

Toothed belt axes ELGR

FESTO



Toothed belt axes ELGR

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Key features

At a glance

- Ideal price/performance ratio
- Ready-to-install unit for quick and easy configuration
- Excellent reliability thanks to tested service life of 5,000 km
- Motor assembly possible on 4 sides with identical mounting accessories
- Complete kit for simple and space-saving solution for end-position sensing
- Plain-bearing guide
 - For small loads
 - Operating behaviour with torque load = Average
 - Guide backlash = 0.05 mm (on delivery)
- Recirculating ball bearing guide
 - For medium loads
 - Operating behaviour under torque load = Very good
 - Backlash-free guide (preloaded guide elements)

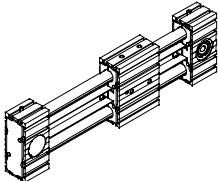
Applications

- Pick and Place with effective loads of up to 15 kg
- Positioning and handling with low process forces
- Actuation of guard doors in processing machines

Characteristic values of the axes

The specifications shown in the table are maximum values.

The precise values for each of the variants can be found in the relevant technical data.

Version	Size	Working stroke [mm]	Speed [m/s]	Repetition accuracy [mm]	Feed force [N]	Guide characteristics				
						Forces and torques				
						Fy [N]	Fz [N]	Mx [Nm]	My [Nm]	Mz [Nm]
	35	50 ... 800	3	±0.1	50	50	50	2.5	20	20
	45	50 ... 1,000	3	±0.1	100	100	100	5	40	40
	55	50 ... 1,500	3	±0.1	350	300	300	15	124	124

-  - Note
PositioningDrives
sizing software
www.festo.com

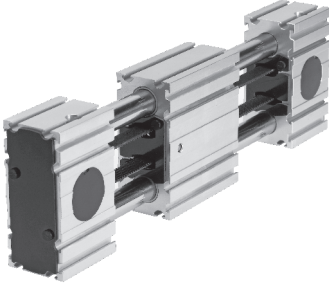
Toothed belt axes ELGR

Key features

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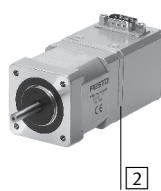
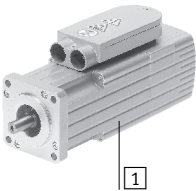
Complete system comprising toothed belt axis, motor, motor controller and motor mounting kit

Toothed belt axis with recirculating ball bearing or plain-bearing guide



Motor

→ 18



- 1 Servo motor EMMS-AS
- 2 Stepper motor EMMS-ST



Note

A range of specially adapted complete solutions is available for the toothed belt axis ELGR and the motors.

Motor controller

Technical data → Internet: motor controller



- 1 Servo motor controller CMMP-AS, CMMS-AS
- 2 Stepper motor controller CMMS-ST

Motor mounting kit

→ 18

Axial kit



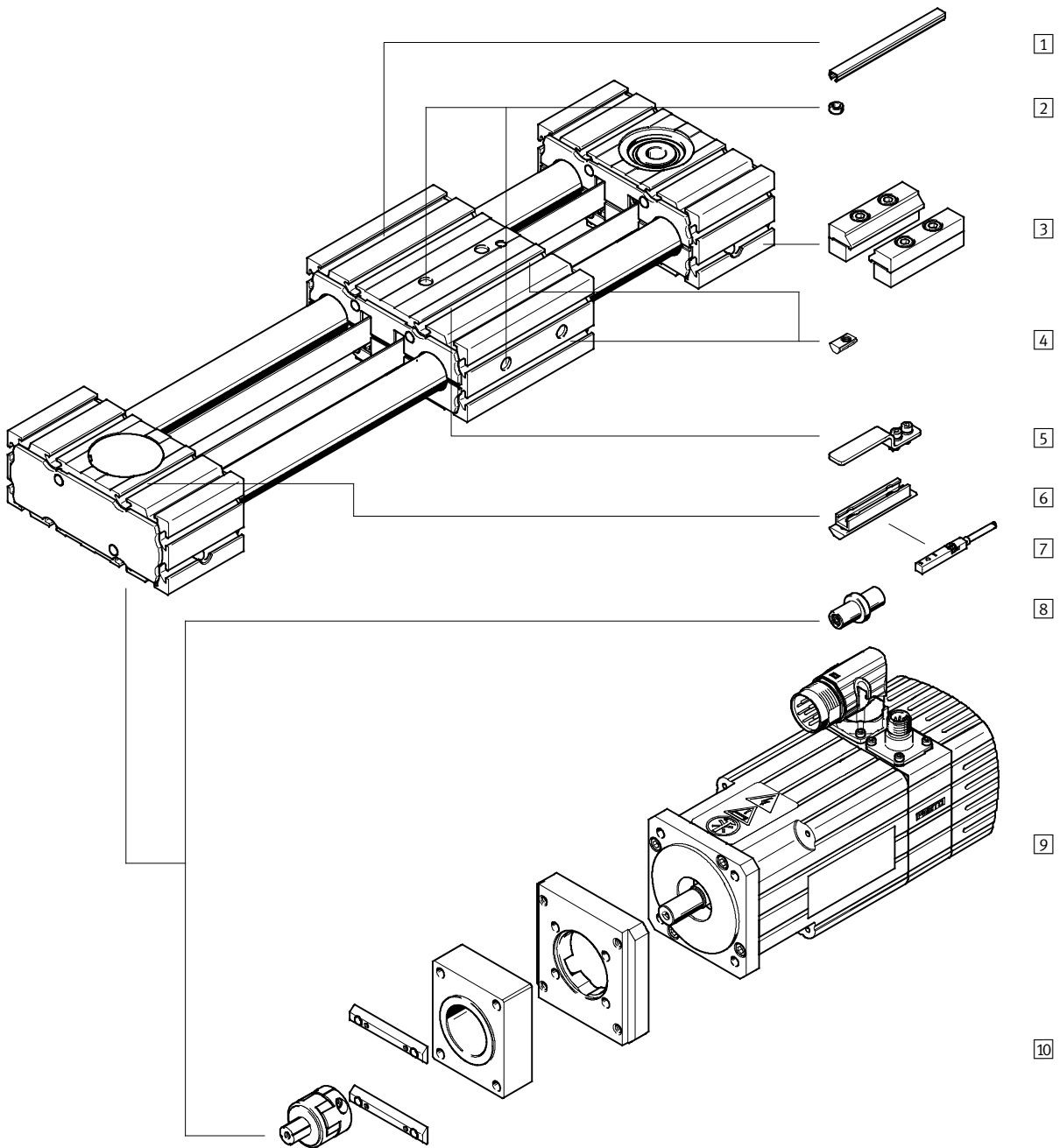
Kit comprising:

