S 530

Hardware Manual (HW)
Manufacturer's Documentation

Valid for

Product: S 530.501

Edition: July 2010
Code:

Restrictions

Guarantees

The product may offer performances that are not described in these manuals. Esa/Gv shall neither be obliged to maintain these functions in new versions of the product nor to guarantee the relative assistance.

Checks have been carried out in order to ensure that the contents of these manuals correspond to the documented product. Despite this fact, there may be discrepancies. Esa/Gv therefore offers no guarantees as to the full compliance and completeness of the texts.
The information in this document is periodically revised and new editions are issued when necessary.

This manual has been compiled in partial compliance with ANSI/IEEE std 1063-1987 “IEEE Standard for software User Documentation”.

Editions

This document is liable to be modified without prior notice. These modifications may involve further editions or revisions of the document.
Further editions imply complete substitution of the document.
Revision involves replacement/addition/elimination of pages of the document.
Each page is identified by the code of the document at the bottom.

Notes

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The chronological list of editions of this document is given in the following table:

Evolution of the document

Edition	Document Code	Release	Type of edition
25/06/2004		0	New document

Modifications

Release	Chapters - Pages	Description

Hardware Manual

END OF SUMMARY

Notes for the reader

General information

The information in this manual only applies to the software versions indicated on the frontispiece.

Not all the available functions may be described in this manual. In these cases, Esa/Gv shall be obliged to neither guarantee these functions nor include them in future versions.

Purpose

This document contains information allowing technicians to correctly service the product described on the frontispiece.

Users

This document contains information for:

- Specialized installer technicians/specialized test technicians with a good working knowledge of the numeric control and machine. Basic knowledge of electromechanics and industrial control panels.

Use of the document

The document is divided into chapters that describe a well defined characteristic of the product.

Notification of difficulties

Please contact Esa/Gv if any difficulties should arise when this manual is used.

Explanation of the symbols

Graphic symbols may appear beside the text. These are used to emphasize information of particular importance.

Attention
This symbol is used when failure to take the appropriate precautions **could cause slight damage to persons and property**.

Danger
This symbol appears when failure to take the appropriate precautions or accomplishment of incorrect manoeuvres **could cause serious damage to persons and/or property**.

Important
This symbol appears in the manual to indicate information of particular importance. It is essential to read these sections in order to fully understand the manual.

Option
This symbol indicates sections of the manual that describe optional functions or parts. Use of optional performances must be established with the machine manufacturer.

Manufacturer
This symbol indicates those sections of the manual reserved to the machine manufacturer.

Password
This symbol indicates sections of the manual that describe functions access to which is safeguarded by software passwords.

CN
This symbol indicates sections of the manual that describe functions only available in CN and not in the PC.

PC
This symbol indicates sections of the manual that describe functions only available in the PC and not in CN.

Printer's conventions

Particular printer's conventions are used to make it easier to identify the information in this manual. These conventions are illustrated below.

Keyboard and video

The following conventions are used.

- The names of the screen-printed keys are indicated in **boldface** and are enclosed within square brackets. If the name of the key is preceded by "button", reference is being made to a key on the push button panel.
  - **[ENTER]**. Identifies the key that bears the word ENTER.
  - **[+]** indicates the + key of the keyboard, while button **[+]** indicates the + key of the push button panel.
- The names of the function keys are indicated in ***boldface italics*** and are enclosed within square brackets.
  - **[*Plc Menu*]**. Identifies the function key that bears the words Plc Menu.
- References to fields and/or messages on the video are written in ***boldface italics***.
- The specific text to be digitized by the user is underlined.
  - If the manual indicates "digitize ok, the user must digitize exactly "ok".
- DIRECTION or DIRECTIONAL keys is the collective name used to indicate the UP, DOWN, LEFT and RIGHT keys.
- Pressure, in sequence, on a series of keys is written by separating the identifiers of the required keys with the ">" character.
  - **[*Manual*]** > **[START]**. Describes pressure, in sequence, on the **[*Manual*]** and **[START]** keys.
- Pressure on several keys at the same time is indicated by separating the identifiers of the keys themselves with the "+" character.
  - **[SHIFT]** + **[→]** Describes contemporaneous pressure on the **[SHIFT]** and **[→]** keys.

Text

The following conventions are used.

- *Italics* are used to identify specialistic terms.
- **Boldface** is used to emphasize words of particular importance.

Glossary

CNC This is an abbreviation of *Computerized Numerical Control* and indicates the instrument that governs the machine, i.e. the electronic device through which the machining cycles are programmed, the axes moved, etc..
It corresponds to one of the devices whose operation is described in this manual.

I/O Input/Output.

SW Software.

HW Hardware

BUS Connections that join two or more cards/components among them.

ON

OFF

END OF PREFACE

1 General information

1.1 Description of the product

S 530 is a high-performance compact CNC based on a standard open PC platform. It consists of a dedicated keyboard, 7inc color display and has digital inputs/outputs, analog inputs/outputs, analog axes management, digital axes management, serial lines, can open, ethernet and can be expanded towards the Remote I/O system.
It is also equipped with an integrated PLC and ISO interpreter.
For more details on the characteristics of the control, read the following manual and the software manual of your application

The product comprises the following parts:

Microprocessor	AMD Geode™ LX800 processor 500MHz
Memory	256 Mbytes of DRAM, used by the Microprocessor.
	1 Mbytes **of** SRAM memory used for the machine parameters
	128 Mbyte (or more) of Flash Disk for the application program, the machine parameters and the user programs.
Display	Color active matrix TFT-LCD
	7” WVGA (16:9 diagonal) configuration
	Resolution (800(R.G.B) X 480)
	262,144 colors
LEDs	4 LEDs (green) for signalling the powering voltages generated by the power supplier board.
	1 LED (green) for the CNC’s RUN signals.
	1 LED (red) for the CNC’s STOP signals.
	1 DISPLAY with 7 segments (red) used as System Monitor.
Analog inputs	2 (two) 12-bt analog input 0 - 5V/0 - 10V
Analog outputs	2 (two) 0-10V 12-bit analog outputs
Communication lines	Serial line COM 2 standard RS232C.
	2 (two) interfaces USB 1.1
	1 interface CAN
	1 network interface
Axes interface	4 SINGLE ENDED/DIFFERENTIALS +5V encoder inputs.
	4 (four) +/-10V 14-bit analog outputs.
Digital Inputs	32 PNP inputs,.
Digital Oututs	32 PNP outputs, protected
Customizing	Jumpers for internal settings
Battery	Lithium battery 3,6V AACR2032 to buffer SRAM memory and Clock Calendar
Other functions	RESET, PWF, and WATCHDOG TIMER circuit
Expansions	Expansion towards the Remote I/O system.

Front view

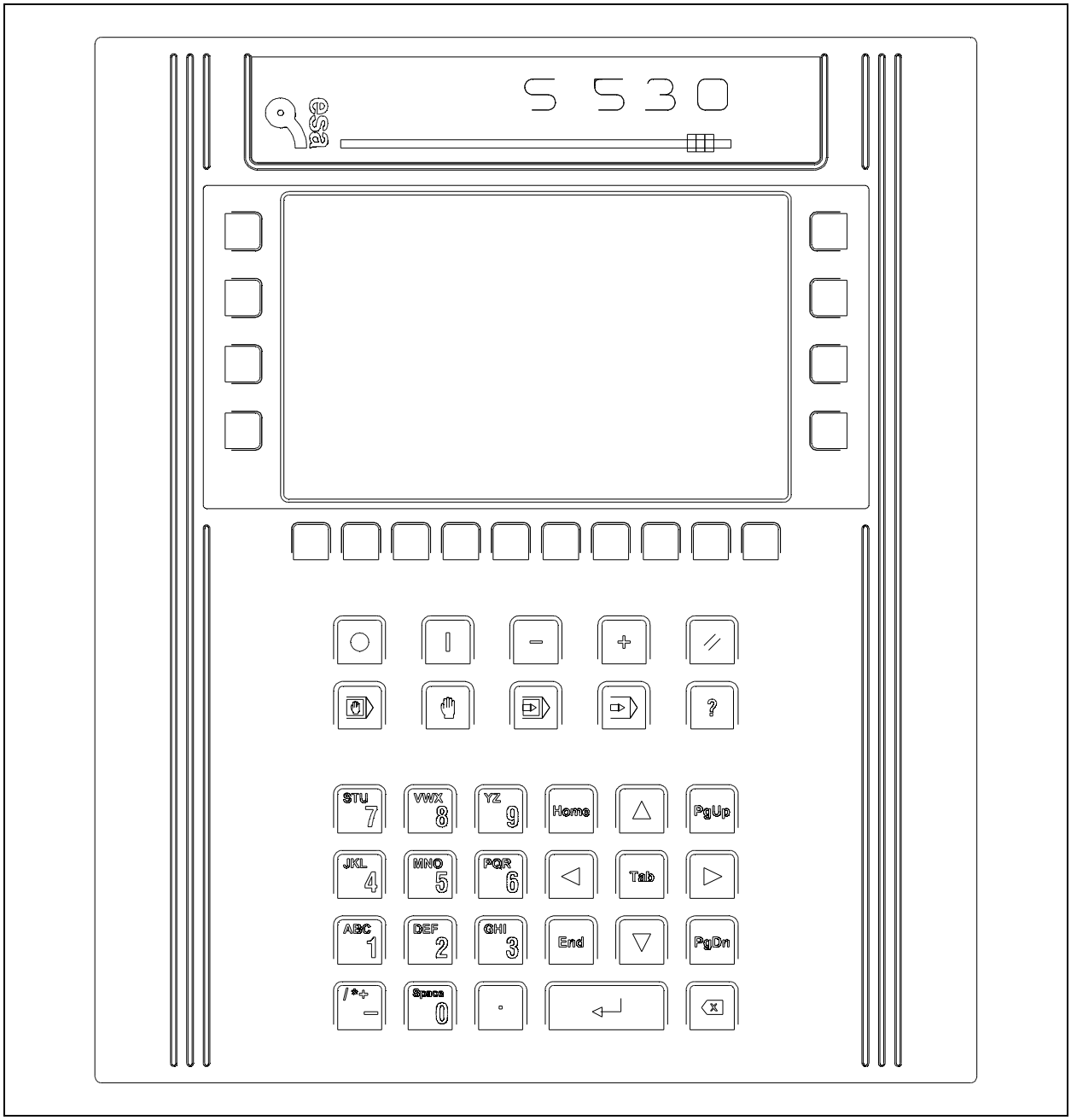


Figure 1.1 – Front view of the S 530

Rear view

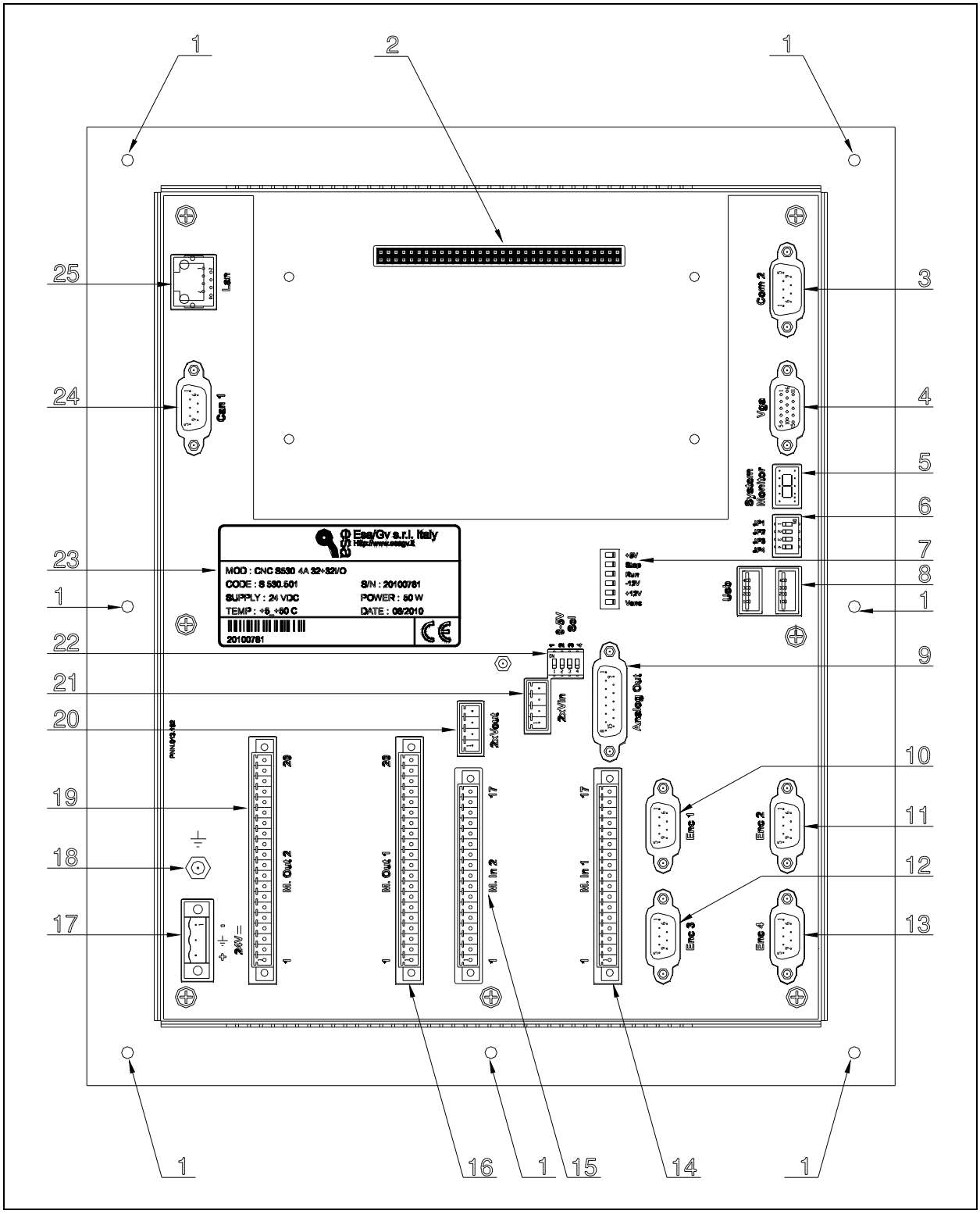


Figure 1.2 – Rear view of the S 530

1) Screws for fixing the numeric control
2) Expansion connector
3) Serial interface COM2
4) VGA interface
5) System Monitor Display
6) Dip switches for customizing
7) LEDs to signal power supply and NC status
8) USB interfaces
9) Analog outputs of the axes
10) Encoder 1
11) Encoder 2
12) Encoder 3
13) Encoder 4
14) Digital inputs 1 -:- 16
15) Digital inputs 17 -:-32
16) Digital outputs 1 -:- 16
17) Power socket
18) Grounding screw
19) Digital outputs 17 -:-32
20) 0-10V 12-bit analog outputs
21) 12-bit analog inputs
22) Analog inputs range selection jumpers
23) Product identification label
24) CAN interface
25) Ethernet interface

Rear view with remote I/O expansion

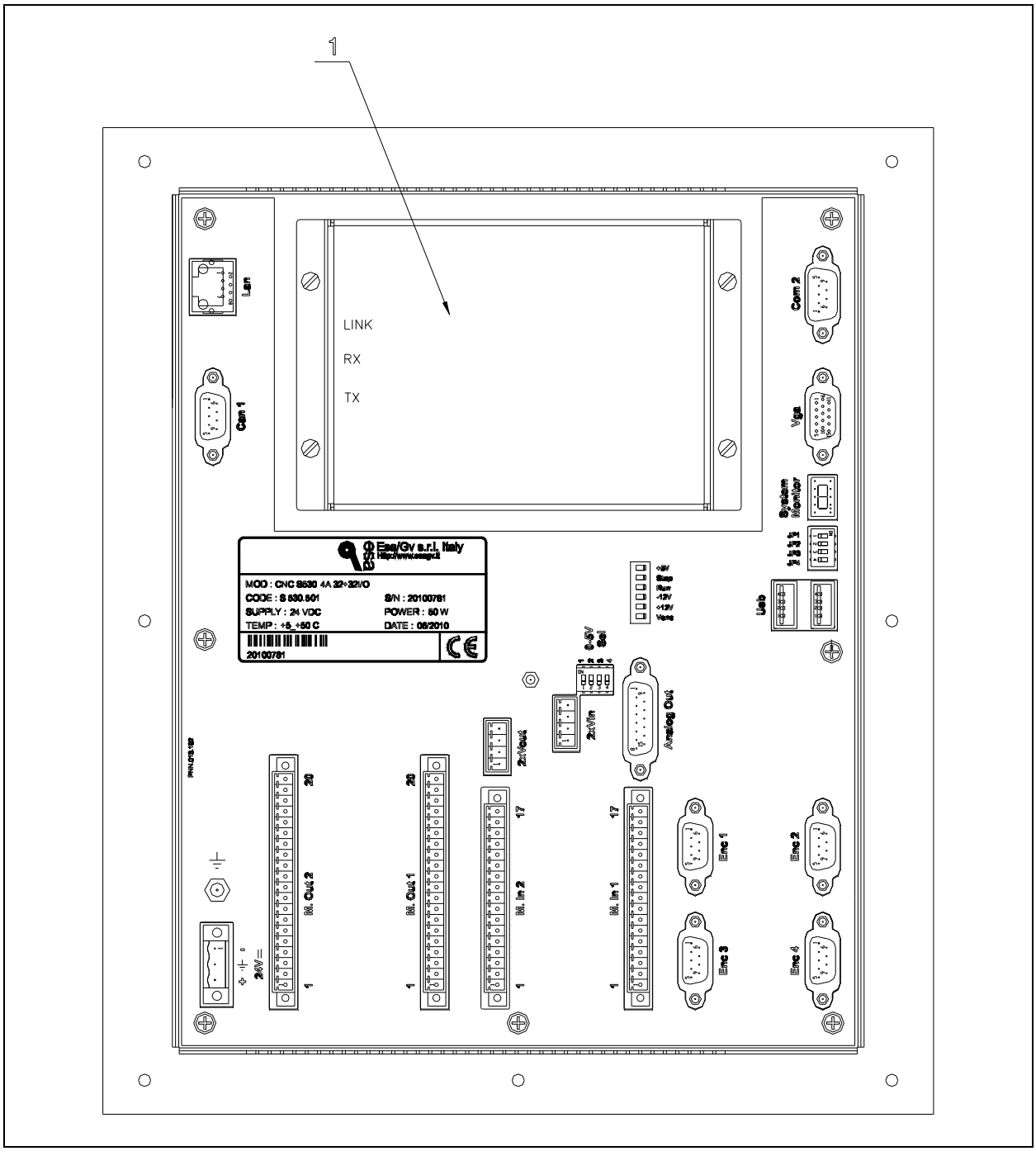


Figure 1.3 – Rear view of the S 530 Rack with remote I/O expansion

1) BRD.019.402 remote I/O expansion board

Right side view with remote I/O expansion

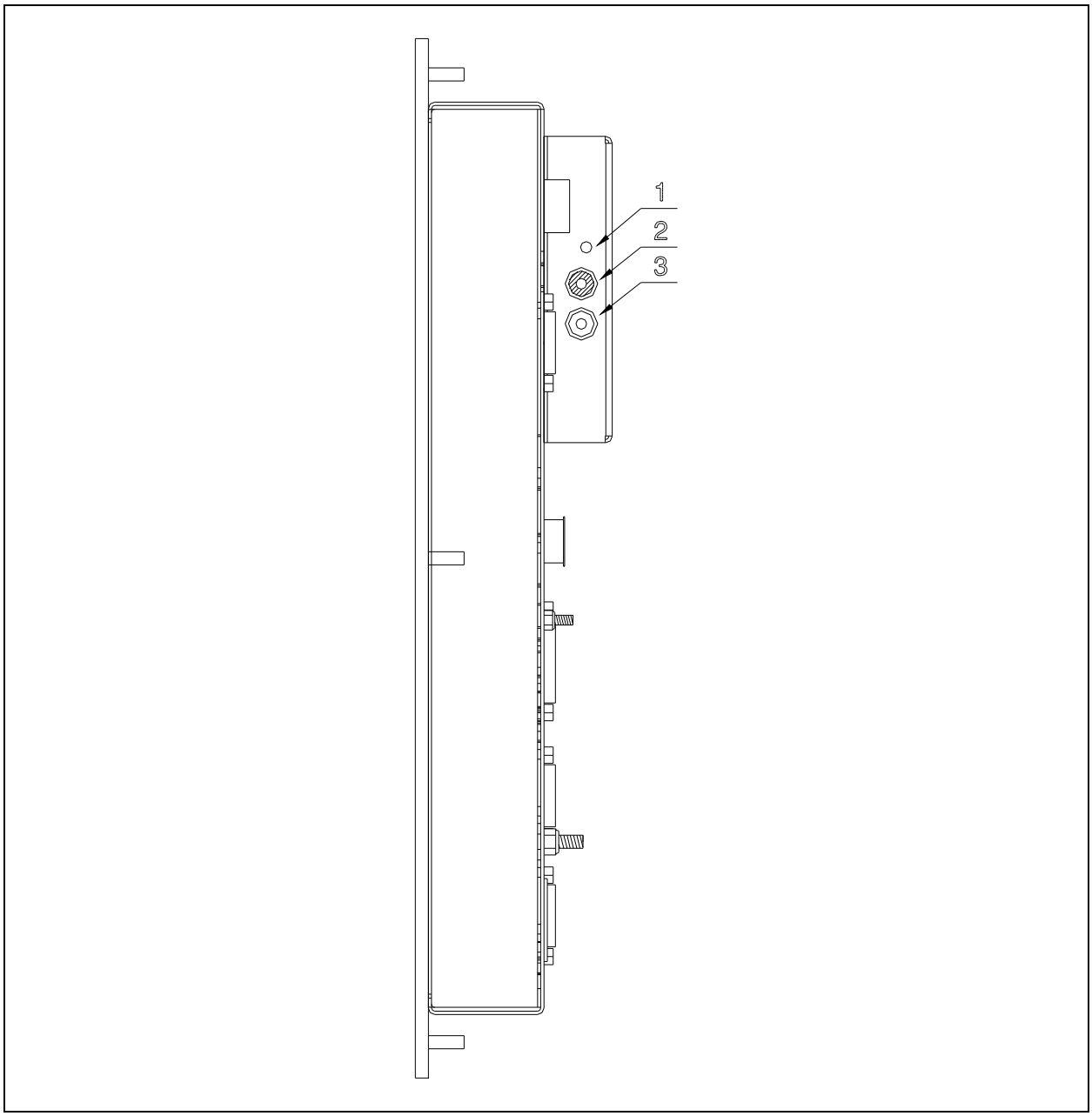


Figure 1.4 – Right side view of the S 530 Rack with remote I/O expansion

1) Remote I/O LINK LED
2) Remote I/O receiver (RX)
3) Remote I/O transmitter (TX)

1.2 Identification labels

The following is a list of the labels affixed to each product so that it can be correctly identified if assistance or spare parts are required.

