MEDLINE® CARELINE®
IMPROVING EFFICIENCY IMPROVING EFFICIENCY

Lifting Columns
User Manual

LINAK.COM/MEDLINE-CARELINE

LINAK®
WE IMPROVE YOUR LIFE

Contents

Preface **4**
GENERAL ASSEMBLY INSTRUCTIONS **5**
DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY **6**
Important information **7**
General warnings **8**
General recommendations **11**
General Regulatory Considerations **12**
General warranty periods **12**
Electromagnetic Compatibility (EMC) **13**
EMC Warnings 13
EMC responsibilities for LINAK actuator systems 14
Electrostatic discharge (ESD) 15
RF transmitter/receiver properties 16
FCC and IC Statements 16
Symbols **17**
Batteries **19**
General battery warnings 19
Lithium ion batteries 20
Lead acid batteries 23
System description **24**
Connecting the system **24**
General environmental conditions **25**
Information on start-up, deinstallation and operation **26**
Before installation, deinstallation or troubleshooting 26
Before start-up 26
During operation 26
Cleaning **27**
Cleaning warnings 27
IPX6 Washable 28
Rinsing aids 29
IPX6 Washable DURA™ 30
Cable wash 31
General maintenance **32**
Maintenance of all LINAK lifting columns 32
Repair and disposal **33**
Troubleshooting **34**

BL1 ..... **35**
LC1 ..... **42**
LC3 ..... **55**
Contacts **78**

Preface

Dear User,

We are delighted that you have chosen a LINAK® product.

LINAK systems are high-tech products based on many years of experience in the manufacture and development of actuators, lifting columns, desk frames, electric control boxes, controls, batteries, accessories and chargers.

This User Manual does not address the end user. It is intended as a source of information for the equipment or system manufacturer only, and it will tell you how to install, use and maintain your LINAK product/system. The manufacturer of the end product has the responsibility to provide a User Manual where relevant safety information from this manual is passed on to the end user.

We are convinced that your LINAK system will give you many years of problem-free operation.

Before our products leave the factory they undergo full function and quality testing. Should you, nevertheless, experience problems with your product/system, you are always welcome to contact your local supplier.

LINAK subsidiaries and some distributors situated all over the world have authorised service centres, which are always ready to help you.

LINAK provides a warranty on all products (see warranty section).

This warranty, however, is subject to correct use in accordance with the specifications, maintenance being done correctly and any repairs being carried out at a service centre, which is authorised to repair LINAK products.

Changes in installation and use of LINAK systems can affect their operation and durability. The products are only to be opened by authorised personnel.

This User Manual has been written on the basis of the present technical knowledge. LINAK is constantly keeping the information updated and we therefore reserve the right to carry out technical modifications.

The introductory pages of this manual may contain information that is not applicable to the technical product pages and are to be seen as general information for all LINAK products.

LINAK A/S

GENERAL ASSEMBLY INSTRUCTIONS

Please read the following safety information carefully. Ensure that all staff who are to connect, mount, or use the actuator are in possession of the necessary information and that they have access to this assembly instruction.

Persons who do not have the necessary experience or knowledge of the product/products must not use the product/products. Besides, persons with reduced physical or mental abilities must not use the product/products, unless they are under surveillance or they have been thoroughly instructed in the use of the apparatus by a person who is responsible for the safety of these persons. Moreover, children must be under surveillance to ensure that they do not play with the product.

Warnings

Failure to comply with these instructions may result in accidents involving serious personal injury.

It is important for everyone who is to connect, install, or use the systems to have the necessary information and access to the User Manual on www.linak.com.

- If there is visible damage on the product it must not be installed.
- If the control box / Twindrive makes unusual noises or smells, switch off the mains voltage immediately.
- The products must only be used in an environment that corresponds to their IP protection.
- The cleaners and disinfectants must not be highly alkaline or acidic (pH value must be 6 to 8).
- Irrespective of the load, the duty cycle stated in the data sheets, must NOT be exceeded.
- The DESKLINE® systems can only be used in push applications.
- The control box / Twindrive must only be connected to the voltage stated on the label.
- System not specified for pull must only be used in push applications.
- Fastening screws and bolts must be tightened correctly.
- Do not open the closing device on the Twindrive during operation.
- Specifications on the label must under no circumstances be exceeded.
- NOT TO BE OPENED BY UNAUTORISED PERSONNEL.
- Use only the actuator within specified working limits.
- Note that during construction of applications, in which the actuator is to be fitted, there must be no risk of personal injury, such as squeezing of fingers or arms.
- If irregularities are observed, the actuator must be replaced.
- If the actuator is used for pull in an application where personal injury can occur, the following is valid: It is the application manufacturer's responsibility to incorporate a suitable safety arrangement, which will prevent personal injury from occurring, if the actuator should fail.
- MEDLINE® & CARELINE® products products are rated to operate at an altitude < 2000 m.

Recommendations

Failure to follow these instructions can result in the actuator being damaged or being destroyed.

- Before you start mounting/dismounting, ensure that the following points are observed:
  - The actuator is not in operation.
  - The mains current supply is switched off and the plug has been pulled out.
  - The actuator is free from loads that could be released during this work.
- Before you put the actuator into operation, check the following:
  - The actuator is mounted correctly as indicated in the relevant user instructions.
  - The equipment can be freely moved over the actuator's whole working area.
  - The actuator is connected to a mains electricity supply/transformer with the correct voltage and which is dimensioned and adapted to the actuator in question.
  - Ensure that the voltage applied matches the voltage specified on the actuator label.
  - Ensure that the connection bolts can withstand the wear.
  - Ensure that the connection bolts are secured safely.
- During operation
  - Listen for unusual sounds and watch out for uneven running. Stop the actuator immediately if anything unusual is observed.
  - Do not side load the actuator.
  - Use only the actuator within the specified working limits.
  - Do not kick or step on the actuator.
- When the equipment is not in use
  - Switch off the mains supply or pull out the plug in order to prevent unintentional operation.
  - Check regularly the actuator and joints for extraordinary wear.
- Note: If the actuator is operated as a hand crank, it must be operated by hand, otherwise there is a risk of overloading the actuator and hereby damage the actuator.
  When changing the cables on a LINAK actuator, it is important that this is done carefully, in order to protect the plugs and pins.
  Please ensure that the plug is in the right location and fully pressed in before mounting the cable lid.

DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY

LINAK A/S
Smedevænget 8
DK - 6430 Nordborg

LINAK A/S hereby declares that LINAK DESKLINE® products, characterised by the following models and types:

Control Boxes	CBD6S
Linear Actuators	DB5, DB6, DB14, LA23, LA31
Lifting Columns	DL1A, DL2, DL4S, DL5, DL6, DL8, DL9, DL10, DL11, DL12, DL14, DL15, DL16, DL17, DL18, DL19, DL20, DL21, BASE1, LC1
Desk Panels	DPA, DPB, DPH, DPF, DPG, DPT, DP1CS, DPI
Wireless Controls	BP10
Frames and Feet	Kick & Click, DF2, DF3, DF4, DF5, DLF
Accessories	BA001, BLE2LIN, CHUSB, DESK Sensor, SLS, SMPS, USB2LIN, WiFi2LIN, DC Connector, RFRL

LINAK A/S hereby declares that LINAK HOMELINE® products, characterised by the following models and types:

Control Boxes	CBD6DC
Linear Actuators	LA10, LA18, LA40 HOMELINE, BASE1
Dual Actuators	TD4, TD5
Controls	BP10, HC10, HC20, HC40, HC50, HC60
Accessories	BA002, CP, BLE2DC, BLE2LIN, LED Light Rail, MD1, SMPS, WiFi2LIN

LINAK A/S hereby declares that LINAK MEDLINE® & CARELINE® products, characterised by the following models and types:

Control Boxes	CA10, CA20, CA30, CA40, CA63, CAL40, CB6, CB6S, CB6P2, CB8, CB9, CBJ2, CBJ Care, CBJ Home, CO41, CO53, CO61, CO65, CO71, COL50, OPS, PJ2
Linear Actuators	KA19, KA30, KA30 ICA, LA20, LA23, LA24, LA24 ICA, LA27, LA28, LA29, LA30, LA31, LA34, LA40, LA42, LA44
Lifting Columns	BL1, LC1, LC3
Controls	ABL, ACC, ACK, ACO, ACOD, ACOM, ACL, DP, DPH, FS, FS3, FPP, HB30, HB70, HB80, HB100, HB190, HB200, HB400, HD80, HL70, HL400, SC01
Accessories	BA15, BA16, BA18, BA19, BA22, BAJ, BAJL, BAL40, BAL50, CH01, CHJ2, CHL40, CHL50, DJB, LIN2OB, MJB2, MJB5 Plus, Massage Motor, PJB4, QLCI2, SLS, SMPS10, UBL, UBL2, UBL4 Motion, USB-A Power Adapter

LINAK A/S hereby declares that LINAK TECHLINE® products, characterised by the following models and types:

Linear Actuators	LA12, LA14, LA21, LA23, LA25, LA30, LA33, LA35, LA36, LA37, LA73, LA76, LA77
Lifting Columns	LC3 IC
Accessories	FMB

comply with the following parts of the Machinery Directive 2006/42/EC, ANNEX I, Essential health and safety requirements relating to the design and construction of machinery: 1.5.1 Electricity supply

The relevant technical documentation is compiled in accordance with part B of Annex VII and this documentation or part hereof will be transmitted by post or electronically to a reasoned request by the national authorities.

This partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive 2006/42/EC where appropriate.

Nordborg, 2026-05-18

LINAK A/S

John Kling, B.Sc.E.E., Certification and Regulatory Affairs
Authorised to compile the relevant technical documentation

Original declaration

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Important information

LINAK® products, within the scope of this manual, are not classified as medical electrical equipment or systems, nor do they fall within the scope of the EU Medical Device Directive/Regulation or other similar national regulations. The products are components to be built into a piece of medical electrical equipment by a manufacturer.

To support the assessment and certification task of the complete medical electrical equipment or system worldwide, LINAK provides certification, on a component level, according to the IEC 60601-1, (Medical electrical equipment – Part 1: General requirements for basic safety and essential performance) as recognised components by NRTL (Nationally Recognized Testing Laboratories).

Description of the various signs used in this manual:

Warnings

Failure to comply with these instructions may result in accidents involving serious personal injury.

Recommendations

Failing to follow these instructions can result in product damage.

Please read the following safety information carefully:

Ensure that all staff who are to connect, mount, or use the actuator system are in possession of the necessary information and that they have access to these assembly instructions.

Persons who do not have the necessary experience or knowledge of LINAK products should not use these. Moreover, persons with reduced physical or mental abilities must not use the products, unless they are under surveillance or they have been thoroughly instructed in the use of the equipment by a person who is responsible for the safety of these persons. Moreover, children must be under surveillance to ensure that they do not play with the product.

Please be aware that LINAK has taken precautions to ensure the safety of the actuator system. The manufacturer/OEM is responsible for the overall approval of the complete application.

LINAK recommends to use the actuators in push applications rather than pull applications.

LINAK actuators are not to be used for repeated dynamic push-to-pull movements.

For general pull applications or repeated dynamic push-to-pull movements in the application, please contact LINAK A/S if in doubt.

LINAK actuators and electronics generally fall outside the IEC 60601-1 definition of applied parts and are not marked as such.

However, assessing the risk whether actuators and electronics can unintentionally come into contact with the patient, determines that they are subject to the requirements for applied parts. All the relevant requirements and tests of the standard are carried out as part of the IEC CB* Scheme/NRTL** assessment.

* CB: Certification Body

**NRTL: Nationally Recognised Testing Laboratory

General warnings

Failure to comply with these instructions may result in accidents involving serious personal injury:

The medical device manufacturer is responsible for the incorporation of a suitable safety arrangement, if the actuator or lifting column is used for pull in an application where personal injury can occur, which will prevent personal injury from occurring in case of actuator failure.

Note that during construction of applications, in which the actuator is to be fitted, there must be no possibility of personal injury, for example the squeezing of fingers or arms.

The plastic parts in the system cannot tolerate cutting oil.

Assure free space for movement of the application in both directions to avoid a blockade.

The application and actuators are only to be operated by instructed personnel.

In applications with spline function, the blockage by an obstacle when the application is moving inwards, the removal of the obstacle will cause the load to drop until the spindle hits the nut.

Do not turn the outer tube.

Do not use chemicals.

Inspect the actuator system regularly for damage and wear.

Do not expose LINAK actuator system components to high intensity ultraviolet radiation disinfection lamps. This may damage the enclosure, supporting parts and cables.

LINAK actuators and electronics are not designed for use within the following fields:

- In the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide
- Planes and other aircrafts
- Explosive environments
- Nuclear power generation

If faults are observed, the products must be replaced.

A LINAK control box, actuator and accessory component must, in the final application, be placed where it is not exposed to any impact. This is to prevent damage if a passer-by accidentally hits it with an object or when cleaning the floor with a broom or a mop. On a medical bed e.g. this might be underneath the mattress support platform. If necessary to mitigate this risk, additional protection might be required.

To avoid unintended movement, prevent foreign objects or persons from unintentionally activating a footswitch or a hand control at any time, for instance during normal use or maintenance.

If there is visible damage on the product it should not be installed.

If the actuator system makes unusual noise or smells, switch off the mains voltage immediately and disconnect batteries, if applicable.

The products must only be used in an environment that corresponds to their IP protection class.

The cleaners and disinfectants must not be highly alkaline or acidic (pH value 6-8). See cleaning section.

Irrespectively of the load, the duty cycle stated on the product label must NOT be exceeded.

The control box must only be connected to the voltage stated on the label.

Systems not specified for pull must only be used in push applications.

Fastening screws and bolts must be tightened correctly.

Specifications on the product label must under no circumstances be exceeded.

NOT TO BE OPENED BY UNAUTHORISED PERSONS.

Only use the actuator within specified working limits.

Be aware that during the design of medical devices, the risk of personal injury (for instance squeezing of fingers or arms) must be minimised.

If irregularities are observed, the actuator must be replaced.

All cables must be mounted in such a way that they are not trapped or exposed to tension or sharp objects when the application is moved in different directions.

General recommendations

Failing to follow these instructions may result in actuator system damage:

The duty cycle printed on the actuator system label must always be respected. If exceeded, there is a risk that the actuator system is damaged. Unless otherwise specified on the label, the duty cycle is max. 10%, max. 2 min. in use followed by 18 min. not in use.

All detachable connections between components must be locked by the cable locking mechanism - when applicable.

It is recommended to have options like quick release, manual lowering or similar built into the system in case of power loss or system failure or if movement of the system is critical. After service it is recommended to test the system for correct functionality before it is put back into operation.

Prior to assembly/disassembly, ensure that the following points are observed:

- The actuator system is not in operation.
- The mains current supply is switched off and the plug has been pulled out.
- Batteries - if applicable - may also power the system.
- Actuators are free from loads that could be released during this work.

Prior to operating the actuator system, check the following:

- Actuator system components are correctly mounted as indicated in the product-specific user instructions.
- The equipment can be operated in its entire intended range of movement.
- Ensure that the load-supporting bolts can withstand the wear.
- Ensure that the load-supporting bolts are secured safely.

During operation:

- Listen for unusual sounds and watch out for uneven movement. Stop the actuator system immediately if anything unusual is observed.
- Do not sideload the actuator.
- Do not step on or kick any LINAK component.

When the equipment is not in use:

- Switch off the mains supply or pull out the plug in order to prevent unintentional operation.

Cables and plugs:

- It is important to remove the transport plastic bag before using the cable.
- When changing the cables on a LINAK® actuator system, it is important that this is done carefully in order to protect the plugs and pins.
- Please ensure that the plug is in the right location and properly inserted before the cable lid is mounted.

General Regulatory Considerations

Certain LINAK components are not individually certified under IEC 60601-1 due to incomplete constructional features that prevent full compliance. Specifically, products without enclosures, such as for instance those exposing printed circuit boards or mechanical parts, do not meet the safety requirements outlined in the standard.

Medical equipment must comply with strict regulations to ensure the safety of patients and healthcare professionals.

When LINAK components are integrated into a medical device, it is the responsibility of the medical device manufacturer to ensure that these components are adequately enclosed.

Ultimately, the medical device manufacturer is responsible for ensuring that the final product complies fully with IEC 60601-1 and all other applicable standards.

General warranty periods

As general warranty period, LINAK provides 5 years (60 months) warranty on MEDLINE and CARELINE products used in beds and medical applications. If MEDLINE and CARELINE products are used in other applications, they will be covered by 1½ years (18 months) warranty.

Batteries are covered by a specific product warranty of 12 months.

External products that are not manufactured by LINAK A/S: 12 months are added to the warranty period, for instance for transportation and stocking. Relabelling of these products only takes place, if the production date exceeds one year from the date of dispatch to the customer.

If there is any doubt whether returned products are covered by the warranty, they are covered by the warranty. Please use the date of the control box or actuator as reference, if possible.

Electromagnetic Compatibility (EMC)

EMC Warnings

Electromagnetic compatibility – general

LINAK® actuator systems bear the CE marking as an attestation of compliance with the EMC Directive 2014/30/EU. The systems are designed to meet all requirements of applicable standards and have been tested to meet IEC 60601-1-2 requirements.

Emission:

LINAK Actuator Systems are CISPR 11, Group 1, Class B products, comply with IEC 61000-3-2, Class A and IEC 61000-3-3.

Immunity:

Test levels are according to Professional Healthcare Facility and Home Healthcare Facility Environment.

Electromagnetic phenomena are evaluated on a system level, with the actuator connected to a LINAK control box and accessories.

LINAK always recommends to perform verification tests on the final medical device.

Electromagnetic compatibility – third party components

Use of accessories, transducers and cables other than those specified by LINAK could result in increased electromagnetic emissions or decreased electromagnetic immunity of the actuator system and result in improper operation.

Electromagnetic compatibility – interference with other equipment in general

Use of the actuator system adjacent to or stacked with other equipment should be avoided as this could result in improper operation. If such use is necessary, the actuator system and the other equipment should be observed to verify that they are operating properly.

If the user notes unusual behavior of the actuator system, in particular if such behaviour is intermittent and associated with the standing right next to mobile phones, microwaves and radio broadcast masts, this could be an indication of electromagnetic interference.

If such behaviour occurs, try to move the actuator system further away from the interfering equipment.

Electromagnetic compatibility – interference with other equipment, RF communications

RF communication equipment (e.g. RFID, wireless RF etc. including peripherals such as antenna cables and external antennas) should be used at a distance no closer than 30 cm (12 inches) to any part of the actuator system. This also applies to cables specified by the manufacturer. Otherwise, a performance degradation of this equipment could result.

EMC responsibilities for LINAK actuator systems

LINAK verifies the EMC performance of each LINAK product and approves them individually. The LINAK products can be combined and integrated into many different systems. LINAK also verifies the system EMC performance on commonly used combinations.

LINAK has certificates in accordance with applicable standards for each product and provides the customers, who are building the application and integrating these products into systems (systems with control box, actuators, cables, batteries, etc.), with these certificates.

However, EMC testing of LINAK products in generic LINAK systems is not made in an environment that corresponds to the specific application environment which differs from the generic testing environment. There will be differences that can affect the EMC performance in the specific target application.

The customer is responsible for qualifying and approving the complete application including the LINAK system.

