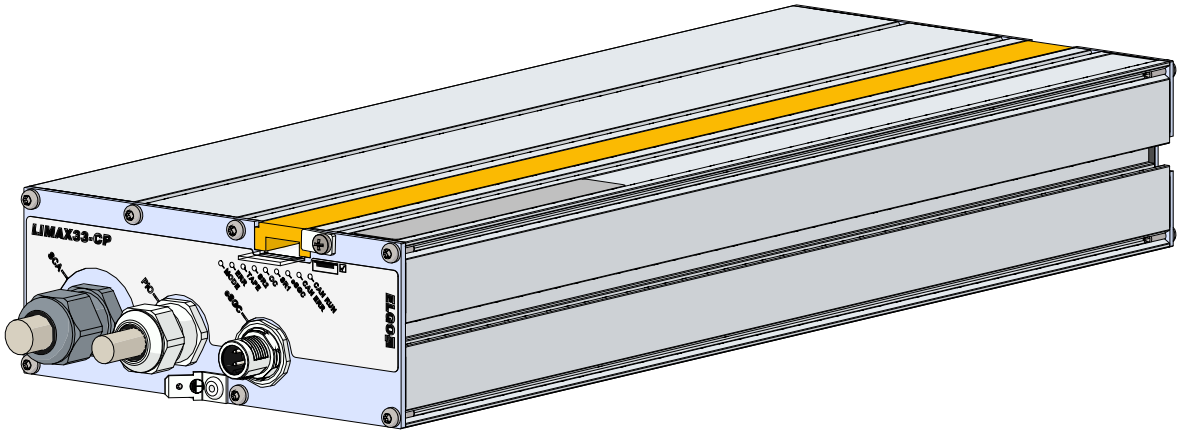
D-102840 / Rev. 30 / 2022-02-18

Safety Manual

SERIE *LIMAX33 CP-00*

Safe Magnetic Absolute Shaft Information System - STANDARD VERSION
(Original Safety Manual)



- Easy and flexible installation
- Replaces various electromechanical components in the elevator shaft
- Resistant to dirt, smoke and humidity
- Absolute position is always and directly available, no referencing even after long power failure
- Noiseless measuring principle

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3 General

3.1 Information on the Safety Manual

This manual contains important information regarding the handling of the device. For your own safety and operational safety, please observe all safety warnings and instructions.

Precondition for safe operation is the compliance with the specified safety and handling instructions. Moreover, the existing local accident prevention regulations and the general safety rules at the site of operation have to be observed.

Please read the operating manual carefully before starting to work with the device! It is part of the product and should be kept close to the device and accessible for the staff at any time. The illustrations in the manual are for better demonstration of the facts. They are not necessarily to scale and can slightly differ from the actual design.

3.2 References

/LIMAX33CP-00-MI/	Mounting Instructions for LIMAX33 CP-00 with installation kit LIMAX S-RMS2 https://www.elgo.de/fileadmin/user_upload/pdf/manual/lift/LIMAX33CP-00-MI-E.pdf
/CiA DR303-3/	CiA Draft Recommendation 303, Part 3: Indicator specification; CAN in Automation
/EN81-20/	Safety rules for the construction and installation of lifts
/EN81-21/	Safety rules for the construction and installation of lifts

3.3 Explanation of Symbols

Special notes in this manual are characterized by symbols.
The notes are introduced by signal words which express the magnitude of danger.
Please follow this advice and act carefully in order to avoid accidents and damage and injuries.

Warning notes:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	WARNING! This symbol in connection with the word „Warning" means a possibly impending danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	CAUTION! This symbol in connection with the signal word "Caution" indicates a possibly dangerous situation. Failure to heed these instructions can lead to injuries or damage of property.

Special safety instructions:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons due to voltage. Failure to heed these instructions can result in serious damage to health and even fatal injury. The operations may only be carried out by a professional electrician.

Tips and recommendations:

NOTE!
… points out useful tips and recommendations as well as information for an efficient and trouble-free operation.

References:
(☞) This symbol marks a reference to a chapter of this document
(🕮) This symbol marks a reference to chapter of another document

3.4 Statement of Warranties

The statement of warranties is enclosed separately in the sales documents.

Guarantee
The producer guarantees the functional capability of the process engineering and the selected parameters. The period of warranty is one year and begins with the date of delivery.

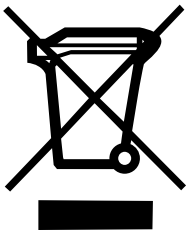
3.5 Demounting and Disposal

Unless acceptance and disposal of returned goods are agreed upon, demount the device considering the safety instructions of this manual and dispose it with respect to the environment.

Before demounting:
Disconnect the power supply and secure against re-start. Then disconnect the supply lines physically and discharge remaining energy. Remove operational supplies and other material.

Disposal:
Recycle the decomposed elements:

- Metal components in scrap metal
- Electronic components in electronic scrap
- Recycle plastic components
- Dispose the remaining components according to their material consistence



CAUTION!
Wrong disposal causes environmental damages!
Electronic scrap, electronic components, lubricants and other auxiliary materials are subject to special refuse and can only be disposed by authorized specialists!

Local authorities and waste management facilities provide information about environmentally sound disposal.

4 Safety

	CAUTION! Please read the operating manual carefully, before using the device! Observe the installation instructions! Only start up the device if you have understood the operating manual. The operating company is obliged to take appropriate safety measure. The initial operation may only be performed by qualified and trained staff. Selection and installation of the devices as well as their embedding into the controlling system require qualified knowledge of the applicable laws and normative requirements on the part of the machine manufacturer.

4.1 General Causes of Risk

This chapter gives an overview of all important safety aspects to guarantee an optimal protection of employees and a safe and trouble-free operation.
Non-observance of the instructions mentioned in this operating manual can result in hazardous situations.

4.2 Personal Protective Equipment

Employees have to wear protective clothing during the installation of the device to minimize danger of health.

Therefore:
Change into protective clothing before performing the works and wear them throughout the process.
Additionally observe the labels regarding protective clothing in the operating area.

Protective clothing:

	PROTECTIVE CLOTHING … is close-fitting working clothing with light tear strength, tight sleeves and without distant parts. It serves preliminarily for protection against being gripped by flexible machine parts. Do not wear rings, necklaces or other jewelry.
	PROTECTIVE GLOVES … for protecting the hands against abrasion, wear and other injury of the skin.
	PROTECTIVE HELMET … for protection against injuries of the head.

4.3 Conventional Use

The product described in this manual was developed to execute safety-related functions as a part of an entire assembly or machine. It is the responsibility of the manufacturer of a machine or installation to ensure the proper operation of the system. The ELGO-device is conceived only for the intended use described in this manual.

The ELGO length measuring system LIMAX33 CP-00 serves only to measure lengths in lift systems and to fulfill the required safety functions (described in chapter ☞ 13).

CAUTION!
Danger through non-conventional use!

Non-intended use and non-observance of this operating manual can lead to dangerous situations.

Therefore:

- Only use the device as described
- Strictly follow the instructions of this manual

Avoid in particular:

- Remodeling, refitting or changing of the construction or single components with the intention to alter the functionality or scope of the device.

Claims resulting from damages due to non-conventional use are not possible.
Only the operator is liable for damages caused by non-conventional use.

4.4 Risks caused by displacement of the tape

The integrity of all safety functions, which depend on positions, is based on the fact that the position of the magnetic tape remains invariable after commissioning. This means that, in retrospect, no appreciable displacements of the magnetic tape take place relative to the relevant points of the building or elevator shaft. These relevant points are e.g. positions of the thresholds of the shaft doors, positions of the buffer surfaces, position of the bottom of the pit or position the shaft ceiling.
Causes for displacement of the tape and possible counter measures are described in the next subsections

4.4.1 Tape break

The tape presence sensor secures the risk for shifting of the tape caused by break of the tape. The tape presence sensor opens the safety circuit in case the lower tape fixture is more than 55mm downwards or upwards out of its origin position.
In case of tape break the spring will pull the lower tape fixture out of its origin position and the presence sensor will open the safety circuit.

4.4.2 Lengthening of the tape caused by differences of temperature

The decisive factor for a potential safety risk is the difference between the longitudinal temperature extent of magnetic tape on one side and the building / elevator rail on the other side.

This is calculated as follows:

$\Delta T * L * (\alpha_t - \alpha_r)$

$\alpha_t = 16* 10^{-6} K^{-1}$ (expansion coefficient of the tape)
$\alpha_r = 12 * 10^{-6} K^{-1}$ expansion coefficient of rail and building almost the same, assumed to by a building of reinforced concrete, what will be normally the case for higher buildings (and only these are critical).

L = 260m worst case (max. measuring length).
ΔT is the maximum difference of temperature at the moment of commissioning and temperature at operation. This is assumed to be 50°C:
It is assumed, the LIMAX33 CP-00 will not operate at an average temperature over the shaft length below 0°C and not over 50°C
Average temperature over the shaft means that – e.g. concerning the maximum temperature - it may be even hotter than 50°C (e.g. in the shaft head) but in the shaft pit it will be colder to compensate, so that the expansion of the band corresponds to that at a temperature of 50°C with equal temperature distribution.
Similar words apply to the minimum average temperature of 0°C.

Taking these values as a basis, the result is a maximum difference of 52mm. This means the tape detector will not trip.
In case commissioning is carried out at more average temperature conditions (e.g. between 20°C and 30°C) the maximum ΔT will be only 30°C and the maximum difference longitudinal extent will be reduced to 31mm.

The user must consider possible shift of positions between building and tape caused by longitudinal temperature extent.
The user must consider possible positional shifts between building and tape caused by the longitudinal temperature, especially if:

- The building is high
- The building is construct with another material than reinforced concrete
- Commissioning took place at extremely high or extremely low temperatures in the shaft
- The occurrence of extremely high or extremely low temperatures in the shaft during operation is expected

If necessary, a corresponding tolerance must be included when determining the tripping points / distances of the safety functions.

4.4.3 Settlement of the building

Many buildings are built in such a way that, when the building settles, there is a shift between the actual building and the elevators rail, which also shifts the trip points of the safety functions.
Building settlement is a process that lasts for several years.
During the annual inspection, shifts in the trip points of the safety functions are detected.
If the building was just constructed, there may be an increased settlement in the first few months. Therefore it may appear a considerable difference between the threshold of the car and of the floors even before the next annual inspection. This is then remedied by re-learning or adjusting the floor positions, which would also correct the tripping points of the door bridging and UCM safety function.
In order to adapt other position-dependent safety functions to the new conditions, the reference positions would have to be corrected in this case as well. Therefore also the reference positions have to be checked and – if so – adjusted every time the necessarily for re-adjustment of the floor positions appears.

The user must judge based on the structural conditions of the building, if building settlement is expected in a considerable extend.
Furthermore the possibility of an increased settlement is in the first year(s) after construction of the building has to be considered. A suitable measure is to check the safety functions in a shorter time interval than one year at least in new high buildings.

Remark: the tape presence sensor **does not secure** this risk because relative positions between rail/mounting crossbars and tape are normally not influenced by settlement of the building.

4.4.4 Displacement of mounting crossbars

Especially loosening of fixation of upper mounting crossbar is critical with regard to safety: The force of the spring can pull the upper mounting crossbar and the tape downwards. This would cause a shift of all tripping points of the safety functions in downwards direction. Depending on the respective safety function this can be the dangerous direction.
The presence sensor is an effective counter measure, if an appropriate tolerance for determinations of the tripping points/distances of the safety functions is applied (the tripping distance of the presence sensor of 55mm must be considered).

Further countermeasures are:

- Use of a torque wrench when tightening the fixations and consideration of the mounting instruction of LIMAX-SRMS2
- Checking the fixation for strength and correct position in regular time intervals
- Whenever the need for adjustment of floors positions appears, the fixation of mounting brackets must be checked. In case it is stated that one of them is loosened, it must be fixed and afterwards either all safety functions must be checked or a complete new commissioning must take place.

Remark: During elevator operation, it is noticeable when floor and car threshold are not on the same level. Then the floors are usually adjusted by maintenance personnel. During this work the technician should also check the cause for the shift of floor positions, because it is likely that this cause will also have an impact on the safety functions. The cause can be settlement of the building or a shift of mounting bracket.

5 Transport and Storage

5.1 Safety Instructions for Transport, Unpacking and Loading

CAUTION!
Transport the package (box, palette etc.) professionally. Do not throw, hit or fold it.

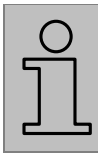
5.2 Handling of Packaging Material

Notes for proper disposal: ☞ 3.5

5.3 Inspection of Transport

Check the delivery immediately after the receipt for completeness and transport damage.
In case of externally recognizable transport damages:

- Do not accept the delivery or only accept under reserve.
- Note the extent of damages on the transportation documents or delivery note.
- File complaint immediately.



NOTE!
Claim any damage immediately after recognizing it. The claims for damage must be filed in the lawful reclaim periods.

5.4 Storage

Store the device only under the following conditions:

- Do not store outside
- Keep dry and dust-free
- Do not expose to aggressive media
- Protect from direct sun light
- Avoid mechanical shocks
- Storage temperature (☞ 7) needs to be observed
- Relative humidity (☞ 7) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

6 Product Features

LIMAX33 CP-00 is a magnetic tape-based shaft information and safety system which covers:

- Several safety functions named in the EN81-20/21, refer to chapter 13.
- The requirements regarding cab position measurement (e.g. as information for lift control)
- Non safety relevant functions like door zone indication for emergency release

The magnetic measuring principle makes the sensor insensitive even to black smoke and splash water. Magnetic tape and sensor can be mounted easily.

ADVANTAGES

The drastic reduction of the components offers significant cost advantages. Time for installation and maintenance is reduced significantly. A possible troubleshooting is also simplified, especially since the electronic provides diagnostic options.

LIMAX33 CP-00 is as well suitable for serial production with new installations as for upgrading existing elevator systems.

6.1 Functional principle

The tape carries the unique positioning information as a magnetic code. It is installed free hanging in the elevator shaft by use of a mounting kit. The LIMAX33 CP-00 is mounted to the elevator car. While the actual measurement is contactless the tape must be kept within a maximum distance to the sensor head. Therefore, the tape is guided along theLIMAX33 CP-00 by use of the polymer tape guide which is an integral component of the sensor head.

The magnetic measurement principle is extremely robust. Dust, dirt and humidity do not affect the measurement in any way. Also, smoke and even higher temperatures have no influence on the measuring quality. Further the tape is robust enough to withstand the harsh conditions in elevator shafts.

7 Technical Data

7.1 Identification

7.1.1 General Remarks concerning Identification

There are two labels attached on the housing of the sensor that serve to identify the device: the type label (refer to 7.1.2) and the info label (refer to 7.1.3).

The designation “LIMAX3CP” on both labels is equivalent to the designation “LIMAX33CP” in the certificate.

The abbreviated notation LIAMX3CP is due to the requirements of the enterprise resource planning system used at ELGO.

Similar words apply to the hardware-version: it is designated as 3.3 on the sticker and as 03.3 in the certificate. Both designations are equivalent. On older devices the designation 3.3 was also used on the sticker. The abbreviation of this designation became necessary also due to the requirements of the resource planning system.

If further versions of the software and/or hardware are certified at a later point in time by means of an addition to the certificate, the version designation of the hardware and software will also change. In this case, this Safety Manual does not necessarily have to be updated for the figures concerned. The specific designations of hardware and software in the following chapters reflect the current status (January 2022). They only serve as an example.

7.1.2 Type Label

The type label serves for the identification of the unit. It is located on the housing of the sensor, at the top of the side with the guide rail mounted.

It gives the exact type designation (= order reference, see ☞ 9) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number, the production date as well as the hardware and software versions. When corresponding with ELGO always indicate this data.

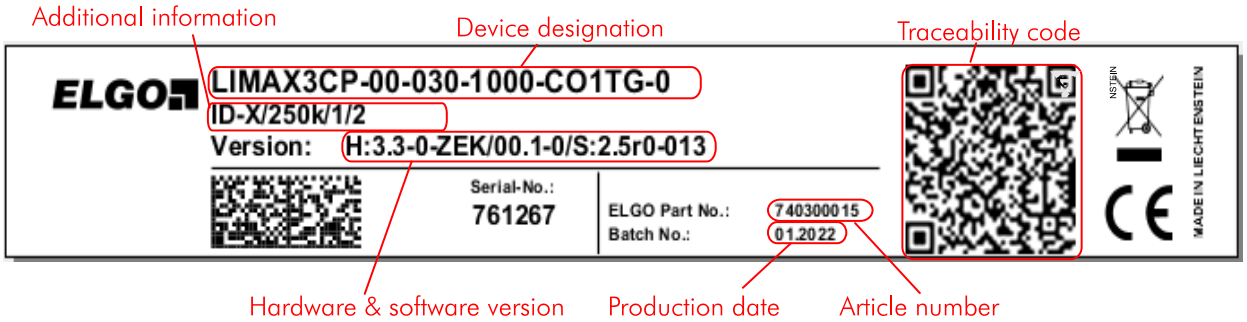


Figure 1: Example of a type label for identification of the sensor

The software version is part of the certificate with its version number and CRC. The version number is symbolized in the above label as v2.5r0.

The hardware version is part of the certificate with its board version (in the above label as 3.3).

The additional indications are the software customizations and the assembly version of the HW.

The customizations of the software and assembly versions of the hardware are not part of the certificate. Different of them can be generated without the need of a recertification. The corresponding process to generate them was part of the certification of the device.

7.1.3 Info Label and Info Sheet

The Info label (Figure 2) contains general information about the device. It is located on the top of the side opposite to the guide rail mounted.

Each system needs a specified configuration which must fit to the corresponding lift (☞ 14.1).

On the info label a space is reserved to attach the CRC-info-sticker, which contains the CRC of the configuration.

As an alternative, the CRC of the configuration and the date can be handwritten on the space provided on the info label.

For subsequent transparency of the respective configuration it is strongly recommended to attach an info sheet (Figure 3) with all important settings to the documentation of the installation.

The CRC on the info sheet must fit the CRC on the info label.

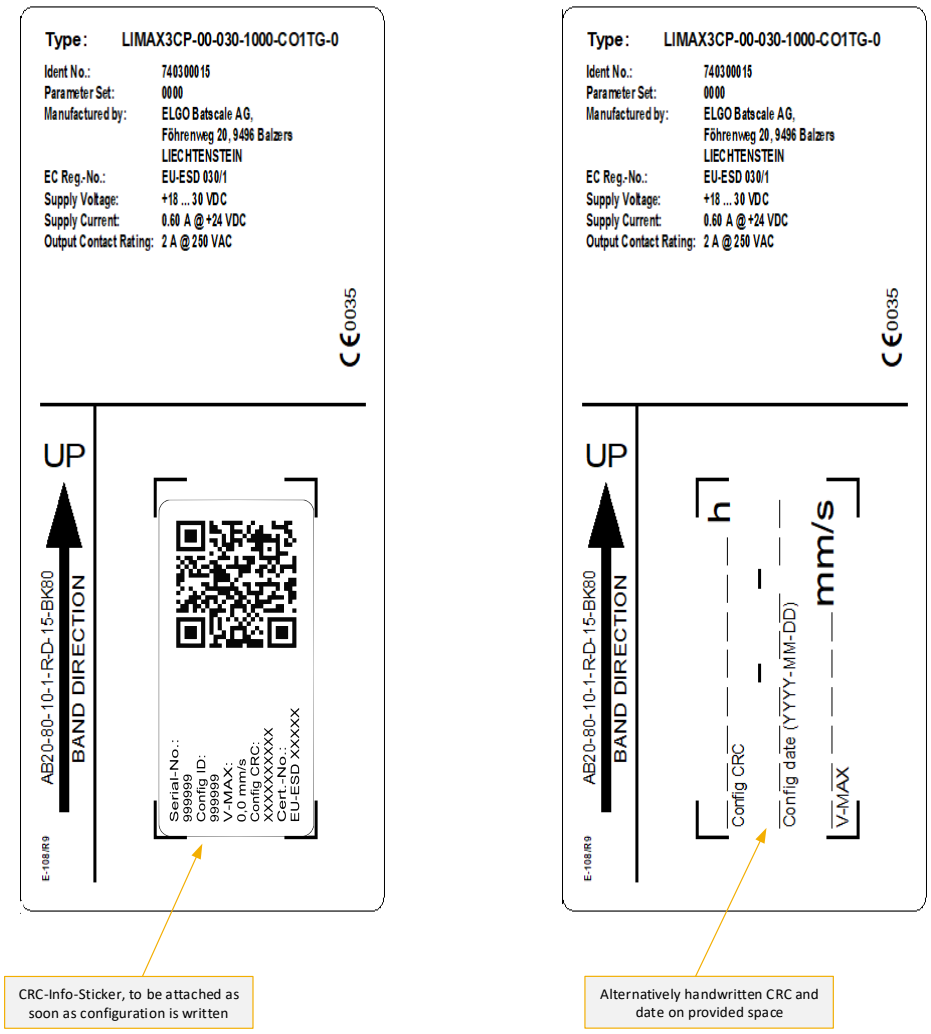


Figure 2: Example of an info label on the housing with a specific system configuration

	WARNING! Removing, exchanging or distorting of the information on the info label is prohibited. If the Info- label is accidently damaged so that the information – especially the configuration-CRC - is not clearly recognizable anymore, the device has to be treated in the same way like a defective device. <u>Any distortion of the information noted on the info-label can cause a dangerous situation.</u> There is one exception from this rule: If the configuration is erased in order to download a new configuration (refer to section 14.1.1.5) the CRC-info-sticker <u>must</u> be exchanged to a sticker fitting the new configuration.

Configuration 863

ELGO ELECTRONIC

Project Identifier: Example for Safety Manual
Device Type: LIMAX3CP-00-xxx-xxxx-xxxx-0 ID-X/xxxx/1/1 – 009 (DS417 - eSGC)
Configuration created on: 09.07.2021 09:00
Configuration-CRC: 0x1FC0FB04

By entering the CRC, you confirm that you have checked all the configuration parameters and that they match the current lift system.

Safety Functions

Disable Inspection	FALSE
Disable Over speed inspection (final tripping)	FALSE
Disable Working platform	FALSE
Disable upper Pre-triggered stopping system	FALSE
Disable lower Pre-triggered stopping system	FALSE
Disable Final limit switches	FALSE
Disable Over speed (pre- tripping)	FALSE
Disable Over speed teach (pre- tripping)	FALSE
Disable ETSL (check on retardation)	FALSE
Disable Over speed (final tripping)	FALSE
Disable Over speed teach (final- tripping)	TRUE
Disable Doors (Door bridging + UCM)	FALSE
Enable Automatic teach	FALSE
Enable Automatic adjustment	FALSE

Actuators

Enable OC, Safety Circuit	TRUE
Enable SR1	TRUE
Enable SR2	FALSE
Enable UCM only OC	FALSE
Enable SGC, Safety Gear Contact	TRUE
Enable SGC only down	FALSE

Tripping Speeds

Nominal speed (0-13 m/s)	1
Pre tripping speed (0-13 m/s)	1.15
Final tripping speed (0-13 m/s)	1.3
Pre tripping speed in teach (0-3 m/s)	0.7
Final tripping speed in teach (0-3 m/s)	0
Pre tripping speed in inspection (0-1 m/s)	0.6
Final tripping speed in inspection (0-1 m/s)	1

Shaft Offsets

Offset upper pre-triggered stopping System (0-2500 mm, in 10mm steps)	1200
Offset lower pre-triggered stopping System (0-2500 mm, in 10mm steps)	0

Deceleration Control (ETSL)

ETSL a (0,1-10 m/s²)	1.2
ETSL t_{jerk} (20-500 ms)	200
ETSL v_{corr} (0-2,5 m/s)	0.6
ETSL Offset Top (0-1000 mm)	0
ETSL Offset Bottom (0-1000 mm)	0

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Figure 3: Example of an info sheet for the documentation of the installation with a specific system configuration

7.2 Dimensions of LIMAC33 CP-00

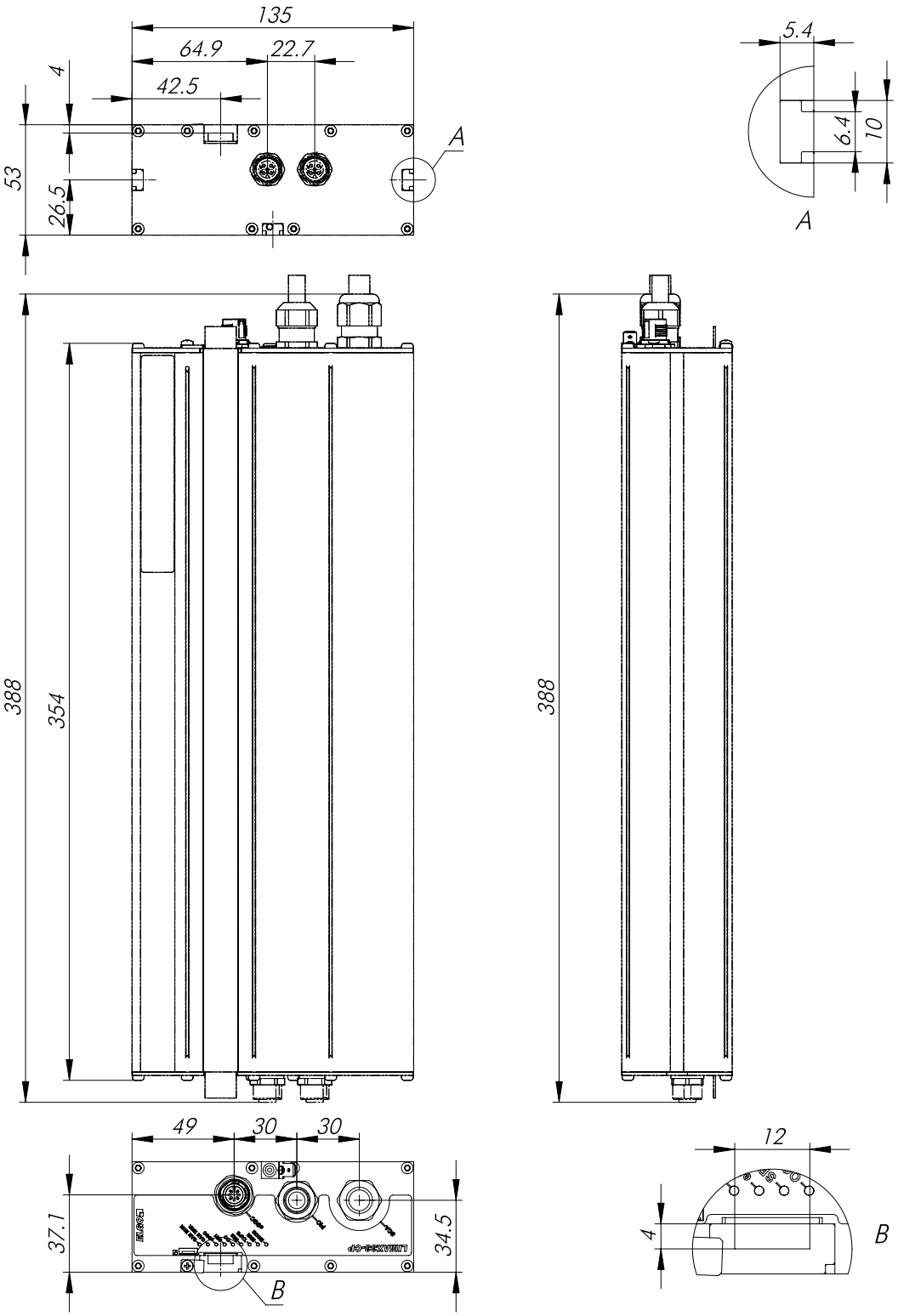


Figure 4: Dimensions of the sensor

7.3 Technical Data LIMAX33 CP-00

LIMAX33 CP-00 (Standard version)	
Mechanical Data	
Measuring principle	Absolute
Repeat accuracy	±1 increment
System accuracy in µm at 20°C	±(1000 + 100 x L) L = measuring length in meters
Distance sensor / magnetic tape	the correct distance is guaranteed by guidance
Basic pole pitch	8 mm
Sensor housing material	aluminum
Sensor housing dimensions	refer to Figure 4; minor modifications reserved
Necessary magnetic tape	AB20-80-10-1-R-D-15-BK80
Maximum measuring length	260 m
Connections	2 outlets with open wire ends for PIO and SCA cables (plug connectors on request) M12 4 pole male for eSGC; according to ICE61067-2-101
Sensor cable (PIO, SCA)	standard length: 3.0 m (others on request)
Weight	approx. 1400 g without cable; cable: approx. 60 g per meter
Electrical Data	
Supply voltage	18[1] ... 30[2] VDC (stabilized). A SELV/PELV power supply must be used
Residual ripple	< 100 mV
DZO rating	+ 24 VDC −20 %, max.200 mA (PNP)
Reverse polarity protection	integrated
Power input	max. 600 mA at 24 VDC
Interfaces	CAN: CANopen DS406 or DS417 (others on request) [3]
Digital input voltage	18 … 30 VDC for high level; open for low level
Relay contact rating OC, SR1, SR2	• 0...230VAC (max. 250VAC), max. 2A • 24VDC (max. 30VDC), max. 1A • 48VDC (max. 53VDC), max. 600mA • 110VDC (max. 120VDC), max. 250mA each with a resistive/inductive load with L/R < 40 ms
Rating for external supply of SGC-actuator	24 VDC, min. 18 V; max. 30 V; constraints for connected trip coil to be observed (refer also to chapter☞ 8, topic ☞ 23 and ☞ 24
Environmental Conditions	
Storage temperature	−25 … +85° C
Operation temperature	−20 … +65° C (−25 … +85° C on request)
Humidity	max. 95 %, non-condensing

[1] LIMAX33 CP-00 will open all actuators if the supply voltage falls under a threshold which lays between 14 and 16V (dependent on the load situation, mainly the number of closed actuators), it will close the actuators if the supply voltage exceeds a threshold which lays between 17 and 18V.

[2] LIMAX33 CP-00 will open all actuators if the supply voltage exceeds a threshold of about 31V. If after this the voltage falls under this threshold (minus a few 100mV hysteresis) the actuators close again.

