PAS4xB

Toothed belt axis
Product manual

V2.05, 03.2015

MNA1MLBDM00EN, V2.05, 03.2015

Green Premium™ Product

Schneider Electric™

www.schneider-electric.com

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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.

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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.

⚠ DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

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

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.

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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 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.

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⚠ 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. [1)]
- 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.

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About the book

This manual is valid for PAS4xB 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^2 (AWG 14)

Glossary

Explanations of special technical terms and abbreviations.

Index

List of keywords with references to the corresponding page numbers.

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1 Introduction

1.1 Overview of product properties

The toothed belt axes excel with outstanding flexibility in terms of motor mounting as well as numerous options such as roller guide or recirculating ball bearing guide. The toothed belt axes lend themselves for dynamic positioning of loads over short and long distances.

The toothed belt axes can be equipped with up to 3 carriages for moving multiple or long loads. If heavy or large loads are to be positioned, you can use a second portal axis mounted in parallel.

1.1.1 Product family

The linear axes product family consists of the following sizes:

- PAS41B - cross section axis body 40 x 40 mm (1.57 x 1.57 in)
- PAS42B - cross section axis body 60 x 60 mm (2.36 x 2.36 in)
- PAS43B - cross section axis body 80 x 80 mm (3.15 x 3.15 in)
- PAS44B - 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.

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1.1.2 Features and options of the linear axis

The linear axis provides the following features and options:

- 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
- Motor mounting possible at 4 sides, can be changed at any later point in time
- Options
  - Antistatic toothed belt
  - Increased corrosion resistance, see "2.2 Information on increased corrosion resistance"
  - 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

Roller guide
- High velocity
- Smooth operation
- Low-noise operation

Recirculating ball bearing guide
- High acceleration
- High payload
- High torque load
- High accuracy
- Long service life

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1.1.4 Motor mounting

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

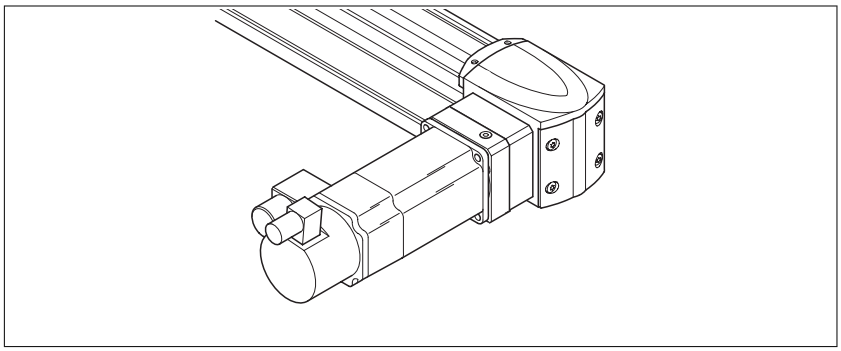

Figure 1: Motor mounting left or right

1.2 Product overview

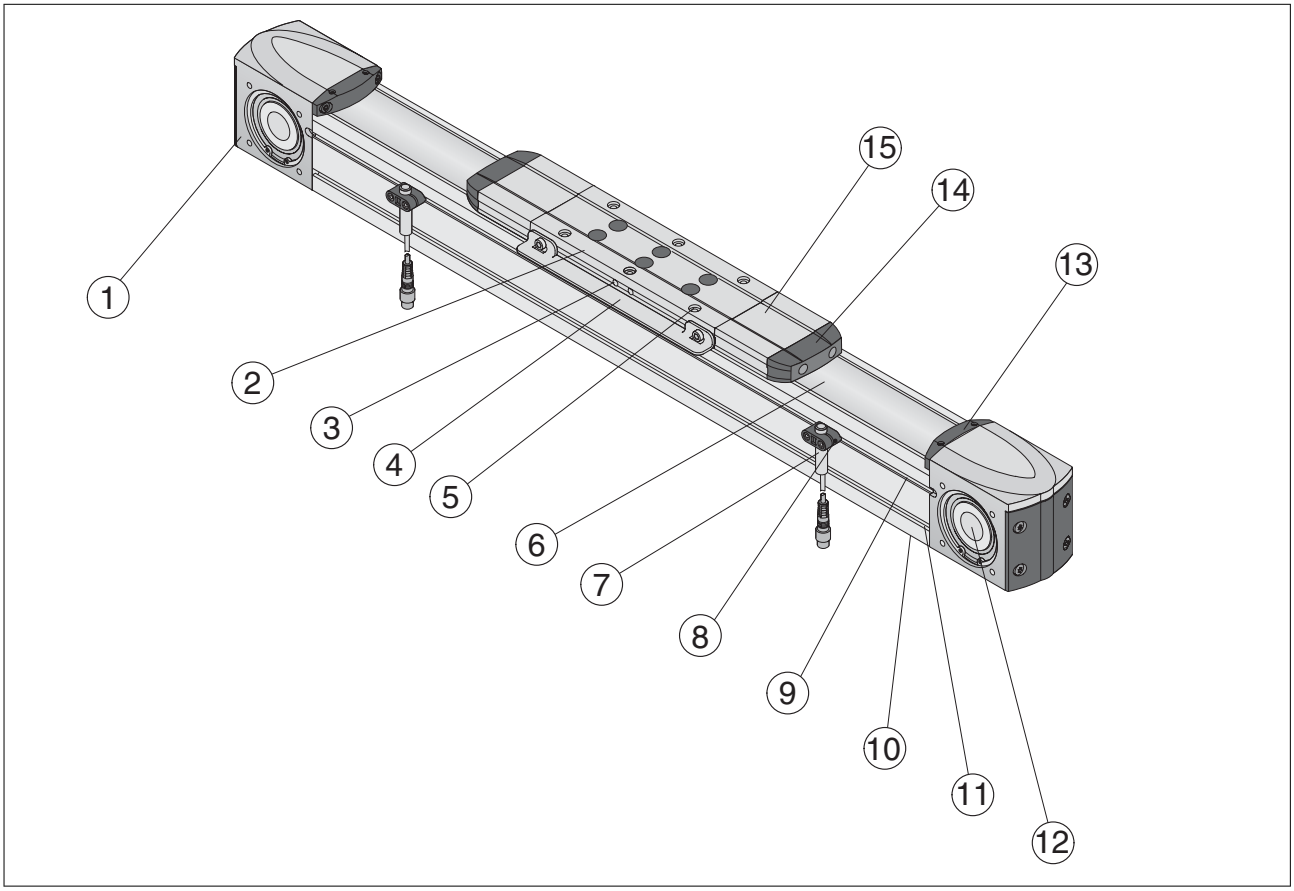

Figure 2: Product overview toothed belt axis

(1)	End block
(2)	Carriage
(3)	Grease nipples, 3 pieces
(4)	Contact plate sensor
(5)	Threads for fastening the payload
(6)	Cover strip
(7)	Sensor with cable and connector
(8)	Sensor holder
(9)	T slot for fastening the sensor holder
(10)	Axis body
(11)	T slot for fastening the axis body
(12)	Hollow shaft for elastomer coupling or shaft extension
(13)	Clamp fastener for cover strip
(14)	Rubber buffer
(15)	Strip deflection

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1.3 Nameplate

The nameplate contains the following data:

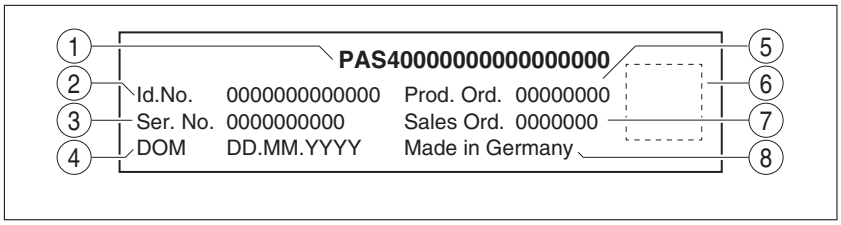

Figure 3: Nameplate

(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	1	B	R	M	1000	A	2	B	A	XXX	R
Product designation PAS4 = Portal axis												
Size - cross section axis body 1 = 40 x 40 mm (1.57 x 1.57 in) 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)												
Drive element B = Toothed belt H = Support axis (without drive)												
Guide type R = Roller guide (sizes 1, 2, 3) B = Recirculating ball bearing guide (sizes 2, 3, 4)												
Feed per revolution M = 84 mm (3.31 in) for size 1, M = 155 mm (6.10 in) for size 2, M = 205 mm (8.07 in) for size 3, M = 264 mm (10.39 in) for size 4 N = Support axis												
Stroke xxxx = in mm (maximum stroke per size see Technical Data)												
Limit switch [1] 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												
Carriages (all driven) 1 = Type 1 (sizes 2, 3, 4) 2 = Type 2 4 = Type 4												
Options N = Without B = With cover strip C = Increased corrosion resistance, with cover strip A = Antistatic toothed belt, without cover strip A = Increased corrosion resistance, antistatic toothed belt, without cover strip L = Antistatic toothed belt, with cover strip												
Number of carriages [2] A = One carriage B = Two carriages C = Three carriages												
Distance between carriages Minimum distance between 2 carriages: see table dimensional drawings 000 to 999 in mm XXX = With a single carriage												
Drive interface (see Figure 4) R = Right L = Left H = Without (hollow shaft at both ends) N = Support axis												

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

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2) Only carriages of the same type can be used, all carriages are driven. Inquire for more carriages.

PAS4 1B R M 1000 A 2 B A XXX R/	2	1G	0	H7	0

Motor / gearbox interface
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

Gearbox interface
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

Mounting direction gearbox
(with clamping hub mounting screw of adapter plate)
3 = 0°
0 = 90°
9 = 180°
6 = 270°
X = No gearbox

Motor interface
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

Mounting direction motor with reference to motor connection
(with clamping hub mounting screw of adapter plate)
3 = 0°
0 = 90°
9 = 180°
6 = 270°
X = No motor

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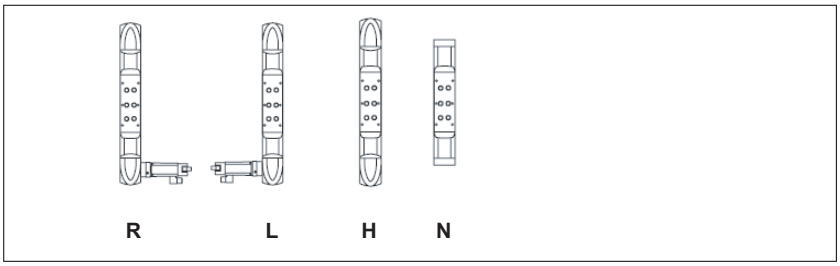

Figure 4: Drive interface

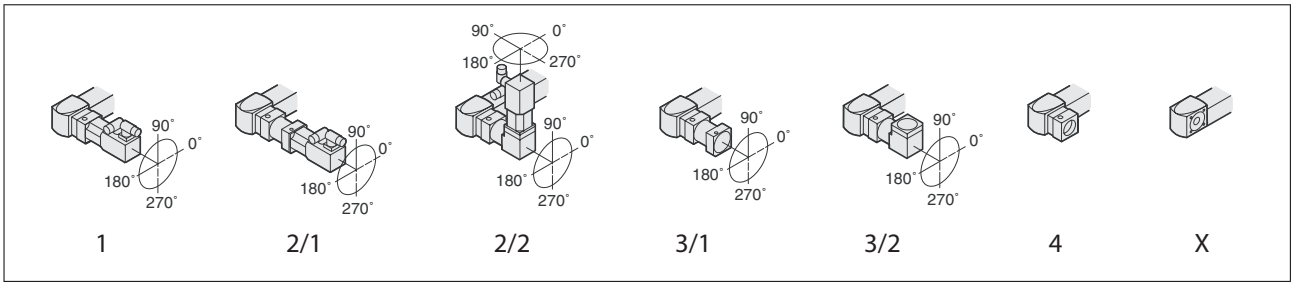

Figure 5: Mounting direction motor and gearbox

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: PAS42BR$1200C1NB100R/23G0V90

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

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: 1000000142_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

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

combination of axis model and motor model complies with all essential requirements of the Machinery Directive2006/42/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:
DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL 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	**EN ISO 12100:2010** 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

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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

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".

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2.2 Information on increased corrosion resistance

The linear axes are not suitable for contact with wash down water and chemical cleaning agents.

The linear axes are not approved for direct use in food applications.

Coated materials lose the corrosion resistance if the coating is damaged or worn.

Component		Standard version	Increased corrosion resistance
Axis body		Aluminum, anodized	
Carriage		Aluminum, anodized	
End blocks		Aluminum, die-cast, not anodized	
Roller guide	Guide rods	Steel 100 CR 6	Stainless steel X 46 Cr 13
	Roller	Steel 100 CR 6	Stainless steel 1.4112
Recirculating ball bearing guide	Guide rail	Steel	Armoloy-coated
	Guide carriage	Steel	
Toothed belt pulley	Toothed belt pulley	Aluminum, anodized	
	Flanged wheel	Steel, galvanized	
	Ball bearings	Steel 100 CR 6	Stainless steel 1.4112
Ball bearing seal		NBR	
Contact plate sensor		Stainless steel	
Sensor		Brass, nickel-plated	
Sensor holder		POM	
Sensor cable		PUR	
Rubber buffer		P-Chlorop-K-sw-75ShA	
Expanding hub		Aluminum, not anodized; cone stainless steel 1.4112	
Clamping hub		Aluminum, not anodized	
Elastomer spider		PUR 98 Sh A-GS	
Shaft extension		Aluminum, not anodized; cone stainless steel 1.4112	

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Component		Standard version	Increased corrosion resistance
Toothed belt tensioner		Stainless steel X6 Cr Ni 18-9	
Toothed belt	Belt	PUR 92 Sh A	
	Fibres	PA	
	Tension members	Steel, galvanized	
Toothed belt, antistatic	Belt	PUR 92 Sh A, conductive	
	Fibres	PA	
	Tension members	Steel, galvanized	
Grease nipples		Stainless steel	
Option: cover strip		Steel, not stainless, Teflon-coated	
Strip deflection	Housing	Aluminum, anodized	
	Deflection unit	PA6.6	
	Brush	PA6.6	
Cover strip clamp	Housing	PPS	
	Clamping plate	Stainless steel: X5 Cr Ni1 8-10	
Cover end block		POM	
Screws		Steel, galvanized	
Circlips		Steel, galvanized	
Slot nuts		Steel, galvanized	
Locating dowel		Stainless steel: X8CrNiS 18-9	
Clamping claws		Aluminum, anodized	
Gearbox and motor adaptation		Aluminum, not anodized	

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2.3 PAS41

2.3.1 Technical dataPAS41

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

Technical data portal axis		**PAS41BR**	
Drive element		Toothed belt 15HTD-3M	
Guide type		Roller guide (W06)	
Payload	kg (lb)	8 (17.64)	
Carriage type		Type 2	Type 4
Carriage length	mm (in)	297 (11.69) [1] / 200 (7.87) [2]	377 (14.84) [1] / 280 (11.02) [2]
Feed per revolution	mm/rev. (in/rev.)	84 (3.31)	
Effective diameter toothed belt pulley	mm (in)	26.738 (1.0527)	
Maximum feed force Fx_{max} [3]	N (lbf)	300 (67.44)	
Maximum velocity [4]	m/s (ft/s)	8 (26.25)	
Maximum acceleration [4]	m/s^2 (ft/s^2)	20 (65.62)	
Maximum driving torque M_{max} [3]	Nm (lb·in)	4 (35.40)	
Breakaway torque 0 stroke axis	Nm (lb·in)	0.3 (2.66)	
Breakaway torque per additional carriage [5]	Nm (lb·in)	0.1 (0.89)	
Moment of inertia 0 stroke axis	$kgcm^2$) ($oz·in·s^2$)	1.2 / 1.0 (0.17 / 0.14)	1.4 / 1.2 (0.20 / 0.17)
Moment of inertia per additional carriage [5]	$kgcm^2$) ($oz·in·s^2$)	1.0 / 0.8 (0.14 / 0.11)	1.2 / 1.0 (0.17 / 0.14)
Moment of inertia per 1 m of stroke	$kgcm^2$) ($oz·in·s^2$)	0.1 (0.01)	
Moment of inertia per 1 kg of payload	$kgcm^2$) ($oz·in·s^2$)	1.8 (0.25)	
Maximum force Fy_{dynmax} [3]	N (lbf)	660 (148.37)	
Maximum force Fz_{dynmax} [3]	N (lbf)	430 (96.67)	
Maximum torque My_{dynmax} [3]	Nm (lb·in)	11 (97.36)	28 (247.82)
Maximum torque Mz_{dynmax} [3]	Nm (lb·in)	17 (150.46)	43 (380.58)
Max. torque Mx_{dynmax} [3]	Nm (lb·in)	5 (44.25)	

1) With cover strip
2) Without cover strip
3) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves)
4) Load- and stroke-dependent
5) All carriages driven

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Technical data portal axis		PAS41BR	
Mass 0 stroke axis	kg (lb)	2.0 / 1.6 (4.41 / 3.53)	2.3 / 1.9 (5.07 / 4.19)
Mass per additional carriage (with axis body)	kg (lb)	1.3 / 0.9 (2.87 / 1.98)	1.6 / 1.2 (3.53 / 2.65)
Mass per 1 m of stroke	kg (lb)	2.25 (4.96)	
Moving mass carriage	kg (lb)	0.6 / 0.5 (1.32 / 1.10)	0.7 / 0.6 (1.54 / 1.32)
Maximum stroke [1)]	mm (in)	2880 / 3000 (113.39) / (118.11)	2800 / 2920 (110.24) / (114.96)
Minimum stroke [2)]	mm (in)	125 (4.92)	
Repeatability [3)]	mm (in)	± 0.05 (0.002)	
Diameter motor shaft	mm (in)	6.35 ... 14 (0.25 ... 0.55)	
Cross section axis body (W x H)	mm (in)	40 x 40 (1.57 x 1.57)	
Axial area moment of inertia Ix Iy	mm^4	 76640 108930	
Modulus of elasticity (aluminum) E	N/mm^2	72000	
Load rating linear guide C_{stat}	N (lbf)	2230 (501.32)	
Load rating linear guide C_{dyn}	N (lbf)	3950 (888.00)	
Service life [4)]	km (mi)	30000 (18641)	

1) Inquire for greater stroke
2) Minimum stroke required for lubrication of the linear guide
3) Load- and stroke-dependent
4) The service life depends on the forces and torques, see chapter "2.7 Service life".

Technical data support axis		PAS41HR	
Breakaway force 0 stroke axis	N (lbf)	5 (1.12)	
Breakaway force per additional carriage	N (lbf)	5 (1.12)	
Mass 0 stroke axis	kg (lb)	1.5 / 1.1 (3.31 / 2.43)	1.8 / 1.4 (3.97 / 3.09)
For further data (if applicable) see:		PAS41BR	

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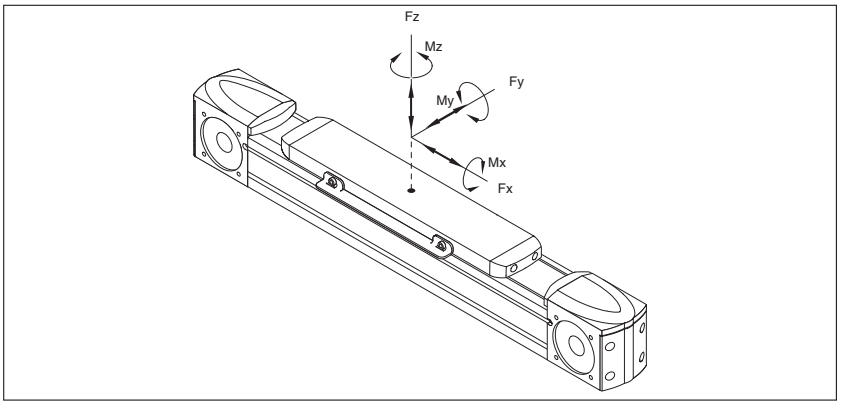

Figure 6: Forces and torques

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2.3.2 Characteristic curves PAS41BR

Maximum feed force F_x

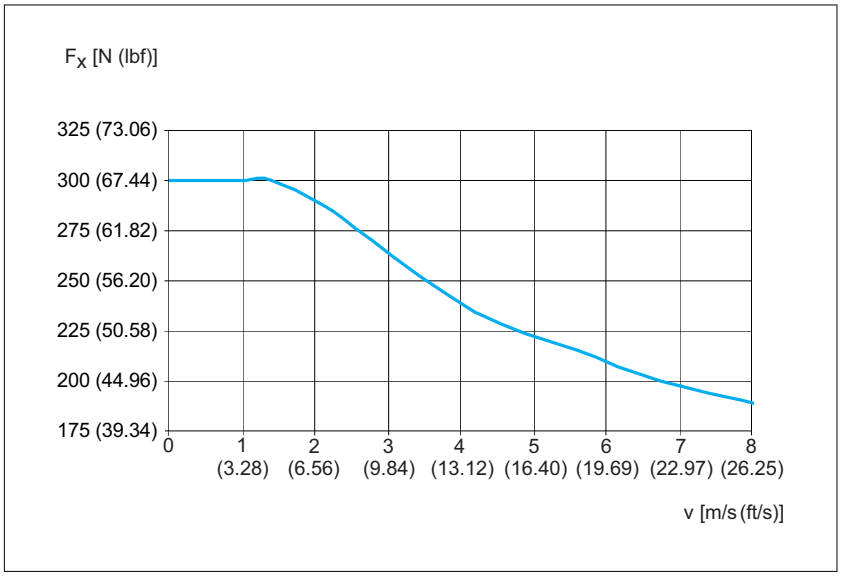

Figure 7: PAS41BR Maximum feed force F_x

Maximum force F_{ydyn}

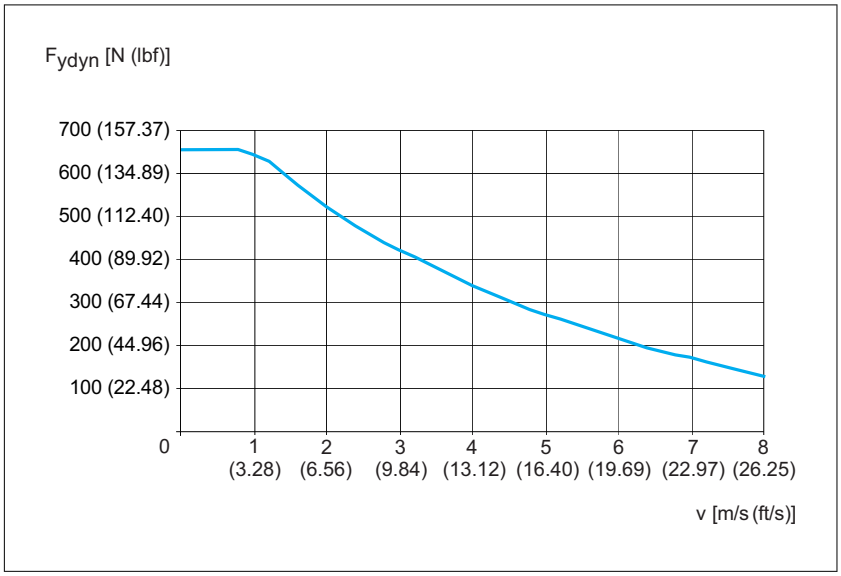

Figure 8: PAS41BR Maximum force F_{ydyn}

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Maximum force F_{zdyn}

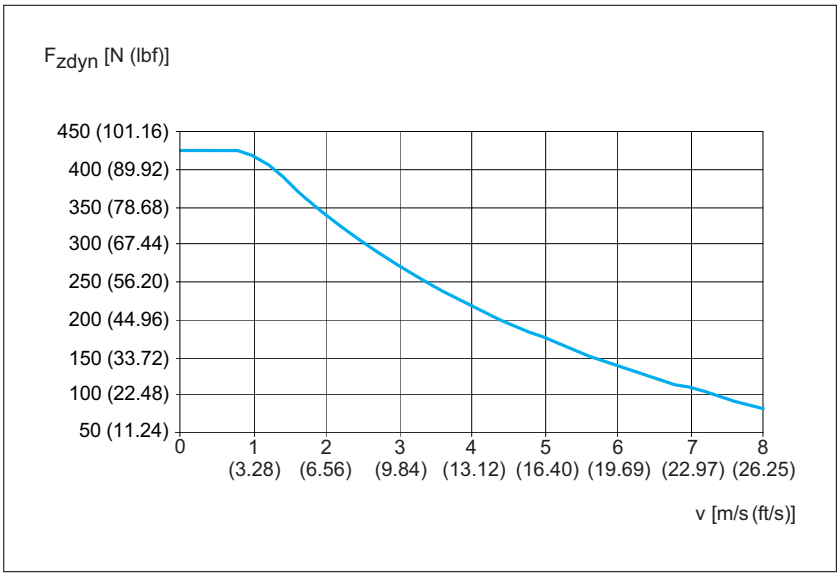

Figure 9: PAS41BR Maximum force F_{zdyn}

Maximum driving torque M_{max}

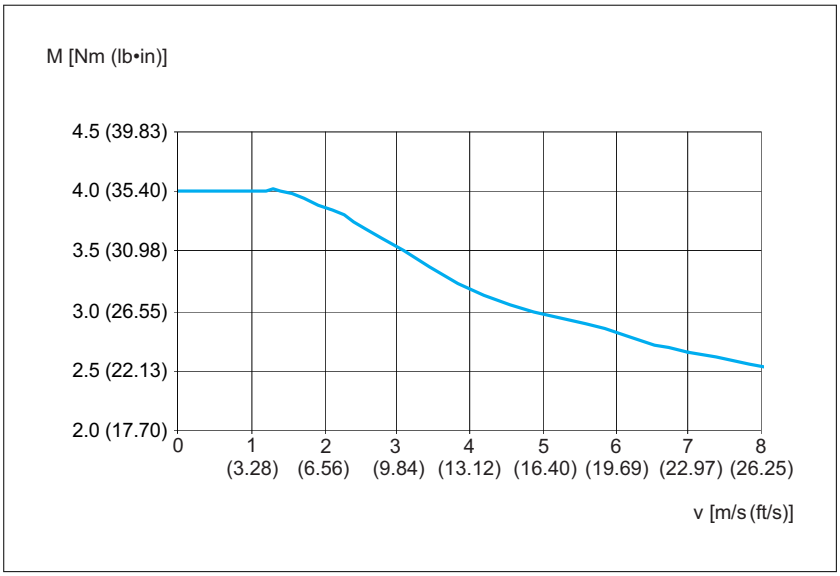

Figure 10: PAS41BRMaximum driving torque M_{max}

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Maximum torque carriage M_{xdyn}

