

CONFIGURATION HANDBOOK

RPS23



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DEVICE PRESENTATION	p3
CONFIGURATION	p3
1) Thermal protection configuration	p4
2) Relays configuration	p5
3) Analog outputs configuration	p6
RS232 LINK SETTING	p7
FIRMWARE UPDATE	p8
EMC CONSIDERATION	p9
1) Introduction	p9
2) Recommendation of use	p9
2.1) General remarks	p9
2.2) Power Supply	p9
2.3) Inputs / Outputs	p9
WIRING	p10
FRONT FACE CONFIGURATION DIAGRAM	p11

Device Presentation

The purpose of the RPS23 is to protect a load against DC over-current heating by the utilization of an inverse time current characteristic. The device has a mV DC voltage input, ranging from 0 to 2000 mV over 2 calibers (0/250 mV & 0/2000 mV), automatically selected according to the configuration of the nominal voltage. To measure a current, an external shunt has to be used. The current measured and displayed is signed but the protection function is carried out on the absolute value of the measurement.

The relay is entirely configurable via the front face keys and display. It can be equipped with 1 to 4 relays and 1 to 2 analog outputs. Relays 1 and 2 are affected to the thermal protection, relay 3 to nominal current overflow detection and relay 4 is the watchdog relay. The watchdog relay is normally closed and LED R4 is off. When a default is detected (internal measure error), the watchdog relay is open and LED R4 is ON.

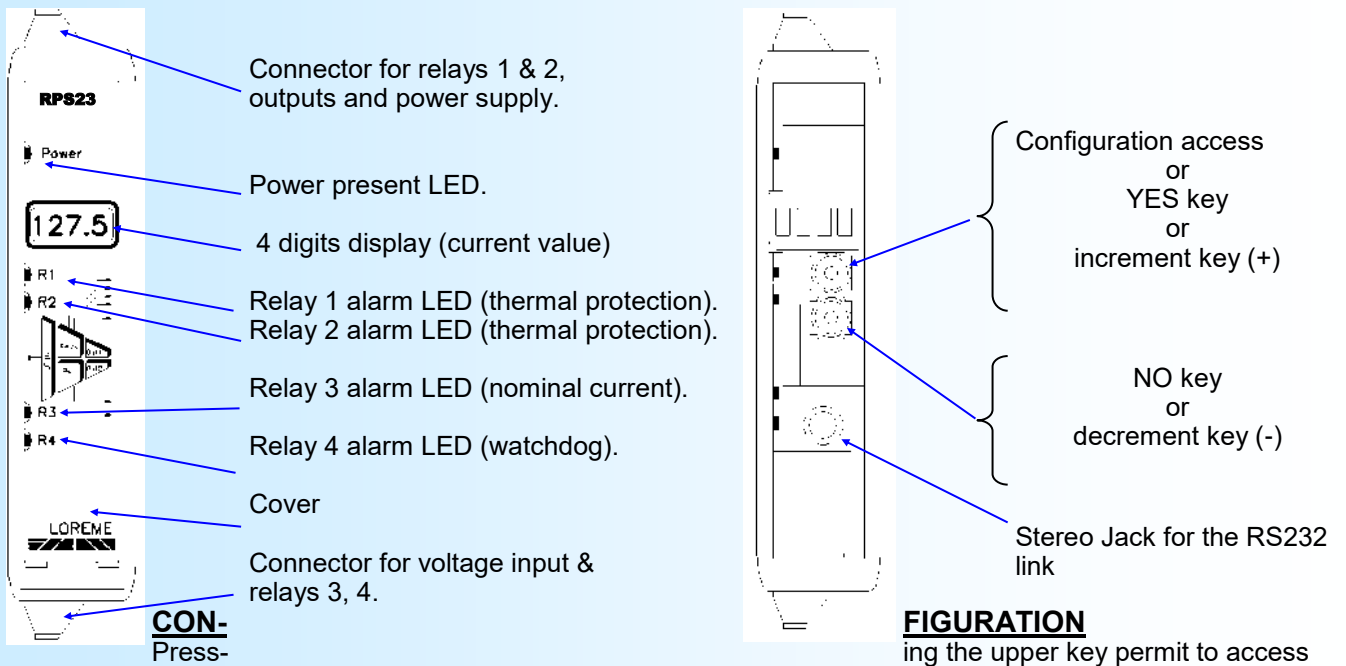
In normal operation, the RPS23 displays the value of the measured current (see configuration). When a default is detected, the device display the following messages:

- "Err" for sensor break or internal measure failure.

