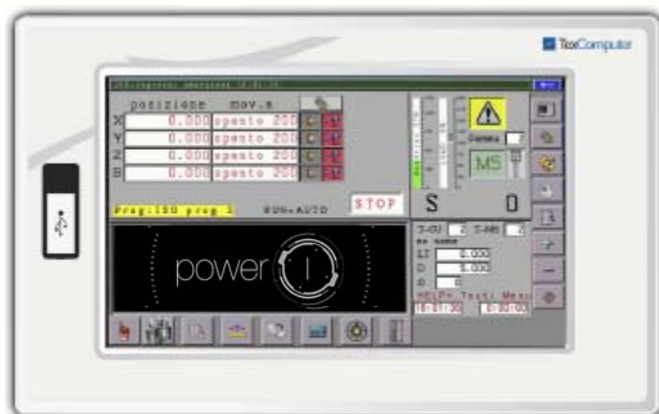# Programmable Automation Controller (PLC + CNC + HMI) for 4 axes

Power I 7" Only touch

- display TFT WVGA (800x480) with touch screen
- socket USB
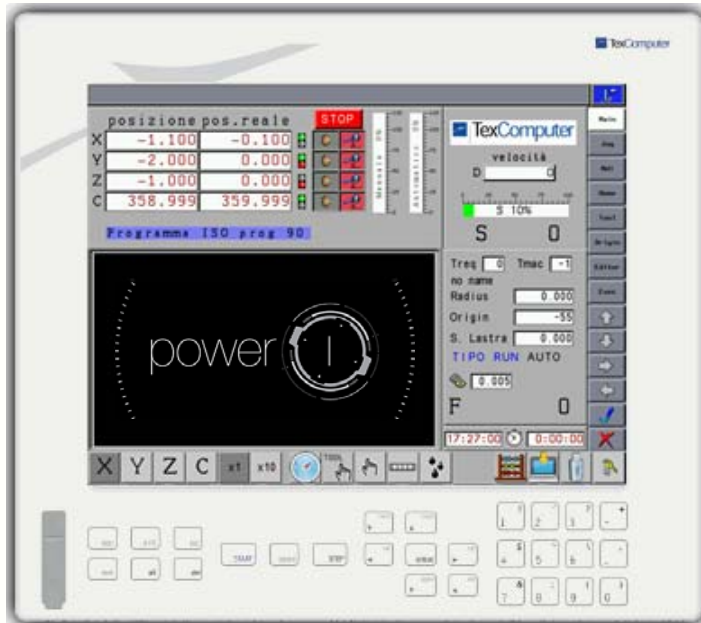- dimensions 243x146x77 (WxHxD in mm)

Power I 10" Only touch

- TFT WSVGA display (1024x600 pixel) with touch screen
- USB socket
- dimensions 310x192x60 (WxHxD in mm)

Power I 10" - 56 keys

- TFT WSVGA display (1024x600 pixel) with touch screen
- 56 key thermoformed membrane keypad
- USB socket
- dimensions 310x300x60 (WxHxD in mm)

Power I 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 I 15" - Only touch

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

Sede Legale e Amministrativa:
47841 Cattolica (RN) - Via Mercadante, 35 - Italy
Tel. +39 0541 832511 - Fax +39 0541 832519

Ufficio Area Nord:
20025 Legnano (MI) - Via Asti, 25 - Italy
Tel. +39 0331 456053 - Fax / Tel. +39 0331 458153

Ufficio Tecnico:
48018 Faenza (RA) - Corso Mazzini, 116 - Italy

REA n. 208216 - Cap.Soc. 99.000,00 iv - Part. IVA 01661960409 - Reg. Imp. di Rimini n. 01661960409 - Soggetta ad attività di direzione e coordinamento Fom Industrie Srl

www.texcomputer.com - commerciale@texcomputer.com

FomGroup

Fixed remotable terminal

- 10,4" WSVGA 1024x600 display with touch screen, dimensions 310x192x60 (WxHxD in mm)
- connection to Power P Box through 36-pole LVDS cable 10 m. long

