12. GENERAL FEATURES

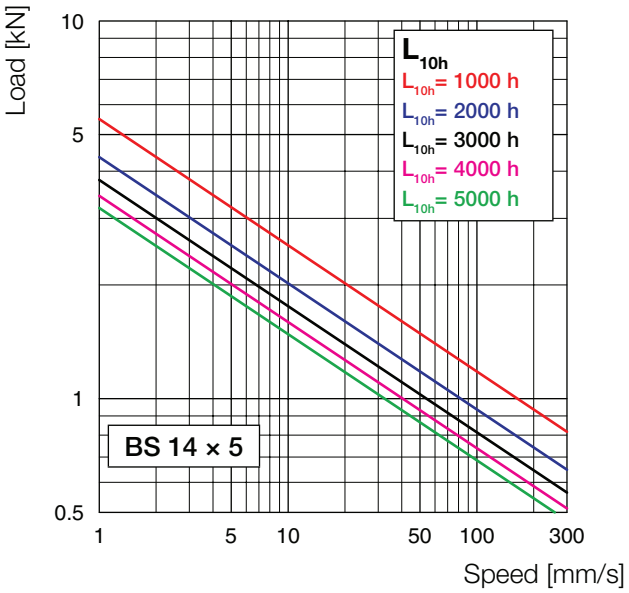
12.1 Ball screws

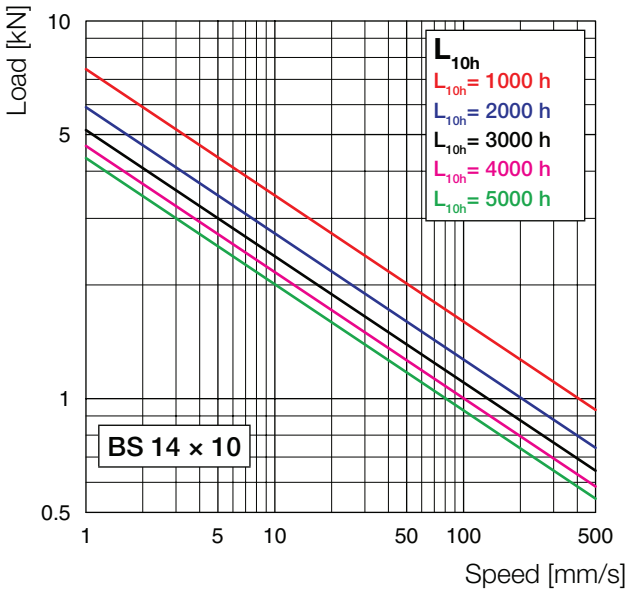
Rolled ball screw, tolerance class IT7.
Screws material: steel 42 CrMo 4 (UNI EN 10083-1) induction hardening treatment for surface hardness 58÷61 HRc
Nuts material: steel 18 NiCrMo 5 (UNI EN 10084) hardened and ground, surface hardness 58÷61 HRc, with balls surface microfinishing.
Standard axial backlash between screw and nut lower than 0.1 mm.
Executions with zero backlash or preloaded available on request.
Rolled ball screws and ball nuts are completely made in Italy, in-house manufactured by Servomech SpA S.U, Bologna.

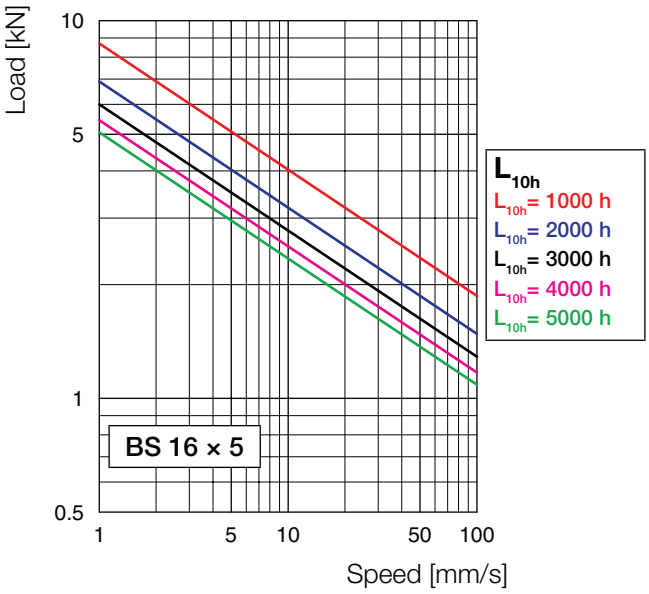
Actuator	Ball screw	Ball diameter [mm]	Nr of ball circuits	Dynamic load C_a [N]	Static load C_{0a} [N]
BSA 08	BS 14 × 5	3.175	2	4 900	6 200
BSA 10	BS 14 × 5	3.175	2	4 900	6 200
BSA 11	BS 14 × 10	3.175	2	5 300	6 900
CLB 25	BS 14 × 5	3.175	2	4 900	6 200
	BS 14 × 10	3.175	2	5 300	6 900
CLB 27	BS 16 × 5	3.175	3	7 800	11 400
BSA 12	BS 20 × 5	3.175	3	9 100	15 400
UBA 0	BS 14 × 5	3.175	2	4 900	6 200
	BS 14 × 10	3.175	2	5 300	6 900

