



G.C.R.

November 2000

Digital mains commander

Ref. A09T0 / 100 VAC

Ref. A09T1 / 230 VAC

Ref. A09T2 / 400 VAC

Technical documentation and calibration

Ref : A09T090004e-en-technical information

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1. INTRODUCTION

This microprocessor module is the fourth version of C.R.E.'s mains commander. It is used together with Barber Colman's or Woodward's isochronous load-sharing modules, generally used when one or more generating sets must be connected to the commercial power. It allows synchronization in manual or automatic mode and incoming power control for the generating sets when they are connected to the commercial power.

There are 3 different versions of the GCR depending on the power supply and measurement voltages:

- Ref A09T0 : 100VAC voltage
- Ref A09T1 : 230VAC voltage
- Ref A09T2 : 400VAC voltage

The different functions of the module are:

- Adjustable min/max power level to protect the generating sets against reverse power, overload and underload.
- Power level ramp for gradual power transfer from the mains to the generating sets and vice-versa, with the following characteristics :
 - * Adjustable from 0 to 30mn (30ms precision).
 - * Linear on all the range with immediat start up whatever the generating sets or commercial power.
 - * Constant transfer time whatever the power to transfer (10s for 100KW = 10s for 1000KW).
- Adjustable forward commercial power level, with hysteresis, which activates an isolated relay at a defined power to, for example, open/close the commercial power breaker.
- Adjustable limit for reverse power level which activates an isolated relay.
- Analog output for a wattmeter indicating the positive/negative commercial power (± 5 VDC or ± 1 mA).
- Synchronising of the generating sets with the commercial power, in automatic (PI function) or manual mode, either using a synchronisation dedicated bus (same results for synchronisation between sets) or using parallel lines. When synchronising a set with several mains, the load transfer is performed gradually mains after mains, when transferring from mains to set or from set to mains.
- Commercial power and generating sets power measurement by 2 ± 20 mA inputs.
- Digital PID regulation (Proportional Integral and Derivative) for the constant commercial power operation (system 2). The 3 parameters are adjustable separately. The commercial power set point can be positive (imported power) or negative (exported power).
- RS485 serial port (2 or 4 wires) allowing :
 - * The configuration and calibration of the module by a PC (CRE's own protocol).
 - * The consultation by MODBUS or JBUS RTU protocol, of all the inputs/outputs and internal parameters of the GCR.
- Complete calibration of the GCR from its integrated screen and keyboard.
- LED signals for the following informations:
 - * GPR in manual synchronisation mode, contact 27 closed (LED MANU lighted)
 - * Generators paralleled with commercial power, contact 20 closed (LED COUPLE lighted)
 - * GPR in system 2 mode, contact 22 closed (LED SYST2 lighted)
 - * GPR power ramp closed, contact 21 closed (LED RAMPE lighted)
 - * Low limit reached (LED LB lighted)
 - * High limit reached (LED LH lighted)

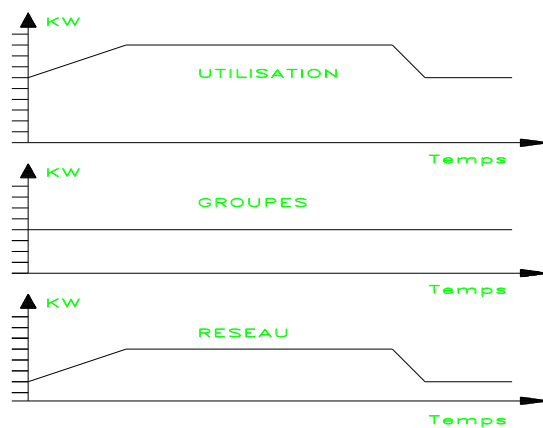
2. OPERATION

After the synchronization of the power plant to the mains, two different applications of the module are possible:

SYSTEM 1:

With this application, each generating set provides a constant power and the commercial power responds to the load changes.

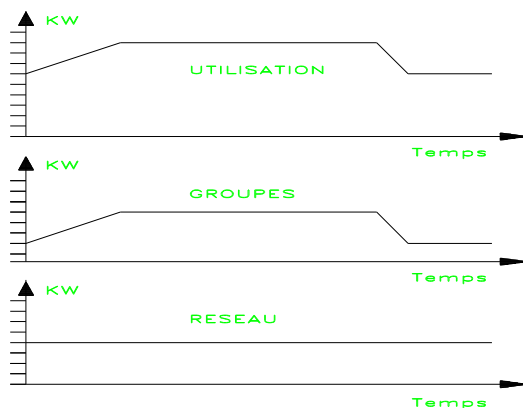
This application is obtained when terminal 22 is not connected and upon connecting a 5 KOhm potentiometer on terminals 1, 3 and 4 (refer to diagram) or from one of the 3 internal set points selected by terminals 24 and 25. This power level will never be above the high limit (overload protection), nor under the low limit (reverse power protection).



SYSTEM 2:

With this application, the commercial power (incoming or outgoing power) is measured with the current and voltage transformers $\pm 20\text{mA}$ signal (terminals 29 and 31). The commercial power supplies a constant power and the generating sets respond to changes of load within the defined low and high limits. If the limit is exceeded, it will operate in a similar way to system 1.

This application is valid when the terminal 22 is connected to the 0V reference (terminal 28). The commercial power set point comes either from an external potentiometer (5Kohms) connected on terminals 5, 7 et 8 (see wiring diagram), or from one of the 3 internal set points selected by terminals 24 and 25.