Product identification label

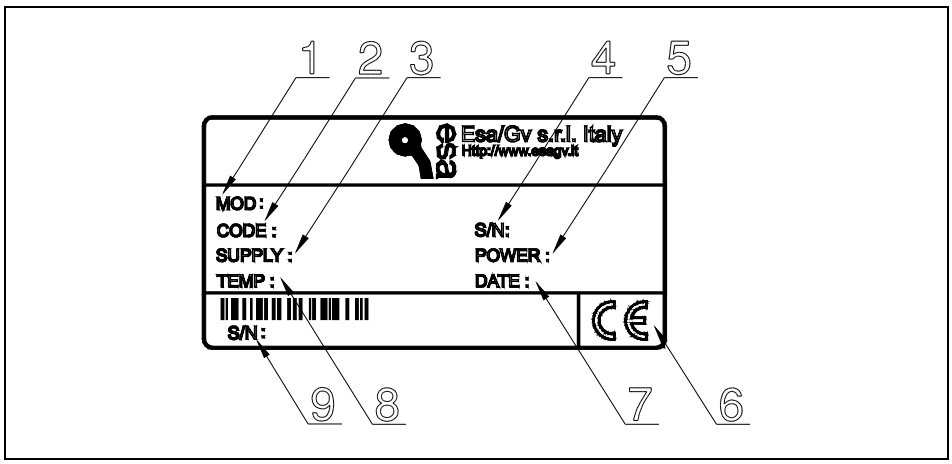


Figure 1.5 – Product identification label

1) Model (E.g. CNC S 530 4A 32+32I/O)
2) Code (E.g. S 530.501)
3) Serial number (E.g. 20100781)
4) Power (E.g. 50W)
5) Operating temperature (E.g. 5-50°C)
6) Powering voltage (E.g. 24V dc)
7) Production date (E.g. 06/2010)
8) CE marking
9) Serial number (E.g. 20100781)

1.3 Accessories

The following list gives the accessories supplied with the product so that it can be installed correctly.

CODE	QUANTITY	DESCRIPTION
CNC.007.041	1	USB cable “A to B” Male/Male 1 mt
CNN.020.002	5	D-Sub 9-pin male connector
CNN.020.027	5	D-Sub 9-pin connector with metallized cap
CNN.020.092	1	D-Sub 15-pin male connector
CNN.020.097	1	D-Sub 15-pin connector with metallized cap
CNN.046.005	1	Panel feed-through USB connector “A to B”
MRS.007.022	1	Phoenix, 3-pin terminal block, p5.08, female
MRS.008.023	2	Phoenix, 4-pin terminal block, p3.81, female
MRS.008.029	2	Phoenix, 17-pin terminal block, p3.50, female
MRS.008.030	2	Phoenix, 20-pin terminal block, p3.50, female

END OF CHAPTER

2 Installation

2.1 Assembly of the instrument

2.1.1 Overall dimensions

Instrument

Specification	Value
Height	319.0 mm
Width	269.0 mm
Depth (maximum dimension)	126.6 mm
Weight	2.3 kg

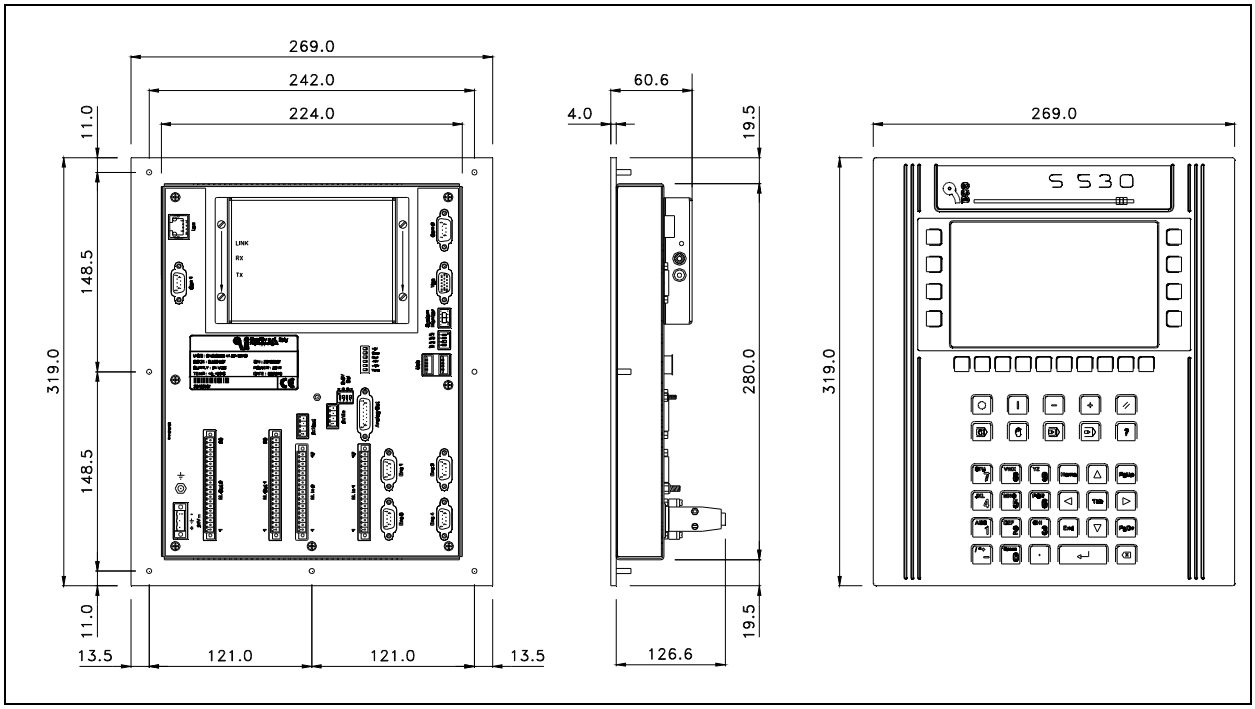


Figure 2.1 – Dimensions of the instrument

2.1.2 Fixing

Instrument

The instrument is pre-engineered for installation on a panel. Proceed in the following way to install:

- drill the panel with the template shown in the figure;
- fix the instrument to the panel by tightening the four screws supplied.

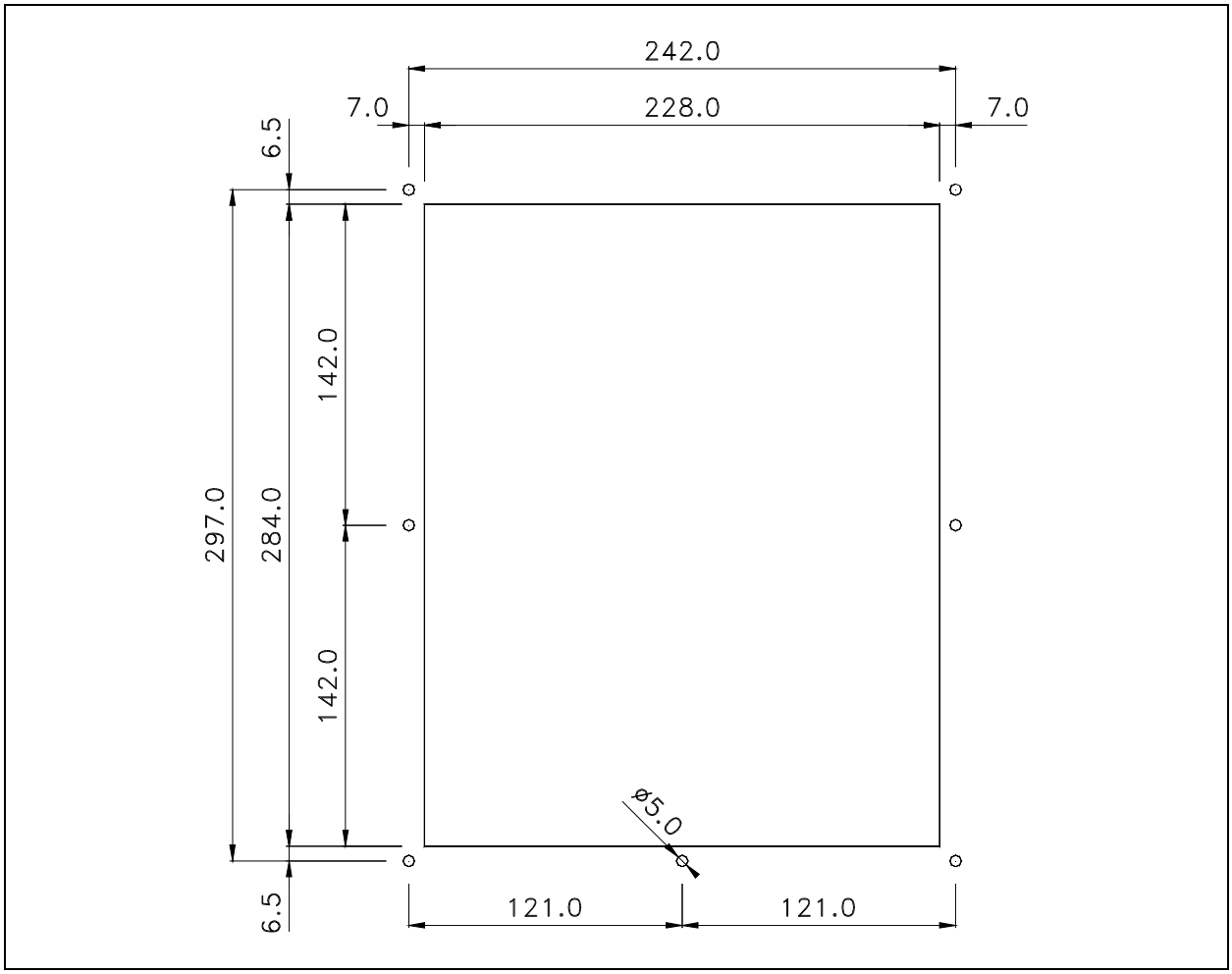


Figure 2.2 – Fixing template

2.1.3 Location

The position in which the instrument is mounted in the electric cabinet must be chosen so as to ensure that it is at least 50 cm away from the power components and cables (remote control switches, actuators, inverters...).
If it is impossible to comply with the indicated distance, it is advisable to separate the instrument from the components and from the power cables with metal screens.
In the majority of cases, the vicinity of the instrument to power components will lead to interference and even breakage of the actual instrument itself.

2.2 Environmental conditions

The product has been designed to operate in the environmental conditions described in this chapter.
To ensure correct operation:

- comply with the indicated environmental conditions during operation, transport and storage;
- make sure that the product is correctly installed.

Information and assistance

Contact Esa/Gv's "Assistance Service" if information and/or assistance are required

2.2.1 Climatical condirions for operation

The product is cooled by natural convection. It is not equipped with a forced ventilation system.

It is advisable to leave a gap of about 10 cm or so all around the instrument, to facilitate the air flow.

Install a heat exchanger or conditioner if it is impossible to comply with the specified limit values.

Specifications	Limit value
Operating temperature:	
Minimum	5°C
Maximum	50°C
Average during the 24 h period	45°C
Relative humidity	
Minimum	50%
Maximum	95%
Condensation	Not permitted
Maximum altitude tolerated	2000 m

2.2.2 Transporting and storing conditions

The following specifications only apply to the product it its original packing.

Specifications	Limit value
Storage temperature:	
Minimum	-25°C
Maximum	70°C
Relative humidity	
Minimum	5%
Maximum	95%
Condensation	Not permitted
Atmospheric pressure (More or equal)	70 Kpa (3000m)

2.2.3 End of product's life cycle

If the product must be removed from the machine in which it is installed for demolition purposes, it is absolutely forbidden to dispose of it as normal waste.

It is obligatory to consign it to an enterprise authorized to recycle and dispose of electrical and electronic products.

2.2.4 Electromagnetic compatibility

Emission

Generic standard for industrial environments: EN61000-6-4 .
Basic standard EN55011 is used.

Test	Limit
Disturbance conveyed via the power cables	Class A
Irradiated disturbance	Class A

Immunity

Generic standard for industrial environments: EN61000-6-2
The following basic standards are used.

Test	Limit
Electromagnetic field with conducted radio frequency EN61000-4-6	Test voltage: 10 V rms Frequency: 0.15 to 80 MHz 80% of AM 1 KHz modulation
Electromagnetic field with irradiated radio frequency EN61000-4-3	Field intensity: 10 V/m Frequency: 26-1000 MHz, 1400-2000 MHz 80% of AM 1 KHz modulation
Magnetic field with irradiated radio frequency and pulse modulation EN6100-4-3	Field intensity: 10V/m Frequency: 800-1000 MHz 100% pulse modulation at 200 Hz
Fast transients (burst) EN61000-4-4	Test voltage: 2 KV
Electrostatic discharge EN61000-4-2	Test voltage by contact: 4 KV Test voltage in air: 8 KV Duration of test: 10 discharges Repeats: 1 discharge/s

Suppression of radio interference must be considered if the product is to be installed correctly. Pay particular attention to the way the cables are routed. Contact Esa/Gv if further information is required. Refer to the “Guide to installation according to EMC and LVD directives” available from Esa/Gv in order to correctly install the product in relation to EMC problems.

2.2.5 Exposure to external contaminants

Dust (iron, sawdust, etc.) or soil in the place where the instrument works may prevent this latter from operating correctly. The instrument must operate in an electric panel with appropriately filtered and adequate air changes to ensure that it is cooled in the proper way. Periodically check the filters and replace them if necessary.

Protection degrees

The instrument is guaranteed for the following protection class (IP)

SPECIFICATION	Limit
PRODUCT	IP 20 (Note 1)

Note 1: Protection against solid bodies larger than Ø 12mm. No protection against liquids.

2.3 Electrical specifications

2.3.1 Power supply

Electrical specifications

The power supply for the instrument must comply with the following values:

Specifications	Limit value
Typical power supply voltage rating	24 VDC.
Maximum power supply voltage rating	28.8 VDC.
Minimum power supply voltage rating	20.4 VDC.
Typical powering current	2 A
Typical power used	50 W
DC/GROUND input insulation voltage	The instrument must be powered with an insulated and stabilized DC power supplier.
Protection against overvoltages	YES, with varistor
Hold up Time	>10 mSec

The power rating of the power supplier must be the same as the instrument's power draw or more. The instrument will switch off if the powering voltage drops below the nominal values. If the powering voltage is not sufficiently stable, it is advisable to power the instrument by means of a no-break unit. Consider the power draw of the instrument and its technical specifications when choosing the no-break unit. It is certainly advisable to use no-break units with zero activation time and not stabilizers (even electronic ones) which supply a certainly stable output voltage but which, in the event of even brief voltage drops, are unable to guarantee continuity for the output.

2.4 Customizing

Incorrect customizing of the dip-switches may damage the instrument or any sensors connected. The customizing operations must therefore be carried out by specialized personnel using special tools able to prevent the components from being damaged through electrostatic discharge. Bracelets are available on the market that prevent the human body from charging with a voltage potential that could harm the electronic parts.

2.4.1 Dip-switches customizing

In order to customize the instrument, it may be necessary to set some of the dip-switches on the instrument. The positions of the dip-switches on the instrument and their relative meanings are given below.

Location of the system switch on the instrument

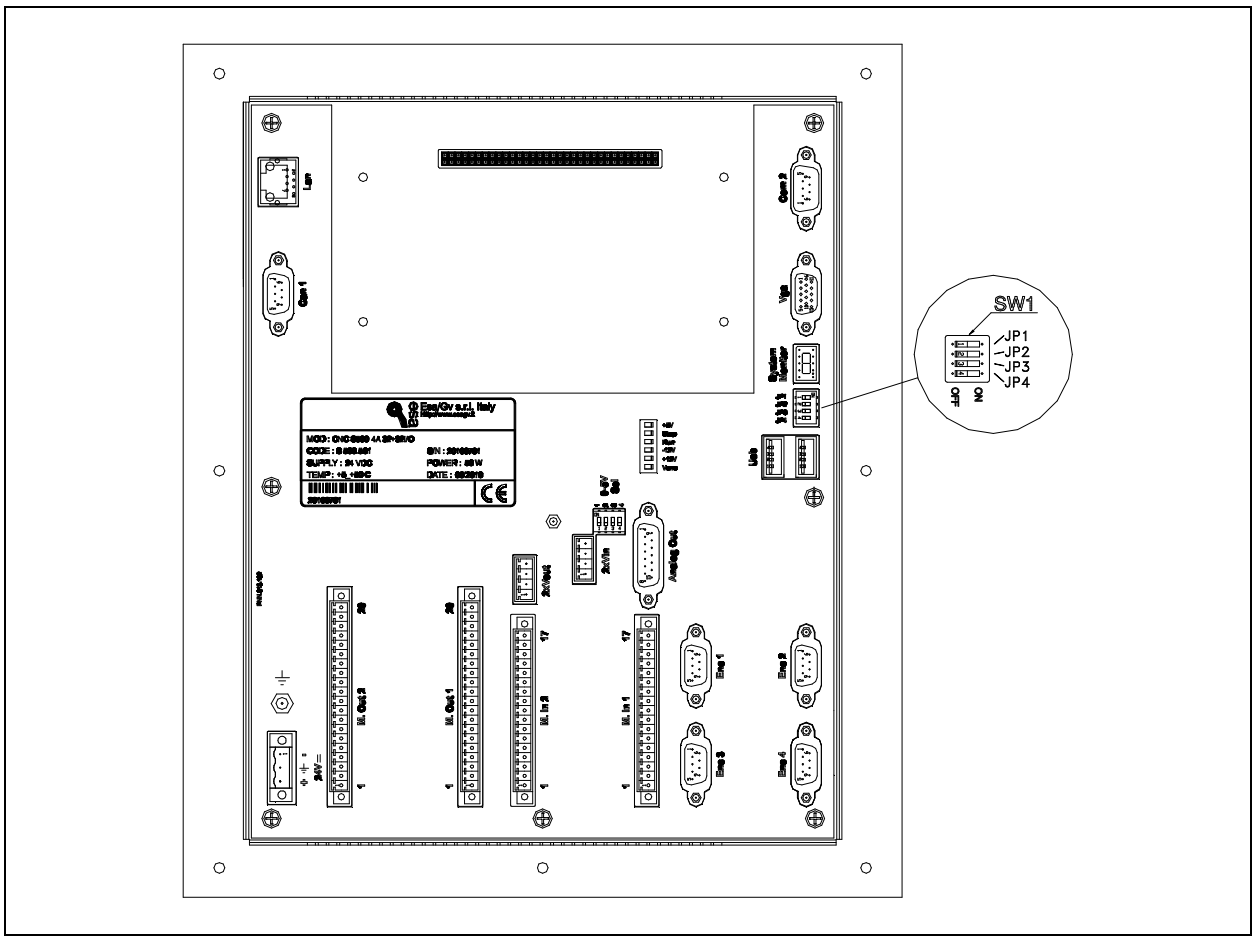
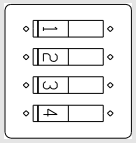
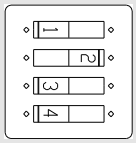


Figure 2.3 – Location of the system switch on the instrumen

- **SW1 - JP1:** Reserved
- **SW2 - JP2:** Enabling USB Autosetup
- **SW3 - JP3:** SERVICE mode
- **SW4 - JP4:** Reserved

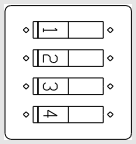
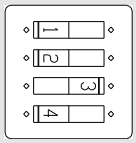
SW1 - JP2: Enabling USB Autosetup

This switch is used to enable Autosetup function via USB.