Regulatory standard

LINAK products, being components to be incorporated by a Manufacturer [definition: IEC 60601-1 ed.3.1, cl. 3.55] into Medical Electrical Equipment [definition: IEC 60601-1 ed.3.1, cl. 3.63], are tested concerning the EMC phenomena according to the Collateral Standard IEC 60601-1-2 ed. 4.1.

IEC 60601-1-2 ed. 4.1 sets forth the requirements for the electromagnetic compatibility of Medical Electrical Equipment, ensuring that devices operate safely and effectively within their intended environments. Compliance with this standard is essential to minimize electromagnetic interference and maintain the integrity and performance of Medical Devices.

Furthermore, IEC 60601- 1-2 ed. 4.1 states:

"This collateral standard recognizes that the Manufacturer has the responsibility to design and perform Verification of Medical Electrical Equipment and Medical Electrical Systems to meet the requirements of this Collateral Standard and to disclose information to the Responsible Organization or Operator so that the Medical Electrical System will remain safe throughout its Expected Service Life."

Qualification process of a new application

The qualification process for a new application is normally done in cooperation between the customer and LINAK. LINAK provides the relevant support, competence and documentation needed for the customer's overall development plan and test plan for the specific application.

The driver of the qualification process is the customer who has the ultimate application responsibility (MDS). The customer identifies and specifies the needed testing based on many different parameters (experience, risk management, requirements from standards, etc.).

In many cases, the customer is establishing and verifying tests early in the project to ensure that the approval process has a low risk of failing when tested in the approval institute.

The customer identifies which tests to make and when they are to be performed in the project to mitigate the risk of failure in the approval process which also includes EMC testing.

Electrostatic discharge (ESD)

LINAK® considers ESD to be an important issue and years of experience have shown that equipment designed to meet the levels specified in standards might be insufficient to protect electronic equipment in certain enviroments.

1. Handling and mounting electrostatic discharge sensitive devices (ESDS devices).

- Handling of sensitive components shall only take place in an ESD Protected Area (EPA) under protected and controlled conditions.
- Wrist straps and/or conductive footwear (personal grounding) shall always be used when handling ESDS devices.
- Sensitive devices shall be protected outside the EPA by the use of ESD protective packaging.

2. Responsibility LINAK/customer

- ESDS devices must under no circumstances, during transport, storage, handling, production or mounting in an application, be exposed to harmfull ESD.
- LINAK can only guarantee the lifetime of ESDS devices if they are handled in the same way from production at LINAK A/S until they are mounted in the manufacturer's application. It is therefore important that the ESDS devices are not removed from the ESD protected packaging before they are physically within the EPA area at the customer premises.

Please refer to EN61340 for further information:

EN61340-5-1, Electrostatics - Protection of electronic devices from electrostatic phenomena - General requirements

EN61340-5-2, Electrostatics - Protection of electronic devices from electrostatic phenomena - User guide

RF transmitter/receiver properties

Some LINAK products emit RF-power by intention for communication purposes.

Frequency band of transmission: 2402 MHz - 2480 MHz

Type: Bluetooth® Low Energy

Modulation: GFSK

Maximum Effective Radiated Power (ERP): 10 dBm

FCC and IC Statements

For RF-emitting products (e.g. Bluetooth®, Wi-Fi) intended to be used on the North American continent, the following applies:

FCC statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

IC statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) L' appareil ne doit pas produire de brouillage;

(2) L' appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d' en compromettre le fonctionnement.

Symbols

The following symbols are used on the LINAK product labels, where applicable:

	IEC 60417-5172: Class II equipment		Compliance to all relevant EC directives
	IEC 60417-5840: Applied part type B		UK Conformity Assessment
	IEC 60417-5019: Class I equipment Protective earth; protective ground		Regulatory compliance mark: The Australian Safety/EMC Regulations
	IEC 60417-5002: Positioning of cell		Alternating current
	ISO 7000-0434A: Caution, consult accompanying document		Direct current
	ISO 7000-1641 Operating instructions	XXXXXX	Reduced ETL recognised component mark for Canada and the United States. X: The mark is always accompanied by a control number of 6 or 7 figures. For complete description, see ETL marking on next page.
	Electronics scrap		
	Electronics scrap		Bluetooth®
Li-ion	Recycle		Japanese TELEC
c US	Recognised Component mark for Canada and the United States		
PSE	PSE diamond mark		
PSE	PSE circle mark		

Electrical Testing Laboratories (ETL) marking

Due to space limitations, the complete ETL marking demands are not represented on the marking plates.

The full ETL recognised component markings are shown here:

C/N 120690
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 4008004
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 4008838
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 9901916
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 4008005
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 4008671
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 4008003
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 4008623
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

C/N 4009507
Conforms to ANSI/AAMI Std. ES60601-1
Cert. to CSA Std. C22.2 No. 60601-1

Batteries

To comply with the EU Battery Regulation (EU) 2023/1542, battery-related information is provided through this QR code.

Scanning the QR code gives access to battery identification details, as well as safety and environmental information available on the LINAK website.

This information must also be included in the end-product user manual.

General battery warnings

Handle batteries carefully. Do not short circuit the battery.

Avoid continuous battery discharge when the medical device is not in use, as this may cause lead sulphate formation, which, if left in this state for too long, will irreversibly damage the battery.

LINAK battery packs may emit flammable gases. Do not expose the battery packs to fire or equipment that emits sparks. Moreover, do not store the battery in a closed environment or incorporate it into a closed structure of an enclosure as this may cause an explosion, fire, equipment damage, or injury.

Handle tools carefully and do not wear jewelery when handling batteries. A short-circuit of the battery terminals can cause burn injuries, damage or trigger explosions.

Only connect LINAK batteries to compatible chargers.

LINAK battery packs contain toxic substances. If the internal battery fluid leaks out and gets onto skin or clothing, make sure it is washed off with clean water. Moreover, if the fluid gets into the eyes, rinse them immediately with clean water and seek medical assistance.

Do not use or store LINAK battery packs in places where the ambient temperature exceeds 50 °C, such as inside a hot automobile, in direct sunlight, or in front of a stove or a source of intense heat. Doing so can shorten the battery life, lower its performance level, cause the battery to leak fluid, explode, cause fire, or be damaged.

Applications where batteries serve as backup and not as the main power source should always be connected to mains whenever possible.

Lithium ion batteries

Li-Ion batteries are moving in the direction of minimising the physical size and, at the same time, increasing the capacity. This gives a very compact battery with a high energy concentration. It also increases the risk of thermal runaway (see note below) due to internal short circuits.

The general use of Li-Ion batteries has increased, and the inherent risk of thermal runaway has led to stricter rules within the transport industry, specifically air transport with tightened restrictions on the quantity, handling, and storage of specific products.

The OEMs and consumers must recognise that although safe to use, Li-Ion cells always have a very small risk of thermal runaway. The risk could be as little as 1 PPM or even less.

LINAK currently bases our Li-Ion battery design on cell types with an industry-proven history (e.g. electric cars). The use of well-proven cell technology reduces the risk of thermal runaway, but it does not eliminate it. LINAK has completed activities to reduce this risk and the complete battery package is approved in accordance with UL.

An external, internationally recognised expert has also reviewed the design to ensure that it is manufactured according to the latest recommendations. Further to that, we only use cells from well-recognised manufacturers.

LINAK recommends that when using Li-Ion batteries, the customers should carry out proper risk analysis on their application. The risk analysis must also take into consideration that these products are not mounted in positions where they are in direct contact with flammable materials.

LINAK Li-Ion batteries have no greater risk of thermal runaway than other Li-Ion cells from well-recognised manufacturers within the market. Therefore, LINAK cannot take responsibility for any failures that occur due to a failure that is inherent in the nature of Li-Ion batteries.

If any of the Li-Ion batteries built into LINAK products are found to be defective under warranty, LINAK will provide the OEM with a new product. LINAK explicitly disclaims all other remedies. LINAK shall not in any event be liable under any circumstances for any special indirect punitive incidental or consequential damages or losses arising from any incident related to the inherent risk of thermal runaway in the Li-Ion cell and any use of LINAK products. Moreover, LINAK explicitly disclaims any responsibility for profit loss, failure to realise expected savings, any claim against our customer by a third party, or any other commercial or economic losses of any kind, even if LINAK has been advised of the possibility of such damages or losses.

Note: ‘Thermal runaway’ is overheating of a cell, and it could lead to a small fire and smoke from the cell.

Transportation

The lithium ion batteries must be packed and transported in accordance with applicable regulations. Always ask your local transportation provider how to handle the transportation of lithium ion batteries.

Please see the general assembly instructions and the mounting section for detailed information.

Warnings

When using Li-Ion batteries with patient lift control boxes, loss of power might happen due to the battery deep discharge protection. This will only happen in case of continuous battery use despite warnings. In this event, there may be no warning, and the application may not be able to move when expected.

In his risk analysis, the customer must take into consideration how to assure alternative means to make movement, for instance quick release or manual lowering.

Do not open the battery housing as damaging the cell or circuitry may develop excessive heat.

If product caution is not clearly visible at low light intensity, read the product label instructions symbol. A warning must be included in the application manufacturer manual for the medical device.

The application manufacturer must test the application and ensure that intentional and unintended operations do not exceed the battery specification limits.

Defective or damaged Li-Ion batteries are not allowed for transportation.

For safety reasons, please adhere to the indicated charging and operation temperature.

In case the battery is too hot, disconnect it, evacuate the room, and wait for 2 hours before taking further steps.

Mounting instructions must be followed in order to avoid exposing batteries to water.

In general, recharging of batteries must take place every 12 months. However, please note:

- New Li-Ion batteries, shipped from LINAK are in a deep-sleep state, where the self-discharge is very little
- When mounted in an application, LINAK Li-Ion batteries wake up, resulting in a higher rate of charge, depending on the application/system
- Application manufacturer must consider this idle consumption for his specific system and make precautions to avoid discharged batteries.
- Contact your LINAK sales team for further information

If batteries are to be shipped by air, they shall not be charged to more than 30%

Disposal of the battery takes place in accordance with local regulations.

Recommendations

- Do not exceed the storage temperature as it will shorten the product life and performance.
- Allow the battery to settle to room temperature before use.
- Lithium ion batteries are not intended for use in outdoor applications and indoor pool environments.
- If the battery is completely discharged, then recharge the battery before storage.
- Always use correct LINAK charger

DO NOT:

- Heat or burn the batteries.
- Expose the batteries to high impact/excessive force.
- Crush or puncture the batteries.
- Use batteries with signs of damage or corrosion.
- Charge or store the batteries near combustible material.
- Exceed IP-ratings.
- Overcharge or fully discharge the batteries.

Safety feature

Lithium ion batteries contain several mechanisms to protect themselves from being damaged due to excessive use. In case of overheating, the device will activate a thermal protection. No power output will be available until the temperature is again within normal operating range.

Overheating may occur by extensive use at high temperatures or when exceeding the duty cycle (see product label).

Lead acid batteries

Maintenance of batteries

Prior to first use of LINAK® batteries, please make sure that they are charged at least 24 hours and if possible even longer for proper functioning and prolonging the battery lifetime.

Replacement of batteries

The batteries must only be replaced by the same type of batteries or mechanical and electrical equivalent types. The batteries must be new or maintained by means of charging at least every 6 months. The batteries, which make a set, must be supplied with identical production codes.

Production code mismatch may lead to a severely reduced lifetime expectancy.

Before mounting, ensure that the battery set is correctly connected, compare with the drawing in the battery room and check that no connectors are loose.

Warnings in connection with battery replacement

Please observe the following maintenance, replacement, and disposal requirements to ensure a safe and reliable operation.

The batteries are to be replaced after 4 years at the latest. Perhaps earlier, depending on the pattern of use. Frequent and high-powered discharges reduce the battery life. For an optimum lifetime, the product must be connected to the mains voltage as often as possible. It is recommended that the batteries are to be charged for at least every 6 months - otherwise the batteries will have reduced capacity due to self-discharge. It is recommended to test the battery function at least once every year.

The battery compartment is hermetically separated from the electronics compartment. When replacing the batteries this separation must not be damaged or modified as this may allow penetration of battery gas into the electronics compartment with risk of explosion.

When replacing batteries in waterproof products (IPX5 and IPX6), precautions must be taken that the sealing material (silicone ring or joint filler) is not damaged and that it is correctly placed in the groove. Hereafter, the screws in the cover are to be fastened with approx. 1 Nm.
If necessary, replacement sealing is available at LINAK.

The battery compartment is supplied with ventilation that ensures correct and necessary airing of the battery compartment. This airing must not be blocked or covered as a positive pressure may occur with risk of explosion.

If the product has been exposed to mechanical overload (lost on the floor, collision/squeezing in the application or a powerful stroke), the product must be sent to an authorised workshop for control of the hermetic separation between the battery and electronics compartment.

Disposal

Lead acid batteries must be disposed of in the same way as car batteries. Alternatively, they may be returned to LINAK.

System description

LINAK® actuators, lifting columns and electronics have been developed for use in all places where a linear movement is required.

LINAK products can for example be used for:

- Adjustment of beds
- Patient lifts within the care and hospital sector
- Adjustment of dentist chairs/gynaecological chairs

Connecting the system

Do not connect the mains cable until all actuators and hand controls have been connected to the control box.

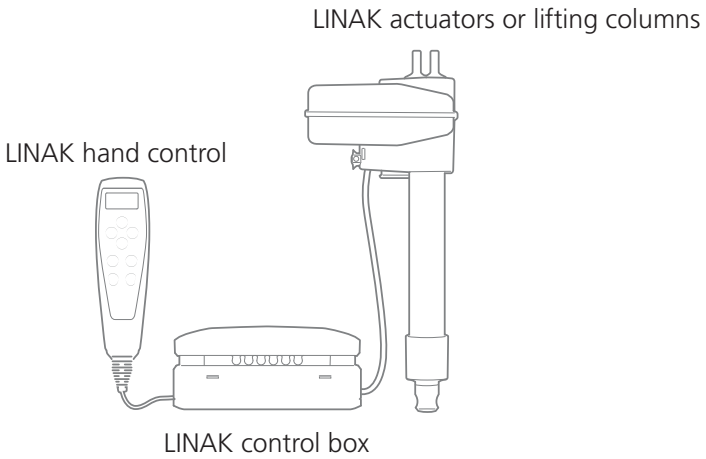
Start by connecting the hand control to the control box. The connection in the control box is marked with "HB".

Connect the different actuators to the different channels on the control box. Each channel is marked with a number (e.g. "1", "2", "3"…….).

Check that all plugs are well connected and firmly pushed into the connector. Due to the fact that LINAK® control boxes are designed for a high IP degree, a firm force can be required.

Connect the mains cable.

The actuators can now be operated by pressing a button on the hand control button.



Any non-detachable power supply cord with mains plug is considered to be the disconnecting device.

Charging is only allowed in dry environment, and the appliance inlet must be thoroughly dried before connecting to mains.

General environmental conditions

Operating, storage and transport	
Operating temperature Relative humidity Atmospheric pressure	+5 °C to +40 °C 20% to 80% - non-condensing 700 to 1060 hPa (Rated to be operated at an altitude ≤ 3000 m)
Storage temperature Relative humidity Atmospheric pressure	-10 °C to +50 °C 20% to 80% - non-condensing 700 to 1060 hPa (Rated to be stored at an altitude ≤ 3000 m)
Transport temperature Relative humidity Atmospheric pressure	-10 °C to +50 °C 20% to 80% - non-condensing 700 to 1060 hPa (Rated to be transported at an altitude ≤ 3000 m)
These values apply unless specified otherwise in the product-related texts.	

Information on start-up, deinstallation and operation

Before installation, deinstallation or troubleshooting

- Stop the actuator/lifting column.
- Switch off the power supply or pull out the mains plug and pull out the plug to the actuator/lifting column.
- Relieve the actuator/lifting column of any loads, which may be released during the work.

Before start-up

- Make sure that the system has been installed as instructed in the relevant product manual.
- The individual parts (actuator/lifting column/hand controls etc.) must be connected before the control box is connected to the mains.
- Make sure that the mains voltage to be connected to the product or the system is the one stated on the label.
- The equipment can be moved freely over the whole working area of the actuator/lifting column.
- Check correct function after mounting.
- The actuator/lifting column must not be loaded in excess of the values indicated in the specifications on the product label.
- The duty cycle noted on the product label must always be observed. Otherwise there is a risk of product damage. Exceeding the duty cycle will result in a dramatic reduction of the system lifetime.
- Unless specified otherwise on the product label, the duty cycle is max. 10%, max. 2 minutes in use followed by 18 minutes not in use.
- The actuator/lifting column system may only be used in an environment corresponding to the IP rating of the system. LINAK products are marked with the actual IP rating on the label.
- If the actuator is assembled in the application and is exposed to push or pull during transportation, the actuator can be damaged.
- If any individual parts are suspected to be damaged, do not install the parts, but return them for inspection/service.

During operation

- Check for unusual sounds and irregular movement. Stop the actuator/lifting column immediately if anything unusual is observed.
- If the control box makes unusual noises or smells, switch off the mains voltage immediately and the external battery, if any.
- Take care that the cables are not damaged.
- Unplug the mains cable on mobile equipment before it is moved.

Cleaning

The products can be cleaned as described in the following according to their IP protection stated on the product label.

The IP code specifies the protection degree provided by the enclosures. For most products, only the protection against ingress of water (second characteristic numeral) is specified, ingress of solid foreign objects or dust (first characteristic numeral) is not specified and therefore replaced by the letter X in the code. However, it should be noted that compliance with the requirements of IEC 60601-1 automatically allows to rate the medical equipment as IP2X because the requirements of IEC 60529 for this rating are the same as the accessibility requirements.

IP protection	Cleaning instructions
IPX0	Clean with a damp cloth
IPX1	Clean with a damp cloth
IPX2	Clean with a damp cloth
IPX3	Clean with a damp cloth
IPX4	Clean with a damp cloth
IPX5	Wash with a brush and water, but not water under pressure
IPX6	Wash with a brush and water. The water can be under pressure, but the system must not be cleaned directly with a high pressure cleaner. Max. 20 °C
IPX6 Washable according to IEC 60601-2-52	Clean by the use of wash tunnels according to IEC 60601-2-52
IPX6 Washable DURA™	Clean by the use of wash tunnels according to IEC 60601-2-52, extended washing cycle test

To avoid degreasing of the piston rod, the actuator should be retracted to minimum stroke and without load before washing.

Cleaning warnings

The systems must not be sprayed directly with a high pressure cleaner.

Interconnecting cables must remain plugged in during cleaning to prevent water ingress.

Cleaning with a steam cleaner is not permitted

UV cleaning is not permitted.

IPX6 Washable

LINAK® washable products frequently undergo a fully regulated washing test.

At LINAK, 'IPX6 Washable' means that the products conform only to this test.

Standard washing procedure

Reference: The standard IEC 60601-2-52 newest revision, which includes special demands to fundamental safety and relevant functional characteristics for hospital beds.
The demands for the washing process are described in the German "Maschinelle Dekontamination" from the organisation AK-BWA (Arbeitskreis Bettgestell- und Wagen-Dekotaminationsanlagen).

Description: At LINAK, the washing test takes place in an instrument washing machine, which is fitted and programmed in such a way that it duplicates the process used in a typical hospital installation for the cleaning of beds and other medical equipment.
During the test, the products are exposed to both thermal and chemical effects.
To avoid degreasing of the piston rod, the actuator should be retracted to minimum stroke and without load before washing.