3. CALIBRATION / ADJUSTMENTS

The complete calibration/adjustment of the module does not need a dynamic operating mode (generators running) with the exception of the digital PID which has to be adjusted in control power mode. The complete calibration/adjustment of the module is achieved by a 2 lines 16 characters screen and a 6 key keyboard. All the menus can be in French or English, choice being done in the SYSTEM CONFIGURATION menu. There also exists a calibration/adjustment capability via a PC through the RS485 serial port of the module.

Remove the cover by unscrewing the 4 M3 nuts to access the adjustments.

Access code:

Input an access code before each use :

Press any key of the keyboard, the text "ACCESS CODE" is displayed.

Press the ESC key 5 times (factory access code) to access to the menus.

A modification of this code is possible by the SYSTEM CONFIGURATION menu, the access code must always have 5 characters.

If none of the keys are pressed during 30mn, the system goes back to standby mode and requires the access code.

The 6 keys of the keyboard are defined from top to bottom and left to right :

(↑) Scrolling up the menus

(↓) Scrolling down the menus

(+) Increase in value of the displayed parameter with 2 levels of acceleration.

(-) Reduction in value of the displayed parameter with 2 levels of acceleration.

(ESC) Allows to go up in the menu tree, to the menu level-1.

(↵) Enter : Allows to confirm and go down in the menu tree, to the menu level+1.

IMPORTANT NOTE : The keys work in "hold down " or "step by step" mode.

3.1. MENUS : DESCRIPTION AND STRUCTURE

RAMP ADJUSTMENT

- SYSTEM 1 RAMP UP: 00mn00s to 30mn00s
- SYSTEM 1 RAMP DOWN: 00mn00s to 30mn00s
- SYSTEM 2 RAMP UP: 00mn00s to 30mn00s
- SYSTEM 2 RAMP DOWN: 00mn00s to 30mn00s

POWER CALIBRATION

- CONVERTER POWER INPUT 1: 00000KW to 65530KW
- CONVERTER OKW INPUT 1 : 0mA to 12mA
- CONVERTER POWER INPUT 2: 00000KW to 65530KW
- CONVERTER OKW INPUT 2 : 0mA to 12mA

LOAD SETS ADJUSTMENT

- GENSETS POWER SYSTEM 1
 - SYSTEM 1 POWER SET 1: 000% to 150%
 - SYSTEM 1 POWER SET 2: 000% to 150%
 - SYSTEM 1 POWER SET 3: 000% to 150%

- COMMERCIAL POWER SYSTEM 2
 - SYSTEM 2 POWER SET 1: -65530KW to +65530KW
 - SYSTEM 2 POWER SET 2: -65530KW to +65530KW
 - SYSTEM 2 POWER SET 3: -65530KW to +65530KW
- GENSETS POWER HIGH LIMIT: 000% to 150%
- GENSETS POWER LOW LIMIT: 000% to 50%

SYSTEM 2 PID ADJUSTMENT

- PROPORTIONAL: 000% to 100%
- INTEGRAL: 000% to 100%
- DERIVATIVE: 000% to 100%
- PID ON SYST 2 RAMP: ON/OFF

POWER TRIPS ADJUSTMENT

- FORWARD POWER TRIP ON: 00000KW to 65530KW
- FORWARD POWER TRIP OFF: 00000KW to 65530KW
- REVERSE POWER TRIP: 00000KW to 65530KW

SYNCHRONISATION

- OFFSET: >/<
- GAIN: 000% to 100%
- INTEGRAL: 000% to 100%
- PHASE MATCH: 000 to 015°
- VOLTAGE MATCH: 000 to 020%
- 1 OR 2 BUS MODE
- MAXIMUM FREQUENCY DERIVATIVE : 0.00 to 2.55Hz/400ms
- MAXIMUM FREQUENCY DIFFERENCE (0.00 to 2.55Hz)
- TIME BEFORE RESYNCHRONIZING (000 to 255/4 s)

INDICATOR OUTPUT SIGNAL

- FULL SCALE: 00000KW to 65530KW
- ADJUSTMENT: >/<

SYSTEM CONFIGURATION

- ACCESS CODE CHANGE
 - NEW CODE ENTRY: *****
 - NEW CODE CHECK: *****
 - NEW CODE OK or ENTRY CODE ERROR
- LANGUAGE FRENCH/ENGLISH
- COMMUNICATION PARAMETERS
 - CRE OWN PROTOCOL/MODBUS RTU PROTOCOL
 - BAUD RATE: 4800, 9600, 19200, 38400
 - ADDRESS: 001 to 254
- GCR RESET

Setting example:

At level 0, the screen displays "LOAD SETS ADJUSTMENT"

Press the (←) key to acced to level 1, the screen displays "GENSETS POWER SYSTEM 1"

Press the (↓) key, the screen displays "COMMERCIAL POWER SYSTEM 2"

Press the (←) key to acced to level 2, the screen displays "SYSTEM 2 POWER SET 1: 00000KW"

Press the (↓), the screen displays " SYSTEM 2 POWER SET 2: 00000KW "

Press the (+) key, the SYSTEM 2 POWER SET 2 value increases

Press the (-) key, the SYSTEM 2 POWER SET 2 decreases

Press the (↵) key to validate the displayed SYSTEM 2 POWER SET 2 value

IMPORTANT NOTE : Exiting using the ESC, (↓) or (↑) does not save the modifications. To validate the inputs, pressing the (↵) key is necessary.

3.2. INITIAL OPERATIONS

- 3.2.1. Wire the module following the diagram.
- 3.2.2. Calibrate speed and voltage electronic regulators on each generating set.
- 3.2.3. Calibrate the load sharing modules and the synchronisers on each generating set.

