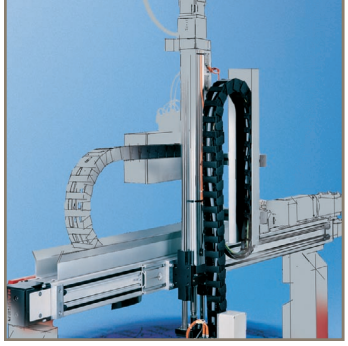

aerospace
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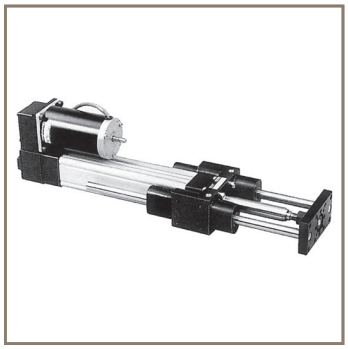
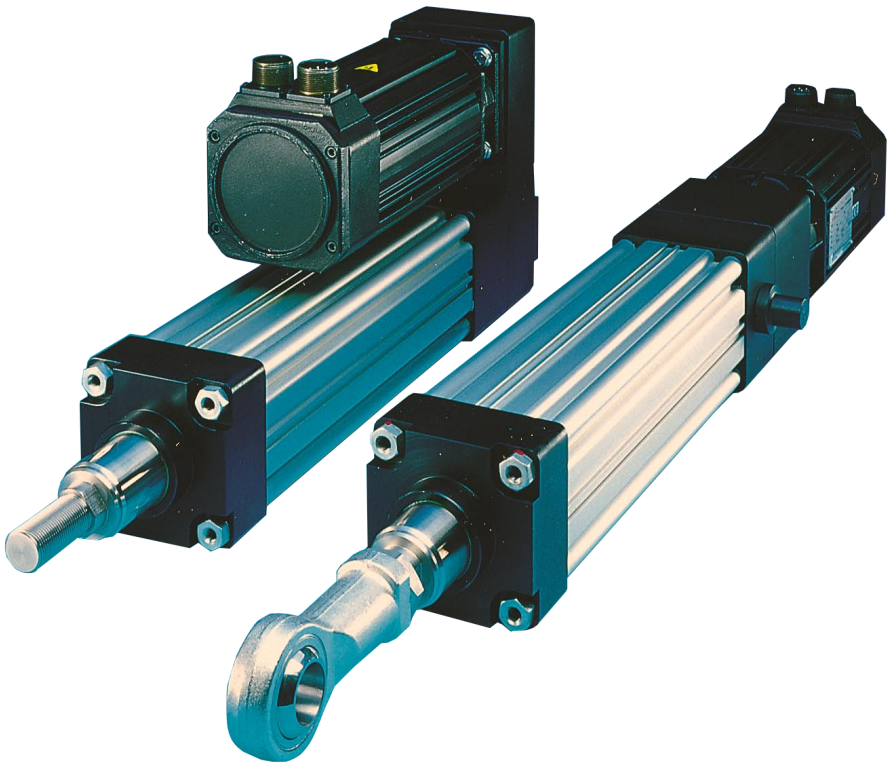
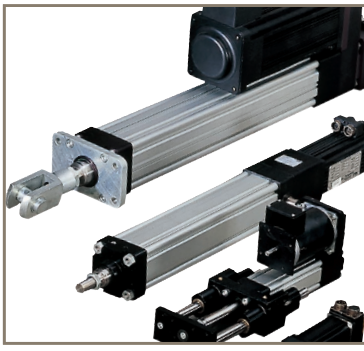
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding





ET - electro-thrust cylinder

Motion, positioning, material feed and setting



Parker

ENGINEERING YOUR SUCCESS.

The ET Electro Thrust Cylinder

Contents

The ET electro-thrust cylinder: Motion, positioning, material feed and setting

Product description

Typical fields of application:

The electro thrust cylinder closes the gap between pneumatic and hydraulic drives. Together with the wide choice of accessories, it offers many possibilities in the field of:

⇨ **Material handling and feed systems,**

- wood and plastic working industry
- vertical actuators for loading machine tools
- in the textile industry for tensioning / gripping textile fabrics
- in the automotive industry for transporting and feeding components

⇨ **Testing equipment and laboratory applications**

⇨ **Valve and flap actuation**

Performance / Technical data:

For precise motion, positioning, setting and actuating, the ET offers:

- High mechanical efficiency up to 90%
- Stroke up to 2400mm
- High traction/thrust force up to 44500N
- Repeatability ± 0.07mm (up to ± 0.01mm)
- Speeds up to 1.3m/s
- Timing belt drive (with parallel motor mounting) also available with transmission ratios
- Screw pitch from 5 to 50mm/rev
- 5 different sizes + ETV32 and ETV100 (V=longer service life)
- Available with servo or stepper motor drive
- IP54 Standard (Option IP65)

The technology:

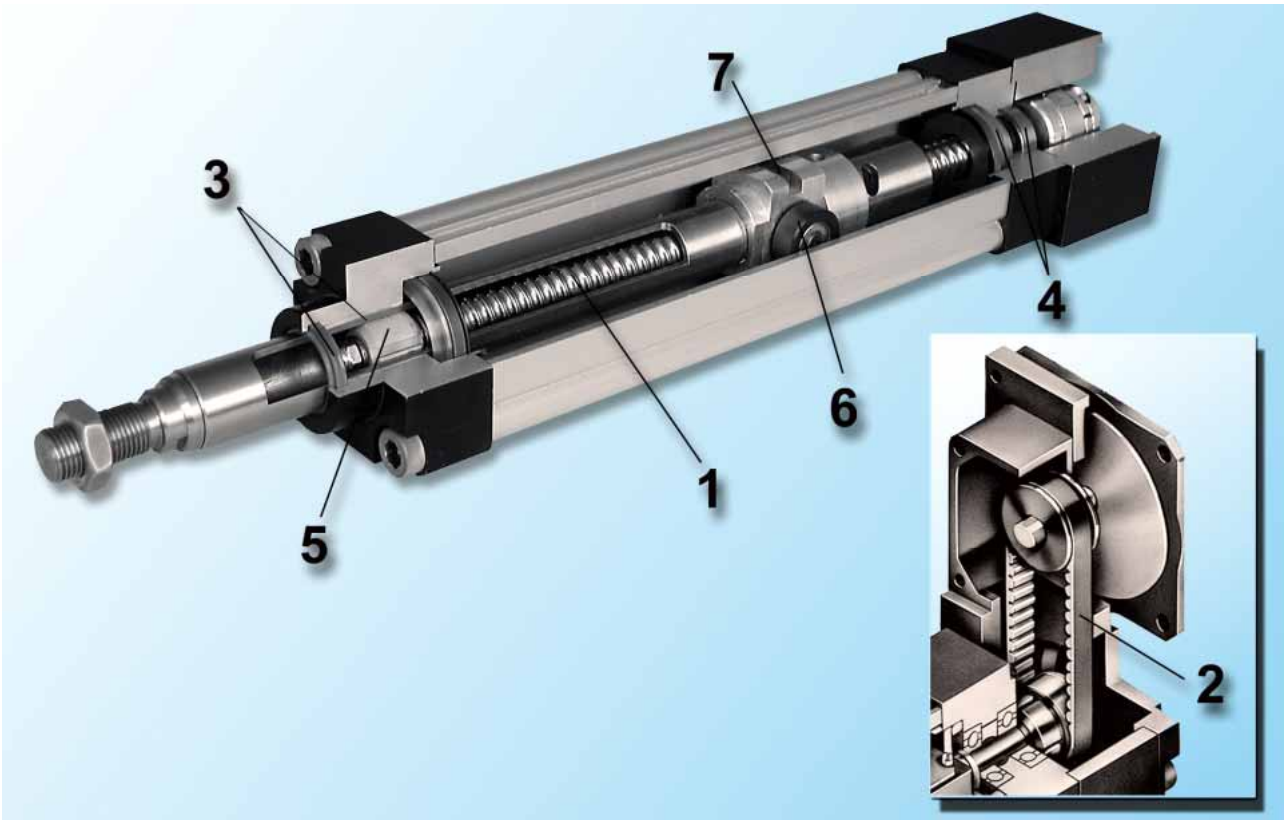
⇨ **Advantages of the ballscrew drive**

- Smooth operation
- Low wear
- Low maintenance
- High efficiency
- long life
- High precision even at low speed, as hardly any stick-slip effect occurs
- High speeds are possible due to high efficiency and low heat generation

Direct drive

Parallel drive

Product design



(1) Ballscrew:

⇨ As a feed unit, a high-quality precision class C7 ballscrew is used.

⇨ The balls between spindle and nut ensure a low frictional resistance. This ensures an especially smooth operation over the entire speed range, high lifetime and an excellent efficiency. Smallest travels are possible due to a low stick-slip effect.

(2) Timing belt transmission:

⇨ The slip- and maintenance free timing belt transmission (only with parallel drive) has an excellent efficiency.

⇨ The transmission ratios 1:1, 1:1.5, 1.51 and 2:1 are available.

(3) Linear sliding bearing:

⇨ The extra long cylinder rod bearing allows high side load forces. A wiper ring prevents the ingress of external contamination under normal conditions. In the event of fine dust, a high amount of dirt as well as muds and liquids, special sealing is required, which is available on request.

(4) rear screw bearing:

⇨ The screw bearing on the drive side accepts high axial and radial forces. It consists of two interlinked angualr contact ball bearings which accept the thrust and traction forces of the cylinder.

(5) Front screw bearing:

⇨ The front screw support bearing is supported by a polymer sliding bearing. This eliminates vibrations and run-out. This increases the precision, dynamic behaviour and lifetime of the screw.

(6) Anti-rotation device

⇨ The integrated anti-rotate mechanism, with three Nylatron NS wheels prevents the rod-rotation and can absorb minor torsional movements.

(7) Permanent magnet

⇨ All electro thrust cylinders are equipped with a permanent magnet integrated into the screw nut. The permanent magnet actuates the sensors, which can be mounted in the longitudinal grooves of the cylinder body.

IP65 rating

The IP65 version is intended for the use under difficult environmental conditions, if the drives must be cleaned with liquids or for use in dusty or wet environments. Depending on the medium, the sealing system might need adaption. It is therefore necessary, to contact us to discuss the application.

- ⇨ **Available for the sizes ET_32, 50, 80 and 100.**
- ⇨ **Polyester/polyurethane cylinder body**
- ⇨ **Special dual piston rod seal**
- ⇨ **All external fixnings in corrosin-resistant materials**
- ⇨ **Accessories are available in corrosion resistant steel as an option.**
- ⇨ **Use of the standard position sensors**

Special designs

The following special features are available on request:

- ⇨ **blow valve**
- ⇨ **Oil splash lubrication of the screw for high-duty applications**
- ⇨ **Customized mountings and rod ends**
- ⇨ **Mounting of customer motors**
- ⇨ **Preparation of the cylinder for use under aggressive environmental conditions**
- ⇨ **Overlong thrust rod**
- ⇨ **Polished thrust rod**
- ⇨ **Thrust rod hard-chrome plated**
- ⇨ **.....**

