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Service manual
Electronic Crane Scales

KERN HFA

Version 1.0
03/2015
GB

HFA-SH-e-1510

GB

KERN HFA

Version 1.0 03/2015

Service manual

English

Contents

English

1. Basic Information

The device must be repaired only by trained specialist staff or personnel with professional formation (such as a repair-specialist accredited by law concerning verification). The service manual is obligatory for repair work. After repair, original conditions of the device have to be restored. Only original spare parts should be used.

Instructions about conformity-evaluated scales:

Repair must be carried only at 100% compliance with the type approval. A violation of this specification will result in a loss of the type approval! After successful repair the balance will have to be reverified before it can be used again in a statutorily regulated field.

Detailed instructions about conformity-evaluated scales:

Repair must be carried only at 100% compliance with the type approval. A violation of this specification will result in a loss of the type approval!

After successful repair the balance will have to be reverified before it can be used again in a statutorily regulated field.

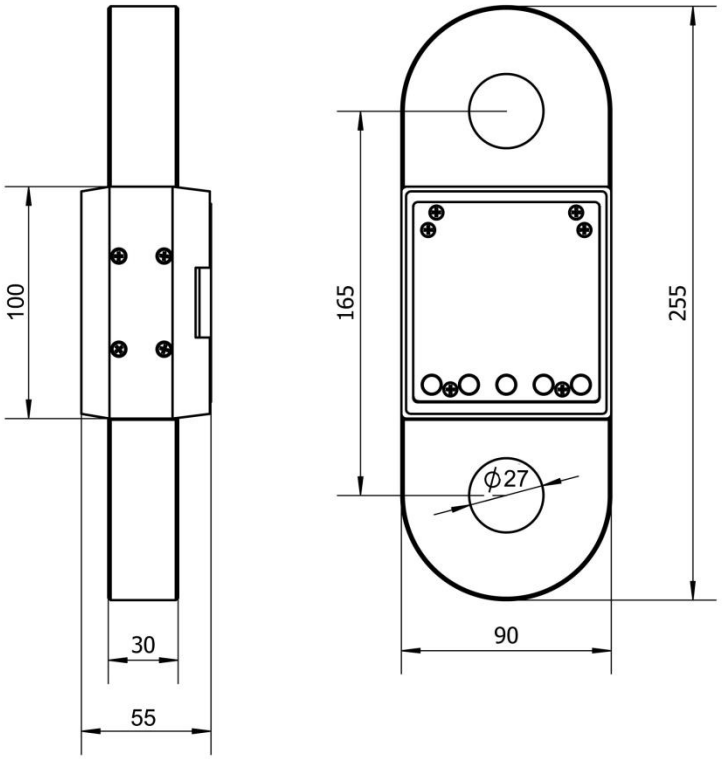
2. Introdution

This service manual covers the EOA series and is edited for the authorized servicing personnel.

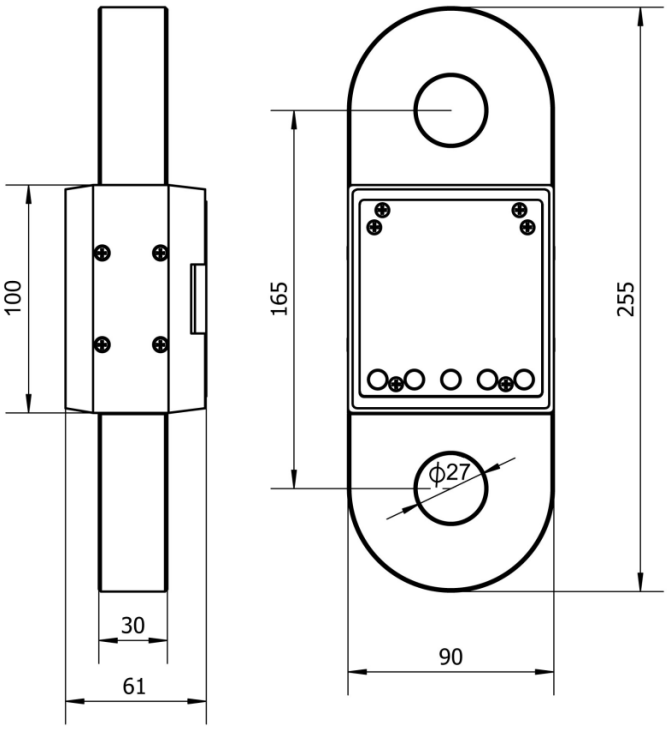
3. Technical data

3.1 Dimensions

Balance 0.6 t / 1 t



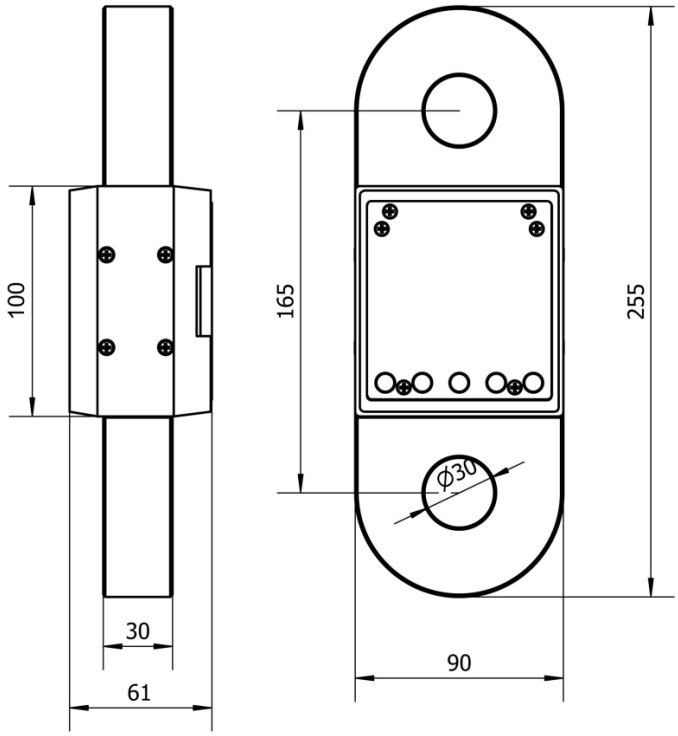
Balance 3 t



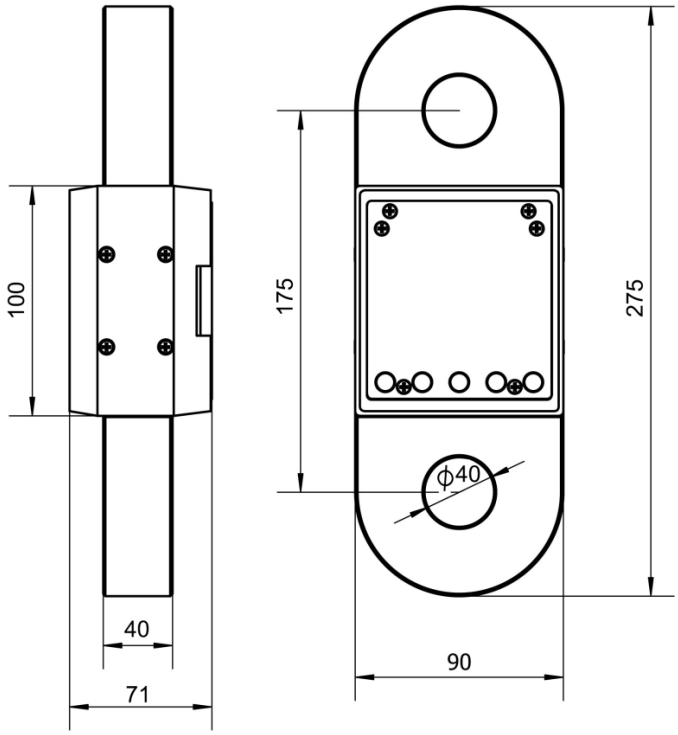
English

English

Balance 5 t



Balance 10 t



4. General Safety Instructions

4.1 Duties of the owner-operator

Follow national accident prevention regulations and all operator health and safety at work and operating regulations.

