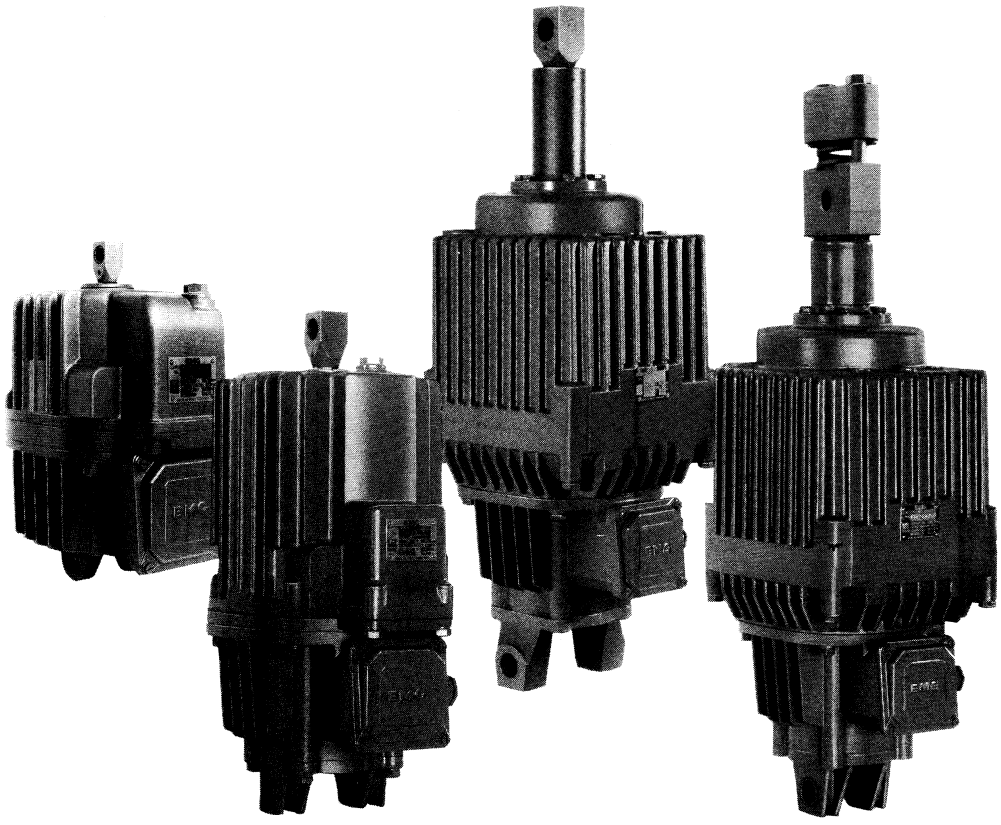
Technical Data for Electro-hydraulic Thrusters ELDRO®

