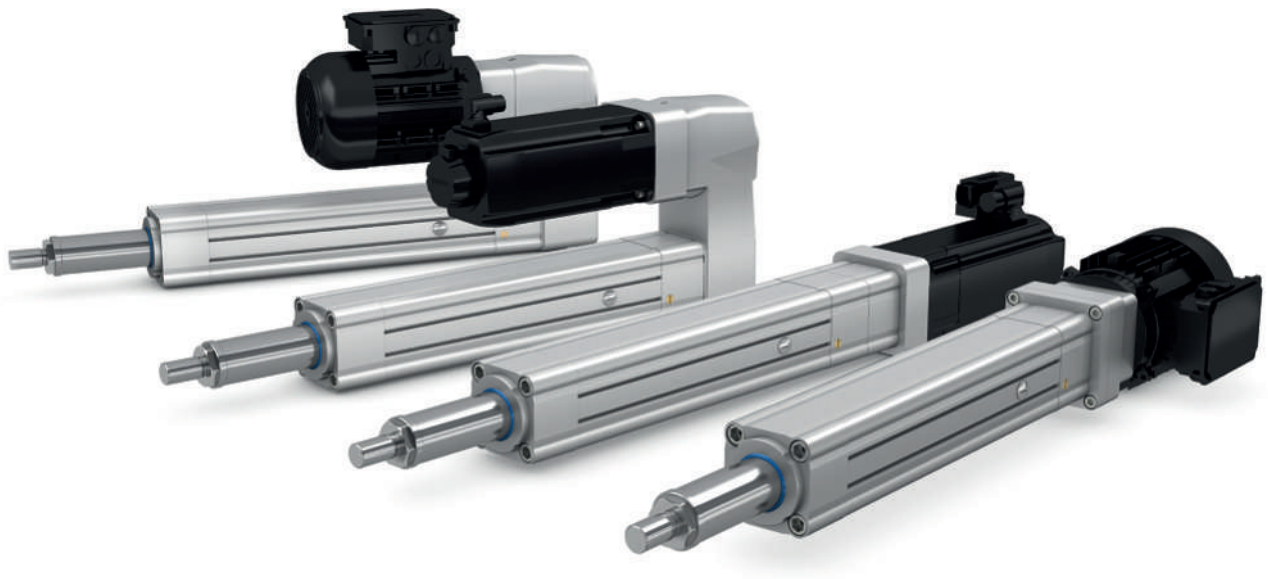

EWELLIX

Electromechanical EWELLIX Linear Actuator EMA-100

High-Performance Actuators

Technical Product Information

We pioneer motion

SCHAEFFLER

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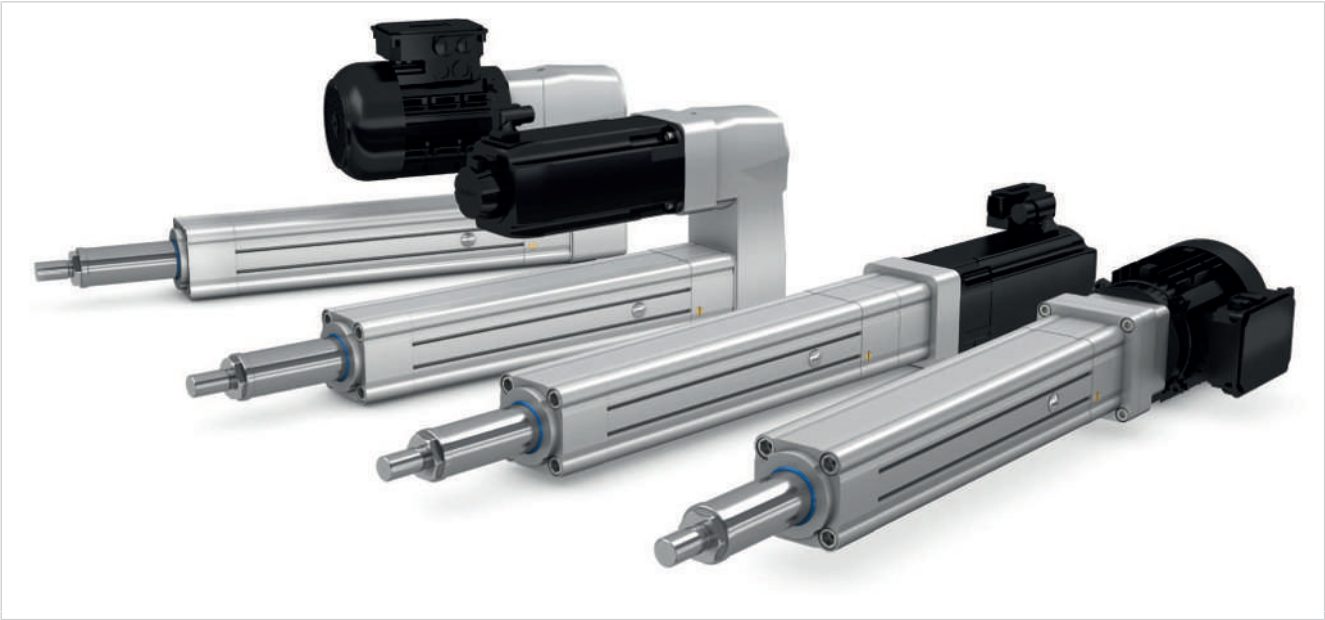
1 Introduction



Features

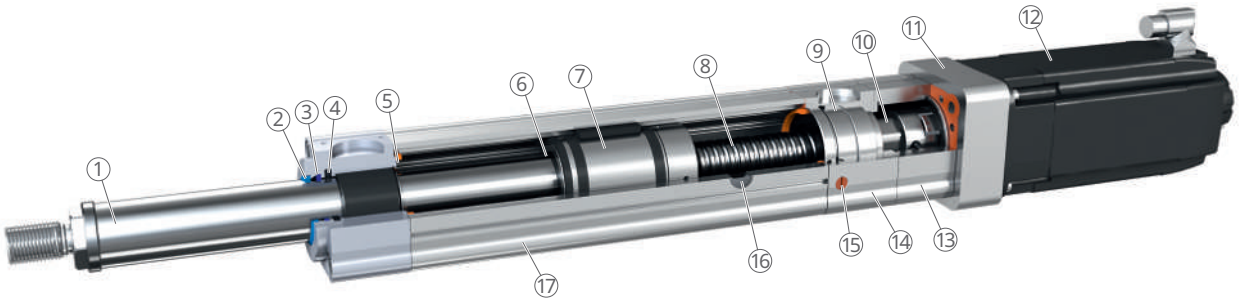
- Modular electric cylinder
- Ball-screws or roller-screws
- Inline and parallel gearboxes
- High efficiency
- High level of precision and repeatability
- Wide range of accessories

Benefits

- Energy saving
- Optimal lifetime even at very high forces
- High level of flexibility with variance of body assembly fitting most of the applications
- Fits AC induction motor motors and servo motors
- Accurate positioning

1.1 Product description

Schaeffler developed an innovative modular electric cylinder platform to address most of the applications in the automation and heavy machinery industries, mainly replacing hydraulic solutions. In this new design, instead of limiting the selection on the “linear unit - gearbox – motor” modules only, Schaeffler takes it a step further. The modularity has been extended to the base component level. Within each module, the customer can select the components inside to build a custom-like solution as standard. This concept makes it possible to find the optimal solution for almost every application within its power range with the best performance/cost ratio.



001BB455

1	Push tube	2	Wiper ring
3	Solid oil ring (only EMA-100-1)	4	Sealing ring
5	Rubber bumber	6	Magnet ring for optional proximity sensors
7	Nut with guiding rings and anti-rotation	8	High quality ball and roller screws with low axial play and low friction
9	High quality bearings	10	Radial shaft sealing ring
11	Motor adapter	12	Motor
13	Gearbox	14	Rear housing/bearing housing
15	Sinter filter for high airflow	16	Relubrication port
17	Protection tube		

1.2 Actuator select

To facilitate customers in defining their own actuator, Schaeffler has released an online configurator, where you can configure your optimal EMA-100 cylinder in just a few steps. Since the cylinders are assembled with standard components, any customer defined configuration will not influence the lead time.

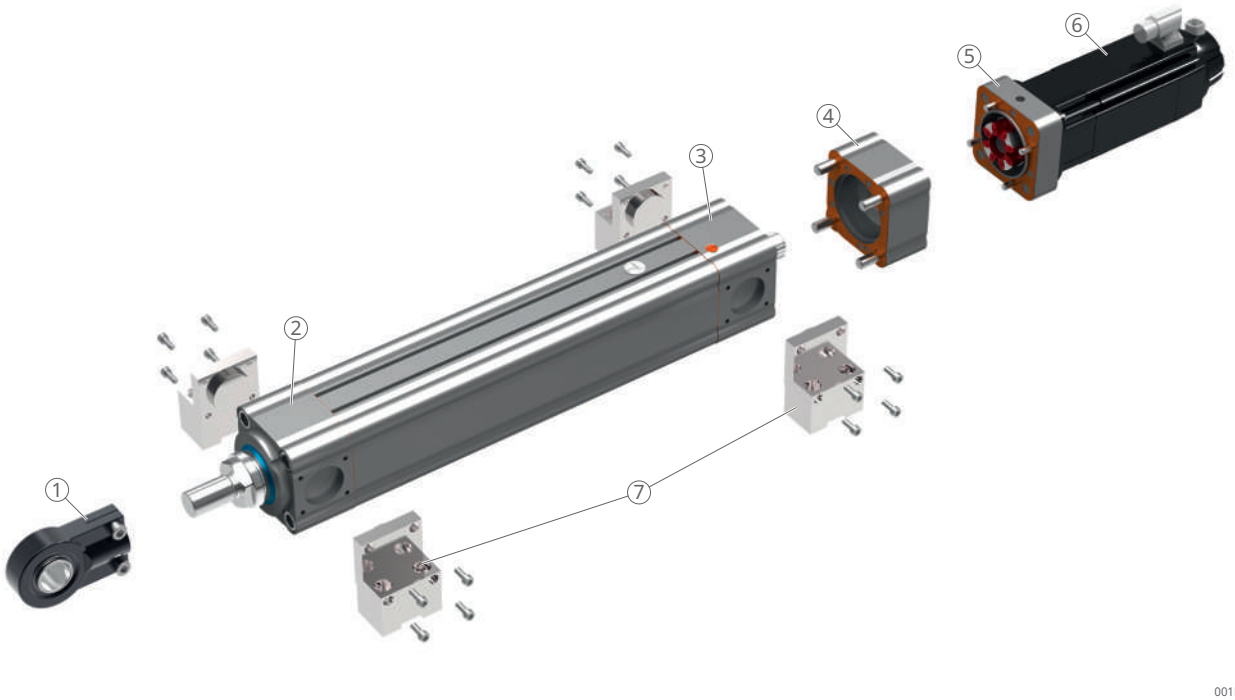
To meet any space and performance requirements, Schaeffler provides inline and parallel gearboxes as well as AC and servo motors. All motors are equipped with specific adapters to keep the same mechanical interface, independent of the selected motor type.

This standardized interface allows customers to also attach their own preferred motor, that customers are already familiar with (motor and drives).

medias | Engineering Tool |
Actuator select |
https://www.schaeffler.de/std/204A

1.3 System interfaces

The EMA-100 modular system comprises different components that are connected to each other through standardized interfaces. Each component provides a unique function for the complete system and is connected as shown below.



1	Push tube attachment	2	Front housing
3	Rear housing	4	Gearbox
5	Motor adapter	6	Motor
7	Housing attachments		

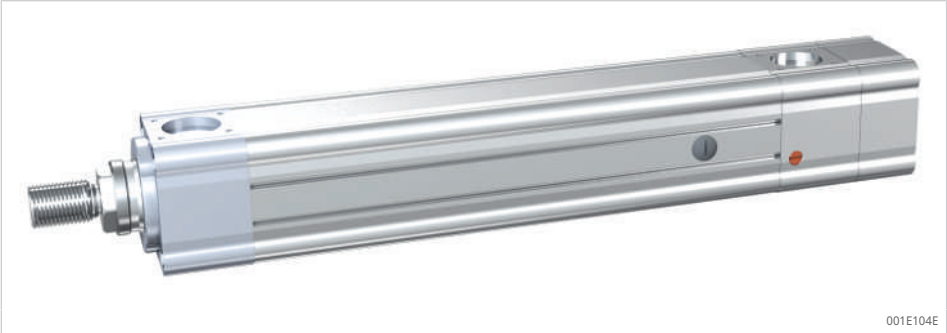
1. **Push tube attachment:** mechanical connection between the actuator and the moving part of the application. It is screwed to the push tube through the standard male thread
2. **Front housing:** component that supports the push tube, through a dedicated bushing, also including the front sealing package
3. **Rear housing:** component that contains the set of ball bearings that support the screw shaft. Depending on screw version two or four bearings are used.
4. **Gearbox:** connecting module between the linear unit and the motor adapter. Is available in parallel or inline versions, with different reduction ratios
5. **Motor adapter:** connecting module between the gearbox and the electric motor
6. **Motor**
7. **Housing attachments:** actuator body attachments, connected to the fix part of the application. Depending on the attachment type, they can be installed on the different housings - front, bearing or gearbox

2 Linear unit

Linear units are offered in a ball screw version and roller screw version with different screw leads and diameters.

2.1 EMA-100-1 Ball screw

EMA-100 linear units are available in multiple versions either with a ball screw or with a roller screw inside. Ball screw is a more cost effective option while roller screw version provides the highest power density, longest life, higher acceleration, speed and stiffness. Screws are also offered with different screw lead and diameter. There are also a ball screw with back-up nut for push loads. For roller screw version (EMA-100-2-R...) see ➤21 | 2.2.



Designation	Symbol	Unit	EMA-100-1-BA	EMA-100-1-BB EMA-100-1-CB*	EMA-100-1-BC
Performance Data					
Max. dynamic axial force[1)]	F_{max}	kN	23	57	60
Max. dynamic axial force L10[2)]	F_{L10}	kN	22	57	60
Max. static axial force	F_{0max}	kN	52	60	60
Dynamic load capacity	C	kN	27,1	71	41,3
Maximum torque to reach F_{max}	T_{max}	Nm	43	107	225
Max. linear speed	v_{max}	mm/s	260	210	750
Max. rotational speed	n_{max}	1/min	1 560	1 260	2 250
Max. acceleration	a_{max}	m/s^2	6	6	12
Duty cycle	D_{unit}	%	100	100	100
Mechanical Data					
Screw type	–	–	Ball screw	Ball screw	Ball screw
Screw diameter	d_{screw}	mm	32	40	40
Screw lead	p_{screw}	mm	10	10	20
Lead accuracy	–	–	G9	G9	G9
Stroke[3) 4)]	s	mm	50...2 000	50...2 000	50...2 000
Internal overstroke each side	s_0	mm	2	2	2
Backlash	$s_{backlash}$	mm	0,20	0,20	0,20
Efficiency	η_{lu}	%	> 85	> 85	> 85
Inertia @ 0 mm stroke	J_{lu}	kgm^2	0,00041	0,00051	0,00051
Δ Inertia per 100 mm	ΔJ	$kg \cdot m^2$	0,000064	0,000144	0,000138
Weight @ 0 mm stroke	m_{lu}	kg	11,0	12,7	12,3
Weight per 100 mm	Δm	kg	2,4	2,7	2,7
Environment					
Ambient temperature	$T_{ambient}$	°C	–20...+50	–20...+50	–20...+50
Max. humidity	Φ	%	95	95	95
Degree of protection	IP	–	54S / 65[5)]	54S / 65[5)]	54S / 65[5)]

* Back-up nut, for more information see ➤17 |

[1] Buckling limitation for long strokes, also limited by accessories and configurations. Please check the EMA-100 configuration tool from Schaeffler.

[2] Maximum dynamic axial force usable to apply the theoretical lifetime calculation (L10)

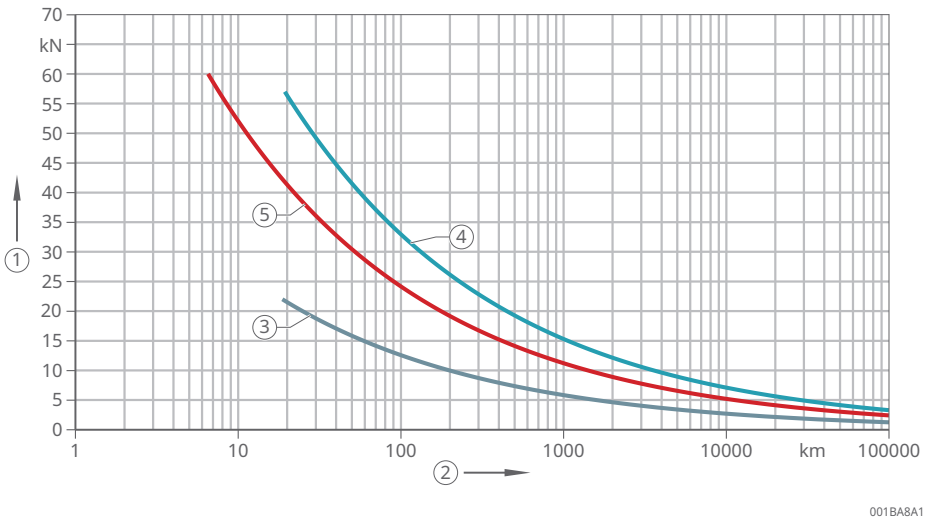
[3] Preferred stroke range:
from 50 to 1 000 mm stroke is by 50 mm step (50, 100, 150, ..., 900, 950, 1 000)
from 1 000 to 2 000 mm stroke is by 100 mm step (1 100, 1 200, ..., 1 900, 2 000)
For all other strokes, out of the preferred range, consider an additional 1 week on standard leadtime. Please contact Schaeffler.

[4] Longer strokes are available at longer lead times, please contact Schaeffler for more information.

[5] Linear unit available in IP65 option, see ➤17|2.1.2

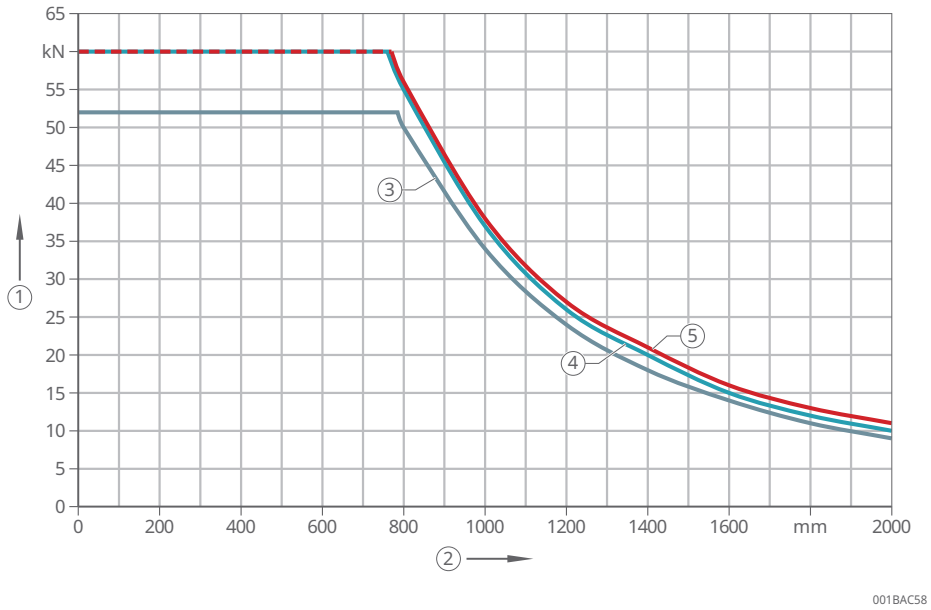
Ordering key, see ➤31|2.3

Performance diagram



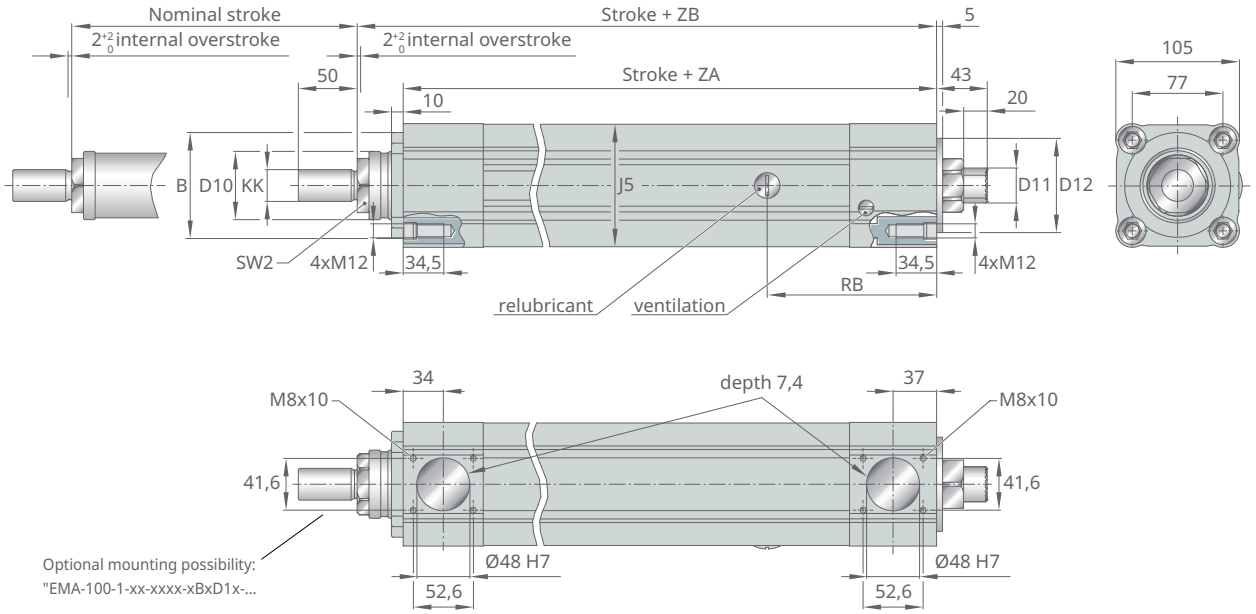
1	F_{mean} [kN]	2	Lifetime [km]
3	EMA-100-1-BA	4	EMA-100-1-BB / EMA-100-1-CB
5	EMA-100-1-BC		

Buckling load diagram

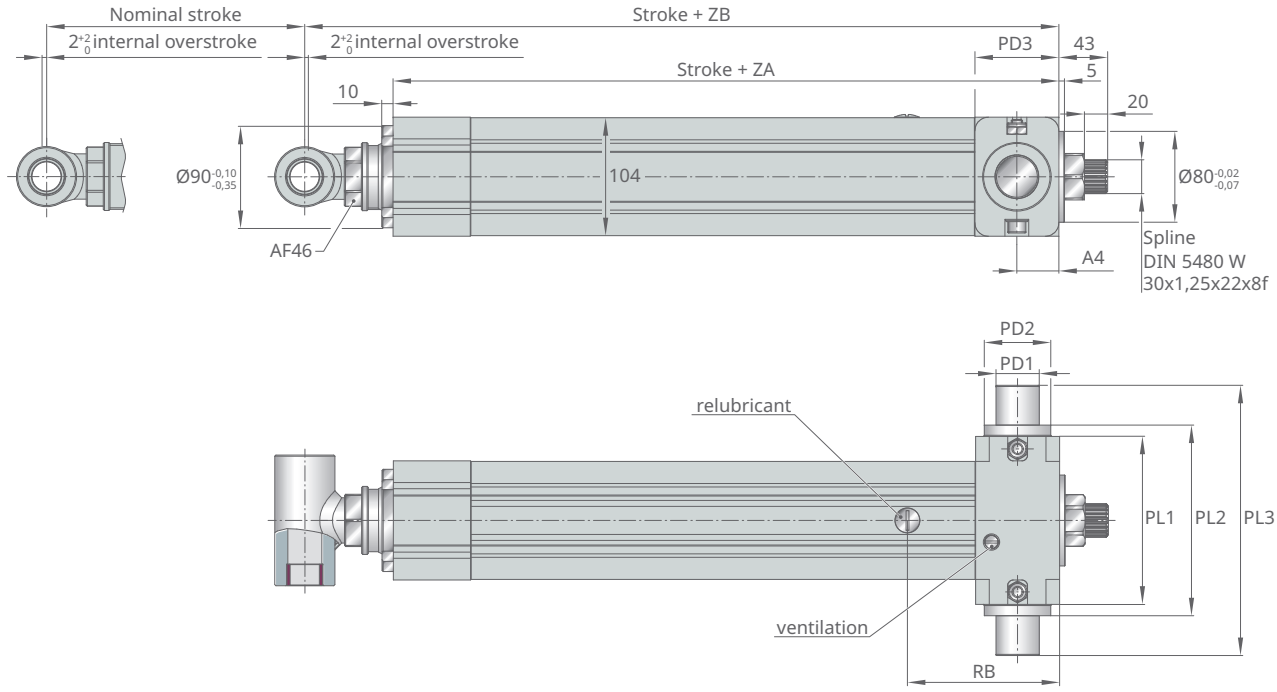


1	Buckling load [kN]	2	Stroke [mm]
3	EMA-100-1-BA	4	EMA-100-1-BC
5	EMA-100-1-BB / EMA-100-1-CB		

Dimensional drawing - EMA-100-1



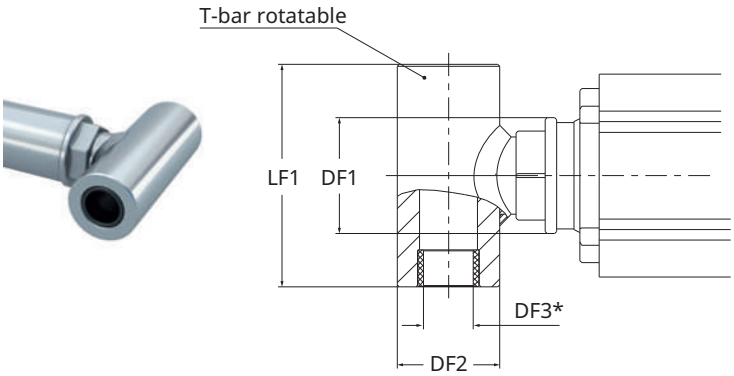
Linear Unit	J5 mm	ZA	ZB	B		D10	KK –	RB mm	D12		SW2 –	D11 –
EMA-100-1-xx-xxxx-**A**... [Standard version]	□104	287±1,5	326±2	Ø90	- 0,10 - 0,35	Ø58	M27x2	134	Ø80	- 0,02 - 0,07	AF 46	Spline DIN 5480 W 30x1,25x22x8f
EMA-100-1-**CB**-xxxx-**A**... [Ball screw 40x10 with back-up nut]	□104	301±1,5	340±2	Ø90	- 0,10 - 0,35	Ø58	M27x2	148	Ø80	- 0,02 - 0,07	AF 46	Spline DIN 5480 W 30x1,25x22x8f



Linear Unit	ZA mm	ZB	RB	PL1	PL2	PL3	PD1	PD2	PD3	A4
EMA-100-1- xx- xxxx-xxx**E1**xx [High performace pivot housing]	287±1,5	365±2	134	14,8	168	238	Ø38,1	Ø58,5	74	37
EMA-100-1- xx- xxxx-**C**xxxxxx [Push tube with T-bar, L 115mm]	287±1,5	365±2	134	–	–	–	–	–	–	–
EMA-100-1- xx- xxxx-**D**xxxxxx [Push tube with T-bar, L 155mm]	287±1,5	365±2	134	–	–	–	–	–	–	–
EMA-100-1- **CB**-xxxx-**C**xxxxxx [Ball screw 40x10 with back-up nut with T-bar]	301±1,5	379±2	148	–	–	–	–	–	–	–

Push tube attachment T-bar

The push tube attachment provides a drop in-replacement for the common attachment points found in hydraulic cylinders. To help the assembly, the push tube attachment is rotatable. If the push tube attachment is chosen, also the Anti-rotation option needs to be chosen.



