LIMAX 33CP

configuration in conjunction

with a LiSA controller

Fred Giebel	22.02.2019	Newly created	Rev 1.0
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Fred Giebel	20.12.2023	Annual Reset	Rev 3.2

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1. General notes

This description deals exclusively with the system-specific configuration of the safety functions of LIMAX33CP by ELGO and its integration into the LiSA controller.

For information on the complete functions and settings as well as safety regulations for LIMAX33CP we explicitly refer to the respective documentation, such as the safety manual for the LiMAX series 33CP by ELGO Batscale AG.

1.1 Functions

LIMAX33CP is a shaft information and safety system based on magnetic tape which covers the following functions:

- measurement of the car position

- various safety functions defined in EN81-20

- not safety-relevant functions, e.g. door zone signalling in the event of emergency rescue

1.2 Safety information

Caution:
Selection and installation of the devices as well as the integration into the control are subject to a qualified knowledge of the relevant legislation and normative requirements.
The suitable safety-relevant measures shall be taken and implemented.
The commissioning must only be carried out by qualified and instructed staff.

1.3 Basics on the configuration

Prior to the installation of the LiMAX33CP it must be ensured that its safety-relevant basic configuration corresponds to the lift system concerned. Two options for the basic configuration of the safety functions of the LiMAX33CP can be selected. Either a pre-configured device can be ordered from ELGO specifying all relevant data or Schneider Steuerungstechnik performs the basic configuration on an empty device.

On site, further required settings (teach-in) will then be effected via the LiSA controller. This description should support the mechanic in effecting these adjustments.

Note:
The safety-relevant basic configuration of a LIMAX33CP cannot be changed subsequently!
 It is only possible to delete them completely and to create them once again.

2. Overview of the integration into the lift installation

2.1   Information on the hardware

This overview shows how the Limax33CP hardware is integrated into the lift system (maximum configuration).
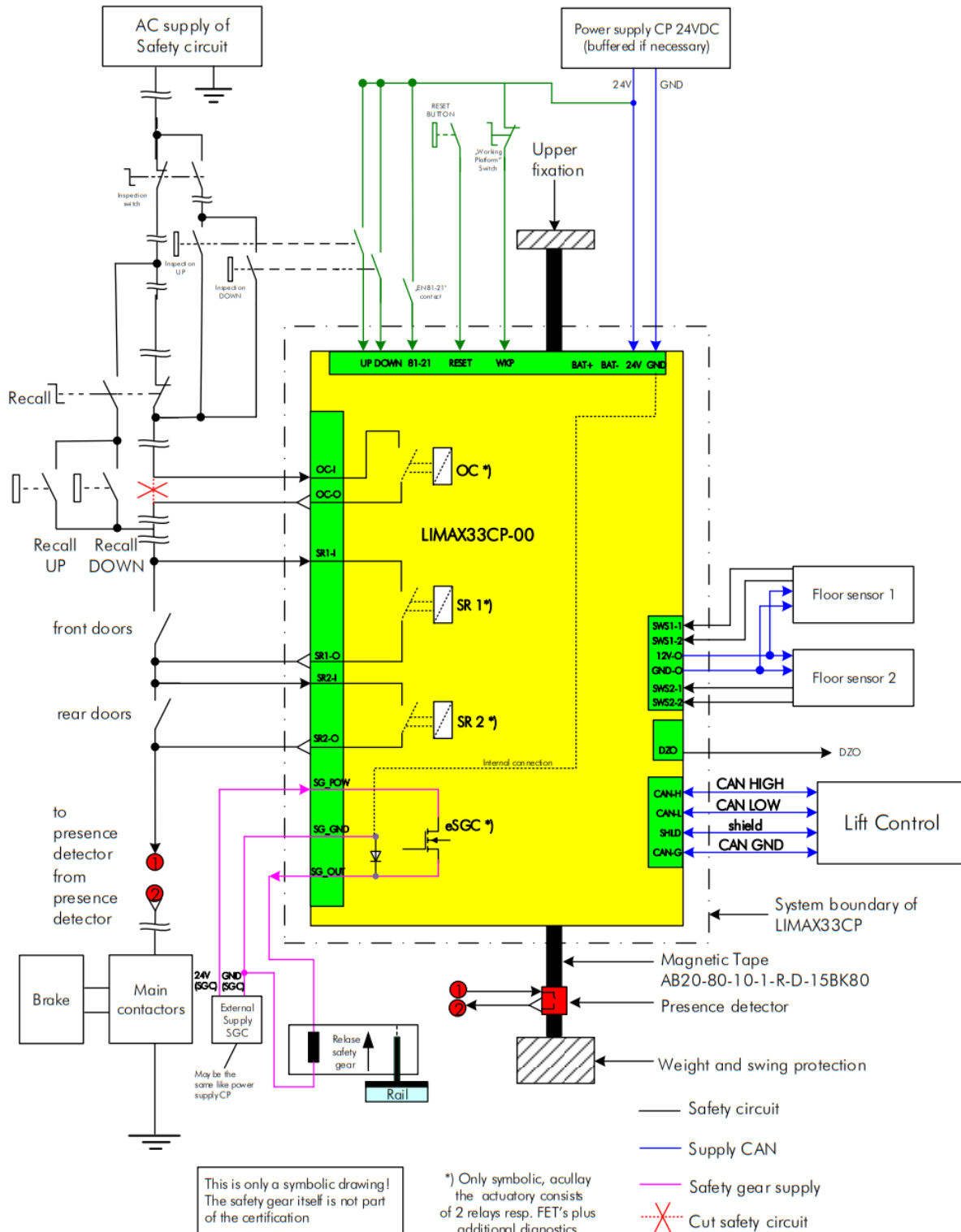
2.2 Safety functions using LIMAX33CP