3.3. Set mains synchronization's voltage reference (2 BUS MODE).

Perform a continuous voltage measure between terminals 13 (-) and 15 (+) on the load sharing modules (DYN2 80108 or 80109) of one of the generating sets of the plant (the load sharing modules must be powered in 24V). Set the internal GCR's P2 potentiometer (above a relay) to obtain the same voltage between GCR's terminals 28 (-) and 43 (+).

IMPORTANT NOTE : When using the "Solo load commander" associated to the load sharing modules (GPS ref. A00T6), the above setting isn't necessary, the synchronisation orders will be given in differential.

The K relay (see wiring diagram) that allows to select on the load sharing module the command from the genset or mains synchronizer must always be, by default, on generating set position and must only switch when asking for synchronisation to the mains.

IMPORTANT NOTE : If the power disappears, the K relay must always remain in "synchro set" position, otherwise, this will create a frequency fall in the plant.

3.4. 1 BUS MODE INFORMATION AND SETTING

The GCR can synchronize the generating sets with the commercial power, either by a synchronizing dedicated bus or by parallel lines (one bus mode).

IMPORTANT NOTE : The one bus mode must be used only if it is very technically difficult to wire a synchronizing dedicated bus.

The synchronization by parallel lines is internally less dynamic than on the dedicated bus. There is a problem due to this dynamic when a pulse variation of the load appear during synchronization.

To resolve this problem, the GCR stop synchronizing (Stop level can be setting in the menu:

SYNCHRONIZATION → MAXIMUM FREQUENCY DERIVATIVE), and let the speed regulator to adjust the frequency difference. When the frequency difference is under the frequency difference set (set in the menu

SYNCHRONIZATION → MAXIMUM FREQUENCY DIFFERENCE), the GCR resynchronize. In case of the commercial power isn't stable in frequency, the GPS resynchronised after a time (which can be set in the menu

SYNCHRONIZATION → TIME BEFORE RESYNCHRONIZING)

N.B. This three parameters don't have any influence when the 2 bus mode is selected.

3.5. SYSTEM 1 CONTROL AND SETTING

3.5.1. INITIAL SETTINGS :

3.5.1.1. Power level ramps : System 1's upgoing (mains to generating sets) or downgoing (generating sets to mains) power level ramps can be set separately between 0s and 30mn (pre-set at 10s) on the keyboard (refer to chap. 3.1., RAMP AJUSTMENT menu). The upgoing ramp is powered by closing the contact between 0V and terminal 21. The downgoing ramp is powered by opening this same contact.

3.5.1.2. Low limit : Allows to protect the plant against reverse power. This limit corresponds to the minimum possible outgoing correction on the load sharing bus. This limit is expressed in % (of the nominal value 3V of the load sharing bus) and can be set between 0 and 50%. This limit is systematically reached when the power level ramp contact is open (terminal 21). Pre-setting : 5% (0,15VDC).

3.5.1.3. High limit : This limit allows to protect the plant against overloads. This limit corresponds to the maximum possible outgoing correction on the load sharing bus. This limit is expressed in % (of the nominal value 3V of the load sharing bus) and can be set between 0 and 150%. This limit is reached when the value is lower than the power set point. Pre-setting : 95% (2,85VDC).

IMPORTANT NOTE : Always set the low limit lower than the high limit. The setting of these 2 limits correspond to a 6V full load calibration on TP1 TP2 of each load sharing module of the plant.

3.5.1.4. Power set points : In System 1, four different power set points are available (3 internal software set points plus external set point given by the "genset power set point" potentiometer). Each of the 3 software set points can be set between 0 and 150% of the plant power with the keyboard (refer to chap. 3.1. above, LOAD SETS ADJUSTMENT, sub-menu GENSETS POWER SYSTEM 1). The external setting varies from 0% (CCW) to 150% (CW). This potentiometer is optionnal and does not need to be connected. In this case, only the software set points are used. Software set points pre-setting : Limit 1 : 50%, Limit 2 : 80%, Limit 3 : 150%.

The 4 set points are selected by the least significant and most significant contacts on terminals 24 and 25 following this logic :

- Least significant = 0 (open contact) and most significant = 0 : external set points
- Least significant = 1 and most significant = 0 : Limit 1 power set point.
- Least significant = 0 and most significant = 1 : Limit 2 power set point.
- Least significant = 1 and most significant = 1 : Limit 3 power set point.

3.5.2. SYSTEM 1 CONTROL :

- Select the external set point (least significant = most significant = 0). Turn the external plant power set point potentiometer completely (terminals 1-3-4, CW of pot. on 4) counter-clockwise (mini position).
- Start the generating set plant and connect to the mains, in manual mode by synchronising the frequency using the 5KOhms potentiometer wired on terminals 9, 11 and 12 (CW of pot. on 12), or in automatic mode after to have closed the contact terminal 19. Automatic or manual synchronisation mode is selected on the contact of terminal 27. The correction signal for synchronisation of the generating sets to the mains varies between terminals 28 and 42. If when starting up the synchronisation, a frequency shift is noticed, it is possible to change the OFFSET in the SYNCHRONISATION menu. If synchronisation is too slow or unsettled, it is possible to change the GAIN and the INTEGRAL in the SYNCHRONISATION menu (pre-setting : 50%). The contact on terminal 20 must shut after connecting to the mains.
- The power of the sets must correspond to LOW LIMIT set point.

- Shut the Power level ramp contact on terminal 21. The outgoing power must remain at the low limit.
- Slowly turn the external generating set power setting potentiometer clockwise to increase its power. If the plant's power exceeds the installation's consumption, part of the power will be exported to the mains.
- The high limit test can be executed by turning the power set point potentiometer clockwise until no action is detected.

IMPORTANT NOTE : If the desired limit cannot be reached, check the "mechanical" limit of the generating sets.