10.4" Passive mobile terminal

- ergonomic plastic case
- connection to Power E 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
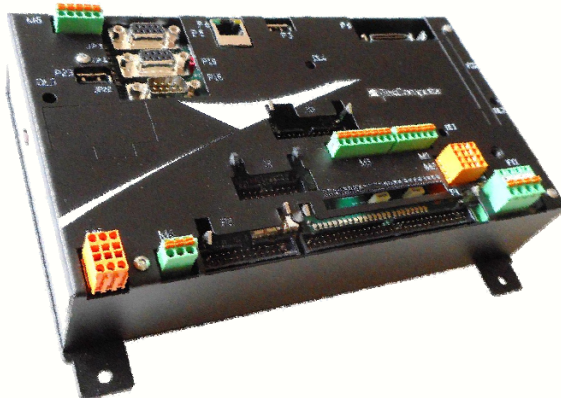
Box version

- control board for wall mounting
- IP00 protection grade
- dimensions 231x167x63 (WxHxD in mm)

Technical data

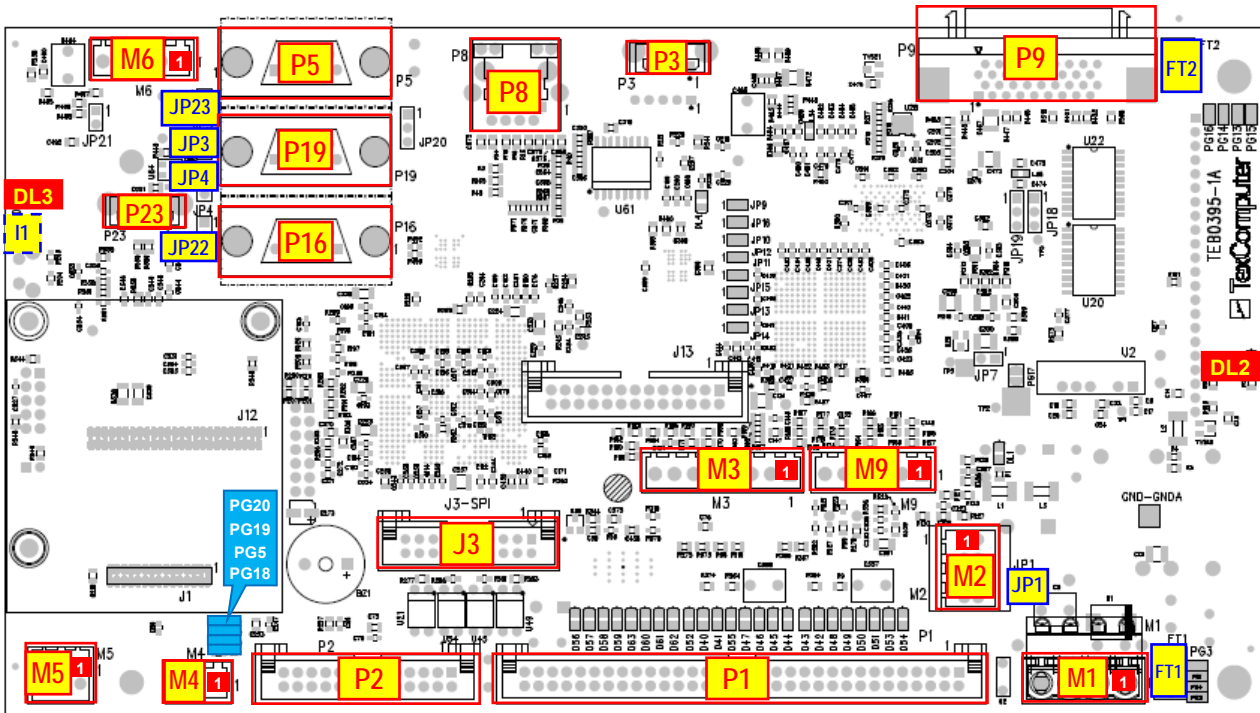| Description		Notes / Options
CPU	**RISC 32 bit**	264 MHz - Dual core
Flash memory (include F volume)	**16 MB**	
Ram (with buffer battery)	**8 MB**	
Volatile internal Ram	**512 KB**	
Clock calendar	**Yes**	
Buzzer	**Yes**	
Touch screen	**Yes**	
Keypad management	**Yes**	Maximum 75 keys
Digital inputs PNP 24 Vdc	17	Locally expandable to 33 with INT-SPI
Digital inputs 5V TTL	2	Can be conditioned via INT-185 GP
Protected outputs PNP 0,6 Amp. 24Vdc	8	Locally expandable to 24 with INT-SPI
Isolated outputs 60 mA 24Vdc PNP	4	
Digital outputs 5V TTL	8	
Analog inputs 0..5 volt - 14 bit	7	With Sigma Delta converter
Analog input +/-10 volt - 14 bit	1	With Sigma Delta converter
Analog input 0-20 mA - 14 bit	1	With Sigma Delta converter
Analog outputs +/-10V, from DAC	4	+/- 16 bit resolution
5V Line Driver encoder interface	3	On P1 connector; on request they can be 5 V Push Pull
5V Line Driver encoder interface	1	Optional, on terminal board; on request they can be 5 V Push Pull
5V Line Driver encoder interface without zero index	1	Optional, on terminal board; on request they can be 5 V Push Pull
STEP / DIRECTION or PWM outputs	**for 4 axis**	5V Push Pull , can be conditioned to 5V Line Driver via INT-185 GP
RS232 port	2	
RS485 port	1	
CAN port	2	CANopen CiA 401, CiA 402 and CiA 406
Ethernet 10-100 T port	1	TCP/IP, FTP, ModbusTCP & WEB server
USB port 1.1	1	
USB port 2.0	1	
SPI port (local I/O expansion)	1	For INT-SPI interface with 16 I +16 O
LVDS interface for remote terminal	1	36 pin connector
Power supply	**24 Vdc**	Low consumption
Maximum number of axes managed	4	

