LINET

Service Manual

Eleganza 4

Positionable Bed for Intensive Care

version with and without scales

CE 0123

D9S001GE4-0101
Version: 06
Date of revision: 2022-05

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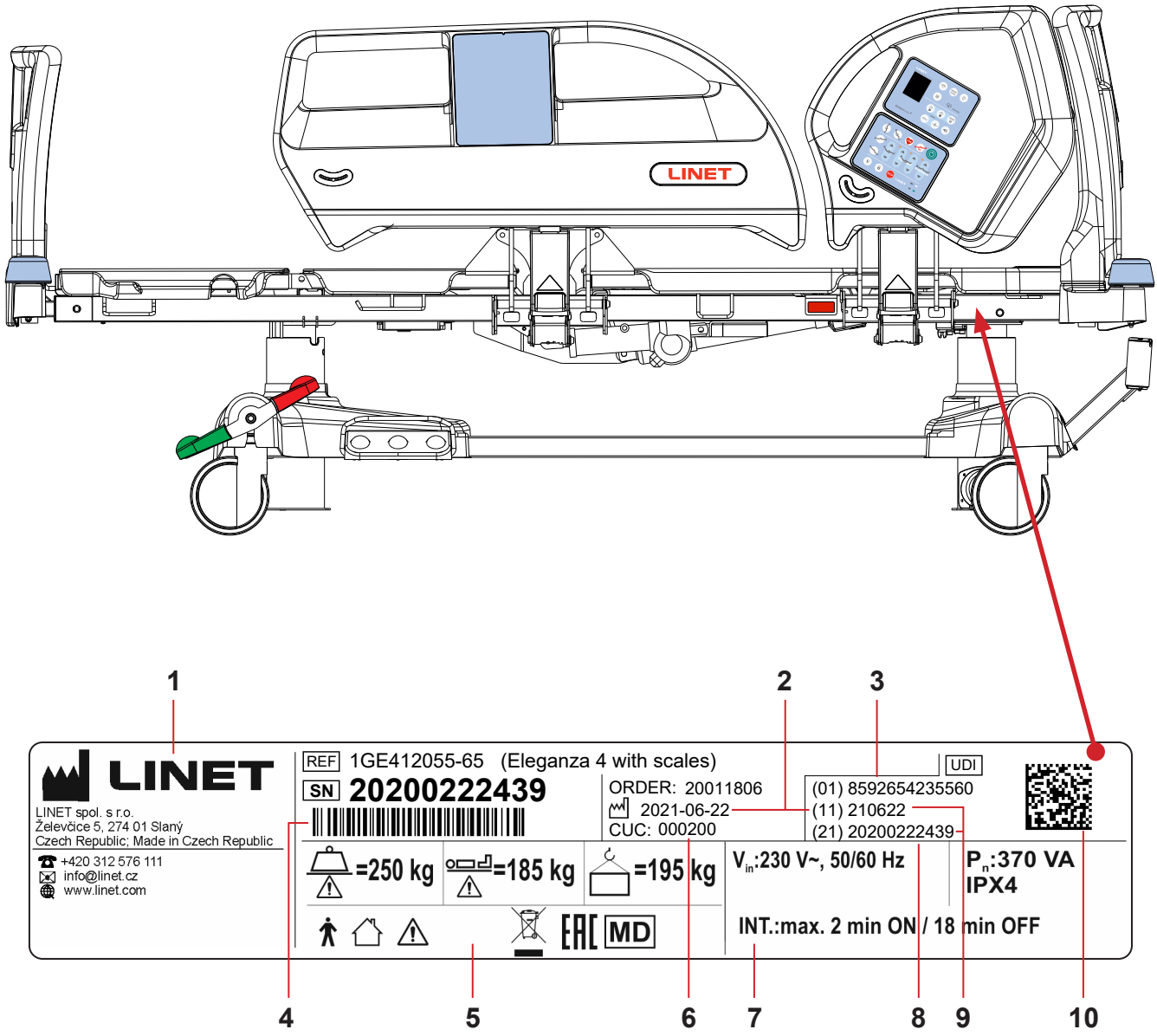
1 Introduction - General information

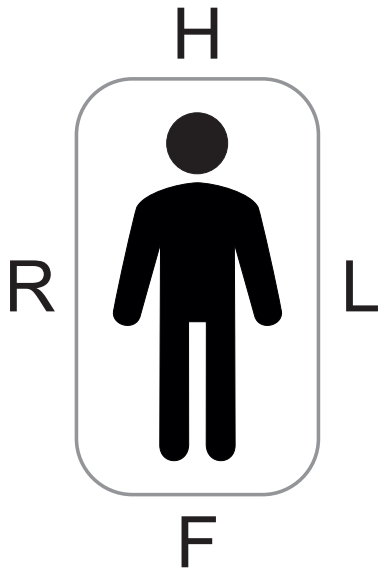
1.1 Product and technical label description and location

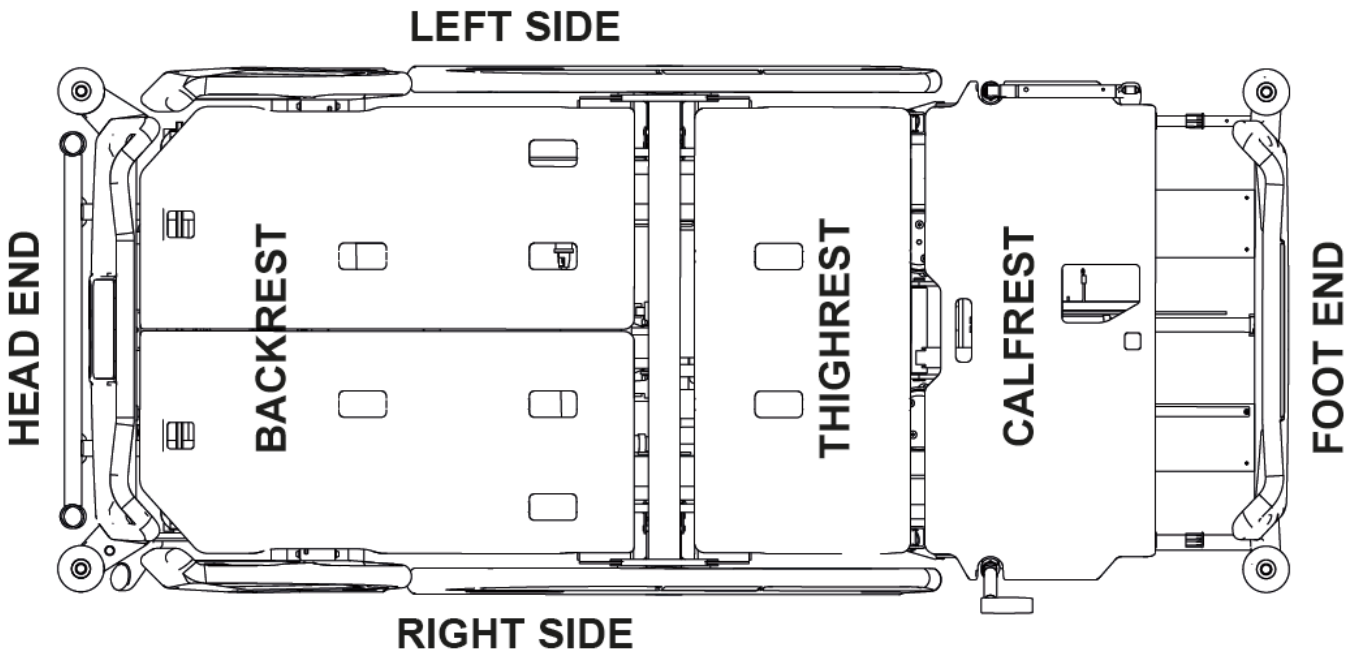


Position	Description	Position	Description
1	Distributor Address	6	Configuration number
2	Manufacturing Date (Year-Month-Day)	7	Electrical Specification
3	**DI** (Device Identifier) / GTIN (Global Trade Item Number)	8	Serial Number
4	1D Bar code GS1-128 (Serial Number)	9	**PI** (Product Identifier)
5	Symbols	10	2D Bar Code (GS1 DataMatrix) **DI+PI=UD**

1.2 Identification of bed sides

Throughout this Service Manual, the words **“right” and “left”** refer to the **right and left sides of a patient lying on his/her back on the bed.**





2 Technical data and Symbols

Follow User Manual for Eleganza 4 (D9U001GE4-0101 for EU or D9U001GE4-0110 for USA) to find Technical Data and used Symbols.

3 Theory of Operations

The aim of the chapter is to explain the functional principles of sets and individual components of the given LINET product model, and their mutual relations.

3.1 Control box

The control box is the brain of the E4 bed. It consist of:

1) Control unit
2) Battery pack
3) Power box
4) Fuses
5) Power cable

The power box, the control unit and the battery pack are implemented together into an one plastic box (standard version without i-Drive option). In case of i-Drive option, the control box is separated from the power box. The power box is then placed on the undercarriage and the power box on a mattress platform.

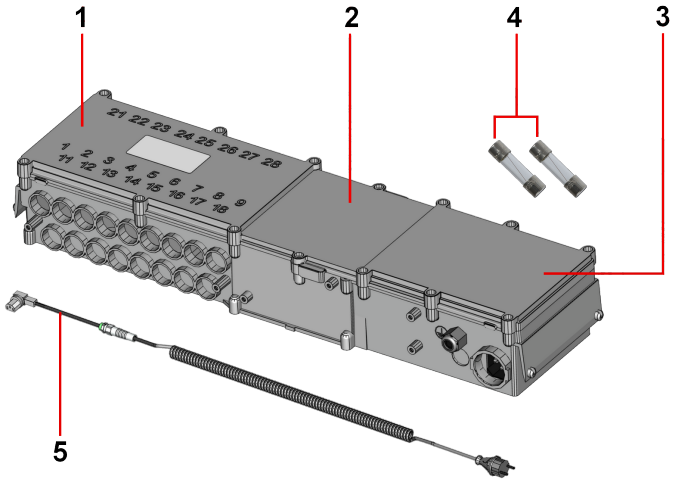


Fig. 1 Control box description

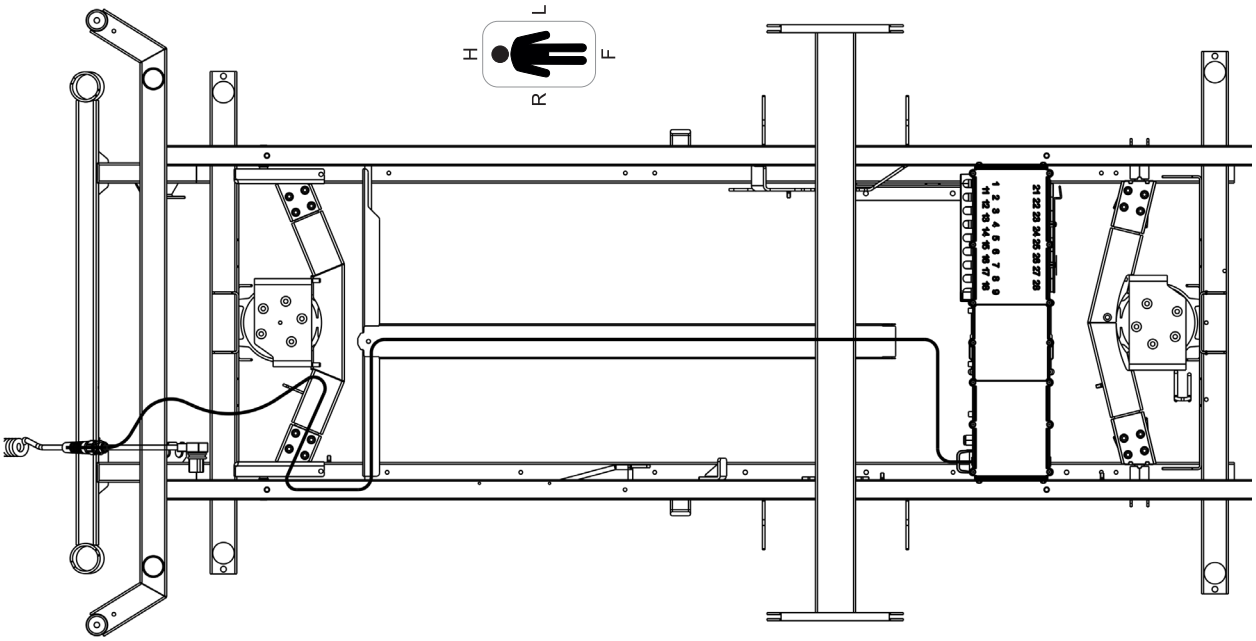


Fig. 2 Location of the control box on a mattress platform (standard version without i-Drive option)

3.1.1 Power box

The power box **transforms input voltage to 24V** and **sends** it to the control unit. Mains power is supplied to the power box via a three-core mains cable (in the relevant national standard). The power unit is standard at voltage 230V – 50/60 Hz, and alternatively at voltage 100, 110, 127V – 50/60Hz. A filter is in the mains connector of the power box. The power box transformer contains two current fuses. The first fuse automatically disconnects voltage at a temperature of 100°C/212°F and reconnects the voltage after cooldown. The second fuse disconnects the voltage permanently at a temperature of 130°C / 266°F. The 24 V AC power box has two 1,6A fuses for the 230V version (2x 3,15 A for low voltage – 100, 110, 127 V).

Technical parameters:

Parameters	Values
Nominal supply voltage	AC 230, 100, 110, 127V (±10%) / 50-60 Hz
Fuse protection	2 x tube fuse 5 x 20mm: T1,6A for 230V; T3,15A for 100-127V; T2,0A for 230V (bed with i-Drive); T4,0A for 100-127V (bed with i-Drive)
Maximum performance	internally limited
Maximum tolerance of configuration of current limitation	±20%

3.1.2 Control unit

The PB43 unit is used for **controlling** 4 linear units, with outputs for controllers and a **backup** rechargeable battery power source. It is controlled via low-voltage switches and allows the use of membrane keypads. The control unit has 4 outputs for the linear units, an input for connecting a rechargeable battery, and an input for control panels with safety functions (ACP). The PB43 red unit also contains inputs for weight transducers, an undercarriage module, limit switches, and an add-on matrix controller. The PB43 red unit is built into the instrument case and is equipped for dual power from the **mains** and from **batteries**. During mains operation, the rechargeable battery is continuously powered and charged, and while the rechargeable battery is in operation, the electronics are **disconnected** after approximately **3 minutes** without command.

The control unit has a function to **synchronise speed** of the lift units of the mattress platform , and to lock the units (*see chapter "3.1.2.1 Control unit modes and safety functions"*). If resistance is detected in any of the controllers, it is signalled by all the lock LEDs flashing, the control unit always permitting one movement of the bed after the STOP button is pressed. Information about the leak is **recorded** simultaneously in the permanent memory of the control unit. Positioning function locks and safety circuit detects overload (*see chapter "3.1.2.1 Control unit modes and safety functions"*).

Technical parameters:

Parameters	Values
Dimensions	310 x 125 x 90 mm
Protection degree	IP54
Number of outputs for motor units	4
Output current for motors	5 A
Current load of any motor output during positioning	less than or equal to 5 A
Maximum voltage at outputs for motors idling	42 V DC
Maximum performance	internally limited
Maximum tolerance of configuration of current limitation	±20%
Number of control buttons (functional inputs)	30 - basic matrix 6 x 5

3.1.2.1 Control unit modes and safety functions

The architecture of the control unit is designed to exclude or significantly **limit the risks** arising from using a programmable electronic system. The default general requirement is the **safety** of the system when there is one fault. **The basic safety features are:**

» Lifting units speed synchronisation (calibration)

The function to stabilise speed of lift units allows **the lift speed** of all columns **to be synchronized**. This makes it possible to maintain the bed in a horizontal position. Synchronisation **must be performed after each change of column, control unit, and accelerometer** *(more in chapter "5.1 Column and accelerometer calibration")***.**

» STOP button located on the ACP panel

The main STOP button **immediately** stops all movements of the bed (undesirable movement) and deactivates GO if positioning is not permitted or during failure of electrical components. A 10 kΩ resistor is connected in parallel to the STOP button inside the keypad. The electronics of the system detect the correct connection of the resistor (connection of keypad and functionality of the STOP button). Its interruption (error in keypad, faulty resistor, cable...) is **signalled** by an intermittent tone from the control unit. Without **correct** connection of ACP controller to the resistors, this function after activation with the GO button is only active for 5s.

» GO button located on the ACP panels, the handset, and side rails

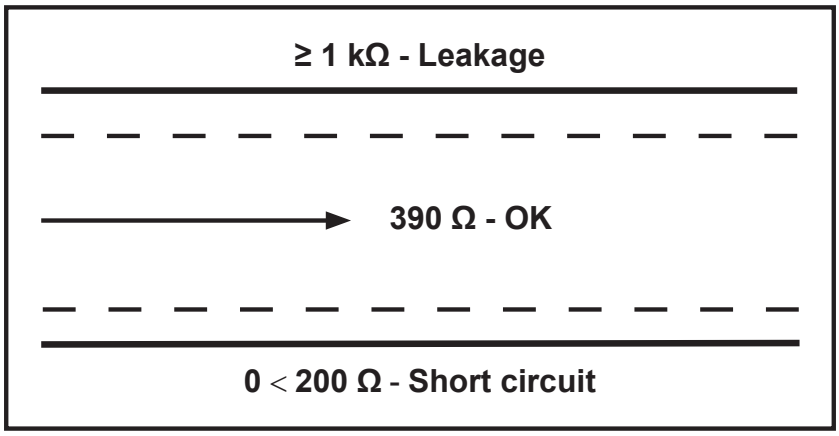
All the control functions are **conditioned** by the initial pressing of the GO button (only the CPR and the STOP button do not require the GO button to be previously pressed). When GO is pressed, the control system is activated for **3 minutes** (except for the STOP circuit failure described above). When any function is pressed for more than 2 seconds, the button is released for an extension of the GO period by another 3 minutes. When a function is pressed for less than 2 seconds, the original time limit of 3 minutes remains. After 3 minutes from the previously selected function, the control electronics are deactivated and any further function is conditional on the GO button being pressed again. Pressing the GO button is only valid if **no other** control button has been pressed at the same time. The use of the GO button significantly limits the possibility of accidental movement of the bed during a fault or from unintentional pressing of controllers. For the the US version the GO period lasts 10 minutes.

» Recognition of simultaneous pressing of any two buttons

The control unit is issued with the function for recognizing two pressed buttons at the same time. When two buttons are pressed at the same time, control unit blocks function. Unblocking is automatic after all presses have been released (including the error ones).

» RC circuits – protection against shorting and spontaneous movement

An **RC circuit** is installed in **all** the analogue control elements connected to the ACP control unit (ACP, handset, Mob-Lift, foot controller). The value of the RC circuit resistor is 390 **Ω**. If the function is not active, the circuit resistance is infinite as standard. When any function is pressed, the resistance of the circuit is 390 **Ω**, the function is detected as valid and it begins. If a **short** is present in the circuit of the button, the resistance drops below **200 Ω**, the control unit detects the function as invalid and positioning does not occur. The RC circuit serves to prevent spontaneous movements of the bed caused by short circuit in the wiring.



» Leaks measuring

The control unit is able to measure leaks in individual controllers in the **kΩ** range.

If resistance is detected in any of the controllers, it is signalled by all the lock LEDs flashing, the control unit always permitting one movement of the bed after the STOP button is pressed. Information about the leak is recorded simultaneously in the permanent memory of the control unit.

» Positioning functions locks

The locks of the position functions have an **electronic** design and their actual condition is always saved in an EEPROM type memory. If case of the **locks failure**, the LED light under the corresponding lock starts flashing.

» Overload detection

While **monitoring current** drawn by the motor units, the electronics stabilise the maximum current and thus partially limit start-up current peaks. If a **constant** current overload is detected, movement is halted after approximately 1 second.

» Thermal protection

Built-in thermal protection signals temperature **exceeded** in the internal cooler and near the switching transistors (approx. 100°C) during overload. A constant tone signals this condition. After an additional **increase** of approximately 15°C, the switching power elements are disconnected (this makes positioning impossible), also signalled by a constant tone. Information about the thermal overload is **recorded** simultaneously in the blackbox.

» Connectors

Inputs and outputs of the control units are fitted with different types of connectors, meaning they **may not be mixed.** If connectors of the same type (telephone ones) are used, mixing them up during assembly or servicing **does not lead to damage** of the control unit.

3.1.2.2 Control unit saved values

The control unit saves following values:

a) Statistical values

b) Records of previous events

c) Calibration values

d) Evidence of last action

3.1.3 Battery pack

Lead hermetic rechargeable batteries 2x12V/1.2 Ah are connected in series in a plastic housing, protected by a **15 A fuse**. The plastic housing is inserted in a control unit box. The rechargeable batteries serve as an emergency **backup power source for the bed** while it is disconnected from the mains electricity or during transport. The rechargeable battery type has no memory effect and should not be run fully flat to increase their lifespan.

Technical parameters:

Parameters	Values
Input/output voltage	24 V DC
Class	II IP65
Maximum charging time	24 hours
Type	Lead-acid

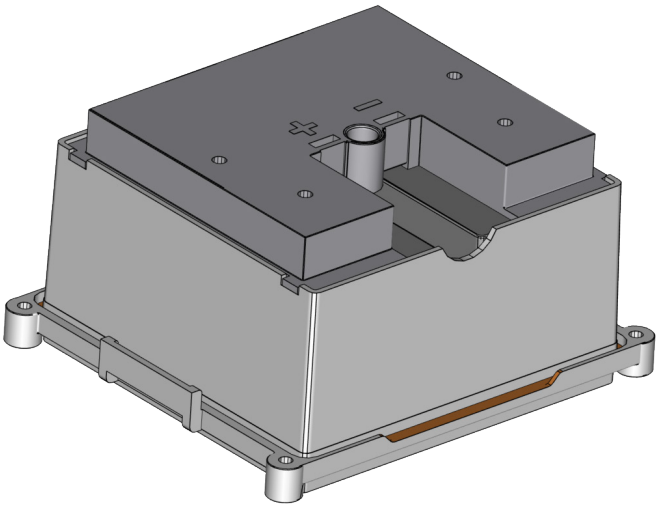


Fig. 3 *Battery pack*

3.1.3.1 Charging of rechargeable battery

The rechargeable batteries are charged intelligently from the control unit. The charging method used is called the “Dual Level Float Charger” method (two charge levels, current limiting and automatic switching from charging to maintenance mode).

Information about charging and modes of the rechargeable battery is signalled by the rechargeable battery’s LED as follows:

Battery´s LED light status	Battery´s mode
OFF	• The rechargeable battery is charged (one exception may be a certain type of damage to the rechargeable battery, which may occur due to its age or unsuitable storage)
FLASHES **ON** for short time - **OFF** for a longer time	• The rechargeable battery is charging If this type of signal occurs continuously over the long term, it is necessary to replace the rechargeable battery!
FLASHES **ON** for a long time - **OFF** for a short time	• Low rechargeable battery voltage (either completely flat or defective rechargeable battery) If this type of signal occurs continuously over the long term, it is necessary to replace the rechargeable battery!
PERMANENTLY ON	• No rechargeable battery (broken power lead, faulty rechargeable battery, missing rechargeable battery faulty fuse)
FLASHES RAPIDLY	• The rechargeable battery is very flat, it is necessary to replace or recharge it. Positioning of the bed is disconnected, except for CPR function.

3.1.3.2 Warranty & Use of the battery pack

- The service life of the accumulator depends on the frequency and method of use - **2 years at the maximum**
- The manufacturer provides a **6-month warranty** for the full function of the accumulator.
- Charging of the accumulator before use of the bed takes approximately **4 hours**
- The battery box cannot be disassemble. The box must be replaced by a completely new one

3.2 Column units

The purpose of column units is high adjustment of the bed platform

The column unit does not have limit switches. It is connected by a cable with a 2-pin connector. The maximum current consumption is 5.5A and maximum working voltage is 24V. The value of the consumed current and supply voltage is displayed at LINIS.

There are 2 types of column on the Eleganza 4 bed:

- The **head column is equipped with a lock** and it is connected to the control unit with a 2-pin connector. The head column is located near the back rest part. The cable length is 2090 mm. Inside of the column is located a cable for localization.
- The **foot column does not contain a lock** and it is connected to the control unit with a 2-pin connector (power) and molex connector (data – undercarriage module). The foot column is located under the leg rest area. The cable length is 1550 mm. Inside of the column is located a cable for connection of Undercarriage module.

The columns are fixed to the undercarriage frame by four screws (18+2Nm), using two clamps. The clamps are tightened with hex screws and nuts (8+2 Nm). The mattress platform frame is fixed to the columns with 5 screws and the cable is routed so as to avoid its damage.

