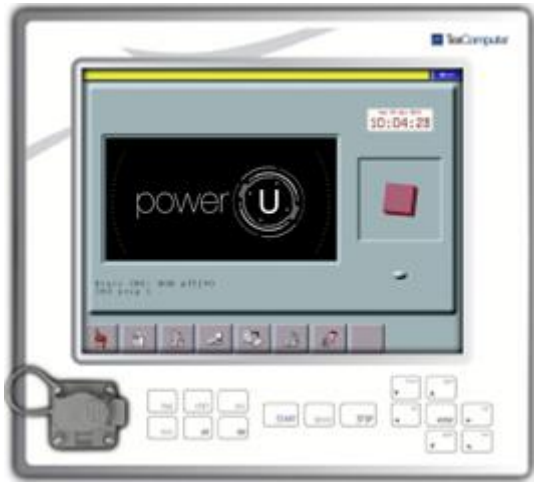
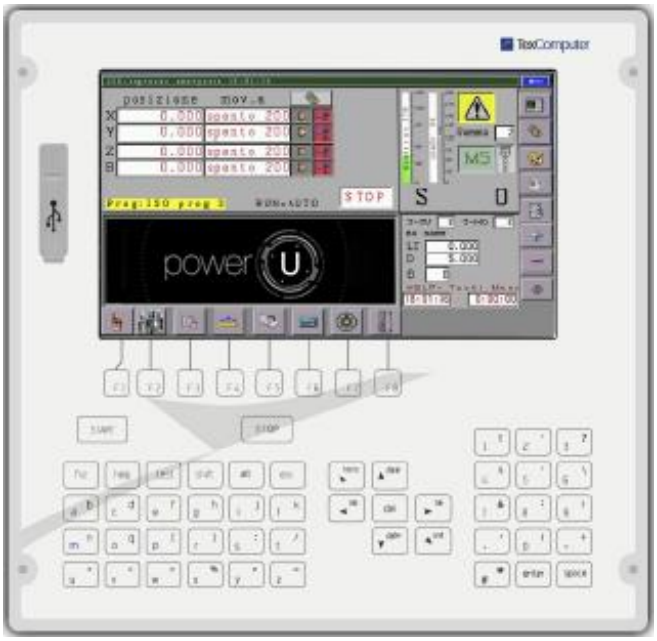
Programmable Automation Controller to manage 12 interpolated axes

This controller can manage in PID task maximum 8 axes with encoder bidirectional incremental or SSI absolute, or up to 12 axes through fieldbus motion CANopen, Mechatrolink II or EtherCAT. Mixed configurations are also possible where the maximum number of interpolated axis depends on the kind of fieldbus used and on the complexity of the applicative program.



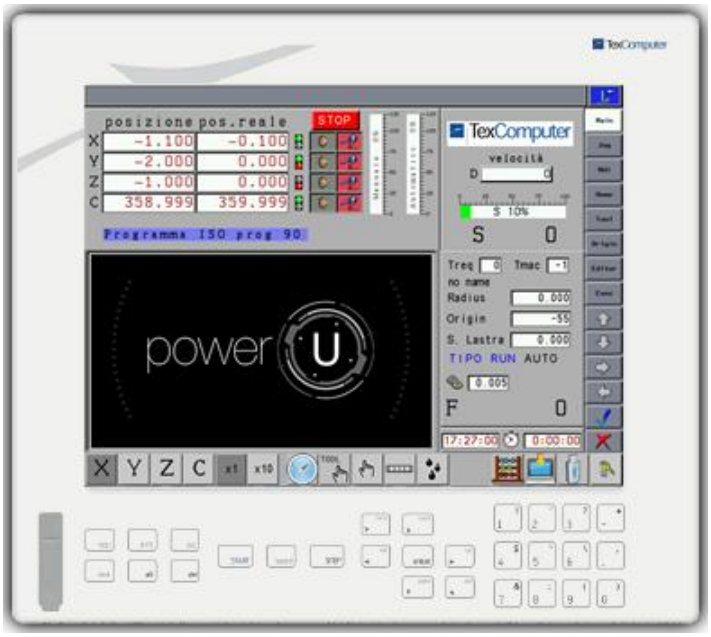
Power U 10.4” Compact

- TFT SVGA 800x600 pixel display with touch screen
- 16-key thermoformed membrane keypad
- IP65 USB socket
- dimensions 290x270x100 (WxHxD in mm)



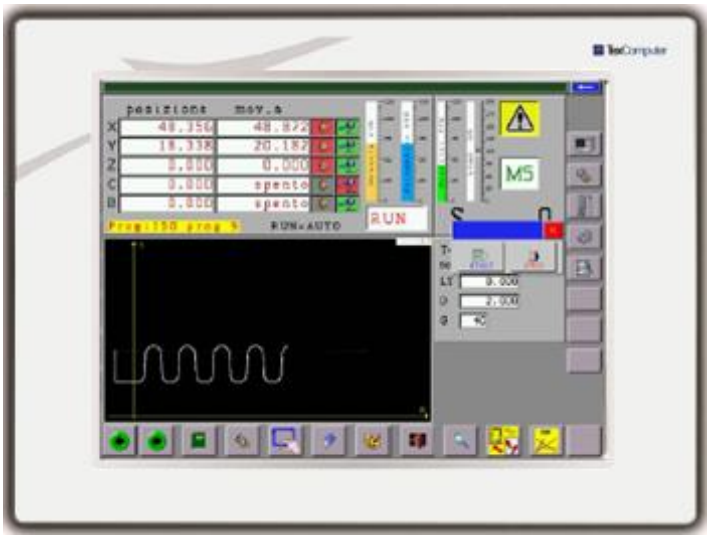
Power U 10” - 56 keys

- TFT WSVGA display (1024x600 pixel) with touch screen
- 56 key thermoformed membrane keypad
- USB socket
- dimensions 310x300x100 (WxHxD in mm)



Power U 15” - 28 keys

- display TFT XGA 1024x768 pixel display with touch screen
- 28-key thermoformed membrane keypad
- USB socket
- dimensions 400x355x100 (WxHxD in mm)



Power U 15” - Only touch

- display TFT XGA 1024x768 pixel with touch screen
- dimensions 398x296x100 (WxHxD in mm)

Fixed remotable terminal

- 10,4” WSVGA 1024x600 display with touch screen), dimensions 310x192x60 (WxHxD in mm)
- 15” XGA 1024x768 display with touch screen, dimensions 398x296x60 (WxHxD in mm)
- connection to the Power F Box through 36-pin LVDS cable, 10 m length

10.4” passive mobile Terminal

- ergonomic plastic case
- connection to Power U Box through 36-pole LVDS cable, 10 m. long
- TFT WSVGA 1024x600 pixel display with touch screen
- 4-key keypad
- dual-contact mushroom-head emergency button
- optional “dead man” button

Power U Box

- board without display and keyboard
- fixing from inside panel
- IP00 protection grade
- dimensions without FDC 259x230x63 (WxHxD in mm)
- dimensions with FDC 259x230x130 (WxHxD in mm)

Technical Data

Description		Notes / Options
CPU	**RISC 32 bit**	264 MHz - Dual core
Flash memory (include F volume)	**16 MB**	
Serial Flash memory	**16 MB**	Optional, for icon and charset
Ram (with buffer battery)	**8 MB**	
Volatile internal Ram	**512 KB**	
Digital inputs 24 Vdc PNP	**40 ***	
PNP digital input, 24 Vdc	**1**	for “dead man” button or other input
Protected PNP output, 24Vdc - 1A	**16 ***	
PNP output, 24Vdc-60mA	**2**	
Analog inputs 0…10 volts - 14 bit	**4**	On flat cable connector
Analog inputs 0...5 volts - 14 bit	**6**	On flat cable connector
Analog inputs 0...5 volts - 14 bit	**3**	On on-board terminal board
Analog input +/-10 volts - 14 bit	**1**	On on-board terminal board
0-20 mA analog input - 14 bit	**1**	On on-board terminal board
Analog outputs +/-10V from PWM	**4**	
Analog outputs +/-10V from DAC	**4**	On optional INT-DAC card, 16-bit resol.
5 V Push Pull encoder interface	**4**	
5V Line Driver encoder interface	**4**	On on-board terminal board
Absolute encoder interfaces	**for 8 SSI encoder**	On optional SF80328 card
STEP / DIRECTION outputs	**for 8 axes**	On optional T15-GENFR5 card
PWM Outputs	**for 8 axes**	On flat cable connector
RS 232 serial port	**2**	
RS 485 serial port	**1**	
CAN port	**2**	CANopen, CiA 401, 402 and 406
Mechatrolink -II port	**1**	On optional INT- Mechatrolink card
10-100 T Ethernet port	**2**	TCP/IP, FTP, ModbusTCP & WEB server. EtherCAT as optional, with CoE protocol
1.1 USB Port	**1**	
2.0 USB Port	**1**	
LVDS interface for remote terminal	**1**	On 36 pin connector
24V NPN/PNP safety inputs	**2**	Optional, without SIL cerification
Safety relay	**1**	
Safety output, PNP 24 Vdc - 60 mA	**1**	
Power Supply	**24 Vdc**	

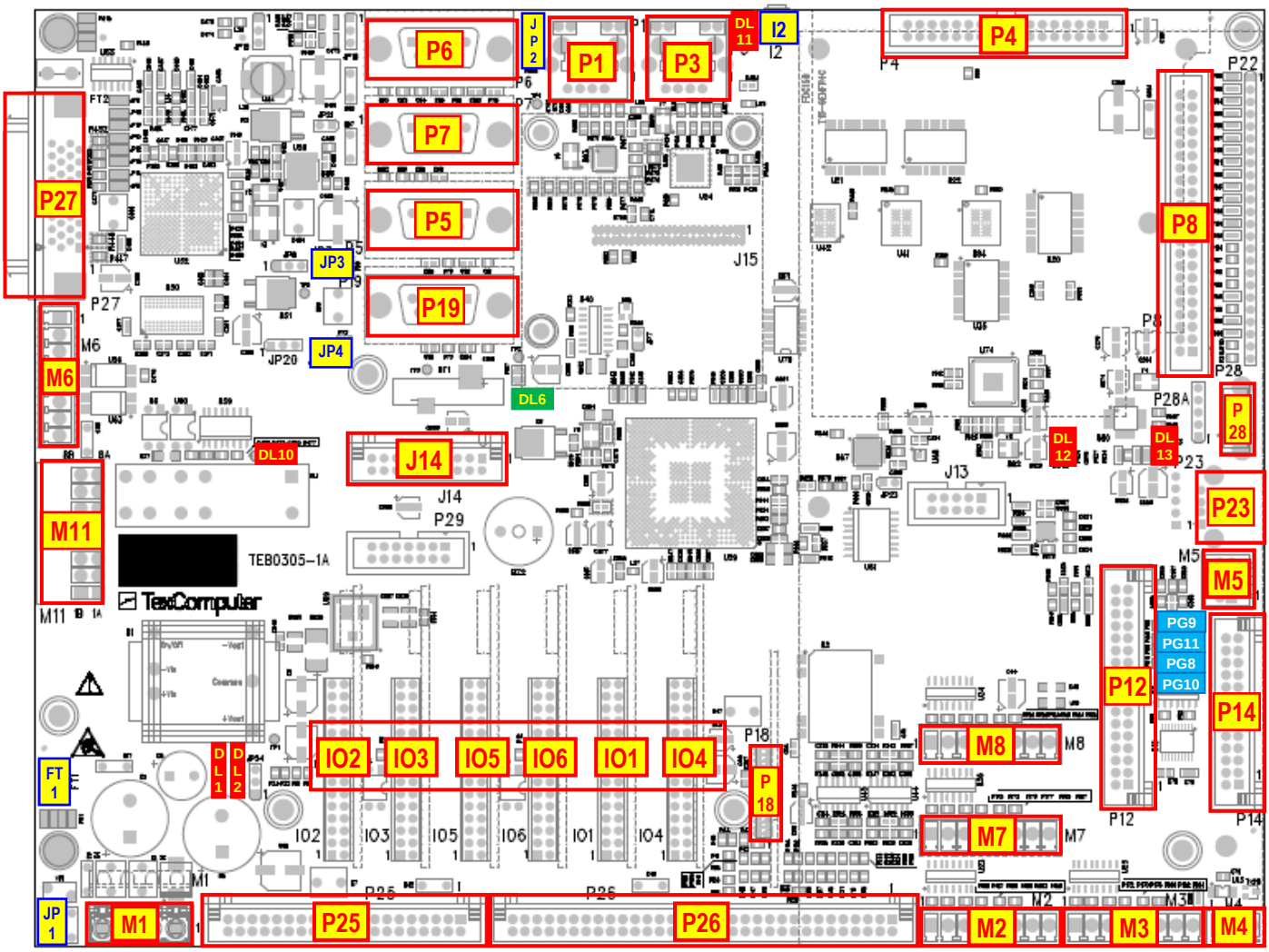
* Available on request in configuration 32 I + 24 O or 24 I + 32 O

Warnings

Before powering up the controller you should always check the following:

1. **That the power is supplied only via terminal M1**
2. **That the supply voltage never exceeds 27 VDC**
3. **That the connections between the + and - of the power supplies are not reversed, both incoming or exiting the controller**
4. **That the encoders are not fed with voltages other than those provided by the controller**
5. **That the position of connectors having the same number of poles have not been inverted**

Failure to observe any of these recommendations could cause irreparable damage to the controller.