The safety functions of the LiMAX33CP can be adapted to the requirements of the respective system by setting the parameters. The safety functions which can be monitored by LIMAX33CP are summarised in the following table.

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	

Abbreviations:

SIL: Safety Integrity Level (1-4), rating of the functional safety

OC: The actuator for the emergency limit switch and the speed/delay control

SR1/SR2: Safety Relay for the door override

eSGC: electronic Safety Gear Contact, the actuator for a electronic safety gear device, rope brake, etc.

Note: The function of the working platform or the safeguarding of protective spaces with the LiMAX33CP is only possible in conjunction with an electronically triggered safety gear, effective in both directions. If this function is used in conjunction with safety gear wich 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).

Safeguarding of protective spaces: In conjunction with an electronic safety gear device, effective in both directions, the LiMAX33 can be used to safeguard protective spaces instead of safety supports, etc. If this is the case and no further safety measures must be taken after the emergency unlocking of a shaft door, the protective space lights are green. A prerequisite is that the input "Safety zone active" is not parameterised in the LiSA controller.

2.3 The LED status indicators

In order to indicate different operating states, LiMAX33CP is equipped with a set of status LEDs. The following table provides an overview of the status indicators.
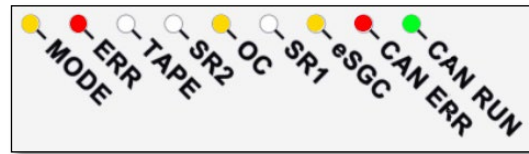
LED	Meaning	
MODE	Normal operation	LED flashes 1x per second
	Pre-commissioning mode	LED flashes 10x per second
	Teaching mode	LED is permanently on
ERROR	Flashes in case of emergency error, ON in case of normal error (see ELGO safety manual)	
TAPE	ON if no magnetic tape is recognised	
eSGC	ON if the eSGC contact (semiconductor) is closed	
OC	ON if the OC relay is closed	
SR1	ON if the SR1 relay is closed	
SR2	ON if the SR2 relay is closed	
CAN-ERR	CANopen status (error)	
CAN-RUN	CANopen status (operating)	

3. Basic configuration of LIMAX33CP

The basic setting of the Elementary Safety Functions is either performed by ELGO at the factory or by Schneider Steuerungstechnik according to the system-specific data.

The description under section 3.1 primarily serves as an illustration of the basic settings and is included here only for the sake of completeness.

All further required settings are effected via the LiSA controller and are described in chapter 4.

3.1 The ELGO LiMAX Safe GUI

The configuration software LiMAX Safe GUI is used for the basic setting. This software does not have to be installed and can therefore simply be started on a Windows PC.

In order to establish a connection from the PC to LiMAX33CP, a USB-to-CANopen adapter is also required. After connecting the LiMAX, the connection can be established by clicking on the "Connect" button.