[3] CANopen is the standard communication protocol. There is a special CANopen-Specification, defining the communication objects, which are special for LIMAX33 CP-00. There may be other, customer specific protocols. In this case please refer to the corresponding communication specification instead of the CANopen specification. What is said here in the text in relation to CANopen then applies to the particular protocol

Protection class	IP54 (according to EN60529), higher on request
Interference emission / immunity	EN 12015 / EN 12016
Vibration / shock resistance	EN 60068-2-6 / EN 60068-2-27, EN 60068-2-29
Others	
Maximum operating time	20 years
Safety relay contact reaction time	< 55 ms
Solid state contact (eSGC) reaction time	< 45 ms

8 Constraints for Use (Safety requirements for integration)

The general constraints for use of LIMAX33 CP-00 are listed here:

1. Configuration of LIMAX33 CP-00 and the elevator (where it is installed) must fit. The configuration is noted on the info sheet ☞ 7.1.3. The following topics must be taken into consideration when defining the configuration:

    a. It is possible to disable all safety functions related to inspection and/or "EN81-21"- state in combination[1]. In this case neither pre-triggered stopping system (top/bottom), nor inspection limit switch (top/bottom) nor overspeed inspection (pre-/final-tripping) are performed by the LIMAX33 CP-00. In this case these safety functions must be implemented by other means (if necessary) outside of the scope of LIMAX33 CP-00.
    b. All actuators necessary for the safety functions which are enabled, must be enabled in the configuration and connected to the safety circuit resp. an external braking element for eSGC following ☞ 10.4.3, ☞ 10.4.4, ☞ 10.4.5 and ☞ 10.4.8 . Section ☞ 14.1.4 shows an overview over the actuators necessary for the single safety functions.
    c. In case of pre-triggered stopping system top resp. bottom is DISABLED, it must be ensured that there is
        i. either ample survival space for a person on the car roof resp. in the shaft pit even if the car is on the highest resp. lowest possible position.
        ii. or survival space for a person on the car roof resp. in the shaft pit is implemented by other means outside of the scope of LIMAX33 CP-00.
        iii. The combination pre-triggered stopping system top is ENABLED and trip direction is "only down" is forbidden. It is also prevented by the software of the LIMAX33 CP-00 that this combination is programmed.
    d. If all safety functions related to inspection resp. "EN81-21"- state in combination are disabled, also the inspection limit switches top/bottom are disabled. In this case it must be ensured that EN81-21 §5.5.3.4, §5.7.3. resp. EN81-20 §5.12.1.5.2.1 g) are implemented by other means outside of the scope of LIMAX33 CP-00.
    e. In case of pre-triggered stopping system top and/or bottom is ENABLED (not disabled) it is recommended **not** to disable the safety function "overspeed inspection final tripping". If "overspeed inspection final tripping" is disabled while pre-triggered stopping system top/bottom is enabled, the user must ensure the worst-case speed for calculation of braking distance for pre-triggered stopping system (refer to point ☞ m) by other means.
    f. In case safety function "ETSL" = DISABLED, it must be ensured that
        i. either ETSL is not needed because the buffers are designed for nominal speed of the lift
        ii. or safety function ETSL is implemented by other means outside of the LIMAX33 CP-00 scope
    g. In case safety function "final limit switches" = DISABLED, it must be ensured that safety function "final limit switches" is implemented by other means outside of the scope of LIMAX33 CP-00
    h. Safety function "door bridging" and "UCM" can only be disabled in combination. "door bridging" / "UCM" = DISABLED, neither door bridging nor UCM will be performed by LIMAX33 CP-00
        i. In case safety function "overspeed final tripping" is DISABLED, it must be ensured that this safety function is implemented by other means outside of the scope of LIMAX33 CP-00 (usually by a conventional speed governor). In case safety function "over-speed final-tripping" is ENABLED, safety function "over-speed final-tripping" will only fulfill EN81-20 §5.6.2.2.1.1a.) in case the eSGC actuator is connected to a suitable (electronic triggered) safety gear. In case "over-speed final-tripping" is ENABLED and "trip direction" is "only down", it must be ensured that the safety function overspeed final tripping is either not needed in upwards direction (may be due to the construction of the lift), or that overspeed final tripping in upwards direction is secured by other means (outside the scope of LIMAX33 CP-00).

[1] Some, but not all of the „inspection/ EN81-21-state"- safety functions can also disabled individually

i. The rated speed of the LIMAX33 CP-00 must fit with the rated speed of the lift
j. Pre-tripping and final tripping speed must be chosen in compliancy with EN81-20 with respect to the rated speed.
k. The speed limited by safety function overspeed inspection final tripping can be used to ensure the worst-case speed for the determination of the braking distance for pre-triggered stopping system (see point ☞ m)
l. The inspection speed is normally limited by lift control. LIMAX33 CP-00 supervises this limitation by safety function "overspeed inspection pre-tripping". The tripping speed should be chosen so that is
    i. big enough, so that this safety function does not trip by fail if the car travels in an inspection trip with normal inspection speed.
    ii. small enough so that - in case of a too fast inspection trip by failure - this safety function has the chance to stop the car by machine brake via safety circuit before the car is stopped by safety gear (tripping of safety gear caused by "overspeed inspection final tripping")

m. The offset of limit positions for "pre-triggered stopping systems" top/bottom must be chosen in such a way, that ample survival space for a person on car roof resp. in the shaft pit is ensured after the sequence car stopped → safety gear tripped → limit positions for "pre-triggered stopping systems" top/bottom have been over travelled. Braking distance under worst case conditions must be considered when defining the offsets. Braking distance depends on actual speed (due to worst case assumption, refer to ☞ k and ☞ e), reaction time of CP (see point ☞ 8. below) and delay and the deceleration of the safety gear.
n. The feature "trip direction" = "only down" may be used if the safety gear is only unidirectional. In this case all safety function using the eSGC as an actuator will trip only in downwards direction. Therefore, the combination "trip direction" = "only down" is forbidden in combination with some of the safety functions (refer also to ☞ c and ☞ o). Other safety functions can only be used under constraints if "trip direction" = "only down" (refer to ☞ h.i and ☞ p)
o. LIMAX33 CP-00 is able to fulfill EN81-20 §5.2.6.4.3.1 b.), if safety function "working platform" is enabled. The combination "working platform is enabled" and "trip direction = only down" is forbidden. It is also prevented by the software of the LIMAX33 CP-00 that this combination is programmed.
p. If "door bridging / UCM" is enabled and "trip direction = only down" is enabled, tripping of UCM will act the braking element connected to the eSGC actuator (normally the safety gear) only in downwards direction. If UCM trips in upwards direction only OC opens (additional to SR1 and SR2). In this case it must be either ensured that it is in compliancy with the EN81-20 that UCM can be fulfilled with the machine brake in upwards direction or "UCM in upwards direction" must be secured by other means (outside the scope of LIMAX33 CP-00).
q. If "UCM only OC" is enabled, only OC will open (additional to SR1 and SR2). In this case the machine brake is the braking element for the safety function "UCM". Therefore, the machine brake must be a certified safety brake in order to fulfil EN81-20 §5.6.7.
r. Safety function "over speed teach pre-tripping" is intended to be used as a substitute for ETSL (deceleration control) during teach mode. If this safety function is not needed, it may be disabled. If it is needed, the tripping speed for "over speed teach pre-tripping" should not be higher than the buffer speed.
s. Safety function "over speed teach final-tripping" is intended to be used for general additional safety (without a reference to the EN81-20). It may be disabled if not desired.
t. The Parameter "a", "V_{buf}", "t_{del}" and "offset" must be adjusted in such a way, that – in case ETSL trips - the car hits the buffer surface with a speed not bigger the buffers are designed for.
u. The OC actuator must be enabled in any case

2. To prevent any short-circuit between the 24 VDC "EN21-21" signal of the electrical safety device and adjacent circuits, the requirements of EN81-50§5.15 must be met.
3. The technical data (mechanical, electrical and environmental) concerning the LIMAX33 CP-00 - sensor as defined in chapter ☞ 7.3 are valid for constraints for use.
4. The technical data (mechanical, magnetically and environmental) concerning the magnetic tape as defined in a separate data sheet are valid for constraints for use.
5. The value of fuse protecting the safety circuit must be in compliancy with the electrical data of safety circuit defined in chapter ☞ 7.3

6. The value of fuse protecting the eSGC circuit must be in compliancy with the electrical data of eSGC-circuit defined in chapter ☞ 7.3
7. Operation height: up to 2000 m above sea level
8. The worst case reaction times of relay contacts OC, SR1 and SR2 when a safety function is triggered is <55 ms and concerning the eSGC <45 ms.
9. Constraints for Installation of magnetic tape according to its instruction manual must be observed
10. A tape presence detector securing the risk of break of the magnetic tape must be integrated into the safety circuit, see also the installation schemes (Figure 8, Figure 9and Figure 12).
11. The OC-actuator must always be integrated in the safety circuit, see Figure 8 and Figure 9.
12. The eSGC-actuator must be connected to an electromechanical braking element following the idle current principle.
13. The inspection controls signals must be connected following Figure 8.
14. The earthling lug on the LIMAX33 CP-00 must be connected to protection earth.
15. The inductivities switched by the actuators (examples: contactors at the end of safety circuit switched by OC, SR1 or SR2; tripping coil of electronic safety gear - switched by eSGC) must be equipped by suitable interference suppression measures; e.g. recovery diodes for DC-circuits; RC-circuits for AC-circuits.
16. The safety functions overspeed final tripping, pre-triggered stopping system and ETSL must fulfill SIL 3 and therefore the PFHD of the whole functional chain must be smaller than 100 FIT. Concerning the PFHD capability of the LIMAX33 CP-00 (☞ 16.1).
17. The braking element connect to the eSGC actuator may be:
    1. an electronic triggered safety gear,
    2. a conventional safety gear triggered by a conventional speed governor, which in turn is triggered via the remote triggering of the LIMAX33 CP-00
    3. another braking element the safety gear or the machine brake (e.g. a rope gripper)

    b. The braking element following a.) can always be chosen, no matter if safety function "overspeed final tripping" UCM, pre-triggered stopping system or working platform should be fulfilled via the eSGC-actuator.

    c. The braking element following b.) can be chosen, no matter if safety functions "UCM", "pre-triggered stopping system" or "working platform" should be fulfilled via the eSGC-actuator.
    d. Overspeed final tripping following EN81-20 §5.6.2.2.1.1a.) is normally fulfilled by the conventional speed governor in this case.

    e. The braking element following c.) can only be used for the safety function "UCM". The safety functions "working platform" or "pre-triggered stopping system" can only be fulfilled by a brake acting on the rails (due to EN81-20).

18. The CAN bus is not intended to be used for safety relevant purposes.
19. After commission, the floor table must be checked before the lift is allowed to be released for public use.
20. A power cycle or a reset must be applied to the LIMAX33 CP-00 at least once per year.
21. The reaction time of the electronic safety gear (resp. other braking element on eSGC) is in the responsibility of the user. In the technical data ☞ 7.3, "Solid state contact (eSGC) reaction time" a time of 45 ms is defined. This concerns to the time from appearance of a hazardous speed until solid state switch is opened and therefore voltage on trip is switched off. The reaction time of the electronic safety gear is the time from opening of the solid state switch until braking force is present. The reaction time of the electronic safety gear consists of an electrical and mechanical portion. Concerning the electrical portion refer also to topic ☞ 23.d.
22. It must be ensured that the eSCG-braking element trips (goes to safe state) if the voltage on its trip coil amounts to 2 V or below.
23. The trip coil of the eSGC-braking element connected to the eSGC-actuator must fulfill the following conditions (refer also to Figure 5), *Remark: if resistance or inductivity of the wire from eSCG-connector to the trip coil have a relevant magnitude, this must also be taken into account*
    a. L < 1.5 H
    b. Current consumption < 1 A => R > 24 Ohm @24 V (the eSGC – actuator is secured inside the CP with a 1 A self-resetting polyfuse)
    c. L/R > 1 ms (recommended): for L/R << 1 ms there is a danger that the braking element would fall during the test of the eSGC-actuator, refer also to chapter ☞ 12.7.

d. L/R < 10 ms (recommended). The L/R influences – beside the mechanical construction – the time for the braking element to fall. A big L/R causes a slower falling of the current through the coil after the voltage has been switched off. The current again influences the holding force of the coil, refer also to topic ☞ 21.

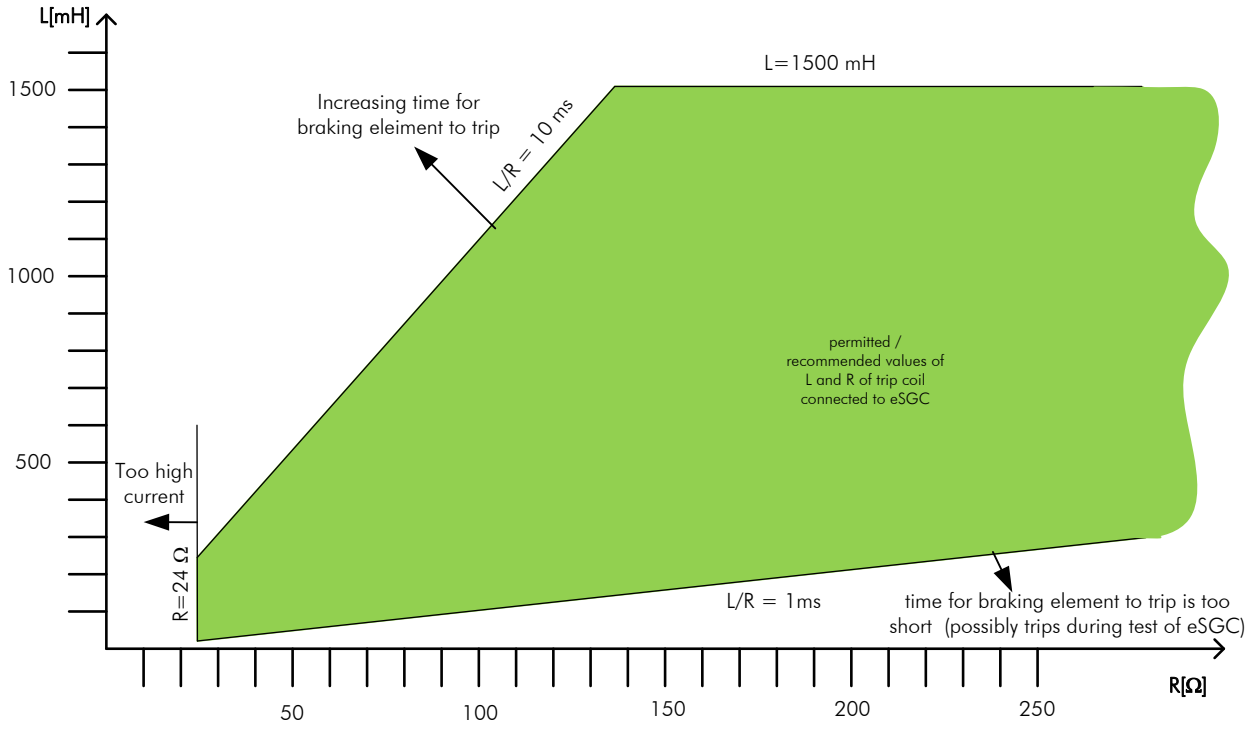


Figure 5: Values for L and R of trip coil

24. SG_pow – SG_GND connection must be supplied with a 24 V SELV/PELV power supply. It must be guaranteed that 30 V cannot be exceeded.
25. UCM is only supervised by the LIMAX33 CP-00, if the door circuit(s) is/are bridged by SR1 and/or SR2. Please note chapter 13.2.5 regarding the UCM-functionality.

9 Type Designation

Designation 1 (example): LIMAX3CP - 00 - 030 - 1000 - CO0TG - 0

Series / Type:

LIMAX3CP = LIMAX33 CP
(2-channel safety system)

Version:

00 = Standard version
01 = 1. special version (etc.)

Signal Cable Length:

030 = 3.0 m (Standard)
050 = 5.0 m
060 = 6.0 m
Other lengths on request. Specified in decimeters.

Resolution:

1000 = 1000 µm = 1.00 mm at delivery state*
* Freely configurable according to CiA 406

Interface:

COX = CANopen [special protocol separately defined by version number]
CO0TG = CANopen [Encoder Profil DS406]
CO1TG = CANopen [Elevator Profil DS417 on request]

NOTE:
-> The CAN interface is with 120R terminated (T) and galvanically isolated (G)

Floor Sensors:

0 = no floor sensor
1 = 1 floor sensor
2 = 2 floor sensors

Designation 2 (example): ID-1 / 250k / 0 / 1

XXXXX = Parameter set (will be defined by the customer)

CAN Bitrate:

125k = 125 kbps
250k = 250 kbps
500k = 500 kbps

eSGC - actuator:

0 = without SGC/eSGC
1 = with eSGC
2 = with SGC

SR - relay pairs:

0 = no SR - relay pair
1 = 1 SR - relay pair
2 = 2 SR - relay pairs

Additional information about the parameter set (Designation 2):
The parameter set is used to designate devices that are preconfigured at the ELGO Batscale on special customer request ☞ 14.1.1.3. For the standard devices (delivered with an "empty" configuration which is configured by the customer) the parameter set is ID-0.

10 Installation and First Start-Up

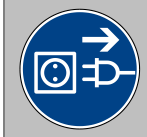
CAUTION
Please read this safety manual carefully before using the device! Strictly observe the Installation instructions! In case of damage caused by failure to observe this safety manual, the warranty expires.

ELGO is not liable for any secondary damage and for damage to persons, property or assets.

The operator is obliged to take appropriate safety measures. The first start-up may only be performed by staff that has been trained and authorized by the operator.

10.1 Operating Area

WARNING!
Do not use the device in explosive or corrosive environments!
The device must not be installed close to sources of strong inductive or capacitive interference or strong electrostatic fields!



CAUTION!
The electrical connections must be made by suitably qualified personnel in accordance with local regulations. Wiring works may only be performed in the de-energized state!

Thin cable strands have to be equipped with end sleeves!

Before switching on the device, connections and plug connectors have to be checked!

The device must be mounted in a way that it is protected against harmful environmental influences such as splashing water, solvents, vibration, shock and severe pollution and the operating temperature must not be exceeded.

10.2 Check of Safety Relevant Configuration

Before installing the LIMAX33 CP-00, the technician must ensure that the safety-relevant configuration specified on the info sheet belonging to the LIMAX33 CP-00 complies with the relevant lift conditions. If this is not the case, the LIMAX33 CP-00 must not be used for this lift. Instead, a LIMAX33 CP-00 with suitable configuration must be acquired, or an empty LIMAX33 CP-00 must be programmed with suitable configuration.

10.3 Mechanical Installation

PLEASE NOTE:
There is a separate mounting instruction for the installation of the magnetic tape and the LIMAX33 CP-00 which has to be observed (🕮 LIMAX33CP-00-MI).

The cables for the supply, inputs/outputs (PIO cable) as well as for the safety circuit and the actuators (SCA cable) must be laid with mechanical protection.

10.4 Electrical Installation

10.4.1 Basic Design

The complete system LIMAX33 CP-00 consists of:

- the LIMAX33 CP-00 sensor head
  (measuring system electronic, logic and safety relevant and not safety relevant interfaces)
- the magnetic tape AB20-80-10-1-R-D-15-BK80
- the mounting kit for the magnetic tape
- and the tape presence detector

The figure on the next page shows the top side and bottom side view of the LIMAX33 CP-00. There are two versions of LIMAX33 CP-00: One version with eSGC (refer to Figure 6) and one without eSGC. On the version without eSGC, the M12 connector is not fitted and the assignment of the LEDs is different.

"eSGC" is an abbreviation for "**e**lectronic Safety Gear Contact". This actuator-contact is implemented by solid state switches (therefore "electronic"). The eSGC actuator (also referred as "SGC" in this manual) is intended to act an accordingly suitable safety gear, a blocking device of a speed governor or another braking element – except the brake handled via safety circuit – e.g. a rope gripper. The braking element for eSGC is electrically connected to the LIMAX33 CP-00 via a connector on the top side.

If an eSGC actuator is needed according to the safety functions, the system should fulfill (☞ 14.1.4), the version with eSGC must be used. If no eSGC actuator is needed according to the safety functions, the system should fulfill, it is arbitrary if a system with eSGC (eSGC actuator disabled in this case) or a system without eSGC is used.

Other actuator contacts are: OC, SR1 and SR2. They are implemented as dry contacts between each two wire ends of the SCA-cable (see below). They are intended to be wired in the safety circuit (☞ 10.4.3).

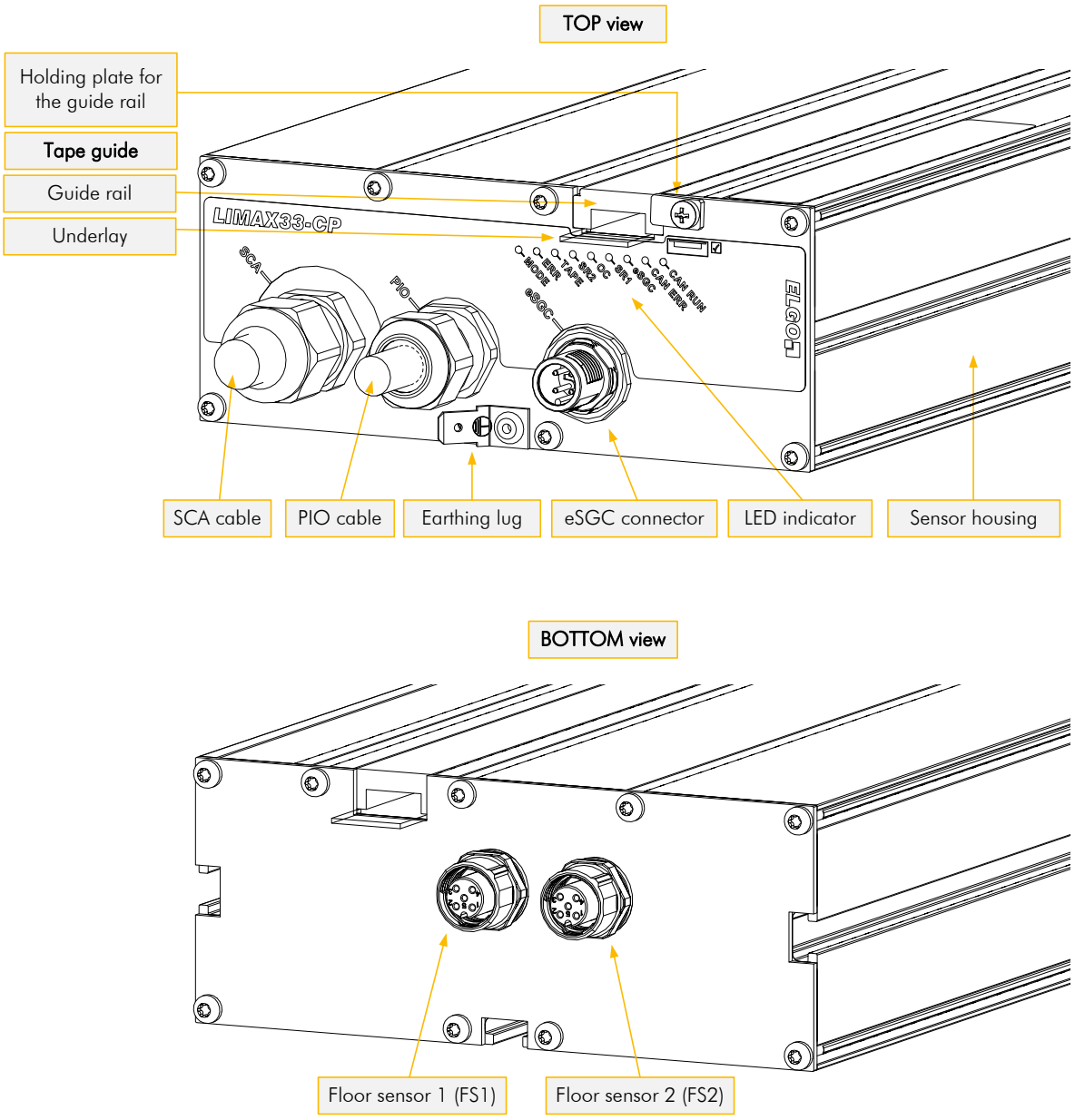


Figure 6: View on the top- and bottom-side of LIMAX33 CP-00 with eSGC

Remark: The top side view of the version without eSGC is slightly deviant:
The eSGC-connector is not fitted and the LED assignment differs depending on the order.

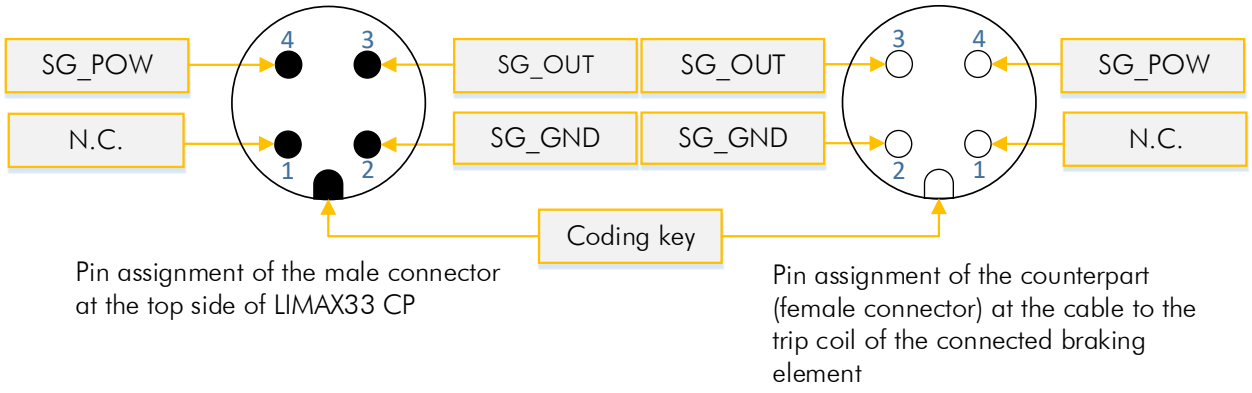
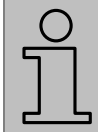


Figure 7: Pin assignment eSGC connector (mechanical data according to IEC 61076-2-101)



NOTE!
Before the electrical installation can begin, the complete elevator unit has to be de-energized. The upper part of Figure 6 shows a view on the LIMAX33 CP-00 housing (including the definition of the cable assignment, connectors and earthling lug to the designations used in the following tables).

Table 1: Connections PIO and SCA-Cable

PIO-cable

Abbreviation	Function	Wire colour
GND	0 V / GND	white
24V	+24 VDC	brown
CAN-H	CAN-HIGH	yellow
CAN-L	CAN-LOW	green
SHLD	Shield	blank
CAN-G	CAN-GND	black
BAT_IN−	Battery supply −	blue
BAT_IN+	Battery supply +	red
DZO	Door zone output	pink
EN81-21	EN81-21-state	white/green
UP	Inspection direction “UP”	red/blue
DOWN	Inspection direction “DOWN”	grey/pink
RESET	RESET input	yellow/brown
WKP	Working platform state	brown/green

SCA-cable

Abbreviation	Function	Wire colour
OC-I	OC IN	white
OC-O	OC OUT	brown
SR1-I	SR1 IN	blue
SR1-O	SR1 OUT	red
SR2-I	SR2 IN	pink
SR2-O	SR2 OUT	grey

Remark: The PIO and SCA cable of the LIMAX33 CP-00 have open wire ends by default, so the function is defined by the wire color. Later LIMAX33 CP-00 cable ends may be equipped with plugs due to customer order. In this case this manual will be extended or a separate document will exist which defines the pin-assignment of the plugs.

Table 2: eSGC-Connector (only for versions with eSGC)

Abbreviation	Function	M12 Pin
n. c.	not conncected	1
SG_GND	Ground (reference potential) for External power supply for trip coil of eSGC-braking-element; to be connected to GND of external power supplly as well as to the other side of the trip coil.	2
SG_OUT	Switched SG_POW; will be swtiched on if lift movement can be released concerning to eSGC-actuator, switched off if safe state must be established. To be connected to one side of the trip coil of eSGC-braking-element.	3
SG_POW	To be connected to external power supply for trip coil of eSGC-braking-element; 24 V recommended; SELV/PELV supply required; 30 V must not be exceeded.	4

Table 3: Floor Sensor plugs

Number of Floor Sensors	Type of electrical Installation
No floor Sensor	No installation necessary
(max.) 2 floor Sensors	In case of LIMAX33 CP-00 with (optional) two floor sensors, there are circular connectors on the bottom side. Each of them is closed with a protective cap. The cap must only be removed immediately before the floor sensor is plugged. The person removing the cap and plugging the floor sensor must be grounded.

Remark: In case floor sensors are used, each floor level must be marked with a floor magnet.

Concerning mechanical installation of floor sensor(s) and magnets refer to the manual of the floor sensors.

Table 4: Earthing lug

The earthing lug on the LIMAX33 CP-00 must be connected to protection earth

10.4.2 Protection against Electrical Shock

For protection against electrical shock by direct contact, the housing of the LIMAX33 CP-00 has a protection class of IP54.

For protection against electrical shock by indirect contact, the housings of the LIMAX33 CP-00 are equipped with an earthing lug. This needs to be connected to the protection earth (refer to section ☞ 10.4.14).

10.4.3 Overview of the Integration in the Lift Installation

Figure 8 and Figure 9 on the next pages shows the circuit diagrams to connect the single wires of the PIO and SCA cable due to their functions to the elevator system.

