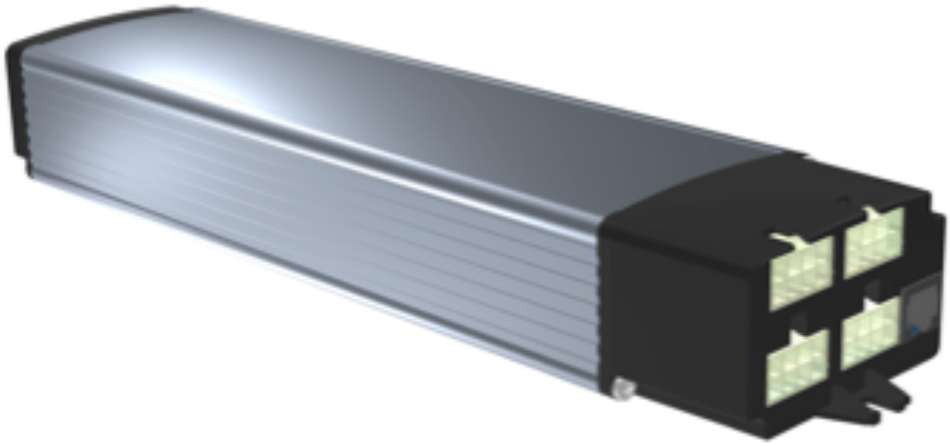
MOVETEC

Installation and operating instruction

LTC Series



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The LTC table controller

Thank you for purchasing our Controller. The well-shaped controllers can be easily mounted below a table top or into a crossbar of a height adjustable table. A variety of control panels and control modes enables the user to find the optimum solution for many applications.

This instruction will show how to install and how to operate the controller.

Application

The LTC Controller series is designed and can be exclusively used to control motors for the height adjustment of tables. Verify that the performance parameters of the motors and the connections of the motors fit the parameters and connections of the controller!

If used for other applications neither the function nor the safety can be ensured! Therefore, such use is not permitted, and warranty will be voided if used in applications outside the table height adjustment area.

Whom is this document prepared for

This document is an installation and operation instruction for the LTC series Laing Table Controllers and its accessories. The document is dedicated to manufacturers of height adjustable table frames and tables.

This document is not intended for end users!

Precondition for the use of this document

This document describes the installation and operation of the Controllers. It is assumed, that the controller has been configured for the application in which it is intended to be used! Program all parameters for the table the controller is intended to be mounted to, before actual installation.

Do not install system before programming!

Safety instructions

Attention There are no user serviceable or repairable parts inside the controller! Do not open the controller. If opened, the warranty will be void.

For all Laing Table Controllers and all accessories (products) please note:

- Before any work is done with the products, read the instruction manual and follow the instructions!
- The products may only be used as intended. Danger may occur if products are used in another way or in other applications than the intended ones.
- The installation may only be performed by qualified personnel with the required knowledge and the required capabilities!
- When making electrical connections, applicable electrical codes must be observed in respect to the way the connection is made, as well as, who is authorized to perform such connection.
- Electrical installations can only be made by authorized personnel!
- Operation outside the specified operation limits is not allowed!
- Operation outside the specified environmental limits is not allowed!

For the operation of height adjustable tables please note:

- Operation of a height adjustable table is only allowed after being instructed by a person familiar with the product or after thorough study of the instruction manual!
- Children are not allowed to play with the table!
- When operated, no persons are allowed on the table top!
- **Danger of collision!** The table must be placed in a way that it can operate without colliding with any objects like drawers or window sills!
- **Danger of injury by squeezing!** The table must be placed and operated so that no person can be squeezed between the table top or other parts of the table and other objects in the vicinity of the table.
- Kids under the age of 8 and persons with mental or physical disabilities are only allowed to operate the table if they have been sufficiently familiarized with the operation of the table and if it is certain, that they will not be over challenged by the operation of the table!
- Use of the table is only permitted in closed buildings where it can be insured the no water or high humidity can get to the electrical parts!

The controllers are manufactured and tested using the utmost care. Should there be a problem, please contact our service department.

Design of the table controllers

- Highly efficient switching power supply drives one, two, three or four motor channels.
- The motor channels are controlled by a powerful processor.
- The processor can be configured to a wide variety of applications by an easy to use configuration software.

- The aluminum housing provides superior heat dissipation, that's why in most applications the cool down time is not determined by the controller but by the motors connected to the controller.
- Port for the OptoSense Sensor
- GyroSense option
- Status indication by LED
- Remote service option by use of the Laing Cloud Interface
- A bus connection is provided for the following uses
    - Connection of the control panels
    - Configuration of the controller (by PC)
    - Firmware update
    - Synchronization of up to six controllers.
- An internal extension port is provided for the following extension boards
    - WiFi
    - BLE

Specifications

Typ	**2 Motor**	**3 Motor**	**4 Motor**
Max. output power	300 W	380 W	380 W
Input Voltage	115 V 50/60 Hz	115 V 50/60 Hz	115 V 50/60 Hz
Input current	5,3 A	6,3 A	6,3 A
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Output voltage	24 V	24 V	24 V
Output current total	15 A	19 A	19 A
Motor channels	2	3	4
Max. current per channel	9 A	9 A	9 A
Standby power	250 mW	250 mW	250 mW
Synchronization	by HUB or LD	by HUB or LD	by HUB or LD

Environmental conditions

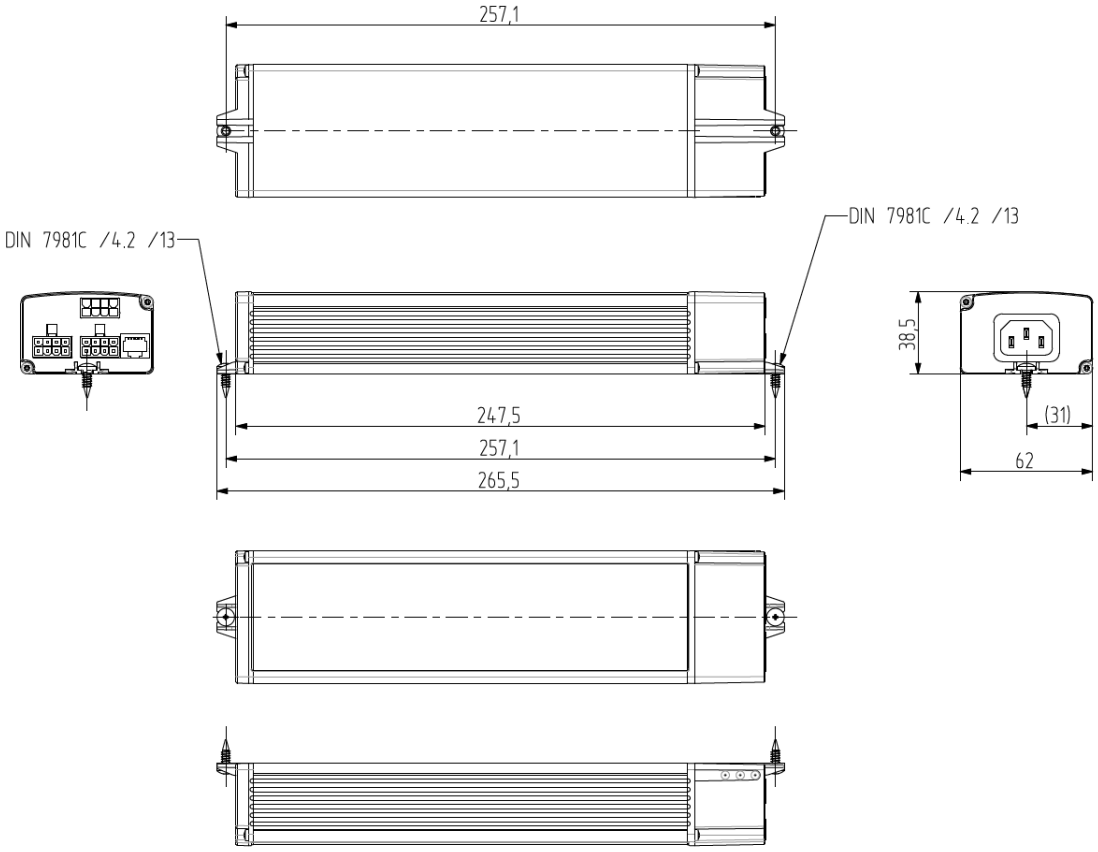
For the controller and all accessories please note:

Maximum Environmental temperature for storage and transport	-20°C to 60°C
	-4°F to 140°F
Max. Environmental temperature for operation	5°C to 45°C

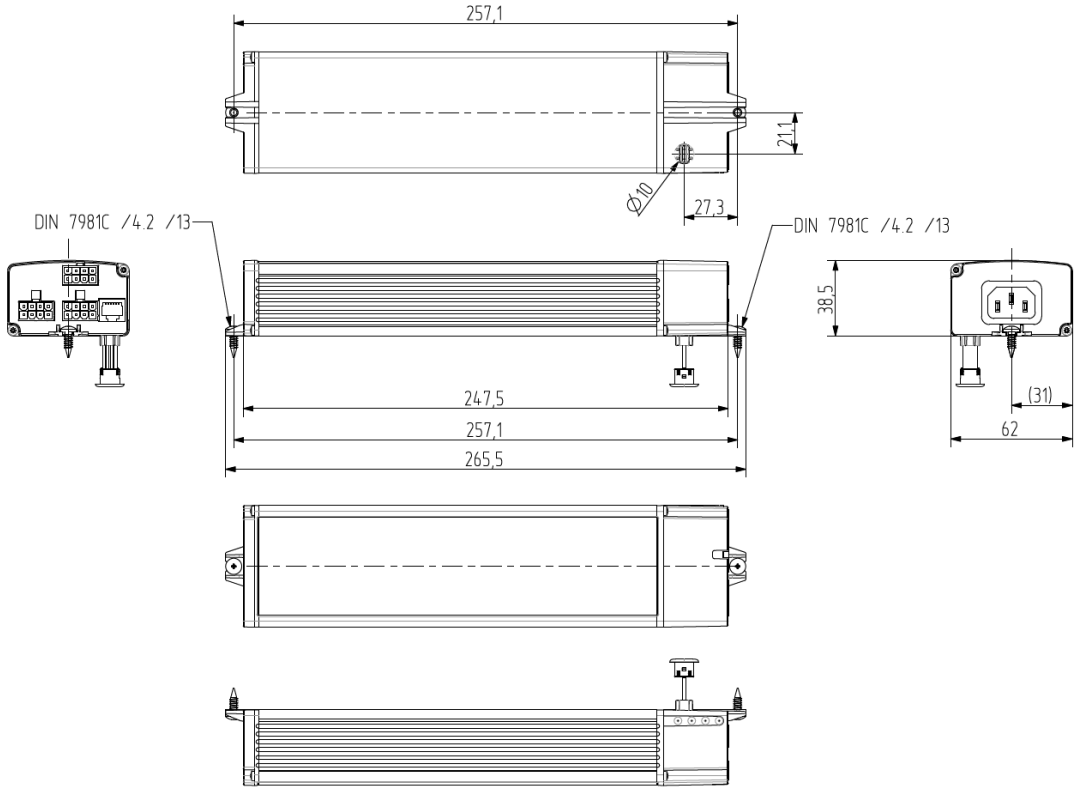
	41°F to 113°F
Max. Humidity for storage, transport and operation	95% non-condensing

Dimensions

Controller without OptoSense



Controller with OptoSense



Options

The following options can be ordered with the controller

- WiFi Module, the controller will be supplied with an integrated WiFi module. All table functions can be controlled through WiFi
- BLE module, the controller will be supplied with an integrated BLE module. All table functions can be controlled through BLE, this can be done e.g. by a smart phone app. This also is required for the wireless control panel.
- OptoSense option, the controller will be supplied with the OptoSense sensor and a connector inside the controller for the OptoSense sensor. This sensor allows the user to control the table by gestures.
- GyroSense Option, the controller will be supplied with an integrated collision detection sensor.

