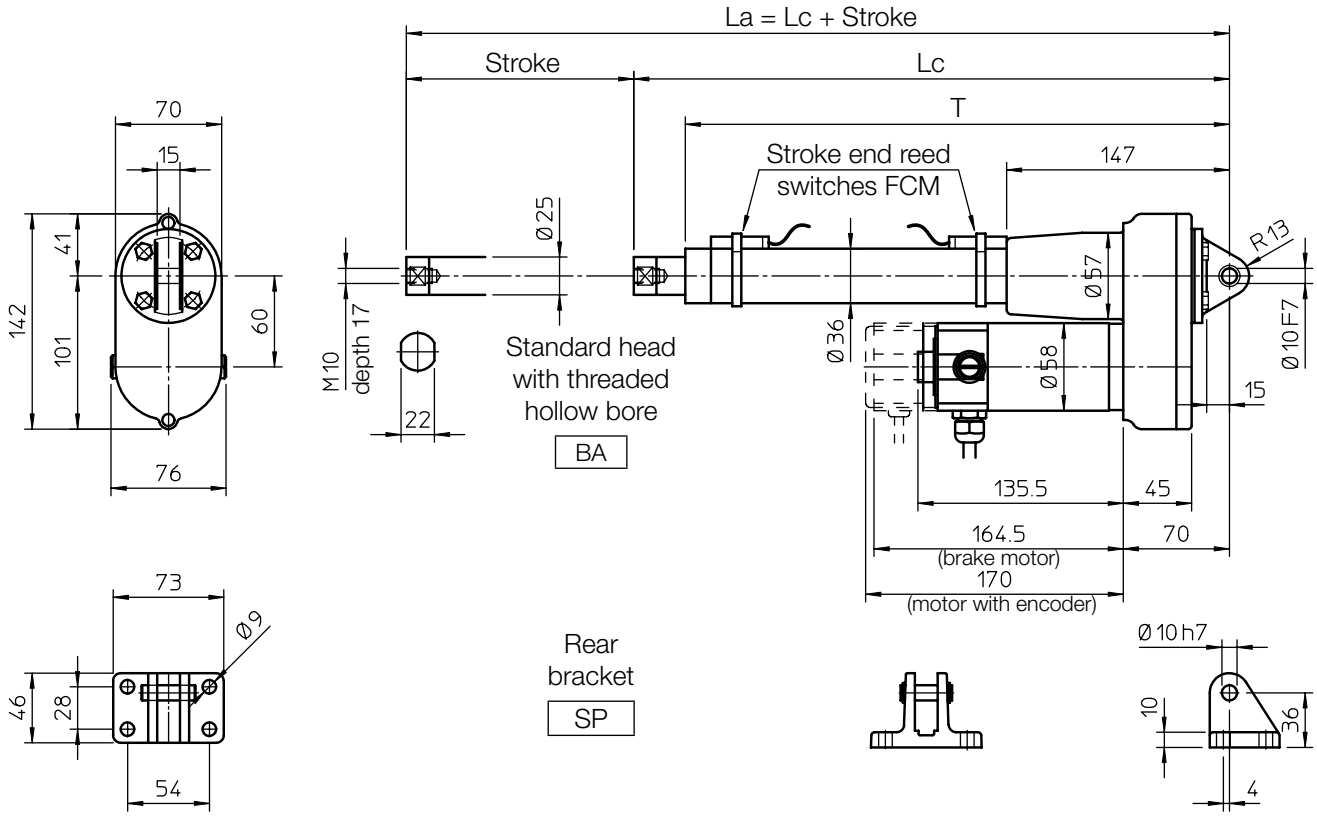
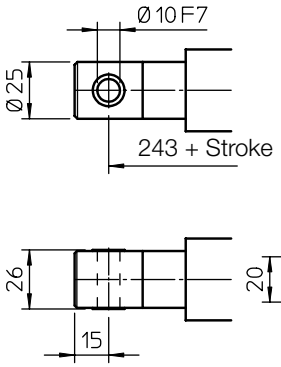
OVERALL DIMENSIONS



