PLEIGER

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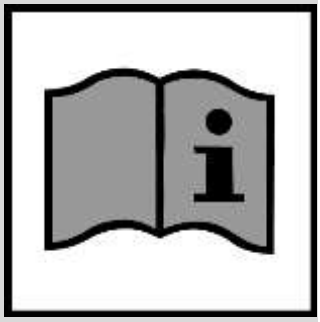

Electro – Hydraulic System

EHS-D3

Operating instruction

Please read this manual carefully before operation.

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English version

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1. Common Information

The present document is part of the EHS, manufactured by company Pleiger Maschinenbau, and describes how to operate the unit safe and well.
The operating instructions contains important information that will help you to operate the system safely and correctly. The electro hydraulic system (hereafter "EHS") is built according to state of the art and the recognized safety rules. Existing residual risks and necessary safety precautions are documented in the operating instructions.
If you have questions, the customer service is at your disposal.

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2. Safety

Safety instructions warn you of dangers and help you avoid injuries, environmental damage and property damage.
Make sure that you have read and understood all safety instructions in this operating manual. Follow the safety instructions in any case.

For safe operation, do not read the general safety instructions in this chapter only, but also read and follow the safety instructions in all the chapters that relate to your work.

2.1 Intended Use of Actuators EHS-D3

The rotary actuator is used to drive flaps / valves to the required operating position ("OPEN" / "CLOSED").

2.2 Structure of Safety Advices

Signal word fields

Warnings and reference texts are highlighted by colored signal word fields.

The following signal word fields identify different danger levels by means of different symbols, colors and signal words:

Danger levels

DANGER! Failure to follow this safety instruction will result in death or serious injury.

WARNING! Failure to follow these safety instructions may result in minor injury.

ATTENTION Failure to follow this note may result in damage to material.

Structure

Structure of safety instructions is always the same.
They include signal word, type and source of danger, consequences of non-compliance and measures to prevent and avoid danger.

2.3 Duty of Care of the Operator

The operator must ensure that:

- the working environment is adequately lit and complies with the other requirements of the employers' liability insurance association.
- that the EHS is used only as intended.
- that the EHS is operated in a faultless and functional condition.
- the protective devices are regularly checked for their proper function.
- necessary personal protective equipment for operating, maintenance and repair staff are available and used.
- the operating instructions are always available in legible condition and completely close to the place of use of the EHS.
- only qualified personnel operates, services and repairs EHS.

2.4 Personnel and their Qualification

Basing on their qualifications, different groups of people and their activities can be differentiated.

Operating personnel

- Operators, authorized to operate the EHS, shall only be trained persons who are aware of the tasks assigned to them and of the potential dangers of improper conduct and who are expected to perform their work reliably. People whose ability to react is restricted, for example by drugs or alcohol, are not allowed to operate the EHS

Qualified personnel

- Qualified personnel, due to their professional training, knowledge and experience as well as knowledge of the relevant provisions, are able to carry out the work assigned to them and to independently recognize and avoid possible dangers. In particular, the following specialized personnel are required for commissioning, troubleshooting, adjustments and special maintenance work: industrial mechanic, electrician, programmer.

Trainees

- Personnel to be trained, such as trainees, interns or temporary staff may undertake activities under supervision of qualified staff only

Unauthorized personnel

- Unauthorized personnel are all persons who do not meet the requirements stated above.

Regular instructions

- The operator is obliged to instruct the staff regularly. For better follow-up the execution of the instruction is logged.

2.5 General Safety Instructions

The EHS are built according to the state of the art and the recognized safety rules. Nevertheless, dangers to life and limb of the user or third parties as well as impairment of the end product may arise during its use.

Safe behaviour

The following safety instructions apply to all work on the machine:

- Comply with the applicable national and international safety regulations for occupational safety.
- Work on electrical equipment may only be carried out by qualified personnel.
- Eliminate immediately faults that affect your safety or the safe operation of the machine. Take the machine out of operation until the fault is cleared.
- When working on the machine, wear only tight-fitting clothing. Secure long hair. Put trinkets beside before work.

Personal protective equipment

- Wear appropriate protective equipment when working on the machine.


Safety glasses


Safety shoes


Head protection


Safety gloves


Close-fitting protective clothing

3. Components and their Function

The EHS-D3 rotary actuator is an electro-hydraulic system for remote actuation of valves in shipbuilding (e.g. ballast-, fuel-, scrubber- systems,) and for industrial applications. The connected shut-off valve (butterfly- or ball valve or comparable) rotates in both directions with hydraulic force.

The EHS electro-hydraulic system is based on the combination and advantages of purely hydraulic and electric actuators in a single device, the EHS.
The EHS is independent, which means that the system uses the proven STK or STKG type quarter-turn actuators and the proven PVK linear drive with the attached EHS.
All EHS drive functions are controlled and electrically monitored by a separate EHS-CM control module. The EHS-CM control module also serves in combination with a bus interface BI as an interface connection to a higher-level computer control or (without BI) as a control device for operation from a control panel.

3.1 General System Requirements with Control Module CM

The electro-hydraulic system is operated using the CM control module. It implements all necessary control signals and safety functions.

The CM control module can be integrated into the overall control system (automation) by means of a so-called Bus interface BI or just by using the digital inputs/outputs.

Refer to appendix, operating instructions‘ of the CM4 control module for further information.

3.2 EHS-D3

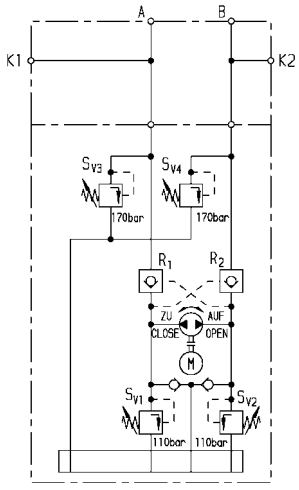
3.2.1 Description of Internal Hydraulic Layout and Function

The hydraulic pump unit provides the EHS-D3 actuator with hydraulic pressure. When switching to **OPEN**, the electric motor driven pump will supply the hydr. fluid to the actuator, passing the piloted check-valve R_2, thus opening the valve. At the same time unpressurised oil returns from the other piston side via the piloted check-valve R_1 to the tank. When reaching the end position **OPEN**, the electric motor is turned off by the CM module after receipt of the end position feedback **OPEN** and programmed over-run time. When switching to **CLOSE**, the direction of the pump rotation is changed and the hydr. fluid will flow in the opposite direction, the module stop function in the end position is identical.