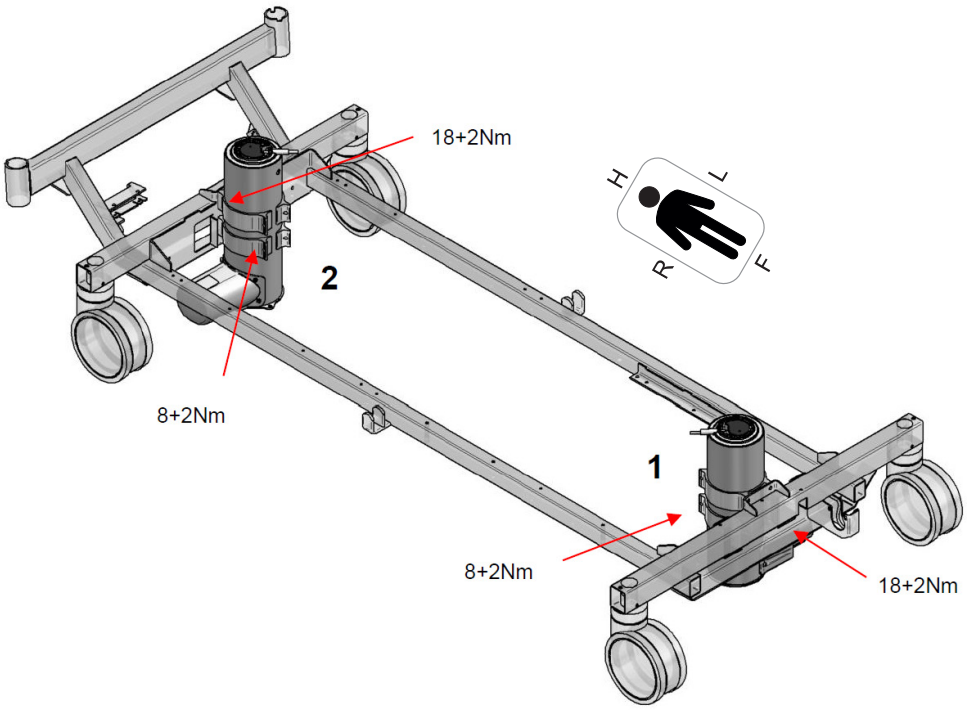


Fig. 4 *Column units*

Position	Description
1	• Foot column, without a lock, cable length 1550 mm • Foot column, without a lock, a data cable for connection of Undercarriage module inside the column, the cable length 1550 mm
2	• Head column, with a lock, cable length 2090 mm • Head column, with a lock, a cable for localization inside the column, the cable length 2090 mm

3.3 Mattress platform actuators

Eleganza 4 bed is equipped with 2 types of linear actuators:

1) Backrest linear actuator
2) Thighrest linear actuator

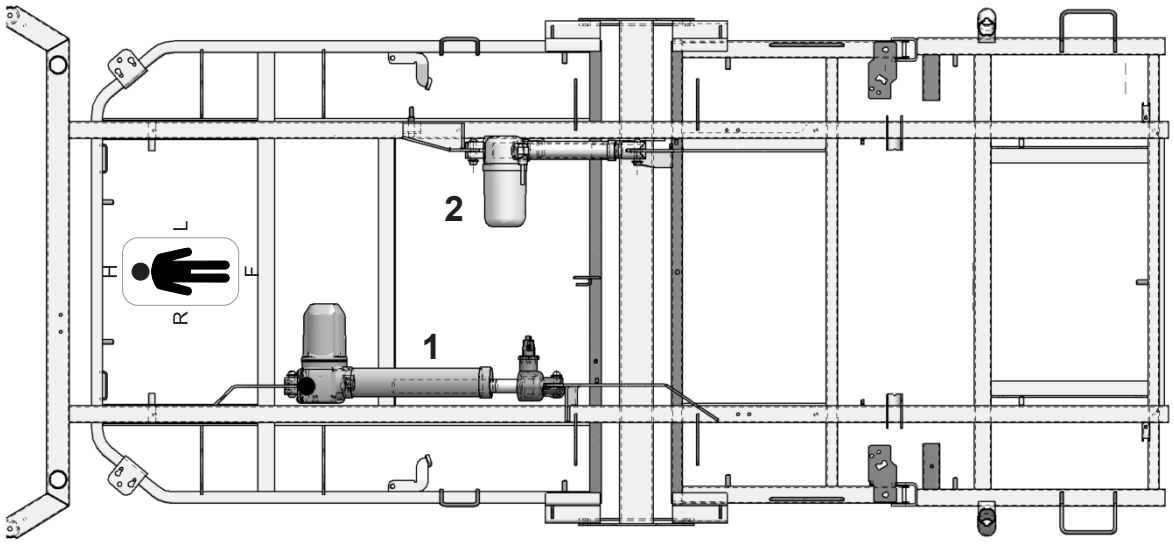


Fig. 5 Mattress platform actuators

3.3.1 Backrest actuator

The back motor lifts the bed's back mattress platform. It is connected to the construction using two pins and secured with star-lock washers. The back motor contains mechanical unblocking function. The head of the motor is connected to the CPR lever by a steel cable. The motor is equipped with end switches for indication of end position. For safety reason the upper end switch is doubled. If first upper end switch is damaged and second one is activated the motor stops work. A two-core cable with repro-Din connector runs from the motor. The cable is connected to the control unit in pos. 7.

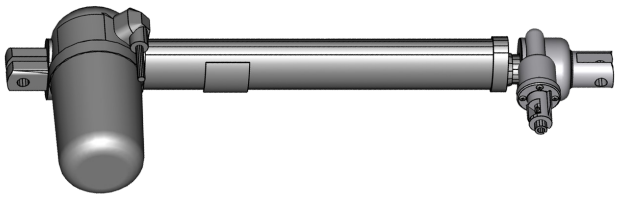


Fig. 6 Backrest Actuator

Technical parameters:

Parameters	Values
Length	475.0 [mm]
Length after extension	700.0 [mm]
Compression strength	3.00 [kN]
Tensile strength	0 [kN]
Mechanical release	Yes
Input voltage	24 [V]
Overvoltage protection	No
Protection degree	IPX6
Max. current load	3 A

3.3.2 Thighrest actuator

The thigh motor lifts the thigh section of the bed's mattress platform. It is connected to the construction using two pins and secured with starlock washers. The motor is equipped with end switches for indication of end position. For safety reason the upper end switch is doubled. If first upper end switch is damaged and second one is activated the motor stops work. A two-core cable with repro-Din connector runs from the motor and it is connected to the control unit in pos. 8. The cable can be disconnected from the actuator.

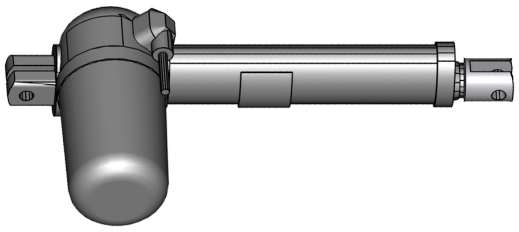


Fig. 7 *Thighrest actuator*

Parameters	Values
Length	300 - 430 [mm]
Compression strength	4.0 [kN]
Tensile strength	0 [kN]
Mechanical release	No
Input voltage	24 [V]
Overvoltage protection	No
Protection degree	IP66
Max. current load	3 A

3.4 Integrated controllers in head and foot side rails

3.4.1 iBoard Basic (version with scales only)

The iBoard Basic is the standard control element for the caregivers. It is integrated in the outside of both head siderails. Only the bed version with scales can be equipped with iBoard Basic. The iBoard Basic serves for control of scales and control of Bed Exit Monitoring

It is **built into the outer side of <u>both</u> head side rails**. The iBoards Basic are connected to the head side rails using six screws covered by six adhesive blanking plugs. They are connected using 6-core cables with a mini Din connector to the cable in the side rail mechanism (it leads from the control unit). The iBoard Basic is equipped with **2,4" display** and keyboard with buttons. There are no positioning buttons on the panel. On the rear side of the panel is a production and a technical label, and the backrest accelerometer.

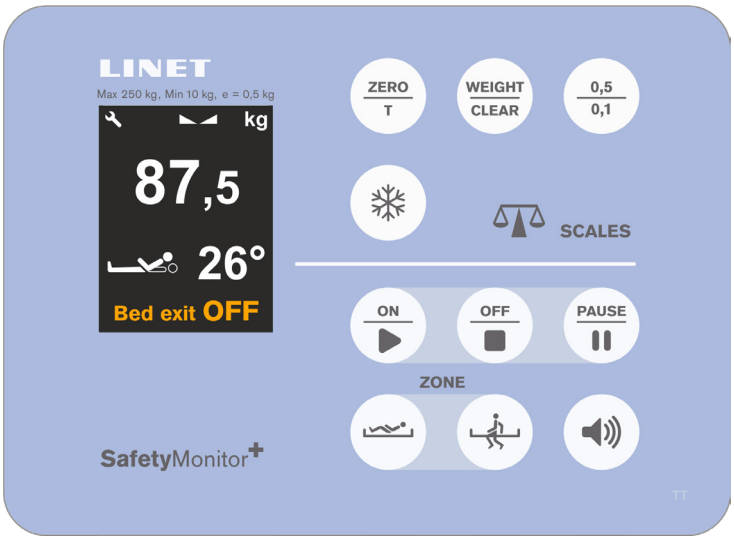


Fig. 8 *iBoard Basic*

3.4.1.1 Backrest accelerometer in iBoard Basic Control Panels

The backrest accelerometer is a part of the both iBoards Basic and is used to determine the **tilt** of the bed's backrest. When the tilt of the backrest changes gradually due to gravity, the voltage in the accelerometer changes and the angle of tilt is calculated. This information is sent to the control unit, which then displays it on the panel. **The angle of tilt is relative to the ground**, which means that if the bed is not on a horizontal floor the backrest of the bed is tilted, the angle of tilt of the floor (ground) is added to the angle of tilt of the frame. The control panels **cannot be interchanged** – Left must be on the left side and right on the right side. In case of incorrect connection it displays wrong tilt angle of the backrest.

3.4.2 Integrated Attendant Control Panel (ACP)

The integrated Attendant Control Panel (Nurse Control Panel) is the main control element for caregivers. It is integrated in the outside of both head siderails and connected to the control unit via a 14-core cable terminated by a 13- in DIN connector. Each ACP panel is connected to the Plug&Play connector which is located under the head siderails. Both ACP panels are fitted with a STOP button. The ACPs contains a lock to block individual functions of the control unit, indicator lights for a mode and condition of the rechargeable battery, a selection of special functions, and settings for standard positions of the bed.

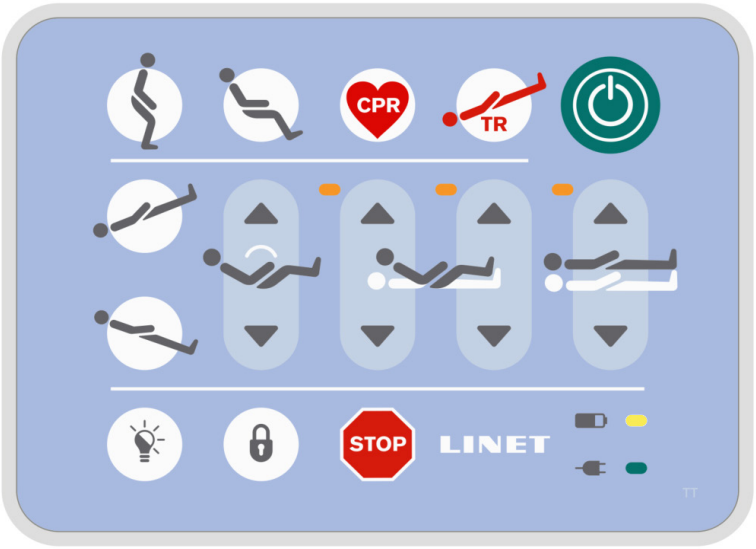


Fig. 9 *Integrated Attendant Control Panel (Nurse Control Panel) in the head siderails*

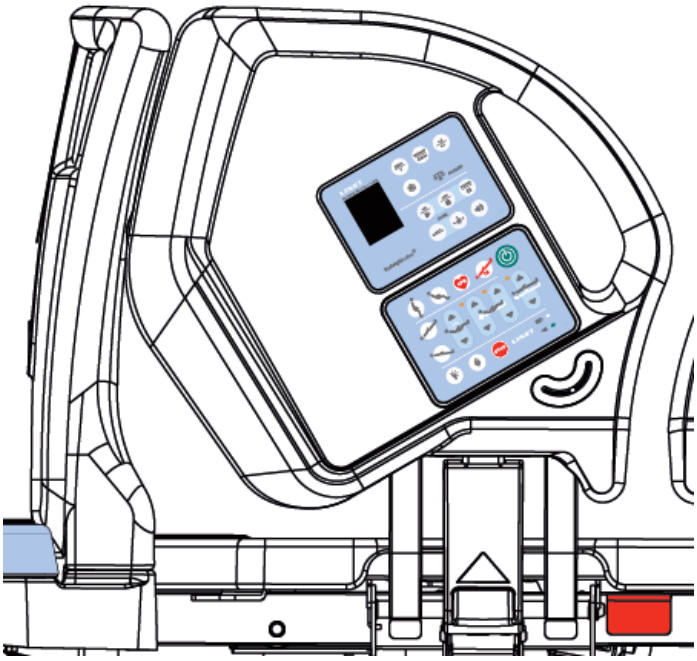


Fig. 10 *iBoard and ACP in the head siderails*

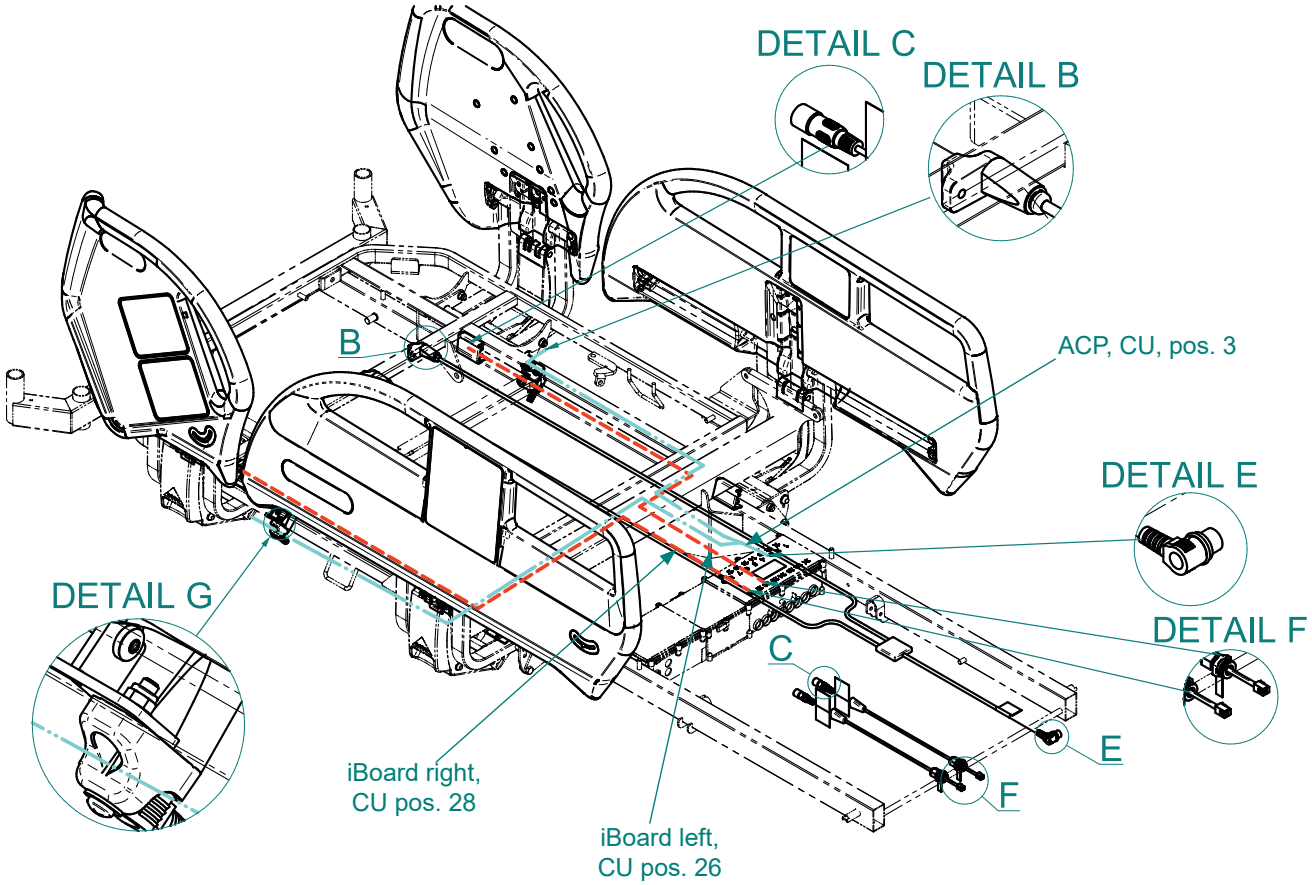


Fig. 11 *iBoard and ACP connection schema (S6017616_02)*

3.4.3 Controllers in foot siderails (optional)

The control panels (left/right) allow the patient **to set the position of the backrest and thighrest**. Autocontour buttons are also available. Controller commands are detected as voltage increase via a cable connected to the control unit. The cables of the side rail can be disconnected at the edge of the mattress platform using Mini Din connectors

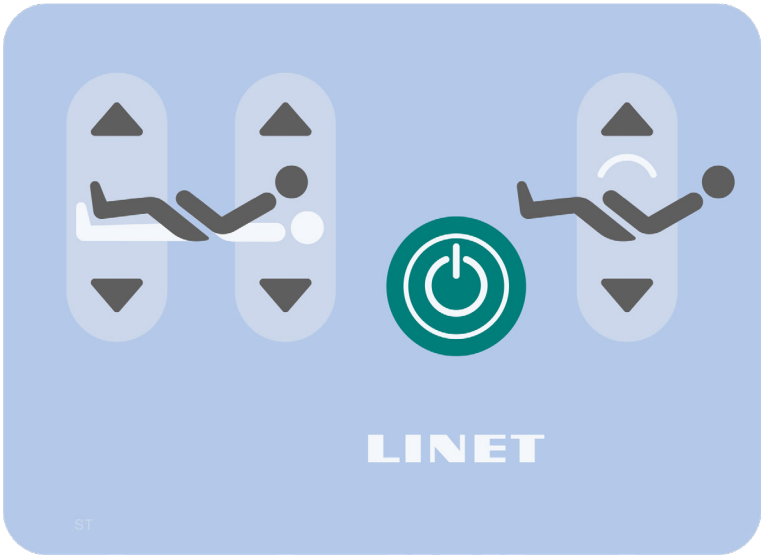


Fig. 12 *Control panel in the foot siderail*

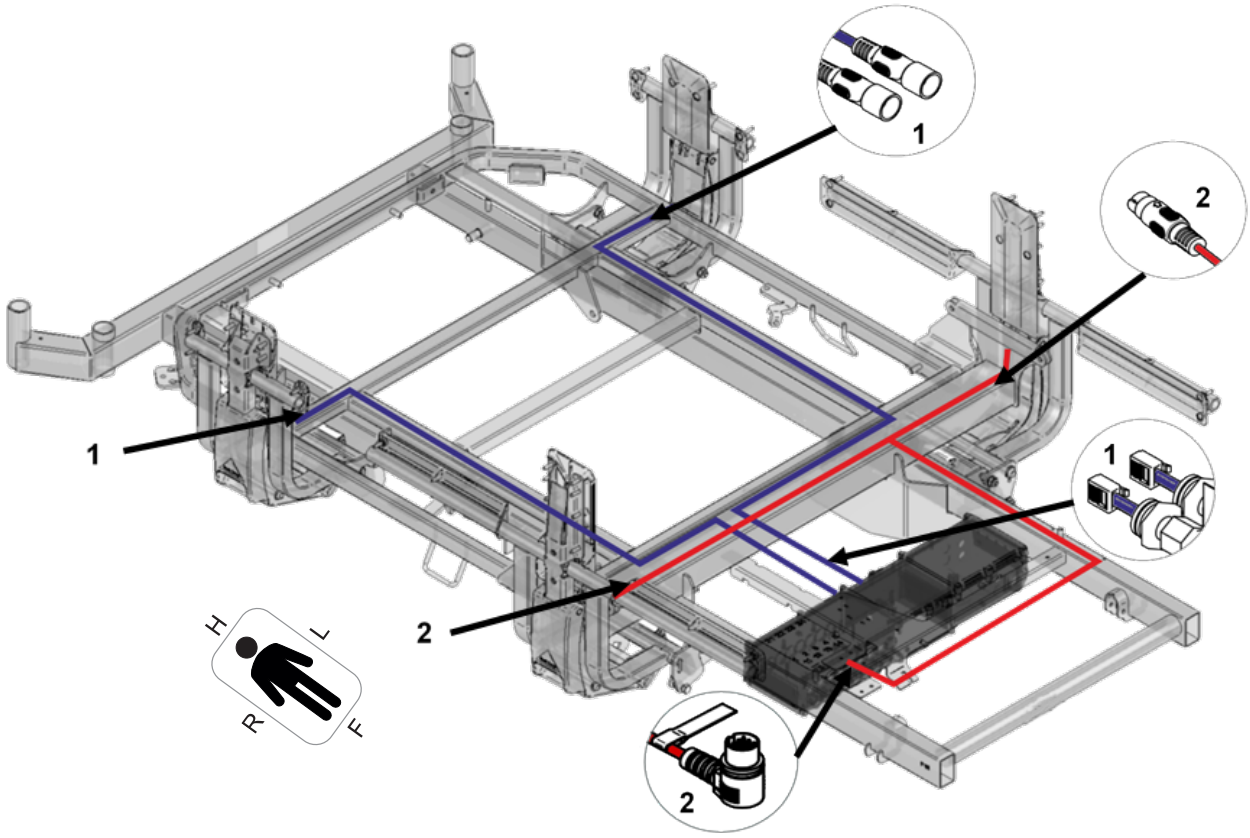


Fig. 13 *Siderail Cables*

Position	Description
1	iBoard Basic Cable (Left, Right)
2	Foot Siderail Control Cable

3.5 External controllers

3.5.1 Remote Attendant Control Panel (ACP)

The **remote** ACP is used mainly in the case the Attendant Control Panel is **not integrated** in the head siderail. It is connected to the control unit via a 14-core cable terminated by a 13-pin DIN connector. The ACP panel is connected directly to the control unit.

The remote ACP can be hung on the foot board or on the siderails if required. It can also be stored in the Linen Shelf. It is possible to hold the ACP in a hand while operating.

The remote Attendant Control Panel is fitted with a STOP button and contains a lock to block individual functions of the control unit, indicator lights for the mode and condition of the rechargeable battery, a selection of special functions and settings for standard positions of the bed. If the bed **is not equipped with** integrated Attendant Control Panels in the head siderails, the remote ACP panel is equipped with a STOP button.

Fig. 14 *ACP without STOP button(for bed with integrated Attendant Control Panels in side rails)*

Fig. 15 *ACP with STOP button (for bed without integrated Attendant Control Panels in side rails)*

3.5.2 Handset (optional)

The handset (Fig. 15) is an optional controller of the bed. The handset is available in two versions, with illuminated buttons or without (or as a variant with mattress platform lift - up/down). The handset button lighting is active if the bed is connected to the mains. The functions of both handsets are identical. A cable with an 8-pin DIN connector is connected to a Plug&Play adaptor, which is linked to the control unit. The controller has an RC unit to detect short circuits.

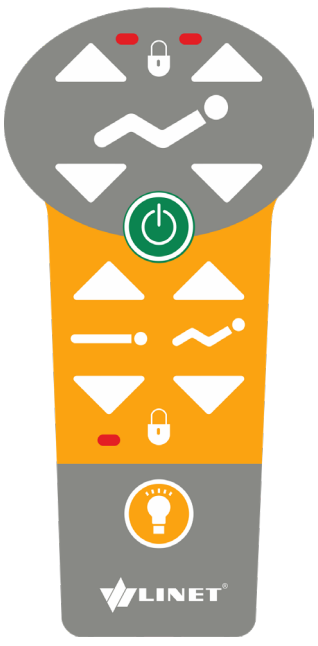


Fig. 16 *Handset*

Fig. 17 *Mobi-Lift®*

3.5.3 Mobi-Lift® (optional)

Mobi-Lift® handles (Fig. 16) are optional ancillary handles with a built-in height adjustment button. There are two switches in the head of the controller, and a cable terminated with an RJ11 connector runs from them.

The Mobi-Lift® from 4/2020 is equipped with a PCB with angle switch. It allows deactivation of the Mobi-Lift® in the horizontal position and activation in vertical position.

Both controllers (left and right) have the same cable connection.