- After testing the high limit, bring the power set point potentiometer back to the desired value.
- Open the power level ramp contact on terminal 21. The power delivered by the generating sets must lower right to the LOW LIMIT, according to the downgoing system 1 ramp time.
- Close the power level ramp contact back onto terminal 21. The power delivered by the generating sets must increase right to the set value on the external setting potentiometer "genset power set point" according to the upgoing system 1 ramp time.

IMPORTANT NOTE : The power set points expressed in % correspond to the % of the nominal power of the generating sets working on the mains.

3.6. SYSTEM 2 CONTROL AND SETTING

3.6.1. FIRST SETTINGS :

3.6.1.1. Power level ramps :

Upgoing (mains to generating sets) and downgoing (generating sets to mains) power level ramps of system 2 can be set independently between 0s and 30mn (pre-set at 10s) with the keyboard (refer to chap 3.1. above, RAMP ADJUSTMENT menu). The upgoing ramp is powered by the closing of the contact wired between 0V and terminal 21. The downgoing ramp is powered by the opening of the contact wired between 0V and terminal 21. In this mode (system 2), the power level ramps are constantly compensated (active PID) to maintain a constant transfer delay, whatever the power consumption. For special cases where perfectly linear transfers aren't possible, this compensation can be cancelled to obtain more stability. This PID ON RAMP SYST.2: ON/OFF selection is done in the SYSTEM 2 PID ADJUSTMENT 2 menu (pre-set on ACTIF).

3.6.1.2. Low limit :

This limit corresponds to the minimum possible outgoing correction on the load sharing bus. This limit is expressed in % (of the nominal value 3V of the load sharing bus) and can be set between 0 and 50%. This limit is systematically reached when the power level ramp contact is open (terminal 21). Pre-setting : 5% (0,15VDC).

3.6.1.3. High limit :

This limit corresponds to the maximum possible outgoing correction on the load sharing bus. This limit is expressed in % of the nominal value 3V of the load sharing bus) and can be set between 0 and 150%. This limit is reached when the value is lower to the power set points. Pre-setting : 95% (2,85VDC).

IMPORTANT NOTE : Always set the low limit lower than the high limit. The setting of these 2 limits corresponds to a 6V full load calibration on TP1 TP2 of each load sharing module of the plant.

3.6.1.4. Power set points : In System 2, four different power set points are available (3 internal software set points + external set point given by the "genset power set point" potentiometer). Each of the 3 software set points can be set between -65530KW and +65530KW with the keyboard (refer to LOAD SETS ADJUSTMENT menu, sub-menu COMMERCIAL POWER SYSTEM 2). The external setting varies from -65530KW (CCW) to +65530KW (CW). This potentiometer is optional and wiring-on is optional. In this case, only the software set points are used. Software set points pre-setting : Limit 1 : -1000KW, Limit 2 : 0KW, Limit 3 : 1000KW.

The 4 set points are selected by the least significant and most significant contacts on terminals 24 and 25 following this logic :

- Least significant = 0 (open contact) and most significant = 0 : external set points
- Least significant = 1 and most significant = 0 : Limit 1 power set point.
- Least significant = 0 and most significant = 1 : Limit 2 power set point.
- Least significant = 1 and most significant = 1 : Limit 3 power set point.

IMPORTANT NOTE : The settings of the power converters on input 1 and input 2 must be entered before the power set points. Otherwise, the power set points will only be validated after resetting the GCR (or power cut).

3.6.1.5. Setting of the mains power measure on input 1 (+/- 20 mA) :

The CONVERTER POWER. INPUT 1 setting in POWER CALIBRATION menu corresponds to the value of the converter (wired on terminals 29-31) at 20mA. This setting varies between 0 and 65530KW (preset at 2000KW).

In system 2, this measure of the mains power is necessary to maintain a steady set point on the mains when the generating sets are connected. This measure entry also allows to read the exported power (between -20mA and 0) and also the imported power (between 0 and +20mA). The CONVERTER 0KW INPUT 1 setting in the POWER CALIBRATION menu allows an offset for the 0KW from 1 to 12mA. The GCR can then be compatible with the 4-20mA converters (0KW to 4mA) and the 4-20mA (0KW to 12mA).

Pre-setting : 0KW = 0mA

IMPORTANT NOTE : The response delay of the power converter wired onto the GCR must be lower to 200ms. CRE proposes a three-phase desequilibrated power converter associated to the GCR. It can be set (zero and gain) and is available in 100VAC (ref A24Z0), 230VAC (ref A24Z1) et 400VAC (ref A24Z2).

3.6.2. SETTING OF POWER LIMITS AND INDICATORS :

3.6.2.1. Mains active power limit ON :

The FORWARD POWER TRIP ON setting in the POWER TRIP ADJUSTMENT menu varies between 0 and 65530KW and corresponds to the limit (upgoing) which will shut the NO contact of the relay on terminals 13 and 14.

Pre-setting : 1000KW.

3.6.2.2. Mains active power limit OFF :

The FORWARD POWER TRIP OFF setting in the POWER TRIP ADJUSTMENT menu varies between 0 and 65530KW and corresponds to the limit (downgoing) which will open the NO contact of the relay on terminals 13 and 14.

Pre-setting : 500KW.

IMPORTANT NOTE : The OFF active power limit must always be lower than the ON active power limit.

3.6.2.3. Mains power return limit :

The REVERSE POWER TRIP setting in the POWER TRIP ADJUSTMENT menu varies between 0 and 65530KW and corresponds to the power return limit that will open the NF contact of the relay on terminals 15 and 16.

Pre-setting : 500KW.

