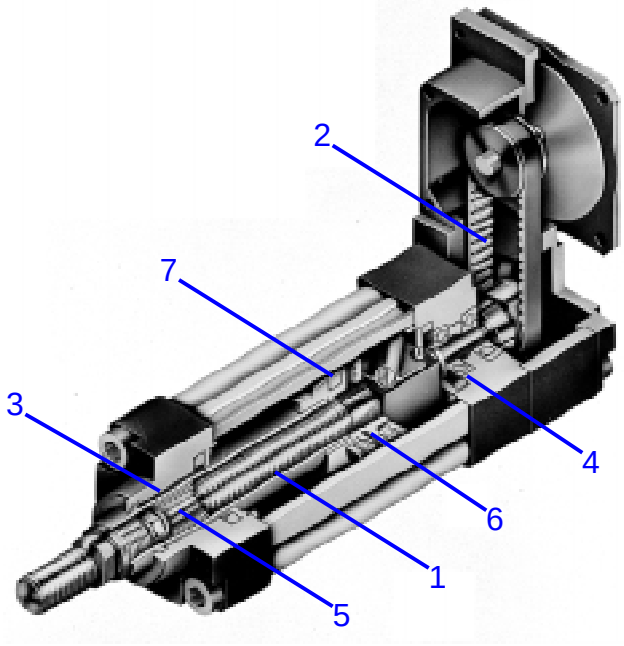
The Electro-Thrust Electric Cylinder

The Electro-Thrust electric cylinder offers an alternative to pneumatic and hydraulic systems in applications where the programmable functionality of electro-mechanical drives is required. Used in conjunction with the wide range of accessories, this device can perform a variety of functions in material handling and supply systems, machine tools, test rigs and laboratory equipment. Typical applications include handling operations in wood and plastics processing, vertical feeding axes in machine tools, tensioning and clamping fabrics in textile processing, component handling in automotive production and remote actuation of valves and regulators.

Features of the Electro-Thrust cylinder include:

- Stroke lengths up to 1500mm
- Ballscrew pitches from 5 to 40 mm/rev.
- Thrust forces in excess of 20,000N
- Typical repeatability ± 0.07mm
- Speeds up to 2 m/s
- Timing belt pulley drive (with parallel motor installation), available with 4 drive ratios
- High mechanical efficiency (up to 90%)
- 4 different frame sizes



Ball screw (1)

The Electro-Thrust cylinder incorporates a high quality C7 class ball screw drive, giving smooth operation throughout the entire speed range. Life expectancy and efficiency are both high. Very short movements are possible due to the absence of stick-slip effects.

Timing belt transmission (2)

The slip-free, zero-maintenance timing belt transmission used in parallel drive versions offers high efficiency and smooth operation. Drive ratios up to 2:1 are available depending on the cylinder size; the ET32 is also available with a 1:1.5 step-up ratio.

Extra-long rod bearing (3)

The long cylinder rod bearing allows high side load forces to be applied with less bearing deflection. The bearing retains cylinder lubrication by means of gaskets which also prevent the ingress of external contamination.

Rear screw support bearing (4)

Angular contact bearings at the drive end are designed to accommodate high axial and radial forces. Generous dimensions ensure long screw and bearing life.

Front screw support bearing (5)

A Delrin bearing supports the front end of the ball screw. This eliminates vibration and run-out, improving positioning accuracy and extending screw life

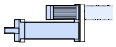
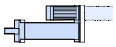
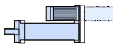
Precision anti-rotate mechanism (6)

Nylatron NS wheels virually eliminate rod end play and noise whilst rigidly supporting the drive screw for longer life and smoother operation.

Switch operating magnet (7)

The permanent magnet integrated in the screw nut serves to operate home and limit switches which can be fitted to a longitudinal groove in the cylinder body.

Technical Data

Cylinder size	Unit	ET 32		ET 50		ET 80			ET 100		
Screw type		**M05**	**M10**	**M05**	**M10**	**M05**	**M10**	**M25**	**M05**	**M10**	**M40**
Screw data											
Lead	mm	5	10	5	10	5	10	25	5	10	40
Screw diameter	mm	12		16		25			40		
Screw length with zero travel											
Parallel drive 	mm	174.7	174.7	200.3	203.1	227.0	245.5	252.4	332.2	352.0	416.1
Inline drive 	mm	160.7	160.7	190.7	193.7	211.2	229.8	236.6	309.4	329.2	393.2
Stroke, speed and acceleration											
Available strokes	mm	Infinitely variable, from 50-750 mm		Infinitely variable, from 50-1000 mm		Infinitely variable, from 100-1500 mm					
Maximum permissible speed if stroke =											
50-300 mm	mm/s	833	1667	625	1250	400	800	2000	250	500	2000
450 mm	mm/s	448	895	568	1125	400	800	2000	250	500	2000
600 mm	mm/s	276	552	354	702	400	800	2000	250	500	2000
750 mm	mm/s	187	374	241	480	383	735	1808	250	500	2000
1000 mm	mm/s	--	--	145	289	230	444	1096	250	500	2000
1250 mm	mm/s	--	--	--	--	153	297	735	232	450	1647
1500 mm	mm/s	--	--	--	--	109	213	527	166	325	1204
Max. acceleration	m/s²	3	6	3	6	3	6	10	3	6	10
Forces											
Max. thrust force[2]	N	600		3350		8300			21200		
Mass & inertia											
Mass of basic unit without stroke	kg	1.3		2.3		6.8			14.3		
Mass of additional length	kg/m	3		6		10			20		
Inertia J_0 in relation to drive shaft without stroke for i=1; for i≠1, $J_{total} = [J_0(i=1)+J_H(i=1)] / i^2$ (i=drive ratio)											
Parallel drive 	$kgm^2 10^{-4}$	0.0417	0.0437	0.554	0.576	1.289	1.353	1.428	7.083	7.492	9.189
Inline drive 	$kgm^2 10^{-4}$	0.0247	0.0270	0.129	0.158	0.748	0.811	0.887	4.018	4.427	6.124
Inertia J_H in relation to drive shaft per metre of additional length for i=1;											
Parallel drive 	$\frac{kgm^2 10^{-4}}{m}$	0.166	0.185	0.516	0.54	3.020	3.060	3.32	19.78	19.86	21.38
Inline drive 	$\frac{kgm^2 10^{-4}}{m}$	0.166	0.180	0.512	0.54	3.020	3.060	3.32	19.78	19.86	21.38
Precision											
Unidirectional repeatability	mm	± 0.07 (when operating temperature remains constant)									
Efficiency											
Ball screw	%	90									
Timing belt drive	%	90									
Drive ratios											
Available drive ratios:		**1:1** (i=1; direct or parallel drive); **1.5:1** (i=1.5; parallel drive); **2:1** (i=2; parallel drive, not ET32); **1:1.5** (i=0.67; parallel drive, ET32 only)									

Quoted data does not include any safety margins. For type designations, see system code, page 13. The data is valid for a temperature range of 0° 60°C. Max. permissible relative humidity: 90% non condensing.

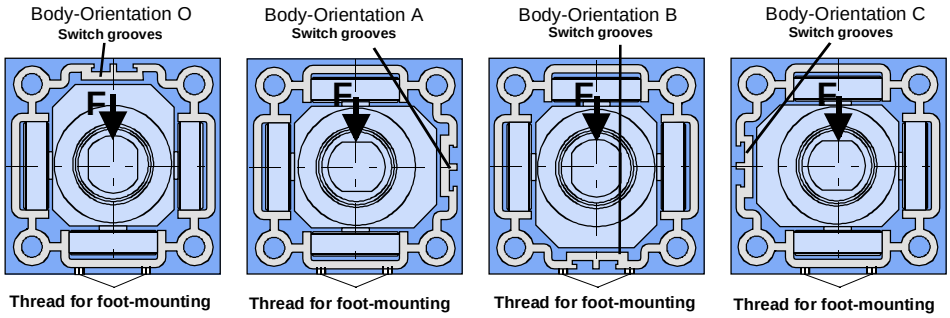
[2] Values refer to the maximum permissible screw bearing load. Please note life expectancy curve on page 12. In parallel drive, the maximum thrust force from the timing belt is limited – (see page 4 "Allowable torque in parallel drive")

Rod end-load capacity

The Electro-Thrust electric cylinder has a generously dimensioned front bearing which supports the rod in conjunction with three roller bearing-mounted plastic rollers. This system enables the cylinder to accommodate a certain amount of side load. Please note the side load capacity increases with the stroke length because of the greater separation between the bearings. To reach the required load values during a given application, it is sometimes useful to select a cylinder with greater stroke than is required for the application. Example: an ET50 with a 200mm stroke can accommodate approx. 72N of side load when fully extended. An ET50 with a 300mm stroke can accommodate approx. 166 N of load when it is only extended by 200 mm.