SW1 - JP2		
Enabling USBAutosetup	DISABLED (default)	ENABLED

SW1 - JP3: Service Mode

This switch is used to enable the service functions of the instruments.

SW1 - JP3		
Service Mode	DISABLED (default)	ENABLED

N.B. For the correct functioning of the instrument all the Dip Switches must to be OFF.

Location of the analog inputs range switch on the instrument

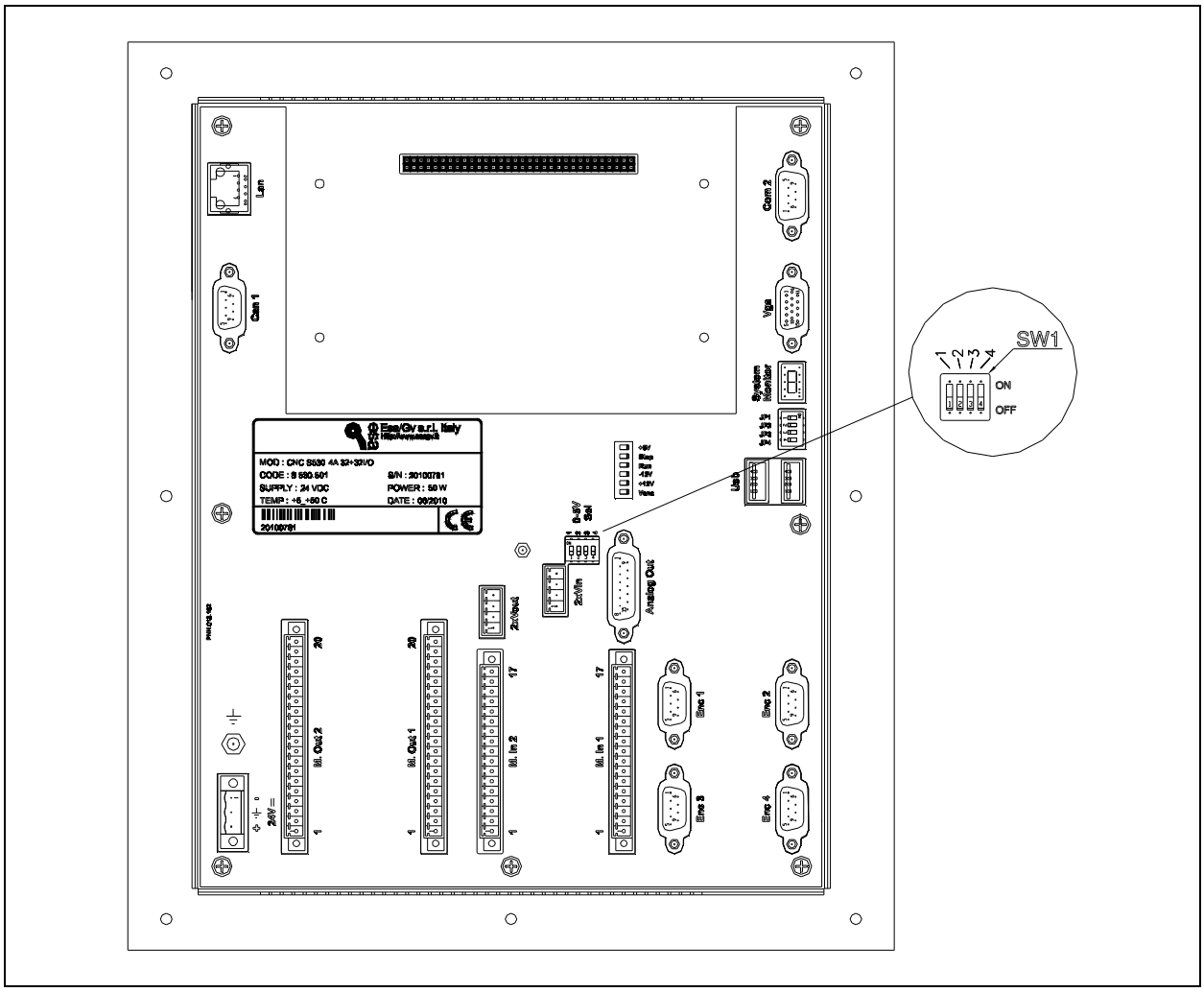
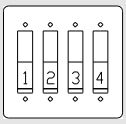
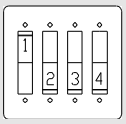


Figure 2.4 – Location of the analog inpu range switch on the instrument

- **SW2 - 1:** Analog input 1 range selection
- **SW2 - 2:** Analog input 2 range selection
- **SW2 - 3:** Analog input 3 range selection.
- **SW2 - 4:** Analog input 4 range selection

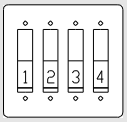
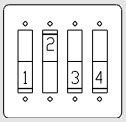
SW2 - 1: Analog input 1 range selection

This switch is used to select the analog input range (0-5V, 0-10V) applicable to analog input 1.

SW2 - 1		
Analog input 1 range selection	0 - 10V	0 - 5V (default)

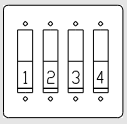
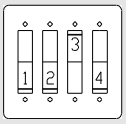
SW2 - 2: Analog input 2 range selection

This switch is used to select the analog input range (0-5V, 0-10V) applicable to analog input 2.

SW2 - 2		
Analog input 2 range selection	0 - 10V	0 - 5V (default)

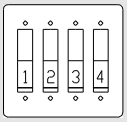
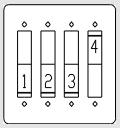
SW2 - 3: Analog input 3 range selection

This switch is used to select the analog input range (0-5V, 0-10V) applicable to analog input 3.

SW2 - 3		
Analog input 3 range selection	0 - 10V	0 - 5V (default)

SW2 - 4: Analog input 4 range selection

This switch is used to select the analog input range (0-5V, 0-10V) applicable to analog input 4.

SW2 - 4		
Analog input 4 range selection	0 - 10V	0 - 5V (default)

2.5 Connections

2.5.1 Standard references and indications for the wiring

Particular care must be taken when routing the wires in the electric panel to prevent disturbances when the instrument operates.

Definition of the cables

Signal cables:

- Serial links
- +24V DC ON/OFF inputs/outputs
- Encoder inputs
- Analog inputs
- Analog outputs

Power cables:

- Power supply cables (380 V AC, 230 V AC).
- Drive – motor connection cables.
- Cables connected to the inductive loads powered with 110 V AC voltage or more.

Installation rules

Comply with the following regulations to ensure the maximum immunity against disturbance.

- Route the signal cables as far as possible from the power cables.
- Do not route the signal cables near to intense magnetic fields generated by motors or transformers, for example.
- Route the signal cables well away from neon lights as they generate disturbance.
- Cables that convey impulsive signals with rapid voltage and current variations must be completely separated from all the others. If sufficient separation is impossible to obtain, install the signal cables inside screened metal ducts.
- Install the instrument well away from intense electromagnetic fields, neon lights and power cables.

Failure to comply with the following rules can prevent the instrument from operating correctly.

Filters for suppressing disturbance

To eliminate the disturbance generated by coils, solenoid valves, hydraulic valves, remote control switches, motors and other inductive loads, filters can be installed directly on the source of the disturbance, or as near as possible to it. The filter must be securely fixed to prevent it from breaking.

Refer to the indications given in the manual entitled “Guide to installation according to EMC and LVD Directives” available from Esa/Gv, in order to install the instrument in the correct way.

2.5.2 Ground connection

To ensure that the instrument is safe to use and immune from disturbance, it must be correctly grounded.

The instrument must be connected to the central grounding point of the electric panel (EP) by means of the grounding screw identified by the relative label.

A bad ground connection could jeopardize the operator's safety and prevent the instrument from operating correctly.

Connection example

Figure 2.5 – Ground connection of the instrument

2.5.3 Power supply

- The grounding pin of the instrument's power socket must be connected to the central grounding point of the electric panel.

Type of connector

Phoenix MSTBV 2.5/3-GF-5.08 3-pin male terminal board Code 1777086

Loose part: Phoenix FRONT-MSTB 2.5/3-STF-5.08 Code 1777811

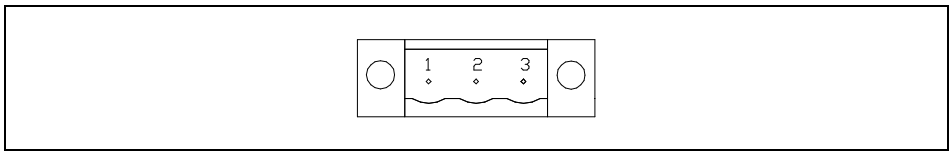


Figure 2.6 – Power socket

Pin	Name	Type
1	- DC TERMINAL	VI
2	FIELD GND	VI
3	+ DC TERMINAL	VI

Name of signal:

DC TERMINAL	Power supply voltage rating
FIELD GND	Ground reference

Type of signal:

VI	Input voltage rating

Connection examples

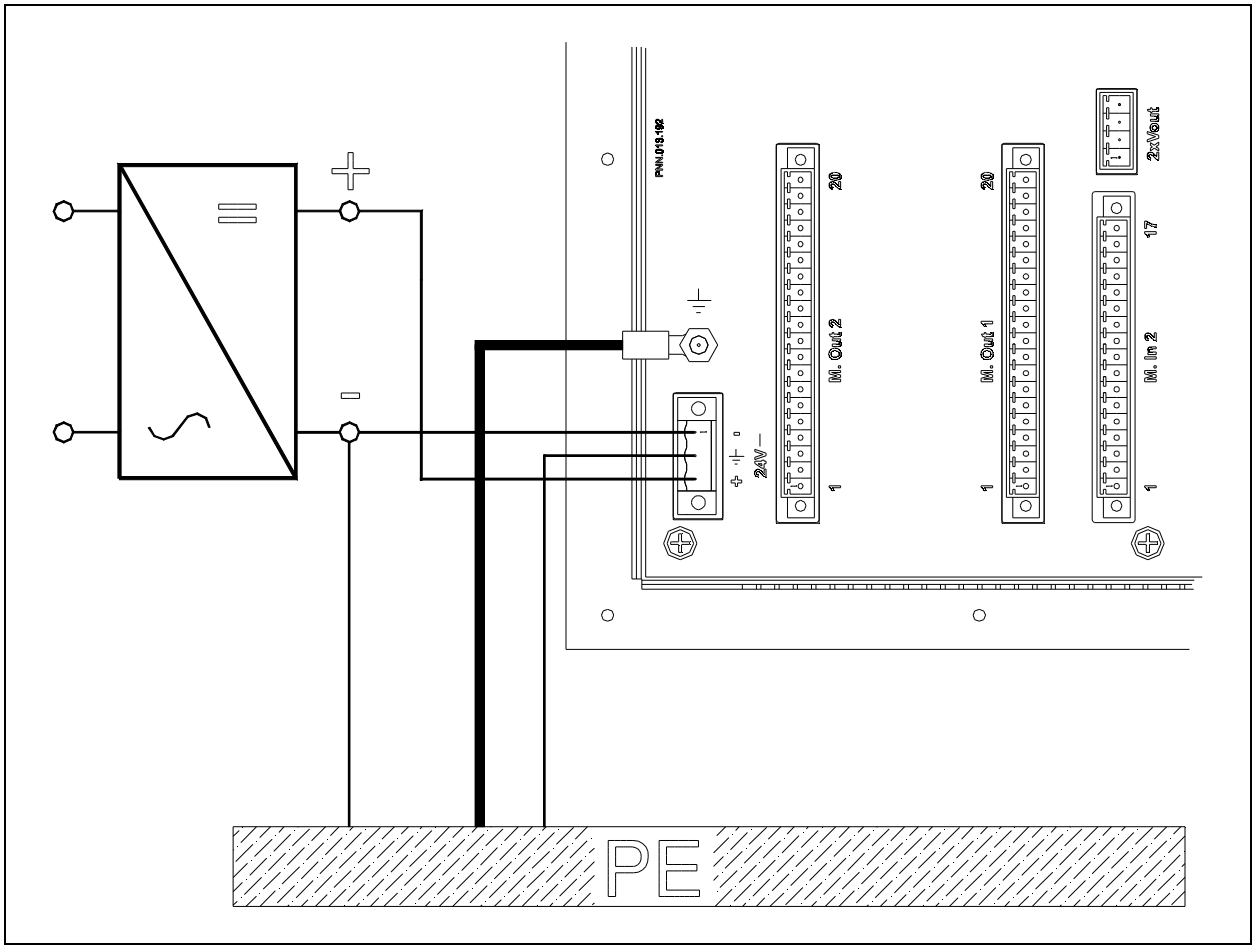


Figure 2.7 – 24 VDC power supply

2.5.4 12 bit analog inputs

- A potentiometer must be connected with a screened cable. The screen must only be connected from the CNC side.
- If the cable must be sectioned with a removable connector, never install the analog input cable with the power cables in the same connector. This is because there is no braid in the section where the contacts pass. It is thus unable to exercise its screening function and could allow spurious signals to enter.
- If the cable is sectioned with a removable connector, connect the screen on both sides of the connector so that it remains unbroken.

Electrical specifications

Static specifications	Value
Number of inputs	2
Input impedance in the signal field	1 Mohm
Input voltage range	0÷+5 VDC 0÷+10 VDC
Digital resolution	12 bits
Value of the least significant bit	1.25 mV
Maximum tolerated permanent overload (without damage)	-12 VDC +12 VDC
Digital output value in overload conditions	= F.S.
Type of input	Single ended
Potentiometer power supply: • Power supply voltage rating • Maximum powering current Protection against short-circuits	 +5 VDC. 40 mA YES (not permanent)

Dynamic specifications	Value
Total duration of input transfer	1 mS
Sampling period	Programmable
Characteristics of the input filter: • Order • Transition frequency (-3 Db)	 First 1 kHz

General features	Value
Type of protection	RC
Insulation potential in normal service conditions: • between channel and channel	 +12 / -12 VDC

Type of connector

Male 4-pin terminal strip Phoenix MCV 1.5/4-G-3.81 Code 1803442

Loose part: Phoenix MC 1.5/4-ST-3.81 Code 1803594

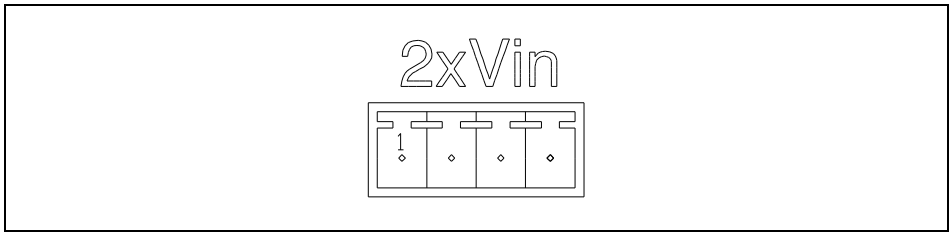


Figure 2.8 – Analog input terminal strip

Pin	Name	Type
1	INPUT 1	I
2	INPUT 2	I
3	VAL	VO
4	GND	VO

Name of signal:

GND	Power source ground
INPUT 1 - 2	Signal input
VAL	+5V power supply

Type of signal:

I	Input signal
VO	Output voltage

Connection examples

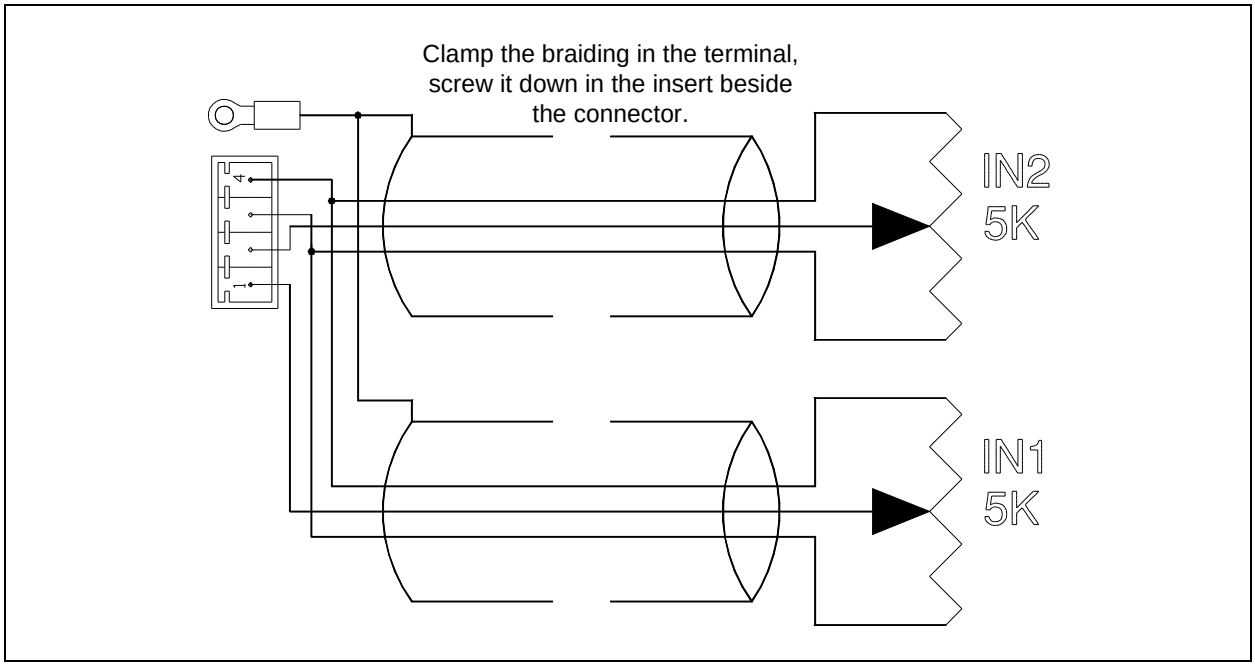


Figure 2.9 - Potentiometers.