- Motor flange
- Coupling housing
- Coupling
- Screws
- Slot nuts

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Peripherals overview

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Toothed belt axes ELGR

Peripherals overview

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Variants and accessories		
Type	Brief description	→ Page/Internet
1 Slot cover NC	For protecting against ingress of dirt	20
2 Centring sleeve ZBH	- For centring loads and attachments on the slide 2 centring sleeves included in the scope of delivery of the axis	20
3 Profile mounting MA	For mounting the axis on the bearing cap	19
4 Slot nut NM	For mounting attachments	20
5 Switching lug SA, SB	For sensing the slide position	19
6 Sensor bracket SA, SB	Adapter for mounting the inductive proximity sensors on the axis	19
7 Proximity sensor, slot type 8 SA, SB	- Inductive proximity sensor, for slot type 8 - The order code SA, SB includes 1 switching lug and 1 sensor bracket in the scope of delivery	21
8 Drive shaft EA	- Can be used as an alternative interface if required - The axis/motor combinations → 18 do not require a drive shaft	20
9 Motor EMMS	Motors specially matched to the axis, with or without brake	18
10 Axial kit EAMM	For axial motor mounting (comprising: coupling, coupling housing and motor flange)	18
– Connecting cable NEBU	For proximity sensor (order code SA and SB)	21

Toothed belt axes ELGR

Type codes

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		ELGR	-	TB	-		-	45	-	500	-	30H	-	L	-	
Type																
ELGR	Linear axis															
Drive function																
TB	Toothed belt															
Guide																
-	Recirculating ball bearing guide															
GF	Plain-bearing guide															
Size																
Stroke [mm]																
Stroke reserve																
Slide																
-	Slide Standard															
L	Slide, long															
Additional slide																
-	No additional slide															
ZR	1 slide on right															
ZL	1 slide on left															
ZB	1 slide on right, 1 slide on left															

Toothed belt axes ELGR

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Type codes

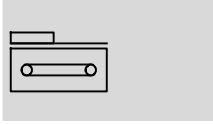
→		2SA		4NM	EA	2MA
Proximity sensor						
...SA	Proximity sensor (SIES), inductive, slot type 8, PNP, N/O contact, cable 7.5 m					
...SB	Proximity sensor (SIES), inductive, slot type 8, PNP, N/C contact, cable 7.5 m					
Cover						
...NC	For mounting slot					
Slot nut						
...NM	For mounting slot					
Drive shaft						
...EA	Drive shaft					
Profile mounting						
...MA	Profile mounting					

Toothed belt axes ELGR

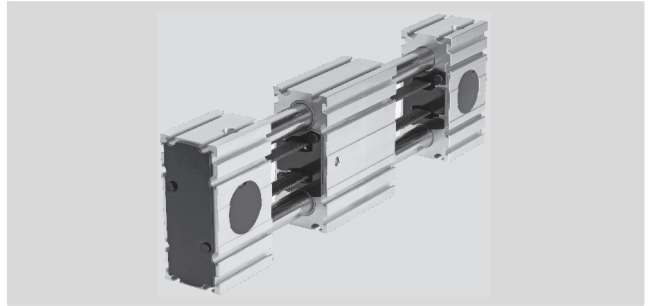
Technical data

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Function



-  Size
35 ... 55
-  Stroke length
50 ... 1,500 mm
-  www.festo.com



General technical data				
Size		35	45	55
Constructional design		Electromechanical linear axis with toothed belt		
Guide		Recirculating ball bearing guide		
		Plain-bearing guide		
Mounting position		Any		
Working stroke	[mm]	50 ... 800	50 ... 1,000	50 ... 1,500
Max. feed force F_x	[N]	50	100	350
Max. no-load torque	[Nm]	0.1	0.2	0.4
Max. driving torque	[Nm]	0.46	1.24	5
Max. no-load resistance to displacement	[N]	10.8	16.1	27.9
Max. speed				
Recirculating ball bearing guide	[m/s]	3		
Plain-bearing guide	[m/s]	1		
Max. acceleration ¹⁾	[m/s ²]	50		
Repetition accuracy	[mm]	±0.1		

1) The max. acceleration is dependent on the moving load, the driving torque and the max. feed force

Operating and environmental conditions			
Ambient temperature			
Recirculating ball bearing guide	[°C]	-10 ... +50	
Plain-bearing guide	[°C]	0 ... +40	
Degree of protection		IP20	
Duty cycle	[%]	100	

Weight [kg]			
Size	35	45	55
Recirculating ball bearing guide			
Basic weight with 0 mm stroke ¹⁾			
Slide standard	1.5	3.2	5.4
Slide long	1.9	4.3	7.4
Additional weight per 1,000 mm stroke	2.5	5.0	7.8
Moving load	0.5	1.1	1.9
Slide			
Slide standard	0.5	1.0	1.8
Slide long	0.8	1.7	3.0
Additional slide	0.4	0.9	1.7

1) Incl. slide

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Weight [kg]			
Size	35	45	55
Plain-bearing guide			
Basic weight with 0 mm stroke ¹⁾			
Slide standard	1.4	3.1	5.1
Slide long	1.9	4.3	7.3
Additional weight per 1,000 mm stroke	2.5	5.0	7.8
Moving load	0.4	0.9	1.5
Slide			
Slide standard	0.4	0.9	1.5
Slide long	0.7	1.6	2.8
Additional slide	0.3	0.7	1.3

