1 Introduction

This short manual only serves to provide an overview of the necessary steps for installing and commissioning the LIMAX33CP. In particular, the safety instructions, both concerning the functional safety of the device as well as regarding the personal safety of the installation personnel are not exhaustive. Also the safety instructions in the safety manual must be observed. In addition, the full functionality of the LIMAX33CP is described in the safety manual: /🕮 LIMAX33CP-00 Safety Manual/.
Furthermore there is an installation manual for the mechanical installation of the tape and LIMAX33CP-00 (/🕮LIMAX33CP-00-MI/) and of the CAN-protocol of LIMAX33CP-00 (/🕮LIMAX33CP-00 CANopen specification/).

Chapter ☞ 2 ☞ 3 ☞ 4 are a quick start-up user guide for installation and commissioning.
Chapter ☞ 5 explains the behavior of safety functions after commissioning and the possibilities for configuration.

2 Electrical installation

Figure 1, Figure 2 and Table 1 give an overview over the electrical connectors.

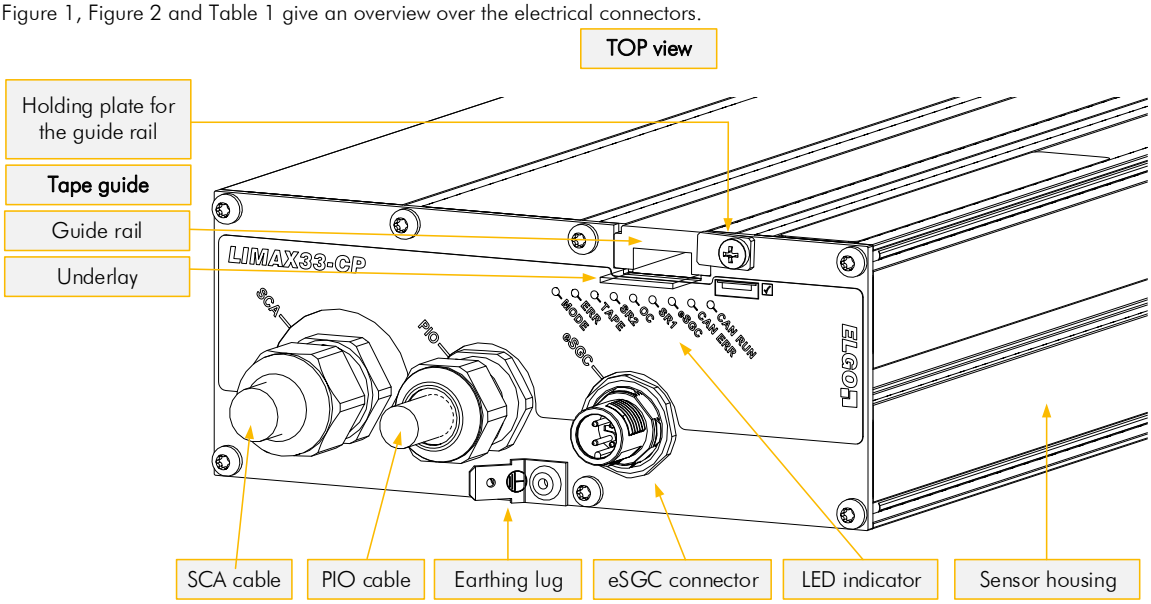


Fig. 1: cables and connectors

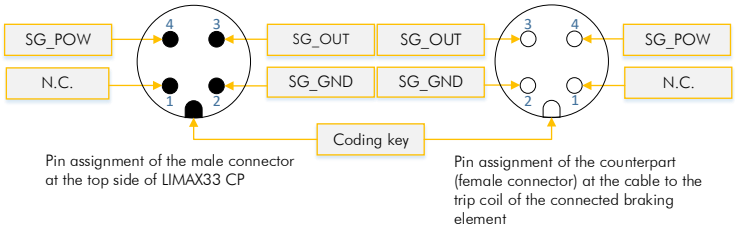


Fig. 2: Pin assignment eSGC connector (mechanical data according to IEC 61076-2-101)

Table 1: assignment of 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	gray

*) SR2 is usually not installed (only installed if front and rear doors should be bridged separately)

Fig. 3 shows how the single connectors have to de integrated in the lift installation. The following restrictions must be observed:

Supply voltage	18 ... 30 VDC (stabilized). SELV/PELV power supply must be used
DZO rating	+ 24 VDC −20 %, max.200 mA (push-pull)
Power input	max. 600 mA at 24 VDC
Digital input voltage	18 ... 30 VDC for high level; open for low level
Relay contact rating OC, SR1, SR2	0 ... 230 VAC (max 250 VAC), max. 2 A; or 24 VDC (max. 30 VDC), max. 1 A; or 110 VDC, max. 250 mA; each with a resistive/inductive load with L/R < 40 ms
Rating for external supply of eSGC-actuator and specification of trip coil to be connected	24 VDC, min. 18 V; max. 30 V; SELV/PELV power supply must be used. Constrains for connected trip coil to be observed: a. L < 1.5H b. Current consumption < 1A => R > 24Ohm @24V (the eSGC – actuator is secured inside the CP with a 1A self-resetting polyfuse) c. L/R > 1ms (recommended): for L/R << 1ms there is a danger that the braking element would fall during the test of the eSGC-actuator. d. L/R < 10 ms (recommended).

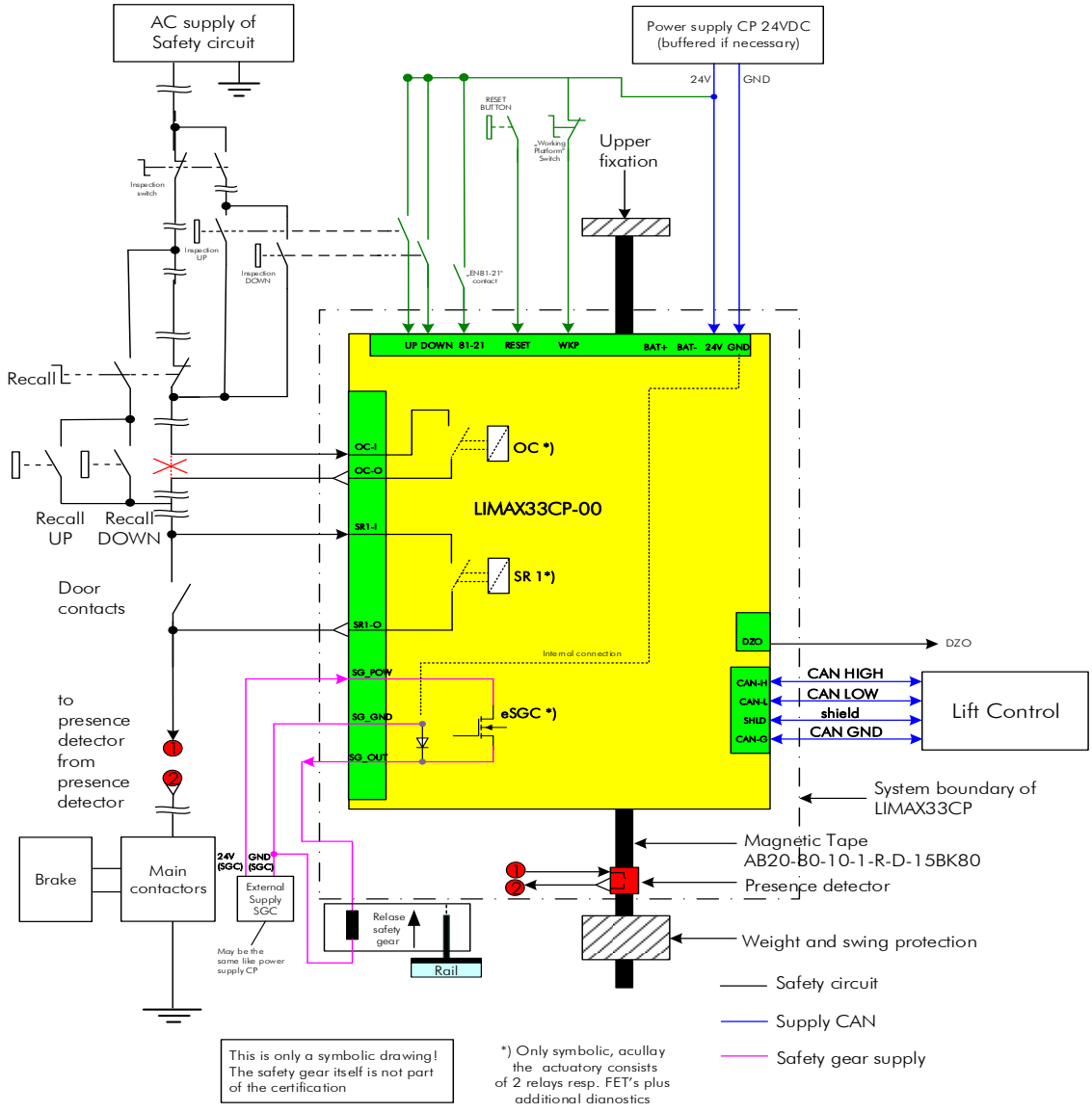


Fig. 3: Installation Diagramm

3 Commissioning

Immediately after electrical installation and first power up, the device is in pre-commissioning mode. A commissioning is necessary in order to learn the reference positions and the floor position; these positions are needed in order to fulfill the safety functions, refer to chapter ☞ 4 , correctly.

The procedure for commissioning is as follows:

- Immediately after first power up LIMAX33CP-00 should be in pre-commissioned mode
- Go to teach mode (refer to 🕮CANopen-Specification)
- Move the car to the lowermost position (normally where the car is on the buffer)
- Teach lowermost position as lower reference position (refer to 🕮CANopen-Specification)
- Move the car to the uppermost position (normally where the counterweight is on the buffer)
- Teach uppermost position as upper reference position (refer to 🕮CANopen-Specification)
- Move the car to be floor position after the other (floor position must be each flush with door threshold)
- Teach the each floors (refer to 🕮CANopen-Specification)
- Leave teach mode to normal mode (refer to 🕮CANopen-Specification)

Remarks:

- In teach mode the car can be moved in normal lift operation as well as in inspection travel.
