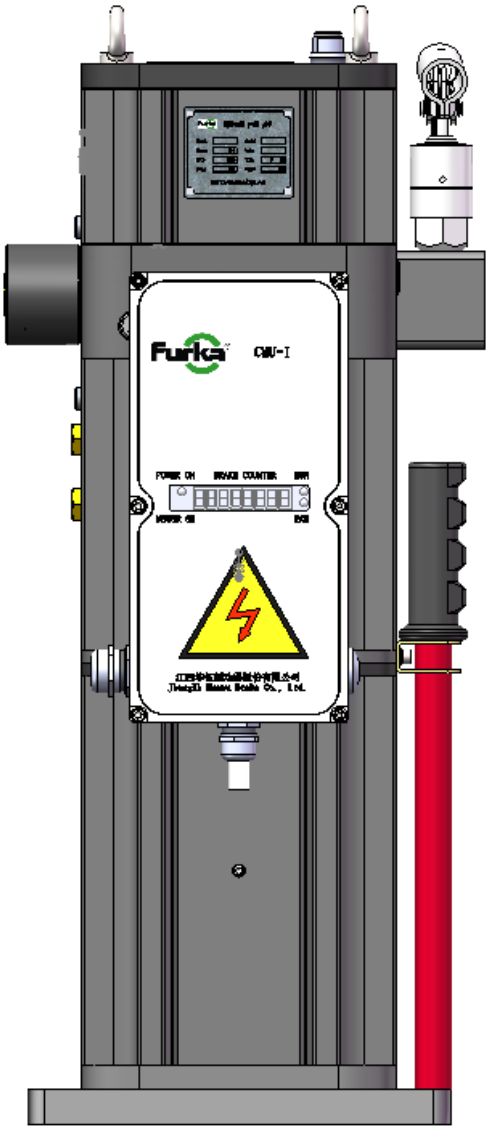
Furka® F-HED2008 Series hydraulic power unit for safety / emergency brakes



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1. Safety regulations

1.1 General advice

The safety of your **F-HED2008** (thruster) depends on proper and regular inspection and maintenance. Study the manual before starting the installation. If in doubt, please don't hesitate to contact our service-department or your local retailer.

1.1.1 Qualification of the personal

The activities described in this documentation require elementary knowledge of mechanics, electrics and hydraulics as well as the safe handling of the relevant technical terms.

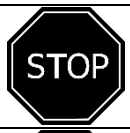
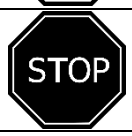
Only trained specialists and instructed persons under the supervision of a specialist are authorised to carry out the activities described in this documentation.

A specialist is a person who is able to recognise hazards and take appropriate safety measures on the basis of his technical training, knowledge and experience. Furthermore, a skilled worker is obliged to comply with the relevant professional rules.

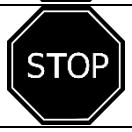
1.2 Safety and warning symbols

	Warning of personal injury	This signal indicates a threat of danger. If this danger is not avoided, this will result in death or serious injuries.
	Warning of product damages	This symbol indicates a warning which may contribute to prevent material or machine damage.
	General advice	This symbol indicates information that helps to avoid adverse results and conditions.

1.3 General hazard warnings

	When operating the THRUSTER, strong electro-magnetic radiation may occur, which is why persons with pacemakers are advised not to stay in the vicinity.
	A sudden start-up of the installation endangers the life of the maintenance personnel! Secure the drive and the installation against any accidental movement before starting any work! **Reading the operating instructions is indispensable.**

- The following applies to all work and operations with the THRUSTER: **Safety first**
- Don't use any mechanical devices to block the brake.
- Ensure, that **the drive** is disconnected from the electrical power supply.
- Ensure, that **the brake** is disconnected from the electrical power supply.
- Any electrical work is only to be done by a trained electrician.
- Only use original Furka® spare parts
- The THRUSTER must not be disassembled.
- **Never open the thruster or the screw plug when it is hot! Escaping hot oil may cause burns!**
- **Before repair or refilling, let the unit cool down to room temperature!**
- Furka® THRUSTERs are fully factory tested prior to delivery and are supplied in a perfect condition.