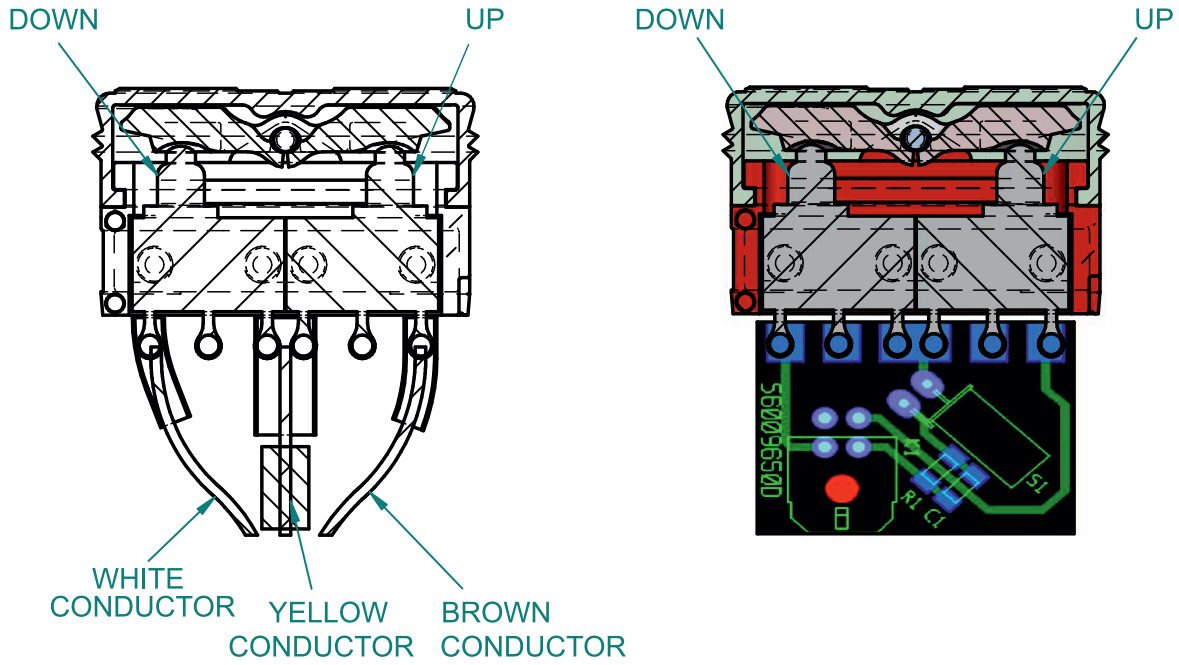


Fig. 18 *Mobi-Lift® switches - older version (left) vs new version with a PCB (right)*

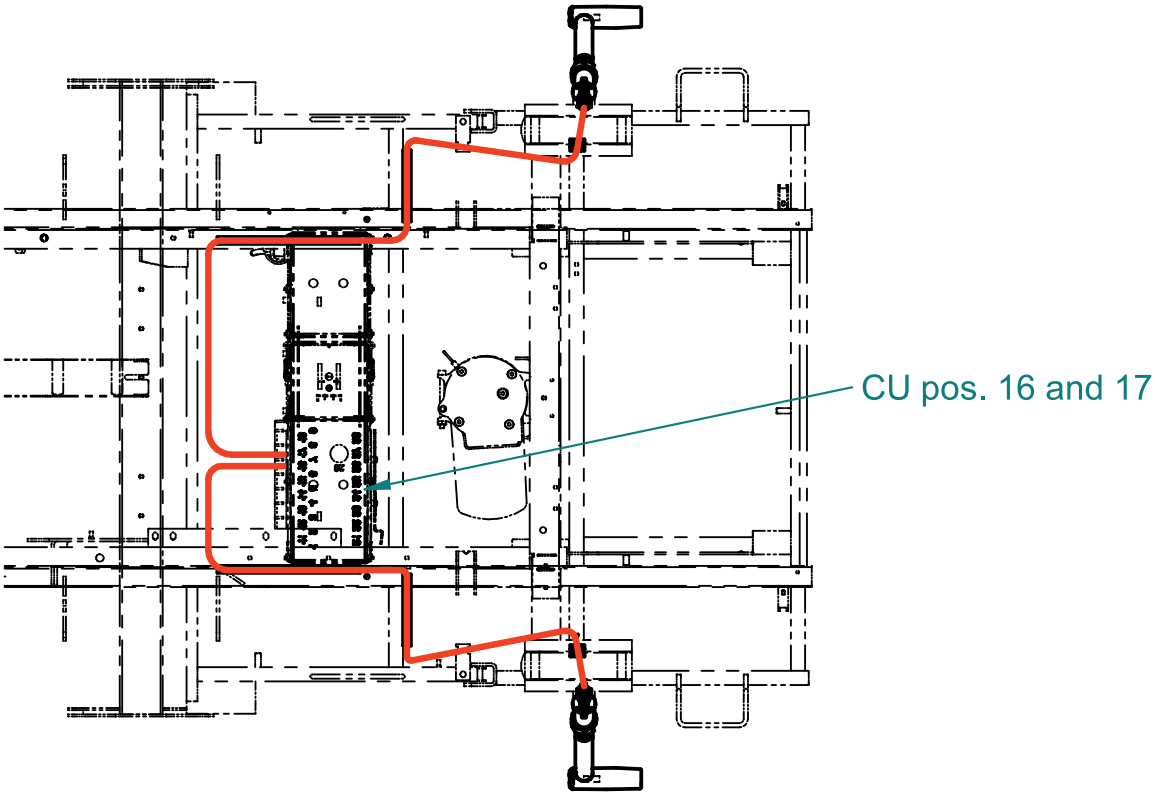


Fig. 19 *Mobi-Lift® connection schema*

3.5.4 Foot controller (optional)

The foot controller for **height adjustment** is a paired component of the bed. It is located on the undercarriage at the foot section of the bed and attached to the undercarriage frame with two screws (**11 ± 1 Nm**). There are three buttons on the controller – lift upwards, lift downwards and lift to examination position. A cable runs from the foot controller to the undercarriage module (UM). The controllers are connected to the UM by an RJ12 connector. In the UM, the connectors of the controllers are attached at position 4 and 5. The Mini GO function is engaged in the software of the control unit for the foot controller. This is a function whereby pressing the foot controller button once again, the GO period runs for 20 seconds without the need for pressing GO on the siderail controller or handset (allows positioning without having to use your hands).

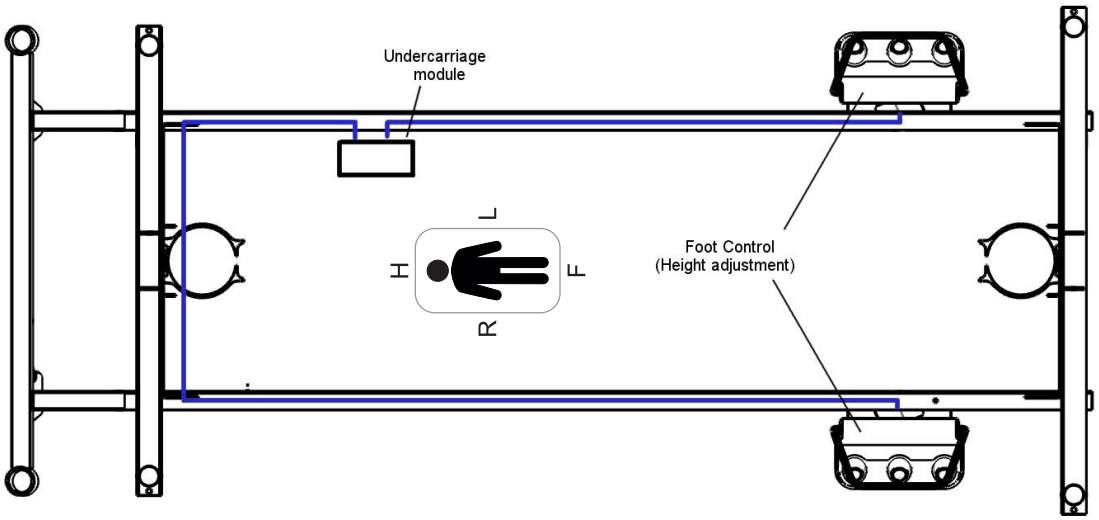


Fig. 20 *Position of the footcontrollers*

3.5.5 m-Panel (optional)

m-Panel **is intended to signalize** if the safety statuses of Eleganza 4 bed are monitored and if the corresponding alerts are triggered in the case of insecure statuses. **Monitorable statuses** of the bed are: brake status (braked castors/unbraked castors), siderail status (siderails up/siderail down), bed height (bed in the lowest position/bed not in the lowest position) and backrest angle (backrest in more than 30°/backrest in less than 30°). The secure statuses are: braked bed, siderails up and locked, bed in the lowest position and backrest in more than 30°. Alerts are notice signals for insecure statuses indicated visually by the orange colour on the display of the m-Panel. Monitoring of the 4 statuses (brake status, siderail status, bed height and backrest angle) can be also set on the m-Panel.

The m-Panel is not firmly attached to the bed, it can be held in the hand while using. **It is recommended** to hang the m-Panel on the Foot Board when it is not used. m-Panel connector is connected to the Control Unit (port 22).

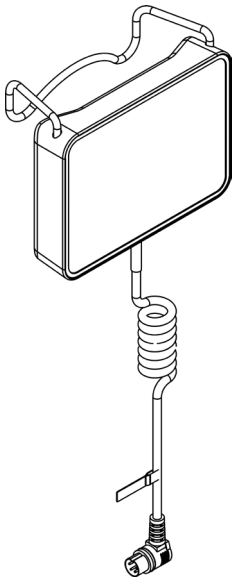


Fig. 22 *m-Panel Display and Keyboard*

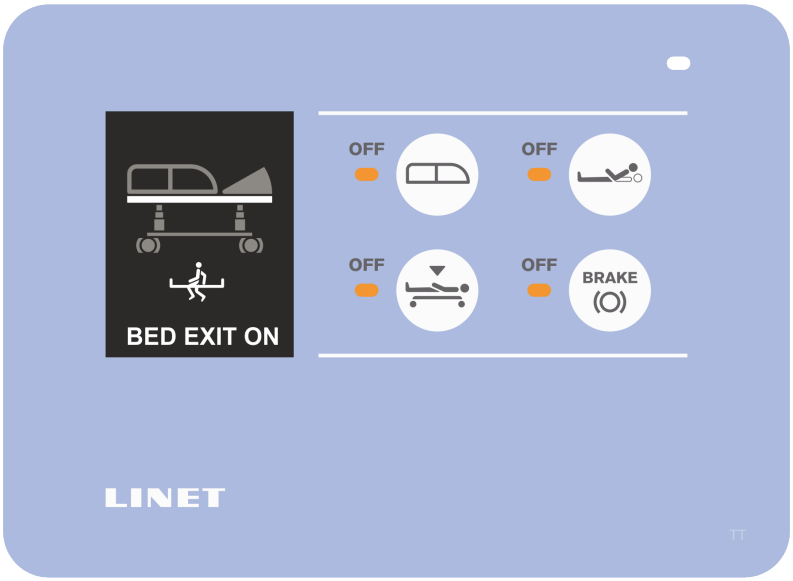


Fig. 21 *m-Panel with a cable (S6018146)*

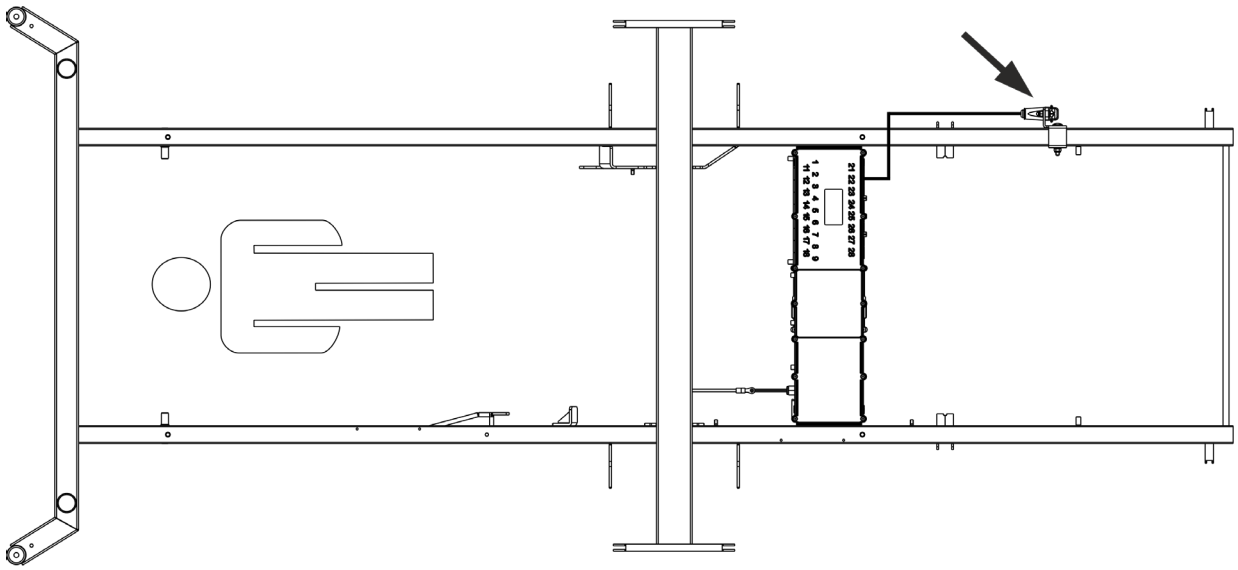


Fig. 23 *Position of the m-Panel connector (left foot end)*

3.6 Outlet (US market only)

The o**utlet is an extension of the electrical source via the bed**, available only for the US market. It allows **easier connection** of peripheral units. A 3-core cable with plug specified by the standard runs from the bed undercarriage. The cable is plugged into a power box. The cable runs via a goose-neck to the frame of the mattress platform and then to the outlet box located on the foot crosspiece of the mattress platform frame.

The outlet contains 2x sockets for 110 V, 50/60 Hz, 10 A. **Without connection** of the outlet to the electricity mains, it is not possible to use the outlet.

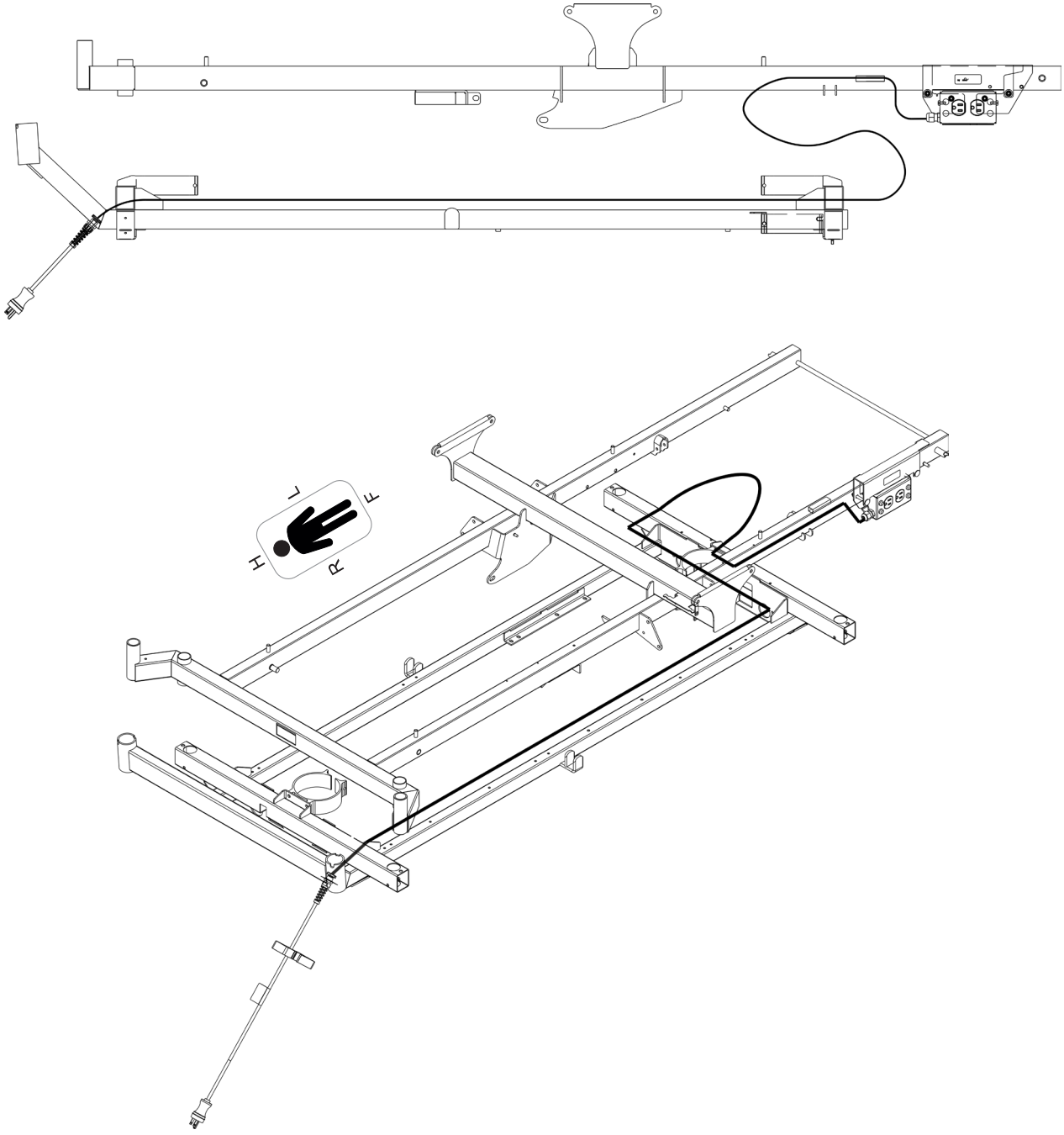


Fig. 24 *Outlet - cable routing*

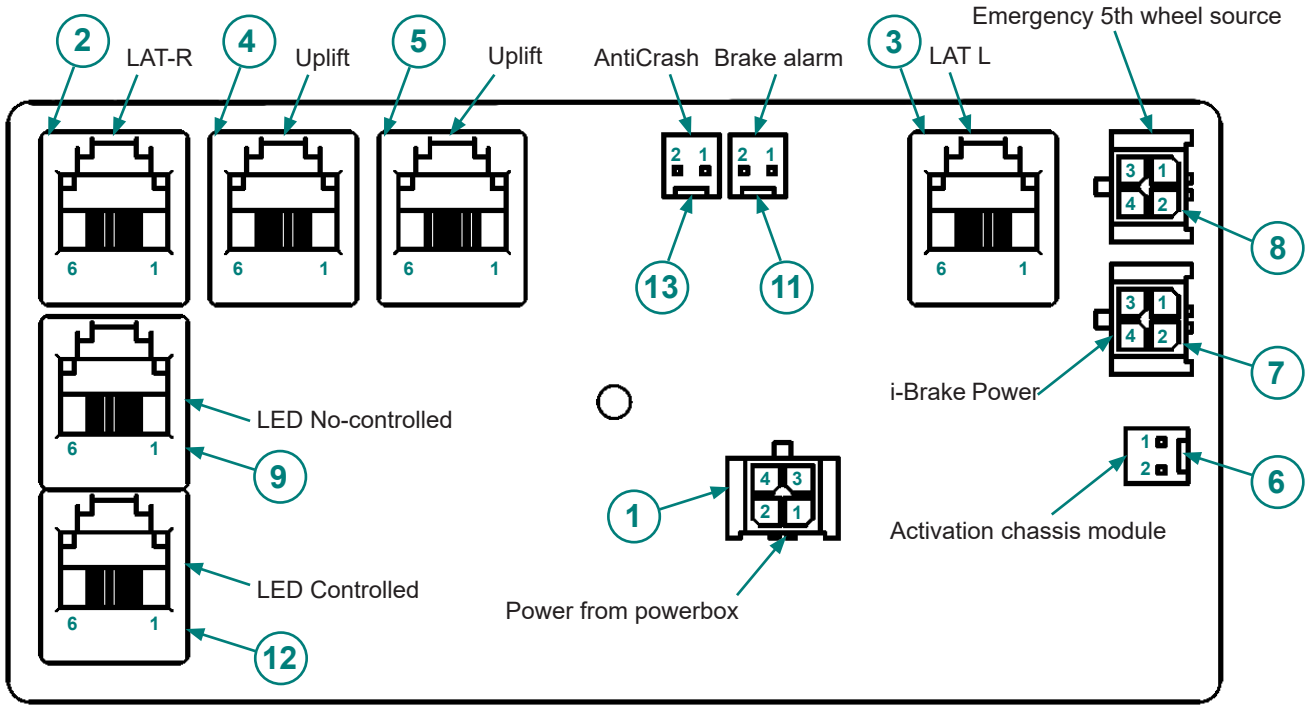
3.7 Undercarriage module (UM)

The undercarriage module (hereinafter UM) allows all peripherals located on the undercarriage to be **controlled** and **integrates the control** of these peripherals via the control unit.

The UM is connected to the control unit by a 4-core communication cable with Molex connectors. This cable **carries power and digital data** simultaneously. The power supply of the UM also powers the 5th castor, i-Brake. Voltage is measurable at the connector on pin number 1 and 3 (see diagram, connector No 8).

The analogue signal of the UM allows the presence of mains power to the bed **to be identified**. This information is essential for the function of the 5th castor and i-Brake.

2x lift foot controllers are also connected to the UM. The signal from these controllers is analogue and is converted in the UM to digital before being transmitted to the control unit. The UM is fitted with leak measurement and short-circuit detection in the controller wires. This information is transmitted to the control unit.



POZ. 1, 7, 8
1 – (+)
2 – RXD
3 – GND
4 – TXD

POZ. 2
1 – COM
2 – Go
3 – COM
4 – LAT L
5 – COM
6 – LAT R

POZ. 3
1 – COM
2 – Go
3 – COM
4 – LAT R
5 – COM
6 – LAT L

POZ. 4, 5
1 – COM
2 – Examination position
3 – COM
4 – Hight DOWN
5 – COM
6 – Hight UP

POZ. 9, 12
1 – NC
2 – LED anode (+)
3 – NC
4 – NC
5 – LED cathode (–)
6 – NC

POZ. 11, 13
1 – Sensor
2 – Sensor

POZ. 6
1 – Activation contact
2 – Activation contact

***Fig. 25** Undercarriage module*

3.7.1 Undercarriage module – Basic

The bed with basic equipment (e.g. without i-Brake, Anticrash, etc.) is equipped with **elementary undercarriage module**. The output from the undercarriage module is a molex connector which is connected to the column and then into the control box.

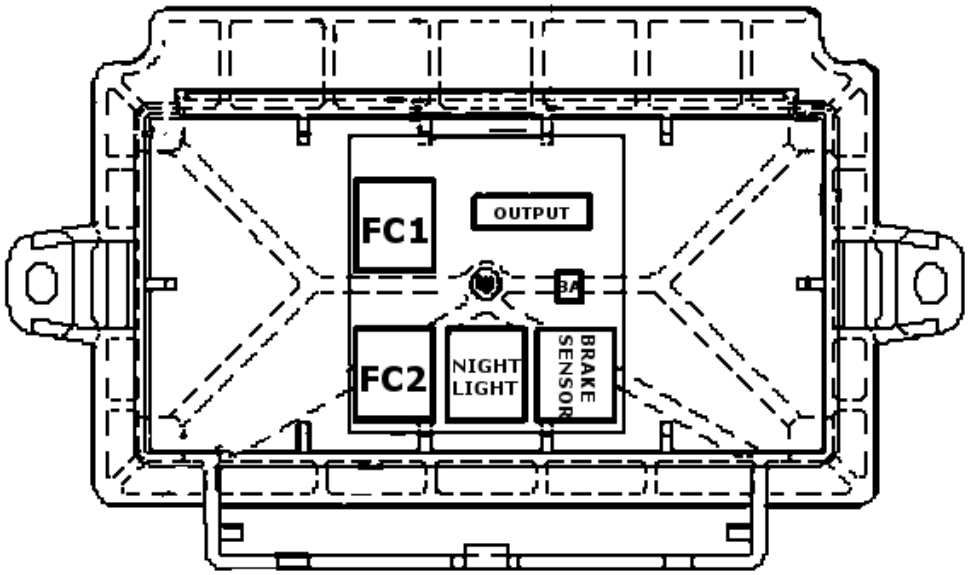


Fig. 26 *Undercarriage module - Basic*

3.8 Night illumination

The control unit allows a pair of illuminating “white” LEDs to be connected, ensuring illumination of the mattress platform. The night illumination (LEDs) are connected via a ribbon cable to the control unit.

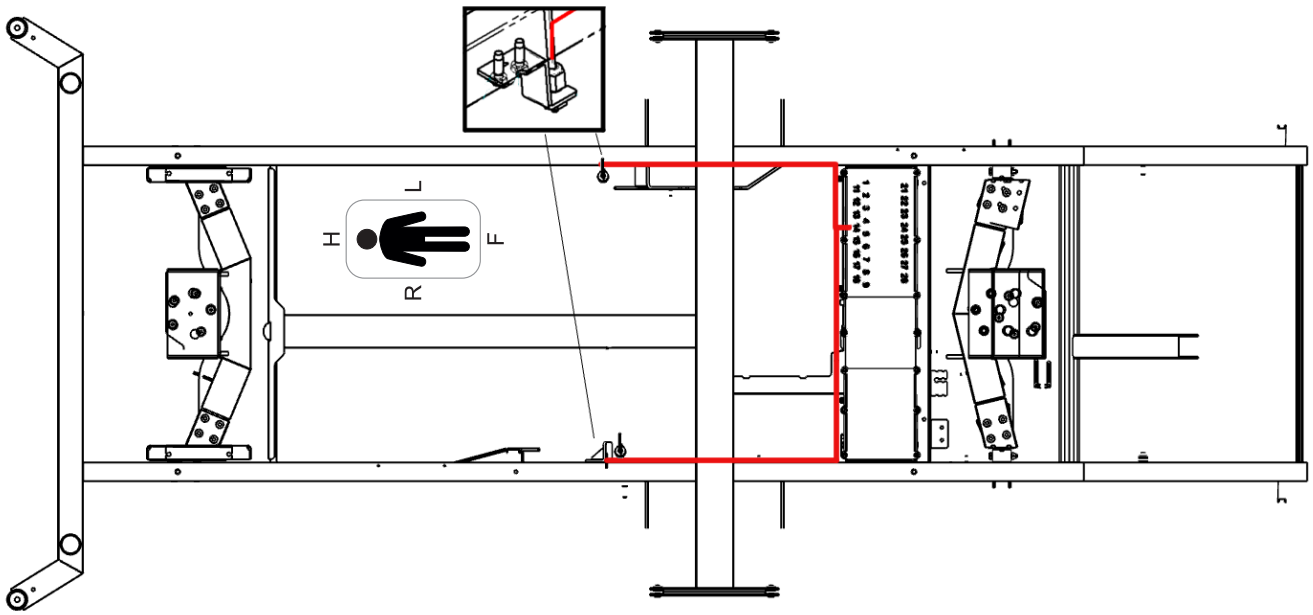


Fig. 27 *Night illumination* - LEDs connection to the control unit

3.9 Safe Stop (AntiCrash)

Safe Stop **prevents user of the bed from injuries** due to crushing by the lowered Mattress Platform. When obstacle occurs on the undercarriage and Mattress Platform is going down, **the motion is stopped automatically.**

Safe Stop consist of 6 microswitches connected together in serie to undercarriage module. If the Safe Stop is activated or not connected to undercarriage module correctly or the circuit is interrupted the system does not allowed height adjustment down. The Safe Stop circuit must be replaced for a new one.