If your application requires an even greater load capacity, then the cylinder can be fitted with the linear rod guide module which is available as an option.

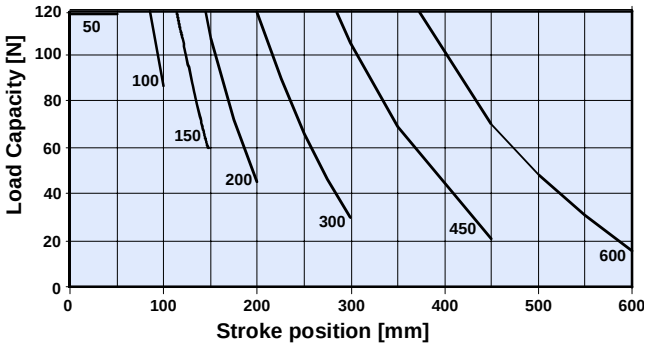
⚠ The curves specified here only apply to body orientation O and B if side load is applied from above or below. In body orientation C and A, the rod end load capacity is halved.



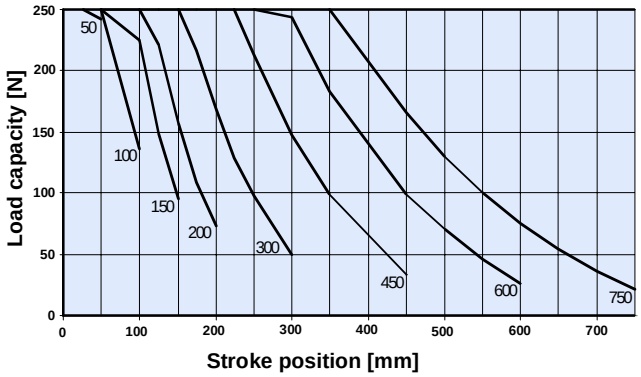
View on rod-end

In body orientation O or B, the side load is carried by two rollers. In orientations A and C, the load is carried by only one roller.
If side load F is not applied from above or below as shown in the diagram, but from the right or the left, then the reverse of the above applies.
The ET100 is fitted with switch grooves on all sides.

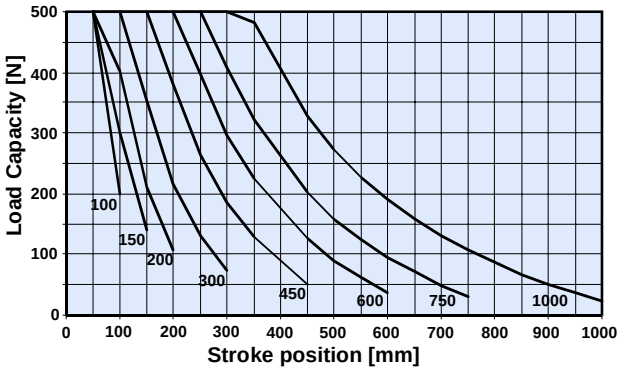
Permissible side load ET32



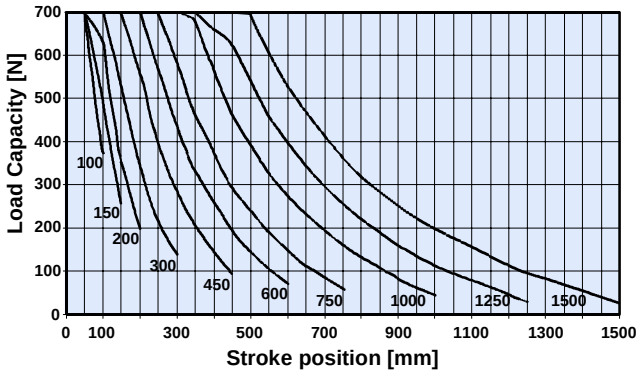
Permissible side load ET50



Permissible side load ET80



Permissible side load ET100



Allowable torque in parallel drive

		Motor type												Max. allowable motor torque [Nm] vs. speed								
		Step mot.			Servomotor																	
		STT..			ML	ML MD	HDX..							Motor speed [rpm]								
Cyl.	ratio	57	83	106	23	34	55 C4	70 C4	92 E6	115 A6	115 C6	142 C6	142 G6	10	500	1000	1500	2000	2500	3000	3500	5000
ET32	1:1	X			X		X							1.68	1.35	1.09	0.92	0.84	0.75	0.68	0.65	0.65
ET32	1:1.5	X			X		X							1.22	0.99	0.82	0.72	0.63	0.57	0.53	0.50	0.50
ET50	1:1	X			X									2.80	2.19	1.73	1.42	1.27	1.12	1.01	0.99	0.99
ET50	1.5:1	X			X									1.93	1.55	1.25	1.04	0.94	0.84	0.76	0.73	0.73
ET50	2:1	X												1.43	1.16	0.94	0.80	0.73	0.66	0.60	0.57	0.57
ET50	1:1		X			X		X	X					3.64	2.93	2.39	2.10	1.85	1.67	1.53	1.38	1.24
ET50	1.5:1		X											2.40	1.96	1.62	1.44	1.28	1.17	1.08	0.99	0.93
ET80	1:1		X											7.07	5.55	4.39	3.77	3.22	2.84	2.52	2.20	2.06
ET80	1.5:1		X											5.08	4.04	3.25	2.83	2.46	2.21	2.00	1.78	1.56
ET80	2:1		X											3.64	2.93	2.39	2.10	1.85	1.67	1.53	1.38	1.24
ET80	1:1			X		X			X	X	X			13.4	10.6	8.43	7.16	6.11	5.40	4.79	4.18	3.92
ET80	1.5:1			X		X			X	X	X			9.66	7.69	6.18	5.38	4.68	4.19	3.79	3.38	2.96
ET80	2:1					X			X					6.91	5.57	4.54	4.01	3.51	3.18	2.91	2.65	2.35
ET100	1:1									X	X	X	X	61.2	37.1	32.6	30.4	28.5	27.6	25.9	24.8	22.3

The table shows the maximum torques which can be transmitted by the timing belt. Please note the maximum thrust force (see Technical Data page). For conversion purposes, use the torque/thrust table below.

Torque/thrust factor and zero load torque

The table below displays the thrust generated for every 1Nm torque at the screw. The table takes account of efficiency, belt ratio and lead. The table is for general guidance only. The inertia of the screw must also be taken into consideration for a more precise dimensioning of the drive unit.

ET32	Thrust factor [N/Nm]	Zero load torque for motor [Nm]
ET32-M05LA	1130	0.2
ET32-M05PA	1015	0.2
ET32-M05PZ	675	0.4
ET32-M10LA	565	0.3
ET32-M10PA	510	0.3
ET32-M10PZ	335	0.4

ET50	Thrust factor [N/Nm]	Zero load torque for motor [Nm]
ET50-M05LA	1130	0.4
ET50-M05PA	1015	0.4
ET50-M05PB	1525	0.3
ET50-M05PD	2035	0.2
ET50-M10LA	565	0.5
ET50-M10PA	510	0,6
ET50-M10PB	765	0.4
ET50-M10PD	1015	0.3