*Recommended shaft tolerance: Ø25,38-25,43

Linear Unit	DF1 mm	DF2	DF3	LF1
EMA-100-1-xx-xxxx-**C**xxxxxx [Push tube with T-bar, L 115mm]	Ø60	Ø53	Ø25,53 - 25,73	115 ±1
EMA-100-1-xx-xxxx-**D**xxxxxx [Push tube with T-bar, L 155mm]	Ø60	Ø53	Ø25,53 - 25,73	155 ±1

2.1.1 Options - EMA-100-1

The following parts are available as options and can be ordered directly through the typekey. It is not necessary (but optional) to order as extra lines if already configured and selected in the typekey.

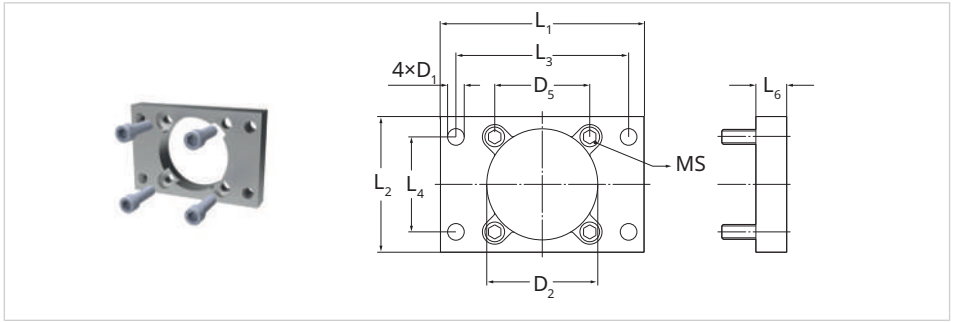
These attachments are only for the EMA-100-1. For EMA-100-2-R.., see ➤25|2.2.1

Front plate - EMA-100-1

Only compatible with standard push option A (Male thread M27), ordering key EMA-100-**1**-xx-xxx-**A**...

Can not be used with T-bar.

Type	MS	L_1	L_2	L_3	L_4	D_1	D_5	D_2	L_6	m
–	–	mm								kg
ZBE-377918	M12 x 40	165	109	140	77	Ø13,5	□ 77	Ø90	25	2,1



Force	Load
kN	Cycles
max. 60	100000
55	388000
50	676000
45	964000
40	1252000
35	1539000
30	1827000
27	2000000
< 27	Inf.

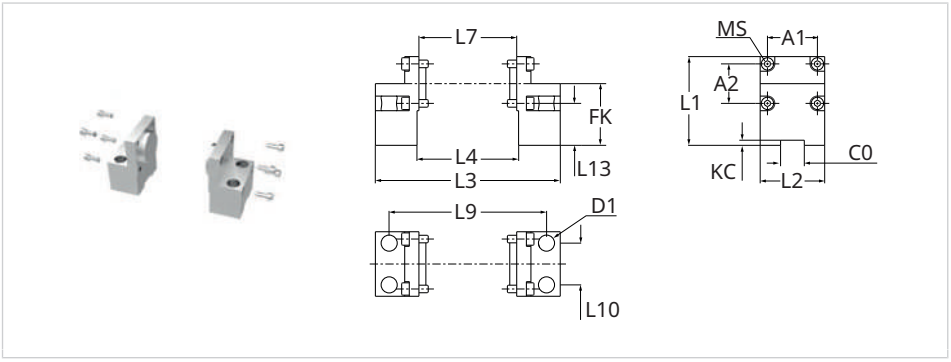
Ordering key: ZBE-377918

Foot mount - EMA-100-1

Requires front and/or rear rear housing with mounting option.

Ordering key - Front housing: EMA-100-**1**-xx-xxxx-x**B**...

Ordering key - Rear housing: EMA-100-**1**-xx-xxxx-xxx**D1**...



Type	MS	L_1	L_2	L_3	L_4	L_7	FK	A_1	A_2	L_9	L_{10}	KC	C0	L_{13}	D_1	m
–	–	mm														kg
ZBE-377920	M8 x 18	93,5	68	194,8	107	103	65	52,6	41,6	165,8	44	5,4	25	44	Ø17	2,8

Ordering key: ZBE-377920

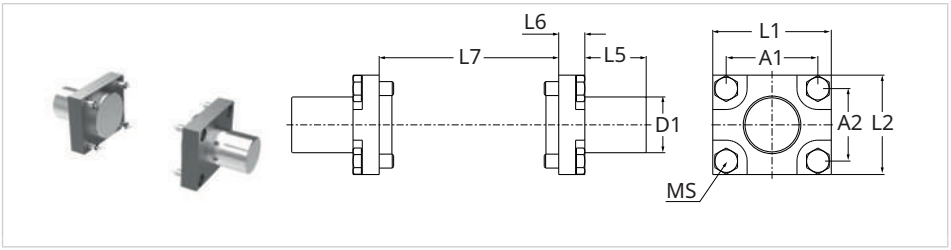
Load limit see graph in section "housing attachment" below.

Pivot attachment - EMA-100-1

Requires front or rear rear housing with mounting option.

Ordering key - Front housing: EMA-100-**1**-xx-xxxx-x**B**...

Ordering key - Rear housing: EMA-100-**1**-xx-xxxx-xxx**D1**...



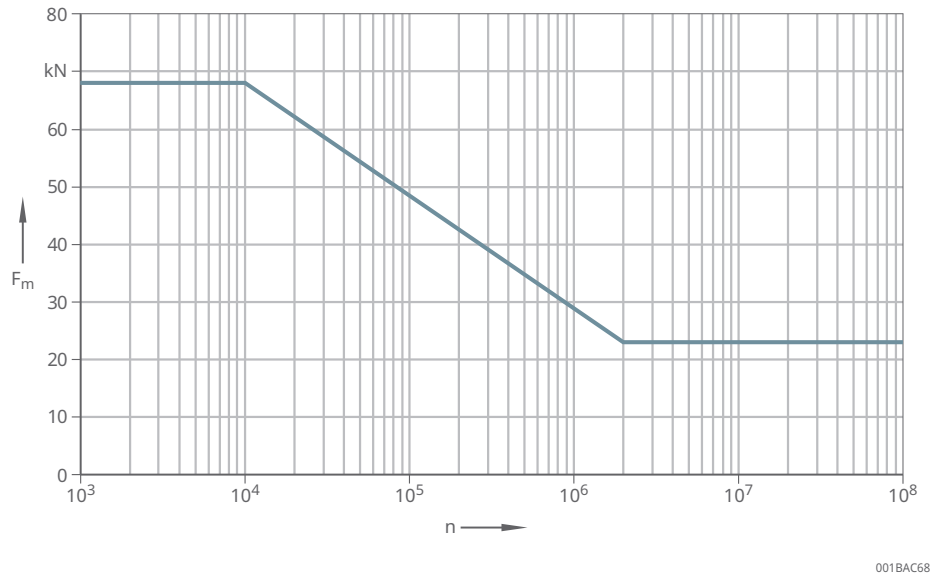
Type	MS	L_1	L_2	A_1	A_2	L_5	L_6	L_7	D_1	m
–	–	mm								kg
ZBE-377919	M8 x 18	68	57	52,6	41,6	35,2	15	103	Ø32	1,5

Ordering key: ZBE-377919

Load limit see graph in section "housing attachment" below.

Housing attachment

Load rating and lifetime limitation of the pivot attachment (ZBE-377919) and foot mount (ZBE-377920), see graph below. If higher performance is needed, switch to the high performance pivot housing option E1.



F_m	Load [kN]	n	Number of cycles

Back-up nut

The back-up nut is a feature that can be added to the main nut. It is not in contact with the screw during normal operation and will prevent the actuator from collapsing if the main nut fails. It can be used to safely retract the actuator but creates high friction on the screw. Once the back-up nut is engaged the actuator must be replaced. Back-up nut in only available for push load, solutions for pull available on request.

2.1.2 Ingress protection - EMA-100-1

The linear unit is available with the following ingress protection options (note that IP ratings are valid if the bearing housing is sealed by Schaeffler gearbox or others with similar sealing performances):

Option B: IP54S

Protected against dust and water spray if standing still.

Option C: IP65 with sinter filter

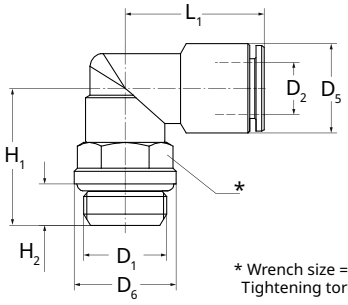
Requiring sinter filter to be protected from dust and water. As a consequence it is required to face sinter filter downwards to protect it from rain. If not possible to protect the sinter filter, and to ensure ingress protection level, please take option D (see below). In addition, and due to the use of solid oil ring and single lip wiper on the front, performances are restricted to avoid premature wear on the sealing. It restricts performances to the following:

Max. linear speed	Vmax	35 mm/s
Lifetime distance driven	L	100 km

Option D: IP65 with hose

If selected, a dedicated interface valve is provided and mounted on the linear unit, allowing the actuator to breath. A hose (not provided by Schaeffler) need to be connected to this interface valve in order to supply it with clean air. It still restricts performances as indicated for Option C.

Interface valve

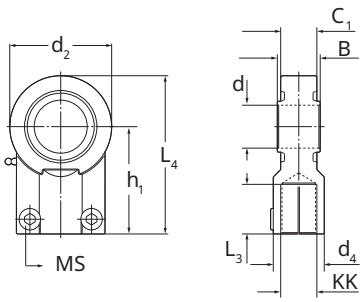


G thread with sealing ring							
Connections	**Tubing O.D.**						**Weight/piece**
D1	**D2**	**D5**	**D6**	**H1**	**H2**	**L1**	
–	**Ø**	**Ø**	**Ø**				**g**
G 1/4	12	19	16	25,5	6,5	28,5	58,5

2.1.3 Accessories - EMA-100-1

Push tube attachments

Rod End - M27



Technical info

Dynamic load rating: C=65,6 kN

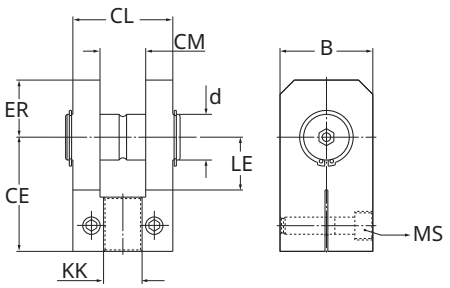
Static load rating: C=100 kN

Ordering key

Rod End Ø32: ZBE-377900
(According to DIN8132 standard)

Type	KK	MS	L_3	B	C_1	d	d_4	L_4	h_1	d_2	m_2
–	–	–	mm								kg
ZBE-377900	M27 × 2	M10	37	32	28	Ø32	Ø40	119	80	76	1,2

Rod Clevis - M27



Technical info

Nominal force: 50 kN

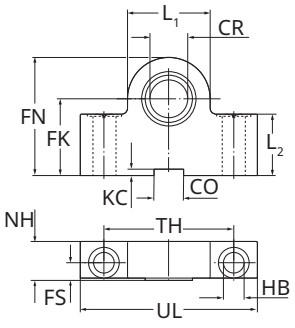
Ordering key

Rod Clevis Ø32: ZBE-377917
(According to DIN8132 standard)

Type –	KK –	MS	CL mm	CM	LE	CE	ER	d	B	m kg
ZBE-377917	M27 × 2	M12	70	32	42	80	40	Ø32	65	2,7

Trunnion Bracket Centric

Accessory for "Pivot Attachment - EMA-100-1" see ➤16|



Technical info

Nominal force: 50 kN

Delivery

in pairs

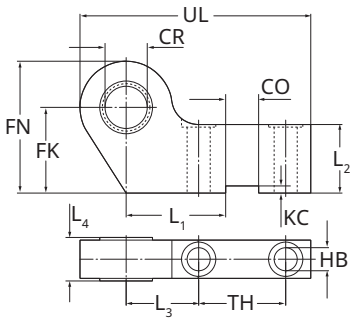
Ordering key

Trunnion Bracket Centric Ø32: ZBE-377902
(According to ISO8132 standard)

Type –	CR mm	FN	FK	HB	NH	TH	UL	CO	KC	FS	L_1	L_2	m kg
ZBE-377902	Ø32	100	65	Ø17,5	33	110	150	25	5,4	15	70	52	4,7

Trunnion Bracket Eccentric

Accessory for "Pivot Attachment - EMA-100-1" see ➤16|



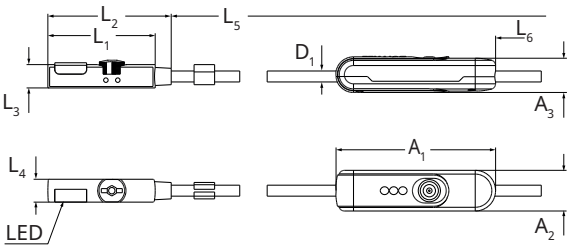
Technical info
Nominal force: 50 kN
Delivery
in pairs

Ordering key
ZBE-377910

ll Type –	CR mm	FN	FK	TH	HB	L_3	UL	CO	KC	L_4	L_2	L_1	m kg
ZBE-377910	Ø32	100	65	66	Ø17,5	55	175	25	5,4	33	52	75,5	4,2

Proximity Switch

Teachable proximity switch



Ordering key
ZSC-377925

Type –	L_1 mm	L_2	L_3	L_4	L_5	D_1	A_1	A_2	A_2	L_6	m kg
ZSC-377925	23,5	27	5,5	5	2 000	Ø2,4	35	8,9	7,9	1 765	0,016

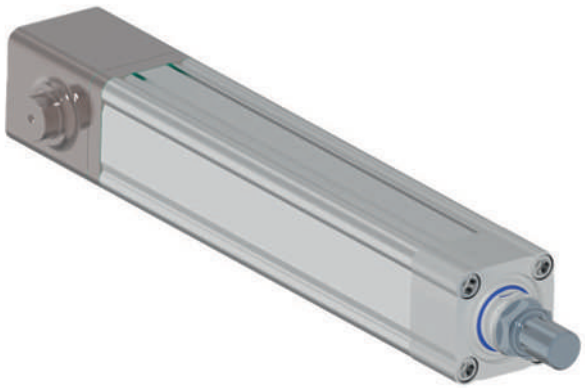
Please refer to Balluff datasheet BMF 235K H-PO-C-A2-PU-02 for detailed technical information.

2.2 EMA-100-2-R Roller screw

Linear unit - Roller screw 2nd version - High load and life

With the new EMA-100 roller screw series, Schaeffler offers performances improvements and power density for multiple processes, impacting several important application parameters:

- Long service life
- Increased productivity and high duty
- Peak load acceptance
- Easy force and position control
- Force repeatability for constant quality



Technical data

Designation	Symbol	Unit	EMA-100-2-RA	EMA-100-2-RB
Performance Data				
Max. dynamic axial force[1)]	F_{max}	kN	80	80
Max. dynamic axial force L10[2)]	F_{L10}	kN	60	80
Max. static axial force	F_{0max}	kN	80	80
Dynamic load capacity	C	kN	105	145
Maximum torque to reach F_{max}	T_{max}	Nm	87	161
Max. linear speed	v_{max}	mm/s	445	890
Max. rotational speed	n_{max}	min^{-1}	5340	5340
Max. acceleration	a_{max}	m/s^2	6	12
Duty cycle	D_{unit}	%	100[4)]	100[4)]
Mechanical Data				
Screw type	–	–	Roller screw	Roller screw
Screw diameter	d_{screw}	mm	30	30
Screw lead	p_{screw}	mm	5	10
Lead accuracy	–	–	G5	G5
Stroke[3)]	s	mm	0...1300	0...1300
Internal overstroke each side	s_0	mm	2	2
Backlash	$s_{backlash}$	mm	0,03	0,05
Efficiency	η_{lu}	%	0,73	0,79
Inertia @ 0 mm stroke	J_{lu}	$kg \cdot m^2$	0,00060	0,00060
Δ Inertia per 100 mm	ΔJ	$kg \cdot m^2$	0,00007	0,00007
Weight @ 0 mm stroke	m_{lu}	kg	18,3	18,3
Weight per 100 mm	Δm	kg	2,3	2,3
Environment				
Ambient temperature	$T_{ambient}$	°C	0...+40	0...+40
Max. humidity	Φ	%	90	90
Degree of protection	IP	–	54S / 65[5)]	54S / 65[5)]

[1] Buckling limitation for long strokes, also limited by accessories and configurations. Please check the EMA-100 configuration tool from Schaeffler.

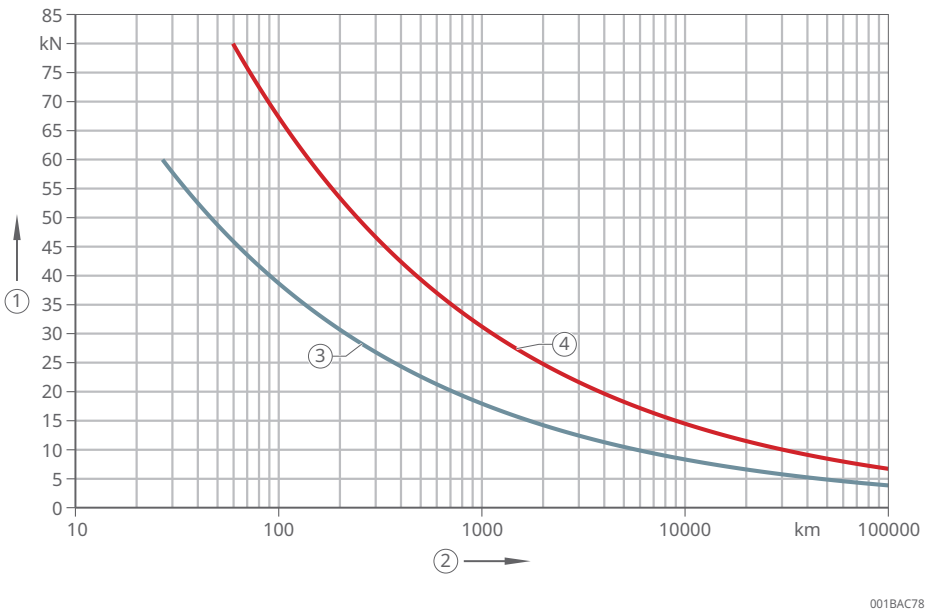
[2] Maximum dynamic axial force usable to apply the theoretical lifetime calculation (L10)

[3] Preferred stroke range: 0 to 1 300 mm stroke in steps of 100 mm. For other strokes please contact Schaeffler.

