# LT Range

INSTALLATION MANUAL
HARDWARE SPECIFICATIONS

FOREWORD

This manual contains all the necessary information for the installation, cabling and powering up of the LT.

The equipment implementation includes a description for assembly, dimensions, connections and equipment specifications.

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Presentation

Hardware architecture - terminology

The LT is a modular plat-form. It comprises a **base** on which the **blocks** are fixed.
The base consists of a metallic rack and a flexible bus with HE10 connectors.
The section extremities of the base are fitted with 2 **brackets** which enable it to be screwed to a cabinet. The section may also be fitted, on option, with 2 **flanges** which enable the fixation to an asymmetric DIN rail.

A **block** consists of a **functional module** (for instance DI310 Digital inputs, AO121 analog outputs CPU332 central processor ...) associated with **terminal modules** (for instance, 16i.24b for 16 24V digital inputs on a screw terminal , 8o.c1b for 8 ANA current outputs on a screw terminal , ...). All modules on the same block are solidary and screwed together on a plate.

BLOCK	Functional module Connected on the bus	Terminal modules
Power block	1	No
CPU block	1	1 to 4 modules : communication links
I/O block	1	1 to 4 modules : I/O channels
Extension block	1	No

Each module need a **2.5 cm slot** on the base which has a **modular length of n slots**. The minimum length of a base is 4 slots and the maximum length is **30 slots**. The distance between the CPU and the most distant block should not (including the extension cable) exceed **1 meter.**

One CPU block can manage up to 15 I/O blocks coded from 1 to F in the connector on the bus.

The connectors which receive a input/output block have a code between 1 anf F (hexadecimal base) . The code of the connector which receive a CPU block, a power supply block or an extension block is 0.

- One slot ⇔ One physical place (max 30 on the same base) ⇔ One module
- One block ⇔ One Logical place between 0 (CPU) and 15 ⇔ 2,3,4 or 5 modules according to the number of terminal modules.

Nb of slot 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 ...
Nb of block 0 0 0   1   2   3   4   5   6   7

Base

Functional module

Terminal module 1

Terminal module 2

Block 0 = CPU.
Here, the processor board (functional module) with 2 communication modules (terminal modules)

Bus between **Logical** places = connectors of **blocks**

Take care than the numero of blocks must continue on the extension base.

Block Connector (socket). Its position (numero of slot) depends of the width of previous blocks)

Block Connector (plug)

Example :
Block no 5 = One Input/output block.
Here, the functional module with 4 terminal modules on slots 19 to 23.

One block = One sale reference = No dismantled device

CAUTION :

The width of blocks varies between 1and 5 depending of the number of terminal modules. So, the distance between HE10 block connector sockets varies between 1 and 5 slots / steps. So you can't always invert blocks if their width are different.

The build of the base is made on demand in factory in accordance with the customer configuration on the purchase order.

Extension bases

The LT accepts up to 2 extension bases. The width can be different. Bases are linked by extension cable and extension module preferably in slot 1.

So, on main base, there are :
- One extension module (1 module)
- Power supply block (1 module)
- CPU block and I/O blocks.

On extension base :
- One extension module
- Additional power supply modume (if necessary),
- Other I/O blocks

The I/O block numbering continues over the extension base. (see diagram below)
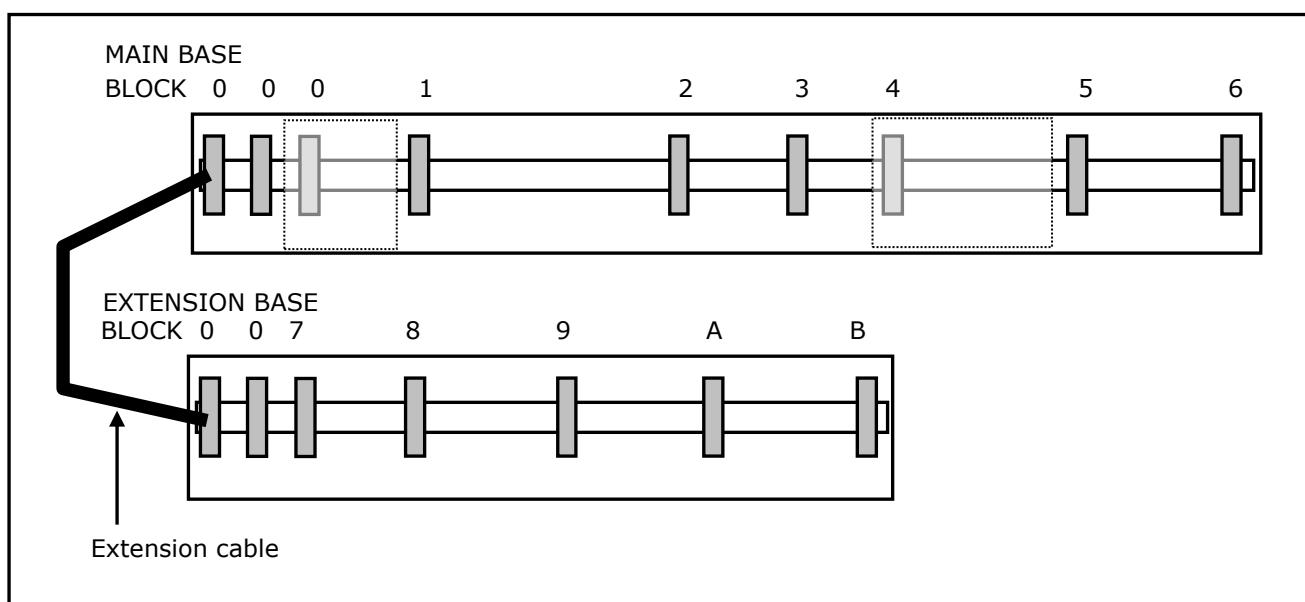
If the extension base needs a power supply block, you must install a EXT101 extension block on the extension base.

Catalogue

Power supply, extension, Mechanics

Description	Sale reference	Functional module	steps
Power supply			
24V-48V	LPSD331	PSD331	1
120V	LPSD342	PSD342	1
Extension blocks			
Extension 100	LEXT100	EXT100	1
Extension 101 (if an additional power supply is on the extension base)	LEXT101	EXT101	1
Extension cables			
simple, length 22cm	PCABEXT22		
simple, length 45cm	PCABEXT45		
double, length 22cm (Y cable for 3 embases)	PCABEXTY22		
double, length 45cm (Y cable for 3 embases)	PCABEXTY45		
Screw terminals connectors			
frontal (female removable)	LCBVF18	5.08mm apart	
Lateral (female removable)	LCBVL18	5.08mm apart	
Spring cage (female removable)	LCBCR18	5.08mm apart	
lateral for PT100 blocks	LCVBL12	3.5mm apart	
bases from 4 to 30 slots	From LEMB004 to LEMB030		4 to 30
Base attachment			
With short brackets	LFIX000		
With 'flanges' on Din rail	LFIX001		
With long brackets	LFIX003		
Reserve **(1 reserve = 1 HE10 connector on the flexible bus)**			
1 slot for future insertion of a 1 slot block.	LRES1		1
2 slot for future insertion of a 2 slot block.	LRES2		2
3 slot for future insertion of a 3 slot block.	LRES3		3
4 slot for future insertion of a 4 slot block.	LRES4		4
5 slot for future insertion of a 5 slot block.	LRES5		5
Cache **(1 cache = NOT HE10 connector on the fexible bis → no insertion of future bloc**			
1 slot.	LRESC		1

CPU Blocks

CPU	LUC3xxx (LT160)	LUC4xxx (LT200)
OS	Proprietary	Linux 2.6.12
IEC611316-3 software	Isagraf V3	Straton
C language	no	Linux Software Development Kit

LUC330x : LT160 CPU blocks without Ethernet link

(*) **The same 9 pins D-sub connector contains the two RS232 and RS485 interfaces which may be used exclusively according to the wiring**.

Sale block reference	Module composition	Description	Steps
LUC3300	CPU332 COM301	CPU RS232/Prg + RS232/485 (*)	2
LUC3301	CPU332 COM301 COM311	CPU RS232/Prg + RS232/485 (*) RS232C + RS232 C	3
LUC3302	CPU332 COM301 COM312	CPU RS232/Prg + RS232/485 (*) RS232/485 + RS232/485	3
LUC3303	CPU334 COM301 COM311 COM312	CPU RS232/Prg + RS232/485 (*) RS232C + RS232 C RS232/485 + RS232/485	4
LUC3304	CPU334 COM301 COM312 COM312	CPU RS232/Prg + RS232/485 (*) RS232/485 + RS232/485 RS232/485 + RS232/485	4
LUC3305	CPU334 COM301 COM311 COM312 COM312	CPU RS232/Prg + RS232/485 (*) RS232C + RS232 C RS232/485 + RS232/485 RS232/485 + RS232/485	5
LUC3306	CPU334 COM301 COM312 COM312 COM312	CPU RS232/Prg + RS232/485 (*) RS232/485 + RS232/485 RS232/485 + RS232/485 RS232/485 + RS232/485	5

LUC350x : LT160 CPU blocks with Ethernet link

Sale block reference	Module composition	Description	Steps
LUC3500	CPU354 COM303	Ethernet CPU RS232/Prg + 10Base-T RJ45	2
LUC3501	CPU354 COM303 COM311	Ethernet CPU RS232/Prg + 10Base-T RJ45 RS232C + RS232 C	3
LUC3502	CPU354 COM303 COM312	Ethernet CPU RS232/Prg + 10Base-T RJ45 RS232/485 + RS232/485	3
LUC3503	CPU354 COM303 COM311 COM312	Ethernet CPU RS232/Prg + 10Base-T RJ45 RS232C + RS232 C RS232/485 + RS232/485	4

LUC3504	CPU354	Ethernet CPU	4
	COM303	RS232/Prg + 10Base-T RJ45	
	COM312	RS232/485 + RS232/485	
	COM312	RS232/485 + RS232/485	
LUC3505	CPU354	Ethernet CPU	5
	COM303	RS232/Prg + 10Base-T RJ45	
	COM311	RS232C + RS232 C	
	COM312	RS232/485 + RS232/485	
	COM312	RS232/485 + RS232/485	
LUC3506	CPU354	Ethernet CPU	5
	COM303	RS232/Prg + 10Base-T RJ45	
	COM312	RS232/485 + RS232/485	
	COM312	RS232/485 + RS232/485	
	COM312	RS232/485 + RS232/485	

LUC4xxx : LT200 CPU blocks

Sale Block reference	modules	Description	Steps
LUC4001	CPU610 COM630	CPU : RS232 and USB connectors Ethernet 10-100 base T **with anti-vibration RJ45 connector** 3 x RS232/RS422 /RS485 **Vernished boards**	2
LUC4003	CPU610 COM630	CPU : RS232 and USB connectors Ethernet 10-100 base T Standard RJ45 connector 3 x RS232/RS422 /RS485	2

Digital inputs

Description	Sale block reference	Composition : Functional module / terminal modules	steps
Digital inputs			
24V (filtered inputs)			
16 channels			
Screw terminals	LID14241	DI310 /1×16i.24b	2
25 pin SubD connector	LID14641	DI310 /1×16i.24s	2
32 channels			
Screw terminals	LID16241	DI310 /2×16i.24b	3
25 pin SubD connector	LID16641	DI310 /2×16i.24s	3
24V (no filtered inputs)			
48 channels			
Screw terminals	LID18241	DI410 /3×16ix24b	4
64 channels			
Screw terminals	LID19241	DI410 /4×16ix24b	5
37 pin SubD connector	LID19641	DI410 /2×32ix24s	3
48V (filtered inputs)			
16 channels			
Screw terminals	LID34242	DI310 /1×16i48b	2
25 pin SubD connector	LID34642	DI310 /1×16i48s	2
32 channels			
Screw terminals	LID36242	DI310 /2×16i48b	3
25 pin SubD connector	LID36642	DI310 /2×16i48s	3
48V (no filtered inputs)			
48 channels			
Screw terminals	LID38241	DI410 /3×16ix48b	4

	64 channels Screw terminals	LID39241	DI410 /4×16ix48b	5

* 1psl./x voies : 1 power supply for x channels

Description	Sale block reference	Composition : Functional module / terminal modules	steps
Digital inputs with wiring control (for anti intrusion or secured systems) 16 channels Screw terminals	LID44241	DI312 / **1**×16is24b	2
32 channels Screw terminals	LID46241	DI312 / **2**×16is24b	3

Secured digital inputs			
24V/48V/120V 16 channels Screw terminals	LID64202	DI130/8i120b-1/8i120b-2	3

Digital outputs

Description	Sale block reference	Composition : Functional module / terminal modules	steps
Static output (24V 100mA)			
16 channels			
Screw terminals	LOD14240	DO310 / 16o.24b	2
25 pin SubD connector	LOD14640	DO310 / 16o.24s	2
32 channels			
Screw terminals	LOD16240	DO310 / 2 x 16o.24b	3
25 pin SubD connector	LOD16640	DO310 / 2 x 16o.24s	3
Relay outputs			
8 channels			
Screw terminals	LOD52200	DO310 / 8om3Ab	2
25 pin SubD connector	LOD52600	DO310 / 8om3As	2
16 channels			
Screw terminals	LOD54200	DO310 / 2 x 8om3Ab	3
25 pin SubD connector	LOD54600	DO310 / 2 x 8om3As	3
24 channels			
Screw terminals	LOD55200	DO310 / 3 x 8om3Ab	4
25 pin SubD connector	LOD55600	DO310 / 3 x 8om3As	4
32 channels			
Screw terminals	LOD56200	DO310 / 4 x 8om3Ab	5
25 pin SubD connector	LOD56600	DO310 / 4 x 8om3As	5

Mixte digital input/output blocks			
16 inputs (24V) + 8 relay outputs			
Screw terminals	LIO15200	DIO210 / 6i.24b / 8om3Ab	3
25 pin SubD connector	LIO15600	DIO210 / 16i.24s /8om3As	3
8 three voltage inputs (24V/48V/120V) + 8 relays outputs with redundant commands (for sub station energy management)	LIO64202	DIO130 / 2 x 8io120b	3

Analog inputs and outputs

Description	Sale block reference	Composition : Functional module / terminal modules	steps
Analog inputs			
-20 mA/ +20 mA			
8 channels			
Screw terminals	LIA12210	AI110 / 8i.c1b	2
SubD 25 points	LIA12610	AI110 / 8i.c1s	2
16 channels			
Screw terminals	LIA14210	AI210 / 2 x 8i.c1b	3
SubD 25 points	LIA14610	AI210 / 2 x 8i.c1s	3
-10 V/ +10V			
8 channels			
Screw terminals	LIA32210	AI110 / 8i.v1b	2
SubD 25 points	LIA32610	AI110 / 8i.v1s	2
16 channels			
Screw terminals	LIA34210	AI210 / 2 x 8i.v1b	3
SubD 25 points	LIA34610	AI210 / 2 x 8i.v1s	3
-5 V/ +5V			
8 channels Screw terminals	LIA52210	AI110 / 1x 8i.v2b	2
16 channels Screw terminals	LIA54210	AI210 / 2 × 8i.v2b	3
Analog outputs			
4 / 20mA			
8 channels Screw terminals	LOA12211	AO121 / 8o.c1b	2
-10V / +10V			
8 channels			
Screw terminals	LOA32211	AO121 / 8o.v1b	2
SubD 25 points	LOA32611	AO121 / 8o.v1s	2

Mixte analog input / output blocks		(Screw terminals)	
8 inputs −20/+20mA 4 outputs 4-20mA	LIO33200	AIO320 8i.c1b 4o.c1b	3
8 inputs −10/+10V 4 outputs −10V/+10V	LIO43200	AIO320 8i.v1b 4o.v1b	3
8 inputs PT100 (-200/+350°C)	LIO52200	AIO320 8i.p1b	2
8 inputs PT100 (-200/+350°C) 4 outputs 4-20mA	LIO53203	AIO320 8i.p1b 4o.c1b	3
8 inputs PT100 (-200/+350°C) 4 outputs −10V/+10V	LIO53204	AIO320 8i.p1b 4o.v1b	3

* 8ip1b screw terminals have 12 pins.

# Fixing - Sizes

Fixing to a plate or grid : short brackets

The base consists of a rack (modular : n slots x 250mm) and a bracket for screwing (M6) to a grid or plate at each side.

Front view

Left profile view

22 n mm

90

75

108

n+25 mm

25
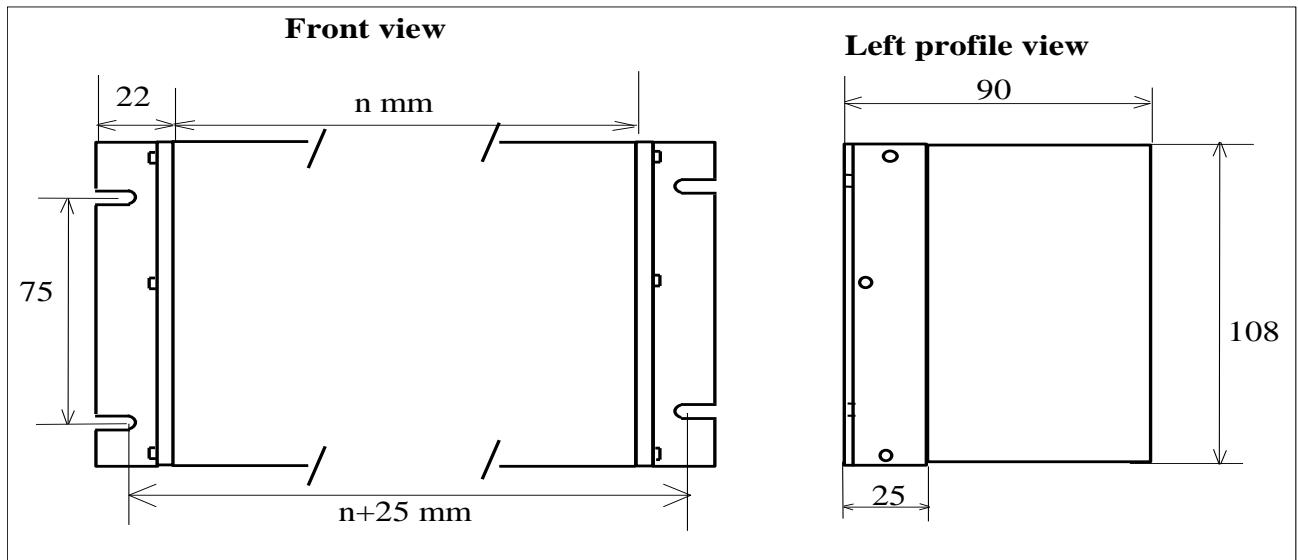
LT dimensions with short brackets screw attachment

Fixing to an asymmetric G DIN rail

The base consists of a **rack** (n slots x 250mm) and at each side a lateral protection flange fixed with 3 screws. The rail is situated 40 mm below the flange bottom and exceeds the LT depth by 6 mm. 7 cms free space should be envisaged above the **DIN Rail** to enable the LT pivoting during its rail insertion or removal.

Front view

Left profile view

4 n mm 4

91

108

32

40

85

Latéral flange
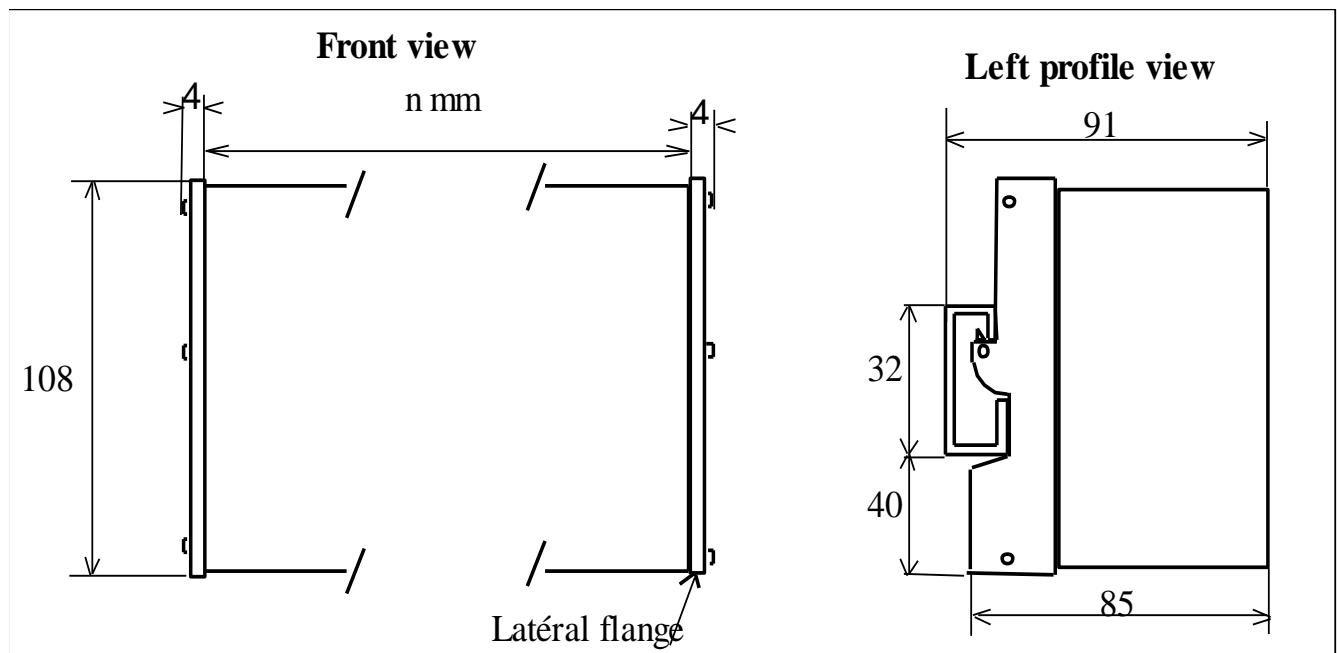
Fixing to a 19'' bay : long brackets

The base consists of a rack (n slots x 250mm) and a bracket on either side for screwing to a 19" mounting bay with M6 screws.

