E/809000/*
Electromechanical actuator with or without servo motor

- > Ø32 ... 100 mm
- > Robust construction
- > Cylinder based on ISO 15552
- > Maintenance-free
- > Reliable performance
- > Long life
- > Servo motors
- > Optional with IP65
- > Different feedback systems available
- > Holding brake available
- > Drives available with EtherCAT, PROFINET, PROFIBUS, EtherNet/IP, DeviceNet & CANopen communications
- > Wide range of accessories

Technical features

Function:
Actuator with ball screw; with or without servo motor
Standard:
Based on ISO 15552
Cylinder diameters:
32, 40, 50, 63, 80, 100 mm
Strokes:
Available 100 ... 1500 mm (short strokes < 100 mm on request)
Speed:
max. 0,2 ... 1,6 m/s
(see graph page 11)

Forces F_{max}:
2,5 ... 30,4 kN (thrust force)
Motor data
Voltage:
400 VAC
Rated current:
0,7 ... 9 A
Power:
0,16 ... 3,3 kW
Drive data
Voltage:
400 VAC
Rated current:
3 ... 10,5 A

Output power:
0,75 ... 4,0 kW
Duty cycle:
100 %
Operating temperature
0 ... 80 °C (32 ... 176 °F)
IP Protection rates:
Actuator: IP40 (optional with IP65)
Motor: IP65

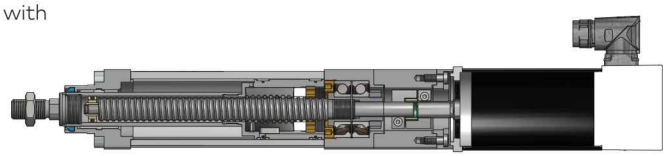
Standard Materials:
Barrel: Anodized aluminum
End covers: Anodized aluminum
Piston rod: Stainless steel (austenitic)
Piston rod seals: PUR

Technical data

Cylinder Ø(mm)	32		40			50			63			80				100			
Spindle diameter (mm)	12		16			20			25			32				40			
Spindle pitch (mm)	5	10	5	10	16	5	10	20	5	10	25	5	10	20	32	5	10	20	40
Axial clearance Actuator (mm)	+ 0,02		+ 0,04			+ 0,04			+ 0,04			+ 0,04				+ 0,04	+ 0,07		
Dynamic force C (N)	5000	5100	10100	7900		13100	9700	6800	14600	14500	7400	23400	26500	16800	11400	25400	44600	33800	22800
F max axial (N)	3000	2520	5200	4100	4200	8000	5500	3800	10150	10100	4750	20000	20000	11950	7750	24600	30400	22200	14450
Momentum torque max (Drive shaft) (Nm)	2,4	4,0	4,2	6,5	10,8	6,4	8,8	12,2	8,1	16,1	19,0	16,0	31,9	38,1	39,6	19,6	48,4	70,7	92,2
Orderstroke (mm)	100 ... 800		100 ... 800			100 ... 1000			100 ... 1200			100 ... 1500				100 ... 1500			
Available velocity with standard Norgren servo motor (m/s)	0,25	0,5	0,25	0,5	0,8	0,25	0,5	1,0	0,25	0,5	1,25	0,2	0,5	0,9	1,5	0,2	0,4	0,8	1,6
Max permissible velocity (m/s)	0,6	1,3	0,5	1,0	1,6	0,4	0,8	1,5	0,3	0,6	1,5	0,2	0,5	0,9	1,5	0,2	0,4	0,8	1,6
Max permissible rpm (1/min)	7690	7630	6470	6120	6000	4590	4660	4570	3610	3670	3640	2840	2830	2830	2820	2280	2380	2380	2370
Acceleration max (m/s²)	10																		
Max. angle of rotation at the piston rod (°)	0,65		0,6			0,5			0,4			0,3				0,25			

The function

The new Norgren ELION provides a high performance ball screw actuator with servo motor. The actuator can easily be configured and ordered with the Norgren online tool:
https://www.norgren.com/uk/en/technical-support/configurators
or visit our landing page for more information:
https://www.norgren.com/uk/en/list/electric-actuators



NORGREN

List of Content:

Norgren Family (Actuator ranges in the red frame are shown in this data sheet)

Picture	Function	Data sheet title	Data sheet number
	Electromechanical	E/809000/* Electromechanical actuator with or with or without servo motor	en 1.6.300
	Pneumatic	PRA/802000/M, RA/802000/M, RA/8000, RA/8000/M ISOLine™ 15552 cylinder, double acting	en 1.5.220
	Electromechanical	E/149000/* Electromechanical rodless spindle actuator with or without servo motor	en 1.6.400
	Electromechanical	E/148000/* Electromechanical toothed belt actuator with or without servo motor	en 1.6.500
	Pneumatic	M/146000, M/146100, M/146200, LINTRA®PLUS rodless cylinder Magnetic & Non-magnetic piston, double acting	en 1.6.009

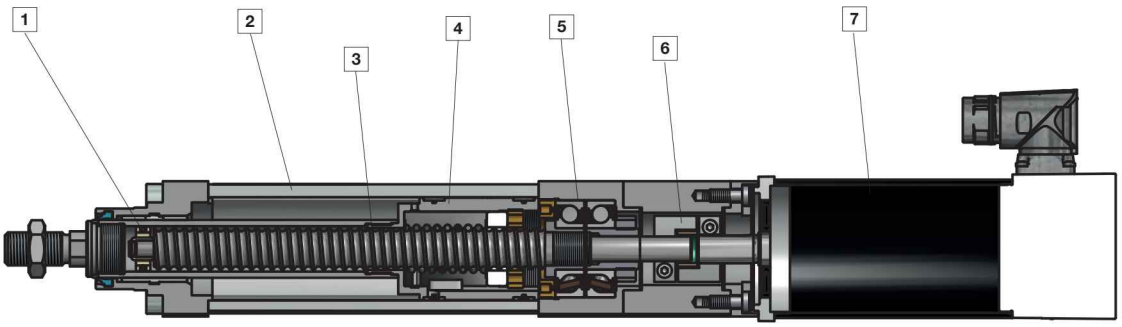
Golden Rules
The Norgren ELION electric actuator is a combination of a ball screw driven actuator and an electric servo motor. Therefore, it must be ensured that the system design, installation, commissioning/start-up and maintenance are carried out by personnel who have the necessary training and competence. They must read this safety information and I&M guide carefully.

Operating conditions
The actuator can perform multiple linear positioning tasks. To prevent damage of the electromechanical actuator, lateral forces on the piston rod must be avoided, e.g. by the implementation of external guiding. Impact load on the piston rod and housing must also be avoided to prevent damage on the ball screw nut and bearings.

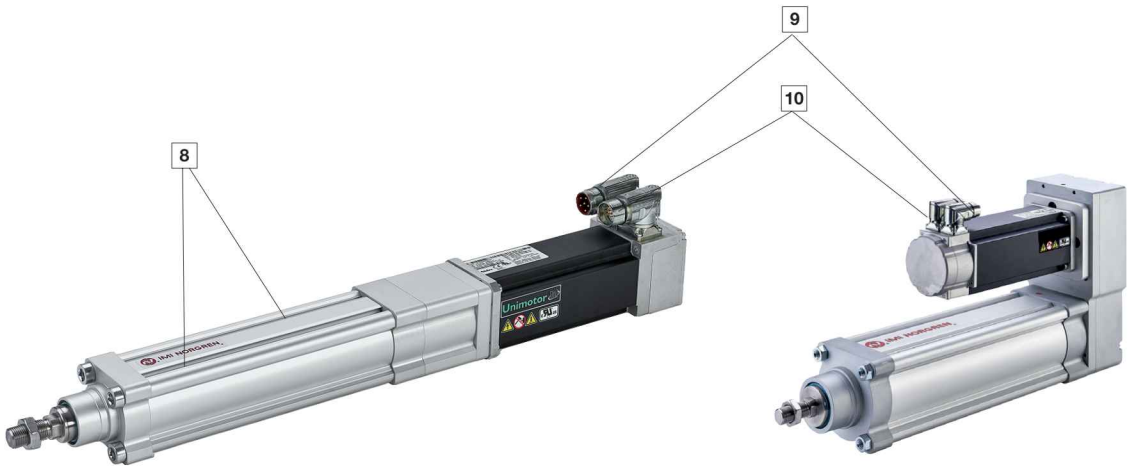
Actuator sizing
Ball screw drive actuators like the Norgren ELION are complex mechanical systems transferring the rotational movement of an electric motor into a linear motion. Please be advised that the technical data presented on page 1 may vary for different applications. For exact sizing, please refer to page 8, use the Norgren online configurator or contact our technical service.

