CONFIGURATION HANDBOOK

INL100

INL150

INL100W

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Download manual at : www.loreme.fr

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Device Presentation

This versatile product can be used like a simple analogue scanner with alarm management, or used as a communicating control unit with advanced processing function.

It's necessary to notice the difference between models:

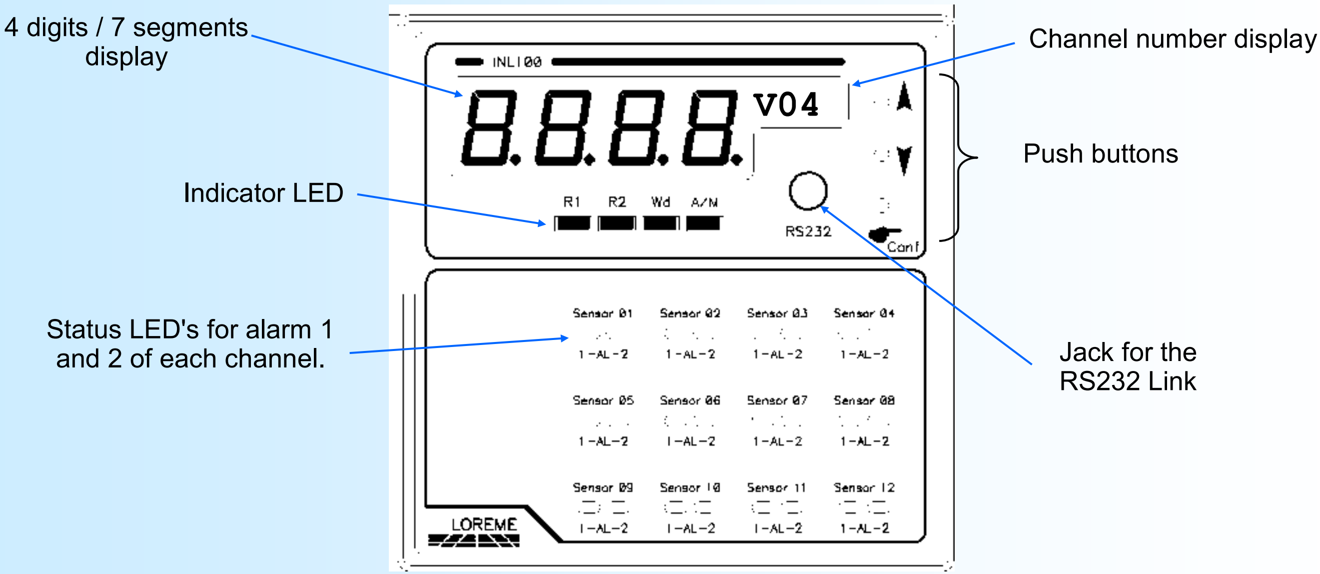
INL100: Up to 12 input channels individually configurable, 2 alarms by channel, 2 common relays, 1 watchdog relay.
INL150: Up to 24 input channels individually configurable, 2 alarms by channel, 2 common relays, 1 watchdog relay.

INL100W: Temperature input (thermocouple, pt100, cu10), mV, mA 0..4..20mA.

INL100/150: Temperature and process inputs.
INL100P/150P: 0/20 mA, 4/20 mA current and 0/10 V voltage inputs.
INL100-pt4f/150-pt4f: 4 wires PT100 only input.

INL1../R: Individual relays for each channel option.
INL1../Ri: Individual relays without common (4 isolated NO contacts).
INL1../S: One insulated analog output option.
INL1../CMTCP: Modbus TCP communication option.
INL1../CM: Modbus RTU communication option.
INL1../CP: Profibus DP communication option.

The technical datasheet can be downloaded here: http://www.loreme.fr/fichtech/INL100-INL150_eng.pdf



The device front panel is composed of:
- 1 four digits / 7 segments display - 10 000 pts for the measure value.
- 1 four digits alphanumeric display for the channel number and configuration messages.
- 4 indicator LED's:
  - R1 The alarm 1 common relay is activated,
  - R2 The alarm 2 common relay is activated,
  - Wd Status of watchdog relay, LED OFF -> relay ON, LED ON -> relay OFF,
  - A/M Indication of display mode, automatic (LED OFF), manual (LED ON).
- 2 LED's for each input channel alarm 1 and 2 state indication.
- One 3.5 mm Jack plug for the RS232 link,
- 3 push buttons:
  - ▲ In measure mode, select manual display, increase channel number.
    In configuration mode increase value, response <YES>.
  - ▼ In measure mode, select auto display.
    In configuration mode decrease value, response <NO>.
  - ☛ Access to the configuration mode.
    In configuration mode, validate the choice or the setted value.

1) Functions

This device can scan up to 12 (INL100) or 24 (INL150) measure points. It consist of a display card and 1 to 6 measure cards. Each measure card handle four analogical input channels. The input channels are individually configurable in voltage, current, resistance input or pt100, CU10 and thermocouple input on an INL100 or current (mA), voltage (V) on an INL100P or is freeze in PT100 four wires on a INL100-pt4f.
Two alarms may be associated with each channel. The front panel allow to visualize the state of the device with the two displays and many LED's. The push button are used to change the display and to setup the device.

2) Display information

There are two display mode: automatic and manual. The automatic mode is the default mode. The channel number is increased every 3 seconds.

The measure value is displayed on 4 digits. An error message can be displayed in place of the measure:
- '**Err**' in case of faulty input or sensor breaking.
- '**oFF**' indicates that the channel is not scanned and is not a follower channel.

Note:
A communication absence (device in configuration mode) or a fault (device in measuring mode) between the display and measurement cards, makes the alarm AL2 (right LED) of the input 4,8,12 (INL100) or 4,8,12,16,20,24 (INL150) blinking.
A communication failure with a card causes a default of the 4 measure channels of the card.

3) Watchdog relay

At power ON, the **Wdog** relay is activated. The output contact is close. The LED **Wd** is off. The relay is deactivated when an internal default appears (a lost of internal communication between the display card and measures cards, indicated by "Default M" or a faulty reading of internal temperature sensor, indicated by "Default T"). In this case, the output contact is open and the LED **Wd** is on.

4) Resetting of memorized alarms

When the relay 1 and/or relay 2 alarm hold function has been enabled in the configuration and an alarm has been memorized, buttons ⮝ and ⮟ must be pressed simultaneously for more than 1 s to reset the relays 1 & 2 alarm state.

5) Front panel configuration

The device can be setup by the front panel if the configuration access is unlock!! (with the RS232 link only). You can change the input, the display range, the alarms, the relays, the communication parameters. The configurable parameters depends on the selected display mode.

In manual display mode the parameters for the **selected channel** are:
- Scanning (scanned or not scanned and not follower, or not scanned and follower + selection of the channel to be copied).
- Input type (V, mA, R...).
- Display range (voltage, current and resistance inputs only).
- Alarms 1 and 2 of the scanned channels and the follower channels.

In automatic display mode the parameters for **all the channels** are:
- The input type.
- The display range (only on current, voltage or resistance inputs).
- The alarms 1 and 2.
- The relay 1 & 2 (security, alarm hold function, activation delay) and the channel relays (image, security) parameters .
- The output parameters (scales, security value, response time, limitation).
- The communication parameters (address, baud rate, parity or IP address).

To access configuration mode press the ☛ button. The device displays the Hard and Soft revision number on the right display. If the access to configuration is locked or if the **'out'** channel is displayed in manual mode the text 'NOT ALLOWED' is displayed.

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The parameter name scroll's on the right display.
The ⮝ button (YES) validate the function or accesses the parameter setting.
The ⮟ button (NO) invalidate the function or skip to the next parameter.

For a parameter value, the ⮝ button increase and ⮟ decrease the value (the **A/M** LED blink's during value setting). All the parameters are limited (the message LOW or HIGH is displayed in case of overflow). To store the value press the ☛ button.

At the end of configuration the message **'OK!'** is displayed indicating that the parameters are saved.

Note:
If no button are pressed in a delay of 30 seconds, the device return's automatically to the measure mode without saving the parameters.

SOMMAIRE

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

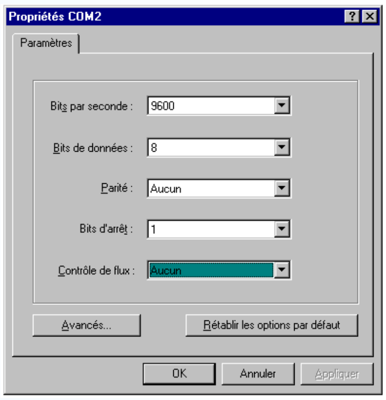
Up to XP version
- Go to **"Programs \ Accessories \ Communication \ Hyper Terminal"**
- Click on **"Hypertrm.exe"**

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

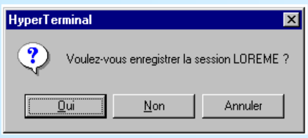
4 Choose the communication port related to the adapter.

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 page 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 

will permit to communicate with all LOREME devices.

Note: To modify the parameters of the terminal whereas this one is connected, it is necessary to disconnect it, modify the parameters and then to reconnect it.

