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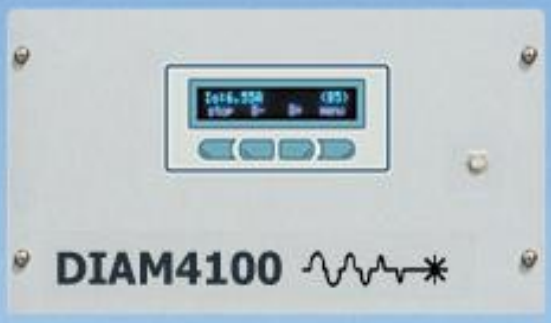
Installation & maintenance

DIAM 4100

L828/L829 and IEC Single-phase SCR-type Constant Current Regulator



Compliance with standards:
ICAO Aerodrom design manual, part 5
IEC 61822 et 61821
FAA (AC 150/5345-10F Spec.L828/L829)
AENA (PPT2 ed4(2004)

RECORD OF CHANGES

Rev.	***Pages***	***Description***	***From S/N***	***By***	***App.***	***Date***
1.0		First issue		ED	RG	17/09/07
1.1		corrections		RG	RG	09/10/07
1.2	33, 56	LV and HV Intervention instruction and warning		RG	RG	22/10/07
1.3		Interface board &Jbus table		ED	RG	18/07/08
1.4	46,47,51	Jbus address 105 →70, 98→69		ED	RG	14/10/08
1.5	65, 68	Spare parts list modification		OE	RG	28/11/08
1.6	27,28	LFD measurement		ED	RG	18/12/08
1.7	37	SOURIAU remote control		ED	RG	23/12/08
1.8	21	Capacitive current detection		ED	RG	26/03/09
1.9	92	Ordering information		ED	RG	04/05/09
1.10	67, 68	Spare list (thyristor board)		ED	RG	22/06/09
1.11	26	Rotative cutout		ED	RG	03/10/09
1.12	29 33	Note on insulation measurement §I.8.3 Circuit breaker recommendation update §II.1.5.2		TVD	RG	29/03/11
1.13	27	Add external rotative cutout – page setup		TVD	RG	18/05/11
1.14	54	Remote priority, remote fail safe		ED	RG	26/05/11
1.15	27	Note lightning arrestor status using EFD		TVD	RG	13/09/11
1.16	40,41	AENA modifications		ED	RG	19/03/12
1.17	39	SOURIAU connections		ED	RG	28/03/12
1.18	32	Update low voltage protection table		TVD	RG	22/05/12
1.19	71, 72, 73	Update spare parts codes		TVD	RG	12/06/12
1.20	69, 70	Internal error codes description		TVD	ED	18/10/12
1.21	56	Remote control Ethernet + serial link Remove Jbus table compatible 4000		ED	ED	30/06/15
1.22		Add reference in spare parts list		ED	ED	15/11/16
1.23	2	Warranty modification		RG	RG	15/05/17
1.24	50, 78	FAA terminal block		RG	RG	15/05/17
1.25		Maintenance CIMALT & New codification	>2018	RG	RG	20/02/18
1.26	1	New logo		RG	RG	23/05/18
1.27		B option (CIMALT)		RG	RG	12/09/18
1.28		Adding new 24 relays board		ED	RG	30/09/18
1.29		Adding multi terminal inductance Remove the remote control and cut out pages Notice 6021732 : Remote control notice Notice 6021752 : Cut out notice		ED	RG	31/01/19

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SAFETY

Safety precautions

This equipment is normally used or connected to circuits that may employ dangerous and lethal voltages. Extreme caution should be exercised by operating or maintenance people when working on or with this equipment.
See IEC 61820 & 61821 standard (CCR type IEC), or FAA AC150/5340-26 advisory circular (CCR type FAA), concerning safety rules and precautions. While practical safety precautions have been incorporated in this equipment, the following rules must be strictly observed :

- **KEEP AWAY FROM LIVE CIRCUITS** :
  Operating and maintenance people must at all time observe all safety regulations. Do not change components nor perform maintenance inside equipment with power ON or the lighting loop energised.
- **RESUSCITATION** :
  Operating and maintenance personnel should familiarise and keep themselves trained with resuscitation techniques found in widely published manuals about first aid instructions.
- **ELECTROSTATIC DISCHARGE (ESD)** :
  Electronic sub-assemblies and boards should be touched only for unavoidable operation (replacement, for example). Before to operate, maintenance people must first of all eliminate unwanted electronic charges, discharging his own body while touching a conductive earthed object or part. Electronic boards and components as power semiconductors must be stored and carried an conductive packing.
- **DESTRUCTION** :
  In case of dismantling, scrapping or placing out of service, the user must follow all the required precautions for component, materials or equipment elimination, according the local rules.

EEC DIRECTIVES

CE

This equipment complies with the requirements of EC directives :

- 89/336/EEC, 92/31/EEC and 93/68/EEC with regard of Electromagnetic Compatibility
- 73/23/EEC with regard of Low Voltage Equipment

TABLE OF CONTENTS

ABBREVIATIONS

Abbreviation	Definition
A	Ampere
AC	Alternating Current
B	Brightness
CCR	Constant Current Regulator
DC	Direct Current
EFD	Earth Fault Detector
HV	High Voltage
IT	Injection Transformer
LFD	Lamp Fault Detector
LV	Low Voltage
OO	Out of order
V	Volt
VA	Volt-Ampere

I DESCRIPTION

I.1 OVERVIEW

DIAM4100 series CCRs are low costs fully static devices controlled by two thyristors (anti-parallel mounting type dimmer). They are designed to maintain a constant, pre-displayed and adjustable output current independently of the load and power supply fluctuations.

These devices are specifically designed for airfield lighting on runways, taxiways, aprons. They meet both national and international standards.

In order to do this, they use an adapted triggering and regulation mechanism that is not affected by external interference and does not emit measurable interference in the Aviation Band between 100 and 400 MHz.

This type of regulator uses natural air-cooling. The output current remains constant with an accuracy of 100mA for mains voltage fluctuations of –5/+10% (+/-10% for IEC type). At the rated load and the rated or higher voltage, accuracy of regulation is maintained for all load between 0 and 100%, and for up to 30% of transformers with open secondary. The output power of the regulator can be adjusted to the load by means of transformers taps, by steps of 12.5%.

Here are some of its advantages:

- **Flexibility of use:**
  The alphanumeric display and menu type keyboard allow the CCR to be configured without connection with a computer.
  Regulation is fully digital which enables parameters to be simply modified for a particular load.
  Emergency and warning messages are clearly displayed.

- **Simplicity:**
  CCR type regulators have a very simplified architecture both for the electronic control unit and the LV and HV power parts.

- **Adaptability and safety:**
  An optional Cut-out and Earthing plate, using two pluggable jumpers can be used to disconnect the CCR from the loop, to earth or short-circuit the loop without disconnecting the load at any time.

- **Construction:**
  It has been optimised to keep the number and variety of spare parts to a minimum. The device is made up of modular sub-assemblies.

- **Standards:**
  - ICAO: Airport design manual, part 5
  - STNA: CCTP 91068 rev.93
  - CENELEC: prENV 50231
  - FAA: AC150/5345-10^{F,} L828 or L829
  - AENA: PPT NTA2-rev.5 (1995) & ed.4 (2004)
  - IEC: 61822 (CCRs), 61821 (Maintenance)

I.2 MECHANICAL DESCRIPTION

I.2.1 DESCRIPTION

Each CCR is housed in a cabinet fitted with lifting rings. The frame has three distinct parts: an “electronic” control part, a “low voltage” compartment and a “high voltage” compartment.

- The **Electronic unit** of the CCR consists of a main electronic circuit board fitted to the upper panel of the cabinet.
  All the basic functions of the regulator are included in the electronic compartment and are accessible from the front and the top of the CCR.

- The **Low voltage unit** contains all the components connected to the power supply with, for example, the thyristors and associated driver boards, the master switch, the LV fuses and connection terminals. It is located in the upper part of the CCR.

- The **High voltage unit,** situated at the back of the CCR, contains all the components connected to the output loop such as the power transformer, the lightning arrestors, the CI-MALT (optional) and the HV part of the insulation fault detection unit. The load regulating plate and the load loop connections are accessible from the front of the device.

All these components are easily accessible from the front, the top or the back of the cabinet.

I.2.2 GENERAL MECHANICAL FEATURES

Regulators are contained in the same cabinet for all powers and input voltage. A taller one (+ 30cm) is available when inside additional equipment is requested by customer, as Circuit selector or ORCA unit (*). Both cabinets are provided with hoisting eye rings, with or without casters, and can be located cuddled up to each other.

Standard cabinet : 500mm Wide x 700mm Deep x 1380mm High
Heightened cabinet : 500mm Wide x 700mm Deep x 1720mm High

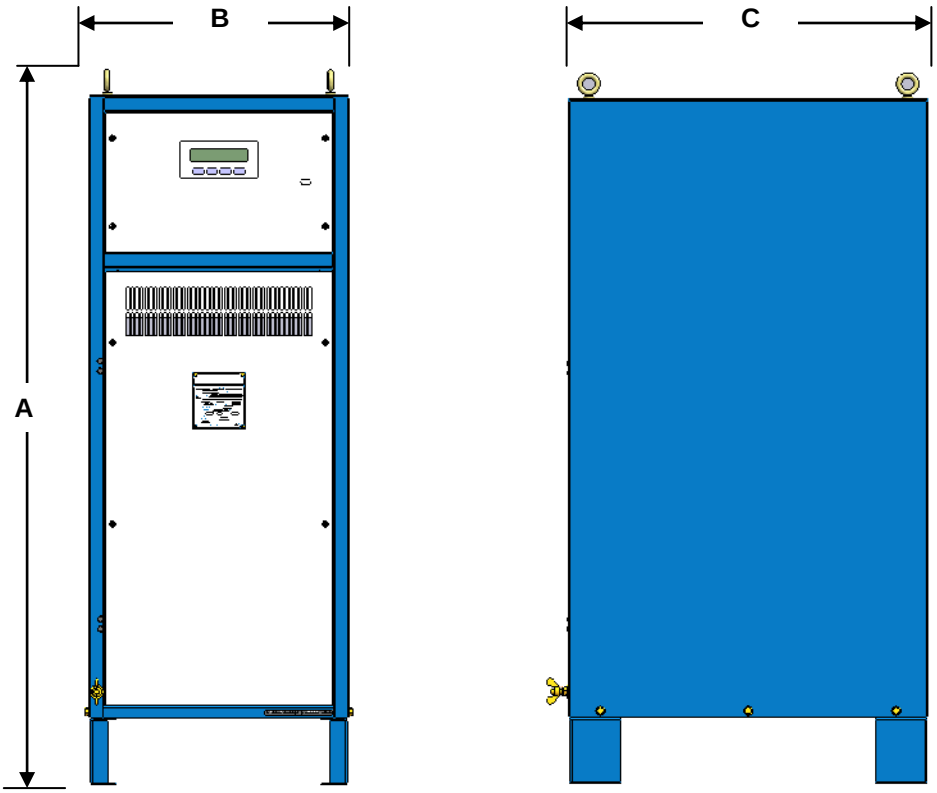
- Protection Index for the Casing: IP 21. (Contact us for other Protection Indices)
- Distances inter-axes (if casters option) : 355 x 610 mm
- Usage: Ambient temperature between -40°C and +55°C (FAA type) or –20°C to +55°C (IEC type), with maximum relative humidity of 95%. Natural air cooling.

(*) ORCA : Loop Communication Equipment, from SCB communication system (Please ask for more information)

I.2.3 STORAGE CONDITIONS

The components are designed to be stored in a dry, airy location, sheltered from rain, water discharges and chemical agents. We must be consulted if the components are to be stored outside, or in an ambient temperature out of the range -40°C/+55°C.

I.2.4 DIMENSIONS



	A (mm)	*B (mm)*	*C (mm)*
1 to 30 kVA	1380	500	700

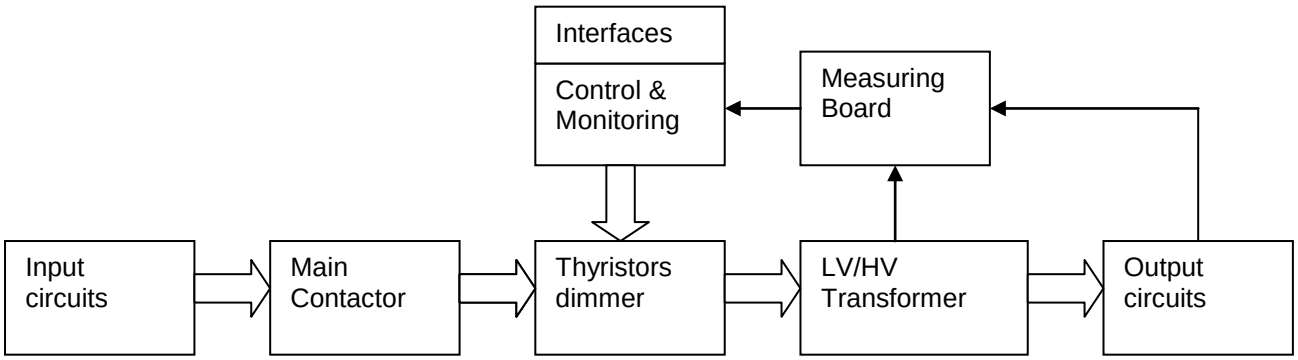
Load	***2.5kVA***	***4kVA***	***5kVA***	***7.5kVA***	***10kVA***	***15kVA***	***20kVA***	***25kVA***	***30kVA***
Weight	135 kg	155kg	155kg	170kg	175kg	220kg	280kg	295kg	330kg

