ELEVATE™
User Manual

LINAK®

WE IMPROVE YOUR LIFE

Contents

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 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 product/system will give you many years of problem-free operation.

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

LINAK subsidiaries and some distributors situated all over the world have authorised service centres, which are always ready to help you. Locate your local contact information on the back page.

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 may only be opened by authorised personnel.

This User Manual has been written based on the present technical knowledge. LINAK reserves the right to carry out technical modifications and keeps the associated information updated.

LINAK A/S

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Introduction

The LC3 IC electric lifting column comes with a built-in controller to facilitate easy integration into industrial applications. The integrated controller allows you to choose between digital and analogue signals or Ethernet Modbus TCP/IP. These interfaces provide several feedback options like position, speed, current temperature, status and error codes.

The brushless DC motor enables better motor control and precise positioning, which results in smooth acceleration and an increased lifetime.

The LC3 IC can push or pull loads of up to 1,000 N with a speed of up to 100 mm/sec. The speed is adjustable and independent of the load. If higher loads are needed, please contact your local LINAK office.

LC3 IC is ideal for applications in areas such as material handling as well as industrial automation and ergonomics, as it features:

• **Integrated controller:** easy integration due to compact size and industrial interfaces

• **BLDC motor:** for precise control and longer lifetime

• **Speed up to 100 mm/sec:** adjustable and independent of load

The LC3 IC comes in a 3-stage version and offers stroke lengths of up to 1,100 mm. The column can handle high bending moments - dynamic as well as static - and can be mounted in both vertical directions.

The integrated controller removes the need for an external control box, which makes the LC3 IC fit even where space is limited.

With its faint sound, this discreet electric lifting column also benefits the work environment.

Safety information

Please read this safety information carefully.

Be aware of the following three symbols throughout the user manual:

Warning!

Failing to follow these instructions can cause accidents resulting in serious personal injury.

Recommendations

Failing to follow these instructions can result in the product suffering damage or being ruined.

Additional information

Usage tips or additional information that is important in connection with the use of the product.

Furthermore, 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 a describing manual.

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 application, 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, if children are to use the application - they must be under surveillance to ensure that they do not play with the application.

⚠ Warnings

- Not to be used horizontally.
- The product is NOT to be opened by unauthorised personel.
- 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 IC is heavy (more than 20 kg). To avoid personal injury and product damage, DO NOT DROP!
- Take special precautions concerning 3rd party interfacing. If needed, please contact LINAK for further information.
- Do not adjust anything during movement or while connected to mains, as it can cause personal injury.
- To avoid cable interruption and column 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. If used in parallel applications, misalignment between two or more columns must be avoided.
- Do not loosen any screws on the LC3 IC, as this can cause collapse of the column!
- All cables must remain plugged in during cleaning to prevent the ingress of water.
- The lifting column can become functional safety systems compliant with EN ISO10218-2. To integrate the LC3 IC into a functional safety chain, external safety devices such as safety contactors/relays havs to be implemented.

Recommendations

- Please follow the important LC3 IC mounting guidelines.
- LC3 IC is for use in both push and pull applications, cable outlet from smallest profile (top). See top and bottom plate dimensions. The lifting column can be mounted upside down.
- It is recommend to make a functional test of the application with all accessories connected before putting it into operation.
- Intended for indoor use only.
- Not intended for use in harsh environments like e.g. pool environments, marine environments and agriculture buildings with ammonia vapors.
- Do not place the column in very dusty environments, since this affects the sliders.
- Listen for unusual sounds and watch out for uneven running during operation. Stop the lifting column immediately if anything unusual is observed.

Features and options

- 24 V DC Brushless motor
- 1,000 N load in push and pull
- Max. speed 100 mm/sec. (adjustable and independent of load)
- Stroke length from 400 mm to 1,100 mm in steps of 100 mm
- Protection class: IP4X
- Position accuracy: +/- 1.5 mm
- Profile colour: Anodised aluminium
- Top and bottom plate colour: Zinc grey bottom plate / aluminium grey top plate
- Built-in dimensions: Stroke/2 + 280 mm - minimum BID is 400/2 + 280 = 480 mm
- Noise level: 58 dB (A)
- Weight: 29 kg with 900 mm stroke
- Dynamic bending moment: Up to 1,400 Nm (allowed bending moment between cobot and column while the column is running in or out
- Static bending moment: Up to 3,000 Nm (allowed bending moment between cobot and column while the column is not moving
- Mounting directions: The column can be mounted vertically with a top plate upright or upside down
- IC interfaces:
  - I/O
  - Modbus TCP/IP

Usage

- Duty cycle: 20% at full load and 25°C ambient temperature (4 minutes use, 16 minutes not in use)
- Current consumption: 20 A (Supply)
- Operation temperature: +5°C to + 40°C
- Storage temperature: -40°C to + 70°C
- Relative humidity: 20% to 80% - non-condensing
- Atmospheric pressure: 700 to 1060 hPa
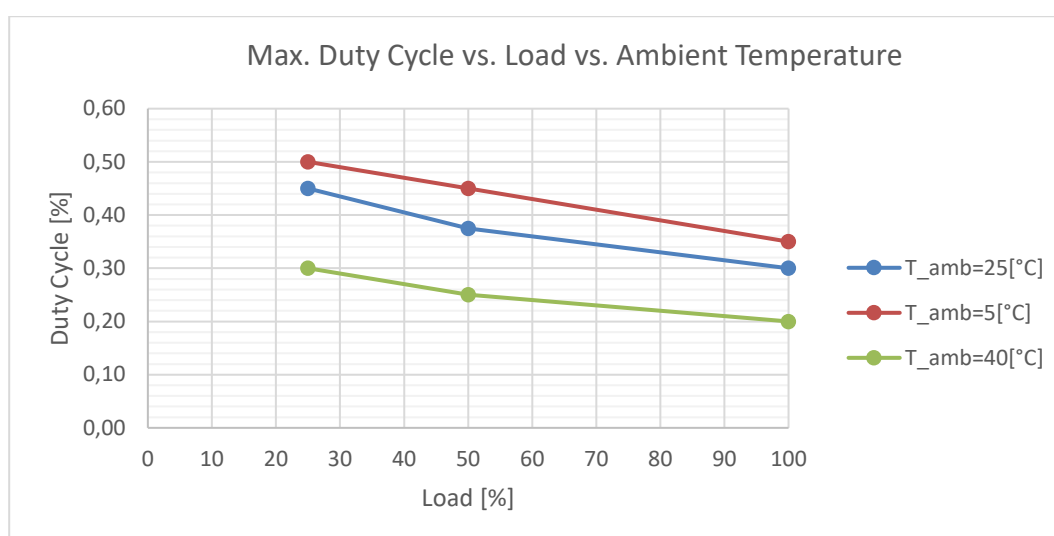- Meters above sea level: Max. 3000 meters

Approvals:
- EN 55016-2-3:2017+A1, EN 55016-2-1:2014
- EN 61000-4-2:2009, EN IEC 61000-4-3:2020, EN 61000-4-4:2012
- EN 61000-4-5:2014+A1, EN 61000-4-6:2014, EN 61000-4-8:2010
- EN IEC 63000:2018
- EN 61000-6-2:2019 – Part 6-2
- EN 61000-6-4:2019 – Part 6-4
- BS EN 55016-2-3:2017+A1, BS EN 55016-2-1:2014
- BS EN 61000-4-2:2009, BS EN IEC 61000-4-3:2020, BS EN 61000-4-4:2012
- BS EN 61000-4-5:2014+A1, BS EN 61000-4-6:2014, BS EN 61000-4-8:2010
- BS EN IEC 63000:2018
- BS EN 61000-6-2:2019 – Part 6-2
- BS EN 61000-6-4:2019 – Part 6-4

Technical specifications

LC3 IC with 24 V motor

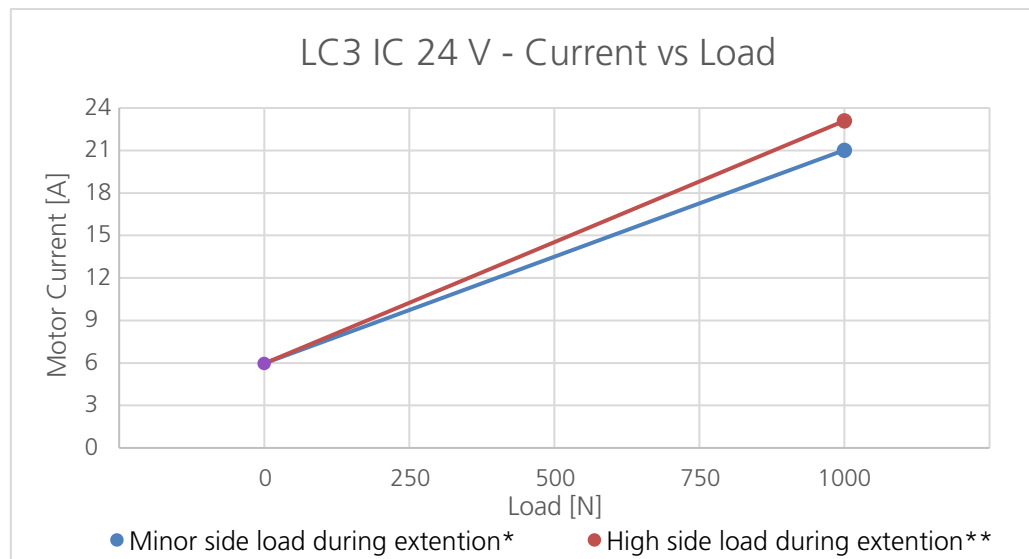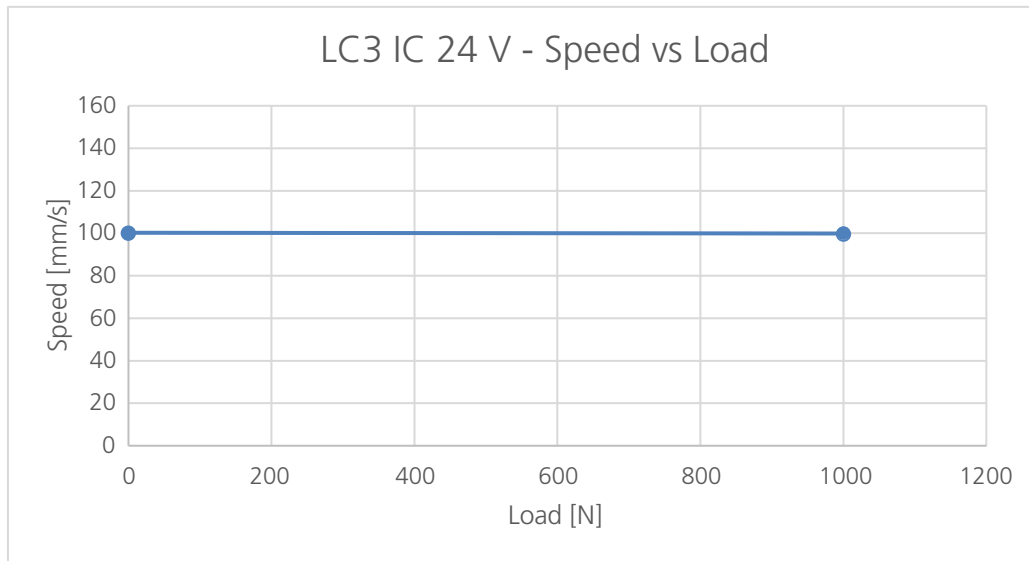| Order number	Push max. (N)	Self-lock min. (N) Push	Pitch (mm/ spindle rev.)	Regulated speed (mm/s) Load	Standard stroke lengths (mm) in steps of 100 mm	Typical amp. (A)	
						No load	Full load
LC3xxxxxxxxxxxxxxxxxxxx-000	1,000	2,000	20	100	400-1,100	6	20