[4] Permitted average output power < 450 W

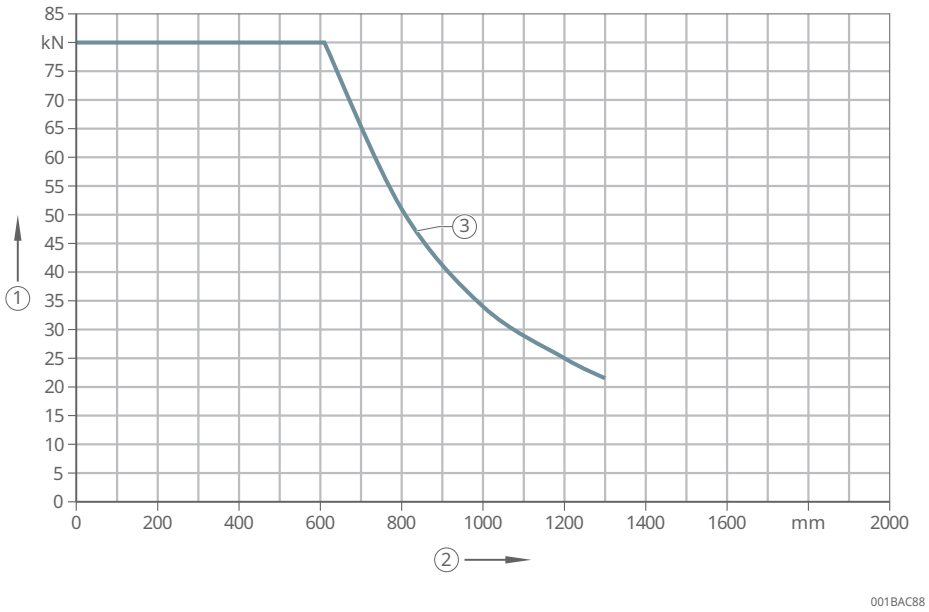
[5] Linear unit available in IP65 option, see ➤17|2.1.2

Performance diagram



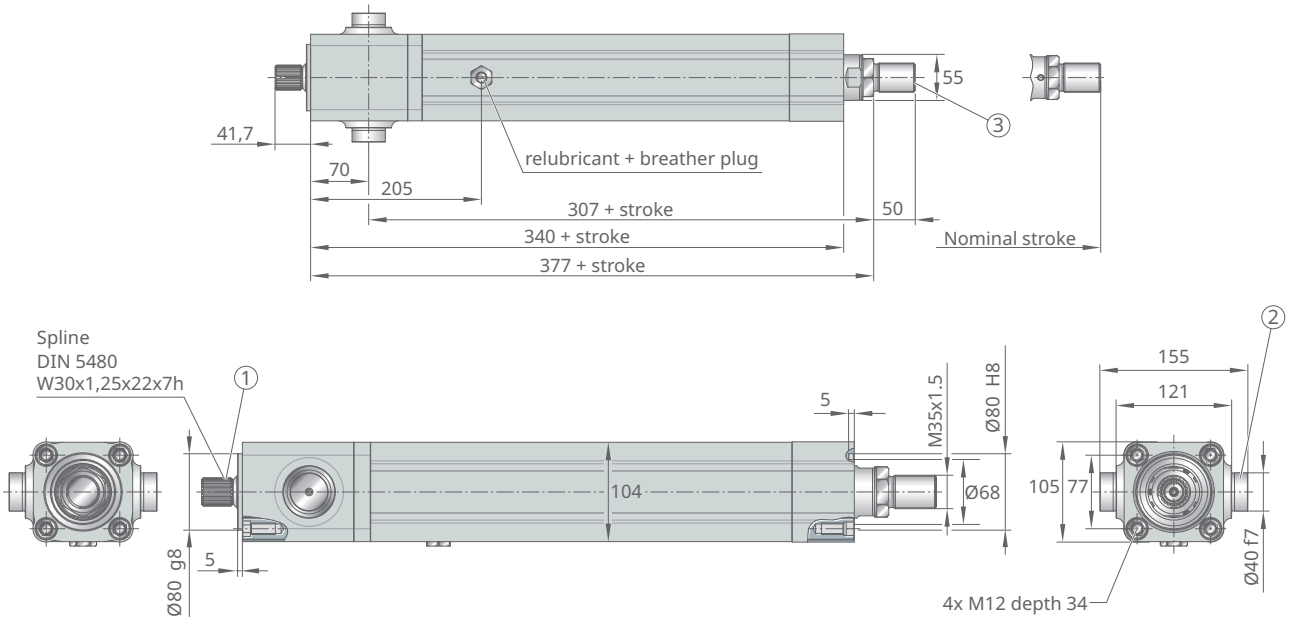
1	F_{mean} [kN]	2	Lifetime [km]
3	EMA-100-2-RA (60kN -> 27km)	4	EMA-100-2-RB (80kN -> 60km)

Buckling load diagram

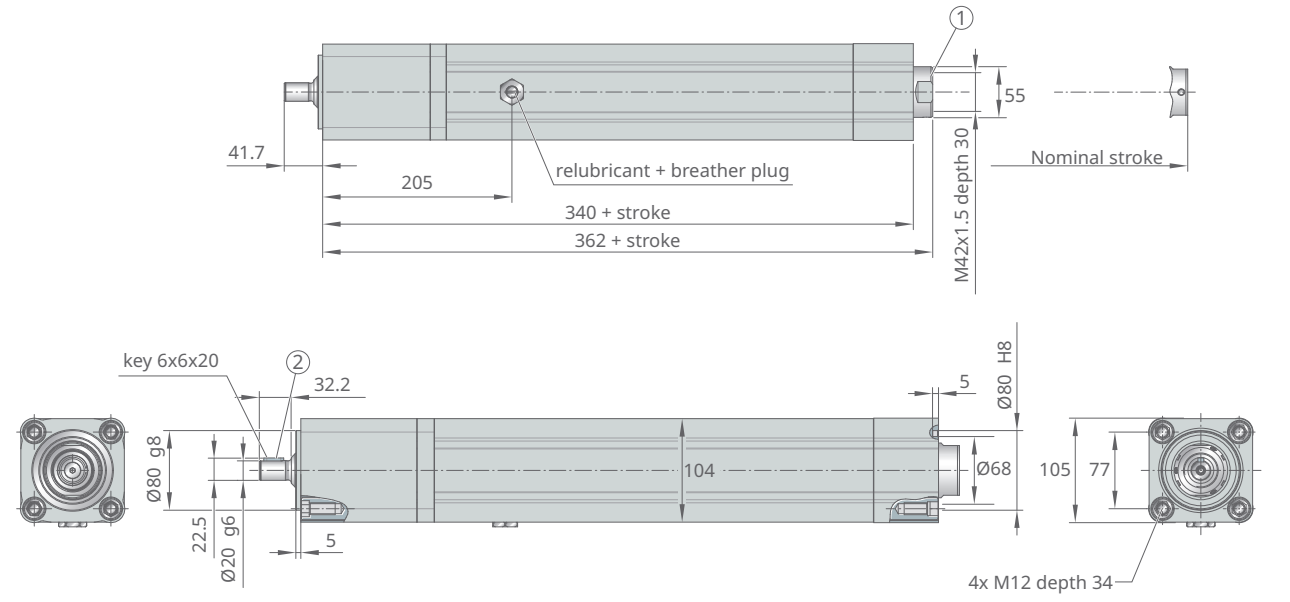


1	Buckling load [kN]	2	Stroke [mm]
3	EMA-100-2-RA / EMA-100-2-RB		

Dimensional drawing - EMA-100-2



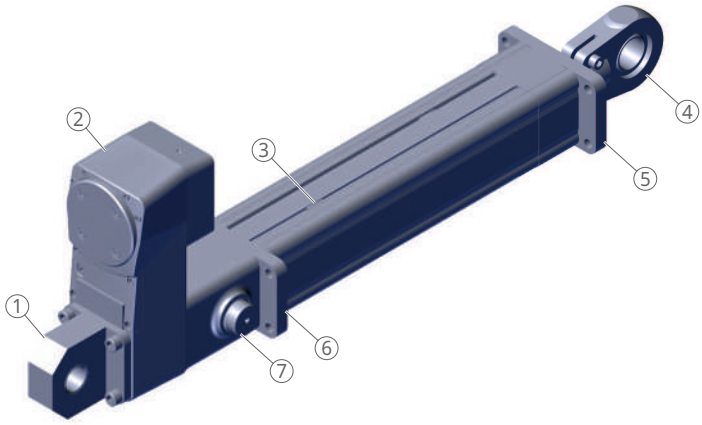
1	Spline (Standard)	2	Trunnion mount rear housing
3	Male thread M35x1.5		



1	Female thread M42x1.5 depth 30	2	Keyway

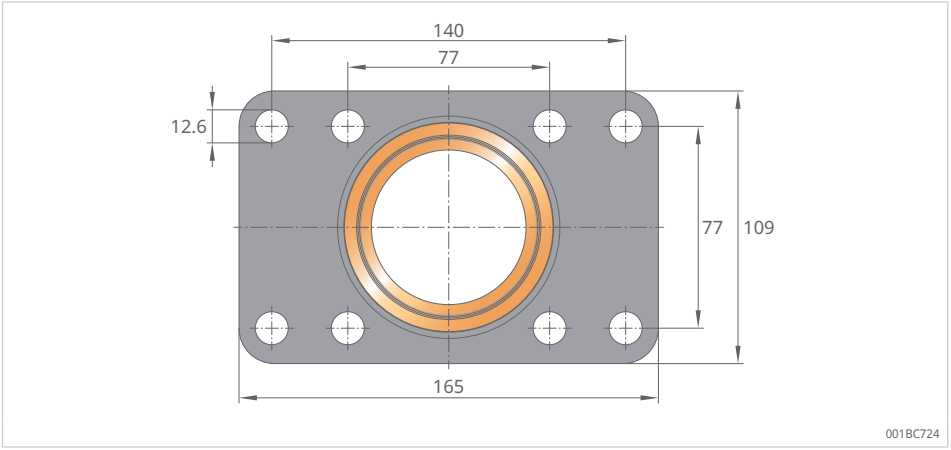
2.2.1 Options for EMA-100-2 roller screw

The built-in modularity of the new EMA series allows customers to create tailor-made solutions through a vast number of standard components. Considering the multiple options in body attachments, rod attachments, end shaft (spline or keyway to fit customer standard needs), motor interfaces and gearboxes, several hundreds of combinations are possible to meet most demanding application requirements.

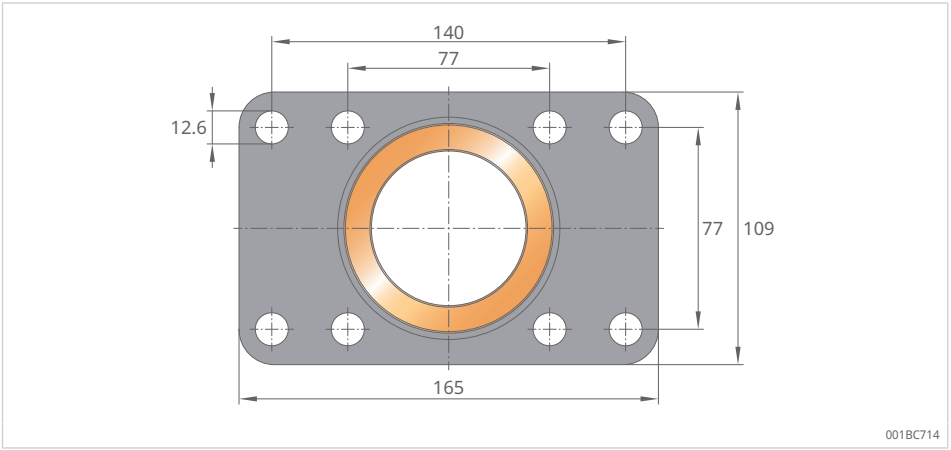


1	Rear attachment gearbox ➤40|3.3.2	2	Gearbox ➤35|3
3	Proximity switch ➤20|	4	Rod end M35
5	Front plate	6	Rear plate
7	Rear housing with trunnions		

Rear plate option- EMA-100-2-R



Front plate option- EMA-100-2-R



2.2.2 Ingress protection - EMA-100-2-R

The linear unit is available with the following ingress protection options (note that IP ratings are valid if the bearing housing is sealed by Schaeffler gearbox or others with similar sealing performances):

Option B: IP54S with sinter filter

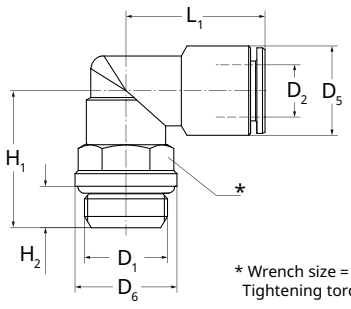
Protected against dust and water spray if standing still.

EMA-100-2-R actuators in option B (sinter filter) can be integrated in an IP65 environment as long as sinter filter is protected or oriented downward away from rain.

Option D: IP65 with hose

If selected, a dedicated interface valve is provided and mounted on the linear unit, allowing the actuator to breath. A hose (not provided by Schaeffler) need to be connected to this interface valve in order to supply it with clean air. No speed or lifetime restriction for EMA-100-2-R for option D as applicable for EMA-100-1 option C and option D.

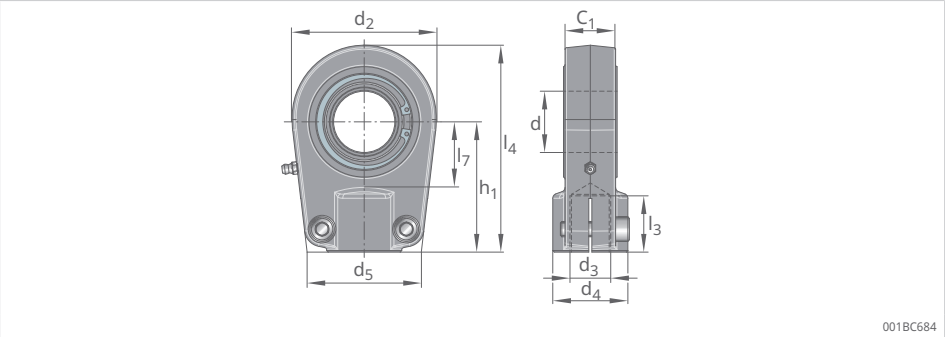
Interface valve



G thread with sealing ring							
Connections	**Tubing O.D.**						**Weight/piece**
D1	**D2**	**D5**	**D6**	**H1**	**H2**	**L1**	
–	**Ø**	**Ø**	**Ø**				**g**
G 1/4	12	19	16	25,5	6,5	28,5	58,5

2.2.3 Accessories - EMA-100-2-R

Rod end M35



Ordering key

GIHRK40-DO-B

Proximity Switches

Limit switch, normally closed:

Switch type: MK5155 (MKT3020BAPKG/A/0.3M/ZH/AS)

Ordering key

SEN-IFM-MK5155

Home switch, normally open:

Switch type: MK5159 (MKT3020BBPKG/A/0.3/ZH/ASR)

Ordering key

SEN-IFM-MK5159

Supplier: ifm eletronic GmbH

Please refer to ifm datasheet for detailed technical information.

The location of the home and limit switches can be adjusted easily on the linear unit.

2.2.4 High performance actuator for heavy duty applications

Power density and modularity

In multiple industries and sectors, electrification is already mature. It offers an excellent solution to reduce final energy consumption and has rapidly changed the mechanical design landscape. Performance optimization, easy integration and environmental friendliness are three key factors that lead to savings in total cost of ownership.

Schaeffler, with a long-standing tradition of technical expertise, helps customers transition from established manufacturing process technologies to innovative approaches with easy, safe and environmentally friendly linear motion solutions. We support customers in improving automation equipment with processes that run faster, longer, and safer sustainably.

Critical drivers for automation processes

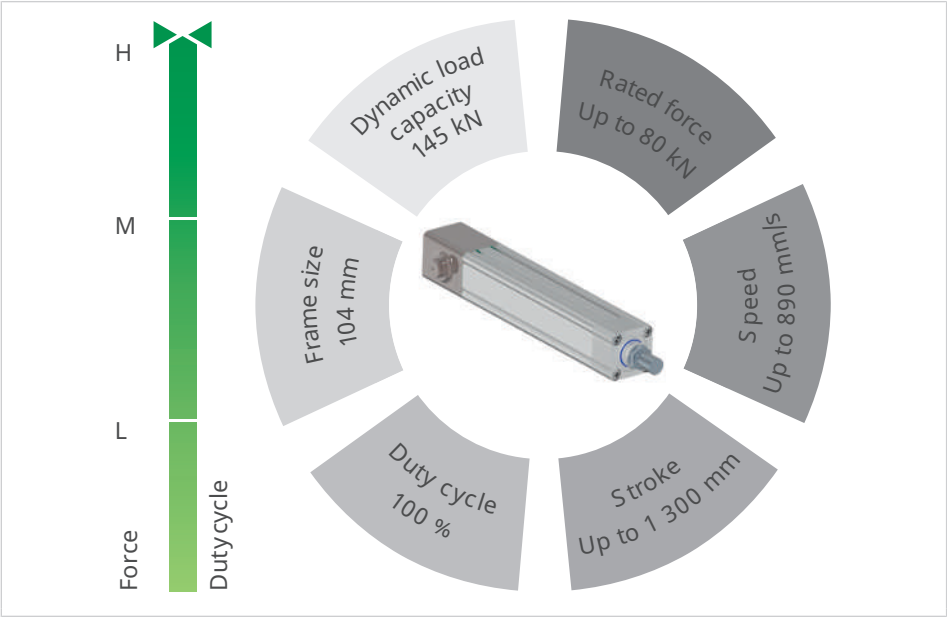
Greater productivity
High-performance roller screws guarantee continuous use and improve service life while having minimized maintenance.

Flexibility and programmability
Modular design offers easy integration into automation equipment

Pneumatic free systems
Mechatronic systems are environmentally friendly and offer greater efficiency in energy reduction.

Maximized power density
Compact and robust technology where high force and reliability are essential, leading to millions of cycles.

Schaeffler solutions - EMA-100-2-R



Performance improvements*

+20 % dynamic capacity

+70 % service life

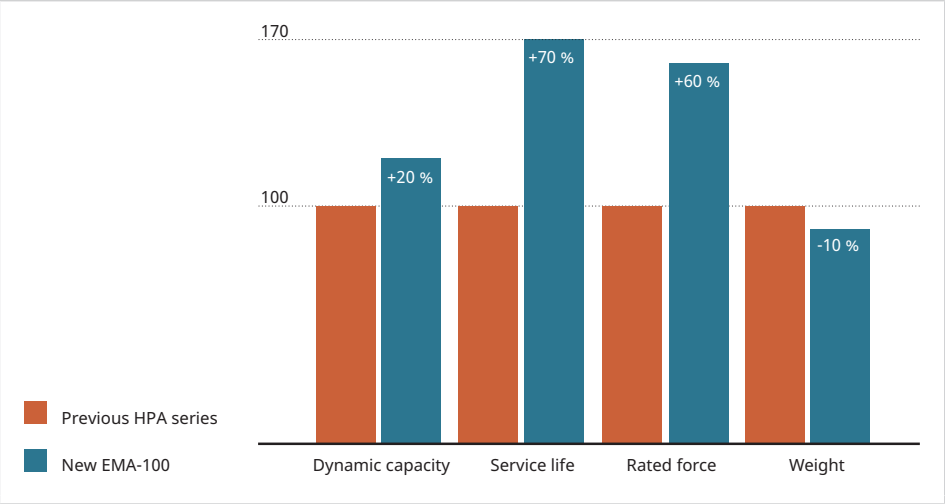
+60 % rated force [1)]

–10 % kg when considering the extra capacity vs. former series [2)]

* Actuator with Ø 30 roller screw

[1)] Usable force to apply the theoretical lifetime calculation L_{10}.

[2)] Factor ratio between weight (kg) and dynamic capacity (kN), to evaluate power density.



Planetary roller screw technology benefits

- Power density
- Robustness and shock load resistance
- Long service life
- Efficiency and energy reduction

Design highlights:

- Bearing housing in steel for stronger load path resistance
- Robust anti rotation for higher torque resistance
- Sealed body for IP54S ingress protection
- Multiple bearing orientation options fitting working conditions.
  - 2+2 as standard for similar tension and compression loads
  - 3+1 recommended for predominantly compression loads
  - 1+3 in case of predominantly tension loads

  Having different bearing orientations helps to improve load capacity of bearings vs working force direction, leading to more robustness and reliability.
- Thanks to our modularity on the end shaft, EMA100 roller screw series can fit both standards from the company and market interfaces you find on the shelves.
  - Spline interface is used as standard, following Schaeffler EMA platform.
  - Key way interface is an option to match standard coupling, taper lock or gearbox from industrial market.

2.3 Ordering key

Ordering key:

- Linear unit
  - EMA-100-1 ➤32|1
  - EMA-100-2 ➤33|2
- Gearbox ➤45|4
- Motor adapter ➤59|18
- Complete actuator ➤67|5.6

EMA-100-1

1 Ordering key for linear unit EMA-100-1

Product version
Electric-actuator EMA-100-1

Spindle type

B A	Ball screw 32×10
B B	Ball screw 40×10
B C	Ball screw 40×20
C B	Ball screw 40×10 with back-up nut (push load only)

Stroke

...	Stroke in mm
2000	

Push tube interface and rod interface

A	Male thread M27
C	T-bar, L = 115 mm, requires anti-rotation, different lengths available on request
D	T-bar, L = 155 mm, requires anti-rotation, different lengths available on request

Front housing and front housing mounting options

A 0	No mounting option
A A	Front plate with mounting position 90°
A B	Front plate with mounting position 0°
B 0	With mounting option, but without attachment
B C	Pivot attachment (bracket must be ordered separately)
B D	Foot mount 0° mounting position
B E	Foot mount 180° mounting position

Rear housing and rear mounting options

C 1 0	Aluminium, no mounting option
D 1 ...	Aluminium, prepared for pivot mounting or foot mounting
... ... 0	+ no attachment mounted
... ... C	+ Pivot attachment, trunnion brackets must be ordered separately
... ... D	+ foot mounting with mounting position 0°
... ... E	+ foot mounting with mounting position 180°
E 1 0	Aluminum, high-performance pivot housing

Protection tube orientation

A	Aluminum, 90°, recommended for parallel mounting
B	Aluminum, 180°
C	Aluminum, 270°
D	Aluminum, 0°, recommended for inline mounting

Sealing

B	IP54S
C	IP65 with sinter filter, speed limit <35 mm/s, seal life 100 km
D	IP65 with hose, speed limit <35 mm/s, seal life 100 km

Lubrication

A	Standard lubrication

Relubrication

1	With relubrication possibility

Anti-rotation

0	No anti-rotation
1	With anti-rotation

Spindle shaft end interface

0	Standard-Spline

Free parameter

0	Empty

Customer-specific options

0 0 0	No customer-specific option

001C5A45

EMA-100-2

2 Ordering key for linear unit EMA-100-2

Product version
Electric-actuator EMA-100-2

Spindle type

R A	Roller screw 30×5 high load and long service life
R B	Roller screw 30×10 high load and long service life

Stroke

...	Stroke in mm
1300	

Push tube interface and rod interface

A	Male thread M27, with limitations of max. linear force and lifetime
G	Male thread M35
H	Female thread M42

Front housing and front housing mounting attachment

A 0	No mounting option
A A	Front plate with mounting position 90°
A B	Front plate with mounting position 0°

Rear housing and rear mounting options

S 1 0	Steel, standard option, no attachment
S 2 0	Steel, push-optimized, no attachment
S 3 0	Steel, pull-optimized, no attachment
T 1 0	Steel, standard option, trunnion attachment
T 2 0	Steel, push-optimized, trunnion attachment
T 3 0	Steel, pull-optimized, trunnion attachment
S 1 P	Steel, standard option, mounting plate with mounting position 0°
S 2 P	Steel, push-optimized, mounting plate with mounting position 0°
S 3 P	Steel, pull-optimized, mounting plate with mounting position 0°
S 1 Q	Steel, standard option, mounting plate with mounting position 90°
S 2 Q	Steel, push-optimized, mounting plate with mounting position 90°
S 3 Q	Steel, pull-optimized, mounting plate with mounting position 90°

Protection tube orientation

A	Aluminum, 90°, recommended for parallel mounting
B	Aluminum, 180°
C	Aluminum, 270°
D	Aluminum, 0°, recommended for inline mounting

Sealing

B	IP54S
D	IP65 with hose

Lubrication

A	Standard lubrication
F	Food-grade grease, for linear unit only
H	High-load lubricating grease
S	Short-stroke lubricating grease

Relubrication

1	With relubrication possibility

Anti-rotation

0	No anti-rotation
1	With anti-rotation

Spindle shaft end interface

0	Standard - Spline
K	Keywax D = 20mm, not compatible with EMA-100 gearboxes

Free parameter

0	Empty

Customer-specific options

0 0 0	No customer-specific option

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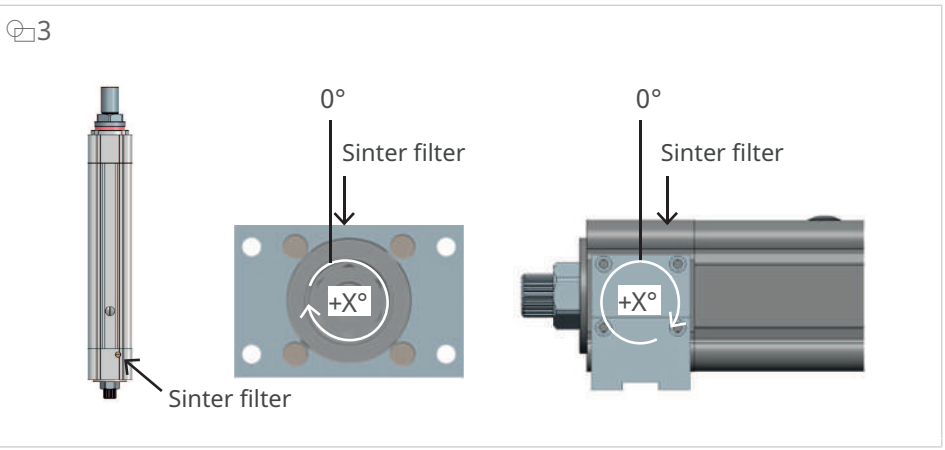
2.4 Mounting position front plate and foot mount

The 0° reference for the linear unit is the sinter filter position. The front plate can be turned in 90° steps clockwise. The foot mount can be turned in 180° steps clockwise.



3 Gearboxes

3.1 Introduction to gearboxes

Schaeffler offers several types of gearboxes. They vary in shape, technology, ratio and lubrication.

Different shapes allow to meet challenging build-in situations. Parallel gearboxes shorten the retracted length while inline gearboxes optimize cross section.

Our technologies and ratios allow to optimize input requirements so that motor cost can be reduced.

Several accessories and options such as manual override, rear attachment, centrifugal and holding brakes are available to meet the various applications.

3.1.1 Inline gearbox

Inline gearboxes consist of a housing which fits on one side to the linear unit and on the other side to the motor adapter with the matching coupling. The coupling can be pushed on the shaft of the linear unit and locked by a screw. The counterpart of the coupling is delivered with the motor adapter.

The inline gearbox transmits the motor torque (max. 150 Nm) directly to the linear unit with a gear ratio 1:1 and is maintenance-free.

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3.1.2 Parallel gearbox

Parallel gearbox consists of one housing which fits on one side to the linear unit and on the other side to the motor adapter with the matching coupling. The coupling is already mounted on the input shaft of the gearbox and locked by a screw. The counterpart of the coupling is delivered with the motor adapter. Schaeffler offer the parallel gearbox into options Spur gear box and Belt gear box.

Spur gear variant

The parallel gearbox transmits the motor torque through three stage spur gear directly to the linear unit (max. output torque 300 Nm). Three gear ratios are available and it is maintenance free. The ratios allow to keep motor torques low and therefore save motor cost.

Belt gear variant

A belt transmits the torque from the motor shaft to the linear unit. This version allows higher linear unit speed while keeping noise at lower level.

The belt gear is available with a light rear cover if retracted length and cost must be optimized. For additional features such as rear attachment, manual override, centrifugal or holding brakes the standard rear cover is the best choice.