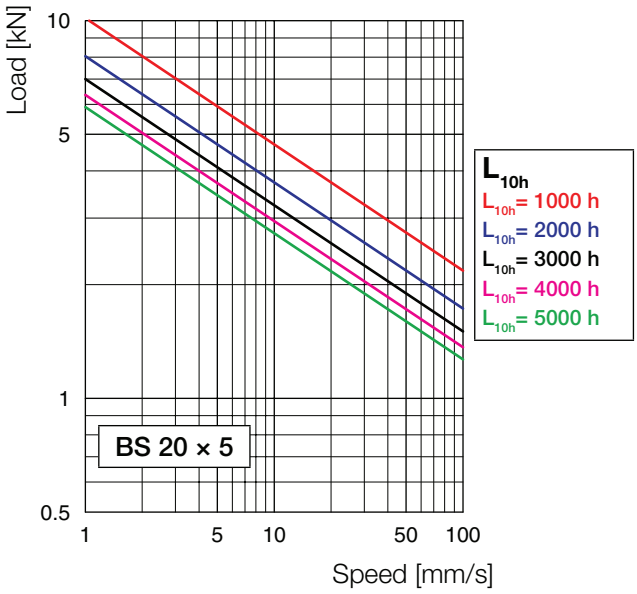
Static and dynamic load according to norm ISO 3408 and DIN 69051

Ball screws LOAD - LIFETIME diagram









12.2 Static and Dynamic Self-locking Conditions

A linear actuator is in self-locking condition when:

- A push or pull load applied on a not running linear actuator does not start the linear movement (**statically self-locking**).
- Switching off the motor power supply of a running linear actuator, with push or pull load, the movement stops (**dynamically self-locking**).

Self-locking conditions are described in the following situations:

1. **Totally static self-locking**
   Not running actuator, no load vibration.
   A push or pull load (up to the maximum permissible) applied on the actuator does not start the linear movement: 1-start acme screw linear actuators.
2. **Partially static self-locking**
   Not running actuator, no load vibration.
   - a push or pull load (up to 70% of the maximum permissible) applied on the actuator does not start the linear movement: 2-starts acme screw linear actuators, ratios RL and RN.
   - a push or pull load (up to 50% of the maximum permissible) applied on the actuator does not start the linear movement: 2-starts acme screw linear actuators, ratios RV and RH.
   - a push or pull load (up to 30% of the maximum permissible) applied on the actuator does not start the linear movement: 3-starts acme screw linear actuators.

NOTE: for loads higher than the stated ones we suggest to use a brakemotor.

3. **Static back-driving**
   Ball screw actuators are basically static back-driving even with applied load values lower than 20% of the maximum value allowed.
   Therefore, we recommend to use a brakemotor.

For all uncertain self-locking conditions, both static and dynamic, please contact our Technical Dpt.

Stopping accuracy

Switching off the motor power supply, the actuator stopping depends on the following factors:

- actuator efficiency and linear speed;
- motor inertia;
- load inertia.

It is important to evaluate the correlation of all these factors to verify the need of a electric braking and, therefore, a load deceleration ramp and/or a brakemotor.

Generally, acme screw linear actuators working at a linear speed up to 15÷20 mm/s do not require auxiliary braking devices. Under high loads in the moving direction or when stopping accuracy and repeatability are required, brakemotor is recommended.

The brake is not available on actuators that fit small DC motors without interchangeable brushes (see page 69). In such cases the stopping accuracy and the static back driving should be improved by our electronic dynamic braking device (see page 77).

For any doubts concerning your application, we recommend you to contact our Technical Dpt. for further proper evaluations.

12.3 DC MOTORS

Motors with interchangeable brushes (actuators ATL 10, UAL 0, BSA 10, BSA 11, UBA 0, CLB 25, CLB 27)

Permanent magnet DC motors, without fan, available with or without brake.
Long-life brushes, easy to replace.

Bipolar power supply cable 2 x 1 mm2, 1.5 m length. Motor weight: 1.3 kg.

Output power	70 W	
Rated current	3.7 A (24 V)	8.4 A (12 V)
Peak current	18 A (24 V)	30 A (12 V)
Resistance	0.85 Ohm (24 V)	0.23 Ohm (12 V)
Protection class	IP 54	

Rated speed	3000 rpm	
Rated torque	0.22 Nm	
Peak torque	1.1 Nm	
Inductance	1.34 mH (24 V)	0.36 mH (12 V)
Insulation class	F	

MOTOR BRAKE: Normally closed holding brake activated by DC electromagnet available on request.

Brake separately wired with bipolar cable 2 x 1 mm2, 1 m length.

Motor with brake total weight: 1.8 kg.

