PROGRAMMABLE NETWORK CONVERTER ANALYZERS

LOREME

UTILIZATION AND CONFIGURATION HANDBOOK

IPL244 - IPL144L

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Download manual at : www.loreme.fr

REV 2.3 - 19/04/10

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Device Presentation

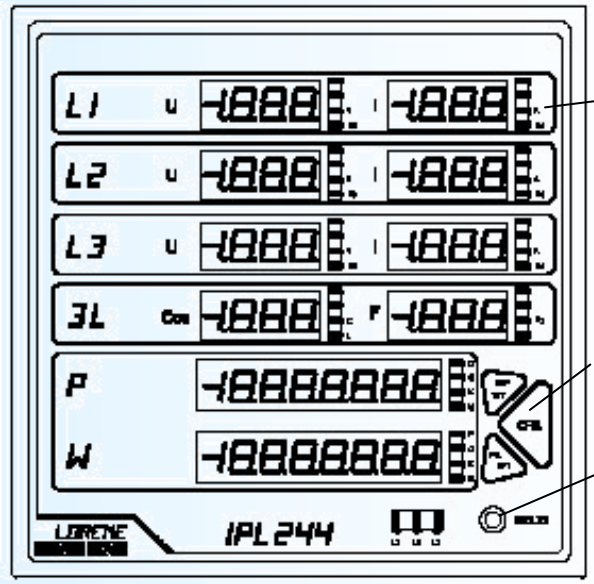
The purpose of this configuration handbook is to allow to become familiar with the functions supplied by the device. The devices are provided of functions required to the analyst of every networks. It possess 3 voltage inputs and 3 current inputs totaly isolated among it, who allows the realisation of direct and alternating measures, monophase or triphase, balanced or unbalanced, with or without neutral system.
They can receive up to 8 slots. Number and functions are listed below and must be specified at the order:

- analogical slot, current, voltage,
- relay slot, alarm, energy meter,
- communication slot, RS485 MODBUS / JBUS.

Difference between twos devices comes from their display.

USER INTERFACE

1) IPL244:



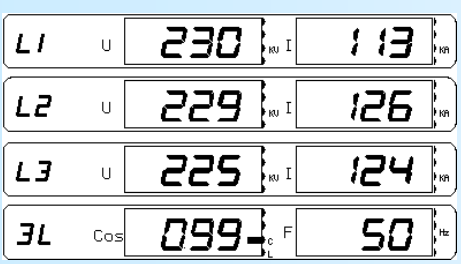
IPL244 front side is composed of:

- 10 displays with 8 mm red leds:
  - 8 values of 3 digits 1/2,
  - 2 valued of 7 digits 1/2.
- 1 jack 3.5 plug for RS 232 link,
- 3 keys:

-  "DSP" button allows to change size type displayed value on zone B, power, positive energy, negative energy.
-  "PH" button allows to change displayed phase on zone B, phase 1, 2, 3 or phases sum.
-  both buttons simultaneously pushed resets all energies measures, if function is validate in configuration.

Three displays modes are available. For A zone, change is made by RS232, and for B zone, by front side buttons.

- Zone A, "Voltage/Current" display:
  - voltage and current for each phases,
  - network cos phi and frequency.



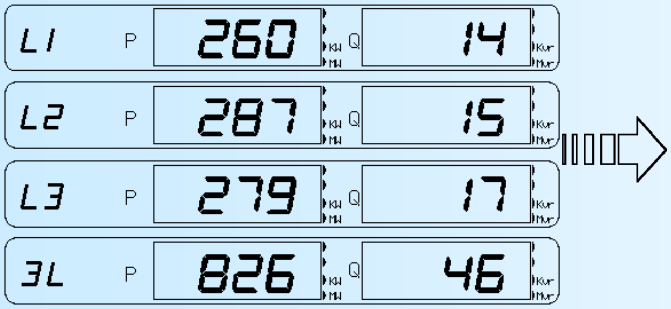
Voltages and currents measures are in V and A when leds are off, KV and KA when leds "KV" and "KA" are on.

Cos phi is capacitive, when "C" led is on, inductive, when "L" led is on. Frequency is given in Hz.

Note: When device is connected to a unbalanced three-phase network with neutral, displayed voltages can be star-voltage or interlinked voltage.

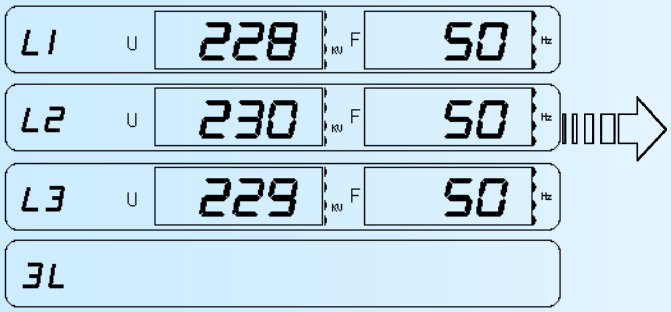
User Interface

- Zone A, "Power" display:
  - active and reactive power for each phase,
  - active and reactive network power.



Actives and reactives powers are in W and "VAR" when leds are off, KW and KVAR when "KW" and "KVAR" leds are on, MW and Mvar when "MW" and "MVAR" leds are on, GW and GVAR when "KW + MW" and "KVAR + MVAR" leds are on.

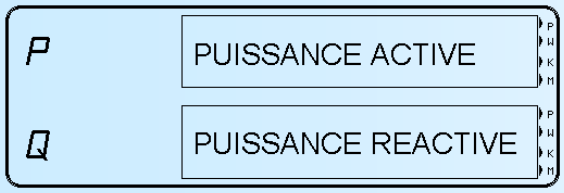
- Zone A, "Voltage/Frequency":
  - each phases voltage and frequency.



Frequencies are in Hz.

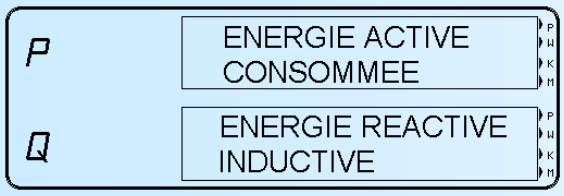
Voltages are in V, when leds are off, KV when KV leds are on.

- Zone B, "Power" display:
  - active and reactive power of the selected phase



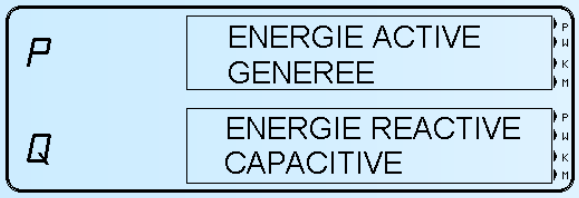
P led is on.

- Zone B, "Positive energy" display:
  - consumed active energy of the selected phase,
  - inductive reactive energy of the selected phase.



W led is on.

- Zone B, "Negative energy" display:
  - generated active energy of the selected phase,
  - capacitive reactive energy of the selected phase.



W led is on and "-" sign precede the value.

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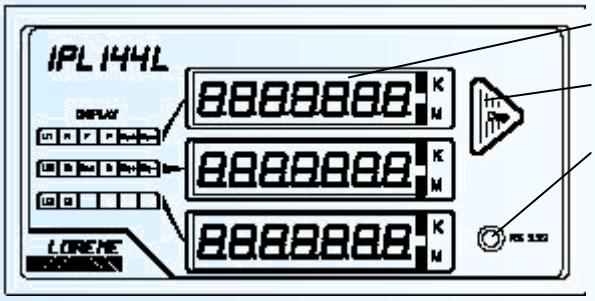
User Interface

