

# SBP 02

Switching Block Power 2.5 A

## TECHNICAL MANUAL



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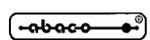
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**SBP 02**

Edition 5.00

Rel. 14 March 2002

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BLOCK format, measuring **120x40x60 mm**, complete of plastic container for omega rails DIN 247277-1 and 247277-3; electrical connection by two comfortable screw terminal, quick release, 2 pins connectors; one **LED** which indicates the presence of the generated voltages; wide **heat sinks** that ensure the correct functionality even with heavy external environment conditions; protection on over temperature, over output voltage and short circuit; average efficiency of **90%**; required voltage: variable according with selected model in the range 8÷33 Vac or 10÷46 Vdc; generated voltages: variable according with selected model (see following table)

Model	Output voltage - current
<b>SPC 02</b>	5 Vdc - 2.5 A
<b>SPC 02.12</b>	12 Vdc - 2.5 A
<b>SPC 02.15</b>	15 Vdc - 2.5 A
<b>SPC 02.24</b>	24 Vdc - 2.5 A

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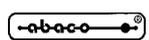
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For specific informations on the components mounted on the card, please refer to the Data Book of the builder or second sources.

### SYMBOLS DESCRIPTION

In the manual could appear the following symbols:

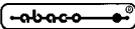


Attention: Generic danger



Attention: High voltage

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

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## INTRODUCTION

The use of these devices has turned - IN EXCLUSIVE WAY - to specialized personnel.

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 environment, 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 respect 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 **SBP 02** card release **110794** and later. The validity of the bring informations is subordinate to the number of the card release. The user must always verify the correct correspondence among the two denotations. On the card the release number is present in more points both board printed diagram (serigraph) and printed circuit (for example between small heat sink and coil on the component side or below coil on the solder side).

## GENERAL FEATURES

The **SBP 02** module is a complete, low cost, switching power supply with extremely reduced dimension.

It is provided in a plastic container for a direct mounting on omega rails where it has a front side of only 40 mm, while two quick release scrow terminal connectors allow the connections to external circuits. These features simplify and reduce the required time for mounting, installation, replacement and connection of the same card.

A **LED** informs about the presence of the output voltage and it adds the possibility to visually diagnose any possible **failure**.

Proper **heat sinks** ensure the 2.5 A output current on the connected load, even when the power supply works in external hostile surroundings.

The wide range of input voltage, both **alternate** or **direct**, yields the use of **SBP 02** in all the industrial electric panels, that normally have standard voltages like 24 Vac or 24 Vdc. Moreover the use of a low voltage input respects the security norms.

An efficient protection, against the short circuit and high temperature, safes the power supply module when the temperature reaches the 150 °C.

The **SBP 02** is available in 4 different models that have different generated voltages:

Model	Output voltage - current	Input voltage
<b>SPC 02</b>	5 Vdc - 2,5 A	8÷33 Vac or 10÷46 Vdc
<b>SPC 02.12</b>	12 Vdc - 2,5 A	11÷33 Vac or 16÷46 Vdc
<b>SPC 02.15</b>	15 Vdc - 2,5 A	14÷33 Vac or 19÷46 Vdc
<b>SPC 02.24</b>	24 Vdc - 2,5 A	23÷33 Vac or 30÷46 Vdc

- BLOCK format, measuring **120x40x60 mm**, complete of plastic container for omega rails DIN 247277-1 e 247277-3
- Electrical connection by two comfortable screw terminal, quick release, 2 pins connectors
- One **LED** which indicate the presence of the generated voltages
- Wide **heat sinks** that ensures the correct functionality even with heavy external environment conditions
- Protection on over temperature, over output voltage and short circuit
- Average efficcence of **90%**
- Required voltage: variable according with selected model (see previous table)
- Generated voltages: variable according with selected model (see previous table)

Here follows a description of the board's functional blocks, with an indication of the operations performed by each one. To easily locate these blocks and verify their connections please refer to figure 3.



