

CONFIGURATION HANDBOOK

CPL165



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Device Presentation

The CPL165 is a complete and very compact measuring unit for power consumption measurement (building management, workshops, data centers, ...) in an energy efficiency approach. The Ethernet link allows measures supervision while ensuring easy and fast integration into existing networks. The internal bus allows multiple modules focused on Ethernet. The product can be used independently on a three-phase or a single-phase network.

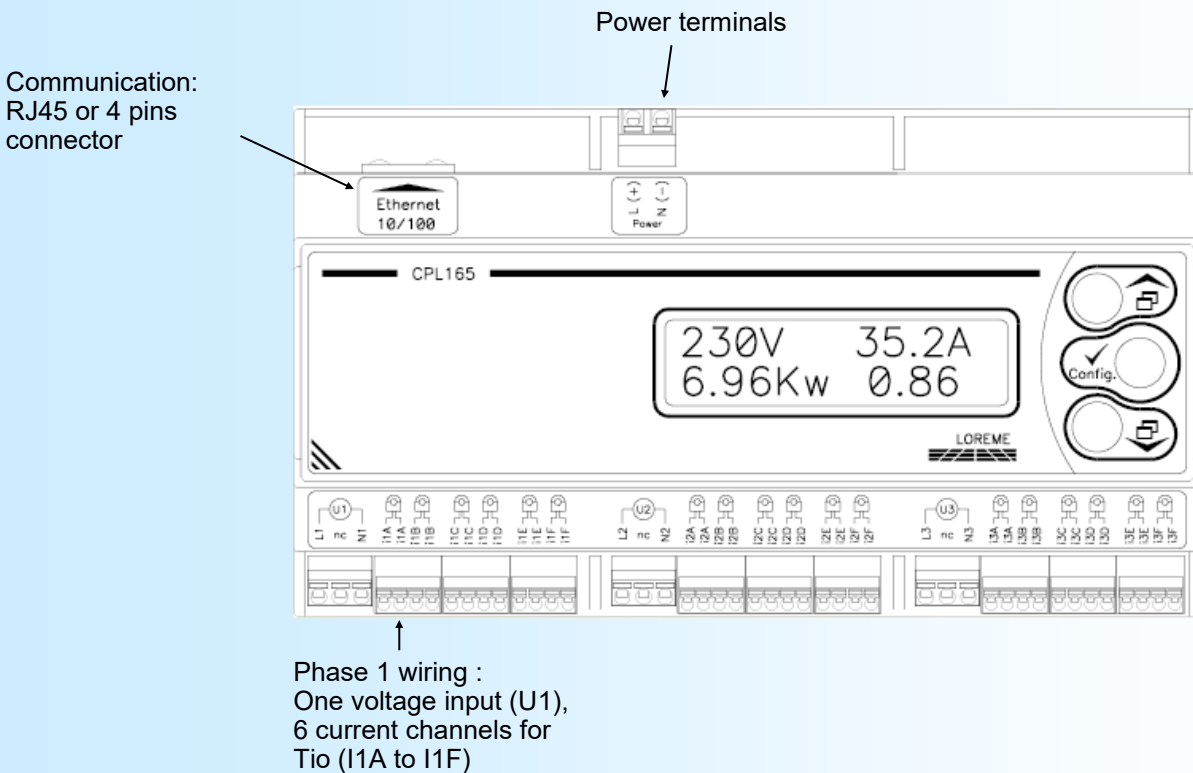
Devices have several options:

- CPL165 : low level Tio input.
- CPL165/CMTCP : Ethernet Modbus TCP link.
- CPL165/BUS : Slave version over internal bus (Modbus TCP).
- CPL165/SNMP : Ethernet link SNMP protocol (no internal bus).
- CPL165/CM : RS485 Modbus link (9600/19200 bauds).

No internal bus incorporated on DIN rail if RS485 modbus or SNMP.

The technical data sheets is downloadable here: http://www.loreme.fr/fichtech/CPL165_eng.pdf

USER INTERFACE



Push buttons func-

tions:

- ▲ Measure mode: visualize previous measure page.
Configuration mode: <Yes> button or incrementing button.
- ▼ Measure mode: visualize next measure page.
<No> button or decrementing button.
- ✓ Access to device configuration or value validation.

1) VISUALIZATION

The CPL165 can view several measurements pages. Pressing the button '▼' will display the pages in the order page 1 -> page 33 -> page 1. The button '▲' will display the pages in the order page 33-> page 1 -> page 33.

U1:225V/ 1125W Page 1: phase 1 display : Voltage U1 / Channel 1A active power
IA:5.00A / 1.00 and Channel 1A current / cosinus phi (power factor).

U1:225V/ 1121W Page 2: phase 1 display : Voltage U1 / Channel 1B active power
IB:4.98A / 1.00 and Channel 1B current / cosinus phi.

... ..

U1:228V/ 1140W Page 6: phase 1 display : Voltage U1 / Channel 1F active power
IF:5.00A / 1.00 and Channel 1F current / cosinus phi.

Page 7 to 12 : display phase 2 information's.
Page 13 to 18: display phase 3 information's.

W1A:0.02KWh Page 19: Energy display per channel for phase 1 / channels A and B.
W1B:0.01KWh

... ..

W1E:0.02KWh Page 21: Energy display per channel for phase 1 / channels E and F.
W1F:0.01KWh

Page 22 to 24: display phase 2 information's.
Page 25 to 27: display phase 3 information's.

Σ PA:3.21KW Page 28: Display total active power and accumulated energy per channel (A)
 Σ WA:0.01KWh (sum of powers P1A, P2A, P3A and sum of the energies W1A, W2A, W3A).

Σ PF:3.21KW Page 33: Display total active power and accumulated energy per channel (F)
 Σ WF:0.01KWh (sum of powers P1F, P2F, P3F and sum of the energies W1F,W2F, W3F).

2) CONFIGURATION

The CPL165 can be configured entirely by the front panel. Pressing the button 'Config' allows access to the configuration. The device display's the following message:

```
CONFIGURATION
ver 0.5           This is the device version in the form Hard . Soft.
```

2.1) Configuration access with password

If the « Password » function is activated (see p6), entering a code is necessary to access at the configuration.

```
PASSWORD?      Use '▲' or '▼' buttons to change the character.
-----        (only alphanumeric characters are accepted: '0' to '9' and 'A' to 'Z').
                The 'Config' button validate the character.
```

The message 'INVALID CODE' is displayed for 3 seconds if the password is wrong then the device return to measure mode.

2.2) Language configuration

```
LANGUAGE?      Language choice, FR: French, ENG: English
<FR> ENG       Use '▲' or '▼' buttons to change the language, 'Config' to validate.
```

2.3) Current inputs configuration

- MEASUREMENT? Press the ‘▲’ (Yes) button to access the rubric.
 (Y-N) Press the ‘▼’ (No) button to skip the rubric.
- CONF. I CHANNEL? It is possible to set the rated current for a particular channel by selecting <ONE>
 <ONE> ALL or all channels by selecting <ALL>.