It is necessary to notice the differences between all the models:

- RPS23:** 1 relay (thermal protection).
- RPS23/R2:** 2 relays (thermal protection).
- RPS23/R3:** 3 relays (idem R2 + nominal current overflow alarm).
- RPS23/R4:** 4 relays (idem R3 + watchdog).
- RPS23/S1:** 1 insulated analog output
- RPS23/S2:** 2 insulated analog outputs, independently configurable.

The technical data sheet is downloadable here: http://www.loreme.fr/fichtech/RPS23_eng.pdf



the configuration.

For each rubric, a message is streaming on the display and the <YES> key permits to access the rubric and the <NO> key to skip it. For a choice selection, the <YES> key validate the choice and the <NO> key invalidate it or pass to the next choice.

During an adjustment procedure, the upper key increment the value and the lower key decrement the value and the relay 1 LED is flashing. All the parameters are limited excepted the nominal current (LOW or HIGH is displayed on overflow). The adjustment procedure is terminated automatically after 4 seconds if no key is pressed.

The message "OK !" is displayed at the end of the configuration after all the parameters have been memorized. If the configuration is stopped before the message "OK !" appears, the newly configured parameters are not saved.

Configuration via the front face

1) Thermal protection configuration

In this rubric, the user can set the different thermal protection parameters.

1.1) Nominal Voltage (mV)

The nominal voltage is the voltage trip point for the relay. It is used in the calculation of the trip time, and can be configured from 0 mV to 200 mV. Usually this value should be set to the value of the measurement shunt caliber. For example 50mV for a 50 mV / 500 A shunt. The scale of the input is equal to 10 times the nominal voltage. For example, for a nominal voltage = 50 mV, the input range will be 0/500 mV so the RPS23 will switch its input high caliber 0/2000 mV.

1.2) Nominal current (A)

This parameter is normally set to the current rating value of the measuring shunt. E.g. 500 A for a 50 mV / 500 A shunt. It may also be configured to the value of **Unominal / Rshunt** if the configured nominal voltage is not the nominal shunt voltage. It serves as a:

- switching threshold for relay 3 (over current detection).
- display scale for displaying the current measurement.
- measurement scale for the calculation of the analog output.

1.3) Measure filter

In some noisy environment, it is necessary to filter the input signal. This parameter is the coefficient of the digital filter included in the device. By increasing the value, the response time of the filter is increased and thus the response time of the device. If the value is zero, there is no filtering. The parameter can be configured from 0 to 50 in 0.1 steps.

1.4) Thermal equations coefficients

The coefficients K, R, a, b, c used in the calculation of the thermal image are entirely configurable to adapt the relay to quiet any protection curve. The relay uses the equation 1 for heating and the equation 2 for cooling:

$$1) \quad t = K \times (a / ((U / Unom)^b - 1) + c), \quad \text{for } (U / Unom)^b > 1.$$

$$2) \quad t = K \times R / ((U / Unom)^b - 1), \quad \text{for } (U / Unom)^b < 1.$$

1.4.1) K coefficient

The K coefficient can be configured from 0 to 50 in 0.1 steps.

1.4.2) R coefficient

The R coefficient is used in the cooling equation. It can be configured from 0 to 100 in 0.01 steps.

1.4.3) a coefficient

The a coefficient can be configured from 0 to 100 in 0.001 steps.

1.4.4) b coefficient

The b coefficient is the power factor of thermal equations. It can be configured from 0 to 3 in 0.001 steps.

1.4.5) c coefficient

The c coefficient can be configured from 0 to 10 in 0.001 step.

See table next page for some examples of coefficient values for different thermal protection.

Remark:

RPS23 Timing accuracy:

Within $\pm 5\%$ or $\pm 300\text{ms}$ whichever is greater. This is true when the “measure filter” is set to 0. Increasing the “measure filter” parameter will increase the tripping time of the relay.