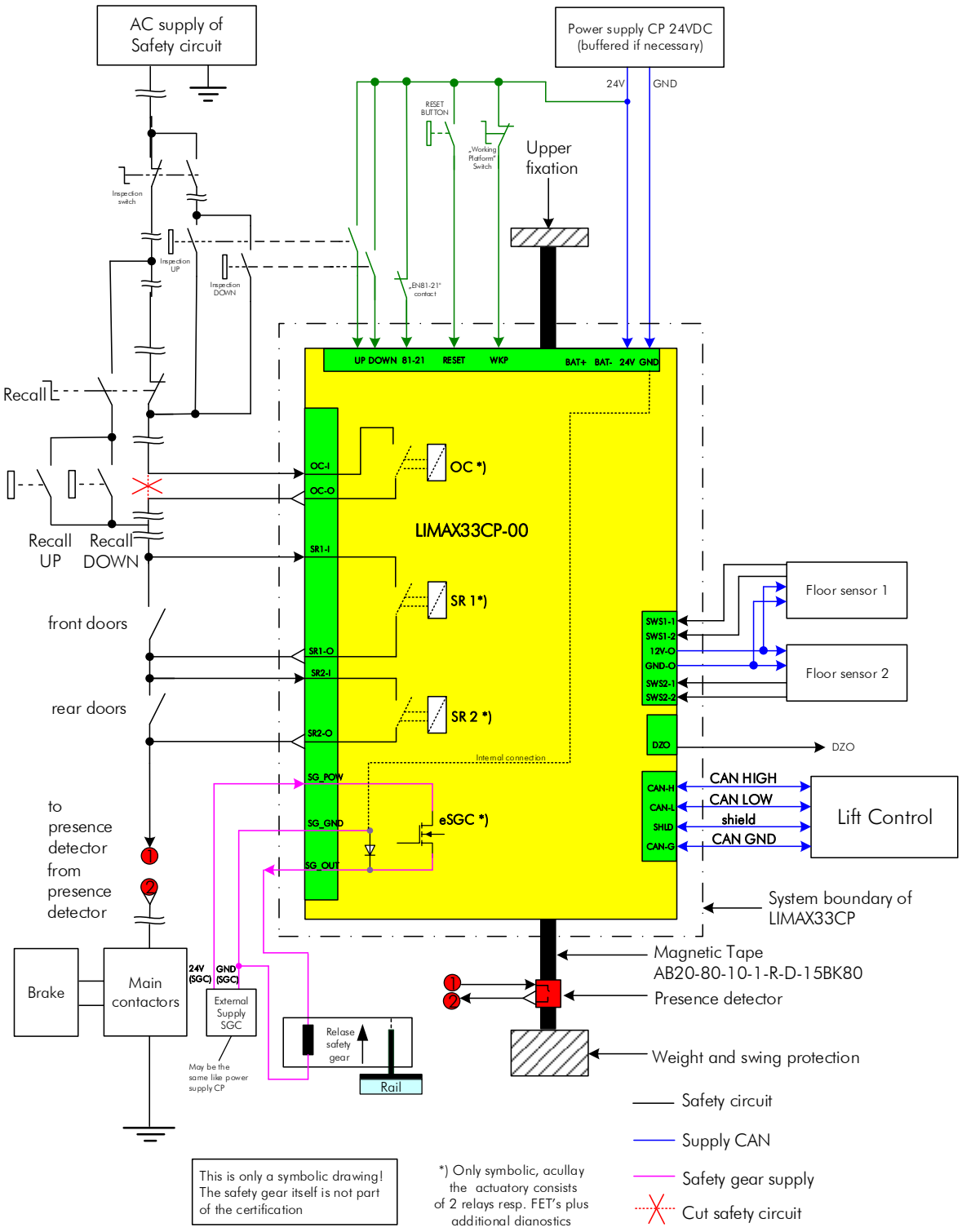


Figure 8: Installation circuit diagram of LIMAX33 CP-00 (maximum configuration)

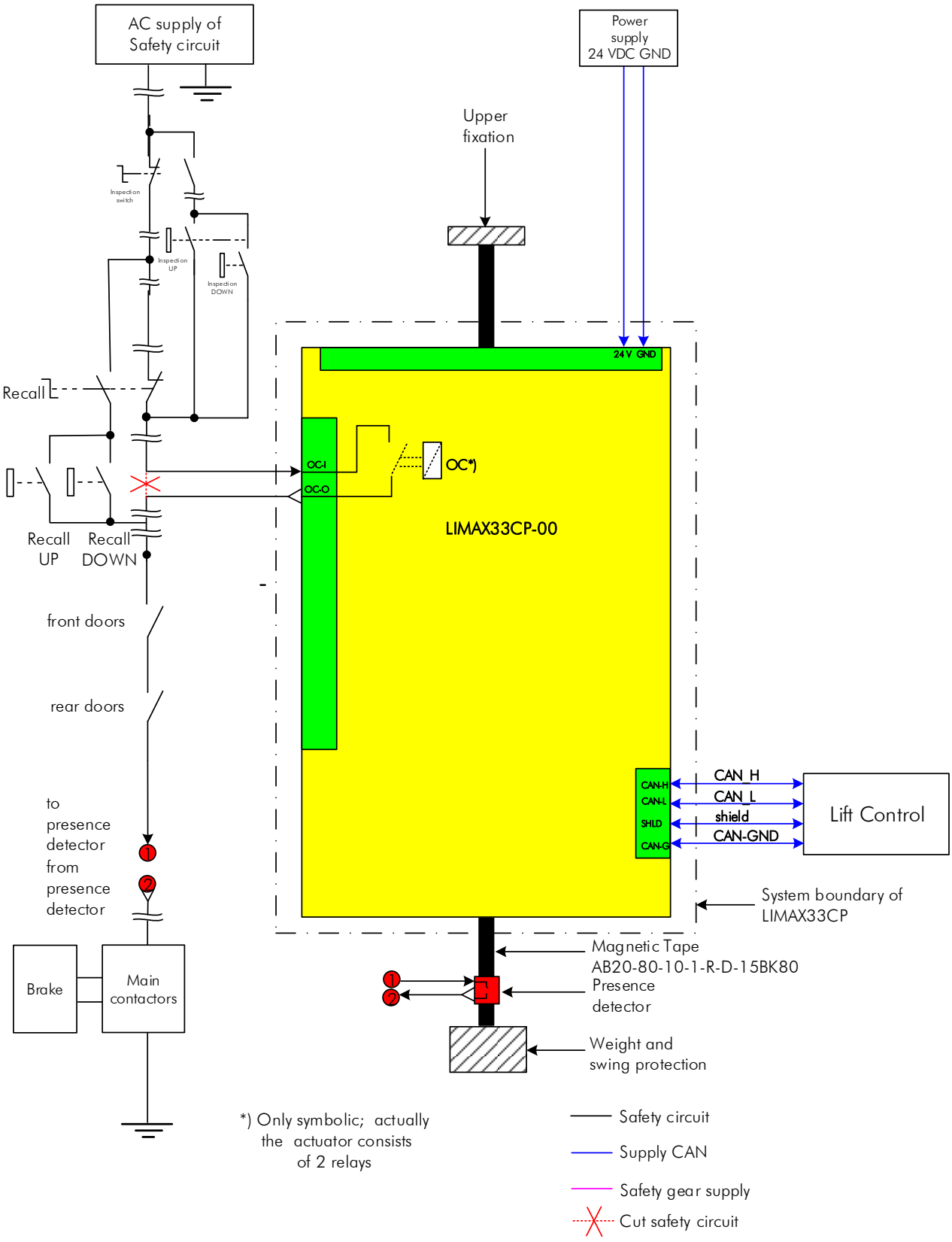


Figure 9: Installation circuit diagram of LIMAX33 CP-00 (minimum configuration)

10.4.4 Integration of the bridgeable contact (OC)

The integration is placed in a way that assures that OC can be bridged by the recall panel (refer to Figure 8 and Figure 9).

10.4.5 Integration of the SR

In case of two SR's, SR1 and SR2 should be connected following Figure 8.

In case of one SR, the SR1 should be wired due to Figure 10 (see below) if there is only one door side in the shaft (only front) and due to Figure 11 (see below) if there are front and rear doors.

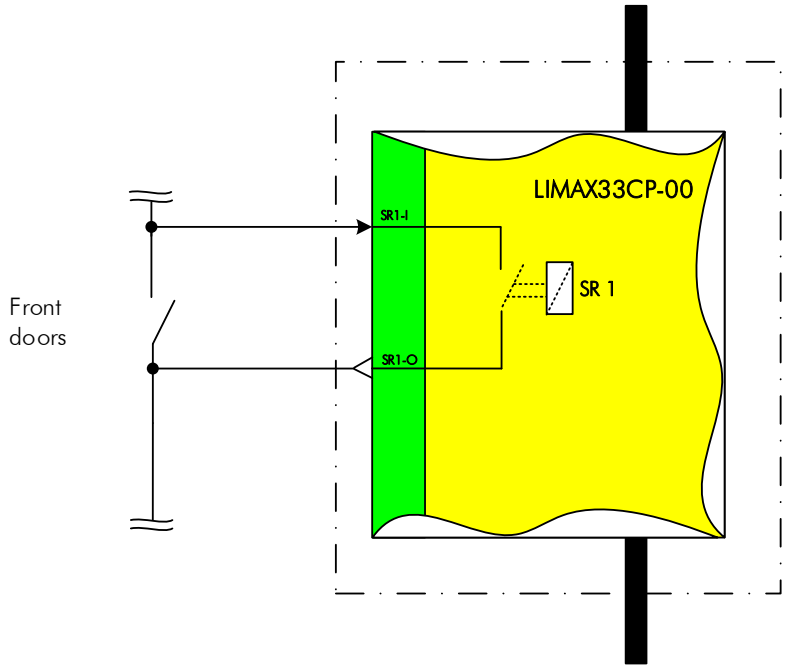


Figure 10: One SR and one door side

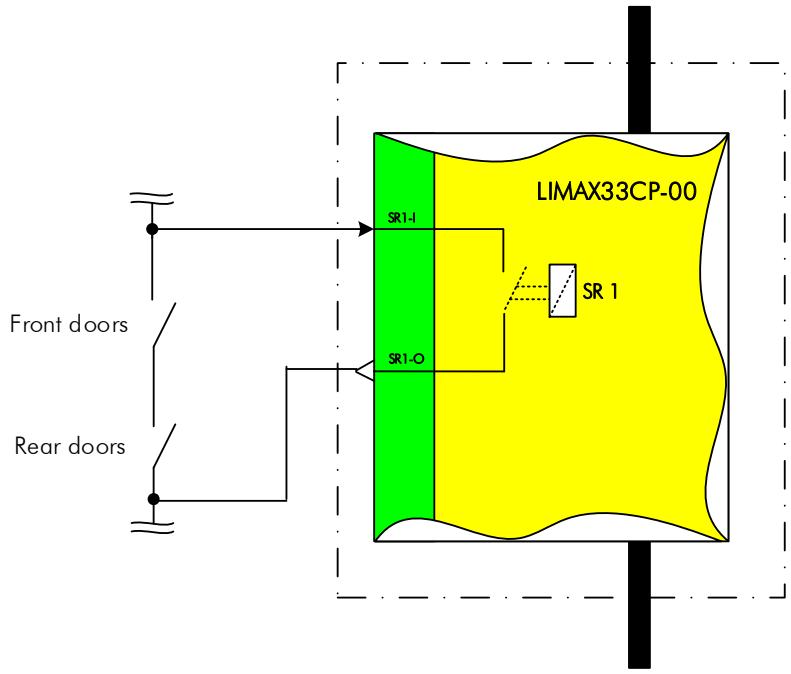


Figure 11: One SR and two door sides

10.4.6 Integration of the Magnetic Tape Presence Detector

The magnetic tape presence detector is a contact which must open the safety circuit if the magnetic tape is not in the correct position. The contact has to be placed in non-bridgeable position within the safety circuit.

It is not allowed to place the presence detector in a spot where it can be bridged by the recall panel. Furthermore, it is not allowed to place it within the door circuit, since this circuit can be bridged by the door bridging functionality of SR-contacts.

10.4.7 Connection of the Power Supply and Emergency Power Supply

The 24 V supply for LIMAX33 CP-00 is powered by an external power supply.
A missing 24 V supply causes an opening of all actuators

The 12 V emergency power supply should be switched to the BAT−/BAT+ inputs. LIMAX33 CP-00 will open all actuators if supplied with 12 V. LIMAX33 CP-00 can only serve position information if it is supplied with 12 V.

10.4.8 Connection of the eSGC

Alternatively, eSGC may be connected to the remote tripping coil of the speed governor (see Figure 12 below).

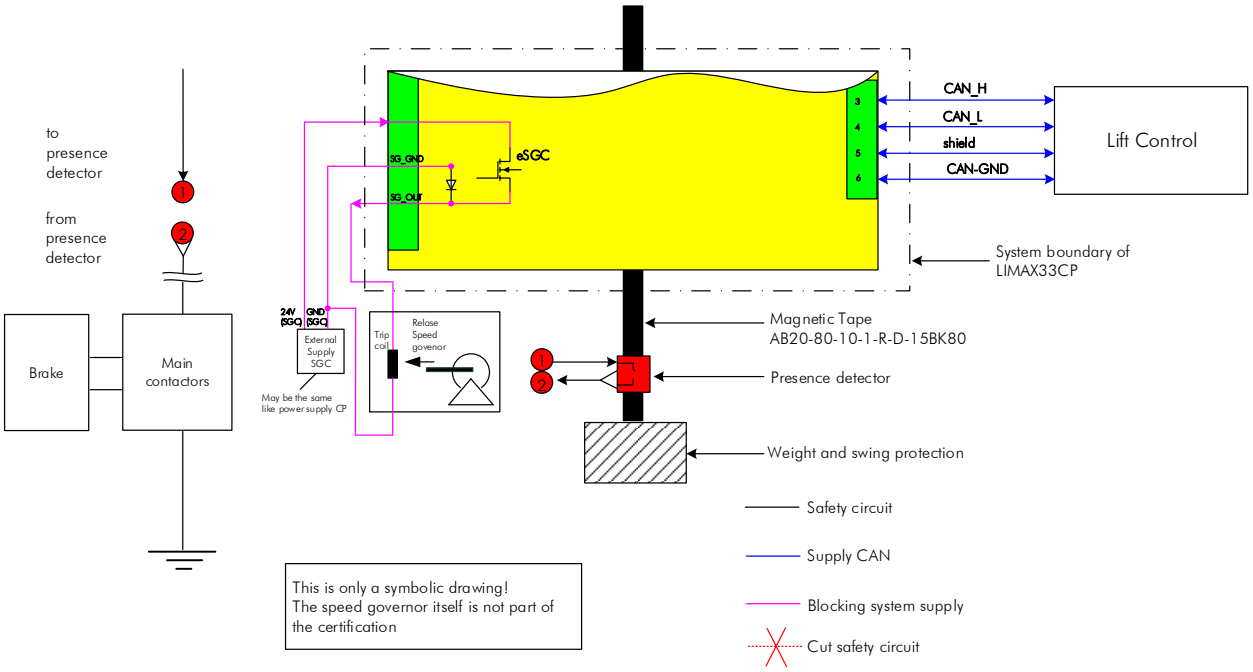


Figure 12: eSGC actuator connected to a blocking device on the speed governor (remote tripping)

The electromechanically tripped braking element (electronic safety gear or blocking device - remote tripping - on the speed governor) must be built in such a way, that the mechanical part is in the safe state if the electrical supply is disconnected.

In order to comply with the relevant standards, the entire electromechanical / mechanical functional chain connected to the eSGC actuator must be certified.
Attention: this is often not the case for the remote tripping device of the speed governor.

10.4.9 Connection of the Signals from Inspection Control

The 24 V level (circuit for information purpose) of the inspection control has to be connected to the LIMAX33 CP-00 as described in Figure 8.

The connection of the inspection control to the safety circuit remains unchanged.
The 24 V level must be galvanically isolated from adjacent electric circuits, especially from the safety circuit.

10.4.10 Connection of the EN81-21-Input

The "EN81-21-input" must be connected to the "EN81-21-signal". In normal lift operation this signal should be HIGH (24 V). This signal must be LOW (resp. open input) if a door giving access to the car roof or the shaft pit is opened by a key.

After this signal became LOW, it is only allowed to become HIGH level if EN81-21 §5.5.3.2.1 a.) – d.) are fulfilled. This demand must be fulfilled externally (not in scope of LIMAX33 CP-00).

10.4.11 Connection of the Working Platform Input

The working platform input must be connected by an external switch that is wired to 24 V on the other side. During normal lift operation this switch is closed (24 V on the input). A soon the user opens this switch, the LIMAX33 CP-00 opens all actuators and therefore each lift movement is prevented.

10.4.12 Connection of the Reset-Input

The Reset-Input may be connected by an external push-button, wired to 24 V on the other side
(if the user may perform a system-reset by operating the push button).

REMARK:
A System Reset can also be done by CANopen; therefore connecting of the RESET-Input is optionally.

Over CANopen it is also possible to make a fault reset (safety functions only) instead of a complete system reset. The fault reset doesn't restart the system. So, actuators which are closed, stay closed.

10.4.13 Connection of the CAN Bus

The LIMAX33 CP-00 CAN bus connections CAN HIGH and CAN LOW must be connected to the CAN bus of the control unit.

The shield for the CAN bus is connected on the device side via the housing to protection earth (see also section ☞ 10.4.14). If it can be ensured that there is a protection earth on the control side, in which no potential differences can occur to the contact point of the device-side protection earth, and thus no ground loops are formed, the shield must also be connected to the protection earth on the control side. This is an ideal solution for optimal interference suppression.

If the ground loops cannot be excluded with certainty, the shield must not be connected on the control side in order to avoid EMC-induced faults of the operation.

10.4.14 Earthing Connector

The LIMAX33 CP-00 housing is equipped with an earthing lug. This needs to be connected via a suitable earth cable with protection earth. The earth cable should be equipped with a suitable flat plug for connection to the earthing lug.

Ideally a cable with a recommended cross-section of 4 mm^2 is used. This is not included in the scope of delivery but can be ordered as an accessory.

To connect the earth cable to the earthing lug, the cable is provided on one side with a flat plug sleeve and on the other side with a ring cable lug for placing on the protection earth.

NOTE!
For protection against electrical shock, a cable with 0.75 mm² would be sufficient, but to optimize the immunity to interference, 4 mm² is recommended.

11 Operation modes and Commissioning

11.1 Operation Modes

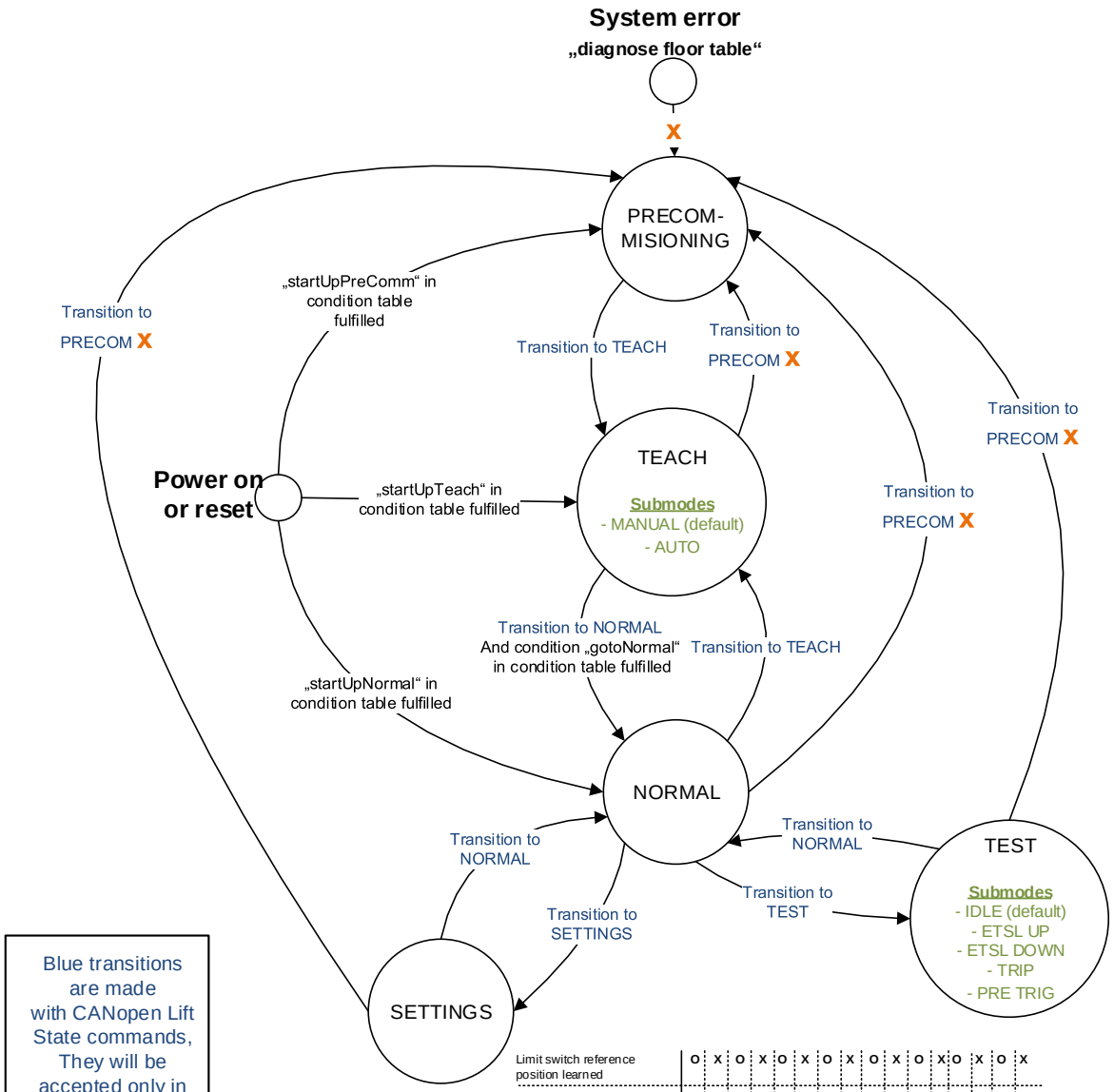
The following operation modes are available:

- Pre-commissioning mode
- Teach mode
- Normal mode
- Test mode
- Settings mode

Teach mode and test mode provide additional sub-modes.

The figure on next page shows an overview of the operation modes and the transitions between them. Mode transitions initiated by CANopen commands will only be accepted in stand still[1].

[1] At this point, as well as at other points in the manual, the following applies to the term standstill: A very slow movement (V < 50 mm / s) is also rated as a standstill by the LIAMX33CP.



Limit switch reference position learned	o	x	o	x	o	x	o	x	o	x	o	x	o	x	o	x	o	x	
At least one limit switch refer. dependent safety function enabeled	o	o	x	x	o	o	x	x	o	o	x	x	o	o	x	x			
floor table availible	o	o	o	o	x	x	x	x	o	o	o	o	x	x	x	x			
Door-bridging/UCM Enabeled	o	o	o	o	o	o	o	o	x	x	x	x	x	x	x	x			
Cond. „gotoNormal“ fulfilled	1)	1)	o	x	1)	1)	1)	1)	o	1)	o	o	x	1)	o	x			
Cond. „startUpPreComm“ fullfilled	o	2)	x	o	2)	2)	2)	2)	x	2)	x	o	o	2)	x	o			
Cond. „startUpTeach“	o	2)	o	o	2)	2)	2)	2)	o	2)	o	x	o	2)	o	o			
Cond. „startUpNormal“ fulfilled	x	2)	o	x	2)	2)	2)	2)	o	2)	o	o	x	2)	o	x			

1) these situations cannot appear in teach mode: because of the configuration either learning of floor table or learning of refernce position or even transistion to teach mode would be refused

2) these situations cannot appear at start up; same situations and same cause like footnote 1) above; only difference: situation that neither „limit switch dependent“ nor „door dependent“ safety functions are enabled can appear at power up => system will start directly in normal mode in this case,

Figure 13: Operation modes overview

In teach mode shaft information can be learned.
There are two types of shaft information:

1. The floor table (total number of floors, positions of the single floors and possibly side of the floors)
2. The (limit switch) reference positions refer to ☞ 11.2.2

It depends on the enabled safety functions/features whether only the floor table, only the reference positions or both of them or none of them are needed, refer to section ☞ 14.1.3.

After start up (no matter if caused by power up or RESET) the LIMAX33 CP-00 goes into

- Normal mode, if all needed shaft information is available at start up[1]
- Teach mode, if floor table as well as reference positions are needed, but only reference positions and no floor table are available.
- Pre-commissioning mode in all other cases

In case diagnostics of the floor table detected a corrupted floor table (CRC-check or comparison between the channels failed) the LIMAX33 CP-00 goes to pre-commissioning mode.

The transitions between the modes can be demanded by CANopen communication.

11.1.1 Pre-commissioning

After a correct physical installation of LIMAX33 CP-00, the device starts into pre-commissioning mode. Since there is no valid floor table stored, not all safety functions are active. The safety actuators (relays concerning OC, SR1 and SR2; solid state switches concerning SGC) have the following state:

Table 5: Safety output states in pre-commissioning mode (see also ☞ 13.4)

Safety output	State
OC	Open if a (pre-tripping-) overspeed-function trips*) or in EN81-21 state (provided inspection resp. EN81-21-functions are not disabled). Otherwise closed
SR1	Always open
SR2	Always open
eSGC	Open if a (final tripping-) overspeed-function trips*) or in EN81-21 state (provided inspection functions resp. pre-triggered stopping system are/is not disabled). Otherwise the (solid state-) contact is closed

*) provided these safety functions are not disabled ☞ 14.1.3

Pre-commissioning mode can be left by transition to teach mode ☞11.1.2.2.

[1] If neither floor table nor reference positions are available, but also not needed the device starts also up in normal mode.

11.1.2 Teach Mode

11.1.2.1 General

In order to reach the normal mode (for normal lift operation), it is necessary to teach a valid floor table and/or reference positions using a commissioning process. This can only be done in teach mode.

There are two kinds of teach procedures: manually and automatically. Therefore, the teach mode provides two sub-modes:

- teach sub-mode manual, refer to ☞ 11.1.2.2
- and teach sub-mode auto, refer to ☞ 11.1.2.3

Concerning the safety output states both modes behave in the same way.

Reference positions can always be learned in teach mode regardless of the sub-mode.
If reference positions are needed but not available, the behavior of the safety outputs is the same as in pre-commissioning mode ☞ 11.1.1.

If reference positions are available, the behavior of the safety outputs will have the following states:

Table 6: Safety output states in teach mode or teach auto mode when reference positions are available

Safety output	State
OC	Open if a (pre-tripping-) overspeed-function trips*) or in EN81-21 state outside of the range between the (direction dependent) inspection limit switches (provided inspection functions are not disabled). Otherwise closed.
SR1	Always open
SR2	Always open
eSGC	If a (final-tripping-) overspeed-function trips*) or pre-triggered stopping system trips*) or safety function "working platform" trips *), the (solid state-) contact is open. Otherwise closed.

*) provided these safety functions are not disabled ☞ 14.1.3

Teach mode (regardless of the sub-mode) can be left to normal mode by CANopen command, refer also to CANopen specifications.

If the teach process was not successful (because floor positions are not in an increasing row according to their numbering), LIMAX33 CP-00 will refuse a demand to enter normal mode and will stay in teach mode[1]. If the teach process was successful LIMAX33 CP-00 will accept the demand to enter normal mode and the floor table will be stored in a non-volatile way.
Afterwards the mode changes to "normal".

Teach mode (regardless of the sub-mode) can also be left to pre-commissioned mode by another CANopen command, refer also to CANopen specifications. In this case an existing floor table will be erased. Reference positions which may be available in teach mode, are also erased in this case.

If a power cycle occurs during teach mode or if a RESET command by CANopen was given all floors positions learned up to that moment will get lost.

In opposite to this, reference positions will be kept at power cycle or a RESET - provided both of them are available (they are stored in a non-volatile way as soon as both reference positions have been learned).

LIMAX33 CP-00 will restart in pre-commissioning mode after power cycle happened in teach mode when no – or only one reference position has been learned. If both reference position have been learned in teach mode, a

[1] The situation that no floor or only one floor has been learned is no reason to refuse entering of normal mode

power cycle in teach mode will cause immediate re-entering of teach mode or direct entering of normal mode if no floor table is needed due to the configured safety function.

Remarks:

1. *If neither floor table nor reference positions are needed in order to fulfil the respective enabled subset of safety functions the LIMAX33 CP-00 will start directly in normal mode even after first installation. A demand to enter the teach mode will be refused.*
2. *If either floor table or reference positions are not needed in order to fulfil the respective enabled subset of safety functions the LIMAX33 CP-00 will refuse a demand to learn the each not needed information. For example, if "door safety functions" are disabled, LIMAX33 CP-00 will refuse to learn floor positions in teach mode. If inspection functions, ETSL and final limit switches are disabled, LIMAX33 CP-00 will refuse to learn reference positions in teach mode.*

11.1.2.2 Entering Teach Mode, Sub-Mode "Manual"

- When LIMAX33 CP-00 is in pre-commissioned or in normal mode, the teach mode can be entered by the corresponding CANopen command.
- When teach mode is entered from pre-commissioned mode, no floor table is available after entering.
- When teach mode is entered from normal mode a valid floor table is already available after entering (floor table from normal mode will not be erased but kept).
- Teach mode is entered immediately after power up resp. system reset only if reference positions are already available but no floor table.
- Immediately after entering teach mode, the sub-mode is "manual".
- In Sub-mode "manual" floors can be learned by a CANopen command.
  Refer also to CANopen specifications.

11.1.2.3 Teach Mode, Sub-Mode "Auto"

- In teach mode, sub-mode auto, the floor table can be learned by using the floor sensor(s) ☞ 11.3.2.
- Sub-mode auto can only be entered from teach mode (default: sub-mode manual) by demanding the sub mode change via CANopen-command. Refer also to CANopen specifications.

11.1.3 Normal Mode

After successful commissioning the LIMAX33 CP-00 is in normal mode:

- The lift is used in normal operations.
- The LIMAX33 CP-00 fulfils the specified safety functions ☞ 13.2.

11.1.4 Settings Mode

Settings mode can only be entered from normal mode. This is done by the corresponding CANopen command. Refer also to CANopen specifications.

- In settings mode adjustments of floor positions by CANopen can be done (☞ 11.6.1) and the parameters which are settable by CANopen, can be changed (☞ 14.2).
- Settings mode can be left with transition to normal- or to pre-commissioning mode. This is done by the corresponding CANopen command.
- Refer also to CANopen specifications.

11.1.5 Test Mode

Test mode can only be entered from normal mode. This is done by the corresponding CANopen command. The test mode provides the following sub modes:

- Idle
- Trip
- ETSL-UP
- ETSL-DOWN
- Pre-trig

Immediately after entering test mode the sub mode idle is activated. In sub mode idle, the behavior of the safety functions is the same like in normal mode. Concerning the other sub-modes, the behavior of each one safety function is changed for test purposes. For details refer to the next sub-chapters. Each of these sub modes can be entered by the CANopen demand to change to the corresponding sub-mode, provided the device is still in test mode.

Test mode can be left with transition to normal- or to pre- commissioning mode. This is done by the corresponding CANopen command.

11.1.5.1 Test Mode, Sub-Mode Trip

Sub mode trip can be entered by CANopen command to change the sub-mode to “trip”.

In sub-mode “trip” the final tripping speed for the safety function overspeed final tripping is set to a reduced value. This value must be smaller than the normal final tripping speed. The value for the test final tripping speed is same as the rated speed by default. This value can be changed via CANopen in normal mode (before sub-mode trip is entered).

If the test final tripping speed has been set to a value bigger than the normal final tripping speed, the CANopen-demand to enter sub-mode trip will be refused.

If the test final tripping speed is set to a value smaller than the normal final tripping speed, the CANopen-demand to enter the sub-mode trip will be successful. In sub-mode trip the safety function overspeed final tripping already trips at this reduced test final tripping speed.

OC will open latest at the same speed than eSGC in sub-mode trip.

So, if test final tripping speed is below the normal pre-tripping speed, OC will open at the same speed as eSGC during the test.

If the value of test final tripping speed is between the normal pre-tripping speed and the normal final tripping speed, the opening of OC will take place at the normal pre-tripping speed.

The whole other functionality is identical to normal mode.

If test mode sub mode trip is entered, normally a test of overspeed final tripping will be performed. A lift travel e.g. with rated speed will be initiated and overspeed final tripping will trip due to the reduced tripping speed. After tripping of overspeed final tripping a RESET is necessary. After RESET the safety function will be reset and LIMAX33 CP-00 will restart in normal mode.

