GMB HR84

Housing Relay - 8 Opto In, 4 Outputs

GMM 936

grifo® Mini Module P89LPC936

TECHNICAL MANUAL

grifo®
ITALIAN TECHNOLOGY

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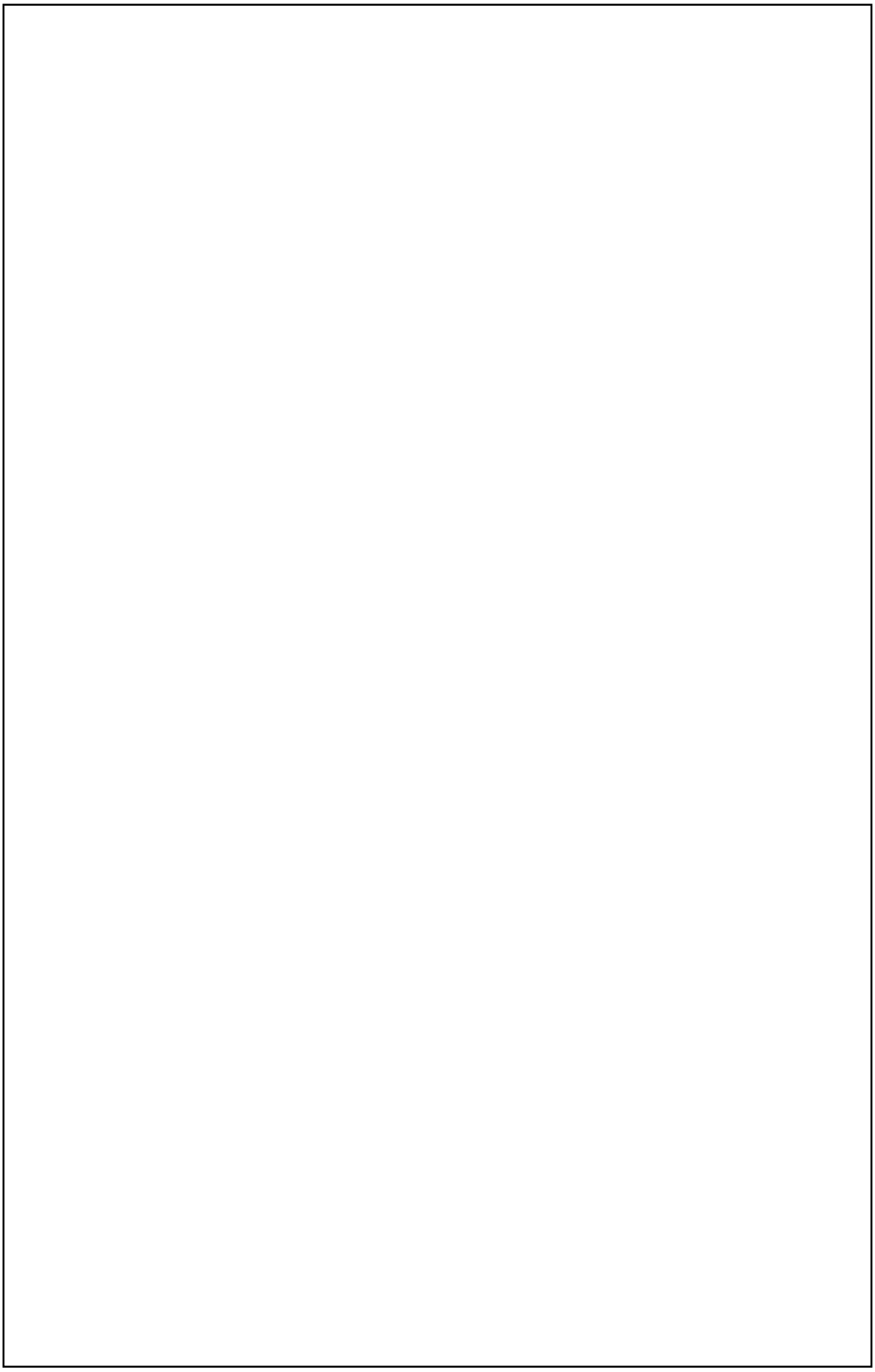
GMB HR84 & GMM 936 Rel. 5.00 *Edition 09 March 2005*



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Modular plastic Container **DIN 50022 Modulbox**, model **M4 HC53**; size: front **90** x **71** mm, height **58** mm; mounting on **Omega** rail DIN 46277-1 and DIN 46277-3; **GMM 936** already included in delivery; **8** Optocoupled Inputs that can be both **NPN** or **PNP**; status of **8** inputs shown by **8 LEDs**; one input can pefrom **Interrupt** functions; one input can perform Counter functions; **4** Relay Outputs **5 A**; status of **4** outputs shown by **4 LEDs**; some outputs can perform automatic timing functions; Serial Line in RS 232, RS 422, RS 485, current loop or **TTL**; all signals can be connected through connectors featuring **Normalized** pin out; **4 I/O TTL** signals; **I²C BUS** available on connector for external devices; **Switching** power supply on board; protection of on board logic, through **TransZorb**; power supply in **DC** or in **AC**: 10 ÷ 40 Vdc or 8÷24 Vac for logic supply; possibility to manage internal FLASH and EEPROM in **In System Programming** mode; free software for **PC**, downloadable from Philips web site, to support **ISP** programming upload the generated code into on-board FLASH memory; wide range of development software available: **C** Compilers (µC/51); **BASIC** Compilers (BASCOM 8051); **LADDER** Compilers (LadderWORK); etc.; several demo programs and use examples provided as source code completely commented available for every development structure

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IMPORTANT

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grifo® reserves the right to change the contents and form of this document, as well as the features and specification of its products at any time, without prior notice, to obtain always the best product.

For specific informations on the components mounted on the card, please refer to the Data Book of the builder or second sources.

SYMBOLS DESCRIPTION

In the manual could appear the following symbols:

Attention: Generic danger

Attention: High voltage

Attention: ESD sensitive device

Trade Marks

abaco, **GPC®**, grifo® : are trade marks of grifo®.

Other Product and Company names listed, are trade marks of their respective companies.

GENERAL INDEX

FIGURE INDEX

INTRODUCTION

The use of these devices has turned - IN EXCLUSIVE WAY - to specialized personnel.
This device is not a **safe component** as defined in directive **98-37/CE**.

Pins of Mini Module are not provided with any kind of ESD protection. They are connected directly to their respective pins of microcontroller. Mini Module is affected by electrostatic discharges. Personnel who handles Mini Modules is invited to take all necessary precautions to avoid possible damages caused by electrostatic discharges.

The purpose of this handbook is to give the necessary information to the cognizant and sure use of the products. They are the result of a continual and systematic elaboration of data and technical tests saved and validated from the manufacturer, related to the inside modes of certainty and quality of the information.

The reported data are destined- IN EXCLUSIVE WAY- to specialized users, that can interact with the devices in safety conditions for the persons, for the machine and for the enviroment, impersonating an elementary diagnostic of breakdowns and of malfunction conditions by performing simple functional verify operations , in the height respect of the actual safety and health norms.

The informations for the installation, the assemblage, the dismantlement, the handling, the adjustment, the reparation and the contingent accessories, devices etc. installation are destined - and then executable - always and in exclusive way from specialized warned and educated personnel, or directly from the TECHNICAL AUTHORIZED ASSISTANCE, in the height respect of the manufacturer recommendations and the actual safety and health norms.

The devices can't be used outside a box. The user must always insert the cards in a container that rispect the actual safety normative. The protection of this container is not threshold to the only atmospheric agents, but specially to mechanic, electric, magnetic, etc. ones.

To be on good terms with the products, is necessary guarantee legibility and conservation of the manual, also for future references. In case of deterioration or more easily for technical updates, consult the AUTHORIZED TECHNICAL ASSISTANCE directly.

To prevent problems during card utilization, it is a good practice to read carefully all the informations of this manual. After this reading, the user can use the general index and the alphabetical index, respectly at the begining and at the end of the manual, to find information in a faster and more easy way.

CARD VERSION

The present handbook is reported to the **GMB HR84** card release **220503** and **GMM 936** card release **300803**. The validity of the bring informations is subordinate to the number of the card release.

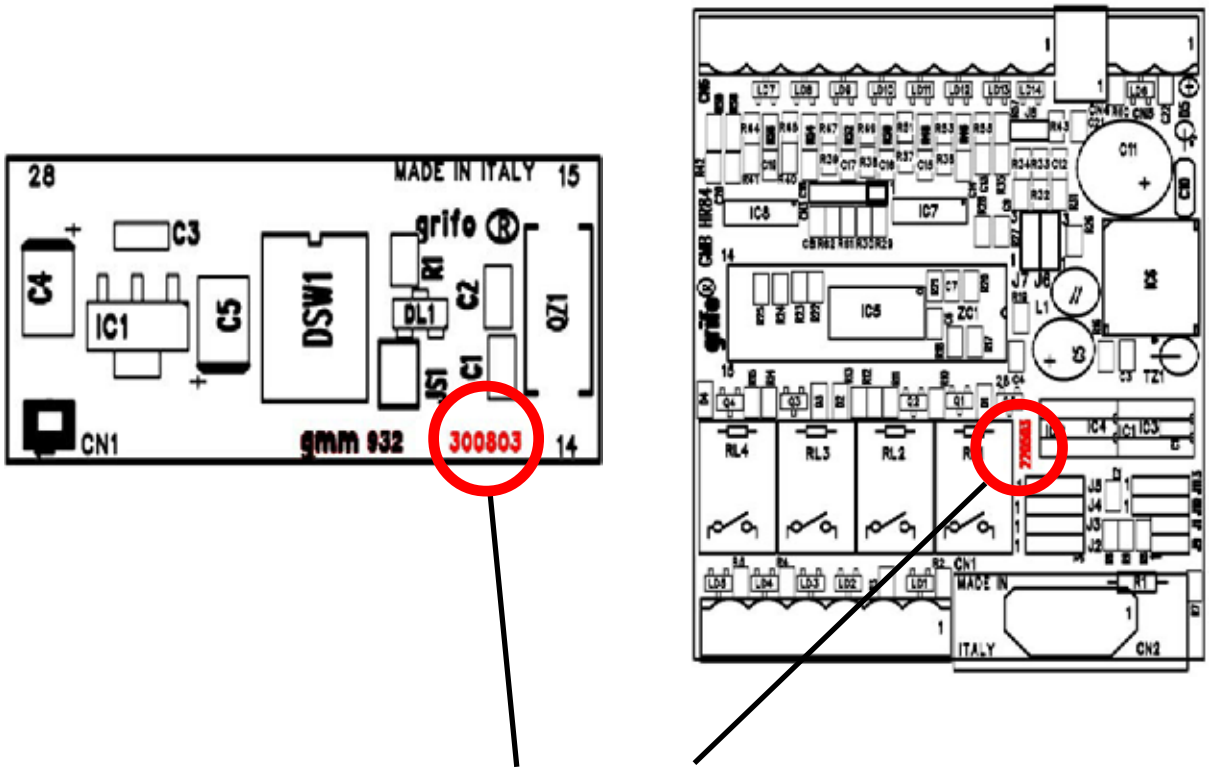

FIGURE 1: POSITION OF CARD RELEASE OF GMM 936 AND GMB HR84

NOTE ABOUT MINI MODULE NAME

Please note the Mini Module name, near the printed circuit revision number.
The name is **GMM 932**.
GMM 936 is made starting from a **GMM 932** printed circuit where a P89LPC936 is installed.
To distinguish **GMM 932** and **GMM 936** it is compulsive to refer the type of CPU installed, as reported here:

CPU installed:	**P89LPC936**	**P89LPC932**
Mini Module name	**GMM 936**	**GMM 932**

GENERAL INFORMATION

GMB HR84 & GMM 936 is a module for DIN rail with a **grifo®** Mini Module CPU type **GMM 936** already included in delivery.
The board features 8 galvanically isolated inputs and 4 relays outputs with LEDs visualizations; an asynchronous serial line; an I²C BUS serial line; a PWM output; up to 4 I/O TTL. Its rank is low cost controller, that can work as intelligent peripheral in autonomy and/or remoted inside a wider telecontrol/teleacquisition network.
The union **GMB HR84 & GMM 936** is provided with a standard plastic container with clamps for common Omega rails that can be found in any electric panel.
Low cost of this interface and CPU Mini Modules allow to build with great profit a serie of low budget automation systems.
It is possible to create complete applications in astonishing short times and minumum costs by taking advantage of wide variety of software development tools, like **BASCOM 8051**, unexpensive and portable, C compilers **µC/51** and **HTC 51**, or Ladder WORK, a **LADDER** compiler all available from **grifo®.**
The union is provided with a set of comfortable connectors that can be easily linked to the signals of the field without any additional module, so there is no additional cost.
Such connectors easy also update and assistance phases, that can be needed in time.
Overall features of union **GMB HR84 & GMM 936** are:

- Modular plastic Container **DIN 50022 Modulbox**, model **M4 HC53**
- Size: front **90** x **71** mm, height **58** mm
- Mounting on **Omega** rail DIN 46277-1 and DIN 46277-3
- **GMM 936** included in delivery
- **8 Optocoupled Inputs** that can be both **NPN** or **PNP**
- Status of **8** inputs shown by **8 LEDs**
- One input can pefrom **Interrupt** function
- One input can perform **Counter** function
- **4 Relay** Outputs **5 A**
- Status of 4 outputs shown by **4 LEDs**
- Some outputs can perform automatic timing functions
- **Serial Line** in RS 232, RS 422, RS 485, current loop or TTL
- All signals can be connected through connectors featuring **Normalized** pin out
- **4 I/O TTL** signals
- **I²C BUS** availabe on connector for external devices
- **Switching** power supply on board; protection of on board logic, through **TransZorb**
- Power supply in **DC** or in **AC**: 10 ÷ 40 Vdc or 8÷24 Vac for logic supply
- Possibility to manage internal FLASH and EEPROM in **In System Programming** mode
- Free software for PC, downloadable from Philips web site, to support **ISP** programming upload the generated code into on-board FLASH memory
- Wide range of development software available: C compilers (**µC/51**); BASIC compilers (**BASCOM 8051**); LADDER compilers (**LadderWORK**); etc.
- Several demo programs and use examples provided as source code completely commented available for every development structure

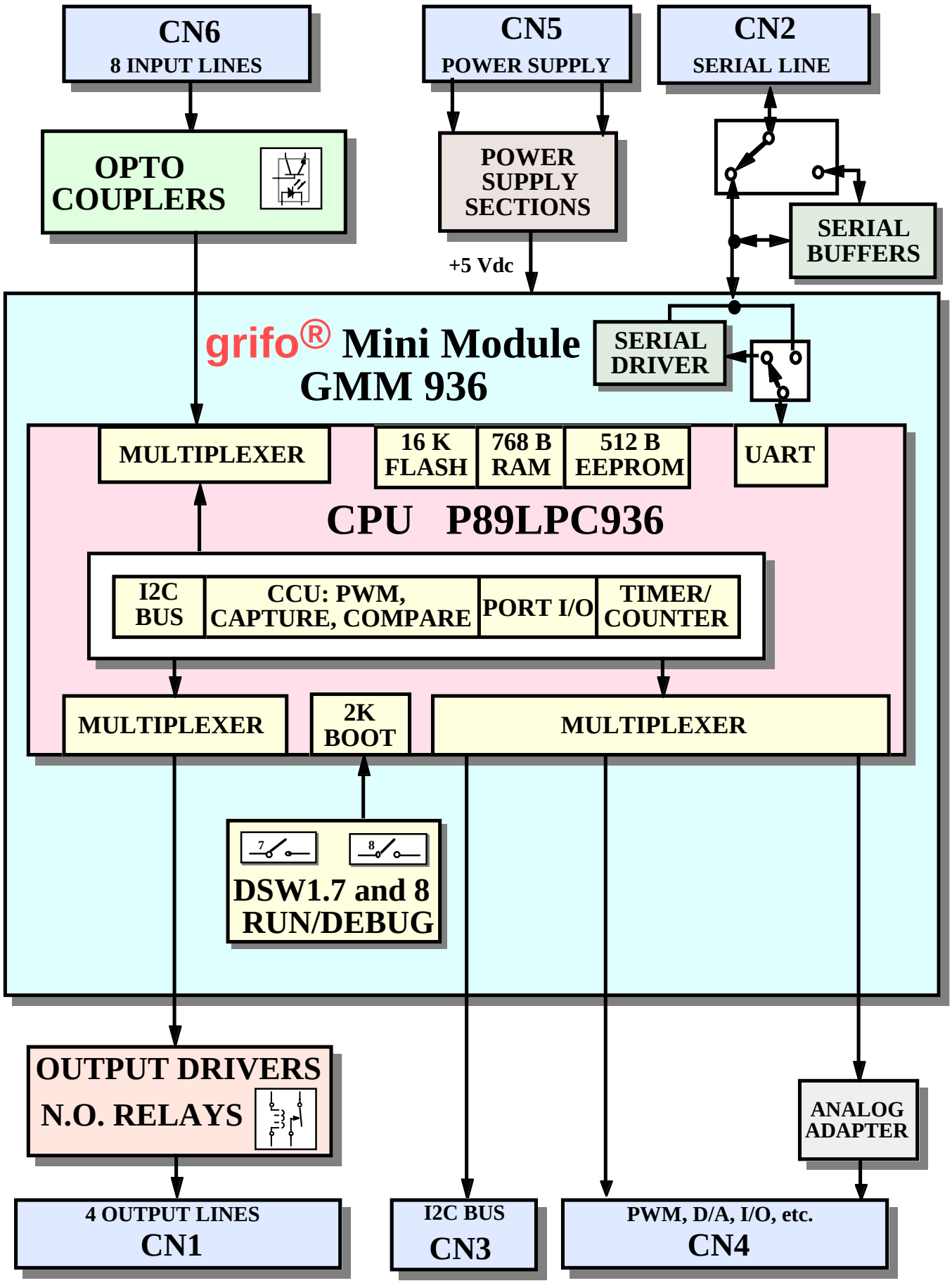

FIGURE 2: BLOCKS DIAGRAM

Here follows a description of the board's functional blocks, with an indication of the operations performed by each one.
To easily locate such section on verify their connections please refer to figure 2.

OPTOCOUPLED DIGITAL INPUT LINES

The card features 8 NPN/PNP inputs connected to two quick release screw terminal connectors and visualized by specific LEDs.
Optocoupled inputs are supplied by a specific external voltage called +Vopto that the user must provide.
For further information please refer to manual **GMB HR84**.

DIGITAL RELAYS OUTPUTS

The board is provided with 4 relays outputs 5 A, normally open, whose status is visualized by 4 LEDs. Each line is driven directly by a signal of **GMM 936**, buffered through a specific driver and connected to a comfortable quick release screw terminal connector to easy interface to the field signals.
For further information please refer to manuals **GMB HR84** and **GMM 936**.

I/O TTL SIGNALS

GMB HR84 features up to 4 digital I/O TTL signals of **GMM 936** connected to a specific connector (CN4).
For further information please refer to manuals **GMB HR84** and **GMM 936**.

FIGURE 3: SNAPSHOT OF GMB HR84 AND MINI MODULE GMM 936

I²C BUS LINES

GMB HR84 is provided with one connector (CN3) dedicated to I²C BUS, a hardware peripheral of the microcontroller, connected to two signals of **GMM 936** (P1.2 and P1.3), each provided with a 4.7 kΩ pull-up on board of **GMB HR84**.
This kind of interface allows to connect devices featuring the same communication standard, to easily improve the system performances.
A wide set of software examples explains the management of most common I²C BUS peripherals like A/D and D/A converters, display drivers, memories, temperature sensors, etc.
For this purpose it can be intresting to condifer **K51-AVR**, for which both technical manual and electric diagram are available, also a wide set of examples in several languager are avalable.
For further information please refer to manuals **GMB HR84** and **GMM 936**.

POWER SUPPLY SECTION

GMB HR84 is provided with an efficent switching power supply section, that provides supply +5 Vdc voltage needed by logic and output circuits, in any condition of input load and voltage.
If this section is not present, supply voltages must be provided from an external source.
The board features components and circuits designed to reduce consumptions (including the possibility of power-down and idle working modes of Mini Modules) and to reduce noise sensibility.
Remarkable is protection circuit based on TransZorb™ that avoids damages due to incorrect voltages.
To supply optocouplers of galvanically isolated sections an extezrnal voltage is needed.
For further information please refer to chapter “ELECTRIC FEATURES” and paragraph “SUPPLY VOLTAGES”.

SERIAL COMMUNICATION

GMB HR84 features one 9 ways D-type dedicated connector (CN2) for serial communication.
By hardware it is possible to select the electric protocol, through a comfortable set of jumpers and drivers to install.
In detail line can be buffered in **current loop, RS 232, RS 422 or RS 485**; in these last two cases also abilitation and direction of line can be defined using signals P2.0 or P2.6 when jumper J7 is connected respectively in position 1-2 or 2-3.
For further information please refer to manuals **GMB HR84** and **GMM 936**.

TECHNICAL FEATURES

GENERAL FEATURES

On board resources:
8 optocoupled digital inputs NPN and PNP
1 optocoupled digital input NPN and PNP is interrupt
1 optocoupled digital input NPN and PNP is counter
4 relays digital buffered outputs 5 A
1 serial line (RS 232, TTL, RS422, RS485, Current Loop, etc.)
1 connector for I^2C BUS lines
1 eight bit PWM output
Up to 4 digital I/O TTL
1 switching power supply section
14 status LEDs + 1 internal LED
1 internal eight pin Dip Switch

Mini Module: **GMM 936**

Opto input cut-off frequency: 13 KHz

PHYSICAL FEATURES

Size:
90 x 71 x 58 mm (container DIN 50022)
85 x 66 x 32 mm (without container)

Container: DIN 50022 modulbox, model M4 HC53

Montaggio: On Ω rails type DIN 46277-1 and DIN 46277-3

Weight: 166 g

Connectors:

CN1:	6 pins quick release screw terminal connector
CN2:	9 pins D type female, vertical, connector
CN3:	4 pins strip, male, vertical
CN4:	2x4 vie AMP MODU II, male, vertical
CN5:	2 pins quick release screw terminal connector
CN6:	9 pins quick release screw terminal connector

Temperature range: from 0 to 50 centigrad degreeses

Relative humidty: 20% up to 90% (without condense)

ELECTRIC FEATURES

Power supply:	10÷40 Vdc or 8÷24 Vac	(control logic)
Power required for logic:	2.3 W	(*)
Output power supply:	+5 Vdc	
Current required by GMB HR84:	310 mA max 16÷75 mA max	(+5 Vdc) (+V opto)
Current on +5 Vdc output:	400 mA - 310 mA - 25 mA = 64 mA	(**)
Relays max voltage:	35 Vdc	
Relays max non inductive current:	5 A	(resistive load)
On board battery:	3.0 Vdc; 180 mAh	
Backup current:	2.3 µA	
Optocouplers input voltage:	+V opto = 8 ÷ 30 Vdc	(*)
Power required for optocouplers:	4.4 W	
Analog input range:	0÷2.5; 0÷10 V	
Analog input impedance:	4.7 kΩ	
Pull-up on I^2C BUS dedicated lines:	4.7 kΩ	
Termination network RS 422-485:	Line termination resistor Positive pull up resistor Negative pull down resistor	=120 Ω =3.3 KΩ =3.3 KΩ

(*) The data are referred to 20 C° work temperature (for further information please refer to chapter "POWER SUPPLY VOLTAGE").

INSTALLATION

In this chapter there are the information for a right installation and correct use of the card.
The user can find the location and functions of each connector, LEDs, jumper, etc. and some explanatory diagrams.

CONNECTIONS

Module **GMB HR84 & GMM 936** has 6 connectors that can be linkeded to other devices or directly to the field, according to system requirements. In this paragraph there are connectors pin out, a short signals description (including the signals direction) and connectors location (see figure 17).

CN5 - POWER SUPPLY CONNECTOR

CN5 is a 2 ways, quick release screw terminal connector, vertical, 5.00 mm pitch.
CN5 allows to provide power needed by the switching power supply to generate logic control and optocouplers supply voltage.

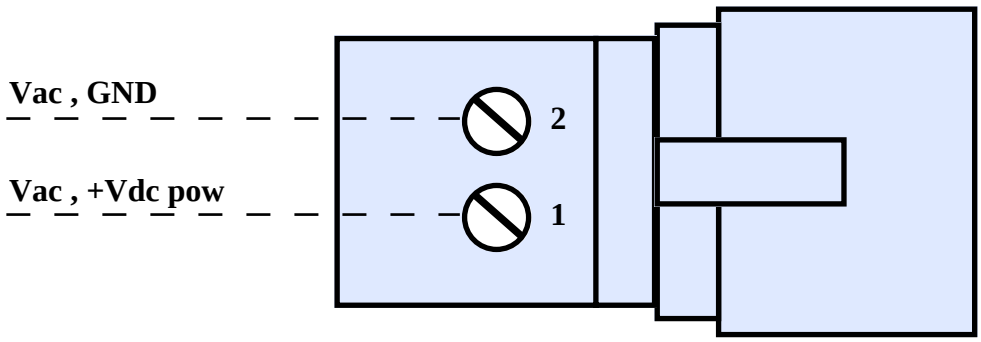

FIGURE 4: CN5 - POWER SUPPLY CONNECTOR

Signals description:

Vac , +Vdc pow = I - Positive terminal of direct supply voltage.
Vac , GND = I - Negative terminal of direct supply voltage.

For further information please refer to paragraphs "POWER SUPPLY" and "ELECTRIC FEATURES".

CN3 - I²C BUS LINE CONNECTOR

CN3 is a 4 ways, male, vertical, strip connector with 2.54mm pitch.
On CN3 is available a standard interface for any I²C BUS peripheral device.
The connector features +5 Vdc supply voltage generated by on board switching power supply that can be connected to external devices or systems.
Signals are TTL compliant, according to I²C BUS standard, their disposition has been designed to reduce interferences and so easy the connection.

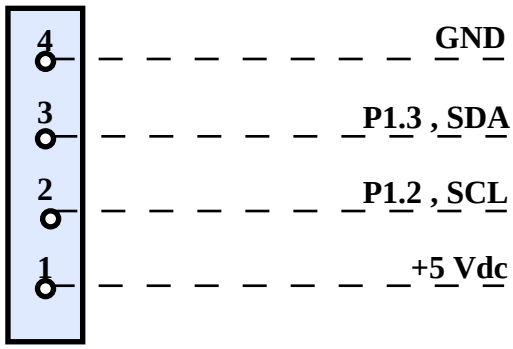

FIGURE 5: CN3 - I²C BUS LINE CONNECTOR

Signals description:

P1.3, SDA = I/O - Data signal of I²C BUS software serial line connected to P1.3.
P1.2, SCL = O - Clock signal of I²C BUS software serial line connected to P1.2.
+5 Vdc = O - Unique +5 Vdc power supply.
GND = - Ground.