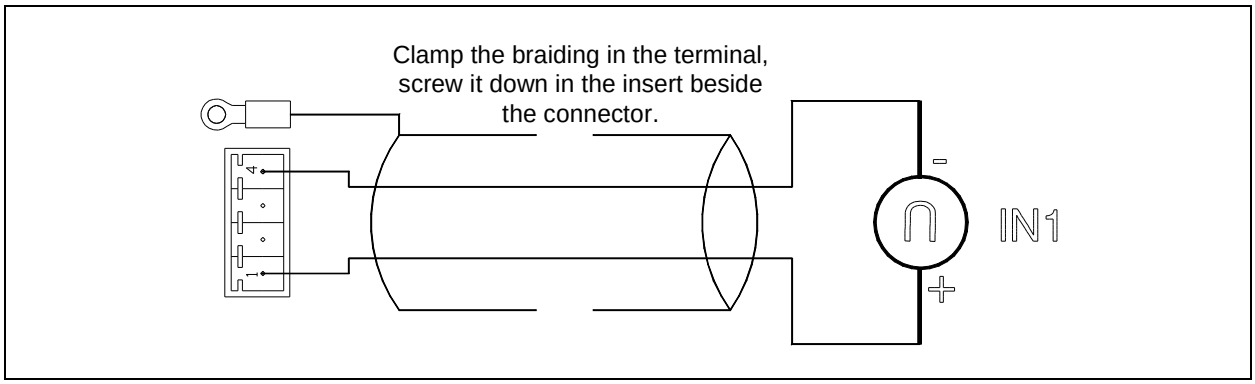


Figure 2.10 – Input in voltage

2.5.5 Analog outputs

- The connection must be made with a screened cable. The screen must only be connected from the CNC side.
- If the cable must be sectioned with a removable connector, never install the analog output cable with the power cables in the same connector. This is because there is no braid in the section where the contacts pass. It is thus unable to exercise its screening function and could allow spurious signals to enter.
- If the cable is sectioned with a removable connector, connect the screen on both sides of the connector so that it remains unbroken.

Electrical specifications

Static specifications	Value
Number of outputs	2
Output voltage range	0 - 10 VDC
Maximum output current	5 mA
Output ripple	20 mV
Digital resolution	12 bits
Value of the least significant bit	2.44 mV

Dynamic specifications	Value
Total duration of output transfer	1 uS

General features	Value
Type of protection	NO
Insulation potential in normal service conditions: • between channel and power supply	 0 VDC.
Common points between channels	GND
Type of load permitted	Insulated GROUNDED
Effect of incorrectly connected output terminals	Breakage

Type of connector Male 4-pin terminal strip: Phoenix MCV 1.5/4-G-3.81 Code 1803442

Loose part: Phoenix MC 1.5/4-ST-3.81 Code 1803594

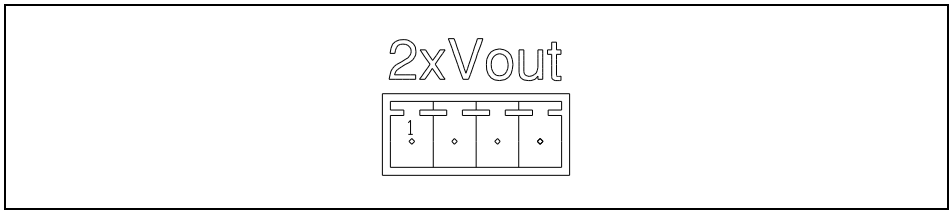


Figure 2.11 – Analog output terminal strip

Pin	Name	Type
1	OUTPUT 1	O
2	GND	REF
3	OUTPUT 2	O
4	GND	REF

Name of signal:

OUTPUT 1 - 2 Signal output

GND Ground

Type of signal:

O Output signal

REF Signal reference

Connection examples

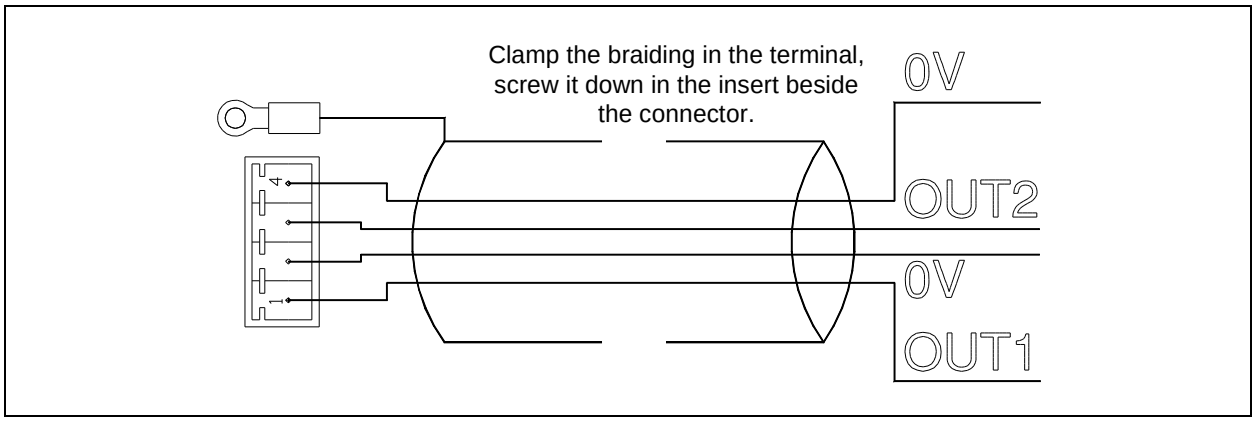


Figure 2.12 –Analog outputs

2.5.6 Digital inputs

General information

The input voltage can come from a power supplier obtained from a threephase transformer with diodes and condenser. The value of the alternate residue voltage (ripple) must comply with the minimum and maximum value given in the following table.
The contact of a limit switch or relay connected to the board's input terminal strip must be absolutely free from further connections with voltages relative to the machine's auxiliary circuit.
Do not use a limit switch with double contact if one of the two is connected to the 110 VAC auxiliary voltage or higher. The presence of humidity could cause a discharge between the two sections.
Failure to comply with these instructions could lead to damage in the board's input circuit.

Parallel inputs

If the same contact must also be used with another similar input (e.g. an external PLC or another numeric control input), install a decoupling diode in series as indicated in the "Connection examples" section.

Characteristics of the contact

Pay attention to the minimum switchable current and voltage when choosing the characteristics of the contact, for example of the relay or limit switch: the commutation voltage is 24 VDC while the current is about 4.5 mA

Cable sections

Consider the tensile stress due to the weight of the wires connected to the terminal board when choosing the section of the connection cables. There are no particular problems with a 1mm² section. Larger sections could make it difficult to fix the wires. The maximum section allowed by the terminal boards is 1.5 mm².

Common connection of the inputs (FIELD GND)

At least one common input contact (FIELD GND) must be connected.

Electrical specifications

Specification	Value
Number of inputs	32
Typical input voltage rating	+24 VDC.
Maximum input voltage rating	+30 VDC.
Minimum input voltage rating	+10 VDC.
Typical input current	4.5 mA
Maximum input current	6 mA
Hardware filter (RC)	No
Maximum commutation frequency	3 KHz
Delay on energizing	Sel. From SW
Delay on de-energizing	Sel. From SW
Protection against polarity reversal	YES
Protection against overvoltages	NO
Decoupled inputs in relation to the I/O BUS	YES

Type of connector

17-pin male terminal strip with block screw: Phoenix MCV 1.5/17-GF-3.5 Code 1843376

Loose part: Phoenix MC 1.5/17-STF-3.5 Code 1847275

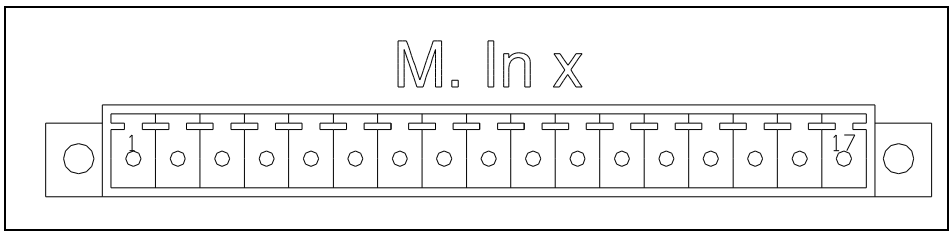


Figure 2.13 – Input terminal board

Pin	Name	Type
1	INPUT 1	I
2	INPUT 2	I
3	INPUT 3	I
4	INPUT 4	I
5	INPUT 5	I
6	INPUT 6	I
7	INPUT 7	I
8	INPUT 8	I
9	INPUT 9	I
10	INPUT 10	I
11	INPUT 11	I
12	INPUT 12	I
13	INPUT 13	I
14	INPUT 14	I
15	INPUT 15	I
16	INPUT 16	I
17	FIELD GND	REF

Name of signal:

INPUT 1 - 16	Digiyal input
FIELD GND	Input common contact reference

Type of signal:

I	Input signal
REF	Signal reference

Limit switch or relay contact connection example

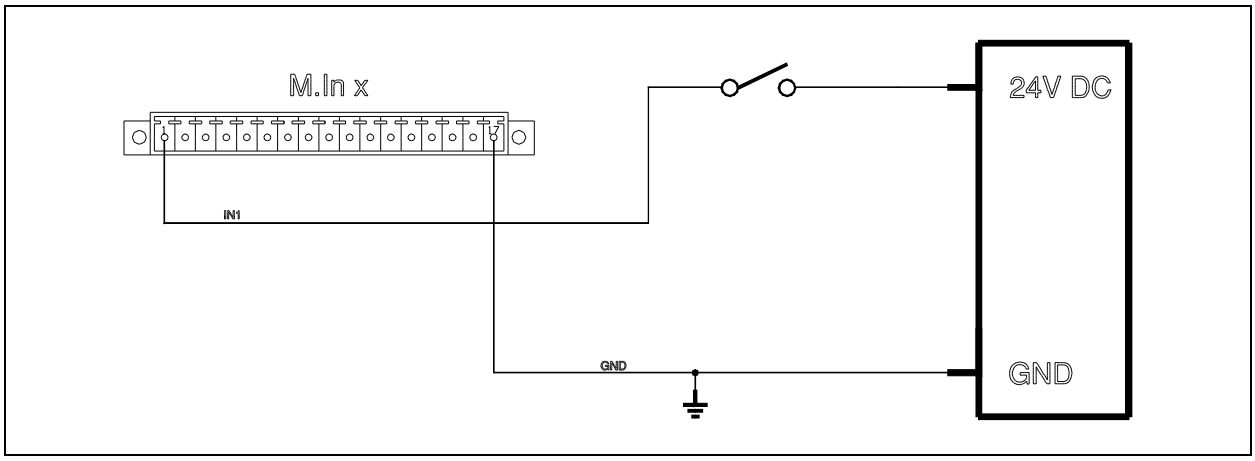


Figure 2.14 – Limit switch or relay contact

PNP open collector sensor connection example

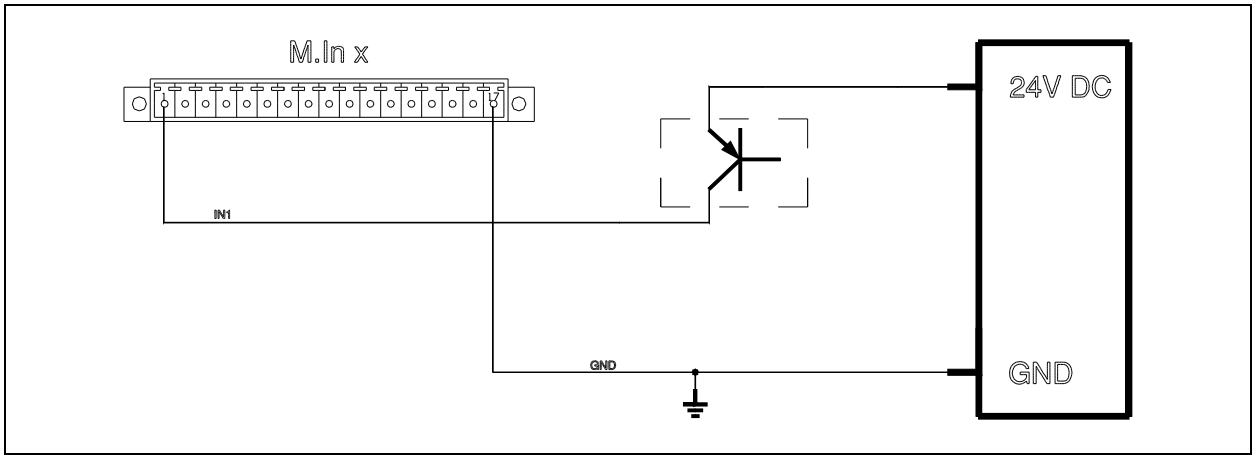


Figure 2.15 – PNP open collector sensor

Push pull sensor connection example

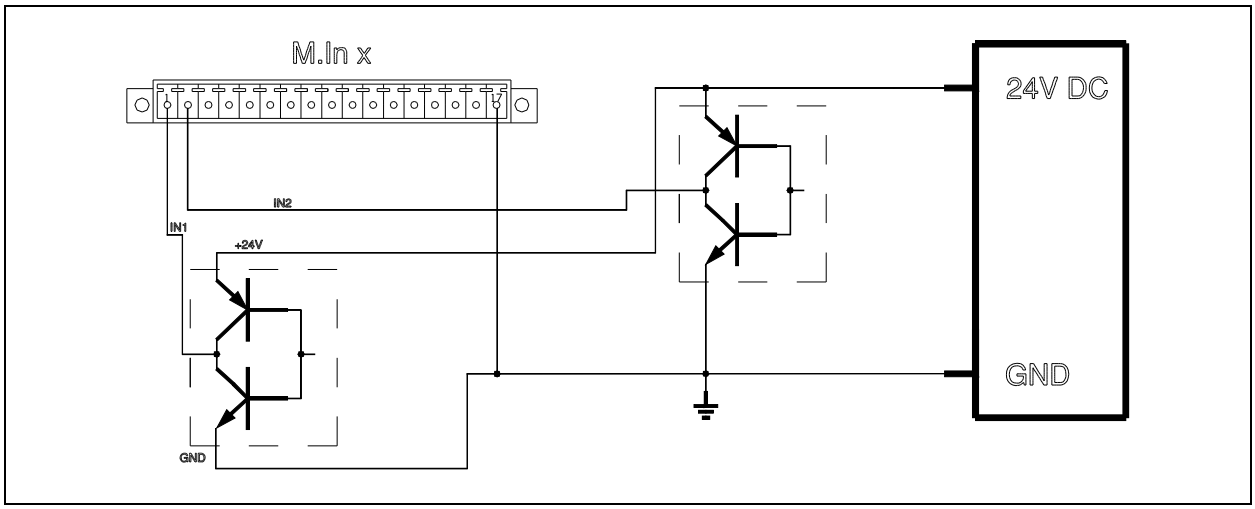


Figure 2.16 – Push pull sensor

Connection example of parallel inputs

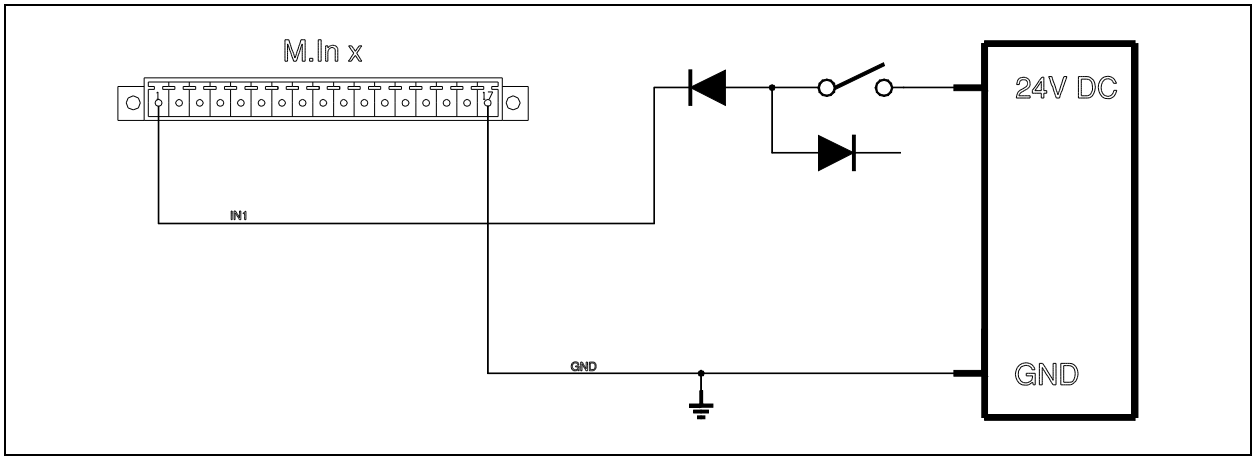


Figure 2.17 – Parallel inputs

2.5.7 Outputs

Cable sections

The cable section is bound to both the value of the output current (0.6A) and the tensile stress due to the weight of the wires connected to the terminal board. There are no particular mechanical or electrical problems with a 1mm² section. Larger sections could make it difficult to fix the wires. The maximum section allowed by the terminal boards is 1.5 mm².

Common output contact connection

Connect to GND as indicated in the figure

Electrical specifications

Specification	Value
Number of outputs	32
Typical output power supply voltage rating	+24 VDC
Maximum output power supply voltage rating	+28 VDC
Minimum output power supply voltage rating	+20 VDC
Outputs decoupled in relation to the BUS	No
Maximum direct current on the output	0.6 A (Note 1)
Typical output current	10 mA-600 Ma
Maximum direct current on the output (2 outputs in parallel)	1 A
Maximum direct current on the output (4 outputs in parallel)	2 A
Maximum current on each output common contact pin	2.5 A
Maximum commutation frequency for Io=0.7 A	3 KHz
Protection against short-circuits	YES
Protection against overload	YES
Protection against overvoltages	Max. +47VDC
Maximum inductive load demagnetization energy that can be dissipated	60 mJ
Minimum ON output voltage for Io=0.6 A with +24V DC power supply	23.8 VDC
Maximum OFF output voltage with +24V DC power supply	0.1 VDC

Note 1:

This is the maximum value possible prior to activation of the current limitation function or the protection against short-circuits.