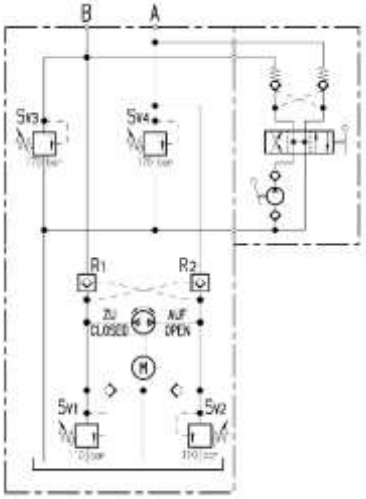
The pressure reducing valves $\mathbf{S_{v1}}$ and $\mathbf{S_{v2}}$ are adjusted to nominal 110 bar, in some cases also higher or lower (only factory adjustment)! The factory adjustment of the internal pressure relief valve $\mathbf{S_{v3}}$ and $\mathbf{S_{v4}}$ is set to 170 bar, and limits any excess pressure. It protects the EHS against inadmissible pressure rise, i.e. caused by increasing temperature of the hydraulic liquid during stand-still of the actuator.

WARNING! **Never change the factory adjustment of the pressure relief valves S_{v1}, S_{v2}, S_{v3} and S_{v4}!**

In case of a stepless control / indication, (CM module software for stepless control chosen) the actuator will stop in the desired position and be held hydraulically by means of the piloted check-valves R_1 and R_2. The analogue position indication (4-20mA) is transferred to the CM module.



Hydr. diagram in case of quick couplings for portable hand pump



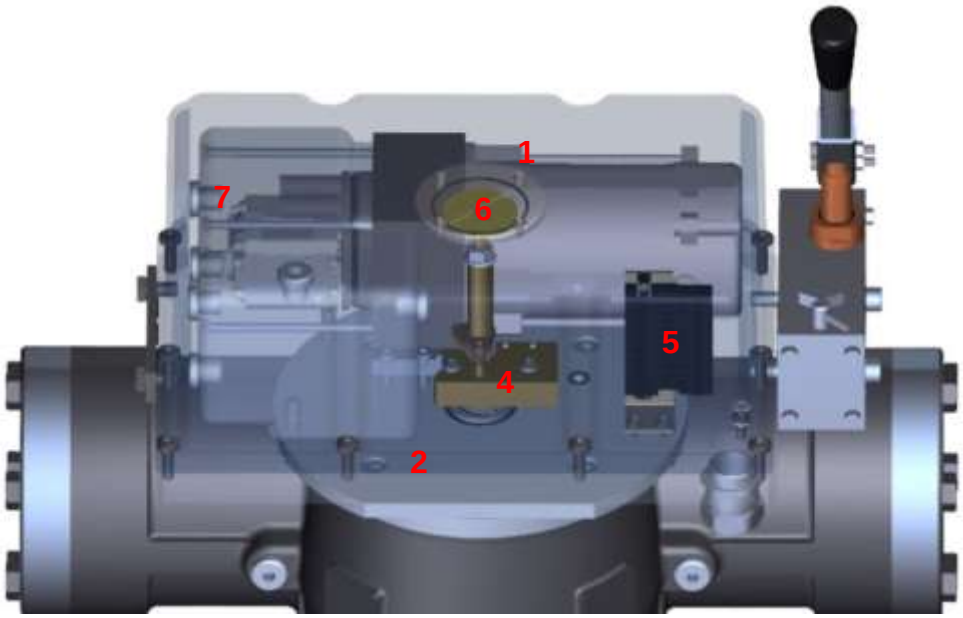
Hydr. diagram with directly fixed hand pump

3.2.2 Malfunction

In case of a current failure, the actuator will stop in the momentary position and be held hydraulically by means of the piloted check-valves R_1 and R_2.

If the valve is blocked by foreign matters, although the EHS is switched to **OPEN** or **CLOSED,** the electric power supply will be cut off when reaching the preselected operation time at the control module EHS-CM and alarm will be indicated.

3.2.3 General outer structure with main components



1	Pump unit, consisting of electro motor, hydraulic pump and oil reservoir	2	Base plate
3	Capacitor for electric motor	4	Indication unit with LED's, green OPEN, red CLOSED indication
5	Multiplugs, male and female for external connection	6	Mechanical position indicator
7	Tank with Tank plug	8	Bracket
K1	Quick coupling for port. hand pump	K2	Quick coupling for port. hand pump

3.2.4 Pump Unit

The pump unit is consisting of electric motor, hydraulic pump and oil tank. All hydraulic components required to operate the actuators hydraulically are included in the pump unit. The pump unit creates the necessary oil pressure for movement of the actuator. The pressure is fixed adjusted, and must usually not be modified.

Rotary Actuator Type	**Nominal Oil Flow (2 different supplier)**	**Opening torque at 110bar**
meas. Unit	---	Nm
STK15	200/240cm³/min	130
STK34	200/240cm³/min	275
STK56	200/240cm³/min	465
STK100	300/320cm³/min	780
STK200	450/530cm³/min	1540
STK420	450/530cm³/min	3370
STK600	450/530cm³/min	4400
STK620	450/530cm³/min	5100
STK900	450/530cm³/min	6600
STK1400	1100cm³/min	10260
STK2700	1100cm³/min	19800

Optional: Quick Running Actuators with 1,1 l/min, 1,4 l/min or 2,5 l/min (at 50Hz).