But this test-mode, sub-mode trip, can also be left explicitly transition to normal mode, initiated by CANopen command.

11.1.5.2 Test mode, sub-mode ETSL-UP

Test mode, sub-mode ETSL-UP can be entered by CANopen command to change the sub-mode to "ETSL-UP". This can be only done if the device is in test mode.

The behavior of safety function ETSL (deceleration control) is different in this sub-mode:

- When moving up, distance "s" in the ETSL-formula is not calculated as the distance of the actual position to the position of the reference position top minus ETSL- offset top, but as the distance of the actual position to the "middle of the shaft". For details see ☞ 13.2.3.
- The behavior of all other safety functions, including the behavior of ETSL when moving down, is identical to normal mode.
- The CANopen command to change the sub-mode to ETSL-UP (while the device is in test mode) is only accepted if the actual position is below the "middle of the shaft".

Concerning calculation of position of "middle of the shaft" refer to Table 15.

11.1.5.3 Test mode, sub-mode ETSL-DOWN

Test mode, sub-mode ETSL-DOWN can be entered by CANopen command to change the sub-mode to "ETSL-DOWN". This can only be done if the device is in test mode.

The behavior of safety function deceleration control (ETSL) is different in this sub-mode:

- When moving down, distance "s" in the ETSL-formula is not calculated as the distance of the actual position to the position of the reference position bottom plus ETSL offset bottom, but as the distance of the actual position to the "middle of the shaft". For details see ☞ 13.2.3.
- The behavior of all other safety functions, including the behavior of ETSL when moving up, is identical to normal mode.
- The CANopen command to change the sub-mode to ETSL-DOWN (while the device is in test mode) is only accepted if the actual position is above the "middle of the shaft".

Concerning calculation of position of "middle of the shaft" refer to Table 15.

11.1.5.4 Test Mode, Sub Mode Pre-Trig

Sub mode "pre-trig" can be entered by CANopen command to change the sub-mode to "pre-trig". This can only be done, if the device is already the test mode. The behavior of safety function pre-triggered stopping system is different in this mode:

- In normal mode the pre-triggered stopping system trips in case of EN81-21-state (☞ 13.2.6.1) and if the actual position is higher than the pre-triggered stopping limit top resp. bottom.
- In sub-mode pre-trig, the safety function trips if the actual position is higher than the pre-triggered stopping limit top resp. lower than the pre-triggered stopping limit bottom– no matter if there is EN81-21-state or not.

But the behavior of the inspection limit switches depends on the EN81-21-state also in sub-mode pre-trig, (same behavior like in normal mode). So, if there is sub-mode pre-trig and no EN81-21-state, the pre-triggered stopping system is active, but the inspection limit switches are not active. That means, in this situation the pre-triggered stopping system can be tested:

1. It is possible to send the lift towards the shaft end from outside of the lift with activated the pre-triggered stopping system
2. when approaching the shaft ends, no inspection limit switches stop the car

When approaching the shaft ends, pre-triggered stopping system will trip, because the inspection limit switches will not prevent tripping of pre-triggered stopping system.

After tripping of pre-triggered stopping system, a RESET is necessary. After RESET the safety function will be reset and LIMAX33 CP-00 will restart in normal mode.

But this mode can also be left explicitly by the transition to normal mode, initiated by CANopen command.

WARNING!
The trigger position of the pre-triggered stopping system is determined by two component

- the reference position
- the offset

While the offset is part of the configuration and therefore cannot be changed easily, the reference position can be changed easily also afterwards.

The following scenario could create a dangerous situation by chaining of unfortunate circumstances:

1. Too small a value was incorrectly defined for the offset.
   The relevant reference position was not learned on the buffer, but further "inside" in the shaft.
2. The relevant reference position was not learned on the buffer, but more in direction to the shaft middle.

If the safety function pre-triggered stopping system is tested, it will not be noticed that the value for the offset is actually too small for the shaft layout, because the wrong offset is compensated be the fact that the reference position was learned too far in direction of the shaft middle.

3. Later – may be in course of an elevator maintenance - the reference positions may be learned again on the buffer position, without testing the safety function again.

In this remaining space in the shaft head / pit may be too small which would be dangerous.

This situation can be avoided by learning of the reference only at a position where the car

resp. the counterweight is on the buffer

11.2 Manual Learning of the Floor Table

NOTE!
This chapter gives a summary about the procedure when learning the floor table manually.

The following figure shows an overview of the flow of events in teach mode, sub mode manual.
Details are described in the following subchapters.

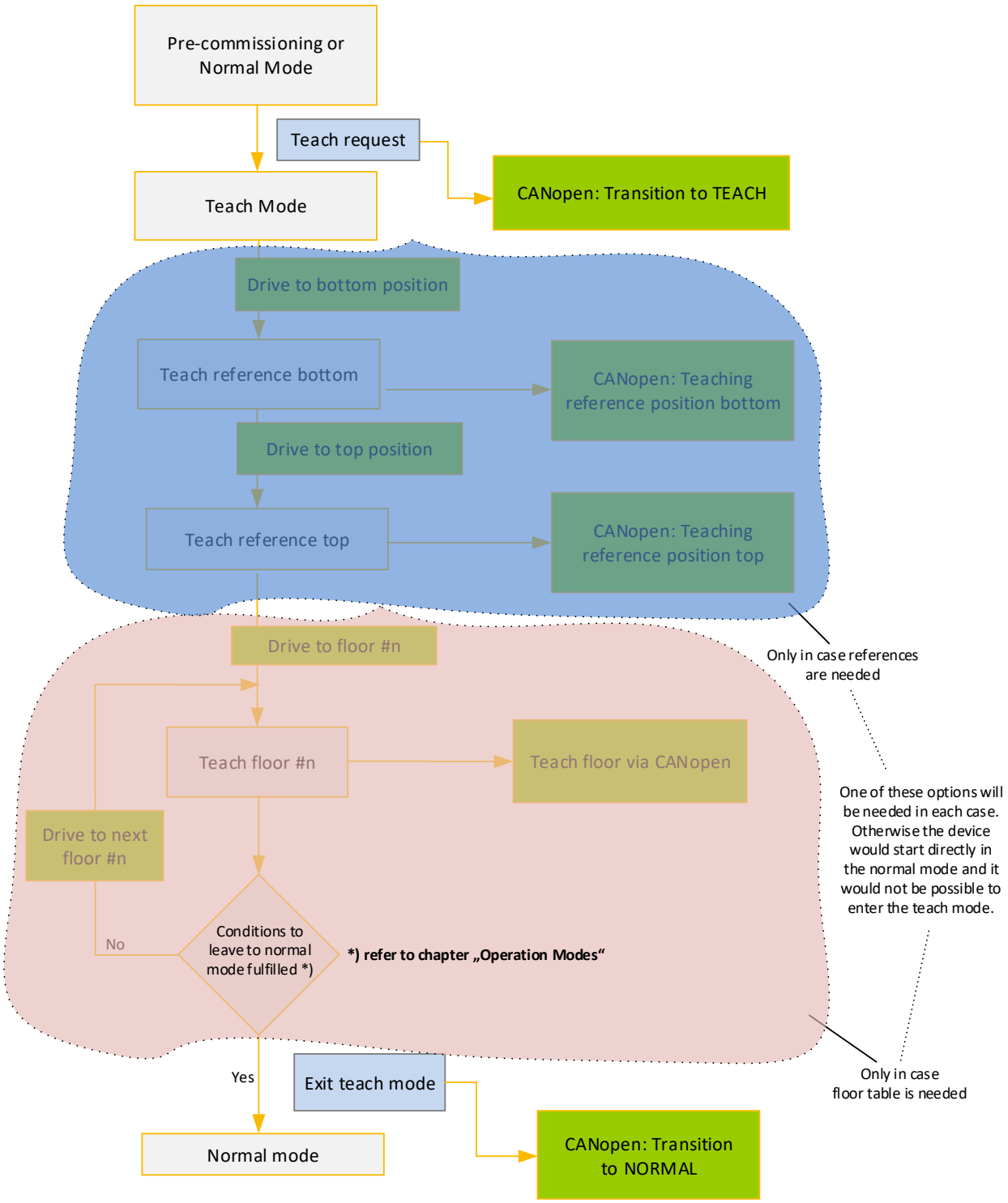


Figure 14: Flow of events in teach mode

The order of learning is absolutely arbitrary - not only concerning the single floors, but also the order of learning of the reference positions and the floors. So, it is possible to save time by optimizing the order of events:
If

- first one reference positions is learned,
- after this one floor after the other on the way to the other side of the shaft is learned
- and then the other reference position is learned, the time for one travel through the whole shaft can be saved (flow of events similar to Figure 17).

11.2.1 Activation of Teach Mode, Sub Mode Manual

On delivery, there is no shaft information in the LIMAX33 CP-00 (neither a floor table nor reference positions) this is the pre-commissioning mode. LIMAX33 CP-00 must learn the floor table and/or the reference positions. In order to do this, the technician requests transition into teach mode via CANopen-command:
→ LIMAX33 CP-00 will transit to teach mode, the sub-mode will be manual (default)

If the floor table of LIMAX33 CP-00 is not empty (normal mode) and the floor table should be corrected or extended for some reason (e.g. add, delete or shift the position of a floor), the technician carries out the transition into teach mode in an identical manner as from the pre-commissioning mode (described above). The existing floor table and the reference positions will be kept at the transition into teach mode.

In teach mode, there is an acoustic signaling by buzzer: there is a short acoustic signal every 2 second.

11.2.2 Learning of the References for Limit Switches

(Limit switch-) reference positions are used as references for calculation of the final- and inspection-limit-switch positions, the pre-triggered stopping system limits and the distance to the assumptive buffer for ETSL-calculation, refer also to ☞ 13.2.8.

The technician moves the car to the lowest possible position (normally this is the position where the car is on the buffer). He signals to the control that the current position has to be learned as the reference position bottom. For this purpose, the cabin must be in stand still. The control passes on this signal via CANopen to LIMAX33 CP-00

The technician moves the car to the highest possible position (normally this is the position where the counterweight is on the buffer). He signals to the control that the current position has to be learned as the reference position top. The control passes on this signal via CANopen to the LIMAX33 CP-00. For this purpose, the cabin must be in stand still.

If the technician tries to learn a reference top on a position below the reference bottom, this command will be refused. The same applies if he tries to learn a reference bottom on a position higher than the reference top.

If the technician gives a CANopen-command to learn a reference top while a reference position top is already available, the old reference top will be overwritten. The same applies for the reference position bottom.

Reference positions will be erased when teach mode is left to pre-commissioning mode, but they will be kept if teach mode is left to normal mode.

Reference positions will also be kept on power cycle starting from teach mode.

	NOTE! The reference bottom can be learned before the reference top or vice versa. It is also possible to learn one reference first, then learn the floor table and at last learn the 2nd reference.

	NOTE! If a power cycle happens starting from teach mode and both reference positions have been learned, LIMAX33 CP-00 will restart in teach mode for the case that LIMAX33 CP-00 needs also a floor table , reference positions will be available, but floor positions may be learned up to that moment will be lost. The teach process can be directly continued with learning of the floor table.

	NOTE! If a power cycle happens starting from teach mode and both reference positions have been learned, LIMAX33 CP-00 will restart in normal mode for the case that LIMAX33 CP-00 does not need a floor table , reference positions will be available. Learning process is finished.

WARNING!
It is highly recommended to learn the references only at a position where the car / counter-weight is on the buffer. Closer explanations can be found in the box at the end of chapter 11.1.5.4

11.2.3 Learning the Floor Table

After learning the reference positions, an inspection trip between the inspection limit switches is possible. In this phase, the technician can teach the lift control.

DANGER!
In case of short head/pit, the technician must not be on the cabin roof / in the shaft (if the pre-triggered stopping system is not tested).

NOTE!
If possible, it should be avoided in this phase to enter the cabin roof / pit. This applies in particular in the case of a short shaft head / pit.
The following applies if the safety of the technician in the case of a short shaft head / pit is secured by the LIMAX33CP:
If entering the cabin roof / pit is unavoidable - e.g. in order to teach the lift control, and the shaft head / pit is short, the safety function pre-triggered stopping system must be tested before entering the shaft. The following gives an example how this test can be done in this phase:

- Leave teach mode to normal mode
- Enter test mode
- Enter test mode sub mode pre-trig
- If necessary perform test of pre-triggered stopping system top, refer to chapter 11.1.5.4
- If necessary perform test of pre-triggered stopping system bottom, refer to chapter 11.1.5.4
- Lever test mode to normal mode
- Enter teach mode

The reference positions are still available now and teach procedure can be continued with learning of the floor positions.

After any necessary works to teach the lift control is finished, the elevator is set to normal (the LIMAX33 CP-00 remains in teach mode).

The elevator can now be moved by car call. The speed is limited to pre-tripping speed teach ☞ 14.1 .

1. The technician now drives to one floor after the other.
2. At each floor, he opens the doors and checks if the door thresholds are level with the floor ground.
   - If not, he can adjust the position of the cabin by correcting the position of the floor in the lift control and then he induces the control to make a correction.
3. When the door thresholds are level with the floor ground, the technician signals to the lift control that this floor should now be learned by LIMAX33 CP-00.
   - The technician must not signal that LIMAX33 CP-00 should learn a floor position before the cabin is level to the floor ground.
   - When doing this, the number of the floor (index of the floor table, refer also to CANopen-Specifications must also be included in the signal (numbering from bottom to top, starting with number 1 for the lowest floor).

- When doing this, the side of the floor (first side, second side or both sides) must also be included in the signal
- The cabin must be at standstill.

4. The control has to pass on this signal via CAN bus to LIMAX33 CP-00.
5. Repeat the last steps until all floors are learned.

Figure 15 and Table 7 illustrate the learning of double sided floors:

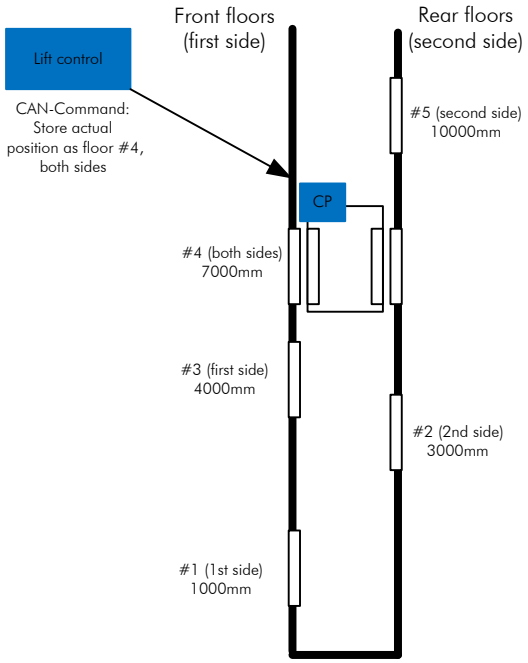


Figure 15: CANopen learning of double sided floors

Table 7: Floor table as stored in CP in case of double sided floors

Floor No.	Position	First side	Second side
#1	1000	X	
#2	3000		X
#3	4000	X	
#4	7000	X	X
#5	10000	X	

Concerning Teach mode manual it is strictly prohibited to implement a fully automatic learn trip for LIMAX33 CP-00 in the lift control. The technician has to confirm manually at each floor that the floor level is correct. The lift control is only allowed to send the CAN command to teach this specific floor to the LIMAX33 CP-00 system in case the technician has confirmed.

11.2.4 Leaving the Teach Mode, Sub-Mode Manual to Normal Mode

When the reference positions and all floors have been learned the technician leaves the teach mode to normal mode by CANopen command. If the teaching is succeeded, LIMAX33 CP-00 will leave teach mode to normal mode. The commissioning is now finished.

If teaching was not successful, the LIMAX33 CP-00 refuses the demand to transit to normal mode and will stay in teach mode. This is the case if:

- The position of the single floors is not increasing with an increasing index
- There are no empty spaces in between the table (all entries in the table, starting from index 1 up to the highest floors must be filled => corresponding floors have been learned).
- No reference position or only one of them has been learned although they are needed due to the configuration

In this case the technician has the following possibilities:

- To stay in teach mode and correct the floor table by leaning, adding, or deleting floors, resp. learning the missing reference positions
- To leave the teach mode to pre-commissioning mode (☞ 11.2.5) and start over the teach process by re-entering of teach-mode, sub-mode manual again (☞ 11.2.1).
- To perform either a power cycle or a system reset. This may be advantageous if reference positions are already available: They will be kept and the system will restart directly in teach mode. In case no reference positions are available, the LIMAX33 CP-00 will re-start in pre-commissioned mode.

11.2.5 Leaving the Teach Mode, Sub-Mode "Manual" to Pre-Commissioning Mode

If a transition to pre-commissioning mode is demanded in teach mode, this will succeed, no matter if teach process has been successful or not. The floor table – possibly available – and reference positions - possibly available – will be erased.

11.3 Automatic Learning of the Floor Table

Figure 16 (see next page) shows an overview on the flow of events in teach mode auto. Details are described in the flowing subchapters. When teaching according to Figure 16 it will be necessary to move the car worst case two and a half-time through the whole shaft:

1. change to teach manual
2. move to the uppermost[1] positions (through the half shaft)
3. teach reference top
4. move to the lowermost position (though the whole shaft)
5. teach reference bottom
6. change to teach, sub-mode auto
7. move upward through the whole shaft, passing by all floor magnets (though the whole shaft)
8. leave teach mode to normal mode

[1] In this example starting with uppermost position; if the car is in the lower half of the shaft at the beginning, the technician would normally start with the lowermost position

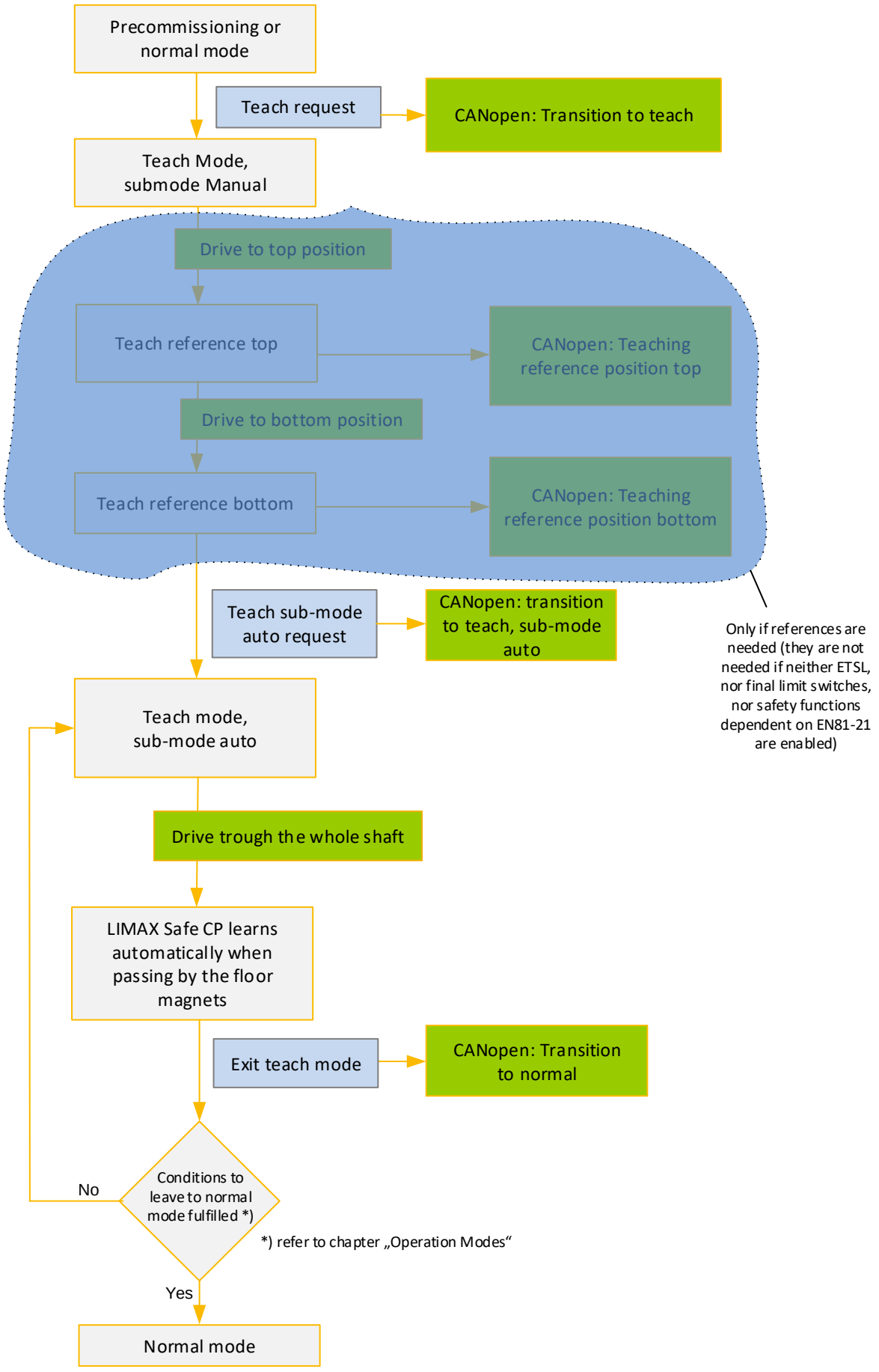


Figure 16: Flow of events in teach mode auto

The order of learning reference positions and floor positions by passing by the floor magnets is arbitrary; therefore it is also possibly to optimize the flow events in order to save time.

If the teaching process follows Figure 17 (see next page), it is only necessary to move one and a half time through the whole shaft:

1. change to teach manual
2. change to teach, sub mode auto
3. move to the uppermost positions (through the half shaft)
4. teach reference top,
5. move to the lowermost position, passing by all floor magnets (though the whole shaft)
6. teach reference bottom
7. leave teach mode to normal mode

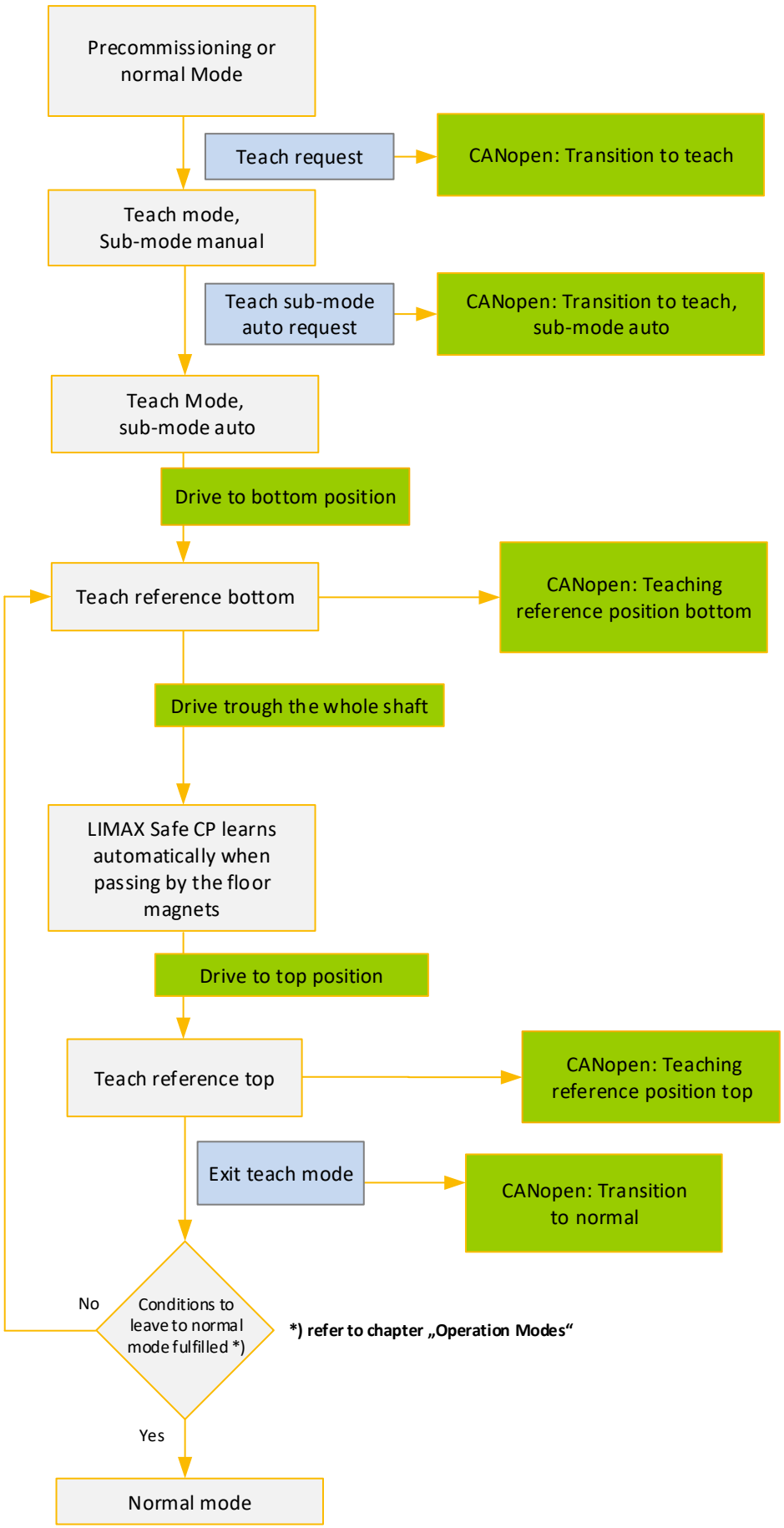


Figure 17: Time-saving flow of events in teach mode auto

11.3.1 Activation of Teach Mode "Auto"

The technician first enters teach mode by CANopen command. The default sub mode is "manual". Optionally, he can teach the reference positions. Chapters ☞ 11.2.1 and ☞ 11.2.2 are here applicable as well.

Remark: reference positions can also be learned later, after change to sub mode "Auto".

Now that the device is already in teach mode (sub-mode "manual"), the sub-mode can be changed to "auto". This can be done by a CANopen command.

11.3.2 Learning of floors in Teach Mode, Sub-Mode "Auto"

The technician carries out a teach trip. The direction is arbitrary. It is only important that the car passes by all floor positions.

During this teach trip LIMAX33 CP-00 passes by the single floors and detects the positions of the floor magnets using the floor detection sensor(s).

Whenever a floor magnet is detected in teach mode auto, LIMAX33 CP-00 learns the new floor at the position.

In case of lift installations with double-sided entries normally two floor sensors are necessary: one of them detects the floor magnets on the first (front) side, the other on the second (rear side).

NOTE!
When the learning trip is carried out at a high speed, the individual floors are not learned with the same precision as during a slow learn trip.

Like in manual Teach ☞ 11.2 the floor table will be filled with the single floor positions. But in Teach, sub-mode auto, the LIMAX33 CP-00 determines the respective index under which a certain floor is stored on its own (in such a way that floor positions are increasing with an increasing index).

The floor sensor (of first side or of second side), which detected the floor magnet, determines the side. The side information will also be stored in the floor table.

In case the first- and the second side sensor each detect a floor in between a distance of ± "Door minimum distance"[1], LIMAX33 CP-00 will store this as one floor with two sides; if the position where the first side is detected and the position where the second side is detected are not exactly the same, first side takes the leadership concerning the position entry in the floor table (by definition).

The same applies if e.g. a floor is already in the table on the first side and later a floor magnet is added on second side (may be because a new door is added). In order to learn this second side of the floor, teach mode auto will be re-entered and LIMAX33 CP-00 will add the second side as soon as the second side floor magnet is detected in between a distance of ± "Door minimum distance" around the already existing first side floor. After this the floor will be double-sided (1st and 2nd side). In case the distance is bigger than ± "Door minimum distance" an own floor (only one side: on 2nd side) will be added.

Figure 18 and Table 8 (on next page) illustrate the learning of double sided floors.

[1] „Door minimum distance" is a settings parameter, refer to Table 26

In case a floor which is already stored in the floor table is detected a second time during teach mode (within a tolerance of ± "Door minimum distance"), the new detected position overwrites the position already available in the table. In case this happens at a double-sided floor (double side information already stored in the table), only the position detected on first side overwrites the position in the table. When the second side is detected, this information is ignored (first side takes the leadership by definition).

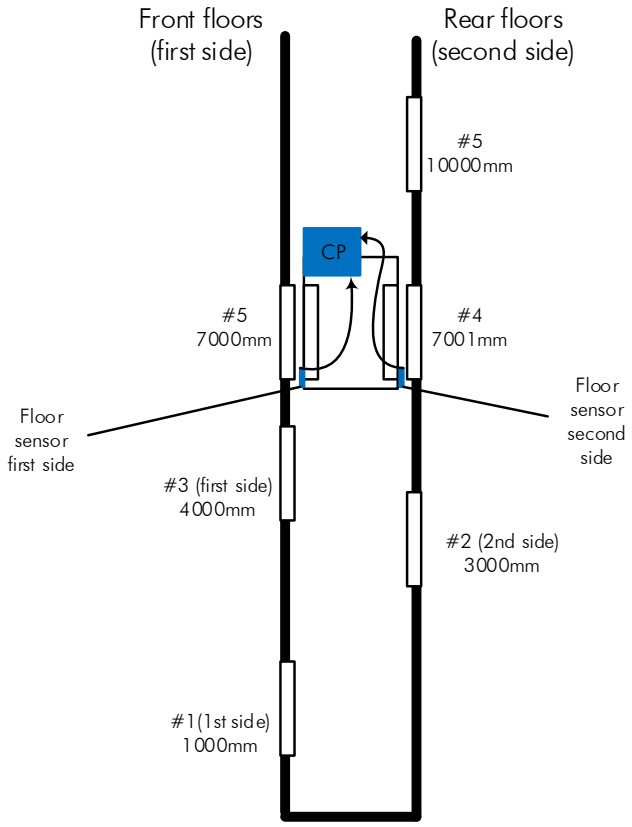


Figure 18: Automatic learning of double sided floors

Table 8: Floor table as stored in CP in case of double sided floors learned automatically

Floor No.	Position	First side	Second side
#1	1000	X	
#2	3000		X
#3	4000	X	
#4	7000	X	X
#5	10000	X	

NOTE!

When carrying out the learn trip by car call, it may happen that the highest floor is not detected: Because of tolerances it may happen the car stops a very small distance below the highest floor. In this case it would help to drive the cabin a small distance upwards by recall control.
The same applies for the lowest floor.

11.3.3 Leaving the Teach Mode, Sub-Mode Auto to Normal Mode

When all floors have been learned (refer to chapter ☞ 11.3.2) the technician can leave the teach mode, sub-mode "auto" to normal mode via CANopen command. If teaching succeeded, LIMAX33 CP-00 will leave teach mode to normal mode. Commissioning is finished now.