	Caution: Hydraulic fluid can be hazardous to health, contact with skin and eyes can cause serious damage. Follow the instructions in the safety data sheets of the hydraulic fluid manufacturer with regard to the protection of personnel and safety.
	Caution: Hydraulic fluid may be harmful to the environment. It is therefore recommended that the unit is installed incl. a drip pan to prevent environmentally harmful fluid escaping through leaks what can lead to contamination.
	Caution: Intentional or unintentional tampering with valves, accessories or components is not permitted. Opening a throttle valve can e.g. cause a load to fall freely.
	Attention: All installation, maintenance, dismantling and replacement work on the hydraulic unit and its components may only be carried out in compliance with the the safety instructions. During this work the hydraulic system must be depressurised (pressure 0) and the drives driven by the unit must be unloaded (load 0).

1.4 Warranty

The warranty and its duration depends on the contract. For details on the supplier's warranty please refer to the terms of the contract. Any warranty- or liability claims are excluded in case they occur because of one or more of the following conditions:

- Non-designated use of the F-HED2008.
- Improper handling, setup, operation and maintenance of the F-HED2008 by the operating company.
- Neglection of the regulations and notes in this manual concerning transport, setting up, operation or maintenance of the F-HED2008.
- Improper maintenance and repairs of the F-HED2008.
- Improper monitoring of components, which are prone to wear.
- Catastrophes, external objects and forces and force majeure.
- Changes at the F-HED2008 without approval of Furka®.

- The information in this manual has been checked thoroughly. Nevertheless we can't accept liability for errors.

1.5 Non-designated use

Only the use described in this document is permitted. The risks associated with improper use lie solely with the user and Furka Antriebstechnik GmbH accepts no liability.

Unintended use is defined as

Disregard

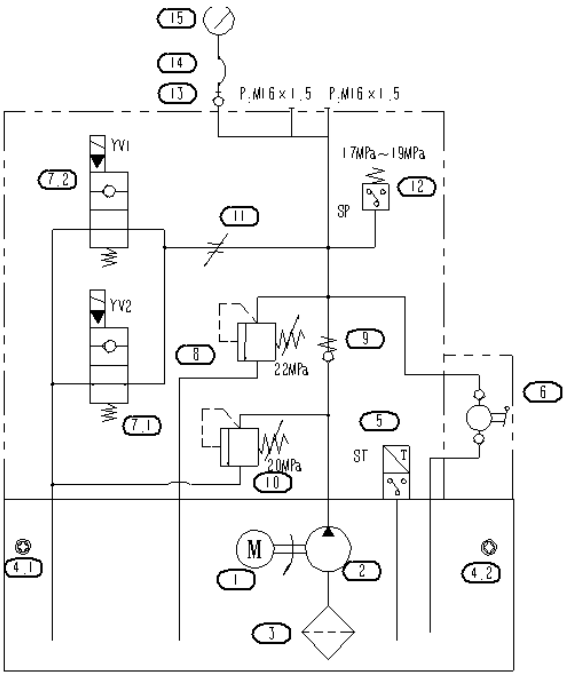
- of the operating pressure level in the installation drawing,
- of the specifications regarding the pressure fluid,
- the correspondingly deviating operating and environmental conditions.

2. Valve controlled electro-hydraulic thruster

2.1 Basic function

The F-HED2008 is an independent unit that consists of motor, gear pump, valves and protective casing completed by a CMU integrated control device. Typical applications are safety/emergency brakes, actuator for industrial valves, gates, as well as rotating, pivoting and clamping devices. For basic functionality please refer to figure 1.

The control and monitoring unit controls the motor and the relay and monitors the hydraulic functions. Braking times, error types and times as well as information about the motor status can be read out via a LED display.



