Operating manual

Type 2913.8 - 210460
Lifting device for LSS magnets

230 V electric drive unit for levelled lifting and lowering
E.C. Manufacturers Declaration

to 98/37/EC IIB

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Description:
Designation: Lifting-, Levelling device
Type: 2913.8 – 210007 – 210460
Capacities 5 – 10 t

Relevant E.C. Directives:

98/37/EC EC-machinery directive
73/23/EWG EC- low-voltage directives

Harmonised standards:

DIN EN ISO 12100  safety of machines

National standards and technical specifications:

BGV A1 Unfallverhütungsvorschriften (Allgemeine Vorschriften)
BGV D8 Unfallverhütungsvorschriften (Winden, Hub-Zuggeräte)
VBG 14 Unfallverhütungsvorschriften (Hebebühnen)
DIN 1055 Blatt 4 Verkehrslasten-Windlast
DIN/VDE 0530 Teil 1 umlaufende, elektrische Maschinen
DIN/VDE 0660 Teil 2 Niederspannungsgeräte, Steuergeräte, Schaltelemente
DIN/VDE 0470 Schutzarten IP
DIN/VDE 0113/EN 60204 Allgemeines zu Messungen

This product must not be used until it is established that the equipment of which it forms part complies with the guidelines of the EC Directive 98/37/EC IIB.

Signed:

Freudenberg, 26.06.07

gb issue 3; 06/07
Formblatt-Nr. 100021
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This operating manual is to be kept on the lifting device. It must be ensured that everybody who must complete work on the lifting device can examine this operating manual at any time. In addition, the operating manuals described in the Safety of Work Law and the Equipment Usage Directive must be provided.

All safety and operating notice signs on the machine are to be kept in a clearly legible condition at all times. Damaged or illegible signs are to be replaced immediately.
1. Safety instructions

Duty of care of the operator
The lifting device Type 889 has been designed and built after careful selection of the harmonised standards it has to comply with and according to other technical specifications. It is therefore state of the art and offers maximum safety.

However, this safety level can only be achieved in practice if all the action required for it is actually taken. It is a matter for the operator of the lifting device to plan this action and to check that it is implemented.

The operator must in particular ensure that
- the lifting device is only used for the purpose for which it is designed (see „3. General, ...“).
- the lifting device is only operated if it is in perfect working order and special safety equipment is checked regularly to ensure that it remains fully functional.
- the operating manual is available at the place of use of the lifting device at all times in legible condition.
- only suitably qualified and authorised personnel is allowed to operate, service and repair the lifting device.
- this personnel is instructed at regular intervals in all matters of industrial safety and environmental protection. This personnel must be familiar with the operating manual and the safety instructions contained there in.
- all the safety and warning notices on the lifting device remain on the device and are kept in legible condition.
- no persons are on, under or near the charge whilst it is lifted or lowered.

Basic safety action
To prevent damage and fatal injuries when operating the lifting device, do not
- exceed the maximum load (see section entitled Technical data).
- exceed the maximum inclination (see section entitled Other instructions).

The use of the lifting device outside is restricted. (scope of temperature, charges of wind, snow, ice, ....)

Should you wish to lift the maximum load, ensure that the centre of gravity of the load is positioned as centrally as possible between the supports.

Requirements on the operating personnel
The lifting device may only be operated by people who have been trained, instructed and authorised to do so. These people must be familiar with the operating manual and act accordingly. The authority of the operating personnel must be clearly defined.

Damage or defects on the lifting device are to be reported to the appropriate person without delay. Do not work with the lifting device until the damage or defect has been rectified.

Servicing and repair work
Servicing and repair work may only be completed by trained personnel.

Do not make any unauthorised modifications to the lifting device for safety reasons – this particularly applies to welding work on load-bearing parts. All planned modifications must be approved in writing by haacon hebetechnik gmbh.

The electric control equipment is sealed. Intervention is only permitted by the manufacturer.

