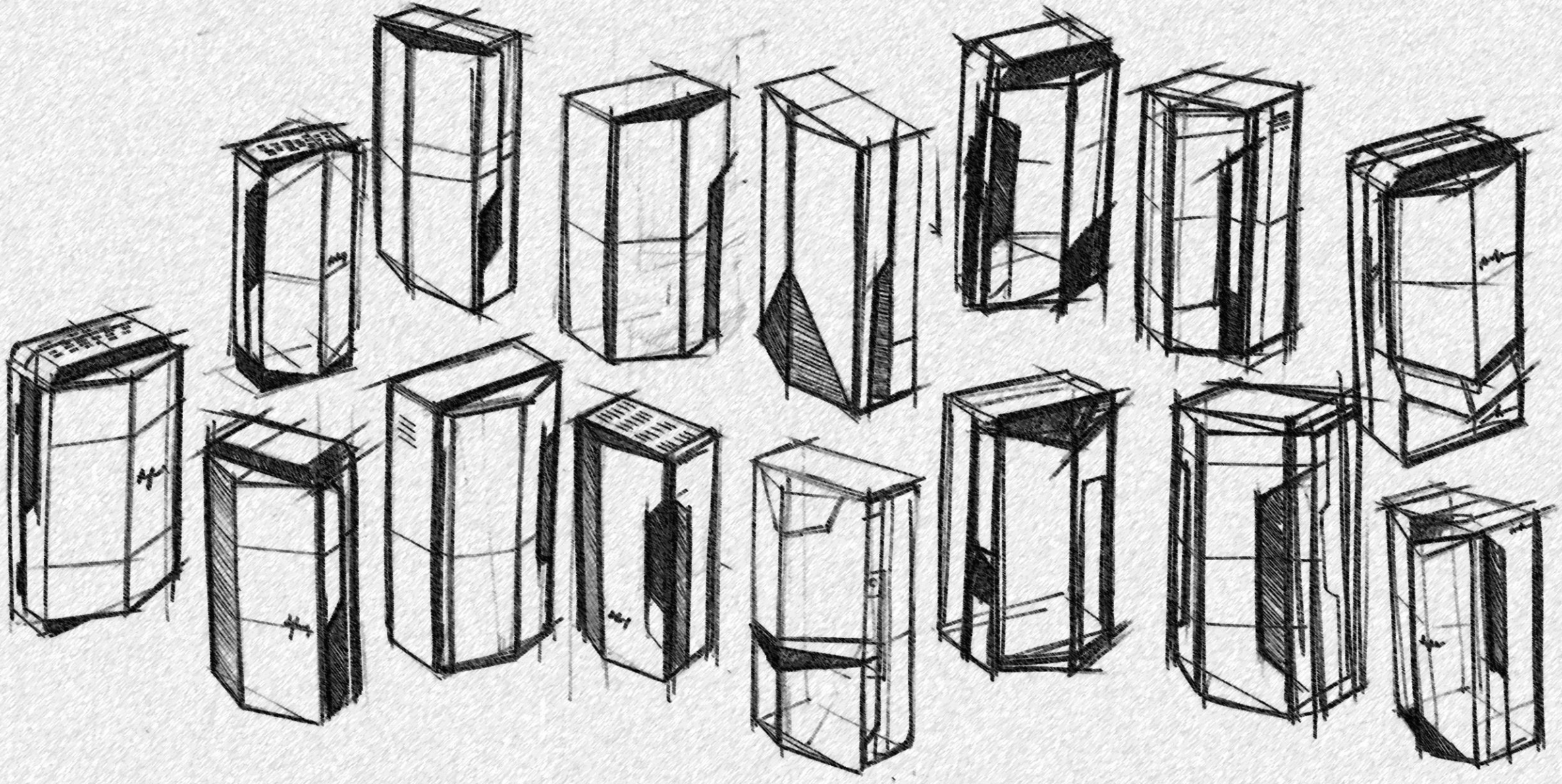

AE-SMART

Monoblock Elevator Control System

- AE-SMART is a Monoblock Lift Control System
- It includes VVVF Motor Driver, Lift Control Board and other electrical switching devices.
- AE-SMART is used only for Electric lifts

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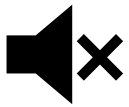
AE-SMART

Monoblock Elevator Control System

Why AE-SMART is STO?


- AE-Smart is a contactor-less controller (STO).
- STO eliminates the noise and mechanical vibration caused due to the contactors.
- Since the current of the motor driver transistors (IGBT) are not cut by mechanical switches (contactors), STO extends the life of the device significantly.

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AE-SMART

Monoblock Elevator Control System

What are AE-Smart General features?

- 3KW to 15kW
- Contactorless operation
- Up to 12 stops
- Simplex and duplex operation
- Pre-torque and anti-rollback functions
- Open Loop and Close Loop operation
- Supports Geared and Gearless machines
- Direct Landing
- Easy Set-up

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AE-SMART

Monoblock Elevator Control System

AE-Smart General Specifications

Specification	Supported Values	Remarks
Lift Type	Electric Lift	
Motor Type	Geared traction machine (asynchronous motor)	Open loop (without encoder)
		Closed loop (without encoder)
	Gearless (synchronous motor)	With absolute encoder (EnDat, SinCos, biss, SSI)
Motor Driving System	STO – Contactor-less	
Line Voltage	3x400V	704xx series - 4…15 kW
	3x190V	702xx Series - 4… 7,5 kW
Safety Voltage	42V AC	
Number of Stops	12	
Number of Doors	1	
Lift Standard	EN81-20/50 EN81-1+A3 EN81-1+A2	
Fire Standard	EN81-73	
Other Lift Standards	EN81-28 EN81-70	
Electric Distribution Panel	Optional for gearless machines	
Controller - Car Circuit Communication	Serial	Low Speed, Fault Tolerant CAN-Bus
Car Operating Panel	Serial	With RBC board as car controller
	Parallel	With SCB board as car controller
Controller – Landing Panels Communication	Serial	Base configuration
	Parallel	Using optional RBIO board.
Inputs in Shaft Pit	Parallel	Base Configuration
	Serial	With optional CIO board (via CAN1)
Lift Standard	EN81-20/50 EN81-1+A3 EN81-1+A2	
Car Position Information	Motor Encoder	Supported in closed loop operation
	Shaft Encoder	Optional ENC board is required
	Mono Magnet Switch	Counter with magnet switches
	Bi-Stable Magnet Switch	Counter with magnet switches
CAN Ports	CAN0	Low Speed CAN Used for car circuit
	CAN1	High Speed CAN Used for landing panels
	CAN2	Low Speed CAN Used for duplex communication
Rescue System	Internal	with batteries
	External	With batteries or with UPS

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AE-SMART
Monoblock Elevator Control System

AE-Smart Power Range

MODEL (400V Series)	SM403	SM405	SM407	SM411	SM415
Nominal Motor Power	3 kW	5.5 kW	7.5 kW	11 kW	15 kW
	(4,3 HP)	(7.5 HP)	(10 HP)	(15 HP)	(20 HP)
Nominal Output Current	7 A	13 A	18 A	25 A	32 A
Maximum Current	14 A	26 A	36 A	50 A	64 A
Allowed Time	5 s	5 s	5 s	5 s	5 s
Control Circuit Supply Voltage	1-Phase 100V.....240V AC 50/60 Hz +- %5				
Line Voltage	3-Phase 340V.....420V AC 50/60 Hz +- %5				
Motor Output Voltage	3-Phase 0V.....420V AC 0.....100 Hz				
Carrier Frequency	6....16 kHz				

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AE-SMART

Monoblock Elevator Control System

AE-SMART PRODUCT CODE DEFINITION						
Prefix	Lift Standard	Line Voltage	Rescue System	Power	Motor Type	Box [cm]
7	0	4	B	5	R	80x40x26
	1	2	J	7	D	80x40x26
				11	E	105x40x26
	0 : EN81-20/50	4: 3x400V	J: Internal	04: 4 kW	R: asyncronous (Geared)	80x40x26
	1 : EN81-1	2: 3x190V	B: External	05: 5,5 kW	D: Syncronous (Gearless)	80x40x26
		or 1x230V	not supplied	07: 7,5 kW	E: Syncronous (Gearless)	
				11: 11 kW	with electric distribution	105x40x26
				15: 15 kW	panel	

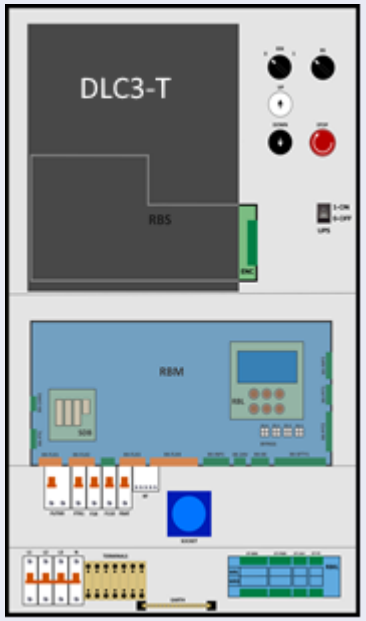
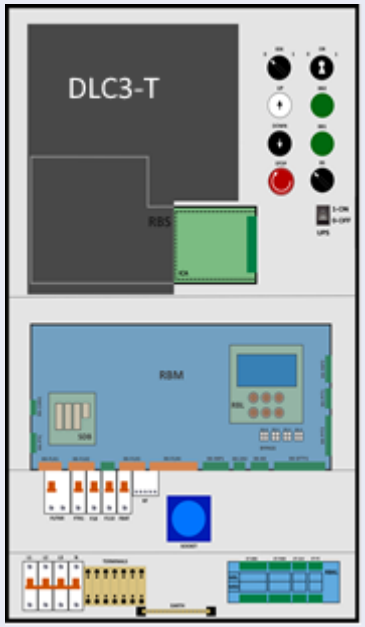
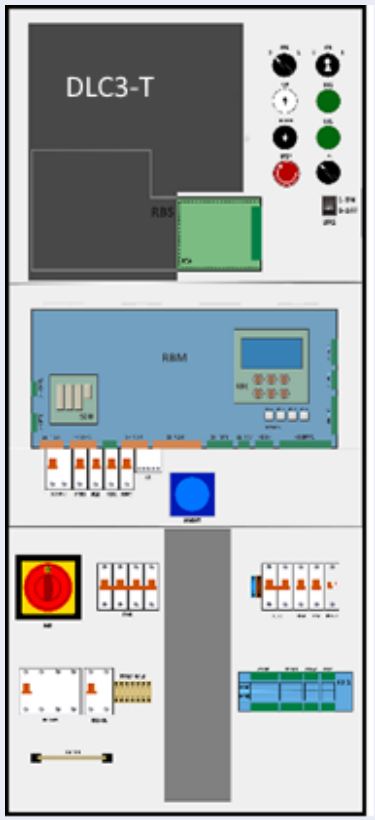
80x40X26cm