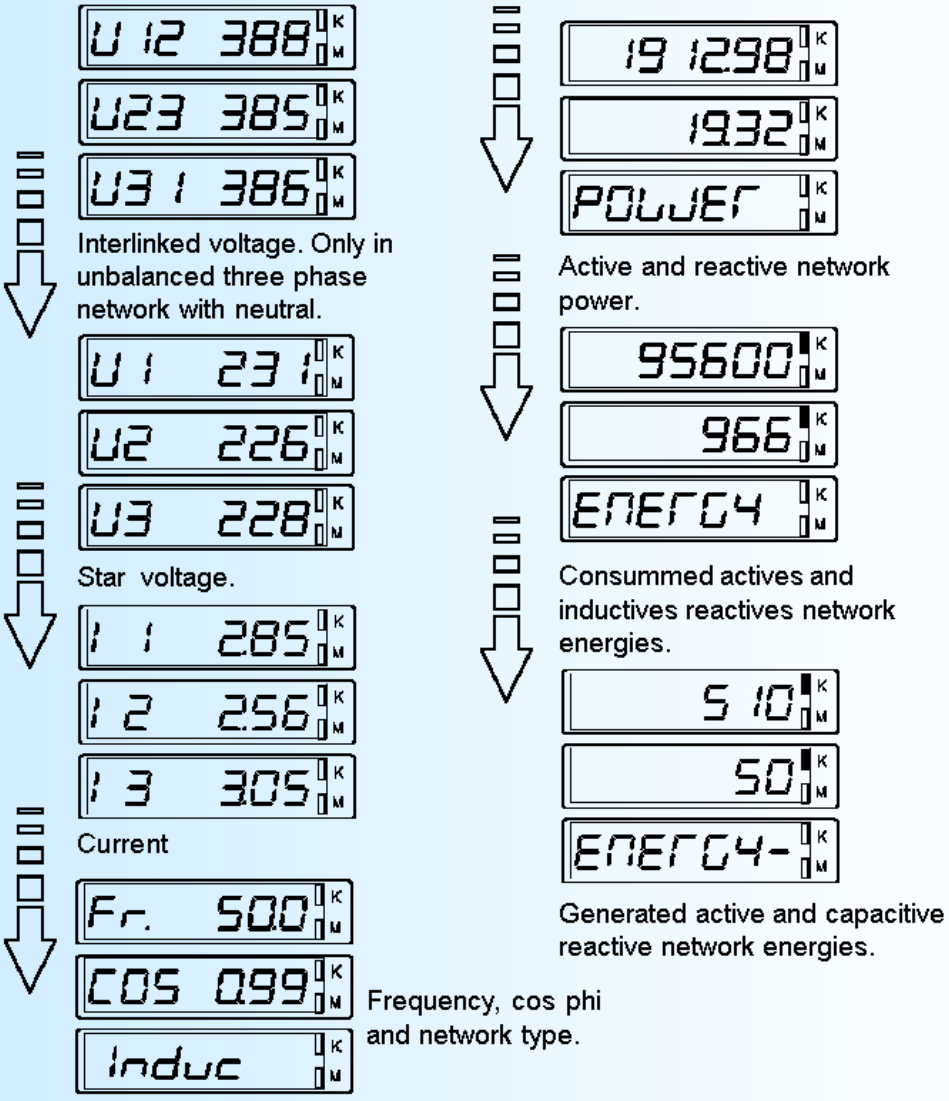
2) IPL144L:



IPL144L front side is composed of:
- 3 displays 7 digits with red leds 8mm,
- 1 jack 3.5 plug for the RS 232 link,
- 1 push button,

"Dsp" button allows to change size type displayed, star voltage, interlinked voltage, currents, power, cos phi, frequency, energies. A 5 s push allows to reset all measured energies.
This function is validated in RS232 mode

7 display tables are available:
Measure are in Kilo when "K" led is on, Mega when "M" led is on, Giga when "K" + "M" leds are on.



Dialogue - Terminal Mode

Numeric devices can converse with all terminal emulation mode systems. As the dialogue and configuration part are in device's memory, no software or specific interface are necessary for their configuration.
Two terminal emulation mode systems are presented: the PSION and the PC. Differents procedures are enumerated below.

PSION Workabout: (terminal portable)

To start up the PSION push on the **"ON"** key.
At the presentation, push on the **"MENU"** key. Select **"SYSTEME SCREEN"** mode and validate by **"ENTER"**.

Icons display: **DATA CALC SHEET PROGRAM COMMS**

Select icon **"COMMS"** and validate by **"ENTER"**, on display, a cursor flashing. The **PSION** is in terminal mode. Plug in "RS232" on PC. The measure is displayed and, to configure, push **"C"** on keyboard.

To quit terminal mode and switch off PSION, push on **"OFF"** key. When you re-start the **PSION** in terminal mode, it start automaticaly and directely in terminal mode without re-start configuration.
du **PSION**, celui-ci se placera automatiquement et directement en mode terminal sans qu'aucune configuration ne soit nécessaire.

PC with WINDOWS:

Step for start up terminal program:

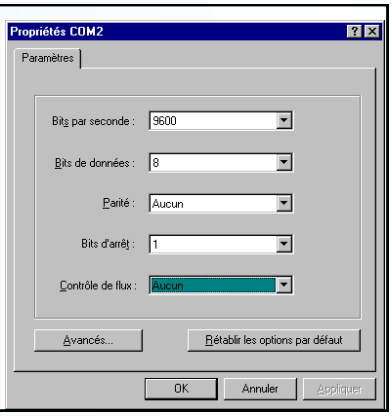
1

1 - Clic on **"START"** bouton.
2 - Tick off **"Programs \ Accessories \ Communication \ Hyper Terminal"**
3 - Clic on **"Hypertrm.exe"**

2 Enter a name for the new connection

3 Choose a communication port

4 Choose:
- 9600 bauds
- 8 data bits
- no parity
- 1 stop bit
- no flow control



5 PC is now in terminal mode, connect to device by plugging the RS232 link cable. Measure is now displayed and to access configuration, press **"C"** key .

6 When leaving HyperTerminal, the following window will appear.

By accepting the reccording of the session, terminal mode will be able to be started again without using this procedure..

Thus, the short cut 

will permit to communicate with all LOREME devices.

Note: to modify 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.

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Visualization

When switching on, device is automatically put in measure mode.
On 2 lines display mode, the next messages will be displayed:

CONFIGURATION	Accessing to configuration mode
TAPEZ SUR C	Press on "C" key

Access keyboard keys:

"C"	device configuration access.
"$"	full-screen mode (PC only),
"Enter"	2 lines display mode,

The presentation of the measures in a full-screen mode is as follows:

	L1	L2	L3	3L
VOLTAGE	230 V	229 V	225 V	228 V
CURRENT	1.13 A	1.26 A	1.24 A	1.21 A
FREQUENCY	50 Hz	50 Hz	50 Hz	50 Hz
COS PHI	0.99	0.99	0.99	0.99
ACTIVE P.	260 W	287 W	279 W	829 W
REACTIVE P.	14 Var	15 Var	17 Var	46 Var
APPARENT P.	259 VA	287 VA	279 VA	829 VA
ACTIVE CONS. W.	54 kW.h	47 kW.h	49 kW.h	150 kW.h
ACTIVE GENE. W.	0 kW.h	0 kW.h	0 kW.h	0 kW.h
REACTIVE IND. W.	0 kvar.h	0 kvar.h	0 kvar.h	0 kvar.h
REACTIVE CAP. W.	5 kvar.h	4 kvar.h	4 kvar.h	13 kvar.h

UNBALANCED TRIPHASE NETWORK WITH NEUTRAL

CT RATIO	1.00
TI RATIO	1.00

Full-screen mode is available only on a PC with KERMIT software. It isn't possible to use this mode with WINDOWS. Full-screen mode slows down the device. It is recommended to quit this mode when it is not necessary.

CONFIGURATION

The handbook explains in detail the different configurations possibilities:
Language choice, input caliber, network, energy, slots.
To enter configuration mode, just press **"C"** key.

1) Method:

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

1.1) Menu selecton:

exemple: INPUT — The user makes a choice by pressing the keys **"Y"** or **"N"**.
Y - N — This choice allows to access the different menus of configuration.

1.2) Parameter selection:

exemple: VOLTAGE (Y - N) YES or VOLTAGE (Y - N) NO

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

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

Configuration

Choice is made by pressing **"Y"** or **"N"** ke ys, and validation is made by pressing corresponding key to displayed answer (**"Y"** for YES and **"N"** for NO) or **"Enter"** (PC)/**"EXE"** (PSION). Pressing key **Enter/EXE** without modification allows to validate the previous answer.

1.3) Value acquisition:
exemple: LOW SCALE
4 mA

Two cases are possible:
- validation without modification, just press Enter / EXE,
- value modification on keyboard (simultaneous display), followed by validation with Enter / EXE.

Note concerning acquisitionvalue :
- It is possible, when a mistake is made during a value acquisition, before validating it, to go back by pressing "DEL" key (only on PSION), which re-displays the message without taking notice of the wrong value.
- In configuration mode, if there is no action, device goes back in operating mode after a two minutes delay without taking notice of modifications made before.
- In configuration mode, if you want to shift to measure mode without taking notice of the modifications made before, you just have to press "ESC" (PC) or "SHIFT + DEL" (PSION) key.

During configuration, if sum has been chosen, device calculate:
- channels mean for voltage, current and frequency.
- channels sum for power and energy.
- channels result for cos φ.

2) Language:
Languages possibilities are:
- French,
- English.

3) Caliber:
On inputs voltage, 2 calibers are available in standard. To use one of twos, just select it in configuration:
- voltage 125 V,
- voltage 500 V.

4) Network:
Network wiring possibilities are:
- in alternating current:
  - monophase,
  - balanced three-phase without neutral,
  - balanced three-phase with neutral,
  - unbalanced three-phase without neutral,
  - unbalanced three-phase with neutral.
- in direct current:
  - 1 channel,
  - 2 channels,
  - 3 channels.

It is also necessary to configure:
- PT ratio (potential transformer),
- CT ratio (current transformer).

5) Energy:
In this menu, it is possible to:
- validate energies reset access by front side push-buttons.
- reset all the energies.

Warning: all energies are definitely reseted.

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Configuration

6) Slots:

6.1) Analogical slot:

Analogical slot configuration is composed of 2 rubrics:

- output assignement:
  - measured value:
    - star voltage, interlinked voltage (only in 3 wattmeters),
    - current, invert current (only in 3 wattmeters),
    - frequency,
    - cos phi,
    - active, reactive, apparent power
    - consumed/generated active, inductive/capacitive reactive energy.
  - measured phase, according to network configuration:
    - phase 1,
    - phase 2,
    - phase 3,
    - phases sum or mean.
  - measure scale, low and high.