Technical Data

Cylinder size	Unit	ET_32		ETV32		ET_50			ET_80		
Type		**M05**	**M10**	**M05**	**M10**	**M05**	**M10**	**M16**	**M05**	**M10**	**M25**
Screw											
Screw pitch	mm	5	10	5	10	5	10	16	5	10	25
Screw diameter	mm	12		12		16			25		
Travels, speeds and accelerations [1]											
Available strokes	mm	continuous, from 50-750		continuous, from 50-750		continuous, from 50-1000			continuous, from 100-1500		
Max. permissible speeds at a stroke =											
50-300mm	mm/s	420	840	420	840	320	730	1170	270	540	1340
450mm	mm/s	420	840	420	840	320	730	1170	270	540	1340
600mm	mm/s	270	540	270	540	320	630	1000	270	540	1340
750mm	mm/s	190	380	190	380	230	450	720	270	540	1340
1000mm	mm/s	-	-	-	-	150	300	470	210	420	1040
1250mm	mm/s	-	-	-	-	-	-	-	150	290	720
1500mm	mm/s	-	-	-	-	-	-	-	110	210	530
Max. acceleration	m/s^2	3	6	3	6	3	6	10	3	6	10
Forces [2]											
Max. traction/thrust force	N	600		600		3300			8300		
Weight and mass moments of inertia											
Weight of base unit with zero stroke	kg	1.3		1.2		2.3			6.8		
Weight of additional length	kg/m	3		3		6			10		
Mass moment of inertia J_0 refers to the drive shaft without stroke for i=1, for i ≠ 1 applies: $J_{total}=[J_0(i=1)+J_H(i=1)] / i^2$											
Parallel drive	$kgmm^2$	4.2	4.4	3.8	4.1	55.4	57.6	60.5	128.9	135.3	142.8
Direct drive	$kgmm^2$	2.5	2.7	2.4	2.5	12.9	15.8	18.7	74.8	81.1	88.7
Mass moment of inertia J_H refers to the drive shaft per meter of additional length for i=1;											
Drive parallel/direct	$kgmm^2/m$	16.6	18.5	16.6	18.5	51.6	54.0	56.8	302.0	306.0	332.0

Precision and backlash		
Repeatability	mm	± 0.07
Backlash	mm	0.02 with inline drive/0.025 with parallel and reverse drive
Efficiency		
Direct drive	%	90
Parallel drive	%	81
ratios		
ratios		1:1 (inline or parallel drive); 1.5:1 (parallel drive-transmission to slow); 2:1 (parallel drive-transmission to slow); 1:1.5 (parallel drive – transmission to fast only with ET_032)

[1] Please contact us if you wish to work at higher speeds or at operation times >80%!

[2] Values refer to the maximum permissible cylinder load. Please do also respect the "life time curve"! With parallel drive, the maximum thrust/traction force is limited by the timing belt, see "transmissible torques at parallel drive"

ET_32, ETV32, ET_50, ET_80 available for servo motor or stepper motor mounting

Cylinder size	Unit	ETB100				ETV100		ETB125			
Type		**M05**	**M10**	**M20**	**M40**	**M05**	**M10**	**M05**	**M10**	**M20**	**M50**
Screw											
Screw pitch	mm	5	10	20	40	5	10	5	10	20	40
Screw diameter	mm	40				40		50			
Travels, speeds and accelerations [1]											
Available strokes	mm	continuous,from 100-1500						continuous,from 100-2400			
Max. permissible speed at stroke =											
50-300mm	mm/s	170	340	670	1340	170	340	140	270	540	1340
450mm	mm/s	170	340	670	1340	170	340	140	270	540	1340
600mm	mm/s	170	340	670	1340	170	340	140	270	540	1340
750mm	mm/s	170	340	670	1340	170	340	140	270	540	1340
1000mm	mm/s	170	340	670	1340	170	340	140	270	540	1340
1250mm	mm/s	170	340	670	1340	170	340	140	270	540	1340
1500mm	mm/s	160	310	610	1220	160	310	140	270	540	1340
1600mm	mm/s	-	-	-	-	-	-	140	270	540	1340
1800mm	mm/s	-	-	-	-	-	-	140	270	530	1330
2000mm	mm/s	-	-	-	-	-	-	120	230	450	1100
2200mm	mm/s	-	-	-	-	-	-	100	190	380	950
2400mm	mm/s	-	-	-	-	-	-	90	170	330	820
Max. acceleration	m/s^2	3	6	6	10	-	-	3	36	6	10
Forces [2]											
Max. traction/thrust force	N	21200				21200		44500			
Weight and mass moments of inertia											
Weight of base unit with zero stroke	kg	14.8				16.6		30			
Weight of additional length	kg/m	20				20		37			
Mass moment of inertia J_0 refers to the drive shaft without stroke for i=1, for i ≠ 1 applies: $J_{total}=[J_0(i=1)+J_H(i=1)] / i^2$											
Parallel drive	$kgmm^2$	708.3	749.2	818.3	918.9	866.9	947.9	3470.1	3484.7	3543.2	3952.7
Direct drive	$kgmm^2$	401.8	442.7	517.7	612.4	442.1	523.1	3364.4	3379.0	3437.5	3847.1
Mass moment of inertia J_H refers to the drive shaft per meter of additional length for i=1											
Drive parallel/direct	$kgmm^2/m$	1978.0	1986.0	2016.4	2138.0	1978.0	1986.0	4821.6	4836.4	4895.7	5312.0
Precision and backlash											
Repeatability	mm	± 0.07									
Backlash	mm	0.02 with inline drive/0.025 with parallel and reverse drive									
Efficiency											
Direct drive	%	90									
Parallel drive	%	81									
ratios											
ratios		1:1 (inline or parallel drive); 1.5:1 (parallel drive-transmission to slow); 2:1 (parallel drive-transmission to slow)									

[1] Please contact us if you wish to work at higher speeds or at operation times >80%!

[2] Values refer to the maximum permissible cylinder load. Please do also respect the "life time curve"! With parallel drive, the maximum thrust/traction force is limited by the timing belt, see "transmissible torques at parallel drive"

ET_100, ETV100, ET_125 available for operation with servo motor drive

Technical data with safety factor S=1 taken into consideration. Temperature range from 0°C to +60°C. Max. permissible air humidity: 90% - the dew point may not be reached at the cylinder! The technical data apply under normal conditions and only for the individual operating and load mode. In the case of compound loads, it is necessary to verify in accordance with normal physical laws and technical standards whether individual ratings should to be reduced. In case of doubt please contact Parker Hannifin.

