



AE-MAESTRO

INTEGRATED LIFT CONTROLLER

TECHNICAL TRAINING COURSE -1A

GENERAL SPECIFICATIONS AND DEVICE CONNECTIONS FOR PREWIRED SYSTEM

Melih Aybey







AE-MAESTRO CONTROL SYSTEM GENERAL FEATURES

- > It may run up to 64 floors for electrical elevators
- Complies with EN81-20/50 (The current safety standard of elevators) and EN81-1 (previous safety standard of elevators)
- CE certified of STO (Safety Torque Off)
- Pit communication is car serial or full serial.
- > Simpleks, dubleks, tripleks... may run up to 8 within group
- ➤ All PCBs communicates in serial way to one other over CAN-BUS.
- Turkish, English, French and Spanish as language options



AE-MAESTRO 3x400V SERIES

MODEL (400V SeriES)	AEM403	AEM405	AEM407	AEM411	AEM415	AEM422	AEM430
Nominal Motor power	3 kW	5.5 kW	7.5 kW	11 kW	15 kW	22 kW	30 kW
Nominal Output Current	7 A	13 A	18 A	25 A	32 A	45 A	60 A
Maximum Current Allowed time	18 A 5 s	26 A 5 s	36 A 5 s	50 A 5 s	64 A 5 s	90 A 5 s	120 A 5 s
Control Circuit Supply Voltagei	1-Phase 100V240V AC 50/60 Hz +- %5						
Line Voltage	3-Phase 340V420V AC 50/60 Hz +- %5						
Motor Output Voltage	3-Phase 0V420V AC 0100 Hz						
Carrier Frequency	616 kHz						



AE-MAESTRO 3x200V SERIES

MODEL (200V Series)	AEM204	AEM205	AEM207	AEM211	
Nominal Motor Power	4 kW	5.5 kW	7.5 kW	11 kW	
Nominal Output Current	18 A	25 A	32 A	45 A	
Maksimum Current	36 A	50 A	64 A	90 A	
Allowed Time	5 s	5 s	5 s	5 s	
Control Circuit Supply Voltage	1-Phase 100V240V AC 50/60 Hz ± %5				
Line Voltage	3-Ph	3-Phase 190V220V AC 50/60 Hz ± %5			
Motor Output Voltage	3	3-Phase 0V220V AC 0100 Hz			
Carrier Frequency	616 kHz				

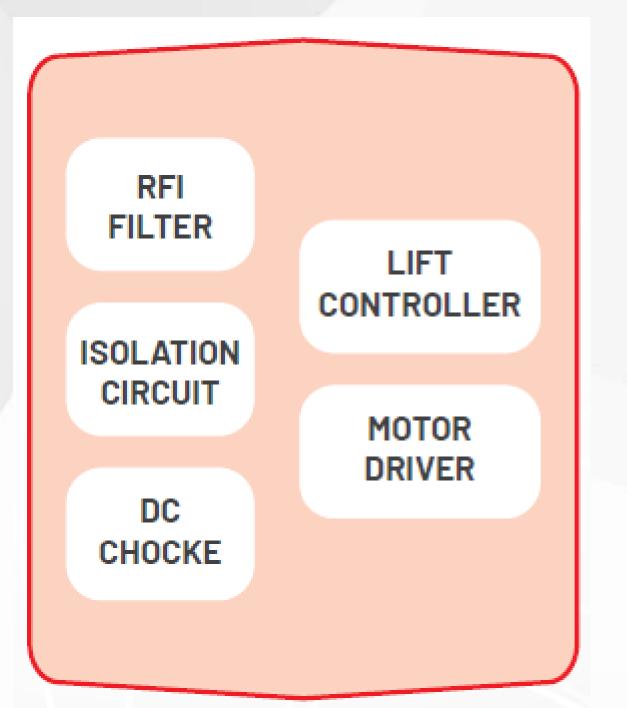
MAESTRO CODE STRUCTURE



Product Code	AE MAESTRO 3X400V SERIES	Current	Door Bridging Circuit	Safety Circuit Voltage		
264AEM05N48	AE-MAESTRO 5,5 kW (EN81-1+A2)	13 A	No	48 V		
264AEM05N22	AE-MAESTRO 5,5 kW (EN81-1+A2)	13 A	No	220 V		
264AEM05D48	AE-MAESTRO 5,5 kW (EN81-20/50 and EN81-1+A3)	13 A	SDB	48 V		
264AEM05D22	AE-MAESTRO 5,5 kW (EN81-20/50 and EN81-1+A3)	13 A	SDB	220 V		
Product Code	AE MAESTRO 3X400V SERIES	Current	Door Bridging Circuit	Safety Circuit Voltage		
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262AEM05D22	AE-MAESTRO 5,5 kW (EN81-20/50 and EN81-1+A3)	25 A	SDB	220 V		
264AEM05N48	26	4	AEM	5	N	48
	26	Х	AEM	KW	K	G
	CONSTANT	LINE	STABLE	POWER	BRIDGING DOOR BOARD	SAFETY CIRCUIT
	•			4-4KW	N-NO	48-48V
				5-5.5KW	D-YES	220-220V
		2 2001/		7-7.5kW		
		2-200V		11-11KW		
		4-400V		15-15KW		
				22-22KW		
				30-30KW		







AE-MAESTRO is a compact integrated control system.

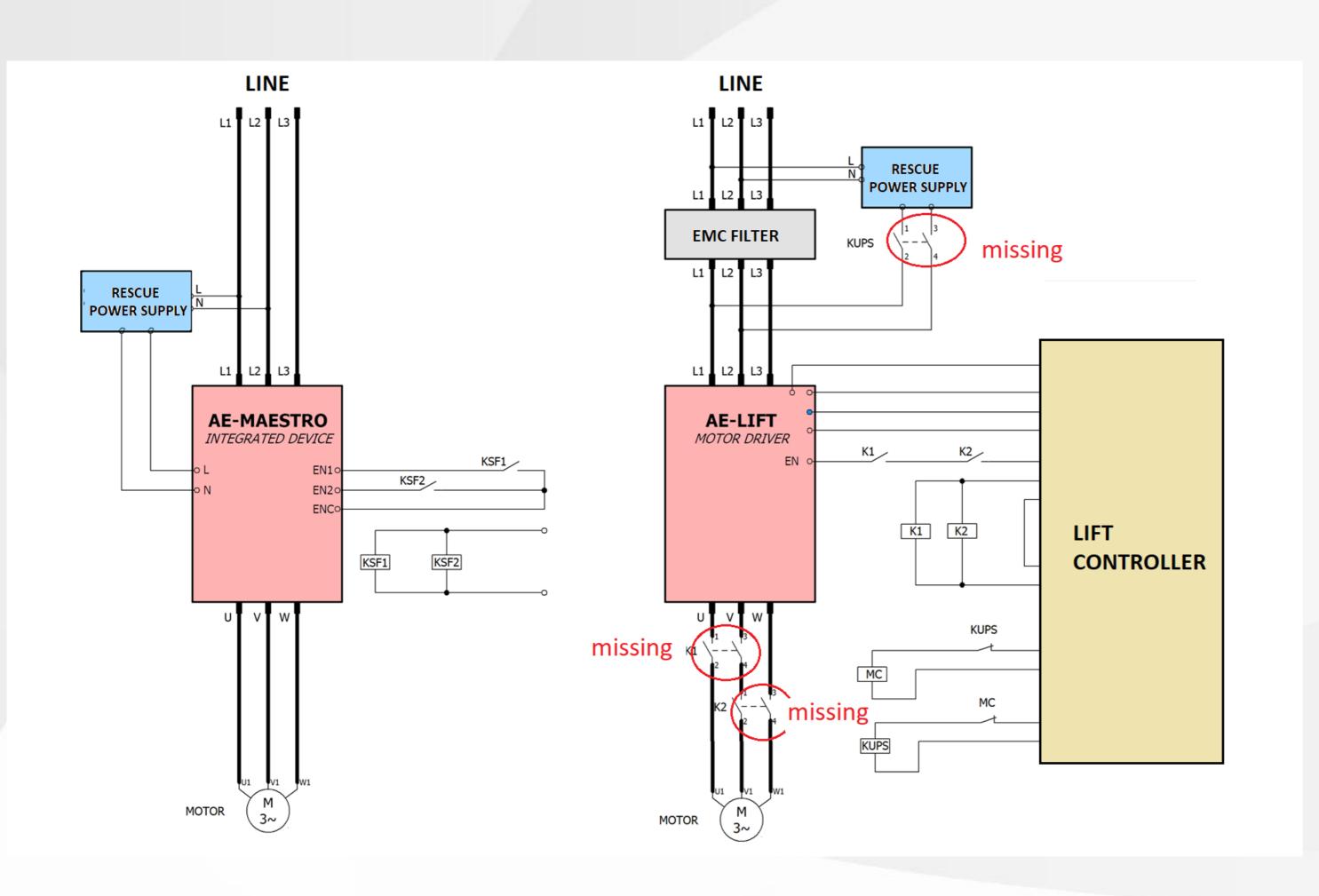
• **AE-MAESTRO** is compact integrated lift controller where lift controller and motor driver are in one device.

AE-MAESTRO includes;

- EMC filter
- Dc choke coil
- Rescue system isolating circuits

inside the device.



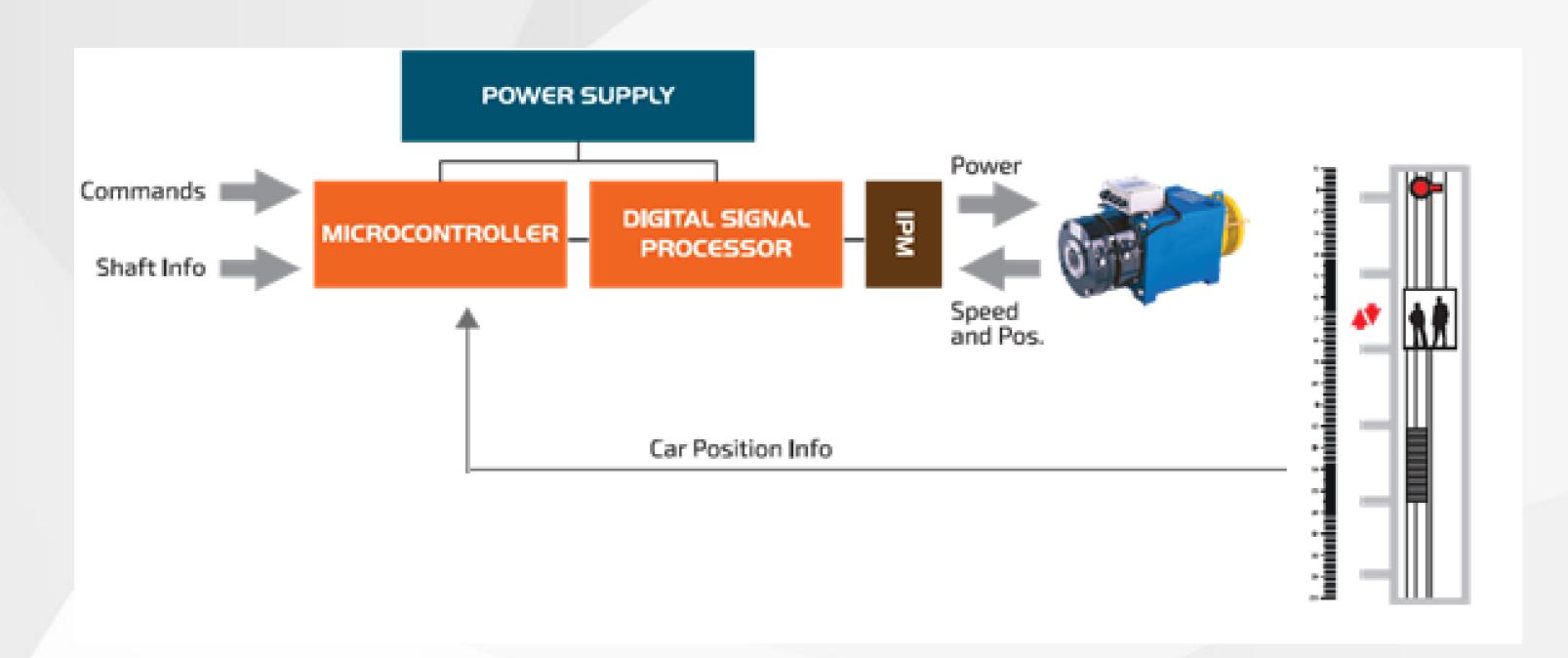


- **AE-MAESTRO** reduces number of wiring in control panel as it is driven in STO and includes rescue system power isolating circuits, EMC filter and DC choke coil(180->90).
- Production process time of control panel reduced and simplified as well
- Easy troubleshooting
- Malfuctions due to contactors are eliminated

HIGH PERFORMANCE



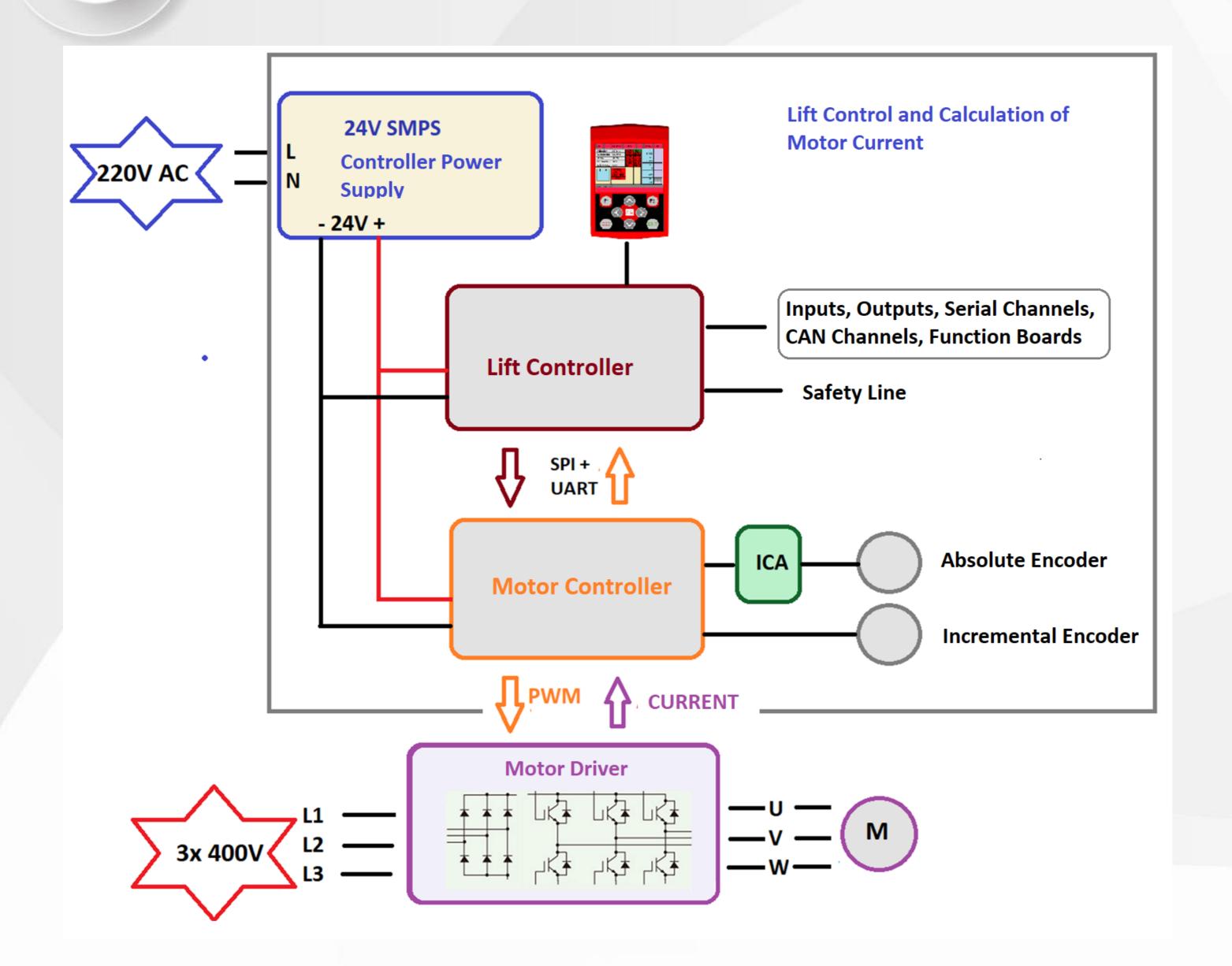
AE-MAESTRO is a combination of control board and high performance motor driver with double microprocessor architecture.



