EMC ELHY®

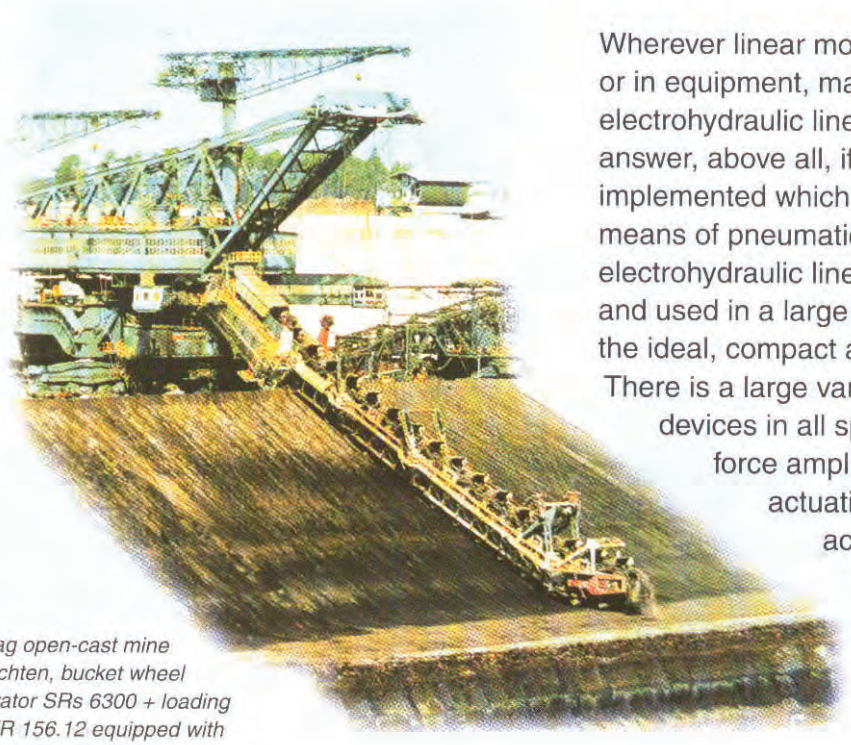
Electrohydraulic Thrustors ELHY®

EB Series (120 – 6300 N)

Product Specifications

Technical data

The Compact Alternative

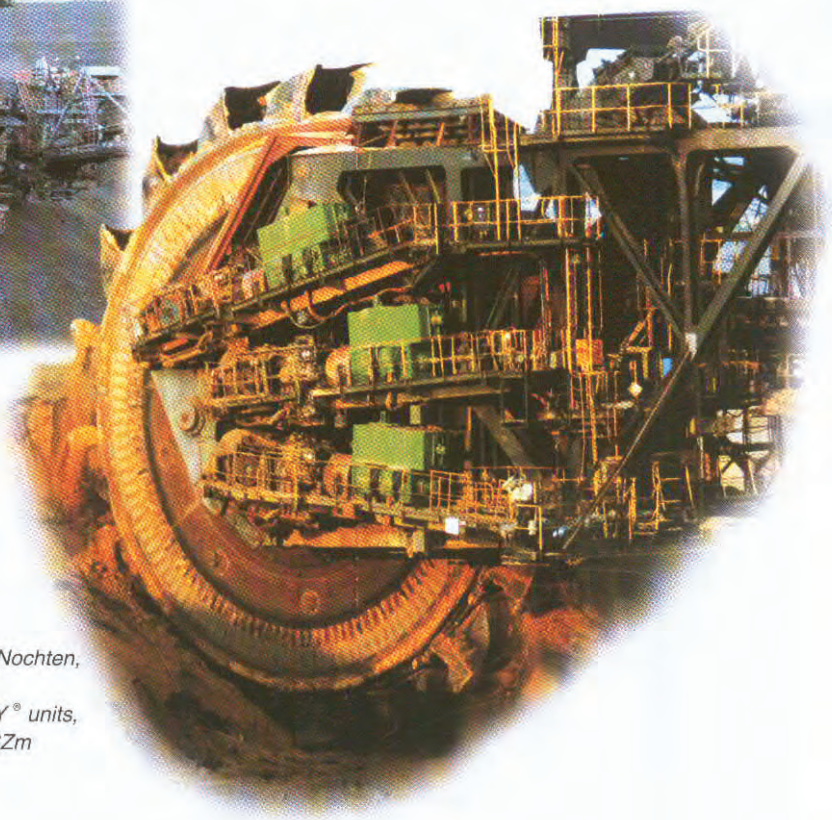


Laubag open-cast mine at Nochten, bucket wheel excavator SRs 6300 + loading unit VR 156.12 equipped with 50 ELHY® units

Wherever linear movements are to be carried out on or in equipment, machinery or devices, the electrohydraulic linear drive (Elhy) is the ideal answer, above all, if reliable drive solutions are to be implemented which can hardly be obtained by means of pneumatic or hydraulic systems. The electrohydraulic linear drive can be easily modified and used in a large variety of applications, making it the ideal, compact alternative.

