm ( $0.0019685 \pm 0.000394$  in).



- ▶ Move the carriage until the contact plate is above the sensor holder.
- ▶ Slide the sensor through the sensor holder opening until the switching distance has been reached.  
Measure the distance using a feeler gauge.
- ▶ Tighten screw (2).
- ▶ Finally, verify correct switching distance with the feeler gauge.



- The T slot (1) can hold up to 3 sensor cables. See chapter "6.4 T slot covers" for suitable slot covers.
- ▶ Route the sensor cable in the T slot.

3.3.5 Mounting the motor and the gearbox

The motor or the gearbox can be mounted in different arrangements (turned in increments of 4 x 90°).



Unless otherwise specified, the standard tightening torques indicated on page 59 apply.

Special tightening torques

Clamping hub		PAS42	PAS43	PAS44
Screw ISO 4762 - 10.9		M6 x 16	M6 x 20	M8 x 25
Wrench size	mm	5	5	6
Tightening torque	Nm (lb-in)	14 (123.91)	14 (123.91)	35 (309.78)
Mounting dimension	mm (in)	13 (0.51)	14 (0.55)	14 (0.55)

Before mounting

See chapter "6 Accessories and spare parts" for suitable elastomer couplings (elastomer spiders, clamping hubs).

You need a set of hex keys and a torque wrench with hexagon socket.

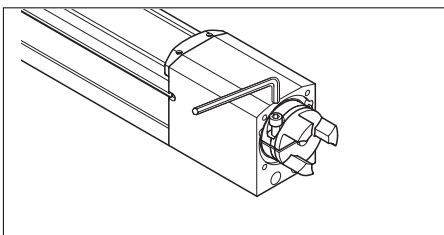
NOTE: Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

- ▶ Clean all parts.
- ▶ Inspect all parts for damage.

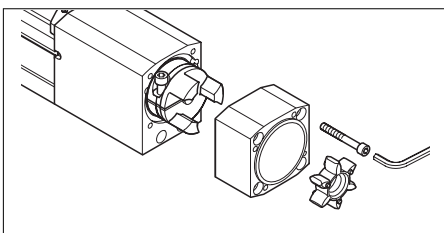
NOTE: Polluted or damaged parts may cause run-out which has an adverse effect on the service life of the elastomer coupling and the linear axis.

Mounting the elastomer coupling

The elastomer coupling has 2 clamping hubs with different holes.

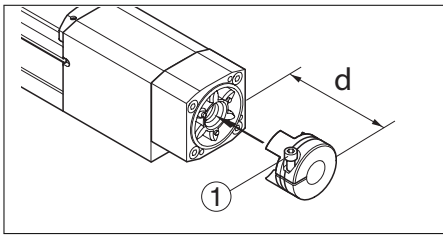


- ▶ Slide the matching clamping hub onto the shaft extension of the linear axis all the way to the stop.
- ▶ Tighten the clamping screw at the clamping hub with the tightening torque specified on page 64.



- ▶ Fit the elastomer spider onto the clamping hub.  
Slightly greasing the elastomer spider or the hub facilitates the fitting process. Use only mineral oil based lubricants without additives or silicon based lubricants.  
NOTE: If the elastomer spider can be fitted too easily (without pre-loading), it must be replaced.
- ▶ Mount the coupling housing with the 4 screws. Verify that the coupling housing has even contact.

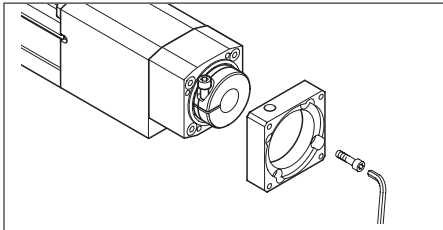




- ▶ Fit the second clamping hub.

Respect the installation dimension  $d$  measured to the collar as specified in the table on page 64.

Verify the orientation of the clamping screw (1), it should be upwards, if possible. The clamping screw is tightened at a later point in time through the hole in the motor adapter plate.

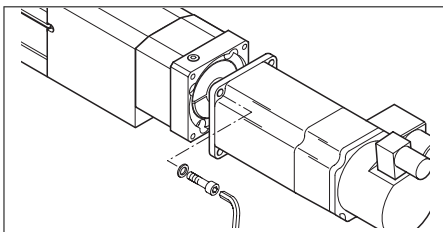


- ▶ Fit the motor adapter plate with even contact.

Watch out for the position of the hole at the narrow side. The clamping screw of the clamping hub is tightened through this hole.

- ▶ Tighten the 4 screws.

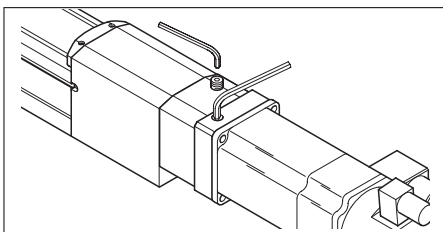
#### *Motor mounting only*



- ▶ Fit the motor onto the motor adapter plate with even contact.

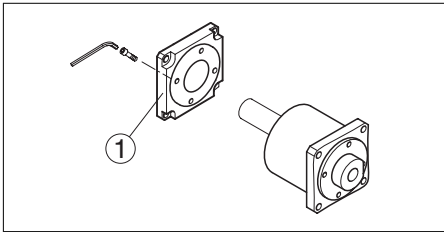
Secure the motor to keep it from falling down.

- ▶ Fasten the motor to the motor adapter plate with the 4 screws and washers.

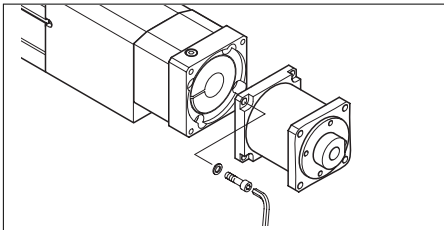


- ▶ Remove the screw plug in the hole at the side of the motor adapter plate.
- ▶ Tighten the screw of the clamping hub through the hole with the tightening torque specified on page 64.
- ▶ Close the hole with the screw plug.

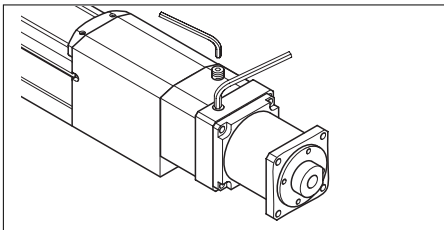
#### Gearbox mounting only



- A flange plate (1) is required if the gearbox does not have its own flange.
  - ▶ Mount the flange plate to the gearbox with the 4 screws.
- Verify that the flange plate has even contact.



- ▶ Fit the gearbox onto the motor adapter plate with even contact.
- Secure the gearbox to keep it from falling down.
- ▶ If the gearbox has a parallel keyway, align the keyway and the slot of the clamping hub.
- ▶ Fasten the gearbox with the 4 screws and washers.



- ▶ Remove the screw plug in the hole at the side of the motor adapter plate.
- ▶ Tighten the screw of the clamping hub through the hole with the tightening torque specified on page 64.
- ▶ Close the hole with the screw plug.

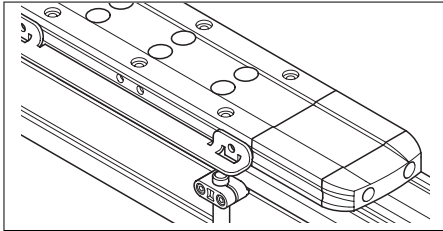


*Please refer to the gearbox manual for mounting a motor to the gearbox.*

3.3.6 Mounting the payload



Unless otherwise specified, the standard tightening torques indicated on page 59 apply.



Mounting threads on the carriage allow you to fasten the payload. Each thread is provided with a counterbore for a locating dowel for reproducible mounting of the payload. See chapter "6 Accessories and spare parts" for suitable locating dowels.

Carriage

Carriage		PAS42	PAS43	PAS44
Thread	-	M5	M6	M8
Depth	mm (in)	10 (0.39)	12 (0.47)	16 (0.63)
Diameter counterbore for locating dowel	mm (in)	8 (0.31)	10 (0.39)	12 (0.47)

### 3.4 Electrical installation

#### 3.4.1 Connecting the sensors

The sensors are equipped with an M8 x 1 connector.