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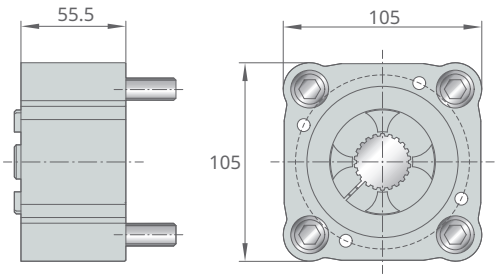
3.2 Inline gearboxes

Technical data

Gearbox type **Short designation**	**Unit**	**GB-100-GI-AA**
Type	–	Inline
Gear reduction	–	1
Nominal output torque	Nm	75
Max. output torque	Nm	150
Max. input speed	r/min	11 000
Efficiency	%	100
Weight	kg	1
Length	mm	55,5

Dimensional drawing



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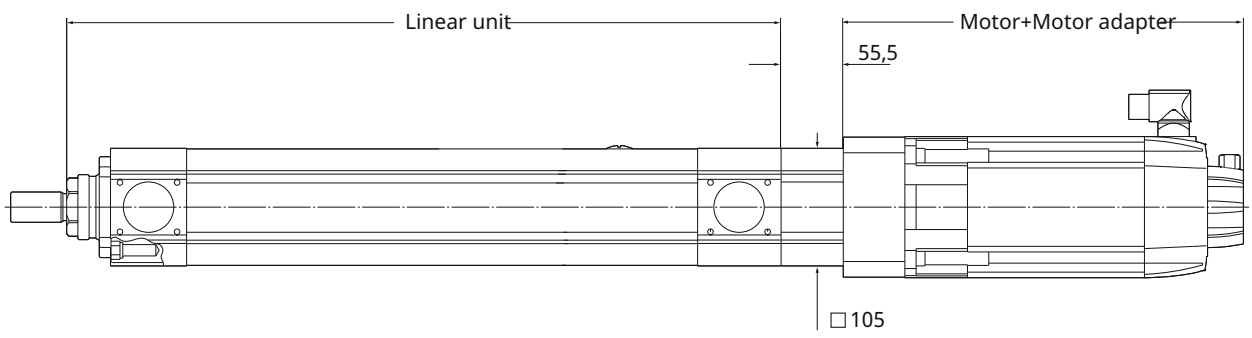
All dimensions in mm

Complete actuator



All dimensions in mm

3.3 Parallel gearboxes

Technical data

Gearbox type		GB-100-GB-CAC	GB-100-GB-CEC	GB-100-GB-CAD	GB-100-GB-CED	GB-100-GS-CBB	GB-100-GS-CCB	GB-100-GS-CDB
Short designation	**Unit**							
Type	–	Belt				Spur		
Cover	–	Standard		Light		Standard		
Lubrication	–	None				Grease		
Gear reduction	–	1	2	1	2	3,89	9,82	24,95
Nominal output torque	Nm	63	90	63	90	100		
Max. peak output torque	Nm	90	117	90	117	150	300	
Max. nominal input power	W	9 500	6 000	9 500	6 000	2 100	1 700	1 200
Max. input speed	r/min	8 000				4 500		
Max pull load	kN	30 kN when using rear attachment				When using rear attachment see limit for attachment ➤41|	
Max push load	kN	36 kN when using rear attachment				When using rear attachment bar type see limit for attachment ➤42|	
Service interval	–	Replace belt every 6 years				None		
Efficiency	%	90				85		
Weight	kg	11,5	9,7	10	8	9		
Length	mm	81				98,5		

Manual override

The parallel gearbox has a manual override as built-in functionality. The gearbox can be manually operated through a hexagonal key located on the gearbox motor axis. As standard, the access to this key is covered by a plate (**fig. 1**). On request, it's possible to have a round opening for direct access (**fig. 2**).

On request gearbox accessories

It's possible to mount an electromagnetic brake (**fig. 3**) on the gearbox or other devices like an absolute position encoder.

Speed limiting centrifugal brake

When safety is non-negotiable, a centrifugal brake (**fig. 4**) can be a useful device. It is recommended together with a electro-mechanical brake on the motor. When releasing such a brake, the applied load may cause a rapid retraction of the machine, if no centrifugal brake is used. A centrifugal brake can be adjusted to the application in order to limit the retracting speed to a safe value. The centrifugal brake is mounted similar to an electromagnetic brake (**fig. 3**). For technical details see ➤43|3.3.3.

Fig. 1

Fig. 2

On request

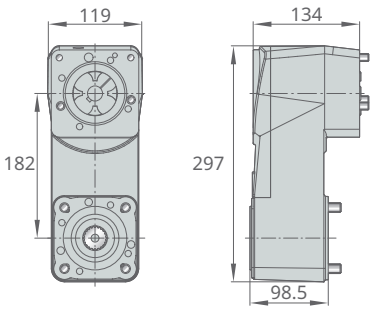
Fig. 3

On request

Fig. 4

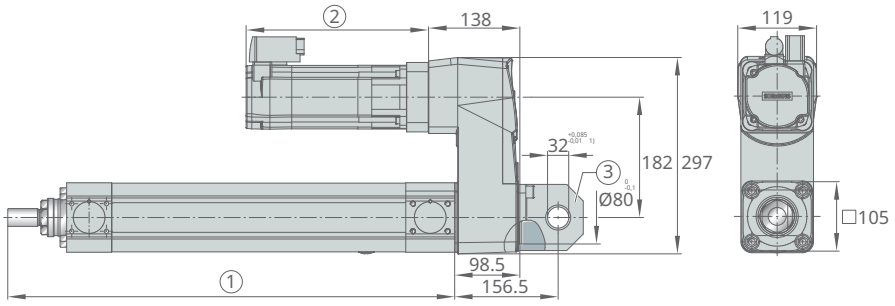
3.3.1 Spur gearbox

Dimensional drawing



All dimensions in mm

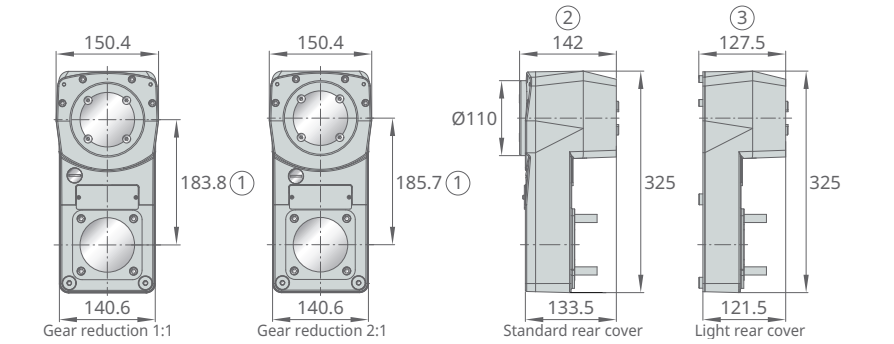
Complete actuator



1	Linear unit	2	Motor-kit
3	Recommended shaft tolerance: f7		

3.3.2 Belt gearbox

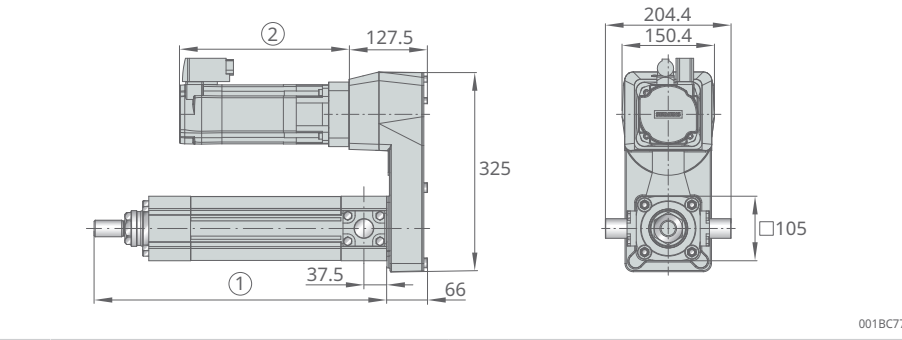
Dimensional drawing



1	Distance between pulleys	2	Standard rear cover
3	Light rear cover		

All dimensions in mm

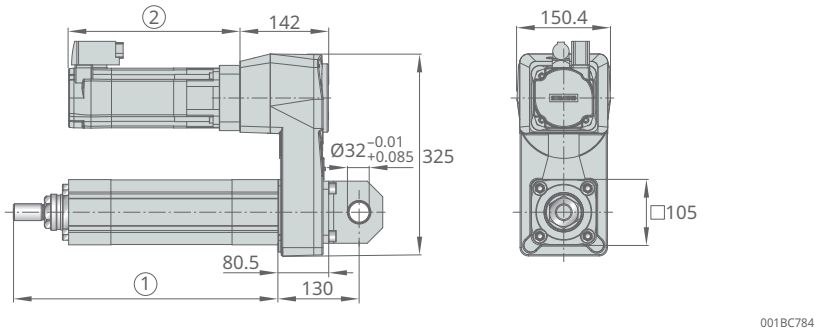
Complete actuator – Thin cover



1	Linear unit	2	Motor-kit

All dimensions in mm

Complete actuator - Thick cover



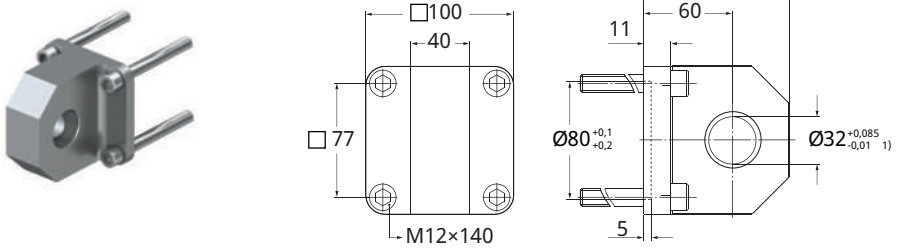
1	Linear unit	2	Linear unit

Ordering key rear attachment option see following chapter "rear attachment".

All dimensions in mm

Rear attachment

Lifetime	
Force [kN]	**Lifetime Load Cycles**
60 (max)	75 000
50	139 000
40	334 000
35	594 000
30	1 393 000
<30	Inf.



[1] Recommended shaft tolerance: f7

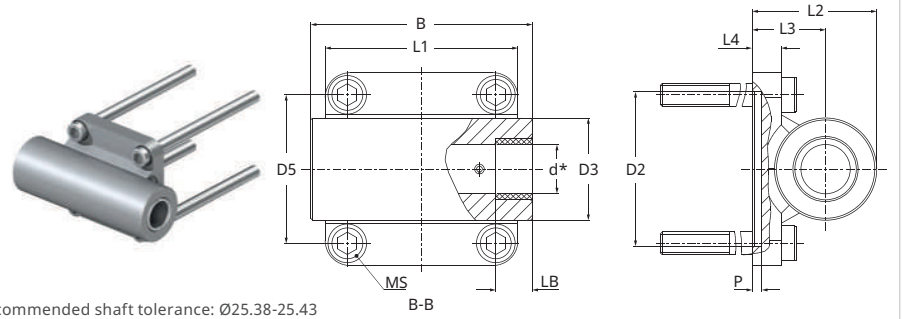
Ordering key

Spur gearbox
ZBE-377921

Belt gearbox
ZBE-00251333

Rear attachment - bar type

Force [kN]	Load Cycles
60 (max)	300 000
50	521 000
40	1 000 000
<40	Inf.



*Recommended shaft tolerance: Ø25.38-25.43

Ordering key

Spur gearbox
ZBE-377933

Belt gearbox
N/A

Type	d +0,33 +0,13	LB	B[1] +1 −1	L1	L2	L3	L4	D2 +0,2 +0,1	D3 +0,3 −0,3	P	D5	MS	weight
–	mm											–	kg
Spur gearbox													
ZBE-377933-0115	Ø25,4	19,5	115	□100	64,5	38	15	Ø80	Ø53	5	□77	M12x140	2,96
ZBE-377933-0155	Ø25,4	19,5	155	□100	64,5	38	15	Ø80	Ø53	5	□77	M12x140	3,5

[1] Are available in different dimensions on request, up to 245 mm

3.3.3 Centrifugal Brake Option Type B

The centrifugal brake is a device to limit the actuator linear speed in case of motor brake failure to a defined max. speed. The centrifugal brake can also be used to lower the application in case of electric power failure in a controlled manor. Schaeffler can provide one standard configuration for the centrifugal brake. Depending on the application needs a customer specific configuration of the centrifugal brake can be made in collaboration with Schaeffler.

Note: Only for ball screw versions

Performance data

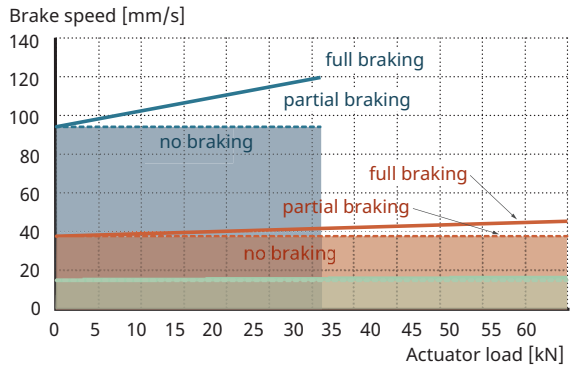
Gearbox Type:	**GB-100-GS-CBA-XX**		**GB-100-GS-CCA-XX**		**GB-100-GS-CDA-XX**	
Screw Type	**V_{Cinit}**	**V_{Cmax}**	**V_{Cinit}**	**V_{Cmax}**	**V_{Cinit}**	**V_{Cmax}**
EMA-100-1-XB...-...-...A-...	94,2 mm/s	119,9 mm/s	37,3 mm/s	47,5 mm/s	14,7 mm/s	18,7 mm/s
EMA-100-1-XC...-...-...A-...	188,4 mm/s	239,8 mm/s	74,6 mm/s	95 mm/s	29,4 mm/s	37,4 mm/s

V_{Cinit}: linear unit speed when centrifugal brake gets engaged

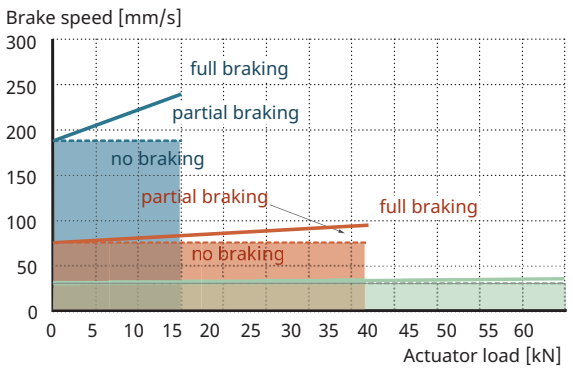
V_{Cmax}: linear unit speed for maximal actuator load

Performance diagram

EMA-100-1-BB/CB



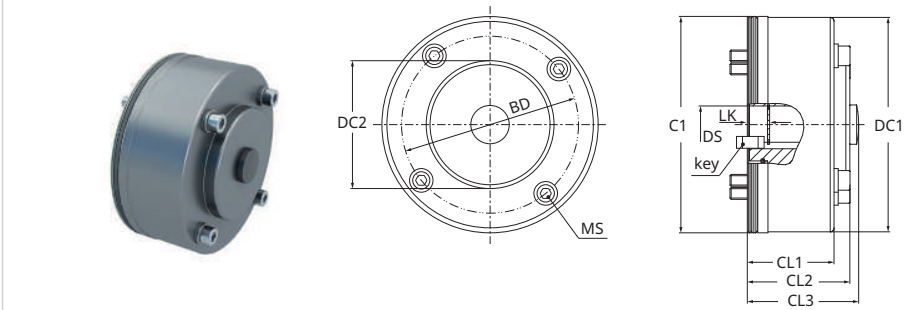
EMA-100-1-BC



Gearing ratio 4:1 — Gearing ratio 10:1 — Gearing ratio 25:1

Different speed configurations are available on request.

Dimensions



Type	C1 -0,1 -0,3	DC1	DC2	CL1	CL2	CL3	DS	LK	key	MS	BD	weight
–	mm								–	–	mm	kg
ZBE-377939	Ø110	Ø109	Ø65	44,1	52,1	56,6	Ø19 G7	10,3	6×6×14	M6x55	Ø90	2,24

3.4 Ordering key

Ordering key:

- Linear unit
  - EMA-100-1 ➤32|⧉1
  - EMA-100-2 ➤33|⧉2
- Gearbox ➤45|⧉4
- Motor adapter ➤59|⧉18
- Complete actuator ➤67|5.6

⧉4 Ordering key for individual gearbox unit

Gearbox type
I Inline
B Belt (not for ball screw drive BA)
S Spur gear

Gearbox type
A Inline servo motor
B Inline asynchronous motor
C Parallel gearbox

Gear ratio
A 1:1 (inline gearbox and belt gearbox only)
B 4:1 (spur gearbox only)
C 10:1 (spur gearbox only)
D 25:1 (spur gearbox only)
E 2:1 (belt gearbox only)

Cover options
A Standard option for inline gearbox
B Standard option for spur gearbox
C Belt gearbox, rear cover
for rear mounting or brakes, IP54S
D Belt gearbox, lightweight rear cover
(no rear mounting or brakes), IP40S

Rear mounting
0 No
B Rear attachment 0°
C Rear attachment 90°
D Rear attachment, bar type, L = 115 mm, 0°, (spur only)
other lengths available on request
E Rear attachment, bar type, L = 155 mm, 0°, (spur only)
other lengths available on request

Options
0 No accessories
B Centrifugal brake (switch-on speed: 2200 min^{-1}) not for roller screw versions

Customer-specific options
0 0 0 No customer-specific option

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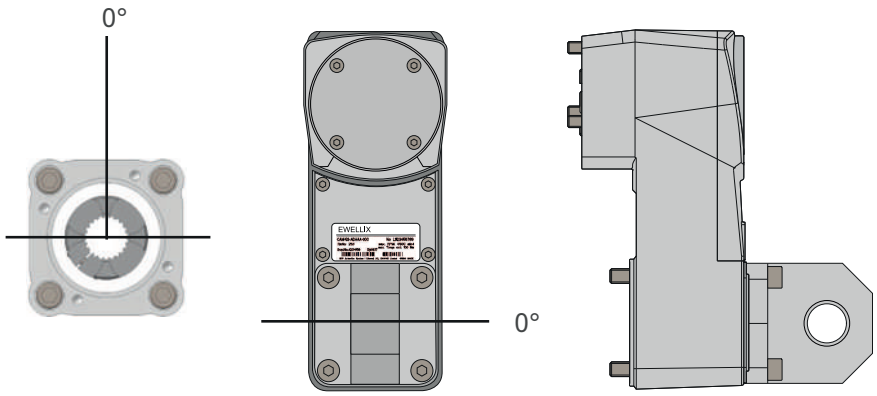
3.5 Mounting position parallel gearbox rear attachment

The 0° reference for the parallel gearbox rear attachment is the gearbox itself. The rear attachment can be turned in 90° step.

5 Gearbox orientation



3.6 Performance overview complete actuator

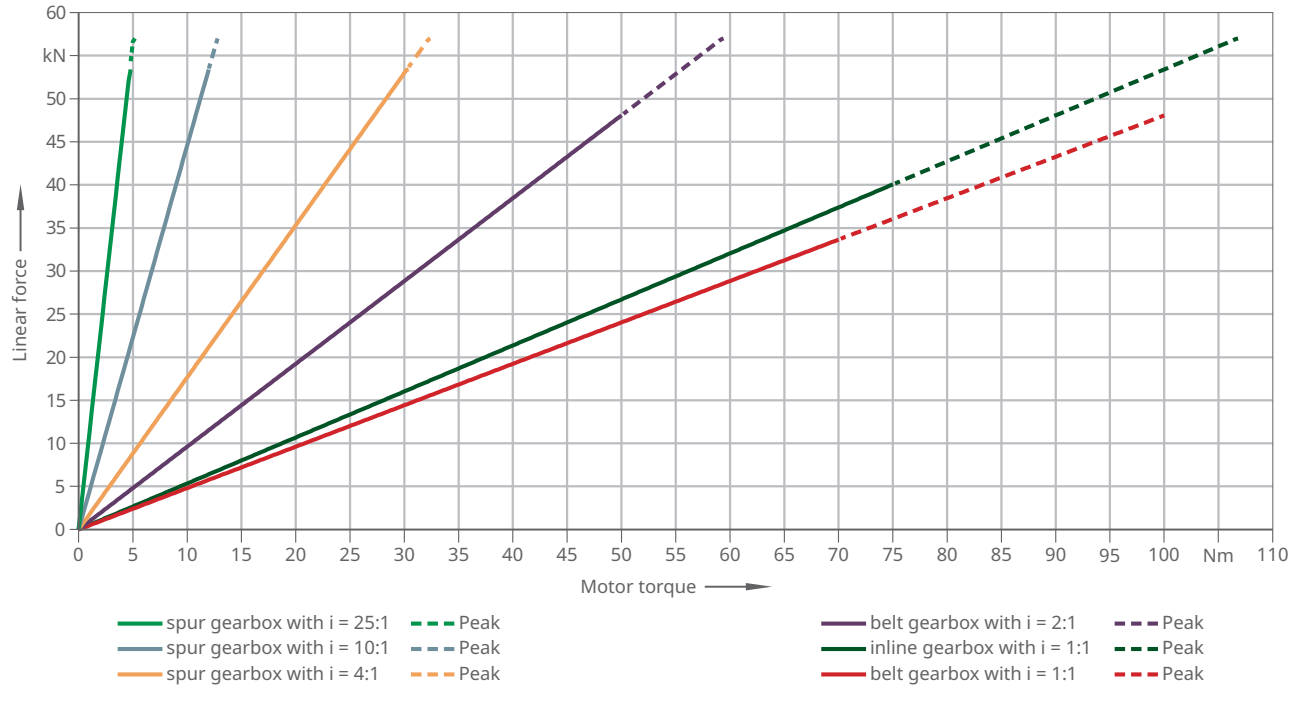
Linear units are offered with different screw options, the modular range allows for combining the linear unit with different gearboxes. Graphs below show the required motor torque and required motor rpm to reach the desired linear force and linear speed.

