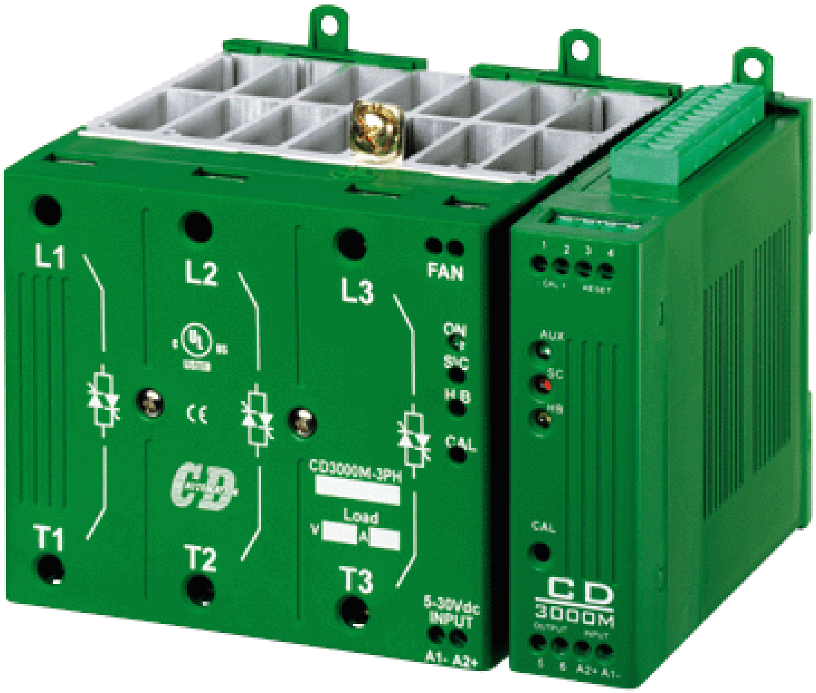
USER'S MANUAL
Rev. 5/2005

CD3000M-1ph
THYRISTOR UNIT
Up To 110A



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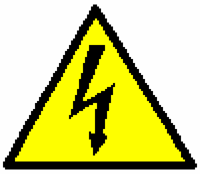
CD3000M-1PH Thyristor Unit up to 110A

Index:



CAUTION

Thyristor units are used in power industrial equipment. When the thyristor unit is working, there are on the unit the following voltages
- Maximum main supply voltage on power terminals up to 600V.
- Auxiliary supply 230-460Vac.
- Fan voltage 230Vac 50/60Hz Power consumption 14W.

Don't remove the plastic cover which provides adequate protection against electric shock.
Don't use this thyristor in aerospace and nuclear application.

Electric Shock Hazard (Risque the 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 permit to discharge internal capacitors. Thus be secure that:

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

Important warnings(attention)

- Local regulations regarding electrical installation should be rigidly observed.
- Safety regulations must be rigidly observed.
- Don't bend components to maintain insulation distances.
- Protect the units from high temperature, humidity and vibrations.
- Don't touch components to prevent elettrostatichal discharges on them.
- Verify that all ratings are in line with real needs.
- If authorized personnel must measure voltage, current etc. on units, take away rings and other jewels from fingers and hands.
- Authorized personnel working on thyristor unit under power supply voltage must work on insulated board. Be secure that board is not connected to earth.

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

Protection(protection)

CD3000 thyristor family has a polymeric plastic cover in compliance to International specification IP20. To understand if IP20 protection is sufficient should be evaluated the installation place where the units are installed.
Open Type Equipment(équipment de type ouvert).
Maximum surrounding air temperature 40°C(Temperature de l'air environnante maximum 40°C).

Earth(terre)

CD3000 family has isolated heatsink. For safety connect the heatsink to earth to avoid shocks in case that circuit board or thyristors lost insulation. Earth impedance should be correspondent to local earth regulation. Periodically the earth efficiency should be inspected.

Electronic Supply(alimentation électronique)

CD3000 family electronic circuit should be supplied by dedicated voltage supply for all electronic circuit but not in parallel with contactor's coil, solenoids and other inductive or capacitive loads. It's recommended to use a shielded transformer.

Electromagnetic compatibility (compatibilité électromagnétique)

Our thyristor unit has an excellent immunity to electromagnetic interferences if all suggestions contained in this manual are respected. In respect to a good Engineering practise, all inductive loads like solenoids contactor coils should have a filter in parallel.

Emissions (emission)

All thyristor switching at high speed generate some radiofrequency disturbance. CD3000 serie complies with EMC rules for CE mark. In many installations near electronic devices has not been noted problems. If radiofrequency device at low frequency are used near the thyristor unit, some precautions should be taken like line filters and shielded cables for input signal and for load cables.

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LISTED

NOTE

We reserves the right to apply modifications to the our products without any advice.

1. Glossary

1.1 Terminology

V: voltage power supply.
I: the full circulating current in thyristor unit.
P: total load power.

1.2 Input signal

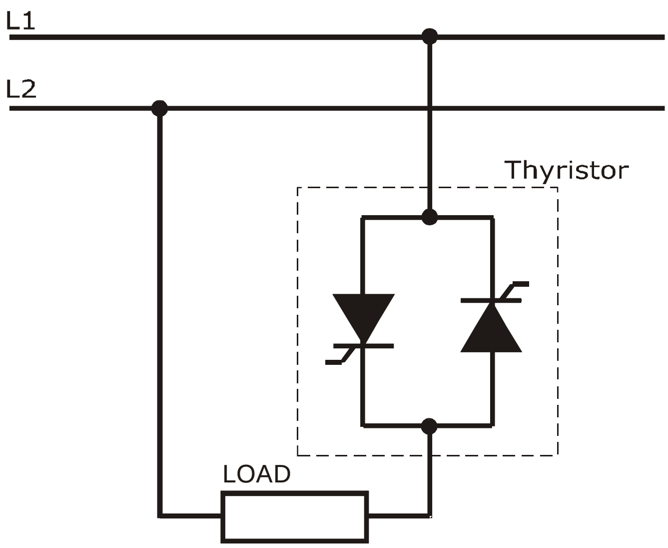
SSR: This input type is a square waveform generated by a temperature controller.
AN: Analog input.
IRS: Communication command.

1.3 Power feed back

Feedback: supply voltage fluctuation changes the power to the load. To overcome this effect the voltage supplied to the load is measured and compared with power demand from controller, the error signal is used to automatically hold the power at demanded level.

1.4 What is a thyristor unit

A thyristor unit is semiconductor device which acts as a switch formed by two thyristors in antiparallel. To switch on the alternating current the input signal will be on and the thyristor will switch off at first zero crossing voltage with no input signal. The benefits of thyristor units compared with elettromechanical contactors are numerouses: no mooving parts, no maintenance and capacity to switch very fast. Thyristors are the only solution to control transformers and special loads that change resistance with temperature and with age.



2. Technical specifications

2.1 General features

Operating temperature	0÷40°C for higher temperature see derating curve
Voltage power supply	24 V minimum, 480V max and 600 V on request
Input signal	SSR 4÷20 mA 0÷10V potentiometer (10k ohm) customer configurable with automatic zero/span calibration
Firing mode	One of these firing modes can be configured on line via serial port Zero Crossing (ZC) Single Cycle (SC) Burst Firing (BF) Soft Start + Burst Firing (S + BF) Delayed Triggering + Burst Firing (DT + BF) Phase Angle (PA)
Auxiliary voltage supply	230V range (230 ±15%) 10VA 460V range (380 –15%) ÷ (460 +15%); 10VA (sincronized with supply Voltage)
Fan voltage supply	230V ±15%; 110V ±15% on request
Heater break alarm	Discrimination better than 20%. Circuit microprocessor based to diagnose partial or total load failure and short circuit on Thyristors. Latching alarm plus reset. Relay output 0,5A at 125V
Line Drop Voltage	Automatic compensation ±15% of supply voltage with analog input
Mounting	Din rail mounting up to 110A
Protection	IP20

2.2 Input features

Input signal	Maximum current drain	Input Impedance	ON condition	OFF condition
SSR	5mA constant current		≥4V - max 30V	≤1V
Analog 0÷10V	-	8200 ohm		
Analog 4÷20mA	-	100 ohm		
Potentiometer 10K ohm		8200 ohm		

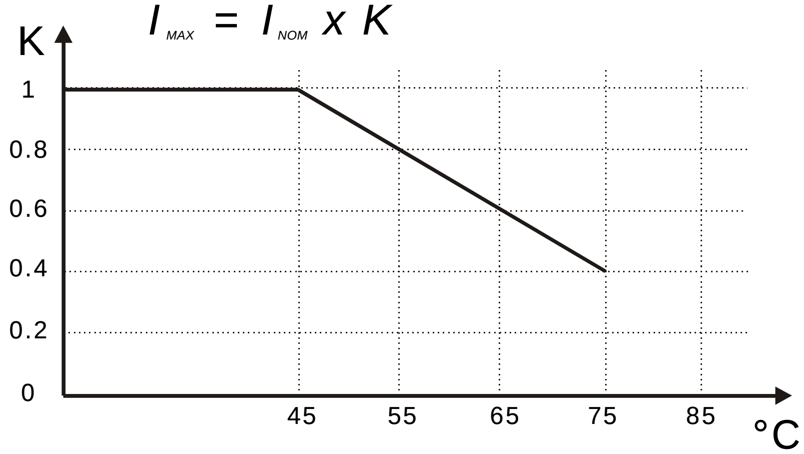
2.3 Output features

NA=not Available

Current	Voltage range	Ripetitive peak reverse voltage		Latching current	Max peak one cycle	Leakage current	I^2T value thyristor	Frequency range	Power loss	Isolation Voltage
(A)	(V)	(480V)	(600V)	(mAeff)	(10msec.) (A)	(mAeff)	tp=10msec	(Hz)	I=Inom (W)	Vac
15	24÷480	1200	1200	150	230	15	610	47÷70	18	2500
25	24÷480	1200	1200	150	230	15	610	47÷70	30	2500
35	24÷600	1200	1600	250	400	15	780	47÷70	42	2500
45	24÷600	1200	1600	250	600	15	1800	47÷70	54	2500
60	24÷600	1200	1600	450	1000	15	4750	47÷70	72	2500
90	24÷600	1200	1600	450	2000	15	19100	47÷70	108	2500
110	24÷600	1200	1600	450	1540	15	11300	47÷70	137	2500

2.4 Derating curve

$$I_{MAX} = I_{NOM} \times K$$



3. Ordering information

Model CD3000M 1PH

	1	2	3	4	5	6	7
CD3000M-1PH							
Ex:CD3000M 1PH /	**90A /**	**400V /**	**480V /**	**460V /**	**SSR /**	**ZC /**	**UL**

1	Nominal current of CD3000M				
15A 25A 35A		45A 60A 90A		110A	

2	Operating Load Voltage (incoming voltage supply)
Specify the value of the line supply.	

3	Max VOLTAGE of CD3000M
480V 600V	
The voltage on the identification label must be equal or more than operating voltage. The minimum voltage supply to the load is 24V.	

4	Auxiliary Voltage
230V	200÷230V ±15%; 10VA
460V	300÷460V ±15%; 10VA
600V	600V ±15%; 10VA (on request)

5	Input
SSR	4÷30VDC
0-10V	0÷10V analog input
4-20mA	4÷20mA analog input
10K pot	Potentiometer

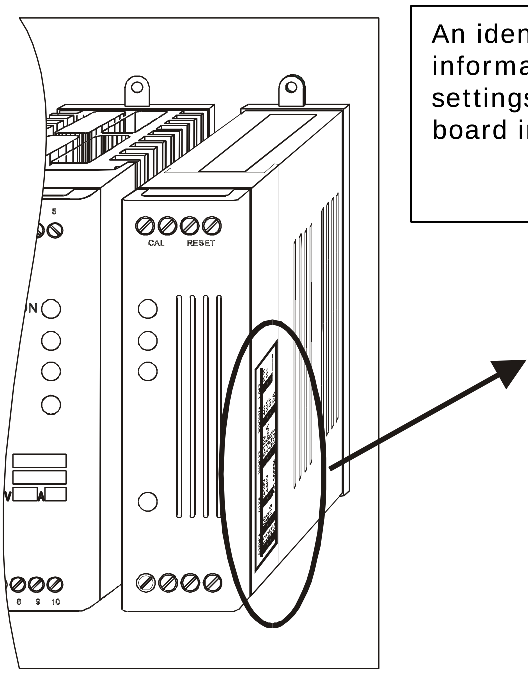
6	Firing
ZC	Zero Crossing
SC	Single Cycle
BF	Burst firing. Specify the number on ON cycles at 50% of power.
S+BF	Soft Start + Burst Firing
PA	Phase Angle. Soft Start and feedback in voltage are not availables, just in supply compensation. If feedback is necessary, you need to use CD3200.
DT	Delayed Triggering + Burst Firing

7	Options
COMM	MODBUS protocol in RS485 is standard
CD-KP	External Keypad
HB	Heater Break Alarm
FAN110	Fan voltage supply 110VAC ± 15% (std 230VAC ± 15%) 14W 50/60Hz
UL	UL Certification

4. Installation and wiring information

4.1 Identification of the unit

Before to install the CD3000M unit examine for damages or deficiencies. If any is found, notify the carrier immediately. Check that the product features shown on CD3000M cover and identification label corresponds to that ordered.



An identification label provides all the informations regarding the factory settings of the unit. This label is on the board inside the unit, as represented

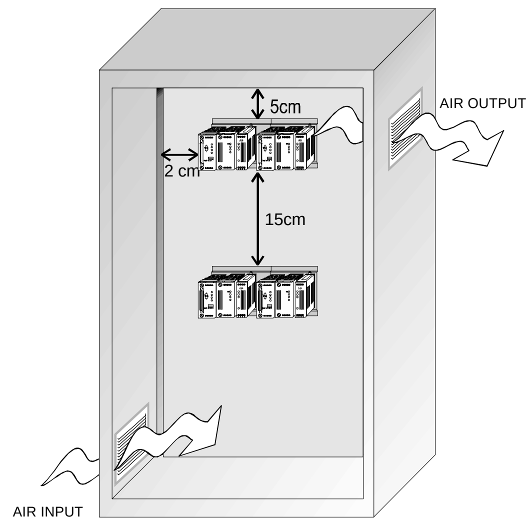
AMPS		AUX.	INPUT	FIRING	OPT.
☐15	☐60	☐ 240V	☐ 0-10V	☐ ZC	☐ S.S
☐25	☐90	☐ 440V	☐ 4-20mA	☐ SC	☐ DT
☐35	☐110	☐ ___	☐ SSR	☐ BF__	☐ ___
☐45	☐___		☐ POT	☐ PA	

4.2 Installation

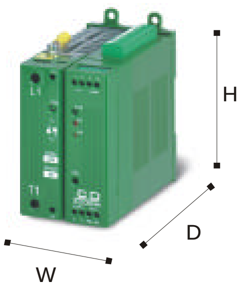
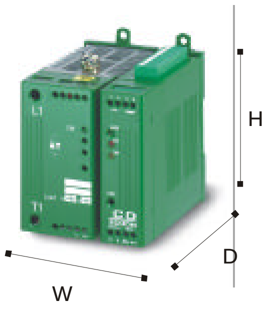
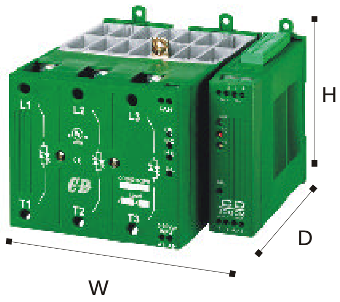
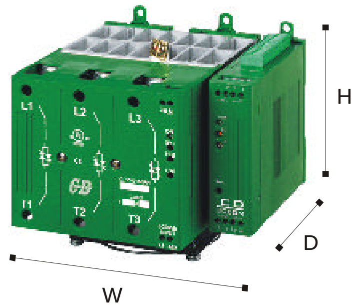
CD3000M unit should be always mounted in vertical position to improve air cooling on heatsink. Maintain minimum distances in vertical and in horizontal as below represented. Don't install in proximity of hot elements and near units generating electromagnetic interferences.