- Observe all safety regulations of the crane manufacturer.
- The balance may only be used for the proposed purpose. Any type of use which is not specified in these operating instructions will be considered as improper use. The customer is solely responsible for material damage and injury of persons resulting from an improper use, Messrs. KERN & Sohn will not be liable under any circumstance.
  Messrs. KERN & Sohn cannot be held liable, if the suspended balance is modified or used improperly and if damage is resulting from such use.
- Carry out service and repair to suspended balance (see chap. 9.3), crane and lifting tackle at regular intervals.
- Log the test result and keep it in the logbook.

4.2 Organizational measures

- Only trained and instructed staff may operate the balance.
- Make sure that the operating instructions are kept nearby the operation site of the suspended balance.
- Assembly, commissioning and maintenance should only be carried out by trained specialists.
- Weight-bearing components must not be replaced.

4.3 Environmental conditions

- Never operate suspended balance in spaces exposed to explosion hazards. The serial version is not explosion protected.
- Operate the suspended balance only under environmental conditions as specified in these operating instructions (especially in chapter 1 „Technical data“).
- Do not expose the suspended balance to strong humidity. Non-permitted condensation (condensation of air humidity on the appliance) may occur if a cold appliance is taken to a considerably warmer environment. In this case, acclimatize the disconnected appliance for ca. 2 hours at room temperature.
- Do not use suspended balance in environments exposed to corrosion hazards.
- Protect the suspended balance against high humidity, vapours and dust.
- Major display deviations (incorrect weighing results) may be experienced should electromagnetic fields (e.g. due to mobile phones or radio equipment), static electricity accumulations or instable power supply occur. Change location or remove source of interference.

4.4 Pay attention to the instructions in the Operation Manual

⇨ Carefully read this operation manual before setup and commissioning, even if you are already familiar with KERN balances.

⇨ All language versions contain a non-binding translation. The original German is binding.

4.5 Proper use

The balance you purchased is intended to determine the weighing value of material to be weighed. It is intended to be used as a “non-automatic“ balance, i.e. the material to be weighed is suspended on the load receptor only vertically, manually, carefully and without jerks. As soon as a stable weighing value is reached the weighing value can be read.

- Use the suspended balance only for lifting and weighing of freely movable loads.
- Danger of injury due to improper use. Not allowed are e.g.:
  - Exceeding the allowed nominal load of crane, suspended balance or any type of load attachment devices
  - Conveying persons,
  - Pulling loads over an inclined surface,
  - Tearing-off, pulling or towing loads.
- Modifications or reconstructions of the suspended balance or of the crane are not allowed.

4.6 Improper Use

Do not use balance for dynamic weighing. In the event that small quantities are removed or added to the material to be weighed, incorrect weighing results can be displayed due to the “stability compensation“. (Example: Slowly draining fluids from a container suspended on the balance.) Do not leave permanent load suspended on the balance. This may damage the measuring system as well as safety-relevant parts.

The balance may only be used according to the described conditions. Other areas of use must be released by KERN in writing.

4.7 Warranty

Warranty claims shall be voided in case

- Our conditions in the operation manual are ignored
- The appliance is used outside the described uses
- The appliance is modified or opened
- Mechanical damage and damage caused by media, liquids,
- Natural wear and tear
- The appliance is improperly set up or incorrectly electrically connected
- The measuring system is overloaded

4.8 Safe working

- Do not stand under swinging loads, see chap. 5.1.
- Position the crane in a way that the load is lifted vertically.
- When working with the crane and suspended balance wear personal safety equipment (helmet, safety shoes etc.).

4.9 Monitoring of Test Resources

In the framework of quality assurance the measuring-related properties of the balance and, if applicable, the testing weight, must be checked regularly. The responsible user must define a suitable interval as well as type and scope of this test. Information is available on KERN's home page (www.kern-sohn.com) with regard to the monitoring of balance test substances and the test weights required for this. In KERN's accredited DKD calibration laboratory test weights and balances may be calibrated (return to the national standard) fast and at moderate cost.

4.10 Testing upon acceptance

Inspect packaging immediately upon receipt and inspect device when unpacking (see chap. 4.1.) in the event of any evident damage.

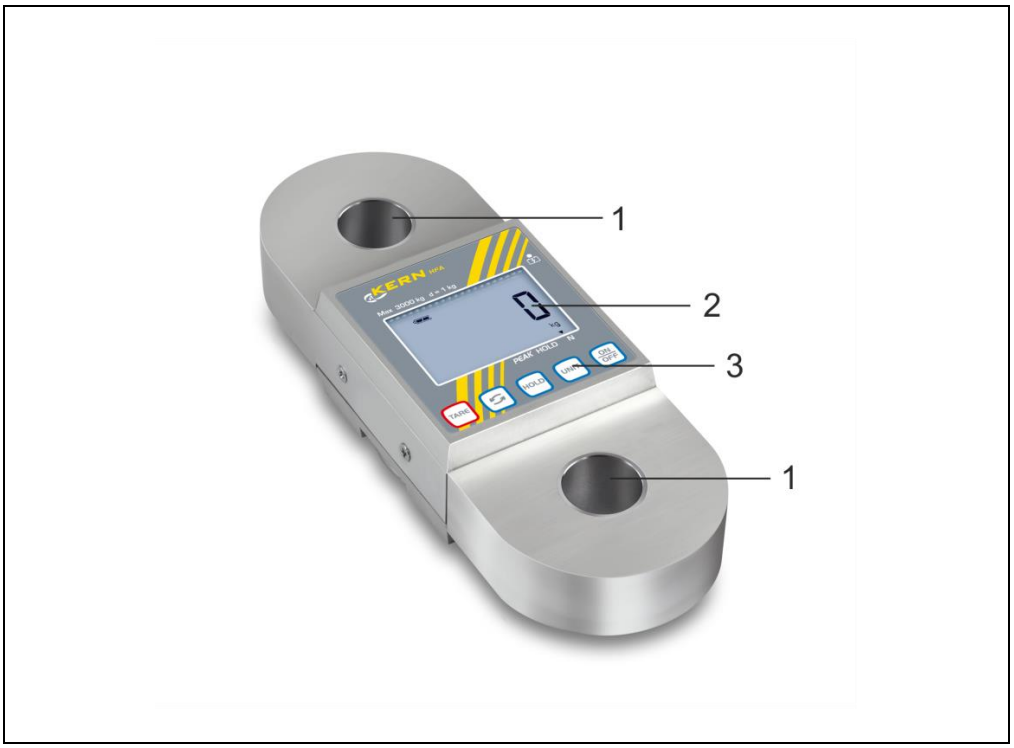
4.11 Initial Commissioning

In order to obtain exact results with the electronic balances, your balance must have reached the operating temperature (see warming up time chap. 1).
During this warming up time the balance must be connected to the power supply (mains, accumulator or battery).
The accuracy of the balance depends on the local acceleration of gravity.
Strictly observe hints in chapter Adjustment.
For checking original dimensions, s. chap. 4.3

4.12 Shutdown and storage

- Remove suspended balance from crane and remove all attachment devices from the suspended balance.
- Do not store suspended balance outdoors.

5. Appliance overview



1 Anchor eyelet

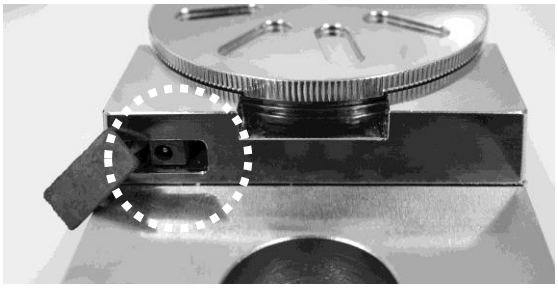
2 Display

3 Keyboard

Lifting tackle not included in scope of delivery.

Standardised attachment devices are to be used to attach loads.