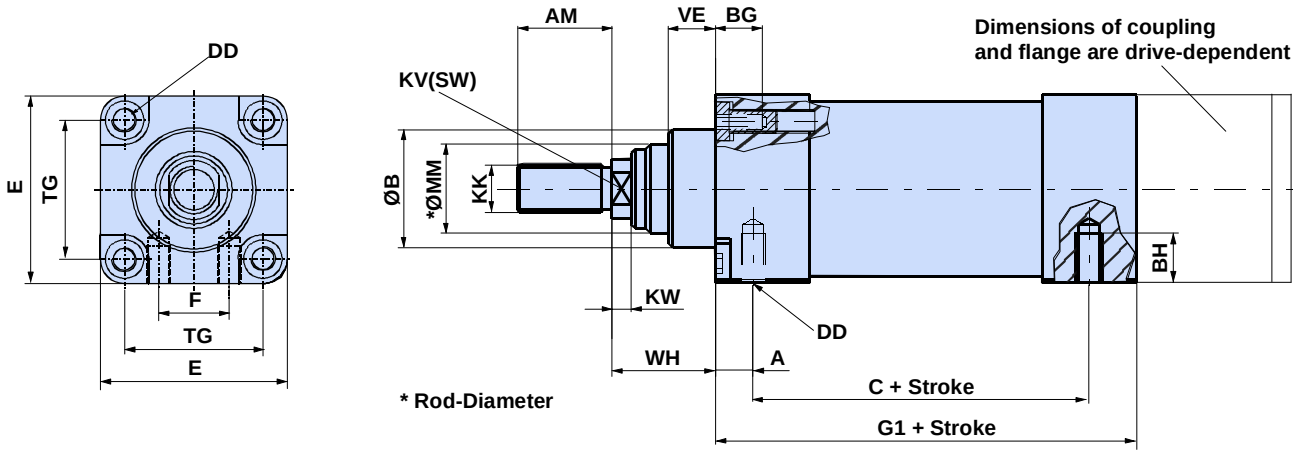
ET80	Thrust factor [N/Nm]	Zero load torque for motor [Nm]
ET80-M05LA	1130	0.5
ET80-M05PA	1015	0.6
ET80-M05PB	1525	0.4
ET80-M05PD	2035	0.3
ET80-M10LA	565	0.6
ET80-M10PA	510	0.7
ET80-M10PB	765	0.4
ET80-M10PD	1015	0.3
ET80-M25LA	225	0.9
ET80-M25PA	205	1.0
ET80-M25PB	305	0.7
ET80-M25PD	405	0.5

ET100	Thrust factor [N/Nm]	Zero load torque for motor [Nm]
ET100-M05LA	1130	0.5
ET100-M05PA	1015	0.6
ET100-M10LA	565	0.6
ET100-M10PA	510	0.7
ET100-M40LA	140	0.9
ET100-M40PA	125	1.0

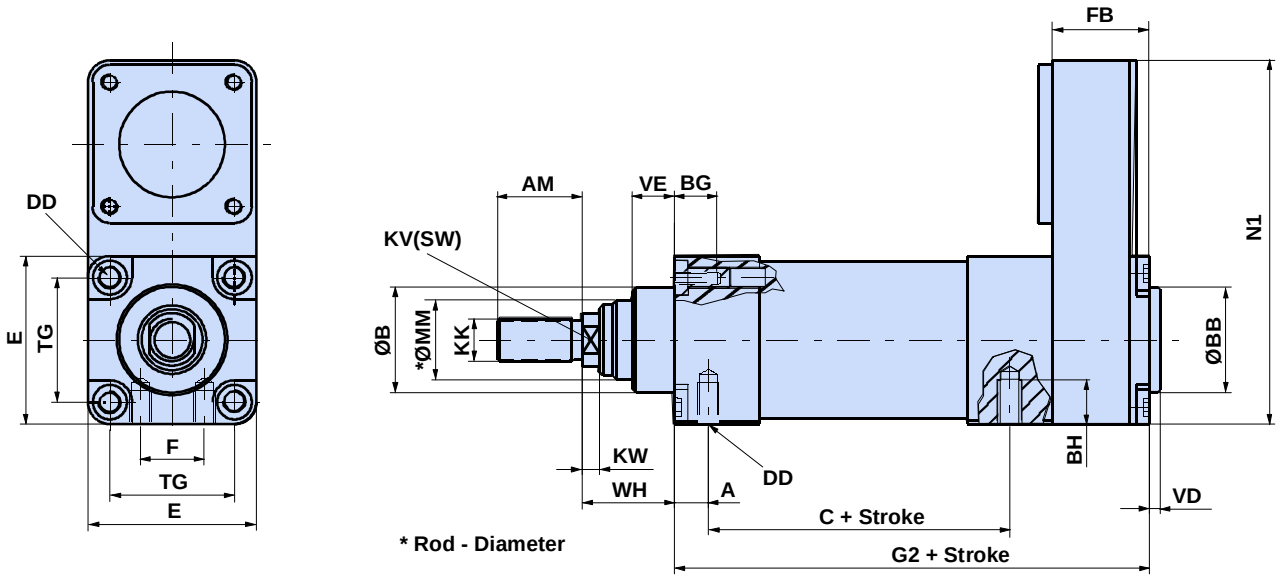
The “P” in the part number applies to all parallel and/or reverse parallel motor positions; "A" means ratio i = 1:1; "B" i = 1.5:1; "D" i = 2:1; "Z" i = 1:1.5 (also see page 13).

Dimensions

Electro-Thrust electric cylinder with inline drive



Electro-Thrust electric cylinder with parallel drive



General dimensioning of the ET - cylinder

Cyl.	A	AM	ØB	BG	BH	DD	l	F	KK	KV	ØMM	TG	VE	WH	KW	N1	FB	VD	ØBB
ET32	14	22	30	14.5	9	M6x1 (note 2)	46.5	16	M10 x1.25	10	18	32.5	13	26	5	106.4	37	4	30
ET50	16	32	40	16	12.7	M8 x1.25	63.5	24	M16 x1.5	17	25	46.5	16	37	6.5	139.4	39	4	40
ET80	21	40	50	16	17.5	M10 x 1.5	95.3	30	M20 x1.5	22	35	72	20	46	10	191.3	57	5	45
ET100	27.5	54	65	16	24	M12 x1.75	114	50	M27 x2	27	50	89	20	51	13	254	79	4	55

‘Zero stroke’ dimensions

Cylinder	ET32		ET50		ET80			ET100		
Type	M05	M10	M05	M10	M05	M10	M25	M05	M10	M40
C	112.5	112.5	128.4	131.4	129.5	148.1	154.9	201.5	221.3	285.3
G1	140.5	140.5	160.4	163.4	173.0	191.6	189.4	259.7	279.5	343.5
G2	176.7	176.7	199.5	202.5	228.3	246.9	253.7	335.5	355.3	419.3

2 If you intend to attach a component to the front screws of the ET32 (with thread DD=M6x1), please ensure that this component has clearance holes of at least 7mm diameter.

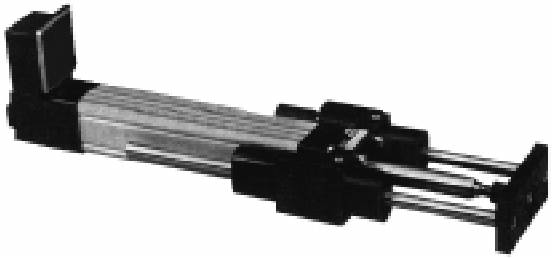
Accessories & options

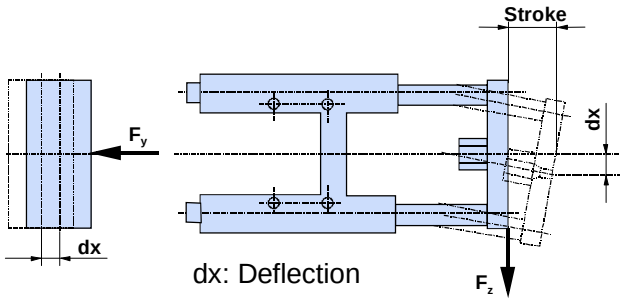
Linear rod guide module

The linear rod guide module has the following functions:

- Resists rotation at higher levels of torque
- Accommodates high levels of side load
- Relieves the cylinder of side load

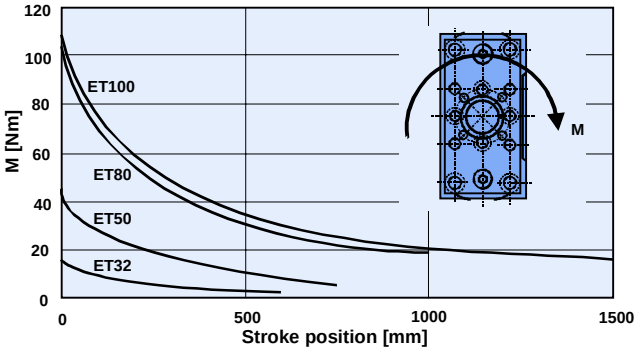
The high levels of stability and precision are achieved by two hardened steel guide rods which operate in conjunction with four linear roller bearings.