Front view

29   n mm

51,75

n + 38 mm

Left profile view

123

132,5
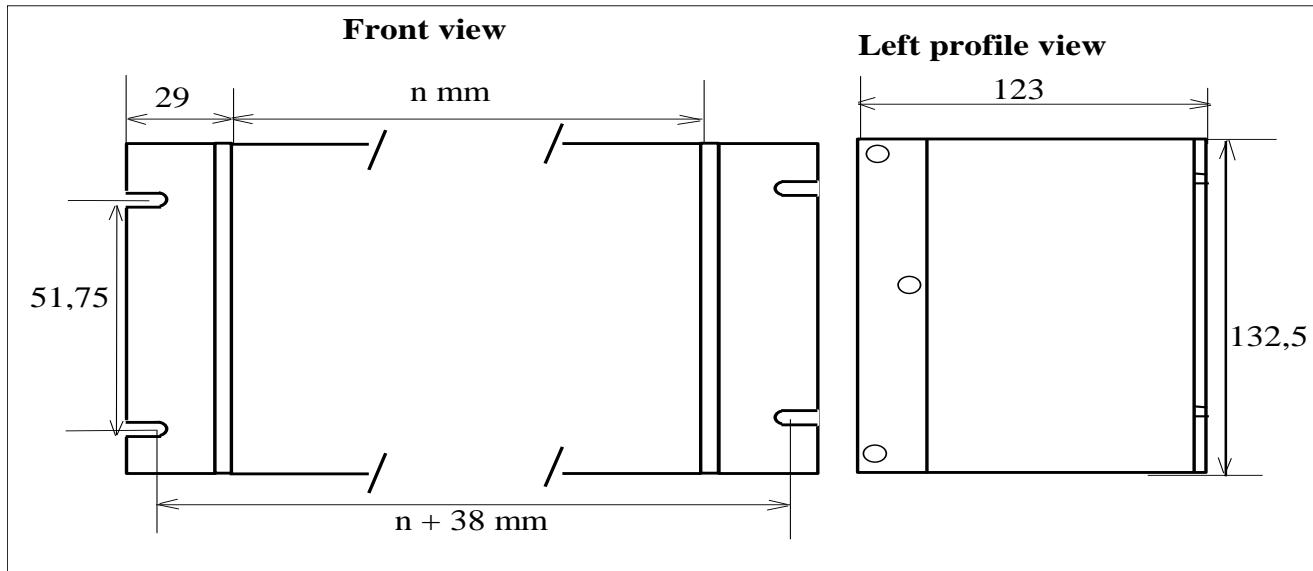
LT dimensions with long brackets screw attachments

Component weights

equipment	Nb slots	weight (grams)
base (short brackets)	6	210
	17 (19 pouces)	600
	30	1100
Power supply block	1	100
CPU blocks	2	270
	3	370
	4	470
	5	570
I/O blocks	2	240
	3	360
	4	470
	5	580

Connections

Grounding – Shields - Watchdog
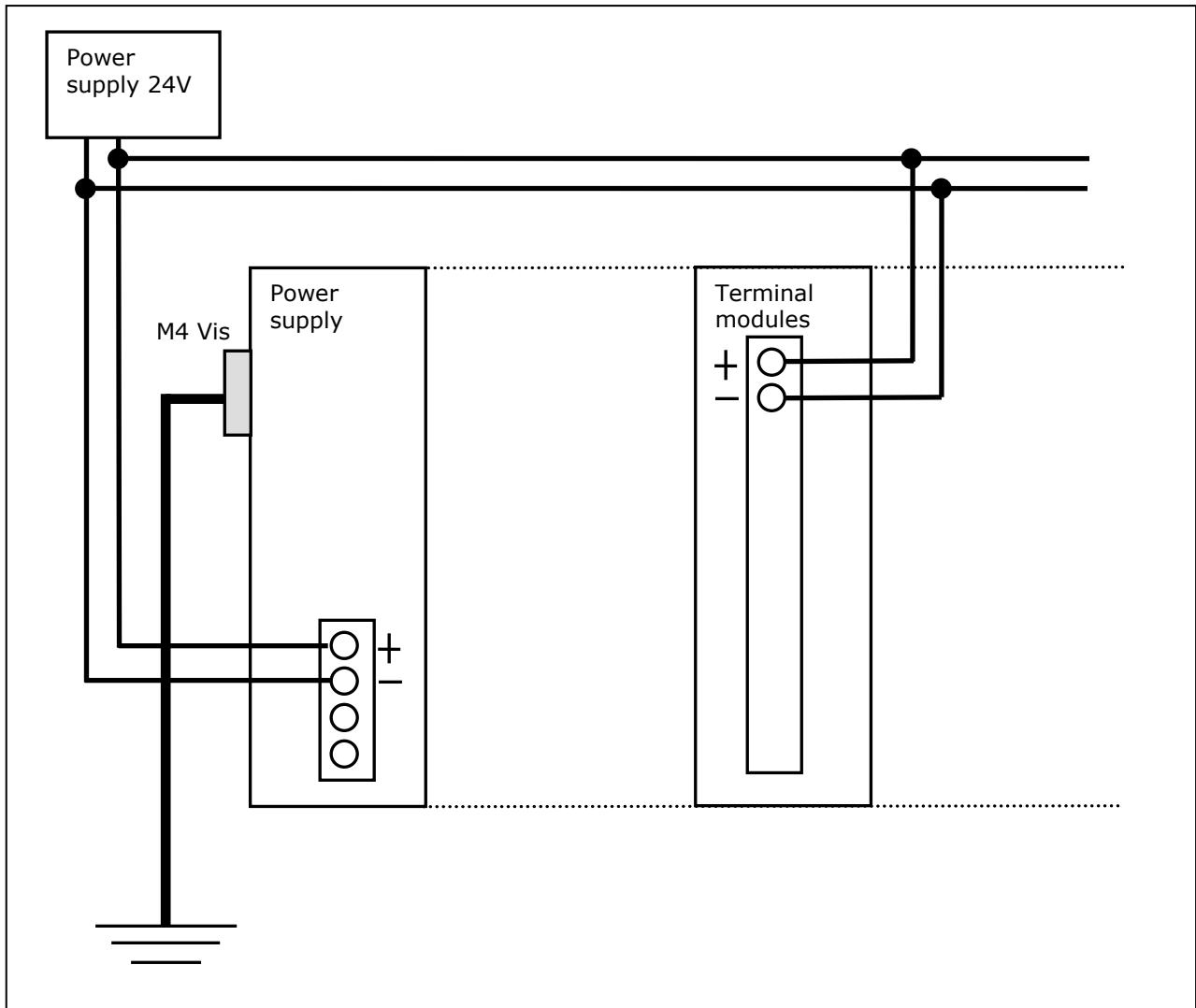

General wiring diagram

Rules to respect :

- Connect the LT chassis to the ground through the M4 screw on the left flange of the base.
- Use shielded cables to transport analog and communication signals.
- Connect the cable shielding to an grounding bar close to the LT which is also connected to the ground.
- The terminal module wiring : verify that the wiring diagrams of each board to see if a fuse needs to be placed in the power supply circuit. (Note : some terminal modules are passive and do not require a power supply).
- Shielding of the Digital I/O cables is recommended for disturbed environments..

LUC3xxx CPU wiring

Communication module List

(see also the previous paragraph: Catalogue / CPU Blocks / LUC30X and LUC350X)

The LUC3xxx CPU supports 1 to 4 communication terminal modules. Each terminal module supports **2 communication ports** fitted with 9 pins D-sub. The upper D-Sub is called com0 and the lower com1. The different terminal modules available on the LT are
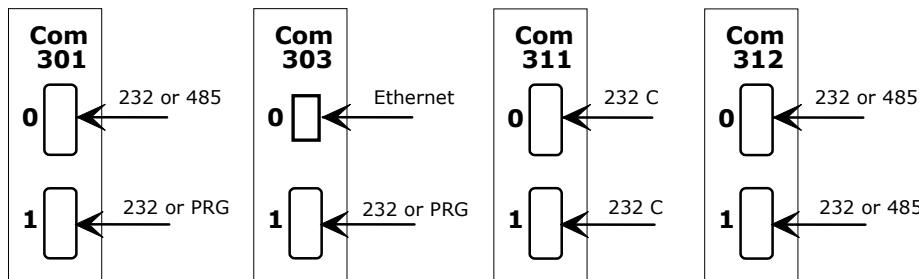

Connector	Com301	Com303	Com311	Com312
Com0 (upper)	RS232/ RS485	Ethernet 10 base T	RS232C	RS232/ RS485
Com1 (lower)	RS232/ Prg (*)	RS232/Prg (*)	RS232C	RS232/ RS485

(*)CAUTION : A bridge between no 1 and no 6 pins allows to switch to a special Mode to upload a new Operating System.

Ethernet channel

Available on the com0 of the Com303.

Speed	10 Mbits base T
Connector	Shielded RJ-45
Médium	Failed twisted-pair cable (FTP 100Ω)
Lenght	100 m max between the LT and the switch
Topology	Star. point to point
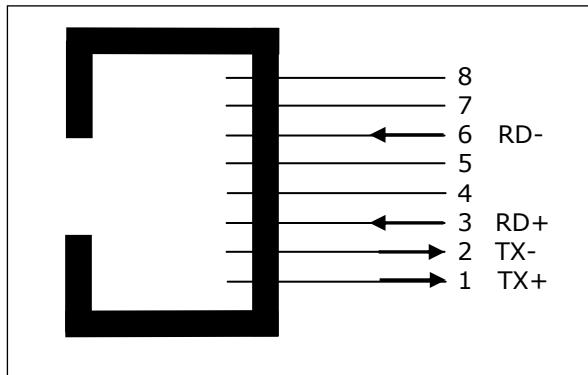
RS485

Available on the com0 of the Com301 and on the com0 and com1 of the Com312.

The RS485 signal is the voltage difference between 2 terminals, A and B. The RS485 is said to be mono-pair: the same pair is used to transmit and receive.

On transmission :

- The 0 bit is characterized by a voltage differential -5V < Ua-Ub < -1.5V, in practice approximately -2.5V
- The 1 bit is characterized by a voltage differential +1.5V < Ua-Ub < +5V, in practice approximately +2.5V

On reception :

- If -5V < Ua-Ub < -1.5V, then the received signal is interpreted as a 0 bit
- If +1.5V < Ua-Ub < +5V, then the received signal is interpreted as a 1bit

Idle : Ua-Ub is equal to approximately +250mV under the condition that the line is **adapted** and **polarized**.
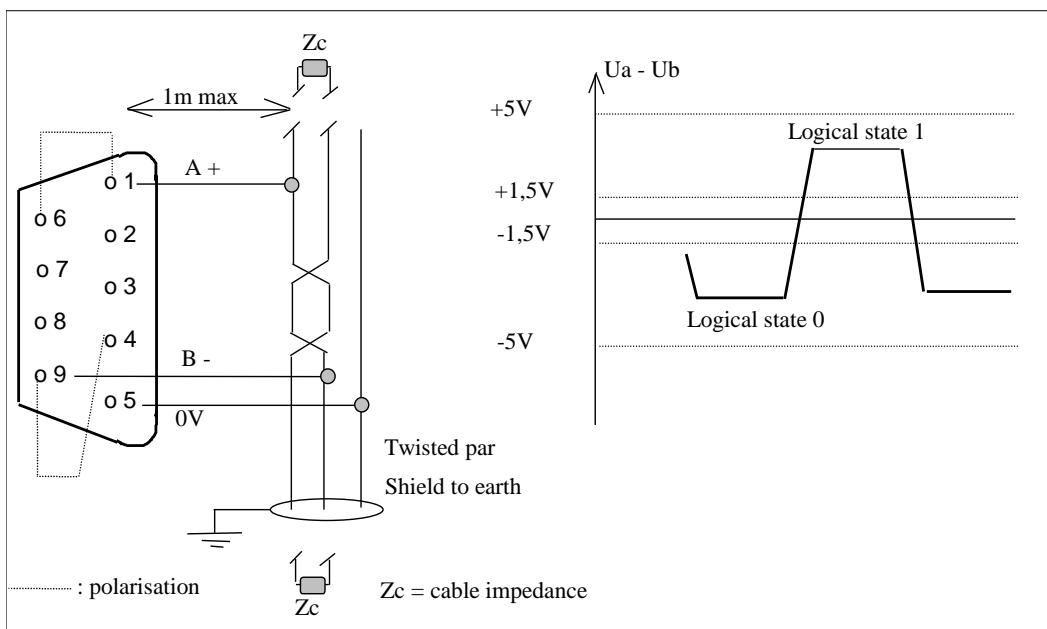
Reminder : an RS232 or RS485 is used on a com but never simultaneously (however, the transmission may be simultaneous but not the reception) .

2 operations are necessary for the normalization of your RS485 network : **polarize and adapt** the line.

Line Polarization: The A+ and B- terminals are pre-polarized (150kΩ) internally. These suggested default values enable the LT station polarization when not connected to a RS485 network. In order to customize your installation you must polarize your line at 470Ω. **Polarization should be undertaken at a single unique point on the line.** On the LT, it is sufficient if you bridge the pins 1 and 6 and then 9 and 4. The 470Ω resistances are available internally (refer to IV.3.2 "Technical data").

Line adaptation : Wire an adaptation resistance to each extremity of the network. The value of this resistance should be equal to the impedance characteristic of the transmission wire which is normally 120Ω. This is required if the line is longer than 100 meters. The resistance should be added between the pins 1 and 9.

RS232 (simple)

Available on the com0 of the Com301 and on the com0 and com1 of the Com312.

Warning : the RS232 and RS485 are present on the same D-Sub. Connect the pins 2, 3, 5 and if required the 7 and 8 (RTS and CTS) to use the RS232.

Also, under the Jbus/Modbus protocol the RTS output is activated (electrically between 5 and 12 volts) when the LT sends. This can be used to pilot a converter.

PRG Bridge :

On the com1 of the Com301 and Com303, Pins 1 and 6 enable the launching of the LT in programming mode (Prg). The programming mode is used to release the operating system (Technical support only).

Bridge PRG (if necessary, contact the technical support)

Pin	Signal	Description
1		
6		
2	Rx	Receive data
7	RTS	Request to send
3	Tx	Transmit data
8	CTS	Clear to send
4		
9		
5	0V	Ground
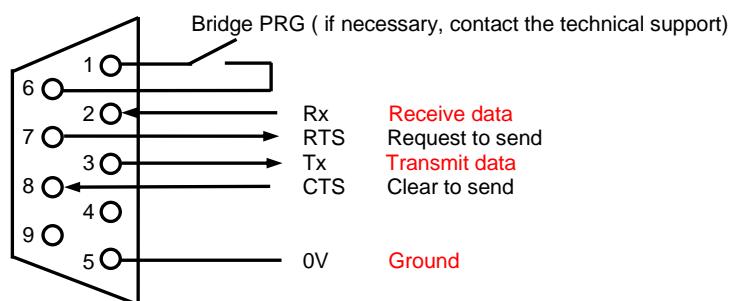
RS232C (complete)

Available on com0 and com1 of the Com311.

The RTS output (pin 7), on the Jbus/Modbus protocol, is activated (electrically between +5 et +12 volts) when the LT transmits. It can be used for piloting a converter.

The DTR and RTS signals may be piloted by the application software. The DCD, DSR and CTS may be read..

Pin	Signal	Description
1	DCD	Data carrier detector
6	DSR	Data set ready
2	Rx	Receive data
7	RTS	Request to send
3	Tx	Transmit data
8	CTS	Clear to send
4	DTR	Data terminal ready
9	RI	Ring indicator (no connected)
5	0V	Ground
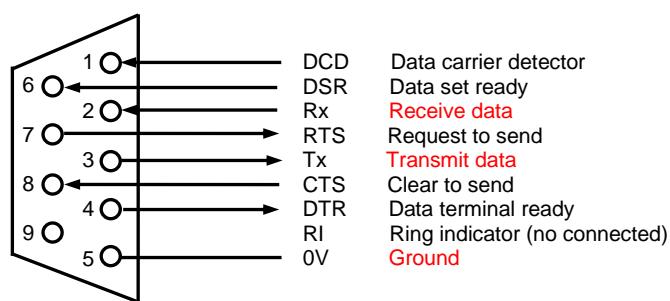
LUC4xxx CPU wiring

Sale Block reference	Modules	Description	Steps
LUC4001	CPU610 COM630	CPU : RS232 and USB connectors Ethernet 10-100 base T **with anti-vibration RJ45 connector** 3 x RS232/RS422 /RS485 **Vernished boards**	2
LUC4003	CPU610 COM630	CPU : RS232 and USB connectors Ethernet 10-100 base T Standard RJ45 connector 3 x RS232/RS422 /RS485	2

Serial links of CPU610 module (on the same SubD 9 pins connector)
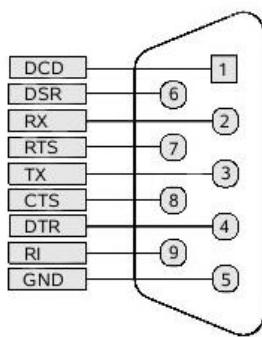
**RS232**   **RS422**
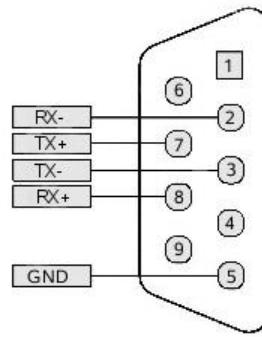
NOTA : The RS485 is not possible because it would use a bridge between 7 ans 8 pins, but this bridge is tested on power ON to switch in Program Restart Mode (PRM). If you need RS485 link, use the COM630 links.

COM63x Module

Ethernet channel

Pin	Description
1	Out +
2	Out -
3	In +
4	Common
5	Common
6	In -
7	Common
8	Common

Serial links
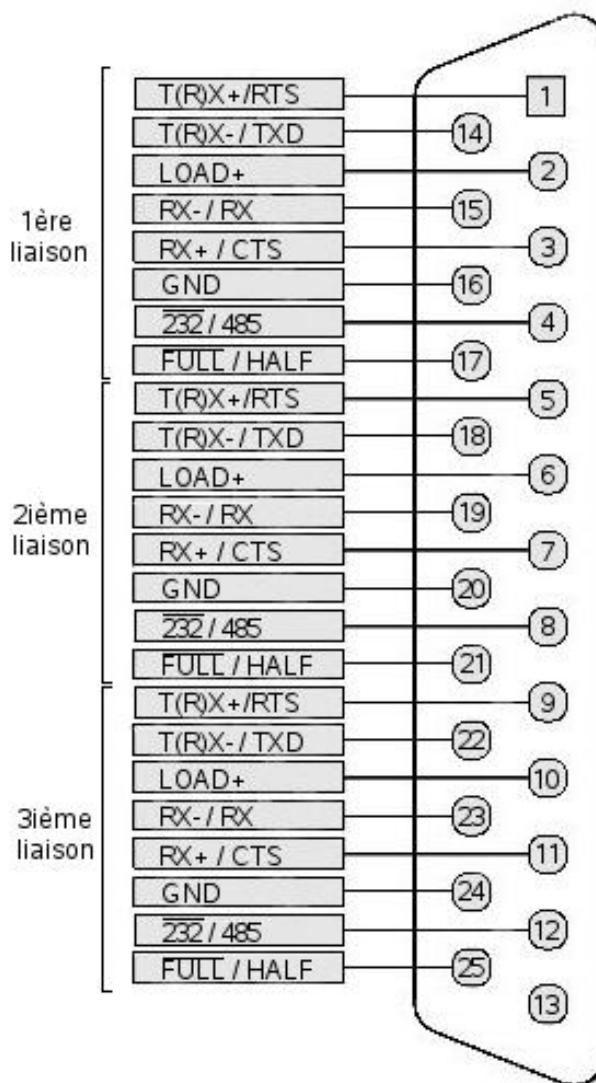
Choice of RS type
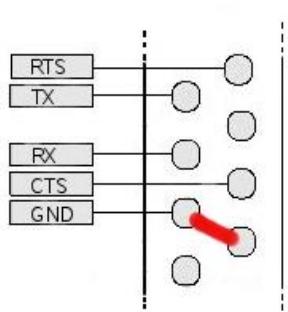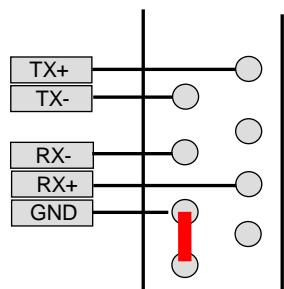
RS232	RS422	RS485
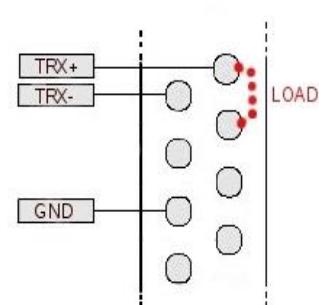
**About RS485 :**
TRX+ and TRX- lines are internaly polarized with 150 kΩ resistor.
There is a 120 Ω adaptation resistor between TRX+ and TRX-. To use it , bridge the TRX+ and LOAD pins.

I/O terminal module wiring

Reminder : An input output module consists of
- a functional module
- 1 to 4 terminal modules

The convention is to name **terminal module n°1 the closest to the function board**. In the following wiring plans the channel numbers are given for terminal module 1. The channel numbers of the other terminal modules, if present, follow respectively.

In order to find the wiring which corresponds to your board :
> **Read the print** on the function module and then the terminal module.
> Deduce **the reference for the wiring plan** and go to the following pages.

Important : some blocks have to be powered. Generally the power supply is situated on the first two wiring points.

Except precision within wiring, only one terminal module requires a power supply in order power all terminal modules of the block.

In complement of the protection of the terminal module against over voltage, it is recommended to protect their supply circuit by a 0.5A fuse.

If necessary (After Sales Service), the blocks should be dismantled with a Pozidriv n°1 cruciform screwdriver. The torque force is 1Nm.

Wiring diagram table

Digital inputs	Power supply	Connector	Diagram
DI310 / 16i.24b	24V	Screw terminal	**A**
DI310 / 16i.24s	24V	SubD 25 pins	**N**
DI310 / 16i48b	48V	Screw terminal	**A**
DI310 / 16i48s	48V	SubD 25 pins	**N**
DI312 / 16is24b	24V	Screw terminal	**G**
DI410 / 16ix24b	24V	Screw terminal	**A**
DI410 / 16ix48b	48V	Screw terminal	**A**
DI410 / 32ix24s	24V	SubD 37 pins	**T**
DIO210 / 16i.24b	24V	Screw terminal	**A**
DIO210 / 16i.24s	24V	SubD 25 pins	**N**
DI130/8i.120b-1/8i.120b-2	24V/48V/120V	Screw terminal	**U**
DIO130/8io.120b-1/8io.120b-2	24V/48V/120V	Screw terminal	**V**
Digital outputs	**Signal**		
DO310 / 16o.24b	Sorties statiques 24V	Screw terminal	**B**
DO310 / 8om3Ab	Sorties relais	Screw terminal	**C**
DO310 / 8om3As	Sorties relais	SubD 25 pins	**M**
DO310 / 16o.24s	Sorties statiques 24V	SubD 25 pins	**P**
DIO210 / 8om3Ab	Sorties relais	Screw terminal	**C**
DIO210 / 8om3As	Sorties relais	SubD 25 pins	**M**
DIO130/8io.120b-1/8io.120b-2	Sorties relais	Screw terminal	**V**

| Analog inputs	Signal		
AI110 / 8i.c1b	-20 / +20mA	Screw terminal	**D**
AI110 / 8i.v1b	-10 / +10V	Screw terminal	**D**
AI110 / 8i.v2b	-5 / +5V	Screw terminal	**D**
AI110 / 8i.c1s	-20 / +20mA	SubD 25 pins	**O**
AI110 / 8i.v1s	-10 / +10V	SubD 25 pins	**O**
AI110 / 4iyv1s	0 / 10V	SubD 9 pins	**Q**
AI110 / 4iyc1s	0 / 20mA	SubD 9 pins	**Q**
AI210 / 8i.c1b	-20 / +20mA	Screw terminal	**D**
AI210 / 8i.v1b	-10 / +10V	Screw terminal	**D**
AI210 / 8i.v2b	-5 / +5V	Screw terminal	**D**
AI210 / 8i.c1s	-20 / +20mA	SubD 25 pins	**O**
AI210 / 8i.v1s	-10 / +10V	SubD 25 pins	**O**
AI210 / 4iyv1s	0 / 10V	SubD 9 pins	**Q**
AI210 / 4iyc1s	0 / 20mA	SubD 9 pins	**Q**
AIO320 / 8i.c1b	-20 / +20mA	Screw terminal	**D**
AIO320 / 8i.v1b	-10 / +10V	Screw terminal	**D**
AIO320 / 8i.p1b	-50°C / +350°C	Screw terminal	**S**
Analog outputs	**Signal**		
AO121 / 8o.c1b	4 / 20mA	Screw terminal	**E**
AO121 / 8o.v1b	-10 / +10V	Screw terminal	**F**
AO121 / 8o.v1s	-10 / +10V	SubD 25 pins	**O**
AIO320 / 4o.c1b	4 / 20mA	Screw terminal	**R**
AIO320 / 4o.v1b	-10 / +10V	Screw terminal	**S**

DIAGRAM A : DI310 / 16i.24b - 16i48b, DI410 / 16ix24b - 16ix48b, DIO210 / 16i.24b

Digital inputs , **type P** , screw terminal 18 pins, 1 power supply .