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Terminal mode

Visualization

On power on, the device is in measure mode. If a terminal is connected, the measure information's are displayed every 4.5 seconds (for example a measure information for a 8 channel device) :

```
CONFIGURATION V01  136.4 Ohms             AL    0/390 Ohms 0/390.0 Ohms
 Press   <C>   V02  95.9 °C               AL    PT100      -200/800 °C
               V03  95.1 °C               AL    PT100      -200/800 °C
               V04  94.7 °C               AL    PT100      -200/800 °C
               V05  95.4 °C               AL    PT100      -200/800 °C
               V06  Err                   AL12  PT100      -200/800 °C
               V07  Err                   AL12  PT100      -200/800 °C
               V08  Err                   AL12  PT100      -200/800 °C
```

Channel number — Measure value or error message — Alarms 1 and 2 are activated — Input type for temperature input, input range for process input — Input range (°C) or display range (process)

The device can display several error messages:

- '**Err**' for a sensor breaking.
- '**DEFAULT M**' for a measure default.
- '**DEFAULT T**' for a default of the temperature sensor (Thermocouple input cold junction compensation).
- '**OFF**' if the channel is not scanned & is not a follower channel.

The function keys are:

"C"	To access the device configuration.
"A"	Change to automatic displaying (scrolling). The **A/M** LED on the front panel is off.
"M"	Change to manual displaying: The front display stops on one channel. Each time 'M' is pressed, the channel changes. The **A/M** LED on the front panel is on.

Configuration

To access configuration mode, type on **'C'** key. In the front panel the message **'CONF'** is display.
The first displayed message is:

CONFIGURATION

REV x.y	Device version, where **'x'** is the hardware revision and **'y'** the software revision.
TAG: ———	Device tag, which can consist of 10 alphanumeric characters.

1) Method

At configuration, several question types are asked. For each of them, several answers are possible.

Note:
During the configuration, the LED of alarm 2 of the channel 4, 8,1 2, 16, 20, 24 may blink!!.
It is normal because in configuration mode there is no internal communication between the display card and the measure cards.

Here are their description:

1.1) Menu selection

Example: LANGUAGE (Y-N) — The choice is done by typing on **"Y"** or **"N"** keys.
This choice allows access to different configuration menus.

1.2) Parameter selection

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

Previous choice = YES:	- Type on **"Y"** or **"Enter"**	=> Validate choice = YES,
	- type on **"N"**	=> Change and validate choice = NO.
Previous choice = NO:	- type on **"N"** or **"Enter"**	=> Validate choice = NO,
	- type on **"Y"**	=> Change and validate choice = YES.

LOREME

1.3) Value acquisition

Example: THRESHOLD
80 °C

Two cases are possible:
- Validate the value without change by type on **"Enter"**,
- Change the value by type on the numerical keys and validate.

Note:
- *It is possible, when a mistake is made during a value acquisition, before validating it, to go back pressing* **"←"** *which re-displays the message without taking notice of the wrong value.*
- *In configuration mode, if there is no action, the device goes back in operating mode after a two minutes delay without taking notice of the 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" key.*

2) Configuration messages

2.1) Language

```
LANGUAGE CONFIGURATION?
(Y-N)
```

Two possibilities are allowed:
- French
- English

2.2) Input

```
INPUT CONFIGURATION?
(Y-N)
```

This page is displayed when the input configuration is accessed:

Input type

```
CHANNEL ?          V01 PT100       -200.0/800.0 °C
0,1....24          V02 PT100       -200.0/800.0 °C
 <ENTER>           V03 PT100       -200.0/800.0 °C
->                 V04 PT100       -200.0/800.0 °C
0:ALL CHANNEL      V05 OFF/COPY OF CHANNEL: 01
SELECTION          V06 OFF/COPY OF CHANNEL: 02
                   V07 OFF/COPY OF CHANNEL: 03
                   V08 OFF
```

Input range or display range.

Channels 5, 6 & 7 are not scanned and configured as follower channels.

Channel 8 is not scanned & not a follower channel.

Channel number.

```
...
  LEAVE
Press <L>
```

To change the input parameters for the channel, enter the channel number and press <Enter>.
The number ‘0’ is for a configuration for all channel. Press <L> to leave the input configuration.
Once the channel is selected, the device access the configuration of the channel.

```
CHANNEL 01
```

```
SCANNING?
(Y-N)NO
```

Permits to activate (yes) or deactivate (no) the measurement.

```
CHANNEL FOLLOWER(Y/N)?
(Y-N)YES
```

If the channel is not scanned, it is possible to configure it as a follower channel of an other channel. The measure of the other channel is copied to the follower channel.

```
CHANNEL TO COPY?
1
```

Input the number of the copied channel. Only scanned channels are accepted.
If the number is incorrect, the message **CHANNEL NOT ALLOWED!** is displayed.

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The physical input range are fixed.

The input are for a INL100, INL100W:
- Voltage (mV), 0/120 mV.
- Current (mA), 0/20 or 4/20 mA. *(external shunt for INL100)*
- Resistance (Ω), 0/390 Ω.
- Pt 100 (°C), -200/800 °C.
- CU10 (°C), -100/200 °C.
- compensated thermocouple (°C).

The input are for a INL100P:
- Voltage, 0/10 V.
- Current, 0/20 mA or 4/20 mA.

Particularity:

Choice of the Thermocouple type:

B (200 à 1800 °C)	**S** (0 à 1600 °C)
E (-250 à 1000 °C)	**T** (-250 à 400 °C)
J (-200 à 600 °C)	**N** (-250 à 1350 °C)
K (-200 à 1350 °C)	**W3** (0 à 2300 °C)
R (0 à 1750 °C)	**W5** (0 à 2300 °C)

2.3) Display range

```
DISPLAY RANGE?
(Y-N)
```

The display range is accessible only for process inputs (Ω, mV, mA).

The range converts the input signal to a physical quantity. This one facilitates the measures interpreting.

Ex: Input 4-20 mA / Range 0 - 1000 kg.
➔ input = 12 mA, display = 500 kg.

For the range configuration, you need:
- the unit,
- the low scale,
- the high scale,
- the number of decimal.

The unit of the display range is facultative and is only useful to interpret the real size on the terminal. It is limited to 4 characters. This characters are type on keyboard and display to the terminal. If the unit is configured by the front panel, the user can choose one unit in a list of 37 different units.

The decimal number correspond to the number of digit displayed behind the decimal point. This number is limited to 2.

2.4) Standard alarms function

```
ALARM CONFIGURATION?
(Y-N)
```

To change the alarm parameters for the channel, enter the channel number and press <Enter>.
The number '0' is for a configuration for all channels. Press <L> to quit the alarm configuration.

Threshold value, hysteresis alarm 1

Threshold value, hysteresis alarm 2

```
CHAN-              NEL ?          V01 THRES1/HYST:
                   55.0/1.0 °     C    H!  THRES2/
HYST: 100.0/1.0 °C   L!
0,1....24     V02 THRES1/HYST: OFF!   THRES2/HYST: OFF
 <ENTER>      V03 THRES1/HYST: OFF!   THRES2/HYST: OFF
->            V04 THRES1/HYST: OFF!   THRES2/HYST: OFF
0:ALL CHANNELV05 THRES1/HYST: OFF!    THRES2/HYST: OFF
SELECTION     V06 THRES1/HYST: OFF!   THRES2/HYST: OFF
              V07 THRES1/HYST: OFF!   THRES2/HYST: OFF
              V08 THRES1/HYST: OFF!   THRES2/HYST: OFF
```

Threshold alarm not activated

Sensor breaking alarm activated

No sensor breaking alarm

Type of threshold detection:
L => Low
H => High

```
  LEAVE
Press <L>
```

ALARME 1?
(Y-N)

ALARME 2?
(Y-N)

Each channel has two alarms AL1 and AL2. The user can choose for each one the type of detection:

The **breaking detection** activate the alarm on sensor breaking.

The **threshold detection** activate alarm on threshold overstepping. It is necessary to choose the type of detection (high or low), the threshold and hysteresis value. This two detection can be cumulated.

The **threshold detection** works in this manner:
- **high threshold** detection:
  - .alarm is activated when measure goes above threshold,
  - .alarm is removed when measure goes below threshold minus hysteresis.
- **low threshold** detection:
  - .alarm is activated when measure goes below threshold,
  - .alarm is removed when measure goes above threshold plus hysteresis.