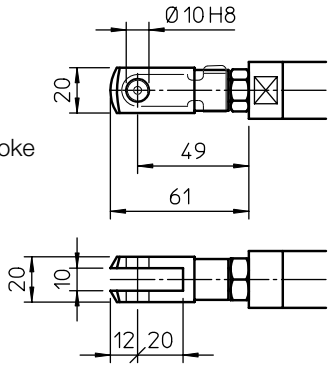
STROKE CODE	STROKE [mm]	LENGTH		T [mm]	MASS standard motor [kg]	MASS brake motor [kg]
		Lc [mm]	La [mm]			
C100	100	343	443	309	3.5	4.0
C200	200	443	643	409	3.8	4.3
C300	300	543	843	509	4.1	4.6
C400	400	643	1043	609	4.4	4.9
C500	500	743	1243	709	4.7	5.2

FRONT ATTACHMENT

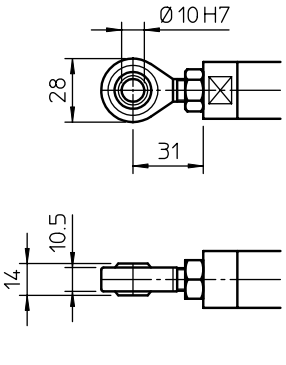
ROD END
ROE



CLEVIS END
FO



BALL JOINT
TS



PERFORMANCES AND FEATURES

- Pull-Push load up to 400 N
- Linear speed up to 600 mm/s
- Standard stroke lengths: 100, 200, 300, 400, 500 mm (for different / longer stroke lengths please contact us)
- Aluminium alloy housing and rear attachment with bronze bush
- Anodized aluminium outer tube
- Chrome-plated push rod – tolerance f7
- Standard head BA or rod end ROE in stainless steel AISI 303 with bronze bush
- 12 or 24 V DC motor (motor features details on page 69)
- Duty cycle with max load: 30% over 10 min at (-10 ... +40) °C
- Standard protection IP 54
- Long-life lubrication, maintenance free

ACCESSORIES

- Different front attachments
- Stainless steel push rod (code SS)
- Rear bracket (code SP)
- Brake motor
- Two adjustable stroke end reed switches (code FCM)
- Extra switch for intermediate position
- Bi-directional incremental encoder, 100 ppr with zero set pulse, Push-Pull, 8÷24 Vcc (code EH38) (encoder features details on page 75)

OPTIONS

- Fixing attachment turned at 90° (code RPT 90)

PERFORMANCES with 24 V DC motor

(Performances with 12 V DC motor: same load, linear speed 10 % less, electrical consumption 2 times more)

1-start acme screw Tr 14×4			
RATIO	**LOAD** [N]	**SPEED** [mm/s]	**CURRENT** [A]
RV1	210	200	4
RN1	390	100	4

2-starts acme screw Tr 14×8 (P4)			
RATIO	**LOAD** [N]	**SPEED** [mm/s]	**CURRENT** [A]
RV2	120	400	4
RN2	230	200	4

3-starts acme screw Tr 14×12 (P4)			
RATIO	**LOAD** [N]	**SPEED** [mm/s]	**CURRENT** [A]
RV3	90	600	4
RN3	170	300	4

