



MIAE Board

APPLICATION GUIDE

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1 – INTRODUCTION

MIAE is a microprocessor board, designed and built up by SMS for lift emergency operation. Compact and versatile, it carries out the following functions:

- THREE-PHASE AUXILIARY INVERTER
- CONTROL LOGIC FOR EMERGENCY OPERATION

The MIAE board is supplied in open version, it has to be installed inside cabinet with IP20 or higher protection level.

2 – GENERAL DESCRIPTION

The MIAE board includes 2 sections:

- Power section

Input: 48VDC 15A
Output: 3-Phase 35V 50Hz 12A
Power: 720VA

- Logic section:

Supply Voltage: 24VDC

It includes the microprocessor with its accessories, inputs and outputs for the control logic of the emergency operation (supply switching for control panel, power contactor command, auxiliary inverter ON and OFF, battery charge supervision, protections, signals, etc...).

The MIAE board can carry out 2 different kinds of operation, referring to the 2 different kind of emergency devices built up by SMS: RED-R and RED-NX.

This manual refers to application of the MIAE board inside the control panel, in order to supply again the operation transformer during emergency: the operation considered is the RED-NX one, and it is described in the next chapter “OPERATION PRINCIPLE”.

For this kind of operation, you must set the **Dip Switch 4 of SW1 in OFF position** (see MIAE BOARD MAP).

3 – OPERATION PRINCIPLE

When power supply is cut off, or only one phase is off, the MIAE board starts the emergency cycle, which is carried out in the following way:

- After a few seconds, the output KE1 is activated, to insulate the supply voltage which comes from mains to operation transformer.
- After 2 seconds, the auxiliary inverter is switched ON: a three-phase 35V 50Hz voltage comes out, and by means of same operation transformer or by means of an added elevator transformer, it reproduces the three-phase 400V 50Hz voltage.
- Then, output KE2 is activated, to supply the motor inverter (Main Inverter) by means of batteries (48/96V)

When the car reaches the floor:

- After the door opening time elapses, the auxiliary inverter is switched off and output KE2 goes OFF.
- After further 2 seconds, output KE1 goes OFF.

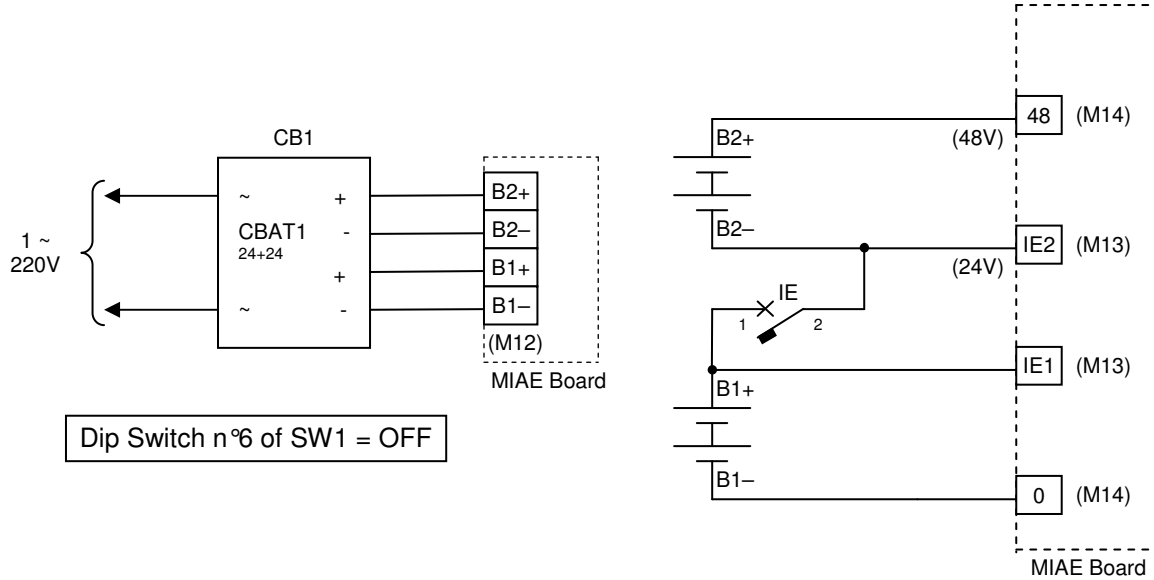
When KE1 goes OFF, the emergency cycle ends and the lift is taken back to the normal operation condition.

During the whole emergency cycle, the battery charge status is checked: if the battery voltage drops under the minimum threshold, the emergency cycle breaks off.

