



Linear Actuators and Electronics User Manual

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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, 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 electronics. 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 systems, you are always welcome to contact your local dealer.

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.

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 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.

LINAK A/S

Valid for

This User Manual is valid for the following products:

- Actuators:** LA20 Inline, LA22, LA23, LA23 IC, LA27, LA28, LA28 Compact, LA29, LA30, LA31, LA32, LA34, **LA40**, LA44
- Columns:** BL1, LC2, **LC3**, LP2
- Control boxes:** CA30, CA40, CA63, CB6, CB6P2, CB7, CB8A, CB8-T, CB9 HOMELINE®, CB9 CARELINE® and CB9 CARELINE® Basic, CB12, CB20, CBR1, **CO53**, CO61, CO65, CO71, **OPS**, PJ2
- Controls:** ACC, ACK, ACL, ACM, ACO, ACOM, ACT, DPH Medical, FPP, FS, **FS3**, HB30, HB40, HB50, HB60, HB70, HB80, HB100, **HB200 Wireless**, HD80, HD80 JUMBO, HL70, HL80, LS, LSD
- JUMBO systems:** **BAJ**, BAJL Li-Ion, CBJ1/2, CBJ-Care, CBJ-Home, COBO, CH01, CHJ2, MBJ1/2/3
- Accessories:** **BA16 Lead acid**, BA18, BA19 Lead acid, BA21 Li-Ion, CS16, DJB, EBC, Massage Motor Medical, MJB, MJB8, Simulator tool, SLS, Under Bed Light, Under Bed Light 2, WET Sheet, QLC12

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 IEC-certificate and listed as recognised components by NRTL (Nationally Recognized Testing Laboratories).

Description of the various signs used in this manual:



Warning

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



Recommendation

Failing to follow these instructions can result in product damage.

Please read the following safety information carefully:

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

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 assessment.

RF transmitter properties:

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

Frequency band of transmission: **2402 MHz - 2480 MHz**

Type: BLUETOOTH Low Energy BLE 4.2

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.

Output ratings:

Nominal values:

On LINAK control boxes, battery boxes and power supply marking plates, the nominal output voltage at a certain load for a certain product may be stated.

Depending on product and load, this value may vary significantly due to construction.

The expected output voltage may for instance vary depending on product and load within a range from approximately 20 V DC to approximately 50 V DC for a product with a nominal output voltage of 24 V DC due to the construction.

When combining LINAK control boxes, battery boxes and power supplies with other LINAK components, compatibility is ensured. When combining LINAK control boxes, battery boxes or power supplies with third party products, special precautions may be taken. In this case, contact LINAK.

Classification:

The equipment is not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.



Warning

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 unless stated otherwise in the relevant section of this document.

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.



Warning

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.



Warning

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.



Warning

Electromagnetic compatibility – interference with other equipment, RF communications

Portable RF communication equipment (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.



Warning

If the actuator or lifting column is used for pull in an application where personal injury can occur, the following is valid:

The medical device manufacturer is responsible for the incorporation of a suitable safety arrangement, which will prevent personal injury from occurring in case of actuator failure.



Warning

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.



Warning

The plastic parts in the system cannot tolerate cutting oil.



Warning

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



Warning

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



Warning

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.

-  **Warning**
Do not turn the outer tube.
-  **Warning**
Do not use chemicals.
-  **Warning**
Inspect the actuator system regularly for damage and wear.
-  **Warning**
Do not expose LINAK actuator system components to high intensity ultraviolet radiation disinfection lamps. This may damage the enclosure, supporting parts and cables.
-  **Warnings**
LINAK® actuators and electronics are not designed for use within the following fields:
- Planes and other aircrafts
 - Explosive environments
 - Nuclear power generation
-  **Warning**
If faults are observed, the products must be replaced.
-  **Warning**
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.
-  **Warning**
Handle batteries carefully. Do not short circuit the battery.
-  **Warning**
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.
-  **Warning**
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.
-  **Warning**
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.
-  **Warning**
Handle tools carefully and do not wear jewelry when handling batteries. A short-circuit of the battery terminals can cause burn injuries, damage or trigger explosions.
-  **Warning**
Only connect LINAK batteries to compatible chargers.
-  **Warning**
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.
-  **Warning**
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.



Recommendation

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.



Recommendation

Important information regarding 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 size-effective battery but with a high concentration of energy within a small physical size. 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 placed on the quantity to be transported and handled, and on the storage of specific products moving via air.