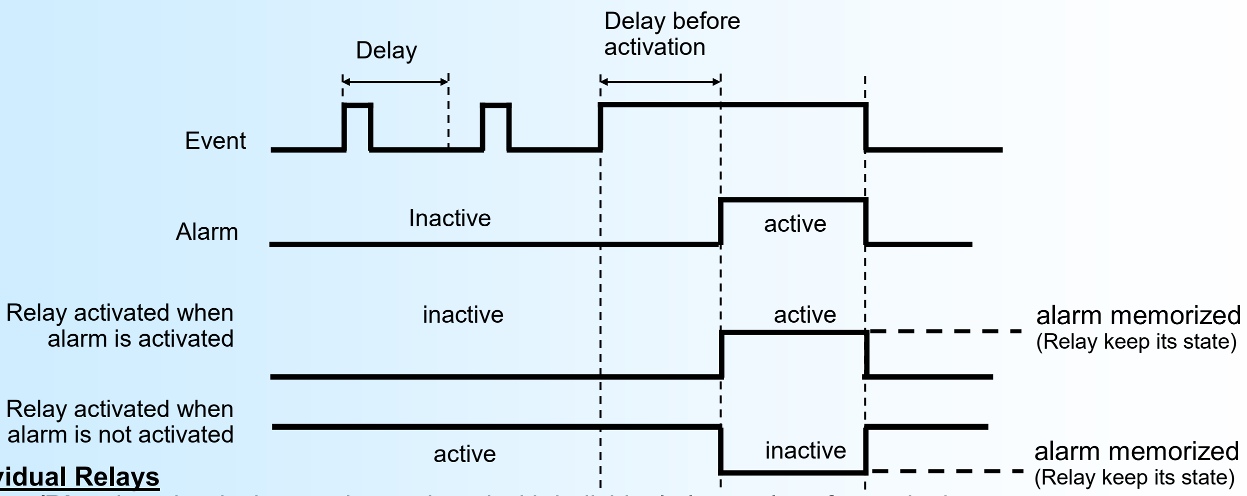
2.5) Differential alarms
The differential alarms rubric allows to configure two alarms, independent from AL1 and AL2.
These alarms monitor the difference between the minimum and the maximum of all the scanned channels (see page 12, under "Special Functions").

2.6) Relays
The device has 2 relays R1 and R2 associated respectively with the alarms 1 and 2 of all channels.
The configurable parameters are:
- The **security**, allows to choose if the relay is activated in alarm or activated out of alarm.
- The **alarm hold function** (ALARM HOLD FCT).
- The **activation delay value,** from 0 to 9999 seconds, determines the time above which alarm changes its state after event appearance. The entered value is rounded to multiple of 1.5 seconds (measure cycle timing).

RELAY CONFIGURATION?
(O-N)

RELAY 1?
(Y-N)

RELAY 2?
(Y-N)



2.6.1) Individual Relays
With the **/R** or **/Ri** option, the device can be equipped with individual alarm relays for each channel.

ALARM RELAY? Or **INDIVIDUAL RELAY?**
(Y-N) **(Y-N)**

The configurable parameters are the association of the alarms and the security mode.

IMAGE OF AL1? Allows to choose if the individual relay is associated with the alarm AL1.
(Y-N)YES

IMAGE OF AL2? Allows to choose if the individual relay is associated with the alarm AL2.
(Y-N)YES

At factory setting, the individual relays are associated to AL1 & AL2. The alarm status of the individual relays is a logical OR function between AL1 and AL2. The security mode is "relay activated in alarm".

2.7) Analogue output
OUTPUT CONFIGURATION?
(Y-N)

This configuration menu are accessible only for a device with the **/S** option.
This output can be define with:
- **The output scales 0% and 100 %**, allows to define the range for the output signal (ex: 4, 20mA)

- **The security value**, define the output value when a sensor breaking condition is detected.

- **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**, is adjustable from 0 to 60 seconds.

- **The input measure scales** 0% and 100 %, permits to assign an input range to output levels 0% and 100% (ex: 0 to 100 ° C for a 4 to 20 mA output).

- **The type of input measurement** allows to dedicated the output to :
    - the maximum, minimum, average of all scanned channels,
    - the difference between the maximum and minimum of the scanned channels,
    - one channel,
    - The sum of all the scanned channels,
    - rolling channel (rolling speed of 1.5 seconds, channels witch are not scanned (followers or not) are skipped).

*In « **rolling channel** » mode, each scanned input is copy to the output at the rate of 1.5 seconds per channel. In this mode the response time must be set to 0 second.*
*In "**one channel**" mode, the output take the security value if the channel is not scanned (followers or not).*

2.8) Communication
This part of configuration is accessible only for device with /**CM, /CP** or **/CMTCP** options.
COMMUNICATION?
(Y-N)

2.8.1) MODBUS TCP (/CMTCP option)
The parameters are the IP address and the network mask.
with the front face button, only the IP address can be modify.

2.8.2) MODBUS (/CM option)
The communication parameters are :
    - **slave address** of the device (1 to 255)
    - **baudrate** : 1200, 2400, 4800, 9600,19200, 38400 bauds
    - **parity**: odd, even, none
The data are present in few format:
    - float number 32bits IEEE
    - 16bits unsigned integer (percentage of the measurement range)
    - 32bits reversed signed integer (value x 100).

2.8.3) PROFIBUS (/CP option)
The communication parameters are:
    - **slave address** of the device (1 to 126).

- **baudrate** : 9.6 k, 19.2 k, 93.75 k, 187.5 k, 0.5 M & 1.5 Mbauds

The data exchange are : measure value in 32 bits IEEE floating format, state of alarm AL1 and AL2, input state.

For more explanation, read the specific part of the manual.

2.9) Tag configuration

The tag allows to easily identify the device. It can be made of up to 10 alphanumerical characters. The user only has to enter the tag on the keyboard and validate it with the "Enter" key. The tag will now be displayed on each configuration access. If a character can not be displayed, the "-" character is displayed in place.

2.10) Special functions

```
LOCK FRONT PANEL ACCESS?
(Y-N)NO
```

The function **lock front panel access,** forbid the access to the configuration with the push button (see page 4).

```
DIFERENTIAL ALARM 1?
(Y-N)
```

The function **Differential alarms** allow to configure 2 alarms independently of the standards alarms AL1 and AL2. This alarms monitor the difference between the mini and maxi measures of all the scanned channels. The setting parameters are:

- **The breaking detection**, the alarm is activated if one channel is in sensor breaking.
- **The threshold detection**, the threshold and the hysteresis values are to be configured.

The differential alarm is activated when the maximum difference between channel is over the threshold value.
The two type of detection may be cumulated

Note:
- The differential alarms 1 and 2 acts only on relays 1 and 2.
- If the standard alarm AND the differential alarm are activated simultaneously, the device makes a logical OR between the standard and differential alarms.

CHANNEL OFFSET

Sometimes, it may be interesting to modify the measure by a simple terminal keyboard intervention.
It can be used in many situations as sensor aging, an input refinement as a result of magnifying effect...
This function is available individually on each channel.

To shift the measure of a channel, it is necessary:
- to be in measure mode,
- to be in manual display mode with the desired channel selected,
- type on **"+"** or **"-"** to access the function,
- on terminal display become:

OFFSET CHANNEL 01: 10	channel number, offset value,
105.2 °C	measure value with offset,

- use keys **"+"** and **"-"** to adjust offset, measure is directly modified.
- type on **"ENTER"** to memorize the offset.

To adjust another channel, select the channel in manual mode and proceed in the same manner.

Note:
When the device is not supplied the offset stays active.
*To reset the offset, it is necessary to start the **"OFFSET"** function, put this value to zero by **"+"** and **"-"** keys, then validate by **"ENTER"**. In offset control mode, when there is no action on **"+"**, **"-"** or **"ENTER"** keys during 2 minutes, the device leaves the mode without keeping the adjusted offset.*

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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 « F » key has been pressed in the allowed time, the device enters the firmware loader and displays the following message:

FIRMWARE LOADER Rev3
READY TO TRANSFER...

The device is in “file waiting” mode. This file is provided by LOREME and contains the firmware code in Intel HEX format. Selected 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 Rev3
READY TO TRANSFER
*********** <—————————— The star characters appears to show the progress of the uploading.

At the end of data loading, the message « **PROGRAMMING OK !** » is displayed if no error occurs. Otherwise, one of the following messages can be displayed:

- **SERIAL COM ERROR !** Error during data transfer.
- **SERIAL TIMEOUT !** Time elapsed.
- **PROGRAMMING FAILED !** Programming error in the internal flash memory.

<u>Notes</u>:
If an error occurs during the programming process, the device will be non-functional. It is then necessary to restart all of the procedure.