The basic settings are effected in the "Settings" menu; the CRC check sum is also created here, and the setting is transferred to LiMAX33CP. In this respect observe the LiMAX33CP manual, chapter 13, too. For basic setting, LiMAX33CP must be in the "Pre-commissioning" operating state (see item 2.3).
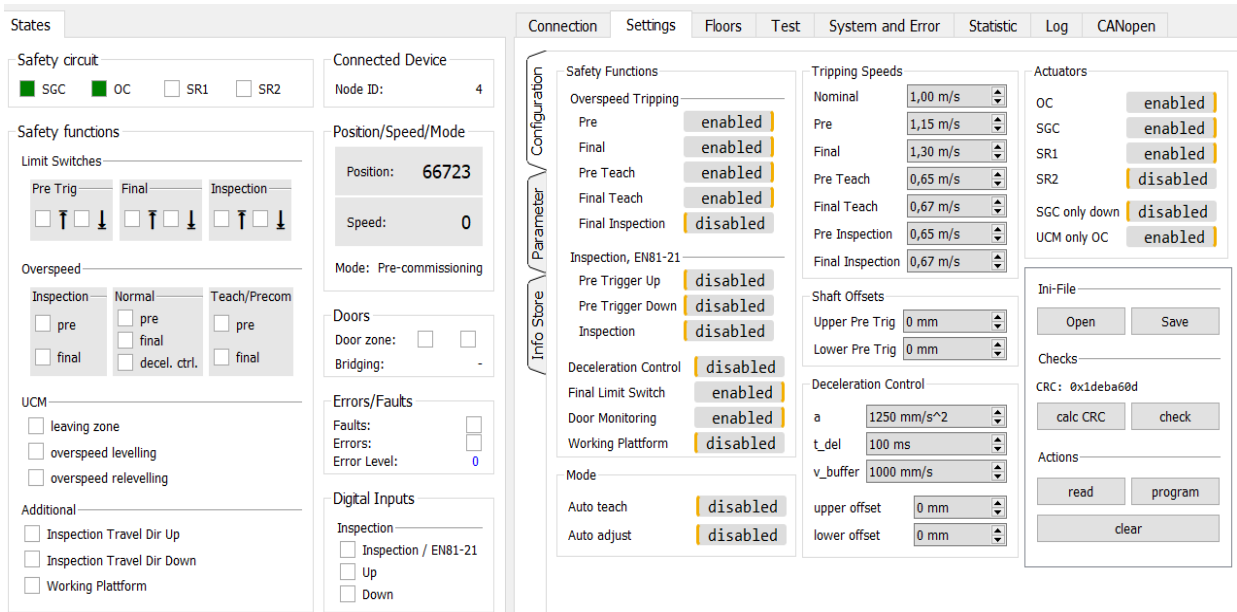
Basic settings in the "Settings" menu

Note: The settings determined here must be recorded on an information sheet. This sheet belongs to the respective system in order to allow for subsequent replacement. Besides, the check sum of the settings (CRC) generated here must imperatively be entered on the nameplate of the LiMAX33CP.

4. Configuration via the LiSA controller

After installing a LiMAX33CP pre-set with the safety-relevant configurations, the further settings and adjustments can be made using the handheld terminal of the LiSA20/21. The procedure and the settings required at the LiSA are described in the following section.

4.1   Specific settings at the LiSA for LiMAX33CP

Settings for the LiMAX33CP are made by entry at the handheld terminal of LiSA20/21, for this purpose the software version of the handheld terminal must at least be V2.05. The software version is displayed in the main menu in the upper left corner of the handheld terminal.

In order to be able to access the LiMAX33CP, the CANopen connection must be activated on LiSA; for this purpose on page 91 after entering
CMD -> 7091-> OK, "CANopen" is set to "Yes". Furthermore, in the CANopen menu on page 238 (CMD -> 7238 -> OK) the parameter "Encoder" must be set to "Yes".