Name	Type	Function
P1	Connector RJ45	Ethernet 10/100 T , port # 1
P3	Connector RJ45	Ethernet 10/100 T , port # 2 (EtherCAT optional)
P5	Connector 9-pole F	CAN A (addressable nodes 0-63)
P6	Connector 9-pole M	RS232 COM 1
P7	Connector 9-pole M	RS232 COM 2 + RS485 COM 3
P8	40-pin flat connector	Connection to the FDC expansion card
P12	34-pin flat connector	PWM Outputs and DIR # 5, 6, 7 and 8 No 4 digital outputs, OC 30Vdc - 30 mA No 4 analog inputs 0-10 V / 0-20 mA at 14-bit No 2 analog input 0-5V at 14-bit, not buffered
P14	26-pin flat connector	PWM output and DIR # 1, 2, 3 and 4 No 4 digital outputs, OC 30Vdc - 30 mA No 4 analog inputs 0-5Volt 14-bit, buffered
P18	Slot for optional INT-DAC	No 4 + / - 10 V from 16-bit DAC (# 1, 2, 3 and 4)
P19	Connector 9-pole	CAN B (64 to 127 addressable nodes) + VA Power
P23	USB connector # 1	2.0 USB port - active status indicated by LED DL12
P25	Connector flat 40 pins	No 11 digital inputs, 24 V No 14 digital I/O points on IO1/IO6 modules No 8 digital outputs, PNP 24V - 1A No 1 digital output, PNP 24V - 60 mA

Name	Type	Function
P26	64-pin flat connector	A, B and Z signals for encoder # 1, 2, 3 and 4 + / - 10 V Analog outputs (PWM # 9, 10, 11 and 12) No 1 emergency input No 13 digital inputs (for use as Fc Zero) No 2 digital I/O points on IO6 module No 8 digital outputs, PNP 24V - 1A No 1 digital output, PNP 24V - 60 mA
P27	36 poles Pan Connector	LVDS interface for remote terminal
P28	USB connector # 2	1.1 USB port - active status indicated by LED DL13
M1	4-pin Terminal board, clamp Screw	Controller & protected outputs power supply
M2	8-pin Terminal board clamp. Spring	A, B and Z signals encoder # 5 - 5V Line Driver (5V Push Pull on request)
M3	8-pin Terminal board clamp. Spring	A, B and Z signals encoder # 6 - 5V Line Driver (5V Push Pull on request)
M4	3 pin Terminal board clamp. Spring	No 1 analog input + / - 10V - 14 bit, buffered No 1 analog input 0-20mA - 14 bit, buffered
M5	6-pin Terminal board clamp. Spring	No 3 analog inputs 0-5 V -14 bit, not buffered
M6	8-pin Terminal board clamp. Spring	Contacts of the push buttons on the mobile terminal + digital input i16, 24V PNP (dead man)
M7	8-pin Terminal board clamp. Spring	A, B and Z signals encoder # 7 - 5V Line Driver (5V Push Pull on request)
M8	8-pin Terminal board clamp. Spring	A, B and Z signals encoder # 8 - 5V Line Driver (5V Push Pull on request)
M11	8-pin Terminal board clamp. Spring	NA and NC contacts of safety relay (on request) No 1 safety transistor output, PNP 24V - 60 mA
J14	20-pin flat connector	SPI port for internal optional card
JP1	Jumper	Short-circuit of power supply VA with VAX
JP2	Jumper	Termination resistor for RS485 port
JP3	Jumper	Termination resistor for CAN port A
JP4	Jumper	Termination resistor for CAN port B
FT1	Faston	2,5 mm^2 earth connection
I2	Micro switch (internal input i88)	Launch of Boot and Card recovery functions
DL1	Red led	24V power supply OK
DL2	Red led	Internal power supply OK
DL6	Green led	RAM battery low
DL10	Red led	Signalling safety relay ON
DL11	Red led (internal output o43)	Signalling functions selectable by micro switch I2
DL12	Red led	Active status on P23 port (USB 2.0)
DL13	Red led	Active status on P28 port (USB 1.1)
PG8	Welding point	Configure analog input # 259 as 0-20 mA
PG9	Welding point	Configure analog input # 261 as 0-20 mA
PG10	Welding point	Configure analog input # 260 as 0-20 mA
PG11	Welding point	Configure analog input # 262 as 0-20 mA

For connectors without numbering, pin 1 is highlighted in red.

M1 TERMINAL BOARD (power supply)

Terminal	Function
1	VA +24 Vdc power supply
2	GNDA 0Vdc power supply
3	GNDA 0Vdc power supply
4	VAX with jumper JP1 closed (default configuration) it's connected to terminal 1

M2 TERMINAL BOARD (encoder # 5)

Terminal	Function	Notes
1	CLK A channel A straight encoder # 5	5V Line Driver / Push Pull *
2	CLK/ A channel A negated encoder # 5	
3	CLK B channel B straight encoder # 5	5V Line Driver / Push Pull *
4	CLK/B channel B negated encoder # 5	
5	NOTCH /0 channel 0 negated encoder # 5	5V Line Driver / Push Pull *, usable in interrupt as i60
6	NOTCH 0 channel 0 straight encoder # 5	
7	GND power supply ground encoder # 5	
8	VDC +5Vdc power supply for encoder # 5	

The encoder inputs can be filtered by software acting on Info 1623 and Info 1648.

M3 TERMINAL BOARD (encoder # 6)

Terminal	Function	Notes
1	CLK A channel A straight encoder # 6	5V Line Driver or Push-Pull*
2	CLK/ A channel A negated encoder # 6	
3	CLK A channel B straight encoder # 6	5V Line Driver or Push-Pull*
4	CLK/B channel B negated encoder # 6	
5	NOTCH /0 channel 0 negated encoder # 6	5V Line Driver or Push-Pull*, usable in interrupt as i61
6	NOTCH 0 channel 0 straight encoder # 6	
7	GND power supply ground encoder # 6	
8	VDC +5Vdc power supply for encoder # 6	

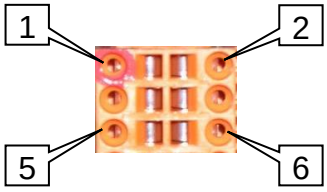
* On request, the inputs of encoder # 6 can be supplied in 5V Push-Pull configuration; in this case the input signals must be connected to the straight channels and the negated channels must be left disconnected.

The encoder inputs can be filtered by software acting on Info 1623 and Info 1648.

M4 TERMINAL BOARD (+/- 10V and 0-20 mA input)

Terminal	Function
1	+/- 10 V Analog input # 16, range 1640…14744, resolution 14 bit
2	Analog GND
3	0-20 mA Analog input # 17, range 0… 16384, 14 bit

M5 TERMINAL BOARD (3 analog inputs 0-5V)

Terminal	Function	Layout
1	Analog GND	
2	0-5 V Analog input # 256, resolution 14 bit	
3	0-5 V Analog input # 257, resolution 14 bit	
4	0-5 V Analog input # 258, resolution 14 bit	
5	Analog GND	
6	+ 5V for potentiometer power supply	

M6 TERMINAL BOARD (interfacing with mobile terminal)

Terminal	Function
1	EMG1 emergency button contact 1 (N.C.)
2	EMG2 emergency button contact 2 (N.C.)
3	i16 digital PNP input (linked to Pin 27 of connector P25)
4	Reserved
5	Common of emergency contacts 1 & 2
6	Digital input i91, 24 Vdc PNP linked together with pin 63 of connector P26 (can be connected to the "dead man" button of the mobile terminal)
7	24 VA +24 Vdc (parallel to Pin 1 terminal board M1)
8	GNDA 0Vdc (parallel to Pin 2 terminal board M1)

N.C. = normally closed

M7 TERMINAL BOARD (encoder # 7)

Terminal	Function	Note
1	CLK A channel A straight encoder # 7	5V Line Driver or Push Pull *
2	CLK/ A channel A negated encoder # 7	
3	CLK A channel B straight encoder # 7	5V Line Driver or Push Pull *
4	CLK/B channel B negated encoder # 7	
5	NOTCH /0 channel 0 negated encoder # 7	5V Line Driver or Push Pull * usable in interrupt as i62
6	NOTCH 0 channel 0 straight encoder # 7	
7	GND power supply ground encoder # 7	
8	VDC +5Vdc power supply for encoder # 7	

The encoder inputs can be filtered by software acting on Info 1623 and Info 1648.

M8 TERMINAL BOARD (encoder # 8)

Terminal	Function	Note
1	CLK A channel A straight encoder # 8	5V Line Driver or Push Pull *
2	CLK/ A channel A negated encoder # 8	
3	CLK A channel B straight encoder # 8	5V Line Driver or Push Pull *
4	CLK/B channel B negated encoder # 8	
5	NOTCH /0 channel 0 negated encoder # 8	5V Line Driver or Push Pull ^ usable in interrupt as i63
6	NOTCH 0 channel 0 straight encoder # 8	
7	GND power supply ground encoder # 8	
8	VDC +5Vdc power supply for encoder # 8	

* On request, encoder's inputs # 7 and 8 can be supplied in 5V Push-Pull configuration; in this case the input signals must be connected to the straight channels and the negated channels must be left disconnected.

The encoder inputs can be filtered by software acting on INFO 1623 and INFO 1648.

M11 TERMINAL BOARD (Safety I/O without SIL certification)

Terminal	Function	I/O	Note
1A	XOK1-		Negative pole of safety input 1
2A	XOK2-		Negative pole of safety input 2
3A	XOK1+	i90	Positive pole of safety input 1
4A	XOK2+	i89N	Positive pole of safety input 2, active low
5A			Do not connect
6A			Do not connect
7A	XRL2C contact # 2	o40	NC contact 2 of safety relay
8A	XRL2NC contact # 2		
1B	XRL4NA contact # 4		NA contact 4 of safety relay
2B	XRL4C contact # 4		
3B	XRL3C contact # 3		NA contact 3 of safety relay
4B	XRL3NA contact # 3		
5B	XRL1C contact # 1		NA contact 1of safety relay
6B	XRL1NC contact # 1		
7B	+ VAY + 24 Vdc		Test point of power supply for safety outputs
8B	XOUTD1	o45	Safety output 24V - out 60mA

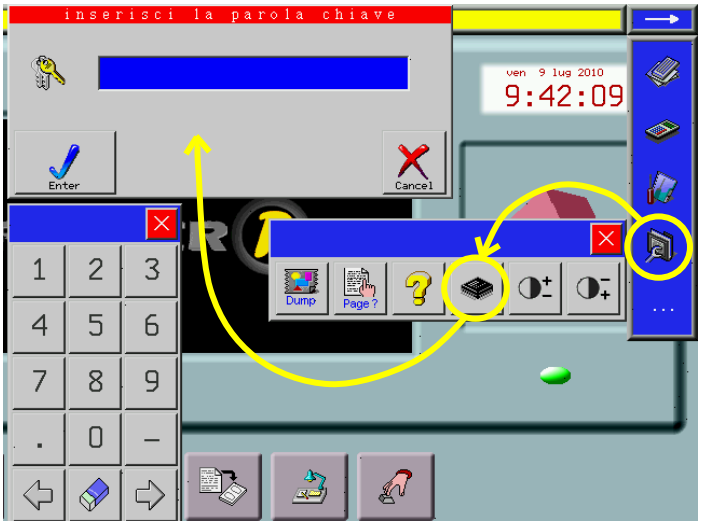
The internal relay is a safety output relay OMRON G7SA-2A2B or equivalent SCHRACK with two pair of guided contacts (XRL1/2/3/4).

The redundancy is achieved by connecting in series the two NO contacts and in parallel between them 2 NC contacts.

The power supply for the safety outputs is present only if the JP1 is closed.

Ethernet Connection

There is one parameter to enable Ethernet connection, one to set its IP address and one to declare its subnet mask; the first and the third one are accessible in the machine parameters, while the Ethernet address is in the "change card parameters" list accessible from the Boot menu (see also "Basic touch screen functions" in this data sheet). If the controller does not have a full hardware keyboard, the Boot menu should be accessed through the touch screen tool bar (remember that this access is protected by a password):



For further information, refer to the "User interface" section of the html manual.
By default, the connection is already enabled and the controller can be accessed at IP address 192.168.0.200, subnet mask 255.255.255.0; to make a direct connection to a PLC (peer to peer mode), use a crossover Ethernet cable with 8-pin RJ45 connectors.

Names of axes

This hardware configuration parameter associates the names of the axes to the hardware resources on the motherboard. These resources can be identified per type and differ for a consecutive numbering (e.g. encoder # 1, encoder # 2, PWM # 5 etc.). In the default configuration, the names XYZW are assigned to the axes and the position assumed by each letter indicates the number of the hardware resource which will be associated to the axis concerned if installed.

Installed axes

In order to be installed and rendered operational, the axes must be entered in the specific hardware configuration parameter. The default allocation of the hardware resources can be modified using each axis's respective special parameters.
For example: installing axes X and Y and modifying the "encoder number" parameter of the "X axis special parameters" from the "default" value to value "4" transfers the X axis feedback from encoder # 1 to encoder # 4, while the Y axis feedback will remain the default correlation to # 2.
The freed resources (encoder # 1 in the example) can be used by other axes or managed through specific commands available in the programming language.

Parameters to associate hardware resources to the axes

"PWM/DAC/freq output number": destination of the PID output of the axis (valid values from 1 to 16).
"encoder number": velocity/position feedback of the axis (valid values from 1 to 9)
"enabling output": output to enable the drive of the axis (any available user output is **valid).**
"zero sensor": input to change the position of the axis (only interrupt inputs are valid)
"minimum sensor": input to limit the minimum stroke of the axis (any available input is valid). "maximum sensor": input to limit the maximum stroke of the axi**s (any available input is valid). The output which controls the direction of the axis cannot be changed from the default setting**.

Management of the limit switches dedicated to the axes

The inputs with a preset function are associated by default to each axis installed:

- **Zero Limit Switch,** which allows modification of the axis's position at the moment of deactivation or on reception of a pulse generated by the encoder by means of the "0 Notch" signal. The input must be controllable in interrupt mode.
- the **Minimum Limit Switch** which, when activated, halts movement of the axis, switches it to alarm status and prevents any movement towards lower position values. The input must remain active until the physical bottom limit for axis travel is reached.
- the **Maximum Limit Switch** which when activated halts movement of the axis, switches it to alarm status and prevents any movement towards higher position values. The input must remain active until the physical top limit for axis travel is reached.

Generally, the Zero Limit Switch can also simultaneously serve as one of the two other limit switches (minimum or maximum), therefore by default the Zero and Minimum Limit Switches use the same input.

Interrupt Inputs

Almost all the inputs available on the motherboard are manageable, except interrupt i21, i32 and i49.

+/- 10V Analog input

To use correctly analog input connected to pin 1 of terminal M4, you have to execute linearization of the value read through ADC (16) opearator, considering that:

- an input value of -10V corresponds to a value of 1640 um
- an input value of 0V corresponds to a value of 8192 um
- an input value of +10V corresponds to a value of 14744 um

As the converter's resolution is 12 bit, the minimum change noticeable will be 1,5996 um

Other analog inputs

All analog inputs read by the operator ADC (xx) must be linearized with respect to the value of full scale (FS) of the input taking into account that:

- an input value of 0 % FS corresponds to a value of 0 um
- an input value of 100% FS corresponds to a value of 16384 um

As the converter's resolution is 12 bit, the minimum change noticeable will be 4 um

Processing of the analog inputs via Sigma-Delta units

The card has 4 Sigma-Delta (SD) units for analog signals processing; all analog inputs readable via the ADC operator (xxx) may be directed to one of these units through the command SDADC. The value, filtered and digitized, can be read with a 14 bits resolution on the INFOs 2091-2094 (one for each unit). The syntax is the following: *SDADC n, xxx* where *n* is the SD channel number (1 to 4) and *xxx* is the analog channel to be processed, one for every SD unity. For example using the # 4 SD unit to process the signal on pin # 2 of the M5 terminal, the command to use will be SDADC 4, 256; the filtered and digitized value will be readable on INFO 2093. Note that the value returned is formatted at 15 bits, while the same channel read with the command ADC is formatted at 14 bits.

64-bit math libraries

Power F, by default, is supplied with firmware provided with math libraries to perform calculations in floating point 32-bit .

However, there are some applications where it is often necessary to increase the accuracy of the calculations in order to ensure maximum accuracy in the generation of the trajectories of the axes; for these cases there is also a version of the firmware compiled with 64-bit math libraries.

Logically, in order to obtain greater precision in the calculations you need to keep busy longer the CPU on the same mathematical instructions resulting in decreased processing speed of the application program.

For more information please contact the technical staff of Tex Computer.