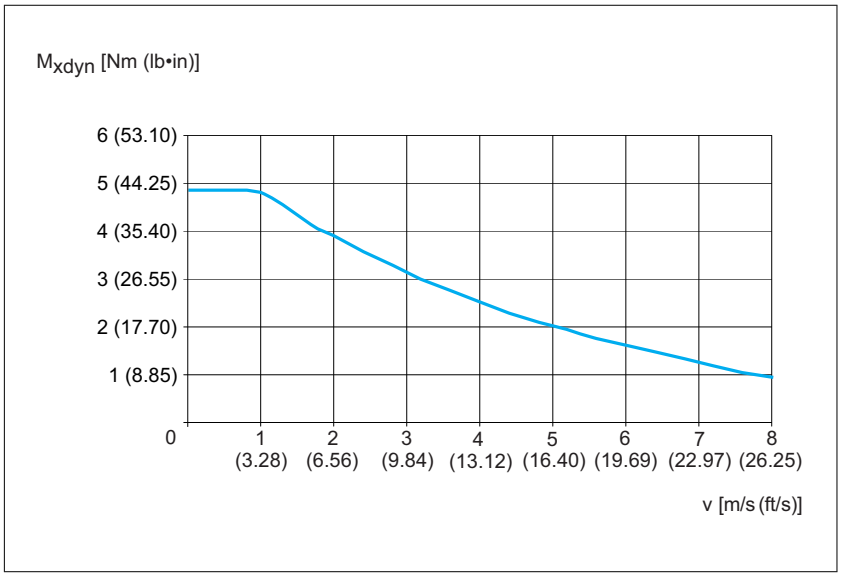

Figure 11: PAS41BR Maximum torque carriage M_{xdyn}

Maximum torque carriage M_{ydyn}

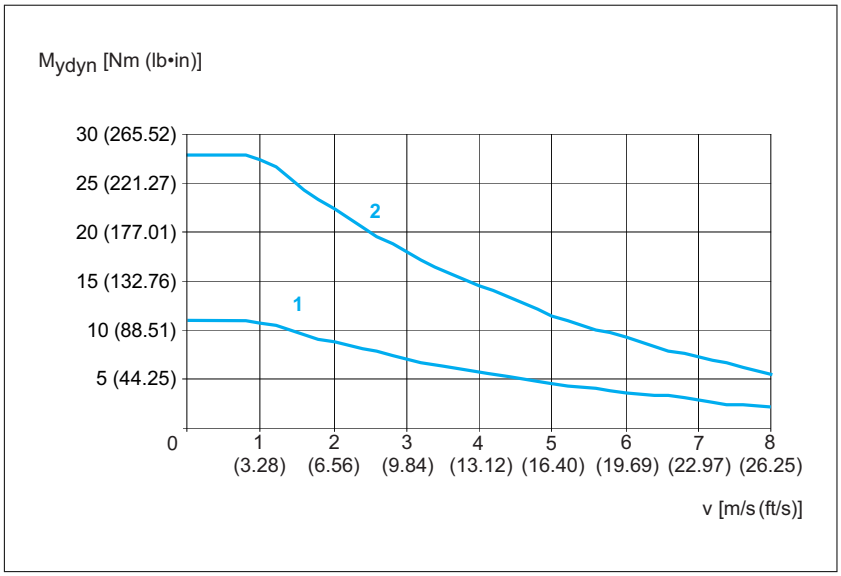

Figure 12: PAS41BR Maximum torque carriage M_{ydyn}

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

Maximum torque carriage M_{zdyn}

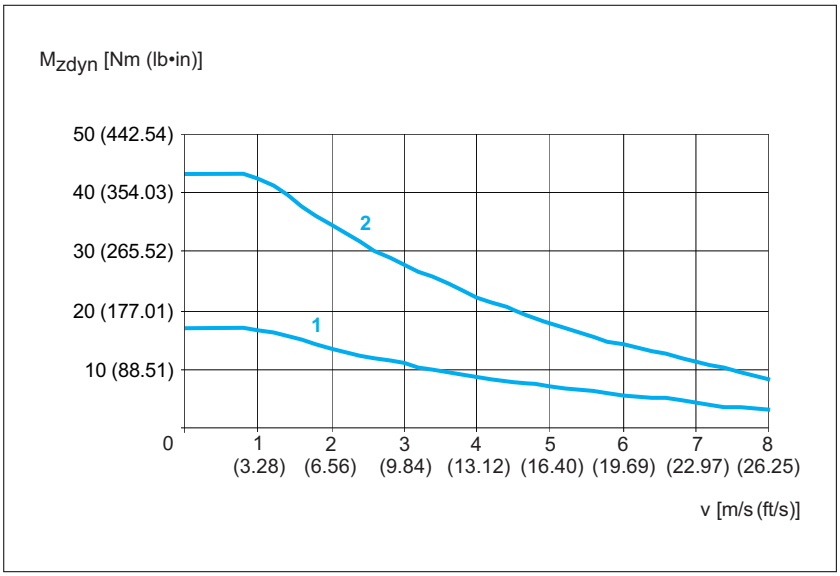

Figure 13: PAS41BR Maximum torque carriage M_{zdyn}

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

Service life load curve

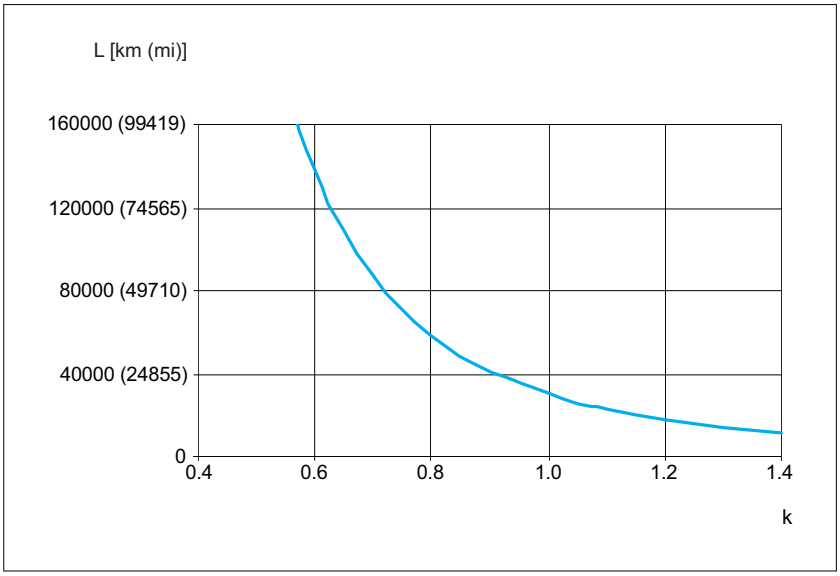

Figure 14: PAS41BR Service life load curve

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.

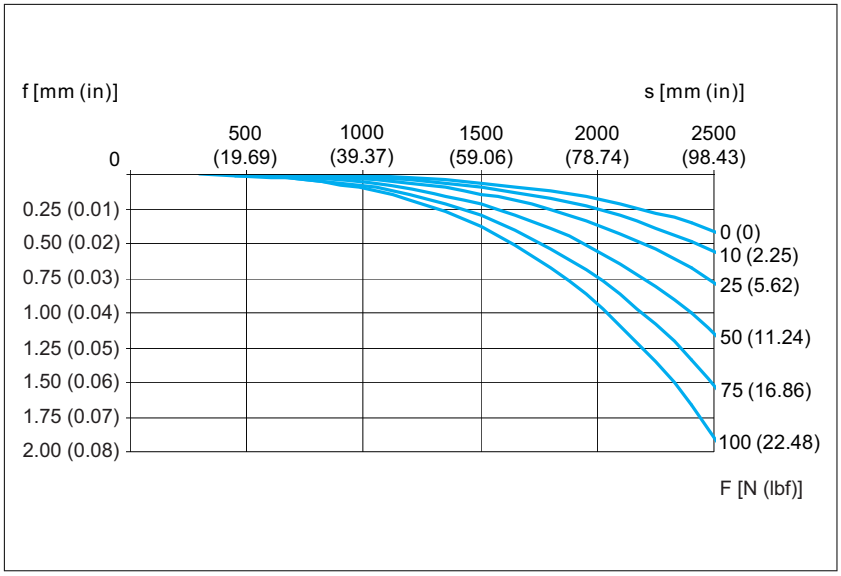

Figure 15: PAS41BR Maximum deflection

2.3.3 Dimensional drawingsPAS41BR

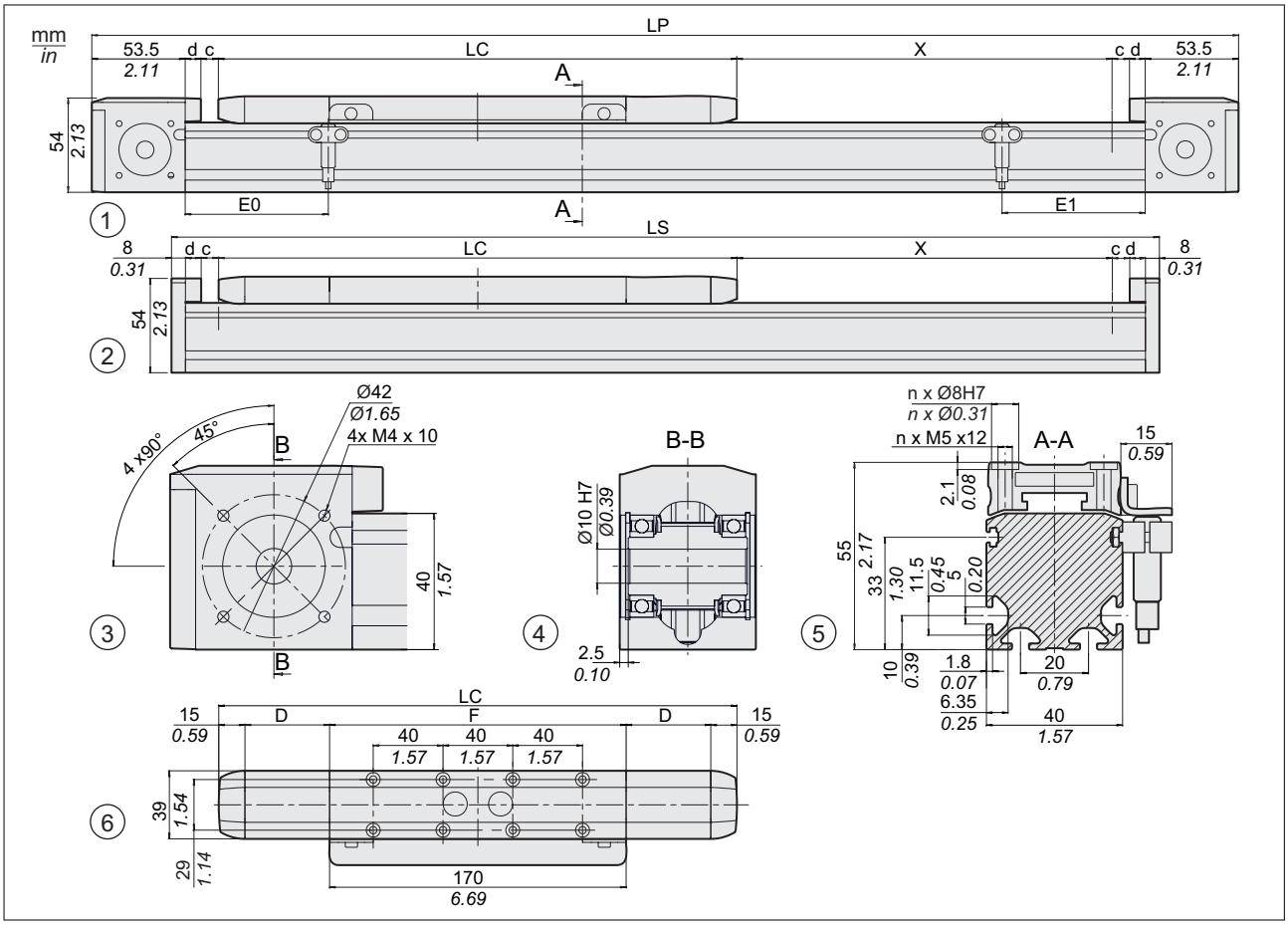

Figure 16: Dimensional drawings PAS41BR

(1) Portal axis
(2) Support axis
(3) End block
(4) Section of end block
(5) Section of axis
(6) Carriage type 2 (type 4 has more tapped holes for mounting)

Carriage type			**Type 2**		**Type 4**	
Cover strip			No	Yes	No	Yes
Total length of portal axis [1)]	LP	mm (in)	327 + X (12.87 + X)	442 + X (17.40 + X)	407 + X (16.02 + X)	522 + X (20.55 + X)
Total length of support axis	LS	mm (in)	236 + X (9.29 + X)	351 + X (13.82 + X)	316 + X (12.44 + X)	431 + X (16.97 + X)
Stroke	X	mm	See technical data		See technical data	
Carriage length	LC	mm (in)	200 (7.87)	297 (11.69)	280 (11.02)	377 (14.84)
Profile length of carriage	F	mm (in)	170 (6.69)		250 (9.84)	
Number of tapped holes for mounting [2)]	n		8		12	
Distance between tapped holes		mm (in)	40 ±0.03 (1.57 ± 0.0012)		40 ±0.03 (1.57 ± 0.0012)	
Limit switch position at drive end	E0	mm (in)	25 (0.98)	82 (3.23)	25 (0.98)	82 (3.23)
Limit switch position opposite drive end	E1	mm (in)	25 (0.98)	82 (3.23)	105 (4.13)	162 (6.38)
Stroke reserve up to mechanical stop	c	mm (in)	10 (0.39)		10 (0.39)	
Length of cover strip clamp	d	mm (in)	-	9 (0.35)	-	9 (0.35)
Deflection of cover strip	D	mm (in)	-	48.5 (1.91)	-	48.5 (1.91)
Minimum distance between 2 carriages		mm (in)	35 (1.38)	90 (3.54)	35 (1.38)	90 (3.54)

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)

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2.4 PAS42

2.4.1 Technical dataPAS42B

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

Technical data portal axis		PAS42BR			PAS42BB		
Drive element		Toothed belt 25HTD-5M			Toothed belt 25HTD-5M		
Guide type		Roller guide (W06)			Recirculating ball bearing guide (size 15)		
Payload	kg (lb)	12 (26.46)			25 (55.12)		
Carriage type		Type 1	Type 2	Type 4	Type 1	Type 2	Type 4
Carriage length	mm (in)	303 / 206 (11.93 / 8.11)	363 / 266 (14.29 / 10.47)	483 / 386 (19.02 / 15.20)	303 / 206 (11.93 / 8.11)	363 / 266 (14.29 / 10.47)	483 / 386 (19.02 / 15.20)
Feed per revolution	mm (in)	155 (6.10)			155 (6.10)		
Effective diameter toothed belt pulley	mm (in)	49.338 (1.9424)			49.338 (1.9424)		
Maximum feed force Fx_{max} 1)	N	800 (179.85)			800 (179.85)		
Maximum velocity 2)	m/s (ft/s)	8 (26.25)			5 (16.40)		
Maximum acceleration 2)	m/s^2 (ft/s^2)	20 (65.62)			20 (65.62)		
Maximum driving torque M_{max} 1)	Nm (lb·in)	20 (177.01)			20 (177.01)		
Breakaway torque 0 stroke axis	Nm (lb·in)	1.2 (10.62)			1.8 (15.93)		
Breakaway torque per additional carriage 3)	Nm (lb·in)	0.2 (1.77)			0.8 (7.08)		
Moment of inertia 0 stroke axis	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	8.8 / 7.7 (1.25 / 1.09)	10.1 / 9.0 (1.43 / 1.27)	12.9 / 11.8 (1.83 / 1.67)	9.6 / 8.5 (1.36 / 1.20)	10.6 / 9.5 (1.50 / 1.35)	12.9 / 11.8 (1.83 / 1.67)
Moment of inertia per additional carriage 3)	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	6.5 / 5.4 (0.92 / 0.76)	7.9 / 6.8 (1.12 / 0.96)	10.7 / 9.6 (1.52 / 1.36)	7.3 / 6.2 (1.03 / 0.88)	8.4 / 7.3 (1.19 / 1.03)	10.7 / 9.6 (1.52 / 1.36)
Moment of inertia per 1 m of stroke	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	1.2 (0.17)			1.2 (0.17)		
Moment of inertia per 1 kg of payload	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	6.1 (0.86)			6.1 (0.86)		
Maximum force Fy_{dynmax} 1)	Nm (lb·in)	660 (5841.49)			2810 (24870.60)		
Maximum force Fz_{dynmax} 1)	Nm (lb·in)	430 (3805.82)			2810 (24870.60)		

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves)
2) Load- and stroke-dependent
3) All carriages driven

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Technical data portal axis		PAS42BR			PAS42BB		
Maximum torque My_{dynmax})	Nm (lb·in)	18 (159.31)	31 (274.37)	56 (495.64)	74 (654.96)	194 (1717.04)	362 (3203.97)
Maximum torque Mz_{dynmax})	Nm (lb·in)	28 (247.82)	48 (424.84)	87 (770.01)	74 (654.96)	194 (1717.04)	362 (3203.97)
Max. torque Mx_{dynmax})	Nm (lb·in)	9 (79.66)			19 (168.16)		
Mass 0 stroke axis	kg (lb)	4.7 / 3.9 (10.36 / 8.60)	5.2 / 4.4 (11.46 / 9.70)	6.2 / 5.4 (13.67 / 11.90)	5.2 / 4.3 (11.46 / 9.48)	5.7 / 4.8 (12.57 / 10.58)	6.7 / 5.8 (14.77 / 12.79)
Mass per additional carriage (with axis body)	kg (lb)	2.5 / 1.9 (5.51 / 4.19)	3.0 / 2.4 (6.61 / 5.29)	3.9 / 3.3 (8.60 / 7.28)	2.9 / 2.2 (6.39 / 4.85)	3.4 / 2.7 (7.50 / 5.95)	4.4 / 3.7 (9.70 / 8.16)
Mass per 1 m of stroke	kg (lb)	4.6 (10.14)			5.6 (12.35)		
Moving mass carriage	kg (lb)	1.1 / 0.9 (2.43 / 1.98)	1.3 / 1.2 (2.87 / 2.65)	1.8 / 1.6 (3.97 / 3.53)	1.2 / 1.0 (2.65 / 2.20)	1.4 / 1.2 (3.09 / 2.65)	1.8 / 1.6 (3.97 / 3.53)
Maximum stroke 1)	mm (in)	5540 / 5660 (218.11 / 222.83)	5480 / 5600 (215.75 / 220.47)	5360 / 5480 (211.02 / 215.75)	5540 / 5660 (218.11 / 222.83)	5480 / 5600 (215.75 / 220.47)	5360 / 5480 (211.02 / 215.75)
Minimum stroke 2)	mm (in)	130 (5.12)			9 (0.35)		
Repeatability 3)	mm (in)	± 0.05 (0.002)			± 0.05 (0.002)		
Diameter motor shaft	mm (in)	6.35 ... 20 (0.25 ... 0.79)			6.35 ... 20 (0.25 ... 0.79)		
Cross section axis body (W x H)	mm (in)	60 x 60 (2.36 x 2.36)			60 x 60 (2.36 x 2.36)		
Axial area moment of inertia Ix Iy	mm^4	 435390 651610			 435390 651610		
Modulus of elasticity (aluminum) E	N/mm^2	72000			72000		
Load rating linear guide C_{stat}	N (lbf)	2230 (501.32)			24200 (5440.38)		
Load rating linear guide C_{dyn}	N (lbf)	3950 (888.00)			14200 (3192.29)		
Service life 4)	km (mi)	30000 (18641)			30000 (18641)		

1) Inquire for greater stroke with recirculating ball bearing guide
2) Minimum stroke required for lubrication of the linear guide
3) Load- and stroke-dependent
4) The service life depends on the forces and torques, see chapter "2.7 Service life".

Technical data support axis		PAS42HR			PAS42HB		
Breakaway force 0 stroke axis	N (lbf)	8 (1.80)			30 (6.74)		
Breakaway force per additional carriage	N (lbf)	8 (1.80)			30 (6.74)		
Mass 0 stroke axis	kg (lb)	3.1 / 2.4 (6.83 / 5.29)	3.6 / 2.9 (7.94 / 6.39)	4.6 / 3.9 (10.14 / 8.60)	3.6 / 2.8 (7.94 / 6.17)	4.1 / 3.3 (9.04 / 7.28)	5.1 / 4.3 (11.24 / 9.48)
For further data (if applicable) see:		PAS42BR			PAS42BB		

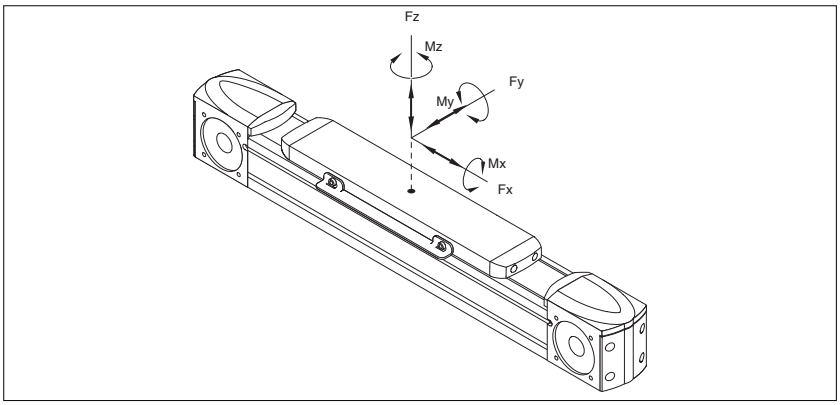

Figure 17: Forces and torques

2.4.2 Characteristic curves PAS42BR

Maximum feed force F_x

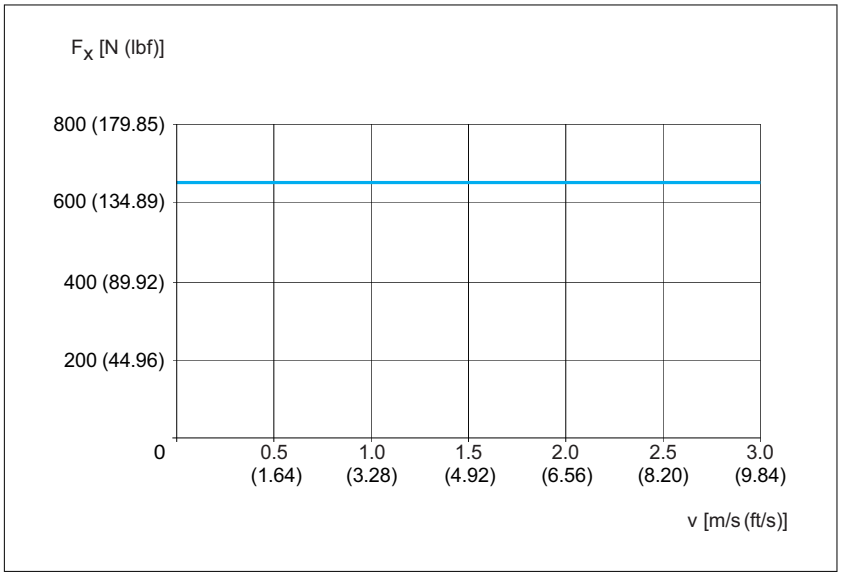

Figure 18: PAS42BR Maximum feed force F_x

Maximum force F_{ydyn}

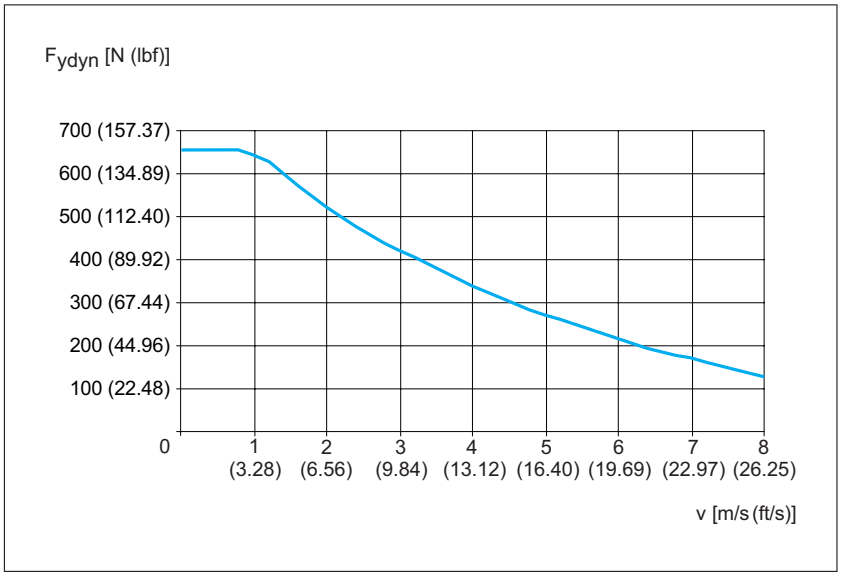

Figure 19: PAS42BR Maximum force F_{ydyn}

Maximum force F_{zdyn}

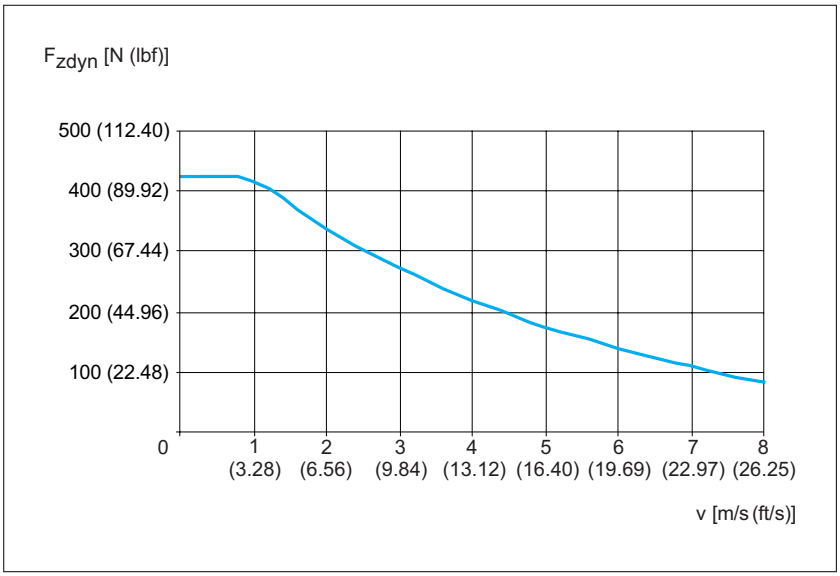

Figure 20: PAS42BR Maximum force F_{zdyn}

Maximum driving torque M_{max}

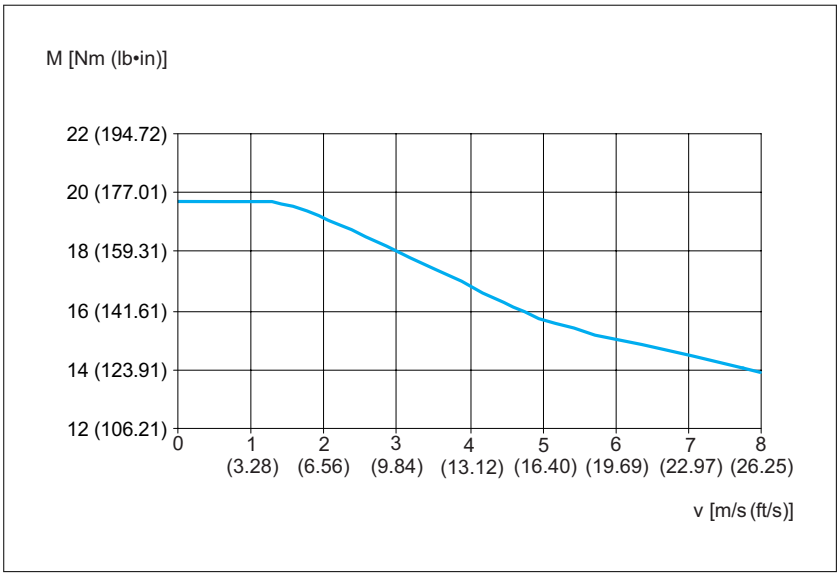

Figure 21: PAS42BRMaximum driving torque M_{max}

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Maximum torque carriage M_{xdyn}

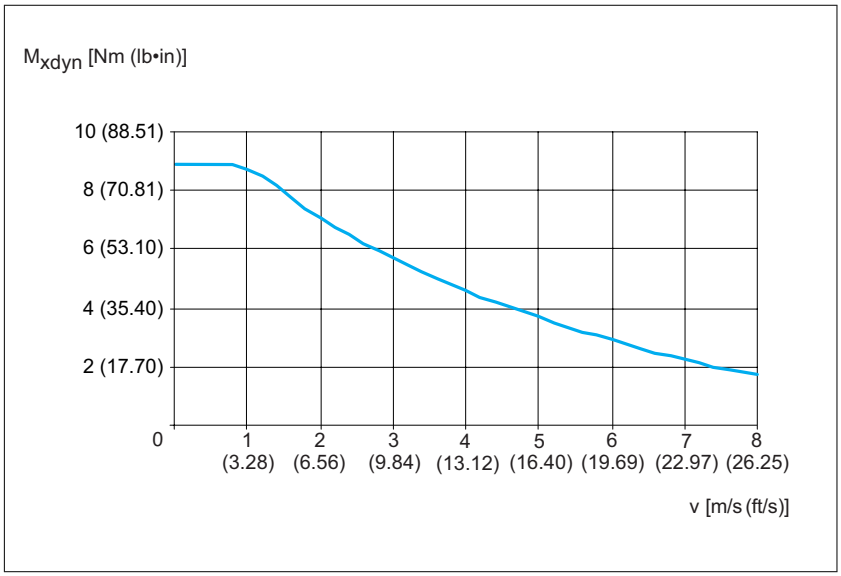

Figure 22: PAS42BR Maximum torque carriage M_{xdyn}

Maximum torque carriage M_{ydyn}

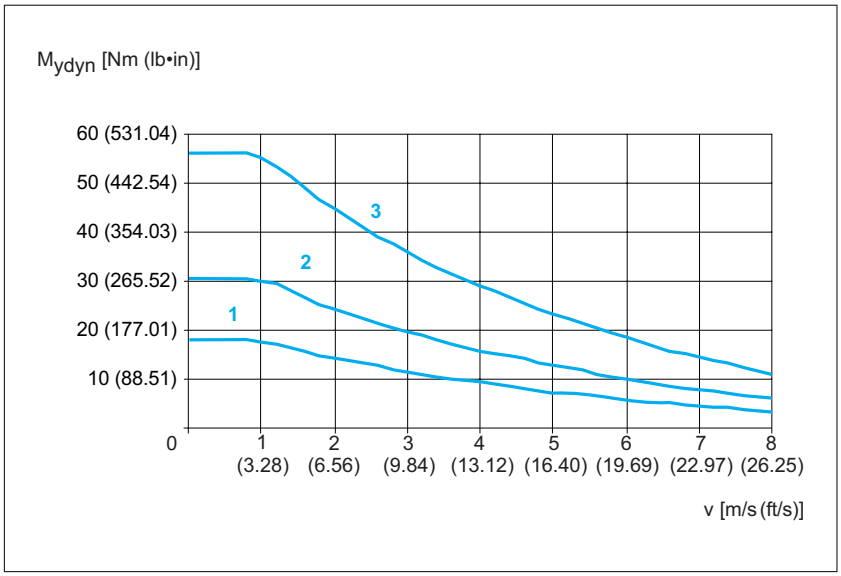

Figure 23: PAS42BR Maximum torque carriage M_{ydyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Maximum torque carriage M_{zdyn}