The input is ON when the sensor switch to V+.

Channel numbers : terminal module 1 : 0 to F; terminal module 2 : 10 to 1F.

| Terminal module	Functional module	V+	Advice
16i24b	DI310	24V	
16i24b	DIO210	24V	no need to wire the +V
16i48b	DI310	48V	Supply all the terminal modules
16ix24b	DI410	24V	
16ix48b	DI410	48V	Supply only one terminal module if several terminal modules are present.
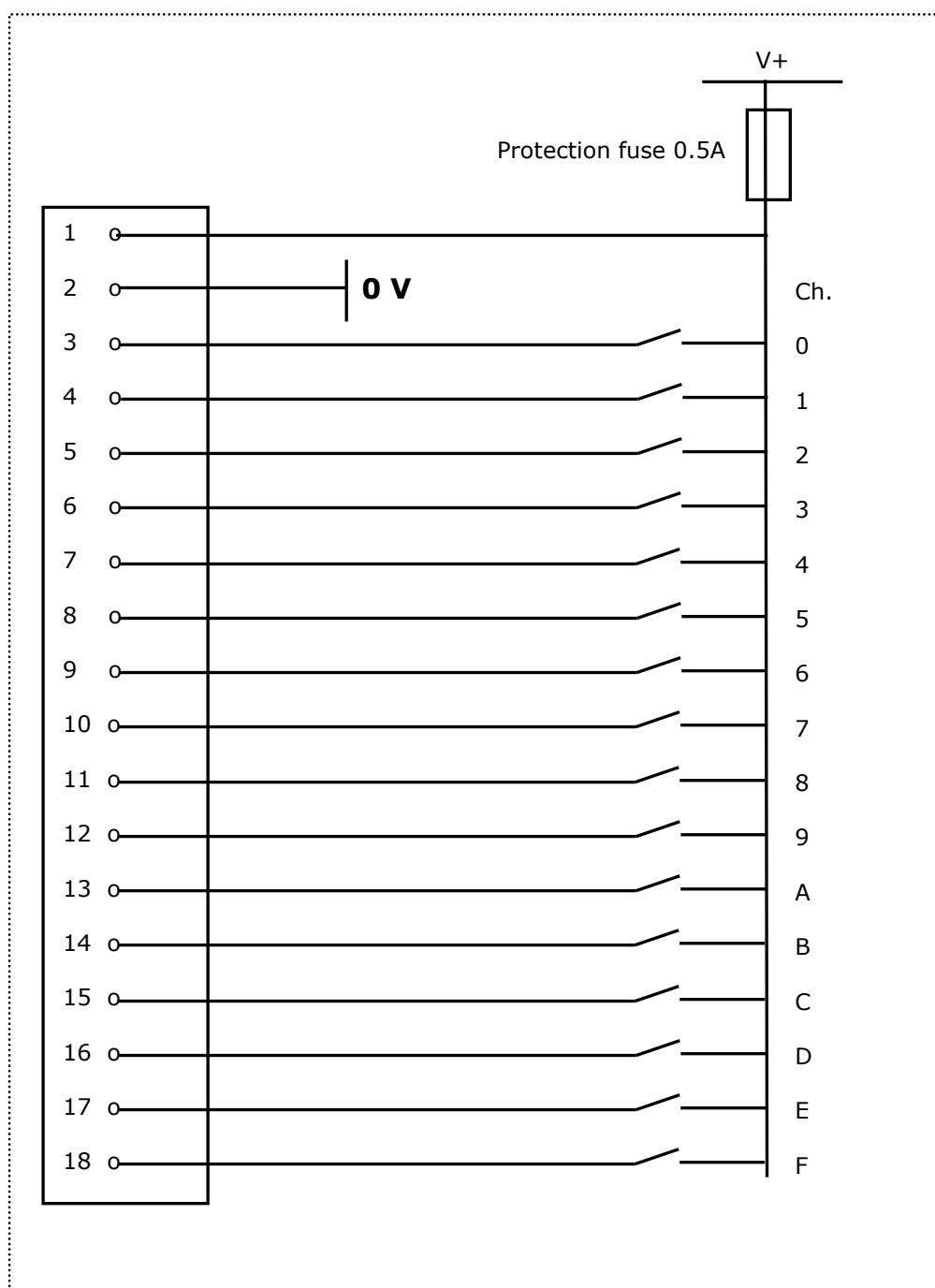
DIAGRAM B : DO310 / 16o24b

16o24b terminal module : 16 digital outputs , **24Vcc, screw terminal** , type P, 1 supply for 16 channels.
The output switches the load at + V. The unplugged loads have to be connected to 0V.
Channel numbers : terminal module 1 : 0 to F; terminal module 2 : 10 to 1F

I/O terminal module wiring
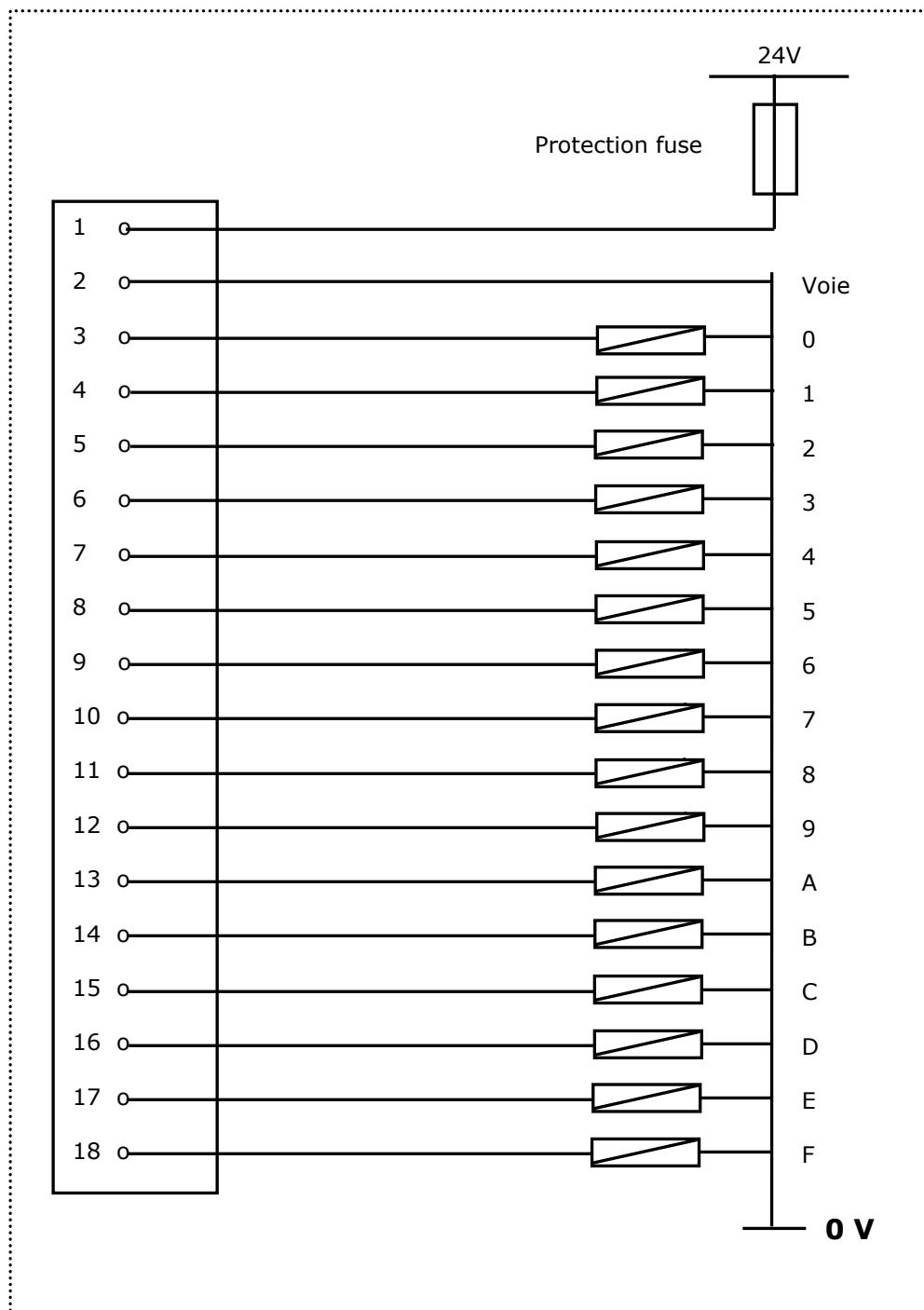
DIAGRAM C : DO310 / 8om3Ab, DIO210 / 8om3Ab

8 **relay** Digital Outputs (1T : the contact operates without potential) on 18 pins screw terminal .

A common 24V power supply for the coils of the 8 relay.channels.

Channel numbers : terminal module 1 : 0 to 7; terminal module 2 : 8 to F; terminal module 3 : 10 to 17; terminal module 4 : 18 to 1F.

Perminal module	Functional module	Advice
8om3Ab	D0310	Necessary to supply the terminal module (24V for relay coils)
8om3Ab	DIO210	**NOT necessary** to supply the terminal module (pin 1 and 2)
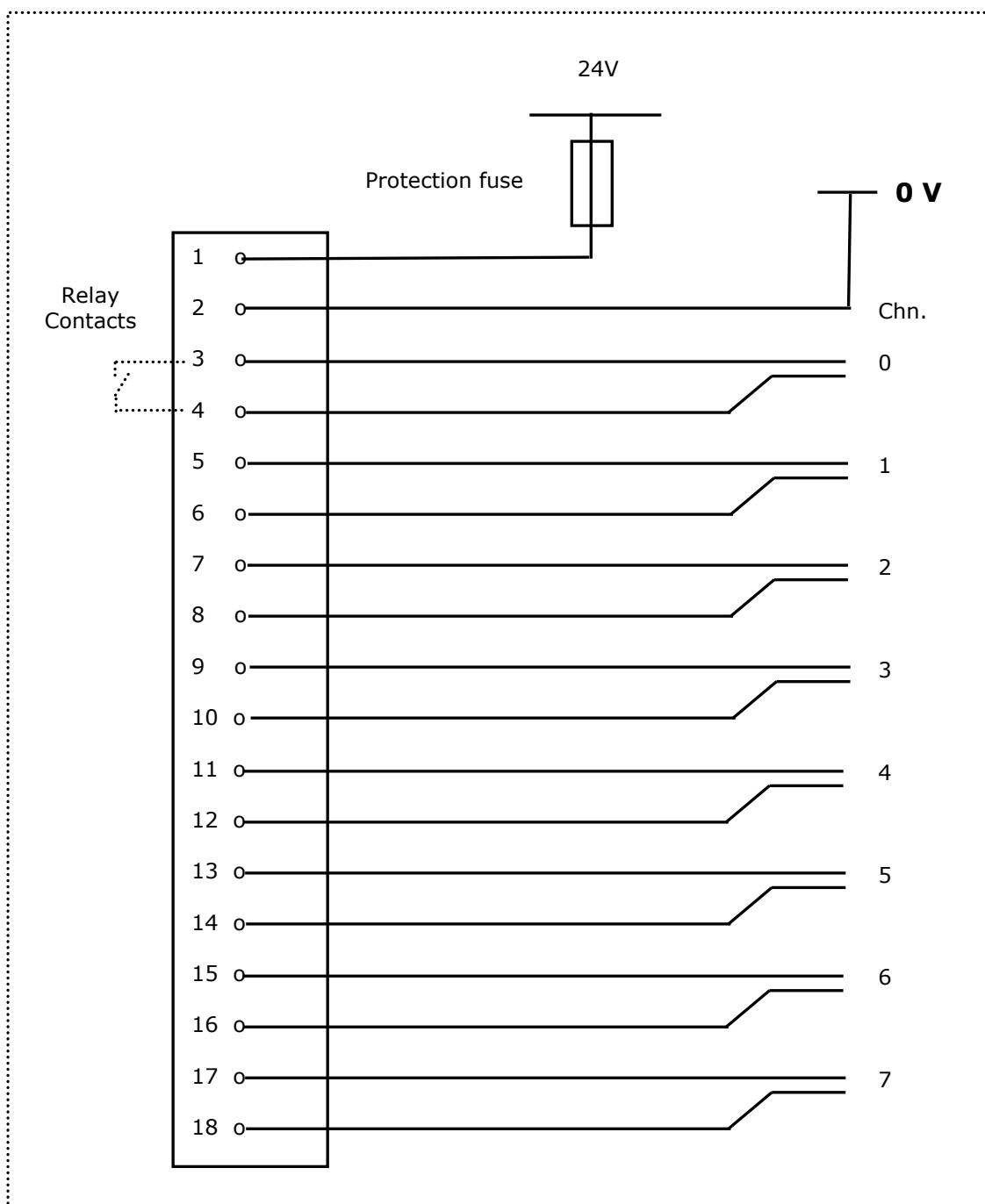
DIAGRAM D : AI110 or AI210 / 8i.c1b or 8i.v1b or 8i.v2b

AIO320 / 8i.c1b - 8i.v1b

8iC1b module : 8 analog inputs **-20/+20 mA**

8iV1b module : 8 analog inputs **-10 / + 10V**

Bornier 8iV2b : 8 analog inputs **-5 / +5V**

Channel numbers : terminal 1 : 0 to 7;   terminal 2 : 8 to F.

Important : link the negative inputs pins to the amplifier reference available on pin number 2.

Pin	Voie
1	
2	Voie
3	0+
4	0-
5	1+
6	1-
7	2+
8	2-
9	3+
10	3-
11	4+
12	4-
13	5+
14	5-
15	6+
16	6-
17	7+
18	7-
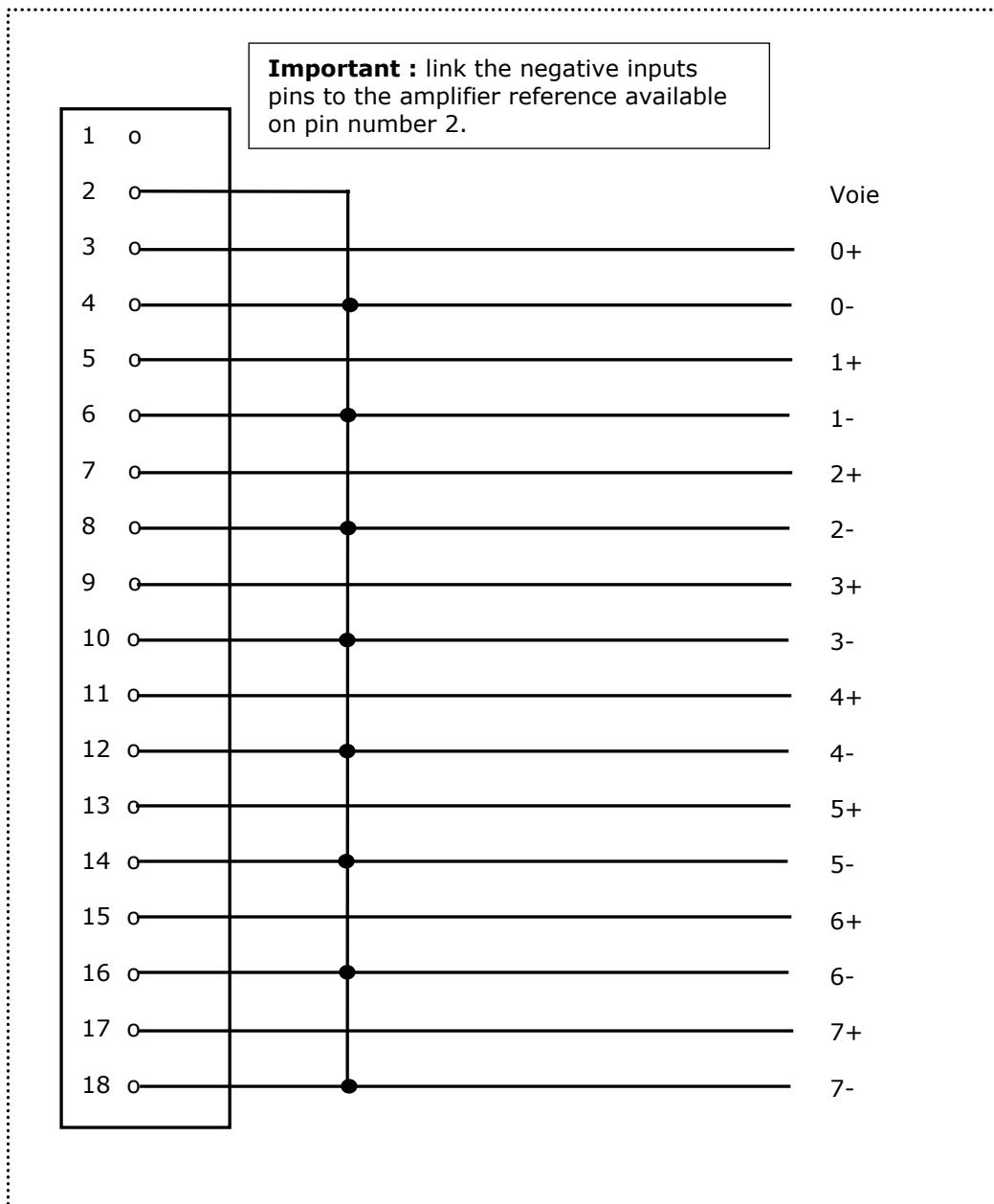
DIAGRAM E :   AO121 / 8o.c1b

8oC1b module : 8 analog outputs **4-20mA** . Screw terminal 18 pins.

1 power supply entry for 8 channels.

Channel numbers : terminal 1 : 0 to 7.
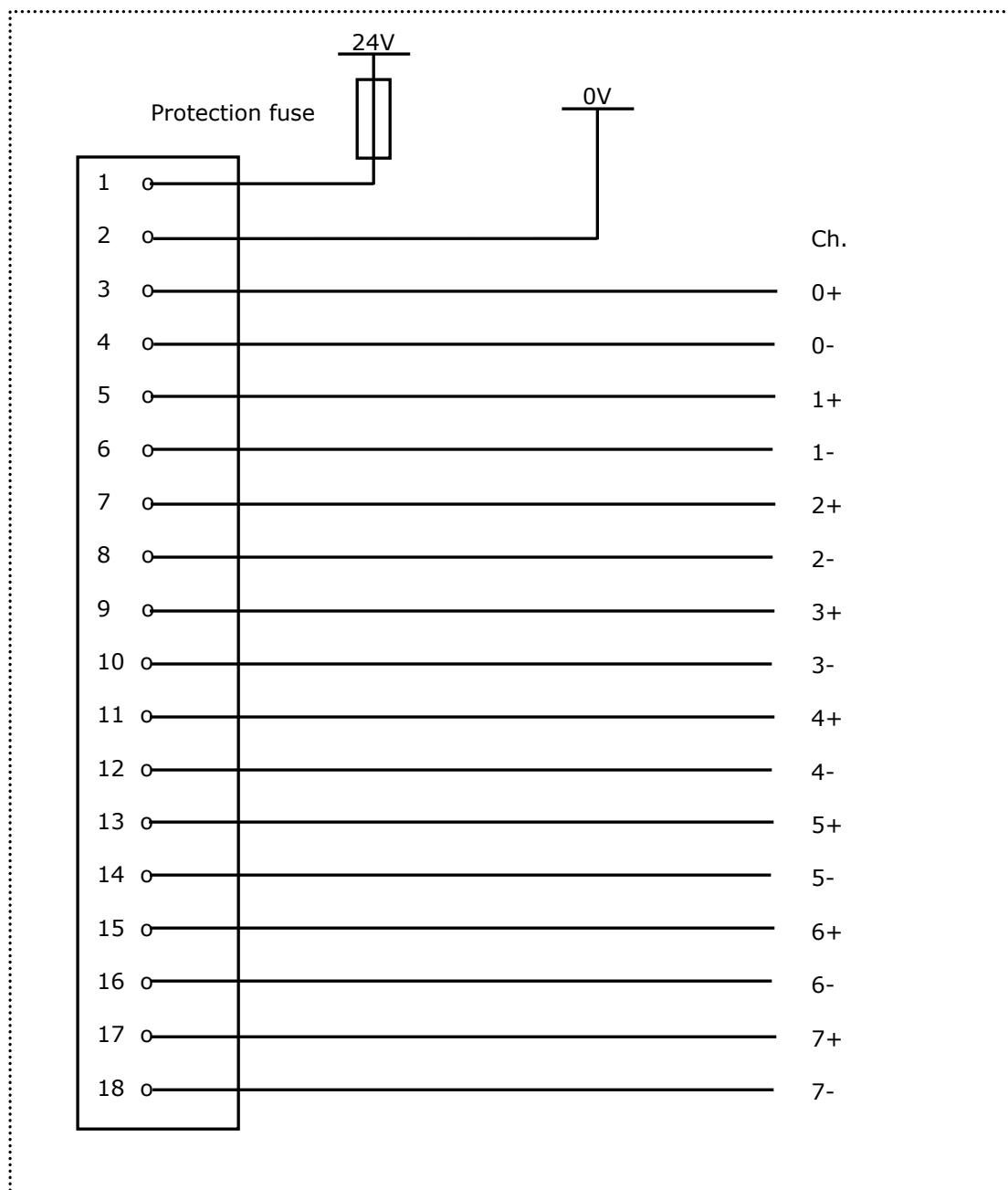
DIAGRAM F : AO121 / 8o.v1b

8oV1b : 18 pins screw terminal - 8 analog outputs **-10/+10V** ..