Performance overview of linear unit

Linear unit	Screw	F_{max} Max dynamic axial force	F_{L10} Max dynamic axial force L10	F_{0max} Max static axial force	V_{max} Max linear speed
		kN	kN	kN	mm/s
EMA-100-1-BA	Ball screw 32×10	23	22	52	260
EMA-100-1-BB	Ball screw 40×10	57	57	60	210
EMA-100-1-BC	Ball screw 40×20	60	60	60	750
EMA-100-2-RA	Roller screw 30×5	80	60	80	445
EMA-100-2-RB	Roller screw 30×10	80	80	80	890

EMA-100-1

6 Motor torque and resulting linear force EMA-100-1-BB



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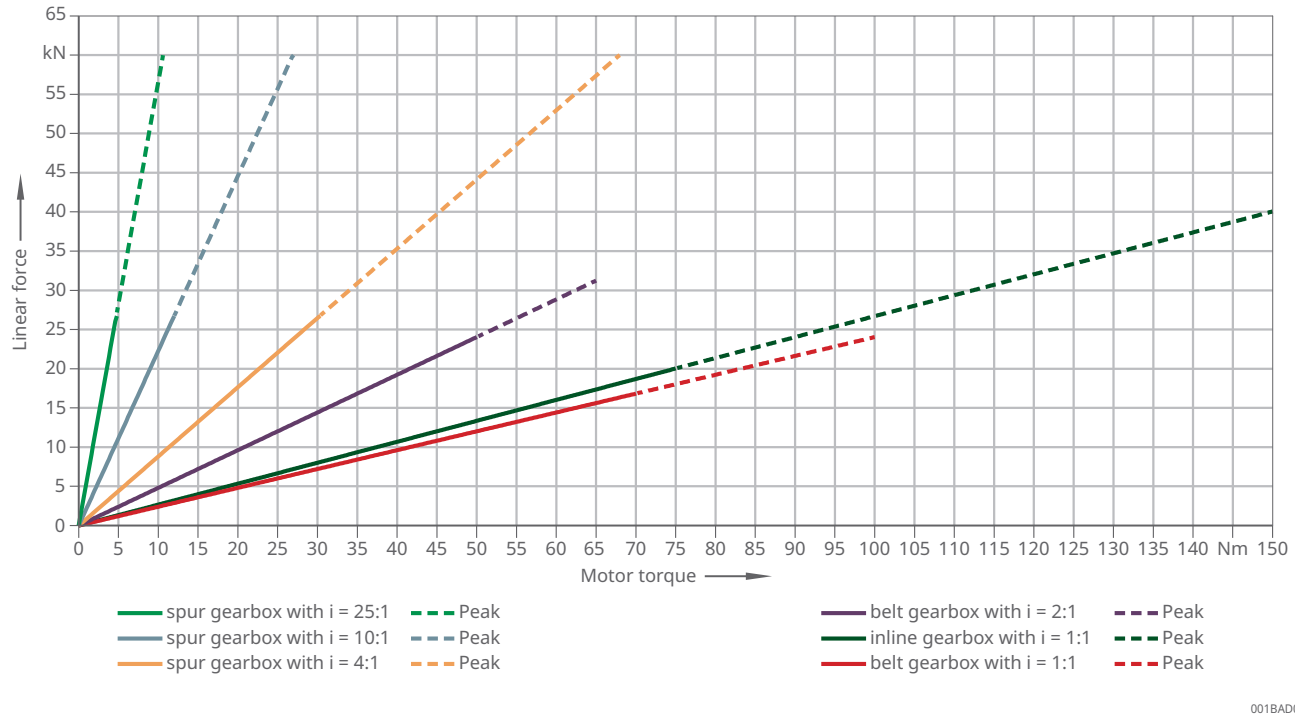
7 Motor torque and resulting linear force EMA-100-1-BC



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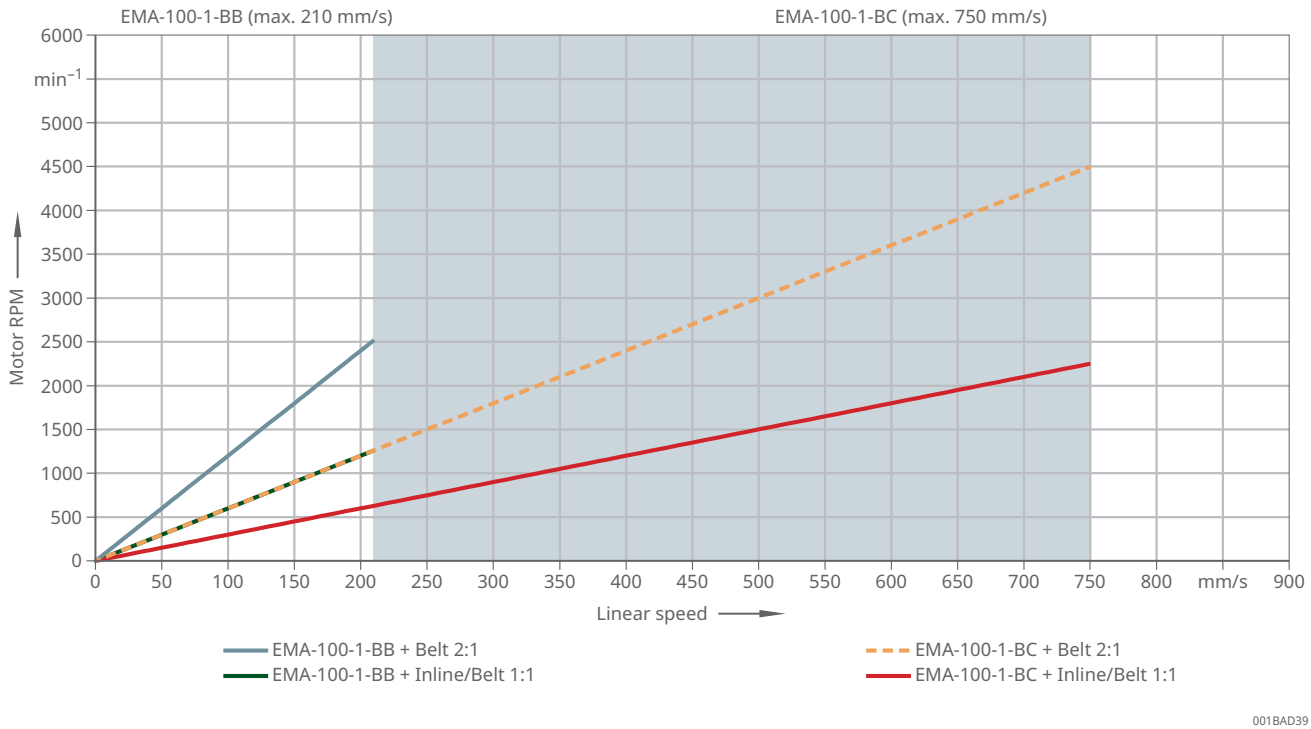
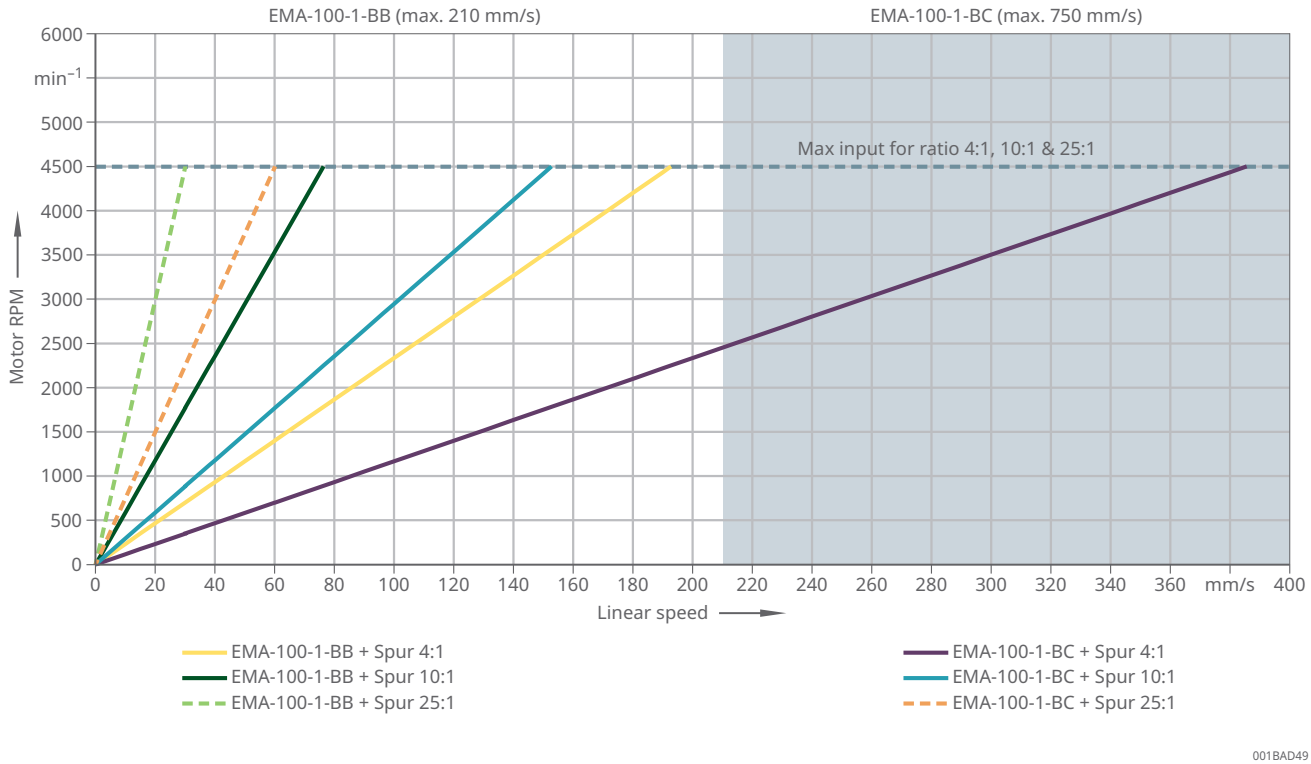
8 Required motor RPM to reach Linear speed (mm/s) EMA-100-1 + Inline & Belt gearbox (1:1, 2:1)



9 Required motor RPM to reach Linear speed (mm/s) EMA-100-1 + Spur gearbox (4:1, 10:1 & 25:1)

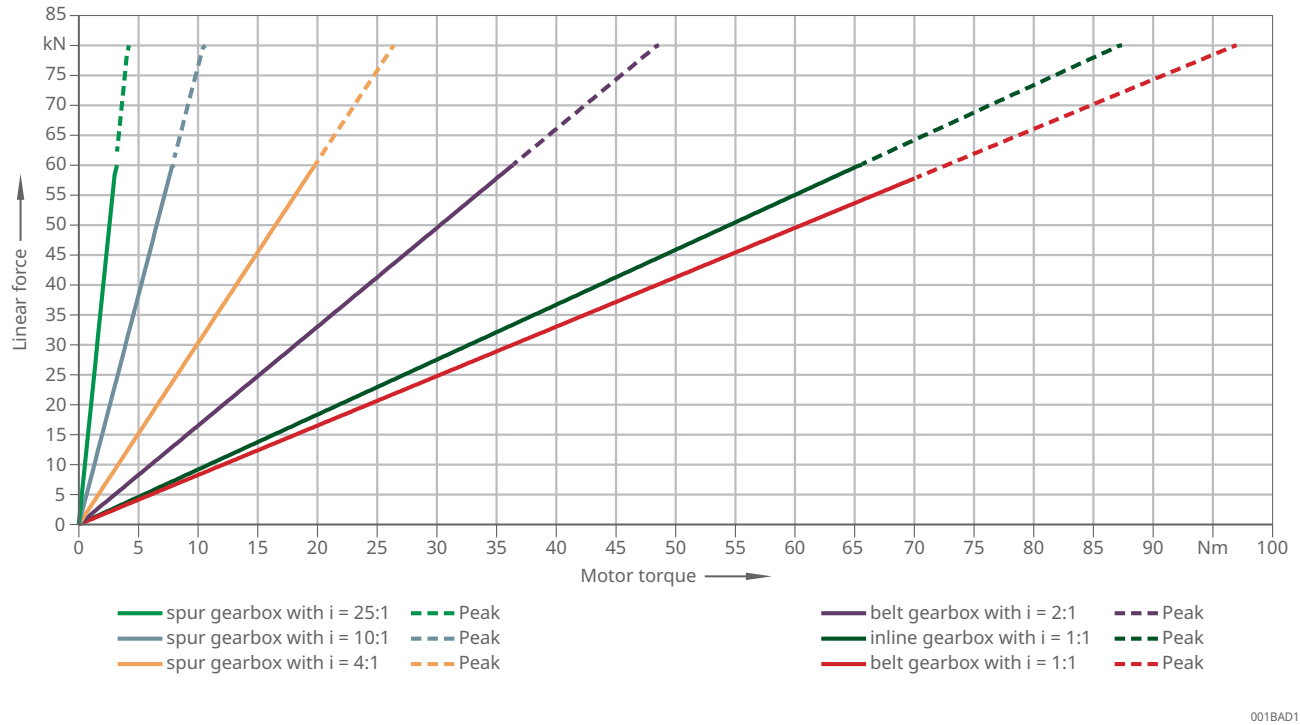


max. linear speed:

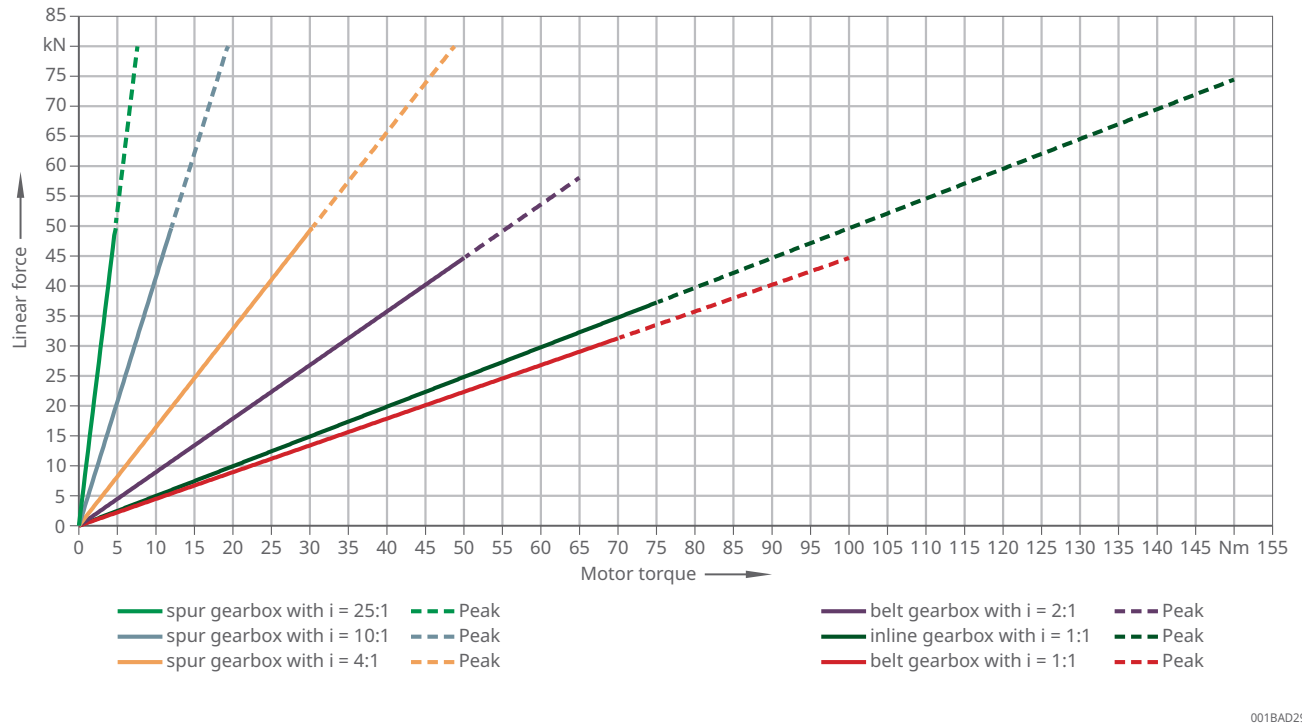
- EMA-100-1-BB: 210 mm/s
- EMA-100-1-BC: 750 mm/s

EMA-100-2

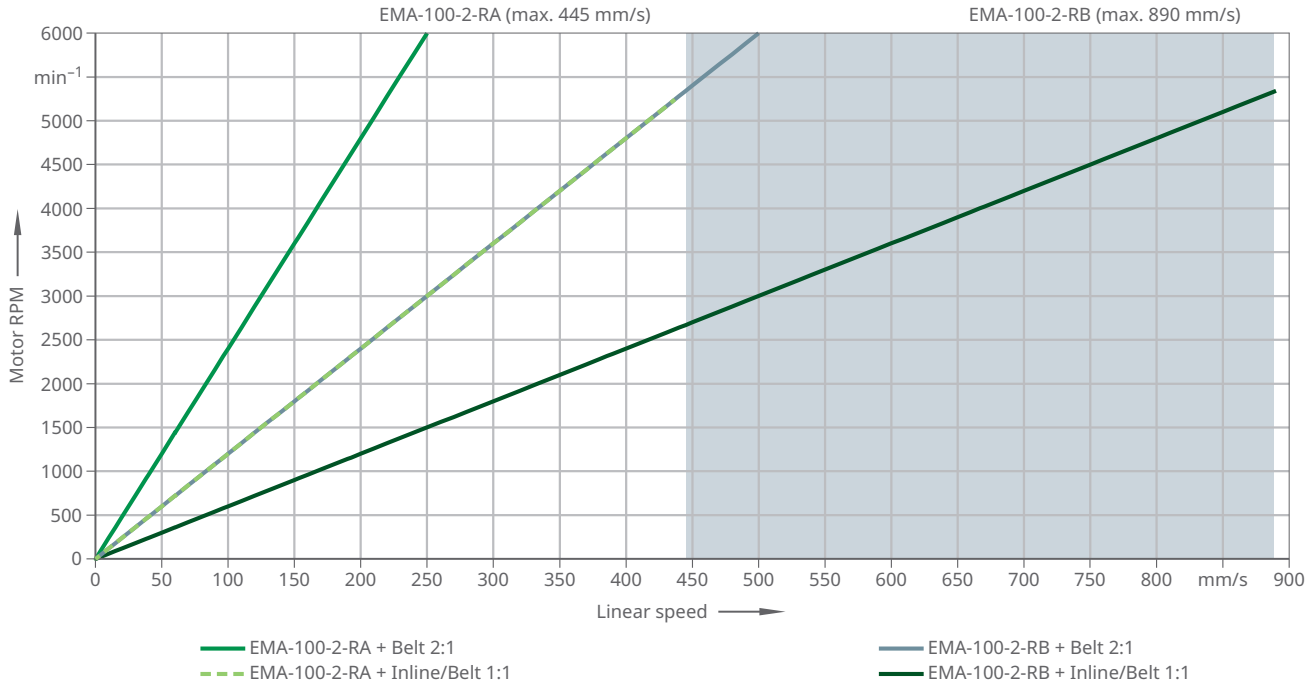
10 Motor torque and resulting linear force EMA-100-2-RA



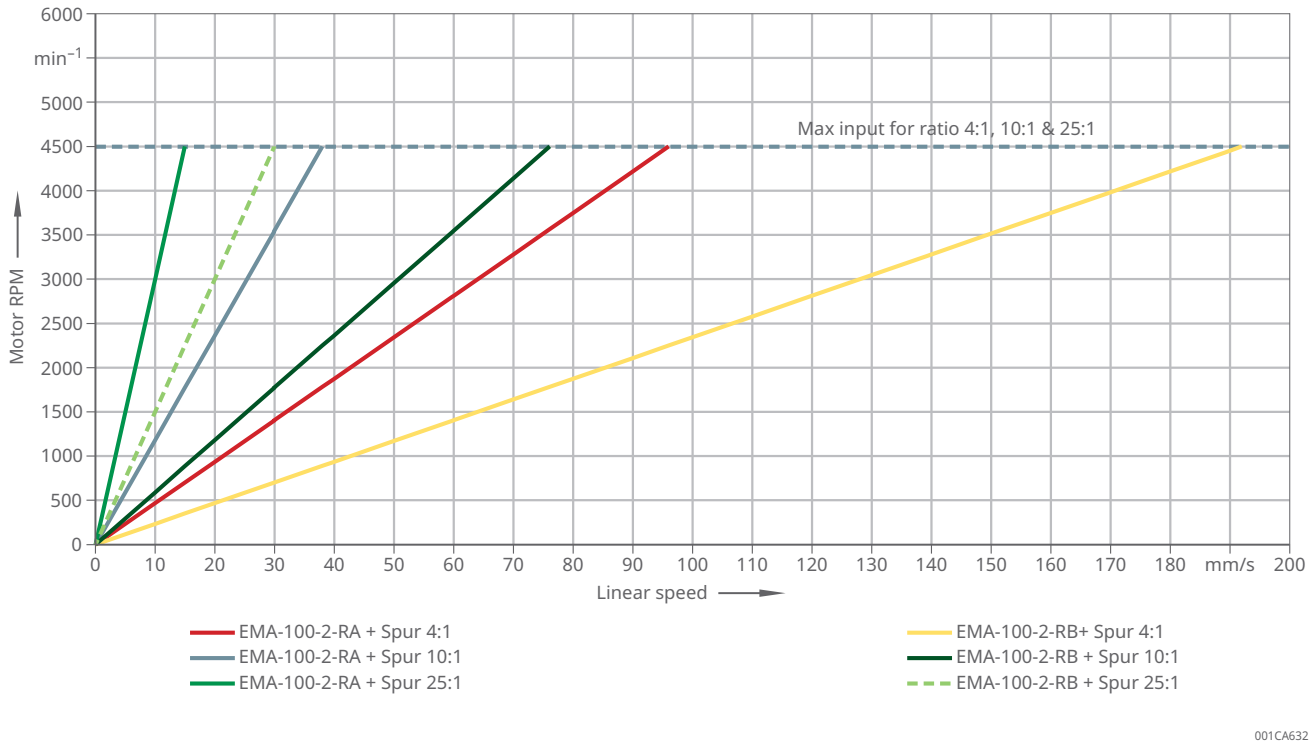
11 Motor torque and resulting linear force EMA-100-2-RB



12 Required motor RPM to reach Linear speed (mm/s) EMA-100-2-R + Spur gearbox (4:1, 10:1 & 25:1)



13 Required motor RPM to reach Linear speed (mm/s) EMA-100-2-R + Spur gearbox (4:1, 10:1 & 25:1)

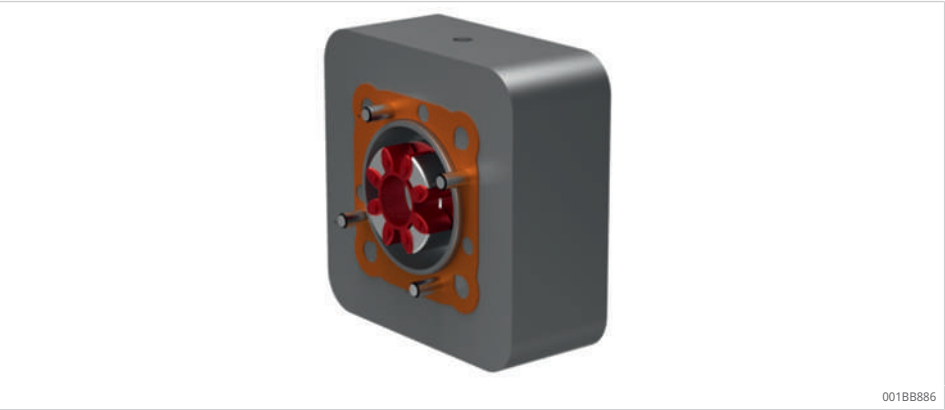


max. linear speed:

- EMA-100-2-RA: 445 mm/s
- EMA-100-2-RB: 890 mm/s

4 Motor adapter and motor

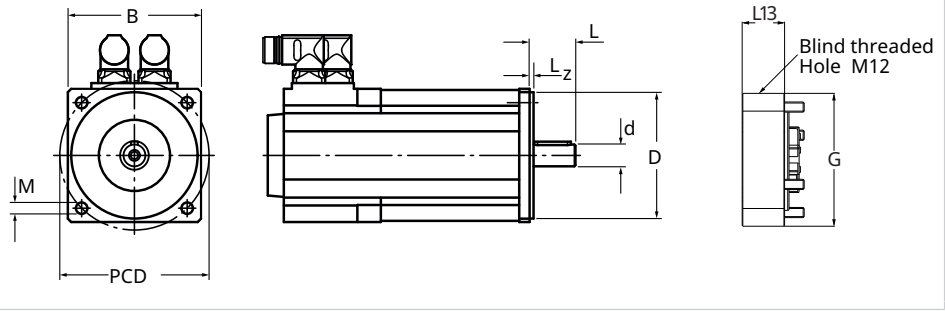
4.1 Motor adapter



The modular system of EMA-100 enables the use of virtually any kind of motor. The motor adapter module makes your motor fit the entire EMA-100 range, independent of the configuration. In fact, thanks to the standardized mechanical interface,this module can be directly attached to any inline or parallel gearbox. Sealings, screws and half coupling parts are included in the package to make it plug and play. Each motor adapter is provided with blind threaded hole M12 to screw an eye bolt for easier actuator handling.

In order to attach your preferred motor to the gearbox, Schaeffler offers motor adapter flanges for the most common motor types. If your motor does not fit the following specifications, please contact Schaeffler.

4.1.1 Rear mounted motor



D [mm]	Lz [mm]	d [mm]	L [mm]	PCD [mm]	M -	B [mm]	G [mm]	L13 [mm]	Motor adapter
60	<7	14	30	75	M5	≥ D + 6	□105	35,5	CG9
70	<7	19	40	90	M5	≥ D + 6	□105	45,5	CC4
70	<7	22	56	85	M6	≥ D + 6	□105	61,5	CG1
80	<7	14	30	100	M6	≥ D + 6	□105	35,5	CD1
80	<7	16	40	100	M6	≥ D + 6	□105	45,5	CC1
80	<7	19	40	100	M6	≥ D + 6	□105	45,5	AA1
80	<7	19	40	100	M6	≥ D + 6	□105	45,5	CG8
95	<7	19	40	115	M8	≥ D + 6	□105	45,5	CC8
95	<7	19	55	115	M8	≥ D + 6	□104	60,5	CD9
95	<7	24	50	115	M8	≥ D + 6	□105	55,5	CC9

D [mm]	Lz [mm]	d [mm]	L [mm]	PCD [mm]	M -	B [mm]	G [mm]	L13 [mm]	Motor adapter
95	<7	24	50	130	M8	≥ D + 6	□ 125	55,5	CG5
110	<7	19	40	130	M8	≥ D + 6	□ 125	45,5	CC2
110	<7	22	55	145	M8	≥ D + 6	□ 125	60,5	CC5
110	<7	24	50	130	M8	≥ D + 6	□ 115	55,5	CH2
110	<7	24	50	130	M8	≥ D + 6	□ 125	55,5	AA2
110	<7	24	55	145	M8	≥ D + 6	□ 125	60,5	CC6
110	<7	24	65	145	M8	≥ D + 6	□ 125	70,5	CD2
110	<7	28	55	145	M8	≥ D + 6	□ 125	60,5	CD7
114,3	<7	35	70	200	M12	≥ D + 6	□ 189	75,5	CH1
114,3	<7	35	79	200	M12	≥ D + 6	□ 189	84,5	CD5
114,3	<7	35	80	200	M12	≥ D + 6	□ 189	85,5	CD4
114,3	<7	42	79	200	M12	≥ D + 6	□ 189	84,5	CG3
114,3	<7	42	113	200	M12	≥ D + 6	□ 189	118,5	CG2
130	<7	24	50	164	M12	≥ D + 6	□ 139	55,5	CE1
130	<7	24	50	165	M10	≥ D + 6	□ 139	55,5	CC3
130	<7	28	60	165	M10	≥ D + 6	□ 139	65,5	CD6
130	<7	32	58	165	M10	≥ D + 6	□ 139	63,5	AA3
130	<7	32	80	165	M10	≥ D + 6	□ 139	85,5	CD8
180	<7	28	60	215	M12	≥ D + 6	□ 189	65,5	CD3
180	<7	38	80	215	M12	≥ D + 6	□ 192,5	85,5	AA4

4.1.2 Front mounted

AC motor standard	Motor adapter
IEC AC 71 B14A	AC1
IEC AC 80 B14A	AC2
IEC AC 90 B14A	AC3
IEC AC 100 B14A	AC4

4.2 Servo motors

Combining the linear unit with a servo motor gives the highest accuracy, power density, efficiency and control. Below is a list of common servo motors families on the market and the main values. Consult the motor manufacture directly for details or contact Schaeffler for assistance.