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 data sheet (direction of assembly, spacing between the devices, ...).
- Comply with the recommendations of use indicated in the technical data 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

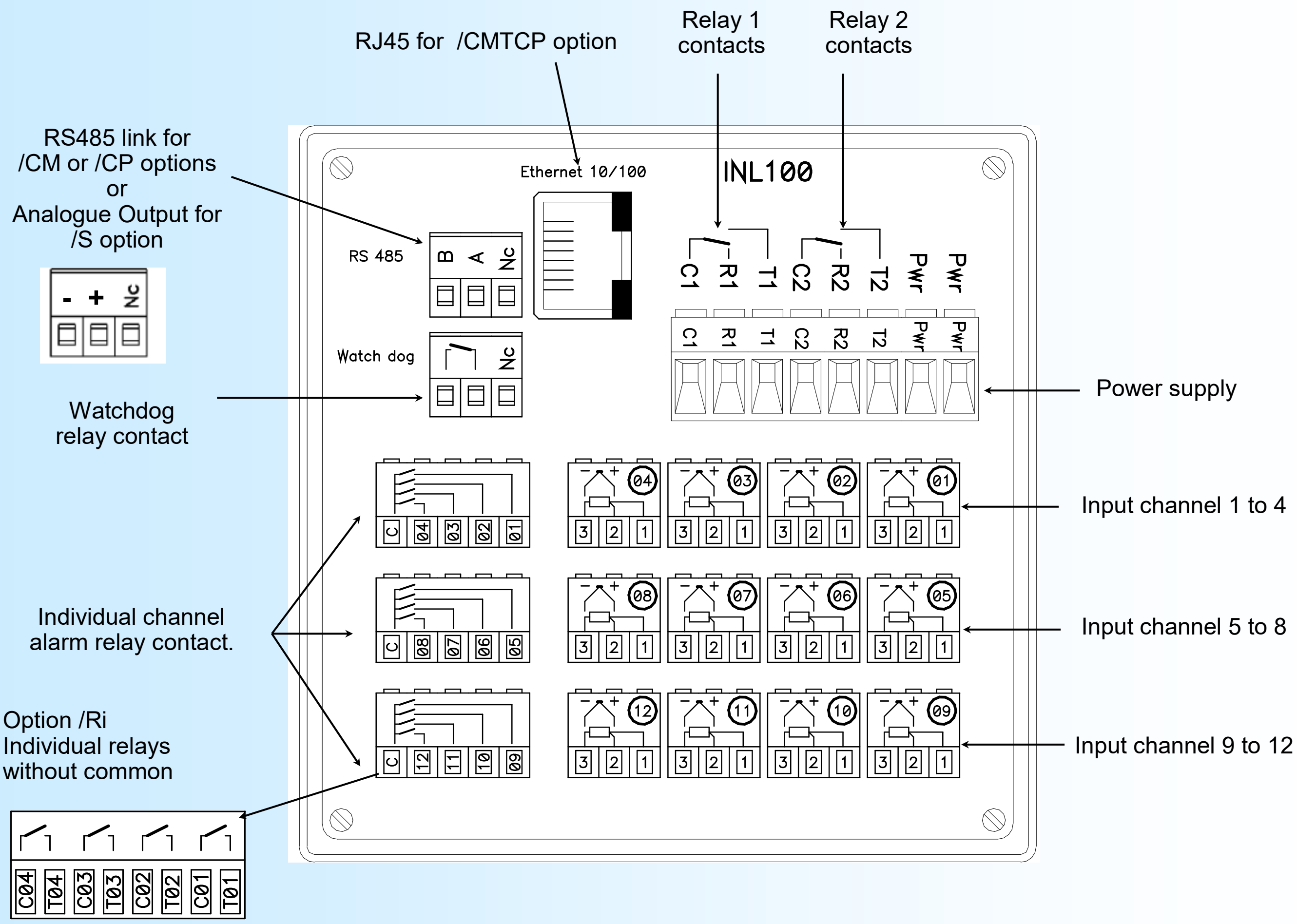
- Comply with the features indicated in the technical sheet (power supply voltage, frequency, allowance of the values, stability, variations ...).
- It is better that the power supply should come from a system with section switches equipped with fuses for the instrumentation element and that the power 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

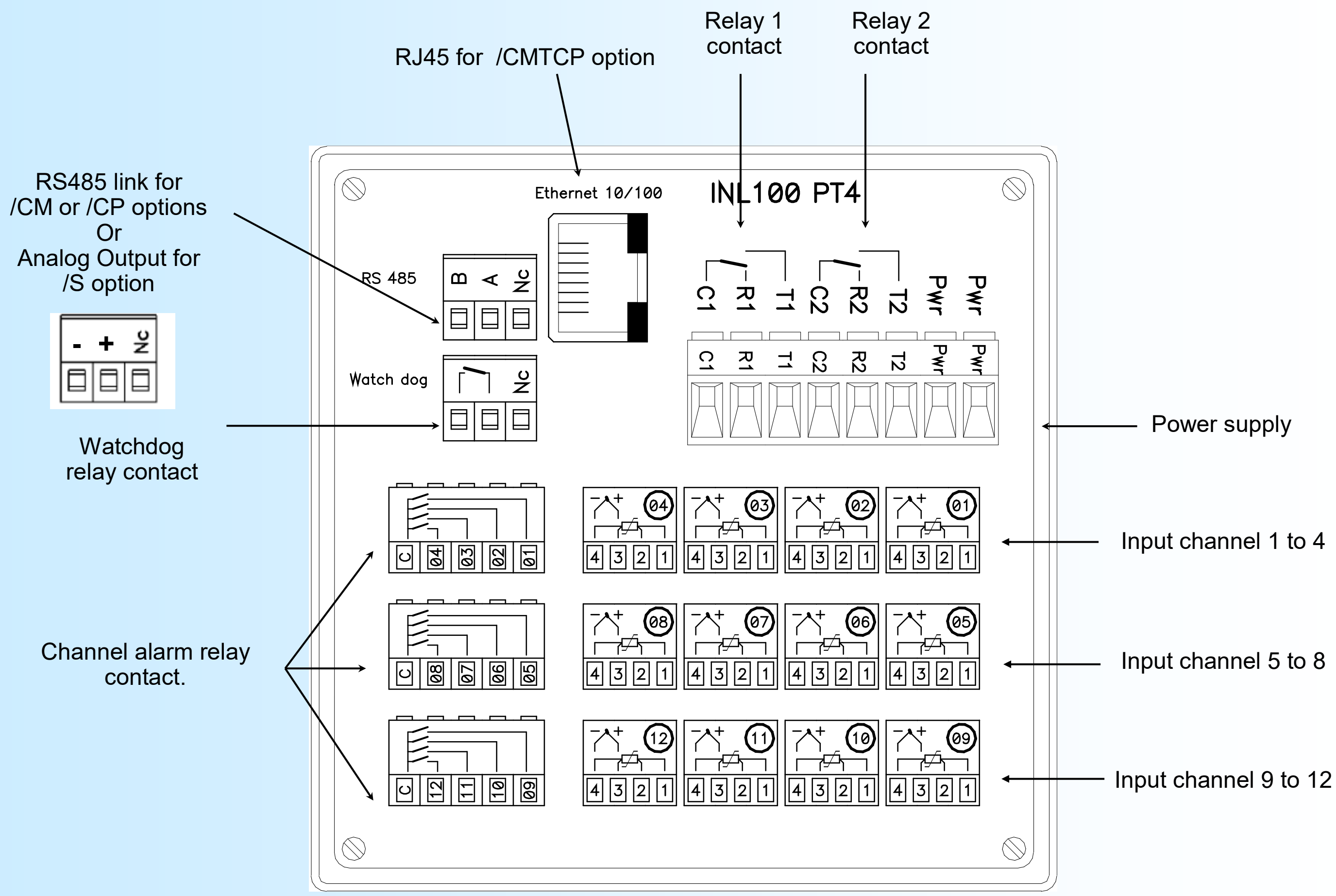
WIRING DIAGRAM FOR INL 100, INL100P



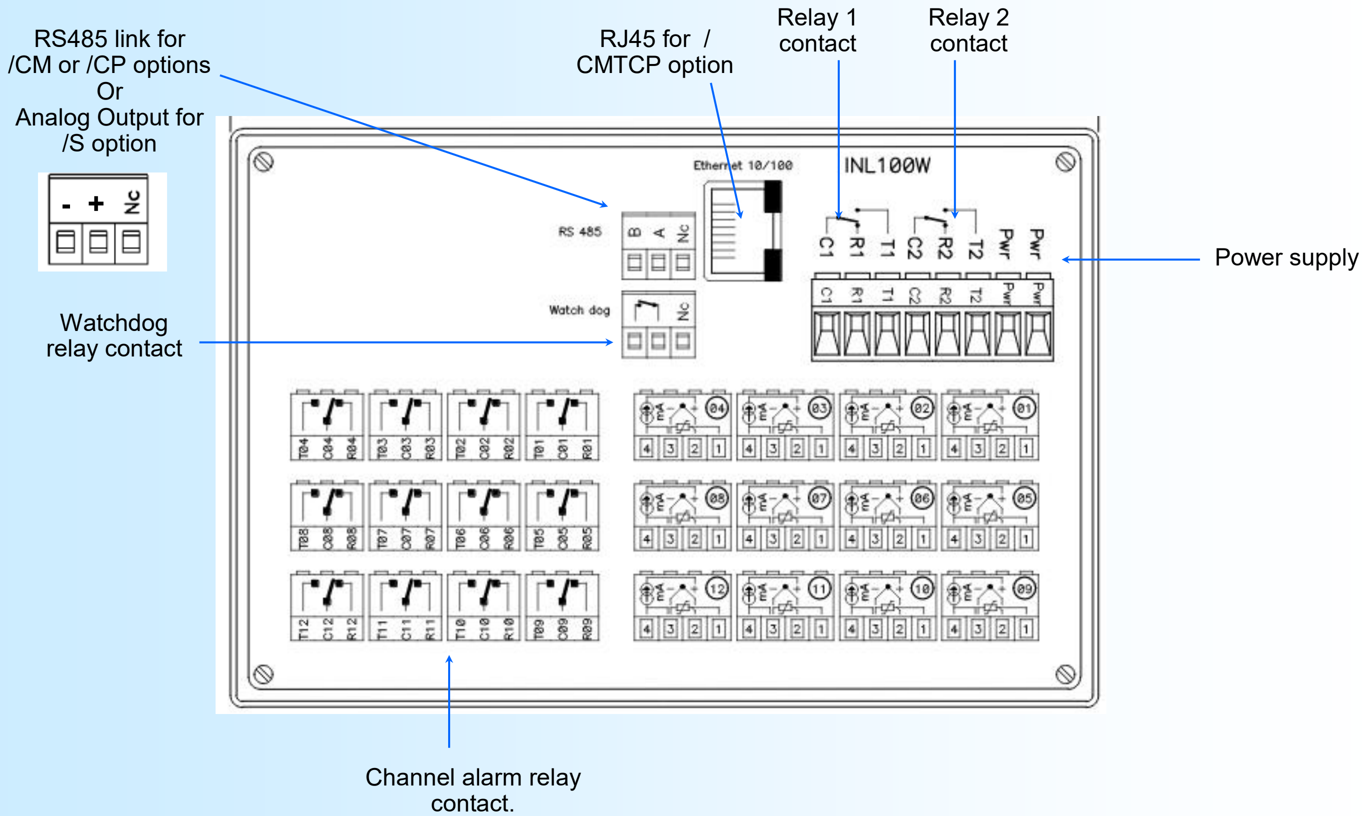
INL100 wiring:
Terminal 1: PT100 or resistance line compensation input.
Terminal 2: input + (mA input with external 5 Ohms shunt).
Terminal 3: ground.