Motor
The sizing of the motor depends on the load cycle applied to the actuator. At all times, the maximum torque requirements must stay below the mittlerer Lastmoment the motor can apply. To prevent overheating of the motor, the mean torque demand must be below the Dauermoment of the motor. For exact sizing, please refer to page 35 ... 38, use the Norgren online configurator or contact our technical service.

Holding brake
The motors supplied by IMI Precision Engineering can be equipped with a mechanical holding brake. While both hardware and software are designed to high standards of quality and robustness, they are not intended for use as safety functions, i.e. where a fault or failure would result in a risk of injury. Do not apply the brake while the motor shaft is rotating. The brake can only take a limited number of emergency braking operations and must not be used for repeated dynamic braking.



1	Piston rod bearing
2	Profile barrel
3	Spindle
4	Ball screw nut
5	Ball screw bearing
6	Coupling
7	Motor
8	Switch groove
9	Power
10	Motor feedback



NORGREN

Standard cylinder variants (IP40)

E/809★★★/★★★/★★★/★★★★/★★★

Size Sub. 1		Ball Screw Sub. 2		Variants Sub. 3				Motor Kit Sub. 4		Flange/Motor Sub. 5	Sub. 6					Stroke (mm) Sub. 7	Piston rod extension (mm) Sub. 8
				Standard	Piston rod bellows	Piston rod extension	Internal thread				Resolver	Absolute (multi turn)	Holding brake, resolver	Holding brake, absolute (multi turn)			
Ø32	032	12x5	05	M	G	U	X	Actuator only, no coupling, no housing (see page 17)	A	No motor	X	X				100 ... 800	1 ... 200 (Use only for Variant "U" otherwise leave empty)
								Actuator with coupling and housing for customer individual motor (see page 20)	B		07, 08, 09, *						
								Axial kit (see page 20)	D	No motor, flange □ 40; ØN=30; ØM=46	X	1					
										No motor, flange □ 55; ØN=40; ØM=63		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
								Parallel kit - "North" (see page 21)	N	No motor, flange □ 40; ØN=30; ØM=46	X	1					
										No motor, flange □ 55; ØN=40; ØM=63		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
								Parallel kit - "East" (see page 21)	E	No motor, flange □ 40; ØN=30; ØM=46	X	1					
										No motor, flange □ 55; ØN=40; ØM=63		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
		12x10	10					Parallel kit - "South" (see page 21)	S	No motor, flange □ 40; ØN=30; ØM=46	X	1					
										No motor, flange □ 55; ØN=40; ØM=63		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
								Parallel kit - "West" (see page 21)	W	No motor, flange □ 40; ØN=30; ØM=46	X	1					
										No motor, flange □ 55; ØN=40; ØM=63		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
Ø40	040	16x5	05	M	G	U	X	Actuator only, no coupling, no housing (see page 17)	A	No motor	X	X				100 ... 800	1 ... 200 (Use only for Variant "U" otherwise leave empty)
								Actuator with coupling and housing for customer individual motor (see page 20)	B		09, 12, 14, *						
								Axial kit (see page 20)	D	No motor, flange □ 55; ØN=40; ØM=63	X	1					
										No motor, flange □ 67; ØN=60; ØM=75		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
										Motor □67 (2,45 Nm)	J						
								Parallel kit - "North" (see page 21)	N	No motor, flange □ 55; ØN=40; ØM=63	X	1					
										No motor, flange □ 67; ØN=60; ØM=75		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
										Motor □67 (2,45 Nm)	J						
		16x10	10					Parallel kit - "East" (see page 21)	E	No motor, flange □ 55; ØN=40; ØM=63	X	1					
										No motor, flange □ 67; ØN=60; ØM=75		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
										Motor □67 (2,45 Nm)	J						
								Parallel kit - "South" (see page 21)	S	No motor, flange □ 55; ØN=40; ØM=63	X	1					
										No motor, flange □ 67; ØN=60; ØM=75		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
										Motor □67 (2,45 Nm)	J						
		16x16	16					Parallel kit - "West" (see page 21)	W	No motor, flange □ 55; ØN=40; ØM=63	X	1					
										No motor, flange □ 67; ØN=60; ØM=75		2					
										Motor □55 (1,05 Nm)	E	A	B	M	N		
										Motor □67 (2,45 Nm)	J						

* For more versions please contact the technical service.

NORGREN

Standard cylinder variants (IP40)

E/809★★★/★★★/★★★/★★★★/★★★

Size Sub. 1		Ball Screw Sub. 2		Variants Sub. 3 (Standard, Piston rod bellows, Piston rod extension, Internal thread)	Motor Kit Sub. 4		Flange/Motor Sub. 5	Resolver / Absolute (multi turn) / Holding brake, resolver / Holding brake, absolute (multi turn) Sub. 6	Stroke (mm) Sub. 7	Piston rod extension (mm) Sub. 8
Ø50	050	20x5	05	M G U X	*Actuator only, no coupling, no housing (see page 17)*	A	*No motor*	X	X	100 ... 1000	1 ... 250 *(Use only for Variant "U" otherwise leave empty)*
					Actuator with coupling and housing for customer individual motor (see page 20)	B			09, 12, 14, *	
					Axial kit (see page 20)	D	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □67 (3,50 Nm)	N		
		20x10	10		*Parallel kit - "North" (see page 21)*	N	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □67 (3,50 Nm)	N		
					Parallel kit - "East" (see page 21)	E	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □67 (3,50 Nm)	N		
		20x20	20		*Parallel kit - "South" (see page 21)*	S	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □67 (3,50 Nm)	N		
					Parallel kit - "West" (see page 21)	W	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □67 (3,50 Nm)	N		
Ø63	063	25x5	05	M G U X	*Actuator only, no coupling, no housing (see page 17)*	A	*No motor*	X	X	100 ... 1200	1 ... 300 *(Use only for Variant "U" otherwise leave empty)*
					Actuator with coupling and housing for customer individual motor (see page 20)	B			14, 18, 19, *	
					Axial kit (see page 20)	D	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							No motor, flange □89; ØN=80; ØM=100		2	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □89 (6,90 Nm)	R		
		25x10	10		*Parallel kit - "North" (see page 21)*	N	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							No motor, flange □89; ØN=80; ØM=100		2	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □89 (6,90 Nm)	R		
					Parallel kit - "East" (see page 21)	E	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							No motor, flange □89; ØN=80; ØM=100		2	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □89 (6,90 Nm)	R		
		25x25	25		*Parallel kit - "South" (see page 21)*	S	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							No motor, flange □89; ØN=80; ØM=100		2	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □89 (6,90 Nm)	R		
					Parallel kit - "West" (see page 21)	W	*No motor, flange □67; ØN=60; ØM=75*	X	1	
							No motor, flange □89; ØN=80; ØM=100		2	
							Motor □67 (2,45 Nm)	J	A B M N	
							Motor □89 (6,90 Nm)	R		

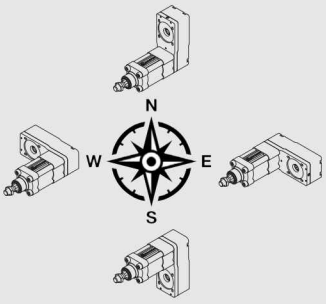
* For more versions please contact the technical service.