Type of connector

20-pin male terminal strip with block screw: Phoenix MCV 1.5/20-GF-3.5 Code 1843402
Loose part: Phoenix MC 1.5/20-STF-3.5 Code 1847301

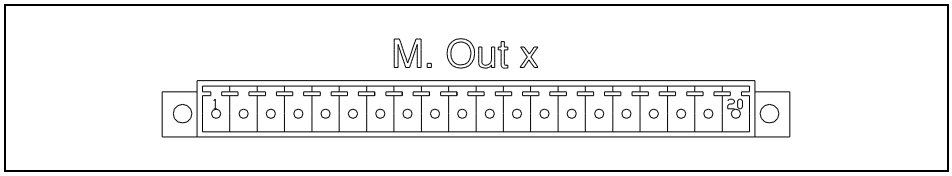


Figure 2.18 – Output terminal board

Pin	Name	Type
1	OUTPUT 1	O
2	OUTPUT 2	O
3	OUTPUT 3	O
4	OUTPUT 4	O
5	OUTPUT 5	O
6	OUTPUT 6	O
7	OUTPUT 7	O
8	OUTPUT 8	O
9	OUTPUT 9	O
10	OUTPUT 10	O
11	OUTPUT 11	O
12	OUTPUT 12	O
13	OUTPUT 13	O
14	OUTPUT 14	O
15	OUTPUT 15	O
16	OUTPUT 16	O
17	+24V DC Ext	VI
18	+24V DC Ext	VI
19	+24V DC Ext	VI
20	+24V DC Ext	VI

Name of signal:

OUTPUT 1 - 16 Digital Output

+24V DC Ext Output common contact (+24V DC power supply)

Type of signal:

O	Output signal
VI	Input voltage

Example of connection of a +24V DC solenoid valve

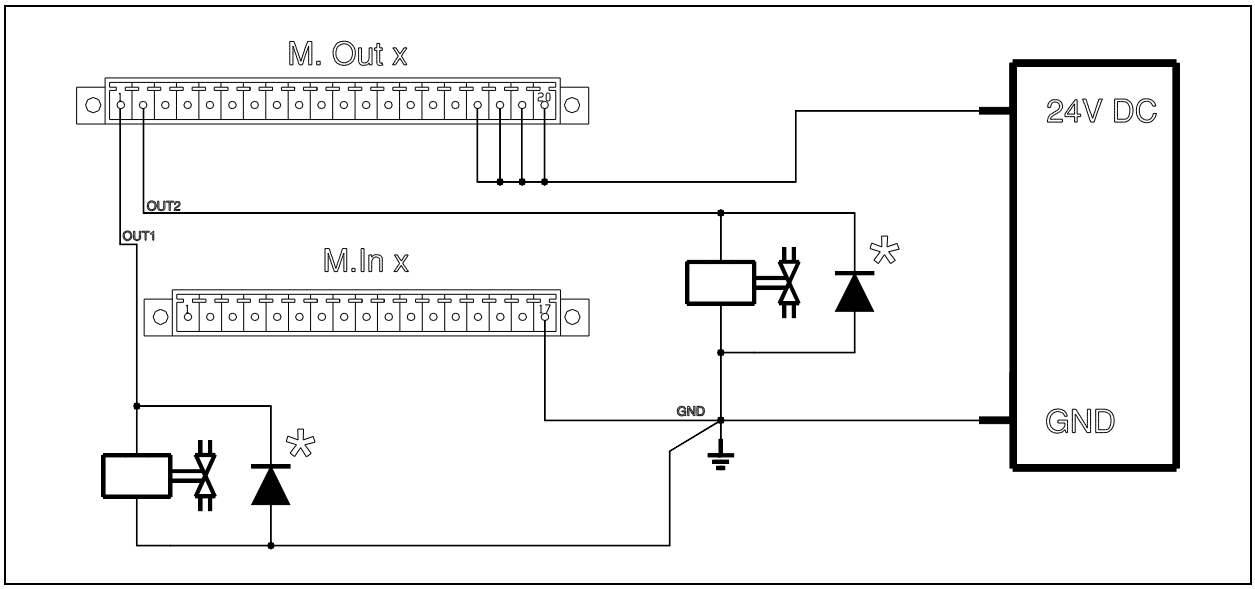


Figure 2.19 – +24 VDC solenoid valve

Example of connection of a +24V DC relay

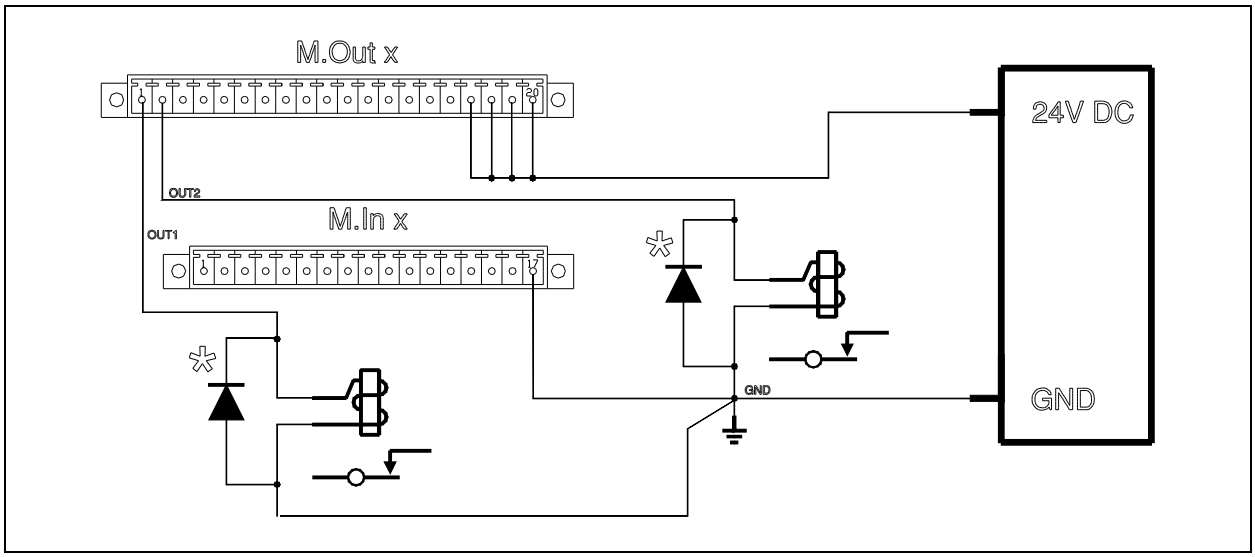


Figure 2.20 – +24 VDC relay

Note

The protection device marked with an asterisk * is not always necessary when it comes to dissipating the demagnetizing energy of an inductive load. However, it is necessary if the electromagnetic compatibility aspects are considered. The protection device considerably reduces the interference issued by the load during its commutations.

Connection example of an external PC

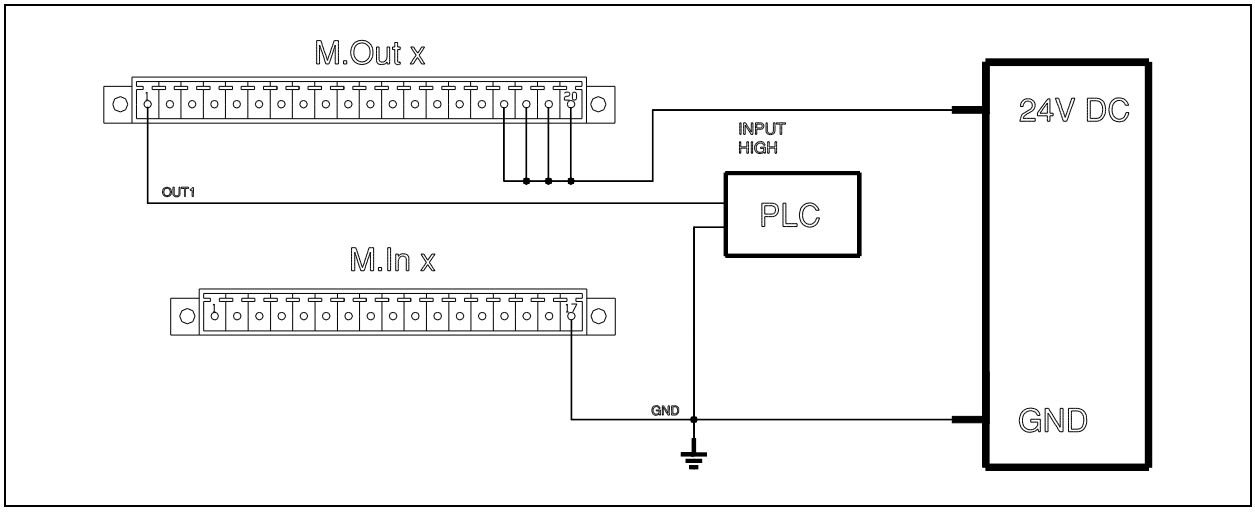


Figure 2.21 – External PLC

2.5.8 Encoder inputs

- The connection cable of the encoder must necessarily be shielded. The shield must only be connected on the CNC side and not on the encoder side, so long as this is fixed to a grounded metal support, otherwise the shield must be connected to the encoder if this latter is insulated from ground. The shield must be squashed in the middle of the connector's metallized cap.
- If the cable must be sectioned with a removable connector, never route the encoder cable with the power cables in the same section as the contacts are routed. This is because there is no braid in the section where the contacts pass and it is thus unable to exercise its screening function and could allow spurious signals to enter.
- If the cable is sectioned with a removable connector, connect the screen on both sides of the connector so that it remains unbroken.

Encoder inputs in parallel

Refer to the "Connection examples" section when connecting the encoder inputs in parallel. Take care to comply with the shield connection and do not exceed the maximum current limit the encoder outputs can supply. Do not connect the encoder power supply of both the inputs or both the machines. Only connect one power supply to the encoder (the nearest one). Incorrect power supply connection could break the power suppliers in the CNC.

Characteristics of the connector

Use the connector and the relative cap supplied with the board. If other connectors are used, the contact must possess the following characteristics:

- Contact resistance <= 10 mOhm.
- Gilded contact.
- Performance level 3 guaranteed for at least 50 activations/deactivations, according to standard DIN41652 part 2.

The cap must be the metallic or metallized type in order to provide adequate shielding.

Cable sections

The section of the connection cables must not be less than 0.2 mm^2. Moreover, it must also be selected to suit the load input and distance (normally, a cable with 0.22 mm^2 section conductors is used). The maximum connection distances given in the "Electrical specifications" tables can be doubled if double section cables are used).

Failure to comply with these instructions could lead to damage the input circuit's board or could prevent the system from functioning correctly.

Electrical specifications

Specification	Value
Number of inputs	4
Maximum input voltage rating	+7 VDC.
Minimum input voltage rating	-0.3 VDC.
Typical input current	2.3 mA @ 5 VDC
Maximum input current	5.0 mA @ 5 VDC
Input impedance in the signal field for single-ended inputs	2.2 Kohm
Input impedance in the signal field for differential inputs at +5V (Line driver)	1 Kohm
Differential input impedance in the signal field for differential inputs at +5V (Line driver)	120 Ohm
Hardware filter	No
Software filter	programmable
Maximum commutation frequency	500 KHz
Protection against polarity reversal	No
Protection against overvoltages	No
Decoupled inputs in relation to the I/O BUS	No
Type of cable to use for connecting the encoders	Shielded cable, with double shield and 0.2 mm^2 section
Maximum length of the cable to use for connecting the encoders	20 m max

Type of connector

D-Sub 9-pin female

Loose part: D-sub 9-pin male, to be soldered

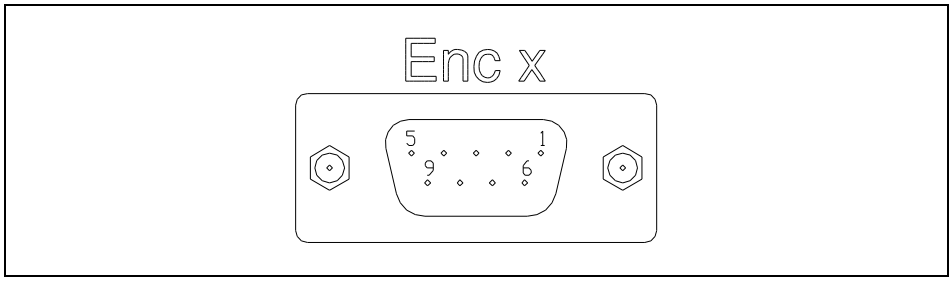


Figure 2.22 – Encoder input connector

Pin	Name	Type
1	N.C.	NC
2	+VE	VO
3	GND	VO
4	PHASE /A	I
5	PHASE A	I
6	PHASE /B	I
7	MARK /0	I
8	MARK 0	I
9	PHASE B	I
Cap	SHIELD	SCH

Name of signal:

+VE	Encoder power supply, selected from either +5V or +12V
GND	Power source GND
PHASE /A	Phase A denied
PHASE A	Phase A
PHASE /B	Phase B denied
PHASE B	Phase B
MARK /0	Mark 0 denied
MARK 0	Mark 0
N.C.	Not connected
SHIELD	Shield to press between the two halves of the connector’s metal cap.

Type of signal:

VO	Output voltage
I	Input signal
SCH	Shield

Example of a single ended encoder connection

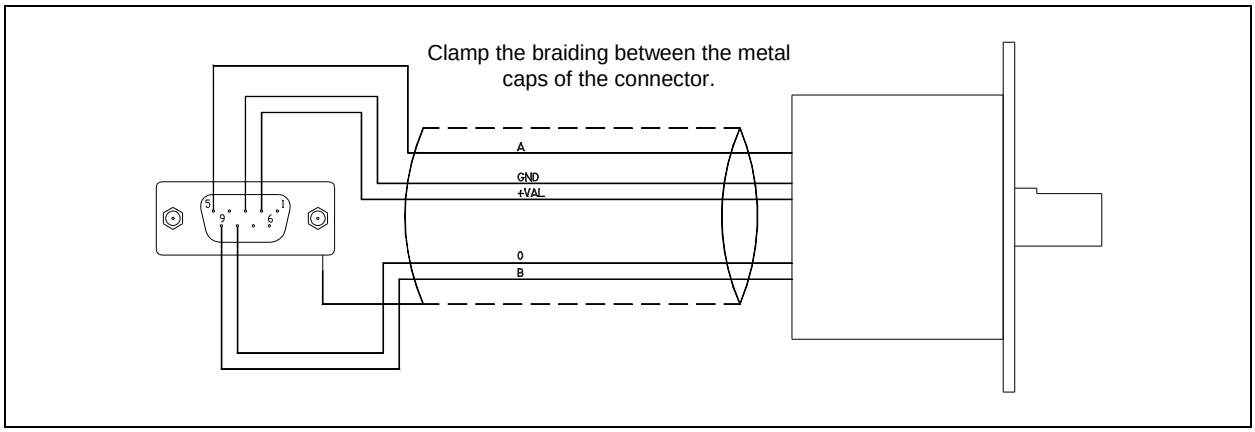


Figure 2.23 – Single ended encoder connection

Example of a differential encoder connection

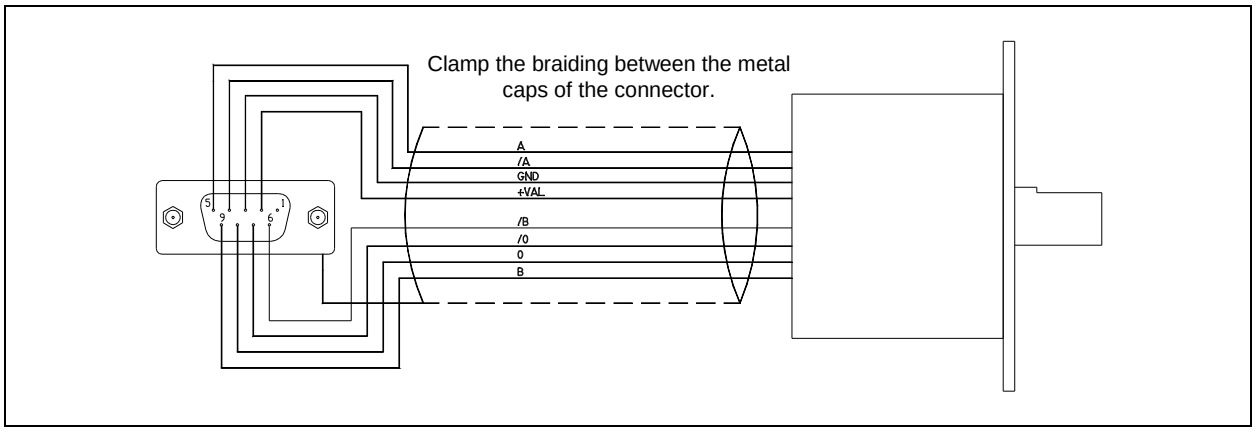


Figure 2.24 – Differential encoder connection

Example of parallel connection for encoder inputs

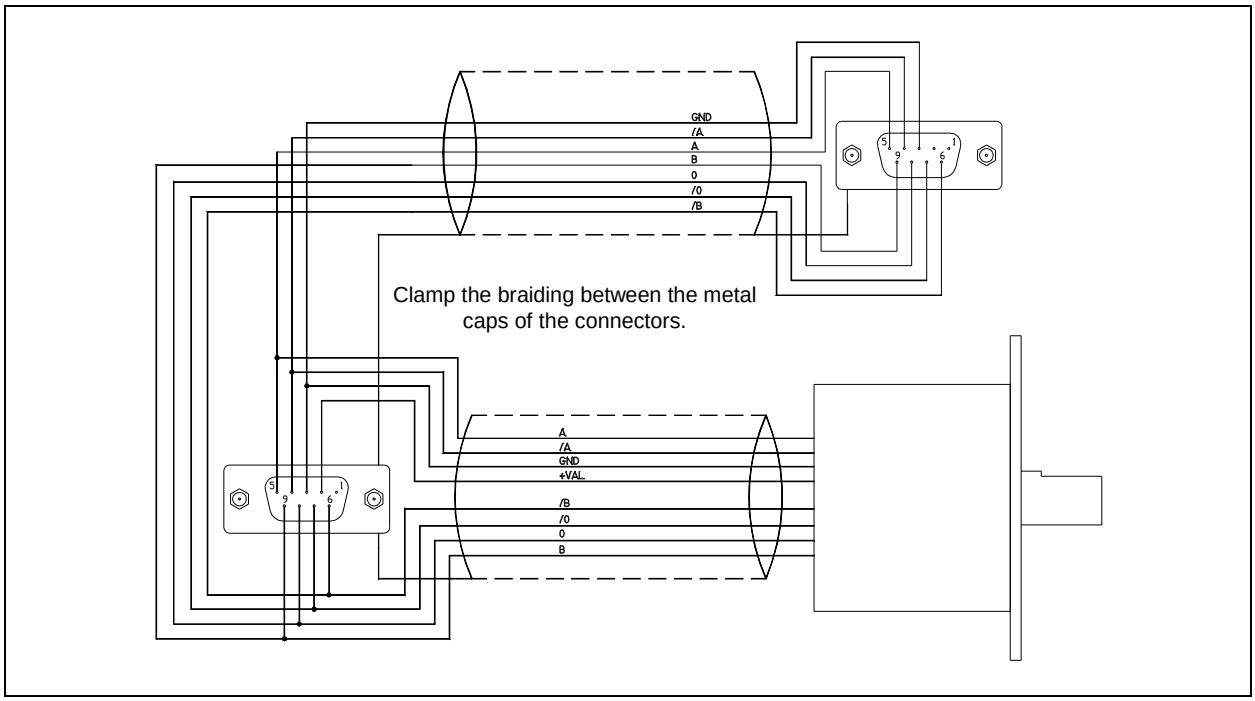


Figure 2.25 – Encoder input connection in parallel

2.5.9 Analog outputs of the axes

- The connection must be made with a shielded cable. The shield must only be connected from the CNC side. By and large, it is also advisable to connect it from the drive side, even though this sometimes worsens matters owing to the presence of potential differences between the various ground connections. Contact the Esa/Gv Services if you are unsure about how the connections must be made.
- If the cable must be sectioned with a removable connector, never install the analog output cable with the power cables in the same connector. This is because there is no braid in the section where the contacts pass. It is thus unable to exercise its screening function and could allow spurious signals to enter.
- If the cable is sectioned with a removable connector, connect the screen on both sides of the connector so that it remains unbroken.

Characteristics of the connector

Use the connector and the relative cap supplied with the board. If other connectors are used, the contact must possess the following characteristics:

- Contact resistance <= 10 mOhm.
- Gilded contact.
- Performance level 3 guaranteed for at least 50 activations/deactivations, according to standard DIN41652 part 2.

The cap must be the metallic or metallized type in order to provide adequate shielding.

Failure to comply with these instructions could prevent the entire system from functioning correctly.

Electrical specifications

Static specifications	Value
Number of outputs	4
Output voltage range	-10 -:- +10 VDC
Maximum output current	5 mA
Output impedance in the signal field	68 Ohm
Output ripple	1.25 mV
Digital resolution	14 bits
Value of the least significant bit	1.25 mV

General features	Value
Type of protection	NO
Insulation potential in normal service conditions: * between channel and power supply	 0 VDC
Common points between channels	GND
Type of load permitted	Insulated GROUNDED
Effect of incorrectly connected output terminals	Breakage

Type of connector

D-Sub 15-pin female

Loose part: D-sub 15-pin male, to be soldered

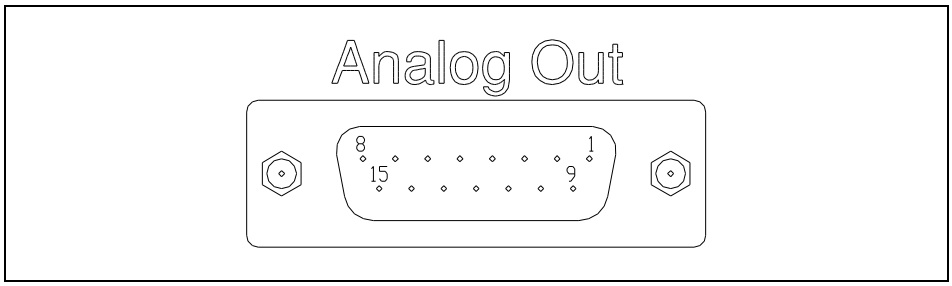


Figure 2.26 – Terminal strip for the analog outputs of the axes

Pin	Name	Type
1	OUTPUT 1	O
2	N.C.	NC
3	OUTPUT 2	O
4	N.C.	NC
5	N.C.	NC
6	OUTPUT 3	O
7	N.C.	NC
8	OUTPUT 4	O
9	GND	REF
10	N.C.	NC
11	GND	REF
12	N.C.	NC
13	GND	REF
14	N.C.	NC
15	GND	REF
Cap	SHIELD	SCH

Name of signal:

OUTPUT 1 - 4	Signal output
GND	Ground
N.C.	Not connected
SHIELD	Shield to press between the two halves of the connector’s metal cap.