105x40X26cm

AE-SMART

Monoblock Elevator Control System

Models

Model R	Model D	Model E
Geared machines	Gearless machines	Gearless machines with electric distribution panel
		

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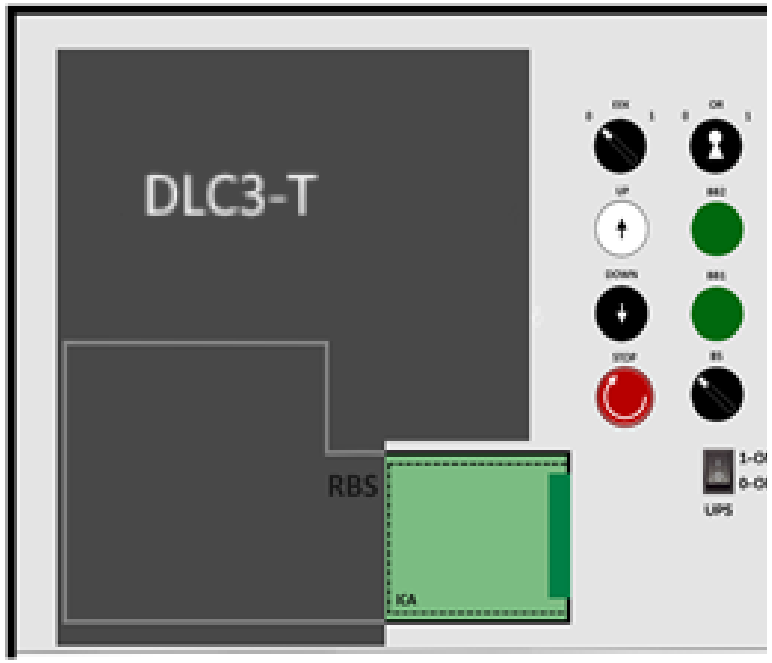
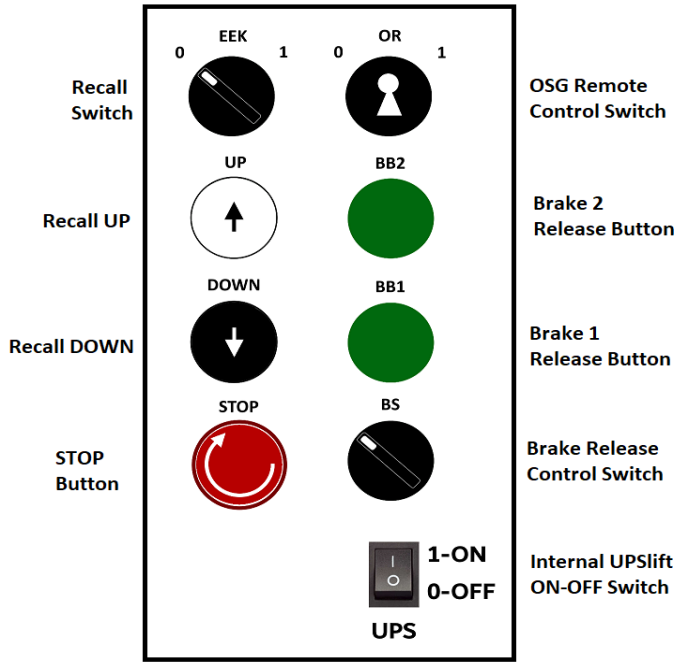
Model D and E- Upper Section – Gearless

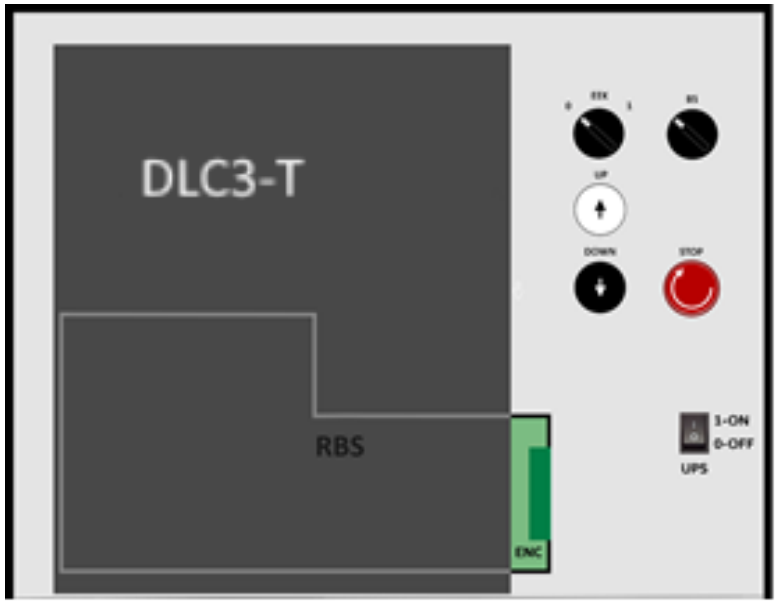
- The upper section in gearless model contains recall buttons and manual brake opening buttons.
- ICA board serves as interface for absolute encoder of synchronous motors.
- UPS switch is present only in models produced with integrated rescue unit.

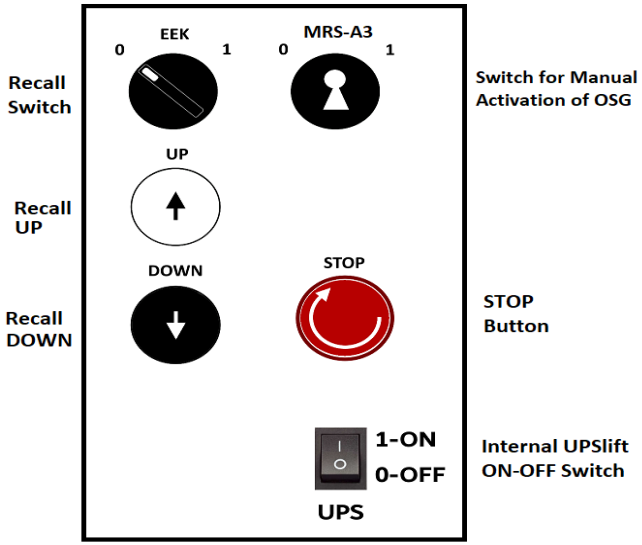




Model R - Upper Section – Geared

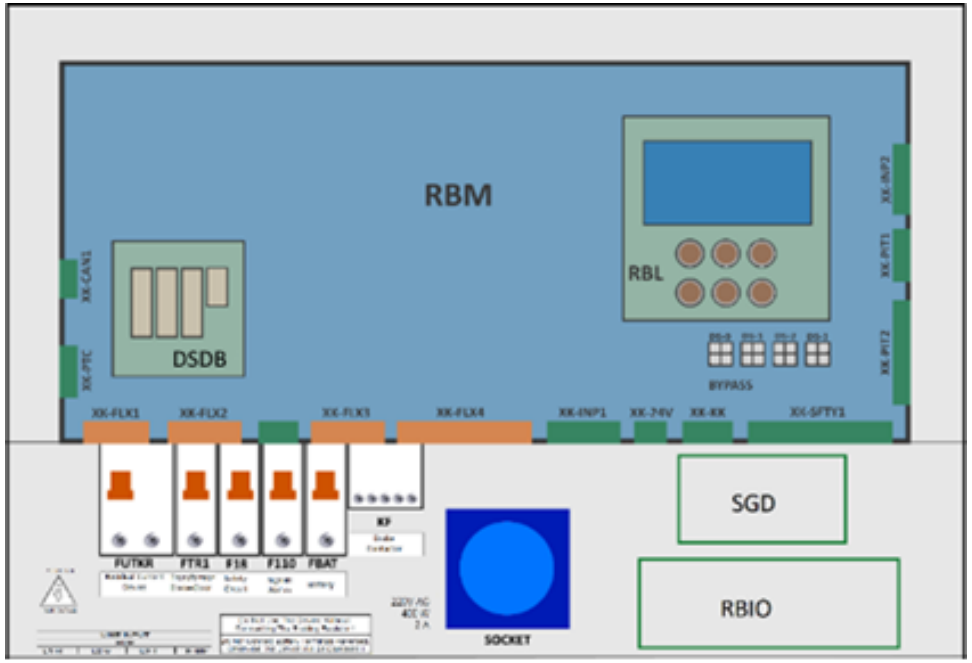
- The upper section in geared model contains recall buttons and OSG activation switch.
- Interface for incremental encoder is located on board.
- UPS switch is present only in models produced with integrated rescue unit.



