USER'S MANUAL
Rev. 9/2011

REVO S 2PH

SOLID STATE RELAY

60 TO 90 A___
120 TO 210 A

00015

CD AUTOMATION

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Dichiarazione di Conformità CE
CE Declaration of Conformity

PRODUTTORE:
PRODUCT MANUFACTURER: CD Automation S.R.L.

INDIRIZZO:
ADDRESS: Via Pablo Picasso 34//36
20025 Legnano (Mi)
Italia

Dichiara che il prodotto:
Declare that the product:

RevoS, 2ph da 60 a 210A

SODDISFA I REQUISITI DELLA NORMA :

Specifica di sicurezza	EN60947-1 :2008
	EN60947-4-3:2001
Specifica sulle emissioni	EN60947-4-3:2000
Specifica sulle Immunità	EN60947-4-3:2000

FULFILS THE REQUIREMENTS OF THE STANDARD:

Electrical safety Standard	EN60947-1 :2008
	EN60947-4-3:2001
Generic Emission standard	EN60947-4-3:2000
Generic Immunity standard	EN60947-4-3:2000

CDAutomation dichiara che I prodotti sopra menzionati sono conformi alla direttiva

CDAutomation declares that The products above mentioned they am conforming to the directive

EMC 2004/108/CEE e alla direttiva Bassa Tensione (low Voltage) **2006/95/CEE**

DESCIZIONE DEL PRODOTTO: Unità di controllo potenza elettrica
PRODUCT DESCRIPTION: Elettric power controll

UTILIZZO: Controllo processi termici
SCOPE OF APPLICATION: Thermal controll process

Data di emissione: 20/04/2010
Issued on: 20/04/2010

Amministratore Unico e
Legale Rappresentante
Claudio Brizzi

1 Important warning for safety

The Thyristor unit are integral part of industrial equipments.
When it is supply, the Thyristor unit is subject to dangerous tensions. Don't remove the plastic cover.
Don't use this unit in aerospace and nuclear application.

Electric Shock Hazard (Rischi di scosse elettriche, Risque de choque électrique)
When thyristor unit has been connected to main supply voltage and is switched off, before to touch it be secure that the unit is isolated and wait at least one minute to allow discharging internal capacitors.
Thus be secure that:

- access to thyristor unit is only permitted to specialised personnel;
- the authorised personnel must read this manual before to have access to the unit;
- the access to the unit must be denied to unauthorised personnel.

Important warnings (Avvertenze importanti, attention)
During the operations with units under tension, local regulations regarding electrical installation should be rigidly observed:

- Respect the internal safety rules.
- Don't bend components to maintain insulation distances.
- Protect the units from high temperature humidity and vibrations.
- Don't touch components to prevent electrostatic discharges on them.
- Verify that the size is in line with real needs.
- To measure voltage current etc. on unit, remove rings and other jewels from fingers and hands.
- Authorized personnel that work on thyristor unit under power supply voltage must be on insulated board

This listing does not represent a complete enumeration of all necessary safety cautions

Protection (Protezione, Protection)
The unit have IP20 protection rating as defined by the specific international. Is necessary consider the place of installation.

Earth (Messa a terra, Terre)
For safety, the Thyristor unit with isolated heat-sink must be connected to earth.
Earth impedance should be correspondent to local earth regulation. Periodically the earth efficiency should be inspected.

Electromagnetic compatibility (Compatibilità elettromagnetica, Compatibilité électromag.)
Our thyristor units have an excellent immunity to electromagnetic interferences if all suggestions contained in this manual are respected. In respect to a good Engineering practice, all inductive loads like solenoids contactor coils should have a filter in parallel

Emissions (Emissioni, Emission)
All solid-state power controllers emit a certain amount of radio-frequency energy because of the fast switching of the power devices. The CD Automation's Thyristor unit are in accord with the EMC norms, CE mark.
In most installations, near by electronic systems will experience no difficulty with interference. If very sensitive electronic measuring equipment or low-frequency radio receivers are to be used near the unit, some special precautions may be required. These may include the installation of a line supply filter and the use of screened (shielded) output cable to the load.

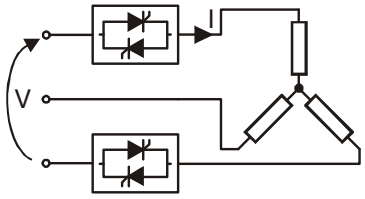
CE

2 Basic Connections

Star wiring with resistive load (control on two phases)

$$I = \frac{P}{1{,}73V}$$

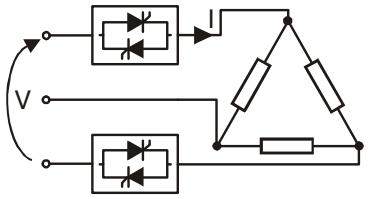
V = Nominal voltage of the load
I = Nominal current of the load
P = Nominal power of the load



Delta wiring with resistive load (control on two phases)

$$I = \frac{P}{1{,}73V}$$

V = Nominal voltage of the load
I = Nominal current of the load
P = Nominal power of the load



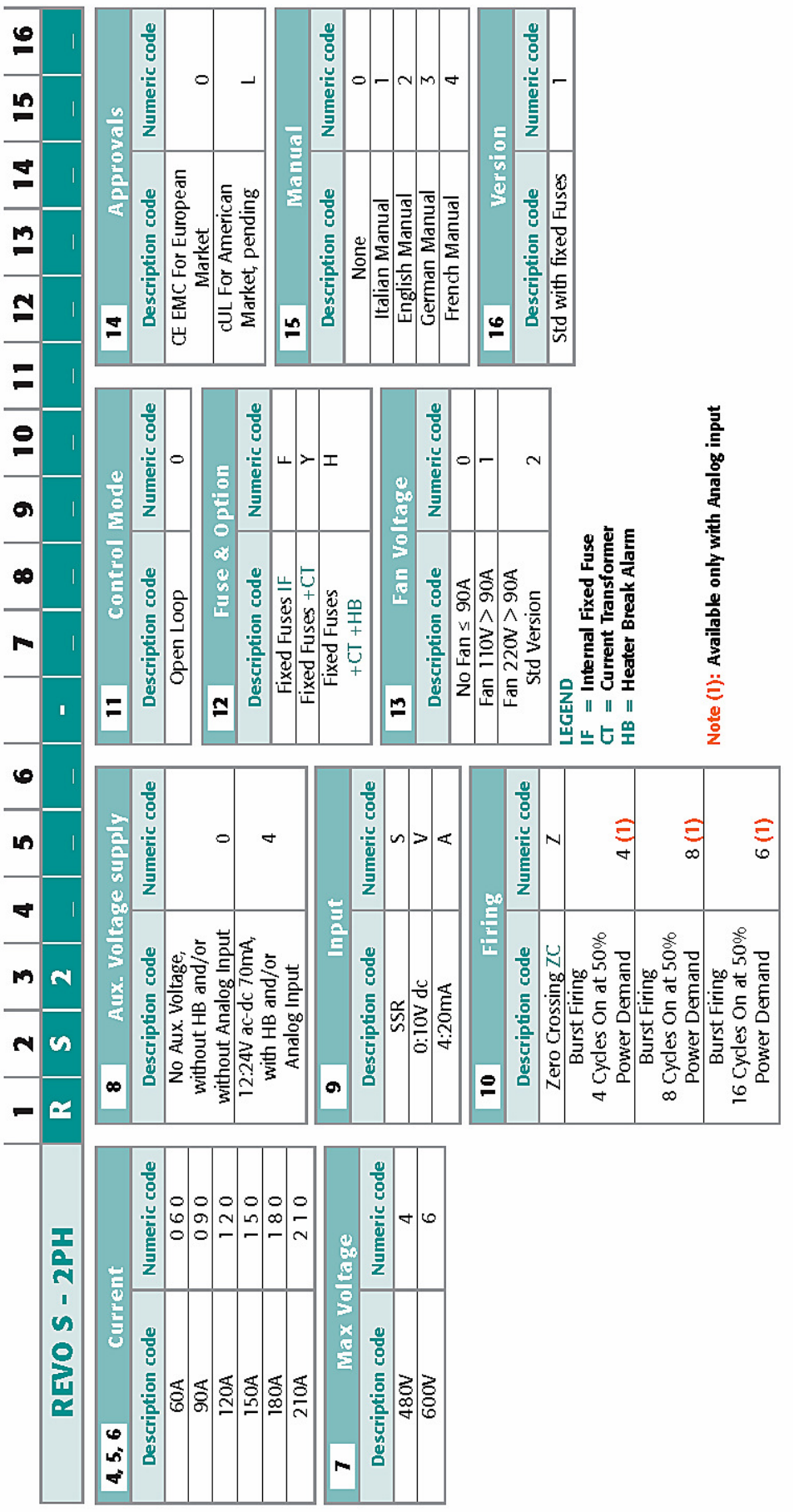
3 Identification and Order Code

3.1 Identification of the unit

Caution: *Before to install, make sure that the Thyristor unit have not damages. If the product has a fault, please contact the dealer from which you purchased the product.*

The identification's label give all the information regarding the factory settings of the Thyristor unit, this label is on the unit, like represented in figure.
Verify that the product is the same thing as ordered .