Type of signal:

O	Output signal
REF	Signal reference
SCH	Shield

Connection examples

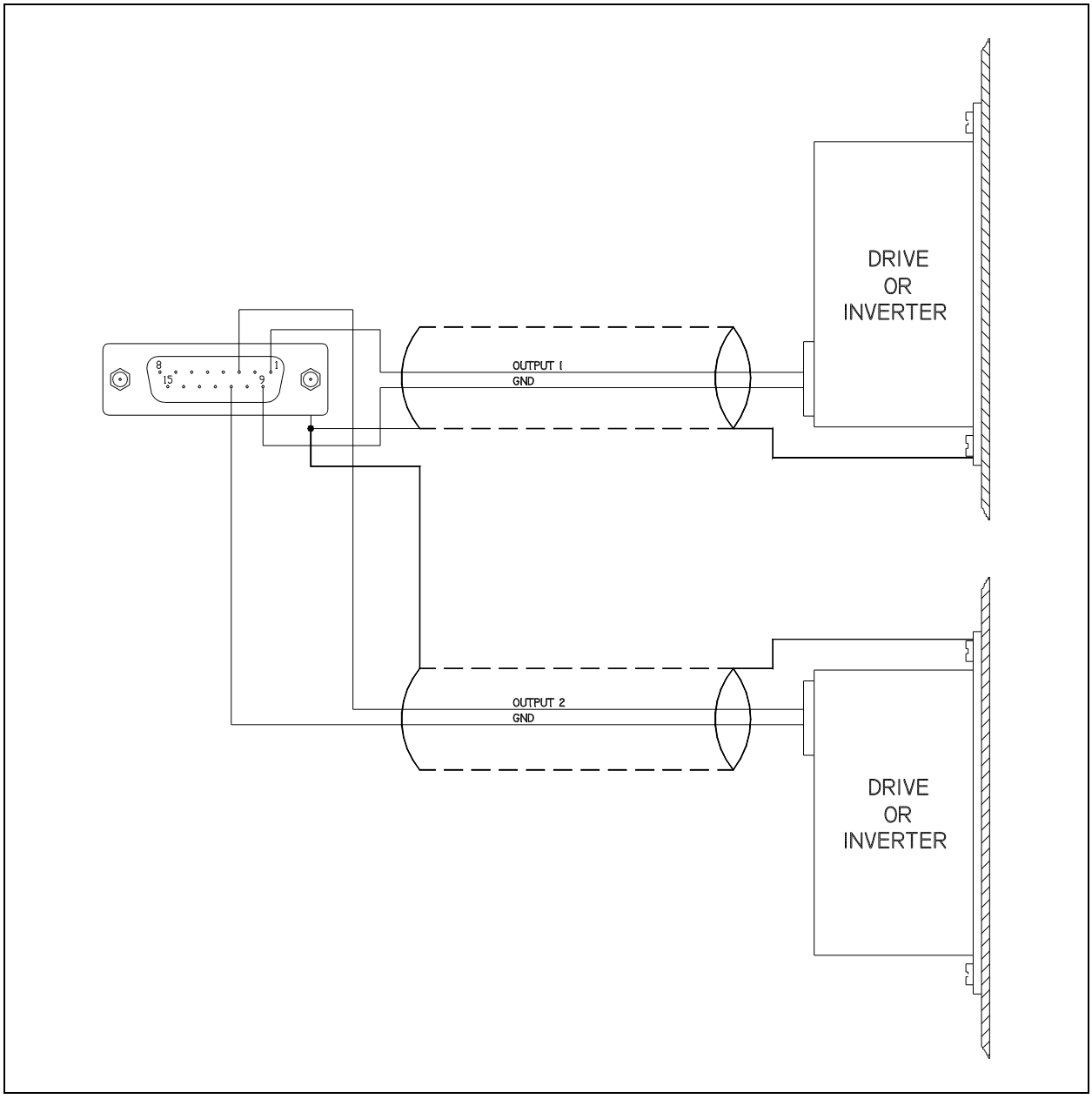


Figure 2.27 - Connection of the analog outputs ⇔ Drive

2.5.10 Serial links

- The connection between the CNC and peripheral device must be made with the instrument off. Connection with even only one device powered could break the line driver or line receiver.
- The connection must be made with a shielded cable. It is absolutely essential for the shield to be connected on both sides.
- If the cable must be sectioned with a removable connector, never install the signal cables with the power cables in the same connector. This is because there is no braid in the section where the contacts pass. It is thus unable to exercise its shielding function and could allow spurious signals to enter.
- If the cable is sectioned with a removable connector, connect the screen on both sides of the connector so that it remains unbroken.

Failure to comply with these instructions could lead to damage the input circuit's board or could prevent the system from functioning correctly.

Electrical specifications

RS232 Standard specification	Value
Number of channels	1 Com 2
Minimum input voltage rating	±3 VDC
Maximum input voltage rating	±30 VDC
Minimum input resistance	30 Kohm
Minimum output voltage	±9 VDC
Typical output voltage	±10.5 VDC
Maximum cable length	10 m
Maximum transreceiving frequency	115000 Baud

Type of connector

D-sub 9-pin male.
Loose part: D-sub 9-pin female, to be soldered

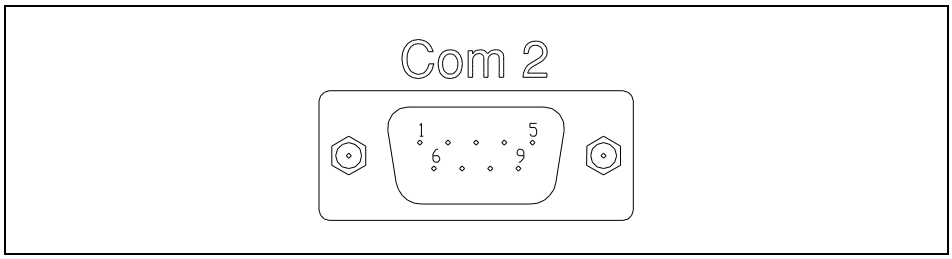


Figure 2.28 – Serial link connector

RS232C standard

Pin	Name	Type
1	DCD	I
2	RX	I
3	TX	O
4	DTR	O
5	GND	REF
6	DSR	I
7	RTS	O
8	CTS	I
9	RI	I
Cap	SHIELD	SCH

Name of signal:

DCD	Data Carrier Detect
RX	Receive
TX	Transmit
DTR	Data Terminal Ready
GND	Ground
DSR	Data Set Ready
RTS	Request To Send
CTS	Clear To Send
RI	Ring Indicator
SHIELD	Shield to press between the two halves of the connector’s metal cap.

Type of signal:

I	Input signal
O	Output signal

REF	Signal reference
SCH	Shield

RS232C standard connection examples

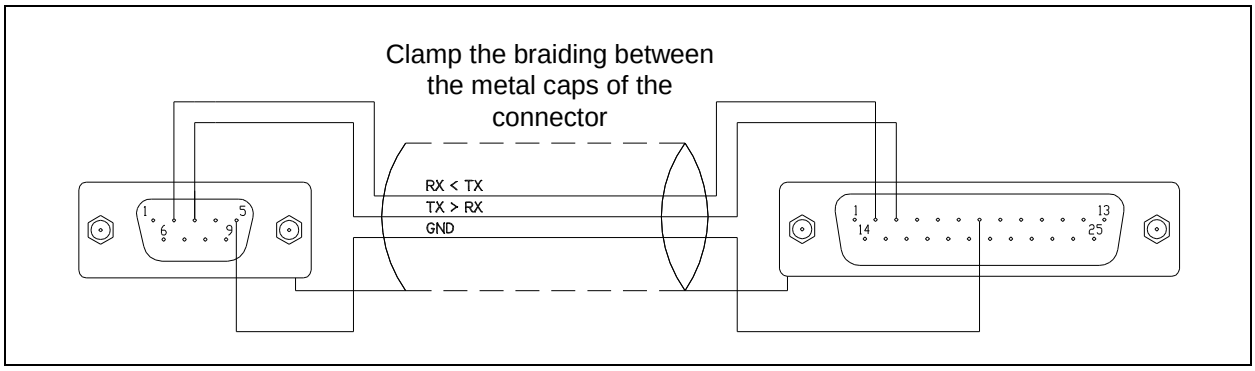


Figure 2.29 - CNC, → PC DTE, with 25-pin connector; RS232C

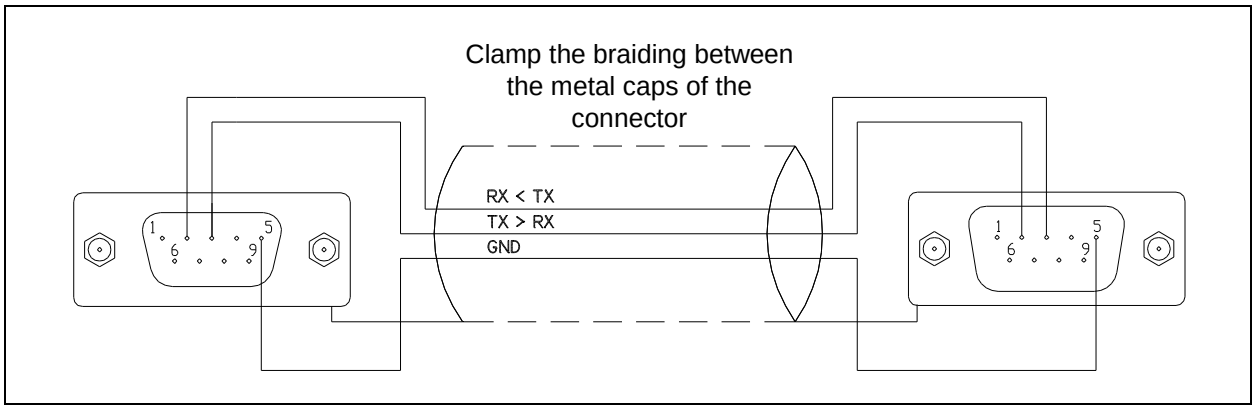


Figure 2.30 - CNC, → PC DCE, with 9-pin connector; RS232C

2.5.11 Ethernet Interface

- The subsistem Ethernet allows the support for standards: 10Mbit/s and 100Mbit/s, on RJ45 connector.

Type of connector RJ45

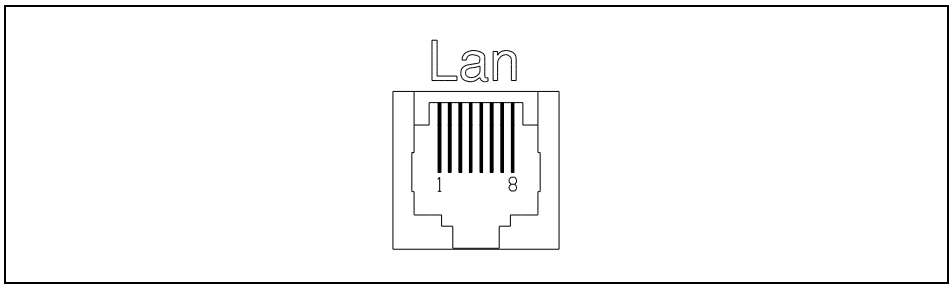


Figure 2.31 – Ethernet connector

Ethernet standard

Pin	Name	Type
1	TX+	O
2	TX-	O
3	RX+	I
4	N.C.	NC
5	N.C.	NC
6	RX-	I
7	N.C.	NC
8	N.C.	NC

Name of signal:

TX+	Positive differential trasmission signal
TX-	Negative differential trasmission signal
RX+	Positive differential reception signal
RX-	Negative differential reception signal
N.C.	Not connected

Type of signal:

I	Input signal
O	Output signal

2.5.12 VGA Interface

- The CNC has a video interface compatible with standard IBM VGA. At the interface connector it is possible connect an analog VGA or multisync monitor.

- For a connection between CNC and monitor is required to use cables supplied by the manufactures of the devices.

Failure to comply with these instructions could lead to damage the input circuit's board or could prevent the system from functioning correctly.

Electrical specifications

VGA specification	Value
Standard	Compatible with IBM VGA standard
Resolution r	1024x768 (16 M/colors)
Memory	SVGA - XGA
Monitor type managed	30 Kohm

Type of connector D-Sub 15-pin female High Density

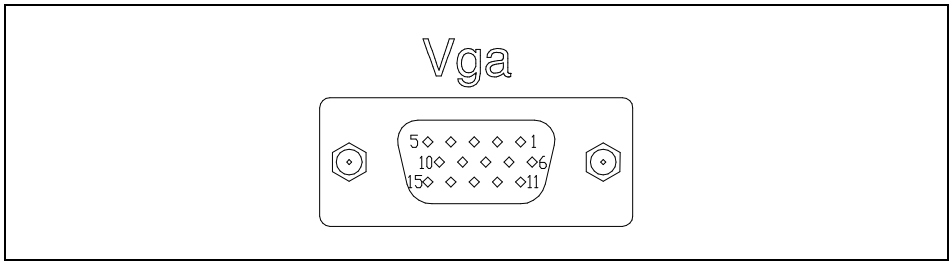


Figure 2.32 – VGA connector

VGA standard

Pin	Name	Type
1	RED+	O
2	GREEN	O
3	BLUE	O
4	N.C.	NC
5	GND	REF
6	GND (Red)	REF
7	GND (Green)	REF
8	GND (Blue)	REF
9	N.C.	NC
10	GND (Sync)	REF
11	Reserved	NC
12	DDDA	IO
13	H SYNC	O
14	V SYNC	O
15	DDCK	IO

Name of signal:

RED	Analog video out Red color
GREEN	Analog video out Green color
BLUE	Analog video out Blue color
GND	Ground
GND (Red)	Red Ground
GND (Green)	Green Ground
GND (Blue)	Blue Ground
DDDA	Display Data Channel Data
H SYNC	Horizontal Syncronization pulse
V SYNC	Vertical Syncronization puls
DDCK	Display Data Channel Clock
N.C.	Not Connect
RESERVED	Not Connect

Type of signal:

I	Input signal
O	Output signal
IO	Input/Output signal (BUS)
REF	Signal reference

2.5.13 USB Interface

- The CNC has two Universal Serial Bus (USB) connectors for connecting USB devices.

- For a connection between CNC and USB device is required to use cables supplied by the manufactures of the devices.

Failure to comply with these instructions could lead to damage the input circuit's board or could prevent the system from functioning correctly.

Electrical specifications

USB specification	Value
Number of channels	2: USB1, USB2,
Connector type	Type A
Version	2.0

Type of connector Standard A female

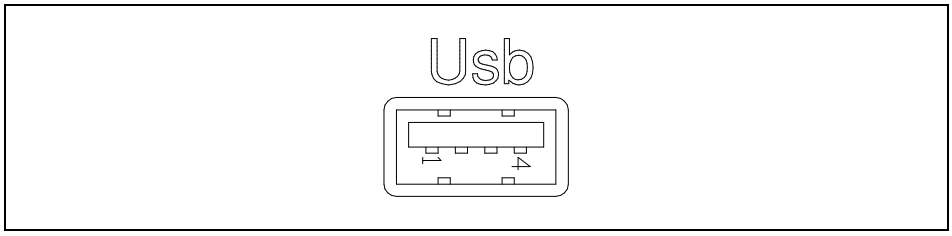


Figure 2.33 – USB connector

USB standard

Pin	Name	Type
1	VCC	VO
2	- USB	IO
3	+ USB	IO
4	GND	VO
Cap	SHIELD	SCH

Name of signal:

VCC	USB power supply, +5V DC
- USB	Negative differential signal USB
+ USB	Positive differential signal USB
GND	Power source GND
SHIELD	Shield to clamp between the two metal caps of the connector

Type of signal:

IO	Input/output signal (BUS)
VO	Output voltage
SCH	Shield

2.5.14 CAN BUS Interface

This manages the digital I/O, axes with the CAN interface.

- The connection cable must respect the CiA/DS-102.
- The cable must not be sectioned.

Cable characteristics

The connection cable must respect the CiA/DS-102.

- Number of wires = 1 pair, shielded.
- Impedance = 120 Ohm.
- Resistance and capacity = Function of lenght and transmission rate.

Failure to comply with these instructions could lead to damage the input circuit's board or could prevent the system from functioning correctly.

Electrical specifications

CAN BUS specification	Value
Number of channels	1
Number of nodes	60
BUS characteristic impedance	120 Ohm
Max. cable lenght	25 m (1Mbps) 1 km (50Kbps)
Max. common mode voltage	2 VDC
Max. bit rate	1Mbps

Type of connector

D-Sub 9-pin female

Loose part: D-sub 9-pin male, to be soldered

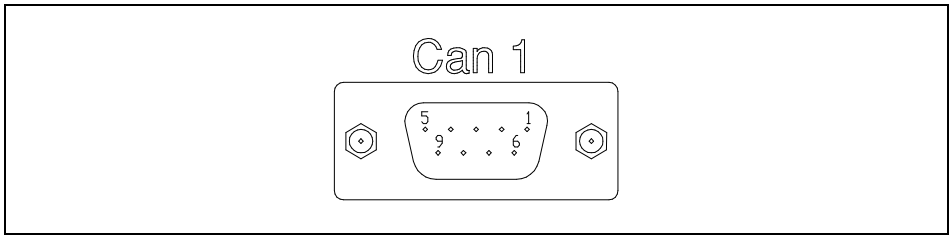


Figure 2.34 – CAN BUS connector

CAN BUSstandard

Pin	Name	Type
1	N.C.	NC
2	CAN-Low	IO
3	CAN-GND	REF
4	N.C.	NC
5	N.C.	NC
6	GND	REF
7	CAN-High	IO
8	N.C.	NC
9	N.C.	NC
Cap	SHIELD	SCH

Name of signal:

CAN-High	Bus signal
CAN Low	Bus signal negate
CAN GND	Ground
GND	Ground
N.C.	Not connected
SHIELD	Shield to clamp between the two metal caps of the connector

Type of signal:

IO	Input/output signal (BUS)
REF	Signal reference
SCH	Shield

CAN BUS connection examples

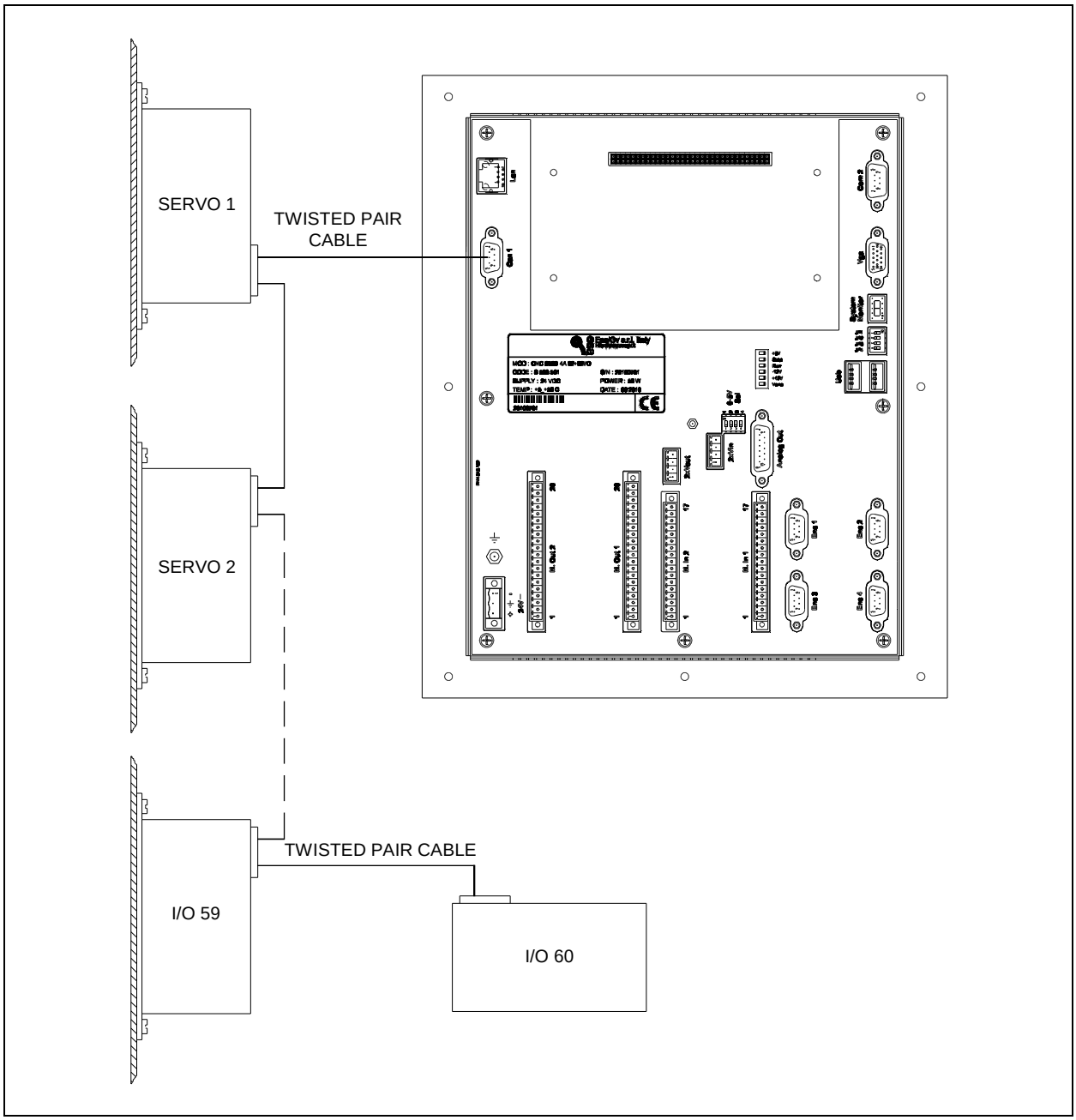


Figure 2.35 - Drives, I/O connection

N.B. The CAN BUS requires termination resistor at both ends. Internally, the CNC has already entered the termination resistor. CNC must to be the first ort the last phisical device on the can bus line.