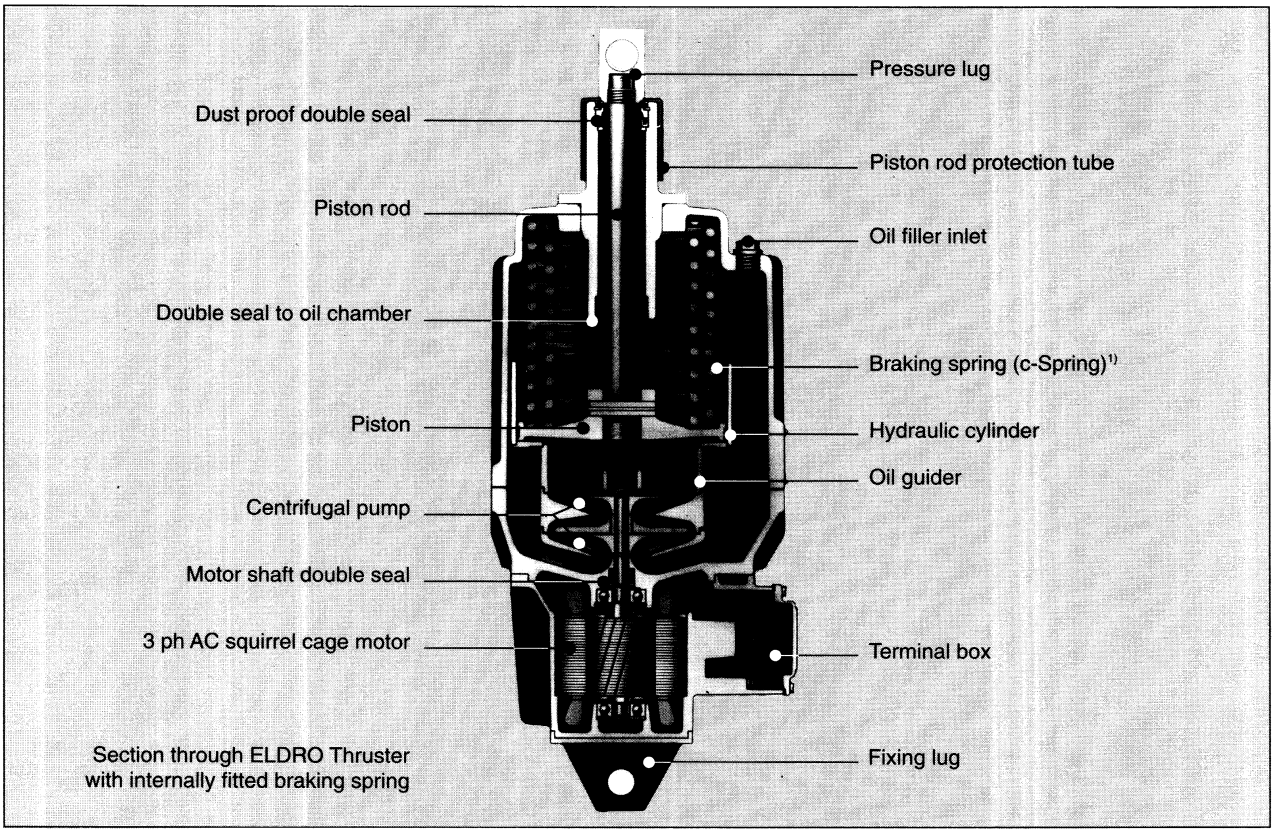
Standard range, 3 phase AC design



TÜV CERT

CERTIFICATE
Quality Assurance System
DIN ISO 9001 / EN 29001
Registration No. 70100 M 504

Design and Method of Operation



Section through ELDRO Thruster with internally fitted braking spring

[1)] Accessories

Design

The basic components of the ELDRO Thruster, i.e. electric motor and closed hydraulic system are coaxially assembled to form a functional unit. The working fluid of the hydraulic system serves as the operating medium for the generation of thrust.

Method of Operation

In the switched-off state (de-energised), the hydraulic piston with the piston rod is at its lower limit.

In the switched-on state, the centrifugal pump delivers the working fluid under the piston and produces there hydraulic pressure, i.e. the thrust of the ELDRO unit. As a result of this pressure, the piston travels along its path against the internally fitted braking or re-setting spring or against an external load. The work resulting from the product of 'force x distance' is transmitted via the piston rod and the pressure lug to the device to be operated. Thus, the piston can either travel the total stroke distance or the externally reduced stroke lengths.

In accordance with the hydraulic transmission principle, at each end position of the piston, motor power consumption decreases relative to power intake for lifting action. Simultaneously the pressure within the thruster reaches its maximum value.

The driving motor is therefore less loaded when the piston is at rest. In that way the ELDRO Thruster becomes insensitive to mechanical overloads e.g. blocking of the brake. The result of all these factors is that electrical thermal protection is unnecessary.

The thrusters are equipped with asynchronous motors. Mains voltage fluctuations therefore have minimum influence only on the function of the thrusters as the motor speed is primarily frequency dependent, and less voltage dependent.

When the thruster is in the disconnected state the piston returns to its original position under the impact of the external force (braking spring or weight).

Except for the starting and running down phases of the motor, the lifting and lowering speeds are linear. The response times obtained depend on the magnitude of the load as well as on the viscosity of the working fluid injected, which in turn is effected by the ambient temperature.

Characteristics

Technical Data

Type	Lifting force	Stroke	Thrust	Braking spring force (c-spring)[1]	Power consumption[2]	Current consumption at 400 V/50 Hz[2]	Duty rating at S3 – 60% duty cycle[3]	Weight
	N	mm	N cm	N	W	A	c/h	kg
Short-stroke units								
Ed 23/5	220	50	1100	180	165	0.5	2000	10
Ed 30/5	300	50	1500	270	200	0.5	2000	14
Ed 50/6	500	60	3000	460	210	0.5	2000	23
Ed 80/6	800	60	4800	750	330	1.2	2000	24
Ed 121/6	1250	60	7500	1200	330	1.2	2000	39
Ed 185/6[4]	1850	60	11100	1900	450	1.3	2000	39
Ed 201/6	2000	60	12000	1900	450	1.3	2000	39
Ed 301/6	3000	60	18000	2700	550	1.4	1500	40
Long-stroke units								
Ed 50/12	500	120	6000	–	210	0.5	1200	26
Ed 80/12	800	120	9600	–	330	1.2	1200	27
Ed 121/12	1250	120	15000	–	330	1.2	1200	39
Ed 201/12	2000	120	24000	–	450	1.3	1200	39
Ed 301/12	3000	120	36000	–	550	1.4	900	40
Ed 185/16	1850	155	29600	–	450	1.3	400	40
Ed 301/15	3000	150	45000	–	550	1.4	400	50
Ed 350/20	3500	200	70000	–	550	1.4	400	50
Units up to 6300 N lifting force and 200 mm stroke on request								

All technical data are mean values related to + 20 °C operating temparature of unit.

1) Values of braking force apply to 1/3 of the rated stroke.

2) Values at end-position of piston. During lifting operation the specified values multiply.
At – 25 °C operating temperature of unit the current consumption is approx. 1.5 times that of the current consumption at + 20 °C.

3) Continuous operation S1 and intermittent service S3 are permitted up to + 50 °C ambient temperature.

4) Only to be used as exchange thruster for Ed 5.