The OEMs and end users must recognise that although safe to use, there is still a very small risk of thermal runaway in a Li-Ion cell. The size of that risk could be as little as 1PPM or even less.

LINAK® currently bases our Li-Ion battery design on industry proven cell types that have a 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 UL approved.

An external, internationally recognised expert has also reviewed the design to ensure that it is in accordance with the recommendations. Further to that, LINAK only uses cells from well-recognised manufacturers.

When using Li-Ion batteries, LINAK recommends that the customer carries out a proper risk analysis for their application. The risk analysis must also focus on non-mounted products that can be in direct contact with flammable materials.

LINAK Li-Ion batteries have no more risk of thermal runaway compared to other Li-Ion cells from well-recognised manufacturers within the market. Therefore, it is clear that LINAK cannot take responsibility for any failures that occur due to Li-Ion battery inherent failures.

If any of the Li-Ion batteries built into LINAK products is found to be defective under warranty, LINAK will provide a new product to the OEM. 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 lost profits, failure to realise expected savings, any claim against our customers 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.

General assembly instructions

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 the product/products should not use the product/products. Moreover, 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 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.



Warnings

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

- 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.
- 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).
- 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.



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

- 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.
 - 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 relevant 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 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.
- Note:
 - 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.

DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY

LINAK A/S
Smedevænget 8
DK - 6430 Nordborg

Herewith declares that **LINAK DESKLINE®** products as characterised by the following models and types:

Control Boxes	CBD6S
Linear Actuators	DB5, DB6, DB14, LA23, LA31
Lifting Columns	DL1A, DL2, DL4S, DL5, DL5IC, DL6, DL6IC, DL7, DL8, DL8IC, DL9, DL9IC, DL10, DL10IC, DL11, DL11IC, DL12, DL14, DL15, DL16, DL16IC, DL17, DL19, DL19IC, BASE1
Desk Panels	DPA, DPB, DPH, DPF, DPG, DPT, DP, DP1CS
RF Controls	HB10RF, HB20RF, RFRL
Accessories	BA001, BLE2LIN, DS1, DF2, Kick & Click, SLS, SMPS001, SMPS002, SMPS006

Herewith declares that **LINAK HOMELINE®** products as characterised by the following models and types:

Control Boxes	CB9H, CBH Advanced, CBH Basic
Linear Actuators	LA10, LA18, LA27, LA29, LA31 HOMELINE, LA40 HOMELINE
Dual Actuators	TD3, TD4, TD5
Controls	HB10, HB10 Wireless, HB40, HB60, HC05 Wireless, HC10 Wireless, HC20 Wireless, HC30 Wireless
Accessories	BLE2LIN, DC CONNECTOR, LED Lightbox, LED Light Rail, Lightplug001, Massage Motor, SMPS001, SMPS002, SMPS006

Herewith declares that **LINAK MEDLINE® & CARELINE®** products as characterised by the following models and types:

Control Boxes	CA30, CA40, CB6, CB6S, CB6OBMe, CB6P2, CB8, CB9, CB12, CB14, CB16, CB20, CBJ, CBJ Care, CBJ Home, CO41, CO61, CO65, CO71, PJ2
Linear Actuators	LA12, LA20, LA22, LA23, LA27, LA28, LA29, LA30, LA31 MEDLINE CARELINE, LA32, LA34, LA40 MEDLINE CARELINE, LA43, LA43IC, LA44, LA44IC
Lifting Columns	BL1, LP2, LP3, LC2, LC3
Controls	ACC, ACK, ACO, ACOM, ACL, ACM, ACP, ACT, DP, DPH, FS, FS3, FPP, HB20, HB30, HB40, HB50, HB70, HB80, HB100, HD80, HL70, HL80, IRO
Accessories	BA18, BA19, BA21, BAJ, BAJL, CCM, CH01, CHJ2, COBO, DJB, EBC, IRO, MJB, MJB8, SMPS19, SMPS30, SCO, SLS, Massage Motor, QLCI, QLCI2, UBL2, WET

Herewith declares that **LINAK TECHLINE®** products as characterised by the following models and types:

Linear Actuators	LA12, LA14, LA22, LA23, LA25, LA30, LA33, LA35, LA36, LA37
Power Supply	SMPS-T160
Accessories	CS16, FMB, LSD

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 that 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, 2019-05-27



LINAK A/S
John Kling, B.Sc.E.E.
Certification and Regulatory Affairs
Authorized to compile the relevant technical documentation