I.3 ELECTRICAL DESCRIPTION

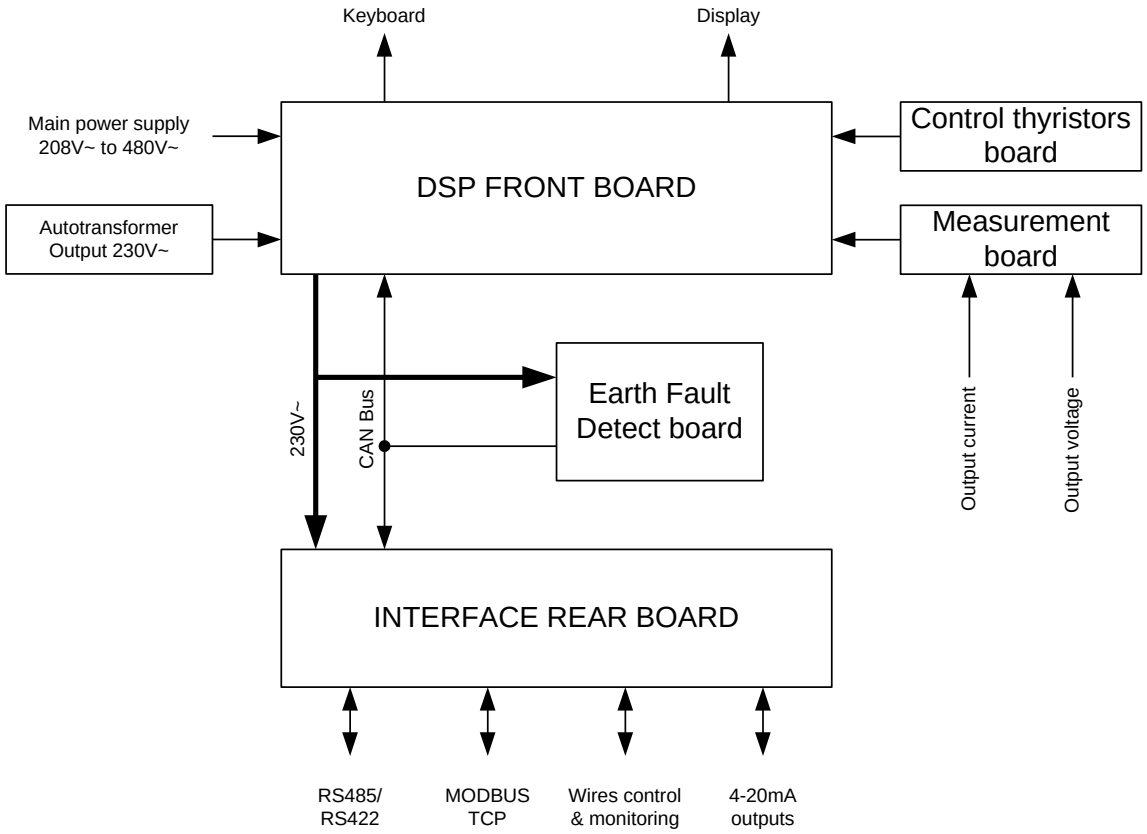
I.3.1 BLOCK DIAGRAMS

ⓘ See paragraph I.5 for the device operating description

I.3.1.1 Overview:



I.3.1.2 Electronics :



I.3.2 GENERAL CIRCUIT DIAGRAMS

ⓘ **See**

ⓘ APPENDIX A: DIAGRAMS

I.3.3 GENERAL ELECTRICAL FEATURES

- **Power supply voltage**:
  Single phase; two series :

FAA type : 208Vac, 220Vac, 240Vac, 277Vac, 400Vac, 480Vac –5/+10%, 45 to 66 Hz

IEC type : 220Vac, 230Vac, 240Vac, 380Vac, 400Vac, 415Vac +10/-10%, 45 to 66 Hz

- **Maximum rated current**: 6.6 A (other values available).

- **Number of Brightness Levels:** maximum 8, adjustable.

- **Heating Brightness ("Black current"):**
  The CCR can produce "heating" level brightness at low current (1.8A preferred value), which is used to remove condensation from the interior of the lamp lenses without lighting up their bulb. The symbol for local setting is 'B0'.

- **Remote Control:** By voltage from 20V to 60V DC positive or negative, or dry contact, or 120Vac, serial network, TCP/IP network (MODBUS TCP).

- **Remote indication:**

FAA or IEC type : Relays, 120VAC , 2A max, 10µA min., and/or serial network

- **Output power:** 1, 2.5, 4, 5, 7.5, 10, 15, 20, 25, 30 kVA

- **Power factor:**

FAA type : > 90% (up to 10kW CCRs) or > 95% (15 to 30kW CCRs), at voltage and rated resistive load

IEC type : > 90% at nominal voltage and rated resistive load

- **Efficiency :** > 90% at nominal voltage and rated resistive load.

- **Output Current Regulation:**
  Better than ±100mA under the following conditions: Power supply voltage: ± 10% (IEC) or –5/+10% (FAA) - Frequency: 45 to 66 Hz - Load: from 0 to 100%

- **Load adaptation**:
  The output transformer is equipped with adjustment taps in order to adapt the rated output voltage of the CCR to the present load. Two brass straps allow load adaptation with steps of 12.5%, between 12.5% and 100% (8 possibilities).

- **Protection:**
  The electronic circuitry is protected against fluctuations by the use of a Hall effect sensor for measuring current. Electronic board manages all overcurrent, open circuit or mains under/over voltage.

- **LV Protection**:
  A set of high-power fuses (or optional circuit breaker), a set of fuses for the power supply to the auxiliaries, and "glass" fuses on the circuit boards provide LV protection.

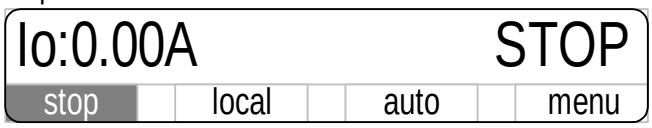
- **Lightning arrestors** :
  These regulators can be optionally provided with input and output lightning arrestors.

I.4 INSTRUCTIONS FOR USE

I.4.1 USER INTERFACE

Operating mode:

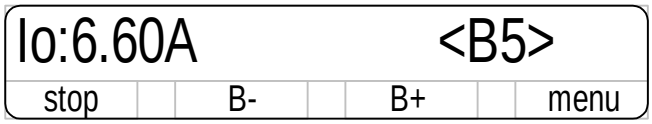
Stop mode :



Preferred information displayed: It can be changed by a long press on the “STOP” key, meanwhile the CCR is in Stop mode. The choice can be :

- Output current Io – Brightness state Bx (as seen in examples below and above)
- Output current Io – Output power Po
- Output current Io – Output voltage Uo

Local mode :

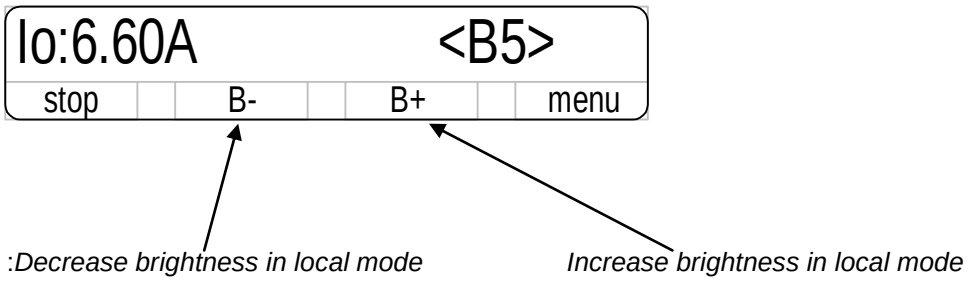


Access is given to B+ and B-, in order to increase / decrease the brightness.

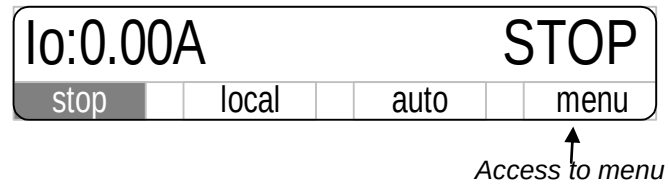
Remote control mode :

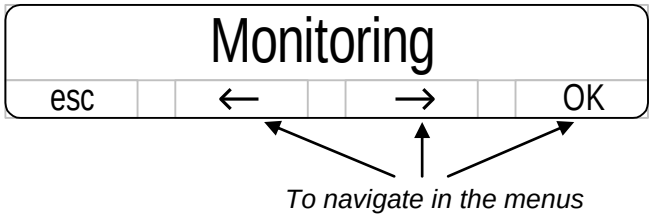
“Auto” is highlighted, in order to indicate the current state.

Brightness selection in local mode:



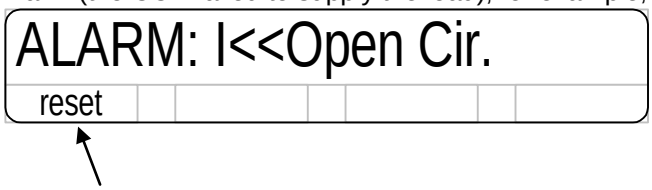
Menus:





Alarms and Warnings:

Alarm (the CCR failed to supply the load); for example, the CCR is stopped by a loop open circuit :

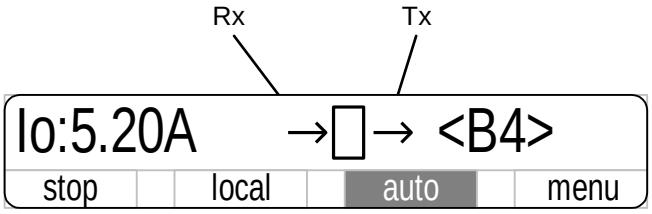


Warning (the CCR doesn't stop; warning is only indicative); for example the earth insulation fault level 1 is detected :

USB link:

An USB socket (type B) is located in front of the CCR, in order to connect a lap-top computer

Rx: indicator Data reception on USB connection
Tx: indicator Data transmission on USB connection



Alphanumeric display:

VFD Blue display (16 x 140 pts) :

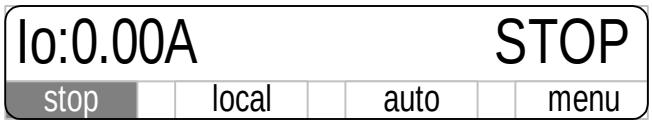
- upper line: information datas),
- lower line :key definition.

Screen saver : The brightness decreases automatically or turn off after one hour if the keyboard is not used. Turns on again instantly when a key is pressed. (Function user-definable)

I.4.2 CONTROL

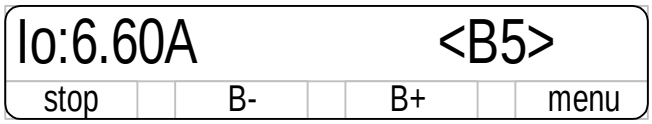
The device is controlled by mean of a 4 buttons keypad which allows to change the operating mode: “Stop” – Manual or “Local” mode – Remote or “Auto” control mode.

- **Stop mode:**



In that mode, “Stop” is highlighted. The CCR stops, whatever the current brightness orders (remote control or local selection).
Menus can then be accessed.

- **Local mode:**



In that mode appears brightness controls : The brightness is chosen by pressing buttons **B-** and **B+** (from B0 to B7 maximum, according to the number of brightness levels configured).

- **Remote control mode:**

In that mode, “Auto” is highlighted. Operation of the CCR is governed by remote control inputs on the CCR’s motherboard. If remote control commands overlap, priority is given to the first choice of brightness. The remote control is either of the multiwire type (20 to 60 DC positive or negative, or 120Vac), or the dry-contact type with internal power supply, and/or given by the mean of a serial network.

ⓘ See paragraph II.2.2 for configuring the remote control type.
ⓘ See paragraph I.5.2 for adjusting brightness values and protection levels.

I.4.3 LOCAL INFORMATION FEEDBACK

Alphanumeric display:

- The display shows the RMS current flowing in the loop and the selected brightness (preferably).

In the “**Monitoring”** menu, the following information are shown:

- Uo: RMS output voltage in Vrms
- Po: RMS output power in KVA
- Ui: Mains power supply voltage in Vrms
- Ii: Mains power current in Arms
- If option “EFD” exists: Insulation resistance of the loop with respect to earth in KOhms
- Load plate tap value from 0 to 100% (0 to 8/8 by increments of 1/8)
- If option “LFD” exists: Number of burnt lamps, and VA drop if FAA type
- The operating time (powered on and for each brightness) in Hours

Warning:

WARNING is an indicative message, which does not change regulation and supply function in connection with the load. (Except for mains warning)

If any warning have been detected, the following message(s) can be shown on the display:

- If option “EFD” exists:

  "No EFD" (interface EFD board not present or faulty)

  “No HV (500V) EFD” (no injection voltage : measurement of earth leakage cannot be done)

  “R Level EFD1” (A leakage has been detected, with a resistance value lower than the level 1).

  “R Level EFD2” (A leakage has been detected, with a resistance value lower than the level 2).

- If option “Burnt lamps” exists:

  “Level 1 Burnt lamps” (The current number of burnt lamps is greater than level 1)

  “Level 2 Burnt lamps” (The current number of burnt lamps is greater than level 2)

  “Power drop” (if FAA selected : the load was cut more than 10%, in VA)

- Mains power supply outside limits (Input voltage lower or greater than +/-10%)
- Regulation outside limits (as “error regulation” programmed values)
- "BAD Interface" message (control and monitoring board not present or faulty)

Fault:

ALARM represents a major fault of the CCR or due to an external event, which have stopped the CCR (in order to protect itself or the lighting loop).

In case of fault or damage, the display shows that the CCR stopped and one or more faults have been detected. The following message(s) are shown on the display:

- Overcurrent Level 1 (after a trial to restart, the CCR cannot contain the output current which had reach the 1st level as programmed)
- Overcurrent Level 2 (ditto, for 2nd level)
- Overcurrent Level 3 (ditto, for 3rd level)
- Peak Overcurrent (ditto, for a 4th level, not configurable)
- Open circuit (the CCR detected an output current lower and during a greater time than the programmed parameters)

In order to re-start (after having fixed the fault), cancel the ALARM pressing the RESET key.

I.4.4 REMOTE INFORMATION FEEDBACK

Dry contacts:

Information returned:

- Selected brightness
- Operating mode: Local/Remote control
- “Open Circuit” fault
- “Overcurrent” fault
- If option “EFD” appears: EFD Level 1 and 2 warnings
- If option “Burnt lamps” appears: Burnt lamps level 1 and 2 warnings
- If option “Burnt lamps” and FAA type: Power drop

ⓘ See the “Remote control terminal block” connection table in the appendix.