- output parameter:
  - type, current or voltage,
  - scale, low and high,
  - numerical filter,
  - limitation.

Numerical filter allows to smooth an analogical output, measure of which would be disrupted, fluctuating or exposed to interferences.

Limitation allows, for all measured signal values, to peak clip the output signal swing at scale configuration.

6.2) Relay slot:

Relay slot can be used in alarm or energy meter

6.2.1) Alarm:

Slot relay configuration in alarm is composed of 2 rubrics:

- alarm assignement:
  - measured value:
    - star voltage, interlinked voltage (only in 3 wattmeters),
    - current, invert current (only in 3 wattmeters),
    - frequency,
    - cos φ,
    - active, reactive, apparent power
    - consumed/generated active, inductive/capacitive reactive energy.
  - measured phase, according to the configuration of the network:
    - phase 1,
    - phase 2,
    - phase 3
    - phases sum or mean.

- alarm parameters:
  - detection type, high or low threshold,
  - threshold value,
  - hysteresis.

Detection type works in this way:

- **High threshold:**

.alarm is active when measure is beyond threshold,
.alarm is inactive when measure is below threshold less hysteresis.

- **Low threshold:**

.alarm is active when measure is below threshold,
.alarm is inactive when measure is beyond threshold more hysteresis.

Configuration

6.2.2) Energy meter:
Relay slot configuration in energy meter is composed of 2 rubrics:
- assigning the meter:
    - measured value:
        - consumed active energy,
        - generated active energy,
        - inductive reactive energy,
        - capacitive reactive energy,
    - phase measured according to network configuration:
        - phase 1,
        - phase 2,
        - phase 3,
        - sum of the phases.

- counting parameters:
    - impulse load value, in kvar.h or kW.h.

6.3) RS485 slot:
Configuration of communication is composed of 3 rubrics:
- device **address** in communication network, from 1 to 255,
- **speed**, 600, 1200, 2400, 4800, 9600, 19200 or 38400 bauds,
- **parity**, even, odd or without.

Measured datas are available on differents formats:
- 32 integer signed bits for measures,
- 32 integer unsigned bits for energies,
- 32 integer bits in per cent of full measure caliber for inverted current.

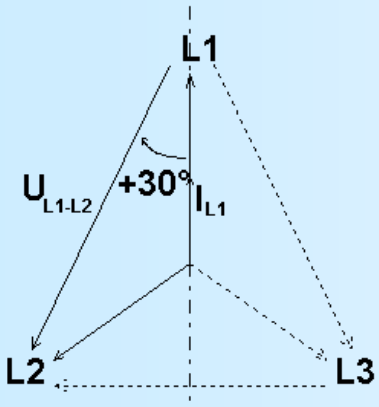
For more details, see RS485 communication Modbus capter at the end of handbook.

7) Special functions:
Special functions are linked to network type used. Network configuration will allows differents access to functions.

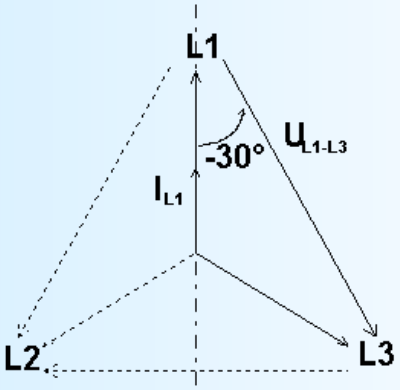
7.1) Single voltage mode:
This function is used only for an unbalanced three-phase network with neutral. It allows to realise a unbalanced three-phase with neutral measure with a single voltage wired. This voltage, L2 phase, has to be wired on the 3 voltages inputs.

7.2) Initial angle:
Used only for a balanced three-phase network without neutral.This function allows a wiring adaptation. Phase angle acquisition between voltage and current allows to use any voltage phases with any current phases.

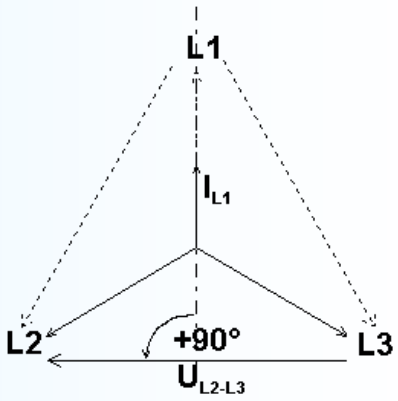
Configuration



With I1, L1 and L2,
+30° initial angle



With I1, L1 and L3,
-30° initial angle



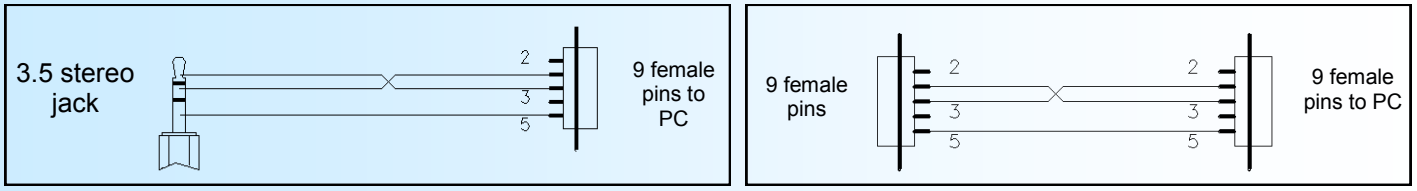
With I1, L2 and L3,
+90° initial angle

VALUE TO ENTER AT THE QUESTION : INITIAL ANGLE

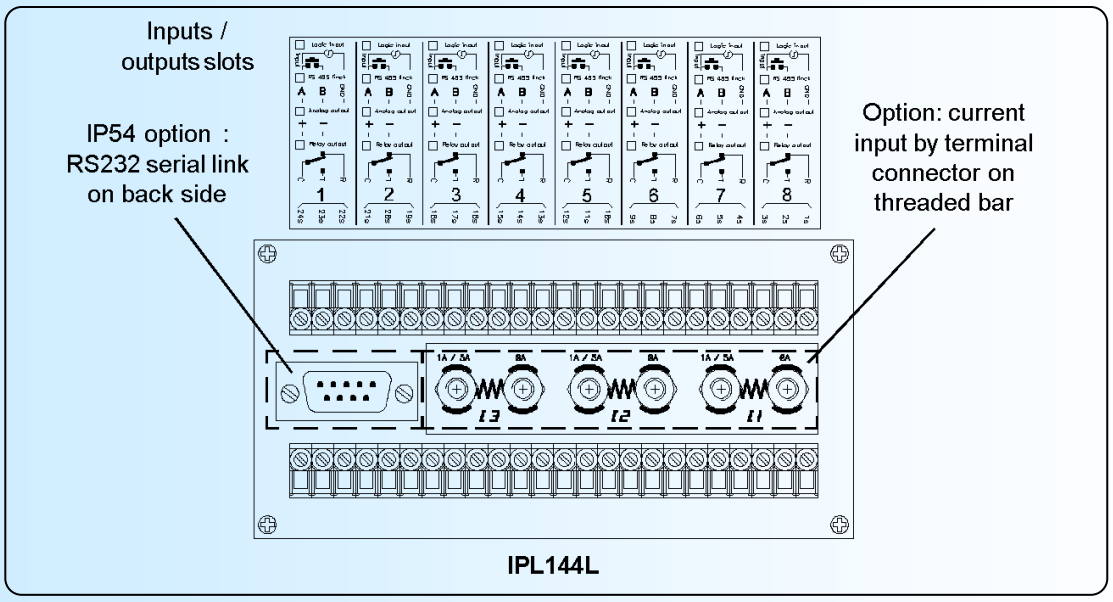
	I1	I2	I3
With L1 and L2	**+30°**	**-30°**	**+90°**
With L1 and L3	**-30°**	**+90°**	**+30°**
With L2 and L3	**+90°**	**+30°**	**-30°**