Rear

	
Battery or rechargeable battery compartment	Mains connection

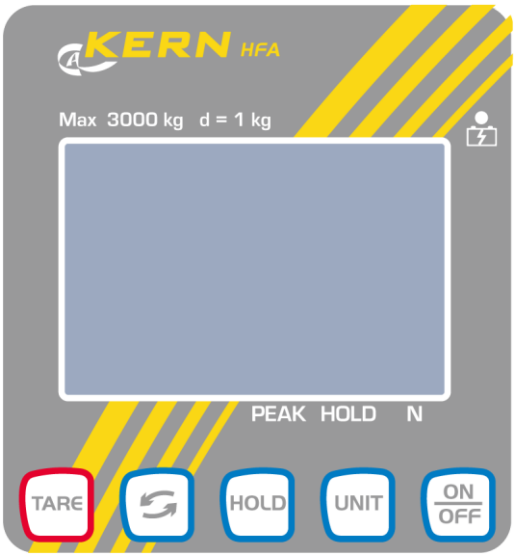
English

5.1 Overview of display

Display	Significance
	Rechargeable battery capacity
	Indicators for weighing with tolerance range
M+	Totalization
STABLE	Stability display
ZERO	Zero indicator
Net	The displayed weighing value is a net weighing value
OZT **Lb** **kg**	Weighing Units

English

5.2 Keyboard overview



Button	Description of function
TARE	• Taring • Zeroing • Exit menu / back to weighing mode.
	• Switch-over weighing unit • Scroll up/down menu • For numeric entry increase value of digit • Set readability (options: 1d/2d/5d/10d/20d)
HOLD	• Set weight display • Set peak load • Confirm
UNIT	• Switch over weighing unit (kg→lb→N) • Select digits for numeric entry
ON OFF	• Turn on/off balance

English

5.3 Label

⇨ Do not stand or go under suspended loads.

⇨ Do not use on building site.

⇨ Keep an eye on suspended loads.

(example)

⇨ Do not exceed nominal rated load of balance.

⇨ The product conforms to the requirements of the German Equipment and Product Safety Act.

English

6. Battery

6.1 Battery / rechargeable battery operation

Battery operation:

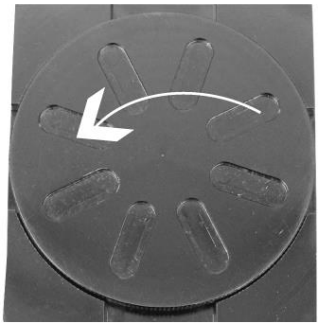
When batteries are empty,  will appear on the balance's display

Press 

and replace batteries.
Open battery compartment, replace batteries and close battery compartment again.

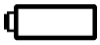
In order to save the battery, the balance switches automatically off after 4 minutes without weighing. This auto-off function can be deactivated in the menu, see chap. 6.

When the suspended balance is out of operation for a longer period, remove the batteries.

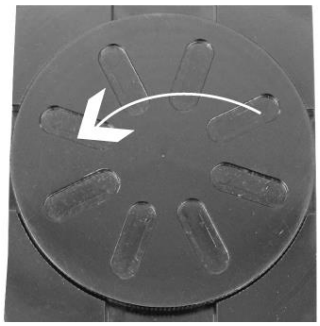
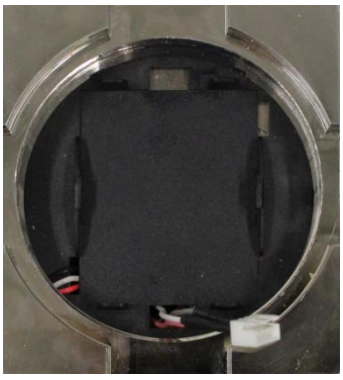
Unscrew battery / rechargeable battery compartment in the direction of the arrow.	
Replace batteries and relock battery / rechargeable battery compartment.	

English

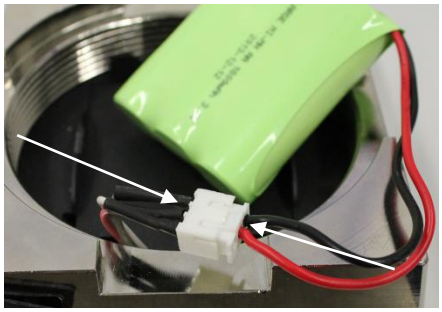
6.2 Accu operation:

When the rechargeable battery is empty,  appears on the balance's display.
Turn off balance and connect power supply unit; battery is charged.
Once the battery has been fully charged the display will show the  symbol.

Insert rechargeable battery:

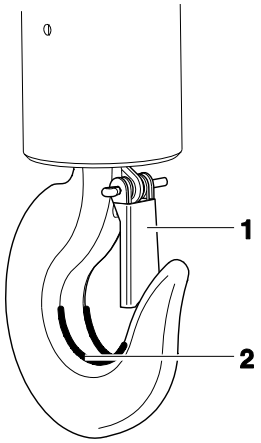
Unscrew battery compartment in arrow direction.	
Remove batteries including battery mount from the device.	 

English

Connect cable of balance to battery cable as shown on image.	
Insert battery in the centre. Ensure that the cables are not kinked. Relock battery compartment.	

English

6.3 Suspending the balance



Condition
The crane needs a safety bracket (1) that the unloaded suspended balance cannot fall down.
If the safety bracket is missing or damaged, please contact the crane manufacturer in order to receive a hook with this safety equipment.

⇨ Attach the suspended balance to the lower hook of a crane and close the safety bracket.
The crane scale’s upper eyelet should rest in the saddle (2).

7. Operation

7.1 Safety instructions

<table>
<tr>
<td>  </td>
<td>DANGER Risk of injury due to falling loads!</td>
</tr>
<tr>
<td> 
 
 
 

(example)</td>
<td>⇨ Take great care when operating the crane and follow the general rules for crane operation.
⇨ Check all parts (hook, carbines, rings, rope slings, cables, chains etc.) for excessive wear or damage
⇨ If faults can be seen on the safety bracket of the crane hook or if it is missing completely, the scales must not be used.
⇨ Work only with appropriate speed
⇨ Always avoid vibrations and horizontal forces. Avoid any kind of shock, torsion and oscillating (e.g. caused by inclined suspending)
⇨ Do not use the suspended balance for conveying loads.
⇨ Do not stand or go under suspended loads.
⇨ Do not use on building site.
⇨ Keep an eye on suspended loads.
⇨ Do not exceed nominal rated load of crane, suspended balance or any kind of attachment device on the suspended balance.</td>
</tr>
</table>

English

7.2 Loading the suspended balance

For good weighing results observe the following, illustrations see next page:

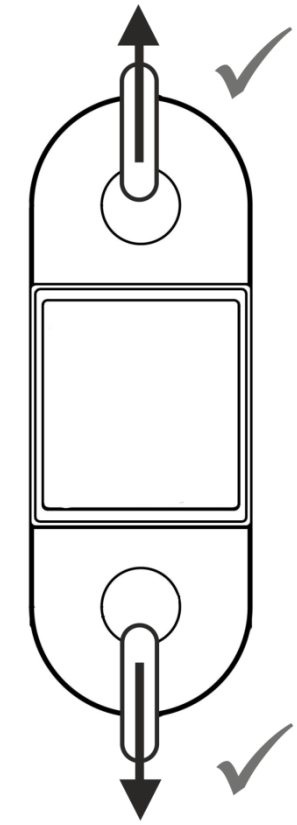
- ⇨ Only use load attachment devices which guarantee a one-spot suspension and where the scales can be suspended freely.
- ⇨ Do not use too large load attachment devices which do not guarantee any one-spot suspension.
- ⇨ Do not use multiple suspensions.
- ⇨ Do not pull or push the load or the loaded balance.
- ⇨ Do not pull the hook horizontally.