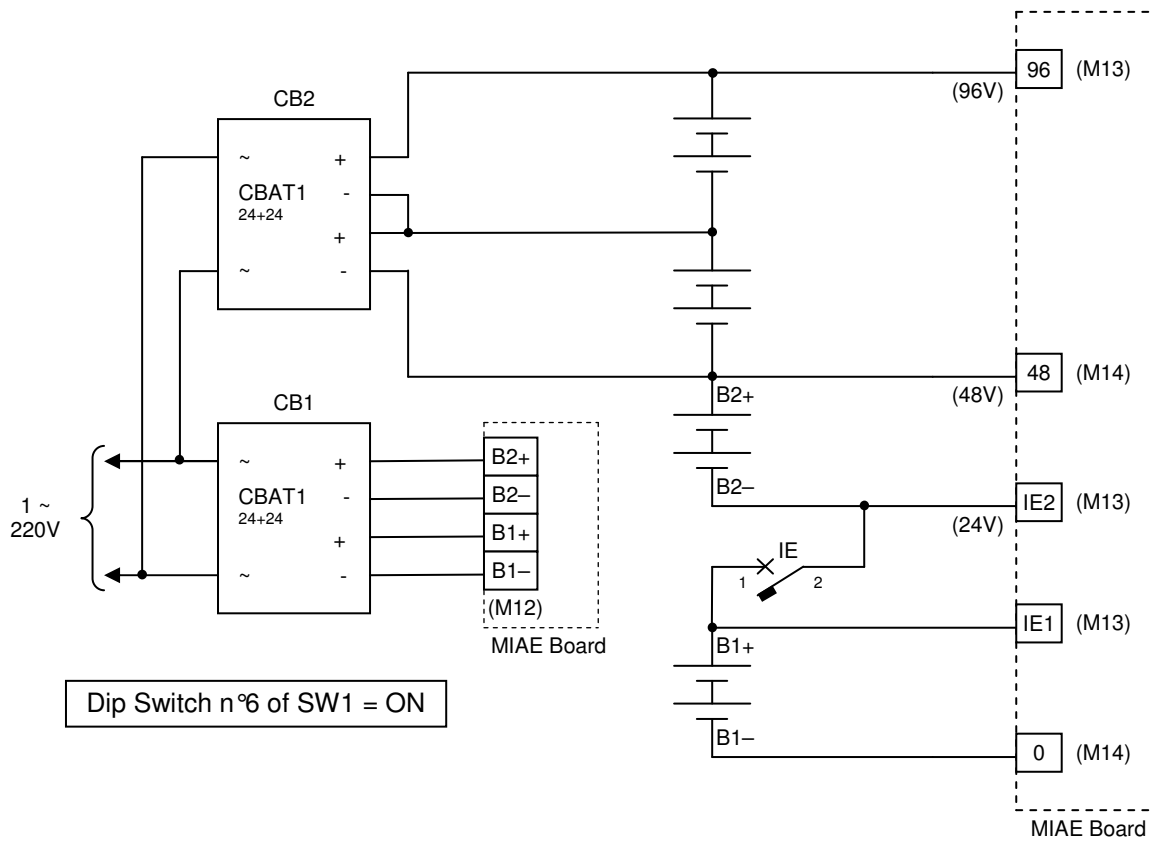
4 – CONNECTIONS

4.1 – BATTERY CHARGER AND SUPPLY (Terminals M12 – M13 – M14)

CASE 1 – 48VDC MAIN INVERTER SUPPLY (type NXP)



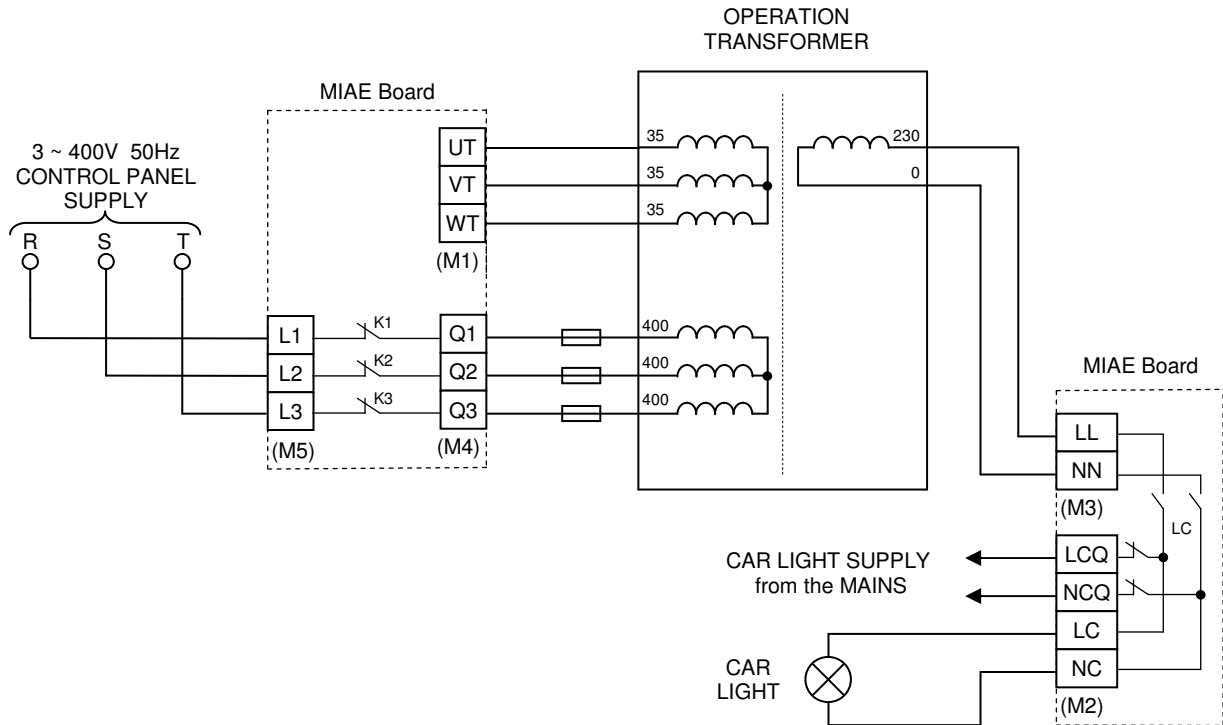
CASE 2 – 96VDC MAIN INVERTER SUPPLY (type NXP or NXL)