MODBUS TCP link or Insulated RS485 link:

A JBUS table is accessible via an ethernet interface, an insulated JBUS RS422/485 link or through the USB socket (type B) in front of the CCR.
The values in the table are used to control and monitor the device remotely.

ⓘ See the JBUS table in the **Erreur ! Source du renvoi introuvable.**, for more details.

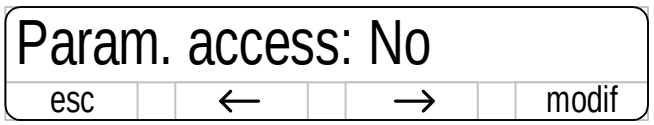
I.5 OPERATION

ⓘ **The "*Parameter Access"* function must be activated before changing parameters, in order to avoid unwanted changes.**

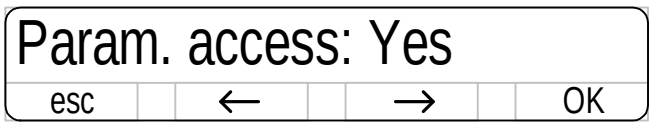
Pressing the **menu** touch, the display shows:

then scroll through the top-level menu items using the ◄ and ► keys. When the "*Options*" item is shown like:

press **OK** to go into the "*Options*" menu, then scroll through the items until the "*Param. access: NO"* item is displayed:



Press **modif** in order to modify the parameter. When the "*NO*" displayed blinks, it is possible to change the parameter : press **<** or **>** to in order to change "*NO*" to "*YES*" :



Save the modification by pressing **OK** .
Press **esc** twice to go back to the initial state.

ALL PARAMETERS ARE MODIFIED USING THE SAME PROCEDURE.

I.5.1 CONFIGURATION

The "*Configuration*" menu is used to define the basic parameters of the CCR (for example when replacing the main board):

- Rated mains voltage in Vrms: *208-220-230-240-277-380-400-415-480*
- Rated power in KVA:*1-2.5-4-5-7.5-10-15-20-25-30*
- Number of brightness (Including B0): *from 1 to 8*

I.5.2 SETTING

The "*Setting"* menu is used to assign values of current to brightness levels B0 to B7.

- Minimum value = 1 Arms
- Maximum value = 6.8 Arms

I.5.2.1 Current range:

The "Regulation Error" warning is triggered if the measured current is outside the ranges defined for each setting B0 to B7.
Each range is automatically calculated when a setting is changed (as described below) in the following way:

- Minimum value = Setting – 100mA
- Maximum value = Setting +100mA

Nevertheless it is possible to set two limits of the current range manually using the "*Current range*" menu.

I.5.3 PROTECTIONS

I.5.3.1 LV power monitoring:

Mains voltage	**Duration**	**CCR status**
Ui < 75% of rated voltage	0s	CCR stops (Power supply Warning)
Ui > 130% of rated voltage	0s	CCR stops (Power supply warning)
Ui < 85% of rated voltage	60s	CCR stops (Power supply warning)
Ui > 120% of rated voltage	60s	CCR stops (Power supply warning)
90% < Ui < 110% of rated voltage	0s	CCR automatically restarts

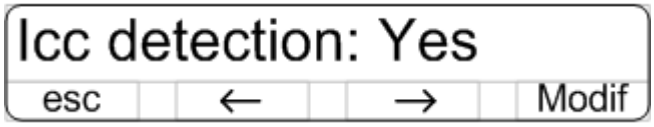
I.5.3.2 "Open circuit":

Open Circuit Protection is activated if the output current goes below a defined value (*I level OC*) for a defined period (*Duration OC).* The CCR stops instantly, and the display shows the message "*Open Circuit*".

Setting *I level OC* and *Duration OC*:
Go into the menu "*Alarms and Warnings"* then "*Open Circuit*".

I.5.3.3 "Capacitive current detection":

The standard IEC61822 Ed2 (7.5.1) note an "Open Circuit detection" with a capactive current highest than the open circuit level value (see above).This protection can be enabled or disabled in the menu *"Options"* and:



I.5.3.4 "Overcurrent":

Overcurrent protection is activated if the output current goes above a defined value for a defined period. There are three adjustable Overcurrent levels:

Setting current levels *I>> Level 1, I>> Level 2, I>> Level 3, Duration IL1, Duration IL 2, Duration IL 3 :*
Go into the menu "*Alarms and Warnings"* then "*Overcurrent*".

There is a fourth level, which is not adjustable : The fault "*Peak Overcurrent!*" occurs if the output current goes instantly above twice the nominal peak current (see IEC definition).

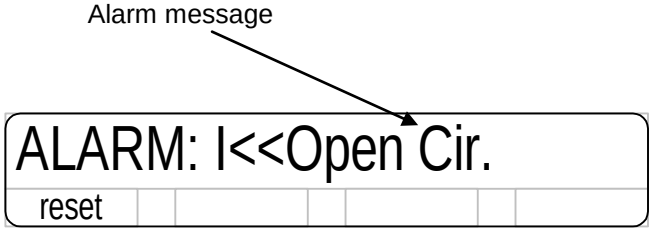
An Overcurrent fault can be automatically cancelled according to the value of the "*Restarts number*" parameter.
As each fault occurs, the number of faults is incremented. If the number of faults is greater than or equal to "*Restarts number*" in a period of less than 10s the fault is activated. The number of faults is reset to 0 after 10s without fault.
If the programmed number of restarts is reached without control of the current, the CCR stops instantly, and the display shows which level has been reached.

Setting the "*Restarts number*" parameter :
Go into the menu "*Alarms and Warnings"* then "*Overcurrent*".

I.5.3.5 Cancelling "Open circuit" and "Overcurrent" faults:

Faults are memorised during a mains power loss :

Alarm message



to cancel any faults, press **reset** , when CCR is energised in the stop mode.

I.5.4 AUTOMATIC OPERATION:

The operation of the device is programmed into the software. In local mode, the brightness selected from the keyboard is activated, in remote control mode the highest priority is given to multiwire remote control (control terminal block), then to the JBUS link or other present communication interface

When a brightness level is activated, the motherboard turns on the main contactor and controls the thyristors in order to have an output current according to the desired setting.

It continually compares the loop current measurement coming from the measuring board (which uses a HALL effect sensor) and the requested setting, and then applies the error obtained to a digital regulator which synthesises thyristor control impulses and transmits them to the thyristor interface board.

The phase control for the thyristors is therefore constantly adjusted so that the true RMS current in the loop corresponds to the required setting with an accuracy better than 100mA.

ⓘ See paragraph I.3.1 for block diagrams of the system.

I.6 ACCESSORIES

I.6.1 "ALIZE4100" SOFTWARE

The CCR is configured in factory but its parameters can be changed directly on the equipment without using any special accessories. The CCR can also be configured via a PC-type computer linked to the USB socket on the front of the device.

The free software, called "ALIZE4100", allows to :

- Configure the device and save or retrieve the parameters in a file.
- Download the CCR's own software (For updates)
- Help maintenance people in fault diagnosis (Displaying internal voltages, state of inputs/outputs, etc).
- Test and monitor the CCR, allowing to send remote orders and to see its back indication.

I.7 OPTIONS

I.7.1 CUT OUT (OPTION)

AUGIER/OCEM 's experience regarding CCRs has been used to simplify the HV compartment and maintenance operations to the maximum.

With that option, the CCR is equipped with an cut-out which allows to carry out all maintenance and measurement operations, without unscrewing any load terminal or earth connection, and without requiring any special tools.

ⓘ SEE NOTICE 6021752.

I.7.2 EARTH FAULT DETECTOR (EFD)

This option is used to measure the insulation of the load with respect to earth.

The insulation controller, or "earth fault detector" continually checks the electrical resistance between the loop and earth. It uses the principle of continuous current injection at 500V and its range of measurement is between 1 kΩ and 50 MΩ.

The insulation resistance value can be seen in the "*Monitoring*" menu
Two comparison levels (warning and alarm) are available. They are preferably set at 1MΩ and 100kΩ.

Setting the *Level EFD1 and Level EFD2* parameters:
Go into the menu "*Alarms and Warnings"* then "*Earth fault*".

Remote indication :

- Each level passed is indicated by a contact relay
- The insulation resistance value, levels and warnings are transferred to the Jbus table.

Note: this option can be used to diagnose lightning arrestor status. This possibility is fully explained during the CCR training course.

I.7.3 OUTPUT LIGHTNING ARRESTORS

This option consists of two lighting arrestors, which protect the CCR at each end of the loop. Current discharge is conducted through the CCR's main earth link, which must be of sufficient gauge.

If a particularly large current flow occurs (e.g. lightning strike directly on the loop cable), the lightning arrestor can short-circuit itself permanently, thus creating a "Earth fault". In this case, the two lightning arrestors must be replaced unconditionally.

ⓘ If the CCR is not fitted with an optional cutout device, it is mandatory to disconnect the lightning arretors in order to perform insulation measures.

I.7.4 INPUT LIGHTNING ARRESTORS

This option include two lighting arrestors on input mains, in order to protect the CCR. Current discharge is conducted through the CCR's main earth link, which must be of sufficient gauge.

The active part of the protector can be replaced, in case of failure or short circuit due to particularly high energy overvoltage.

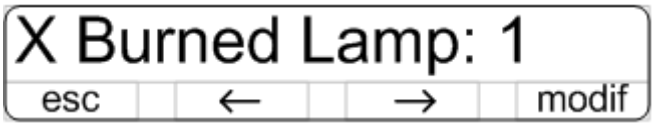
I.7.5 CASTERS

CCRs can be delivered with or without chassis casters, preferably uni-directional (other models on request)

I.7.6 BURNT LAMPS DETECTION:

This option determines the number of burnt lamps in the output load.
This is carried out by measuring the load Voltage versus Current phase shift.
Internal parameters of the data collection system must be re-initialised each time the loop is modified (addition of transformers, replacement of transformers by more powerful ones, etc) or if any settings have been changed (load adjustment, for example).

To increase the accuracy of the measurement, it is necessary to perform the calibration with **0** lamp burned (1st stage) and **minimum 3%** of lamps burned (2nd stage).
Before perform the calibration, it is necessary to set the following parameter in the menu "*Calibration*":

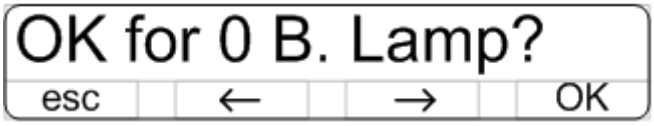


The X number must be set in function of the total number of lamps in the loop to realize the calibration (X can be set for 1 to 10 lamps).

Example: if the load loop is about 20 lamps, set the X parameter to 1 (1/20 = 5% > 3%).
Example: If the load loop is about 200 lamps, set the X parameter to 6 lamps. (6/200 = 3%).

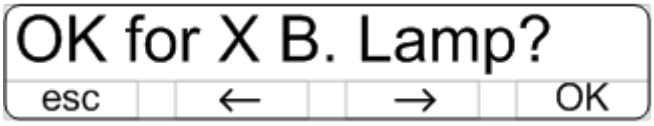
Initialisation can be carried out in two stages:

1. The loop should be connected up to the CCR with **no** burnt lamp (all lamps are working).
   Go into the "*Calibration"* menu then:



   Press **OK** to start initialisation.
   The message " *Wait please..."* blinks, meaning that data collection is in progress.
   When the message stops flashing, data collection has been completed.

2. The loop should be connected up to the CCR with **X** lamp disconnected:
   Go into the "*Calibration"* menu then



   Press **OK** to start initialisation.
   The message " *Wait please..."* flashes meaning that data collection is in progress.
   When the message stops flashing, data collection has been completed.

The number of fault lamps can be seen in the "*Monitoring"* menu

Two comparison levels (warnings level 1 & 2) are available. They are preferably fixed at 5 and 10.

Setting *Level LFD1 and Level LFD2* parameters:
Go into the menu "*Alarms and Warnings"* then "*Burnt Lamps Fault*".

Remote back indication:

- Each level reached is indicated by a dry contact output
- The number of fault lamps, levels and warnings are transferred to the Jbus table.

To reset the stored values (for 0 and X lamp burned) during learning. Go in the menu "Calibration" then:

When press 'OK', learning is resetting and to determine the number of burnt lamps in the output load, it is necessary to realize a new learning calibration (for 0 and X lamp burned).

I.7.7 OUTPUT POWER DROP DETECTION:

Only on FAA type CCRs.

This option detect a 10 percent or greater drop in the volt-amperes being delivered to the loop.
The calibration is made in the same time as the **no** burnt lamp calibration (see above paragraph I.7.6)

Power drop indication message: "*Warning: Power Drop"*

The power drop is indicated by a dry contact output, and information set in the Jbus table

I.7.8 TIME METERS:

This option performs time measurement for :

- Running time for each brightness,
- Total working time
- CCR is powered ON
- Elapsed time : The total running time is compared to an internal value (set preferably to 1000H). When reached, back indication is sent by a dry contact output, and information set in the Jbus table.

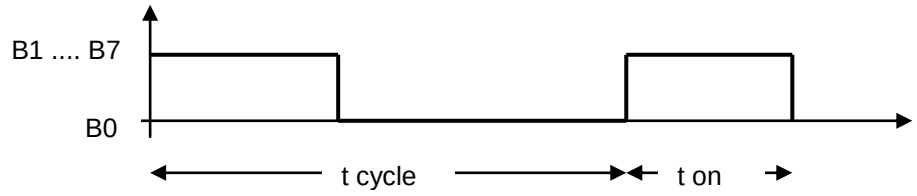
I.7.9 BUZZER

The CCR can be provided with a sound alarm: when fault occurs, the buzzer will sound. To stop the noise, it is mandatory to acknowledge the fault (by pressing RESET).

I.7.10 WIG WAG

The CCR can operate in wig wag mode (LAHSO applications), activating the option flag in the "*Option"* menu.

In the menu "*Wig Wag*", it is possible to modify the "*WigWag tcycle*" and the "*WigWag ton*".