Assignment of the memory volume G or H to the USB ports

If you use 2 memory volumes, in order to determine which port associate at G or H volumes, you need to insert a time in the "USB n init. delay" operator parameters. At power up, the USB port with the shorter initial delay time will be automatically assigned with the volume G

P26 CONNECTOR (Analog outputs, encoder # 1…4 and digital I/O)

Pin	DESCRIPTION	NOTES
1	GNDANAL X X axis analog ground	
2	VREF X reference signal, +/- 10V	obtained from channel PWM # 9
3	GNDANAL Y Y axis analog ground	
4	VREF Y reference signal, +/- 10V	obtained from channel PWM # 10
5	GNDANAL Z Z axis analog ground	
6	VREF Z reference signal, +/- 10V	obtained from channel PWM # 11
7	GNDANAL W W axis analog ground	
8	VREF W reference signal, +/- 10V	obtained from channel PWM # 12
9	GND logic ground for connection to screen	
10	GND logic ground for connection to screen	
11	CLKA X encoder # 1 channel	encoder # 1
12	CLKB X encoder # 1 channel	
13	NOTCH 0 X 0 channel encoder # 1	User input i56 only non optoinsulated IPT, 5V
14	GND logic ground for encoder power supply	
15	CLKA Y encoder # 2 channel	encoder # 2
16	CLKB Y encoder # 2 channel	
17	NOTCH 0 Y 0 channel encoder # 2	User input i57 only non optoinsulated IPT, 5V
18	GND logic ground for encoder power supply	
19	CLKA Z encoder # 3 channel	encoder # 3
20	CLKB Z encoder # 3 channel	
21	NOTCH 0 Z 0 channel encoder # 3	User input i58 only non optoinsulated IPT, 5V
22	GND logic ground for encoder power supply	
23	CLKB W encoder # 4 channel	encoder # 4
24	CLKB W encoder # 4 channel	
25	NOTCH 0 W 0 channel encoder # 4	User input i59 only non optoinsulated IPT, 5V
26	GND logic ground for encoder power supply	
27	VDC +5Vdc power supply for encoder	
28	VDC +5Vdc power supply for encoder	
29	VDC +5Vdc power supply for encoder	
30	VDC +5Vdc power supply for encoder	
31	User output o16	By default ENBX enabling of driver # 1
32	VA +24 V *	Iout max 200 mA
33	User output o17	By default ENBY enabling of driver # 2
34	Do not connect	
35	User output o18	By default ENBZ enabling of driver # 3
36	GNDA I/O power supply ground	
37	User output o19	By default ENBW enabling of driver # 4
38	GNDA I/O power supply ground	
39	User input i46	By default Axis # 4 (W) zero limit stop
40	User input i40	By default Axis # 1 (X) zero limit stop
41	FCEMG emergency, Machine Running	s127, if EMG is deactivated becomes input i47
42	User input i41	By default Axis # 1 (X) max limit stop
43	User output o32	Can become DIRO X axis # 1 direction output if “drive type” parameter = 2 or 4
44	User input i42	By default Axis # 2 (Y) home limit stop
45	User output o33	Can become DIRO Y axis # 2 direction output if “drive type” parameter = 2 or 4
46	User input i43	By default Axis # 2 (Y) max limit stop

Pin	DESCRIZIONE	NOTE
47	User output o34	DIRO Z axis # 3 direction output if “drive type” parameter = 2 or 4
48	In utente i44	per default = Fc Zero asse # 3 (Z)
49	User output o35	DIRO W axis # 4 direction output if “drive type” parameter = 2 or 4
50	User input i45	By default Axis # 3 (Z) max limit stop
51	VA +24 V *	Iout max 200 mA
52	GNDA , 0V power supply	In parallel to the pins 2 & 3 of M1
53	User input i48 / User output o48	It depends on the type of this Module IO6
54	User input i49 / User output o49	It depends on the type of this Module IO6. If it’s an input, it can’t be used in interrupt
55	User input i32	Not usable in interrupt
56	GNDA , 0V power supply	In parallel to the pins 2 & 3 of M1
57	User input i18 **	
58	User input i19 **	
59	User input i21 **	Not usable in interrupt
60	User input i20 **	
61	GNDA , 0V power supply	In parallel to the pins 2 & 3 of M1
62	VA +24 V *	Iout max 200 mA
63	User input i91 **	Linked in parallel with Pin 6 of M6 (Dead man)
64	User output o42 **	24Vdc PNP Optocoupler , Imax 60 mA

* In parallel to the pin 1 of M1, must not be used to feed the controller but only small non-inductive loads

** It is recommended to use these resources only after you have used all those available in the removable I/O modules.

Encoder inputs are CMOS type RC filter at input.
Logic level 0 of the encoder signal must be less than 1 Volt; logic level 1 must be higher than 4 Volts.
If the frequency is higher than 250Khz use of the LINE-DRIVER interface is recommended.
The maximum count frequency is 500kHz with standard filters, but on request can be applied special filters to bring upper limit.

The GNDANAL signals must be connect to the differential input of the drive, if they have one. If this is not the case the GNDANAL input signal must be free.
In this case, the GND is used as common reference signal between POWER U and DRIVE.
In the case of DRIVES without differential input, it might be necessary to connect the screened cable to ground at both ends or to connect the -vref signal of the drive directly to ground in the gnd drive.
It depends on the specifications of drive and on how the control panel is constructed.
The analog signal that control the electric motor velocity is achieved by converting the digital PWM signal into an analog integrator.
The parameter " drive type " for that analog output must be set to 1; the resolution PWM can be to 13 or 14 bits.

P25 CONNECTOR (Digital I/O)

Pin	DESCRIPTION	NOTES
1	GNDA , 0V power supply	In parallel to the pins 2 & 3 of M1
2	VA +24 V *	Iout max 200 mA
3	GNDA , 0V power supply	In parallel to the pins 2 & 3 of M1
4	VA +24 V *	Iout max 200 mA
5	RUN CNC runs the last program executed by the CNC	User input i36
6	HOLD blocks axis movement	User input i38
7	RUN PLC activates the PLC program	User input i37
8	User input i35	
9	User output o20	
10	User input i0 / User output o8	Depends on the type of module on IO1
11	User output o21	
12	User input i1 / User output o9	Depends on the type of module on IO1
13	User output o22	
14	User input i2 / User output o10	Depends on the type of module on IO1
15	User output o23	
16	User input i3 / User output o11	Depends on the type of module on IO1
17	User output o36	
18	User input i4 / User output o12	Depends on the type of module on IO1
19	User output o37	
20	User input i5 / User output o13	Depends on the type of module on IO1
21	User output o38	
22	User input i6 / User output o14	Depends on the type of module on IO1
23	User output o39	
24	User input i7 / User output o15	Depends on the type of module on IO1
25	User output o44 **	24Vdc PNP Optocoupler , Imax 60 mA
26	User input i33	
27	User input i16 **	Linked in parallel with Pin 3 of M6
28	User input i39	
29	User input i17 **	
30	User input i34	
31	User input i22 **	
32	User input i50 / User output o50	Depends on the type of module on IO6
33	User input i23 **	
34	User input i51 / User output o51	Depends on the type of module on IO6
35	GNDA , 0V power supply	In parallel to the pins 2 & 3 of M1
36	User input i52 / User output o52	Depends on the type of module on IO6
37	VA +24 V *	Iout max 200 mA
38	User input i53 / User output o53	Depends on the type of module on IO6
39	User input i55 / User output o55	Depends on the type of module on IO6
40	User input i54 / User output o54	Depends on the type of module on IO6

* In parallel to the pin 1 of M1, must not be used to feed the controller but only small non-inductive loads

** It is recommended to use these resources only after you have used all those available in the removable I/O modules

P14 CONNECTOR (PWM # 1, 2, 3 and 4 + analog inputs)

Pin	DESCRIPTION	NOTES
1	VCC + 5Vdc power supply	
2	# 1 PWM control output for PWM drivers	
3	GND Logic Ground	
4	DIR # 1 output direction for PWM driver	User output o24 (5V TTL)
5	GND Logic Ground	
6	# 2 PWM control output for PWM drivers	
7	GND Logic Ground	
8	DIR # 2 output direction for PWM driver	User output o25 (5V TTL)
9	GND Logic Ground	
10	# 3 PWM control output for PWM drivers.	
11	GND Logic Ground	
12	DIR # 3 output for PWM driver	User output o26 (5V TTL)
13	+ 12/15 Volt DC 0.05A max	
14	# 4 PWM control output for PWM drivers.	
15	- 12/15 Volt DC 0.05A max	
16	DIR # 4 output direction for PWM driver	User output o27 (5V TTL)
17	ENABLE # 2 negated (0 = driver enabled)	o192N (O.C. max. 30V – 30mA)
18	ENABLE # 1 negated (0 = driver enabled)	o193N (O.C. max. 30V – 30mA)
19	ENABLE # 4 negated (0 = driver enabled)	o194N (O.C. max. 30V – 30mA)
20	ENABLE # 3 negated (0 = driver enabled)	o195N (O.C. max. 30V – 30mA)
21	VREF for analog inputs + 5Vdc	
22	AGND analog ground for analog inputs	
23	Analog input # 21	The analog inputs have a resolution of 14 bits and accept voltages between 0 and 5 volts. Their input resistance to AGND is 100Kohm.
24	Analog input # 20	
25	Analog input # 23	
26	Analog input # 22	

P12 CONNECTOR (PWM # 5, 6, 7 and 8 + analog inputs)

Pin	DESCRIPTION	NOTES	
1	VCC + 5Vdc power supply		
2	PWM # 5 PWM driver command output		
3	GND logic ground		
4	DIR # 5 output direction for PWM driver	User output o28 (5V TTL)	
5	GND logic ground		
6	PWM # 6 uscita comando per driver PWM		
7	GND logic ground		
8	DIR # 6 output direction for PWM driver	User output o29 (5V TTL)	
9	GND logic ground		
10	PWM # 7 output command for PWM driver.		
11	GND logic ground		
12	DIR # 7 output direction for PWM driver	User output o30 (5V TTL)	
13	Don't connect	Reserved for future developments	
14	PWM # 8 PWM driver command output		
15	Don't connect	Reserved for future developments	
16	DIR # 8 output direction for PWM driver	User output o31 (5V TTL)	
17	ENABLE # 6 negated (0 = driver enabled)	User output o196N (O.C. max. 30V – 30mA)	
18	ENABLE # 5 negated (0 = driver enabled)	User output o197N (O.C. max. 30V – 30mA)	
19	ENABLE # 8 negated (0 = driver enabled)	User output o198N (O.C. max. 30V – 30mA)	
20	ENABLE # 7 negated (0 = driver enabled)	User output o199N (O.C. max. 30V – 30mA)	
21	VREF for analog inputs + 5Vdc		
22	AGND analog ground for analog inputs		
23	Analog input # 260	Conditioned 0-20 mA welding PG10	Note
24	Analog input # 259	Conditioned 0-20 mA welding PG8	
25	Analog input # 262	Conditioned 0-20 mA welding PG11	
26	Analog input # 261	Conditioned 0-20 mA welding PG9	
27	Analog input # 272	Non-buffered 0-5V	
28	AGND analog ground for analog inputs		
29	Analog input # 273	Non-buffered 0-5V	
30	AGND analog ground for analog inputs		
31	Don't connect	Reserved for future developments	
32	GND logic ground		
33	Don't connect	Reserved for future developments	
34	GND logic ground		

Note: The buffered analog inputs have a resolution of 14 bits and accept voltages between 0 and 10 volts. Their input resistance is equal 200 Kohm referenced to AGND. They can be conditioned to accept input signals to 0-20 mA shorting its welding point (PG) that inserts an input resistance of 500 ohms to AGND.

WARNING: this document only describes the electrical connections of the connectors most often used. For all further information about electrical connections refer to the "Electrical Connections" section of the electronic document entitled "**Power Family Controllers - USE AND PROGRAMMING MANUAL**". The constantly updated version of this manual, supplied as a compiled HTML Help file called "**Power Family.chm**", can be downloaded from the "Download Service" area of the www.texcomputer.com site.

DIGITAL INPUTS (consecutive numbering)

input	connector	pin	I/O slot	notes
i0	P25	10	IO1	Configurable as o8 ^
i1	P25	12		Configurable as o9 ^
i2	P25	14		Configurable as o10 ^
i3	P25	16		Configurable as o11 ^
i4	P25	18		Configurable as o12 ^
i5	P25	20		Configurable as o13 ^
i6	P25	22		Configurable as o14 ^
i7	P25	24		Configurable as o15 ^
i16 **	P25	27	motherboard	
	M6	3		
i17 **	P25	29		
i18 **	**P26**	**57**		
i19 **	**P26**	**58**		
i20 **	**P26**	**60**		
i21 **	**P26**	**59**		Not usable in interrupt
i22 **	P25	31		
i23 **	P25	33		
i32	**P26**	**55**	IO4	Not usable in interrupt
i33	P25	26		
i34	P25	30		
i35	P25	8		
i36	P25	5		RUN CNC (enable the CNC program in use)
i37	P25	7		RUN PLC (enable the PLC program, interrupt MDA)
i38	P25	6		HOLD (suspends execution of the CNC program)
i39	P25	28		
i40	**P26**	**40**	IO5	Axis # 1 (X) home limit switch
i41	**P26**	**42**		Axis # 1 (X) max limit switch
i42	**P26**	**44**		Axis # 2 (Y) home limit switch
i43	**P26**	**46**		Axis # 2 (Y) max limit switch
i44	**P26**	**48**		Axis # 3 (Z) home limit switch
i45	**P26**	**50**		Axis # 3 (Z) max limit switch
i46	**P26**	**39**		Axis # 4 (w) home limit switch
i47	**P26**	**41**		s127 emergency input (if EMG is deactivated => i47)
i48 *	**P26**	**53**	IO6	Configurable as o48*
i49 *	**P26**	**54**		Not usable in interrupt, Configurable as o49 *
i50 *	P25	32		Configurable as o50 *
i51 *	P25	34		Configurable as o51 *

input	connector	pin	I/O slot	notes
i52 *	P25	36	IO6	Configurable as o52 *
i53 *	P25	38		Configurable as o53 *
i54 *	P25	40		Configurable as o54 *
i55 *	P25	39		Configurable as o55 *
i56	**P26**	**13**	motherboard	NOTCH 0 encoder # 1 (Interrupt , 5V TTL)
i57	**P26**	**17**		NOTCH 0 encoder # 2 (Interrupt , 5V TTL)
i58	**P26**	**21**		NOTCH 0 encoder # 3 (Interrupt , 5V TTL)
i59	**P26**	**25**		NOTCH 0 encoder # 4 (Interrupt , 5V TTL)
i60	M2	5,6		NOTCH 0 encoder # 5 (Interrupt , 5V Line Driver)
i61	M3	5,6		NOTCH 0 encoder # 6 (Interrupt , 5V Line Driver)
i62	M7	5,6		NOTCH 0 encoder # 7 (Interrupt , 5V Line Driver)
i63	M8	5,6		NOTCH 0 encoder # 8 (Interrupt , 5V Line Driver)
i88	-	-		I2 push-button
i89N	M11	4A/2A	motherboard	positive/negative of security input 2, active low
i90	M11	3A/1A		positive/negative of security input 1
i91 **	**P26 / M6**	**63 / 6**		Can be connected to the "dead man" button of the mobile terminal

^ It depends on the type of form IO1 on this and if it is a form of inputs, the hardware configuration parameter "direction I / O port user" must be set to **0**00000X0.

* Depending on the type of form IO6 on this and if it is a form of inputs, the hardware configuration parameter "direction I / O port user" must be set to X00000**0**0.