This has the effect that the absolute encoder selection with LiMAX33CP as reading head is set. Save the settings using the "Save" button in the main menu. Then carry out a reset by means of CMD -> 6060 -> OK. Now an additional CP33 button is visible in the main menu of the handheld terminal.
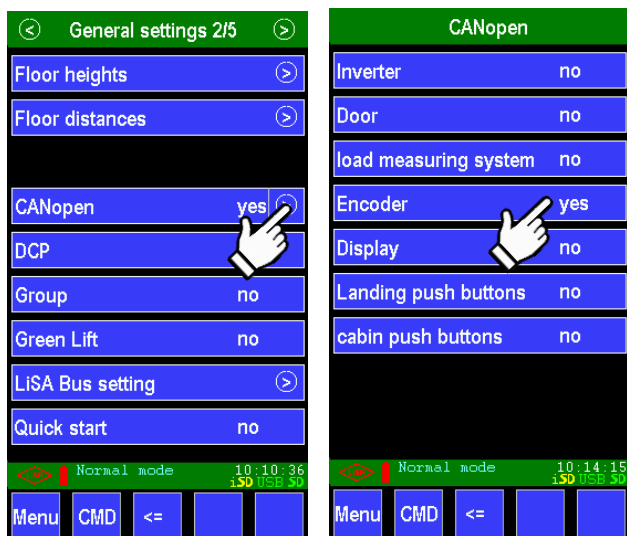
[Direct access: CMD -> 7091 or 7238]

When switching to LiMAX33CP as absolute encoder reading head, the controller will initially display the error message "Out of operation 177" as LiMAX33CP is not yet in normal operation.

In the teach-in mode with activated installation travel and when the recall is turned on, this error is suppressed.

In the main menu, the "Setup" button is used to call the setup menu where the installation travel can be activated with "Yes".

In lower right corner of the the main menu, the new "CP33" button is visible. Here you can switch to the LiMAX33CP settings menu.

Main menu

Setup

In this CP33 setting menu, the following three pages are available. The first page of them is mainly provided for configuration, the second page for information on the operating states. The parameter settings of the LiMAX33CP are presented on the third page.

CP33/1

CP33/2

CP33/3

The arrows in the bottom line are used to change between these pages.

CP33/1

The switching state of OC, SGC and SR1/2 is displayed in the 2nd line of CP33/1 (green = on). The absolute values of the individual landings are listed in the table highlighted in yellow.

Below it there are the upper and lower pre-trigger fields. In case of the safeguarding of protective spaces by means of the LiMAX33CP, these fields serve to indicate whether the car is outside the protective space (display green). This is important for the mechanic in order that no error is tripped when switching on the inspection.

Below that, the digital nameplate of the ELGO LiMAX33CP is visible in normal mode. In addition to the serial number, the CRC checksum of the system-specific settings as well as the hardware and software version of the LiMAX33CP is displayed here, too.

On the right, the absolute encoder values and the positions of the limit switches are also shown below the switching states of the safety circuit contacts.

They are as follows:

UP: = top shaft end   **UN:** final limit switch top   **UI**: = inspection limit switch top

LI*: = inspection limit switch bottom   **LN:** final limit switch bottom   **LP:** = bottom shaft end (buffer)

The values are adopted from the basic settings of the LiMAX33CP and can be changed in teaching mode. Using the command entry, the indication of the values can be changed:

- CMD 45: the absolute encoder values are displayed

- CMD 44: changes back to the relative values

Below that, half the zone length and the current operating mode of the 33CP is displayed. The orange-coloured buttons below serve to reset the 33CP and to switch between teaching mode and normal operation.

CP33/2

In the upper part of page CP33/2, the switching states of the safety circuit taps and the inspection travel as well as the working platform (working plate) are displayed (green = active/red = inactive).
The "safety functions" field shows the switching states of the limit switches (green = not triggered).
The "overspeed" field indicates the switching states of the speed monitoring in the different operating modes, with the following meaning: Pre = pre-switching: OC has been triggered, Final = safety gear: SGC has been triggered. (green = not triggered, red = triggered).
The field below that shows the UCM monitoring and the speed monitoring in the zone: leveling = approaching speed (max. 0.8m/sec), releveling = releveling speed (max. 0.3m/sec).
In case of an error, the error code of the LiMAX33CP is displayed on the right.

CP33/3

This page contains the setting parameters for limit switches and zone length (see chapter 4.5) and the button to save the parameter settings.

The lower area of this page shows the factory-set, safety-relevant basic settings of the LiMAX33CP. This display is only for information, changes are not possible here.

4.2   Teach-in travel using LiMAX33CP

In order to be able to travel, the installation travel must be activated in the software and the recall must be turned on.

To start the teach-in procedure, the car is put in the flush position in the first landing. This, however, is not stringently required, but is recommended for simplification of the procedure.