There is a large variety of applications for Elhy devices in all spheres of industry ranging from force amplification, flap adjustment and actuation of barriers to valve control, actuation of clutches and feed positioning. A major field of application in lifting and handling processes is the actuation of machine brakes of various designs. The advantages of electrohydraulic actuation as compared to magneto-electric brake actuation are undisputed and unsurpassed from the point of view of safety.

ELHY® - thrusters in use at open pit mine „Vostocniy" located in Ekibastuz/ Kazakstan

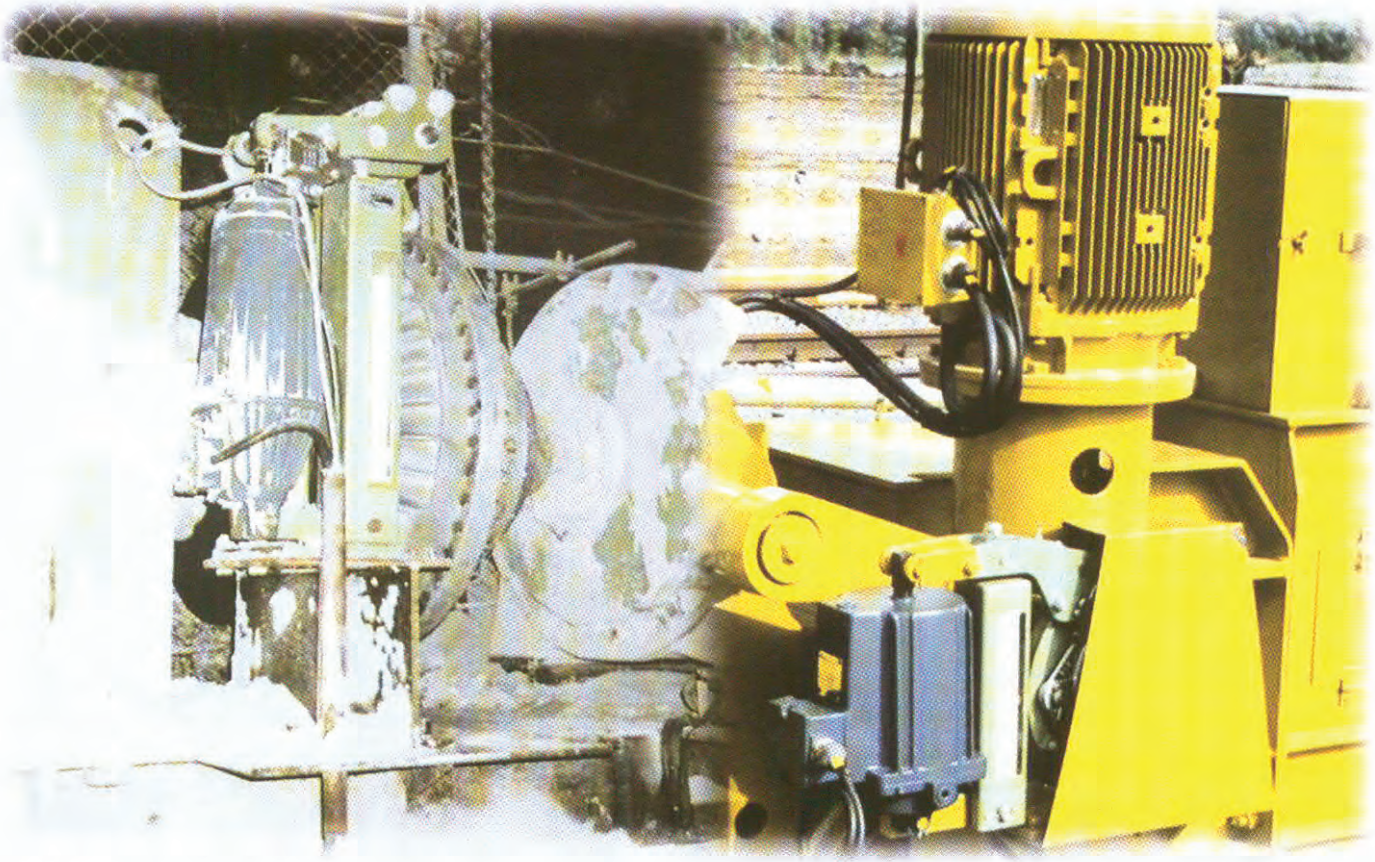


Laubag open-cast mine at Nochten, bucket wheel drive SRs 6300 equipped with 3 ELHY® units, version EB 320/100 c320 SZm

KBE Gernsheim, double-link level luffing crane with 14 ELHY® units

The Elhy Series 'EB' comprises a complete range of devices for actuating forces from 200 N to 3200 N in useful grading. The devices are available in the following basic versions:

- Standard series
- Series in compliance with DIN 15430
- Special versions following DIN 15430.



