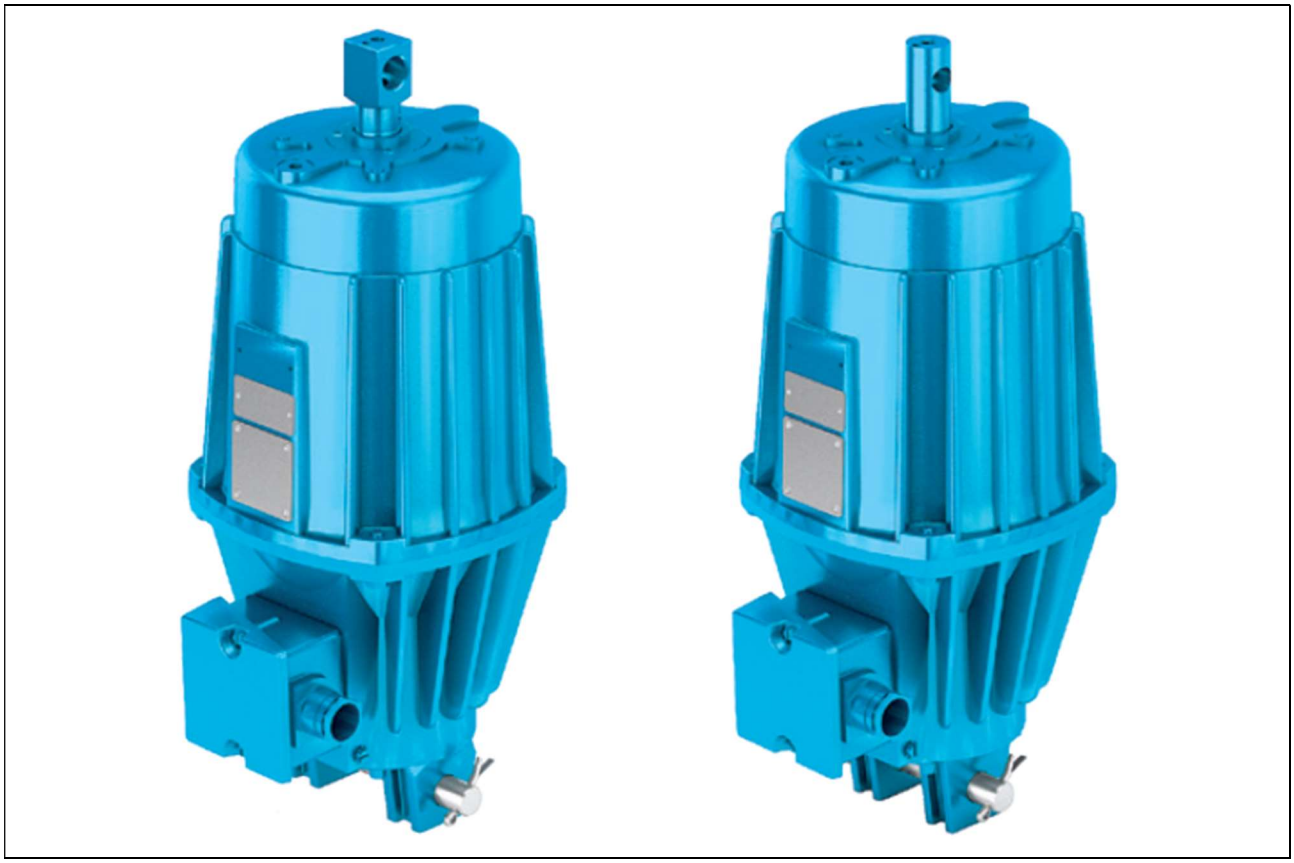
Assembly manual



General designation

ELHY® electro-hydraulic lifting devices

Type designation

EB 12 to EB 630 (TGL 35868) and EB 220 to EB6300 (DIN 15430) (three-phase version)

Status:

01.2022

EMG Automation GmbH, Industriestr. 1, D-57482 Wenden / Germany

Table of contents

1 General

1.1 Information about this assembly manual

This assembly manual was prepared according to the principles of technical editing and the minimum legal requirements of directive 2006/42/EU are used as a basis. The assembly manual enables the safe and efficient operation of the ELHY® electro-hydraulic lifting thruster (subsequently referred to as ELHY® thruster).

This maintenance manual is part of the ELHY® thruster and must be kept in its immediate vicinity and accessible to staff at all times.

The staff must have read this assembly manual carefully and understood it before starting any work.

Version	Description	Date	Author
V1.0	First draft	12/08/2021	CE Design

1.2 Manufacturer

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1.3 Validity

This manual corresponds to the technical state of the ELHY® thruster at the time of issue. The contents of this manual are not contractually binding but are provided as information.

EMG Automation GmbH reserves the right to make content and technical changes compared to this manual without having to specify these. EMG Automation GmbH cannot be held responsible for any inaccuracies or incorrect specifications in this manual, which are caused by content and technical changes after delivering this ELHY® thruster, as there is no obligation to update this manual continually.

1.4 Further applicable documents

All documents listed in the appendix (further applicable documents) to this assembly manual must be observed.

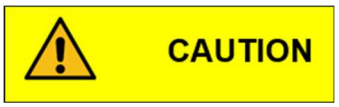
1.5 Formal information about this assembly manual

Document version: V1.0

Date: 08.2021

1.6 Format conventions

Table 1: Format conventions

Format	Meaning
1. Action	Action step with a sequence
▪	Action step / user instruction
–	List
"ABC"	Highlighting of special terms in the text
⇒	Reference to chapters or sections of this assembly manual or to further applicable documents (e.g ⇒ Technical data chapter)
	This signal word indicates an immediate threat of danger. If this danger is not avoided, this will result in death or serious injuries.
	This signal word indicates a possible danger. If this danger is not avoided, this may result in death or serious injuries.
	This signal word indicates a possibly dangerous situation. If this dangerous situation is not avoided, this may result in minor or moderate injuries.
	This signal word indicates actions for preventing property damage. Observing this information prevents damage or destruction of the ELHY® thruster.
	Supplementary information

1.7 Structure of warning notices

If observed, warning notices protect against possible personal injury and property damage and classify the extent of the danger by the signal word.

⚠ WARNING = Signal word

Source of danger

Possible consequences of non-compliance

– Measures for avoidance/prohibited actions

Hazard signs

The hazard sign indicates warning information that alerts you of personal injury hazards.

Source of danger

The source of the danger indicates the cause of the hazard.

Possible consequences of non-compliance

The possible consequences when failing to observe the warning information are bruises, burns or other serious injuries.

Measures/prohibited actions

Measures / prohibited actions contains a list of instructions that must be implemented in order to avoid a hazard or that are prohibited in order to avoid a hazard.

1.8 Terms and abbreviations

The following terms and abbreviations are used in the assembly manual.

Table 2: Terms and abbreviations

Term/abbreviation	Meaning
Brake spring	Cylindrical pressure spring that counteracts the hydraulic force. As a result, only the force difference on the lifting rod is effective as the actuating force.
CSA	Canadian Standards Association
Damping spring R (DIN)	Spring for gentle braking. This reduces the braking force by applying the brake shoes continuously until the stop value is reached. When bleeding the brake, the braking force reduces continuously from the highest value to zero (releasing the brake shoes).
DIN devices	Installation dimensions according to DIN 15430
Throttle valve D	Valve to reduce the lifting and lowering speeds
EAC	Eurasian Conformity mark
ED	Duty cycle
ELHY® thruster	Electro-hydraulic lifting thruster that converts electrical energy into mechanical energy in a straight line movement by hydraulic means
Highest value for additional load	Total of the forces that apply to the lifting rod head and that affect the lifting movement and setting time, e.g. friction and mass of the connection elements
Lifting valve H	Valve to reduce the lifting speed
Lifting time	Time from switching the motor on until the top piston limit position is reached
Nominal operating point	Operating point that is at 1/3 of the nominal lift
Nominal lift	Maximum path that the extending lifting rod can take
Nominal reset force	Minimum force at the nominal operating point for a machine with reset spring c
Nominal actuating force	Usable hydraulic force on the lifting rod head for a machine without reset spring c
Regulation braking	Braking to regulate three-phase motors to low speeds, virtually independent of the load. A pump wheel with optimum adjustment determines the hydraulic force with the nominal reset force. Thrusters for regulation braking are equipped with reset spring c and damping spring d.
Regulating spring R (TGL)	See damping spring
Reset spring c	See brake spring
Lowering valve S	Valve to reduce the lowering speed
Lowering time	Time from switching the motor off until the bottom piston limit position is reached.

Table 2: Terms and abbreviations

Term/abbreviation	Meaning
TGL thrusters	Installation dimensions according to TGL 35868
X devices	Special installation dimensions

2 Safety

ELHY® thrusters are reliable electro-hydraulic machines for use in industrial systems. They are state of the art.

The generally applicable regulations and other binding directives regarding health and safety, accident prevention and environmental protection must be adhered to.

The following safety regulations must be adhered to before beginning any work on ELHY® thrusters:

- Ensure that the industrial system is shut down
- De-energise the system
- Safeguard the system to prevent it being switched on again
- Test to ensure a de-energised state
- Cover or isolate adjacent live parts

2.1 Intended use

The ELHY® thruster is partly completed machinery and must be connected to other parts to form a complete machine. The safety of this complete machine must prevent hazards caused by controlling and operating the system.

ELHY® thrusters are used to apply straight work movements using electro-hydraulics. In drive technology, drives are braked or stopped using brakes with electro-hydraulic actuation thrusters (lifting thrusters).

The ELHY® electro-hydraulic lifting devices are used to activate a mechanical device (e.g. industrial brakes)

However, ELHY® thrusters can also be used in other areas of production, transport technology, warehousing and handling technology, wherever a straight work movement is required and a single drive is wanted. Applications as an actuator include actuating

- Valves
- Couplings
- Slides
- Throttle valves
- Locking thrusters

Intended use also includes adhering to the assembly, operating and maintenance procedures described in this assembly manual.

The technical data and the specifications for terminal assignments are specified on the type plate and in the manual, and must be adhered to.

ELHY® thrusters may only be operated in the permissible installation position and operating mode. Only this intended use is permissible. Any other use is prohibited.

2.2 Unintended use

Reasonably foreseeable misuse

Any unintended use or impermissible operating modes constitutes misuse of the ELHY® thrusters. For safety reasons, all applications not listed in the intended use section are strictly prohibited by the manufacturer.

All applications as an actuator always require confirmation from the manufacturer. Applications as actuators that cause the power supply for retracting the lifting rod to fail are not permitted due to the associated risk of accidents.

2.3 Staff qualifications

Qualified staff must be used for the ELHY® thruster's intended use. The scope of responsibility, authority and supervision of personnel must be precisely stipulated by the operating company.

Qualified staff are people who, due to their training, experience and instruction, as well as their knowledge of applicable standards, regulations, accident prevention regulations and operating conditions, are authorised by the person responsible for system safety to perform the relevant required tasks and are thereby able to identify and avoid possible hazards.

Work on or with ELHY® thrusters may only be performed by trained and qualified staff who have received system-specific instructions, who are authorised to do so and who have special knowledge and experience with the corresponding field.

Contact EMG Automation GmbH if the required staff qualifications are unclear.

2.3.1 Qualified personnel

ELHY® thrusters may only be transported, set up, connected, operated and maintained by specialists. All work must be performed with the intended, intact tools, equipment, test equipment and consumables, and must be inspected by the specialists responsible. The specialists must be authorised to perform the required tasks by the person responsible for the industrial system's safety.

Specialists include industrial mechanics or people who have comparable, country-specific training and who have the following knowledge:

- Knowledge and experience in transporting, storing, assembling and disposing of the ELHY® thrusters
- Knowledge and experience of the electrical, mechanical and hydraulic equipment on the components for the ELHY® thrusters
- ELHY® thruster functions
- Modifying the ELHY® thrusters and re-adjusting them properly
- Hazards on the system and suitable safety measures

2.3.2 Qualified electrician

Electrical specialists include electricians who,

- due to their technical training, knowledge, and experience, as well as knowledge of applicable standards and regulations, are capable of carrying out work on electrical systems
- who have been commissioned and trained by the operating company to perform work on electrical systems and equipment on the ELHY® thrusters
- are familiar with the ELHY® thruster functions
- can detect and avoid possible hazards by taking suitable safety measures.