B10 data

The lifetime of the LC3 lifting columns was tested by subjecting three units to a lifetime test. These were rated 24 V (BLDC) and had a 900 mm stroke length with a 20 mm spindle. The test involved running the lifting columns at their max. rated load of 1,000 N with an off-centre load of 1,000 N at 0.3 m from the centre. The test was conducted with a 20% duty cycle, and the columns were operated until they reached the point of failure, which was characterized by an extreme hopping action when retracting.

On the basis of this, the following data were collected:

Kilometres at 65% confidence: 414.527 km
Cycles at 65% confidence: 230,293 cycles

Speed, load and current curves

LC3 IC 24 V - Speed vs Load

LC3 IC 24 V - Current vs Load

● Minor side load during extention*   ● High side load during extention**

* The cobot and the load is positioned around the centre of the column during extension.

** The cobot and load can be freely positioned placed or moved during extension.

Motor current vs power supply current:
When choosing a suitable power supply, please be aware of how the actuator current consumption is defined. The current feedback from the actuator via bus communication and the Actuator Connect™ service tool can appear higher than the current measured at your power supply. This is due to the way the actuator speed is regulated and can affect the expected result of a set current limit. The internal current limit is based on the motor current and not the current of the power supply.

Example:
If the power supply current reads 16 amps, the motor current may be measured to 19 amps due to the speed regulation. The set current limit is based on the motor current and if set to 18 amps, it can trigger an overcurrent state even though the power supply current is at 16 amps.

Ordering example

LC3 200 900 F700 0E 0730 8 2 3 1 C - 000

Type	LC3	
Spindle Pitch	200	= 20 mm (1,000 N)
Stroke Length	XXX	= mm (in steps of 100 mm). Min. 400 mm and max. 900 mm
	B00	= 1,100 mm
Option	F600	= Power and signal connector
	F700	= Power, signal and RJ45 connector
Platform	B3	= ELEVATE Easy
	C3	= ELEVATE Pro
	0E	= ELEVATE Modbus TCP/IP
Installation dimension	XXXX	= mm (min. length: 480 mm)
Part	8	= 3-part column 1/2s + 280 min. (heavy duty profiles and mounting holes)
Motor type	2	= 24 V BLDC
Endstop	3	= Zero Point
Mounting direction	1	= Default
Ingress Protection	C	= IP4X
Colour	-	= Aluminium
Not used	000	

See cable variants and mounting plates overview in the paragraph "Accessories"

Installation

Before mounting/dismounting the lifting column ensure that the following points are observed:

• The lifting column is not in operation.

• The lifting column is free from loads that could be released during this work.

Before the lifting column is being put into operation, check the following:

• The lifting column is correctly mounted as indicated in the relevant user instructions.

• The equipment can be freely moved over the lifting column's whole working area.

• The lifting column is connected to a mains electricity supply/transformer with the correct voltage, and which is dimensioned and adapted to the lifting column in question.

• Ensure that the voltage applied matches to the voltage specified on the lifting column label.

• Ensure that the connection screws are secured safely.

Stop time

When the speed of the column is reduced or the motor power is removed the brake will engage and stop the column and self-lock it. The following table shows the stop time when a stop signal is sent, or the motor power is removed.

Interface	Soft stop when stop signal is sent	Stop time by power loss
ELEVATE Easy	1,500 ms	500 ms
ELEVATE Pro	500 ms	500 ms
ELEVATE Modbus	1,500 ms	500 ms

Installation dimensions

Built-in dimensions and their stroke lengths

Built-in dimensions	Stroke length: 200-900 mm*								
Stroke (S) in mm	200**	300**	400	500	600	700	800	900	1,100
BID = S/2 + 280 mm Standard	480	480	480	530	580	630	680	730	830
Built-in tolerances in mm	+/- 1.5	+/- 1.5	+/- 1.5	+/- 1.5	+/- 1.5	+/- 1.5	+/- 1.5	+/- 1.5	+/- 1.5

* Stroke length tolerance: +/- 1.5 mm
** Special article
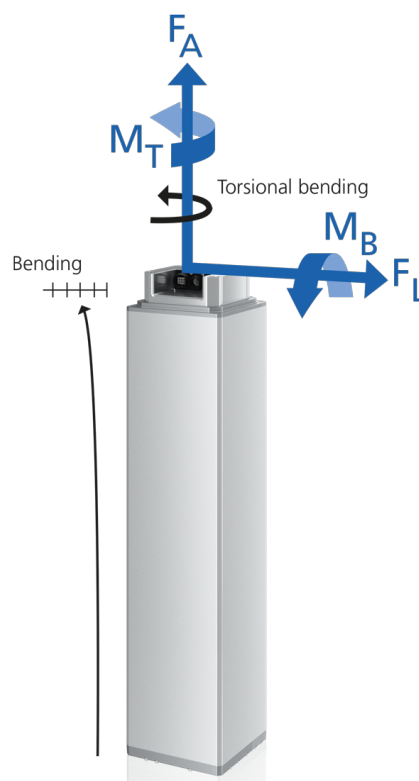
Bending

Bending moment - Static

The maximal bending moment for static column use is 3000 Nm. Static column use is when the column is not moving and e.g. the cobot creates a bending moment.

High off-centre loads apply bending moments onto the lifting column and cause bending of the column. The following graph shows the expected bending for different bending moments (MB, MT) and strokes. The data is representative for columns with 900 mm stroke. Runtime has an impact on the bending of the column. The graphics show the bending for a new column with 900 mm stroke (0.1 km runtime), a new column with 1,100 mm stroke, and a used 900 mm stroke column (135 km runtime). The used column ran 135 km with a constant off-centre of 100 kg and a bending moment of 350 Nm.

It might appear that the column has a greater bending when high bending moments are applied. However, this is mainly caused by the bending of the basis on which the column is mounted. Small bending on the basis causes greater bending of the whole application. Make sure your basis is resilient enough to withstand forces from the column and cobot.

For heavy cobots like UR20, H2017 etc., we recommend running the cobot at default collaborated speed and acceleration to avoid vibrations in the system and ground. Too fast acceleration and deceleration negatively affect position accuracy and lifetime of the column and robot. Examples of default collaborated speed are:

- Speed 60° /s (joint movement)
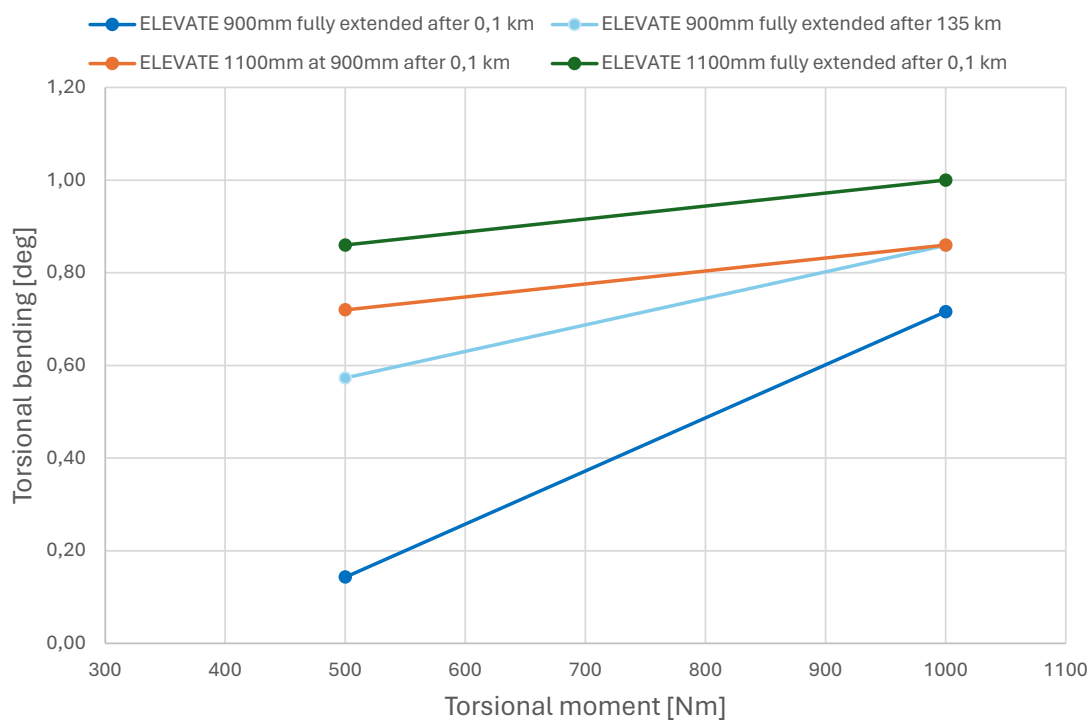- Acceleration 80° /s^2 (joint movement)