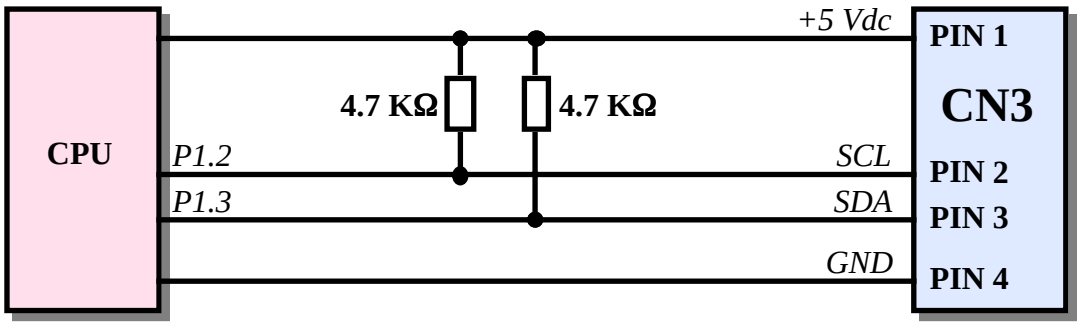

FIGURE 6: I²C BUS CONNECTION DIAGRAM

CN2 - SERIAL LINE CONNECTOR

CN2 is a 9 ways, female, vertical, D-type type connector.
This connector features signals for serial communication in RS 232, RS 422, RS 485, current loop and TTL, performed through hardware module on ZC1 hardware serial port.
Signals position, reported as follows, has been designed to reduce interferences and easy connections to the field, while signals are compliant to CCITT standard of protocol used.
For further information please refer to figure 8 or to the manuals of **GMB HR84** and **GMM 936**.

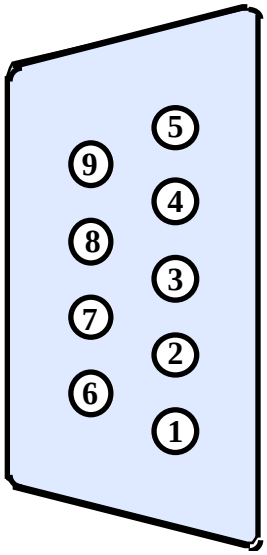

FIGURE 7: CN2 - SERIAL LINE CONNECTOR

Pin	*Signal*	*Direction*	*Description*
RS 232 serial line (please see paragraph "SERIAL COMMUNICATION SELECTION"):			
2	**RX RS232**	= I -	Receive Data for RS 232.
3	**TX RS232**	= O -	Transmit Data for RS 232.
5	**GND**	= -	Ground signal.
RS 422 serial line (please see paragraph "SERIAL COMMUNICATION SELECTION"):			
1	**RX- RS422**	= I -	Receive Data Negative for RS 422.
2	**RX+ RS422**	= I -	Receive Data Positive for RS 422.
3	**TX- RS422**	= O -	Transmit Data Negative for RS 422.
4	**TX+ RS422**	= O -	Transmit Data Positive for RS 422.
5	**GND**	= -	Ground signal.
RS 485 serial line (please see paragraph "SERIAL COMMUNICATION SELECTION"):			
1	**RXTX+ RS485**	= I/O-	Receive/Trasmit Data Positive for RS 485.
2	**RXTX- RS485**	= I/O-	Receive/Trasmit Data Negative for RS 485.
5	**GND**	= -	Ground signal.
Current Loop serial line (please see paragraph "SERIAL COMMUNICATION SELECTION"):			
9	**RX- C.L.**	= I -	Receive Data Negative for Current Loop.
8	**RX+ C.L.**	= I -	Receive Data Positive for Current Loop.
7	**TX- C.L.**	= O -	Transmit Data Negative for Current Loop.
6	**TX+ C.L.**	= O -	Transmit Data Positive for Current Loop.
5	**GND**	= -	Ground signal.

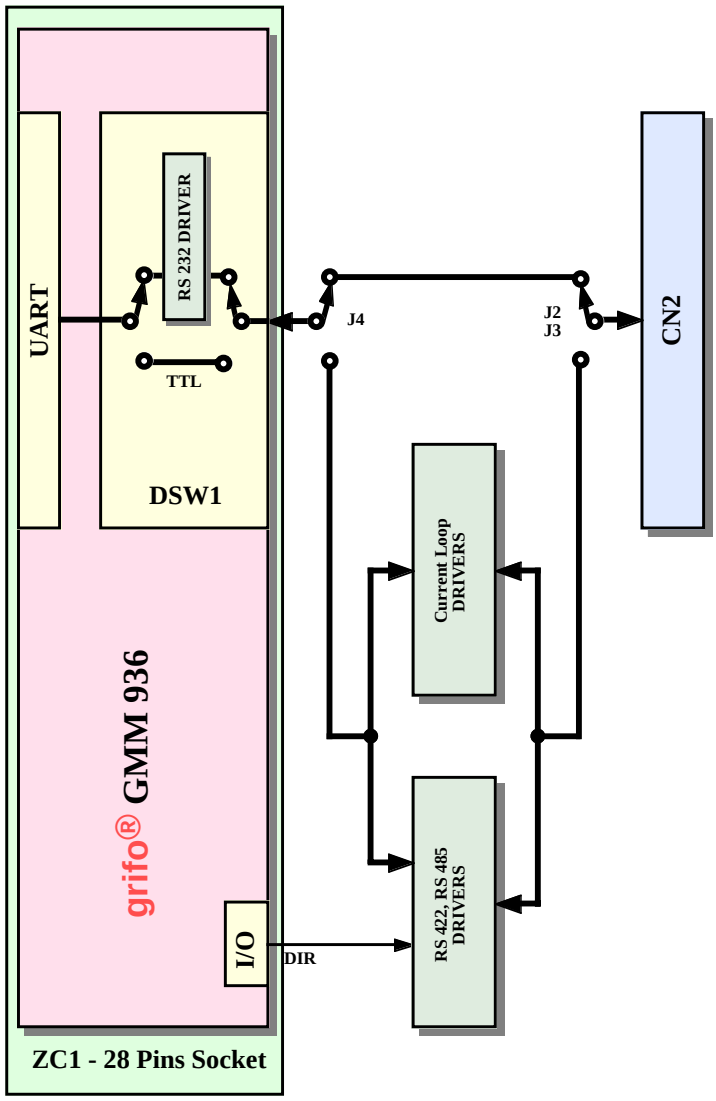

FIGURE 8: SERIAL COMMUNICATION BLOCK DIAGRAM

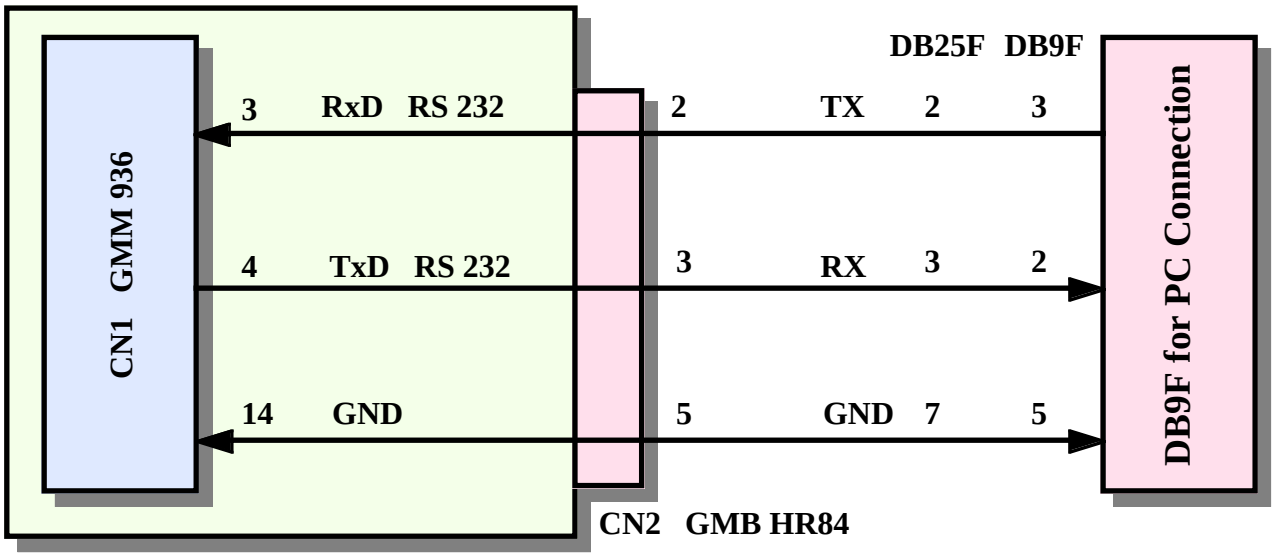

FIGURE 9: RS 232 PC POINT TO POINT CONNECTION EXAMPLE

CN6 - OPTOCOUPLED DIGITAL INPUTS CONNECTOR

CN6 is a 9 ways, quick release, screw terminal connector, pitch 5.0 mm.
CN6 is used to connect the 8 optocoupled NPN or PNP input signals that the card manages and are visualized by green LEDs.
One of these **inputs** (IN4) is connected directly to **interrupt** signal, so transictions on this input can generate an immediate interrupt request to the CPU.
One more of these **inputs** (IN8) is connected to the exernal trigger of timer/counter, so transictions on this input can be **counted by hardware** by CPU.
Please refer to figure 19 for further information.
Connector also features the common pin where to connect one input to close it.
These signals are software managed through **GMM 936** I/O ports have been carefully selected to take advantage of **grifo®** Mini Modules internal peripherals.
For further information please refer to manual **GMB HR84**.

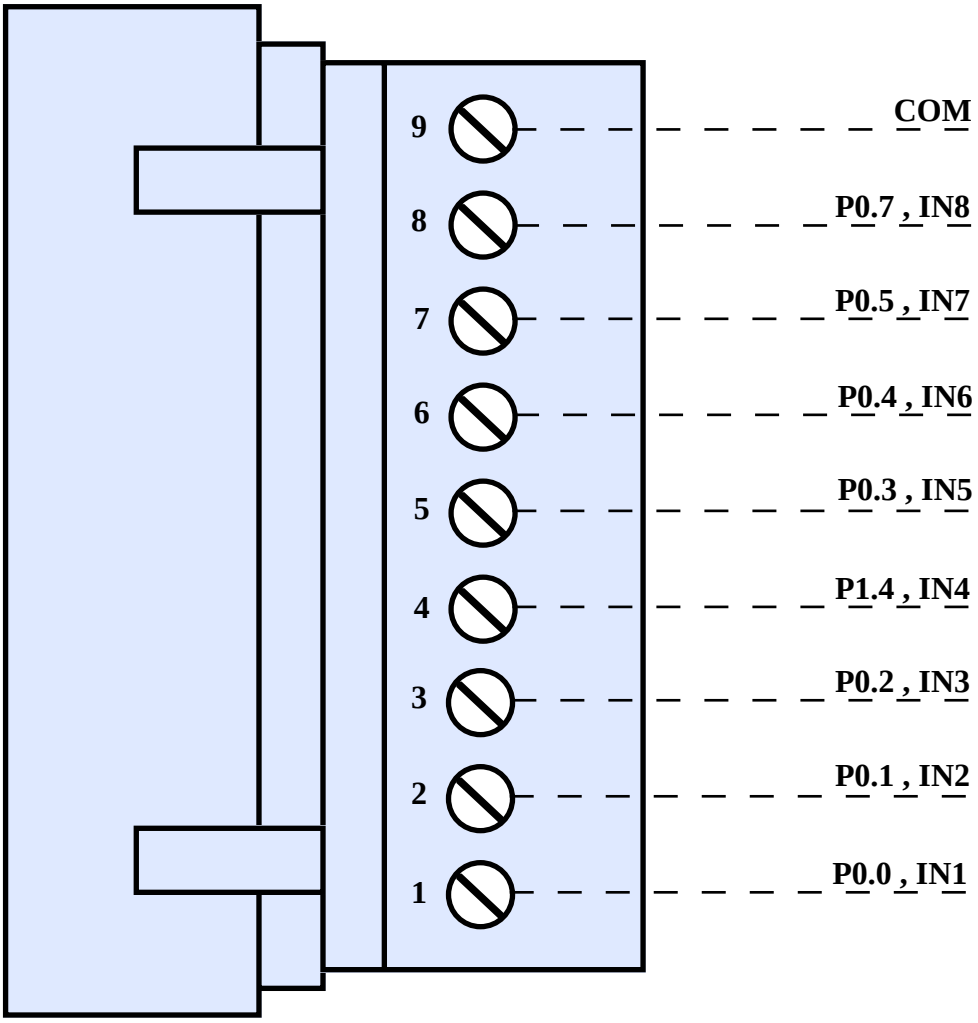

FIGURE 10: CN6 - OPTOCOUPLED DIGITAL INPUTS CONNECTOR

Signals description:

Px.y, INn	=	I - n-th optocoupled input type NPN or PNP, connected to indicated port.
COM	=	- Common pin where an input must be connected to close it.