2.3.3 Maintenance personnel

Maintenance staff include industrial mechanics or people who have comparable, country-specific training. Maintenance staff are people who have been commissioned by the operating company to maintain the system and who have the following knowledge:

- Knowledge and experience of the electrical, mechanical and hydraulic equipment on the components for the ELHY® thrusters
- ELHY® thruster functions and maintenance points
- Hazards on the system and suitable safety measures
- Lubricating, cleaning, preserving, topping up to replacing consumables
- Replacing wear parts
- Modifying the ELHY® thrusters and re-adjusting them properly

2.3.4 Responsible staff

The following table provides you with information on the staff qualifications that are the prerequisites for the corresponding tasks. Only people who have the corresponding qualification may perform these tasks.

Table 3: Responsible staff

Task	Responsible staff			Manufacturer or service partner authorised by the manufacturer
	Qualified personnel	Qualified electrician	Maintenance personnel	
Transport	x			
Assembly	x			
Electrical installation		x		
Starting up	x			
Shutting down	x			
Fault rectification	x		x	x
Electrical fault rectification		x		x
Maintenance	x		x	
Repairs	x			x
Electrical repairs		x		x
Dismantling	x			
Storage	x			
Disposal	x			x

Contact EMG Automation GmbH if the required staff responsibilities are unclear.

2.4 Personal protective equipment

The operating company must prescribe personal protective equipment according to the danger risk.

Personal protective equipment includes the following among others:

- Safety shoes, work clothing, protective clothing if required
- Protective gloves
- Hard hat
- Safety goggles

This list of personal protective equipment is not exhaustive.

2.5 Electrical operating equipment

- Work on electrical equipment must be carried out exclusively by electricians.
- When performing any work on electrical components, the five safety rules must be adhered to:
  - Disconnect from the electrical supply
  - Safeguard to prevent a restart
  - Test to ensure a de-energised state
  - Earth and short-circuit
  - Cover or isolate adjacent live parts
- Perform regular checks for insulation and housing damage.
- Never operate the ELHY® thruster with electrical connections that are faulty or not ready for operation.
- If there are power supply faults, the system must be switched off immediately.
- Before any work on electrical components, switch the mains disconnection thruster off and secure it to prevent it being switched on again.
- It is essential to observe the inspection and maintenance intervals specified by the manufacturer for electrical components.

- All touchable, conductive parts of the system are connected to the external earthing conductor system. The earthing conductor system must be inspected after performing maintenance work (e.g. replacing components).
- Some equipment (e.g. mains power units, servo controllers, converters) with electrical intermediate circuits may store residual voltage for a certain time after being disconnected. Before starting work on these systems, check that they are de-energised.

2.6 Process media

- The instructions on the manufacturer's material safety data sheets must be followed.
- Contact with eyes or the skin should be avoided.
- Avoid inhaling vapours or mist.
- Soak up any spilled or leaking process media immediately with a binding agent and dispose of it properly.
- Keep containers with flammable substances and compressed, liquefied gases away from sources of heat.

2.7 Modifications

Changes, attachments and modifications to ELHY® components, which could impair safety or functions may not be performed without written approval from the manufacturer.

2.8 Spare and wear parts

The use of spare and wear parts from third-party manufacturers may lead to risks. Only original parts or spare and wearing parts approved by the manufacturer may be used.

For information regarding replacement part orders for ELHY® types that can no longer be supplied, see the "Ordering notes for replacement thrusters" list.

3 Technical data

3.1 Type designation and type key

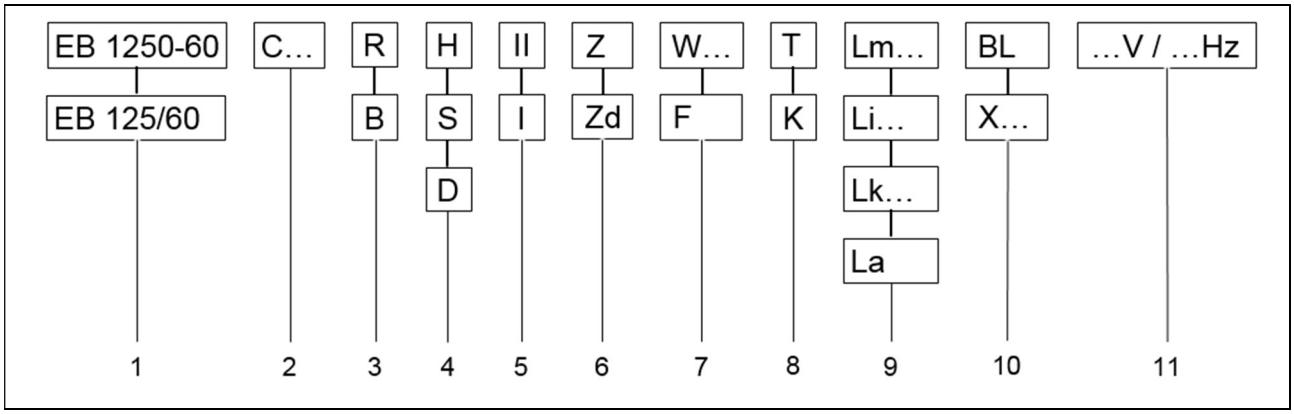


Figure 1: Type designation and type key

1 ELHY® type
2 Brake/reset spring
3 Regulating spring, version for control braking
4 Lift, lowering, throttle valve
5 Design (depending on installation position and fastening)
6 Protective cover, special scraper
7 Temperature class, low temperature version
8 Corrosion protection class
9 Sensors, limit switches
10 Adaptors, special series
11 Connection data (motor voltage / frequency)

3.2 Specifications on the type plate

Figure 2: Type plate

1	CE or CSA or CE EAC	12	Switching type
2	Thruster type	13	Current consumption
3	Equipment	14	Frequency
4	Year of manufacture/serial number	15	Weight
5	Lifting path in mm	16	Power consumption
6	Lifting force in N	17	Additional text 1
7	Switching processes per hour	18	ISO class
8	Operating mode	20	Protection category
9	Voltage	21	Temperature range
10	Switch-on duration in %	22	Return force
11	Voltage tolerance		

3.3 Characteristics

Type EB (TGL 35868)

Table 4: Identification data - Types TGL 35868 - EB 12-EB 630

ELHY® type	EB								
	12	20	50	80	125	150	250	320	630
Lifting force [N]	220	300	500	800	1,250	1,500	2,500	3,200	6,300
Lifting path [mm]	50	50	50–100	60–160	60–160	60–160	60–160	100	120
Power consumption [W]	160	180	200	300	400	400	500	600	850
Current consumption at 400 V 50 Hz [A]	0.4	0.4	0.4	0.5	0.7	0.7	0.9	1.1	1.6
Switching frequency at S3-60% ED[3)] [c/h]	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	240
Weight [kg]	12	11	14–15[1)]	19–26[1)]	19–26[1)]	19–26[1)]	33–40[1)]	40	45

1) Depending on the lifting path

Type EB (DIN 15430)

Table 5: Identification data - Types DIN 15430 - EB 220-EB 6300

ELHY® type	EB							
	220	300	500	800	1250	2000	3000	6300
Lifting force [N]	220	300	500	800	1,250	2,000	3,000	6,300
Lifting path [mm]	50	50	60–120	60–120	60–120	60–120	60–120	120
Power consumption [W]	160	180	200	300	400	500	600	850
Current consumption at 400 V 50 Hz [A]	0.4	0.4	0.4	0.5	0.7	0.8	0.9	1.6
Switching frequency at S3-60% ED[3)] [c/h]	2000	2,000	2,000	2,000	2,000	2,000	2,000	240
Weight [kg]	12	11	14–15[1)]	19–25[1)]	26	33–40[1)]	40	45

1) Depending on the lifting path

3.4 Dimensions

3.4.1 Type EB (TGL 35868)

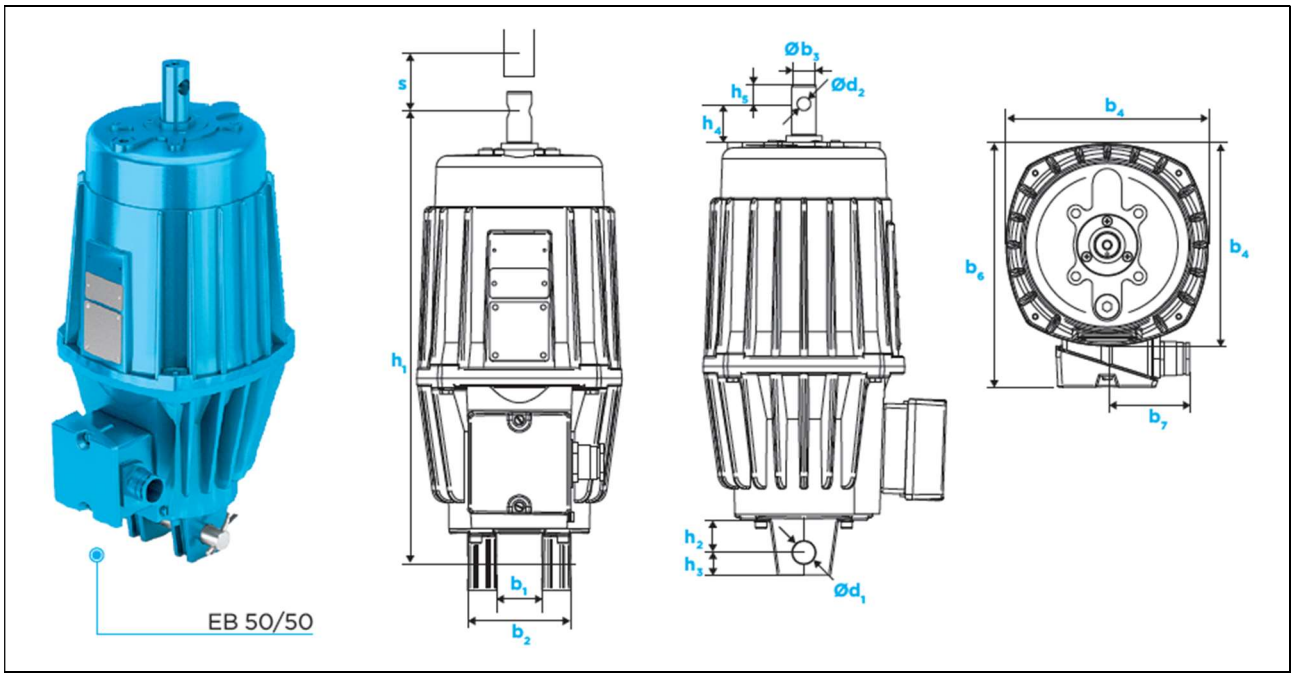


Figure 3: Types EB (TGL 35868) - Example EB 50/50

The foot attachment can be mounted offset by 90°. The thrust shackle at the top can be turned. For limit switches, a desired swivelling of the foot attachment or the thrust shackle/lifting rod head must be taken into account.