When more units are mounted inside a cubicle provide air circulation as below represented.

Sometimes it is necessary to provide a fan to have a better air circulation.

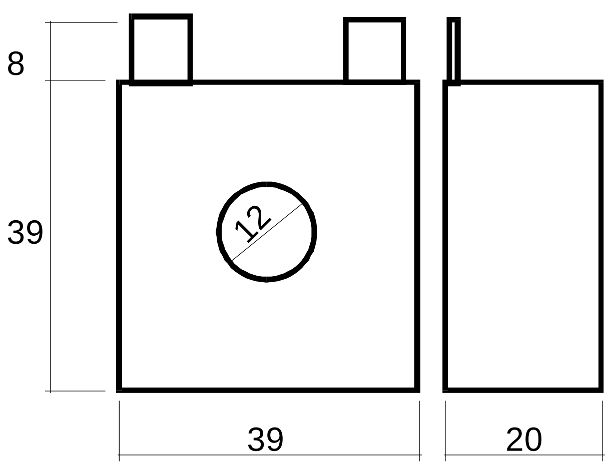


4.3 Dimensions

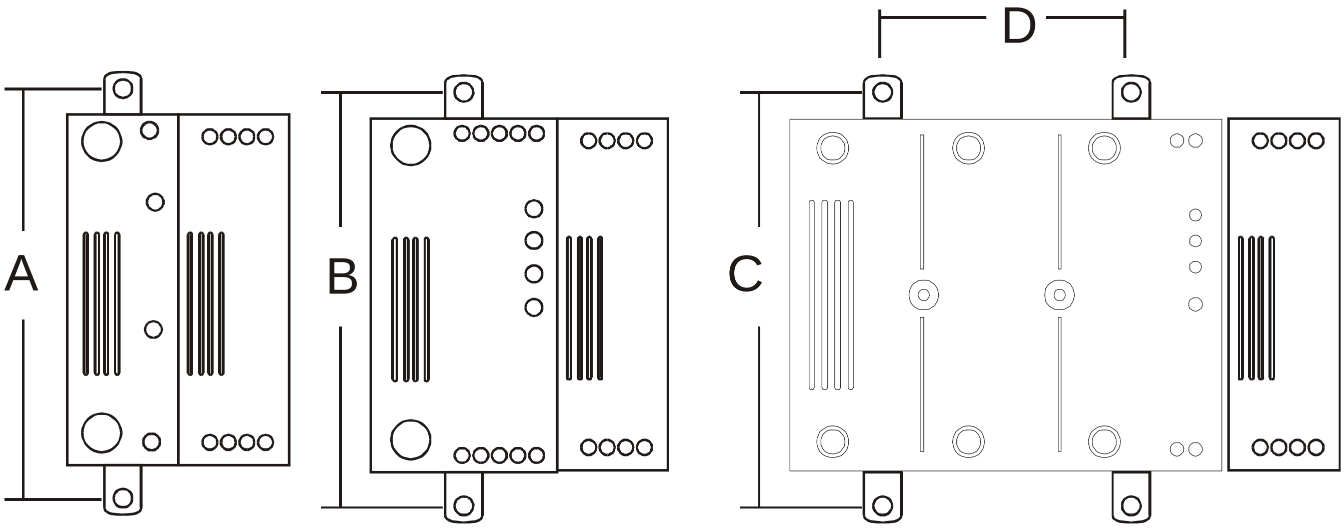
CD3000M 1PH 15-25A (S0C)	CD3000M 1PH 35-45A (S3C)	CD3000M 1PH 60-90A (S7C)	CD3000M 1PH 110A (S8C)
			

Size	W(mm)	H(mm)	D(mm)
15A (S0C)	63	120	120
25A (S0C)	63	120	120
35A (S3C)	85	120	120
45A (S3C)	85	120	120
60A (S7C)	148	120	159
90A (S7C)	148	120	159
110A (S8C)	148	128	159

4.4 CT dimensions (Heater Break HB)



4.5 Fixing holes



Size	A(mm)	B(mm)	C(mm)	D(mm)
15A (S0C)	110	-	-	-
25A (S0C)	110	-	-	-
35A (S3C)	-	110	-	-
45A (S3C)	-	110	-	-
60A (S7C)	-	-	110	65
90A (S7C)	-	-	110	65
110A (S8C)	-	-	110	65

5. Wiring Instructions

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

CD3000M unit has isolated heatsink. For safety connect the heatsink to hearth using its terminal with hearth symbol.
CD3000M can be susceptible to airborne interferences from near equipment or from interferences on main supply, so a number of precautions must be taken.

- Contactors coils and chokes must have in parallel a RC filter and must be supplied with a different voltage line.
- All input/output signal must use screened bifilar wires.
- Signal input and output must not routing in same cable try and must not be parallel.
- Local regulations regarding electrical installation should be rigidly observed.

5.1.1Auxiliary terminals

Before connect or disconnect, make sure that the power, control cables and wires are insulated from the voltage.

Terminal	Description
1	- External Calibration command 24 Vdc max
2	+ External Calibration command 24 Vdc max
3	Reset
4	Reset
5	+ Output Command signal to CD3000 (Internal Connections)
6	- Output Command signal to CD3000 (Internal Connections)
A2+	+ Input command signal 4÷20mA,0÷10V,SSR
A1-	- Input command signal 4÷20mA,0÷10V,SSR
7	RS485 A
8	RS485 B
9	Output +8Vdc stabilized 1 mA MAX
10	Common relay H.B. alarm
11	NC/NO H.B. relay alarm
12	Option
13	CT input with H.B. option
14	CT input with H.B. option
15	Nc not connected
16	Auxiliary supply voltage 230-460Vac
17	Ground
18	Auxiliary supply voltage 230-460Vac

5.1.2 Power Terminals

Before connect or disconnect, make sure that the power, control cables and wires are insulated from the voltage.

Terminal	Description
L1	**Line Input**
T1	**Load Output**

5.2 Cabling detail

Use 75°C copper (CU) conductor only, provided with the terminal type indicated below.
(Utiliser conducteur de cuivre (CU) pour 75°C seulement, avec les terminal suivants)

Current / courant	**Torque / couple Lb-in (N-m)**	**Wire / cable**	**Wire terminal / terminal**
15A, 25A, 35A, 45A	26.6 (3.0)	18-8	UL Listed (ZMVV) Wire Pin Terminal (terminal avec cosse)
60A, 90A, 110A	70.8 (8.0)	18-1	UL Listed (ZMVV) - Fork/Spade Terminal (terminal avec cosse a fourche) - Copper Tube Cr. Lug (cosse tubulaire a plage étroite)

Power terminals wire details:

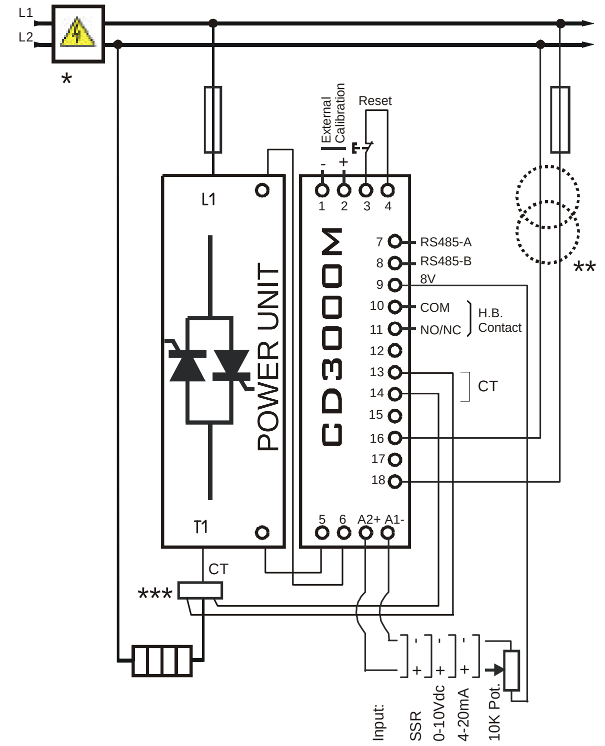
Current	**Supply**			**Load**		
	Cable		**Screw**	**Clable**		**Screw**
	mm²	**AWG**	**M**	**mm²**	**AWG**	**M**
15A	4	12	M5	4	12	M5
25A	6	10	M5	6	10	M5
35A	10	8	M5	10	8	M5
45A	10	8	M5	10	8	M5
60A	16	6	M6	16	6	M6
90A	35	3	M6	35	3	M6
110A	35	2	M6	35	2	M6

Auxiliary connectors and earth:

Current	**Auxiliary Supply**			**Earth**		
	Cable			**Clable**		**Screw**
	mm²	**AWG**		**mm²**	**AWG**	**M**
15A	0,50	18		4	12	M4
25A	0,50	18		4	12	M4
35A	0,50	18		6	10	M5
45A	0,50	18		6	10	M5
60A	0,50	18		6	10	M5
90A	0,50	18		10	8	M5
110A	0,50	18		16	6	M5

5.3 Wiring Connection

5.3.1 CD3000 15-25A



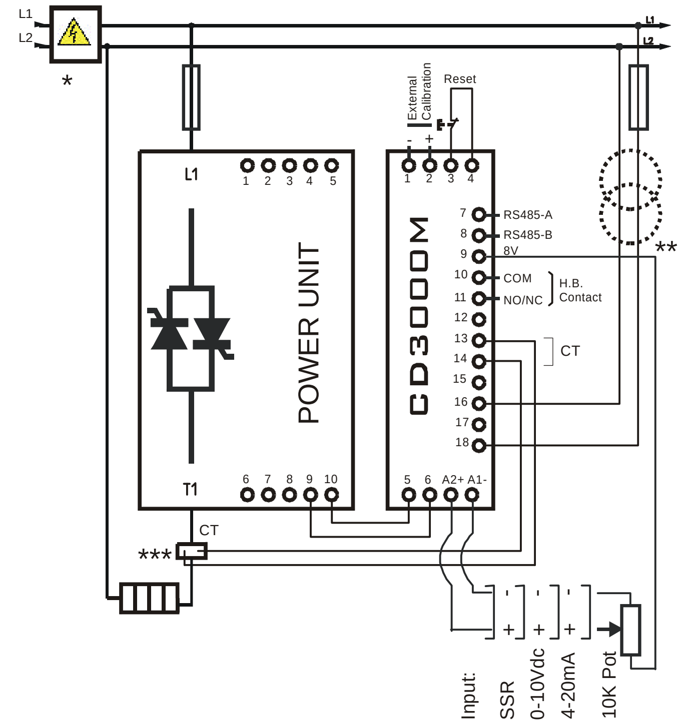
* The user installation must be protect by electromagnetic circuit breaker or by fuse isolator

** If the Auxiliary Voltage (written on the identification label) is different from Supply Voltage (to the load), use an external transformer as designated above.

*** CT only with HB option.

NOTE: *IMPORTANT*
To work, terminals 3-4 must be linked.
The auxiliary voltage supply of Drive M unit must be connected as above, and must be syncronized with load voltage power supply (L1, L2).

5.3.2 CD3000 35-45A



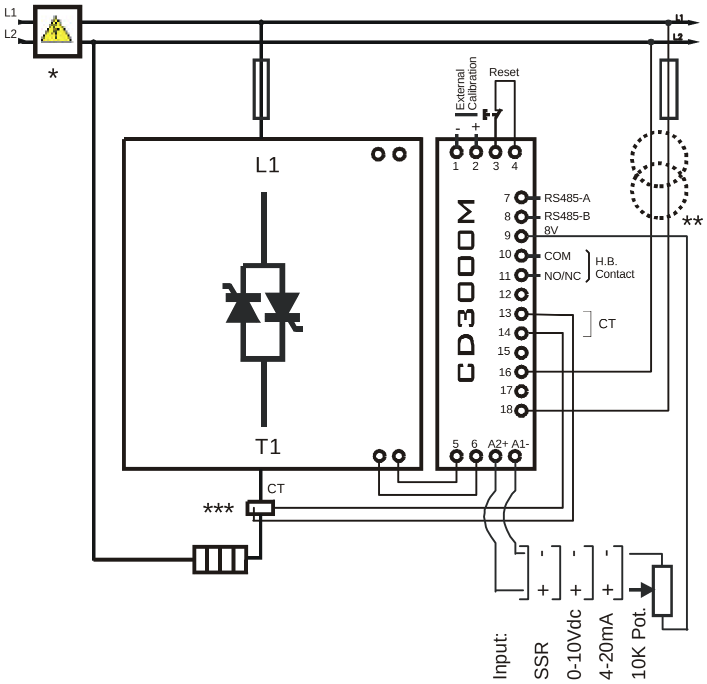
* The user installation must be protect by electromagnetic circuit breaker or by fuse isolator

** If the Auxiliary Voltage (written on the identification label) is different from Supply Voltage (to the load), use an external transformer as designated above.

*** CT only with HB option.

NOTE: *IMPORTANT*
To work, terminals 3-4 must be linked.
The auxiliary voltage supply of Drive M unit must be connected as above, and must be syncronized with load voltage power supply (L1, L2).

5.3.3 CD3000 60-90A



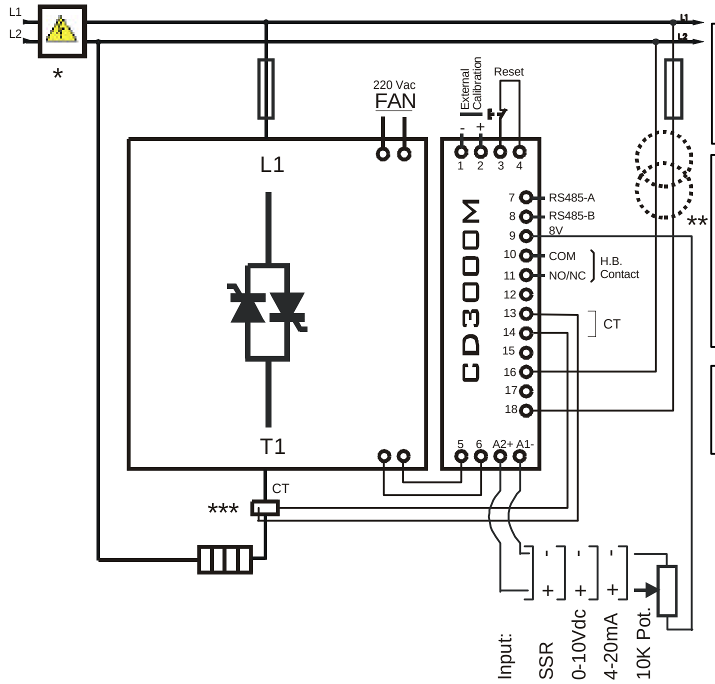
* The user installation must be protect by electromagnetic circuit breaker or by fuse isolator

** If the Auxiliary Voltage (written on the identification label) is different from Supply Voltage (to the load), use an external transformer as designated above.

*** CT only with HB option.

NOTE: *IMPORTANT*
To work, terminals 3-4 must be linked.
The auxiliary voltage supply of Drive M unit must be connected as above, and must be syncronized with load voltage power supply (L1, L2).

5.3.4 CD3000 110A



* The user installation must be protect by electromagnetic circuit breaker or by fuse isolator

** If the Auxiliary Voltage (written on the identification label) is different from Supply Voltage (to the load), use an external transformer as designated above.