Only use original spare parts / original wear parts. These parts have been specially designed for the machine. If you use other parts it cannot be guaranteed that they are designed and built to withstand the stresses safely. Parts and special equipment that are not supplied by haacon hebetechnik gmbh have not been approved for use on the lifting device.

The maintenance work set out in the operating manual (cleaning, lubrication, servicing, inspection, etc.) must be completed on schedule.
**Other instructions**

Important!

1. People are not be allowed to stand on or under the load during the lifting and lowering procedure.
2. The loaded lifting device with load must not be put into vibration by means of crank impulses in emergency manual mode.
3. The load may only be placed on solid ground.
4. The area on which the load is placed or from which it is lifted must be as flat as possible.
5. The maximum angle of 2° applies to all types with a maximum load and at full lifting height.
6. The controller will not permit angles of more than 4°.
7. For use outside take care of the slope of temperature and heavy charges caused by wind, snow, ice, etc.

![Diagram showing max. incline with a cab width and length of the load.](image)

**fig 1-1**
Technical instructions on the lifting device

To prevent accidents and damage, notice signs (fig. 1-2 and 1-3) are affixed on the lifting device and on the control unit (hand-held control unit), and the instructions there on must be followed:

**WARNING**
only for LSS-magnets

max. Last pro Stützenpaar
12.000 kg

ATTENTION!
dangerous electric voltage

**Before opening disconnect mains.**

Ensure that nobody is on, under or beside the charge during lifting and lowering!

Personne n'est admis sur, sous on à côté de la charge lors du levage et l'abaissement!

In addition the control unit (hand-held control unit) contains an explanation of the operating modes.

All the safety signs and operating instruction signs on the lifting device are to be kept clearly legible at all times. Damaged or illegible signs are to be replaced without delay.

2. Technical data

<table>
<thead>
<tr>
<th>TYPE 2913.8</th>
<th>210460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum load / set</td>
<td>t</td>
</tr>
<tr>
<td>Maximum load / support</td>
<td>t</td>
</tr>
<tr>
<td>Weight / set approx.</td>
<td>kg</td>
</tr>
<tr>
<td>Crank force / Support pair (manual mode)</td>
<td>N</td>
</tr>
<tr>
<td>Lift / Turn of crank (manual mode)</td>
<td>mm</td>
</tr>
<tr>
<td>Lifting time (E-Antrieb)</td>
<td>min</td>
</tr>
<tr>
<td>Lift</td>
<td>mm</td>
</tr>
<tr>
<td>Design height</td>
<td>mm</td>
</tr>
<tr>
<td>Protection type</td>
<td></td>
</tr>
<tr>
<td>Operating voltage</td>
<td>V</td>
</tr>
<tr>
<td>Max. overall current consumption</td>
<td>A</td>
</tr>
<tr>
<td>operating temperature</td>
<td>°C</td>
</tr>
</tbody>
</table>
3. General, Structure

The lifting device with automatic levelling is designed for lifting and lowering loads with a maximum gross weight of 24 tonnes. It consists of four spindle winches with spur gears and gear motors. These have to be rolled one by one to the operation site by means of a guiding bar which can be screwed on. The spindle winches have to be screwed together with a cradle. Always two spindle winches have to be connected with a cable. They can then be operated with the control unit. (see picture 1-3 page 8)

The automatic levelling is programmed in the way that the load may be lowered horizontally or parallel to the ground. The levelling lowers the charge paralellely in direction of the y-axis (position sensor in the control box at a landing gear) In the direction of the x-axis, the operators have to level the front and the back side manually at sight. (see fig 1-3, page 8).

The lifting device has a self-blocking spindle nut system, which holds the load safely at any height. (You must nevertheless follow the safety instructions.)

The spindle winches and the cradles form a stable unit. On the cradles charges are attached by means of strap retainers.

The lifting device is powered by four electric motors (160 V DC, 500 W). In emergency manual mode these are shut down by a limit switch.

The central controller for the automatic levelling system is cabled in the container and may only be installed in a defined position (position sensor).