- Motor signals are processed by DSP in AE-Maestro.
- Motor driving is provided in the highest precision cause DSP is only dedicated to generating motor signals
- Lift is managed by a seperated microprocessor.
- In this way, AE-MAESTRO has a strong basis from double microprocessor architecture (multi-processing)

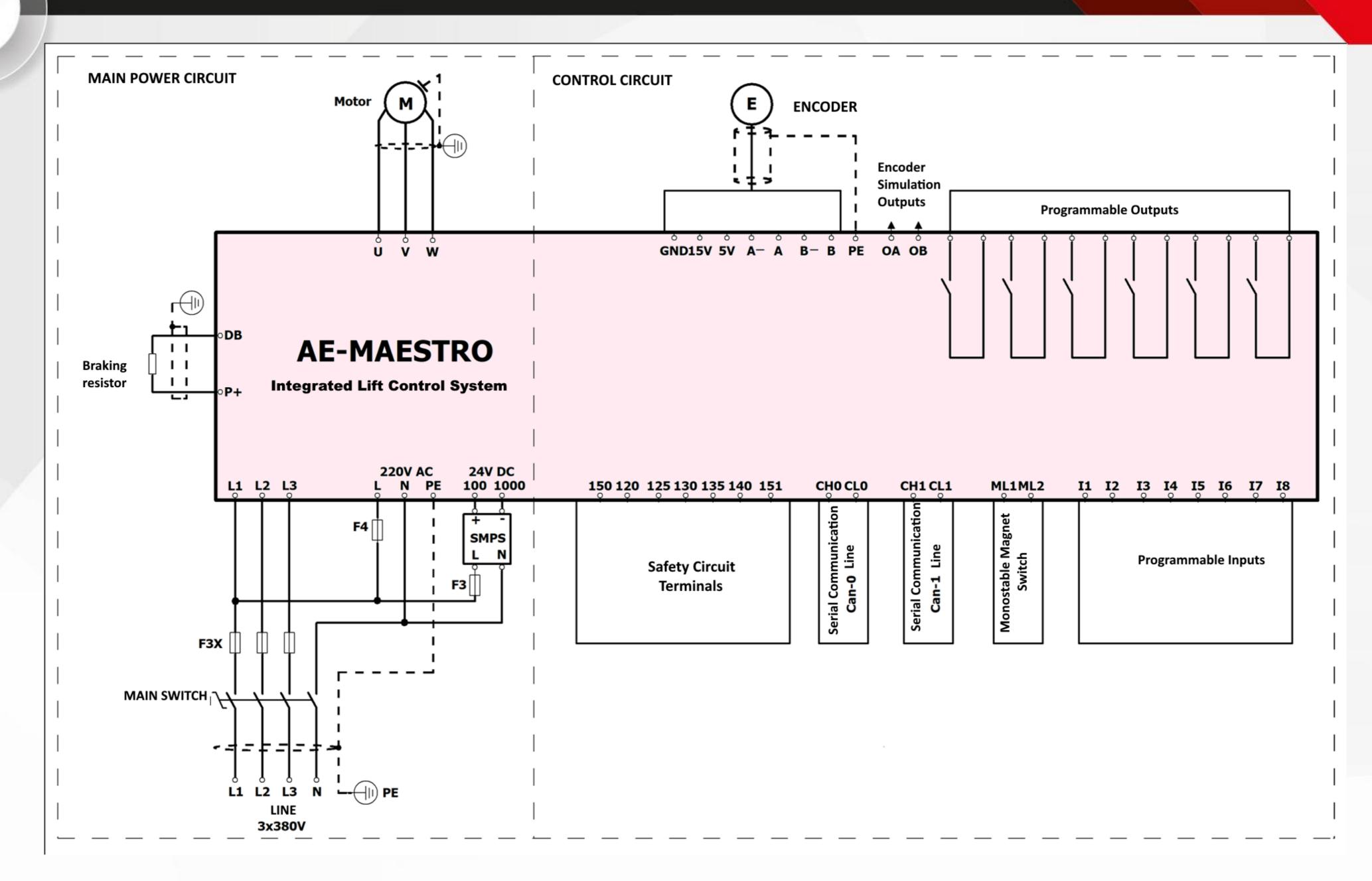
BLOCK DIAGRAM OF THE SYSTEM





- System consists of 3 parts: System lift manager, motor manager and motor driver.
- Power from inputs L,N energizes all the electronic control, processing and communication parts.
- DC Bus voltage is acquired by being rectifying power from terminals L1,L2 and L3 on motor board.
- Intelligent Power Module (IPM) drives motor by PWM signal from motor managment board.
- In case of rescue operation battery or UPS voltage switched by isolation circuit is transmitted to inputs L1,L2 and L3.





AE-MAESTRO CONTROL PANELS





- Control panels are manufactured in three main types :
- Machine Room (MR),
- Machine Roomless (MRL).
- Shaft+Door Frame



MR Panel



Shaft Control Panel

- The other type of control panel is one consistings of two part shaft controller and door frame switch panel.
- All hand switching components are placed into door frame panel.
- The other components placed into shaft controller.



Door Frame Panel

AE-MAESTRO HUMAN-MACHINE INTERFACE

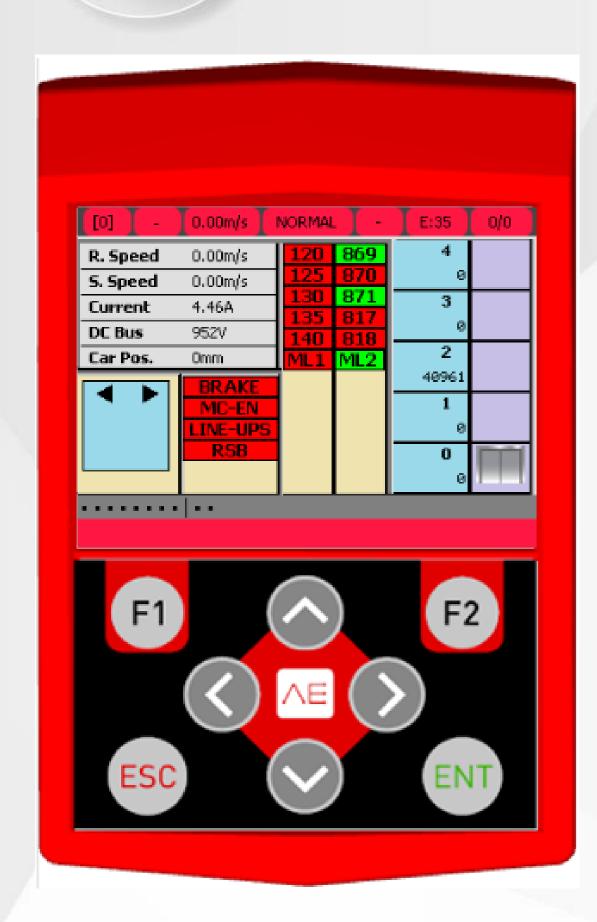




- Dismountable hand terminal with 8 buttons and a TFT display
- The system may run without display but not possible to change any parameter.
- LED indicators show status of the system.
- All additional boards exist behind the top cover.

AE-MAESTRO HUMAN MACHINE INTERFACE

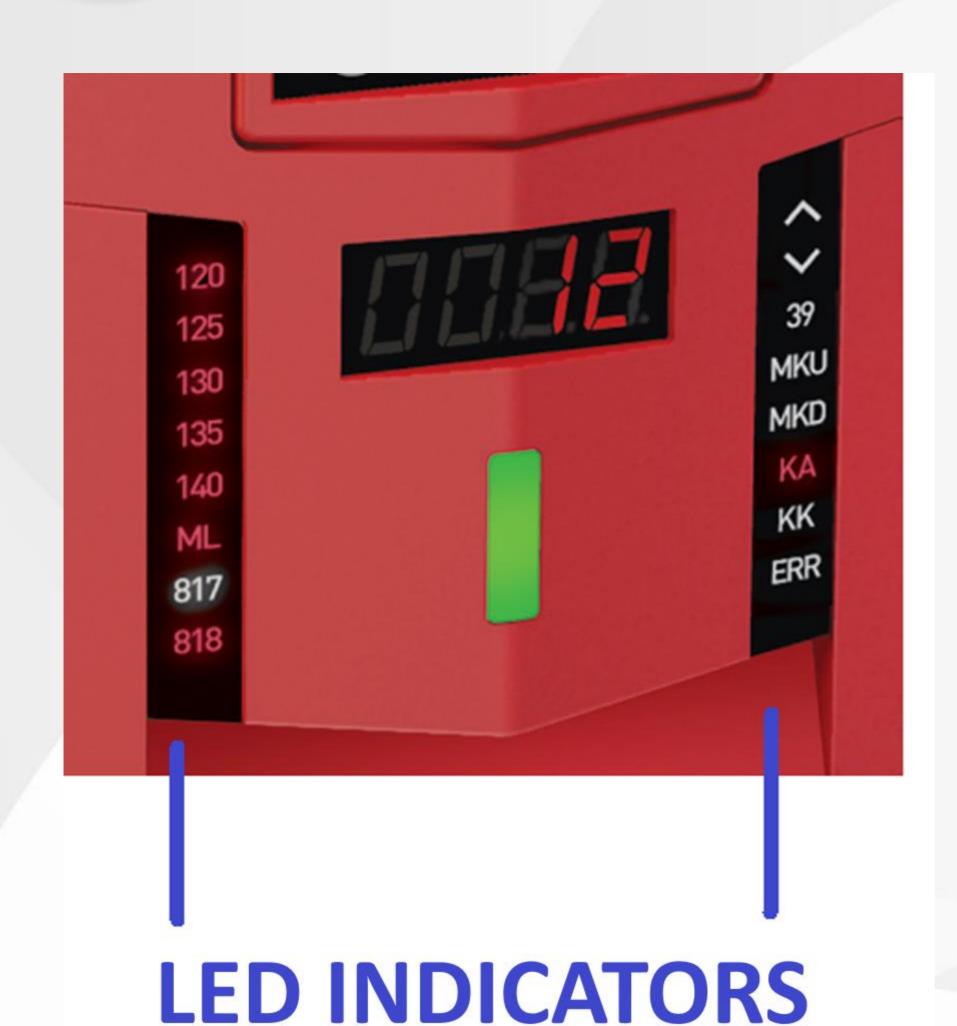




CAN UART

- It provides a wide variety of software upgrade, storing parameters, error inspection and graphs of observations.
- > A dedicated location at the top surface of the system is allocated for TFT hand terminal.
- One UART and one CAN connection socket in that location.
- Fast communication is achieved over UART so the hand terminal turns on more quickly when connected to the system.
- The hand terminal has a SD card reader so possible to transmit new softwares and parameters to the system.
- > SW upgrade can only be done over UART which means the hand terminal is mounted to its location on the system.
- > TFT hand terminal can be used to control the system by connecting to CAN socket in anywhere in the shaft.





- AE-MAESTRO shows some of important inputs, current floor number, errors by LED panel.
- Led indicators at both sides show current status of related inputs.
- All safety circuit and pit position detector, errors and door commands can be observed in this panel.
- LED red illuminated indicates at a detected input signal (closed contact)
- Led not lit indicates at no input signal (open contact).





[E03] - DEVICE LED DISPLAY

0	Floor Number
1	Real Speed
2	Travel Speed
3	Set Speed
4	Current
5	DC Bus Voltage
6	Target Floor
7	Device Phase
8	Motion Phase

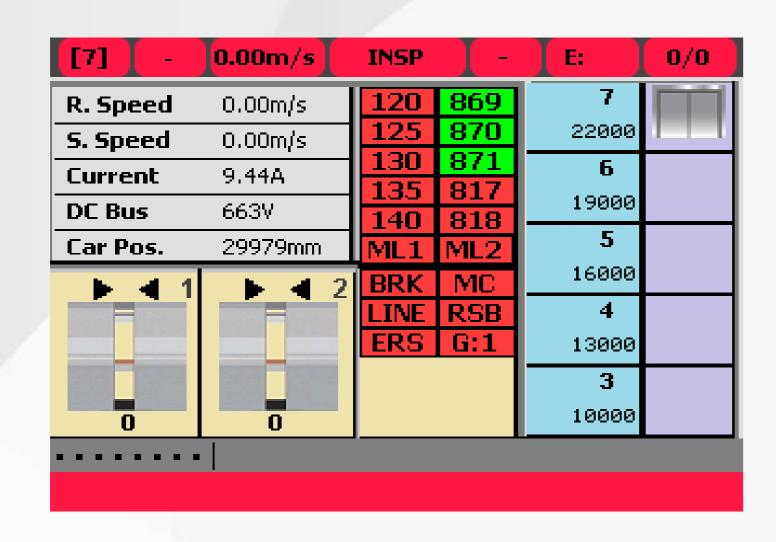
- LED Digital 7 Segment Display
- Led digital 7 segment display can be set through **E03** to observe parameters.
- The display is set to current floor number as default.
- It denotes error code by flashing in case of trouble.





STATUS INDICATOR

- It shows status of lift controller by color and blinking.
- Color green means lift in normal mode
- Color red in case of trouble,
- Color yellow means inspection mode.
- Blinking indicates at lift movement.



The main screen shows the following values about the lift:

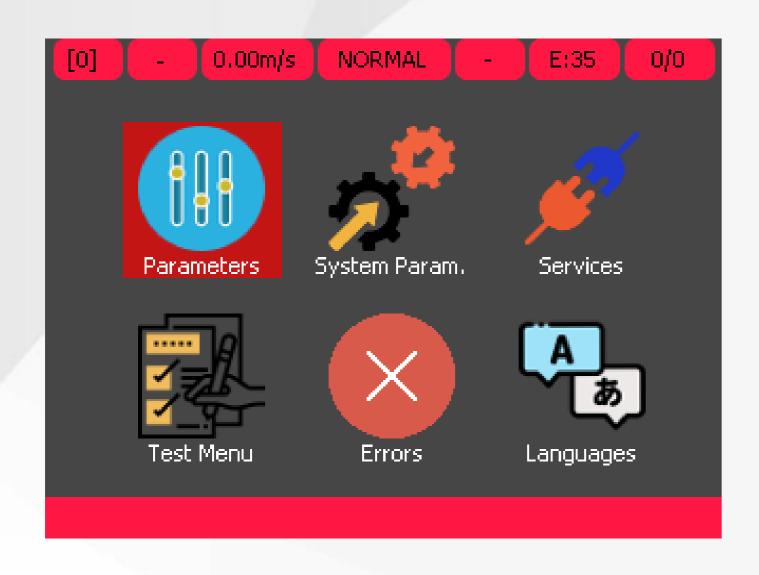
- Real time travel of the car.
- Safety line.
- Car position
- Car speed
- Door state
- Current calls
- A message line about the state of the lift.
- Some of the important inputs and outputs.



[0] - 0.00	Jm/s │ IN	SP] -] E:3!	5 0/0
Table A	1	Tabl	e B
PARAMETER	VALUE	PARAMETER	VALUE
Serial No:	1448304471	Date:	02.02.2021
Control Board:	2.33r	Clock:	14:05
Motor Driver:	2,20n	Maintenance Time:	19.05.2021
Hand Terminal:	2.22u	Start:	0
SD Version:	2.0m	Remaining Starts:	3584
Line Voltage:	200 V	Direction Change:	0
Power:	4 KW	Maks. Dir.Change:	15000000
Device Total Starts	986652	Weight:	0

lm/s∐ IN:	5P] -] E	:35 0/0
3 2	. Ta	able C
VALUE	PARAMETER	VALUE
02.02.2021	ALxK:	1.5
14:05	SCBa:	-
19.05.2021	SCBb:	-
0	PWL:	1.9
3584	PWSa:	1.53
0	PWSb:	1.53
Maks. Dir.Change: 15000000		-
0	Angl:	0
	VALUE 02.02.2021 14:05 19.05.2021 0 3584 0 15000000	Z VALUE PARAMETER 02.02.2021 ALxK: 14:05 SCBa: 19.05.2021 SCBb: 0 PWL: 3584 PWSa: 0 PWSb: 150000000 ICG:

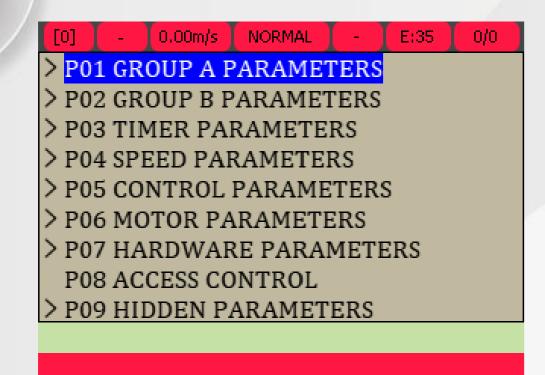
- After pressing ESC Button in main screen info screen can be seen.
- In this screen some information about the device, softwares of the connected boards, maintenance, start counter and some other variables are displayed.