IMPORTANT NOTE : Power converter settings on input 1 and input 2 must be entered before the power limits. Otherwise, the power limits will only be validated after resetting the GCR (or power cut).

3.6.2.4. Mains kilowattmeter indicator :

The FULL SCALE setting in the INDICATOR OUTPUT SIGNAL menu varies between 0 and 65530KW and corresponds to the mains indicator's full scale value (5V or 1mA).

Pre-setting : 2000KW.

The ADJUSTMENT setting in the INDICATOR OUTPUT SIGNAL menu allows to refine the mains power indicator's output if necessary ("blind" settings with + and - keys).

When pressing "+" or "-", the display of an arrow indicates the correction direction. When the arrow is no longer displayed, the correction limit is reached.

This indicator output gives a +/-5V signal (terminals 37, 38) or +/-1mA signal (terminals 35, 37), centered around zero so that the mains exported or imported power can be displayed. If the plant's power is never exported on the mains, a 0-5V or 0-1mA indicator can be used.

3.6.3. SYSTEM 2 CONTROL :

- Select the set point using the external potentiometer (least significant=most significant=0). Turn the mains power set point external potentiometer (terminals 5-7-8, CW of pot. on 8) completely, clockwise.
- Start the generating set plant and connect it with the mains, in manual mode by synchronising the frequency using the 5KOhms potentiometer wired on terminals 9, 11 and 12 (CW of the pot. on 12), or in automatic mode after to have closed the contact terminal 19. Automatic or manual synchronisation selection is made on terminal 27.

The correction signal for the mains to generating sets synchronisation varies between terminals 28 and 42.

If when starting the synchronisation, a frequency shift is noticed, it is possible to change the OFFSET in the SYNCHRONISATION menu. If synchronisation is too slow or unstable, it is possible to change the GAIN and INTEGRAL in the SYNCHRONISATION menu (pre-setting : 50%). The contact on terminal 20 must shut after the mains connection.

- The incoming power of the sets must correspond to GENSETS POWER LOW LIMIT set point.
- Shut the Power level ramp contact on terminal 21. The outgoing power must remain at the low limit.
- Slowly turn the external mains power setting potentiometer (terminals 5, 7 and 8) clockwise. This will lower the mains set point, and the generating sets will progressively increase the delivered power as soon as the power consumed by the installation is higher than the set point.
- The high limit test can be executed by turning the power set point potentiometer clockwise until no action is detected.

IMPORTANT NOTE : If the desired limit cannot be reached, check the "mechanical" limit of the generating sets.

- Turn back the mains power set point external potentiometer (terminals 5, 7 and 8) until the desired set point is reached.
- In this mode, the sets operate in power control (permanent power correction to maintain a steady mains set point). To improve results and stability for this regulation, it is possible to set Proportional, Integral and Derivate control parameters using the keyboard (refer to SYST 2 PID ADJUSTMENT menu). These 3 parameters can be set independently between 0 and 100% and are similar to speed regulation PID settings. Pre-setting : 50% on the 3 parameters.

IMPORTANT NOTE : If despite of PID settings, a satisfying stability cannot be obtained, check that the response delay of the power converter is lower than 200ms.

- Open the power level ramp contact on terminal 21. The power delivered by the sets must lower down to the LOW LIMIT according to the system 2 downgoing ramp delay.
- Shut the power level ramp contact on terminal 21. The power delivered by the sets must increase up to the set value on the mains power level external setting potentiometer according to the system 2 upgoing ramp delay.

3.6.4. INTERFACING OF AN INSTALLATION ON SEVERAL SUCCESSIVE MAINS WITH PROGRESSIVE LOAD TRANSFER :

In this case, use power converter input 2 measure entry. The GCR must be configured in system 2, the mains power limit must be set at 0KW and the power level ramp contact (terminal 21) must be shut during all transfers, at input and output.

Setting of power converter input 2 measure (+/-20mA) :

The CONVERTER POWER INPUT 2 setting in the POWER CALIBRATION menu corresponds to the converter's value (wired on terminals 32-34) at 20 mA. This setting varies between 0 and 65530KW (pre-set at 2000KW).

The CONVERTER 0KW INPUT 2 setting in the POWER CALIBRATION menu allows a 0 to 12mA shift for the 0KW. The GCR can then be compatible with 4-20mA(0KW to 4mA) or 4-20mA (0KW to 12mA) converters.

Pre-setting : 0KW = 0mA.

IMPORTANT NOTE : The response delay of the power converter wired onto the GCR must be lower to 200ms. CRE proposes a three-phase desequilibrated power converter associated to the GCR. It can be set (zero and gain) and is available in 100VAC (ref A24Z0), 230VAC (ref A24Z1) et 400VAC (ref A24Z2).

In this application, one GCR is combined with each mains ; the measure input 1 is dedicated to the mains measure, and the measure input 2 is dedicated to the measure of the central branch combined with that mains (refer to attached diagram). The measures on inputs 1 will be used during transfers from mains to installation (terminal 26 contact open) ; measures on inputs 2 will be used during transfers from installation to mains (terminal 26 contact closed).

IMPORTANT NOTE : In the case of a classic power transfer and connection on one mains, the contact on terminal 26 must remain shut and the input 2 power measure is not used.

4. MODBUS RTU on serial port RS485

All the logical and analog input/output values, and all the other parameters that appear in the GCR menus can be obtained by the serial port RS485, terminals 44 to 48. Wiring on the serial port can be achieved using 2 or 4 wires, in point to point mode (1 master and 1 slave) or in mains mode (1 master and several slaves). If wiring with 2 wires, it is necessary to connect together terminals 44-48 and 45-47.