FIGURE 1: CARD PHOTO

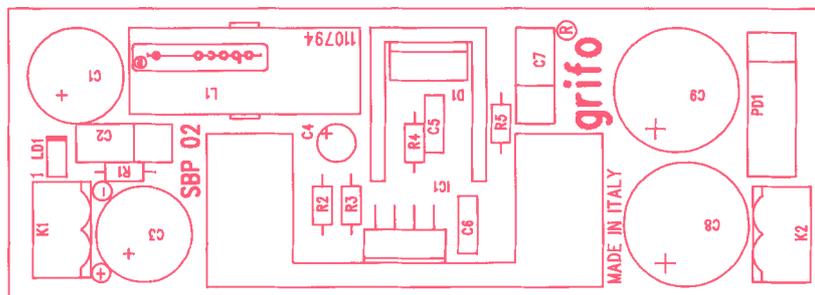


FIGURE 2: COMPONENTS MAP

## RECTIFIER SECTION

AC voltage in input to **SBP 02** is rectified by the specific rectifying section that generates a DC voltage for the switching power supply. Rectifying section is made of a simple bridge rectifier with capacitors that assure a DC voltage erogation in all the operating conditions of the power supply. Components are selected to reduce the value of ripple on the switching input whatever input voltage or output load is present. Rectifier section is always present but, if the input voltage is DC, output voltage from **SBP 02** will have a different potential reference than input voltage.

## SWITCHING REGULATOR

**SBP 02** power supplies are based on an efficient switching regulator that performs the task to keep the output voltage under control and limit the output current. The main component of this section is the **L4960** power regulator manufactured by SGS. These modules have been designed specifically to build industrial power supplies of middle power with best price/peformance rate and a good reliability, once matched to some external components. The overall features of switching regulation section are:

- soft start after a power on
- high efficiency, up to 90%
- protection against overcurrent or output short circuit
- protection against overheat
- switching frequency up to 200 KHz
- 0 to 100% duty cycle
- step down regulation
- wide heatsink

Also in this section components have been selected to reach maximum efficiency and warrant anyway the maximum output current 2.5 A for the selected output voltage.

Some components of the regulation section may vary according to the model selected, so the output voltage selection cannot be made by the customer but must be specified in the order.

## OUTPUT SECTION AND FILTERS

Output section of **SBP 02** simply filters the stabilized voltages generated by the switching regulator through specific capacitors (for high and low frequencies) and visualizes the power supply status by specific LEDs. Components of this section do not vary according to the model selected and, as usual, all components have been selected to assure stability of output voltage under any operating condition.