1) Incl. slide

Toothed belt			
Size	35	45	55
Pitch [mm]	2	3	3
Tensile stress ¹⁾ [%]	0.094	0.08	0.21
Width [mm]	10	15	19.3
Effective diameter [mm]	18.46	24.83	28.65
Feed constant [mm/rev.]	58	78	90

1) At max. feed force

Mass moment of inertia			
Size	35	45	55
J ₀			
Slide standard [kg mm ²]	40.26	155.13	360.48
Slide long [kg mm ²]	66.50	271.52	638.74
J _S per metre stroke [kg mm ² /m]	0.26	1.06	1.88
J _L per kg working load [kg mm ² /kg]	85.19	154.13	205.21
J _W Additional slide [kg mm ²]	36.75	136.55	301.92

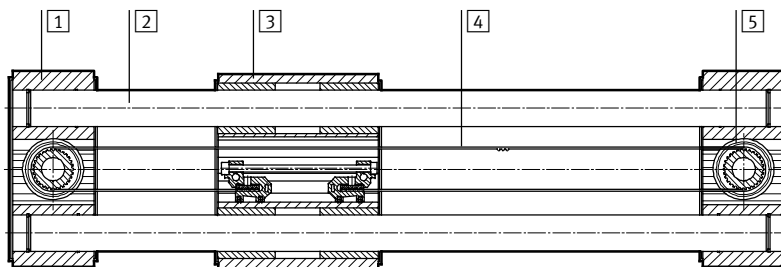
The mass moment of inertia J_A of the entire axis is calculated as follows:

$$J_A = J_0 + K \times J_W + J_S \times \text{working stroke [m]} + J_L \times m_{\text{effective load [kg]}}$$

K = Number of additional slides

Materials

Sectional view



Axis	
1 Bearing cap, profile	Wrought aluminium alloy, anodised
2 Guide rods	Steel
3 Slide, profile	Wrought aluminium alloy, anodised
4 Toothed belt	Polychloroprene with glass cord and nylon coating
5 Belt pulley	High-alloy stainless steel
Note on materials	
RoHS-compliant	
Contains PWIS (paint-wetting impairment substances)	

Toothed belt axes ELGR

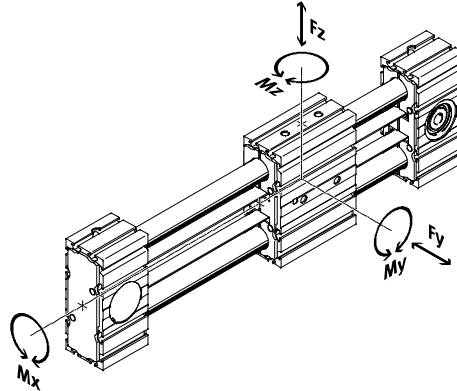
Technical data

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Characteristic load values

The indicated forces and torques refer to the centre of the guide. The point of application of force is the point where the centre of the guide and the longitudinal centre of the slide intersect.

These values must not be exceeded during dynamic operation. Special attention must be paid to the cushioning phase.



If the axis is subjected to more than two of the indicated forces and torques simultaneously, the following equation must be satisfied in addition to the indicated maximum loads:

Calculating the load comparison factor:

$$f_v = \frac{|F_{y,dyn}|}{F_{y,max.}} + \frac{|F_{z,dyn}|}{F_{z,max.}} + \frac{|M_{x,dyn}|}{M_{x,max.}} + \frac{|M_{y,dyn}|}{M_{y,max.}} + \frac{|M_{z,dyn}|}{M_{z,max.}} \leq 1$$

Permissible forces and torques for a service life of 5,000 km						
Guide	Plain-bearing guide			Recirculating ball bearing guide		
Size	35	45	55	35	45	55
$F_{y,max.}, F_{z,max.}$ [N]	50	100	300	50	100	300
Slide standard						
$M_{x,max.}$ [Nm]	1	2.5	5	2.5	5	15
$M_{y,max.}$ [Nm]	4	8	16	8	16	48
$M_{z,max.}$ [Nm]	4	8	16	8	16	48
Slide long						
$M_{x,max.}$ [Nm]	1	2.5	5	2.5	5	15
$M_{y,max.}$ [Nm]	10	20	40	20	40	124
$M_{z,max.}$ [Nm]	10	20	40	20	40	124

Service life

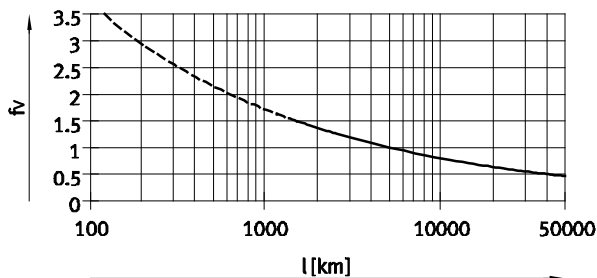
The service life of the guide depends on the load. To provide a rough indication of the service life of the guide, the

graph below plots the load comparison factor f_v against the service life.

This graph only shows theoretical values. Consultation with your local contact person at Festo is mandatory

for load comparison factors f_v greater than 1.5.

Load comparison factor f_v as a function of service life



Example:

A user wants to move an X kg load. Using the above calculation gives a value of 1.5 for the load comparison factor f_v . According to the graph, the guide would have a service life of

approx. 1,500 km. Reducing the acceleration reduces the M_z and M_y values. A load comparison factor of 1 now gives a service life of 5,000 km.

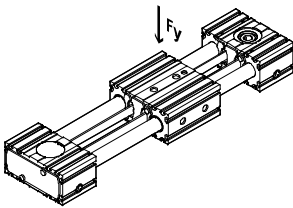
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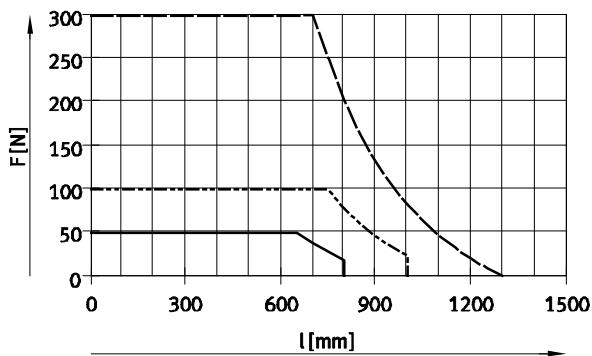
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Max. load with flat mounting position



The characteristics in the graph correspond to the max. recommended deflection of 0.5 mm.