Approximate calculation for current consumption for non-standard voltages:

$$I_X = \frac{U_{(400\ V)}}{U_{(X)}} \cdot I_{(400\ V)}$$

Performance in Service depending on Ambient Temperatures

Temperature range	Hydraulic fluid	Performance in service
– 25 °C to + 50 °C	HL 10, DIN 51524, part 1	In the lower range of ambient temperatures the lifting times may increase up to four times the specified lifting times when the unit is operated the first time. The lowering times remain unaffected.
over + 50 °C	Special fluid	Enquire
– 35° to + 40 °C	Special low temperature fluid	Space heater not required.
below – 25 °C[1]	HL 10, DIN 51524, part 1	Space heater required in unit. Connect up heater in terminal box using an additional Pg 16 cable gland. 230 or 115 volt connected voltage. Thermostatic control to be provided by customer.

1) The details given apply for vertical positioning when temperatures drop below – 25 °C.

Thruster Versions

Electrical Design

Motor

3 ph AC squirrel cage motor, construction according to VDE 0530. For performance details refer to technical data. Insulation class F.

Modes of Operation

Continuous operation S1 and intermittent service S3 – 60 % duty cycle.
> 50 °C ambient temperature technical data change – please enquire.

Voltages and Frequencies

230/400 V, 50 Hz, 3 ph AC
290/500 V, 50 Hz, 3 ph AC
400/690 V, 50 Hz, 3 ph AC
All units are on principle star (Y) connected at delivery.
Special windings 110 V – 690 V, 3 ph AC at extra charge.
60 Hz design at extra charge.
DC and AC versions, flameproof and explosion-proof design on request.

Terminal Box

6-pole terminal board, with heater 9-pole terminal board. Connection screws M 4. Protective conductor terminal M4. Earthing screw M5 (outside on terminal box).

Cable Gland

Cable gland Pg 21 for conductor sizes up to 4 x 2,5 mm^2 (Ø 17-19 mm)

Motor Circuit Breakers

When protecting the units by motor circuit breakers the thermal trigger should be set at least on 1.5 times the rated current for all types.

Mechanical Design

Assembly Dimensions

refer to dimension tables.

Mounting Positions

Vertical: piston rod uppermost.
Horizontal and intermediate positions: rating plate to be on top.
Types Ed 301/15 and 350/20 only vertical mounting position.

Mounting Options except units with limit switches

The base mounting is bolted and 90° rotatable.
The base mounting with types Ed 23/5 and Ed 30/5 is available shifted in steps of 90° (indicate when ordering).
The top pressure lug is rotatable with all types.

Working Fluid

Hydraulic oil HL 10 acc. to DIN 51524, part 1, filled at factory.

Safety Measures

Dust proof double seal.
Double seal to oil chamber.
Piston rod chromium plated to size.
Piston rod tube to protect against the ingress of foreign bodies with types Ed 121, Ed 201, Ed 301, Ed 350.

Standard Paint

Synthetic resin lacquer varnish, impact and scratch resistant.
Coating thickness ~ 40 µ.
Tint RAL 7022 (umbergrey),
other colours and coating 'Increased Protection against Corrosion' at extra charge

Enclosure

IP 65 to EN 60529, DIN VDE 0470 T1

Additional Equipment

Lifting or Lowering Valve (H, S, HS)

Built-in lifting (H) and/or lowering (S) valves for stepless prolongation of normal lifting or lowering times. The adjustable minimum values obtain a level 10-20 times the standard values.
Built-in valves in setting 'open' result in increased lifting and lowering times for short stroke units of approx. 0.1 to 0.2 seconds and for long stroke units of approx. 0.2 to 0.4 seconds.
The valves are adjusted from the outside.

Braking Spring (c-Spring)

The c-spring generates the braking force. The specified force of the c-spring applies for 1/3 of the piston rod's rated lift stroke or 2/3 of the rated lower stroke.

Re-setting Spring

Operation similar to c-spring, re-setting force is, however, lower (on request).

Damping Spring (d-Spring)

For an aperiodic transient of the brake. This assists the brake to close smoothly. Only effective in conjunction with a built-in braking spring. No limit switch can be annexed in this case. There is no alteration in the mounting distance A.
When determining the operating point of the brake the dimension 'z' is to be considered (see dimension drawing).
Main application: ELDRO-regulated brake.

High-Speed Lowering Circuit

By means of motor capacitors, or by shortcircuiting the stator winding and inserting a contactor. The lowering times are reduced by approx. 15%.

Heater

For operation below – 25 °C a heating element must be installed; also to be used as a stand-by heater. The customer has to provide a separate power supply and temperature regulator.

Increased Protection against Corrosion

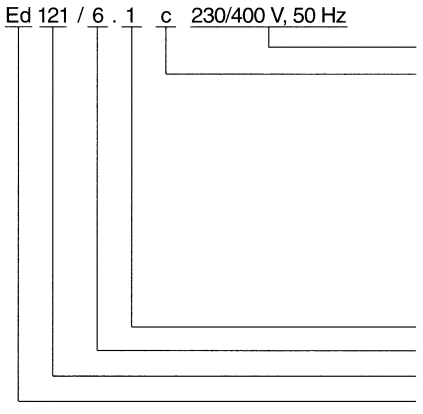
Application: aggressive media and/or high relative humidity and the resulting danger of formation of condensate.
Motor: fully vacuum potted stator, applicable also instead of idling space heater (on request).
Special paint: Polyurethane lacquer (KOR).
Primer: one coat
Paintfinish: two coats polyurethane varnish.
Tint RAL 7022 (umbergrey).