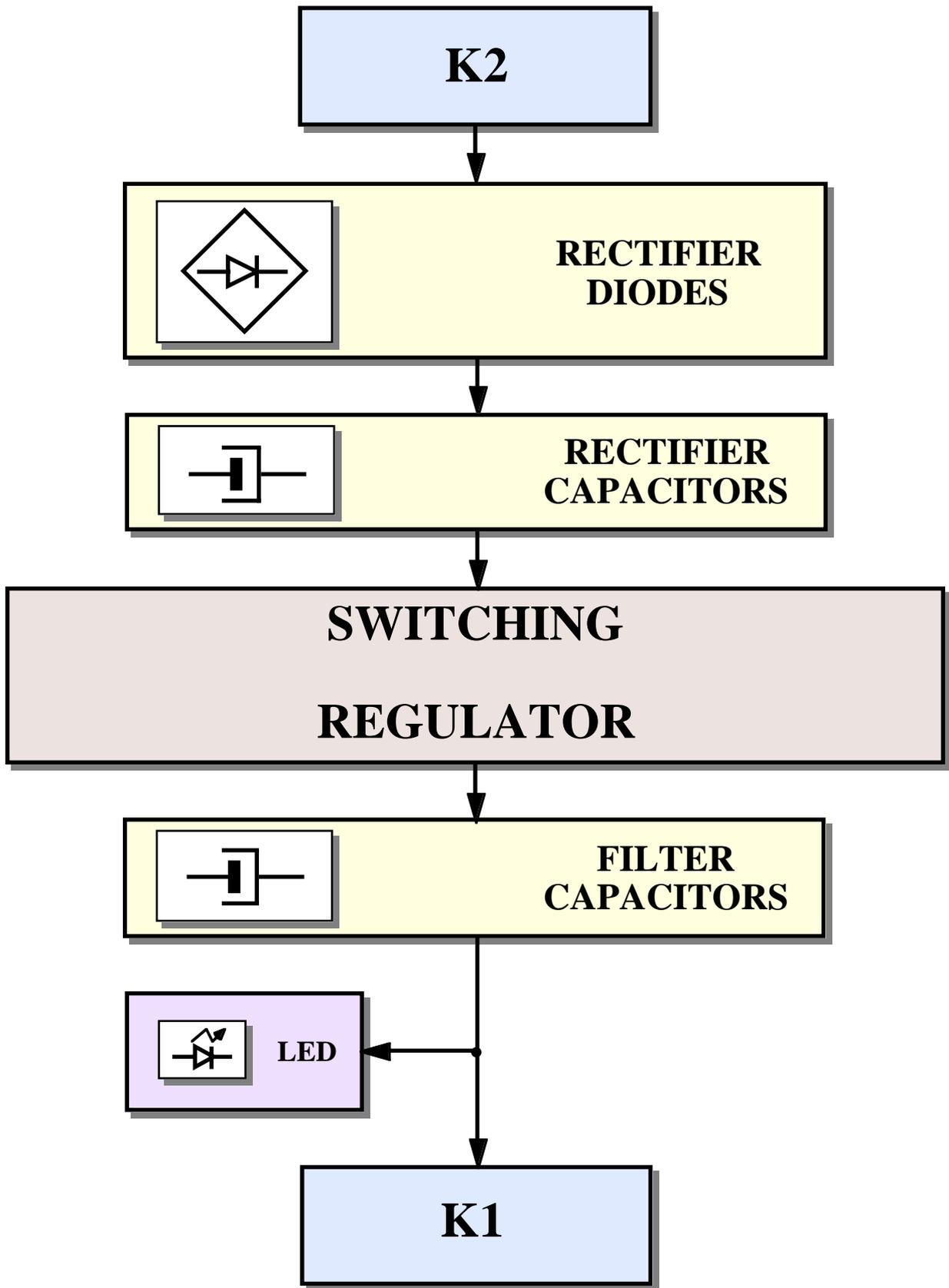


FIGURE 3: BLOCK DIAGRAM

## TECHNICAL FEATURES

### GENERAL FEATURES

<b>Switching Frequency:</b>	100 KHz
<b>Average efficiency:</b>	90%
<b>Overheat protection:</b>	150 °C, disables output and recovers automatically
<b>Overload protection:</b>	3 A, disables output and recovers automatically
<b>Visualization:</b>	one status LED colour red for output voltage

### PHYSICAL FEATURES

<b>Size:</b>	120 x 40 x 60 mm
<b>Weight:</b>	140 g
<b>Mounting:</b>	Ω rails, DIN 247277-1 and 247277-3
<b>Connectors:</b>	K1: 2 pins quick release screw terminal connector K2: 2 pins quick release screw terminal connector
<b>Temperature range:</b>	0÷50 °C
<b>Relative humidity:</b>	20%÷90% (without condense)

### ELECTRIC FEATURES

<b>Input voltages:</b>	<b>SBP 02</b> = 8÷33 Vac or 10÷46 Vdc <b>SBP 02.12</b> = 11÷33 Vac or 16÷46 Vdc <b>SBP 02.15</b> = 14÷33 Vac or 19÷46 Vdc <b>SBP 02.24</b> = 23÷33 Vac or 30÷46 Vdc
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<b>Output voltages:</b>	<b>SBP 02</b> = 5 Vdc <b>SBP 02.12</b> = 12 Vdc <b>SBP 02.15</b> = 15 Vdc <b>SBP 02.24</b> = 24 Vdc
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<b>Input voltage frequency:</b>	50÷60 Hz
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<b>Output current:</b>	2.5 A (referred to a 20° C environmental temperature)
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## 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 and LED and some explanatory diagrams to improve operating conditions etc..