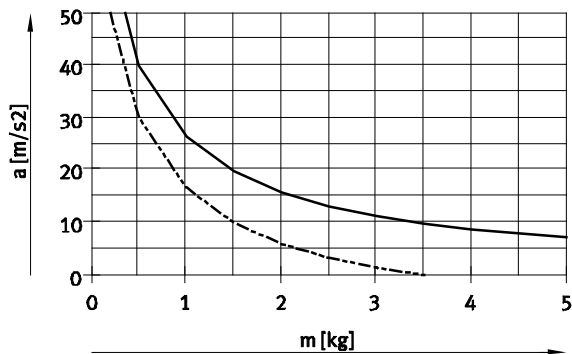
In this case, the axis can no longer support the maximum load past a certain stroke length.



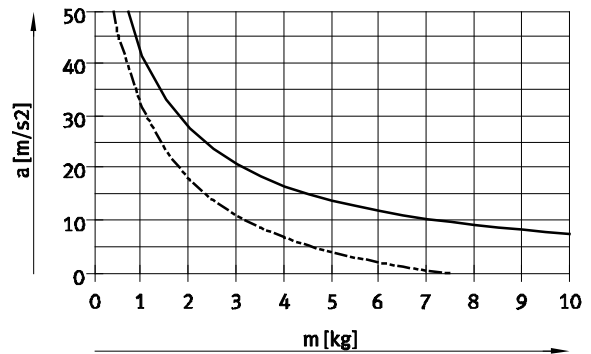
— ELGR-TB-35
 - - - ELGR-TB-45
 - · - ELGR-TB-55

Maximum acceleration a as a function of applied load m

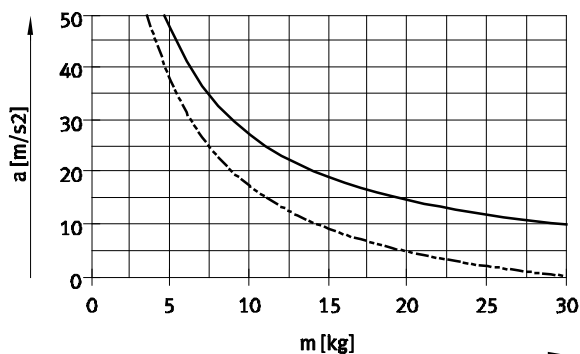
ELGR-35



ELGR-45



ELGR-55



— Horizontal
 - - - Vertical

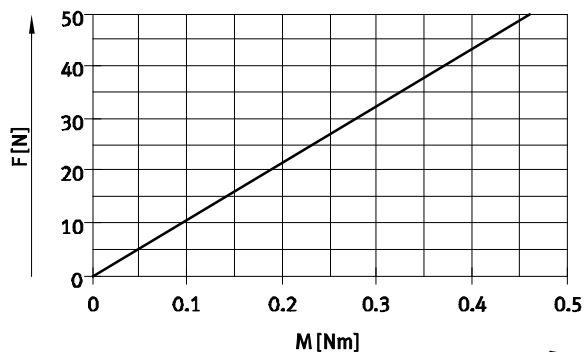
Toothed belt axes ELGR

Technical data

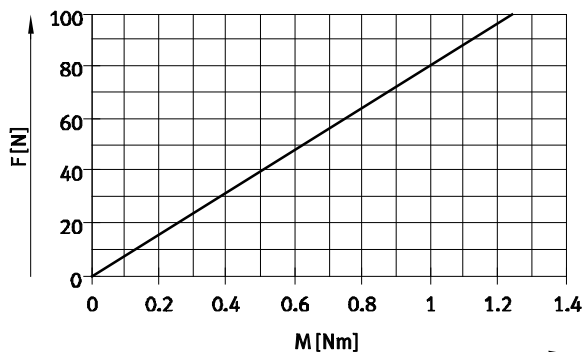
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Feed force F_x as a function of input torque M

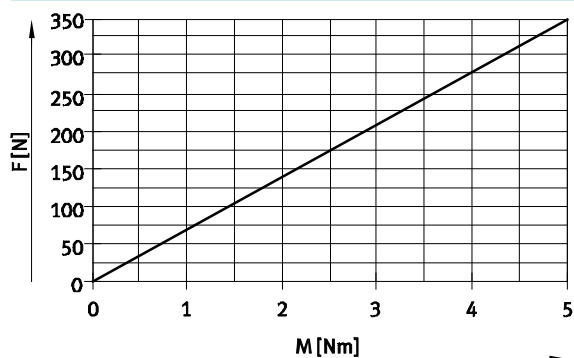
ELGR-35



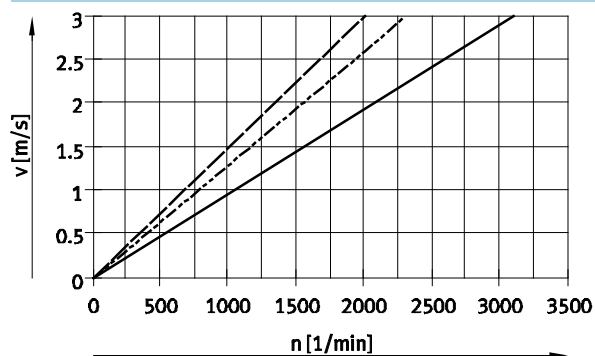
ELGR-45



ELGR-55



Speed v as a function of rotational speed n



— ELGR-TB-35
 - - - ELGR-TB-45
 — ELGR-TB-55

Toothed belt axes ELGR

Technical data

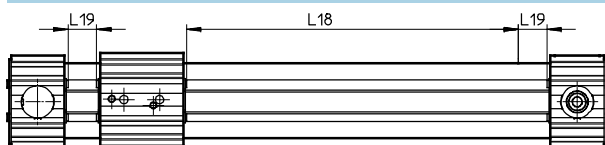
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Min. nominal stroke

With standard slide or long slide L with additional slide ZR/ZL/ZB

Size	35			45			55		
Variant	-/L	ZR/ZL	ZB	-/L	ZR/ZL	ZB	-/L	ZR/ZL	ZB
Min. nominal stroke [mm]	50	126	202	50	146	242	50	166	282

Stroke reserve



L18 = Nominal stroke

L19 = Stroke reserve

- The stroke reserve is a safety distance available on both sides of the axis in addition to the nominal stroke
- The sum of the stroke length and 2x the stroke reserve must not exceed the maximum working stroke
- The stroke reserve length can be freely selected
- The stroke reserve is defined in the modular product system using the "Stroke reserve" feature.