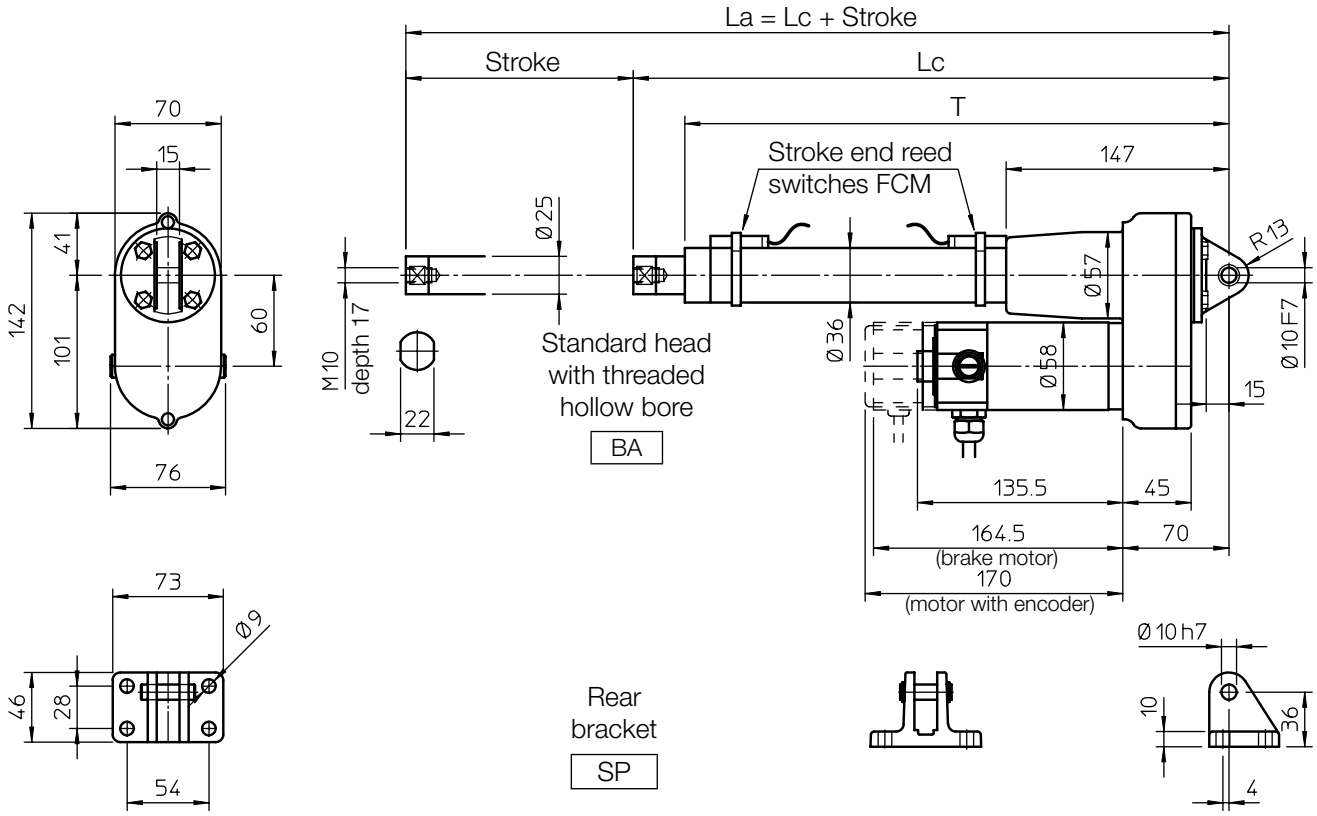
Self-locking conditions

Information about statically self-locking conditions with pull or push load on page 68.

ORDERING CODE EXAMPLE

UAL 0	RL1	C200	CC 24 V	FCM					
Actuator	Selected ratio	Required stroke	Motor	Stroke end switches	Accessories			Options	

OVERALL DIMENSIONS

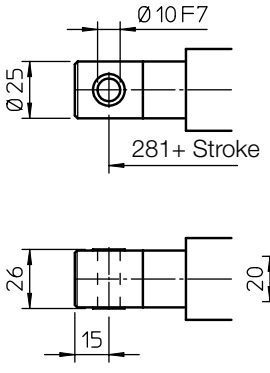


Length [mm]	Actuator
Lc	281 + Stroke
T	249 + Stroke

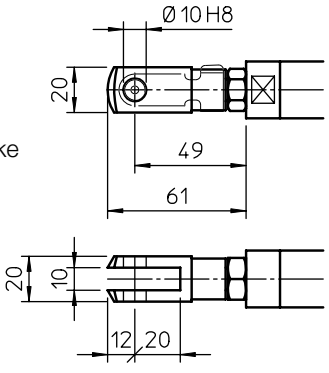
STROKE [mm]	**LENGTH**		**T** [mm]	**MASS** [Kg]	
	Lc [mm]	**La** [mm]		standard motor	brake motor
100	381	481	349	3.7	4.2
200	481	681	449	4.0	4.5
300	581	881	549	4.3	4.8
400	681	1081	649	4.7	5.2
500	781	1281	749	5.0	5.5