Limit Switches

For electrical indication of the release or closing positions of the brake, mechanical or inductive limit switches can be fitted as standard.
The appropriate types of switches are listed in the technical data sheet 'Limit Switches'.

All additional equipment is to be ordered separately at extra charge.

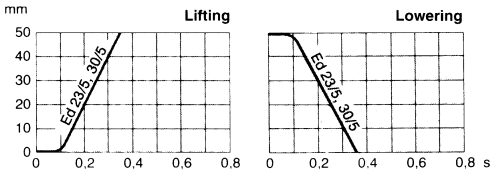
Key to Types



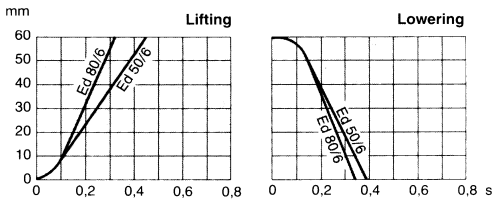
Rated voltage
Code for additional equipment
c Braking spring (c-spring)
d Damping spring (d-spring)
H Lifting valve
S Lowering valve
E Limit switch, mechanical
EB Limit switch, inductive
EExI For underground mines
EExII For hazardous atmospheres
Code for exchange unit
Stroke in cm
Lifting force x 10 in N
Ed: ELDRO, 3 ph AC version
Eg: ELDRO, DC version