2.3.1) Individual configuration

We identifies the current to change by its phase and its channel. (I3B: current phase 3, channel B).

- PHASE (1, 2, 3)? Phase choice. Press ‘▲’ or ‘▼’ buttons to change the phase, ‘Config’ to validate.
 1
- CHAN. (A, B..F)? Channel choice.
 A
- I CHANNEL (I1A) Setting the rated current. Press ‘▲’ or ‘▼’ buttons to change the value,
 32A ‘Config’ to validate.
- MORE CHANNEL? Press the ‘▲’ (Yes) button to modify an other channel current or ‘▼’ (No) to go to the
 (Y-N) next rubric.

2.3.2) Common configuration

The rated current will be applied to all 18 channels.

- RATED CURRENT? Press ‘▲’ or ‘▼’ buttons to change the value, ‘Config’ to validate.
 32A

2.4) Communication configuration

- COMMUNICATION? Press the ‘▲’ (Yes) button to access the rubric.
 (Y-N) Press the ‘▼’ (No) button to skip the rubric.

2.4.1) Communication for the /CMTCP option

- IP ADDRESS? Press ‘▲’ or ‘▼’ buttons to modify the IP address fields.
 192.168.000.253 The ‘Config’ button is use to validate the field.
- IP MASK? Press ‘▲’ or ‘▼’ buttons to modify the mask field.
 255.255.255.000 ‘Config’ button to validate.
 by default, the IP address is 192.168.0.253 and the mask is 255.255.255.000.

2.4.2) Communication for the /BUS option

- BUS ADDRESS? Press ‘▲’ or ‘▼’ buttons to modify the bus address.
 1 ‘Config’ to validate the value.

2.4.3) Communication for the /CM option

- BAUDRATE (Kbds)? Press ‘▲’ or ‘▼’ buttons to select the baudrate.
 <9.6> 19.2 ‘Config’ to validate the selected baudrate.

ADDRESS?
1 Press '▲' or '▼' buttons to modify the bus address.
'Config' button to validate.

2.5) Energy meters start value configuration

ENERGY ? Press the '▲' (Yes) button to access the rubric.
(Y-N) Press the '▼' (No) button to skip the rubric.

CONF. W CHANNEL? It is possible to set the energy counter for a particular channel by selecting <ONE>
<ONE> ALL or all channels by selecting <ALL>.
(In the same manner as the configuration of the currents).

2.6) End of configuration. Parameters saving

MEMORIZING This message is display only when the user enter in COMMUNICATION menu.

OK! This message indicate the end of configuration and that the parameters are saved in memory.

Note : *The device leaves the configuration mode if no action are made within 60 seconds without saving the modified parameter. It's only at the end of configuration that new parameters are saved in memory.*

3) Configuration protection

It is possible to forbid the access to the device configuration's. When the "Password" function is activated, the user must enter a 4 characters code to access the configuration mode.

3.1) Activating the function

When the device is in measure mode, press simultaneously on '▲' and '▼' buttons for at least 5 seconds.
The following message is displayed:

PASSWORD? The buttons '▲' or '▼' change the selection.
YES <NO> The 'Config' button validate the choice.

- <NO> : deactivating the "Password" function. Access to configuration mode is free.
- <YES> : activating the function. Need to enter a password to access the configuration mode.

Enter a new code:

PASSWORD? '▲' or '▼' buttons to change the character. The 'Config' button validate the character.
---- (only alphanumeric characters are accepted: '0' to '9' and 'A' to 'Z').

Note: *When the function is activated by answering YES, a new code is automatically requested.*

RS232 link setting

The device can be configured or updated in terminal mode via an RS232 link.

Step 1: Driver installation for USB / RS232 adapter



- download driver at www.loreme.fr:
http://www.loreme.fr/aff_produits.asp?rubid=53&langue=fr
- Click on executable file to install the driver,
- Plug the cable on a USB port, Windows install a new serial communication port **COMx** (x >= 4).

Note :

The use of the cable on another USB port don't generates a new communication port. Use of another adapter generates another communication port number (COMx) and requires the reconfiguration of the HyperTerminal.

Step 2: Setting of terminal emulation software (PC with windows).

1 The terminal emulation software for PC « HyperTerminal » is resident in windows up to XP version. For later versions, it is downloadable on : www.loreme.fr in **download part** (<http://www.loreme.fr/HyperTerm/htpe63.exe>)
=> Run the downloaded software to install it.

2 Start a "hyper Terminal" connection :
- Click on **"START"** button
Up to XP version
- Go to **"Programs \ Accessories \ Communication \ Hyper Terminal"**
- Click on **"Hypertrm.exe"**
Or if the software was downloaded
- Go to **"All programs \ HyperTerminal Private Edition"**
- Click on **"HyperTerminal Private Edition"**

3 Enter name for the new connection


4 Choose the communication port related to the adapter.

5

Choose:
- 9600 bauds
- 8 DATA bits
- no parity
- 1 stop bit
- **XON/XOFF**

6 The PC is now in terminal mode, connect it to the device by plugging the RS232 cable. The measure is now displayed on the terminal. To access configuration, press 'C' key.

7 When leaving Hyper terminal, the following window will appear. By saving, the terminal session will start with the same configuration.

Thus, the shortcut  **LOREME.ht** will permit to communicate with all LOREME devices.

Note: to modify the parameters of terminal mode whereas this one is already started, it is necessary, after having carried out the modifications, to close the terminal and to open it again so that the modifications are effective.

Terminal mode

1) Visualization

At the power on, the device is automatically in measure mode.
If a terminal is connected, the device sends a series of measurement.

Page 1

	L1	L2	L3	TOTAL
U	:0 V	0 V	0 V	
IA	:0 A	20.24 A	20.20 A	
IB	:0 A	20.25 A	20.24 A	
IC	:20.74 A	20.25 A	20.21 A	
ID	:20.26 A	20.17 A	20.22 A	
IE	:20.28 A	20.19 A	20.22 A	
IF	:20.24 A	20.16 A	20.20 A	
CosA	:0	0	0	
CosB	:0	0	0	
CosC	:0	0	0	
CosD	:0	0	0	
CosE	:0	0	0	
CosF	:0	0	0	
PA	:0 W	0 W	0 W	0 W
PB	:0 W	0 W	0 W	0 W
PC	:0 W	0 W	0 W	0 W
PD	:0 W	0 W	0 W	0 W
PE	:0 W	0 W	0 W	0 W
PF	:0 W	0 W	0 W	0 W

Display of voltage, current and Cosinus Phi (power factor) for each phase.