Working sequence for electric elements("+" means the element be energized)

Action \ Element		YV	SP	M	T	BMS
brake release(remote)		+		+		+
brake hold		+	+ upper limit	−		+
system compensate pressure		+	+ lower limit	+		+
brake close(remote)		−		−		−
Alarm	motor continuously operates over 1s					+
	while brake holding, motor starts over one time in 5min					+
	oil temperature is up to 70℃				+	

Power supply of electric elements: M:380V; SP, YV: 24VDC

Figure 1: Hydraulic diagram, Valve logic

Pos.	Description	Pos.	Description	Pos.	Description
1	Motor	6	Hand pump	11	Throttle valve
2	Gear pump	7.1 7.2	directional poppet valve	12	Pressure switch
3	Filter	8	Safety valve (Direct-acting relief valve)	13	Plug-in Coupling
4.1 4.2	Oil sight glass	9	Check valve	14	Hose
5	Temperature switch	10	Direct-acting relief valve	15	Pressure gauge

2.2 Storage, transport and packaging

The THRUSTER is shipped ready to mount.

- F-HED2008 are shipped ready to use complete with hydraulic fluid.
- Store and transport the F-HED2008 dust- and waterproof.
- Protect the F-HED2008 during the whole storage- and transport time against damage.

In case of additional painting, do NOT contaminate:

- Electrical components
- Signs and plates

If the THRUSTER isn't installed directly after delivery heed the following instructions:

Store and / or transport the F-HED2008 dust- and waterproof with drying agent until installation.

- Protect the brake/F-HED2008 against external damages during the complete storage- / transport-period.

ⓘ	**Note!** **Depending on the type, the F-THRUSTER has a weight of up to 56kg.** **Always use a proper lifting device to transport the THRUSTER! Danger of injury.**

2.3 Technical parameters

2.3.1 Suitable operating environment

1) Ambient temperature -30 °C - +60 °C
2) Indoor, outdoor, sea side
3) Rain-, rust-, wind-, sand-, and vibration-proof

2.3.2 Motor duty / Load cycles

1) Rating: S3 intermittent operation duty
2) Unlimited working cycles
3) Maximum operating frequency is 180c/h

2.3.3 Supply voltage and IP protection classes

1) IP protection class of THRUSTER is IP66
2) IP protection class of the control box is IP67
3) Supply voltage: 340…420V, 50/60Hz
4) Power: 3kW

Voltage fluctuations should not exceed ±10% of the rated voltage.
It is not permissible to operate the THRUSTER with a supply voltage and frequency other than those specified on the nameplate.

2.3.4 Safety and maintenance rules

	**Before installing or mounting the hydraulic unit, make sure that the relevant system parts are depressurised. Never remove screw connections, hoses and couplings before the hydraulic unit has been depressurised!**

1) The operator is responsible for the cleanliness of the THRUSTER and brake.

2) Do not make any changes (type and size) on electrical or hydraulic components.
3) The hydraulic flow valve may only be adjusted by trained personal.
4) The hydraulic safety valve and the overflow valve may only be adjusted by trained personal.
5) Changes in the CMU software may be only implemented by qualified personal.
6) When wiring the motor, make sure that the direction of rotation of the motor is correct.
7) The THRUSTER must not be operated in case the oil level is too low.
8) Only use oil that is specified in this manual.
9) Before disassembling the THRUSTER make sure that supply and control voltage have been switched off and that there are no constraining forces on the THRUSTER.

2.3.5 Interface requirements

1) Oil supply connection thread is M16x1.5

3) Base plate connection via 4 x Ø10mm bores, 232mm x 171mm (length x width)

4) Water-proof cable gland of control cable M20×1.5, cable diameter Ø 6～12mm (optional)

2.4 Tool list

Description	Tools
Control unit (CMU)	Allen key 3mm
Conduit gland	Spanner 27mm
Terminal bolt	Screw driver PH2 or straight 5mm
Top cover, oil filler plug	Allen key 6mm
Solenoid valve, overflow valve, throttle valve locknut	Spanner 17/19
Pressure gauge, pressure hose	Spanner 14/17