Example:

Type ELGR-TB-45-500-20H...

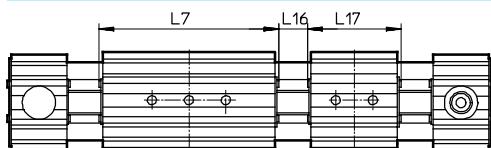
Nominal stroke = 500 mm

2x stroke reserve = 40 mm

Total stroke = 540 mm
(540 mm = 500 mm + 2x 20 mm)

Working stroke reduction

With standard slide or extra-long slide L with additional slide ZR/ZL/ZB



L7 = Slide length

L16 = Distance between both slides

L17 = Additional slide length

- For a toothed belt axis with additional slide, the working stroke is reduced by the length of the additional slide and the distance between both slides
- When ordering the extra-long slide L variant, the additional slide is not extended

Example:

Type ELGR-TB-35-500-...-ZR

Working stroke without additional slide = 500 mm

L16 = 10 mm

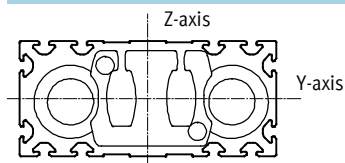
L7, L17 = 76 mm

Working stroke with additional slide = 414 mm
(500 mm - 10 mm - 76 mm)

Dimensions – Additional slide

Size	35	45	55
Length L17 [mm]	76	96	116
Distance between the slides L16 [mm]	≥ 0		

2nd moment of area



Size	35	45	55
I _y [mm ⁴]	3.77x10 ³	1.57x10 ⁴	3.83x10 ⁴
I _z [mm ⁴]	1.89x10 ⁵	8.08x10 ⁵	1.85x10 ⁶

Recommended deflection limits

Adherence to a maximum deflection of 0.5 mm is recommended so as not to impair the functional performance

of the axes. Greater deformation can result in increased friction, greater wear and reduced service life.

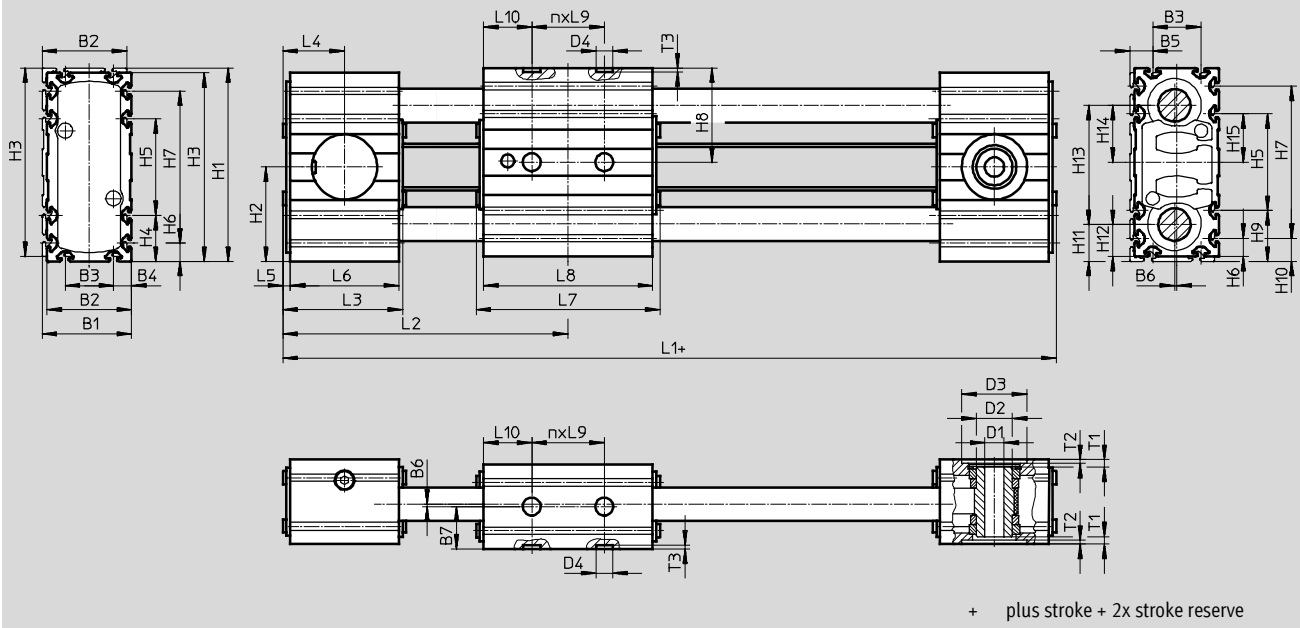
Toothed belt axes ELGR

Technical data

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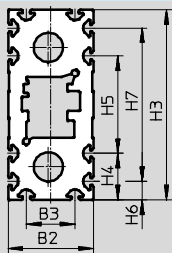
Dimensions