NORGREN

Standard cylinder variants (IP40)

E/809★★★/★★★/★★★/★★★★/★★★

Size		Ball Screw		Variants				Motor Kit		Flange/Motor						Stroke (mm)	Piston rod extension (mm)
Sub. 1		Sub. 2		Sub. 3				Sub. 4		Sub. 5	Sub. 6					Sub. 7	Sub. 8
				Standard	Piston rod bellows	Piston rod extension	Internal thread				Resolver	Absolute (multi turn)	Holding brake, resolver	Holding brake, absolute (multi turn)			
Ø80	080	32x5	05	M	G	U	X	Actuator only, no coupling, no housing (see page 17)	A	No motor	X	X				100 ... 1500	1 ... 350 (Use only for Variant "U" otherwise leave empty)
								Actuator with coupling and housing for customer individual motor (see page 20)	B		14, 18, 19, *						
								Axial kit (see page 20)	D	No motor, flange □67; ØN=60; ØM=75	X	1					
										No motor, flange □89; ØN=80; ØM=100		2					
										Motor □67 (3,50 Nm)	N	A	B	M	N		
										Motor □89 (6,90 Nm)	R						
		32x10	10					Parallel kit - "North" (see page 21)	N	No motor, flange □67; ØN=60; ØM=75	X	1					
										No motor, flange □89; ØN=80; ØM=100		2					
										Motor □67 (3,50 Nm)	N	A	B	M	N		
										Motor □89 (6,90 Nm)	R						
		32x20	20					Parallel kit - "East" (see page 21)	E	No motor, flange □67; ØN=60; ØM=75	X	1					
										No motor, flange □89; ØN=80; ØM=100		2					
										Motor □67 (3,50 Nm)	N	A	B	M	N		
										Motor □89 (6,90 Nm)	R						
		32x32	32					Parallel kit - "South" (see page 21)	S	No motor, flange □67; ØN=60; ØM=75	X	1					
										No motor, flange □89; ØN=80; ØM=100		2					
										Motor □67 (3,50 Nm)	N	A	B	M	N		
										Motor □89 (6,90 Nm)	R						
								Parallel kit - "West" (see page 21)	W	No motor, flange □67; ØN=60; ØM=75	X	1					
										No motor, flange □89; ØN=80; ØM=100		2					
										Motor □67 (3,50 Nm)	N	A	B	M	N		
										Motor □89 (6,90 Nm)	R						
Ø100	100	40x5	05	M	G	U	X	Actuator only, no coupling, no housing (see page 17)	A	No motor	X	X				100 ... 1500	1 ... 350 (Use only for Variant "U" otherwise leave empty)
								Actuator with coupling and housing for customer individual motor (see page 20)	B		19, 22, 24, *						
								Axial kit (see page 20)	D	No motor, flange □89; ØN=80; ØM=100	X	1					
										No motor, flange □115; ØN=110; ØM=130		2					
										Motor □89 (6,90 Nm)	R	A	B	M	N		
										Motor □115 (10,50 Nm)	W						
		40x10	10					Parallel kit - "North" (see page 21)	N	No motor, flange □89; ØN=80; ØM=100	X	1					
										No motor, flange □115; ØN=110; ØM=130		2					
										Motor □89 (6,90 Nm)	R	A	B	M	N		
										Motor □115 (10,50 Nm)	W						
		40x20	20					Parallel kit - "East" (see page 21)	E	No motor, flange □89; ØN=80; ØM=100	X	1					
										No motor, flange □115; ØN=110; ØM=130		2					
										Motor □89 (6,90 Nm)	R	A	B	M	N		
										Motor □115 (10,50 Nm)	W						
		40x40	40					Parallel kit - "South" (see page 21)	S	No motor, flange □89; ØN=80; ØM=100	X	1					
										No motor, flange □115; ØN=110; ØM=130		2					
										Motor □89 (6,90 Nm)	R	A	B	M	N		
										Motor □115 (10,50 Nm)	W						
								Parallel kit - "West" (see page 21)	W	No motor, flange □89; ØN=80; ØM=100	X	1					
										No motor, flange □115; ØN=110; ØM=130		2					
										Motor □89 (6,90 Nm)	R	A	B	M	N		
										Motor □115 (10,50 Nm)	W						

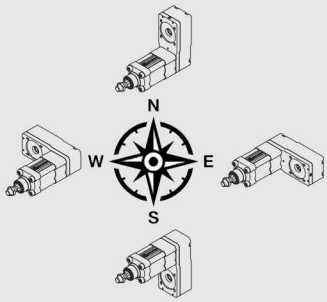


* For more versions please contact the technical service.

NORGREN

Cylinder variants with IP65

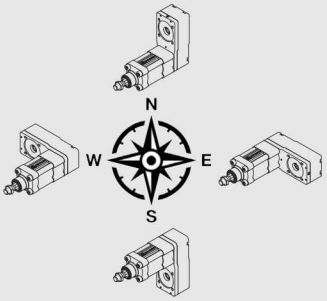
E/809★★★/★★★/★★★/★★★★/★★★

Size		Ball Screw		Variants				Motor Kit		Flange/Motor							Stroke (mm)	Piston rod extension (mm)
Sub. 1		Sub. 2		Sub. 3				Sub. 4		Sub. 5		Sub. 6					Sub. 7	Sub. 8
				Standard with IP65	Piston rod bellows	Piston rod extension	Internal thread					Resolver	Absolute (multi turn)	Holding brake, resolver	Holding brake, absolute (multi turn)			
Ø32	033	12x5	05	M	G	U	X	*Axial kit (see page 20)*	D	*Motor □55 (1,05 Nm)*	E	A	B	M	N		100 ... 800	1 ... 200 *(Use only for Variant "U" otherwise leave empty)*
								Parallel kit - "North" (see page 21)	N									
								Parallel kit - "East" (see page 21)	E									
		12x10	10					*Parallel kit - "South" (see page 21)*	S									
								Parallel kit - "West" (see page 21)	W									
Ø40	041	16x5	05	M	G	U	X	*Axial kit (see page 20)*	D	*Motor □55 (1,05 Nm)*	E	A	B	M	N		100 ... 800	1 ... 200 *(Use only for Variant "U" otherwise leave empty)*
										Motor □67 (2,45 Nm)	J							
		16x10	10					*Parallel kit - "North" (see page 21)*	N	*Motor □55 (1,05 Nm)*	E							
										Motor □67 (2,45 Nm)	J							
								Parallel kit - "East" (see page 21)	E	*Motor □55 (1,05 Nm)*	E							
										Motor □67 (2,45 Nm)	J							
								Parallel kit - "South" (see page 21)	S	*Motor □55 (1,05 Nm)*	E							
		16x16	16							*Motor □67 (2,45 Nm)*	J							
								Parallel kit - "West" (see page 21)	W	*Motor □55 (1,05 Nm)*	E							
										Motor □67 (2,45 Nm)	J							
Ø50	051	20x05	05	M	G	U	X	*Axial kit (see page 20)*	D	*Motor □67 (2,45 Nm)*	J	A	B	M	N		100 ... 1000	1 ... 250 *(Use only for Variant "U" otherwise leave empty)*
										Motor □67 (3,50 Nm)	N							
		20x10	10					*Parallel kit - "North" (see page 21)*	N	*Motor □67 (2,45 Nm)*	J							
										Motor □67 (3,50 Nm)	N							
								Parallel kit - "East" (see page 21)	E	*Motor □67 (2,45 Nm)*	J							
										Motor □67 (3,50 Nm)	N							
								Parallel kit - "South" (see page 21)	S	*Motor □67 (2,45 Nm)*	J							
		20x20	20							*Motor □67 (3,50 Nm)*	N							
								Parallel kit - "West" (see page 21)	W	*Motor □67 (2,45 Nm)*	J							
Ø63	064	25x05	05	M	G	U	X	*Axial kit (see page 20)*	D	*Motor □67 (2,45 Nm)*	J	A	B	M	N		100 ... 1200	1 ... 250 *(Use only for Variant "U" otherwise leave empty)*
										Motor □89 (6,90 Nm)	R							
		25x10	10					*Parallel kit - "North" (see page 21)*	N	*Motor □67 (2,45 Nm)*	J							
										Motor □89 (6,90 Nm)	R							
								Parallel kit - "East" (see page 21)	E	*Motor □67 (2,45 Nm)*	J							
										Motor □89 (6,90 Nm)	R							
								Parallel kit - "South" (see page 21)	S	*Motor □67 (2,45 Nm)*	J							
		25x25	25							*Motor □89 (6,90 Nm)*	R							
								Parallel kit - "West" (see page 21)	W	*Motor □67 (2,45 Nm)*	J							
										Motor □89 (6,90 Nm)	R							

* For more versions please contact the technical service.