Note: There might be some motors in the series that does not fit with the listed motor adapter, please check the motor dimensions from the manufacture against the motor adapter. Contact Schaeffler for support.

Technical data - 3rd party motors

Manufacturer	Motor	rated torque [Nm]	rated speed [rpm]	max. torque [Nm]	max. speed [rpm]	rated power [kW]	EMA-100 Adapter**
Siemens	1FK704x...	1,5...3,7	2000...6000	5,1...13	< 9000	0,59...1,26	AA1
	1FK706x...	4,7...10	2000...4500	17,3...35	< 7500	1,11....2,75	AA2
	1FK708x...	6,8...18	2000...4500	25...105	< 6000	2,1...3,75	AA3
	1FK710x...	12...37	2000...3000	55...150	< 5000	3,05...8,2	AA4
	1FK2204...	0,9...3,2	1500...6000	7,1...9,5	< 8000	0,38...1	CC4
	1FK2205...	2,5...5,5	1500...4500	10,8...18	< 9000	0,53...1,45	AA1
	1FK2105...	1,7...8	1500...4500	15...24	< 9000	0,79...2,1	CC8
	1FK2206...	3,85...10,9	1500...4500	18...36	< 8000	0,97...2,85	AA2
	1FK2208...	11,1...53,5	1500...3000	51...80	< 6000	1,7...4	AA3
	1FK2210...	18...43	750...3000	90...150	< 5000	2,5...7,1	AA4
Bosch Rexroth	MS2N05...	3,75...9,35		11,5...34	4000...6000		CC8
	MS2N06...	3,25...16,3		10,2...53,4	4000...6000		CG5
	MS2N07...	7,4...38,2		22,8...119,5	4000...6000		AA3
	MS2N10...	15,6...103		41,3...313,0	2000...6000		AA4
Lenze	MCS09...	1,8...4,5	3750...6000	9,5...32		1,0....1,9	CD1
	MCS12...	4,3...17	1350...4050	18...56		1,1...5,7	CC2
	MCS14...	7,5...42	1050...3600	29...105		1,45...9,1	CC3
	MCS19...	21...72	1200...3000	86....190		4,0...15,8	CD3
SEW	CMP63...		3000...6000	11,1....30,4	3000...6000		CD1
	CMP(Z)71 ...		2000...6000	19,2...46,9	2000...6000		AA2
	CMP(Z)80 ...		2000...6000	42,1...107	2000...6000		CD6
Beckhoff	AM8x4x...	2,1...7,0	500...8000	9,14...39,1	< 9000	0,15...3,43	AA1
	AM8x5x... [1]	2,7...12,8	400...8000	17,74...70,70	< 9000	0,25...5,84	CC9
	AM8x6x...	6,1...33,3	300...5000	37,07...148	< 6000	0,4...11,7	AA3
	AM8x7x...	8...85	200...4500	78...356	< 5000	1,12...8,27	AA4
B&R	8LSA3..-3	0,6...14,4	2200...6000	3...9,2	< 9000	0,22...1,27	CD1
	8LSA4..-3	2...8,7	2200...6000	15,2...38	< 12000	0,8...3,1	CC8
	8LSA5..-3 [1]	3,9...40	1500...4500	13,8...177	< 9000	0,9...8,48	AA3, CC3
	8LSA6..-3 [1]	9,5...24,5	2200...4500	46,9...114,2	< 9000	2,7...7,3	AA4, CD3
	8LSA7..-3 [1]	16...48,5	1500...4500	107...330	< 6000	5,04...13,8	AA4, CD3
Kollmorgen	AKM2G4...	2,19...8,39	900...6000	7,25...27	< 6000	0,267....2,85	AA1
	AKM2G5...	4,67...19,3	1100...6000	15,7...54,8	< 6000	0,78...5,28	AA2
	AKM2G6...	9,6...31,1	750...5000	37,4....87	< 6000	1,56...7,79	AA3
	AKM2G7...	12,0...66,5	900...4900	49,3...164,6	< 6000	2,42...11,8	AA4

NOTES:

- Please consult Schaeffler before ordering the motor adapter to verify the fit to your motor. The motor dimensions of the listed motor-series may have been changed by the motor manufacturer.
- Please check the manufacturer's data sheets for exact motor performance values. This table mentions the performance range or the max. performance values of the selected motor-series.
- Adapters for motors or motor manufacturers which are not mentioned in this table, please contact Schaeffler for support in selecting a suitable motor adapter or visit the motor-adapter/previous page.
- Motor adapters fit to the motors only. Gearboxes which can be provided by the motor manufacturer may not fit to the mentioned motor adapters. Please contact Schaeffler for support in selecting a suitable motor-gearbox adapters.

[1] Certain motor configurations excluded.

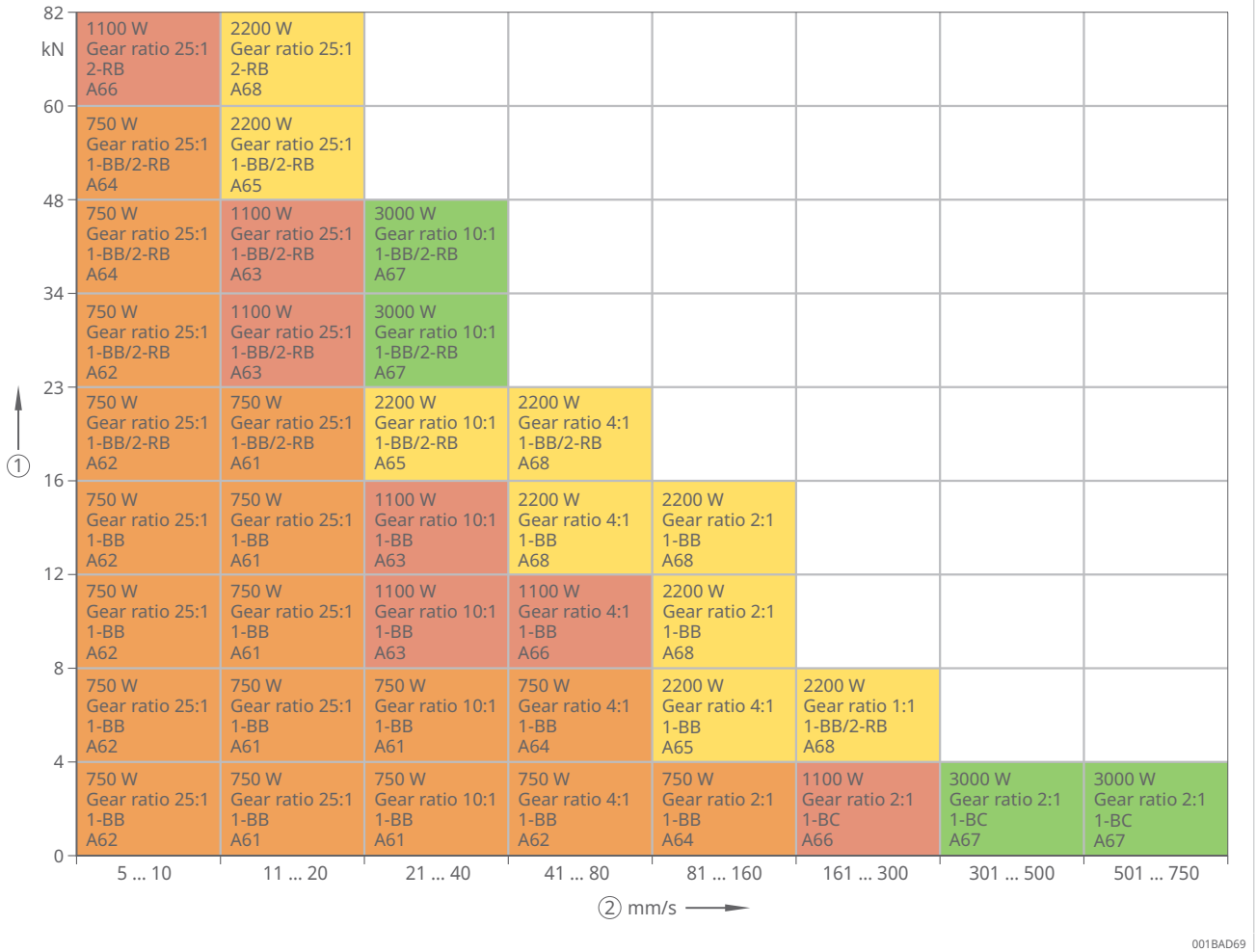
4

4.3 AC induction motors

Examples of linear unit, parallel gearbox and IEC AC motor combinations

The table below is a guidance to understand the performance levels that can be reached by using spur gearbox (GB-100-GS) ➤35|3 or belt gearbox (GB-100-GB) with standard IEC AC asynchronous motors, in terms of maximum dynamic axial force and linear speed.

In particular, by selecting the desired force and speed range, it's possible to quickly see which combination of screw, gearbox and AC induction motors motors fulfills the application requirements. This is a generic guidance, while the detailed performance values of each mentioned combination should be calculated.



1	Max. dynamic axial force	2	Linear speed

Legend

Row description	
Row 1	Rated power
Row 2	Gear ratio
Row 3	Ball or roller scew type
Row 3	Selected Servo motor

Ball or roller screw type	
1-BB	Ball screw 40x10
1-BC	Ball screw 40x20
2-RB	Roller screw 30x10

Rated power | AC Motors	
750 W (orange)	A61/A62/A64
1 100 W (red)	A63/A66
2 200 W (yellow)	A65/A68
3 000 W (green)	A67

4.3.1 IEC AC Motors

The Siemens SIMOTICS low-voltage electric motors provided by Schaeffler comes with a holding brake and PTC thermistor as standard.

It is a SIMOTICS GP 1LE1 self-ventilated aluminium motor with standard terminal box.

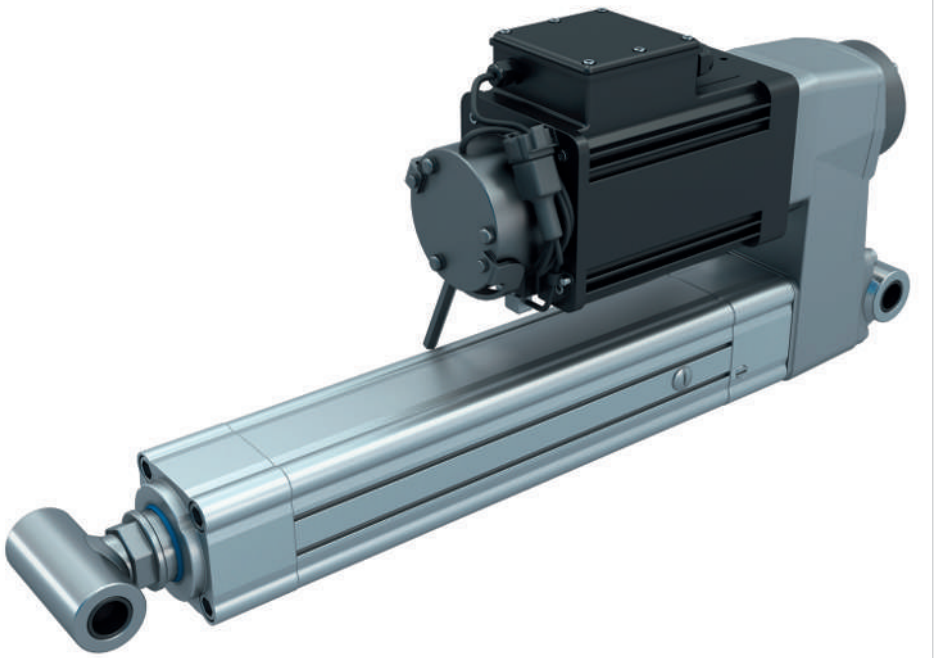
In addition, the motors are equipped with a two channel rotary pulse encoder as feedback.

Motor type[1)] Designation	Size	Type	Rated power kW	Rated speed RPM	Rated current A	Rated torque Nm	Efficiency level -	Motor weight kg	Motor inertia kgm^2	Brake inertia kgm^2
A61	IEC-71-2	2 poles / with encoder	0,55	2750	1,34	1,9	IE2	7	0,00045	0,00001 3
A62	IEC-71-4	4 poles / with encoder	0,37	1380	1,02	2,6	IE2	7	0,00095	0,00001 3
A63	IEC-80-2	2 poles / with encoder	1,1	2885	2,25	3,6	IE3	12	0,0013	0,00004 5
A64	IEC-80-4	4 poles / with encoder	0,75	1450	1,75	4,9	IE3	14	0,0029	0,00004 5
A65	IEC-90-2	2 poles / with encoder	1,5	2910	3,0	4,9	IE3	15	0,0031	0,00016
A66	IEC-90-4	4 poles / with encoder	1,1	1440	2,4	7,3	IE3	16	0,0036	0,00016
A67	IEC-100-2	2 poles / with encoder	3	2920	5,6	9,8	IE3	26	0,0054	0,00036
A68	IEC-100-4	4 poles / with encoder	2,2	1465	4,4	14,0	IE3	30	0,014	0,00036

[1)] Voltage 400 VΔ, 50Hz

4.4 AC induction motor, e-MOVEKIT

14 AC induction motor, e-MOVEKIT



With this AC induction motor most hydraulic application use cases for mobile machinery can be fulfilled. This motor together with the quick start e-MOVEKIT or the system integration e-MOVEKIT allows for a plug-and-play solution for a wide variety of applications running on 24 VDC battery power. This motor provides high power in a small footprint and was specially designed for the application in linear actuators. The included fail-safe electromagnetic brake allows for a safe operation state in every situation.

Technical data

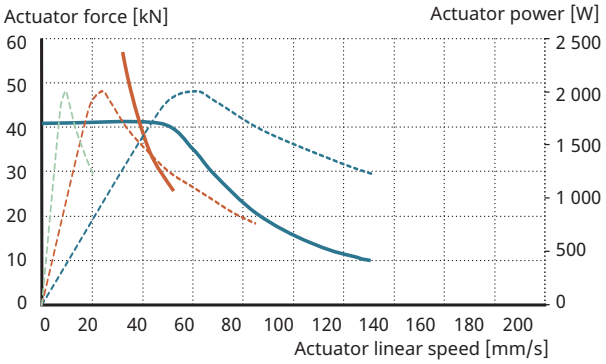
Designation	Symbol	Unit	Data
Motor Type	–	–	Nidec AC induction motor, 1,4kW, with EM-brake
Ordering key	–	–	B0-N11
Rated output power	PM	kW	1,4
Bus voltage	U	V DC	24
Rated voltage	U_{rated}	V AC	16
Rated current	I_{rated}	A	85
Rated speed	n_{rated}	rpm	2050
Maximum speed	n_{max}	rpm	3000
Rated torque (S3-15%)	M_{rated}	Nm	6,05
Peak torque (S2-2 min)	M_{peak}	Nm	25
Speed sensor	–	–	2 × 64 pulse quadrature encoder
Temperatur sensor	–	–	PT1000
Brake type	–	–	Electromagnetic
Brake voltage level	U_{brake}	V DC	24
Brake power level	P_{brake}	W	25
Manual brake release	–	–	lever

4.4.1 Performance diagram

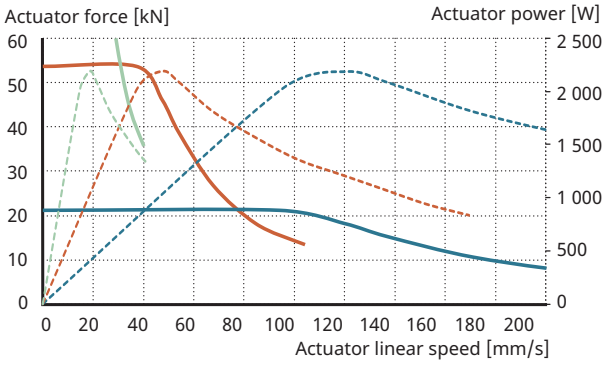
Speed-load diagramms (S2-2 min)

15 Speed-load diagramms (S2-2 min)

EMA-100-1-BB/CB



EMA-100-1-BC



Actuator force	Gearing ratio 4:1	Gearing ratio 10:1	Gearing ratio 25:1
Actuator power	Gearing ratio 4:1	Gearing ratio 10:1	Gearing ratio 25:1

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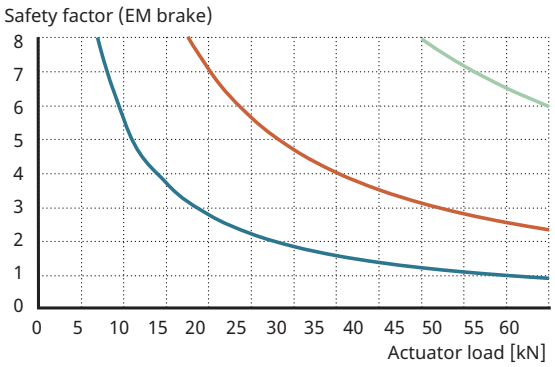
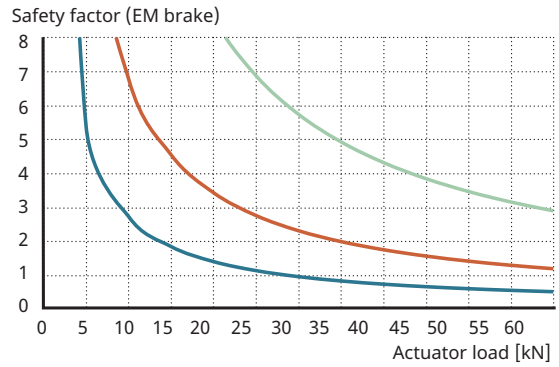
Safety factor load diagrams

16 Safety factor load diagrams

EMA-100-1-BB/CB



EMA-100-1-BC



Gearing ratio 4:1 | Gearing ratio 10:1 | Gearing ratio 25:1

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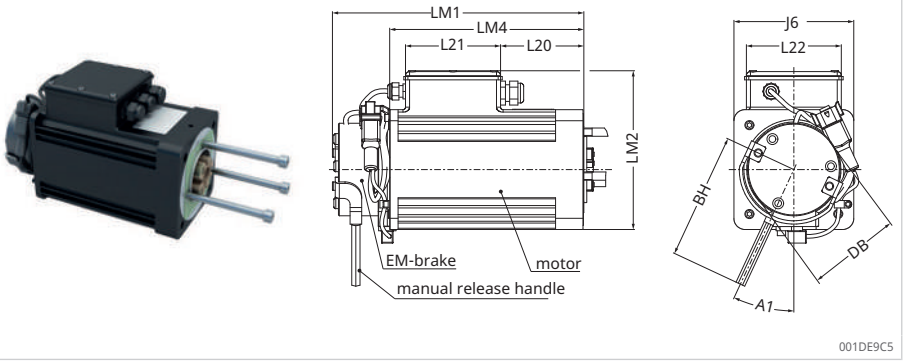
4.4.2 Dimensional drawing

17 Dimensions



1 Dimensions

Type	LM1	LM2	LM4	L20	L21	L22	J6	A1	BH	DB
-	mm									
MK-100-MA-B0-N11	304,2	192	234,8	100,8	115	115	145	25°	153	Ø 112

4.5 Ordering key

Ordering key:

- Linear unit
  - EMA-100-1 ➤32|1
  - EMA-100-2 ➤33|2
- Gearbox ➤45|4
- Motor adapter ➤59|18
- Complete actuator ➤67|5.6

18 Ordering key for motor

	MK-100-MX-XX-XXX-000
Motor supplied and installed by Schaeffler	**–B0–**
Servo motor – Siemens (type S – rear mounting)	
Siemens 1FK7044-4CH71-1UH0	S–B0–A11
Siemens 1FK7064-4CF71-1RB0	S–B0–A12
Siemens 1FK7086-4CF71-1RB0	S–B0–A13
Siemens 1FK7105-2AF71-1RB0	S–B0–A14
AC motor - Siemens (type A – front mounting)	
Siemens IEC-71-2 (1LE1001-0CA32-2KB4-Z=F01+F11+G11)	A–B0–A61
Siemens IEC-71-4 (1LE1001-0CB32-2KB4-Z=F01+F11+G11)	A–B0–A62
Siemens IEC-80-2 (1LE1003-0DA32-2KB4-Z=F01+F11+G11)	A–B0–A63
Siemens IEC-80-4 (1LE1003-0DB32-2KB4-Z=F01+F11+G11)	A–B0–A64
Siemens IEC-90-2 (1LE1003-0EA02-2KB4-Z=F01+F11+G11)	A–B0–A65
Siemens IEC-90-4 (1LE1003-0EB02-2KB4-Z=F01+F11+G11)	A–B0–A66
Siemens IEC-100-2 (1LE1003-1AA42-2KB4-Z=F01+F11+G11)	A–B0–A67
Siemens IEC-100-4 (1LE1003-1AB42-2KB4-Z=F01+F11+G11)	A–B0–A68
Motor adapter only	**–00–**
Adapter mounted by Schaeffler – Siemens servo motor (type S – rear mounting)	
Siemens 1FK7044 series	S–00–AA1
Siemens 1FK7064 series	S–00–AA2
Siemens 1FK7086 series	S–00–AA3
Siemens 1FK7105 series	S–00–AA4
Adapter mounted by Schaeffler – third-party servo motor (type S – rear mounting)	
See table for full list	S–00–
Adapter provided by Schaeffler – AC interface (type A – front-mounted motor)	
IEC AC 71 B14A	A–00–AC1
IEC AC 80 B14A	A–00–AC2
IEC AC 90 B14A	A–00–AC3
IEC AC 100 B14A	A–00–AA4
Customer-specific flanges	
Customer-specific flanges, see table for dimensions	#–00–###
Customer option	
No option	000

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5 Complete actuator combinations

The built-in modularity of the EMA-100 actuator allows customers to create tailor-made solutions through a vast number of standard components.

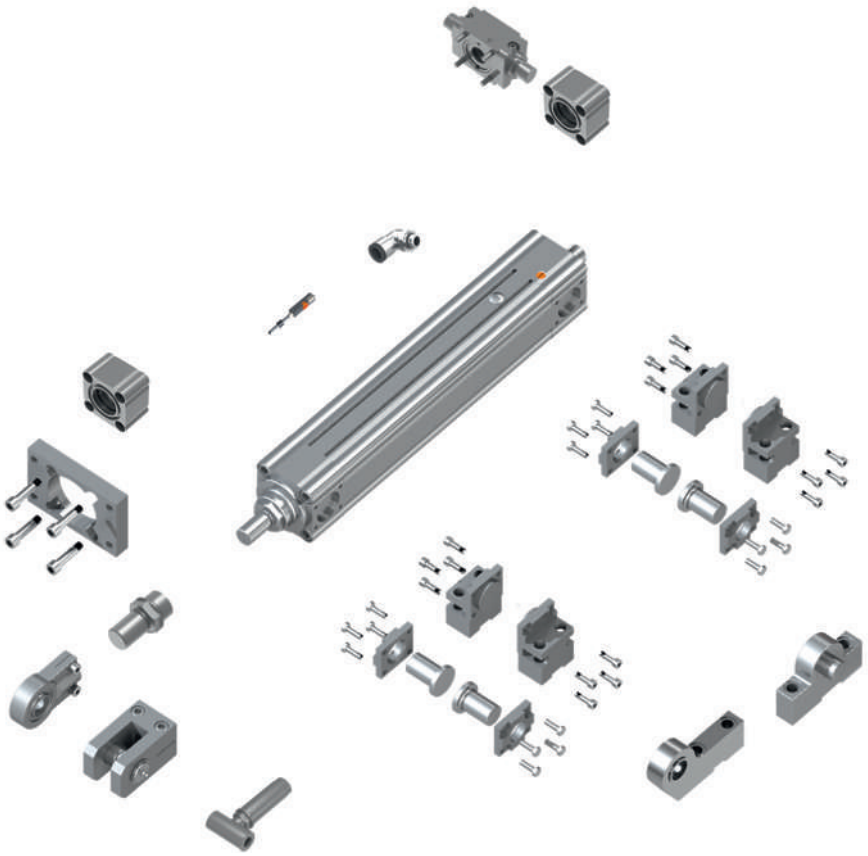
Considering the different types and sizes of screws, gear- boxes, motors, push tubes, bearing units, sealing kits and attachments available, several hundreds of combinations are possible.

Each of them can deliver a unique performance to fulfill even the most demanding application requirements.