Download CAD data → www.festo.com

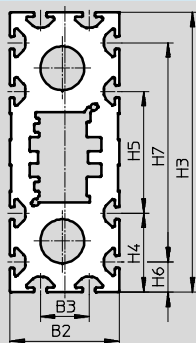


Profile

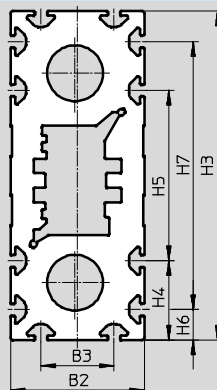
ELGR-35



ELGR-45



ELGR-55



Toothed belt axes ELGR

Technical data

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Size	B1	B2	B3	B4	B5	B6	B7	D1 Ø H7	D2 Ø	D3 Ø H7	D4 Ø H7	H1	H2	H3	H4	H5	H6	H7	H8	H9
ELGR-35	37	35	20	7.5	9.5	1	17.5	8	15	27	7	80	39	78	19	40	7.5	63	39	21
ELGR-35-L																				
ELGR-45	47	45	20	12.5	14.5		22.5	10	20	38		117	57.5	115	32.5	50	12.5	90	57.5	34.5
ELGR-45-L																				
ELGR-55	57	55	30	12.5	14.5		27.5	16	25	48		137	67.5	135	32.5	70	12.5	110	67.5	34.5
ELGR-55-L																				

Size	H10	H11	H12	H13	H14	H15	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	n	T1	T2	T3
																				+0.1
ELGR-35	9.5	15.5	13.5	49	23.5	20	178	89	51	25.5	3	45	76	70	30	20	1	3.1	1.6	1.6
ELGR-35-L							248	124					146	140		40	2			
ELGR-45	14.5	23	21	71	34.5	25	219	108	60	30		54	96	90	40	25	1	3	1.7	
ELGR-45-L							309	153					186	180		50	2			
ELGR-55	14.5	25.5	23.5	86	42	35	243	120	62	31		56	116	110	40	35	1	4.5	2	
ELGR-55-L							353	175					226	220		70	2			

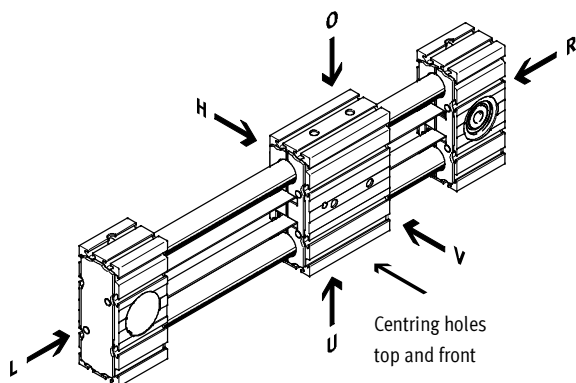
Toothed belt axes ELGR

Ordering data – Modular products

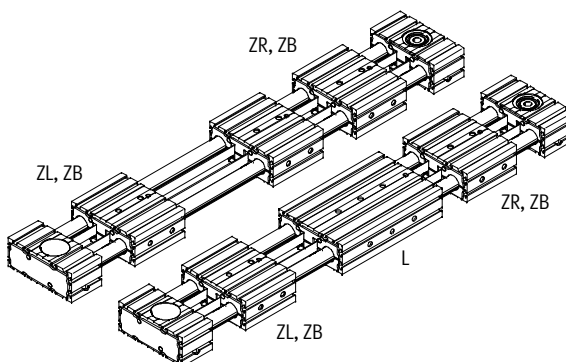
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Order code