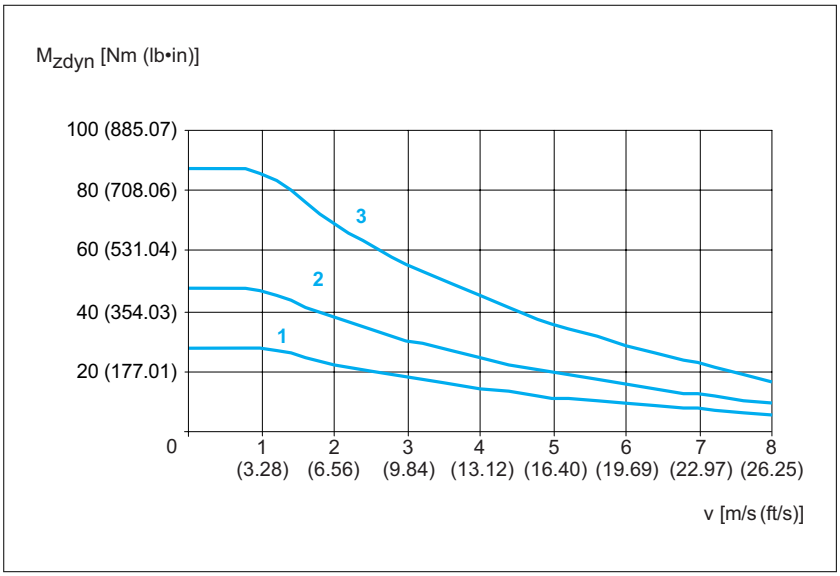

Figure 24: PAS42BR Maximum torque carriage M_{zdyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Service life load curve

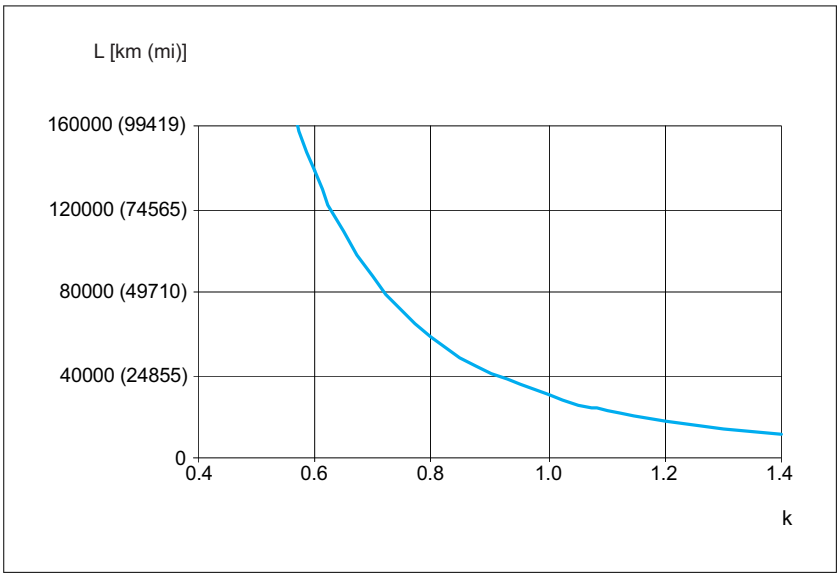

Figure 25: PAS42BR Service life load curve

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.

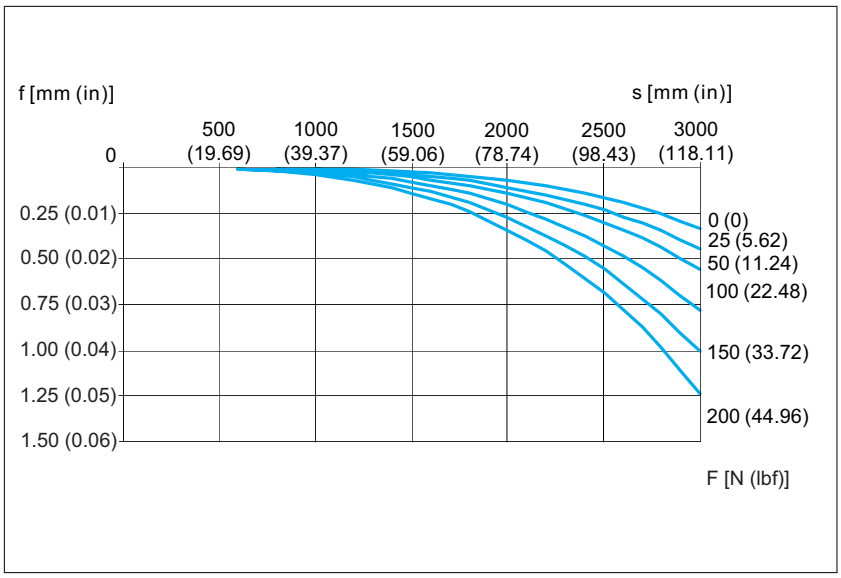

Figure 26: PAS42BR Maximum deflection

2.4.3 Characteristic curves PAS42BB

Maximum feed force F_x

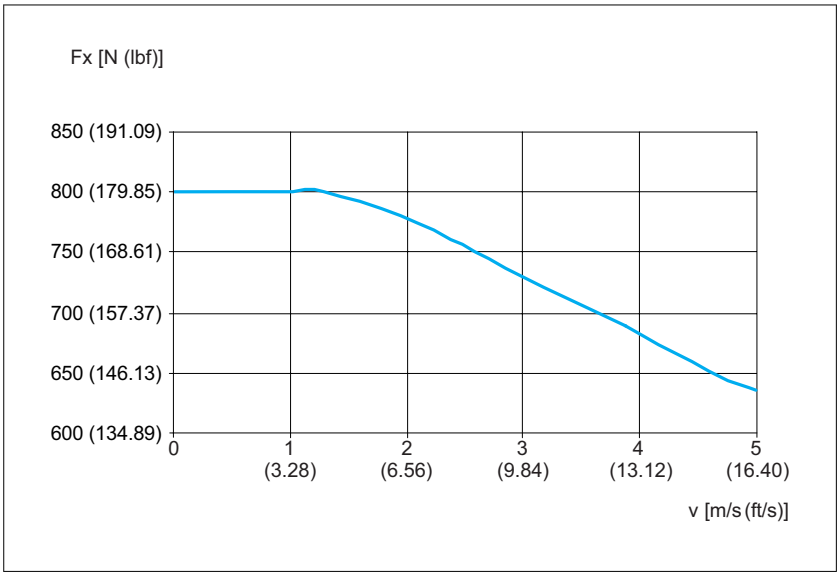

Figure 27: PAS42BB Maximum feed force F_x

Maximum force F_{ydyn}

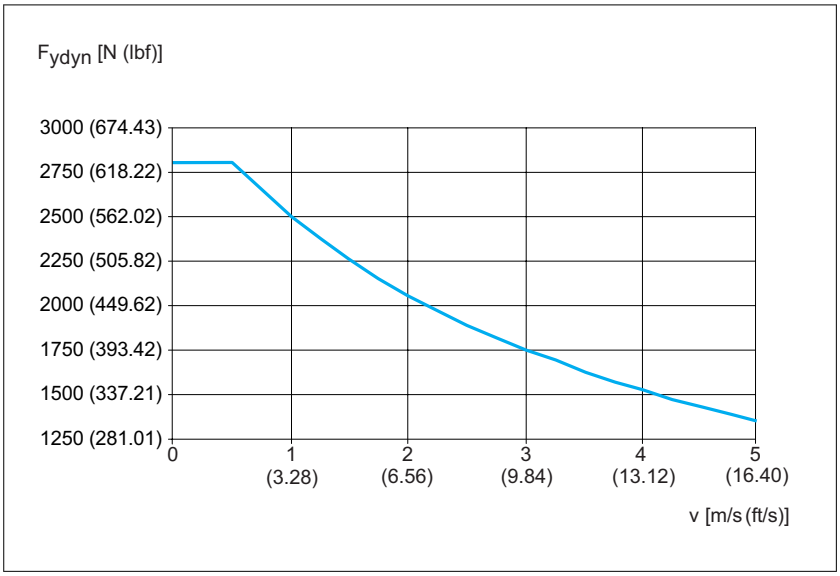

Figure 28: PAS42BB Maximum force F_{ydyn}

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Maximum force F_{zdyn}

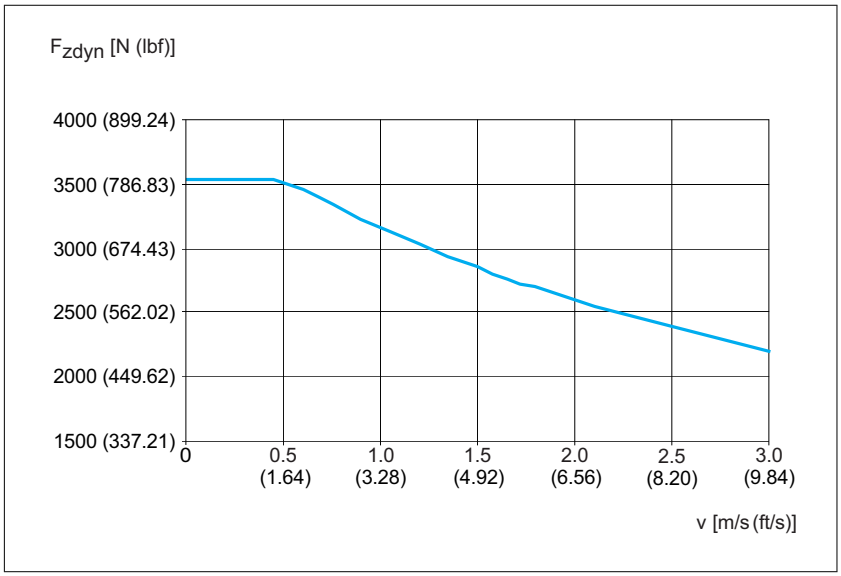

Figure 29: PAS42BB Maximum force F_{zdyn}

Maximum driving torque M_{max}

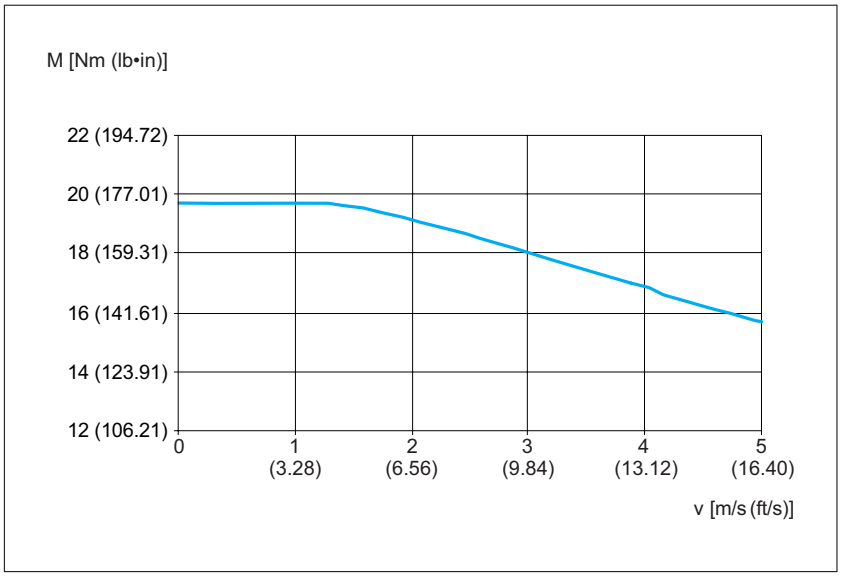

Figure 30: PAS42BBMaximum driving torque M_{max}

Maximum torque carriage M_{xdyn}

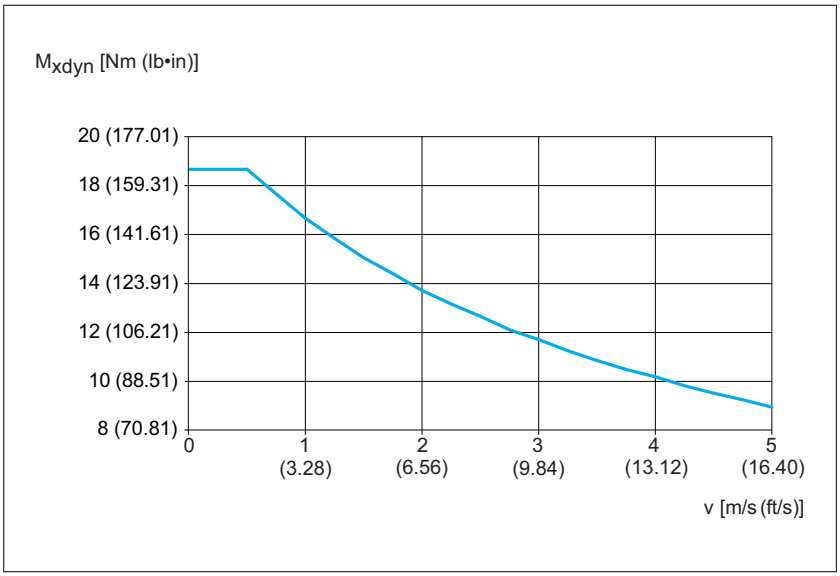

Figure 31: PAS42BB Maximum torque carriage M_{xdyn}

Maximum torque carriage M_{ydyn}

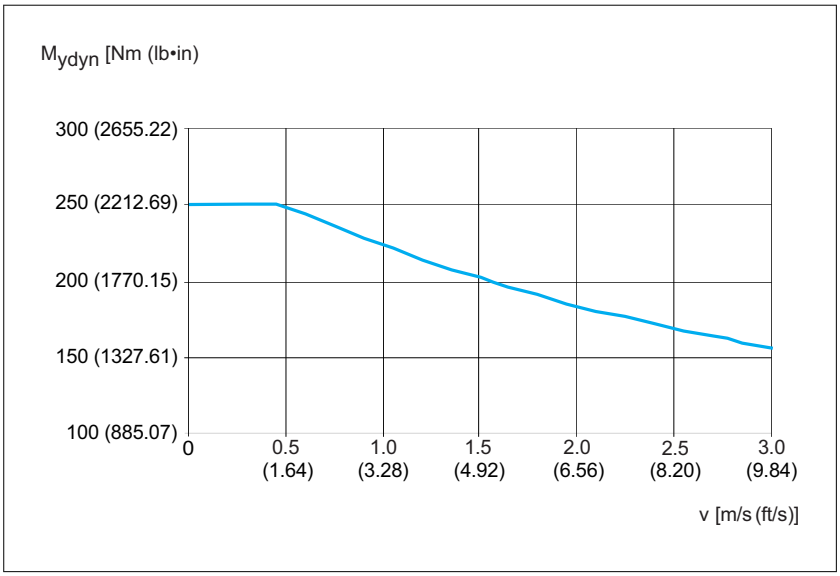

Figure 32: PAS42BB Maximum torque carriage M_{ydyn}

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Maximum torque carriage M_{zdyn}

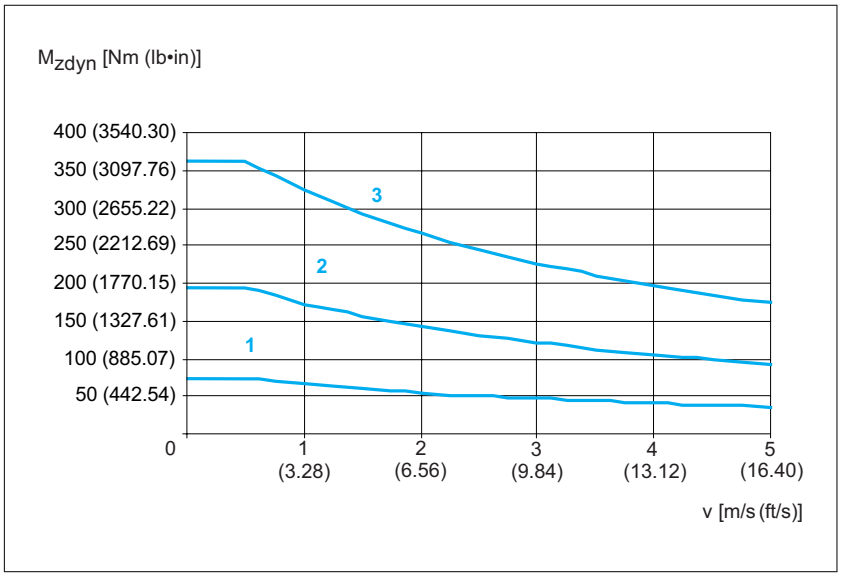

Figure 33: PAS42BB Maximum torque carriage M_{zdyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Service life load curve

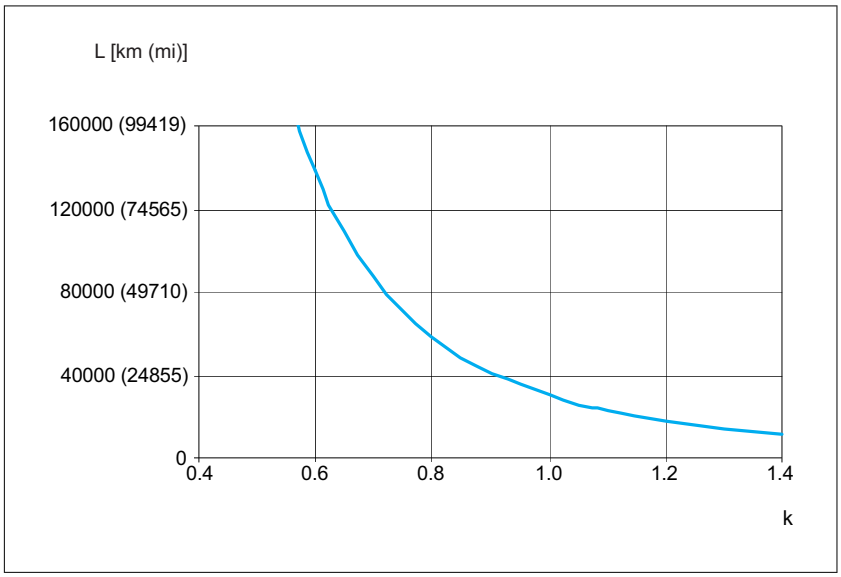

Figure 34: PAS42BB Service life load curve

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.

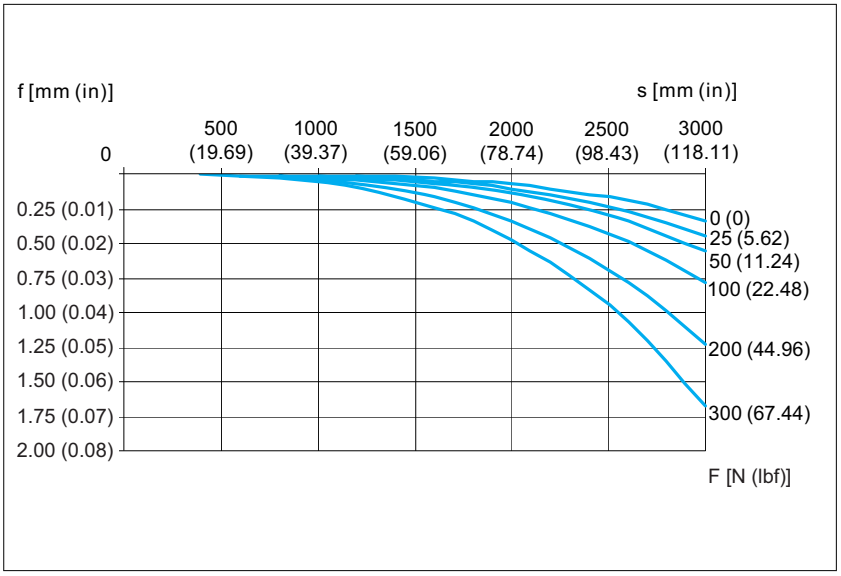

Figure 35: PAS42BB Maximum deflection

2.4.4 Dimensional drawingsPAS42B

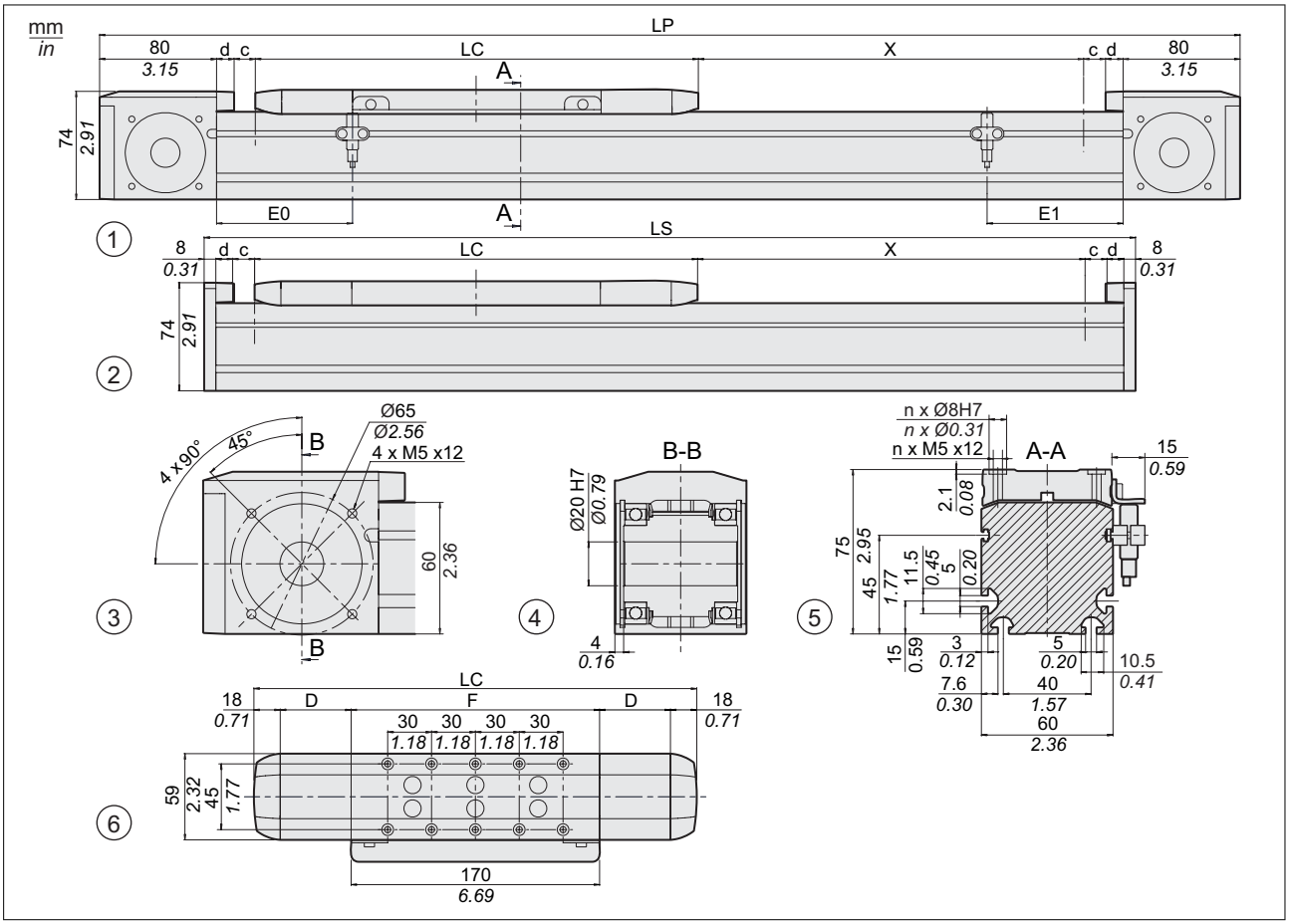

Figure 36: Dimensional drawings PAS42B

(1) Portal axis
(2) Support axis
(3) End block
(4) Section of end block
(5) Section of axis
(6) Carriage type 1 (types 2 and 4 have more tapped holes for mounting)

Carriage type			**Type 1**		**Type 2**		**Type 4**	
Cover strip			No	Yes	No	Yes	No	Yes
Total length of portal axis [1]	LP	mm (in)	396 + X (15.59 + X)	516 + X (20.31 + X)	456 + X (17.95 + X)	576 + X (22.68 + X)	576 + X (22.68 + X)	696 + X (27.40 + X)
Total length of support axis	LS	mm (in)	252 + X (9.92 + X)	372 + X (14.65 + X)	312 + X (12.28 + X)	432 + X (17.01 + X)	432 + X (17.01 + X)	552 + X (21.73 + X)
Stroke	X	mm (in)	See technical data		See technical data		See technical data	
Carriage length	LC	mm (in)	206 (8.11)	303 (11.93)	266 (10.47)	363 (14.29)	386 (15.20)	483 (19.02)
Profile length of carriage	F	mm (in)	170 (6.69)		230 (9.06)		350 (13.78)	
Number of tapped holes for mounting [2]	n		10		14		22	
Distance between tapped holes		mm (in)	30 ±0.03 (31.18 ±0.0012)		30 ±0.03 (31.18 ±0.0012)		30 ±0.03	
Limit switch position at drive end	E0	mm (in)	33 (1.30)	93 (3.66)	33 (1.30)	93 (3.66)	33 (1.30)	93 (3.66)
Limit switch position opposite drive end	E1	mm (in)	33 (1.30)	93 (3.66)	93 (3.66)	153 (6.02)	213 (8.39)	273 (10.75)
Stroke reserve up to mechanical stop	c	mm (in)	15 (0.59)		15 (0.59)		15 (0.59)	
Length of cover strip clamp	d	mm (in)	-	11.5 (0.45)	-	11.5 (0.45)	-	11.5 (0.45)
Deflection of cover strip	D	mm (in)	-	48.5 (1.91)	-	48.5 (1.91)	-	48.5 (1.91)
Minimum distance between 2 carriages		mm (in)	40 (1.57)	90 (3.54)	40 (1.57)	90 (3.54)	40 (1.57)	90 (3.54)

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)