Permissible side loads

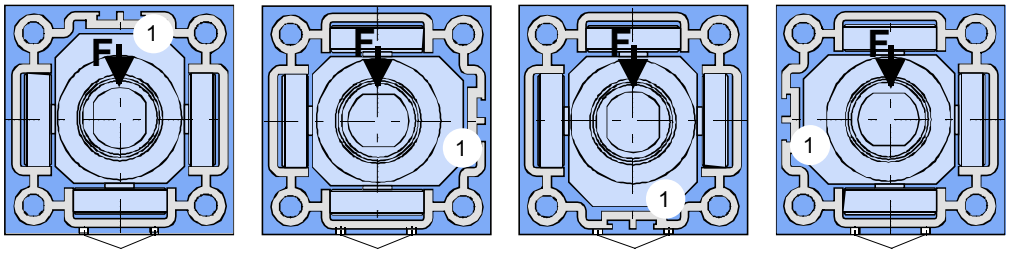
The electro thrust cylinder disposes of a generously dimensioned cylinder rod bearing together with 3 Nylatron NS wheels which prevent the rod rotation. Thanks to this system, the cylinder is able to accept a certain side load.
Please note that the load bearing capacity increases with a longer stroke, as the distance between the bearings becomes longer. In order to reach the required load values in a given application, it can be useful to select a cylinder with a longer stroke than necessary for the application.

Example: An ET_50 with 200mm stroke can bear a lateral force of 72N in fully extended state.
An ET_50 with 300mm stroke can however, if only 200mm are extended, accept a lateral force of 166N.
If your application requires an even higher load bearing capacity, you can fortify the cylinder with the **rod guiding system** (see page 20) available as an option (not for ETB125).

Lateral load – profile orientation

Profile orientations – view on the thrust rod

Standard	A	B	C
12 hrs	3 hrs	6 hrs	9 hrs



1: Sensor mounting grooves: on ET_32, 50 and 80 only on one side, on ET_100 and ETB125 on all sides.

2: Thread for foot mounting

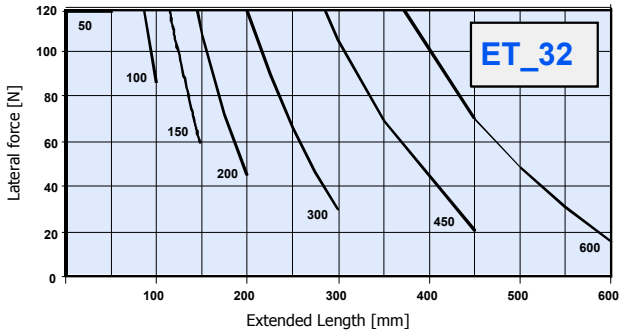
F: Lateral force

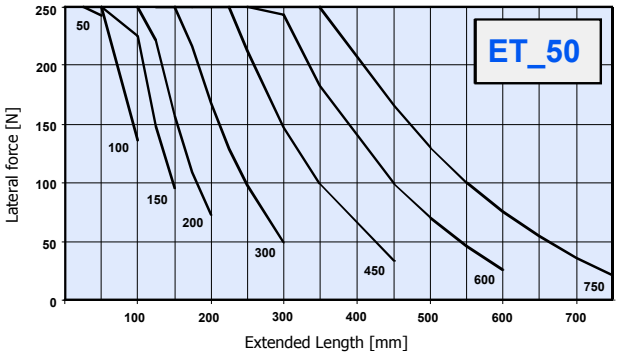
- with standard and B profile orientation the lateral force is accepted by two rollers, with A and C profile orientation, only by a single roller.
- If the lateral force F does not apply, as in the drawing, from above or below but from the right or the left, the opposite of the above description applies!

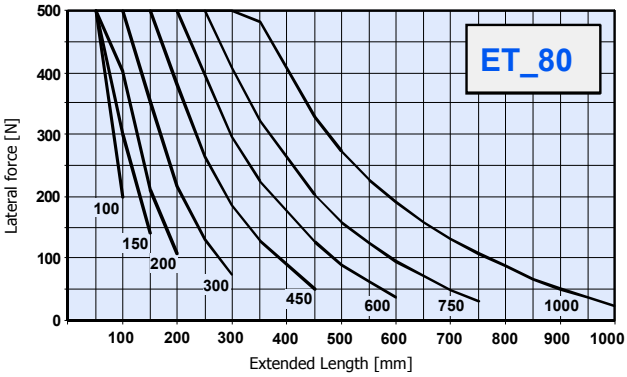
The profile orientation of ET_32, 50 and 80 does also determine the mounting position of the sensors and does therefore also influence the mounting position of the motor. At the same time, the profile orientation defines the position of the lubrication bore.

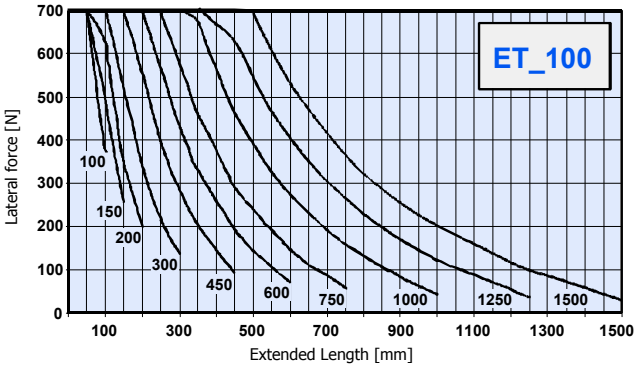
Lateral forces may reduce the lifetime of the cylinder. If you want to exploit the maximum possible lateral force at 100%, you will have to reduce the duty cycle to 40% or you can only exploit 40% of the max. possible lateral force if you want to operate at a 100% duty cycle.