Support of Modbus RTU by the GCR is performed in the following field :

- Communication speed : 4800, 9600, 19200 et 38400. This setting is done in the SYSTEM CONFIGURATION, COMMUNICATION PARAMETERS menu (pre-setting : 9600).
- Number of bits by character : 8
- Number of parity bits : 0
- Number of stop bits : 1
- RTU address: 1 to 254 (addresses 0 and 255 reserved). This setting is done in the SYSTEM CONFIGURATION, COMMUNICATION PARAMETERS menu.
- Supported function : 4 (register reading).

RTU Registers:

<u>RTU Register</u>	<u>RTU Addresses</u>	<u>Returned values</u>	<u>Name</u>
PUI1	000h	-6553 to +6553	input 1 power (on 16 bits)
PUI2	001h	-6553 to +6553	input 2 power (on 16 bits)
POTR1	002h	-6553 to +6553	Mains external pot. set point when the measure is made on input 1 (on 16 bits)
POTR2	003h	-6553 to +6553	Mains external pot. set point when the measure is made on input 2 (on 16 bits)
POTG	004h	0 to 150%	Installation power pot. set point
SYM	005h	-100% to +100%	Manual synchro signal (terminal 11)
SYA	006h	-100% to +100%	Automatic synchro signal (terminal 19)
BUSW	007h	0 à 150%	Power bus signal (terminals 39-40)
Logic inputs	100h	xxxxxxxxxxxxxxxx	Bit 0 = 0 when connected to mains Bit 1 = 0 when ramp contact closed Bit 2 = Not used Bit 3 = 0 when syst. 2 (=1 for system 1) Bit 4 = 0 when least significant contact closed Bit 5 = 0 when most significant contact closed Bit 6 = 0 if measure on input 2 (=1 if input 1) Bit 7 = 0 when manual synchronisation Bit 8 to 15: Not used
Logic outputs	200h	xxxxxxxxxxxxxxxx	Bit 0 = 1 when power return active Bit 1 = 1 when active power relay closed Bit 2 = 1 when high limit reached Bit 3 = 1 when low limit reached Bit 4 = 1 if Led syst 2 switched on Bit 5 = 1 if Led Manu switched on Bit 6 = 1 if Led connected switched on Bit 7 = 1 if Led Ramp switched on Bits 8 à 15: Not used
LIMH	400h	0 to 150%	High limit
LIMB	401h	0 to 50%	Low limit
KP	402h	0 to 100%	Proportionnal gain of PID
KI	403h	0 to 100%	Integral gain of PID
KD	404h	0 to 100%	Derivate gain of PID
CPA1	405h	0 to 65530KW	Full scale converter input 1
CPA2	406h	0 to 65530KW	Full scale converter input 2

IND	407h	0 to 65530KW	Full scale indicator
PON	408h	0 to 65530KW	Active power limit ON
POFF	409h	0 to 65530KW	Active power limit OFF
RP	40Ah	0 to 65530KW	Power return limit
CG1	40Bh	0 to 150%	Installation set point N°1
CG2	40Ch	0 to 150%	Installation set point N°2
CG3	40Dh	0 to 150%	Installation set point N°3
CR1	40Eh	-6553 to +6553	Mains set point N°1
CR2	40Fh	-6553 to +6553	Mains set point N°2
CR3	410h	-6553 to +6553	Mains set point N°3
RMR	411h	0 to 1800sec	Upgoing level ramp system 2
RDR	412h	0 to 1800sec	Downgoing level ramp system 2
RMG	413h	0 to 1800sec	Upgoing level ramp system 1
RDG	414h	0 to 1800sec	Downgoing level ramp system 1
0KW1	415h	0 to 12mA	0KW convert. input 1
0KW2	416h	0 to 12mA	0KW convert. input 2
GSY	417h	0 to 100%	Synchronization gain
ISY	418h	0 to 100%	Synchronization integral
DMAX	419h	0 to 15°	Phase match
VMAX	420h	0 to 20%	Voltage match

Values do not need any conversion after request, except parameters expressed between -6553 and +6553 that are expressed in ten KW. These parameters having signs (+ or -), it isn't possible to express them between -65530 and +65530 with 2 bytes (16 bits).

All registers containing consecutive addresses can be read in one request.

There is only one 16 bit register (with some unused) for logic inputs and only one 16 bit register (with some unused) for logic outputs.

Reading example : Slave N°5, addresses from 001h to 003h included (3 registers)

Request :

Fields	Value (hex)
Slave address	05
Function	04
MSB start address	00
LSB start address	01
MSB number of registers	00
LSB number of registers	03
CRC	--

Response :

Fields	Valeur (hex)
Slave address	05
Function	04
Number of bytes	06 (3 registers * 2 bytes per register)
1st byte (MSB of 1st reg.)	xx
2nd byte (LSB of 1st reg.)	xx
3rd byte (MSB of 2nd reg.)	xx
4th byte (LSB of 2nd reg.)	xx
5th byte (MSB of 3rd reg.)	xx
6th byte (LSB of 3rd reg.)	xx
CRC	--

5. EUROPEAN CE MARK

The GCR follows the European CE Mark requirements.

So that your panel disposes of the best CEM characteristics, respect the following points :

* Equipotentiality : To guarantee a good equipotentiality between the GCR and the rest of the panel, we recommend to connect the panel's earth on the ground terminal of the GCR

* Shielding connections : To avoid any EM disturbance on the signals, we recommend to connect all wire shields following attached diagram

6. ENVIRONMENT - CHARACTERISTICS

Operating ambient temperature : 0 to +70°C.

Assembly : Can be mounted in any position.

Humidity : Tropicalised circuits for humid climat operating.