The pin 2 is linked internally to the negative outputs pins.

| Pin		Ch.
1	o	
2	o	Ch.
3	o————————————————	0+
4	o————————————————	0-
5	o————————————————	1+
6	o————————————————	1-
7	o————————————————	2+
8	o————————————————	2-
9	o————————————————	3+
10	o————————————————	3-
11	o————————————————	4+
12	o————————————————	4-
13	o————————————————	5+
14	o————————————————	5-
15	o————————————————	6+
16	o————————————————	6-
17	o————————————————	7+
18	o————————————————	7-
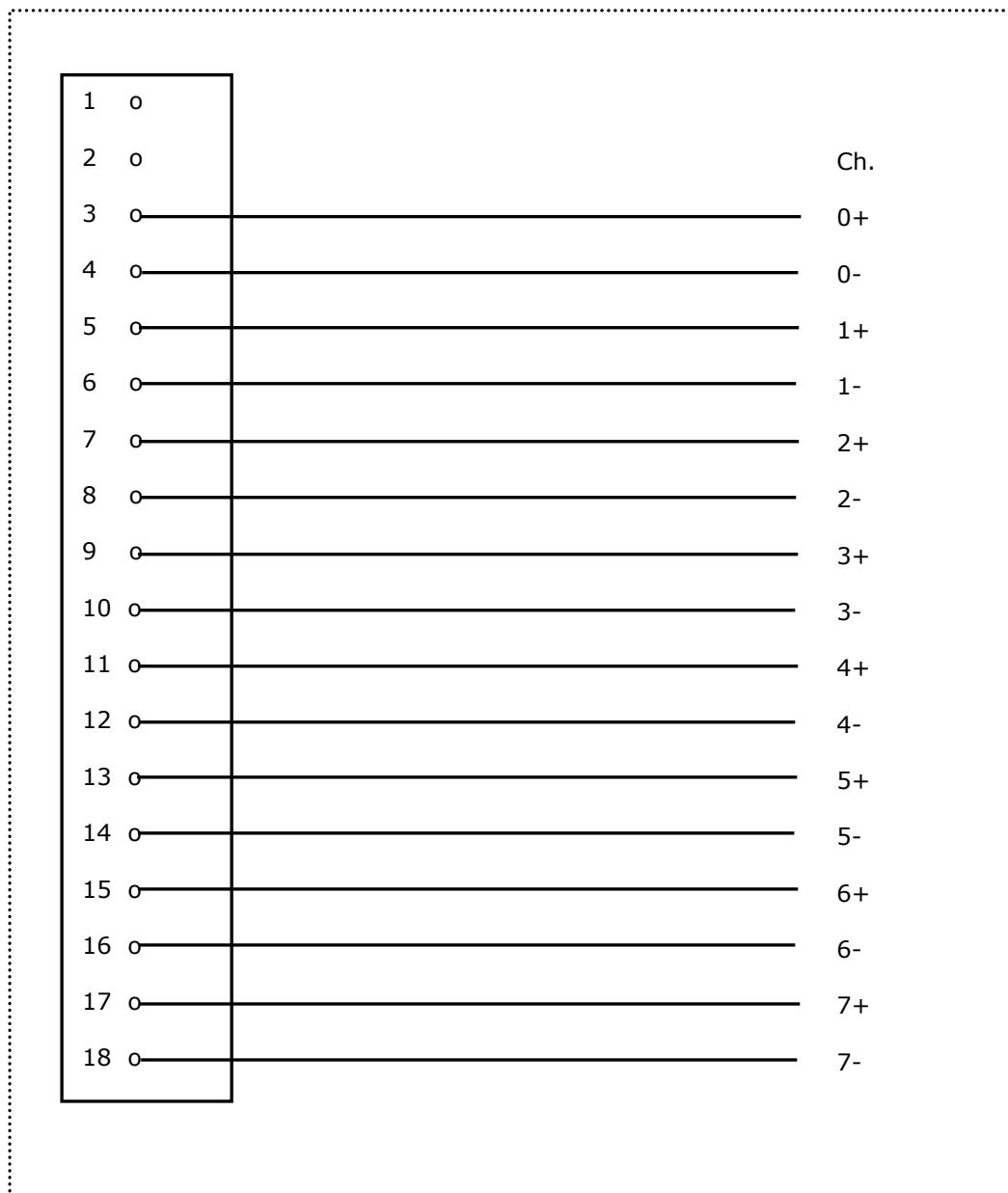
DIAGRAM G : DI312 / 16is24b

16is24b screw 18 pins terminal : 16 secured logic inputs

The input is active when the sensor switches to +V. The unplugged loads have to be connected to the power +V connector.

Channel numbers : terminal module 1 : 0 to F; terminal module 2 : 10 to 1F.

Note the name of the points L1, L1', L2, L2' to understand the explanations of the next page.
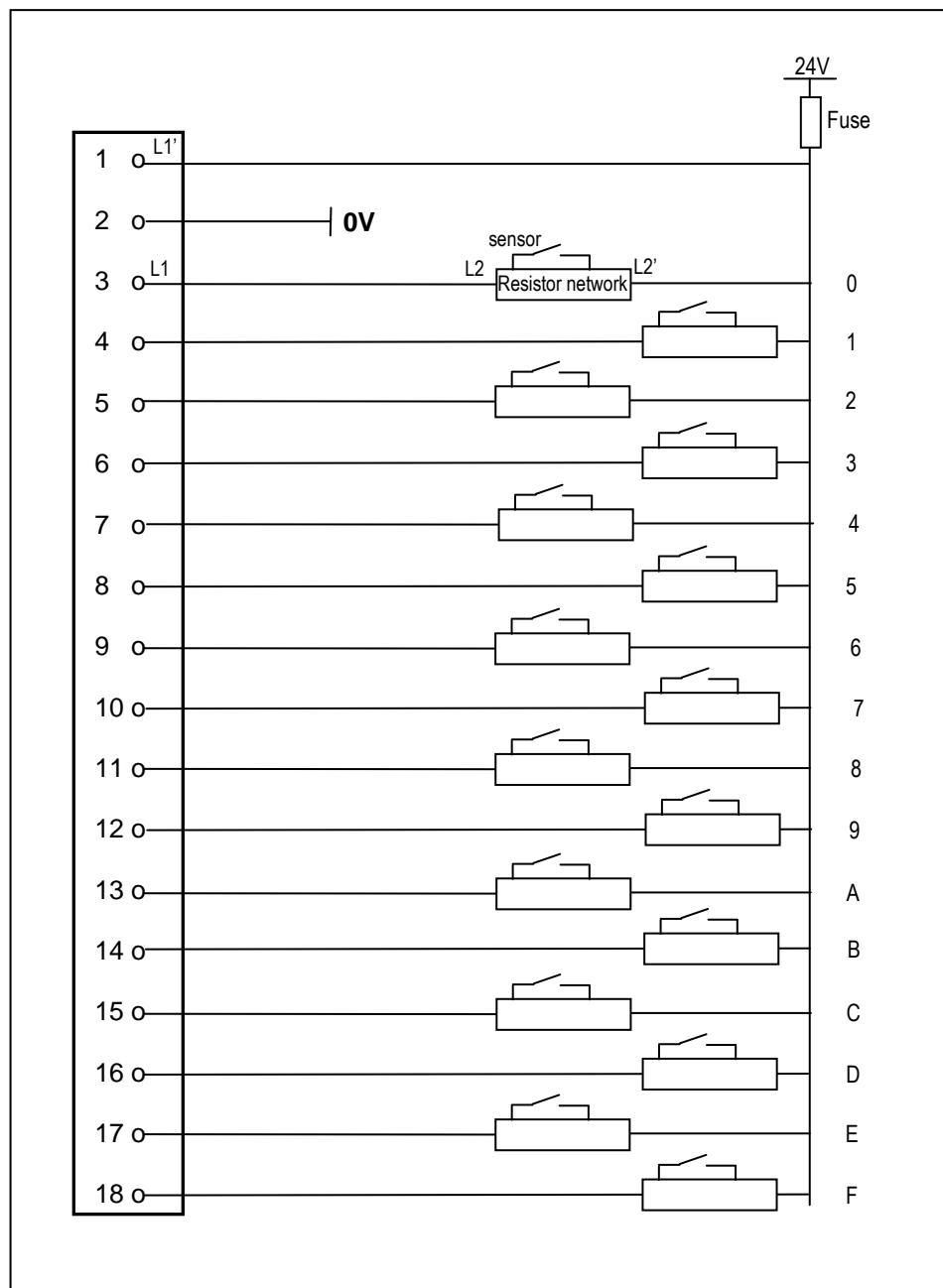
DI312 / 16is24b : Set up of monitoring line (see diagram below)

The DI312 module can detect
- if the sensor is normally opened (NO),
- if the sensor is normally closed (NC),
- if the line between the PLC input « L1 » and the Sensor L2 is failed,
- if the line between the PLC input « L1' » and the Sensor L2' is failed.
   « Failed » means Open circuit or Short circuit.

To detect the 4 states, it is necessary to place 2 resistors Rs and Rp near the sensor.
Two networks are possible (see below).
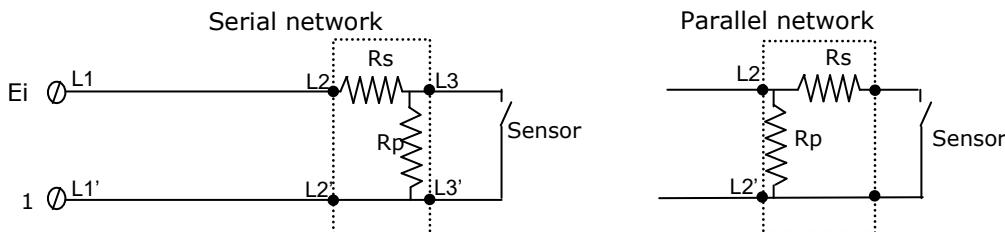
Sensor	Equivalent resistor	Serial network	Parallel network
opened	Rno =	Rs + Rp	Rp
closed	Rnc =	Rs	(Rs x Rp) / (Rs + Rp)

CAUTION : the values to capture in OPAL software or Isagraf Software are Rno and Rnc (NOT Rs and Rp). They must be identical for all channels of the same DI312 board.

Rs and Rp values
Rs and Rp must be selected so that the point (Rno,Rnc) is included in the below grey polygon.

CAUTION : Line resistance = resistance between L1 and L2 + resistance between L1' and L2'.
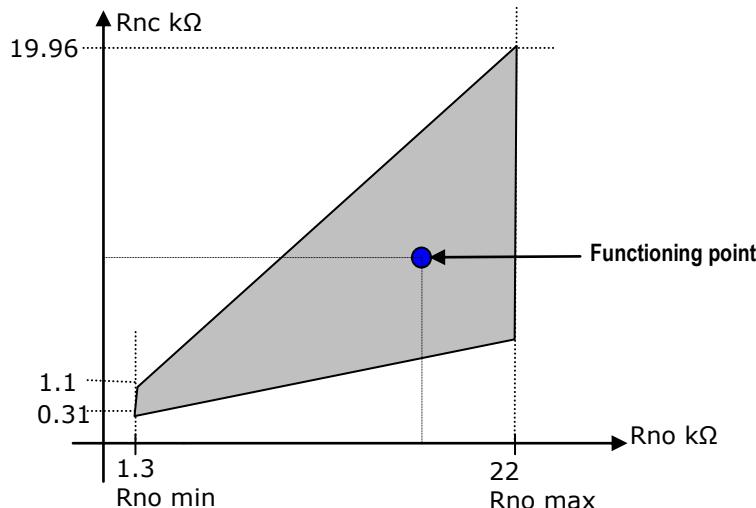
Current in the sensor = I (mA)= 22 / (1 +Rno) with Rno in kΩ

Exemple

We want I = 3mA (reasonable value)
⇨ Rno= (22/I) - 1 = (22/3) − 1 = 6.333kΩ
⇨ Rnc can be between 1k and 5.6k .
⇨ We choose the serial network , Rs = Rnc = 3.3k (standard value)
⇨ Rp = Rno-Rs = 6.3 – 3.3 = 3k.
⇨ We select Rp = 3.3k (standard value) so I = 22/(1+6.6) = 2.9 mA

DIAGRAM M : DO310 / 8om3As, DIO210 / 8om3As

8om3As : SubD 25 pins terminal

8 relay outputs (1 working contact).

A 24V power supply for the 8 channels and relay coils.

Channel numbers : terminal module 1: 0 to 7; terminal module 2: 8 to F; terminal module 3: 10 to 17; terminal module 4: 18 to 1F.
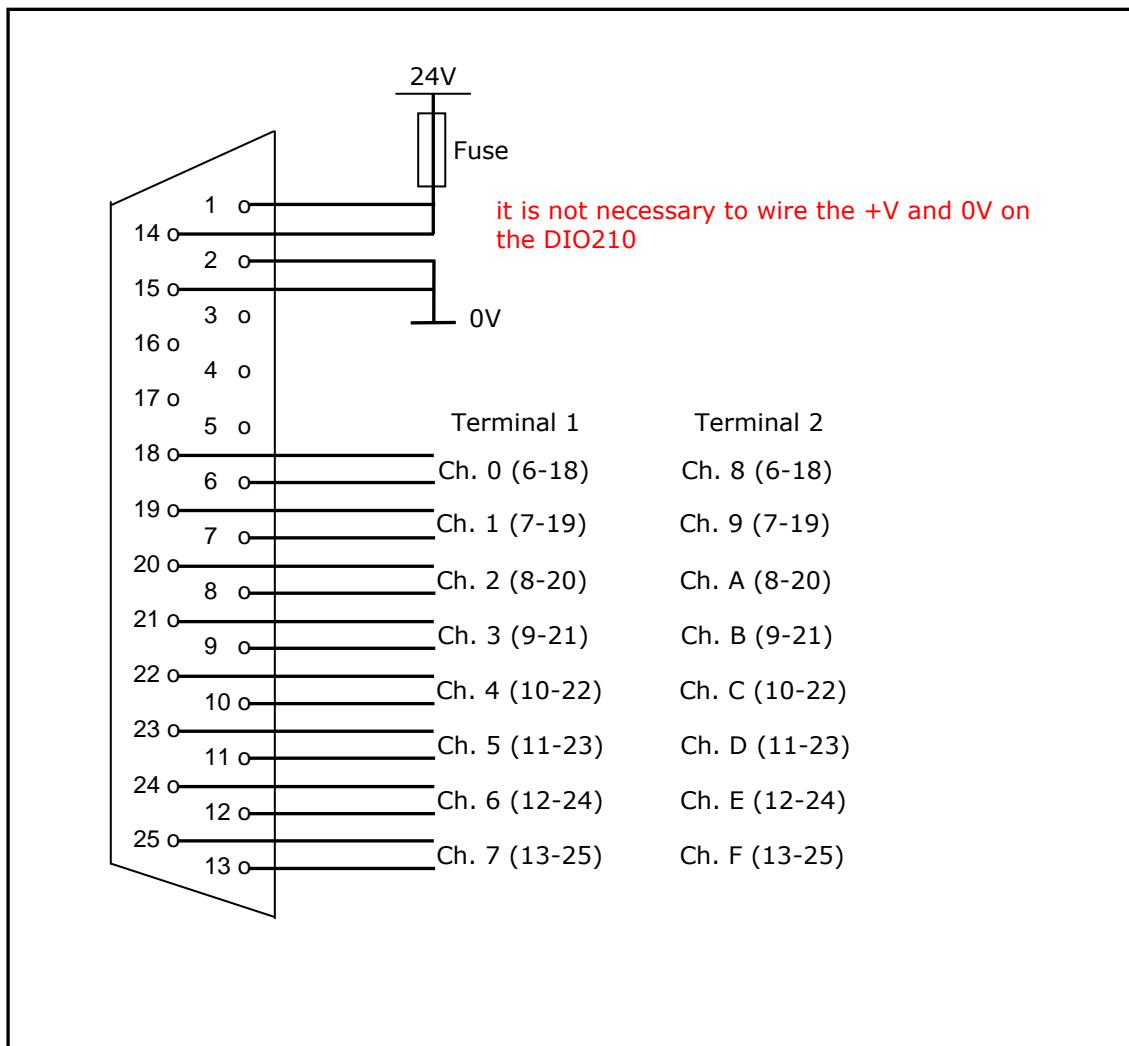
DIAGRAM N : DI310 / 16i.24s - 16i.48s;   DIO210 / 16i.24s

PNP type 24V or **48V** Digital inputs on a 25 pins D-Sub connector : 1 power supply for 16 channels.

The input is active when the sensor switches to +V.

Channel numbers : terminal module 1 : 0 to F ; terminal module 2 : 10 to 1F

24V or 48V

Fuse 0.5A

For the DI310f module, all 16if48s must be powered.

It is not necessary to wire the +V on the DIO210

0V

Ch.

| 1 |
| 14 |
| 2 |
| 15 |
| 3 |
| 16 |
| 4 |
| 17 |
| 5 |
| 18 |
| 6 |
| 19 |
| 7 |
| 20 |
| 8 |
| 21 |
| 9 |
| 22 |
| 10 |
| 23 |
| 11 |
| 24 |
| 12 |
| 25 |
| 13 |

| 0 |
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 |
| 7 |
| 8 |
| 9 |
| A |
| B |
| C |
| D |
| E |
| F |

I/O terminal module wiring
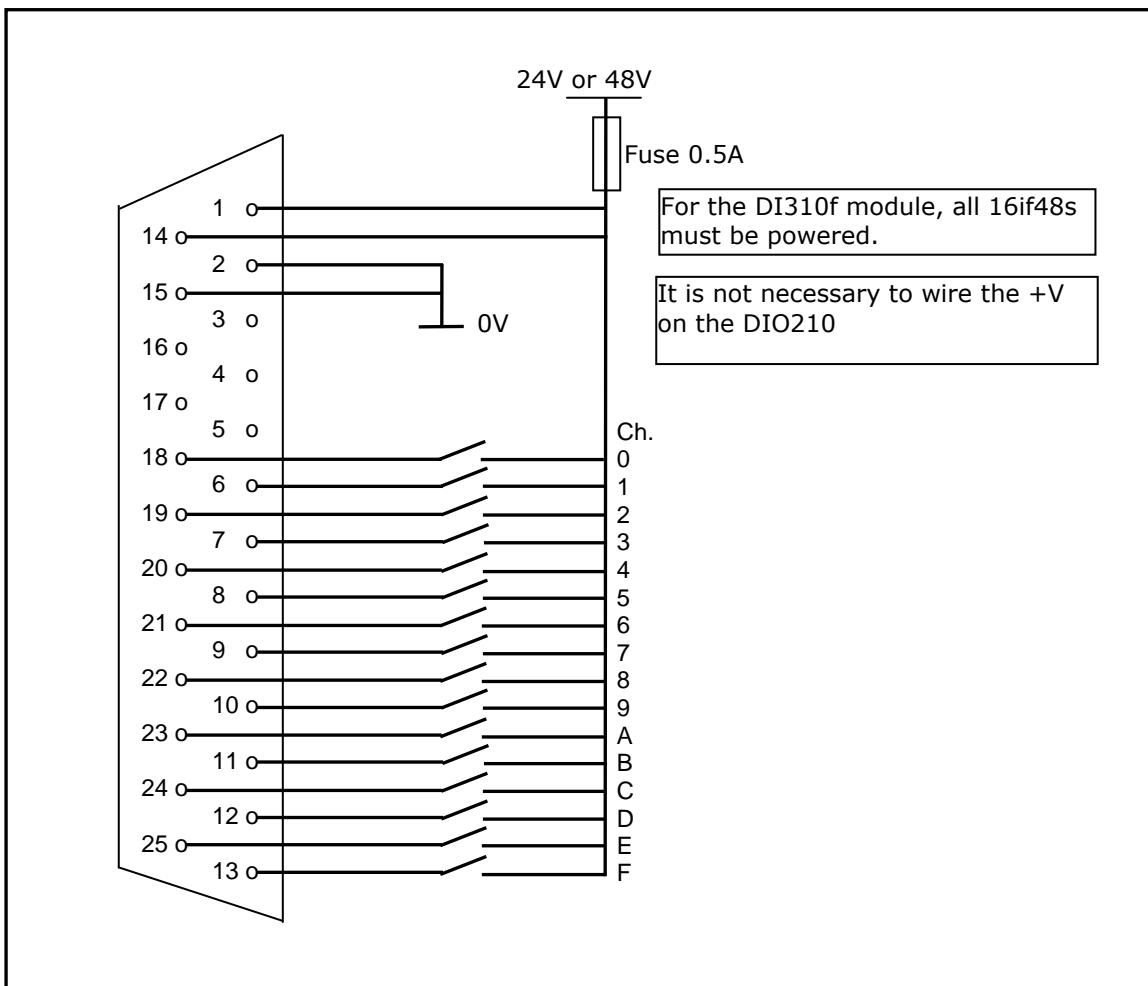
DIAGRAM O : AI110 - AI210 / 8i.c1s - 8i.v1s   AO121 / 8o.v1s

8 analog inputs, **current -20/+20mA, (8i.c1s)** on 25 pins D-Sub.

8 analog inputs, **voltage -10V/+ 10V (8i.v1s)** on 25 pins. D-Sub

8 analog outpus, **voltage -10V/+10V (8o.v1s)** on 25 pins D-Sub

Channel numbers : terminal module 1: 0 to 7; terminal module 2: 8 to F.

For indication purposes, please refer to chapter IV "Technical Specifications", depending on the type of sensor (1 or 2 outputs).
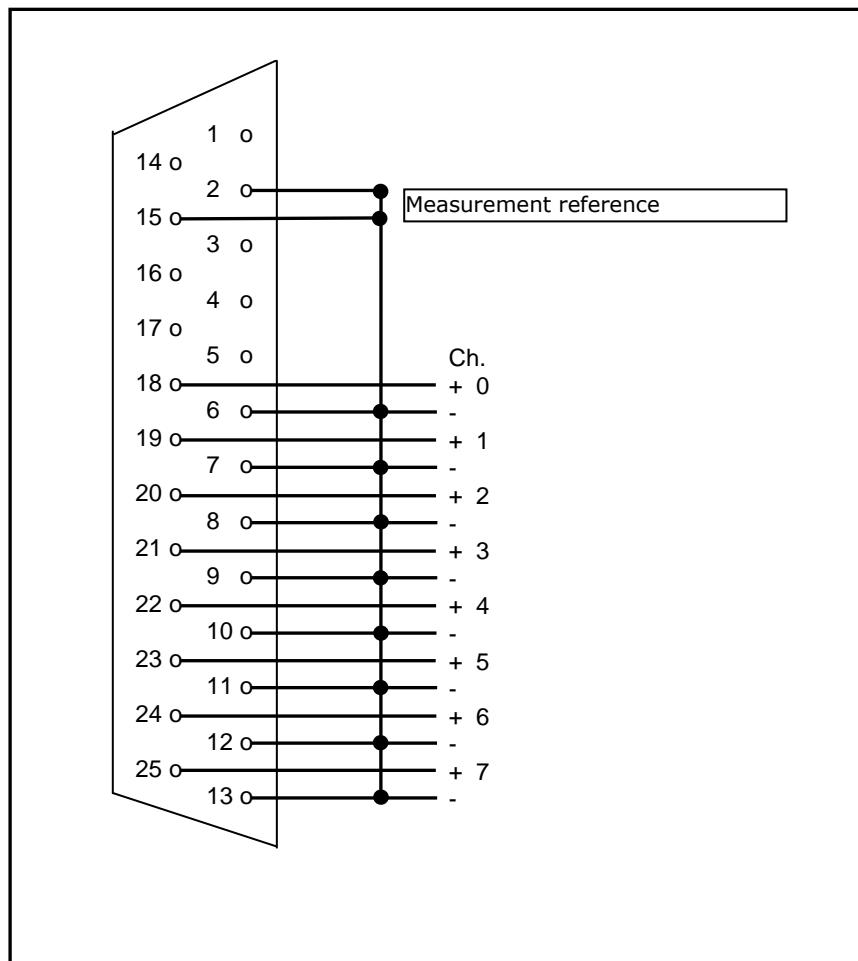
DIAGRAM P : DO310 / 16o.24s

PNP type 24V outputs on 25 pins D-Sub connectors.