Cylinder variants with IP65

E/809★★★/★★★/★★★/★★★★/★★★

Size Sub. 1		Ball Screw Sub. 2		Variants Sub. 3				Motor Kit Sub. 4		Flange/Motor Sub. 5		Sub. 6				Stroke (mm) Sub. 7	Piston rod extension (mm) Sub. 8
				Standard with IP65	Piston rod bellows	Piston rod extension	Internal thread					Resolver	Absolute (multi turn)	Holding brake, resolver	Holding brake, absolute (multi turn)		
Ø80	081	32x5	05	M	G	U	X	Axial kit (see page 20)	D	Motor □67 (3,50 Nm)	N	A	B	M	N	100 ... 1500	1 ... 350 (Use only for Variant "U" otherwise leave empty)
										Motor □89 (6,90 Nm)	R						
		32x10	10					Parallel kit - "North" (see page 21)	N	Motor □67 (3,50 Nm)	N						
										Motor □89 (6,90 Nm)	R						
		32x20	20					Parallel kit - "East" (see page 21)	E	Motor □67 (3,50 Nm)	N						
										Motor □89 (6,90 Nm)	R						
								Parallel kit - "South" (see page 21)	S	Motor □67 (3,50 Nm)	N						
										Motor □89 (6,90 Nm)	R						
		32x32	32					Parallel kit - "West" (see page 21)	W	Motor □67 (3,50 Nm)	N						
										Motor □89 (6,90 Nm)	R						
Ø100	101	40x04	05	M	G	U	X	Axial kit (see page 20)	D	Motor □89 (6,90 Nm)	R	A	B	M	N	100 ... 1500	1 ... 350 (Use only for Variant "U" otherwise leave empty)
										Motor □115 (10,50 Nm)	W						
		40x10	10					Parallel kit - "North" (see page 21)	N	Motor □89 (6,90 Nm)	R						
										Motor □115 (10,50 Nm)	W						
		40x20	20					Parallel kit - "East" (see page 21)	E	Motor □89 (6,90 Nm)	R						
										Motor □115 (10,50 Nm)	W						
								Parallel kit - "South" (see page 21)	S	Motor □89 (6,90 Nm)	R						
										Motor □115 (10,50 Nm)	W						
		40x40	40					Parallel kit - "West" (see page 21)	W	Motor □89 (6,90 Nm)	R						
										Motor □115 (10,50 Nm)	R						

* For more versions please contact the technical service.

Communications of motors, drives and bus protocols

Symbol	□55	□67	□89	□115	Bus Protocol - Option Module Card * SI-PROFINET RT V2	SI-PROFIBUS	SI-EtherNet	SI-EtherCAT	SI-CANopen	SI-DeviceNet	SI-IO	Standard model drive	Description	Page
	X	X			X	X	X	X	X	X	X	QE/D01400030	Standard drive with internal Bus- system (for motor size □55 - 67)	42
			X	X								QE/D02400105	Standard drive with internal Bus- system (for motor size □89 - 115)	

Option selector

E/809★★★/★★★/★★★/★★★★

Cylinder Ø	Substitute 1
32 standard with IP40	032
32 optional with IP65	033
40 standard with IP40	040
40 optional with IP65	041
50 standard with IP40	050
50 optional with IP65	051
63 standard with IP40	063
63 optional with IP65	064
80 standard with IP40	080
80 optional with IP65	081
100 standard with IP40	100
100 optional with IP65	101

Spindle pitch	Substitute 2
5	05
10	10
16	16
20	20
25	25
32	32
40	40

Variants	Substitute 3
Standard	M
Piston rod bellows	G
Piston rod extension	U
E/809***/**U/***/****/***	Extension (mm)
Piston rod thread female	X

Orderstroke (mm)	Substitute 7
100 ... 1500	

Motor / Feedback /Brake	Substitute 6
Motor with resolver, without brake	A
Motor with Absolute (Multi turn), without brake	B
Motor with resolver, with brake	M
Motor with Absolute (Multi turn), with brake	N
No motor, no coupling, no housing	X
No motor; small flange	1
No motor; big flange	2

Flange	Substitute 5
Flange for motor □55; 1,05 Nm	E
Flange for motor □67, 2,45 Nm	J
Flange for motor □67; 3,50 Nm	N
Flange for motor □89; 6,90 Nm	R
Flange for motor □115; 10,50 Nm	W
No motor (see Substitute 6 for flange) E/809***/***/**?/*** No motor, no coupling, no housing	X X
No motor; small flange	1
No motor; big flange	2

Motor mounting	Substitute 4
Axial	D
Parallel - "North"	N
Parallel - "East"	E
Parallel - "South"	S
Parallel - "West"	W
Actuator only, no coupling, no housing (see page 15)	A
Actuator with coupling and housing for customer individual motor	B
Use Sub. 5 & 6 as motor shaft diameter E/809***/***/**B**/***	07 ... 24

E.g. 07 = 7 mm motor shaft
08 = 8 mm motor shaft
...
24 = 24 mm motor shaft

Note: If position is not required, disregard option position with part number e.g. E/809032/05M/DEA/200.
For combinations of cylinder variants consult our technical service.
This option selector explains only the cylinder variants.
Additional variants/options are not possible.
Details see table on page 4-6.

NORGREN

Sizing Rules and Formulas

1. Definition of the load cycle

The load cycle includes all movements of the actuator. For every step, the following values must be defined:

- Direction of the movement
- End position of the movement
- External load mass
- Friction coefficient of a possible external guiding
- Acceleration and deceleration
- Maximum velocity
- Constant external forces
- Possible pause times at the end of the movement

Due to the high positioning accuracy of the Norgren ELION actuators, the number of steps in one cycle is not limited.

2. Calculation of the forces acting on the actuator

For a basic selection of the actuator, the knowledge of the acting forces during the load cycle is essential. For each movement of the load, the total force must be calculated. The total force F_{tot} can be calculated as the sum the inertial force F_{I}, external friction forces F_{fr}, the gradient force F_{gr} caused by moving a mass against gravity and possible constant external forces $F_{const.}$

$$F_{\mathrm{tot}} = F_{\mathrm{I}} + F_{\mathrm{fr}} + F_{\mathrm{gr}} + F_{\mathrm{const}}$$

The forces can be calculated as follows:

$$F_{\mathrm{I}} = -\left(m_{\mathrm{mov,act}} + m_{\mathrm{load}}\right) \cdot a$$
$$F_{\mathrm{fr}} = -\mathrm{sign}(\Delta x) \cdot \mu \cdot \left|\cos(\varphi) \cdot \left(m_{\mathrm{mov,act}} + m_{\mathrm{load}}\right) \cdot g\right|$$
$$F_{\mathrm{gr}} = \sin(\varphi) \cdot \left(m_{\mathrm{mov,act}} + m_{\mathrm{load}}\right) \cdot g$$

a	Acceleration/deceleration	m/s²
$m_{mov,act}$	Moving mass of the actuator	kg
m_{load}	Load mass applied on actuator	kg
Δx	Stroke of each movement	m
φ	Direction of the movement	°
μ	Friction coefficient	-
g	Gravitational acceleration	m/s²

3. Selection of the actuator

3.1 Safety stroke

Disregarding the initial set up, the actuator must not touch its mechanical end stops.
A safety stroke should be considered, respecting the application boundaries and environments.
We generally recommend a safety stroke of 20 mm per side for electric actuators.
The order stroke = working stroke + safety stroke of 2 x 20 mm.