Use the CP33 button in the main menu to get to the LiMAX33CP settings. Here the absolute values of the landings as well as the final positions at the top and bottom of the shaft are entered. Besides, the status of the safety circuit SK1-4 as well as of OC and SGC is displayed here, too.

Switching the LiMAX33CP between teaching mode and normal operation is performed by means of the orange-coloured buttons on page 33/1, just like the reset of the absolute encoder.

The LiMAX33CP is switched to its different operating modes by entering the respective command after the CMD button.

*Note:* These CMD commands must be performed in the CP33 menu.

The following table provides an overview of the commands and operating modes:

CMD	Operating mode
511511	Reset
512512	Pre-commissioning mode
513513	Teach-in mode
516516	Return to normal operation

After making all the preparations and parking the car in the flush position in the first landing, the teach-in travel can be started. First carry out a reset of LiMAX33CP by entering CMD -> 511511 -> OK. Afterwards, the OC output must be active (OC field highlighted in green)

Now enter CMD -> 512512 -> OK to activate the pre-commissioning mode and then CMD -> 511511 -> OK to carry out a reset.

Important note: By activating the pre-commissioning mode, all possibly entered floor values are deleted.
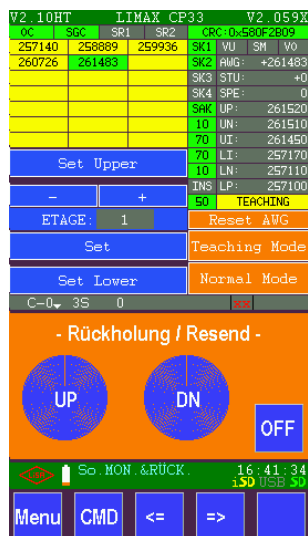
CP33/1 in Teaching-Mode

Now activate the teach-in mode by entering CMD -> 513513 -> OK. LiMAX33CP also indicates this operating mode by an acoustic signal at an interval of 2 seconds.

Now the car is moved all the way down to the buffer and this value is applied to LiMAX33CP using the "Set lower" button. An acknowledgement tone sounds. Then the lowest landing is approached and the absolute value is entered using "Set". This value is displayed in the yellow-coloured table. The display changes from Landing 1 to Landing 2; now this one can be taken over into the table in the same way.
You can only program the number of landings which is also set in the basic settings of LiSA.
It is not stringently required to approach the landings in sequence, you can also select a different landing using the + and – buttons.
Then travel upwards up to the shaft end until the counterweight reaches the buffer and the value is accepted using "Set Upper"

Important note: Finally, the car must be moved out of this upper shaft area, e.g. to the next stop, as otherwise an error state will occur when switching back to normal mode.

The teach-in mode can now be ended with the Normal Mode button or by entering
CMD -> 516516 -> OK. The LiMAX is now in normal operation, the mode LED flashes 1x per second.

Important note: During the entire teach-in process, OC must not trip out, e.g. for overspeed, otherwise all values entered during the teach-in will be deleted by the reset subsequently required and the re-activation of the pre-commissioning mode.

4.3   Applying the teach-in values to the controller

The values determined during the teach-in must be transferred to LiSA20 now. For this purpose execute the command CMD -> 602 -> OK. Then everything must be saved using CMD -> 600 -> OK or the "Save" button highlighted in yellow in the main menu.

Thus the teach-in travel is completed, now the installation travel is also switched off; for this purpose select Main menu -> Setup -> Installation travel -> No. Now switch off the recall, too, in order to change to the normal operation.

4.4   Fine tuning of the flush position

In a normal travel every landing is approached now in order to determine any possible deviations from the flush position. Should any correction be required, the deviation is measured in mm and the values determined are put down in a table (see appendix). Here the maximum possible correction value is 50mm.

Example: In landing 2, the car is 15mm too high -> enter the correction value -15mm in the table

For the correction, LiMAX is switched to the teach-in mode. For this purpose, go to the menu of the LiMAX settings using the CP33 button in the main menu. There switch LiMAX33CP to the teach-in mode by CMD -> 513513 -> OK. Back in the main menu call "Floor heights" using -> Setup in order to correct the landing heights by the values from the table determined before. The previous value is displayed in the input field on the left side.

Example: In the line for landing 2, a value of 5500 is entered, therefore: 5500 -15mm = 5485 is the new value to be entered.