Table 6: EB 12 – EB 630 (TGL 35868) dimensions

Size	Type	s	b_1 +2	b_2 +1	b_3 e8	b_4	b_6	b_7	d_1 +0.1	d_2 F9	h_1 +/-1	h_2	h_3 +1	h_4 +/-1	h_5
0	EB 12-1[1)]	50	–	–	20	162	236	100	16.1	12	272	–	–	23	17
	EB 12-2[2)]	50	40	80	20	162	236	100	16.1	12	286	20	16	23	17
	EB 12-3[3)]	50	40	80	20	162	236	100	16.1	12	314	38	16	23	17
1	EB 20	50	40	80	21.5	150	200	100	20.2	12	380	30	20	30	17
2	EB 50	50	40	90	21.5	180	220	100	20.2	12	400	30	20	32	17
	EB 50	100	40	90	21.5	180	220	100	20.2	12	452	30	20	32	17
3	EB 80 EB 125 EB 150	60	40	90	27.5	208	232	100	20.2	16	458	30	25	36	21
	EB 80 EB 125 EB 150	160	40	90	27.5	208	232	100	20.2	16	573	30	25	36	21
4	EB 250	60	40	90	35.5	250	265	100	20.2	20	549	30	25	36	25
	EB 250	160	40	90	35.5	250	265	100	20.2	20	660	30	25	36	25
	EB 320	100	40	90	35.5	250	265	100	20.2	20	660	30	25	36	25
5	EB 630	120	40	90	35.5	250	265	100	20.2	20	660	30	25	36	25

1) Flange design

2) Basic unit with cast-on feet

3) Device with screwed-on foot plate

3.4.2 Type EB (DIN 15430)

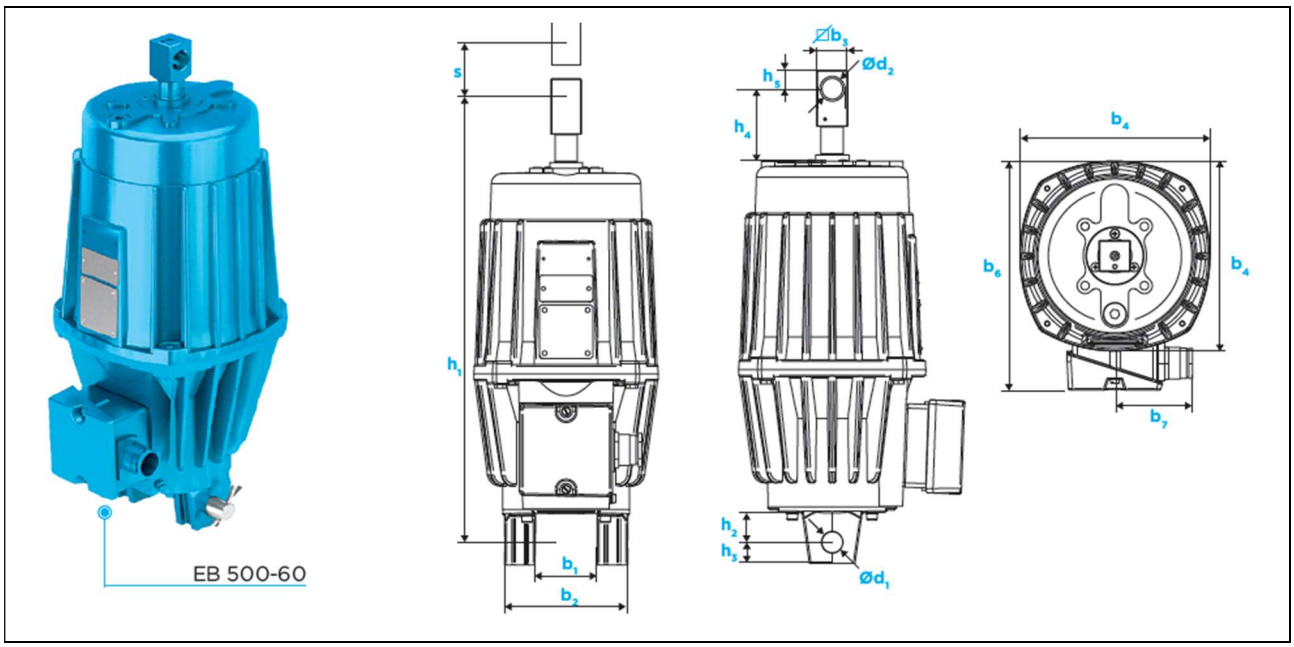


Figure 4: Types EB DIN 15430 - Example EB 500-60

Table 7: EB 120 – EB 6300 (DIN 15430) dimensions

Size	Type	s	b_1 +2	b_2 +1	b_3 e8	b_4	b_6	b_7	d_1 +0.1	d_2 F9	h_1 +/-1	h_2	h_3 +1	h_4 +/-1	h_5
0	EB 120-2[2)]	40	25	45	20	110	178	55	12.1	12	265	12	14	20	10
	EB 120-3[3)]	40	40	60	20	110	178	55	16.1	12	286	16	23	20	10
	EB 220-1[1)]	50	–	–	20	162	236	100	16.1	12	272	–	–	26	15
	EB 220-2[2)]	50	40	80	20	162	236	100	16.1	12	286	20	16	26	15
	EB 220-3[3)]	50	40	80	20	162	236	100	16.1	12	314	38	16	26	15
1	EB 300	50	40	80	25	150	200	100	16.1	16	370	18	16	32	15
2	EB 500	60	60	120	30	180	220	100	20.1	20	435	30	20	67	18
	EB 500	120	60	120	30	180	220	100	20.1	20	515	30	20	95	18
3	EB 800	60	60	120	30	208	232	100	20.1	20	458	23	22	42	18
	EB 800	120	60	120	30	208	232	100	20.1	20	530	23	22	39	18
	EB 1250	60	40	90	40	208	232	100	25.1	25	645	30	25	108	25
	EB 1250	120	40	90	40	208	232	100	25.1	25	705	30	25	168	25
4	EB 2000	60	40	90	40	250	265	100	25.1	25	645	30	25	132	25
	EB 2000	120	40	90	40	250	265	100	25.1	25	705	30	25	81	25
	EB 3000	60	40	90	40	250	265	100	25.1	25	660	30	25	36	25
	EB 3000	120	40	90	40	250	265	100	25.1	25	705	30	25	81	25
5	EB 6300	120	40	90	40	250	265	100	25.1	25	705	30	25	83	25

1) Flange design

2) Basic unit with cast-on feet

3) Device with screwed-on foot plate

Special versions based on DIN 15430

Table 8: Dimensions of special versions EB 320 - EB 3200

Size	Type	s	b_1 +2	b_2 +1	b_3 e8	b_4	b_6	b_7	d_1 +0.1	d_2 F9	h_1 +/-1	h_2	h_3 +1	h_4 +/-1	h_5
2	EB 320	50	40	80	25	180	220	100	16.1	16	385	18	16	30	18
	EB 320	100	40	80	25	180	220	100	16.1	16	493	18	16	85	18
	EB 500	50	60	120	30	180	220	100	20.1	20	435	30	20	65	18
	EB 500	100	60	120	30	180	220	100	20.1	20	515	30	20	95	18
3	EB 800	160	60	120	30	208	232	100	20.1	20	573	23	22	42	18
	EB 1250	160	40	90	40	208	232	100	25.1	25	705	30	25	168	25
	EB 1500	60	40	90	40	208	232	100	25.1	25	645	30	25	108	25
	EB 1500	160	40	90	40	208	232	100	25.1	25	705	30	25	168	25
4	EB 2500	60	40	90	40	250	265	100	25.1	25	645	30	25	152	25
	EB 2500	160	40	90	40	250	265	100	25.1	25	705	30	25	81	25
	EB 3200	100	40	90	40	250	265	100	25.1	25	660	30	25	36	25

3.5 Electrical system

3.5.1 Voltages and frequencies

All thrusters are switched to star (Y) when delivered. AC versions (with condenser for Steinmetz circuit) on request.

Standard

Table 9: Electrical voltages and frequency (standard)

Name	Values
Electrical power supply	3/N/PE AC 400/230 V
Frequency	50 Hz
Electrical power supply	3/N/PE AC 500/290 V
Frequency	50 Hz
Electrical power supply	3/N/PE AC 690/400 V
Frequency	50 Hz

Special version

Table 10: Electrical voltage and frequency (special version)

Name	Values
Electrical power supply	3/N/PE AC 110–690 V
Frequency	50/60 Hz

3.5.2 Follow-up training

Table 11: Electrics - follow-up training

Name	Values
Terminal board	6-pole
Terminal board for devices with position indicator Lk/la	M4
Supply line connection	M5
Protective conductor connection inside	M5
Protective conductor connection outside	M5
Lk/La connection	M4

3.6 Operating fluid

The operating fluid used depends on the ambient temperatures at the place of installation. For information on the dependence of the operating fluid on the ambient temperatures, see the section Operating conditions (⇒ section Ambient temperatures).

3.7 Airborne sound emissions

The A-rated emission sound pressure level for all ELHY® thrusters is 55 dB (A). This value was determined using an integrated sound pressure level measuring unit in accordance with DIN 45633 under the following measurement conditions:

- The ELHY® thruster (measurement object) ran continuously.
- The measurement object was on a table around 0.8 m above the ground
- The measurement microphone was 1.6 m above the ground.
- The diagonal gap between the measurement microphone and the measurement object was 1 m.

3.8 Operating conditions

3.8.1 Ambient temperatures

With suitable operating fluids, the ELHY® devices can be operated at the following ambient temperatures:

Table 12: Different ambient temperatures and required operating fluids

Ambient temperature range	Operating fluid	Remark
Standard range -25 °C to +40 °C	Transformer oil	The lifting times may extend by up to four times on cold thrusters. The lowering times remain unchanged.
High temperature range up to max. 80 °C	Transformer oil	The manufacturer must be contacted
Low temperature range -40 °C to +40 °C	Silicone oil	– Heating not required – The manufacturer must be contacted

3.8.2 Air humidity

Up to 100 % air humidity is permitted if special measures are taken.

3.8.3 Aggressive ambient conditions

Special measures (special paint) are required for use in aggressive ambient conditions (e.g. salty ambient air).

3.8.4 Voltage and frequency tolerances

The permissible voltage tolerances in operation are ±10 % at the measured power and measured frequency unless otherwise specified on the type plate.

The permissible frequency tolerance is ±2 %.

3.8.5 Installation height

The maximum permissible installation height is 1,000 m above sea level unless otherwise specified on the type plate.

4 Functional description

The ELHY® electro-hydraulic lifting thrusters are manufactured as different sizes (types). These individual types can be merged into the following type groups due to their common attributes.

Table 13: Type groups

Size	ELHY® type		
	TGL 35868	DIN 15430	Special versions
0		EB 120/40	
	EB 12/50	EB 220-50	
1	EB 20	EB 300	
2			EB 320
	EB 50	EB 500	EB 500
3	EB 80	EB 800	EB 800
	EB 125	EB 1250	EB 1250
	EB 150		EB 1500
4		EB 2000	
	EB 250		EB 2500
		EB 3000	
	EB 320		EB 3200
5	EB 630	EB 6300	

4.1 Mechanical layout

The ELHY® thruster combines all structural elements of a complete hydraulic system in one structural unit. This comprises a three-phase asynchronous motor, a closed hydraulic system and the work cylinder with piston and lifting rod. The hydraulic system's operating fluid is used to generate the force.

4.1.1 Type group up to EB 2500

The ELHY® thrusters (type groups to EB 2500) are equipped with a single-stage hydraulic pump.