INL100P wiring:
Terminal 1: + 0/10 V input (250 kOhms input impedance).
Terminal 2: + mA input (internal 5 Ohms shunt).
Terminal 3: ground.

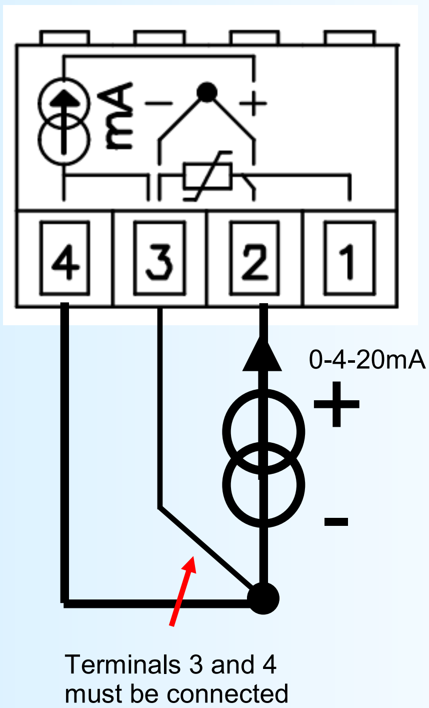
WIRING DIAGRAM FOR INL100-pt4f



WIRING DIAGRAM FOR INL100W



WIRING DIAGRAM FOR 0..4..20mA curent input



MODBUS Communication

1) Features

Protocol:	MODBUS RTU.
Link:	RS485.
Baud rate:	1200bauds to 38400bauds.
Parity:	odd, even, none.
Address:	1 to 255.
Connector:	2 pins pluggable connector.
Reading operation:	Code function 03, 04.
Writing operation:	Not allowed.
Data type:	State and threshold value of alarm AL1, AL2, measure value.
Data format:	- State of alarm's in 16 bits binary format, - Measure in 16 bits unsigned integer, 32 bits floating point, 32 bits reversed signed integer.

Note:
The address, the baud rate and the parity must be configure by the RS232 link or by the front panel.

2) Communication data

2.1) Data's type

All measures are accessible in reading mode. It is possible to read the measure of one channel, several channels (consecutives), or all channels, alarm statements of one channel, several channels (consecutives), or all channels.
Data's are available in different formats:

- 2 words, 4 bytes, for measures in the 32 bits IEEE floating point format,
- 2 words, 4 bytes, for alarms threshold in the 32 bits IEEE floating point format,
- 1 word, 2 bytes, for measures in the 16 bits integer format. The value is in percent of the input scale,
- 2 words, 4 bytes, for measures in the 32 bits integer format,
- 1 word, 2 bytes, 16 bits integer format, for the alarms statement.

➔ Consult the enclosed tables for detail of data's.

2.2) Exception frame

If the slave receive an corrupted frame (CRC16 or parity), it doesn’t answer.
If it is a frame error (data address, function, value), the slave send a exception frame. The exception frame is a 5 bytes frame.

Details of the exception frame:
Function code: The function code of the exception frame is identical to the question frame, but this MS bit is set to 1
Error code: The error code indicate the reason of the exception frame

Error code	Details
$01	Function code not allowed. Only the function codes $03 or $04 are used by the INL100-150 (register reading function).
$02	Data address not allowed.
$04	Slave busy. The internal communication slot is not in connection with the measure part.

2.3) Data format

- Alarm data in 16 bits integer.
Data are transmitted Most significant byte first, 1 byte per alarm or 1 word per channel.
MSB is for AL1, LSB is for AL2.
Alarm activated = $FF, alarm not active = $00

Byte 1		Byte 2	
b_{15}	b_8	b_7	b_0

- Data in 16 bits integer format.
Data are transmitted most significant byte first, 2 bytes or 1 word long.
The 16 bits unsigned integer values correspond to the percentage of the input scale.
$0000 or $FFFF = sensor breaking.

$0001 = Low overstepping of input scale,
$FFFE = High overstepping of input scale.
$0002 à $FFFD = Percentage of input scale.

Example:
- PT100 input (-200 /800°C), 16 bits value = 37442 => [((37442 - 2)/65531) * (800+200)] - 200 = 371,3 °C.
- Tc K input (-200 /1350°C), 16 bits value = 20900 => [((20900 - 2)/65531) * (1350+200)] - 200 = 294,3 °C.

- Data in 32 bits reversed signed integer format.
Data are transmitted **Least significant word**, 4 bytes or 2 words long.
The 32 bits signed integer value correspond to the measure x 100.

Byte 3		Byte 4		Byte 1		Byte 2	
b_{15}	b_8	b_7	b_0	b_{31}	b_{24}	b_{23}	b_{16}
Most significant word				Least significant word			

- Data in 32 bits IEEE floating point format.
Data are transmitted Most Significant Byte first, 4 bytes or 2 words long.
$FFFFFFFF = sensor breaking.

Sign	Exponent		Mantissa	
b_{31}	b_{30}	b_{23}	b_{22}	b_0

3) Table of 32 bits floating point format measures

Register address in decimal (Hexadecimal)	Designation	
4096 ($1000)	Measure of channel 1	Word 1
	(32 bits IEEE floating format)	Word 2
4098 ($1002)	Measure of channel 2	Word 1
		Word 2
4100 ($1004)	Measure of channel 3	Word 1
		Word 2
4102 ($1006)	Measure of channel 4	Word 1
		Word 2
. . .	. . . . . .	
4142 ($102E)	Measure of channel 1	Word 1
		Word 2

Start address: 4096 ($1000) first measure word channel 1
End address: 4142 ($102E) first measure word channel 24
Total number of word 48 Total number of byte 96

4) Table of 16 bits integer format measures

Register address in decimal (Hexadecimal)	Designation
0000 ($0000) or 12288 ($3000)	Measure of channel 1 (16 bits integer) Word 1
0001 ($0001) or 12289 ($3001)	Measure of channel 2 (16 bits integer) Word 1
0002 ($0002) or 12290 ($3002)	Measure of channel 3 (16 bits integer) Word 1
0003 ($0003) or 12291 ($3003)	Measure of channel 4 (16 bits integer) Word 1
. . .	. . . . . .
0023 ($0017) or 12311 ($3017)	Measure of channel 24 Word 1

Start address:	12288 ($3000) or 0 ($0000)	measure channel	1
End address:	12311 ($3017) or 23 ($0017)	measure channel	24
Total number of word	24	Total number of byte	48

5) Table of 32 bits integer format measures

Register address in decimal (Hexadecimal)	Designation	
40960 ($A000)	Measure of channel 1	Word 1
	(32 bits signed integer format)	Word 2
40962 ($A002)	Measure of channel 2	Word 1
		Word 2
40964 ($A004)	Measure of channel 3	Word 1
		Word 2
40966 ($A006)	Measure of channel 4	Word 1
		Word 2
. . .	. . . . . .	
41006 ($A02E)	Measure of channel 1	Word 1
		Word 2

Start address:	40960 ($A000)	first measure word channel	1
End address:	41006 ($A02E)	first measure word channel	24
Total number of word	48	Total number of byte	96

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6) Table of alarms

Register address in decimal (Hexadecimal)	Designation	
8192 ($2000)	Alarms Channel 1 *(MS Byte: AL1, LS Byte: AL2)*	Word 1
8193 ($2001)	Alarms Channel 2	Word 1
8194 ($2002)	Alarms Channel 3	Word 1
8195 ($2003)	Alarms Channel 4	Word 1
. . .	. . . . . .	
8214 ($2016)	Alarms Channel 23	Word 1
8215 ($2017)	Alarms Channel 24	Word 1