1. System description:

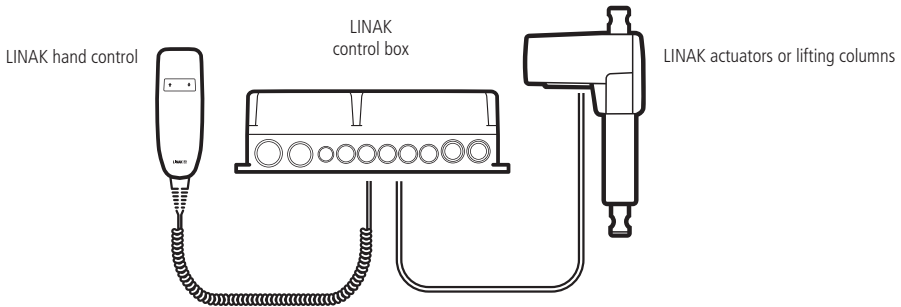
Usage/type of applications:

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 hoists within the care and hospital sector
- Adjustment of dentist chairs/gynaecological chairs
- Etc.

The principles of a LINAK system are as follows:



Attention should be paid to the following:

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



Recommendation

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.

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 environments.

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.

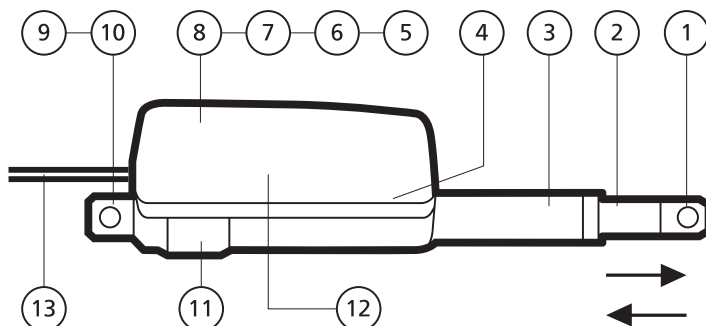
- ESDS devices must under no circumstances, during transport, storage, handling, production or mounting in an application, be exposed to harmful ESD.
- LINAK can only guarantee the lifetime of ESDS devices if they are handled in the same way from production at LINAK A/S until they are mounted in the 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

Fundamental actuator construction



1. Piston rod eye

2. Piston rod

3. Location of mechanical splines

4. Location of brake

5. Motor

6. Motor with optical switch

7. Motor with potentiometer

8. Motor with reed-switch

9. Back fixture

10. Back fixture with electrical splines

11. Quick release mechanism

12. Transmission between motor and spindle

13. Cable for connection to DC by means of plug via control box

General Warranty periods

These are general warranty periods. Some segments may have special warranty agreements depending on application types. Ex. TECHLINE solar applications. And some customers have Quality agreements with LINAK. These are to be handled accordantly.

MEDLINE® and CARELINE®:

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.

HOMELINE®:

LINAK® provides 3 years (36 months) warranty on HOMELINE actuator systems used in comfort furniture.

If these 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.

DESKLINE®:

LINAK® provides 5 years (60 months) warranty on all DESKLINE® products produced after 01.05.2015. Products produced before 01.05.2015 will still have a 36 months warranty.

If these 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.

TECHLINE®:

LINAK® provides 1½ years (18 months) warranty on TECHLINE products.

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

General information:

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.

Subsidiaries are allowed to offer additional warranty periods.

IP Protection degree

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.

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.



Warning

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



Warning

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



Warning

Cleaning with a steam cleaner is not permitted.

IPX6 Washable

The LINAK understanding of the word 'washable' is that the products conform to the following and none other:

Reference: The standard IEC 60601-2-52, cl. 201.11.6.6.101.
The demands for the washing process are described in the German '*Maschinelle Dekontamination*' from the organisation AK-BWA.

Water: Hardness degree is 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 deteriorate grease

Washing machine: Only flat squirt nozzles are allowed. An approved setup could be:
Water Pressure 3 Bar, water volume 5,61 L/min, Dispersion angle 120 degree, flat squirt nozzle.

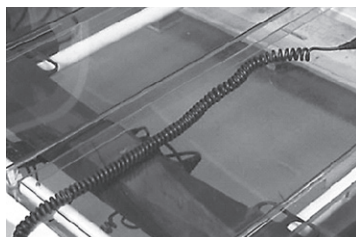
Cable Wash

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.