3.2 Order Code



1	2	3	4	5	6		7	8	9	10	11	12	13	14	15	16
R	S	2	_	_	_	-	_	_	_	_	_	_	_	_	_	_

REVO S - 2PH

4, 5, 6 Current	
Description code	Numeric code
60A	0 6 0
90A	0 9 0
120A	1 2 0
150A	1 5 0
180A	1 8 0
210A	2 1 0

7 Max Voltage	
Description code	Numeric code
480V	4
600V	6

8 Aux. Voltage supply	
Description code	Numeric code
No Aux. Voltage, without HB and/or without Analog Input	0
12:24V ac-dc 70mA, with HB and/or Analog Input	4

9 Input	
Description code	Numeric code
SSR	S
0:10V dc	V
4:20mA	A

10 Firing	
Description code	Numeric code
Zero Crossing ZC	Z
Burst Firing 4 Cycles On at 50% Power Demand	4 (1)
Burst Firing 8 Cycles On at 50% Power Demand	8 (1)
Burst Firing 16 Cycles On at 50% Power Demand	6 (1)

11 Control Mode	
Description code	Numeric code
Open Loop	0

12 Fuse & Option	
Description code	Numeric code
Fixed Fuses IF	F
Fixed Fuses +CT	Y
Fixed Fuses +CT +HB	H

13 Fan Voltage	
Description code	Numeric code
No Fan ≤ 90A	0
Fan 110V > 90A	1
Fan 220V > 90A Std Version	2

LEGEND
IF = Internal Fixed Fuse
CT = Current Transformer
HB = Heater Break Alarm

Note (1): Available only with Analog input

14 Approvals	
Description code	Numeric code
CE EMC For European Market	0
cUL For American Market, pending	L

15 Manual	
Description code	Numeric code
None	0
Italian Manual	1
English Manual	2
German Manual	3
French Manual	4

16 Version	
Description code	Numeric code
Std with fixed Fuses	1

4 Technical Specifications

4.1 General features:	
Cover and Socket material:	PolymericV2
Utilization Category	AC-51 AC-55b
IP Code	20
Method of Connecting	Load in Delta, Load in Star
Auxiliary voltage:	12÷24V dc/ac (max 70mA)If requested
Relay output for Heater Break Alarm (only with HB option):	0.5A a 125VAC

4.2 Input features:	
Logic input SSR:	5 ÷ 30Vdc 18mA Max (ON ≥ 5Vdc OFF < 4Vdc)
Logic input SSR with HB option:	4 ÷ 30Vdc 5mA Max (ON ≥ 4Vdc OFF < 1Vdc)
Analog Input V:	0 ÷ 10Vdc (15KΩ)
Analog Input A:	4 ÷ 20mA (100Ω)
Digital Input calib. (only with HB option):	12 ÷ 24V dc/ac (max 37mA)

4.3 Output features(power device):

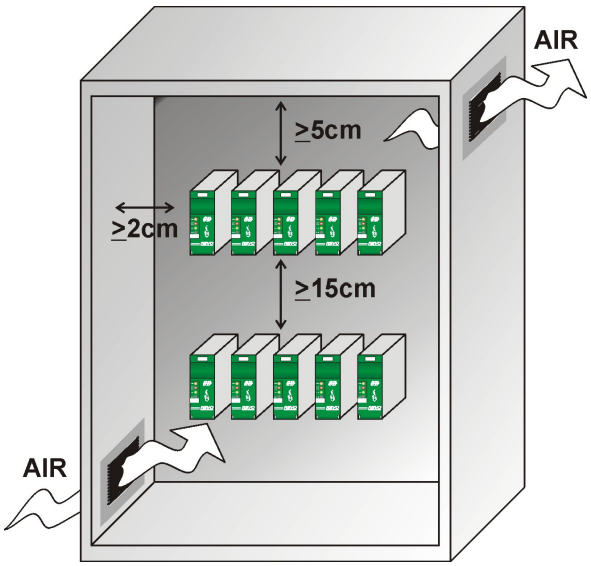
Current	Nominal Voltage range (Ue)	Repetitive peak reverse voltage (Uimp)		Latching current	Max peak one cycle	Leakage current	I^2T value max	Frequency range	Power loss	Isolation Voltage (Ui)
(A)	(V)	(480V)	(600V)	(mAeff)	(10msec.) (A)	(mAeff)	tp=10msec	(Hz)	I=Inom (W)	Vac
60	24÷600	1200	1600	450	1000	15	4750	47÷70	130	2500
90	24÷600	1200	1600	450	2000	15	19100	47÷70	168	2500
120	24÷600	1200	1600	450	1540	15	11300	47÷70	276	2500
150	24÷600	1200	1600	450	2000	15	19100	47÷70	324	2500
180	24÷600	1200	1600	300	4800	15	108000	47÷70	356	2500
210	24÷600	1200	1600	300	5250	15	128000	47÷70	404	2500

4.4 Fan Specification 60-90A	
Supply: 230V Standard	Input Power 16W (1 Fan)
Supply: 115V Option	Input Power 14W (1 Fan)

4.5 Fan Specification 120-210A	
Supply: 230V Standard	Power 32W (16W for 2 Fan)
Supply: 115V Option	Power 28W (14W for 2 Fan)

5 Installation

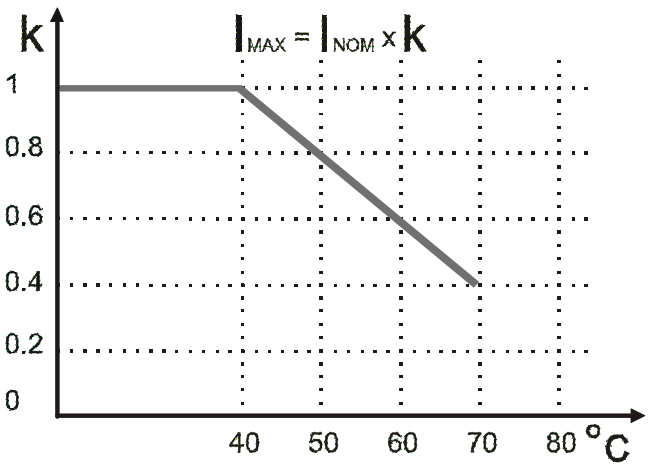
Before to install, make sure that the Thyristor unit have not damages.
If the product has a fault, please contact the dealer from which you purchased the product.
Verify that the product is the same thing as ordered.
The Thyristor unit must be always mounted in vertical position to improve air cooling on heat-sink.
Maintain the minimum distances in vertical and in horizontal as represented.
When more unit has mounted inside the cabinet maintain the air circulation like represented in figure.
Sometimes is necessary installing a fan to have better air circulation.



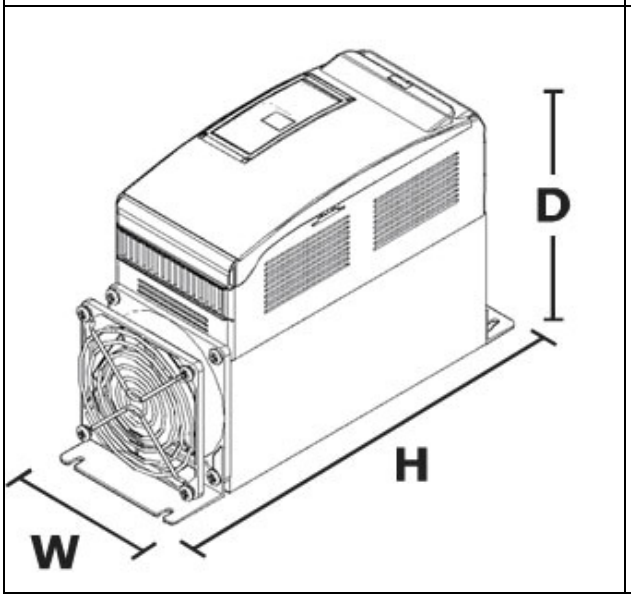
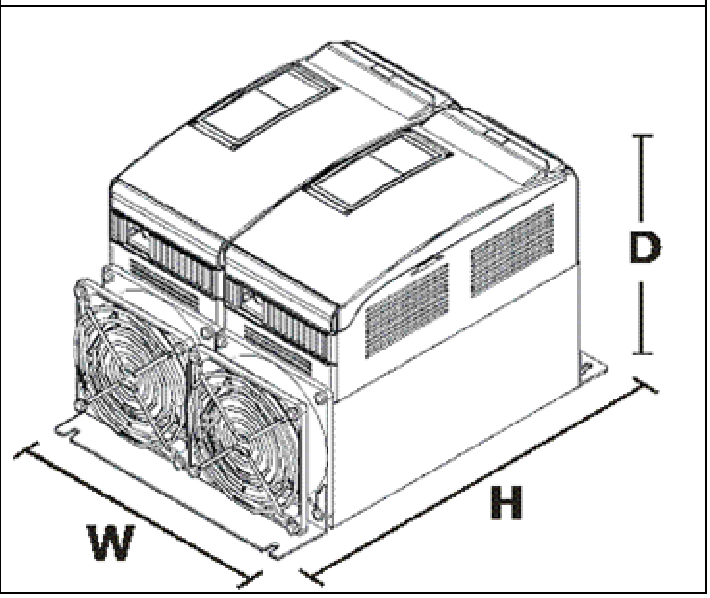
5.1 Environmental installation conditions