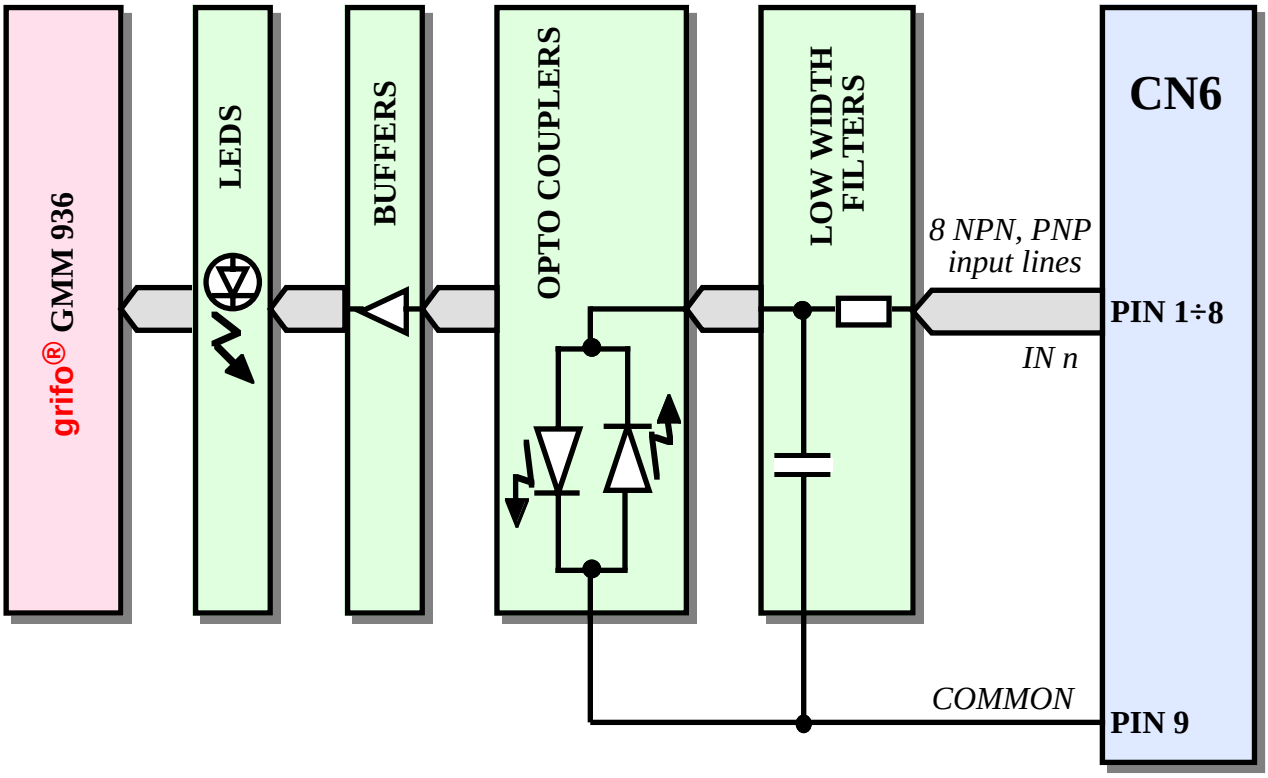

FIGURE 11: OPTOCOUPLED INPUTS BLOCK DIAGRAM

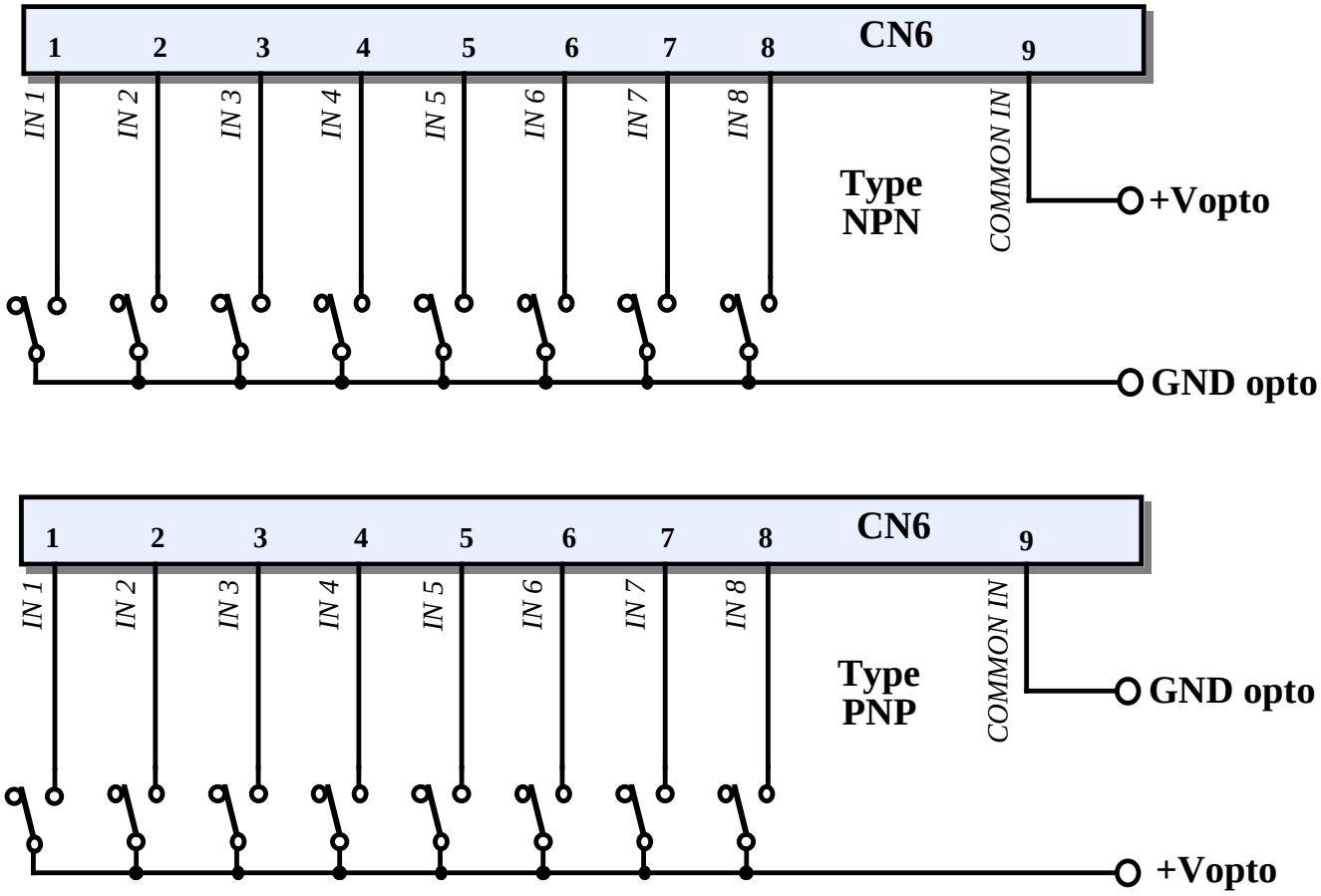

FIGURE 12: OPTOCOUPLED INPUTS CONNECTION DIAGRAM

CN1 - RELAYS OUTPUTS CONNECTOR GROUPS A AND B

CN1 is a 6 ways, quick release screw terminal connector, pitch 5.0 mm.
This connector allows to connect 4 normally open contacts and common pins relays outputs available on **GMB HR84**.
Please remark that maximum (resistive) load for each line is **5 A** and maximum voltage is **35 Vdc**.
These signals are software managed through **GMM 936** I/O ports, opportunely buffered, and selected carefully to easy management (plese refer to chapter "PERIPHERAL DEVICES SFOTWARE DESCRIPTION").
For further information please refer to manual **GMB HR84**.

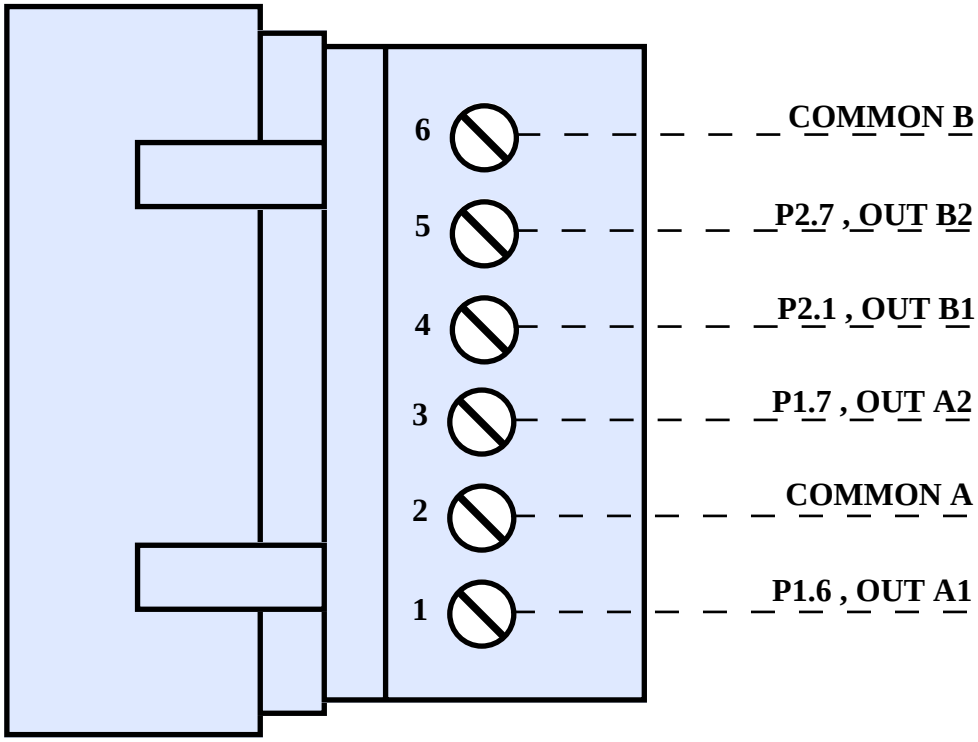

FIGURE 13: CN1 - RELAYS OUTPUTS CONNECTOR GROUPS A AND B

Signals description:

P1.x, OUT An = O - Normally open contact for n-th relay of group A, connected to P1.x.
COMMON A = - Common contact for relays of group A.
P2.x, OUT Bn = O - Normally open contact for n-th relay of group B, connected to P2.x.
COMMON B = - Common contact for relays of group B.