Setup -> Floor heights

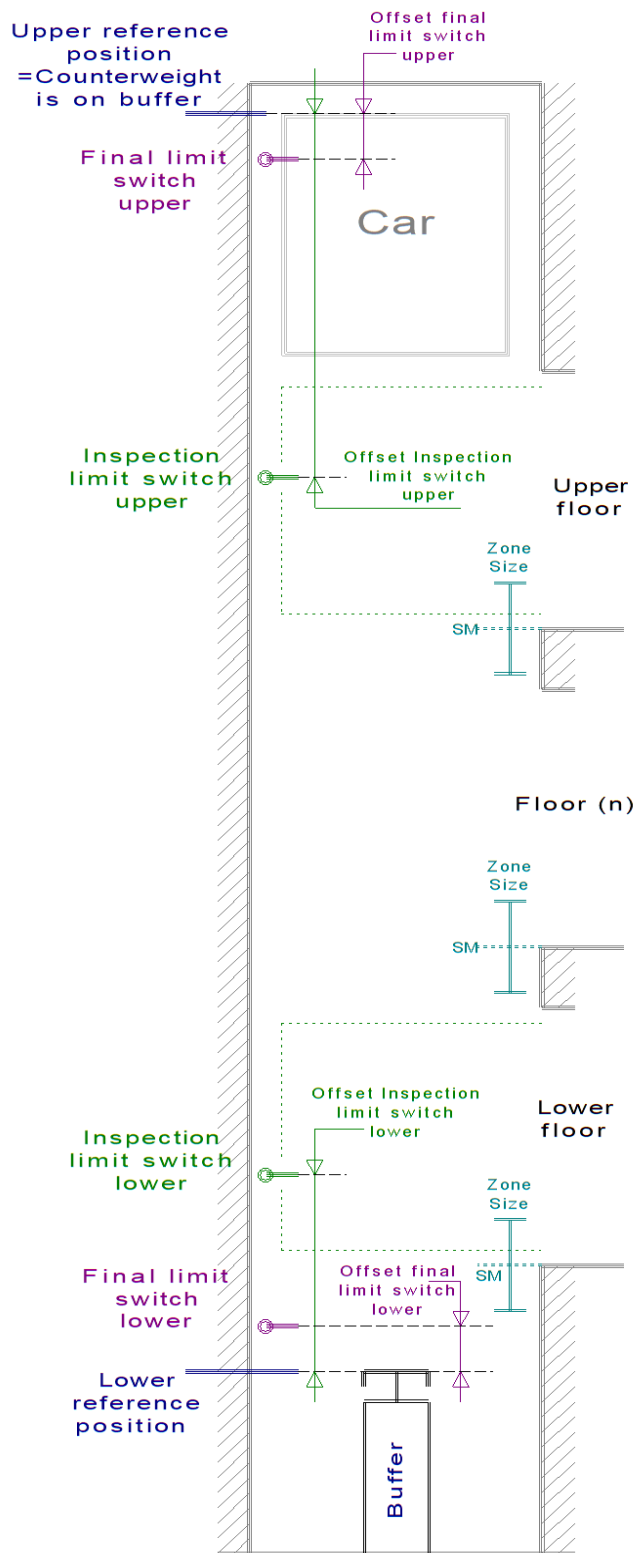All landing values can be corrected in this way. Finally complete the teach-in mode -> Main menu -> CP33 -> CMD -> 516516 -> OK and save the values using the "Save" button in the main menu. Transfer the data CMD -> 602 -> OK and then save again by CMD -> 600 -> OK.

4.5 Correction of the values for limit switches and zone length

Shaft overview:

The setting values of the limit switches and inspection limit switches as well as the zone length are values of the basic configuration, however they can be changed subsequently at the LiMAX33CP using the LiSA controller.

For the correction, the LiMAX is switched to the teach-in mode. For this purpose, go to the menu of the LiMAX settings using the CP33 button in the main menu. Use the Teaching Mode button or CMD -> 513513 -> OK to switch the LiMAX33CP to the teach-in mode.

Go back to page CP33/3, here you can adapt the values for the limit switches, the top and bottom inspection limit switches as well as the zone length (corresponds to the setting page "Elgo parameters" CMD -> 7243 in the LiSA menu)

Then save the values using "Save parameters".

Now exit the teach-in mode -> Main menu -> CP33 -> CMD -> 516516 -> OK.

Transfer the data CMD -> 602 -> OK and then save again by CMD -> 600 -> OK.