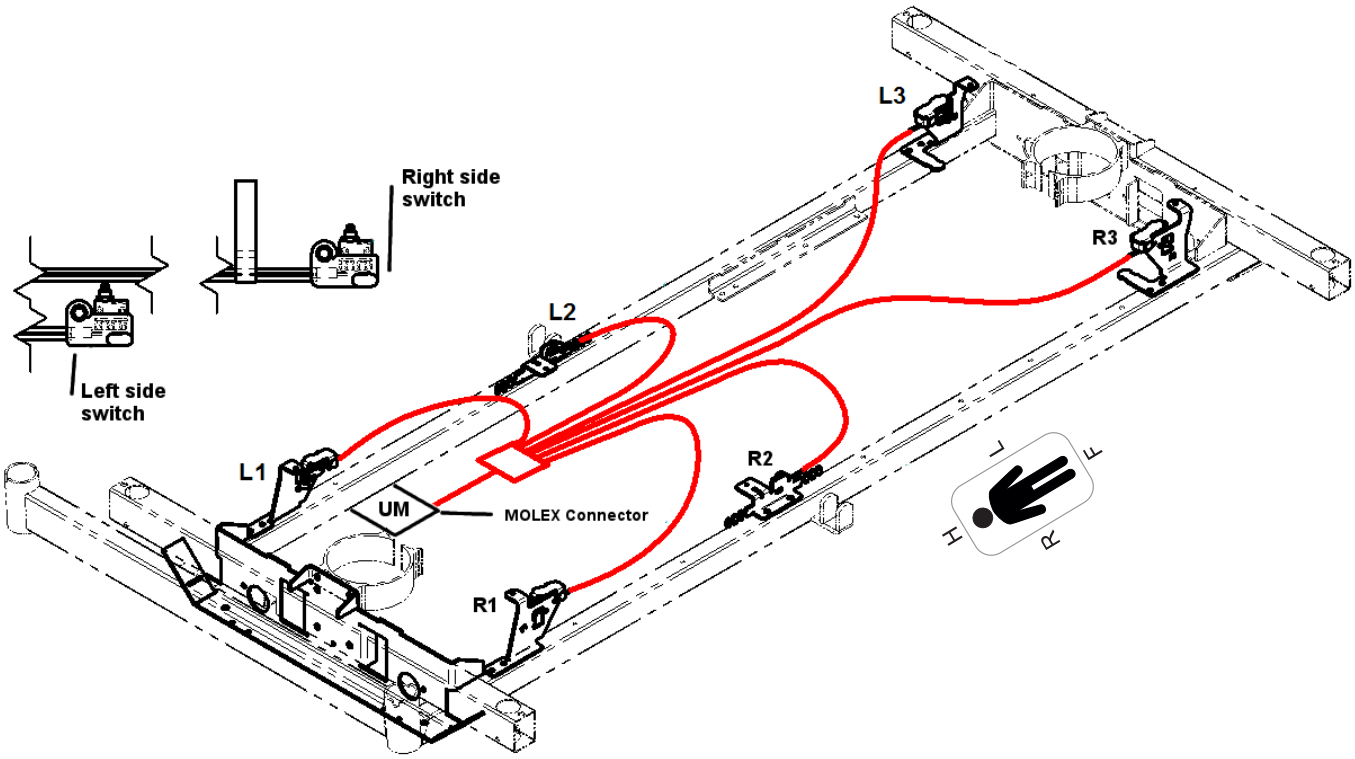


Fig. 28 *Safe Stop (AntiCrash) - sensors wiring diagram*

3.10 i-Brake (optional)

The i-Brake is a device allowing **automatic braking** of unbraked beds after they have been connected to the mains. i-Brake automatically brakes the bed within **60 s** after it has been connected to the mains. If the brake is deactivated mechanically (for example during cleaning), the system brakes the bed again.

The principle of the device is an **electromagnetic impulse** on the rod of the Castor Central Control (CCC), replacing the activity of the operator. The position of the CCC (braked – unbraked) is detected by a single **magnetic** limit switch. Its signal is transmitted via the undercarriage module to the control unit. If the rod does not achieve the desired braked position, the i-Brake repeats the entire process twice more.

The drive is an electric motor – it is **protected** by a 3A current fuse and limit switches in both limit positions of the worm gear transmission. The manual braking function is preserved.

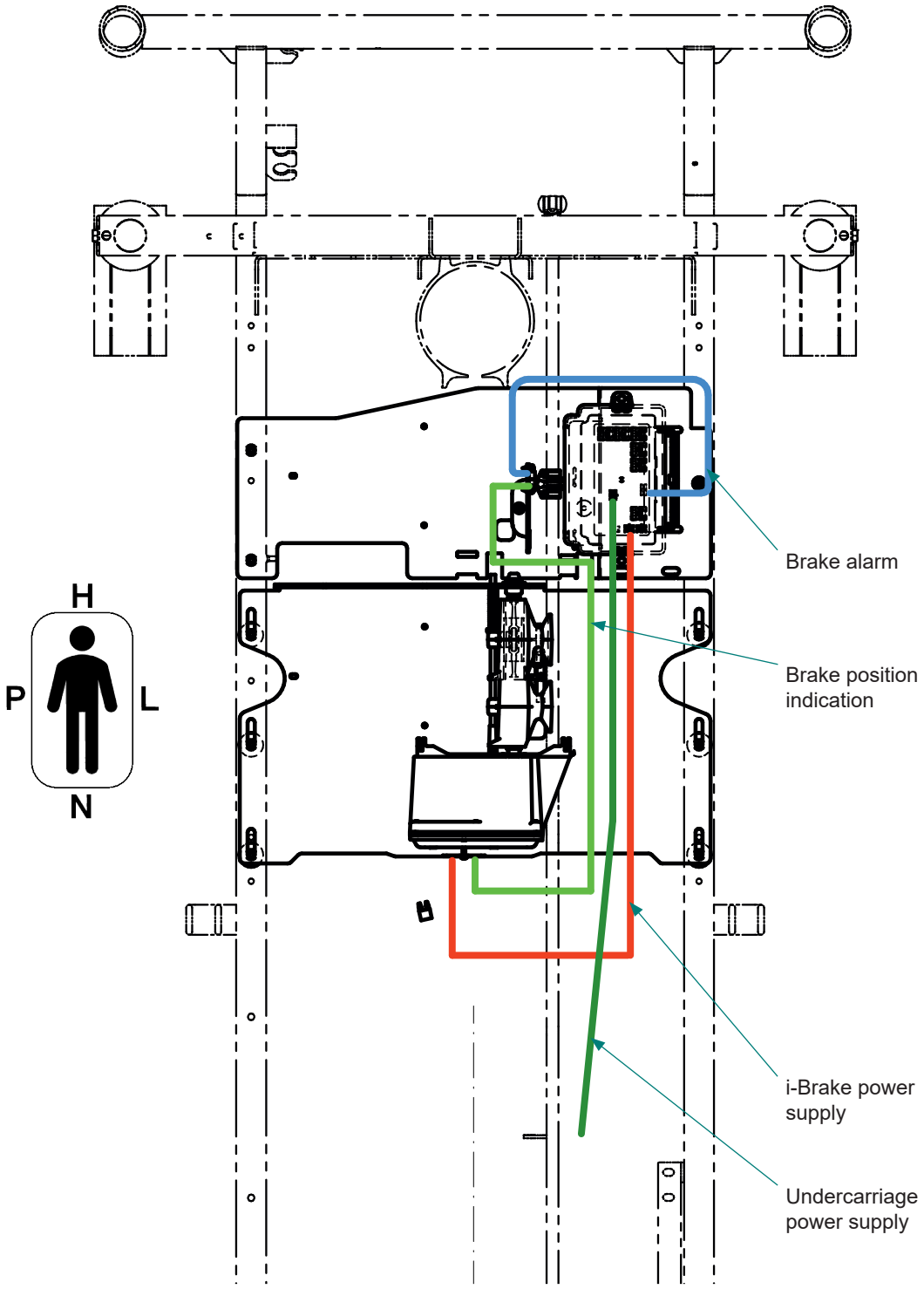


Fig. 29 *i-Brake and Brake alarm connection schema (S6018107)*

3.11 Brake alarm (optional)

If the bed is equipped with Brake alarm and this bed is connected to the mains power, the Brake Signal sounds when the bed is not braked.

If the magnet attached to the brake rod is aligned with the magnetic sensor then a signal indicating the brake position is sent. If the magnet is not aligned with magnetic sensor then the bed starts to beep.

3.12 Scale and Nurse Call System (only version with scales)

The scale system is providing measuring and calcutation of patient weight. **It consists of a scale box, 4 tensometers, a control box and an iBoard Basic controller. Optional part** is a nurse call system.

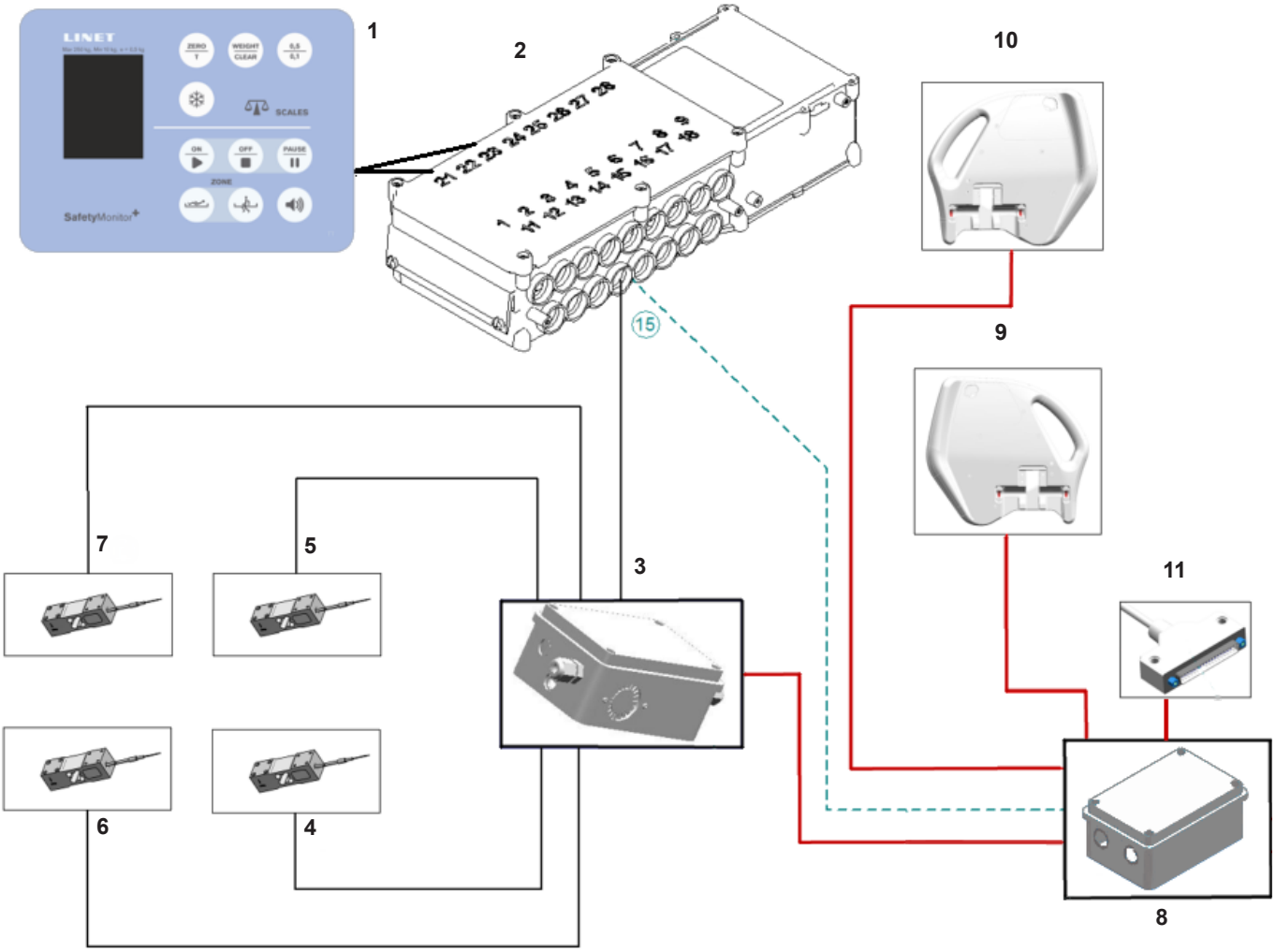


Fig. 30 *Scale and Nurse Call System connection scheme*

Position	Description
1	iBoard Basic (Scale display and controler)
2	Control Box
3	Scale Box
4	Tensometer 1 - Head Left
5	Tensometer 2 - Head Right
6	Tensometer 3 - Foot Leftt
7	Tensometer 4 - Foot Right
8	Nurse Call Box
9	Nurse Call controller
10	Nurse Call controller
11	37-pin Nurse Call connector

3.12.1 Scale box

The scale box allows the bed's mattress platform load to be **calculated**. **Four scale sensors (tensometers)** are connected to the scale box. The **tensometer constants**, the gravitational constant, as well as the **overall** calibration constant **generated during calibration** of the scales are saved to the scale box. The **weight** of the load is calculated from tensometer data and calibration constants and sent digitally to the control unit. The processed information is displayed on the iBoard Basic. Information from scale box are in Scale diagnostic screen (Tensometer constant, Absolute values, etc.). One part of the box is a **speaker** for the Bed Exit Alarm (sound / space - 0.5 s/0.5 s). The scale box is powered from the control unit by a 4-core cable with RJ14 connector and is connected to the control unit.

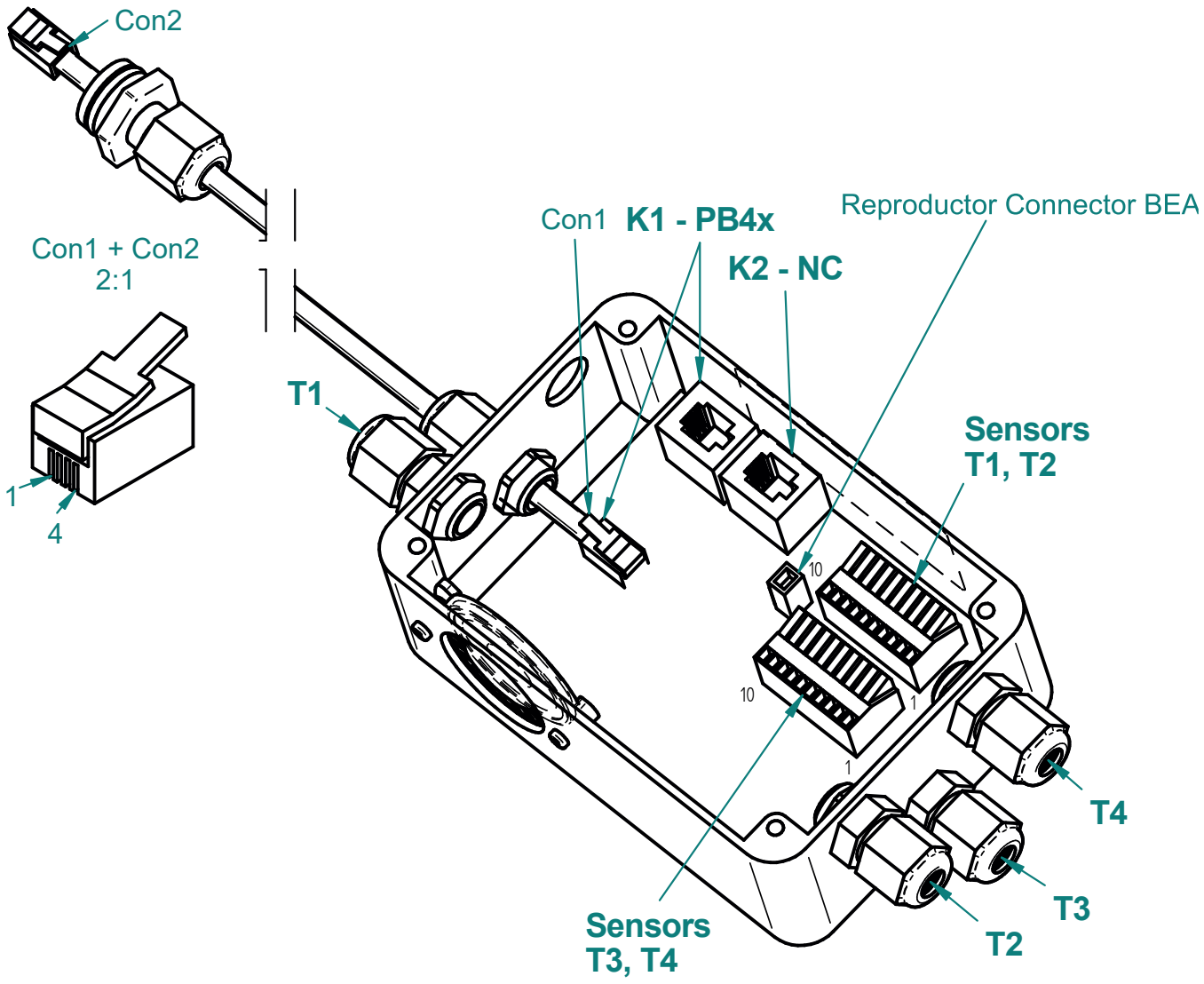


Fig. 31 *Scale box - connection schema*

3.12.2 Scale sensors (tensometers)

According to the load, the electrical resistance in the scale sensor changes. The change is transmitted immediately to the scale box, which processes the values. There are four scale sensors (tensometers) on the bed – 2 at the feet and 2 at the head. They are secured using eight screws (**6+2 Nm**). The scale sensors are connected to the scale box by a 4-core shielded cable.

The value from each tensometer has a unique constant.

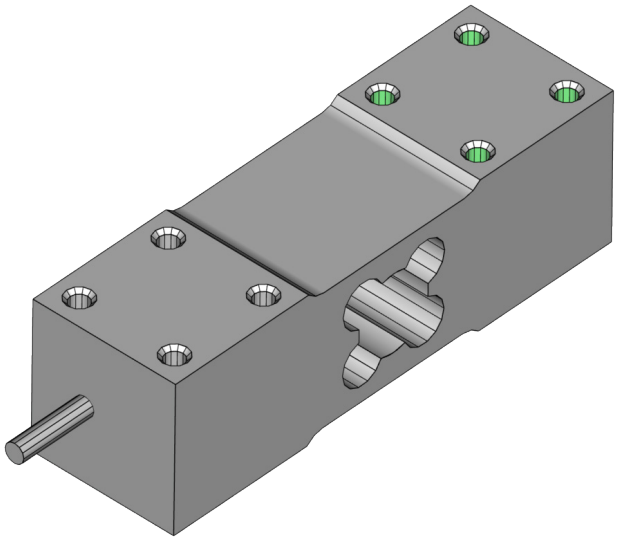


Fig. 32 *Scale tensometer*

The functions of the individual cores are described in the table.

Model number of tensometer			**8300-0674A**	**Model number of tensometer**			**8300-0674A**
Sensors T1, T2	**PIN**	**Meaning**	**Colour**	**Sensors T3, T4**	**PIN**	**Meaning**	**Colour**
	1	T1 shielding	transparent		1	T3 shielding	transparent
	2	T1 – supply	brown		2	T3 – supply	brown
	3	T1 + output	green		3	T3 + output	green
	4	T1 – output	white		4	T3 – output	white
	5	T1 + supply	yellow		5	T3 + supply	yellow
	6	T2 shielding	transparent		6	T4 shielding	transparent
	7	T2 – supply	brown		7	T4 – supply	brown
	8	T2 + output	green		8	T4 + output	green
	9	T2 – output	white		9	T4 – output	white
	10	T2 + supply	yellow		10	T4 + supply	yellow

3.12.3 Nurse call

A device for urgent summoning of personnel, remote control and communication with patient, nurse call comprises several components. **The main component is a central box processing signals from peripheral components and transmitting them to the output.** The central Nurse Call box is powered from the scale module and is connected to it by an RJ connector to the position K1. It receives information about the state of the Bed Exit Alarm from the scale module.

4 peripherals are connected to the central box – Control of Nurse call function, which is in the head side rail controllers - left and right (including speaker/microphone). The central box also contains an output (DIN connector - female (13 pins)), via which it sends and receives data to/from an external equipment. The Nurse Call output connector K2 ends by 37 pin connector. The output for connection to the Nurse Call system is on the undercarriage in the head section.

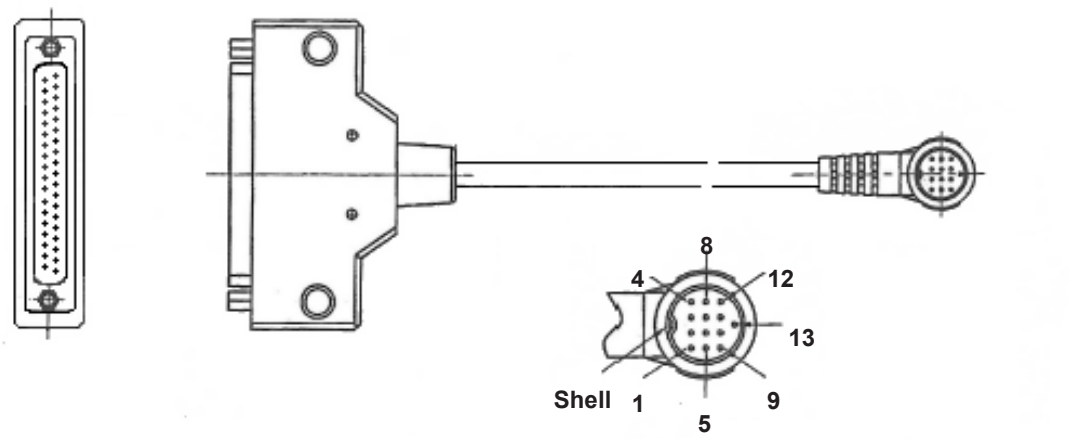


Fig. 33 *37-pin Nurse Call connector*

PIN 14	Colour
1	green
2	white
3	brown
4	pink
5	light red
6	dark red
7	dark blue
8	orange
9	light blue
10	grey
11	dark green
12	yellow
13	violet
14	black (shell)

PIN 37	Function
16	+ red LED
29	- red LED
19	+ green LED
28	- green LED
7 + 25	Nursecall
26	Nursecall
30	Bed exit
31	Bed exit
4	Speaker - L
22	Speaker - R
35	Speaker com

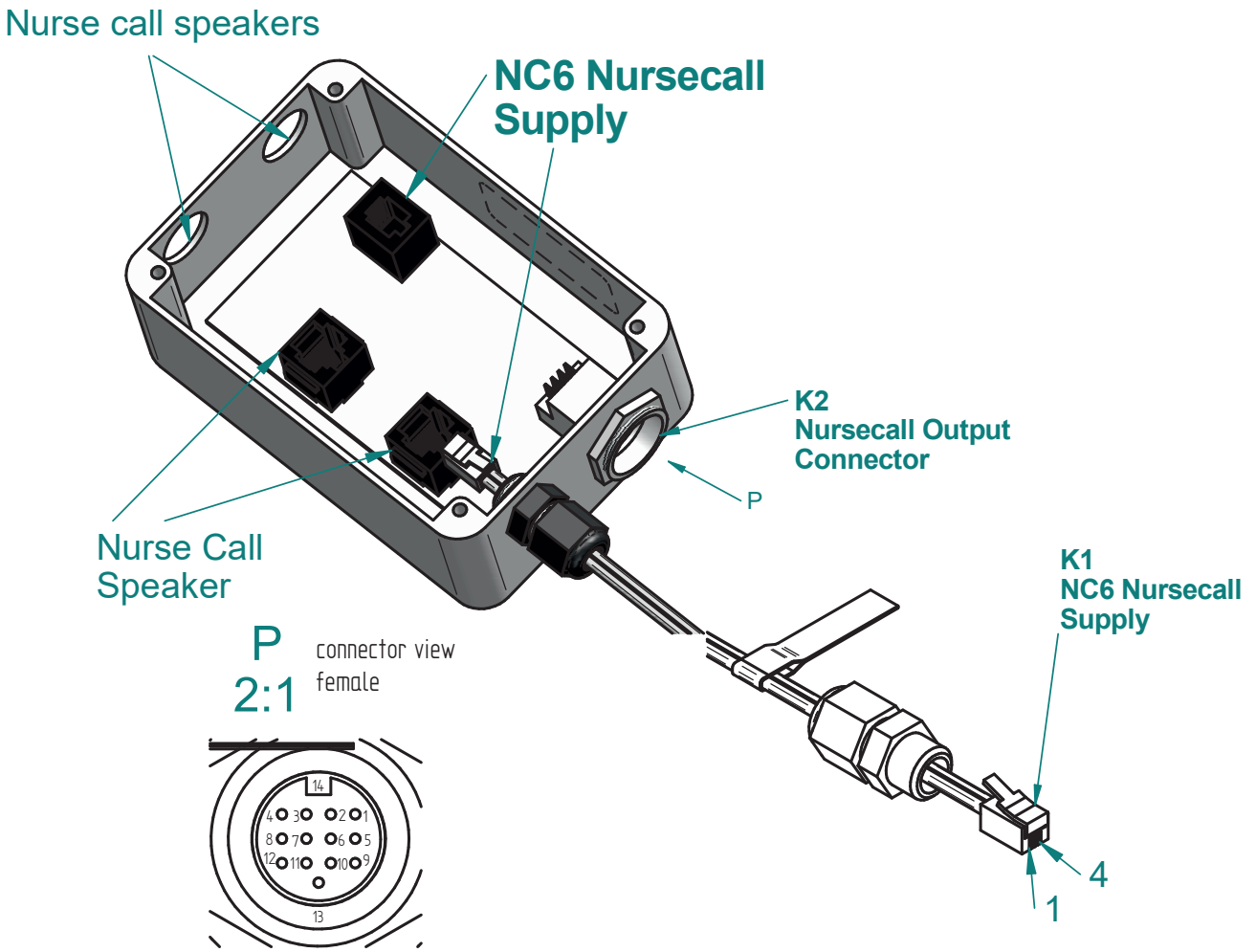


Fig. 34 *Wiring diagram of the central Nurse Call box*

Connector	PIN	Function
K2 Nursecall Output	1	- green LED
	2	+ green LED
	3	- red LED
	4	+ red LED
	5	Bed exit
	6	Bed exit
	7	Nursecall
	8	Nursecall
	9	Speaker com
	10	Speaker -R
	11	Speaker -L