Start address:	8192 ($2000)	Alarms channel	1
End address:	8215 ($2017)	Alarms channel	24
Total number of word	24	Total number of byte	48

7) Table of 32 bits floating format for alarms threshold

Register address in decimal (Hexadecimal)	Designation	
8448 ($2100)	Channel 1 AL1 threshold	Word 1
8449 ($2101)	*(32 bits IEEE floating format)*	Word 2
8450 ($2102)	Channel 1 AL2 threshold	Word 1
8451 ($2103)	*(32 bits IEEE floating format)*	Word 2
8452 ($2104)	Channel 2 AL1 threshold	Word 1
8453 ($2105)		Word 2
. . .	. . . . . .	
8540 ($215C)	Channel 24 AL1 threshold	Word 1
8541 ($215D)		Word 2
8542 ($215E)	Channel 24 AL2 threshold	Word 1
8543 ($215F)		Word 2

Start address: 8448 ($2100)
first word for AL1 threshold of channel 1
End address: 8542 ($215E) first word for AL2 threshold of channel 24
Total number of word 96
Total number of byte 192

MODBUS TCP Communication

1) Features

Link:	Ethernet.
Baud rate:	10/ 100 base T.
Default IP address:	192.168.0.253.
Port:	502 in exploitation, WEB page in administration.
IP protocol:	Modbus TCP.
Connector:	RJ45.
Reading operation:	Code function 03, 04.
Writing operation:	Not allowed.
Data type:	State of alarm AL1, AL2, measures value.
Data format:	- State of alarm in 16 bits binary format, - Measure in 16 bits unsigned integer, 32 bits IEEE floating point format, 32 bits signed integer.

2) Data explanation

The data available are the same as the MODBUS protocol (see page 16 to 19).

3) Response time

It’s the time between the reading frame send by the master and the data frame send by the slave.
The INL100/CMTCP answer in less than 30 ms to a reading frame of 48 registers.

4) Multi master using

The INL100/CMTCP supports to be access by master with different IP address. However, the network load have to be less then 30 request /second. A higher network load can cause communication error due to the traffic.

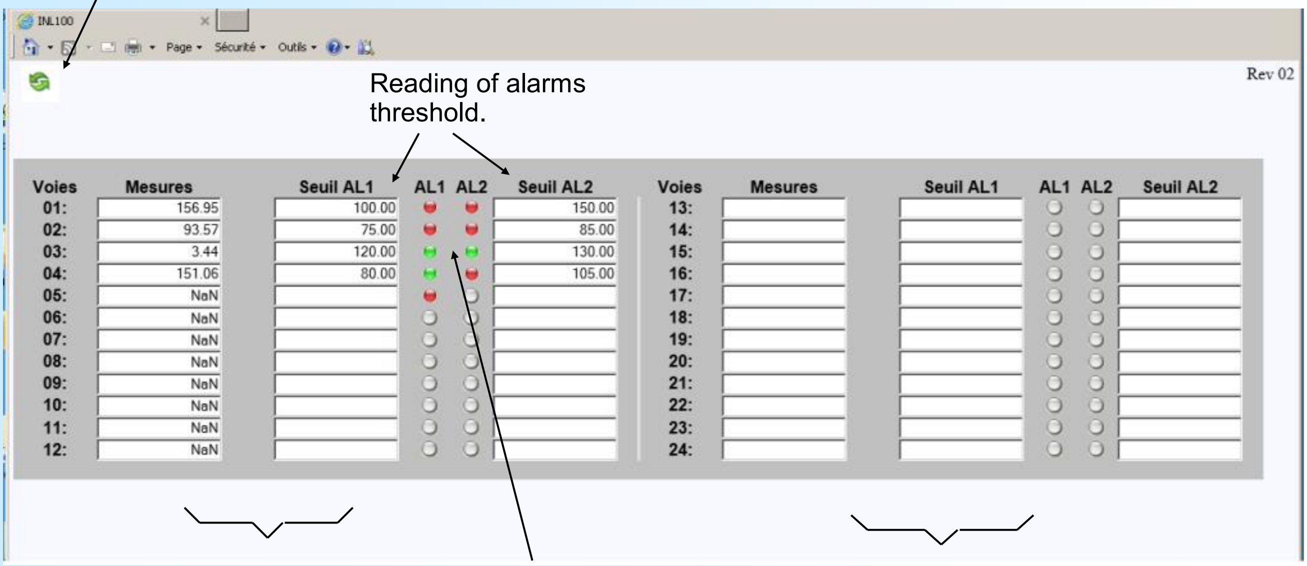
WEB Server

WEB page presentation

With the version 3.11 and later, the INL100-150/CMTCP integrates a web server to view the measures.
The web page consist of an array of channels measurement and show the alarms state. An icon allows to refresh the web page.

Example:

Click to refresh



Channels presents on device.

Show alarm state:
Green: Not in alarm.
Red: In alarm.

Ex: For the channel 5, AL1 is setup in breaking detection and not in threshold detection.

Channels not presents on device.

PROFIBUS Communication

1) Features
This device meet the PROFIBUS specification EN 50710 volume 2.

Supported baud rate: 9.6 k, 19.2 k, 93.75 k, 187.5 k, 0.5 M, 1.5 Mbauds.
Type of transmission: RS485, 8 bits data, 1 stop, even parity.
Connector: unpluggable 3 points.

2) Implementation
The network address and the baud rate should be configured in the device. All communication information's are in the GSD file provide with the device (or may be download at www.loreme.fr).
This information's are in 3 parts:
- Information about the functionality of the device,
- data configuration,
- list of alarms and parameters.

2.1) Explanation of input/output data
A data exchange frame has 105 byte long:
- 96 bytes for the measure in 32 bits IEEE floating point format.
- 3 bytes for the alarm 1 status (1 bit per channel, set to 1 if alarm is activated).
- 3 bytes for the alarm 2 status (1 bit per channel, set to 1 if alarm is activated).
- 3 bytes for the input status (1 bit per channel, set to 1 in case of sensor breaking).

2.2) Explanation of diagnostic data
There are 6 bytes of standard diagnostic data and 2 bytes for device specific data's.

2.3) Data exchange frame

	b7 b6 b5 b4	b3 b2	b1 b0	Total Word	Total Byte
Measure	Channel 1	Byte 1	Word 1	1	1
		Byte 2			2
		Byte 3	Word 2	2	3
		Byte 4			4
	Channel 2	Byte 1	Word 1	3	5
		Byte 2			6
		Byte 3	Word 2	4	7
		Byte 4			8
	Channel 3	Byte 1	Word 1	5	9
		Byte 2			10
		Byte 3	Word 2	6	11
		Byte 4			12
	Channel 4	Byte 1	Word 1	7	13
		Byte 2			14
		Byte 3	Word 2	8	15
		Byte 4			16

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				Word	Byte
	Channel 24	Byte 3	Word 2	48	95
		Byte 4			96
AL1	Channel 1 to 8	Byte 1			97
status	Channel 9 to 16	Byte 2			98
	Channel 17 to 24	Byte 3			99
AL2	Channel 1 to 8	Byte 1			100
status	Channel 9 to 16	Byte 2			101
	Channel 17 to 24	Byte 3			102
Sensor	Channel 1 to 8	Byte 1			103
Breaking	Channel 9 to 16	Byte 2			104
Status	Channel 17 to 24	Byte 3			105

2.4) <u>Details of the status bytes AL1, AL2</u>
When a bit is set to 1, the corresponding channel is in alarm or sensor breaking.

	b7	b6	b5	b4	b3	b2	b1	b0	bit
State of channel 1 to 8	8	7	6	5	4	3	2	1	byte 1
State of channel 9 to 16	16	15	14	13	12	11	10	9	byte 2
State of channel 17 to 24	24	23	22	21	20	19	18	17	byte 3

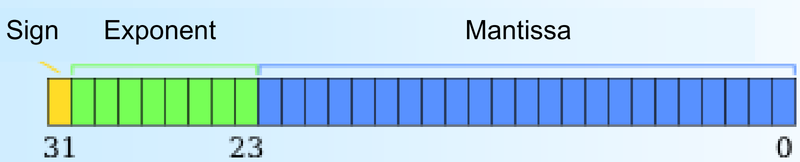
2.5) <u>Device specific Diagnostic data</u>

bytes 1 to 6 : standard diagnostic

0	0	0	0	0	0	1	0	byte 7: header
0	0	0	0	0	0	0	0/1	byte 8: diagnostic
b7	b6	b5	b4	b3	b2	b1	b0	bit 0: measure default

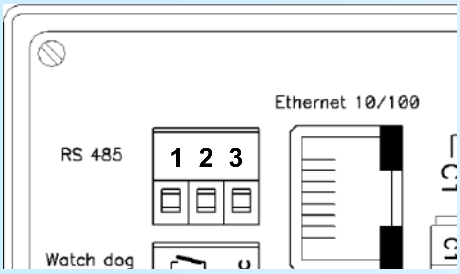
The ‘Measure Default’ appears when the communication slot don’t receive data from the measure part within a 3 s delay (It’s the case if the user enter the device in configuration mode by RS232 link or front panel).
In this case ALL data exchanged are set to 0 !!