Bending with bending moment M_B
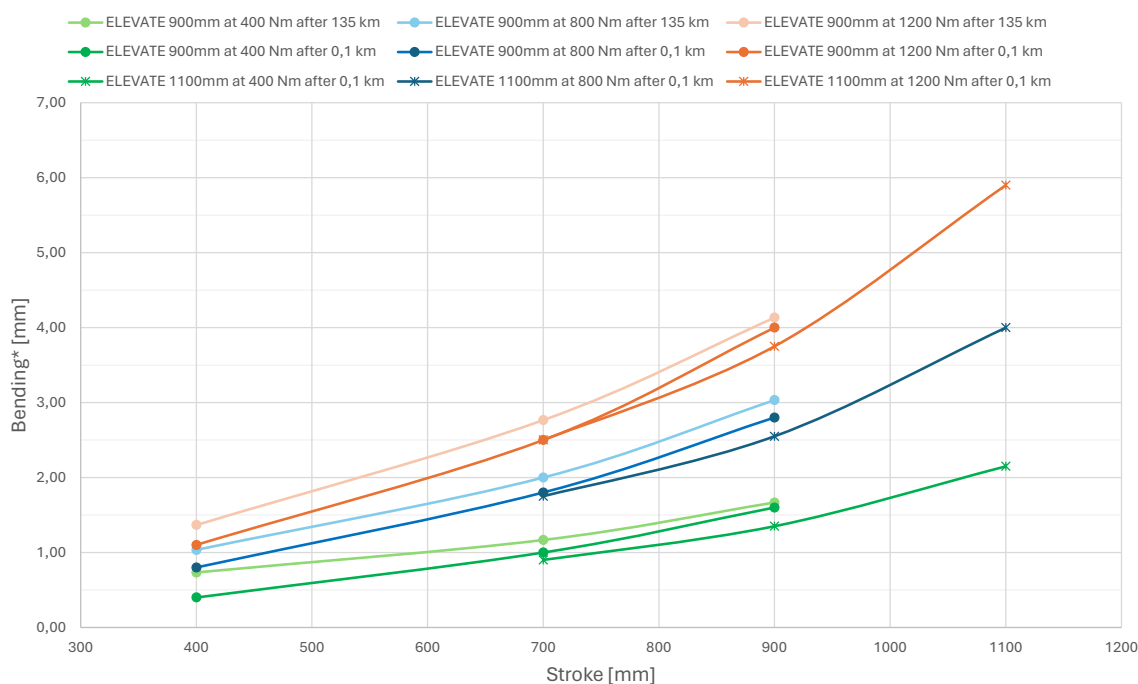
* The bending is measured at the top of the column in a horizontal direction.

Bending with torsional moment M_T

Bending moment - Dynamic

The maximal bending moment for dynamic column use is 1,400 Nm. This value must not be exceeded while the column is running in or out. In general, it is recommended to retract or partially retract the cobot while the column is running. Do not operate the column while the cobot arm is fully extended.

A fully horizontal extended cobot can cause a stick and slip effect at the last 200 mm of stroke (for 900 mm stroke: between position 700 mm and 900 mm) during downward movement of the column. Stick and slip is the result of an interplay between sliding friction and static friction between sliders and aluminium profiles inside the lifting column. This is caused by a too high bending moment and the absence of downwards force on the column. The result is short start/stop movements, which should be avoided during operation.

If off-center load is applied to an LC3 column, final testing and approval by the customer is recommended, as stability and performance depend on each specific customer application.
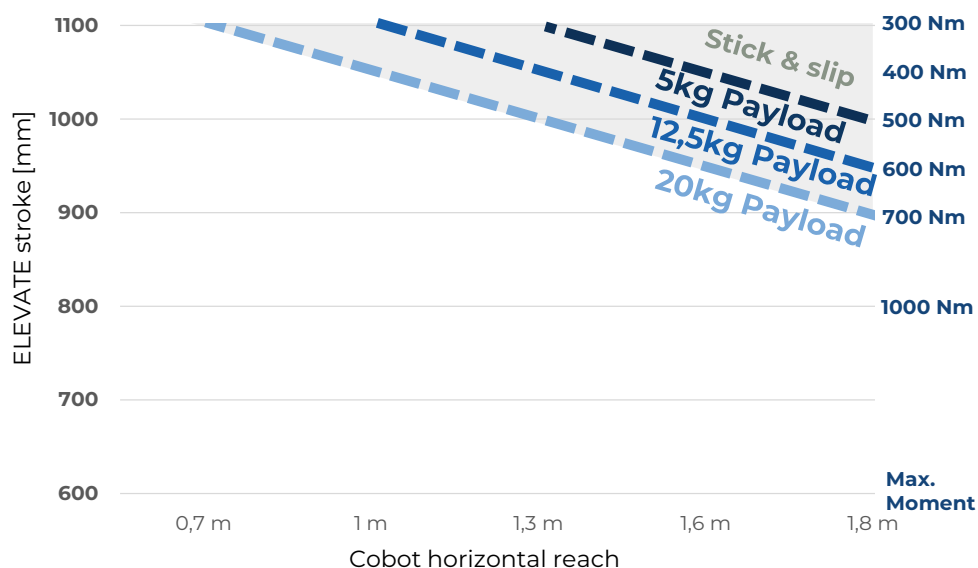
The following two graphs show the stick and slip areas for ELEVATE™ with 900 mm and 1,100 mm stroke.
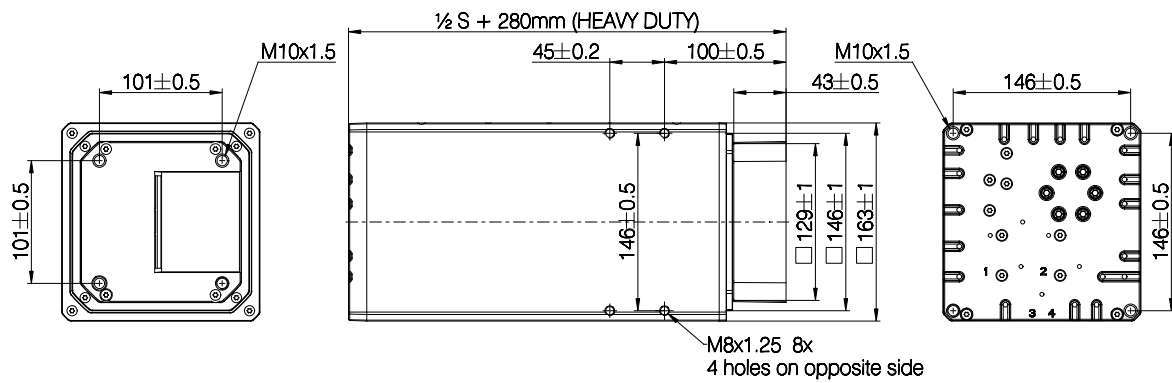
ELEVATE with 900 mm stroke:
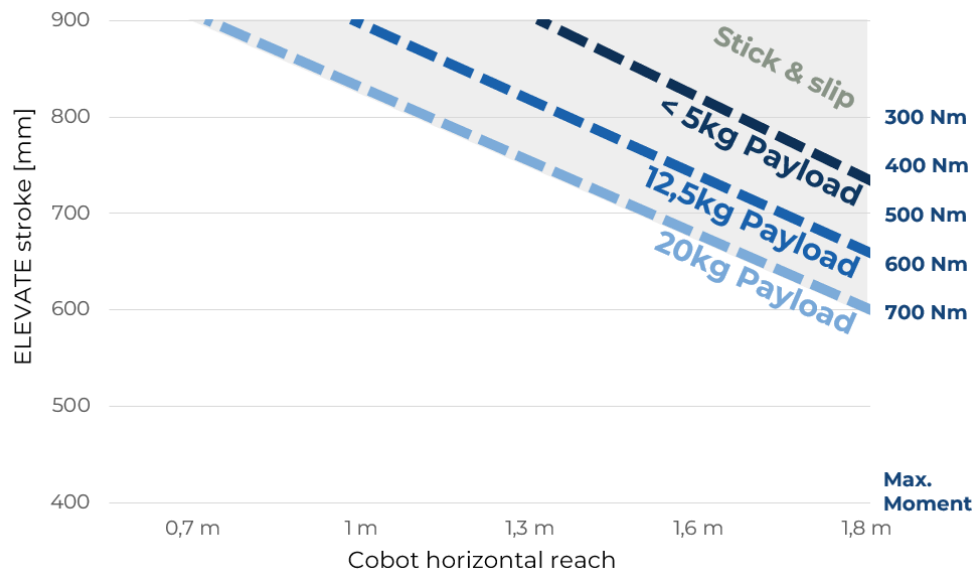
No stick and slip below 600-700 mm (depending on load)

ELEVATE with 1,100 mm stroke and improved stick and slip:

No stick and slip until 900 mm stroke.

Built-in dimensions

The ELEVATE™ options with a stroke of 700 mm, 900 mm and 1,100 mm come with 8 M8 mounting holes on the outer profile. All other options come without these holes. See chapter "Mounting of tools on the side of an LC3 IC" for more mounting options.

LC3 IC mounting guidelines

LC3 IC is for use in push and pull applications and can be mounted in both directions – largest profile down or largest profile up. The column can only be used for vertical movement - not for horizontal.

Top plate up   Top plate down

Note: The cable outlet for motor connection is positioned at the top (smallest profile)
Mount the LC3 IC in the application using the 4x M10 mounting holes in both end plates.

If the column is to be used with a constant high off-centre load, we recommend to install the constant 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 and noise when the lifting column reaches the endstop position.
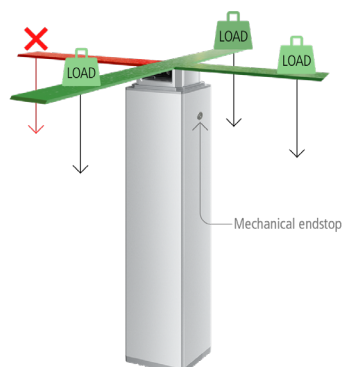
Use 4 pcs. M10 8.8 bolts at each end of the column for mounting to the application.
The screw depth must be min. 20 mm and max. 30 mm in the aluminium profile.

Screw torque: 35 Nm.