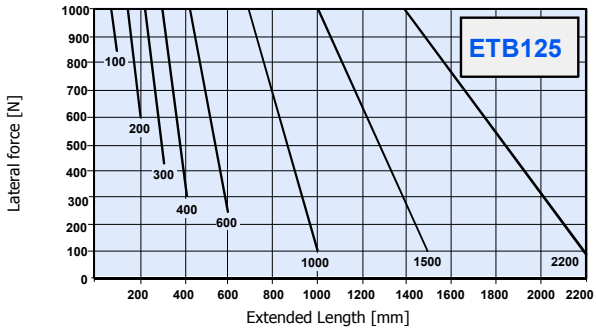
The curves given here are only valid for a profile orientation of 12 hrs (standard) and 6 hrs (B), if the lateral force applies from above or from below. With profile orientation 3 hrs and 9 hrs (A and C), the permissible lateral load is halved!











Thrust force factor and breakaway torque

The following table shows the resulting thrust or traction per 1Nm of torque at the screw, taking the efficiency, belt transmission ratio and screw pitch into consideration. The table can be used for a rough calculation of the drive dimensioning. For precise drive dimensioning, the mass moment of inertia of the screw must be taken into consideration! Please do also account for *transmittable torques in parallel drives* ***(see page 11) and other limit values***

The "L" or "P" stands for the motor mounting L = direct (in-line), P = all parallel or reverse motor positions;"**A**" stands for a ratio of i = 1:1, "**B**" for i =1.5:1, "**D**" for i = 2:1, **Z**" for i = 1:1.5.

Example: ET_32 (size) M04 (screw pitch) L (motor mounting) A (ratio)

	Thrust force factor [N/Nm]	Breakaway torque for the drive [Nm]
ET_32		
ET_32-M05LA	1130	0.2
ET_32-M05PA	1015	0.2
ET_32-M05PZ	675	0.4
ET_32-M10LA	565	0.3
ET_32-M10PA	510	0.3
ET_32-M10PZ	335	0.4
ET_50		
ET_50-M05LA	1130	0.4
ET_50-M05PA	1015	0.4
ET_50-M05PB	1525	0.3
ET_50-M05PD	2035	0.2
ET_50-M10LA	565	0.5
ET_50-M10PA	510	0.6
ET_50-M10PB	765	0.4
ET_50-M10PD	1015	0.3
ET_50-M16LA	353	0.5
ET_50-M16PA	317	0.6
ET_50-M16PB	476	0.4
ET_50-M16PD	635	0.3
ET_80		
ET_80-M05LA	1130	0.5
ET_80-M05PA	1015	0.6
ET_80-M05PB	1525	0.4
ET_80-M05PD	2035	0.3
ET_80-M10LA	565	0.6
ET_80-M10PA	510	0.7
ET_80-M10PB	765	0.4
ET_80-M10PD	1015	0.3
ET_80-M25LA	225	0.9
ET_80-M25PA	205	1.0
ET_80-M25PB	305	0.7
ET_80-M25PD	405	0.5
ET_100		
ET_100-M05LA	1130	0.5
ET_100-M05PA	1015	0.6
ET_100-M10LA	565	0.6
ET_100-M10PA	510	0.7
ETB100-M20LA	283	0.7
ETB100-M20PA	255	0.8
ETB100-M40LA	140	0.9
ETB100-M40PA	125	1.0
ETB125		
ETB125-M05LA	1130	2.6
ETB125-M05PA	1107	2.9
ETB125-M10LA	565	3.0
ETB125-M10PA	508	3.3
ETB125-M20LA	283	3.4
ETB125-M20PA	255	3.8
ETB125-M50LA	113	3.8
ETB125-M50PA	102	4.2

Transmissible torques in parallel drive mounting

The table shows the torques that can be transmitted by the timing belt.
Please respect in addition the maximum permissible traction/thrust force:
ET_32, 50, 80 (see page 6), **ET_100, ETB125** (see page 7).
For the conversion, you can use the **thrust force factor table** (see page 10).

The "L" or "P" stands for the motor mounting L = direct (in-line), P = all parallel or reverse motor positions;"**A**" stands for a ratio of i = 1:1, "**B**" for i =1.5:1, "**D**" for i = 2:1, **Z**" for i = 1:1.5.

		Motor / gear type																		transmissible motor torque [Nm]							
		Stepper motor Motor code			Servo motor Motor code									Gear code						Speed at the drive shaft [rpm]							
		20	30	40	37	47	57	67	77	87	J4	J5	J6	J7	P3	P4	P5	P7	N6	N8	100	500	1000	1500	2000	2500	3000	3300
ET_32	PA	X				X															1.68	1.35	1.09	0.92	0.84	0.75	0.68	0.65
	PZ	X				X															1.22	0.99	0.82	0.72	0.63	0.57	0.53	0.50
ET_50	PA	X			X																2.80	2.19	1.73	1.42	1.27	1.12	1.01	0.99
	PB	X																			1.93	1.55	1.25	1.04	0.94	0.84	0.76	0.73
	PD	X																			1.43	1.16	0.94	0.80	0.73	0.66	0.60	0.57
	PA		X				X	X											x		3.64	2.93	2.39	2.10	1.85	1.67	1.53	1.38
	PB		X																		2.40	1.96	1.62	1.44	1.28	1.17	1.08	0.99
ET_80	PA		X																		7.07	5.55	4.39	3.77	3.22	2.84	2.52	2.20
	PB		X																		5.08	4.04	3.25	2.83	2.46	2.21	2.00	1.78
	PD		X																		3.64	2.93	2.39	2.10	1.85	1.67	1.53	1.38
	PA			X	X			X	X		X				x				x	x	13.4	10.6	8.43	7.16	6.11	5.40	4.79	4.18
	PB			X	X			X	X						x				x		9.66	7.69	6.18	5.38	4.68	4.19	3.79	3.38
	PD				X			X											x		6.91	5.57	4.54	4.01	3.51	3.18	2.91	2.65
ET_100	PA								X	X		X	X			x	x			x	61.2	37.1	32.6	30.4	28.5	27.6	25.9	24.8
ETB125	PA									X			X	X			x	x			91.0	81.0	77.0	72.0	71.0	--	--	--

Motor / gear codes: **Order code** (see page 26)

Nominal lifetime

Nominal lifetime of ballscrew and rear screw bearing

The lifetime depends strongly on the degree of power exploitation and on impermissible operating states occurring – even if only for a short time -. The lifetime of the stripper depends strongly on the frequency and speed of motion, especially in connection with lateral forces (danger of heating) as well as the amount of contamination.