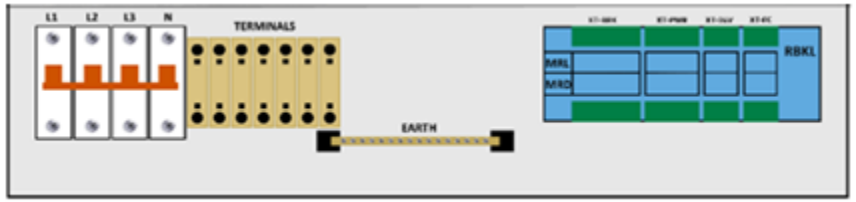


Middle Section

- The mid-section of the box is common in all models.
- Circuit breakers, brake contactor, RCD, main controller board RBM, socket are located in this section.
- RBM is the main controller board.
- SGD board is used for OSG coil control for UCM. It is placed in this section when needed.
- RBIO boards is used when landings are parallel. It will be placed onto the designated place.

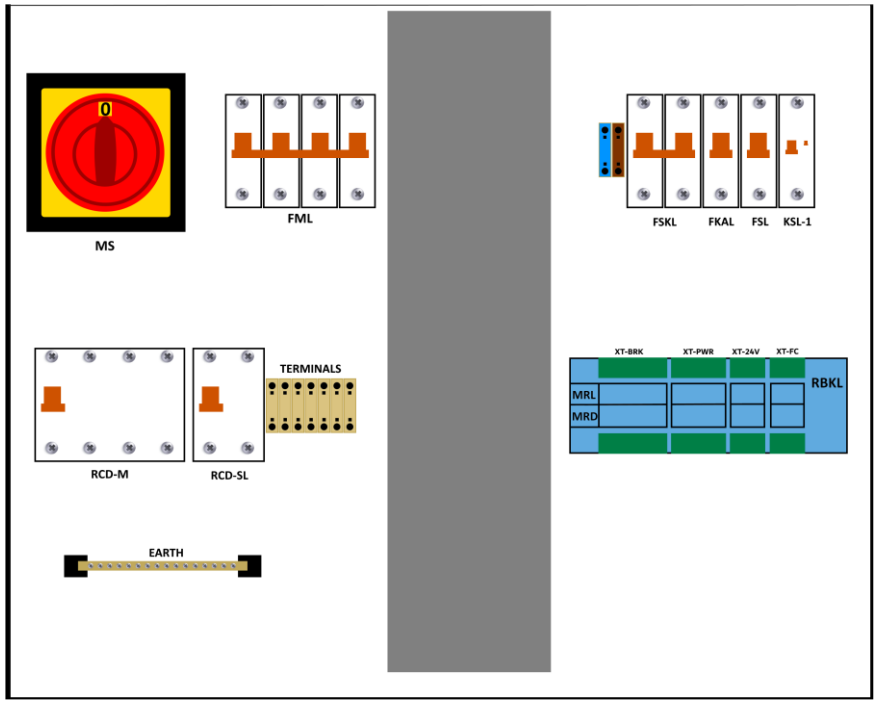


Bottom Section in Model R and D



- The bottom-section in model R and D contains 3-pole power circuit breaker, terminal board RBKL, line input and motor terminals and earth bar.
- RBKL serves as the terminal board of the device.

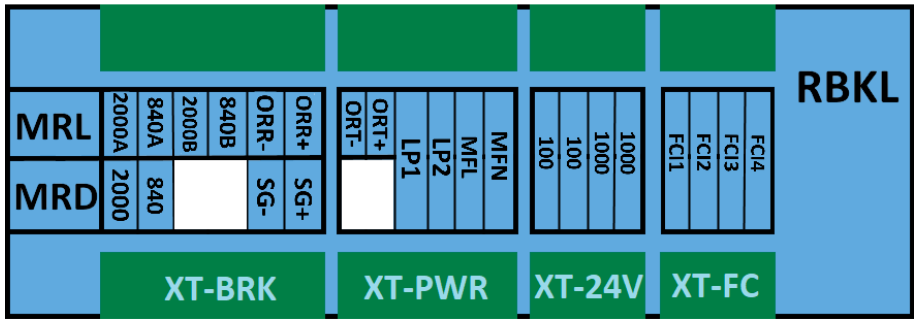
Bottom Section in Model E



- The bottom-section in E contains main switch, 4-pole power circuit breaker, 3-phase RCD, RCD for car light, terminal board RBKL, line input and motor terminals and earth bar.
- RBKL serves as the terminal board of the device.

Terminal Board

- RBKL is the terminal board of the device.
- Use upper line labels for gearless machines (Model D, E).
- Use lower line labels for geared machines (Model R).

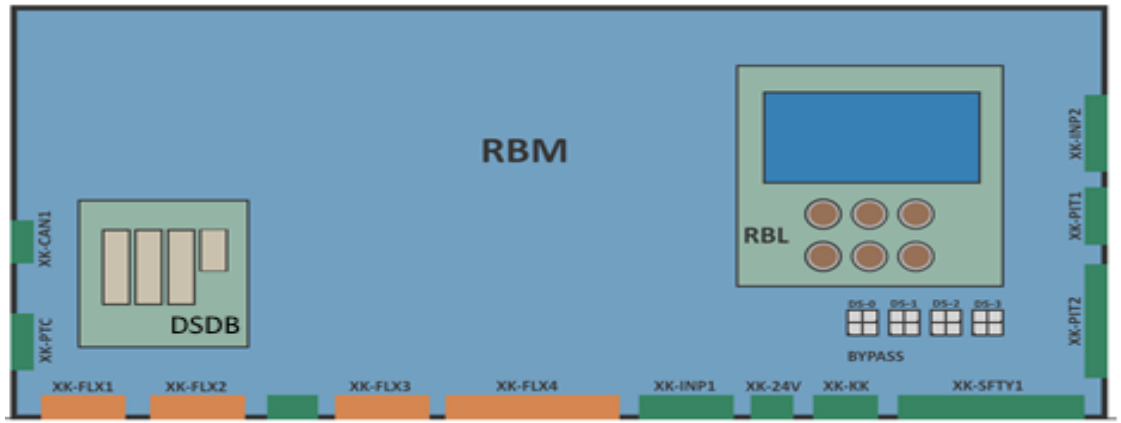


RBM Main Board

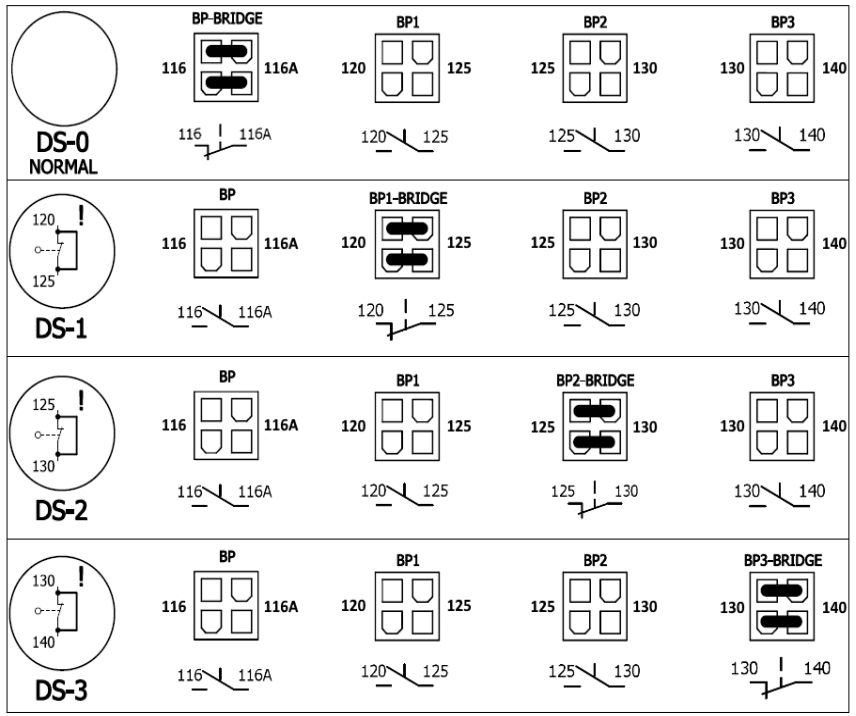
- RBM is the main board of the device.
- It contains…
  - RBL, keypad and screen,
  - bypass sockets
  - DSB door bridging board

- The terminal blocks connected to the flex cable and going to the car circuit are in orange colour.

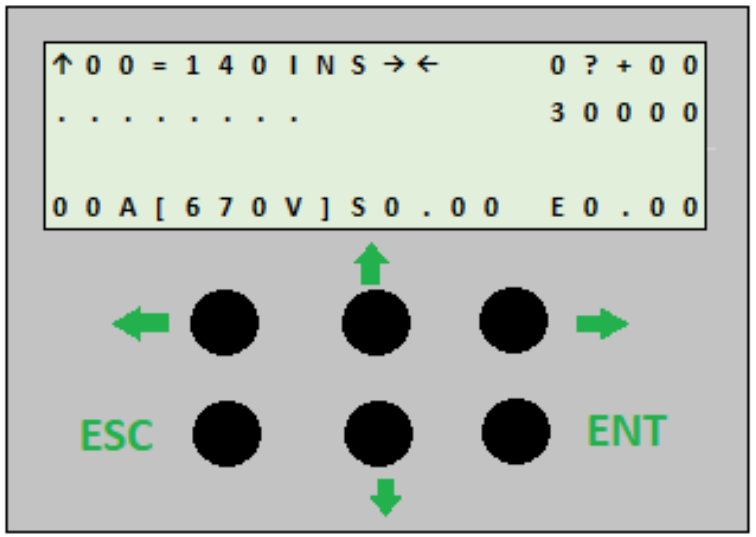
- The terminal blocks used for shaft circuit and machine room connections are green.