WARNING: After changing the parameter you need to recompile the PLC program

** It is recommended to use these resources only after you have used all those available in the removable I/O modules

DIGITAL OUTPUTS (consecutive numbering)

output	connector	pin	I/O slot	note
o8 ^	P25	10	IO1	Configurable as i0 ^
o9 ^	P25	12		Configurable as i1 ^
o10 ^	P25	14		Configurable as i2 ^
o11 ^	P25	16		Configurable as i3 ^
o12 ^	P25	18		Configurable as i4 ^
o13 ^	P25	20		Configurable as i5 ^
o14 ^	P25	22		Configurable as i6 ^
o15 ^	P25	24		Configurable as i7 ^
o16	**P26**	**31**	IO2	ENB # 1
o17	**P26**	**33**		ENB # 2
o18	**P26**	**35**		ENB # 3
o19	**P26**	**37**		ENB # 4
o20	P25	9	IO3	ENB # 5
o21	P25	11		ENB # 6
o22	P25	13		
o23	P25	15		
o24	**P14**	**4**	motherboard	PWM DIR # 1 (5V TTL)
o25	**P14**	**8**		PWM DIR # 2 (5V TTL)
o26	**P14**	**12**		PWM DIR # 3 (5V TTL)
o27	**P14**	**16**		PWM DIR # 4 (5V TTL)
o28	**P12**	**4**		PWM DIR # 5 (5V TTL)
o29	**P12**	**8**		PWM DIR # 6 (5V TTL)
o30	**P12**	**12**		PWM DIR # 7 (5V TTL)
o31	**P12**	**16**		PWM DIR # 8 (5V TTL)
o32	**P26**	**43**	IO2	DIRO # 1 if drive # 1 type = 2 or 4
o33	**P26**	**45**		DIRO # 2 if drive # 2 type = 2 or 4
o34	**P26**	**47**		DIRO # 3 if drive # 3 type = 2 or 4
o35	**P26**	**49**		DIRO # 4 if drive # 4 type = 2 or 4
o36	P25	17	IO3	DIRO # 5 if drive # 5 type = 2 or 4
o37	P25	19		DIRO # 6 if drive # 6 type = 2 or 4
o38	P25	21		
o39	P25	23		
o40	M11	-	motherboard	Safety relay with multiple contacts
o41	-	-		Buzzer
o42	**P26**	**64**	motherboard	PNP 24V - 60 mA optoisolator
o43	-	-		Led DL11
o44 **	P25	25		PNP 24V - 60 mA optoisolator

output	connector	pin	I/O slot	note	
o45	M11	8B	motherboard	XOUTD1- safety output PNP 24Vdc - 60 mA	
o48 *	**P26**	**53**	IO6	Configurable as i48 *	
o49 *	**P26**	**54**		Configurable as i49 *	
o50 *	P25	32		Configurable as i50 *	
o51 *	P25	34		Configurable as i51 *	
o52 *	P25	36		Configurable as i52 *	
o53 *	P25	38		Configurable as i53 *	
o54 *	P25	40		Configurable as i54 *	
o55 *	P25	39		Configurable as i55*	
o192N	P14	18	motherboard	ENBN # 1	OC outputs (30V - 30 mA) that can be used as **inverted enable** of axes # 1, 2, 3 and 4
o193N	P14	17		ENBN # 2	
o194N	P14	20		ENBN # 3	
o195N	P14	19		ENBN # 4	
o196N	P12	18		ENBN # 5	OC outputs (30V - 30 mA) that can be used as **inverted enable** of axes # 5, 6, 7 and 8
o197N	P12	17		ENBN # 6	
o198N	P12	20		ENBN # 7	
o199N	P12	19		ENBN # 8	

^ It depends on the type of form IO1 on this and if it is an output module hardware configuration parameter "direction I / O port user" must be set to **1**00000X0.

* Depending on the type of form IO6 on this and if it is an output module hardware configuration parameter "direction I / O port user" must be set to X000001**1**0.

WARNING: After changing the parameter you need to recompile the PLC program

** It is recommended to use these resources only after you have used all those available in the removable I/O modules

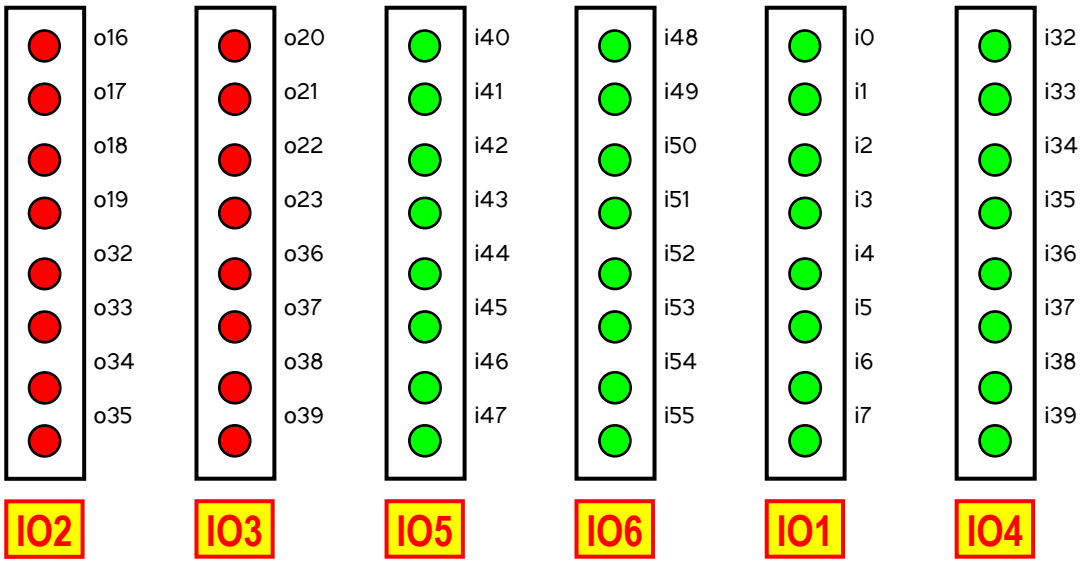
Power supply for outputs separate from VA

On slots IO1, IO2, IO3 and IO6 are pluggable the output modules that, by default, are powered by the voltage VA which supplies the controller.

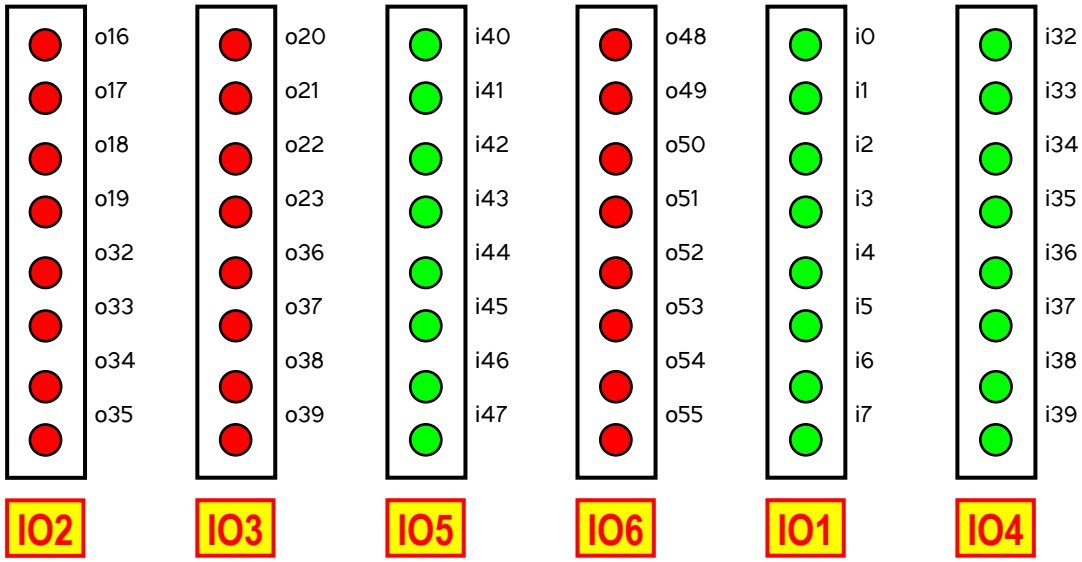
In each module there are a faston and a jumper: removing the jumper disconnects the faston from VA so that it can be used to apply to the module a different voltage supply.

The max. applicable voltage is 30 Vdc, with the positive on the faston, and the negative in common with the power supply of the controller (GNDA); the max. output current from each output is 1A, but the whole module must not supply more than 3A.

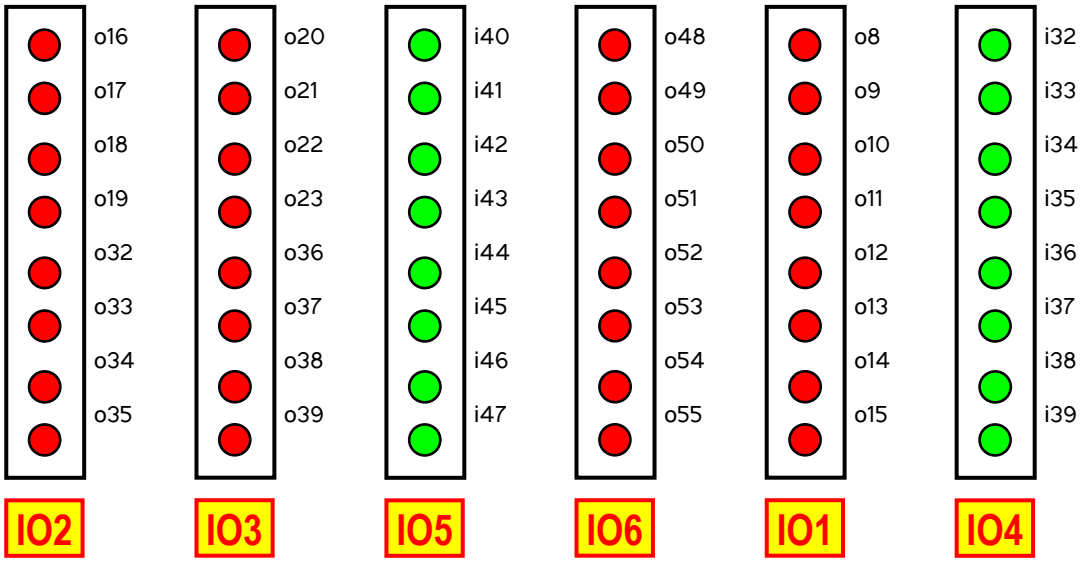
Provision of diagnostic LED configuration with 40 + 16 input output



Provision of diagnostic LED configuration with 32 + 24 input output



Provision of diagnostic LED configuration with 24 + 32 input output



Warning: the maximum current that can flow from each group of output is 3A

ANALOG INPUTS (consecutive numbering)

input	connector	pin	full scale	notes
16	M4	1	+/- 10V	14 bit, buffered
17		3	0-20 mA	
20	P14	24	0-5V	14 bit, buffered with inputs resistance of 100 KΩ to GND
21		23		
22		26		
23		25		
256	M5	2	0-5V	14 bit, not buffered
257		3		
258		4		
259	P12	24	0-10V o 0-20 mA *	14 bit, buffered with inputs resistance of 200 KΩ to GND
260		23		
261		26		
262		25		

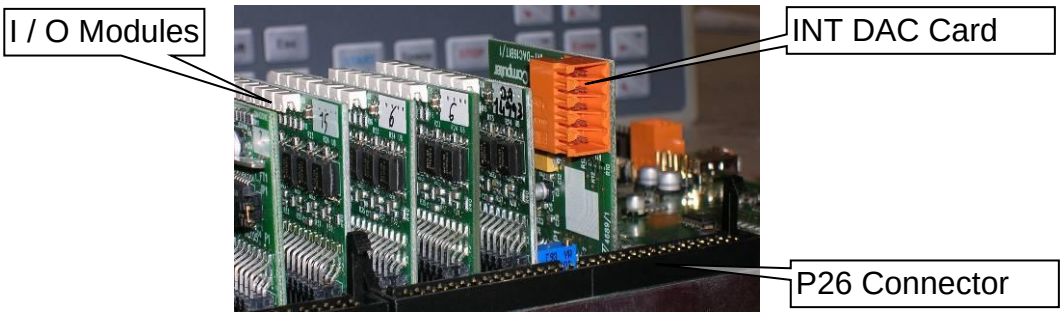
* Welding the drop pads PG8, PG9, PG 10 and PG11, you can fit 499 Ω precision resistors to GND in order to configure these inputs as 0-20 mA current inputs.

ANALOG OUTPUTS (consecutive numbering)

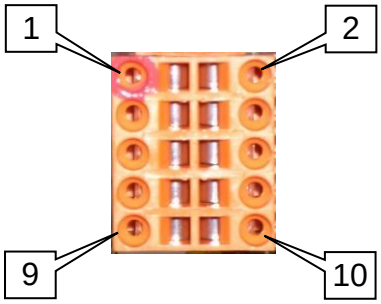
output	connector	pin	full scale	notes
9	P26	2	+/- 10V	from PWM, with 12-14 bits resolution
10		4		
11		6		
12		8		

OPTIONAL INT DAC CARD

The optional INT DAC card comes already welded into the slot located next to P18 control module I / Os; through it are made available to the 4 analog outputs + / - 10V identified as # 1, 2, 3 or 4 in the parameter "PWM / DAC output number".



The card is equipped with a removable terminal polarized by 10 pins with spring clamp having the following features:

Terminal	Function	Layout
1	GNDANAL # 1 analog ground	
2	# 1 reference signal VREF + / - 10V	
3	GNDANAL # 2 analog ground	
4	# 2 reference signal VREF + / - 10V	
5	GNDANAL # 3 analog ground	
6	# 3 reference signal VREF + / - 10V	
7	GNDANAL # 4 analog ground	
8	# 4 reference signal VREF + / - 10V	
9	GND analog ground	
10	GND analog ground	

Unlike analog output identified as # 9, 10, 11 and 12 which are derived from a PWM signal, these analog outputs are generated by DAC (Digital / Analog Converter) with 16-bit resolution, which implies that it is necessary to use them to set in "Special parameters axis" parameter "type operation" to 2, 3, 4 or 5.