Stroke-Time-Diagrams

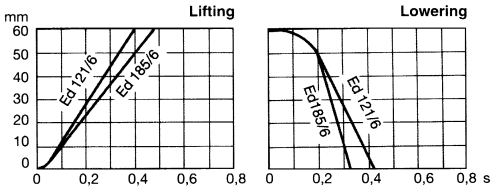
Ed 23/5, Ed 30/5



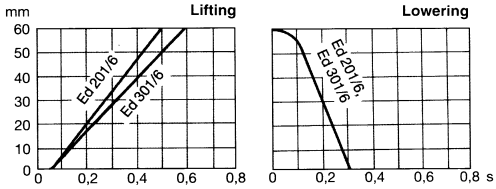
Ed 50/6, Ed 80/6



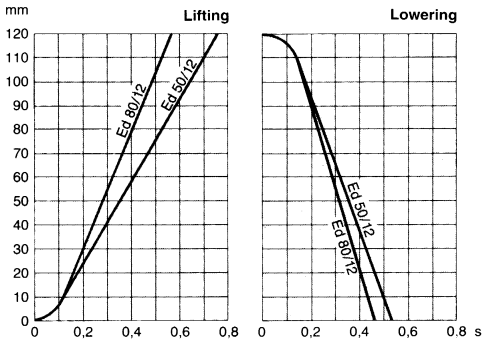
Ed 121/6, Ed 185/6



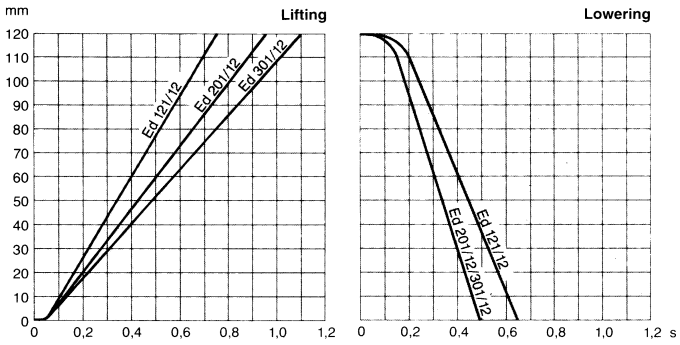
Ed 201/6, Ed 301/6



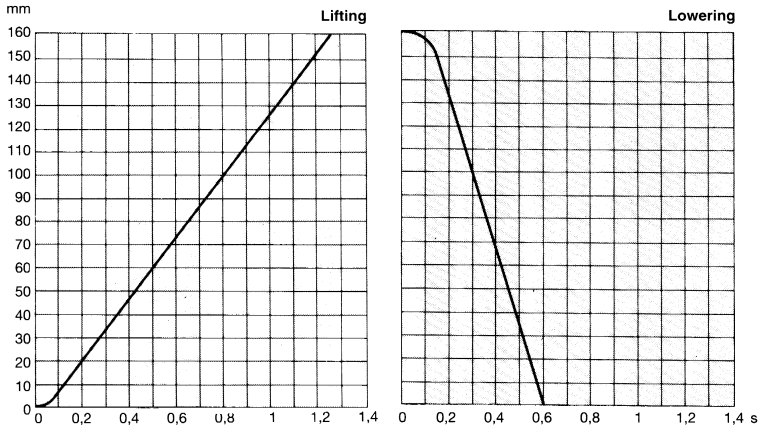
Ed 50/12, Ed 80/12



Ed 121/12, Ed 201/12, Ed 301/12



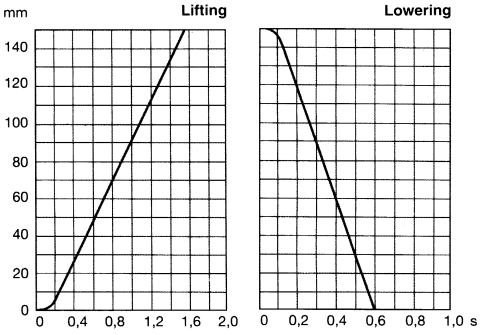
Ed 185/16



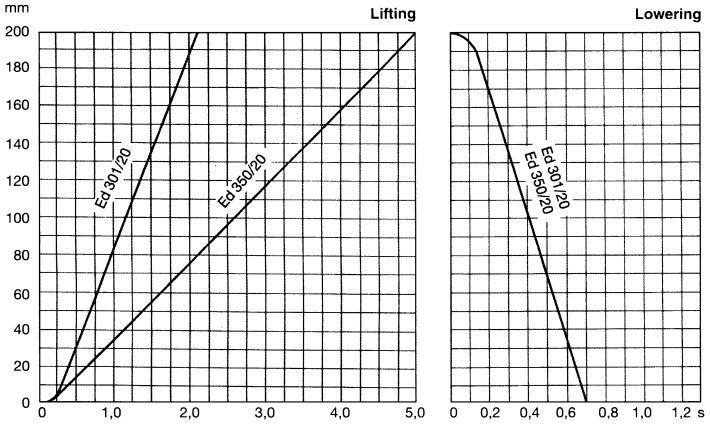
Diagrams taken under load
at + 20 °C operating temperature of unit.

When applying the high-speed lowering circuit, the given lowering times are reduced by approx 15 %.

Ed 301/15

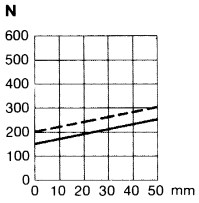


Ed 301/20, Ed 350/20

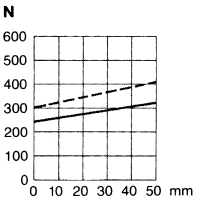


c-Spring-Diagrams

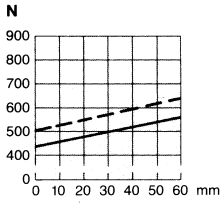
Ed 23/5 c



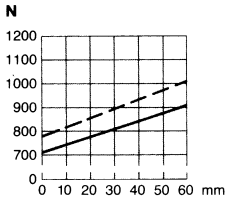
Ed 30/5 c



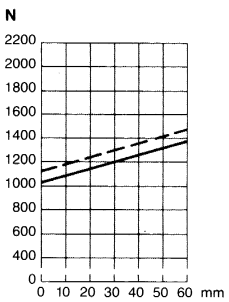
Ed 50/6 c



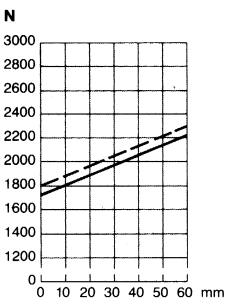
Ed 80/6 c



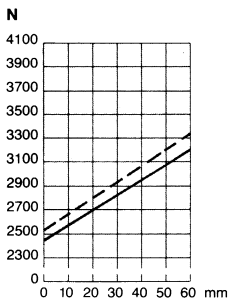
Ed 121/6 c



Ed 185/6 c, Ed 201/6 c



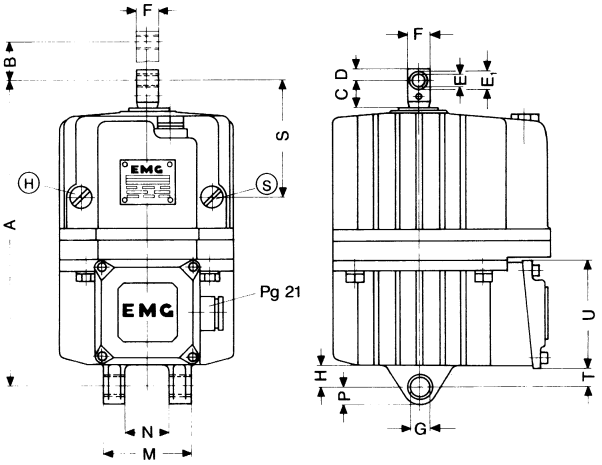
Ed 301/6 c



Parameter values in Newtons (N)
- - - necessary force to compress c-spring
—— force given from c-spring (braking force)

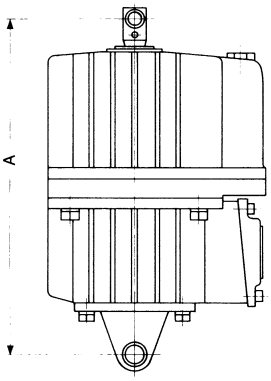
Dimension Drawings

Ed 23/5



Ed 23/5.1

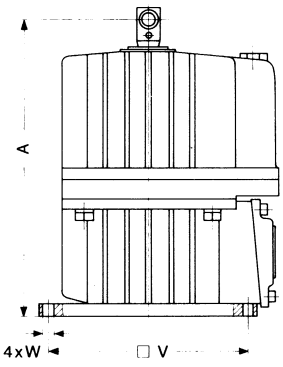
Baseplate version



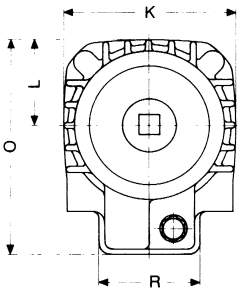
H = Lifting valve

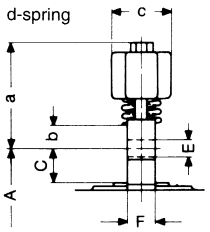
Ed 23/5.2

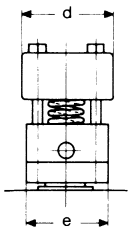
Flange mounting version

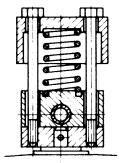


S = Lowering valve

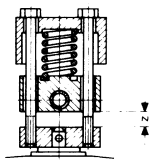








expanded
(unit is lifted)



compressed
(unit in braking mode)