Connector	PIN	Function
K1 Nursecall Supply	1	+
	2	Bed exit
	3	-
	4	Nursecall

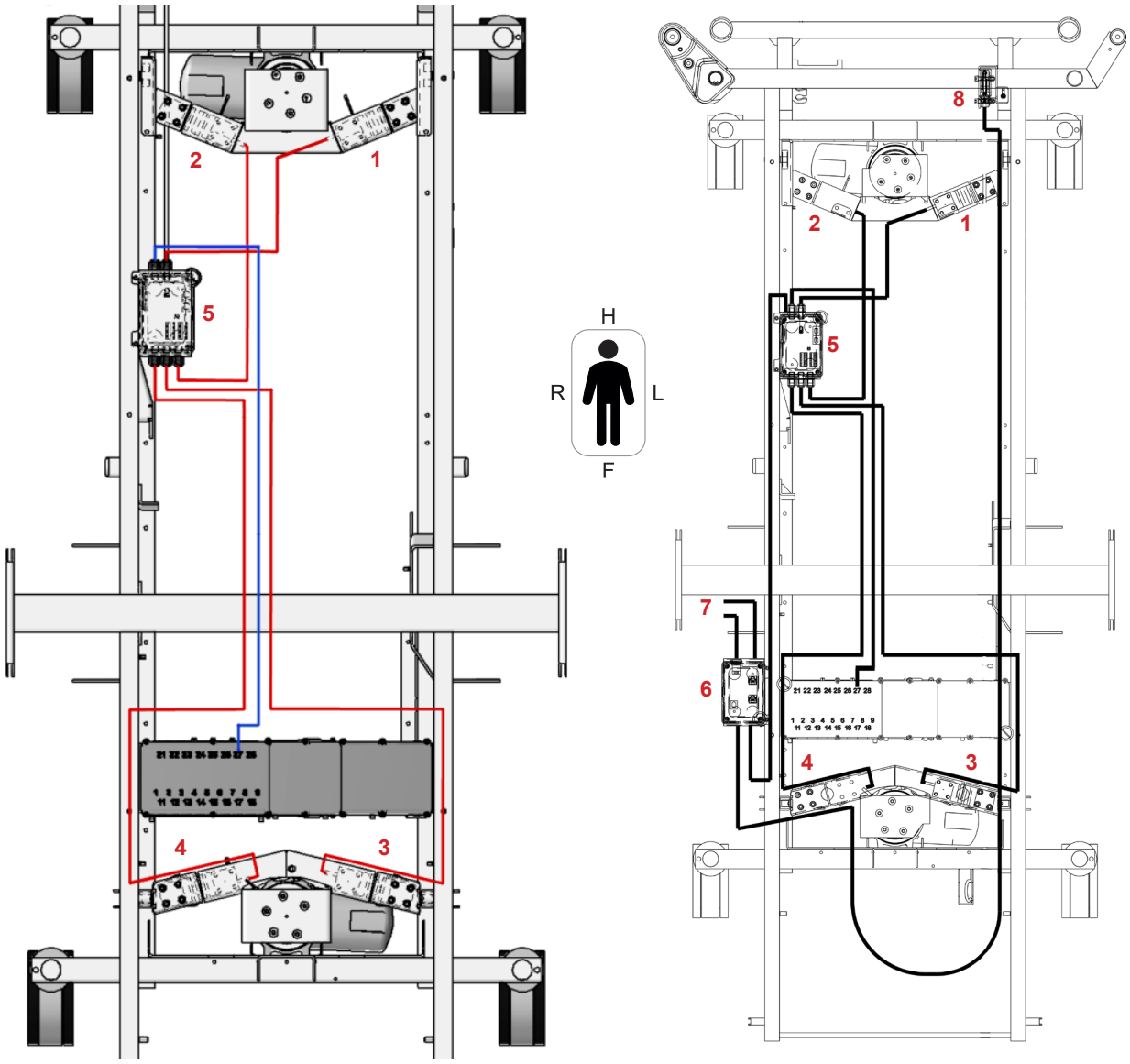


Fig. 35 Scale module with tensometers (left) vs Scale module with tensometers and a Nurse Call (right)

Position	Description
1	Tensometer No. 1 - head left
2	Tensometer No. 2 - head right
3	Tensometer No. 3 - foot left
4	Tensometer No. 4 - foot right
5	Scale module
6	Nurse Call
7	Connection to siderails
8	Nurse call connector

3.13 SmartCare components

3.13.1 Integration module

The integration module serves as the bed's **communication centre.** It contains Ethernet and Wi-Fi communication interfaces, via which it transmits data to the server about the operation of the bed. The integration module is connect to the control unit. The data from the sensors on the bed and other peripherals are loaded via the following interfaces:

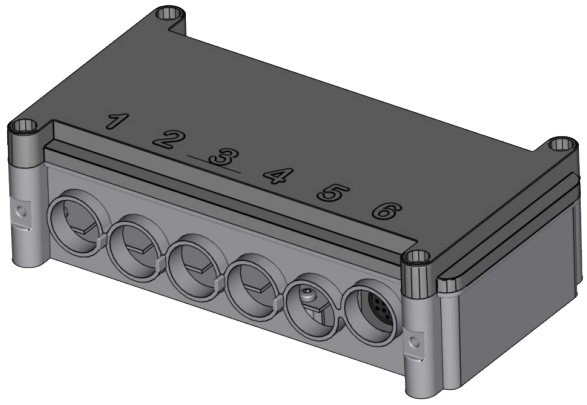


***Fig. 36** Integration module*

Position	1	2	3	4	5	6
Function	Ethernet	Control Unit	N/A	Localisation	N/A	Diagnostic
Connector	RJ45	RJ11 6/4	N/A	RJ11 4/4	N/A	DIN13

The outputs from these interfaces are **converted** according to configuration into reports that are sent at **regular** intervals to the server.

Each device is **marked** with a label containing important information about the integration module. The label contains the product number of the product, power supply level, type of hardware, and software version. It also contains the product serial number, which is important for identifying a device during communication with the server.

More information about LINIS SafetyMonitor/SafetyPort find in separated LINIS SafetyMonitor/LINIS SafetyPort service manual.

3.13.1.1 Device mode Indication

Three LEDs are in the lower part of the device (RED, GREEN and BLUE) to indicate its mode.

Type	Indication	Description
RED	Peripherals	• Each flash indicates one peripheral • If red is on continuously for 30s, a short-circuit has been detected in the peripheral's power supply, and this peripheral's power supply has been switched off
GREEN	Communication with server	• One flash – IM running • Two and three flashes – communication with server
BLUE	Ethernet and Wi-Fi	• One flash - Ethernet connected • Two flashes - connected to Wi-Fi • Three flashes - connected to both.

3.13.2 Left and right side rail limit switches

The limit switches serve to detect the current position of the side rails. If the side rail is in the up position, the limit switch is pressed via the mechanism of the side rails and a signal is sent to the integration module and vice versa. Limit switches are not separately connected, Left and right limit switches are in serie. The limit switches are connected to the merging box. The concept of the limit switches is to determine that when the side rail is up, the given switch is closed (in case of non-connection, broken wire, the situation is detected as dangerous, i.e., side rail down).

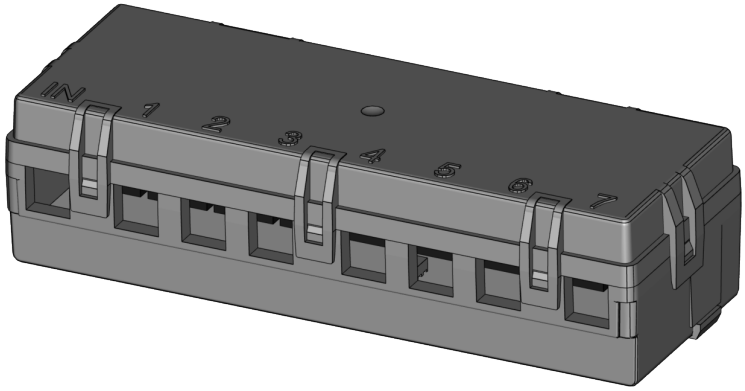


Fig. 37 *Merging box*

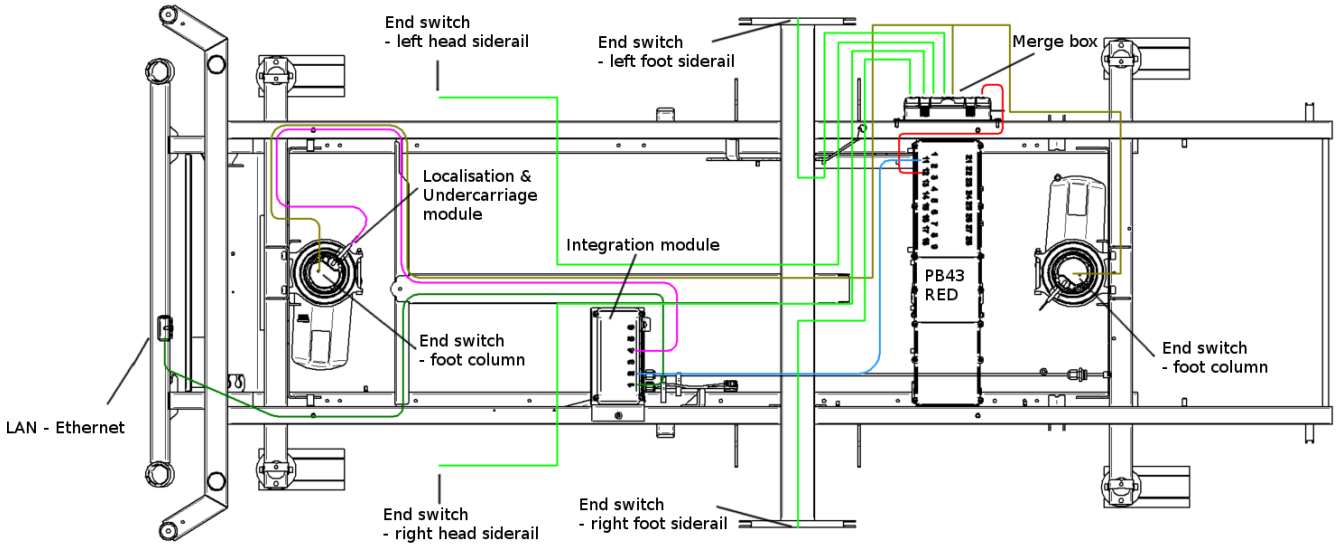


FIG. 38 *LINIS SafetyMonitor/LINIS SafetyPort ready solution*

3.14 Castors

Eleganza 4 is fitted with 4 castors plus additionally with 5th castor. If the bed is fitted with 5th castor then there are 3 standard castors and one static castor. The bed without 5th castor must be fitted with directional castor. The position of directional castor is according to the control direction. If the control direction is **from the foot side** then the directional castor is on the **right head side** and if from **the head side** then the directional castor is on the **left foot side**.

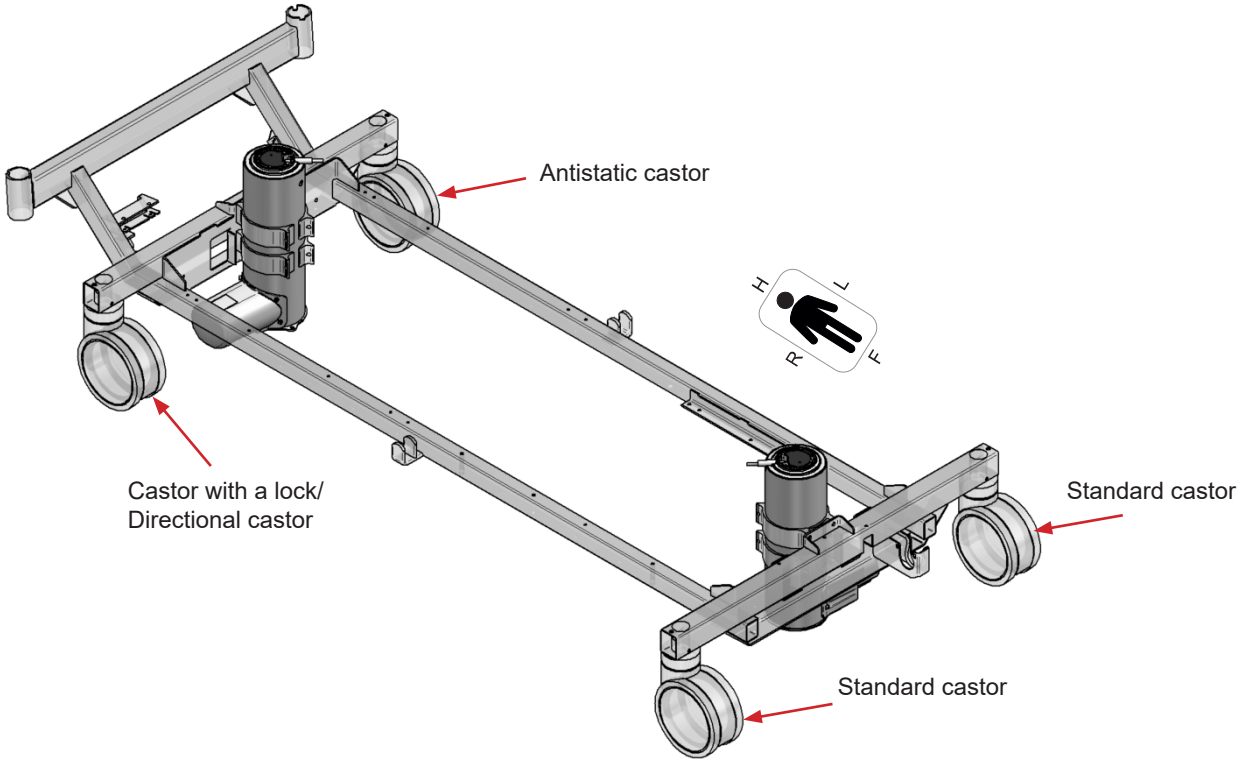


Fig. 39 *Position of antistatic and directional castors (control direction is **from** the foot side)*

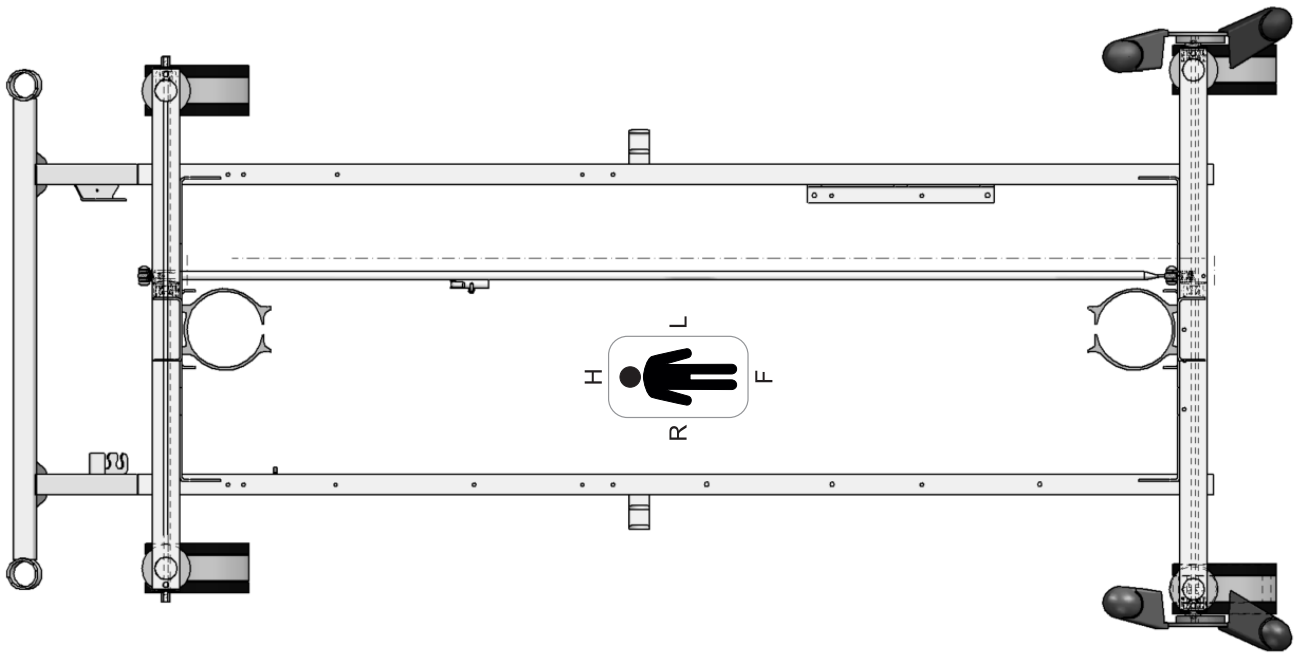


Fig. 40 *Central castor control*

3.14.1 Fifth Castor (optional)

It is possible to equip the bed with Fifth Castor in the centre of the undercarriage. The Fifth Castor helps to steer and manoeuvre the bed in long corridors and small rooms.

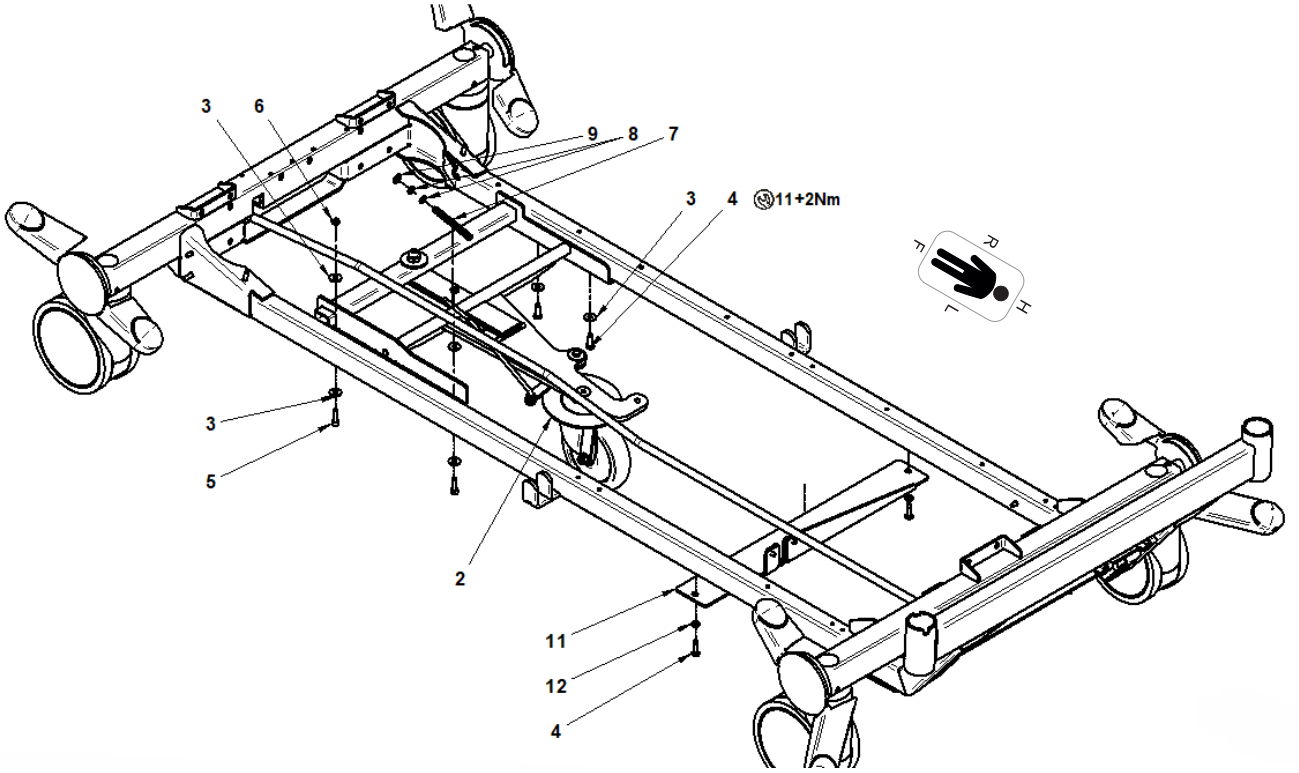


Fig. 41 *Mechanical 5th castor*

Position	Description
2	5th castor, foot controlled
3	Distance washer, Fe, Zn-Cr,d6.4 D18 T1.6 DIN 9021
4	Screw, Fe, Zn-Cr, M6 L20 DIN 7500C,TORX
5	Screw, Fe, Zn,M6 L20 DIN 912,VAL Hex
6	Nut, M 6 DIN 985
7	Spring, D9 T0.8 L80|DIN 17242
8	Plastic distance washer, d6.5 D12 T1
9	Starlock, Fe, d6

3.14.2 i-Drive - Driven 5th castor (optional)

The bed may be fitted with a driven i-Drive Power™ wheel to help hospital personnel **move** a bed with a patient on it while applying only **minimum force**.

The driven castor i-Drive Power™ is located **in the middle of the bed's undercarriage**. Using the i-Drive's **servo** mechanism, the i-Drive is lifted according to the operator's need or dropped and forced against the floor in a way that it is possible to use the castor's torque to make it easier to move the bed in a straight direction. The castor has its own rechargeable battery and **charging** independent of the functions of the bed. If the i-Drive has been fully discharged, the functions of the bed can still be used. The bed has one i-Drive Power™ controller.

Technical specifications

Specifications	Value
Diameter of i-Drive Power™ wheel	210 mm
Max. fast forward speed	4.43 km/h (±15%)
Max. forward speed	2.16 km/h (±15%)
Max. reverse speed	2.16 km/h (±15%)
Max. angle of climb	6°
Noise level (when the castor is pulled)	65 dB

Electrical specifications

Specification	Value
Nominal battery voltage	36 V DC, Capacity: 12 Ah
Input Voltage, Frequency	230 V AC, 50/60 Hz 127 V AC, 50/60 Hz 120 V AC, 50/60 Hz 110 V AC, 50/60 Hz 100 V AC, 50/60 Hz
Maximum Power Input	300 W
Transformer fuse Version 230 V Version 127 V Version 120 V Version 110 V Version 100 V	 2 x T1,6A L 250V 2 x T3,15A L 250V 2 x T3,15A L 250V 2 x T3,15A L 250V 2 x T3,15A L 250V
Battery fuse	MDP 030 (30 A)

3.14.2.1 i-Drive control panels

The i-Drive is activated by the activation panel, which is on the bed's undercarriage and protrudes from the cover of the undercarriage. Activation panel of i-Drive with buttons **ON** (activation of i-Drive is active for 3 minutes, extension from last selected function) and button **OFF** for lifting the driven castor.

***Fig. 42** i-Drive Activation panel*

After i-Drive is activated, the castor remains braked until it is given a movement command by the button. After standard expiry of the "ON period" the system switches off, the i-Drive does not lift, and if it´s not braked, it brakes. After **OFF** is pressed (for approximately 350 ms to protect against accidental pressing), the i-Drive lift function is activated and after it has retracted, the "ON period" is deactivated and the system enters sleep mode. This button cannot be activated if any other button is pressed on the controller or the touch sensor is switched on.

The i-Drive castor is controlled using the i-Drive controller. The controller contains four **press** buttons and one **touch** sensor.

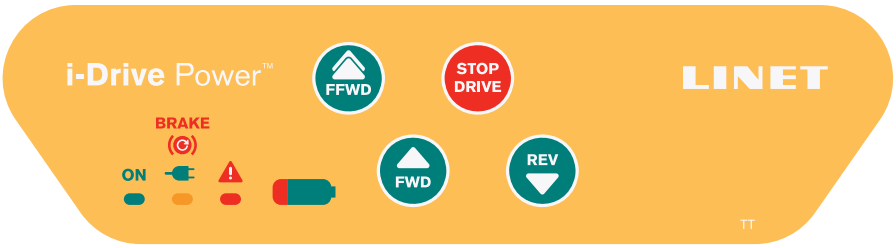


Fig. 43 *i-Drive Main control panel*

If “Forward” and “Reverse” are pressed **at the same time** on the control panel without the touch sensor being on, the built-in accelerometer in the control unit will be calibrated for the horizontal position of the bed after 5 seconds, which is signalled by a 2-second audio signal *(see chapter "5.2 i-Drive Power™ accelerometer calibration")*.

NOTE:
The main control panel has a touch sensor; the user’s hand must be in constant contact with the touch sensor for the functions to be used. If the hand is removed from the touch sensor, i-Drive Power™ stops.

NOTE:
The deployment and retraction of the i-Drive Power™ wheel is controlled electronically on the activation panel.

3.14.2.2 Emergency button to retract the i-Drive

The emergency button for lifting the driven castor serves as a safety feature in situations when, for example, the standard button for lifting stops functioning or the i-Drive battery is fully discharged. The button is in the middle of the control unit fixed on a holder. The cable runs from the emergency button directly to the driven castor server.

Emergency retraction of i-Drive Power™:

1) Press any GO button on the bed.
2) Deactivate the driven castor using the i-Drive Power™ Mains Switch
3) Press the i-Drive Power™ Emergency Retraction Button

NOTE:
Only use the emergency castor retraction button if the battery is fully discharged or if there is a castor error in order to push the bed manually to a safe place without use of the driven castor.

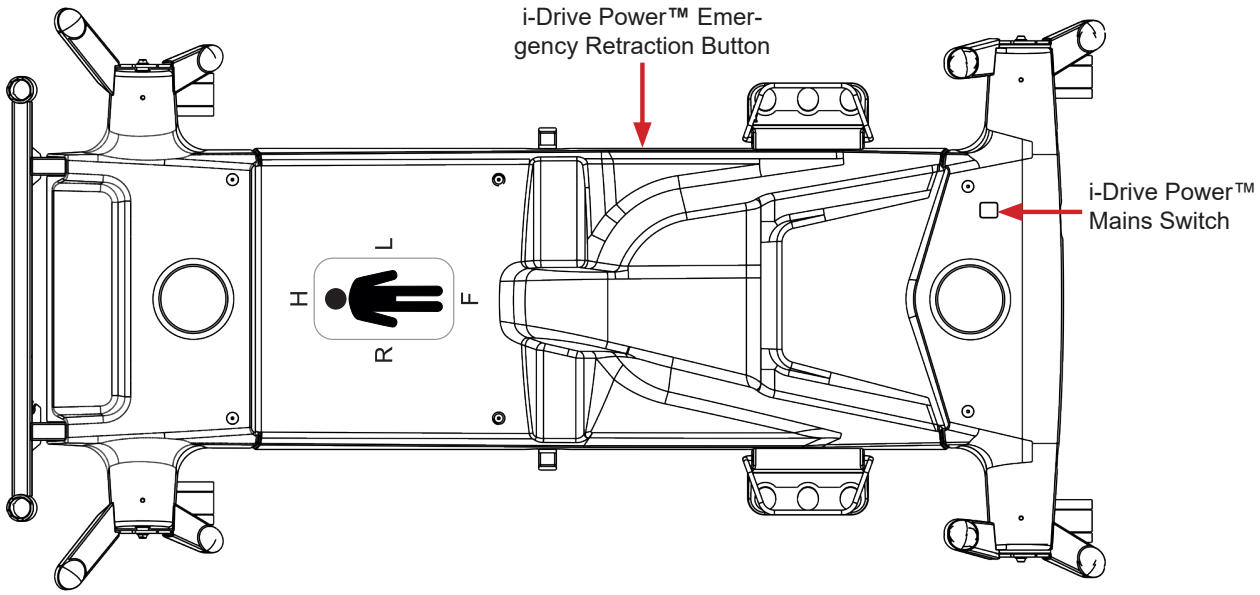


Fig. 44 *Location of the i-Drive emergency retraction button and the i-Drive Power™ Mains Switch*

3.14.2.3 i-Drive control unit

The control unit is used to control a special direct current motor (300W, 36V/60uH/0.8Ohm), one servo of the driven castor (36 V, 3 A max.), and an electromagnetic brake. It is equipped with an input for a **36 V rechargeable battery,** an AC charging source, an input for the “Braked Bed” magnetic **switch**, and an analogue motor **temperature sensor** input.