3.2.5 Actuator Performance

50Hz:

Type EHS-D3/xxxx	**time for 90° opening**	**time for 90° opening (1,1 l/min)**	**time for 90° opening (1,4 l/min)**	**time for 90° opening (2,5 l/min)**
meas. Unit	sec	sec	sec	sec
EHS-D3/15	6	1,3	1	0,5
EHS-D3/34	12	2,7	2	1,2
EHS-D3/56	20	4,5	3,4	1,9
EHS-D3/100	25	7,5	5,8	3,3
EHS-D3/200	33	16,5	12,5	7,1
EHS-D3/420	68	34	26	14,6
EHS-D3/600	97	48	37	21
EHS-D3/620	100	50	38	22
EHS-D31/900	150	75	57	32
EHS-D31/1400	106	---	84	48
EHS-D31/2700	206	---	162	92

60Hz:

Type EHS-D3/xxxx	time for 90° opening at 50 Hz	time for 90° opening (1,2 l/min)	time for 90° opening (1,5 l/min)	time for 90° opening (2,9 l/min)
meas. Unit	sec	sec	sec	sec
EHS-D3/15	5	1,1	0,9	0,5
EHS-D3/34	10	2,4	1,9	1
EHS-D3/56	17	4	3,2	1,7
EHS-D3/100	21	6,7	5,4	2,8
EHS-D3/200	27	14,5	11,6	6
EHS-D3/420	57	30	24	12,4
EHS-D3/600	81	43	34	17,7
EHS-D3/620	84	44	36	18
EHS-D31/900	125	67	53	28
EHS-D31/1400	89	---	78	41
EHS-D31/2700	172	---	151	78

All technical data are theoretical, weight see separate data sheet

3.2.6 Max. Actuator Bolt Hole Circles and Shaft Diameters

EHS Type	Flange EN ISO 5211	Hollow Shaft Ø [mm]	Hollow Shaft □ [mm]
EHS-D3/15	F04 / F05 / F07	15	14
EHS-D3/34	F07 / F10 /F12	22	22
EHS-D3/56	F07 / F10 /F12	26	24
EHS-D3/100	F10 / F12 / F14	35	30
EHS-D3/200	F10 / F12 / F14 / F16	48	40
EHS-D3/420	F14 / F16	65	55
EHS-D3/600	F16 / F25	80	60
EHS-D3/620	F16 / F25	75	65
EHS-D31/900	F25 / F30	100	75
EHS-D31/1400	F25 / F30	120	85
EHS-D31/2700	F30 / F35	115	80

3.2.7 Pressure relief- and reducing valves

WARNING!

In case of unauthorized adjustment of the pressure relief valves:
Danger of malfunctions and damage!

- Note that a change in the setting of the pressure reducing valves S_{v1} and S_{v2} may **only** be carried out by factory!
- The pressure reducing valve S_{v1} setting corresponds to the hydr. output torque of the rotary actuator resp. valve closing torque.
- The pressure reducing valve S_{v2} setting corresponds to the hydr. output torque of the rotary actuator resp. valve break-out torque.

The **pressure relief valve S_{v3}, S_{v4}** and **pressure reducing valve S_{v1}, S_{v2}** are factory-set to:

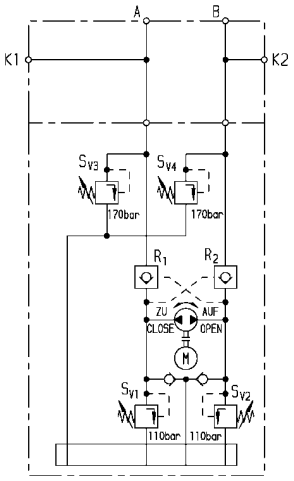
S_{v1}, S_{v2} = 110 bar, in some cases higher or lower.

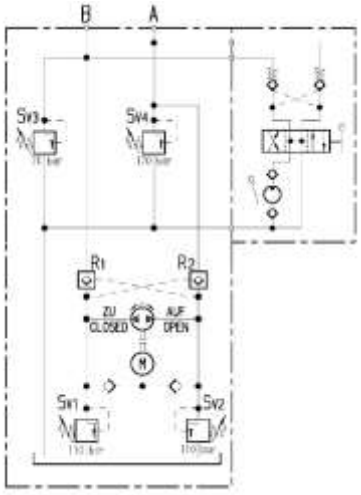
S_{v3}, S_{v4} = 170 bar

WARNING!

The pressure reducing valve settings correspond to the rated torque of the rotary actuator! Increasing these values may result in damage to the connected valve!

The pressure relief valves **S_{v3}, S_{v4}** are arranged inside the hydraulic tank in the pump base block. They protect the EHS against inadmissible pressure rise, i.e. caused by increasing temperature of the hydraulic liquid during stand-still of the actuator. For safety reasons never touch this valve.





3.2.8 General Technical Data

Actuating system	Double-acting EHS –D3: Operated hydraulically in both directions
Protection class	IP67 (IP68 on request)
Housing	Weather proof Aluminium casting
Coating	Base- / top coat: 2K Epoxy resin
Operating temperature	-25° to +70° C (< 0°C on request)
Installation position	According dimension sheet
Cabling	Cable gland M25x1.5, Ø 13 - 18 mm
Operating pressure	110 bar, in some cases higher or lower (factory setting)
Hydraulic medium	ISO VG 15, please refer to recommendation list
Tank volume	Around 300 cm³ (Quick Running actuators: 750 cm³, with accululator acc. to Ch. 4.8.2: 940 cm³)

Electrical Data:

	Electric Motor
Operating voltage	230 V AC; 50/60 Hz (Quick Running Actuators with 2,5 l/min: 400 V AC 3Ph)
Rated power	300 W (Quick Running Actuators: 420 W, 600 W)
Starting current	4,0 A
Nominal current	1,3 A (Quick Running Actuators: 1,9 A, 1 A)
Power supply for position indication	24 V DC
Analogue signal for continuous position indication	4-20 mA
Nominal mode of operation	S3 – 10%
max. ambient temperature	+70° C

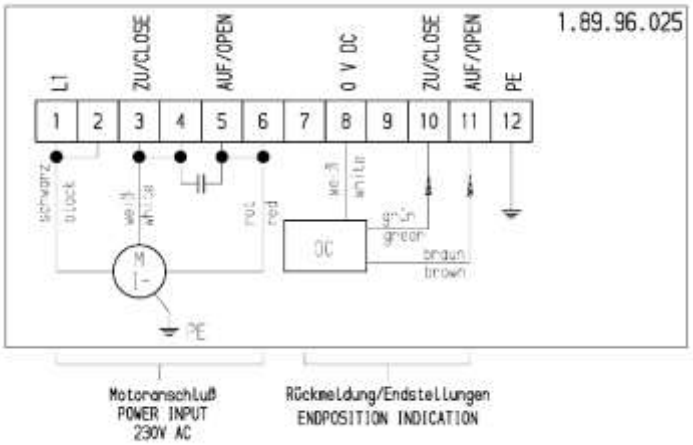
4. Assembly of the actuator unit

All delivered EHS-D3 are fully assembled, basic adjusted, filled with oil and ready for operation.