Ambient temperature	0-40°C at nominal current. Over 40°C use the derating curve.
Storage temperature	-25°C a 70°C
Installation place	Don't install at direct sun light, where there are conductive dust, corrosive gas, vibration or water and also in salty environmental.
Altitude	Up to 1000 meter over sea level. For higher altitude reduce the nominal current of 2% for each 100m over 1000m
Humidity	From 5 to 95% without condense and ice
Pollution Level	Up to 2nd Level ref. IEC 60947-1 6.1.3.2

5.2 Derating Curve

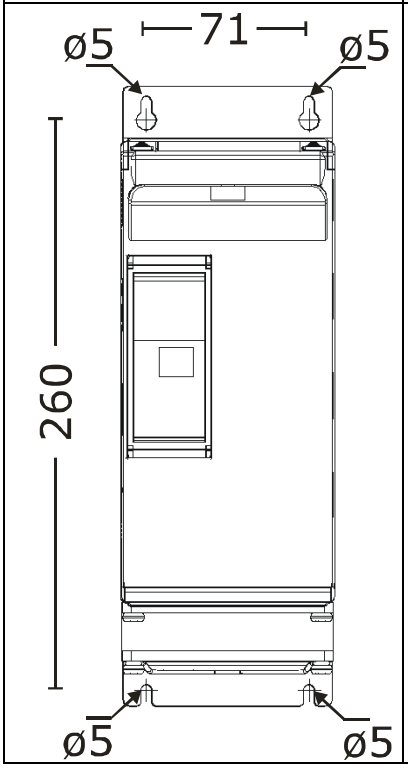
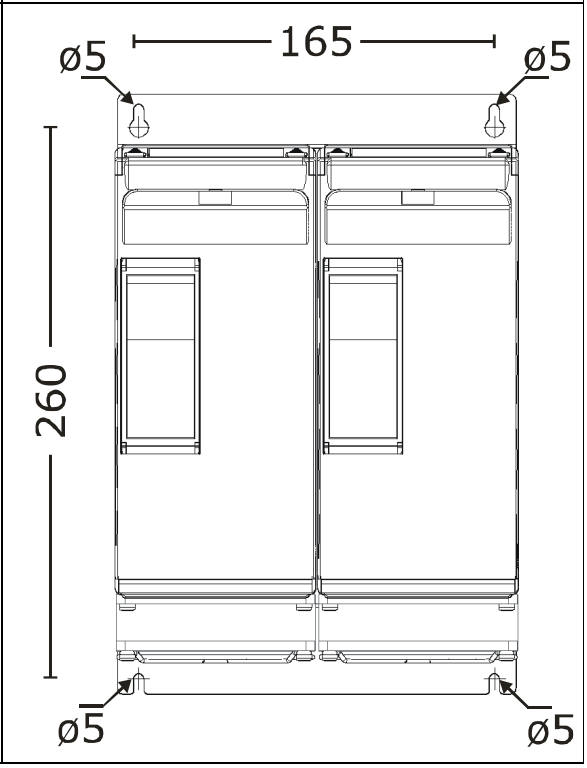


5.3 Dimensions and Weight

REVO S 2PH (60-90A)	REVO S 2PH (120-210A)
	

Size	W(mm)	D(mm)	H(mm)	Weight (kg)
2PH (60-90A)	93	170	273	3,6
2PH (120-210A)	186	170	273	7

5.4 Fixing holes

REVO S 2PH (60-90)	REVO S 2PH (120-210A)
	

6 Wiring instructions

The Thyristor unit could be susceptible to interferences lost by near equipments or by the power supply, for this reason in accord to the fundamental practices rules is opportune take some precautions:

- The coil contactor, the relays and other inductive loads must be equipped with opportune RC filter.
- Use shielded bipolar cables for all the input and output signals.
- The signal cables must not be near and parallel to the power cables.
- Local regulations regarding electrical installation should be rigidly observed.

Use copper cables and wires rated for use at 75°C only.

6.1 Power cable torque (suggested)

Type	Connector Type	Torque Lb-in (N-m)	Wire Range mm²(AWG)	MAX Current Terminals	Wire Terminals UL Listed (ZMVV)
060 090 120	Screw M6	70.8 (8.0)	1	150	Fork/Spade Terminal Copper Tube Crimp.Lug
150 180 210	Screw M8	265 (30.0)	1 3/0	250	Copper wire Compact (Solid) Stranded

6.2 Cable dimensions of the Command Terminals

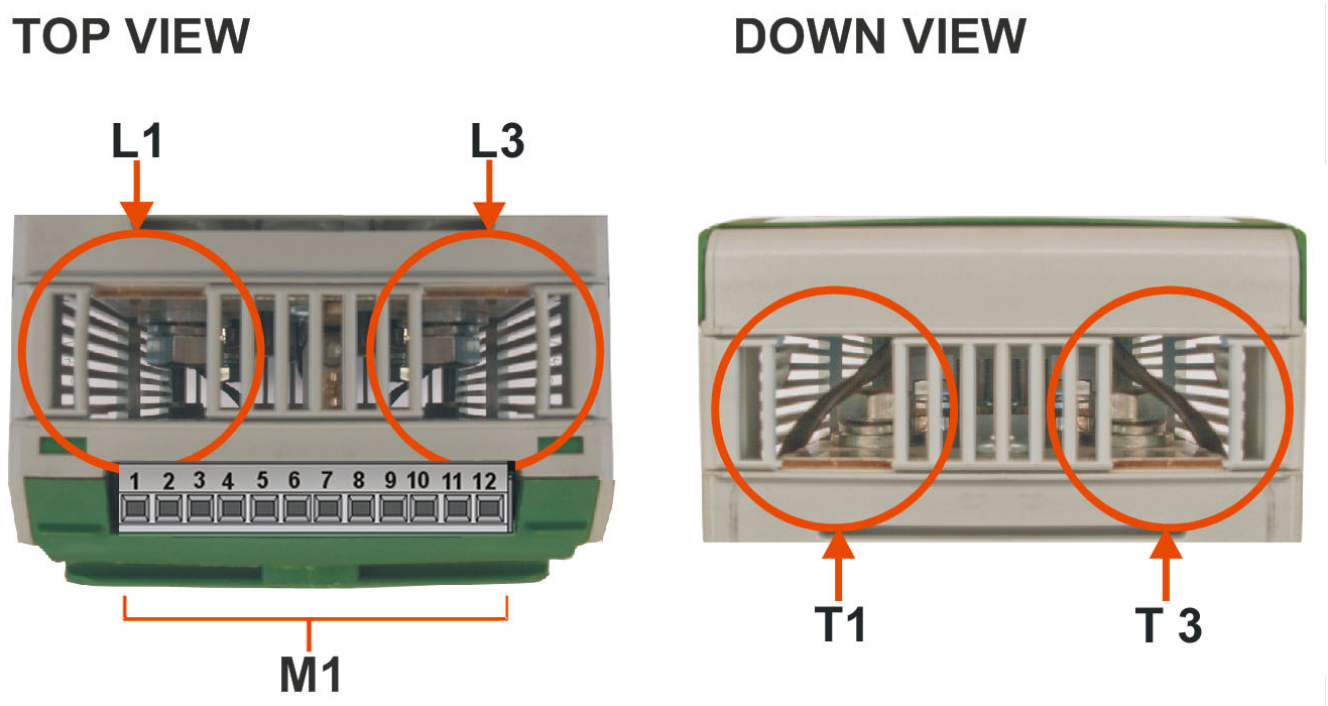
0.5mm² (AWG 18)