Prerequisite:

- ⇨ **Bearing and screw temperature between 20°C and 40°C**
- ⇨ **no affectation of the lubricant, for example by external particles**
- ⇨ **lubrication conform to the specifications**
- ⇨ **the given values for thrust force, speed and acceleration must be adhered to at any rate.**
- ⇨ **no contact to mechanical end stops (external or internal) and no other abrupt loads**
- ⇨ **no lateral forces are being applied to the cylinder rod**
- ⇨ **no short stroke (stroke smaller than 2.5 x screw pitch)**
- ⇨ **no vibration at standstill or at very low speed**
- ⇨ **no high exploitation of several power features at a time (for example maximum speed or thrust force)**

only under these circumstances, the service life corresponds to the nominal lifetime

Determination of the medium dynamic axial load:

If the load on the ballscrew is varying, the lifetime must be determined with the aid of the medium dynamic axial load. The medium dynamic axial load is determined as follows in the event of cascaded load changes:

$$F_m = \sqrt[3]{\frac{1}{L} * \left(Fa_1^{\,3} * s_1 + Fa_2^{\,3} * s_2 + \ldots + Fa_n^{\,3} * s_n\right)}$$

F_m = medium dynamic axial load [N]
F_{an} * = varying load [N]
s_n * = travel under a defined load F_n [mm]
L * = total travel [mm]

**** Forces and travels must be entered as absolute values.***

If you need the lifetime as the number of possible cycles, just divide the lifetime in kilometers by twice the stroke traveled.

The application factor fw

The application factor has a strong influence on the lifetime of a screw.
The application factor can be roughtly determined with the aid of the following table:

Load from vibration, shock, temperature, dirt	Screw speed	fw
light	n < 500 rpm	1.0 - 1.5
Medium	500 < n < 2000 rpm	1.5 - 2.0
high	2000 < n < 3300 rpm	2.0 - 3.5

Lifetime calculation:

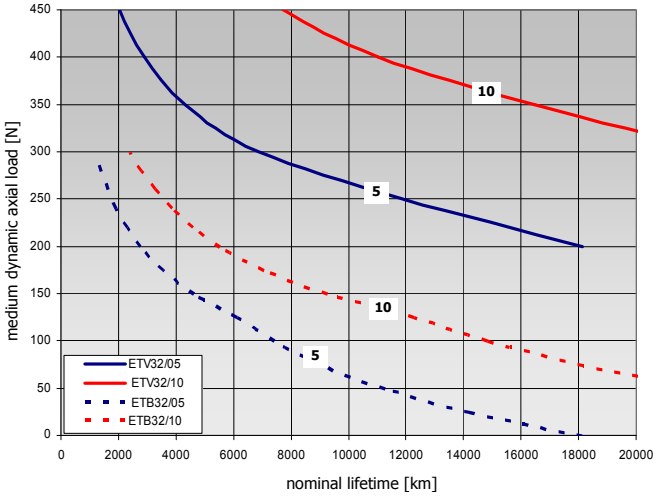
$$Ln\,(fw) = \frac{Ln(fw=1.0)}{fw^3}$$

Ln: Nominal lifetime
Ln(fw=1.0): see lifetime diagrams
fw: application factor

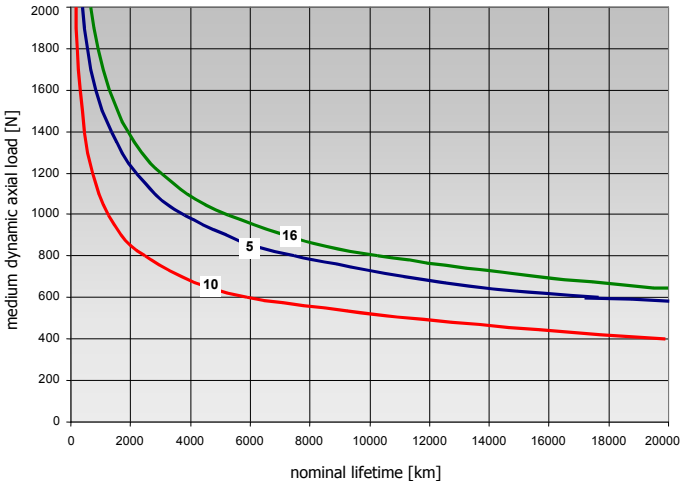
Lifetime diagrams

The screw lifetime is calculated with the factor fw=1.0.

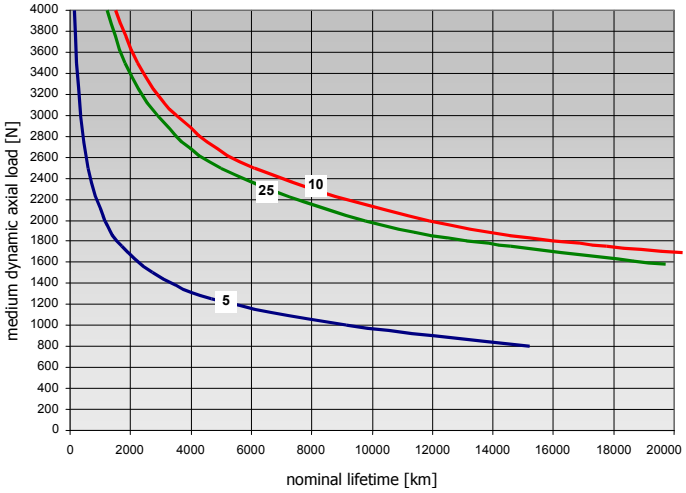
Lifetime of an ET_32 screw and fixed bearing