5.   Inspection mode

When all the system-specific settings are completed, you can perform a regular inspection travel. In order to switch the LiMAX33CP to inspection mode, the input EN81-21 at the LiMAX33CP is used. In normal operation, this input is constantly connected to +24V. If it is not wired (input open), the LiMAX33CP switches to the inspection mode.
In inspection mode, the speed (max. 0.63m) is additionally monitored by the LiMAX33CP. In the event of overspeed, the safety circuit (oc contact) is opened.

5.1   Safeguarding for protective spaces according to EN80-21 during inspection

In conjunction with an electronical safety gear device, effective in both directions, the LiMAX33 can be used to safeguard protective spaces instead of contactors, etc.
In this case, switching to the inspection mode is performed by the emergency release of the shaft doors in addition to the inspection control. Here the LiMAX33CP is switched to the inspection mode by opening the contact of K1 on the emergency release board.

If after the emergency release of a shaft door no further safety measures must be taken, the protective space light is green. A prerequisite is that the input "Safety zone active" is not parameterised in the LiSA controller.

6. Appendix

6.1 Troubleshooting

-> Error 135 "LiMAX safe not available" is displayed; the LiMAX is not recognised. The possible cause could be a faulty CANopen connection with the controller. Check whether "CANopen" is set to "Yes" in the basic settings menu and "Encoder" is also activated by "Yes" in the sub-menu. Absolute encoder selection with ELGO LiMAX Safe must be chosen as selection method. Further check the CANopen connection (C.L, C.H) between LiSA20 and LiMAX.

-> No travel is possible in teach-in mode; the cause could be that the inspection is turned on. During the teach-in you can only travel with the recall function, the installation travel must be activated at the handheld terminal. Further check whether the EN81-20 input at LiMAX33CP is wired to +24V and whether the BUS module in the pit is connected to BUS signals.
From software version 2.064H of LiSA, the handheld terminal indicates if "inspection" is active on the LiMAX33CP as an aid for troubleshooting.

-> Changing from the teach-in mode to normal operation is not possible. Here you need to check the programmed settings of the limit switches. As an aid for troubleshooting, the respective messages for the switch positions are displayed on configuration page 1. Furthermore it is possible to check the switch positions manually. Proceed as follows:
Use the installation travel to travel up to the shaft ends (buffers) in order to determine the absolute encoder values via the display of the handheld terminal. *The absolute encoder value of the lower buffer + the offset value of the respective switch in mm = position of the lower switch.* For the upper limit switches, the offset value is deducted from the final value (buffer counterweight) in order to calculate the switch position. The offset values of the switches can be taken from the supplied table of configuration data of LiMAX33CP.

- **Limit switches:** Here it is vital that the position determined at the top and bottom must not be within the landings. This value must be <u>outside</u> the respective last landing.

- **Inspection limit switches:** It must be observed that no distinction is made between a reduced shaft head and a low shaft pit. This means that in this case both inspection limit switches must be <u>within</u> the respective last landing.

-> Error during inspection travel "LiMAX Error Monitoring Insp. Travel Direction Up/Down"; in this case check whether the signals of inspection up and down arrive at the correct input of LiMAX33CP. If the signals are reversed, the travel is stopped by LiMAX after a short distance.

Note: In the "Log" menu [direct access: CMD -> 7148 -> OK] you can call up failure events particularly concerning the LiMAX33CP in chronological order using the "CP33 log" menu item.

6.2   Annual Reset

For safety reasons, it is necessary to reset the LiMAX33CP once a year. If this reset is delayed by more than 6 months, the LiMAX33CP automatically triggers a reset, which usually results in the elevator going into lockout.

To avoid this, the controller displays the due date on the handheld terminal.

<p align="center">-> CP33 annual reset required! <-</p>

To perform this reset, the LiMAX33CP menu is called up in the main menu via the CP33 button. The reset can now be triggered here with the command -> cmd -> 519519.

6.3   Table for correction values

Landing	Correction value +/- in mm
Landing 1	
Landing 2	
Landing 3	
Landing 4	
Landing 5	
Landing 6	
Landing 7	
Landing 8	
Landing 9	
Landing 10	
Landing 11	
Landing 12	
Landing 13	
Landing 14	
Landing 15	

<p align="center">In the event of questions and problems please do not hesitate to call our</p>

<p align="center">**hotline: +49 (0) 8076 9187-222**</p>