Display of active power values for each phase and the total per channel.

Page 2

	L1	L2	L3	TOTAL
WA	:0.02 KWh	0 KWh	0 KWh	0.02 KWh
WB	:0.48 KWh	0 KWh	0 KWh	0.48 KWh
WC	:0 KWh	0 KWh	0 KWh	0 KWh
WD	:0 KWh	0 KWh	0 KWh	0 KWh
WE	:0 KWh	0 KWh	0 KWh	0 KWh
WF	:0 KWh	0 KWh	0 KWh	0 KWh

Display of active energy meters for each phase and the total per channel.

2) Configuration

To access to the configuration mode, just press <C> key. The following message is displayed on LCD display:

```
CONF BY RS232
IN PROGRESS...
```

The following message is displayed on the terminal window:

```
CONFIGURATION
```

```
ver 0.5
```

This temporary message is displayed to indicate the version of the device (Hard . Soft)

2.1) Method

At the configuration time, different types of questions are displayed. For each one, several answers are possible. You will find below the detailed description of each case.

2.1.1) Menu selection

Example: LANGUAGE (Y-N) The user makes a choice by pressing the keys <Y> or <N>.

2.1.2) Parameters selection

Example: FRENCH (Y-N)YES or FRENCH (Y-N)NO

Previous choice = YES: - pressing <Y> or <Enter> => choice validation = YES.
- pressing <N> => choice changing = NO.

Previous choice = NO: - pressing <N> or "Enter" => choice validation = NO.
- pressing <Y> => choice changing = YES.

2.1.3) Value acquisition

Example: RATED CURRENT
32 A

There are two possibilities:

- The validation without modification by pressing the <Enter> key,
- The modification with simultaneous display followed by validation with the <Enter> key.

Remarks:

- It is possible, when a mistake is made during a value acquisition, before validating it, to go back by pressing on <backspace> key. This re-displays the message without taking notice of the mistake.
- In configuration mode, if you want go back to measure mode without taking notice of modifications made before, just press the <escape> key.

2.2) Language

LANGUAGE? Configuration of message language (French or English).
(Y-N) Press <Y> to access the rubric

ENGLISH?
(Y-N) YES

2.3) Current

RATED CURRENT Rated current configuration access.
(Y-N)

CHANNEL	I1A 32 A	To change the rated current of a particular channel, you must enter the phase number and the channel name. Press <Enter> to confirm the selection.
0, 1A, 3F, 2B..	I1B 32 A	
<ENTER>	I1C 32 A	
->	I1D 32 A	
0:ALL CHANNEL	I1E 32 A	To set the rated current for all the channels to the same value, press the <0> key and <Enter> to confirm.
SELECTION	I1F 32 A	
	I2A 32 A	
	I2B 32 A	
	I2C 32 A	
	I2D 32 A	
	I2E 32 A	
	I2F 32 A	
	I3A 32 A	
	I3B 32 A	
	I3C 32 A	
	I3D 32 A	
	I3E 32 A	
	I3F 32 A	

LEAVE
Press <L>

2.3.1) Individual configuration

CHANNEL 3A Channel identification.

RATED CURRENT Rated current value acquisition for one channel.
32 A

2.3.2) Common configuration

COMMON CONFIGURATION ACCESS?
(Y-N) Press <Y> to access the rubric.

ALL CHANNEL

RATED CURRENT 32 A Rated current value acquisition for all the channels.

2.4) Communication

COMMUNICATION
(Y-N) Press <Y> to access the rubric.

2.4.1) /CMTCP option

IP ADDRESS? 192.168.000.253 Enter the IP address with each field separated by a dot '.' <Enter> to validate.

IP MASK? 255.255.255.000 Enter the IP mask with each field separated by a dot '.' <Enter> to validate.

2.4.2) /BUS option

BUS ADDRESS? 1 Bus address value acquisition.

2.4.3) /CM option

ADDRESS? 1 Modbus address value acquisition.

BAUDRATE (Kbds) : 9.6 (Y-N) NO Baudrate choice 9.6 kbauds

BAUDRATE (Kbds) : 19.2 (Y-N) YES or 19.2 kbauds

2.5) Energy

ENERGY ? (Y-N) Press <Y> to access the rubric.

(Continued on next page)

```

CHANNEL      W1A 0.02 KWh
0,1A,3F,2B.. W1B 0.48 KWh
<ENTER>     W1C 0 KWh
->          W1D 0 KWh
0:ALL CHANNEL W1E 0 KWh
SELECTION    W1F 0 KWh
             W2A 0 KWh
             W2B 0 KWh
             W2C 0 KWh
             W2D 0 KWh
             W2E 0 KWh
             W2F 0 KWh
             W3A 0 KWh
             W3B 0 KWh
             W3C 0 KWh
             W3D 0 KWh
             W3E 0 KWh
             W3F 0 KWh
    
```

To change the counter value of a particular channel, you must enter the phase number and the channel name. Press <Enter> to confirm the selection.

To set the counter value for all the channels, press the <0> key and <Enter> to confirm.

```

LEAVE
Press <L>
    
```

2.5.1) Individual configuration

```

CHANNEL 1A          Channel identification.

PRESET W           Counter value acquisition for one channel.
0.02 KWh
    
```

2.5.2) Common configuration

```

COMMON CONFIGURATION ACCESS?
(Y-N)              Press <Y> to access the rubric.

ALL CHANNEL

PRESET W           Counter value acquisition for all the channels.
0 KWh
    
```

2.6) End of configuration. Parameters saving

```

MEMORIZING        This message is display only when the user enter the COMMUNICATION menu.
****

OK!               This message indicate the end of configuration and that the parameters are saved in memory.
    
```

Note : *if there is no action on a key during 2 minutes, device goes back in measure mode without taking notice of the modifications made before.*

FIRMWARE update

To access to the firmware update function, you must first open an HyperTerminal session on a PC, connect the device to the PC with the RS232 link cable and then power on the device.

The following character is send to the terminal:

> <————— The device sends this character then it waits the « F » key during 0.5 s.

If the user has pressed the « F » key in the allowed time, the following message is displayed in the HyperTerminal windows:

```
FIRMWARE LOADER Rev2.3  
READY TO TRANSFER...
```

The device is now in the firmware load mode and is waiting for the firmware file. This file is provide by LOREME and contain the firmware code in Intel HEX format.

Select the « Transfer », « Send a text file ... » in the HyperTerminal menu.
Select the directory and open the file. The HyperTerminal program begins to send the file to the device.

```
FIRMWARE LOADER Rev2.3  
READY TO TRANSFER  
***** <————— The star characters appears to show the progress of the uploading.
```

At the end, the message « **PROGRAMMING OK !** » is display if no errors occurs. Otherwise, these following message could be displayed:

- **SERIAL COM ERROR !** Error during receipt.
- **SERIAL TIMEOUT !** Waiting time of receipt elapsed (60 s).
- **PROGRAMMING FAILED !** Programming error in the internal flash memory.