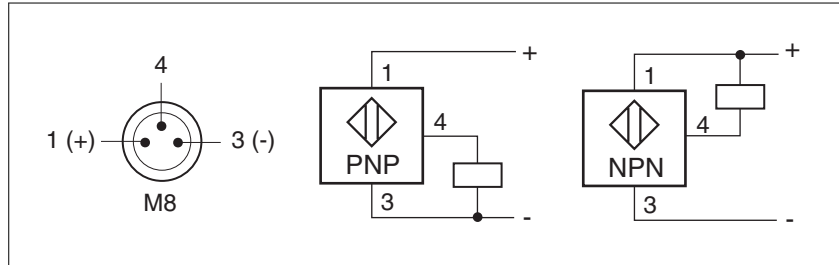


Figure 47: Connection assignment sensors

Pin	Description	Color
1	PELV supply voltage (+)	BN (brown)
3	PELV supply voltage (-)	BU (blue)
4	Output	BK (black)

The maximum cable length is 100 mm (3.94 in). Extension cables with various lengths are available as accessories, see chapter "6 Accessories and spare parts".

#### 3.4.2 Motor connection

See the motor manual for details on connecting the motor.

### 3.5 Verifying installation

Verify that you have correctly installed the product after having performed the above steps.

- ▶ Verify correct mounting and cabling of the product. In particular, check the mains connection and the 24V connection.
  - Did you connect all protective ground conductors?
  - Do you use correct fuses?
  - Did you isolate all unused cable ends?
  - Did you properly install and connect all cables and connectors?
  - Did you properly install the sensors?
  - Do the sensors function as required?
  - Is it possible to freely move the carriage with the contact plate for the sensors along the entire travel length?

## 4 Commissioning

When the axis is operated for the first time, there is a risk of unintended equipment operation caused by possible wiring errors or unsuitable parameters. The carriage of linear axes mounted in vertical or tilted positions can move in an unanticipated way.

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

- Verify that the axis is properly fastened so it cannot come loose even in the case of fast acceleration.
- Take all necessary measures to ensure that the carriage of linear axes mounted in vertical or tilted positions cannot move in an unanticipated way.
- Verify that a functioning button for emergency stop is within reach.
- Verify that the system is free and ready for the movement before starting the system.
- Run initial tests at reduced velocity.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## 4.1 Commissioning procedure



*You must also re-commission an already configured product if you want to use it under changed operating conditions.*

- ▶ Verify correct installation, see chapter "3.5 Verifying installation".
- ▶ For commissioning, respect the instructions provided in the manual of the motor used and in the manual of the drive used.
- ▶ Verify that the actual loads conform to the required and engineering data prior to operating the product.
- ▶ Limit the maximum torque of the motor in accordance with the maximum driving torque of the linear axis.

The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves).

- ▶ Verify the function of the sensors. The integrated LED must indicate the switching state correctly.
- ▶ Verify the distance between the sensors and the mechanical stops. The movement must be stopped by the sensors before the carriage reaches a mechanical stop.
- ▶ Perform initial tests at reduced velocity. During these tests, verify that the controller responds correctly to the sensors in both directions of movement.
- ▶ Verify that the ambient conditions and actual loads conform to the required and engineering data. See chapter "2.1 Ambient conditions".

## 5 Diagnostics and troubleshooting

### 5.1 Troubleshooting

Error	Cause	Troubleshooting
Sensor overtraveled	Sensor	Adjust or replace sensors, see page 88
	Controller	Check controller
Motor load increases, controller switches off because of overload.	Guides and/or ball screw drive under mechanical tension or excessive friction caused by poor lubrication.	Contact service
Noise and vibrations at high speed of rotation of the ball screw shaft.	Speed of rotation too high	Reduce speed of rotation
	Poor lubrication (in the case of noise)	Lubricate, see page 96
	Run-out of the ball screw shaft caused by impact or shock	The ball screw shaft must be replaced. Contact service
Running inaccuracy and noise of the guides	Poor lubrication	Lubricate, see page 96
	Damage to the guides, for example by shock or impact on the carriage	Replace guides, contact service
Carriage has backlash and positions inaccurately	Backlash in ball screw drive or guides after a collision or poor lubrication	Contact service





## 6 Accessories and spare parts



Contact your local sales office if you have questions or need spare parts that are not listed.

### 6.1 Clamping claws

Order data

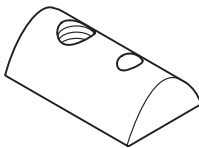
	<b>Description</b>	<b>Order no.</b>	
	For mounting the axis body to a mounting surface. Contains 10 piece	<b>For axis ...</b>	
		PAS42	<b>VW33MF10512</b>
		PAS43	<b>VW33MF10613</b>
	PAS44	<b>VW33MF10814</b>	

Dimensional drawings

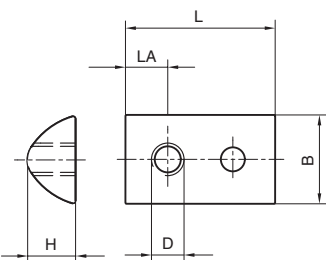
	<b>For axis ...</b>	<b>PAS42</b>	<b>PAS43</b>	<b>PAS44</b>	
	<b>A</b>	mm (in)	18 (0.71)	18 (0.71)	18 (0.71)
	<b>B</b>	mm (in)	19 (0.75)	24 (0.94)	28 (1.10)
	<b>B1</b>	mm (in)	14 (0.55)	16 (0.63)	20 (0.79)
	<b>B2</b>	mm (in)	7 (0.28)	8 (0.31)	10 (0.39)
	<b>D1</b>	mm (in)	5.5 (0.22)	11 (0.43)	15 (0.59)
	<b>D2</b>	mm (in)	5.5 (0.22)	6.6 (0.26)	9 (0.35)
	<b>H</b>	mm (in)	16.2 (0.64)	21.5 (0.85)	22 (0.87)
	<b>H1</b>	mm (in)	5.4 (0.21)	6.4 (0.25)	12 (0.47)
	<b>L</b>	mm (in)	76 (2.99)	76 (2.99)	76 (2.99)
	<b>LA1</b>	mm (in)	40 (1.57)	40 (1.57)	40 (1.57)

6.2 Slot nuts

Order data


	Description			Order no.
	The slot nuts are inserted into the T slots of the axis body to fasten the axis or parts of the axis.  Contains 10 piece	For axis ...	Slot nut type	
		PAS41 / PAS42	5 steel M5	<b>VW33MF010T5N5</b>
		PAS43	6 steel M6	<b>VW33MF010T6N6</b>
		PAS44	8 steel M6	<b>VW33MF010T8N6</b>
8 steel M8	<b>VW33MF010T8N8</b>			

Dimensional drawings

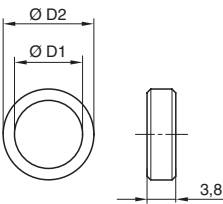
	Slot nut type	B	D	H	L	LA	
	For axis ...	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	
	PAS41 / PAS42	5 steel M5	8 (0.31)	5 (0.20)	4 (0.16)	11.5 (0.45)	4 (0.16)
	PAS43	6 steel M6	10.6 (0.42)	6 (0.24)	6.4 (0.25)	17 (0.67)	5.5 (0.22)
	PAS44	8 steel M6	13.8 (0.54)	6 (0.24)	7.3 (0.29)	23 (0.91)	6.5 (0.26)
8 steel M8		13.8 (0.54)	8 (0.31)	7.3 (0.29)	23 (0.91)	7.5 (0.30)	

6.3 Locating dowels

Order data

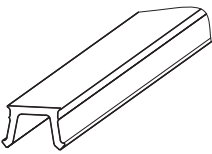
	Description		Order no.
	For precise and reproducible mounting of the payload, the locating dowels are inserted into the holes at the carriage.  Contains 20 piece	For axis ...	
		PAS41 / PAS42	<b>VW33MF020LD01</b>
		PAS43	<b>VW33MF020LD02</b>
	PAS44	<b>VW33MF020LD03</b>	