- Even in normal lift operation the speed in teach mode is limited to pre-tripping speed teach
- The order of teaching is absolutely arbitrary (order as described above only as an example)

4 LED signals

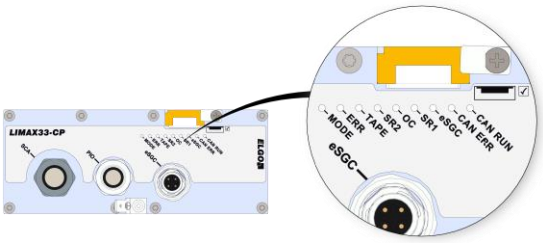


Fig. 4: LED´s on the upper side of the sensor in case of eSGC – Version (Version without eSGC differs concerning order of LED)

Table 2: 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
ERROR	Flashes at an emergency error ON at a normal error (for more details refer to 🕮 Safety manaul)	
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	

5 Explanation of configuration and safety functions

5.1 Explanation of the safety functions depending on the associated Parameters and on the Configuration concerning LIMAX33-CP-00

Table 3: Safety functions dependent on positions[1]

Superordinate safety function feature	Safety function feature	Safety function	Parameter (belonging to safety function)	Safety function tripping condition (corresponding CP-actuator opens[2] , refer to right column)	Actuator
Inspection[3] [10][4]	Upper pre-triggered stopping system [8]	Upper pre-triggered stopping system	Offset upper pre-triggered stopping system [35]	Position > upper_reference_position[5] – offset_upper_pre-trig_stop_sys [35] **AND** „EN81_21–input is open“	eSGC
	Lower pre-triggered stopping system [9]	Lower pre-triggered stopping system	Offset lower pre-triggered stopping system [36]	Position < lower_reference_position + offset_lower_pre-trig_stop_sys [36] **AND** „EN81_21–input is open“	eSGC
		Upper inspection limit switch	Offset upper inspection limit switch [3]	Position > upper_reference_position – offset_upper_pre-trig_stop_sys [35] – offset_upper_insp_limit_switch [3] **AND** „EN81_21–input is open“	OC
		Lower inspection limit switch	Offset lower inspection limit switch [4]	Position < upper_reference_position + offset_upper_pre-trig_stop_sys [36] + offset_upper_insp_limit_switch [4] **AND** „EN81_21–input is open“	OC
Final limit switches[6] [13]		Upper final limit switch	Offset upper final limit switch [1]	Position > upper_reference_position – offset_upper_final_limit_switch [1]	OC
		Lower final limit switch	Offset lower final limit switch [2]	Position < lower_reference_position + offset_lower_final_limit_switch [2]	OC