Maintenance

Valid for all LINAK products

- LINAK® products must be cleaned at regular intervals
- Inspect for malfunction, mechanical damage, wear and cracks. Worn-out parts must be replaced
- Inspection/maintenance intervals may be defined by the medical device manufacturer
- LINAK products are closed units and require no internal maintenance
- Only type IPX6, IPX6 Washable and IPX6 Washable DURA™ are waterproof
- 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 dismantled or replaced, the O-ring must be replaced, and the O-rings and the receptacle insert must be greased with an acid-free Vaseline.

Valid for all LINAK actuators and lifting columns

- Actuators/lifting columns must be 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

Valid for all LINAK control boxes and hand controls

- Electronics must be inspected at attachment points, wires, enclosure, and plugs
- Inspect the connections, cables, enclosure, and plugs, and check for correct functioning
- The control box is sealed and maintenance-free

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)
If the actuator is assembled in the application and is exposed to push or pull during transportation, the actuator can be damaged. Do not drop an actuator or otherwise damage the housing during disassembly or transportation. We do not recommend to use an actuator which has been damaged.	












Valid if nothing otherwise is stated under the specific products in a later section.










Insulation class

LINAK® control boxes are available in insulation class 1 and insulation class 2.

Key to symbols

The following symbols are used on the LINAK product labels:

	IEC 60417-5172: Class II equipment
	Product with a thermofuse
	IEC 60417-5957: For indoor use only
	IEC 60417-5222: Safety isolating transformer, general
	IEC 60417-5840: Patient part of type B
	IEC 60417-5019: Protective earth; protective ground
	IEC 60417-5002: Positioning of cell
	ISO 7000-0434A: Caution, consult accompanying document
	ISO 7000-1641 Operating instructions
	Electronics scrap
	Electronics scrap

	Recycle
	Recognised Component mark for Canada and the United States
	PSE mark
	Compliance to all relevant EC directives
	China Pollution control mark (also indicates recyclability)
	Regulatory compliance mark: The Australian Safety/EMC Regulations
	Alternating current
	Direct current
	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.

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. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 4008004

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 4008838

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 9901916

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 4008005

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 4008671

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 4008003

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 4008623

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1



C/N 4009507

Conforms to ANSI/AAMI Std. E560601-1
Cert. to CSA Std. C22.2 No. 60601-1

Mounting

Actuator:

Do not use any other screws for the mounting brackets than those recommended by LINAK®. If longer screws are used, they will come into contact with the inner parts of the actuator. This will result in an irregular operation or even damage the actuator.

During mounting, the actuator must always be:

- Fixed to protect it against torque and bending. **See Figure 2 on the next page.**
- Fixed so that it is restrained, but free to move on its mountings. **See Figure 3 on the next page.**
- Fixed in brackets, which can take up the torque reaction. **See Figure 3 on the next page.**
- Mounted at right angles so that the right angle requirement is observed. **See Figure 4 on the next page.**
- Mounted with correct bolt dimension.
- Mounted with bolts and nuts made of high quality steel grade (for example 10.8). No thread on bolts inside the back fixture or the piston rod eye.
- Bolts and nuts must be protected from being able to fall out.
- Inspect the actuator for damage before mounting. A damaged actuator must not be mounted. Check for instance for damaged packaging.
- Do not use a too high torque when mounting the bolts for the back fixture or the piston rod eye

Control boxes:

- The mounting screws on the control box must be tightened with a maximum torque of 1 Nm
- The mounting surface to which the control box is attached should have a surface evenness better than ± 0.5 mm.
- Systems must not be installed/deinstalled while in operation.
- Control boxes with a wet alarm must be mounted as shown on figure 5 on the next page.
- Nuts and bolts must be made of steel.
- Nuts and bolts must be tightened securely.
- For control boxes with earth connection (Class 1), the nut must be tightened with a torque of 1 - 1.2 Nm.



Cables:

It is important to remove the transport plastic bag before using the cable.

Accessories:

The mounting screws on accessories must be tightened with a maximum torque of 1 Nm

- The mounting surface to which the accessory is attached should have a surface evenness of more than ± 0.5 mm
- Systems must not be installed/deinstalled while in operation
- Nuts and bolts must be made of steel
- Nuts and bolts must be tightened securely

Controls:

The mounting screws on the controls must be tightened with a maximum torque of 1 Nm

- The mounting surface to which the accessory is attached should have a surface evenness of more than ± 0.5 mm
- Systems must not be installed/deinstalled while in operation
- Nuts and bolts must be made of steel
- Nuts and bolts must be tightened securely

For further instructions regarding mounting, see the data sheet for the individual product or in chapter 5, 6 or 8 in this manual.