Dimensional drawings

	For axis ...	D1	D2
		mm (in)	mm (in)
	PAS41 / PAS42	5.5 (0.22)	8 h6 (0.31 h6)
	PAS43	6.6 (0.26)	10 h6 (0.39 h6)
	PAS44	9 (0.35)	12 h6 (0.47 h6)

## 6.4 T slot covers

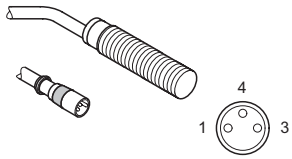
Order data

	Description			Order no.
	Length 2 m	For axis ...	T slot size	
	Contains 5 piece	PAS41 / PAS42	5	<b>VW33MC05B05</b>
		PAS43	6	<b>VW33MC05A06</b>
PAS44		8	<b>VW33MC05A08</b>	

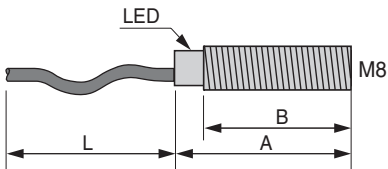
6.5 Sensors and additional parts

6.5.1 Sensors

Order data

	Description		Order no.
	With signal display with 100 mm (3.94 in) cable and 3-pin M8 circular plug-in connector.  1 piece	PNP, normally closed contact	<b>XS508B1PBP01M8</b>
		PNP, normally open contact	<b>XS508B1PAP01M8</b>
		NPN, normally closed contact	<b>XS508B1NBP01M8</b>
NPN, normally open contact		<b>XS508B1NAP01M8</b>	

Dimensional drawings

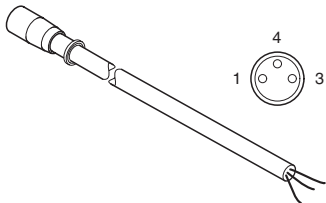
	Total length	Thread length	Cable length
	<b>A</b>	<b>B</b>	<b>L</b>
	mm (in)	mm (in)	mm (in)
	33 (1.30)	25 (0.98)	100 (3.94)
	See chapter "3.4.1 Connecting the sensors" for the connection assignment.		

Technical data

Model		Cylindrical thread M8 x 1
Approvals		CE
Electrical connection (PUR cable with M8 connector)	mm (in)	100 (3.94)
Nominal switching distance $S_n$ (in the case of steel)	mm (in)	1.5 (0.06)
Hysteresis		1 to 15% of the real switching distance
Degree of protection as per IEC 60529		IP67
Temperature (storage)	°C (°F)	-40 ... 85 (-40 ... 185)
Temperature (operation)	°C (°F)	-25 ... 70 (-13 ... 158)
Housing material		Nickel-plated brass
Cable material		PUR, 3 x 0.12 mm <sup>2</sup>
Function indicator output		Yellow LED
Function indicator supply voltage		No
Supply voltage (PELV)	Vdc	12 ... 24 with reverse polarity protection
Supply voltage (including residual ripple)	Vdc	10 ... 36
Switching current (overload and short-circuit protection)	mA	< 200
Voltage drop, output conducting	V	< 2
No-load current	mA	< 10
Maximum switching frequency	Hz	5000
Switch-on time	ms	< 0.1
Switch-off time	ms	< 0.1

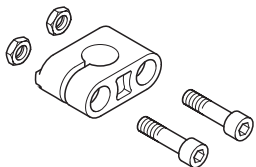
6.5.2 Sensor extension cable

Order data

	<b>Description</b>			<b>Order no.</b>
	Suitable for drag chain applications; sensor side end 3-pin M8 circular connector, second cable end open	m (ft)	5 (16.40)	<b>VW32SBCBGA050</b>
	Contains 1 piece	m (ft)	10 (32.81)	<b>VW32SBCBGA100</b>
		m (ft)	20 (65.62)	<b>VW32SBCBGA200</b>

6.5.3 Sensor holder

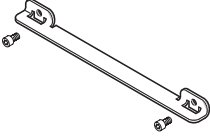
Order data

	<b>Description</b>		<b>Order no.</b>
	For standard limit switch with 8 mm diameter (0.31 in); movable		<b>VW33MF010M8</b>
Contains 10 piece			

MNA 1MLS DM00EN, V2.05, 03.2015

## 6.5.4 Contact plate

*Order data*

	Description	Order no.
	For mounting to the carriage of the axis Content 1 contact plate 2 screws	<b>VW33MASP1</b>

6.6 Coupling assemblies

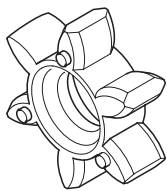


*Respect the maximum permissible driving torque of the linear axis. The coupling elements can transmit a greater torque than the linear axis can accept.*

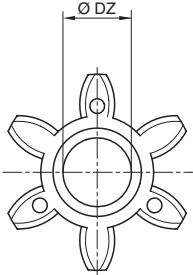
	<p>Coupling assemblies are required to mount motors to axes.</p> <p>A coupling assembly consists of the following components:</p> <ul style="list-style-type: none"> <li>• 2 clamping hubs, one each for ball screw end and motor end</li> <li>• 1 elastomer spider, as a decoupling element between the hubs</li> <li>• 2 screws</li> </ul>
<p>Coupling assembly                  (1) Clamping hub                  (2) Elastomer spider                  (3) Clamping hub</p>	

## 6.6.1 Elastomer spiders

## Order data

	Description		Order no.
	Decoupling element between the hubs Contains 1 piece, color red	For axis ...	
		PAS42	<b>SPM3MFR14A034</b>
		PAS43	<b>SPM3MFR20A120</b>
	PAS44	<b>SPM3MFR25A320</b>	

## Dimensional drawings

	For axis ...		PAS42	PAS43	PAS44	
	Shore hardness		98 Sh A	98 Sh A	98 Sh A	
	Color		Red	Red	Red	
	Max. torque	$M_{max}$	Nm (lb·in)	34 (300.93)	120 (1062.09)	320 (2832.24)
	Nominal torque	$M_N$	Nm (lb·in)	17 (150.46)	60 (531.04)	160 (1416.12)
	Moment of inertia	J	kgcm <sup>2</sup> (oz·in·s <sup>2</sup> )	0.013 (0.0018)	0.067 (0.0095)	0.150 (0.0212)
	Diameter	DZ	mm (in)	14 (0.55)	20 (0.79)	25 (0.98)



## 6.6.2 Clamping hubs

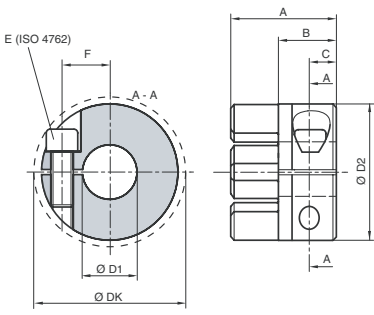
## Order data

	Description		Order no.
	Clamping hub Contains 1 piece		
	D1 [mm (in)] <sup>1)</sup>	M <sub>max</sub> [Nm (lb-in)]	
For axis ...	Inquire for other diameters	Maximum torque that can be transmitted	
PAS42	6.35 (0.25)	32.5 (287.65)	SPM3MFCC06A07
	8 (0.31)	35 (309.78)	SPM3MFCC08A07
	9 (0.35)	36 (318.63)	SPM3MFCC09A07
	10 (0.39)	41 (362.88)	SPM3MFCC10A07
	11 (0.43)	45 (398.28)	SPM3MFCC11A07
	12 (0.47)	50 (442.54)	SPM3MFCC12A07
	14 (0.55)	53 (469.09)	SPM3MFCC14A07
	16 (0.63) <sup>2)</sup>	55 (486.79)	SPM3MFCC16A07
	19 (0.75)	58 (513.34)	SPM3MFCC19A07
	20 (0.79)	60 (531.04)	SPM3MFCC20A07
PAS43	12 (0.47)	49 (433.69)	SPM3MFCC12A08
	14 (0.55)	54 (477.94)	SPM3MFCC14A08
	19 (0.75)	75 (663.81)	SPM3MFCC19A08
	20 (0.79) <sup>2)</sup>	76 (672.66)	SPM3MFCC20A08
	22 (0.87)	78 (690.36)	SPM3MFCC22A08
	24 (0.94)	85 (752.31)	SPM3MFCC24A08
	25 (0.98)	98 (867.37)	SPM3MFCC25A08
PAS44	12 (0.47)	108 (955.88)	SPM3MFCC12A09
	14 (0.55)	111 (982.43)	SPM3MFCC14A09
	19 (0.75)	128 (1132.90)	SPM3MFCC19A09
	20 (0.79)	138 (1221.40)	SPM3MFCC20A09
	22 (0.87)	154 (1363.01)	SPM3MFCC22A09
	24 (0.94)	158 (1398.42)	SPM3MFCC24A09
	25 (0.98) <sup>2)</sup>	160 (1416.12)	SPM3MFCC25A09