The output switches the load to + V. The unplugged loads have to be connected to the 0V.

Channel numbers : terminal module 1 : 0 to F ; terminal module 2 : 10 to 1F.
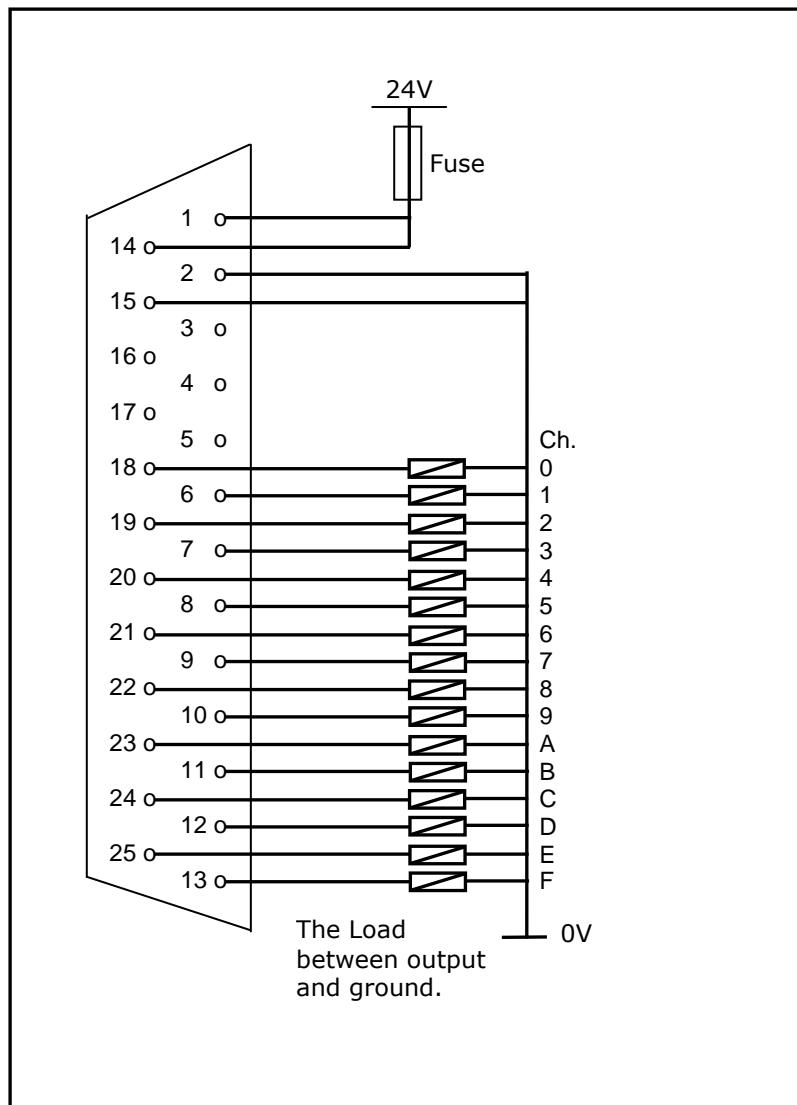
DIAGRAM Q : AIO320 / 4o.c1b

4 analog outputs, **current 4/20mA,** on 18 pins screw terminal s: 1 power supply for 4 channels.

Idem diagram E : only 4 channels.
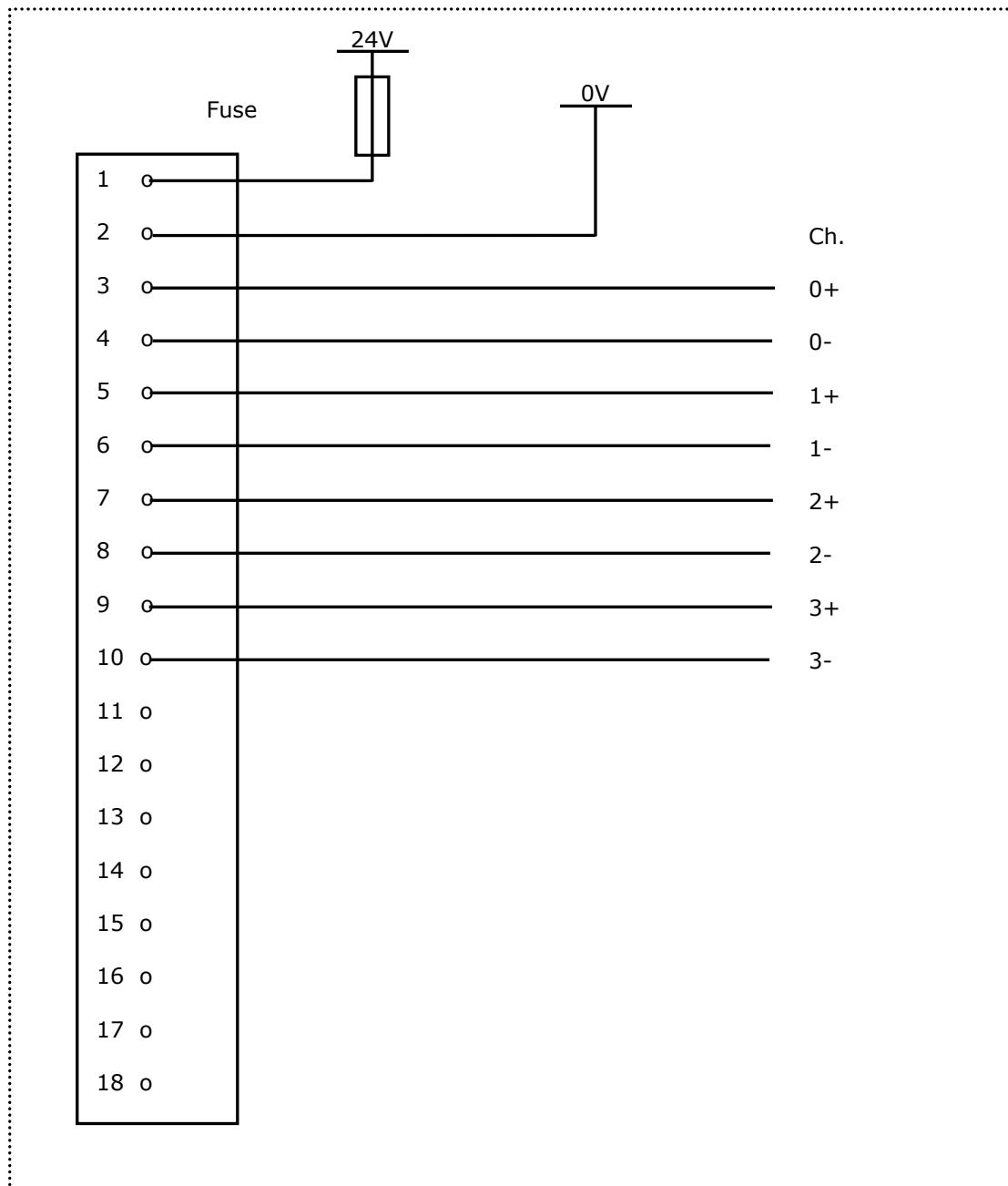
DIAGRAM R : AIO320 / 4o.v1b

4 analog outputs **-10/+10V,** on 18 pins screw terminal

Pin number 2 is linked internally to the negative outputs pins.

Idem diagram F : only 4 channels.

Pin		Ch.
1	o	
2	o	
3	o———	0+
4	o———	0-
5	o———	1+
6	o———	1-
7	o———	2+
8	o———	2-
9	o———	3+
10	o———	3-
11	o	
12	o	
13	o	
14	o	
15	o	
16	o	
17	o	
18	o	
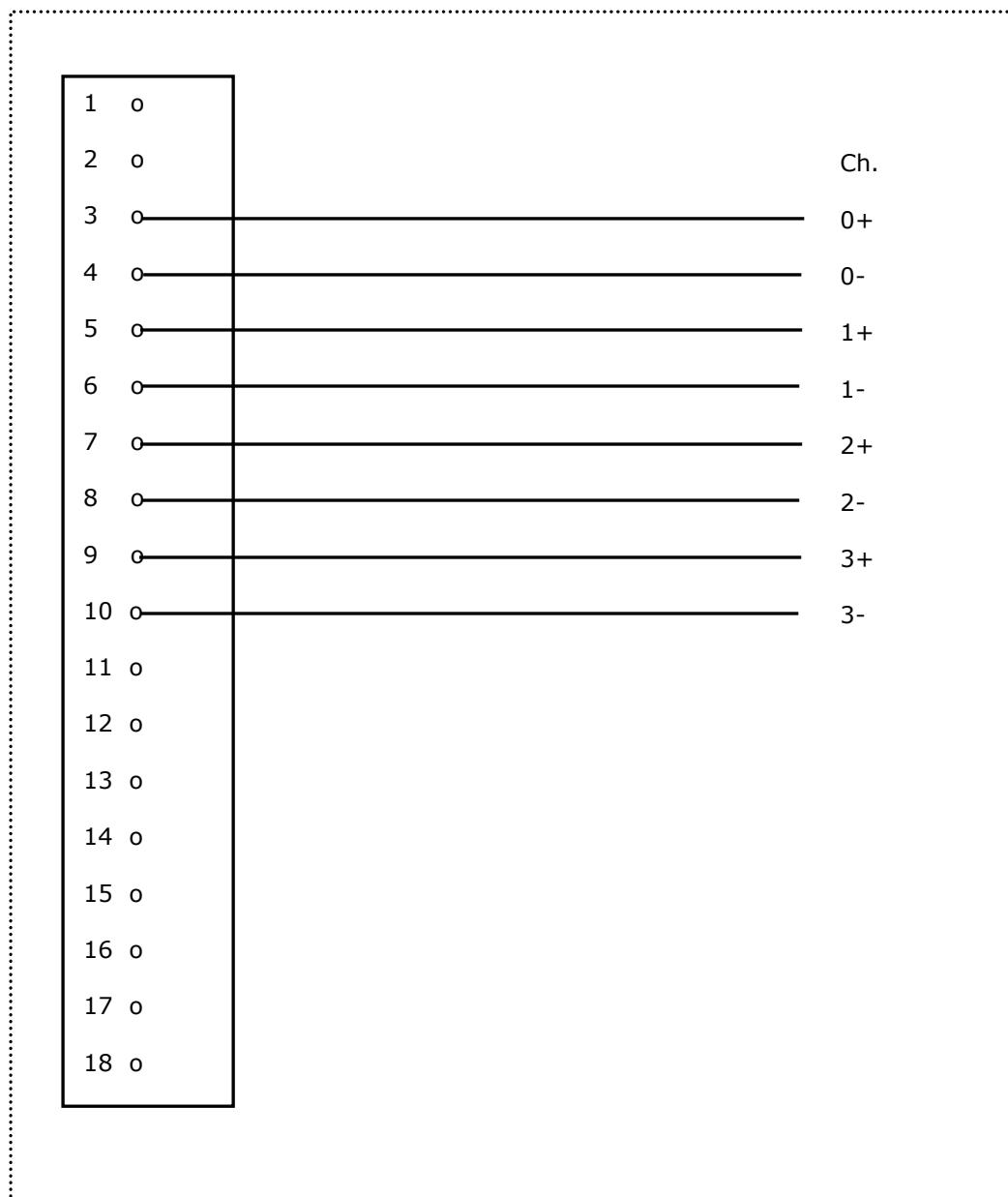
DIAGRAM S : AIO320 / 8i.p1b

8 inputs for **PT100 sensor** on 12 points terminal screw (see catalogue).

For 2 wire PT100 sensor, bridge pin Xm and pin X-
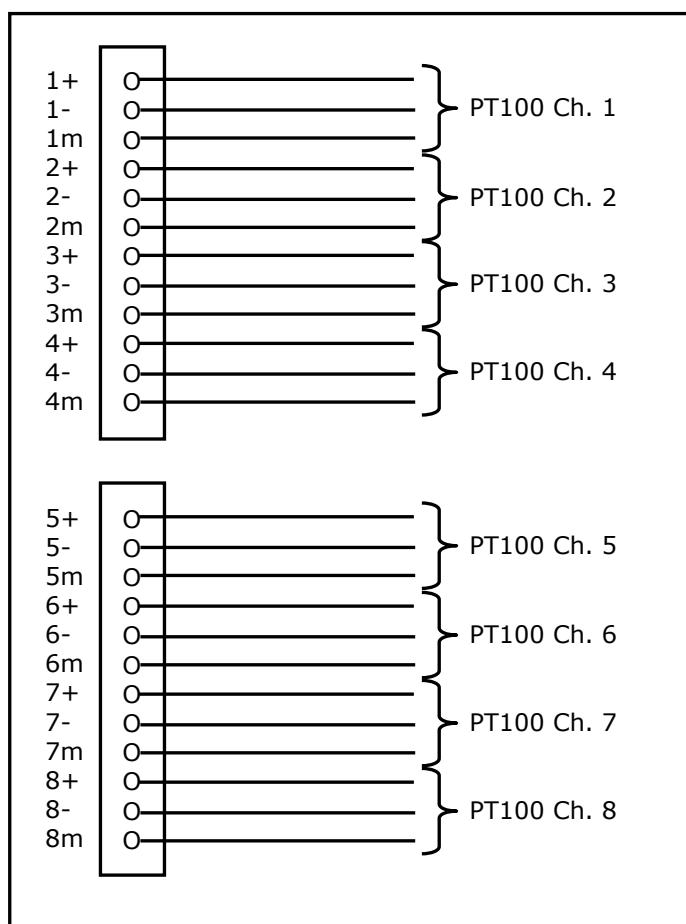
DIAGRAM T : DI410 / 32ix24s

24V PNP type Digital inputs on Dsub 37 points : 1 common power supply for 32 channels.
The input is activated when the sensor switches to +V.
Channel numbers : terminal module 1 : 0 to 1F; terminal module 2 : 20 to 3F.

I/O terminal module wiring
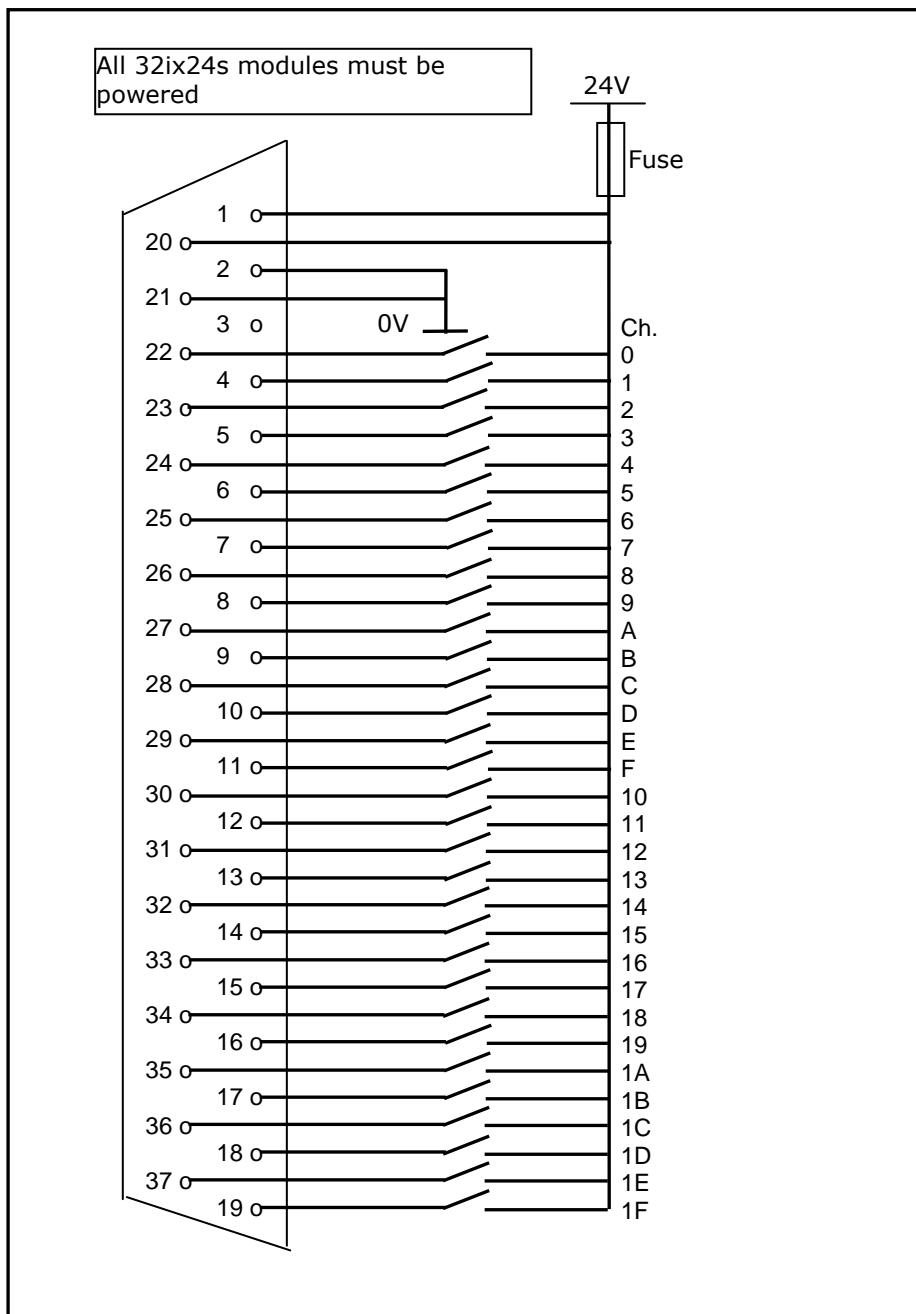
DIAGRAM U : DI130 / 8i.120b-1/8i.120b-2

8 digital inputs **24Vcc, 48Vcc or 120Vcc PNP type** on four screw connectors (4 pins) :

☐ 1 power supply for 2 inputs.
☐ The input is active when the sensor switches to +V : the 24V, 48V, 120V pins must be connected to the common of power supply
☐ Channel numbers : terminal module 1 : I1 to I8 ; terminal module 2 : I9 to I16.
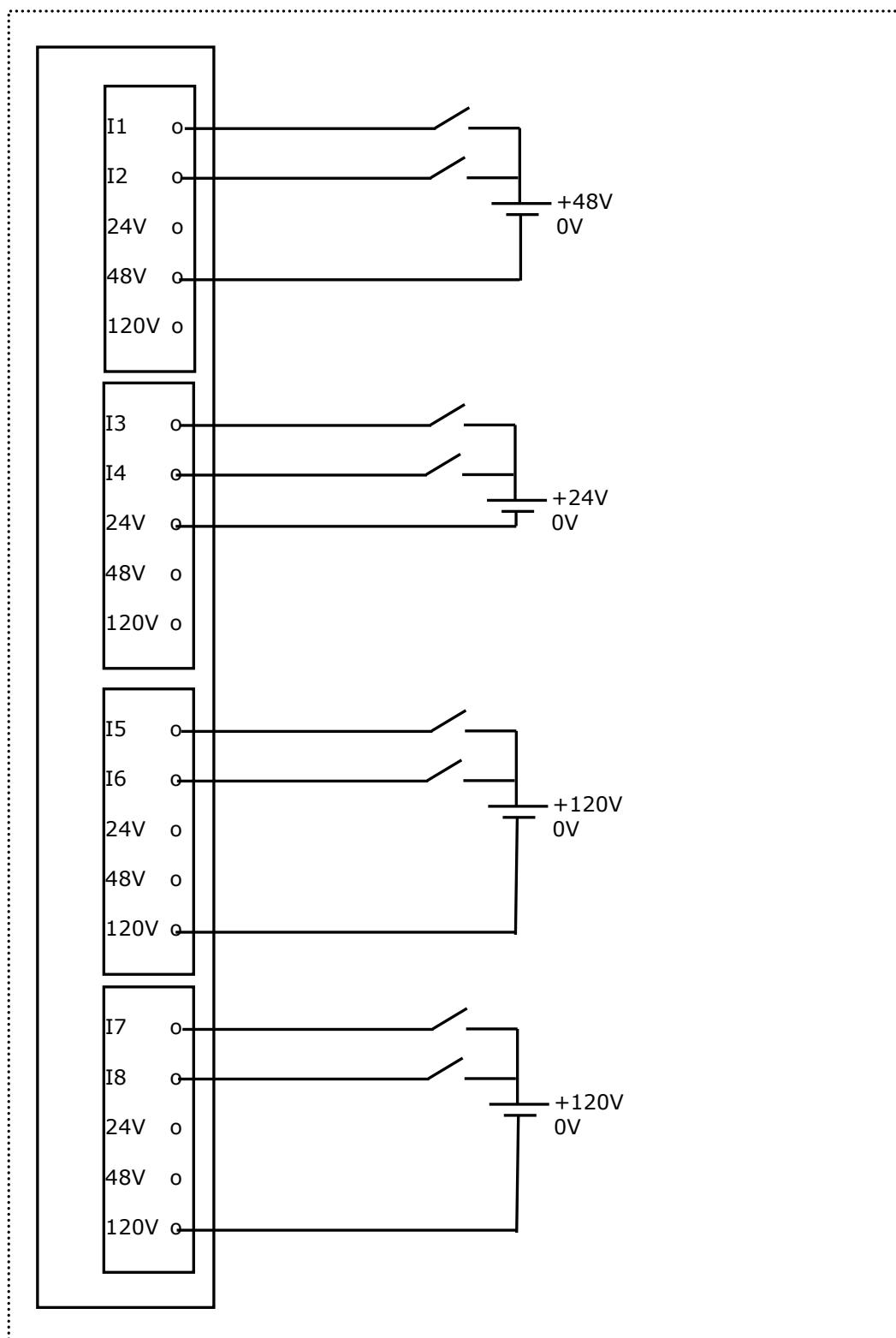
DIAGRAM V : DIO130 / 8io.120b-1/8io.120b-2

