

CONFIGURATION HANDBOOK

INL100N INL150N

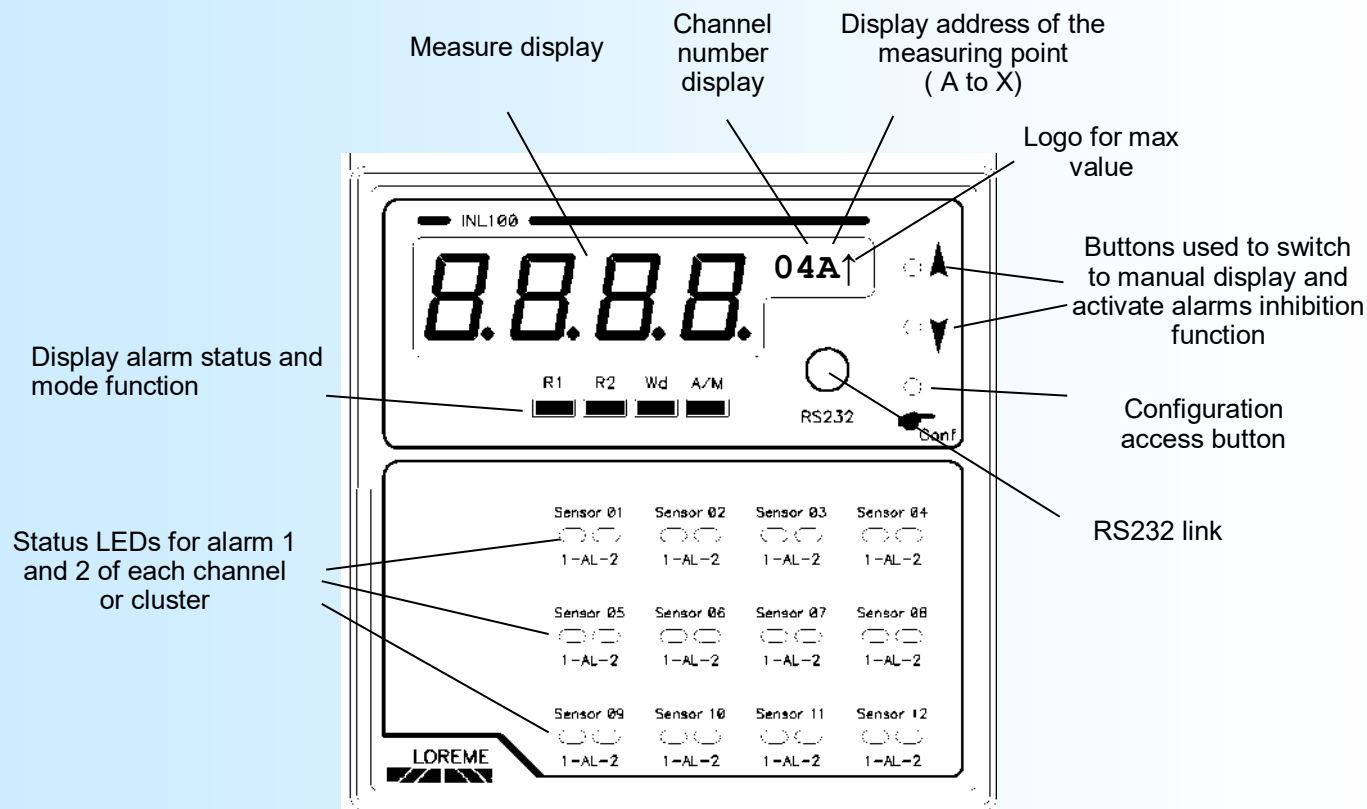


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Device Presentation

The purpose of this configuration handbook is to allow to become familiar with the functions supplied by the device.



It's necessary to make the difference between models:

INL100N: up to 12 channels of 24 points.

INL150N: up to 24 channels of 24 points.

INL1..N/CMTCP: modbus TCP communication option.

INL1..N/CM: modbus communication option.

INL1..N/CP: profibus communication option.

Warning:

Some wiring recommendations must be strictly respected for proper operation of the device (see page 14).

The device front panel is composed by:

- 1 four digits display - 10 000 pts for the measure value at 1/10 of °C.
- 1 four digits alphanumeric display for the channel number and address point.
- 4 LEDs indicators:
 - R1 The alarm 1 common relay is activated,
 - R2 The alarm 2 common relay is activated,
 - Wd status of watchdog relay, relay ON -> led off, relay OFF -> led on,
 - A/M indication of display mode, automatic (led off), manual (led on).
- 8 to 48 LEDs to signal the state of alarms 1 and 2 of each channels,
- 1 jack Ø 3,5 mm plug for the RS232 link,
- 3 push buttons:
 - ▲ In measure mode, select manual display, increase channel number.
In configuration mode increase value and response <YES>.
 - ▼ In measure mode, select auto display, increase point number.
In configuration mode decrease value and response <NO>.
 - ⚙ Access to the configuration mode.
Validate the input value in configuration mode.

1) Features

The device can monitor up to 288 (INL100N) or 576 (INL150N) temperature points, grouped in channels of 1 to 24 points. It consists of a control card and 1 to 6 measure cards. Each measure card handles 4 digital input channels. The measure cards are controlled by the control card through an internal communication link. Two fully configurable alarms are associated with each channel. The front face allows complete visualization of the state of the device with two displays and numerous LEDs. The push buttons allow a change of display, and reconfiguration of alarms settings (unlocked access)

Remark:

An absence or a default of communication between the control card and measure cards, leads to a flashing of the alarm 2 LED of channels 4, 8, 12 on a INL100N and 4, 8, 12, 16, 20, 24 on a INL150N (LED on the right).

Warning:

Each measuring point of a channel is individually addressed by a letter from A to X at manufacturing. The INL100N determines the position of the point in the channel by reading this address. For this reason, it is forbidden to connect on the same input, sensors having the identical addresses. For example two sensors of 3 points addressed A, B, C! If this occurs, the device detects the default and displays an error message.