I.7.11 OTHER OPTIONS

CCRs can also be equipped with the following options:

- Circuit breaker (instead of power fuses)
- Circuits selector (consult Augier)
- ECB (Loop communication Equipment, type STB or SCB : ask for more informations)
- Interbus-S, Lonwork or other bus for monitoring and control.
- 20 A output current – In this case, parameters in the Jbus file, or from ALIZE4000 software, are seen as standard (max. Current = 6.6A).

The following option can be designed after consultation :

- IP protection > 21
- Various supply voltage
- Various output current. For that case, parameters in the Jbus file, are seen as standard (max. read current = 6.6A).

II INSTALLATION

II.1 PREPARATION

II.1.1 EQUIPMENT RECEPTION

II.1.1.1 Equipment delivered:

The following are delivered with the CCR:

- The “Installation and Maintenance” instructions manual for the device
- A leaflet detailing possible added (non regular) options
- Factory test report for the device

II.1.1.2 Checking the equipment:

When the device is received, check that the frame and its components (in particular the electronic and LV units) are in good mechanical condition with no distortion or signs of impact.

Check also that the power transformer shows no signs of being transported in a wrong position and that its protective packaging is not damaged.

II.1.2 DEVICE LOCATION

In deciding the permanent operating location for the device, the following points must be kept in mind:

- An easy access must be kept to the front panel with no obstruction preventing the panel being opened.
- CCRs can be placed side-by-side
- Leave a gap of at least 20cm at the back of the device to allow sufficient ventilation
- Environmental conditions must be such that the temperature does not go outside the range -40°C to +55°C and that relative humidity does not exceed a maximum of 95%.
- The location must be compatible with the “IP21” protection index of the CCR.

II.1.3 CHECKING THE INSTALLATION

In checking the suitability of the electrical installation in which the CCR is to be integrated, the following points must be observed:

II.1.3.1 Single phase power supply:

This must be compatible with the electrical characteristics of the device as shown on the rating plate and factory test report.

The rated mains voltage is recorded in the software on the motherboard and is required for calculations.

The configured rated voltage can be seen in the "*Configuration*" menu, and written on the identification plate, on the front panel.

ⓘ See paragraph I.3.3 for the electrical characteristics of DIAM CCRs.

II.1.3.2 LV Protection:

The switchboard of the sub-station containing the regulators will have to include individual and lockable isolating devices, allowing the visible consignment of each regulator.

When these devices are associated to LV protection, that LV protection for each CCR must be proportioned according to the power of the CCR, the rated voltage and the type of protection already present on the CCR.

The following tables are given for information only, for cable lengths between fuse boxes and CCRs of less than 30m (Circuit breaker examples : MG references)

	208V Power Supply		220 to 240V Power Supply	
Power	**LV cable gauge**	**LV circuit breaker**	**LV cable gauge**	**LV circuit breaker**
2,5 kVA	6 mm²	IC60N 32A D	6 mm²	IC60N 25A D
4 kVA	10 mm²	IC60N 50A D	10 mm²	IC60N 40A D
5 kVA	10 mm²	IC60N 63A D	10 mm²	IC60N 50A D
7,5 kVA	16 mm²	C120N 100A D	16 mm²	C120N 100A D
10 kVA	25 mm²	C120N 125A D	25 mm²	C120N 125A D
15 kVA	35 mm²	NSX160F TM160D	35 mm²	NSX160F TM160D
20 kVA	70 mm²	NSX250F TM250D	50 mm²	NSX250F TM200D
25 kVA	95 mm²	NSX400F TM300D	70 mm²	NSX250F TM250D
30 kVA	95 mm²	NSX400F TM300D	95 mm²	NSX400F TM300D

	277V Power Supply			
Power	**LV cable gauge**	**LV circuit breaker**		
2,5 kVA	6 mm²	IC60N 25A D		
4 kVA	6 mm²	IC60N 32A D		
5 kVA	10 mm²	IC60N 40A D		
7,5 kVA	16 mm²	IC60N 63A D		
10 kVA	16 mm²	C120N 100A D		
15 kVA	25 mm²	C120N 125A D		
20 kVA	35 mm²	NSX160F TM160D		
25 kVA	50 mm²	NSX250F TM200D		
30 kVA	70 mm²	NSX250F TM250D		

	380 to 415V Power Supply		480V Power Supply	
Power	**LV cable gauge**	**LV circuit breaker**	**LV cable gauge**	**LV circuit breaker**
2,5 kVA	4 mm²	IC60N 20A D	4 mm²	IC60N 20A D
4 kVA	6 mm²	IC60N 25A D	6 mm²	IC60N 25A D
5 kVA	6 mm²	IC60N 32A D	6 mm²	IC60N 25A D
7,5 kVA	10 mm²	IC60N 50A D	10 mm²	IC60N 40A D
10 kVA	16 mm²	IC60N 63A D	10 mm²	IC60N 50A D
15 kVA	25 mm²	C120N 125A D	16 mm²	C120N 100A D
20 kVA	25 mm²	C120N 125A D	25 mm²	C120N 125A D
25 kVA	35 mm²	NSX160F TM160D	25 mm²	C120N 125A D

II.1.3.3 Lighting loop:

Check that the installed power corresponds to the power of the CCR, check the continuity of the loop and the number of lamps blown.

The rated output power is recorded in the software on the motherboard and is required for calculations.

The configured rated power can be seen in the "*Configuration*" menu

II.1.3.4 Management by remote control:

Check the remote control mode: dry contact/external voltage/serial network. For external voltage mode (multiwire interface), check that the remote control voltage is compatible with the electrical characteristics of the CCRs.

ⓘ See paragraph I.3.3 for the electrical characteristics of the DIAM CCRs.

ⓘ See paragraph **Erreur ! Source du renvoi introuvable.** in order to configure the remote control mode.

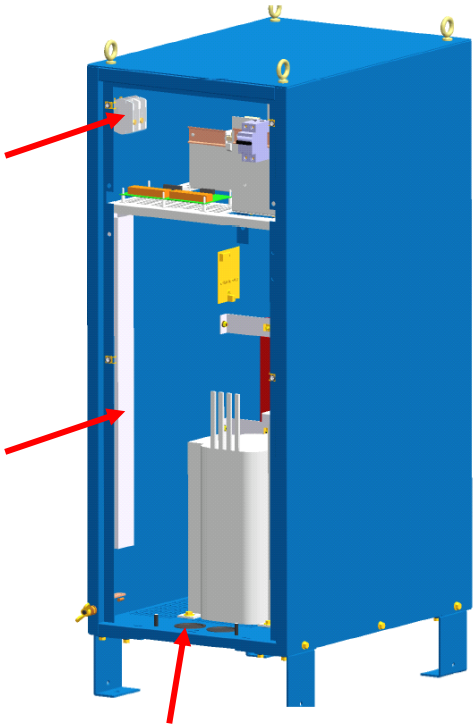
II.2 CONNECTIONS

II.2.1 POWER AND EARTH

ⓘ **N.B.:** before making any connections, make sure the installation is turned OFF.

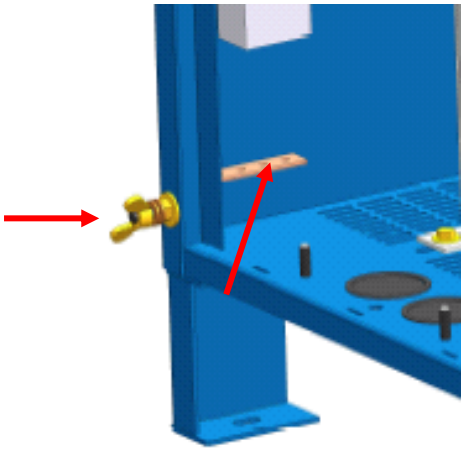
II.2.1.1 LV supply:

Connection to the mains is made at the back of the CCR, by the two cage terminals provided: the two power cables run from beneath the frame in the left duct, and have to be connected to the power supply block in the left upper part of the LV unit. Leave a loop in the power cable near the terminal to allow it to be opened.



II.2.1.2 Earthing

The Main Earth circuit must be connected to the earthing stud situated in the lower part of the frame at left (external or internal connection, at rear)



II.2.1.3 Lighting loop:

Connection is made at the front, the cables arriving through the base, from beneath the device:

- Connect the two load cables to the “HV1” and “HV2” terminals on the load plate (or on the Cut out plate, if the option is present) by crimping the lugs (φ 8mm) onto the core of the cable (or onto the two terminals of the FAA isolating switch if this option installed).

WARNING :
For all brass screws and bolts of that load plate ,
A TIGHTENING TORQUE RANGING BETWEEN 6.5 and 7 Nm MUST BE RESPECTED

- Connect the cable screens (strap or braided) to the CCR ground after having crimped a lug (φ 6mm).

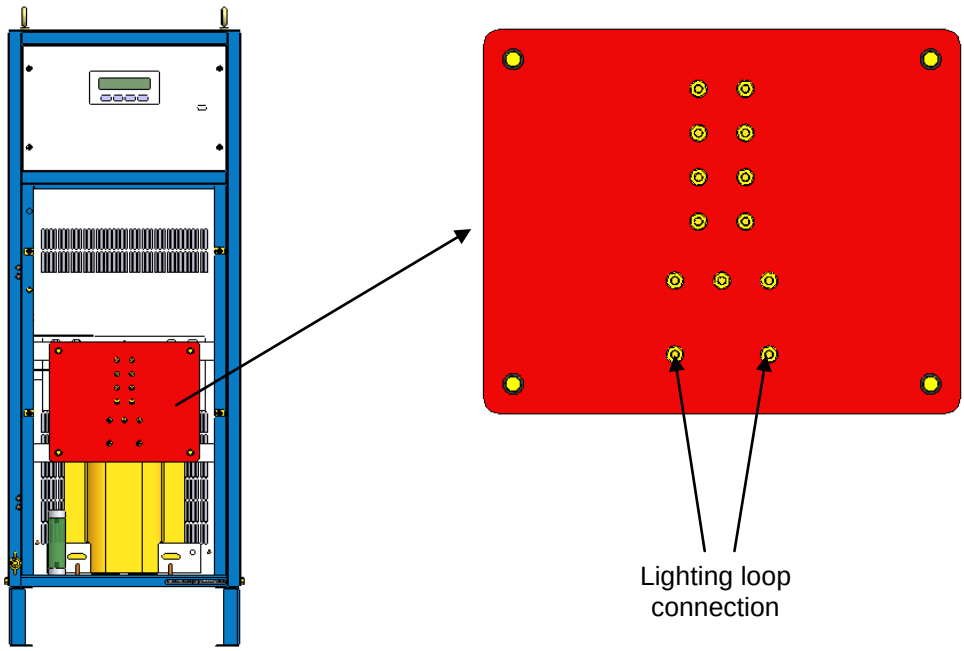
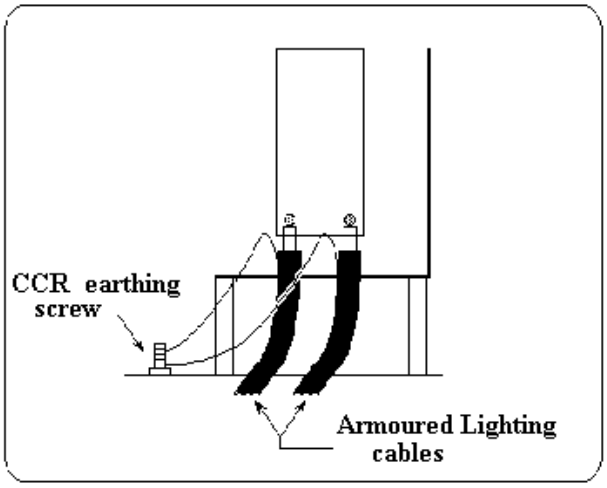
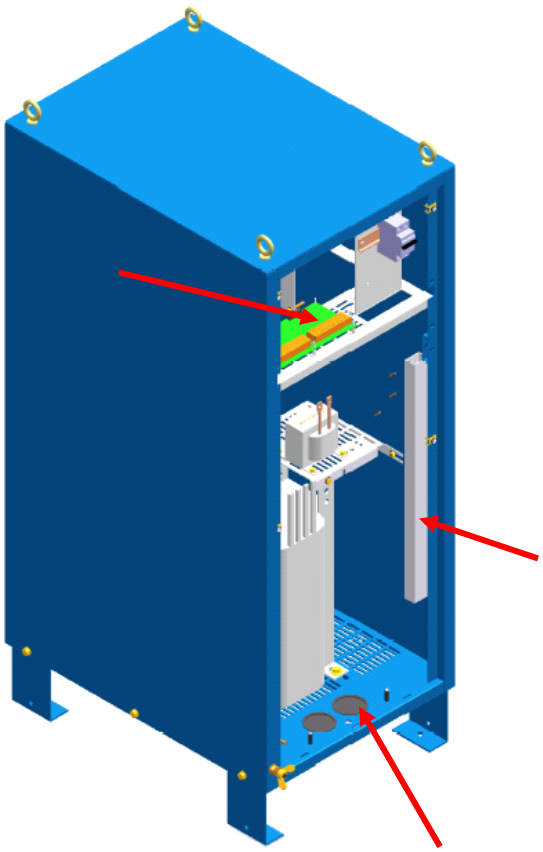


Diagram: load connection



II.2.2 REMOTE CONTROL CONNECTIONS

Connections to the control system is made at the back of the CCR, on terminal bloc provided on the interface board (FAA or IEC type). If the cable is screened, connect the shield only on 1 side, to the frame or at controller's ground terminal.
The control cables run from beneath the frame in the right duct, and have to be connected to interface board laid on the LV unit.



ⓘ FOR ALL REMOTE INFORMATION, SEE NOTICE 6021732.

II.2.3 CIRCUIT SELECTOR:

External CS :

The DIAM CCR has two electrical interlock terminals, **terminal S1 and S2** , located near the two power supply terminals, which must be connected to the door contact and circuit selector interlock.

When the CCR is used with a circuit selector, it must be stopped about 100ms before the circuit is selected. This is automatically done by the selector itself (Augier) by connecting terminals S1 & S2 to the selector interlock mechanism, or by remote control.