FRONT ATTACHMENT

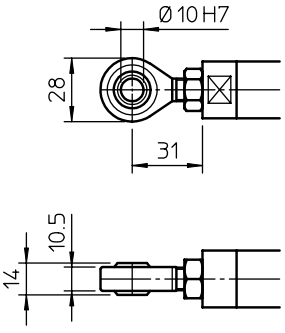
ROD END
ROE



CLEVIS END
FO



BALL JOINT
TS



PERFORMANCES AND FEATURES

- Push-Pull load up to 420 N
- Linear speed up to 500 mm/s
- Standard stroke lengths:
  100, 200, 300, 400, 500 mm
  (for different / longer stroke lengths please contact us)
- Ball screw BS 14 x 5 or BS 14 x 10
  (technical details on page 66)
- Aluminium alloy housing and rear attachment with bronze bush
- Anodized aluminium outer tube
- Chrome-plated steel push rod – tolerance f7
- Standard head BA or rod end ROE in stainless steel AISI 303 with bronze bush
- 12 or 24 V DC motor
  (motor features details on page 69)
- Duty cycle with max load:
  100% over 10 min at (-10 ... +40) °C
- Standard protection IP 54
- Long-life lubrication, maintenance free

ACCESSORIES

- Different front attachments
- Stainless steel push rod (code SS)
- Rear bracket (code SP)
- Two adjustable stroke end reed switches (code FCM)
- Extra switch for intermediate position
- Bi-directional incremental encoder, 100 ppr with zero set pulse, Push-Pull, 8÷24 Vcc (code EH38)
  (encoder features details on page 75)

OPTIONS

- Fixing attachment turned at 90° (code RPT 90)

PERFORMANCES with 24 V DC motor

(Performances with 12 V DC motor: same load, linear speed 10 % less, electrical consumption 2 times more)

Ball screw BS 14 x 5			
RATIO	**LOAD** [N]	**SPEED** [mm/s]	**CURRENT** [A]
RV1	210	250	4
RN1	420	125	4

Ball screw BS 14 x 10			
RATIO	**LOAD** [N]	**SPEED** [mm/s]	**CURRENT** [A]
RV2	110	500	4
RN2	220	250	4

Self-locking conditions

Self-locking condition is achievable with brake motor only.
Information about statically self-locking conditions with pull or push load on page 68.

ORDERING CODE EXAMPLE

UBA 0	RN1	C200	CC 24 V	FCM					
Actuator	Selected ratio	Required stroke	Motor	Stroke end switches	Accessories			Options	

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.

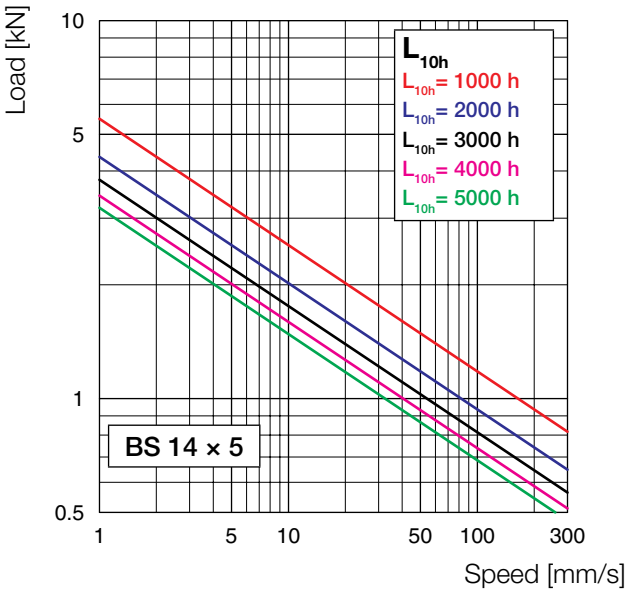
Executions with zero backlash or preloaded available on request.