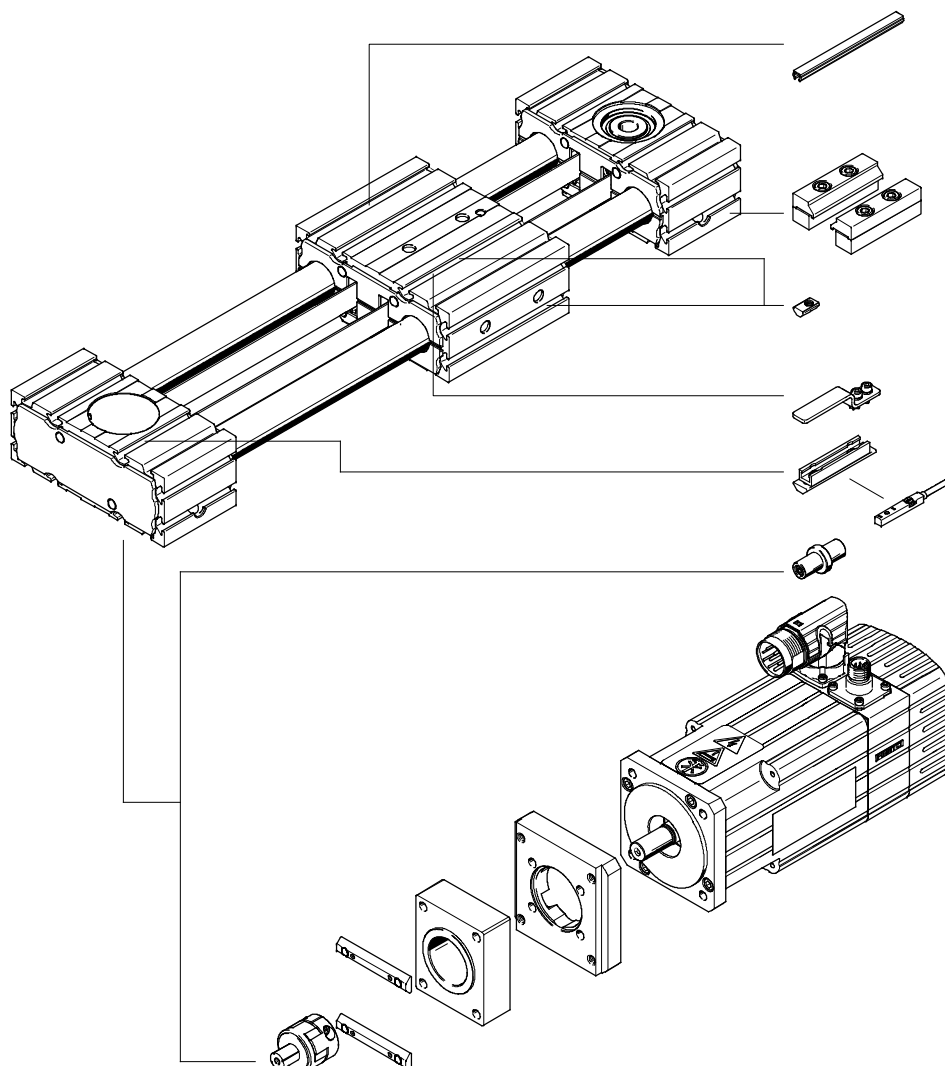
Mandatory data



O top
U underneath
R right
L left
V front
H rear



Accessories



NC

MA

NM

SA, SB

SA, SB

EA

Servo motor EMMS-AS
Stepper motor EMMS-ST
→ 18

Axial kit
→ 18

Toothed belt axes ELGR

Ordering data – Modular products

FESTO

Ordering table									
Size	35	45	55	Condi- tions	Code	Enter code			
[M] Module No.	560505	560506	560507						
Design	Linear axis				ELGR	ELGR			
Drive type	Toothed belt				-TB	-TB			
[O] Guide	Recirculating ball bearing guide								
	Plain-bearing guide				-GF				
[M] Sizes	35	45	55		-...				
Stroke length [mm]	50 ... 800	50 ... 1,000	50 ... 1,500	[1]	-...				
Stroke reserve [mm]	0 ... 999 (0 = no stroke reserve)			[1]	-...H				
[O] Slide design	Standard slide								
	Slide, long				-L				
Additional slide	No additional slide								
	1 slide on right				[2] -ZR				
	1 slide on left				[2] -ZL				
	1 slide on right, 1 slide on left				[2] -ZB				
Accessories	Accessories enclosed separately				+	+			
Proximity sensor (SIES), inductive, slot type 8, PNP, N/O contact, cable 7.5 m, incl. switching lug and sensor bracket	1 ... 6				...SA				
Proximity sensor (SIES), inductive, slot type 8, PNP, N/C contact, cable 7.5 m, incl. switching lug and sensor bracket	1 ... 6				...SB				
Mounting slot cover	-	1 ... 50 (1=2 pieces, 500 mm in length)			...NC				
Slot nut for mounting slot	1 ... 99				...NM				
Drive shaft	1 ... 4				...EA				
Profile mounting	1 ... 2				...MA				

[1] -... The sum of the stroke length and 2x the stroke reserve in mm must not exceed the maximum stroke length

[2] ZR, ZL, ZB Working stroke reduction → 13

Size	35			45			55		
Variant	-/L	ZR/ZL	ZB	-/L	ZR/ZL	ZB	-/L	ZR/ZL	ZB
Min. nominal stroke [mm]	50	126	202	50	146	242	50	166	282

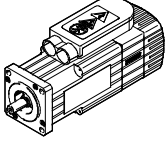
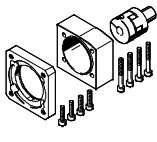
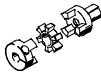
Transfer order code

	ELGR	-	TB	-		-		-		-		+							
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Toothed belt axes ELGR

Accessories

FESTO

Permissible axis/motor combinations with axial kit – Without gear unit				Technical data → Internet: eamm-a
Motor	Axial kit	Axial kit consisting of:		
		Motor flange	Coupling	Coupling housing
				
Type	Part No. Type	Part No. Type	Part No. Type	Part No. Type
ELGR-35				
With servo motor				
EMMS-AS-55-...	1133400 EAMM-A-R27-55A	558176 EAMF-A-38A-55A	557999 EAMD-19-15-9-8X10	1133397 EAMK-A-R27-38A
With stepper motor				
EMMS-ST-57-...	1133403 EAMM-A-R27-57A	560692 EAMF-A-38A-57A	561292 EAMD-16-15-6.35-8X10	1133397 EAMK-A-R27-38A
ELGR-45				
With servo motor				
EMMS-AS-70-...	1133401 EAMM-A-R38-70A	558018 EAMF-A-38A-70A	558000 EAMD-25-22-11-10X12	1133398 EAMK-A-R38-38A
With stepper motor				
EMMS-ST-57-...	1578138 EAMM-A-R38-57A	560692 EAMF-A-38A-57A	561293 EAMD-25-22-6.35-10X12	1133398 EAMK-A-R38-38A
EMMS-ST-87-...	1133404 EAMM-A-R38-87A	560693 EAMF-A-38A-87A	558000 EAMD-25-22-11-10X12	1133398 EAMK-A-R38-38A
ELGR-55				
With servo motor				
EMMS-AS-70-...	1578139 EAMM-A-R48-70A	558025 EAMF-A-48A-70A	558001 EAMD-32-32-11-16X20	1133399 EAMK-A-R48-48A
EMMS-AS-100-...	1133402 EAMM-A-R48-100A	558020 EAMF-A-48A-100A	558002 EAMD-42-40-19-16X25	1133399 EAMK-A-R48-48A
With stepper motor				
EMMS-ST-87-...	1133405 EAMM-A-R48-87A	560695 EAMF-A-48A-87A	558001 EAMD-32-32-11-16X20	1133399 EAMK-A-R48-48A

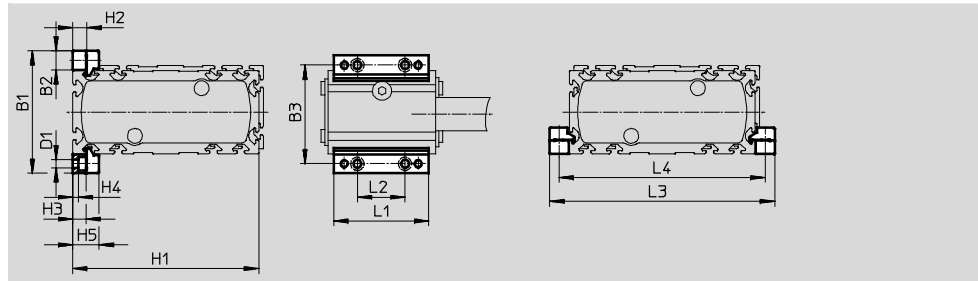
Toothed belt axes ELGR

Accessories

FESTO

Profile mounting MUE (order code MA)