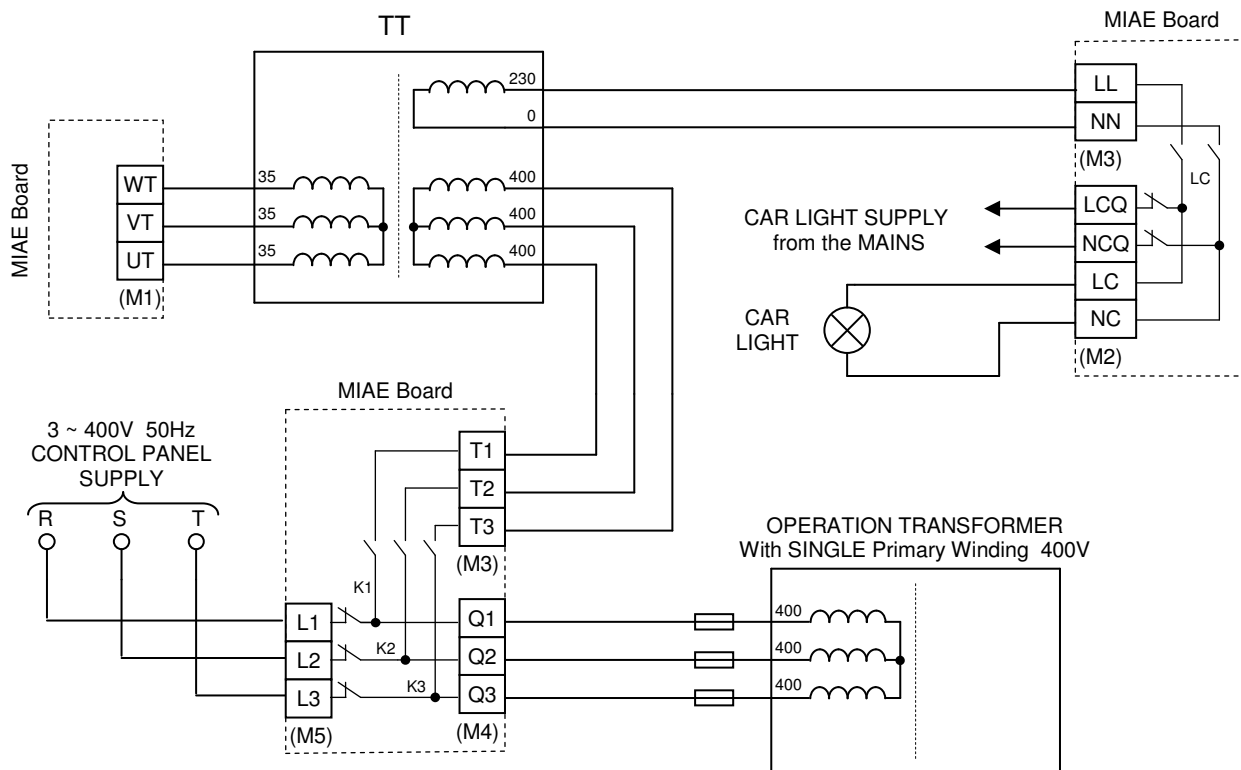
CB1, CB2 Double battery charger with two independent sections, type CBAT1, 24 + 24V
IE Emergency Main Switch, 32A

**4.2 – 3-PHASE MAINS INPUT, CONTROL PANEL AND CAR LIGHT SUPPLY
(Terminals M1 – M2 – M3 – M4 – M5)**

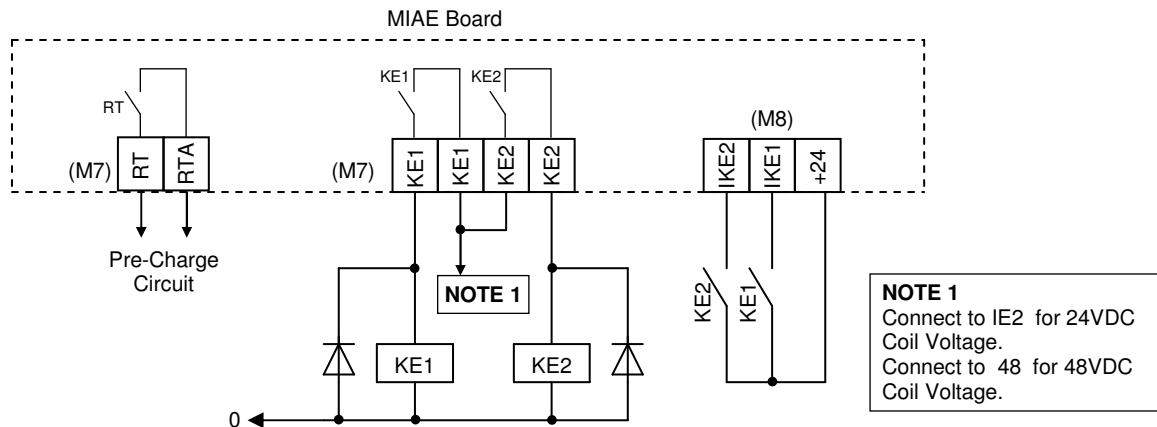
CASE 1 – OPERATION TRANSFORMER WITH DOUBLE PRIMARY WINDING (3 ~ 35/400V)



**CASE 2 – OPERATION TRANSFORMER WITH SINGLE PRIMARY WINDING 3 ~ 400V +
ELEVATOR TRANSFORMER 35/400V (TT)**



4.3 – CONTACTORS FOR INVERTER SUPPLY SWITCHING AND PRE-CHARGE (Terminals M7 – M8)



- **RT, RTA – PRE-CHARGE CIRCUIT (RT Relay)**

when KE2 is activated, also RT relay energizes for about 3 seconds, in order to carry out the capacitor pre-charge of the TAKEDO 3VF NX...inverter, and so to activate the “Fault” Relay (terminals 22-23).