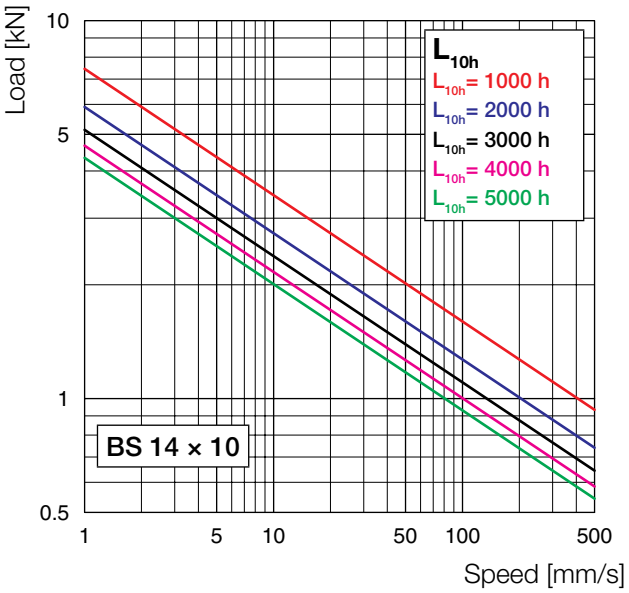
Rolled ball screws and ball nuts are completely made in Italy, in-house manufactured by Servomech SpA S.U, Bologna.

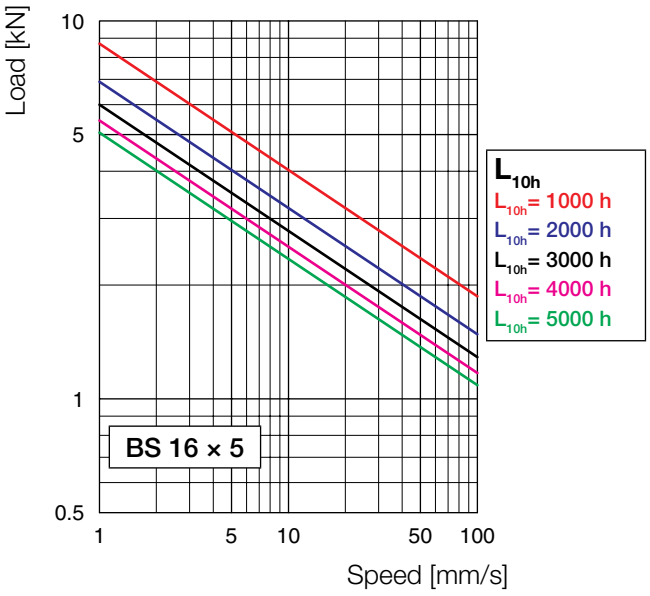
Actuator	Ball screw	Ball diameter [mm]	Nr of ball circuits	Dynamic load C_a [N]	Static load C_{0a} [N]
BSA 08	BS 14 × 5	3.175	2	4 900	6 200
BSA 10	BS 14 × 5	3.175	2	4 900	6 200
BSA 11	BS 14 × 10	3.175	2	5 300	6 900
CLB 25	BS 14 × 5	3.175	2	4 900	6 200
	BS 14 × 10	3.175	2	5 300	6 900
CLB 27	BS 16 × 5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