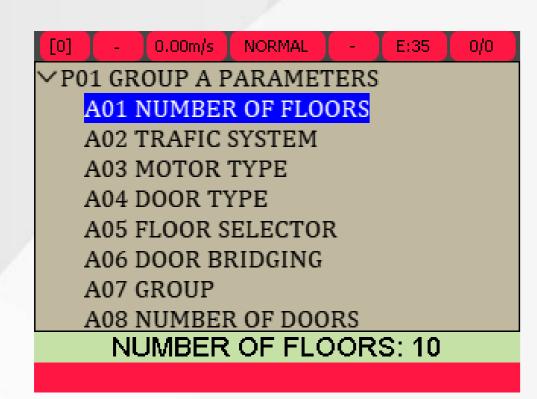


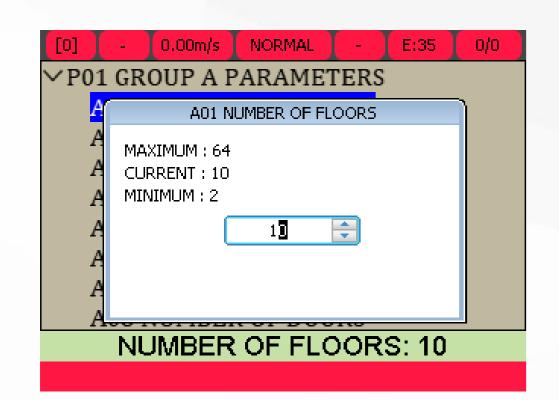
- Pressing ENT button in main screen leads to the menu.
- In this screen you can move by using cursor keys (arrows).
- In order to enter into an application or sub-menu come to the related icon by using cursor keys on the screen and press ENT when its icon is highlighted.
- For example, select Parameters and press ENT while parameter icon is being highlighted.
- So, you will go into parameter menu.

LED PANEL – PARAMETER MENU









The parameters can be edited in parameter menu.

P01-GROUP A PARAMETERS: These parameters are denoted with a prefix letter 'A' as Axx. Main parameters define the type and basic functions of the lift. They can be modified only when the lift is resting.

P02- GROUP B PARAMETERS: These parameters are denoted with a prefix letter 'B' as Bxx. Auxiliary parameters define most of the functions of the lift. They can be modified at any time.

P03-TIMER PARAMETERS: These parameters are denoted with a prefix letter 'C' as Cxx. Timer parameters store all of the user definable timer settings. They can be modified at any time.

P04-SPEED PARAMETERS: This section contains parameters for speed adjustments. They can be modified only when the lift is resting.

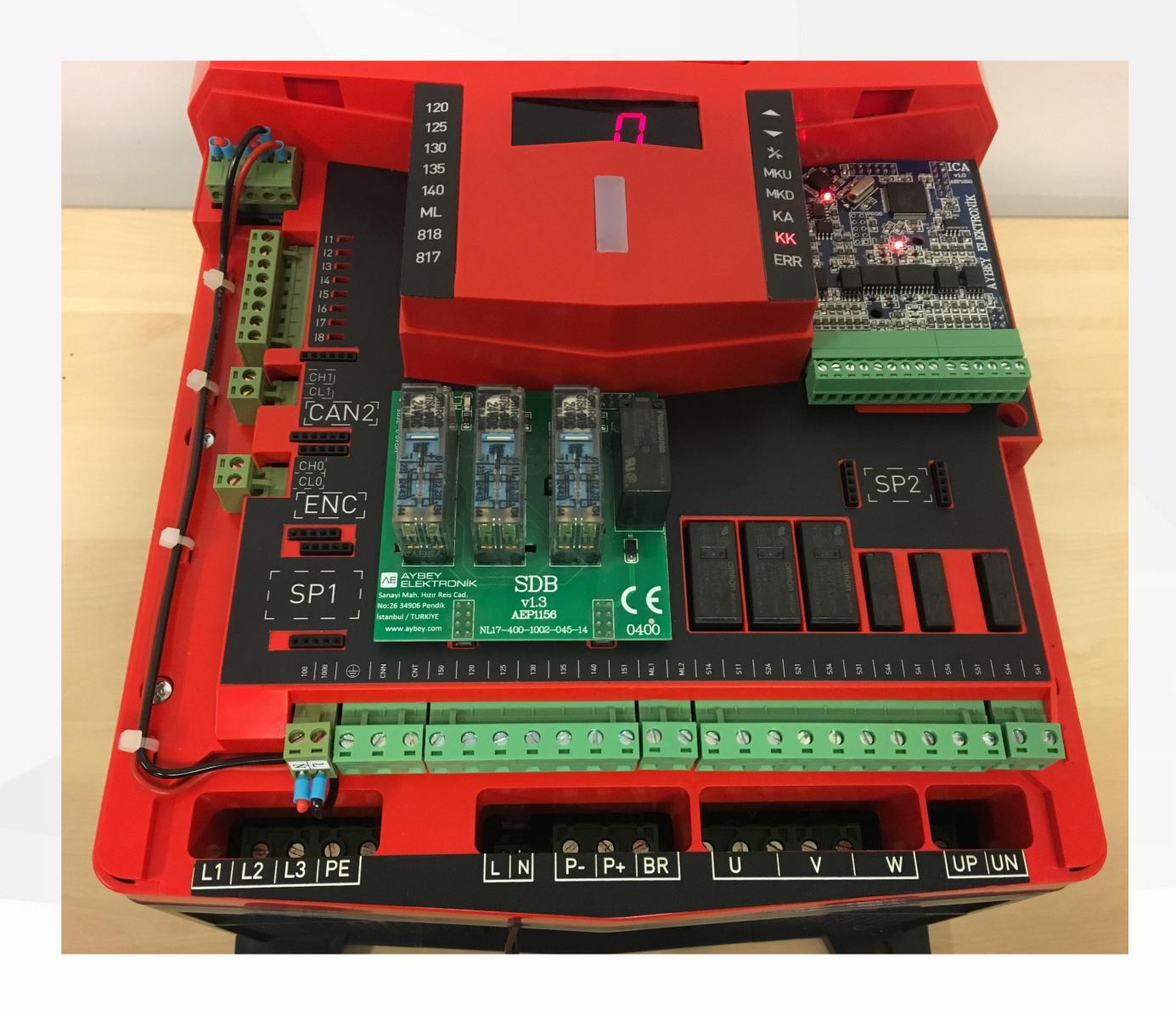
P05-CONTROL PARAMETERS: Control parameters are mainly the parameters which are used to control the behaviour of the motor. They can be modified only when the lift is resting.

P06-MOTOR PARAMETERS: This section has parameters on motor and encoder specifications. They can be modified only when the lift is resting.

P07-HARDWARE PARAMETERS: These parameters store the settings for the hardware of the device.



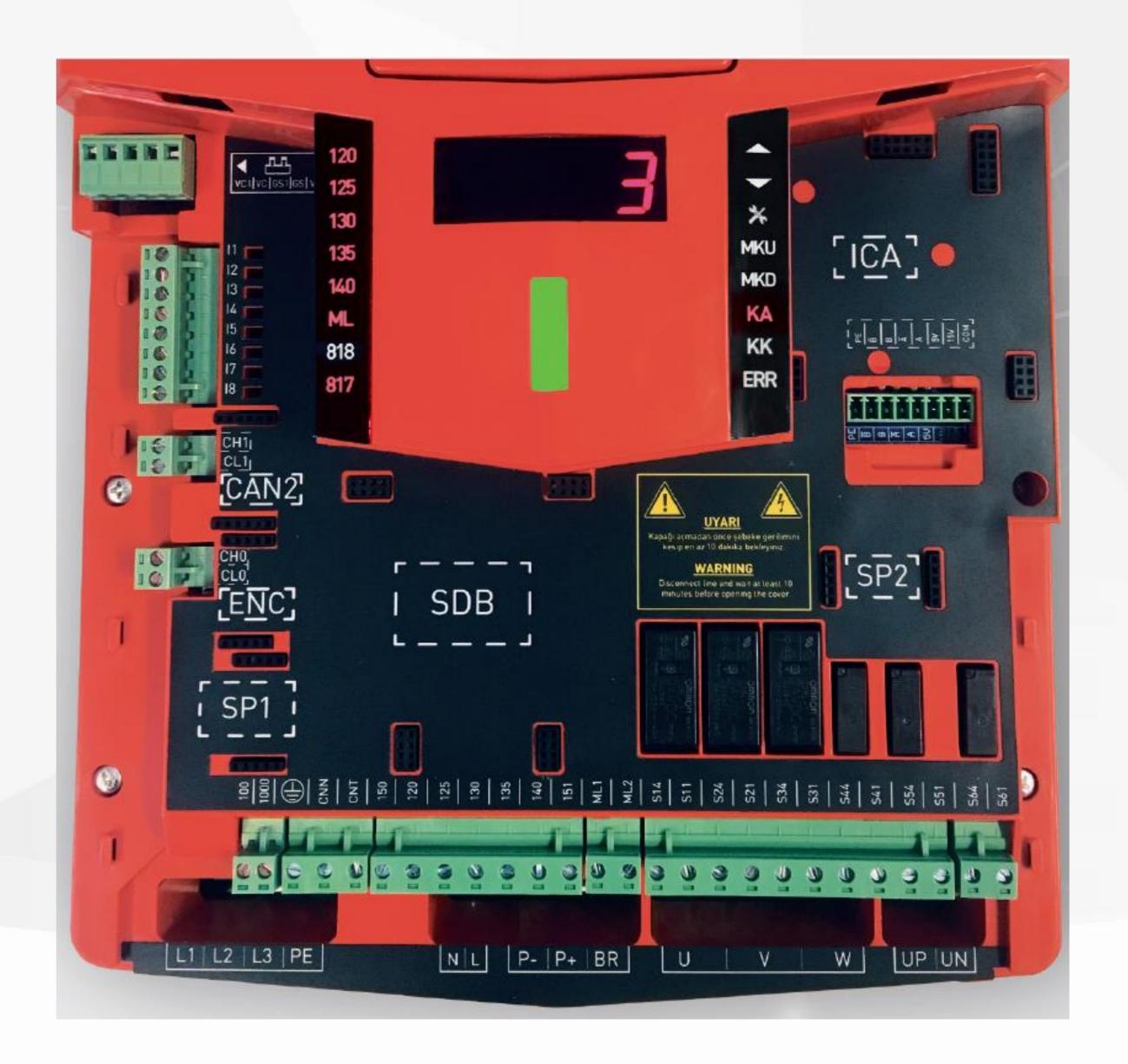
- All low current connections done behind the top cover
- Additional function boards mounted here.
- Electronic boards except the additional function boards are restricted to access.
- Cables can be fixed by cable tire at the both sides.





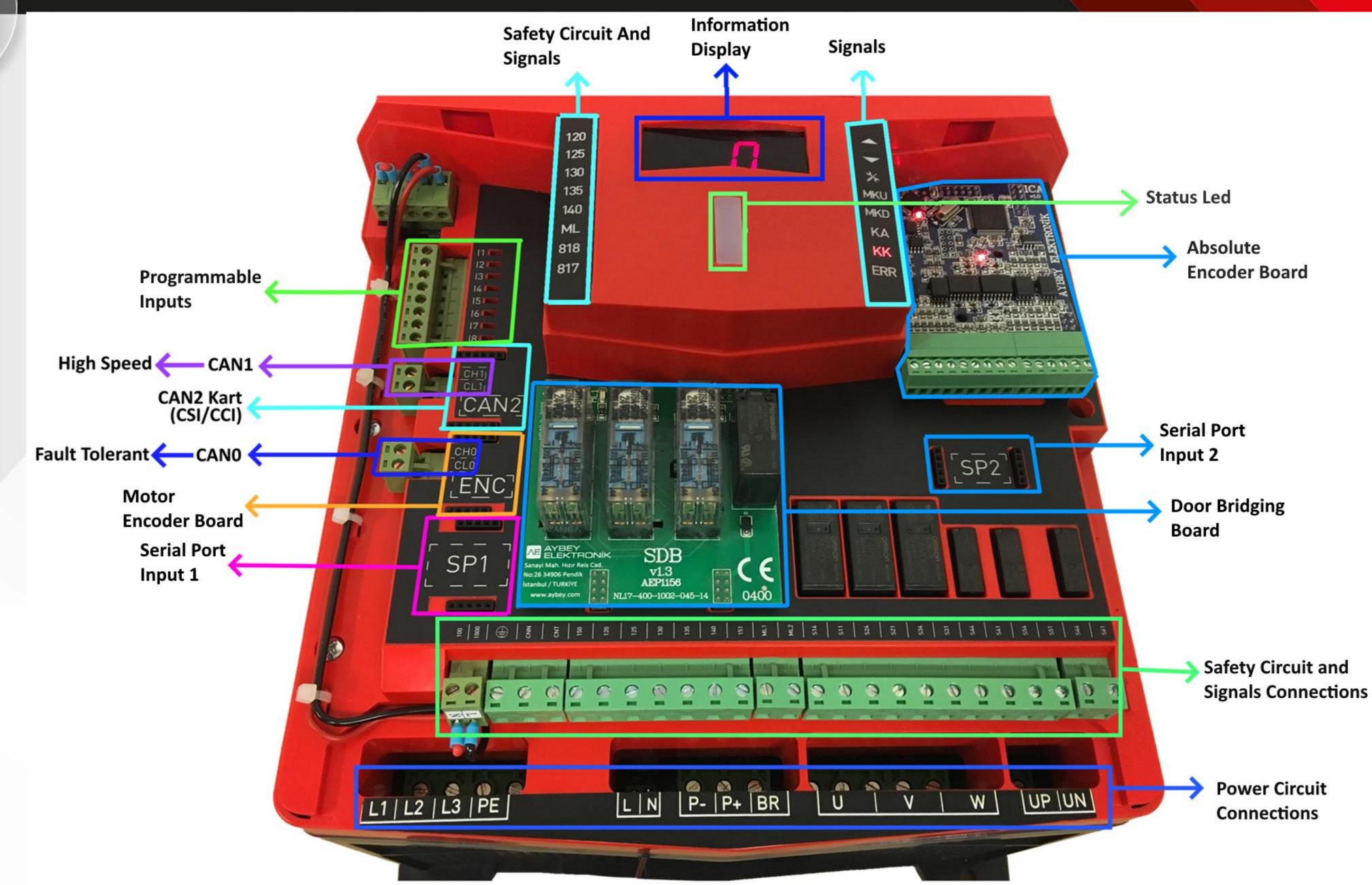


 Locations for all the additional boards are specified behind the top cover.



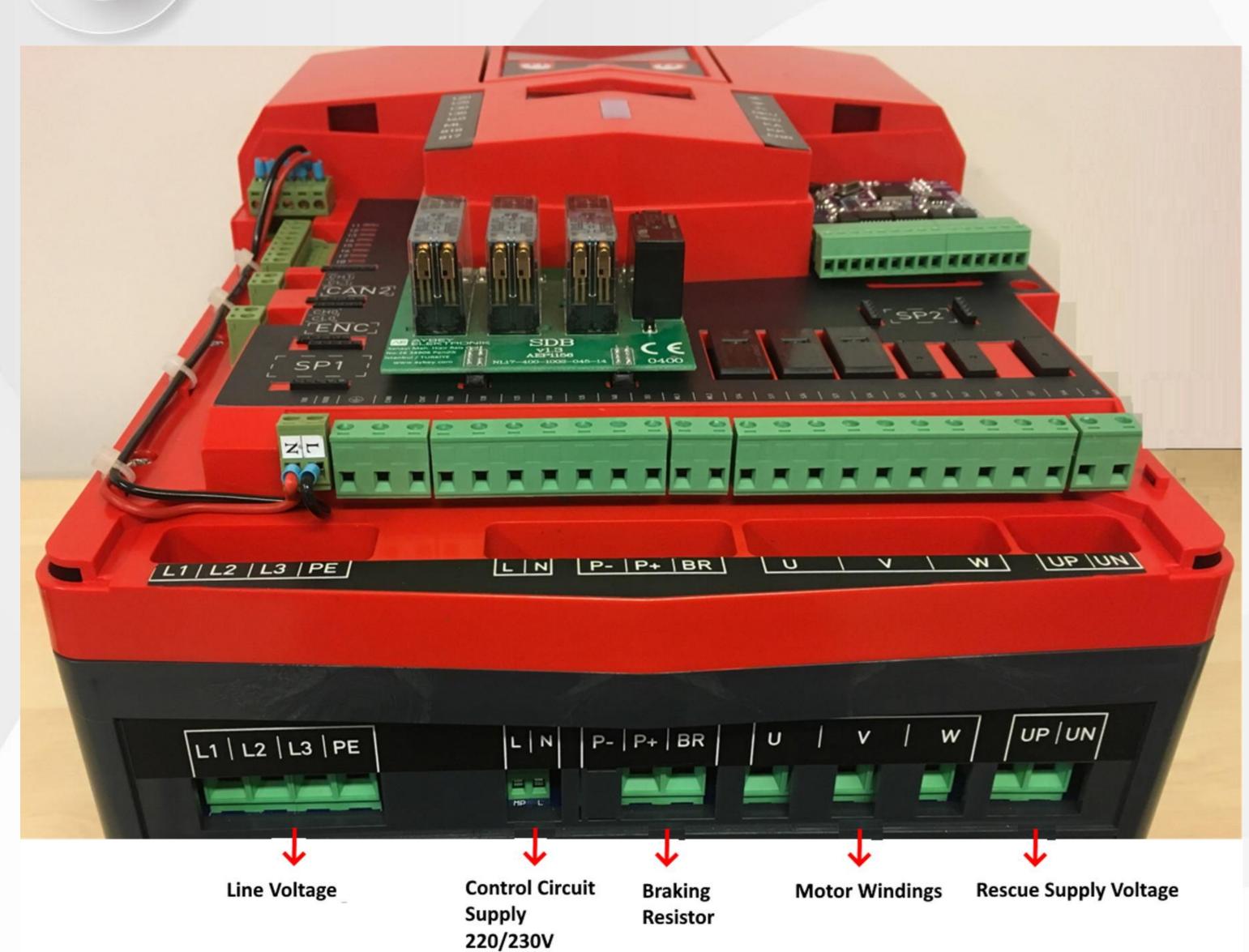
DEVICE CONNECTIONS AND ADDITIONAL BOARDS