Attention:

*If an error occurs during the programming process, it is necessary to start again the whole procedure.
A bad programming leads to an inoperative device.*

EMC CONSIDERATION

1) Introduction

To meet its policy concerning EMC, based on the Community directives **2014/30/EU** & **2014/35/EU**, the LOREME company takes into account the standards relative to this directives from the very start of the conception of each product.

The set of tests performed on the devices, designed to work in an industrial environment, are made in accordance with **IEC 61000-6-4** and **IEC 61000-6-2** standards in order to establish the EU declaration of conformity. The devices being in certain typical configurations during the tests, it is impossible to guarantee the results in every possible configurations. To ensure optimum operation of each device, it would be judicious to comply with several recommendations of use.

2) Recommendations of use

2.1) General remarks

- Comply with the recommendations of assembly indicated in the technical sheet (direction of assembly, spacing between the devices, ...).
- Comply with the recommendations of use indicated in the technical sheet (temperature range, protection index).
- Avoid dust and excessive humidity, corrosive gas, considerable sources of heat.
- Avoid disturbed environments and disruptive phenomena or elements.
- If possible, group together the instrumentation devices in a zone separated from the power and relay circuits.
- Avoid the direct proximity with considerable power distance switches, contactors, relays, thyristor power groups, ...
- Do not get closer within fifty centimeters of a device with a transmitter (walkie-talkie) of a power of 5 W, because the latter can create a field with an intensity higher than 10 V/M for a distance fewer than 50 cm.

2.2) Power supply

- Comply with the features indicated in the technical sheet (power supply voltage, frequency, allowance of the values, stability, variations ...).
- It is better that the power supply should come from a system with section switches equipped with fuses for the instrumentation element and that the power supply line be the most direct possible from the section switch.
- Avoid using this power supply for the control of relays, of contactors, of electrogates, ...
- If the switching of thyristor statical groups, of engines, of speed variator, ... causes strong interferences on the power supply circuit, it would be necessary to put an insulation transformer especially intended for instrumentation linking the screen to earth.
- It is also important that the installation should have a good earth system and it is better that the voltage in relation to the neutral should not exceed 1V, and the resistance be inferior to 6 ohms.
- If the installation is near high frequency generators or installations of arc welding, it is better to put suitable section filters.

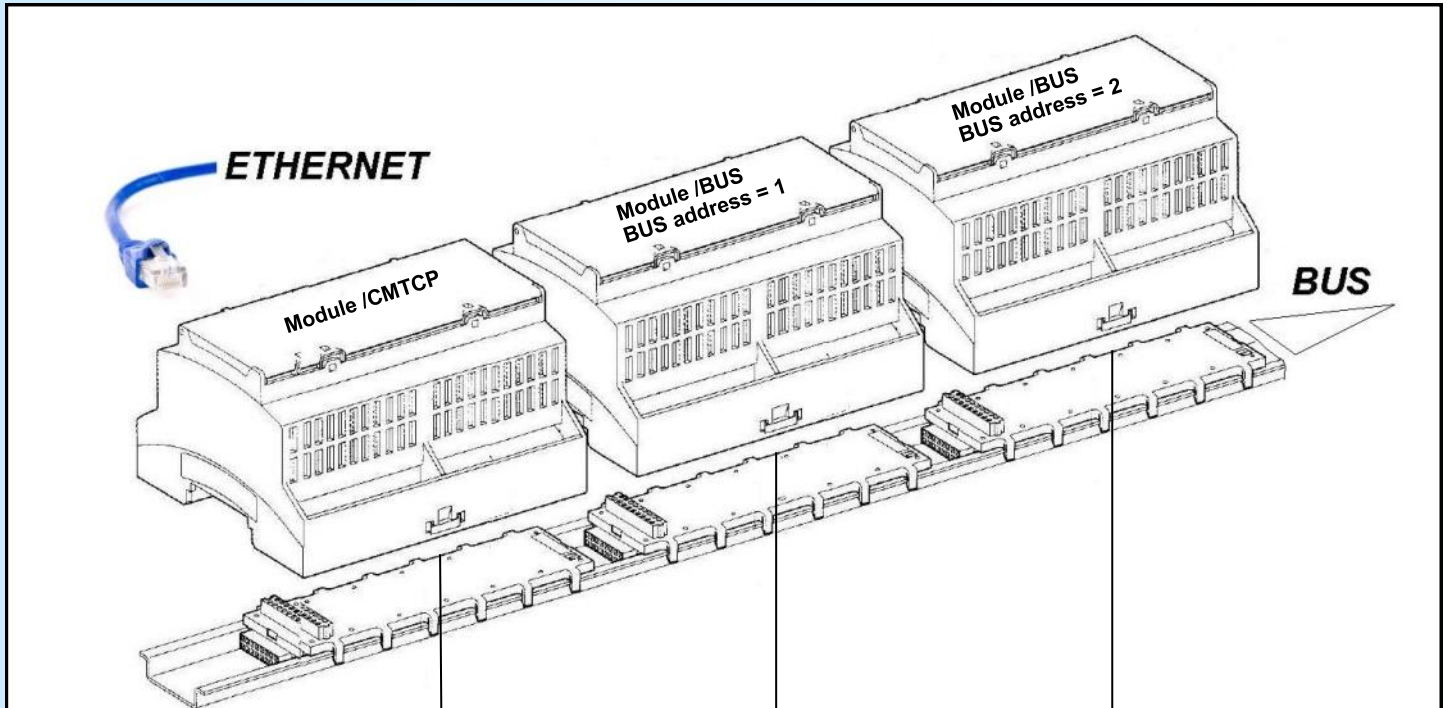
2.3) Inputs / Outputs

- In harsh conditions, it is advisable to use sheathed and twisted cables whose ground braid will be linked to the earth at a single point.
- It is advisable to separate the input / output lines from the power supply lines in order to avoid the coupling phenomena.
- It is also advisable to limit the lengths of data cables as much as possible.

BUS100 system

The BUS100 is a modular system composed of one master (/CMTCP module. Module with Ethernet link) and slaves modules (/BUS model without Ethernet link). All modules are reachable by the Ethernet link. Each module is accessible via its own address range. The master module is always accessible in the address range of 0 to 999. The slaves module (/BUS module) are reachable in an address range equal to **1000 x BUS address**. The address parameter is configurable by the front face of device and should be different for each BUS module connected as shown below.