[1] For closer explanations of the safety functions dependent on positions refer also to chapter 5.5
[2] Conditions for reset of the safety functions vary, refer to safety manual
[3] „Inspection“ is a superordinate safety function feature, which means that all safety functions belonging to the feature Inspection are disabled, if Inspection is disabled. Some – but not all “inspection-safety-functions” can also be disabled separately when Inspection is enabled
[4] The blue numbers [xy] correspond with number of parameter/feature in the order sheet
[5] Upper and lower reference position are learned in teach mode
[6] Final limit switches is a superordinate safety function feature, which means that safety function upper and lower final limit switch are always enabled/disabled combined

Table 4: Safety functions dependent on velocities

Superordinate safety function feature	Safety function feature	Safety function	Parameter (belonging to safety function)	Safety function tripping condition	Actuator
	Over speed (pre-tripping) [14]	Over speed (pre-tripping)	Pre-tripping speed[29]	speed > Pre_tripping_speed	OC
	Over speed (final-tripping) [15]	Over speed (final-tripping)	Final tripping speed[30]	speed > Final_tripping_speed	eSGC
	Over speed teach (pre-tripping) [16]	Over speed teach (pre-tripping)	Pre-tripping speed in teach[31]	speed > Pre_tripping_speed_teach AND „mode is actual teach or precommissioning“	OC
	Over speed teach (final-tripping) [17]	Over speed teach (final-tripping)	Final tripping speed in teach[32]	speed > Final_tripping_speed_tach AND „mode is actual teach or precommissioning“	eSGC
Inspection		Over speed inspection (pre-tripping)	Pre-tripping speed in inspection[33]	speed > Pre_tripping_speed_inspection AND „EN81_21–input is open“	OC
	Over speed inspection (final-tripping) [11]	Over speed inspection (final-tripping)	Final tripping speed in inspection[34]	speed > Final_tripping_speed_inspection AND „EN81_21–input is open“	eSGC

Table 5: Safety functions dependent on positons and velocities

Superordi-nate safety function feature	Safety function feature	Safety function	Parameter (belonging to safety function)	Safety function tripping condition	Actuator
	Decelera tion control [12]	Decelera tion control	a[37] t_{del}[38] V_{buf}[39] $offset_{ETSL\_UP}$ [40] $offset_{ETSL\_DOWN}$ [41]	Safety function trips if actual speed exceeds V_{ETSL} , with: V_{ETSL} = MAX (sqrt (2 * a* s + V_{Buffer}^2 + a^2 * t_{del}^2) – a*t_{del} ; V_{Buffer}) for s >=0 V_{Buffer} for s < 0 S = upper_reference_postion – actual _ position - **$offset_{ETSL\_UP}$** (for moving up) S = actual _ position - lower_reference_postion - **$offset_{ETSL\_DOWN}$** (for moving down) Refer also to “closer explanations and recommended settings” below	OC

“Closer explanations and recommended settings” concerning the parameter for deceleration control:

“a” is the “deceleration-parameter”:
- “a” should be significant bigger than the delectation during normal travel when approaching a terminal floor, otherwise the safety function will trip by fail;
- “a” should be significant smaller than the worst case delectation appearing during an emergency stop otherwise the safety function would trip to late if it is needed and the car would hit the buffer too fast.

A commonly used value rage for “a” is 0.8…1.8 m/s²

"t_{del}" is the time delay from the moment that V_{ETSL} is exceeded until the deceleration begins. "t_{del}" is composed of the response time of the LIMAX33CP (worst case 55ms) and the time delay determined by the lift components following in the functional chain (e.g., main contactor and machine brake).

Vbuf is the rated speed for which the buffers are designed.

offsetETSL_up and offsetETSL_DOWN cause a computational shortening of the distance "s" and thus an earlier triggering of the safety function. These are usually set to 0.