Wiring

PC - ANALYZER LINK



DIAGRAMS OF CONNECTIONS



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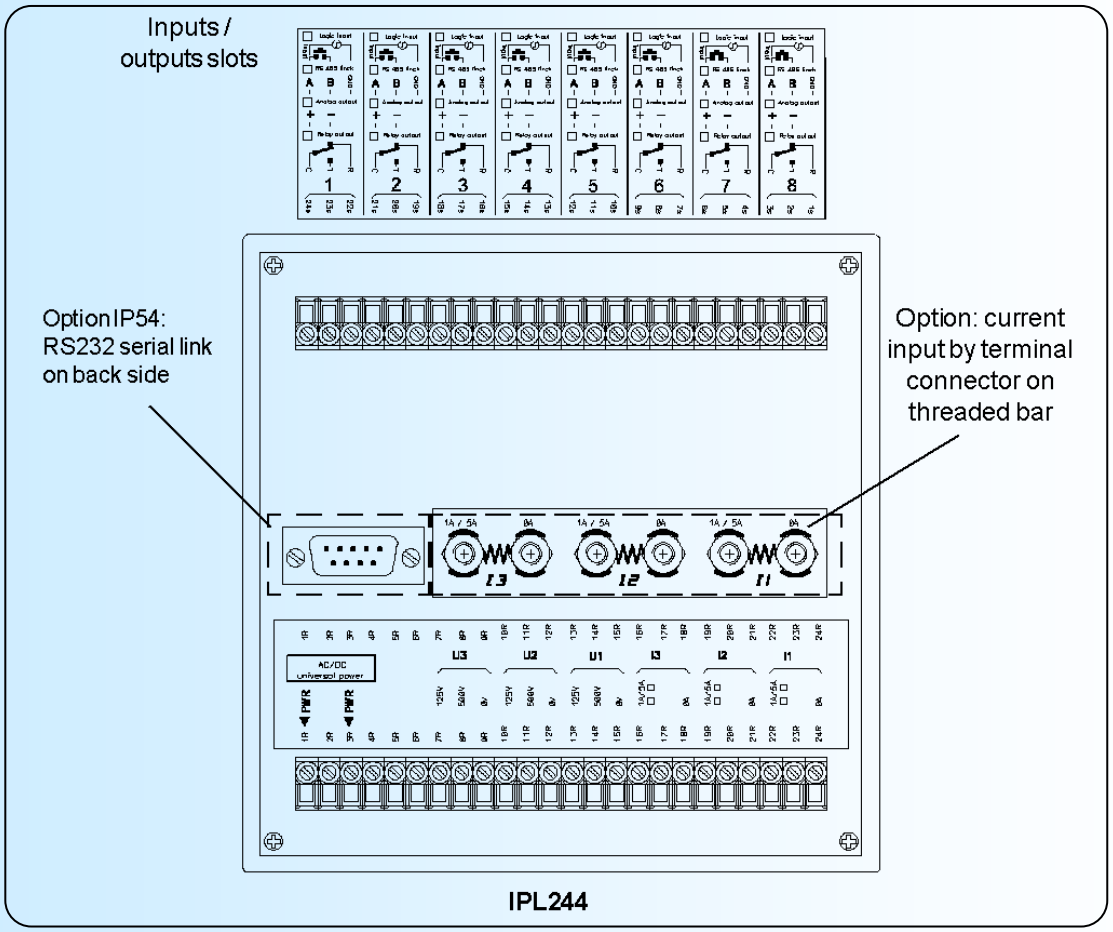

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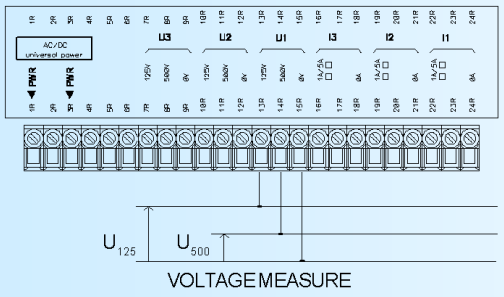
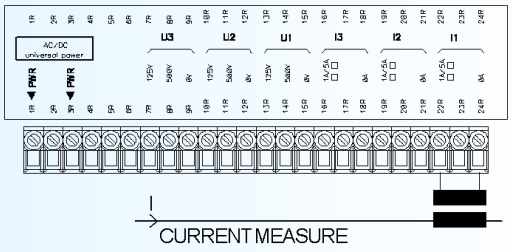
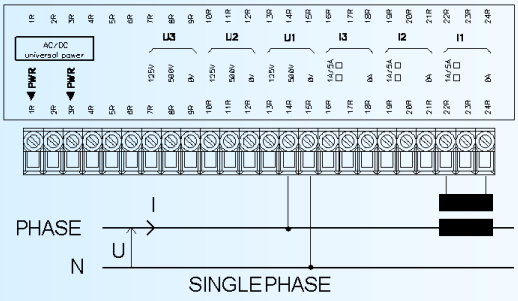
Diagrams of connection



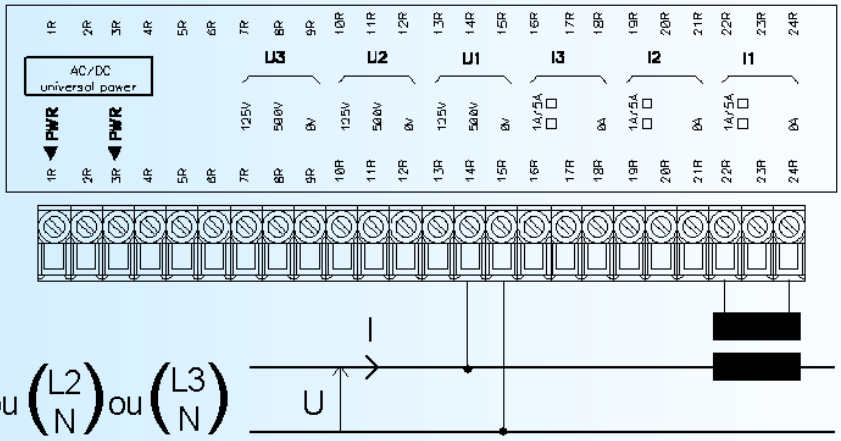
VOLTAGE MEASURE



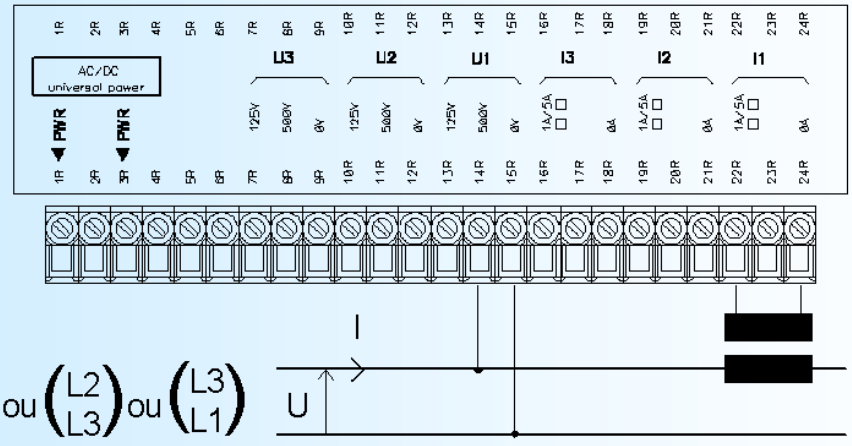
CURRENT MEASURE



SINGLE PHASE



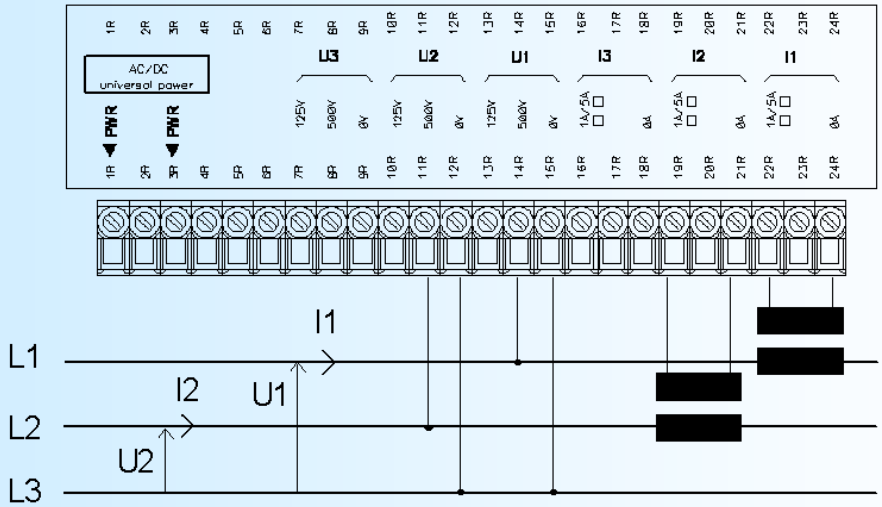
BALANCED THREE-PHASE WITH NEUTRAL



BALANCED THREE-PHASE WITHOUT NEUTRAL

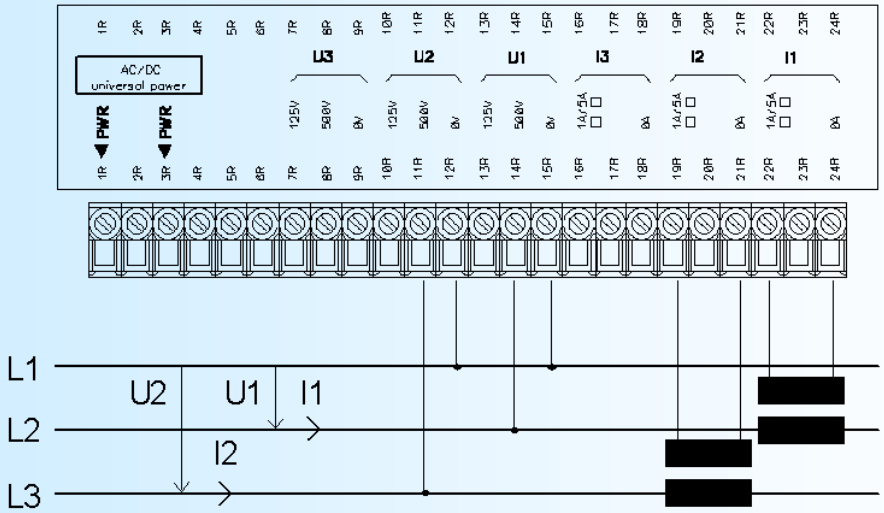
Using of initial angle for wiring adaptation