If teaching was not successful, the LIMAX33 CP-00 refuses demand to transit to normal mode and will stay in teach mode, sub-mode "auto". This is the case if no reference positions have been learned although they are needed due to the configuration.

NOTE!
The situation "teach fail", because of "no rising order of floor positions" or because of "empty spaces in the floor table" ☞ 11.2.4 cannot occur because LIMAX33 CP-00 sorts the floor by its own in teach mode auto.

11.3.4 Leaving the Teach Mode, Sub-Mode „Auto" to Pre-Commissioning Mode

A demanded "transit to pre-commissioning mode" in teach, sub-mode "auto" will be succeed, no matter if teach process has been successful or not. A floor table (possibly available) and reference positions (possibly available) will be erased.

11.4 Reentering of Teach Mode, Sub-Mode "Manual"

If teach mode is entered via CANopen-command from normal mode, the floor table will not be erased. Reference positions will also not be erased.

Entering Teach mode via CANopen-command from normal mode may be useful if:

- A floor position should be moved for a distance bigger than the adjustment distance permitted in settings mode (refer to☞ 11.6.1). In this case this is a floor which is already in the table is taught a second time by the teach-command. The old positions of this floor will be overwritten. For moving the floor by a second teach-command the car must be on the position where the corrected floor positions should be taught. If the car is not on the position which should be taught as the new floor position the technician can use the "move"-command (see below).
- A floor position should be moved for a distance bigger than the adjustment distance permitted in settings mode. This can be done by the "move"-command. In this case it is not necessary to be on the new floor position. The floor can be moved by an offset, included in the "move"-command.[1]
- A floor position should be added. If a floor is to be added as the new highest floor the floor can be learned in the known manner. If the position of the floor to be added is in between the floor table which is already present, this can be done by the command "ADD".
- "A floor position should be deleted." If the floor which is deleted is not the highest floor, the floor positions of the floors above are all shifted by one index down, so that there is again a continuous row of indexes. A floor can be deleted by the command "CLR".
- When all operations concerning the floor table have been finished, teach mode can be left ☞ 11.2.4.

Further details concerning the commands mentioned above can be found in the CANopen specifications.
All these commands can be used not only if teach-mode is re-entered but also when the LIMAX33 CP-00 is in teach mode for the first time.

[1] If floor position is changed by "move"-command or by teaching of an already known floor a second time on a corrected position, this affects always the "original" – floor. -position, used for the limitation of adjustments ☞ 11.6.1

11.5 Reentering of Teach Mode, Sub-Mode „Auto“

After re-entering teach mode ☞ 11.4, sub-mode can be changed to “auto” by the corresponding CANopen command.

This may be useful if a new floor should be added. In this case it is sufficient to pass by only the new floor magnet. The position of this new floor will be added.

If the position of the new floor magnet is in between ± “Door minimum distance” around the position of an already existing floor on the other side, the other side (side of the new floor magnet) is added to the already existing floor. This results in a double-sided floor. If position of 1st (front-) and 2nd (rear-) side are not exactly the same, the position of the 1st (front-) side takes the leadership.

Remark: *this corresponds to the situation that the first- and second side sensor each detects a floor in between a distance of ± “Door minimum distance” during first teach-auto-process ☞ 11.3.2.*

After all floors have been added, teach mode (sub-mode auto), can be left to normal mode.

11.6 Adjustments

11.6.1 Adjustment by CANopen

Floor positions can be adjusted by CANopen in case five conditions do apply:

1. The actual mode is the settings mode or the teach mode
2. The new position (after adjustment) of the floor must be within ±100 mm related to its original position[1]
3. The cabin needs to be in the range of ±50 mm of the actual position of the floor (before adjustment)
4. The cabin needs to be in the range of ±50 mm of the new position of the floor (after adjustment)
5. The adjustment must not change the ascending floor ordering

There are two possibilities to adjust a floor by CANopen:

1. Firstly, an already known floor can be adjusted by a CANopen similar to the CANopen teach-message (refer also to CANopen-specification). LIMAX33 CP-00 is commanded by this message to store the actual position as the new (adjusted) position of the floor (adjustment by actual position). The CANopen adjustment must contain the floor number.

   If all of the conditions above apply, the actual position will be stored as the new position of the floor.

2. The second possibility for adjustment (adjustment by offset) is quite similar: Another adjustment message (“adjustment by offset”) also must indicate floor number. Additionally, this adjustment message must contain an offset.

   LIMAX33 CP-00 will only accept the adjustment if the following conditions applies additional to the three conditions mentioned at the beginning of this subchapter.

   - The offset must be in a range between −50 mm and +50 mm

   If the condition above applies, the new position of the floor will be calculated as old position (before adjustment) + (signed) offset.

[1] The original position is the position where the floor has been initially learned. This is not necessarily the actual position (before adjustment)

11.6.2 Automatic Adjustment by Floor Sensors

While adjusting, using floor detection sensors, an already known floor in the floor table will be adjusted automatically under the following conditions:

- The actual speed is less than 1 m/s
- A floor sensor (first or second side) detects a floor which already exists in floor table. This means: The distance of the actual position to nearest floor position with a door existing on the side corresponding to the floor sensor is smaller than ±50 mm
- The new position (after adjustment) of the floor must be within ±100 mm related to its original position
- The distance of the actual position to nearest floor position in the floor table on the corresponding side is bigger than ±5 mm.
- In case of double side floors, the 1st side floor position takes the leadership: only the position of front side is taken into account concerning the adjustment.
- The adjustment must not change the ascending floor ordering.

If all conditions above apply, the actual position will be stored as the new position of the corresponding floor in the floor table. Otherwise the detected floor is ignored and floor table will not be changed.

Automatic adjustment by floor sensors will be carried out in normal-, settings-, test- and teach-mode (regardless of the sub-modes). Automatic adjustment by floor sensors will not be carried out if it is not enabled in the configuration ☞ 14.1.6.

12 During Operation

Once LIMAX33 CP-00 was commissioned correctly, it is only in the following cases that any necessary operations are required on LIMAX33 CP-00:

- Emergency evacuation and troubleshooting if a safety function has been triggered or in case of defects of the system itself (only if necessary)
- Setting the parameters (only if necessary)
- Examination of the elevator by the notified body (after commissioning and then annually)

12.1 Triggering the Safety Functions

When an elevator fault, which is covered by the safety functions described in chapter 8, occurs, the actuator-contact specified for the respective safety function is opened, refer to chapter 13.2, 13.3 and 13.4.

12.2 DZO-Signal for emergency evacuation

The DZO-Signal is HIGH if the actual position is a door zone (stored in LIMAX33 CP-00) for levelling. It is LOW otherwise.

This can be used for signaling that a floor level is reached, if the cabin is (e.g. by manually lifting of the motor brake) moved for emergency evacuation.

12.3 The Error Level and Error Codes

LIMAX33 CP-00 has a variety of self-diagnostic functions to ensure functional safety. When the self-diagnostic function detects a defect, a unique error code identifying the specific error is set in addition the error level defined for this specific error. The error-level determines the reaction of the LIMAX33 CP-00:

Table 9: Error -level

0	No reaction, No error or error with level 0 (for information) is set.
1	If the cabin moves there is no reaction for the time being. As soon as standstill is reached, the error level is increased to level 2, and the LIMAX33 CP-00 reacts corresponding to level 2
2	OC opens
3	Reserve (may be for later use)
4	eSGC, OC and SR1/(SR2) open

An error level can only be increased. Dependent on the reason for the error, the error level will be reset to 0 if the error disappears or a power cycle or CanOpen-system-reset are needed, refer to chapter 12.4.

Which errors are self reset ("YES" in last column) and which do need a power cycle resp. system reset ("NO" in last column), can be found in Table 10.
Some errors are related to some mismatch of non-volatile date in the EEPROM. They are quite unlikely, but if they appear they need a special reset procedure, which is described in Table 11.

The error codes are also stored in the defect logs (A & B).

It's the task of the lift control to read all error codes from defect registers A and B which appear and to display them together with date and time.

If an error occurs, the technician reads all error codes which appeared since last lift operation without error. The table below gives hints for troubleshooting. If the error affects the lift or the external wiring, LIMAX33 CP-00 is not defective and need not be replaced.

If the error affects LIMAX33 CP-00, the concerned component must be replaced. An error reset without replacing the component is then not allowed.

In case of an error-level >0 is set, LIMAX33 CP-00 does not accept teaching of floors or of reference positions.

Table 10: Error codes

	Meaning of the code/group of codes	Error codes	Meaning of special errors	Measures to fix the error	Self Reset
1xxh	Position errors	101h – 115h	Failures in position	The cause for these errors may be. 1. Incorrect mounting 2. The magnetic tape 3. the LIMAX33 CP-00 (electronics) For troubleshooting 1st check the correct mounting of the tape, tape guiding and LIMAX33 CP-00 (correct up-direction, tape in the tape-guiding, and so on…) If this is correct try to replace LIMAX33 CP-00 (electronics), if this does not help, replace the magnetic tape. Hint: if the error occurs always about at the same position, it is more likely that the cause is the tape. If it occurs everywhere over the whole reading distance it is more likely that the cause is the LIMAX33 CP-00 (electronics)	NO
33Eh **34xh**	Relays error	33Eh	There was no Reset or power cycle for more than one and a half year,	Perform a power cycle or a reset (it order to maintain the defined test-intervals for some diagnostics it is mandatory to perform a power cycle or reset annually)	NO
		340h	This error is set during the daily relay test	This error is set during the daily relays test. This is no actual error. The only purpose of the error is to open the OC in order to test it. This error has error level 1 which means that there is not reaction as long as the cabin moves. As soon as stand still is reached, the error level is increased to 2 so that OC opens for test purpose. After the OC test the error is reset automatically.	NO
		34xh	Other Relay failures	replace LIMAX33 CP-00	NO
35xh	eSGC (solid state relay) error	350h	eSGC undervoltage	1. Check (external) supply voltage of SCG-actuator. If supply is not connected or voltage too low (<18V), fix it. 2. Check for a short circuit between terminals SG_POW and SG_OUT (for example, a connected trip coil which is faulty). In this case, the self-resetting fuse becomes high-impedance. If this does not help, replace LIMAX33 CP-00	YES
		351h	eSGC overvoltage	Check (external) supply voltage of SCG-actuator. If voltage is too high (>30V), fix it. If this does not help, replace LIMAX33 CP-00	NO
		35xh	Other eSGC – errors	Check if trip coil of SGC-actuator is properly connected and possibly fix the fault concerning the connection. For older hardware versions (eSGC-HW 0.00) the following may help: Connect a load resistor between SG_OUT and SG_GND. The recommended value amounts to 4K7. Please take care of the maximum rating for power dissipation of the resistor. If this does not help replace LIMAX33 CP-00	NO
37xh	Voltage error	370h	Over/under voltage external (24V) and/or internal supply voltage	Check 24 V supply, a voltage of more than 30 V may cause this error. Rectification: use a supply voltage of 24 V. If this does not help or supply voltage was not too high, replace LIMAX33 CP-00	YES
		37xh (other than 370h)	Failure concerning test of the internal voltages	replace LIMAX33 CP-00	NO
64xh **66yh**	Nonvolatile data	64xh, x=3h..Eh 66yh, y=2h..Dh	Failure concerning check of nonvolatile stored data	These errors may appear if the system has been powered down, while storing of data in the EEPROM was in progress. For more detailed descriptions und measures to fix the error see Table 11	see Table 11

	Meaning of the code/group of codes	Error codes	Meaning of special errors	Measures to fix the error	Self Reset
7xxh	Configuration	700h	Configuration empty	Program the intended configuration to the device	NO
		72xh	Failure in programming the configuration (tried to program an invalid configuration)	Check/correct the configuration to be programmed, try to program the configuration again.	NO
		71xh	All other failures concerning the configuration	replace LIMAX33 CP-00	NO
All other error codes	Only of interest for repair at ELGO-plant	All other error codes	Only of interest for repair at ELGO-plant	replace LIMAX33 CP-00	NO

Table 11: Errors concerning nonvolatile stored data

Name	Error codes	Measures
Shaft parameter (offset final limit switch, offset inspection limit switch)	1. 0x643 2. 0x644 3. 0x662 4. 0x663	▪ Go to settings or teach mode. ▪ Set new shaft parameter or set them to default.
Shaft references (reference position for the limit switches)	1. 0x645 2. 0x646 3. 0x664 4. 0x665	▪ Go to Pre-Commissioned mode. ▪ Make a power cycle. ▪ Redo the teach-process.
Floor table	1. 0x647 2. 0x648 3. 0x666 4. 0x667	▪ Go to Pre-Commissioned mode. ▪ Make a power cycle. ▪ Redo the teach-process.
Floor parameter (number of floors, valid flag)	1. 0x649 2. 0x64A 3. 0x668 4. 0x669	▪ Go to Pre-Commissioned mode. ▪ Make a power cycle. ▪ Redo the teach-process.
Door parameter (relevelling zone size, levelling zone size, minimum distance)	1. 0x64B 2. 0x64C 3. 0x66A 4. 0x66B	▪ Go to settings or teach mode. ▪ Set new door parameters or set them to default.
Safety Functions (state of the safety functions)	1. 0x64d 2. 0x64e 3. 0x66C 4. 0x66D	▪ Make two system resets.

Legend:

1. CRC mismatch to EEPROM (at initialization)
   - This can happen,
     - if the store was not successful, caused by power cycle
     - or an EEPROM error

2. Channel CRC mismatch (at initialization)

   - This can happen,
     - if the store was not successful on one channel, caused by power cycle
     - or an EEPROM error

3. CRC mismatch to EEPROM (at runtime)

   - This can happen,
     - if the store was not successful, caused by power cycle (consequence of 1.)
     - or an EEPROM error or RAM error

4. Channel CRC mismatch (at runtime).

   - if the store was not successful, caused by power cycle (consequence of 2.)
   - or an RAM error

12.4 Reset of faults and errors

An open actuator in LIMAX33 CP-00 may be caused by an error (refer to chapter The Error Level and Error Codes12.3) or by tripping of a safety function (refer to chapter 13.2, 13.3 and 13.4, which is called a fault).

There are the following reset types:

- System reset
  It can be triggered by CANopen or the Reset input (high for more than 1s, but less than 5s).
  The system makes a power cycle and the errors and faults are cleared.
- Fault reset:
  It can be triggered by CANopen. Only the faults get cleared. It the UCM fault should be cleared, the door bridging must be cleared, otherwise the fault reset will not work for the UCM safety function. The advantage of the fault reset is that the eSGC-actuator (which may be still closed, e.g. safety function "overspeed pre-tripping" tripped) will not open and therefore a possibly connected electronic safety gear will not fall.
- Power Cycle
  A power cycle clears the errors.
- Autoreset
  If the fault condition disappears, some safety functions are auto reset (refer to chapter 13.2, 13.3 and 13.4). Same applies to some errors (refer to Table 10.

Table 12: Reset of errors and safety functions

	Power cycle	System reset by CANopen or Reset -Input	Fault reset by CANopen	Addititonal condition
Errors which are not automatically cleared	X	X	-	Error disappeared, resp. does not appear at power up
Overspeed (pre- and final tripping)	-	X	X	Stand still
Pre-triggered stopping system	-	X	X	No EN81-21-State (EN81-21-input is HIGH)
UCM	-	A fault reset will reset UCM, if door bridging is disabled before. A system reset (restart and fault reset combined) will always reset UCM: by system restart the door bridging will be deactivated and after this the fault reset will be accepted.		

12.5 The Fault Register

The fault register contains the information if a safety function (☞ 13) tripped.
A detailed description of the fault register can be found in the CANopen specifications.

12.6 Testing of the OC- Relays

When a relay is opened by LIMAX33 CP-00, it is checked by the feedback contacts whether the relay has really opened. OC is normally always closed during normal lift operation

OC must be checked at least once per day that the OC-Relays are still able to open. This is done normally explicitly by a command of lift control, refer to CANopen Specification: If LIMAX33 CP-00 receives this command, it opens OC for a short period of time (approx. half a second), and then it closes OC again.

If LIMAX33 CP-00 did not open OC for longer than 24h (may be because the CAN-command was not received for some reason), LIMAX33 CP-00 opens OC at next stand still automatically for a short time (approx. half a second).

If LIMAX33 CP-00 is also not able to perform this test at next stand still for 12h more for some reason (OC stayed closed for more than 36h), LIMAX33 CP-00 sets the lift out of service by setting of error-level 4.
This is done regardless of the actual movement state.

Remark: Normally it is always possible to open OC for a short time without disturbing normal lift operation when the car is in stand still.

12.7 Testing of the eSGC-actuator

The eSGC actuator is tested during operation: the eSGC-(solid state-) switch is opened very briefly and it is thereby tested whether the voltage at eSGC-OUT has dropped off.

The opening for test purposes is so short (<250 μs) that as a rule no disturbing influences on the normal operation are to be expected, provided that certain boundary conditions are respected (refer to chapter 8, topic 23 b).

12.8 LED Signals

The LEDs at the upper side of the sensor indicate the operating status or possible errors.

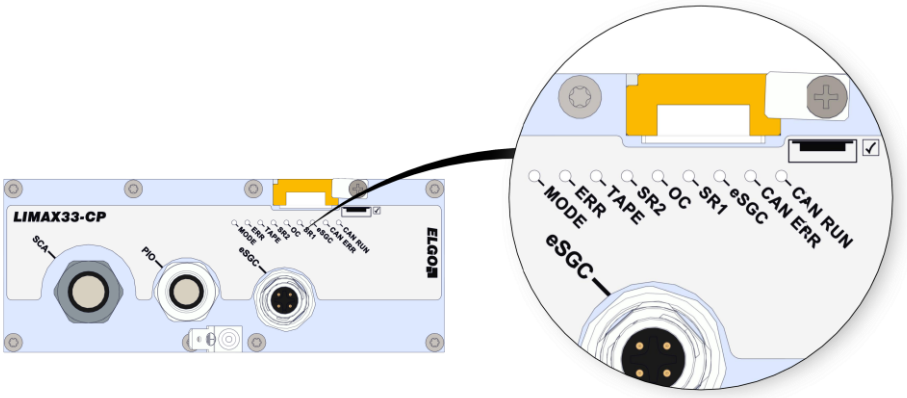


Figure 19: LED´s on the upper side of the sensor in case of eSGC – Version

Note: The view on the top side of version without eSGC is similar, but LED-assignment differs.

Table 13: Meaning of the LEDs

LED	Meaning	
MODE	Normal mode	LED flashes once per second
	Pre-commissioning mode	LED flashes ten times per second
	Teach mode	LED lights permanently
	Teach mode auto	LED lights permanently
ERROR	Flashes with a certain long/short pattern at an emergency error Flashes with 10Hz if the CP is not configured ON at a normal error	
TAPE	ON, if no magnetic tape was detected	
eSGC	ON, when eSGC-contact (solid state contact) is closed	
OC	ON, when OC-relay is closed	
SR1	ON, when SR1-relay is closed	
SR2	ON, when SR2-relay is closed	
CAN-ERR	Status CANopen	
CAN-RUN	Status CANopen	

13 Safety Functions

13.1 Safety Function Configuration

The safety functions LIMAX33 CP-00 can be adapted to the needs of the customer. The behavior of some safety functions can be changed by adapting configuration or settable parameter ☞ 14.1 / ☞ 14.2.

And most of the safety functions (☞ 14.1.3) can be completely disabled because:

- The function is not required for the lift (e.g. ETSL is not needed if buffers are designed for nominal speed or pre-triggered stopping system is not needed in case of enough head/pit clearance).
- Or the customer wants to solve some safety functions externally (e.g. if the mechanical speed governor / mechanical tripping of safety gear is kept, a LIMAX33 CP-00 with safety function "overspeed final tripping" = **disabled** may be used).

13.2 Safety Functions after Commissioning

After correct installation and commissioning (LIMAX33 CP-00 is in normal mode ☞ 11.1), the system fulfils the following safety functions:

Table 14: Safety Functions after Commissioning

Name	Norm reference	SIL	OC	SR1	(SR2)	eSGC	Comments
Overspeed pre-tripping	EN81-20 §5.6.2.2.1.6.a.)	SIL 2	X				
Overspeed final-tripping	EN81-20 §5.6.2.2.1.1a.)	SIL 3	X			X	
Final limit switches	EN81-20 §5.12.2.3.1.b.)	SIL 1	X				
deceleration control, synonym: ETSL	EN81-20 §5.12.1.3	SIL 3	X				
Door bridging (monitoring the levelling and re-levelling)	EN81-20 §5.12.1.4	SIL 2		X	(X)		
Unintended car movement	EN81-20 §5.6.7.7	SIL 2	X	X	(X)	X	
Inspection limit switches	EN81-21 §5.5.3.4, / § 5.7.3.4 (SIL2); resp. EN81-20 §5.12.1.5.2.1 g.) (No SIL)	SIL 2	X				
Supervision on inspection direction	No norm reference	SIL2	X				In order to complete safety of direction dependency of "inspection limit switches"
Overspeed inspection pre-tripping	*EN81-20 §5.12.1.5.2.1 e.)* *Please note the comment*	No SIL	X				This function is fulfilled by lift control LIMAX33 CP-00 only supervises the speed adjusted in the configuration
Overspeed inspection final tripping	*No Norm reference*	SIL3	X			X	This is in order to ensures the braking distance if "pre-triggered stopping system" trips. Therefore SIL3.
Pre-triggered stopping system	EN 81-21 §5.5.2.2 / §5.7.2.2	SIL 3	X			X	
Working platform	EN81-20 §5.2.6.4.3.1 b.)	SIL 3	X			X	

Remarks concerning the table above:

If the SGC triggers due to a safety function, the SR actuator(s) always opens.
In the table this is only shown for the safety functions, where this is mandatory.
This table shows, which actuators must be activated in the configuration and integrated to fulfill the corresponding safety function.

13.2.1 Overspeed Pre-Tripping / Final Tripping

If the actual speed exceeds the pre-tripping speed, OC opens. OC is kept open even after stand still. This state is stored in a non-volatile way: OC will also be kept open after a power cycle. This state is cleared by manual reset by RESET (by CANopen). The pre-tripping speed depends on the configuration, refer to chapter ☞ 14.1.

If the actual speed exceeds the final-tripping speed, eSGC opens additional to OC. eSGC is kept open even after stand still. This state is stored in a non-volatile way: eSGC will also remain open after a power cycle. This state is cleared by manual reset by RESET (by CANopen). The final-tripping speed depends on the configuration, refer to chapter☞ 14.1.
Remark: SR1 and SR2 are normally already open in this situation due to the speed.

13.2.1.1 Actuator and Braking element for overspeed pre-tripping

- The OC is the actuator for "overspeed pre-tripping".
- The OC is integrated in the safety circuit, refer to ☞ 10.4.4
- Therefore, the machine brake is normally the actuator for overspeed pre-tripping.

13.2.1.2 Actuator and Braking element for overspeed final-tripping

The eSGC is the actuator for "overspeed final tripping".

If LIMAX33 CP-00 is used as an electronic speed governor (as a substitute for the mechanical speed governor => EN81-20 §5.6.2.2.1.1a.) (overspeed final tripping) it is mandatory to use an electronic safety gear as the braking element connected to the eSGC-actuator.

13.2.2 Final Limit Switches

If car position is higher than final limit switch top or car position is lower than final limit switch bottom, OC opens due to safety function "final limit switches". Safety function "final limit switches" is reset automatically and therefore OC closes if the car position is back in the area between final limit switch top and bottom.

The position of final limit switch top is calculated as
"reference position top – offset final limit switch top"

The position of final limit switch bottom is calculated as
"reference position bottom + offset final limit switch bottom"

Refer also to ☞ 13.2.8.

13.2.2.1 Actuator and Braking element for final limit switches

The OC is the actuator for "final limit switches".
The OC is integrated in the safety circuit, refer to ☞ 10.4.4.
Therefore, the machine brake is normally the braking element for final limit switches

13.2.3 Deceleration Control (ETSL)

"If the slowdown when approaching the terminal landings is not effective the machine brake shall cause the car speed to be reduced in such a way that if the car or the counterweight comes into contact with the buffers, the striking speed shall not exceed that for which the buffers are designed." (Excerpt from EN81-20 §5.12.1.3)

The permitted ETSL-speed is a function of the distance "s" to the buffer, the car resp. the counterweight is approaching. The permitted ETSL-speed is decreasing when approaching the shaft end.

LIMAX33 CP-00 does know the position of the buffers by the reference position top resp. bottom, refer to ☞ 11.2.2.

Additional there may be set an offset in order to reduce the (assumed) distance to the buffer. There are two offsets, one of them for moving up and one for moving down. These two offsets are configuration parameter ☞ 14.1.2. Refer also to ☞ 13.2.8.

For decel test mode up when moving up the assumed distance to the buffer is calculated as the distance to the middle of the shaft. Distance of car to position of this assumptive buffer in the middle of the shaft will be valid for "decel test mode up" and moving up and for "decel test mode down" and moving down.

For "decel test mode up" and moving down and for "decel test mode down" and moving up, normal calculations are valid.

In "decel test mode" tripping of ETSL under real conditions can be tested without any risk for the material.

Furthermore, the ETSL-speed depends on fixed configuration parameter☞ 14.1.2 .
These Parameters are:

a	=	deceleration caused by the machine brake (it must be guaranteed that the average deceleration caused by the machine brake is bigger or at least equal than parameter "a"
t_{del}	=	delay from the moment the safety circuit is opened until the deceleration caused by the machine brake starts.
V_{Buffer}	=	striking speed the buffers are designed for.
$Offset_{ETSL\_up}$	=	offset for calculation of distance s in reference to the reference position top; refer to Table 15.
$Offset_{ETSL\_down}$	=	offset for calculation of distance s in reference to the reference position bottom; refer to Table 15 (meaning of $Offset_{ETSL\_up}$, and $Offset_{ETSL\_down}$, already mentioned above).

The formula for the permitted ETSL-speed (absolute value) is:

$$V_{ETSL} = MAX\left(sqrt\left(2 * a * s + V_{Buffer}^2 + a^2 * t_{del}^2\right) - a * t_{del};\ V_{Buffer}\right) \text{ for } s >= 0$$
$$V_{Buffer} \text{ for } s < 0$$

Table 15 defines how the distance "s" in the formula above is determined.

Table 15: Distance to assumptive buffer dependent on moving direction and mode

	Normal mode	Decel Test mode up	Decel Test mode down
Moving UP	$S = Pos_{reference\_top} - Offset_{ETSL\_up} - Pos_{car}$	$S = (Pos_{reference\ top} + Pos_{reference\ bottom} - Offset_{ETSL\_up} - Offset_{ETSL\_down}) / 2 - Pos_{car}$	$S = Pos_{reference\_top} - Offset_{ETSL\_up} - Pos_{car}$
Moving DOWN	$S = Pos_{car} - Pos_{reference\_bottom} - Offset_{ETSL\_down}$	$S = Pos_{car} - Pos_{reference\_bottom} - Offset_{ETSL\_dov}$	$S = Pos_{car} - (Pos_{reference\_top} + Pos_{reference\_bottom} - Offset_{ETSL\_up} - Offset_{ETSL\_down}) / 2$

Figure 20 shows the functional graphs of the ETSL-Formula for normal mode, moving up; normal mode, moving down; and “ETSL test mode up”, moving up as examples

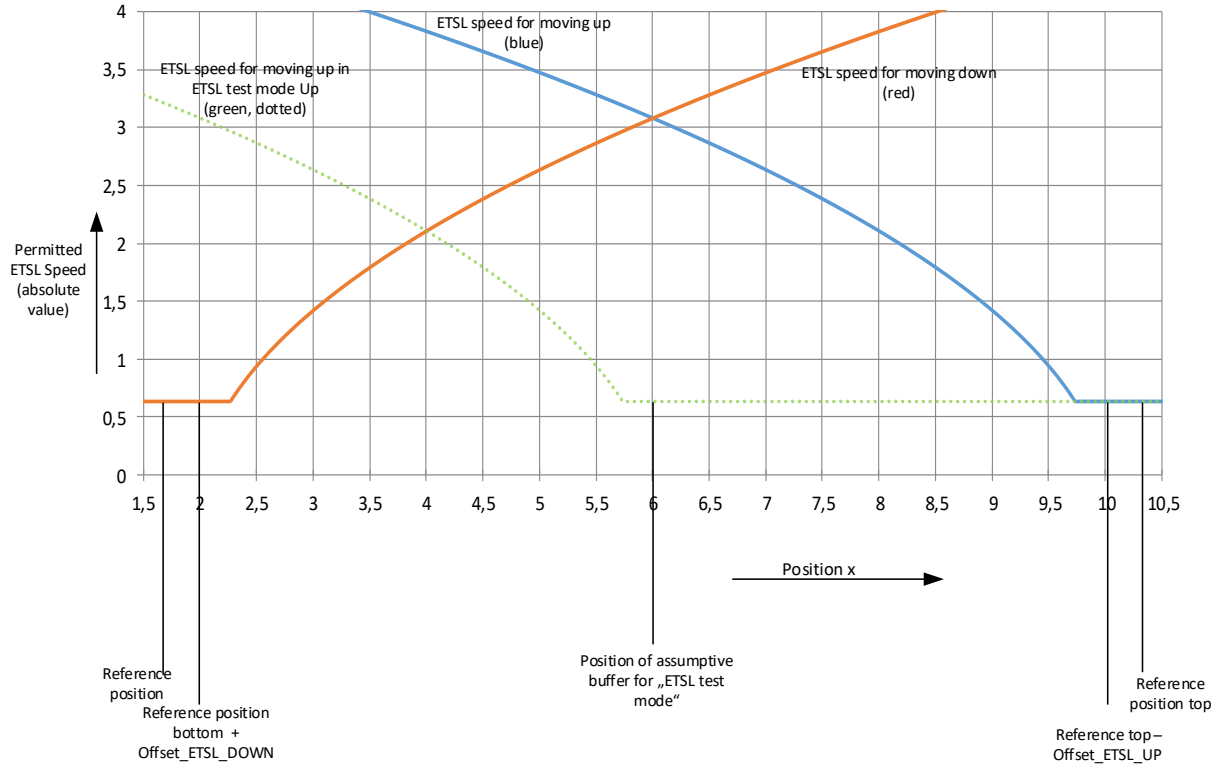


Figure 20: ETSL-Curves

When the permitted ETSL-speed is exceeded, OC opens. OC will be kept open until stand still is reached and held for 1s. After this the ETSL-safety function resets automatically and OC close.

13.2.3.1 Actuator and Braking element for ETSL

- The OC is the actuator for ETSL.
- The OC is integrated in the safety circuit ☞ 10.4.4
- Therefore, the machine brake is normally the braking element for ETSL.

13.2.4 Door Bridging

There are two kinds of door bridging: “door bridging levelling„ and “door bridging re-levelling”.