3. Structure, installation and operation of F-HED2008

3.1 F-HED2008 structure

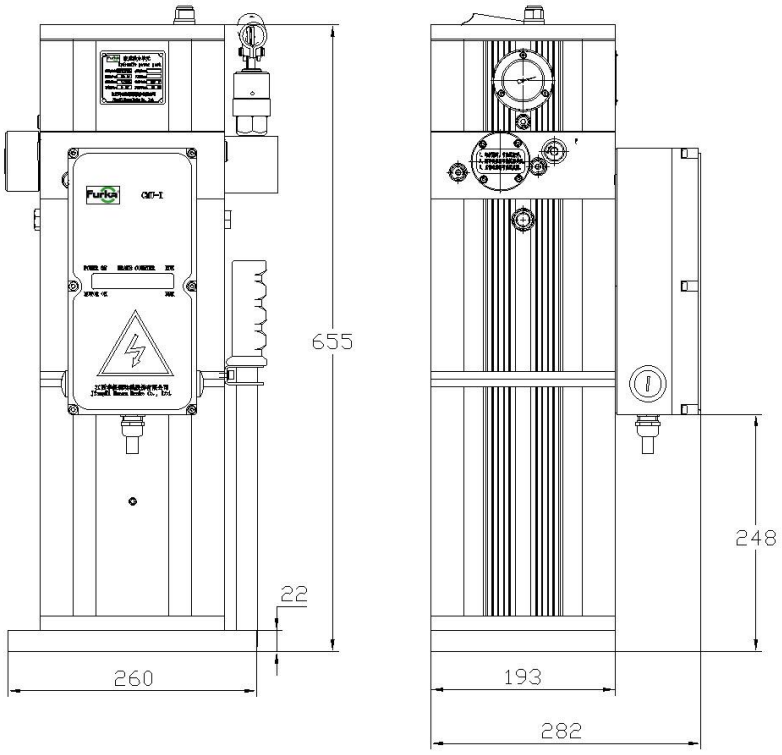


Figure 2: Main dimensions

The electrohydraulic thruster (F-HED2008) described in figure 2 is a compact thruster consisting of motor-pump unit, valve group and electric control device.

3.2 Installation

3.2.1 Set-up

The thruster must be installed vertically. Fixing screw size is M8 (tightening torques as per table in the annex). In case of extreme vibrations, the unit should be placed on damping pads.