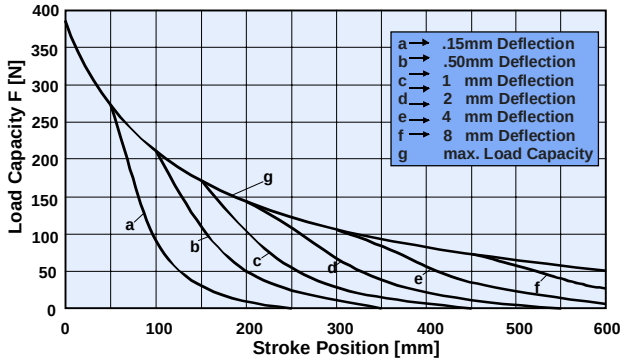
Diagrams apply to F_z or F_y

Permissible torque

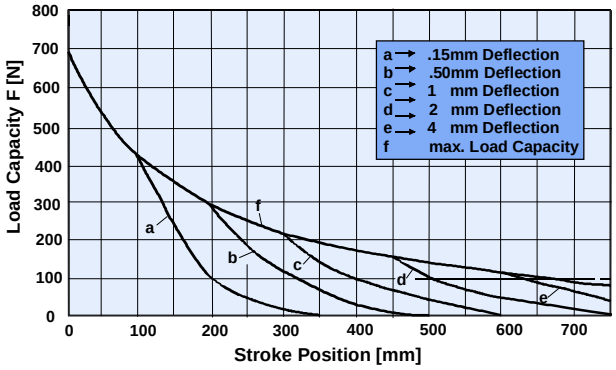


Load capacity for cylinder fitted with linear rod guide module

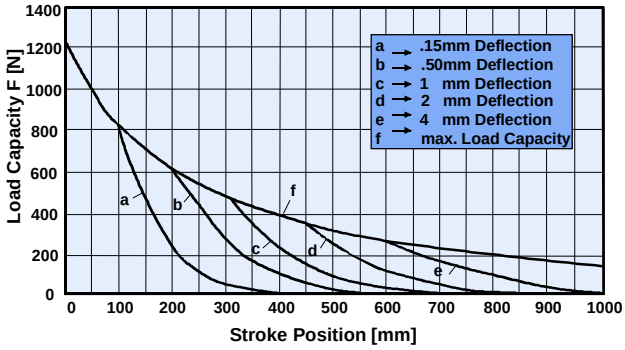
ET32 with linear rod guide module



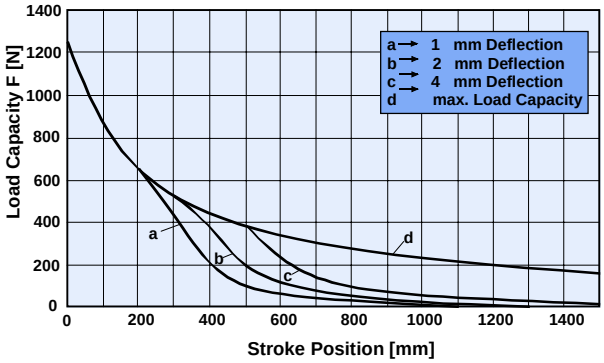
ET50 with linear rod guide module



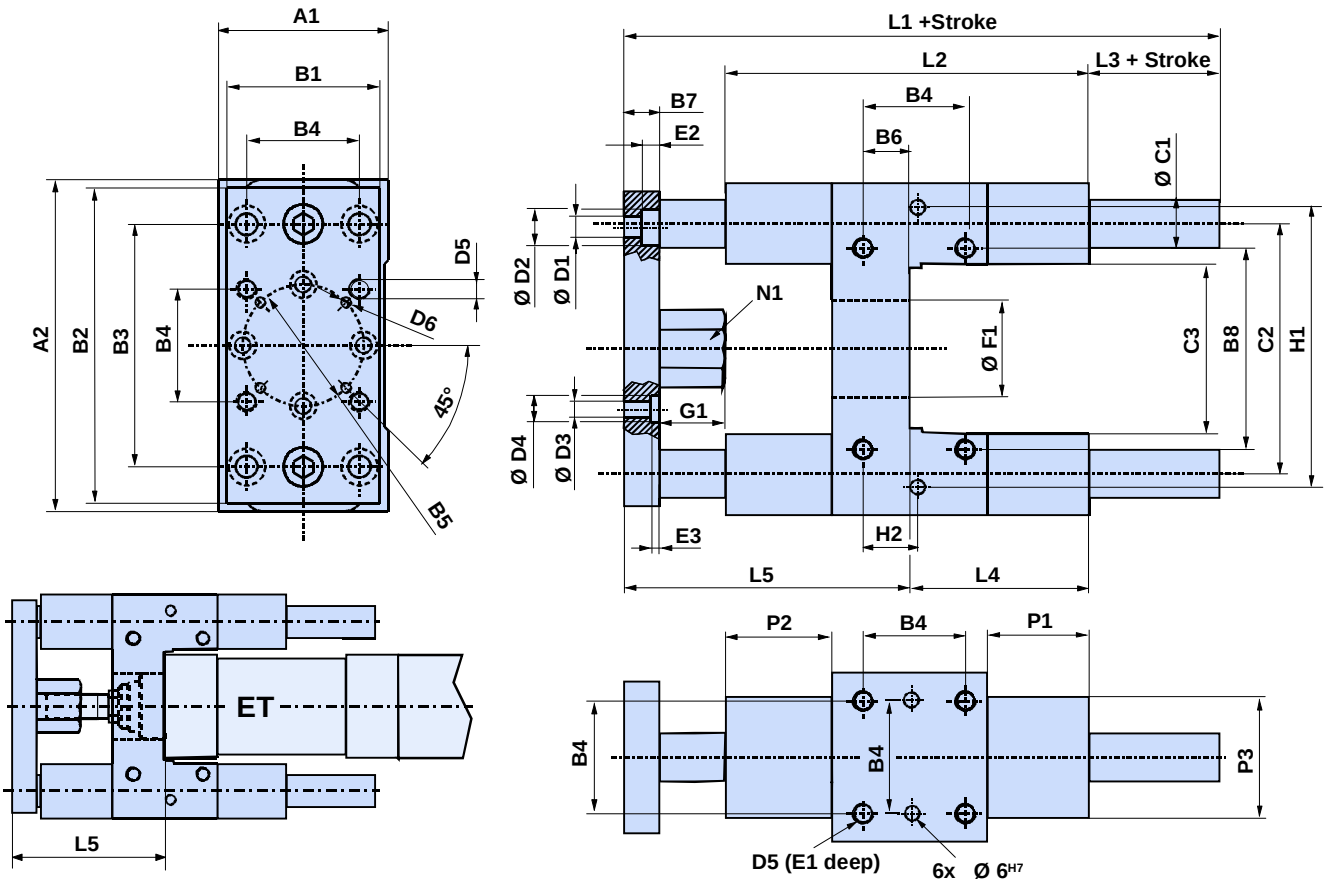
ET80 with linear rod guide module



ET100 with linear rod guide module



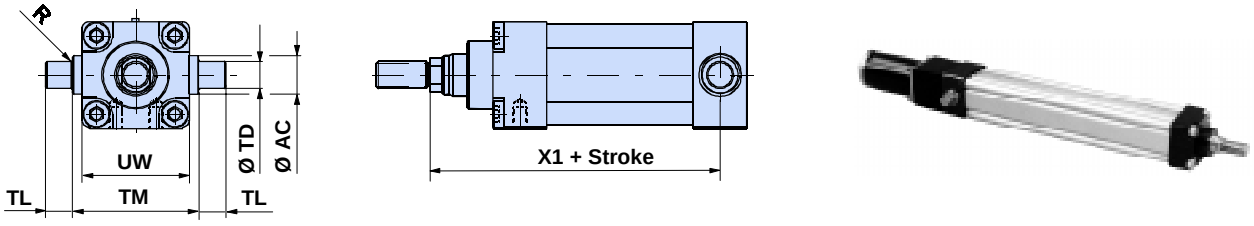
Dimensions of Linear Rod Guide Module



	A1	A2	B1	B2	B3	B4	øB5	B6	B7	B8	øC1	C2	C3	øD1	øD2	øD3	øD4	øD5	øD6	E1
ET32	50	97	45	90	78	32.5	31.5	4	12	61	12	73.5	50	6.6	11	5.2	9	M6	4	12
ET 50	70	137	63	130	100	46.5	50	19	15	85	20	103.5	70	9	14	6.4	11	M8	4	16
ET 80	105	189	100	180	130	72	76	21	20	130	25	147	105	11	17	8.4	14	M10	6	20
ET 100	130	213	120	200	150	89	76	24.5	20	150	25	171.5	130	11	17	8.4	14	M10	6	20