3.2 Spindle pitch

The pitch of the driving spindle can be defined by the maximum velocity of the load

$$v_{\mathrm{cycle}} \leq v_{\mathrm{max,actuator}}$$

The correlation between the maximum stroke length and the maximum velocity of the actuator must be considered as well as the different spindle pitch values defining the maximum velocity.
Using the values for stroke length and velocity, the maximum force necessary during the load cycle can be compared to the maximum force applicable to the actuator. Here, the direction of movement has to be considered to prevent buckling of the cylinder rod and spindle.

$$F_{\mathrm{tot,max}} < F_{\mathrm{max,actuator}}$$

In general, side loads on the actuator should be avoided. If lateral forces appear, an external guiding system must be applied!

4. Selection of a motor

For each actuator, two motor sizes are available. The selection of the motor is based on the driving torque T and rotational speed rpm which have to be calculated for each step of the load cycle. All values calculated must be below the intermittent torque the motor can deliver (diagr. p. 35 to 38).

$$T = F_{\mathrm{tot,step}} \cdot \frac{P_{\mathrm{spindle}}}{2\pi \cdot 0.85}$$

$$rpm = \frac{v_{\mathrm{max,step}}}{P_{\mathrm{spindle}}} \cdot 60000$$

T	Torque	Nm
rpm	Rotational speed	min⁻¹
$v_{max,step}$	Maximum velocity of each step	m/s
$P_{spindle}$	Spindle pitch	mm

To avoid overheating of the motor, the mean torque T_{rms} of the load cycle must be lower than the continuous torque (diagr. p. 35 to 38).

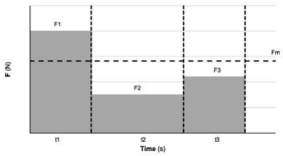
$$T_{\mathrm{rms}} = \sqrt{\sum\left(\frac{F_{\mathrm{tot,step}} \cdot P_{\mathrm{spindle}}}{2\pi \cdot 0.85}\right)^2 \cdot \frac{t_{\mathrm{step}}}{t_{\mathrm{tot}}}}$$

$$rpm_{\mathrm{rms}} = \sqrt{\sum\left(rpm_{\mathrm{step}}\right)^2 \cdot \frac{t_{\mathrm{step}}}{t_{\mathrm{tot}}}}$$

5. Estimation of expected life time

The estimated life time of the ball screw drive can be calculated according to DIN ISO 3408-5. Therefore, the mean velocity v_m and the mean force F_m must be calculated.

$$F_{\mathrm{m}} = \sqrt[3]{\sum_{j=1}^{n}\left(\left|F_{\mathrm{tot,step},j}^3\right| \cdot \frac{\left|v_{\mathrm{step},j}\right|}{v_{\mathrm{m}}} \cdot \frac{t_{\mathrm{step},j}}{t_{\mathrm{tot}}}\right)}$$



Then, the life time in revolutions is calculated from the dynamic force C of the ball screw nut and the mean force.

$$L = \left(\frac{C}{F_m}\right)^3 \cdot 10^6$$

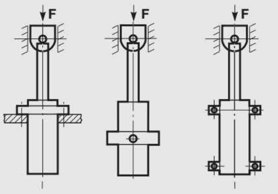
The life time L_{km} in km is then calculated with the spindle pitch P.

$$L_{\mathrm{km}} = L \cdot P \cdot 10^{-6}$$

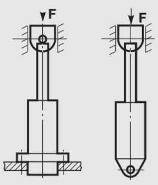
For more information please visit:
https://www.norgren.com/uk/en/list/electric-actuators