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2.5 PAS43

2.5.1 Technical dataPAS43B

Technical data portal axis		PAS43BR			PAS43BB		
Drive element		Toothed belt 30HTD-5M			Toothed belt 30HTD-5M		
Guide type		Roller guide (W10)			Recirculating ball bearing guide (size 20)		
Payload	kg (lb)	25 (55.12)			60 (132.28)		
Carriage type		Type 1	Type 2	Type 4	Type 1	Type 2	Type 4
Carriage length	mm (in)	364 / 244 (14.33 / 9.61)	434 / 314 (17.09 / 12.36)	574 / 454 (22.60 / 17.87)	364 / 244 (14.33 / 9.61)	434 / 314 (17.09 / 12.36)	574 / 454 (22.60 / 17.87)
Feed per revolution	mm/rev.	205 (8.07)			205 (8.07)		
Effective diameter toothed belt pulley	mm (in)	65.254 (2.5691)			65.254 (2.5691)		
Maximum feed force Fx_{max} 1)	N (lbf)	1100 (247.29)			1100 (247.29)		
Maximum velocity 2)	m/s (ft/s)	8 (26.25)			5 (16.40)		
Maximum acceleration 2)	m/s^2 (ft/s^2)	20 (65.62)			20 (65.62)		
Maximum driving torque M_{max} 1)	Nm (lb·in)	36 (318.63)			36 (318.63)		
Breakaway torque 0 stroke axis	Nm (lb·in)	2.5 (22.13)			3.5 (30.98)		
Breakaway torque per additional carriage 3)	Nm (lb·in)	0.3 (2.66)			1.3 (11.51)		
Moment of inertia 0 stroke axis	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	33.7 / 29.3 (4.77 / 4.15)	38.5 / 34.1 (5.45 / 4.83)	48.1 / 43.7 (6.81 / 6.19)	35.5 / 31.1 (5.03 / 4.40)	39.5 / 35.1 (5.59 / 4.97)	47.9 / 43.5 (6.78 / 6.16)
Moment of inertia per additional carriage 3)	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	24.4 / 20.1 (3.46 / 2.85)	29.2 / 24.9 (4.14 / 3.53)	38.9 / 34.6 (5.51 / 4.90)	26.2 / 21.9 (3.71 / 3.10)	30.2 / 25.9 (4.28 / 3.67)	38.6 / 34.3 (5.47 / 4.86)
Moment of inertia per 1 m of stroke	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	2.5 (0.35)			2.5 (0.35)		
Moment of inertia per 1 kg of payload	$kgcm^2$ ($oz{\cdot}in{\cdot}s^2$)	10.7 (1.52)			10.7 (1.52)		

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves)
2) Load- and stroke-dependent
3) All carriages driven

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Technical data portal axis		PAS43BR			PAS43BB		
Maximum force Fy_{dynmax} [1]	N (lbf)	1760 (395.66)			4410 (991.41)		
Maximum force Fz_{dynmax} [1]	N (lbf)	1040 (233.80)			4410 (991.41)		
Maximum torque My_{dynmax} [1]	Nm (lb·in)	51 (451.39)	87 (770.01)	160 (1416.12)	162 (1433.82)	379 (3354.43)	687 (6080.46)
Maximum torque Mz_{dynmax} [1]	Nm (lb·in)	86 (761.16)	148 (1309.91)	271 (2398.55)	162 (1433.82)	379 (3354.43)	687 (6080.46)
Max. torque Mx_{dynmax} [1]	Nm (lb·in)	29 (256.67)			42 (371.73)		
Mass 0 stroke axis	kg (lb)	10.6 / 8.9 (23.37 / 19.62)	11.6 / 9.9 (25.57 / 21.83)	13.6 / 11.9 (29.98 / 26.24)	11.8 / 9.9 (26.01 / 21.83)	12.6 / 10.7 (27.78 / 23.59)	14.6 / 12.7 (32.19 / 28.00)
Mass per additional carriage (with axis body)	kg (lb)	5.2 / 3.8 (11.46 / 8.38)	6.2 / 4.8 (13.67 / 10.58)	8.2 / 6.8 (18.08 / 14.99)	5.9 / 4.3 (13.01 / 9.48)	7.0 / 5.4 (15.43 / 11.90)	9.1 / 7.5 (20.06 / 16.53)
Mass per 1 m of stroke	kg (lb)	8.0 (17.64)			9.5 (20.94)		
Moving mass carriage	kg (lb)	2.3 / 1.9 (5.07 / 4.19)	2.8 / 2.4 (6.17 / 5.29)	3.7 / 3.3 (8.16 / 7.28)	2.5 / 2.1 (5.51 / 4.63)	2.9/ 2.5 (6.39 / 5.51)	3.7 / 3.2 (8.16 / 7.05)
Maximum stroke [2]	mm (in)	5450 / 5600 (214.57 / 220.47)	5380 / 5530 (211.81 / 217.72)	5240 / 5390 (206.30 / 212.20)	5450 / 5600 (214.57 / 220.47)	5380 / 5530 (211.81 / 217.72)	5240 / 5390 (206.30 / 212.20)
Minimum stroke [3]	mm (in)	175 (6.89)			11 (0.43)		
Repeatability [4]	mm (in)	± 0.05 (0.0012)			± 0.05 (0.0012)		
Diameter motor shaft	mm (in)	12 ... 25 (0.47 ... 0.98)			12 ... 25 (0.47 ... 0.98)		
Cross section axis body (W x H)	mm (in)	80 x 80 (3.15 x 3.15)			80 x 80 (3.15 x 3.15)		
Axial area moment of inertia Ix Iy	mm^4	 1285260 1867210			 1285260 1867210		
Modulus of elasticity (aluminum) E	N/mm^2	72000			72000		
Load rating linear guide C_{stat}	N (lbf)	4850 (1090.32)			38400 (8632.66)		
Load rating linear guide C_{dyn}	N (lbf)	8500 (1910.88)			22300 (5013.24)		
Service life [5]	km (mi)	30000 (18641)			30000 (18641)		

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves).
2) Inquire for greater stroke with recirculating ball bearing guide
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 "2.7 Service life".

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Technical data support axis		PAS43HR			PAS43HB		
Breakaway force 0 stroke axis	N (lbf)	10 (2.25)			40 (8.99)		
Breakaway force per additional carriage	N (lbf)	10 (2.25)			40 (8.99)		
Mass 0 stroke axis	kg (lb)	6.7 / 5.0 (14.77 / 11.02)	7.7 / 6.0 (16.98 / 13.23)	9.7 / 8.0 (21.38 / 17.64)	7.5 / 5.6 (16.53 / 12.35)	8.5 / 6.6 (18.74 / 14.55)	10.6 / 8.7 (23.37 / 19.18)
For further data (if applicable) see:		PAS43BR			PAS43BB		

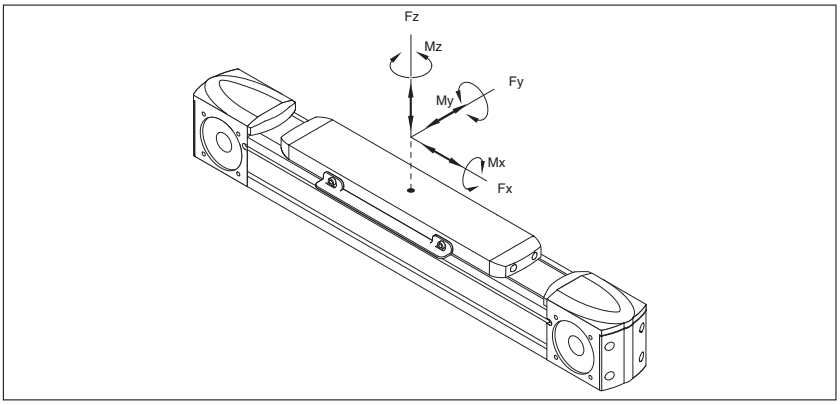

Figure 37: Forces and torques

2.5.2 Characteristic curves PAS43BR

Maximum feed force F_x

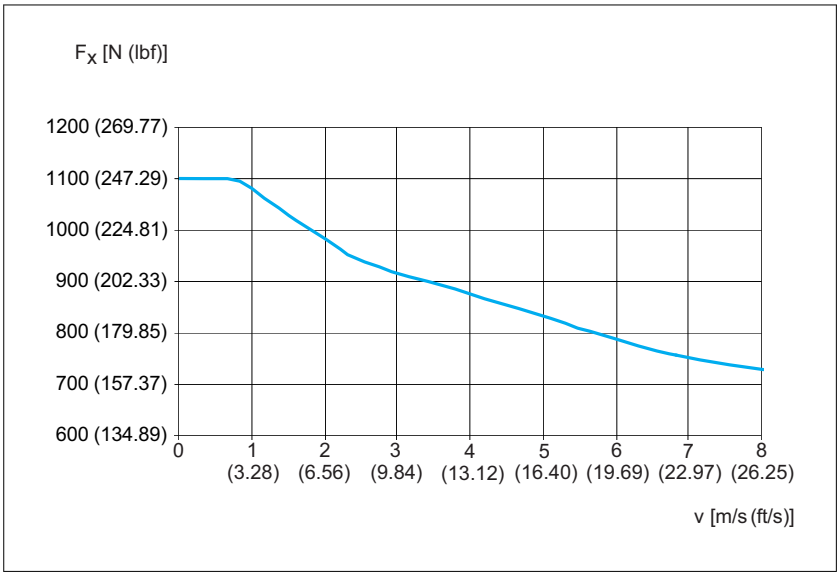

Figure 38: PAS43BR Maximum feed force F_x

Maximum force F_{ydyn}

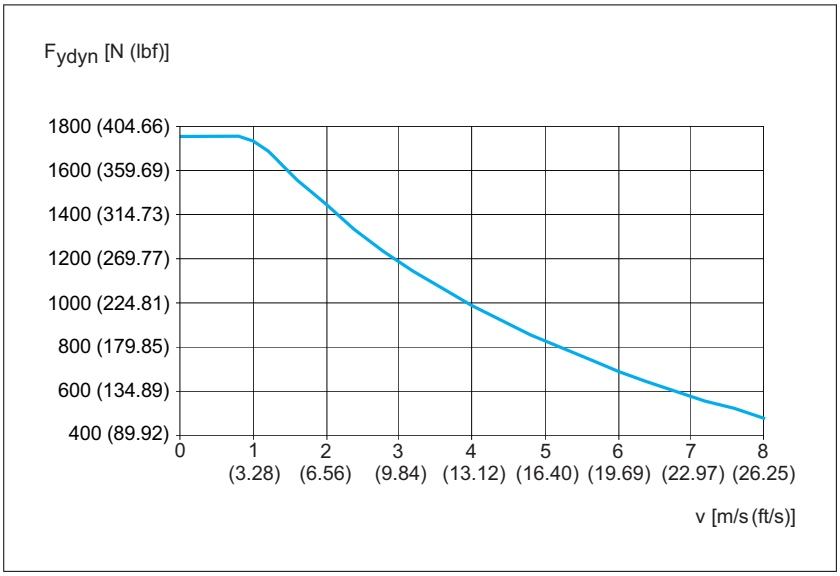

Figure 39: PAS43BR Maximum force F_{ydyn}

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Maximum force F_{zdyn}

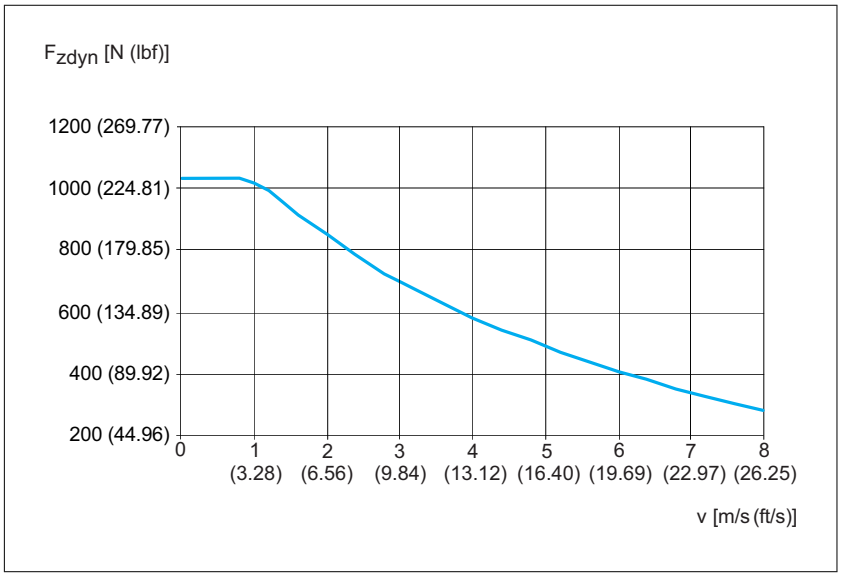

Figure 40: PAS43BR Maximum force F_{zdyn}

Maximum driving torque M_{max}

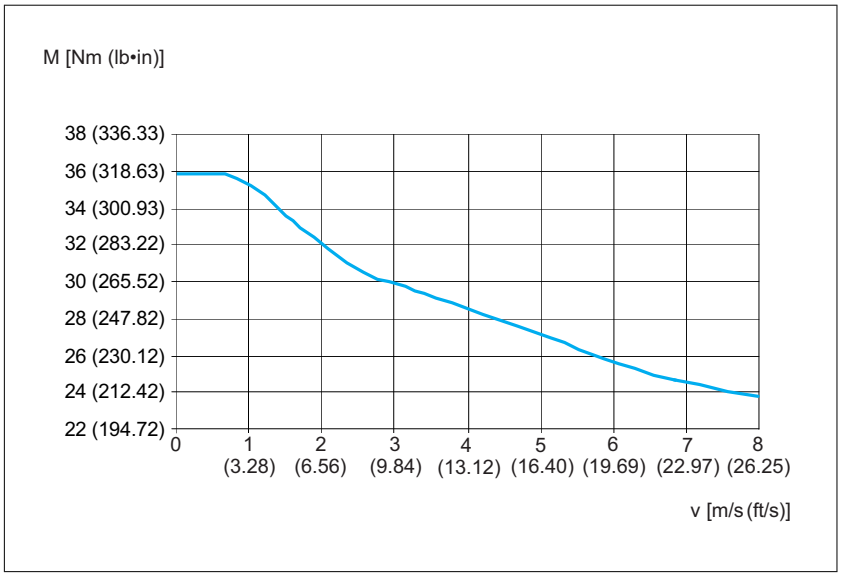

Figure 41: PAS43BRMaximum driving torque M_{max}

Maximum torque carriage M_{xdyn}

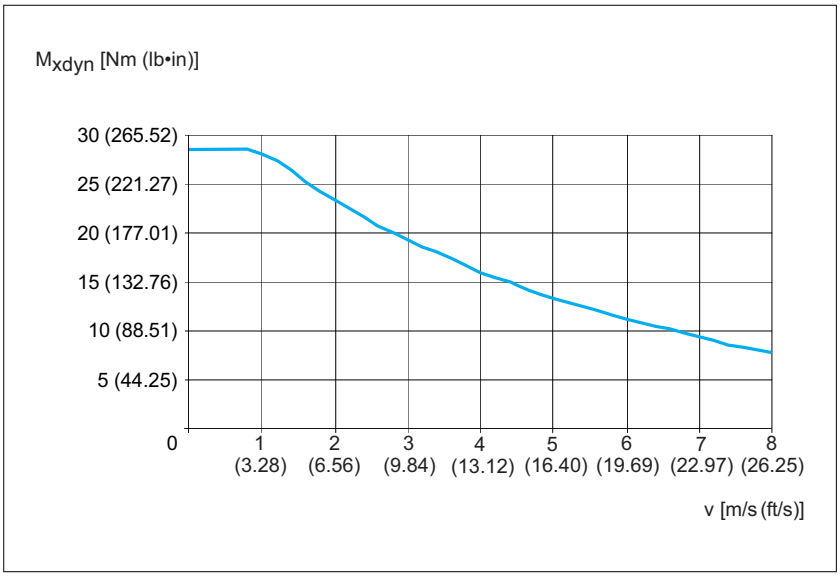

Figure 42: PAS43BR Maximum torque carriage M_{xdyn}

Maximum torque carriage M_{ydyn}

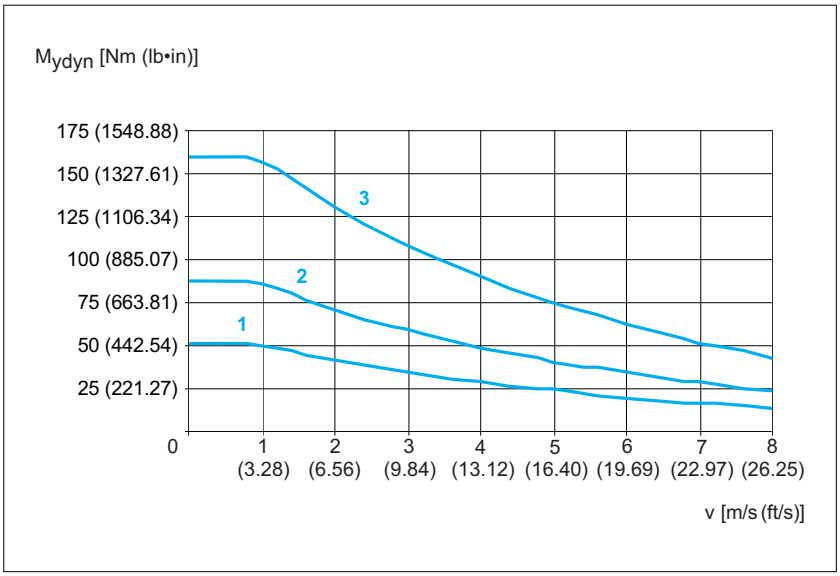

Figure 43: PAS43BR Maximum torque carriage M_{ydyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

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Maximum torque carriage M_{zdyn}

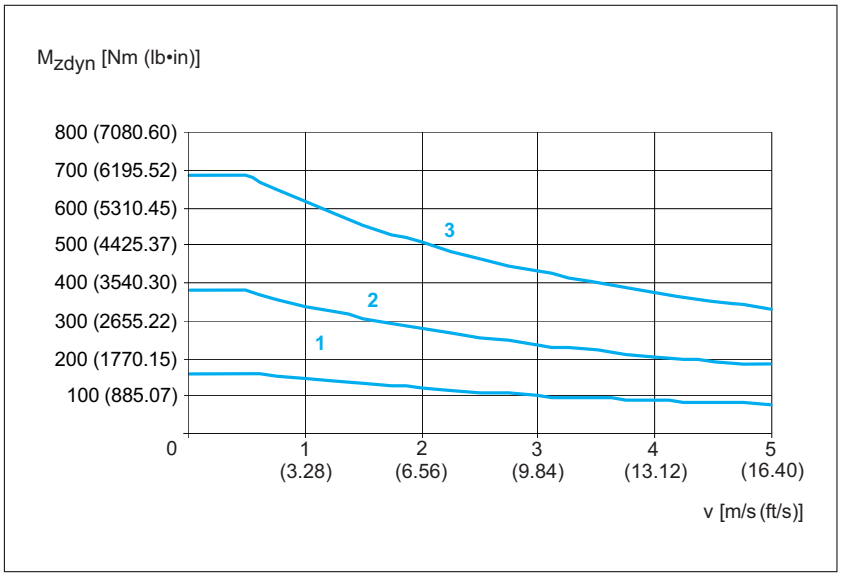

Figure 44: PAS43BR Maximum torque carriage M_{zdyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Service life load curve

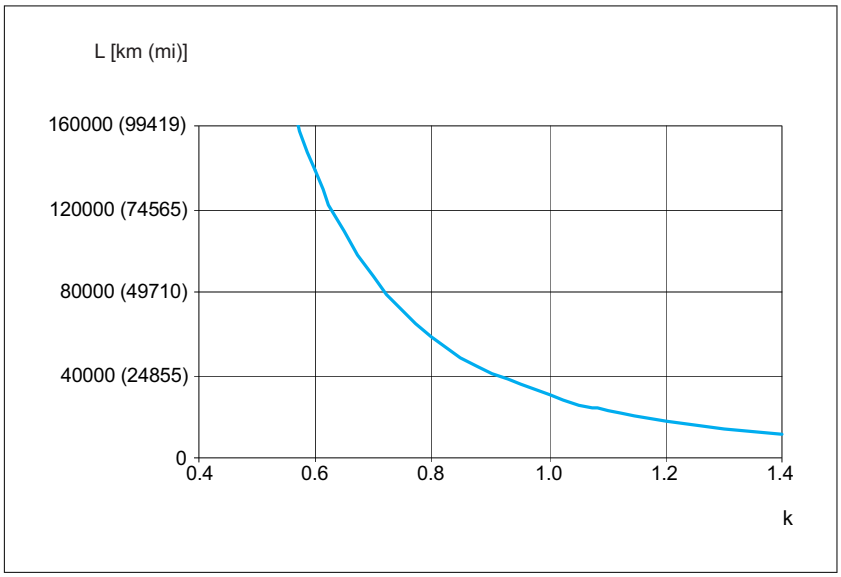

Figure 45: PAS43BR Service life load curve

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.

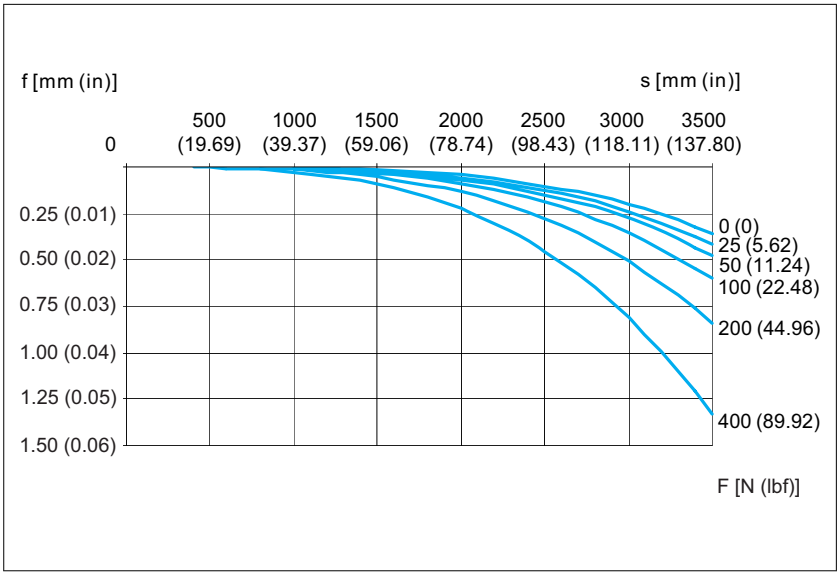

Figure 46: PAS43BR Maximum deflection

2.5.3 Characteristic curves PAS43BB

Maximum feed force F_x

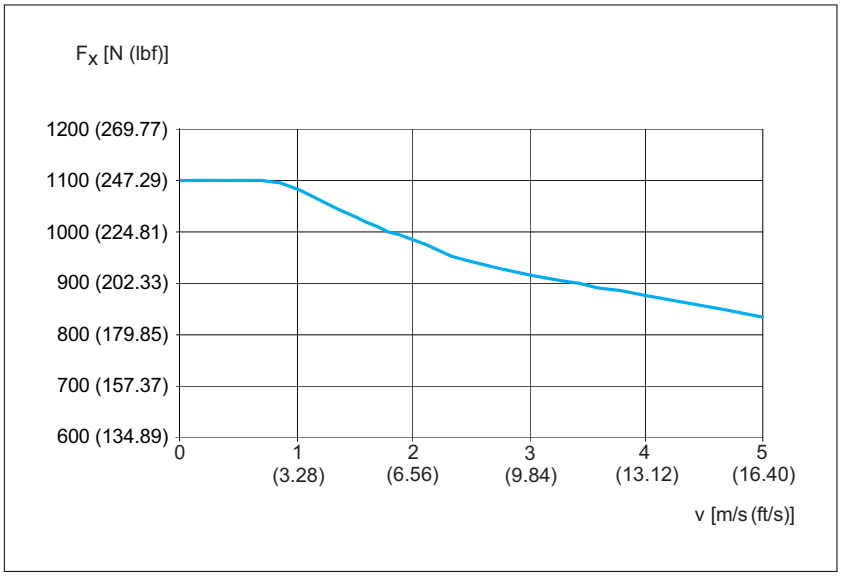

Figure 47: PAS43BB Maximum feed force F_x

Maximum force F_{ydyn}

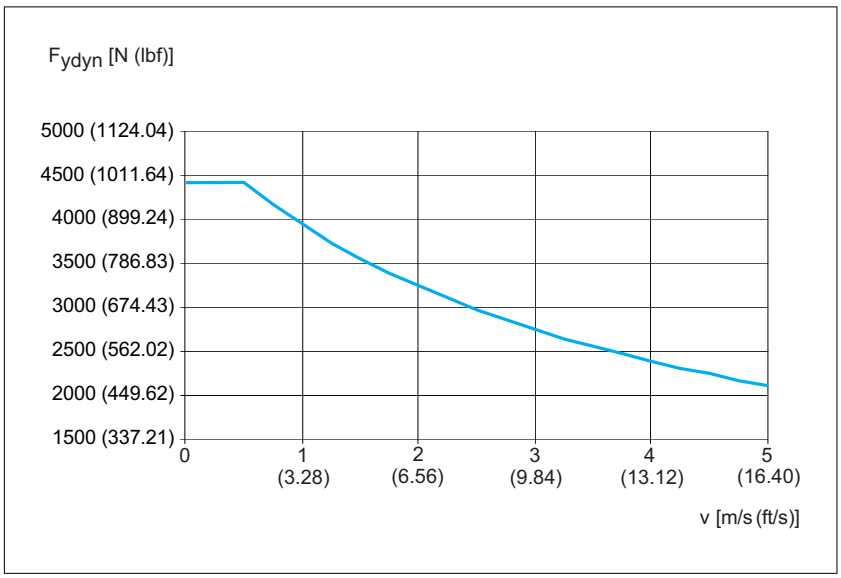

Figure 48: PAS43BB Maximum force F_{ydyn}

Maximum force F_{zdyn}

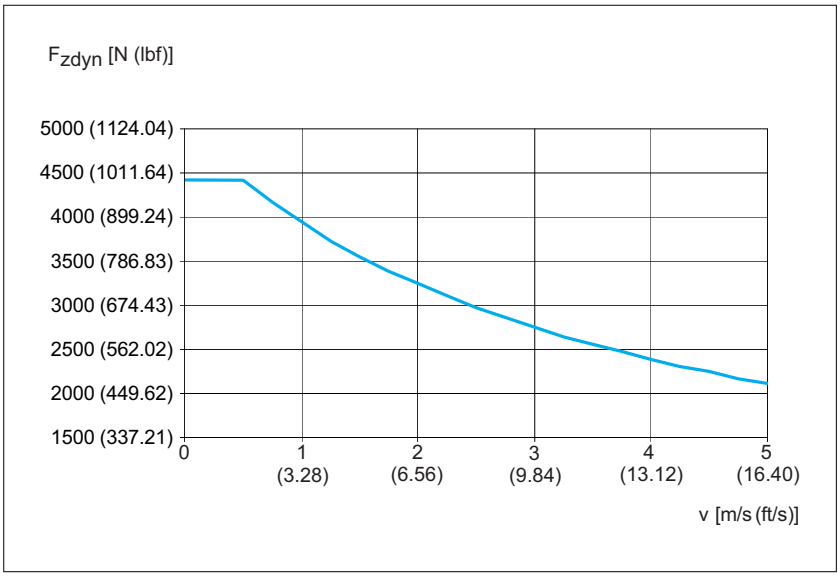

Figure 49: PAS43BB Maximum force F_{zdyn}

Maximum driving torque M_{max}

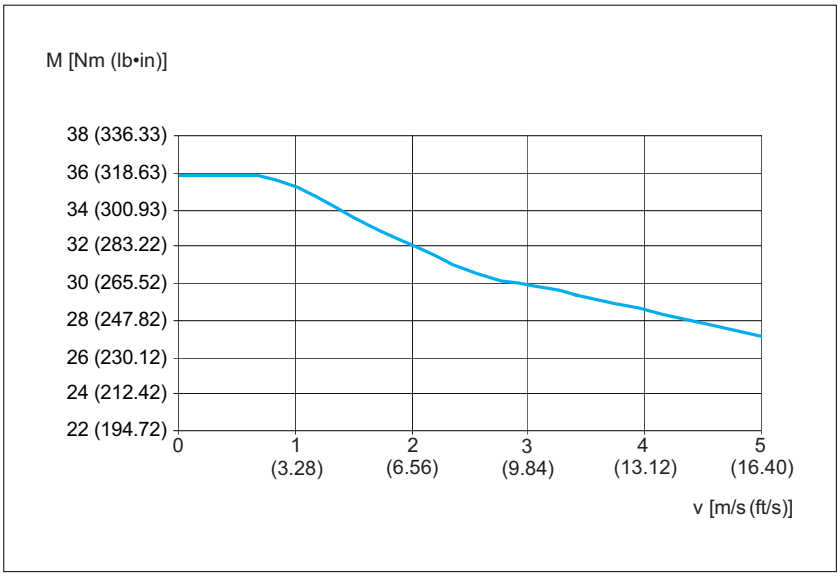

Figure 50: PAS43BBMaximum driving torque M_{max}

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Maximum torque carriage M_{xdyn}