The pre-charge voltage must be equal or higher than 220VAC, and must be connected to terminals L2 – L3.

The battery voltage must be connected to terminals L1 – L2.

For more details about connections, please see the example of drawing in the APPENDIX A

This function is used for all the inverter TAKEDO 3VF type NXL, or for the inverter type NXS/NXP supplied during emergency by 96V, without NXEM1 Board inside, up to the 27A size.

For bigger sizes, the NXEM1 Board inside the inverter is always needed, and you have to supply it by 220Vac for the whole emergency run – see the example of drawing in the APPENDIX B.

- **KE1 – KE2 – CONTACTOR COMMAND**

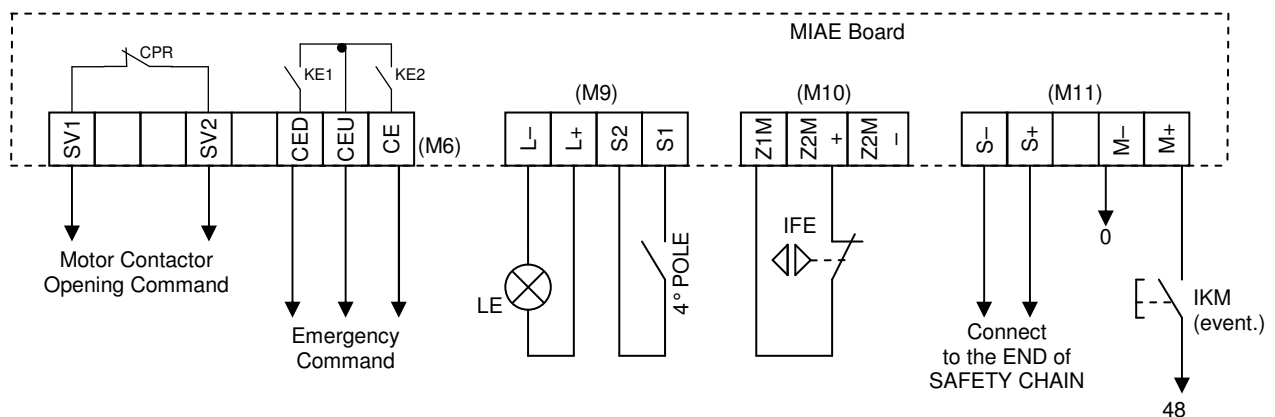
The KE1 – KE2 contactors carry out the power supply switching for the inverter, from the mains to the batteries. They must have the following characteristics:

Coil Voltage: 24 o 48VDC (see NOTE 1)

Power Contacts: 2NO+2NC

For more details about the power contact connections, please see the examples of drawing in the APPENDIX A, B and C.

4.4 – VARIOUS INPUTS AND OUTPUTS (Terminals M6 – M9 – M10 – M11)



LE Emergency Light 24VDC (MAX 2 lamps 24VDC 3W parallel connected)

IFE Emergency Stop Switch

IKM Switch for Emergency Manual Command

- **SV1, SV2** – MOTOR CONTACTOR OPENING COMMAND (CPR Relay)
Connect SV1–SV2 (N.C. contact of CPR, which opens at floor reaching in emergency) in series to the contactor coil supply. This connection is needed only if you would stop the car at the first-encountered floor, or any case when the control panel cannot control the emergency stop by itself.
- **CE, CEU, CED** – EMERGENCY COMMAND
On terminals CE,CED,CEU (Terminal M2) there are free voltage contacts which you should use to make the emergency call.
Connect CE-CED in parallel to the bottom floor call button, and CE-CEU in parallel to the top floor call button, in order to ensure the car moving even if it stands within the slowing-down zone of one of the limit floors.
if the control panel has an emergency command input (for PLC or microprocessor board, for instance), you should use the contact between terminals CEU-CED.
- **IFE** – EMERGENCY STOP SWITCH
There are 3 terminals for the emergency stop switch connection (Z1M, Z2M+, Z2M–), so you have 2 possibilities:
 - 1) if you use an added stop switch, dedicated only to emergency operation, you must connect it to terminals Z1M e Z2M+, as shown in the M10 drawing (**set JP2 in 2 position**).
 - 2) if you use in emergency the same stop switch already existing for normal operation, connect Z2M+ to the control panel screw-terminal which the above mentioned switch is connected to, and Z2M- to the common of the voltage which the switch is supplied by (if this common is negative (positive logic), otherwise connect in the opposite way if the common is positive (negative logic) (**set JP2 in 1 position**).
- **S–, S+** – SAFETY CHAIN
Connect to terminals S– S+ the operation voltage taken downstream the safety chain.
This voltage can be DC or AC (for DC voltage: S+ = positive, S– = negative).
See the chapter MIAE BOARD MAP to check the allowed voltage values.
- **IKM** – MANUAL COMMAND SWITCH (eventual)
The emergency operation can also be controlled manually (to carry out tests or to move manually the car in case of main supply missing, etc.)
For this purpose, you need to bring the 48VDC battery voltage to terminals M+ and M–, as shown in the M11 drawing.
The manual emergency operation comes to end when the voltage at the M+ / M- terminals is cut off.
See the chapter OPERATION DESCRIPTION about the differences respect to the automatic operation.