By-Pass circuit and sockets are on RBM board. Door bypass can be done only by changing the socket.



DS-0 : The lift operates only in NORMAL mode.
DS-1: 120-125 is bridged in safety line. If the landing doors are semi-automatic, then landing door contacts are bridged.
DS-2: 125-130 is bridged in safety line. 1) If the landing doors are semi-automatic, then landing door locks are bridged. 2) 2) If doors are automatic, then the landing door locks are bridged.
DS-3: 130-140 is bridged in safety line. Car doors are bridged.

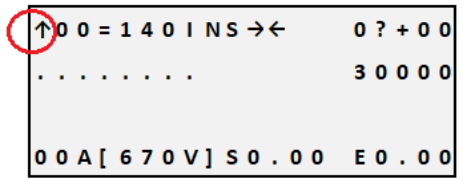


RBL is the screen and keypad of the device.

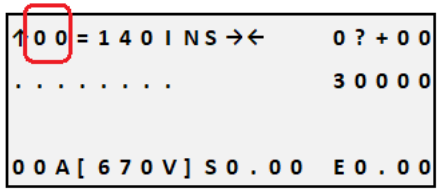
AE-SMART

Monoblock Elevator Control System

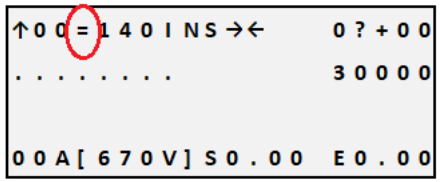
LCD SCREEN



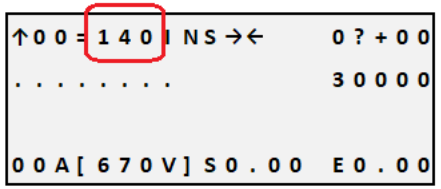
Direction



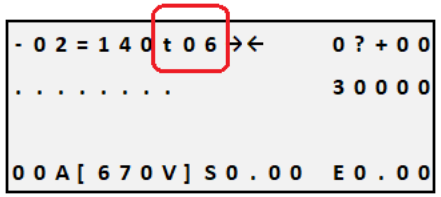
Floor Number



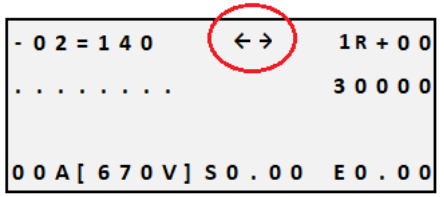
Door Zone



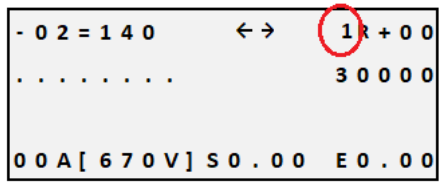
Safety Circuit



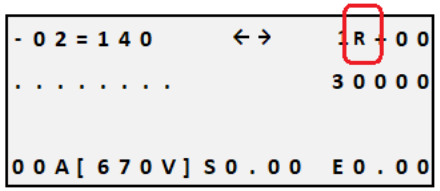
Target Floor / Mode



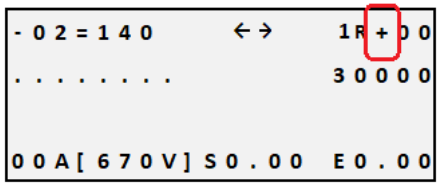
Door Command



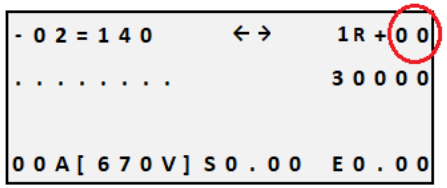
Door Open Test



Floor Resetted / Group No



Internal Communication

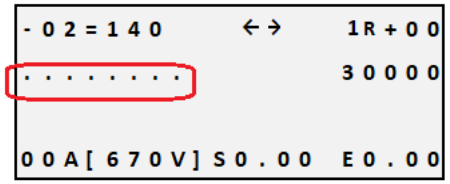


Motion Status

AE-SMART

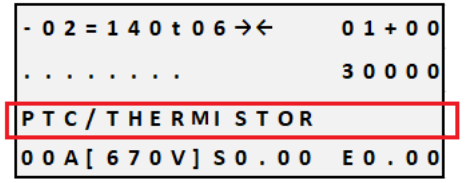
Monoblock Elevator Control System

LCD SCREEN

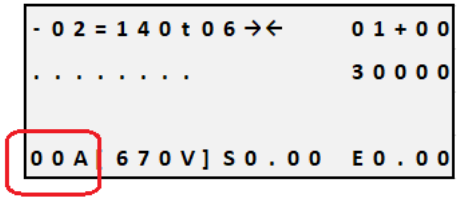


Calls

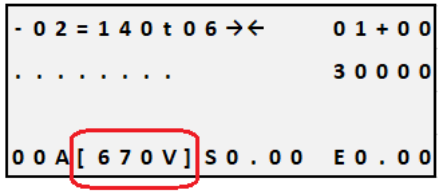
▬	No call		▲▬	Car and Up Call
▼	Down call		▲▬▼	Car, Up and Down call
▲	Up call		▬▼	Car and Down Call
▬	Car call			



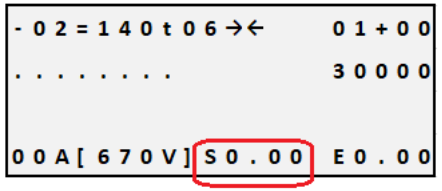
Message Line



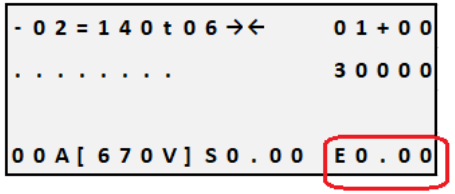
Motor Current



DC Bus Voltage



System Speed



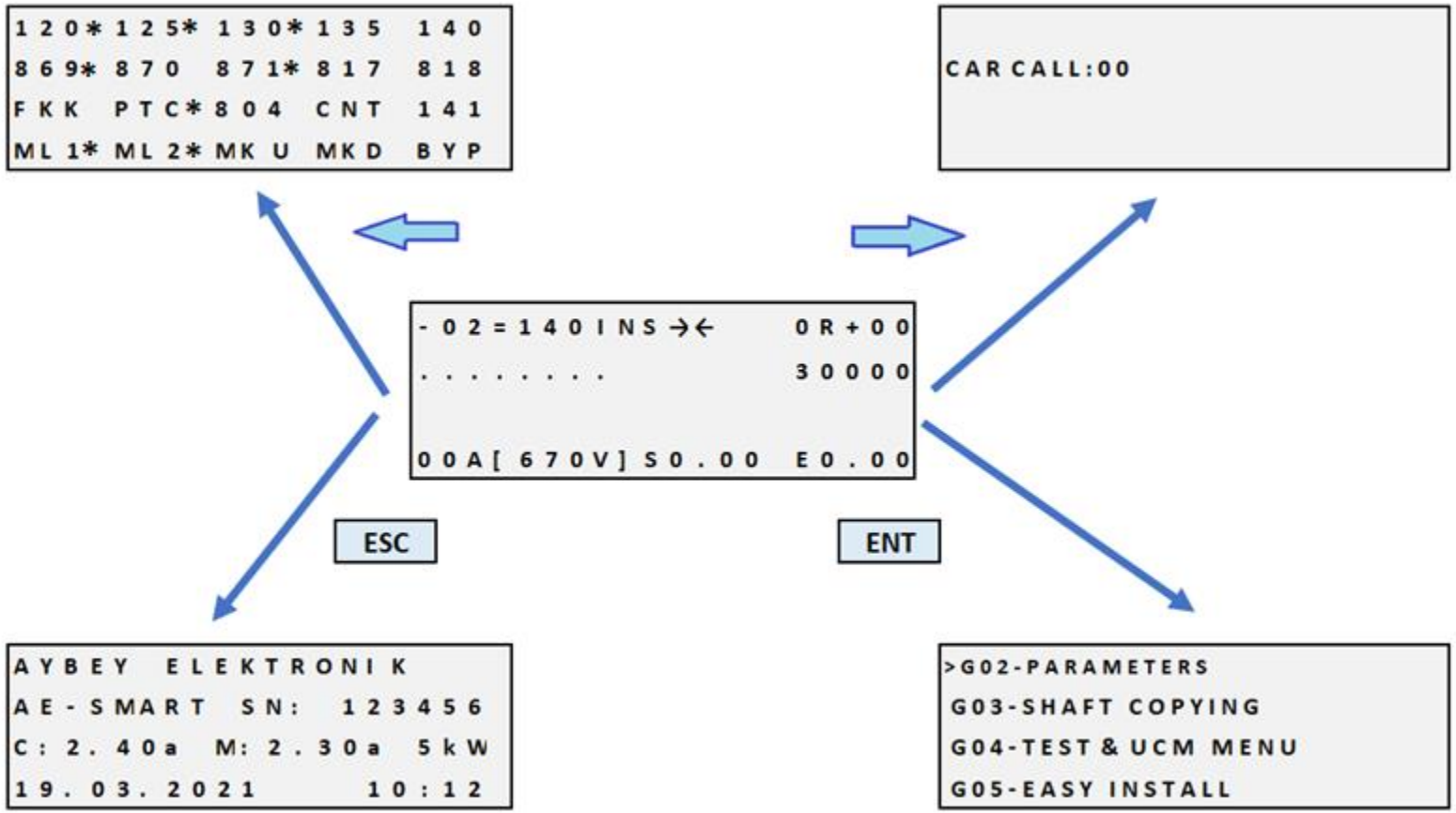
Encoder Speed

AE-SMART

Monoblock Elevator Control System

LCD SCREEN

HOT BUTTONS IN MAIN SCREEN



AE-SMART

MENU TREE

G01-MAIN MENU	»	P01-GROUP A PARAMETERS
		P02-GROUP B PARAMETERS
		P03-TIMER PARAMETERS
		P04-SPEED PARAMETERS
		P05-CONTROL PARAMETERS
		P06-MOTOR PARAMETERS
		P07-HARDWARE PARAMETERS
		P08-DEFINE INPUTS
		P09-SPECIAL PARAMETERS
		P10-DEFINE OUTPUTS
G02-PARAMETERS		
G03-SHAFT COPYING	»	1-SHAFT LEARNING
		2-LEVEL ADJUST IN CABIN
		3-ENCODER FLOOR LEVELS
		4-ENCODER PULSE RATIO
		5-ENCODER LEARNING FLOORS
		6-RELEVEL START mm
		7-RELEVEL STOP mm
		8-REGISTER LEARN
		9-CLEAR ENCODER DATA
G04- TEST & UCM MENU	»	1-AUTO TEST MENU
		2-UCM ERROR CLEAR
		3-UCM CONTROLLER
		4-UCM TEST
		5-LIMIT STOP TEST
		6-SAFETY GEAR TEST
		7-BUFFER TEST