Cylinder variants
Permissible axial forces F_{max}

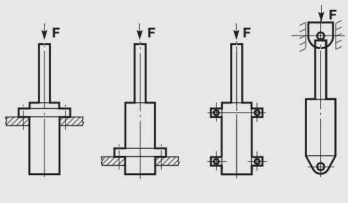
Case 1



Case 2

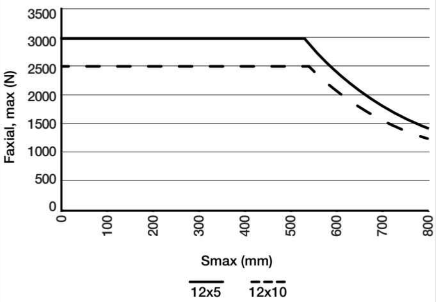


Case 3

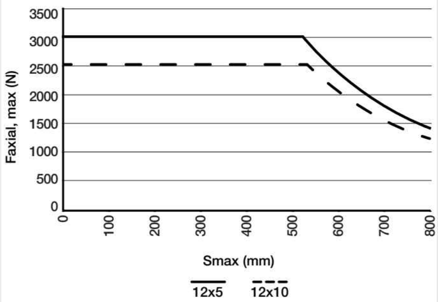


Ø32

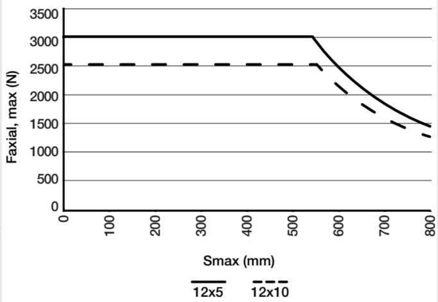
Case 1



Case 2

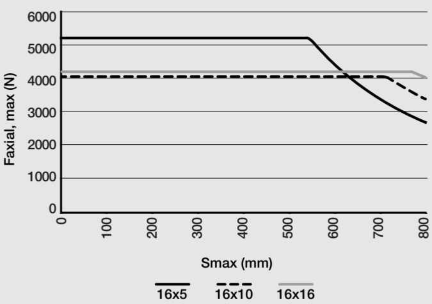


Case 3

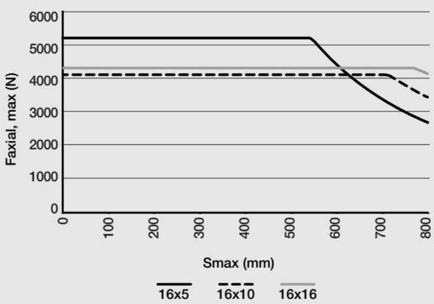


Ø40

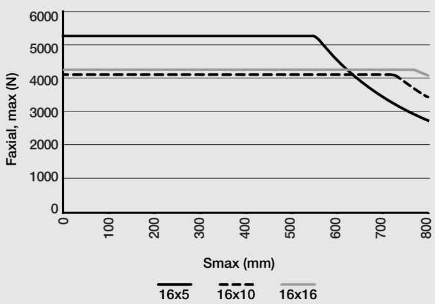
Case 1



Case 2

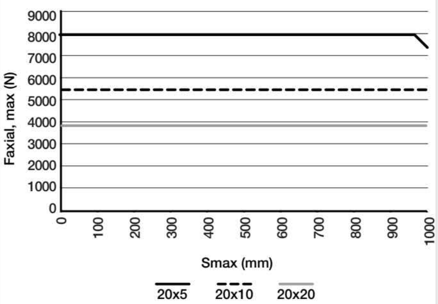


Case 3

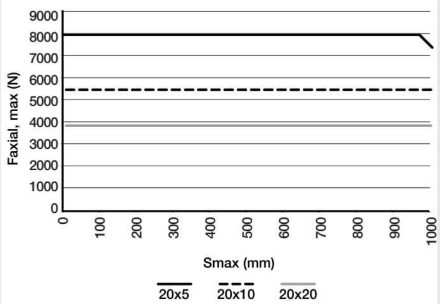


Ø50

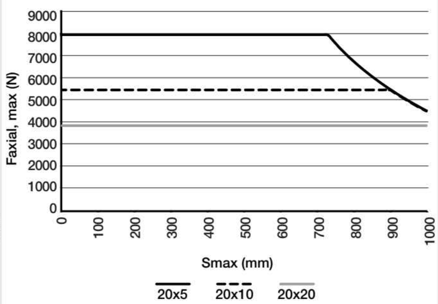
Case 1



Case 2

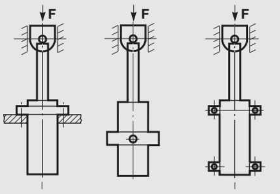


Case 3

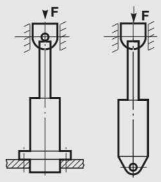


Cylinder variants
Permissible axial forces F_{max}

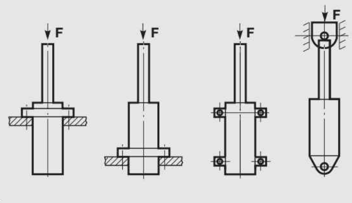
Case 1



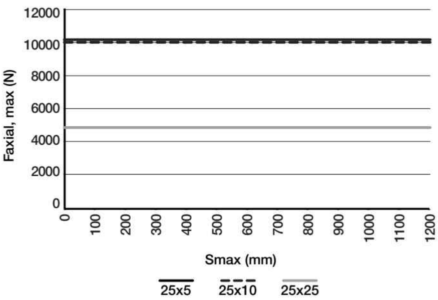
Case 2

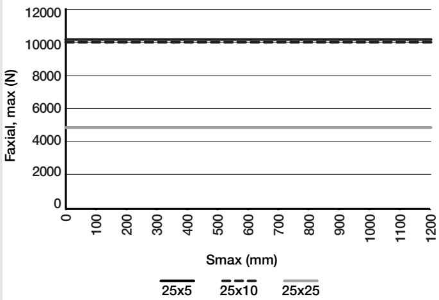


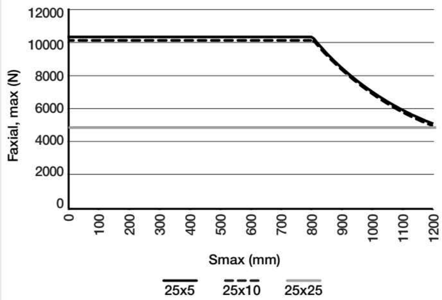
Case 3



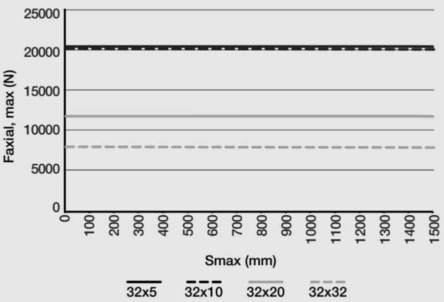
Ø63

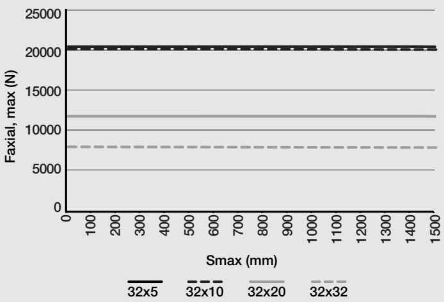


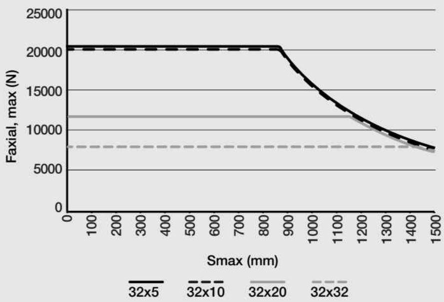




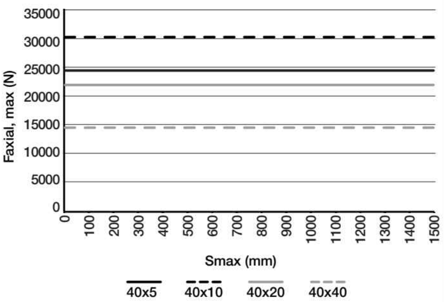
Ø80

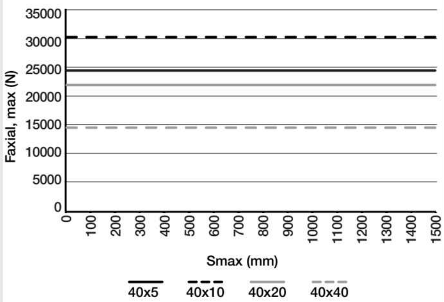


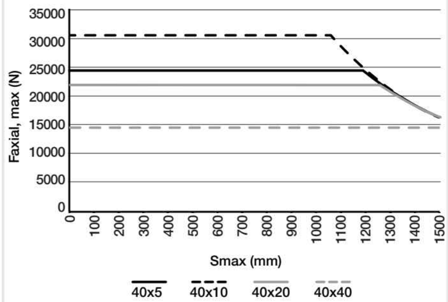




Ø100

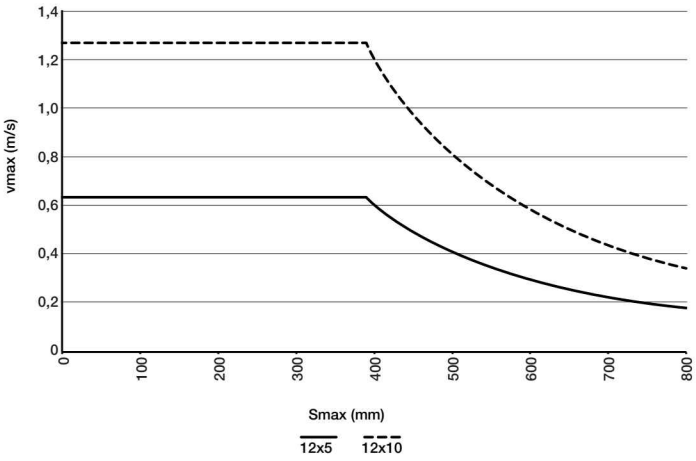




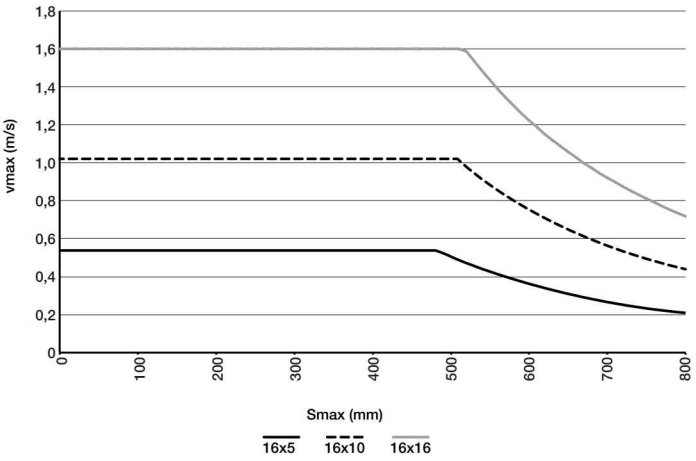


Permissible Speeds

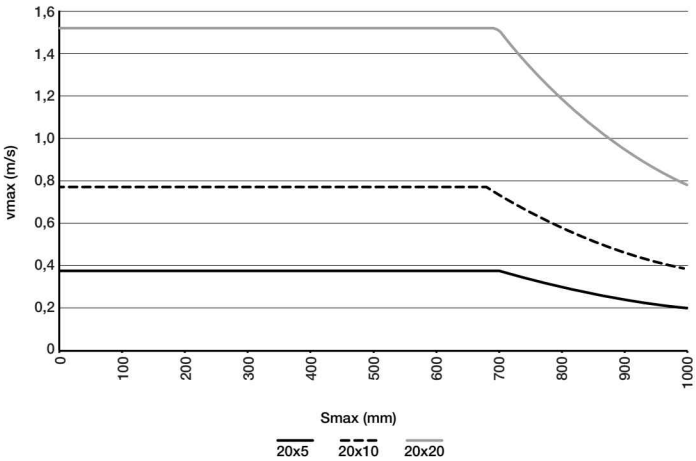
Ø32



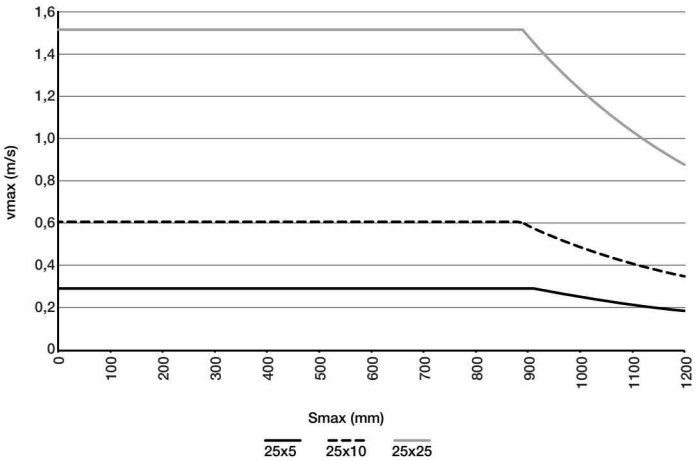
Ø40



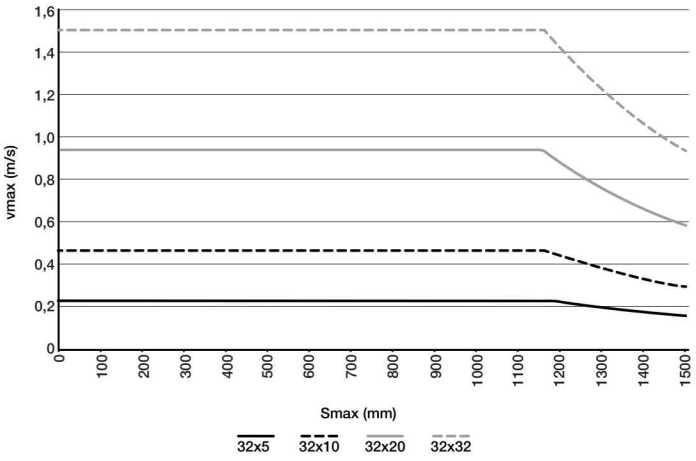
Ø50



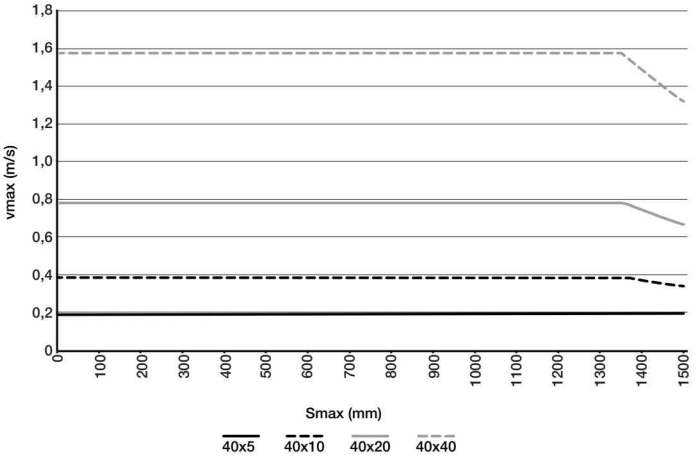
Ø63



Ø80



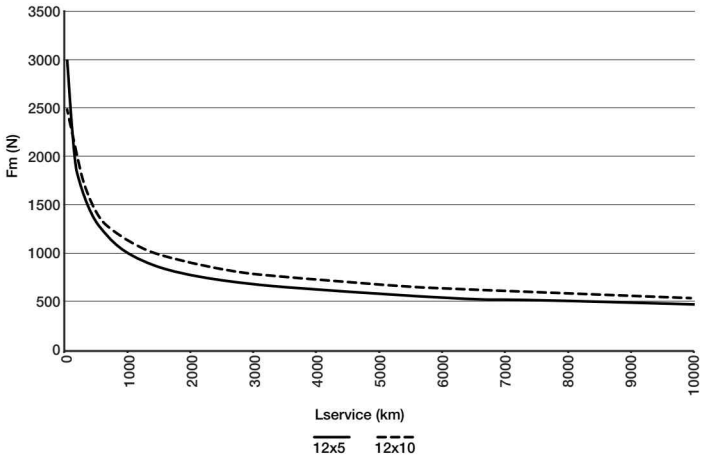
Ø100



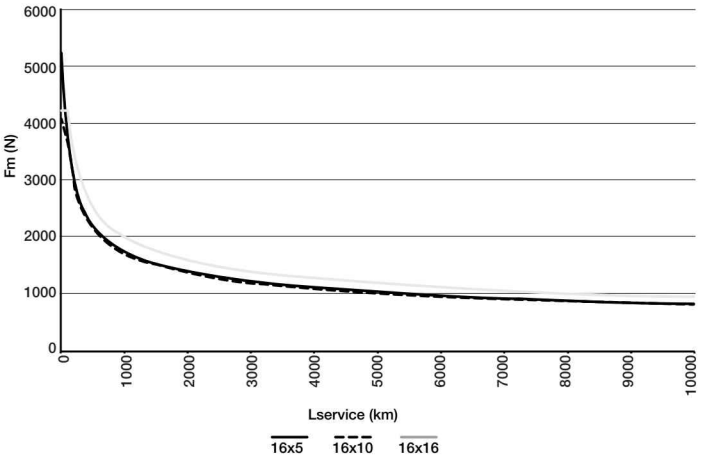
NORGREN

Force Life Time

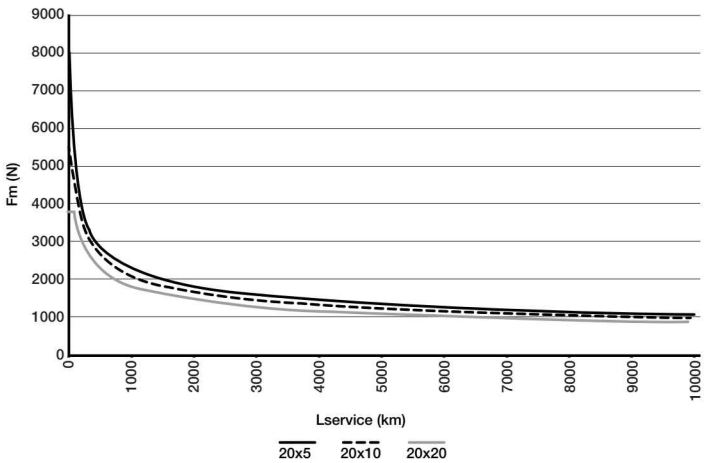
Ø32



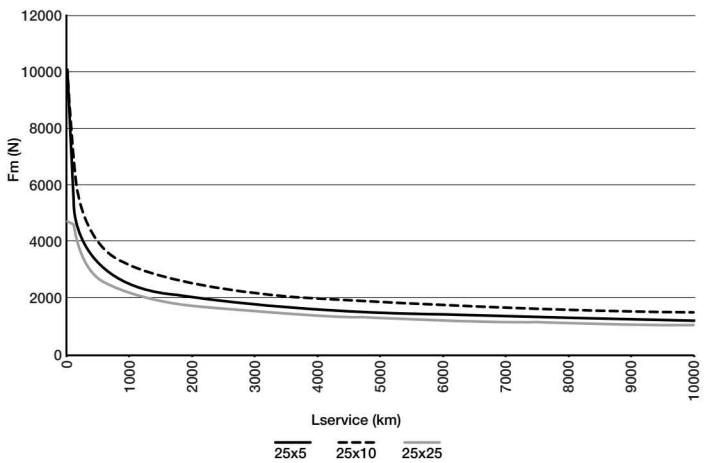
Ø40



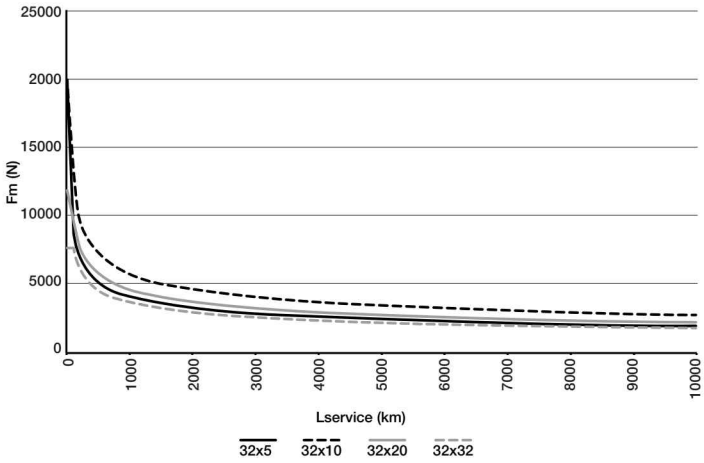
Ø50



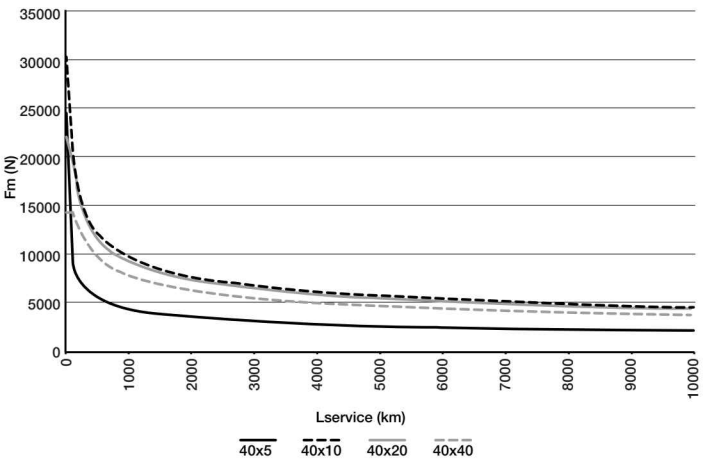
Ø63



Ø80



Ø100



Example for the selection of an electromechanical actuator

A mass of 95 kg is to be pulled 850 mm upwards at an angle of 60° by a device (5 kg). The instroke time is nine seconds.