### CONNECTIONS

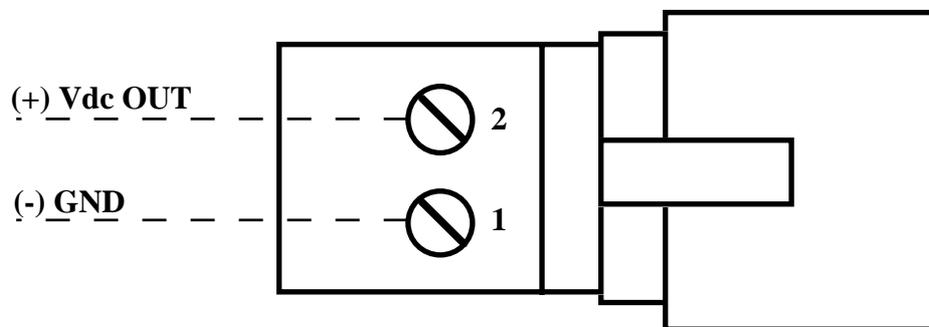
The **SBP 02** power supply has 2 connectors that can be linkeded to other devices or directly to the field, according to system requirements. In this paragraph there are connectors pin out, a short signals description (including the signals direction), connections examples and jumper configuration. Connectors view are reported to the external side of power supply and are easily recognizable through their shape and serigraph.

Quick release connectors ease cabling phase, even with thick cables, and allows a faster (eventual) replacement of the whole power supply in case of damage or maintenance.

#### **K1 - OUTPUT VOLTAGE CONNECTOR**

K1 is a 2 pins screw terminal connector, 5 mm pitch.

K1 allows to fetch the regulated output voltage to connect it to the external device to supply.



**FIGURE 4: K1 - OUTPUT VOLTAGE CONNECTOR**

Signals description:

(+) **Vdc OUT** = O - Positive terminal of regulated output voltage  
 (-) **GND** = - Negative terminal of regulated output voltage

Value of output voltage varies in a wide range as described in the previous paragraph “ELECTRIC FEATURES”.

## K2 - INPUT VOLTAGE CONNECTOR

K2 is a 2 pins quick release screw terminal connector 5 mm pitch.

Through K2 any kind of external generator (like a transformer, a battery, another power supply, etc.) can provide AC or DC input voltage to **SBP 02**.

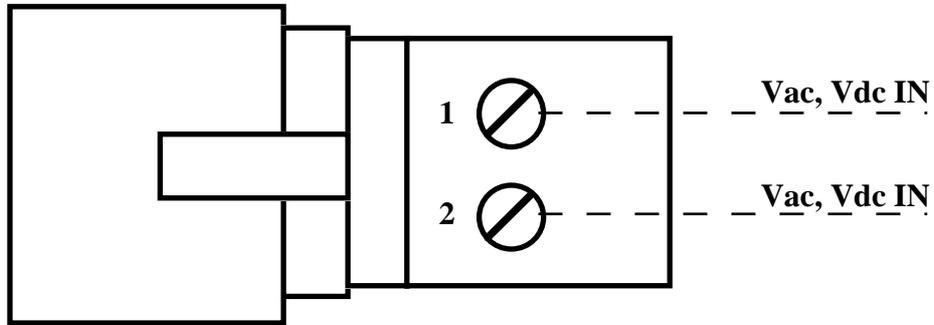


FIGURE 5: K2 - INPUT VOLTAGE CONNECTOR

Signals description:

**Vac, Vdc IN** = I - AC or DC input voltage lines

Value of output voltage varies in a wide range as described in the previous paragraph “ELECTRIC FEATURES”. Power of input signal must, of course, be enough to provide the required power to output signal as described in the successive paragraph “POWER PROVIDED”.

In case of DC input no polarity is reported because the rectifier section is always used so connection polarity is not important. In such condition please remark that ground of DC input voltage is not physically connected to ground of regulated output voltage. In fact the two grounds differ of about 1.5 V, typical difference of potential due to the bridge rectifier.