SECTION A-A
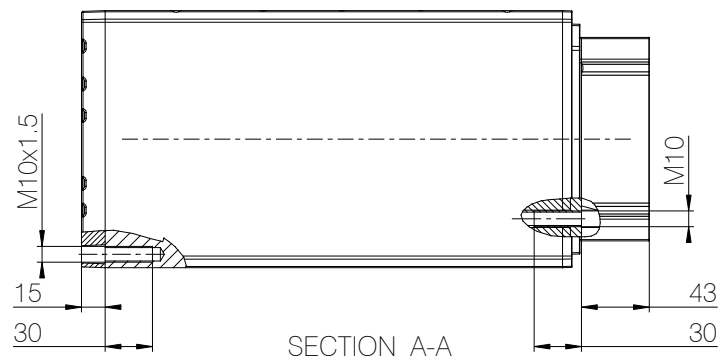
15 mm distance to thread   Bolt depth min. 20 mm   43 mm distance to thread

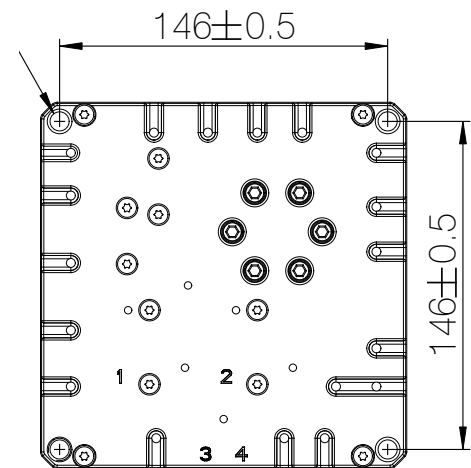Mounting holes
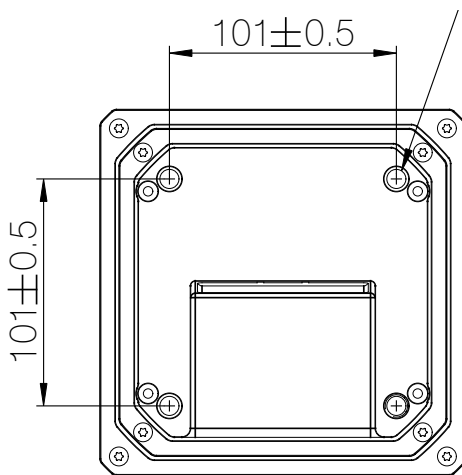
• It is recommended to use bolts with thread-lock adhesive

• Bolts of high quality steel 8.8 or 10.9 must be used to secure safe mounting of the LC3 IC to the application.

The minimum built-in dimension (BID) is 480 mm due to the design of the lifting column.
The tolerance for BID is +/- 1.5 mm

Accessories

ELEVATE™ is the cobot option for LC3 IC. There are different accessories available to simplify the integration with compatible cobot brands. Plug-in software is freely available on LINAK.com.

Cable set

The set includes a 5 m power cable, a 5 m signal cable, and a cable lock with a mounting screw. The cable set is required for the electrical installation of an LC3 IC.

Info: The internal bending radius of the cables must be bigger than 3 times the outer dimension of the cable.

For instance, if the outer cable dimension is Ø7, the internal radius of the maximum cable bending is 21 mm.

Base plate

The base plate is the standard bottom plate for LC3 IC to mount the column to the base of your application. It is important to use a solid ground since deflections on the ground influence the precision of the whole system. The steel plate can also be used to mount on the top of the column. Drawings can be downloaded from LINAK.com
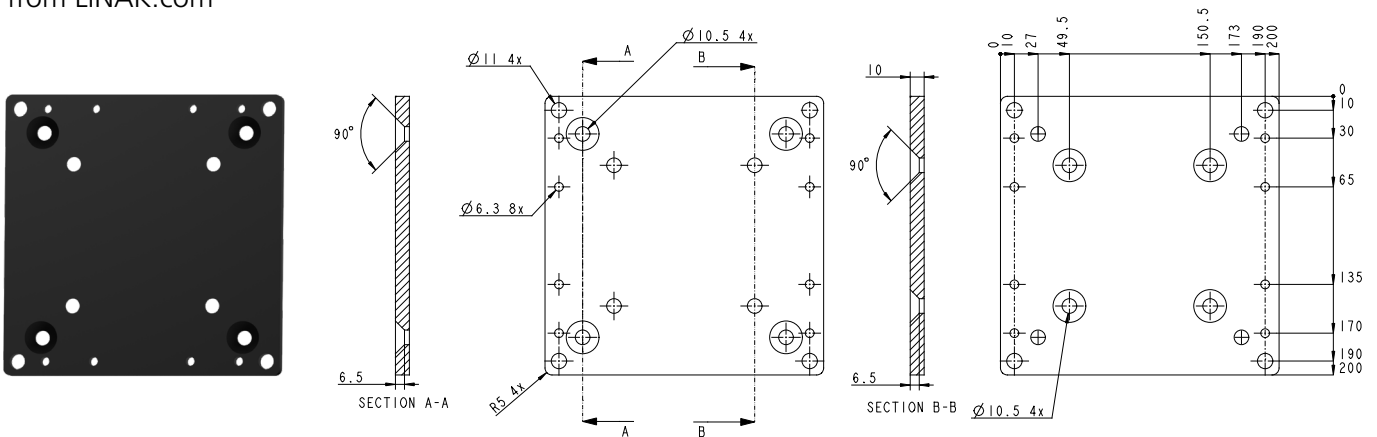
ELEVATE™ Universal Mounting Plate

The universal mounting plate is compatible with most cobot brands. The aluminium plate comes with 2 additional M6 x 1.0 holes to mount an energy chain. Drawings can be downloaded from LINAK.com
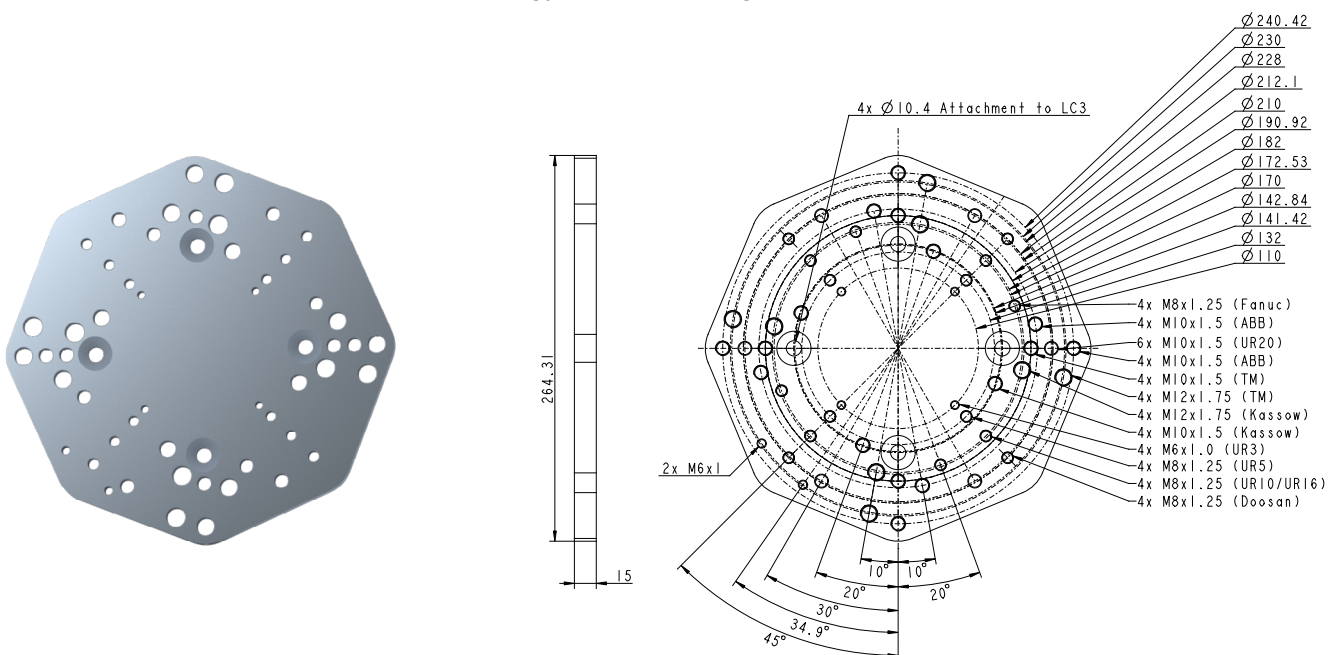
Top Plate Doosan TM

The plate comes with 2 additional M6 x 1.0 holes to mount an energy chain. Drawings can be downloaded from LINAK.com
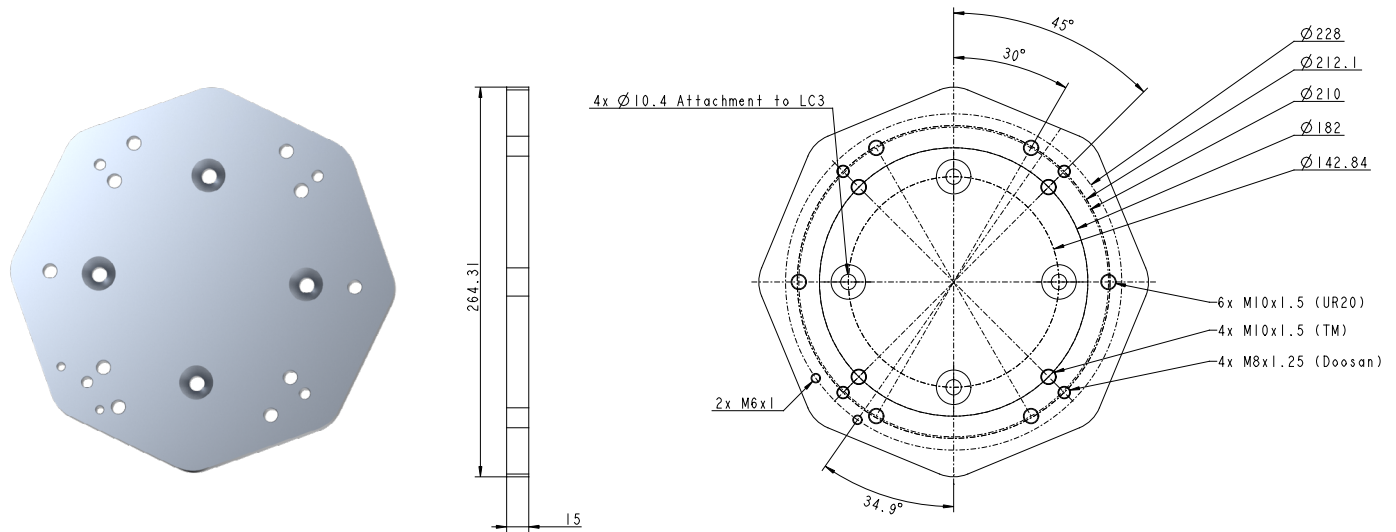
Top Plate UR