2) Display information's

There are two display mode: automatic and manual.

The automatic mode is the default mode. The number channel is increased every 2 to 3s and is the point with the maximum temperature measurement that is displayed (logo ↑). In manual mode, button ▲ lets you change the number of the channel and the button ▼ to select a particular temperature point in the channel. Two change speeds are available, the normal speed and fast speed that is activated after 4 s if the button has not been released.

The device returns in automatic display mode after 15 seconds if no button has been pressed during this time.

The measure value is displayed on 4 digits with a resolution of 0.1 °C. Several error messages can be displayed.

- 'Err' indicates a measure point failure (temperature sensor breaking).
- 'ini' indicates that the measure point of the channel has not been initialized (no address).
- 'Adr' indicates that the address of the measuring point has been found several times in the same channel.
- 'oFF' indicates that the measure point is deactivated, or was inhibited after a failure.

3) Measure point activation/deactivation

This feature allows to activate/deactivate a single measure point. For this, select the channel by pushing the ▲ button (manual display mode) and then the measure point by pushing the ▼ button. After that, push simultaneously the ⬅ and ▲ buttons to deactivate the point (OFF) or the ⬅ and ▼ buttons to activate it. The activation / deactivation state of a point is stored in non-volatile memory, and thus is kept even after a device power off.

Remark:

A point which is deactivated is reactivated after an alarms inhibition cancellation procedure (see remarks below).

4) Alarms inhibition

This feature allows to disable the consideration of the alarm status of one or more measurement points without disabling detection. To activate inhibition, the buttons ▲ and ▼ must be pushed simultaneously for more than 5 seconds. The device beeps at the end of five seconds to signalize the success of the operation. To inhibit all alarms for all channels, the device must be in automatic display mode. To inhibit the alarms of a single channel, select the desired channel using the button ▲ (switching to manual display mode) and **activate inhibition before the device returns in automatic display.**

The device distinguishes between alarm inhibition on sensor failure and threshold crossing:

- For a sensor failure, inhibition of the alarms deactivates the point (see above).
- For a threshold alarm, the inhibition of one or several measurement points is saved in volatile memory and is disabled in case of device power off or if the threshold alarm condition disappears.

Remarks:

- A measuring point whose threshold alarm has been inhibited, is indicated by displaying an exclamation point "!" after the address.
- To cancel the sensor failure inhibition of one or more points, it's necessary, after having changed the defect sensors, to repeat the above inhibition procedure.

5) Configuration via the front face

The device is fully configurable with the push button on the front. This requires that the access is unlocked (by the RS232 link) and the device is in manual display mode. Alarms, relays and communication parameters can be configured. The alarms parameters of the selected channel are reconfigured.

To access the configuration, press the  button. If the access is locked, the message 'NOT ALLOWED!' is displayed. If the device is in automatic mode display, the message is 'AUTO DISPLAY!'

For each entry, a message scroll on the display panel. The  (YES) button validates the function or access to the parameter setup. The  (NO) button deactivates the function or switches to the next entry.

During a value setup, the button  is for incrementing the value and  button for decrement. For saving the new value, press the  button.

At the end of the configuration, the message 'OK!' is displayed and all the parameters are saved.

Rq: If no action in the buttons is made within a 30 seconds delay, the device returns in measure mode without saving the new configuration.

6) Configuration rubrics

- **Alarms Configuration?** : allows to setup the type of detection, the threshold and hysteresis.

- **Relays Configuration?** : allows to setup the state of relay in alarm or out of alarm.

- **Communication configuration?** :

For a INL100N /CP or CM: Configure the protocol, the baudrate and the slave address.

For a INL100N/CMTCP: The protocol is Modbus TCP (Open modbus), configure the IP address.

Example of PROFIBUS configuration settings:

Press the button  (YES) or  (NO) to switch to manual mode. The A/M LED must power up. Press  to access the configuration.

The INL100N displays the first category: '**ALARM CONFIG ?**'. Press the button  (NO) to advance to the next category.

INL100N displays '**RELAY CONFIG ?**'. Press the button  (NO) to advance to the next category.

INL100N displays '**COMMUNICATION CONFIG ?**'. Press the button  (YES) to change the communication parameters. INL100N displays the type of protocol currently validated.

INL100N displays the protocol type, if the display is '**MODBUS TCP?**', Press the button  (NO) to display the next protocol. If the display is '**MODBUS?**', press the button  (NO) to display the next protocol. If the display is '**PROFIBUS?**', press the button  (YES) to validate the protocol.

INL100N displays '**ADDRESS?**', press the button  (YES) to change the setting, press the button  (NO) to go to the next parameter.

=> Change of address: INL100N displays the address on the main display

Press any button  (+) or  (-) to change the address. Press the button  to confirm the displayed address.

INL100N displays '**SPEED?**', press the button  (YES) to change the setting, press the button  (NO) to go to the next parameter.

=> Change of speed: INL100N displays the speed in kbauds on the main display.

Press any button  (+) or  (-) to change the speed. Press the button  to validate the display speed

INL100N displays '**OK !**'

End of the configuration, the changes have been saved.

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/download/ rubric accessories

- 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).

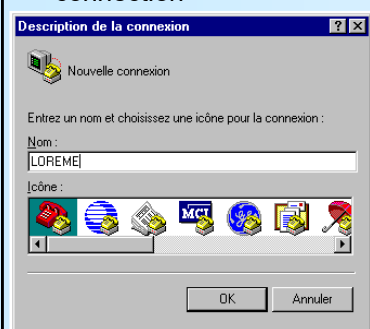
1 The terminal emulation software for PC « HyperTerminal » is resident in windows up to XP version. For later versions, it is downloadable on : **www.loreme.fr in download part** (www.loreme.fr/download/)

=> Run the downloaded software to install it.