POWER SUPPLY AND MOTOR CONNECTIONS





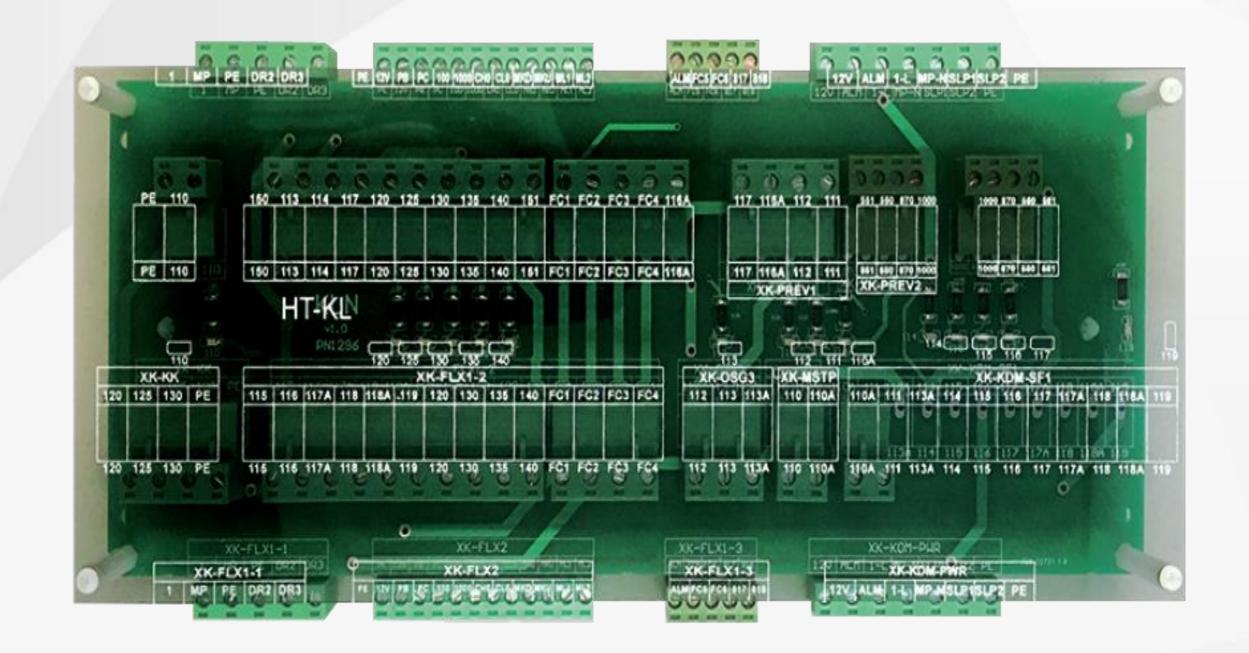
Connections to power supply, motor and braking resistor done through terminal at the bottom of the system.



Connections of all signals and safety circuit done through terminals behind the top cover, which is indicated by yellow rectangular below.







HT-KL Board serves as the terminal of the controller.

The terminals for the flex cable are on HT-KL board.

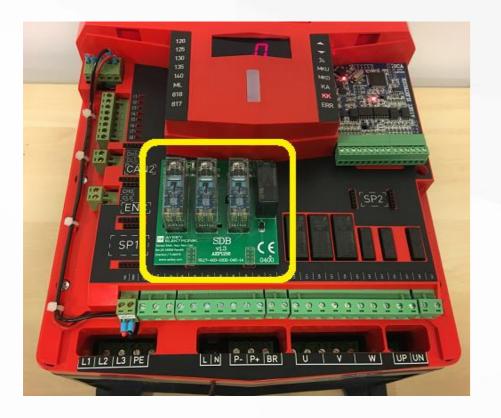
There are two pieces flex cables between car and controller, one 12 the other 24 wires.





SDB Door Bridging Board



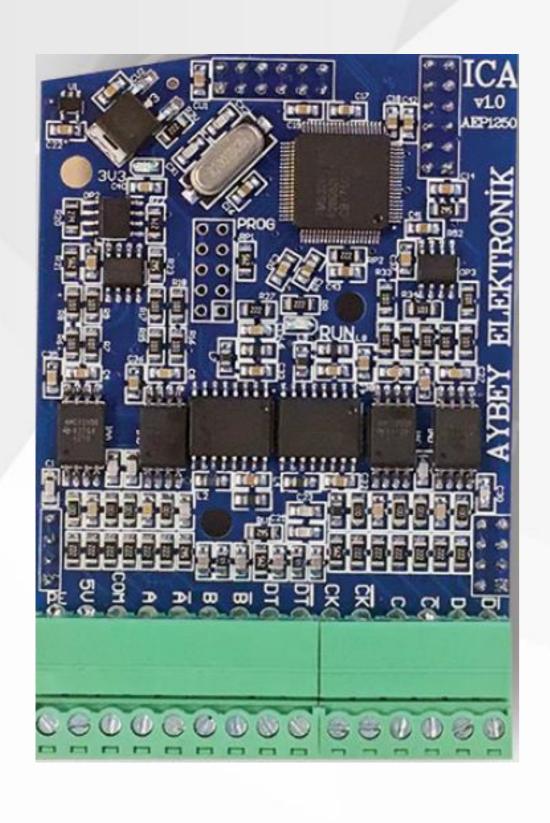


- > It is a **certified** board in charge of bridging door contacts and safety relays.
- Mounted into SDB socket at AE-MAESTRO controller system.
- > Application:
- Levelling
- Early door opening
- Floor levelling inside car in case of encoder as floor selector.
- Mandatory to use this board according to EN81-20/50 standards. Open door test which is necessary for the standard can be done by SDB.





ICA Absolute Encoder Board



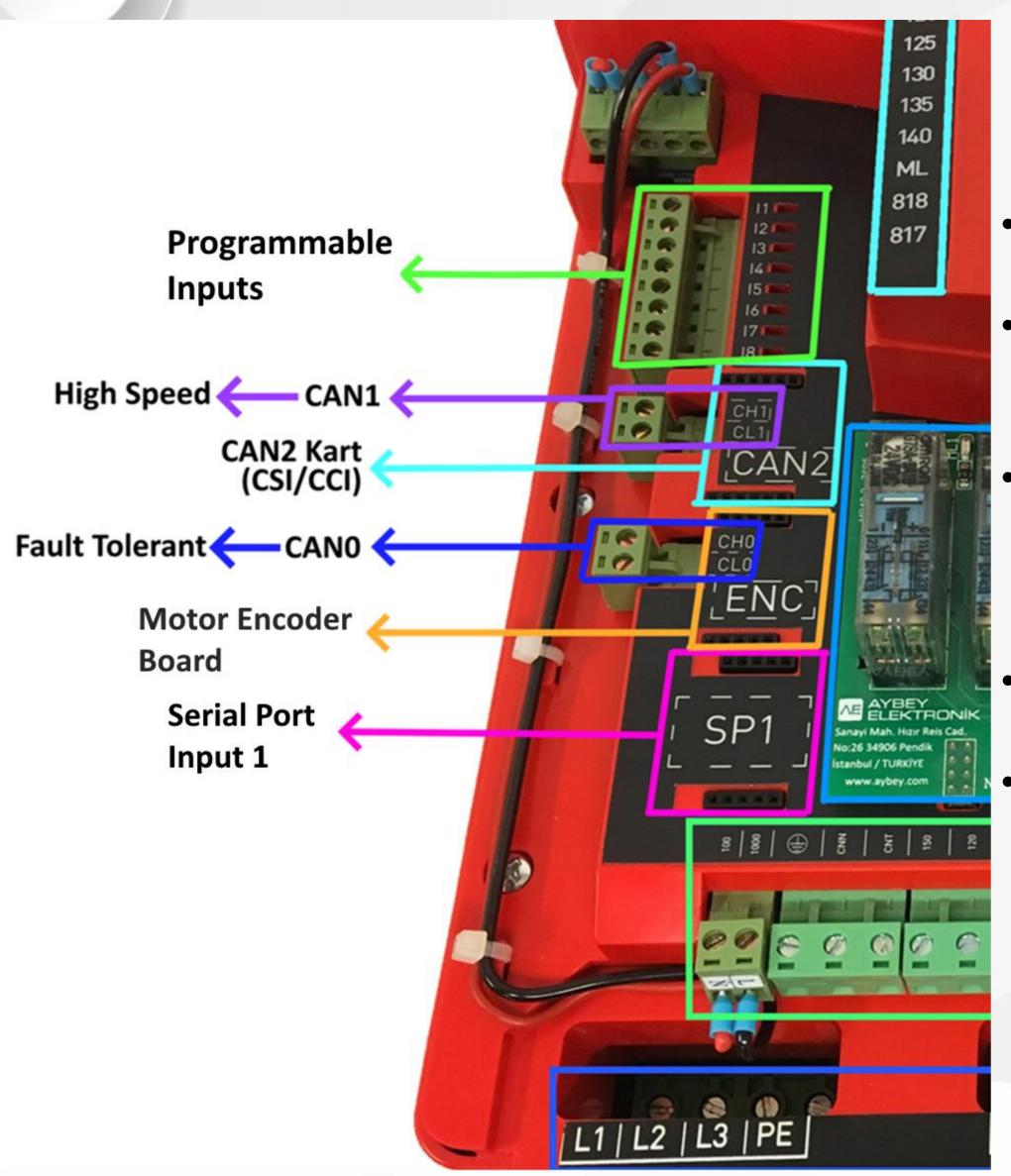


[M16] – ENCODER TYPE

0	INCREMENTAL	Closed Loop Asynchronous Machine
1	ENDAT	Synchronous Machine
2	SINCOS	
3	BISS (Gray)	
4	SSI (Gray)	
5	ENDAT-SPI	
6	BISS-BINARY	
7	SSI-BINARY	

- > ICA Absolute Encoder board is used within gearless machines (synchronous motor).
- Mounted at ICA socket on AE-MAESTRO controller system.
- Supports SinCos, EnDAT, biss and SSI encoders.
- > Parameter M16 must be set depending on encoder type selected in application.





- Terminals of CAN 0 and CAN 1, 8 programmable inputs behind the top cover.
- CAN 2 can be become active by using CSI and CCI depending on the requirments of application.
- In case of shaft encoder(mounted on speed governor regulator) as floor selector, Incremental encoder board is connected to ENC socket. No more functions.
- Communication channels are SP1 at the left side and SP2 at the right side.
- SP1 and SP2 sockets are suitable for boards of USB, Ethernet, RS232, RS485 communications.

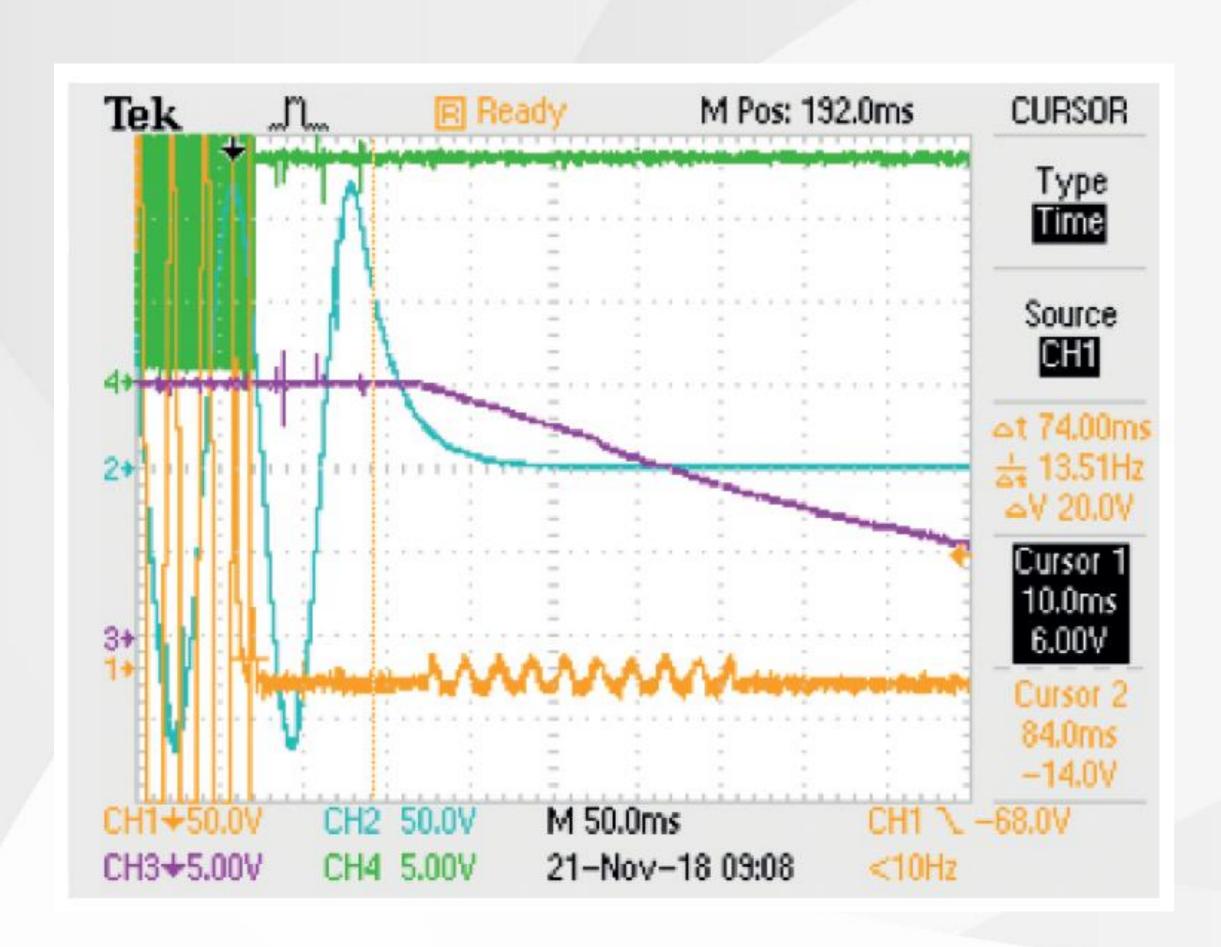




AE-MAESTRO is contactorless integrated lift control system.