2.5.15 Remote I/O interface (optional)

Only available with the remote I/O expansion board

Board BRD.019.402 Remote I/O interface board.

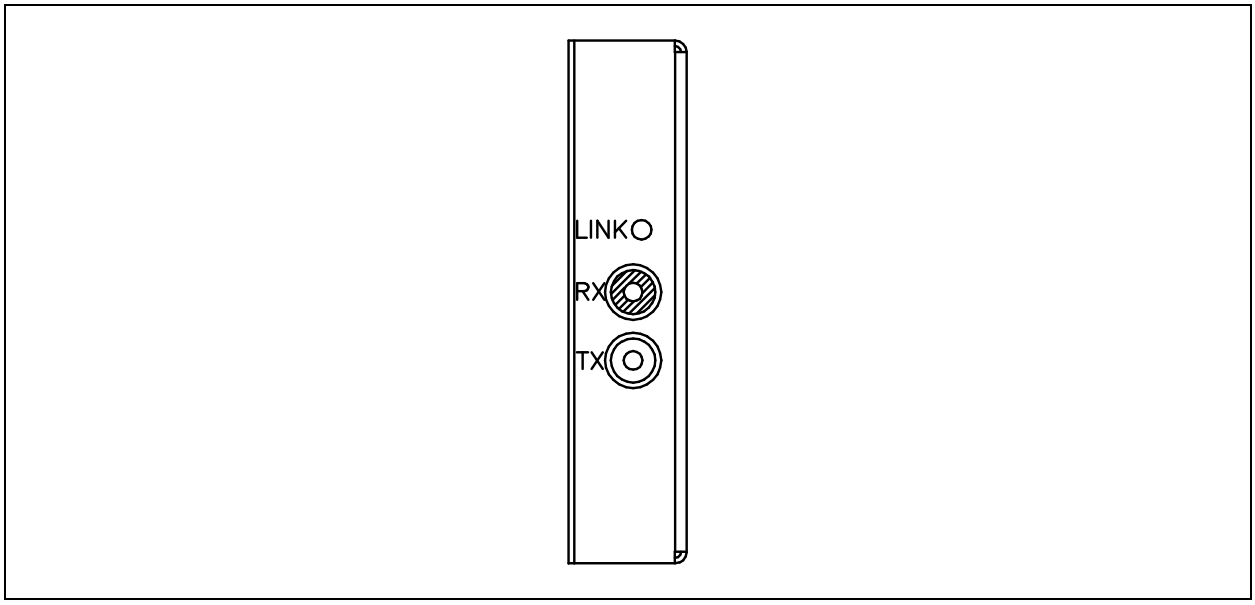


Figure 2.36 - BRD.019.402 remote I/O interface board

Optic fiber specifications

Optic fiber specifications	Value
Type	Plastic
Diameter	2.2 mm
Maximum tolerance	± 0.05 mm
Maximum attenuation	0.27 dB/m
Maximum extension force	1 N
Maximum radius of curvature	35 mm
Maximum length on TX output	20 m
Maximum transmission speed	2 Mb/s
Storage temperature	-55 to 85°C
Installation and operating temperature:	-20 to 85°C

Optic fiber connection

Proceed as described below to connect the optic fiber to the TX transmitter and RX receiver modules:

- cut the end using a cutter or knife;
- insert the optic fiber as far as possible into the modules;
- to remove the optic fiber, push the outer ring and pull the optic fiber as indicated in the figure.

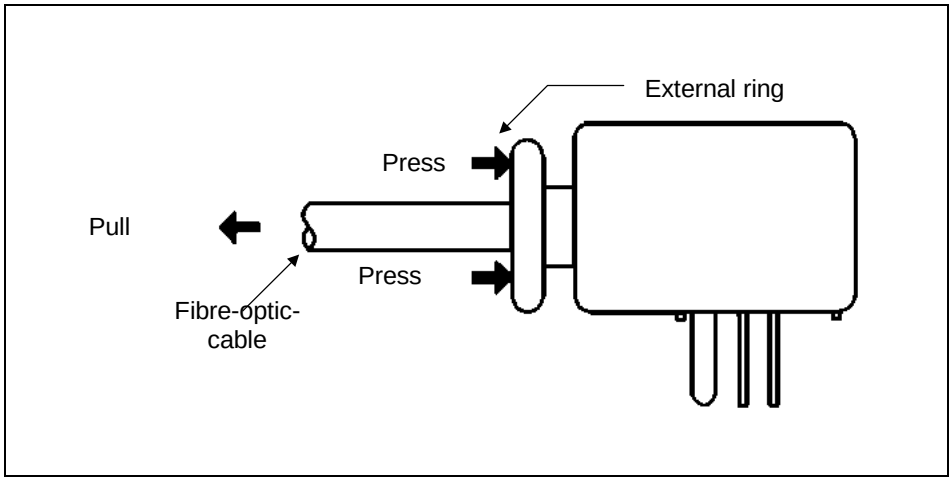


Figure 2.37 – How to remove the optic fiber

Do not remove the optic fiber from the TX or RX modules without pressing the outer ring as it could break and remain inside the module

Comply with the following instructions in order to use the optic fiber in the correct way:

- prevent dirt or dust from entering the TX or RX modules;
- do not use acids or alkaline solvents on the modules and do not inject these substances into the optic fiber hole. If this occurs, dry them with a small cotton swab;
- do not bend or pull the optic fiber beyond the value given in the specifications. Such action could cause the fiber to break.

Take great care when routing the optic fiber so as to prevent it from breaking. There are no particular problems involving disturbances owing to the optic nature of the signal conveyed along the fiber. Refer to the relative manual entitled “Remote I/O System” available from the Esa/Gv service division for further information about the remote I/O connections.

Remote I/O Bus connection example

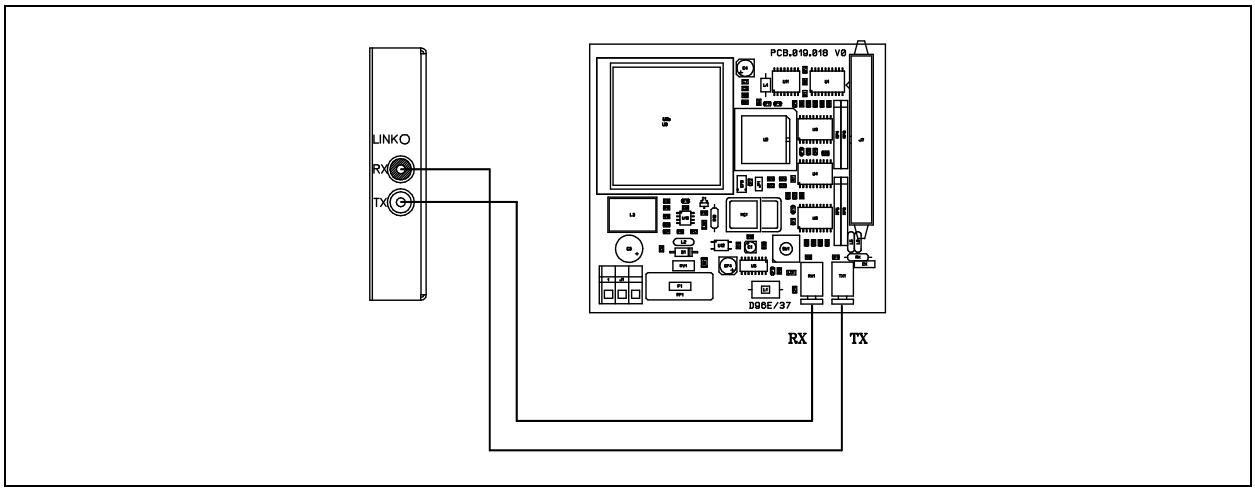


Figure 2.38 – CNC ⇔ Remote I/O connection (1 module)

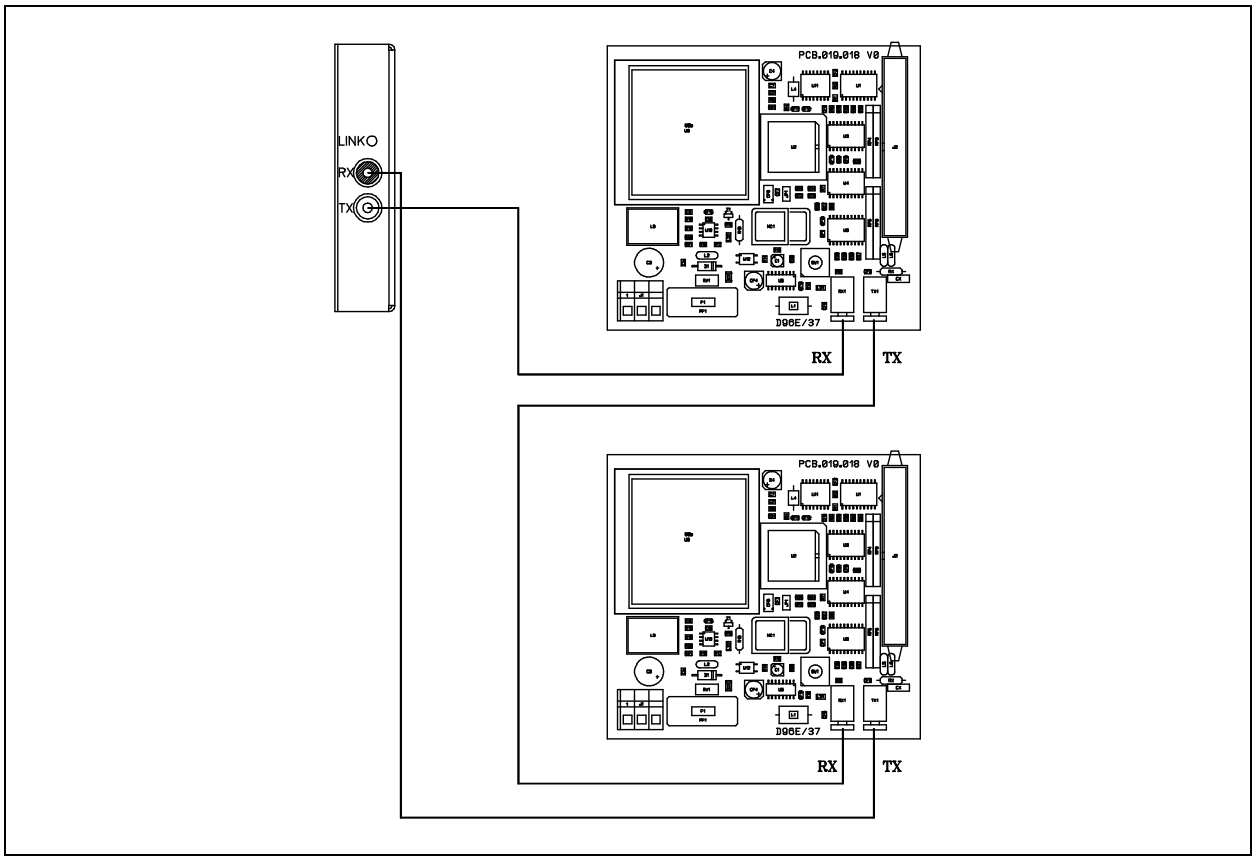


Figure 2.39 – CNC ⇔ Remote I/O connection (2 modules or more)

2.5.16 Shield connection

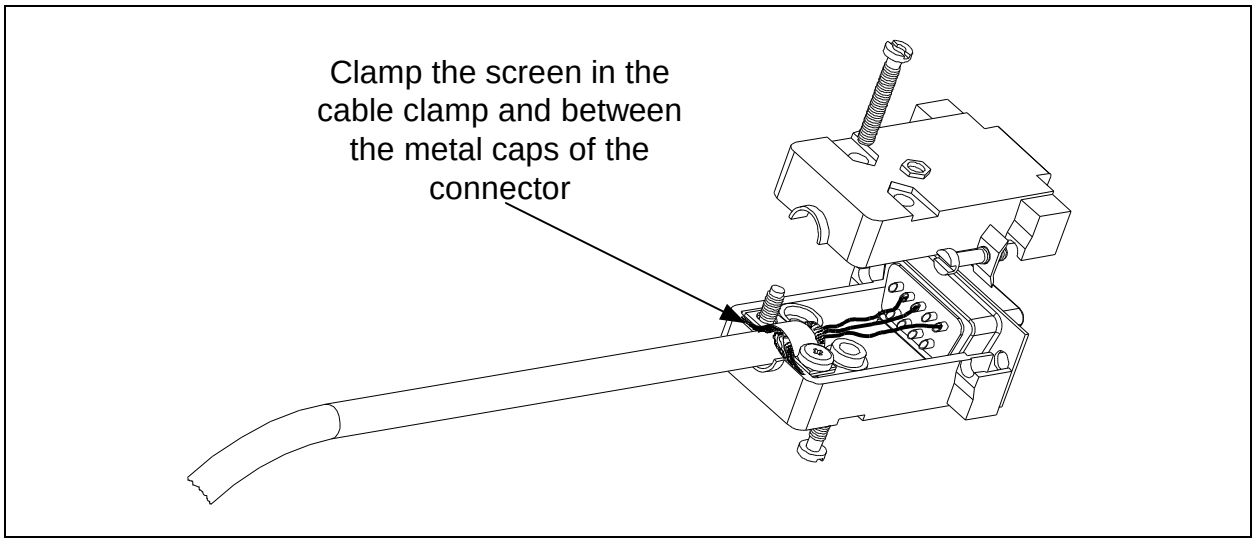


Figure 2.40 – Shield connection

FINE CAPITOLO

3 Diagnostics

3.1 LED

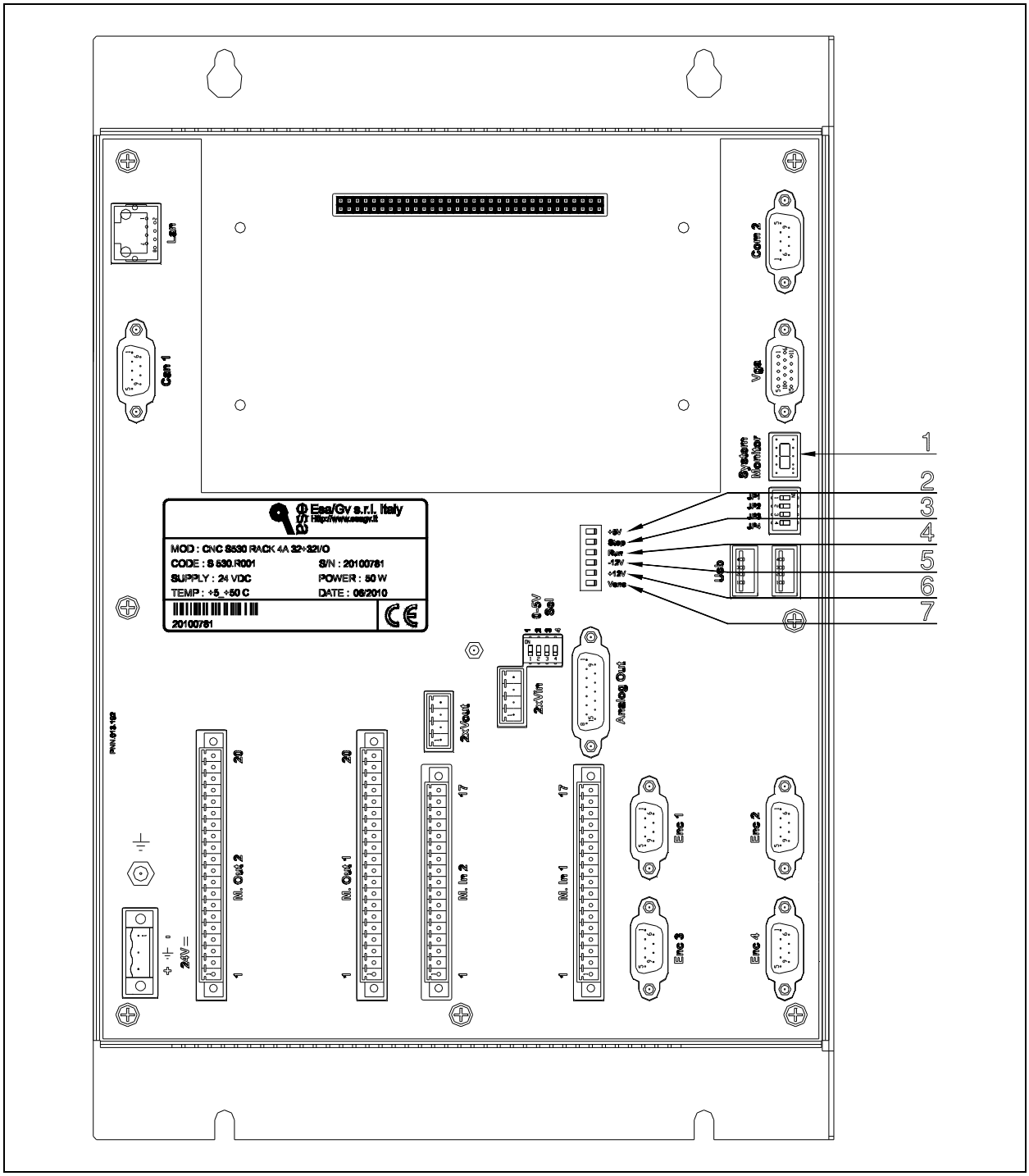


Figure 3.1 – CNC LEDs

1) System Monitor Display
2) + 5V LED. Signals the +5 VDC internal power supply (green led)
3) Stop LED. Signals when the CNC is not operating (STOP) (red led)
4) Run LED. Signals when the CNC is operating (RUN) (green led)
5) - 12V LED. Signals the -12 VDC internal power supply (green led)
6) + 12V LED. Signals the +12 VDC internal power supply (green led))
7) Venc LED. Signals the +Venc (+5 VDC) internal power suplly (green led)

Power Supply LEDs

The 4 LEDs (**+5V LED**, **-12V LED**, **+12V LED** and **Venc LED**) indicate the status of the voltages generated by the power supplier board and used by the instrument for operation. The following conditions may occur:

- All LEDs are on: the board operates correctl y.
- All LEDs are off: the board is not powered correctly. This can be caused by:
  - absence of 24 V DC powering voltage;
  - there has been a breakdown in the numeric control. Contact Esa/Gv's assistance service.
- **Venc LED** is off, but all the others are on. the board does not operate correctly, the internal protectione of the Venc is active. This can be caused by:
  - one of the sensors connected to the CNC (encoder, optic lines, etc.) causes a short-circuit on the encoder powering line. Disconnect the electric power supply from the CNC and disconnect all the encoder connectors . Power the CNC. If **Venc LED** comes on, this means that one of the sensors is broken or the wiring is incorrect. Repeat the operation by activating one encoder at a time and then check the wiring and sensors.
  - there has been a fault in the instrument. Contact Esa/Gv's assistance service.
- Any configuration differing from those described above, but with at least one led off: the board does not operate correctly. This can be caused by:
  - one of the boards in the instrument is broken and trips the powering voltage protection. In this case, fault finding requires comprehensive knowledge of the CNC, thus it is advisable to replace it;
  - there has been a fault in the instrument. Contact Esa/Gv's assistance service.