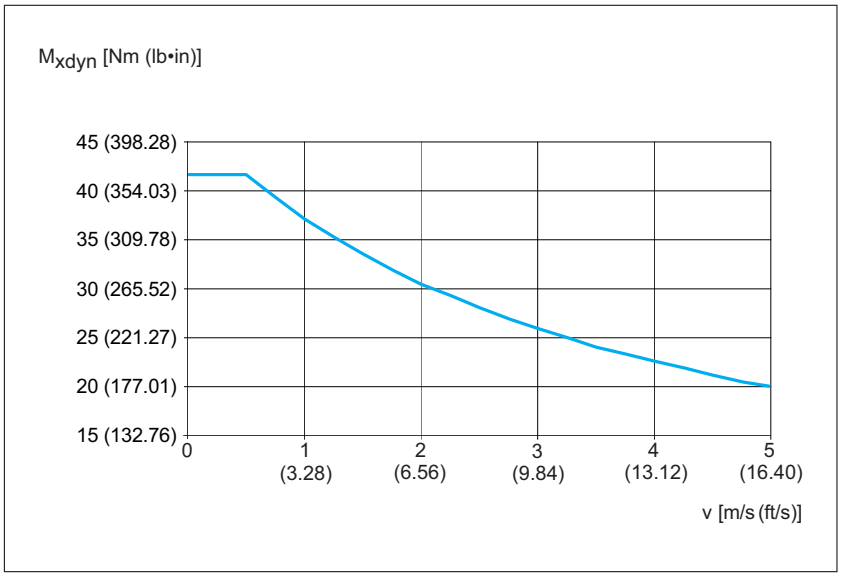

Figure 51: PAS43BB Maximum torque carriage M_{xdyn}

Maximum torque carriage M_{ydyn}

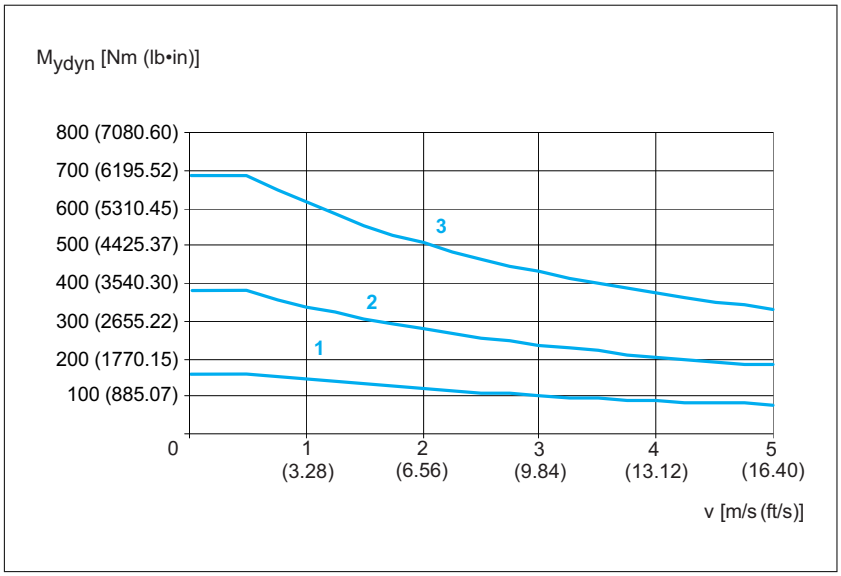

Figure 52: PAS43BB Maximum torque carriage M_{ydyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Maximum torque carriage M_{zdyn}

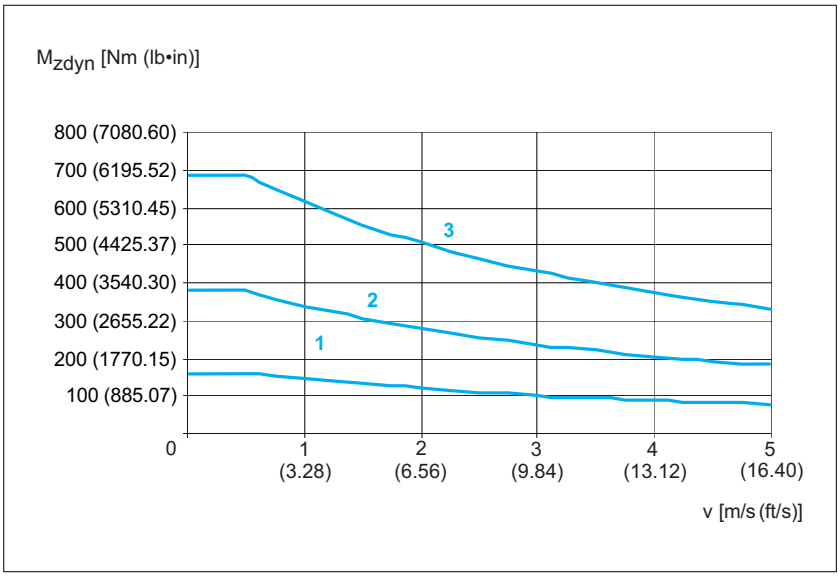

Figure 53: PAS43BB Maximum torque carriage M_{zdyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Service life load curve

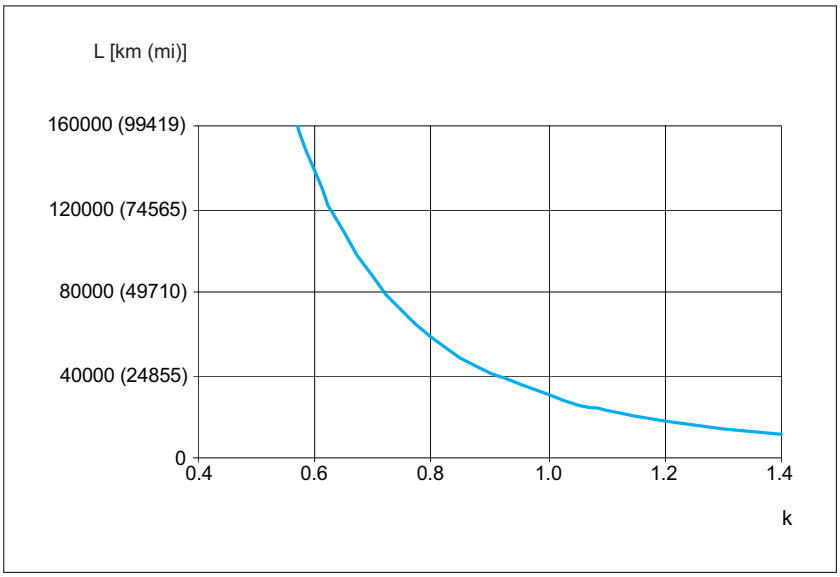

Figure 54: PAS43BB Service life load curve

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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.

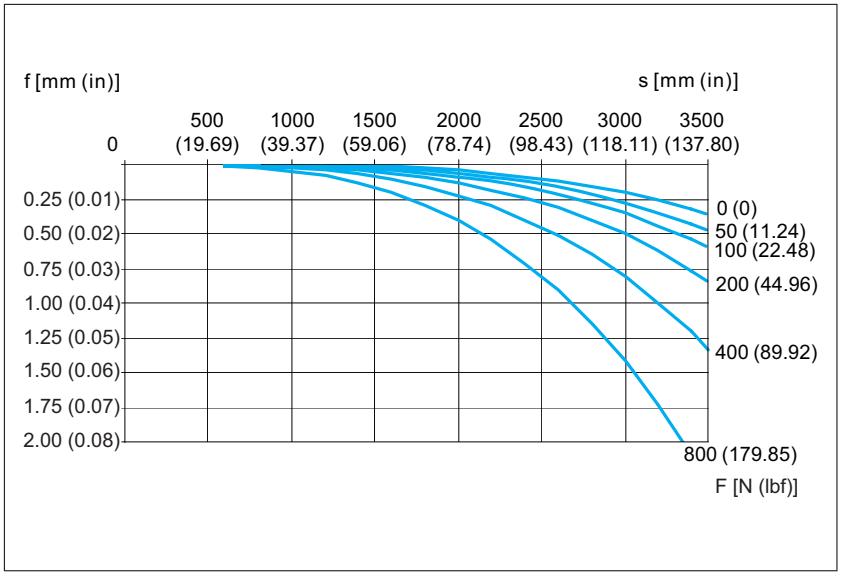

Figure 55: PAS43BB Maximum deflection

2.5.4 Dimensional drawingsPAS43B

Dimensional drawings PAS43B

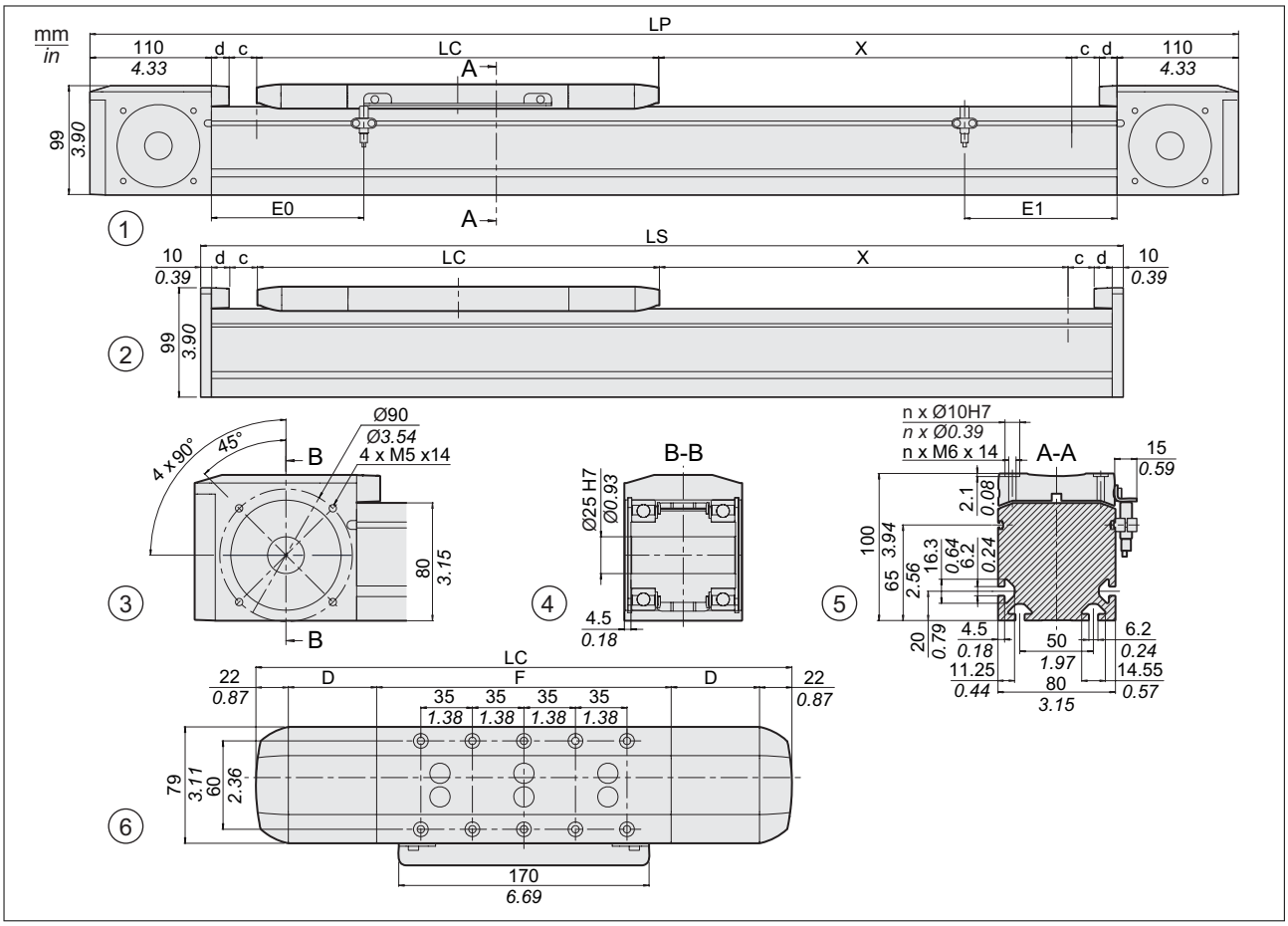

Figure 56: Dimensional drawings PAS43B

(1) Portal axis
(2) Support axis
(3) End block
(4) Section of end block
(5) Section of axis
(6) Carriage type 1 (types 2 and 4 have more tapped holes for mounting)

Carriage type			**Type 1**		**Type 2**		**Type 4**	
Cover strip			No	Yes	No	Yes	No	Yes
Total length of portal axis [1)]	LP	mm (in)	514 + X (20.24 + X)	664 + X (26.14 + X)	584 + X (22.99 + X)	734 + X (28.90 + X)	724 + X (28.50 + X)	874 + X (34.41 + X)
Total length of support axis	LS	mm (in)	314 + X (12.36 + X)	464 + X (18.27 + X)	384 + X (15.12 + X)	534 + X (21.02 + X)	524 + X (20.63 + X)	674 + X (26.54 + X)
Stroke	X	mm	See technical data		See technical data		See technical data	
Carriage length	LC	mm (in)	244 (9.61)	364 (14.33)	314 (12.36)	434 (17.09)	454 (17.87)	574 (22.60)
Profile length of carriage	F	mm (in)	200 (7.87)		270 (10.63)		410 (16.14)	
Number of tapped holes for mounting [2)]	n		10		14		22	
Distance between tapped holes		mm (in)	35 ±0.03 (1.38 0.0012)		35 ±0.03 (1.38 0.0012)		35 ±0.03 (1.38 0.0012)	
Limit switch position at drive end	E0	mm (in)	63 (2.48)	138 (5.43)	63 (2.48)	138 (5.43)	63 (2.48)	138 (5.43)
Limit switch position opposite drive end	E1	mm (in)	63 (2.48)	138 (5.43)	133 (5.24)	208 (8.19)	273 (10.75)	348 (13.70)
Stroke reserve up to mechanical stop	c	mm (in)	25 (0.98)		25 (0.98)		25 (0.98)	
Length of cover strip clamp	d	mm (in)	-	15 (0.59)	-	15 (0.59)	-	15 (0.59)
Deflection of cover strip	D	mm (in)	-	60 (2.36)	-	60 (2.36)	-	60 (2.36)
Minimum distance between 2 carriages		mm (in)	45 (1.77)	110 (4.33)	45 (1.77)	110 (4.33)	45 (1.77)	110 (4.33)

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)

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2.6 PAS44

2.6.1 Technical dataPAS44BB

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

Technical data portal axis		**PAS44BB**		
Drive element		Toothed belt 50HTD-8M		
Guide type		Recirculating ball bearing guide (size 25)		
Payload	kg (lb)	100 (220.46)		
Carriage type		Type 1	Type 2	Type 4
Carriage length	mm (in)	470 / 310 (18.50 / 12.20)	560 / 400 (22.05 / 15.75)	740 / 580 (29.13 / 22.83)
Feed per revolution	mm/rev.	264 (10.39)		
Effective diameter toothed belt pulley	mm (in)	84.034 (3.3084)		
Maximum feed force Fx_{max} 1)	N (lbf)	2600 (584.50)		
Maximum velocity 2)	m/s (ft/s)	5 (16.40)		
Maximum acceleration 2)	m/s^2 (ft/s^2)	20 (65.62)		
Maximum driving torque M_{max} 1)	Nm (lb·in)	110 (973.58)		
Breakaway torque 0 stroke axis	Nm (lb·in)	4.5 (39.83)		
Breakaway torque per additional carriage 3)	Nm (lb·in)	2.1 (18.59)		
Moment of inertia 0 stroke axis	$kgcm^2$ ($oz·in·s^2$)	121.2 / 105.1 (17.16 / 14.88)	137 / 120.9 (19.40 / 16.99)	169.2 / 153.1 (23.96 / 21.68)
Moment of inertia per additional carriage 3)	$kgcm^2$ ($oz·in·s^2$)	89.6 / 73.5 (12.69 / 10.41)	105.4 / 89.3 (14.93 / 12.65)	137.6 / 121.5 (19.49 / 17.21)
Moment of inertia per 1 m of stroke	$kgcm^2$ ($oz·in·s^2$)	11.2 (1.59)		
Moment of inertia per 1 kg of payload	$kgcm^2$ ($oz·in·s^2$)	17.7 (2.51)		
Maximum force Fy_{dynmax} 1)	N (lbf)	6270 (1409.55)		
Maximum force Fz_{dynmax} 1)	N (lbf)	6270 (1409.55)		
Maximum torque My_{dynmax} 1)	Nm (lb·in)	256 (2265.79)	665 (5885.75)	1209 (10700.55)
Maximum torque Mz_{dynmax} 1)	Nm (lb·in)	256 (2265.79)	665 (5885.75)	1209 (10700.55)
Max. torque Mx_{dynmax} 1)	Nm (lb·in)	68 (601.85)		

1) The maximum permissible dynamic forces and torques decrease at increasing velocities (see characteristic curves)
2) Load- and stroke-dependent
3) All carriages driven

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Technical data portal axis		PAS44BB		
Mass 0 stroke axis	kg (lb)	25.4 / 21.0 (56.00 / 46.30)	27.8 / 23.4 (61.29 / 51.59)	32.5 / 28.1 (71.65 / 61.95)
Mass per additional carriage (with axis body)	kg (lb)	12.9 / 9.3 (28.44 / 20.50)	15.3 / 11.7 (33.73 / 25.79)	20.1 / 16.5 (44.31 / 36.38)
Mass per 1 m of stroke	kg (lb)	16.9 (37.26)		
Moving mass carriage	kg (lb)	5.1 / 4.2 (11.24 / 9.26)	6.0 / 5.1 (13.23 / 11.24)	7.8 / 6.9 (17.20 / 15.21)
Maximum stroke [1)]	mm (in)	5310 / 5510 (209.06 / 216.93)	5220 / 5420 (205.51 / 213.39)	5040 / 5240 (198.43 / 206.30)
Minimum stroke [2)]	mm (in)	13 (0.51)		
Repeatability [3)]	mm (in)	± 0.05 (0.0012)		
Diameter motor shaft	mm (in)	12 ... 32 (0.47 ... 1.26)		
Cross section axis body (W x H)	mm (in)	110 x 110 (4.33 x 4.33)		
Axial area moment of inertia Ix Iy	mm^4	 4713490 6624690		
Modulus of elasticity (aluminum) E	N/mm^2	72000		
Load rating linear guide C_{stat}	N (lbf)	52400 (11779.99)		
Load rating linear guide C_{dyn}	N (lbf)	31700 (7126.44)		
Service life [4)]	km (mi)	30000 (18641)		

1) Inquire for greater stroke with recirculating ball bearing guide
2) Minimum stroke required for lubrication of the linear guide
3) Load- and stroke-dependent
4) The service life depends on the forces and torques, see chapter "2.7 Service life".

Technical data support axis		PAS44HB		
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)	17.1 / 12.8 (37.70 / 28.22)	19.5 / 15.2 (42.99 / 33.51)	24.3 / 20.0 (53.57 / 44.09)
For further data (if applicable) see:		PAS44BB		

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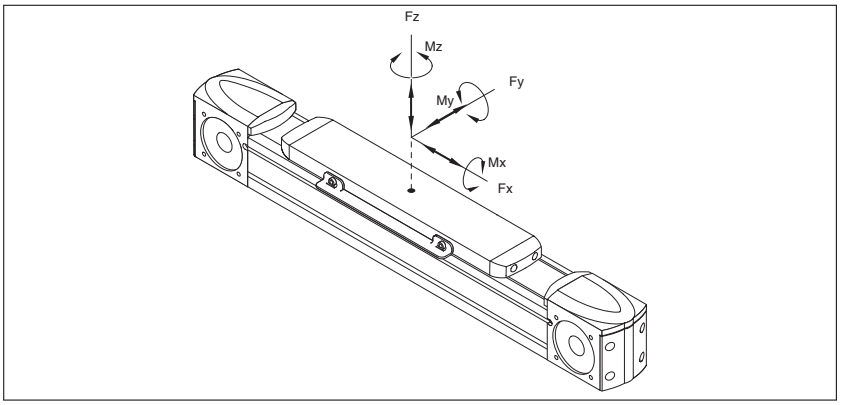

Figure 57: Forces and torques

2.6.2 Characteristic curves PAS44BB

Maximum feed force F_x

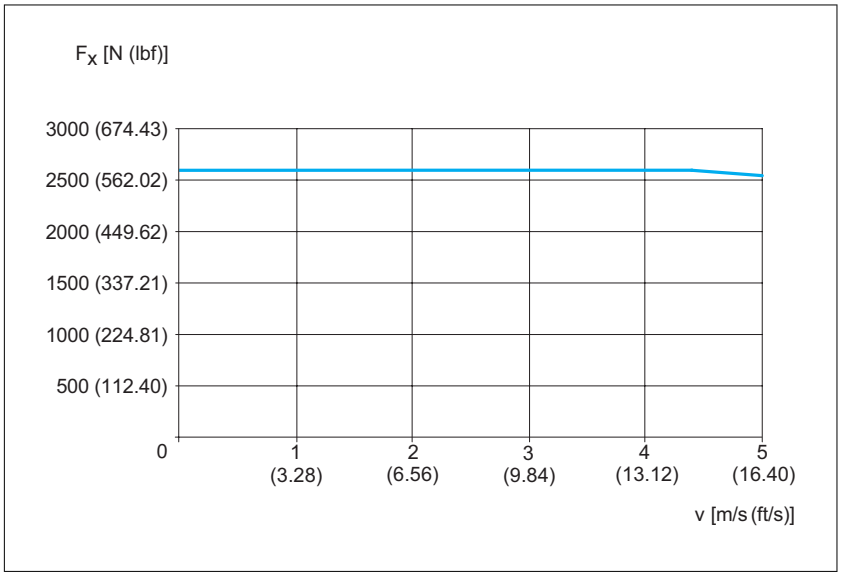

Figure 58: PAS44BB Maximum feed force F_x

Maximum force F_{ydyn}

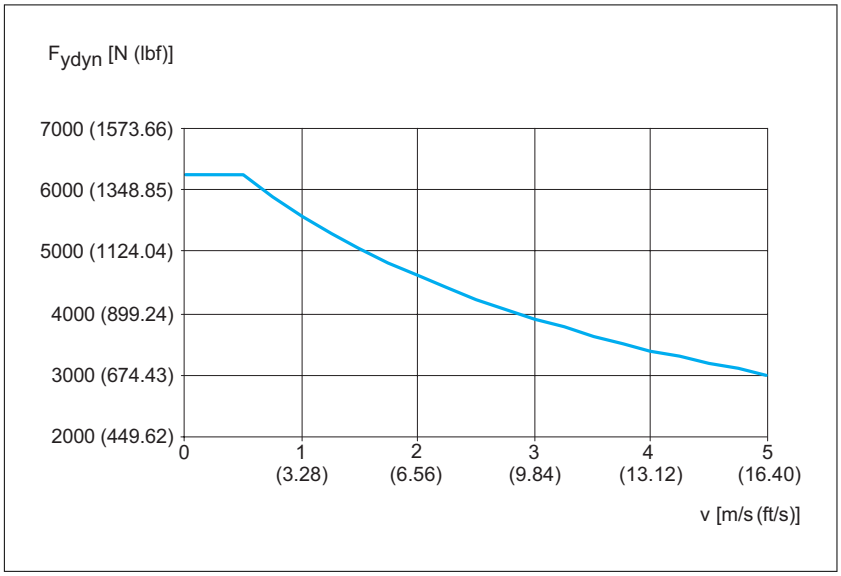

Figure 59: PAS44BB Maximum force F_{ydyn}

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Maximum force F_{zdyn}

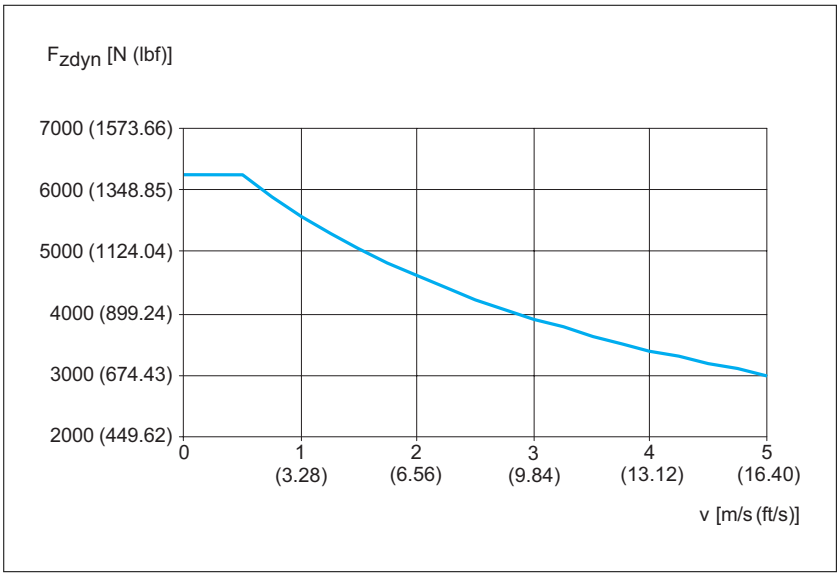

Figure 60: PAS44BB Maximum force F_{zdyn}

Maximum driving torque M_{max}

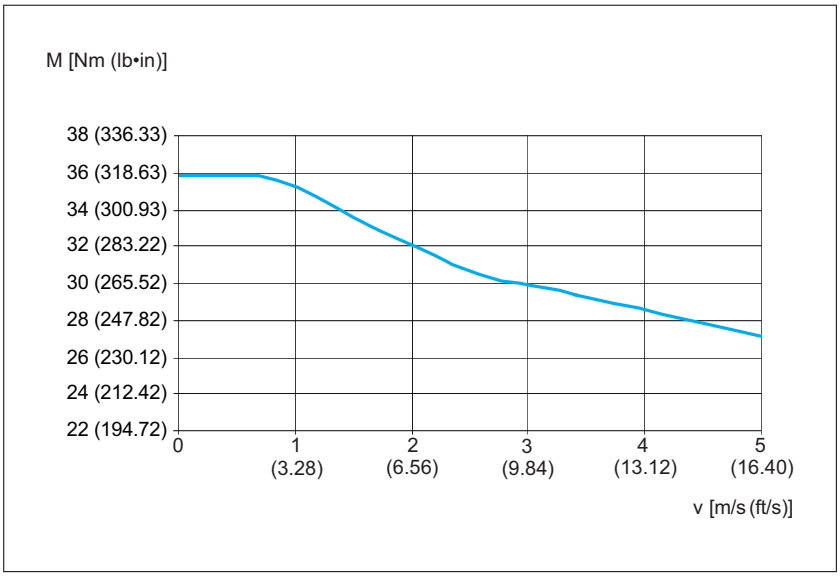

Figure 61: PAS44BBMaximum driving torque M_{max}

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Maximum torque carriage M_{xdyn}