Kali und Salz AG, Unterbreitzbach works, conveyor drive, disk brake RST 2 with ELHY® version EB 1250 – 60 Lm 2

Kranbau Eberswalde, balancing crane 6 t x 40 m equipped with 4 ELHY® units EB 220 – 50/2 (at YBBS, Austria)

Mechanical Design

The electrohydraulic thrustor (Elhy) comprises all basic components of an hydraulic system in one single packaged unit. It consists of an hydraulic pump with electric drive motor, a closed hydraulic guide system and the working cylinder with piston and lifting rod and converts electric energy by way of hydraulics into mechanical straightline movements.

The Elhy devices are available in three different series of uniform functional principle, internal setup, and outer appearance. Since the only difference between the series are the mounting dimensions, the data given in this catalogue apply to all three series.

The motor casing houses the stator of the drive motor which is designed as a threephase asynchronous squirrel-cage motor. The electric connection is via the terminal box which seals the motor casing tightly. The feet cast en bloc with the motor casing serve to mount the Elhy device. On the one hand, the rotor with shaft is supported in the motor casing, on the other hand in the end shield. The blade wheel of the pump is mounted on the shaft. The guide cylinder with piston which moves axially is situated above the blade wheel. The device is filled with hydraulic fluid up to the level of the inlet opening.
In the version which is equipped with pull-back springs, the latter are accommodated between the piston and the bottom of the guide cylinder.

The adjusting spring (standard series) or attenuation spring (series in compliance with DIN 15430 including special versions following DIN 15430) is mounted on the lifting rod of the Elhy device. The connecting bolts of the adjusting spring, e.g. for connecting the brake linkage, are located at the same level as the bore in the lifting rod so that height of installation h1 is obtained in line with the basic design.

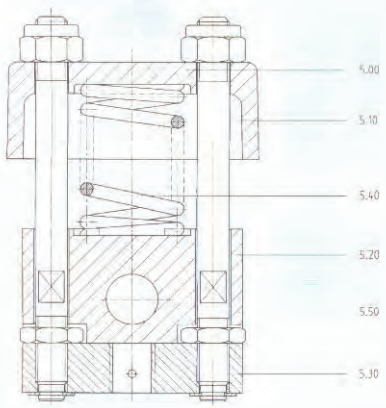
The connecting butt strap of the attenuation spring has the same dimensions as the pertinent lifting rod head so that the assembly dimensions are identical for devices with and without attenuation spring.

Elhy devices can be equipped with inductive or mechanical switching elements thus allowing supervision of release and/or closing positions of the brake as well as any wear of brake linings.

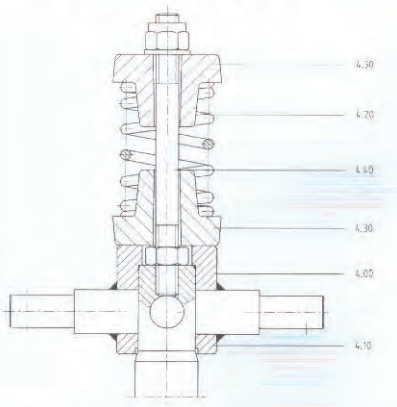
Note:
The items shown in the sectional drawings can be ordered under these part numbers as spare parts. In addition, the exact type designation of the Elhy device should be indicated together with the number of the device, if possible.

1.21 Motor casing
1.22 Stator
1.23 Locking plate
1.40 Rotor
1.41 Radial deep groove ball bearing
1.42 Compensation washer for ball bearing
1.50 End shield
1.51 Radial deep groove ball bearing
1.60 Impellor
1.62 Cover plate
1.63 Top end shild
1.64 Cover plate
1.70 O-ring
1.80 Screw plug with packing ring
1.90 Bolt
2.10 Cylinder jacket
2.20 Lifting rod
2.21 Lifting rod head
2.30 Piston
2.31 Seal strip
2.40 Pull-back spring
2.50 Sealing system of lifting rod, compl.
2.51 Scraper ring
2.52 Retainer
2.53 Special rotary shaft seal
2.70 Guide cylinder
2.72 Regulating plug
2.73 Valve
2.74 O-ring
2.80 Seal
3.00 Terminal box, compl.
3.10 Terminal box frame
3.11 Special seal
3.20 Terminal board, compl.
3.30 Terminal box cover
3.50 Compressed gland
4.00 Adjusting spring, compl.
4.10 Spring pipe
4.20 Spiral spring
4.30 Spring plate
4.40 Stud bolt including hexagon nut with clamping element, washer and lock nut
5.00 Attenuation spring, compl.
5.10 Cap
5.20 Connecting butt strap
5.30 Strap
5.40 Spiral spring
5.50 Stud bolt including hexagon nut with clamping element, washer, lock nut and circlip