If the conditions for “door bridging levelling” or for “door bridging re-levelling” are fulfilled, SR(1/2) closes (door circuit is bridged). Otherwise if neither the conditions for “door bridging levelling” nor for “door bridging re-levelling” are fulfilled SR(1/2) opens (door circuit is not bridged any longer).

13.2.4.1 Door bridging levelling

The conditions for door bridging levelling are:

1. Door bridging command for levelling has been given by CANopen.
2. Actual position is in the door zone for levelling of that floor, the door bridging levelling has been enabled for ☞ 13.2.4.3. The door zone extends from the *flush position of the relevant floor (due to CANopen-command)* MINUS *door zone size for levelling* to *flush position of the relevant floor (due to CANopen-command)* PLUS *door zone size for levelling*. Concerning *door zone size for levelling* see ☞ 14.2 .
3. Actual speed < 0.8 m/s

If all three conditions listed above are fulfilled, SR(1/2) closes due to door bridging levelling.

13.2.4.2 Door bridging re-levelling

The conditions for door bridging re-levelling are:

1. Door bridging command for re-levelling has been given by CANopen.
2. Actual position is in the door zone for re-levelling of that floor, the door bridging re-levelling has been enabled for☞ 13.2.4.3. The door zone extends from the *flush position of the relevant floor (due to CANopen-command)* MINUS *door zone size for re-levelling* to *flush position of the relevant floor (due to CANopen-command)* PLUS *door zone size for re-levelling*. Concerning *door zone size for re-levelling refers* to ☞ 14.2 .
3. Actual speed < 0.3m/s

If all three conditions listed above are fulfilled, SR(1/2) closes due to door bridging relevelling.

13.2.4.3 Door bridging Command by CANopen

Door bridging is enabled by CANopen-command. This Command contains
1. Information if door bridging should be enabled for levelling or for re-levelling
2. Number and position of that floor, the door bridging should be enabled for
3. (entry-) side (1st side, 2nd side or both sides) of the floor.

If one of the conditions mentioned above does not fit, LIMAX33 CP-00 will not accept the door bridging-command and neither SR1 nor SR2 will close.

In case the three conditions mentioned above do apply and the additional conditions concerning speed and zone do apply, SR1 or/and SR2 will close. Concerning the details about the dependency SR1/SR2 from 1st side/2nd side / both side floor and bridge command 1st side/2nd side / both sides refer to the table in the Appendix “bridging operations for double sided floors” in the CANopen Specification. In this table it can be also found, how LIMAX33 CP-00 deals with the situation that there is only one SR, but a double-sided door.

The following list specifies for accepting/not accepting a CANopen door bridging command.
- Door bridging cannot be enabled for more than one floor at the same time.
- It is possible to switch directly from door bridging levelling to bridging re-levelling (concerning one and the same floor)
- It is not possible to switch directly from door bridging re-levelling to bridging levelling
- It is not possible to switch directly from door bridging re-levelling or levelling to door bridging re-levelling or levelling of another floor
- In case of a double-sided floor it is possible to switch directly from one side to the other, from one single side to both sides or from both sides to one single side.
- door bridging (levelling or re-levelling) will stay enabled until it is
  a.) disabled by CANopen-command or
  b.) until an invalid CANopen-levelling/re-levelling command is received (e.g. wrong floor position) or
  c.) until CANopen-levelling/re-levelling command is received which is indeed valid, but for another floor than a CANopen-levelling/re-levelling which is already pending

For more details refer to the CANopen specification.

13.2.5 Unintended Car Movement (UCM)

Three conditions must be fulfilled for causing door over-bridging (SR1/SR2 close)☞ 13.2.4:

1. Door over-bridging (for levelling or re-levelling) must be enabled by CAN: "CAN-condition"
2. Speed must be below 0.8 m/s for levelling resp. 0.3 m/s for re-levelling: "speed-condition"
3. Position must be in the levelling resp. re-levelling zone of the correct floor: "zone-condition"

Otherwise SR1/SR2 opens.

If "CAN-condition", "speed"-condition" and "zone-condition" are all fulfilled (and therefore SR1/2 is/ are closed) and then "speed"-condition" or "zone-condition" is hurt (levelling resp. re-levelling speed exceeded or levelling resp. re-levelling- zone is left) unintended car movement (UCM) is triggered.

If UCM is triggered, all SR1/2 and OC will open. Whether eSGC opens depends on the concerning configuration and on the direction of the movement which caused UCM to trip ☞ 14.1.5.

If UCM is triggered, this state is stored in a non-volatile way: The corresponding relays will also be kept open after a power cycle. This state is cleared by RESET (by CANopen).

If the car is on a floor level with doors bridged (SR1 or/and SR2 closed) lift control must always disable door bridging by CANopen, before a new travel can start. Otherwise UCM would be triggered.
Refer also to Figure 21.

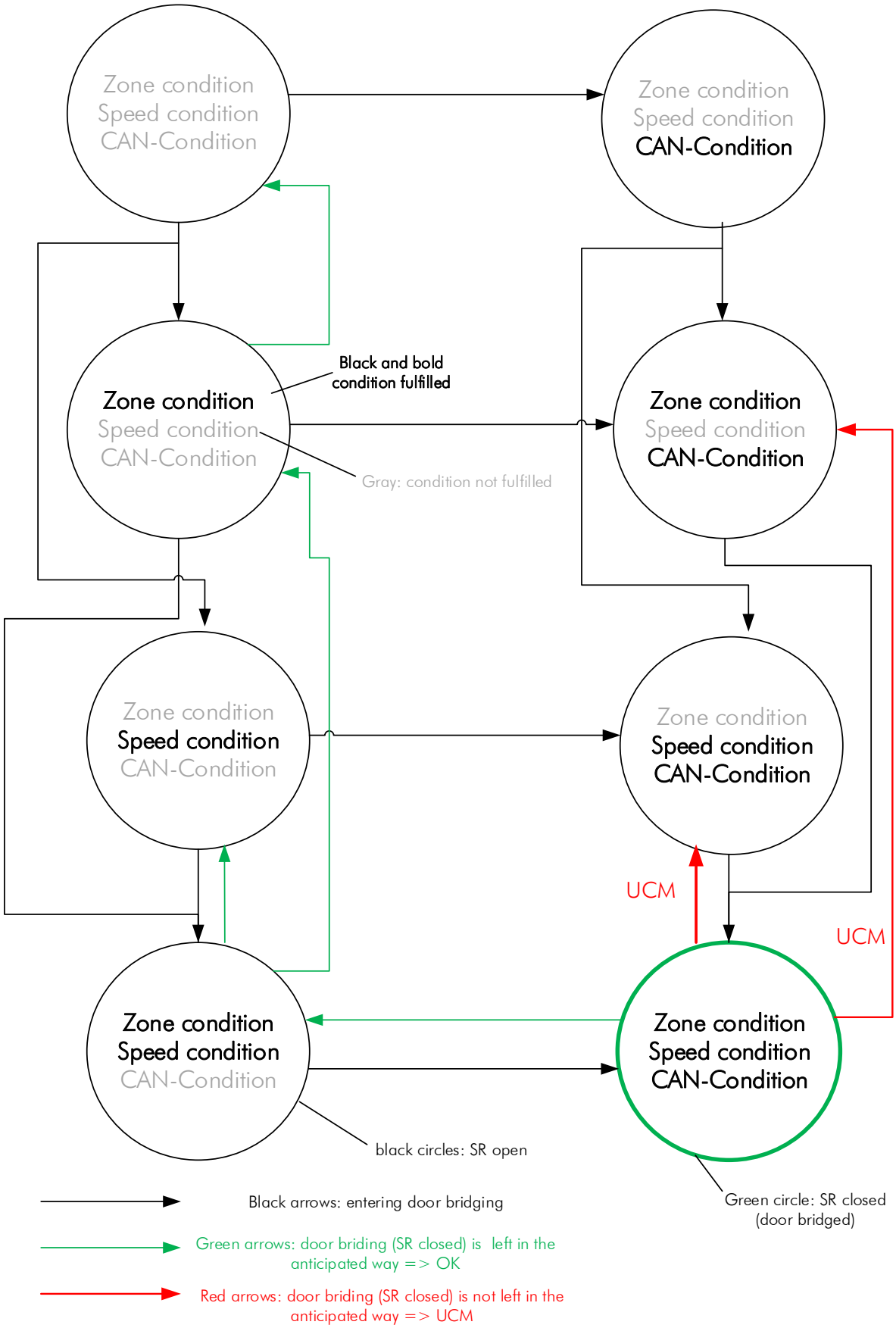


Figure 21: Conditions for door bridging and UCM

13.2.5.1 Actuator and Braking element for UCM

If the machine brake built due to EN81-20 §5.9.2.2.2, the machine brake may be the braking element for UCM. Therefore, the eSGC-actuator is not necessarily needed with regard to UCM.

If the machine brake is not built due to EN81-20 §5.9.2.2.2, a brake, which is not needed for controlling the speed in normal lift operation, must be the braking element for UCM. This may be

- An electronic trigger-able safety gear
- A conventional safety gear tripped by speed governor. This speed governor again is tripped by a blocking device (remote tripping) connected to eSGC.
- A rope gripper

The tripping coil of this braking element must be connected to the eSGC-actuator.

13.2.6 Safety Functions in EN81-21 State

13.2.6.1 Activation of EN 81-21 State

LIMAX33 CP-00 fulfills safety functions in order to protect a person in the pit on the car roof or elsewhere in the shaft for maintenance work.

These safety functions are activated in case of EN81-21-state. EN81-21 state is activated if the EN81-21-signal (input) is active. An open input or LOW level means "active", 24 V on the input means "not active".

The following subchapters define those safety functions which depend on the EN81-21-state.

13.2.6.2 Overspeed Inspection Pre-Tripping

OC opens, if there is actual EN81-21-state and speed exceeds "pre-tripping speed inspection". "Pre-tripping speed inspection" is a fixed configuration parameter ☞ 14.1

This safety function is reset (and therefore OC closes) in case standstill is reached and hold for 1s.

13.2.6.3 Overspeed Inspection Final Tripping

eSGC opens additional to OC, if there is actual EN81-21-state and speed exceeds "final-tripping speed inspection". "final tripping speed inspection" is a fixed configuration parameter ☞ 14.1
After tripping of this safety function, eSGC and OC are kept open even after stand still. This state is stored in a non-volatile way: eSGC and OC will also kept open after a power cycle. This state is cleared by manual reset (by CANopen).
SR1 and SR2 are already open due to EN81-21-state

13.2.6.4 Actuator and Braking element for Overspeed Inspection Final Tripping

The braking element for Overspeed inspection (final tripping) may be:

- An electronic trigger-able safety gear
- A conventional safety gear tripped by speed governor. This speed governor again is tripped by a blocking device (remote tripping) connected to eSGC.
- A rope gripper

The tripping coil of this braking element must be connected to the eSGC-actuator.

13.2.6.5 Positions of "inspection limit switches" and "pre-triggered stopping system"

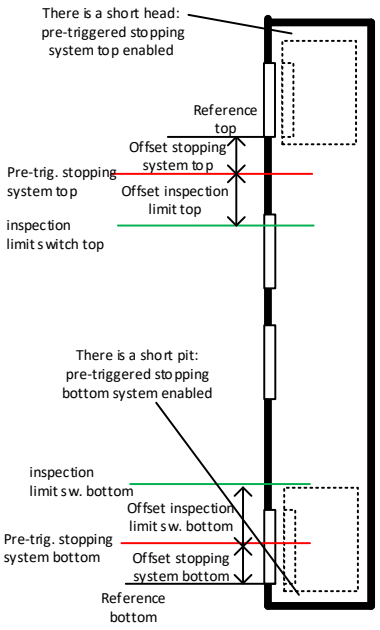
In EN81-21-state additional limit switches are activated:

1. pre-triggered stopping system limits (top/bottom) => opening eSGC and therefore acting safety gear when the corresponding pre-triggered stopping system limits (top/bottom) are over-traveled. Theses limit-switches are only active if the corresponding safety function (pre-triggered stopping system top/bottom) is enabled (☞ 14.1.3), they are calculated with reference to the limit switch references top/bottom as they have been learned in teach mode (☞ 11.2.2), refer also to ☞ 13.2.8.
2. inspection limit switch top/bottom => opening OC and therefore stopping the car by machine brake the corresponding inspection limit switch positions are over-traveled. They are calculated with reference to the pre-triggered stopping system limits (top/bottom) (see above and refer also to ☞ 13.2.8).

Before the pre-triggered stopping system limit is reached, the OC opens (inspection limit switch). So normally the car will stop before the pre-triggered stopping system limit is reached.

In case of pre-triggered stopping system top/bottom is disabled, there is no pre-triggered stopping system limit. In this case the position of the inspection limit top/bottom is calculated as an offset to the references (top/bottom) as it has been learned in teach mode ☞ 11.2.2.

Conditions in case of short head and short pit:



Conditions in case of sufficiant head and pit clearance due to EN81-20§5.2.5.7/§5.5.5.8

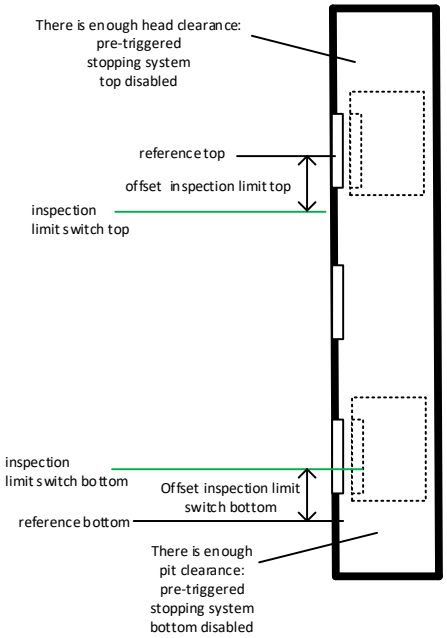


Figure 22: Positions of inspection and stopping system limits in case of short head/pit and in case of head/pit-clearance

13.2.6.6 Pre-triggered Stopping System

There is a pre-triggered stopping system top for the shaft head
and a pre-triggered stopping bottom for the shaft pit:

- The pre-triggered stopping system top trips if "there is EN81-21-state" AND "actual position is higher than the pre-triggered stopping system limit top"
- The pre-triggered stopping system bottom trips if "there is EN81-21-state" AND "actual position is lower than the pre-triggered stopping system limit bottom ".

These safety functions are only active if they are "enabled".
They may be "disabled" in case there is no short head/pit.

For closer explanation short head/head clearance resp. short pit/pit clearance and for calculation of positions of stopping system limits top resp. bottom refer to Table 22 & Table 23 in chapter ☞ 14.1. Refer also to ☞ 13.2.8.

If pre-triggered stopping system top or bottom trips, eSGC and OC will open (SR1/2 are already open due to EN81-21-state). After tripping of pre-triggered stopping system, the actuators are kept open – even after power cycle - until the safety function is reset by CANopen-reset. So, it is not possible to move the car with the inspection pod after the pre-triggered stopping system has tripped.

In order to avoid the situation that a person on the roof or in the pit is trapped when approaching the shaft end in inspection travel, the inspection limit switches top/bottom should be able to stop the car before the pre-triggered stropping system top/bottom trips. The user should take this into account when setting the offsets of the inspection limit switches by CANopen ☞ 14.2.

If pre-triggered stopping system top/bottom is enabled (or both enabled), eSGC must be available, enabled and installed due to ☞ 10.4.8. Concerning this safety function, it is arbitrary if eSGC drives directly an electronic safety gear, or the blocking device of a speed governor (remote triggering of speed governor).

13.2.6.7 Actuator and Braking element for pre-triggered stopping system

The braking element for pre-triggered stopping system may be:

- An electronic trigger-able safety gear
- A conventional safety gear tripped by speed governor. This speed governor again is tripped by a blocking device (remote tripping) connected to eSGC.

The tripping coil of this braking element must be connected to the eSGC-actuator.

13.2.6.8 Inspection Limit Switches

Inspection limit switches operate the OC-contact.
They are only active in EN81-21-state and they are direction dependent:

- The inspection limit switch top (OC) opens, if there is "EN81-21-state" AND "actual position is higher than the inspection limit top", AND "there is actual no demand of a travel in DOWN-direction" (by inspection direction buttons).
  Refer also to Table 16 (see next page).
- The inspection limit switch bottom (OC) opens if there is an "EN81-21-state" AND "actual position is lower than the inspection limit bottom", AND "there is actual no demand of a travel in UP-direction" (by inspection direction buttons).
  Refer also to Table 17 on the next page.

Table 16: OC reaction if position is higher than inspection limit top

		DOWN-Button	
		pushed	released
UP-Button	pushed	OPEN	OPEN
	released	CLOSED	OPEN

Table 17: OC reaction if position is lower than inspection limit bottom

		DOWN-Button	
		pushed	released
UP-Button	pushed	OPEN	CLOSED
	released	OPEN	OPEN

The direction dependency of the inspection limit switches means, that it is possible to drive the car into the safe direction with the inspection pod even after OC has opened due to over -travelling of the inspection limit switch. Therefore, a person e.g. on the roof is no trapped, but he can release himself by moving the car downwards.

13.2.6.9 Supervision on inspection direction

LIMAX33 CP-00 supervises also the consistency of direction button and real moving direction:

- If the UP Button is pushed and the car travels DOWN, OC will open
- If the DOWN Button is pushed and the car travels UP, OC will open

The roll-back (at start of movement) effect is taken into account.

If OC opened due to a contradiction of direction button state and real movement, they will close again after stand still and both buttons released. The connections of LIMAX33 CP-00 with the inspection panel should be checked in this case.

13.2.7 Safety function „Working Platform“

LIMAX33 CP-00 fulfills the safety functions “working platform” in order to prevent a movement of the car under all conditions.

- Safety concerning “Working Platform” is activated if the “Working Platform”-signal (input) is active.
- An open input “Working Platform” or Low-level means “active”, 24 V on the input means “not active”.
- In case safety concerning “Working Platform” is activated, all actuators will open.
- They will close again if input “Working Platform” is deactivated (24 V on the input).

NOTE!
If this functionality is used in conjunction with safety gear which does not reset itself, there is a danger that the technician will lock himself in using this function (for example, on the roof of the car above the uppermost floor). Electronically triggered safety gears often have the characteristic, for example, that they do not reset themselves when the voltage returns, even if they have triggered at standstill.

13.2.8 Relations limit switches/Offsets/ETSL and reference positions (summary)

Figure 23 (below) illustrates the final limit switch bottom, the pre-triggered stopping limit bottom, the inspection limit bottom and the distance s for ETSL-calculation when moving down related to the reference position bottom.

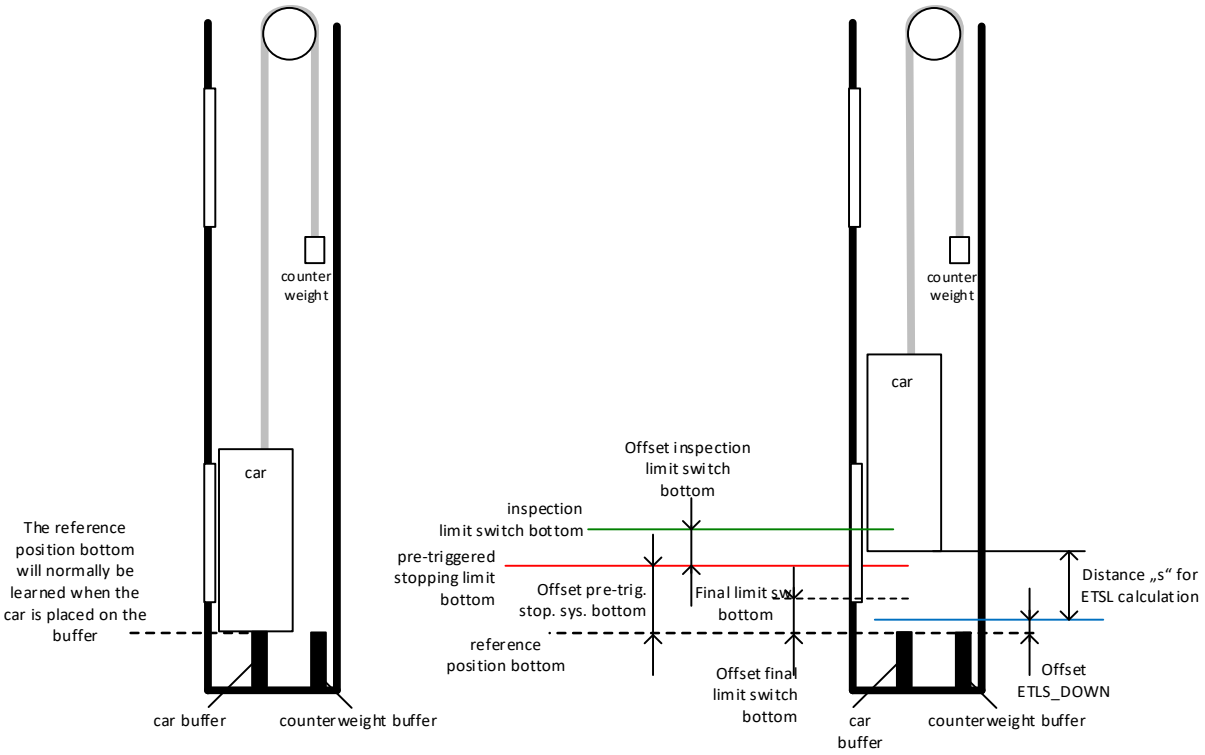


Figure 23: Relations to the reference position bottom

Relations to the reference position top see Figure 24 on next page.

Figure 24 (below) illustrates the final limit switch top, the pre-triggered stopping limit top, the inspection limit top and the distance s for ETSL-calculation when moving up related to the reference position top.

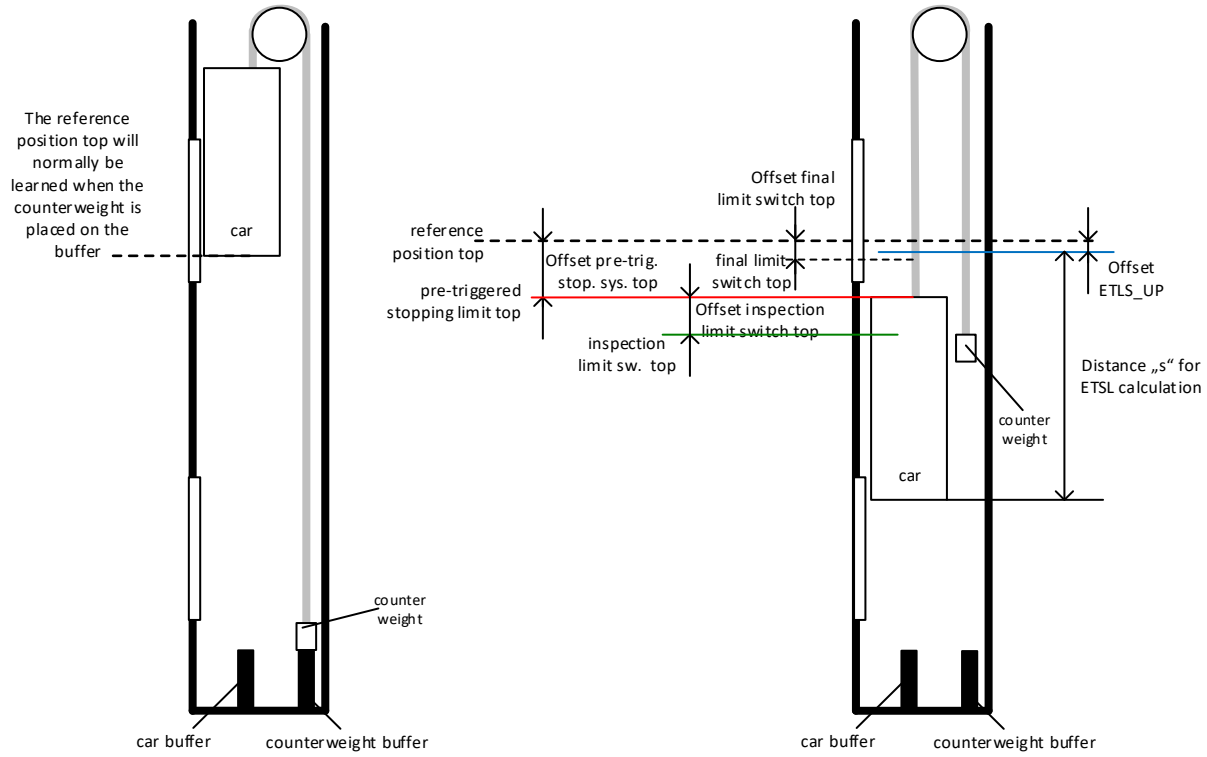


Figure 24: Relations to the reference position top

13.3 Safety Functions during Commissioning

During commissioning (LIMAX33 CP-00 is in Teach mode ☞ 11.1) the system fulfils the safety functions listed in the table below:

Table 18: Safety functions during commissioning

Name	Norm reference	SIL	Comments
Overspeed pre-tripping	EN81-20 §5.6.2.2.1.6.a.)	SIL 2	Same as in normal mode
Overspeed final tripping	EN81-20 §5.6.2.2.1.1a.)	SIL 3	Same as in normal mode;
Final limit switches	EN81-20 §5.12.2.3.1.b.)	SIL1	Always closed
Inspection limit switches	EN81-21 §5.5.3.4 / § 5.7.3.4	SIL2	If reference positions are available: same as in normal mode. Always opens if reference positions are not available
Supervision on inspection direction	no norm reference	SIL2	Same as in normal mode
Pre-triggered stopping system	EN 81-21 §5.5.2.2 / §5.7.2.2	SIL3	If reference positions are available: Same behavior as in normal mode If reference positions are not available: pre-triggered stopping system will always trip in EN81-21-state
Overspeed inspection pre-tripping	EN81-20 §5.12.1.5.2.1 e.)	No SIL	Same as in normal mode
Overspeed inspection final tripping	no norm reference	SIL3	Same as in normal mode
Overspeed teach pre-tripping	Additional function, no norm reference	SIL3	Protection in teach mode. Substitute for ETSL, which is not carried out in teach mode. OC opens if speed exceeds pre-tripping speed teach. "Pre-tripping speed teach" is a fixed configuration parameter ☞ 14.1. This safety function is reset (and therefore OC closes) in case standstill is reached and hold for 1s.
Overspeed teach final tripping	Additional function, no norm reference	No SIL	Protection in teach mode. eSGC opens additionally to the OC if the speed exceeds final-tripping speed teach. Final-tripping speed teach is a fixed configuration parameter ☞ 14.1 After tripping of this safety function, eSGC is kept open even after stand still. This state is stored in a non-volatile way: eSGC will also remain open after a power cycle. This state is cleared by manual reset by RESET (by CANopen).
Working platform	EN81-20 §5.2.6.4.3.1 b.)	SIL 3	Same as in normal mode

No door bridging and no UCM are active in teach mode.

⇨ SR1 and SR2 are always open in teach mode

13.4 Safety Functions before Commissioning

The behavior of the safety functions in pre-commissioning mode ☞ 11.1 is the same as in teach mode ☞ 13.3.
Remark: Reference positions are never available in pre-commissioning mode.

In pre-commissioning mode☞ 11.1, only the following safety functions are active:

Table 19: Safety functions before commissioning

Name	Norm reference	SIL	Comments
Overspeed pre-tripping	EN81-20 §5.6.2.2.1.6.a.)	SIL2	Same as in normal mode
Overspeed final tripping	EN81-20 §5.6.2.2.1.1a.)	SIL 3	Same as in normal mode
Overspeed teach pre-tripping	Additional function, no norm reference	SIL3	Same as in teach mode
Overspeed teach final tripping	Additional function, no norm reference	No SIL	Same as in teach mode
Inspection limit switches	EN81-21 §5.5.3.4,/ § 5.7.3.4	SIL2	Always open (because no references available in pre-comm. mode) => OC opens as soon as EN 81-21 state is active.
Supervision on inspection direction	no norm reference	SIL2	Same as in Normal mode
Pre-triggered stopping system	EN 81-21 §5.5.2.2 / §5.7.2.2	SIL3	pre-triggered stopping system will always trip in EN81-21-state
Working platform	EN81-20 §5.2.6.4.3.1 b.)	SIL 3	Same as in normal mode

No door bridging and no UCM are active in pre-commissioning mode.

⇨ SR1 and SR2 are always open in pre-commissioning mode .

14 Configured/settable Parameter and Features

Most of the safety functions depend on parameters/features, which are either configured in the LIMAX33 CP-00 or settable/changeable by CANopen during operation.

ATTENTION!
It obligates the user to ensure that the configuration of the device fits the lift, where it will be installed. The hints given in this chapter must be observed.

14.1 Configuration

14.1.1 Procedure of Configuration

The following sections describe processes to configure the LIMAX33 CP-00 and how this can be done in a safe way. These processes have to be looked at as proposals. The lift company (customer) may define its own safe processes.
In this case, however, ELGO assumes no responsibility for the process. Only the processes described in this safety manual have been checked and certified by TÜV-SÜD. This safety manual is part of the certificate.

The following processes are proposed:

- The customer orders fully configured devices
- The customer orders not configured devices and configures them in his plant or on site
- The customer orders fully configured devices with a standard configuration and changes them if necessary in the factory or on site

14.1.1.1 Basic Procedure

The procedure of the configuration consists basically of the following steps:

1. Determination of the configuration
   In a first step, all necessary configuration parameters and features for a lift installation where LIMAX33 CP-00 should be installed must be determined. A technically responsible person at the elevator company must derive the configuration (parameters and features) from the technical conditions of the elevator to be equipped. If the LIMAX33 CP-00 is a substitute for a – may be defect - device which has already been installed, the configuration can normally be taken from the configuration sheet of the lift (refer to chapter 14.1.1.6).
2. Download of the configuration to the device
   After the configuration is fixed, it can be downloaded via CAN-bus on a blank device (device which contains no configuration). In addition to the actual configuration information, the CRC must be sent to the device. → refer also to CANopen specification. The LIMAX33 CP-00 will only accept a configuration, in case the CRC fits to the configuration data. The CRC must not be calculated from the tool, which sends the configuration to the device.
3. Marking of the device /info sheet
   An info sheet, which contains the configuration must be filed to the documentation of the elevator and the CRC and final tripping speed must be attached to the device.

14.1.1.2 Necessary qualifications

The procedure is divided into two areas of responsibility:

- The definition of the configuration (step 1 in chapter 14.1.1.1)
- The download, check and documentation of the configuration (step 2 and 3 in chapter 14.1.1.1)

The person responsible for definition of the configuration is called Definition Responsible.
The person responsible for the download, check and documentation is called Download Responsible.

The Definition Responsible must have the technical and normative knowledge to determine a safe configuration of the elevator. He must know the configuration features of the LIMAX33 CP-00 in detail and must know the current documentation.
Additional he must know the necessary technical details of the lift installation.