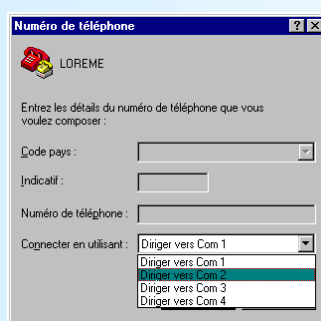
2 Start a "hyper Terminal" connection :

- Click on **"START"** button
- Go to **"All programs \ HyperTerminal Private Edition"**
- Click on **"HyperTerminal Private Edition"**

3 Enter name for the new connection

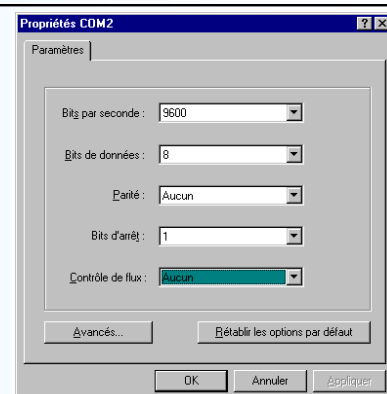


4 Choose the communication port related to the adapter.



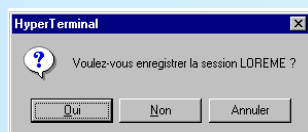
5

- 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.

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 = NON,
 - Type on **"Y"** => Change and validate choice = YES.

2.1.3) 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.

2.2) Language:

Remark:

- It is possible, when a mistake is made during a value acquisition, before validating it, to go back pressing **"←"** which redisplay 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.

Two possibilities:

- French
- English

2.3) Alarms:

The next page is displayed when accessing the alarms configuration rubric:

	Threshold	Direction	Hysteresis	Threshold	Direction	Hysteresis
		Alarm 1			Alarm 2	
CLUSTER ?	CLUSTER01 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
0, 1 . . . 24	CLUSTER02 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
<ENTER>	CLUSTER03 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
->	CLUSTER04 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
0: ALL CLUSTER	CLUSTER05 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
SELECTION	CLUSTER06 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER07 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER08 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER09 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER10 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER11 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER12 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER13 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER14 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER15 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER16 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER17 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER18 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER19 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER20 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER21 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
	CLUSTER22 TRESH1: 40 °C	HIGH^	HYST: 1 °C	TRESH2: 50 °C	HIGH^	HYST: 1 °C
LEAVE	CLUSTER23 TRESH1: 20 °C	HIGH^	HYST: 1 °C	TRESH2: OFF^		
Press <L>	CLUSTER24 TRESH1: 20 °C	HIGH^	HYST: 1 °C	TRESH2: OFF		

Breaking failure de-
 tection activated

Threshold & breaking detection
 deactivated

To change the alarm parameters of a channel/cluster, enter the channel/cluster number and press <Enter>. The number '0' is to set the same configuration to all the channel/clusters. Press <L> to quit the alarm configuration rubric.

The alarm configuration is presented through 2 rubrics:

- Detection type:
 - breaking detection
 - threshold detection

The breaking detection activate the alarm on sensor breaking.

The threshold detection activate alarm on threshold crossing. It is necessary to choose the type of detection (high or low), the threshold value and hysteresis.

The 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.

2.4) Relays

A single parameter is configurable for relays: The relay state according to the alarm state.

Two options are possible:

- Relay energized in alarm.
- Relay energized out of alarm.

2.5) Communication

2.5-1) RS485 slot (MODBUS/PROFIBUS)

The communication configuration is composed of 3 sections:

- **address** of device on the communication network, 1 to 255,
- **speed** 1200, 2400, 4800, 9600, 19200, 38400 bauds,
- **parity** even, odd, none.

The communication configuration Profibus is composed of 2 sections:

- **address** of device on the network (0 to 126),
- **speed** (9600, 19200, 93.75K, 187.5K, 0.5M, 1.5Mbauds).

For more information on MODBUS communication see pages 15-17, PROFIBUS see pages 18-20.

2.5-2) Ethernet slot (MODBUS TCP)

The communication configuration is composed of 3 sections:

- The IP address (each fields has 3 digits, a character '.' between the fields is displayed automatically)
- The IP mask (each fields has 3 digits, a character '.' between the fields is displayed automatically)

For more information on communication by MODBUS TCP see page 21.

2.6) Tag configuration

The tag allows to easily identify the device. It can be made of up to 10 alphanumerical characters. The user only have 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 is not a display character, the display is "-".

2.7) Front face configuration access lock

This function allows to lock the access to the configuration via the front face buttons. (see page 5).

Remark:

During configuration, the alarm 2 LED of channels 4, 8, 12, 16, 20 and 24 can begin to blink!!! This blinking is normal, because in configuration there is no internal communication between the control card and measurement cards.

FIRMWARE update

To access to the firmware update function, 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 Rev2.1
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 Rev2.1
READY TO TRANSFER

***** <————— The star characters appears to show the progress of the uploading.

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

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

Attention

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

EMC Consideration

1) Introduction

In order to satisfy its policy as regards EMC, based on the Community directive 2004/108/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 functioning 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

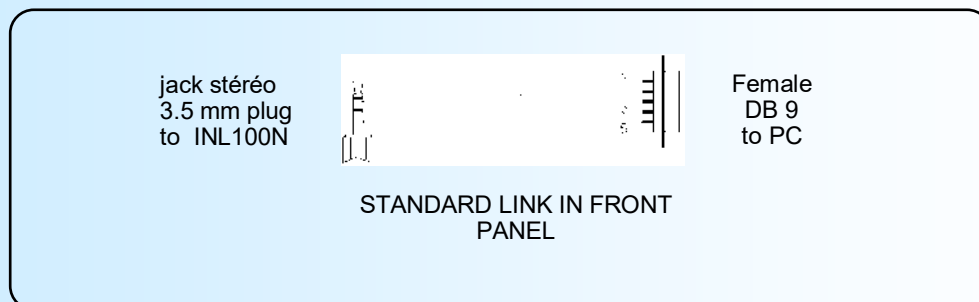
- Comply with the features indicated in the technical sheet (power supply voltage, frequency, allowance of the values, stability, variations ...).
- It is better that the power supply should come from a system with section switches equipped with fuses for the instrumentation element and that the power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