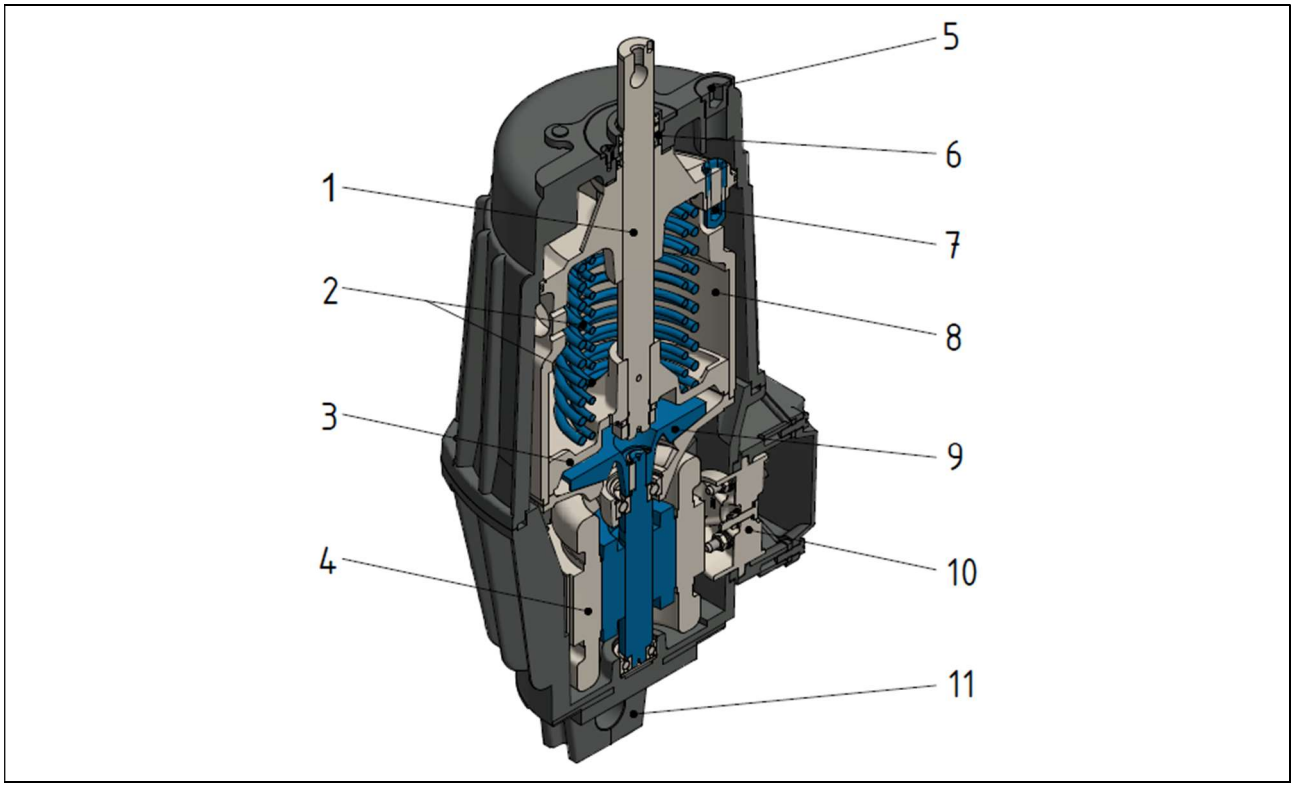


Figure 5: ELHY® thruster layout - Type group up to EB 2500

1	Lifting rod	7	Regulating plug
2	Brake spring (C-spring)[1)]	8	Guide cylinder
3	Piston	9	Hydraulic pump
4	Two-pole three-phase asynchronous motor	10	Junction box
5	Oil filling opening	11	Foot attachment
6	Sealing system		

1) Additional equipment

4.1.2 Type group from EB 3000

The ELHY® thrusters (type groups from EB 3000) are equipped with a two-stage hydraulic pump.

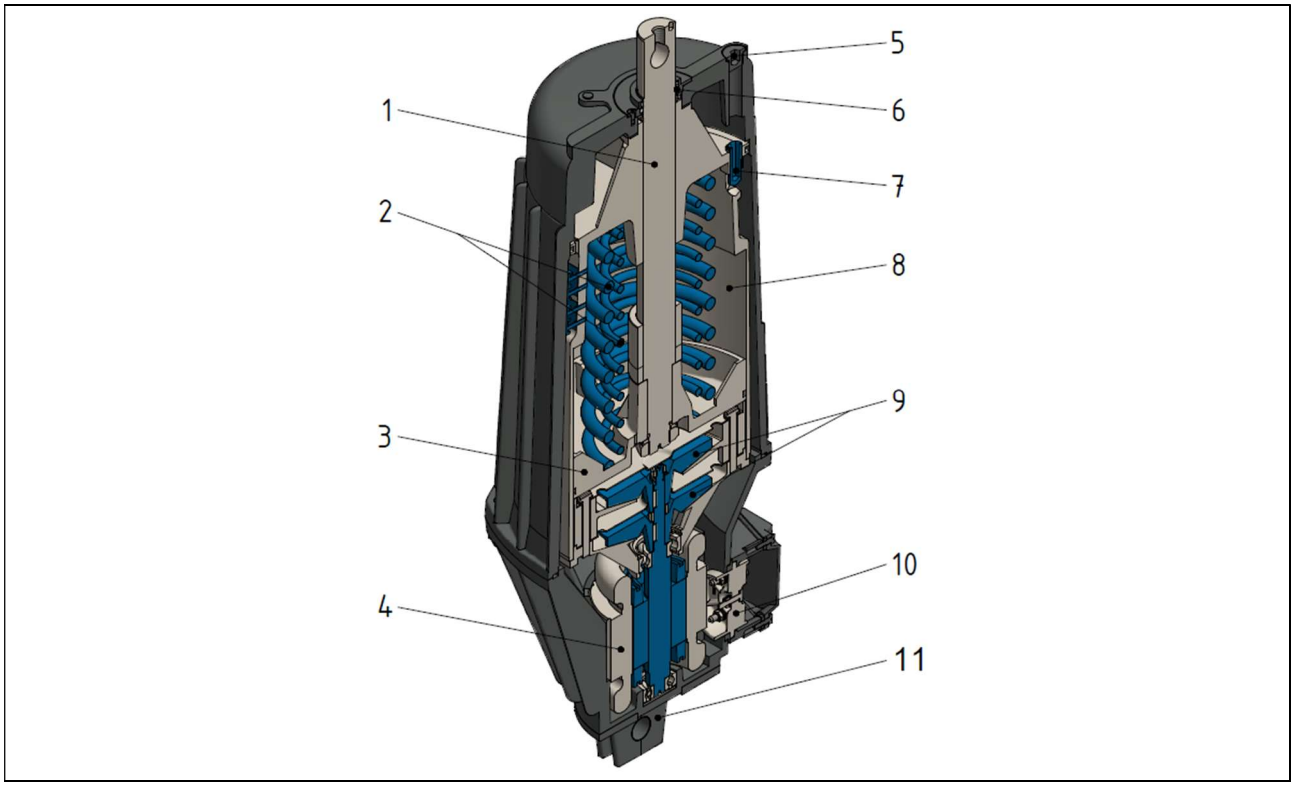


Figure 6: ELHY® thruster layout - type groups from EB 3000

1	Lifting rod	7	Regulating plug
2	Brake spring (C-spring)[1)]	8	Guide cylinder
3	Piston	9	Hydraulic pump
4	Two-pole three-phase asynchronous motor	10	Junction box
5	Oil filling opening	11	Foot attachment
6	Sealing system		

1) Additional equipment

4.1.3 Mechanical equipment

Installation positions

Table 14: Installation positions/features

Installation position	Features
Vertical	Lifting rod, upwards: without restrictions
Vertically suspended	Lifting rod, downwards: Note the operating mode If necessary, consult EMG Automation GmbH
Horizontal and intermediate positions	Device type plate on the side! If necessary, consult EMG Automation GmbH

4.1.4 Protective measures

- Redundant dust protection seal
- QPQ piston rod
- Protective cover against external mechanical influences

4.2 Electrical equipment

A three-phase asynchronous motor is used for the drive. The power supply is provided via screw terminals that are located in a junction box.

4.2.1 Motor

- Two-pole three-phase asynchronous motor
- Standard insulation according to insulation class F
- Special version in insulation class H

4.2.2 Operating modes

- Continuous operation S1 and intermittent operation S3 - 100 % ED (duty cycle) standard
- Differing technical values for ambient temperatures > 40 °C

For further information on the deviating technical values, please contact EMG Automation GmbH.

4.2.3 Junction box

Information on the connections can be found in the technical data (⇒ chapter Technical data, section Follow-up training).

Cable entry

The junction box is equipped with an M25 x 1.5 cable infeed for the following line parameters:

- Cable diameter 7.5 mm to 18 mm, with protection class IP66 for cable diameters from 11 mm to 16 mm
- Conductor cross-sections up to 4 x 2.5 mm^2

4.3 Additional mechanical and electrical equipment

4.3.1 Lift, lowering or throttle valve (H, S, D)

- With a built-in lifting, lowering or throttle valve, the lifting or lowering times as well as both times together can be extended continuously. The adjustable minimum values reach 10 to 20 times the normal values.
- Installed valves in the “Open” position result in the following prolongation of the lifting and lowering times:
  - on short lifting devices from approx. 0.4 to 1.0 seconds
  - on long lifting devices from approx. 0.7 to 2.0 seconds.
- The desired lifting and/or lowering time is set from the outside of the ELHY® thruster in an upright position.

Quick lowering circuit

By using three-phase motor capacitors or by short-circuiting the stator winding via a contactor, the lowering times are reduced by approx. 15 %.

4.3.2 Regulating/damping spring (R/D-spring)

Assembly mounted on the head of the lifting rod for damping the aperiodic transient oscillation of the brake (special application: Regulation braking).

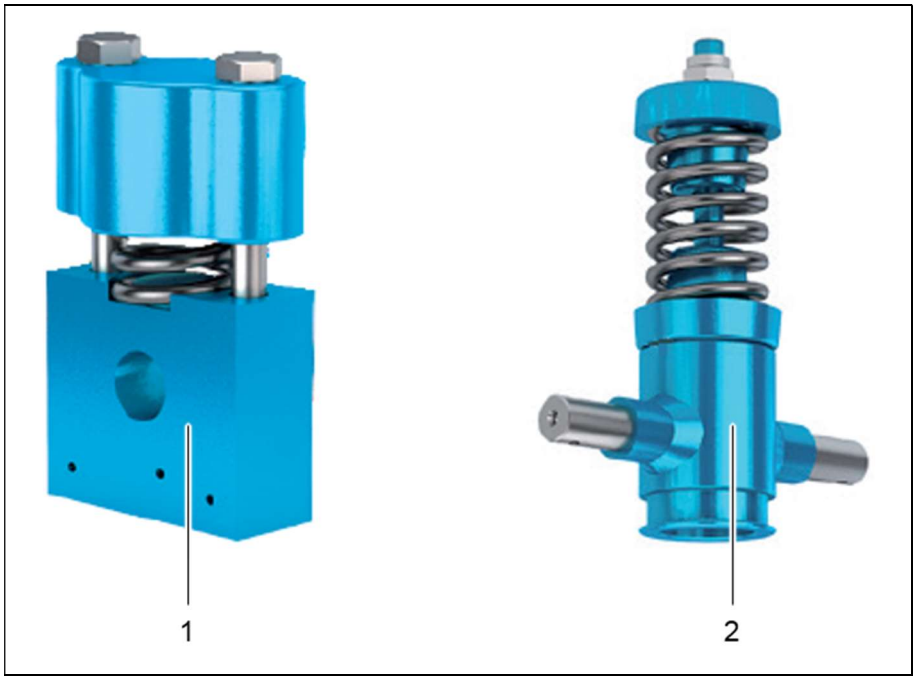


Figure 7: Regulating/damping spring (R/D-spring)

1 D-spring (DIN 15430)
2 R-spring (TGL 35868)

- Damping of the load changes when the brake is applied
- The R/D spring is only effective in conjunction with a C-spring.
- The installation dimension “h1” of the thruster does not change.
- When determining the operating point of the brake, the spring characteristic curve must be taken into account.
- Main application: ELHY® regulating brake

4.3.3 Brake spring (C-spring)

The built-in C-spring is used to generate the braking force. The specified braking force of the C-spring is achieved at 0 to maximum of the nominal stroke.