As a result of the compatability (Safe Torque Off – STO) of AE-MAESTRO which could be connected to directly motor without contactor, it is approved and certified after a series of challanging tests

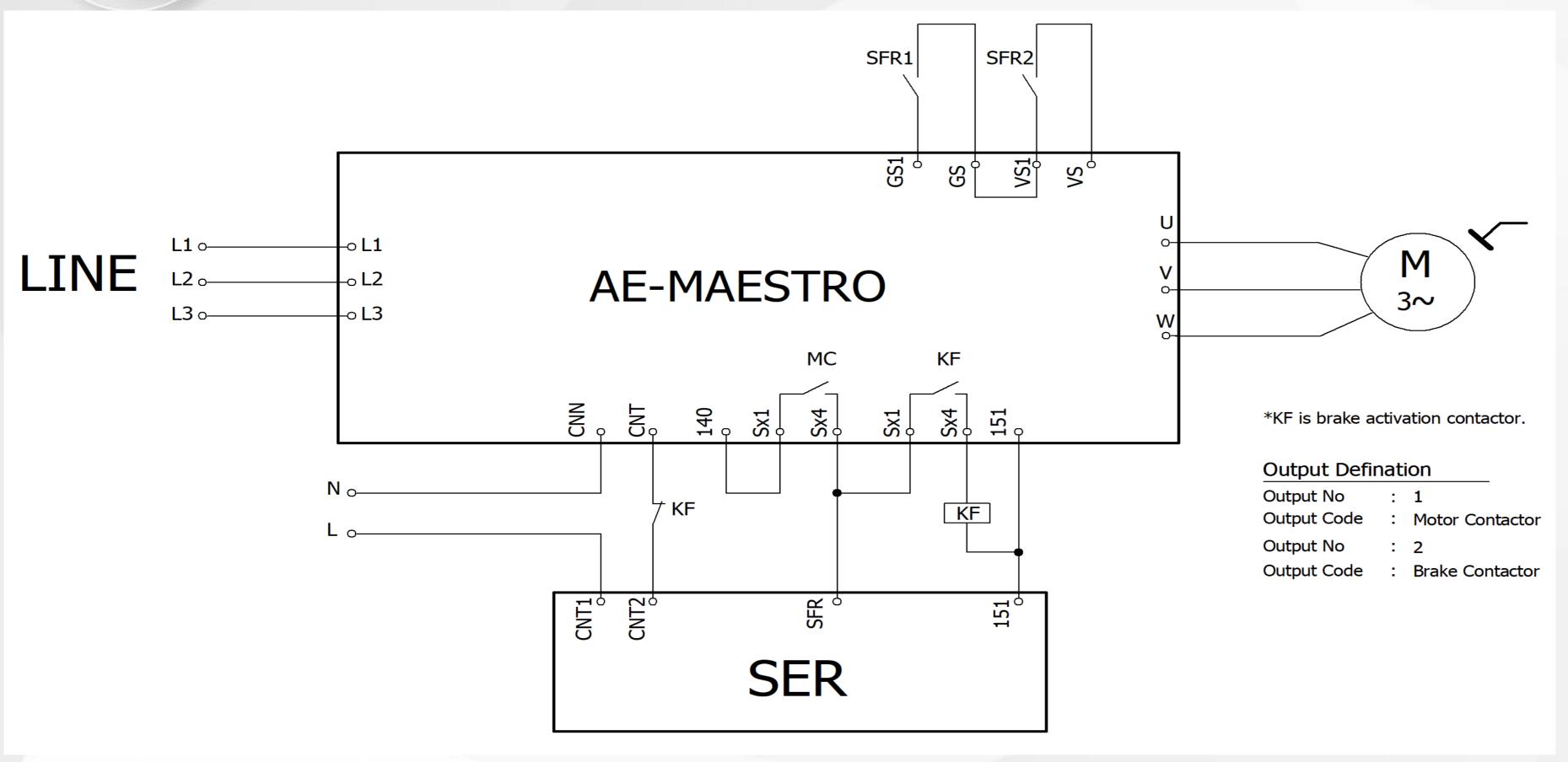


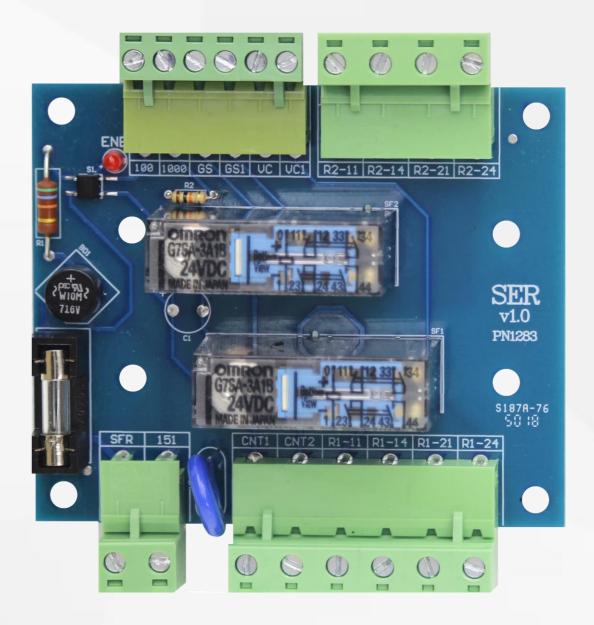
Motor current cuts down by 80 ms whenever Safety circuit breaks down with STO.

- The system detects in a short period and stops motor in case of dangerous circumstance happened.
- It cuts down current to motor electronically by 80 ms whenever safety circuit breaks down.
- The reliability of the system is verified by a wide variety of tests.



Contactorless Operation with SER Board





SER Safety Board

The other way to drive without contactorless is to get SER board.

It covers safety relays and circuit required.

No need for power contactors in case of SER.



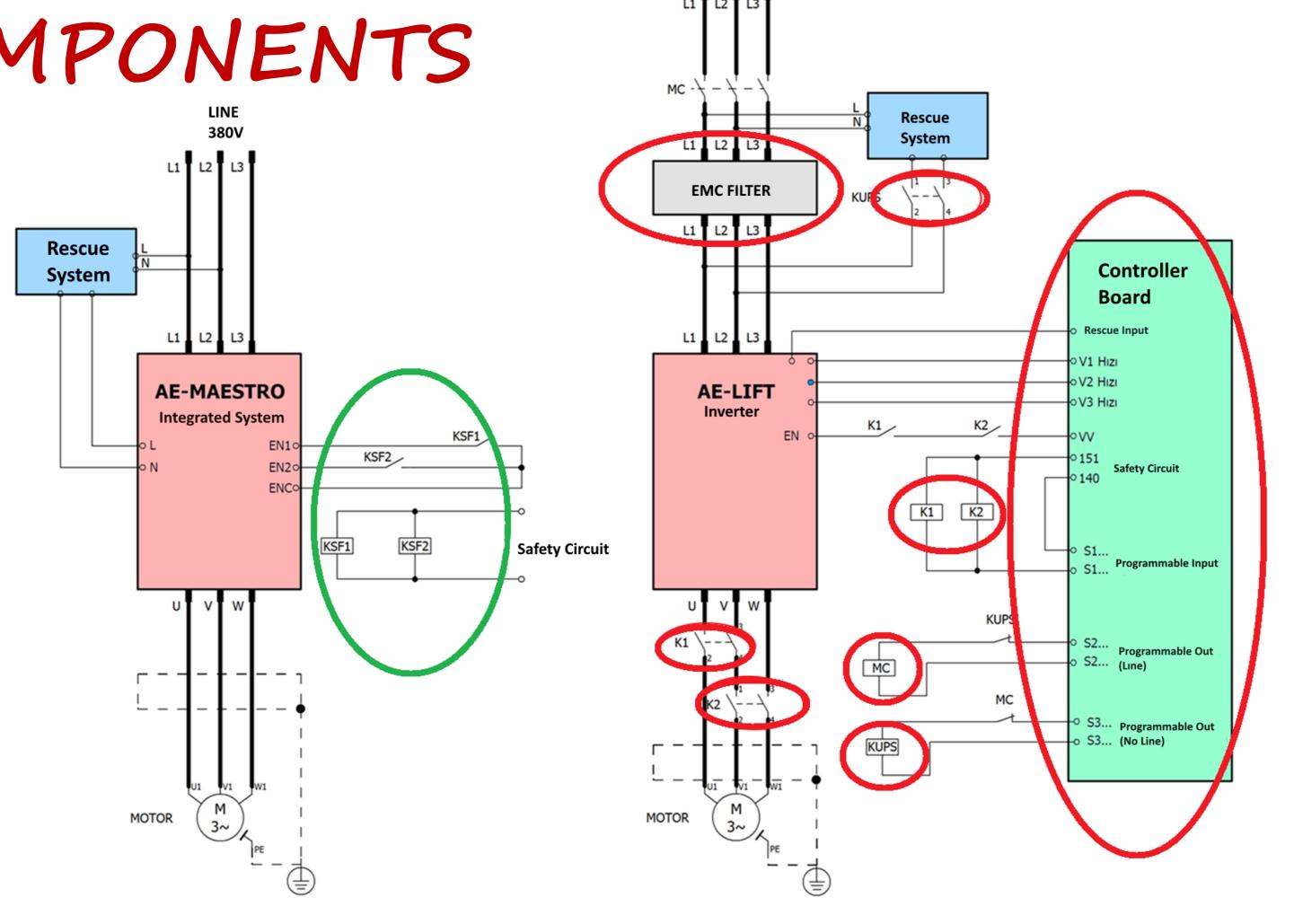




- Control panel without contactors works silently because of no mechanical switching components.
- Transistor outputs of motor driver are never switched mechanically.
- Transistor current is always dampened through motor winding and damping never stops.
- That's why **lifetime of power transistors (IGBT)** which is the most sensitive components of the system will be **longer.**
- This leads to longer lifetime for the whole system.
- Less components will be needed in control panel.
- Connections is less and simple.
- Less connections and components, less malfunctions.



LESS COMPONENTS



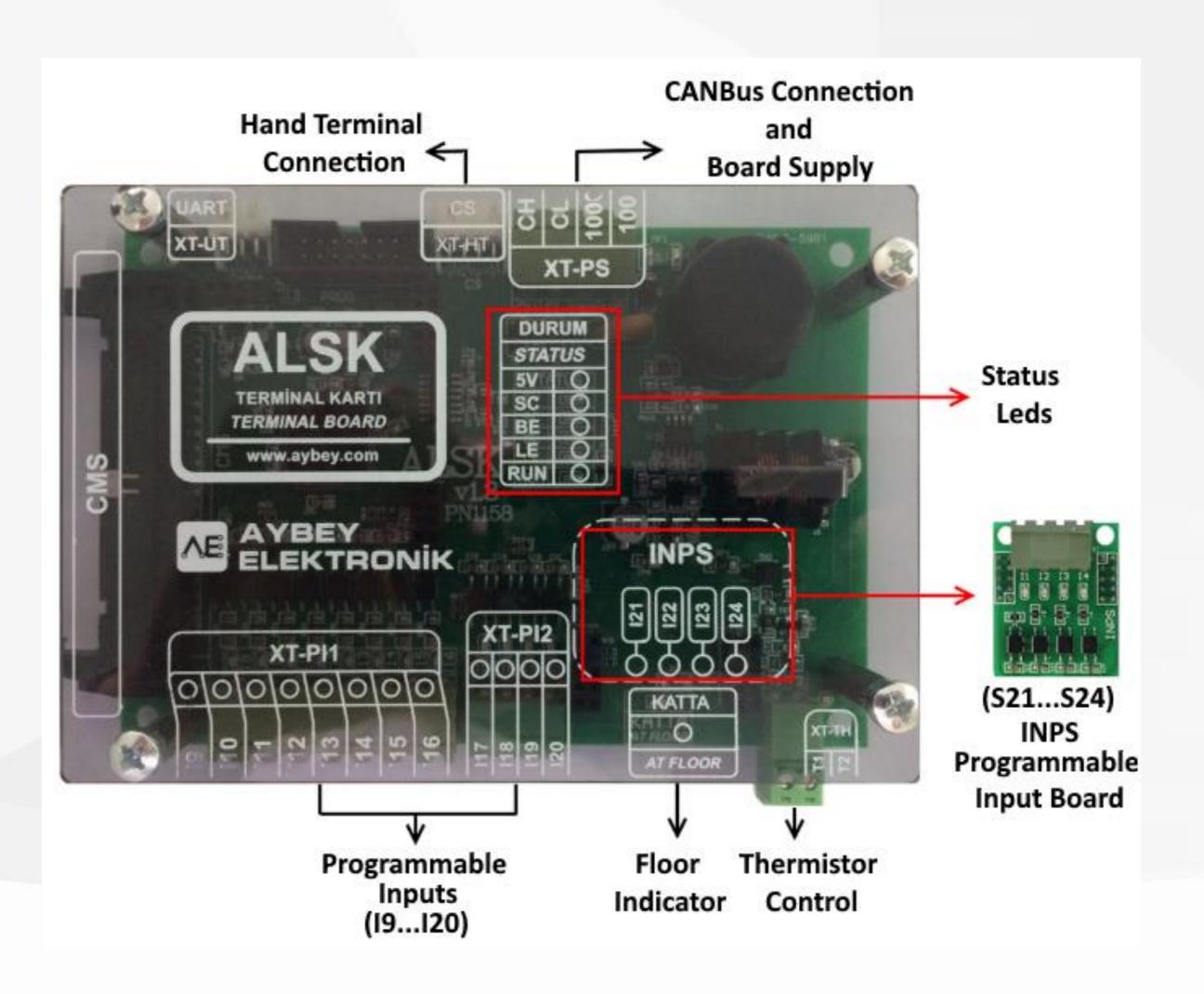
380V





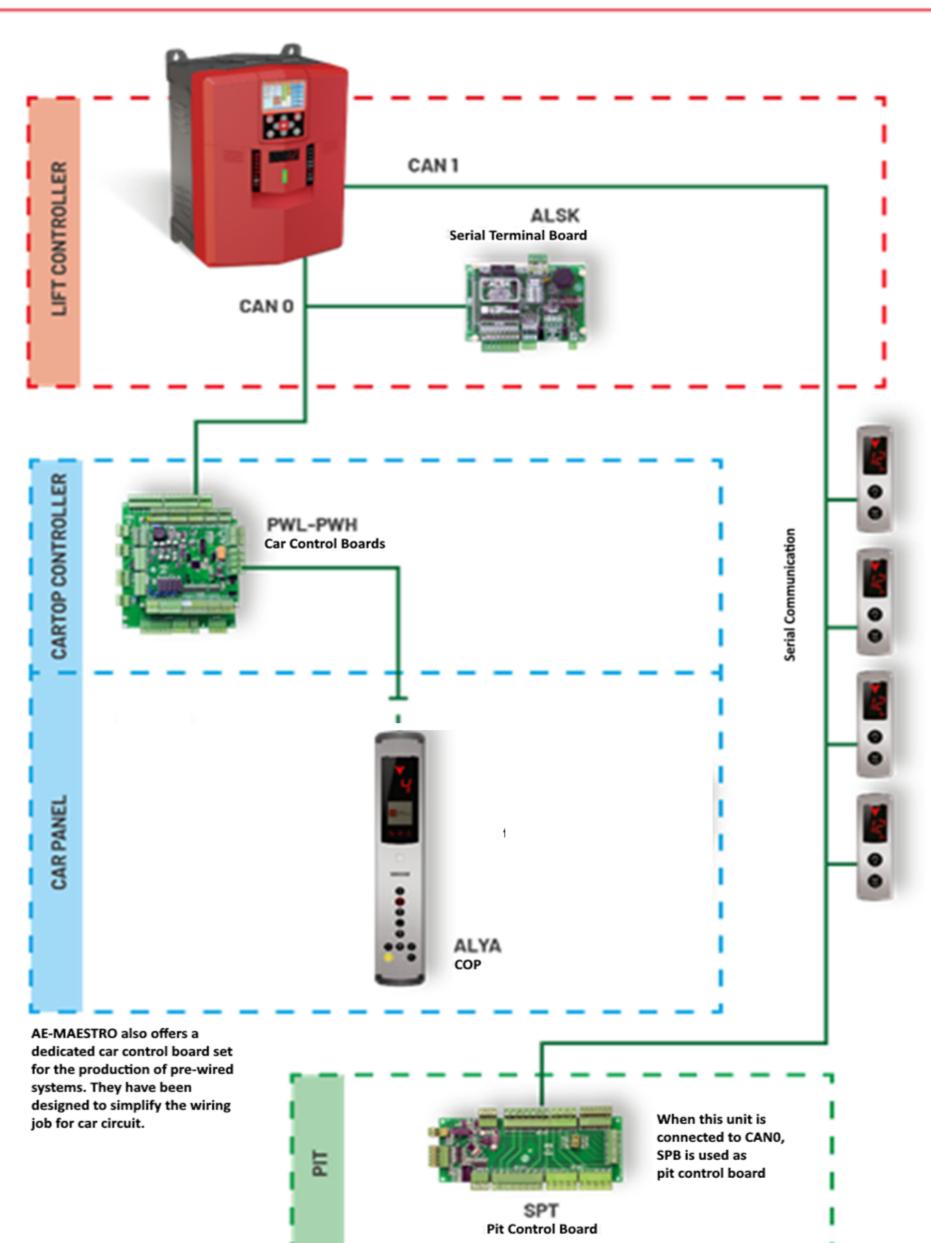
ALSK Terminal Board

- ➤ It is the terminal board of AE-MAESTRO system in full serial communication.
- Communicates with AE-MAESTRO over CAN-Bus.