*** CT only with HB option.

NOTE: *IMPORTANT*
To work, terminals 3-4 must be linked.
The auxiliary voltage supply of Drive M unit must be connected as above, and must be syncronized with load voltage power supply (L1, L2).
Fan voltage supply standard 230VAC ±15% 14W 50/60Hz or optional110VAC ±15% 14W 50/60Hz

5.4 LED Status Table

LED	STATUS	DESCRIPTION
PW	○	Auxiliary supply is not connect
	●	Auxiliary supply is connect
SC	○	SCR OK
	●	SCR short circuit
HB	○	Laod OK
	●	Load Fault
ON	○	OFF Condition(Load IS NOT Powered)
	●	ON Condition(Load IS Powered)

○ = OFF	● = ON

6. Start up

Before to supply the thyristor unit:

- verify that load current equal or less than nominal;

For resistive load

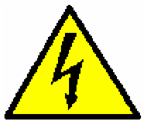
$$I = \frac{P_{Tot}}{V}$$

For inductive load

$$I = \frac{P_{Tot}}{V \cos \phi}$$

- verify that there is no short circuit on load;
- verify that main voltage equal or less than nominal;
- verify that all auxiliary connections are right and syncronized to main voltage!!!;
- Fan voltage equal than nominal (230V std, 120V optional)

After which supply thyristor unit giving the maximum input signal and verify that load current is equal or less than thyristor unit nominal current.

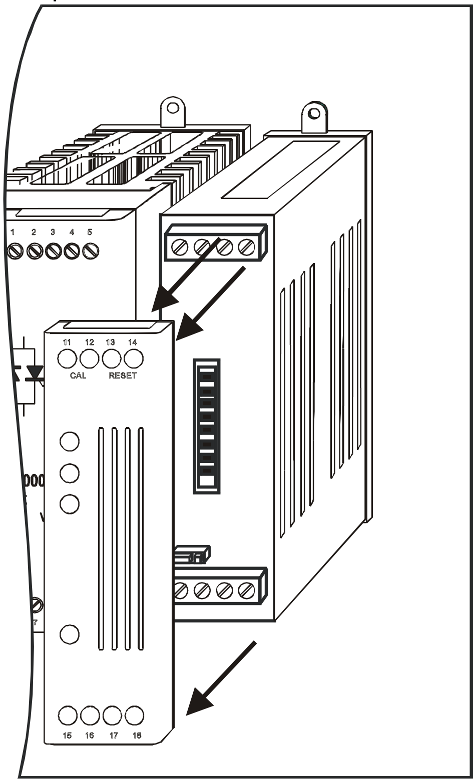


Warning: *this procedure can be done just by specialized personnel*.

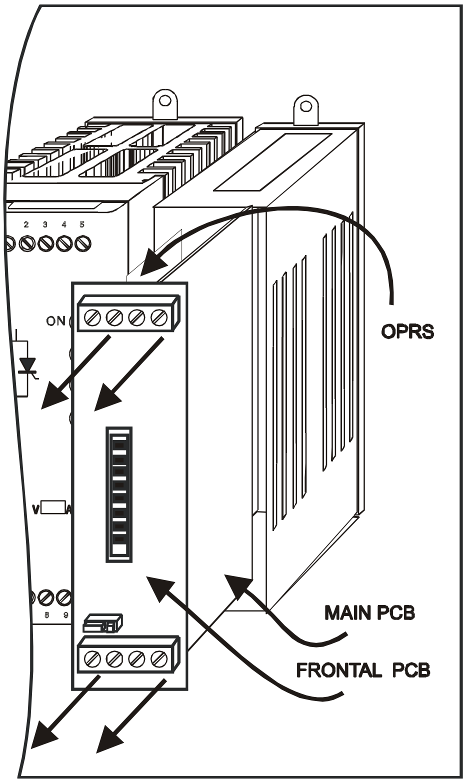
The thyristor unit is delivered configured and tuned in line with customer requirements. If it's necessary to change on site the configuration, procede as below specified.

6.1 To remove the board

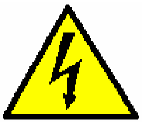
1 Remove plastic Cover



2 Pull the PCB

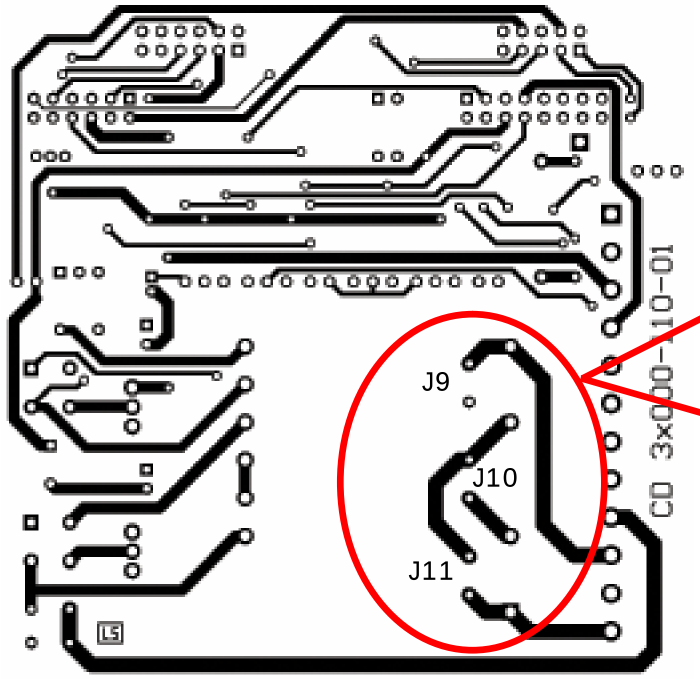
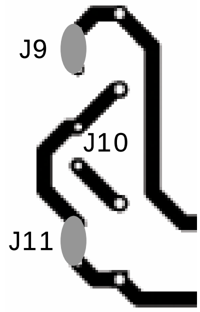
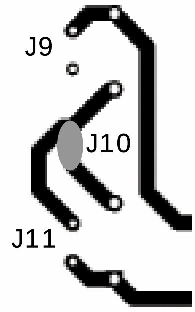


6.2 Auxiliary supply



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

To change auxiliary supply voltage sold the correct link-jumper on main PCB

<table>
<tr><td rowspan="2">Main PCB

</td><td>230V Auxiliary supply

</td></tr>
<tr><td>460V Auxiliary supply

</td></tr>
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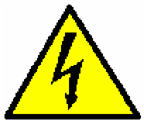
- If the Auxiliary Voltage (written on the identification label) is different from Supply Voltage (to the load), use an external transformer.
- If load voltage is not included in range of 230V ±15% or 460V +15% provide an external transformer with primary equal to load voltage and secondary 230V if your unit is setted to 230V.

6.3 Analog input



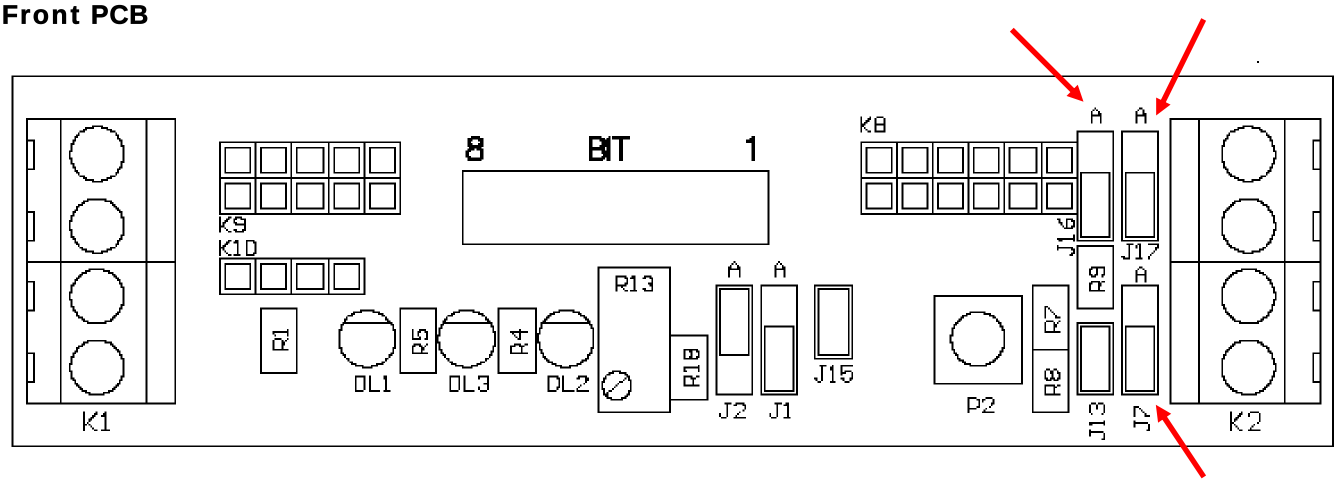
Warning: *this procedure can be done just by specialized personnel.*

6.3.1 Setting Analog input

To change input type remove plastic cover and configure jumpers as represented below:

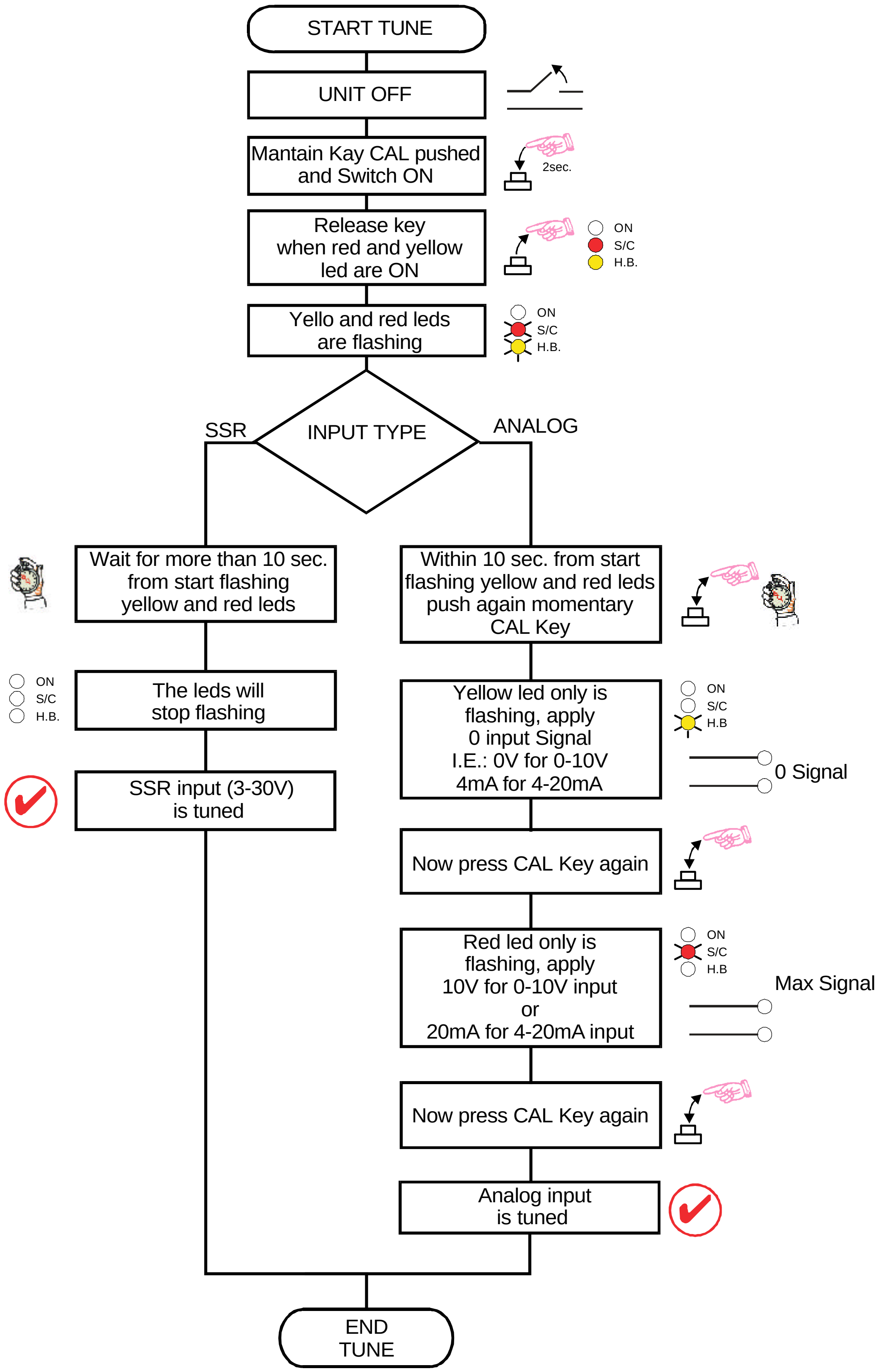
Jumpers Configuration			
	FRONT PCB		
Input	**J7**	**J16**	**J17**
SSR	A B C	C B A	C B A
0÷10V	A B C	C B A	C B A
4÷20MA	A B C	C B A	C B A

Front PCB



6.3.2 Tuning Analog input

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



6.4 Heater Break Alarm

Heater Break Alarm is a microprocessor based circuit to diagnose partial or total load failure and short circuit on SCR and fuses failure.

- discrimination better than 20%;
- latching alarm plus reset;
- relay output 0.5A at 125VAC.

Minimum current 3A. If load current is below this value make two turns or more around current transformer. H.B. circuit also diagnose fuse failure.

H.B. circuit reads load current via a current transformer 25-50/0.05 or 100/0.05 depending on thyristor size.

6.4.1 Heater Break Alarm indication

LED	STATUS	DESCRIPTION
SC	○	SCR OK
	●	SCR short circuit
HB	○	Laod OK
	●	Load Fault

○: LED off
●: LED on

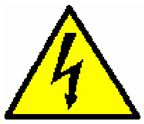
The thyristor unit is supplied with a normally closed (N/C) contact.

In alarm condition and without auxiliary voltage the contact is closed (relay coil not energized). In normal condition (no alarm) the contact is open (relay coil energized).

6.4.2 Reset

To reset Heater Break Alarm open RESET contact on terminal 3-4.