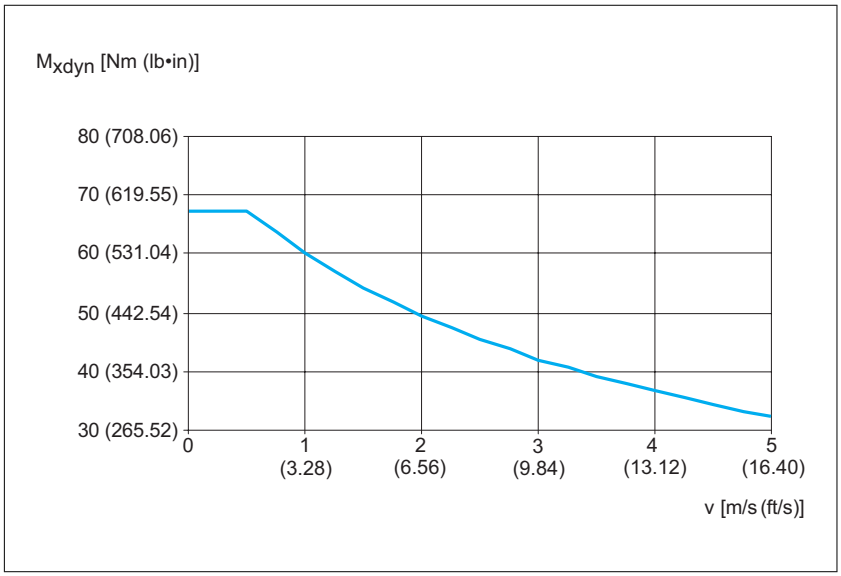

Figure 62: PAS44BB Maximum torque carriage M_{xdyn}

Maximum torque carriage M_{ydyn}

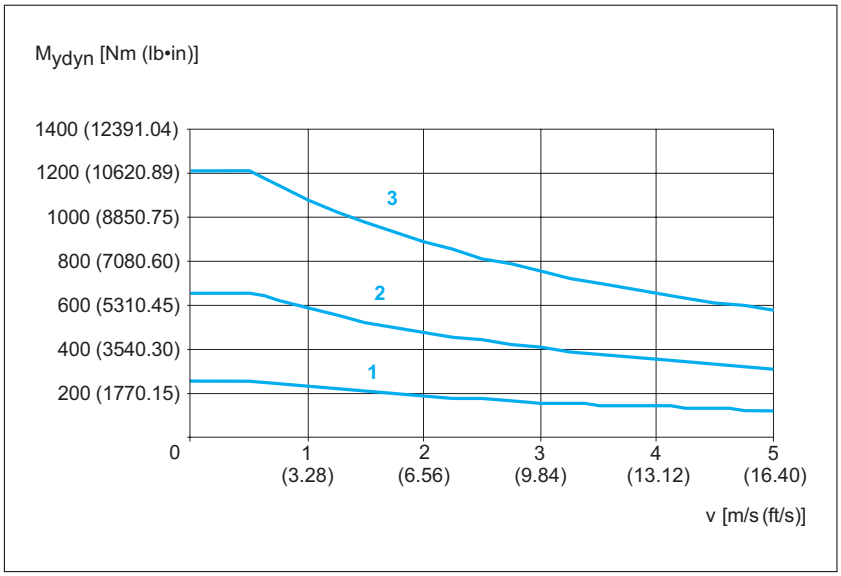

Figure 63: PAS44BB Maximum torque carriage M_{ydyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Maximum torque carriage M_{zdyn}

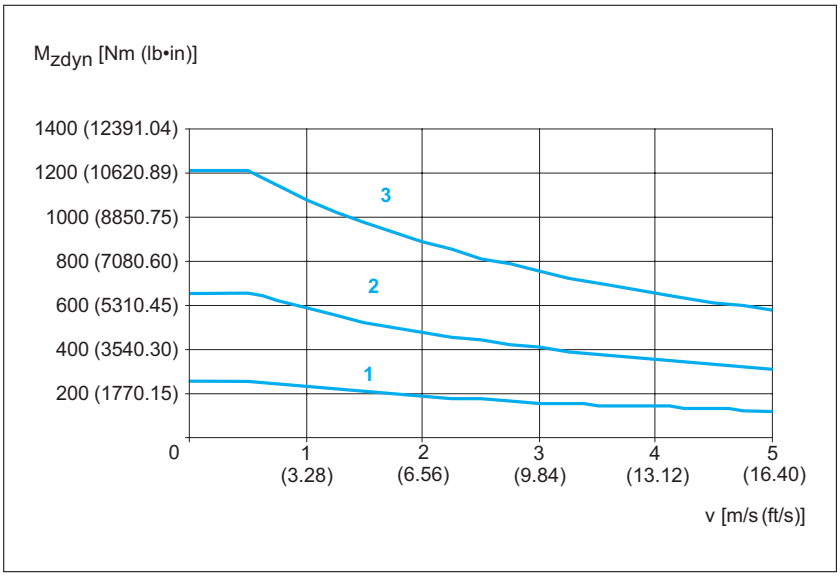

Figure 64: PAS44BB Maximum torque carriage M_{zdyn}

(1) Carriage type 1
(2) Carriage type 2
(3) Carriage type 4

Service life load curve

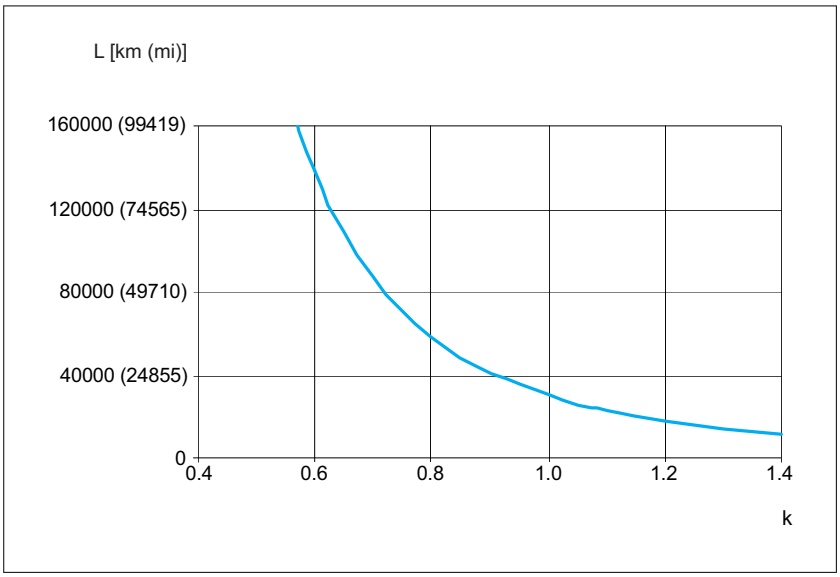

Figure 65: PAS44BB Service life load curve

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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.

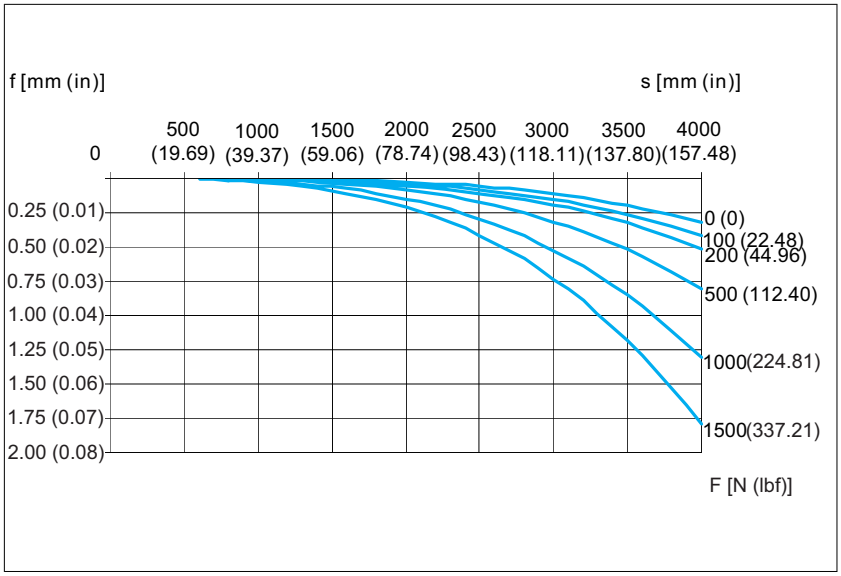

Figure 66: PAS44BB Maximum deflection

2.6.3 Dimensional drawingsPAS44BB

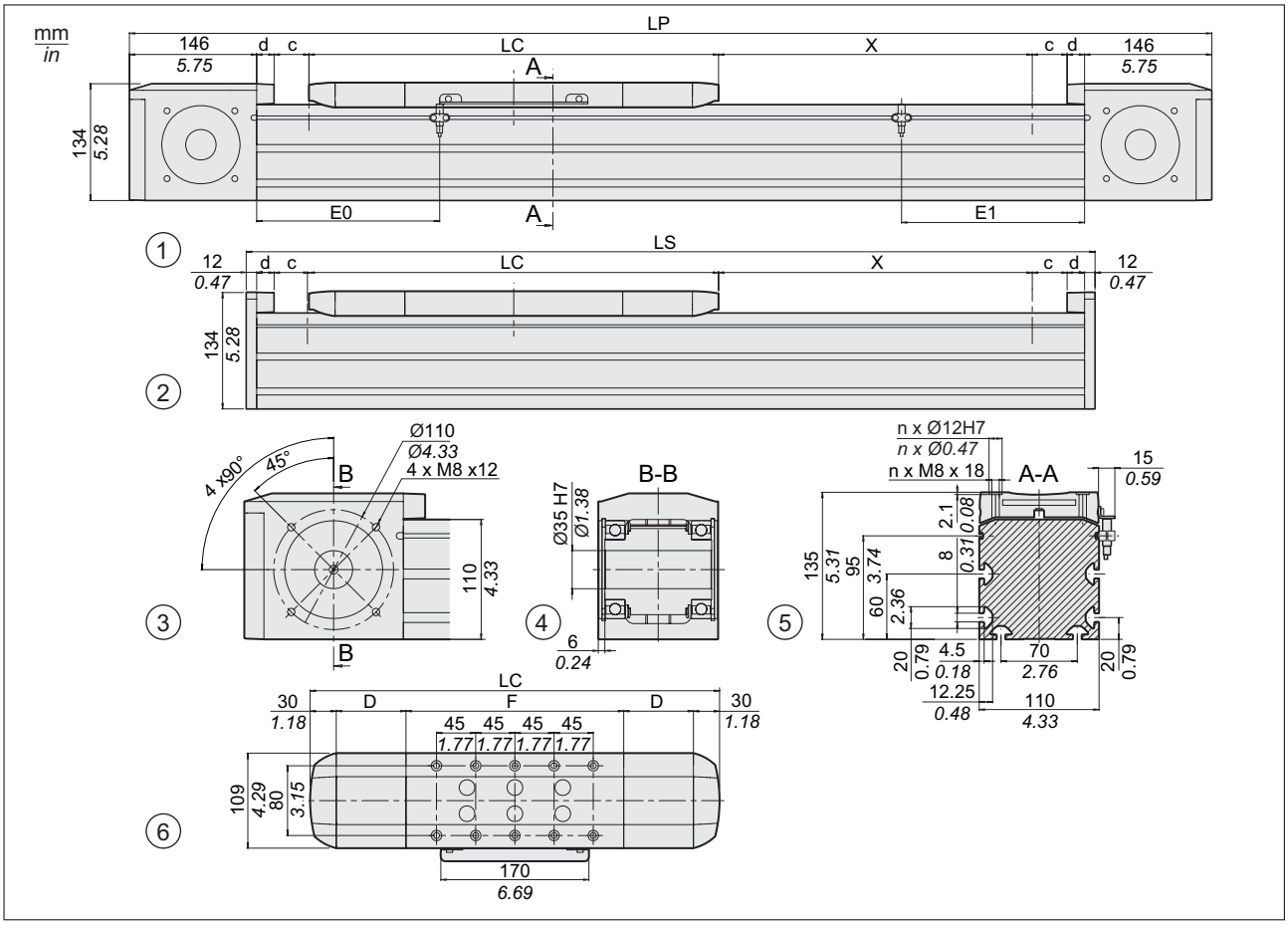

Figure 67: Dimensional drawings PAS44BB

(1) Portal axis
(2) Support axis
(3) End block
(4) Section of end block
(5) Section of axis
(6) Carriage type 1 (types 2 and 4 have more tapped holes for mounting)

Carriage type			**Type 1**		**Type 2**		**Type 4**	
Cover strip			No	Yes	No	Yes	No	Yes
Total length of portal axis [1]	LP	mm (in)	682 + X (26.85 + X)	882 + X (34.72 + X)	772 + X (30.39 + X)	972 + X (38.27 + X)	952 + X (37.48 + X)	1152 + X (45.35 + X)
Total length of support axis	LS	mm (in)	414 + X (16.30 + X)	614 + X (24.17 + X)	504 + X (19.84 + X)	704 + X (27.72 + X)	684 + X (26.93 + X)	884 + X (34.80 + X)
Stroke	X	mm (in)	See technical data		See technical data		See technical data	
Carriage length	LC	mm (in)	310 (12.20)	470 (18.50)	400 (15.75)	560 (22.05)	580 (22.83)	740 (29.13)
Profile length of carriage	F	mm (in)	250 (9.84)		340 (13.39)		520 (20.47)	
Number of tapped holes for mounting [2]	n		10		14		22	
Distance between tapped holes		mm (in)	45 ±0.03 (1.77 ±0.0012)		45 ±0.03 (1.77 ±0.0012)		45 ±0.03	
Limit switch position at drive end	E0	mm (in)	110 (4.33)	210 (8.27)	110 (4.33)	210 (8.27)	110 (4.33)	210 (8.27)
Limit switch position opposite drive end	E1	mm (in)	110 (4.33)	210 (8.27)	200 (7.87)	300 (11.81)	380 (14.96)	480 (18.90)
Stroke reserve up to mechanical stop	c	mm (in)	40 (1.57)		40 (1.57)		40	
Length of cover strip clamp	d	mm (in)	-	20 (0.79)	-	20 (0.79)	-	20 (0.79)
Deflection of cover strip	D	mm (in)	-	80 (3.15)	-	80 (3.15)	-	80 (3.15)
Minimum distance between 2 carriages		mm (in)	55 (2.17)	135 (5.31)	55 (2.17)	135 (5.31)	55 (2.17)	135 (5.31)

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)

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2.7 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.

$$\frac{Fy}{Fymax} + \frac{Fz}{Fzmax} + \frac{Mx}{Mxmax} + \frac{My}{Mymax} + \frac{Mz}{Mzmax} = k$$

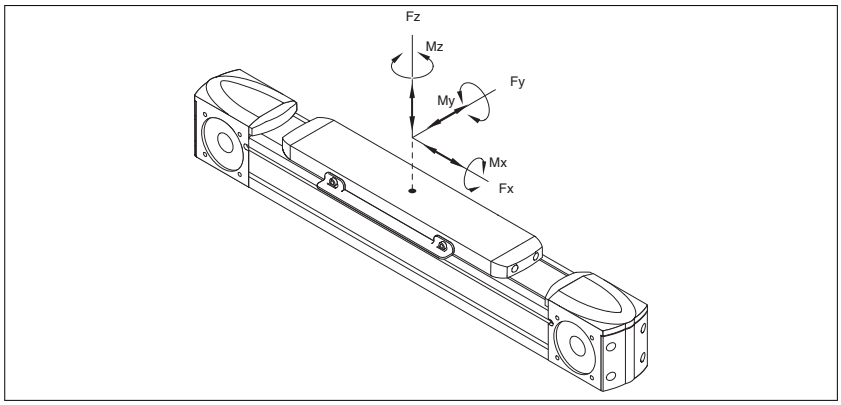

Figure 68: Forces and torques

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".

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2.8 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
- Pitch of the toothed belt
- Stiffness of the toothed belt
- 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, toothed belt, cover strip)

2.9 Motor

See the motor manual for information on the motor.

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3 Installation

⚠ WARNING

GREAT MASS OR FALLING PARTS

- Use a 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.

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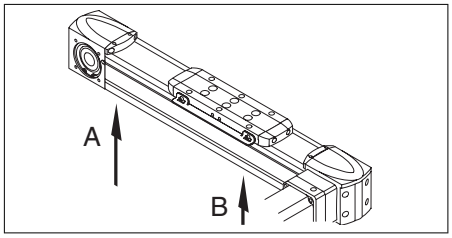
3.1 Preparing installation

The linear axis is a precision product and must be handled with care. Shocks and impacts may damage the guides. 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.**

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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 reduces the loads on the bearings.

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)

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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.

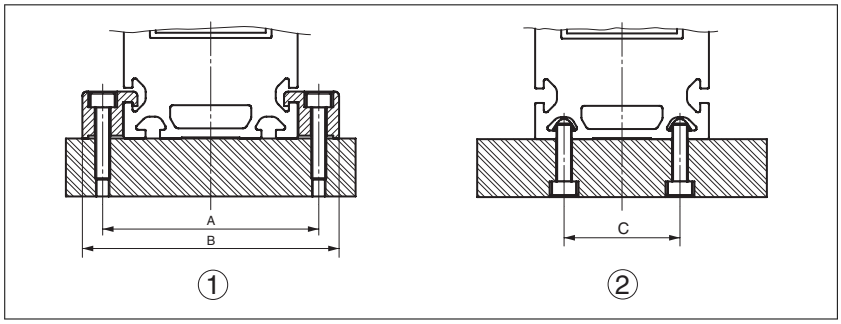

Figure 69: Fastening by means of clamping claws (1) and slot nuts from the bottom (2)

Tapped hole distance		**PAS41**	**PAS42**	**PAS43**	**PAS44**
A	mm (in)	54 (2.13)	74 (2.91)	96 (3.78)	130 (5.12)
B	mm (in)	68 (2.68)	88 (3.46)	112 (4.41)	150 (5.91)
C	mm (in)	20 (0.79)	40 (1.57)	50 (1.97)	70 (2.76)

Maximum distance [1]		**PAS41**	**PAS42**	**PAS43**	**PAS44**
Clamping claws	mm (in)	400 (15.75)	600 (23.62)	800 (31.50)	1000 (39.37)
Slot nuts	mm (in)	400 (15.75)	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.

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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 81.

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 81 *apply.*

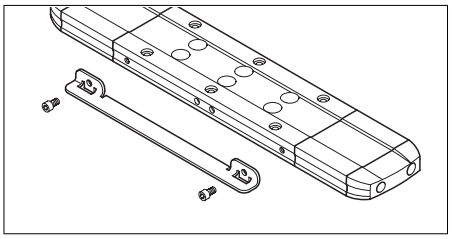
Before mounting

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).

⚠ WARNING

LOSS OF CONTROL

- Ensure that limit switches are installed if your application, based on your risk assessment, requires limit switches.
- Verify correct connection of the limit switches.
- Verify that the limit switches are mounted in a position far enough away from the mechanical stop to allow for an adequate stopping distance.
- Verify correct parameterization and function of the limit switches.

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

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 cutouts at both end blocks for inserting the fastening nuts.

Unless otherwise specified, the standard tightening torques indicated on page 81 *apply.*

Before mounting

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

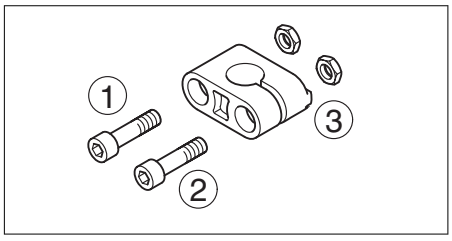
You need a set of hex keys and a feeler gauge.

- ▸ 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.

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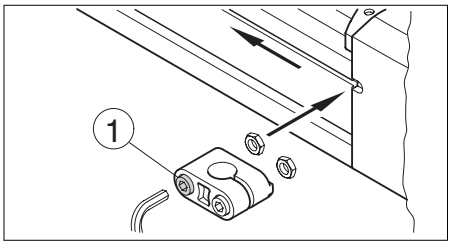
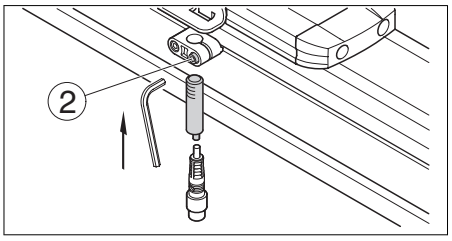


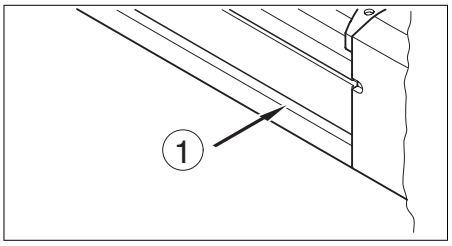
- Slide each nut into the T slot at the cutout.
- Place the the sensor holder with the two screws into position. Leave the two screws loose at first.
- Slide the sensor holder to the desired position and tighten screw (1) with a tightening torque of 0.3 Nm (2.66 lb·in).

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 ± 0.1 mm (0.0019685 ± 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 to either side of the two end blocks.

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

Maximum mass and torque

The maximum mass of the mounted parts is limited by the torque at the end block:

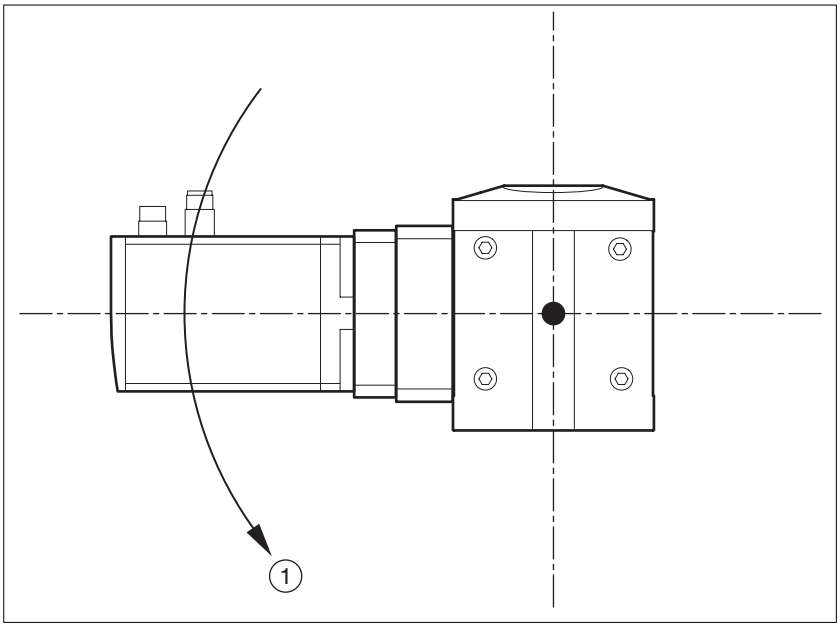


Figure 70: Torque at end block by mounted parts such as motor and gearbox.

		PAS41B	PAS42B	PAS43B	PAS44B
Maximum permissible mass of mounted parts	kg (lb)	3.5 (7.72)	11 (24.25)	20 (44.09)	35 (77.16)
(1) Maximum permissible torque (static) [1)]	Nm (lb·in)	22 (4.95)	150 (33.72)	270 (60.70)	550 (123.64)

1) Dynamically moving linear axes may be exposed to impermissible loads on the end block. Calculate the dynamic torque acting on the end blocks. A limitation to fifty percent of the static limit value has proven to be a reasonable value.

Unless otherwise specified, the standard tightening torques indicated on page 81 *apply.*

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Special tightening torques

Clamping hub		PAS41	PAS42	PAS43	PAS44
Screw ISO 4762 - 10.9		M3 x 10	M6 x 16	M6 x 20	M8 x 25
Wrench size	mm	2.5	5	5	6
Tightening torque	Nm (lb·in)	1.9 (16.82)	14 (123.91)	14 (123.91)	35 (309.78)
Mounting dimension	mm (in)	8 (0.31)	13 (0.51)	14 (0.55)	14 (0.55)

Expanding hub		PAS41	PAS42	PAS43	PAS44
Screw ISO 4762 - 8.8		M4 x 16	M6 x 18	M8 x 30	M10 x 60
Wrench size	mm	3	5	6	8
Tightening torque	Nm (lb·in)	2.9 (25.67)	10 (88.51)	25 (221.27)	49 (433.69)

Before mounting

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

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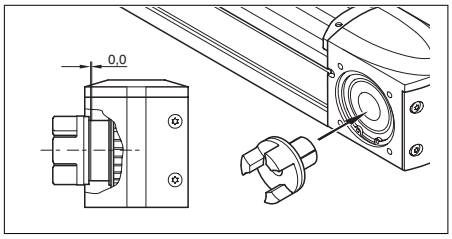
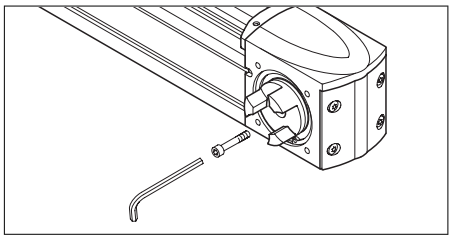
Mounting the elastomer coupling

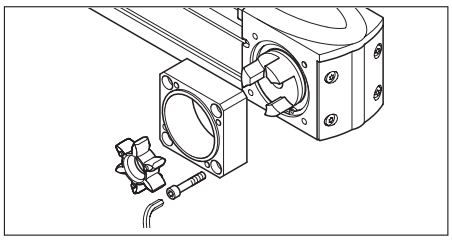


- Push the expanding hub into the hollow shaft of the toothed belt pulley until the expanding hub has even contact.



- Tighten the screw of the expanding shaft with the tightening torque specified on page 87.

  If the carriage is in the end position, the toothed belt pulley does not turn along.

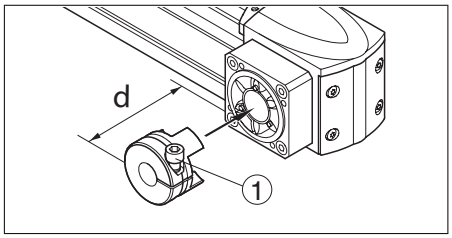


- Fit the elastomer spider onto the expanding hub.

  Slightly greasing the ring gear 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 preloading), it must be replaced.
- Mount the coupling housing with the 4 screws.

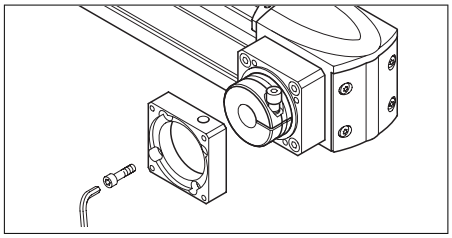
  Verify that the coupling housing has even contact.



- Fit the clamping hub.

  Note the installation dimension d measured to the collar as specified on page 87.

  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.

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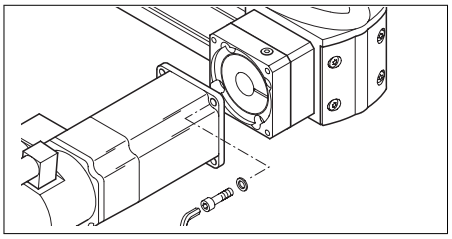
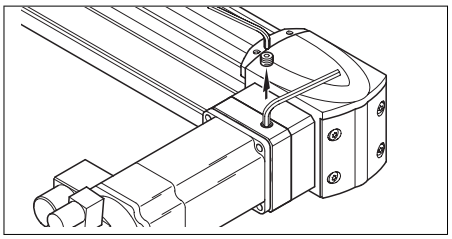
Motor mounting only



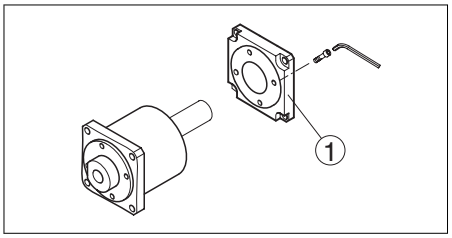
- Fit the motor onto the motor adapter plate with even contact.

  Secure the motor 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 motor to the motor adapter plate with the 4 screws and washers.



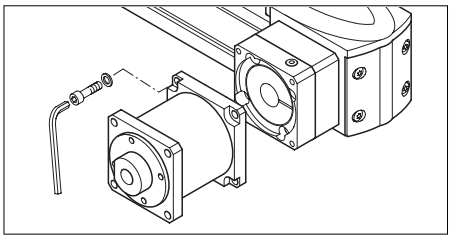
- Remove the screw plug in the hole at the side of the motor adapter plate.
- Tighten the screw of the clamping hub through the hole with the tightening torque specified on page 87.
- Close the hole with the screw plug.

Gearbox mounting only



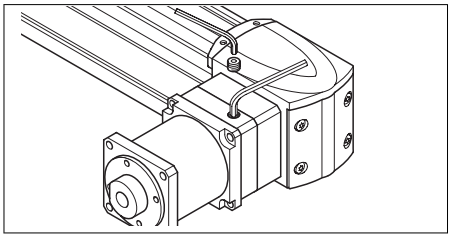
- A flange plate (1) is required if the gearbox does not have its own flange.
- Mount the flange plate to the gearbox with the 4 screws.

  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 87.
- Close the hole with the screw plug.

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

3.3.6 Mounting a shaft extension

A shaft extension can be used to couple a motor or an encoder.

Shaft extensions can retrofitted to either end block.

Special tightening torques

Shaft extension		PAS41	PAS42	PAS43	PAS44
Screw ISO 4762 - 8.8		M4 x 16	M6 x 18	M8 x 30	M10 x 60
Wrench size	mm	3	5	6	8
Tightening torque	Nm (lb·in)	2.9 (25.67)	10 (88.51)	25 (221.27)	49 (433.69)

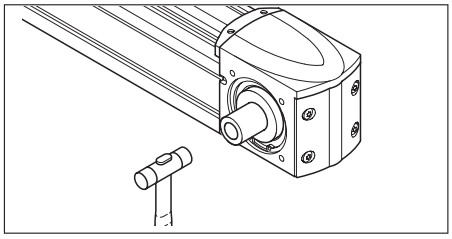
Before mounting

See chapter "6 Accessories and spare parts" for suitable shaft extensions.