Weight/Bulk : 3,2Kg - 330 X 220 X 60 (fixing : 4 screws 314 X 150 between axes).

Alternative power supply and measurement voltages (terminals 101-102-103-104) :

- Ref A09T0 : Power supply 100VAC/9VA

- Ref A09T1 : Power supply 230VAC/9VA

- Ref A09T2 : Power supply 400VAC/9VA

Input 1 or 2 power measure (terminals 29-31 or 32-34) :

The signal wired on the circuit can be isolated or referenced to the continuous 0V. The response delay between the measure and the input signal on the GCR must be of 200ms maximum. The accepted signals are -20/+20mA (0KW=0mA), 4/20mA (0KW=4mA), 4/20mA (0KW=12mA).

IMPORTANT NOTE : CRE proposes a three-phase desequilibrated power converter associated to the GCR. It can be set (zero and gain) and is available in 100VAC (ref A24Z0), 230VAC (ref A24Z1) et 400VAC (ref A24Z2).

Mains wattmeter output signal indicator (terminals 35-37 or 37-38) :

+/-5VDC or +/-1mA centered around zero to indicate the mains imported or exported power :

- 1 KOhms minimum for +/-5VDC.

- 500 Ohms maximum for +/-1mA.

Mains active power relay contacts (terminals 13-14 Normally open) :

Intensity/Nominal voltage : 8A/250VAC.

Maximum voltage : 440 VAC.

Nominal load (ohmic load) : 2000 VA.

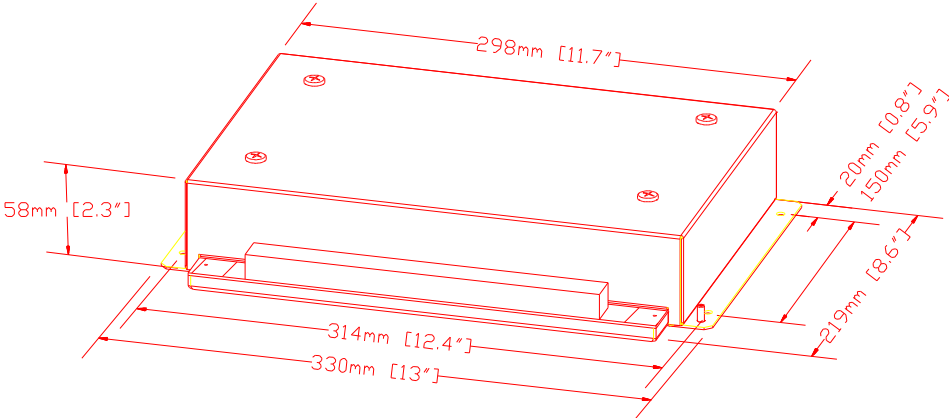
Mains power return relay contact (terminals 15-16 Normally closed) :

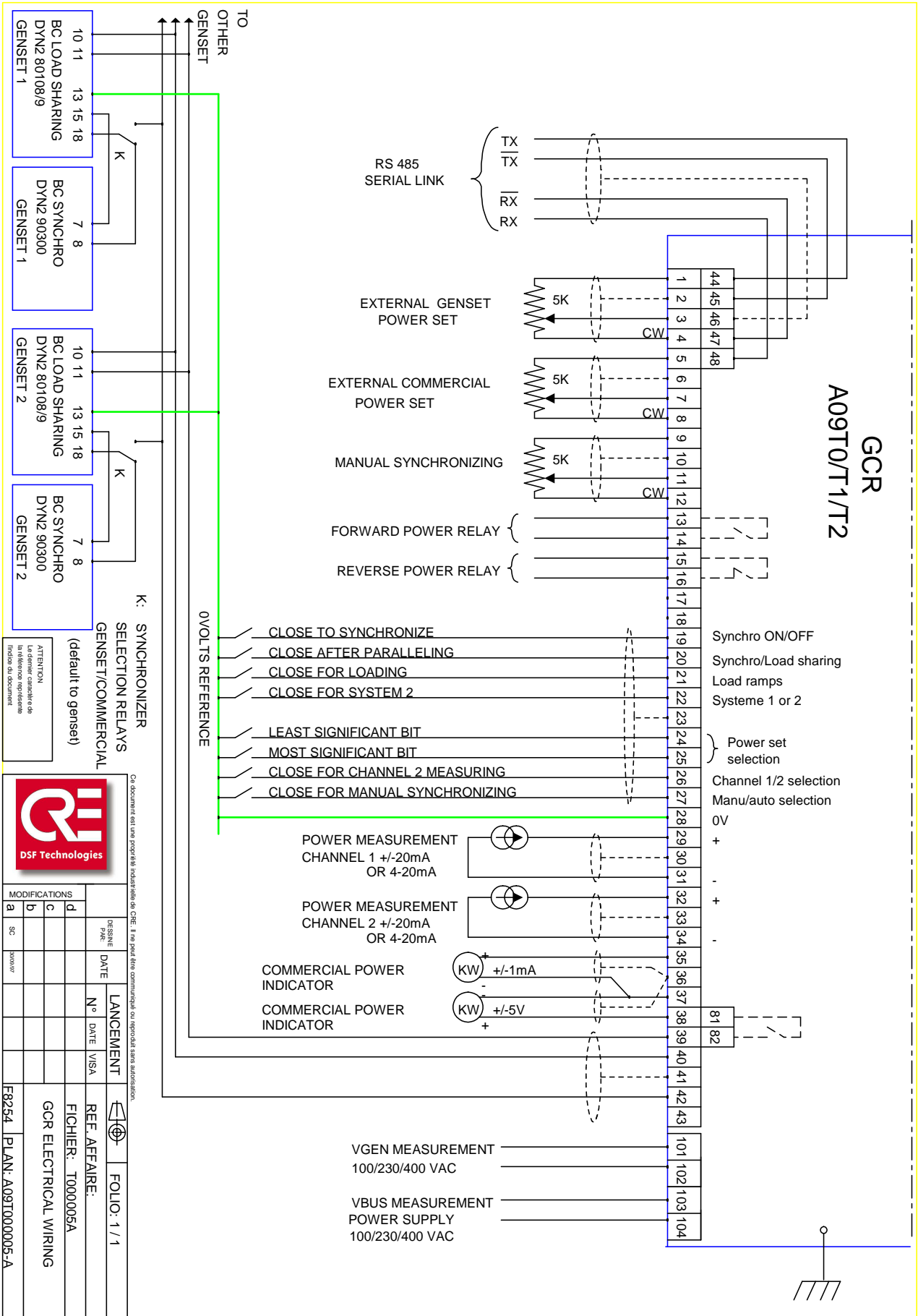
Intensity/Nominal voltage : 8A/250VAC.