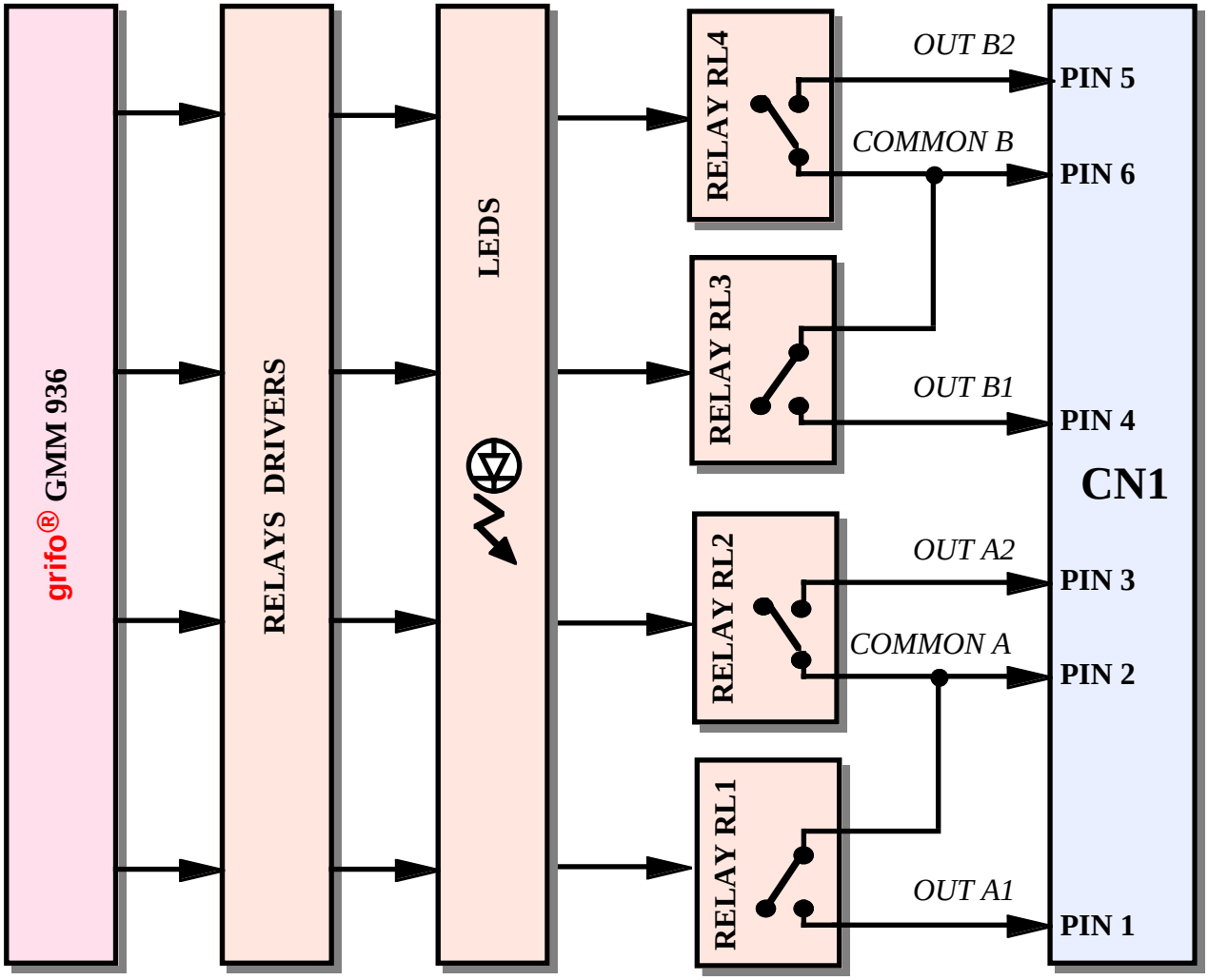

FIGURE 14: RELAY OUTPUTS A AND B BLOCK DIAGRAM

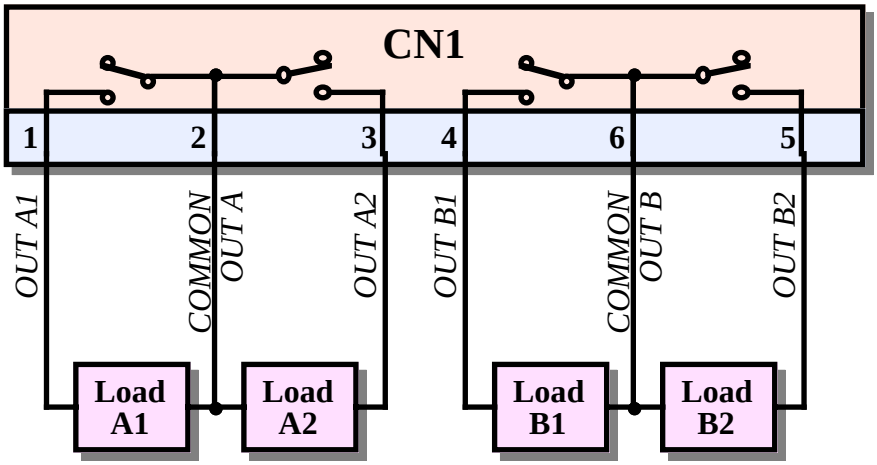

FIGURE 15: RELAY OUTPUTS A AND B CONNECTION DIAGRAM

CN4 - TTL I/O, D/A, ETC. CONNECTOR

CN4 is a 8 ways, male, vertical, AMP MODU II 2x4 connector with pitch 2.54 mm.
This connector features +5 Vdc supply voltage (generated by on board switching power supply) and up to 4 TTL digital I/O signals.
Female connector can be ordered from **grifo®** (cod. **CKS.AMP8**) or its parts can be purchased from AMP catalog (P/N 280365: connector and P/N 182206-2: pins to crimp).
It is also possible to order the female connector with pins to crimp already mounted and one meter long cables (**grifo®** cod. **AMP8.cable**).
For further information please refer to the manual of **GMB HR84**.

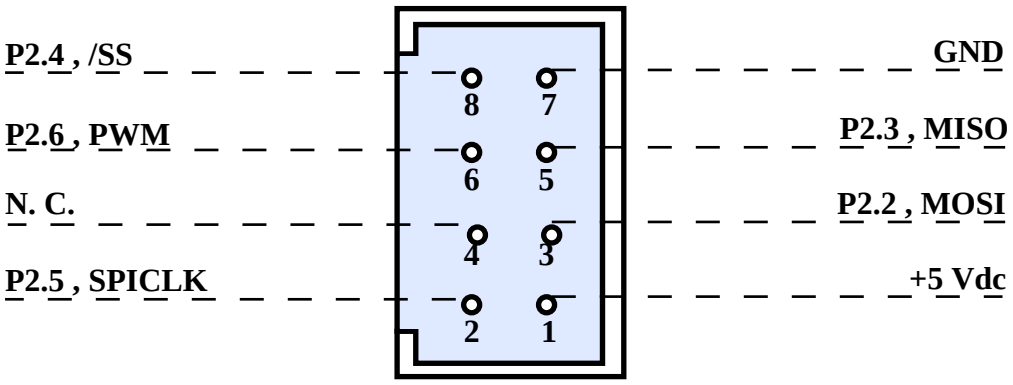

FIGURE 16: CN4 - TTL I/O, D/A, ETC. CONNECTOR

Signals description:

Px.y	= I/O	- TTL digital I/O signal, connected to pin x of socket ZC1
PWM	= O	- Pulse Width Modulation TTL output of Mini Module
SPICLK	= I/O	- Clock signal of synchronous interface SPI.
MISO	= I/O	- MISO signal of synchronous interface SPI.
MOSI	= I/O	- MOSI signal of synchronous interface SPI.
/SS	= I	- SPI slave select signal.
+5 Vdc	= O	- Positive terminal of +5 Vdc power supply.
GND	=	- Ground signal.
N. C.	=	- No connection.

INTERRUPTS

Possible interrupt sources are:

- Input IN4 of CN1 -> Generates an external interrupt called /INT1.
- CPU internal peripherals -> Generate internal interrupts. In detail interrupt sources can be: Timer 0, Timer 1, Timer 2, CCU, Watch dog, Real Time Clock, I²C BUS, EEPROM, UART.

Please refer to **GMM 936** manual for further information.

I/O CONNECTION

To prevent possible connecting problems between **GMB HR84 & GMM 936** and the external systems, the user has to read carefully the previous paragraph information and he must follow these instrunctions:

- For RS 232, RS 422, RS 485, Current Loop, and I²C BUSsignals the user must follow the standard rules of each one of these protocols.

- For all TTL signals the user must follow the rules of this electric standard. The connected digital signal must be always referred to card digital ground and if an electric insulation is necessary, then an opto coupled interface must be connected. For TTL signals, the 0V level corresponds to logic state 0, while 5V level corrisponds to logic state 1, connector CN3 of **GMB HR84** also features a 4.7 KΩ pull-up on signals SDA and SCL.

- For optocoupled input signals, both the contact to acquire and external +Vopto must be connected in serie. In detail, contacts must perform the follwing connection:

	NPN	PNP
IN x	GND opto	+V opto
COMMON	+Vopto	GND opto

to avoid problems with electric noise, it is suggestable to keep galvanically separated +Vopto and board power supply, this means to keep separate board GND and GND opto.

- Relays outputs must be connected directly to the load to drive (remote control switches, power relays, etc.). Board contact is normally open and can bear **5 A** up to **35 Vdc**. To drive load with different supplies, different COMMONS for two groups of relays are available.

POWER SUPPLY

GMB HR84 & GMM 936 is provided with an efficent circuitery that solves in a comfortable and efficent way the problem to supply the card in any condition of use.
Here follow the volages required by the card:

+V opto: Provides power supply to optocouplers of board input section; input voltage must be in the range 8÷30 Vdc and must be provided on connector CN6.

Vac, +Vdc pow, GND: Provide power supply to control logic and to output section of the board through the on board switching power supply; input voltage must be in the range 10 ÷ 40 Vdc or 8 ÷ 24 Vac and must be provided though pins 1 and 2 of CN5 (in case of Vdc, pin 1 must be connected to positive terminal). This allows to supply the cards using standard devices of industrial sector like transformers, batteries, solar cells, etc. Also, if there is the need to supply at +5 Vdc I^2C BUS external peripherals from **GMB HR84 & GMM 936**, pins 1 and 4 of CN3 can be used. Please remark that on board switching power supply is provided with single diode rectifier, so in case of Vdc supply, all ground signals (GND) of the card are at the same potential.

To warrant highest immunity against noise and so a correct working of the cards, it is essential that these two voltages are galvanically isolated
In order to obtain this power supply **EXPS-2** can be ordered.
This device performs galvanic isolation starting from mains power supply.
GMB HR84 features a **TransZorb™**-based protection circuit to avoid damages from incorrect tensions and break-down of power supply section.
On board power supply is visualized through a LED on the bottom left corner.
Current available to supply external loads using +5 Vdc **must be less than:**

400 mA - current absorbed by **GMB HR84** - current absorbed by Mini Module

in this case:

400 mA - 310 mA - 25 mA = 64 mA

For further information please refer to paragraph “ELECTRIC FEATURES”.

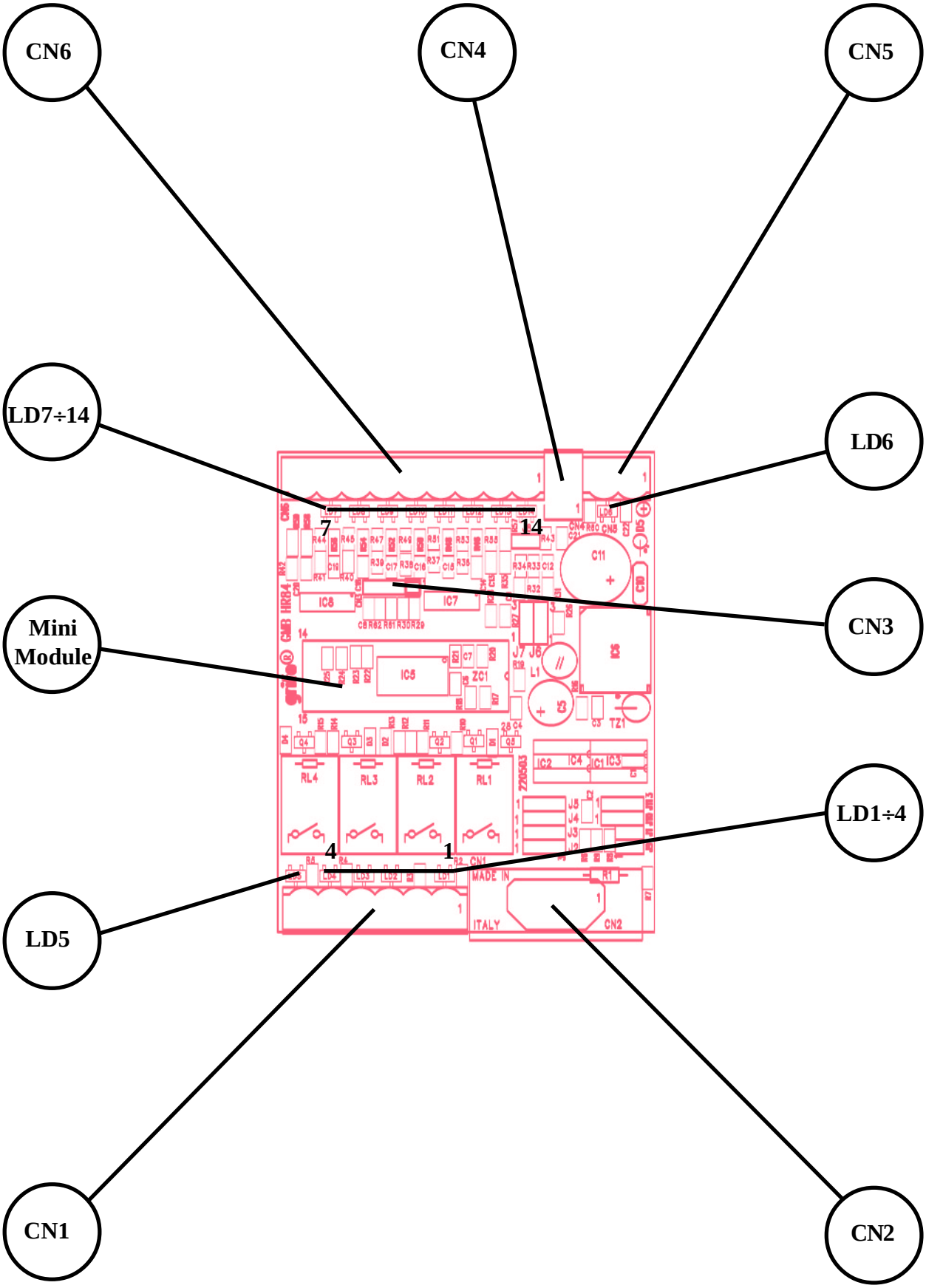

FIGURE 17: LEDS, CONNECTORS, ETC. LOCATION

CORRESPONDANCE OF SIGNALS

All hardware resources of **GMB HR84 & GMM 936** are managed by **GMM 936** through signals and peripherals of local microcontroller, Philips P89LPC936.
To have the complete control of such resources, it is enough to refer to the table in the near page, which indicates the signal and/or peripheral that drives a specific resource.