When the bed is plugged into the mains, the rechargeable battery is charged and the travel functions of the bed are blocked. After the bed is disconnected from the mains, all the drive functions are available if the rechargeable battery has been sufficiently charged. If no command is given in battery mode within approximately 3 minutes, the electronics are then automatically disconnected and minimum energy consumption mode starts. Restart is automatic after pressing the ON button on the ON/OFF activation panel.

3.14.2.4 i-Drive power box

The i-Drive Power™ driven castor is **charged from an AC power source**. The power box is next the main power box on the bed’s undercarriage frame. The power is supplied by a 3-core cable from the main power box to the i-Drive power box. The i-Drive power box transforms the voltage to approximately 36 V AC (depending on the mains voltage) and is protected by a current fuse. The power box is then connected to the control unit by a power cable terminated with a Lumberg connector.

3.14.2.5 Correction of voltage on i-Drive

The voltage on the driven castor **is corrected** both to protect and for greater ease of use. To protect the i-Drive, its voltage is corrected so that the current **does not exceed** approximately **29 A**. For more direct movement over an inclined surface, the voltage is corrected according to the **tilt** of the bed measured by the **accelerometer**. For proper functioning of this correction, the accelerometer must be **calibrated** in a horizontal position (see chapter *"5.2 i-Drive Power™ accelerometer calibration"*). One effect of this function may be a minor correction of voltage expressed when **passing over** certain types of unevenesses. The voltage on the driven castor is also corrected according to the **battery voltage**, so that its lower voltage during gradual discharge **is compensated for**.

3.14.2.6 i-Drive rechargeable battery

The driven castor rechargeable battery comprises **three 12 V** rechargeable batteries connected in series.

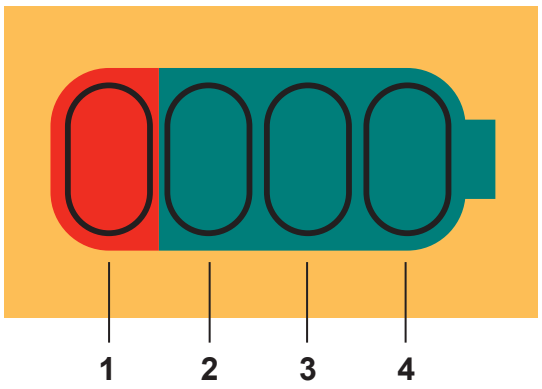
The battery is **charged** if the bed is **connected** to the mains and is **braked**.

Charging uses the “Dual Level Float Charger” system (two charge levels, current limiting, automatic switching from charging to maintenance mode). If the maximum permitted charging **current** or the maximum charging **period** is exceeded, charging is disconnected and the condition is **signalled** by all the battery’s LEDs flashing.

The battery condition is signalled during discharge or charging only if the “ON period” is active.

In the event of **very low battery charge**, this condition is **signalled** by an intermittent **audio** signal.

Battery indicator levels (i-Drive Power™)



1) Red LED Flashing - critically discharged

2) 50% charged

3) 75% charged

4) 100% charged

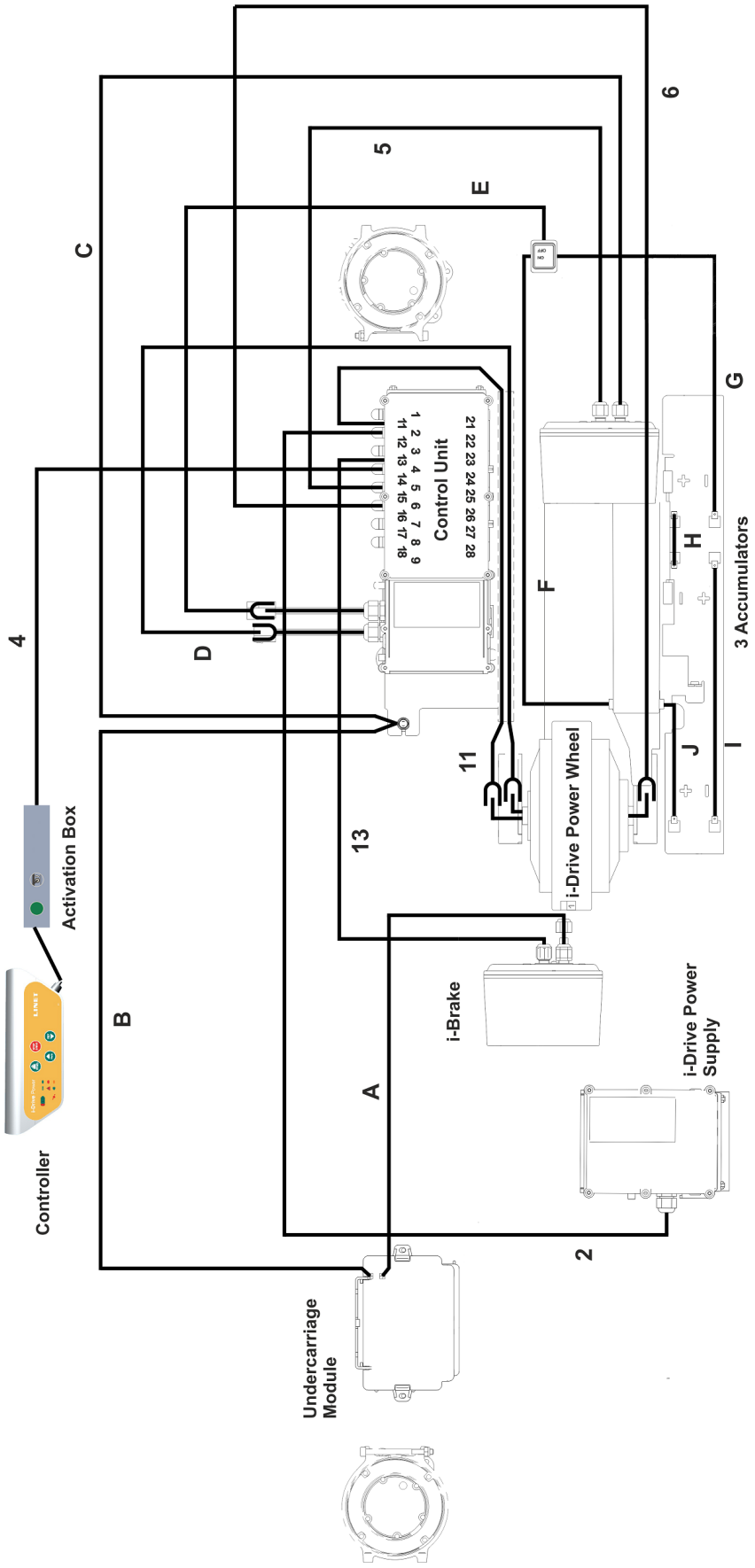
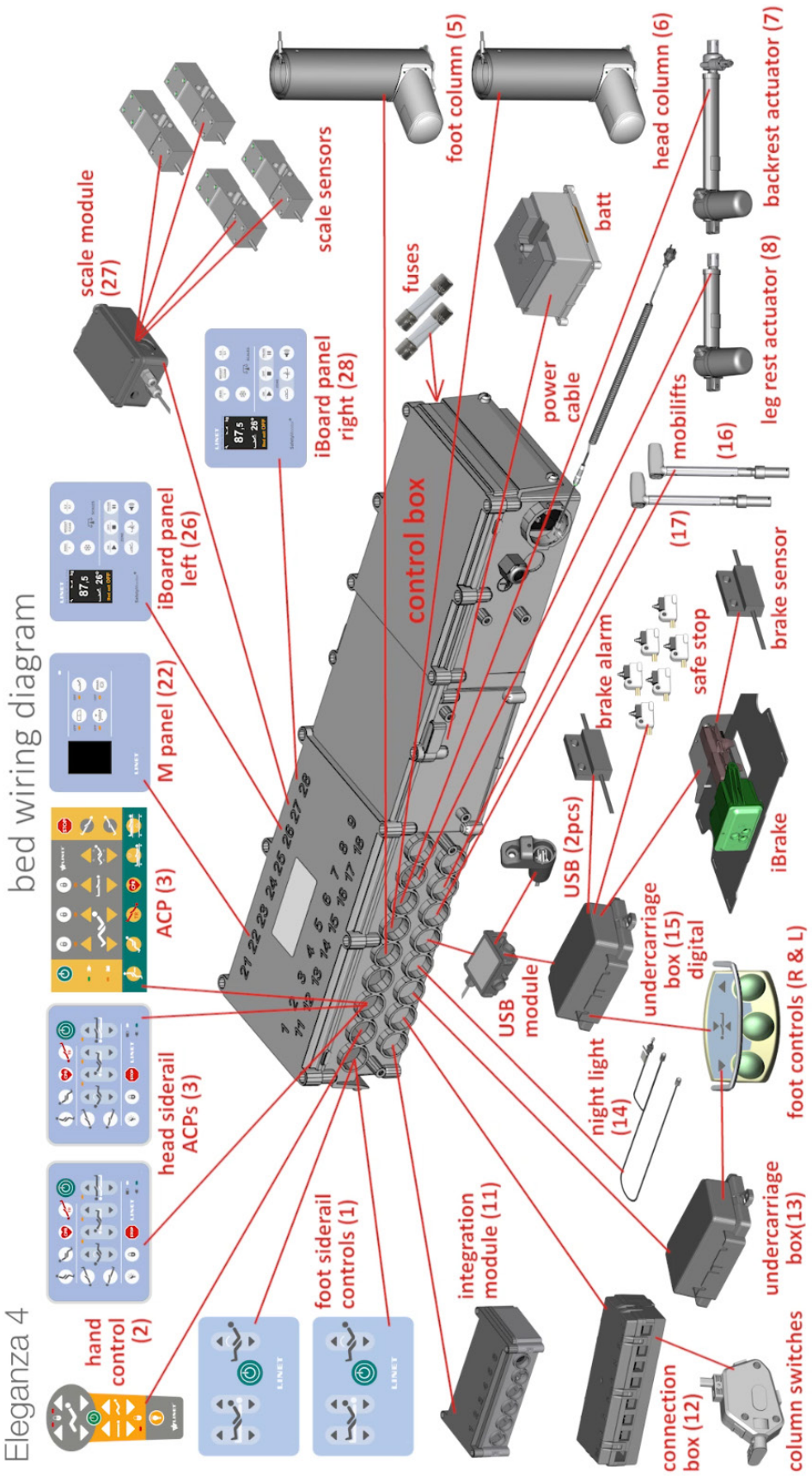


Fig. 45 i-Drive Power™ - connection scheme

Position	Description
2 (Position in Control Unit)	Power Supply Cable
4 (Position in Control Unit)	Activation Box Cable
5 (Position in Control Unit)	Servo Lifting Cable
6 (Position in Control Unit)	Brake Cable
11 (Position in Control Unit)	Thermal Sensor Cable
13 (Position in Control Unit)	Castor Control Position Cable (with Sensor)
A	i-Brake Cable
B	i-Drive Power™ Wheel Emergency Retraction Cable (with switch)
C	i-Drive Power™ Wheel Emergency Retraction Cable (with switch)
D	Power Supply Cable of i-Drive Power™ Wheel
E	Battery Disconnector Cable
F	Disconnector- Fuse Cable
G	Minus Battery Cable
H	Battery Interconnection
I	Battery Interconnection
J	Battery Fuse Cable

3.15 Bed Wiring Diagram



4 Bed Diagnostic

4.1 Errors – Failure States

4.1.1 Pop Ups

POP-UP	Meaning	Action required
	Function locked	• Activate function by unlocking respective lock
	Activation required	• Press GO button to activate keypad or touchscreen
 OVERLOAD	Safe Working Load exceeded	• Remove weight • Check scales (tensometers, scale module)
BLOCK	Locked kg / lb switch	• Unlock the kg/lb button in settings
 SCALE/BEA DISCONNECTED	Scale system disconnected.	• Check the scale system – Scale module, etc.
 STOP SERVICE	Malfunction of bed movement protection after perfoming one movement.	• To solve this issue it is necessary to find the problematic part connected to the control box, i.e. you must systematically disconnect components from the control box, one by one. After disconnection the defective part, the Pop-Up “STOP SERVICE” disappears. When the defective part is disconnected and the “STOP SERVICE” message disappears, then it is necessary to determine whether the problem is in cable or in the component. The next step is to exchange the defective part. • If the "STOP SERVICE" message still remains after disconnecting all parts, then the problem is most likely in the control box.
 SAFE STOP	Movement of the Mattress support platform stopped by function Safestop	• Remove an object from undercarriage to continue adjusting the bed height. • Check connection of Safe Stop in undercarriage module. • Check Safe Stop cables and switches.

POP-UP	Meaning	Action required
LOW	Bed is underload	• Check bed undercarriage for any obstacle • Check tensometers and scale module • Check bed absolute zero value.
HIGH	Safe workload exceeded (4.5 to 10 kg above safe working load)	• Remove the load
	Insufficient load for Bed Exit monitoring	• Place patient on the bed to enable the Bed Exit monitoring.
	Disconnected from the mains power supply during Bed Exit monitoring or during activation of the Bed Exit monitoring	• Connect bed to the mains in order to start Bed Exit monitoring again • Check power supply and power cable.

4.1.2 LED Blinking statuse

Service / status	LED status					
	Mains	**Battery**	**Thigh Lock**	**Back rest lock**	**Lift lock**	**Foot controls lock**
Locked	-	-	Illuminated	Illuminated	Illuminated	Illuminated
Short circuit	Blinking 600ms ON, 600ms OFF In antiphase	-	Blinking 600ms ON, 600ms OFF	Blinking 600ms ON, 600ms OFF	Blinking 600ms ON, 600ms OFF	Blinking 600ms ON, 600ms OFF
First fault	Blinking 600ms ON, 600ms OFF	-	-	-	-	-
Movement block	-	-	Blinking 600ms ON, 600ms OFF	Blinking 600ms ON, 600ms OFF	Blinking 600ms ON, 600ms OFF	Blinking 600ms ON, 600ms OFF
Power	Illuminated	-	-	-	-	-
Power fault	Not illuminated	-	-	-	-	-
Battery NA or defective	Illuminated	Illuminated	-	-	-	-
Battery defect	-	Illuminated	-	-	-	-
Battery very discharged	-	Blinking 1600ms ON, 200ms OFF	-	-	-	-
Batterydischarged completely (Only CPR)	-	Blinking 100ms ON, 100ms OFF	-	-	-	-
Battery charging	-	Blinking 200ms ON, 1600ms OFF	-	-	-	-

NOTE: *The first value always means blinking of the LED and the second value means the LED is turned off.*

4.1.3 Beeping - Sound signals

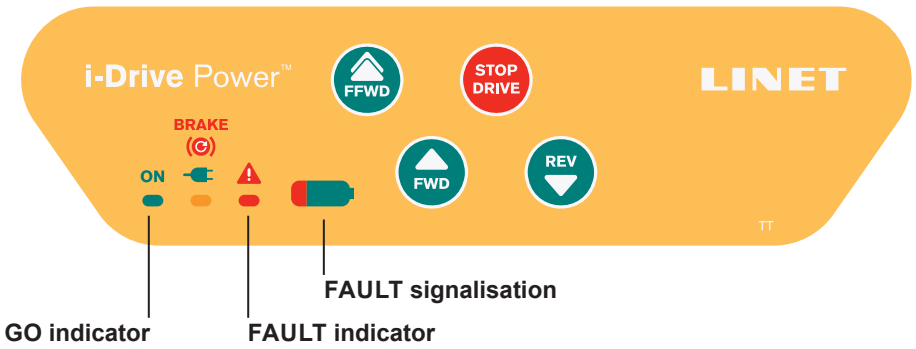
Beeping	Sound signals			
	Unlimited time			
Continuous	control box over heated	battery overcurrent	scale overloaded	actuator overloaded
Intermittent	STOP error (all STOP buttons are disabled) (0,6s sound / 2,6s silence)	Bed Exit Alarm (melody: 3 beeps - pause - 2 beeps - longer pause - 3 beeps - pause - 2 beeps)	-	-
	Limited time			
Short 0,3 s	confirms the operation	function blocked	-	
Short 0,5 s	start of service mode or end of service mode	function movement caused by leakage	lowering to the lowest position	-
Long 3 s	system error	-	-	-
Long 5 s	scale module disconnected (only version with scales)			
Long 3 min: 1,1 s sound/ 1,1s silence	Brake alarm Beeps	-	-	-

4.2 i-Drive signalisation

4.2.1 Audio signalling

Audio signal	Meaning
Continuous - 0.5 second	• Emergency stop • Limiting conditions for starting the bed after switching on touch sensor (connection to mains, braked castors, or driven castor up) • Braked castors after pressing movement buttons
Continuous - 2 seconds	• Successful calibration of accelerometer is signaled • If the signal does not sound, calibration has not occurred
Continuous - 3 seconds	• Overvoltage on control bridge of driven castor
Intermittent signal	• Very low battery • Overheated stator of driven castor • Overheated control unit

4.2.2 Light indicators



Indicator type	Status	Meaning
GO indicator	**ON**	• Hand is on touch sensor; drive wheel is ready for use
	FLASHES	• Hand is **not** on touch sensor; i-Drive is not ready for use
FAULT indicator	**ON**	• i-Drive cannot be activated (i-Drive wheel is not lowered, castor control lever is braked, bed is connected to the mains).
	FLASHES	• System is faulty (indicated on accumulator status indicator) • i-Drive control box heat protection is activated

4.2.3 Fault signalisation (i-Drive Power™)

The system is protected against failure states, by stopping and braking the drive system, and respective signalization. The fault indicator flashing briefly and the accumulator indicator shows the fault state. Some defects are cleared automatically (e.g.: drive overheating). When drive or electronics is overheated, an short acoustic signal occurs before the drive is blocked.

Error	LED1	LED2	LED3	LED4
Drive overheated*	Off	Off	Off	On
Electronics overheated*	Off	Off	On	Off
Brake error	Off	Off	On	On
Retraction not completed	Off	On	Off	Off
5V off limits	Off	On	Off	On
FET closing penetrated	Off	On	On	Off
Control circuit overheated	Off	On	On	On
Control circuit error	On	Off	Off	Off
Activation button stuck	On	Off	Off	On
Retraction button stuck	On	Off	On	Off
Active button after start	On	Off	On	On

**An acoustic signal occurs before the drive is blocked (short acoustic signalisation)*
***NOTE:** the LED indicators are numbered from the left.*

4.3 LINIS

iBoard Basic - To enter LINIS mode, simultaneously press (5s) **BEA Inner zone + BEA Outer zone**

Navigation by (**ZERO**)/(**HOLD**) buttons. Exit by **CLEAR** button.

4.3.1 Description of LINIS items displayed on iBoard segment display

	LINIS Code	Description	Values
1	AD COL0	AD potentiometer column 0	-----
2	AD COL1	AD potentiometer column 1	-----
4	AD X	AD accelerometer PCB x	-----
5	AD Y	AD accelerometer PCB y	-----
6	AD BR	AD backrest accelerometer	0° - 80° (Chair)
8	AD STOP	AD stop	100-120 (1x STOP), 65-85 (2x STOP)
9	OPER C	Operation codes *(see chap. 4.3.3)*	XX-YY (XX - function code, YY – code of periphery)
10	STOP C	Bed stop code *(see chap. 4.3.2)*	-----
11	SYS ERR	System fault *(see chap. 4.1)*	-----
12	END-SW	End switches status *(see chap. 4.3.1.1)*	xxxxxxxx
13	PB SW	Power box SW version	XXYY (9.12->_912; 10.12-> 1012
14	EXP SW	SW version of expansion	-----
15	DU SW	SW version of touchscreen	XXYY (9.12->_912; 10.12-> 1012

4.3.1.1 End Switches

Function	Position	Value (0 or 1)
N/A	1	0
N/A	2	0
Brake	3	Activated = 0, Deactivated = 1
Head column - highest position	4	Activated = 1, Deactivated = 0
Foot column – lowest position	5	Activated = 1, Deactivated = 0
N/A	6	0
Anticrash	7	Activated = 0, Deactivated = 1
Siderails (All)	8	Up=1, Down=0

4.3.2 STOP codes

Code	Cause
2	Foot control pressed after STOP
4	Two buttons pushed simultaneously longer than 1 second
5	Keyboard not released after system start
6	Main control box temperature exceeded
7	Column current overload 0
8	Column current overload 1
10	Actuator current overload – backrest
11	Actuator current overload – thighrest
12	Stopped due to resistance on the same function
13	Short circuiton on analog control (RC detection)
101	GO button not active
102	Locked function
111	Function blocked during one fault state
123	Absolute scale overload > 254,5 kg
126	Anticrash

4.3.3 Operation codes

Code	Function
0	**No function is activated**
1	Foot control - Height adjustment down
2	Autocontour – down
3	Lock - central
4	Examination position
5	Lock – legs
6	Foot control - Height adjustment – up
7	Lock – backrest
8	Lock – height adjustment
9	Lock - pedals
10	Thighrest – up
11	Foot control - Height adjustment up
12	Thighrest - down
13	Trendelenburg
15	Backrest - up
16	CPR
17	Backrest - down
18	Anti-Trendelenburg
19	Mobilisation position
20	Height adjustment – up
21	Cardiac chair position
22	Height adjustment - down
23	GO
24	GO
26	CPR Trendelenburg
29	Low position
30	Autocontour – up
31	Ineffective function (eg: two buttons pressed at once)
32	Simultaneous GO

See LINIS: *Description of LINIS items displayed on iBoard segment display*

5 Bed Setup

5.1 Column and accelerometer calibration

After replacing always calibrate:

a) any column

b) control box

c) any accelerometer (iBoard Basic)

NOTE:
Calibration of columns means: Calibrating the speed of the columns during up or down movement
Calibration of accelerometers means: Calibrating the mattress platform and backrest accelerometers in the horizontal position

5.1.1 Column and accelerometer calibration using the ACP

- ► **Ensure the bed is on a level floor (in a horizontal position)!**
- ► Enter the calibration mode by pressing a combination of four buttons on the nurse control panel
- ► Simultaneously press **backrest UP** (1), **backrest DOWN** (2), **CPR** (3) and **anti-Trendelenburg** (4) buttons, and hold them for 3 seconds

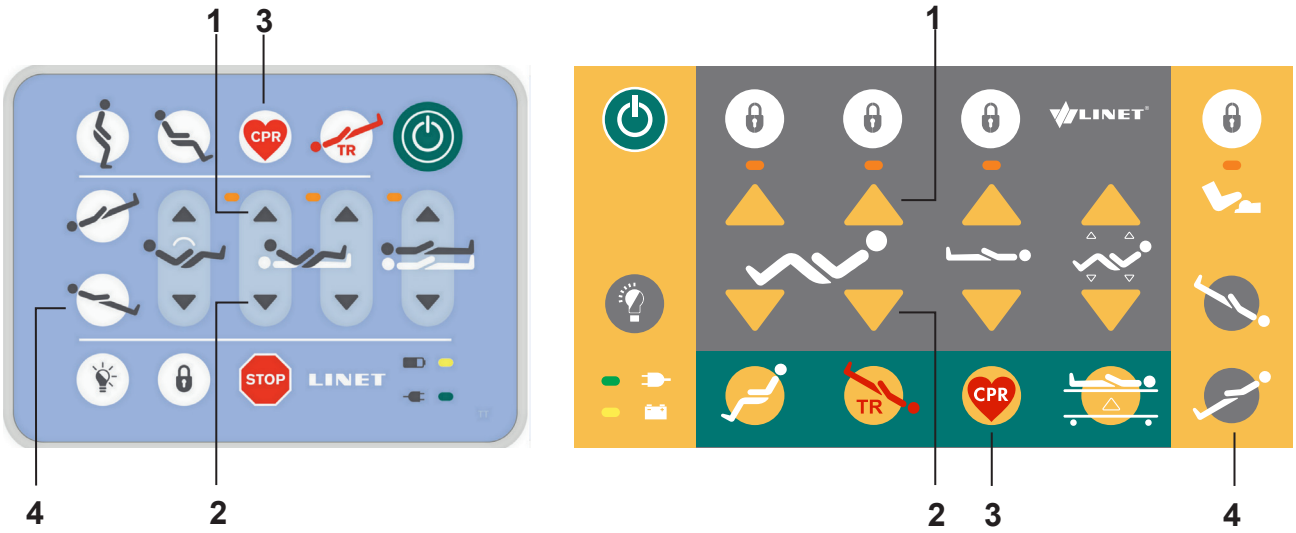


Fig. 46 *iBoard Basic integrated Attendant control panel (left) vs. External Attendant control panel (ACP) (right)*

- ► Check whether you are in calibration mode. The lock functions and battery LEDs should be flashing on the ACP control panel as well as the battery LED on the iBoard panel and the lock function LEDs on the hand control
- ► This mode is only active for 1 minute
- ► Hold **CPR** button. The bed will go **DOWN,** then **UP** and then **DOWN** again. After each end position one LED lock will turn off
- ► In case of unpressed **CPR** button during the calibration, the calibration stops and must be repeated

5.2 i-Drive Power™ accelerometer calibration

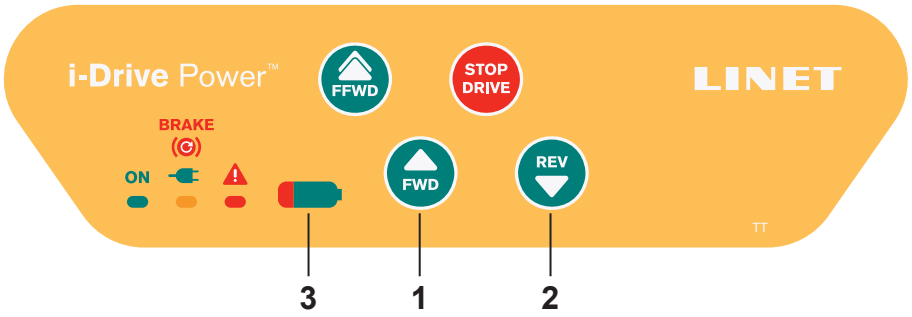
It is necessary to calibrate the i-Drive Power™ accelerometer after any service intervention.