	E2	E3	øF1	G1	H1	H2	L1	L2	L3	L4	L5	N1	P1	P2	P3	Mass	Additional mass / 100mm stroke
ET32	7	4	30	17	81	16	150	120	15	71	64	17	36	31	40	970g	175g
ET 50	9	9	40	27	119	23	192	150	24	79	89	24	42	44	50	2560g	495g
ET 80	11	5	50	32	166	36	247	200	24	113	110	30	50	52	70	6530g	770g
ET 100	11	5	55	55	190	45	290	220	24	128	138	30	49	51	70	8760g	770g

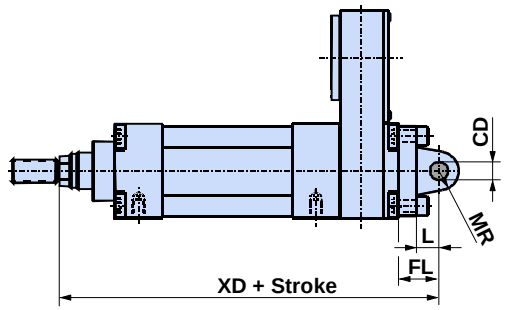
Centre Trunnion Mounting

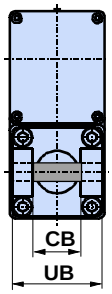


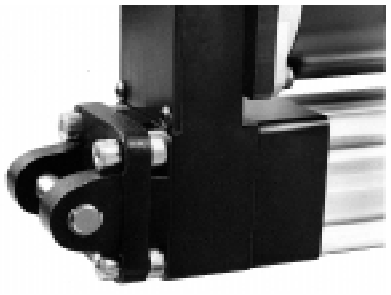
Cylinder	ET32		ET50		ET80			ET100		
Type	M05	M10	M05	M10	M05	M10	M25	M05	M10	M40
X1	152.5	152.5	181.4	184.4	196.5	215.1	221.9	280.7	300.5	364.5
UW	46.5		63.5		95.3			114.3		
øTD	12		16		20			25		
R	0.8		0.8		0.8			1.6		
TL*	12		16		20			25		
TM**	50		75		110			132		
øAC	18		25		30			40		

* according to ISO tolerance class e9 / ** according to ISO tolerance class h14

Rear Clevis (Only for parallel drive or reverse parallel drive)

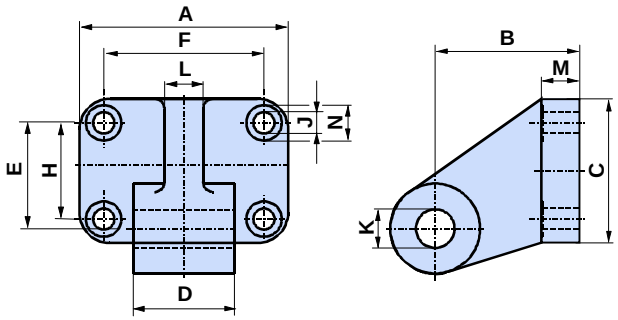






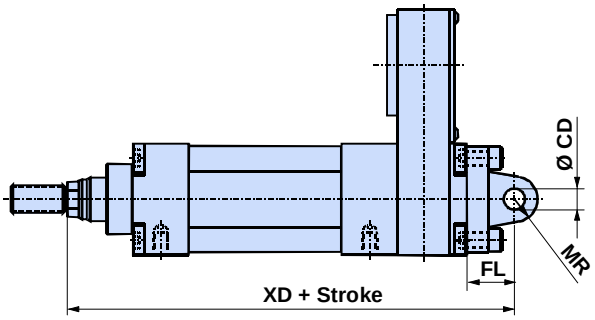
Cylinder	ET32		ET50		ET80			ET100		
Type	M05	M10	M05	M10	M05	M10	M25	M05	M10	M40
XD	224.7	224.7	263.5	266.5	310.3	328.9	335.7	428.7	448.5	512.5
UB	44.7		59.6		89.7			109.5		
CB	26		32		50			60		
øCD	10		12		16			20		
MR	10		13		20			22		
L	12		15		20			25		
FL	22		27		36			41		

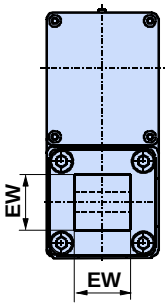
Hinge Bracket (counterpart of rear clevis shown above - please order separately.)

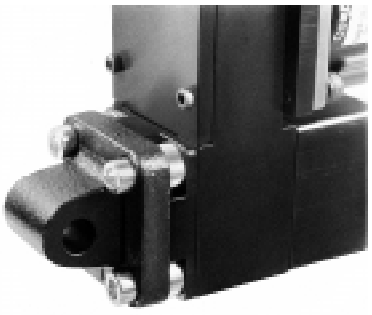


Cylinder	Type	A	B	C	D	I	F	H	øJ	øK	L	M	øN
ET 32	32-2800T	51	32	31	25.6±0.2	21	38	18	5.5^{H13}	$10^{+0.036}$	10	8	10
ET 50	50-2800T	65	45	45	31.6±0.2	33	50	30	6.6^{H13}	$12^{+0.043}$	12	12	11
ET 80	80-2800T	86	63	60	49.6±0.2	47	66	40	9.0^{H13}	$16^{+0.043}$	16	14	15
ET 100	100-2800T	96	71	70	59.5	55	76	50	11^{H13}	$20^{+0.052}$	20	15	15

Rear Eye Mounting (only for parallel or reverse parallel drive)





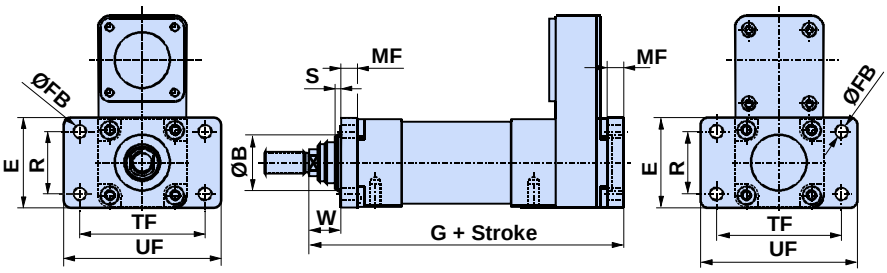


Cylinder	ET32		ET50		ET80			ET100		
Type	M05	M10	M05	M10	M05	M10	M25	M05	M10	M40
XD	224.7	224.7	263.5	266.5	310.3	328.9	335.7	428.7	448.5	512.5
EW	$25.3^{+0.5}$		$31.3^{+0.5}$		$49.7^{+0.5}$			59.0		
øCD*	10.0		12.0		16.0			20		
MR*	10.0		13.0		20.0			22		
FL*	22.0		27.0		36.0			41		