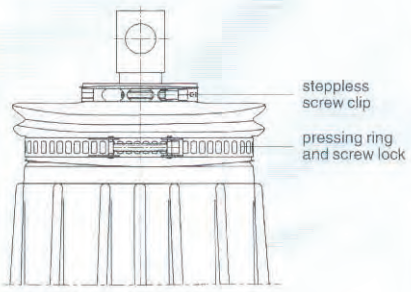
Attenuation spring R



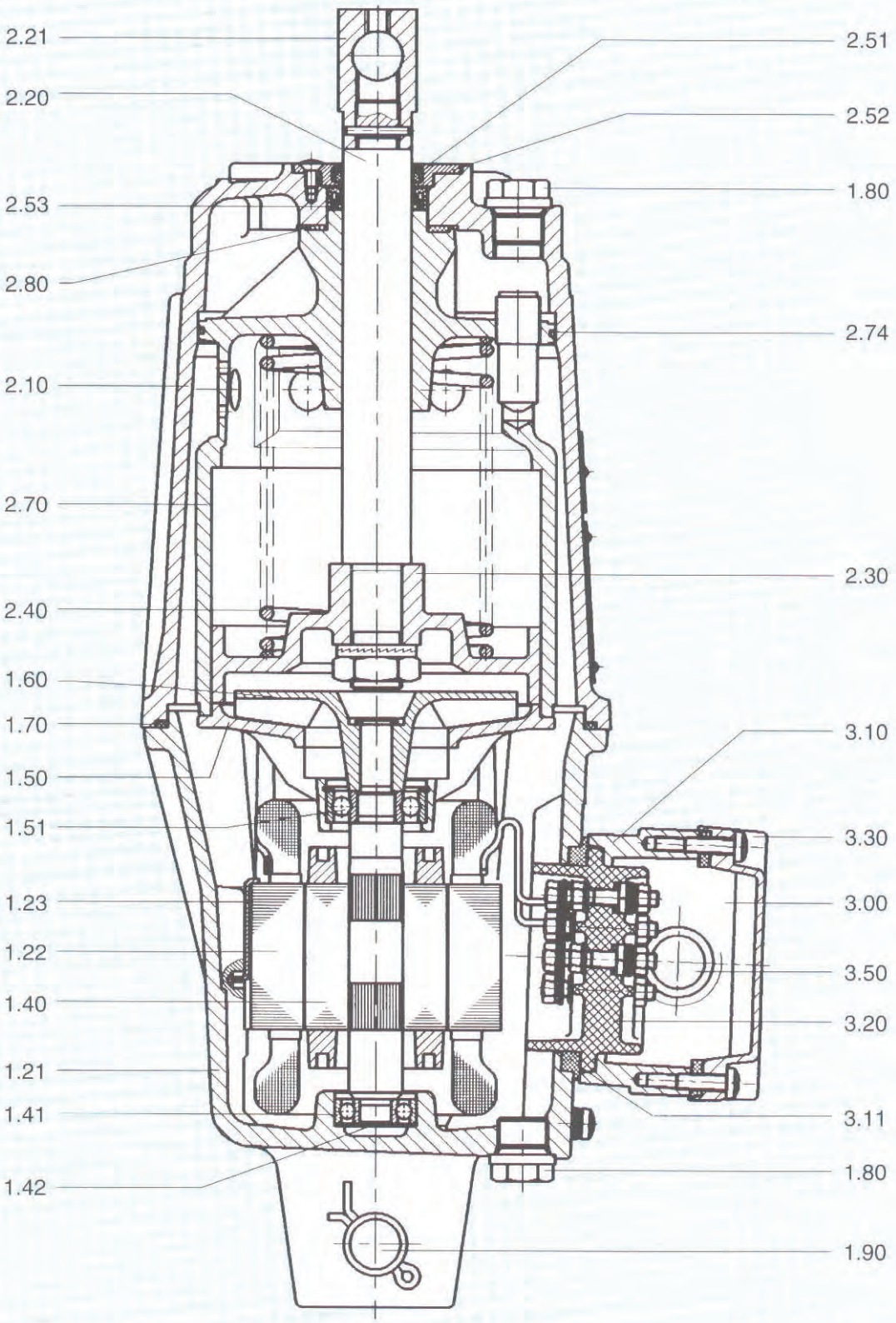
Adjusting spring R



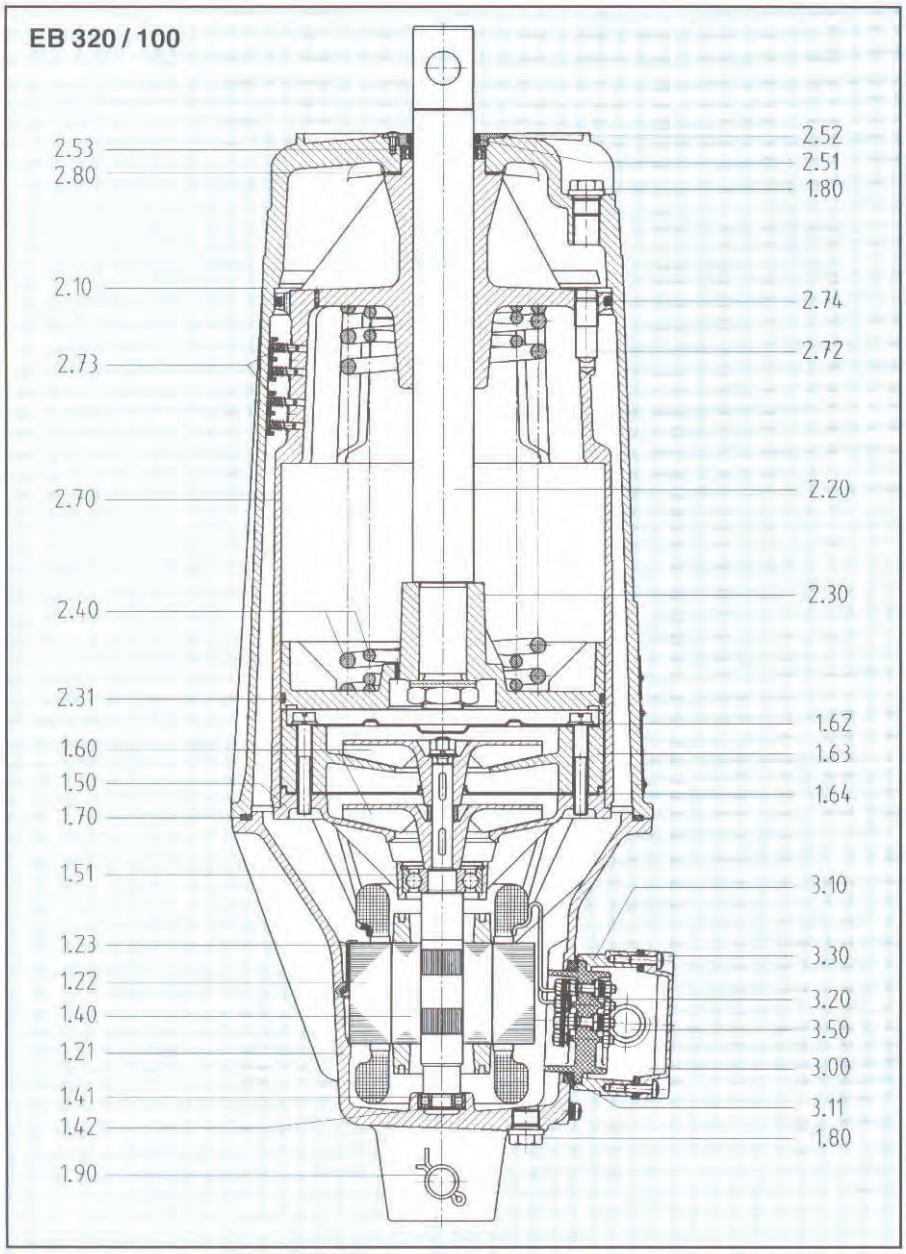
Version with protective hood



EB 300 – 50


2.21
2.20
2.53
2.80
2.10
2.70
2.40
1.60
1.70
1.50
1.51
1.23
1.22
1.40
1.21
1.41
1.42
2.51
2.52
1.80
2.74
2.30
3.10
3.30
3.00
3.50
3.20
3.11
1.80
1.90

Design and Function



The motor-driven blade wheel generates a hydraulic pressure in the space beneath the piston. Consequently, a hydraulic force will act on the piston surface This force is dependent on the hydraulic pressure and the size of the piston surface. However, the hydraulic force is independent of the position of the piston Under the influence of the hydraulic force, the piston moves up and down and delivers the hydraulic fluid through the bypass duct to the inlet opening of the blade wheel. When the motor is switched off, the piston is returned into its home position under the influence of the external load or the built-in pull-back spring. During this return motion, the hydraulic fluid under the piston is forced back through the blade wheel, the inlet opening and the bypass duct of the casing into the cylinder space above the piston.