The motor housing with terminal box can be rotated in steps of 90° (indicate when ordering).
Mounting options, except units with limit switches:
The base mounting with type Ed 23/5 is cast integral with the housing and can be supplied rotated by 90° (indicate when ordering), the base mounting with type Ed 23/5.1 is bolted and 90° rotatable, the top pressure lug is rotatable on all units.

Dimension Table

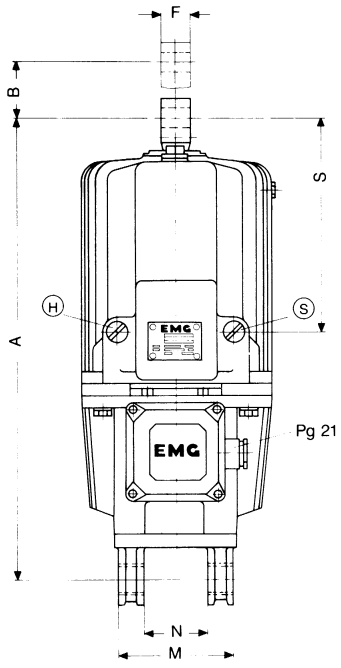
Type	A	B	C	D	E[1]	E_1[1]	F	G[2]	H	K	L	M	N	O	P	R	S	T	U	V	W	a	b	c	d	e	z
Ed 23/5	286	50	26	12	12	16	20	16	20	160	80	80	40	200	16	92	110	18	100	—	—	100	20	55	85	75	15
Ed 23/5.1	314	50	26	12	12	16	20	16	20	160	80	80	40	200	16	92	110	18	100	—	—	100	20	55	85	75	15
Ed 23/5.2	272	50	26	12	12	16	20	16	20	160	80	80	40	200	16	92	110	18	100	130	9	100	20	55	85	75	15

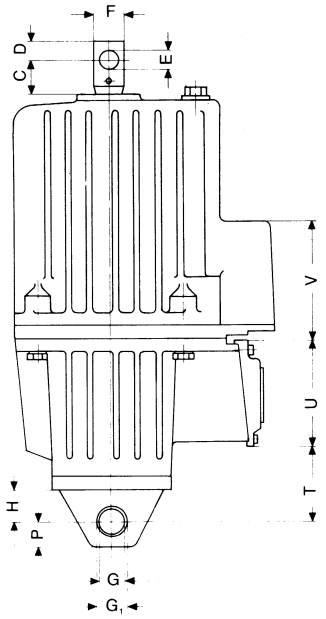
1) tolerance $^{+0.1}$ 2) tolerance $^{+0.25}_{+0.15}$ E changable to E_1 by removing of the clamping bush All dimensions in millimeters

For exchanging ELDRO Thrusters of the former design refer to separate “Ordering Instructions for Exchange Units”

Dimension Drawings

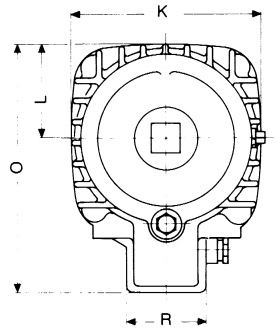
Ed 30/5, Ed 50/6, Ed 80/6, Ed 50/12, Ed 80/12

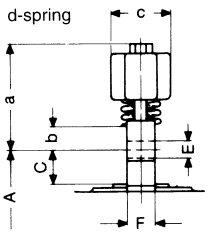


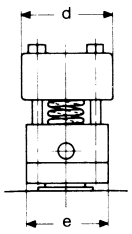


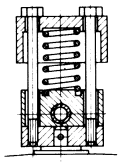
The motor housing with terminal box can be rotated in steps of 90° (indicate when ordering).
Mounting options, except units with limit siwtches:
The base mounting with type Ed 30 is cast integral with the housing and can be supplied rotated by 90° (indicate when ordering), the base mounting with types Ed 50 and Ed 80 is bolted and 90° rotatable, the top pressure lug is rotatable on all units.

(H) = Lifting valve (S) = Lowering valve

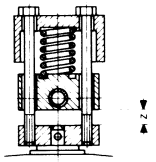








expanded
(unit is lifted)



compressed
(unit in braking mode)