ATTENTION Check correct electrical connection. Please refer to the respective connection diagram. A terminal connection diagram is fixed inside the cover of the EHS.

4.1 Electrical Connection for OP/CL

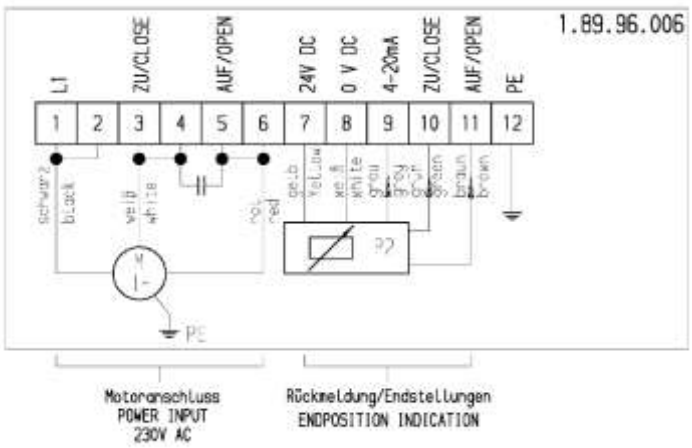
The EHS carry a 12-pole plug for connection of external cablings. The external cable must carry at least 7 cores: 3 cores for power supply of the electro motor of the pump unit, 3 cores for position indication and 1 core for grounding/earthing. Please see below connection scheme for your reference. Attention: The sticker with the circuit diagram in the EHS cover must always be observed!



Electrical connection for EHS-D3 with OP/CL indication

4.2 Electrical Connection for CONTI

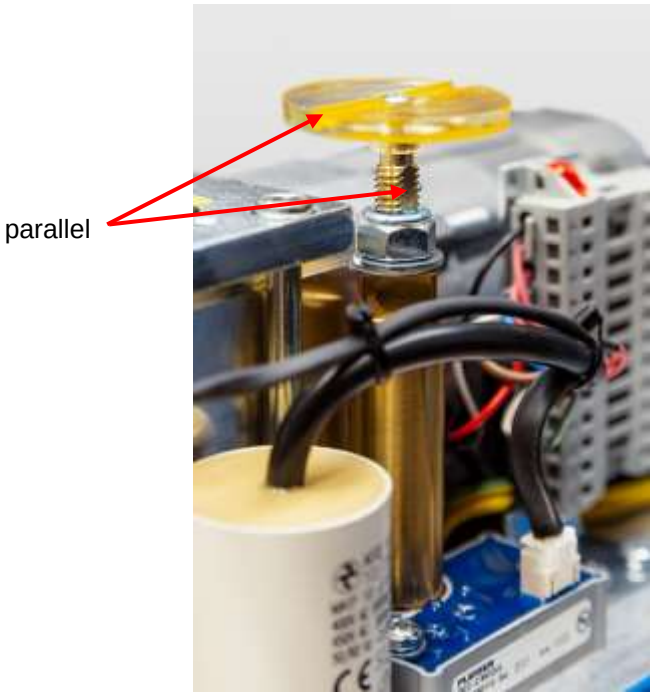
The EHS carry a 12-pole plug for connection of external cablings. The external cable must carry at least 9 cores: 3 cores for power supply of the electro motor of the pump unit, 5 cores for position indication and 1 core for grounding/earthing. Please see below connection scheme for your reference. Attention: The sticker with the circuit diagram in the EHS cover must always be observed!



Electrical connection for EHS-D3 with continuous indication

4.3 Mounting of the Actuator to a Valve

When installing the actuator, please pay attention to the position of the yellow stripe on the position indicator. If the yellow stripe is not in accordance with the actual direction/position of the flats on the shaft of the position indicator, as shown below, turn it into its appropriate position.



Note, that the sight window in the EHS cover shows “OP” and “CL” in a 90° offset. If necessary, the sight window in the EHS cover should also be turned.

4.4 Adjustment of the Mechanical End Stop of Actuator EHS-D3

The adjustment of the end position "CLOSE" or "OPEN" can be adjusted via the stroke adjustment bolt on the rotary actuator STK. The stroke adjustment (Fig.1) is installed in the pressure cover on which the piston rests in the closed/open position (=> spring closing, spring opening) of the flap. By means of adjusting screw, lock nut and cap nut the stroke of the piston can be limited until the perfect position of the flap is reached. In case of a ball valve both end stops have to be adjusted, for that reason then also the other side of the EHS carries a stroke adjustment. (Fig.2)

Fig.1

Fig.2

1. Unfasten the cap- and lock-nut and remove the cap nut completely.
2. Move the piston of the rotary actuator with the hand pump a little towards “OPEN” or “CLOSE”.
3. Turn the bolt anti-clockwise for some rounds in order to release it from mechanical force.

Fig. 3

4. Turn the adjusting bolt (Fig. 3) anti-clockwise to reduce the angle limitation. Turn it clockwise to increase the limitation.
5. Fix the nuts again when the desired angle limitation is reached.
6. Note that in case of ball valves the actuator is equipped with mechanical end stops on both sides and both have to be adjusted.

4.5 Adjustment of the Electric OP/CL Position

1. EHS-D3 must be in CLOSED position
2. Connect the actuator to the power supply (according to wiring diagram)
3. Loosen stop nut (1), use wrench 13mm
4. Turn sleeve with magnet (2) until LED RED (3) is on
5. Lock sleeve with magnet (2) with stop nut (1)
6. Check proper function of actuator by running several times from closed to open position, if necessary, please readjust. Please note that individual adjusting of position OPEN (LED GREEN) is not possible.