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	Flat connector 64 pin	no. 3 signals A, B and Z Line driver encoder # 1 no. 3 signals A, B and Z Line driver encoder # 2 no. 3 signals A, B and Z Line driver encoder # 3 no. 2 analog outputs +/- 10 V (from DAC # 1 and 2) no. 16 digital inputs (to use also as Fc Zero) no. 8 digital protected outputs PNP 0,6 A – 24 Vdc no. 4 digital outputs opto PNP 60 mA – 24 Vdc
P2	Flat connector 26 pin	PWM / STEP outputs and DIR # 1, 2, 3 and 4 (5V TTL) no. 2 digital inputs 5V TTL (available on INT-185 GP) no. 8 digital output 5V TTL no. 4 Analog inputs 0-5 V 14 bit, buffered
P3	USB connector # 2	1.1USB port
P5	Sub-D connector 9 pin F	CAN A (addressable nodes 0-63)
P8	Connector RJ45	Ethernet 10/100 T
P9	36 pin D connector	LVDS interface for remote terminal
P16	Pan connector 9 pin M	RS232 (COM1 & COM2) + RS485 (COM3)
P19	Sub-D connector 9 pin F	CAN B (addressable nodes 64-127)
P23	USB connector # 1	2.0 USB port
M1	4-pin Terminal board	Controller power supply
M2	8-pin Terminal board	no. 4 +/- 10 V analog outputs (from DAC # 1, 2, 3 and 4)
M3	8 pin terminal board	A, B and Z signals, line driver encoder # 4
M4	3 pin Terminal board	Analog inputs +/- 10V and 0-20 mA - 14 bit, buffered
M5	6 pin Terminal board	no. 3 Analog inputs 0-5Volt 14-bit, not buffered
M6	5 pin Terminal board	no. 1 digital input 24V PNP no. 2 Emergency contacts from remote terminal
M9	6 pin Terminal board	A and B signals, line driver encoder # 5
J3	Connector 20 pin	Connection to INT-SPI interface (local expansion for 16 digital Inputs + 16 digital Outputs)