Dimension Table

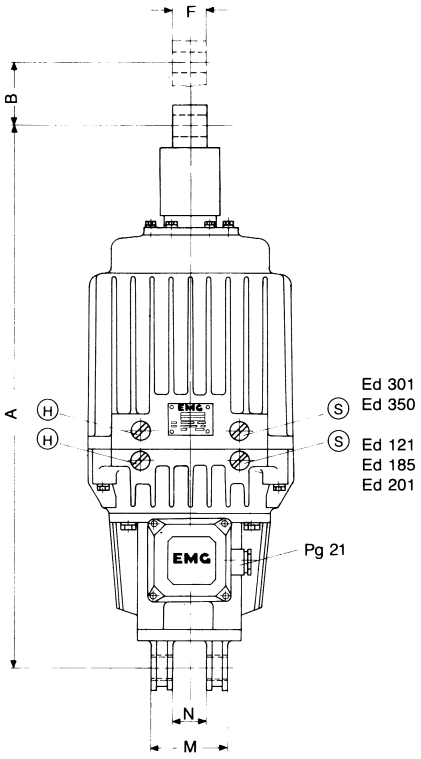
Type	A	B	C	D	E[1]	F	G[2]	G_1[2]	H	K	L	M	N	O	P	R	S	T	U	V	a	b	c	d	e	z
Ed 30/5	370	50	34	15	16	25	16	—	18	160	80	80	40	197	16	80	175	34	100	77	100	20	55	85	75	15
Ed 50/6	435	60	36	18	20	30	20	24	23	195	97	120	60	254	22	90	217	52	100	120	100	22	55	85	75	15
Ed 80/6	450	60	36	18	20	30	20	24	23	195	97	120	60	254	22	90	217	67	100	120	100	22	55	85	75	15
Ed 50/12	515	120	36	18	20	30	20	24	23	195	97	120	60	254	22	90	297	52	100	176	—	—	—	—	—	—
Ed 80/12	530	120	36	18	20	30	20	24	23	195	97	120	60	254	22	90	297	67	100	176	—	—	—	—	—	—

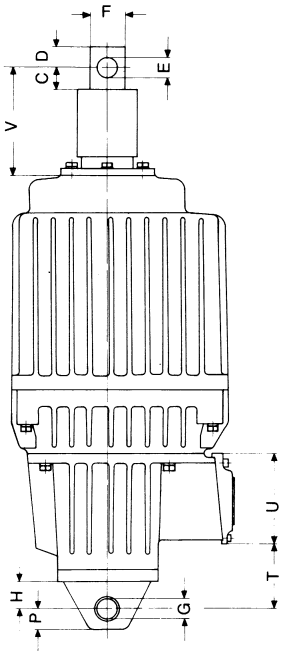
1) tolerance $^{+0.1}$ 2) tolerance $^{+0.25}_{+0.15}$ G changeable to G_1 by removing of the clamping bush All dimensions in millimeters

For exchanging ELDRO Thrusters of the former design refer to separate “Ordering Instructions for Exchange Units”

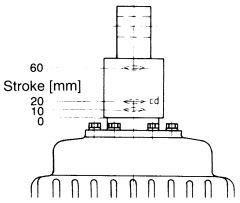
Dimension Drawings

Ed 121/6, Ed 185/6, Ed 201/6, Ed 301/6, Ed 121/12, Ed 201/12, Ed 301/12, Ed 185/16, Ed 301/15, Ed 350/20

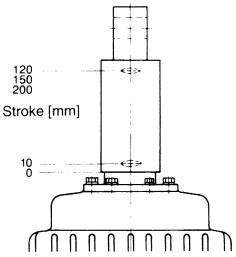




Lifting Marks



Ed.../6

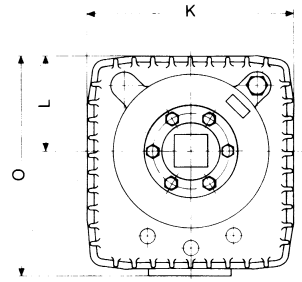


Ed.../12/15/20

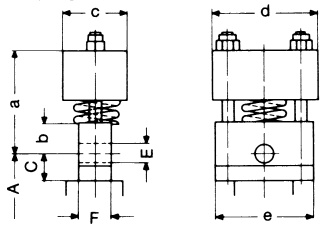
For easier setting and checking of the brake the piston guide bush of the thruster is marked. These marks can be read at the bottom edge of the piston rod protection tube (see drawing).

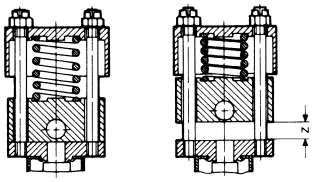
The motor housing with terminal box can be rotated in steps of 90° (indicate when ordering).
Mounting options, except units with limit switches:
The base mounting is bolted and 90° rotatable, the top pressure lug is rotatable.

Ⓗ = Lifting valve Ⓢ = Lowering valve



d-spring





expanded
(unit is lifted)

compressed
(unit in braking mode)