4.6 Adjustment of the CONTI Position

1. EHS-D3 must be in CLOSED position
2. Connect the actuator to the power supply (according to wiring diagram)
3. Gears (1, 2) must be in position as shown on the picture for end position CLOSED. If not, loose stop nut (3) by using 13mm wrench and headless screw at pinion (2) and readjust gear segment (1)
4. Lock gear segment (1) with stop-nut (3)
5. If not already done, loose headless screw at pinion (2) and turn axle of potentiometer until LED RED (4) is on
6. Clamp pinion again with headless screw
7. Connect ammeter at terminal 8+9
   (analogue feedback 4-20mA)
8. Adjust 4mA with trimmer (5)
9. Operate actuator to mechanically OPEN end stop using hand pump
10. Adjust 20mA with trimmer (6)
11. Check proper function of actuator by running several times from closed to open position, if necessary trim the end positions by means of the potentiometers (5 or 6) again.

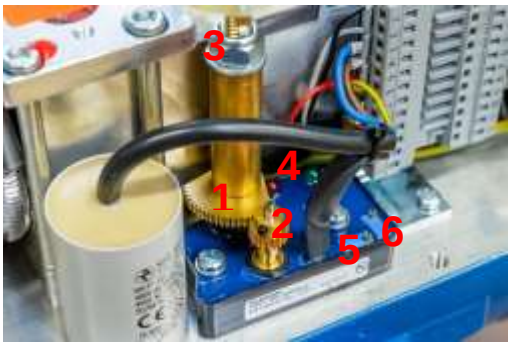
Note

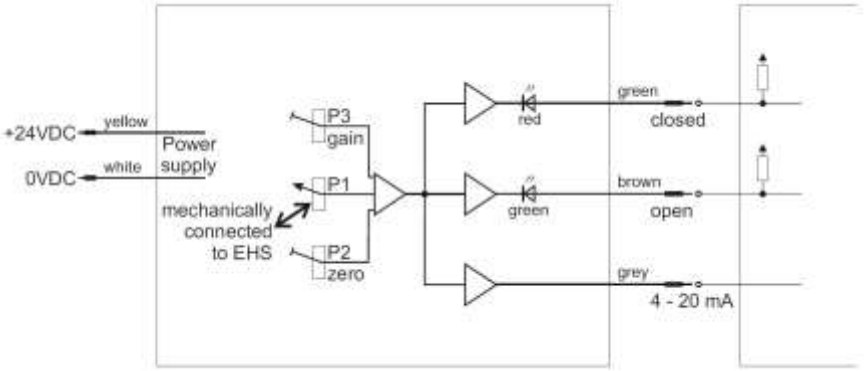
Potentiometer (5): position CLOSED - 4mA
Potentiometer (6): position OPEN - 20mA

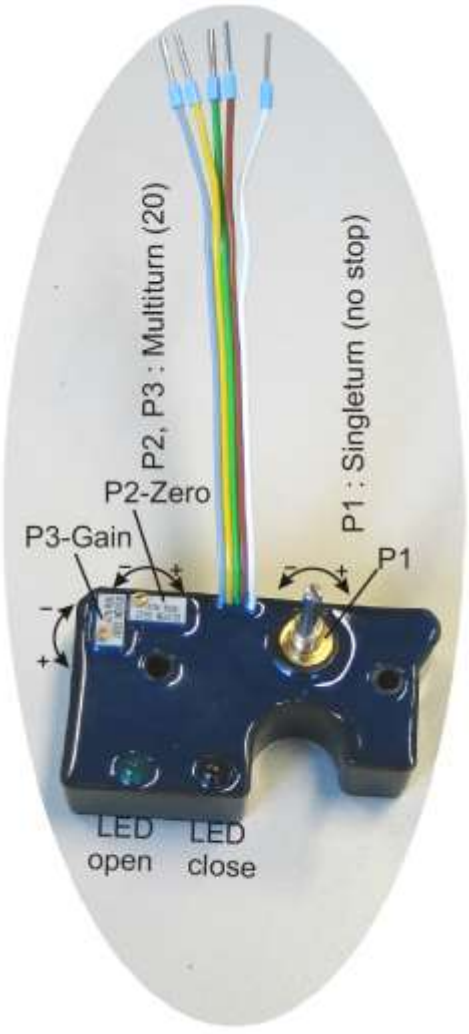
The end position contacts are already energized at:
4,3mA - for CLOSED position (approx. 2%) and
19,4mA-f for OPEN position (approx. 96,2%)

From 4,3 to 4,0mA the actuator will close completely due to control function of the CM module.

Any energizing of the actuator from fully closed to max. 2 % OPEN will activate the CM module and force the actuator back into fully CLOSED position.




+24VDC
yellow
Power
supply
0VDC
white
mechanically
connected
to EHS
P3
gain
P1
P2
zero
red
green
green
closed
brown
open
grey
4 - 20 mA


P2, P3 : Multiturn (20)
P1 : Singleturn (no stop)
P2-Zero
P3-Gain
P1
LED
open
LED
close

4.7 Operation by Hand Pump

In emergency cases or for maintenance it might be necessary, to move the actuator by means of the directly fixed or an external hand pump.

WARNING!

Beware of injuries caused by incorrect operation of the actuator with hand pump

- Normally the actuator only needs to be operated with hand pump when the EHS is de-energized or with the connector disconnected.
- A hand pump operation of double acting EHS-D3 is impossible, when the EHS is still energized. The CM module checks the end position permanently and restarts the power pack, whenever the end position is lost, so also when a hand pump would be used.

ATTENTION

Operation of types EHS-D3 is possible with an external hand pump. Alternatively, the emergency operation is possible with a mounted hand pump.

➔ Consider following steps when operating with hand pump:

1. The EHS-D3 should be de-energized
2. Connect the hoses of the portable hand pump to the quick connectors K_1 and K_2 of the EHS, if a portable hand pump shall be used
3. Choose the direction OPEN or CLOSED at the lever of the portable or directly fixed hand pump
4. Pump until the actuator has reached its end position.