The mass is removed from the device at the upper position (pause 2 s); the device is then lowered again within three seconds. After another three seconds, the cycle starts again.
The ambient temperature is between 20 and 35 °C. There are no special material requirements. The device is not externally guided. The expected service life is approx. 1,000,000 load cycles.

Step 1: Overview of the technical parameters

a)	Weight of the load to be lifted (instroke)	F_1	= (95 kg + 5 kg) x 10 m/s² =	1000 N
b)	Weight of the load to be lifted (outstroke)	F_2	= 5 kg x 10 m/s² =	50 N
c)	Required stroke length	s		850 mm
d)	Load case	L	Non-guided	3
e)	Ambient temperature	T_{max}		35 °C
f)	Material requirements			keine
g)	Maximum speed (instroke)	v_1	$= \frac{\frac{\Delta x}{2}}{\frac{1}{3} t_{ein}} =$	0,142 m/s
h)	Maximum speed (outstroke)	v_2	$= \frac{\frac{\Delta x}{2}}{\frac{1}{3} t_{aus}} =$	0,425 m/s
i)	Mean speed	v_m	$= \sum_{j=1}^{n} \frac{t_j}{t_{tot}} \cdot v_j =$	0,106 m/s
j)	Mean Force	F_m	$= \sqrt[3]{\sum_{j=1}^{n} \left(F_j^3 \cdot \frac{v_j}{v_m} \cdot t_j / t_{tot} \right)} =$	795 N
k)	Life expectancy in load cycles	L_{Zykl}		1.000.000
l)	Life expectancy in km	L_{km}	1.000 .000 x (850 mm / 1.000.000 km/mm) x 2	1.700 km

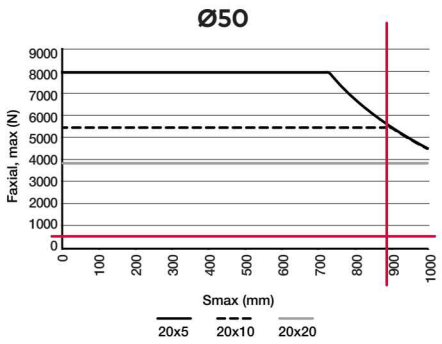
Step 2: Selection of suitable actuators based on the working stroke

The maximum permissible order strokes for the individual actuators can be found in the table "**Technical data**" on page 1 of the data sheet.
Size 32 and 40 have insufficient stroke for this application.

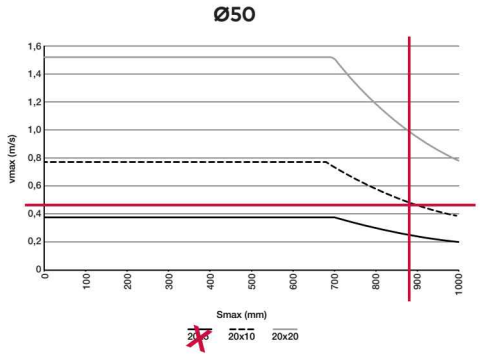
Cylinder Ø(mm)	**32**		**40**			**50**			**63**			**80**				**100**			
Spindle diameter (mm)	12		16			20			25			32				40			
Spindle pitch (mm)	5	10	5	10	16	5	10	20	5	10	25	5	10	20	32	5	10	20	40
Axial clearance Actuator (mm)	+ 0,02		+ 0,04			+ 0,04			+ 0,04			+ 0,04				+ 0,04	+ 0,07		
Dynamic force C (N)	5000	5100	10100	7900		13100	9700	6800	14600	14500	7400	23400	26500	16800	11400	25400	44600	33800	22800
F max axial (N)	3000	2520	5200	4100	4200	8000	5500	3800	10150	10100	4750	20000	20000	11950	7750	24600	30400	22200	14450