Diagrams of connection



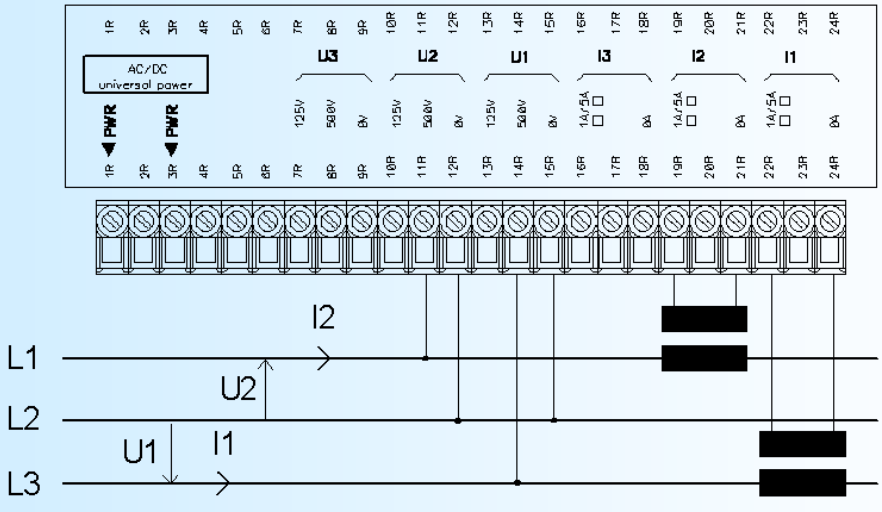
UNBALANCED THREE-PHASE WITHOUT NEUTRAL

2 wattmeters methode with I1 and I2 available



UNBALANCED THREE-PHASE WITHOUT NEUTRAL

2 wattmeters methode with I2 and I3 available



UNBALANCED THREE-PHASE WITHOUT NEUTRAL

2 wattmeters methode with I3 and I1 available

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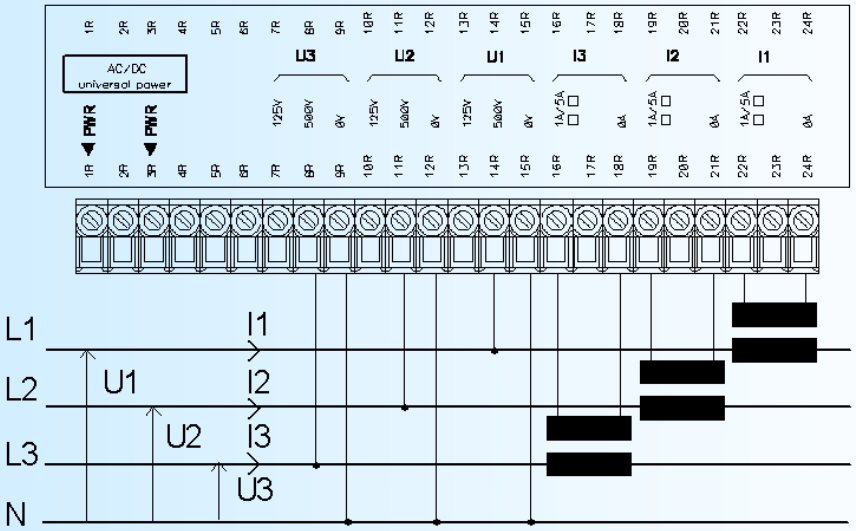
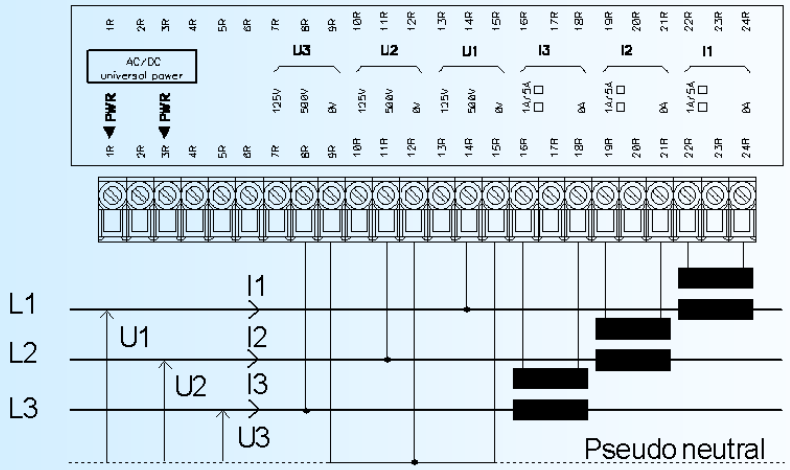
Diagrams of connection

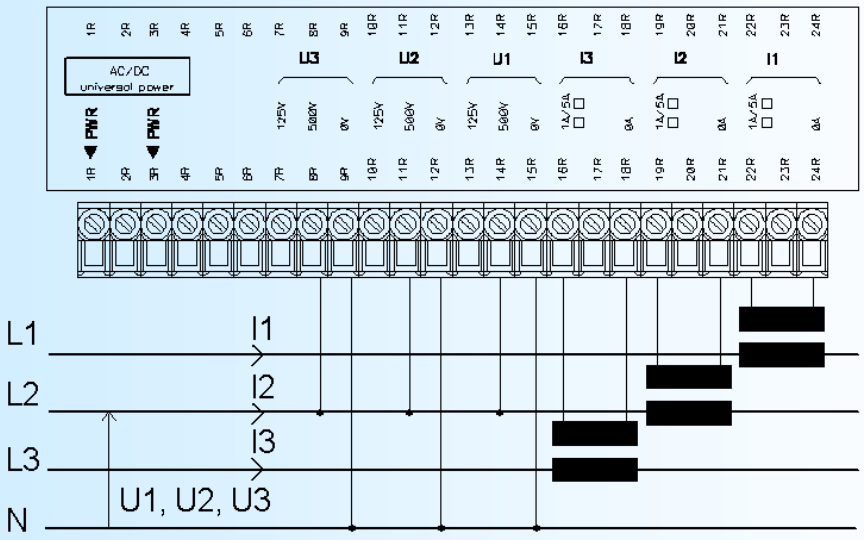


UNBALANCED THREE-PHASE WITH NEUTRAL



UNBALANCED THREE-PHASE WITHOUT NEUTRAL
WITH 3 CURRENTS

Unbalanced three-phase with neutral configuration, the three 0V are linked, device reconstitue a pseudo neutral



UNBALANCED THREE-PASE WITH NEUTRAL

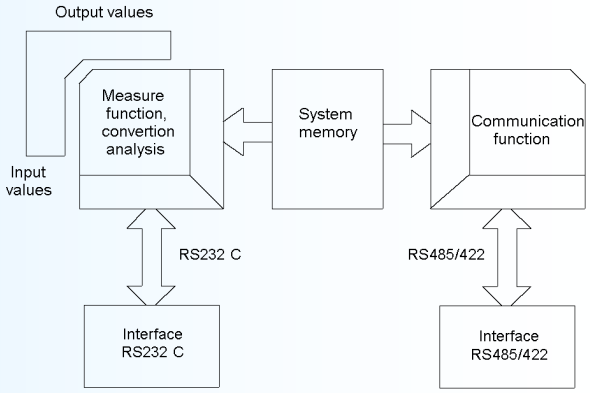
Single voltage mode

RS485 Communication Modbus

1) Internal structure:

1.1) Presentation:

The device is divided in two cells. Each cell has a specific function while keeping a continuous exchange of pieces of information with the second cell.
The first cell is in charge of the measure, analysis and conversion function.
The second cell is in charge of the communication function.
The information exchange is continuous and automatic.



1.2) Measure function:

The measure cell runs the acquisition of the different signals and calculates all the values with regards to the configuration of the device.
It also runs all the output functions (analogical, alarm, meter, RS 232). All measured or calculated parameters are stored in the system memory and are constantly refreshed.

1.3) Communication function:

The communication cell runs the RS485 communication interface in the MODBUS/JBUS protocol. It analyzes the requests of the main station and answers if the device is addessed. It draws all these data from the system memory that can be continuously accessed.

1.4) System memory:

Each cell can continuously access the system memory. The latter has a dual access, which allows a reading/writing of the data whitout any possible internal conflicts.

2) Communication:

The type of protocol used is: MODBUS/JBUS in RTU mode. The communication has neither header nor delimitator of frame. The detection of the start of frame is made by a silence whose time is at least equal to the transmission of 3.5 bytes. It implies that a frame received can be processed only after a time equal to the silence given before. The time of this silence is directly linked to the speed of transmission of the system:

Ex: Speed 9600 bauds - no parity (10 bits/byte)
Silence = (3.5 x 10) / 9600 = 3.64 ms
The device starts to process the frame 3.64 ms after receiving the last byte.

Note: The time separating two bytes from a same frame must be inferior to a silence. If the user does not comply with this condition,the second byte will be considered as the first one of a new frame.