ANALOG OUTPUTS (consecutive numbering)

output	pin	full scale	notes
1	2	+/- 10V	from DAC, with 16 bits resolution
2	4		
3	6		
4	8		

CONNECTION EXAMPLES

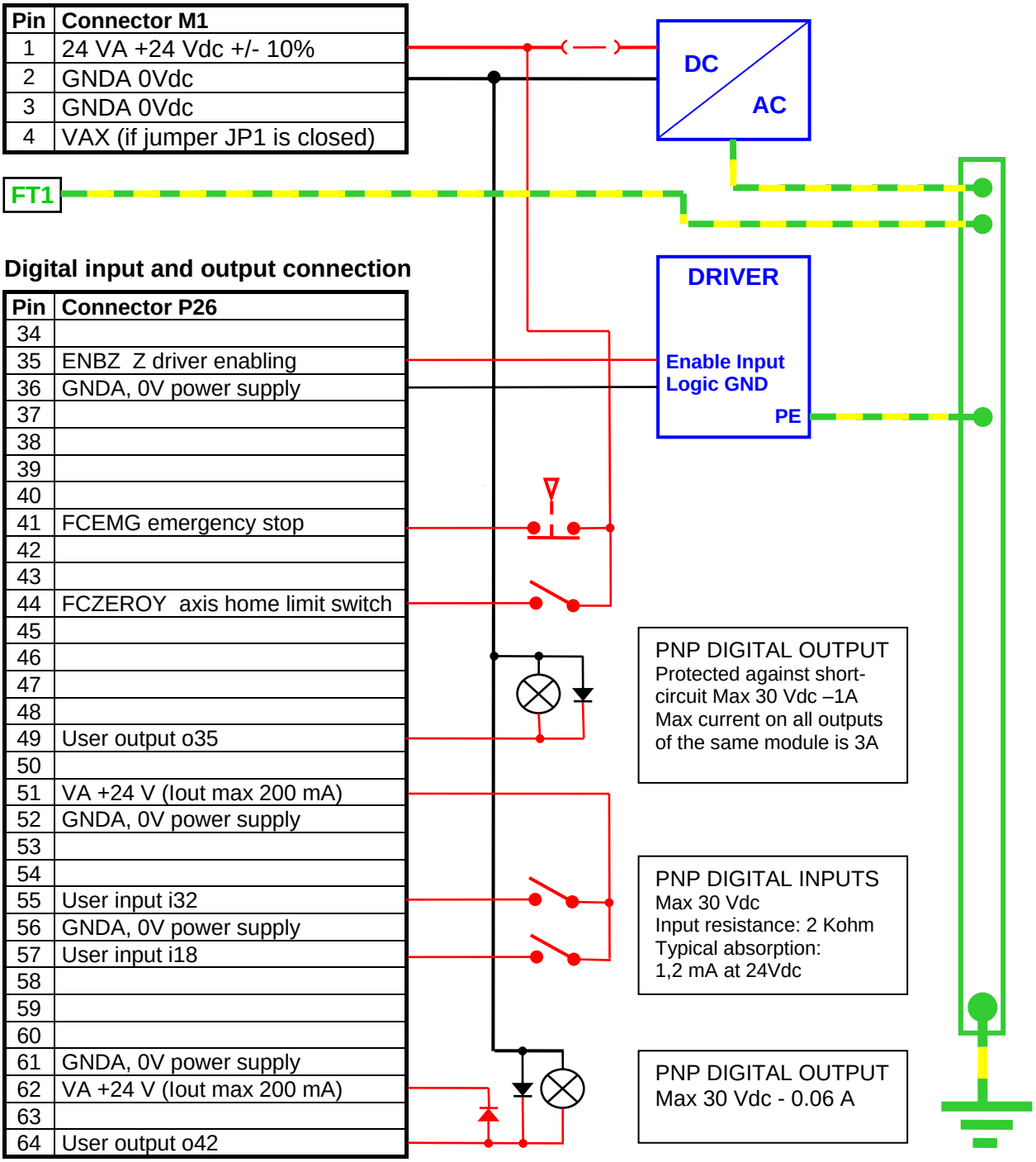
This section is an extract of the information provided in the "Electrical Connections" section of the manual supplied with the controller, to which you must always refer for the wiring of the system according to the constructor's technical recommendations.

Power supply and ground connection

Pin	Connector M1
1	24 VA +24 Vdc +/- 10%
2	GNDA 0Vdc
3	GNDA 0Vdc
4	VAX (if jumper JP1 is closed)

Digital input and output connection

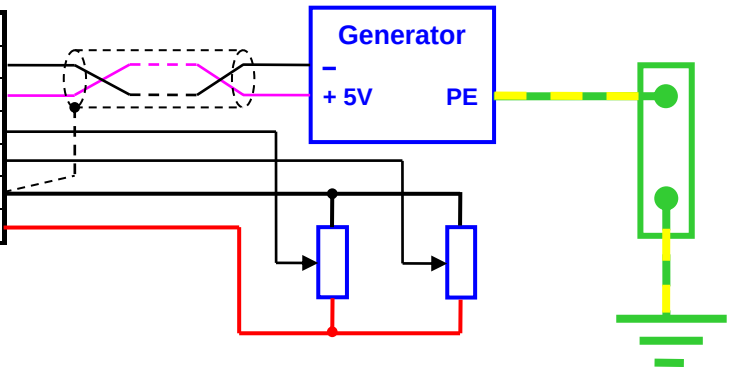
Pin	Connector P26
34	
35	ENBZ Z driver enabling
36	GNDA, 0V power supply
37	
38	
39	
40	
41	FCEMG emergency stop
42	
43	
44	FCZEROY axis home limit switch
45	
46	
47	
48	
49	User output o35
50	
51	VA +24 V (Iout max 200 mA)
52	GNDA, 0V power supply
53	
54	
55	User input i32
56	GNDA, 0V power supply
57	User input i18
58	
59	
60	
61	GNDA, 0V power supply
62	VA +24 V (Iout max 200 mA)
63	
64	User output o42



NB: CE regulations recommended to place the free-wheeling diode in proximity of each inductive load to prevent the spread of electromagnetic interference along the wiring cables.

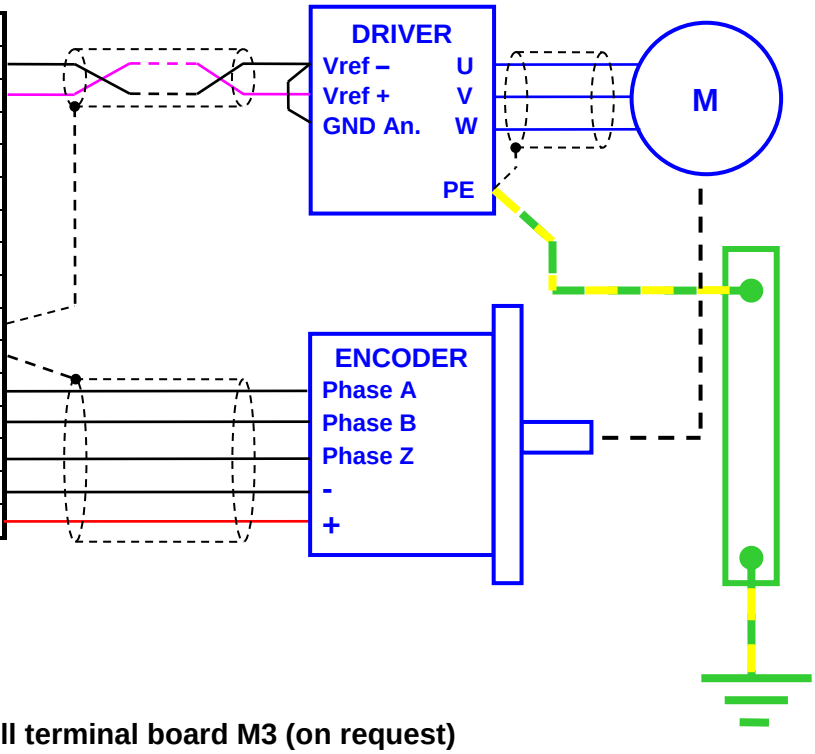
Analog input connection

Pin	Connector M5
1	Analog GND
2	Analog input # 256
3	Analog input # 257
4	Analog input # 258
5	Analog GND
6	+ 5V for potentiometer power supply



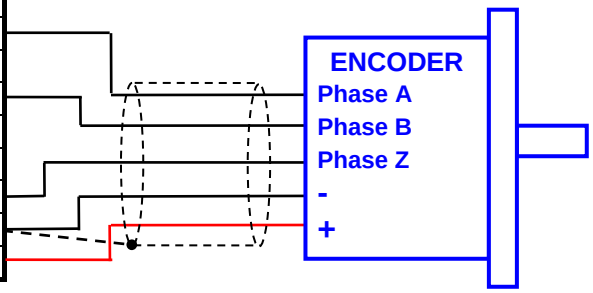
Connection to 5 V Push Pull encoder

Pin	Connector P26
1	GNDANAL X X axis analog ground
2	VREF X X reference signal, +/- 10V
3	GNDANAL Y Y axis analog ground
4	VREF Y Y reference signal, +/- 10V
5	GNDANAL Z Z axis analog ground
6	VREF Z Z reference signal, +/- 10V
7	GNDANAL W W axis analog ground
8	VREF W W reference signal, +/- 10V
9	GDN logic ground for screening
10	GDN logic ground for screening
11	CLKA X encoder X axis channel
12	CLKB X encoder X axis channel
13	NOTCH 0 X X axis enc. channel 0
14	GDN logic ground for encoder
27	VDC encoder +5Vdc power supply



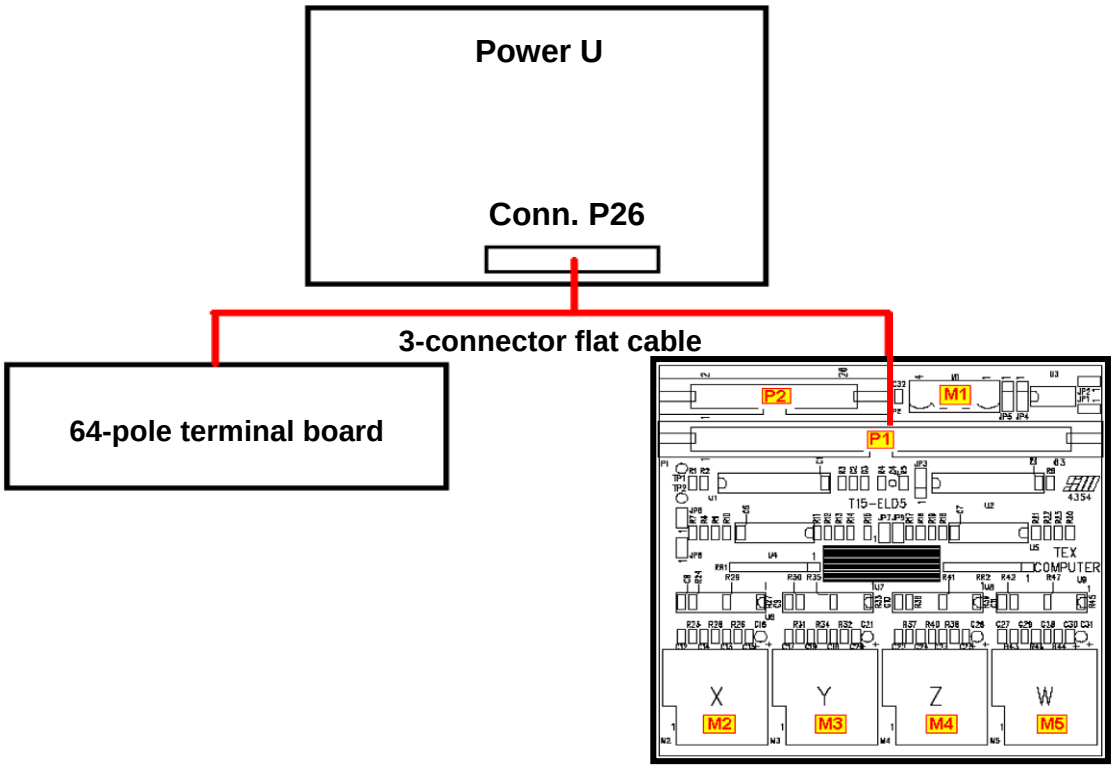
Encoder connection to 5 V Push Pull terminal board M3 (on request)

Pin	**Connector M3** (encoder # 6)
1	CLK A channel A straight
2	CLK/A channel A negated
3	CLK B channel B straight
4	CLK/B channel B negated
5	NOTCH /0 channel 0 negated
6	NOTCH 0 channel 0 straight
7	GDN logic ground
8	+ 5V for encoder power supply



Connection to 5V Line Driver encoder

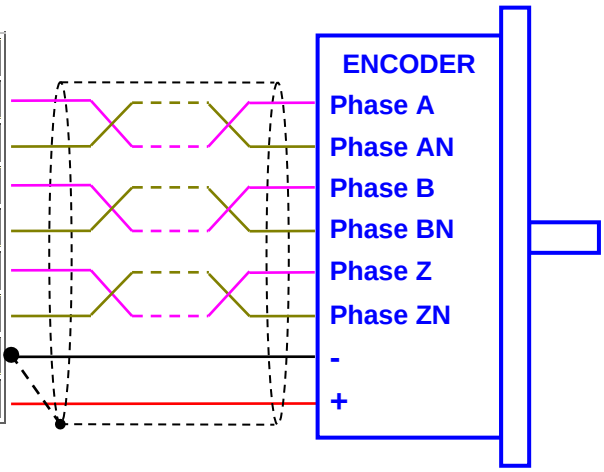
The controller has 5 terminals (M2, M3, M7 and M8) for the connection of as many incremental encoders with 5V Line Driver outputs. In order to connect more 5V Line Drivers encoders the encoder inputs on the connector P26 can be used interposing an interface card called **T15ELD**. This interface must be connected by means of a 3-connector flat cable which makes all the necessary electrical connections available on 4 different terminal boards, called **M2**, **M3**, **M4** and **M5**. When the T15ELD is connect to the "simulated encoder" of the Driver do not connect the terminal + 5Vdc.



T15ELD interface connections

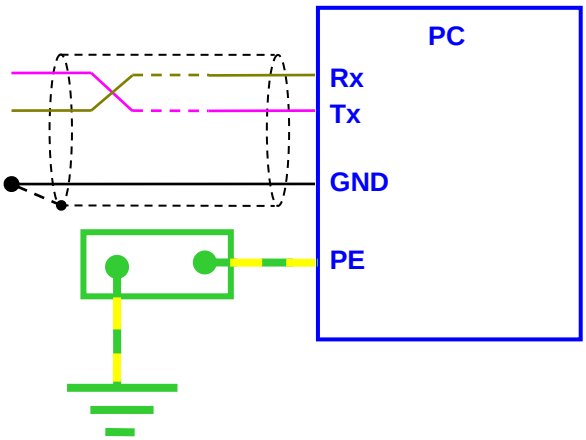
The connections must be made by means of twisted screened cable. If the “simulated encoder” outputs generated by the driver are connected to the T15ELD interface instead of the encoder, the + 5Vdc terminal is not connected.

Pin	M2 / M3 / M4 / M5
1	Ch. A asse X
2	Ch. /A asse X
3	Ch. B asse X
4	Ch. /B asse X
5	Ch. 0 asse X
6	Ch. /0 asse X
7	GND
8	+5V DC



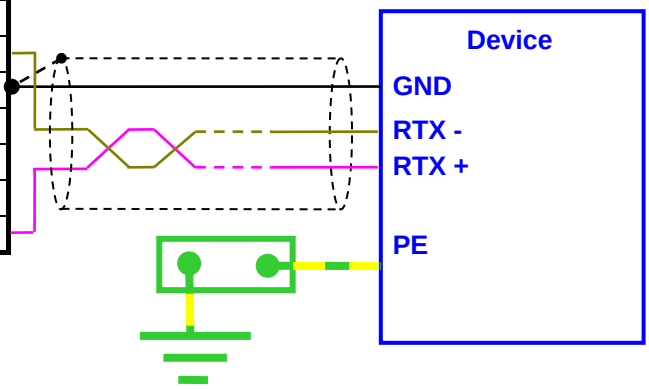
Connection of RS232 serial interface (Com 1 & Com 2)

Pin	Connector P6 / P7
1	
2	RX
3	TX
4	
5	GND logic ground
6	
7	
8	
9	



Connection of RS485 serial interface (Com 3)

Pin	Connector P7
1	
2	
3	
4	RTX -
5	GND logic ground
6	
7	
8	
9	RTX +



NB: add a 120 ohm termination resistance at the beginning and end of the line.