5 – OPERATION DESCRIPTION

When the main power supply is ON and the lift is working properly, on the MIAE board the following LED are light on:

- **RS-ST** presence of 3-phase supply
- **4P** 4TH pole closed
- **DLD** flashing – microcontroller active
- **DLA** board ready for emergency operation

When main power supply is cut OFF, or only one phase is off, after a few seconds the emergency operation starts, and the MIAE board performs the following sequence:

- a) It turns the led DLA off (ready for emergency operation)
- b) It turns the led DLB on (emergency in progress)
- c) It activates KE1 (which breaks the 3-phase mains) and LC (which breaks the 230Vac car light line), and checks the KE1 contactor activation.
- d) It activates KE2, RT (that turns off after 3 seconds), ONIAUX, and checks the KE2 contactor activation.
- e) It starts the 3-phase auxiliary inverter.
- f) It waits for the closing of the safety chain at terminals S+ / S- for maximum 20 seconds.
- g) When the safety chain is closed, it waits for the stop switch signal.
- h) When the stop zone has been reached, it waits for the stop delay, adjusted with trimmer P2 (0÷5sec).
- i) Once that the stop delay is elapsed, it activates the CPR output (to open the contactors of the control panel), and it waits for the door opening time, adjusted with trimmer P1 (0,1÷31sec).
- j) Once that the door opening time is elapsed, it turns off ONIAUX, the 3-phase auxiliary inverter and KE2.
- k) It deactivates KE1 and CPR, so that the lift is brought back to normal operation, supplied by the mains.
- l) It turns the led DLB off and turns the led DLC on (the emergency cycle is now ended).

A new emergency operation will be possible only after the mains supply has been reset.
Once that the 3-phase mains is back, the led DLC turns off and the led DLA turns on.

5.1- MANUAL OPERATION

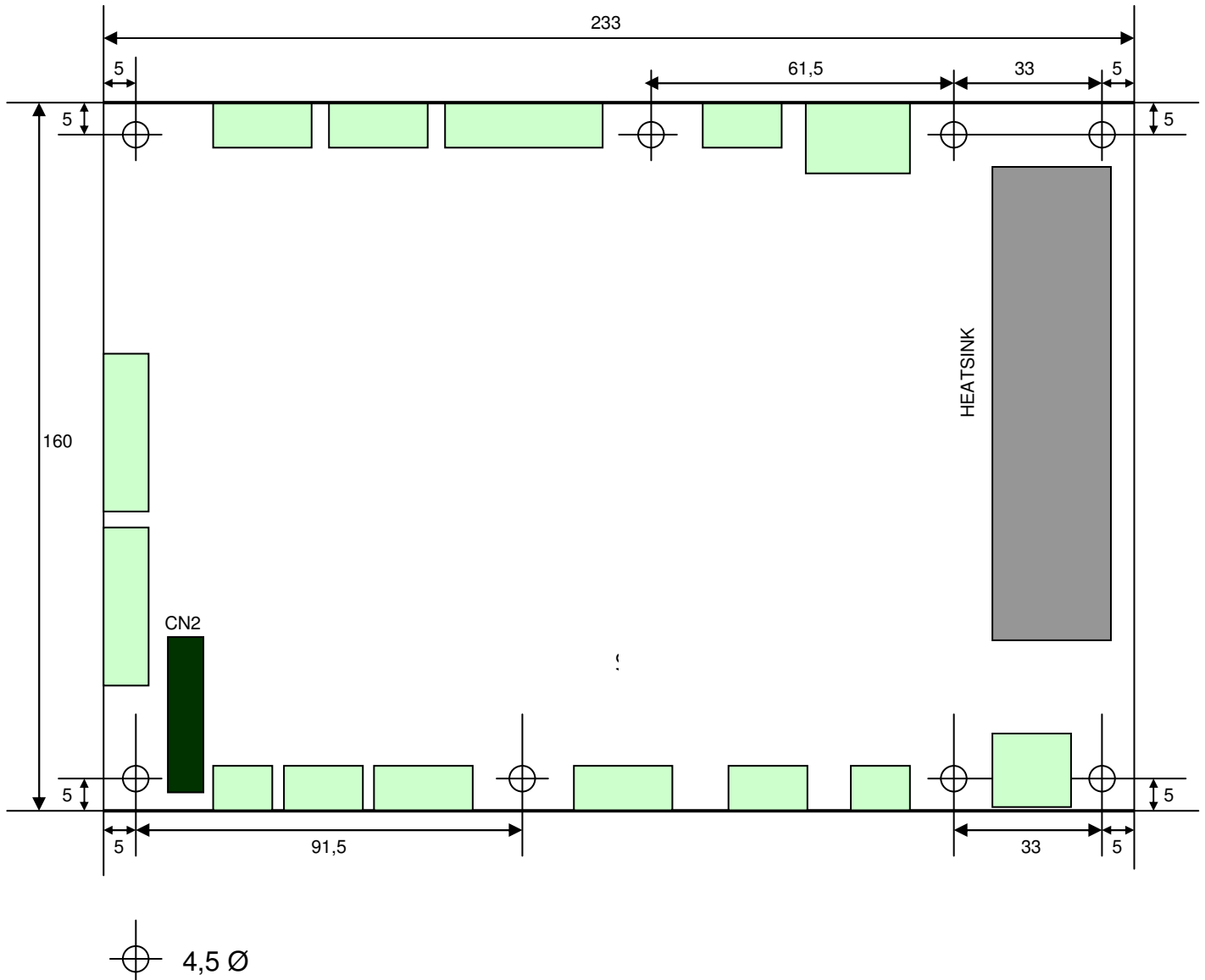
Connecting the M+ / M- input to 48VDC, the manual emergency operation starts. It follows the sequence of the automatic cycle, with the following differences:

- The control of failure at starting is not done.
- The stop switch is not considered.
- The delays set with P1 and P2 are not considered.
- The emergency ends when the voltage at input M+—M- is cut off.

Usually, this manual operation is used when it is necessary to move the car under the control of the maintenance man, for instance to move the car, with main power supply missing, by means of an appropriate maintenance control box (emergency electrical operation); by the way, we'd like to remind that the inverter TAKEDO-3VF NX, supplied by 96V or higher batteries for asynchronous motors, or supplied by 192V or higher batteries for synchronous motors, can give the rated torque to the motor, so that it can move the car in any run direction, with any load.

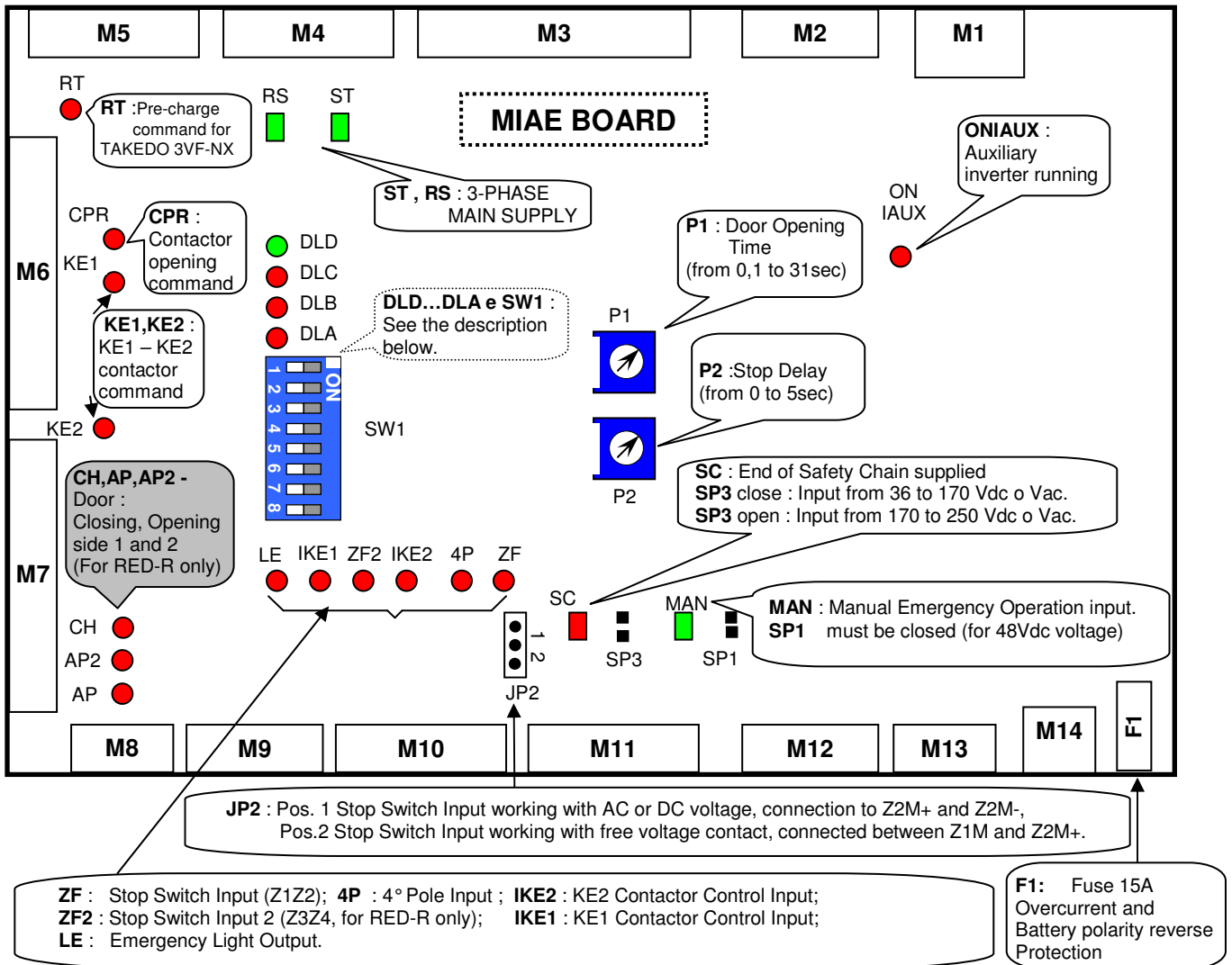
Both for the AUTOMATIC operation and the MANUAL operation, the maximum time allowed for the emergency cycle is 15 minutes. After this time the emergency operation breaks off any way and light on the Led DLA – DLC (permanent) – DLB (flashing), in order to signal that maximum operating time has elapsed.