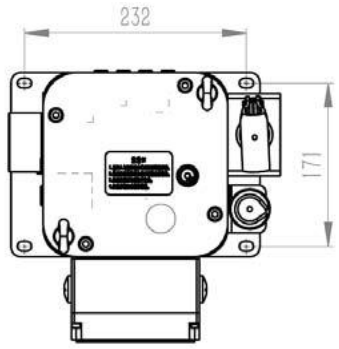


Figure 3: Top view

3.2.2 Hydraulic connection

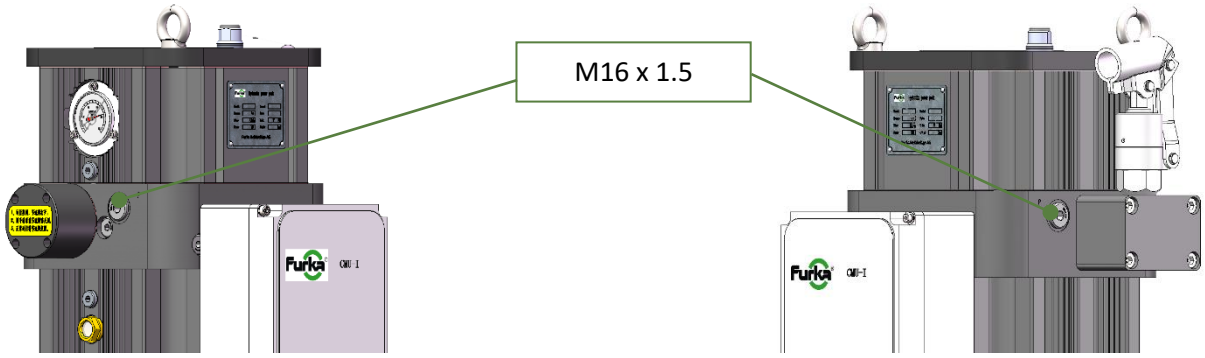


Figure 4: hydraulic hose connection

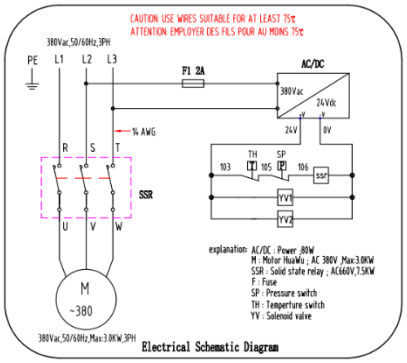
The THRUSTER has two threads size M16 x 1.5 for oil supply. Please use only male stud fittings with 24° taper (tightening torque 35Nm). Max. operation pressure is up to 320bar.

3.2.3 Electrical connection

STOP	**Danger!** The applied electrical voltages are dangerous to life! The electrical connection and all other electrical tasks must only be done by a **trained electrician**!

Connect the phases to L1, L2, L3 and PE in the control box of the hydraulic power unit; note that grounding must be mandatory to protect the motor from phase failure and overload; connect cables.

Wiring see illustration below.



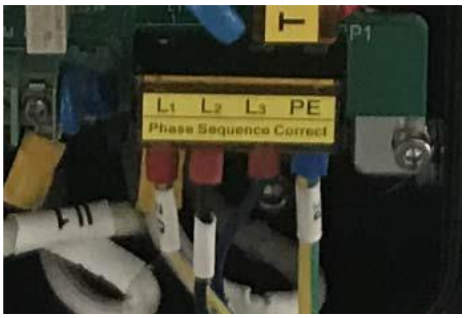


Figure 5: Electrical connection

The direction of motor rotation depends on the phase sequence. Check 4.2.2 for determining correct phase sequence.
Supply voltage is 380V AC, 50Hz.
Power: 3kW
Current: 6.8A

3.3 Operation of F-HED2008

⚠	**If there is not enough oil in the hydraulic unit, it can be damaged and smooth operation is no longer possible!**

3.3.1 Oil charge

Oil	Ambient temperature	Remark
L-HV32	-18 °C – 60 °C	Recommended
L-HS22	-30 °C – 60 °C	

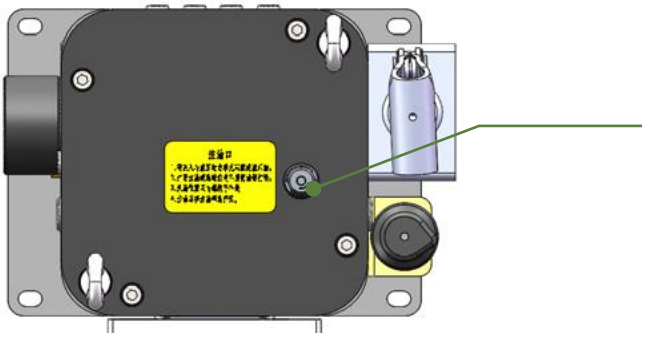


Figure 6: Top view thruster cover

Use a funnel to pour in the oil.

Remove the throttle valve cover with a 2mm Allen key and turn the throttle valve clockwise to close it.
Open the top cover of the thruster. Unscrew the connections to the pressure gauge and the pressure line slightly for bleeding the thruster.
Operate the hand pump until the oil is pressed out without any signs of air bubbles. Tighten all connections properly and take care that the O-ring of the pressure hose does not get lost.