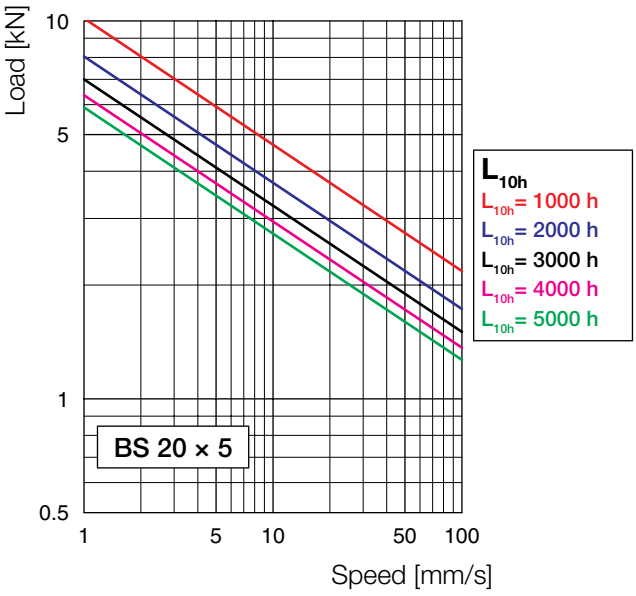
Static and dynamic load according to norm ISO 3408 and DIN 69051

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.

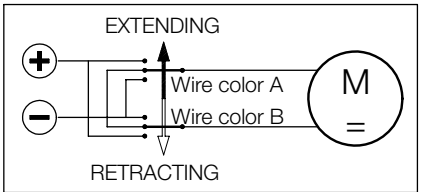
Standard motors winding has insulation class B.

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.

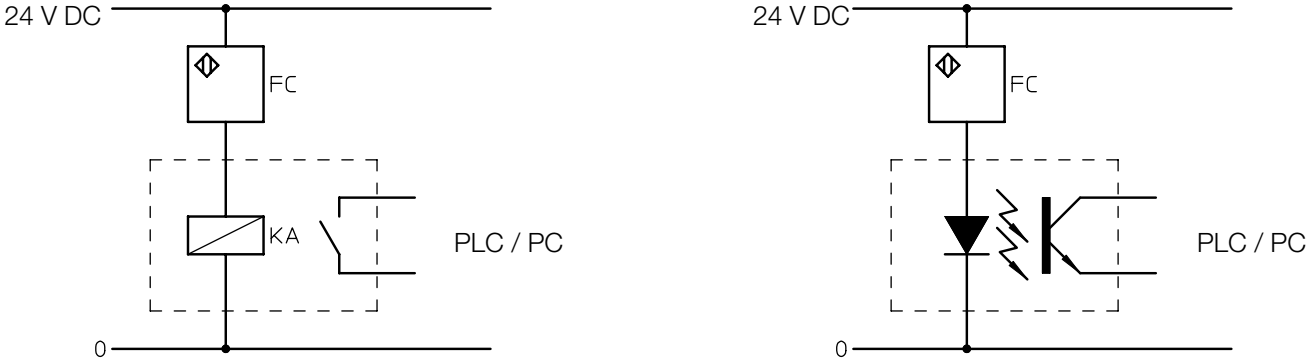
(2) Normally closed activated by DC electromagnet.
The electromagnet is powered by a 1-phase rectifier fitted in the terminal box.

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

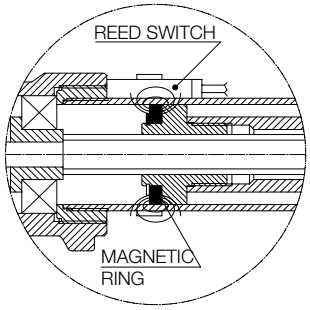
13. STROKE END SWITCHES AND POSITIONING CONTROL

GENERAL NOTE

In case the linear actuator is used in an application where the stroke end switches must be connected to PLC or PC, we suggest to make the connection with a galvanic separation circuit.



13.1 Magnetic stroke end switches (reed) FCM (linear actuators ATL, BSA, UAL, UBA Series, LMI 02 and LMP 03)

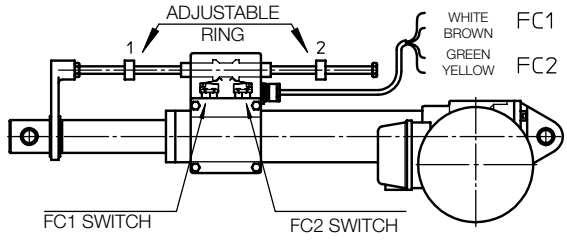


The magnetic field of the ring fixed on the nut activates the reed contact of the switch locked on the protective tube with a clamp.
The position of the switches along the tube is easily adjustable.
The switches used to determine any intermediate position (between Lc and La) will switch over in two different positions, depending on the push rod motion direction (extending or retracting).
WARNING! The magnetic reed-switches can work only if connected to a wiring control circuit in order to activate the electric relay. Do not connect them in series between the power supply and the electric motor!