6.3 Cable dimensions of the Earth (suggested)

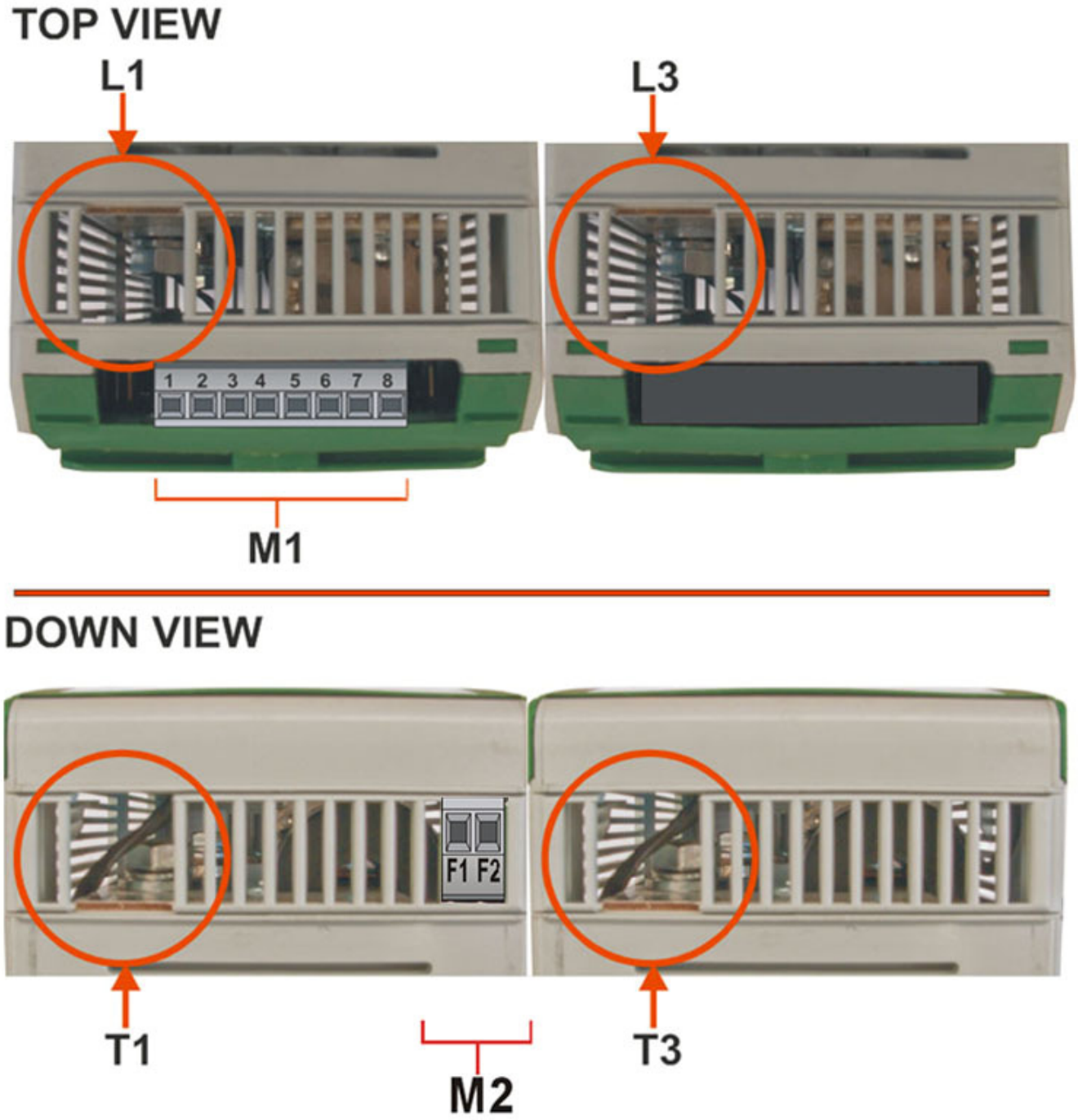
16 mm² (AWG 6) up to 120A

25 mm² (AWG 4) up to 210A

6.4 Terminals Positions 2Ph 60-90A Size



6.5 Terminals Positions 2Ph 120-210A Size



6.6 Power Terminals from 60 to 90 A

Warning: *Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.*

Terminal	Description
L1	Line Input Phase 1
T1	Load Output Phase 1
L3	Line Input Phase 3
T3	Load Output Phase 3

6.7 Command Terminals from 60 to 90 A

Warning: *Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.*

6.7.1 Terminal block M1 for SSR Input

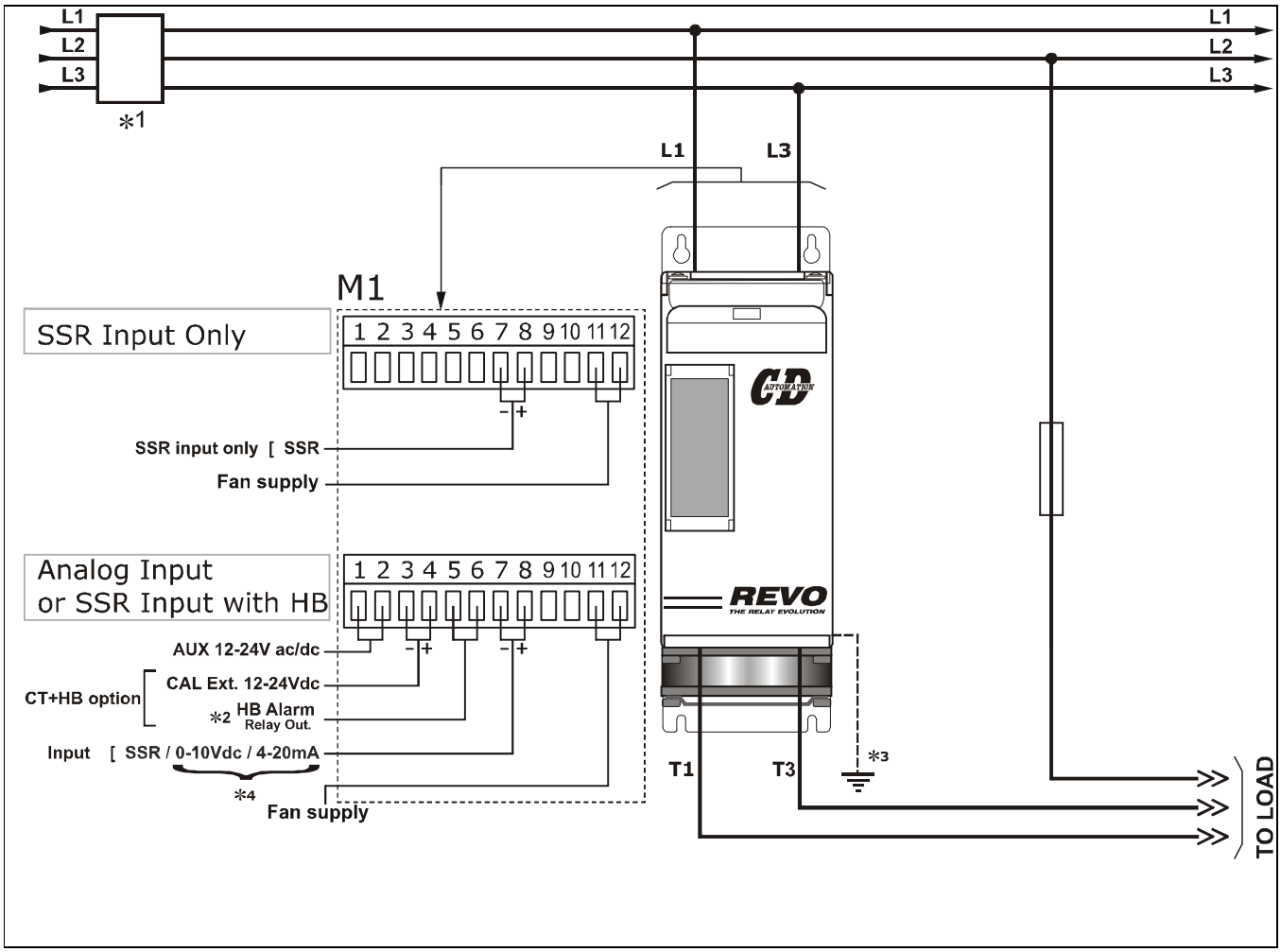
Terminal	Description
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	Not connected
6	Not connected
7	- Input SSR
8	+ Input SSR
9	Not connected
10	Not connected
11	Fan supply voltage (230V standard – 115V option)
12	Fan supply voltage (230V standard – 115V option)

6.7.2 Terminal block M1 for Analog Input or SSR input with HB

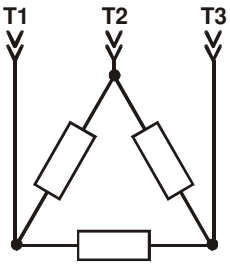
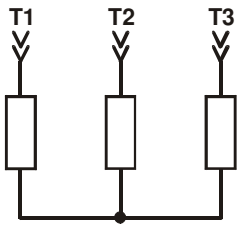
Terminal	Description
1	Aux – Voltage Supply for elettronic boards 12-24V AC/DC
2	Aux – Voltage Supply for elettronic boards 12-24V AC/DC
3	- Cal Ext. 12/24Vdc
4	+ Cal Ext. 12/24Vdc
5	C –Common contact relay alarm output(see HB Alarm contact for config.)
6	NC\NO–Normally Close\Open contact alarm relay output(see HB Alarm contact for config.)
7	- Control Input (SSR/0-10Vdc/4-20mA)
8	+ Control Input (SSR/0-10Vdc/4-20mA)
9	Not connected
10	Not connected
11	Fan supply voltage (230V standard – 115V option)
12	Fan supply voltage (230V standard – 115V option)

Caution: *this procedure must be performed only by qualified persons.*

6.8 Connection Diagram for 3 phases (control on 2 phases) from 60 to 90 A



- *1 A suitable device must ensure that the unit can be electrically isolated from the supply(electromagnetic circuit breaker or by fuse isolator), this allows the qualified people to work in safety.
- *2 Only for the HB option See par. "Heater break Alarm and SCR short circuit"
- *3 The heat-sink must be connected to the earth.
- *4 Only for the Analog Input option , the analog input isn't isolated from Aux Supply
  a series connection between analogue inputs of the units is not possible.
  With AC Aux supply it's not possible connect the zero terminal of Analogue Input to the earth.
  With DC Aux supply is not possible to connect the zero of the power supply with the zero of analog input