Versions with brake spring (C-spring)

Table 15: Versions with brake spring (C-spring) - TGL 35868 / DIN 15430 series

TGL 35868 series		DIN 15430 series	
ELHY® type	**Brake spring force [N]**	**ELHY® type**	**Brake spring force [N]**
EB 12/50 C12	110–160	EB 220-50 C220	200–290
EB 20/50 C20	220–260	EB 300-50 C270	260–310
EB 50/50 C32	370–450	EB 500-60 C500	540–680
EB 50/50 C50	540–680	EB 800-60 C800	740–1060
EB 80/60 C80	740–1060	EB 1250-60 C1250	1200–1630
EB 125/60 C125	1200–1630	EB 2000-60 C2000	1900–2500
EB 150/60 C125	1200–1630	EB 3000-60 C3200	2540–3690
EB 250/60 C200	1900–2500		
EB 320/100 C320	2540–3690		

4.3.4 Heating

Down to -25 °C (hydraulic medium: transformer oil) or down to -40 °C (hydraulic medium: silicone oil), heating of the ELHY® thruster is not necessary. For extreme operating temperatures (below -50 °C), preheating can be implemented via the motor winding.

EMG Automation GmbH must be contacted for further information.

4.4 Position indicators

4.4.1 Sensors

Analogue displacement sensor (La)

Table 16: Analogue displacement sensor (La) - parameters

Parameters	Value/size
Installation location	Installed internally, observe connection diagram in terminal box
Connection	Terminal board (optional plug connection)
Measuring amplifier	Integrated
Output	4–20 mA
Supply voltage	17–30 V DC

Magnetic inductive sensors (Lk...*)

Table 17: Magnetic inductive sensors (Lk...*) - parameters

Parameters	Value/size
Installation location	Installed internally!
Connection	Terminal board (optional plug connection)
Contact	N/O contact (optionally N/C contact or N/C contact and N/O contact)
Switching output, max.	10 W
Switching voltage, max.	250 V AC/DC (NC contact only up to 150 V)
Switching current, max.	0.5 A
Service life, max.	10^5 to 10^6 circuits (depending on load conditions)

* Number of signal generators and signal contents:

2 1xSG, lifting rod extended

5 1xSG, lifting rod retracted

7 1xSG, function-dependent intermediate position

3 2xSG, lifting rod extended + lifting rod retracted

4 2xSG, lifting rod extended + function-dependent intermediate position

6 2xSG, lifting rod retracted + function-dependent intermediate position

For detailed information and availability of the respective sensor version, please contact EMG Automation GmbH.

4.4.2 Limit switches

Standard switches are used as limit switches (other switch types optionally possible).

Mechanical limit switches (Lm...*)

Table 18: Mechanical limit switches (Lm...*) - parameters

Parameters	Value/size
Type	M3R 330-11y (Schmersal)
Voltage	24–250 V AC/DC
Rated current	2.5 A
Continuous current, max.	6 A
Switching voltage, max.	250 V AC/DC
Contact	Changer
Protection category	IP65

Inductive limit switches (Li...*)

Table 19: Inductive limit switches (Li...*) - parameters

Parameters	Value/size
Type	BI 15-CP40-FZ3X2 (Turck)
Voltage	20–250 V AC/DC
Output current, max.	300 mA
Contact	NC or NO contact, programmable
Switching distance	15 mm
Protection category	IP66

* Number of signal generators and signal contents:

2 1xSG, lifting rod extended

5 1xSG, lifting rod retracted

7 1xSG, function-dependent intermediate position

3 2xSG, lifting rod extended + lifting rod retracted

4 2xSG, lifting rod extended + function-dependent intermediate position

6 2xSG, lifting rod retracted + function-dependent intermediate position

For detailed information and availability of the respective limit switch version, please contact EMG Automation GmbH.

4.5 Function sequence

The hydraulic pump driven by the motor conveys the hydraulic medium into the space below the piston. This generates hydraulic pressure that acts outwards via the piston and lifting rod.

The piston and lifting rod move backwards after the motor is switched off either due to a force acting from the outside (brake weight, brake spring) or due to the integrated reset spring. The lifting force that is available to the user of the ELHY® thruster is therefore always the difference between the generated hydraulic force and any external or internal counterforce.

The lifting and lowering times depend on both the load and the viscosity of the hydraulic medium, which is in turn affected by the ambient and operating temperatures. In the versions with lifting, lowering or throttle valves, the setting/resetting speed of the lifting rod and therefore the lifting and lowering times can be adjusted infinitely within a specific range.

If the piston is in the limit position (e.g. in continuous mode S1), the motor's power consumption reduces due to hydraulic laws. This prevents the ELHY® thruster overloading and a thermal protective switch is therefore not required.

5 Transport and storage

5.1 Transport

⚠ CAUTION

The ELHY® thrusters weigh between 8 and 45 kg

Risk of injury when lifting the load manually

- Use suitable lifting equipment (e.g. crane).
- Never remain below suspended loads.
- Use a transport aid (e.g. lifting carriage) with sufficient load bearing capacity.

⚠ CAUTION

Falling ELHY® thruster

Risk of injury due to a falling ELHY® thruster during transport.

- Wear safety shoes

NOTICE

Do not damage the fastening eyes and the lifting rod when setting down. The lifting rod must be protected in a suitable way.

The ELHY® thrusters are packed so that transport damage will not occur under normal transport conditions. The packaging requires corresponding labels

The delivery must be checked for transport damage and completeness immediately upon receipt.

If there is clearly visible transport damage, proceed as follows:

- Do not accept the deliver or accept it with reservations.
- Note the extend of the damage on the transport documents or on the carrier's delivery note.
- Declare the faults.

Declare every fault as soon as it is discovered. Claims for damage can only be made within the legal warranty period.

5.1.1 Transport sketch

Attach a suitable load carrying thruster to the attachment point to transport using lifting gear.

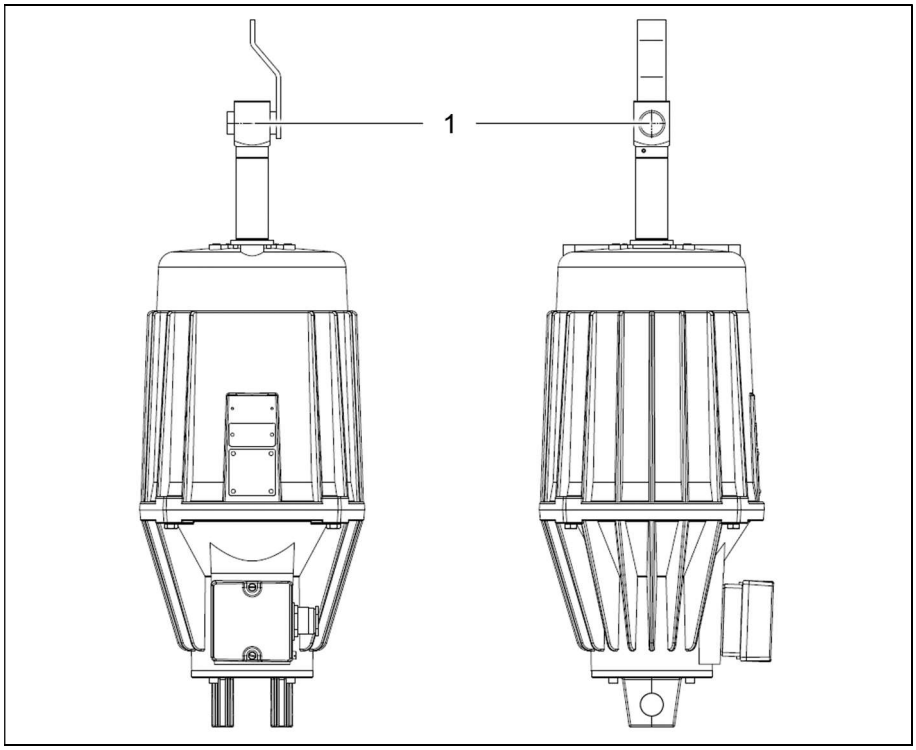


Figure 8: Attachment point

1 Attachment point

5.2 Storage

The ELHY® thrusters can be transported or stored upright or lying down until commissioned. After storing for more than 6 months, we recommend storing the ELHY® thrusters upright. Even though the thrusters are basically suitable for installation outdoors, we recommend taking protective measures against the effects of weather while storing.

NOTICE

If stored for an extended period, the regulations for storage conditions and storage periods for rubber materials and moulded items must be observed with regard to sealing. Even when installed, the seals that were stored for too long lose their elasticity and therefore their full function.

6 Assembly and installation

The following safety regulations must be adhered to before beginning any work on ELHY® thrusters:

- Ensure that the industrial system is shut down
- De-energise the system
- Safeguard the system to prevent it being switched on again
- Test to ensure a de-energised state
- Earth and short-circuit
- Cover or isolate adjacent live parts

6.1 Assembly

The ELHY® thruster may only be assembled by specialists (e.g. industrial mechanics/electricians) with many years of experience.

WARNING

Cylinder movements

Risk of crushing between surrounding hindrances and the cylinder or connected components.

- When assembling, ensure sufficient free space to prevent crushing.
- Take alternative measures to safeguard this hazard point.

WARNING

Hot surface

During operation, the surface of the lifting device can heat up to 100 °C. If there are components in the direct vicinity that are not designed for these temperatures (low ignition temperature), there is a danger of fire.

Contact may cause burns

- Pay attention to the high temperatures during planning and assembly (minimum distances, avoid heat accumulation).
- The lifting device must be positioned so that it cannot be reached during operation.

⚠ CAUTION

The ELHY® thrusters weigh between 8 and 45 kg.

Risk of injury when lifting the load manually.

- Use suitable lifting equipment (e.g. crane).
- Never remain below suspended loads.
- Use a transport aid (e.g. lifting carriage) with sufficient load bearing capacity.

⚠ CAUTION

Sudden power failure or switch-off due to any c springs, brake springs, brake weights that may be installed or due to other external influences

Risk of crushing due to the lifting rod.

- Before removing the ELHY® thrusters, the downstream drive must be secured, as the lifting rod retracts automatically.

NOTICE

The lifting rod must not be damaged or contaminated, e.g. by paint as a result of painting the entire system. A failure to observe this will destroy the lifting rod.

NOTICE

The fastening bolts on the foot hole and the lifting rod must be secured reliably to prevent them slipping out (e.g. using cotter pins).

NOTICE

The ELHY® thruster must not be subjected to any loads at an angle to its working direction. If installed upright, there must be no additional load beyond its own weight.

When replacing old ELHY® thruster versions with thrusters with the current version, the manufacturer must be contacted due to the different installation dimensions.

6.1.1 Permissible installation positions

ELHY® thrusters may be installed vertically, horizontally and in angled positions in accordance with the following illustration. The type plate must always be at the top. This is important, as the compensation space that is below the type plate must always be at the top.