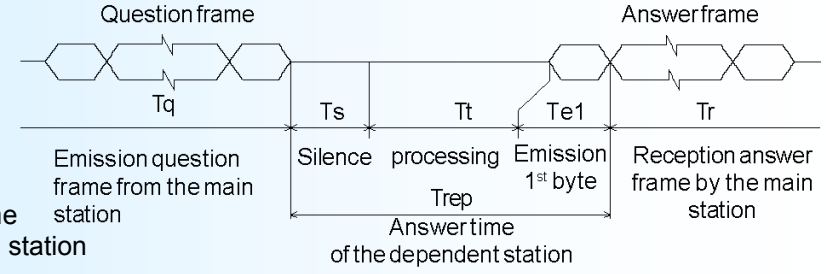
The interval of time separating the end of reception of the last byte of the question frame and the end of emission of the first byte of the answer frame (detection of frame of the main station) constitutes the answer time of the device.

This answer time Trep includes:
- the silence (time of 3.5 bytes) Ts,
- the processing of the frame Tt,
- the emission of the first byte Te1.

The time beyond which the device does not answer is called **"TIME OUT"**. It depends on the transmission parameters (speed, format) and the type of the function asked (reading, writing). This time must be defined by the user and must be superior to the answer time of the device.

A complete communication cycle includes :
- the question frame transmission Tq
- the device answer time Trep
- the answer frame transmission Tr

Three reasons might cause aTIME OUT:
- wrong transmission data at the question frame time
- wrong configuration of the TIME OUT on the main station
- dependent station out-of-order.



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3) Implementation:

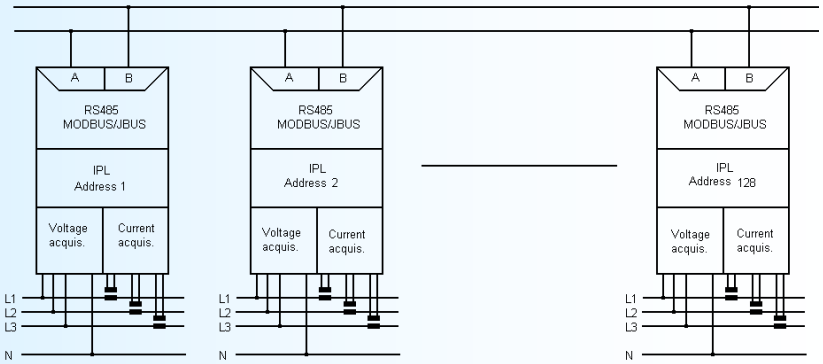
3.1) Parametrizing:

Before starting up the RS485 MODBUS/JBUS communication, make sure that:

- the transmission speed is identical between the dependent stations (LOREME devices) and the main station.
- the parity is identical between the dependent stations (LOREME devices) and the main station.
- the addresses are correctly distributed among the dependent stations (LOREME devices), no identical addresses for two dependent stations.
- the TIME OUT is correctly adjusted on the main station.

All the speed parameters , parity and address must be configured on the devices with the RS232 link.
The devices .configuration possibilities are the following ones:

- address: from 1 to 255
- speed: 600, 1200, 2400, 4800, 9600, 19200, 38400 bauds
- parity: even, odd, without.



3.2) Interconnection:

The RS485 interface used allows to connect 128 dependent stations on the same network. For better operating conditions (noise immunity), the network will have to be made up of a twisted pair.

4) Communication time:

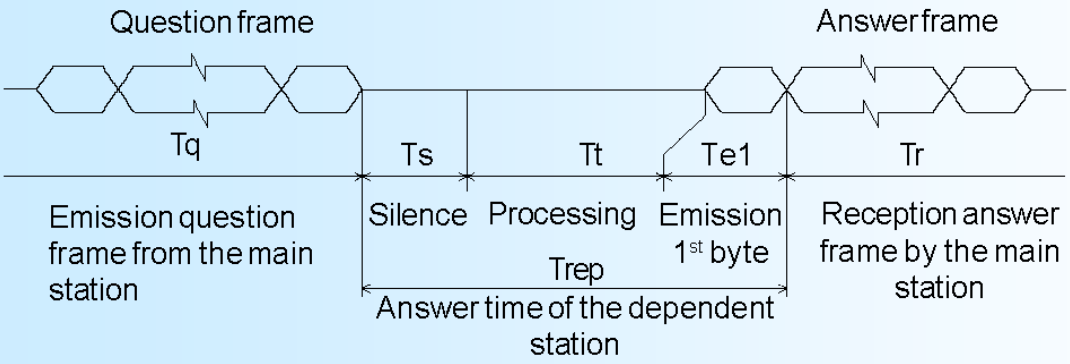
4.1) Procedure:

Analysis of the times of communication for parameters of data transmission and for particular cases.

- reading measure phase, energy,
- energy reset,
- speed: 9600 bauds, parity: none.

4.2) Voltages reading:

Reading of 6 words (12 bytes) from address $A002 to $A007



- 8 bytes question frame	Tq = (8 x 10) / 9600 = 8.33 ms
- Silence	Ts = (3.5 x 10) / 9600 = 3.64 ms
- Processing	Tt = 40 ms
- Emission 1st byte	Te1 = (1 x 10) / 9600 = 1.04 ms
- Answer time	Trep = Ts + Tt + Te1 = 44.68 ms
- Answer frame (17 bytes)	Tr = [(17 - 1) x 10] / 9600 = 16.66 ms
- Complete cycle	Tcyc = Tq + Trep + Tr = 69.67 ms

The processing time Tt is fixed. It depends neither on the speed nor on the transmission format. Consequently, for new transmission parameters, all the times are going to change but for Tt.
To set the **TIME OUT** of the system, you just have to calculate the answer time Trep of the dependent station according to the parameters of communication.
For a total phase reading, the time of cycle of the system is about 70 ms.

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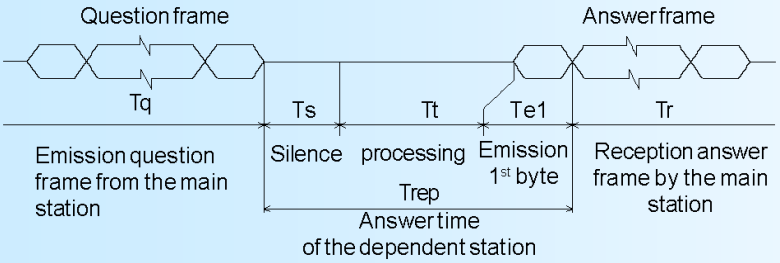
4.3) Energies reading:

Reading of 8 words, 16 bytes, of the address $A01E to $A025 (active consumed and generated, and reactive inductive and capacitive energies)

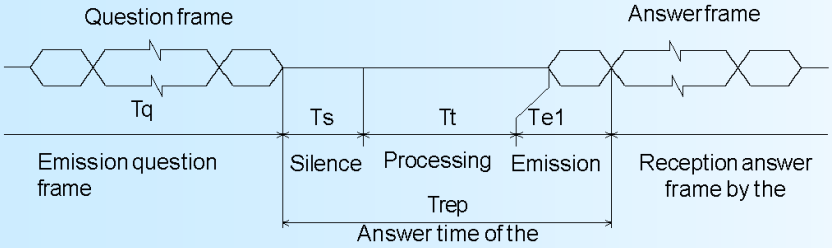


- 8 bytes question frame	Tq = (8 x 10) / 9600 = 8.33 ms
- Silence	Ts = (3.5 x 10) / 9600 = 3.64 ms
- Processing	Tt = 40 ms
- Emission 1st byte	Te1 = (1 x 10) / 9600 = 1.04 ms
- Answer time	Trep = Ts + Tt + Te1 = 44.68 ms
- Answer frame (37 bytes)	Tr = [(21 - 1) x 10] / 9600 = 20.83 ms
- Complete cycle	Tcyc = Tq + Trep + Tr = 73.84 ms

Note: The processing time Tt is fixed. It depends neither on the speed nor on transmission format. Consequently, for new transmission parameters, all the times are going to change but for Tt. To set the **TIME OUT** of the system, you just have to calculate answer time Trep of the dependent station according to the parameters of communication. For a total phase reading, the system time cycle is about 75 ms.

4.4) Energies reset:

Reset of the active consumed and generated, and reactive inductive and capacitive energies by the writing of word $55AA at the address $7000.

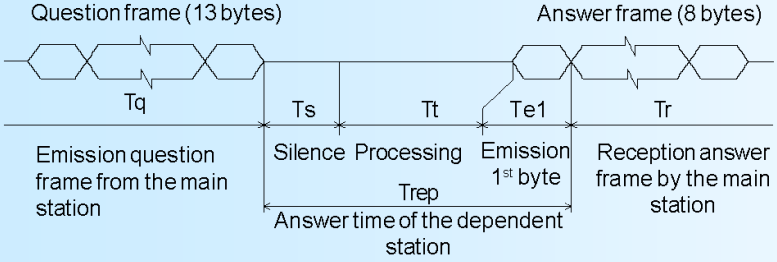


- question frame	Tq = (8 x 10) / 9600 = 8.33 ms
- silence	Ts = (3.5 x 10) / 9600 = 3.64 ms
- processing	Tt = 40 ms
- emission 1st byte	Te1 = (1 x 10) / 9600 = 1.04 ms
- answer time	Trep = Ts + Tt + Te1= 44.68 ms
- answer frame 8 bytes	Tr = [(8 - 1) x 10] / 9600 = 7.29 ms
- complete cycle	Tcyc = Tq + Trep + Tr = 60.3

The processing time Tt is fixed. It depends neither on the speed nor on the transmission format. Consequently, for new transmission parameters, all the times are going to change but for Tt. To set the TIME OUT of the system, you just have to calculate the answer time Trep of the dependent station according to the parameters of communication.For a complete reset of the energies, the time of cycle of the system is about 60 ms.