2.6) <u>Data format of measurement channels</u>
- Data in IEEE 32 bits floating point format.
Data are transmitted Most significant byte first, 4 bytes long.
$FFFFFFFF = sensor breaking.

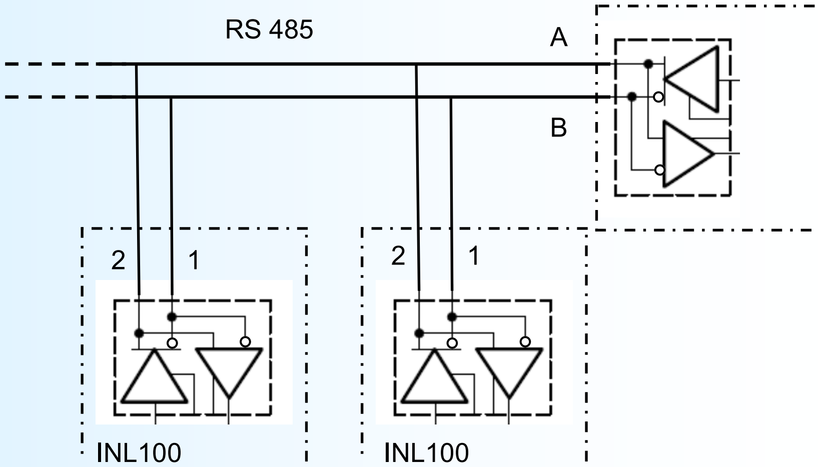


Connexion to the Communication Networks

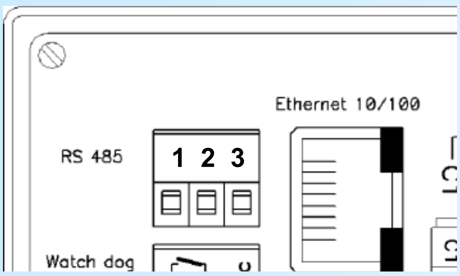
1) Connexion to a MODBUS network



The pin (3) is Not connected

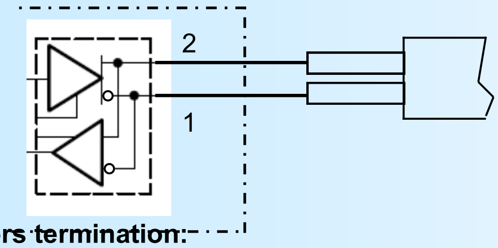


2) Connexion to a PROFIBUS network



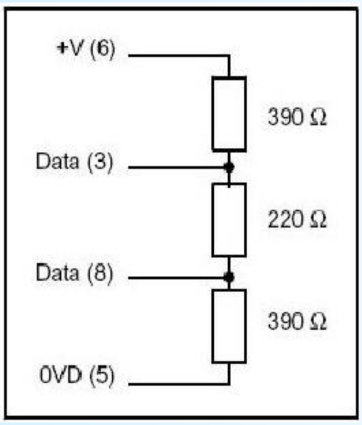
The pin (3) is Not connected

INL100



Profibus cable	wire color	Pin DB9	Designation
	Red	(3)	RxD/TxD - P
	Green	(8)	RxD/TxD - N

Resistors termination:



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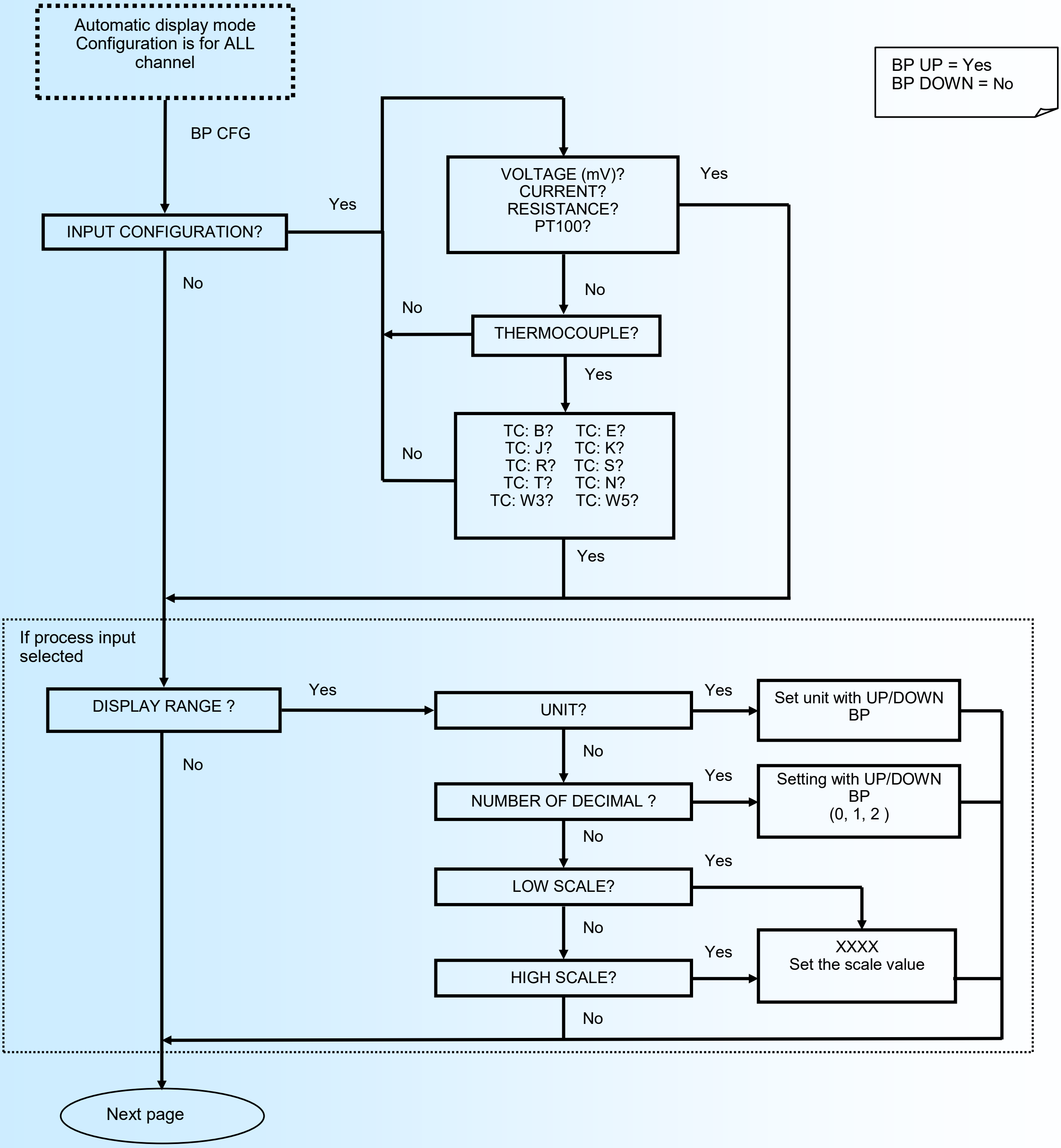
Front panel configuration Flowcharts



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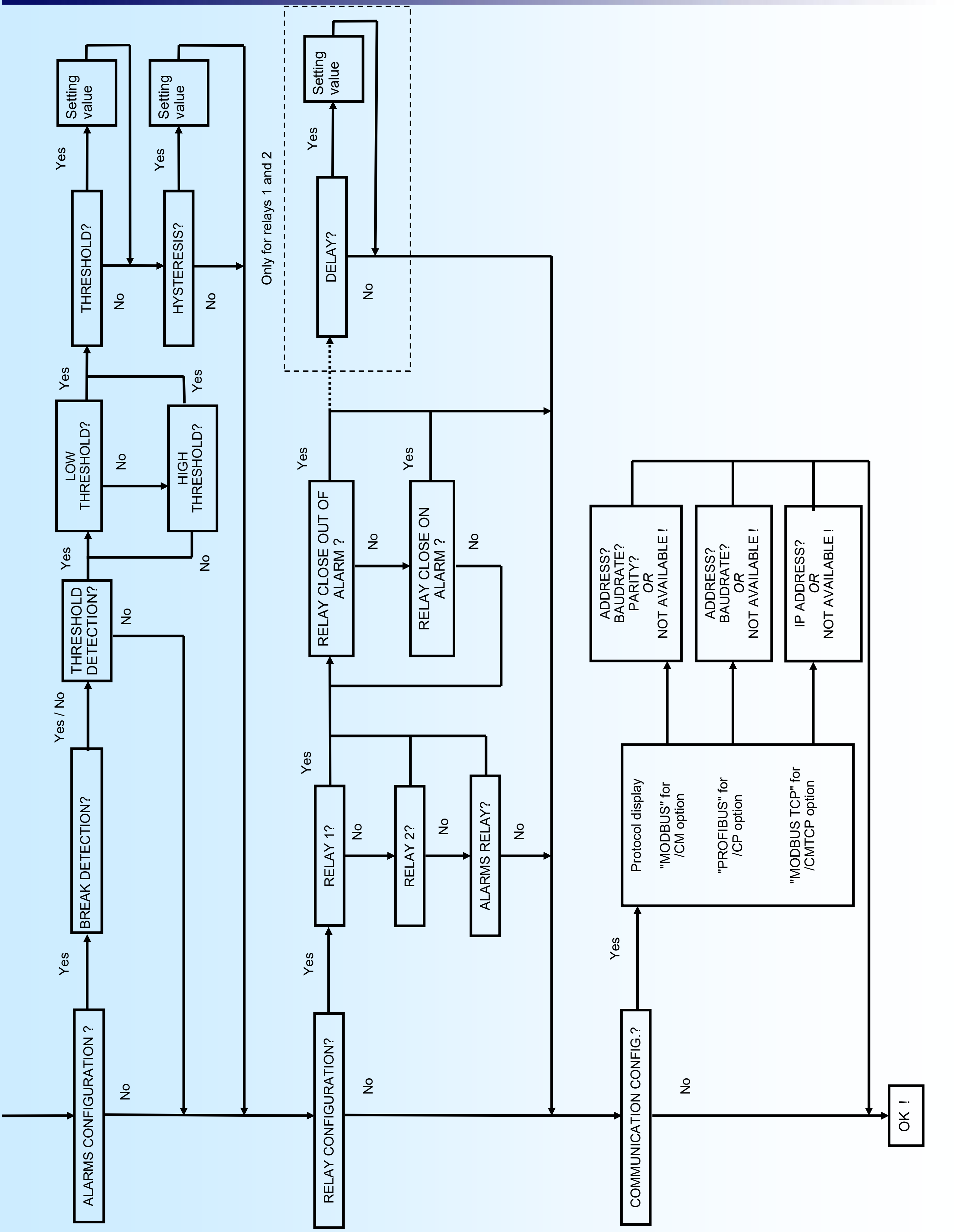