6.4.3 HB alarm contact



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

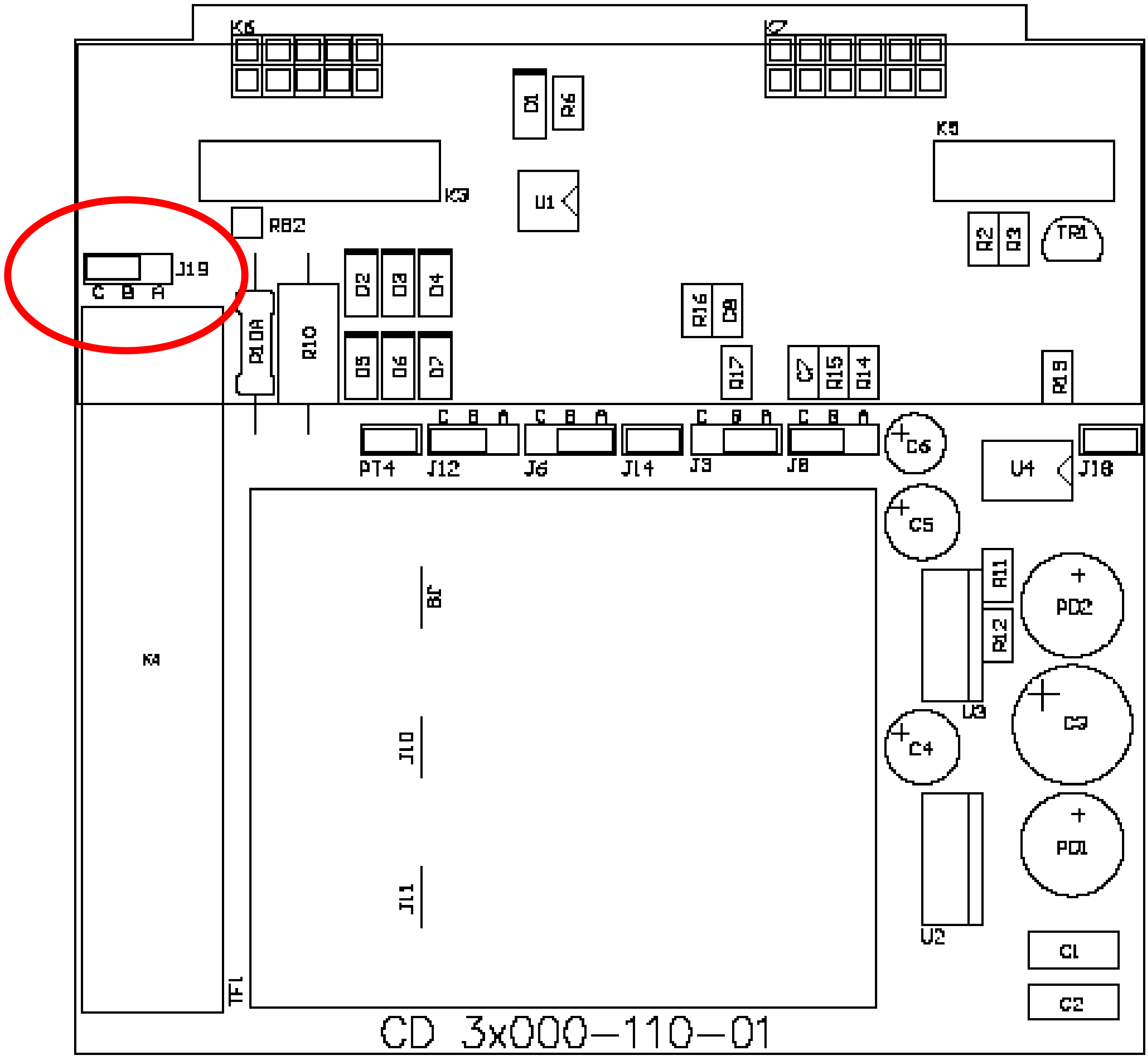
The contact of the H.B. Relay is available on auxiliary terminals.

Terminal	Descriprion
10	Common relay HB alarm
11	NO/NC HB relay alarm

To change relay status remove plastic cover and configure jumpers as represented below:

STATUS	RELE STATUS	MAIN PCB J19
IN Alarm	Close	
Circuit not powered	Close	C B A (std)
OK	Open	
IN Alarm	Open	
Circuit not powered	Open	C B A
OK	Close	

Main PCB

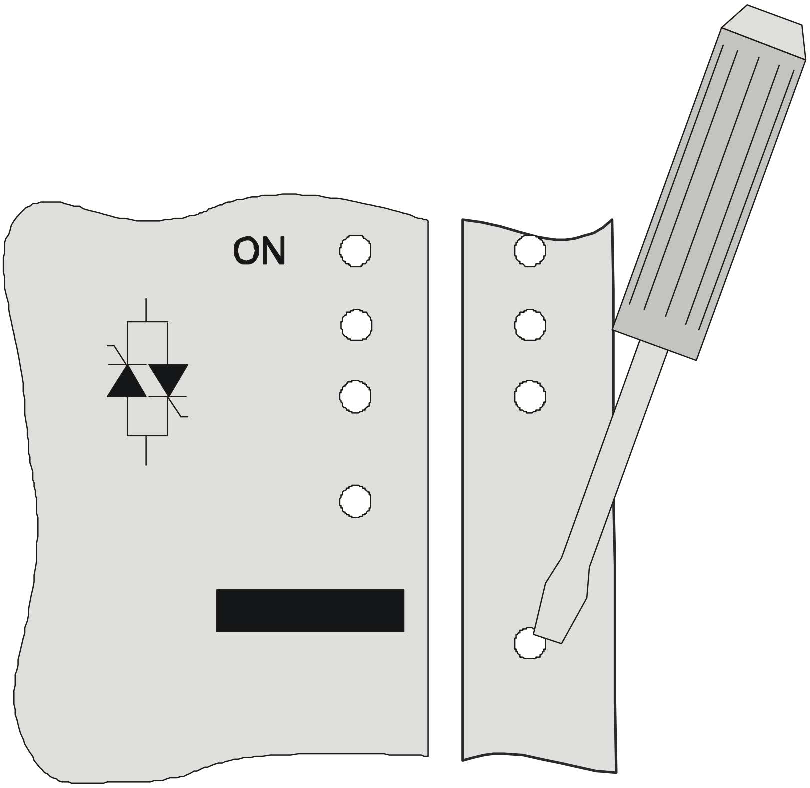

K6
K7
D1
R6
K5
K3
U1
R82
R2
R3
TR1
J19
C B A
D2
D3
D4
R16
D8
R10A
R10
D5
D6
D7
R17
C7
R15
R14
R18
C B A
C B A
C B A
C B A
C6
PT4
J12
J6
J14
J3
J8
U4
J18
C5
J9
R11
PD2
R12
K4
U3
C3
C4
J10
PD1
J11
U2
C1
TF1
C2
CD 3x000-110-01

6.4.4 Calibration

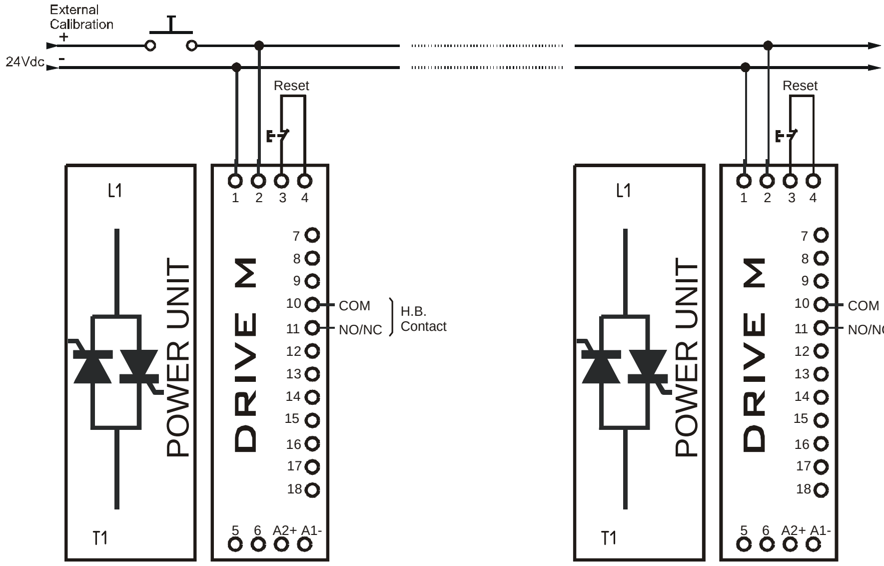
This procedure it's necessary to give set point to Heater Break. CD3000M reads the load current many times and when the value is the same for three times takes it as set point.

Calibration procedure:

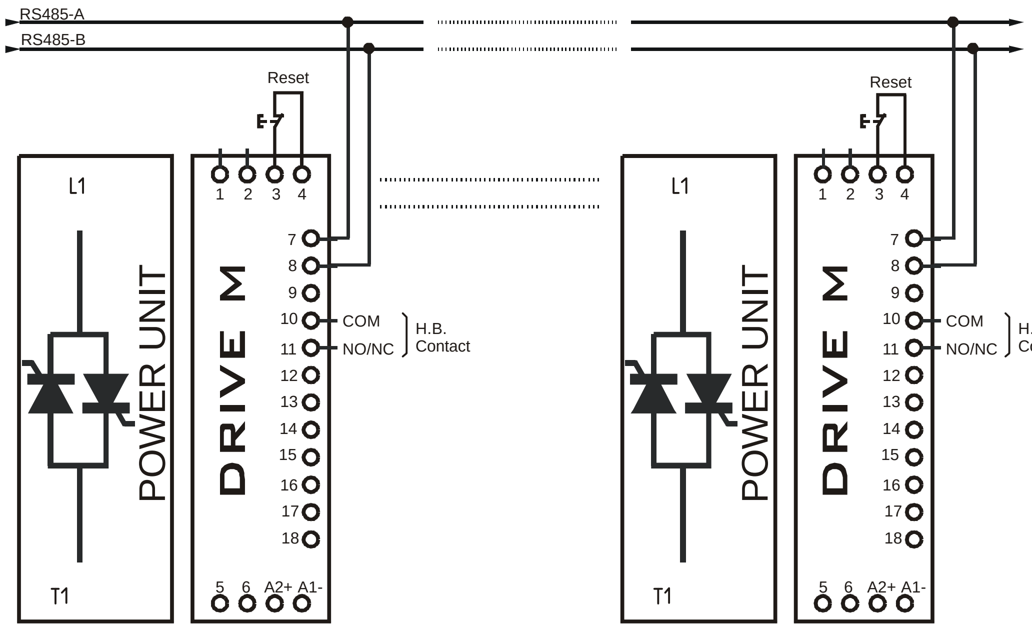
- verify that connections are correct;
- supply the thyristor unit;
- push "CAL" button on front of CD3000M unit,
  or supply with 24Vdc terminals 1-2 or send command via RS485;
- the thyristor unit goes in conduction state to measure load current;
- all LEDS are ON, this means that calibration procedure is active;
- after one minute LEDS for H.B. and S/C switch off (calibration procedure is done);
- the thyristor unit is ready to work.



6.4.5 Digital input Command



6.4.6 RS485 Command

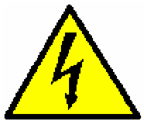


If load current decreases for partial or total load failure (sensitivity 20% standard adjustable via RS485) the yellow LED becomes ON and alarm relay changes status.
If CD3000M is still in conduction with no input signal (LED green OFF) it means that there is a short circuit on thyristors and red LED (SC) becomes ON.

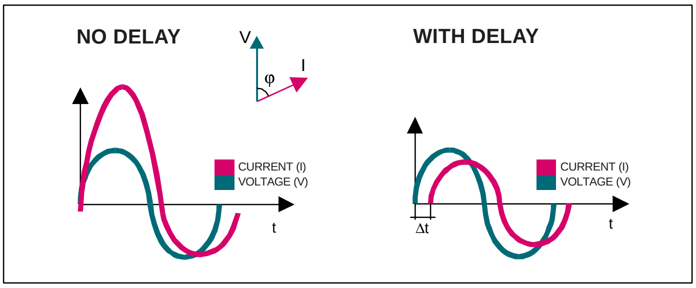
The diagnostic is active only when the switching period is longer than 60ms (3 main voltage cycles).

If the load has been changed calibration procedure must be done again.

6.5 Delay triggering option



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

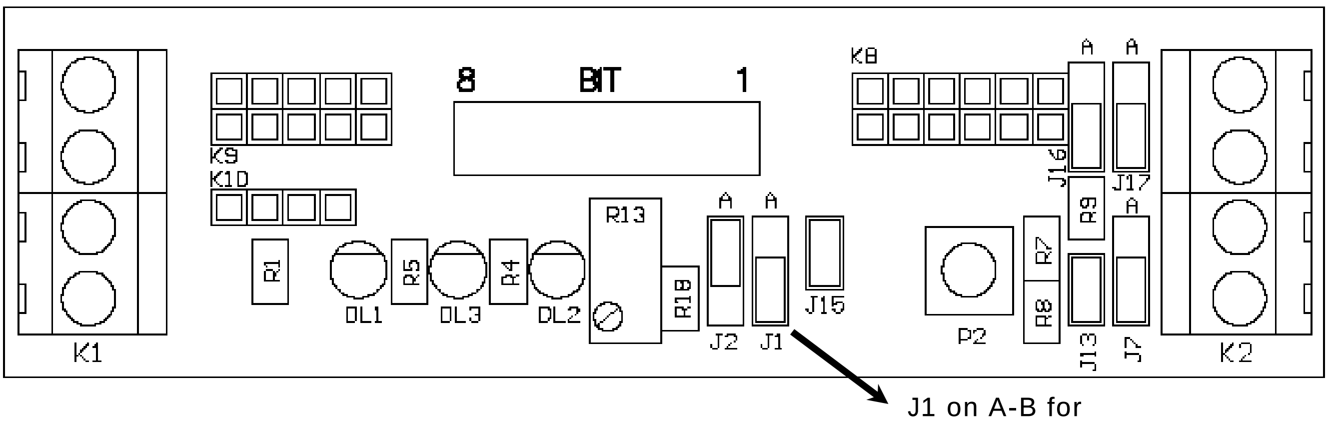


It's used to switch ON-OFF primary of transformer coupled with resistive load on secondary. It's used to prevent inrush surge current when zero voltage switching is used and to avoid fuse blowing. Every time that auxiliary voltage supply of PCB board is switched ON, the unit starts in phase angle for 1 sec., after witch it switches OFF when the supply waveform is negative and starts again when is positive, giving a delay on triggering signal on first halt positive cycle. If circuit board is maintained under voltage phase angle start is not used.

To enable the delay triggering option, remove the plastic cover and configure the link jumper as below represented:

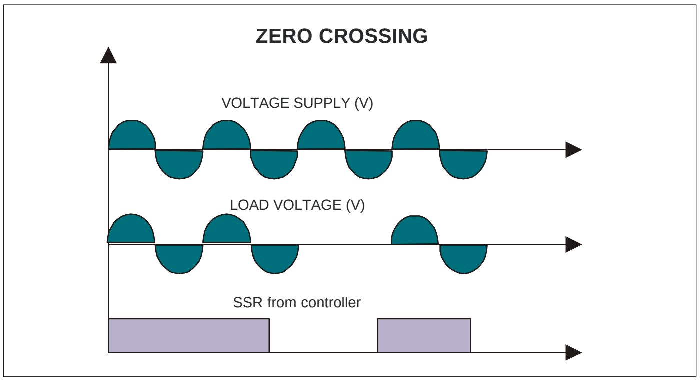
Delay	Front PCB
Triggering	**J1**
Enabled	A B C
Disabled	A B C
	JUMPER

Front PCB



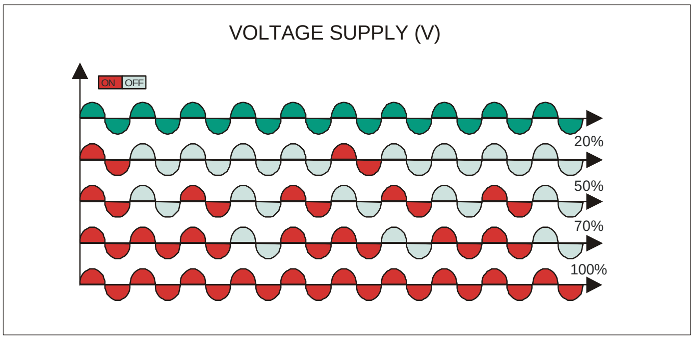
J1 on A-B for
Delay triggering

7. Thiristor firing mode



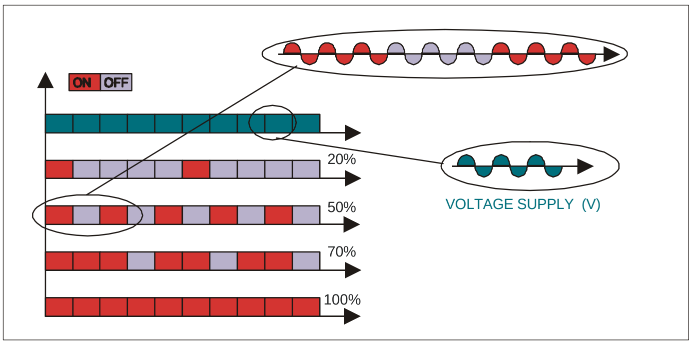
7.1 Zero Crossing (ZC)

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.