4. Safety equipment

As there are personal besides the rised load, each spindle winch has a safety nut that moves with the winch and acts as a back-up. Should the support nut break, the safety nut holds the load thus preventing an uncontrolled fall. The supports may be retracted after, but it is not possible to extend the support again.

The mechanical and electrical components on each spindle winch are protected against overload by a safety clutch.

Each spindle winch has limit positions that are monitored by inductive proximity switches and subsequent mechanical limit stops. If the winch moves over this, the gear parts and motor are protected by the safety clutch. If, after this point, the winch cannot be moved in the other direction by the motor any more, the winch must be released by using a hand crank (emergency manual mode in case of interrupted electric circuit). The limit switch, which the winch has passed over, the controller and the sliding clutch, have to be checked immediately.

5. Delivery

1 lifting device set with an automatic levelling system consists of:
- 2 spindle winches with attached gear motor and control box
- 2 spindle winches with attached gear motor and distribution box
- 2 connection cables, 4 m long
- 2 connection cables, 10 m long
- 2 manual control unit with cable 7 m long
- 2 electric supply cables 20 m long
- 8 guiding rods
- 4 emergency manual drives
- 2 motors SW 24
- 8 eyebolt M12 on extension rod.
Positioning plan

The positioning plan shows the mounting position of supports 1 to 4 on the LSS-magnet. The mounting of the single winches has to be done according to the numbers.

6. Electric motor drive and cables

A mobile hand-held control unit enables the system to be operated simply and easily with all the functions being controlled by joysticks.

6.1 Electrical components

- 4 electric motor drives with each 500 W and 160V for driving the winches
- 2 central control unit with position sensor, PWM speed control, and emergency-off key switch
- 2 manual control unit
- 8 limit switches, 4 manual emergency stop switches
- 2 connecting cable 4 m
- 2 connecting cable 10 m
- 2 electric supply cables 20 m with personal protecting switch

All the electrical components are at least protection type IP 54.

6.2 Description of control unit

The control unit comprises two joysticks, a three-character display, the key switch, a pilot lamp, ON switch and the EMERGENCY STOP switch. When it is moved horizontally, the left-hand joystick is used to select the functions (menu), whilst moving vertically the joystick will execute the functions (lift and lower). Release the Joysticks stops any action (dead man’s control).
The right-hand joystick is used to select parameters or supports.
  Horizontal: Choosing single winches.
  Centre position: both 2 winches will be guided at the same time.

The system is switched on or off by means of the key switch. The green pilot lamp indicates operational readiness. The system can be shut down by pushing the Emergency Stop button.

The following functions for the operation of the lifting device (see 7.1) are available:

--- Display after switching the system on

H Manual mode. Retracting and extending winches without load.
  Only lifting and lowering of winches without load, eg. for mounting at the cradles.
  In this case the LH joystick is for lifting and lowering. Is the RH Joystick moved aside and the LH Joystick is operated, the single winches can be guided separately. If the RH joystick is on the middle position, a pair of winches can be lifted or lowered. The winches are then separately driven until the limit position is reached. Levelling and position control are deactivated.

⚠️ This menu does not allow parallel levelling to the ground!

While lowering, there is a beep-sound and a blinking light on the display.

ASL Automatic synchro level

  With the left joystick a paired support is lifted or lowered keeping the alignment in y-axis which it had starting the action. The operation continues unless one of the winches is reaching its’ end position. The right hand joystick is out of function.

  Use this menu for lifting or lowering charges!

  During the procedure, a permanent variance comparison of the direction of the charge in the x-axis and y-axis takes place. Should there be a discrepancy in the x-axis or the y-axis of more than 2° to point zero, there will be a beep-sound in the control unit and a blinking light on the display. The maximum inclination is limited to ± 4° in the direction of one axis. (see 6.4. error messages L6 or L7)
  The operator has to control the lifting and the lowering. Should one of the winches lose contact to the ground, stop the operation immediately, extend the winch until it contacts the ground again (only possible in menu H). Continue operation in menu ASL.