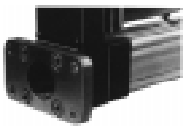
* according to ISO-tolerance class d11

Installation Flanges

Front Flange Mounting



Rear Flange Mounting

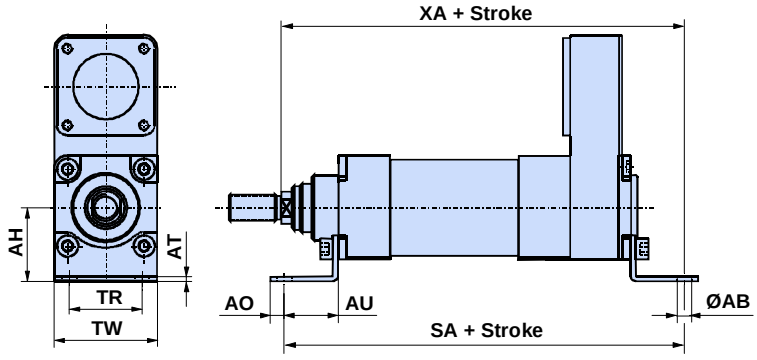


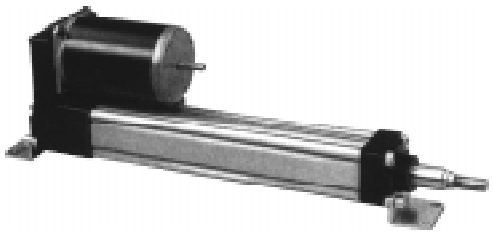
(Only for parallel or reverse parallel drive)

Cylinder	ET32		ET50		ET80			ET100		
Type	M05	M10	M05	M10	M05	M10	M25	M05	M10	M40
G	212.7	212.7	248.5	251.5	290.3	308.9	315.7	402.2	222.0	468.0
UF**	80		113		153			186		
E	47		65		97			115		
TF**	64		90		126			150		
øFB**	7.1		9		12.1			14.1		
R**	32		45		63			75		
W	16		25		30			35		
MF	10		12		16			16		
øB*	30		40		50			65		
S	3		4		4			4		

* according to ISO tolerance class d11 / ** according to ISO 6431

Foot mounting (only for parallel or reverse parallel drive)

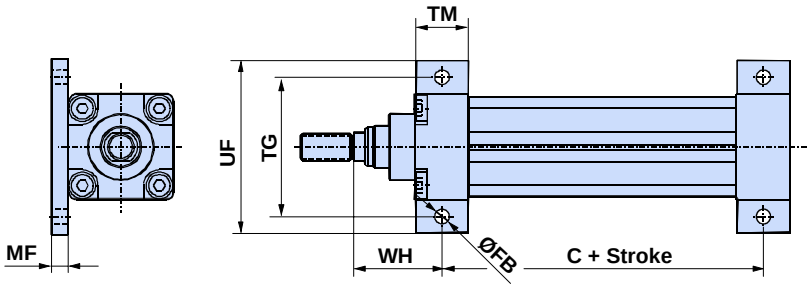




Cylinder	ET32		ET50		ET80			ET100		
Type	M05	M10	M05	M10	M05	M10	M25	M05	M10	M40
SA	226.7	226.7	268.5	271.5	315.3	333.9	340.7	418.2	438.0	502.0
XA	224.7	224.7	263.5	266.5	310.3	328.9	335.7	428.7	448.5	512.5
AH	32.0		45.0		63.0			71		
AT	3.0		3.0		4.0			6.5		
TR	32.0		45.0		63.0			75		
ø AB*	7.0		9.0		12.0			14		
AO*	7.2		9.5		16.5			19		
AU	24.0		32.0		41.0			41		
TW	46.5		64.0		96.0			115		

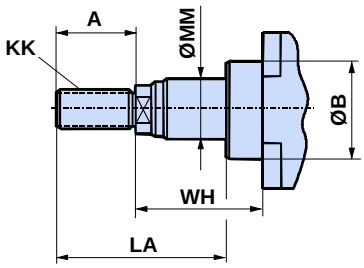
* according to ISO-tolerance class d11

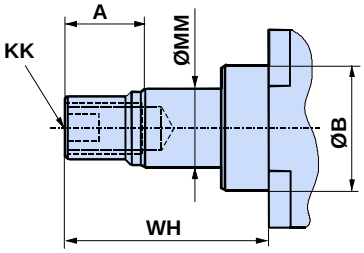
Side Lug Mounting



Cylinder	ET32		ET50		ET80			ET100		
Type	M05	M10	M05	M10	M05	M10	M25	M05	M10	M40
C	112.5	112.5	128.4	131.4	129.5	148.1	154.9	201.5	221.3	285.3
TG	62		84		120			150		
UF	78		104		144			185		
øFB	6.7		8.7		11			12.8		
TM	25.4		31.8		38.1			57.2		
MF	8		10		12			12		
WH	40		53		67			78		

Rod End

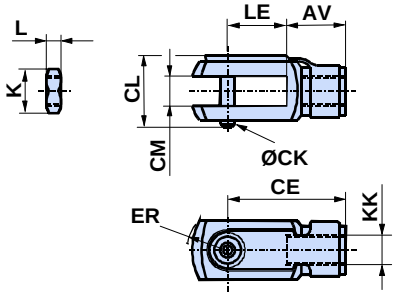




	Male (Standard)						Female				
Cylinder	A	øB*	KK	LA	øMM	WH	A	øB*	KK	øMM	WH
ET 32	22	30	M10x1.25	48	18	26	15	30	M10x1.25	18	32
ET 50	32	40	M16x1.5	69	25	37	25	40	M16x1.5	25	50
ET 80	40	50	M20x1.5	86	35	46	30	50	M20x1.5	35	59
ET 100	40	65	M27x2	85	50	51	40	65	M27x2	50	73

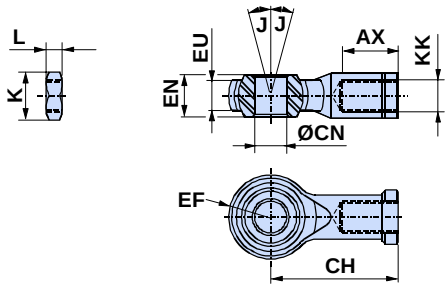
* according to ISO-tolerance class d11

Rod Clevis



Cylinder	KK	CL	CM	LE	CE	AV	ER	øCK	K	L
ET 32	M10x1.25	26.0	10.2 +0.13 -0.05	20	40	20	14	10 +0 -0.1	17	6
ET 50	M16x1.5	39.0	16.2 +0.13 -0.05	32	64	32	22	16 +0 -0.2	24	8
ET 80	M20x1.5	52.5	20.1 +0.02 -0.0	40	80	40	30	20 +0 -0.2	30	9
ET 100	M27x2	72.0	30.0 +0.6 -0.2	54	110	56	35	30 +0 -0.2	41	12

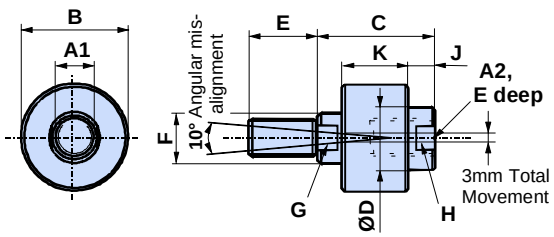
Spherical Rod Eye



Cylinder	øCN*	EN*	EU	AX	CH*	øEF*	KK*	J°	K	L
ET 32	10	14	10.5	20	43	29	M10x1.25	13	17	6
ET50	16	21	15.0	28	64	42	M16x1.5	15	24	8
ET80	20	25	18.0	33	77	50	M20x1.5	14	30	9
ET100	30	37	25.0	51	110	35	M27x2	15	41	12

* According to ISO-tolerance class d11

Linear Alignment Couplers

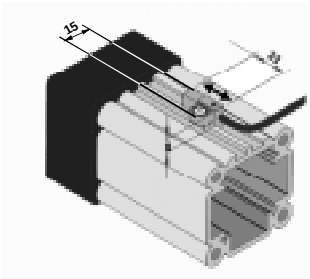


For mounting at rod end

- Compensates for alignment errors
- Increases mounting tolerance
- Simplifies cylinder attachment
- Increases life expectancy of cylinder guides
- Compensates for lateral offset between components and relieves guides of side load
- Withdrawal and thrust capacity is unaffected

Cyl.	Type	A1	A2	B	C	ØD	I	F	G	H	J	K
ET 32	LC32-1010	M10x1.25	M10x1.25	40	51	19	19	16	13	16	13	26
ET50	LC50-1616	M16x1.5	M16x1.5	54	59	32	29	25	22	29	14	33
ET80	LC80-2020	M20x1.5	M20x1.5	54	59	32	29	25	22	29	14	33
ET100	LC100-2727	M27x2	M27x2	89	102	51	51	38	32	43	19	64