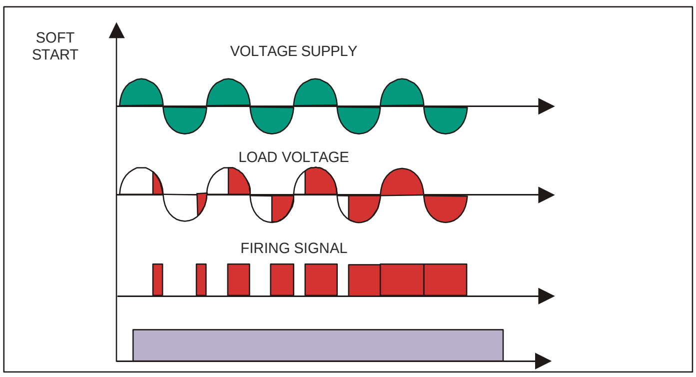
7.2 Single Cycle (SC)

It's the fastest zero crossing switching method in respect to the power demand from a temperature controller or an external signal. At 50% input signal is one cycle ON and one cycle OFF. At 75% is 3 cycles ON-one cycle OFF. If power demand is 76% the unit performs like for 75% but every time that switches ON the microprocessor divides 76/75 and memorizes the ratio and when the sum of rest is one the unit deliveries one cycle more to the load. With this firing is necessary to have analog input.



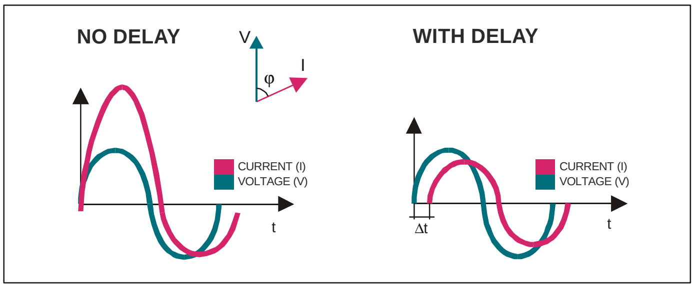
7.3 Burst Firing (BF)

This firing performed in Digital mode in our Thyristor unit gives a lot of advantages because switches Thyristor at zero voltage crossing without EMC interferences. Analog input is necessary for BF and can be decided how many complete cycles we want at 50% of power demand. This value can be implemented from 1 to 255 complete cycles doing the firing less or more fast. When 1 is setted the firing name becomes Single Cycle (see above).



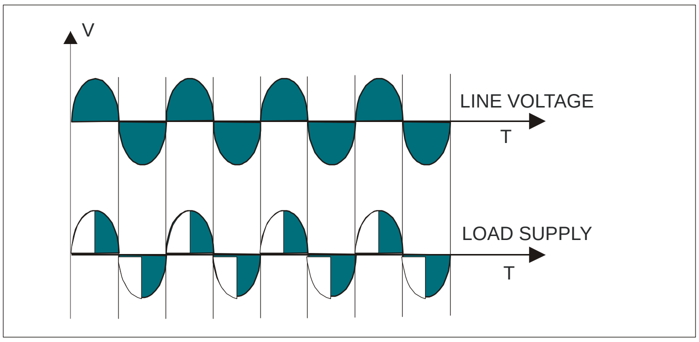
7.4 Soft Start + Burst Firing (S + BF)

This is an additional feature to Burst Firing. The unit start in phase angle mode with a ramp starting from zero up to full voltage in a presetted and Adjustable time. After which the rest of ON period will be at full conduction. This firing S+BF is used to switch ON small inductive loads to avoid inrush surge current and to reduce at minimum electrical interferences.



7.5 Delay Triggering+Burst Firing (DT + BF)

It's used to switch ON-OFF primary of transformer coupled with resistive load on secondary. It's used to prevent inrush surge current when zero voltage switching is used and to avoid fuse blowing. Every time that auxiliary voltage supply of PCB board is switched ON, the unit starts in phase angle for 1 sec., after witch it switches OFF when the supply waveform is negative and starts again when is positive, giving a delay on triggering signal on first halt positive cycle. If circuit board is maintained under voltage phase angle start is not used.

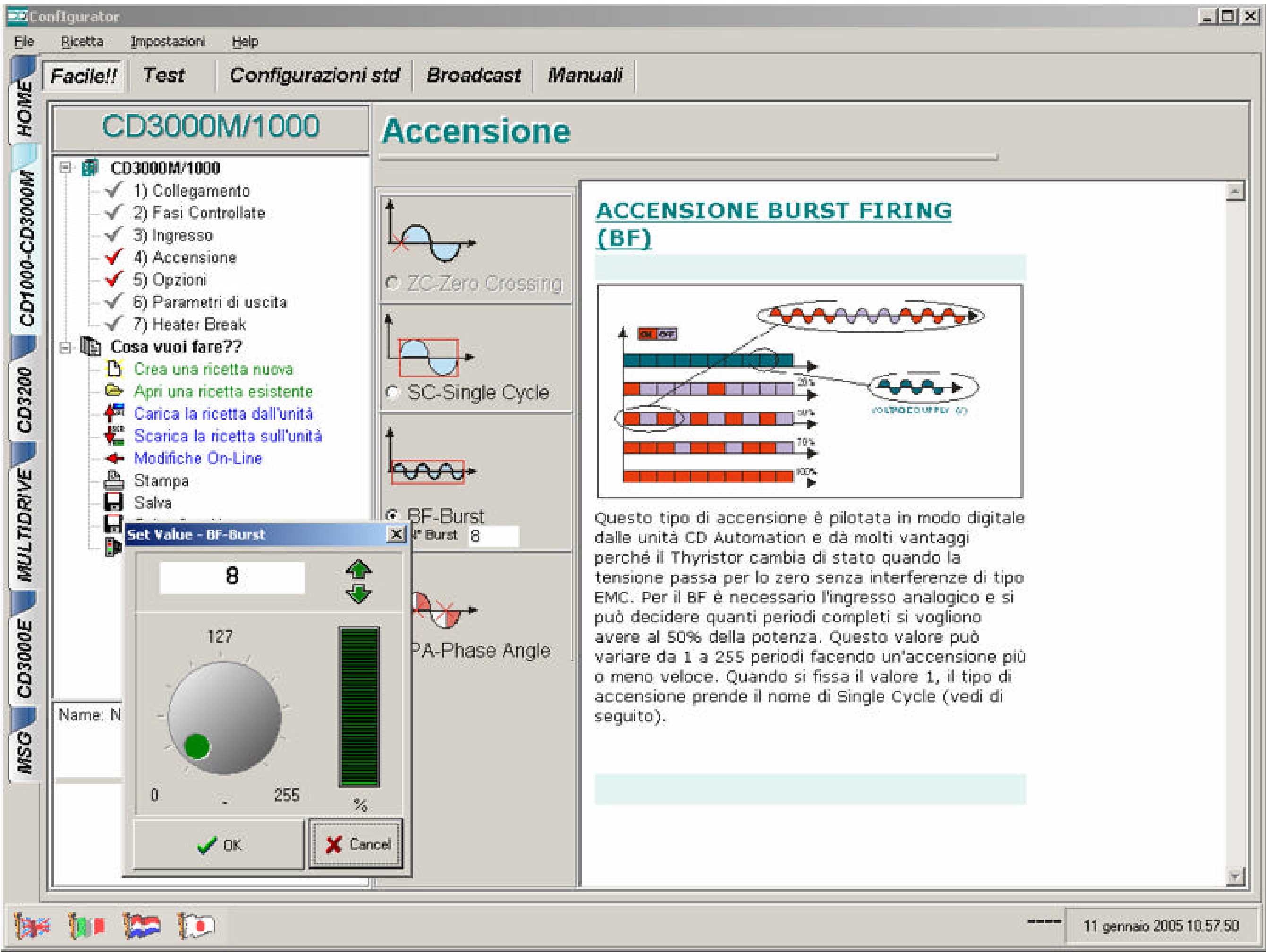


7.6 Phase Angle (PA)

With Phase Angle is possible to control the power to the load allowing to Thyristor to be in conduction for a variable part of the voltage supply halt cycle. The load power can be adjusted from 0 to 100% as a function of analog input signal, normally delivered by temperature controller or by potentiometer. Normal it's used with inductive loads. The only disadvantage with phase angle is the generation of interferences that can be reduced with filters.

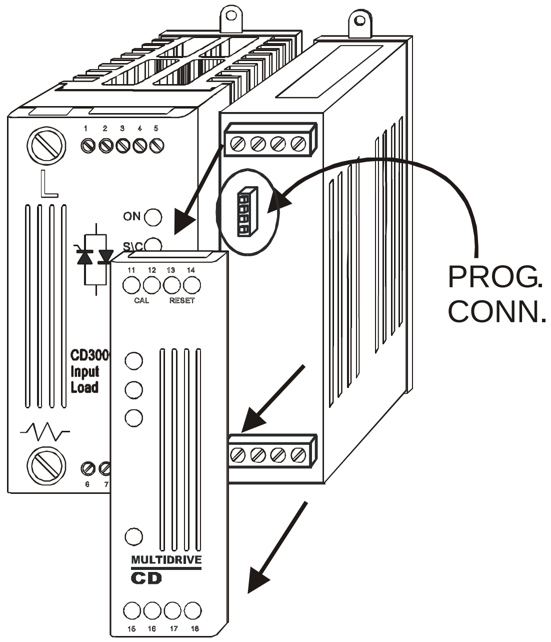
7.7 Configurator

To configure CD3000M unit, you can download the free software and the Configurator Manual from our web site **www.cdautomation.com**.

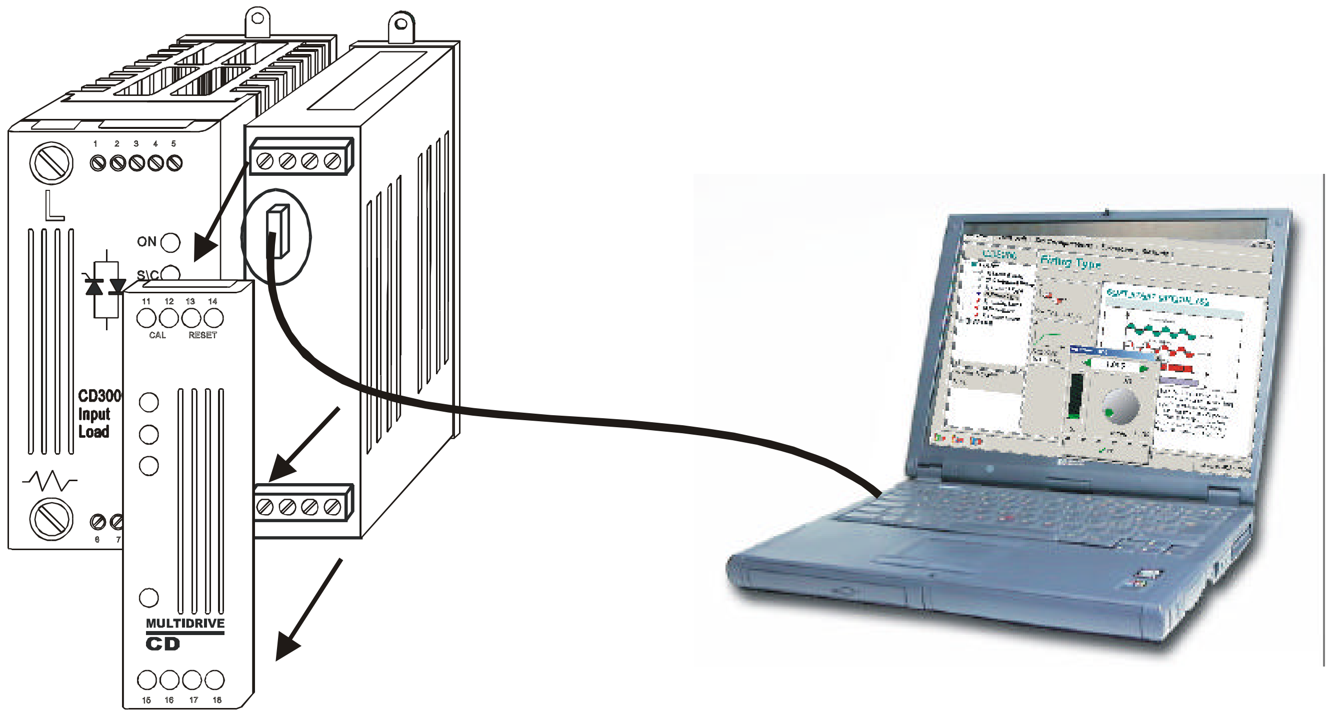


To configure the unit you can use the standard communication on terminals 7-8 or use a programming cable.

To connect the programming cable to the thyristor unit, remove cover as in picture



Once removed the cover, put a side of cable in prog connector(K10) and the other side in the PC RS232(9PIN) serial port.



8. Fuse and fuseholder for UL certification units

8.1 Fuse and Fuse Code

CD3000M unit must be protected by fuses against short circuit selecting the proper I^2t that must be lower than thyristor one. The same caution must be taken if Circuit Breaker is used. Remember that is very difficult to protect the thyristor if this choise is done.

WARNING!! USE SEMICONDUCTOR FUSES ONLY WITH proper I^2t

Sizes	**Bussmann Div - Cooper (UK) Ltd (200 kA_{RMS} Symmetrical A.I.C.)**				**Ferraz Shawmut SA (200 kA_{RMS} Symmetrical A.I.C.)**			
	Fuse Mod. No. / modéle fusible	**Current (A_{RMS})**	**I^2t (A^2sec)**	**V ac**	**Fuse Mod. No. / modéle fusible**	**Current (A_{RMS})**	**I^2t (A^2sec)**	**Vac**
15A	FWC 16A10F	16	150	600	660 Grb 10-16	16	145	660
25A	FWC 32A10F	32	600	600	660 Grb 10-32	32	740	660
35A	FWP 40A14F	40	980	700	CP URC 14x51/40	40	700	660
45A	FWP 50A14F	50	1800	700	CP URC 14x51/50	50	1500	660
60A	FWP 80A22F	80	5100	700	CP URD 22x58/80	80	3800	660
90A	N.A.	- -	- -	- -	CP URQ 27x60/125	125	6970	660
110A	N.A.	- -	- -	- -	CP URQ 27x60/160	160	15000	660

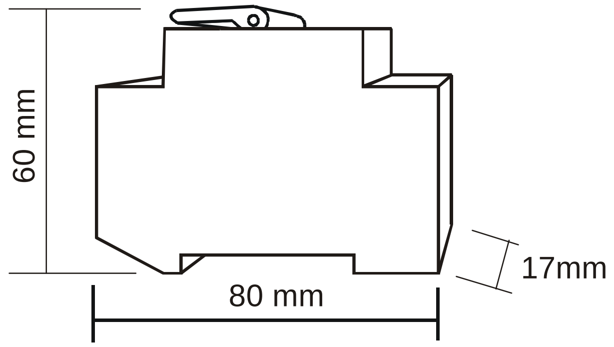
High speed fuses are only used for the thyristor protection and can not be used to protect the installation.

The user installation must be protect by electromagnetic circuit breaker or by fuse isolator.