Loading the balance

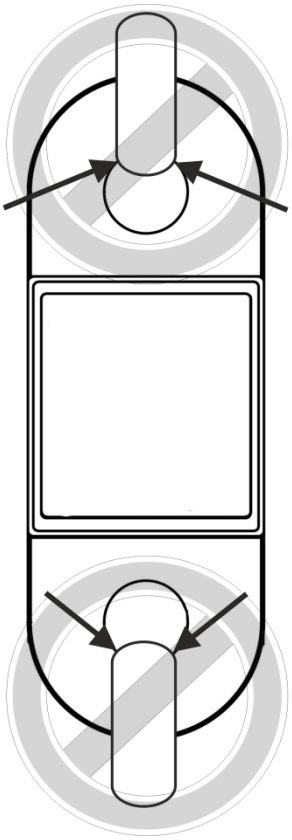
1. Position the hook of the suspended balance over the load.
2. Move downwards the suspended balance until the load can be suspended on the hook of the balance. Reduce the speed when the respective height is going to be reached.
3. Attach load to attachment device. Ensure that all safety-relevant devices are functional (e.g. the safety latch is closed). If the load is fixed by slings, ensure that the slings rest completely on the saddle of the balance hook.
4. Lift-off the load slowly.

   When the load is fixed by slings, ensure that the load is well balanced on both sides and that the slings are correctly positioned

+ **Always use suitable lifting tackle.**



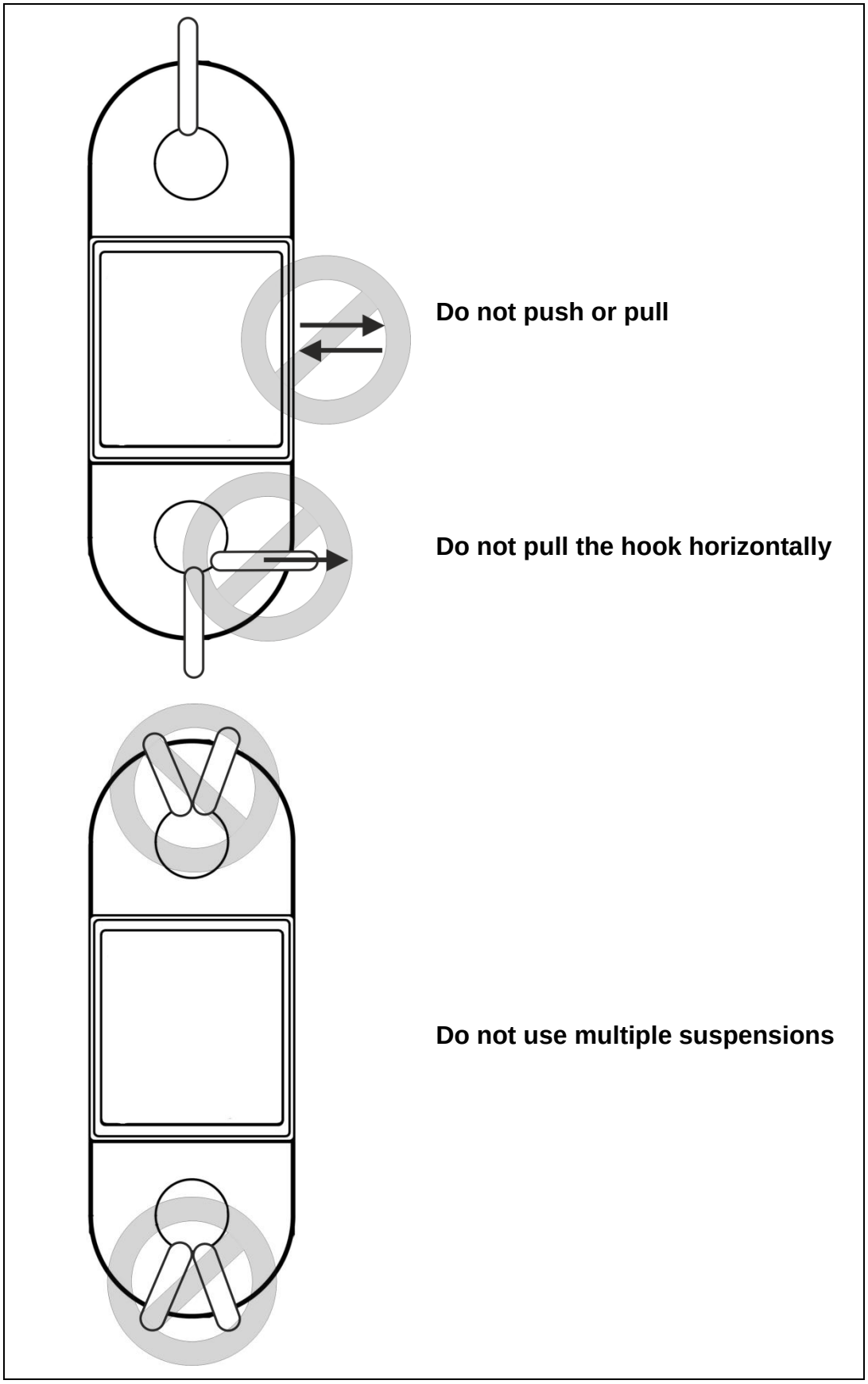
Only use attachment devices which guarantee a one-point suspension and where the scales can be suspended freely.



Do not use too large attachment devices which cannot guarantee a one-point suspension.

English

English


Do not push or pull
Do not pull the hook horizontally
Do not use multiple suspensions

8. Menu

8.1 Navigation in the menu:

Call up menu	⇨ Switch-on balance and during the selftest press HOLD. The first function **F0bk** is displayed.
Select menu item	⇨ With help of , the individual menu items can be selected one after the other.
Select setting	⇨ Confirm selected menu item by pressing HOLD. The current setting will be displayed.
Change settings	⇨ Switch into the available settings using .
Confirm setting	⇨ Press HOLD, balance returns to menu
Exit menu / Return to weighing mode	⇨ Press TARE repeatedly.

English

8.2 Overview

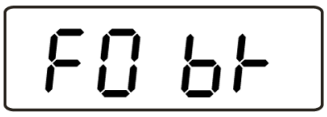
Function	Available settings	Description	
F0 bk Display background illumination	bk on	Background illumination on	
	bk off	Background illumination off	
	bk AU	Background illumination switches on automatically when loaded or a button is pressed	
F1 AZ Autozero	AZ 0.5d	Automatic zero correction (auto-zero) on change of display, Selectable digits available 0.5d,1d, 2 d, 4 d.	
	AZ 1d		
	AZ 2d		
	AZ 4d		
F2 Unt Standard weighing unit	Ut lb	Pound	
	Ut kg	Kilogram	
	Ut N	Newton	
F3 CHk Check weighing	Ck Lo	Lower limit value, input see chap. 5.9	
	Ck Hi	Upper limit value, input see chap. 5.9	
F4 CAP Capacity	1000 kg	Weighing range [Max], options 1000 / 2000 / 3000 / 5000 / 10000 kg	Modifications may only be carried out by a specialist with competent knowledge.
	2000 kg		
	3000 kg		
	5000 kg		
	10 000 kg		
F5 CAL Adjustment / linearization	nonLi	Adjustment	
	Line	Linearization	
F6 isp	XXXXX	Internal A/D converter value	
F7 GrA	Not documented		
F8 rst	Reset to default setting		
F9SPd Display speed	SPd 7.5		
	SPd 15		
	SPd 30		
	SPd 60		
F10of Autom. switch-off function (auto off)	Off 0	Off 0: Autom. switch-off function disabled	
	Off 3	Off 3/5/15/30: Balance will switch off after x minutes in stand-by mode.	
	Off 5		
	Off 15		
	Off 30		

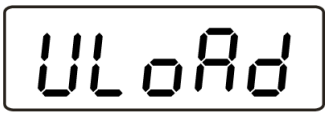
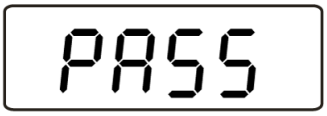
* = default setting

9. Adjustment

As the acceleration value due to gravity is not the same at every location on earth, each balance must be coordinated - in compliance with the underlying physical weighing principle - to the existing acceleration due to gravity at its place of location (only if the balance has not already been adjusted to the location in the factory). This adjustment process must be carried out for the first commissioning, after each change of location as well as in case of fluctuating environment temperature. To receive accurate measuring values it is also recommended to adjust the balance periodically in weighing operation.