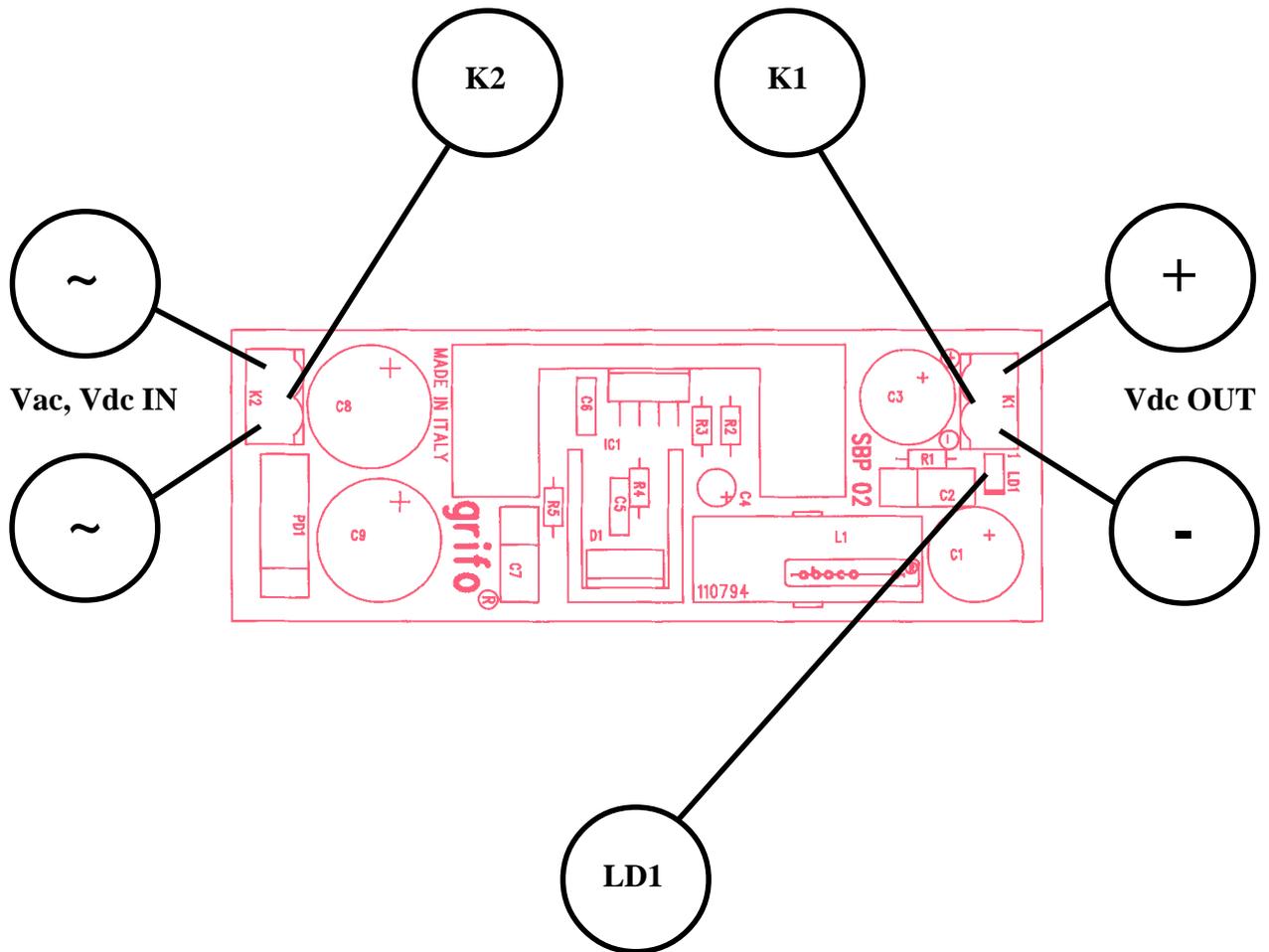


FIGURE 6: LED, CONNECTORS, VOLTAGES ETC. LOCATION

**VISUAL FEEDBACK**

SBP 02 is provided with one LED to signal status condition, as described in the following table:

LED	COLOUR	PURPOSE
LD1	Red	When lit, indicates the presence of stabilized SBP 02 output voltage.

FIGURE 7: VISUAL FEEDBACK TABLE

The main purpose of this LED is to give a visual indication of output voltage presence, making easier the operations of system working verify. The LED allows, for example, to check whether the the swithcing regulator protection has intervented or there is an eventual problem of supplied circuitery. To easily locate the LED on the board, please refer to figure 7.