Load Type	
 Delta	 Star

6.9 Power Terminals from from 120 to 210A

Warning: *Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.*

Terminal	Description
L1	Line Input Phase 1
T1	Load Output Phase 1
L3	Line Input Phase 3
T3	Load Output Phase 3

6.10 Command Terminals from 120 to 210A

Warning: *Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.*

6.10.1 Terminal block M1 for SSR Input

Terminal	Description
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	Not connected
6	Not connected
7	- Input SSR
8	+ Input SSR

6.10.2 Terminal block M1 for Analog Input or SSR input with HB

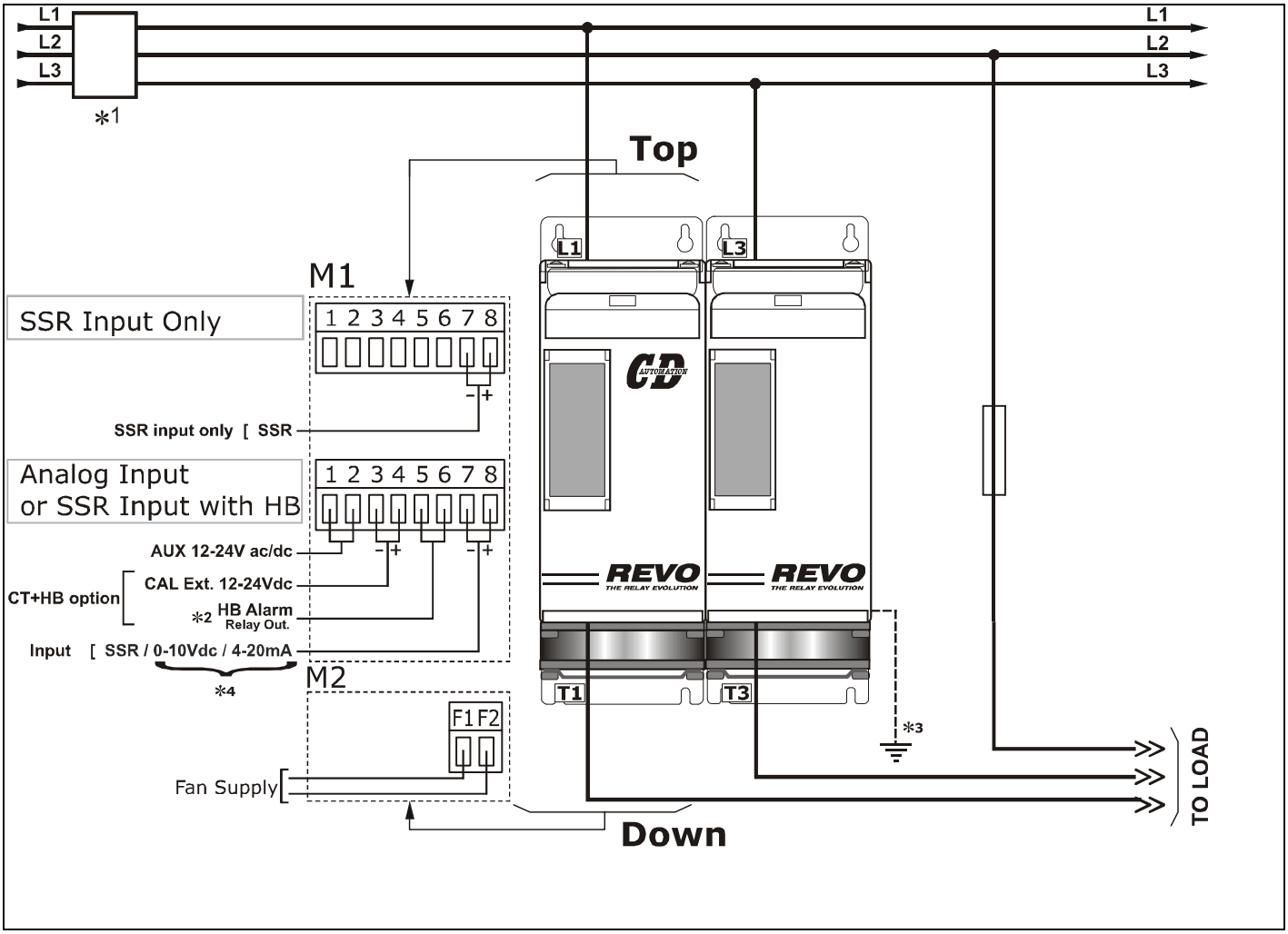
Terminal	Description
1	Aux – Voltage Supply for elettronic boards 12-24V AC/DC
2	Aux – Voltage Supply for elettronic boards 12-24V AC/DC
3	- Cal Ext. 12/24Vdc
4	+ Cal Ext. 12/24Vdc
5	C –Common contact relay alarm output(see HB Alarm contact for config.)
6	NC\NO–Normally Close\Open contact alarm relay output(see HB Alarm contact for config.)
7	- Control Input (SSR/0-10Vdc/4-20mA)
8	+ Control Input (SSR/0-10Vdc/4-20mA)

6.11 Fan Supply terminal M2

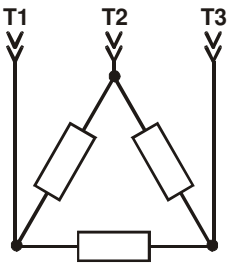
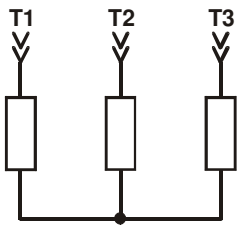
Terminal	Description
F1	Fan supply (230V standard – 115V option)
F2	Fan supply (230V standard – 115V option)

6.12 Connection Diagram for 3 phases (control on 2 phases) from 120 to 210A

Caution: *this procedure must be performed only by qualified persons.*

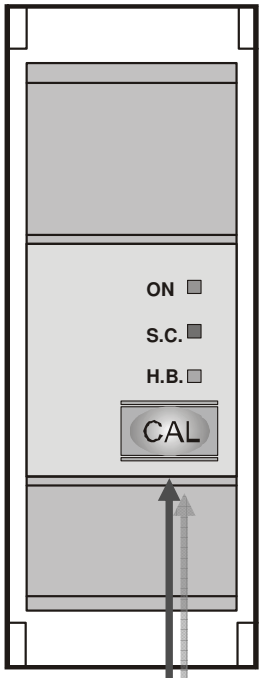


- *1 A suitable device must ensure that the unit can be electrically isolated from the supply(electromagnetic circuit breaker or by fuse isolator), this allows the qualified people to work in safety.
- *2 Only for the HB option See par. "Heater break Alarm and SCR short circuit"
- *3 The heat-sink must be connected to the earth.
- *4 Only for the Analog Input option , the analog input isn't isolated from Aux Supply
  a series connection between analogue inputs of the units is not possible.
  With AC Aux supply it's not possible connect the zero terminal of Analogue Input to the earth.
  With DC Aux supply is not possible to connect the zero of the power supply with the zero of analog input

Load Type	
 Delta	 Star

7 Led status and Alarms

LED	STATUS	DESCRIPTION
H.B. S.C.	LED OFF	Load OK
	LED ON (Yellow)	Load Fault (only with HB option)
	LED ON (Red)	SCR short circuit (only with HB option)
ON	LED OFF	Load is NOT powered
	LED ON (Green)	Load is powered



8 Heater Break alarm and SCR short circuit (HB Option only)

Caution: *to work properly the load must be powered at least about 160msec.*

The Heater Break circuit read the load current with an Internal current transformer (C.T.).
Minimum current is 10% of the current transformer size.
If load current is below this value the Heater Break Alarm doesn't work properly.