- Provide the required adjustment weight, see chap. 1. “Techn. data“.
  The weight to be used depends on the capacity of the scale. Carry out adjustment as near to maximum load as possible. Info about test weights can be found on the Internet at: http://www.kern-sohn.com
- Observe stable environmental conditions. A warming up time (see chapter 1) is required for stabilization.

⇨ Turn off balance and attach suitable lifting tackle.	
⇨ Turn on balance with the lifting tackle attached and press HOLD during self-test. The first function „F0bk“ is displayed.	
⇨ Press ↻ repeatedly until „F5CAL“ is displayed.	
⇨ Press HOLD, the last parameter set will be displayed. • „nonLi“ Adjustment of balance or • „LinE“ Linearisation of balance	 
⇨ Select „nonLi“ by ↻	

⇨ Press HOLD, “ULoAd“ will be displayed. Make sure that no loads apart from the lifting tackle are attached to the hook.	
⇨ Wait for stability display, then press HOLD.	
⇨ Either use the displayed adjustment weight or change by ⇄ and UNIT, the currently enabled digit is flashing. Press UNIT to select the digit to be amended. To change the selected (flashing) digit, press ⇄ repeatedly until the desired value is displayed.	 (example)
⇨ Confirm by HOLD, „LoAd“ will be shown.	
⇨ Attach adjustment weight. Wait for stability display, then press HOLD.	
⇨ After successful adjustment „Pass“ will be displayed. After that, the balance will carry out a self-test, followed by a brief display of “Err4“. Finally the balance returns automatically to weighing mode, adjustment has been carried out successfully.	  (example)

An adjusting error or incorrect adjusting weight will be indicated by the error message; repeat adjustment procedure.

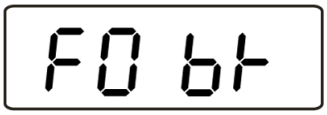
10. Linearization

10.1 Linearization

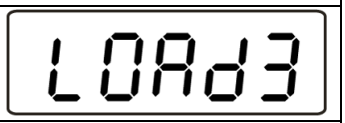
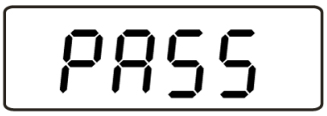
Linearity shows the greatest deviation of a weight display on the scale to the value of the respective test weight according to plus and minus over the entire weighing range.
If linearity deviation is discovered during a monitoring of test resources, you can improve this by means of linearization.

- Carrying out linearization is restricted to specialist staff possessing well acquainted with the workings of balance.
- The test weights to be used must be adapted to the balance's specifications; see chapter 2.9 "Testing instruments control".
- Observe stable environmental conditions. Stabilisation requires a certain warm-up time.
- After successful linearization you will have to carry out calibration; see chapter 2.9 "Testing instruments control"

10.2 Carry out linearization

⇨ Turn off balance and attach suitable lifting tackle.	
⇨ Turn on balance with the lifting tackle attached and press HOLD during self-test. The first function „F0bk" is displayed.	
⇨ Press ↻ repeatedly until „F5CAL" is displayed.	
⇨ Press HOLD, the last parameter set will be displayed. • „nonLi" Adjustment of balance or • „LinE" Linearisation of balance	 
⇨ Select „LinE" by ↻	
⇨ Press HOLD, "LoAd 0" will appear. Make sure that no loads apart from the lifting tackle are attached to the hook.	

English

⇨ Wait for stability display and press HOLD again. “LoAd 1“ (1/3 max) will be displayed.	
⇨ Attach first adjustment weight, wait for stability display Press HOLD, “LoAd 2“ (2/3 max) will be displayed.	
⇨ Attach second adjustment weight, wait for stability display	
⇨ Press HOLD, “LoAd 3“ (max load) will be displayed	
⇨ Attach third adjustment weight, wait for stability display	
⇨ Press HOLD, “PASS“ will be displayed ⇨ Finally the balance will carry out a self-test, “Err19“ is briefly displayed (Ignore error message), then the balance returns automatically to weighing mode, the weight value is displayed and linearization has been completed successfully.	  (example)

If an error occurs, turn off on restart balance and repeat linearization.

11. Cleaning, Maintenance and Disposal

If the scale does not operate properly, find out the problem as possible.
Determine whether the problem is constant or alternate. Be aware that problems can be caused by mechanical or electrical influences.

Check the following.

- Water
- Corrosive materials
- Vibrations or temperature or wind
- Physical damage

Check the scale cables for damage, and check all connections and connecters for any loose contact or incorrect connection

Cleaning

- Disconnect the power before cleaning.
- Use a cloth with mild suds and light cleaning agents.
- Make sure that fluid not able to get into the device.
- Use a clean and soft cloth for rub off.

11.1 Error Codes

Error Code	Description	POSSIBLE CAUSES
Err 4	Zero range exceeded, due to turning on or by pressing 	• Goods on the platform • Overload, when zeroing the scale. • Improper calibration • Load cell problem • PCB problem
Err 6	A/D Count out of the range	• Platform not installed • Load cell problem • PCB problem

11.2 Determine the Problem

Determine whether the problem is in the PCB or the Load Cell

- Remove power from the system, and disconnect the load cell connection from the PCB
- Connect the PCB to a load cell simulator
- Reapply power and test the PCB
- If problem goes away, its source is probably in the Load cell. Check the wiring, connecter, load cell and mechanical components of the load cell.

If problem persists, its source is probably in the PCB. Check the PCB voltages, connecters, cables and function programs

11.3 Testing Load cell

For testing load cell, remove power from the system, and disconnect the PCB from the Load cell

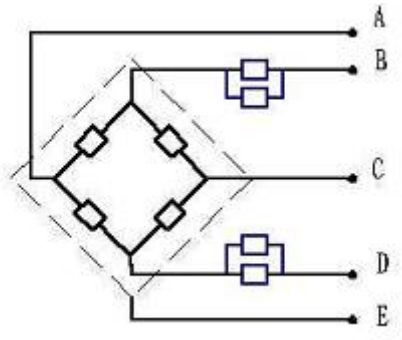
Physical Test:

- Check the moisture, or foreign material inside.
- Check load cell surface badly rusted or corroded
- Check the strain gauge areas become compressed
- Check any physical damage (body bent or twisted) to the load cell
- Check load cell cable, all leads are connected, any cut, splits or tears.
- Check load cell for proper input and output resistances

Electrical Test:

Use an accurate multimeter to check the ohms

Load Cell Connections



Signal + Green
Supply + Red
Signal - White
Supply - Black
Shield

Measuring Points	Resistance
Red (+ Exc) to Black (–Exc)	409 ±6Ω
Green (+Sig) to White (–Sig)	350Ω ±3Ω

Leakage Resistance

- Check each of the load cell wires to the load cell cable screen.
- Check each of the load cell wires to the load cell body.

These readings should be greater than 1000mΩ or OL.
If this reading is less than 1000 mΩ, then this load cell has leakage between the internal circuit and the load cell body or cable screen

Zero Balance

- Connect the load cell to a stable DC source of between 5 to 10V
- Connect multimeter to mV and connect to the load cell signal wires
- The meter should read 0.00mV ± approximately 1 % of full load.

If the output reads greater than ±10% of full scale capacity, then the load cell will require replacement.

11.4 Testing PCB Voltages

If the problem is in the PCB, use a multimeter to check the following voltages

AC Power

Check the AC power socket out put voltage.

- Voltage must be a -20% and +10% of the normal AC voltage.

adapter Voltage

Check the adapter output cable connecter voltage

- Voltage must be minimum 9VDC and maximum 12VDC

PCB Input Voltage

Check the PCB input power connecter voltage

- Voltage must be minimum 9VDC in to the pin AD+

Check Battery Voltage and Charging Voltage

1. Check the Battery Voltage,
   - Voltage must be minimum 6VDC. If below the 6VDC connect the adapter for charging
   - The battery voltage below the 5.5VDC, replace the battery and install new battery.