## PROTECTIONS

Modules **SBP 02** feature the typical protections that allow to save them against improper uses and contemporarily assure that the power supply remains in the range of nominal working values. In detail the power supply is provided with 3 different protections:

Overheat	Switching regulation section keeps under control its own working temperature so when this latter exceeds <b>150 °C</b> it disables the output voltage to allow the temperature to decrease. Output is automatically restored when the temperature value get lower than hysteresis threshold, to prevent instable output conditions.
Overload	Switching regulation section keeps under control output current on K1 so when current exceeds <b>3 A</b> it disables the output voltage. After this, current is automatically restored softly. Soft start delay assures a limitation on output current in case the overload condition is still present.
Short circuit	Considered as overlaod condition.

After protection intervent, output voltage restore is always performed gradually (soft start), with gradual power increase.

It is always a good idea to consider to put an opportunely dimensioned protection fuse on input voltage, both AC and DC, to keep safe the power source.

## POWER PROVIDED

Power supply **SBP 02** can provide a maximum power that changes according to the model, in fact the modul is always able to provide the maximum output current 2.5 A regardless the output voltage selected. In detail, maximum powers are described in the following table:

MODEL	Vac Vdc IN	Power IN	Vdc OUT	Power OUT
<b>SBP 02</b>	8÷33 Vac or 10÷46 Vdc	15.3 W	5 Vdc	12.5 W
<b>SBP 02.12</b>	11÷33 Vac or 16÷46 Vdc	36.7 W	12 Vdc	30.0 W
<b>SBP 02.15</b>	14÷33 Vac or 19÷46 Vdc	45.8 W	15 Vdc	37.5 W
<b>SBP 02.24</b>	23÷33 Vac or 30÷46 Vdc	73.3 W	24 Vdc	60 W

**FIGURE 8: POWER FOR EACH MODEL TABLE**

Values of input power reported are referred to average efficiency of power supply (90%) and increased of 10%. For safety it is always opportune to choose a greater power and an input voltage close to the maximum value reported. To obtain maximum output power it is essential to provide an input voltage with the features specified in figure 8 considering that such values are referred to an environmental temperature of 20 °C. **SBP 02** features components and circuities designed to reduce noise sensibility and increase efficcence; also, the lay out has been carefully tracked to carry thegenerated power in the best way possible, avioding mass rings, instability, emissions, etc.

## EXTERNAL DEVICES FOR SBP 02

The seven models of **SBP 01** can supply most of **grifo®** cards, or many systems of other companies. Most common applications are to provide power supply to mother boards, galvanically isolated input and output sections, or to many **GPC® xxx** control cards. As an example here is reported a list with a short description of overall performances; for further information please consult specific documentation.

### **MB3 01 , MB4 01 , MB8 01 , WMB 12 , WMB 16 , MMB 21**

Mother Board 3, 4, 8, 12, 16, 21 slots

Motherboard with 3, 4, 8, 12, 16, or 21 slots of **ABACO®** industrial BUS industriale; slot pitch 4 or 5 TE; standardized power supply connectors; LEDs for supply visual feed back; local reset key; termination resistors on signals; holes for docking to rack 3 HE.

### **ABB 03**

**ABACO®** Block BUS 3 slots

3 slots **ABACO®** mother board; 4 TE pitch connectors; **ABACO®** I/O BUS connector; screw terminal for power supply; connection for DIN C type and  $\Omega$  rails.

### **OBI 01 - OBI 02**

Opto BLOCK Input NPN-PNP

Interface between 16 NPN, PNP optocoupled and displayed input lines, with screw terminal and **ABACO®** standard I/O 20 pins connector; power supply section; connection for DIN  $\Omega$  rails.

### **OBI N8 - OBI P8**

Opto BLOCK Input NPN-PNP

Interface between 8 NPN, PNP optocoupled and displayed input lines, with screw terminal and **ABACO®** standard I/O 20 pins connector; power supply section; connection for DIN  $\Omega$  rails.

### **TBO 01 - TBO 08**

Transistor BLOCK Output

Interface for **ABACO®** standard I/O 20 pins connector; 16 or 8 transistor output lines 45 Vdc 3 A open collector; screw terminal; optocoupled and displayed lines; connection for DIN 247277-1 and 3 rails.

### **RBO 08 - RBO 16**

Relé BLOCK Output

Interface for **ABACO®** standard I/O 20 pins connector; 8 or 16 displayed Relays 3A with MOV; screw terminal; connection for DIN Ctype and  $\Omega$  rails.