Preparation: As plastic materials to a larger or lesser degree change characteristics and shape with time and climatical exposure, an ageing of the products is carried out first. The conditions for ageing are 65 °C +/- 2 °C in normal dry air for 10 days followed by a minimum of 16 hours at room temperature before the washing process starts.

Water: Degree of hardness, no more than 5° dH and no demineralised water.

Detergents: **LINAK recommends the following products:**

Sekumatic FDR or FRE from Ecolab

Neodisher Dekonta from Dr. Weigert

Thermosept NDR from Schülke or similar with a pH-value of 5 - 8 and in a concentration of 0.5 %

Rinsing aids

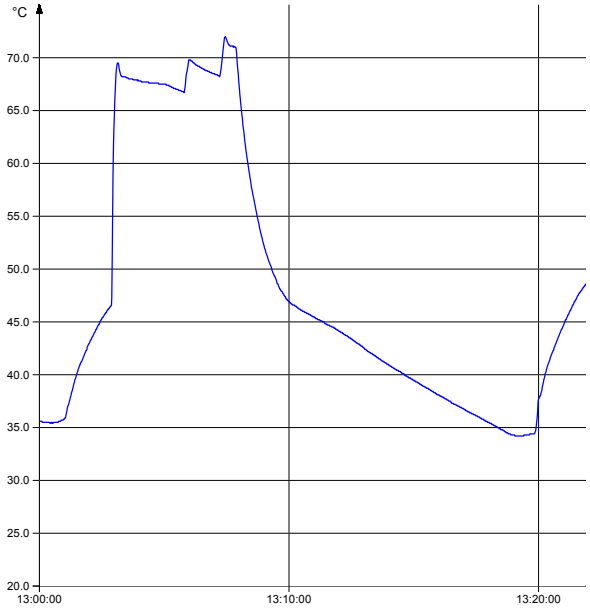
LINAK® recommends the following products:

- Sekumatic FKN from Ecolab
- Neodisher BP or TN from Dr. Weigert
- Thermosept BSK from Schülke or similar with a pH-value of 5 - 8 and in a concentration of 0.2 %.

Demands to chemicals:

- They must not contain caustic solutions
- They must not change the surface structure or adhesive properties of the plastic
- Must not break down grease

LINAK washing profile according to IEC 60601-2-52



LINAK washing machine

IPX6 Washable DURA™

Description of washing test

LINAK washable products frequently go through a fully controlled washing test. The LINAK term "IPX6 Washable DURA" signifies that the products conform exclusively to this test.

The "IPX6 Washable DURA" washing test is used to ensure that products that are rated "IPX6 Washable DURA" comply with the agreed terms and conditions. This washing test differs from the norm EN60601-2-52 as the products are not aged and each washing cycle is followed by a 30 minute cooling process.

Further information regarding the washing process can be found in the German document "Maschinelle Dekontamination" from the organisation AK-BWA.

Estimated time consumption: Approximately 1 month.

Amount of samples: During the development process, the number of tested samples is in accordance with GP082. During running production, the number of tested samples complies with UM-41-22-001.

General: The process applies to the IPX6 Washable DURA system.

Test conditions:

- The units are not aged.
- Products with adhesive foils must be hardened before ageing.
- The hardening time depends on the used adhesive, but is typically 3 days at 20°C.
- The units are washed with new plugs/cables.
- The cables should be as long as possible and free ends should be shut off.
- Detergent and rinsing aids used:
  - Detergent 1: DR. WEIGERT neodisher Dekonta AF
  - Rinsing aid 1: DR. WEIGERT neodisher TN

Test procedure:

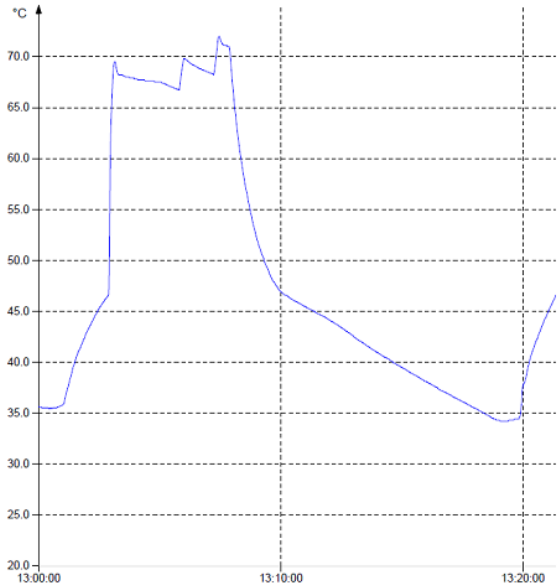
- The units are placed in the washing machine in the intended mounting direction (in the most sensible direction regarding water penetration, if this is not the same direction).
- The washing process (see picture below) is repeated 11 times and consists of:
  - Washing with 0.3 % alkaline detergent for 2 minutes in 70 °C hot water. (Note: the temperature is measured in the tank, not necessarily at the unit).
  - Rinsing with neutral rinsing aid for 20 seconds.
  - Drying and cooling for 30 minutes in the open air at approx. 20 °C.
- After 11 cycles, the products are left in a ventilated room for 24 hours. The above steps are repeated until a total of 250 cycles has been reached.
- Immediately after washing and after further 24 hours, the products are subjected to a high voltage test in accordance with UM-31-30-072.
- A population sample of the products is opened for water penetration control immediately after the washing test.
  Accept criteria are in accordance with UM-20-30-002.

Options: The following options can be used for the test:

- The units may be weighed prior to and after the washing test to detect water.
- The bubble test may be used to detect any leakages.
- X-ray may be used to detect any leakages.

LINAK washing profile for the “IPX6 Washable DURA” process

LINAK washing profile according to DURA™



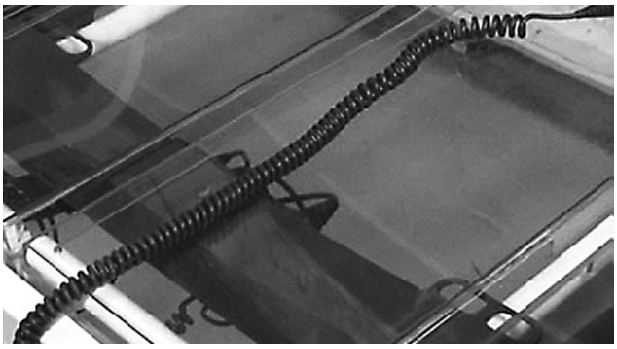
(Note: The temperature is measured at the unit)

LINAK washing machine

Cable wash

Before the washing procedure starts

In order to maintain the flexibility of the cables, it is important that the cable is placed in such a way that the cable’s own weight does not strain the coil during the washing process. This can be done by placing the cable ON the bed or another form of support for the cable. Please see the examples in the picture to the right.



General maintenance

If not otherwise stated in the specific product section.

- LINAK products must be cleaned at regular intervals
- Frequent inspection for malfunction, mechanical damage, wear and cracks. Worn-out parts must be replaced
- Inspection/maintenance intervals are to be recommended by the medical device manufacturer
- LINAK products are closed units and require no internal maintenance
- LINAK products must be IPX6 Washable and IPX6 Washable DURA when cleaning in wash tunnels
- O-rings: When individual parts are replaced in a LINAK IPX6, IPX6 Washable or IPX6 Washable DURA system, the O-rings must be replaced at the same time on all parts. On all products where replaceable cables or fuses have been dismounted or replaced, the O-ring must be replaced, and the O-rings and the receptacle insert must be greased with an acid-free Vaseline.

Maintenance of all LINAK lifting columns

- Actuators/lifting columns must be regularly inspected at attachment points, wires, piston rod, enclosure, and plugs, and it must be checked that the actuators/lifting columns function correctly
- To ensure that the pregreased inner tube remain lubricated, the actuator must only be washed when the piston rod is fully retracted

Repair and disposal

Only an authorised LINAK® service centre should repair the LINAK actuator systems. Systems to be repaired under warranty must be sent to an authorised LINAK service centre.

In order to avoid the risk of malfunction, all actuator repairs must only be carried out by an authorised LINAK Service shop or repairers, as special tools and parts must be used.

If a system is opened by unauthorised personel there is a risk that it may malfunction at a later date.

LINAK systems or components may be disposed of, possibly by dividing them into different waste groups for recycling or combustion.

We recommend that our product is disassembled as much as possible at the disposal and that you try to recycle it. LINAK systems or components should be disposed of in accordance with the environmental regulations applicable in the respective country.

Troubleshooting

Symptom	Possible cause	Action
No motor sound or movement of piston rod	- The actuator is not connnected to the control box - Blown fuse in the control box - Cable damaged	- Connect the actuator to the control box - Fuse must be changed - Send actuator for repair
Excessive electricity consumption		- Send actuator for repair
Motor runs but spindle does not move	- Gear wheel or spindle damaged	- Send actuator for repair
Actuator cannot lift full load	- Clutch is worn - Motor is damaged	- Send actuator for repair
Motor sound but no movement of piston rod		- Send actuator for repair
No signal from Reed or Hall switch		- Send actuator for repair
Motor runs and quick release does not function or is noisy	- Declutching arm turns less than approx. 75 °C	- Adjust cable
Piston rod will only move inwards and not outwards	- Safety nut has operated	- Send actuator for repair
	- Not connected to mains	- Connect to mains
Power indicator does not light up	- The fuse has blown	- Replace fuse, if the system is prepared for external fuse replacement, or send the system for repair
	- Defective power cable	- On control boxes with exchangeable power cable, change the cable. - On control boxes with fixed cable, send it for repair
	- Control box defective	- Send control box for repair
	- Actuator plug not pushed into control box properly	- Push actuator plug properly into control box
Power indicator lights up, but actuator does not run	- Actuator defective	- Replace actuator - Defective control box - Replace the control box
Control box relays are clicking	- Control box defective	- Send control box for repair
Power indicator lights up, but actuator does not run	- Hand control defective	- Send hand control for repair
No relay noise is heard from control box Not valid for CB20/CB6S OBF/CB16 OBF	- Battery completely flat	- Charge battery
Control box completely dead on battery and no relay clicking	- Battery defective	- Replace battery
	- Actuator plug not properly pushed into control box	- Push actuator plug properly into control box
Actuator does not run on battery, but relay clicking can be heard	- Actuator defective	- Replace actuator
	- Control box defective	- Replace control box
	- Hand control defective - Control box defective	- Send hand control for repair - Send control box for repair
Control box okay apart from one direction on one channel		

BL1

The BL1 is a 3-part lifting column designed to be used for example in hospital beds, nursing home beds, treatment chairs, couches and dental chairs.

The lifting column is compact and has a long stroke length. The 3-part guidance enables an overlap between the individual profiles, which ensures a high degree of stability.

The lifting column has an open spindle actuator with a chain drive inside which is practically noiseless.

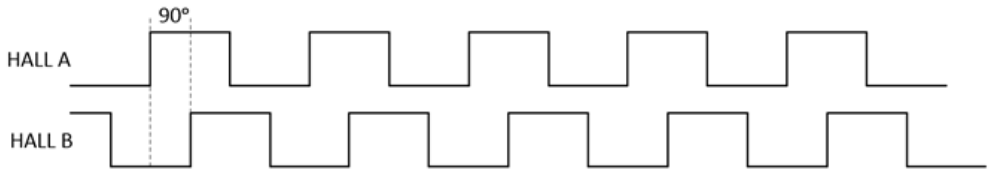
Usage

Duty cycle:	10%, 2 minutes continuous use followed by 18 minutes not in use
Operation temperature:	+5 °C to +40 °C
Storage temperature:	-10 °C to +50 °C
Compatibility:	For detailed compatibility, please contact LINAK.
Relative humidity:	20% to 80% – non-condensing
Atmospheric pressure:	700 to 1060 hPa
Meters above sea level:	Max. 3000 meters
Approvals	IEC60601-1, ANSI/AAMI ES60601-1 CAN/CSA-22.2 No 60601-1 IEC 60601-1-6 IEC 60601-1-2

Input/output specifications: dual Hall, digital positioning

Column with Dual Hall (BL141H) are equipped with two hall sensors, A and B and a spindle magnet. In this way you can have pulses from the column when it moves.

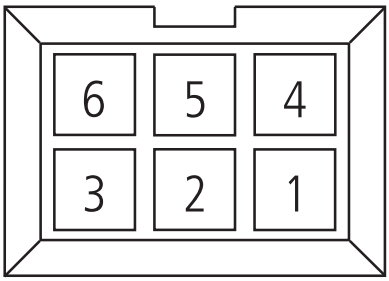
The feedback system has a 8P magnet which gives 16 shifts in pulses per spindle turn.



Hall output

4 mm spindle = 0.25 mm per pulse and 400 pulses per 100 mm stroke.
9 mm spindle = 0.5625 mm per pulse and 178 pulses per 100 mm stroke.

Pin 1	GND
Pin 2	VCC
Pin 3	M+
Pin 4	HALL A
Pin 5	HALL B
Pin 6	M-



Information

The motor must always be short-circuited to obtain self-locking in accordance with the rated label value.

Recommendations

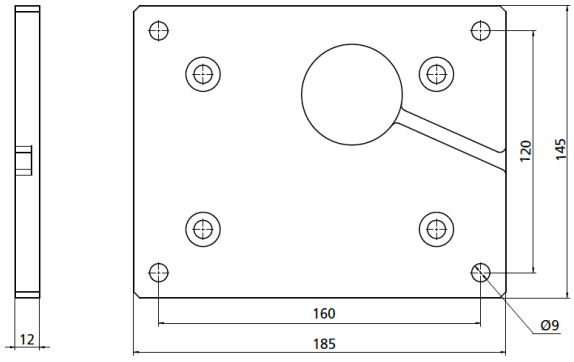
- Please follow the important BL1 mounting guidelines.
- Max. storage temperatures: +50 °C.
- BL1 is for use in push applications, cable outlet from smallest profile (top) or biggest profile (bottom). See top and bottom plate dimensions.
- When washing according to IPX6 parameters, it is not allowed to splash water directly onto the plastic frames between the profiles. Direct splashing is only permitted on the aluminium profiles. Alternatively, BL1 can be mounted upside down with the largest profile at the top. In this configuration, no IP rating applies.

Warnings

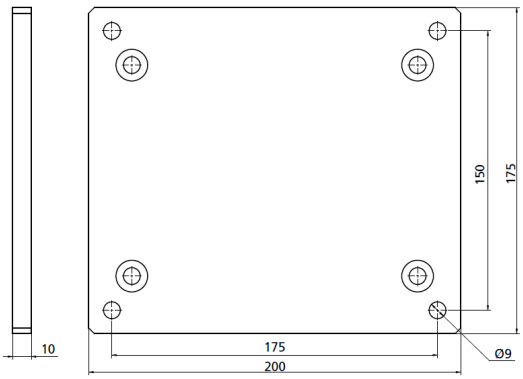
- BL1 is heavy (9.8 kg). To avoid personal injury, DO NOT DROP
- Do not adjust anything during movement, can cause personal injury
- LINAK recommend using a safety nut in medical applications
- A broken chain causes a drop of half the length of actual stroke. Therefore do not overload
- The BL1 is designed for use in push applications, dynamic "Pull forces" can result in damage to the column and cause collapse of the application.
- Do not loosen any screws on the BL1, this can cause collapse of the column
- LINAK recommends making regular measurement of Class 1 protective ground conductivity in the application to avoid a disconnected grounding cable. Worn out or defect parts must be replaced.

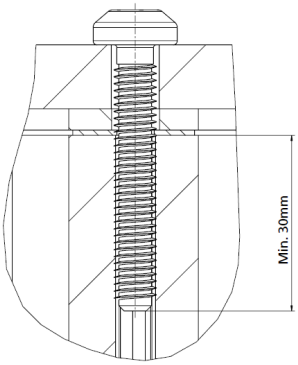
BL1 end plate kit

Top plate dimensions:



Bottom plate dimensions:





BL1 mounting guidelines

- BL1 is for use in push applications, and can be mounted in both directions (smallest profile down, or up). Note: The cable outlet can be positioned at the top (smallest profile). If the option with integrated cable is chosen, the cable outlet can also be positioned at the bottom (biggest profile).
  No IP rating applies when BL1 is mounted with the largest profile at the top (see illustration).
- It is very simple to mount the BL1 in the application using the 4 mounting holes in both endplates.
- Use 4 self-tapping screws, in each end, for mounting to the application.
  Use EJOT PT type DG Ø8, screw depth must be min. 30 mm in aluminium profile.
  Screw torque: 15 - 17 Nm.
- If the column has been loosened from the application, it is very important that the self-tapping screws are mounted in the same thread, to ensure the same strength in the thread. Therefore we recommend that the screws are loosened no more than 1 or 2 times.

BL1 is for use in push applications to obtain IPX6. The mounting direction must be with the largest profile down. It is very simple to mount the BL1 in the application using the 4 self-tapping screws in the mounting holes of both endplates.

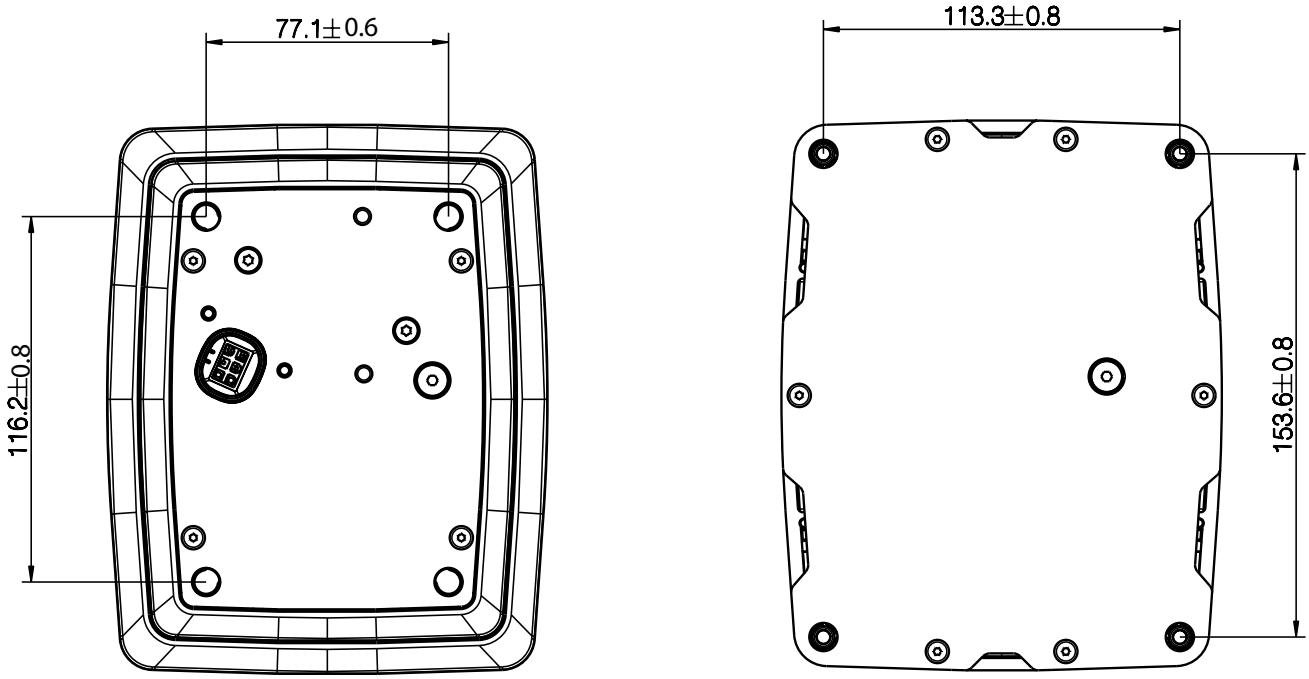
Top plate up

✓ IPX6

Top plate down

✓ IPX0

If the lifting column is mounted upside-down, there is NO ingress protection.