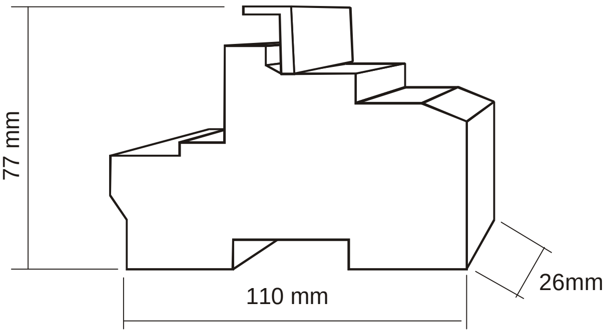
The warranty of thyristor is null if no proper fuses are used. See tab above.

8.2 FuseHolder size

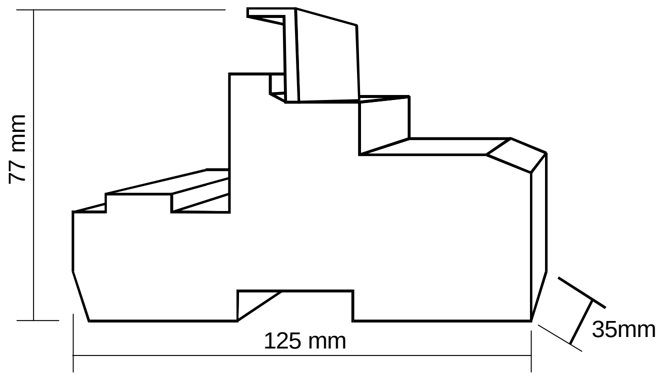
15-25A



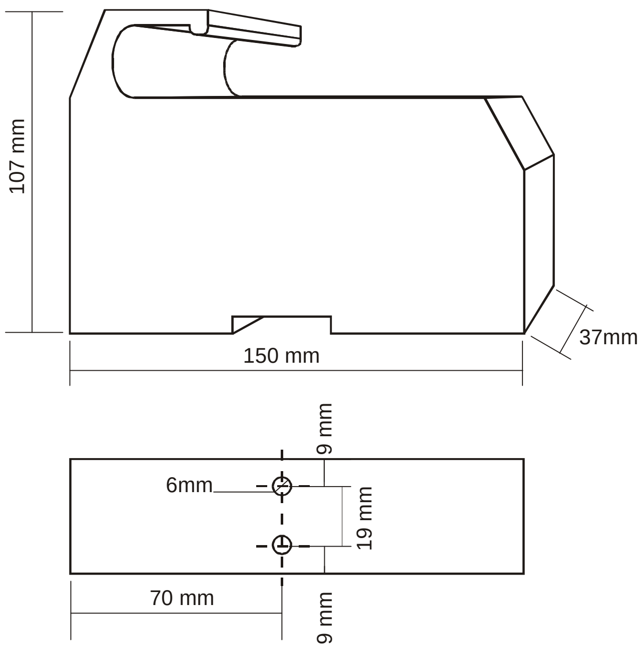
35-45A



60A



90-110A



9. Fuse and fuseholder for CE mark unit

9.1 Fuse and Fuse Code

The thyristor unit must be protected by fuses against short circuit selecting the proper I^2t that must be lower than thyristor one. The same caution must be taken if Circuit Breaker is used. Remember that is very difficult to protect the thyristor if this choise is done.

WARNING!! USE SEMICONDUCTOR FUSES ONLY WITH proper I^2t

Sizes	I^2T (max) (A^2 sec.)	Size and current	Fuse and Fuseholder Code	Fuse Code
15	600	10,3X38 / 16A	FFH1038/16A	FU1038/16A
25	600	10,3X38 / 32A	FFH1038/32A	FU1038/32A
35	780	14X15 / 40A	FFH1451/40A	FU1451/40A
45	1500	14X15 / 50A	FFH1451/50A	FU1451/50A
60	3800	22X58 / 80A	FFH2258/80A	FU2258/80A
90	6970	22X58 / 125A	FFH2258/125A	FU2258/125A
110	11000	27x60 / 160A	FFHPSI27/160A	FFHPSI27/160A

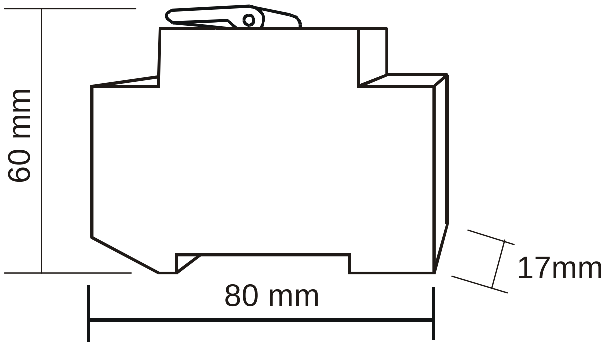
High speed fuses are only used for the thyristor protection and can not be used to protect the installation.

The user installation must be protect by electromagnetic circuit breaker or by fuse isolator.

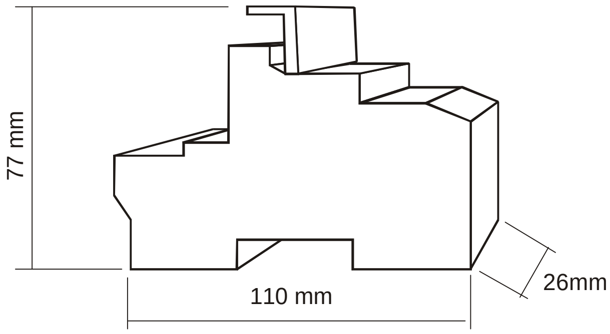
The warranty of thyristor is null if no proper fuses are used. See tab above.

9.2 FuseHolder size

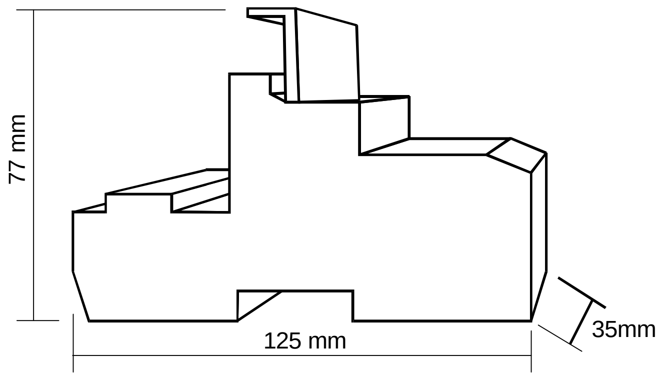
15-25A



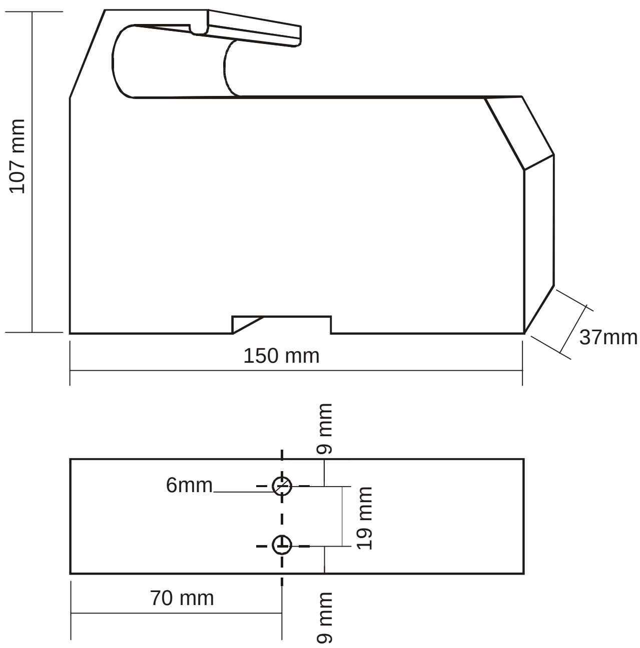
35-45A



60-90A



110A



10.Modbus communication

The CD3000M is equipped with two-wire RS485-compatible serial communications, by which means communication may occur between the Controller and a master device (e.g. a computer or terminal).

10.1 Physical requirements

10.1.1 Character Transmission

Data format is fixed to be one start bit, eight data bits, one stop bit, baud rate 9600 and the parity none.

10.2 ModBus RTU protocol

The standard RS485 Communications uses the industry standard MODBUS RTU protocol.
The following restrictions are imposed:

- *Baud rates is fixed to 9600 Baud only.*
- *Support for multi-parameter Write operations is limited to support of the Multi-Word Write Function (Number 16) but it permits the writing of only one parameter per message.*

The following MODBUS functions are supported:

Function	Function Number
Read Holding Registers (Read n Word)	03
Preset Multiple Registers (Write n Word)	16

The Controller will identify itself in response to a Read Holding Registers message which enquires the values of word parameters 121 and 122 (see Table 4-2).
MODBUS Function 17 (Report Slave ID) is not supported.

10.2.1Message Formats

The first character of every message is the Controller address, in the range 1 - 255 and 0 for broadcast messages.
The second character is always the Function Number.
The contents of the remainder of the message depends upon this Function Number.
In most cases the Controller is required to reply to the message by echoing the address and Function Number.

Broadcast messages are supported at address 0 (to which the CD3000M responds by taking some action without sending back any reply).

Data is transmitted as eight-bit binary bytes with one start bit, one stop bit and parity checking set to none. A message is terminated simply by a delay of more than three character lengths at the Baud rate used(in this case 9600 baud); any character received after such a delay is considered to be the potential address at the start of a new message.

Since only the RTU form of the protocol is supported, each message is followed by a two-byte CRC 16 (a 16-bit cyclic redundancy checksum).
This checksum is calculated in accordance with a formula which involves recursive division of the data by a polynomial, with the input to each division being the remainder of the results of the previous division.

The dividing polynomial is

$2^{16} + 2^{15} + 2^{2} + 1$(Hex 18005)

but this is modified in two ways:

- because the bit order is reversed, the binary pattern is also reversed, making the most significant bit (MSB) the right-most bit;
- because only the remainder is of interest, the right-most (most significant) bit can be discarded.

Thus, the polynomial has the value Hex A001.

10.2.2 Bit's order

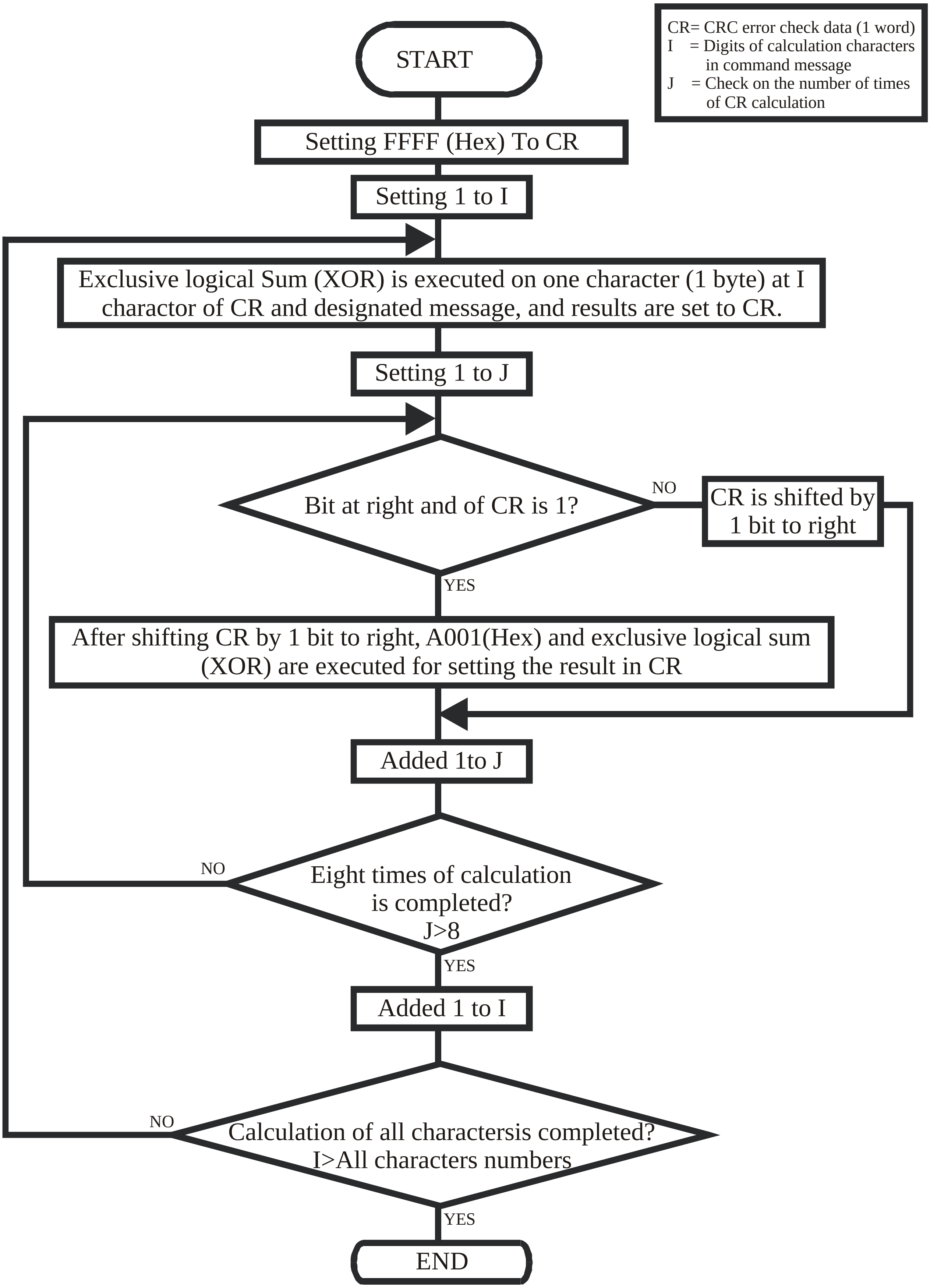
Normal bit order

<table>
<tr><td>Most significant bit</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Least significant bit</td></tr>
<tr><td></td><td colspan="8">Most significant byte</td><td colspan="8">Least significant Byte</td><td></td></tr>
</table>

Reversed bit order

<table>
<tr><td>Least significant bit</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Most significant bit</td></tr>
<tr><td></td><td colspan="8">Least significant Byte</td><td colspan="8">Most significant byte</td><td></td></tr>
</table>

N.B.: Reversed order apples, so CRC16 return Reversed bit order


CR= CRC error check data (1 word)
I = Digits of calculation characters in command message
J = Check on the number of times of CR calculation
START
Setting FFFF (Hex) To CR
Setting 1 to I
Exclusive logical Sum (XOR) is executed on one character (1 byte) at I charactor of CR and designated message, and results are set to CR.
Setting 1 to J
Bit at right and of CR is 1?
NO
CR is shifted by 1 bit to right
YES
After shifting CR by 1 bit to right, A001(Hex) and exclusive logical sum (XOR) are executed for setting the result in CR
Added 1to J
NO
Eight times of calculation is completed? J>8
YES
Added 1 to I
NO
Calculation of all charactersis completed? I>All characters numbers
YES
END

10.2.3 C Language CRC 16 Example

```
static short CRC16 (unsigned char *p_first,unsigned char *p_last)
{
        unsigned int crc=0xffff;
        short j;

        for (;p_first<=p_last;p_first++)
        {
                crc ^= *p_first;
                for(j=8;j>0;j--)
                {
                if(crc & 0x0001)
                        {
                        crc = crc >> 1;
                        crc ^= 0xA001;
                        }
                else
                        {
                        crc = crc >> 1;
                        }
                }

        }
return (crc);
}
```

10.2.4 Read Holding Registers (Read n Words) – Function 03

The message sent to the Controller to obtain the value of one or more registers comprises the following eight bytes:

Addr. unit	**Func.**	**Address 1° word**		**N° of Word**		**CRC 16**	
	3 3Hex	HI	LO	HI	LO	HI	LO

The normal reply will echo the first two characters of the message received followed by a single-byte data byte count (which will not include itself or the CRC).
For this message, the count value equals the number of parameter values read multiplied by two.
Following the byte count, the specified number of parameter values are transmitted, followed by the CRC16 bytes:

Addr. unit	**Func.**	**Cont.**	**1° Value**			**Last Value**		**CRC 16**	
	3 3Hex		HI	LO		HI	LO	HI	LO

10.2.5 Preset Multiple Registers (Write n Words) - Function 16

This is an eleven-byte message. only one parameter may be written for each received message. The usual pre-amble is followed by the address of the parameter to be written, a two-byte word count (always set to 1), a single-byte byte count (always set to 2), the value to be written and the CRC16 bytes:

Addr. unit	**Func.**	**Addr of 1° Word**		**N° of Word**		**Cont.**	**Valore**		**CRC 16**	
	16 10Hex	HI	LO	0	1	2	HI	LO	HI	LO

The Controller normally responds with the following eight-bit reply:

Addr. unit	**Func.**	**N° of Word**		**N° Word**		**CRC 16**	
	16 10Hex	HI	LO	0	1	HI	LO

10.2.6 Error and Exception Responses

If a received message contains a corrupted character (parity check failure, framing error etc.) or if the CRC16 check fails, or if the received message is otherwise syntactically flawed (e.g. byte count or word count is incorrect), the thyristor will ignore that message.