➔ To move the actuator back in the opposite direction please consider following steps:

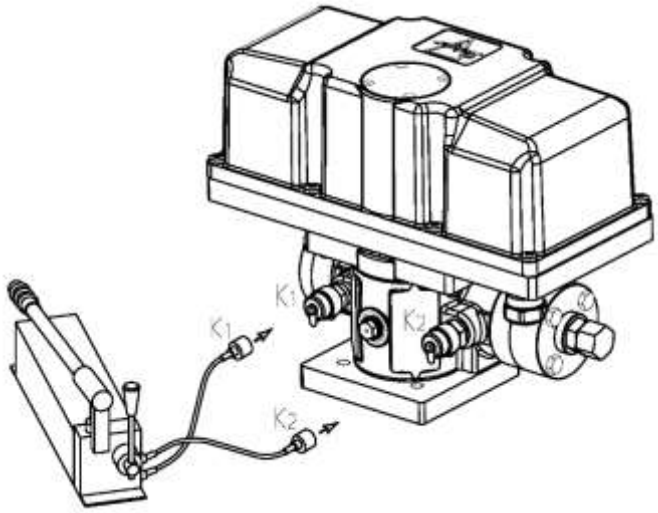
5. Choose the direction OPEN or CLOSED at the lever of the portable or directly fixed hand pump
6. Pump until the actuator has reached its end position.

ATTENTION

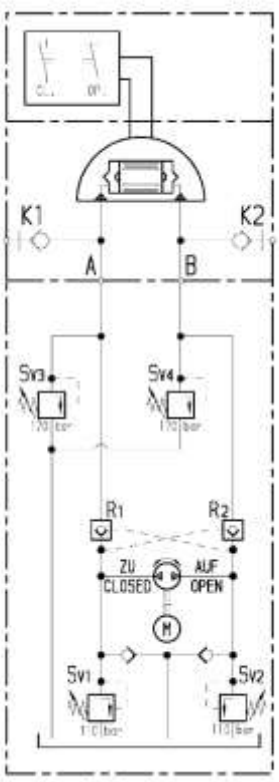
Before normal operation from remote control please make sure, that electric power is available again, and that the connecting plug inside the EHS is back in place.

4.7.1 Use of the Portable Hand Pump

The emergency operation by means of a portable hand pump will be done as shown on the sketch below. An operation instruction is also labeled on top of the hand pump tank.



K_1 (M16x1,5)
K_2 (M18x1,5)



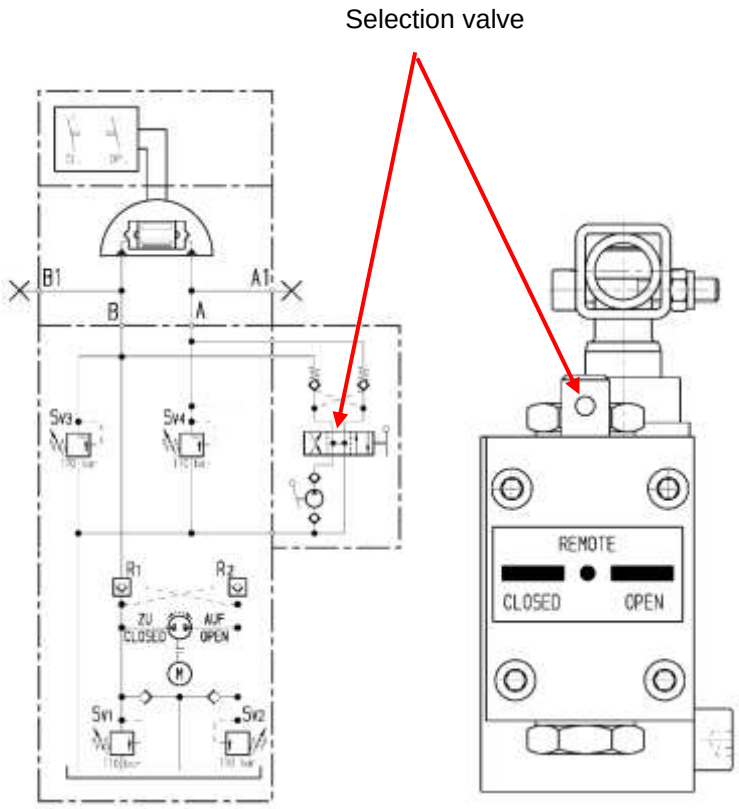
Operation using hand pump

1. Connect K_1 and K_2 to corresponding port of actuator.
2. Select valve position at hand pump for OPEN / CLOSED position.
3. Pump until fully OPEN / CLOSED

4.7.2 Use of the Directly Fixed Hand Pump

The emergency operation by means of a directly fixed hand pump at the EHS will be done as follows.

1. Select required valve position at the hand pump (OPEN or CLOSED) with the selection valve.
2. Pump until valve is opened or closed.
3. Bring the selection valve of the hand pump block back into the center position (REMOTE).



OPEN REMOTE CLOSED

4.8 Check of Oil Level

4.8.1 Standard:

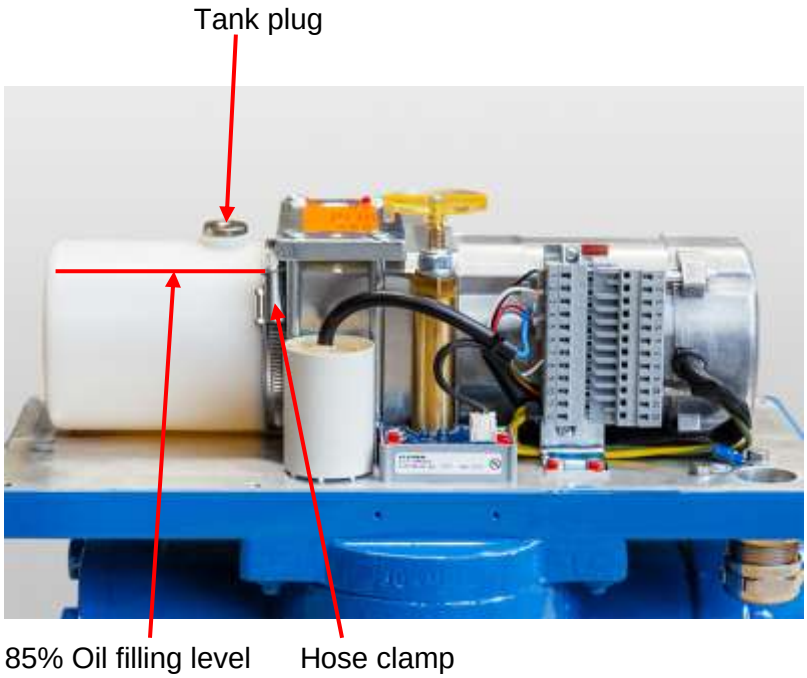
Consider that the hydraulic tank is filled up to 85% with hydraulic liquid for proper function of the EHS (95% for Quick Running Actuators).