6 – DIMENSIONS AND MOUNTING HOLES



7 – MIAE BOARD MAP

LED LEGENDA – TRIMMER, JUMPER, SOLDER POINT AND DIP-SWITCH SETTING



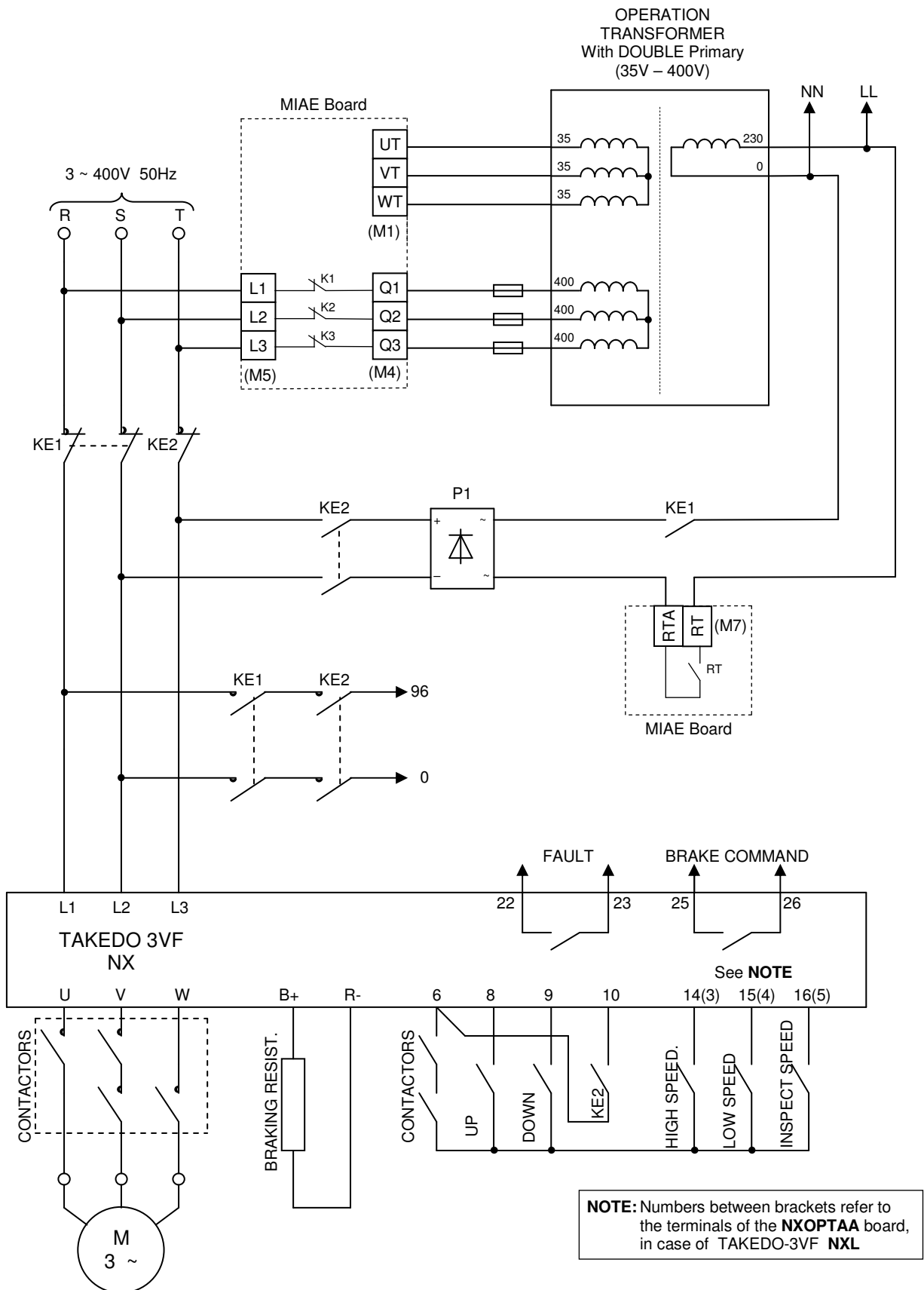
Dip Switch SW1	Description	
1	ON : STOP SWITCH CONTACT TYPE N.O.	OFF : STOP SWITCH CONTACT TYPE N.C.
2 (for RED-R only)	ON : DOUBLE CAR ENTRANCE	OFF : SINGLE CAR ENTRANCE
3 (for RED-R only)	ON : DOOR FORCED CLOSING DURING RUN	OFF : DOOR FORCED CLOSING DISABLED
4	ON : RED-R OPERATION	OFF : RED-NX OPERATION
5	NOT USED	
6	ON : 96 Vdc VOLTAGE CONTROL ENABLED	OFF : 96 Vdc VOLTAGE CONTROL DISABLED
7 (for RED-R only)	ON : M+ M- INPUT CONTROL DISABLED	OFF : M+ M- INPUT CONTROL ENABLED
8	ON : PHASE CONTROL DISABLED	OFF : PHASE CONTROL ENABLED