2. Check the Battery Charging Voltage;
   - Remove the battery connection terminals (Red and Black) from the battery.
   - Connect the power and turn on the scale
   - Voltage into the terminal minimum 6.5VDC

11.5 Trouble Shooting

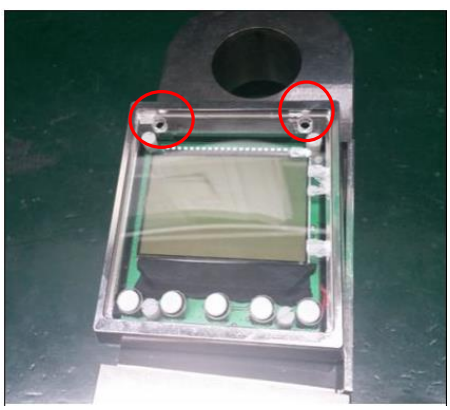
Problem	Possible Cause	Common Solutions
Display is blank, no self-checking	Mains power is turned off. Power supply not plugged in Internal battery not charged Display turned off	Check the power is going inside and switch is turned on. Verify the voltage
After self-checking error message stuck	Crane not installed Unstable weight Load cell damaged Mechanics damaged	Check again after turn on the scale Check the load cell connecters
OL or ------ appears on the display	Maximum capacity exceeded Load cell or mechanism damaged Power supply fault	Check the crane is installed correctly Check again after turn on the scale Check the power connecters

------ or NULL displayed	Weight on the scale below the permissible limit. Crane has been removed Load cell or mechanism damaged	Check the platform is installed correctly Try to make zero by pressing zero key Check again after turn on the scale Check the load cell connecters
Display is unstable	Sample is moving from the crane Due to vibration, air variation and temperature variation Power supply faulty Load cell damaged	Check the scale is acceptable location is good Check the power supply Check the load cell and connecters
Incorrect value	Calibration error Calibrated with inaccurate weight. Goods not placed correctly to the platform Wrong unit is displayed Load cell damaged	Calibrate again. Check the calibration weight is correct and accurate. Check the crane is installed correctly Check the goods is placed correctly. Check the load cell and connecters
Cannot use full capacity	Overload stopper is touching Transporting lock is not removed Parameter settings incorrectly Load cell damaged PCB damaged	Check the transporting lock and overload stopper Check the parameters settings Check the platform is installed correctly Check the load cell Check the PCB
Battery not charging	Mains voltage is not correct. adapter damaged Charging circuit failure Battery failure	Check the mains voltage Check the adaptor Check the power connecters and circuit Check the battery

English

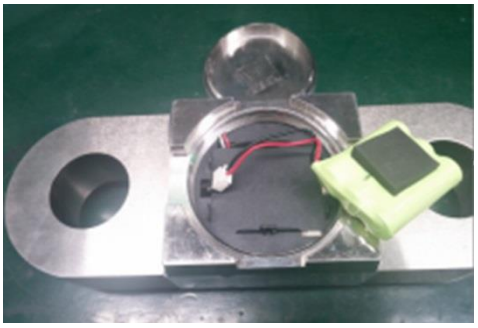
12. Parts Replacement

12.1 Replace Main Board



- Remove the top overlay
- Remove the two screw from acrylic plate
- Remove the power connecter
- Remove the load cell cable and display connecter from the PCB.
- Install a new main PCB.
- Connect load cell cable and display cable.
- Connect the power connecter.
- Fix the PCB to the housing with screws.
- Recover the top overlay.

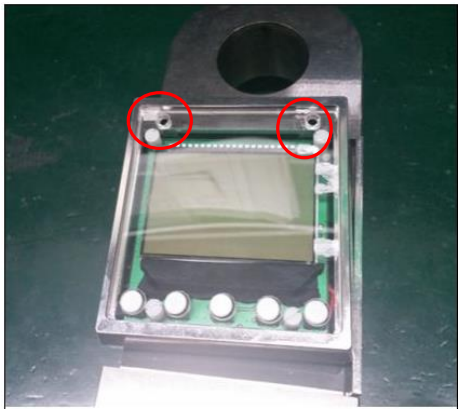
12.2 Replace Battery



- Open the rear cover.
- Take out the battery from in side of the housing.
- Remove the connecters from the battery terminals.
- Change the new battery .
- Connect the connecters to the battery.
- Battery, place it proper to inside the housing.
- Close the battery box cover.

English

12.3 Replace Display

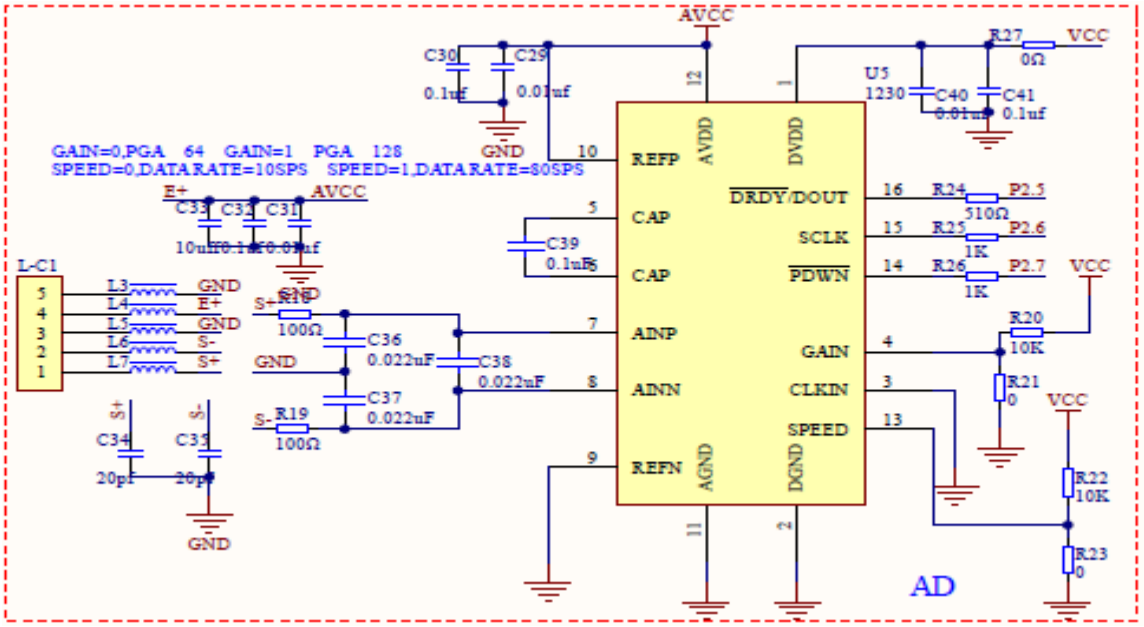


- Open the top overlay.
- Remove the two screw from acrylic plate
- Remove display connecter from the PCB.
- Replace the new display
- Connect display connecter from the PCB.
- Fix the PCB to the housing with screws.
- Recover the top overlay.