Drawing no.: 0807000-1

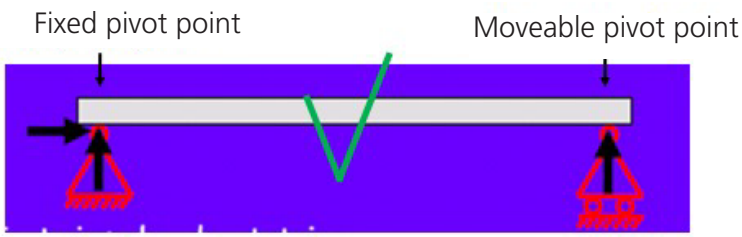
Recommendations

- The mounting plate in the application must cover the entire top plate of the BL1 and be strong enough to carry the load.
- Remember to secure the cable mounted in the top of the column to the application, so that it cannot be pulled out of the column. We recommend to use LINAK Cable:
  - Lock kit for BL1 with motor cable: 0808040
  - Lock kit for BL1 with hand control cable through: 0808046

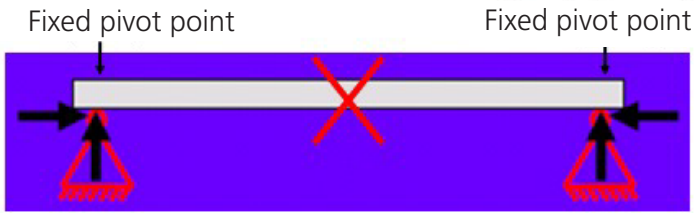
  Use only the screws included in the kit.
- For motor cable mounted at the top, use the long screw with the coarse thread.
  Screw torque 1.7 Nm.
- For motor cable mounted at the bottom and for cable through, use the short screw with the fine thread.
  Screw torque 2.7 Nm.
- Electro Static Discharges!
  There is no electrical connection through the length of the BL1 column. Therefore, to avoid ESD issues, consider external potential alignment between the top and bottom of the bed frame.
  To connect for further earth wiring in the application, use an appropriate ø8 mm cable shoe under one of the 8 mm screws at both the top plate and the bottom plate.
- Remember to mount the blind plugs in the top plate if the motor cable is connected from the bottom plate to ensure the IPX6 protection.

When mounting more than one BL1 you need to consider the fixation:

Example 1.

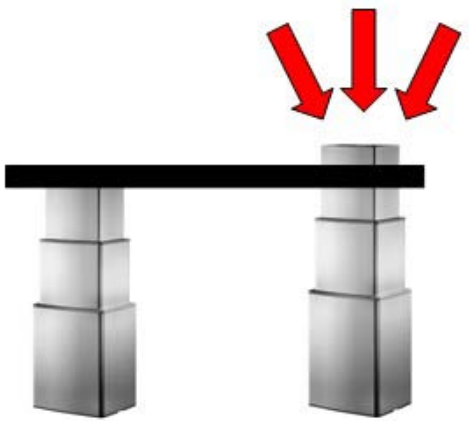


Example 2.



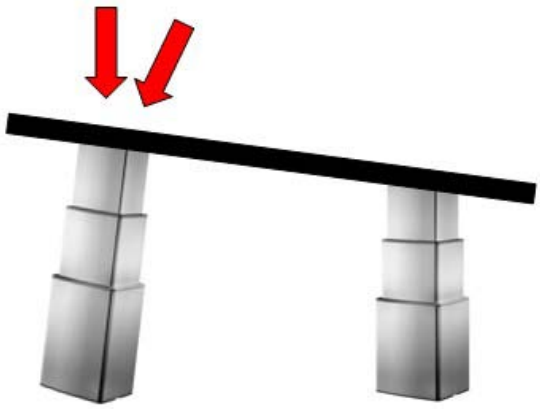
The reason why it is important only to fix one column, is that the columns will not move exactly in parallel – even if you have positioning such as hall.

If more than one column is fixed it can lead to dangerous situations.



If you have a trend/anti-trend function in your application, you need to mount one or more BL1s with a slider.

Having sliders prevents the column from bending as illustrated below.



LC1

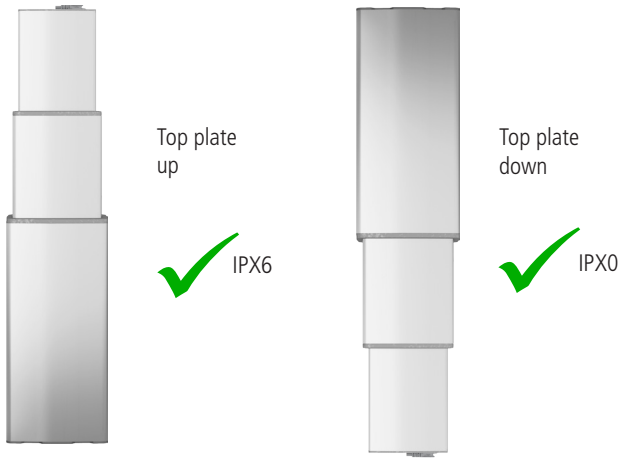
The lifting column LC1 is tailor-made for use in medical applications and adds a powerful and stable new option to the LC family of columns. The 3-stage telescopic column has many customisation possibilities, both as to height and performance, and offers a more precise choice of movement within the range of up to 4,000 N.

Usage

Duty cycle:	10%, 2 minutes continuous use followed by 18 minutes not in use
Operating temperature:	+ 5 °C to + 40 °C
Storage temperature:	10 °C to +50 °C
Compatibility:	Compatible with LINAK or customer-own control boxes. Please contact LINAK for further information.
Relative humidity:	20% - 80%, non-condensing
Atmospheric pressure:	700 to 1060 hPa
Meters above sea level:	Max. 3000 meters
Approvals:	IEC 60601-1 ANSI/AAMI ES60601-1 CAN/CSA-C22.2 NO. 60601-1

Mounting guidelines

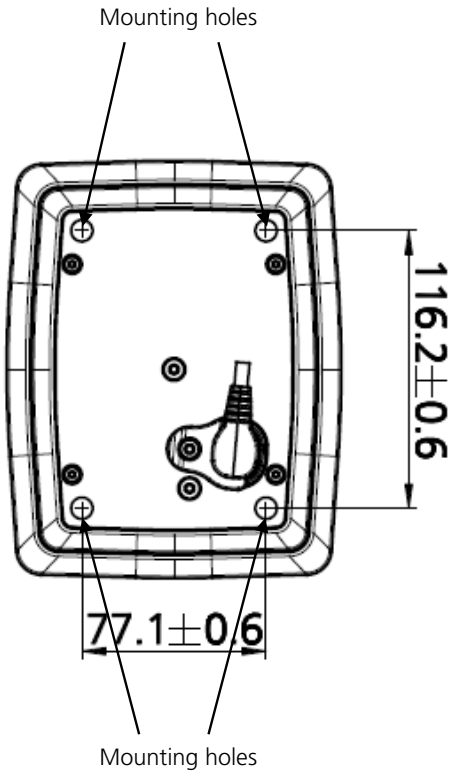
LC1 is for use in push applications to obtain IPX6. The mounting direction must be with the largest profile down. It is very simple to mount the LC1 in the application using selftapping screws in the mounting holes of both endplates.

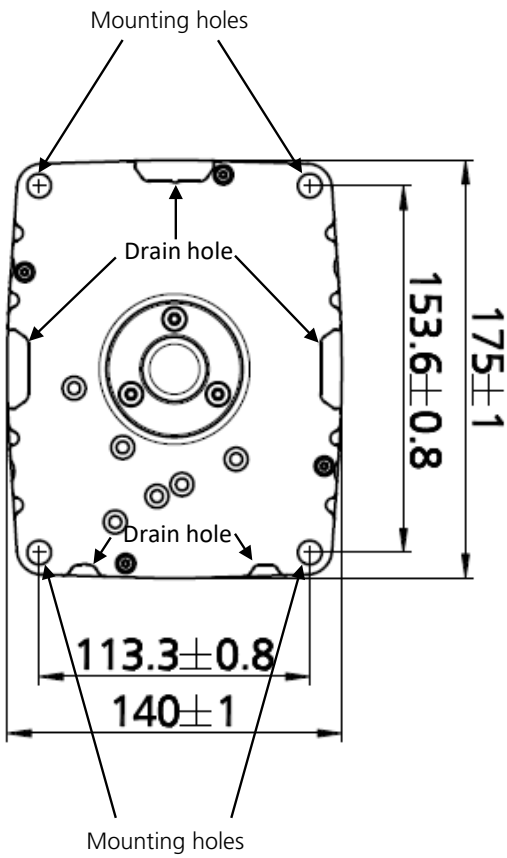


If the lifting column is mounted upside-down, there is NO ingress protection (IP).

Information

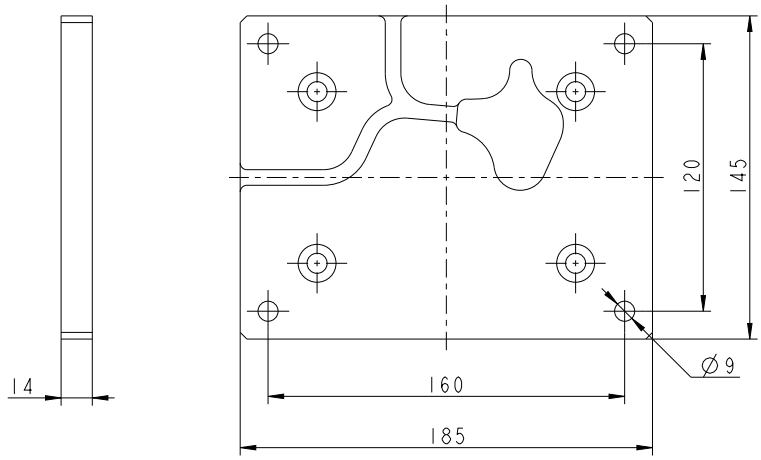
If LC1 is used in pull, special mounting might be needed to avoid personal injuries.





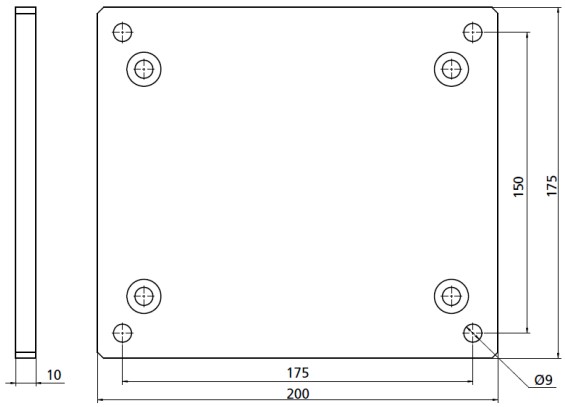
Mounting plates

Top plate



Drawing no.: 1053w4006

Bottom plate

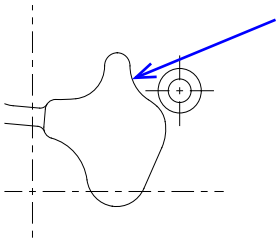


Drawing no.: 0801263

Customer production of top and/or bottom mounting plates:

LINAK can forward a 3D drawing with dimensions that comply with the customer choice of cables/plugs.

If the customer uses own top plate design, remember to make a drainage hole to drain water from the area around the cable plug to obtain IPX6.

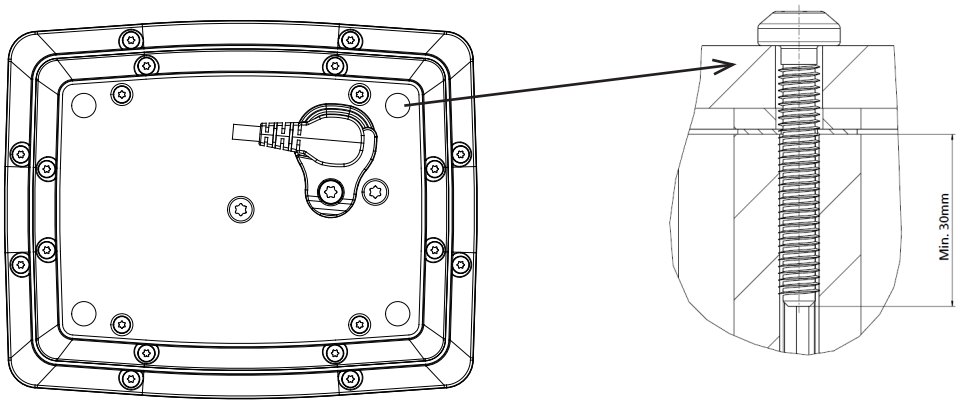


Mounting screws

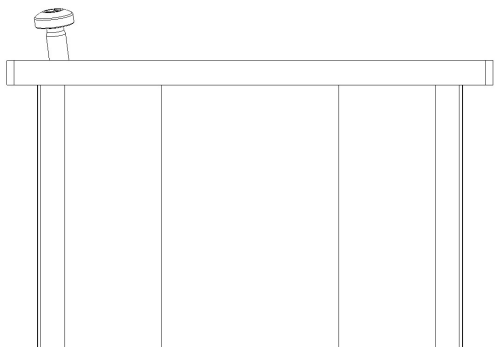
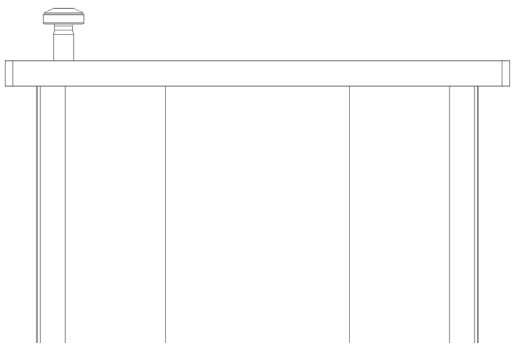
For the safety factor and off-centre load specifications to be valid, the correct mounting screws must be used.

The thread engagement length needs to be minimum 30 mm (into the aluminium profile).

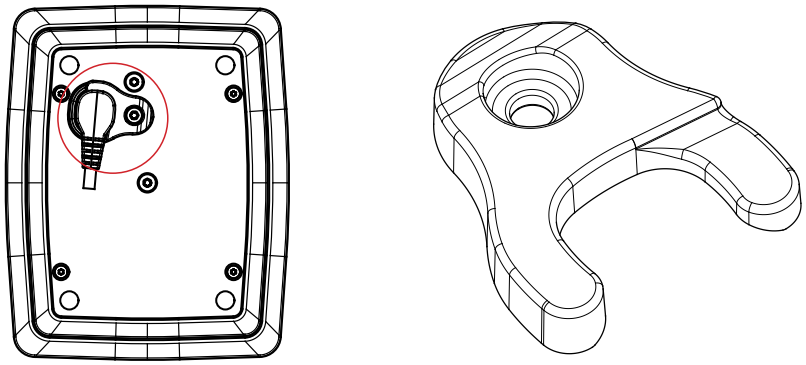
Recommended screw torque is 20 Nm ±10%.



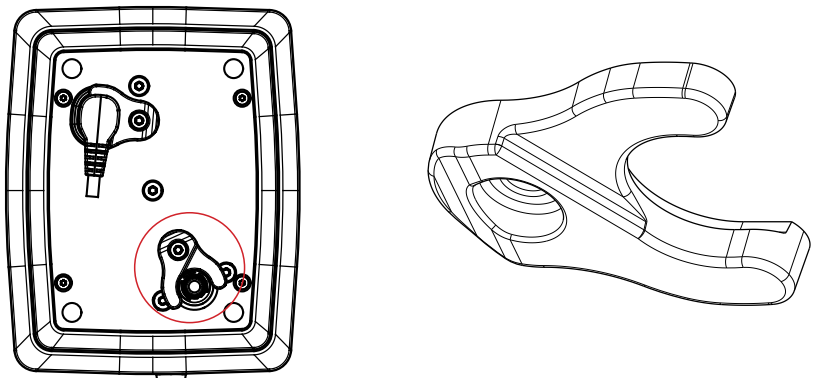
Screw length for LC1-R:
max. 50 mm

Wrong positioning of screw	Correct positioning of screw
	

Cable lock



Kit LC1 cable lock, item no.:
1053W8011



Kit LC1 HB cable lock, item no.:
1053W8021

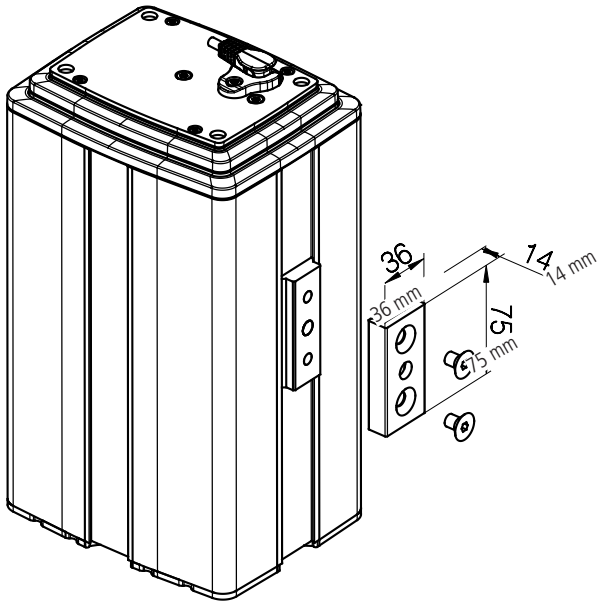
For proper cable mounting, use cable lock and self-tapping screw.

Recommended torque for cable lock is 2.5 Nm ± 0.5 Nm.

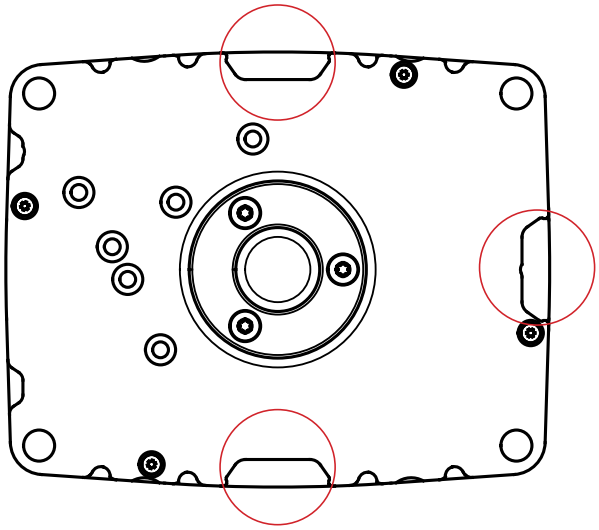
Mounting bracket for LC1-D profile

The mounting bracket can for instance be used for placement of an extra actuator, customised cover for encapsulation, control box, computer etc.