Figure 2

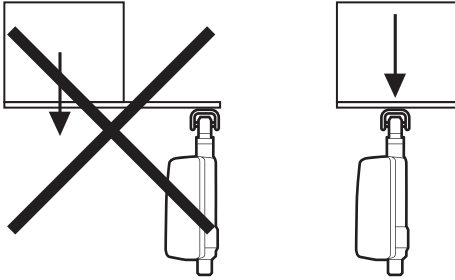


Figure 3

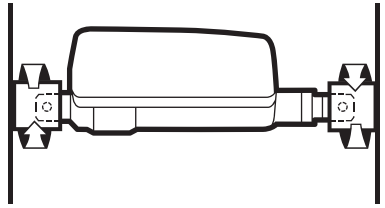


Figure 4

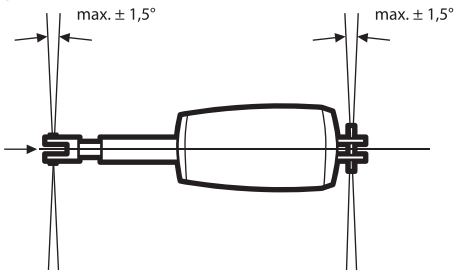
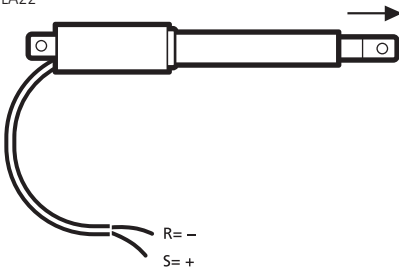
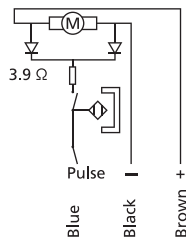
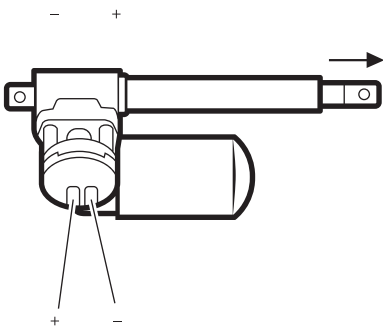


Figure 6

1) LA22



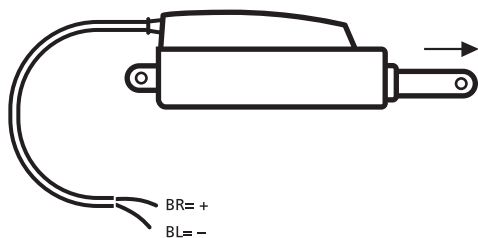
3) LA30 and 30S



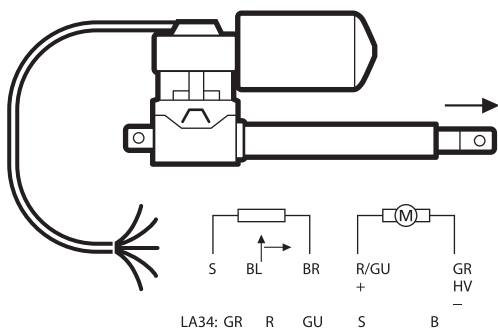
Brown	Black	
+	-	Out going
-	+	In going

Figure 6

4) LA12



5) LA30, LA30S, LA32 and LA34 with potentiometer



Colour codes:

S	Black
BR	Brown
R	Red
O	Orange
GU	Yellow
G	Grey
BL	Blue
V	Purple
GR	Green
HV	White

6) LA30, LA30S and LA32 with optical encoder

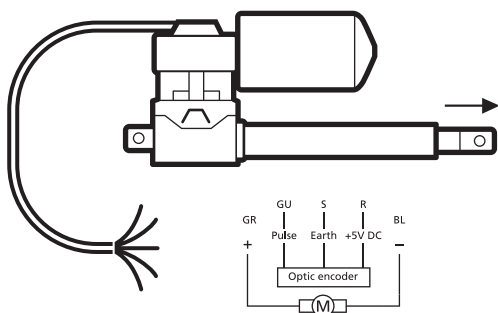
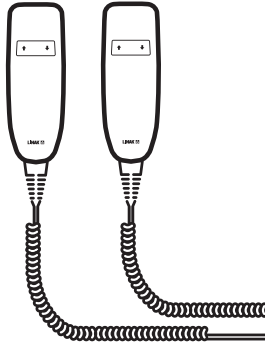