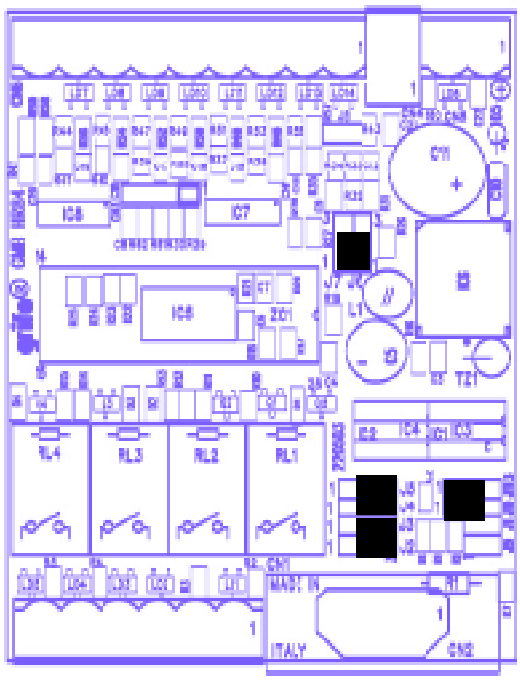

FIGURE 18: JUMPERS CONNECTION

Connector GMB HR84	PIN	Signal GMB HR84	PURPOSE	PIN CN1 GMM 936	Signal GMM 936
OPTO INPUTS	1	Input 1	Optocoupled input n° 1.	pin 26	P0.0
	2	Input 2	Optocoupled input n° 2.	pin 25	P0.1
	3	Input 3	Optocoupled input n° 3.	pin 19	P0.2
	4	Input 4	Optocoupled input n° 4 or Interrupt 1.	pin 18	P1.4, /INT1
	5	Input 5	Optocoupled input n° 5.	pin 17	P0.3
	6	Input 6	Optocoupled input n° 6.	pin 16	P0.4
	7	Input 7	Optocoupled input n° 7.	pin 15	P0.5
	8	Input 8	Optocoupled input n° 8 or counter Timer 1.	pin 13	P0.7, T1
	9	Common pin of optocoupled inputs			
RELAY OUTPUTs	A1	Output 1	Relay output 5 A n° 1.	pin 23	P1.6
	A	Common pin of buffered relay outputs of group A on connector CN1			
	A2	Output 2	Relay output 5 A n° 2.	pin 22	P1.7
	B1	Output 3	Relay output 5 A n° 3.	pin 21	P2.1
	B	Common pin of buffered relay outputs of group B			
	B2	Output 4	Relay output 5 A n° 4.	pin 20	P2.7
AMP 8 I/O	pin 1	+5 Vdc	Power supply +5 Vdc.	pin 28	+5 Vdc
	pin 2	I/O	I/O TTL.	pin 12	P2.5
	pin 3	CAN L	I/O TTL.	pin 8	P2.2
	pin 5	CAN H	I/O TTL.	pin 9	P2.3
	pin 6	D/A	PWM of CCU or I/O TTL.	pin 24	P2.6
	pin 7	GND	Ground of Mini Block.	pin 14	GND
	pin 8	A/D	I/O TTL.	pin 27	P2.4

FIGURE 19: TABLE OF CORRESPONDANCE BETWEEN SIGNALS AND RESOURCES

HOW TO START

One of the most important features is the possibility to program the microprocessor Philips P89LPC936 internal FLASH through RS232 serial connecton without removing Mini Module from socket ZC1.

A) MAKE SERIAL CONNECTION BETWEEN HARDWARE AND PC:

A1) First of all, open the container of **GMB HR84** to install Mini Module **GMM 936** on socket ZC1.

. A2) To supply **GMB HR84**, power supply **EXPS-2** can be used. It can provide two galvanicallt isolated tensions, required for the correct working of **GMB HR84 & GMM 936**. Also any other power supply capable to generated the two required voltages can be used.

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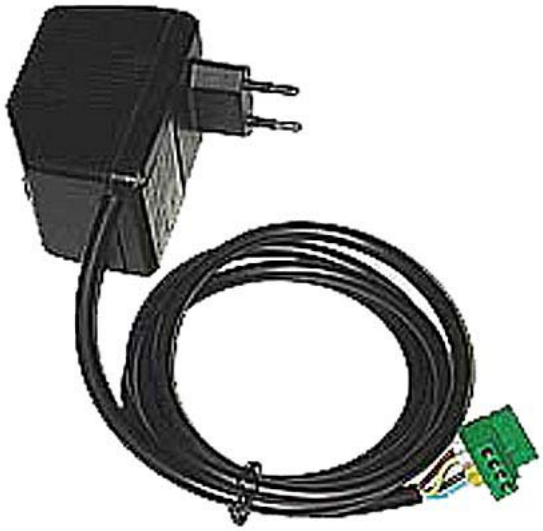

FIGURE 20: PICTURE OF POWER SUPPLY EXPS-2

A3) Make the connection described in figure 22.

A4) Keep ready a terminal emulatore on the PC, configure it to use the serial port conneted to the Mini Module with 19200 baud, 8 data bit, 1 stop bit, no parity.

A5) Set DEBUG mode, that is on **GMM 936** move dip switch DSW1.7 in position ON and DSW1.7 in position OFF.

. A6) Supply **GMB HR84 & GMM 936**. Please, find the demo program of **GMB HR84 & GMM 936** on grifo® CD, the file is called "gmbiob.hex" and can be found from the starting follwing the path: English | Examples Tables | Mini Block and Mini Modules programs | GMB HR 84.

.

PROGRAMMI PER MINI MODULI E MINI BLOCK

TIPO DI SCHEDA	GET	ASM	Ladder	Abaco® Link BUS	BASIC CB280	BASIC BASCOM 8051	BASIC BASCOM AVR	PIC BASIC	BASIC VARI	MCS® Basic 52	C	PASCAL	TIPO DI CPU / BLOCK
VARI	-	-	-	-	-	●	-	-	-	-	-	-	-
CAN GM0	●	-	-	-	-	●	-	-	-	-	●	-	Atmel T89C51cc03 - 8051 Code
CAN GM1	●	-	-	-	-	●	-	-	-	-	●	-	Atmel T89C51cc01 - 8051 Code
CAN GM2	●	-	-	-	-	●	-	-	-	-	●	-	Atmel T89C51cc02 - 8051 Code
GMM 5115	●	-	-	-	-	●	-	-	-	-	●	-	Atmel T89C5115 - 8051 Code
GMM 876	●	-	-	-	-	-	-	●	-	-	-	-	Microchip PIC16F876A - PIC 14 Code
GMM 932	●	-	-	-	-	●	-	-	-	-	-	-	PHILIPS P89LPC932 - 8051 Code
GMM AC2	●	-	-	-	-	●	-	-	-	-	●	-	Atmel T89C51AC2 - 8051 Code
GMM AM08	●	-	-	-	-	-	●	-	-	-	-	-	Atmel ATMega08 - AVR Code
GMM AM32	●	-	-	-	-	-	●	-	-	-	-	-	Atmel ATMega32 - AVR Code
GMB HR84	●	-	-	-	-	●	●	●	-	-	●	-	Mini Block 8 input opto 4 output relè
GMB HR168	●	-	-	-	-	●	-	-	-	-	●	-	Mini Block 16 input opto 8 output relè

FIGURE 21: EXAMPLES TABLES

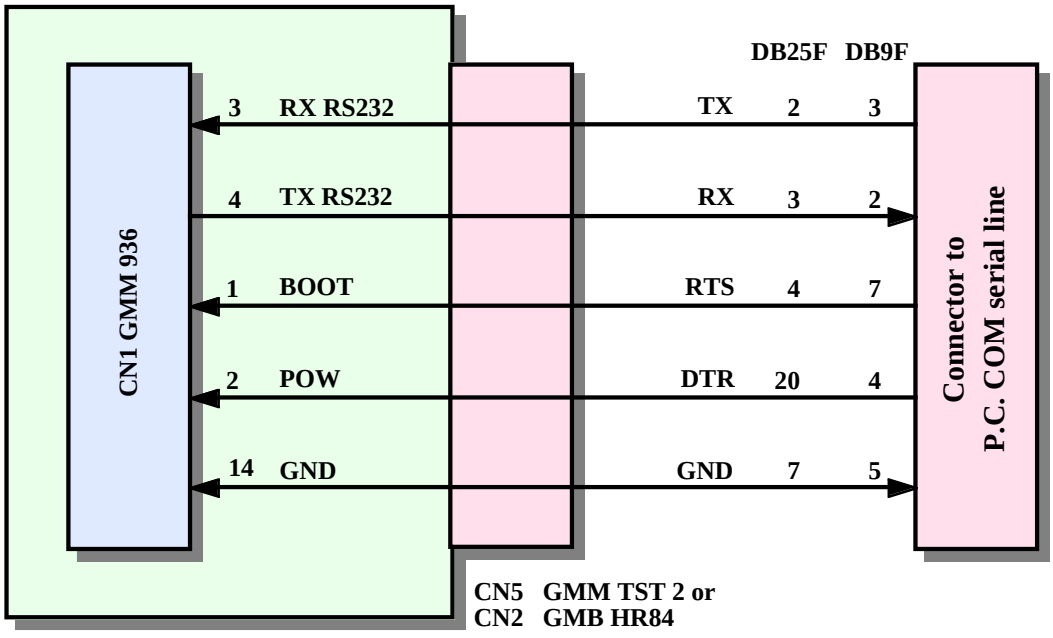

FIGURE 22: SERIAL CONNECTION FOR GMM 936 PROGRAMMING

B) FLASH REPROGRAMMING:

B1) Find and save to a comfortable position on your hard drive the file "gmbiob.hex".

B2) On grifo® CD it is also available the utility program FLASH MAGIC. that manages the ISP programming of microcontroller memories on board of **GMM 936** through the simple serial connection seen at point A; find it and install it on a comfortable position on your hard drive. It is suggested to use version 2.07 or greater.

B3) Put DSW1.7 in position ON and DSW1.8 in position OFF on **GMM 936** to set DEBUG mode.

B4) Disconnect the terminal emulator and any other progam from serial line.

B5) Turn off and then turn on again **GMB HR84 & GMM 936**.

B6) Run ISP programming sofware installed at step B2.

B7) Inside windows **1** perform the following settings:
Com Port = COMx of development P.C., connected at point A3
Baud Rate = 9600
Device = 89LPC936
Oscillator Freq. (MHz) = 7.3728 if using **GMM 936** without oscillator
Oscillator Freq. (MHz) = 11.0592 if using **GMM 936** with option **.11MHz**

B8) Select the option "Advanced options" from menu “Options” and in the displayed window perform the following settings:
Hardware Config | Use DTR and RTS to enter ISP mode
Hardware Config | Hardware = Keil MCB 900
Hardware Config | T1 = 250
Hardware Config | T2 = 120
Security | Protect ISP Code
and once confirmed the shown requests, check that the communication is established with Boot Loader of the card.

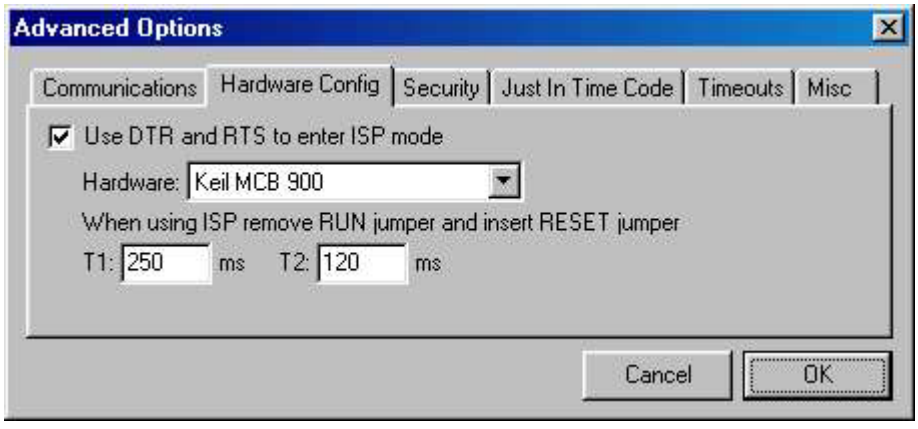

FIGURE 23: FLASH MAGIC SETTING WINDOW (1 OF 4)

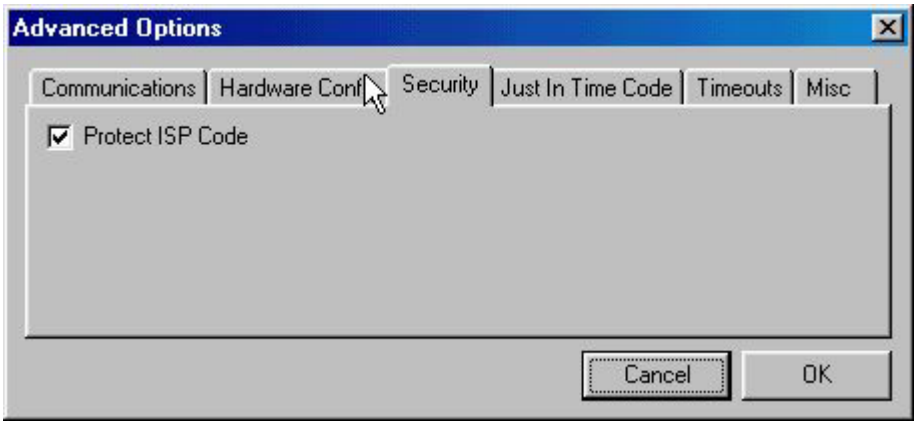

FIGURE 24: FLASH MAGIC SETTING WINNDOW (2 OF 4)

B9) Inside windows **2** perform the following settings:
Erase all Flash

B10) Inside windows **3** load the file to program gmbiob.HEX, described at point B1.

B11) Inside windows **4** disable all the possible settings.

B12) Inside windows **5** begin the programmation by pressing the "Start" button, confirm (Yes) the request of modified erase operation that protect the ISP code and verify that all the following steps are correctly executed.