REED CONTACT RATED VALUE		
	DC	AC
Rated voltage	(3 ... 130) V	(3 ... 130) V
Max. commutable power	20 W	20 VA
Max. commutable current	300 mA (resistive load)	
Max. inductive load	3 W	

Standard: NC switch (normally closed contact) equipped with signalling LEDS and protective varistor against voltage peaks.
Standard cable length 2 m; wires 2 × 0.75 mm²
Different configurations available on request:
NO (normally open); CS (exchanging contact).
For more information please contact our Technical Dpt.

13.2 Electric stroke end switches FCE (actuators ATL 10, ATL 12, BSA 10, BSA 12)



Two electric switches, installed inside a sealed plastic box, are activated by two adjustable rings through a shaft collar.
Standard switches are wired on the NC contact, cable length 1.5 m; wires 4 × 0.75 mm²
On request, they can be wired on the NO contact or on the switch-over contact CS (for available configurations please contact our Technical Dpt).
Min retracted length Lc is adjusted by ring 1. FC1 switch is connected with the WHITE and the BROWN cables.
Max extended length La is adjusted by ring 2. FC2 switch is connected with the YELLOW and the GREEN cables.
The position of the brass rings along the stainless steel supporting rod is easily adjustable.

CONTACT RATED VALUE		
Voltage	Max current	
	Resistive load	Inductive load
250 Vac	5 A	3 A
30 Vdc	5 A	0.1 A
125 Vdc	1.4 A	-

WARNING! The electric reed switches can work only if connected to a wiring control circuit in order to activate the electric relay. Do not connect them in series between the power supply and the electric motor!

13.5 Encoder GI (linear actuators LMR 01, LMR02, LMR 03 and LMP03)

Hall effect, bi-directional, incremental encoder

Output configuration: PUSH-PULL

Code GI 21: 2 output channels, 1 pulse per revolution

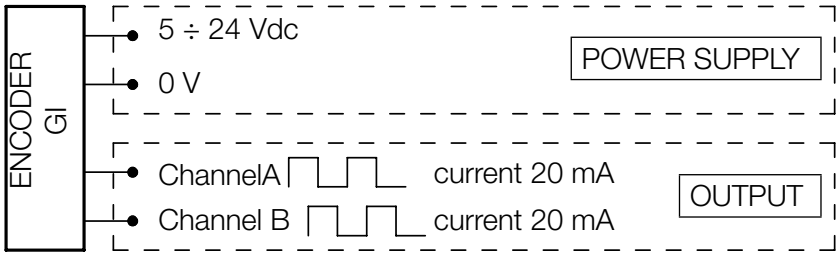
Code GI 24: 2 output channels, 4 pulses per revolution

Cable length: as motor cable

Protected against polarity inversion

Protected against any incorrect output connection

NOTE: For conductive cables colour, please refer to the wiring diagram in the “Installation Instructions” supplied with the product.



13.6 Encoder EH38 (linear actuators ATL 10, UAL 0, BSA 10, UBA 0)

Bi-directional, incremental, optical encoder

Output configuration: PUSH-PULL

Code EH38: 2 output channels, 100 pulses per revolution, with zero set pulse

Cable length: 1.3 m

Protected against short circuit

Protected against polarity inversion

Protected against any incorrect output connection

Input voltage: 8÷24 Vcc

No load power consumption:100 mA

Max. commutable current: 50 mA per channel

NOTE: Safety clutch FS cannot be used with rotative encoder
(the position reference would be lost due to its slipping).