4.5) Energy value writting:

Writing of one energy value at once, active consumed or generated, reactive inductive or capacitive energy on the sum of the channels. Writting of 2 words, 4 bytes, of the adress $A01E $A01F (active consummed energy).



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- Question frame Tq = (13 x 10) / 9600 = 13.54 ms
- Silence Ts = (3.5 x 10) / 9600 = 3.64 ms
- Processing Tt = 40 ms
- Emission 1st byte Te1 = (1 x 10) / 9600 = 1.04 ms
- Answer time Trep = Ts + Tt + Te1 = 44.68 ms
- Answer frame Tr = [(8 - 1) x 10] / 9600 = 7.29 ms
- Complete cycle Tcyc = Tq + Trep + Tr = 65.51 ms

Note: The processing time Tt is fixed. It depends neither on the speed nor on the format of transmission. Consequently, for new parameters of transmission, all the times are going to change but for Tt. To set the **TIME OUT** of the system, you just have to calculate the answer time Trep of the dependent station according to the parameters of ommunication. For a writing of energy value, the time of cycle of the system is about 65 ms.

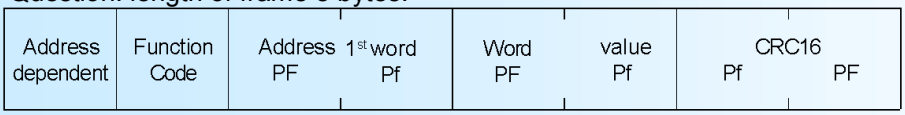
5) Frames structure:

5.1) Words reading:

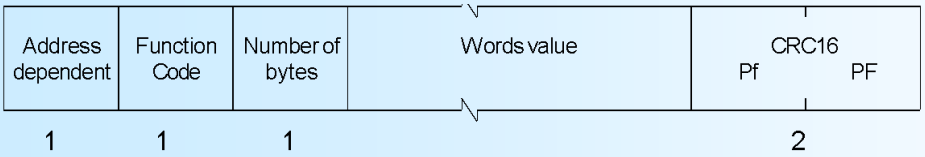
Function code used: $03 or $04

Table reading: address $A000 to $A05B

Question: length of frame 8 bytes.



Answer: length of frame 5 bytes+ number of read bytes.

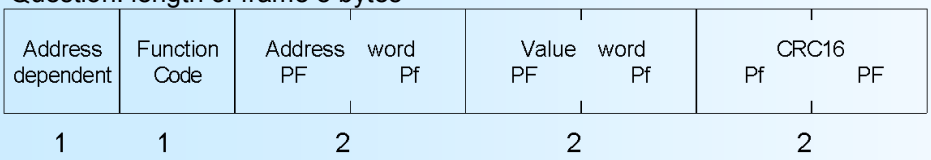


5.2) Word writing:

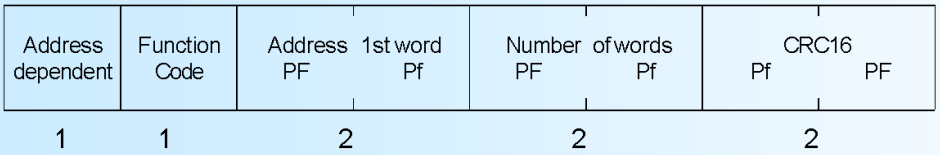
Function code used: $06

Reset of all energies: Address $7000 Word value $55AA

Question: length of frame 8 bytes



Answer: length of frame 8 bytes



5.3) Words writting:

Function code used: $10

Writing of an energy value:

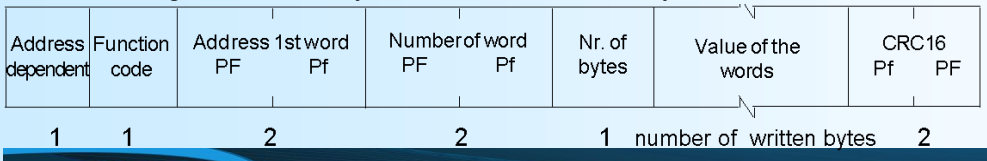
Active consumed energy: address $A01E

Active generated energy: address $A020

Reactive inductive energy: address $A022

Reactive capacitive energy: address $A024

Question: length of frame 9 bytes + number of written bytes.



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Answer: length of frame 8 bytes.

Address dependent	Function code	Address 1st word PF Pf	Number of words PF Pf	CRC16 Pf PF
1	1	2	2	2

5.4) Exception frame:
When a physical error of transmission of a question frame occurs (CRC16 or parity), the dependent station does not answer.
If an error of frame (data address, function, value) occurs, an answer of exception will be emitted by the dependent station.

Length of frame: 5 bytes.

Address dependent	Function code	Error code	CRC16 Pf PF
1	1	1	2

Features of the exception frame:
- Function code:
The function code of the exception frame is identical to the one of the question frame, but its bit of strong load is set to 1 (logical or with $80).

- Error code:
Error code establishes the reason of a sending of an exception frame.

Error frame	Meaning
$01	Function code not used. Only the functions reading of words, $03 or $04, writing of a word $06, or words $10 are allowed.
$02	Non-valid data address. Memory access not allowed.
$03	Non-valid value. Value of word not allowed.

6) Communication data:
6.1) Reading:
All measures are accessible in reading mode, voltage, current, frequency, active, reactive, apparent power, cosinus phi, consumed/generated active and inductive/capacitive reactive energy on phases 1, 2, 3 and sum.

Numerical values are:
- on 2 words at signed 32 bits integer format (4 bytes), for voltages, currents, frequencies, active, reactive, apparent powers and cos φ.
- on 2 words at 32 bits integer format (4 bytes) in % of full caliber of measure for inverse current.
- on 2 words unsigned 32 bits integer format (4 bytes), for energies (value in kW.h or kVAR.h).

Consult the enclosed tables for measures detail.

6.2) Writing:
It's possible to reset all energies by a write. Reset is made by writtiing $55AA value at $7000 address.

Phases sum energy values are accessible individually in writtig and only one value at time. Write format is the same as reading one, unsigned 32 bits integer format.

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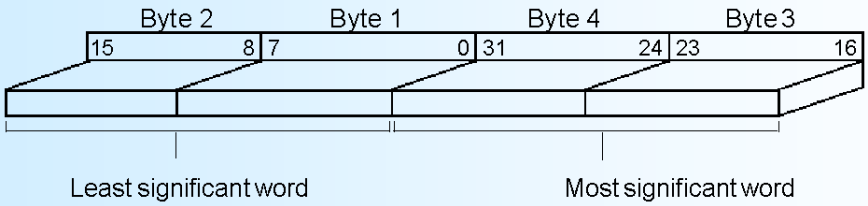
6.3) Data format:

Datas are given in integer 32 bits format.

Datas transmitted lest significant word first, compound of 4 bytes i.e 2 words.



The datum of reset is a hexadecimal code. This code is compound of 2 bytes, i.e.1 word. Code $55AA: reset of all energies.

7) Data Table:

Decimal word adrdess (Hexadecimal)	b7 b6 b5 b4 b3 b2 b1 b0			Total Words	Bytes
40960 ($A000)	Invert current	Byte 1	Word 1	1	1
	(% of the full caliber)	Byte 2			2
40961 ($A001)	(A)	Byte 3	Word 2	2	3
		Byte 4			4
40962 ($A002)	Star voltage	Byte 1	Word 1	3	5
	phase 1	Byte 2			6
40963 ($A003)	(V)	Byte 3	Word 2	4	7
		Byte 4			8
40964 ($A004)	Star voltage	Byte 1	Word 1	5	9
	phase 2	Byte 2			10
40965 ($A0005)	(V)	Byte 3	Word 2	6	11
		Byte 4			12
40966 ($A006)	Star voltage	Byte 1	Word 1	7	13
	phase 3	Byte 2			14
40967 ($A007)	(V)	Byte 3	Word 2	8	15
		Byte 4			16
40968 ($A008)	Interlinked voltage	Byte 1	Word 1	9	17
	Phase 1-2	Byte 2			18
40969 ($A009)	(V)	Byte 3	Word 2	10	19
		Byte 4			20
40970 ($A00A)	Interlinked voltage	Byte 1	Word 1	11	21
	Phase 2-3	Byte 2			22
40971 ($A00B)	(V)	Byte 3	Word 2	12	23
		Byte 4			24
40972 ($A00C)	Interlinked voltage	Byte 1	Word 1	13	25
	Phase 3-1	Byte 2			26
40973 ($A00D)	(V)	Byte 3	Word 2	14	27
		Byte 4			28