CANopen interface connection

The Power U is able to control up to 2 CAN ports using both the CiA 301 general communication protocol and the specific profiles CiA 401 (I/O devices), CiA 402 (drives) and CiA 406 (encoder).

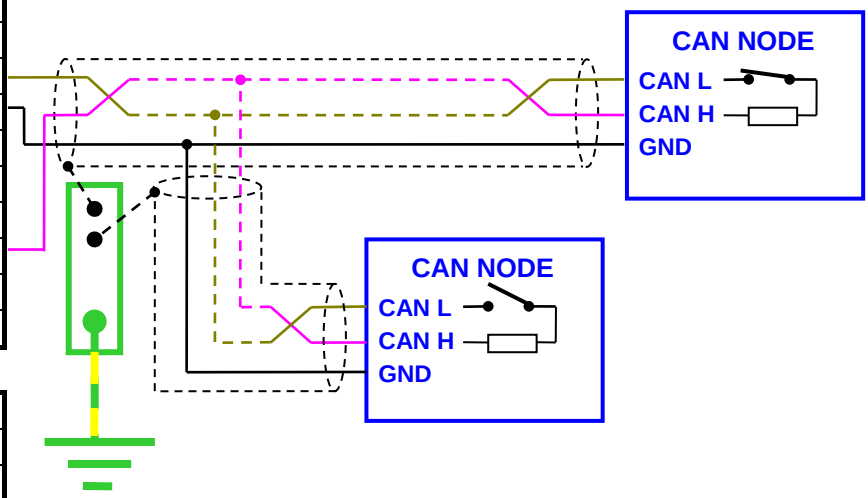
Be careful not to use in the same network devices CiA 401 and CiA 402 because it could result in a malfunction.

The CAN network must be done with twisted screened cables and the furthest ends of CAN H and CAN L signals must be charged through a 120 ohm termination resistance.

In the Power U, the termination resistances are already connected by default and can be disconnected by removing jumpers JP3 (CAN A), JP4 (CAN B), but you have to install the termination resistance at the other end of the network.

Pin	Connector P5 – CAN A
1	
2	CAN L
3	GND logic ground
4	
5	
6	
7	CAN H
8	
9	

Pin	Connector P19-CAN B
1	
2	CAN L
3	GND logic ground
4	
5	GNDA (0Vdc)
6	
7	CAN H
8	
9	VA (+24 Vdc – 100 mA)



The same power supply voltage supplied to the controller is available between pins 5 and 9 of connector P19. This voltage can be used to supply external devices which do not absorb more than 100 mA.

Connection to an active remote Panel

The Power E BOX is equipped with an LVDS (Low Voltage Differential Signaling) interface, with which you can connect the controller, up to a maximum distance of 10 m, with any front Panel complete with display, touch screen, keyboard and USB port.

On board of the active remote panel must be present the intelligent card TRM-003 which manages, through its own microprocessor, the keyboards with 16, 28, 56, 75 or 80 keys (for this last with the exclusion of the vertical keys from A4 to A8).

The keys and the local I/O of the card are encoded and transmitted via RS232 to the controller, which takes care of the direct management of LCD, touch screen and USB port using the signals present in the LVDS cable.

Through the same LVSD cable the electrical contacts, relative to an emergency button and to a "dead man" safety button, can be transferred on the M6 terminal of the controller.

The serial port used is the COM 2 (P7 connector of the controller) on which you will find, already inserted, a connector with the cable to link it with the graphics card; to function properly, the communication must be set with the following parameters:

- baud rate: 57600
- parity = N
- format: 8 bit data + 1 bit stop

IMPORTANT: the remote panel chassis must be connected to ground by means of a cable with gauge of at least 2.5 mmq.

Connection to 8.4" active mobile Terminal

Since March 2016 the active 8.4 "mobile terminal is equipped with smart card TRM-003 and therefore are valid the considerations done in the previous paragraph.

On board there is the M1 connector, which supports the following electrical connections:

Pin	M1 terminal board
1	1 EMG CONTACT (N.C.)
2	2 EMG CONTACT (N.C.)
3	1 & 2 EMG CONTACT (Common)
4	VA terminal power supply, coming from LVDS cable
5	Dead man CONTACT
6	
7	GND
8	GND
9	
10	GND

The logic states of the **key-switch** and **buzzer** installed on the mobile terminal are visible from the application program through system's parameters:

s331: key-switch

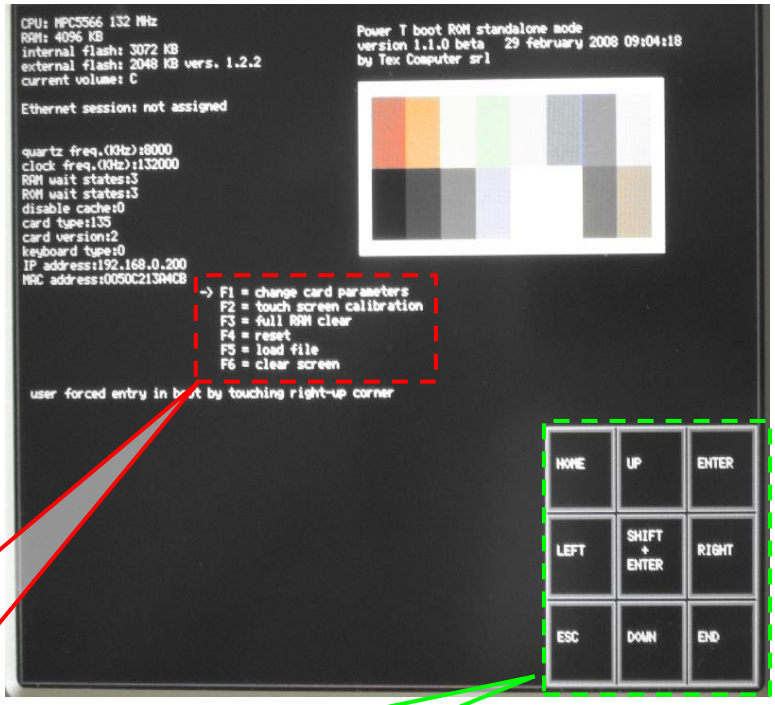
s332: buzzer

For more information refer to TRM-003 data sheet.

Basic functions of the touch screen

On the controllers equipped with touch screen, a number of basic functions can be accessed immediately without having to enable and calibrate the screen.

1. If at start up the system detects a pressure at the top right-hand corner of the screen, it accesses **Boot menu**:



BOOT FUNCTIONS
F1 = change card parameter
F2 = touch screen calibration
F3 = full ram clear
F4 = reset
F5 = load file
F6 = clear screen
F7 = save current firmware
F8 = export card parameter

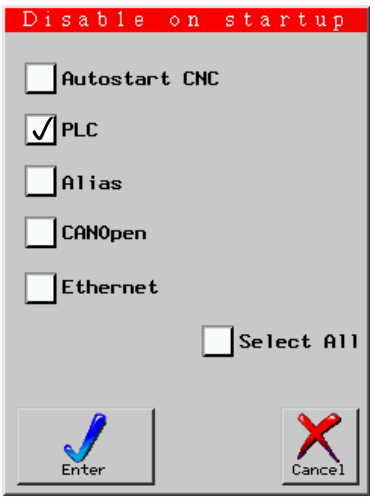
Touch keys to browse the boot functions

WARNING: the Boot menu only manages the USB memories and not any other peripherals, such as the keypad and the mouse, which may be connected to the same USB port by means of a hub.

Once you are in Boot menu, we suggest you to calibrate the touch screen so that the touch function is still active when the system is switched on again, even after running functions F3 and F4 which partially or totally clear the RAM memory.

We recommend not to alter the card's basic configurations without contacting first the Tex Computer's technical staff.

2. If at start up the system detects a pressure at the top left-hand corner of the screen you enter the menu which allows the operator to disable some functions during the current start-up phase. The following check list will be displayed:



Touching the screen on each of the white boxes allows the user to check or un-check the functions to be disabled during the current start-up phase. Pressing ENTER you confirm the selections made, which affect the current start-up phase only and not the following ones

For further information about the functions of the touch screen, refer to the manual with the same name.

Power U 10,4" XGA with electronic handwheel

In this version, the controller is supplied equipped with the optional INT-CFC-USB1 card fitted behind the front door which gives access to the Ethernet port, the USB slot and the CF removable memory connector.

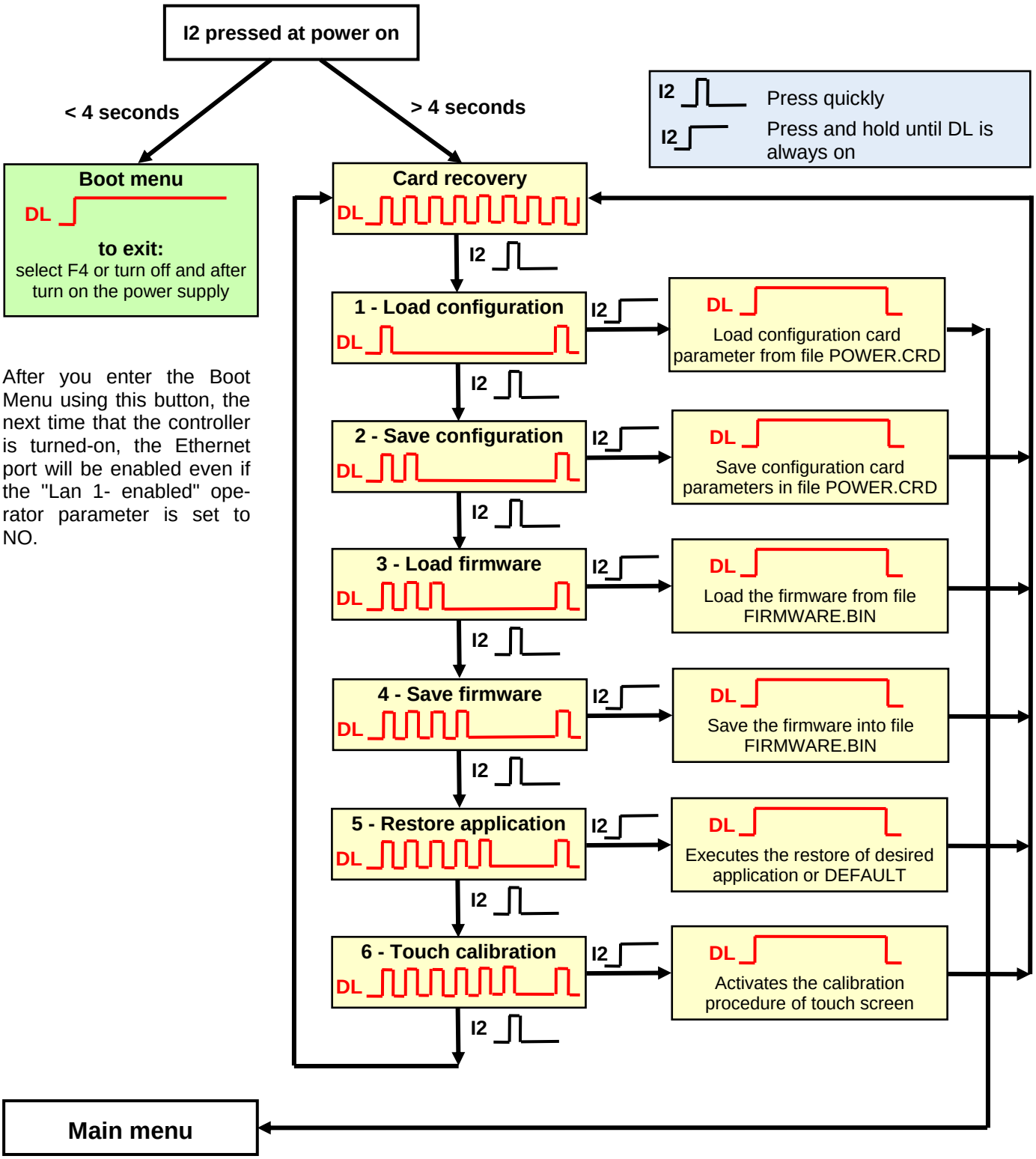
The following resources are electrically connected to the INT-CFC-USB1 card and terminal board M5:

Name	Typical function with ISO program	Resource
Electronic Handwheel	100 ppr incremental encoder which can be used to move the axis selected with the axis selector in electric shaft mode.	Encoder at your choice
Axis selector	Allows selection of the axis to be linked to the control knob in electric shaft mode; just one input will be active corresponding to the letter shown. In OFF position, no inputs are active.	i224 (X axis) i225 (Y axis) i226 (Z axis) i227 (A axis) i228 (B axis) i229 (C axis)
Numerical selector knob	Can be used to change the resolution of electric shaft movement of the axis connected to the electronic handwheel	i232 (setting 1) i233 (setting 2) i234 (setting 3) i235 (setting 4)
Axis overfeed	Regulates the axis feed speed	Analog input # 256 *
Spindle Overfeed	Regulates the spindle rotation speed	Analog input # 257 *

* On terminal board M5

To enable operation of card INT-CFC-USB1 the **"has a INT-FDC-CFC-USB"** parameter must be set as "yes".

Recalling Boot and Card recovery Functions from I2



After you enter the Boot Menu using this button, the next time that the controller is turned-on, the Ethernet port will be enabled even if the "Lan 1- enabled" operator parameter is set to NO.

The controller is equipped with a microswitch, called I2, located on one side of the motherboard; next to it there is also a red LED DL11. Pressing the microswitch I2 at power on you can access both the **Boot menu** and the **Card recovery** functions which allow you to upload from a removable storage device, a text file, called POWER.CRD, where there are listed the values of the main card configuration parameters, including the IP address of the controller; these features are particularly useful for Box version controllers.

The functions available are:

- *1 - Load configuration;* loads the motherboard with the configuration parameters of the file POWER.CRD
- *2 - Save configuration; c*reate a POWER.CRD file with the motherboard data
- *3 - Load firmware;* loads, in two different moments, indifferently both the Main and the Boot of the controller if in the storage medium they are both called FIRMWARE.BIN
- *4 - Save firmware; s*ave the motherboard firmware by creating a file named FIRMWARE.BIN
- *5 - Restore application;* activates the procedure that allows to instantly load the backup of an application program, present on the main root of a removable storage drive, whose name is defined in the operator parameter restore al reset. If this parameter is empty it will be automatically searched for an application program called DEFAULT
- *6 - Touch calibration;* gives you instant access to the calibration of the touch screen

You can exit the Card recovery menu at any time by turning off and on the power supply of controller.