Figure 6

7A-B) LA28/28S/32 with CS28/28S/32 - PC-board version A and B

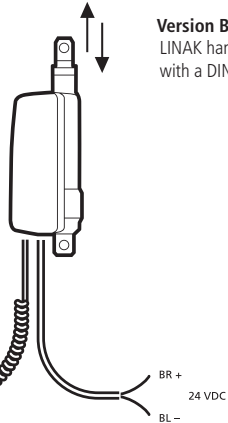
Version A

LINAK hand control HB is connected with a telephone plug



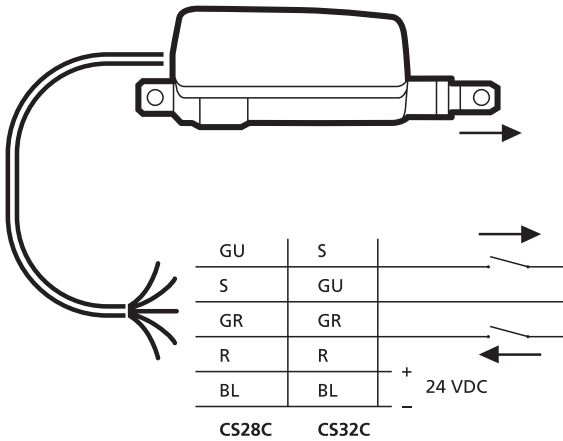
Version B

LINAK hand control HB is connected with a DIN plug



7C) LA28/28S/32 with CS28/28S/32 - PC-board version C

Version C



8) LA28, LA28S, LA32 with reed-switch and LA34 with pulse system

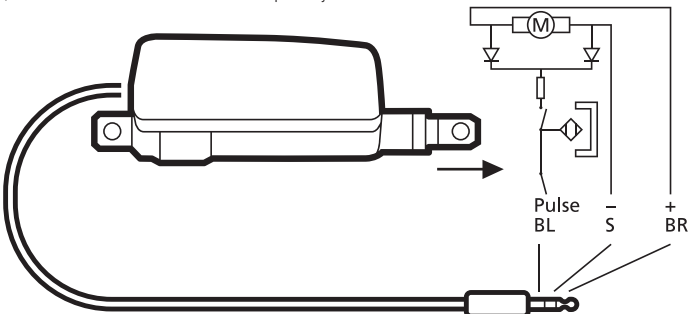
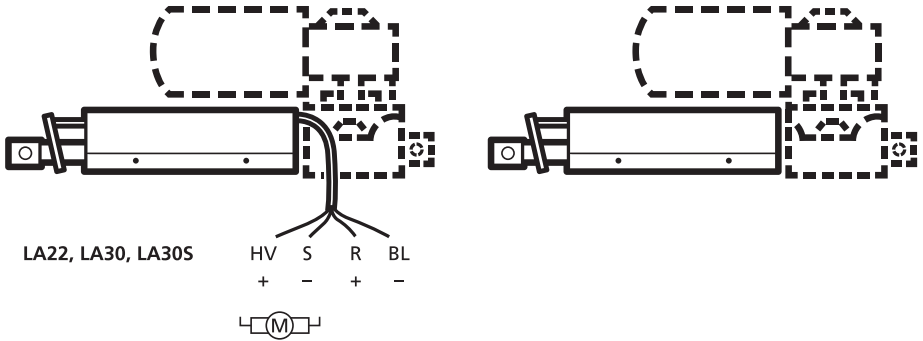
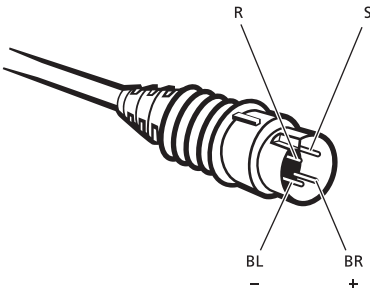


Figure 6

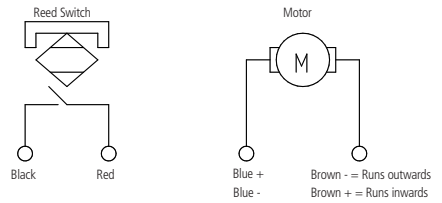
9) LSD



10) LA31, LA34 with electronic pulse coder (reed-switch)