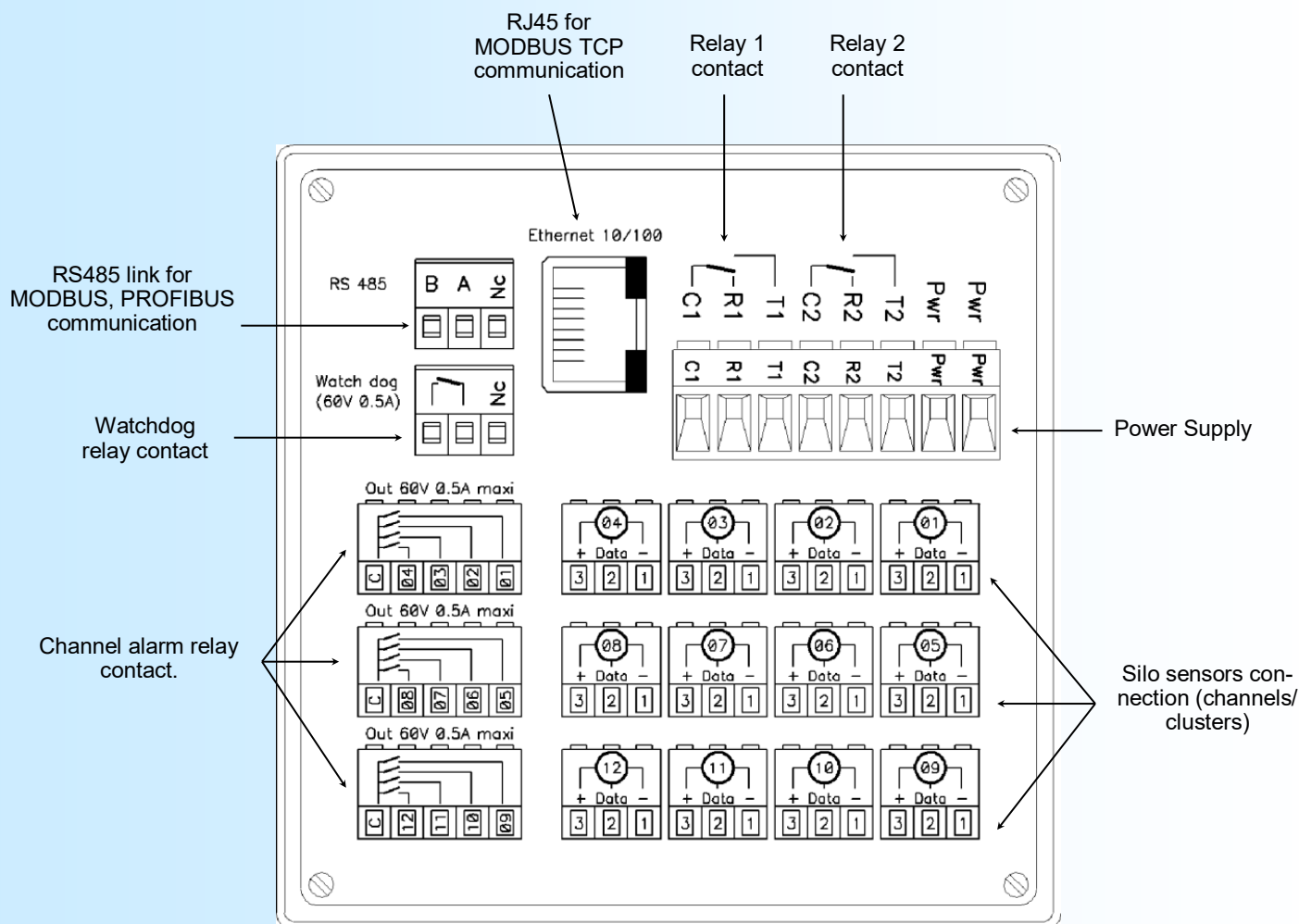
- In harsh conditions, it is advisable to use sheathed and twisted cables whose ground braid will be linked to the earth at a single point.
- It is advisable to separate the input / output lines from the power supply lines in order to avoid the coupling phenomena.
- It is also advisable to limit the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

Wiring

DEVICE-TERMINAL LINK



WIRING DIAGRAM FOR INL100N



Output contacts: These contacts allow to know which silo sensor is in alarm. They are in groups of 4 with a common terminal and each defined a specific sensor. (Eg the contact between 'C' and '01' defined the silo sensor 01, the contact between 'C' and '12' defined the silo sensor 12)

Operating principle of a solution based on numeric temperature sensors in Silo application.



The numeric silo probe use a communication bus called '1 wire'. The data are transmitted in 1 wire and in bidirectional way. The two other wire of probe are used for power supply. Each temperature sensor have a unique 64 bits identifier number and a 8 bits position register (this register is define at the probe . This register is use to define the sensor position inside the silo probe). The communication is working in master / slave mode. Each silo probes are interrogated one after another through a multiplexer, the reading time of a complete probe is approximately 25 ms per temperature point. The silo probe are « plug and play » type and are interchangeable in service, no installation procedure is needed.