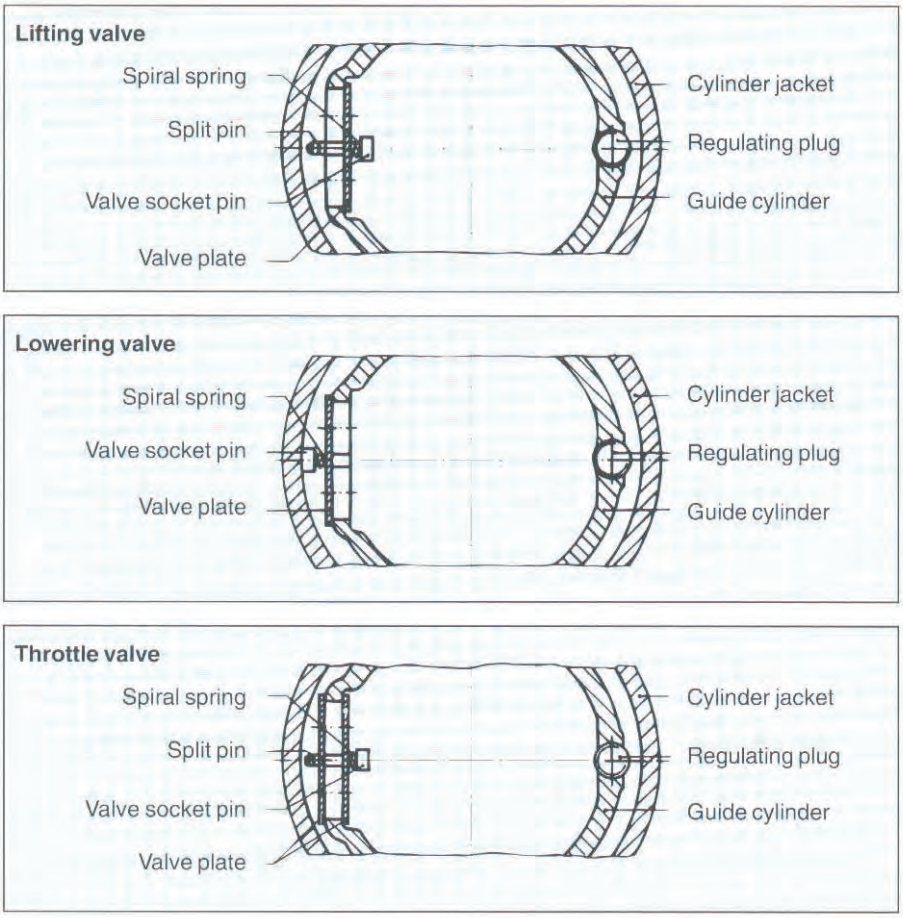
Pull-back spring C
If a pull-back spring is provided between the piston and the bottom of the guide cylinder, then the hydraulic force is opposed by the spring force. Consequently, only the difference between these two forces is available as actuating power.

Adjusting spring R/Attenuation spring R
The adjusting spring R/attenuation spring R which is mainly provided in Elhy devices used as brake magnets ensures that during braking the braking force steadily increases from the moment of contact of the brake shoes till the value for stopping is reached, i.e. very smooth braking is facilitated. When the brake is released, the braking force steadily decreases from the maximum value down to zero.

Lifting, lowering and throttle valves H, S, D
If the Elhy device is furnished with one of these three valve types, it acts as a control point in the hydraulic circuit guiding the hydraulic flow in one and/or both directions. The type of valve used most frequently in Elhy devices applied as brake magnets is the lowering valve (S) which causes a delayed return movement of the piston and, consequently, compared to the switch-off moment, a delayed action of the brake. In actuating (lifting) direction of the piston, the valve will be opened due to the flow pressure in the hydraulic circuit, thus clearing a much larger inlet cross section in the partition wall between the cylinder space above the piston and the bypass duct allowing a quick actuating (lifting) movement. During the return movement, the valve is closed by the valve springs as well as by the flow pressure, and the hydraulic fluid can only flow through the opening which is cleared by the particular position of the regulating plug.

In the version using the lifting valve (H), the valve is arranged such that it acts opposite to the direction of the hydraulic flow and, consequently, also opposite to the piston stroke.

In the version using the throttle valve (D), the valve acts in both directions, i.e. the lowering as well as the lifting direction, so that a delay is caused in both stroke directions of the piston. The setting or pull-back times which are infinitely variable are set by means of the regulating plug.



Controlled braking
Controlled braking is used to control the speed of three-phase motors independent of the load down to low speeds, e.g. in hoisting gears of assembly cranes. For this type of application, special Elhy devices are offered which should be selected in accordance with the customer's particular requirements

Service features
The actuating movement of the Elhy device is caused by a hydraulic force while the return movement is obtained under the influence of an external force (load). In devices with built-in pull-back spring, the return movement is brought about by this spring. In addition to overcoming the load, the hydraulic force must also overcome the kinetic resistances. Lifting is very smooth, because during motor start-up (lasting 0.1 to 0.15 sec.) the lifting power increases from zero as a function of the speed. Subsequently, the lifting speed is constant, even under conditions of spring loading.

Moreover, the return movement does also not commence immediately after the motor is disconnected, but approx 0.2 to 0.3 sec later. After an accelerated transition period, this motion is almost uniform, even in the case of spring loading. Just any position of the piston may be selected as home and end position. When used as a brake magnet, this feature means a great advantage with a view to brake lining wear. In the latter case, the first third of the stroke should be selected as home position when using new brake linings.