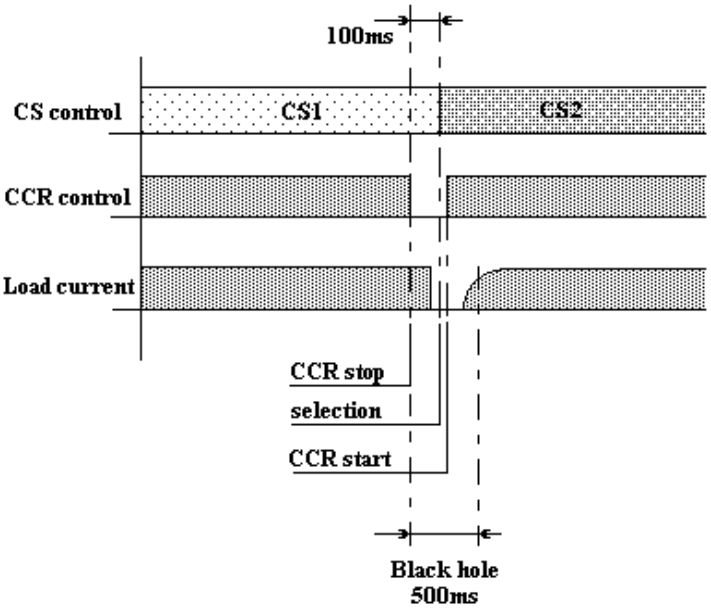
Corresponding cables must be placed in the same duct (at left) than power supply cables

Operation without selectors:
The two terminals S1 & S2 must be short-circuited, (Strap wired at delivery) in order to work without CS contact.

Operation with selectors:
The good practice, to select or un-select a way, is to do it at null current. Thus, no overcurrent can appear and lamps remain protected. At the contrary, an instantaneous short circuit (total or partial) of the load will create an instantaneous overcurrent proportional to the load reduction, during the regulation time. These repeated overcurrents cause a reduction of the lifespan of lamps. So, when used with a circuit selector, the regulator must be stopped 100ms approximately before changing a circuit.
That can be carried out by the selector itself (Augier selector) by cabling terminals S1 and S2 with interlock terminals of the selector, or by the monitoring system.

While S1/S2 are connected, the CCR shall be stopped if the selector box is opened, giving access to the H V load connections.

Chronogram of operation :



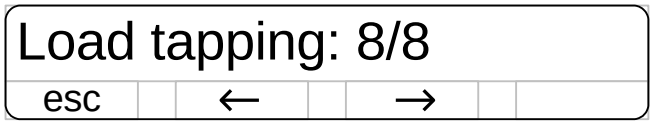
II.3 ADJUSTING THE CCR

II.3.1 LOAD PLATE

The main function of the load adaptation plate is to adjust the power of the CCR to the installed power of the lighting loop..

The load plate can be accessed from the front of the device. Opening the panel forces the CCR to stop by the mean of door contact.

The value of the present tap of the load adaptation plate can be seen in the menu "*Monitoring*" then "*Load tapping*":



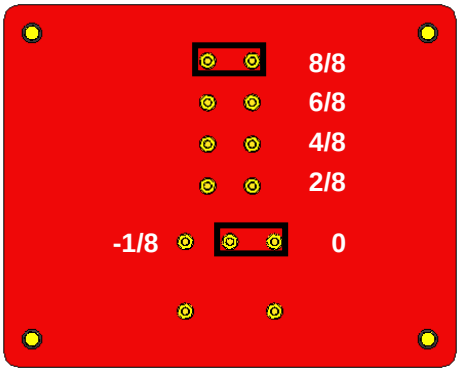
II.3.1.1 Adaptation to load:

The transformer comprises output connections which allow 8 settings from 12.5% (1/8 load) to 100% (8/8). Two brass straps are used for this.

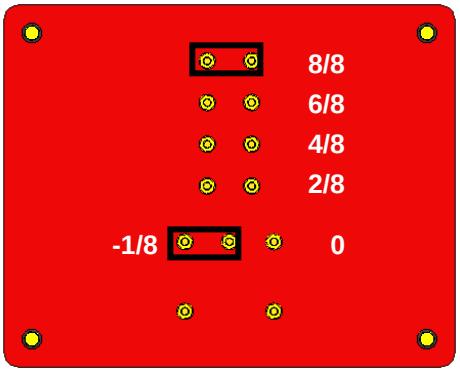
- One strap carries out adjustments in steps of 25% (100%,75%,50%,25%)
- The other carries out a supplementary adjustment of 0 or –12.5%, which is added to the preceding value.

Examples :

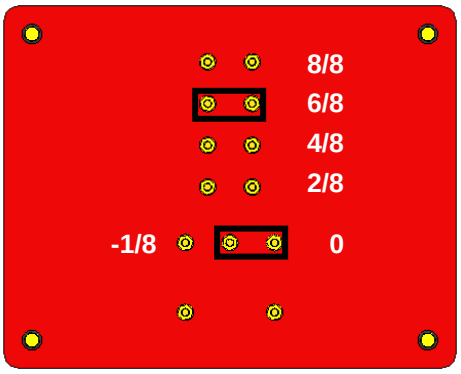
100% Load tapping: 8/8



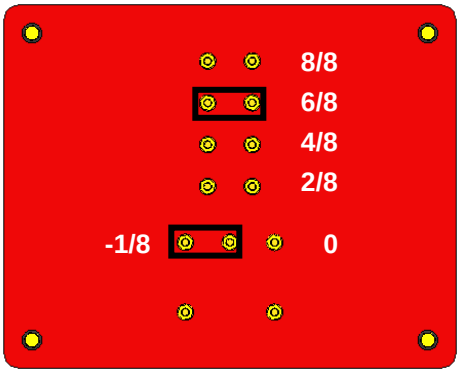
87.5% Load tapping: 7/8



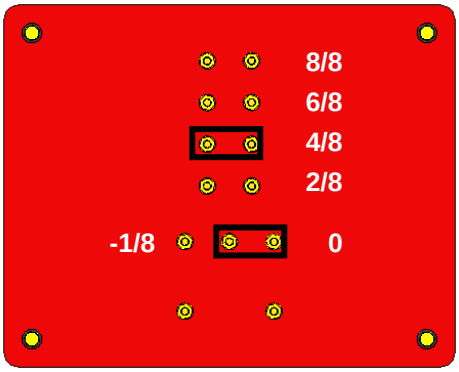
75% Load tapping: 6/8



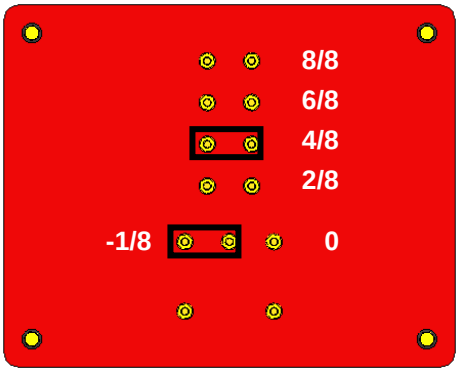
62.5% Load tapping: 5/8



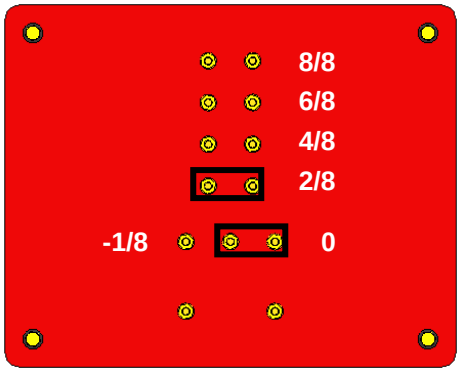
50% Load tapping: 4/8



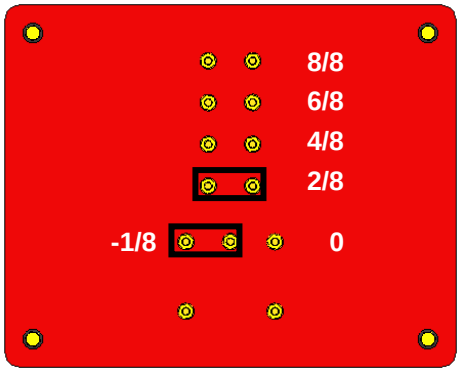
37.5% Load tapping: 3/8



25% Load tapping: 2/8



12.5% Load tapping: 1/8

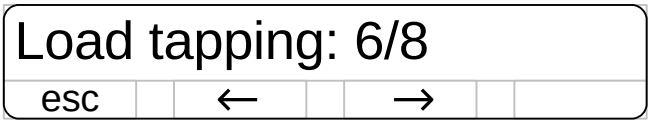


II.3.1.2 Automatic load plate position computation:

An input current transformer (TC, see: appendix a: diagrams) is added in the primary power supply to compute automaticaly the position of the load plate when it changes. With this option, it is not necessary to set the load plate value each time the load plate value changes.

You can see the load plate value in the menu "Monitoring"

At the item "Load tapping"



Adjusting the CCR output power to that installed, using the load plate : This can be done by moving the load setting straps between 1/8 and 8/8. For example, if the load is equivalent to 60% of the rated power of the CCR, the setting is to the nearest value above, i.e. 5/8 = 62.5%. Before any change, memorise the present value as showed in Par. 1.6.1

If the load power is not known, set the load plate straps to 8/8.

WARNING :
For all brass screws and bolts of that load plate ,
A TIGHTENING TORQUE RANGING BETWEEN 6.5 and 7 Nm MUST BE RESPECTED

ⓘ See paragraph II.3.1 for a description of the load plate

II.3.1.3 Maximum output power available for each power settings:

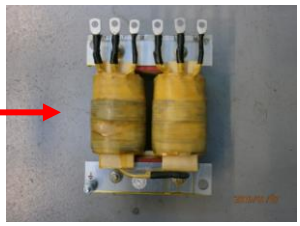
The maximum power levels (in Kva, or in KW on a resistive load) allowed for each power setting, according to the rated power of the CCR are as follows:

Rated power	***Charge adaptation setting***							
	1/8	**2/8**	**3/8**	**4/8**	**5/8**	**6/8**	**7/8**	**8/8**
2.5 kVA	< 0.32	< 0.63	< 0.94	< 1.25	< 1.57	< 1.88	< 2.19	< 2.50
5 kVA	< 0.63	< 1.25	< 1.88	< 2.50	< 3.13	< 3.75	< 4.38	< 5.00
7.5 kVA	< 0.94	< 1.87	< 2.81	< 3.75	< 4.69	< 5.63	< 6.56	< 7.50
10 kVA	< 1.25	< 2.50	< 3.75	< 5.00	< 6.25	< 7.50	< 8.75	< 10.0
15 kVA	< 1.88	< 3.75	< 5.63	< 7.50	< 9.38	< 11.3	< 13.2	< 15.0
20 kVA	< 2.50	< 5.00	< 7.50	< 10.0	< 12.5	< 15.0	< 17.5	< 20.0
25 kVA	< 3.13	< 6.25	< 9.38	< 12.5	< 15.7	< 18.8	< 21.9	< 25.0
30 kVA	< 3.75	< 7.50	< 11.3	< 15.0	< 18.8	< 22.5	< 26.3	< 30.0

II.3.2 MULTI TERMINAL INDUCTANCE

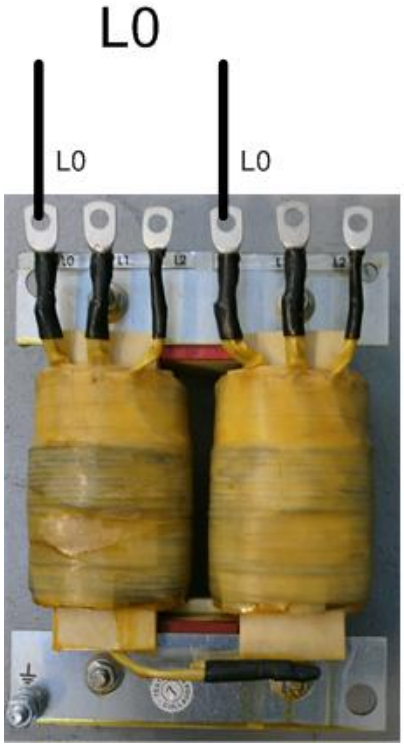
An inductance is in the CCR to filter the input current. Position in the CCR:

Multi terminal inductance

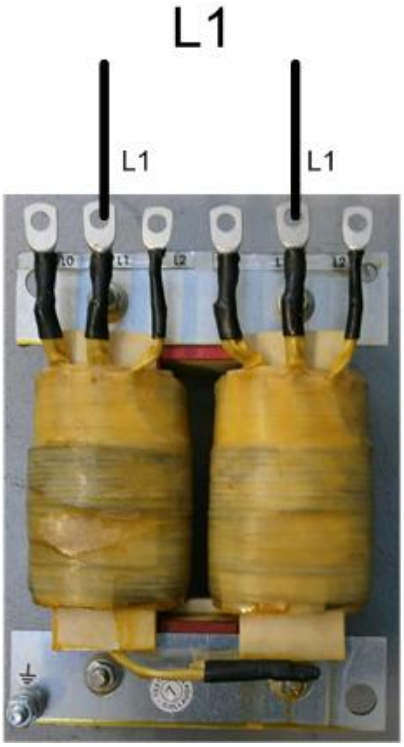


The inductance has 3 values available (L0, L1 and L2). L0 (the lower value) is selected by default. Depending of the loop load, the output current can be unstable.
It can be necessary to increase the inductance value.
It is possible to select L1 or L2 inductance moving the cables connections according to the following drawing:

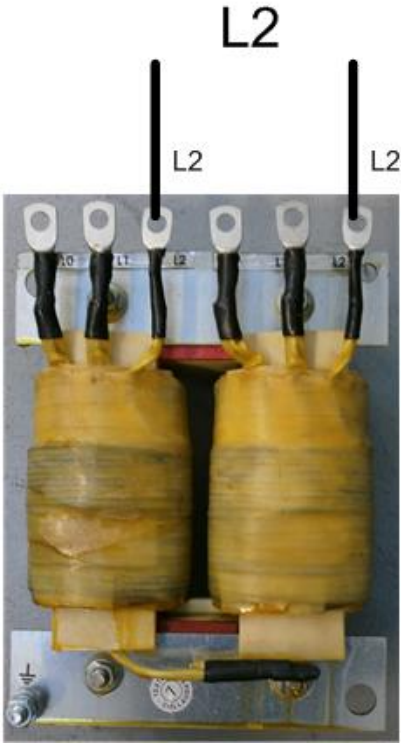
LOW VALUE (defaultvalue)



MEDIUM VALUE



HIGH VALUE



This inductance is connected to live parts, power down supply on the CCR before moving connections!