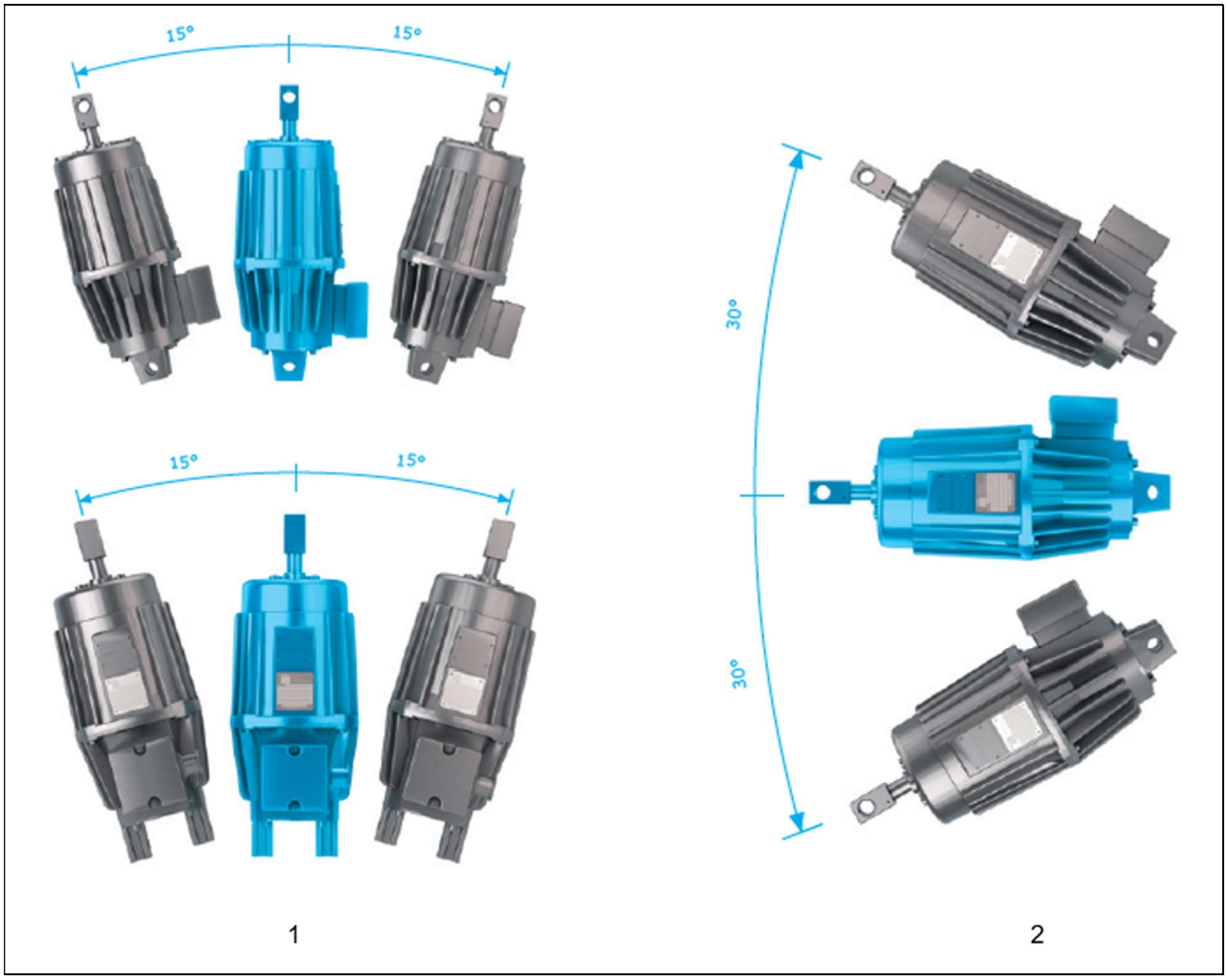


Figure 9: Permissible installation positions

1 Vertical installation position

2 Horizontal installation position

If a horizontal installation position with the junction box arranged on the side or underneath is required due to the space available for example, the manufacturer must modify the ELHY® thruster.

6.1.2 Installing the ELHY® thruster

To attach the ELHY® thruster, there are fastening eyelets on the motor housing and holes in the lifting rod, which can be used with suitable bolts to establish the connection to the equipment to be operated (e.g. brakes).

The diameter and length of the required bolts are specified in the dimension tables (⇒Technical data chapter, Dimensions section).

When selecting or measuring the bolts (by the customer) the required pivoting ability of the ELHY® thruster must be observed.

The ELHY® thruster is installed in the following steps:

- Use lifting gear to move the ELHY® thruster to the required installation location.
- Grease the bolt slightly in order to prevent it rusting tight.
- Insert the bolt into the foot hole.
- Insert the bolt into the thrust shackle hole.

NOTICE

Both bolt axes must be parallel as otherwise, the lifting rod jams and the thruster's free power development is not guaranteed.

- Use cotter pins or similar to secure the bolts to prevent them slipping out.

6.2 Electrical connection

DANGER

Live components

Fatal electric shock or serious burns

- Work on live components may only be performed by electricians.
- When performing any work on electrical components, the five safety rules must be adhered to:
  - 1. Disconnect from the electrical supply
  - 2. Safeguard to prevent a restart
  - 3. Test to ensure a de-energised state
  - 4. Earth and short-circuit
  - 5. Cover or isolate adjacent live parts
- The earthing conductor must always be connected before all other cables.
- Electrical power may only be supplied once the earthing conductor is connected.

Standard requirements must be observed when connecting the ELHY® thruster.

Before connecting, check whether the mains voltage and the mains frequency correspond to the specifications on the type plate.

6.2.1 Junction box and terminal diagram

There is a connection diagram in the terminal box cover. The motor is voltage switchable for delta connection (Δ) or star connection (Y). On delivery, the devices are connected in star connection (Y). The phase sequence for the connection is arbitrary.

6-pin terminal board

Terminal diagram:

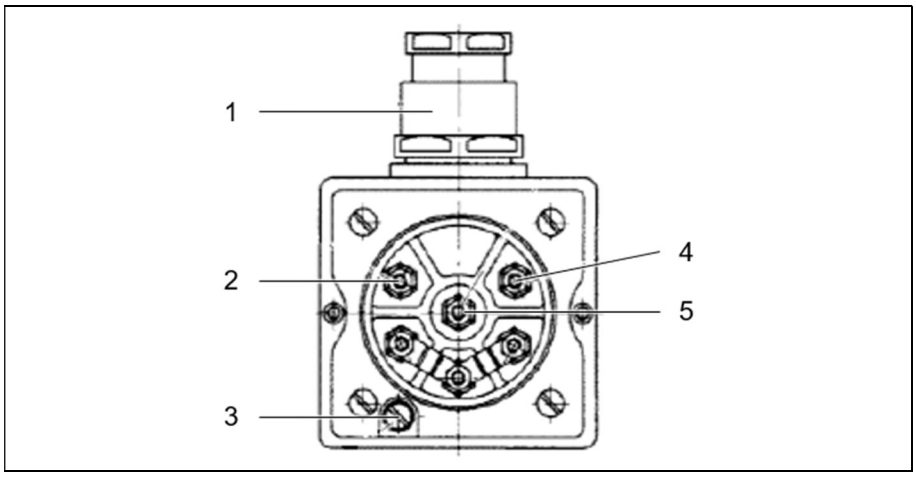


Figure 10: 6-pin terminal diagram (dual voltage)

1 Screwed connection for motor cable M25 x 1.5
2 L1
3 PE earthing conductor terminal
4 L2
5 L3

Terminal board 3-pole with position indicator Lk/La

Terminal diagram:

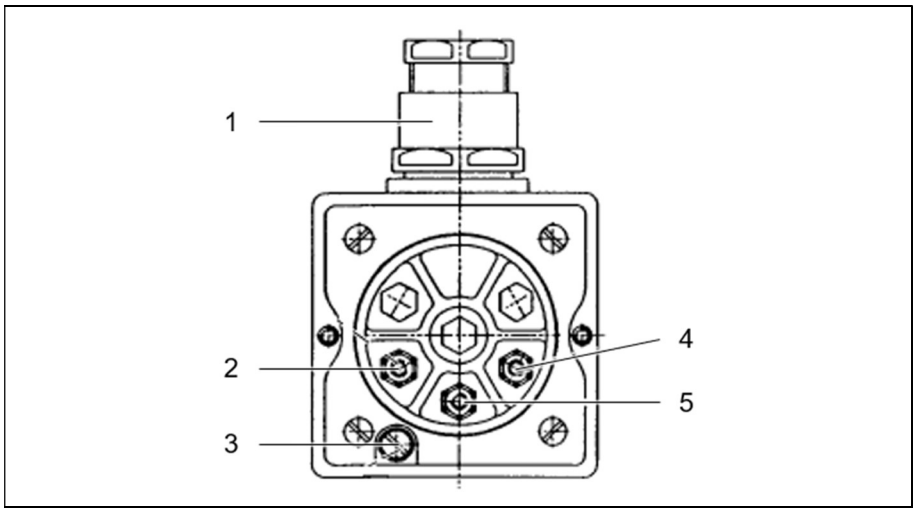


Figure 11: 3-pin terminal diagram (single voltage)

1 Screwed connection for motor cable M25 x 1.5
2 L1
3 PE earthing conductor terminal
4 L2
5 L3

6.2.2 Earthing conductor connection

NOTICE

If the external earthing conductor connection is used, the thruster's pivoting ability and the surface temperature must be considered.

- The earthing conductor must always be connected before all other cables.

There is one earthing conductor in the junction box (⇒Junction box and terminal diagram section) and one in the immediate vicinity of the junction box on the outside of the ELHY® thruster. The earthing conductor must be installed on the ELHY® thruster in accordance with the applicable standards. The purpose of the earthing connector is to reduce the contact voltage in the event of coil or insulation damage to a safe amount and to switch the system off in conjunction with monitoring equipment. This can only be achieved by measuring the earthing conductor sufficiently, installing it properly and ensuring that it is intact.

6.2.3 Power supply connection

NOTICE

Before connecting, check whether the mains voltage and the mains frequency correspond to the specifications on the type plate.

Always keep the junction box clean.

Check that the sealing elements on the junction box are intact and tight.

Always lock the junction box cover after connecting.

The M 25x 1.5 cable insert must be provided by the operating company properly in accordance with the IP protection class specified on the type plate.

Due to hydraulic laws, the motor's power consumption reduces when the piston has reached the limit position. This prevents overloading. A thermal protective switch is therefore not required. If a motor protection switch is used to safeguard the ELHY® thrusters despite this, we recommend adjusting the thermal overcurrent trigger to 1.5 times the thruster current according to the type plate.

Electrical power may only be supplied once the earthing conductor is connected and can be provided as a fixed cable if the thruster is arranged stationary.

If using a quick lowering switch (capacitors) and a motor protection switch, the overcurrent trigger must be adjusted after consulting EMG Automation GmbH.

A pivoting arrangement requires a flexible cable. A minimum cable cross section of 1.5 mm^2 must be provided for all thruster sizes. The connection terminals permit a maximum cable cross section of 2.5 mm^2. When selecting the cables, the ambient conditions (e.g. temperature, humidity) at the installation location must also be considered.

The junction box is equipped with an M25 x 1.5 cable infeed (cable diameters from 7.5 mm to 18 mm) for cable cross-sections up to 4 x 2.5 mm^2.

- The supply lines are always connected in accordance with the switch diagrams on the inside of the junction box cover (⇒Junction box and terminal diagram section).
- Only connection cables with a temperature approval of at least 110°C may be used.

Unless ordered differently, all three-phase motors are wired for a star connection as delivered from the factory. If required, the user can reconnect the bridges (⇒ Junction box and terminal diagram section) to also operate the motors in delta connection. The motor's phase sequence and therefore its direction of rotation do not matter.

6.3 Adjusting the valves

When the ELHY® thrusters are delivered, both the actuating time and the reset time are not set, i.e. the valves are open a few turns. The setting times depend on the temperature and must be adjusted when the machine is at operating temperature.

The versions with lifting and/or lowering valves enable the lifting rod's set or reset speed (setting or resetting time) to be adjusted infinitely within a specific range. The type designation on the type plate specifies whether an ELHY® thruster is equipped with valves (see type plate; ⇒Type designation and type key section).

Examples for the version with valves:

- Lowering valve (S): e.g. EB 50/50 S
- Lifting valve (H): e.g. EB 800-60 H
- Throttle valve (D): e.g. EB 125/60 D

All thrusters can be equipped or modified with valves retrospectively by the manufacturer.

6.3.1 Setting times

Table 20: Setting times - TGL 35868 / DIN 15430 series

TGL 35868 series			DIN 15430 series		
ELHY® type	Adjustable lowering time		ELHY® type	Adjustable lowering time	
	min. s	max. s		min. s	max. s
EB 12/50… S	1.3	11.0	EB 120-40… S	0.5	15.0
EB 20/50… S	1.5	6.0	EB 220-50… S	1.3	11.0
EB 50/50… S	0.8	6.0	EB 300-50… S	0.8	6.0
EB 80/60… S	1.3	11.0	EB 500-60… S	1.0	7.0
EB 125/60… S	1.2	9.0	EB 800-60… S	1.3	10.0
EB 150/60… S	1.1	8.0	EB 1250-60… S	1.2	9.0
EB 250/60… S	2.0	10.0	EB 2000-60… S	1.3	8.0
EB 50/100… S	1.5	10.0	EB 3000/60… S	1.2	6.0
EB 80/160… S	2.5	15.0	EB 500-120… S	1.8	12.0
EB 125/160… S	2.3	14.0	EB 800-120… S	2.4	14.0
EB 150/160… S	2.2	13.0	EB 1250-120… S	2.2	13.0
EB 250/160… S	3.5	15.0	EB 2000-120… S	2.8	12.0
EB 320/100… S	2.5	11.0	EB 3000-120… S	2.5	10.0
			EB 6300-120… S	2.0	8.0

6.3.2 Adjustment screw installation location

The installation location for the adjustment screws is specified on the dimensional drawings (⇒ Dimensions section).