Types of duty
Elhy devices are mainly used in intermittent duty (S3). However, there are also types of application, requiring the devices to be permanently connected over extended periods of time (S1), such as travelling gear brakes which must be kept in the released position. The intermittent duty is determined by the percentage duty cycle (ED%) and frequency of operating cycles (c/h) The stress limit of the Elhy devices is determined by the heating up of components and hydraulic fluid. It is caused by losses occurring in the motor and in the pump system. Assuming an ambient temperature of +40°C, the admissible service temperatures will be below +100°C. Under conditions of high ambient temperatures (in tropical countries, installation near furnaces etc.), the type of duty shall be selected so that the admissible service temperature will not be exceeded. Otherwise the service life of the devices would be reduced. This should be considered during the design stage of the devices. Uninterrupted continuous operation of the Elhy devices leads to the highest permissible heating. In the case of intermittent duty, it should be observed that high switching rates as given in the rating table will be obtained when the drive motor is always started in the same direction of rotation In the case of reversing operation, the possible number of switching operations is much lower.

Further extras
- Textile protective hood for the lifting rod,
- Position indicator with inductive or mechanical position sensor assembled external at the Elhy,
- Position indicator with magnetical-inductive sensor integrated in the Elhy,
- internal position sensor with analogue signal along the whole stroke with integrated transmitter for the indicated values (standard output signal 4 – 20 mA, three-wire connection),
- Plug and socket connection for terminal box,
- EB-thruster usable for higher ambient temperatures up to 70°C (Please enquire),
- Pedal control unit for soft braking

Electrical Versions

The Elhy devices are equipped with a threephase asynchronous squirrel-cage motor. Use of single-phase alternating current is possible in connection with a capacitor, however, the service parameters of the device will change in such a case. The same applies to operation in connection with a frequency converter. The terminal board will be supplied with three terminal clamps (U, V, W) or, on request, with six terminal clamps for windings which cannot be clamped (such as star-delta connections). After removing the four mounting screws, the frame of the terminal box can be turned through 90° each time.

Type of enclosure
In general, the casing of the Elhy device is completely tight, consequently all built in units including the motor are protected from any adverse environmental effects. Only the terminal box is subject to evaluation of the protective system. The terminal box is made in type of enclosure IP 56. The conduit hub Pg 21 is used for cable entry (11 to 20 mm diameter of feed line) and is made to the same type of enclosure.

Versions
To satisfy various requirements of application and environmental conditions, different types and versions are available. An overview over these versions is given in the table below. All sorts of combinations are possible.

Explanations to Table 'Ratings'
The service parameters given in the Table are applicable to 380 V/50 Hz and a transformer oil filling TRF-HX at +20°C.

1) The rated stroke is the largest possible piston stroke of a particular design. For practical use, the size of stroke can be freely selected within these limits, i.e. for any home and end positions.
2) The rated regulating power is the force which is available at the lifting rod in extending direction.
3) The rated resetting force is the minimum force in the rated operating point in case of a device equipped with a pull-back spring.
4) The service point is at the end of the first third of the rated stroke.
5) Power and current consumption data refer to an operating temperature of +20°C. At lower temperatures, these values may increase.
6) In general, all devices will be supplied with hydraulic fluid filling.
7) Setting and resetting times are applicable to weight loading or loading with the pull-back spring for devices without valves in vertical or horizontal service position. Maximum admissible deviations are +10%. The switching rate indicated refers to the thermal capacity. At rated load and utilization of the entire stroke, in some cases lower than specified switching rates may occur in some cases.
8) When pull-back spring C250/C2500 or C320/C3200 is installed, the stroke is limited to 60 mm.

Note:
All devices are available for types of duty S1 and S3 up to 2000 c/h and a cyclic duration factor of max. 100% for all three-phase voltages from 200 V to 690 V for 50 or 60 Hz.
All sealing materials used are free from asbestos!

Versions

	Standard version	Tropicalized version	Low-temperature version	Version for higher ambient temperature	Marine version	Explosion-version
Symbol		T	F	ZW, W**)	M***)	EExe****)
lowest admissible ambient temperature	–25°C	–25°C	(–50°C)*) –40°C	–10°C	–25°C	–20°C
highest admissible ambient temperature	+40°C	+45°C	+40°C	+50°C +60°C +70°C	+45°C	+40°C
Hydraul. fluid	Transformer oil	Transformer oil	Silicone	Transformer oil	Transformer oil	Transformer oil
Protection against corrosion	1-fold coating	3-fold coating	3-fold coating	3-fold coating	3-fold coating	3-fold coating

*) Heating during standatill via motor winding recommended
**) With reduced max. permissible mode of operating (not S1, S3 with max. 240 c/h, duration of switch on agreed with EMG-ELTMA)
***) Marine version in accordance with regulations Germanic Lloyd or of DSRK
****) Elhy devices in explosion-proof design, type of protection "d", enclosure resistant to pressure EExdI/II BT 4 in compliance with European Standards EN 50014, 50018, 50019 are designed and maufactured as special series, compare Catalogue EExd.