Triggering time characteristics				
Triggering time characteristics	Constants and equations (t in s)			
(k = 0.01...10.00)	a	b	c	R
Constant time			t = K	
According ANSI/IEE C37.112	Triggering			Drop Time
Moderately inverse	0.0515	0.0200	0.1140	4.85
Very inverse	19.6100	2.0000	0.4910	21.60
Extremely inverse	28.2000	2.0000	0.1217	29.10
According to ANSI	Triggering			Drop Time
Normally inverse	8.9341	2.0938	0.17966	9.00
Short time inverse	0.2663	1.2969	0.03393	0.50
Long time inverse	5.6143	1.0000	2.18592	15.75

$$t = k \cdot \left[\frac{a}{\left(\frac{I}{I_{ref}}\right)^b - 1} + c \right]$$

$$t = k \cdot \frac{R}{\left(\frac{I}{I_{ref}}\right)^2 - 1}$$

Factory output default value

2) Relays configuration

The relays 1 to 3 are independently configurable. Relay 1 and 2 goes into alarm state when the calculated thermal image exceeds the trip point and goes out of alarm when the thermal image falls below the trip point minus hysteresis. Relay 3 goes into alarm state when the measured current exceeds the nominal configured current and goes out of alarm when the current falls below the nominal current minus hysteresis.

For each relay, the programmable parameters are:

- The hysteresis,
- The security,
- The activation and de-activation delay.

The **hysteresis** is set in % of thermal trip point for relay 1 and 2, and in % of the nominal current for relay 3.

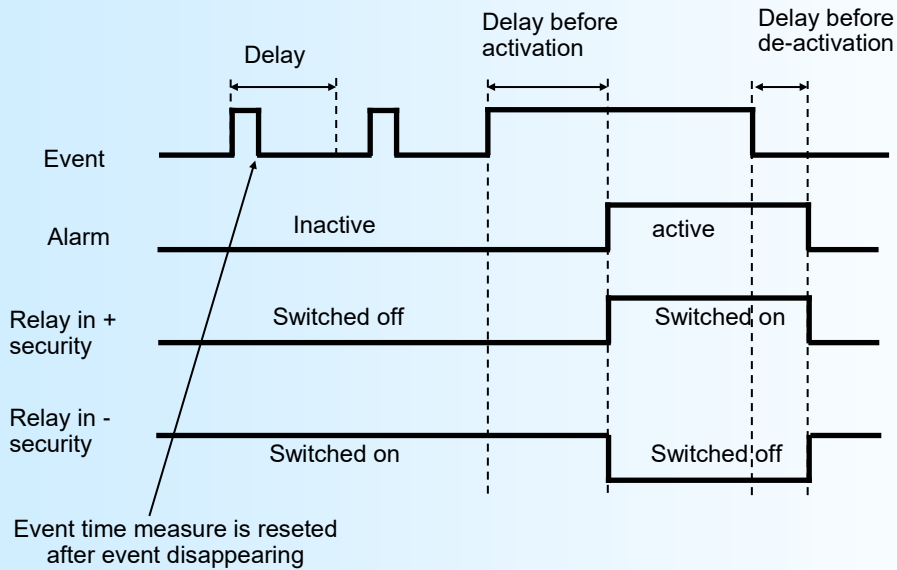
The **security** parameter allows to choose between the activation or the de-activation of the relay when alarm is activated:

- in **positive** security, relay is switched on when alarm is active, "work" contact is closed on alarm, opened out of alarm, "rest" contact is opened on alarm, closed out of alarm.
- in **negative** security, relay is switched on when alarm is inactive, "work" contact is opened on alarm, closed out of alarm, "rest" contact is closed on alarm, opened out of alarm.

The **delay value**, configurable from 0 to 30 s, determines the time above which alarm changes its state after event appearance and disappearance. For each relay, the user can configure an activation delay and a deactivation delay.

Default factory setup is:

- Hysteresis = 2%,
- Positive security,
- Delays = 0 s.



3) Analogs outputs configuration

In standard, the device has no output. It can, by /S1,/S2 options, provide 1 or 2 outputs. These outputs, insulated between themselves, are independently configurable. Analog outputs configuration is presented through 2 rubrics:

- Output type:
 - current output (mA),
 - voltage output (V).

And for each output type, the low and high scale.

- Output parameters:
 - security value,
 - limitation,
 - response time.

The security value allows to set the output to a known state when there is a sensor breaking or a measure range overflow. This value will be transferred to output.

The limitation allows to bound the output signal swing to the configured output scales for all input signal values. Only security value goes beyond this function.