4 digital inputs **24Vcc, 48Vcc or 120Vcc PNP type** and 4 relay outputs on 2 screw connectors (10 pins) :

- 1 power supply for 2 inputs
- The input is active when the sensor switches to +V : the 24V, 48V, 120V pins must be connected to the common of power supply
- Channel numbers :
  - terminal module 1 : 4 relays output R1 to R4 and 4 digital input I1 to I4
  - terminal module 2 : 4 relays output R5 to R8 and 4 digital input I5 to I8

I/O terminal module wiring
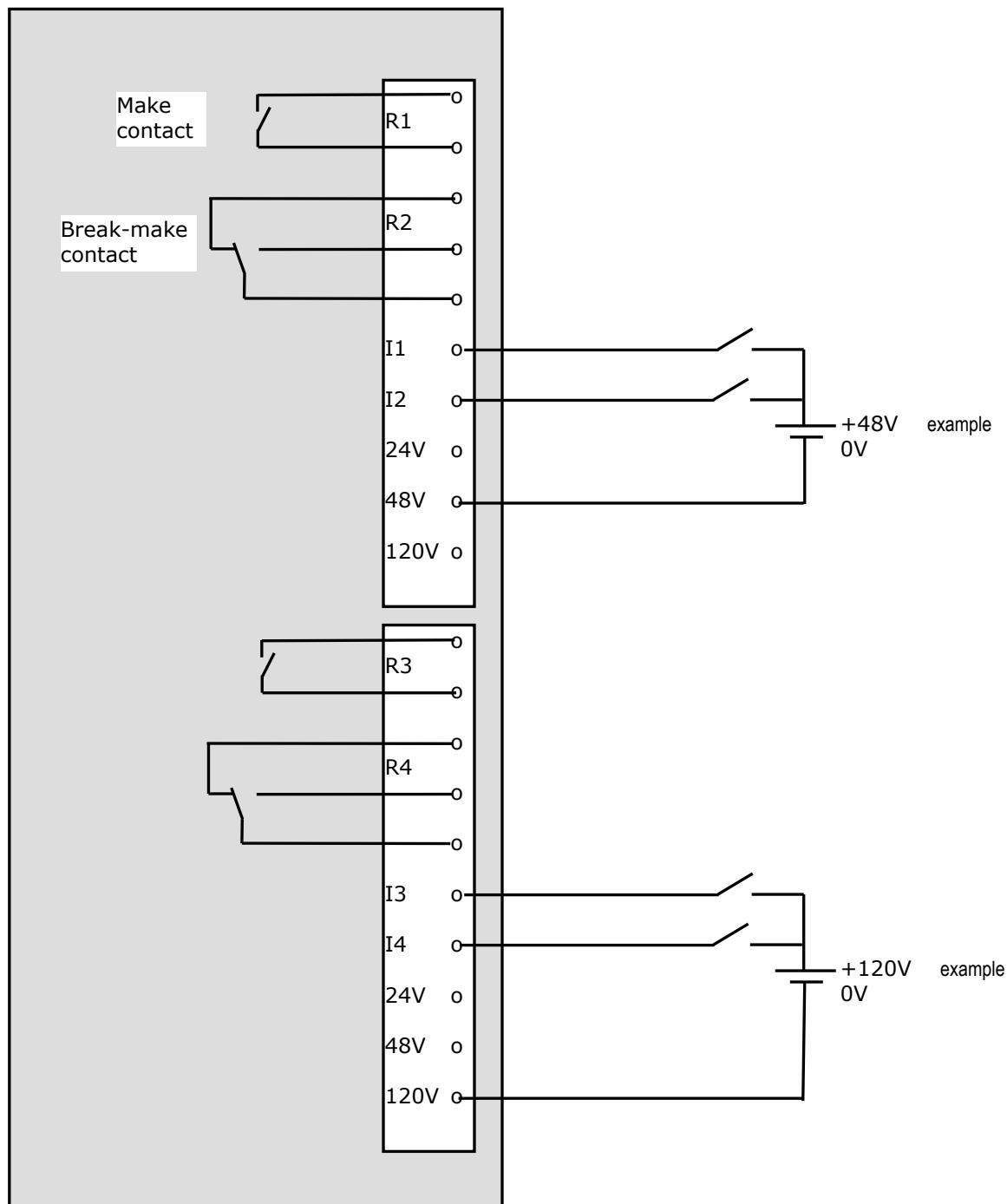
ROBUSTNESS

Electromagnetic compatibility

EMISSION

Standards **: EN61000-6-3 / CISPR 22**

Conducted emission (low frequencies)
Between 150 kHz and 500 kHz : emission < 68 dB µV < limit = 84 dBµV
Between 500 kHz and 30 MHz : emission < 64 dB µV < limit = 74 dBµV

Radiated emission (high frequencies)

Between 30 Mhz and 230 Mhz : emission < 25 dB (µV/m) < limit = 30 dB (µV/m) à 10 m
Between 230 Mhz and 1Ghz : emission < 15 dB (µV/m) < limit = 37 dB (µV/m) à 10 m

IMMUNITY

Standards: NF EN 61 131-2 (1994) and additional clause A11 (1996) and Additionnal clause PrA12 (1999)

Immunity to electrostatic discharges : NF EN 61000-4-2
Immunity criterion B
- against contact direct discharges ±4 kV on conducting surfaces
- against air discharges ±8 kV , all surfaces.
Discharge applications : 10 points of impact with 2 polarities

Immunity to radiated electromagnetic fields : NF EN 61000-4-3
Immunity criterion A
- Severity class 3 : **10 V/m** , 80Mhz to 2GHz, sinusoïdal amplitude modulation 80% at 1kHz.

Immunity to electrical fast transient/burst : NF EN 61000-4-4
Stress : 200 burst trains. Repetition : 5 kHz. Wave form 5ns/50ns

Immunity criterion A (EN 61000-6-1)
- capacitive coupling on Bus and signal ports : ± 0.5 kV / 1mn
- Direct coupling on power ports : ± 0.5 kV / 1mn

Surge immunity : EN61000-4-5
Stress : Waveform 1.2uS/50uS open circuit Class 1.   5 impacts by polarity.

Immunity criterion A
- Differential mode and common mode on power and signal ports : ± 0.5 kV

Immunity to conducted disturbances, inducted by radio frequency fields : EN61000-4-6
Stress : frequencies of electromagnetic filed between 150kHz and 80 MHz. sinusoïdal amplitude modulation 80% at 1kHz

Immunity criterion A with field strenght = 3V/m
Immunity criterion A with field strenght = 10V/m except for analog inputs (incorrect values)

Climatic environment

Working and storage temperatures

LT160 CPU : working	-20+C à +70°C
LUC4001 LT200 CPU : working Cold start up at −40°C (IEC 68-2-1:1990 test Ad)	−40°C à + 70°C
Digital I/O blocks : working	−40°C à + 70°C
Analog I/O blocks working	−30°C à + 70°C
Storage (EN60068-2-1)	−40°C à + 85°C
Damp heat (EN60068-2-30 test Db) 2 days with varnished boards	55°C 95% without condensation

Shock/Vibration stress

Shocks

Standard : EN 60068-2-27 test Ea : « equipment fasten to road vehicle, railway vehicle or transport aircraft»

Stress : semi sinusoidal impulse, Acceleration = 30g , Impulse duration = 18 ms.
3 shocks x 2 directions x 3 axis.

Random vibrations

Standard: EN 60048-2-27
Stress : white noise random vibrations with spectrum density between 0.20 g²/Hz and 0.01 g²/Hz
, frequencies between 5Hz and 500 Hz
Stress duration : 2 h , each axis

Sinusoidal vibrations

Standard: EN 60048-2-27 test Fc
Stress :
Stress duration : 2 hours by axis
Equipment working
Sweeping between 0 and 200Hz

Cross-over frequency = 10Hz
• Below the Cross-over frequency, the vibration amplitude is specified as constant displacement :
  5mm
• Above the Cross-over frequency, the vibration amplitude is specified as constant acceleration :
  o   From 10 to 15 hz : 20 m/s²
  o   From 15 to 200hz : 10 m/s²

Technical specifications

Power supply

	Unité	PSD331 (24-48Vcc)	PSD342 (120Vcc)
Voltage			
Nominal value	Vcc	24 / 48	120
Permitted range	Vcc	20 - 60	84 - 150
Max absorbed power	W	20	20
Startup current	A	5 (during 5ms)	3 (during 10ms)
Fuse (soldered to board)	A	7	
Power available	W	15	
Display		1 green LED : ON if power supply OK	
Voltage isolation			
Input ⇔ internal logic	Veff	1500	
Input ⇔ ground	Veff	1500	
Alarm output (relay) - release - relay - break power - max voltage - contact	 W Vcc	CPU,WDG or power failure Dry contact (no protected) 60 (2A - 30V dc) 220 OPENED : LT unpowered or faulty CLOSED : nominal operation	

CPU and communication blocks

CPU	LUC3xxx (LT160)	LUC4xxx (LT200)
OS	Proprietary	Linux 2.6.12
IEC611316-3 software	Isagraf V3	Straton
C language	no	Linux Software Development Kit

The CPU has a processor board and a communication board within the same casing. The physical connection interfaces of the communication board are displaced on the annexed casings better known as the terminal modules.

LUC3xxx CPU

Composition

REMARK : 1 Asynchronous RS232 is required in order to connect the ISaGRAFV3 workbench.

Physical Interfaces : RS232 , RS485, Ethernet

Communication board (UART, Ethernet)

Microprocessor board (microprocessor + memory)

Processor board	
Microprocessor FLASH memory RAM memory FRAM Backup memory	INTEL 386 Ex - 50 MHz 512 Ko 256 Ko 2 Ko
I/O capacity Consumption	Max 15 blocks 2 W
RTC	Rechargeable battery backed clock with an unlimited life span, autonomy : 147 hours at 25°C Year-Month-Day-Hour-Minute-Second. Quartz clock; precision ±5.10E-5 at 25°C, reset possible from software

CPU display (LED)

LED	Color	meaning
RUN	green	Isagraf V3 or OPAL : slow flashing (1s) = correct application execution
		Isagraf V3 or OPAL : fast flashing (1/10s) = Program Restart Mode selected
TEST	red	ON = Flash program defective OR one I/O board faulty
I/O	Red	ON = I/O block faulty (code, status, power…)
PRM	Green	ON = Program Restart Mode selected. OFF after reboot if PRM not selected
PRG	Green	ON if PRG mode selected (bridge between pins 5 and 6 of COM1) . OFF after reboot without bridge.
WDG	Red	ON = start up OR fatal fault. See also software manual.
COMx	green	ON = correct protocol on this port

RS232 / RS485 ports

Speed	75 to 115200 bits/s
Frame	8 data bits , Parity : Odd Even None
Display	2 green leds TX and RX
	+ 1 led TEN (Transmit ENable) for RS485
Protocols	Modbus/Jbus RTU master and slave
	Null protocol : simple Emit/receive frame
Signaux DCD, DSR, DTR, RTS, CTS (only complete RS232)	gérés par le logiciel applicatif

Physical layer	
connector	SubD 9 pins
isolation	By transformer and optocoupler
- Communication Channel ⇔ channel	1500V
- Communication channel ⇔ I/O blocks	1000V
- Communication Channel ⇔ ground	1000V

The choice between channel 232 or 485 is done by external wiring.

Remark : The LT pre-polarizes the RS485 with the Rp1=Rp2=150 kΩ resistances. Rp3 and Rp4 are available on the terminal module to polarize the line. Their value is 470Ω.

Ethernet channel

Transmission	
connector	Shielded RJ45
code	Manchester
Speed	10 base T
Display	
1 green led Tx	lit while sending frames
1 red led Col	lit on collision detection by the LT
1 green led Lnk	lit if the port is correctly wired
Protocols	IP, ARP, ICMP, UDP, TCP
	Modbus TCP, SNMP, SMTP, telnet sont proposés selon les logiqiels applicatifs. Consulter le manuel utilisateur correspondant au noyau logiciel embarqué

LUC4xxx CPU

Composition

Block reference	Modules	Description	Steps
LUC4001	CPU610 COM630	CPU : RS232 and USB connectors Ethernet 10-100 base T **with anti-vibration RJ45 connector** 3 x RS232/RS422 /RS485 **Vernished boards**	2
LUC4003	CPU610 COM630	CPU : RS232 and USB connectors Ethernet 10-100 base T Standard RJ45 connector 3 x RS232/RS422 /RS485	2

Ehernet link (10/100 base T) with RJ45 Push Pulll

RS232 or RS422 serial link

3 RS232/RS422/RS485 serial links (Choice by wiring)

USB device link (maintenance channel)

CPU610 central unit module

Microprocessor	Intel PXA 255	300 Mhz
Coprocessor for Inputs/Outputs management	FPGA Spartan III	100 Mhz
Working memory	SRAM	32 Mo
Storage memory	FLASH ROM	16 Mo including 4 Mo for user
Permanent memory	FRAM	8 Ko including 4 Ko for user
Real Time Clock / calendar		Quartz stability : +/- 50 10e-6 Life : 96h à 25°C (Backup by capacitor)

Serial link on CPU610 module
RS232 or RS422 : choice by wiring (see below)
Connector : SudD 9 plug
Insulations of signals by photocouplers. Insulation of power supply by transformer.
Speeds : 50, 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bits/s
Frame : 7 or 8 bits of data ; even, odd or no parity; 1 or 1.5 stop bits.

Wiring :   RS232   RS422
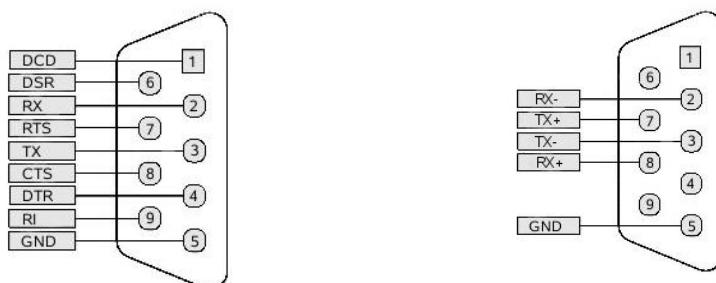
NOTA : <u>RS485 is not possible.</u> RS485 would require a bridge between 7 and 8 pins, but this bridge is tested at the power on in order to go into the Program Restart Mode (PRM). Use RS485 channels on COM630 module.

CPU610 module diagnosis lights

Serial link

Marking	Meaning	LED	Behavior
Tx	Transmit	Green	On or flickering if the Com0 channel emits
Rx	Receive	Green	On or flickering if the Com0 channel receives
SM	Serial Mode	Green	OFF : Com0=RS232 ; ON : Com0=RS422
TE	Transmit Enable	Green	if Com0=RS422, ON = Transmit Enable active

Ethernet link

Marking	Meaning	LED	Behavior
Lk	Link	Green	ON = Ethernet link OK
Tx	Transmit	Green	Flickering = emission

Central unit

Marking	Meaning	LED	Behavior
RUN		Green	Its behavior depends on the applicative software (*).
Fail		orange	Its behavior depends on the applicative software (*).
I/O	Inputs / Outputs	Green	Its behavior depends on the applicative software (*).
PRM	Program Restart Mode	Green	ON= Program Restart Mode active. To move into the PRM, see after.
WDG	Watch Dog	Red	ON during the initialisation or after a fatal hardware failure or after a stop of the Linux kernel.
CP	CoProcessor	Green	ON = the inputs/outputs manager is OK
F1		Green	Reserved
F2		Green	Reserved

(*) The applicative software is the software of the user. It can be an OPAL application, an Isagraf program or an user application in C/C++ language. See the appropriate user manual.

Behavior of the lights after the power on

Sequence time	Sequence	Behavior
25 s	Start and running of the boot Installation and running of the Linux kernel	RUN and I/O lights are flickering in turn
15 s	Installation and running of services	All lights are ON
Then …	Start and running of the user applicative software : - C/C++ application - Isagraf - OPAL	Depends of the application. See the appropriate user manual.

Going to the Program Restart Mode (PRM)

Power off the product. Put a bridge between 7 and 8 pins of the SubD9 connector.
Power on the product. Wait 3s then the PRM Led is ON : the PRM is running.
To understand the usefulness of the Program Restart Mode, see the user manual of the appropriate applicative software.

COM630 communication module

This module consists of an Ethernet link (RJ45) and 3 serial links (subD 25p).

Ethernet link

Features

RJ45 socket (with push pull system for the COM630 module)

Speeds : 10 or 100 base T

Ethernet cable for the push pull system (COM630 module)
- You can get a supply of the cable from
  - o   Leroy Automation
  - o   HARTING reference 09 45 701 11 xx. (xx depends of the length and the opposite connector)
- You can make the cable with the RJ45 pushpull connector set from chez HARTING ref 09 45 145 1100 (4 data contacts) .

Ethernet connector pin assignment

Nota : The Cat5 4 poles cable has the threads no 1,2,3,6 only.

Pin	Meaning
1	Out +
2	Out -
3	In +
4	Common
5	Common
6	In -
7	Common
8	Common

Ethernet lights

The Ethernet lights are on the CPU610 module (see above).

Serial links

Features

SudD 25 plug connector

RS232 or RS422 or RS485 : choice by wiring (see below)

Insulations of signals by photocouplers. Insulation of power supply by transformer

Speeds :

50, 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bits/s

Frame : 7 or 8 bits of data ; even, odd or no parity; 1 or 1.5 stop bits.

Lights (for each link)

| LED	Marking	Meaning
Green	Rx	ON= The channel receives
Green	Tx	ON= The channel emits

SubD 25 pin connector assigment
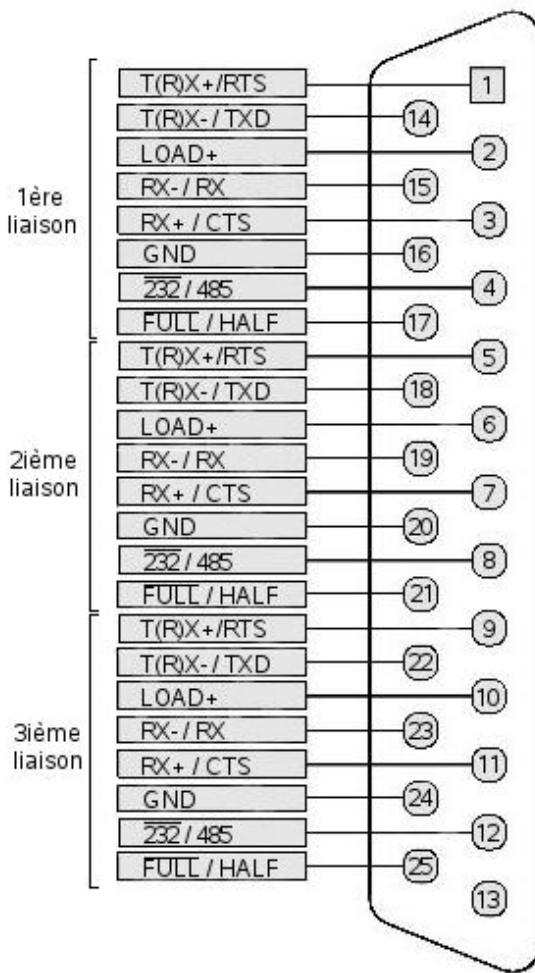

Wiring

| RS232 | RS422/RS485 4 wires full duplex | RS485 |
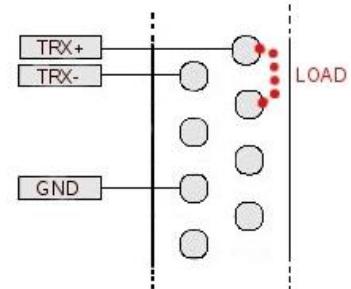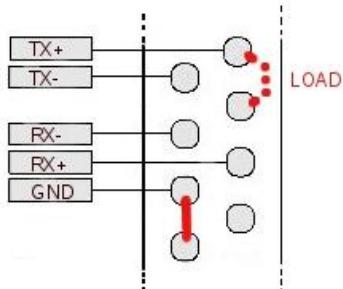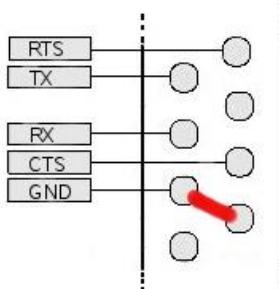
Bias resistors : Lines TRX+ et TRX- are inside pre-loaded with R=150 kΩ.
Adaptation resistor : the COM630 module has a inside resistor (120Ω) between TRX+ and TRX-.
You can use it by connecting TRX+ and LOAD pins.