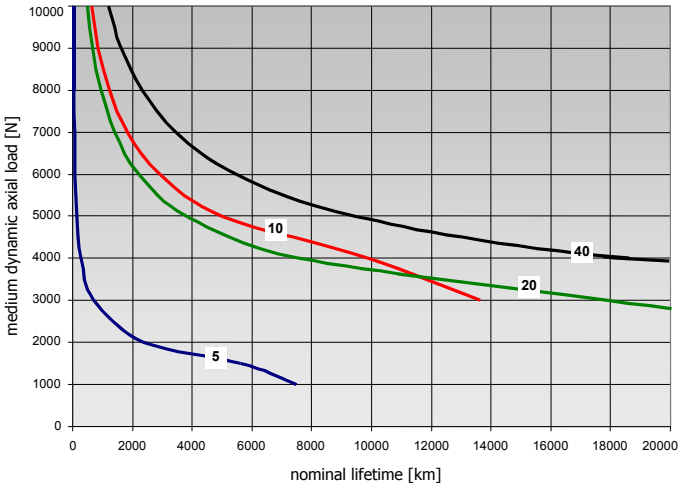
Lifetime of an ET_50 screw and fixed bearing



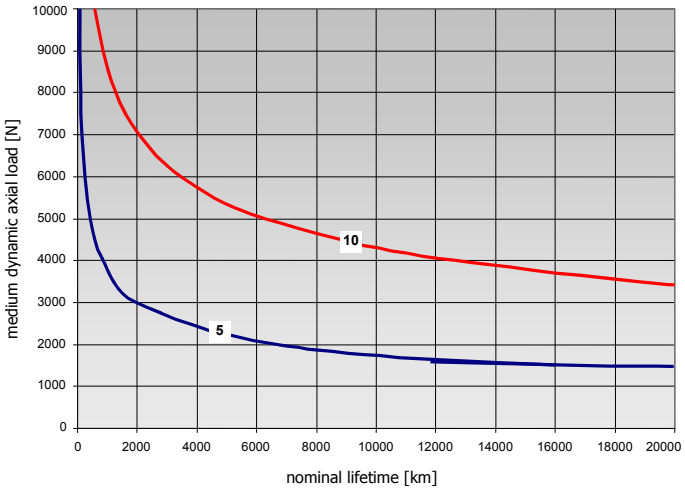
Lifetime of an ET_80 Screw and fixed bearing



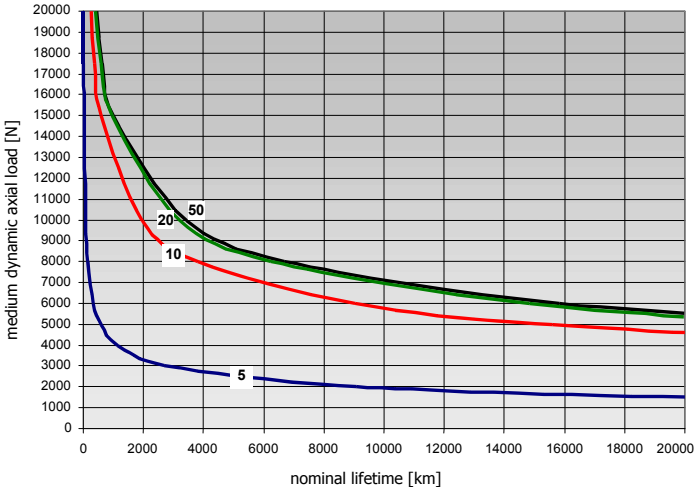
Lifetime of an ETB100 Screw and fixed bearing



Lifetime of an ETV100 Screw and fixed bearing



Lifetime of an ETB125 Screw and fixed bearing

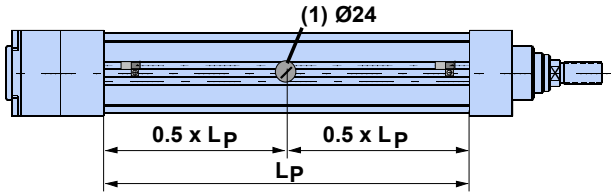


Designation: 5 = 5mm, 10 = 10mm screw pitch etc.

Relubrication

Lubrication interval for the ballscrew drive

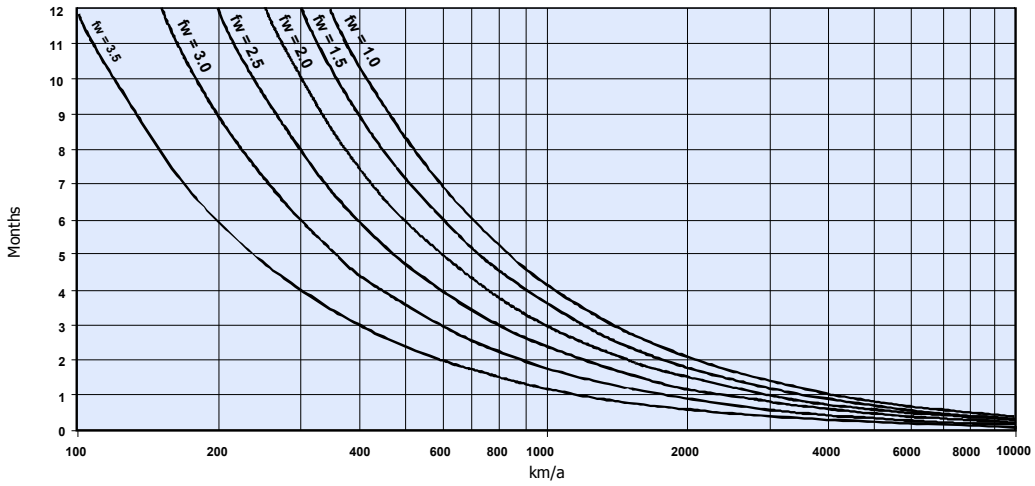
All sizes have a lubrication bore in the cylinder body (in the middle of the aluminium profile), which permits to lubricte the screw nut.
On the ET_32, 50 and 80 cylinders, this bore can be found at the same side as the sensor mounting grooves. Free access to this bore – even after integration of the cylinder into a system – can be ensured by choosing the corresponding **profile orientation** (see page 8).
The necessary lubrication intervals depend on the application.