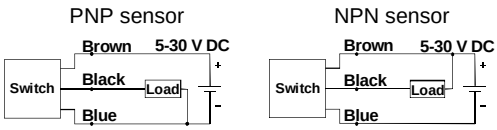
Home & Limit Switches



All standard Electro-Thrust electric cylinders are equipped with a permanent magnet which is integrated in one of the screw nuts. The cylinder body features two T-grooves on one side (on each side with the ET100) for fitting limit & home sensors. These can be positioned freely along the entire length of the casing. Two different types of switch are available for the ET cylinder range:

Hall effect sensor

- N.C. or N.O.
- electronic
- LED display
- moderate cost
- long life expectancy



Reed contact

- N.C.
- mechanical
- LED display
- low cost
- moderate life expectancy

Hall effect sensors								
Type	Function	LED colour	Logic	Cable	Switch current	Power supply current	Supply voltage range	Operating frequency
SMH-1P*	N.O.	Green	PNP	1.5 m	max. 150 mA	7mA at 12VDC	5-30 V DC	max. 500 Hz
SMH-1N*	N.O.	Red	NPN					
SMC-1P*	N.C.	Yellow	PNP			14mA at 24VDC		
SMC-1N*	N.C.	White/red	NPN					

* Add “C” to part number for 150mm cable with connector in place of 1.5m cable, e.g. SMH-1PC

Reed contact								
Type	Function	LED Colour	Cable	Switch current		Nominal power rating		Supply voltage	Operating-frequency
				ohmic load	ind. load	ohmic load	ind. load		
SMR-1	N.O.	Green	1.5 m	30-300 mA	30-100 mA	AC/DC 10W	AC/DC 5W	5-30 V DC	300 Hz
SMR-1L	N.O.	Red	1.5 m	5-40 mA	5-25 mA	AC/DC 10W	AC/DC 5W		300 Hz
SMD-1L	N.C.	Yellow	1.5 m	5-25 mA	5-25 mA	AC/DC 3W			200 Hz

Only use SMC-1P with COMPAX. With PDX drives, use SMH-1N as the home switch and 2x SMC-1N as the limit switches. Limit switch attachment and possible limit switch/cylinder combinations: see page 14

Life expectancy

The diagrams show the travel distance achieved or exceeded by 90% of a large number of identical or similar screws and their bearings before they fail due to material fatigue. Gaskets, the front screw support and the timing belt for parallel drive are not included.

Establishing the Mean Load

The mean load for different forces at varying speeds can be calculated using the following formula:

$$F_m = \sqrt[3]{F_1^3 \cdot \frac{n_1}{n_m} \cdot \frac{q_1}{100} + F_2^3 \cdot \frac{n_2}{n_m} \cdot \frac{q_2}{100} + F_3^3 \cdot \frac{n_3}{n_m} \cdot \frac{q_3}{100} + F_4^3 + \ldots}$$

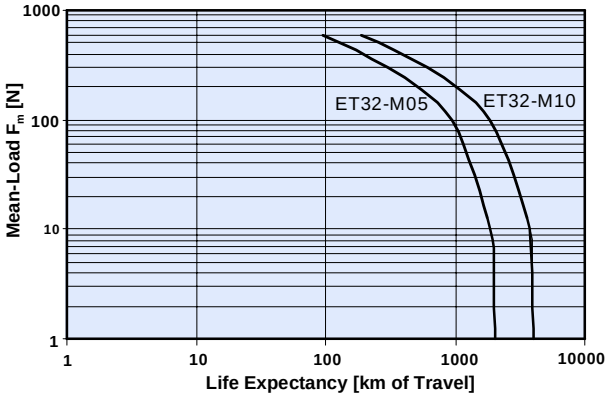
n_m, the mean speed, is calculated as follows:

$$n_m = n_1 \cdot \frac{q_1}{100} + n_2 \cdot \frac{q_2}{100} + n_3 \cdot \frac{q_3}{100} + n_4 \cdot \ldots$$

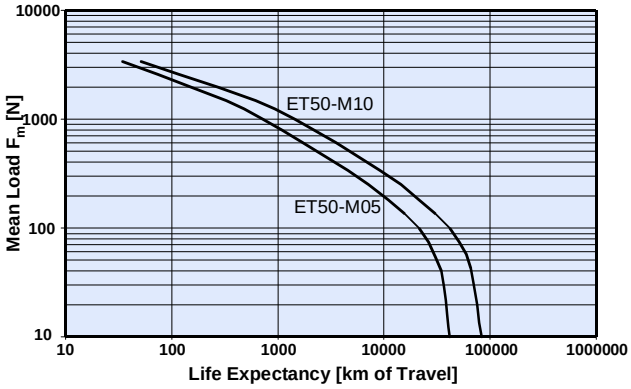
F_m = mean load [N]
n_m = mean speed [rpm]
$F_{1.2.3}$ = individual forces [N]
$n_{1.2.3}$ = speeds at which an individual force F_1, F_2 or F_3 is applied [N]
$q_{1.2.3}$ = time proportion (in percent) of the overall cycle when an individual force F_1, F_2 or F_3 is applied

If the life expectancy is required in terms of operating cycles, simply divide the life expectancy in kilometres by twice the travel distance.