English

13. CIRCUIT DIAGRAM

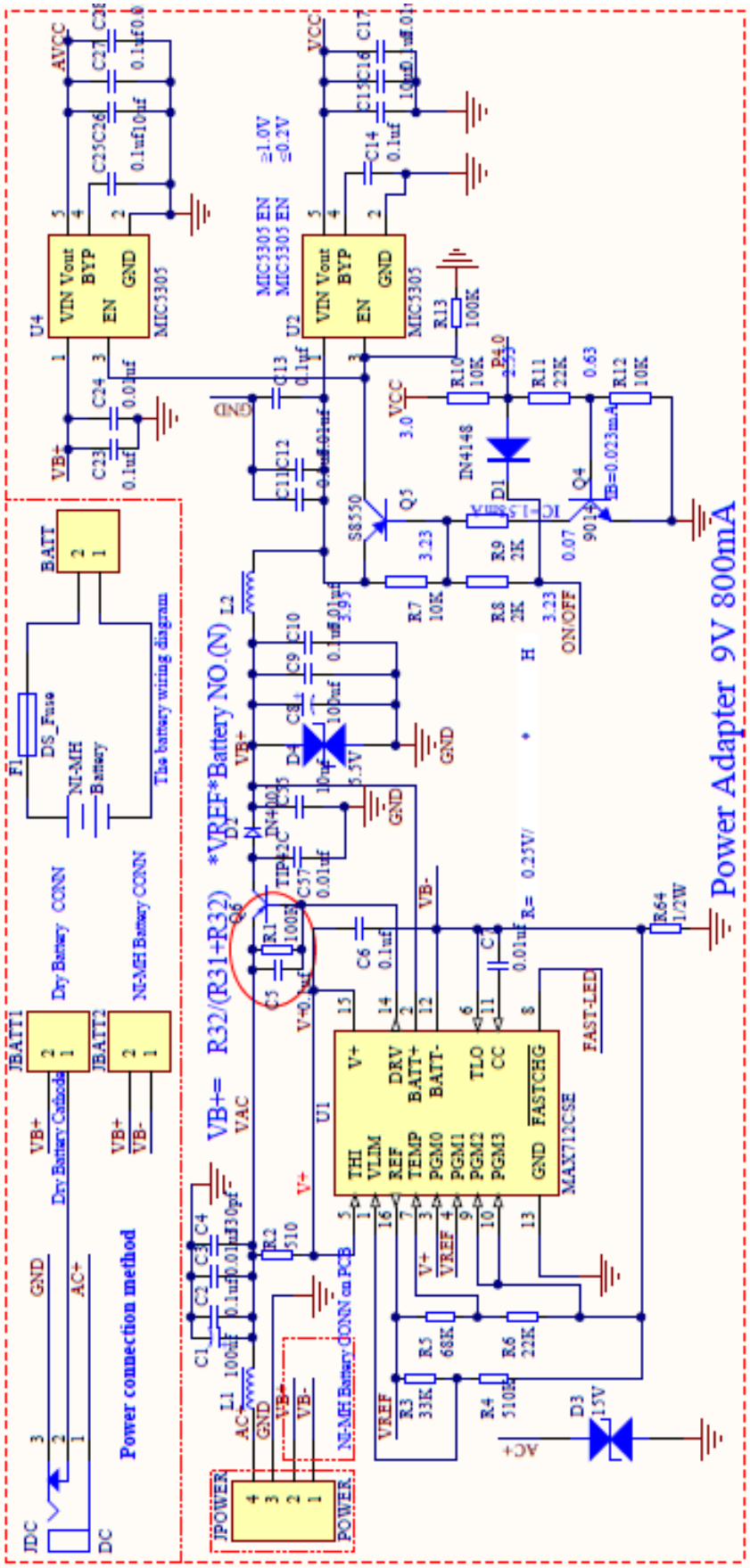
A/D



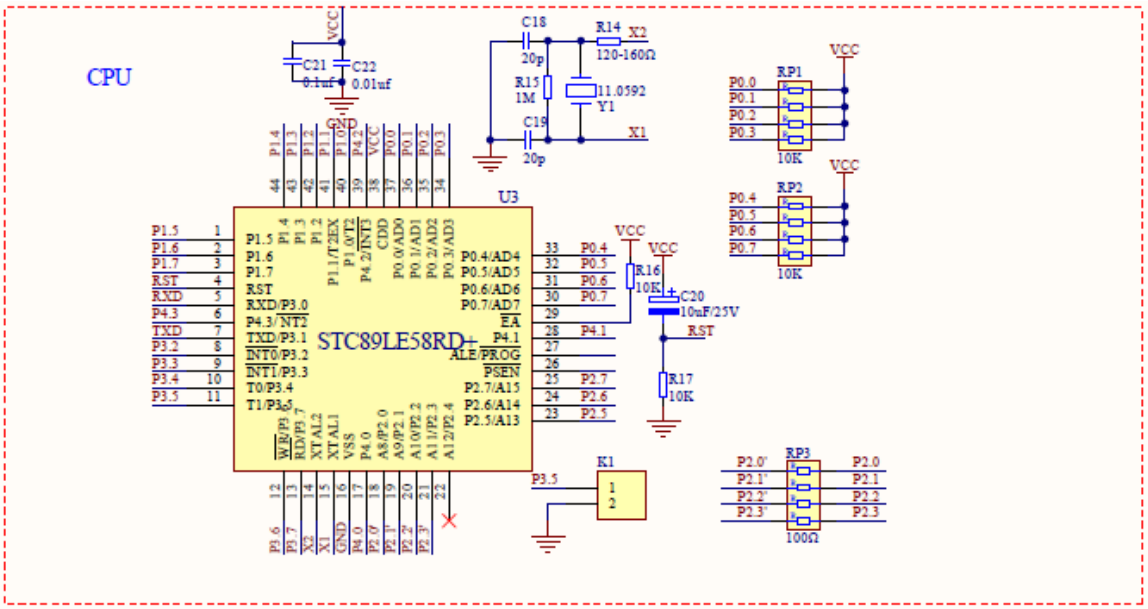
English

English

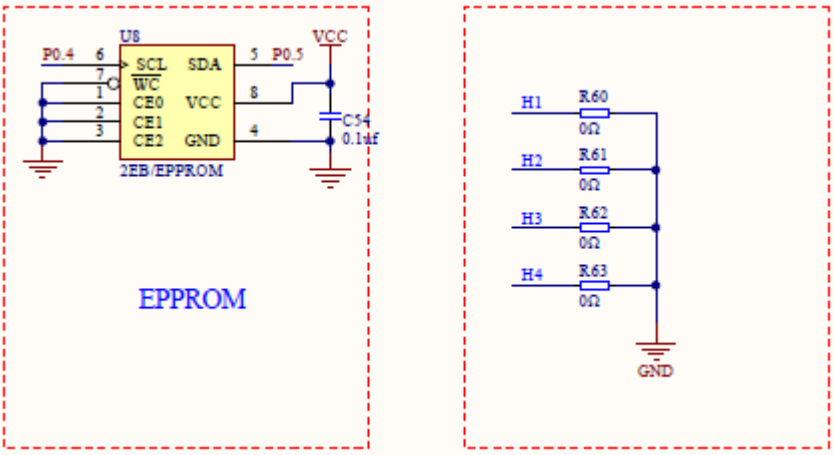
Battery , power adapter and charge



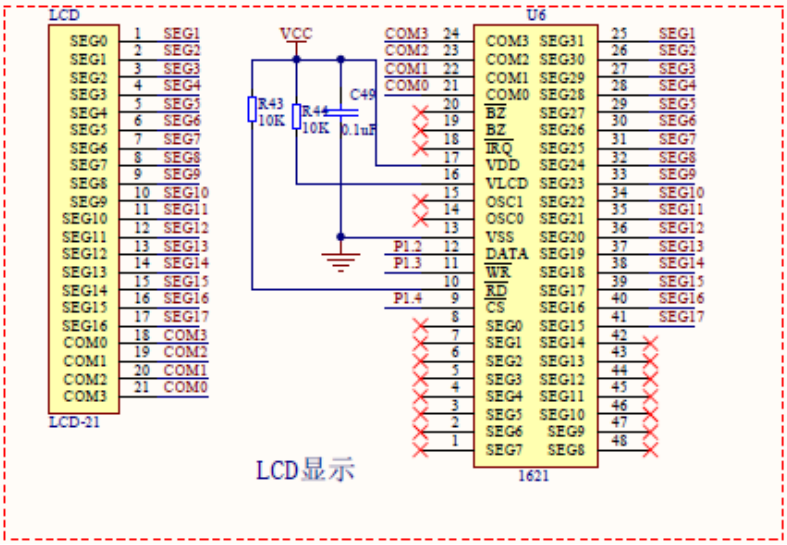
CPU



EPPROM



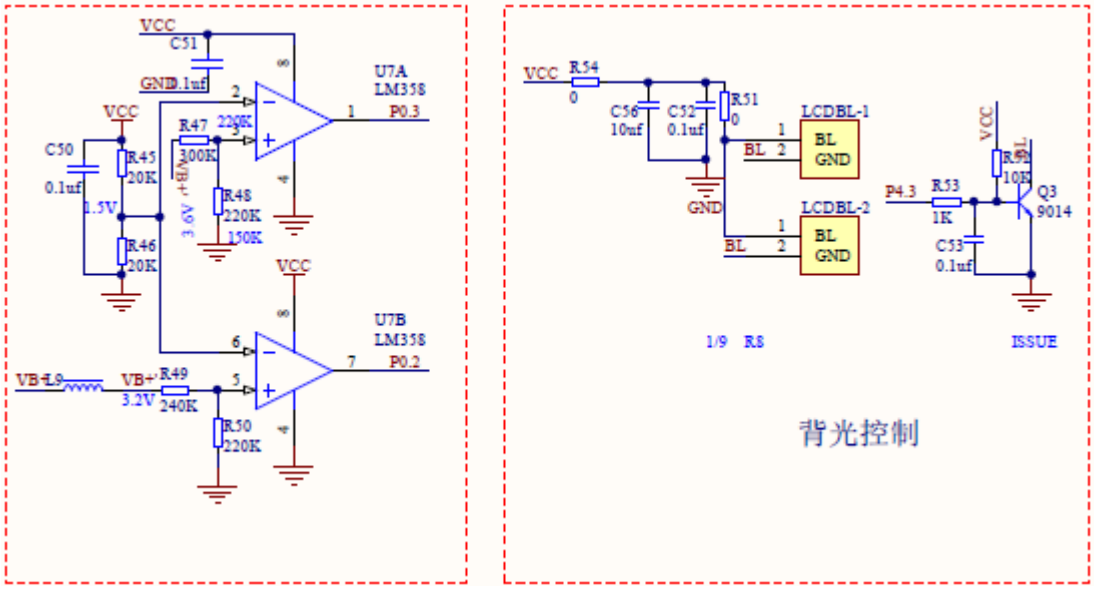
Display