A' L Alignment to zero position

  During lifting from the ground the charge is levelled in y-direction to the horizontal position (zero position). After that the charge can be lifted or lowered in levelled condition. The right hand joystick is out of function.
  If the total deviation measured by these means is less than 0.15°, the display changes to -0-.

  Use this menu for lifting or lowering charges!

  The visual and the acoustic alarm for inclination >2°, are activated. In spite of this it is necessary to supervise the procedure with regard to the soil contact of each support in this menu, too.
**Additional options of the control system:**

Normally, not to be used by the operator. To be chosen in a sub-menu. Therefore move the RH joystick to the outside (in direction of support 2 or 4) when switching on the system (simultaneously).

**AS1-4** Alignment to memory

(Additional function for loading the container on to a truck. Not required for lifting off and placing on the ground.)

The charge is lifted or lowered in the way that it is adjusted to the position which has been programmed first. This position remains fix for further operations. The display then shows -0-.

The operator can search for the relevant memory position by moving the right-hand joystick vertically.

**PS1-4** Programming the memory

(Additional function for loading the container on to a truck. Not required for lifting off and placing on the ground.)

The actual position of the lifted load can be saved in the non-volatile memory by moving the LH joystick vertically (4 memory positions)

**SA** Status query

This function can be used to find out the system status. The user can choose between the following information using the LH joystick.

Changing Display

O 1...0 [ ] Top limit switch

The open brackets indicate open limit switches, which monitor the upper limit of the supports (see display in section 7.1).

U 2 ...U [ ] Bottom limit switch

As above.

E 3 ...E [ ] Earth or ground contact switch

The open brackets indicate supports, which are not in contact with the ground.

C 4 ...-22 Display of the position sensor temperature

If the temperature falls below -20°C a heating phase must be completed before the system is started. Before this the temperature will flash on the display and the system cannot be used.

U 5 ...15 Displays the current operating voltage at the mains transformer, in this case, for example 15 V. If U < 12 V an error message will be put out.

L 6 ...1.2 Display of the current position in the x-axis. The reference point is support no. 1. If this is raised further than the other supports, the X and Y angles are positive (see Figure 1-5).

L 7 ...-2.0 Display of the current position in the Y-axis.

A 8 ..00 Display of the maximum set value in % with which the motors are started.

**6.3 Description of default settings**

The operator cannot adjust the motor power and the position offset during normal operation.

There is a concealed sub-function for this purpose, which is only reached if both joysticks point inwards when the system is switched on.
**This menu contains the following setting points:**

IL  Adjustment of the maximum motor power from 53% to 100%. The default setting is 100%. If the set value is lower than this, the speed and the power of the motors are throttled. This reduces the lifting speed and the total current consumption.

L06  Displays the absolute deviation of the position sensor in the X direction. The value set here is used as the zero point for levelling mode.

L07  Displays the absolute deviation of the position sensor in the Y direction. The value set here is used as the zero point for levelling mode.

If the position offset is greater than ±-2° the system must be adjusted, that means that the winch with the control box has to be aligned again.

Push both joysticks inwards to exit the menu. The set current limit and the position offset will be stored in the non-volatile memory.

Then switch the controller off and back on again.

**6.4 Description of error messages**

If an error occurs during operation the system will automatically display the condition that caused the error. For example, if the operating voltage falls below 12 V whilst the system is lifting the container, the system will automatically stop the action and display FEH as well as, after using the LH joysticks, together with the measured voltage, for example U11.

In general, error messages are split into two priorities, with the controller errors being assigned to a higher level. These can only be deleted by switching the system off and then on again. If possible the error will also be put out on the hand-held control unit display in number form:

No. 1  Error in one of the joysticks.

No. 2  Error in the bus connection towards the hand-held control unit.

No. 3  Error in the bus connection away from the hand-held control unit.

No. 4  Error in the bus connection within the controller.