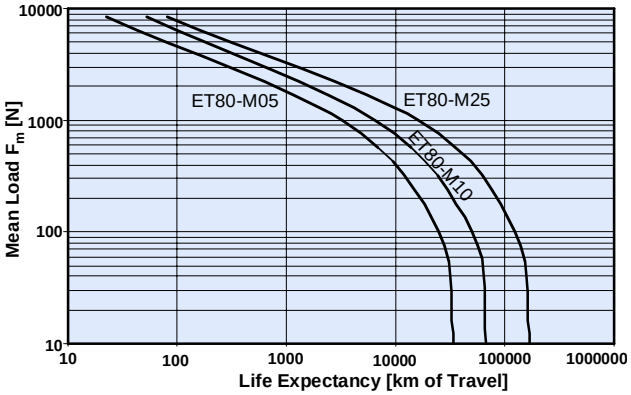
ET32



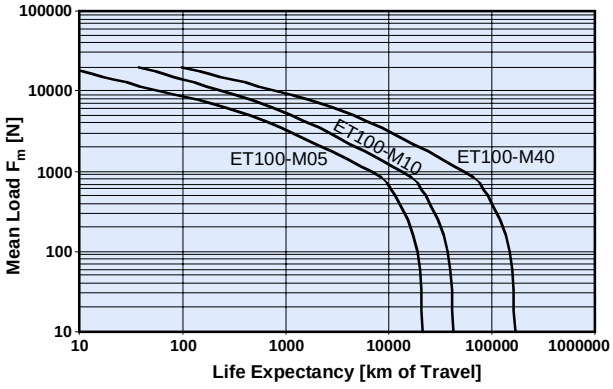
ET 50



ET 80

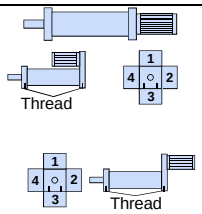


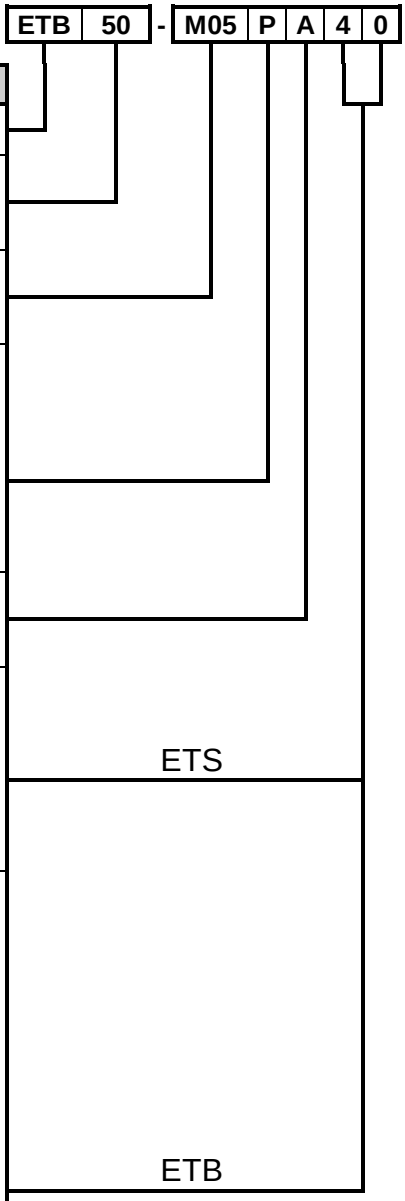
ET 100



Order code

Feature	Description	ET 32	50	80	100	Symbol
Series	Electro-thrust electric cylinder for step motor drive	x	x	x	x	**ETS**
	Electro-thrust electric cylinder for servomotor drive	x	x	x		**ETB**
Model / size	ET 32					**32**
	ET 50					**50**
	ET 80					**80**
	ET 100					**100**
Screw type	Ball screw, 5 mm lead	x	x	x	x	**M05**
	Ball screw, 10 mm lead	x	x	x	x	**M10**
	Ball screw, 25 mm lead			x		**M25**
	Ball screw, 40 mm lead				x	**M40**
Motor Mounting Style	Inline, Direct drive, Motor on end					**L**
	Parallel drive, pos.1					**P**[3]
	Parallel drive, pos.2					**M**[4]
	Parallel drive, pos.3					**N**[5]
	Parallel drive, pos.4					**Q**[6]
	Reverse parallel drive, pos1					**R**
	Reverse parallel drive, pos2					**S**
	Reverse parallel drive, pos3					**T**
	Reverse parallel drive, pos4					**V**
Drive Ratio	**1:1** (Inline drive, parallel/ reverse parallel drive)	x	x	x	x	**A**
	1.5:1 (parallel drive, reverse parallel drive) [1]		x	x		**B**
	2:1 (parallel / reverse parallel drive) [1]		x	x		**D**
	1:1.5 (parallel / reverse parallel drive) [1]	x				**Z**
Motor fitting option Step motors	STT57-102, only prepared for fitting[2]	x	x			**20**
	STL57-102, motor fitted with 3m cable	x	x			**27**
	STT57-102, motor fitted with grommet	x	x			**28**
	STT83-135, only prepared for fitting [2]		x	x		**30**
	STL83-135, motor attached with a 3m cable		x	x		**37**
	STT83-135, motor fitted with grommet		x	x		**38**
	STT106-178, only prepared for fitting[2]			x		**40**
	STL106-178, motor fitted with 3m cable			x		**47**
	STT106-178, motor fitted with grommet			x		**48**
Motor fitting option Servo motors[7]	ML2340B, only prepared for fitting[2]	x	x			**20**
	ML2340B-10, fitted	x	x			**21**
	ML2340A-XX fitted	x				**24**
	ML2340A-XX, only prepared for fitting[2]	x				**25**
	ML3450B or ML3475B, only prepared for fitting[2]		x	x		**30**
	ML3450B-10, fitted		x	x		**31**
	ML3475B-10, fitted			x		**35**
	MD3450/14/230V, fitted		x	x		**36**
	MD3450/14 or MD3475/14, only prepared for fitting[2]		x	x		**37**
	MD3475/14/230V, fitted			x		**38**
HDX-Motors	HDX55C4-32S, fitted	x				**46**
	HDX55C4-32S, only prepared for fitting[2]	x				**47**
	HDX70C4-44S, fitted		x			**56**
	HDX70C4-44S, only prepared for fitting[2]		x			**57**
	HDX92E4-44S, fitted		x	x		**66**
	HDX92E4-44S, only prepared for fitting[2]		x	x		**67**
	HDX115E6-88S, fitted			x	x	**72**
	HDX115E6-130S, fitted			x	x	**73**
	HDX115A6-88S, fitted			x	x	**76**
	HDX115, only prepared for fitting[2]			x	x	**77**
	HDX115C6-88S, fitted			x	x	**78**
	HDX142E6-88S, fitted				x	**82**
	HDX142E6-130S, fitted				x	**83**
	HDX142C6-88S, fitted				x	**86**
	HDX142, only prepared for fitting[2]				x	**87**
	HDX142G6-88S, fitted				x	**88**
	Special Customer Supplied Motor	x	x	x	x	**90**
	Non-standard motor	x	x	x	x	**99**





1 Possible motor / cylinder combinations with parallel drive: see page 4 "Allowable torque in parallel drive".

2 Only prepared for fitting means: prepared for fitting motor with flange and coupling for inline drive or flange, pulley and timing belt for parallel drive.

3 Body orientation 12 o'clock (code -) not possible, since switch grooves are obscured by motor.

4 Body orientation 3 o'clock (code A) not possible since switch grooves are obscured by motor.

5 Body orientation 6 o'clock (code B) not possible since switch grooves are obscured by motor.

6 Body orientation 9 o'clock (code C) not possible since switch grooves are obscured by motor.

7 Prepared for fitting motor with flange and coupling for inline drive or flange, pulley and timing belt for parallel drive.

- F M A 600 - A

Symbol	Description	Feature
A	Series designation (factory use only)	Series
xxxx	Stroke in mm (Total stroke: see below) **ET32:** 50-750 mm **ET50:** 50-1000 mm **ET80**: 100 - 1500 mm **ET100**: 100 - 1500 mm	Stroke [mm]
- A B C	12 o'clock (standard) 3 o'clock 6 o'clock 9 o'clock	Body Orien-tation (page 3)
M F K C S R X	Male (standard - metric) (page 10) Female (page 10) Male - imperial Clevis (page 10) Spherical Rod Eye (page 11) Linear Rod Guide Module (page 6) Special Rod End	Rod End
B C D E F G H J N X	Foot Mounting (page 9) (Not with Inline drive) Rear Clevis (page 8) (Not with inline drive) Center Trunnion Mounting (page 7) Rear Eye Mounting (page 8) (Not with inline drive) Bottom Tap (standard) (page 5) Foot Side Lug (page 10) Rear Flange Mounting (page 9, Installation flanges) (Not with inline drive) Front Flange Mounting (page 9, Installation flanges) Front and rear flange mounting (page 9, Install. flanges) (Not with inline drive) Special mounting option	Cylinder Mounting

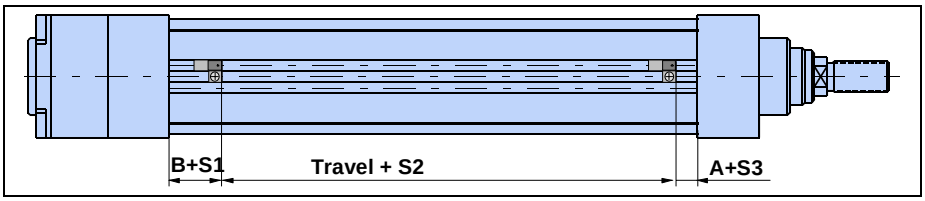
Example of order:

ETB50 - M05LA57 - FMA600 - A

Total stroke

The total stroke to be given in the system code is calculated as follows:

Total stroke = Travel + S1+S2+S3 (application-dependent)



S1, S3: stopping distance after limit switch operates

S2: difference between software limit range and hardware limit range

limit switch positions

limit switch → Cylinder ↓	SMH-1P		SMH-1N		SMC-1P		SMC-1N	
	A ±1**	B ±1**	A ±1**	B ±1**	A ±1**	B ±1**	A ±1**	B ±1**
ET 32	0*	0*	0*	0*	10.0	78.0	0*	0*
ET50-M05	5	89	4	90	16	85	5	90
ET50-M10	5	92	4	94	16	88	5	94
ET80-M05	11	73	10	74	22	69	11	74
ET80-M10	11	89	10	90	22	85	11	90
ET80-M25	11	98	10	99	22	94	11	99
ET100-M05	0*	0*	0*	0*	9.5	126	0*	0*
ET100-M10	0*	0*	0*	0*	9.5	146	0*	0*
ET100-M40	0*	0*	0*	0*	9.5	310	0*	0*

Technical data for limit switch: see page 11

* Ensure that there is an additional stroke of 3 mm if these switches are used

** Approximate values only, set up during commissioning.