Operation:

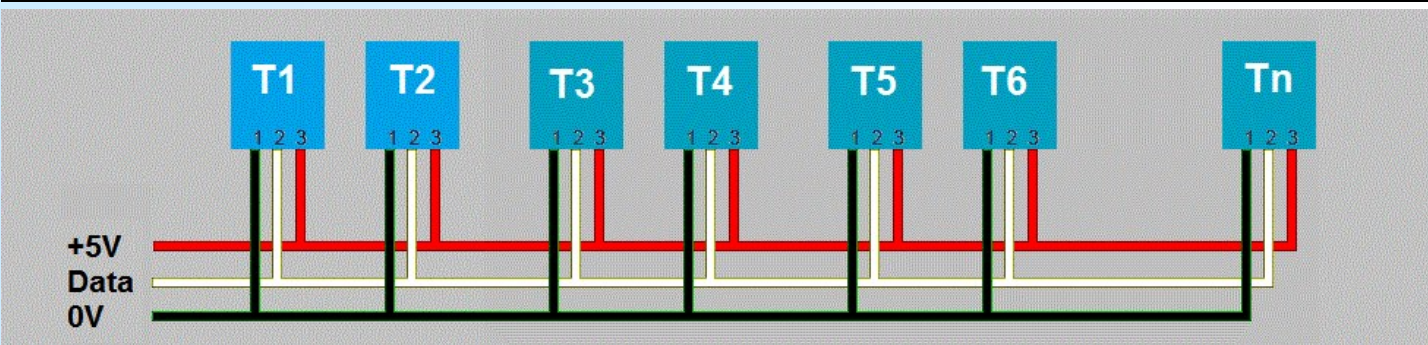
For each new silo probe reading, a specific search algorithm define the number of temperature sensors present in the silo probe and verify the consistency with the device configuration settings (detection of a point out of order is possible during this operation).

Once all points are identified, the device reads the temperature value and the position of each sensor and treat them to alarms, display, external communication, ... and go to the next silo probe.

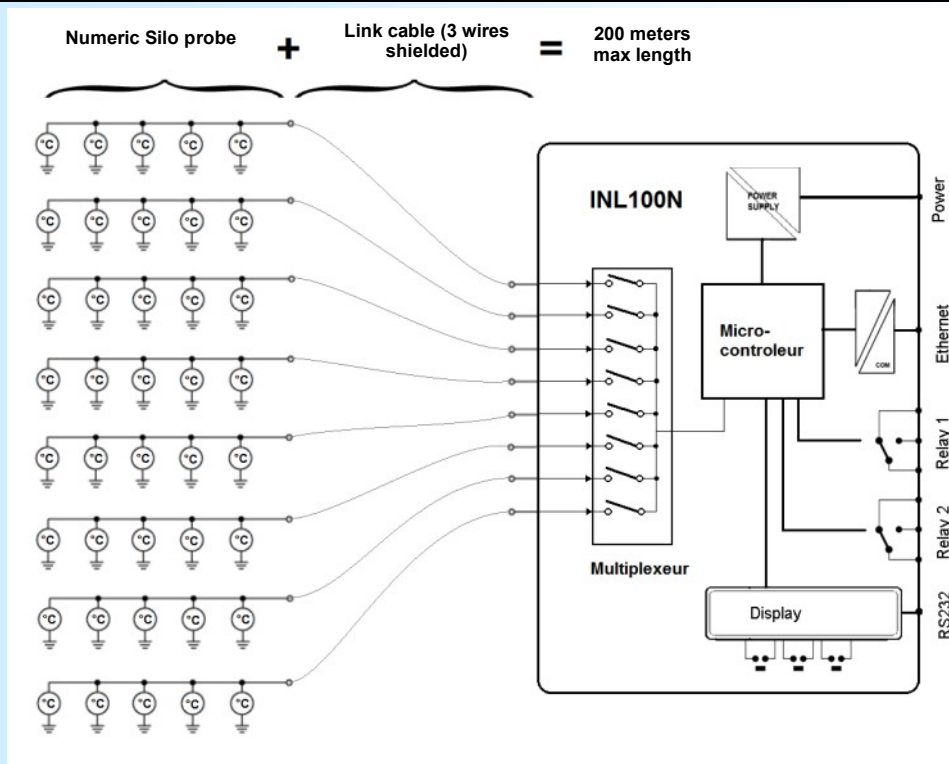
Security:

All data exchange are controlled with a checksum. A transmission error give automatically an reiteration. Each probe is fully re-initialised before each reading. This operating mode allows a perfect reliability of the measures and avoids false alarms.

Internal constitution of a numerical Silo temperature probe



Synoptic of implementation and internal structure of a INL100N



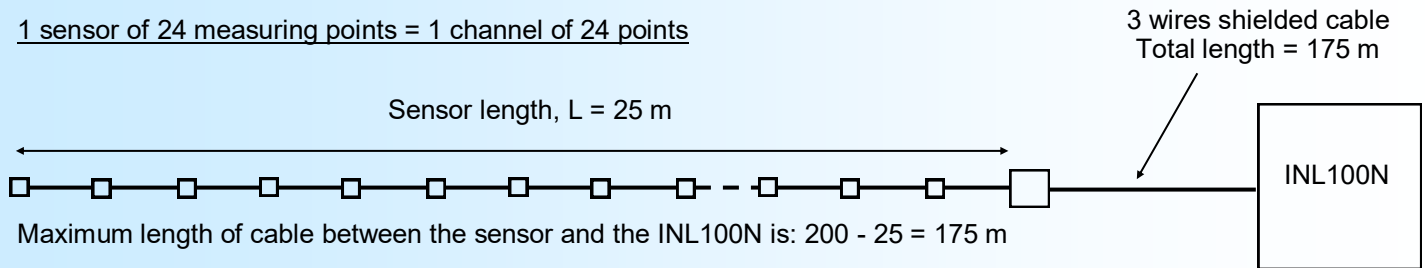
RECOMMENDATIONS FOR WIRING

The measuring element used in the sensors are 3 wires digital type (+5 V, data, GND), and certain rules must be respected for the wiring of a BUS type installation:

- The **BUS length wiring should not exceed 200 m, sensor length included.**
- The **cable used must be a 3 wires shielded type for data transmission (LOREME can recommend the type of cable to use).**
- The **shielding must be interconnected along the entire length of the BUS.**

Example of installation:

1 sensor of 24 measuring points = 1 channel of 24 points

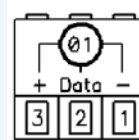


TROUBLESHOOTING

In case of problems, it is possible to make some measurements to determine the causes.

On each sensor connectors of INL100N, measure with a voltmeter the voltage between the lines:

- + & - (gnd)
- & DATA & - (gnd)



Note:
As voltages on these lines are present only during the communication between the INL100N and the numeric sensor, the voltmeter must be connected long enough to see these voltage. (Knowing that INL100N spend about 2 seconds on each sensor, a INL100N with 4 input channels will take about 8 s to communicate with all the sensors).