Momentum torque max (Drive shaft) (Nm)	2,4	4,0	4,2	6,5	10,8	6,4	8,8	12,2	8,1	16,1	19,0	16,0	31,9	38,1	39,6	19,6	48,4	70,7	92,2
Orderstroke (mm)	100 ... 800		100 ... 800			100 ... 1000			100 ... 1200			100 ... 1500				100 ... 1500			
Velocity/speed max (m/s)	0,6	1,3	0,5	1,0	1,6	0,4	0,8	1,5	0,3	0,6	1,5	0,2	0,5	0,9	1,5	0,2	0,4	0,8	1,6
RPM max spindle (1/min)	7690	7630	6470	6120	6000	4590	4660	4570	3610	3670	3640	2840	2830	2830	2820	2280	2380	2380	2370
Acceleration max (m/s²)	10																		
Max. angle of rotation at the piston rod (°)	0,65 °		0,6 °			0,5 °			0,4 °			0,3 °				0,25 °			

Step 3: Selection of suitable actuators based on the maximum permissible forces

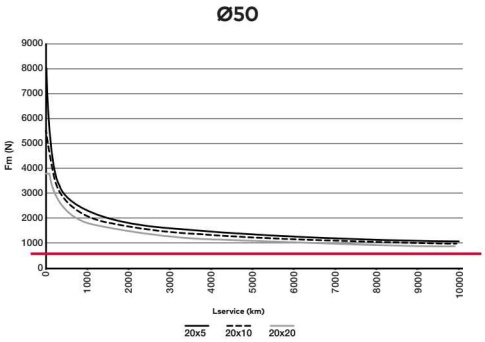
The maximum permissible force depends on the order stroke and can be taken from the diagrams on pages 9 to 10 of the data sheet.
This application is installed according to "Load case 3". This means that all drives from size 50 are suitable for the application.



Step 4: Selection of suitable actuators based on the maximum permissible speed
The maximum permissible speed depends on the order stroke and can be taken from the diagrams on page 11 of the data.
The spindle 20x5 mm is omitted.



Step 5: Selection of suitable actuators based on estimated service life
The mean force acting on the actuator is used to calculate the service life. The mean force Fm can be calculated using the formula on page 8.
With an average force of 795 N, a service life of > 1,700 km can be expected.



Step 6: Selection of the appropriate order stroke (working stroke + stroke reserve)
To prevent damage to the actuator, a stroke reserve of at least 20 mm is recommended at each end side:
Order stroke = working stroke + 2 x 20 mm
= 850 mm + 40 mm
= 890 mm

Step 7: Check all remaining parameters
e) temperature requirement of T'_{max}=35 °C is met
h) there are no specific requirements for the material

Result:
E/809050/10M/890 is the chosen electromechanical actuator, because it meets all requirements.