Interchangeability with Power E

Power U has been designed in such a way as to make possible to increase the performance of machines equipped with Power E by making only minor modifications to the electrical wiring and to the program. At hardware level, the main difference are:

- In Power U the available inputs are only PNP
- In Power U the P12 connector is 34-pin while in Power E it is 26-pin
- In Power E RS485 is alternative to RS232 Com 1, Power U instead use the Com 3 port.
- Power U Box is smaller than Power E Box, so the mounting holes are not interchangeable
- In Power U, Boot & Card Recovery functions are accessed via the micro-button I2, while I1 is used in Power E

The table shows the changes needed to achieve interchangeability:

Description	Power E	Power U	Interchangeability
P6 - Pin 2 - RS485 RTX+	Com 1	**P7** - pin 9, Com 3	with wiring and software modification
P6 - Pin 3 - RS485 RTX-	Com 1	**P7** - pin 4, Com 3	
P12 - Pin 17 - Axis enable # 6	o21N	o197N	changes are possible with both software and hardware modifications because P12 in Power E has 26 pins while in Power F it has 34 pins.
P12 - Pin 18 - Axis enable # 5	o20N	o196N	
P12 - Pin 19 - Axis enable # 8	o23N	o199N	
P12 - Pin 20 - Axis enable # 7	o22N	o198N	
P12 - Pin 23 - 0-10V analog in	# 6	# 260	
P12 - Pin 24 - 0-10V analog in	# 5	# 259	
P12 - Pin 25 - 0-10V analog in	# 8	# 262	
P12 - Pin 26 - 0-10V analog in	# 7	# 261	
P14 - Pin 17 - Axis enable # 2	o17N	o193N	with software modification
P14 - Pin 18 - Axis enable # 1	o16N	o192N	
P14 - Pin 19 - Axis enable # 4	o19N	o195N	
P14 - Pin 20 - Axis enable # 3	o18N	o194N	
P14 - Pin 23 - 0-5V analog in	# 1	# 21	
P14 - Pin 24 - 0-5V analog in	# 0	# 20	
P14 - Pin 25 - 0-5V analog in	# 3	# 23	
P14 - Pin 26 - 0-5V analog in	# 2	# 22	
P26 - +/-10V analog outputs	PWM # 5,6,7,8	PWM # 9,10,11,12	with parameters modification
P26 - Pin 63	o42 Collector	i91	only if doesn't use i91
P26 - Pin 64	o42 Emitter	o42 24V PNP 60mA	only if Pin 63 was connected to + 24V
P25 - Pin 8	i39	i35	with software modification
P25 - Pin 25	i55 / o55 Imax 1A	o44 Imax 60mA	with software modification only if on PowerE P10 is an output module and the connected load absorbs up to 60 mA

Description	Power E	Power U	Interchangeability
P25 - Pin 28	i34	i39	with software modification
P25 - Pin 30	i35	i34	
P25 - Pin 31	i26	i22	
P25 - Pin 33	i27	i23	
P25 - Pin 39	-	i55 / o55	
M4 - Pin 1 - +/- 10V analog in	# 32	# 16	with software modification
M4 - Pin 3 - 0-20 mA analog in	# 13	# 17	
M5 - Pin 2 - 0-5V analog in	# 10	# 256	with software modification
M5 - Pin 3 - 0-5V analog in	# 11	# 257	
M5 - Pin 4 - 0-5V analog in	# 12	# 258	

Interchangeability with Power F

The Power U is designed in such a way as to be practically interchangeable to the Power F in most applications.

The main differences are:

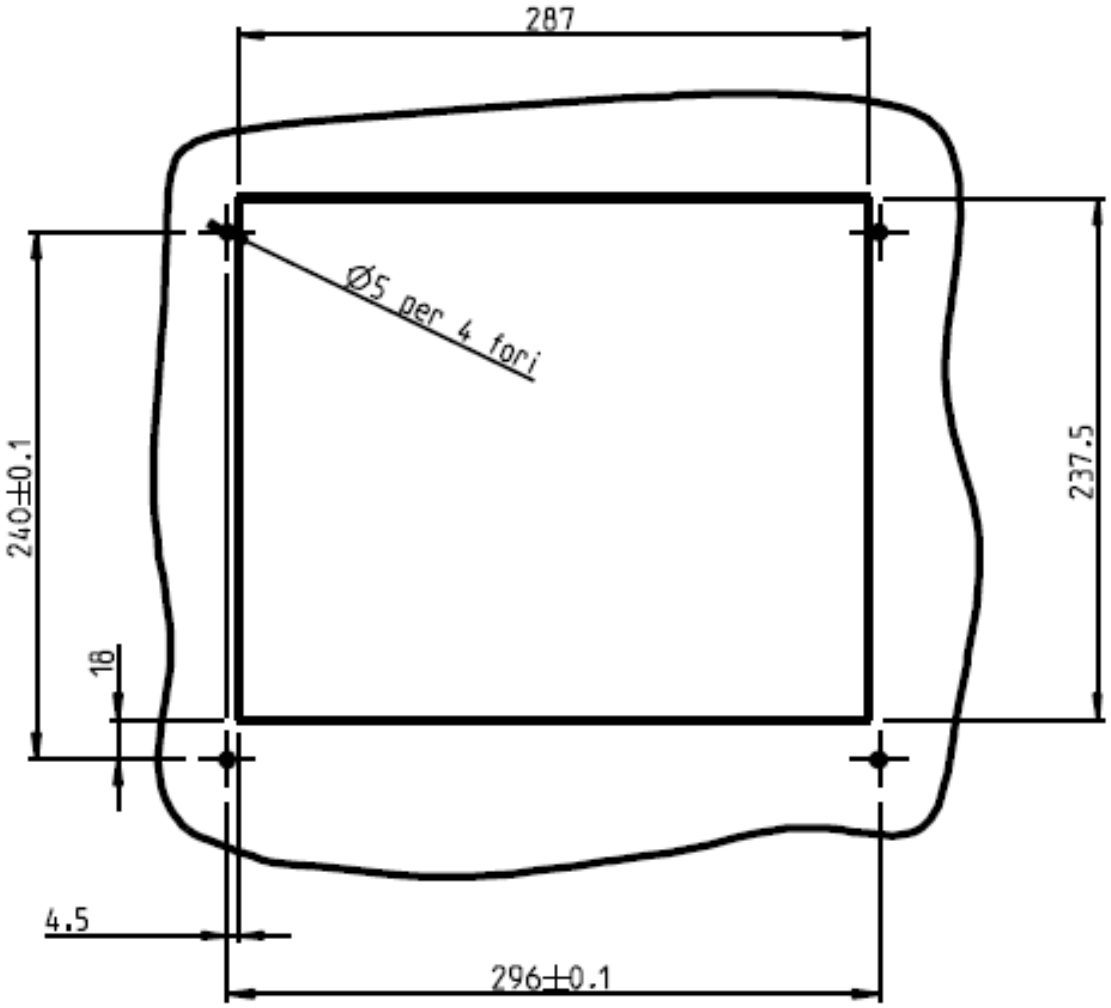
- In Power U there are available only PNP digital inputs
- The inverted outputs for enabling the drives, present on P12 and P14 connectors, are different from those of the Power F
- Power U lacks of M9 connector, usually used to connect the wheel encoder
- In Power F the RS485 is alternative to RS232 Com 1, instead in Power U it is the Com 3
- In Power U there is not the optional M10 connector for the I/O of the safety circuit
- In PowerU the safety circuit lacks; in the optional M11 connector are reported only contacts from a safety relay and a transistor output that are enabled according to a logic which is not certifiable as SIL
- Power U Box is smaller than Power F Box, so the mounting holes are not interchangeable

The table shows the changes needed to achieve interchangeability:

Description		Power F	Power U	Interchangeability
P6 - Pin 2 - RS485 RTX+		Com 1	**P7** - pin 9, Com 3	with wiring and software modification
P6 - Pin 3 - RS485 RTX-		Com 1	**P7** - pin 4, Com 3	
P12 - Pin 18	Inverted enable of axes # 5, 6, 7 and 8	o20N	o196N	with software modification
P12 - Pin 17		o21N	o197N	
P12 - Pin 20		o46N	o198N	
P12 - Pin 19		o47N	o199N	
P12 - Pin 31 - PWM output		PWM # 3	don't connect	with wiring modification
P12 - Pin 33 - PWM output		PWM # 4		
P14 - Pin 18	Inverted enable of axes # 1, 2, 3 and 4	o16N	o192N	with software modification
P14 - Pin 17		o17N	o193N	
P14 - Pin 20		o18N	o194N	
P14 - Pin 19		o19N	o195N	
P14 - Pin 23 - input 0-5V		# 1	# 21	with software modification
P14 - Pin 24 - input 0-5V		# 0	# 20	
P14 - Pin 25 - input 0-5V		# 3	# 23	
P14 - Pin 26 - input 0-5V		# 2	# 22	
P26 - Pin 64		o41	o42	with software modification
M4 - Pin 1 - input +/- 10V		# 266	# 16	with software modification
M4 - Pin 3 - input 0-20 mA		# 267	# 17	
M9 - Inputs for encoder # 9		Yes	No	Only if you do not use M9
M10 - Safety circuit I/O # 1		Yes	No	Only if you do not use M10
M11 - Safety circuit I/O # 2		Yes	Yes	With changes at the operating logic of I/O

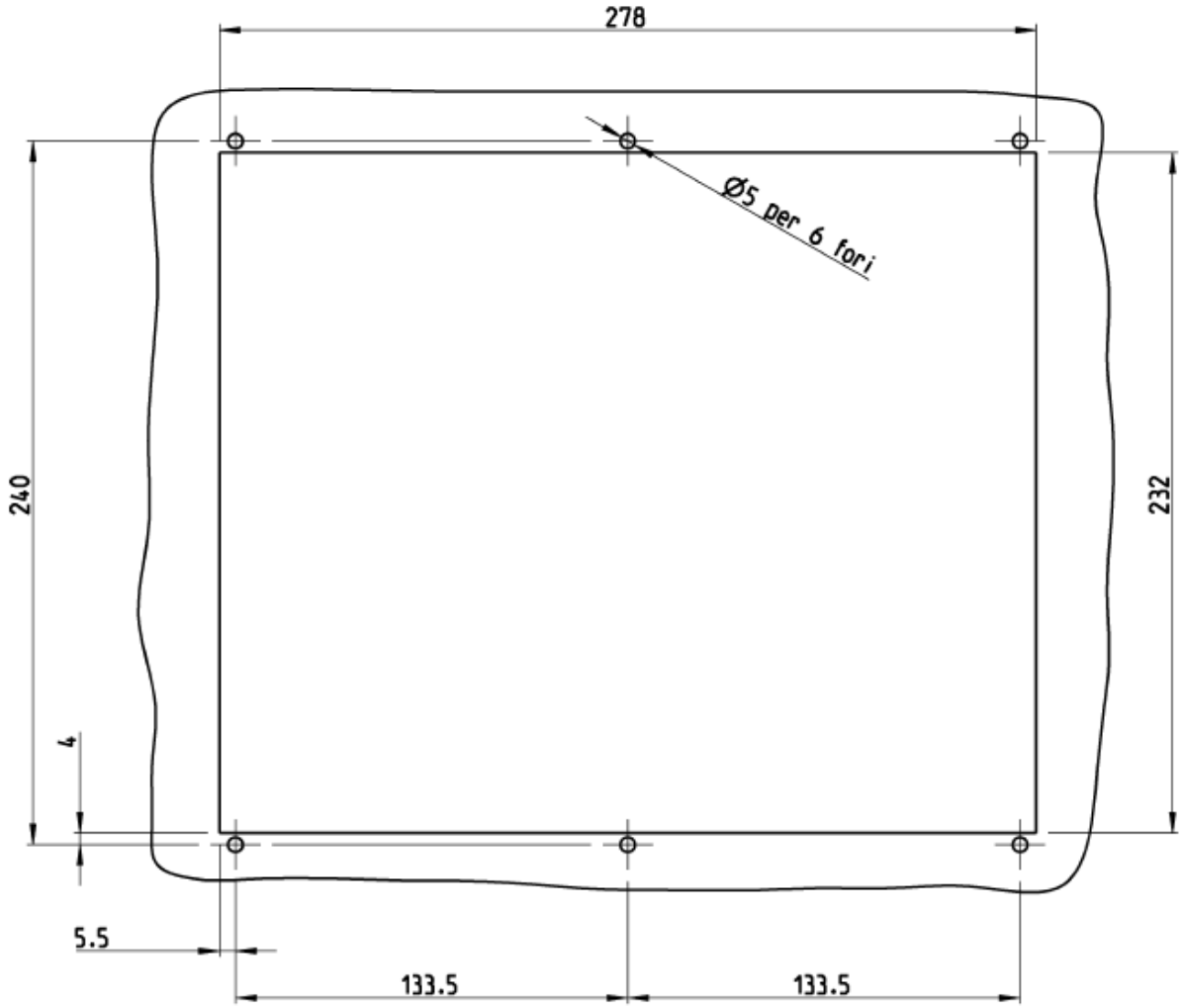
Power U 10” - 56 keys drilling template

(Dimensions in mm)



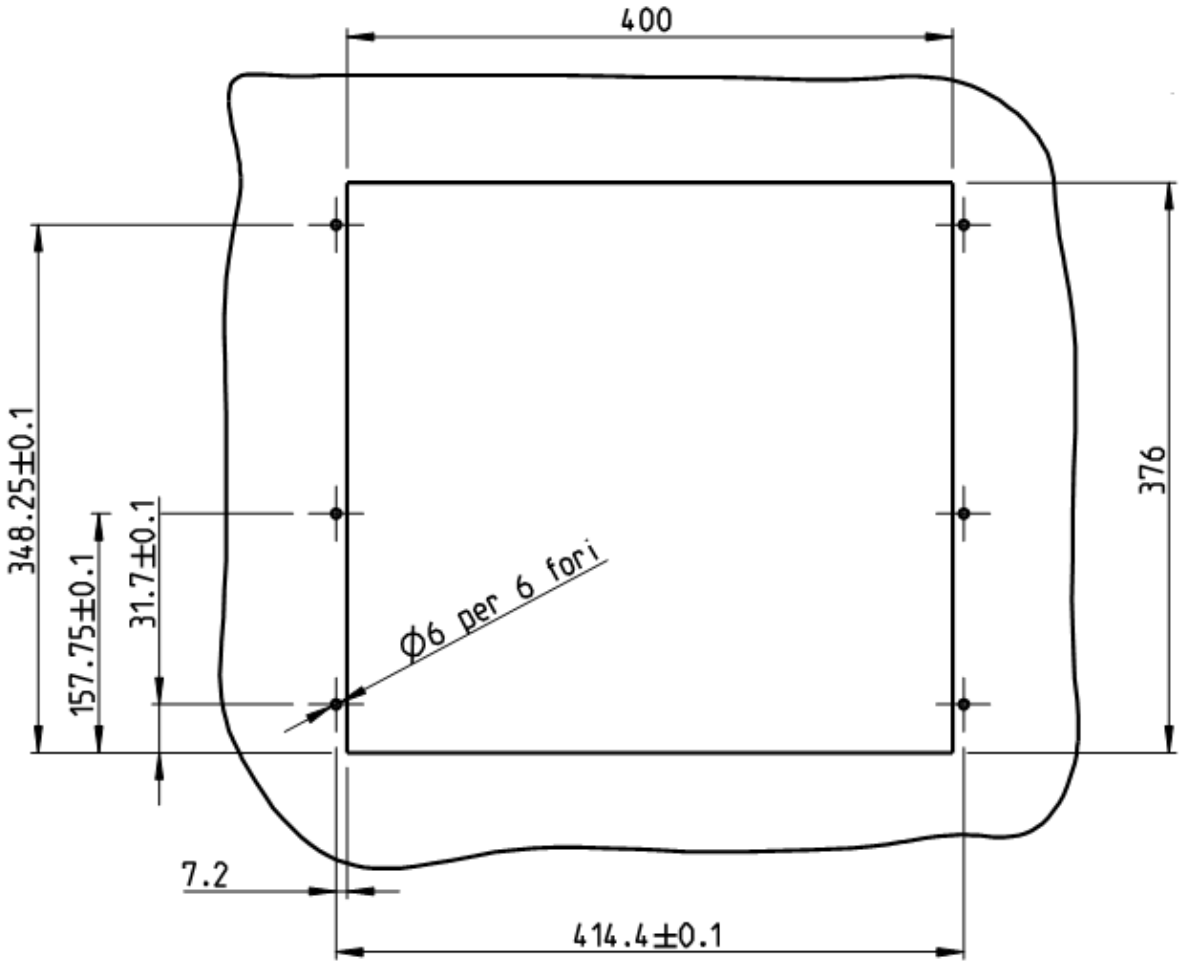
Power U 10,4” Compact drilling template

(Dimensions in mm)