No. 5  Error in the non-volatile memory of the controller.

No. 255  Processor crash triggered by the monitoring circuit.

Second level errors can be deleted using the joystick, the cause is then shown on the display:

O [ ]  Top limit switch open, no further lifting is possible.

U [ ]  Bottom limit switch open, one or more supports are fully retracted.

C 4 ...-24  Temperature too low. Wait for the heating phase for the position sensor to finish.

U 5 ...11,8  Supply voltage defective, in this case 11.8 V. During operation the voltage has become unreliable and finally failed. Either the power from the power source must be increased or the overall current consumption of the system must be reduced, see section 6.3.

FS 2  Defective connection to the motor controller, in this case support 2.

Check the connections between the controller and the support and the support to the limit switch.

L 6 ...5.2  The angle to the x-axis (5.2°) is too large. It is not allowed to incline any more. The position has to be adjusted by changing the position of one of the pairs of winches (front or back).

L 7...5.2  Angle to y-axis (7.2°) is too large. No further inclination is allowed. The position has to be adjusted by changing the position of one of the pairs of winches (LH or RH).
7. Operation
The supports are picked from the trolley, rolled to their position and mounted to the cradle. The cradles are aligned and fixed to the magnet. All supporting disks must contact the soil. Keep an eye on not inclining the supports. To eliminate inclined floor adjust with the adjusting spindle at the tunnel sided supports.

7.1 Electrical drive unit
To prevent all dangers to human life and to the lifting device, before you lift the charge you must ensure the following:

- The lifting capacity must not be exceeded.
- The ground has to be solid.
- no persons are allowed to be on, under or between the charges and the tunnel wall or the already installed components.

Effect readiness for operation:
- couple a pair of supports via connecting cable
- connect remote control to electric box
- make electric connection
- the green pilot lamp on the control flashes, if:
  - all cables are connected correctly
  - the emergency switches are released
  - none limit switch of the manual emergency operation is pressed.
- turning the key switch in mode ‘On’ is starting the control. On the display is shown the count-down time until the capacitators are loaded (20 s).
- the display shows: “---”. Now the lifting device is ready for use.

Lifting:
- Select function „ASL“ or „AoL“ by moving the LH Joystick horizontally through menu function.
  In the menu „ASL“ both spindles are extended, the existing alignment of axis Y is kept. In the menu „AoL“ a pair of supports will be aligned horizontally and keeps his position during the whole lifting procedure. This is useful, if, prior to bracing of magnet and cradle, the supports were already levelled horizontally.
- Move the LH Joystick vertically towards „UP“ extends the supports.
  Until the required height has been achieved or the system shuts down automatically when it reaches a limit position sensor.
  Display shows: FEH
  after using the LH joystick
  Display shows: O (RH support has reached the upper limit position)
or
  Display shows: O (LH support has reached the upper limit position)

The starting position is automatically kept only in the direction of the y-axis. In direction of the y-axis, the leveling has to be done by the two operators on sight. During lifting and lowering, the supports have to be observed. Should one of the supports lose contact to the ground, the two operators have to stop the operation immediately and to extend the single support until it contacts the ground again. Start lifting simultaneously.
Lowering:
- Use the left-hand joystick to select function ASL or AoL.
- Retract the paired supports using the left-hand joystick.
- Interrupt the lowering procedure when the charge is put on the horizontal shifting table. Undo the strap retainers between magnet and cradle. Continue the lowering procedure, until the supports are completely retracted. FEH. After using the LH joystick on the display appears:

Display: U or U

If necessary retract also the other support until the limit position is reached (use menu „H“)

The starting position is automatically kept only in the direction of the y-axis. In direction of the y-axis, the levelling has to be done by the two operators on site. During lifting and lowering, the supports have to be observed. Should one of the supports lose contact to the ground, the two operators have to stop the operation immediately and to extend the single support until it contacts the ground again. Start lowering simultaneously.

If an error message appears on the display whilst you are using the system, see section 6.4 (error description).