II.3.3 PARAMETER MODIFICATION

Preferably, and according to the CCR, the parameters are **pre-set in the factory as ordered**, so it is not necessary to reconfigure them during device installation and commissioning.

II.3.3.1 Preferred configuration values:

The preferred configuration (if no precision on orders, or in case of new mother board) is as follow :

- Setting

I B0 = 1.50 A
I B1 = 2.80 A
I B2 = 3.40 A
I B3 = 4.10 A
I B4 = 5.20 A
I B5 = 6.60 A

Brightness number = 6
Maxi current = Setting value + 100mA
Mini current = Setting value - 100mA

- Protection

Earth fault level 1 = 1MΩ (if option present)
Earth fault level 2 = 100KΩ (if option present)

Restarts number = 1

Over-current level 1 = 6.80 A (+ 3%)
Disable time = 2.50 s

Over-current level 2 = 6.93 A (+ 5%)
Disable time = 1s

Over-current level 3 = 8.25A (+ 25%)
Disable time = 200 ms

Open circuit current = 1.00A
Disable time = 600 ms

- Burnt lamps

Burnt lamps level 1 = 5 (if option present)
Burnt lamps level 2 = 10 (if option present)

Calibration cancelled.

- Wig wag

Cycle time = 2.5s
On time = 1.7s

- USB link

Slave Id = 1
Baud Rate = 38400

- Jbus RS485 link

Slave Id = 1
Baud Rate = 9600

II.3.3.2 Brightness values:

See paragraph I.5.2

ⓘ If the CCR does not supply the desired current, either it is in overload or the load contains transformers with open secondaries (missing or burnt lamps)

II.3.3.3 Value of “Open Circuit” protection level:

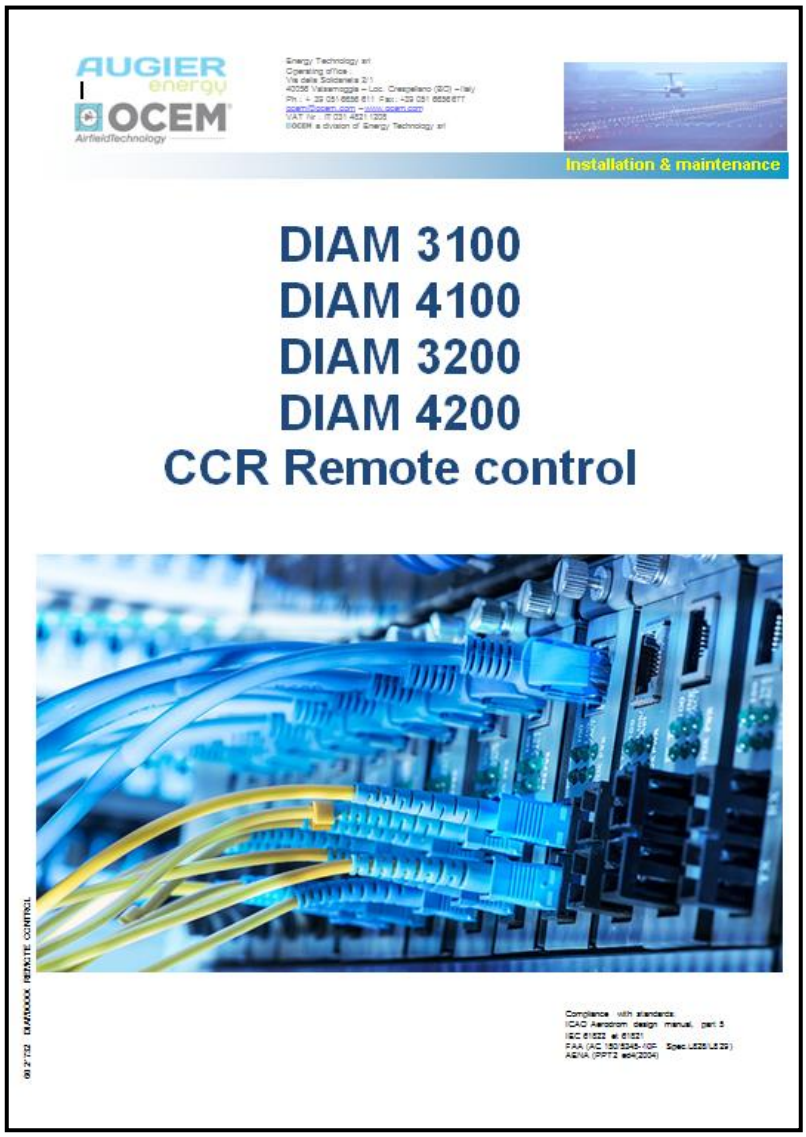
See paragraph I.5.3.2

II.3.3.4 Value of “Overcurrent” protection levels:

See paragraph I.5.3.4

II.4 REMOTE CONTROL

ⓘ FOR ALL REMOTE INFORMATION, SEE NOTICE 6021732.



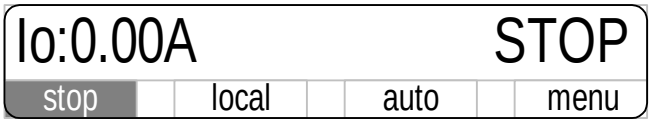
III COMMISSIONING

After that all installation operations defined in the previous section have been completed, the DIAM4100 CCR can be commissioned.

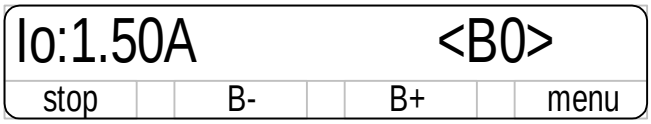
III.1 PROCEDURE

1. Close the fuse box master switches, or the main circuit breaker
2. Be sure that the jumpers of the Cut-out plate (if option) are in Vertical position (“Loop”)
3. Close the front panel of the DIAM4100
4. Connect the installation to the power

ⓘ The display lights up:



5. Press **local** button, the display seems to:



ⓘ The CCR starts up and the output current is displayed on the front panel.

6. Progressively increase the brightness levels using the selection buttons while systematically checking the current value shown by the numeric display, maximum brightness being fixed at 6.6A.
7. Decrease the brightness levels again, then stop the CCR by pressing **stop** button

ⓘ If the CCR does not supply the desired current, see paragraph IV.4.2

8. Check operation of the CCR in remote control mode. (Press **auto** button)

III.2 TESTS

III.2.1 SHORT-CIRCUIT TESTS

ⓘ **DO NOT** carry out this test if there is any doubt about the operation of the CCR, or if there is a fault or breakdown.

1. Switch off the CCR from the power.
2. Completely disconnect the lighting loop. (or use the Horizontal position of the Cut-out plate, **without disconnection**)
3. Short circuit terminals “HV1” and “HV2” on the load plate, (or use the Horizontal position of the Cut-out plate, as above)
4. Connect the CCR to the power.
5. Put the CCR in “Local” mode.

ⓘ The CCR starts up and the output current is displayed on the front panel.

6. Progressively increase the brightness levels using the selection buttons while systematically checking the current value shown by the numeric display, maximum brightness being fixed at 6.6A.
7. Decrease the brightness levels again then stop the CCR.
8. Disconnect from the power, connect the Lighting loop (or replace the jumpers of the Cut-out option), and eventually re-adjust the load tapping.

ⓘ If there is any problem (e.g. tripping out, Overcurrent), do not repeat the tests: check the connections again (ground, circuit board terminals, etc) and check the state of the thyristors before starting up again.

III.2.2 OVERLOAD TESTS

This test can be carried out as part of a breakdown investigation, to allow a device already in service to be put back into operation without knowing its state, and without damages for the lighting loop.

Move the two brass straps of the load plate so that the maximum power of the CCR is much less than the loop power. This ensures that, even for a direct short-circuit of the thyristors (or equivalent: “full wave” voltage on the load terminals, boards non-operational, etc) the current delivered by the equipment will always be less than 6.6A.

For example:
10kVA CCR with a load of 8kVA; optimum load adaptation is 7/8. To place it in overload state and test the device, put them in position 5/8. On start-up, the correct adjustment of the first brightness levels can be ascertained (up to a current of about 5A), but in case of failure, the device cannot deliver more than about 5A in this position. For example If the thyristors are faulty (short-circuit), the CCR will deliver 5A as soon as it is started up whatever the brightness setting (no danger of Overcurrent into the lamps), which will show up a fault in regulation, control or the thyristors.

ⓘ See load adaptation table, paragraph **Erreur ! Source du renvoi introuvable.**

III.2.3 OPEN-CIRCUIT TEST

Physically disconnect the loop (or remove jumpers of the Cut-out option) and start the CCR: the device should stop after about 0.3s (running time) with the fault indication.

IV MAINTENANCE

IV.1 FORMALISATION

To follow maintenance procedures correctly, the following points must be observed:

- Create a maintenance file containing the headings “Date”, “Time”, “Maintenance Engineer”, “CCR reference”, “Problem definition”, “Solution applied”, and “Time spent”
- The spare parts monitoring sheet (with their control numbers) should be completed if necessary.
- An overall maintenance operation book or folder for each maintenance post will be kept up to date with these sheets. It will gather together, in particular, all the device test reports and references to the initial states of the devices.
- A regular examination of these different documents will allow the status of the system to be monitored, facilitate management of spare part batches and improve, if necessary, maintenance procedures.

IV.2 PROCEDURE FOR INTERVENTION

Before any intervention on a regulator :

- Carry out the isolation of the CCR by consigning its power supply. The isolating device shall be locked and located.
- Check on the CCR the absence of supply voltage.
- Proceed to grounding and short-circuiting the parts normally under voltage, in order to discharge the residual capacitors.

Before any intervention on the load loop of load or on a HV part of a regulator :

- Achieve the consignment as considered previously
- Short-circuit and ground the HV loop or HV terminals, by using the devices present on the CCR (Option cut-out switch with jumpers, rotary or of FAA type), or using external cables, in order to discharge the residual capacitors.

IV.3 PREVENTIVE

IV.3.1 FIRST MONTHS

In the first months of use, check the tightness of terminals and connections, particularly for HV or LV power circuits :

- Input terminals, fuse-holders or circuit breaker, contactor
- Output terminals, brass straps on the load plate, all screwed connections at the back of the load plate.

IV.3.2 ANNUAL PROCEDURE

- Remove dust from the bottoms of the casings to avoid accumulation, which could prevent proper cooling.
- Remove dust from the electronic circuit boards and LV rack elements.
- Check the tightness of power connections (Lighting loop, Power, Earth)
- Check operative functions, in local and remote control.

IV.3.3 EVERY THREE YEARS

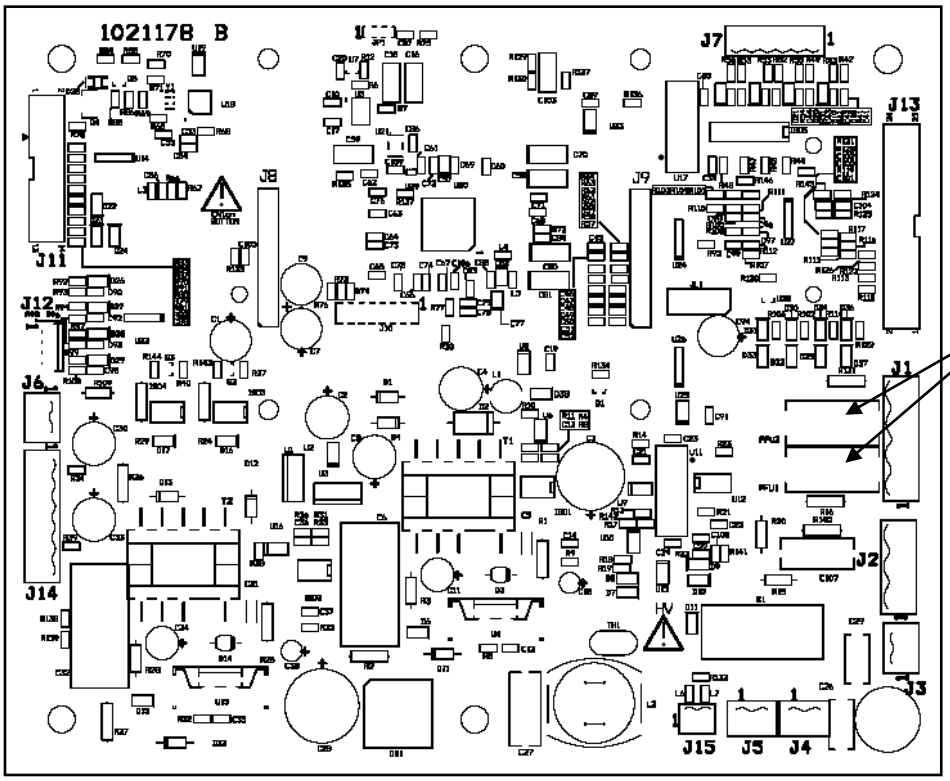
The frequency with which these operations are carried out will depend on the usage of the CCR:

- Start by a general visual inspection
- Check internal connections (tightness of screws and terminals),
- Check the correct correspondence between: current setting, displayed value, measured value (use an insulated true RMS ammeter and clamp of sufficient accuracy)

  In case of discordance, a calibration of the CCR can be carried out.

IV.4 CORRECTIVE

Motherboard fuses



IV.4.1 FAULT DIAGNOSIS

ⓘ See paragraph I.5.3 for a description of the following protections.