Delivery contents

The controller will be supplied in bulk packages, these contain the controller only. The power cable, the motor cables and control panels will be supplied in separate bulk package boxes. The OptoSense sensors too will be supplied in separate boxes. Fixing screws are not provided.

Installation of the controllers

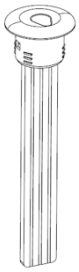
Controllers without OptoSense

The controller will be attached to the bottom of the table top by two screws, one on each fixing point at the ends of the controller. A suitable fastener size is #8 wood screw. The length is determined by the thickness of the table top, however it should be a minimum of ½ inch. When using other size screws, it is important, that the shaft of the screw is not wider than the slot in the fixing point and that the head is not bigger in diameter than 3/8 inch. The torque is determined by the material of the table top, it is important, that the fixing points at the endcap of the controller not be deformed!

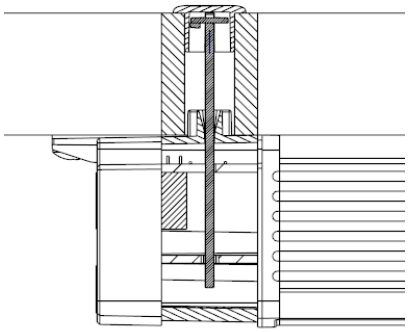
The controller can also be mounted on the cross bar, in this case the mounting can be done by M4 metric screws with a spring washer to secure the connection.

Important! When the GyroSense option is used, the controller must be mounted onto the table top to insure proper operation.

Controller with OptoSense



The picture shows the OptoSense sensor, what has to be inserted into the top of the controller through a hole in the table top.



The picture shows a cross section through the controller and the table top. It can be seen, that the centering stud of the controller endcap reaches into hole in the table top to position the controller.

The controller with OptoSense can only be mounted directly below the table top. It cannot be mounted onto the cross bar!

First a 25/64” hole has to be drilled in the position where the OptoSense sensor shall be located.

Then the controller will be positioned below the table top in a way that the centering stud of the endcap on the motor connection side of the controller will reach into the 25/64” hole. (see sketch).

Now the controller is positioned in reference to the table top. The controller can now be screwed to the bottom of the table top by two screws one on each fixing point at the ends of the controller. A suitable fastener size is #8 wood screw. The length is determined by the thickness of the table top, however it should be minimum ½ inch. When using other size screws, it is important, that the shaft of the screw is not wider than the slot in the fixing point and that the head is not bigger in diameter then 3/8 inch. The torque is determined by the material of the table top, it is important, that the fixing points at the endcap of the controller will not be deformed!

Now the OptoSense sensor can be inserted carefully into the hole in the table top from the top of the table. Eventually the sensing element has to be rotated by a maximum of 90° until it can be inserted with little force into the controller. Once the edge of the transparent cover of the sensor reaches the table top the force must be increased up to about 200N to insert the cover into the hole. The cover must be pressed in until the rim of the cover reaches the surface of the table top.

The retention force of the transparent cap is dependent on the material of the table top. Should the force be too big (too much force needed to insert) or too little (sensor comes out easily) the diameter of the hole in the table top must be adjusted in 4/1000th” steps up or down until the cover can be inserted with maximum 200N and the sensor does not come out easily.

Controller with GyroSense

The sensing element of the GyroSense for the collision detection is contained in the controller itself. This is why the controller with the GyroSense option must be mounted directly to the bottom of the table top as otherwise the movement of the table top cannot be properly sensed.

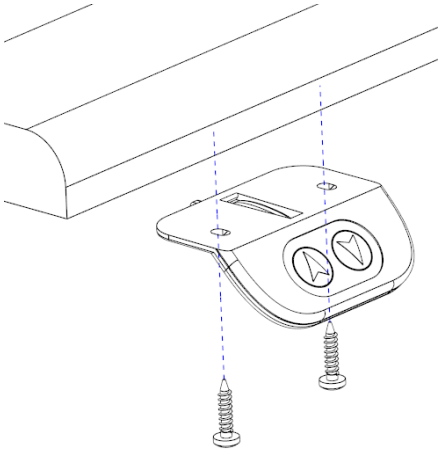
The standard setting assumes that the controller will be mounted in parallel to the cross bar which connects the two legs of the table. Should the controller be mounted perpendicular to the cross bar, the configuration of the controller must be adapted to that. Without that, a reliable collision detection will not be possible.

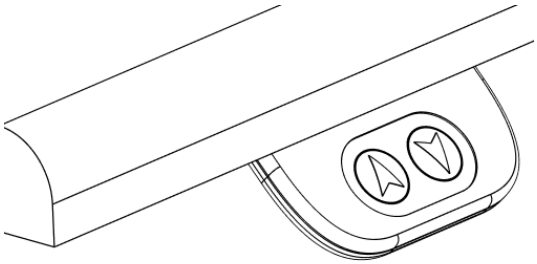
For the successful function of the GyroSense, it is very important that the table stands with all four legs on the floor so that it cannot wobble. If the table can wobble the GyroSense may react to the wobbling instead of a collision.

Installation control panels

Rectangular control panels

The square control panels will be mounted from the bottom to the edge of the table top in a way that the keys will be easily accessible. The cable must be attached to bottom of the table top in a way that it does not put tension on the control panel or the controller but also does not hang loose.



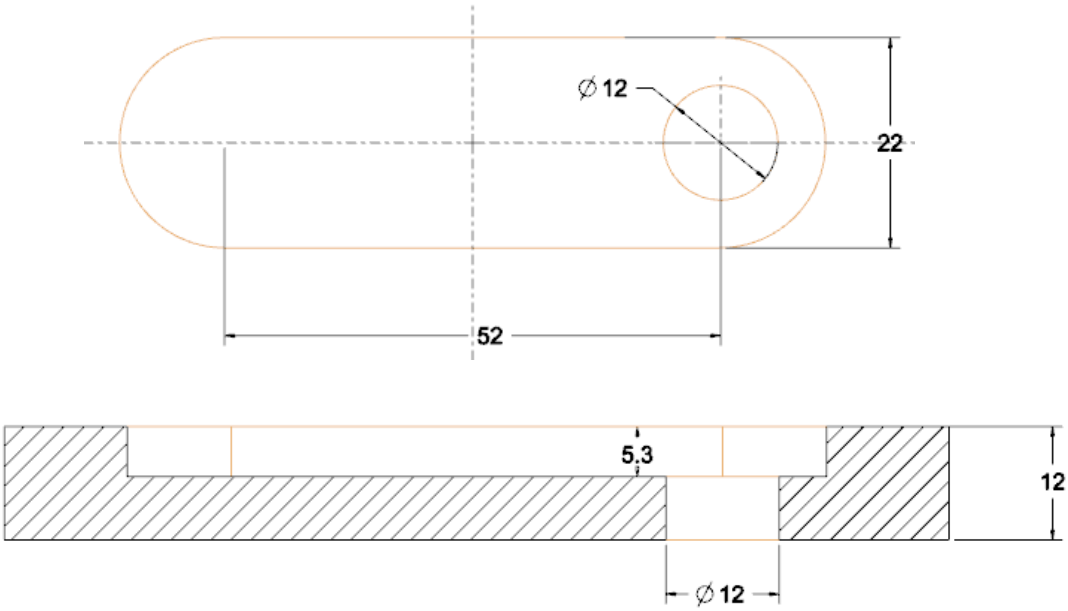


Round control panels

For the installation of the round control panels a 2-3/8” through hole has to be drilled into the table top. Then the cable will be put through the hole from the top, then the control panel will be pressed from the top into the hole. **Make sure the control panel will only be pressed on the fringe or insert it by pressing with a flat tool, covering the whole area of the control panel, on the control panel.** The cable must be attached to the bottom of the table top in a way that it does not put tension on the control panel or the controller but also does not hang loose.

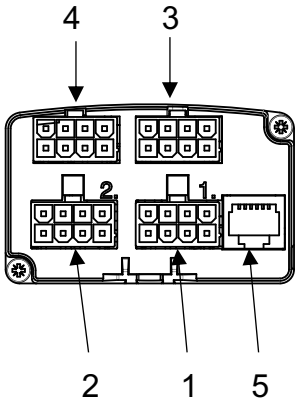
Oval control panels

For the installation of the oval control panels an appropriate pocket and a ½” hole have to be machined into the table top. The cable will be put through the hole from the top, then the control panel will be pressed from the top into the pocket. **While inserting the control panel make sure the control panel will not be pressed too hard, if required the size of the pocket has to be adjusted.** The cable must be attached to the bottom of the table top in a way that it does not put tension on the control panel or the controller but also does not hang loose.



The pictures show the required pocket for the oval control panels, to be machined in the table top. **Note, sizes in mm"**

Electrical connection



The picture shows the output connection side of the controller.

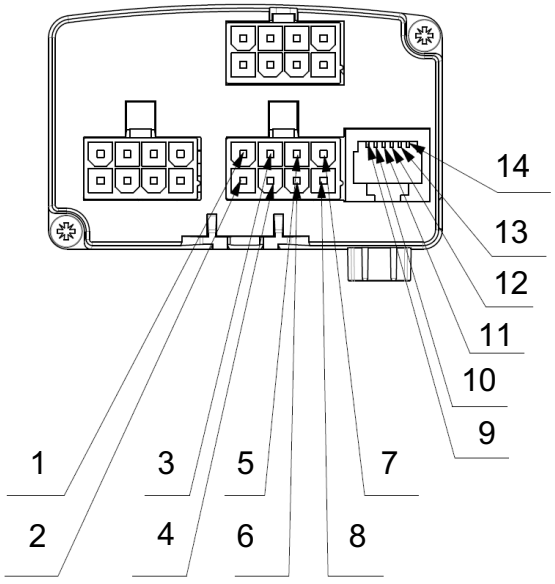
- 1 Motor 1
- 2 Motor 2
- 3 Motor 3 (LTC 383 only)
- 4 Motor 4 (LTC 384 only)
- 5 Control panel and bus connection

Connectable Motors

The controllers are designed to be connected to motors with the following ratings. Besides the suitable rating, it is required that the motor connectors correspond to the pin assignment shown under “Pin assignment for motors” below.