The response time allows a smoothing of the output. It is adjustable from 0 to 60 s.

- Default factory setup is:
- 4 to 20 mA current output,
 - Security value = 22 mA,
 - No limitation,
 - Response time = 0 s.

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.

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
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
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 or bad operative 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.

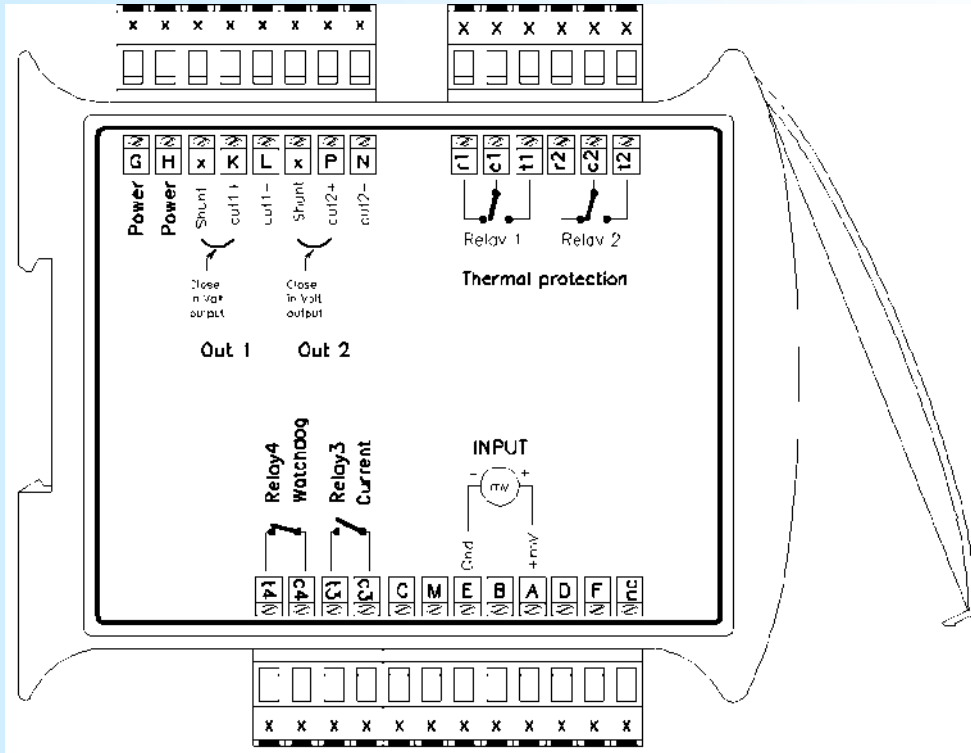
2.2) Power supply

- 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.

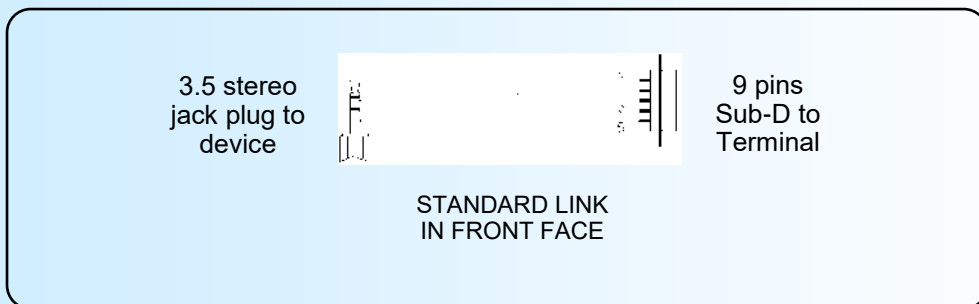
2.3) Inputs / Outputs

- 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.

Wirings



- mV input from: external shunt terminal A (+), terminal E (-)
- Relay 1: terminal R1 (rest), terminal T1 (work), terminal C1 (common)
- Relay 2: terminal R2 (rest), terminal T2 (work), terminal C2 (common)
- Relay 3: terminal T3, terminal C3
- Relay 4: terminal T4, terminal C4
- Power supply: terminal G, terminal H
- Analogue output 1: terminal K (+), terminal L (-) (Terminals K & shunt must be closed for voltage output)
- Analogue output 2: terminal P (+), terminal N (-) (Terminals P & shunt must be closed for voltage output)



Front face configuration diagram