If a support does not extend despite the motor drive unit is working, check the following:
- The support nut may be broken. The support can then only be retracted.
- The support may be blocked. The slip clutch will trip.
- The slip clutch may be set too low due to wear.
- The system may have suffered a mechanical error (gear breakdown)

The lifting device must not be used until it has been returned to perfect condition.

7.2 Manual operation (emergency operation)

- The manual emergency operation can be used to retract the supports also when they are charged. Interrupt the power supply, disconnect the main plug.
- Loosen hexagonal screws M6 and remove the cover. This actuates a limit stop button, which disconnects the motor from the power supply.
- Extend the manual emergency crank to the necessary length and secure it with the linchpin.
- Put the manual emergency crank onto the hexagonal shaft.
- The manual emergency crank can be used to extend the winch by turning the shaft clockwise (without load) and to retract the winch by turning the shaft anti-clockwise (with load).
- Should the load be lifted or lowered by manual operation, operate the supports alternately so that the load does not incline more than 2°.
- After finishing the manual emergency operation, put on and fix the cover. take off the manual emergency gear mechanism, push in the square tube and fix it with the fixing bolt.
8. Servicing

The lifting device is to be inspected by an expert at intervals that depend on the conditions in which it is used, **but at least once per year** (annual safety inspection pursuant to Accident Prevention Directive BGV D8, §23, Sub-Section 2). In addition to the annual inspection all the safety parts must be tested every ten years (including all gear parts such as the safety lock, etc.). We recommend that you have this safety check conducted by haacon hebetechnik gmbh.

Experts are persons who, as a result of their training and experience, have adequate knowledge in the field of winches, lifting and towing equipment and are familiar with the relevant state industrial safety directives, regulations and generally acknowledged rules of engineering (for example DIN EN standards) so that they can assess the safe condition of winches, lifting and towing equipment.

<table>
<thead>
<tr>
<th>Description</th>
<th>Intervals</th>
<th>Parts / Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grease bearing spindle</td>
<td>Depending on frequency of use, but at least annually</td>
<td>Grease nipple (100273) Klübersynth EL 42-32</td>
</tr>
<tr>
<td>Levelling spindle</td>
<td>before and after a downtime &gt; 14 days</td>
<td>Grease nipple (100273) Lithium soap grease</td>
</tr>
<tr>
<td>Change the oil in the flat gear</td>
<td>Depending on frequency of use, but at least after 5 years</td>
<td>Bleed and sealing screw (103589, 100684) Esso Grease TCL (0.3 l)</td>
</tr>
<tr>
<td>Planetary gear</td>
<td>Requires no servicing</td>
<td></td>
</tr>
<tr>
<td>Manual emergency gear mechanism</td>
<td>Requires no servicing</td>
<td></td>
</tr>
<tr>
<td>Safety clutch</td>
<td>Every five years or each time it slips</td>
<td>Clutch casing (129975) Slip torque 45 Nm</td>
</tr>
</tbody>
</table>

The play between the external and internal tubes can be adjusted at the bottom end of the supports. To do this extend the internal tube approx. 300 mm, undo the hexagonal nuts (16 mm) and tighten the grub screws (5 mm Allen key, 8 mm) on all sides evenly until the slide guide press on the internal tube. Then undo all the grub screws by max. 1/4 turn and lock them with the hexagonal nuts. The play is between 0.25 mm and 0.5 mm.

9. Spare parts

Only use original spare parts / original wear parts. These parts have been specially designed for the machine. If you use other parts it cannot be guaranteed that they are designed and built to withstand the stresses safely. Parts and special equipment that have not been supplied by us have not been approved by us for use on the lifting device.

Please quote the following to order spare parts:

- **Type:** – See model plate
- **Factory No:** – See model plate
- **Part No:** – See spare parts list / drawing
- **Description:** – See spare parts list / drawing

(The numbers in brackets correspond to the position numbers of the spare parts lists of the relevant drawings).

**Spare parts list / drawing**

See attachments