Table 6: Safety functions door bridging and UCM

Super-ordinate safety function feature	Safety function feature	Safety function	Parameter (belonging to safety function)	Description of Safety function	CP-Actuator	Remarks
Doors[7] [18]		Door bridging	Door zone size levelling [5] Door zone size re-levelling [6]	SR1 resp. SR2 **close** if actual position of the car is in a door zone for levelling resp. re-levelling of a certain floor **AND** actual speed is below 0.8m/s (for levelling) resp. 0.3m/s (for re-levelling) **AND** Door bridging (for levelling resp. re-levelling) has been enabled by CANopen in the correct manner. Otherwise SR1 resp. SR2 are open.	SR1 [SR2]	whether SR2 is involved in the door bridging functionality, depends on: 1.) whether SR2 is enabled 2.) whether "rear" floors are in the floor table 3.) whether rear floors are handled separated concerning door bridging
		UCM	see above	A door zone for levelling resp. relevelling a certain floor (floor #n) is left, while SR1 resp. SR2 is closed due to activated door bridging for levelling resp. relevelling of this certain floor (floor #n)	[eSGC] SR1 [SR2] OC	[eSGC] => only if feature "UCM only OC" is disabled (refer to chapter 0) [SR2] => only if it is involved in the door bridging functionality (refer to above)

[7] doors is a superordinate safety function feature, which means that safety functions door bridging and UCM, belonging to this superordinate feature, always enabled/disabled combined

5.2 Explanation of special safety function behavior

Feature	Explanation
eSGC only down [26]	Is intended to be enabled in case an unidirectional acting safety gear is connected to the eSGC-actuator. Special constraints must be observed in this case (refer to the safety manual in this case)
UCM only OC [27]	This feature may be enabled if the motor brake is an A3-safety brake and the customer wants to use the machine brake as the one and only braking element for UCM. If this feature is enabled, only OC and SR1 and – if so – SR2 open in case of an UCM-event. eSGC is kept closed. Special constraints must be observed in this case (refer to the safety manual in this case)

5.3 Explanation of actuator configuration

Feature	Explanation
OC [17]	Must always be enabled
SR1 [18]	If SR1 is not assembled in the relevant device, it must be disabled If SR1 is assembled in the relevant device but no door bridging is used, it is arbitrary if SR1 is enabled or disabled If SR1 is assembled in the relevant device, installed in the safety circuit and intended to be used by lift control used by lift control for door bridging, SR1 must be enabled
SR2 [19]	If SR2 is not assembled in the relevant device, it must be disabled If SR2 is assembled in the relevant device but not installed in the safety circuit, resp. not intended to be used by lift control for "separate" door bridging of 2nd doors (rear doors), must be disabled If SR2 is assembled in the relevant device, installed in the safety circuit and intended to be used by lift control used for "separate" door bridging of 2nd doors (rear doors), SR2 must be enabled
eSGC [20]	If eSGC is not assembled in the relevant device it must be disabled If eSGC is assembled but not used (no suitable trip coil is electrically connected[8]) it must be disabled If eSGC is assembled and connected to the trip coil of a braking element (e.g. safety gear, remote tripping of speed governor, rope gripper), eSGC must be enabled.

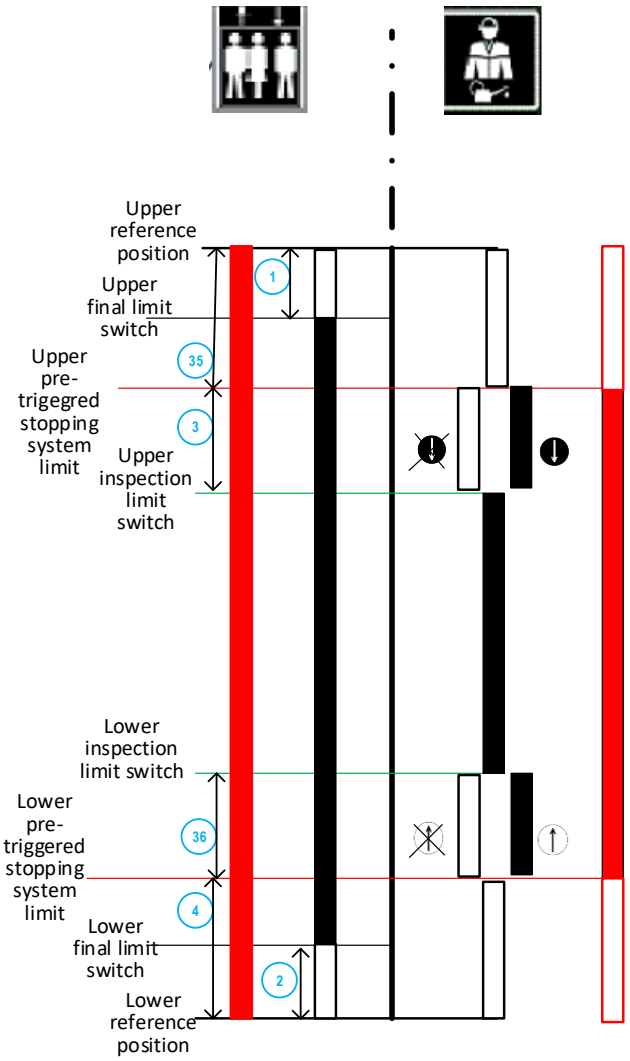
5.4 Explanation special teach behavior, only in case of devices with floor sensor(s)