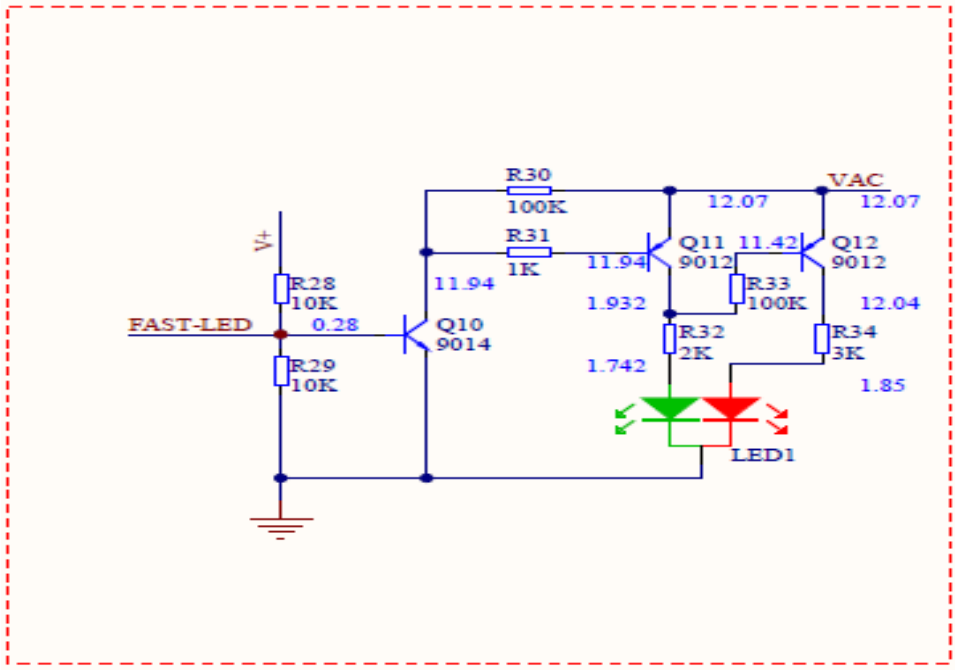
English

English

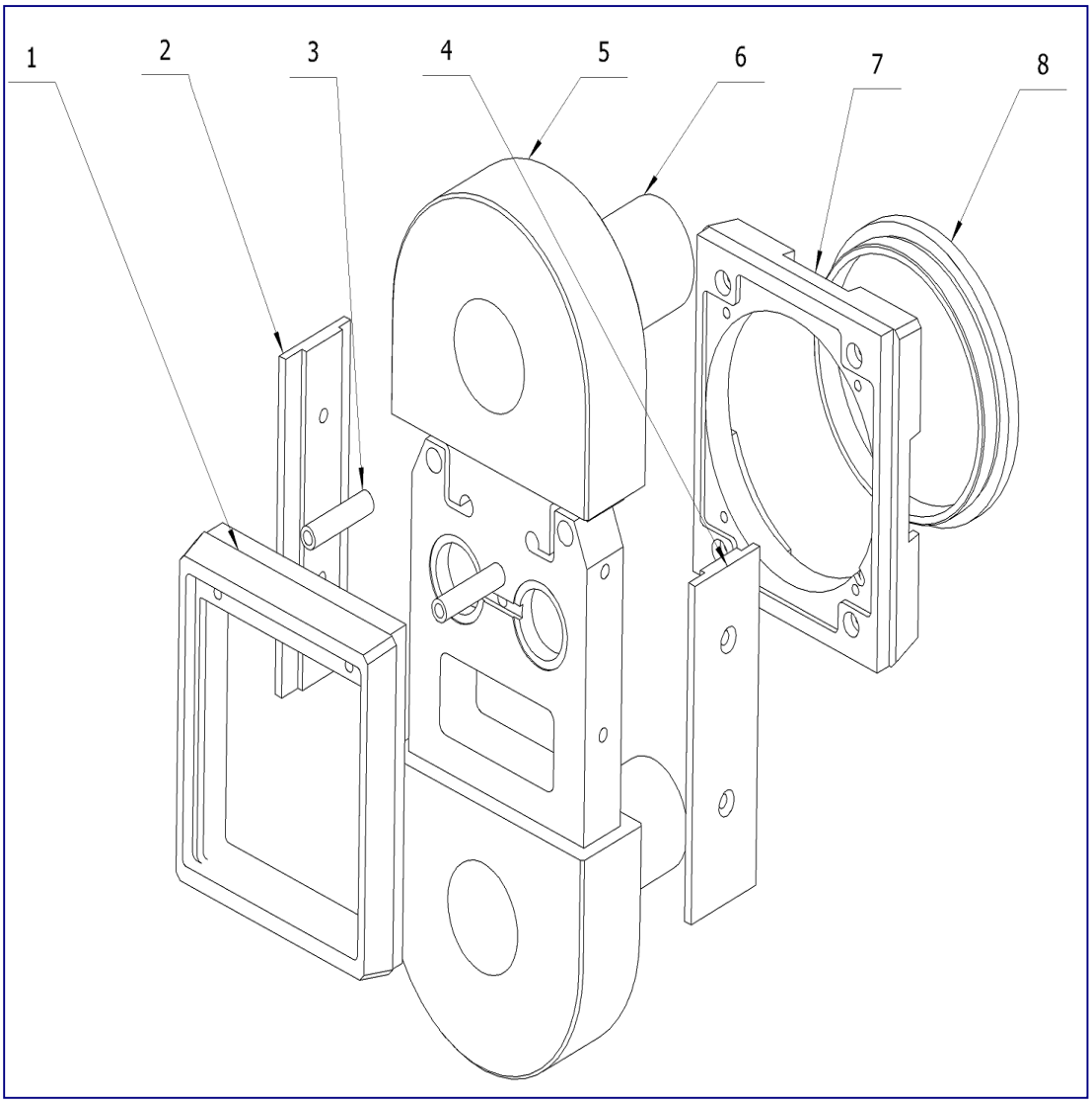
Backlight



LED



14. DRAWING



No	Parts Name	Qty	Spec
1	protegulum	1	aluminum
2	left pressure block	1	aluminum
3	fixed loop	1	
4	right pressure block	1	aluminum
5	elastomer	1	aluminum
6	Distanzbuchse	2	aluminum
7	rear cover	1	aluminum
8	seal cover	1	aluminum