➔ In case of oil loss caused by leakages it might be necessary to fill up the oil level. Take care, that the reason for leakage is eliminated before re-filling the oil.

1. Open the tank plug.
2. Check the oil level, and fill up, if level is below 85% (95%).
3. Tighten the tank plug again.

ATTENTION

Depending on the final actuator installation position, it can happen, that the tank plug is under oil, which is ok, if no oil has to be filled up. To allow an oil fill-up in this case, the tank can be turned without a leakage, after a bit loosing of the hose clamp, so that the tank plug is no longer under oil. Please note that double acting EHS don't need 85% filled oil tanks, so that also half-filled tanks enable a proper function of the EHS.



(For the Quick Running Actuators, there are several plugs, Use the top one)

4.8.2 (Optional:) With Hydraulic Accumulator for pre-pressurizing the Hydraulic Tank:

Consider that the hydraulic tank is completely filled with hydraulic liquid for proper function of the EHS..

➔ In case of oil loss caused by leakages it might be necessary to fill up the oil level. Take care, that the reason for leakage is eliminated before re-filling the oil.

WARNING! **Never open any plug of the hydraulic tank without releasing pressure from the accumulator!**

1. Release pressure from the accumulator first by using the installed quick coupling M16x1,5.
2. Open the plug, that is in highest position.
3. Check the oil level, and fill up, if the level is below around 95%
4. Close the plug after filling and fill up the hydraulic accumulator again.

Caution! Danger!

In Accumulator:

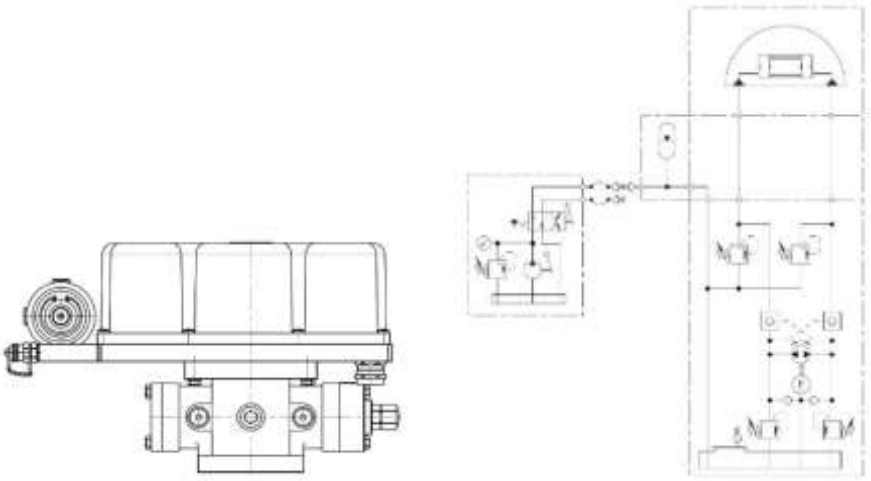
Pre-stressed spring assembly! **Under pressure!**

Prefilling of the accumulator:

The hydraulic accumulator is pre-pressurized with around 2 bar before delivery to the customer.

The pressure in the hydraulic tank should be checked annually and readjusted if necessary.

A portable hand pump with pressure gauge 0-10 bar or similar must be connected to the power units‘ quick disconnect coupling for this purpose. Refer to the hydraulic circuit diagram on the drawing of the power unit for the prescribed tank pressure.



1. Open the quick coupling (M16x1.5) at the hydraulic accumulator and connect testing device (e.g. part no. 9190871120).

2. Should the pressure be significantly too low, it has to be filled up by mobile hand pump (e.g. HYH909-81-4M).

3. Disconnect the hose of the testing device after filling up. Ensure, that the safety cap is again in place on top of the quick coupling.

If the power unit is subject to large temperature fluctuations, it may be necessary to top up with oil.

5. Operation of the EHS-D3

For trouble-free operation, all commands are executed using the EHS-CM control module. The transmission of the "OPEN" / "CLOSE" command signal is carried out by the main controller / automation.
In the event of a complete power failure, the drive automatically stops in the momentary position.

When the power returns and the CM module command is unchanged, the actuator will run further to the commanded position.

ATTENTION

A hand pump operation of double acting EHS-D3 is impossible, when the EHS is still energized. The EHS-CM module checks the end position permanently and restarts the power pack, whenever the end position is lost, so also when a hand pump would be used.

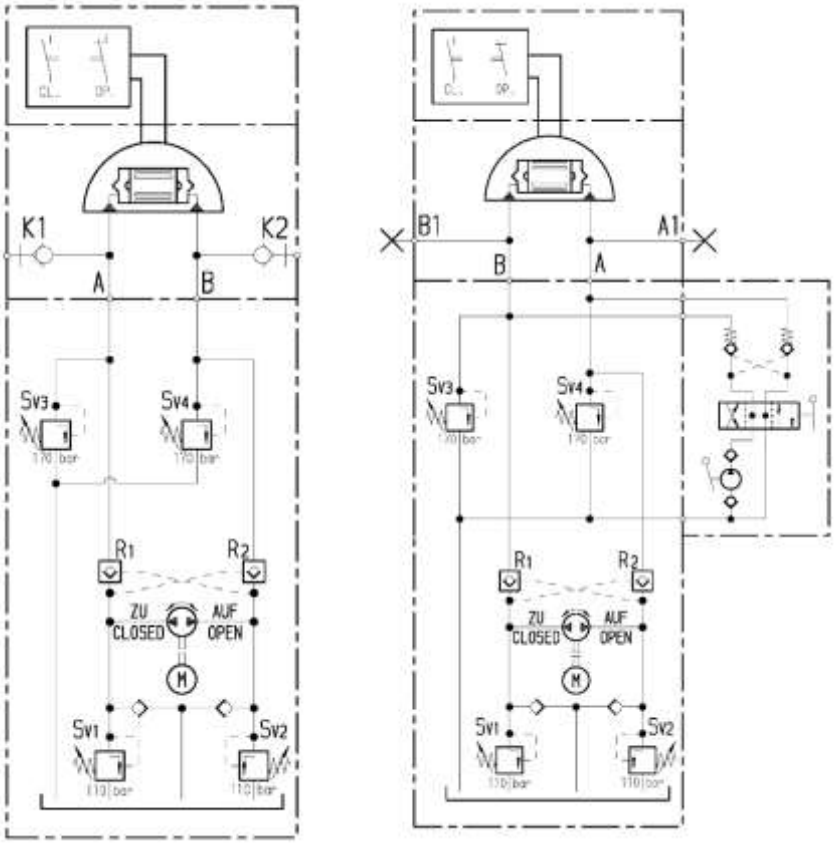
5.1 Normal operation

Opening:

With the command "OPEN", the electric motor is supplied with voltage (230 VAC). The hydraulic oil is pumped to the rotary actuator, which then opens the valve / flap. When reaching the end position OPEN, the electric motor is turned off by the CM module after receipt of the end position feedback OPEN and programmed over-run time. The position feedback is transmitted to the control module EHS-CM, which is monitoring the position of the drive. In case of loss of position feedback (i.e. caused by forces on the flap) the actuator is then moved back to the appropriate position, as the EHS-CM module restarts the power pack.

Closing:

With the command "CLOSE", the electric motor is supplied with voltage (230 VAC). The hydraulic oil is pumped to the rotary actuator, which then closes the valve / flap. When reaching the end position CLOSED, the electric motor is turned off by the EHS-CM module after receipt of the end position feedback CLOSED and programmed over-run time. The position feedback is transmitted to the control module EHS-CM, which is monitoring the position of the drive. In case of loss of position feedback (i.e. caused by forces on the flap) the actuator is then moved back to the appropriate position, as the EHS-CM module restarts the power pack.



5.2 Replacement of the Pump Unit

The pump unit (1) can easily be exchanged.

To minimize the pressure in the EHS, we recommend to bring the actuator into an intermediate position before the pump unit exchange.

Switch off the electro-hydraulic system and secure it to prevent it from being switched back on.

Disconnect the corresponding wiring of the electric motor from the multi plug (4), see wiring diagrams.

Remove mechanical position indicator plate (5) by removing the screw on top (6)

Screw out 4 bolts M6x95, remove plate (3) and lift pump unit from the base plate (2).

The new pump unit must be filled completely with hydraulic oil acc. to ISO VG 15. (max. oil level is 5mm before top filling)

For venting of the hydraulic pump unit hold the complete pump into vertical position (oil tank at the top) and wait until the air is going out of the pump body.

Then fix the new pump unit on the base plate (2) with plate (3) and the 4 screws M6x95.

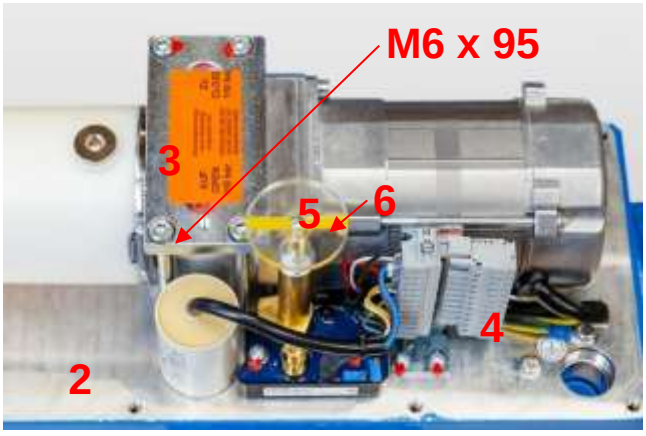
Connect the corresponding wiring of the electric motor again at the multi plug (4).

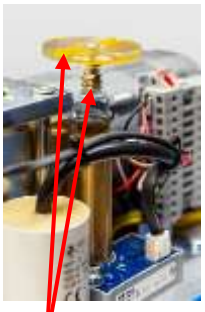
Test the new pump unit by operating the actuator by means of the control module EHS-CM.

Install the mechanical position indicator (5) again with the screw (6)

ATTENTION

After reinstallation of the mechanical position indicator please be sure that the yellow arrow of the mechanical position indicator plate (5) in **in line** with both faces at top of the shaft.





For the Quick Running Actuators the replacement of the pump unit is made accordingly.

5.3 Emergency Operation

Please see explanations under point 4.7!

6. Repair and replacement

Depending on the parts, that have to be replaced, special tools are required. These special tools and disassembly instructions can be provided by Pleiger.

ATTENTION

- ▶ Repair and replacement may only be carried out by Pleiger service engineers or personnel who have been trained by Pleiger with regard to the requirements of functional safety of the drive systems STK and EHS.
- ▶ Forward the repair and replacement protocol to the address below.

ATTENTION

- ▶ After each repair or replacement, a proof test is required.

6.1 Manufacturer notification

The manufacturer must be informed of any type of failure. Contact is made via the service department at the address mentioned. All defective products must be handed over to the manufacturer for further investigation and troubleshooting.

6.2 Useful time

A service life of over 10 years (+1,5 years of storage) can only be approved under the responsibility of the operator, taking into account the specific conditions of use and suitable test cycles.

6.3 Decommissioning

Decommissioning is only permitted if the surrounding systems and consequently a hazard can be reliably eliminated.

ATTENTION

Decommissioning may only be carried out by qualified personell.
Disassembly must be carried out using a separately available device or must be returned to the manufacturer.
The decommissioning must be properly documented.

6.3.1 Disassembly

Before starting disassembly work:

- Switch off the electro-hydraulic system and secure it to prevent it from being switched back on.
- Physically disconnect the electro-hydraulic system from the entire energy supply and discharge stored residual energies.
- Drain and collect the hydraulic oil and dispose of it in an environmentally friendly manner.

Then clean the subassemblies and components properly and dismantle them in line with the local regulations for occupational health as well as safety and environmental protection.

6.3.2 Disposal

ATTENTION

▶ **Risk of environmental damage from incorrect disposal!**

▶ Incorrect disposal can cause environmental hazards.

▶ Have electric waste, electronics components and hydraulic oil disposed of by approved specialist companies.

▶ In case of any doubt on environmentally friendly disposal, contact the local community authority or specialist disposal company for information.

If no agreement has been made for return or disposal, recycle the dismantled components:

- Scrap metals.
- Recycle plastic elements.
- Sort other components