The aluminium plate comes with 2 additional M6 x 1.0 holes to mount an energy chain. Drawings can be downloaded from LINAK.com
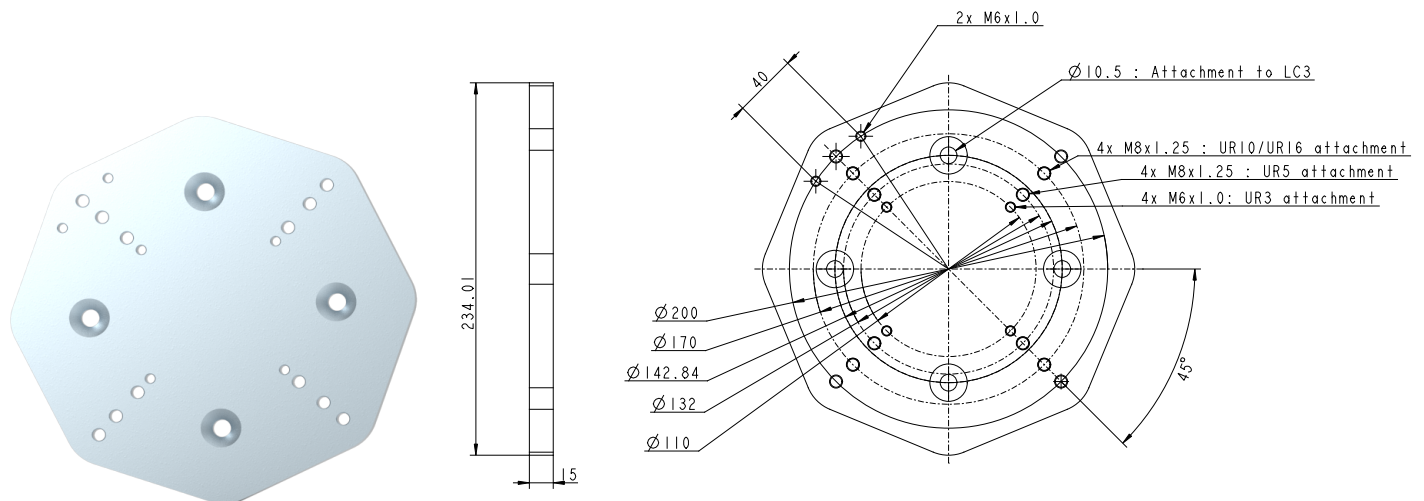
Available kits

The following accessory kits are available:

Cable set

Article number: 1002W8165

Description	Quantity
Power cable, 5 m, 6-pin minifit	1
Signal cable, 5 m, 9-pin microfit	1
Cable lock with mounting screw T15	1

ELEVATE™ Cobot kit

Article number: 1002W8191

Description	Quantity
Power cable, 5 m, 6-pin minifit	1
Signal cable, 5 m, 9-pin microfit	1
Cable lock with mounting screw T15	1
Base screw M10 x 45 A2 ISO 10642	4
Base plate	1
Top screw M10 x 80 A2 ISO 10642	4
ELEVATE Universal Mounting plate	1

ELEVATE Doosan TM

Article number: 1002W8164

Description	Quantity
Power cable, 5 m, 6-pin minifit	1
Signal cable, 5 m,9-pin microfit	1
Cable lock with mounting screw T15	1
Base screw M10 x 45 A2 ISO 10642	4
Base plate	1
Top screw M10 x 80 A2 ISO 10642	4
Top plate Doosan TM	1

ELEVATE Kit UR

Article number: 1002W8163

Description	Quantity
Power cable, 5 m, 6-pin minifit	1
Signal cable, 5 m, 9-pin microfit	1
Cable lock with mounting screw T15	1
Base screw M10 x 45 A2 ISO 10462	4
Base plate	1
Top screw M10 x 80 A2 ISO 10642	4
Top plate UR	1

LC3 IC Mounting kit

Article number: 1002W8192

Description	Quantity
Power cable, 5 m, 6-pin minifit	1
Signal cable, 5 m, 9-pin microfit	1
Cable lock with mounting screw T15	1
Base screw M10 x 45 A2 ISO 10642	4
Base plate	2
Top screw M10 x 80 A2 ISO 10642	4

Electrical installation

When using soft stop on a DC motor, a short peak of high voltage will be sent back towards the power supply. When selecting the power supply, it is important to ensure that it does not turn off the output when this backwards load dump occurs. The power supply should not be able to supply more than 700 W to the columns. A power supply above 700 W has a negative effect on the lifetime of the column if the column runs several times into the mechanical endstop.

Depending on option there can be three different connectors on the LC3 IC Lifting Column:

- The most left is the power connector for a 24 V DC power surply - a CAB0367046-xxxx cable fits the connector.

- In the middle there is a 9-pin signal connector for controlling the LC3 IC, gathering information regarding position, and split supply the communication controller. The CAB0368543-xxxx cable that fits the connector should be connected to a PLC or cobot controller.

- The connector to the most right is a RJ-45 for Ethernet, a shielded (STP) cat 6 ethernet cable or a cable with a category according to the requried transmission speed can be used with this connector. The ethernet cable is not supplied by LINAK.

When the power cable and signal cable are connected to the lifting column, the cable relief can be used to secure both cables to the lifting column. Use a Torx Bit T15 screwdriver and make sure the screw is tightened with 1.6 Nm.

The signal connector offers access to Actuator Connect™. The configuration cable with item no. 0367996 is required in order to use Actuator Connect. This cable must be connected to the 6-pin and 9-pin connector on the actuator side. On the opposite side, power must be applied to the flying leads, and the USB connector must be inserted into your PC.

ELEVATE™ Easy

Connection diagram

Platform: B3

+

24 V DC

−

BROWN

BLUE

INWARDS   BLACK

M

OUTWARDS   RED

YELLOW

GREEN

INPUT/OUTPUT

Power Cable
Flying Leads

Signal Cable
Flying Leads
(Molex mini-fit 12-pin)

Please be aware that if the power supply is not properly connected, you might damage the column!

ELEVATE™ Easy

I/O specifications

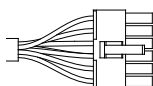| Input/Output	Specification	Comments
Description	Easy-to-use interface with integrated power electronics.	
Brown	24 V DC + (VCC) Connect Brown to positive 24 V ± 10 %, motor current limit: 25 A	Note: Do not change the power supply polarity on the Brown and Blue wires! Power supply GND (-) is electrically connected to the housing
Blue	24 V DC - (GND) Connect Blue to negative	
Red	Extends the column	The signal becomes active at: > 67% of V_{IN}
Black	Retracts the column	The signal becomes inactive at: < 33% of V_{IN} Input current: 10 mA The column comes with a 1,500 ms soft stop and start.
Yellow	Endstop reached in	Output voltage min. V_{IN} - 2 V Source current Max. 100 mA
Green	Endstop reached out	Endstop signals are NOT potential free. Endstop positions can be configured to any needed position with Actuator Connect(R). See virtual endstop.

Current cut-offs should not be used as stop function! This might damage the column. Current cut-offs should only be used in emergencies!

Current cut-off limits are not proportional with the load curves of the column. This means that the current cut-offs cannot be used as load indicator.

There are tolerances on the spindle, nut, gear wheels etc. and these tolerances will have an influence on the current consumption for the specific column.

Wiring example ELEVATE™ Easy

Universal Robot cobots with ELEVATE Easy – Wiring example

ELEVATE Easy can be directly used with a UR cobot due to the ELEVATE URCap. ELEVATE Easy is recommended when the column should only run to its endstop positions. Connect the column to the UR control box as shown in the wiring diagram. You can choose the port number during the setup of the URCap on the teach pendant. ELEVATE does not come with safety relay/contactors nor power supply. The wiring diagram only shows a suggestion to integrate ELEVATE into a safe torque off system.

Download the ELEVATE URCap from LINAK.com and get more information.

URCap wiring diagram for ELEVATE Easy

*Power supply and safety/contactor relays are purchased separately

LC3 IC pinout

IC I/O LC3		Possible UR I/O
Run out	Digital Input	DO0 - DO7
Run in	Digital Input	DO0 - DO7
End stop in	Digital Output	DI0 - DI7
End stop out	Digital Output	DI0 - DI7
Reserved	Orange	
Reserved	Light blue	
Reserved	Violet	
Reserved	Grey	
Reserved	White	
Power	+ 24 V	COX = System emergency stop
GND	GND	
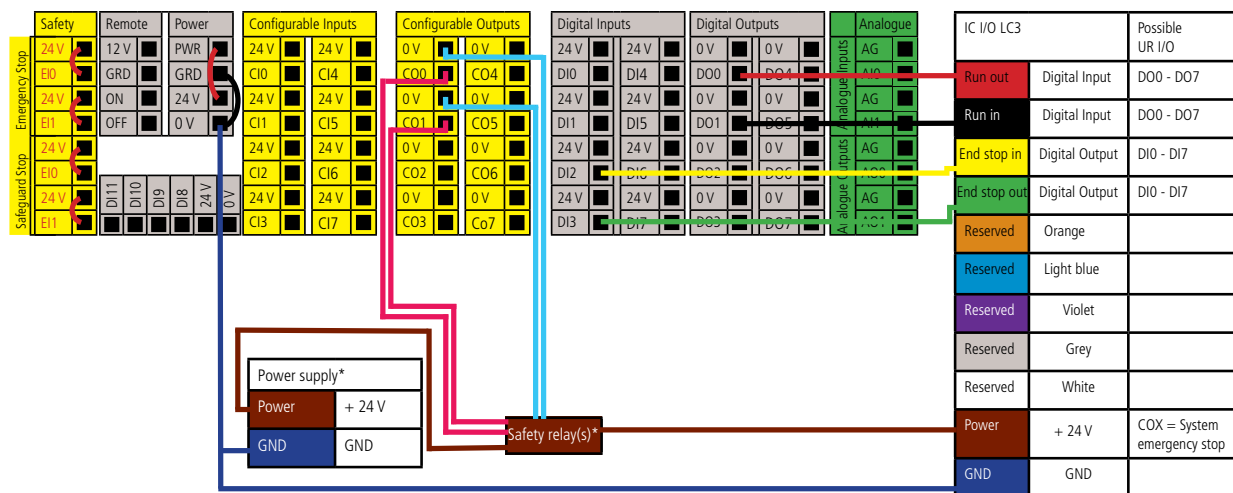
ELEVATE™ Pro