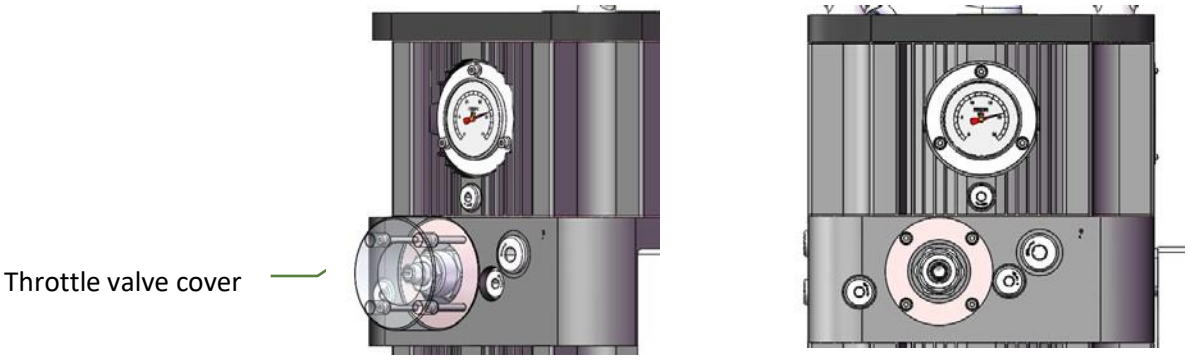


Figure 7: Throttle valve cover and pressure gauge

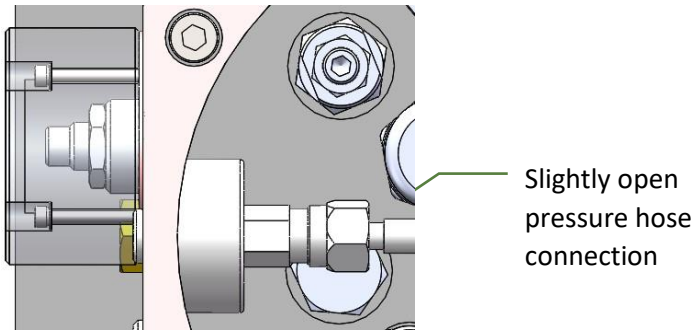


Figure 8: Pressure hose connection

Adjust the throttle valve by counter-clockwise (CCW) rotating 3.5 turns until the throttle valve is opened. It can be locked now and the cover can be mounted again.
Fill oil into the oil filler while operating the hand pump until it is leaking slightly. Close the oil filler plug.

Once the hand pump has built up pressure, the oil filler plug must be loosened again to allow the remaining air to escape. Move the unit slightly to the left and right to allow the remaining air to escape. Close the oil filler cap when the hand pump is in the lower position.

3.3.2 Commissioning

The F-HED2008 is an independent drive unit, with integrated mechanical, electrical and hydraulic functions. Opening, closing and pressure holding is controlled by the main PLC.

3.3.2.1 Command mode

Power supply command: The supply voltage to the F-HED2008 is provided by the main power supply. The brake gets released when the thruster is energized and it will close when the power supply is cut off.
Control power command: The F-HED2008 is switched on and off via the control line.

3.3.2.2 Working principle

Brake open: The F-HED2008 receives the “Open” command from the main PLC. The motor is energised and drives the pump. The solenoid valves are energised and the pump is building up pressure (brake will be released/opened). As soon as a pre-set pressure is reached, the pressure switch switches off the motor. The brake remains opened.

Brake kept open/released:
The use of poppet valves hermetically seals off the volume flow for a certain time keeping the brake in released condition (motor is still shut off!). As soon as the pressure drops below a pre-set value, the pressure switch gives a signal to start the motor so that the pressure can be built up again.

Brake closed/set:
The command "Close brake" is given by the main PLC. The motor and the solenoid valves are de-energised so that the oil can flow back into the tank and the brake closes.

3.3.2 Manual release operation

	**There is no other safety device when the brake is manually released. The drive needs to be secured against any accidental movement.**
	**Before actuating the manual release lever make sure that the load is secured. In case of lowering suspended loads the brake must be <u>slowly</u> opened to avoid slipping of the load. Direct communication between operator and spotter required.**

The brake can be released manually as follows:

Remove the throttle valve cover with a 2mm Allen key and turn the throttle valve clockwise to close it.

Take the extension and insert in in the hand pump.

Figure 9: Manual release operation

You can now open the brake by operating the hand pump. Please observe the maximum pressure on the name plate of the brake. This value should not be exceeded. Please check therefore the pressure gauge on the THRUSTER.

To switch back to normal operation, the throttle valve must be opened completely.
Adjust the throttle valve by counter-clockwise (CCW) rotating 3.5 turns until the throttle valve is opened. It can be locked now and the cover can be mounted again (with a 2 mm Allen key).