If the received message is syntactically correct but nonetheless contains an illegal value, the thyristor will send a five-byte exception response as follows:

Addr. unit	**Func.**	**N.Exception**	**CRC 16**	
			HI	LO

The Function Number byte contains the function number contained in the message which caused the error, with its top bit set (i.e. Function 3 becomes 0x83) and the Exception Number is on of the following codes:

Code	**Name**	**Cause**
1	ILLEGAL FUNCTION	Function number out of range
2	ILLEGAL DATA ADDRES	Parameter ID out of range or not supported
3	ILLEGAL DATA VALUE	Attempt to write invalid data/required action not executed

NOTE: Writing a parameter value equal to its current value is a valid transaction; this will not cause an error response.

10.3 Word parameters

Parameter	N.	Notes
Heater nominal current	1	Read only
Set-point HB	2	Read /write
Status Table (shown in Tab 2.1.2)	3	Read only
Comand Table (shown in Tab 2.1.3)	4	Read /write
Output Power (0 – FFH)	5	Read - (Write if BIT1in Command table i = 1) (0->0% - FF->100%)
Power Adjust (0 – FFH)	6	Read -- (Write if BIT1in Command table i = 1) (0->0% - FF->100%)*

10.3.1 Heater nominal current **Parameter 1**
Operation: Read

Meaning:
It correspond at one value in points (0-255,0-FF Hex).
It represents average current value flowing into thyristors.
Value depends on current transformer ratio that is different from one size to the other one (see below table)

Nominal current (A)	**Zero (0 , 0 Hex)** (A)	**Max (255 , ff Hex) (A)**
3,5	0	3,5
15	0	25
25	0	25
35	0	50
45	0	50
60	0	100
90	0	100
110	0	100

10.3.2 Set-point HB **Parameter 2**
Operations: Read/Write

Meaning:
It correspond at one value in points (0-255, o-FF Hex). It's the set of current value below which HB alarm occurs.
This value is the load current minus % value of parameter 124H. This value depend on nominal current of transformer that change in function of thyristor nominal current as described in below tab.

Nominal current (A)	Zero (0 , 0 Hex) (A)	Max (255 , ff Hex) (A)
3,5	0	3,5
15	0	25
25	0	25
35	0	50
45	0	50
60	0	100
90	0	100
110	0	100

10.3.3 Status Table **Parameter 3**
Operations: Read

Meaning:
It's a tab in bit that represent the "Status" of thyristor unit

10.3.4 Comand Table **Parameter 4**
Operations: Read/Write

Meaning:
It's a tab in bit for remote commands via RS485 (see tab)

10.3.5 Output Power **Parameter 5**

Command from controller

Operations: Read

Meaning:

It rapresent a value in points (0-255, 0-FF Hex) and it's the power demand in % of controller.

Example:

0%	= 0	0 (Hex)
50%	= 128	80 (Hex)
100%	= 255	FF (Hex)

Command via RS485

Operations : Read/Write

Meaning:

It's a value in points (0-255, 0-FF Hex)
It's power set point setted in thirst buffer

Example:

0%	= 0	0 (Hex)
50%	= 128	80 (Hex)
100%	= 255	FF (Hex)

10.3.6 Power adjust **Parameter 6**

Operations: Read/Write

Meaning:

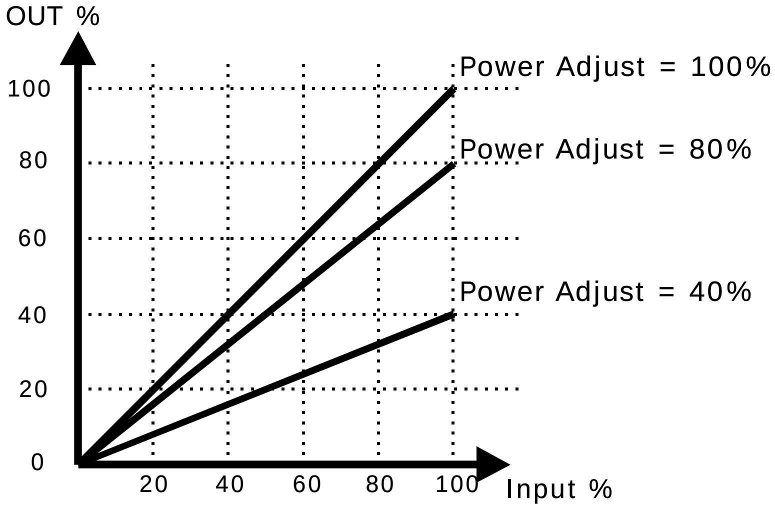
Its' a value in points (0-255, 0-FF Hex)
Its' a scaling factor of power demand

Example 1:

0%	= 0
50%	= 128
100%	= 255

Example 2:

- Output Power :100
  Power Limit :100
  -> Power real : 100
- Output Power :100
  Power Limit :50
  -> Power real : 50
- Output Power :80
  Power Limit :50
  -> Power real : 40



10.3.7 Status Table

Bit	Meaning	Notes
0	Short circuit on SCR	Read only
1	Load Failure	Read only
2	On-Off	Read only
3	HB Calibration in progress	Read only 0=Normal - 1=Calibration

10.3.7.1 Short circuit on SCR *Bit 0*

Operations: Read

Meaning:
Its' a status but that represents the short circuit on thyristor

0 = OK
1 = Short circuit

10.3.7.2 Load Failure *Bit 1*

Operations: Read

Meaning:
It's a bit that represent partial or total load failure.

0 = OK
1 = Load failure

10.3.7.3 On-Off *Bit 2*

Operations: Read

Meaning:
It's a bit that represent when input signal is ON

0 = Input signal OFF
1 = Input signal ON

10.3.7.4 HB Calibration in progress *Bit 3*

Operations: Read

Meaning:
IT'S A BIT STATUS THAT REPRESENT "CALIBRATION IN PROGRESS"

0 = No calibration
1 = Calibration in progress

10.3.8 Command Table

Bit	Meaning	Notes
0	HB Calibration	Read /write 0=Off - 1=ACTVATE Calibration (normal mode set to 0)
1	Firing command	Read /write 0=from terminal - 1=from RS485
2	On-Off	Read /write 0=Off - 1=On
3	RESET HB	Read /write 0=Off - 1=RESET (normal mode set to 0)

N.B.: When unit is switch off all command parameter are set to 0

10.3.8.1 HB Calibration *Bit 0*

Operations: Read / Write

Meaning:
It's a bit that starts the HB calibration procedure
When this bit is zero start the calibration procedure and reset itself automatically at the end.

10.3.8.2 Firing command *Bit 1*

Operations: Read / Write

Meaning:
It's a command bit used to switch from analog external command to command via RS485

0 = Command of analog input
1 = Command of RS485 input

10.3.8.3 On-Off *Bit 2*

Operations: Read / Write

Meaning:
Its' an enable bit to switch ON-OFF the power.

0 = Power disabled
1 = Power enabled

10.3.8.4 HB RESET *Bit 3*

Operations: Read / Write

Meaning:
It's a command bit to reset HB alarm.
This parameter has to be at 0 to have the alarm working properly

0 = Reset disabled
1 = Reset enabled

10.4 Thyristor unit Configuration

Parameter	**N.**	**Notes**
Password	123	Write
Delay trigger	124L	Read /write
% HB	124H	Read /write
Firing type	125L	Read /write
Soft start time	125H	Read /write
N° burst	126L	Read /write
Delay time HB	126H	Read /write
Max power for SSR Input	127L	Read /write
Cycle time	127H	Read /write
N° of half period for Delayed triggering	128L	Read /write (Mantenere a 1)
	128H	Read /write

10.4.1 Password **Parameter 123**

Operations: Write

Meaning:
If properly setted give the access to configuration

10.4.2 Delay triggering **Parameter 124L**

Operations: Read/Write

Meaning:
It's correspond to a value in points (0-50, 0-32 Hex)
Each step is 0,1msec. Range is 0-5msec.
This parameter is the delay of firig in first half period with respect zero voltage crossing.

10.4.3 % HB **Parameter 124H**

Operations: Read/Write

Meaning:
It's correspond to a value in point (0-255, 0-ff Hex)
This parameter is the value in % that decrease the load current to establish the HB current set point

Example:

Load current = 10A
Parameter 124H = 20% 51 Dec 33 Hex
Parameter 2 will be setted at 8A

10.4.4 Firing type **Parameter 125L**

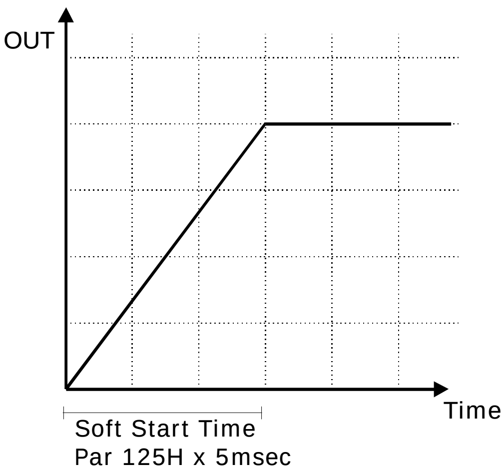
Operations: Read/Write

Meaning:
Selection table of firing modes.

Value		Type	Option
H	L		
0	1	Zero Crossing	-
0	2	Single Cycle	-
0	3	Burst	-
1	1	Zero Crossing	Soft Start
1	2	Single Cycle	-
1	3	Burst	Soft Start
2	1	Zero Crossino	Delay trigger
2	2	Single Cycle	
2	3	Burst	Delay triggering
2	4	Phase angle	Soft start

10.4.5 Soft start time **Parameter 125H**

Operations: Read/Write



Meaning :
It's correspond to a value in points (0 – 255, 0 – FF Hex).
Each step is 5msec .

The unit start in phase angle mode with a ramp starting from zero up to full voltage in a presetted and Adjustable time.
The time is setted by this parameter.

Value of this parameter must be less than cycle time.

For burst firing:
Value of this parameter must be less than:
50Hz -> 20msec x Number of cycles (Parameter 126L).
60Hz -> 16,6msec x Number of cycles (Parameter 126L).

10.4.6 N° burst — Parameter 126L

Operations: Read/Write

Meaning:
It's a value in point (0 – 255, 0 – FF Hex).
In burst firing mode it rapresents the number of cycles at 50% power demand

10.4.7 Delay time HB — Parameter 126H

Operations: Read/Write

Meaning:
It's a value in point (0 – 255, 0 – FF Hex).
Each step is 50msec.
It represent a delay to have HB alarm active

When is used soft start this time must be longer than soft start time.
Par126H x 50msec > Par125H x 5msec

When zero crossing firing is used must be less than cycle time
Par126H x 50msec > Par127H x 50msec

10.4.8 Max power for SSR Input — Parameter 127L

Operations: Read/Write

Meaning:
It's a value in points (0 – 255, 0 – FF Hex).

When SSR input is used it represent the value of the power (%) when is in ON status.

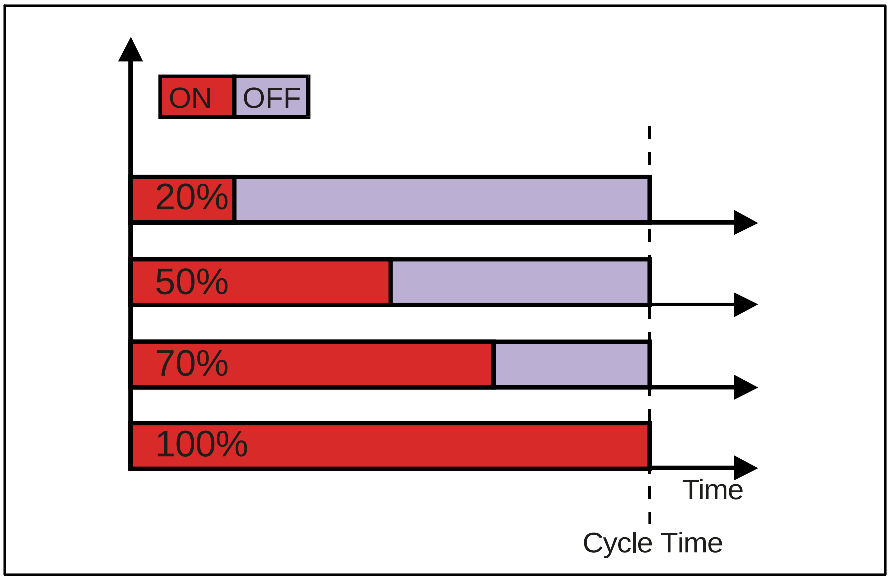
It's the power % when firing command is given on RS485 (1).

Example:

0%	= 0	0 (Hex)
50%	= 128	80 (Hex)
100%	= 255	FF (Hex)

10.4.9 Cycle time **Parameter 127H**
Operations: Read/Write

Meaning:
It's a value in points (0 – 255, 0 – FF Hex).
Each step is 50msec .



When single cycle (SC) and burst firing (BF) is used must be setted at 240 (FO Hex)

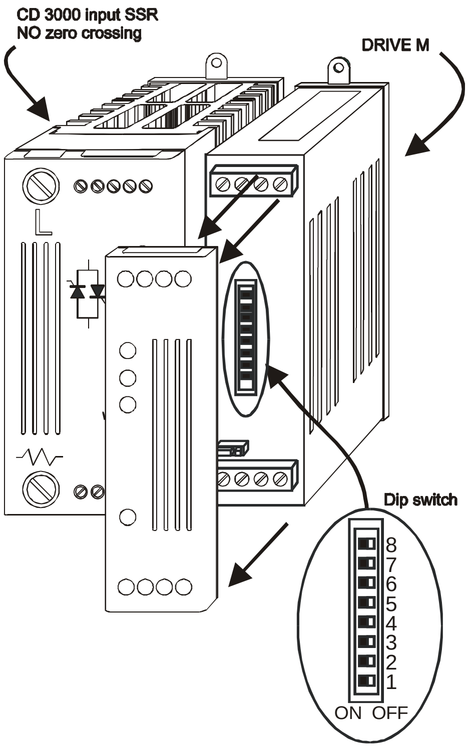
When SSR input is used set at 240 (FO Hex)

When is used zero crossing (ZC) represents the cycle time
(ON time + OFF time, default 60(3C Hex))

10.4.10 Number of half periods for DT firing **Parameter 128L**
Operations: Read/Write

Meaning:
Must be setted at 1.