Connection diagram

Platform: C3

+	BROWN
− 24 V DC	BLUE
4-20 mA PROPORTIONAL	BLACK
	RED
Dual Hall — Hall A	YELLOW
Hall B	GREEN
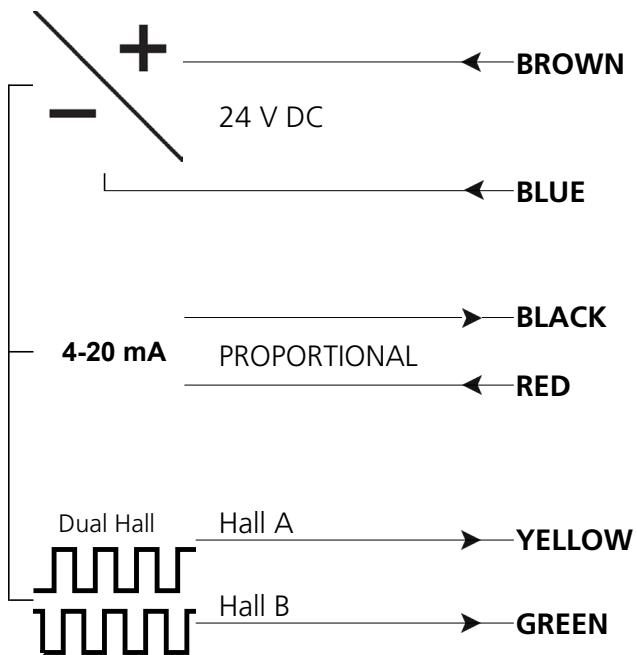
Power Cable
Flying Leads

Signal Cable
Flying Leads
(Molex mini-fit 12-pin)
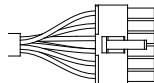
Diagram of Dual Hall:
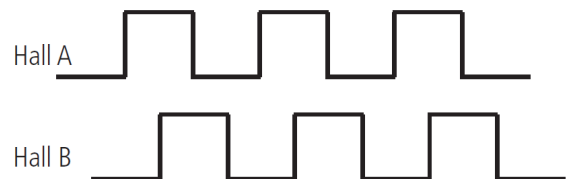
Hall A

Hall B

☞ Please be aware that if the power supply is not properly connected, you might damage the column!

ELEVATE™ Pro

I/O specifications

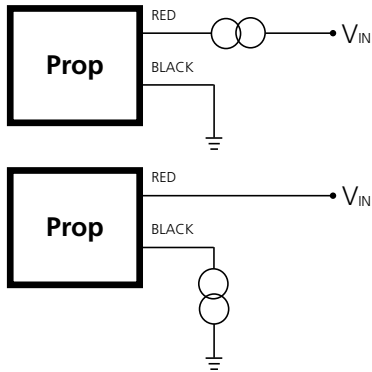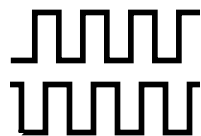| Input/Output	Specification	Comments
Description	Easy-to-use interface with integrated power electronics. The column is speed-controlled by means of a 4-20 mA signal. Proportional provides a wide range of possibilities for customisation.	
Brown	24 V DC + (VCC) Connect Brown to positive 24 V ± 10 %, motor current limit 25 A	Note: Do not change the power supply polarity on the Brown and Blue wires! Power supply GND (-) is electrically connected to the housing.
Blue	24 VDC - (GND) Connect Blue to negative	
Black Red	4-20 mA: 	Sinking current with reference to power GND (Blue) Common mode voltage: GND to V supply Equivalent input resistance ≈ 135 ohm Overcurrent protected, reverse voltage protected. The column comes with a 0 ms soft stop. See paragraph Proportional (speed) control for more details.
Yellow	Hall A Movement per each Hall pulse: 20 mm Pitch -> 0.303 mm/count Hall output: Push/Pull	Dual Hall The Hall sensor signals are generated by the turning of the column gearing. These signals can be fed into a PLC (Programmable Logic Controller). In the PLC the quadrature signals can be used to register the direction and position. Output voltage min. V_{IN} - 2 V Current output: 12 mA. Overvoltage on the motor can result in shorter pulses.
Green	Hall B Movement per each Hall pulse: 20 mm Pitch -> 0.303 mm/count Hall output: Push/Pull	

Current cut-offs should not be used as stop function! This might damage the column. Current cut-offs should only be used in emergencies!

Current cut-off limits are not proportional with the load curves of the column. This means that the current cut-offs cannot be used as load indicator.

There are tolerances on the spindle, nut, gear wheels etc. and these tolerances will have an influence on the current consumption for the specific column.
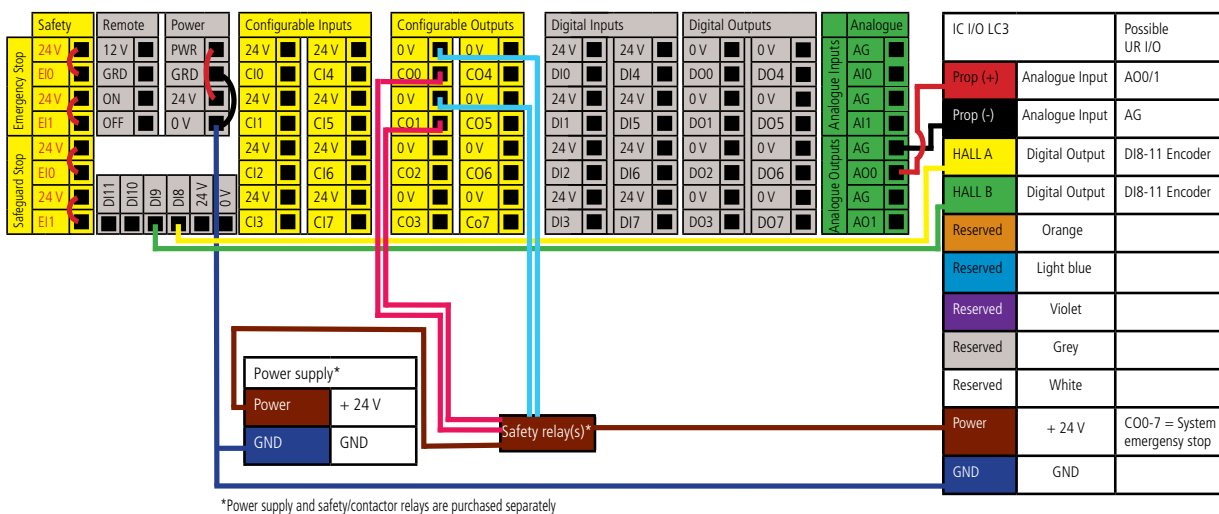
Wiring example ELEVATE™ Pro

Universal Robot cobots with ELEVATE Pro – Wiring example

ELEVATE Pro can be directly used with a UR cobot due to the ELEVATE URCap. ELEVATE Pro is recommended when the cobot needs to be positioned at several positions within the column's stroke. Connect the column to the UR control box as shown in the wiring diagram. You can choose the port number during the setup of the URCap on the teach pendant. ELEVATE does not come with safety relay/ contactors nor power supply. The wiring diagram only shows a suggestion to integrate ELEVATE into a safe torque off system. For ELEVATE Pro, it is important to set a 500 ms delay to the system that cuts off the motor power supply in case of an emergency stop. This 500 ms delay is required to ensure that the column stops and sends the encoder signal to the UR controller before the power is gone. If a 500 ms delay is not implemented, a re-initialization in the program is recommended to keep the position accuracy.

Download the ELEVATE URCap from LINAK.com and get more information.

URCap wiring diagram for ELEVATE Pro

*Power supply and safety/contactor relays are purchased separately

LC3 IC pinout

IC I/O LC3		Possible UR I/O
Prop (+)	Analogue Input	AO0/1
Prop (-)	Analogue Input	AG
HALL A	Digital Output	DI8-11 Encoder
HALL B	Digital Output	DI8-11 Encoder
Reserved	Orange	
Reserved	Light blue	
Reserved	Violet	
Reserved	Grey	
Reserved	White	
Power	+ 24 V	CO0-7 = System emergensy stop
GND	GND	

ELEVATE™ Pro

I/O specifications

The speed control over the analogue 4-20 mA is started when the signal is set between 11-13 mA for 100 ms.
After this initialization the full signal width can be used to control the speed (see graphic below).

In case the analogue signal exceeds 19.5 mA or the signal falls below 4.5 mA, the column will stop and go into an error mode.

This error can be cleared by repeating the initialization sequence, meaning the signal must be set between 11.2-12.5 mA for 100 ms.

The time for full acceleration and deceleration should not be shorter than 500 ms (0.2 m/s^2)

Stop	
Extending at full speed	95% 19.5 mA
100% speed ↑ **Extend** 25% speed	90% 19 mA
Stop	55% 12.5 mA
25% speed ↓ **Retract** 100% speed	45% 11.2 mA
Retracting at full speed	10% 5 mA
Stop	5% 4.5 mA
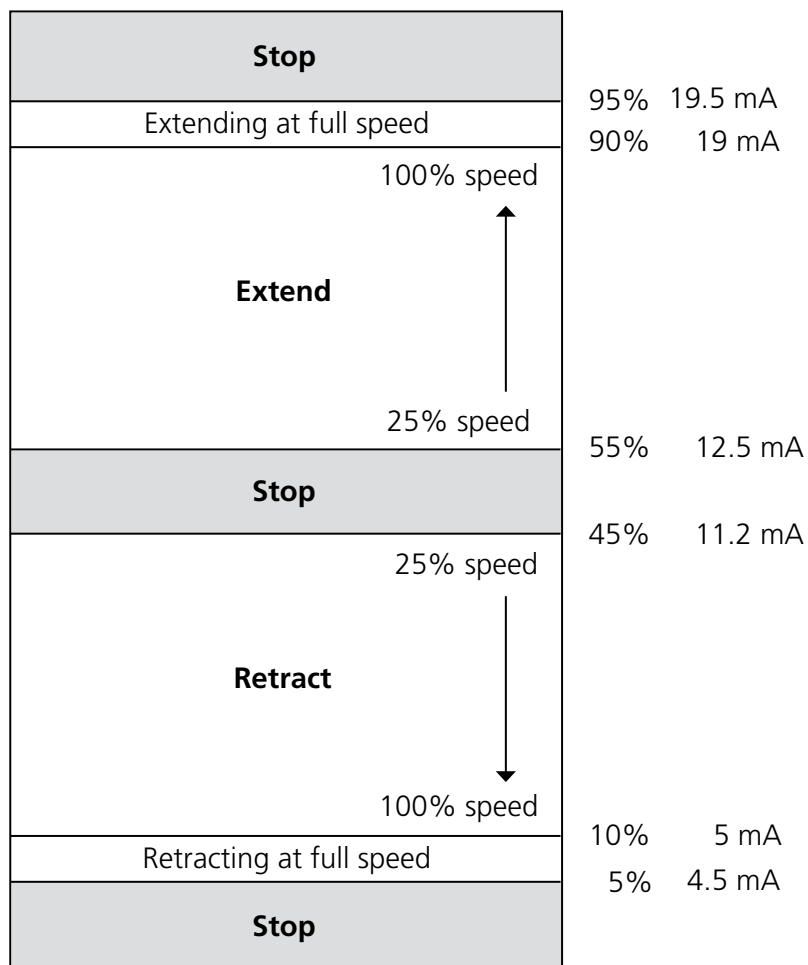
ELEVATE™ Modbus TCP/IP