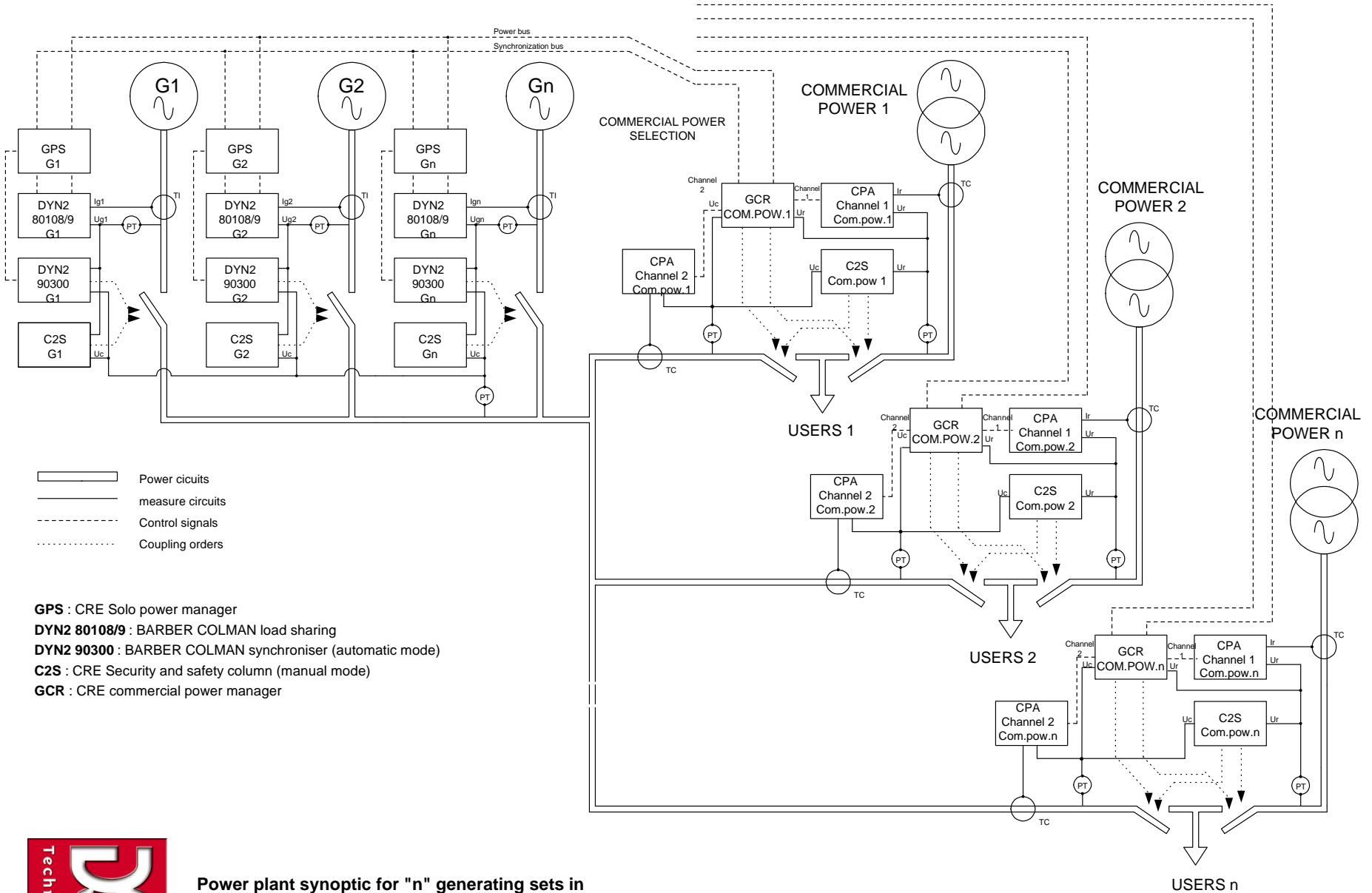
Maximum voltage : 440 VAC.

Nominal load (ohmic load) : 2000 VA.

7. DIMENSIONS







- Power circuits
- measure circuits
- Control signals
- Coupling orders

GPS : CRE Solo power manager
DYN2 80108/9 : BARBER COLMAN load sharing
DYN2 90300 : BARBER COLMAN synchroniser (automatic mode)
C2S : CRE Security and safety column (manual mode)
GCR : CRE commercial power manager



Power plant synoptic for "n" generating sets in parallel with "n" commercial power with BARBER COLMAN and CRE modules.
 The power can be constant on the gensets or constant on the commercial power.