Example of BUS:



Possible address range		Possible address range		Possible address range	
from	0000	from	1000	from	2000
	Range of measure registers		Range of measure registers		Range of measure registers
	<i>(The length of this range depends on the type of device)....</i>		<i>(The length of this range depends on the type of device)....</i>		<i>(The length of this range depends on the type of device)....</i>

	Reserved address for the configuration		Address reserved for the configuration		Address reserved for the configuration

to	0999 Reserved address for a device identification code	to	1999 Reserved address for a device identification code	to	2999 Reserved address for a device identification code

Reserved address for later use.

MODBUS TCP communication

1) Feature

Protocol:	MODBUS TCP
Link:	Ethernet 10/ 100 base T
IP address by default:	192.168.0.253
Port:	502
Connector:	RJ45
Read request:	Function code 03, 04
Write request:	Function code 06, 16
Type of data:	Inputs measurements.
data format:	16 bits and 32 bits unsigned integer.

2) Communication

Measures are refreshed every 2 seconds.

The CPL165 supports to be questioned by several Modbus TCP masters (maximum 6).

The response time to a request is about 20ms, it is strongly influenced according to the network traffic. Excessive load can cause communication errors (response time of the slave exceeded (timeout), ...).

The response time for a write request is in the order of 0.6 s and up to 1.2 s. This is due to the mechanism for reading BUS devices: The master continuously polls the present BUS modules. As the write request is inserted between two readings, so you have more time to finish reading, proceed the writing, wait and return the BUS module acknowledgment.

3) Data's description

3.1) Available data's

All measures are reachable in reading mode. Data are available in different formats:

- 1 word or 2 bytes for voltage, current, phi cosines (power factor) measurements.
- 2 word or 4 bytes for power measurements and energy meters.

3.2) Data's format

- The voltages are transmitted in 16 bits unsigned integer format corresponding to the measurement * 10.
- The currents are transmitted in 16 bits unsigned integer format corresponding to the measurement * 100.
- The phi cosines are transmitted in 16 bits unsigned integer format corresponding to the measurement * 100.
- The powers are transmitted in 32 bits unsigned integer format corresponding to the measurement in W * 100.
- The energies are transmitted in 32 bits unsigned integer format corresponding to the measurement in kWh * 100.

Data are transmitted Most Significant Byte first.

4) Reset of the energy meters

The reset of the energy meters is done by writing 1, 2 or 3 registers at address 300, 301 or 302.

The register at address 300 corresponds to phase 1, 301 to phase 2 and 302 to phase 3.

The value of the register corresponds to the different channels "A-F" to clear:

- Bit 0 (LSB) corresponds to channel A, bit 1 to channel B, up to bit 5 witch corresponds to channel F.
- To clear a counter, set the corresponding bit to 1.

Ex:

If you want to reset the counters W1A, W2B, W3C, so you writes 0001 at address 300, 0002 at 301, 0004 at 302.

Note:

For /BUS model, the address are shifted by [1000 x bus address].

For example:

The register addresses for the master module (address 0) range from 0 (\$ 0000) to 134 (\$ 0086).

A module with a bus address = 5, have measures registers reachable from 5000 (\$1388 hexa) to 5134(\$140E)

5) Measures Tables

The tables show the addressing of the CPL165/CMTCP (bus address = 0). To know the address of the other modules on the bus, it is necessary to add an offset corresponding to 1000 x the location of the module on the bus100. (Ex: to read the value of current 2C for the bus module at address = 4, read the register located at address 4040 (\$0FC8).)

Decimal word address (Hexadecimal)	Designation	Total Words
00 (\$0000)	Voltage U1 (V x 10) Word 1	1
01 (\$0001)	Current 1A (A x100) Word 1	2
02 (\$0002)	Current 1B (A x100) Word 1	3
03 (\$0003)	Current 1C (A x100) Word 1	4
04 (\$0004)	Current 1D (A x100) Word 1	5
05 (\$0005)	Current 1E (A x100) Word 1	6
06 (\$0006)	Current 1F (A x100) Word 1	7
07 (\$0007)	Cos phi 1A (x 100) Word 1	8
08 (\$0008)	Cos phi 1B (x 100) Word 1	9
09 (\$0009)	Cos phi 1C (x 100) Word 1	10
10 (\$000A)	Cos phi 1D (x 100) Word 1	11
11 (\$000B)	Cos phi 1E (x 100) Word 1	12
12 (\$000C)	Cos phi 1F (x 100) Word 1	13
13 (\$000D)	Power 1A (W x 100) Word 1	14
	Word 2	15
15 (\$000F)	Power 1B (W x 100) Word 1	16
	Word 2	17
17 (\$0011)	Power 1C (W x 100) Word 1	18
	Word 2	19
19 (\$0013)	Power 1D (W x 100) Word 1	20
	Word 2	21
21 (\$0015)	Power 1E (W x 100) Word 1	22
	Word 2	23
23 (\$0017)	Power 1F (W x 100) Word 1	24
	Word 2	25
25 (\$0019)	Energy 1A (kWh x 100) Word 1	26
	Word 2	27
27 (\$001B)	Energy 1B (kWh x 100) Word 1	28
	Word 2	29
29 (\$001D)	Energy 1C (kWh x 100) Word 1	30
	Word 2	31

Phase 1 measures

Decimal word address (Hexadecimal)	Designation		Total Words
31 (\$001F)	Energy 1D (kWh x 100)	Word 1	32
		Word 2	33
33 (\$0021)	Energy 1E (kWh x 100)	Word 1	34
		Word 2	35
35 (\$0023)	Energy 1F (kWh x 100)	Word 1	36
		Word 2	37
37 (\$0025)	Voltage U2 (V x 10)	Word 1	38
38 (\$0026)	Current 2A (A x100)	Word 1	39
39 (\$0027)	Current 2B (A x100)	Word 1	40
40 (\$0028)	Current 2C (A x100)	Word 1	41
41 (\$0029)	Current 2D (A x100)	Word 1	42
42 (\$002A)	Current 2E (A x100)	Word 1	43
43 (\$002B)	Current 2F (A x100)	Word 1	44
44 (\$002C)	Cos phi 2A (x 100)	Word 1	45
45 (\$002D)	Cos phi 2B (x 100)	Word 1	46
46 (\$002E)	Cos phi 2C (x 100)	Word 1	47
47 (\$002F)	Cos phi 2D (x 100)	Word 1	48
48 (\$0030)	Cos phi 2E (x 100)	Word 1	49
49 (\$0031)	Cos phi 2F (x 100)	Word 1	50
50 (\$0032)	Power 2A (W x 100)	Word 1	51
		Word 2	52
52 (\$0034)	Power 2B (W x 100)	Word 1	53
		Word 2	54
54 (\$0036)	Power 2C (W x 100)	Word 1	55
		Word 2	56
56 (\$0038)	Power 2D (W x 100)	Word 1	57
		Word 2	58
58 (\$003A)	Power 2E (W x 100)	Word 1	59
		Word 2	60
60 (\$003C)	Power 2F (W x 100)	Word 1	61
		Word 2	62
62 (\$003E)	Energy 2A (kWh x 100)	Word 1	63
		Word 2	64
64 (\$0040)	Energy 2B (kWh x 100)	Word 1	65
		Word 2	66