### **XBI 01**

miXed BLOCK Input Output

Interface for **ABACO®** standard I/O 20 pins connector; 8 transistor output lines 45 Vdc 3A; 8 input lines; screw terminal; optocoupled and displayed I/O lines; connection for DIN 247277-1 and 3 rails.

### **XBI R4 - XBI T4**

miXed BLOCK Input-Output

Interface for **ABACO®** standard I/O 20 pins connector; 4 Relays 3A with MOV or 4 optocoupled Transistors 3A open collectors; 4 input lines optocoupled; screw terminal; connection for DIN Ctype and  $\Omega$  rails.

**FBC xxx**

Flat Block Contactxxx pins

This interconnection system "wire to board" allows the connection to many type of flat cable connectors to terminal for external connections. Connection for DIN  $\Omega$  rails.  
for DIN 247277-1 and 3 rails; 4 type dimension.

**C/O R16**

16 Coupled Input Output Relé

16 optocoupled input with  $\pi$ -filter; input voltage 24 Vdc. 16 micro-relays 1 A with disturb suppression by MOV 24 Vac. I/O visualized through LEDs; 8 bit BUS; standard addressing.

**PCI 01**

32 Peripheral Coupled Input

16 optocoupled input with  $\pi$ -filter; input voltage 24 Vdc; I/O visualized through LEDs; 8 or 16 bit BUS; standard addressing.

**JMS 34**

Jumbo Multifunction Support for axis control

Smart peripheral for axis control; 3 optocoupled inputs for acquisition of incremental bidirectional encoders; zero sign; 4 D/A converter channels 12 bits; output range  $\pm 10$  V; 8 NPN optocoupled inputs; 8 Open Collector transistor outputs 45 Vdc, 500 mA; all I/O visualized through LEDs; 8 bit BUS; extended addressing.

**GPC® 188F**

General Purpose Controller 80C188

80C188  $\mu$ P 20MHz; 1 RS 232 line; 1 RS 232, RS 422-485 or Current Loop line; 24 TTL I/O lines; 1M EPROM or 512K FLASH; 1M RAM Lithium battery backed; 8K serial EEPROM; RTC; Watch Dog; 8 Dip switch; 3 Timer Counter; 8 13 bit A/D lines; Power failure; activity LEDs; single power supply +5Vdc.

**GPC® 554**

General Purpose Controller 80C552

Microprocessor 80C552 at 22 MHz; implementation completely CMOS; 32K EPROM; 32 K SRAM; 32 K EEPROM or SRAM; EEPROM; 2 RS 232 serial lines; 16 I/O TTL; 2 PWM lines; 16 bits Timer/Counter; Watch Dog; 6 signals A/D converter with resolution 10 bit; interface for **ABACO®** I/O BUS.

**GPC® 154**

"4" Type General Purpose Controller Z80

84C15  $\mu$ P, 10÷16 MHz; Full CMOS; 1 RS 232 line; 1 RS 232 or RS 422-485 line; 16 TTL I/O lines; 2÷4 Timers Counters; 512K EPROM or FLASH; 512K RAM and RTC backed; 8K serial EEPROM; Watch dog; 2 readable DIPs; LCD Interface; Abaco® I/O BUS; 5Vdc Power supply; Size: 100x50 mm.

**IPC 52**

Intelligent Peripheral Controller, 24 analogic input

This intelligent peripheral card acquires 24 independent analogic input lines: 8 PT 100 or PT 1000 sensors, 8 J,K,S,T termocouples, 8 analog input  $\pm 2$ Vdc or 4÷20mA; 16 bits + sign A/D section; 0.1 °C resolution; 32K RAM for local data logging; buzzer; 16 TTL I/O lines; 5 or 8 conversion per second; facility of networking up to 127 IPC 52 cards using serial line. BUS interfacing or through RS 232, RS 422, RS 485 or current loop line. Only 5Vdc power supply.