SYSTEM BOARDS IN PREWIRED CONNECTIONS

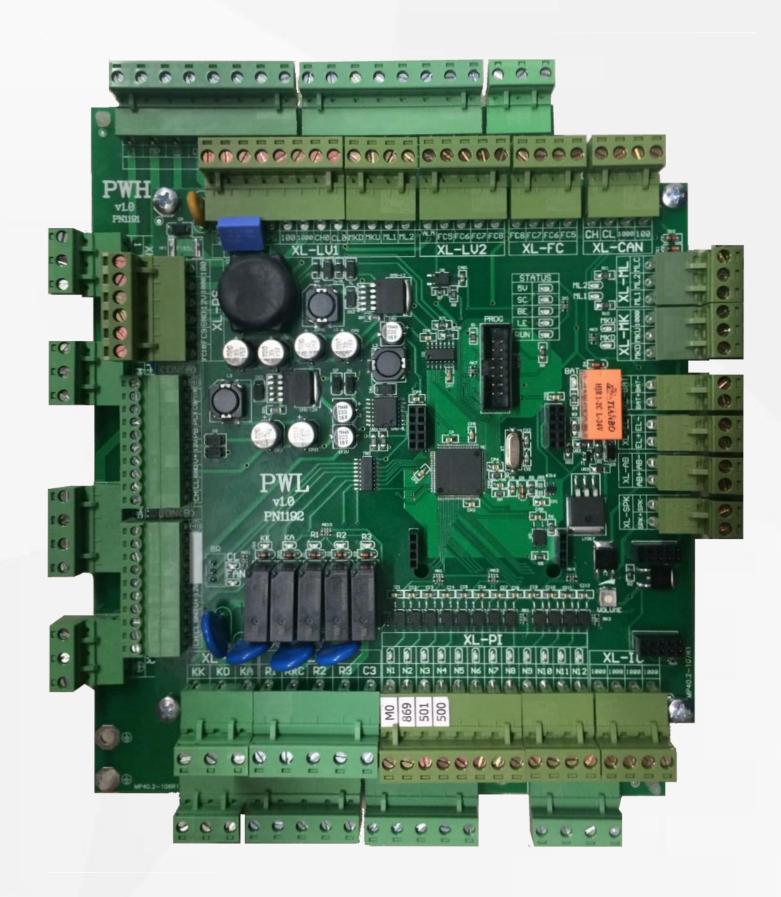
- Components used in connections of landing and panel in full serial communication systems are the same in pre-wired systems.
- The difference is the cabinet circuit comparing to non pre-wired systems.
- Cabinet control board consists of two boards called as PWL-PWH.
- Those board are directly connected to flexible cable.
- 10 wire cable from PWL goes to cabinet panel.
- PWS located inside car panel drives buttons.
- **PWS-C** board has to be selected in case of other brand car panel.
- ALYA BELLA series car panel is directly connected to PWL. No need for PWS board.



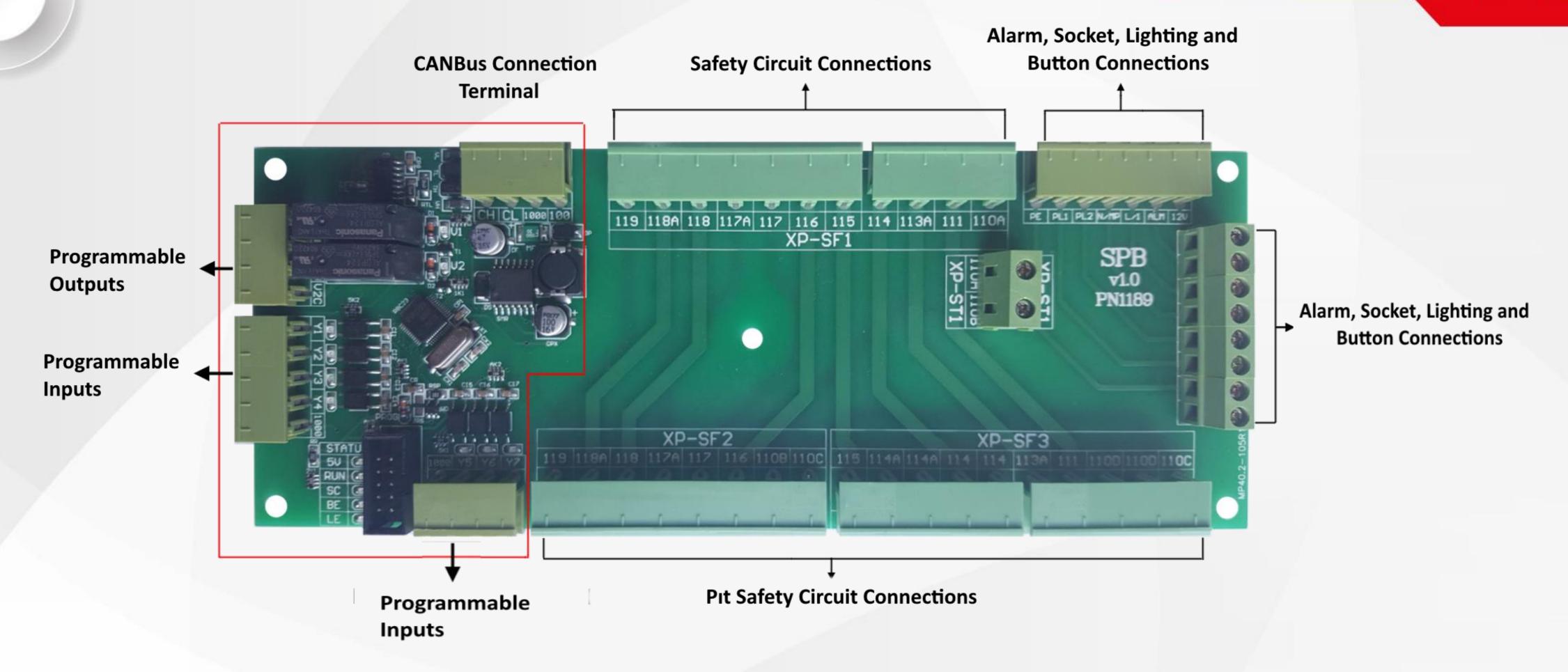


CAR CONTROL BOARDS IN PRE-WIRED SYSTEMS – PWL-PWH

- > Those are car-top control boards in pre-wired systems.
- > PWL provides communication between car board (PWS) and AE-MAESTRO.
- ➤ PWL is the board for low voltage(24V) terminal connections. (for example: Alarm, battery, magnetic switch, programmable input and output connections, etc.)
- PWH is a transition board for high voltage(220V) terminal connections (For example: Automatic door supply voltage, cabinet light, power outlet, photocell supply voltage, fan, etc...)
- > ALYA ve BELLA series car panel could be directly connected.
- Supports 2 car panels.







- > Pit end board is used as a junction box for safety circuit connections between inspection box and mainboard.
- ➤ Inputs at the pit end are transmitted to mainboard by CAN-Bus.
- Included by pit end unit.
- > SPB is used in fault tolerance application and SPT in high speed applications.

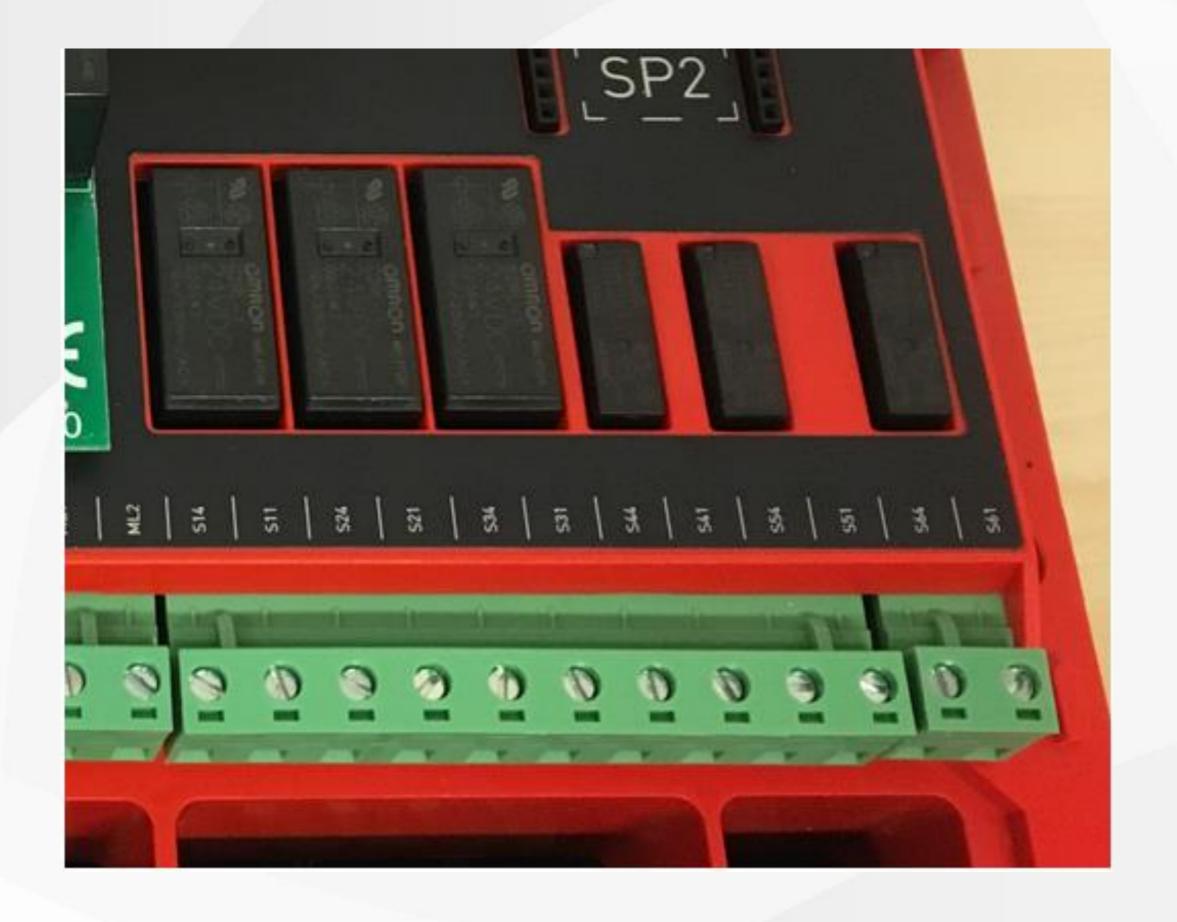


Number of Programmable Inputs

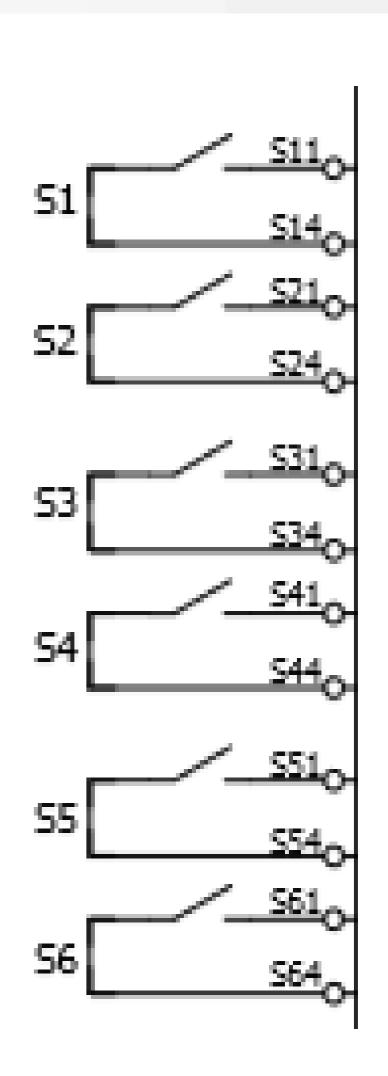
	Default	Optional
AE-MAESTRO Control Board	8	
ALSK Terminal Board	12	4 (INPS)
PWL Car Control Board	12	4 (INPS)
PWS Car Panel Board	1	4 (INPS)
SPB Pit End Board	7	_

Number of Programmable Outputs

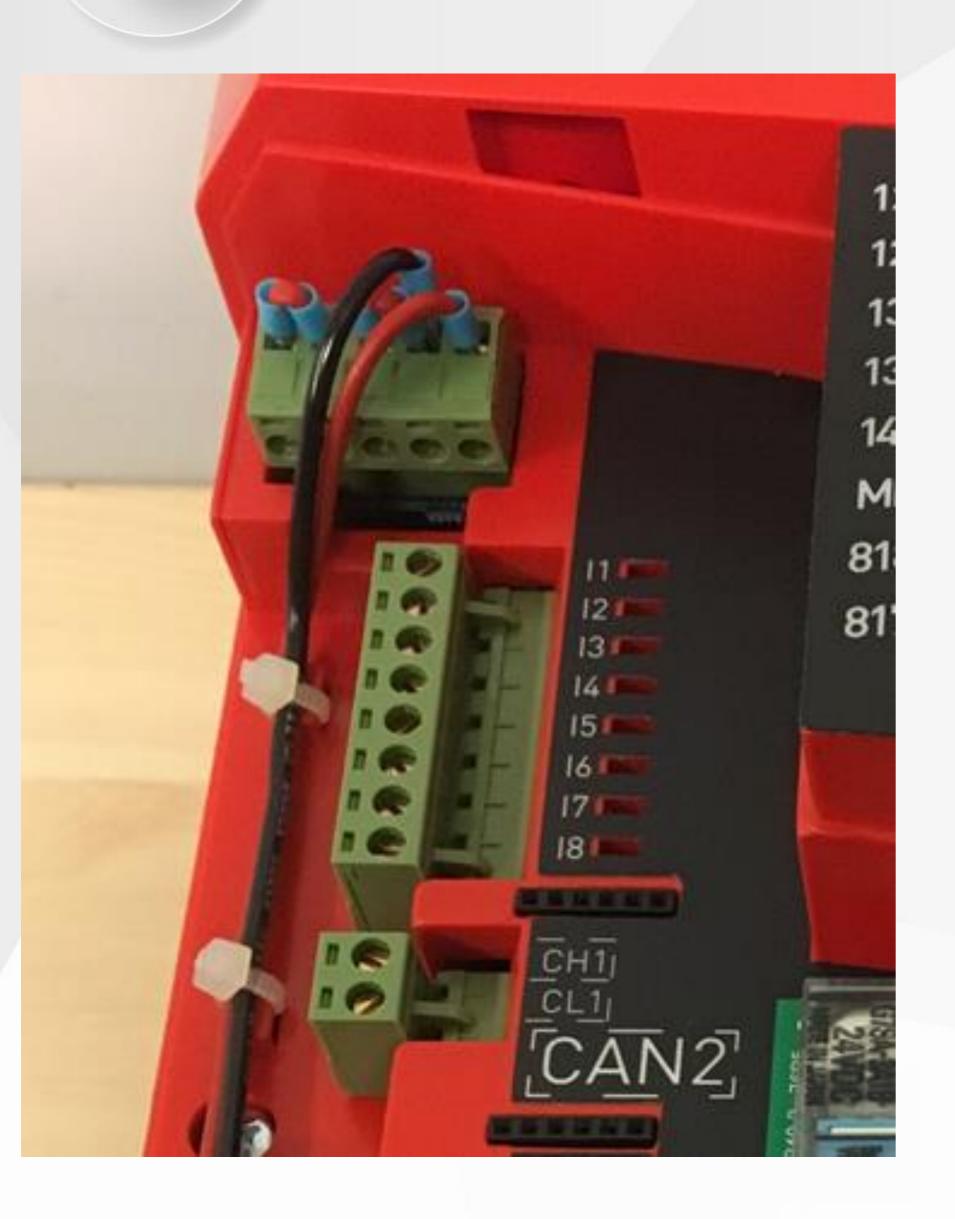
	Default	Optional
AE-MAESTRO Control Board	6	
PWL Car Control Board	3	4 (OUT)
PWS Car Panel Board	1	-
SPB Pit End Board	2	-

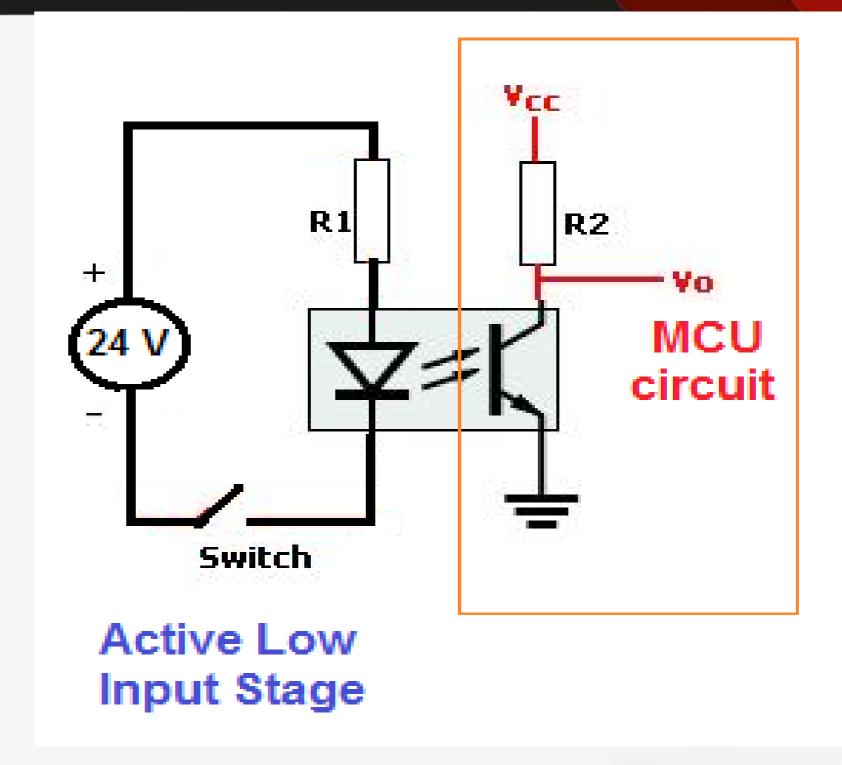


- There are 6 programmable N.O. relays on the device.
- Max. current for S1, S2, S3 is 10A.
- Max. current for S4, S5, S6 is 3A.