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

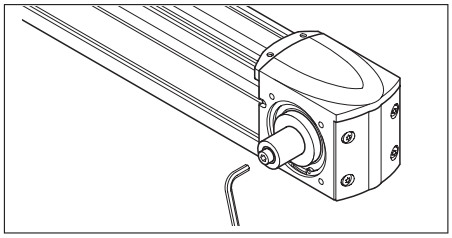
- Clean all parts.
- Inspect all parts for damage.

Procedure



- Slide the shaft extension into the hollow shaft on the end block until it has even contact with the pulley.

  The fit of approx. 2 mm (0.079 in) may require slight taps on the shaft extension with a dead blow hammer (not on the screw head).



- Tighten the screw with the tightening torque specified on page 90.

  If the carriage is in the end position, the toothed belt pulley does not turn along.

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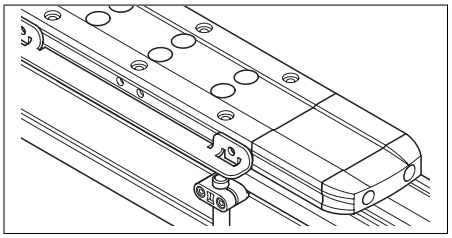
3.3.7 Mounting the payload

Unless otherwise specified, the standard tightening torques indicated on page 81 *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		**PAS41**	**PAS42**	**PAS43**	**PAS44**
Thread	-	M5	M5	M6	M8
Depth	mm (in)	10 (0.39)	10 (0.39)	12 (0.47)	16 (0.63)
Diameter counterbore for locating dowel	mm (in)	8 (0.31)	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.

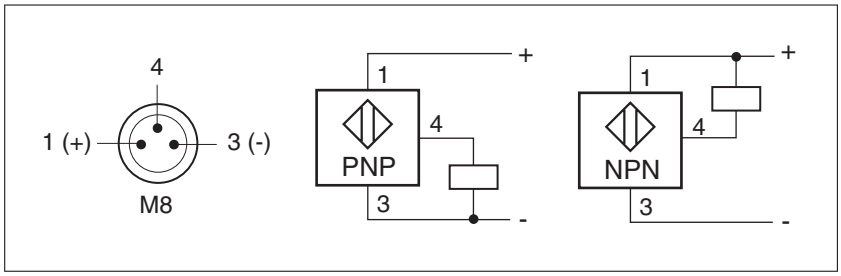


Figure 71: Connection assignment sensors

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?

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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 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".

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5 Diagnostics and troubleshooting

5.1 Troubleshooting

Error	Cause	Troubleshooting
Sensor overtraveled	Sensor	Adjust or replace sensors, see page 117
	Controller	Check controller
Motor load increases, controller switches off because of overload.	Guides under mechanical tension or excessive friction caused by poor lubrication.	Contact service
Noise and vibrations at high velocities	Velocity too high	Reduce velocity
	Poor lubrication (in the case of noise)	Lubricate, see page 132
Running inaccuracy and noise of the guides	Poor lubrication	Lubricate, see page 132
	Damage to the guides, for example by shock or impact on the carriage	Replace guides, contact service
Carriage has backlash and positions inaccurately	Play in guides after a collision or poor lubrication	Contact service

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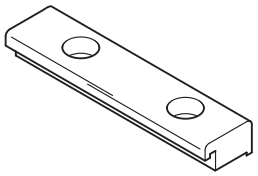
6 Accessories and spare parts

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

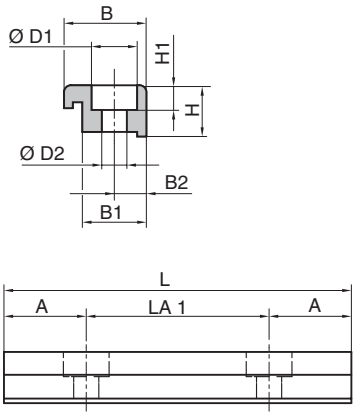
6.1 Clamping claws

Order data



Description		Order no.
For mounting the axis body to a mounting surface. Contains 10 piece	**For axis ...**	
	PAS41	**VW33MF10511**
	PAS42	**VW33MF10512**
	PAS43	**VW33MF10613**
	PAS44	**VW33MF10814**

Dimensional drawings



For axis ...		PAS41	PAS42	PAS43	PAS44
A	mm (in)	18 (0.71)	18 (0.71)	18 (0.71)	18 (0.71)
B	mm (in)	18 (0.71)	19 (0.75)	24 (0.94)	28 (1.10)
B1	mm (in)	14 (0.55)	14 (0.55)	16 (0.63)	20 (0.79)
B2	mm (in)	7 (0.28)	7 (0.28)	8 (0.31)	10 (0.39)
D1	mm (in)	10 (0.39)	10 (0.39)	11 (0.43)	15 (0.59)
D2	mm (in)	5.5 (0.22)	5.5 (0.22)	6.6 (0.26)	9 (0.35)
H	mm (in)	11.2 (0.44)	16.2 (0.64)	21.5 (0.85)	22 (0.87)
H1	mm (in)	5.4 (0.21)	5.4 (0.21)	6.4 (0.25)	12 (0.47)
L	mm (in)	76 (2.99)	76 (2.99)	76 (2.99)	76 (2.99)
LA1	mm (in)	40 (1.57)	40 (1.57)	40 (1.57)	40 (1.57)

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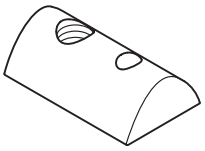
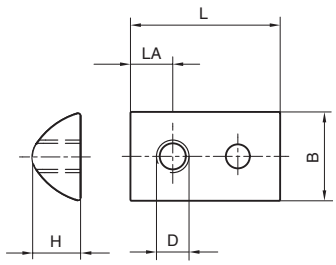
6.2 Slot nuts

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	**VW33MF010T5N5**
	PAS43	6 steel M6	**VW33MF010T6N6**
	PAS44	8 steel M6	**VW33MF010T8N6**
		8 steel M8	**VW33MF010T8N8**

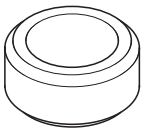
Dimensional drawings



	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)

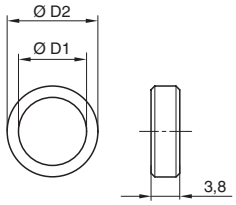
6.3 Locating dowels

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	**VW33MF020LD01**
	PAS43	**VW33MF020LD02**
	PAS44	**VW33MF020LD03**

Dimensional drawings



	D1	D2
For axis ...	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)

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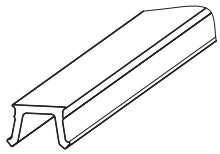
6.4 T slot covers

Order data

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

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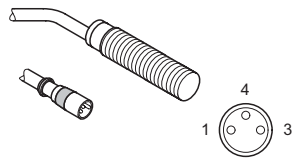
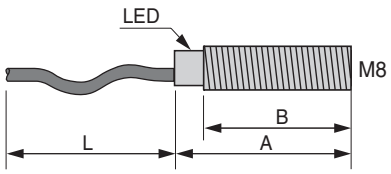
6.5 Sensors and additional parts

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	**XS508B1PBP01M8**
		PNP, normally open contact	**XS508B1PAP01M8**
		NPN, normally closed contact	**XS508B1NBP01M8**
		NPN, normally open contact	**XS508B1NAP01M8**

Dimensional drawings



Total length	Thread length	Cable length
A	**B**	**L**
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.		

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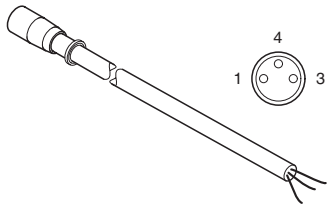
Technical data

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 mm²
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

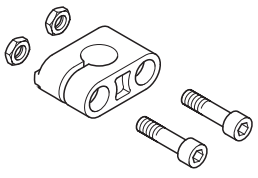
6.5.2 Sensor extension cable

Order data

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

6.5.3 Sensor holder

Order data

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

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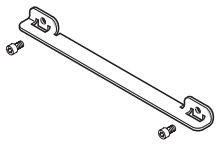
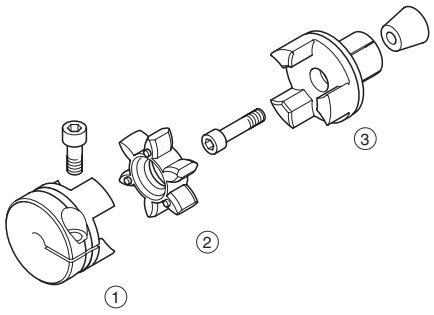
6.5.4 Contact plate

Order data

	Description	Order no.
	For mounting to the carriage of the axis Content 1 contact plate 2 screws	**VW33MASP1**

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.



Coupling assembly

(1) Clamping hub

(2) Elastomer spider

(3) Expanding hub

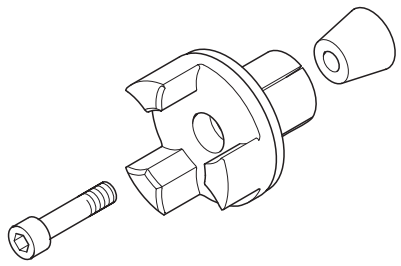
Coupling assemblies are required to mount motors to axes.

A coupling assembly consists of the following components:

- 1 expanding hub for the axis end
- 1 clamping hub for the motor end
- 1 elastomer spider, as a decoupling element between the hubs
- 2 screws

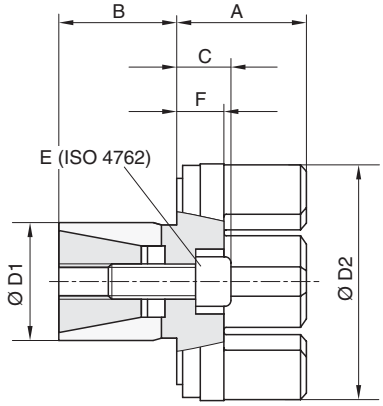
6.6.1 Expanding hubs

Order data



Description		Order no.
Expanding hub for the axis end Contains 1 piece	**For axis ...**	
	PAS41	**SPM3MFSC10A14**
	PAS42	**SPM3MFSC20A20**
	PAS43	**SPM3MFSC25A30**
	PAS44	**SPM3MFSC35A36**

Dimensional drawings



For axis ...			PAS41	PAS42	PAS43	PAS44
Moment of inertia	J	kgcm²) (oz·in·s²)	0.009 (0.0013)	0.09 (0.0127)	0.32 (0.0453)	0.77 (0.1090)
Max. torque	M_{max}	Nm (lb·in)	7.7 (68.15)	35.7 (315.97)	82 (725.76)	182 (1610.84)
Screw ISO 4762	E		M4	M6	M8	M10
Wrench size		mm	3	5	6	8
Tightening torque		Nm (lb·in)	2.9 (25.67)	10 (88.51)	25 (221.27)	49 (433.69)
	A	mm (in)	16 (0.63)	22 (0.87)	24 (0.94)	25.5 (1.00)
Installation length	B	mm (in)	14 (0.55)	20 (0.79)	30 (1.18)	36 (1.42)
	C	mm (in)	7 (0.28)	8 (0.31)	12 (0.47)	13 (0.51)
Expanding hub h9	D1	mm (in)	10 (0.39)	20 (0.79)	25 (0.98)	35 (1.38)
	D2	mm (in)	25 (0.98)	40 (1.57)	55 (2.17)	65 (2.56)
	F	mm (in)	5 (0.20)	8 (0.31)	8 (0.31)	8 (0.31)

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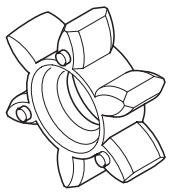
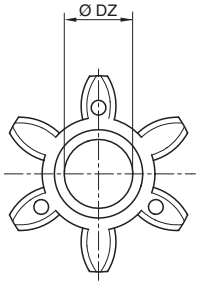
6.6.2 Elastomer spiders

Order data

	Description		Order no.
	Decoupling element between the hubs Contains 1 piece, color red	**For axis ...**	
		PAS41	**SPM3MFR09A018**
		PAS42	**SPM3MFR14A034**
		PAS43	**SPM3MFR20A120**
		PAS44	**SPM3MFR25A320**

Dimensional drawings



For axis ...			**PAS41**	**PAS42**	**PAS43**	**PAS44**
Shore hardness			98 Sh A	98 Sh A	98 Sh A	98 Sh A
Color			Red	Red	Red	Red
Max. torque	M_{max}	Nm (lb·in)	18 (159.31)	34 (300.93)	120 (1062.09)	320 (2832.24)
Nominal torque	M_N	Nm (lb·in)	7 (61.96)	17 (150.46)	60 (531.04)	160 (1416.12)
Moment of inertia	J	kgcm²) (oz·in·s²)	0.001 (0.0001)	0.013 (0.0018)	0.067 (0.0095)	0.150 (0.0212)
Diameter	DZ	mm (in)	9 0.35	14 (0.55)	20 (0.79)	25 (0.98)

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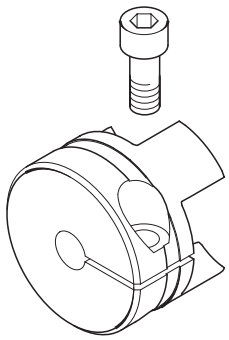
6.6.3 Clamping hubs

Order data



Description			Order no.
Clamping hub Contains 1 piece			
	D1 [mm (in)] [1]	**M_{max} [Nm (lb·in)]**	
For axis ...	Inquire for other diameters	Maximum torque that can be transmitted	
PAS41	6.35 (0.25)	6.8 (60.19)	**SPM3MFCC06A06**
	8 (0.31)	7.4 (65.50)	**SPM3MFCC08A06**
	9 (0.35)	7.8 (69.04)	**SPM3MFCC09A06**
	10 (0.39)	9.7 (85.85)	**SPM3MFCC10A06**
	11 (0.43)	10.7 (94.70)	**SPM3MFCC11A06**
	12 (0.47)	11.6 (102.67)	**SPM3MFCC12A06**
	14 (0.55)	12.2 (107.98)	**SPM3MFCC14A06**
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)	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)	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)	160 (1416.12)	**SPM3MFCC25A09**

1) See dimensional drawings

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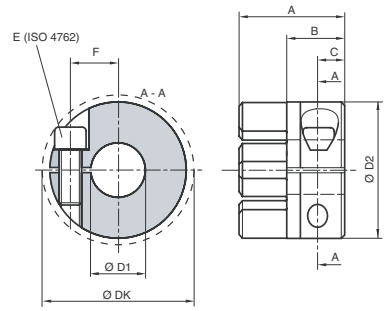
Dimensional drawings

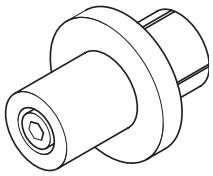


For axis ...			PAS41	PAS42	PAS43	PAS44
Moment of inertia	J	kgcm²) (oz·in·s²)	0.015 (0.0021)	0.15 (0.0212)	0.55 (0.0779)	1.22 (0.1728)
Screw ISO 4762	E		M3	M6	M6	M8
Wrench size		mm (in)	2.5 (0.10)	5 (0.20)	5 (0.20)	6 (0.24)
Tightening torque		Nm (lb·in)	1.9 (16.82)	14 (123.91)	14 (123.91)	35 (309.78)
Hub length	A	mm (in)	22 (0.87)	31 (1.22)	36 (1.42)	39 (1.54)
Hole depth	B	mm (in)	11 (0.43)	17 (0.67)	20 (0.79)	21 (0.83)
Distance between centers	C	mm (in)	5 (0.20)	8 (0.31)	10 (0.39)	9 (0.35)
Inside diameter H7	D1	mm (in)	1)	1)	1)	1)
	D2	mm (in)	25 (0.98)	40 (1.57)	55 (2.17)	65 (2.56)
Outside diameter	DK	mm (in)	25.8 (1.02)	45 (1.77)	57.5 (2.26)	73 (2.87)
	F	mm (in)	8 (0.31)	14 (0.55)	20 (0.79)	25 (0.98)

1) See order data

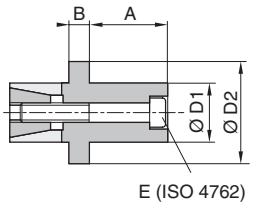
6.7 Shaft extension

Order data



Description		Order no.
Components such as a motor or an encoder can be coupled to the shaft extension. Contains 1 piece	**For axis ...**	
	PAS41	**VW33MF1S12A12**
	PAS42	**VW33MF1S27A20**
	PAS43	**VW33MF1S32A25**
	PAS44	**VW33MF1S37A32**

Dimensional drawings



For axis ...			PAS41	PAS42	PAS43	PAS44
Mass	m	kg (lb)	0.012 (0.03)	0.073 (0.16)	0.148 (0.33)	0.311 (0.69)
Maximum radial force	F_R	N (lbf)	230 (51.71)	400 (89.92)	700 (157.37)	1300 (292.25)
Moment of inertia	J	kgcm²) (oz·in·s²)	0.002 (0.0003)	0.05 (0.0071)	0.16 (0.0227)	0.54 (0.0765)
Max. torque	M_{max}	Nm (lb·in)	7.7 (68.15)	35.7 (315.97)	82 (725.76)	182 (1610.84)
Screw ISO 4762	E		M4	M6	M8	M10
Wrench size	-	mm	3	5	6	8
Tightening torque	-	Nm (lb·in)	2.9 (25.67)	10 (88.51)	25 (221.27)	49 (433.69)
Shaft length	A	mm (in)	12 (0.47)	27 (1.06)	32 (1.26)	37 (1.46)
Collar length	B	mm (in)	5.5 (0.22)	7 (0.28)	7.5 (0.30)	9 (0.35)
Shaft extension diameter H7	D1	mm (in)	12 (0.47)	20 (0.79)	25 (0.98)	32 (1.26)
Diameter	D2	mm (in)	17 (0.67)	35 (1.38)	45 (1.77)	55 (2.17)

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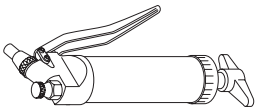
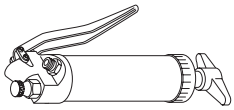
6.8 Grease guns

Order data

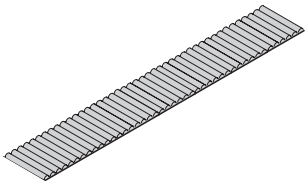
Designation	Description	Order no.
Single-hand high-pressure grease gun 	With nozzle for the lubrication of the linear axes with recirculating ball bearing guide. Suitable nozzle type D. Volume: 120 cm^3 (7.32 in^3); delivery volume: 0.5 cm^3 (0.03 in^3) / stroke	**VW33MAP01**
Single-hand high-pressure oil gun 	With nozzle for the lubrication of the linear axes with roller guide. Suitable nozzle type D. Volume: 120 cm^3 (7.32 in^3); delivery volume: 0.5 cm^3 (0.03 in^3) / stroke	**VW33MAP02**
Nozzle type D6 90° 	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	**VW33MAT01**
Nozzle type D6 20° 	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	**VW33MAT02**

6.9 Toothed belt

Calculation of the required toothed belt length:

L = 2 x total length of axis

Order data



Description			Order no.
For axis ...	**Length m** (ft)		
PAS41	1.5 (4.92)		**SPM3MAS15L015**
	3 (9.84)		**SPM3MAS15L030**
	10 (32.81)		**SPM3MAS15L100**
	1.5 (4.92)	Antistatic	**SPM3MAA15L015**
	3 (9.84)	Antistatic	**SPM3MAA15L030**
	10 (32.81)	Antistatic	**SPM3MAA15L100**
PAS42	1.5 (4.92)		**SPM3MAS25L015**
	3 (9.84)		**SPM3MAS25L030**
	10 (32.81)		**SPM3MAS25L100**
	1.5 (4.92)	Antistatic	**SPM3MAA25L015**
	3 (9.84)	Antistatic	**SPM3MAA25L030**
	10 (32.81)	Antistatic	**SPM3MAA25L100**
PAS43	1.5 (4.92)		**SPM3MAS30L015**
	3 (9.84)		**SPM3MAS30L030**
	10 (32.81)		**SPM3MAS30L100**
	1.5 (4.92)	Antistatic	**SPM3MAA30L015**
	3 (9.84)	Antistatic	**SPM3MAA30L030**
	10 (32.81)	Antistatic	**SPM3MAA30L100**
PAS44	1.5 (4.92)		**SPM3MAS50L015**
	3 (9.84)		**SPM3MAS50L030**
	10 (32.81)		**SPM3MAS50L100**
	1.5 (4.92)	Antistatic	**SPM3MAA50L015**
	3 (9.84)	Antistatic	**SPM3MAA50L030**
	10 (32.81)	Antistatic	**SPM3MAA50L100**

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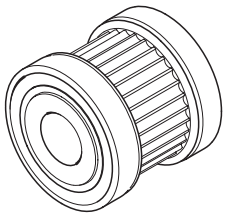
Technical data

Toothed belt	For axis ...	Width	Pitch	Density	Specific spring constant	Belt tension F_V
		mm (in)	mm (in)	g/m	N (lbf)	N (lbf)
15HTD-3M	PAS41	15 (0.59)	3 (0.12)	32	0.145×10^6 (0.0326×10^6)	145 ... 180 (32.60 ... 40.47)
25HTD-5M	PAS42	25 (0.98)	5 (0.20)	96	0.572×10^6 (0.1286×10^6)	570 ... 710 (128.14 ... 159.61)
30HTD-5M	PAS43	30 (1.18)	5 (0.20)	118	0.672×10^6 (0.1511×10^6)	670 ... 870 (150.62 ... 195.58)
50HTD-8M	PAS44	50 (1.97)	8 (0.31)	311	1.917×10^6 (0.4310×10^6)	1915 ... 2400 (430.51 ... 539.54)

6.10 Toothed belt pulleys

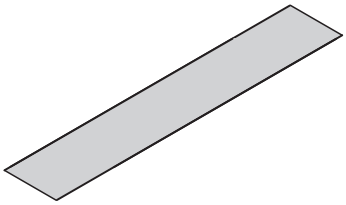
Order data



Description			Order no.
Toothed belt pulley with bearing	For axis ...		
	PAS41		**SPM3MAW1S084**
		Increased corrosion resistance	**SPM3MAW1C084**
	PAS42		**SPM3MAW2S155**
		Increased corrosion resistance	**SPM3MAW2C155**
	PAS43		**SPM3MAW3S205**
		Increased corrosion resistance	**SPM3MAW3C205**
	PAS44		**SPM3MAW4S264**
		Increased corrosion resistance	**SPM3MAW4C264**

6.11 Cover strips

Order data



Description				Order no.
For axis ...	Width [mm (in)]	Height [mm (in)]	Length m (ft)	
PAS41	22 (0.87)	0.15 (0.01)	3 (9.84)	**SPM3MAC22L030**
			6 (19.69)	**SPM3MAC22L060**
PAS42	36 (1.42)	0.15 (0.01)	3 (9.84)	**SPM3MAC36L030**
			6 (19.69)	**SPM3MAC36L060**
PAS43	45 (1.77)	0.15 (0.01)	3 (9.84)	**SPM3MAC45L030**
			6 (19.69)	**SPM3MAC45L060**
PAS44	65 (2.56)	0.15 (0.01)	3 (9.84)	**SPM3MAC65L030**
			6 (19.69)	**SPM3MAC65L060**

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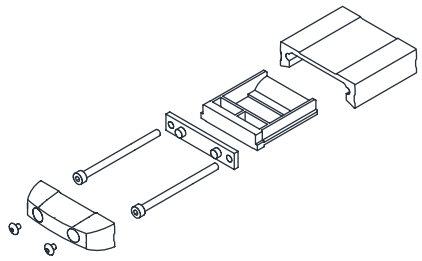
6.12 Strip deflection

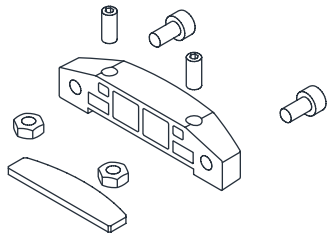
Order data



Description		Order no.
Kit with 1 housing for strip deflection 1 deflection unit with brush 1 holding plate 1 rubber buffers 4 screws	**For axis ...**	
	PAS41	**SPM3MAC1D0041**
	PAS42	**SPM3MAC2D0042**
	PAS43	**SPM3MAC3D0043**
	PAS44	**SPM3MAC4D0044**

6.13 Cover strip clamp

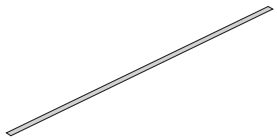
Order data



Description		Order no.
Kit with 1 cover strip clamp 1 clamping plate 2 screws 2 set screws 2 nuts	**For axis ...**	
	PAS41	**SPM3MAC1F041**
	PAS42	**SPM3MAC1F042**
	PAS43	**SPM3MAC1F043**
	PAS44	**SPM3MAC1F044**

6.14 Magnetic strips

Order data



Description				Order no.
Contains 2 piece				
For axis ...	**Width [mm (in)]**	**Height [mm (in)]**	**Length m (ft)**	
PAS41	2.5 (0.10)	1 (0.04)	1.5 (4.92)	**SPM3MAW1S215**
			3 (9.84)	**SPM3MAW1S230**
			6 (19.69)	**SPM3MAW1S260**
PAS42	4.0 (0.16)	1 (0.04)	1.5 (4.92)	**SPM3MAW1S415**
			3 (9.84)	**SPM3MAW1S430**
			6 (19.69)	**SPM3MAW1S460**
PAS43 / PAS44	6.0 (0.24)	1 (0.04)	1.5 (4.92)	**SPM3MAW1S615**
			3 (9.84)	**SPM3MAW1S630**
			6 (19.69)	**SPM3MAW1S660**

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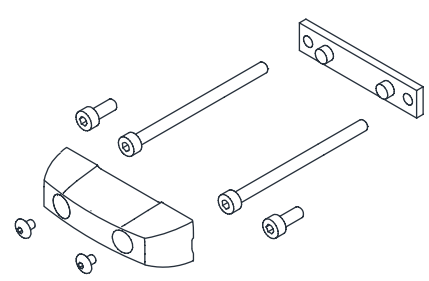
6.15 Rubber buffer

Order data

	Description		Order no.
	Kit with 2 rubber buffers 2 holding plates 12 screws	**For axis ...**	
		PAS41	**SPM3MAC1B041**
		PAS42	**SPM3MAC2B042**
		PAS43	**SPM3MAC3B043**
		PAS44	**SPM3MAC4B044**

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7 Service, maintenance and disposal

⚠ WARNING

GREAT MASS OR FALLING PARTS

- Use a 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 Toothed belt

- Perform a visual inspection of the toothed belt for damage to the teeth and abrasion at the sides. To do so, remove the toothed belt as described in chapter "7.3.6 Replacing the toothed belt".

A damaged toothed belt must be replaced.

7.2.2 Linear guide

The linear guide consists of the guide carriage and the roller guide or 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 toothed belt as described in chapter "7.3.6 Replacing the toothed belt".
- Manually move the carriage (without toothed belt). 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.

7.2.3 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.

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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.

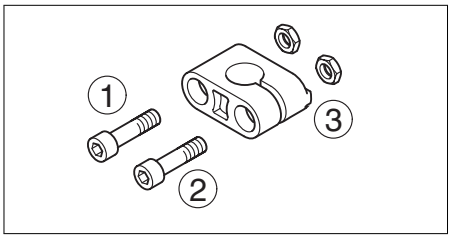
Unless otherwise specified, the standard tightening torques indicated on page 81 *apply.*

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 84.

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 81 *apply.*

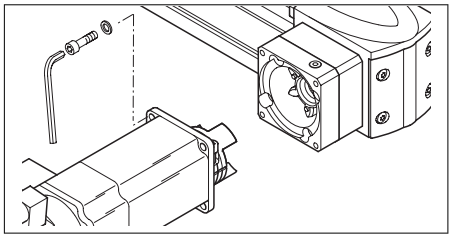
Prerequisites

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.

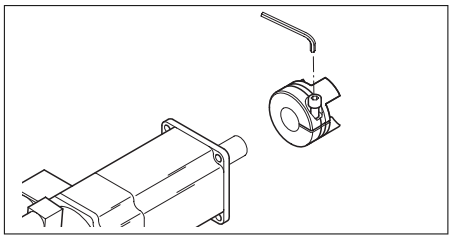
NOTE: Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

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.