Nominal voltage	24 V
Maximum current	8 A
Number of hall sensors (90°)	2
Hall sensor supply voltage	5 V
Maximum current hall sensors	50 mA

Pin assignment controller



Pin assignment motor

1	Motor connection 1
2	Hall sensor 1
3	Ground
4	Hall sensor +5 V
5	Optional 2
6	Optional 1
7	Hall sensor 2
8	Motor connection 2

Pin assignment bus

9	+5V out
10	RS 485 A
11	RS 485 B
12	External +5V power
13	Analog control panel
14	Ground

Connection of the motors

The motors must have an 8 pole Molex plug and must comply with the requirements described under “Connectable motors”

The motors may then be plugged into the connectors of the controller. When plugged in, the snap in pin will retain the plug. Make sure to press the snap in pin when unplugging a motor to avoid damage to the controller.

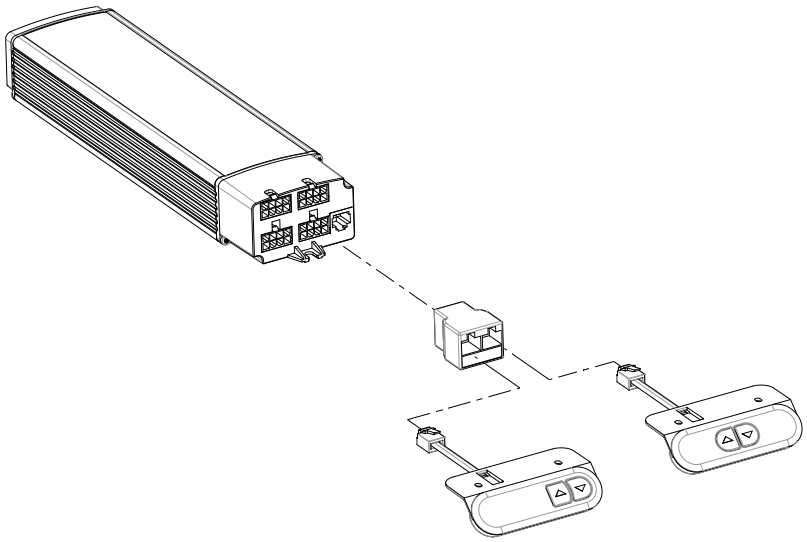
The motors must be connected in the order shown on the controller cover.

Connection of the control panels and other control options

Control panels with cable

The control panels with cable must be plugged into the connector (5) of the controller. Make sure that the plug is locked by the snap in. To unplug the snap in pin must be pressed, not doing so may result in controller damage!

Two control panels



The controllers can be controlled by two control panels. To do so the Y-connector has to be used. The connections must be made as shown on the picture. One connection is made to the controller, one to a control panel with height indication, one to a control panel without height indication.

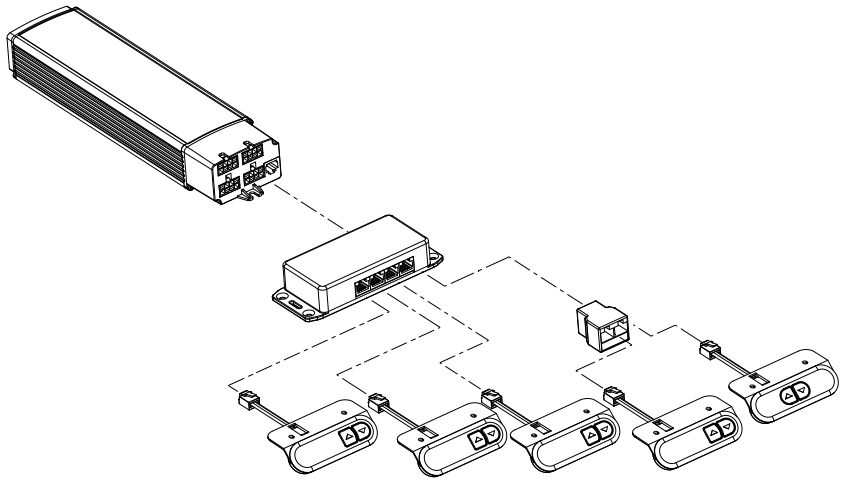
Important! It is not possible to connect two control panels with height indication or two control panels without height indication to one controller. This will result in a malfunction of the controller! Should more control panels be required see next step.

Up to 11 control panels

It is possible to control one controller by up to 11 control panels. To do so the HUB LH 6 is required. The controller will be connected to one port of the HUB, to the other ports of the HUB, control panels can be connected in any combination of control panels with height indication and without height indication.

Where a controller or control panel with height indication is connected a control panel without height indication can be added by use of a Y-connector.

The assignment of control panels to the HUB groups is done through the HUB configuration. When more than one control panel controls one group, the control panel activated first is in control, pressing a button on another control panel while a control panel is still in use, will not have any effect. This also applies to the control through OptoSense, BLE and Wifi.



OptoSense

When the OptoSense is used there is no control panel required!

The OptoSense is ready to use after insertion into the controller. In addition to the OptoSense another control panel can be connected.

Wireless control panel

Connection:

The wireless keyboard LM4RW can be connected to any controller what is equipped with a BLE Module. Make sure the BLE Module in the controller is activate through the Wizard or LD control panel before you go further.

Besides the wireless control panel additional control panels can be connected to the controller.

Mounting:

It is mandatory, that the keyboard will be mounted in a position, from where the movement of the table can be observed while pressing!

The LM4RW will be supplied with an adhesive tape on the bottom. Peel off the protective film and glue the keyboard to the desired place. The place should not be further away of the controller than about 5 feet. Where required the control panel can be fixed with a screw too.

Pairing of the control panel to the controller

After plugging in to the mains, the controller it is ready for pairing for the first 15 seconds. If the controller is plugged in already, make sure, when you unplug it, to wait until the LED in the controller goes off, so wait about 20 to 30 seconds and only then plug it back in!

While the controller is ready for pairing, press the keyboard „UP“ and „Down“ keys on the control panel simultaneously, until you hear a sound from the motors connected to the controller. If the melody goes upwards, the keyboard is paired to the controller. Now the controller can be controlled by the keyboard.

When the keyboard has been paired to the controller before already, the pairing action will result in an unpairing of the keyboard. This is indicated by a descending melody given out by the motors. After being unpaired the controller will not react to the keyboard commands any more.

The pairing can be started through the wizard too, on the „basic“ page. There the pairing mode can be activated in the controller, pressing the „UP“ and „Down“ key of the keyboard simultaneously within 15 seconds of activation of the controller, will have the same effect as described above.

Up to 15 keyboards can be paired with one controller, and a keyboard can be paired with an unlimited number of controllers.

To connect another keyboard or to connect the keyboard to another controller, perform the described pairing procedure again with a different keyboard or a different controller.

When a keyboard is paired with more controllers, all controllers will start moving, once they get the command by the keyboard. However, while the controllers start and stop simultaneously, they will not be synchronized.

When more than one keyboard is paired to a controller, always the keyboard pressed first, controls the controller. If another keyboard is pressed while the movement, initiated by a keyboard is still in progress, this will not have any effect.

Key functions, the key must be pressed and kept pressed:

Up Arrow: Table will move upwards

Down Arrow: Table will move downwards

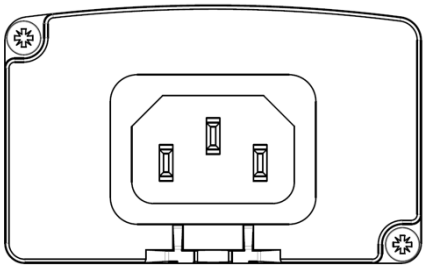
“1” Key: Table will move to memory 1 position

“2” Key: Table will move to memory 2 position

Battery change

Once the controller will not react any more to the control panel the battery in the control panel has to be changed. To do so, a blade has to be carefully inserted between the top cover and the surface, the control panel is glued to, to lift off the top cover. Then the battery can be changed on the PCB. It must be made sure, that the key designation matches the printed designations on the PCB when the cover is put back on the device.

Mains connection



After the connection of the motors and the control panels the controller can be connected to the mains by plugging in the power supply cable to the connector shown on the picture.

Make sure the power cable will be placed in a way what provides stain relief to the plug so that the plug cannot be pulled out of the controller.

Precondition start of operation of the controller

Before the start of operation make sure, that the parameter set suitable for the table to be operated is loaded into the controller. If this not the case, the table may make undesired movements, also required protection settings may not be activated! **Starting the controller with the wrong parameter set may result in injury to the operator and damage to the table and the controller!**

When operated, the table must be free of obstacles and must be able to freely move over the whole movement range without hitting anything or injuring anyone!

Start of operation

After mounting the controller and the control panels, making all electrical connections and making sure that the right parameter set is loaded to the controller, the table can be put into service.

Upon power up, the table makes a reference run to acquire the reference position. To do so the “up” or “down” key must be pressed until the table reaches the reference position (normally the lowest point or the position of a limit switch) and further until the table elevates to the lowest programmed position. (this may be about 25mm or 1” higher than the lowest position).

After the reference has been established, the table is ready for normal operation. By pushing the “up” or the “down” key, the table can be moved between the upper and the lower positions defined in the parameter set in the controller specific for this table.

Current based collision detection

As a standard all controllers are equipped with a simple, current based collision detection. This collision detection must be activated through the parameter set. To achieve a satisfactory functioning of this features parameters specific to the table must be defined and entered.

When activated the current based collision detection will stop the movement of the table as soon as the table top hits an obstacle. After the stop the table top will move in the opposite direction by the distance specified in the parameter set. After that the “up” or “down” key have to be pressed again to move the table top.

Please note that the sensitivity of the current based collision detection on down ward movements is reduced drastically if the table is loaded with some weight!

Should the performance of the current based collision detection not be satisfactory, the use of the GyroSense Collision detection system is recommended.

GyroSense based collision detection

The Laing GyroSense Systems provides collision detection between a table and an obstacle. To enable that, controllers ordered with this option are equipped with a very sensitive sensor that will sense even the smallest disturbance of the table's upward or downward movement.

This system ensures a reliable detection of a collision, as long as, the collision leads to a very small change in position of the table top.

To sense such a change in position, the GyroSense equipped Controller must be mounted to the table top. Placing the controller in the crossbar will not work!

Attention

Even if the system will sense reliably even very small unusual movements of the table it cannot be 100% insured that this will avoid injuries of the table users and persons around the table as also the mechanic of the table and the environment of the table can cause such injuries! This is why no liability can be accepted for personal injury or any other damage! It is the user's sole responsibility to make sure that personal injury and any other damage is avoided throughout the operation of the table.

Reference run

At first start up, when the table legs have an uneven height or if the wrong height is indicated, a reference run is required. For this the reference mode has to be activated by pushing the down arrow 4 times.

When the reference mode is activated, all legs will move downwards with the defined reference speed, when the "up" or "down" key is pressed. The movements are synchronized until the first leg reaches its reference position, after that the remaining legs will continue moving in the current mode until they reach their reference position. After that the travel will be set to zero, that means that the control panel will show the height above the floor. Then the drives move upwards by the defined bottom margin.

The reference positions can be acquired by:

- Hitting the lower stop of the drive
- Reaching a middle switch
- Reaching a limit switch at the lower end what disconnects the motor

The method how to acquire the reference position must be set in the Wizard.