Digital inputs : DI310 - DI410 modules

Input specifications	Unit	
Nominal voltage	Vdc	24 with terminal module 16()24() 48 with terminal module 16()48()
Range	Vdc	12 to 30 with terminal module 16()24() 40 to 60 with terminal module 16()48()
Input type		type P; IEC I1131 standard : type 1 resistive
Input impedance	kΩ	5.5
Nominal current at nominal voltage	mA	5 mA for 24V ; 3 mA for 48V
High level	%	55% of the power voltage
Low level	%	25% of the power voltage
Common to input sensors		To the + of the power supply
Over-voltage protection		With transient voltage suppressors in parallel to the terminal module inputs. 0.5A fuse recommended on the terminal module power supply.
Input response times	ms	<1ms for DI310/410/312 2 ms (RC filter) for DI310
Logic		Positive
Consumption		
on internal voltage	mW	DI310 : 180 + 10 per lit led, attaining 500 max. DI410 : 560 + 10 per lit led, attaining 1200 max.
On the terminal module power voltage	mA	<5xn where n = number of channels in a high state
Channel display		1 green LED per channel
General display		1 red lit LED if board fault
Dielectric rigidity		
Input/ground	Veff	1500 on screw terminal
Input/ground	Veff	1000 on D-Sub and RJ45

The input Leds display the logical state as seen by the central processor

16i.24b   DI310   SR : Shift register
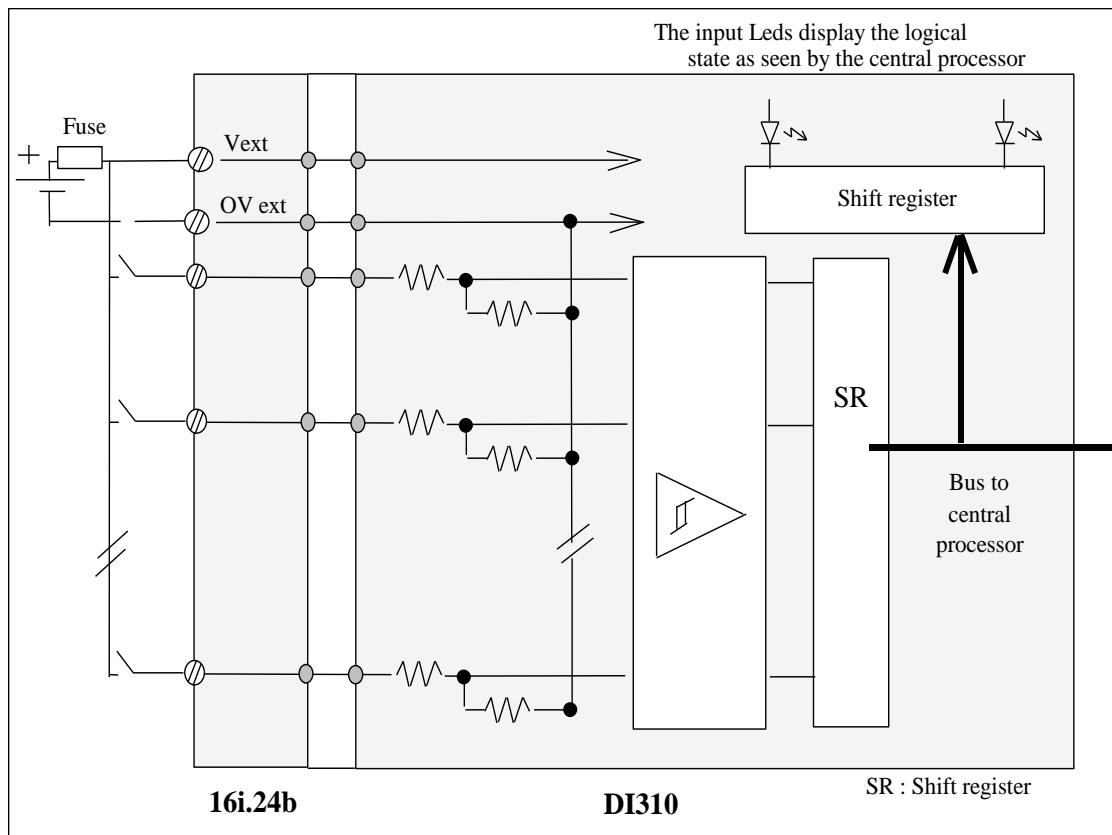
Safety digital inputs (wiring control) : DI312

Input specifications	Unit	
Nominal voltage	Vdc	24 with 16is24b terminal module
Resistance ranges		See below
Common for input sensors		To the power supply + pin
Over-voltage protection		With transient voltage suppressors in parallel to the terminal module inputs.
		0.5A fuse recommended on the terminal module power supply.
Logic		positive
Consumption		
- internal	mW	280 + 10 per led lit attaining 920 max.
- on the voltage of the terminal module power	mA	1 to 10 depending on the resistance values
Channel display		1 green and 1 red LED
General display		1 red FLT LED lit if board fault
Industrial tolerance		
Dielectric rigidity		
Input / ground	Veff	1500 with screw terminal
Input / ground	Veff	1000 with D-Sub and RJ45

See diagram G.

Static digital outputs : DO310 module

Output specifications	Unit	
Nominal voltage	Vdc	24
Maximum nominal current per channel	mA	350 per 8 channel group [0..7][8..F][10..17][18..1F]
Current leakage at low level	mA	<0.5
Waste voltage at state 1 with maximum nominal current	V	<1.8
Over-voltage protection		1,5A fuse recommended on the terminal module power supply.
Common to loads		at 0V of the power supply
Response time (logic + output)	ms	<1
Logic		positive : status 1= output busy
Internal bus consumption	mW	580 + 10 per led lit with a max 900.
External voltage consumption (excluding load current)	mA	<5
Channel display		1 orange LED per channel
General display		1 board fault LED . The outputs at low level if fault
Industrial tolerance		
Dielectric rigidity		
Output/ground	Veff	1500 with screw terminal
Output/ground	Veff	1000 with D-Sub and RJ45
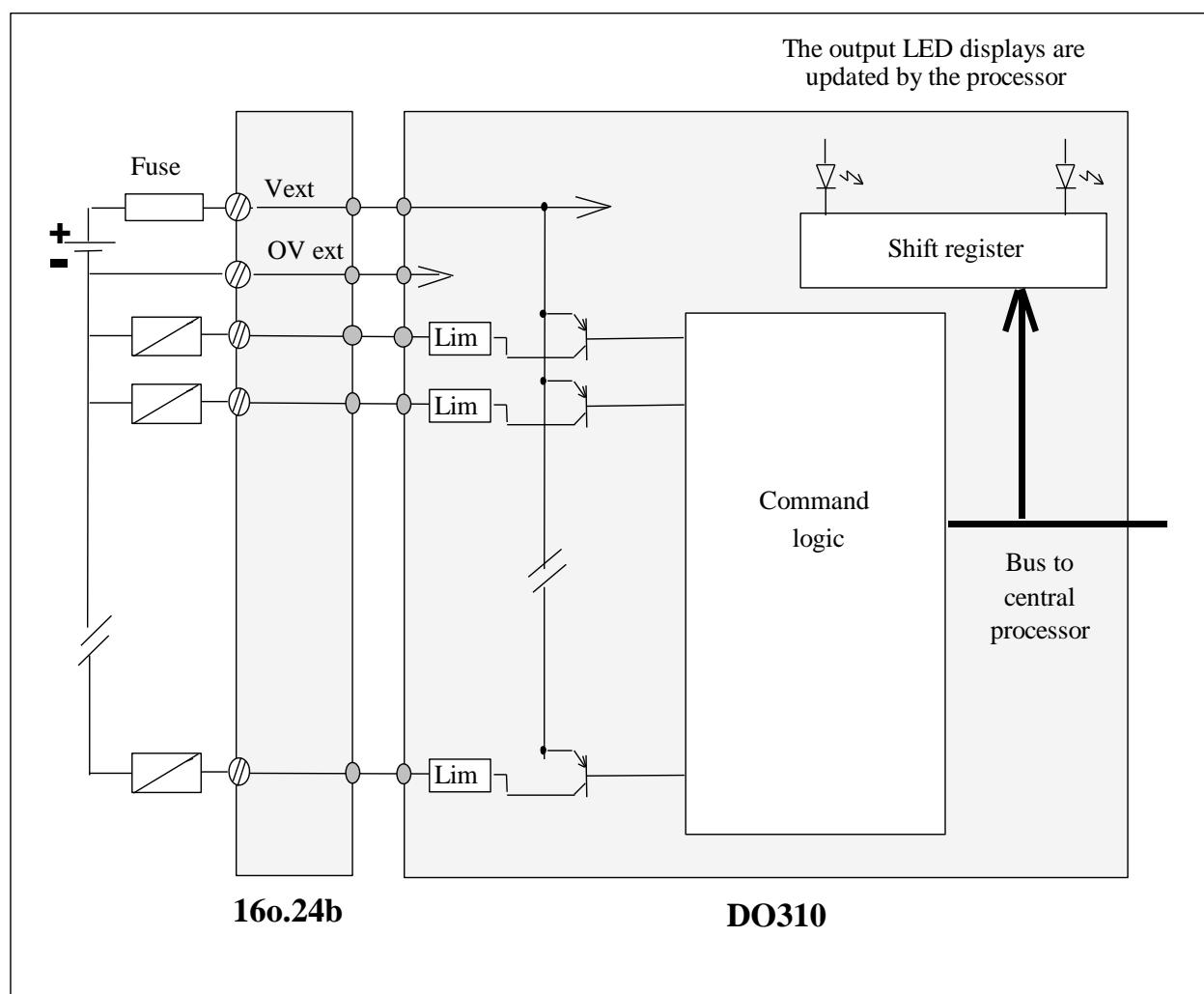
Simplified diagram of a DO310 output

Relay digital outputs : DO310 / 8om3A.

| Output specifications	Unit	
Coil nominal voltage	V	24 V
Contact type		contact 1 T, potential free
Max current per channel	A	
Direct current		See the diagram below
Alternative current		6A - 230V~
Over-voltage protection		By transient voltage suppressors in parallel to the outputs on the terminal modules. 0.5A fuse recommended on the terminal module power supply.
Response time (logic + output)	ms	<10
Logic		positive : high level= output busy
Internal bus consumption	mW	580 + 10 by lit led, attaining 900 max.
External voltage consumption (excluding current load)	mA	10mA per relay coil
Channel display		1 orange LED per channel
General display		1 board fault LED . The outputs at low level if fault
Expected life		$> 30.10^6$ mechanical switches
Industrial tolerance		
Dielectric rigidity		
between outputs	Veff	1500 for screw terminal
between outputs and ground	Veff	1500for screw terminal
between outputs	Veff	1000 for D-Sub
between outputs and ground	Veff	1000 for D-Sub

Max. DC Load Breaking Capacity
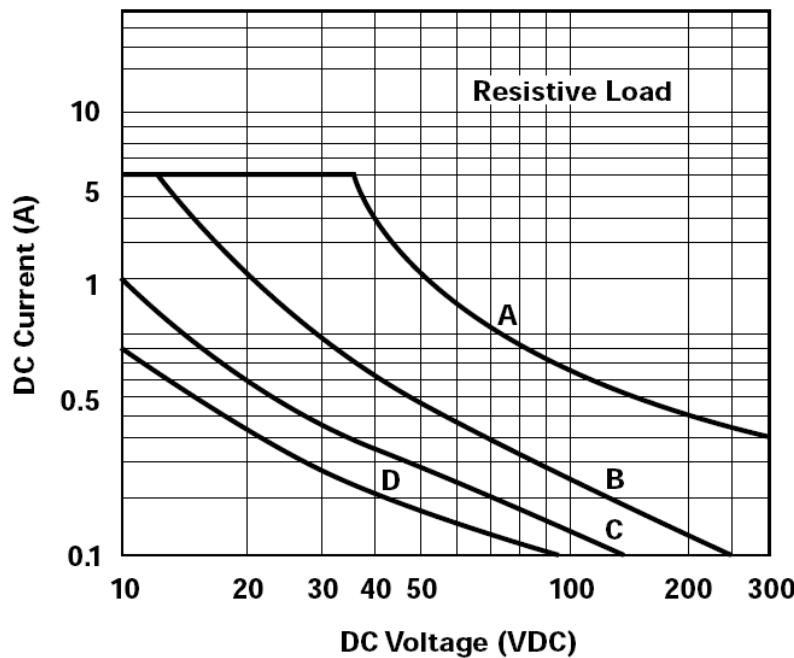
A: Resistive   B: 20 ms   C: 40 ms   D: 60ms

Digital I/O : DIO210

Common specifications	Unit	
Internal voltage consumption	mW	600 + 200 per relay + 10 per lit led attaining 2500 max.
General display		1 red LED lit if board fault
Input specifications	**Unit**	
Nominal voltage	Vdc	24 with 16i.24() terminal module
Range	Vdc	12 to 30 with 16i.24() terminal module
Input type		type P
		IEC1131 standard : type 1 resistive
Input impedance	kΩ	5.5
Nominal current at nominal voltage	mA	5 mA for 24V
Input hysterisis	Vdc	±1.5V around 10.3V
Common to input sensors		at +V
Over-voltage protection		By transient voltage suppressors in parallel to the terminal module inputs.
Input response time	ms	2 ms (RC filter)
Logic		positive
Channel display		1 green LED per channel
Output specifications	**Unit**	
Coil nominal voltage	V	24 V
Contact type		contact 1 T, potential free
Max current per channel	A	3 A on resistive load (30V=)
		2A on inductive load (230V~)
Current leakage at 0 state	mA	<0.5
Response time (logic+output)	ms	<10
Logic		positive : high level= output busy
Channel display		1 orange LED per channel
Dielectric rigidity		
Input / ground	Veff	1500 for screw terminal
Input / ground	Veff	1000 for D-Sub
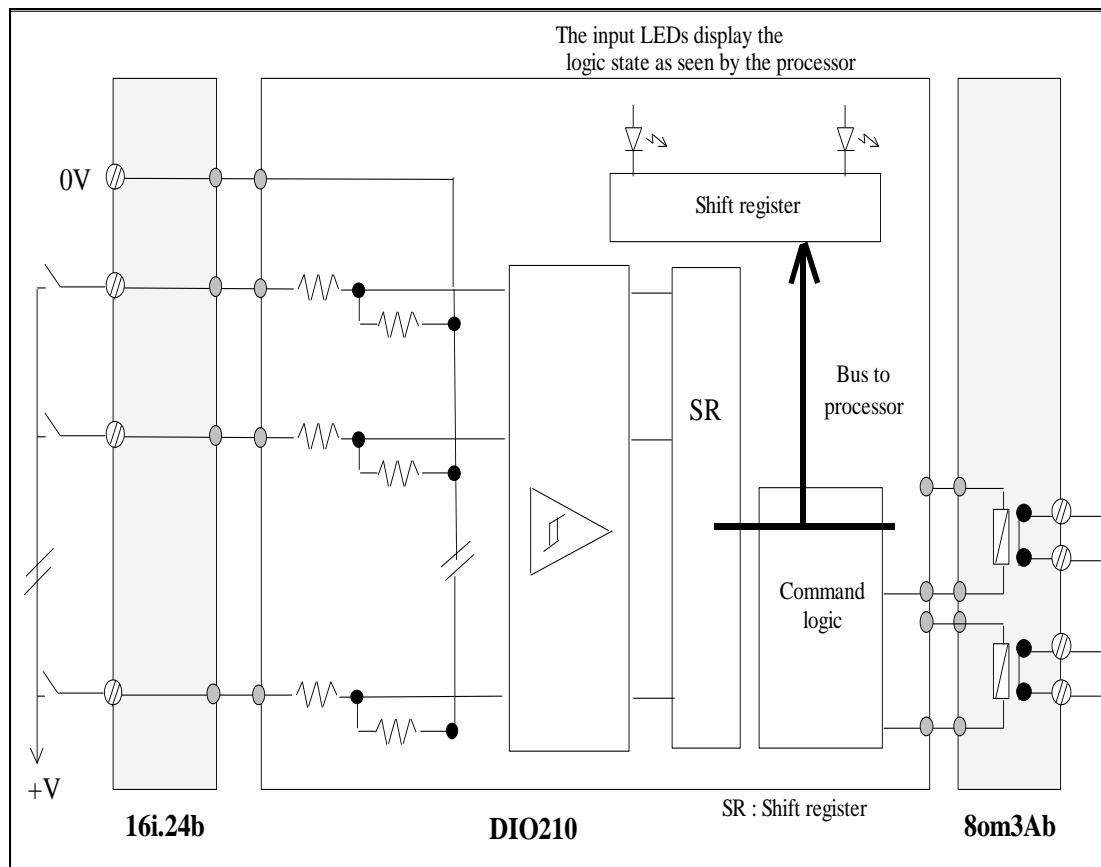
Simplified DIO210 block screw terminal diagram

Non isolated analog current inputs : AI110 - AI210

Input specification	Unit	
input signals	mA	-21.1 / +21.1
Digital resolution	Bits	13 + sign : ± 8192 points
Software correspondence value		**± 21.1mA => ± 32767points**
Galvanic separation		
Between input and ground		yes
Between inputs		no
Input impedance	Ω	240
Conversion time	μs	<10
Maximum error at 25°C	%FS	±0.2 (that is ± 60 points at 25°C with OPAL software)
Temperature coefficient	%FS	±0.005/°K
Maximum error over the complete temperature range	%FS	±0.5
Maximum permanent current in differential mode without destruction	mA	40
Internal bus consumption	mW	580+ 10 per lit Led attaining 900 max.
Channel display		1 green LED + 1red LED per channel
General display		1 lit red LED if board fault
Dielectric rigidity		
Input / ground	Veff	1500 for screw terminal
Input / ground	Veff	1000 for D-Sub and RJ45
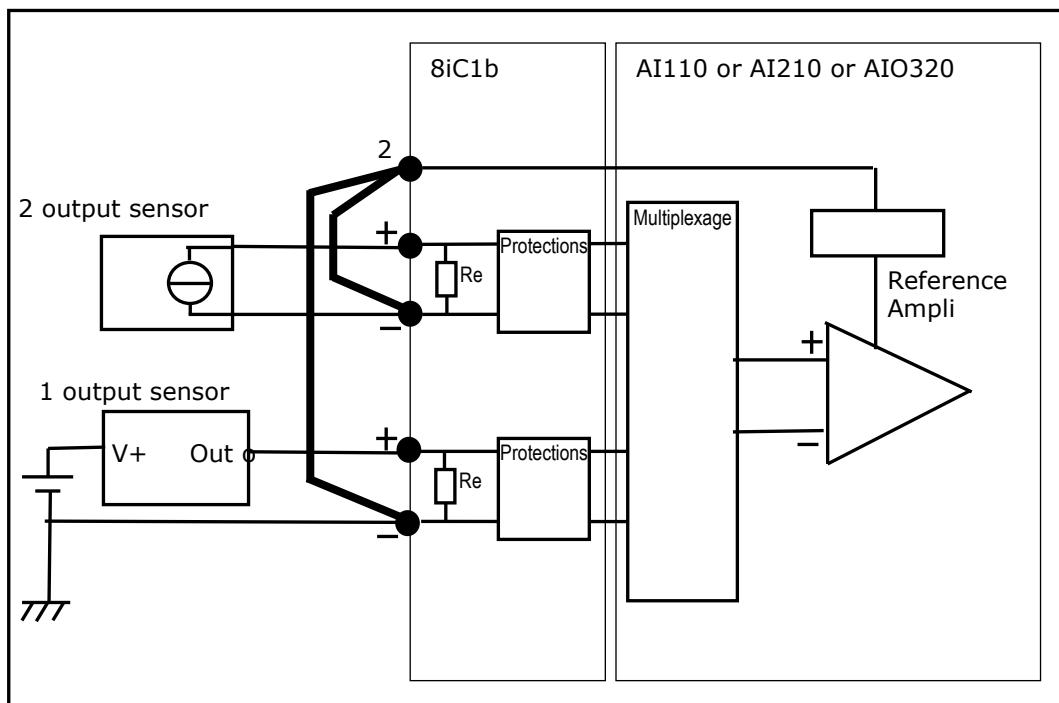
The inputs are symmetrical : a current entering through the + pin and exiting through the - pin supplies a positive digital value and inversely.

Entrées analogiques tension non isolées : AI110 - AI210

Input specifications	Unit	8iv1b module	8iv2b module
Input voltage And converted numeric value		-10.25V = -32767 pts +10.25V = +32767 pts	-5V = -32767 pts +5V = -32767 pts
Input impedance	kΩ	200	
Galvanic separation			
Between input and ground		yes	
Between inputs		no	
Conversion time		<10	
Digital resolution	Bits	13 + sign : ± 8192points	
Max. error at 25°C	%	±0.2 (full scale)	
Temperature coefficient	%	±0.005/°K (full scale)	
Maximum error across the full temperature range	%	±0.5 (sull scale)	
Channel display		1 green LED + 1red LED per channel	
General display		1 red lit LED if board fault	
Internal bus consumption	mW	580 + 10 per lit led attaining 900 max.	
Dielectric rigidity			
Input/ground	Veff	1500 with screw terminal	
Input/ground	Veff	1000 with D-Sub and RJ45	
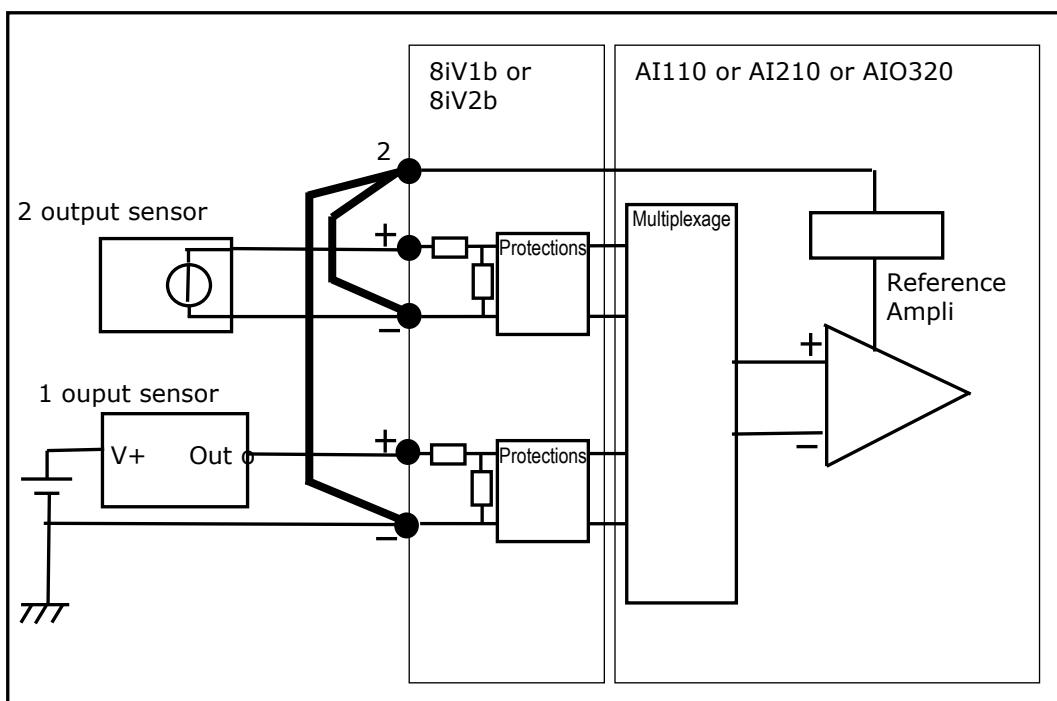
The voltage difference between pin **-** of sensors and the reference of ampli (Pin **2**) don't must exceed :

 ➢ 8i.v2b module (5v input) : ±10.5V
 ➢ 8i.v1b module (10V input) : ± 21V

If this is not the case it will be necessary to reference by wiring to avoid saturation.

The inputs are symmetrical : a voltage applied to the + pin greater than the voltage applied to the - pin supplies a positive numeric value and inversely.