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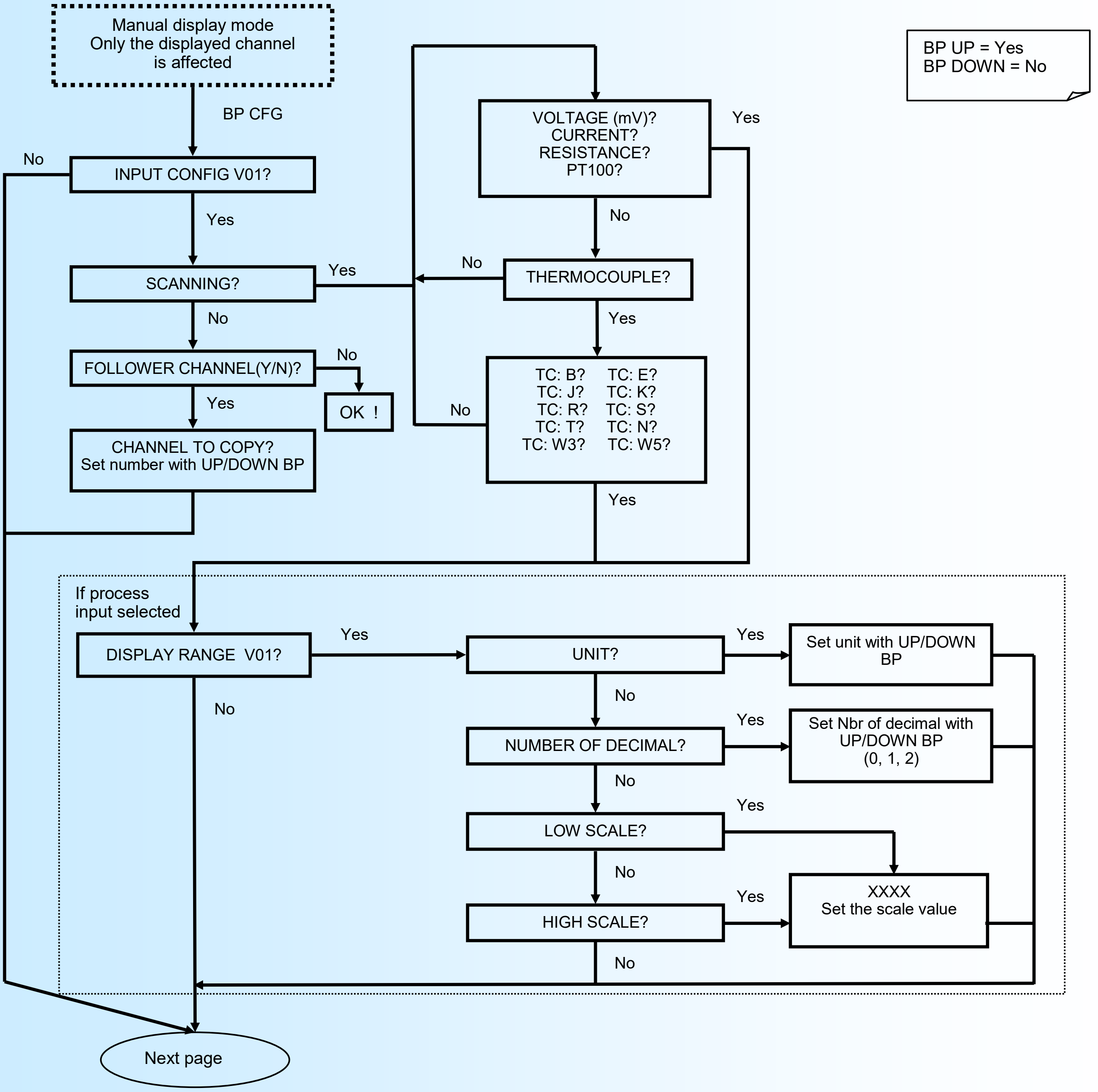
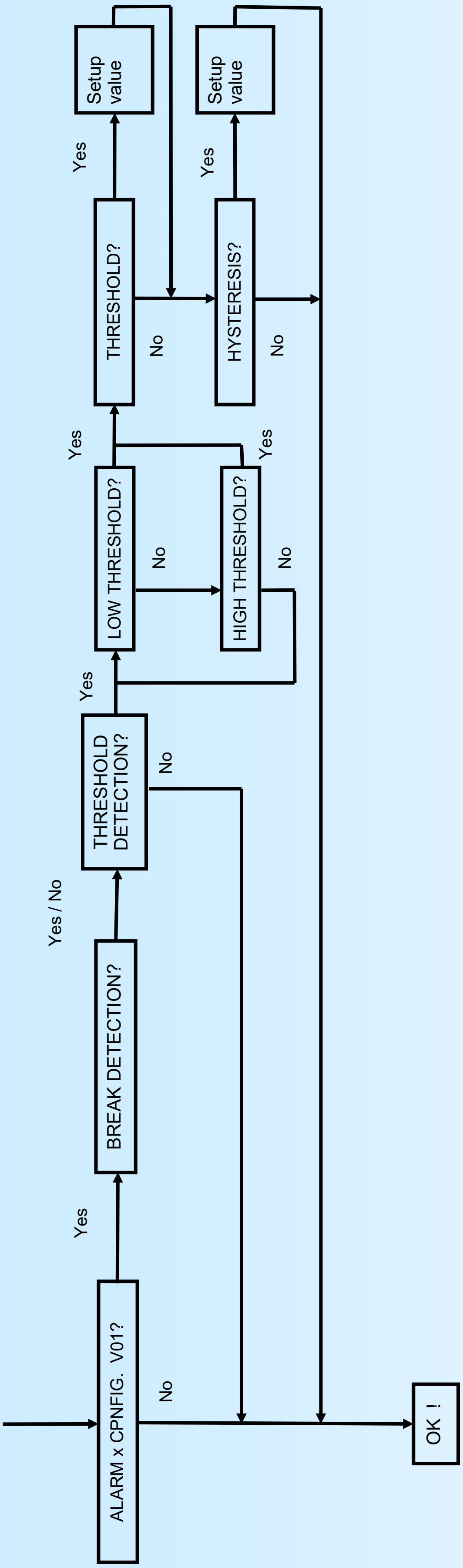

Manual display mode
Only the displayed channel
is affected
BP CFG
INPUT CONFIG V01?
No
Yes
SCANNING?
Yes
No
FOLLOWER CHANNEL(Y/N)?
No
OK !
Yes
CHANNEL TO COPY?
Set number with UP/DOWN BP
VOLTAGE (mV)?
CURRENT?
RESISTANCE?
PT100?
Yes
No
THERMOCOUPLE?
No
Yes
TC: B? TC: E?
TC: J? TC: K?
TC: R? TC: S?
TC: T? TC: N?
TC: W3? TC: W5?
No
Yes
BP UP = Yes
BP DOWN = No
If process
input selected
DISPLAY RANGE V01?
Yes
No
UNIT?
Yes
Set unit with UP/DOWN
BP
No
NUMBER OF DECIMAL?
Yes
Set Nbr of decimal with
UP/DOWN BP
(0, 1, 2)
No
LOW SCALE?
Yes
No
HIGH SCALE?
Yes
XXXX
Set the scale value
No
Next page



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