Determine the stroke by the reference run

When the stroke determination is activated in the Wizard, a reference run will not only establish the reference position but will also determine the stroke of the drive. To enable this, the drives must be equipped with a limit switch at bottom and at the top, or the drive must support, that the bottom and top mechanical stop can be hit to enable the controller to determine the end position without limit switch.

When the reference run is activated, then all drives will move downwards with the set reference speed, independent whether the “up” or “down” arrow is pressed. The movements are synchronized until the first leg reaches its reference position, after that the remaining legs will continue moving in the current mode until they reach their reference position. After that, the travel will be set to zero, that means that the control panel will show the height above the floor. Then the movement is reversed, the drives move upwards, until the first drive reaches its upper limit switch or hits the upper mechanical limit. Then all drives will stop, the actual height will be entered as travel and the drives will move downwards by the defined top margin.

This process will be repeated with every reference run. Throughout the setting of the margins, the distance can be defined the drives keep from the mechanical bottom and mechanical top.

Safety zone

For applications where there is risk of an accident, when reaching the final part of the downward movement, e.g. when heavy tool shop tables are moved, a safety zone can be activated.

This function must be activated in the controller through the Wizard. There also a height has to be entered where the safety zone starts and a speed has to be defined what is active while in the safety zone.

This function is only active when moving downwards.

When the controller is set accordingly, then the controller will stop the downwards movement, when the set height is reached. Only after pressing the down button again, the movement will continue with the speed set for the safety zone.

Safety Input

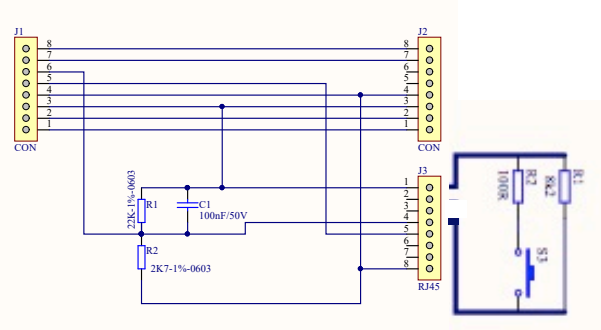
The controller connector for motor 1 provides an input what can be configured as safety input. This function must be activated in the controller through the Wizard, also the voltage levels for normal operation and triggering of the safety function must be set. The connection is made through the safety adapter what provides an RJ45 connector where the safety devices can be connected.

If the safety device provides a voltage what triggers the safety function, then the controller reacts as if there would be a collision. The movements will be stopped, and the drives will move in the opposite direction by the amount defined under “move back after collision”.

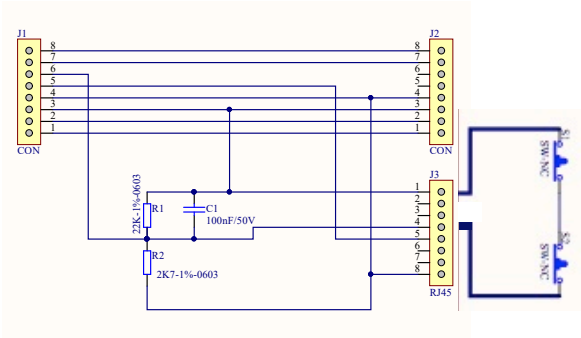
The activation of the safety input can also be done automatically, when the safety adapter is plugged in. The automatic activation must be set in the Wizard, then the safety input function is activated and stays activated after the safety adapter was plugged in once to the motor one connector.

If the adapter is removed after that, the safety function will stay activated, that means an operation without safety adapter and attached safety equipment is not possible. By use of the “LD” control panels this function can be reset to auto detect mode, as described below in the Menu Handling section.

The controller can only used, to protect equipment, it is not suitable to protect humans!



The picture shows the connection of a ribbon switch or sensing bumper to the safety input of the controller. The left side shows the content of the safety adapter, on the right side the part provide by the customer is shown in bolt lines. The 100 Ohm resistor represents the contact resistance of the ribbon switch.



The picture shows the connection of light curtain to the safety input of the controller. The left side shows the content of the safety adapter, on the right side the part provide by the customer is shown in bolt lines.

Automatic motor recognition

When the automatic motor recognition is activated in the controller through the Wizard, then the controller will check at every start up, how many motors are connected by sensing where the Pin 3 to 5 of the motor connector is bridged.

If the number of detected motors equals the number set in the Controller, the drives will work.

If the number of detected motors is bigger than the number set in the Controller, the number of detected motors will be saved to the controller.

If the number of detected motors is smaller than the number set in the Controller, the drives will not work and a “Motor Presence Error” will be shown. In this case the number of motors in the controller has to be changed by the Wizard or by use of the “LD” control panels, as described below in the Menu handling section.

When the automatic motor recognition is activated in the controller, it is recommended to set the number of motors to 1 when the controller is delivered to the customer. This can be done through the Wizard or by downloading the appropriate configuration file. Then, when put into service the controller will automatically set the number of motors to the number recognized.

The number of motors can be selected between one and the number of motor channels of the controller used.

Control through control panels

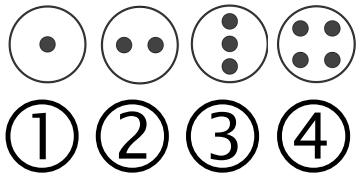
All Control panels

	Table will move upward	Keep the key pushed until the desired position is reached
	Table will move downward	Keep the key pushed until the desired position is reached

Control panels with memory keys

By use of the memory keys the user can assign individual heights to these keys what then can be recalled when the memory key is pressed.

Whether memory positions are stored in a new controller depends on the parameter set entered into the controller when configured by the table supplier.

	Recall previously stored memory positions	Keep the appropriate memory key pushed until the table stops at the stored position

Recall memory position with 2-Button control panel without height indication

Memory position with a 2-button control panel without height indication can be recalled when the button mode is activated.

- To recall memory position 1, the “Up” key must be pressed twice shortly after one another.
- To recall memory position 2, the “Down” key must be pressed twice shortly after one another.

Control panels with height indication

Control panels with height indication show the actual height of the tabletop in centimeters or Inches depending on the configuration.

Configuration of the controller though the “LM” control panels (control panels without height indication)

Store memory positions with “LM” control panels

- Move the table to the desired height by use of the “up” or “down” keys
- Press the left arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- Press the right arrow key once shortly
- Reaching the memory menu will be confirmed by one sound.
- After the sound press the memory key the position should be saved in
- Successful position saving will be confirmed by the number of sounds that correspond to the selected memory key number
- From now on height stored in the memory position can be adjusted by pressing and holding pressed the selected memory key until the table stops at the height stored

User height limit adjustment by “LM” control panels

Adjusting upper and lower limit

Should window boards or drawer container limit the possible movement of the table, then an upper and lower limit can be defined as follows

- Move the table top by use of the arrow keys to the maximum or minimum desired height
- Press the left arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound

- Press the right arrow key shortly twice
- Reaching the limit adjustment menu will be confirmed by two sounds
- Then
  - If the maximum height should be defined press the “up” key. The successful adjustment of the new upper limit will be confirmed by two sounds

  - If the minimum height should be defined press the “down” key. The successful adjustment of the new lower limit will be confirmed by two sounds

Attention: The top and lower positions must keep a minimum distance so that the table can still move after the new limits have been adjusted. This minimum distance is defined in the parameter set entered into the controller. Saving a new upper or lower limit is not possible if the minimum distance is not maintained. In this case when pushing the appropriate arrow key to save the new limit the following short beeps can be heard, indicating that the new limit was not saved. In this case the distance between the upper and lower limit must be increased.

Delete user height limits

- Move the table top to the upper or lower limit by use of the arrow keys (press the key until the table stops as the adjusted limit is reached)
- Press the left arrow key 4 times quickly one after another

- Reaching the program mode will be confirmed by a sound
- Press the right arrow key shortly twice
- Reaching the limit adjustment menu will be confirmed by two sounds
- Then
  - If the table top is at the upper position and the adjustment for the upper position shall be deleted press the “up” arrow key.

  - If the table top is at the lower position and the adjustment for the lower position shall be deleted press the “down” arrow key.

- Successful deletion of the position will be confirmed by a sound

Change the sensitivity of the collision detection by “LM” control panels

Over time the movement of the table may change due to wear or change of the lubrication properties. This may result in a false activation of the collision detection. In this case the sensitivity of the collision detection can be adjusted as follows

- Press the left arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- Press the right arrow key shortly three times
- Reaching the limit adjustment menu will be confirmed by three sounds
- By use of the right arrow key the sensitivity of the collision detection can now be adjusted
    - Press the right arrow key once, (one sound) the collision detection will be deactivated
    - Press the right arrow key two times, (two sounds) the collision detection will be set to the factory setting, maximum sensitivity
    - Press the right arrow key three times, (three sounds) the collision detection will be set to sensitivity medium
    - Press the right arrow key four times, (four sounds), the collision detection will be set to low

Initiate a reference run by “LM”

Should the table for whatever reason show the wrong height or one leg be higher than the other, a reference run must be initiated

- Press the left arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- Press the right arrow key shortly four times
- Reaching the limit adjustment menu will be confirmed by four sounds
- Pressing either arrow key will now initiate the reference run. The key must be kept pressed unit the table reaches its reference position and then moves back to the lower position. Now the reference is recalibrated, the table should be leveled, and the height indication should be correct.

Stroke limit adjustment by “LM” control panels

Adjust upper and lower stroke limit

In some cases, the table may be built in a way that the maximum travel of the drive is limited by some additions to the table like facings. In this case a stroke upper and lower limit can be adjusted what limits the stroke of the drives. The user height then can only be adjusted within the adjusted factory height.

Before the stroke limits are adjusted, the user height limits have to be deleted when the stroke limits will reach into the user height limit range!

As the controller will be supplied with set limits, changes can only be made when the present value is deleted as described below, after that a new limit can be set.


- Move the table top by use of the arrow keys to the maximum or minimum desired height
- Press the left arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- Press the right arrow key shortly six times
- Reaching the limit adjustment menu will be confirmed by six sounds
- Then
  - If the top limit should be defined press the “up” key, the table must be at the desired top position
  - If the bottom limit should be defined press the “down” key, the table must be at the desired bottom position
- The successful adjustment of the new upper limit will be confirmed by two sounds


Attention: The top and lower limits must keep a minimum distance so that the table can still move after the new limits have been adjusted. This minimum distance is defined in the parameter set entered into the controller. Saving a new upper or lower limit is not possible if the minimum distance is not maintained. In this case when pushing the appropriate arrow key to save the new limit the following short beeps can be heard, indicating that the new limit was not saved. In this case the distance between the upper and lower limit must be increased and the process must be repeated.

Delete stroke limits



- **Make sure, no user height limit is defined! If a user height limit is defined, see “delete user height limits” and delete the limits set before you proceed!**
- Move the table top to the upper or lower limit by use of the arrow keys (press the key until the table stops as the adjusted limit is reached)
- Press the left arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- Press the right arrow key shortly six times
- Reaching the limit adjustment menu will be confirmed by six sounds
- Then
  - If the table top is at the upper position and the adjustment for the upper position shall be deleted press the “up” arrow key.
  - If the table top is at the lower position and the adjustment for the lower position shall be deleted press the “down” arrow key.
- Successful deletion of the position will be confirmed by a sound

Configuration of the controller though the “LD” control panels (with height indication)

Operation of “LD” control panels with two buttons

The LD control panels without memory keys cannot use the memory one and memory two key for the menu handling.