(1): Lubrication bore
LP: Length of profile

Greatest interval with an application factor of fw = 1.0:

⇨ **12 months or 350km, depending on which value is first reached.**



Lubrication intervals for the screw bearing

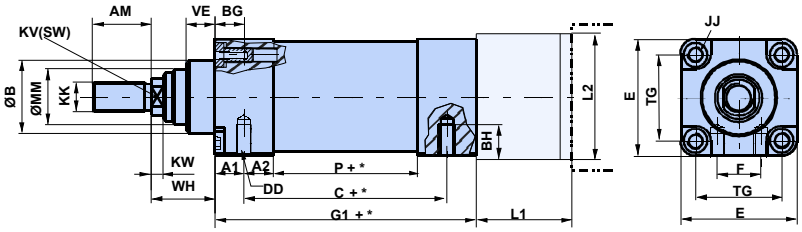
The lubrication interval ist half the grease service life:

ETV100 - M05 (increased service life)	Lubrication after approx. 4000km
ETV100 – M10 (increased service life)	Lubrication after approx. 7000km
ETB125 - M05	Lubrication after approx. 2000km
ETB125 - M10	Lubrication after approx. 3000km
ETB125 - M20	Lubrication after approx. 6000km
ETB125 - M50	-no lubrication necessary up to 20000km

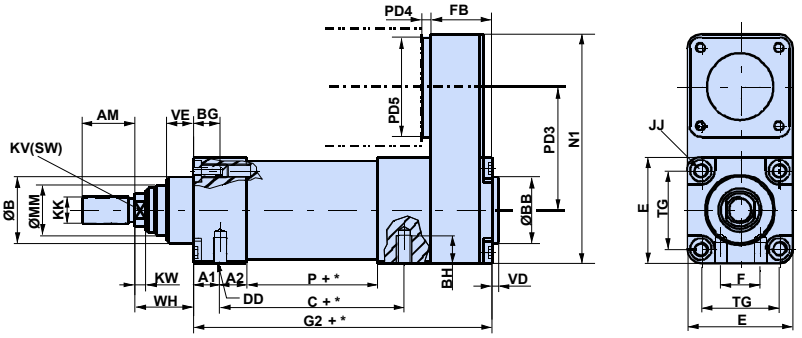
ET_32 to ETB100 are not lubricated at the **screw support bearing**.

Dimensions

Electro thrust cylinder – in-line motor mounting



Electro thrust cylinder – parallel motor mounting



Stated in mm

ET (inline/parallel)

	A1	A2	AM	BG	BH	DD	E	F	JJ**	KK	KV	ØMM	TG	KW	N1	FB	VD	ØBB
ET_32	14	14	22	14,5	9	M6x1.0 (1)	46.5	16	M6x1.0	M10x1.25	10	18	32.5	5	106.4	37	4	30
ET_50	16	16	32	16	12.7	M8x1.25	63,5	24	M8x1.25	M16x1.5	17	25	46.5	6.5	139.4	39	4	40
ET_80	21	21	40	16	17.5	M10x1.5	95.3	30	M10x1.5	M20x1.5	22	35	72	10	191.3	57	5	45
ET_100	27.5	27.5	54	16	24	M12x1.75	114	50	M10x1.5	M27x2.0	27	50	89	13	254	79	4	55
ETB125	42.4	33	72	16	24	M16x2.0	139.7	64	M12x1.75	M36x2.0	41	70	110	13	334.5	127.1	7	60

** Thread "JJ" is not available in IP65 version for ET_32 and ET_50!

(1) If you wish to mount a component at the front screws (with thread II = M6x1), please provide for through holes with a diameter of at least 7mm at this component, even though this is not the common norm.

	Standard cylinder			IP65 rating		
	VE	WH	ØB	VE	WH	ØB
ET_32	13	26	30	40	50	46
ET_50	16	37	40	43	64	62
ET_80	20	46	50	55	81	68
ET_100	20	51	65	60	91	89
ETB125	20	68	90	On request		

Stroke dependent dimensions

		Standard cylinder				IP65 rating			
		C+*	G1+*	G2+*	P+*	C+*	G1+*	G2+*	P+*
ET_32	**M05**	112.5	140.5	176.7	84.5	115.7	143.7	179.9	84.5
	M10	112.5	140.5	176.7	84.5	115.7	143.7	179.9	84.5
ETV32	**M05**	100.0	138.0	163.2	66.5	103.2	141.2	166.4	66.5
	M10	102.8	140.8	166.0	69.3	106.0	144.0	169.2	69.3
ET_50	**M05**	128.4	160.4	199.5	96.4	131.6	163.6	202.7	96.4
	M10	131.4	163.4	202.5	99.4	134.6	166.6	205.7	99.4
	M16	135.4	167.4	206.5	103.4	138.6	170.6	209.7	103.4
ET_80	**M05**	129.5	173.0	228.3	86	132.7	176.2	231.5	86
	M10	148.1	191.6	246.9	104.6	151.3	194.8	250.1	104.6
	M25	154.9	198.4	253.7	111.4	158.1	201.6	256.9	111.4
ETB100	**M05**	201.5	259.7	335.5	132.1	204.7	262.9	338.7	132.1
	M10	221.3	279.5	355.3	151.9	224.5	282.7	358.5	151.9
	M20	239.3	297.5	373.3	169.9	242.5	300.7	376.5	169.9
	M40	249.4	307.6	383.4	179.9	252.6	310.8	386.6	179.9
ETV100	**M05**	222.3	290.2	366	143.1	225.5	293.4	369.2	143.1
	M10	263.1	331	406.8	183.9	266.3	334.2	410.0	183.9
ET125	**M05**	207.0	283.9	411.0	140.0	On request			
	M10	237.0	313.9	441.0	170.0				
	M20	237.0	313.9	441.0	170.0				
	M50	260.0	336.9	464.0	193.0				

+* =Measure + length of desired stroke **Definition of stroke** (see page 16)

Further information:

www.parker-eme.com/et

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