Diagnostic:

1st case : **Measure when the sensor is connected and is functioning properly**

- + line : 5V voltage present during about 2s
- DATA line : a voltage >4V present during about 2s

2nd case: **Measure when no sensor connected (or one wire is cut)**

- + line : 5V voltage present during about 2s
- DATA line : 5V voltage present during about 2s

3rd case: **Measure when the + line is short-circuited**

- + line : No voltage!
- DATA line : No voltage!

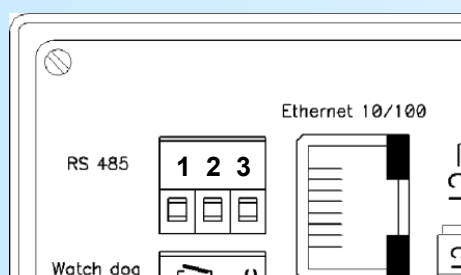
MODBUS Communication

1) Features:

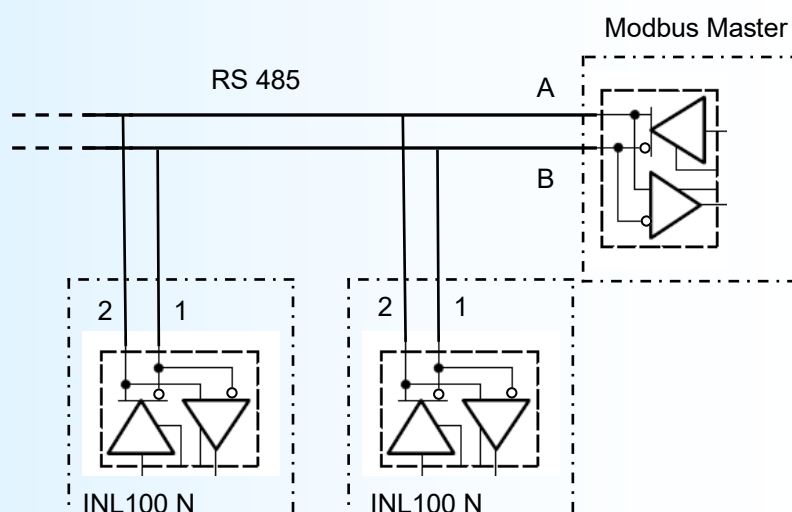
Protocol:	MODBUS RTU
Link:	RS485
Baudrate:	1200bauds to 38400bauds
Parity:	odd, even, none
Address:	1 to 255
Connector:	unpluggable 3 points
Reading operation:	Code function 03,04
Writing operation:	Not allowed
Data type:	State of alarms and temperature measurement
Data format:	- State of alarm in binary 32b, - Measures in 16b unsigned integer

Note : The address, the baudrate and the parity must be configure by the RS232 link or by the button in front.

2) Network connection:



pin 3 is Not connected



3) Data description

For each channel, the user can read a table with the status of alarms and temperature value for each point of the sensor. Each table consists of 29 registers maximum: 1 device status register, 2 status registers for the alarm 1, 2 status registers for alarm 2, and up to 24 registers for temperature. Only one data table can be read at once.

Tables base address		Designation
Decimal notation	Hexadecimal notation	
100	\$0064	data for the channel 01
150	\$0096	data for the channel 02
200	\$00C8	data for the channel 03
250	\$00FA	data for the channel 04
300	\$012C	data for the channel 05
350	\$015E	data for the channel 06
400	\$0190	data for the channel 07
450	\$01C2	data for the channel 08
...	...	...
1150	\$047E	data for the channel 22
1200	\$04B0	data for the channel 23
1250	\$04E2	data for the channel 24

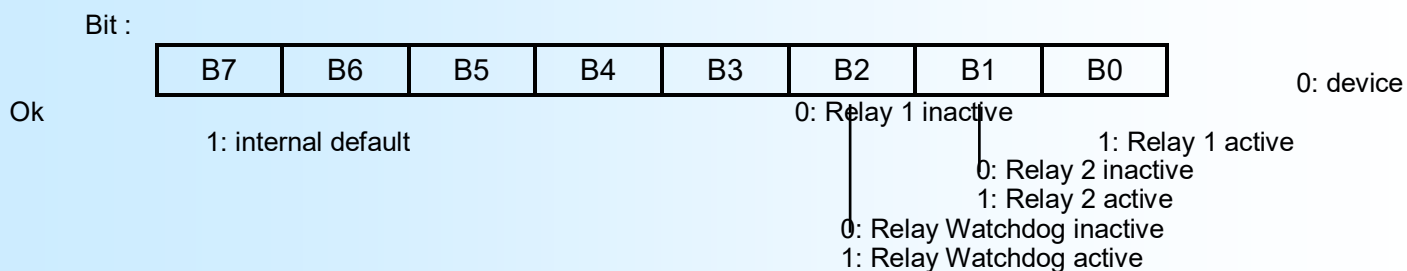
Each table consists of 29 registers arranged as follows:

Registers address	Designation
Basic address of table	State register of device
Basic address of table +1	State register of AL1 (most significant)
Basic address of table +2	State register of AL1 (least significant)
Basic address of table +3	State register of AL2 (most significant)
Basic address of table +4	State register of AL2 (least significant)
Basic address of table +5	Measure register point 1 (MSB first)
Basic address of table +6	Measure register point 2
Basic address of table +7	Measure register point 3
Basic address of table +8	Measure register point 4
...	...
Basic address of table +25	Measure register point 21
Basic address of table +26	Measure register point 22
Basic address of table +27	Measure register point 23
Basic address of table +28	Measure register point 24

4) Registers description :

4.1) State registers of device :