11) LA31 TECHLINE



12) LA12 PLC

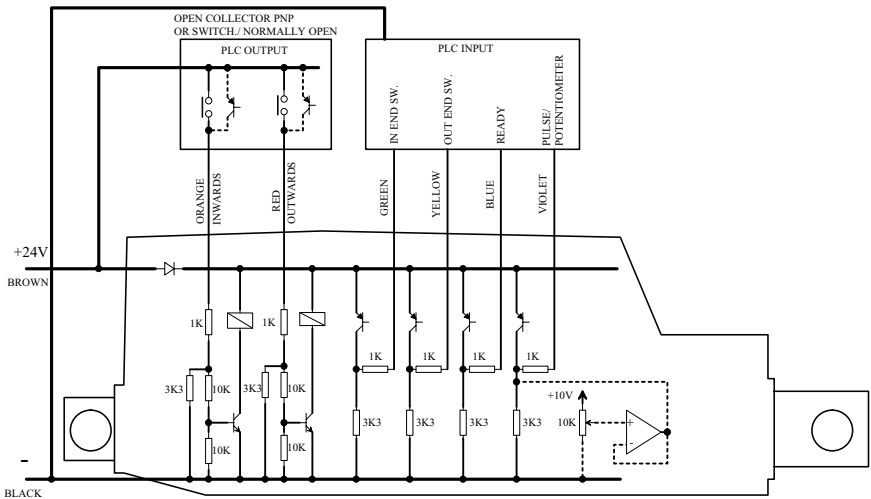
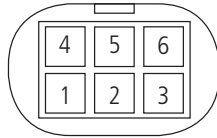


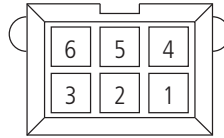
Figure 6

13) Pin-connection for Mini-fit plug (valid for 13 and 14)

Mini-Fit Connector	
Pin 1	
Pin 2	
Pin 3	
Pin 4	
Pin 5	
Pin 6	



Connector front view



PCBA Header top view



0273011 with O-ring

WITHOUT FEEDBACK

LA27 Mini-fit plug cable (LA27 standard; Valid for LA27 article numbers = 27xxxxxxxxxxx0)

CH1-4 MiniFit:	
When a channel is operated UP (Motor connections)	3: Brown: + 6: Yellow: -
End-of-stroke switches	5: Orange: UP 4: Red: DOWN 2: Black: COMMON
Not Used	1: No Connection

(end of stroke = EOS)

LA23/LA31/LA34/BL1/BL4 Mini-fit plug cable

without Feedback

EOS Switch	
Pin 1	Switch com. (GND)
Pin 2	Vbus
Pin 3	M+ (Motor/Power)
Pin 4	EOS wout
Pin 5	EOD in
Pin 6	M- (Motor/Power)

LA27 Mini-fit plug cable (Analog encoded without Hall)

without Feedback

Article numbers = 27xxxxxxxxxxxB

EOS Switch	
Switch com. (GND)	
Vbus	
M+ (Motor/Power)	
EOS out	
EOD in	
M- (Motor/Power)	

WITH FEEDBACK

LA23/LA31/LA34/LA44/BL1 Mini-fit plug cable

with Feedback

Hall	
Pin 1	Hall GND
Pin 2	Vbus
Pin 3	M+ (Motor/Power)
Pin 4	Hall A
Pin 5	Hall B
Pin 6	M- (Motor/Power)

LA27 Mini-fit plug cable

with Feedback

Article numbers = 27xxxxxxxxxxxA

Hall	
Hall com. (GND)	
Vbus	
M+ (Motor/Power)	
EOS (analog)	
Hall	
M- (Motor/Power)	

LA34/LA44 Mini-fit plug cable (potentiometer)

Potentiometer

Pin 1	Pot GND
Pin 2	Vbus
Pin 3	M+ (Motor/Power)
Pin 4	Pot Position
Pin 5	Pot + (3V3)
Pin 6	M- (Motor/Power)

BL4 Mini-fit plug cable

Reed

Reed com. (GND)
Vbus
M+ (Motor/Power)
NC
Reed
M- (Motor/Power)