G05-EASY INSTALL		
G06-MOTOR TUNING	»	1-START TUNING
		2-TUNING MODE
		3-ENCODER DIRECTION
		4-MOTOR DIRECTION
		5-ENCODER OFFSET
G07-FLOOR SETTINGS	»	1-AUTO DISPLAY ADJUST
		2-FLOOR DISPLAYS
		3-ACCESS RIGHTS

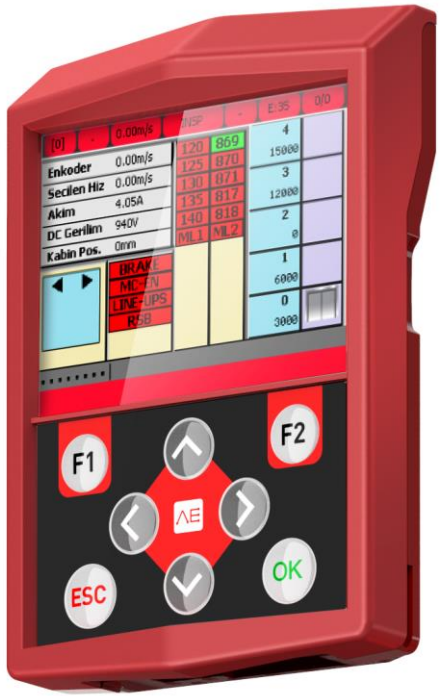
G08-SERVICES	»	1-LANGUAGE
		2-PASSWORD SERVICE
		3-DATE & TIME
		4-MAINTENANCE DATE
		5-SIMULATOR MODE
		6-CLEAR LOAD DATA
		7-FACTORY DEFAULTS
		8-CLEAR ERROR LOG
		9-BACKUP TO DEVICE
		10-RESTORE EPROMS
G09-ERROR LOG		
G10-COUNTERS		
G11-OPERATIONS		
G12-VARIABLES	»	1-INFO SCREEN
		2-MAIN VARIABLES
		3-USER DEF.TIMERS
		4-BOARD VERSIONS
		5-SYSTEM TIMERS

AE-SMART

Monoblock Elevator Control System

Optional Smart TFT hand Terminal

- It can be connected to CAN-0.
- It can be used for monitoring and parameter settings
- Parameter storage
- Easy software update with SD card
- Error review
- Viewing a travelling curves



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AE-SMART
Monoblock Elevator Control System

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.

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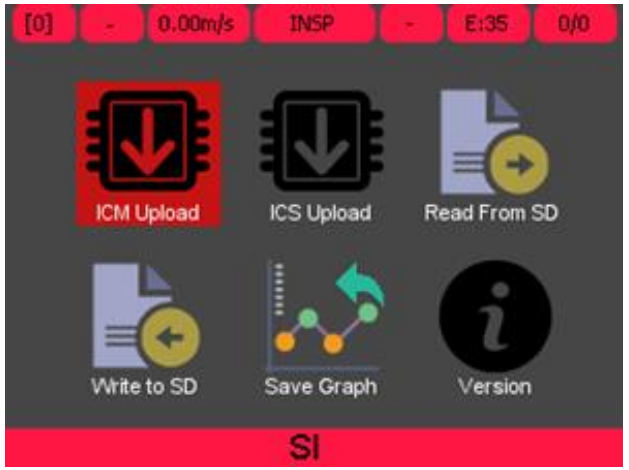
AE-SMART
Monoblock Elevator Control System

- Software of the device can be updated by using the hand terminal.
- Program files can be transported by using SD card.



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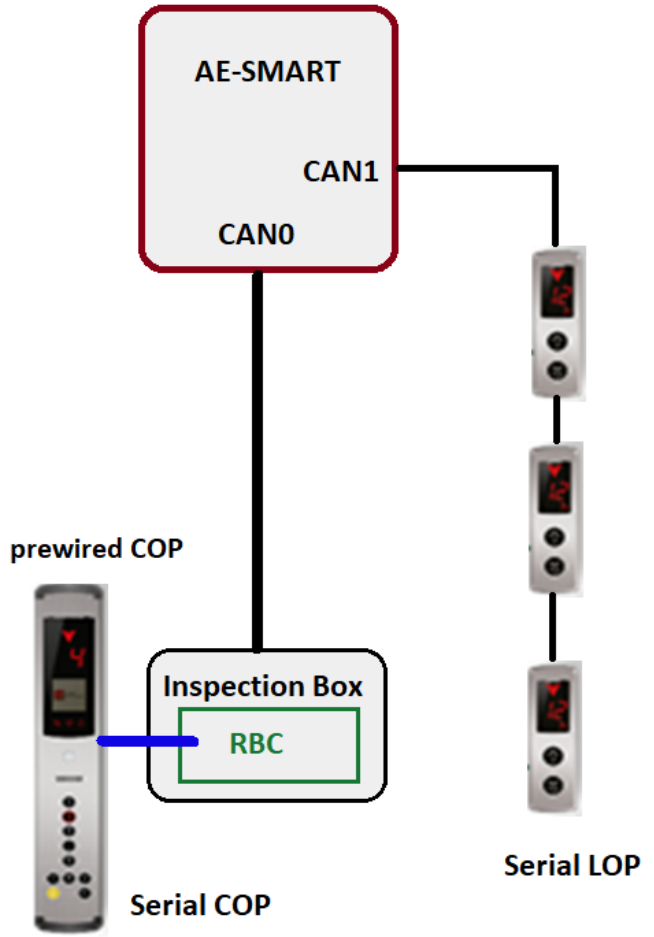
Shaft Communication – Full Serial

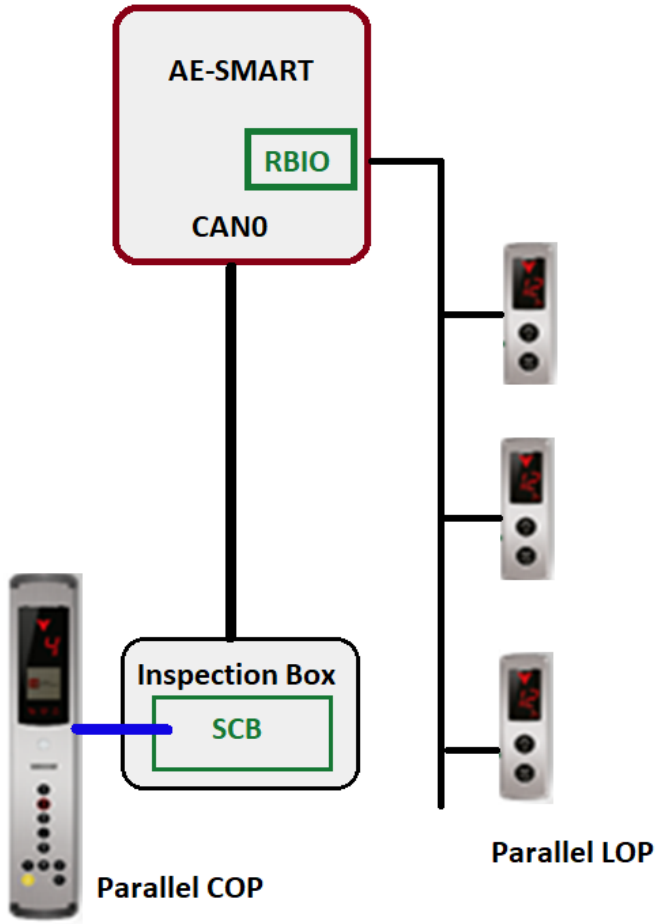
- AE-SMART is delivered always as **full serial**.

- Car circuit uses CAN0. CAN0 is low speed fault tolerant.
- Landing circuit uses CAN1. CAN1 is high speed CAN.
- RBC board should be used as car controller in inspection box for serial COP (pre-wired).
- The terminal order in RBKL is the same as in RBC to standardize pre-wiring system.