Mounting bracket order number: 0578006



Mounting brackets only possible on 3 sides:



Bracket dimensions

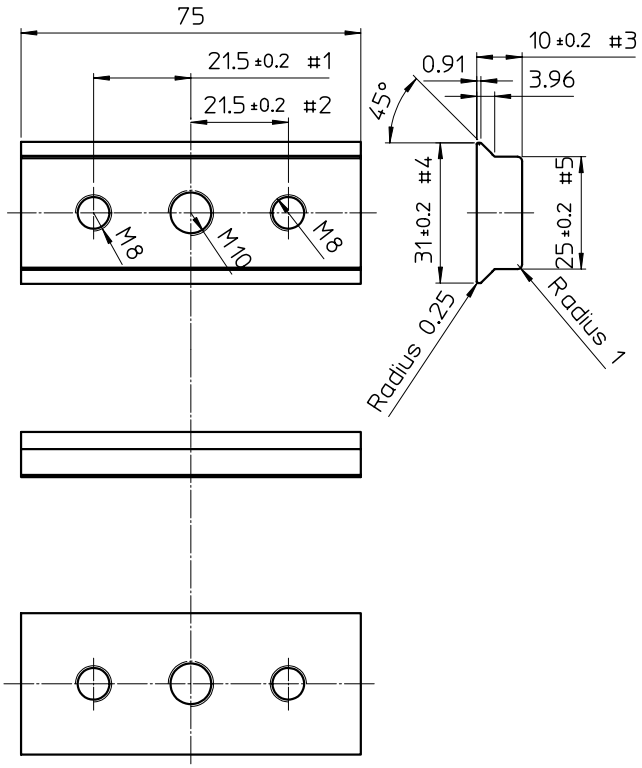


Figure 1 Mounting bracket dimensions (mm)

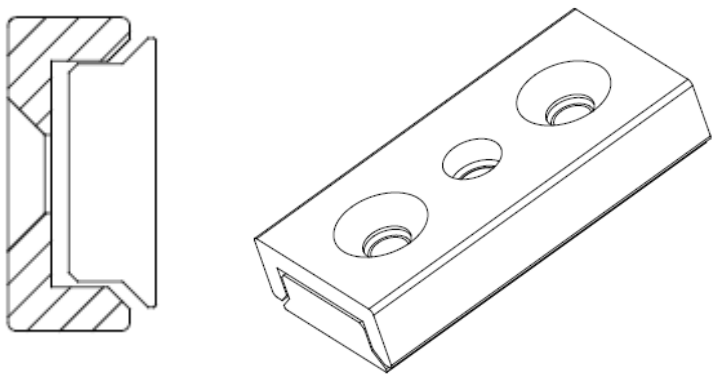


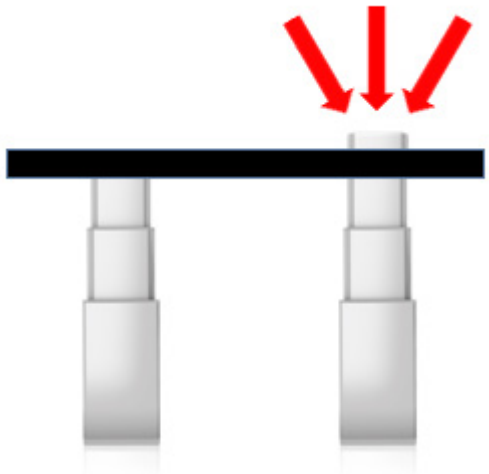
Figure 2 Mounting bracket assembled

Mounting guideline for two LC1 columns in application

When mounting more than one LC1 you need to consider the fixation:

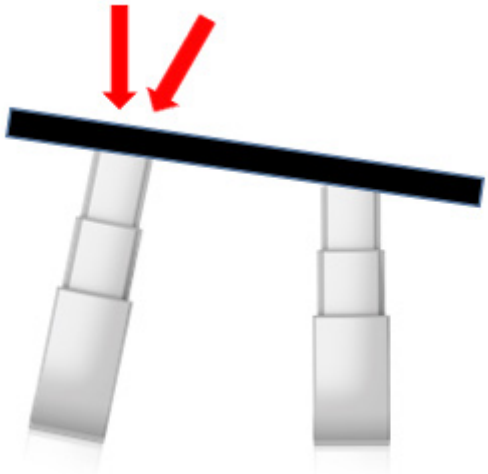
The reason why it is important only to fix one column is that the columns will not move exactly in parallel – even if you have positioning such as Hall.

If more than one column is fixed, it can lead to dangerous situations.



If you have a trend/anti-trend function in your application, you need to mount one or more LC1 columns with a slider.

Sliders prevent the column from bending as illustrated below.



Recommendations

- Be aware to mount the cable plug correctly. The cable slot must fit into the socket.
- Remember to secure the cable mounted in the top of the column to the application so that it cannot be pulled out of the column. We recommend to use LINAK cables:
  - Lock kit for Mini-Fit cable: 1053W8011
  - Lock kit for hand control cable through: 1053W8021
    - Use only screws that are included in the kit. Screw torque = 2 Nm
- The cables coming out of the side of the column should follow the guidelines below. The internal radius should not be less than 3 times the outer dimension - OD - of the cable. If the outer cable dimension is Ø7 for instance, the internal radius of the maximum cable bending is 21 mm.

LC1 - protective grounding cable

- LC1 has potential equalisation between top and bottom plate but the middle profile is not grounded.
- It is recommended to use screws with thread-lock adhesive
- Screws of high-quality steel 8.8 or 10.9 must be used to secure safe mounting of the LC1 to the application.

Feedback specifications

E2 (Signal)	
1	NC
2	COMMON EOS*
3	M+ (Motor/Power)
4	EOS IN
5	EOS OUT
6	M- (Motor/Power)

*EOS equal to end of stroke

E3 (Encoded)	
1	GND
2	VCC
3	M+ (Motor/Power)
4	Analogue encoded (Hall-A+EOS* IN/OUT)
5	NC
6	M- (Motor/Power)

*EOS equal to end of stroke

Analogue encoded	EOS
2.65V-3.25V	NONE
2.15V-2.65V	NONE
1.65V-2.15V	OUT
1.15V-1.65V	OUT
0.65V-1.15V	IN
0.05V-0.65V	IN

E3 (Encoded) F3 (dual Hall encoded)	
1	GND
2	VCC
3	M+ (Motor/Power)
4	Analogue encoded (Hall-A+EOS* IN/OUT)
5	Hall B
6	M- (Motor/Power)

*EOS equal to end of stroke

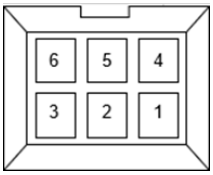
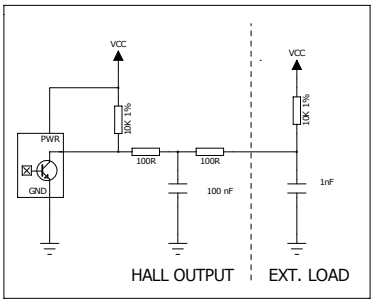
Interval	Hall-A	EOS
2.65V-3.25V	LOW	NONE
2.15V-2.65V	HIGH	NONE
1.65V-2.15V	LOW	OUT
1.15V-1.65V	HIGH	OUT
0.65V-1.15V	LOW	IN
0.05V-0.65V	HIGH	IN

E1 (Power switch)	
1	NC
2	NC
3	M+ (Motor/Power)
4	NC
5	NC
6	M- (Motor/Power)

E1 (Power switch) F2 (dual Hall) See next page	
1	GND
2	VCC
3	M+ (Motor/Power)
4	Hall A
5	Hall B
6	M- (Motor/Power)

Input/output specifications: dual Hall positioning

Dual Hall encoded (F3) is used only for LINAK control boxes.
Dual Hall digital (F2) is used for non-LINAK control boxes.

Item	Specification	Comment
Pin configuration	Pin1 GND Pin2 VCC Pin3 M+ Pin4 HALL A Pin5 HALL B Pin6 M-	Connector in LC1 housing 
VCC	4-15V	
Current	Maximum 15mA @10kΩ and 1nF load. See diagram.	
Resolution	Number of dual Hall state shifts/ spindle turn: N ≅ 108 state/turn: 6 mm spindle: 12/108 10 mm spindle: 20/108	

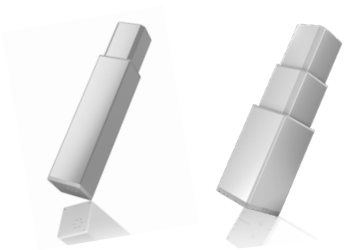
Recommendations

- Always follow the important LC1 mounting guidelines and LINAK specifications to ensure correct functionality.
- LC1 is for use in push applications, cable outlet from (smallest profile) top plate. See top plate dimensions.
- Always use LINAK compatible components and ensure that the application functionality is tested with all accessories connected before bringing it into service.
- The mounting plate in the application must cover the entire LC1 bottom plate and be strong enough to carry the load.
- If LC1 is not mounted/used in vertical position, the internal cable may get squeezed inside the lifting column.
-
- Regular cleaning is recommended to reduce bacteria and increase the hygiene level. Do not use chemicals for cleaning.
- When washing according to IPX6 parameters, it is not allowed to splash water directly onto the plastic frames between the profiles. Direct splashing is only permitted on the aluminium profiles. Alternatively, LC1 can be mounted upside down with the largest profile at the top. In this configuration, no IP rating applies Shielding of sockets is necessary to prevent direct water column pressure.
- The LC1 is intended for indoor use and NOT for use in harsh environments, like for instance pool or marine environments and agriculture buildings with ammonia vapors.
- Collection of water on the top plate will result in drainage failure.
- Assure free space for movement of application in both directions to avoid blockade.
- Do not expose the column to high intensity ultraviolet radiation disinfection lamps as this may damage supporting parts and cables.

Warnings

- The LC1 is heavy and weighs 9.0 kg. To avoid personal injury, DO NOT DROP!
- Always use cable lock to ensure fixation of cables and take care that the cable cannot be squeezed, pulled or subjected to any other stress or damage.
- Make a proper cable installation and inspect regularly for wear, damage and jarring sound to avoid cable interruption and actuator defects. Defective parts must be replaced.
- A damaged housing can cause moisture to gather and lead to dangerous electrical connections between metal parts and wires.
- Always check correct assembly after mounting and service to ensure that the cable locks are mounted.
- Take special precaution concerning third party interfacing. Please contact LINAK® for further information.
- Do not exceed the max. pull load specified on the label.
- Do not add dynamic load when changing between pull and push.
- Do not adjust anything during movement or while connected to mains as this may cause personal injury.
- Interconnecting cables must remain plugged in during cleaning to prevent the ingress of water.
- Be aware that water may enter the lifting column, if cable lock is not used.
- Mount with top late upwards to obtain IPX6.
- After service inspection, the application must be tested for correct functionality before it is brought into operation to avoid misalignment between two columns moving in parallel.
- LINAK recommends to make regular measurements of Class 1 protective ground conductivity in the application to avoid a disconnected grounding cable. If there are worn-out or defective parts, the complete LC1 column must be replaced.
- If LC1 is used in ceiling-hang applications, a third party safety device or safety harness must be used to prevent personal injuries.

LC3



The LC3 2-stage and 3-stage set the standard for vertical lifting columns to high-end medical applications.

This compact lifting column fulfils the market requirements for a solid and stable lifting column.

Usage

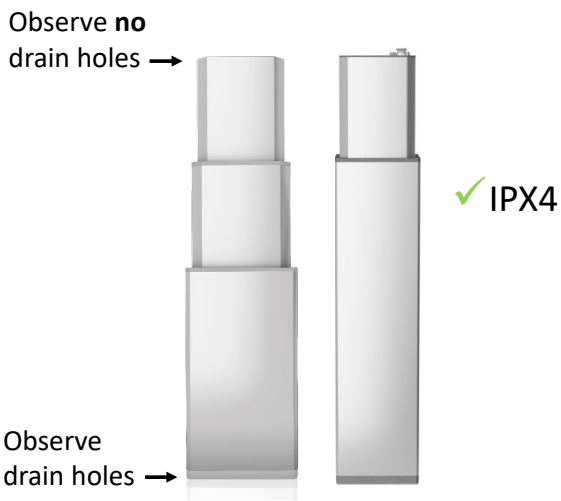
Duty cycle:	10%, 2 minutes continuous use followed by 18 minutes not in use
Operating temperature:	+ 5 °C to + 40 °C
Storage temperature:	-10 °C to +50 °C
Compatibility:	Compatible with LINAK® control boxes. Please contact LINAK for further information.
Relative humidity:	20% to 80%, non-condensing
Atmospheric pressure:	700 to 1060 hPa
Meters above sea level:	Max. 3000 meters
Approvals:	IEC 60601-1 IEC 60601-1-6 ANSI/AAMI ES60601-1 CAN/CSA-C22.2 No. 60601-1

LC3 mounting guidelines

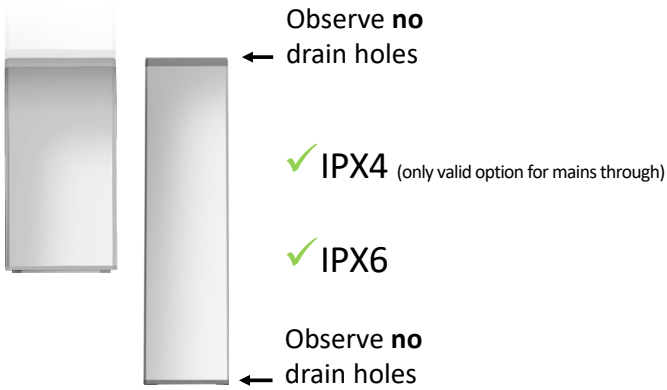
LC3 is for use in push or pull applications and can be mounted in both directions – largest profile down or largest profile up. LC3 must be specified for specific mounting direction.

Mounting direction according to item number nomenclature.

Top plate up



Top plate down



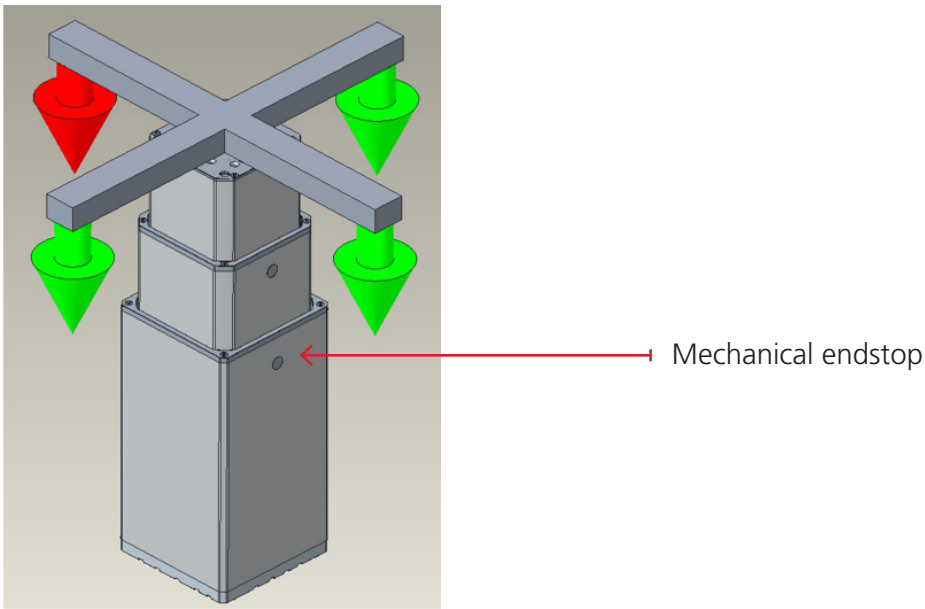
When the LC3 is mounted with the largest profile upwards, the column has IPX6 protection. The LC3 must be fully retracted to be rated IPX6.

When you choose an LC3 with mains through, top plate up (largest profile downwards) is not an option.

Note: The cable outlet for motor connection can be positioned at the top (smallest profile) or from the side of the column.

It is very simple to mount the LC3 in the application using the 4x M10 mounting holes in both endplates.

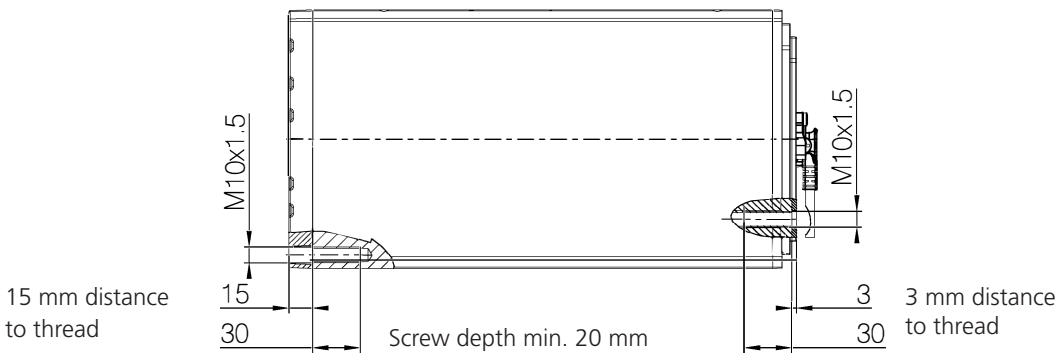
If the column is to be used with a high off-center load, we recommend to install the weight in one of the 3 ways illustrated by the green symbols. It is not recommended to install the weight on the opposite side of the mechanical endstop as illustrated with the red symbol. This installation can create an uneven movement when the lifting column reaches the endstop position.



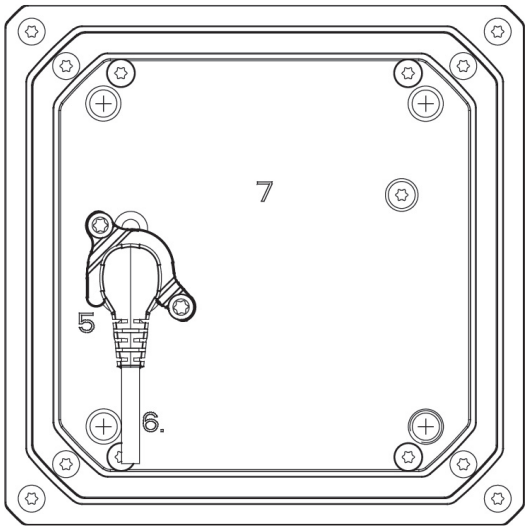
Use 4 pcs. M10 8.8 screws at each end of the column for mounting to the application. The screw depth must be min. 20 mm and max. 30 mm in the aluminum profile.

Screw torque: 35 Nm.