The Download Responsible needs to be instructed to the necessary work steps as described to the following chapters. Dependent of the process the Download Responsible may be an employee of ELGO or an employee of the customers lift company.

The Definition Responsible and the Download Responsible may be one and the same person.

14.1.1.3 Configuration at ELGO plant

It is possible to order a configured device at ELGO on own expense. In this case, the info sheet will be provided by ELGO and the CRC-info-sticker will already be attached on the info label at delivery.
ELGO provides an online-configuration assistant. The customer may ask for access to the configuration assistant at ELGO Batscale. Normally the online-configuration assistant is used in order to fix the configuration for the devices to be ordered. Additionally the configuration assistant provides assistance by checking the configuration, show warnings in case some configurations are only permitted under certain conditions and leading the user step by step.
Figure 25 shows the process:
The customer determines the configuration using the configuration assistant and orders the device(s). ELGO is not responsible for the configuration itself, but only for correct assignment of configuration and sticker to the devices. ELGO downloads the configuration, prints the info sticker and info sheet, attaches the sticker to the device and prepares the device and the info sheet for shipping.

The persons, which done the different steps, must have the necessary qualifications (14.1.1.2).

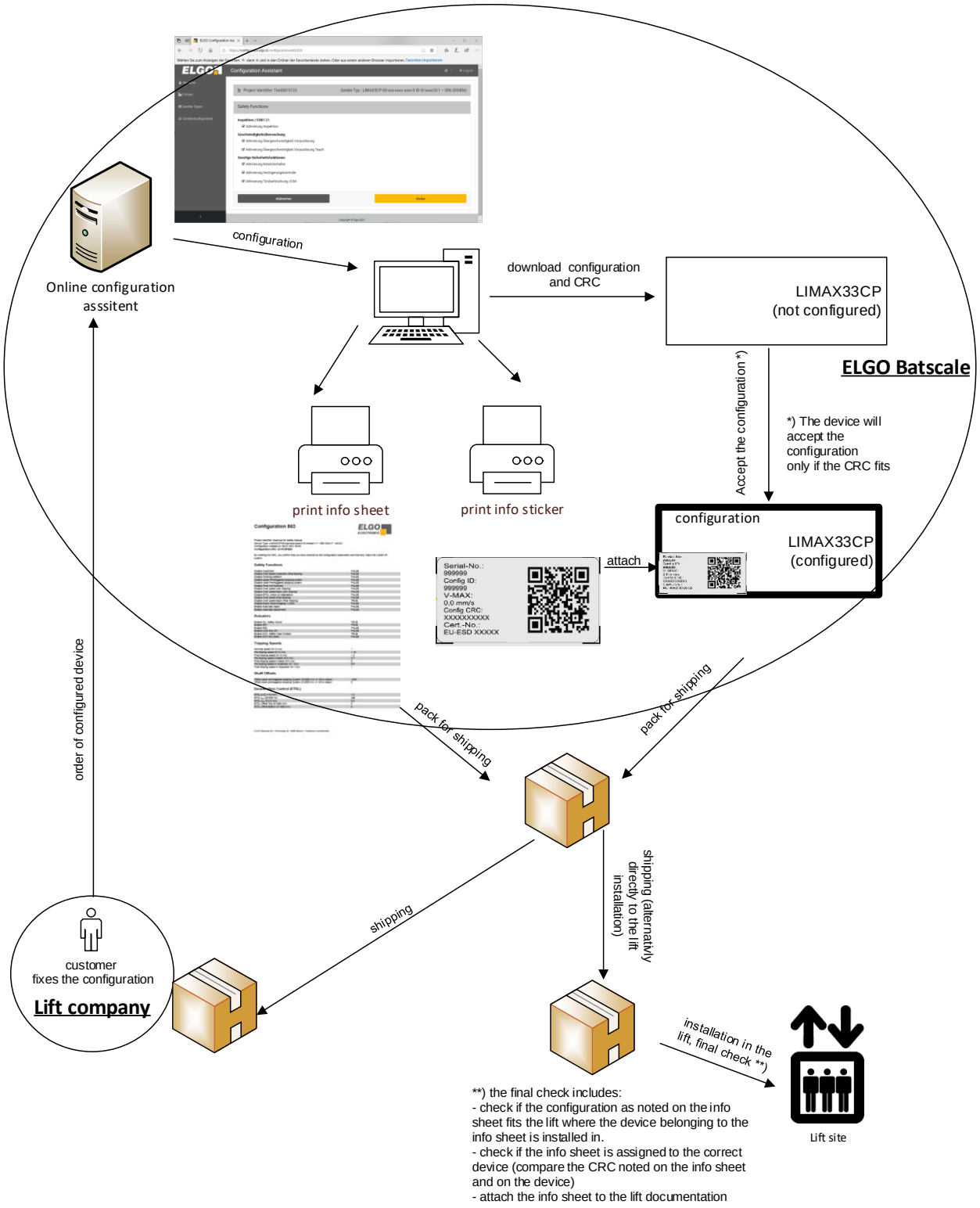


Figure 25: process of configuration, configuration at ELGO

14.1.1.4 Configuration of not configured devices at customers lift plant

The main difference between "configuration at ELGO" and "configuration at customers lift plant" is only that the single work steps take place on different places, refer to Figure 26:

The customer determines the configuration using the configuration assistant. The customer downloads from the configuration assistant:

- The configuration sheet as pdf-format
- The info-sticker as pdf-format
- The ini – file containing the configuration

A not configured LIMAX33 CP-00 is taken form the stock or ordered from ELGO. In order to download the configuration normally a PC or notebook with a CAN-adapter connected to LIMAX33 CP-00 is used. Additionally a PC- software tool which generates CAN-messages – according to the format expect by LIMAX33 CP-00 for configuration messages - from the ini-file is used. The configuration messages include also the CRC of the configuration.
It is important that the PC-software tool is not able to calculate the CRC by its own. In contrast to this, the CRC must be entered manually to the PC. The CRC can be found on the configuration sheet. If the PC-tool would calculate the CRC internally, transmission errors on the way from ELGO-Batscale to the lift plant would possibly not be detected.
Tools like the PC-tool and further information are provided to the customers on the "customer-hub"
After successful configuration of a LIMAX33 CP-00, the info sticker is printed and attached to the device. The info sheet is also printed and shipped together with the device to the lift site.

The persons, which done the different steps, must have the necessary qualifications (14.1.1.2).

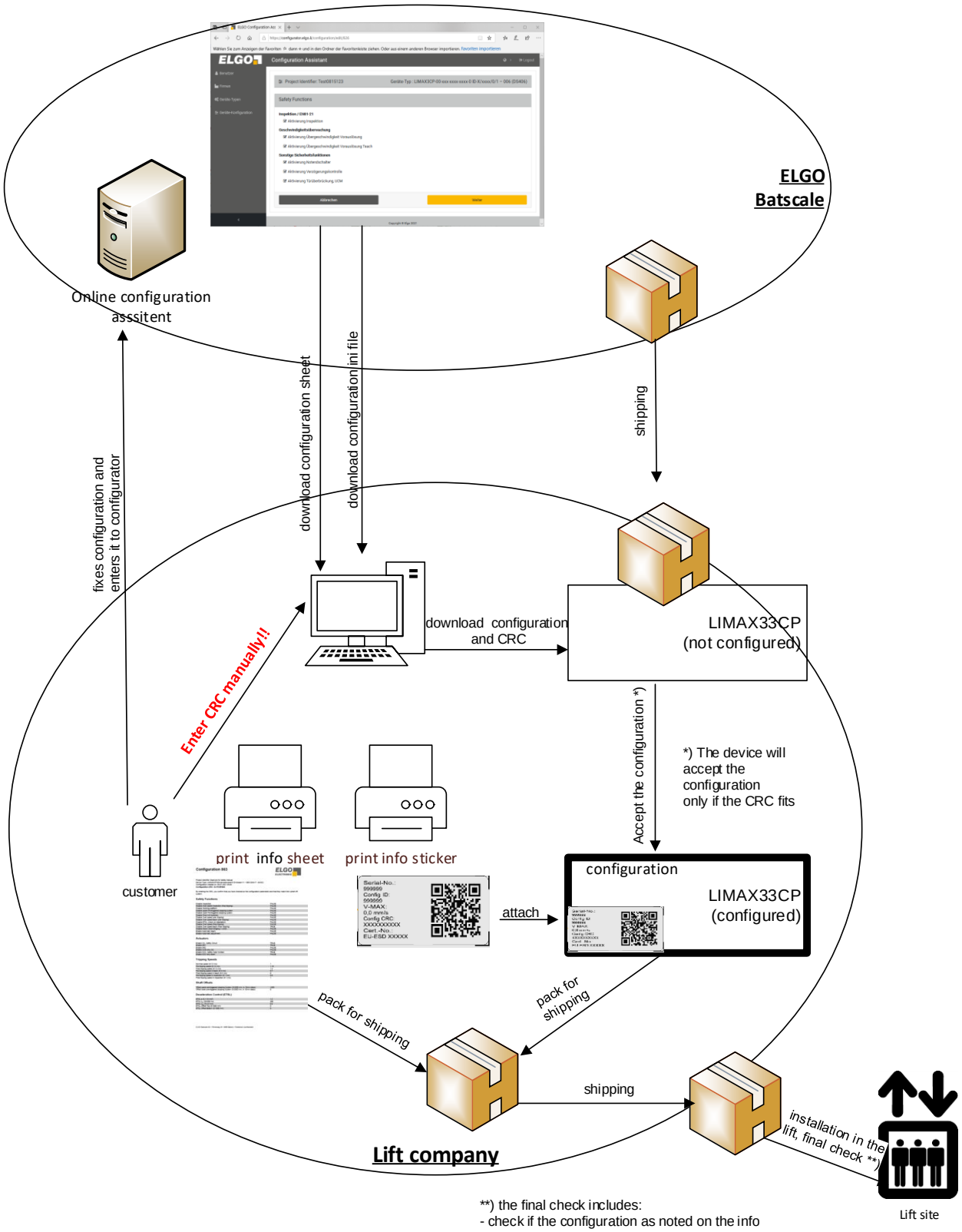


Figure 26: process of configuration, configuration at lift company plant

14.1.1.5 Reconfiguration

For newer devices (firmware 2.3 and – if so – higher) the following applies:
The configuration can be erased. However, this is only possible in pre-commissioning mode. It takes effect after a restart of the system or a system reset. Once the configuration has been erased, the device behaves like a non-configured device: the configuration can be rewritten and all actuators are open.

Erasure of the configuration and the subsequent rewriting with a configuration is the sole responsibility of the user. The user also bears the responsibility for everything related to this, especially for the exchange of the stickers, labels and info sheet and other documentation fitting the old configuration against those fitting the new configuration (refer also to section 7.1.3).

For devices with firmware older than version 2.3 the following two sentences are valid:
The configuration of a LIMAX33 CP-00 cannot be changed after it has been set. It is programmable only once.

If a customer needs the same configuration for the majority of the devices ordered, but there are a few exceptions with a different configuration, the following procedure may be beneficial from a logistical point of view:
The customer orders always devices configured at ELGO with the mainly used configuration (following 14.1.1.3). In case that a different configuration is needed, the configuration is erased (see above) and the desired configuration is applied following the work steps described in chapter 14.1.1.4. The customer must take care that the info-sticker is updated and the correct info- sheet is assigned to the device.

The persons, which done the different steps, must have the necessary qualifications (14.1.1.2).

14.1.1.6 Configuration at site

For configuration at site the following applies:
The device arrives at the lift site without configuration, either via the elevator company or sent directly to the site by ELGO. It makes no difference.
The customer uses the configuration assistant to define the appropriate configuration for the lift concerned. Where this happens (at the lift company, on the lift site or at a third place) is arbitrary. The configuration is downloaded onto the LIMAX33CP on the lift site.
The device can still be outside the lift and be supplied with a separate 24V; or the device is already in the (mechanically and electrically) installed state.
In the first case generally a notebook, which is connected directly to the device via a CAN adapter, is used to download the configuration.
In the second case, the configuration device can also be a notebook, which is then connected to the CAN bus at / in the elevator (to which the LIMAX33CP is also attached); or the lift control is used if the corresponding functionality is implemented there.

The configuration and the CRC can reach the construction site and the configuration device in different ways, e.g .:

- Using the INI file + separate CRC information (e.g. from the info sheet), the INI file is loaded and the CRC is entered manually
- Read the configuration and CRC from the configuration sheet and enter both manually.
- Send configuration and CRC by email, messenger, fax or telephone and enter both manually.

This flexibility in transmitting the configuration on the construction site, while maintaining it at the same time is made possible by the CRC protection. This safeguard rules out the following errors:

1. Transmission error
2. Typo / careless mistakes when entering the configuration on the configuration tool (e.g. notebook or lift control)
3. Transmission error when downloading the configuration via CAN

The configuration device (e.g. notebook or lift control) must not calculate the CRC, as otherwise the error detection for points 1 to 3 would be canceled out.

The way in which the configuration sheet arrives at the construction site can also be handled flexibly:

1. Sent in paper form by the elevator company
2. Sent by e-mail from the elevator company and printed out on site
3. Downloaded and printed out directly on site

Alternatives 2 and 3 are probably rarely used because there is usually no printer on site. In principle, however, it is possible to proceed in this way. The same applies to the info sticker as for the configuration sheet. Here it is also possible to handwrite the information about the configuration on the device in the designated place:

- CRC
- date
- final tripping speed

Especially when the completion of the lift installation is particularly time-critical or a mistake concerning an ordered configuration happened, it appears often that a device is configured at site or the configuration should be changed at site.
In this case, the customer will often be present on the construction site and download the configuration immediately after it has been created. Here the process can be simplified very much as follows:

- The notebook is connected to the LIMAX33CP via CAN and at the same time to the configuration assistant via the Internet
- The customer creates the configuration and downloads the INI file and configuration sheet to the notebook
- The customer loads the INI file into the corresponding application to download the configuration and enters the CRC (read from the configuration sheet)
- The customer starts download the configuration to the LIMAX33CP

The persons, which done the different steps, must have the necessary qualifications (14.1.1.2).

14.1.1.7 Substitute for a defect device at site

A special case of a configuration at site is the substitution of a defect device. In this case the configuration is already defined (so step 14.1.1.1 - 1 is not necessary).
A not configured LIMAX33CP may be configured in the lift. The hardware and software precautions for this have already been defined in the previous chapter(s).
The configuration may be read from the info sheet and entered manually to the configuration device (e.g. note book or lift control). Alternatively the ini-file can be downloaded from the configuration-assistant. The configuration can be found again by the configuration ID, noted in the upper left corner of the info sheet:

Configuration 863

Figure 27: Example for configuration ID

The CRC can be found on the info sheet. This must be entered manually in any case.
Of course these steps can also be executed in the lift company plant.
The persons, which done the different steps, must have the necessary qualifications (14.1.1.2).

14.1.2 Configuration Parameters

The configuration parameters concerning speeds are listed in the following table.

Table 20: configuration parameter concerning speeds

Parameter	Value range	Unit	Explanation
Rated speed	0 … 13000	mm/s	Rated speed of the lift, the device is installed in. This parameter has no direct influence on the safety functions

Parameter	Value range	Unit	Explanation
Pre-tripping speed	0 … 13000	mm/s	Tripping speed for safety function over-speed (pre-tripping)
Final tripping speed	0 … 13000	mm/s	Tripping speed for safety function over-speed (final-tripping)
Pre-tripping speed teach	0 … 3000	mm/s	Tripping speed for safety function over-speed teach (pre-tripping). Refer to the hints on next page.
Final-tripping speed teach	0 … 3000	mm/s	Tripping speed for safety function over-speed teach (final-tripping)
Pre-tripping speed inspection	0 … 1000	mm/s	Tripping speed for safety function over-speed inspection (pre-tripping)
Final-tripping speed inspection	0 … 1000	mm/s	Tripping speed for safety function over-speed inspection (final-tripping). Refer to the hints on next page.

Hint for definition of pre-tripping speed teach:

In teach mode safety function ETSL is not active. The safety function "overspeed pre-tripping teach" is a substitute for ETSL in teach mode. The function protects a technician in the cabin during teach mode. It prevents hitting the buffers with a speed higher than the speed the buffers are designed for. This speed must therefore be at most as great as the speed for which the buffers are designed. This condition may only be hurt in case:

- No ETSL-functionality is needed in normal operation (buffers designed for nominal speed)
- The customer either ensures safety of a person travelling in the car by other means or prohibits travelling in the car during commissioning.

Hint for definition of final-tripping speed inspection:

When the customer defines the offsets for the pre-triggered stopping system limits (see Table 22) he has to take the braking distance of the car after the safety gear tripped into account. The breaking distance again depends on the speed. The final tripping speed inspection must be at most as great as the speed assumed when determining the braking distance.

The speed configuration is only valid, when all of the following rules are met. All of the speeds must be in the allowed range (defined in the table above).

- If V_{rated} <= 1 m/s than the $V_{finaltrip}$ must be < 1.5 m/s
- If V_{rated} > 1 m/s than the $V_{finaltrip}$ must be < (1.25 * V_{rated} + 0.25 / V_{rated})
- If V_{rated} <= 1 m/s than the $V_{pretrip}$ must be <= $V_{finaltrip}$
- If V_{rated} > 1 m/s than the $V_{pretrip}$ must be < $V_{finaltrip.}$
- $V_{pretrip\_teach}$ must be <= $V_{finaltrip\_teach}$
- $V_{pretrip\_inspection}$ must be <= $V_{finaltrip\_inspection}$

Furthermore, there are configuration parameters concerning the ETSL-Curve:

Table 21: configuration parameter for ETSL-Curve

Parameter	Value range	Unit	Explanation
a	100 … 10000	mm/s^2	Deceleration a
t_{del}	20 … 500	ms	Delay of the functional chain: from detecting ETSL-event by LIMAX33 CP-00 until start of deceleration of the car.
V_{Buf}	0 … 10000*)	mm/s	It is sufficient to reduce the speed to that speed the buffers are designed for. This Value gives the remaining speed when the car hits the buffers provided the car retards due to deceleration curve defined in the concerning chapter.
$Offset_{ETSL\_up}$	0 … 1000mm	mm	The distance s to the assumptive buffer when moving up is reduced by this offset
$Offset_{ETSL\_down}$	0 … 1000mm	mm	The distance s to the assumptive buffer when moving down is reduced by this offset

*) in Software prior 2.4, the maximum values of V_{Buf} is 2500 mm/s.

Furthermore, there are configuration parameters concerning the offsets of the stopping system limits:

Table 22: configuration parameter for offsets of stopping system limits

Parameter	Value range	Unit	Explanation
Offset pre-triggered stopping system top	0 … 2500	mm	Determines the position of the stopping system limit top as an offset to the highest reference position: $Pos_{stopping\_system\_limit\_top} = Pos_{reference\_top} - Offfset_{stopping\_system\_top}$
Offset pre-triggered stopping system bottom	0 … 2500	mm	Determines the position of the stopping system limit bottom as an offset to the lowest reference position: $Pos_{stopping\_system\_limit\_bottom} = Pos_{reference\_bottom} + Offset_{stopping\_system\_bottom}$

14.1.3 Configured Safety Functions

Table 23 shows configuration features concerning if single safety functions are enabled /disabled. In some versions of LIMAX33 CP-00 only a certain subset of safety functions is available.

Table 23: configuration features for Safety functions

Feature	Selection	Group*)	Explanation
All "Inspection-safety functions"	disabled/enabled	-	If the user wants to care about safe in inspection/EN81-21-state on his own, a LIMAX33 CP-00 with "inspection safety functions disabled" = YES may be used. In this case the safety functions "inspection limit switches", "supervision on inspection direction", "overspeed inspection (pre- and final tripping)" and pre-triggered stopping system (top and bottom) are disabled at the same time.
Pre-triggered stopping system top	enable/ disable	REFERENCE (fulfilled in case of "enabled")	If there is sufficient head clearance due to EN81-20§5.2.5.8., an pre-triggered stopping system top is not necessary. In this case a LIMAX33 CP-00 with disabled safety function "pre-triggered stopping system top" can be used. In this case the other "inspection safety functions" are still active.
Pre-triggered stopping system bottom	enable/ disable	REFERENCE (fulfilled in case of "enabled")	If there is sufficient pit clearance due to EN81-20§5.2.5.8., a pre-triggered stopping system bottom is not necessary. In this case a LIMAX33 CP-00 with disabled safety function "pre-triggered stopping system bottom" can be used. In this case the other "inspection safety functions" are still active.
Overspeed inspection final tripping	enable/ disable	-	This function ensures that the car is not going to fast when pre-triggered stopping system limits are over traveled, so that a worst-case braking distance can always be guaranteed. Please observe also the hint for definition of final tripping speed inspection.
ETSL	enable/ disable	REFERENCE (fulfilled in case of "enabled")	If the lift installation has no reduced buffers ETSL is not needed. In this case or if the user wants to take care about ETSL on his own, a LIMAX33 CP-00 with disabled safety function "ETSL" can be used.
Final limit switch	enable/ disable	REFERENCE (fulfilled in case of "enabled")	In case the user wants to take care about the final limit switches on his own, a LIMAX33 CP-00 with disabled safety function "final limit switches" can be used
Overspeed pre-tripping	enable/ disable	-	If the user wants to take care about overspeed (pre-tripping) on his own, a LIMAX33 CP-00 with disabled safety function "overspeed (pre-tripping)" can be used
Overspeed final tripping	enable/ disable	-	If the LIMAX33 CP-00 should be used as an electronic speed governor this safety function must be enabled. In this case the eSGC must be available and connected to an electronic safety gear. If the user wants to keep the mechanical speed governor this safety function may be disabled.
Overspeed teach pre-tripping	enable/ disable	-	Overspeed teach (pre-tripping) is a substitute for ETSL in teach mode. It may be disabled for example if no ETSL is needed. Please observe also the hint for definition of pre-tripping speed above.
Overspeed teach final tripping	enable/ disable	-	Only for additional safety
Doors	enable/ disable	DOORS (fulfilled in case of "enabled")	In case the user does not need any door bridging for his lift installation, he may set the value "disable". In this case also UCM is disabled. So, the feature doors enables/disables always door bridging and UCM together.

*) in this column it is noted if the group REFERENCE or DOOR is fulfilled in case the certain feature is enabled resp. has the value "NO" (for "all inspection functions disabled"). If the value of at least one feature fulfils the group REFERENCE, LIMAX33 CP-00 needs the information about the reference positions. They must be learned in teach mode. If feature "doors" is enabled, the group DOORS is fulfilled, otherwise the group DOORS is not fulfilled. If the group "DOORS" is fulfilled, LIMAX33 CP-00 needs the information about the floor table, which must be learned in the teach mode.

From a certain configuring of the safety function, it results, which actuators must be available on the LIMAX33 CP-00. They must be installed according to section☞ 10.4.

14.1.4 Configuration of enabled actuators

General remarks concerning the relationship between "relay-contacts", "relays" and "actuators":
An actuator which appears to the outside when the device is regarded as a black box is the either a dry-contact (concerning OC, SR1 and SR2) or a solid state switch (concerning SGC)

Enabling/disabling of actuators are also configuration features. Additional to the safety functions the needed actuators must be enabled. An actuators which is physical available on the device but not enabled will always stay open.

Table 24: dependency "enabled safety functions" => needed actuators. The table shows an overview: if at least one of the **black and bold** printed features in a column is fulfilled, the corresponding actuators on the top of the column must be physically available on the device, enabled in the configuration and correctly integrated in the lift installation.

Table 24: dependency "enabled safety functions" => needed actuators/relay contacts

Feature	OC **)	eSGC	SR1	SR2[6)]
All "inspection" functions *)	**enabled**	don't care[1)]	don't care	don't care
Pre-triggered stopping system top	**enabled**	**enabled**[1)6)]	don't care	don't care
Pre-triggered stopping system bottom	**enabled**	**enabled**[1)]	don't care	don't care
Overspeed inspection final tripping	**enabled**	**enabled**	don't care	don't care
ETSL	**enabled**	don't care	don't care	don't care
Final Limit switches	**enabled**	don't care	don't care	don't care
Overspeed pre-tripping	**enabled**	don't care	don't care	don't care
Overspeed final tripping	**enabled**	**enabled**[4)]	don't care	don't care
Overspeed teach pre-tripping	**enabled**	don't care	don't care	don't care
Overspeed teach final-tripping	**enabled**	**enabled**	don't care	don't care
Doors (door-bridging + UCM)	**enabled** [2)]	**enabled** [3)]	**enabled**	**SR2 optional** [5)]
Working platform	**enabled**	**enabled**	don't care	don't care

*) all safety-functions activated by an activated "EN81-21"-input: overspeed inspection pre- and final-tripping, inspection limit switch top/bottom, pre-triggered stopping system top/bottom.

**) OC must always be enabled.

1) "Inspection-safety functions disabled" = NO (means: "Inspection-safety functions enabled") is a prerequisite for pre-triggered stopping system top/bottom enabled
2) If UCM opens only the safety circuit.
3) If UCM triggers the safety gear additional to opening of safety circuit
4) In this case eSGC must be connected to an electronic safety gear.
5) SR2 may be optionally enabled and wired additional to SR1 in case of a lift installation with two entry sides. In lift installations with only one entry side SR1 is used. But also in lift installations with two entry sides, devices with only SR1 may be used. The software of LIMAX33 CP-00 adapts its behavior due to CANopen – door bridging message by its own in case of only one SR and double-sided entries, refer to Appendix "Bridging operations for double sided floors" in the CANopen Specification.

6) In case of feature "Safety gear trip direction" = "only down", the pre-triggered stopping system top must be disabled ☞ 14.1.5

14.1.5 Configuration of actuators and Safety Function Behavior

There are two configuration features influencing the behavior of UCM and overspeed final tripping:

1. Safety gear trip direction:
   In case LIMAX33 CP-00 will be used in a lift installation with a unidirectional acting safety gear, the feature "safety gear trip direction" may be configured to "Only Down". In this case the tripping of a safety function acting the eSGC will cause opening the eSGC only in downwards direction, in upward direction only OC will open in this case. This applies to Overspeed final tripping (for normal, teach and inspection) and for UCM. In this case the safety function is either not necessary in upwards direction, the user cares for safety in upwards direction on his own or opening OC is sufficient for safety in upwards direction. Indeed, also the pre-triggered stopping system acts eSGC, but in case of "trip direction of the safety gear" is "only down", LIMAX33 CP-00 cannot care for safety in case of the pre-triggered stopping system top. So, in this case the safety function "pre-triggered stopping system top" must be disabled. The same applies to the safety function "working platform".

2. UCM only OC:
   If it is undesirable that the safety gear trips in UCM-case, the feature "UCM only OC" can be configured to "YES". In this case only OC will open in case of UCM. This applies to upwards and downwards direction as well.

Each combination of setting *"safety gear trip" direction* and *"UCM only OC" is possible*. Table 25 shows the influence of the combination on the affected safety functions.

Table 25: Behavior of UCM and overspeed final tripping dependent on the concerning configuration features

Configuration		Behavior of safety functions			
Safety gear trip direction	UCM only OC	If UCM trips downwards, the contacts listed below open	If UCM trips upwards, the contacts listed below open	If Overspeed final tripping trips downwards, the contacts listed below open	If Overspeed final tripping trips upwards the contacts listed below open
Both	Yes	OC	OC	eSGC and OC	eSGC and OC
Both	No	eSGC and OC	eSGC and OC	eSGC and OC	eSGC and OC
Only Down	Yes	OC	OC	eSGC and OC	OC
Only Down	No	eSGC and OC	OC	eSGC and OC	OC

14.1.6 Configuration concerning Behavior of Adjustment and Teach

It is a configuration feature if adjustment by floor sensors will be done. If this feature is not enabled, no adjustment by floor sensors will be carried out.

14.2 Settable Parameters

Some parameter can be changed by CANopen always and as often. But this is only possible within a defined range in compliancy with the EN81-20.

Table 26: Settable parameters

Parameter	Value range	Default	Unit	Explanation
Offset final limit switch top ($Offset_{final\_limit\_top}$)	10 … 30000*	500	mm	Determines the position of the final limit switch top as an offset to the reference position top: $Pos_{final\_limit\_top} = Pos_{reference\_top} - Offset_{final\_limit\_top}$
Offset final limit switch bottom ($Offset_{final\_limit\_bottom}$)	10 … 30000*	500	mm	Determines the position of final limit switch bottom as an offset to the reference position bottom: $Pos_{final\_limit\_bottom} = Pos_{reference\_bottom} + Offset_{final\_limit\_bottom}$
Door zone size levelling	20 … 350	200	mm	Determines the area of the door zone for levelling around the flush floor position. The door zone for levelling reaches from: flush_floor_position – door_zone_size_levelling … to … flush_floor_position + door_zone_size_levelling
Door zone size re-levelling	20 … 200	140	mm	Determines the area of the door zone for relevelling around the flush floor position. The door zone for relevelling reaches from: flush_floor_position – door_zone_size_relevelling … to … flush_floor_position + door_zone_size_relevelling
Offset inspection limit switch top	20 … 30000*	200	mm	Determines the position of the inspection limit top as an offset to the stopping system limit top: $Pos_{inspection\_limit\_top} = Pos_{stopping\_system\_limit\_top} - Offset_{inspection\_limit\_top}$ This is equivalent to: $Pos_{inspection\_limit\_top} = Pos_{reference\_top} - Offset_{stopping\_system\_limit\_top} - Offset_{inspection\_limit\_top}$ I case of "pre-triggered stopping system top disabled", the following equitation is valid: $Pos_{inspection\_limit\_top} = Pos_{reference\_top} - Offset_{inspection\_limit\_top}$
Offset inspection limit switch bottom	20 … 30000*	200	mm	Determines the position of the inspection limit bottom as an offset to the stopping system limit bottom: $Pos_{inspection\ limit\ bottom} = Pos_{stopping\ system\ limit\ bottom} + Offset_{inspection\ limit\ bottom}$ This is equivalent to: $Pos_{inspection\_limit\_bottom} = Pos_{reference\_bottom} + Offset_{stopping\_system\_limit\_bottom} + Offset_{inspection\_limit\_bottom}$ In case of "pre-triggered stopping system bottom disabled", the following equation is valid: $Pos_{inspection\_limit\_bottom} = Pos_{reference\_bottom} + Offset_{inspection\_limit\_bottom}$
Door minimum distance	0 …100	50	mm	Floors with a distance smaller than "Door minimum distance" will be evaluated as one floor during automatic teach. Behavior of teach mode manual and adjustments are not affected. - If a floor is detected a second time during automatic teach (on the same side as a floor that has already been learned) the floor position that has already been learned will be overwritten with the newly detected floor position, provided that the new and existing floor positions are at a distance smaller than "Door-Minimum-Distance", otherwise the new detected floor position will be "sorted" as a new floor. - If during automatic teach a floor is detected on the other side like an already known floor, it will be complemented "second side" to the already learned floor position and this now counts as a double-sided floor, provided the new and the already existing Floor position have a distance smaller than "Door-Minimum-Distance"; otherwise the new detected floor position will be "sorted" as another floor

Remark: Changeging of the settable parameters is only possible in teach mode and additional in in a special mode, the “settings mode” (refer also to CO-Specs). The LIMAX33 CP-00 will keep changes of these parameters even after power cycle.