IV.4.1.1 LV power fault:

Symptom	Fault	Action
The CCR has stopped The message: "*ALARM : Bad supply*" is displayed	LV power fault	Check the voltage level of the LV power supply Check parameter settings in the "*Configuration*" menu

IV.4.1.2 "Open Circuit" fault:

Symptom	Fault	Action
The CCR has stopped The message: "*ALARM: I << Open Cir*." is displayed	Lighting loop open	Measure the continuity of the loop (on the transformer primaries and secondaries)
	Output current < 1.0A for more than 500 ms	Measure the output current value
		Large load increase on the loop caused by circuit switching
	SCR control cables disconnected or faulty	Check the state of the cables connection between the regulation board and the thyristor control boards
	Measuring board to motherboard link faulty	Check state of the ribbon cable between measuring board and motherboard
	Thyristor trigger-gates faulty	Measure the state of the thyristors
	Protection detection level setting on motherboard	Check setting of the level in the menu "*Alarms and warnings*" then "*Open circuit*"
	Thyristors faulty in open circuit	Measure the state of the thyristors

IV.4.1.3 "Overcurrent" fault:

Symptom	Fault	Action
The CCR has stopped The message: "*ALARM : I >> Level 1, 2 or 3"* or "*ALARM : I >> Peak value*" is displayed	Output current > programmed level	Large load decrease on the loop caused by circuit switching
	Overload combined with load decrease by switching	Check the adaptation of the load plate to the loop power Check the number of ITs open due to missing or fault lamps
	Faulty Thyristors in short-circuit	Measure the state of the thyristors Test in overload
	SCR control cables disconnected or faulty	Check the state of the cables connection between the regulation board and the thyristor control boards
	Levels too low	Check levels in the menu "*Alarms and Warnings"* then "*Overcurrent*".

IV.4.2 OTHER FAULTS

Symptom	Fault	Action
Output current insufficient with load plate set to a position less than 8/8 The message *"Warning: Regulation error"* is displayed	Overload	Check the adaptation of the load plate to the loop power
	Large number of ITs open	Check the number of ITs open due to missing or fault lamps
	CCR power insufficient	Check that the installed power is not greater than the power of the CCR
Display remains off when CCR is connected to the power	CCR LV protection faulty	Check LV fuses
	Motherboard protection faulty	Check state of fuses F1 and F2 on the motherboard (T1A)
	Motherboard faulty	Check motherboard with "Diagnostic" function of ALIZE software
CCR does not work in remote control mode	Remote control protection fuse faulty	Check fuse F1 (T100mA) and F2 (T500mA) on the interface board.
	Wrong configuration of remote control type	Check configuration of remote control type
	Insufficient remote control voltage	Check remote control voltage (from 20 to 60VDC? Or 120Vac)
Some brightness levels do not work in remote control mode The master switch does not close for a brightness command which causes a fault	Faulty link	Check the wiring for the remote control links
	Faulty link	Check the wiring for the remote control links
	Command photoMOS defective	Check photoMOS operation with "Diagnostic" function of ALIZE software
	Power supply fault	Check state of fuse F3 on the motherboard (T315mA)
LV power protection fuses trip during a brightness command	Thyristors faulty	Check state of the thyristors
	Thyristor control boards faulty	Replace the boards
The switch does not close	Power supply fault	Check state of fuse F4 on the motherboard (T315mA)
"WARNING : EFD level 1" *"WARNING : EFD level 2"*	None from the CCR point of view. Light intensity may be impacted.	Check primary cables status as well as primary connectors. Check warning thresholds.
"WARNING : No EFD"	No isolation measurement .	Check EFD board connexions. Replace EFD board.

Symptom	Fault	Action
"WARNING : LFD level 1" *"WARNING : LFD level 2"*	Possible output regulated current instability. Possible loss of CAT conditions.	Replace burnt lamps. Check warning thresholds. Perform function learning again.
"WARNING : Meas. lamps"	No output voltage measurement. Inconsistent measure.	Check wire position in current sensor for proper current direction, using ALIZE4100 ("graphic" display, all curves must be phased) Perform "lamp burnt" learning again.
"ALARM : BAD Interface"	No remote control	Check remote control board connexions. Replace remote control board. Check mother board.
"WARNING : BAD Freq."	CCR stops for internal protection.	Check supply network. Frequency out of range or asymmetrical wave shape.
"WARNING : TC-TS board"	No multiwire remote control	Replace relay remote control board.
"WARNING : Power Drop"	None for the CCR More than 10% output power losses.	FAA : informative warning
"WARNING : Temp. level 1" *"FAULT : Temp. level 2"*	Main transformer overheat.	AENA: Check environmental conditions.
«ALARM : BAD SUPPLY»	CCR stops or does not start	Check supply network voltage, CCR nominal voltage setting (see "configuration" menu) or input voltage measurement (see "Supervision" menu). Refer to chapter I.5.3.1

IV.5 VERIFICATION PROCEDURES

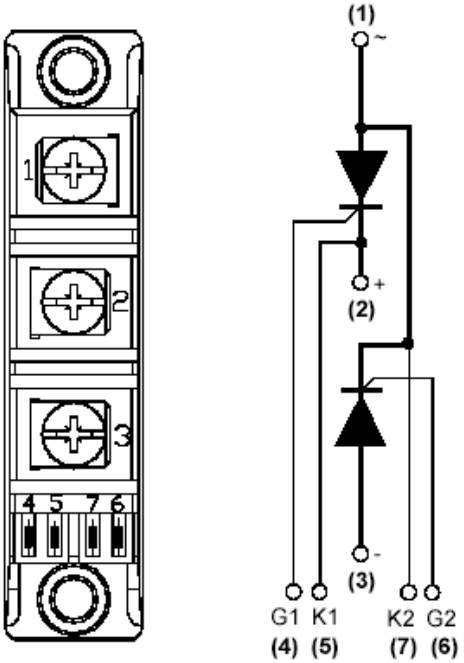
IV.5.1 THYRISTORS

The state of the thyristors can be checked as follows using an ohmmeter:

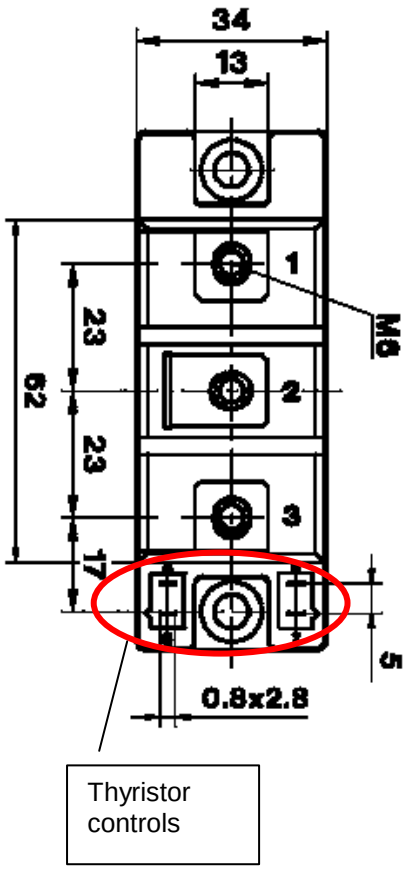
- Between **pin 1** and **pin 2**, and between **pin 3** and **pin 1** : **Several MΩ,** otherwise the Thyristors are in short-circuit
- Between **pin 4** "G1" and **pin 5** "K1", between **pin 6** "G2" and **pin 7** "K2": **A few Ω** otherwise the trigger-gates are cut

Examples:

"IRKT 91/12"



"SKKT 162/12"



IV.6 SPARE PARTS LIST FOR FAA TYPE CCR

See pages below

Designations	Mains voltage	REFERENCES								
		2,5 kVA	4 kVA	5 kVA	7,5 kVA	10 kVA	15 kVA	20 kVA	25 kVA	30 kVA
Fuses F1, F2	208V	10x38 20A gG 10.07058	14x51 32A gG 10.05894	14x51 40A gG 10.05895	14x51 50A gG 10.05896	22x58 80A gG 10.08774	22x58 100A gG 10.17588	T0 160A gG 10.17590	T1 200A gG 10.17591	T1 200A gG 10.17591
	220/240V	10x38 16A gG 10.05891	10x38 25A gG 10.17586	14x51 32A gG 10.05894	14x51 50A gG 10.05896	22x58 63A gG 10.17587	22x58 100A gG 10.17588	22x58 125A gG 10.17589	T0 160A gG 10.17590	T1 200A gG 10.17591
	277V	10x38 16A gG 10.05891	10x38 20A gG 10.07058	10x38 25A gG 10.17586	14x51 40A gG 10.05895	14x51 50A gG 10.05896	22x58 80A gG 10.08774	22x58 100A gG 10.17588	22x58 125A gG 10.17589	T0 160A gG 10.17590
	380/415V	10x38 10A gG 10.05768	10x38 16A gG 10.05891	10x38 20A gG 10.07058	14x51 32A gG 10.05894	14x51 40A gG 10.05895	22x58 63A gG 10.17587	22x58 80A gG 10.08774	22x58 100A gG 10.17588	22x58 125A gG 10.17589
	480V	10x38 10A gG 10.05768	10x38 12A gG 10.20781	10x38 16A gG 10.05891	10x38 25A gG 10.17586	14x51 32A gG 10.05894	14x51 50A gG 10.05896	22x58 63A gG 10.17587	22x58 80A gG 10.08774	22x58 100A gG 10.17588
Circuit breaker DJ	208V	C60N 20A B 10.14730	C60N 32A B 10.14727	C60N 40A B 10.14770	C60N 50A B 10.16371	C120N 80A B 10.21061	NSX100F TM100D 10.17585	NSX160F TM160D 10.16660	NSX250F TM200D 10.17476	NSX250F TM200D 10.17476
	220/240V	C60N 16A B 10.14768	C60N 25A B 10.14769	C60N 32A B 10.14727	C60N 50A B 10.16371	C60N 63A B 10.16526	NSX100F TM100D 10.17585	NSX160F TM125D 10.16659	NSX160F TM160D 10.16660	NSX250F TM200D 10.17476
	277V	C60N 16A B 10.14768	C60N 20A B 10.14730	C60N 25A B 10.14769	C60N 40A B 10.14770	C60N 50A B 10.16371	C120N 80A B 10.21061	NSX100F TM100D 10.17585	NSX160F TM125D 10.16659	NSX60F TM160D 10.16660
	380/415V	C60N 10A B 10.14729	C60N 16A B 10.14768	C60N 20A B 10.14730	C60N 32A B 10.14727	C60N 40A B 10.14770	C60N 63A B 10.16526	C120N 80A B 10.21061	NSX100F TM100D 10.17585	NSX160F TM125D 10.16659
	480V	C60N 10A B 10.14729	C60N 16A B 10.14768	C60N 16A B 10.14768	C60N 25A B 10.14769	C60N 32A B 10.14727	C60N 50A B 10.16371	C60N 63A B 10.16526	C120N 80A B 10.21061	NSX100F TM100D 10.17585
Main contactor KM	208V	A16 4000 10.17570		A45 4000 10.17574			A50 4000 10.17576	A75 4000 10.17578	EK110 4000 10.17580	
	220/240V	A9 4000 10.17568	A16 4000 10.17570	A16 4000 10.17570	A45 4000 10.17574		A50 4000 10.17576	A75 4000 10.17578		EK110 4000 10.17580
	277V		A9 4000 10.17568		A26 4000 10.17572	A45 4000 10.17574		A50 4000 10.17576	A75 4000 10.17578	
	380/415V				A16 4000 10.17570	A26 4000 10.17572	A45 4000 10.17574		A50 4000 10.17576	A75 4000 10.17578
	480V			A9 4000 10.17568	A16 4000 10.17570		A26 4000 10.17572	A45 4000 10.17574		A50 4000 10.17576
Circuit RC1	208/240V	RC B85/220 10.12018								
	277/415V									
	480V									
Circuit RC2	208V	RC5-1/250 10.17581		RC5-2/250 10.17583					RC EH 250/415 10.14793	
	220/240V	RC5-1/250 10.17581			RC5-2/250 10.17583					RCEH250/45 10.14793
	277V	RC5-1/250 10.17581				RC5-2/250 10.17583				
	380/415V	RC5-1/440 10.17582					RC5-2/440 10.17584			
	480V	RC5-1/440 10.17582						RC5-2/440 10.17584		
Inductor L		30.21681	30.21682	30.21683	30.21684	30.21685	30.21686	30.21687	30.21688	30.21689
Current transformer		10 22995								
Thyristors GR	208V	46A 1200V 10.14225			90A 1200V 10.14227			162A 1200V 10.14762		
	220/240V	46A 1200V 10.14225				90A 1200V 10.14227			162A 1200V 10.14762	
	277V	46A 1200V 10.14225					90A 1200V 10.14227			162A 1200V 10.14762
	380/415V	46A 1200V 10.14225						90A 1200V 10.14227		
	480V	46A 1200V 10.14225							90A 1200V 10.14227	