Heater break Calibration procedure

An automatic function sets the Heater Break Alarm.
The auto setting function can be activated using the "CAL" button on front unit, or supply with 12-24Vdc the digital input "Cal Ext." (See Connection Diagram).
The Heater Break calibration procedure is performed in this way:

- The Unit gives the maximum voltage output
- all LEDS are on, this means that calibration procedure is active
- The current value is stored in memory
- After about 15 second the unit comes back to the initial situation

If load current decreases for partial or total load failure (sensitivity 20%) the yellow LED HB become ON and alarm relay change status.
If the unit is still in conduction with no input signal (LED green OFF) it means that there is a short circuit on thyristors and red LED (SC) become ON.
If the load has been changed the Heater Break calibration procedure must be done again

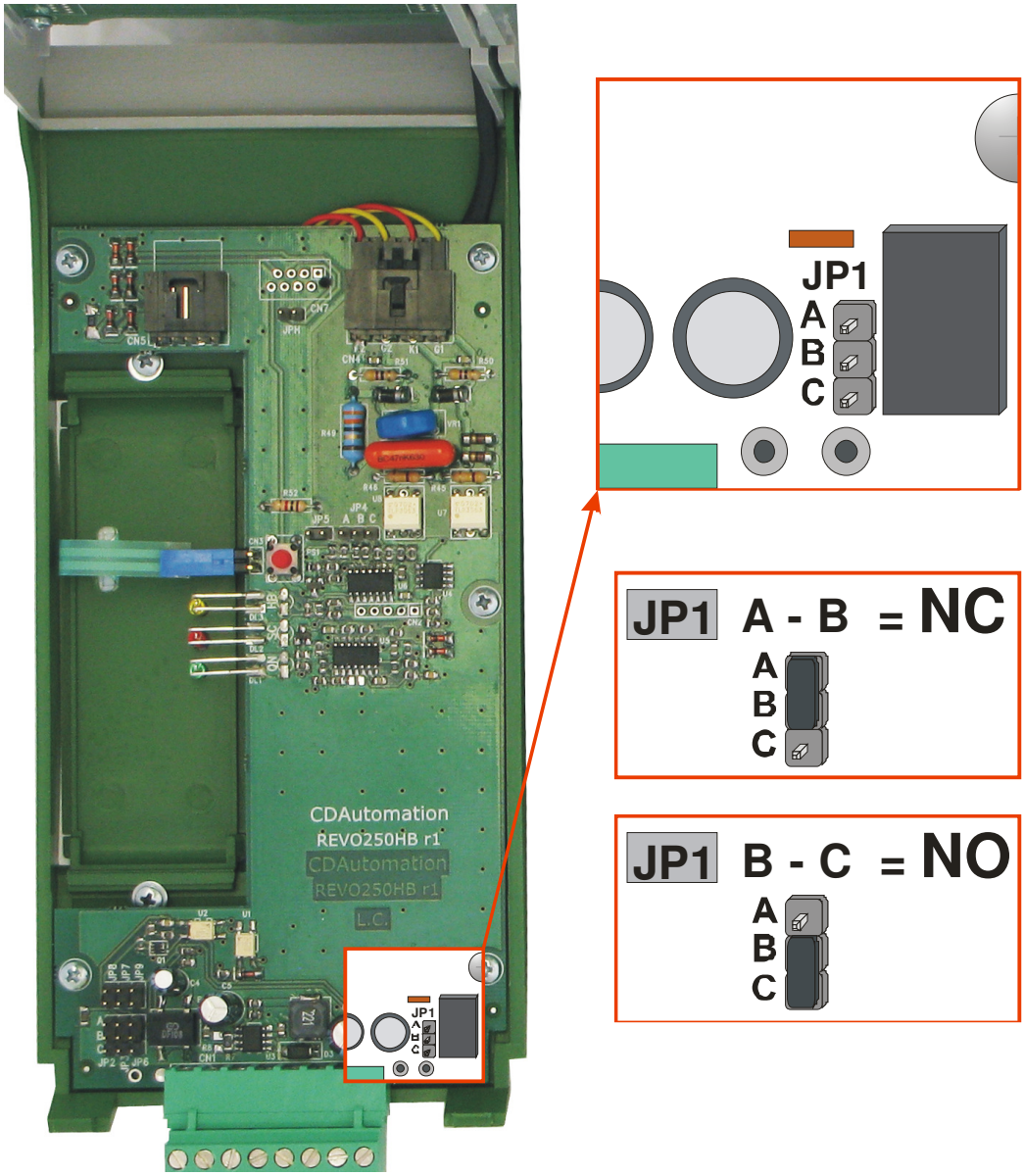
8.1 HB Alarm contact

The Revo unit with HB option, is supplied with Heater Break alarm contact normally opened (NO):

- In normal conditions (without alarm) and with auxiliary power supply, the contact to the terminals has opened (relay coil energized).
- In alarm condition or without auxiliary power supply the contact to the terminals is closed (relay coil not energized).

if you wish to change the alarm contact open the cover of the module and set the jumper as shown in the next page .

Warning: *Before operate, be sure that power and control cables are isolated from voltage sources*

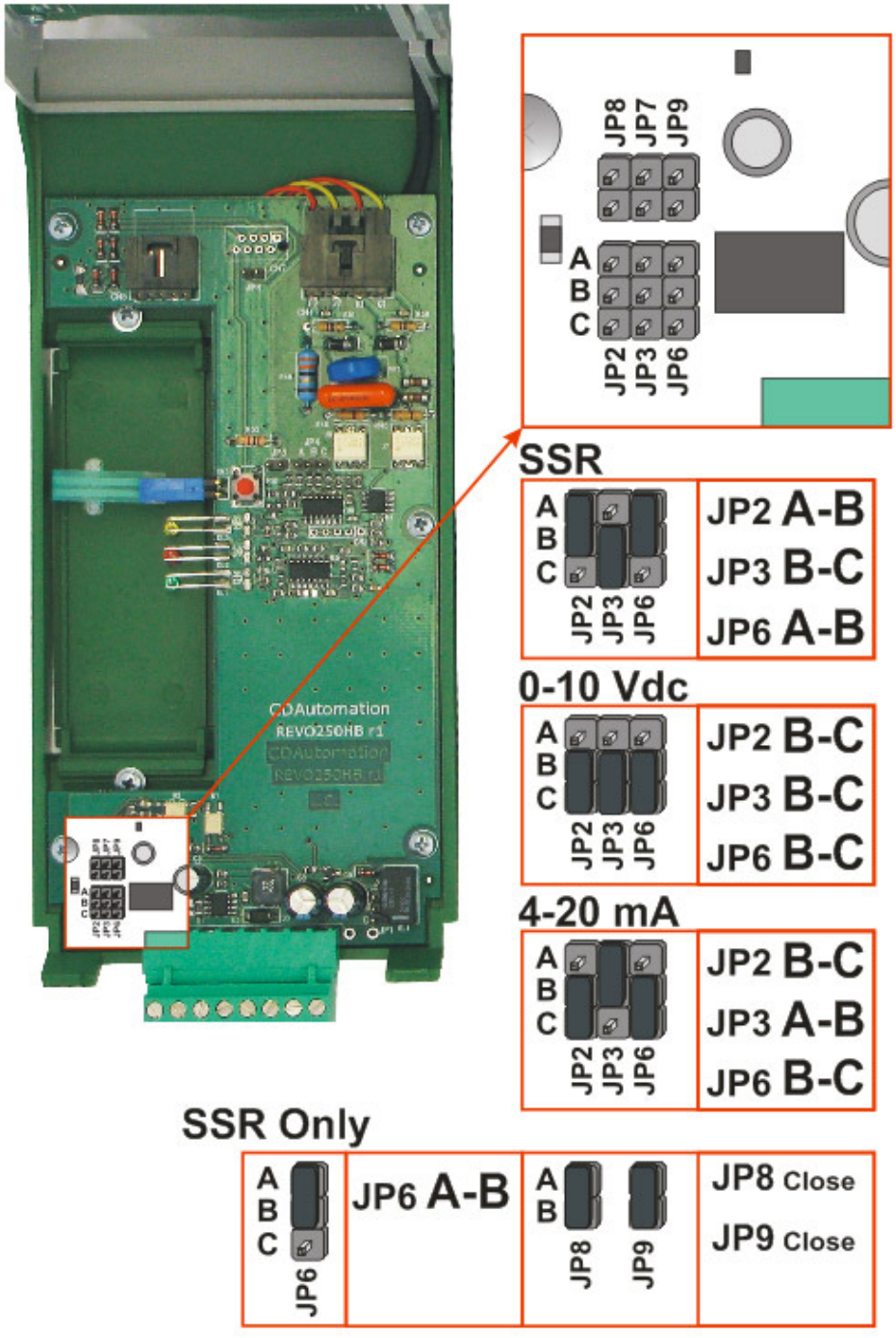


9 Input setting

The input type is already configured in line with customer requirements that are defined in the Order Code. However, if you wish to change the input type (ex. from 0÷10V to 4÷20mA) set the jumpers as below represented and then do the "Input calibration procedure":

<u>Important:</u> The analog input isn't isolated from Aux Supply. The series connection between analogue inputs of the units is not possible.With AC Aux supply it's not possible connect the zero terminal of Analogue Input to the earth. With DC Aux supply is not possible to connect the zero of the power supply with the zero of analog input.