Phase 2 measures

Decimal word address (Hexadecimal)	Designation		Total Words
66 (\$0042)	Energy 2C (kWh x 100)	Word 1	67
		Word 2	68
68 (\$0044)	Energy 2D (kWh x 100)	Word 1	69
		Word 2	70
70 (\$0046)	Energy 2E (kWh x 100)	Word 1	71
		Word 2	72
72 (\$0048)	Energy 2F (kWh x 100)	Word 1	73
		Word 2	74
74 (\$004A)	Tension U3 (V x 10)	Word 1	75
75 (\$004B)	Current 3A (A x100)	Word 1	76
76 (\$004C)	Current 3B (A x100)	Word 1	77
77 (\$004D)	Current 3C (A x100)	Word 1	78
78 (\$004E)	Current 3D (A x100)	Word 1	79
79 (\$004F)	Current 3E (A x100)	Word 1	80
80 (\$0050)	Current 3F (A x100)	Word 1	81
81 (\$0051)	Cos phi 3A (x 100)	Word 1	82
82 (\$0052)	Cos phi 3B (x 100)	Word 1	83
83 (\$0053)	Cos phi 3C (x 100)	Word 1	84
84 (\$0054)	Cos phi 3D (x 100)	Word 1	85
85 (\$0055)	Cos phi 3E (x 100)	Word 1	86
86 (\$0056)	Cos phi 3F (x 100)	Word 1	87
87 (\$0057)	Power 3A (W x 100)	Word 1	88
		Word 2	89
89 (\$0059)	Power 3B (W x 100)	Word 1	90
		Word 2	91
91 (\$005B)	Power 3C (W x 100)	Word 1	92
		Word 2	93
93 (\$005D)	Power 3D (W x 100)	Word 1	94
		Word 2	95
95 (\$005F)	Power 3E (W x 100)	Word 1	96
		Word 2	97
97 (\$0061)	Power 3F (W x 100)	Word 1	98
		Word 2	99
99 (\$0063)	Energy 3A (kWh x 100)	Word 1	100
		Word 2	101

Phase 3 mesures

Decimal word address (Hexadecimal)	Designation		Total Words
101 (\$0065)	Energy 3B (kWh x 100)	Word 1	102
		Word 2	103
103 (\$0067)	Energy 3C (kWh x 100)	Word 1	104
		Word 2	105
105 (\$0069)	Energy 3D (kWh x 100)	Word 1	106
		Word 2	107
107 (\$006B)	Energy 3E (kWh x 100)	Word 1	108
		Word 2	109
109 (\$006D)	Energy 3F (kWh x 100)	Word 1	110
		Word 2	111
111 (\$006F)	Channel A total power	Word 1	112
	(W x 100)	Word 2	113
113 (\$0071)	Channel B total power	Word 1	114
	(W x 100)	Word 2	115
115 (\$0073)	Channel C total power	Word 1	116
	(W x 100)	Word 2	117
117 (\$0075)	Channel D total power	Word 1	118
	(W x 100)	Word 2	119
119 (\$0077)	Channel E total power	Word 1	120
	(W x 100)	Word 2	121
121 (\$0079)	Channel F total power	Word 1	122
	(W x 100)	Word 2	123
123 (\$007B)	Channel A total energy	Word 1	124
	(kWh x 100)	Word 2	125
125 (\$007D)	Channel B total energy	Word 1	126
	(kWh x 100)	Word 2	127
127 (\$007F)	Channel C total energy	Word 1	128
	(kWh x 100)	Word 2	129
129 (\$0081)	Channel D total energy	Word 1	130
	(kWh x 100)	Word 2	131
131 (\$0083)	Channel E total energy	Word 1	132
	(kWh x 100)	Word 2	133
133 (\$0085)	Channel F total energy	Word 1	134
	(kWh x 100)	Word 2	135

Total measures

MODBUS communication

1) Feature

Protocol:	MODBUS
Link:	RS485
Connector:	4 pins connector
Read request:	Function code 03, 04
Write request:	Function code 06, 16
Type of data:	Inputs measurements.
data format:	16 bits and 32 bits unsigned integer.

2) Communication

Measures are refreshed every 2 seconds.
 The response time of the CPL165 to a read request is between 20 ms and 150 ms.
 For a write request it is between 200 ms to 500 ms.

3) Data's description

3.1) Available data's

All measures are reachable in reading mode. Data are available in different formats:

- 1 word or 2 bytes for voltage, current, phi cosines (power factor) measurements.
- 2 word or 4 bytes for power measurements and energy meters.

3.2) Data's format

- The voltages are transmitted in 16 bits unsigned integer format corresponding to the measurement * 10.
- The currents are transmitted in 16 bits unsigned integer format corresponding to the measurement * 100.
- The phi cosines are transmitted in 16 bits unsigned integer format corresponding to the measurement * 100.
- The powers are transmitted in 32 bits unsigned integer format corresponding to the measurement in W * 100.
- The energies are transmitted in 32 bits unsigned integer format corresponding to the measurement in kWh * 100.

Data are transmitted Most Significant Byte first.

4) Measures tables

The registers are accessible in the address 0000 - 134. The arrangement of the measures is the same as for MODBUS TCP (refer to the tables on pages 16 to 19).

5) Reset of the energy meters

The reset of the energy meters is done by writing 1, 2 or 3 registers at address 300, 301 or 302.

Note:
 The read request is limited. It is only possible to read a maximum of 125 consecutive registers.

The register at address 300 corresponds to phase 1, 301 to phase 2 and 302 to phase 3.

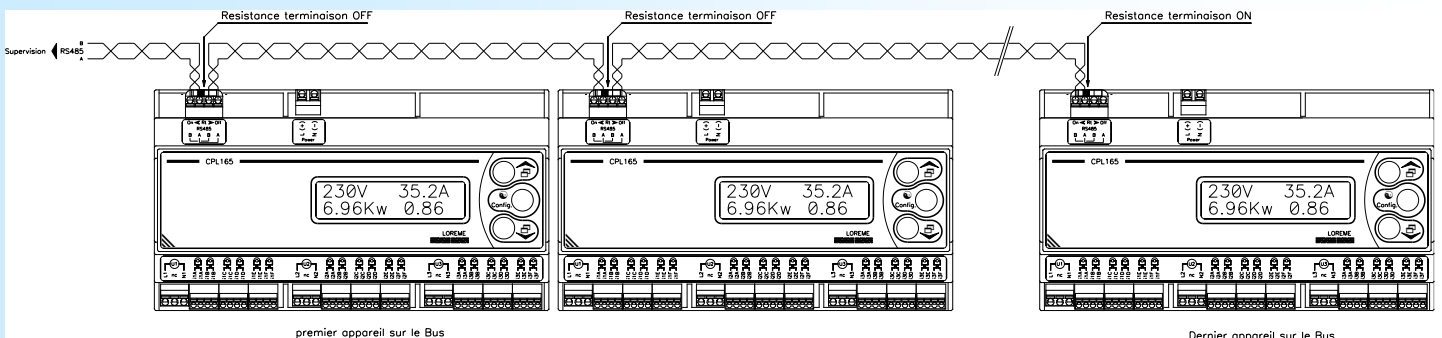
The value of the register corresponds to the different channels "A-F" to clear:

- Bit 0 (LSB) corresponds to channel A, bit 1 to channel B, up to bit 5 witch corresponds to channel F.
- To clear a counter, set the corresponding bit to 1.