NOTE:
The bed must be on a level floor. This can be checked using the spirit level on the head end of the bed.

Calibrate i-Drive Power™ as follows:

- ► **Ensure the bed is on a level floor!**
- ► In case the i-Drive Power™ system is not activated, activate it by pressing the activation button on the undercarriage *(see Fig. 44 in the chapter "3.14.2.2 Emergency button to retract the i-Drive")*
- ► Activate the wheel by pressing the **ON** button on the i-Drive Activation panel so it lowers into the working position

- ► Press and hold the **FWD** (1) and **REV** (2) buttons on the i-Drive controler simultaneously for 5s. **Dont touch „Safety sense“ sensor by hand**



- ► Hold the buttons **FWD** (1) and **REV** (2) and the system will enter the accelerometer calibration mode
- ► The **battery status LED** (3) will be shortly turned OFF
- ► **The battery status LED** (3) will flash and an audible signal sounds
- ► Release the **FWD** (1) and **REV** (2) buttons
- ► The i-Drive Power™ accelerometer has been succesfully calibrated

5.3 Scale Calibration – iBoard Basic version

5.3.1 Scale diagnostic mode

Measured values from scale system is possible to read in diagnostic mode.

To access scale diagnostic mode:

► Press the **ZERO**, **CLEAR** and **HOLD** buttons simultaneously for 5 seconds

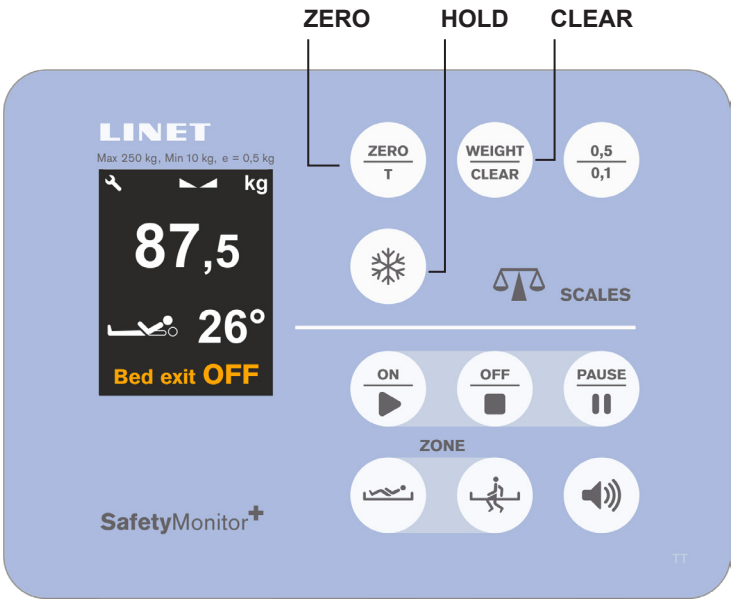


Fig. 47 iBoard Basic

To exit diagnostic mode:

► press **CLEAR** button

5.3.1.1 General instructions

Display:

► The identification number and respective value is displayed

► The first value displayed is always position **TENS 1**

Identification number	Value meaning	Value
TENS 1	Absolute un-recalculated value – tensometer 1 (rounded to ten)	
TENS 2	Absolute un-recalculated value – tensometer 2 (rounded to ten)	
TENS 3	Absolute un-recalculated value – tensometer 3 (rounded to ten)	
TENS 4	Absolute un-recalculated value – tensometer 4 (rounded to ten)	
ABS WGH	Absolute weight	
ABS 0	Absolute 0	
CON 1	Constant – Tensometer 1	1,700 - 2,200
CON 2	Constant – Tensometer 2	1,700 - 2,200

Identification number	Value meaning	Value
CON 3	Constant – Tensometer 3	1,700 - 2,200
CON 4	Constant – Tensometer 4	1,700 - 2,200
CON GR	Gravitation constant	1 - 8
CON CAL	Calibration constant	1,000
NR CAL	Number of calibrations	

5.3.1.2 Display test

Press the **SPEAKER LEVEL** button (see *Fig. 47*) to turn the display test **ON/OFF** – colour lines will be displayed.

5.3.2 Calibration mode - general information

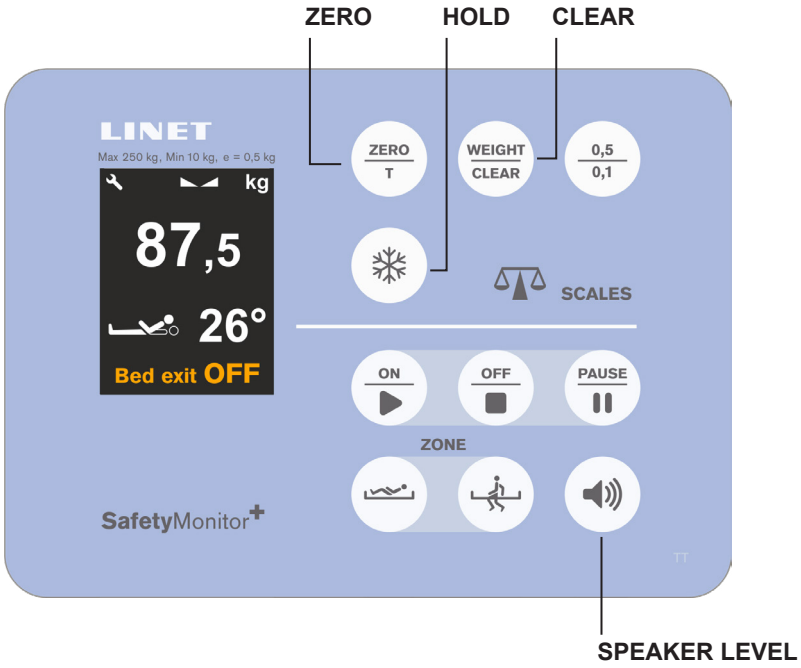
In this mode it is possible to set the sensor constant, geographical zones and calibration constants.

⚠ CAUTION!

Only an authorised person may enter this mode. Each entry into the constants setup changes the calibration counter in the internal memory, and the weighing system is not regarded as a verified measuring instrument any more. The state of the calibration counter is a part of the verification label of the authorised person. The number of calibrations can be displayed in the diagnostic mode *(see chapter "5.3.1.1 General instructions")***. The weighing system as a designated measuring instrument must be verified by an authorised person after any change of constants according to the metrological act.**

To enter calibraton mode:

► Press and hold the **HOLD, CLEAR, ZERO** and **SPEAKER LEVEL** buttons simultaneously for 5 seconds



Display:

► The identification number and respective value are displayed

Identification number	Value meaning	Value
1	Constant – Tensometer 1	1,700 - 2,200
2	Constant – Tensometer 2	1,700 - 2,200
3	Constant – Tensometer 3	1,700 - 2,200
4	Constant – Tensometer 4	1,700 - 2,200
CON GR	Gravitational constant	1 – 8
CON CAL	Calibration constant	1,000

To change the values, press the **HOLD** button (value UP) or **ZERO** button (value DOWN). The tensometer constant can be set in the range 1,700 – 2,200 and the gravitation constant can be set in the range 1 – 8 *(see Fig. 48 and corresponding table.)*. The ,,**CAL**'' position displays the calibration constant.

Saving the value and switching to the next value is done by pressing the **SPEAKER LEVEL** button. To leave the calibration menu press the **CLEAR** button.

5.3.3 Gravitational constant setting

V kalibračním režimu *(viz. kapitola "5.3.2 Kalibrační režim - všeobecné informace")*:

- ► Press the **SPEAKER LEVEL** button and go to the **CON GR** position
- ► Use the **HOLD** and **ZERO** buttons to set the value of the gravitational constant
- ► Save the value by pressing the **SPEAKER LEVEL** button
- ► To exit the Scale calibration menu press the **CLEAR** button.

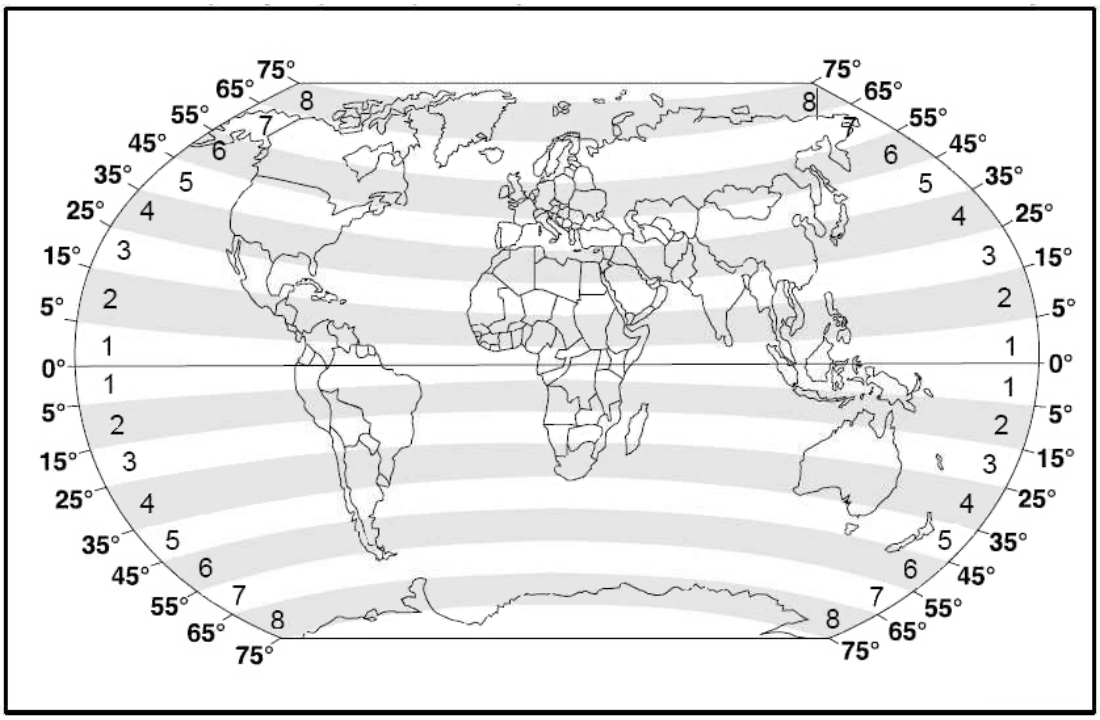


Fig. 48 *Gravitational constant depending on the geographical zone*

CON GR	Geographical zone	CON GR	Geographical zone
1	0° - 5°	5	35° - 45°
2	5° - 15°	6	45° - 55°
3	15° - 25°	7	55° - 65°
4	25° - 35°	8	65° - 75°

5.3.4 Calibration constant setting

⚠ CAUTION!

In this service menu it is possible to perform calibration and set the calibration constant.

However, this method is no longer recommended. To maintain the correct setting of the scale system, use the procedure described in the chapter *"5.3.5 Reconfiguring sensor constants".*

Before setting the calibration constant, the technician needs to set the local geographical zone. The technician can set the final customer's geographical zone after the scale calibration is finished.

When in calibration mode *(see chapter "5.3.2 Calibration mode - general information")*:

- ► Press the **SPEAKER LEVEL** button and go to the **CAL** position
- ► Press the **BED EXIT OUTER ZONE** button for 5 seconds
- ► During this process the sign ,,**ENTER**'' will display on the display

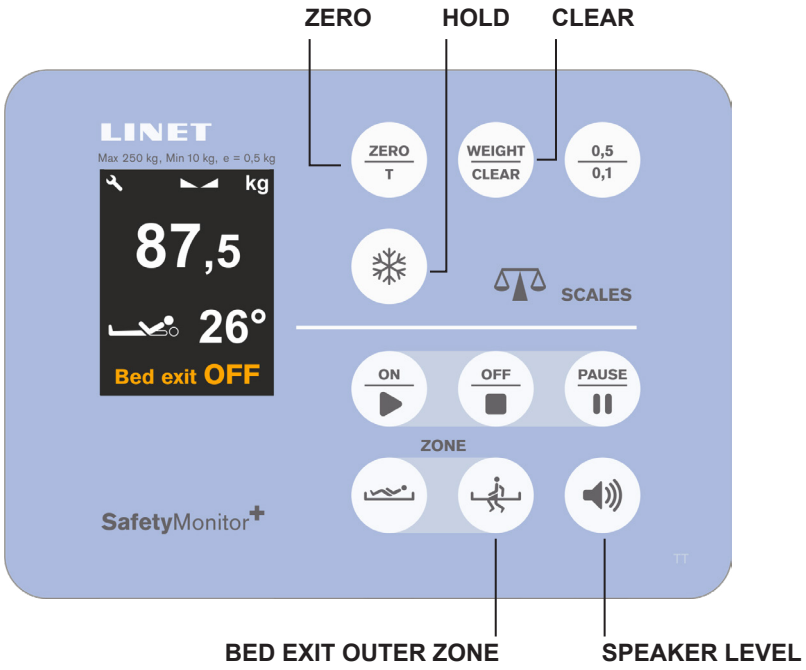


Fig. 49 *iBoard Basic*

Now you are in calibration constant setting mode. **The calibration setting is divided into four phases**. The step between is followed by sound signal "beep".

5.3.4.1 Phase One

Display:

- ► **,,nC"** (the number of calibrations) and the respective value are displayed alternately

After balancing, the scale will move to the next phase.

5.3.4.2 Phase Two

- ► **,,L 0"** (load 0) is displayed on the display. In this phase the bed is calibrated without weight.

Calibration:

- ► Press the **SPEAKER LEVEL** button to start.

The calibration process takes approx. 7 seconds and the symbol ,,L 0'' flashes on the display.

NOTE: **The bed must be balanced throughout the calibration!**

In this phase the **Absolute zero** value is set.

5.3.4.3 Phase Three

,,L160" (load 160) is displayed on the display. It is possible to change the weight level to **80** or **160**. This will be displayed on the display.

Calibration:

- ► Change the weight level to **80** or **160** by pressing the **ZERO** button
- ► Load weights onto the bed according to the previous setting (80 kg or 160 kg)
- ► Confirm the calibration by pressing the **SPEAKER LEVEL** button

The calibration process will take approx. 7 seconds and the symbol ,,**L 160"** or ,,**L 80"** flashes on the display.

NOTE: **The bed must be balanced throughout the calibration!**

5.3.4.4 Phase Four

Display:

- ► ,,**End**'' (directive correction ≤ 5%) and directive value are displayed alternately

-or-

- ► **,,Err"** (directive correction > 5%) and directive value are displayed alternately

Result:
Press the **HOLD** button to save the value when the value is correct (,,**End**'' is displayed). By this action the mode is ended and the system will go back to the Constant setting mode.

-or-

Press the **SPEAKER LEVEL** button to go back to **Phase One** and repeat the process (,,**Err"** is displayed).

NOTE: The calibration mode can be cancelled at any time by pressing the **CLEAR** button for 5 seconds.

5.3.4.5 Scale service mode deactivation

Press the **CLEAR** button.

5.3.5 Reconfiguring sensor constants

5.3.5.1 General instructions

EU version: EU version of the bed is with the button **0,1/0,5** (weight display with 0,1 or 0,5 kg accuracy)

US version: US version of the bed is not equipped with the **0,1/0,5** button on the iBoard Basic panel, i.e. the current displayed value must be used

NOTE:
Before setting the tensometer constant, **it is necessary to zero the value of the weight**. **The bed has to be unoccupied and in a stabilized state**.

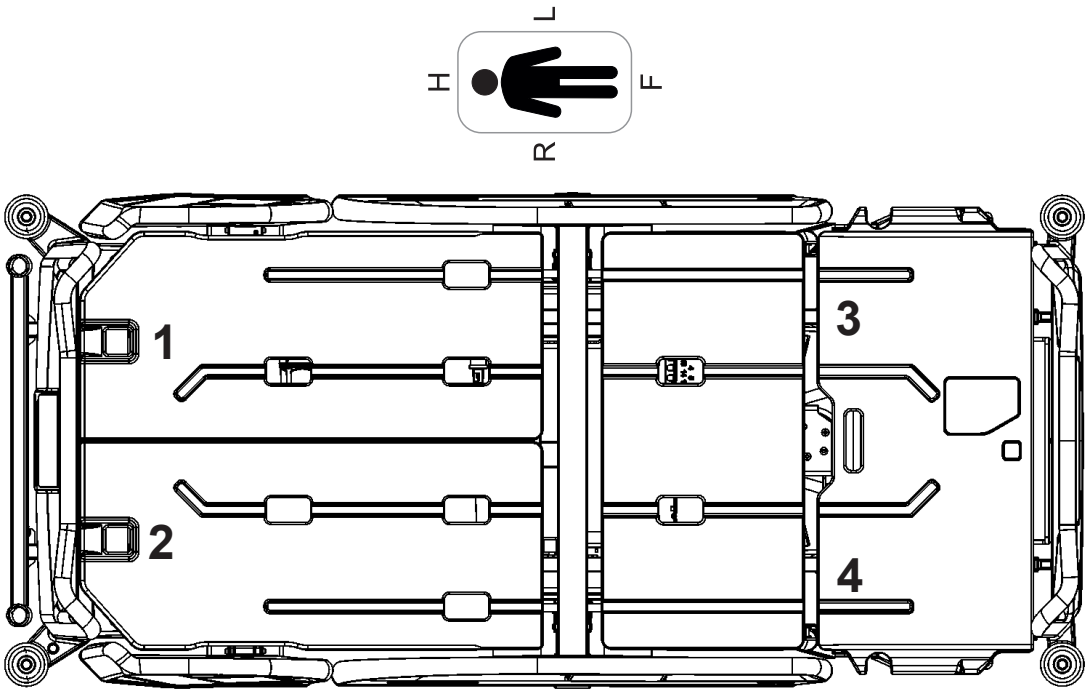
Zeroing the scale

- ► Zero display while the bed is unoccupied

⚠ CAUTION!

Before changing the value of the tensometer constant, it is advisable to write down or photograph the display with the current value of the constant so that you can return to the original setting if necessary.

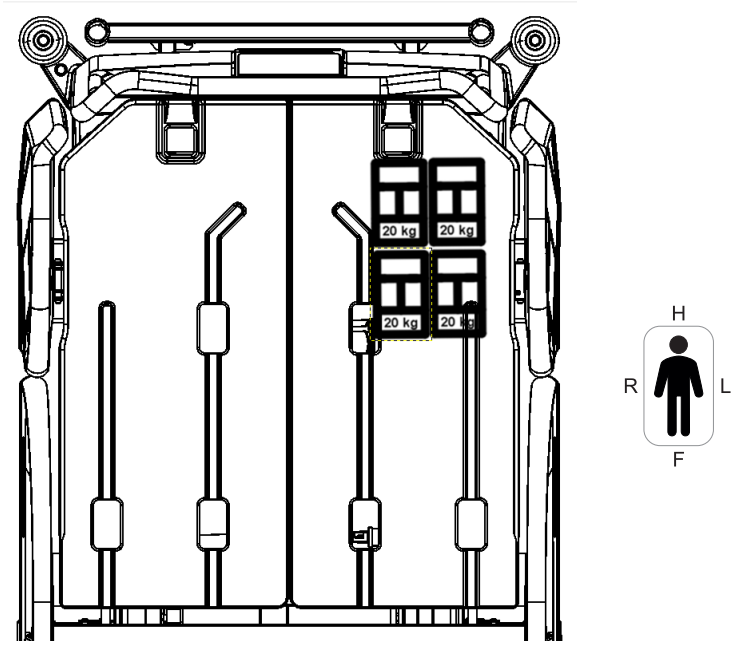
5.3.5.2 Location of the tensometers on the bed



Position	Description	Position	Description
1	Head left	3	Foot left
2	Head right	4	Foot right

5.3.5.3 Calculating and saving the new sensor constant - sensor 1

- ► Write down the value of the constant shown on the label of the tensometer that you will mount on the bed instead of the non-functioning one - in this case **1.9560** (*see Fig. 50, page 62)*
- ► Replace the non-functioning tensometer 1 with the new one
- ► Enter the **Calibration mode** *(see chapter "5.3.2 Calibration mode - general information"),* go to **Identification number 1** (Constant - Tensometer 1) and enter the value of the new tensometer constant
- ► Save the value by pressing the **REPRO** button on the iBoard Basic panel
- ► Make sure the iBoard Basic display shows zero weight value
- ► Position the calibration weight (80 kg) for sensor 1 (sensor in the left head section)



- ► **EU version:** press the 0,5/0,1 button on the iBoard Basic panel
- ► If the iBoard Basic diplay displays a value other than 80 kg, **calculate the new constant value for sensor 1**:

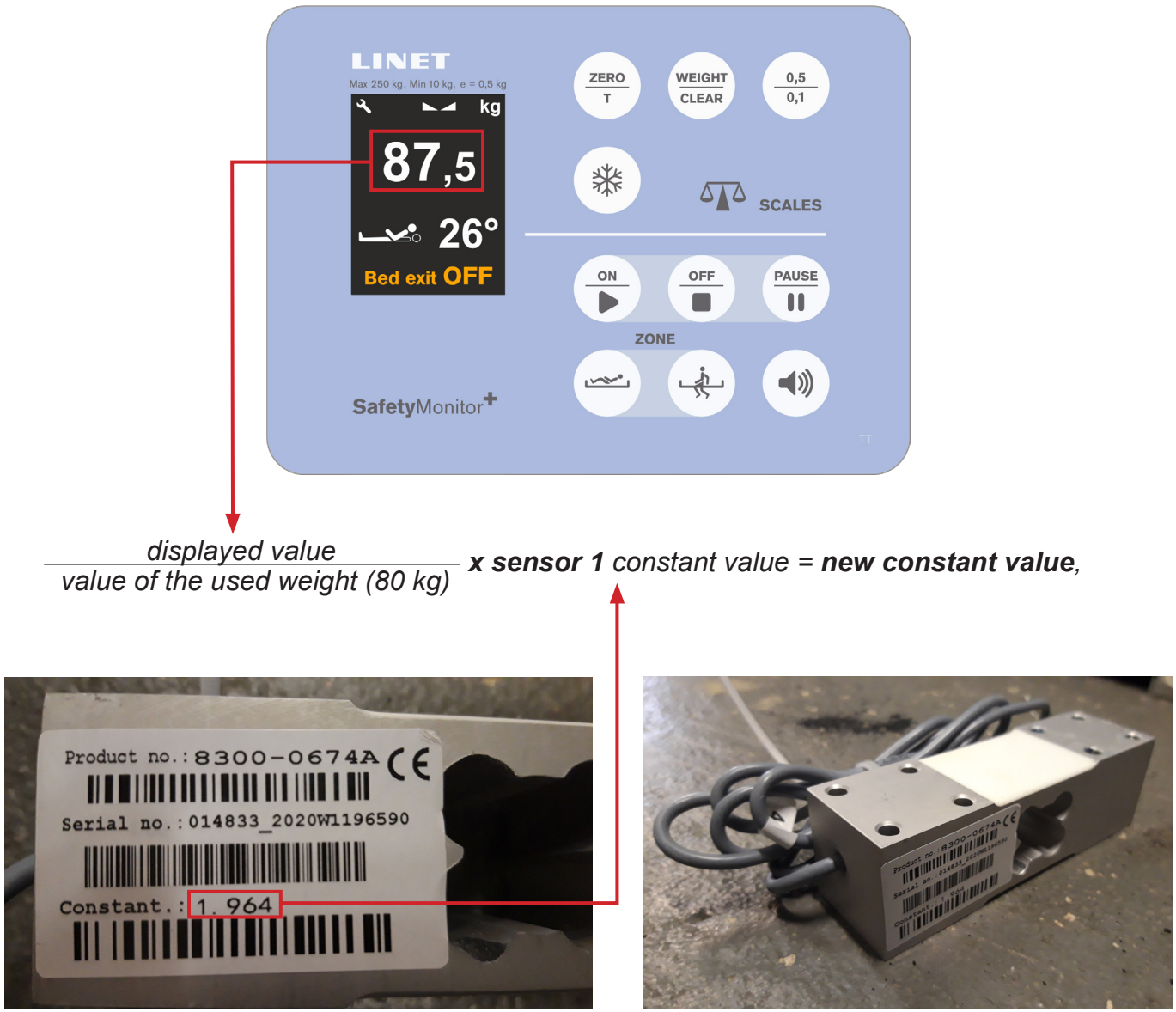


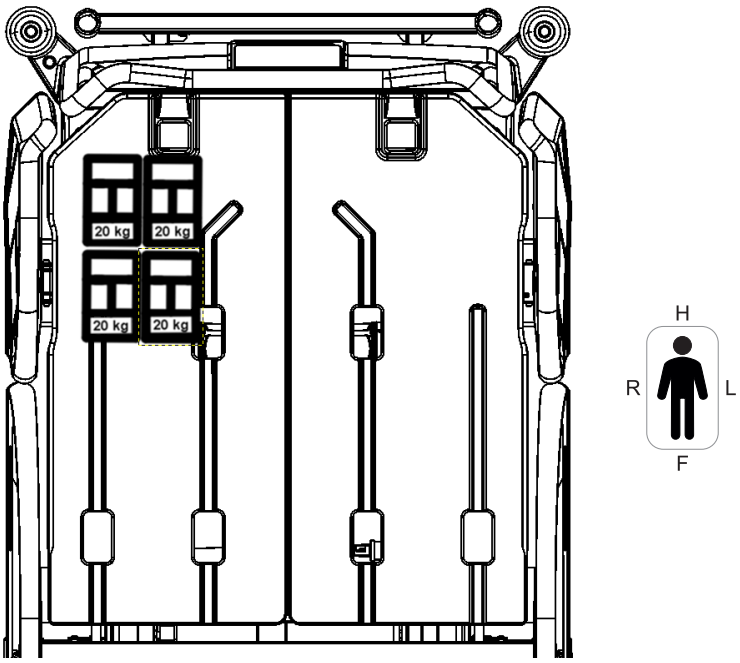
Fig. 50 *Sensor 1 constant value, printed on the sensor product/serial label*

$$\text{e.g. in this case } \frac{87{,}5\ \text{kg}}{80\ \text{kg}} \times 1{,}964 = 2{,}148$$