Connection diagram
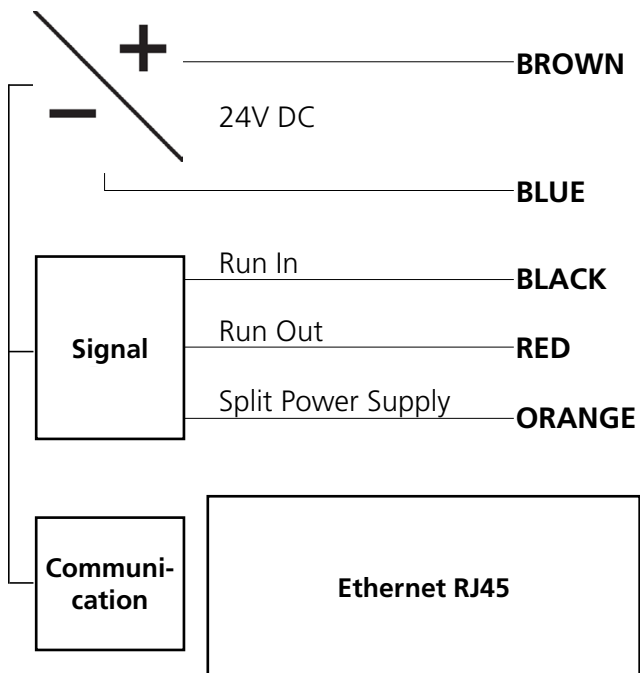
Platform: 0E

BROWN

24V DC

BLUE

Signal

Run In — **BLACK**

Run Out — **RED**

Split Power Supply — **ORANGE**

Communi-cation

Ethernet RJ45

Power Cable	**Signal Cable**	**Ethernet**
Flying Leads	Flying Leads (Molex mini-fit 12-pin)	8 ... 1
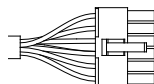
Please be aware that if the power supply is not properly connected, you might damage the column!

ELEVATE™ Modbus TCP/IP

I/O Specifications

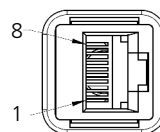| Input/Output	Specification	Comments
Description	Easy-to-use interface with integrated power electronics. Uses Modbus TCP/IP messages to command movement, setting parameters and to deliver feedback form the lifting column	
Brown	24 V DC + (VCC) Connect Brown to positive 24 V ± 10 %, motor current limit: 25 A	Note: Do not change the power supply polarity on the Brown and Blue wires! Power supply GND (-) is electrically connected to the housing
Blue	24 V DC - (GND) Connect Blue to negative	
Red	Extends the column	The signal becomes active at: > 67% of V_{IN}
Black	Retracts the column	The signal becomes inactive at: < 33% of V_{IN} Input current: 10 mA The column comes with a 1,500 ms soft stop and start. Only available if Ethernet communication is established
Orange	Split power supply: 24 V DC with ≈28 mA current consumption. Connect to positive. The split supply uses the common GND from the power supply.	Split power supply is for communication power of the controller only.

Current cut-offs should not be used as stop function! This might damage the column. Current cut-offs should only be used in emergencies!

Current cut-off limits are not proportional with the load curves of the column. This means that the current cut-offs cannot be used as load indicator.

There are tolerances on the spindle, nut, gear wheels etc. and these tolerances will have an influence on the current consumption for the specific column.
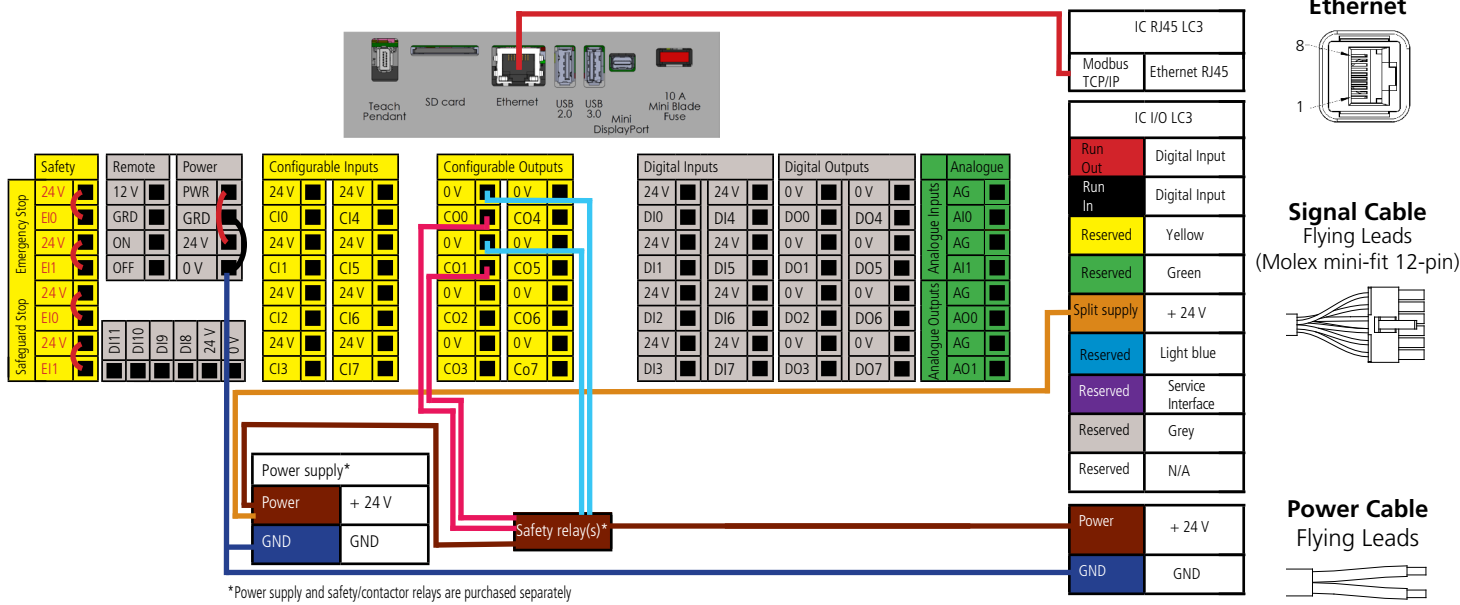
Wiring example ELEVATE™ Modbus TCP/IP

Universal Robot cobots with ELEVATE Modbus TCP/IP - Wiring example

ELEVATE Modbus TCP/IP can be directly used with a UR cobot due to the ELEVATE URCap. ELEVATE Modbus TCP/IP is recommended when the cobot needs to be positioned at several positions within the column's stroke. Connect the column to the UR control box as shown in the wiring diagram. ELEVATE does not come with safety relay/ contactors nor power supply. The wiring diagram only shows a suggestion to integrate ELEVATE into a safe torque off system.

Download the ELEVATE URCap from LINAK.com and get more information.

URCap wiring diagram for ELEVATE Modbus TCP/IP

LC3 IC pinout

Ethernet

IC RJ45 LC3	
Modbus TCP/IP	Ethernet RJ45

IC I/O LC3	
Run Out	Digital Input
Run In	Digital Input
Reserved	Yellow
Reserved	Green
Split supply	+ 24 V
Reserved	Light blue
Reserved	Service Interface
Reserved	Grey
Reserved	N/A
Power	+ 24 V
GND	GND

Signal Cable
Flying Leads
(Molex mini-fit 12-pin)

Power Cable
Flying Leads

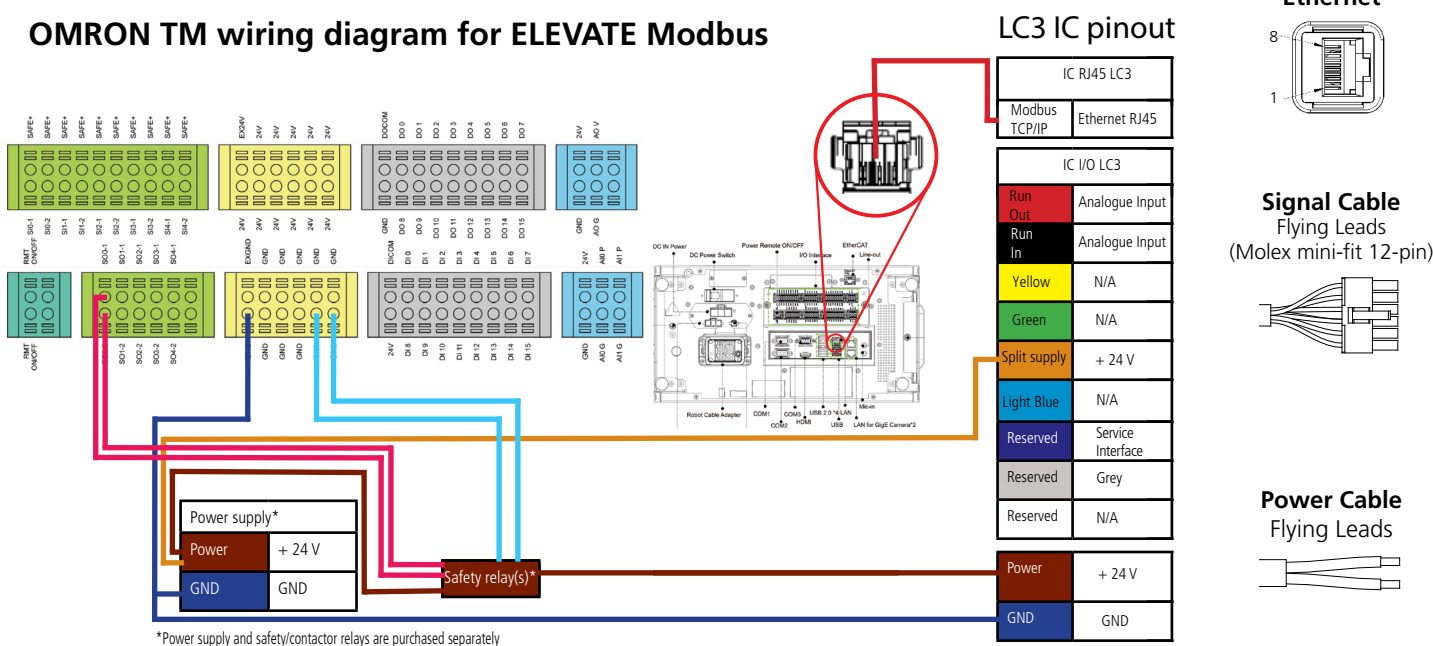*Power supply and safety/contactor relays are purchased separately

OMRON Techman cobots with ELEVATE Modbus TCP/IP - Wiring example

ELEVATE Modbus TCP/IP can be directly used with an OMRON TM cobot due to ELEVATE components for TMFlow. Connect the column to the TM control box as shown in the wiring diagram. ELEVATE does not come with safety relay/contactors nor power supply. The wiring diagram only shows a suggestion to integrate ELEVATE into a safe torque off system.