1) See dimensional drawings

2) Clamping hub with diameter for ball screw shaft extension, see dimensional drawings ball screw axis in chapter "2 Technical Data"

Dimensional drawings

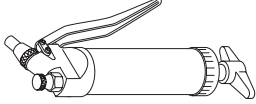
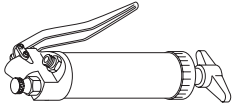
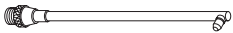



For axis ...			PAS42	PAS43	PAS44
Moment of inertia	J	kgcm <sup>2</sup> (oz·in·s <sup>2</sup> )	0.15 (0.0212)	0.55 (0.0779)	1.22 (0.1728)
Screw ISO 4762	E		M6	M6	M8
Wrench size		mm (in)	5 (0.20)	5 (0.20)	6 (0.24)
Tightening torque		Nm (lb·in)	14 (123.91)	14 (123.91)	35 (309.78)
Hub length	A	mm (in)	31 (1.22)	36 (1.42)	39 (1.54)
Hole depth	B	mm (in)	17 (0.67)	20 (0.79)	21 (0.83)
Distance between centers	C	mm (in)	8 (0.31)	10 (0.39)	9 (0.35)
Inside diameter H7	D1	mm (in)	1) (0.55)	1) (0.79)	1) (0.98)
	D2	mm (in)	40 (1.57)	55 (2.17)	65 (2.56)
Outside diameter	DK	mm (in)	45 (1.77)	57.5 (2.26)	73 (2.87)
	F	mm (in)	14 (0.55)	20 (0.79)	25 (0.98)

1) See order data

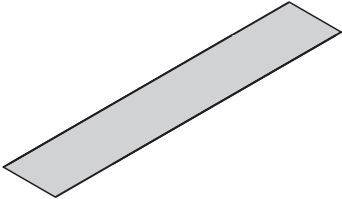
## 6.7 Grease guns

### Order data

Designation	Description	Order no.
<b>Single-hand high-pressure grease gun</b> 	With nozzle for the lubrication of the linear axes with recirculating ball bearing guide. Suitable nozzle type D. Volume: 120 cm <sup>3</sup> (7.32 in <sup>3</sup> ); delivery volume: 0.5 cm <sup>3</sup> (0.03 in <sup>3</sup> ) / stroke	<b>VW33MAP01</b>
<b>Single-hand high-pressure oil gun</b> 	With nozzle for the lubrication of the linear axes with roller guide. Suitable nozzle type D. Volume: 120 cm <sup>3</sup> (7.32 in <sup>3</sup> ); delivery volume: 0.5 cm <sup>3</sup> (0.03 in <sup>3</sup> ) / stroke	<b>VW33MAP02</b>
<b>Nozzle type D6 90°</b> 	For grease nipple type D6; nipple 90°, Ø 6 mm (0.24 in); length 20 mm (0.79 in); with M4 pointed nozzle 90° lateral	<b>VW33MAT01</b>
<b>Nozzle type D6 20°</b> 	For grease nipple type D6; nipple 20°, Ø 6 mm (0.24 in); length 20 mm (0.79 in); with M4 pointed nozzle 20° angled	<b>VW33MAT02</b>

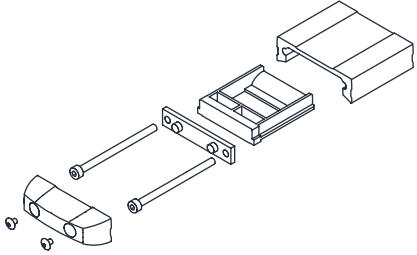
## 6.8 Cover strips

### Order data

	Description			Order no.
	For axis ...	Width [mm (in)]	Height [mm (in)]	
PAS42	36 (1.42)	0.15 (0.01)	3 (9.84)	<b>SPM3MAC36L030</b>
			6 (19.69)	<b>SPM3MAC36L060</b>
PAS43	45 (1.77)	0.15 (0.01)	3 (9.84)	<b>SPM3MAC45L030</b>
			6 (19.69)	<b>SPM3MAC45L060</b>
PAS44	65 (2.56)	0.15 (0.01)	3 (9.84)	<b>SPM3MAC65L030</b>
			6 (19.69)	<b>SPM3MAC65L060</b>

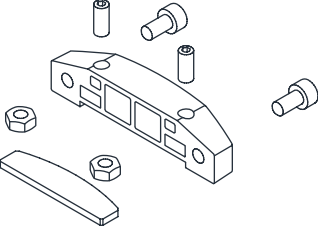
## 6.9 Strip deflection

### Order data

	Description		Order no.
	Kit with	For axis ...	
	1 housing for strip deflection	PAS42	<b>SPM3MAC2D0042</b>
	1 strip deflection	PAS43	<b>SPM3MAC3D0043</b>
	1 deflection unit with brush	PAS44	<b>SPM3MAC4D0044</b>
	1 holding plate		
	1 rubber buffers		
	4 screws		

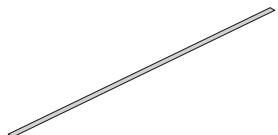
## 6.10 Cover strip clamp

Order data

	Description			Order no.
	Kit with 1 cover strip clamp 1 clamping plate 2 screws 2 set screws 2 nuts			
	For axis ...			
	PAS42			<b>SPM3MAC1F042</b>
	PAS43			<b>SPM3MAC1F043</b>
	PAS44			<b>SPM3MAC1F044</b>

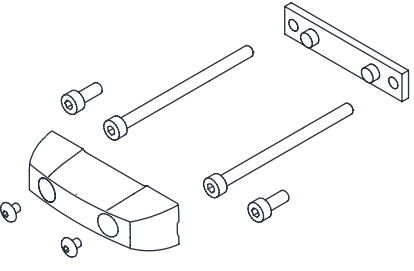
## 6.11 Magnetic strips

Order data

	Description				Order no.
	Contains 2 piece				
	For axis ...	Width [mm (in)]	Height [mm (in)]	Length m (ft)	
	PAS42	4.0 (0.16)	1 (0.04)	1.5 (4.92)	<b>SPM3MAW1S415</b>
				3 (9.84)	<b>SPM3MAW1S430</b>
				6 (19.69)	<b>SPM3MAW1S460</b>
	PAS43 / PAS44	6.0 (0.24)	1 (0.04)	1.5 (4.92)	<b>SPM3MAW1S615</b>
3 (9.84)				<b>SPM3MAW1S630</b>	
6 (19.69)				<b>SPM3MAW1S660</b>	

## 6.12 Rubber buffer

Order data

	Description		Order no.
	Kit with 2 rubber buffers 2 holding plates 12 screws		
	For axis ...		
	PAS42		<b>SPM3MAC2B042</b>
PAS43		<b>SPM3MAC3B043</b>	
PAS44		<b>SPM3MAC4B044</b>	

## 7 Service, maintenance and disposal

### **⚠ WARNING**

#### **GREAT MASS OR FALLING PARTS**

- Use a suitable crane or other suitable lifting gear for mounting the product if this is required by the mass of the product.
- Use the necessary personal protective equipment (for example, safety shoes, safety glasses and protective gloves).
- Mount the product in such a way (tightening torque, securing screws) that parts cannot come loose, even in the case of shocks and vibration.
- Take all necessary measures to avoid unanticipated movements of linear axes mounted in vertical or tilted positions.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### 7.1 Service address

If you cannot resolve an error yourself please contact your sales office. Have the following details available:

- Nameplate (type, identification number, serial number, DOM, ...)
- Type of error (with LED flash code or error number)
- Previous and concomitant circumstances
- Your own assumptions concerning the cause of the error

Also include this information if you return the product for inspection or repair.