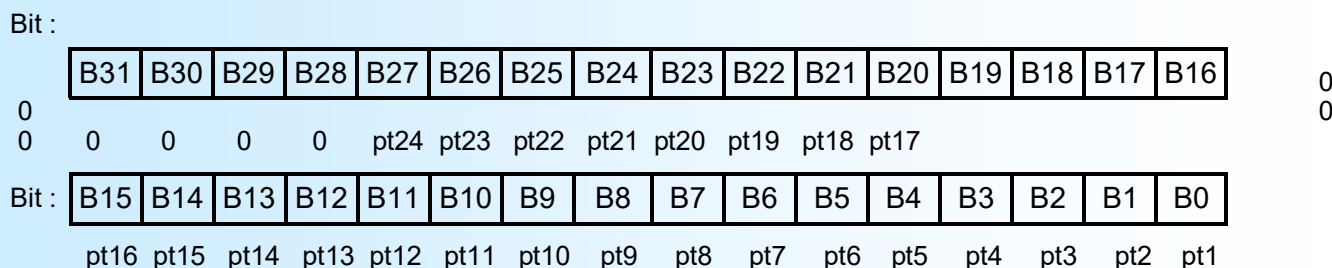
It is a binary word representing the operating status of the device. Only the bits b0 to b7 are used.
This register is accessible thru the basic address of the table (Example: for the channel 03 it corresponds to address 200).



Note : An 'internal default' can occur if the communication part is no longer refreshed by the measurement function in a period of 6s (this happens if the device is in configuration mode).
In this case all the alarms reads by the communication are "0" and measures are all in default.

4-2) State registers of AL1 alarm

It is a 32 bits binary word representing the state of the channel measurement points. Only the bits b0 to b23 are used.
These registers are accessible thru the basic address of the table +1 and +2.
(Example: for the channel 03 it corresponds to address 201 and 202)



pt24...pt1 : correspond to the location of the measurement point in the channel. If the bit is 1, the measure of the point is in alarm.

4-3) State registers of AL2 alarm

It is a 32 bits binary word representing the state of the sensor measurements points. Only the bits b0 to b23 are used.
These registers are accessible thru the basic address of the table +3 and +4.
(Example: for the channel 03 it corresponds to address 203 and 204). The format is the same as for the alarm 1 registers.

4-4) Measure registers

It is a 16 bits unsigned word representing the temperature of the measurement point.

These registers are accessible thru the basic address of table +5 up to basic address +28.

For the channel 03 that corresponds to address 205 for measurement point 1 up to address 228 for measurement point 24.

The integer number corresponds to the percentage of temperature measurement versus the physical range of digital sensor (the sensor can measure temperatures from -55 ° C up to 127 ° C). For a valid temperature, this number varies from 0 to 65533 (\$FFFD in hex). This number is 65535 (\$FFFF in hex) if the point is in breaking failure or 65534 (\$FFFE in hex) if the point is deactivated.

If N correspond to the 16 bits integer, we can recalculate the value of temperature with the following formula:

$$\text{Temperature (}^{\circ}\text{C)} = N \times (127+55)/65533 - 55$$

5) Communication time:

The type of protocol used is MODBUS / RTU mode JBUS. The communication has no header or frame delimiter.

The detection of the start of the frame is realized by a silence whose time is at least equal to the transmission of 3.5 bytes. This implies that a received frame can be processed only after a time at least equal to that silence. The time of this silence is directly related to the transmission speed.

Ex: Baudrate 9600 bauds - No parity (10 bits/byte)

$$\text{Silence} = (3.5 \times 10) / 9600 = 3.64 \text{ ms}$$

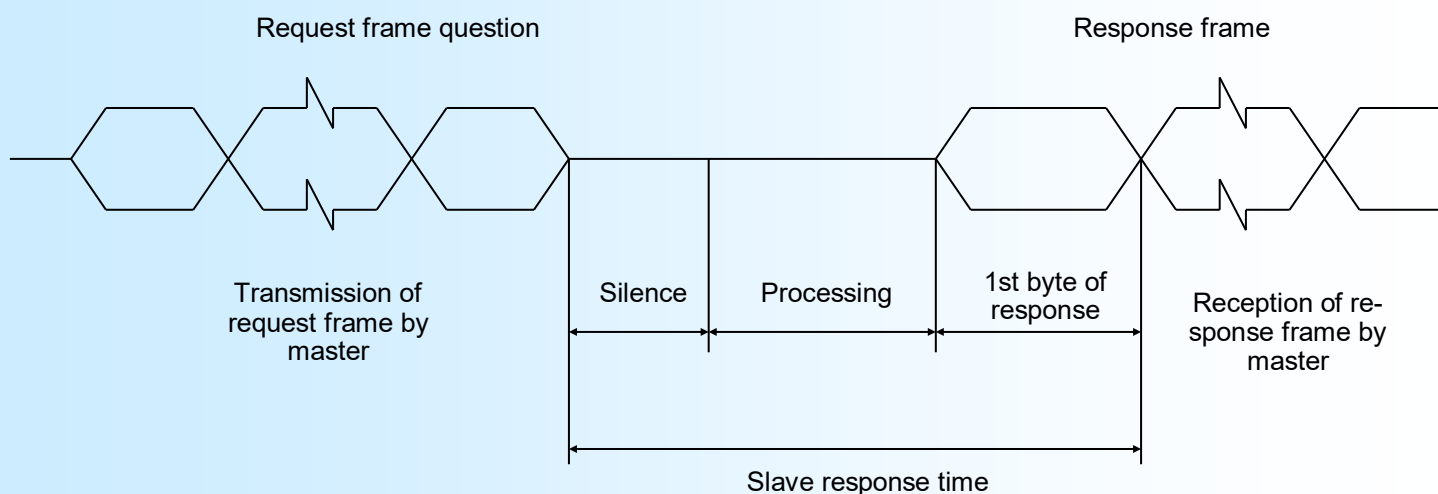
Treatment of the frame starts 3.64 ms after receiving the last byte.

The time between two bytes of a same frame must be less than a silence. If this condition is not respected, the second byte will be considered the first of a new frame.

The time interval between the end of receiving the last byte of the question frame and end of transmission of the first byte of the response frame (frame detection of master station) is the response time of the device.