Power supply: 0.4 A a 24 V; 0.85 A a 12 V	Braking torque: 0.5 Nm

WARNING! The motor brake is normally closed; to open it, a constant rated voltage power supply is required. With lower voltage, the brake does not open.

Motors with non-interchangeable brushes (linear actuators LMR, ATL, CLA, LMP, LMI Series)

Permanent magnet DC motors, without fan.

The brake is not available; the brushes are not interchangeable.

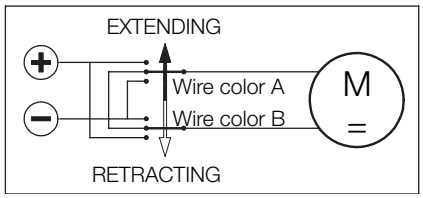
Standard motors winding has insulation class B.

These motors have open enclosures: the actuator is fitted with proper motor outer protections which allow to reach motor Protection Class IP 65.

The performance diagrams concerning actuators with DC motor stated in this catalogue, show the input power variation depending on the load variation.

This allows to select power supply / drivers properly.

Motor wires connection – Actuator push rod travelling direction



Actuator with DC motor, RIGHT-HAND mounting	LMR 01	LMR 03	ATL 02	ATL 05	ATL 08	ATL 12	CLA 20	CLA 25
Wire color A	red	red	brown	brown	brown	red	brown	brown
Wire color B	black	black	blue	blue	blue	blue	blue	blue

Actuator with DC motor, LEFT-HAND mounting	LMR 01	LMR 03	ATL 02	ATL 05	ATL 08	ATL 12	CLA 20	CLA 25
Wire color A	red	red	blue	blue	blue	blue	blue	blue
Wire color B	black	brown	brown	brown	brown	red	brown	brown

12.4 AC MOTOR

Actuator	Motor	Power kW	N° of poles	Input voltage Vca	Frequency Hz	Rated current A	Capacitor uF
ATL 02	AC 3-phase	0.06	2	230/400	50	0,7-0,4	-
	AC 1-phase	0.06		230		0.68	5
ATL 10	AC 3-phase	0.12	2	230/400	50	0,81-0,46	-
		0.09	4			0,8-0,45	-
	AC 1-phase	0.12	2	230		2.6	12.5
		0.09	4			1.6	12.5
ATL 12	AC 3-phase	0.25	2	230/400	50	1,3-0,75	-
		0.18	4			1,1-0,66	-
	AC 1-phase	0.25	2	230		2.1	20
		0.18	4			1.9	16
CLA 20	AC 3-phase	0.06	2	230/400	50	0,7-0,4	-
	AC 1-phase	0.06		230		0.68	5
CLA 25 CLA 25S CLA 25M	AC 3-phase	0.12	2	230/400	50	0,81-0,46	-
		0.09	4			0,8-0,45	-
	AC 1-phase	0.12	2	230		2.6	12.5
		0.09	4			1.6	12.5
CLA 28 CLA 28 T	AC 3-phase	0.06	2	230/400	50	0,7-0,4	-
	AC 1-phase	0.06		230		0.68	5
BSA 10 BSA 11	AC 3-phase	0.12	2	230/400	50	0,81-0,46	-
		0.09	4			0,8-0,45	-
	AC 1-phase	0.12	2	230		2.6	12.5
		0.09	4			1.6	12.5
BSA 12	AC 3-phase	0.25	2	230/400	50	1,3-0,75	-
		0.18	4			1,17-0,66	-
	AC 1-phase	0.25	2	230		2.1	20
		0.18	4			1.9	16
CLB 25 CLB 27	AC 3-phase	0.12	2	230/400	50	0,81-0,46	-
		0.09	4			0,8-0,45	-
	AC 1-phase	0.12	2	230		2.6	12.5
		0.09	4			1.6	12.5

12.4 AC MOTOR

Insulation class (1)	Motor protection class (1)	Fan	Brake	Brake coil power supply (2) (3)	Brake rated current A	Braking torque Nm	Brake protection class
F	IP 55	Not avaible	Not avaible	-	-	-	-
F	IP 55	Standard	On request	DC powered by rectifier	0.05	1.7	IP 44
F	IP 55	Standard	On request	DC powered by rectifier	0.09	4	IP 44
F	IP 55	Not avaible	Not avaible	-	-	-	-
F	IP 55	Standard	On request	DC powered by rectifier	0.05	1.7	IP 44
F	IP 55	Standard	Not avaible	-	-	-	-
F	IP 55	Standard	On request	DC powered by rectifier	0.05	1.7	IP 44
F	IP 55	Standard	On request	DC powered by rectifier	0.09	4	IP 44
F	IP 55	Standard	On request	DC powered by rectifier	0.05	1.7	IP 44

(1) Higher insulation and protection classes available on request.

(2) Normally closed activated by DC electromagnet.
The electromagnet is powered by a 1-phase rectifier fitted in the terminal box.

(3) Motors with separately powered brake available on request.
This solution shall be used for applications with frequency inverter.