Run/Stop LEDs

Run LED and **Stop LED** indicate the operating status of the machine when this is correctly powered. The following conditions may occur:

- **Run LED** is on and **Stop LED** is off: the board operates correctly.
- **Run LED** is on and **Stop LED** is on: the board does not operate correctly. In this case, fault finding requires comprehensive knowledge of the CNC, thus it is advisable to replace it;
- **Run LED** is off and **Stop LED** is on: The CNC does not operate. The board does not operate correctly. In this case, fault finding requires comprehensive knowledge of the CNC, thus it is advisable to replace it;

System Monitor display

The 7-segment display indicates the status of the system. The following conditions may occur:

- The display is on and shows number 8:
  - there has been a breakdown in the instrument. Contact Esa/Gv's assistance service.
- The display is off: this can be caused by:

- the display fails to function correctly but the CNC operates in the correct way. In this case, ask to have the CNC replaced if a serious malfunction occurs;
- there has been a breakdown in the instrument. Contact Esa/Gv's assistance service.

System Monitor display diagnostics

The messages given by the display are listed below. There are other types of message supplied by the display that are considered "exceptions". These exceptions are described in the software manual of the operating system.

- **0 -** OK.
  - CNC OK
- **1 -** Reserved.
- **2 -** Reserved.
- **3 -** Kvara install CNC.
  - The ISO or the SLAVE or the PLC have not been installed. If 3 appears on the display after the application program has been run, it means that the PLC has not started up either because it has not been loaded, or because the I/O are missing or are incorrect. The IOREDIR file for configuring the I/O in disk H of the CNC may also be incorrect. In this case, the application must be reset and installed by means of autosetup.
- **4 -** Kvara application.
  - 4 appears on the display after STARTNC has been run if disk H of the CNC contains the KVARA.GZ file.
- **5 -** Kvara loader.
  - 5 appears on the display when the CNC is powered if the FLASH memory of the CNC contain both BIOSEXT and LOADER, waiting for STARTNC to be run.
- **6 -** Kvara biosext.
  - 6 appears on the display when the CNC is powered if the FLASH memory of the CNC contain both BIOSEXT and LOADER. Reset the LOADER and run an autosetup.
- **7 -** Power Fail.
  - There has been a powering voltage drop for a shorter time than the system RESET, meaning that the power supply is not stable. In this case, turn off the CNC, check the power supply and then power the CNC again.

- **8 -** Power ON.
  - Appears after the CNC has been powered, but must disappear to leave space for 0 when the CNC is operating. 8 remains when the CNC is not operating.
- **9 -** User interface DLL not present.
  - GUIAPP.DLL file missing; restore the file.
- **A -** Diagnostic menu.
  - After STARTNC has been executed, the display indicates A if the KVARA.GZ file is missing from the H disk of the CNC or if PERMISSION=LOADER is present in the KVARA.INI file of the PC. Proceed with an autosetup.
  - Autosetup in progress
  - Recovery in progress
  - Loader, KVARA.GZ decompacting problems, or memory checking or application loading.
- **B –** NC CPU battery fail.
  - Backup battery of the CMOS SETUP discharged. Contact Esa/Gv's assistance service to have the NC board replaced.
- **C -** Shut Down.
  - The CNC can be switched off without losing machine data.
- **D -** Reserved.
  - Debug.
- **E -** Reserved.
  - Not used.
- **F -** MFB reset.
  - CNC in the reset mode. A CNC reset command has been transmitted. Wait until the CNC has been reset.
  - Loader with problems during the File System disk opening phase.

System Monitor display powering sequence

Once the CNC has been powered in operating systems that handle the System Monitor display, the following messages will appear in sequence (within a few tenths of a second).

- Power ON.
  - Messages **8 → 5 → 4 → 3 → 0**.

3.2 Remote I/O interface LED

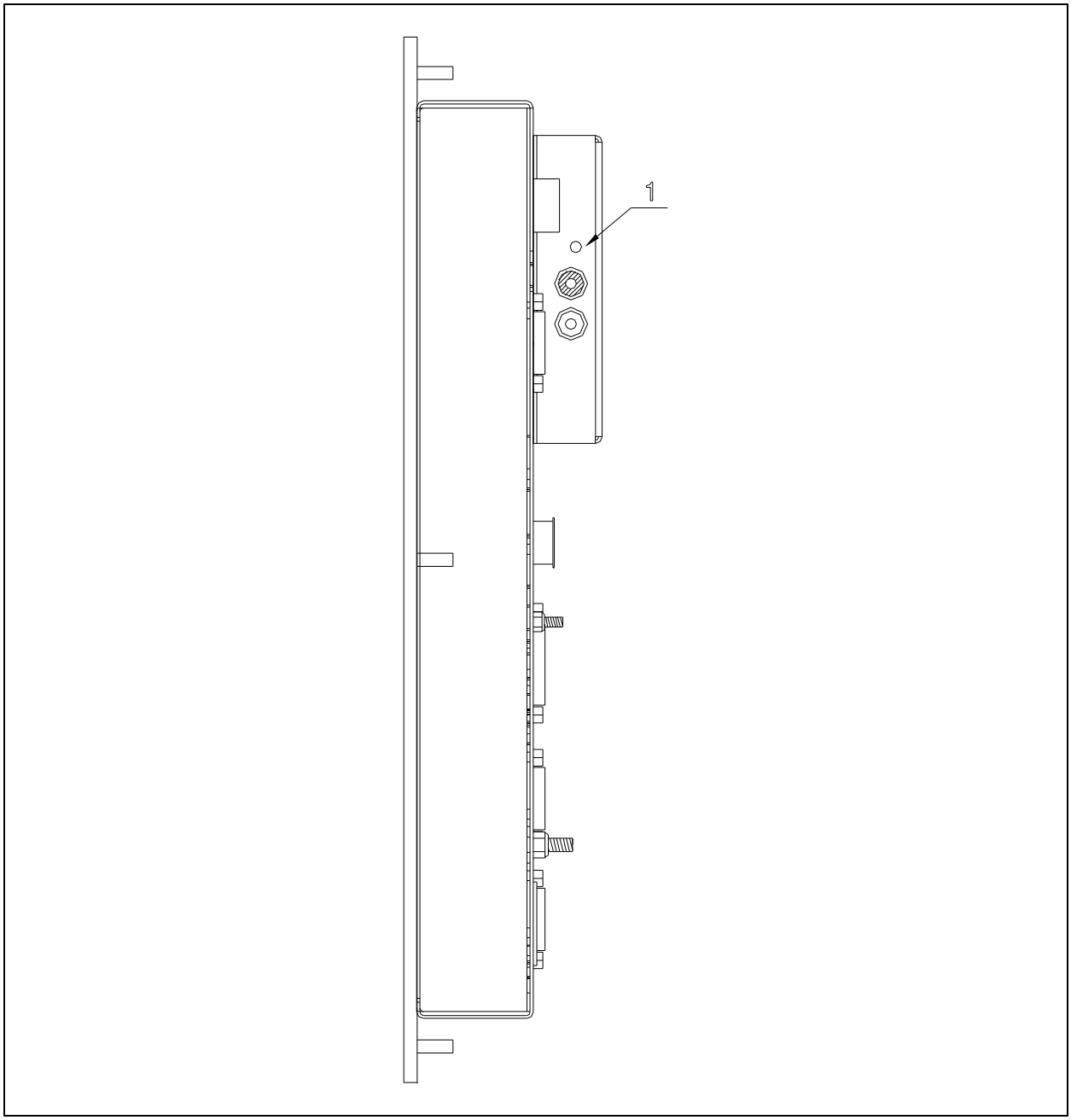


Figure 3.1 – Remote I/O expansion LED

1) LINK LED: Signals the status of the remote I/O BUS (green led)

Remote I/O Link LED

The following conditions may occur:

- LED on: optic fiber serial connection with the transmitter node has been made. The module operates in a regular way.
- LED off: connection with the transmitter node has not been made. An error message will appear on the numeric control. This can be caused by:
  - the receiver node is not addressed by the transmitter node in the numeric control;
  - incorrect position of the rotary dip-switch used for selecting the address of the receiver node;
  - the optic fiber (either the RX or TX) is not connected or is broken, or has been badly cut;
  - the receiver node is faulty;
  - the transmitter node is faulty;
- LED flashing: connection to the transmitter node sometimes fails. An error message will appear on the numeric control. This can be caused by:
  - interference that couples straight on to the transmitter or receiver modules;
  - optic fiber with false contacts in the TX and/or RX connectors;
  - optic fiber damaged or cut badly;
  - defective receiver module;
  - defective transmitter module.

When off, the LINK LED will reset all the outputs of the output modules connected to the I/O BUS. The output RESET signal takes 50 ms to activate from the moment in which there is no longer an optic fiber serial link and the LINK LED goes out.

3.3 Debugging of the instrument

Debugging of the instrument

Refer to the instructions in the “Diagnostic Manual” when debugging the instrument (testing the serial links, inputs, outputs, inputs via encoder, etc.).

END OF CHAPTER

4 Servicing and maintenance

4.1 List of spare parts

A few examples of codes for ordering equipment and spare parts are given below.
Refer to the Esa/Gv Orders department when ordering the parts and the relative codes.

CODE	QUANTITY	DESCRIPTION
S 530.R001	1	CNC S 530 Rack 4A 32+32I/O
BTT.003.006	1	3.6V lithium battery, Size AA

4.2 WARNING

Dangerous voltages are present in certain parts of the electric panel during operation.
Servicing operations carried out in the wrong way could damage the numeric control.

Servicing work must be carried out in the following way:

- Only qualified personnel must be allowed to service the equipment.
- The CNC must be disconnected from the electric power source before any servicing work is carried out.
- Comply with the instructions given below.

4.3 Fuse

The instrument has two internal fuses, that can be reset and not replaced, which protects:

1. the instrument itself and the external power supplier
2. the encoder voltage (Venc).

Proceed in the following way if the resettable fuse 1 should activate (all the power indicator leds are off):

- Disconnect the instrument from the electric power source.
- Remove the connectors that connect the I/O, encoder and analogs so as to insulate against any external short-circuits.
- Wait a few minutes to allow the fuse to reset.
- Power again and make sure that all the power indicator leds are on correctly. If they are not, replace the complete instrument as it is faulty. If all the indications are correct:
- Turn off the electric power supply and re-connect all the connectors in sequence, so as to find any short-circuits.
- Turn on the power again.

Proceed in the following way if the internal fuse 2,on **Venc,** should activate (Venc power indicator led is off):

- Disconnect the instrument from the electric power source.
- Remove the encoder connectors so as to insulate against any external short-circuits.
- Replace the fuse with one of an equivalent type.
- Power again and make sure that all the power indicator leds are on correctly. If they are not, replace the complete module as it is faulty. If the indication is correct:
- Turn off the electric power supply and re-connect all the encoder connectors in sequence, so as to find any short-circuits.

Warning! Contact the Esa/Gv assistance service if the fuse continues to activate.

4.4 Opening the unit

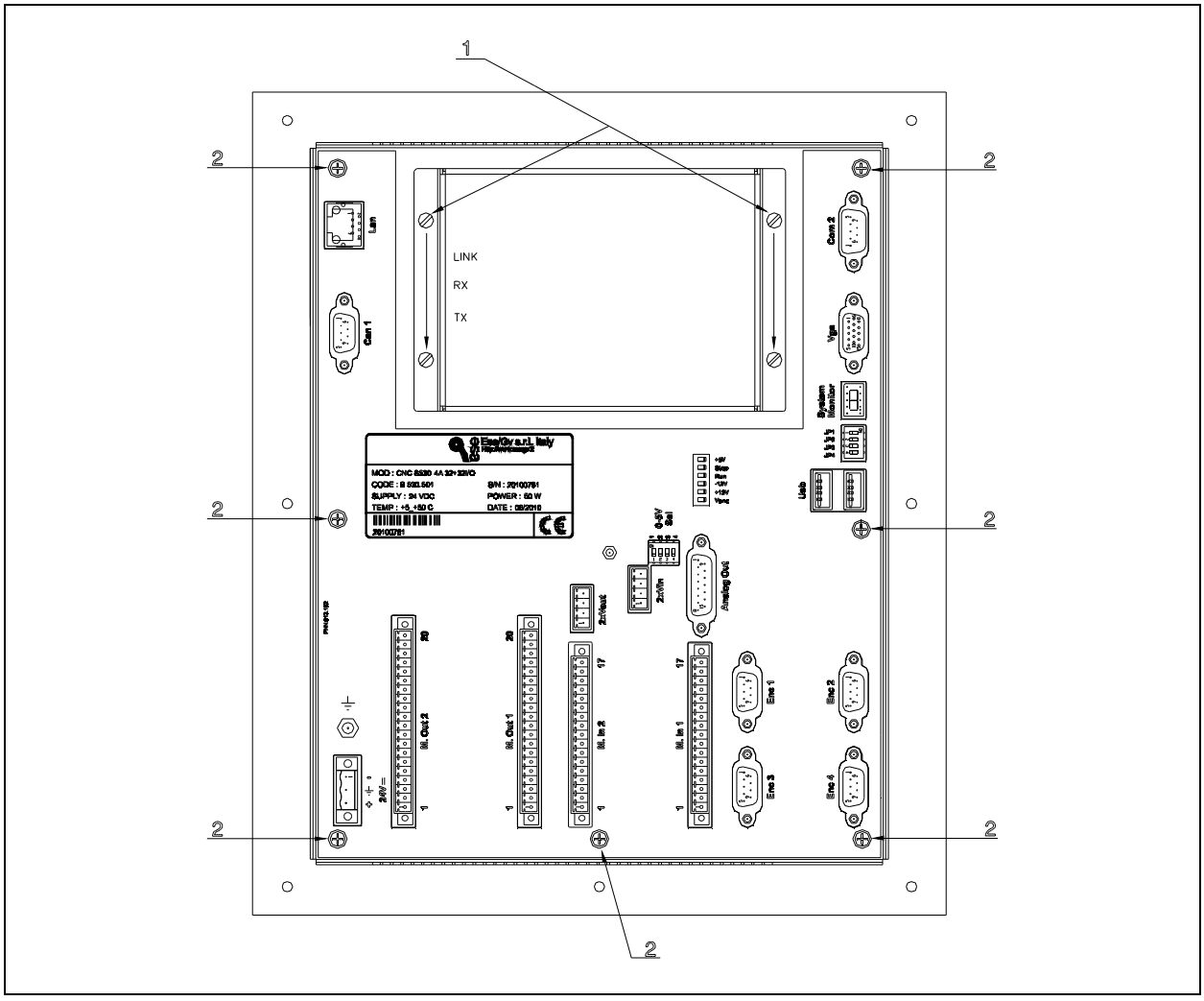


Figure 4.1 – Opening the unit

1) Remote I/O expansion fixing screw
2) Cover fixing screw

Procedure

- Disconnect the unit from the electric power source.
- Disconnect all the wires from the electric panel connected to the unit
- Unscrew the screws that fix the expansion board
- Remove the expansion board
- Unscrew the screws that fix the closing casing of the unit.
- Remove the closing casing from the unit.

4.5 Replacing the battery

The backup battery for the machine data and the work programs, saved in the Shared memory and on disks G and F of the Multifunction card, is a LITHIUM 3.6V AA battery (STILO) and lasts roughly 3 years if the control is turned off regularly.
If the voltage drops below the limit value required to guarantee the data storage, the equipment activates a battery low message. From when this message appears you have roughly 2 weeks to replace the battery; at the end of this period the battery will be flat and the entire memory will be lost if the machine is turned off for more than 8 hours.

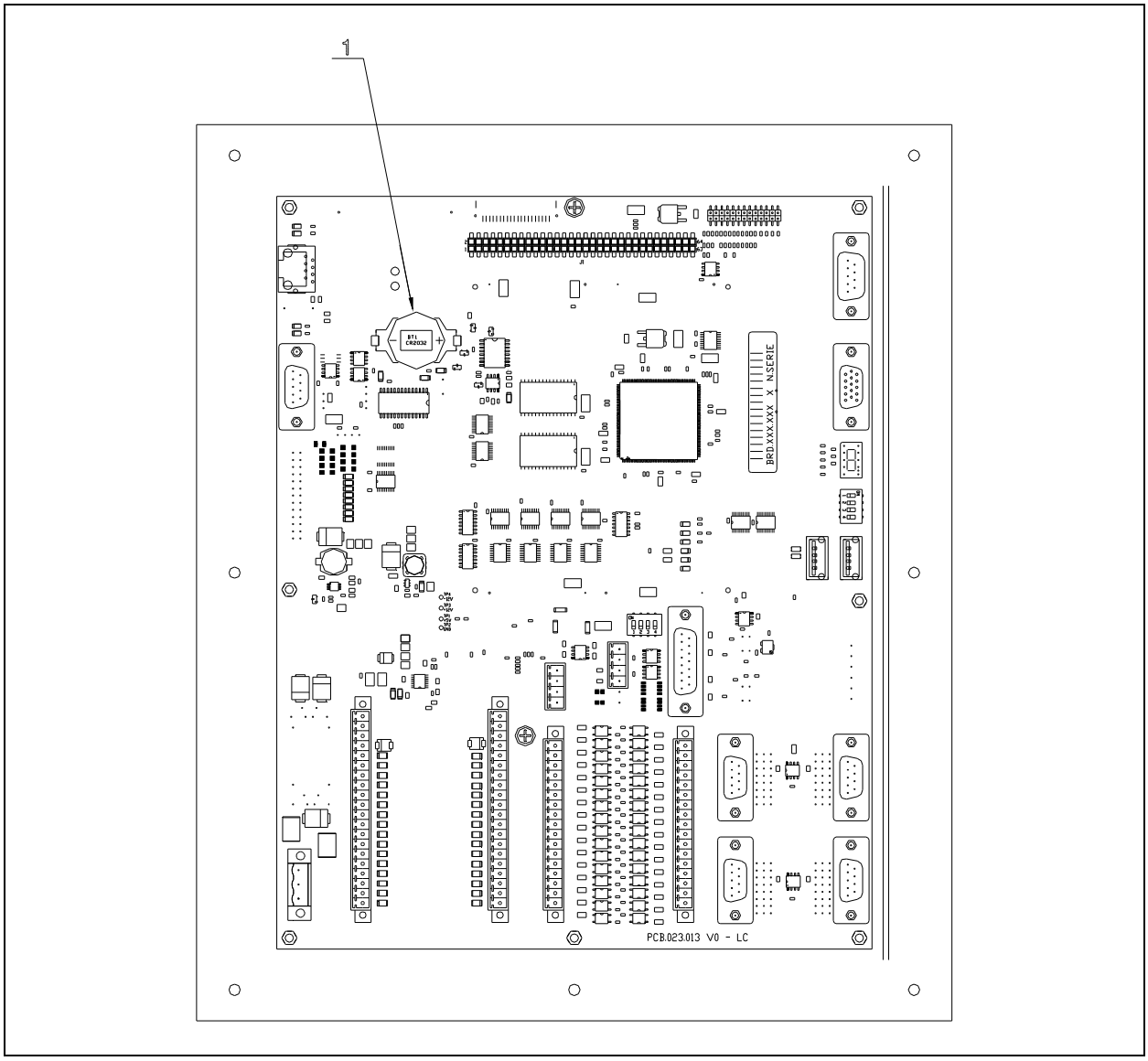


Figure 4.2 - Battery

1) Backup Battery

Procedure

- Turn the CNC off
- Disconnect all the cables from the electric panel.
- Open the unit.
- Extract the battery from the battery holder using a plastic screwdriver to avoid causing short-circuiting.
- Replace the battery being careful not to invert the polarity
- Close the unit, connect the wires and turn on the unit
- Check that the battery low message has disappeared

Spare battery

- The spare battery can be ordered from Esa/Gv using the code in the paragraph “Spare parts list”.
- The following batteries can be installed:

MANUFACTURER	MODEL
VARTA	CR2032(6032)
SANYO	CR2032
MAXELL	CR2032/CR2032H
ENERGIZER	CR2032
PANASONIC	CR2032/BR2032

END OF CHAPTER