- All inputs except ML1-ML2 and safet circuit are active negative.
- It means that an input is assumed as active when connected to the earth reference (0V) of DC power supply.
- All inputs are galvanically isolated and connected to circuit by optical components.

INPUT NO	PLACE / SOCKET	BOARD NAME	TERMINAL NAME
I1I8	PANEL / TERMINAL	AE-MAESTRO	I1I8
I9I16	PANEL / TERMINAL	ALSK	I9I16
121124	PANEL / TERMINAL	ALSK (INPS)	121124
N1N12	CAR / TERMINAL	PWL	N1N12
N13N16	CAR / TERMINAL	PWL (INPS)	I1I4
N17	CAR / TERMINAL	PWS	N17
N18N21	CAR / TERMINAL	PWS (INPS)	I1I4
Y1Y7	PIT CONTROLLER	SPB/SPT	Y1Y7

Locations of programmable inputs are shown in the chart above.

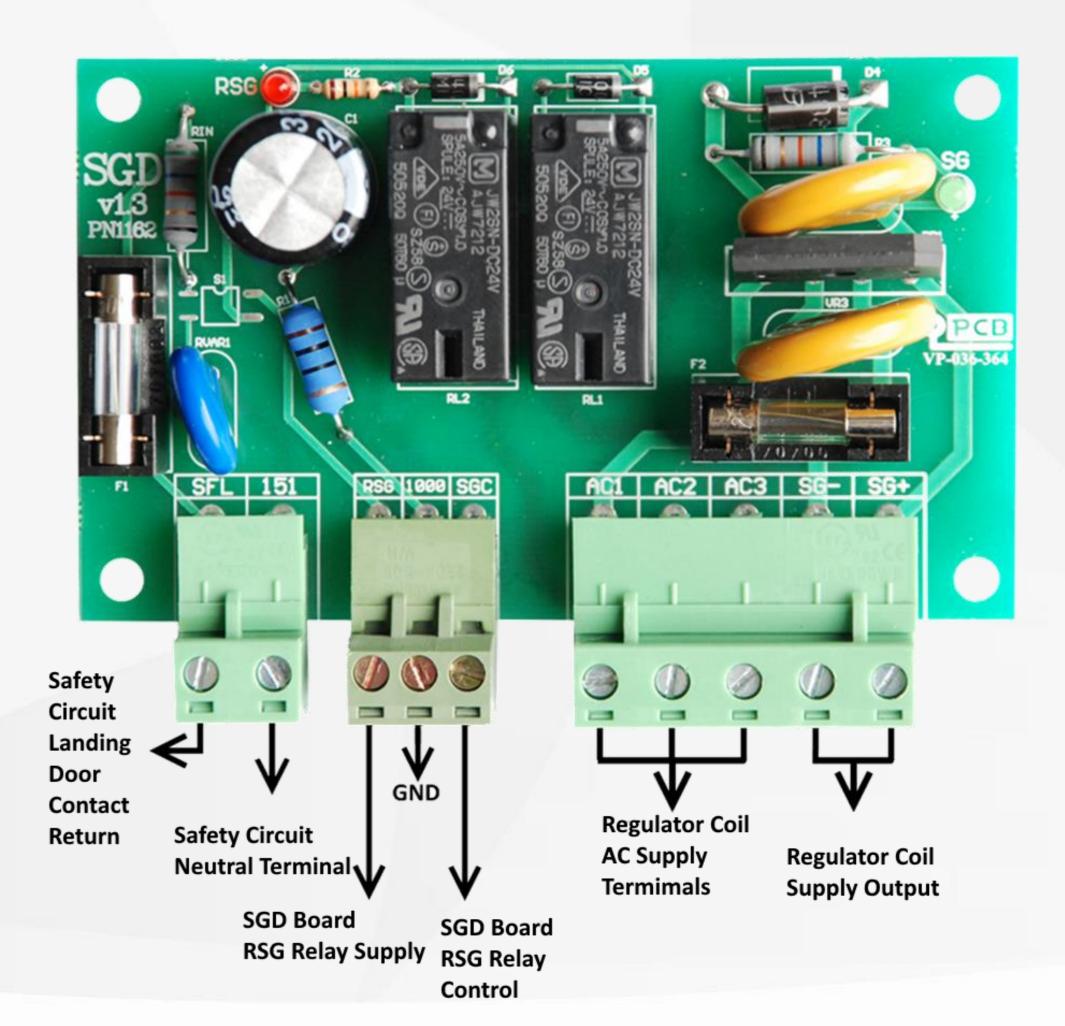


SGD Speed Governer UCM Control Coil Drive Board

- > It is a supply voltage board for UCM Governor coil at Speed governor.
- Located in Control Panel.
- Used in Asynchronous machine applications.
- ➤ Also possible to use it in gearless systems if parameter A27 is set to 1.
- No firmware inside.

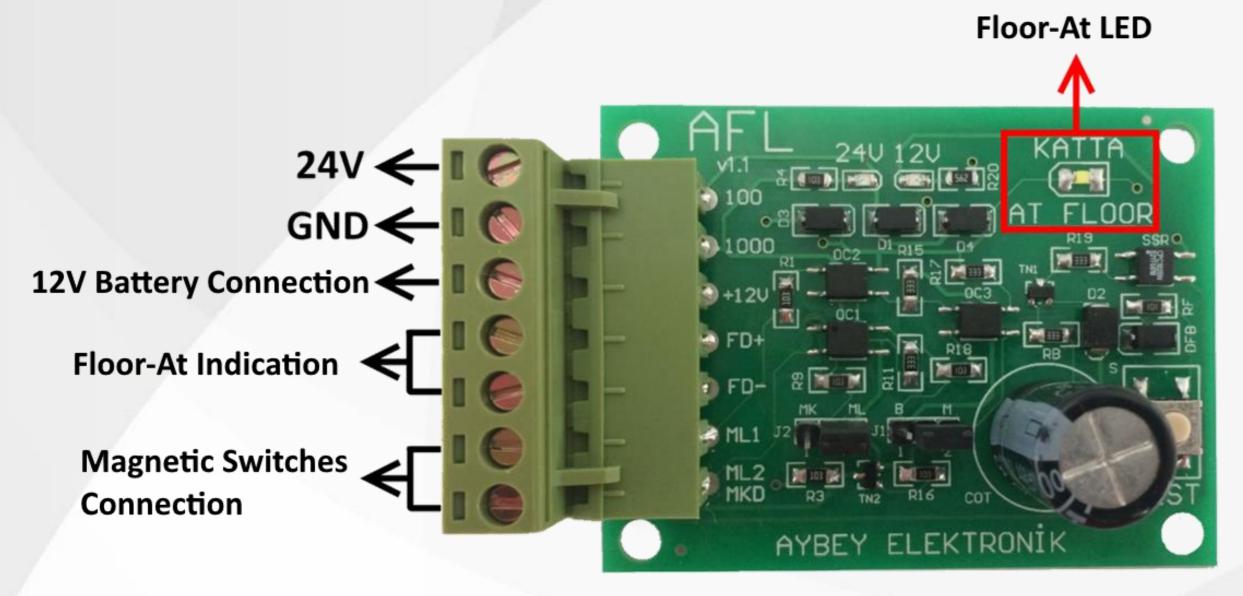
[A27] SGD in Gearless Machine

- Not userSGD board is not used in systems with gearless machines.
- Present
 SGD board is employed for UCM purposes in systems with gearless machines.





AFL Board Car At Floor Level Indicator



- It is a board of car floor-At indication (Floor-At LED is lit when lift is within door open zone.)
- No support from Battery charge but supplied by battery from inspection box when electricity goes out.
- > It also may provide external output of floor-at indication (by 12VDC)
- > It may work with monstable or bistable magnetic switches.
- Located in control panel.



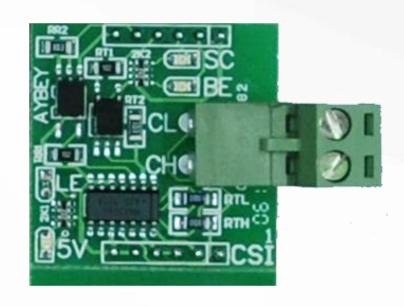
OPTION BOARDS

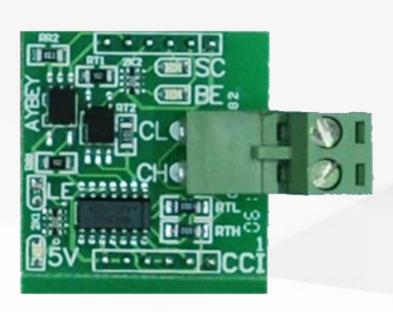
CSI: CAN-Bus interface Board for fault tolerant.

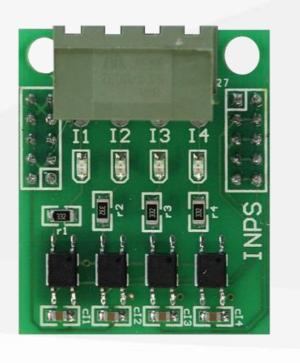
CCI: CAN-Bus interface board for high speed communication. It's used in landing panel circuit.

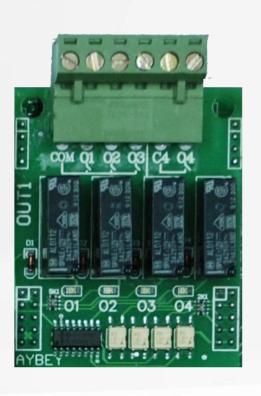
INPS: There are 4 programmable inputs on this board.

OUT: There are 4 programmable output relays on OUT board.







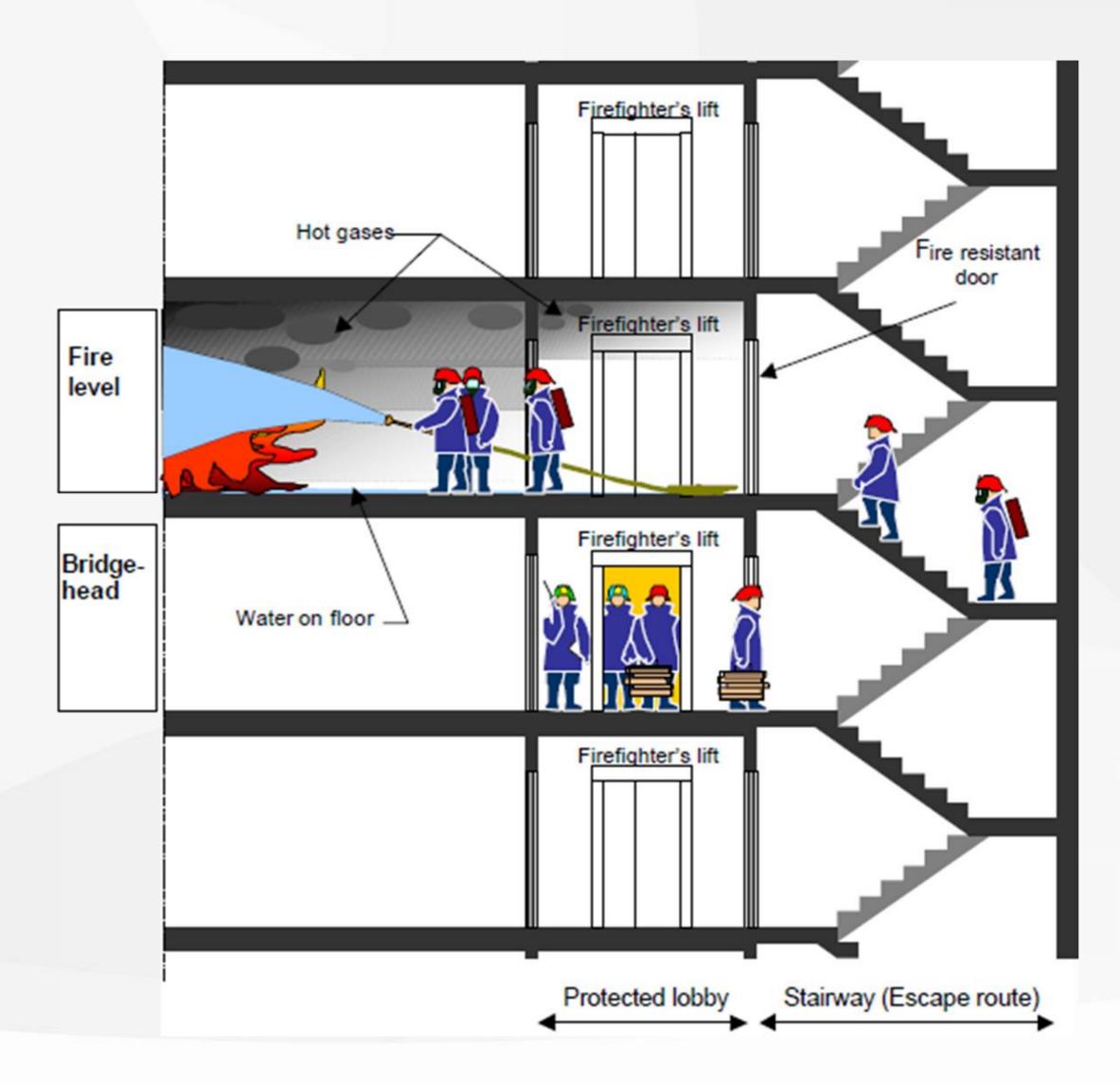






[A14] FIRE STANDARD

0	EN81-73
1	EN81-72 Fire fighter Lift
2	EN81-72 Fire fighter Lift with car fireman switch
3	Reserved
4	EN81-73 with blocking after operation







- AE-MAESTRO supports remote communication standard **EN 81 28**.
- It includes function of ALARM FILTER which prevents unnecessary usage of Emergency call phone.





Access to AE-MAESTRO CONTROL SYSTEM

- ➤ Computer access over USB and Ethernet
- ➤ Computer access over Local Network (LAN) or internet
- >Access by hand terminal in pit where CAN line is available





REMOTE ACCESS OPTION BOARD

USN: USB interface board..

ETN: Ethernet interface board for local network or internet access.