For these control panels:

- Scrolling can only be done by the “Up” arrow key
- Instead of the memory one key, press the “down” arrow once
- Instead of the memory two key, press the “down” arrow twice

Store memory positions by the “LD” control panels


- Move the table top by use of the arrow keys to the desired height
- Press the Memory key, this height should be assigned to, 4 times quickly one after another. Now the present position of the table is stored in the selected memory position

Memory key handling by the “LD” control panels

In this menu item, it can be selected if the memory position key must be kept pressed until the memory position is reached or if one key press is sufficient



- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P05
- Press the memory one key once shortly
- The display shows one or zero.
    - If it shows “0” the Memory key must be kept pressed until the desired height stored under the memory position is reached.
    - If it shows “1” the Memory key must be pressed only once, then the table will move to the desired height stored under the memory position.

- By using the arrow keys the indication can be toggled from “1” to “0”. Once the right selection is made push the “memory one” key to confirm the selection, a sound will confirm that the setting is stored, the display will go back to normal operation and indicate the height

- When the selection is set to “0” the table will move into the stored memory position until the position is reached. Make sure that such an “automatic” operation is allowed in the country the table is operated. If not, you must select the selection “1” where the movement can be stopped by releasing the key

- When the selection “0” is made the “automatic” movement can be stopped at any time by pressing any key on the control panel or on any other control panel connected to the controller

User height limit adjustment by the “LD” control panels

Adjust upper and lower limit

Should window sills or drawers limit the possible movement of the table, then an upper and lower limit can be defined as follows:

- Move the table top by use of the arrow keys to the minimum or maximum desired height
- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows:
  - P06 for adjustment of the lower height limit, the table must be at the minimum position
  - P07 for adjustment of the upper height limit, the table must be at the maximum position

- Press the “memory one” key shortly to store the selected limit

- The successful storage of the user position will be confirmed by the sound shown
- **The top and lower positions must keep a minimum distance so that the table can still move after the new limits have been adjusted. This minimum distance is defined in the parameter set entered into the controller. If the distance is lower, the position will not be stored. This will be indicated by the sound shown**

- **If this is the case the upper limit must be moved upward, or the lower limit must be move downward until the distance is bigger than the minimum distance. Thereafter the process has to be repeated**

Delete user height limits

- Move the table top by use of the arrow keys to the minimum or maximum height. (Keep the “up” or the “down” key pressed until the table stops moving)
- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows:
  - P06 for deletion of the lower height limit select, the table must be at the lowest position
  - P07 for deletion of the upper height limit select, the table must be at the highest position

- Press the “memory one” key shortly to confirm the deletion

- The sound shown will confirm the deletion

Change the sensitivity of the collision detection by the “LD” control panels

Over time the movement of the table may change due to wear or change of the lubrication properties. This may result in a false activation of the collision detection. In this case, the sensitivity of the collision detection can be adjusted as follows

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01

- Press the “up” or “down” arrow key until the display shows P08
- Press the “memory one” key shortly to enter the setting mode

- The display now will show the actual sensitivity level
- Press the “up” or “down” arrow key to select the desired sensitivity of the collision detection:
    - 1: The collision detection will be deactivated
    - 2: Default setting, highest sensitivity
    - 3: Medium sensitivity
    - 4: Lowest sensitivity

- Press the “memory one” key shortly to confirm the selection

Initiate a reference run by the “LD” control panels

Should the table out of any reason show the wrong height or one leg is higher than the other a reference run must be initiated by the following action

- Press the “down” arrow key 4 times quickly one after another
- Now the controller is in reference mode, the display now will shows “- - -“
- Now either arrow key must be kept pressed unit the table reaches its reference position and then moves back to the lower position. If the reference is established the display will show the actual height. Now the reference is recalibrated, the table should be leveled, and the height indication should be correct

Change height indication from centimeter to inch by the “LD” control panels

The height can be indicated in centimeter or inch. The factory setting depends on the parameter set loaded into the controller. To change the indication, proceed as follows:

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound

- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P10
- Press the “memory one” key shortly to enter the setting mode
- The display now will show the actual setting
    - 0: Metric, indication in centimeter
    - 1: Imperial, indication in inch
- Press the “up” or “down” arrow key to select the desired setting
- Press the “memory one” key shortly to confirm the selection

Enter service menu by the “LD” control panel

For service purposes certain values and settings can be indicated in the display. The service menu can be entered as follows:

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P11
- Press the “memory one” key shortly to enter the menu.
- The display now will show P50
- Press the “up” or “down” arrow key to select the desired menu item
- Once the desired menu item is reached press the “memory one” key shortly, now the value for the selected item will be shown
- To leave the menu item shortly press the “memory two” key
- Menu items:
    - P50: Motor count, when selected the display shows the number of motors the controller is configured for
    - P51: GyroSense enabled: “1” GyroSense disabled: “0”
    - P52: OptoSense enabled: “1” OptoSense disabled: “0”
    - P53: BlueTooth enabled: “1” BlueTooth disabled: “0”
    - P54: WiFi enabled: “1” WiFi disabled: “0”
    - P55: Charge state of the Battery (LTCB)
    - P56: Temperature of the Battery (LTCB)

Rest user settings

This menu allows to reset all user settings to the values set when the controller was supplied to the customer. The following values will be reset:

- Memory position 1 to 4
- Upper user limit
- Lower user limit
- Button mode
- Collision detection
- Unit used in the display
- Precision of the indication in the display




- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P12
- Press the “memory one” key shortly to enter the menu.
- The display now will show P30
- Pressing the memory one key shortly, will reset the user settings
- To leave the menu item press the “memory two” key

Stroke limitation adjustment by “LD” control panels

Adjust stroke upper and lower limit

In some cases, the table may be built in a way that the maximum travel of the drive is limited by some additions to the table like facings. In this case a stroke upper and lower limit can be adjusted what limits the stroke of the drives. The user height then can only be adjusted within the adjusted stroke range.

Before the stroke limits are adjusted, the user height limits have to be deleted when the stroke limits will reach into the user height limit range!

As the controller will be supplied with set limits, changes can only be made when the present value is deleted as described below, after that a new limit can be set.






- Move the table top by use of the arrow keys to the minimum or maximum desired height
- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P12
- Press the “memory one” key shortly to enter the menu.
- The display now will show P30
- Press the “up” or “down” arrow key until the display shows:
    - P31 for adjustment of the upper height limit, the table must be at the maximum position
    - P32 for adjustment of the lower height limit, the table must be at the minimum position
- Press the “memory one” key shortly to store the selected limit
- The successful storage of the user position will be confirmed by the sound shown

The top and lower positions must keep a minimum distance so that the table can still move after the new limits have been adjusted. This minimum distance is defined in the parameter set entered into the

controller. If the distance is lower, the position will not be stored. This will be indicated by the sound shown
If this is the case the upper limit must be moved upward or the lower limit must be move downward until the distance is bigger than the minimum distance, then the process has to be repeated.

Delete stroke limits

- **Make sure, no user height limit is defined! If a user height limit is defined, see "delete user height limits" and delete the limits set before you proceed!**

- Move the table top by use of the arrow keys to the minimum or maximum height. (Keep the "up" or the "down" key pressed until the table stops moving)

- Press the "up" arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the "up" or "down" arrow key until the display shows P12

- Press the "memory one" key shortly to enter the menu.
- The display now will show P30
- Press the "up" or "down" arrow key until the display shows:
  - P31 for the deletion of the upper stroke limit, the table must be at the highest position
  - P32 for the deletion of the lower stroke limit, the table must be at the lowest position

- Press the "memory one" key shortly to confirm the deletion

- The sound shown will confirm the deletion

Shift height indication by the "LD" control panels

The indicated height shows the height from the floor to the table top. In some occasions when the table or drive is elevated or lowered it might be desired to shift the indicated height. To shift the indicated height, proceed as follows:

- Press the "up" arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the "up" or "down" arrow key until the display shows P12

- Press the "memory one" key shortly to enter the menu.
- The display now will show P30
- Press the "up" or "down" arrow key until the display shows P33
- Press the "memory one" key shortly to enter the setting mode.

- Press the "up" or "down" arrow key to shift the indicated height until the desired heigth is shown on the display

- Press the “memory one” key shortly to confirm the selection
- To leave the menu item press the “memory two” key

Define rounding for height indication

In this menu it can be defined how the height values indicated in the display will be rounded. E.g. instead of indicating 50,1 or 48,8 the display will show 50. The rounding works the same way for centimeter and for inch

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P12

- Press the “memory one” key shortly to enter the menu
- The display now will show P30
- Press the “up” or “down” arrow key until the display shows P34
- Press the “memory one” key shortly to enter the setting mode
- The display will now show the actually set value
- By pressing the “up” or “down” arrow key the desired setting can be selected:
  - “0” the display will show the first decimal
  - “1” the display will show only ,0 or ,5 as decimal
  - “2” the display will show only ,0 as decimal

- Press the “memory one” key shortly to confirm the selection
- To leave the menu item press the “memory two” key

Activate BLE Module

In this menu the BLE module in the controller can be activated or deactivated.

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P14

- Press the “memory one” key shortly to enter the menu
- The display now will show P40
- Press the “memory one” key shortly to enter the setting mode
- The display will now show the actually set value
- By pressing the “up” or “down” arrow key the desired setting can be selected:
  - “0” BLE deactivated
  - “1” BLE activated

- Press the “memory one” key shortly to confirm the selection
- To leave the menu item press the “memory two” key

Reset controller name

By the Wizard or through the App the controller can be given a name what will be indicated in the App. This menu item will delete the selected name and reset it to the serial number.

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P13

- Press the “memory one” key shortly to enter the menu
- The display now will show P40
- Press the “up” or “down” arrow key until the display shows P41
- Press the “memory one” key shortly to delete the name

- The name is now reset to the serial number
- To leave the menu item press the “memory two” key

Activate the pairing mode

To connect a wireless control panel to the controller it must be paired. To do this the controller must be put into pairing mode. This can be done in two ways:

1. After the controller is connected to the mains, it will be in pairing mode for 15 seconds. If the controller is plugged in already, unplug it for about 30 seconds. Then plug it back in, after that the controller is in pairing mode for 15 seconds. Within this time the keyboard can be paired to the controller

2. Call this menu

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P13

- Press the “memory one” key shortly to enter the menu
- The display now will show P40
- Press the “up” or “down” arrow key until the display shows P42
- Press the “memory one” key shortly to enter the pairing mode
- The controller will now be for 15 seconds in pairing mode, throughout this time the controller can be paired with a wireless control panel

Delete wireless control panel connections

This menu item will delete all paired wireless control panels in the controller. To control the controller by a wireless control panel thereafter, it has to be paired again first.

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P13

- Press the “memory one” key shortly to enter the menu
- The display now will show P40
- Press the “up” or “down” arrow key until the display shows P43
- Press the “memory one” key shortly to delete the connections
- Now all wireless control panel connections in the controller are deleted
- To leave the menu item press the “memory two” key

Reset private mode for APP

Through the App it is possible to activate the private mode in the controller. In this mode only the smart phone what activated the private mode can communicate with the controller.