- ► Enter the calibration mode *(see chapter "5.3.2 Calibration mode - general information")*, go to Identification number 1 (Constant - Tensometer 1) and overwrite the tesometer constant value
- ► Save the value by pressing the **REPRO** button
- ► Check that the displayed weight value is 80 kg (if not, the sensor 1 constant value must be slightly adjusted again)
- ► After successful calibration, remove the weights from the bed

5.3.5.4 Calculating and saving the new sensor constant - sensor 2

- ► Write down the value of the constant shown on the label of the tensometer that you will mount on the bed instead of the non-functioning one - in this case **1.9560** (*see Fig. 51, page 64)*
- ► Replace the non-functioning tensometer 2 with the new one
- ► Enter the **Calibration mode** *(see chapter "5.3.2 Calibration mode - general information"),* go to **Identification number 2** (Constant - Tensometer 2) and enter the value of the new tensometer constant
- ► Save the value by pressing the **REPRO** button on the iBoard Basic panel
- ► Make sure the iBoard Basic display shows zero weight value
- ► Position the calibration weight (80 kg) for sensor 2 (sensor in the right head section)



- ► **EU version:** press the 0,5/0,1 button on the iBoard Basic panel
- ► If the iBoard Basic diplay displays a value other than 80 kg, **calculate the new constant value for sensor 2**:

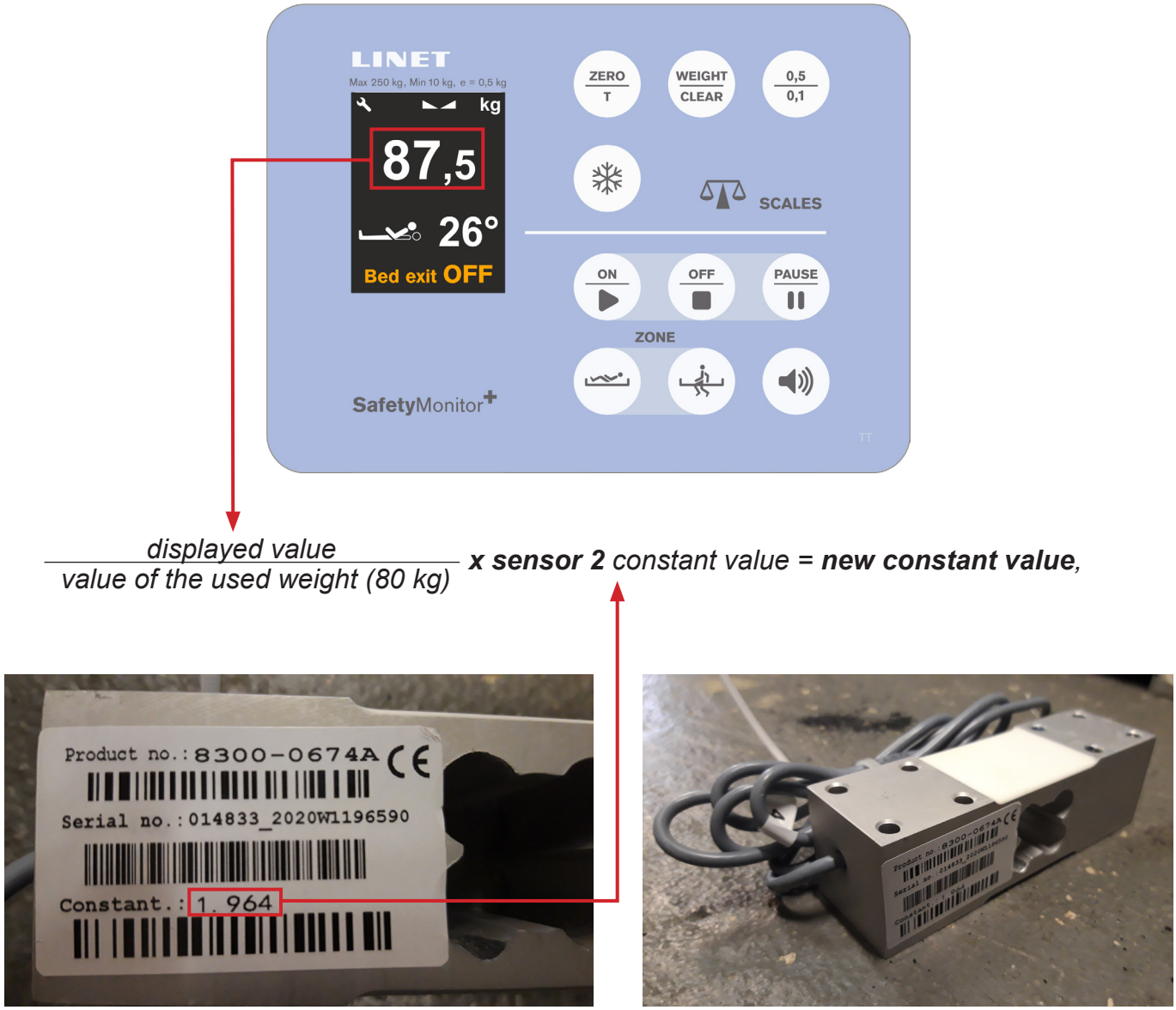


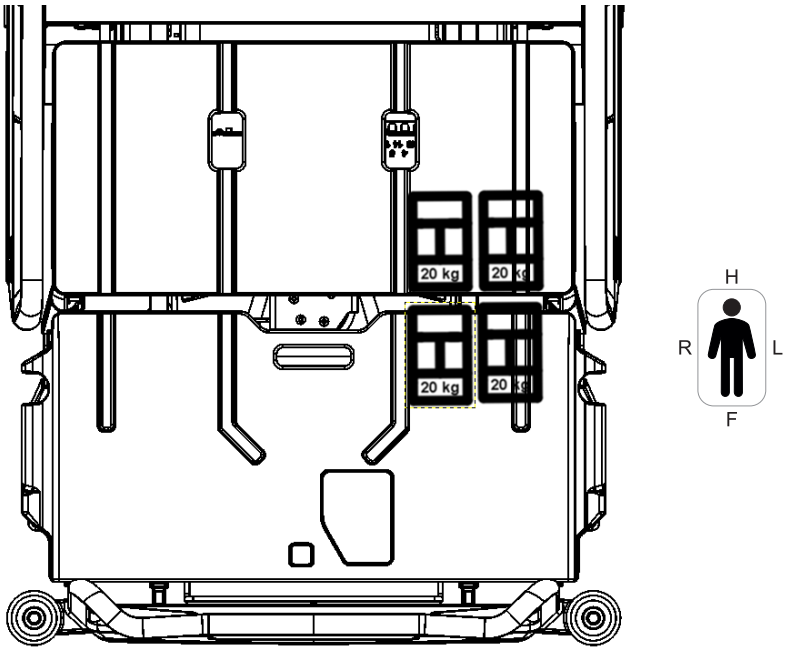
Fig. 51 *Sensor 2 constant value, printed on the sensor product/serial label*

$$\text{e.g. in this case } \frac{87{,}5\ \text{kg}}{80\ \text{kg}} \times 1{,}964 = 2{,}148$$

- ► Enter the calibration mode *(see chapter "5.3.2 Calibration mode - general information")*, go to Identification number 2 (Constant - Tensometer 2) and overwrite the tesometer constant value
- ► Save the value by pressing the **REPRO** button
- ► Check that the displayed weight value is 80 kg (if not, the sensor 2 constant value must be slightly adjusted again)
- ► After successful calibration, remove the weights from the bed

5.3.5.5 Calculating and saving the new sensor constant - sensor 3

- ► Write down the value of the constant shown on the label of the tensometer that you will mount on the bed instead of the non-functioning one - in this case **1.9560** (*see Fig. 52, page 66)*
- ► Replace the non-functioning tensometer 3 with the new one
- ► Enter the **Calibration mode** *(see chapter "5.3.2 Calibration mode - general information"),* go to **Identification number 3** (Constant - Tensometer 3) and enter the value of the new tensometer constant
- ► Save the value by pressing the **REPRO** button on the iBoard Basic panel
- ► Make sure the iBoard Basic display shows zero weight value
- ► Position the calibration weight (80 kg) for sensor 3 (sensor in the left foot section)



- ► **EU version:** press the 0,5/0,1 button on the iBoard Basic panel
- ► If the iBoard Basic diplay displays a value other than 80 kg, **calculate the new constant value for sensor 3**:

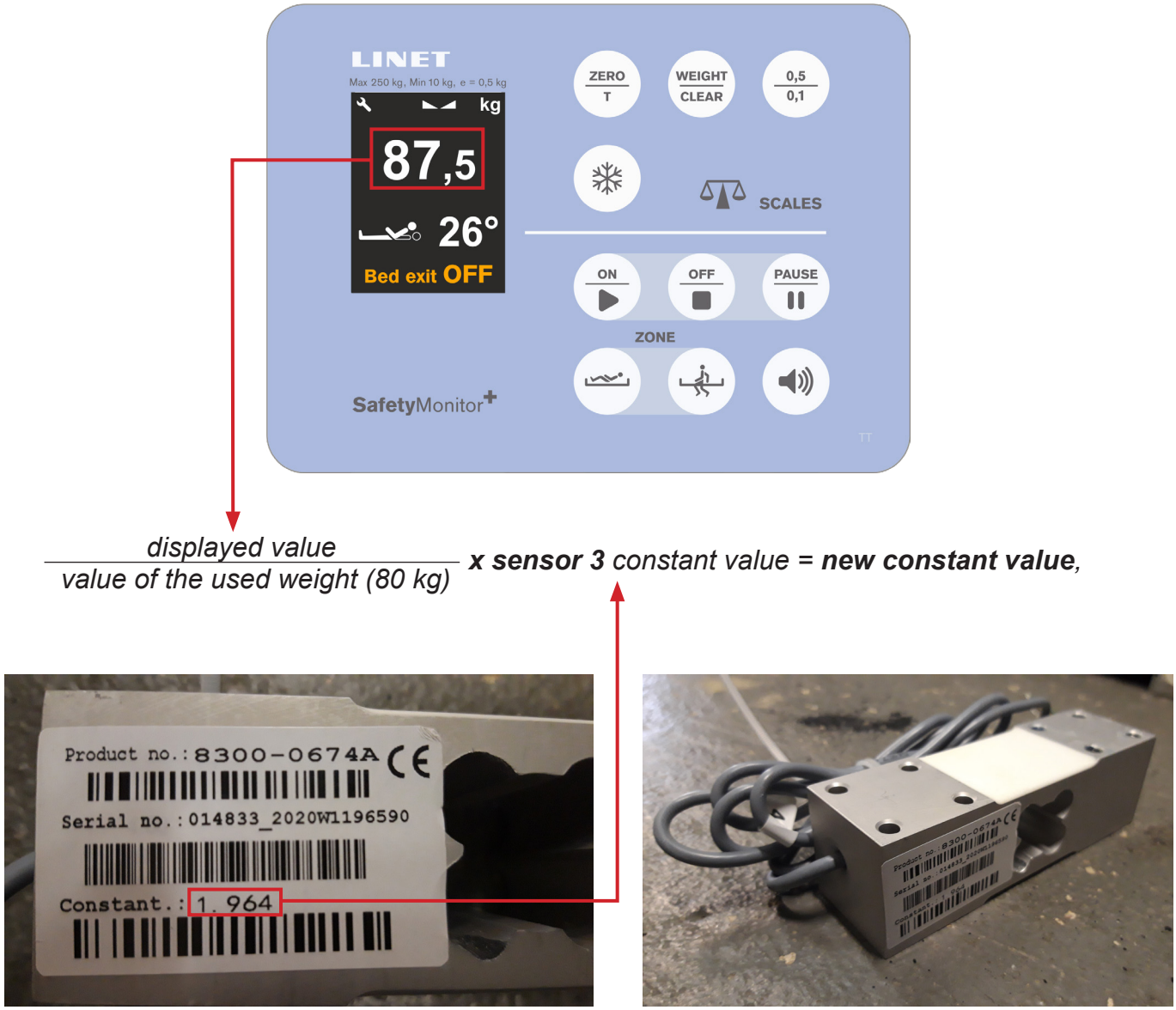


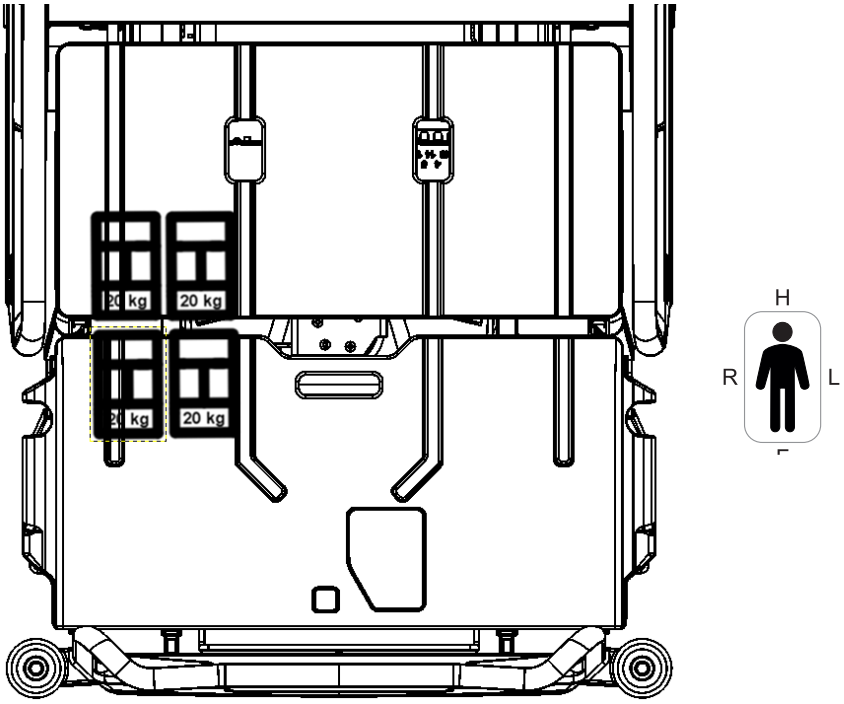
Fig. 52 *Sensor 3 constant value, printed on the sensor product/serial label*

$$\text{e.g. in this case } \frac{87{,}5\ \text{kg}}{80\ \text{kg}} \times 1{,}964 = 2{,}148$$

- ► Enter the calibration mode *(see chapter "5.3.2 Calibration mode - general information")*, go to Identification number 3 (Constant - Tensometer 3) and overwrite the tesometer constant value
- ► Save the value by pressing the **REPRO** button
- ► Check that the displayed weight value is 80 kg (if not, the sensor 3 constant value must be slightly adjusted again)
- ► After successful calibration, remove the weights from the bed

5.3.5.6 Calculating and saving the new sensor constant - sensor 4

- ► Write down the value of the constant shown on the label of the tensometer that you will mount on the bed instead of the non-functioning one - in this case **1.9560** (*see Fig. 53, page 68)*
- ► Replace the non-functioning tensometer 4 with the new one
- ► Enter the **Calibration mode** *(see chapter "5.3.2 Calibration mode - general information"),* go to **Identification number 4** (Constant - Tensometer 4) and enter the value of the new tensometer constant
- ► Save the value by pressing the **REPRO** button on the iBoard Basic panel
- ► Make sure the iBoard Basic display shows zero weight value
- ► Position the calibration weight (80 kg) for sensor 4 (sensor in the right foot section)



- ► **EU version:** press the 0,5/0,1 button on the iBoard Basic panel
- ► If the iBoard Basic diplay displays a value other than 80 kg, **calculate the new constant value for sensor 4**:

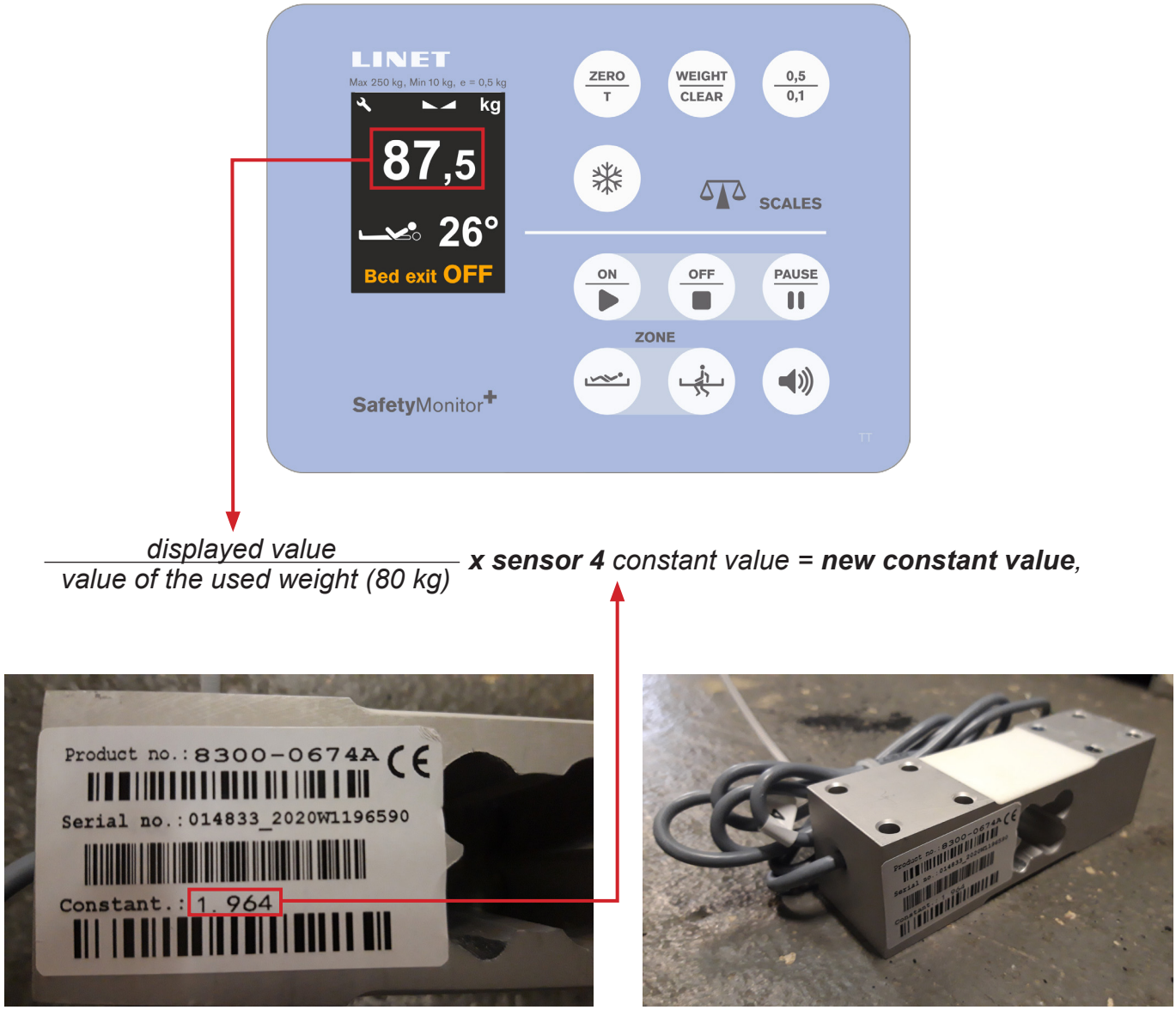


Fig. 53 *Sensor 4 constant value, printed on the sensor product/serial label*

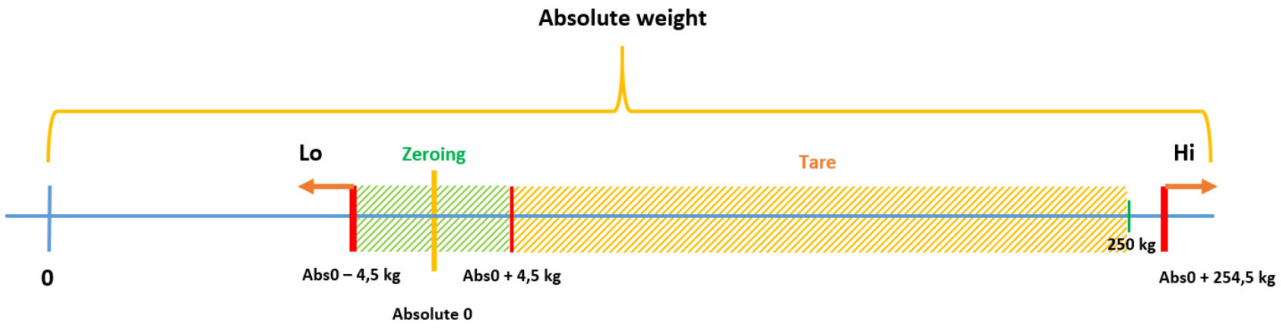
$$\text{e.g. in this case } \frac{87{,}5\ \text{kg}}{80\ \text{kg}} \times 1{,}964 = 2{,}148$$

- ► Enter the calibration mode *(see chapter "5.3.2 Calibration mode - general information")*, go to Identification number 4 (Constant - Tensometer 4) and overwrite the tesometer constant value
- ► Save the value by pressing the **REPRO** button
- ► Check that the displayed weight value is 80 kg (if not, the sensor 4 constant value must be slightly adjusted again)
- ► After successful calibration, remove the weights from the bed

5.3.6 Absolute 0 setting and Multizone Bed Exit Alarm calibration

5.3.6.1 Absolute 0 and limit values

The scale system measures the patient's weight. The weight is measured with scale sensors. An empty tensometer measures 0 kg. The sensors installed on the bed are constantly loaded by the bed frame, the siderails and other mechanical and electrical components that are part of the bed frame. To display clear patient weight, the weight of the bed and the patient weight must be separated. The weight of the empty bed is saved in the control box as an **Absolute 0**. Total weight measured by tensometers (weight of the bed + patient weight) is **Absolute weight**.



The display shows the load value. This can be adjusted to the required value by using the ZERO/T or HOLD functions. If the value is negative, the first segment shows a minus sign.

The scale system works in the range from **-4,9** to **249,9** kg. The **limit values** are calculated from **Absolute 0**.

- If the value is l**ower than -4.9 kg (11.0 lb)**, the display shows "**Lo"**
- If the value is **higher than 254,5 kg (561,1 lb)**, the display shows **"Hi"**
- If the value of **absolute weight is lower than 0,** the display shows "**– – Lo"**

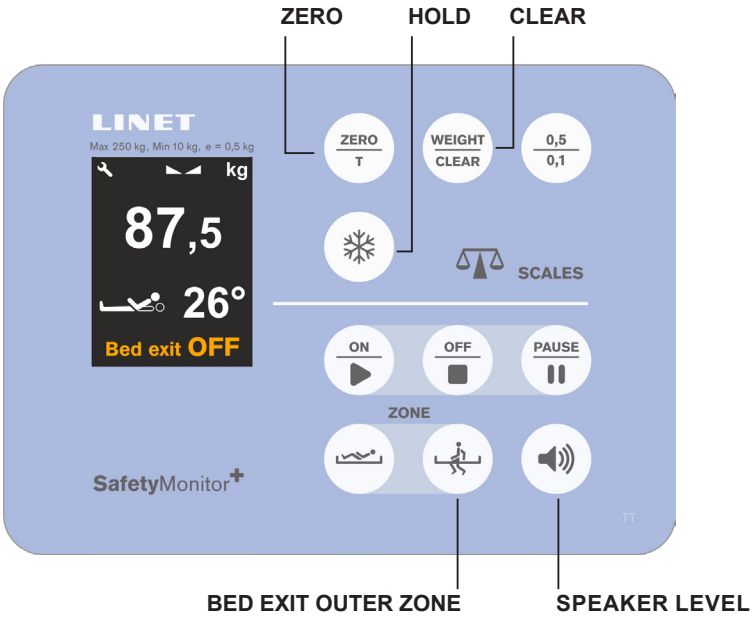
NOTE:
The Absolute 0 value is saved in the control box and can be displayed in a *"Scale diagnostic mode"*. If the **control box is replaced** for a new one the Absolute 0 must be set again.

5.3.6.2 Absolute 0 setting and Multizone Bed Exit Alarm calibration

In this setting the Abs 0 value and the BEA (centre of gravity) are set.)

Calibrate Multizone Bed Exit Alarm and Absolute 0 as follows:

- ► Ensure the bed is empty and in horizontal position (without mattress, patient or any accessories)



- ► Enter to the calibration mode (press simultaneously **HOLD + CLEAR + ZERO + SPEAKER LEVEL**)
- ► Press the **SPEAKER LEVEL** button and go to the **CAL** position.
- ► Press the **BED EXIT OUTER ZONE** button for 5 seconds. During this process the ,,-'' symbol will flash on the last position of the display
- ► Now you are in Multizone Bed Exit Alarm and Absolute 0 Calibration mode. **The calibration is divided into two phases:**

5.3.6.3 Phase One

Display:

- ► **,,nC"** (the number of calibrations) and the respective value are displayed alternately.

After balancing, the scale will move to the next phase.

5.3.6.4 Phase Two

,,L 0" (load 0) is displayed on the display. In this phase bed has to be without weight.

Calibration:

- ► Press the **SPEAKER LEVEL** button to start

The calibration process takes approx. 7 seconds and the symbol **,,L 0''** flashes on the display.

NOTE: The bed must be balanced throughout the calibration!

Calibration and Absolute 0 setting is done. TO xeit the calibration mode:

- ► Press **WEIGHT** to exit for 5 seconds. During this process the **,,-''** symbol flashes in the last position of the display.
- ► Press **WEIGHT** to exit again
- ► Calibration mode has been finished

6 Service Tools and Equipment

6.1 List of tools and equipment

Socket set	
Hex / Torx key bit set	
Screwdriver set	
Engineer's wrench set	
Hex key set	
Torque wrench	
Set of pliers	

Multimeter	
Tape measure	
Knife	
Hammer, nylon hammer	
Crimping tool for RJ connectors	
Service cable for the control box	
Calibration Weights - 20kg (4 pcs)	

Manufacturer:
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Service department: service@linetgroup.com

LINET

Eleganza 4
Positionable Bed for Intensive Care
version with and without scales

Author: L I N E T spol. s r.o.
Related links: www.linet.com

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