Ex:
 If you want to reset the counters W1A, W2B, W3C, so you write 0001 at address 300, 0002 at 301, 0004 at 302.

6) RS485 bus wiring

The CPL165 have a 4-pin connector to facilitate the networking of the devices. A switch activates the terminating resistor. (this resistance limits the reflections on the RS485 line. It should be only activated at each end of the bus).



SNMP

1) General information's

SNMP (Simple Network Management Protocol) is the most widely used protocol for managing network devices. It is based on UDP protocol and provides the control code transmission and reception of response between different network devices. It is based on two main elements: a manager (which generates commands and receives the response messages) and agents (that answer to commands and can generate messages).

To communicate with the different agents, the manager use a database (MIB) dedicated to this agent. This MIB forms a tree structure that includes various accessible parameters of the agent. To access a data item, the manager must know the location of this item in the MIB tree. This location (OID) is represented by a sequence of numbers separated by dots.

The manager sends request to agents by the UDP port 161. This requests therefore contain the OID (the path) of the parameter and the type of action to perform (read or write).

But an agent can also sends message (traps) on UDP port 162. This traps are alert messages issued by agent to the snmp manager to report abnormal events.

2) Use

The CPL165 is a SNMP v1 agent. The supervisor can read all the measures made by the device:

- Measures for phase 1 (voltage, currents, phi cosines, powers and energies),
- Measures for phase 2 (voltage, currents, phi cosines, powers and energies),
- Measures for phase 3 (voltage, currents, phi cosines, powers and energies),
- Measures total (powers and energies per channel).

The format for voltage is 16bits, V x 10

The format for current is 16bits, A x 100

The format for power factor is 16bits value x 100

The format for power is 32bits, W x 100

The format for energy is 32bits, kWh x 100

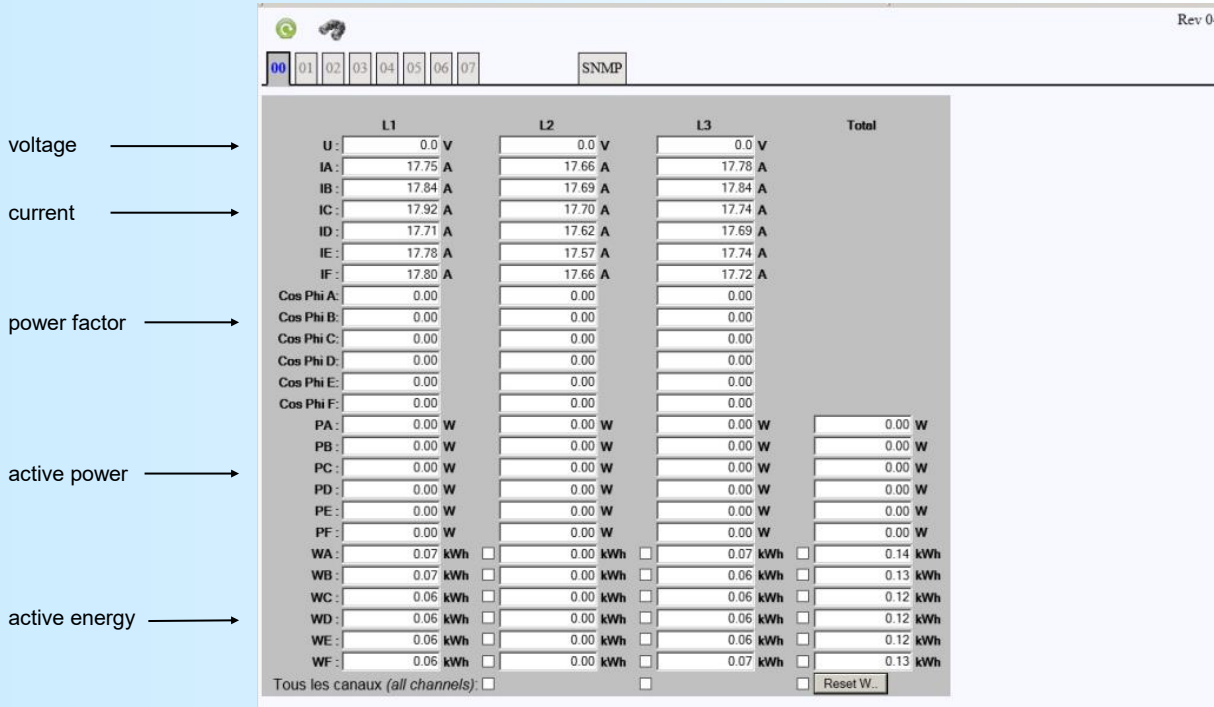
The MIB file is incorporated into the device. It can be downloaded by going on his web page, in the SNMP tab.

Web server

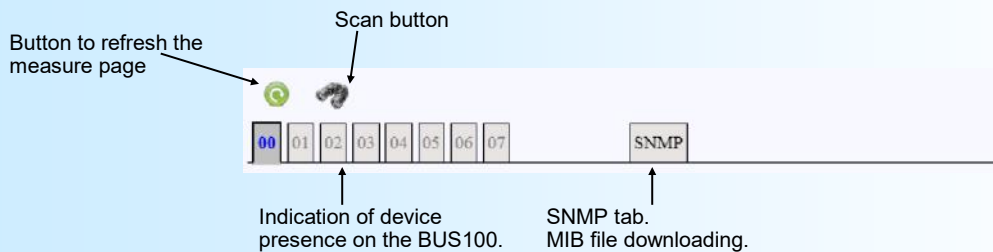
1) WEB page presentation

The CPL165 integrates a Web server which allows to visualize the measures directly.

Example of a measure page:



Details of the banner



SCAN procedure: Allows to make a discovery of the bus. That is the head (master) module (address 0) scrutinizes all the addresses (from 1 to 7) to know the number and the location of slaves modules present on the bus.