Led DLC	Led DLB	Led DLA	Description	Notes
☉	☉	☉	RED not ready (4th Pole open)	The DLD led is OFF when MIAE board is not supplied and is FLASHING when MIAE board is supplied. Legenda : ☉ = Led OFF ● = Led ON ☼ = Led FLASHING
☉	☉	●	RED ready to rescue operation	
☉	●	☉	Rescue operation running	
●	☉	☉	Rescue operation carried off	
☉	●	●	Alarm : Overcurrent	
●	☉	●	Alarm : KE1 contactor doesn't energize	
●	●	☉	Alarm : KE2 contactor doesn't energize	
●	●	●	Alarm : Failure at Starting (S+–S- not activated)	
●	☼	●	Alarm : Maximum operating time elapsed	
☉	☉	☼	Batteries : 24V Voltage too high or too low	
☉	☼	☉	Batteries : 48V Voltage too high or too low	
☼	☉	☉	Batteries : 96V Voltage too high or too low	

NOTA: As mentioned in the GENERAL DESCRIPTION Chapter, this manual refers only to the RED-NX operation type, so you have to ignore any reference to RED-R.

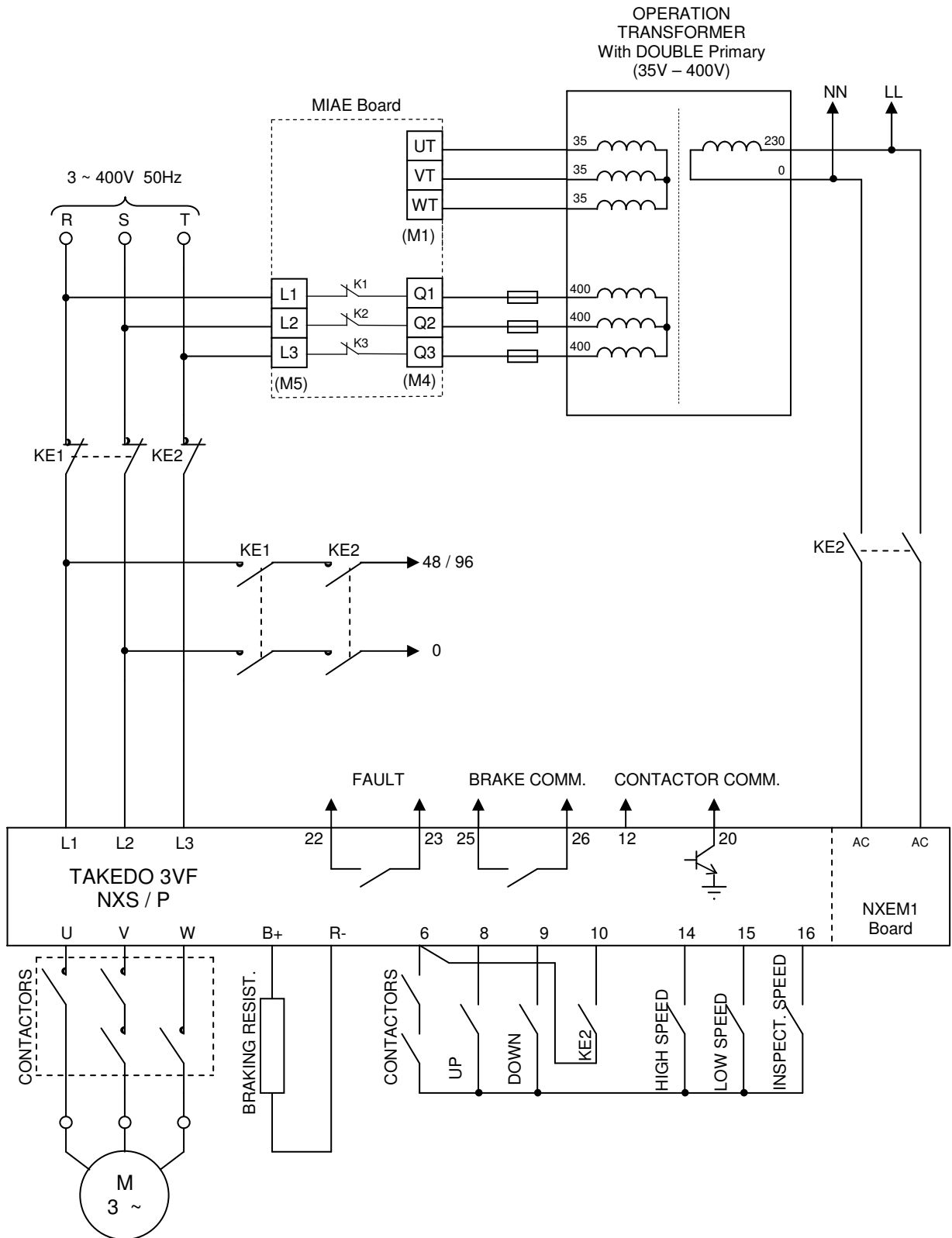
APPENDIX A

EXAMPLE OF EMERGENCY DRAWING FOR INVERTER NXL OR NXP UP TO 27A



APPENDIX B

EXAMPLE OF EMERGENCY DRAWING FOR INVERTER NXP > 27A WITH NXEM1 BOARD INSIDE – BATTERY SUPPLY 48 / 96V



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