***:** In software versions prior to v2.2, the maximum values of the offsets (inspection and the final limit switch) were limited to 5000 mm.

15 Initial and Annual Examination

In this chapter is described how the auditor can check LIMAX33 CP-00 at initial and annual examination.
The existing local accident prevention regulations and additional especially the rules of the EN81 must be observed when carrying out the tests for examination.

15.1 System Restart

Some checks concerning self-diagnostics of LIMAX33 CP-00 are only performed at start-up of the system. Therefore, it is mandatory to restart the LIMAX33 CP-00 at annual examination. This can either be done by RESET-button, by reset-command given by CAN or by disconnection/reconnection the main power supply.

15.2 Magnetic Tape

Concerning the magnetic tape, the tape guiding and the tape presence sensor the maintenance-hints of the manual for the magnetic tape should be followed.
In particular, it should be mode sure that the band presence detector is still in its correct position and that the spring is intact and correctly tensioned, refer also to
https://www.elgo.de/fileadmin/user_upload/pdf/manual/lift/LIMAX33CP-00-MI-E.pdf

15.3 Software Identification

It is possible to read the ROM-CRC[1] of the LIMAX33 CP-00 software by CANopen.
Refer to CANopen specification.

The lift control or alternatively a corresponding auxiliary tool (e.g. a notebook with CAN-adapter and suitable software) must be able to display the ROM-CRC. It must be the same as the respective CRC noted in the certificate.

15.4 Set of Configuration

Compliance with the organizational processes (see chapter14.1.1) ensures that the correct configuration is on the device:

The configurable parameter/features/CRC of LIMAX33 CP-00 are noted on the info-sheet (normally in the documentation of the lift). They must fit the conditions of the lift. This must be checked.
The CRC must fit with the CRC noted on the sticker on the info-label (see chapter Info Label and Info Sheet 7.1.3).

In addition, this can be checked by reading out the configuration data (parameters / characteristics / CRC) of the LIMAX33 CP-00 via CANopen (see CANopen specification). For this purpose the elevator controller or alternatively a corresponding auxiliary tool (e.g. a notebook with CAN adapter and suitable software) can be used (which must then be able to display the corresponding configuration information).
This must also match the information on the info sheet.

Alternatively, the customer can define his own processes in order to ensure that the device is configured as it is intended for the lift in which it is installed. A purely digital process is also conceivable.
The customer is responsible for the process he has defined.

[1] This is the CRC of the software (firmware). It dependents only on the software-version. Please do not confuse this with the configuration CRC (refer to chapters **Fehler! Verweisquelle konnte nicht gefunden werden.** and 0)

15.5 Interference Suppression Measures

It must be checked that the interference suppression measures (refer to “constraints for use, topic ☞ 15) are present and still effective.

15.6 Verification of the Floor Table

The floor table as it is stored in LIMAX33 CP-00 must be verified. For example, this is possible by the following procedure:

- Send the car from one floor to the other. Normally this will be done by car call. All floors stored in the control have to be approached, Lift control should perform pre-opening of the doors approaching the single floors. For pre-opening of the doors, door bridging must be enabled. Otherwise the open door-circuit would cause an emergency stop. So if pre-opening of the doors works without emergency stop it is proved that the floor number and the position of the floor, where the lift control wants to land the car, is the same as in LIMAX33 CP-00: position and number of the target floor are communicated via CANopen to LIMAX33 CP-00. The device will only close SR1 resp. SR2 if these information's fit.
- Check if the car and landing thresholds are flush at each floor.
- Read the total number of floors stored in LIMAX33 CP-00 and compare it with the number of floors stored in the lift control. This is done in order to ensure, that LIMAX33 CP-00 has not stored any additional floor at a position where actually is no floor.

Remark: this procedure is only possible if door bridging is performed. But that is no restriction because for a lift without door bridging it is not necessary to learn the floor table.

Further Remark: if lift control does not support pre-opening it is also possible to carry out the check with the re-levelling functionally: Load/unload the cabin at a floor and watch if the cabin relevels.

15.7 Check of Safety Functions

ATTENTION!

It obligates the user to ensure the safety for persons during check of the safety functions. It is possible, to carry out all of the following tests without the presence of a person in the car, on the car roof or in the pit.

It obligates to the notified body to judge, if it is necessary to carry out all of the following tests concerning the safety functions annually or if it is sufficient to carry out some of them only at initial examination. The concrete proceeding concerning the tests should be locked at as a proposal. The user and/or notified body may find other ways to test the safety functions.

15.7.1 Final Limit Switches

The correct position of the final limit switches should be tested.

- The auditor calculates the position of the final limit switches (top and bottom) from the reference positions and the offsets of the final limit switches (refer also to ☞ 13.2.8).
- Now, the auditor takes the elevator to the top floor by car call. From here, he begins to move the cabin slowly upwards (generally this will be done by using the recall panel) until a point just under the final limit switch top.
- Then he switches off "recall" so that by measuring the voltage behind OC he can determine if the contact is open. Here, the normal safety circuit voltage must exist (OC closed).
- The auditor now over travels the position of the final limit switch top (by recall panel) by the shortest possible distance and switches off recall.
- Now he checks the voltage behind OC. There must not be any voltage as OC must be open. The auditor measures the voltage before OC as to crosscheck. The normal safety circuit voltage must exist.

The final limit switch bottom can be tested by the corresponding procedure.

15.7.2 Pre-Triggered Stopping System

The pre-triggered stopping system top resp. bottom must be tested, if the corresponding safety function is enabled in order to perform safety for a person on the roof resp. in the pit in case of a short shaft head resp. pit.

There must be no person in the shaft or on the car roof when carrying out this test.

The test can be done in test mode, sub mode "pre-trig", refer to section ☞ 11.1.5.4. In this test mode, sub mode pre-trig a travel toward the upper resp. lower shaft end should be performed.

- The travel speed should be equal to the final tripping speed inspection (in order to get a realistic result for the braking distance).
- After the car has been stopped by safety gear (triggered by safety function pre-triggered stopping system top resp. bottom), the auditor checks if there is ample survival space left in the shaft head resp. the shaft pit.

15.7.3 Inspection Direction

The auditor switches the lift to inspection. By using an inspection direction button, the auditor drives the lift for half a meter in up and down directions in order to check that the lift moves in the correct direction.

In case of discrepancies in this test, the wiring of the inspection control is checked and corrected if necessary. In case the lift starts to move in the correct direction, but is stopped by an open OC, wiring of the signals UP and DOWN to the LIMAX33 CP-00 is wrong.

15.7.4 Inspection Limit Switches

When approaching the inspection limit switches with the normal inspection speed, the car should come to stand still – due to open OC - before the pre-triggered stopping system trips. Otherwise a person would be trapped on the roof or in the pit.

The auditor performs an inspection travel with normal inspection travel speed in upwards direction. OC opens when the inspection limit switch top position is over-travelled and car comes to stand still. Check: stand still is reached before the position of the limit for pre-triggered stopping system is over travelled (safety gear did not trip)

The same is done in downwards direction. After the car came to standstill it should possible to move the car into the safe direction by pushing the correct direction button.

Remark: in case that pre-triggered stopping system top and/or bottom is/are disabled, it should be checked, that the car stops before the corresponding final limit switch is over travelled. This is verified in a simple way: if it is possible to move the car into the safe direction with the corresponding direction button, the final limit switch remained closed.

Hint: If pre-triggered stopping system tripped or final limit switch has been over travelled during this test, the offset for the corresponding inspection limit switch should be increased (refer to ☞ 14.2).

15.7.5 ETSL

ETSL in upwards rep. downwards direction can be tested in test mode, sub mode "ETSL up" (☞ 11.1.5.2), resp. ETSL up" (☞ 11.1.5.3):

Starting a trip from the bottom of the shaft upwards in sub mode "ETSL up", resp. from the top of the shaft downwards in sub mode "ETSL down", will cause an (intended) emergency stop cause by the (test-) tripping of ETSL. The car will come to standstill somewhere near the position of the "assumptive buffer" in the middle of the shaft. From the position the car came to standstill, it is possible to judge if the reaction of the functional chain (LIMAX33 CP-00 => Safety circuit => motor / brake) fulfils EN81-20 §5.12.1.3.

15.7.6 Overspeed pre-Tripping

The auditor adjusts lift control/inverter in such a way that overspeed can be reached. He performs a travel, each in upwards and in downwards direction and with a speed just above the pre-tripping speed.

Check: OC opens when pre-tripping speed is reached and the machine brake stops the lift.

15.7.7 Overspeed final tripping

Overspeed final tripping can be performed in the corresponding sub mode of the test mode.
The procedure is done is already described in the corresponding section ☞ 11.1.5.1.

The test in downwards direction is always performed, in upwards direction only if feature setting "trip direction" is "both".

15.7.8 Overspeed Inspection

The auditor performs an inspection travel with inspection travel speed higher than the pre-tripping speed inspection of the LIMAX33 CP-00.

Check: OC opens when pre-tripping speed inspection is reached and the machine brake stops the lift.

Remark: if it is not possible to adjust inspection speed in lift control to a value big enough, so that Safety function overspeed inspection pre-tripping trips leave the lift in normal operation (neither in EN81-21-state, nor in inspection state) and simulate the EN81-21-state to LIMAX33 CP-00 by disconnecting the EN81-21-signal from the corresponding input of LIMAX33 CP-00.

Test of overspeed inspection final tripping will be more difficult in most cases because the machine brake (tripped due to overspeed inspection pre-tripping) may decelerate the cabin before final tripping speed inspection is reached,

If it is nevertheless possible to test the safety function overspeed inspection final tripping in a safe way, check: eSGC opens when "inspection final-tripping speed" is reached and the safety gear stops the lift.

15.7.9 Door Bridging

Door bridging has been already checked in combination with the verification of the floor table.

15.7.10 UCM

The car is on a floor, door circuit is bridged. Now start a travel without disabling the door bridging.
UCM must trip latest as soon as the door zone is left.

Remark: Starting a travel without disabling the door bridging is normally only possible if this is implemented as a special (test-) feature in the lift control. If this is not the case, the car may be moved by recall control while door bridging is enabled. Alternatively, the car may be moved by hand wheel.

15.7.11 Working Platform

The auditor enables safety for "working platform" by opening the corresponding (external) contact. He checks that all available actuators (OC, eSGC, SRS1 and SR2) are open.

16 Functional Safety

16.1 Safety Parameters

Table 27: Required and achieved SIL

Safety function	Norm reference	Required SIL due to EN81 (or due to risk analysis, refer to comments)	Achieved SIL due to PFHD and SFF	PFHD [FIT] (acc. to FMEDA)	Percentage of required SIL	Comments
Overspeed pre-tipping	EN81-20 § 5.6.2.2.1.6 a.)	SIL2	SIL3	40 FIT	4 %	
Overspeed final trip-ping	EN81-20 §5.6.2.2.1.1 a.)	SIL3	SIL3	28 FIT	28 %	
Overspeed inspection pre-tripping	EN81-20 §5.12.1.5.2.1 e.)	No SIL	SIL3	40 FIT	n.a.	This function is named in the EN81 but without any demand for a SIL
Overspeed inspection final-tripping	Not named in EN81	SIL 3	SIL3	29 FIT	29 %	Not named in the EN81 secures braking distance for pre-triggered stopping system, therefore SIL3
Overspeed teach pre-tipping	Not named in EN81	SIL3	SIL3	40 FIT	40 %	The safety function over-speed teach pre-tripping is a substitute for ETSL, which cannot be carried out in teach mode. Because ETSL is SIL 3 according to EN81-20, Annex A, overspeed teach pre- tripping is also SIL3.
Overspeed teach final-tipping	Not named in EN81	No SIL	SIL3	28FIT	n. a.	Cares for additional safety before and during commissioning
Final limit switches	EN81-20 §5.12.2.3.1 b.)	SIL1	SIL3	40 FIT	0.40 %	
Inspection limit switches	EN81-21 §5.5.3.4,/ § 5.7.3.4 (under constraints)	SIL2	SIL3	41 FIT	4.1%	
Supervision on inspec-tion direc-tion	Not named in EN81	SIL2	SIL3	41 FIT	4.1%	In order to complete safety of Inspec-tion limit switches, therefore this is SIL2
Pre-triggered stopping system	EN 81-21 §5.5.2.2 / §5.7.2.2 (under constraints)	SIL3	SIL3	29 FIT	29 %	When the positions where the pre-triggered stopping system trips are defined, a certain stopping distance must be taken. The stopping distance depends directly from the velocity. Therefore, a worst-case value for the velocity must be assumed. The safety function over-speed inspection final tripping supervises that this worst-case velocity is not exceeded. There-fore, it is the same SIL like pre-triggered stopping system: SIL 3.
ETSL	EN81-20 §5.12.1.3	SIL3	SIL3	47 FIT/28FIT	47 % / 28 %	In case the eSGC-actuator is enabled and connected with a suitable brak-ing system, the better values are valid (eSGC would secure a failure of OC

Safety function	Norm reference	Required SIL due to EN81 (or due to risk analysis, refer to comments)	Achieved SIL due to PFHD and SFF	PFHD [FIT] (acc. to FMEDA)	Percentage of required SIL	Comments
						in this case).
Door bridging	EN81-20 §5.12.1.4	SIL2	SIL3	56 FIT	5.6 %	
UCM	EN81-20 §5.6.7.7	SIL2	SIL3	76 FIT	7.6 %	
Working Platform	EN81-20 §5.2.6.4.3.1 b.)	SIL3	SIL3	27 FIT	27 %	

Table 28: Safe failure fraction, HFT and Type of the subsystems

Subsystem	HFT	Type	Required SFF for SIL3	Achieved SFF	Comments
Logic (μ-controller in the broad sense)	1	B	90 %	99.4 %	Required SFF for SIL3 achieved
Digital Inputs	1	A	60 %	99.9 %	Required SFF for SIL3 achieved
Diagnostics for digital inputs	0	A	90 %	99.6 %	Required SFF for SIL3 achieved
Position	1	A	60 %	99.9 %	Required SFF for SIL3 achieved
OC	1	A	60 %	75.8 %	Required SFF for SIL3 achieved
eSGC	1	A	60 %	98.5 %	Required SFF for SIL3 achieved
SR1 and SR2	1	A	60 %	75.8 %	Required SFF for SIL3 achieved
3.3 V and 2 V supply voltage	1	A	60 %	99.5 %	Required SFF for SIL3 achieved
12V Relay supply voltage	0	A	90 %	99.0 %	Required SFF for SIL3 achieved
EMC of main supply	0	A	90 %	97.3 %	Required SFF for SIL3 achieved
EMC of battery Supply	0	A	90 %	97.3 %	Required SFF for SIL3 achieved
Voltage supervision (diagnostics)	0	A	90 %	99,5 %	Required SFF for SIL3 achieved
External watchdog (diagnostics)	0	A	90 %	96.9 %	Required SFF for SIL3 achieved
CAN	0	B	90 %	99,1 %	Required SFF for SIL3 achieved
Floor Sensors	0	A	90 %	99.7 %	Required SFF for SIL3 achieved
Door Zone Output	0	A	90 %	99.0 %	Required SFF for SIL3 achieved
Others	1	A	60 %	97.7 %	Required SFF for SIL3 achieved
μ-controller-PINs	1	B	90 %	92.8 %	Required SFF for SIL3 achieved

Table 29: Diagnostics Test Interval (DTI) of the subsystems

Subsystem	Diagnostic Measurement	DTI	Comments
Position	Comparison of the two channels	10 ms	
	Analogue value range	10 ms	
	Plausibility of pattern of the analog values	10 ms	
	Plausibility of succession of positions	10 ms	
	Dynamic check of analogue branch	90 ms	
Logic (processing)	RAM Test	41 h : 56 min : 35 s	Also 1 x complete at startup before relays close
	ROM Test	17 min : 29 s	Also 1 x complete at startup before relays close
	Self-test of CPU	10 ms	
	Comparison with other channel	10 ms	
	Program flow	10 ms	
	Check of timing	10 ms	
	(hardware) watchdog	15 ms	
Digital inputs (EN81-21., UP,	Pulses are added to the input-signal (in case of High-level of input-signal	10 ms	

Subsystem	Diagnostic Measurement	DTI	Comments
DOWN)			
Digital inputs (RESET)	Defined operation pattern	n. a.	Diagnostics only possible (and necessary) when inputs are actuated
OC	Check of the force guided feedback contacts	24 h	If OC has not been opened regular by CANopen-commend from lift control (for the purpose or relay test) , the LIMAX33 CP-00 will open the OC compulsorily latest at next stand still after 24h for a short time (for purpose of relay test)
SR1/SR2	Check of the force guided feedback contacts	n.a.	SR1 and SR2 must open before next lift travel, otherwise UCM would appear. If opening fails, OC opens and lift travel will be prevented. Therefore SR1 and SR2 are tested before each lift travel
eSGC	Open eSGC for a short time and check if the voltage on SG_OUT goes down.	10 s	The duration of the opening of eSGC is very short (<<1ms) , so that the connected braking element would not trip. The test is. The test is carried out alternately in the A-channel and B-channel: A-channel test, 5s later B-channel test, another 5s later B-channel test and so on…
Voltages	Overvoltage / EMC protection	(continuous)	
	Voltage supervision	10 ms	

16.2 Demands of EN 61508-2, Annex D2

Table 30: Demands of 61508

Ref. 61508	EN 61508 demand	Value, description of references to other chapters
D2.1 a.)	Functional description	☞ 11,☞ 12,☞ 13
D2.1 b.)	Identification of configuration	☞ 7.1
D2.1 c.)	Constraints for use	☞ 8
D2.2 a.)	Kinds of undetected failures	Safe failures (relays open by fail) Dangerous failures (relays closed by fail)
D2.2 b.)	Rate of failures dependent on the kind (refer to a.)	Safe failures λ_S, see footnote 1, dangerous failures λ_D, corresponds to PFHD, refer to Table 27
D2.2 c.)	Kinds of failures detected by diagnostics	Safe failure (relays open by fail)
D2.2 d.)	Kinds of failures of diagnostics	Safe failure (relays open by fail)
D2.2 e.)	Rate of failures concerning c.) and d.)	Summarized to one value λ_{DD} (because reaction of the system is the same): $\lambda_{DD} = \lambda_D - \lambda_{Du}$, the value is mainly determined by the subsystems “position” (2 times), “logic” (2 times) and “relay OC resp. eSGC” (6 times). Because the high diagnostic coverage λ_{DD} is approximately equal to λ_D and therefore the value amounts to: 12927Fit (λ_D values of the single subsystems added, ref Table 31).
D2.2 f.)	Diagnostic test interval	Refer to Table 29
D2.2 g.)	Initiated outputs	☞ 12.3

[1] Rate of undetected safe failures λ_S (relay open by fail) is mainly determined by λ_S of the relay and therefore amounts to about 18000 FIT (8 times λ_S of one relay).

Ref. 61508	EN 61508 demand	Value, description of references to other chapters
D2.2 h.)	Regular test and maintenance	☞ 18, ☞ 15
D2.2 i.)	External diagnostics	not applicable
D2.2 j.)	Hardware failure tolerance	Refer to Table 28
D2.2 k.)	Type A / Type B classification	Refer to Table 28

Table 31: Calculation of λ_D for the entire system

Subsystem	X -times	λ_D (per systems)	λ_D (total)
Logic (μ-controller in the broad sense)	2	575	1150
Digital Inputs	6 (3 * 2)	17	102
Diagnostics for digital inputs	3	33	99
Position	2	3297	6594
Relays (OC SR1 and SR2)	6	615	3690
Solid State actuator (eSGC)	2	158	316
3.3 V and 2 V supply voltage	2	113	226
12V Relay supply voltage	1	81	81
EMC of main supply	1	32	40
EMC of battery Supply	1	32	40
Voltage supervision (diagnostics)	2	51	102
External watchdog (diagnostics)	1	23	23
CAN	1	30	30
Floor Sensors	2	1	2
Door Zone Output	1	(approx.) 0	0
Miscellaneous	1	8	8
μ-Controller-PINs	2	212	424
Σ_{total}			12927

16.3 Safety Requirements for the Integration of the System

Refer to ☞ 8 Constraints for Use (Safety requirements for integration).

17 Disturbances

This chapter describes possible causes for disturbances and measures for their removal. In case of increased disturbances, please follow the measures for fault clearance (☞ 17.1). In case of disturbances that cannot be eliminated by following the advice and the fault clearance measures given here, please contact the manufacturer (see second page).

17.1 Fault Clearance

CAUTION!
The device, the connection line and the signal cable must not be installed next to sources of interference that emit strong inductive or capacitive interference or strong electrostatic fields.

External perturbations can be avoided through suitable cable routing.

Signal cables always have to be routed separately from the load power line. A safety distance of at least 0.5 m has to be kept from inductive and capacitive sources of interference such as contactors, relays, motors, switching power supplies, clocked controllers etc.!

Concerning connection of the shield please refer to ☞ 10.4.13

If interferences occur in spite of all the items stated above being observed, please proceed as follows:

1. Installation of RC-circuits via contactor coils of AC-contactors (e.g. 0,1 µF / 100 Ω)
2. Installation of recovery diodes via DC-inductors
3. Installation of RC-circuits via the different motor phases (in the terminal box of the motor)
4. Do not connect protective earth and ground
5. Connect a mains filter ahead of the external power pack

17.2 Re-Start after Fault Clearance

After the fault clearance:

1. Reset the emergency stop mechanism if necessary
2. Reset the error report at the super-ordinate system if necessary
3. Ensure that there are no persons in the danger area
4. Follow the instructions of chapters ☞ 10 and ☞ 11 as far as necessary

WARNING!

Danger of injury through non-conventional fault clearance!
Non-conventional fault clearance can lead to severe injuries and damage of property.

Therefore:

- Any work to clear the faults may only be performed by sufficiently qualified staff
- Arrange enough space before starting the works
- Make sure that the mounting area is clean and tidy. Loose components and tools are sources of accidents.

If components need to be replaced:

- Pay attention to a correct installation of the spare parts.
- Reinstall all the fixing elements properly
- Before turning on the device, ensure that all covers and safety equipment is installed correctly and works properly

18 Repairs / Maintenance

- The LIMAX33 CP-00 device is maintenance free.
- The magnetic tape is maintenance free.
- Repairs by the user are not allowed.
- If necessary, repairs are carried out by the manufacturer.
- In case of irreparable damages or the end of maximum product life; the LIMAX33 CP-00 and magnetic tape must be disposed in accordance to the statutory applicable regulations.

Replacing Components

18.1 Replacing Magnetic Tapes

When the magnetic tape is replaced, it is absolutely necessary to erase the floor table and the reference positions in LIMAX33 CP-00. The floor table and the reference positions stored in LIMAX33 CP-00 are not valid anymore in combination with the new tape. As soon the new magnetic tape is installed, a learn trip is necessary (☞ 11.2 and ☞ 11.3).

WARNING!

Do not replace the magnetic tape without erasing the floor table and the reference positions.

18.2 Replacing the LIMAX33 CP-00

18.2.1 Replacing a defective LIMAX33 CP-00

The complete lift system must be switched off before disconnecting the LIMAX33 CP-00. The power down of LIMAX33 CP-00 must include the supply voltage of LIMAX33 CP-00 and the emergency supply if there is one.

Subsequently, the electrical connections have to be disconnected. The LIMAX33 CP-00 is dismounted from the fixture and then the replacement device is fixed to the same fixture.

WARNING!

Take care the configuration of the replacement device fits the lift
(see info label on the housing, resp. in the lift)!

Now reconnect the electrical connections. These installations are usually carried out on the cabin roof.
The technician then leaves the cabin roof in order to switch the lift system back on.
It is mandatory to follow the appropriate safety measures during installation.
All further procedures correspond to the learn trip described under ☞ 11.2 and ☞ 11.3.
The proper work of the safety functions should be checked.

18.2.2 Dismantling an intact LIMAX33 CP-00

If an intact LIMAX33 CP-00 is dismounted, it is not allowed to use the device in another lift without careful check that:

- The configuration of the LIMAX33 CP-00 fits the lift where the device in intended to be reused concerning **all** parameters and features
- The LIMAX33 CP-00 has been set to pre-commissioning mode.
  This can be done by entering teach mode/leaving teach mode to pre-commissioned mode without Successful reset to pre-Commissioned mode should be checked, e.g. by watching the Mode-LED (refer to Table 13)

19 Cleaning

WARNING!

The device can only be cleaned with a damp cloth, do not use aggressive cleanser!

20 Accessories

Table 32: Accessories

Order Code	Description
LIMAX S-RMS	Magnetic tape mounting kit for rail mounting
AB20-80-10-1-R-D-15-BK80	Magnetic tape
LIMAX33 CP MW	Mounting angle

21 Glossar

Term mainly used in this document	Synonym (also used in this document)	Also usual in elevator industries and EN81, (terms used in EN81 in *italic bold*)	Explanation
ETSL (Emergency Teminal Speed Limit)	deceleration control	***Check of the retardation*** (Check of the retardation in the case of reduced stroke buffers) EN21-20§5.12.1.3.4	Ensures that car resp. counterweight does not approach too fast the terminal in case of reduced buffers.
offset ETSL up			Offset for ETSL-curve in upwards direction (parameter for the ETSL-curve)
offset ETSL down			Offset for ETSL-curve in downwards direction (parameter for the ETSL-curve)
door bridging		***Check on levelling, re-levelling***	safety function which bridges an open door circuit in order to permit movement under certain condition
UCM		***Unintended Car Movement***	Safety function named in the EN81-20
final limit switches		***Final limit switches***	Safety function named in the EN81-20
inspection limit switches			additional limit switches, activated if EN81-21-signal is active
overspeed pre-tripping			Opens safety circuit (OC) at a certain tripping speed before safety gear trips
overspeed final tripping			Opens actuator for safety gear (eSGC) at a certain tripping speed
overspeed teach pre-tripping			Like overspeed pre-tripping, but only in teach mode
overspeed teach final tripping			Like overspeed final tripping, but only in teach mode
pre-tripping speed			Tripping speed for overspeed pre-tripping
pre-tripping speed inspection			Tripping speed for overspeed inspection pre-tripping
pre-tripping speed teach			Tripping speed for overspeed teach pre-tripping
overspeed inspection pre-tripping			Like overspeed pre-tripping, but only in EN81-21-state
overspeed inspection final tripping			Like overspeed final tripping, but only in EN81-21-state
final tripping speed			Tripping speed for overspeed final tripping
final tripping speed inspection			Tripping speed for overspeed inspection final tripping
final tripping speed teach			Tripping speed for overspeed teach final tripping
rated speed			Rated speed of the elevator
final limit switch top			the upper one of the final limit switches
(position of final) limit switch top			If the car is higher than this position, final limit switch top opens
offset final limit switch top			Needed to calculate position of final limit switch top in relation to reference position top
final limit switch bottom			the lower one of the final limit switches
(position of) final limit switch bottom			If the car is lower than this position, final limit switch bottom opens
offset final limit switch bottom			Needed to calculate position of final limit switch bottom in relation to reference position bottom
inspection limit switch top			the upper one of the final limit switches
position of inspection limit switch top	inspection limit top		If the car is higher than this position and certain other conditions apply, this switch opens
offset inspection limit (switch) top			Needed to calculate position of inspection limit switch top in relation to reference position top
inspection limit switch bottom			the lower one of the final limit switches
position of inspection limit switch bottom	inspection limit bottom		If the car is lower than this position and certain other conditions apply, this switch opens

Term mainly used in this document	Synonym (also used in this document)	Also usual in elevator industries and EN81, (terms used in EN81 in *italic bold*)	Explanation
offset inspection limit (switch) bottom			Needed to calculate position of inspection limit switch bottom in relation to reference position bottom
pre-triggered stopping system top			Safety function, which ensures ample survival space in the shaft head, if there is maintenance personal on the car roof
position (of pre-triggered) stopping system top	pre-triggered stopping (system) limit top		If the car is higher than this position, and certain other conditions apply, this safety function trips
offset (pre-triggered) stopping system top			Needed to calculate position where pre-trig.-stopping system top trips in relation to reference position top
pre-triggered stopping system bottom			Safety function, which ensures ample survival space in the shaft head, if the is maintenance personal in the shaft pit
position (of pre-triggered) stopping system bottom	pre-triggered stopping (system) limit bottom		The car is lower than this position, and certain other conditions apply, this safety function trips
offset (pre-triggered) stopping system bottom			Needed to calculate position where pre-trig.-stopping system bottom trips in relation to reference position bottom
EN81-21-signal			Input from lift installation, activated if a door giving access to car roof or shaft pit is opened
EN81-21-signal active			If EN81-21 signal has high level it is active, the corresponding safety functions are activated
EN81-21-input			Input for EN81-21-Signal
UP-signal			Signal from inspection control UP, used for direction dependency for inspection limit switches
UP-input			Input for UP Signal
DOWN-signal			Signal form inspection control DOWN, signal from inspection control UP, used for Direction dependency for inspection limit switches
DOWN-input			Input for down Signal
door bridging re-levelling		***Check on levelling, re-levelling*** EN81-20 5.12.1.4 a)	Door bridging for the purpose re-leveling at a floor with open doors.
door bridging levelling		pre-opening ; ***Check on levelling, re-levelling*** EN81-20 5.12.1.4 a)	Door bridging for the purpose levelling when approaching a floor with open doors.
re-levelling speed			Max. permitted speed for door bridging when the purpose is re-leveling
levelling speed			Max. permitted speed for door bridging when the purpose is leveling
re-levelling zone			Zone around the floor where door bridging re-levelling is permitted
levelling zone			Zone around the floor where door bridging levelling is permitted
door zone size levelling			Size of levelling zone
door zone size re-levelling			Size of re-levelling zone
floor sensor			Sensor for detection of floor magnets (optionally), used for automatic teach procedure
floor magnet			Sensor to be detected by floor magnets (optionally), used for automatic teach procedure
floor table			Contains number of floors and the positions and positions of the floors

Term mainly used in this document	Synonym (also used in this document)	Also usual in elevator industries and EN81, (terms used in EN81 in *italic bold*)	Explanation
teach mode			Special mode where floor positions and reference positions can be learned
pre-commissioning mode			Mode before the device is commissioned
normal mode			Mode for normal lift operation
test mode			Special mode for test of safety function
settings mode			Special mode for adaption of parameters an small adjustments of floor positions
reference (position) top			Learned in teach mode; needed to determine tripping position of position dependent safety functions
reference (position) bottom			Learned in teach mode; needed to determine tripping position of position dependent safety functions

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