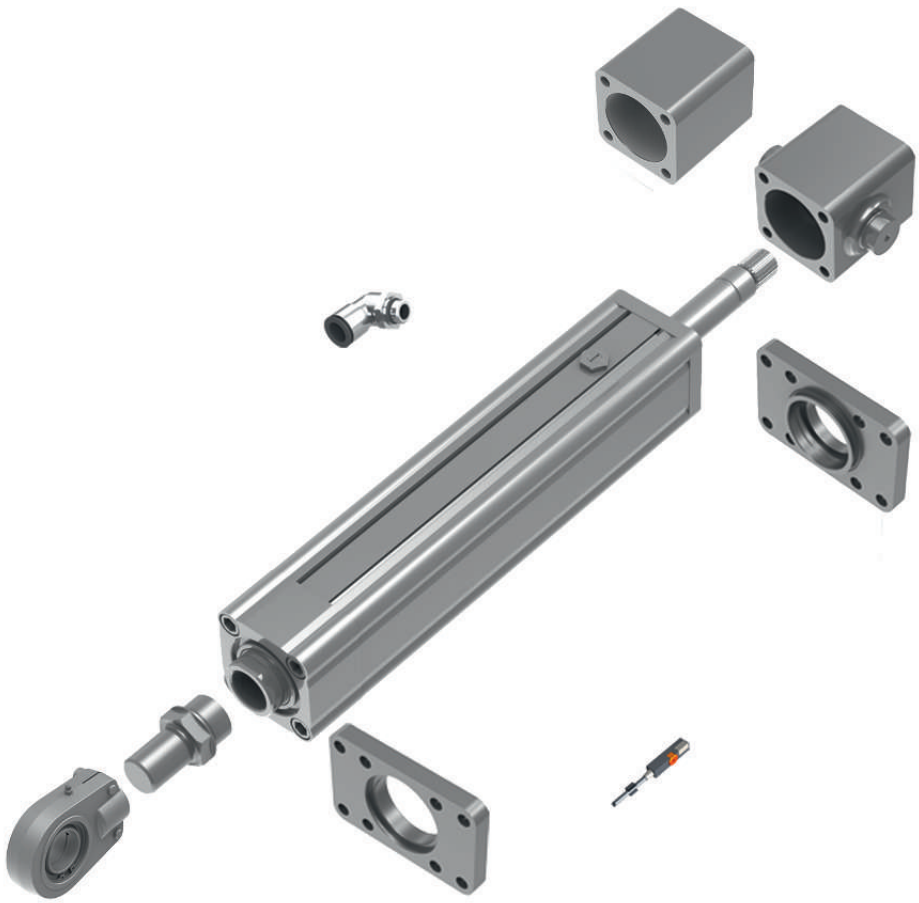
For that reason, the following pages are presenting data-sheets only or the linear units for one of the possible actuator combinations (i.e. linear units with 4 screws - inline adapter - servo motors), as an example.

On schaeffler.com you will be able to configure your EMA-100 actuator and download the 3D files of your configuration.

19 EMA-100-1 with accessories



20 EMA-100-2 with accessories



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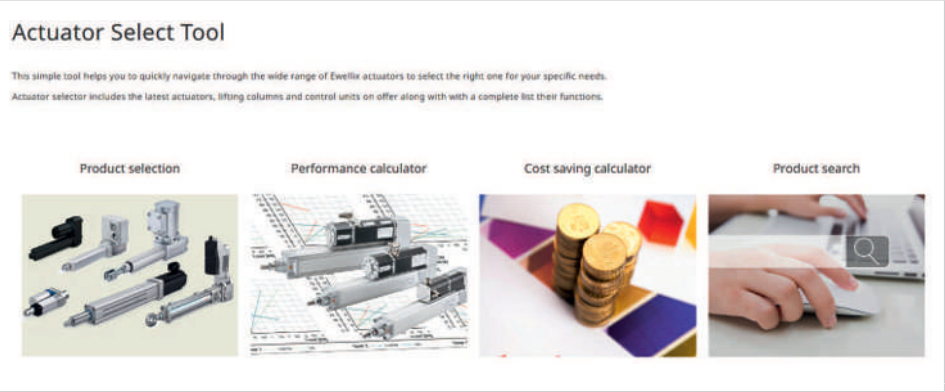
5.1 3D models

Product configurators for 3D models are available on schaeffler.com

https://www.schaeffler.de/std/2208



5.2 Manuals

Supporting documents are available for download on schaeffler.com

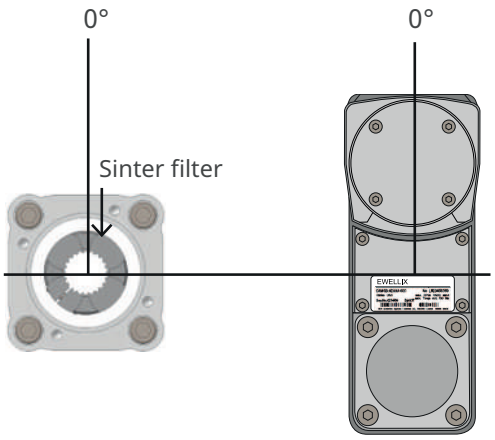
Further information

BA 108 | Electromechanical EWELLIX Linear Actuator |
https://www.schaeffler.de/std/2028

5.3 Mounting positions

For a complete actuator assembly, the gearbox is used as the 0° reference for all connected modules:

21 Gearbox reference

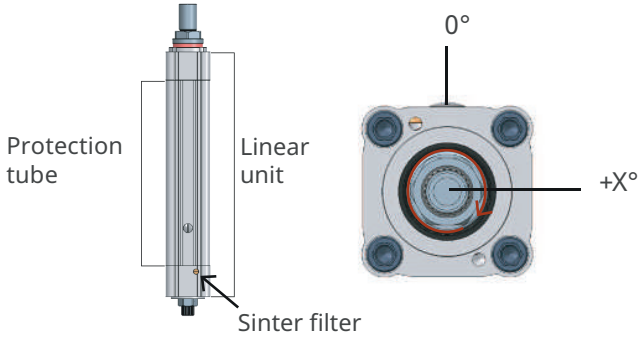


5.4 Mounting position protection tube

The 0° reference for the protection tube is the sinter filter position. The protection tube can be turned in 90° steps clockwise (see graphic "Linear unit reference"). Parallel gearbox mounting positions have some limitations: protection tube with relubrication port can be mounted at 90° - 180° - 270° (0° is not possible) (see graphic "Linear unit orientation").

For roller screw version 2 (EMA-100-2-R..) the rear housing is used as the reference, due to the sinter filter being located on the lubrication port of the linear unit.

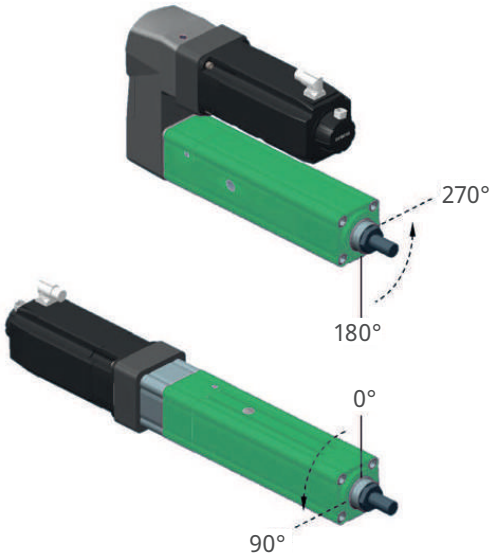
22 Linear unit reference



Orientation recommendation

For parallel version, recommended linear unit mounting position is 0° and protection tube mounting position is 90° (270° also possible).

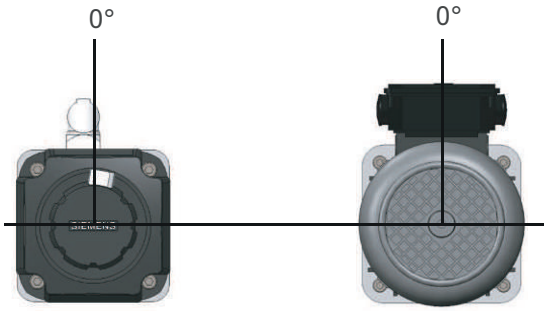
23 Linear unit orientation



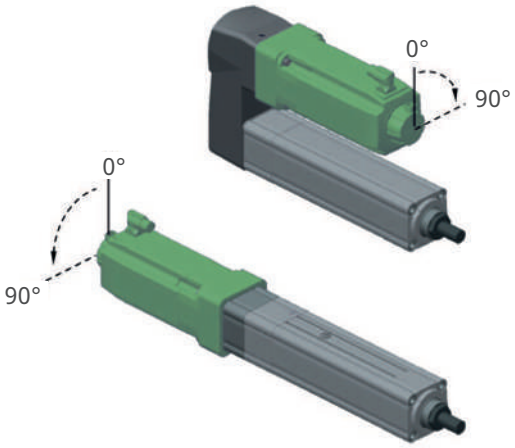
5.5 Mounting position motor

The 0° reference for the motor is the electric connector outlet position. The motor can be turned in 90° steps clockwise (see graphic "Reference motor adapter"). Parallel gearbox mounting position have some limitations: Motor from sizes Servo 8x / IEC AC 80 and bigger can be mounted at 0° - 90° - 270° (180° is not possible) (see graphic "Motor adapter orientation").

24 Reference motor adapter



25 Motor adapter orientation



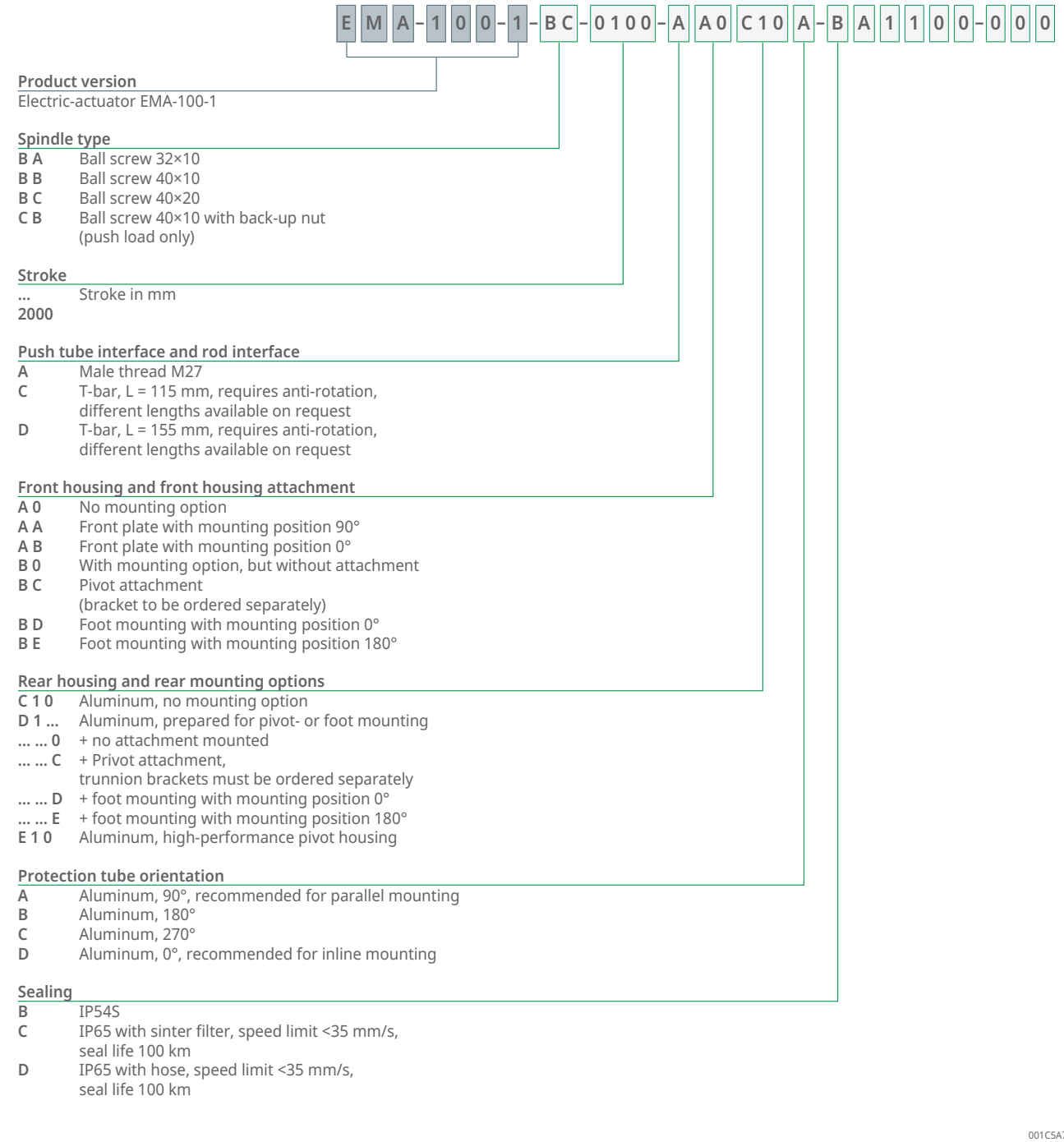
5.6 Ordering key Complete actuator

Ordering key:

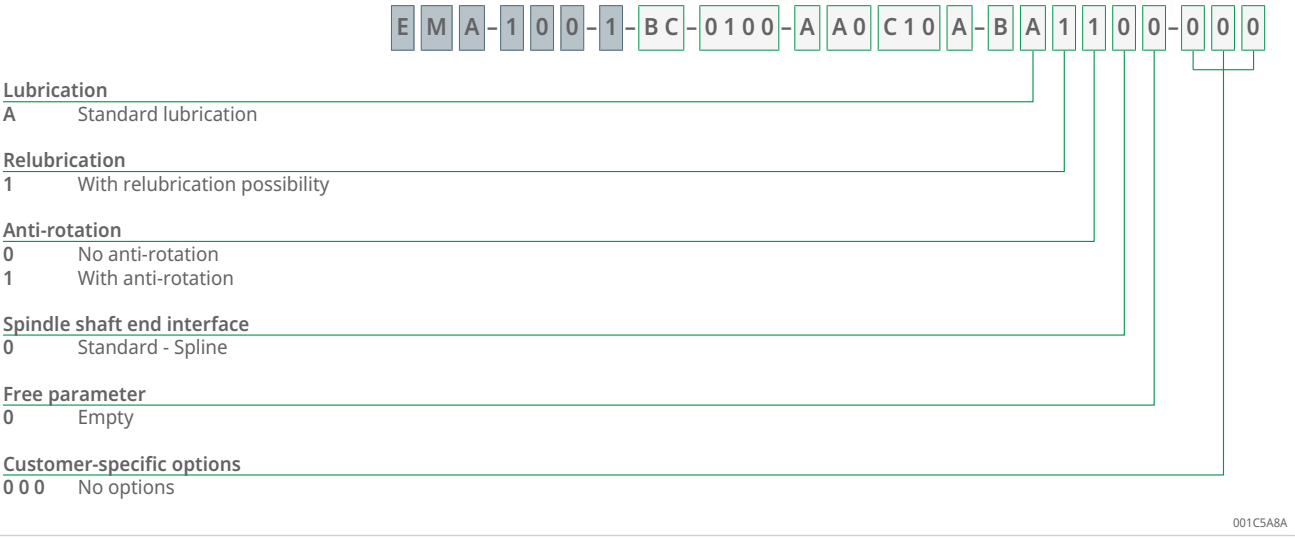
- Linear unit -
  - EMA-100-1:--- FEHLENDER LINK ---
  - EMA-100-2:--- FEHLENDER LINK ---
- Gearbox - --- FEHLENDER LINK ---
- Motor adapter - --- FEHLENDER LINK ---

Linear unit EMA-100-1

26 Ordering key for linear unit EMA-100-1 (part 1)



27 Ordering key for linear unit EMA-100-1 (part 2)



Linear unit EMA-100-2

28 Ordering key for linear unit EMA-100-2 (part 1)

Product version
Electric-actuator EMA-100-2

Spindle type

R A	Roller screw 30×5 high load and long service life
R B	Roller screw 30×10 high load and long service life

Stroke

...	Stroke in mm
1000	

Push tube interface and rod interface

A	Male thread M27, with limitations of max. linear force and lifetime
G	Male thread M35
H	Female thread M42

Front housing and front housing attachment

A 0	No mounting attachment
A A	Front plate with mounting position 90°
A B	Front plate with mounting position 0°

Rear housing and rear mounting options

S 1 0	Steel, standard option, no attachment
S 2 0	Steel, push-optimized, no attachment
S 3 0	Steel, pull-optimized, no attachment
T 1 0	Steel, standard option, trunnion attachment
T 2 0	Steel, push-optimized, trunnion attachment
T 3 0	Steel, pull-optimized, trunnion attachment
S 1 P	Steel, standard option, mounting plate with mounting position 0°
S 2 P	Steel, push-optimized, mounting plate with mounting position 0°
S 3 P	Steel, pull-optimized, mounting plate with mounting position 0°
S 1 Q	Steel, standard option, mounting plate with mounting position 90°
S 2 Q	Steel, push-optimized, mounting plate with mounting position 90°
S 3 Q	Steel, pull-optimized, mounting plate with mounting position 90°

Protection tube orientation

A	Aluminum, 90°, recommended for parallel mounting
B	Aluminum, 180°
C	Aluminum, 270°
D	Aluminum, 0°, recommended for inline mounting

Sealing

B	IP54S
D	IP65 with hose

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29 Ordering key for linear unit EMA-100-2 (part 2)

Lubrication
- **A** Standard lubrication
- **F** Food-grade grease, for linear unit only
- **H** High-load lubricating grease
- **S** Short-stroke lubricating grease

Relubrication
- **1** With relubrication possibility

Anti-rotation
- **0** No anti-rotation
- **1** With anti-rotation

Spindle shaft end interface
- **0** Standard - Spline
- **K** Keyway D = 20mm, not compatible with EMA-100 gearboxes

Free parameter
- **0** Empty

Customer options
- **0 0 0** No options

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Gearbox

30 Ordering key for gearbox unit

Gearbox type

I	Inline
B	Belt (not for ball screw drive BA)
S	Spur gear

Gearbox type

A	Inline servo motor
B	Inline asynchronous motor
C	Parallel gearbox

Gear ratio

A	1:1 (inline gearbox and belt gearbox only)
B	4:1 (spur gearbox only)
C	10:1 (spur gearbox only)
D	25:1 (spur gearbox only)
E	2:1 (belt gearbox only)

Cover options

A	Standard option for inline gearbox
B	Standard option for spur gearbox
C	Belt gearbox, rear cover for rear mounting or brakes, IP54S
D	Belt gearbox, lightweight rear cover (no rear mounting or brakes), IP40S

Rear mounting

0	No
B	Rear attachment 0°
C	Rear attachment 90°
D	Rear attachment, bar type, L = 115 mm, 0°, (spur only) other lengths available on request
E	Rear attachment, bar type, L = 155 mm, 0°, (spur only) other lengths available on request

Options

0	No accessories
B	Centrifugal brake (switch-on speed: 2200 min^{-1}) not for roller screw versions

Customer-specific options

0 0 0	No customer-specific option

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Motor kit

31 Ordering key for motor kit

	M	X	–	X	X	–	X	X	X	–	X	X	–	0	0	0
Motor supplied and installed by Schaeffler													– B	0	–	
Servo motor – Siemens (type S – rear mounting)																
Siemens 1FK7044-4CH71-1UH0													S – B	0	– A	1 1
Siemens 1FK7064-4CF71-1RB0													S – B	0	– A	1 2
Siemens 1FK7086-4CF71-1RB0													S – B	0	– A	1 3
Siemens 1FK7105-2AF71-1RB0													S – B	0	– A	1 4
AC motor - Siemens (type A – front mounting)																
Siemens IEC-71-2 (1LE1001-0CA32-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 1
Siemens IEC-71-4 (1LE1001-0CB32-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 2
Siemens IEC-80-2 (1LE1003-0DA32-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 3
Siemens IEC-80-4 (1LE1003-0DB32-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 4
Siemens IEC-90-2 (1LE1003-0EA02-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 5
Siemens IEC-90-4 (1LE1003-0EB02-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 6
Siemens IEC-100-2 (1LE1003-1AA42-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 7
Siemens IEC-100-4 (1LE1003-1AB42-2KB4-Z=F01+F11+G11)													A – B	0	– A	6 8
Motor adapter only													– 0	0	–	
Adapter mounted by Schaeffler – Siemens servo motor (type S – rear mounting)																
Siemens 1FK7044 series													S – 0	0	– A	A 1
Siemens 1FK7064 series													S – 0	0	– A	A 2
Siemens 1FK7086 series													S – 0	0	– A	A 3
Siemens 1FK7105 series													S – 0	0	– A	A 4
Adapter mounted by Schaeffler – third-party servo motor (type S – rear mounting)																
See table for full list													S – 0	0	–	
Adapter provided by Schaeffler – AC interface (type A – front mounting)																
IEC AC 71 B14A													A – 0	0	– A	C 1
IEC AC 80 B14A													A – 0	0	– A	C 2
IEC AC 90 B14A													A – 0	0	– A	C 3
IEC AC 100 B14A													A – 0	0	– A	A 4
Customer-specific flanges																
See table for dimensions													# – 0	0	– #	# #
Alignment for the complete actuator																
Linear unit mounting position																
0° Recommended for parallel gearboxes (standard, if no gearbox is selected)												A				
90°												B				
180°												C				
270°												D				
Motor mounting position											0					
No motor kit selected											0					
0°											A					
90°											B					
180° Inline gearbox only											C					
270°											D					
Customer option																
No option																0 0 0

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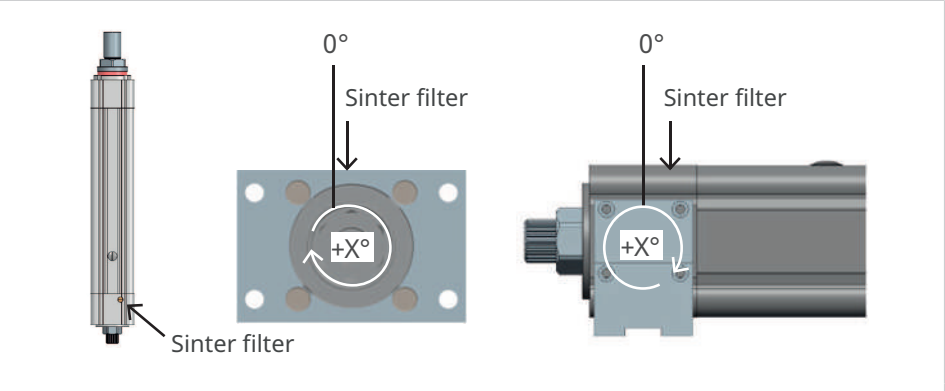
5.7 Mounting position front plate and foot mount

The 0° reference for the linear unit is the sinter filter position. The front plate can be turned in 90° steps clockwise. The foot mount can be turned in 180° steps clockwise.

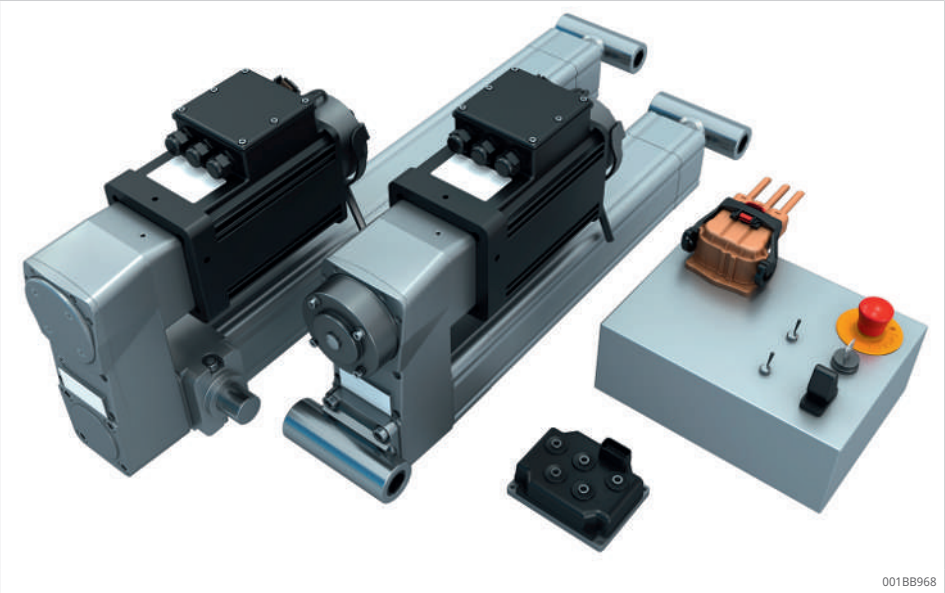


6 e-MOVEKIT

The e-MOVEKIT allows users to unlock the benefits of fully electrified actuation for their equipment, without the hassle of sizing and designing the complete control system.

6.1 System description

The e-MOVEKIT is a complete system offer that consists of all components required to drive a linear actuator in mobile machines that use 24V batteries. It was tested according to industry standards.