*If you have any questions please contact your sales office. Your sales office staff will be happy to give you the name of a customer service office in your area.*

<http://www.schneider-electric.com>

## 7.2 Inspections after collisions

Components of the linear axis may be damaged or destroyed as a result of a collision.

- ▶ After a collision, inspect the drive elements, the linear guide and the elastomer coupling for damage according to the instructions in the following chapters.

### **WARNING**

#### **INOPERABLE EQUIPMENT AND FALLING PARTS**

- Thoroughly inspect all components of the linear axis and all components attached to the linear axis, including the motor and the gearbox, for damage after a collision.
- Do not use the linear axis if any of the components are damaged or suspected to be damaged.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### 7.2.1 Ball screw drive

- ▶ Inspect the linear axis for unusual noise and vibrations..
- ▶ Perform a visual inspection of the ball screw drive for damage. To do so, remove the cover strip as described in chapter "7.3.4 Replacing the cover strip and the strip deflection".



*A damaged ball screw drive must be replaced. Contact your local sales office.*

### 7.2.2 Ball screw bearing

- ▶ Inspect the linear axis for unusual noise and vibrations..



*A damaged ball screw bearing must be replaced. Contact your local sales office.*

### 7.2.3 Linear guide

The linear guide consists of the guide carriage and the recirculating ball bearing guide.

- ▶ Inspect the guide carriage for backlash. If the guide carriage has backlash, the preload has been modified. The preload of the guide carriage can only be adjusted by the manufacturer. Note the serial number of the linear axis and contact your local sales office.
- ▶ Perform a visual inspection of the linear guide for damage. To do so, remove the cover strip as described in chapter "7.3.4 Replacing the cover strip and the strip deflection".
- ▶ Inspect for irregular noise or vibration. Irregular noise or vibration indicates a deformation in the linear guide. Deformation will cause rapid wear.



*A damaged linear guide must be replaced. Contact your local sales office.*

#### 7.2.4 Elastomer coupling

- ▶ Perform a visual inspection of the elastomer coupling for damage. To do so, remove the motor or the gearbox as described in chapter "7.3.2 Replacing the motor or the gearbox".

NOTE: A damaged elastomer coupling must be replaced. See chapter "7.3.2 Replacing the motor or the gearbox" for the procedure.

## 7.3 Replacing parts

Only replace the parts described. Any other parts may only be replaced by technicians trained by the manufacturer.

To replace the entire linear axis, install the new axis as per chapter "3 Installation".

Adjust and verify the linear axis as per chapter "4.1 Commissioning procedure" after replacing parts.

### 7.3.1 Replacing a sensor

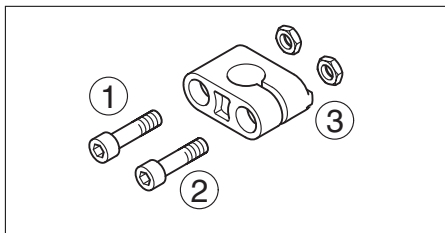
You can replace a sensor without changing the position of the sensor holder.



*Unless otherwise specified, the standard tightening torques indicated on page 59 apply.*

**Prerequisites** See chapter "6 Accessories and spare parts" for suitable spare parts. You need a set of hex keys and a feeler gauge.

#### Procedure



- ▶ Loosen the M3 screw (2) at the slotted side of the sensor holder until the sensor to be replaced can be pulled out from below.
- ▶ Mount the new sensor as described on page 62.



### 7.3.2 Replacing the motor or the gearbox

Dismounting of parts can cause unanticipated movements.

#### **▲ WARNING**

##### **UNINTENDED MOVEMENTS DUE TO DISMOUNTING**

Secure the moving parts of linear axes mounted in a vertical or tilted position against movements.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The motor or the gearbox are coupled by means of a preloaded elastomer coupling.



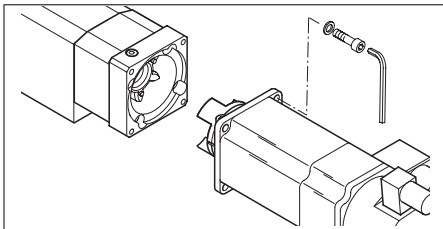
*Unless otherwise specified, the standard tightening torques indicated on page 59 apply.*

#### *Prerequisites*

See chapter "6 Accessories and spare parts" for suitable spare parts. You need a set of hex keys and a torque wrench with hexagon socket.

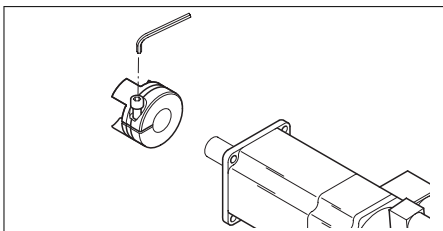
**NOTE:** Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

#### *Dismounting, motor only*



- ▶ Secure the motor to keep it from falling down.
- ▶ Remove the 4 screws and washers at the motor.
- ▶ Pull the motor and the clamping hub off of the motor adapter plate.

This requires a greater force of up to 450 N (101.16 lbf).

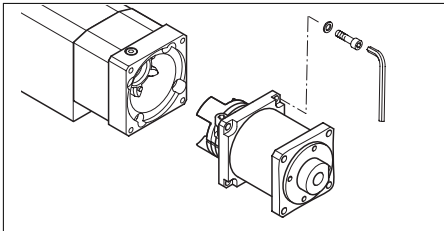


- ▶ Loosen the clamping screw at the clamping hub.
- ▶ Pull the clamping hub off the motor shaft.

*Dismounting, gearbox only*

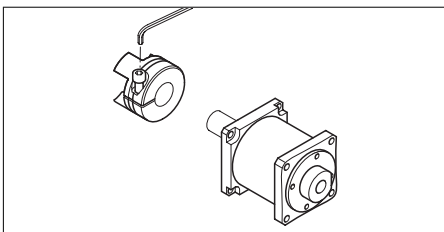


See the gearbox manual for details on removing a motor from the gearbox.

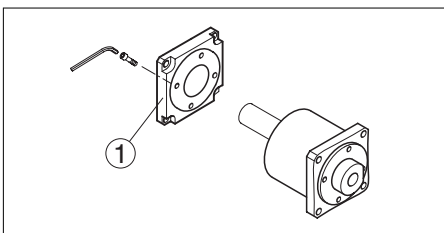


- ▶ Remove the 4 screws and washers at the gearbox flange.
- ▶ Pull the gearbox and the clamping hub off of the motor adapter plate.

This requires a greater force of up to 450 N (101.16 lbf).



- ▶ Loosen the clamping screw at the clamping hub.
- ▶ Pull the clamping hub off the gearbox shaft.



- If the gearbox does not have its own flange, the flange plate (1) must be dismounted.
- ▶ Remove the 4 screws at the flange plate.
- ▶ Remove the flange plate.

*Mounting*

- ▶ Mount the motor or the gearbox as described on page 64.

NOTE: If the new motor or the new gearbox has shaft dimensions different from the old motor or gearbox, you must use a suitable new elastomer coupling. See chapter "7.3.3 Replacing the elastomer coupling" for details on replacing an elastomer coupling.



Refer to the gearbox manual for mounting a motor to the gearbox.

### 7.3.3 Replacing the elastomer coupling



Unless otherwise specified, the standard tightening torques indicated on page 59 apply.

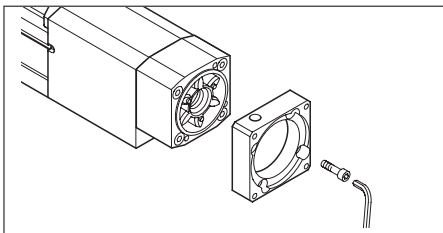
#### Prerequisites

See chapter "6 Accessories and spare parts" for suitable spare parts. You need a set of hex keys and a torque wrench with hexagon socket.