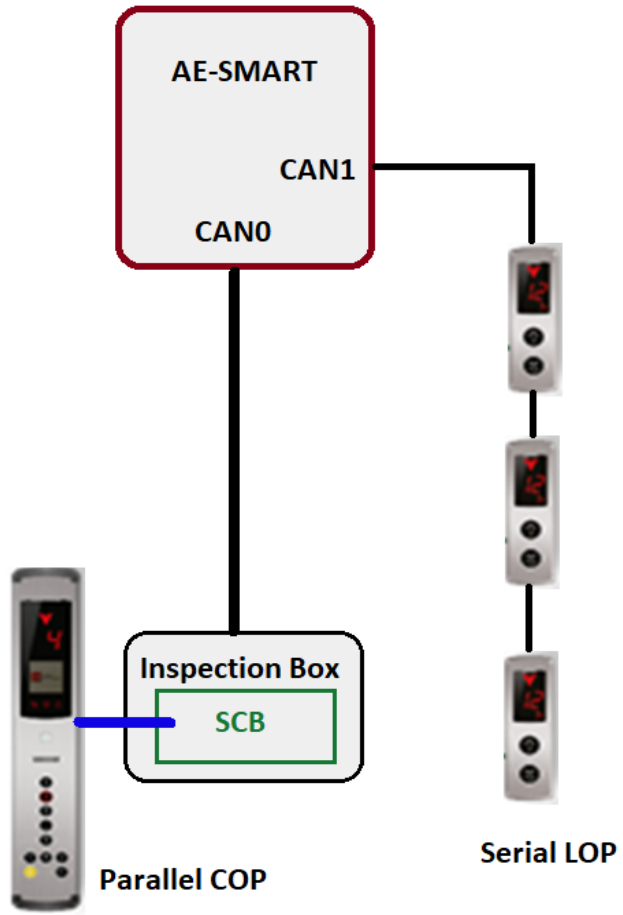


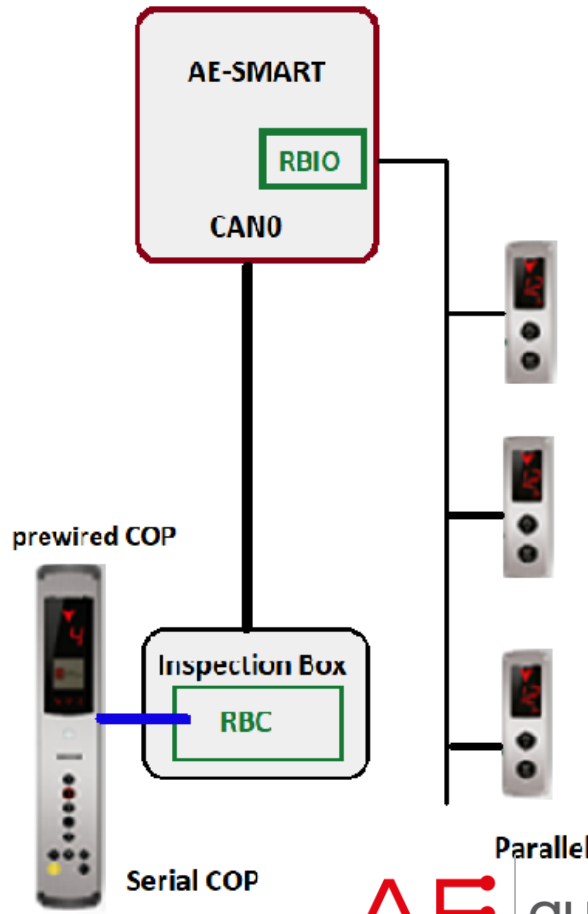
Shaft Communication – Parallel COP Parallel LOP

- If parallel landing panels are used, then a RBIO board is required in controller box.
- RBIO serves as parallel interface for LOPs.
- SCB should be used for parallel COP as car controller board in inspection box.



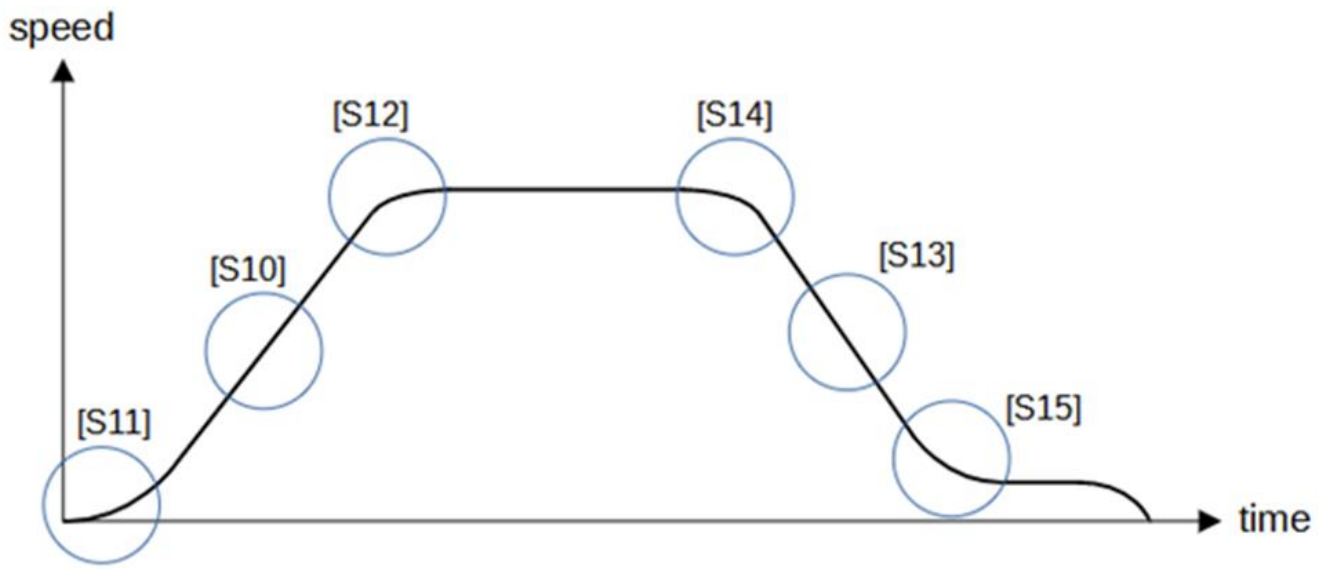
Shaft Communication – Parallel COP Serial LOP - Serial COP Parallel LOP





SPEED MANAGEMENT

- When encoder is selected as floor selector, then distance dependent travel system is automatically activated.
- All speed transitions, acceleration and deceleration rates can be set by the user to evaluate speed curve.
- The controller designs the speed curve by using user set parameters.

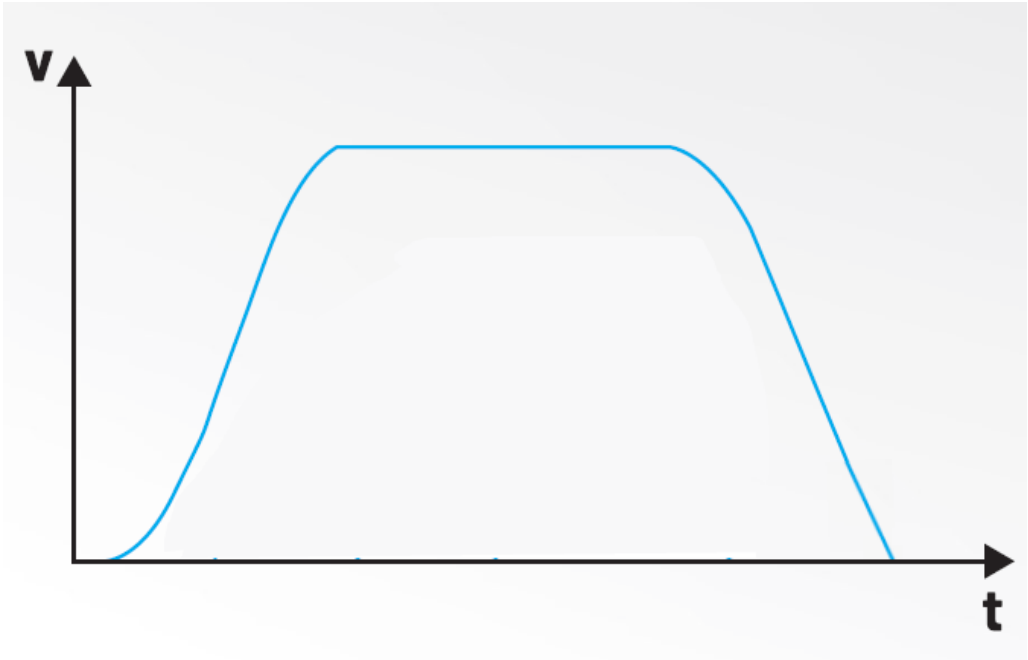


SPEED MANAGEMENT

Direct Landing

- When direct landing is selected, then the controller calculates the travel curves automatically for the target floor regarding to the speed style selection.

- 3 speed styles are available
- Eliminates creeping travel.
- Reduces travel time.
- Very easy to adjust.