Remove the extension from the hand pump and place it next to the unit.

4. Operation and maintenance

4.1 Pre-operation

The F-HED2008 has been run for about 2500 open/close cycles before delivery (Factory tested).

4.2 Check

4.2.1 Mechanical

Before commissioning, check that the F-HED2008 is free of leaks. Check that the thruster has been screwed down properly. Also check the oil level in the oil sight glass. If the oil level is too low, top up to the specified level.

Note: Overflow valve and pressure switch have been set correctly before delivery, which cannot be adjusted at will. In case certain parameters need to be changed, please contact Furka®.

4.2.2 Electrical

Determination of the phase sequence: Check if the pump is running in the right direction by repeatedly switching the drive motor on and off quickly (inching operation) without reaching full speed until it is evident that the pump is working properly. Faultless operation, which can be seen from the noise level of the pressure gauge, should be reached after 30 seconds at the longest.

LED display
The software version will be displayed for 1sec every time the f-HED2008 is powered on.
The standard view shows the number of braking cycles. As soon as an error occurs, the view changes and displays the corresponding information. Please see fig. 10.

Braking cycles
Powered-on times plus 1, LED display XXXXXXXX(XXXXXXX range 0~99999999)

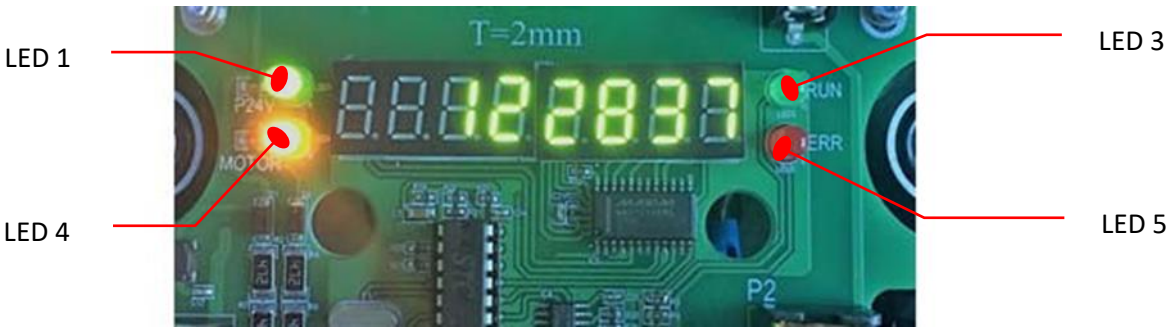


Figure 10: LED display

Fault diagnosis:

Fault	LED display
Motor runs for too long. Continuous operating time of the motor of more than 1 min is detected	**Er 1** flickering display period 1s
Motor starts frequently: Motor starts more than 3 times within 5min	**Er2** display period 1s
Hardware fault: the input signal of the relay is not consistent with the output signal, the inconsistent time is over 3s	**Er4** display period 1s
Oil temperature warning: when the oil temperature of the hydraulic system is detected to be too high	**Er5** flickering display period 5s

Status reading
SW1 is the status inquiry button. Press the button briefly several times (less than 5s) to display the errors and error times. To delete the error memory, press the button for longer than 5s. If the button is not pressed for longer than 5s, the display automatically switches to the display of the braking cycles.
A long press (more than 5s) takes you to the input and output parameter query and a single short press (less than 5s) takes you back to braking times.

LED indicator lights
LED1 is the power indicator light, LED3 is the running indicator light, LED4 is the motor running light, LED5 is the fault indicator light.

5. Trouble shooting

5.1 Motor cannot be started

- Check oil level and temperature

- Check electrical power supply (incl. control power supply) and wiring

- Check wiring of pressure switch 12 (Contact)

- Check if the motor is damaged

5.2 F-HED2008 does not provide enough power, brake cannot be released

- check if the motor is running (phase sequence ok?)