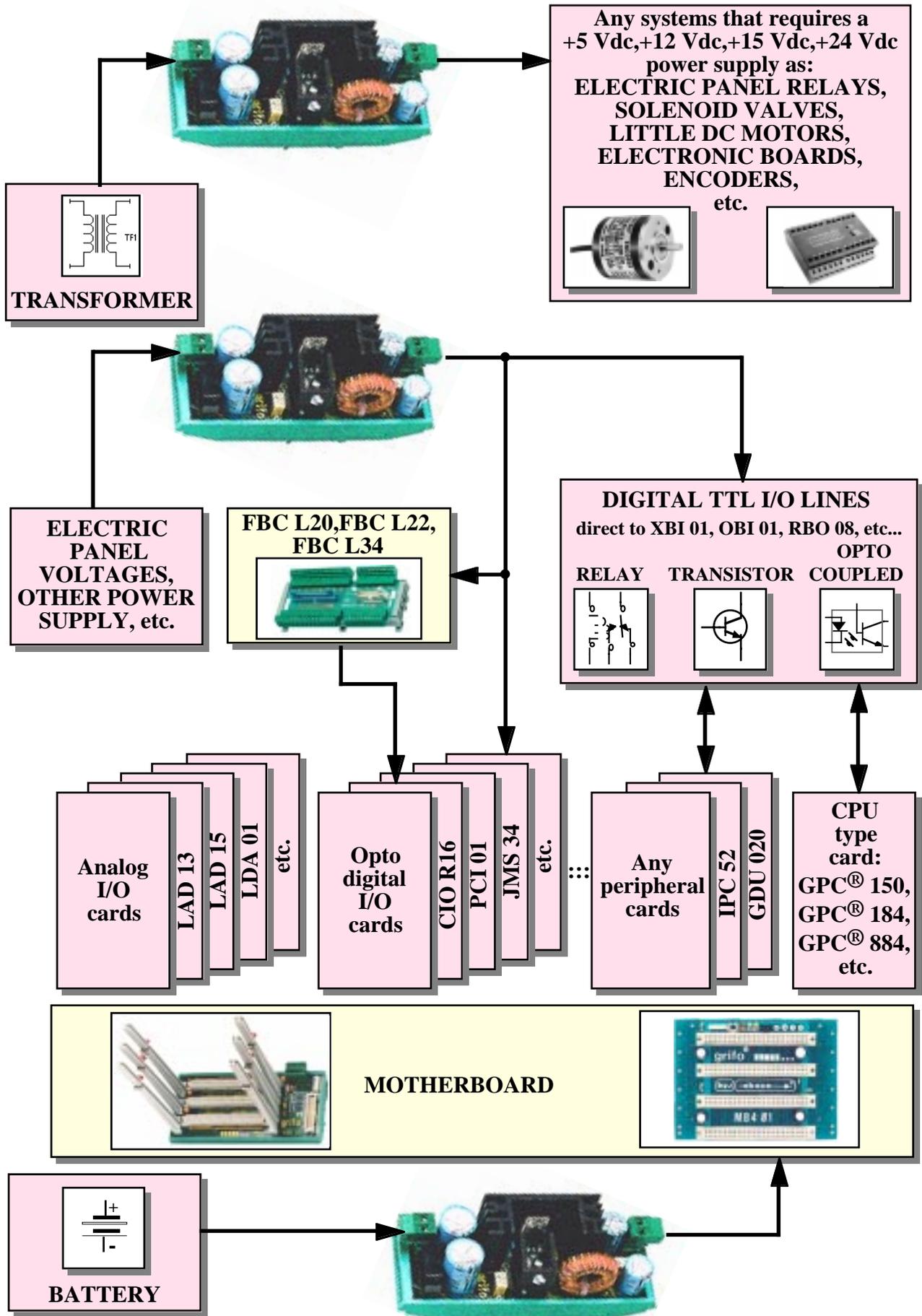


FIGURE 9: POSSIBLE CONNECTIONS DIAGRAM

## BIBLIOGRAPHY

In this chapter there is a complete list of technical books, where the user can find all the necessary documentations on the components mounted on **SBP 01**.

Manuals SGS: *Power supply application manual*  
*GS-R modules application manual*

Manual Motorola semiconductor: *Rectifiers and zener diodes data book*

Manual Harris: *Passive components data book*

For further information and upgrades please refer to specific internet web pages of the manufacturing companies.

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