Figure 7

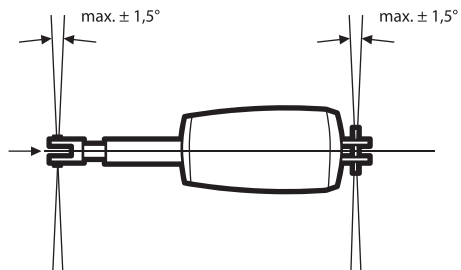


Figure 8

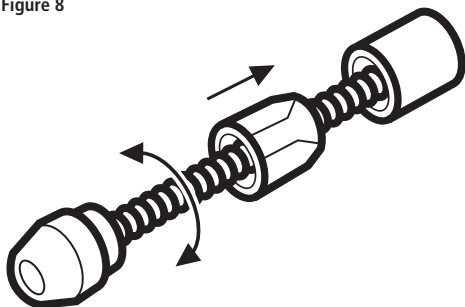


Figure 9

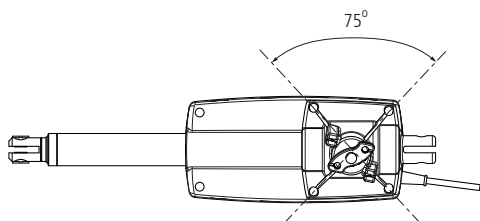
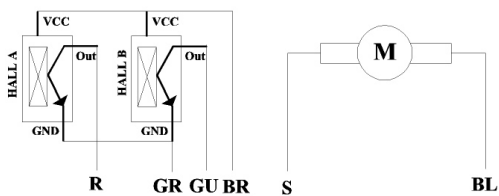


Figure 10



Connecting the system

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

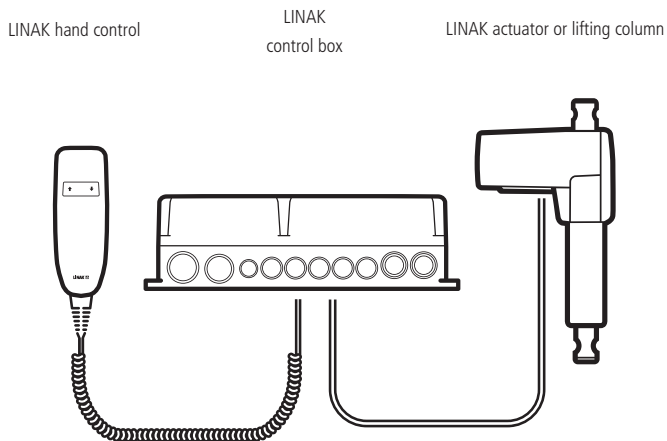
Start by connecting the hand control to the control box. The connection in the control box is marked with "HB".

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.

- a) Actuators with plugs may only be connected to LINAK control boxes
- b) Actuators without plugs are connected as shown in **Figures 6.1 - 6.12.**

Batteries

Lithium ion batteries



Warnings

- When using BAJL and JUMBO 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.
- The combination of CBJ1 or CBJ2 with BAJL might not be able to complete a full cycle after low battery warning.
- 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.
- Recharging of battery must take place every 6 months.
- 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.
- Short circuit 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.
- Expose the batteries to water or other liquids.
- Overcharge or fully discharge the batteries.

For detailed information on specific use of batteries, please see the product information in chapter 5.

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.

Warnings

- 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.

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

- 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 the seal is damaged, it must be replaced by a new silicone string (LINAK article no. 0008004 for a roll of 100 meters).

Disposal

Lead acid batteries, can be returned to LINAK or disposed of in the same way as car batteries.

Warnings

- 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.

2. 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 this User 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.
LINA products are marked with the actual IP rating on the label.
- 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.

Troubleshooting Actuators/Lifting columns

Symptom	Possible cause	Action
No motor sound or movement of piston rod	- The actuator is not connected 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
Motor runs too slowly or does not give full force	- Insufficient power supply - Voltage drop in cable	- Increase power supply - Thicker cable necessary

Troubleshooting Electronics

Symptom	Possible cause	Action
Power indicator does not light up	- Not connected to mains	- Connect to mains
	- 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
Power indicator lights up, but actuator does not run	- Actuator plug not pushed into control box properly	- Push actuator plug properly into control box
Control box relays are clicking	- Actuator defective	- Replace actuator - Defective control box - Replace the control box
Power indicator lights up, but actuator does not run	- Control box defective	- Send control box for repair
No relay noise is heard from control box Not valid for CB20/CB6S OBF/CB16 OBF	- Hand control defective	- Send hand control for repair
Control box completely dead on battery and no relay clicking	- Battery completely flat	- Charge battery
	- Battery defective	- Replace battery
Actuator does not run on battery, but relay clicking can be heard	- Actuator plug not properly pushed into control box	- Push actuator plug properly into control box
	- Actuator defective	- Replace actuator
	- Control box defective	- Replace control box
Control box okay apart from one direction on one channel	- Hand control defective - Control box defective	- Send hand control for repair - Send control box for repair