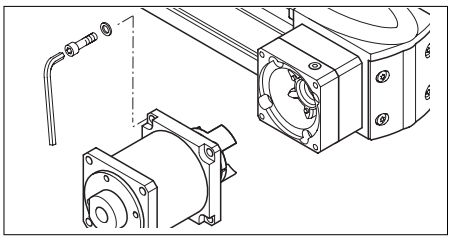
  This requires a greater force of up to 450 N (101.16 lbf).



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

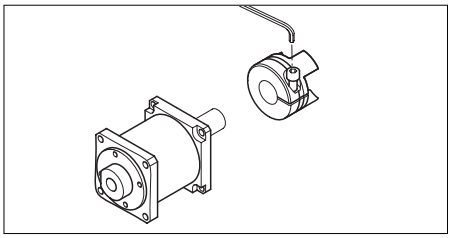
Dismounting, gearbox only

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

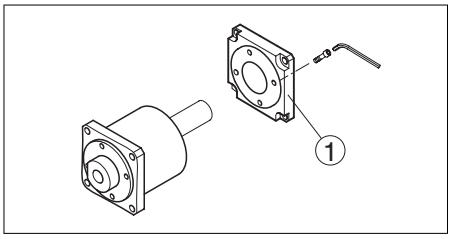


- ▸ Remove the 4 screws and washers at the gearbox flange.
- ▸ Pull the gearbox and the clamping hub off of the motor adapter plate.

  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 86.

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 81 *apply.*

Prerequisites

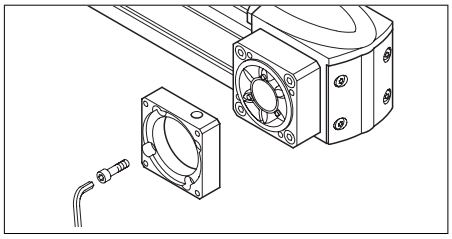
See chapter "6 Accessories and spare parts" for suitable spare parts.

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

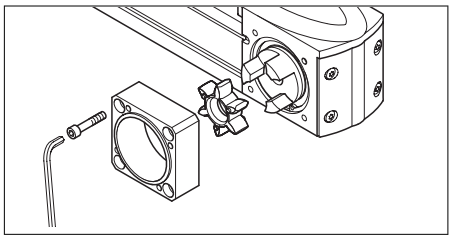
NOTE: Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

Procedure

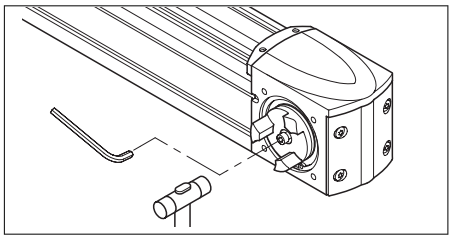
- Dismount the motor or the gearbox as described in chapter "7.3.2 Replacing the motor or the gearbox".



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

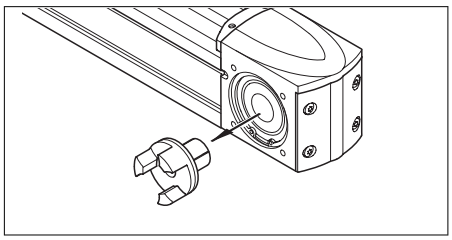


- Dismount the coupling housing with the 4 screws.
- Pull the elastomer spider off of the expanding hub.



- Loosen the screw of the expanding hub.

  If the carriage is in the end position, the toothed belt pulley does not turn along.
- Tap the screw head lightly with a dead blow hammer so the cone comes loose. The expanding hub is now loose and be removed.



- Pull the expanding hub out of the hollow shaft of the toothed belt pulley.

- Mount the elastomer coupling as well as the motor or the gearbox as described on page 86.

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7.3.4 Replacing the shaft extension

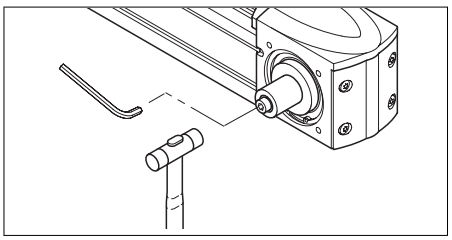
Prerequisites

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 and a dead blow hammer.

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



- Loosen the screw at the shaft extension.

  If the carriage is in the end position, the toothed belt pulley does not turn along.
- Tap the screw head lightly with a dead blow hammer so the cone comes loose.
- Pull the shaft extension out of the end block.

  This requires a greater force.

- Mount the shaft extension as described on page 90.

7.3.5 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 81 *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

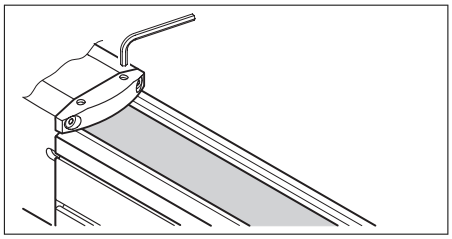
See chapter "6 Accessories and spare parts" for suitable spare parts.

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.

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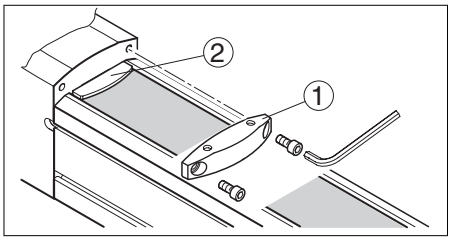
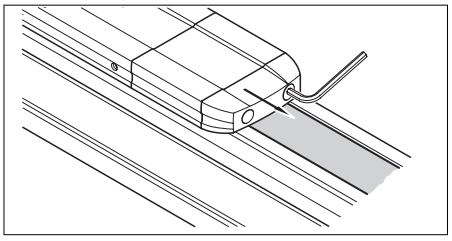
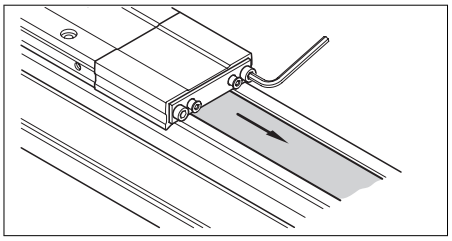


- Remove the cover strip clamp (1). To do so, loosen the two screws.

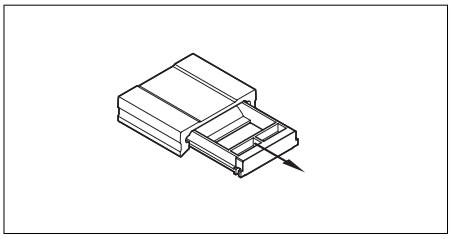
  Keep the screws and the clamping plate (2) from falling down.



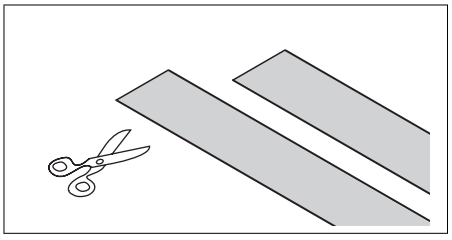
- Remove the rubber buffer at the strip deflection. To do so, loosen the two screws.



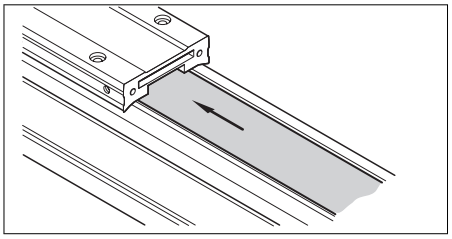
- Remove the holding plate together with the strip deflection. To do so, loosen the two screws.
- Pull out the entire cover strip.



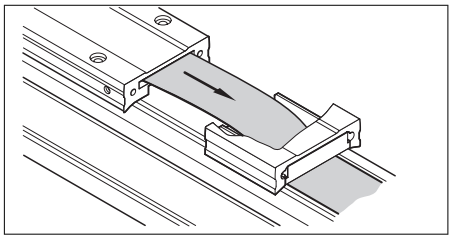
- Remove the plastic unit from the housing of the strip deflection.
- Insert the new plastic unit into the housing of the strip deflection.



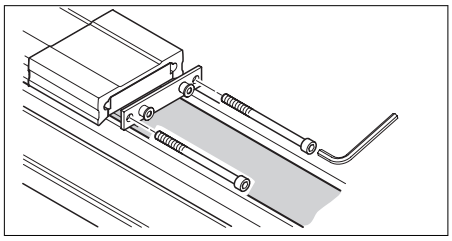
- Cut the new cover strip to the same length as the old cover strip with the tin snips.



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

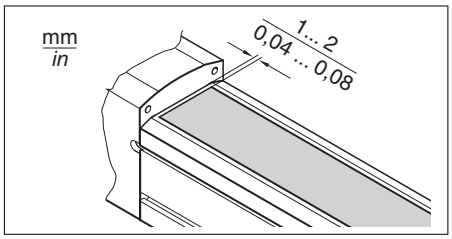


- Guide the new cover strip through the strip deflections.



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

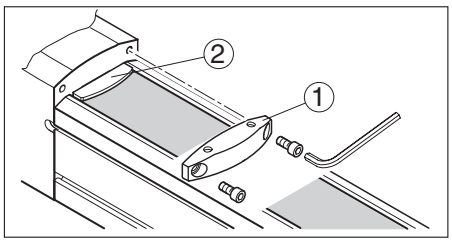
  When doing so, align the strip deflection and the carriage.



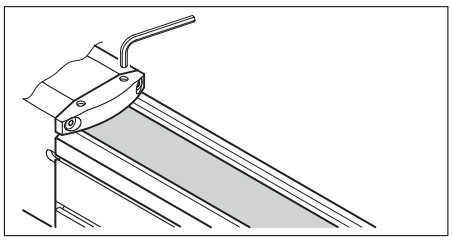
- Place the cover strip over the entire length of the axis body.

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

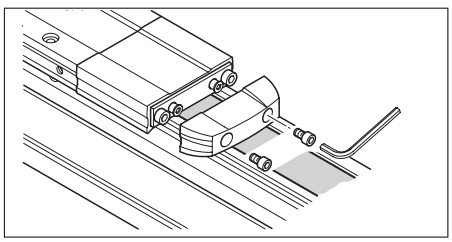
  Verify that the cover strip has even contact with the magnetic strips.



- Fit the clamping plate (2) into place.
- Screw the cover strip clamp (1) into place with the tightening torque specified on page 122.



- Tighten the two set screws for holding the clamping plate with the tightening torque specified on page 122.



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

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Test movements

- Run initial tests at reduced velocity. Verify proper function of the cover strip.

7.3.6 Replacing the toothed belt

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.

Unless otherwise specified, the standard tightening torques indicated on page 81 *apply.*

Special tightening torques

Belt tensioner		**PAS41**	**PAS42**	**PAS43**	**PAS44**
Set screw DIN 913 - 45H		M3 x 4	M4 x 5	M4 x 5	M6 x 6
Wrench size	mm	1.5	2	2	3
Tightening torque	Nm (lb·in)	0.1 (0.89)	0.15 (1.33)	0.15 (1.33)	0.3 (2.66)

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 medium strength threadlocker.

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.

Calculation of the required toothed belt length:

L = 2 x total length of axis

To adjust the belt tension, you need a caliper (distance measurement) or a belt tension meter (vibration measurement).

Distance measurement

Distance measurement measures the position of the belt tensioner. This method is used to preload the toothed belt as described in "Procedure ".

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Vibration measurement

To restore the precise factory-adjusted belt tension, you must use a belt tension meter for vibration measurement.

The factory-adjusted belt tension is shown in the table below. The measured preload values F_V depend on the density of the toothed belt Z_M and a selectable measuring distance A.

The measuring distance A is measured from the center of the end block to the edge of the carriage.

Toothed belt		**PAS41**	**PAS42**	**PAS43**	**PAS44**
Width / pitch		15HTD-3M	25HTD-5M	30HTD-5M	50HTD-8M
Density Z_M	g/m	32	96	118	311
Belt tension F_V	N (lbf)	145 ... 180 (32.60 ... 40.47)	570 ... 1710 (128.14 ... 384.42)	670 ... 1870 (150.62 ... 420.39)	1915 ... 12400 (430.51 ... 2787.63)

Contact your local sales office if you have questions concerning the vibration measurement.

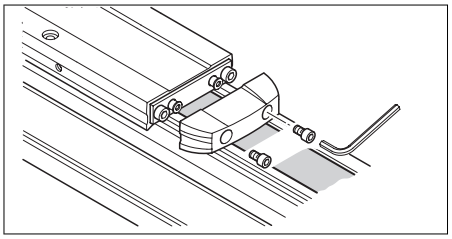
Notes on belt tension

- The belt tension must be so high that the belt is still tensioned under maximum operating load.
- If the tension is not high enough, this may lead to jumping. If the belt tension is too high, this increases the load on the bearings and reduces the service life.
- During the first hours of operation, the belt preload decreases. The belt tension must be verified after 50 operating hours.
- Due to pitch and rigidity tolerances of the toothed belt, the newly adjusted belt tension may differ from the originally adjusted belt tension.

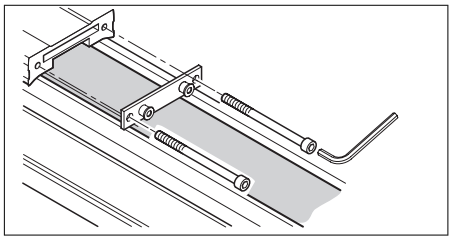
Procedure

- ▸ Push the carriage into center position.
- ▸ If installed, remove the cover strip and the strip deflections as described on page 122.

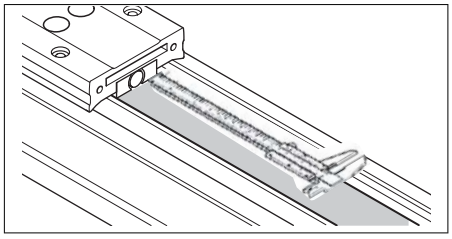
NOTE: Perform the steps described below at both ends of the carriage and at both end of the linear axis.



- ▸ Remove the rubber buffers from the carriage. To do so, loosen the two screws.

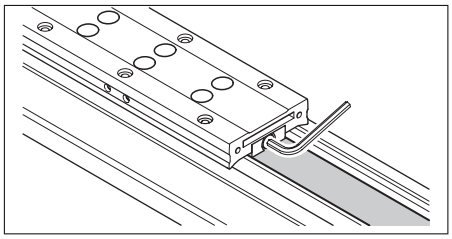


- Remove the holding plate at the carriage. To do so, loosen the two screws.

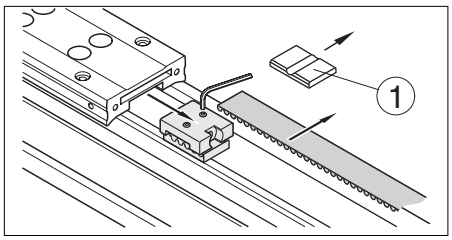


- Perform the following step for preloading with distance measurement at both belt tensioners.
- Measure the position of the belt tensioner with a caliper prior to releasing the belt tension.

  The carriage is the stop. The belt tensioner is the measuring point.
- Record the measured values.



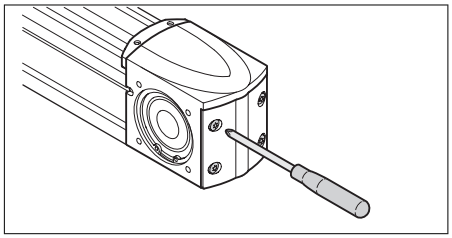
- Loosen the tensioning screw at the belt tensioner.



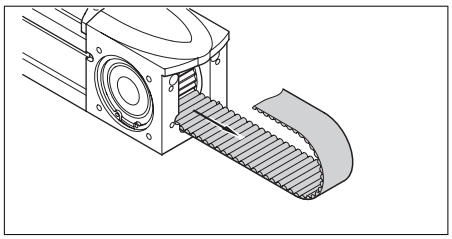
- Pull out the belt tensioner along with the toothed belt.

  This may require a greater force.
- Loosen the two set screws at the belt tensioner.

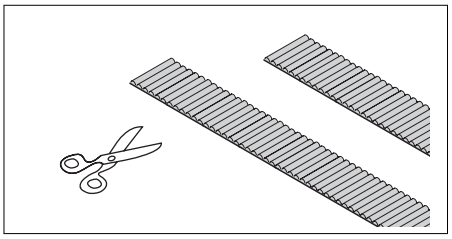
  This requires a greater torque due to the threadlocker.
- Slide the toothed belt to the side out of the belt tensioner.
- Slide the clamping plate (1) to the side out of the belt tensioner.



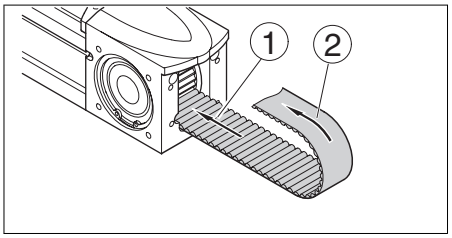
- Remove the cover at the end block. To do so, loosen the 4 screws.



- Remove the toothed belt from the axis body.

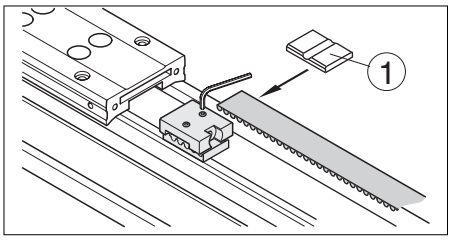


- Place the new and the old toothed belts next to each other. Align the teeth with each other.
- Cut the new toothed belt to the same length (number of teeth) as the old toothed belt.



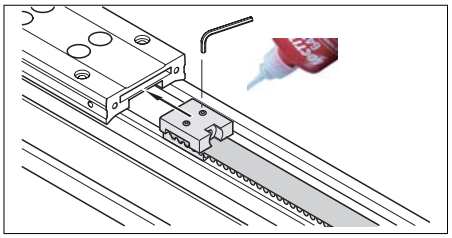
- Guide one end (1) of the new toothed belt below the toothed belt pulley through the end block until it is visible at the end of the linear axis.

  The teeth must point upward.
- Guide the other end (2) of the toothed belt above the toothed belt pulley through the end block.

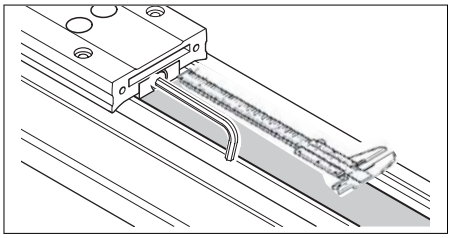


- From the side, insert the end of the toothed belt into the belt tensioner so that all 5 teeth are covered.
- From the side, press the clamping plate (1) with the recess upward into the belt tensioner.

  Verify that the toothed belt is inserted symmetrically and the clamping plate is inserted flush into the belt tensioner.

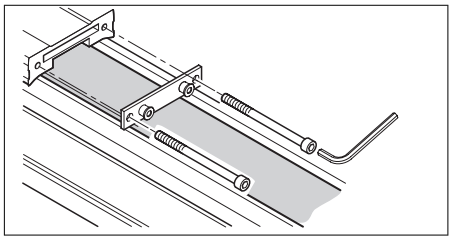


- Apply a thin layer of medium strength threadlocker to the the set screws at the belt tensioner.
- Tighten the set screws with the tightening torque specified on page 90.
- Push the belt tensioner into the carriage.

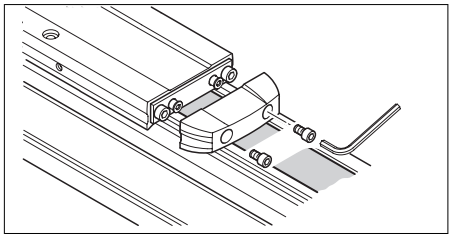


- Perform the following step for preloading with distance measurement at both belt tensioners.
- Tension the toothed belt via the tensioning screws to the recorded measured values.

- Mount the strip deflections and the cover strip as described in chapter "7.3.5 Replacing the cover strip and the strip deflection".



- Place the holding plate for mounting the rubber buffer into position at the carriage.



- Mount the rubber buffer with the screws.

Test movements

- Run initial tests at reduced velocity.
- Respect the information provided in section "Notes on belt tension " in this chapter.

7.3.7 Replacing the toothed belt pulley

Unless otherwise specified, the standard tightening torques indicated on page 81 *apply.*

Prerequisites

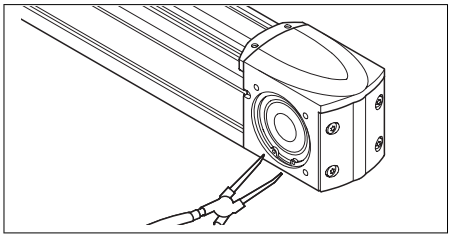
See chapter "6 Accessories and spare parts" for suitable spare parts.

You need a set of Allen keys and a pair of circlip pliers.

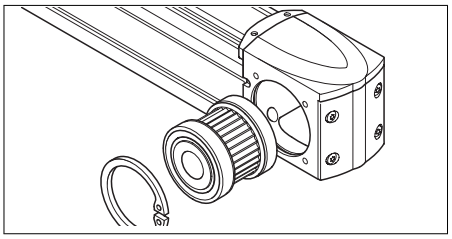
NOTE: Do not use ball head hex keys. Excessive torque may cause the ball head to tear off. A torn off ball head is difficult to remove from the screw.

Procedure

- If you want to replace the toothed belt pulley at the drive end, dismount the motor or gearbox (page 118) and the elastomer coupling (page 118) or the shaft extension (page 121).
- If installed, remove the cover strip and the strip deflections as described on page 122.
- Remove the toothed belt as described on page 126.



- Remove the circlip at one side of the end block with the circlip pliers.



- Remove the toothed belt pulley with the bearing as a unit.
- Clean both bearing seats in the end block.
- Fit the new toothed belt pulley with the bearing.
- Mount the circlip.

- Mount the toothed belt as described on page 126.
- Mount the cover strip as described on page 122.
- Mount the shaft extension as described on page 90.
- Mount the motor as described on page 86.

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

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7.4.3 Lubricating the linear guide and the drive elements

Compare the information on nameplate and in chapter "1.4 Type code" to verify whether your axis has a roller guide or a recirculating ball bearing guide.

7.4.3.1 Lubricating axes with roller guide

The linear screw axis is lubricated with oil from an internal reservoir. The reservoir is factory-prefilled. The carriage features 2 grease nipples at each side for relubrication. The guide rods of the rollers are lubricated and cleaned by oil-soaked lubrication elements.

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

- 2500 km (1553 mi) operational performance

Size	Lubricant [1)]	Relubrication volume	Strokes
PAS41	Lamora D 220	1.25 cm^3 (0.08 in^3)	2 1/2
PAS42	Lamora D 220	3 cm^3 (0.18 in^3)	6
PAS43	Lamora D 220	4.25 cm^3 (0.26 in^3)	8 1/2

1) Alternative lubricating oil CLR220 as per DIN 51517, part 3

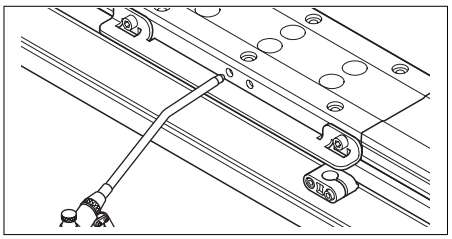
See chapter "6 Accessories and spare parts" for grease guns, nozzles and lubricants.

Notes on greasing

When applying the lubricant, you must not exceed a maximum flow rate. Therefore, the minimum injection time of 5 seconds per grease gun stroke must be adhered to.

Wait for at least 10 seconds between the strokes of the oil gun to allow the oil to penetrate the lubrication elements.

Procedure



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

7.4.3.2 Lubrication of axes with recirculating ball bearing guide

The linear axis is lubricated with grease from a factory-prefilled external reservoir. The carriage features 2 grease nipples at each side for relubrication.

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

- 5000 km (3107 mi) operational performance

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

1) Alternative grease K1N-30 as per DIN 51825

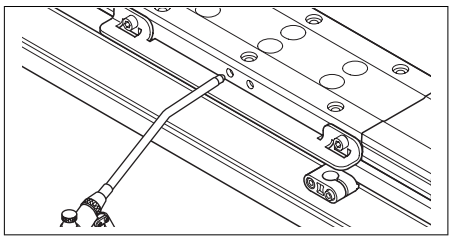
See chapter "6 Accessories and spare parts" for grease guns, nozzles and lubricants.

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



- ▸ 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 grease nipples 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)

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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 m / 0.9144 = 5.468 yd

Length

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

Mass

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

Force

	lb	oz	p	N
lb	-	* 16	* 453.55358	* 4.448222
oz	/ 16	-	* 28.349524	* 0.27801
p	/ 453.55358	/ 28.349524	-	* $9.807*10^{-3}$
N	/ 4.448222	/ 0.27801	/ $9.807*10^{-3}$	-

Power

	HP	W
HP	-	* 746
W	/ 746	-

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Rotation

	min^{-1} (RPM)	**rad/s**	**deg./s**
min^{-1} (RPM)	-	* π / 30	* 6
rad/s	* 30 / π	-	* 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	* $1.129*10^{6}$
lb·ft	* 12	-	* 192	* 1.355822	* 0.138255	* 13.8255	* $13.558*10^{6}$
oz·in	/ 16	/ 192	-	* $7.0616*10^{-3}$	* $720.07*10^{-6}$	* $72.007*10^{-3}$	* 70615.5
Nm	/ 0.112985	/ 1.355822	/ $7.0616*10^{-3}$	-	* 0.101972	* 10.1972	* $10*10^{6}$
kp·m	/ 0.011521	/ 0.138255	/ $720.07*10^{-6}$	/ 0.101972	-	* 100	* $98.066*10^{6}$
kp·cm	/ 1.1521	/ 13.8255	/ $72.007*10^{-3}$	/ 10.1972	/ 100	-	* $0.9806*10^{6}$
dyne·cm	/ $1.129*10^{6}$	/ $13.558*10^{6}$	/ 70615.5	/ $10*10^{6}$	/ $98.066*10^{6}$	/ $0.9806*10^{6}$	-

Moment of inertia

	lb·in^2	**lb·ft^2**	**kg·m^2**	**kg·cm^2**	**kp·cm·s^2**	**oz·in^2**
lb·in^2	-	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
lb·ft^2	* 144	-	* 0.04214	* 421.4	* 0.429711	* 2304
kg·m^2	* 3417.16	/ 0.04214	-	* $10*10^{3}$	* 10.1972	* 54674
kg·cm^2	* 0.341716	/ 421.4	/ $10*10^{3}$	-	/ 980.665	* 5.46
kp·cm·s^2	* 335.109	/ 0.429711	/ 10.1972	* 980.665	-	* 5361.74
oz·in^2	/ 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^2	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^2	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

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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.

Axis body The axis body is aa aluminum precision profile.

Breakaway torque The breakaway torque describes the driving torque required to overcome the static friction and that initiates the transition to sliding friction.

Cantilever axis In the case of a cantilever axis, the carriage is stationary while the axis body moves. Portal axes work the other way round.

DOM **D**ate **o**f **m**anufacturing: 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

Degree of protection 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).

Direction of movement In the case of a rotary motors, 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.

Drive element The drive element of the linear axis consists of the toothed belt and the toothed belt pulley.

Error Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

Feed per revolution The feed per revolution is the distance the carriage covers per motor revolution.

Linear guide The linear guide consists of:

- the rollers and the guide rod which comprise the roller guide (PAS4•BR).
- the guide carriage and the guide rail which comprise the recirculating ball bearing guide (PAS4•BB).

Load torque 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.

Modulus of elasticity 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.

Mounting position 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.

Portal axis In the case of a portal axis, the axis body is stationary while the carriage moves. Cantilever axes work the other way round.

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Positioning accuracy	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.
Recirculating ball bearing	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.
Repeatability	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.
Roller guide	The axis axis body absorbs the forces and torques applied at the carriage via the roller guide.
Running accuracy	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.
Sensor	Inductive proximity switches are used as sensors for limit switches or reference switches. These switches are not a safety function.
Service life	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.
Stiffness	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.
Stroke reserve	The stroke reserve is the distance between a limit switch and the mechanical stop.
Stroke	Stroke is the maximum travel of the carriage between the switching points of the limit switches.
Support axis	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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