This response time include:

- silence (time of 3.5 bytes),
- processing the frame (6 ms),
- transmission of the first byte.

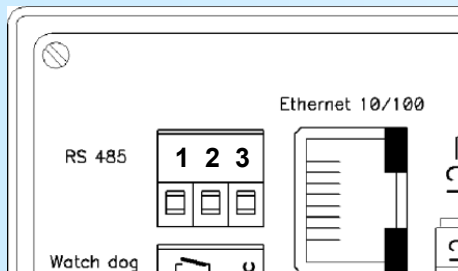


PROFIBUS Communication

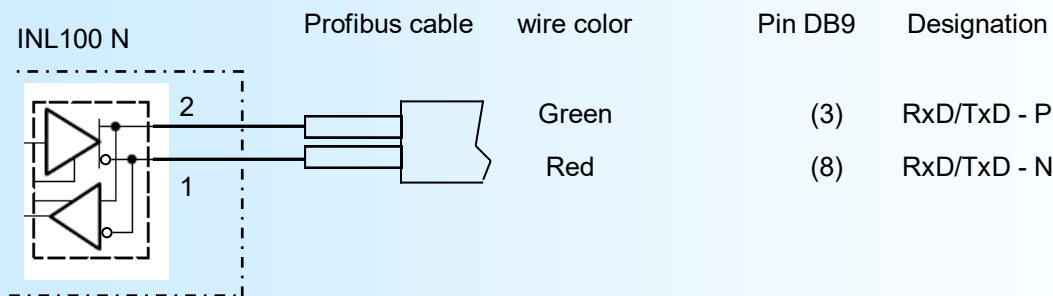
1) Features :

This device meet the PROFIBUS specification EN 50710 volume 2
 Supported baudrate: 9.6K, 19.2K, 93.75K, 187.5K, 0.5M, 1.5Mbauds
 Type of transmission: RS485, 8bits data, 1 stop, even parity
 Connector: unpluggable 3 points

2) Network connection:



Pin 3 is Not connected



3) Implementation:

The network address and the baudrate should be configure in the device via the RS232 or via front face. All information needed to communicate on the network are provided in the GSD file downloadable from our website www.loreme.fr. This information's are in 3 parts:

- Information about the functionality of the device (supported speeds, accessible functions, ...),
- data configuration (data structure of inputs and output),
- list of alarms and function default, parameters.

3.1) Explanation of input/output data:

It has 57 bytes of data exchanged (1 output byte, 56 input bytes). They are grouped into several parts:

- 1 output byte to indicate the number of channel we want read.
- 1 byte to indicate the number of channel read,
- 1 byte for the state of relay AL1, AL2, AL3
- 24 words for the measure in 16 bits unsigned integer format,
- 3 bytes grouping state of alarms 1 (1 bit per point, the bit is 1 if the point is in alarm),
- 3 bytes grouping state of alarms 2 (1 bit per point, the bit is 1 if the point is in alarm),

3.2) Constitution of exchange frame (device response):

To read the measures of a channel, simply put the number of the channel in the output byte. The device will return during the following cyclic exchange:

- The number of the channel, state of relays, the 24 measurements and the status of the alarms.

									Total	
									Words	Bytes
	b7	b6	b5	b4	b3	b2	b1	b0		
Channel number									1	
Status	AL3 AL2 AL1									2
Measures	Channel 1			Byte 1			Word 1		1	3
	Byte 2									4
	Channel 2			Byte 1			Word 1		2	5
	Byte 2									6
	Channel 3			Byte 1			Word 1		3	7
	Byte 2									8
	Channel 4			Byte 1			Word 1		4	9
	Byte 2									10

State bits : bit0 -> 1 if relay AL1 is active, bit1 -> 1 if relay AL2 is active, bit2 -> 1 if relay AL3/Watchdog is active.

				Words	Bytes
State AL1	Channel 24			24	49
					50
	Channel 1 to 8				51
	Channel 9 to 16				52
State AL2	Channel 17 to 24				53
	Channel 1 to 8				54
	Channel 9 to 16				55
	Channel 17 to 24				56

3.3) Details of the status bytes AL1, AL2:

When a bit is set to 1, the corresponding channel is in alarm or input 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

3.4) Device specific Diagnostic data:

The diagnostic data are composed of 6 bytes of standard diagnostic and 2 bytes specific to the device.

bytes 1 to 6 : bytes standard								byte 7: header
0	0	0	0	0	0	1	0	byte 8: diagnostic
0	0	0	0	0	0	0	0/1	bit0: measure default
b7	b6	b5	b4	b3	b2	b1	b0	

The 'Measure Default' appears when the communication slot don't receive data from the measure part within a 6s 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 !!

3.5) Data format of measurement channels:

- Data format 16bits unsigned integer.

Data transmitted MSB first, composed of 2 bytes or 1 word.

\$FFFF = measurement point failure.

\$FFFE = measurement point deactivated.

The integer number corresponds to the percentage of temperature measurement versus the physical range of the digital sensor (the sensor can measure temperatures from -55 ° C up to 127 ° C).

For a valid temperature, this number varies from 0 to 65533 (\$FFFD in hex). This number is 65535 (\$FFFF in hex) if the sensor is in breaking failure or is 65534 (\$FFFE in hex) if the measure point is deactivated.

If N correspond to the 16 bits integer, we can recalculate the value of temperature with the following formula:

$$\text{Temperature (}^{\circ}\text{C)} = N \times (127+55)/65533 - 55$$

1) Features:

Network:	MODBUS TCP
Link:	Ethernet
Baudrate:	10/ 100 base T
Default IP address:	192.168.0.253
Port:	502
IP Protocole:	Modbus TCP
Connector:	RJ45
Reading operation:	Code function 03, 04
Writing operation:	Not allowed
Data type:	State of alarms and temperature measurement.
Data format:	- State of alarm in binary 32b, - Measures in 16b unsigned integer

2) Data explanation :

The data available are the same as for the MODBUS protocol (see page 15 to 17).

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/MTCP answer in less than 30ms to a reading frame of 29 registers.

4) Multi master using :

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