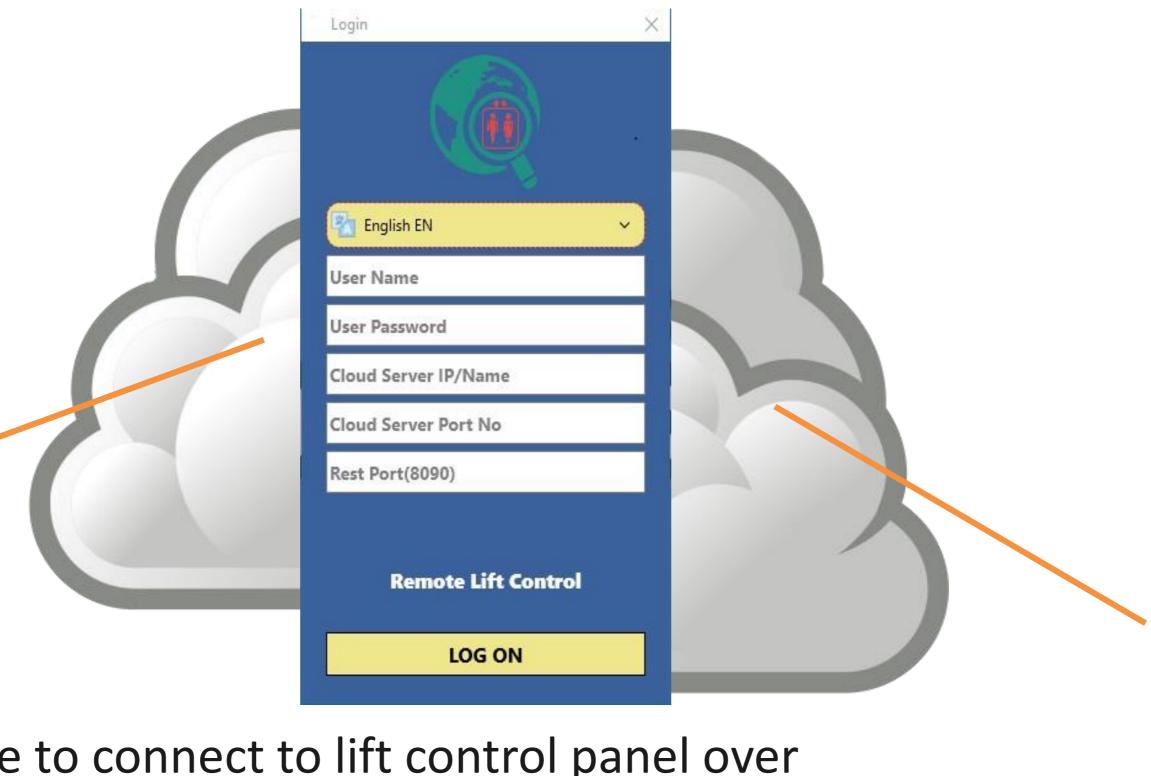




USN

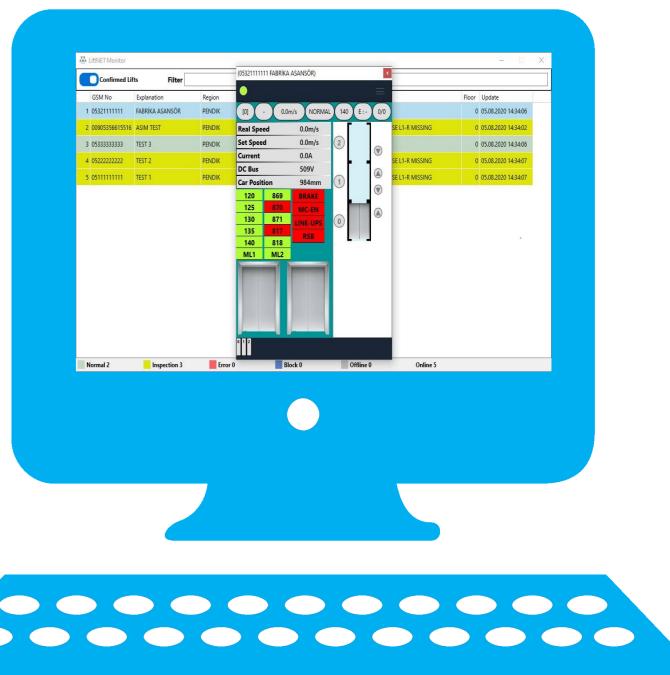


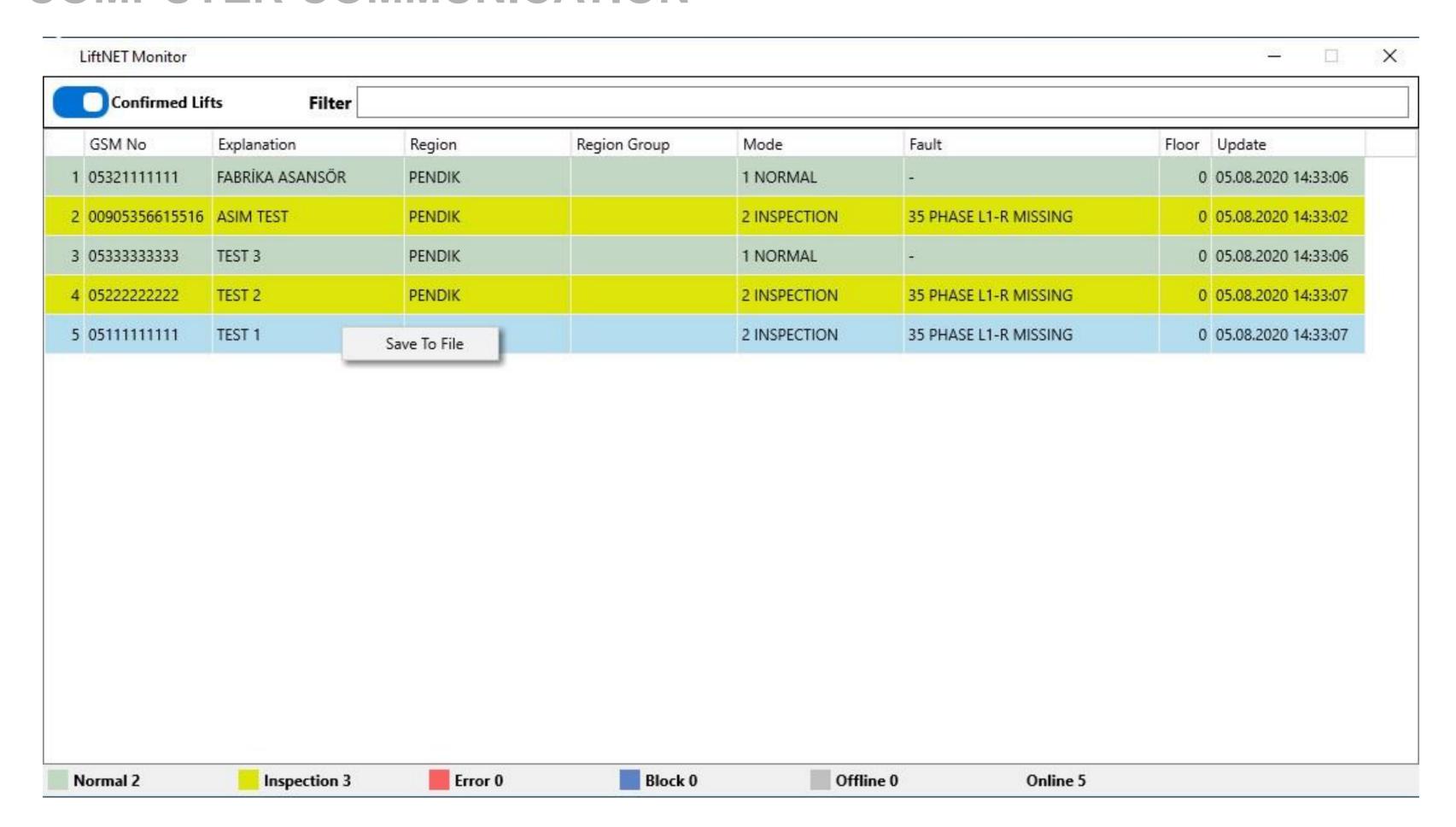




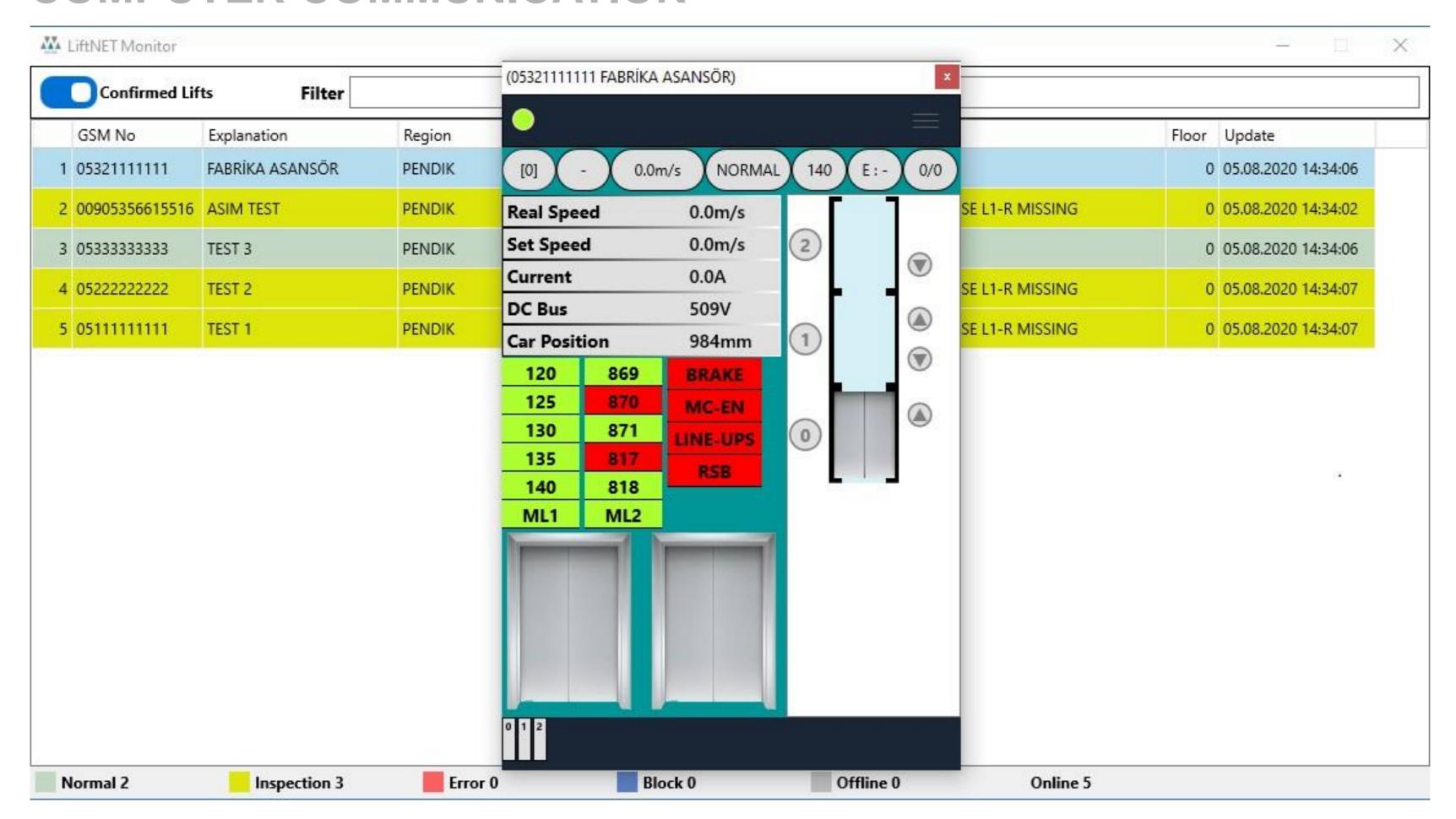
 Possible to connect to lift control panel over AybeyCloud.

- Lift companies may check all maintenance periods of lifts by getting cloud services.
- Control panel may connect to cloud service by GSM communication as well.

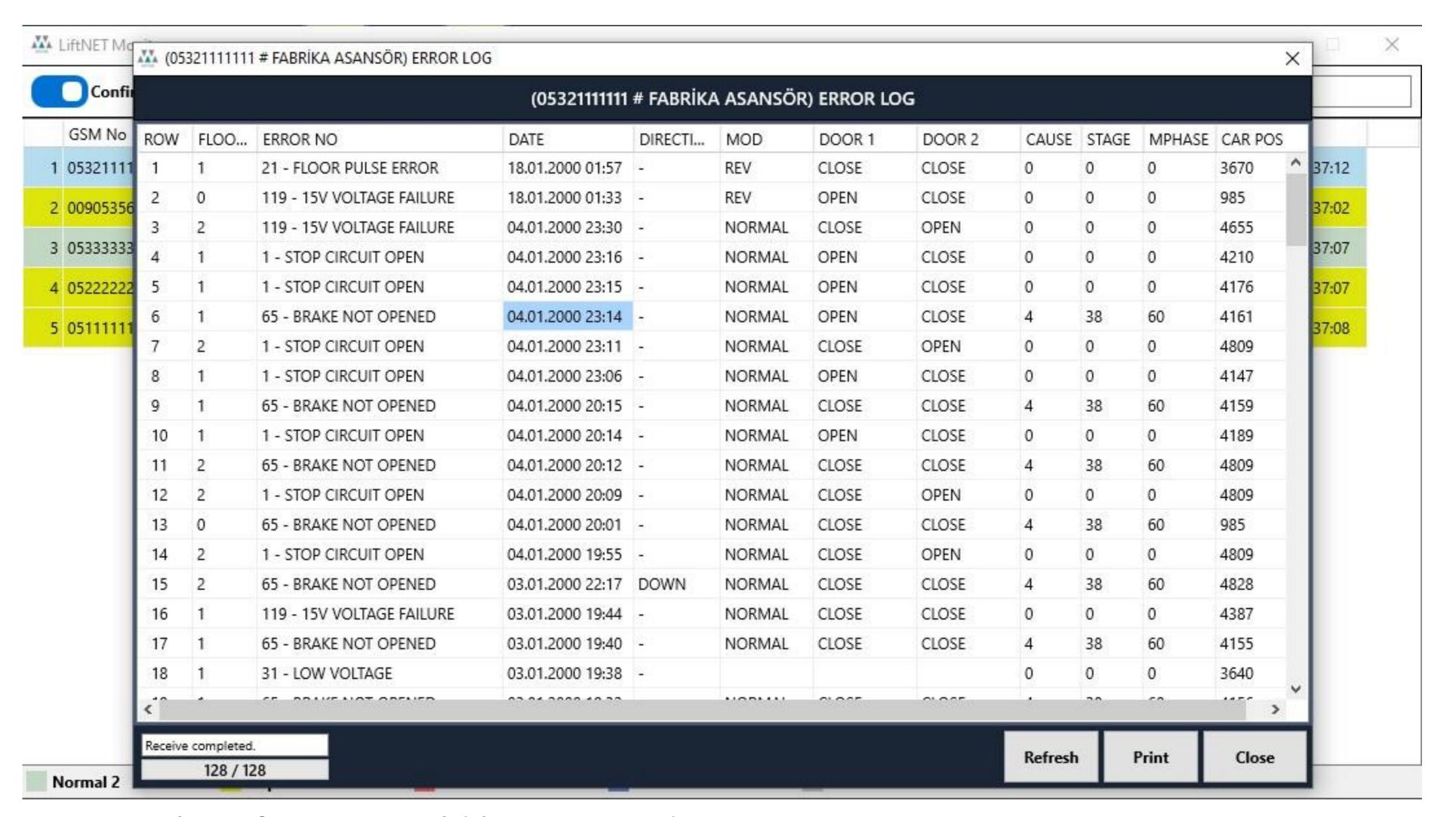




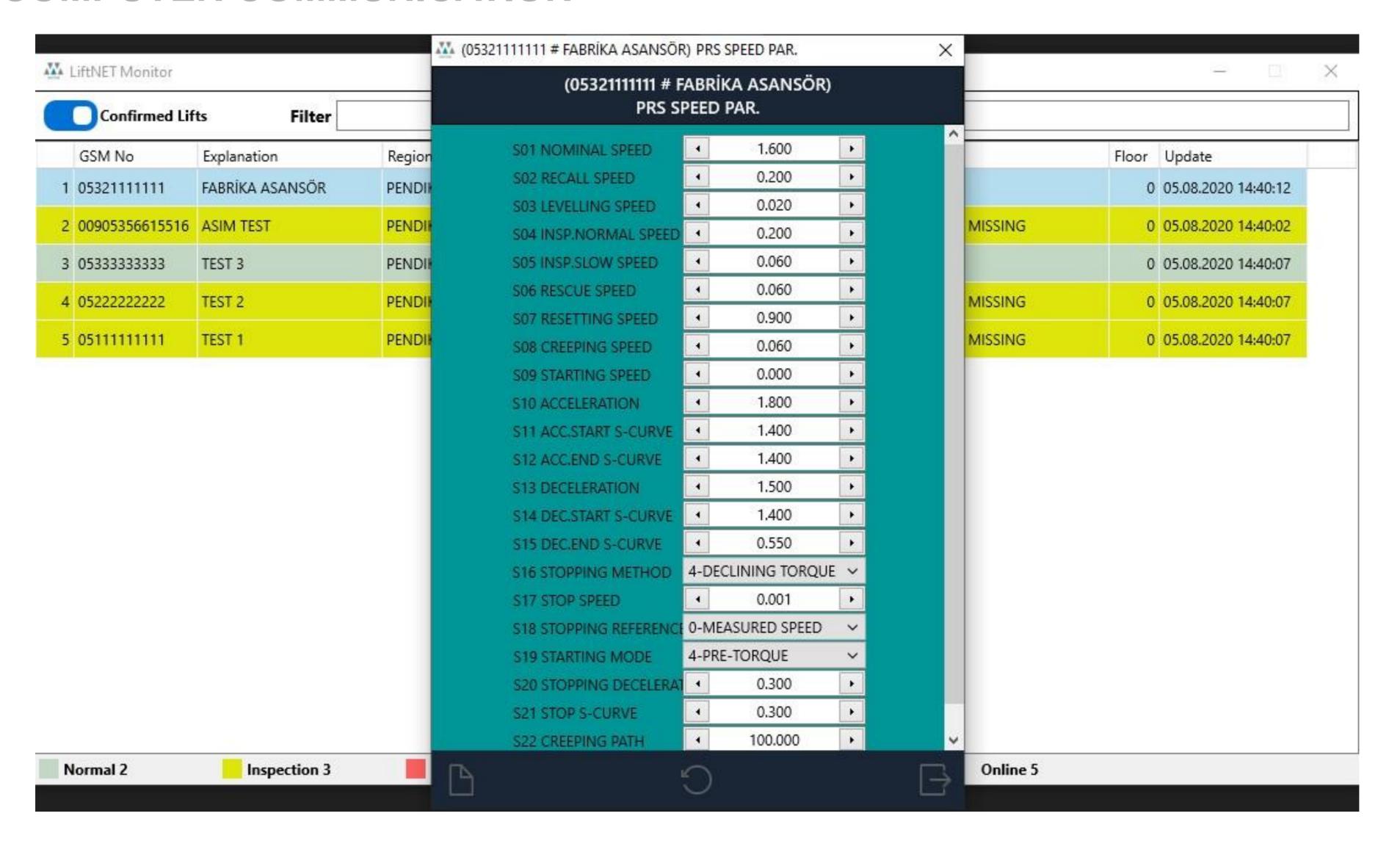
- Could be categorized according to lift companies or regions.
- Users are authorized according to company or region.
- Lift companies may observe the most significant variables of lift.



- Status parameters and lift movement can be viewed.
- Possible to send call.



A list of errors could be retreived.



Parameters can be seen and changed by remote connection