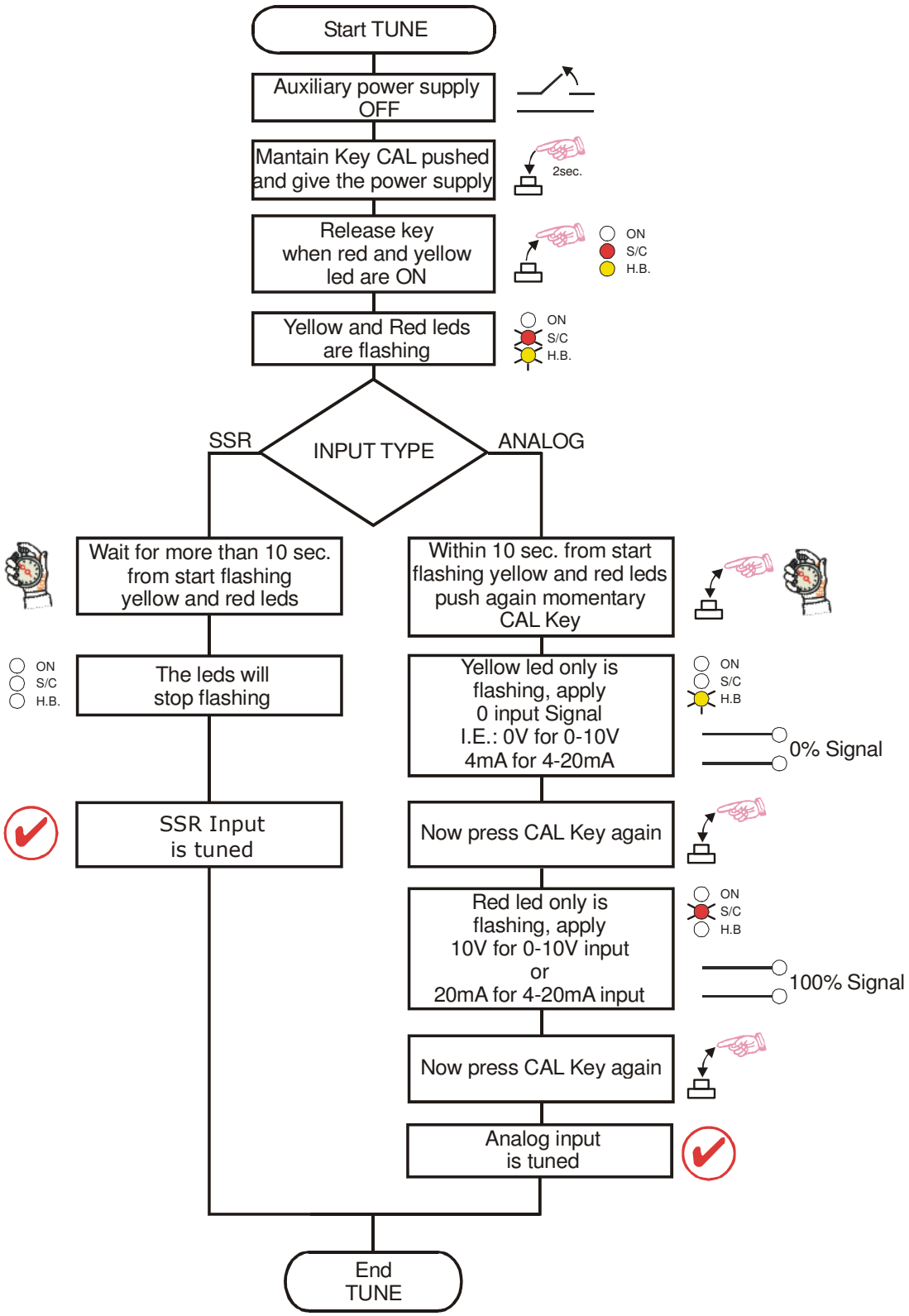
Warning: *Before operate, be sure that power and control cables are isolated from voltage sources*



9.1 Input calibration procedure

Warning: *this procedure can be done just by specialized personnel*

<u>This procedure is needed only if you change the input type</u>



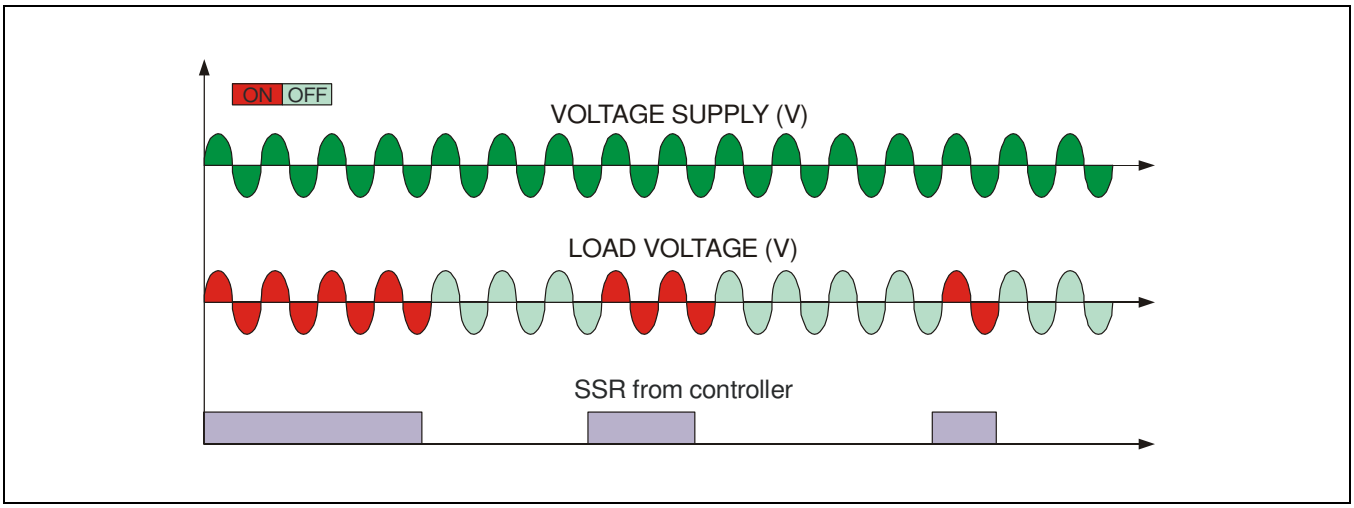
10 Firing type

Choose a correct firing type allows to optimize the thyristor unit for the installed load.
The firing type has already configured in line with customer requirements,Zero Crossing for SSR input and Burst firing for Analog Input.

Caution: *this procedure must be performed only by qualified persons.*

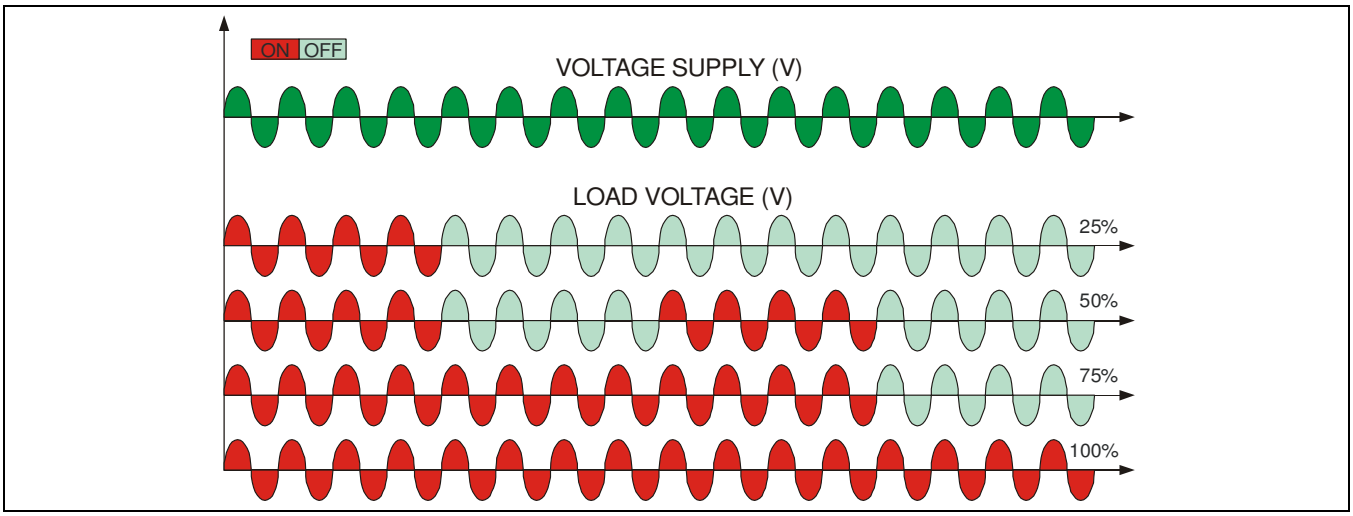
10.1 Zero Crossing (ZC) with SSR input

ZC firing mode is used with Logic Output from temperature controllers and the Thyristor operates like a contactor.
The Cycle time is performed by temperature controller. ZC minimizes interferences because the Thyristor unit switches ON-OFF at zero voltage.