By this menu item the private mode can be reset, after that the controller is accessible through all smart phones again.

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P13

- Press the “memory one” key shortly to enter the menu
- The display now will show P40
- Press the “up” or “down” arrow key until the display shows P44
- Press the “memory one” key shortly to reset private mode
- Now the controller is accessible form all smart phones again

Reset number of connected motors

The controller can be configured in a way to automatically recognize the number of connected motors. The controller saves the recognized number as the actual number of drives connected. When a motor is added, the number will be increased automatically.

When the number of motors is reduced, due to safety reasons the controller will not start the motors as someone might have forgotten to plug in a motor.

So, when the number of connected motors is reduced, the number must be reduced in the controller through the Wizard or through this Menu item to the actual number or a smaller number. Then the controller can be operated again.

- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P14

- Press the “memory one” key shortly to enter the menu
- The display now will show P60
- Press the “memory one” key shortly to enter this menu
- The display will now show the actually set number of motors so a number between 1 and the maximum number of motors the controller can handle
- By pressing the “up” or “down” arrow key the number of motors can be adjusted. If the automatic motor recognition is activated the number can be set to one, with the next movement the controller will recognize the actual number and save it. If the automatic motor recognition is not activated, the motor number must be set to the actual number.
- By pressing the “memory one” key the selected value will be saved

Reset Safety Adapter

The controller can be configured to activate the safety input function automatically, when the safety adapter is plugged into the Motor 1 connection. Thereafter the controller will only start the motors when the safety adapter and the safety devices are connected.

If the controller should operate without safety adapter thereafter, the safety input function has to be deactivated through the Wizard or this menu item. However, for safety reasons the automatic recognition will stay active.

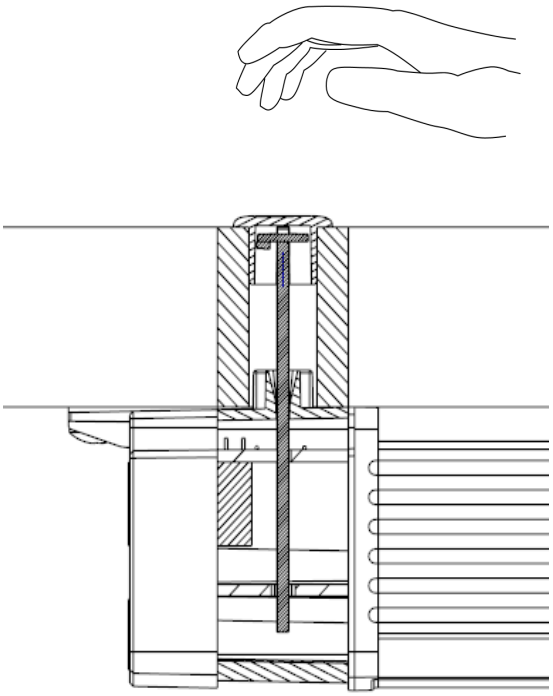
- Press the “up” arrow key 4 times quickly one after another
- Reaching the program mode will be confirmed by a sound
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P14

- Press the “memory one” key shortly to enter the menu
- The display now will show P60
- Press the “up” or “down” arrow key until the display shows P61
- Press the “memory one” key shortly to enter the menu item
- The display will now show the actually set value
- By pressing the “up” or “down” arrow key the desired setting can be selected:
    - “1” Safety adapter active, operation only possible when safety adapter and safety devices are connected
    - “2” Automatic recognition of safety adapter active, operation possible without safety adapter

- Press the “memory one” key shortly to confirm the selection

- To leave the menu item press the “memory two” key

Controller control by OptoSense



- Hold your hand about 5 cm or 2 inch over the OptoSense sensing element
- After about one second, an LED will come on within the sensing element which indicates that the OptoSense is now active
- If, after activation, the hand is moved up for only a small distance the table will start to move upwards until the hand is moved outside the sensing area of the OptoSense Sensor
- If, after activation, the hand is moved down for only a small distance the table will start to move downwards until the hand is moved outside the sensing area of the OptoSense Sensor
- After movement starts, the hand can be moved up or down or even put on the sensor, the table will continue in the direction it started until the hand is moved outside the sensing area of the OptoSense Sensor
- If, after activation, the hand is not moved for about 2 seconds, the sensor will deactivate until the hand or any other object is removed.

Synchronization of 2 Controllers by the control panel

All control panels with height indication (LD series) are able to synchronize 2 controllers. The controllers must be configured as single controllers. The controllers and the control panel will be connected by the Sync-Y-Adapter whereby care has to be taken, that the control panel will be connected to the designated input.

The electronic components in the Sync-Y-Adapter will now configure the HUB Mode in the controllers.

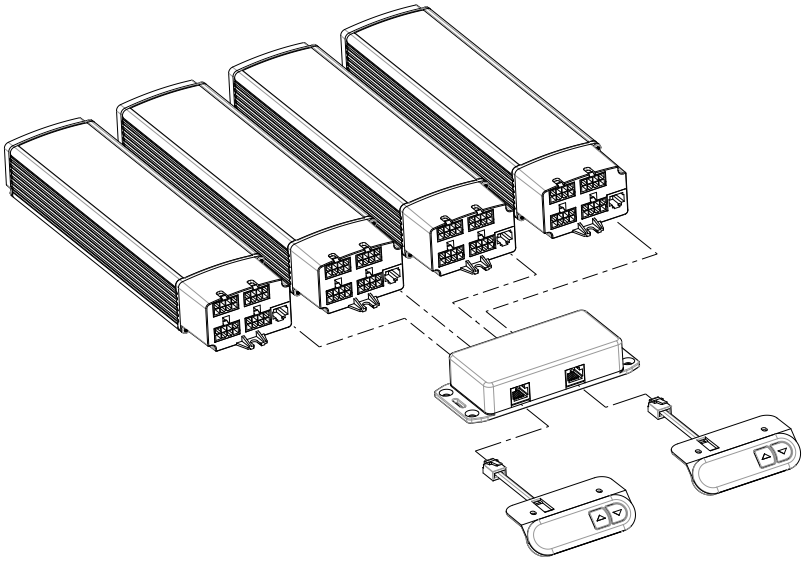
Now, all drives connected to the two controllers will be synchronized.

If only one controller is connected to the Sync-Y-Adapter, no operation is possible.

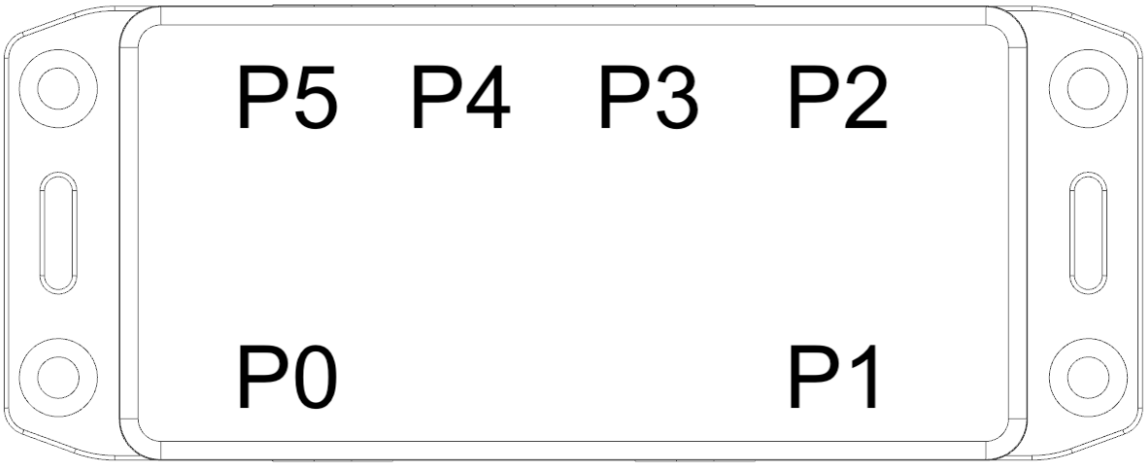
When disconnected from the Sync-Y-Adapter, the controllers automatically will go back to normal mode.

Synchronization of up to 6 controllers

By use of the HUB LH 6 up to 6 controllers can be synchronized allowing to move up to 24 legs synchronously. Every connected control panel, including the OptoSense, WiFi and BLE in the connected controllers can be used to move the connected drives.



Port designation



3

Configuration

The HUB is able to configure the connected controllers. This is useful, when a controller has to be exchanged, in this case, the configuration will automatically be loaded into the new controller.

General rule: Only when the controller is new, so when it does not contain a configuration for any of his ports yet, when connecting a controller to the HUB, the configuration of the connected controller will be transferred to the HUB for this individual port.

Once the HUB contains a configuration for a certain port, because this port before was connected to a controller or the configuration was loaded to the HUB for this port by the Wizard, this configuration will be transferred from the HUB to the controller connected to this port.

Should this not be desired, the HUB must be cleared through the Wizard or by selecting “0” in the Menu 91!

Attention: When delivered, the number of controllers connected to the HUB is set to 6. This insures, that the system will not start operating, before all anticipated controllers are connected to the HUB! Once the system is set up, the actual number of connected controllers has to be set through the menu 91.

The HUB will not start, when it does not find minimum the number of controllers it is set to. (The HUB will check all 6 ports for controllers.) In this case the failure F22 will be shown and the HUB will continue searching for controllers on the ports not yet used. Once the remaining controllers are connected, the F22 will be cleared and the HUB will be ready to operate.

Connecting a PC to the HUB

The HUB can be monitored and configured by the Wizard or the service App. For that the HUB will be connected to the PC by an interface cable.

When the interface cable is plugged in to port P0, then the Wizard will work as if it would be connected to a single controller. Then all parameters can be adjusted the same way as it would be made for a single controller. However, moving the connected drives to determine the direction and transmission ratio is not possible. When saving the configuration to the controller, the changed values will be transferred to all connected controllers and all controllers will be restarted. This process lasts several seconds, throughout this time no movement can be started.

When the interface cable is plugged into P1 to P5, then all ModBus tables in the Hub are accessible. When activated the service App will show the current, position, PWM and power for every connected drive.

Connection of controllers to the HUB

Controllers and control panels can be connected to all of the 6 ports. The controllers will be connected by a 6P6C interface cable to the HUB. To any port connected to a control panel with height indication, a control panel without height indication can be added by us of a Y-adapter.

All controllers are configured the same way

When all controllers to be connected to the HUB will have the same configuration, (including the number of drives connected to the controller), then the controllers can be connected to any port of the HUB. The HUB will then copy the configuration from the controller or, if the HUB contains a configuration already for this port, this configuration will be sent to the controller. In this case it is no problem to connect the controllers later to a different port.

Should a new, not yet configured controller be added to the HUB, it must be connected to a port, where before an already configured controller was connected. Then the configuration will automatically be loaded to the new controller.