Ratings

Standard series

Size	Type EB	Rated stroke 1)	Rated actuating force 2)	Spring version	Rated resetting force 3) at rated operating point 4)	Admissible deviation	Power consumption 5)	Current input 5)	Volume of operating fluid	Weight with hydraulic fluid 6)	Setting time 7)	Resetting time7)
		[mm]	[N]		[N]	[+N]	kW	A	l	kg	s	s
0	12/50	50	220									
				C 12	120	8						
				C 18	180	11	0.16	0.4	2.6	9.3	0.42	0.38
				C 22	220	11						
1	20/50	50	300									
				C 12	120	15	0.14	0.3	1.8	9.6	0.40	0.45
				C 20	200	24						
2	50/50	50	500									
				C 18	180	22						
				C 32	320	39	0.20	0.4	2.6	13.1	0.40	0.45
				C 50	500	61						
	50/100	100	500									
				C 18	130	20						
				C 32	290	50	0.20	0.4	3.2	14.5	0.75	0.70
				C 50	420	70						
3	80/60	60	800									
				C 45	450	54	0.26	0.5	4.3	19.0	0.40	0.45
				C 80	800	80						
	80/160	160	800									
				C 45	300	50	0.26	0.5	6.0	23.0	1.00	0.90
				C 80	520	75						
	125/60	60	1250									
				C 45	450	54						
				C 80	800	80	0.38	0.6	4.3	20.6	0.55	0.38
				C 125	1250	134						
	125/160	160	1250									
				C 45	300	50						
				C 80	520	75	0.38	0.6	6.0	24.2	1.35	0.80
				C 125	820	125						
	150/60	60	1500									
				C 45	450	54						
				C 80	800	80	0.40	0.7	4.3	20.6	0.65	0.35
				C 125	1250	134						
	150/160	160	1500									
				C 45	300	50						
				C 80	520	75	0.40	0.7	6.0	24.2	1.20	0.75
				C 125	820	125						
4	250/60	60	2500									
				C 70	700	70						
				C 130	1300	130	0.50	0.7	9.0	32.8	0.60	0.40
				C 200	2000	200						
	250/160	160	2500									
				C 70	510	60						
				C 130	850	130	0.50	0.7	12.2	39.5	1.50	0.85
				C 200	1360	190						
	320/100	100	3200									
				C 70	580	60						
				C 250[8)]	2300	230	0.55	0.9	10.6	39.5	1.00	0.60
				C 320[8)]	2950	295						
5	630/120	120	6300									
				C 70	580	60						
				C 250[8)]	2300	230	0.80	1.6	10.6	43.5	1.20	0.35
				C 320[8)]	2950	295						

Series EB acc. to DIN 15430

Size	Type EB	Rated stroke 1)	Rated actuating force 2)	Spring version	Rated resetting force 3) at rated operating point 4)	Admissible deviation	Power consumption 5)	Current input 5)	Volume of operating fluid	Weight with hydraulic fluid 6)	Setting time 7)	Resetting time7)
		[mm]	[N]		[N]	[+N]	kW	A	l	kg	s	s
0	120–40	40	120									
				C 6	60	9	0.13	0.4	1.2	7.5	0.21	0.25
				C 12	120	16						
	220–50	50	220									
				C 120	120	8						
				C 180	180	11	0.16	0.4	2.6	9.3	0.42	0.38
				C 220	220	11						
1	300–50	50	300									
				C 120	120	15						
				C 200	200	24	0.14	0.3	1.8	9.6	0.45	0.33
				C 270	270	24						
2	500–60	60	500									
				C 180	180	22						
				C 320	320	39	0.20	0.4	2.6	13.1	0.42	0.33
				C 500	500	61						
	500–120	120	500									
				C 180	132	16						
				C 320	300	36	0.20	0.4	3.5	14.8	0.78	0.55
				C 500	432	52						
3	800–60	60	800									
				C 450	450	54	0.26	0.5	4.3	19.0	0.37	0.40
				C 800	800	80						
	800–120	120	800									
				C 450	300	50	0.38	0.5	6.0	23.0	0.70	0.55
				C 800	520	75						
	1250–60	60	1250									
				C 450	450	54						
				C 800	800	80	0.38	0.6	4.3	20.6	0.48	0.29
				C 1250	1250	134						
	1250–120	120	1250									
				C 450	300	50						
				C 800	520	75	0.38	0.6	6.0	24.2	0.95	0.55
				C 1250	820	125						
4	2000–60	60	2000									
				C 700	700	70						
				C 1300	1300	130	0.50	0.7	9.0	32.8	0.55	0.33
				C 2000	2000	200						
	2000–120	120	2000									
				C 700	510	60						
				C 1300	850	130	0.50	0.7	9.0	32.8	1.10	0.55
				C 2000	1360	190						
	3000–60	60	3000									
				C 700	700	70						
				C 2500[8)]	2300	230	0.55	0.9	10.1	39.0	0.60	0.38
				C 3200[8)]	2950	300						
	3000–120	120	3000				0.55	0.9	10.1	39.0	1.10	0.62
5	6300–120	120	6300									
				C 700	700	70						
				C 2500[8)]	2300	230	0.80	1.6	10.6	43.5	1.20	0.30
				C 3200[8)]	2950	300						