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Data table suite

Decimal word adrdess (Hexadecimal)	b7 b6 b5 b4 b3 b2 b1 b0			Total Words	Bytes
40974 ($A00E)	Current	Byte 1	Word 1	15	29
	Phase 1	Byte 2			30
40975 ($A00F)	(A)	Byte 3	Word 2	16	31
		Byte 4			32
40976 ($A010)	Current	Byte 1	Word 1	17	33
	Phase 2	Byte 2			34
40977 ($A011)	(A)	Byte 3	Word 2	18	35
		Byte 4			36
40978 ($A012)	Current	Byte 1	Word 1	19	37
	Phase 3	Byte 2			38
40979 ($A013)	(A)	Byte 3	Word 2	20	39
		Byte 4			40
40980 ($A014)	Active power	Byte 1	Word 1	21	41
	Network	Byte 2			42
40981 ($A015)	(W)	Byte 3	Word 2	22	43
		Byte 4			44
40982 ($A016)	Reactive power	Byte 1	Word 1	23	45
	Network	Byte 2			46
40983 ($A017)	(VAR)	Byte 3	Word 2	24	47
		Byte 4			48
40984 ($A018)	Apparente power	Byte 1	Word 1	25	49
	Network	Byte 2			50
40985 ($A019)	(VA)	Byte 3	Word 2	26	51
		Byte 4			52
40986 ($A01A)	Network Cosinus	Byte 1	Word 1	27	53
	(value x 100)	Byte 2			54
40987 ($A01B)		Byte 3	Word 2	28	55
		Byte 4			56
40988 ($A01C)	Network Frequency	Byte 1	Word 1	29	57
	(value Hz x 100)	Byte 2			58
40989 ($A01D)		Byte 3	Word 2	30	59
		Byte 4			60
40990 ($A01E)	Network active	Byte 1	Word 1	31	61
	Consumed energy	Byte 2			62
40991 ($A01F)	(KW.h)	Byte 3	Word 2	32	63
		Byte 4			64

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Data table suite

Decimal word adrdess (Hexadecimal)	b7 b6 b5 b4 b3 b2 b1 b0			Total Words	Bytes
40992 ($A020)	Network reactive	Byte 1	Word 1	33	65
	Inductive energy	Byte 2			66
40993 ($A021)	(KVAR.h)	Byte 3	Word 2	34	67
		Byte 4			68
40994 ($A022)	Network active	Byte 1	Word 1	35	69
	Generated energy	Byte 2			70
40995 ($A023)	(KW.h)	Byte 3	Word 2	36	71
		Byte 4			72
40996 ($A024)	Network reactive	Byte 1	Word 1	37	73
	Capacitive energy	Byte 2			74
40997 ($A025)	(KVAR.h)	Byte 3	Word 2	38	75
		Byte 4			76
40998 ($A026)	Active power	Byte 1	Word 1	39	77
	Phase 1	Byte 2			78
40999 ($A027)	(W)	Byte 3	Word 2	40	79
		Byte 4			80
41000 ($A028)	Active power	Byte 1	Word 1	41	81
	Phase 2	Byte 2			82
41001 ($A029)	(W)	Byte 3	Word 2	42	83
		Byte 4			84
41002 ($A02A)	Active power	Byte 1	Word 1	43	85
	Phase 3	Byte 2			86
41003 ($A02B)	(W)	Byte 3	Word 2	44	87
		Byte 4			88
41004 ($A02C)	Reactive power	Byte 1	Word 1	45	89
	Phase 1	Byte 2			90
41005 ($A02D)	(VAR)	Byte 3	Word 2	46	91
		Byte 4			92
41006 ($A02E)	Reactive power	Byte 1	Word 1	47	93
	Phase 2	Byte 2			94
41007 ($A02F)	(VAR)	Byte 3	Word 2	48	95
		Byte 4			96
41008 ($A030)	Reactive power	Byte 1	Word 1	49	97
	Phase 3	Byte 2			98
41009 ($A031)	(VAR)	Byte 3	Word 2	50	99
		Byte 4			100

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Data table suite

Decimal word adrdess (Hexadecimal)	b7 b6 b5 b4 b3 b2 b1 b0			Total Words	Bytes
41010 ($A032)	Apparent power	Byte 1	Word 1	51	101
	Phase 1	Byte 2			102
41011 ($A033)	(VA)	Byte 3	Word 2	52	103
		Byte 4			104
41012 ($A034)	Apparent power	Byte 1	Word 1	53	105
	Phase 2	Byte 2			106
41013 ($A035)	(VA)	Byte 3	Word 2	54	107
		Byte 4			108
41014 ($A036)	Apparente power	Byte 1	Word 1	55	109
	Phase 3	Byte 2			110
41015 ($A037)	(VA)	Byte 3	Word 2	56	111
		Byte 4			112
41016 ($A038)	Cosinus phi	Byte 1	Word 1	57	113
	Phase 1	Byte 2			114
41017 ($A039)	(Value x 100)	Byte 3	Word 2	58	115
		Byte 4			116
41018 ($A03A)	Cosinus phi	Byte 1	Word 1	59	117
	Phase 2	Byte 2			118
41019 ($A03B)	(Value x 100)	Byte 3	Word 2	60	119
		Byte 4			120
41020 ($A03C)	Cosinus phi	Byte 1	Word 1	61	121
	Phase 3	Byte 2			122
41021 ($A03D)	(Value x 100)	Byte 3	Word 2	62	123
		Byte 4			124
41022 ($A03E)	Frequency	Byte 1	Word 1	63	125
	Phase 1	Byte 2			126
41023 ($A03F)	(value Hz x 100)	Byte 3	Word 2	64	127
		Byte 4			128
41024 ($A040)	Frequency	Byte 1	Word 1	65	129
	Phase 2	Byte 2			130
41025 ($A041)	(value Hz x 100)	Byte 3	Word 2	66	131
		Byte 4			132
41026 ($A042)	Frequency	Byte 1	Word 1	67	133
	Phase 3	Byte 2			134
41027 ($A043)	(value Hz x 100)	Byte 3	Word 2	68	135
		Byte 4			136

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Data table suite

Decimal word adrdess (Hexadecimal)	b7 b6 b5 b4 b3 b2 b1 b0			Total Words	Bytes
41028 ($A044)	Active consumed energy	Byte 1	Word 1	69	137
	Phase 1	Byte 2			138
41029 ($A045)	(KW.h)	Byte 3	Word 2	70	139
		Byte 4			140
41030 ($A046)	Reactive inductive energy	Byte 1	Word 1	71	141
	Phase 1	Byte 2			142
41031 ($A047)	(KVAR.h)	Byte 3	Word 2	72	143
		Byte 4			144
41032 ($A048)	Active generated energy	Byte 1	Word 1	73	145
	Phase 1	Byte 2			146
41033 ($A049)	(KW.h)	Byte 3	Word 2	74	147
		Byte 4			148
41034 ($A04A)	Reactive capacitive energy	Byte 1	Word 1	75	149
	Phase 1	Byte 2			150
41035 ($A04B)	(KVAR.h)	Byte 3	Word 2	76	151
		Byte 4			152
41036 ($A04C)	Active consumed energy	Byte 1	Word 1	77	153
	Phase 2	Byte 2			154
41037 ($A04D)	(KW.h)	Byte 3	Word 2	78	155
		Byte 4			156
41038 ($A04E)	Reactive inductive energy	Byte 1	Word 1	79	157
	Phase 2	Byte 2			158
41039 ($A04F)	(KVAR.h)	Byte 3	Word 2	80	159
		Byte 4			160
41040 ($A050)	Active generated energy	Byte 1	Word 1	81	161
	Phase 2	Byte 2			162
41041 ($A051)	(KW.h)	Byte 3	Word 2	82	163
		Byte 4			164
41042 ($A052)	Reactive capacitive energy	Byte 1	Word 1	83	165
	Phase 2	Byte 2			166
41043 ($A053)	(KVAR.h)	Byte 3	Word 2	84	167
		Byte 4			168
41044 ($A054)	Active consumed energy	Byte 1	Word 1	85	169
	Phase 3	Byte 2			170
41045 ($A055)	(KW.h)	Byte 3	Word 2	86	171
		Byte 4			172

RS485 Communication Modbus

Data table suite

Decimal word adrdess (Hexadecimal)	b7 b6 b5 b4 b3 b2 b1 b0			Total Words	Bytes
41046 ($A056)	Reactive inductive energy	Byte 1	Word 1	87	173
	Phase 3	Byte 2			174
41047 ($A057)	(KVAR.h)	Byte 3	Word 2	88	175
		Byte 4			176
41048 ($A058)	Active generated energy	Byte 1	Word 1	89	177
	Phase 3	Byte 2			178
41049 ($A059)	(KW.h)	Byte 3	Word 2	90	179
		Byte 4			180
41050 ($A05A)	Reactive capacitive energy	Byte 1	Word 1	91	181
	Phase 3	Byte 2			182
41051 ($A05B)	(KVAR.h)	Byte 3	Word 2	92	183
		Byte 4			184

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EMC Consideration

1) Introduction:

In order to satisfy its policy as regards EMC, based on the Community directive 89/336/CE, the LOREME company takes into account the standards relative to this directive from the very start of the conception of each product.
As the devices are devised to work in industrial environments, the various tests are carried out in the sight of the EN 50081-2 and EN 50082-2 standards, in order to make out a statement of conformity.
As the devices lie in certain typical configurations during the tests, it is not possible to secure the outcomes in any possible configuration. To ensure the best functionning 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 centimetres 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.