The adjusting screw (also regulating screw) in this case is a screw plug. It is used to set the lifting and lowering time or both simultaneously.

6.3.3 Changing the set time and the reset time

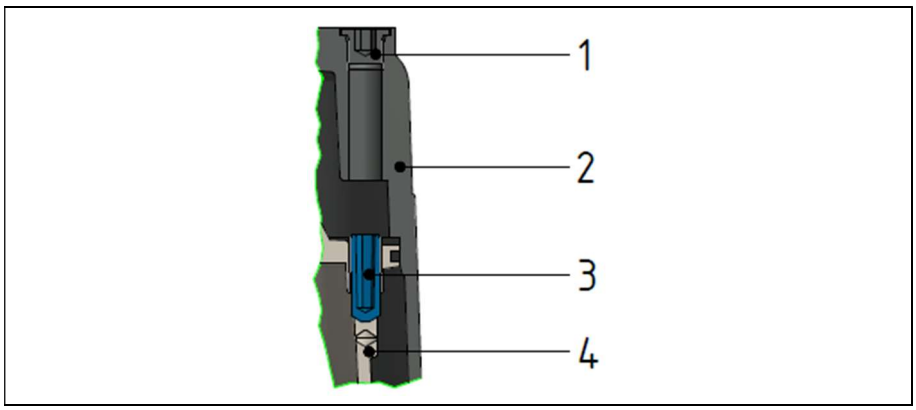


Figure 12: Lifting/lowering valve adjustment parts

1 Screw plug
2 Cylinder casing
3 Regulating plug
4 Guide cylinder

Turning the regulating plug (3) clockwise increases the lifting or lowering time.

Turning the regulating plug (3) anticlockwise reduces the lifting or lowering time.

- Unscrew screw plug (1).
- Turn the regulating plug (3) to set the required set or reset time
- Screw in screw plug (1).

6.4 Completing assembly

After completing assembly, check that the earthing conductor system is consistent.

7 Notes on operation

WARNING

ELHY® thrusters can reach housing surface temperatures of up to 100 °C in continuous mode or in switching mode S3.

Risk of burns on the housing surface

- Avoid touching the housing surface during operation.
- Wear safety gloves.

WARNING

Component failure

Risk of injury due to component failure

- There is the risk of individual components breaking when operating the ELHY® thruster. The lifting force failure can pose subsequent hazards.
- The operating parameters must be adhered to.
- The ELHY® thruster must be installed so that no forces can be applied at an angle to the working direction.

WARNING

Cylinder movements

Risk of crushing between surrounding hindrances and the cylinder or connected components as a result of the cylinder retracting automatically due to the reset spring with a hydraulic pressure drop, or if the power supply is interrupted.

- Switching the motor off returns the cylinder to the limit position.
- When assembling, ensure sufficient free space to prevent crushing or take other measures to safeguard the hazard point.
- Before removing the ELHY® thruster, the connected unit such as the brake must be secured to prevent movement.

Never operate the ELHY® thruster with electrical connections that are faulty or not ready for operation.

The junction box must always be locked. Access must only be granted to authorised staff who have received corresponding training and safety briefings.

If there are power supply faults, switch the ELHY® thruster off immediately.

7.1 Checking the operating conditions prior to starting up

- The ELHY® thruster is assembled and connected according to regulations (⇒Assembly and installation section).
- The permissible voltage and frequency tolerances are adhered to (⇒Technical data chapter, Voltage and frequency tolerances section).
- The ELHY® thruster is filled with the operating fluid prescribed for the usage conditions (⇒ Technical data chapter, Ambient temperature and installation height section) and for the version, and has the required fill level (⇒Maintenance chapter, Operating fluid section).
- The ELHY® thruster is protected against contamination.
- The fastening bolts on the thrust shackle and the foot attachment must be secured to prevent them moving inadvertently (e.g. using locking pins).
- The axes are parallel.

8 Help with malfunctions

If used as intended, no typical malfunctions can occur on the ELHY® thruster.

However, malfunctions can occur due to wear or misuse. Malfunctions on the ELHY® thruster may only be rectified when the system is stopped, disconnected from the power supply and the movements have come to a standstill.

Observe the Assembly and Disassembly chapters for information on troubleshooting.

8.1 Faults and troubleshooting

Table 21: Faults and troubleshooting

Fault	Possible cause	Measure
ELHY® thruster does not lift	Motor not running: Supply line interruption	Search for the interruption and rectify
	Motor not running: Switched off by trigger, e.g. motor protection switch	Check the motor protection switch and fuse elements
	Motor not running: Cable connections have poor contact	Clean corroded contacts
	Motor not running: Rotor is blocked in the stator within the bearing or close to the running wheel (pump)	Replace the thruster and send to the manufacturer for repair
	Thruster loaded too heavily: Too great an external load in addition to the brake and reset spring	Adjust the load on the thruster
	Lack of operating fluid	Top up the operating fluid
	Lifting rod jammed from the outside	Rectify the jam/twisting or lateral forces in the thrusters to be driven
The ELHY® thruster lifts slowly, hesitantly, jerkily	Thruster loaded too heavily: Too great an external load in addition to the brake and reset spring	Adjust the load on the thruster
	Lifting rod jammed from the outside	Rectify the jam/twisting or lateral forces in the thrusters to be driven
	Supply line interruption (two-phase operation)	Search for the interruption and rectify
The ELHY® thruster lifts slowly, hesitantly, jerkily	Air in the pump circuit	Actuate the thrusters a few times when stopped and top up the operating fluid if required
		Check the thruster's installation position and version

Table 21: Faults and troubleshooting

Fault	Possible cause	Measure
	Lack of operating fluid	Top up the operating fluid
Operating fluid escapes	On the lifting rod seal	Replace the thruster and send to the manufacturer for repair
	On the filling screw	Check sealing ring, tighten filler plug
	At the separation level between hydraulic and motor housing	Tighten screw connection
Rattling, metallic noise	Ball bearing damaged	Replace the thruster and send to the manufacturer for repair
Motor protection switch or fuse elements tripped	Short-circuited coil, phase leakage or short circuit	Check the motor's resistors and insulation, replace the thruster and send to the manufacturer for repair if required
Increased current consumption, cause	Between two phases: Short-circuited coil	Measure the resistance, replace the thruster and send to the manufacturer for repair if required
	Between all phases: Rotor is grinding or stuck	Replace the thruster and send to the manufacturer for repair

9 Maintenance

Maintenance work on the ELHY® thruster may only be performed when:

- the system is stopped.
- the system has been disconnected from the power supply and secured to prevent a restart.
- the movements have come to a standstill.
- the ELHY® thruster has cooled off.

Maintenance work may only be performed by instructed specialists (maintenance staff).

9.1 Maintenance tasks

WARNING

Hot surface

Stored residual heat poses a risk of burns if you touch the housing surface

- ELHY® thrusters can reach housing surface temperatures of up to 100 °C in continuous mode or in switching mode S3.
- The ELHY® thruster must cool off before starting maintenance work.

WARNING

Spraying hydraulic oil

Risk of injury (e.g. face and eyes) due to spraying hydraulic oil

- The ELHY® thruster must be secured to prevent a restart before opening.
- Only turn the filling screw slowly.
- Only specialists are permitted to unscrew and remove the filling screw.

WARNING

Pre-tensioned reset spring

Risk of injury when opening the ELHY® thruster due to the pre-tensioned reset spring.

- Never attempt to open the ELHY® thruster in order to access the reset spring.
- The ELHY® thruster may only be opened by instructed specialists with corresponding training and special tools (e.g. disassembly tools for thrusters with c-springs)

WARNING

Cylinder movements

Risk of crushing between surrounding hindrances and the cylinder or connected components as a result of the cylinder retracting automatically due to the reset spring with a hydraulic pressure drop, or if the power supply is interrupted.

- Switching the motor off returns the cylinder to the limit position.
- Before removing the ELHY® thruster, the connected unit such as the brake must be secured to prevent movement.

9.1.1 Operating fluid

ELHY® thrusters are delivered from the factory with operating fluid that depends on the usage conditions and the required version. The type of operating fluid that the thruster was filled with is specified on the type plate.

NOTICE

Observe the safety data sheet issued by the oil manufacturer.

The type of operating fluid already in the thruster must always be used to top it up.

Mixing different hydraulic media is not permitted!

When changing the operating fluid, the ELHY® thruster must be completely drained beforehand.

Table 22: Filling quantities for operating fluid- TGL 35868 / DIN 15430 series

TGL 35868 series	DIN 15430 series	Special versions	Fill quantity in litres, approx.
	EB 120-40		1.2
EB 12/50	EB 220-50		2.6
EB 20/50	EB 300-50		1.8
EB 50/50	EB 500-60	EB 320-50, EB 500-50	2.6
EB 50/100	EB 500-120	EB 500-100	3.5
EB 80/60, EB 125/60, EB 150/60	EB 800-160, EB 1250-60	EB 1500-60	4.3
EB 80/160, EB 125/160, EB 150/160	EB 800-120, EB 1250-120	EB 800-160, EB 1250-160, EB 1500-160	6.0
EB 250/60	EB 2000-60	EB 2500-60	9.0
EB 250/160	EB 2000-120	EB 2500-160	9.0
EB 320/100	EB 3000-60, EB 3000-120	EB 3200-100	10.1
EB 630/120	EB 6300-80, EB 6300-120		10.6

9.1.2 Checking the operating fluid

WARNING

Hot operating fluid

Risk of burns due to hot oil plumes when opening the filling screw when at operational heat.

– The operating fluid may only be checked, topped up or drained when switched off and cool.

– The ELHY® thruster may only opened at a maximum temperature of 40 °C.

NOTICE

If not filled sufficiently, the ELHY® thruster does not develop the full lifting force.

If the liquid level is too high, the expansion of the medium due to self-heating can cause an impermissible overpressure.

Observe the disassembly instructions if the ELHY® thruster is not installed upright (⇒ Disassembly chapter).

- Place the ELHY® thruster upright.
- Open and remove the screw plug
- Remove the regulating plug from the filling nozzle.
- Check the fill level according to the ELHY® type and top up if required.

Fill level height

The ELHY® thrusters are filled correctly if the operating fluid level reaches the lower edge within the filling opening when the thruster is upright and the lifting rod is retracted.