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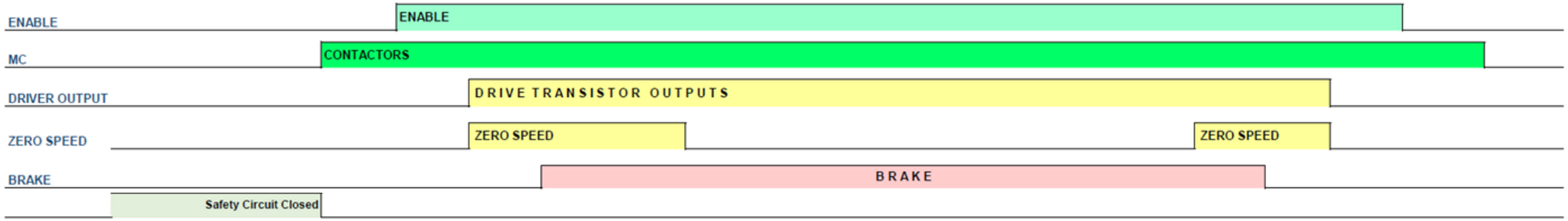
Monoblock Elevator Control System

TIMING CHART

stage	REST	REST	READY	CONT_ON	ENB_ON	TRAVEL										AT_STOP			ENB_OFF	REST
stage	0	0	10	20	35	40										38			33	0
mphase	0	0	0	0	0	41	42	42	43	44	45	46	47	48	49	59	60	61	0	0
	CONTROLLER					MOTOR CONTROL													CONTROLLER	
	idle	Normal Mode: Calls are received Other Modes: Motion request	Close Door Check Inputs Check Safety Activate SG Coil	wait for Start Timer Contactors ON	Drive Outputs Are Enabled (no time delay only EN checking)	Zero Speed At Start			< Motor rotates – Lift moves >						Down to Zero	Zero Speed At Stop		INVERTER OFF	Drive Outputs Are Disabled	Job Completed
									Starting Speed		< Normal Travel >			Seeking Floor Level						
						DriveON	BrakeON	BrakeON	Ramp Period to Start Speed	Starting Speed	Accelerating	Constant Speed	Decelerating	Creeping Speed	Stopping	Stopping Speed Detected	Brake Off	job Completed		



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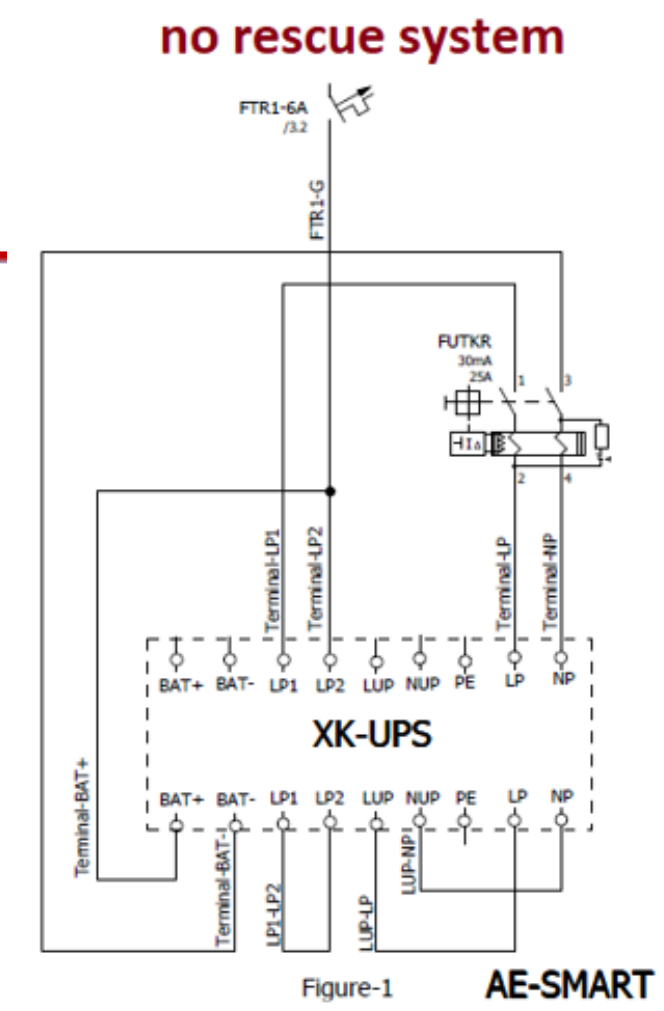
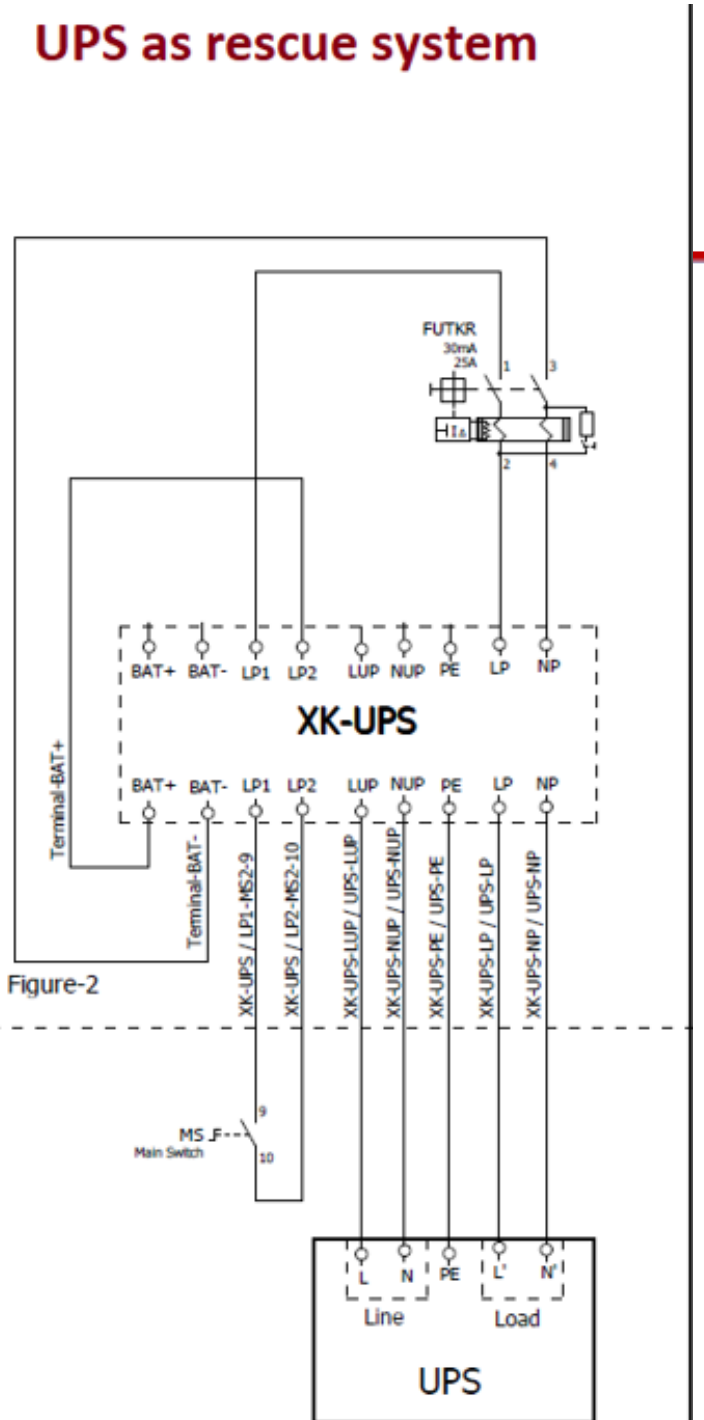
Monoblock Elevator Control System

RESCUE OPERATION

With External Rescue System

- Models 7xxBxxx is delivered no rescue unit inside the device.
- A rescue system can be connected later.





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Monoblock Elevator Control System

RESCUE OPERATION

With Integrated Electronic Rescue System

- Models **7xxJxxx** is delivered with integrated rescue system.
- It needs **5x12VA** batteries BAT+ and BAT- terminals with the supplied red and black cables.

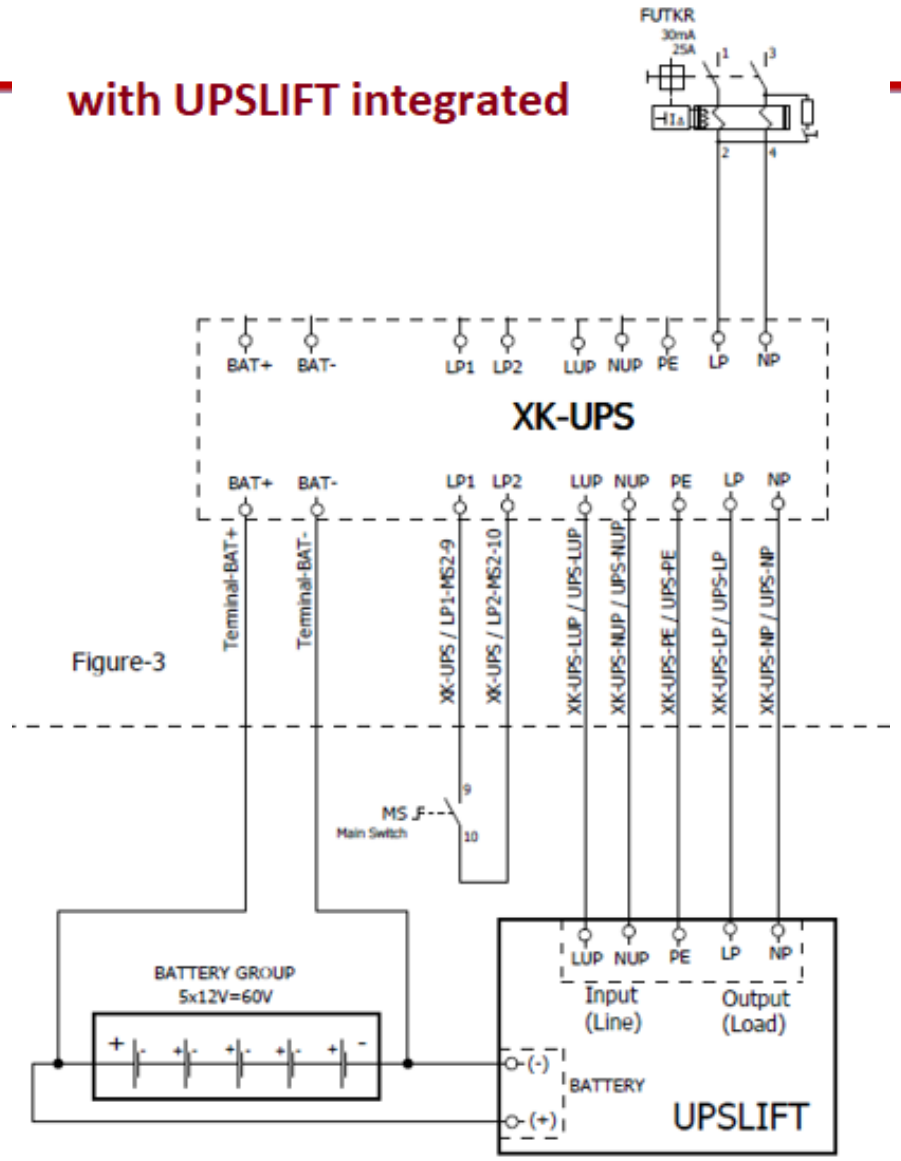
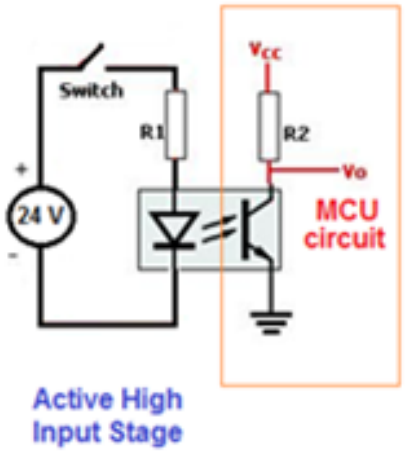
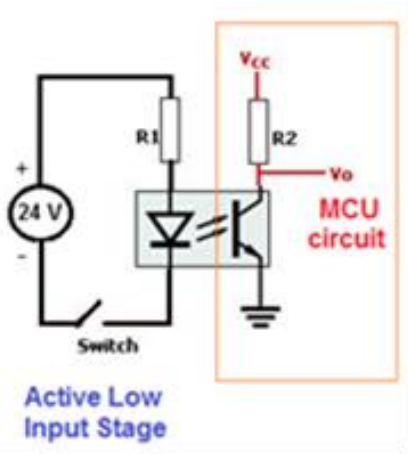