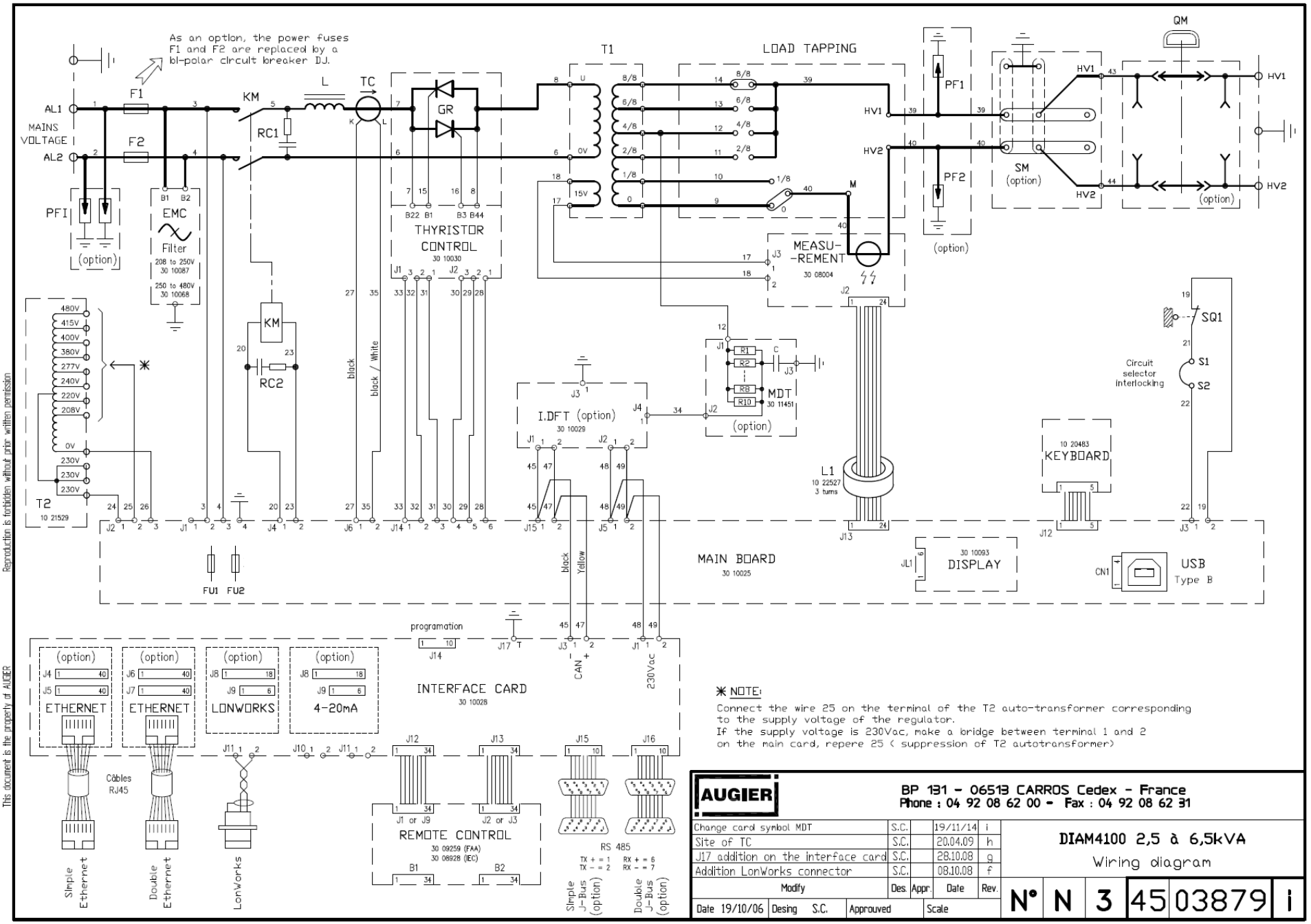
*

Designations	Mains voltage	REFERENCES								
		2,5 kVA	4 kVA	5 kVA	7,5 kVA	10 kVA	15 kVA	20 kVA	25 kVA	30 kVA
Door contact SQ1		10.08192								
Main transformer T1	208V	30.10517	30.10523	30.10529	30.09257	30.09258	30.09402	30.09410	30.09550	30.09422
	220V	30.10518	30.10524	30.10530	30.09433	30.09438	30.09443	30.09448	30.09551	30.09453
	230V	30.10519	30.10525	30.10531	30.09387	30.09394	30.09403	30.09411	30.09552	30.09423
	240V	30.10737	30.10740	30.10743	30.09434	30.09439	30.09444	30.09449	30.09553	30.09454
	277V	30.10738	30.10741	30.10744	30.09435	30.09440	30.09445	30.09450	30.09554	30.09455
	380V	30.10520	30.10526	30.10532	30.09436	30.09441	30.09446	30.09451	30.09555	30.09456
	400V	30.10521	30.10527	30.10533	30.09388	30.09395	30.09404	30.09412	30.09556	30.09368
	415V	30.10522	30.10528	30.10534	30.09437	30.09442	30.09447	30.09452	30.09557	30.09457
	480V	30.10739	30.10742	30.10745	30.10324	30.09100	30.09405	30.09413	30.09558	30.09424
Auxiliary transformer T2	208/480V	10.21529								
* LV Lightning arresters PFI	208/415V	DS41-400 10.19975								
	480V	DS41-480 10.20782								
* HV L. arresters PF1, PF2		CEA3 10.17854					CEA6 10.17855		CEA9 10.17856	
* EFD injection board		30.11451								
* I.DFT (EFD) board		30.10029								
EFD fuse		10 22514 (250V 100mAT 5x20)								
Thyristors board	208V	30.10030						30.10803		
	220/240V	30.10030							30.10803	
	277V	30.10030								30.10803
	380/480V	30.10030								
Mother board		30.10025								
Fuses PFU1, PFU2 (Mother board)		2 x 10 27584 (250V 3.15AT 5x20)								
Measurement board		30.08004								
Remote control		SEE NOTICE 6021732								
Display		30.10093								
Keyboard (4 keys)		10.20483								
Cut out		SEE NOTICE 6021752								
Equipped load plate		30.09347								

IV.7 SPARE PARTS LIST FOR IEC TYPE CCR

	Designations	Mains voltage	REFERENCES							
			2,5 kVA	5 kVA	7,5 kVA	10 kVA	15 kVA	20 kVA	25 kVA	30 kVA
	Fuses F1, F2	220/240V	10x38 16A gG 10.05891	14x51 32A gG 10.05894	14x51 50A gG 10.05896	22x58 63A gG 10.17587	22x58 100A gG 10.17588	22x58 125A gG 10.17589	T0 160A gG 10.17590	T1 200A gG 10.17591
		380/415V	10x38 10A gG 10.05768	10x38 20A gG 10.07058	14x51 32A gG 10.05894	14x51 40A gG 10.05895	22x58 63A gG 10.17587	22x58 80A gG 10.08774	22x58 100A gG 10.17588	22x58 125A gG 10.17589
*	Circuit breaker DJ	220/240V	C60N 16A B 10.14768	C60N 32A B 10.14727	C60N 50A B 10.16371	C60N 63A B 10.16526	NSX100F TM100D 10.17585	NSX160F TM125D 10.16659	NSX160F TM160D 10.16660	NSX250F TM200D 10.17476
		380/415V	C60N 10A B 10.14729	C60N 20A B 10.14730	C60N 32A B 10.14727	C60N 40A B 10.14770	C60N 63A B 10.16526	C120N 80A B 10.21061	NSX100F TM100D 10.17585	NSX160F TM125D 10.16659
	Contactor KM	220/240V	A9 4000 10.17568	A16 4000 10.17570	A45 4000 10.17574		A50 4000 10.17576	A75 4000 10.17578		EK1104000 10.17580
		380/415V		A16 4000 10.17570		A26 4000 10.17572	A45 4000 10.17574		A50 4000 10.17576	A75 4000 10.17578
	Circuit RC1	220/240V	RC B85/220 10.12018							
		380/415V								
	Circuit RC2	220/240V	RC5-1/250 10.17581		RC5-2/250 10.17583					Rceh250/415 10.14793
		380/415V	RC5-1/440 10.17582				RC5-2/440 10.17584			
	Inductor L	220/240V	30 13172	30 13174	30 13175	30 13176	30 13177	30 13178	30 13179	30 13180
		380/415V	30 13181	30 13183	30 13184	30 13185	30 13186	30 13187	30 13188	30 13189
	Thyristors GR	220/240V	46A 1200V 10.14225			90A 1200V 10.14227			162A 1200V 10.14762	
		380/415V	46A 1200V 10.14225					90A 1200V 10.14227		
	Door contact SQ1		10.08192							
	Main transformer T1	220V	30.10503	30.10513	30.09383	30.09390	30.09398	30.09406	30.09414	30.09418
		230V	30.10504	30.10514	30.09209	30.09210	30.09211	30.09212	30.09213	30.09214
		240V	30.10734	30.10736	30.09384	30.09391	30.09399	30.09407	30.09415	30.09419
		380V	30.10505	30.10515	30.09385	30.09392	30.09400	30.09408	30.09416	30.09420
		400V	30.10506	30.10449	30.09250	30.09251	30.09252	30.09253	30.09254	30.09255
		415V	30.10507	30.10516	30.09386	30.09393	30.09401	30.09409	30.09417	30.09421
	Auxiliary transformer T2	220/240V	10.21529							
		380/415V								
*	LV L. Arrester PFI		DS41-400 10.19975							
*	HV L. Arrester PF1, PF2		CEA3 10.17854				CEA6 10.17855		CEA9 10.17856	
*	Carte d'injection EFD		30.11451							
*	EFD board		30.10029							
	EFD fuse		10 22514 (250V 100mAT 5x20)							
	Thyristors board	220/240V	30.10030						30.10803	
		380/415V	30.10030							
	Mother board		30.10025							
	Fuses PFU1, PFU2 (Mother board)		2 x 10 27584 (250V 3.15AT 5x20)							
	Measurement board		30.08004							
	Remote control		SEE NOTICE 6021732							
	Display		30.10093							
	4 keys keypad		10.20483							
*	Cut out		SEE NOTICE 6021752							
	Equipped load plate		30.09347							
	Current transformer		10 22095							

v APPENDIX A: DIAGRAMS



✳ NOTE:
Connect the wire 25 on the terminal of the T2 auto-transformer corresponding to the supply voltage of the regulator.
If the supply voltage is 230Vac, make a bridge between terminal 1 and 2 on the main card, repere 25 (suppression of T2 autotransformer)

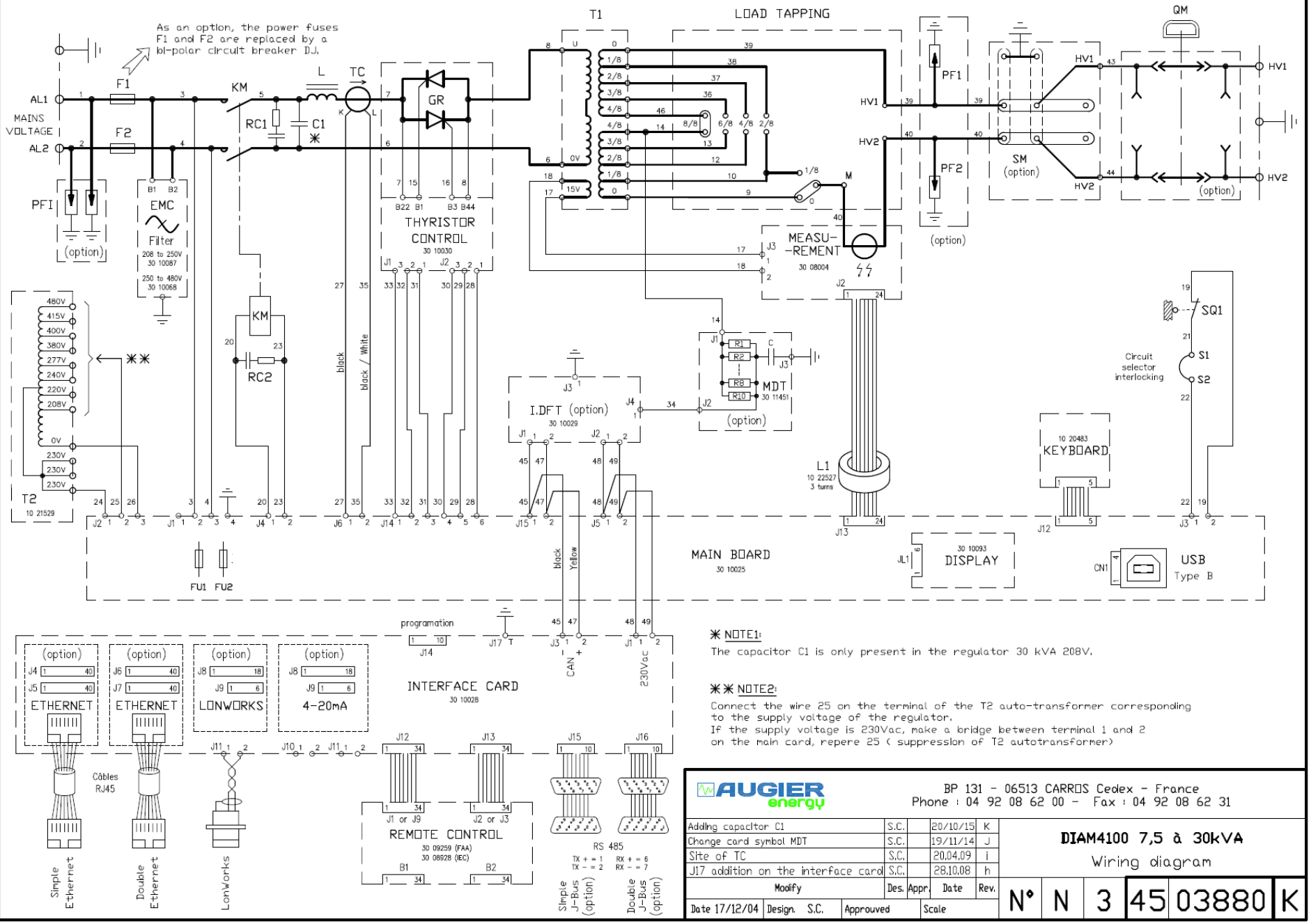
AUGIER
BP 131 - 06513 CARROS Cedex - France
Phone : 04 92 08 62 00 - Fax : 04 92 08 62 31

Change card symbol MDT	S.C.		19/11/14	i
Site of TC	S.C.		20.04.09	h
J17 addition on the interface card	S.C.		28.10.08	g
Addition LonWorks connector	S.C.		08.10.08	f
Modify	Des.	Appr.	Date	Rev.

Date 19/10/06 | Desing S.C. | Approuved | Scale

DIAM4100 2,5 à 6,5kVA
Wiring diagram

N° N 3 45 03879 i



✳ NOTE1:
The capacitor C1 is only present in the regulator 30 kVA 208V.

✳✳ NOTE2:
Connect the wire 25 on the terminal of the T2 auto-transformer corresponding to the supply voltage of the regulator.
If the supply voltage is 230Vac, make a bridge between terminal 1 and 2 on the main card, repere 25 (suppression of T2 autotransformer)

AUGIER energy
BP 131 - 06513 CARROS Cedex - France
Phone : 04 92 08 62 00 - Fax : 04 92 08 62 31

Modify	Des.	Appr.	Date	Rev.
Adding capacitor C1	S.C.		20/10/15	K
Change card symbol MDT	S.C.		19/11/14	J
Site of TC	S.C.		20.04.09	i
J17 addition on the interface card	S.C.		28.10.08	h

Date 17/12/04 | Design. S.C. | Approuved | Scale

DIAM4100 7,5 à 30kVA
Wiring diagram

N° N 3 45 03880 K

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