Feature	Explanation
Automatic teach [15]	If no floor sensor is connected, this feature must be disabled. If one are two floor sensor(s) – intended be used for automatic teach - this feature must be enabled
Automatic adjust [16]	If no floor sensor is connected, this feature must be disabled. If one or two floor sensor(s) is/are connected, but automatic adjustment by floor sensor is undesirable, this feature must be disabled. If one or two floor sensor(s) is/are connected and automatic adjustment by floor sensor is desirable, this feature must be enabled.

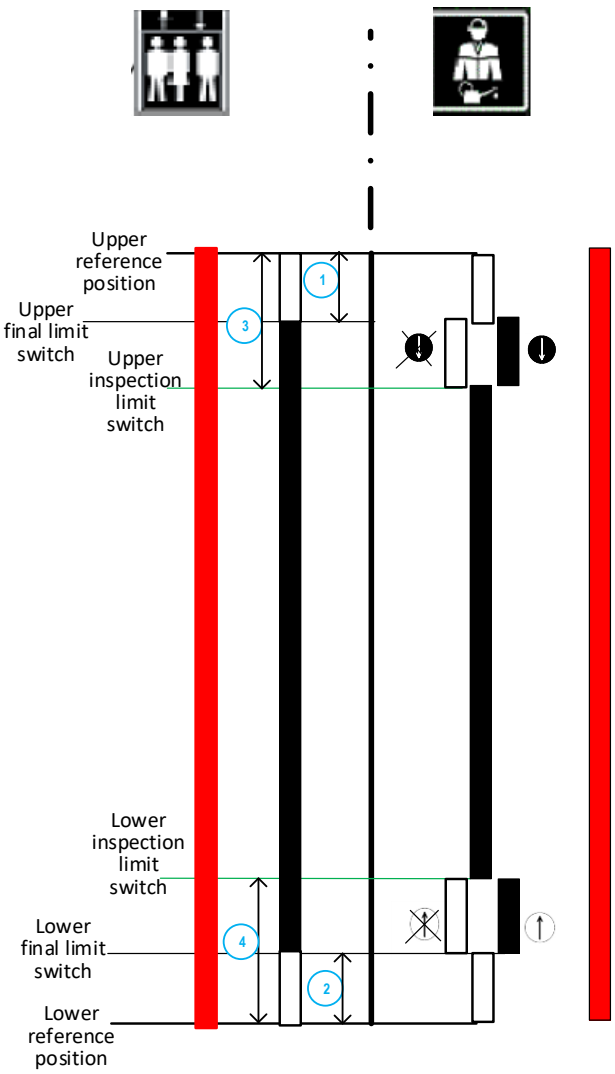
[8] If no suitable inductivity is connected , self-diagnostics of eSGC may cause problems if eSGC is enabled

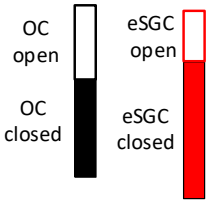
5.5 Futher explaination concering safety functions dependent on position

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 (pre-triggered stopping system disabled)





Conditions during „normal lift operation“ (24V on EN81-21-input)

Conditions during man in shaft operation (EN81-21-input open)

UP-button on inspection pod: pushed / not pushed

DOWN button on inspection pod: pushed / not pushed

1 / 2 Offset upper/lower final limit switch

3 / 4 Offset upper/lower inspection limit switch

35 / 36 Offset upper/lower pre-triggered stopping system limit