10.5 Address configuration



To Configure communication address remove cover and set the dip-switch as below specified.

10.5.1 Address table

ID	8	7	6	5	4	3	2	1
1	-	-	-	-	-	-	-	X
2	-	-	-	-	-	-	X	-
3	-	-	-	-	-	-	X	X
4	-	-	-	-	-	X	-	-
5	-	-	-	-	-	X	-	X
6	-	-	-	-	-	X	X	-
7	-	-	-	-	-	X	X	X
8	-	-	-	-	X	-	-	-
9	-	-	-	-	X	-	-	X
10	-	-	-	-	X	-	X	-
11	-	-	-	-	X	-	X	X
12	-	-	-	-	X	X	-	-
13	-	-	-	-	X	X	-	X
14	-	-	-	-	X	X	X	-
15	-	-	-	-	X	X	X	X
16	-	-	-	X	-	-	-	-
17	-	-	-	X	-	-	-	X
18	-	-	-	X	-	-	X	-
19	-	-	-	X	-	-	X	X
20	-	-	-	X	-	X	-	-
21	-	-	-	X	-	X	-	X
22	-	-	-	X	-	X	X	-
23	-	-	-	X	-	X	X	X
24	-	-	-	X	X	-	-	-
25	-	-	-	X	X	-	-	X

ID	8	7	6	5	4	3	2	1
26	-	-	-	X	X	-	X	-
27	-	-	-	X	X	-	X	X
28	-	-	-	X	X	X	-	-
29	-	-	-	X	X	X	-	X
30	-	-	-	X	X	X	X	-
31	-	-	-	X	X	X	X	X
32	-	-	X	-	-	-	-	-
33	-	-	X	-	-	-	-	X
34	-	-	X	-	-	-	X	-
35	-	-	X	-	-	-	X	X
36	-	-	X	-	-	X	-	-
37	-	-	X	-	-	X	-	X
38	-	-	X	-	-	X	X	-
39	-	-	X	-	-	X	X	X
40	-	-	X	-	X	-	-	-
41	-	-	X	-	X	-	-	X
42	-	-	X	-	X	-	X	-
43	-	-	X	-	X	-	X	X
44	-	-	X	-	X	X	-	-
45	-	-	X	-	X	X	-	X
46	-	-	X	-	X	X	X	-
47	-	-	X	-	X	X	X	X
48	-	-	X	X	-	-	-	-
49	-	-	X	X	-	-	-	X
50	-	-	X	X	-	-	X	-

ID	8	7	6	5	4	3	2	1
51	-	-	X	X	-	-	X	X
52	-	-	X	X	-	X	-	-
53	-	-	X	X	-	X	-	X
54	-	-	X	X	-	X	X	-
55	-	-	X	X	-	X	X	X
56	-	-	X	X	X	-	-	-
57	-	-	X	X	X	-	-	X
58	-	-	X	X	X	-	X	-
59	-	-	X	X	X	-	X	X
60	-	-	X	X	X	X	-	-
61	-	-	X	X	X	X	-	X
62	-	-	X	X	X	X	X	-
63	-	-	X	X	X	X	X	X
64	-	X	-	-	-	-	-	-
65	-	X	-	-	-	-	-	X
66	-	X	-	-	-	-	X	-
67	-	X	-	-	-	-	X	X
68	-	X	-	-	-	X	-	-
69	-	X	-	-	-	X	-	X
70	-	X	-	-	-	X	X	-
71	-	X	-	-	-	X	X	X
72	-	X	-	-	X	-	-	-
73	-	X	-	-	X	-	-	X
74	-	X	-	-	X	-	X	-
75	-	X	-	-	X	-	X	X
76	-	X	-	-	X	X	-	-
77	-	X	-	-	X	X	-	X
78	-	X	-	-	X	X	X	-
79	-	X	-	-	X	X	X	X
80	-	X	-	X	-	-	-	-
81	-	X	-	X	-	-	-	X
82	-	X	-	X	-	-	X	-
83	-	X	-	X	-	-	X	X
84	-	X	-	X	-	X	-	-
85	-	X	-	X	-	X	-	X
86	-	X	-	X	-	X	X	-
87	-	X	-	X	-	X	X	X
88	-	X	-	X	X	-	-	-
89	-	X	-	X	X	-	-	X
90	-	X	-	X	X	-	X	-
91	-	X	-	X	X	-	X	X
92	-	X	-	X	X	X	-	-
93	-	X	-	X	X	X	-	X
94	-	X	-	X	X	X	X	-
95	-	X	-	X	X	X	X	X
96	-	X	X	-	-	-	-	-
97	-	X	X	-	-	-	-	X
98	-	X	X	-	-	-	X	-
99	-	X	X	-	-	-	X	X
100	-	X	X	-	-	X	-	-

ID	8	7	6	5	4	3	2	1
101	-	X	X	-	-	X	-	X
102	-	X	X	-	-	X	X	-
103	-	X	X	-	-	X	X	X
104	-	X	X	-	X	-	-	-
105	-	X	X	-	X	-	-	X
106	-	X	X	-	X	-	X	-
107	-	X	X	-	X	-	X	X
108	-	X	X	-	X	X	-	-
109	-	X	X	-	X	X	-	X
110	-	X	X	-	X	X	X	-
111	-	X	X	-	X	X	X	X
112	-	X	X	X	-	-	-	-
113	-	X	X	X	-	-	-	X
114	-	X	X	X	-	-	X	-
115	-	X	X	X	-	-	X	X
116	-	X	X	X	-	X	-	-
117	-	X	X	X	-	X	-	X
118	-	X	X	X	-	X	X	-
119	-	X	X	X	-	X	X	X
120	-	X	X	X	X	-	-	-
121	-	X	X	X	X	-	-	X
122	-	X	X	X	X	-	X	-
123	-	X	X	X	X	-	X	X
124	-	X	X	X	X	X	-	-
125	-	X	X	X	X	X	-	X
126	-	X	X	X	X	X	X	-
127	-	X	X	X	X	X	X	X
128	X	-	-	-	-	-	-	-
129	X	-	-	-	-	-	-	X
130	X	-	-	-	-	-	X	-
131	X	-	-	-	-	-	X	X
132	X	-	-	-	-	X	-	-
133	X	-	-	-	-	X	-	X
134	X	-	-	-	-	X	X	-
135	X	-	-	-	-	X	X	X
136	X	-	-	-	X	-	-	-
137	X	-	-	-	X	-	-	X
138	X	-	-	-	X	-	X	-
139	X	-	-	-	X	-	X	X
140	X	-	-	-	X	X	-	-
141	X	-	-	-	X	X	-	X
142	X	-	-	-	X	X	X	-
143	X	-	-	-	X	X	X	X
144	X	-	-	X	-	-	-	-
145	X	-	-	X	-	-	-	X
146	X	-	-	X	-	-	X	-
147	X	-	-	X	-	-	X	X
148	X	-	-	X	-	X	-	-
149	X	-	-	X	-	X	-	X
150	X	-	-	X	-	X	X	-

ID	8	7	6	5	4	3	2	1
151	X	-	-	X	-	X	X	X
152	X	-	-	X	X	-	-	-
153	X	-	-	X	X	-	-	X
154	X	-	-	X	X	-	X	-
155	X	-	-	X	X	-	X	X
156	X	-	-	X	X	X	-	-
157	X	-	-	X	X	X	-	X
158	X	-	-	X	X	X	X	-
159	X	-	-	X	X	X	X	X
160	X	-	X	-	-	-	-	-
161	X	-	X	-	-	-	-	X
162	X	-	X	-	-	-	X	-
163	X	-	X	-	-	-	X	X
164	X	-	X	-	-	X	-	-
165	X	-	X	-	-	X	-	X
166	X	-	X	-	-	X	X	-
167	X	-	X	-	-	X	X	X
168	X	-	X	-	X	-	-	-
169	X	-	X	-	X	-	-	X
170	X	-	X	-	X	-	X	-
171	X	-	X	-	X	-	X	X
172	X	-	X	-	X	X	-	-
173	X	-	X	-	X	X	-	X
174	X	-	X	-	X	X	X	-
175	X	-	X	-	X	X	X	X
176	X	-	X	X	-	-	-	-
177	X	-	X	X	-	-	-	X
178	X	-	X	X	-	-	X	-
179	X	-	X	X	-	-	X	X
180	X	-	X	X	-	X	-	-
181	X	-	X	X	-	X	-	X
182	X	-	X	X	-	X	X	-
183	X	-	X	X	-	X	X	X
184	X	-	X	X	X	-	-	-
185	X	-	X	X	X	-	-	X
186	X	-	X	X	X	-	X	-
187	X	-	X	X	X	-	X	X
188	X	-	X	X	X	X	-	-
189	X	-	X	X	X	X	-	X
190	X	-	X	X	X	X	X	-
191	X	-	X	X	X	X	X	X
192	X	X	-	-	-	-	-	-
193	X	X	-	-	-	-	-	X
194	X	X	-	-	-	-	X	-
195	X	X	-	-	-	-	X	X
196	X	X	-	-	-	X	-	-
197	X	X	-	-	-	X	-	X
198	X	X	-	-	-	X	X	-
199	X	X	-	-	-	X	X	X
200	X	X	-	-	X	-	-	-

X	=	ON
-	=	OFF

ID	8	7	6	5	4	3	2	1
201	X	X	-	-	X	-	-	X
202	X	X	-	-	X	-	X	-
203	X	X	-	-	X	-	X	X
204	X	X	-	-	X	X	-	-
205	X	X	-	-	X	X	-	X
206	X	X	-	-	X	X	X	-
207	X	X	-	-	X	X	X	X
208	X	X	-	X	-	-	-	-
209	X	X	-	X	-	-	-	X
210	X	X	-	X	-	-	X	-
211	X	X	-	X	-	-	X	X
212	X	X	-	X	-	X	-	-
213	X	X	-	X	-	X	-	X
214	X	X	-	X	-	X	X	-
215	X	X	-	X	-	X	X	X
216	X	X	-	X	X	-	-	-
217	X	X	-	X	X	-	-	X
218	X	X	-	X	X	-	X	-
219	X	X	-	X	X	-	X	X
220	X	X	-	X	X	X	-	-
221	X	X	-	X	X	X	-	X
222	X	X	-	X	X	X	X	-
223	X	X	-	X	X	X	X	X
224	X	X	X	-	-	-	-	-
225	X	X	X	-	-	-	-	X
226	X	X	X	-	-	-	X	-
227	X	X	X	-	-	-	X	X
228	X	X	X	-	-	X	-	-
229	X	X	X	-	-	X	-	X
230	X	X	X	-	-	X	X	-
231	X	X	X	-	-	X	X	X
232	X	X	X	-	X	-	-	-
233	X	X	X	-	X	-	-	X
234	X	X	X	-	X	-	X	-
235	X	X	X	-	X	-	X	X
236	X	X	X	-	X	X	-	-
237	X	X	X	-	X	X	-	X
238	X	X	X	-	X	X	X	-
239	X	X	X	-	X	X	X	X
240	X	X	X	X	-	-	-	-
241	X	X	X	X	-	-	-	X
242	X	X	X	X	-	-	X	-
243	X	X	X	X	-	-	X	X
244	X	X	X	X	-	X	-	-
245	X	X	X	X	-	X	-	X
246	X	X	X	X	-	X	X	-
247	X	X	X	X	-	X	X	X
248	X	X	X	X	X	-	-	-
249	X	X	X	X	X	-	-	X
250	X	X	X	X	X	-	X	-
251	X	X	X	X	X	-	X	X
252	X	X	X	X	X	X		
253	X	X	X	X	X	X		X
254	X	X	X	X	X	X	X	
255	X	X	X	X	X	X	X	X

11. Maintenance

11.1 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
Thyristor unit doesn't go in conduction with input signal.	Green LED is always light off.	- No voltage auxiliary power supply to terminals 1-3 (see wiring diagram).	- Give auxiliary voltage supply to terminals 1-3.
	Green LED (PW) light on and green LED (ON) in light off condition.	- No input signal. - Reversed polarities of input signal. - Reset contact in open condition (see wiring diagram).	- Provide to give input signal. - Reverse the input signal polarity. - Make link on reset terminals.
	Green LED (PW) in light on condition and green LED (ON) in light on condition.	- Fuse failure. - Load failure. - Load connection interruption. - Thyristor faulty and always in open circuit. - With HB option the yellow led (HB) in light on condition.	- Substitute the fuse. - Repair the load. - Provide to repair the wiring. - Substitute the faulty thyristor. - Check the load.
Load current flows also with no input signal.	Green LED (ON) always in light off condition.	- Short circuit on thyristor. If there is HB circuit the red LED (SC) is light on.	- Substitute the thyristor. Check that load is not in short circuit.
Current flows at nominal value but yellow LED (HB) in light on condition.	Yellow HB in light on condition.	- HB circuit not tuned. - Current transformers not properly wired (if are external to CD3000).	- Push CAL button in front unit to start HB calibration procedure. - Control current transformers wiring and Push CAL button in front unit to start HB calibration procedure.
Red LED (SC) is lighted also if current is at nominal value.	Red LED in light on condition.	- HB circuit not properly tuned.	- Push CAL button in front unit to start HB calibration procedure.
Thyristor unit doesn't work properly.		- Wrong input signal selection. - Wrong input signal calibration (out of range). - Auxiliary voltage supply out of limits.	- Control input signal setting. - Repeat input calibration procedure. - Verify the auxiliary voltage supply.

11.2 Repairing procedure

- Phone to us.
- Explain to Service Engineer the problem because sometimes it can be solved with a phone call.
- If this is not possible ship the unit to us or to your distributor.
- Write a fault description and give the name of your personnel to which refer.
- Use a rugged packaging to ship the unit.

11.3 Fans

The thyristor unit with forced ventilation uses fans that rotate permanently when the unit is supplied. In case of accidental fan failure, there is an over heating temperature on heatsink. In this case to give protection to thyristor there is a thermal switch properly setted. The function of this switch is to open the input signal until the heatsink temperature falls below the setted value. This means that also with input signal in ON condition the unit is switched OFF and the system can not work at full power. For these reason is important to control periodically the fan status checking that is rotating.

11.4 Servicing

In order to have correct cooling, the user must clean the heatsink and the protective grill of fan. The frequence of this servicing depends on environmental pollution.
Check periodically also if the screw for the power cables and safety earth are tightened correctly

11.5 Warranty conditions

We 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 includes products with serial numbers deleted. The faulty product should be shipped to us at your cost and our Service will evaluate if product is under warranty terms.
Substituted parts remains our property.

12. CD Automation's distributors

For a more precise and rapid service, please contact the distributor nearest to you:

ITALY	
CABE S.r.l. Via Ferrara, 15/17 40018 S. Pietro in Casale (BO) Tel: 051 6661345 Fax: 051 6661283 Sig. Bergonzoni info@cabesrl.it	**Vectra Misure S.r.l.** Via Gaidano, 109/17 10137 Torino (TO) Tel: 011 3097003 Fax: 011 3098799 Sig. Cochis vectramisure@libero.it
CEAM Control Equip. S.r.l. Via Val d'Orme, 291 50053 Empoli (FI) Tel: 0571 924181 Fax: 0571 924505 Sig. Campinoti info@ceamgroup.it	**Secif S.a.s.** Via Bachelet, 27 35010 Busa di Vigonza (PD) Tel: 049 8934422 Fax: 049 8934415 Sig. Ferro info@secif.com
Studio Rapaccini S.a.s. Via del Rivo, 138 05100 Terni (TR) Tel: 0744 305105 Cell: 335 6163428 Fax: 0744 305110 Dott. Rapaccini rapaccin@tin.it	

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