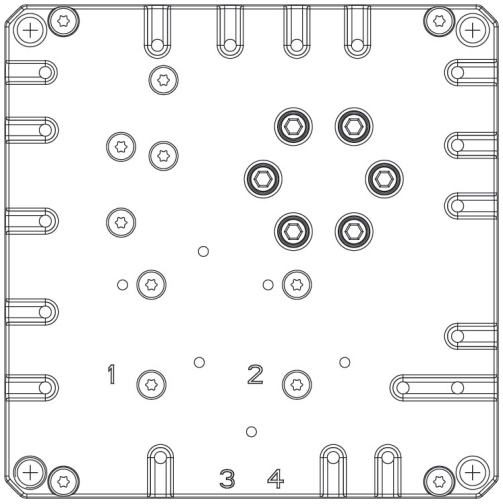
LC3 3-Stage



Mounting holes, top

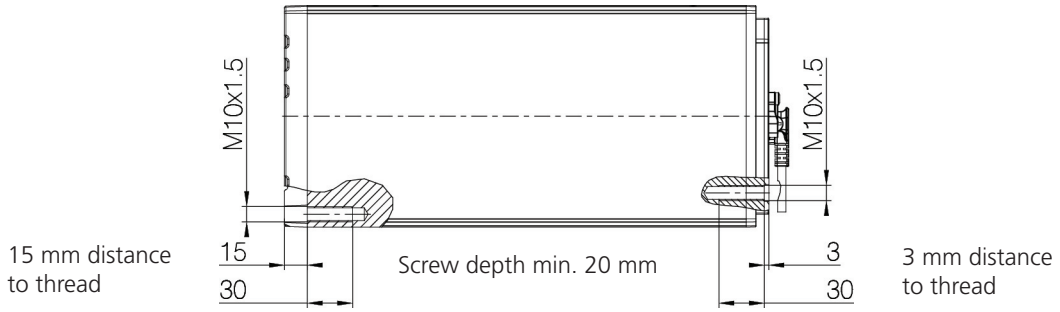


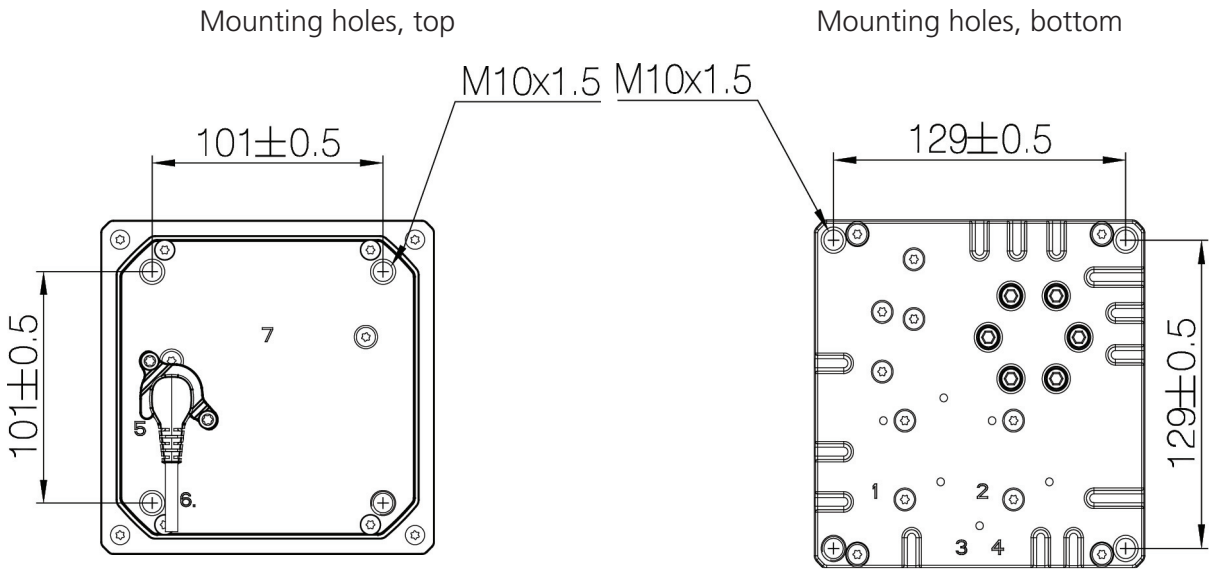
Mounting holes, bottom



Drawing no.: 1002W9005

LC3 2-Stage





Notice that the cable plug must be mounted correctly. The cable slot must fit into the socket.

Information

Remember to secure the cable mounted in the top of the column to the application, so that it cannot be pulled out of the column.

We recommend to use LINAK Cable:

- Lock kit for minifit cable: 1002W8136-A.
- Lock kit for hand control cable through: 1002W8137-A

Use only the screws included in the kit. Screw torque: 2 Nm

Information

The cables coming out of the side of the column should follow below guidelines. The internal radius should not be more than 3 times the outer dimension – OD - of the cable. For instance if the outer cable dimension is Ø7, the internal radius of the maximum cable bending is 21 mm.

Information

- LC3 3-stage - protective grounding cable
- LC3 has potential equalization between top and bottom plate but the middle profile is not grounded.

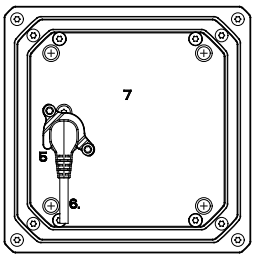
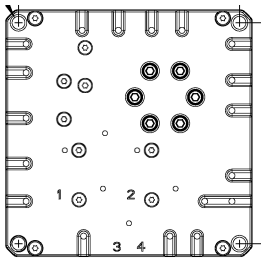
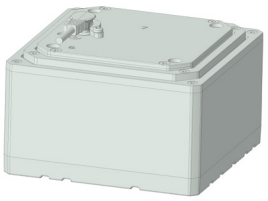
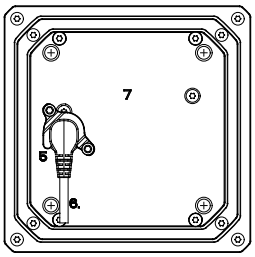
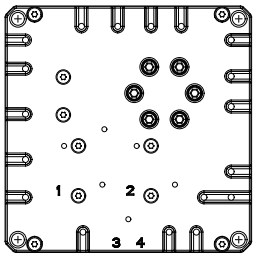
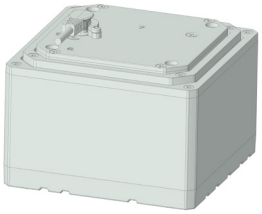
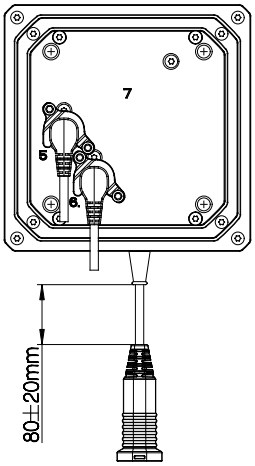
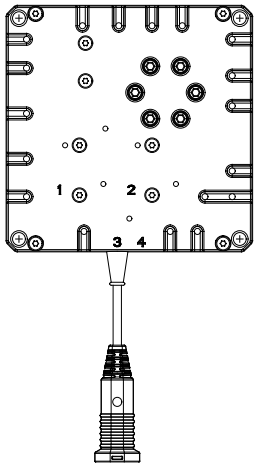
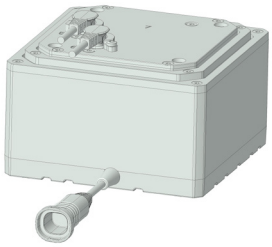
Information

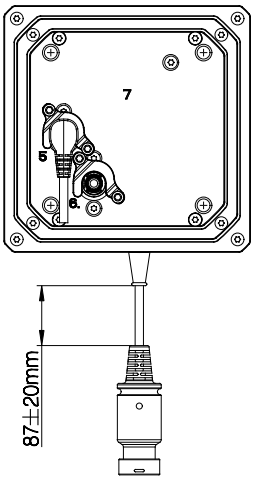
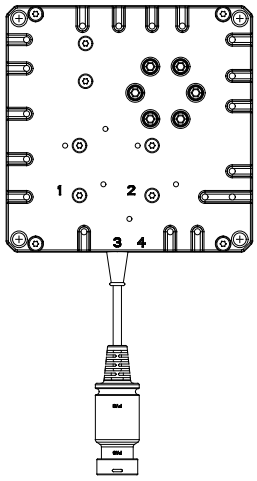
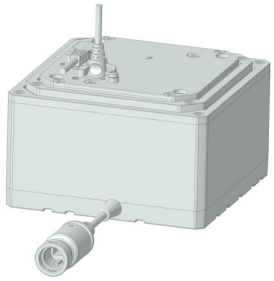
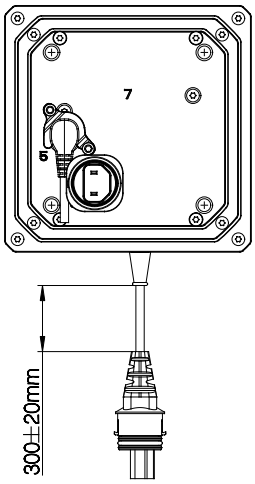
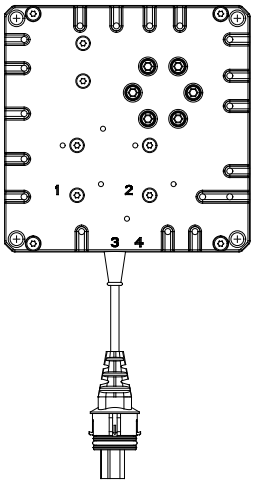
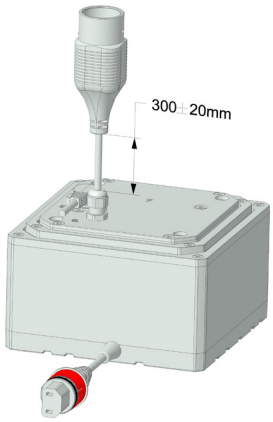
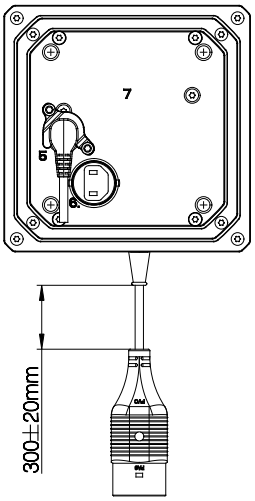
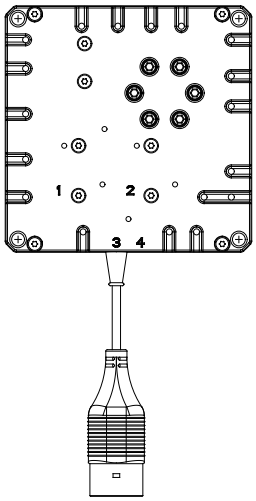
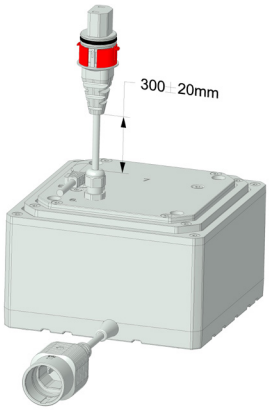
- It is recommended to use screws with thread-lock adhesive
- Screws of high quality steel 8.8 or 10.9 must be used to secure safe mounting of the LC3 to the application.

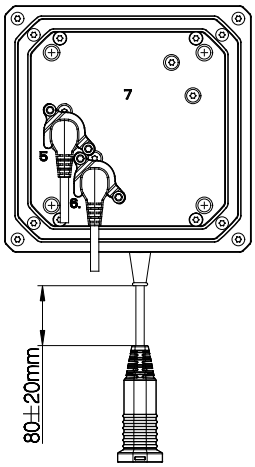
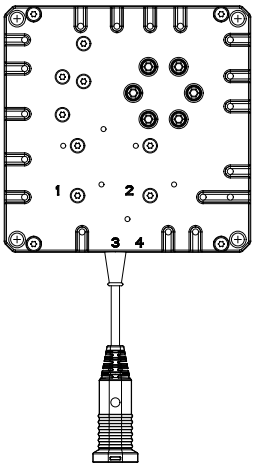
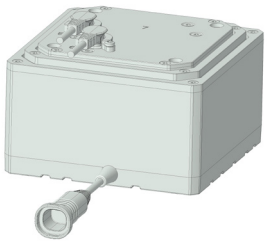
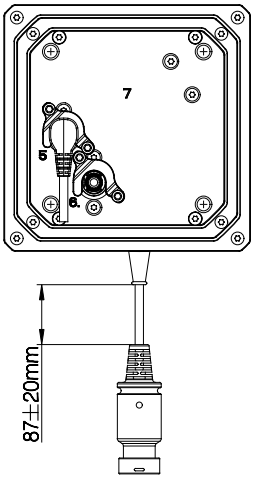
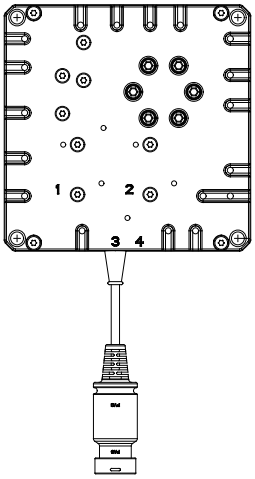
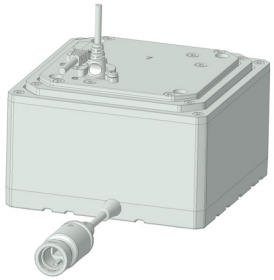
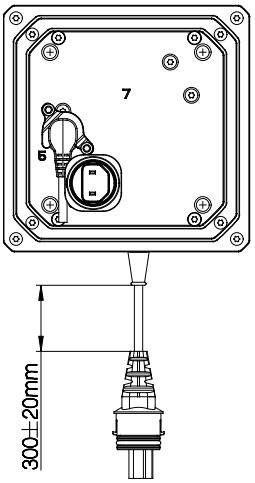
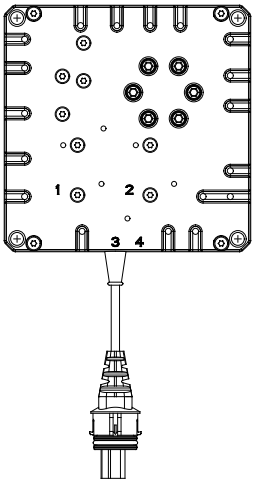
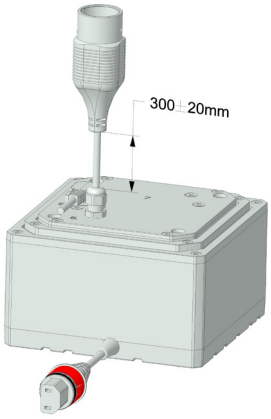
Cable connections overview

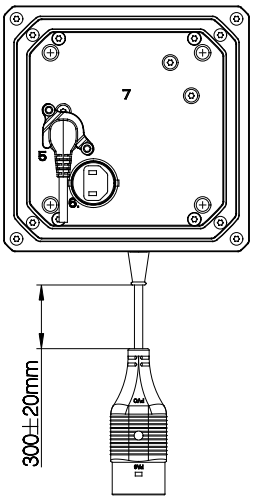
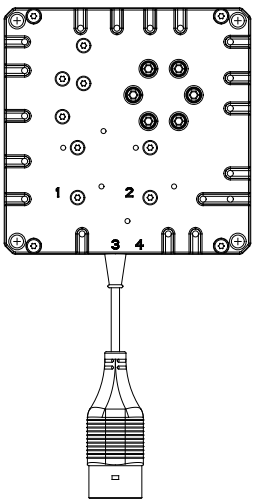
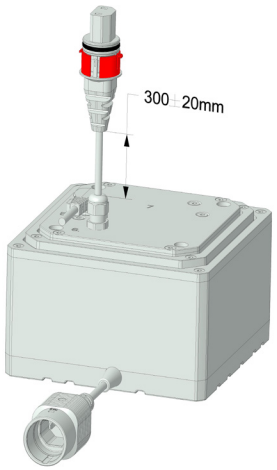
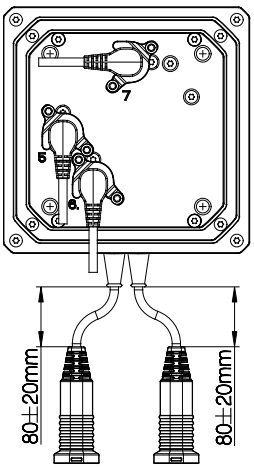
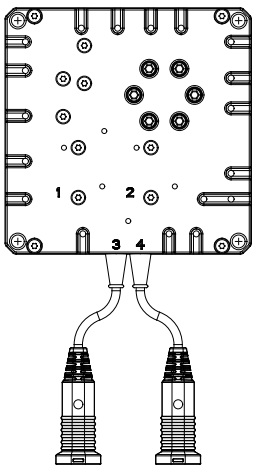
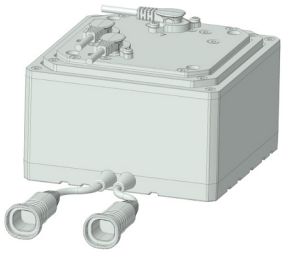
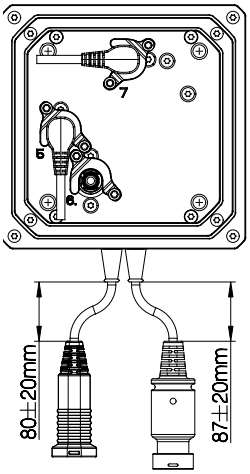
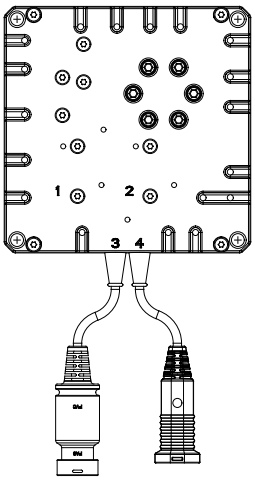
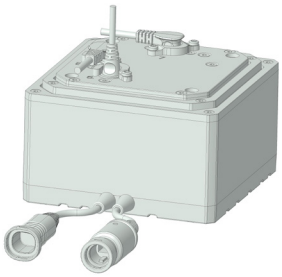
3-stage is used as examples but variants are also applicable for 2-stage.

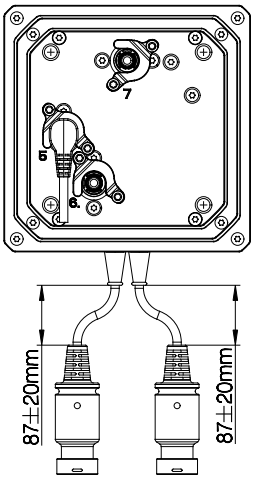
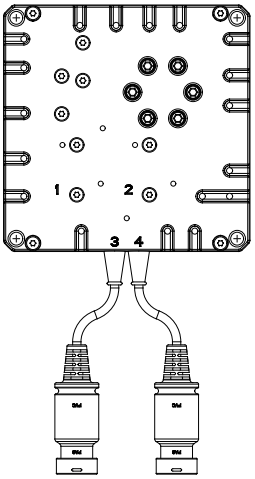
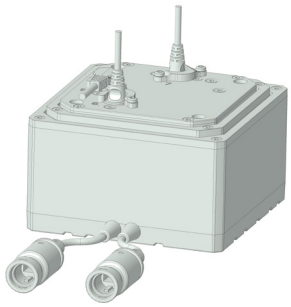
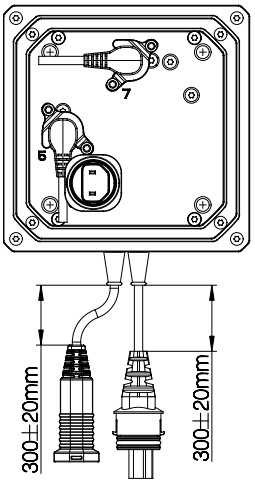
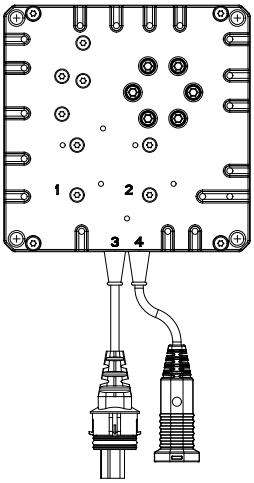
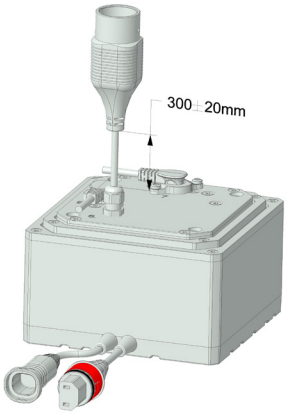
This overview shows all possible cable connections, but please notice that some variants are upon request.