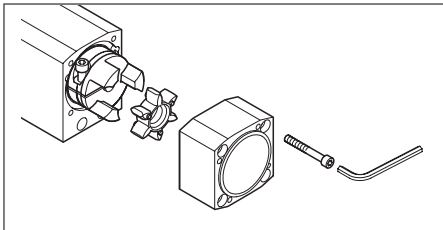
NOTE: Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

#### Procedure

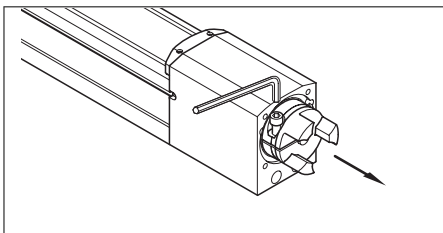
- ▶ Dismount the motor or the gearbox as described in chapter "7.3.2 Replacing the motor or the gearbox".



- ▶ Remove the 4 screws at the motor adapter plate.
- ▶ Remove the motor adapter plate.



- ▶ Dismount the coupling housing with the 4 screws.
- ▶ Pull the elastomer spider off of the clamping hub.



- ▶ Loosen the clamping screw at the clamping hub.
- ▶ Pull the clamping hub off the shaft extension of the linear axis.

- ▶ Mount the elastomer coupling as well as the motor or the gearbox as described on page 64.

### 7.3.4 Replacing the cover strip and the strip deflection

The cover strip has sharp edges. When the cover strip is cut to length, the edges may be particularly sharp.

#### ⚠ WARNING

##### SHARP EDGES

Wear protective gloves.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

When the cover strip is worn, it is recommended that the two strip deflections be replaced at the same time (deflection unit with brush).

*Unless otherwise specified, the standard tightening torques indicated on page 59 apply.*



#### Special tightening torques

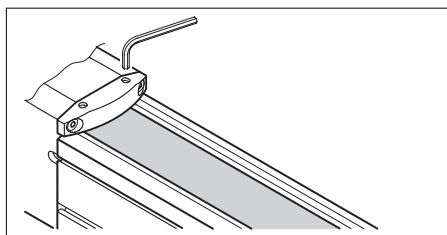
Cover strip clamp		PAS41	PAS42	PAS43	PAS44
Screw ISO 4762 - 8.8		M3 x 8	M4 x 8	M5 x 10	M6 x 14
Wrench size	mm	2.5	3	4	5
Tightening torque	Nm (lb-in)	0.6 (5.31)	1.0 (8.85)	1.5 (13.28)	3 (26.55)

Clamping plate		PAS41	PAS42	PAS43	PAS44
Set screw DIN 913 - 45H		M3 x 10	M4 x 10	M5 x 16	M6 x 20
Wrench size	mm	2.5	3	4	5
Tightening torque	Nm (lb-in)	0.2 (1.77)	0.3 (2.66)	0.4 (3.54)	0.5 (4.43)

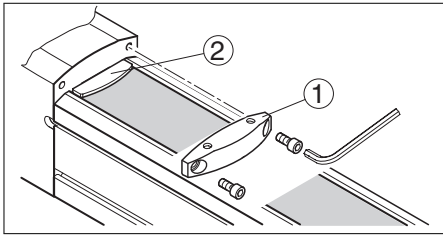
**Prerequisites** See chapter "6 Accessories and spare parts" for suitable spare parts. You need a set of Allen keys and a torque wrench with hexagon socket and a pair of tin snips.

**NOTE:** Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

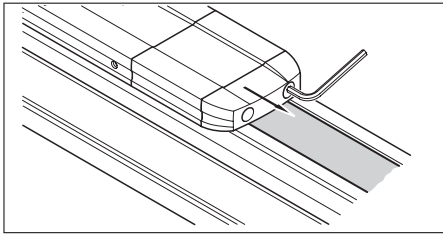
**Procedure** Perform the steps described below at both ends of the carriage and at both end of the linear axis.



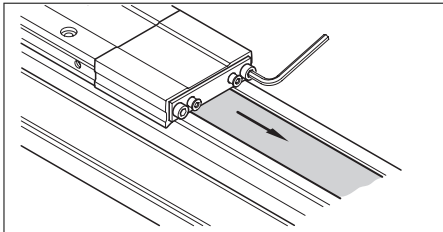
- 2 set screws at the cover strip clamp fixate the clamping plate below and the cover strip.
- ▶ Loosen the two set screws.



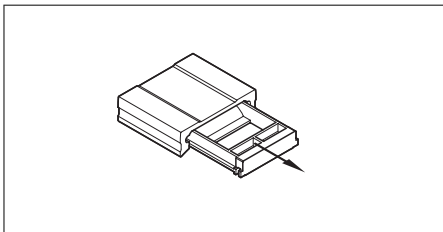
- ▶ Remove the cover strip clamp (1). To do so, loosen the two screws.  
Keep the screws and the clamping plate (2) from falling down.



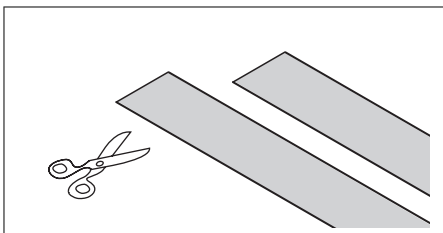
- ▶ Remove the rubber buffer at the strip deflection. To do so, loosen the two screws.



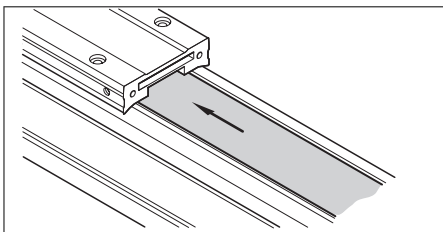
- ▶ Remove the holding plate together with the strip deflection. To do so, loosen the two screws.
- ▶ Pull out the entire cover strip.



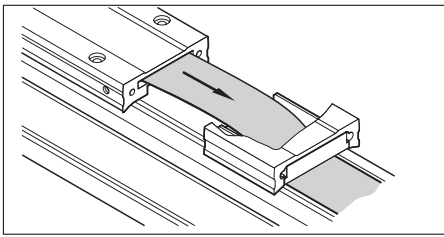
- ▶ Remove the plastic unit from the housing of the strip deflection.
- ▶ Insert the new plastic unit into the housing of the strip deflection.



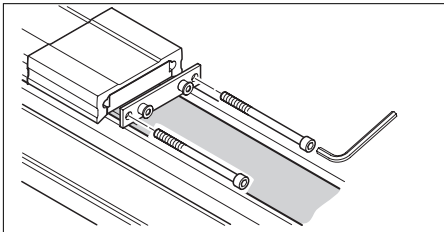
- ▶ Cut the new cover strip to the same length as the old cover strip with the tin snips.



- ▶ Guide the new cover strip through the guide channel inside the carriage.



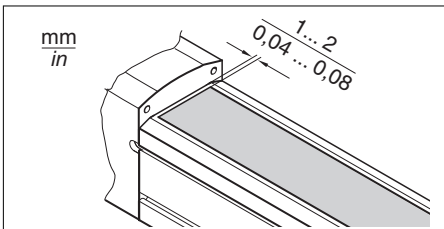
- ▶ Guide the new cover strip through the strip deflections.



- ▶ Place the holding plate for mounting the rubber buffer into position at the strip deflection.

- ▶ Screw the strip deflection into place.

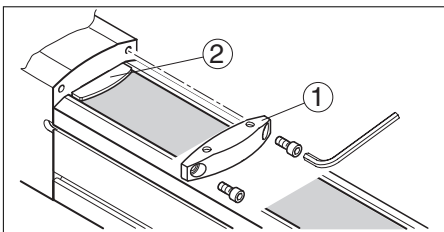
When doing so, align the strip deflection and the carriage.



- ▶ Place the cover strip over the entire length of the axis body.

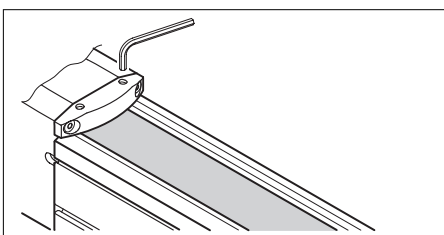
Align the cover strip symmetrically. The distance from the two end blocks must be 1 ... 2 mm (0.04 ... 0.08 in).

Verify that the cover strip has even contact with the magnetic strips.

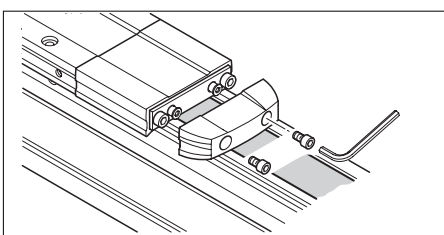


- ▶ Fit the clamping plate (2) into place.