Material:
Anodised aluminium
Conforms to RoHS

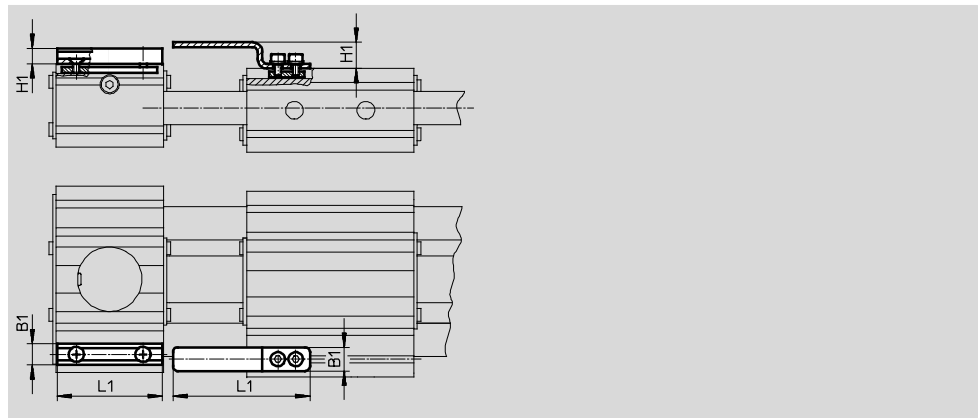


Dimensions and ordering data								
For size	B1	B2	B3	D1 Ø	H1	H2	H3	H4
35	51	8	43	3.4	78	6	5.5	2.3
45	69	12	57	5.5	115	10	9	3.2
55	79	12	67	5.5	135	10	9	3.2

For size	H5	L1	L2	L3	L4	Weight [g]	Part No.	Type
35	11	40	20	94	86	20	558042	MUE-50
45	17.5	52	40	139	127	32	562238	MUE-45
55	17.5	52	40	159	147	32	562238	MUE-45

Sensor bracket EAPM-...-SHS, switch lug EAPM-...-SLS (order code SA/SB)

Materials:
Switch lug: Galvanised steel
Sensor bracket: Anodised wrought
aluminium alloy
Conforms to RoHS



Dimensions and ordering data						
For size	B1	H1	L1	Weight [g]	Part No.	Type
Sensor bracket						
35, 45, 55	9	6.5	44	20	567537	EAPM-L4-SHS
Switch lug						
35, 45, 55	10	11	57.5	15	567538	EAPM-L4-SLS

Toothed belt axes ELGR

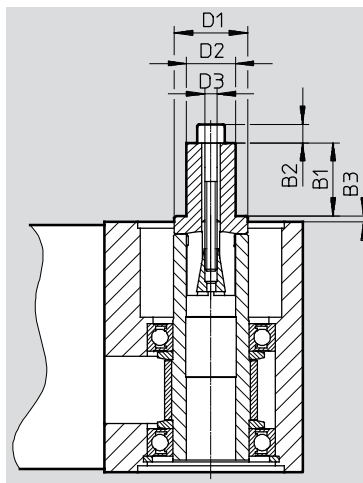
Accessories

FESTO

Drive shaft EAMB

Alternative interface

(order code EA)



Dimensions and ordering data									
For size	B1	B2	B3	D1 Ø	D2 Ø	D3	Weight [g]	Part No.	Type
35	12	3	3,9	16	8	M4	20	558034	EAMB-16-7-8X15-8X10
45	12	4	6	18	8	M5	29	558035	EAMB-18-9-8X16-10X12
55	21	–	1,5	24	15	M6	70	558036	EAMB-24-6-15X21-16X20

Ordering data						
	For size	Comment	Order code	Part No.	Type	PU ¹⁾
Slot nut NST						
	35	For mounting slot	NM	558045	NST-3-M3	1
	45, 55			150914	NST-5-M5	
Centring sleeve ZBH ²⁾						
	35, 45, 55	For slide	–	186717	ZBH-7	10
Slot cover ABP						
	45, 55	For mounting slot every 0.5 m	NC	151681	ABP-5	2

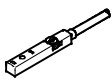
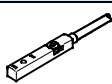
1) Packaging unit

2) 2 centring sleeves included in the scope of delivery of the axis

Toothed belt axes ELGR

Accessories

FESTO

Ordering data – Proximity sensors for T-slot, inductive						Technical data ➔ Internet: sies	
	Type of mounting	Electrical connection	Switching output	Cable length [m]	Order code	Part No.	Type
N/O contact							
	Insertable in the slot from above, flush with the cylinder profile	Cable, 3-wire	PNP	7.5	SA	551386	SIES-8M-PS-24V-K-7,5-OE
		Plug M8x1, 3-pin		0.3	–	551387	SIES-8M-PS-24V-K-0,3-M8D
		Cable, 3-wire	NPN	7.5	–	551396	SIES-8M-NS-24V-K-7,5-OE
		Plug M8x1, 3-pin		0.3	–	551397	SIES-8M-NS-24V-K-0,3-M8D
N/C contact							
	Insertable in the slot from above, flush with the cylinder profile	Cable, 3-wire	PNP	7.5	SB	551391	SIES-8M-PO-24V-K-7,5-OE
		Plug M8x1, 3-pin		0.3	–	551392	SIES-8M-PO-24V-K-0,3-M8D
		Cable, 3-wire	NPN	7.5	–	551401	SIES-8M-NO-24V-K-7,5-OE
		Plug M8x1, 3-pin		0.3	–	551402	SIES-8M-NO-24V-K-0,3-M8D

Ordering data – Connecting cables				Technical data → Internet: nebu	
	Electrical connection, left	Electrical connection, right	Cable length [m]	Part No.	Type
	Straight socket, M8x1, 3-pin	Cable, open end, 3-wire	2.5	541333	NEBU-M8G3-K-2.5-LE3
			5	541334	NEBU-M8G3-K-5-LE3
	Angled socket, M8x1, 3-pin	Cable, open end, 3-wire	2.5	541338	NEBU-M8W3-K-2.5-LE3
			5	541341	NEBU-M8W3-K-5-LE3