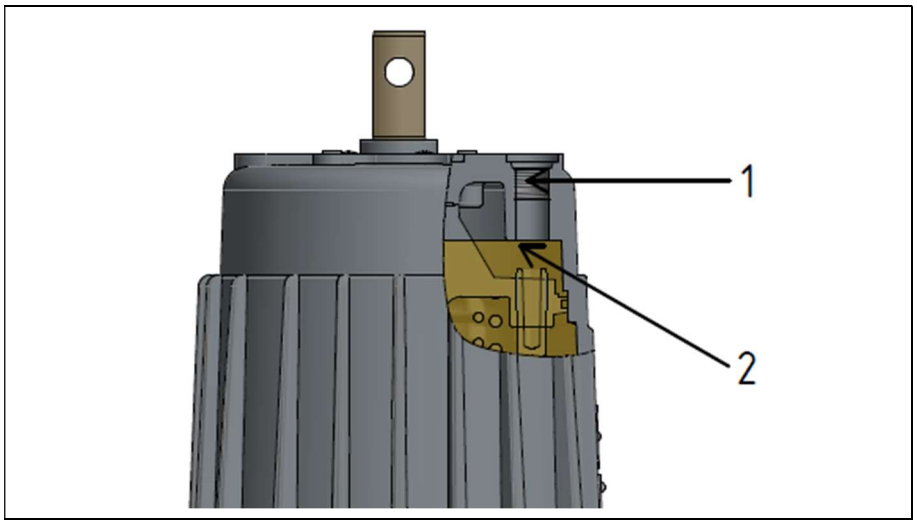


Figure 13: Operating fluid fill height

1 Filler opening with screw plug

2 Fill level

Topping up the operating fluid

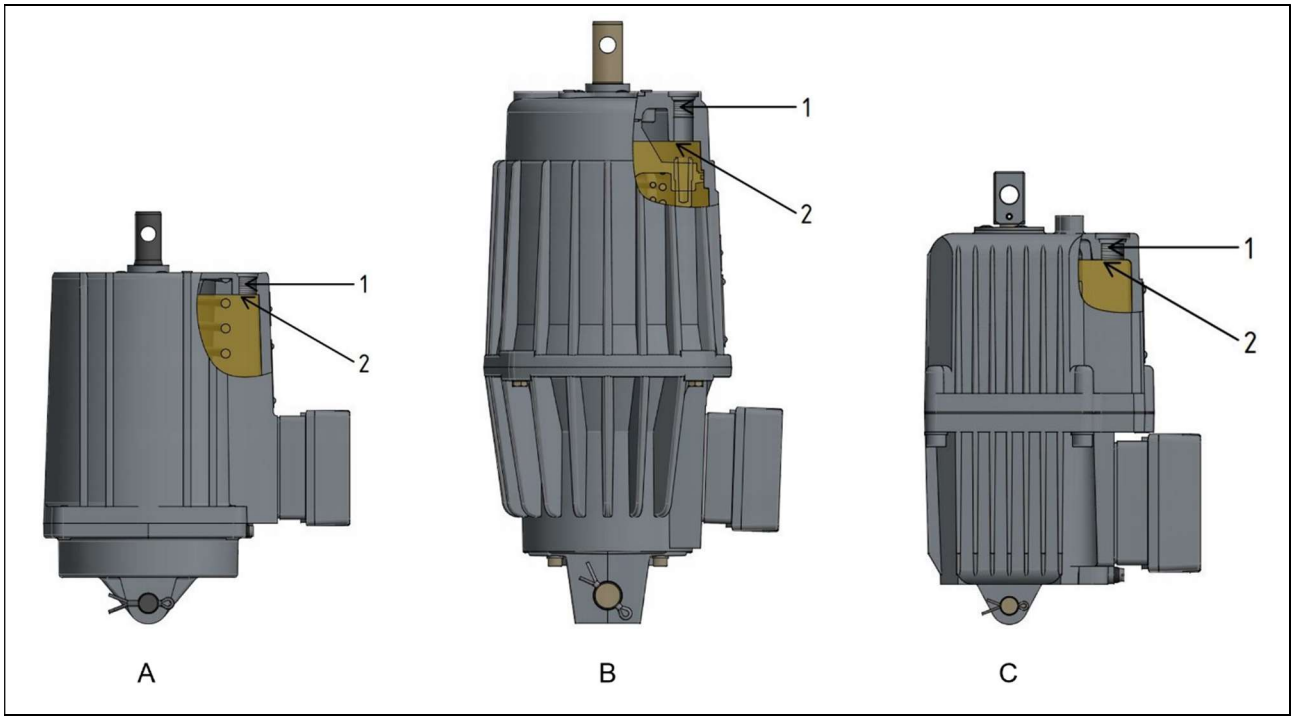


Figure 14: Topping up the operating fluid

1	Screw plug	A	EB 12-50
2	Fill level	B	EB 50-50
		C	EB 120-40

1. Fill the ELHY® thruster with operating fluid up to the filling nozzle bottom edge. Perform several lifting movements while doing so in order to prevent air entering the system.
2. Check the fill level again and top up if required.
3. On version (A), if the adjusting plug has been removed, reinsert and adjust it.
4. Close filler opening with screw plug tightly
5. Return the ELHY® thruster to its original installation position (⇒ Assembly chapter).

9.1.3 Replacing the operating fluid

On the ELHY® thruster, the filler opening for the operating fluid is also the drain opening.

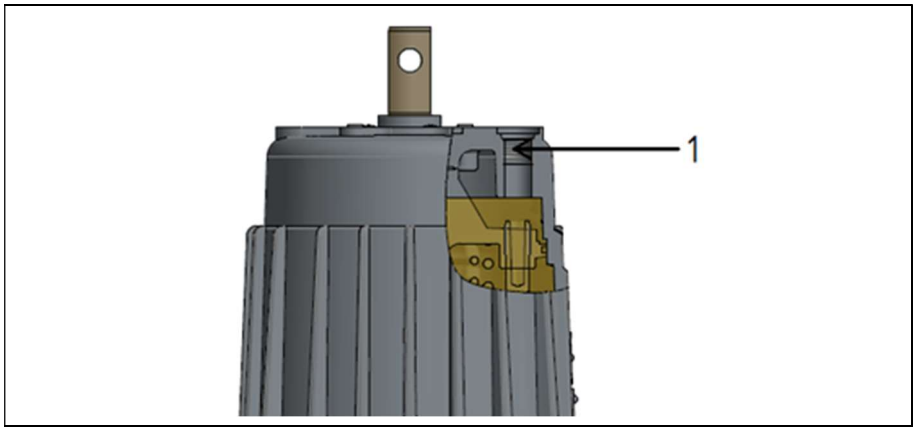


Figure 15: Drain opening with screw plug

1 Drain opening with screw plug

NOTICE

Observe the safety data sheet issued by the oil manufacturer.

The type of operating fluid already in the thruster must always be used to replace it.

Mixing different hydraulic media is not permitted!

When replacing the operating fluid, the ELHY® thruster must be completely drained beforehand.

1. Remove the lifting device
2. Loosen and remove the screw plug for emptying
3. Empty the lifting device completely

The procedure for filling up to the required fill level is as described in the section “Filling up the operating fluid” (⇒ section “Filling up the operating fluid”).

4. Fill operating fluid at the drain opening
5. Screw the screwed connection hand-tight again

9.1.4 Seals

The ELHY® thruster must be checked for leaks at least once per year.

9.2 Maintenance schedule

Table 23: Maintenance log for ELHY® thrusters

ELHY® type				
Serial number				
System ID				
Classification according to section 3.1 (table 1)	**Low requirements**	**Standard**	**Higher requirements**	
	❑	❑	❑	

Test object	**Test interval according to classification**			**Test performed**	**Test passed**	**Evaluation / measured values**
Cleaning	as required	as required	as required	❑	❑	
Test run	Every six months			❑	❑	
Visual checks						
Leaks	Annually	Annually	Every six months	❑	❑	
Bolt connections	Annually	Annually	Every six months	❑	❑	
Terminal box cover	Annually	Annually	Every six months	❑	❑	
Cable connections tight	Annually	Annually	Every six months	❑	❑	
External damage	Annually	Annually	Every six months	❑	❑	
Functional inspection						
Motor functions, running noises		Annually	Annually	❑	❑	
max. lifting path		Annually	Annually	❑	❑	
Terminal box and cable infeed leak tightness		Annually	Annually	❑	❑	
Position indicator, signals, adjustment		Annually	Annually	❑	❑	
Extended test						
Actuating force measurement			Every 2-3 years	❑	❑	
Reset force measurement			Every 2-3 years	❑	❑	
Power consumption measurement			Every 2-3 years	❑	❑	
Insulation resistance measurement			Every 2-3 years	❑	❑	
Coil resistance measurement			Every 2-3 years	❑	❑	

Test object	Test interval according to classification			Test performed	Test passed	Evaluation / measured values
Proof of insulation reliability in accordance with DIN 57530 part 1 / VDE 0530 section17.1			Every 2-3 years	❑	❑	
Maintenance **Replacing all wear parts (bearings, seals, etc.)**		**Recommendation:** Every 5 years or after 5 million switching cycles				

Summary	Complete test passed	Repair required	Next test
	❑	❑	

Confirmation	The test was performed in accordance with the manufacturer's maintenance manual.			
	Location/date	Company	Tester	Signature

9.2.1 Classification

Table 24: Classification

Classification	Low requirements	Standard	Higher requirements
by safety profile	Applications in functions and areas with low safety requirements	Applications in functions and areas with normal safety requirements	Applications in functions and areas with very high safety requirements
or by operating profile	Mainly at a standstill, operation irregular and seldom	Operated in average value ranges of the permissible operating data according to type plate	Operated in limit value ranges of the permissible operating data according to type plate
Test run	Every six months		
Visual checks	Annually	Annually	Every six months
Functional inspection		Annually	Annually
Extended test			Every 2-3 years
Maintenance		**Recommendation:** 5 years or after 5 million switching cycles	

10 Disassembly

The following safety regulations must be adhered to before beginning any work on ELHY® thrusters:

- Ensure that the industrial system is shut down.
- De-energise the system.
- Safeguard the system to prevent it being switched on again.
- Test to ensure a de-energised state.
- Cover or isolate adjacent live parts.

WARNING

Opening the ELHY® thrusters

Risk of injury due to tensioned c springs.

- Only service partners authorised by the manufacturer are permitted to dismantle the ELHY® thrusters outside the manufacturer's factory.

CAUTION

Switch-off due to any c springs, brake springs, brake weights that may be installed or due to other external influences

Risk of crushing due to the lifting rod.

- Before removing the ELHY® thrusters, the downstream drive must be secured, as the lifting rod retracts automatically.

10.1 Disconnecting the electrical connections

DANGER

Live components

Fatal electric shock or serious burns.

- Work on live components may only be performed by electricians.
- First disconnect the electrical power supply.
- The earthing conductor must be disconnected after all other cables.

Observe the allocations in the terminal diagram (⇒Assembly chapter, Electrical connection section).

- First disconnect the electrical power supply.
- Disconnect the earthing conductor after all other cables.

10.2 Removal

CAUTION

Switch-off due to any c springs, brake springs, brake weights that may be installed or due to other external influences

Risk of crushing due to the lifting rod.

- Before removing the ELHY® thrusters, the downstream drive must be secured, as the lifting rod retracts automatically.

CAUTION

The ELHY® thrusters weigh between 8 and 45 kg

Risk of injury when lifting the load manually.

- Use suitable lifting equipment (e.g. crane).
- Never remain below suspended loads.
- Use a transport aid (e.g. lifting carriage) with sufficient load bearing capacity.

NOTICE

Suitable measures must be taken to prevent the ELHY® thrusters falling before removing them. The ELHY® thrusters weigh between 8 and 45 kg.

NOTICE

The lifting rod must not be damaged or contaminated,
e.g. by paint as a result of painting the entire system. A failure to observe this will destroy the lifting rod.

Process

1. Secure the ELHY® thrusters to prevent them falling.
2. Pull the bolt out of the lifting rod.
3. Attach the lifting gear to the ELHY® thruster.
4. Remove the bolt from the foot hole.
5. Use the lifting gear to remove the ELHY® thruster.

11 Disposal

11.1 Disposal consideration

WARNING

Opening the ELHY® thrusters

Risk of injury due to tensioned c springs.

– Only service partners authorised by the manufacturer are permitted to dismantle the ELHY® thrusters outside the manufacturer's factory.

The manufacturer can dispose of ELHY® thrusters for a charge in accordance with the applicable terms and conditions after they have been dismantled properly.

When disposing of the ELHY® thrusters and their process media, observe the following points:

– Observe national regulations on site.
– Observe company-specific requirements.
– Dispose of the operating fluid (oil filling), the plastic parts and the metal parts separately.
– Used process media must be disposed of in accordance with the respective valid safety data sheets.

12 Lists

12.1 Index of figures

12.2 Index of tables

13 Appendix

13.1 Further applicable documents

Table 25: Further applicable documents

Document	Designation
EC Declaration of Incorporation	Original EC Declaration of Incorporation for partly completed machinery
Maintenance manual	ELHY® Electrohydraulic Lifting Units - Maintenance Manual, EB Series Maintenance manual_EB1.0 (EN) 4.2006.pdf