Modules present are then indicated by the tabs with a green writing. The activated tab indicates to which module belongs the page of measure which is actually shown.

Modification of the BUS composition:

It's better to switch off the rail when a module is added or removed.

Important remark on the bus discovery function:

During a scan it is necessary to make sure that all the modules connected on the bus are shown well presents on the web page. If it is not the case, it is necessary to scan again the bus.

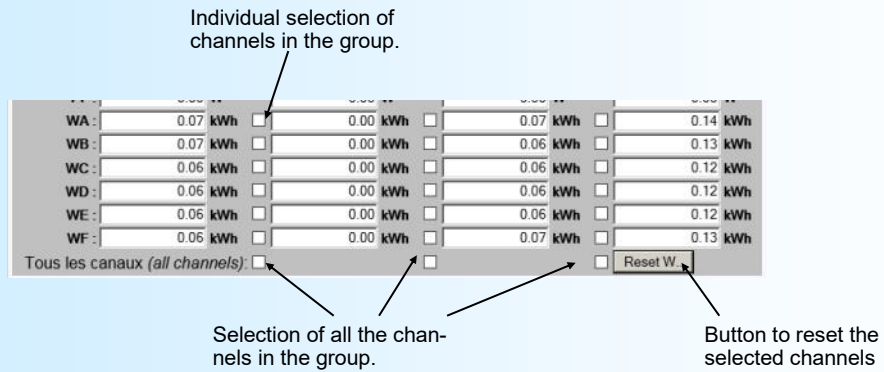
It is imperative to understand that all the modules displayed as absent on the web page, will be also absent for the MODBUS TCP communication!

=> This scenario can happen if a module is in configuration mode during the scan, for example.

It is therefore essential to run a scan if ever the constitution of the bus has changed (adding or removing a module).

2) Procedure to reset the energy meters

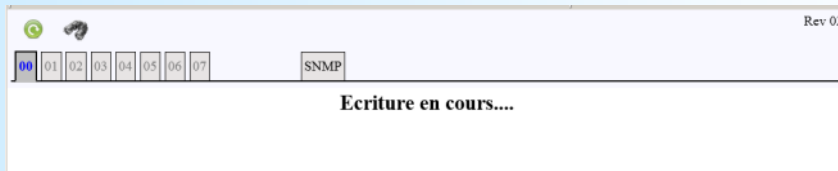
Simply select the channels you want to clear and click on the button « Reset W..».



A window will appear asking for confirmation.

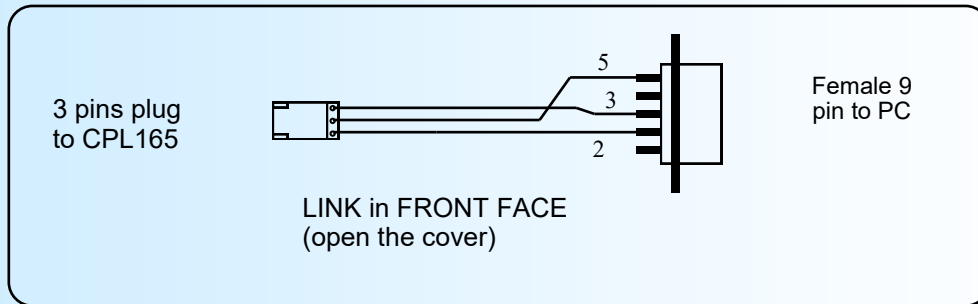


After a waiting message, the module measurement page is displayed again.

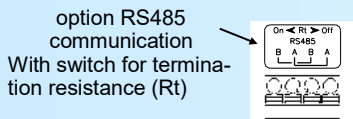


Wirings

PC - DEVICE LINK

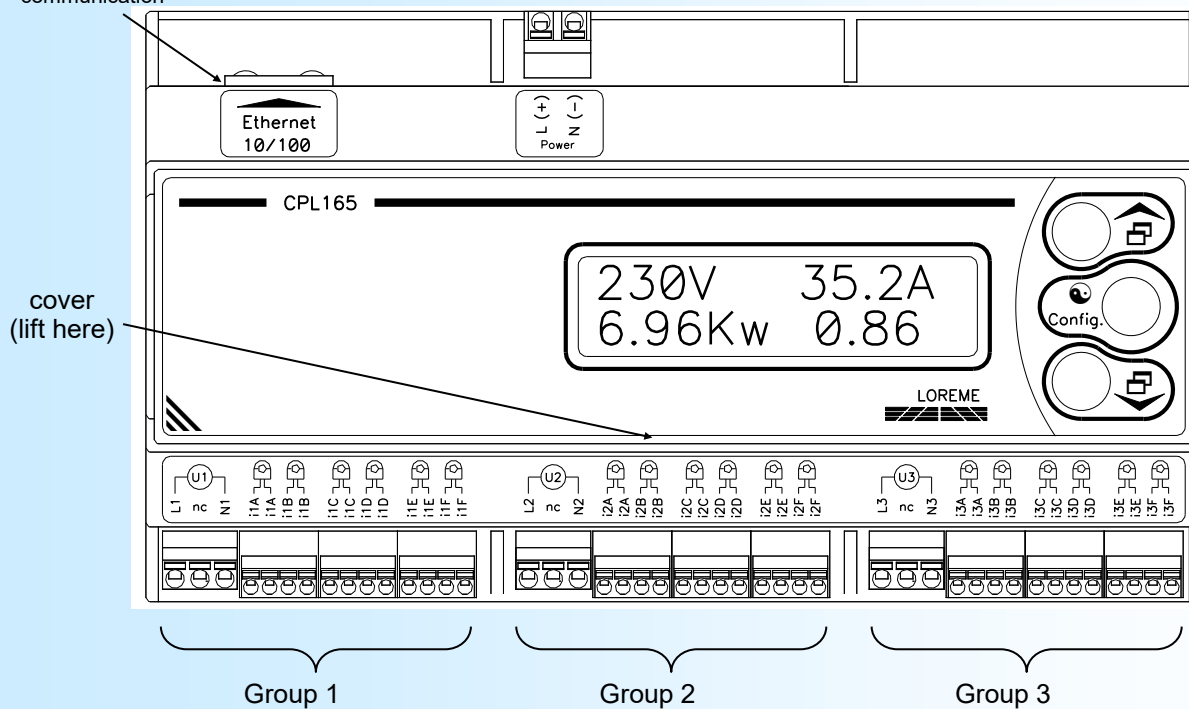


DIAGRAMS OF CONNECTIONS



option Ethernet communication

Power connector



Constitution of a group:

- One voltage input,
- up to 6 current channels (input for opening current transformer (Ti)).
When a current input is not used, it is preferable to short-circuit it to avoid misleading in the calculation of powers / energies.

CPL165 connection with DATA CENTER BOX PLC