Download the ELEVATE components for TMFlow from LINAK.com and get more information.

OMRON TM wiring diagram for ELEVATE Modbus

LC3 IC pinout

Ethernet

IC RJ45 LC3	
Modbus TCP/IP	Ethernet RJ45

IC I/O LC3	
Run Out	Analogue Input
Run In	Analogue Input
Yellow	N/A
Green	N/A
Split supply	+ 24 V
Light Blue	N/A
Reserved	Service Interface
Reserved	Grey
Reserved	N/A
Power	+ 24 V
GND	GND

Signal Cable
Flying Leads
(Molex mini-fit 12-pin)

Power Cable
Flying Leads

*Power supply and safety/contactor relays are purchased separately

Wiring example ELEVATE™ Modbus TCP/IP

Kassow cobots with ELEVATE Modbus TCP/IP - Wiring example

ELEVATE Modbus TCP/IP can be directly used with Kassow cobots with the ELEVATE Cbun.

Connect the column to the Kassow controller as shown in the wiring diagram. ELEVATE does not come with safety relay/contactors nor a power supply. The wiring diagram only shows a suggestion to integrate ELEVATE into a safe torque off system.

Download the ELEVATE Cbun from LINAK.com and get more information.

Kassow wiring diagram for ELEVATE Modbus TCP/IP

*Power supply and safety/contactor relays are purchased separately
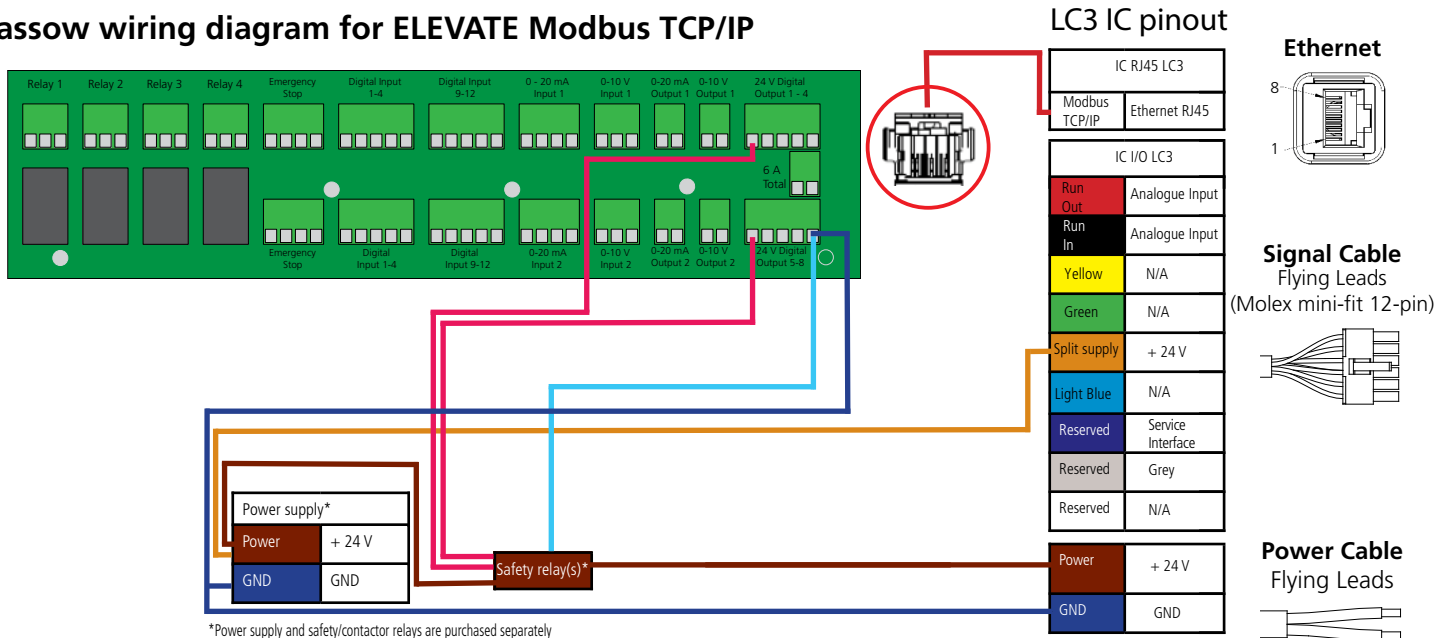
Mounting of tools on the side of an LC3 IC

It is possible to mount tools on all 4 sides of the LC3 IC 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.

3-stage

SECTION C-C
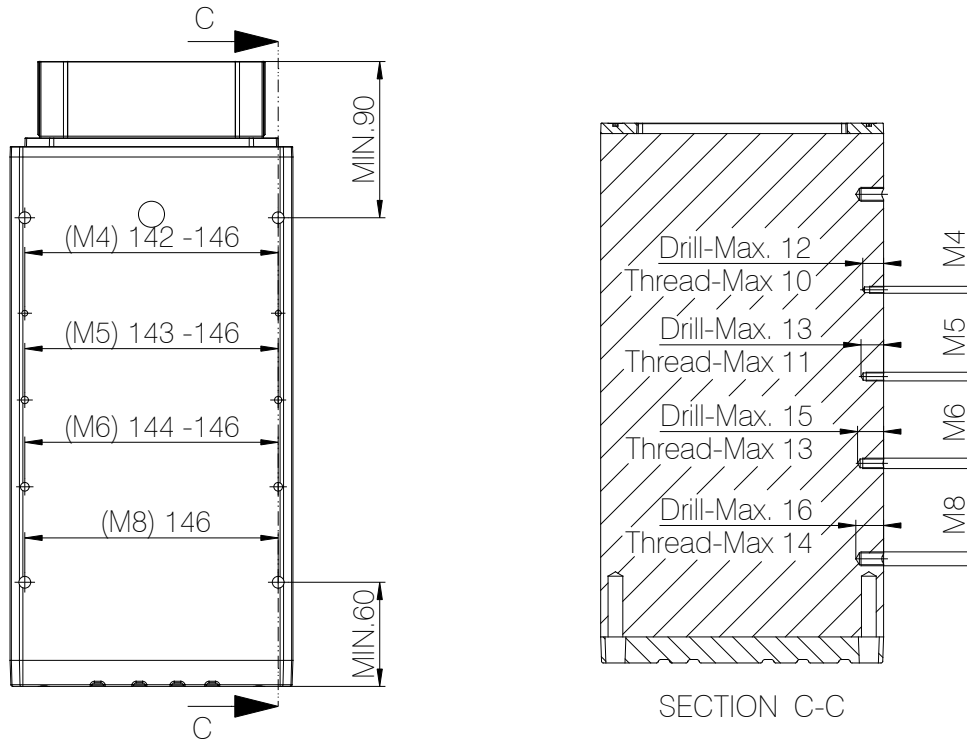
Screws used for mounting of a product on the side of the LC3 IC must be 8.8.

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

Note: There is no installed grounding cable connecting the top and bottom plate.

Declaration of Conformity

DECLARATION OF CONFORMITY

LINAK A/S
Smedevænget 8
DK - 6430 Nordborg

Hereby declares that LINAK Lifting Column:

LC3******F***2H*****C3**-000
LC3******F***3H*****C3**-000
LC3******F***4H*****C3**-000
LC3******F***5H*****C3**-000
LC3******F***6H*****C3**-000
(The * in the product description can either be a character or a number, thereby defining the variation of the product)

complies with the EMC Directive 2014/30/EU according to following standards:
EN 55016-2-3:2017+A1, EN 55016-2-1:2014
EN 61000-4-2:2009, EN IEC 61000-4-3:2020, EN 61000-4-4:2012
EN 61000-4-5:2014+A1, EN 61000-4-6:2014, EN 61000-4-8:2010

complies with RoHS2 Directive 2011/65/EU according to the standard:
EN IEC 63000:2018

Additional information:
The product does comply with the standard:
EN 61000-6-2:2019, Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-4:2019: Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments

DK-6430 Nordborg, 2022-12-13

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

This declaration of conformity is issued under the sole responsibility of the manufacturer.
Original Declaration

DECLARATION OF CONFORMITY

LINAK A/S
Smedevænget 8
DK - 6430 Nordborg

Hereby declares that LINAK Lifting Column:

LC3******F***00*****23**-*F*
LC3******F***00*****23**-*G*
LC3******F***00*****23**-*H*
(The * in the product description can either be a character or a number, thereby defining the variation of the product)

complies with the EMC Directive 2014/30/EU according to following standards:
EN 55016-2-3:2017+A1, EN 55016-2-1:2014
EN 61000-4-2:2009, EN IEC 61000-4-3:2020, EN 61000-4-4:2012
EN 61000-4-5:2014+A1, EN 61000-4-6:2014, EN 61000-4-8:2010

complies with RoHS2 Directive 2011/65/EU according to the standard:
EN IEC 63000:2018

Additional information:
The product does comply with selected parts of the standards:
EN 61000-6-2:2019, Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-4:2019: Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments

DK-6430 Nordborg, 2023-04-26

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Original Declaration

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