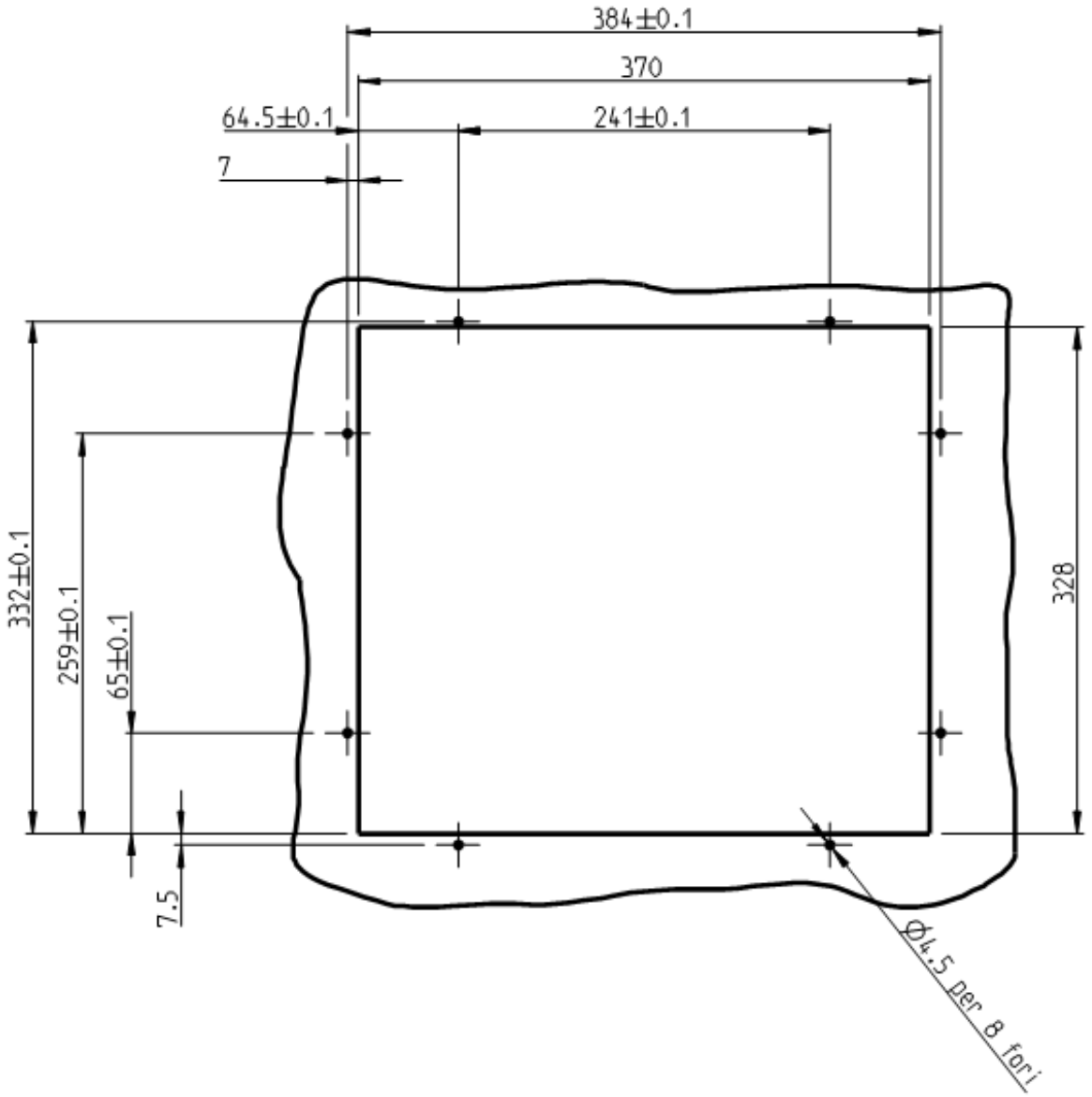
Power U 15” XGA, 80 keys drilling template

(Dimensions in mm)



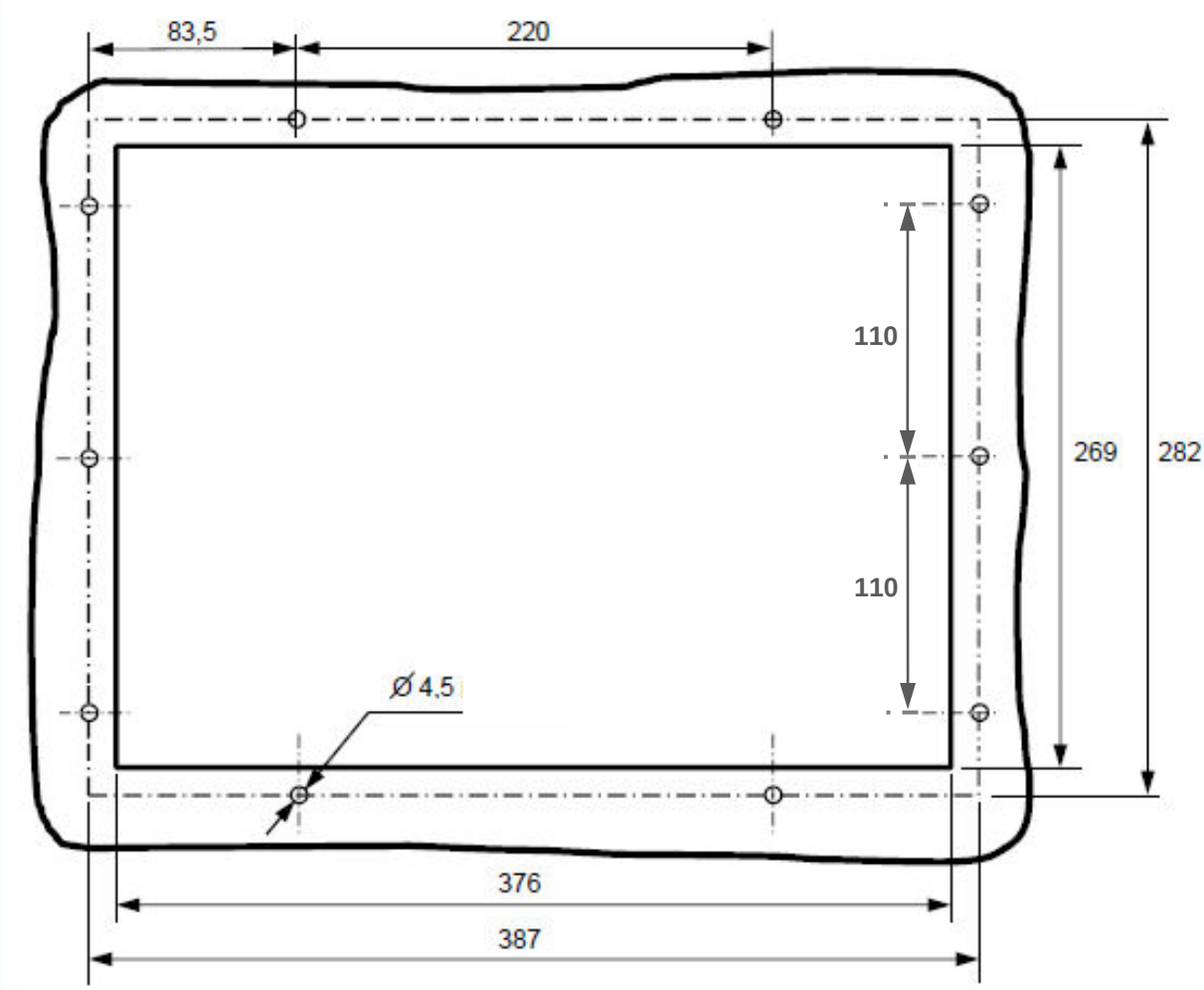
Power U 15” - 28 keys drilling template

(Dimensions in mm)



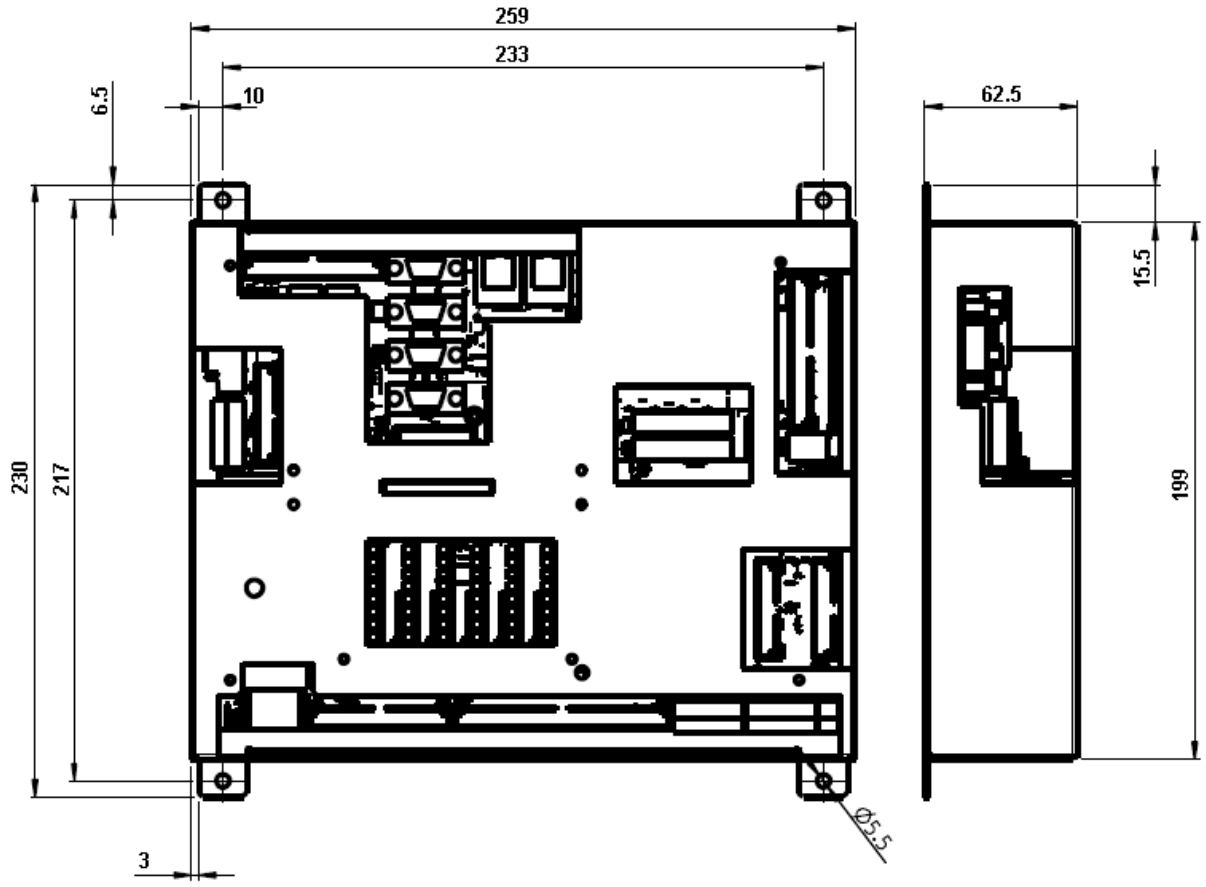
Power U 15” only touch drilling template

(Dimensions in mm)



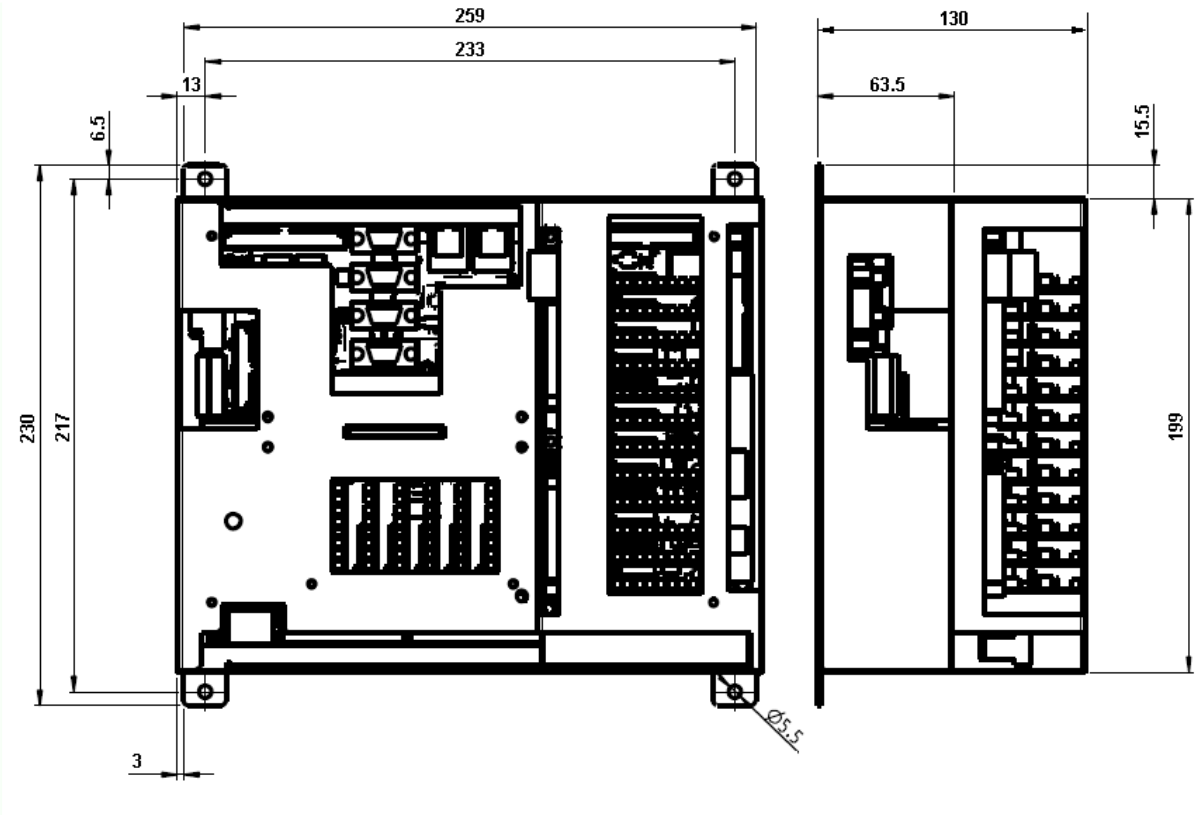
Power U Box, without FDC expansion board, dimensions

(Dimensions in mm)



Power U Box, with FDC expansion board, dimensions

(Dimensions in mm)



For the mounting hole positions and dimensions of other versions, refer to the Power Family html manual.

Data subject to modification without notice