The configuration of the controllers to be connected is different

In this case the controllers can be connected initially to any port, however, from then on, every controller must stay at the port it was initially connected to. This is required as the HUB will synchronize the configuration with the connected controller. Should one controller be equipped with a GyroSense and have 4 motors connected, another controller has only 2 motors connected, changing the ports on the HUB would lead to an overwrite of the configuration in the controller and so to undesired function.

Remaining connections

The ports not connected to controllers can be connected to control panels with or without height indication. By use or a Y-Adapter every port connected to a control panel with height indication can be connected to control panel without height indication too. All connected control panels will operate all drives connected to all the controllers plugged into the HUB, synchronously.

Preconfigured HUB

It is possible to load a configuration for every port into the HUB. Then unconfigured controllers can be connected to the HUB, the HUB will then load the configuration into the controller. In this case, also the number of controllers to be connected to the HUB is already defined.

When the configurations are similar for all controllers to be connected, it makes sense to load this configuration to all 6 ports of the controller. In this case is indifferent where the controller or controllers will be connected later.

For a control panel connected to a port it is indifferent if a configuration was loaded to that port or not.

When the configurations are different, (e.g. because one controller contains a BLE module, another controller a GyroSensor), then the assignment of the controllers to the ports is fixed, the user must connect the controllers to the ports they are assigned to.

Loading the configuration to the HUB can be done by the Downloader or the Wizard.

HUB startup

Throughout startup, the HUB will check, how many controllers are connected to the HUB. This number will be compared to the number the HUB is configured for.

If the HUB detects the number of controllers it is configured for, the system can operate.

If the HUB detects more controllers then it is configured for, the HUB will adjust the number of controllers required for operation to the number of controllers detected. From then on, the HUB requires this number of controllers in order to be operable.

If a smaller number of controllers is connected to the HUB then it is configured for, failure F22 will be shown, the system cannot operate. In this case the number of controllers must be set by the Wizard or the Menu 91 to the actual value.

Unconfigured HUB’s are set to 6 Controllers, so, unless 6 controllers are connected, the number of controllers has to be set in any case by the Menu 91. If thereafter the number of controllers is reduced, there will no operation possible. Failure F22 will be shown until minimum the number of controllers is found the HUB is configured for or the number is adjusted by the Wizard or Menu 91. The

HUB checks every port for controllers, not only the ports once already used by controllers!

The HUB will synchronize all drives of the connected controllers. For this it is mandatory, that the parameters used for the movement of the drives are exactly the same. This is why the HUB will check these parameters critical for the movement, should there be a discrepancy, the HUB will copy the parameters used for the movement from the controller connected to the lowest port number to all other controllers.

(Should later the controller connected to the port with the lowest number be changed, the configuration stored for this port in the HUB will be loaded to that controller. So also, in this case the required configuration will be maintained.)

Now the HUB is ready to operate.

Operation

A movement of the connected drives can be initiated by all connected control panels, also by WiFi, BLE or OptoSense what might be installed in one of the connected controllers. Always the control panel used first, will be and remain active, until the movement is done, only thereafter another control panel can be used.

If another control panel is used while a movement is still in progress, all movements will be stopped.

Identifier for the controller configuration

For special applications it is possible, to mark a configuration in the controller by an identifier. In this case the HUB will check at start up, if all configurations in connected controllers have the same identifier. If this is not the case, there will be no operation, also there will be no synchronization of the configuration with the HUB and failure F23 will be shown. In this case it has to be made sure, that only controllers with configurations with the same identifier are connected.

HUB Menu handling

The HUB and the controllers connected to the HUB can be configured by the control panels with height indication. All Menu items available for single controllers are usable with the exception of:

Menu 50 to 56 (Information menu) and menu 40 to 44 (BLE menu)

In addition to that, the following menus are available what are required for the HUB only.

Restart the HUB with „LD“ control panels

Should the HUB out of any reason, not work anymore or should a new recognition of the connected controllers be required, the HUB can be restarted. Thereafter the HUB again for 5 seconds will search for controllers.

- Press the “up” arrow key 4 times quickly one after another
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P17
- Press the “memory one” key shortly to enter the menu
- The display now will show P90
- Press the “memory one” key shortly to restart the HUB
- To leave the menu item press the “memory two” key

Delete the configurations stored in the HUB with “LD” control panels

With this menu the configurations stored in HUB will be deleted and the number of connected controllers will be set to zero. After deletion, the configurations of the connected controllers will be copied into the HUB and the number of the connected controllers will be stored. Clearing the HUB is required, when one or more of the connected controllers are changed to controllers with a different configuration like with different number of connected motors, GyroSense, WiFi or BLE.

- Press the “up” arrow key 4 times quickly one after another
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P17
- Press the “memory one” key shortly to enter the menu P90
- Press the “up” or “down” arrow key until the display shows P91
- Press the “memory one” key to select the menu item
- Now the present controller number the HUB is set for is shown
- Press the “up” or “down” arrow key until the display shows “0”
- Press the “memory one” key shortly to reset and restart the HUB

Adjust the number of controllers connected to the HUB with “LD” control panels

When a unconfigured HUB is supplied, the number of connected controllers is set to 6. That means, that the HUB will only operate, when 6 controllers are connected. This setting insures, that the HUB cannot be operated, before all desired controllers are connected and the right number of controllers is entered into the HUB by this menu item.

- Press the “up” arrow key 4 times quickly one after another
- The display will now show P01
- Press the “up” or “down” arrow key until the display shows P17
- Press the “memory one” key shortly to enter the menu P90
- Press the “up” or “down” arrow key until the display shows P91

- Press the “memory one” key to select the menu item
- Now the present controller number the HUB is set for is shown
- Press the “up” or “down” arrow key until the display shows the desired number of controllers
- Press the “memory one” key shortly to save the number to the HUB

- ,When throughout the next startup more controllers will be connected, the HUB automatically will save the actual number. Should the number of connected controllers be reduced thereafter, the number must again be adjusted through this menu item, as for safety reasons the number of the connected controllers cannot be smaller than the number the HUB is set to.

BLE Option

Controllers with BLE option have a BLE module integrated in the controller what is able to communicate with other BLE enabled devices and with the wireless control panels. This option allows to operate the table through an App or it enables the controller to provide information about its status and or movements to an App.

The BLE module identifies itself with the serial number of the controller so also when more controllers are equipped with BLE the desired controller can be identified. Through the App or the Wizard, the controller can be given a name, what then will be shown instead of the serial number.

The BLE module can provide all informations available inside the controller e.g. to an App.

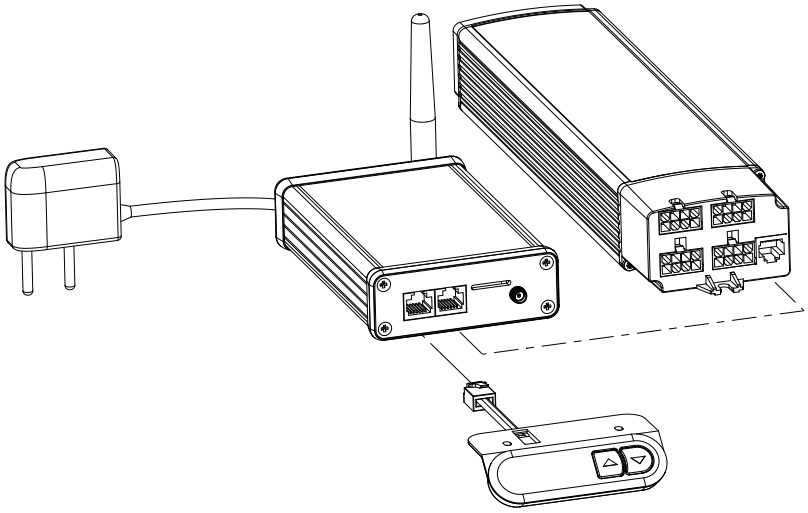
Attention: When controlled through an App, moving the table is possible without visual contact to the table. It must be made sure that the table will be observed throughout any movement to avoid injury!

WiFi Option

Controllers with WiFi option have a WiFi module installed inside the controller what is able to connect to and communicate with WiFi networks. This allows the controller to be controlled e.g. by higher level controls. The network the controller should connect to can be entered by the Wizard to the controller. After the SSID and the passcode have been entered, the controller connects automatically to the network. Then the full functionality of the controller and all information inside the controller can be initiated and accessed through WiFi. The controller identifies itself in the network by its serial number or by the name assigned to it.

Attention: When controlled through WiFi moving the table is possible without visual contact to the table. It must be made sure that the table will be observed throughout any movement to avoid injury!

Remote service through the Internet



The Laing Cloud interface allows to establish a connection between the Laing table controller over the internet. This makes it possible to service or adjust a table controller over the internet. Once connected. the controller can be adjusted in the same way as if the service person would be directly connected to the controller.

In case of a problem or a configuration requirement the Cloud Interface will be sent to the customer, the customer will connect it with a few simple steps, then the service technician will have full access to the controller. This in most cases will avoid a service trip.

The Cloud Interface contains a GSM Modem what will establish the connection to the internet, so the customer does not have to deal with the internet access.

The GSM modem of the Cloud Interfaces must be able to connect to the GSM network. Should there be no network at the location of the controller the Cloud interface must be connected to the Internet by a LAN cable using it's RJ45 connector.

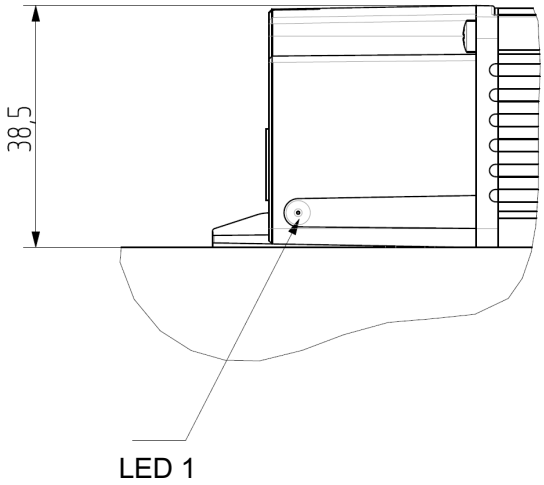
Connecting the cloud interface with the table controller

- Unplug the keyboard (if any) from the bus connector of the controller and plug it into one of the two RJ12 connectors of the Cloud interface
- Plug the one end of the bus cable supplied with the Cloud Interface into the bus connector of the controller and the other end into the other RJ12 connector of the Cloud Interface.
- Connect the power supply supplied with the Cloud Interface to the mains and plug the other end into the DC socket of the Cloud Interface
- Call the service technician who provided the Cloud interface

- Provide the service technician the ID number shown on the cloud interface
- After receiving this number, the service technician will connect to the controller

Attention: The service technician is now able to move the table. Make sure that, while the table is tested and adjusted, nobody will be close to the table and that the table can move freely to avoid injury and damage!

Status and failure mode indicated by the LED



The LED on the controller indicates the following

Indicated code	**Meaning**	**Failure solution**
Constantly on	Controller is switched on and or motors are running	If LED is not on, check the power cable
Constantly blinking	Controller is in reference mode	Press up or down button to perform a reference run. Keep button pressed until the reference run is finished
Short and long blinks	The LED shows a sequence of long and short signals. This indicates the failure mode (F1 to F17) as described below. E.g. long short short short means Failure mode 1	If a control panel with digital height adjustment is connected, read out the failure code. In case of a control panel without digital height adjustment read out the combination of long and short signals and refer to the failure modes described below

Menu codes for control panels without height indication

The control panels without height indication indicate the actual menu item by sounds created when entering the various menu items.