- check for correct installation (no jamming)

- check oil level and bleeding status

- check setting of overflow valve (10) and pressure switch (12)

- check if the solenoid valves are energized

- check for damaged seals

5.3 Motor starts frequently

- check if the solenoid valves (10) are energized (stable power supply wiring of the coils)

- Check for leakages

5.4 Motor starts continuously

- Check 5.2

- Check pressure switch (12)

- Check control board

5.5 Troubleshooting

Nr.	Fault	Troubleshooting
1	Er1, Er2	1. Check for leakages
		2. Check cables and cable connection
		3. Replace pressure switch and temperature switch
		4. Replace MD01 board
2	Er4	1. Check cable and cable connection
		2.Replace MD01 board
3	Er5	1. Check cable and cable connection
		2. Check temperature switch
		3. Replace MD01 board
4	Key and display fault	1. Check cables and cable connection
		2. Replace MD01 board
5	Motor cannot be started	1. Check cable and cable connection
		2. Check motor protection switch for blown fuses
		3. Replace pressure switch, temperature switch and solid state relay
		4. Replace MD01 Board
		5. Replace motor

5.6 Common errors during commissioning

- Filling with unfiltered oil.
- No correct bleeding of the hydraulic unit/system.
- No documentation of the setting values.
- The tank was not filled with (enough) oil before commissioning.
- Abnormal pump noises are not observed (leaking suction line, too much air in the oil).
- Setting of the pressure relief valves with too little distance to the working pressure.
- Pump pressure regulator is set higher or the same as the pressure relief valve.

5.7 Disposal

The disposal of the individual materials must be carried out in accordance with the legal and national regulations of your country or your company's internal specifications. If the hydraulic unit is to be decommissioned and scrapped, the remaining hydraulic fluid must first be carefully drained from all parts of the unit.
Special attention must be paid to the disposal of the pressure fluid and to components with residual pressure fluid. When disposing of the pressure fluids, observe the instructions in the safety data sheet.

The hydraulic unit to be scrapped should be dismantled into its individual parts and disposed of separately according to the various materials in accordance with the applicable regulations.
Dismantling should be carried out by competent personnel. There are no special dangers as long as suitable tools and equipment are used.

6. Annex

Tightening torques acc. to VDI 2230-1:2015

Bolts with metric standard thread:	DIN ISO 68, DIN ISO 724, DIN 13-19
Spanner size of hex bolts	DIN EN ISO 4014 bis DIN EN ISO 4018
Screws with external hexagonal round:	DIN 34800
Socket-head cap screws:	DIN EN ISO 4762
Bore "medium"	DIN EN 20273

μ=0.12 **$\mu=\mu_G=\mu_K$ Friction on the thread / head rest**

	Metric Class						Spanner size	
	8.8		10.9		12.9		acc. to ISO 4014 etc.	acc. to DIN
	Nm	ft·lb	Nm	ft·lb	Nm	ft·lb	mm	mm
M3	1.3	1.0	1.91	1.4	2.24	1.7	5.5	5.5
M3.5	2.01	1.48	2.96	2.18	3.46	2.55	6	6
M4	2.99	2.2	4.39	3.2	5.14	3.8	7	7
M5	5.9	4.35	8.66	6.39	10.1	7.45	8	8
M6	10.2	7.5	15	11.1	17.5	12.9	10	10
M8	24.7	18.2	36.3	26.8	42.4	31.3	13	13
M10	48.6	35.8	71	52.4	84	62.0	16	17
M12	84	62	123	91	144	106	19	19
M14	133	98.1	195	143.8	229	168.9	21	22
M16	205	151	301	222	353	260	24	24
M18	295	217.6	420	309.8	491	362.1	27	27
M20	415	306	591	436	692	510	30	30
M22	567	418.2	808	596.0	946	697.7	34	32
M24	715	527	1018	751	1191	878	36	36
M27	1054	777.4	1501	1107.1	1756	1295.2	41	41
M30	1432	1056	2040	1505	2387	1761	46	46
M33	1934	1426.4	2755	2032.0	3224	2377.9	50	50
M36	2489	1836	3544	2614	4148	3059	55	55
M39	3216	2372	4581	3379	5360	3953	60	60

Tightening torques

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