The system allows for linear movements controlled by analog inputs or through CAN commands. It also offers features that make it easy to replace hydraulic systems like:

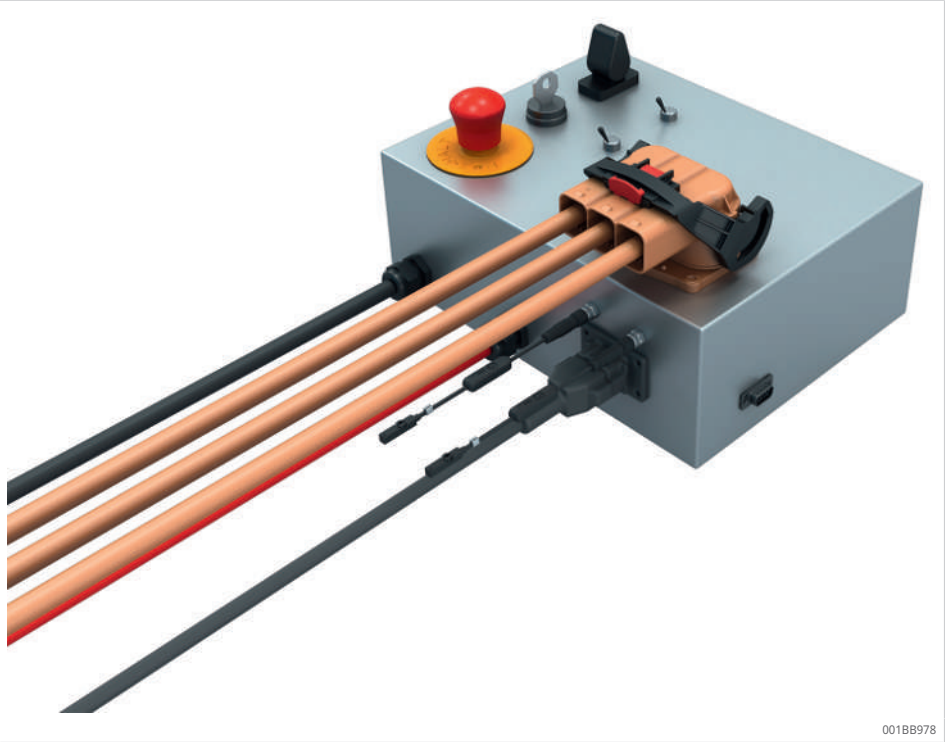
- Easily integrate the actuator into an existing system
- Start using electromechanics with little knowledge required (system integration e-MOVEKIT, quick start e-MOVEKIT)
- Build prototypes quickly / perform feasibility studies
- Purchase all components from a single supplier
- Get support from one supplier (one stop shop)
- Reduce amount of technical interfaces
- Reduce complexity of the system
- Recuperate energy: battery can be charged by recuperating energy when the system is driven (and not actively driving) e.g., when moving down in a lifting device. This increases overall efficiency and can increase the availability. Alternatively, the customer can reduce the battery size compared to a standard hydraulic system
- Operate the actuator in industries that are sensitive to contamination e.g., food industry, server farms or clean rooms
- Oil free
- Reduced maintenance interval and efforts
- Fully documented performance and environmental testing for mobile requirements

6.1.1 Control system

To make integration into any system as simple and smooth as possible, Schaeffler provides several motor control options. With these controllers we can offer the optimal performance in any application.

Both kits can be combined with any of the listed actuator configurations. Schaeffler configures all motor parameters according to the selected actuator. Both kits are equipped with Curtis instruments' AC F2-A motor controller.

Quick start e-MOVEKIT



The quick start e-MOVEKIT is designed for customers unfamiliar with electro-mechanical actuators. It comes with all the components needed to start testing straight out of the box, including the motor controller with all the input controls and cables needed to drive the actuator within the application. The quick start e-MOVEKIT is ideal for prototyping and concept studies.

System integration e-MOVEKIT

The system integration e-MOVEKIT requires a basic knowledge of motor control techniques. The system is already configured with the motor parameters for motor kit N11. While the integration into the application is defined by the customer.

With the system integration e-MOVEKIT, Schaeffler offers a solution for complete one-handed actuator control.

6.1.2 Speed mode

By giving a drive command, the controller will drive the motor at the required speed and adjust the power consumption and torque generation accordingly.

For smooth starts and stops an acceleration ramp can be defined to reduce strain on mechanical components and allow for longer life and a high end feel.

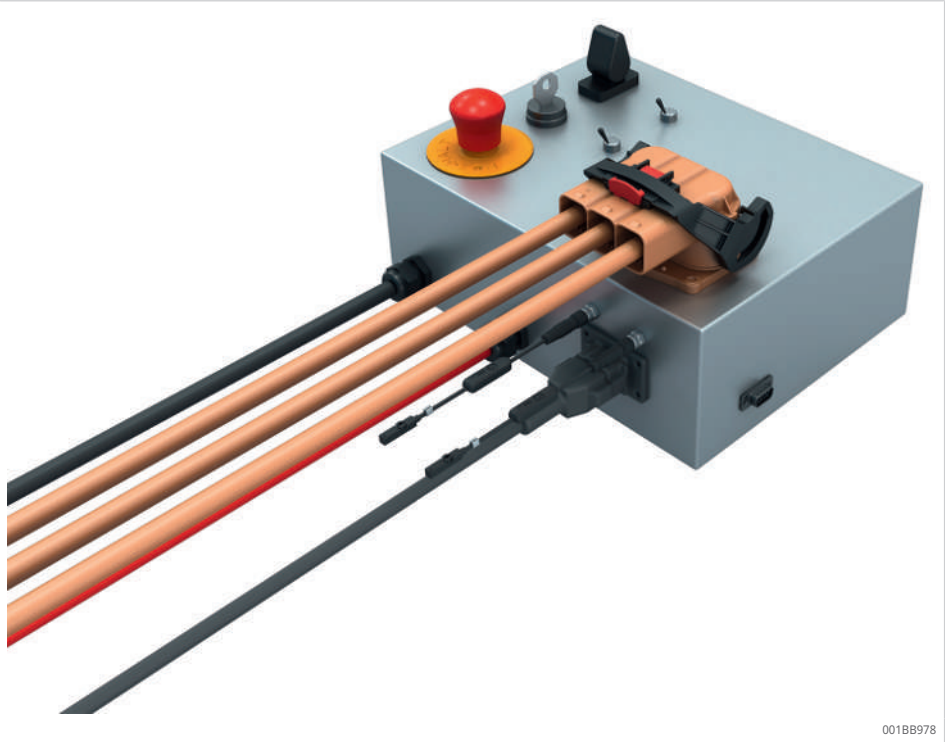
Software features:

- CANopen drive commands
- Analog drive commands (FWD/REV or WIG/WAG)
- Limit switch integration possible, standard for the quick start e-MOVEKIT
- Validated safety detection and error prevention:
  - Un-commanded powered motion
  - Motor braking torque loss

6.2 Quick start e-MOVEKIT

The quick start e-MOVEKIT is specially designed to allow easy first prototype integration and build-up of control know-how for electromechanic actuators. The box already contains all necessary components to get started and is truly a plug-and-play solution. The intend of the quick start e-MOVEKIT is to help in the transition from an existing hydraulic system to an all-electric one. The simple and easy to understand control interface allows for fast prototype testing inside the application.

To prevent any damage to the actuator during the first setup and building the know-how about controlling electromechanics actuators inside the application the actuators ordered together with the quick start e-MOVEKIT comes equipped with limit switches that prevent an overtravel into the physical end stops of the actuator.



Quick start e-MOVEKIT contains:

- Control box
- Motor power cable
- Motor control cable
- Limit switch sensor
- Limit switch extension cable

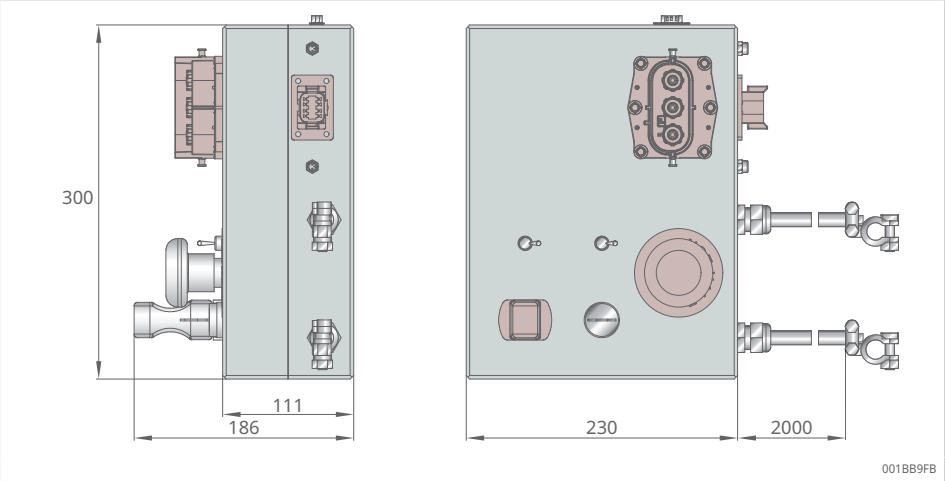
To be ordered separately:

- Linear unit
- Nidec N11 motor
- Attachments & accessories
- Battery 24 V DC (not available from Schaeffler)

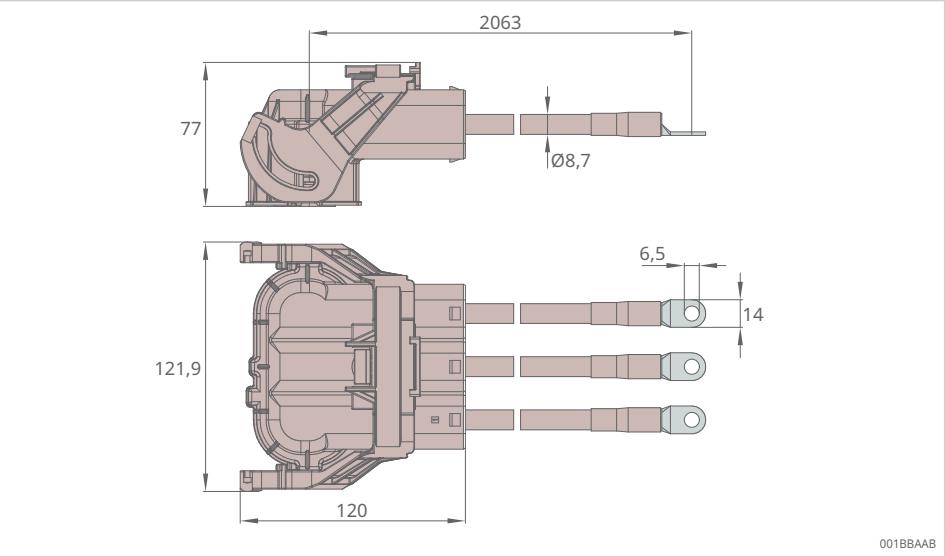
6.2.1 Performance data

Designation	Symbol	Unit	Data
Controller type	–	–	AC-F2-A-200-001
Interlock	–	–	Integrated
Nominal voltage range	–	–	24
Minimum voltage	U_{min}	V DC	12
Burnout voltage	U_{burn}	V DC	8
Maximum voltage	U_{max}	V DC	30
Maximum current [S2-2 min]	I_{max}	A RMS	200
Maximum current [S2-60 min]	I_{max}	A RMS	67
Storage ambient temperature	T_{amb_stor}	°C	–40 ... +95
Operation ambient temperature	T_{amb_op}	°C	–10 ... +40
Designed life	–	h	8000
Current protection (Fuse)	–	–	250
Environmental rating	IP	–	65/67

6.2.2 Dimensions



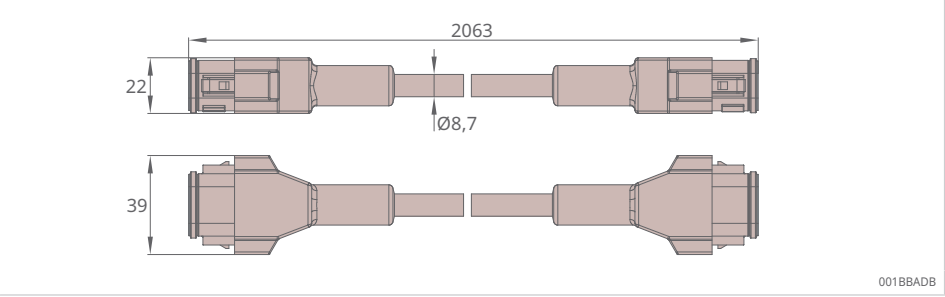
Motor power cable for quick start e-MOVEKIT



Type: ZKA-377946

Connector: Ampenol 3 PIN plugh right angle HVSL1000 08 3 A 1 25

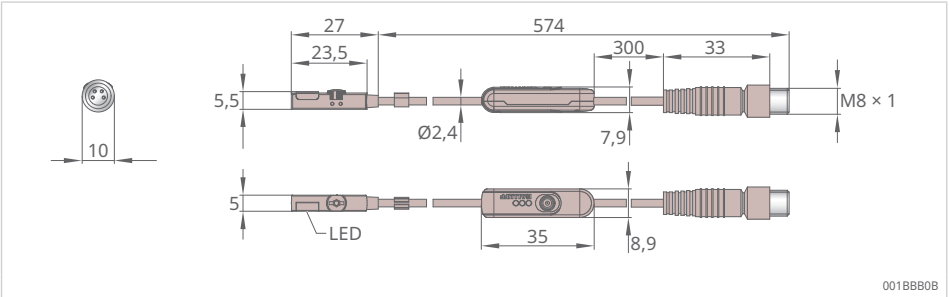
Motor control cable for quick start e-MOVEKIT



Type: ZKA-377945

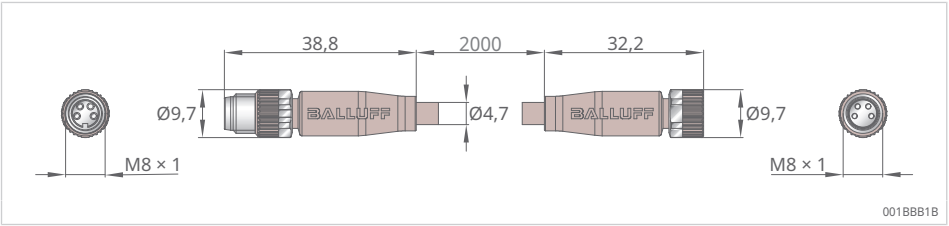
Connector: Deutsch DT06-08SA

Proximity switch for quick start e-MOVEKIT



Type: ZSC-377942

Extension cable for proximity switch



Type: ZSC-377943

6.3 System integration e-MOVEKIT

The system integration e-MOVEKIT allows for an integration into any mobile application. The controller comes pre-configured to run with the AC induction motor and allows for a direct integration and gives high flexibility for the integration into any application.

The system integration e-MOVEKIT is targeted for customers that want to realize a product in small series and like to have one single source for all components necessary to control an electromechanical actuator.

001BB988

System integration e-MOVEKIT contains:

- Motor controller
- Motor profile pre-setup cable

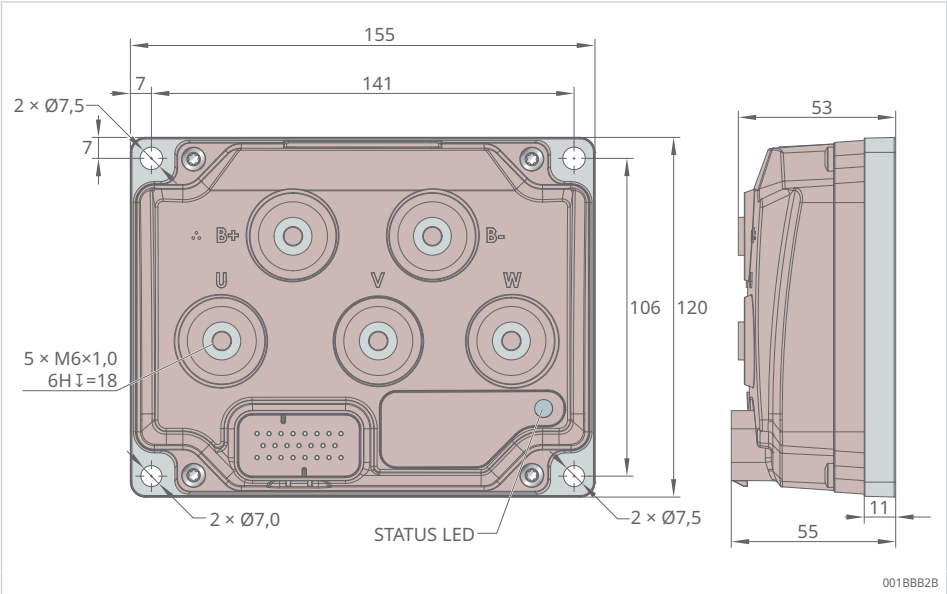
To be ordered separately:

- Linear unit
- Nidec N11 motor
- Motor power cable
- Motor control cable
- Attachments & accessories
- Battery 24 V DC (not available from Schaeffler)

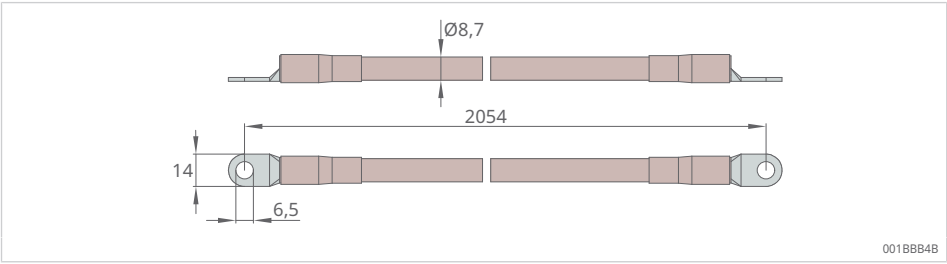
6.3.1 Performance data

Designation	Symbol	Unit	Data
Controller type	–	–	Curtis AC F2-A 24-200-01
Nominal voltage range	–	–	24
Minimum voltage	U_{min}	V DC	12
Burnout voltage	U_{burn}	V DC	8
Maximum voltage	U_{max}	V DC	30
Maximum current [S2-2 min]	I_{max}	A RMS	200
Maximum current [S2-60 min]	I_{max}	A RMS	67
Storage ambient temperature	T_{amb_stor}	°C	–40 ... +95
Operation ambient temperature	T_{amb_op}	°C	–40 ... +50
Designed life	–	h	8000
Environmental rating	IP	–	65/67

6.3.2 Dimensions



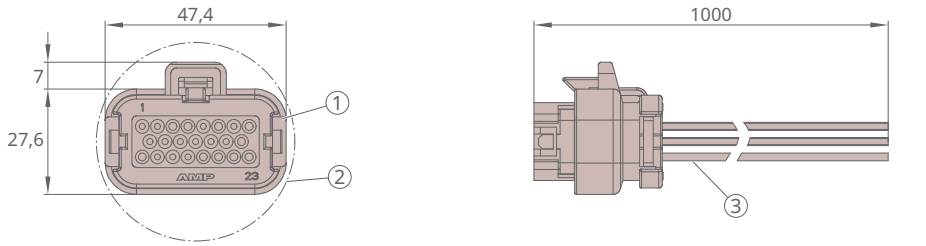
Motor power cable for system integration e-MOVEKIT



Type: ZKA-377947

23pin AMPSEAL - Pre-assembled connector for I/O to the motor controller

001BBB5B



001BBB6B

1	AMPSEAL 23 pin connector receptacle housing including seal	2	assembly will pass through opening Ø50
3	23 cables		

Type: ZKA-377944

6.4 Ordering key

e-MOVEKIT

32 Structure of the ordering designation e-MOVEKIT

Type
Q Quick start e-MOVEKIT (including cables, sensors)
S System integration e-MOVEKIT (without cables)
Cables for system integration e-MOVEKIT are sold as ZKA items

Motor type
N Nidec AC induction motor, 1.4 kW, with electromagnetic brake

Gearbox size
C Small parallel gearbox

Gear ratio
B 4:1 (spur only, see chapter "Parallel gearboxes" for exact ratio)
C 10:1 (spur only, see chapter "Parallel gearboxes" for exact ratio)
D 25:1 (spur only, see chapter "Parallel gearboxes" for exact ratio)

Spindle type
A Ball screw drive 32×10
B Ball screw drive 40×10
C Ball screw drive 40×20

Speed
Linear speed of the unit in mm/s
The speed for options with end switches is limited to 90 mm/s ,
increments of 10 mm/s available as standard, other maximum speeds available by agreement

Other options – sensor
0 No sensor integration
1 Integrated magnetic end switches
(automatically selected with quick start e-MOVEKIT)

Customer-specific options
000 No customer-specific option

001C99CD

7 Compliances EMA-100 Actuator

These compliances are only applicable for following components:

- Linear unit EMA-100-1-BB / BC / CB
- AC Induction Motor - MA-B0-N11
- Parallel spur gearbox
  - ratio 10:1
  - ratio 25:1
- Centrifugal brake
- Rear attachment bar type
- Push tube attachment (T-bar)
- High performance pivot housing (E1)

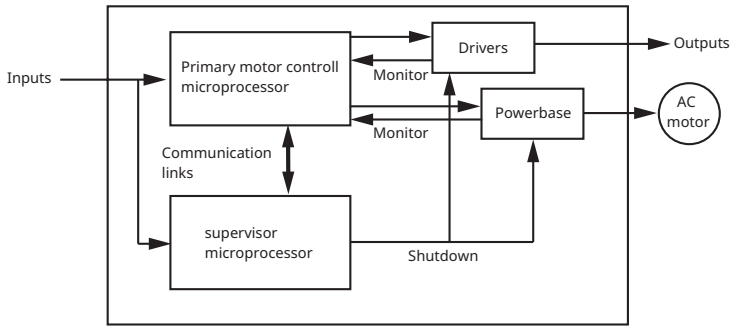
Test	Standard	Performance
Static Safety [1)]	ANSI/SAIA A92.20-2018	Safety Factor: 2x F_{max} with no plastic deformation*
Mechanical Overload [1)]	ANSI/SAIA A92.20-2018	Safety Factor: 2,5x F_{max} without material failure/collapse*
Ball Screw System	ANSI/SAIA A92.20-2018 Section 4.5.4.3	Compliant for option EMA-100-1-CB
Corrosion Protection [1)] / Salt Mist	DIN EN ISO 9227:2017 NSS ASTM B 117 – 18	• Salt Spray Test: NaCl-Solution 50 ±5 g L-1 pH: 6,5 – 7,2 • Test temperature: 35 ±2°C • Test duration: 120h • Salt spray quantity: 1,5 ±0,5 m L h-1 per 80 cm ^{2} • Not red or white rust bleed-out
	DIN EN ISO 9227:2017 NSS	• Salt Spray Test: NaCl-Solution 50 ±5 g L-1 pH: 6,5 – 7,2 • Test temperature: 35 ±2°C • Test duration: 480h • Salt spray quantity: 1,5 ±0,5 m L h-1 per 80 cm^2 • White rust bleed-out
Ingress Protection [1)]	IEC 60529:13 (edition 2.2)	IP 54S IP 65 Pressure washer save [1)]
Vibrations [1)]	EN 60068-2-64:2008 MIL-STD 810G Method 514.6, Annex C, Figure 514.6C-1 MIL-STD 810G Method 514.6, Annex C, Figure 514.6C-2 MIL-STD 810G Method 514.6, Annex D, Figure 5104.6D-9	Full Performance after test
	EN 61373 Cat. 1B:2010 Railway applications	• Random function test: duration: 10 m • Random-endurance test: – Duration: 5 h – Mechanical shock: • Shock acceleration amplitude: 50 m/s^2 • Duration of nominal shock: 30 ms • Numbers of shocks per plane: 18
Temperature [1)]	MIL-STD-810G Method 501.5, Procedure II – Operation with constant temperature condition	• High temperature test: – Operating temperature: +49 °C – Storage temperature: +65°C
	MIL-STD-810G Method 502.5, Procedure II – Operation with constant temperature condition	• Low temperature test: – Operating temperature: –18 °C – Storage temperature: –30°C
Others	RoHS directive 2011/95/EU compliant REACH regulation (EC) No 1907/2006 compliant Dodd Frank Act compliant	

* Depending on stroke configuration.

[1)] All requirements verified through testing (component and actuator).

8 Compliances system integration e-MOVEKIT

2 Compliances system integration e-MOVEKIT

Test	Standard
EMC	Designed to the requirements of EN 12895:2015
Safety	Designed to the requirements of EN 1175-1:1998+A1:2010, EN ISO 13849-1:2015 Category 2 Uncommanded powerd motion PL: d Motor braking torque PL: C
Supervision system	
UL	UL recognized component per UL 583
Ingress protection	IP65 per IEC60529
Temperature	Controller linearly reduces maximum current limit with an internal heatsink Temperature from 85 °C to 95 °C; complete cutoff occurs above 95 °C and bellow −40 °C.
Others	RoHS directive 2011/95/EU compliant REACH regulation (EC) 1907/2006 compliant Dodd Frank Act compliant

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