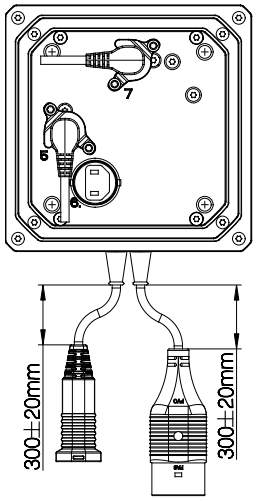
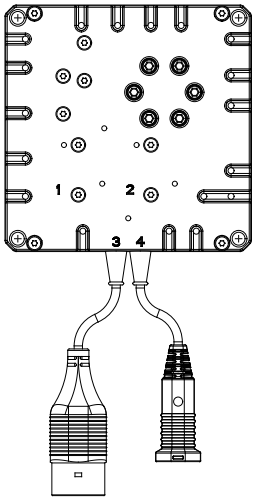
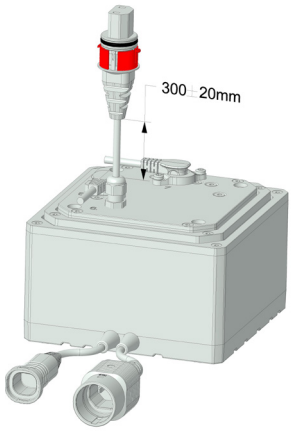
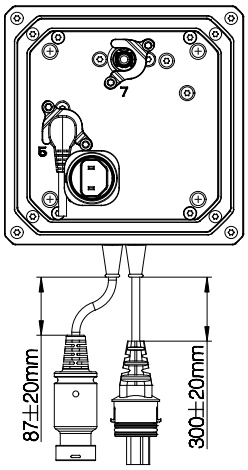
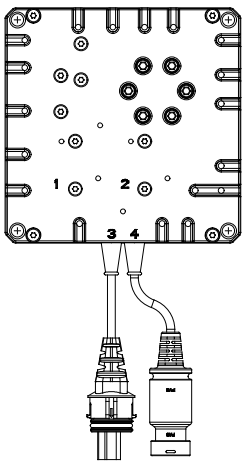
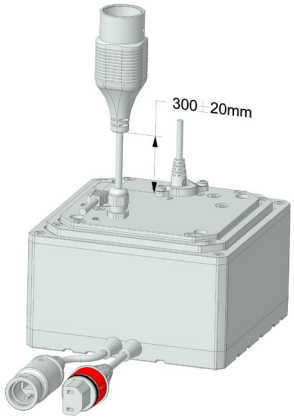
Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
T000				
Connections	5: Motor			
T001				
Connections	5: Motor			Including protective grounding cable
T100				
Connections	5: Motor 6: Minifit through	⟷	3: Minifit through	

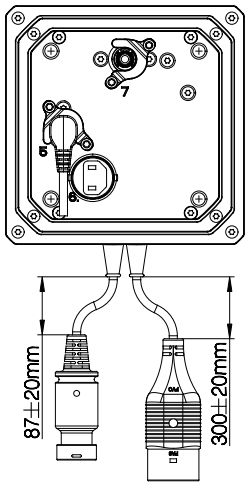
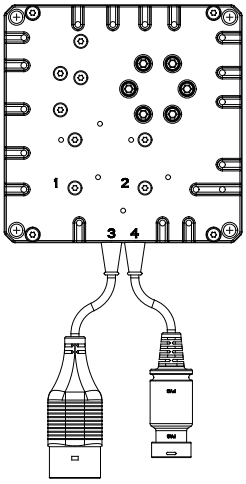
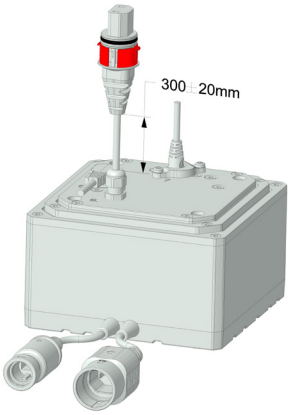
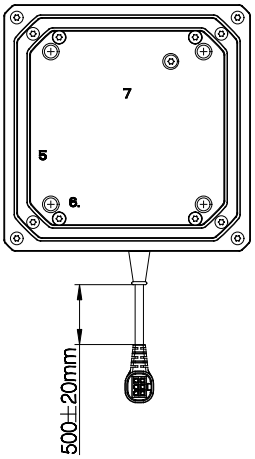
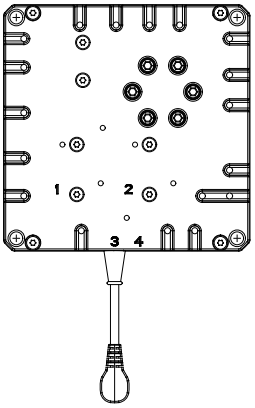
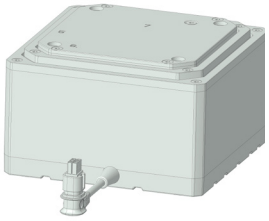
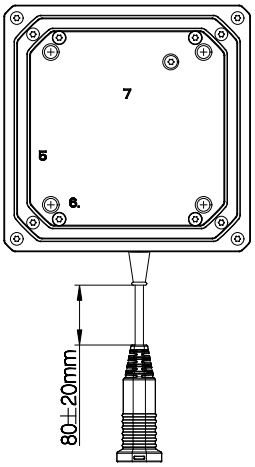
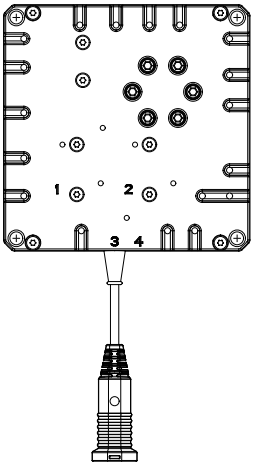
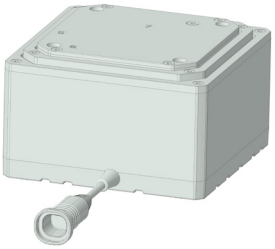
Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
T200				
Connections	5: Motor 6: HB through	⟷	3: HB through	
T030				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 1-2 pin	⟷	3: Mains through 1-2 pin	
T040				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 2-2 pin	⟷	3: Mains through 2-2 pin	

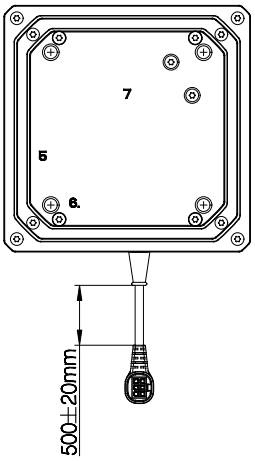
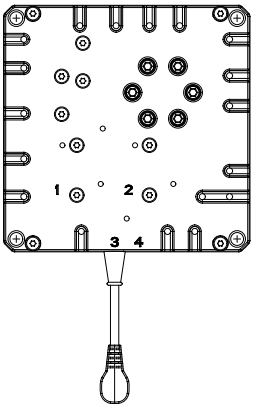
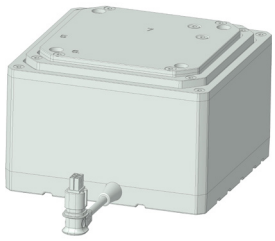
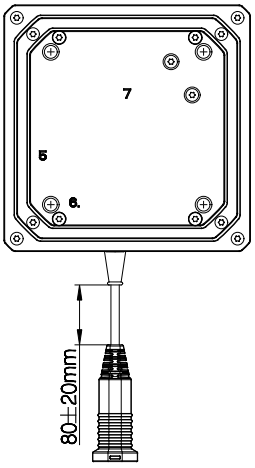
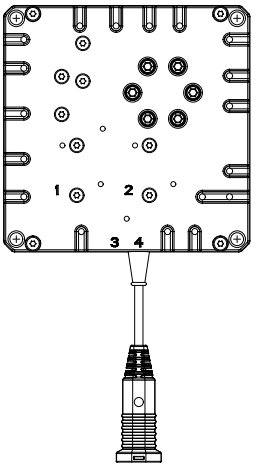
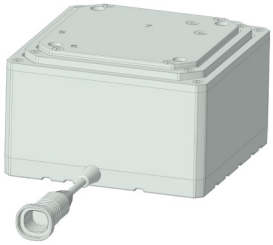
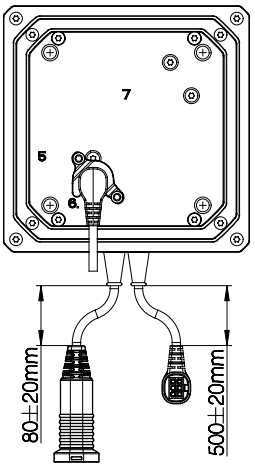
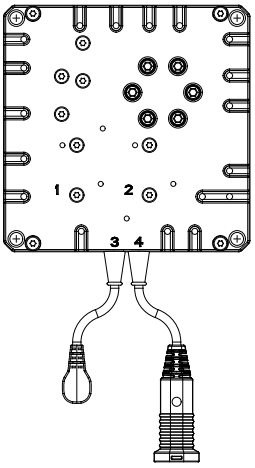
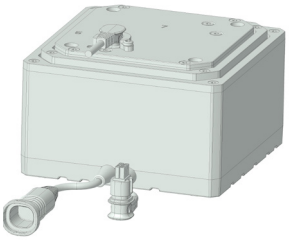
Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
T101				
Connections	5: Motor 6: Minifit through	⟷	3: Minifit through	Including protective grounding cable
T201				
Connections	5: Motor 6: HB through	⟷	3: HB through	Including protective grounding cable
T031				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 1-2 pin	⟷	3: Mains through 1-2 pin	Including protective grounding cable

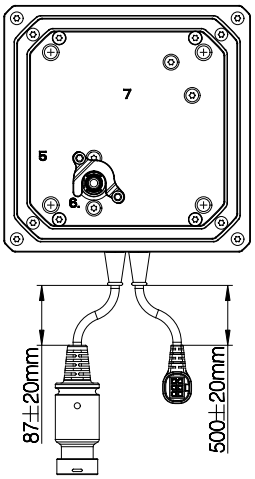
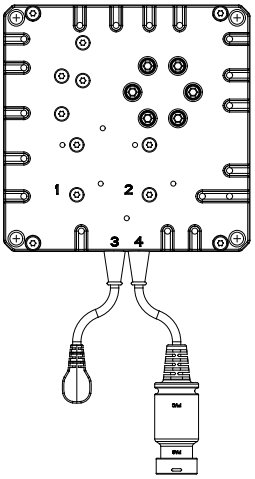
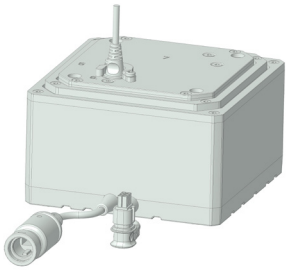
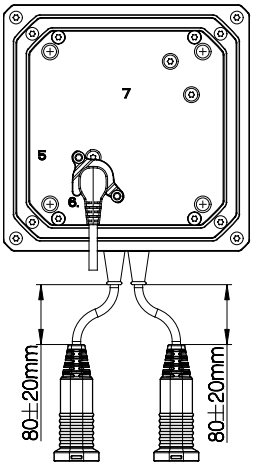
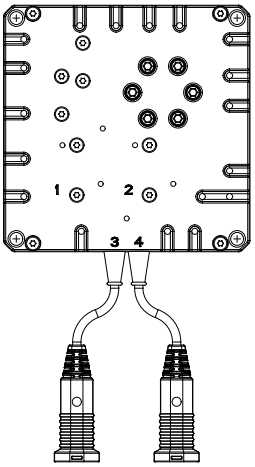
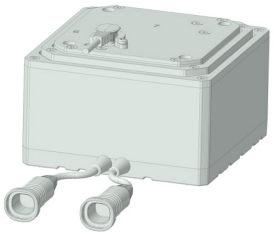
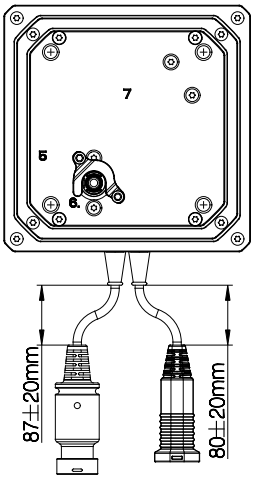
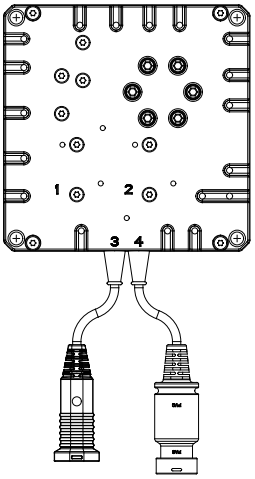
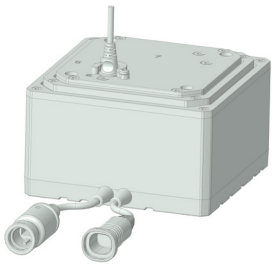
Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
T041				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 2-2 pin	⟷	3: Mains through 2-2 pin	Including protective grounding cable
T110				
Connections	5: Motor 6: Minifit through (top) 7: Minifit through (top)	 ⟷ ⟷	 3: Minifit through (side) 4: Minifit through (side)	
T120				
Connections	5: Motor 6: HB through 7: Minifit through	 ⟷ ⟷	 3: HB through 4: Minifit through	

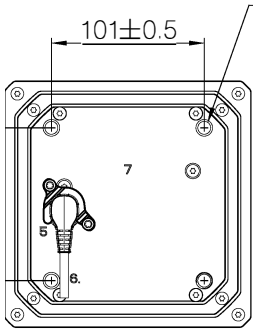
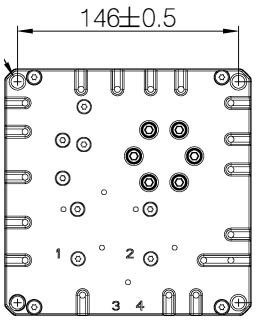
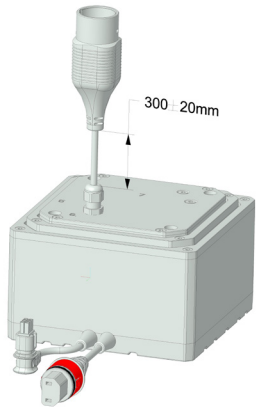
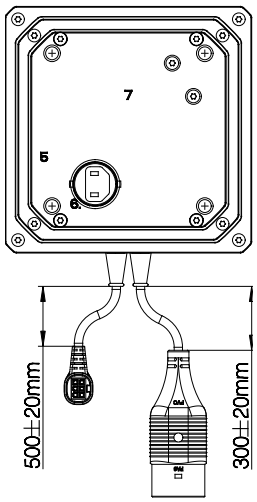
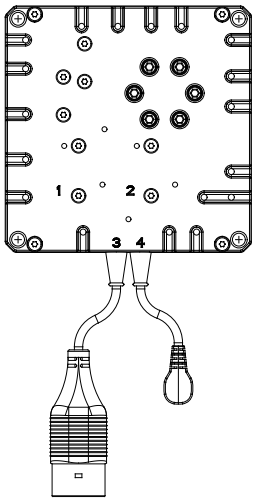
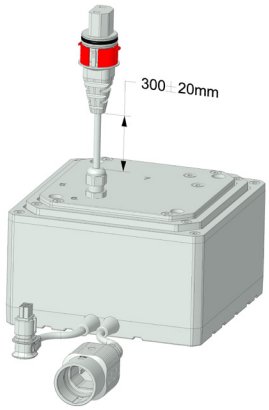
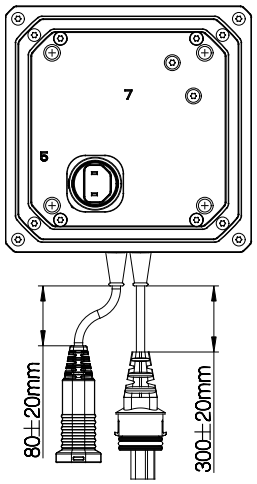
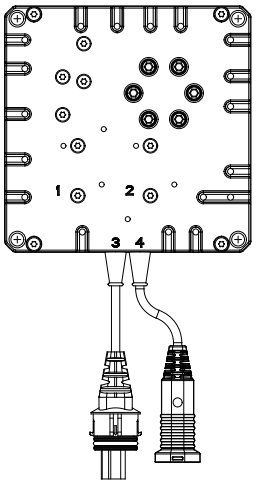
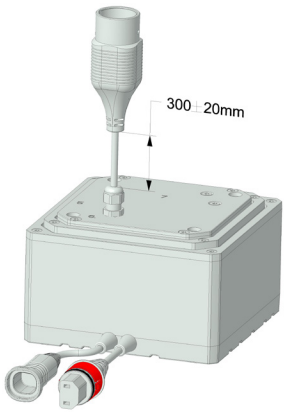
Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
T220				
Connections	5: Motor 6: HB through (top) 7: HB through (top)	 ⟷ ⟷	 3: HB through (side) 4: HB through (side)	
T130				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 1-2 pin 7: Minifit through	 ⟷ ⟷	 3: Mains through 1-2 pin 4: Minifit through	