- ▶ Screw the cover strip clamp (1) into place with the tightening torque specified on page 92.



- ▶ Tighten the two set screws for holding the clamping plate with the tightening torque specified on page 92.



- ▶ Mount the rubber buffer with the two screws and the washers.

- Test movements* ▶ Run initial tests at reduced velocity. Verify proper function of the cover strip.

## 7.4 Maintenance

The maintenance intervals for cleaning and lubrication must be adhered to.

- ▶ Include the maintenance intervals in your maintenance plan.

### 7.4.1 Cleaning

Due to its design, the product is not susceptible to the ingress of contaminants and external objects. The guide is located inside the axis body and it is covered.

The product must be inspected and cleaned at regular intervals.

- ▶ Do not use compressed air for cleaning.
- ▶ Remove large particles and dirt from the surface at regular intervals.
- ▶ Use only neutral cleaning agents for cleaning.
- ▶ Use only damp, soft and lint-free cleaning cloths to wipe the surface.

*Cover strip*

The cover strip is Teflon-coated. The friction causes abrasion on the cover strip.

- ▶ Remove abrasion products at regular intervals.

### 7.4.2 Lubrication

Lubricant is consumed continuously during operation of the linear axis. The product must be lubricated at regular intervals. Incorrect lubricants may damage the product.

#### **NOTICE**

##### **INOPERABLE EQUIPMENT**

Only use the specified type and volume of lubricant (grease, oil).

**Failure to follow these instructions can result in equipment damage.**

See chapter

"7.4.3 Lubricating the linear guide and the drive elements" for information on the type and volume of the lubricant.

The lubrication system is not completely sealed. Therefore, small amounts of lubricants may leak.

Insufficient lubrication or incorrect lubricants increase wear and reduce the service life. The following factors influence the lubrication intervals:

- Dust and dirt particles
- High operating temperatures
- Heavy loads
- Heavy vibration
- Permanent short-distance positioning
- High speed of rotation



### 7.4.3 Lubricating the linear guide and the drive elements

The ball screw axis is lubricated with grease from an internal reservoir. The reservoir is factory-prefilled. The carriage features 3 grease nipples at each side for relubrication.

- The outer grease nipples are used to lubricate the linear guide.
- The inner grease nipples are used to fill the drive element (ball screw drive).

The lubrication interval depends on the load, the velocity, the cycle time and the ambient conditions. The following recommended values apply to lubrication intervals:

*Linear guide*

- 5000 km (3107 mi) operational performance

Size	Lubricant <sup>1)</sup>	Relubrication volume	Strokes
PAS42	Microlube GL 261	0.25 cm <sup>3</sup> (0.02 in <sup>3</sup> )	1/2
PAS43	Microlube GL 261	0.5 cm <sup>3</sup> (0.03 in <sup>3</sup> )	1
PAS44	Microlube GL 261	1.0 cm <sup>3</sup> (0.06 in <sup>3</sup> )	2

1) Alternative grease K1N-30 as per DIN 51825

*Ball screw drive*

- 100 km (62 mi) at a ball screw pitch of 5 mm (0.20 in)
- 200 km (124 mi) at a ball screw pitch of 10 mm (0.39 in)
- 300 km (186 mi) at a ball screw pitch of 16 mm (0.63 in)
- 400 km (249 mi) at a ball screw pitch of 20 mm (0.79 in)
- 500 km (311 mi) at a ball screw pitch of 25 mm (0.98 in)

Size	Lubricant <sup>1)</sup>	Relubrication volume	Strokes
PAS42	Microlube GL 261	1.5 cm <sup>3</sup> (0.09 in <sup>3</sup> )	3
PAS43	Microlube GL 261	3.5 cm <sup>3</sup> (0.21 in <sup>3</sup> )	7
PAS44	Microlube GL 261	4.5 cm <sup>3</sup> (0.27 in <sup>3</sup> )	9

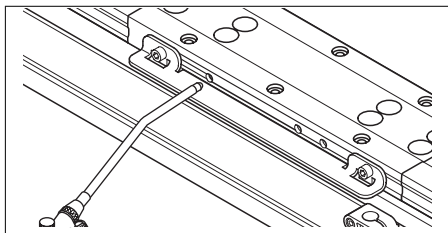
1) Alternative grease K1N-30 as per DIN 51825

See chapter "6 Accessories and spare parts" for grease guns, nozzles and lubricants.

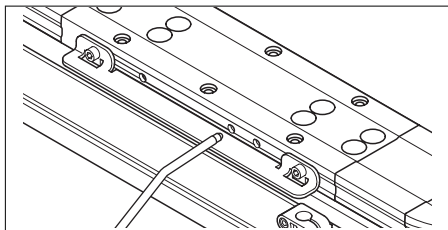
*Notes on greasing*

When applying the lubricant, you must not exceed a maximum flow rate. Therefore, the minimum injection time of 3 seconds per grease gun stroke must be adhered to.

The carriage must be moved between strokes of the grease gun to allow the grease to distribute evenly in the lubricant reservoirs.

*Procedure***Lubricating the linear guide**

- ▶ Position the nozzle at a right angle. Press the nozzle against the grease nipple.
- ▶ Inject the correct type and volume of grease into the two outer grease nipples at one side of the carriage.

**Lubricating the drive element**

- ▶ Position the nozzle at a right angle. Press the nozzle against the grease nipple.
- ▶ Inject the correct type and volume of grease into the center grease nipple at one side of the carriage.

## 7.5 Shipping, storage, disposal

Respect the ambient conditions in chapter "2.1 Ambient conditions".

*Shipping* The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

*Storage* The product may only be stored in spaces where the specified permissible ambient conditions are met.  
Protect the product from dust and dirt.

*Disposal* The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit <http://www.schneider-electric.com/green-premium> for information and documents on environmental protection as per ISO 14025 such as:

- EoLi (Product End-of-Life Instructions)
- PEP (Product Environmental Profile)



## Glossary



### Units and conversion tables

The value in the specified unit (left column) is calculated for the desired unit (top row) with the formula (in the field).

Example: conversion of 5 meters (m) to yards (yd)  
 $5 \text{ m} / 0.9144 = 5.468 \text{ yd}$

#### Length

	<b>in</b>	<b>ft</b>	<b>yd</b>	<b>m</b>	<b>cm</b>	<b>mm</b>
<b>in</b>	-	/ 12	/ 36	* 0.0254	* 2.54	* 25.4
<b>ft</b>	* 12	-	/ 3	* 0.30479	* 30.479	* 304.79
<b>yd</b>	* 36	* 3	-	* 0.9144	* 91.44	* 914.4
<b>m</b>	/ 0.0254	/ 0.30479	/ 0.9144	-	* 100	* 1000
<b>cm</b>	/ 2.54	/ 30.479	/ 91.44	/ 100	-	* 10
<b>mm</b>	/ 25.4	/ 304.79	/ 914.4	/ 1000	/ 10	-

#### Mass

	<b>lb</b>	<b>oz</b>	<b>slug</b>	<b>kg</b>	<b>g</b>
<b>lb</b>	-	* 16	* 0.03108095	* 0.4535924	* 453.5924
<b>oz</b>	/ 16	-	* $1.942559 \cdot 10^{-3}$	* 0.02834952	* 28.34952
<b>slug</b>	/ 0.03108095	/ $1.942559 \cdot 10^{-3}$	-	* 14.5939	* 14593.9
<b>kg</b>	/ 0.45359237	/ 0.02834952	/ 14.5939	-	* 1000
<b>g</b>	/ 453.59237	/ 28.34952	/ 14593.9	/ 1000	-

#### Force

	<b>lb</b>	<b>oz</b>	<b>p</b>	<b>N</b>
<b>lb</b>	-	* 16	* 453.55358	* 4.448222
<b>oz</b>	/ 16	-	* 28.349524	* 0.27801
<b>p</b>	/ 453.55358	/ 28.349524	-	* $9.807 \cdot 10^{-3}$
<b>N</b>	/ 4.448222	/ 0.27801	/ $9.807 \cdot 10^{-3}$	-