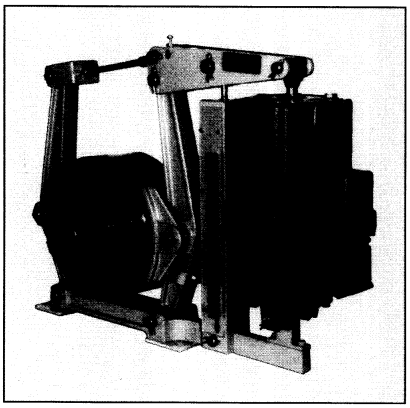
Dimension Table

Type	A	B	C	D	E[1]	F	G[2]	H	K	L	M	N	O	P	T	U	V	a	b	c	d	e	z
Ed 121/6	645	60	38	25	25	40	25	35	240	112	90	40	260	25	77	100	130	147	35	80	130	120	20
Ed 201/6	645	60	38	25	25	40	25	35	240	112	90	40	260	25	77	100	130	147	35	80	130	120	20
Ed 301/6	645	60	38	25	25	40	25	35	240	112	90	40	260	25	77	100	130	147	35	80	130	120	20
Ed 121/12	705	120	38	25	25	40	25	35	240	112	90	40	260	25	77	100	190	—	—	—	—	—	—
Ed 201/12	705	120	38	25	25	40	25	35	240	112	90	40	260	25	77	100	190	—	—	—	—	—	—
Ed 301/12	705	120	38	25	25	40	25	35	240	112	90	40	260	25	77	100	190	—	—	—	—	—	—
Ed 185/6	600	60	42	25	25	40	27	44	240	112	160	80	260	25	87	100	76	147	35	80	130	120	20
Ed 185/16	700	155	42	25	25	40	27	44	240	112	160	80	260	25	87	100	176	—	—	—	—	—	—
Ed 301/15	880	150	38	25	25	40	27	44	250	117	160	80	265	25	87	100	275	—	—	—	—	—	—
Ed 350/20	880	200	38	25	25	40	27	44	250	117	160	80	265	25	87	100	275	—	—	—	—	—	—

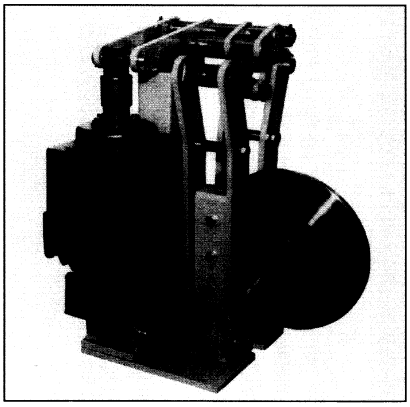
Units in other dimensions on request. All dimensions in millimeters

1) tolerance $^{+0.1}$ 2) tolerance $^{+0.25}_{+0.15}$

For exchanging ELDRO Thrusters of the former design refer to separate “Ordering Instructions for Exchange Units”



Double shoe brake with ELDRO Thruster



Disk brake with ELDRO Thruster

ELDRO and Quality

- Certified quality assurance system to DIN EN ISO 9001
- 100% serial test including 16 hours endurance run and subsequent functional test with documentation of all technical data
- Acceptance certificate to DIN EN 10204
- Homologation of standard units in long-time test
- 12 months guarantee

Characteristic Features

ELDRO Thrusters through their electro-hydraulic mechanism, their suitability to integrate into brake systems and simple electrical commissioning procedure, offer for a wide range of applications the following advantages:

- High reliability.
- Long service life with minimum maintenance due to low wear operation under continuous self lubrication.
- Soft and smooth operation due to the hydraulic principle.
- Fast response (short regulating times).
- High switching frequency: up to 2000 cycles per hour.
- Reversing operation without restrictions.
- Simple installation and dismantling.
- No reversing contactors required as the motor may rotate in either direction.
- Overloading during operation not possible.
- Suitable for adjusting length of stroke from outside as required.
- Stepless prolongation of lifting and/or lowering times by the fitting of valves.
- Universal applications also in hazardous areas in which there is danger of occurrence of explosion.

Standardization and Worldwide Application

Physical dimensions, technical ratings and the specific characteristics of the ELDRO Thruster are factors which have greatly influenced standards applicable to modern industrial brakes. In close cooperation with reputable brake manufacturers, with the industry and the standardization committee the ELDRO type range was enlarged to the graduation available today and prescribed e.g. in the German standard DIN 15430 “Electrohydraulic Thrusters” as well as in the steel and iron working sheet of the “Union of German Ironworkers” (Verein Deutscher Eisenhüttenleute) SEB 602471 “ELDRO Thrusters”. This range of thrusters has been successful in the international market.

In order to remove trade barriers from the market, national standards and regulations have been adapted more and more to the international publications already known.

Design, production and testing of the ELDRO Thrusters are carried out strictly to German regulations and standards (such as DIN and VDE) and thereby also according to the internationally approved IEC publications.

The harmonisation on the sector of ‘low power 3 ph AC rotating electrical machines’ has already lead to conformity of recommendations and regulations in the following countries:

Australia	Italy
Austria	Japan
Belgium	Netherlands
Denmark	Norway
Germany	South Africa
Finland	Sweden
France	Switzerland
Great Britain	USA

Other EMG products and system resolving

DREHMO® Electro-mechanical Actuators
Servo Technique/Strip guiding for the metals industry
Diesel rail car equipment

Associated companies

BST, Bielefelder Servo-Technik GmbH
Web Guides for paper, foils, rubber, textiles
Web inspection systems
Tire Control Systems for quality assurance in the production of tires

EMG-ELTMA Hebezeuge Oschersleben GmbH
Electro-hydraulic thrusters
Electro-mechanical Actuators

EMH, Electromecanica e Hidraulica, Belo Horizonte, Brazil
Electro-mechanical and hydraulic components

BST Pro Mark Technologies Inc., Elmhurst, IL USA
Web and strip guiding systems for metal, paper, foil, rubber, and textile industries
Web inspection systems

BST SAYONA Web Control Systems LTD.; Mumbai, India
Web and strip guiding systems for metal, paper, foil, rubber, and textile industries
Web inspection systems

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