Figure-3

- All inputs except ML1-ML2 and safety circuit are active low.
- It means that an active state from a detector is monitored when this input is connected to the ground reference (0V) of DC power supply.
- All inputs are 100% galvanically isolated from the microcontroller circuit since they are connected via optocouplers to this circuit.





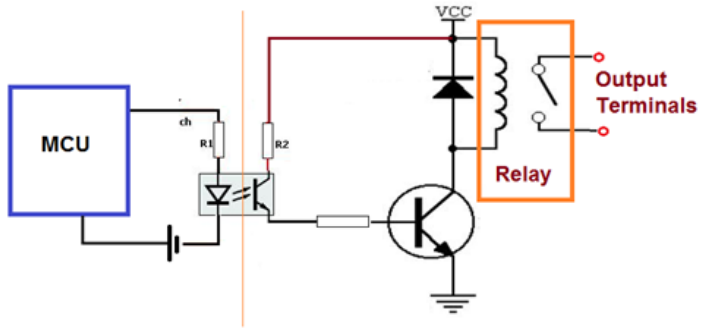
INPUTS

INPUT NO	PLACE / SOCKET	BOARD NAME	TERMINAL NAME
I1…I16	PANEL / TERMINAL	RBM	I1…I16
N1…N16	CAR / TERMINAL	RBC	N1…N16
N17	CAR / TERMINAL	PWS	N17
N18…N21	CAR / TERMINAL	PWS (INPS)	I1…I4
Y1…Y4	PIT / TERMINAL	RBPB (CIO)	Y1…Y4

AE-SMART
Monoblock Elevator Control System

OUTPUTS

NO	CODE	LOCATION	CONTACT V/I	CONTACT TYPE
1	S1	RBM	220V AC/10A	NO
2	S2	RBM	220V AC/10A	NO
3	V1	RBPB (CIO)	220V AC/5A	NO
4	V2	RBPB (CIO)	220V AC/5A	NO
5	R1	RBC	220V AC/5A	NO
6	R2	RBC	220V AC/5A	NO
7	R3	RBC	220V AC/5A	NO
8	R4	RBC (OUT)	220V AC/5A	NO
9	R5	RBC (OUT)	220V AC/5A	NO
10	R6	RBC (OUT)	220V AC/5A	NO
11	R7	RBC (OUT)	220V AC/5A	NO
12	R8	PWS	220V AC/5A	NO



All contactor and programmable outputs are 100% galvanically isolated from the microcontroller circuit by means of optocouplers.

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SIMULATOR MODE

- It is possible to run the device in simulation mode.
- Simulation can be performed for test, demo or education purposes where the device can run with or without motor connected.
- Simulation operation is not allowed when the controller has been connected to the lift motor in the shaft or machine room.

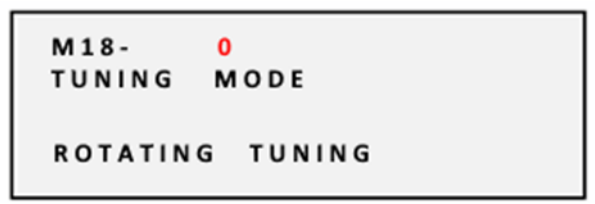
[A19] SIMULATOR MODE	
Not Active Simulation mode is not active.	
Simulator Motor with free running Motor In this mode the device runs the motor. Everything besides the inputs listed above must be connected.	
Simulator Without Motor In this mode the device runs without motor. You should leave motor connections. The errors related to the motor operation and motor cabling will be ignored.	
Simulator Only Device In this mode the device runs without motor and any other external board. No connection to motor as well as car and shaft boards are required. The errors related to the motor operation, motor cabling as well as shaft communication will be ignored.	

INSTALLATION MODE

- There is a facility for installation of the system.
- System must be inspection mode due to inspection box or RECALL switches to activate this utility.
- Some of the inputs are inhibited when this utility is active.
- When the controller returns to the normal mode or system is switched on then this parameter is switched to passive [A15=0] automatically.

TUNING

- Autotuning operation should be carried out to get encoder offset position and motor characteristics for synchronous motor.
- Tuning can be stationary or rotating
- For asyncrounous motors no tuning operation is mostly required.



COUNTERS

Total Number of Starts of the Device [1] xxxxxxx **(^ v)**	This counter stores **Total Number of Starts** of the device. It cannot be edited.
Number of Travels After reset [2] xxxxxxx **(^ v ENT)**	This counter holds the number of **STARTS** after last reset. It is called **STARTS COUNTER**. This counter can be reset by pressing **ENT** button here.
Number of Starts Set for Maintenance [3] xxxxxxx **(^ v ENT)**	This counter is used as an alarm for maintenance. You can set the number of starts to maintenance by pressing **ENT** button in this screen.
MAX.START COUNTER xxxxxxx	If the value of the counter is set to zero, then this function is inhibited and no alarm is activated. If any nonzero value is set as MAXIMUM START COUNTER, then when … **STARTS COUNTER> MAXIMUM START COUNTER** the system will enter into maintenance mode.

Remaining Starts until Maintenance [4] xxxxxxx **(^ v)**	You can see on screen [4] remaining starts to maintenance alarm, namely … (MAXIMUM START COUNTER- STARTS COUNTER).
Number of Direction Changes [5] xxxxxxx **(^ v ENT)**	This counter is called as **DIRECTION COUNTER** and incremented after each reversal of the motion direction. It can be reset by pressing **ENT** button.
Number of maximum Direction Changes [6] xxxxxxx **(^ v ENT)**	Here you can monitor **MAXIMUM DIRECTION CHANGE**. It can be edited by pressing **ENT** button.
SET MAX. DIR CHANGE xxxxxxx	If MAXIMUM START COUNTER is zero, then this function is inhibited and no alarm is activated. If it is greater than zero, it will be active. When **DIRECTION COUNTER > MAXIMUM DIRECTION COUNTER,** then the system will enter into maintenance mode.

TEST MENU

- There is a special utility in system for testing the lift in normal operation.
- The doors or calls can be easily cancelled.
- A call to the top or bottom floor can be created
- Any number of random lift travels can be executed automatically.

AE-SMART
Monoblock Elevator Control System

AE-SMART SPARE PARTS

AE-SMART Hand Terminal

Product Code	Only for AE-SMART	Picture
26AEMTFT	TFT Hand Terminal	

Absolute Encoder Board for Synchronous Motor

Product Code	Product Description	Picture
26ICA	Absolute Encoder Board (EnDat, SinCos, BISS, SSI)	

OSG Coil Drive Board (Used with geared machines in compatible EN81-20/50 or EN81-1/2+A3 standards)

Product Code	Product Description	Picture
457SGD	Overspeed Governor Coil Drive Board	

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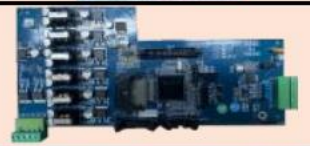
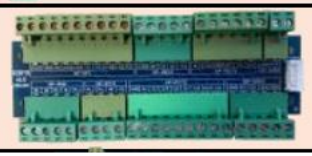
Add-on Boards

Product Code	Product Description	Picture
450ICG	AE-MAESTRO Group Management Unit (necessary for dublex and group operations)	
469RBM	AE-SMART RBM MAINBOARD MASTER	
469RBL	AE-SMART RBL DISPLAY BOARD	
450RBS	RBS MAINBOARD SLAVE	
450RBPB	PARALLEL PIT BOX BOARD	

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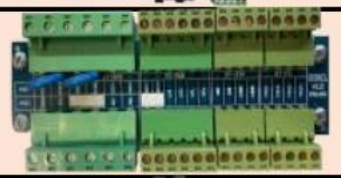
450RBRS	RESCUE BOARD FOR AE-SMART	
457RBKL	AE-SMART TERMINAL BOARD	
457BDB	BRIDGE RECTIFIER BOARD	
457BDC	BRIDGE RECTIFIER BOARD 24V DC	
457SDB	DOOR BRIDGING BOARD	

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