#### Power

	<b>HP</b>	<b>W</b>
<b>HP</b>	-	* 746
<b>W</b>	/ 746	-

## Rotation

	min <sup>-1</sup> (RPM)	rad/s	deg./s
min <sup>-1</sup> (RPM)	-	* $\pi / 30$	* 6
rad/s	* $30 / \pi$	-	* 57.295
deg./s	/ 6	/ 57.295	-

## Torque

	lb-in	lb-ft	oz-in	Nm	kp-m	kp-cm	dyne-cm
lb-in	-	/ 12	* 16	* 0.112985	* 0.011521	* 1.1521	* $1.129 \cdot 10^6$
lb-ft	* 12	-	* 192	* 1.355822	* 0.138255	* 13.8255	* $13.558 \cdot 10^6$
oz-in	/ 16	/ 192	-	* $7.0616 \cdot 10^{-3}$	* $720.07 \cdot 10^{-6}$	* $72.007 \cdot 10^{-3}$	* 70615.5
Nm	/ 0.112985	/ 1.355822	/ $7.0616 \cdot 10^{-3}$	-	* 0.101972	* 10.1972	* $10 \cdot 10^6$
kp-m	/ 0.011521	/ 0.138255	/ $720.07 \cdot 10^{-6}$	/ 0.101972	-	* 100	* $98.066 \cdot 10^6$
kp-cm	/ 1.1521	/ 13.8255	/ $72.007 \cdot 10^{-3}$	/ 10.1972	/ 100	-	* $0.9806 \cdot 10^6$
dyne-cm	/ $1.129 \cdot 10^6$	/ $13.558 \cdot 10^6$	/ 70615.5	/ $10 \cdot 10^6$	/ $98.066 \cdot 10^6$	/ $0.9806 \cdot 10^6$	-

## Moment of inertia

	lb-in <sup>2</sup>	lb-ft <sup>2</sup>	kg-m <sup>2</sup>	kg-cm <sup>2</sup>	kp-cm-s <sup>2</sup>	oz-in <sup>2</sup>
lb-in <sup>2</sup>	-	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
lb-ft <sup>2</sup>	* 144	-	* 0.04214	* 421.4	* 0.429711	* 2304
kg-m <sup>2</sup>	* 3417.16	/ 0.04214	-	* $10 \cdot 10^3$	* 10.1972	* 54674
kg-cm <sup>2</sup>	* 0.341716	/ 421.4	/ $10 \cdot 10^3$	-	/ 980.665	* 5.46
kp-cm-s <sup>2</sup>	* 335.109	/ 0.429711	/ 10.1972	* 980.665	-	* 5361.74
oz-in <sup>2</sup>	/ 16	/ 2304	/ 54674	/ 5.46	/ 5361.74	-

## Temperature

	°F	°C	K
°F	-	(°F - 32) * 5/9	(°F - 32) * 5/9 + 273.15
°C	°C * 9/5 + 32	-	°C + 273.15
K	(K - 273.15) * 9/5 + 32	K - 273.15	-

## Conductor cross section

AWG	1	2	3	4	5	6	7	8	9	10	11	12	13
mm <sup>2</sup>	42.4	33.6	26.7	21.2	16.8	13.3	10.5	8.4	6.6	5.3	4.2	3.3	2.6

AWG	14	15	16	17	18	19	20	21	22	23	24	25	26
mm <sup>2</sup>	2.1	1.7	1.3	1.0	0.82	0.65	0.52	0.41	0.33	0.26	0.20	0.16	0.13

## Terms and Abbreviations

See chapter "Standards and terminology" for information on the pertinent standards on which many terms are based. Some terms and abbreviations may have specific meanings with regard to the standards.

<i>Axis body</i>	The axis body is an aluminum precision profile.
<i>Ball screw drive</i>	The ball screw drive converts a rotary movement into a linear movement. It consists of a ball screw, a ball nut with the ball recirculating elements and the bearing balls. A ball screw drive has a very high efficiency. It allows for high-precision, stiff feed movements and generates high feed forces at high positioning accuracy and repeatability.
<i>Ball screw pitch</i>	The pitch of the ball screw shaft relates to the distance covered by the carriage per revolution of the ball screw. The greater the pitch the higher the maximum velocity.  The following applies to the ball screw pitch: <ul style="list-style-type: none"> <li>• High pitch requires high driving torque</li> <li>• High pitch results in high velocity</li> <li>• High pitch causes high inaccuracy</li> </ul>
<i>Breakaway torque</i>	The breakaway torque describes the driving torque required to overcome the static friction and that initiates the transition to sliding friction.
<i>Buckling stress</i>	Buckling is the loss of stability of the ball screw when the maximum permissible thrust forces whose line of application is along the axis of the ballscrew axis is exceeded. Excessive buckling stress results in a rapidly increasing deformation and deflection of the ballscrew.
<i>Cantilever axis</i>	In the case of a cantilever axis, the carriage is stationary while the axis body moves. Portal axes work the other way round.
<i>Critical speed of the ball screw shaft</i>	If the critical speed of the ball screw shaft is exceeded, deflection of the ball screw and resonance will occur. This will seriously affect the service life of the ball screw drive. Ball screw supports are installed in longer linear axes to increase the critical speed of the ball screw shaft speed and thus the performance data.
<i>DOM</i>	<b>Date of manufacturing:</b> The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. For example: 31.12.11 corresponds to December 31, 2011 31.12.2011 corresponds to December 31, 2011
<i>Degree of protection</i>	The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).
<i>Direction of movement</i>	In the case of a rotary motor, direction of movement is defined in accordance with IEC 61800-7-204: Positive direction is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.
<i>Drive element</i>	The drive element of the linear axis is a ball screw drive.
<i>Error</i>	Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

<i>Feed per revolution</i>	The feed per revolution is the distance the carriage covers per motor revolution.
<i>Linear guide</i>	The linear guide consists of the guide carriage and the guide rail.
<i>Load torque</i>	The permissible load torques are calculated based on the service life of the carriage guide. If the load torque exceeds the specified values, the service life of the axis will be reduced.
<i>Modulus of elasticity</i>	The modulus of elasticity is used to describe the tendency of a material to deform along an axis when opposing forces are applied along this axis; it is the ratio of tensile strain and tensile stress. The higher the value, the stiffer the material.
<i>Mounting position</i>	The linear axes can be installed in any desired mounting position. However, all external forces and torques must be within the ranges of permissible values.
<i>Portal axis</i>	In the case of a portal axis, the axis body is stationary while the carriage moves. Cantilever axes work the other way round.
<i>Positioning accuracy</i>	Positioning accuracy is the tolerance between the specified position and end position actually reached, measured at the carriage. To determine this value, the carriage is moved to the end position from different directions at different velocities.
<i>Recirculating ball bearing</i>	The axis axis body absorbs the forces and torques applied at the carriage via the recirculating ball bearing guide. The recirculating ball bearing guide can absorb high forces and torques.
<i>Repeatability</i>	Repeatability is the accuracy with which it is possible to move to a previous position again under the same conditions. To determine this value, the carriage is moved to the end position from the same direction at the same velocity.
<i>Running accuracy</i>	Due to the manufacturing process, the extruded aluminium profiles have a certain tolerance in terms in straightness and twist. The tolerances are specified in EN 12020-2. To reach the desired running accuracy, the linear axis must be mounted on a precision-machined surface.
<i>Sensor</i>	Inductive proximity switches are used as sensors for limit switches or reference switches. These switches are not a safety function.
<i>Service life</i>	The service life is the distance in kilometers before the first signs of material fatigue can be seen on the guides, the drive elements and the bearings. Service life specifications (kilometers covered) relate to the nominal values specified in the data sheet. If the nominal values are exceeded, the service life decreases accordingly.
<i>Stiffness</i>	Stiffness is a measure of the ability to move and hold with high position accuracy a part to be positioned even when the load changes.
<i>Stroke reserve</i>	The stroke reserve is the distance between a limit switch and the mechanical stop.
<i>Stroke</i>	Stroke is the maximum travel of the carriage between the switching points of the limit switches.
<i>Support axis</i>	A support axis has linear guides, but no drive elements. A support axis carries loads that are applied asymmetrically to the carriage and improves the stability and service life of the system.



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