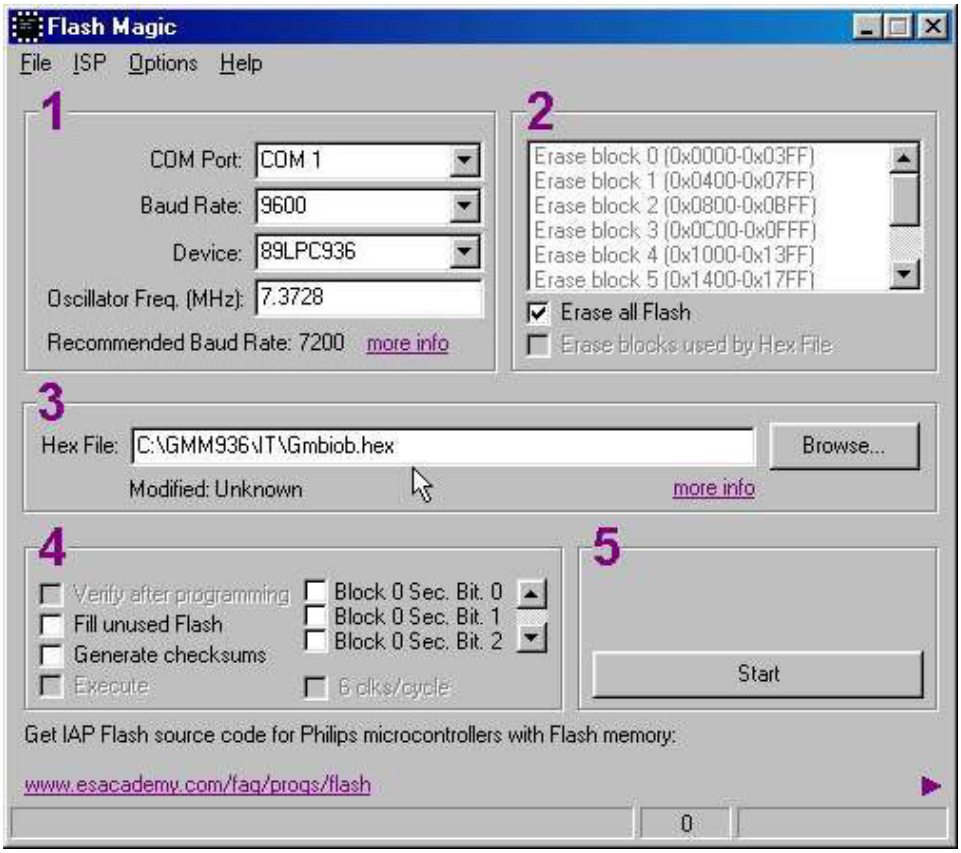

FIGURE 25: FLASH MAGIC SETTING WINDOW (3 OF 4)

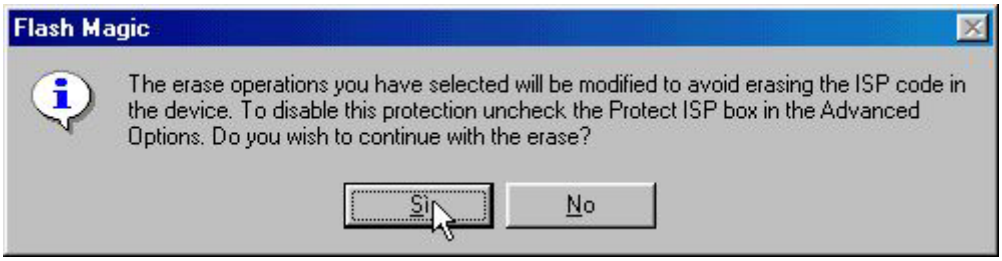

FIGURE 26: FLASH MAGIC SETTING WINDOW (4 OF 4)

B13) Exit from FLASH MAGIC by pressing the X in the high right corner of the window; thus all the performed settings are saved and they must not be repeated in the next use.

B14) Run the teminal emulator HYPERTERMINAL configured as point A4, and check that the application program just programmed is executed from the internal FLASH. The HYPERTERMINAL settings and execution can be also obtained by a simple double click on the icon of a specific configuration file (with extension .HT) that can be created directly by HYPERTERMINAL, with the save option of the "File" menu.

C) GENERATING DEMO EXECUTABLE CODE

C1) Install on the hard disk of the development P.C. the software environment selected to develop the application program. As described in the chapter SOFTWARE DESCRIPTION there are many different software tools that satisfy any customers requirements but here we remind only the most diffused as the BASCOM 8051, µC/51, LADDER WORK, etc.

C2) On **grifo®** CD in addition to file with the executable code of the demo program, described at point B1, there are also the source files of the same. These have an extension that identifies the used software development tools (for example gmbiob.bas for BASCOM 8051 or gmbiob.c for µC/51) and they are properly organized inside demo programs tables available on CD, together with possible definition file (89LPC936.DAT for BASCOM 8051, 89LPC936.H for µC/51, etc.). Once these files have been located they must be copied in a comfortable folder on the hard disk of development P.C.

C3) Compile the source file by using the selected software tools: the file gmbiob.hex must be obtained equal to those available on **grifo®** CD and already used at points B. This operation is very different according to the programming environment selected, so here follow the details:

I) *Ricompilation using BASCOM 8051.*

Ia) When in BASCOM IDE, load the program source with menu File | Open:

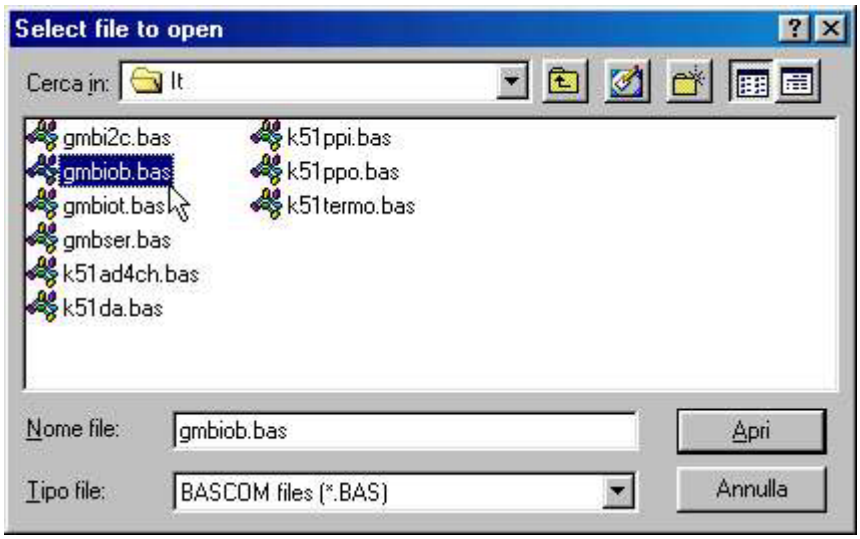

FIGURE 27: LOADING A SOURCE FILE WITH BASCOM 8051

Ib) From menu Options | Compiler | Misc set the value of Byte End to A0, as suggested also in the source code, and press OK:

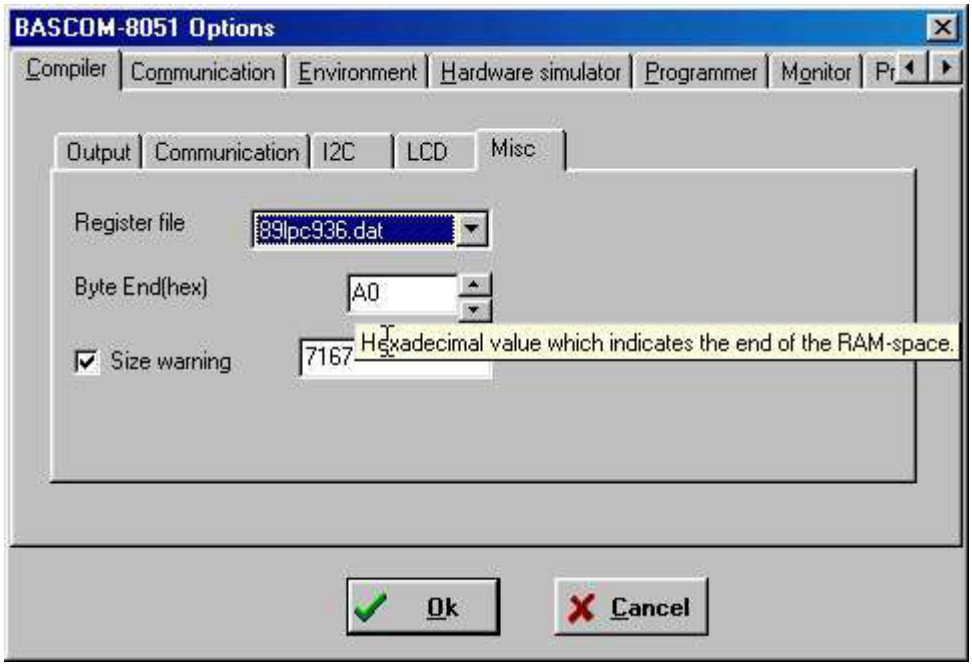

FIGURE 28: CONFIGURATION OF COMPILER BASCOM 8051

Ic) Compile the source file by pressing the button with the icon of an integrated circuit. Presence of file 89LPC936.DAT in BASCOM installation folder is required in order to compile correctly:

FIGURE 29: COMPILATION WITH BASCOM 8051

II) *Ricompilatione with µC/51.*

IIa) After opening standard editor uedit.exe, load the source file pressing the fifth button from the left, the presence of file 89LPC936.h in the same folder of file gmbiob.c is required for a correct compilation:

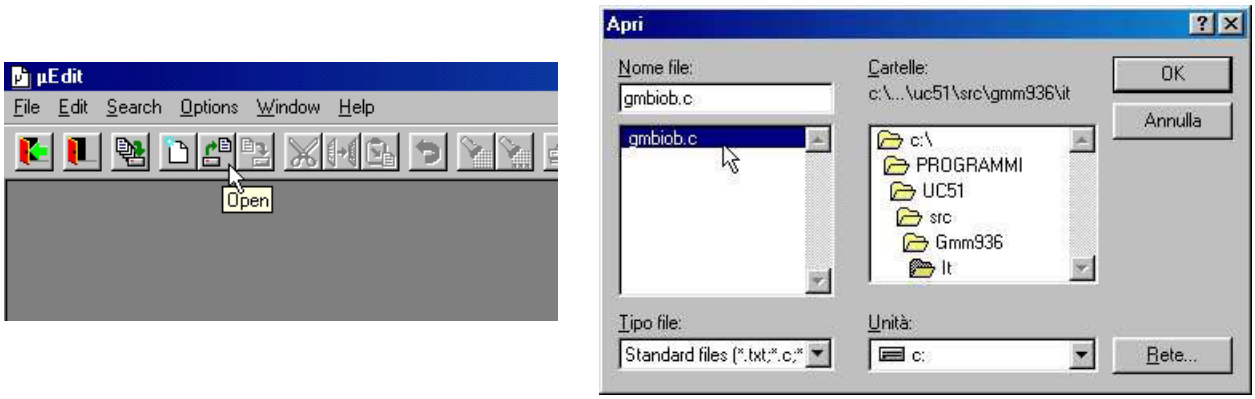

FIGURE 30: LOADING SOUCE FILE WITH µC/51

IIb) Open also MakeFile editor, that is program umshell.exe, and load file gmbiob.mak with the menu File | Load:

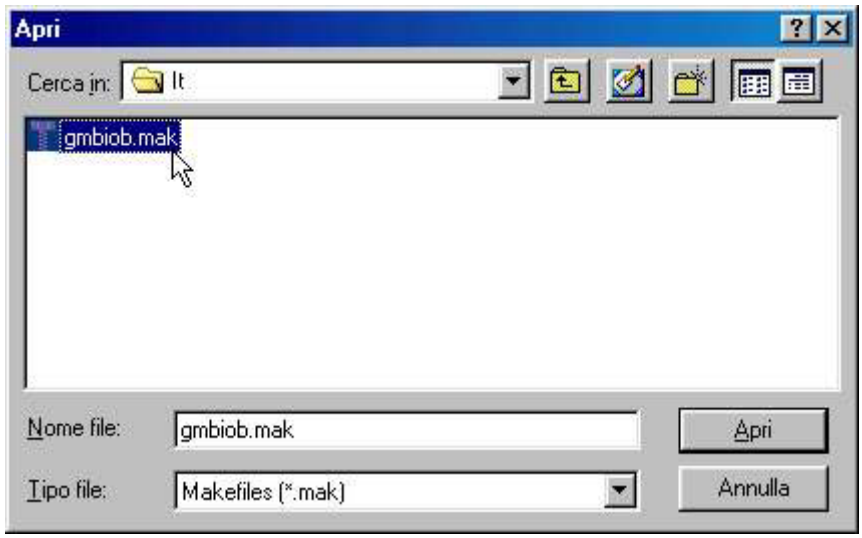

FIGURE 31: LOADING MAKEFILE (COMPILING CONFIGURATION) WITH µC/51

IIc) Compile the source file pressing the first button from the right:

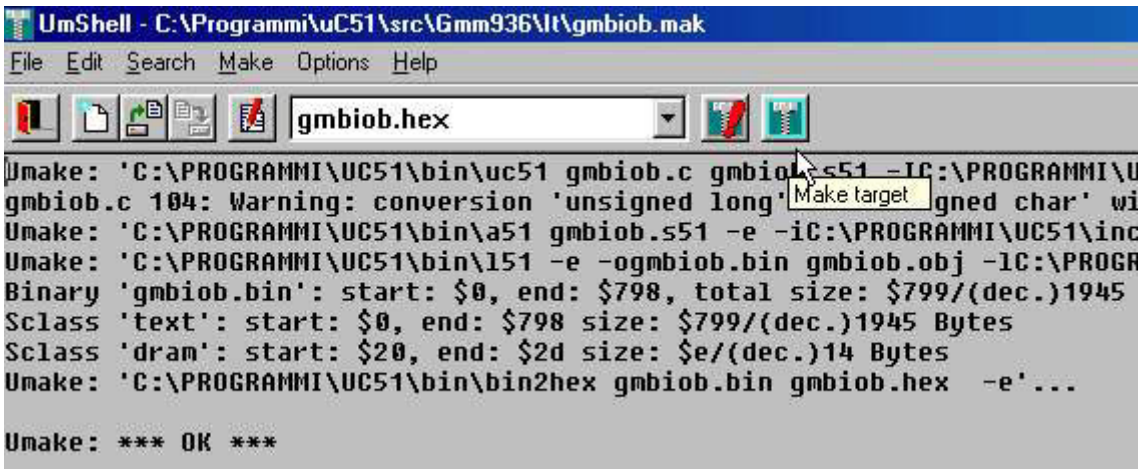

FIGURE 32: COMPILATION USING µC/51

III) *Ricompilation using LADDER WORK.*

IIIa) After opening IDE of LADDER WORK, open the schematic file called gmbiob.pjn with menu File | Open:

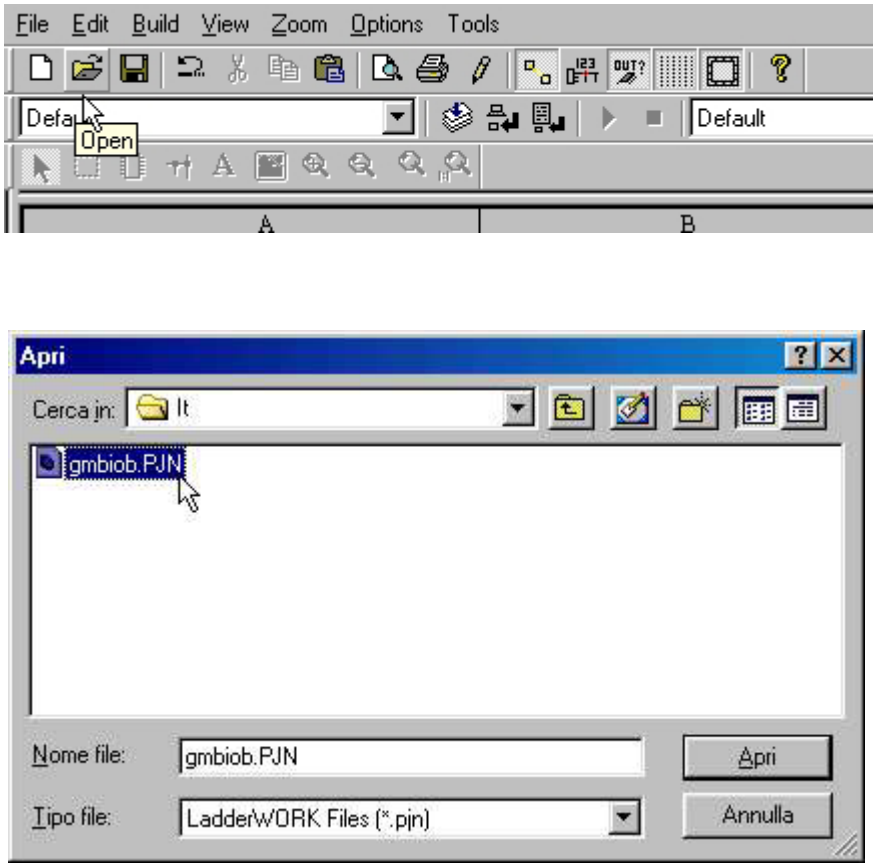

FIGURE 33: LOADING SOURCE SCHEMATIC WITH LADDER WORK

IIIb) Assure that the selected profile is the one specific for **GMM 936**:

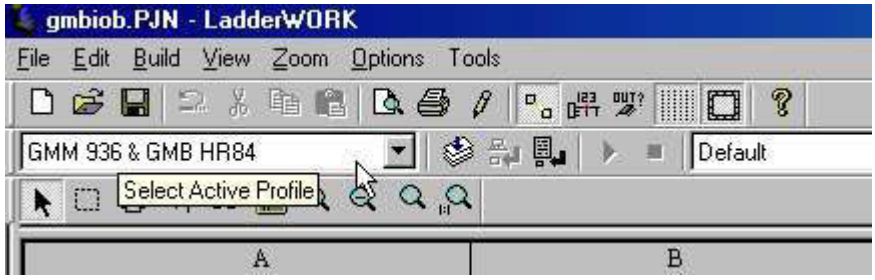

FIGURE 34: COMPILER CONFIGURATION FOR LADDER WORK

IIIc) Compile the source schematic pressing the first button from the right:

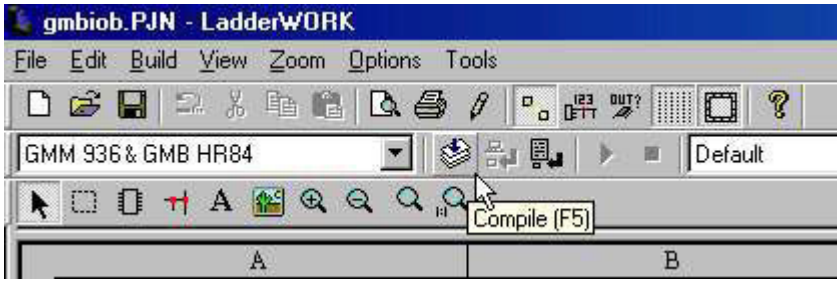

FIGURE 35: COMPILATION WITH LADDER WORK

C4) Reperform the programmation of the obtained HEX file in the Mini Module FLASH, by executing again the points B3÷B14.
About the FLASH MAGIC settings, please remind that they could be inserted only the first time in fact the same program mantains the last setting sucesfully used.

When during execution of the steps above described a problem or a malfunction is found, we suggest to read and repeat again all the steps carefully and if malfunction persists please contact directly grifo® technician.
Instead when execution of all the steps above described is right, the user has realized his first application program that coincides with demo of **GMM 936**.
At this point it is possible to modify the sources of the demo programs according to application requirements and test the obtained program with the steps above listed (from B3 to C4) in cyclic mode, until the developed application program is completely well running.
When this focus is reached the developmnet P.C. can be eliminated, by obtaining a self running card, as below described:

D) *FINAL APPLICATION*

D1) Set up the RUN mode (DSW1.7=OFF and DSW1.8=ON) and disconnect development P.C.

PERIPHERAL DEVICES SOFTWARE DESCRIPTION

In the previous paragraphs are described the peripheral connections to the field, while in this one there is a specific description of registers meaning and function (please refer to I/O addresses table, for the registers names and addresses values).
For a more detailed description of the devices, please refer to documentation of **GMB HR84** and **GMM 936**.
In the following paragraphs the **D7÷D0** and **.0÷7** indications denote the eight bits of the combination used in I/O operations.

RELAYS OUTPUTS

Staus of 4 digital relays outputs is set through 4 signals of 28 pin socket ZC1, which means I/O TTL signals of **GMM 936**.
When the signal of socket ZC1 is set to logic state low (logic 0), the corresponding output is actived (relay contact is connected to its common pin).
Viceversa when the signal is set to logic state high (logic 1) the corresponding output is deactived (relay open).
As previously said, LEDs LD1÷4 provide a visual indication of digital outputs status (LED ON = output actived).
Summarizing, the correspondance is:

P1.6 , OUT A1	->	LED LD1
P1.7 , OUT A2	->	LED LD2
P2.1 , OUT B1	->	LED LD3
P2.7 , OUT B2	->	LED LD4

SERIAL LINE

The **GMM 936** signals used are the ones called TxD and RxD.

I^2C BUS

Signals used are pin 3 of CN3 (SDA) and pin 2 of CN3 (SCL).
Please remark that **GMM 936** is provided with an hardware I^2C BUS interface, so the software must manage the microprocessor internal registers through high level instructions of programming language or the functions in the demo programs.
For further information please refer to component data sheet.
Connector CN3 of **GMB HR84** provides signals SDA and SCL with 4.7 kΩ pull up resistors.

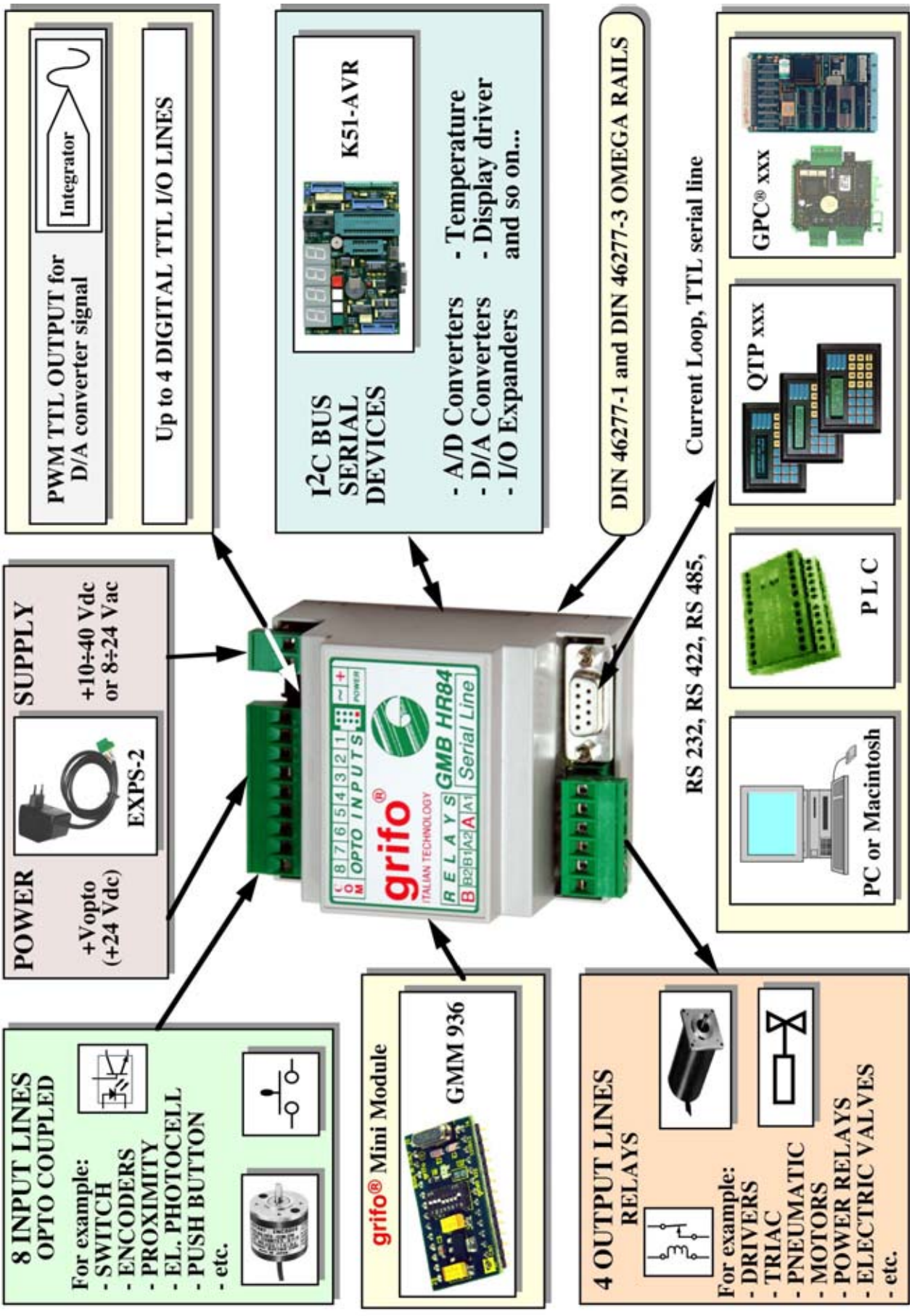

FIGURE 36: AVAILABLE CONNECTIONS DIAGRAM

OPTOCOUPLED INPUTS

Status of 8 digital optocoupled inputs can be acquired by software reading the status of corresponding **GMM 936**.
When NPN or PNP inputs are enabled, corresponding signals are at logic state low (logic 0), viceversa when inputs are disabled a logic level high is acquired (logic 1).
As previously said, LEDs LD7÷14 give a visual indication of digital inputs status (LED ON means input actived).
Summarizing, the correspondance is:

P0.0 , IN1	->	LED LD14
P0.1 , IN2	->	LED LD13
P0.2 , IN3	->	LED LD12
P1.4 , IN4	->	LED LD11
P0.3 , IN5	->	LED LD10
P0.4 , IN6	->	LED LD9
P0.5 , IN7	->	LED LD8
P0.7 , IN8	->	LED LD7

DIGITAL TTL I/O

They are pins 2, 3, 5, 6 and 8 of connector CN4, connected respectively to signals P2.5, P2.2, P2.3, P2.6 and P2.4.
Please remark that pin 8 of CN4 is connected to a 4.7 KΩ pull-down when J6 is connected in position 1-2, so it can be used as digital I/O only if this condition is acceptable.

APPENDIX A: ALPHABETICAL INDEX