10.2 Burst Firing (BF) with Analog Input

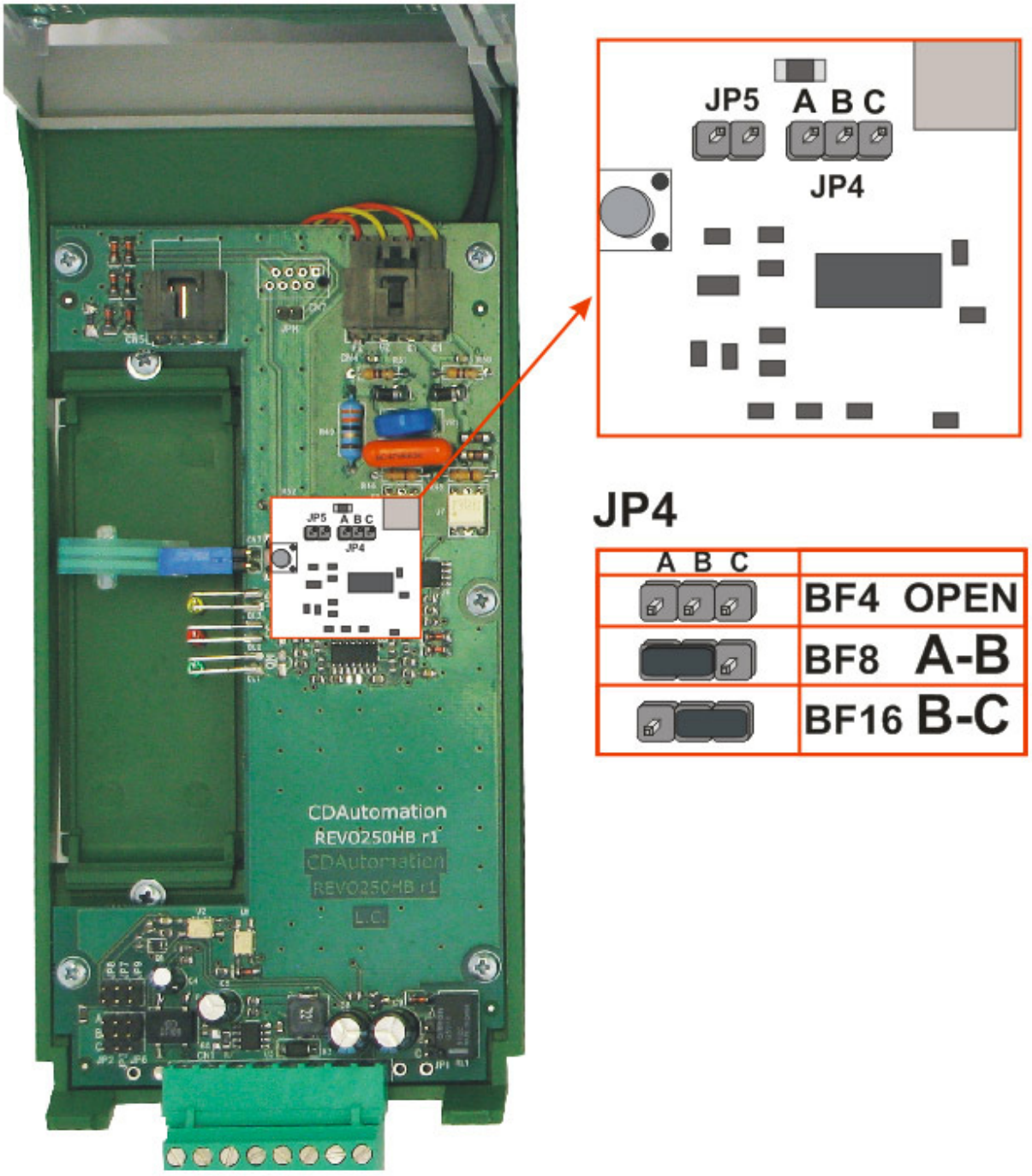
The Burst Firing is similar to the Single Cycle, but consecutive cycles ON are selectable between 2 and 255, with input signal equal at 50%.
Burst Firing is a method zero crossing that it reduces the electromagnetic interferences because the thyristor switches at zero voltage crossing.
The example show the Burst Firing with Burst cycles: 4



10.3 Burst Firing settings

The Burst Firing cycles is already configured in line with customer requirements that are defined in the Order Code. However, if you wish to change the Burst Firing cycles (es. from 4 to 8) set the jumpers as below represented:

Warning: *Before operate, be sure that power and control cables are isolated from voltage sources*



JP4

A B C	
	BF4 OPEN
	BF8 A-B
	BF16 B-C

11 Internal Fuse

The thyristor unit have internal fuse extrarapid at low I²t for the thyristor protection of against the short-circuits. The Fuses must have I²t 20% less than thyristor's I²t.
The warranty of thyristor is null if no proper fuses are used.

11.1 Internal Fuse

Type	Fuse Code Spare Part	Current (ARMS)	I²T (A² sec.)	Vac
060	100FE	100	2800	660
090	100FE	100	2800	660
120	FEE200	200	11400	660
150	FEE200	200	11400	660
180	URB315	315	82000	660
210	URB315	315	82000	660

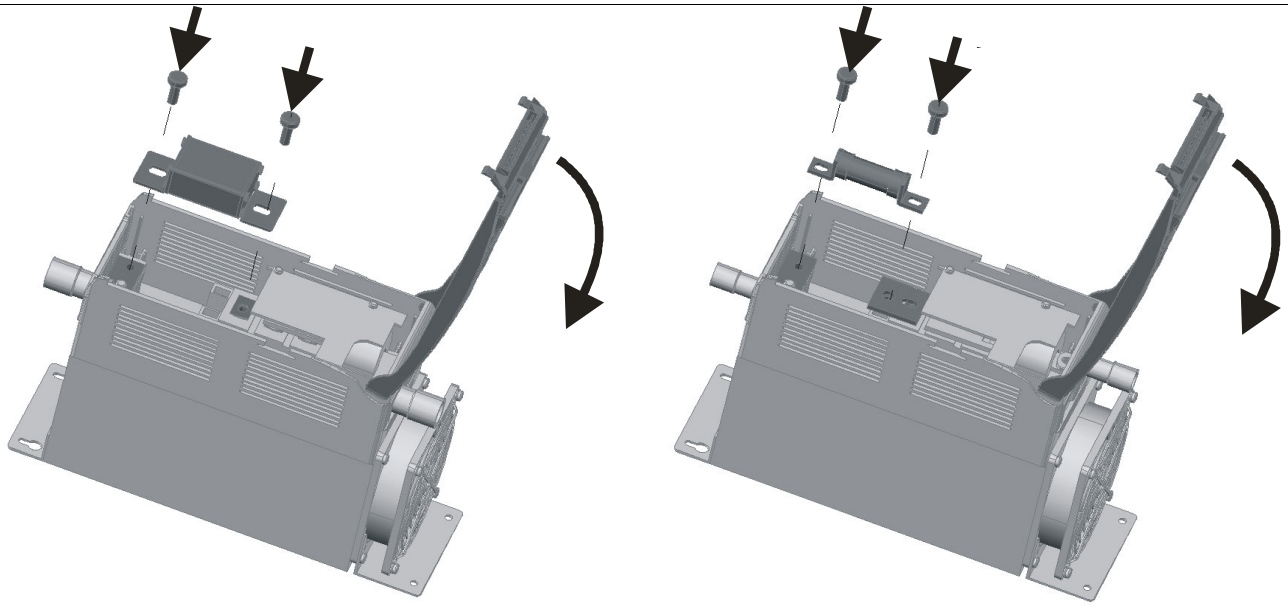
Caution: *High speed fuses are used only for the thyristor protection and can not be used to protect the installation.*

Caution: *The warranty of thyristor is null if no proper fuses are used. See tab.*

Warning: *When it is supply, the Thyristor unit is subject to dangerous voltage, don't open the Fuse-holder module and don't touch the electric equipments.*

11.2 Fuses Replacement

Open the cover and remove the screws



12 Maintenance

In order to have a corrected cooling, the user must clean the heat-sink and the protective grill of the fans. The frequency of this servicing depends on environmental pollution.
Also check periodically if the screw for the power cables and safety earth are tightened correctly (See Connection Diagram)

12.1 Trouble Shooting

Small problems sometimes can be solved locally with the help of the below tab of trouble shooting.
If you don't succeed, contact us or your nearest distributor.

Symptom	Indication on front unit	Possible reasons of the symptom	Actions
Load current doesn't flow	Green LED (ON) light OFF	• No Auxiliary Voltage • No input signal • Reversed polarities of input signal	• Give auxiliary voltage supply (See Connection Diagram) • Provide to give input signal • Reverse the input signal polarity
	Green LED (ON) light ON	• Fuse failure • Load connection interruption • Load failure: The yellow led (HB) is light on (with HB option) • Thyristor fault: The red led (SC) is light on (with HB option)	• Change the fuse • Check the wiring • Check the load • Change the thyristor module
Load current flow also without input signal	Red LED (SC) light on	• Wrong wiring • SCR short circuit	• Check the wiring • Change the thyristor module
Current flows at nominal value but Yellow LED (HB/SC) is light on	Yellow LED (HB) light on or Red LED (SC) light on	• HB circuit not tuned • Current transformers not properly wired	• Make HB calibration procedure • Check current transformers wiring
Thyristor unit doesn't work properly		• Auxiliary voltage supply out of limits • Wrong input signal selection. • Wrong input signal calibration (out of range)	• Verify the auxiliary voltage supply • Control input signal setting. • Check input setting

12.2 Warranty condition

CD Automation gives a 12 months warranty to its products.
The warranty is limited to repairing and parts substitution in our factory and does exclude products not properly used and fuses.
Warranty does not include products with serial numbers deleted. The faulty product should be shipped to CD Automation at customer's cost and our Service will evaluate if product is under warranty terms.
Substituted parts remain of CD Automation property.

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