Analog 4-20mA current outputs : AO121

Output specifications	Unit	
Output signals	mA	4 / 20
Digital resolution	Bits	11 unsigned = 0 / +2048 points
Software value correspondence		**0 / 32767point s=> 4 / 20mA**
Load impedance	Ω	770 max (24V) ; 650 max (24V -10% power)
Conversion time outside of refresh cycle	µs	65 max
LSB value	µA	7.8
Maximum error at 70°C	%	± 0.3 (Full scale)
Over-voltage protection		By transient voltage suppressors in parallel to the outputs on the terminal modules. 0.5A fuse recommended on the terminal module power supply.
Internal bus consumption	mW	1180 + 10 per lit led attaining 1300 max.
Consumption of the 8o.c1b terminal module	mA	20mA + 8 channels x20mA max at 24V
Channel display		1 green LED per channel
General display		1 red LED lit if board fault
Industrial tolerance		
Dielectric rigidity		
Outputs and ground	Veff	1500 with screw terminal
Between outputs and ground	Veff	1000 with D-Sub and RJ45
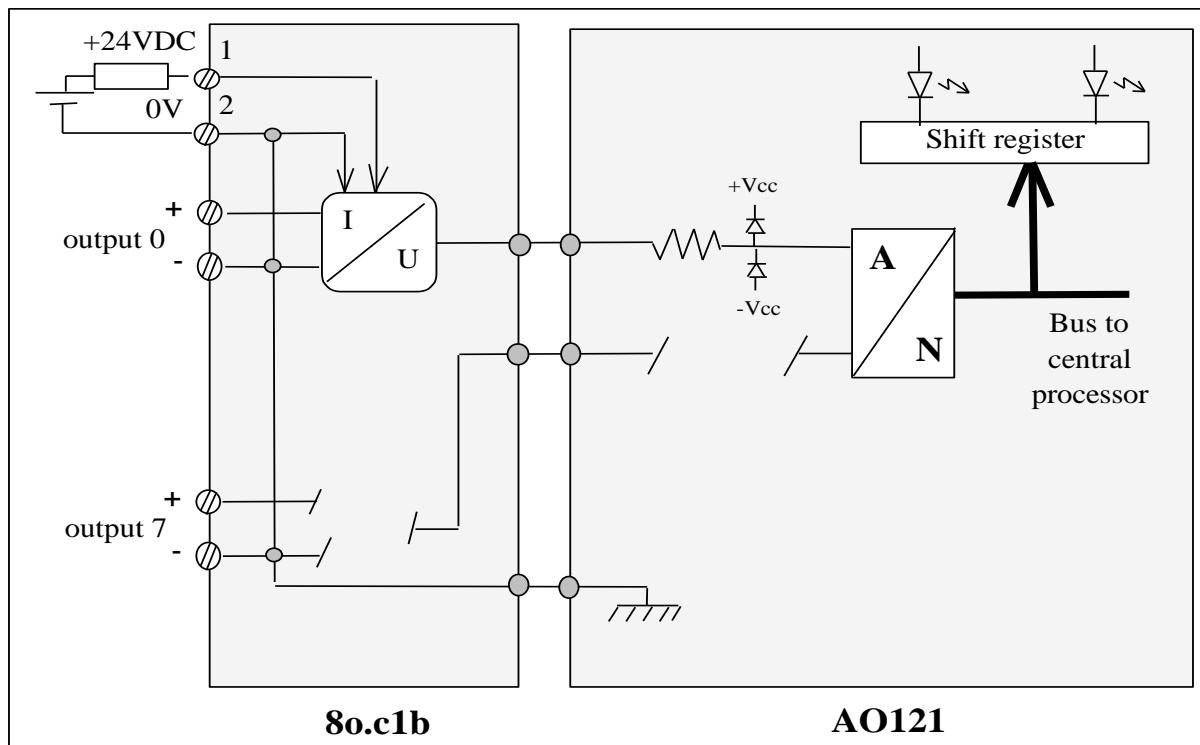
Simplified diagram of an ANA current output (8o.c1b)

Analog voltage outputs : AO121

| Output specification	Unit	
Output voltage and Correspondence value	V	-10 V ➜ -32767 pts +10 V ➜ +32767 pts
Digital resolution	Bits	11 + sign : ± 2048 points
Common point between channels		YES
Load impedance	Ω	>2000
Conversion time outside of refresh cycle	μs	50
LSB value		4.88mV
Maximum error over the complete temperature range	%	±0.2 (full scale)
Incorporated over-voltage protection		yes
Internal bus consumption	mW	1180 + 10 per lit led + 50 per output attaining 1660 max.
Channel display		1 green LED per channel
General display		1 red LED if board fault
Dielectric rigidity		
Between outputs and ground	Veff	1500 with screw terminal
Between outputs and ground	Veff	1000 with D-Sub and RJ45
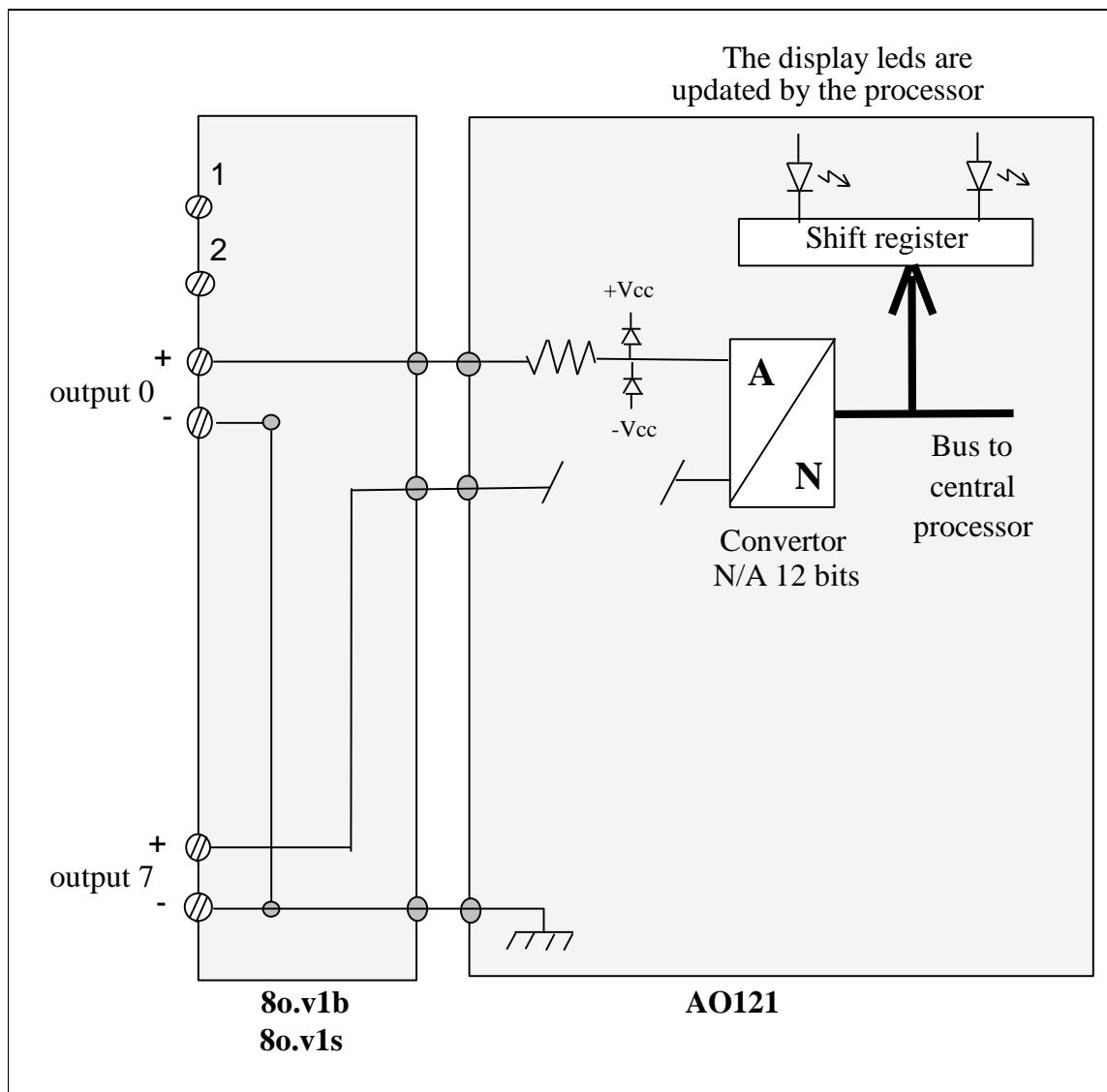
Simplified diagram of an ANA voltage output (8o.v1b – 8o.v1s)

Analog current and voltage I/O : AIO320

ANALOG INPUTS		
Current input specification	Unit	
Max input currents and software value	mA	-20 mA ➔ -32767 pts
		+20 mA ➔ +32767 pts
Input impedance	Ω	240
Voltage input specifications		
Max input voltages and software values	V	-10 V ➔ -32767 pts
		+10 V ➔ +32767 pts
Input impedance	Ω	200k
Common specifications		
Résolution numérique	Bits	15 + signe
overflow		Signaled by led + overflow bit
Analog to Digital conversion time	μs	<25
Error (full scale) : at 25°C / at 60°C	%	±0.1 / ±0.2
Permanent current in differential mode without destruction	mA	40
Channel display		1 orange LED per channel

ANALOG OUTPUTS		
Current output specifications		
Output currents and software values	mA	0 pt ➔ 4mA
		+ 32767points ➔ 20 mA
Load impedance	Ω	770 max (power = 24V),
		650 max (power = 24V -10%)
Current output supply		24V external
Voltage output specifications		
Output volytages and software values	V	-32767 pts ➔ -10V
		+32767pts ➔ +10V
Load impedance	Ω	>1000
Common output specifications	Unit	
Digital resolution	Bits	11 + sign : ± 2048 points
Common point between channels		yes
DAC conversion time	μs	70
Maximum error at 25°C / +60°C	%	±0.2 / ±0.3
protection		against over-voltage and short circuits
Maximum consumption of the 4o.c1b terminal module on an external 24V power supply	mA	100
Channel display		none

| Common I/O specifications	Unit	
Internal bus consumption	W	1.5W outputs at low level or unloaded and 2.1W with 4 outputs at a maximum load (1kΩ)
General display		1 red LED lit on board fault
Industrial tolerance		
Dielectric rigidity input/ground	Veff	1500 with screw terminal
Dielectric rigidity output/ground	Veff	1500 with screw terminal
Dielectric rigidity input-output/internal bus	Veff	1000
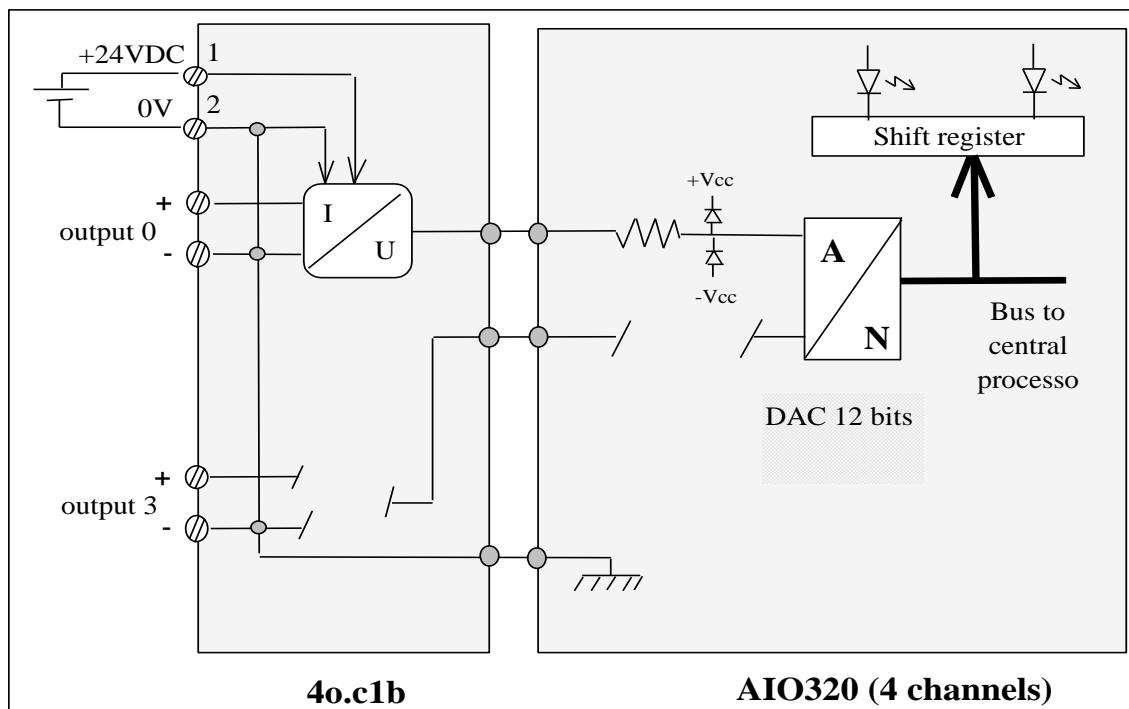
Simplified diagram of an ANA current output (4o.c1b)
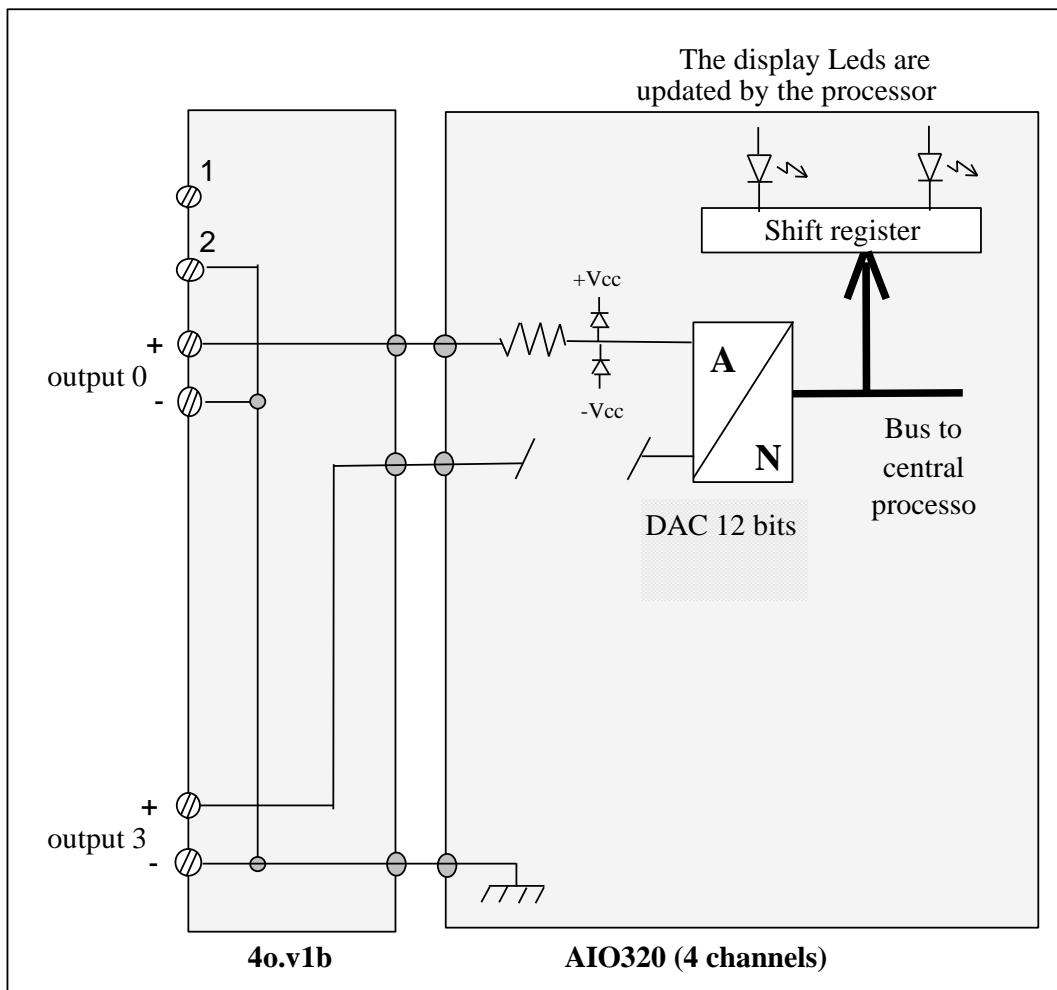
Simplified diagram of an ANA voltage output (4o.v1b)

PT100 sensor inputs : AIO320

PT100 input specifications	Unit	
Number of inputs		8
Type		PT100 2 and 3 wires (according to CEI751)
Min/max Temperatures and software value		**-50°C => -50 points** **+350°C => +350 points**
Measure precision with à LT at +25°C	°C	0.5 with software gain correction and offset
PT100 wires lenght compensation		yes (if wires have the same resistance)
Cut wires detection		yes
Detection of temperature range overflow		yes (by software)
Internal bus consumption	W	2.7W (without analog outputs)
Channel display		1 orange LED per channel for range overflow or threshold set by OPAL software

**AIO320(8 voies pour sondes PT100)**
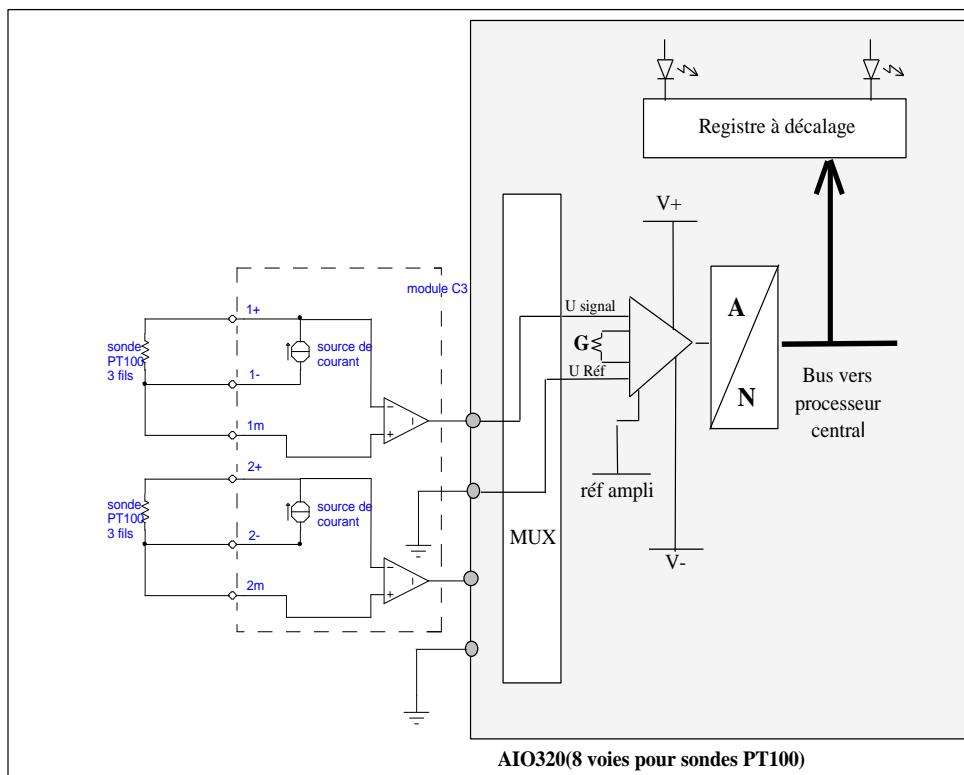
Secured digital inputs : DI130

Interest of this module :

- every input is redounded to generate two complementary bits
- Block of 16 digital inputs. (3 slots)
- power supply of inputs : 24v, 48V or 12OV (choice by wiring)
- good CEM immunity

Input specifications	Unit	
Nominal voltage	Vdc	1 common 24V 1 common 48V 1 common 120V
Range	Vdc	-20% to +15% of the nominal voltage
Input type		type P; IEC I1131 standard : type 1 resistive
Input current	mA	20 for 24V ; 15 for 48V ; 7.5 for 120V
Switch on/off	%	High level =55% of the power voltage Low level =25% of the power voltage
Common to input sensors		To the + of the power supply
Over-voltage protection		With transient voltage suppressors in parallel to the terminal module inputs.
Input response times	ms	15 ms (RC filter)
Logic		positive
Consumption on internal voltage	W	1
Channel display		1 green LED per channel
General display		1 red lit LED if board fault
Dielectric rigidity : Input/ground	Veff	1500 on screw terminal
Local temperature limitation	°C	45 max.
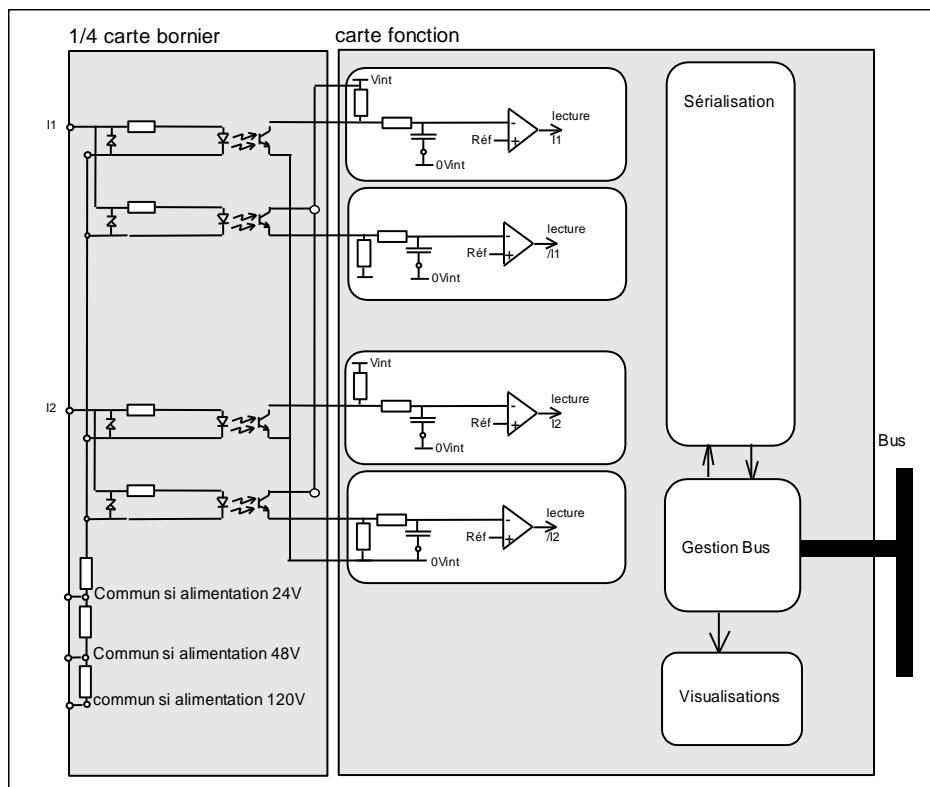
Secured digital inputs / outputs : DIO130

Interest of this module :

- every input is redounded to generate two complementary bits
- Higher modularity : 4 inputs and 4 outputs by terminal board
- Redundancy of the opening commands of relays
- Internal check up of the double command of each relays and activation of a local WDG

Input specifications	Unit	
Nominal voltage	Vdc	24/48/120 ; -20% to +15%
Input current	mA	20 for 24V, 15 for 48V, and 10 for 120V
Switch on/off	%	High level = 55% of the power voltage
		Low level = 25% of the power voltage
Input response times	ms	15
Channel display	mA	1 green LED per channel
Output specifications		
Relays : type		By board :
		1 Make contact relay
		1 make/Break contact relay
Contact		
- Break power	W	30 on inductive load with L/R = 40ms
		(200 mA ,137V ,10.000 mechanical switches)
Coil		
- nominal voltage	V	12 (via internal power supply)
- nominal curent	mA	20
Relays : R2, R4, R6, R8		1 Make/break contact
Relays : R1, R3, R5, R7		1 make contact
Signalisations		
Relays R2, R4, R6, R8		4 green LED
Relays R1, R3, R5, R7		4 red LED
Sa, Sb, Sc, Sd	orange	4 LED managed by program
Wdl	Red	Local Watch Dog : ON if
		- the monostable duration (200ms) is out without any CPU activity
		- the CPU switched on the internal signal Wdg