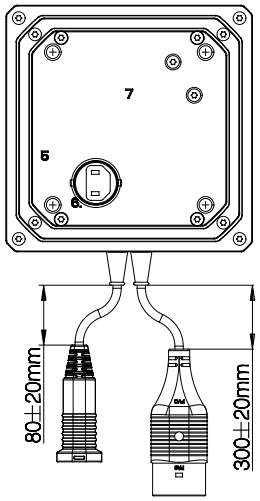
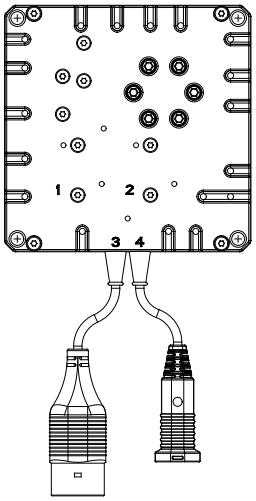
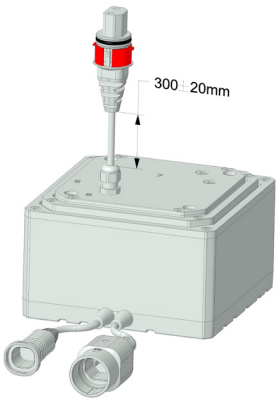
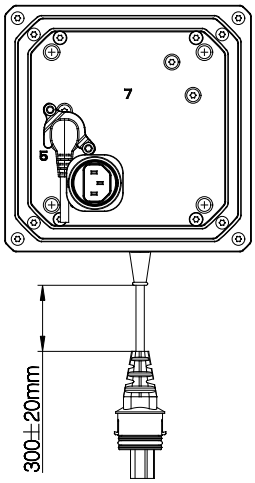
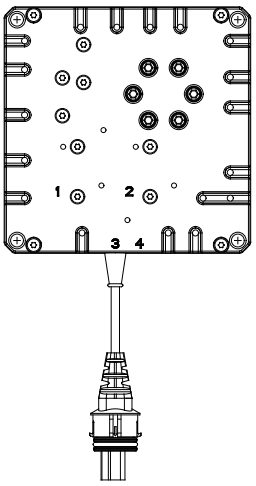
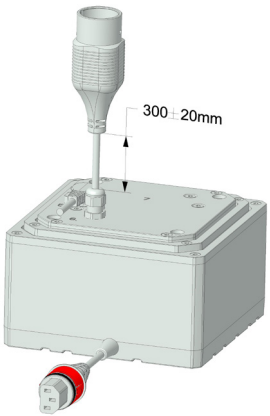
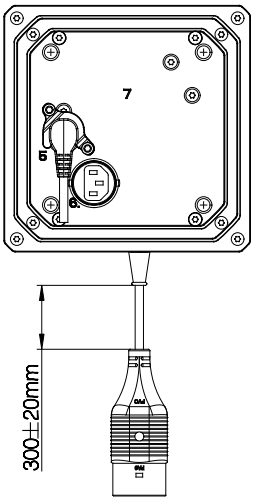
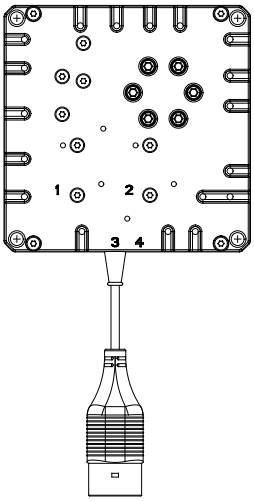
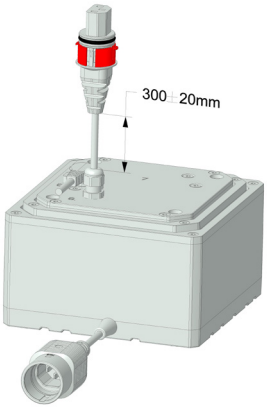
Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
T140				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 2-2 pin 7: Minifit through	 ⟷ ⟷	 3: Mains through 2-2 pin 4: Minifit through	
T230				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 1-2 pin 7: HB through	 ⟷ ⟷	 3: Mains through 1-2 pin 4: HB through	

Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
T240				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 2-2 pin 7: HB through	 ⟷ ⟷	 3: Mains through 2-2 pin 4: HB through	
S300				
Connections			3: Motor supply	
S500				
Connections			3: Motor supply	

Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
S301				
Connections			3: Motor supply	Including protective grounding cable
S501				
Connections			3: Motor supply	Including protective grounding cable
S310				
Connections	6: Minifit through	⟷	3: Motor supply 4: Minifit through	

Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
S320				
Connections	6: HB through	⟷	3: Motor supply 4: HB through	
S510				
Connections	6: Minifit through	⟷	3: Motor supply 4: Minifit through	
S520				
Connections	6: HB through	⟷	3: Motor supply 4: HB through	

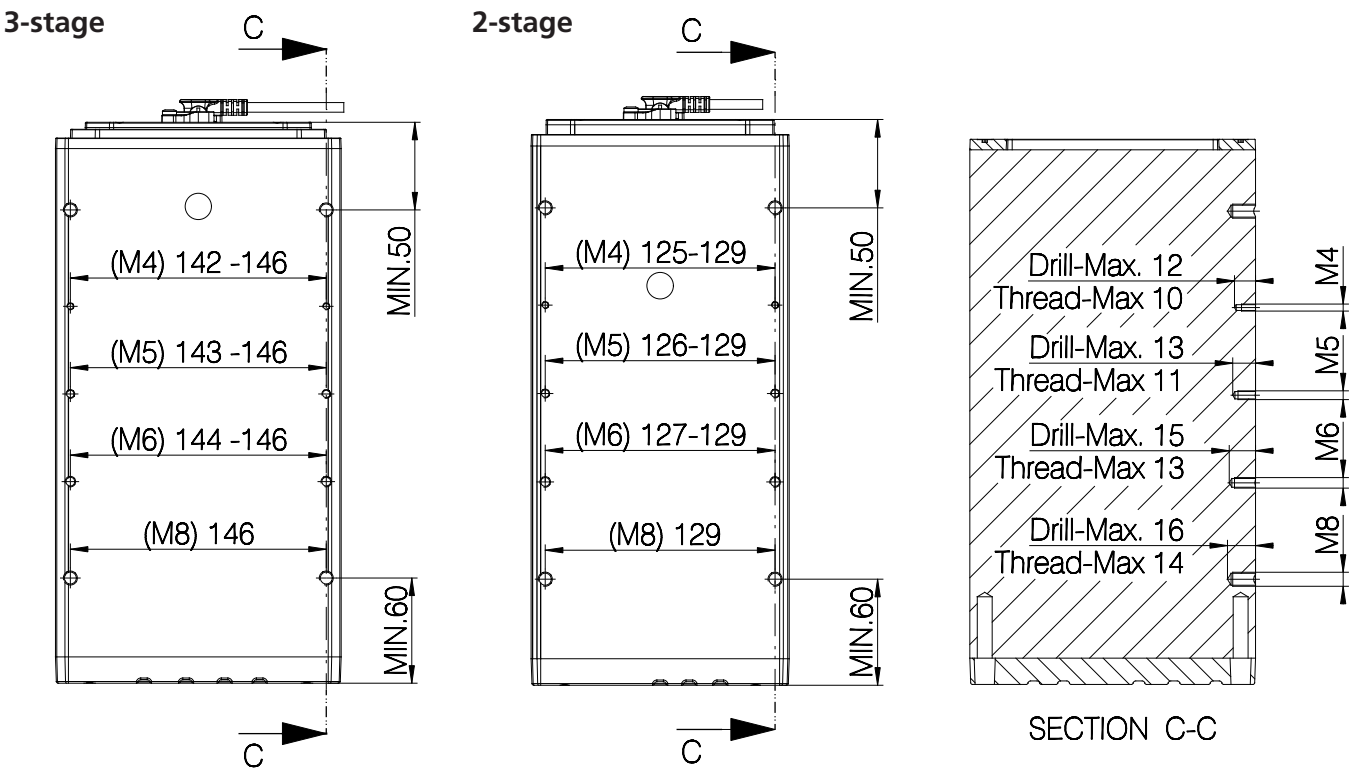
Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
S330				 Note: With mains through option, the top plate will point downwards.
Connections	6: Mains through 1-2 pin	⟷	3: Mains through 1-2 pin 4: Motor	
S340				 Note: With mains through option, the top plate will point downwards.
Connections	6: Mains through 2-2 pin	⟷	3: Mains through 2-2 pin 4: Motor	
S530				 Note: With mains through option, the top plate will point downwards.
Connections	6: Mains through 1-2 pin	⟷	3: Mains through 1-2 pin 4: Motor	

Variant	Top plate Drawing no.:1002W9005		Side entry Drawing no.:1002W9005	Model view
S540				 Note: With mains through option, the top plate will point downwards.
Connections	6: Mains through 2-2 pin	⟷	3: Mains through 2-2 pin 4: Motor	
T051				 Note: With mains through option, the top plate will point downwards.
Connections	5: Motor 6: Mains through 1-3 pin with earth	⟷	3: Mains through 1-3 pin	
T061				
Connections	5: Motor 6: Mains through 2-3 pin with earth	⟷	3: Mains through 2-3 pin	

Mounting of a product on the side of an LC3

It is possible to mount a product on all 4 sides of the LC3 at the same time. However, it requires that the holes for mounting are placed with different distances from the top and/or bottom plate. Otherwise the mounting screws will collide.

Minimum distance from the top and bottom plate must be observed.



General tolerance +/- 0,5 mm

Drawing no.:1002w9005

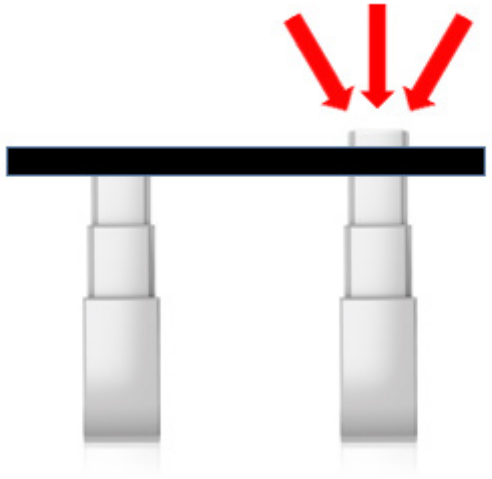
Screws used for mounting of a product on the side of the LC3 must be 8.8.

Screw type	M8	M6	M5	M4
Screw torque Nm	17	7	4	2

When mounting more than one LC3 you need to consider the fixation:

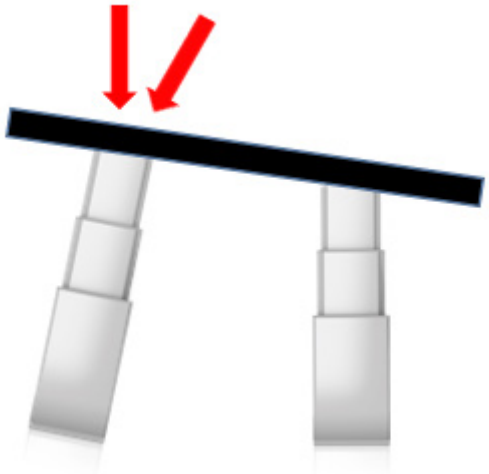
The reason why it is important only to fix one column, is that the columns will not move exactly in parallel – even if you have positioning such as hall.

If more than one column is fixed it can lead to dangerous situations.



If you do have a trend/anti-trend function in your application, you need to mount one or more of LC3 columns with a slider.

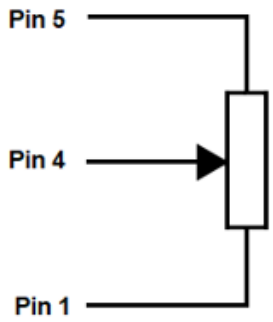
Having sliders prevents the column from bending as illustrated below.



Feedback specifications: Potentiometer

Ordering code no.: 0P

Feedback specification	
VCC max.	15 V
Potentiometer total resistance	10 kΩ ± 20%
Non-linearity	±2%
Hysteresis	±2%



Calculation of output vs. SL/pitch

Notice: Only one gearing available for stroke length variants up to 700 mm

The output ratio of a potentiometer for a given position is defined as:

$$V_{out} = 5\% \times \text{Supply V} + \frac{\left(\frac{SL_{position}\ [mm]}{\text{Pitch}\ \left[\frac{mm}{rev}\right]}\right)}{62{,}83} \times \text{Supply V}$$

where SLposition is the actual position in millimeters on the stroke length (SL), relative to end-stop inwards. In that position, the potentiometer output is 5% of full-scale. Spindle pitch is dependent on the variant, whose value can be found in the table below:

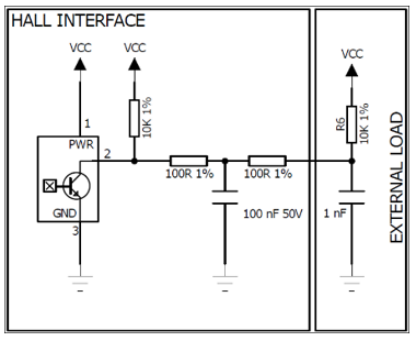
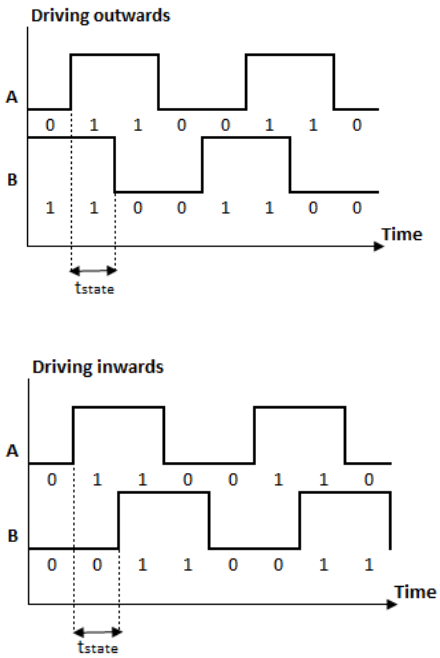
Variant	Pitch [mm/rev]
4000 N	20
5000 N	16
6000 N	12

Example, in a system connecting a 10 V supply to potentiometer with an SL position of 400 mm and 6000 N variant, the output voltage at the given position is:

$$V_{out} = 0{,}05 \cdot 10V + \frac{\left(\frac{400\ mm}{12\frac{mm}{rev}}\right)}{62{,}83} \cdot 10V \cong 5{,}81V$$

Input/output specifications: dual Hall positioning

Dual Hall digital (F3) with power switch

Item	Specification	Comments
Pin configuration	Pin1 GND Pin2 VCC Pin3 M+ Pin4 HALL A Pin5 HALL B Pin6 M-	
VCC	4-15V	
Current	Maximum 15mA @10kΩ and 1nF load. See diagram.	
HALL A/B	TState is minimum 5ms in all states (11,10,00,01) at a minimum mechanical load. Tested with the above specified load. Duty cycle Hall A 30-70% Duty cycle Hall B 30-70% Low level <GND+0.5V @10kΩ and 1nF load High level >VCC-0.5V @10kΩ and 1nF load	Signal pattern during movement: 
Resolution	Number of dual Hall state shifts/ spindle turn: N ≅ 61.67 state/ turn:. 4,000 N: 0.324 mm per shift 5,000 N: 0.260 mm per shift 6,000 N: 0.195 mm per shift	

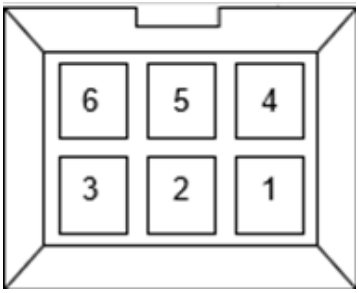
Potentiometer

Potentiometer cables:

Columns with Potentiometer feedback option require specific actuator cables, both for termination through top-plate (option Txxx) and through side-entry (option Sxxx).

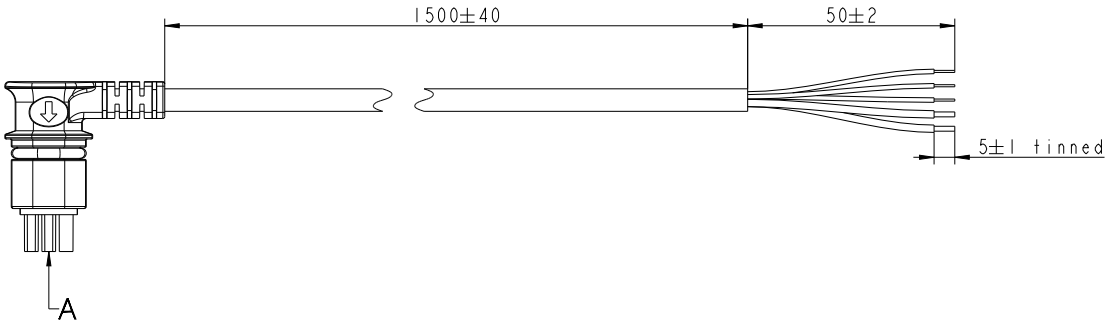
Table 1, connection to the motor and to the potentiometer and their colour.

E1 (power switch) F6 (potentiometer)		Colour Top plate connection	Colour side-entry connection
1	Potentiometer 0V	Black	Black
2	Not connected	-	-
3	M+ (motor/power)	Brown	Blue
4	Potentiometer output	Yellow	Orange
5	Potentiometer VCC	Red	Red
6	M- (motor/power)	Blue	Brown

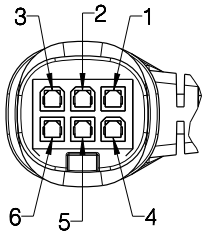


Connection through top-plate:

Columns with cable termination through top-plate (combination Txxx), require a special external cable, with part number 0965213. The cable is 1,5 m long, with open-end termination. The colours are described in the table above.



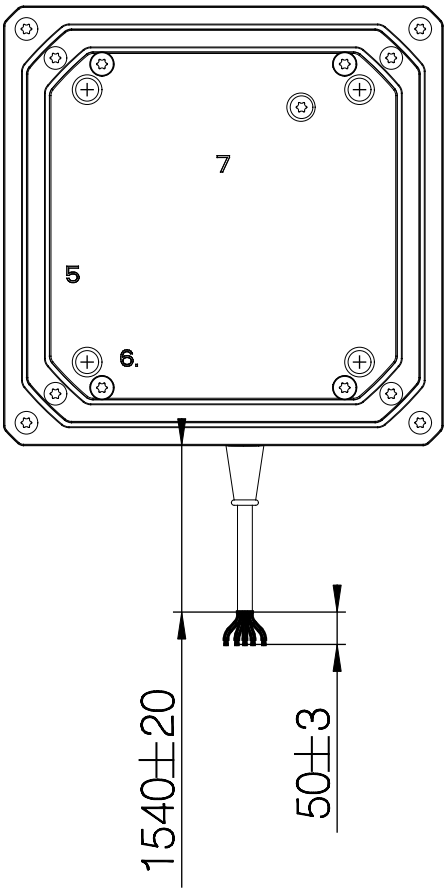
Drawing no. 0965213



Connection through side-entry:

Cable termination is open-end. Please see the figure below.

Please see table 1 for the connection to the motor and to the potentiometer and their colour.



Recommendations

- Please follow the important LC3 mounting guidelines.
- LC3 is for use in push or pull applications, cable outlet from smallest profile (top) or biggest profile (bottom). See top and bottom plate dimensions.
- When washing according to IPX6 parameters please notice that the large profile of the LC3 column must be placed upwards (bottom up).
- We recommend making a functional test of the application with all accessories connected before putting it into operation.
- Regular cleaning is recommended to reduce bacteria and increase the hygiene level
- Intended for indoor use only
- Not intended for use in harsh environments like e.g. pool environment, marine environment and agriculture buildings with ammonia vapors.
- When washing according to IPX6 parameters, it is not allowed to splash water directly onto the zinc frames between the profiles. Direct splashing is only permitted on the retracted aluminium profiles.

Warnings

- Always check correct assembly after mounting and service to ensure that the cable locks are mounted.
- Ensure that the cable cannot be squeezed, pulled or subjected to any other stress or damages.
- LC3 is heavy (more than 10 kg). To avoid personal injury and product damage, DO NOT DROP!
- Take special precautions concerning 3rd party interfacing. Please contact LINAK for further information.
- Do not exceed the max. pull load specified on the label.
- Do not add dynamic load when changing between pull and push.
- Do not adjust anything during movement or while connected to mains, it can cause personal injury.
- To avoid cable interruption and actuator defects make a proper cable installation and inspect regularly for wear, damage and jarring sound. Defective parts must be replaced.
- After service inspection, the application must be tested for correct functionality before it is put into operation, to avoid misalignment between two columns moving in parallel.
- LINAK recommend using a safety nut in medical applications! LC3 has safety nut as standard.
- Do not loosen any screws on the LC3, this can cause collapse of the column!
- LINAK recommends making regular measurement of Class 1 protective ground conductivity in the application to avoid a disconnected grounding cable. If there are worn out or defect parts, the complete LC3 must be replaced.
- Interconnecting cables must remain plugged in during cleaning to prevent the ingress of water.
- Always retract the LC3 column fully to obtain IPX6 protection class.

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