Indicated menu	**Meaning**	**Explanation**
PM1 one sound	Store memory positions	The memory positions for the control panel memory keys can be stored
PM2 tow sounds	Set user upper and lower limit	Users can set individual upper and lower limits for their controller to avoid e.g. collision with a window board above or drawer container below the table
PM3 three sounds	Adjust sensitivity of collision detection	For the current based as well as the GyroSense based collision detection here the sensitivity can be adjusted. Also, the collision detection can be deactivated
PM4 four sounds	Initiate Reference mode	If the table gets out of level a reference run can be initiated in this menu item
PM5 five sounds	Change from metric to imperial units	Here the indicated units can be changed from metric to imperial and back

Menu codes indicated by the “LD” control panels

The following menu codes indication will be shown by the control panels with height indication. If control panels without height indication are used, refer to the sounds created when entering the various menu items.

Indicated menu	Meaning	Explanation
P1	Store memory position 1	The memory position one for the control panel memory key one can be stored
P2	Store memory position 2	The memory position two for the control panel memory key two can be stored
P3	Store memory position 3	The memory position three for the control panel memory key three can be stored
P4	Store memory position 4	The memory position four for the control panel memory key four can be stored
P5	Memory key handling	Users can select if the memory key must be kept pressed until the memory position is reached or if a short key press is sufficient
P6	Set user lower limit	Users can set individual lower limits for their controller to avoid e.g. collision with a drawer container below the table
P7	Set user upper limit	Users can set individual upper limits for their

		controller to avoid e.g. collision with window board
P8	Sensitivity level for the collision detection	For the current based, as well as the GyroSense based collision detection in this menu item the sensitivity can be adjusted. Also, the collision detection can be deactivated
P9	Initiate reference mode	If the table gets out of level or the height is not indicated right, a reference run can be initiated in this menu item
P10	Change from metric to imperial units	In this menu item the indicated units can be changed from metric to imperial
P11	Enter info menu	This menu item leads to the information menu
P12	Enter service menu	This menu item leads to the service menu
P13	Enter BLE menu	This menu item leads to the BLE menu
P14	Enter Reset menu	This menu item leads to the Reset menu
Service Menu		
P30	Reset user settings	All user settings will be reset to the factory settings

P31	Distance from top endpoint	Set the distance from the top endpoint the travel will stop
P32	Distance from bottom endpoint	Set the distance from the bottom endpoint the travel will stop
P33	Distance from the floor	Set the distance from the floor the display will indicate
P34	Display precision	Set if the indicated value is rounded to 0.1, 0.5 or 0.0
BLE Menu		
P40	Activate BLE	Activate or deactivate the BLE
P41	Reset controller name	Controller name will be reset to the serial number
P42	Enter pairing mode	Activate pairing mode for the controller to connect a wireless control panel
P43	Clear paired control panels	All connections to control panels saved in the controller will be deleted
P44	Reset private mode	The private mode for the controller will be deactivated

Info Menu		
P50	Motor count	Number of motors selected
P51	GyroSense	enabled/disabled
P52	OptoSense	enabled/disabled
P53	BLE	enabled/disabled
P54	WiFi	enabled/disabled
P55	Charge state battery	Shows the actual charge state of the battery
P56	Battery temperature	Shows the actual battery temperature
Reset Menu		
P60	Motor number	Adjust/reset the number of motors set in the controller
P61	Safety mode	Reset safety mode to auto detect mode

Failure codes indicated by the control panels

The following failure indication will be shown by the control panels with height indication. If control panels without height indication are used, refer to the blinking of the LED on the controller to determine the failure mode.

Indicated Failure code **LED blinking**	**Failure**	**Failure solution**
con	Communication error	There is no communication between the controller and the control panel. Check the electrical connection
- - -	Reference mode	The controller entered reference mode, a reference run must be performed
F1 LED blinking: long short short short	EEPROM initialization error	Reset error by pressing any key. If the Error remains restart system by unplugging the power cable of the controller and plugging it in again after 20 seconds. If the error reoccurs the controller may be damaged, contact the supplier
F2 LED blinking: short long short short	EEPROM write error	Reset error by pressing any key. If the Error remains restart system by unplugging the power cable of the controller and plugging it in again after 20 seconds.

		If the error reoccurs the controller may be damaged, contact the supplier
F3 LED blinking: long long short short	EEPROM Read error	Reset error by pressing any key. If the Error remains restart system by unplugging the power cable of the controller and plugging it in again after 20 seconds. If the error reoccurs the controller may be damaged, contact the supplier
F4 LED blinking: short short long short	EEPROM inconsistency error	Reset error by pressing any key. If the Error remains restart system by unplugging the power cable of the controller and plugging it in again after 20 seconds. If the error reoccurs the controller may be damaged, contact the supplier
F5 LED blinking: long short long short	Collision detected through GyroSense or current based collision detection	Reset error by pressing any key. Should error reoccur decrease sensitivity level of the collision detection through the control panel menu system
F6 LED blinking:	Motor current reached the overcurrent stop level	Reduce load on the table.

short long long short		Reset error by pressing any key.
F7 LED blinking: long long long short	Motor current reached the error overcurrent level.	Reduce load on the table Reset error by pressing any key.
F8 LED blinking: short short short long	Motor current reached the fault overcurrent level.	Try to reduce load on the table or ensure a smoother travel path of the table mechanism Reset error by pressing any key.
F9 LED blinking: long short short long	Maximum allowed energy amount (I2t) entered into the motors.	Wait for some time, to allow the motors to cool back. The I2t decrease mechanism allows partial usage of the system after a one minute wait time, however for a complete cool back, around 13 minutes are required Reset error by pressing any key.
F10 LED blinking: short long short long	Maximum allowed energy amount (I2t) supplied by the controller	Wait for some time, to allow the controller to cool back. The I2t decrease mechanism allows partial usage of the system after a one minute wait time, however for a complete cool back, around 13 minutes are required Reset error by pressing any key.

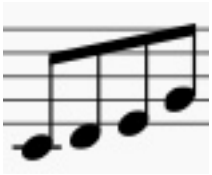
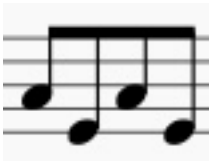
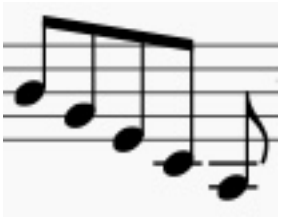
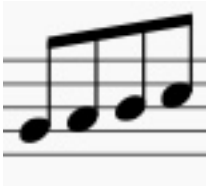
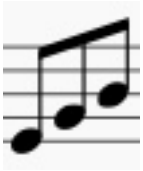
F11 LED blinking: long long short long	Maximum temperature level of the controller main power supply reached	Wait for some time to allow the controller to cool back Reset error by pressing any key.
F12 LED blinking: short short long long	Maximum temperature level of the controller's motor one and two drive reached	Wait for some time to allow the controller to cool back. Reset error by pressing any key.
F13 LED blinking: long short long long	Maximum temperature level of the motor three and four drive reached.	Wait for some time to allow the controller to cool back. Reset error by pressing any key.
F14 LED blinking: short long long long	The maximum height difference between the table legs has been exceeded	The system enters reference mode automatically. Execute reference run by keeping pressed up or down key of the control panel until reference run is done.
F15 LED blinking: long long long long	Motor blocked or so overloaded that it cannot speed up	Try to reduce load on the table or ensure a smoother travel path of the table mechanism Reset error by pressing any key.

F16 LED blinking: short short short short long	Number of motors connected to the controller does not correspond to the number of motors the controller was configured for	Check if all motors are properly connected to the controller. Reset error by pressing any key.
F17 LED blinking: long short short short long	Controller overloaded	Reset error by pressing any key. If the Error remains restart system by unplugging the power cable of the controller and plugging it in again after 20 seconds. If the error reoccurs the controller may be damaged, contact the supplier
F18 LED blinking: long long short short short	Hardware failure	Reset failure by pressing any key Should the failure remain, separate controller from the mains for 20 seconds Should the failure remain, contact the supplier
F19 LED blinking: short short long short short	Wrong sequence of the drives	The drives must be connected in sequence to the controller, starting with 1, then 2,3,4. There cannot be a gap between two successive controllers

F20 LED blinking: long short long short short	Safety-Adapter missing	The controller is configured for a safety adapter; however, a safety adapter is not connected. Connect a safety adapter
F21 LED blinking: short long long short short	Safety-Adapter active	The safety adapter has been triggered. Remove the reason for the Safety-Adapter trigger and push the button again
F22 LED blinking: long long long short short	Number of controllers connected to the hub too small	The number of controllers connected to the hub is smaller than the number the hub was configured for. Connect the right number of controllers or adapt the number in the Hub setting
F23 LED blinking: short short short long short	The configuration identifier is not similar for all controllers connected to the Hub	All controllers connected to the Hub, must have the same identifier. Change the controller or controllers with the different identifier

Sound signals

The following sound signals are given out by the controller:

Sound	Meaning	Explanation
	Acknowledgement signal	The sound acknowledges a selection
	Fail signal	The sound indicates that a selection could not be made as intended
	Deletion confirmation	The sound indicates that a value has been deleted like the user height
	OptoSense activated	The sound indicates that the OptoSense sensor has been activated
	OK Signal	The sound confirms a selection

Directives followed

RoHS 2. 2011/65/EU

Reach 2006/121/EC

Low voltage 2014/35/EU

EMC 2014/30/EU

Approval for European Controllers (230V versions)

The CE sign is based on the compliance to the following standards:

EN 60335-1 2012

EN 61000-6-3 2007

EN 61000-6-2 2005

EN 61000-3-2 2006+A1 2009+A2 2009

EN 61000-3-3 2008

EN 62233 2008

ISO 13849-2 Performance level „B“

Approval for USA and Canada (115V versions)

ETL Mark Approval is based on the following standards:

ANSI/UL 60950-1:2007+A1+A2

CAN/CSA-22.2 No. 60950-1:2007+ A1+A2

Revision_11_E, 27.6.2019

LAING INNOTECH

Declaration of Conformity

We, **Laing Innotech GmbH & Co. KG.,** Theodor-Heuss-Str. 23 D-71566 Althütte, declare under our sole responsibility that the products

Product:	Motor Controller
Models:	LTC 302, LTC383, LTC384

to which this declaration relates, is in compliance with the following documents:

Directives:	2006/95/EC Low Voltage Directive
	2014/30/EU EMC Directive
	2011/65/EU RoHS Directive
Product Safety Standard:	IEC 60335-1:2010 + AMD1:2013
EMC Standards:	EN 61000-6-1:2007
	EN 61000-6-2:2005
	EN 61000-6-3:2007+A1
	EN 61000-6-4:2007+A1

CE

Laing Innotech GmbH + Co. KG
Theodor-Heuss-Str. 23
D-71586 Althütte
Telefon 07000 07000 22

Althütte, 06.24.2019.

Manufacturer's representative