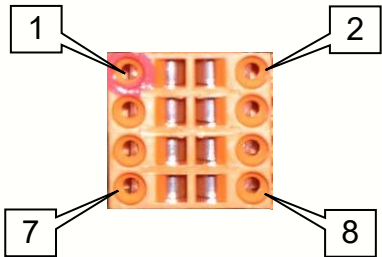| Name	Type	Function
JP1	Jumper	VA supply short circuit with VAX supply
JP3	Jumper	CAN A termination resistance
JP4	Jumper	CAN B termination resistance
JP22	Jumper	RS485 port termination resistance
PG5	Teardrop welding point	0-20 mA configuration of analog input # 20
PG18	Teardrop welding point	0-20 mA configuration of analog input # 22
PG19	Teardrop welding point	0-20 mA configuration of analog input # 259
PG20	Teardrop welding point	0-20 mA configuration of analog input # 21
FT1	Faston	Ground connection with at least 2,5 mm^2 cable
FT2	Faston for SPI interface	Ground connection with at least 2,5 mm^2 cable
I1	Microswitch (input i88)	Launch of Boot and Card recovery functions
DL2	Red led	Internal power supply ok
DL3	Red led (output o43)	Signalling functions selectable by micro switch I1

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

M1 TERMINAL BOARD (power supply)

Terminal	Function
1	VA +24 Vdc controller's 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

VAX terminal allows you to supply the 0.6A protected outputs independently to the power supplied to the controller. This possibility is particularly useful when controller's outputs are used on machines which have to respect CE safety regulations.

M2 TERMINAL BOARD (+/-10V analog outputs from 16 bit DAC)

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

M3 TERMINAL BOARD (encoder # 4)

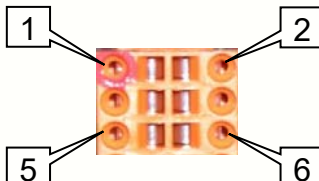| Terminal	Function	Notes
1	CLK A channel A straight encoder # 4	5V Line Driver
2	CLK/ A channel A negated encoder # 4	
3	CLK B channel B straight encoder # 4	5V Line Driver
4	CLK/B channel B negated encoder #4	
5	NOTCH /0 channel 0 negated encoder # 4	5V Line Driver, readable in interrupt as i59
6	NOTCH 0 channel 0 straight encoder # 4	
7	GND power supply ground encoder # 4	
8	VDC +5Vdc power supply for encoder # 4	

On request, the inputs of encoder # 4 can be supplied in 5V Push-Pull configuration; in this case the input signals must be connected to the straight channels and the refused 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 optional inputs)

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

M5 TERMINAL BOARD (0- 5V analog input)

Terminal	Function	Layout
1	GND analog	
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	GND analog	
6	+ 5V for potentiometers supply	

M6 TERMINAL BOARD (interfacing with mobile terminal)

| Terminal	Function
1	EMG NC1 Mushroom-head emergency button contact 1 (N.C.)
2	EMG NC2 Mushroom-head emergency button contact 2 (N.C.)
3	Not connected
4	EMG COM Mushroom-head emergency button contacts (common)
5	Digital input 24V PNP i21 (Can be used to connect the "Dead man switch" of mobile terminal)

M9 TERMINAL BOARD (encoder # 5)

Terminal	Function	Notes
1	CLK A channel A straight encoder # 5	5V Line Driver
2	CLK/ A channel A negated encoder # 5	5V Line Driver
3	CLK B channel B straight encoder # 5	5V Line Driver
4	CLK/B channel B negated encoder # 5	5V Line Driver
5	GND power supply ground encoder # 5	
6	VDC +5Vdc power supply for encoder # 5	

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

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

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):
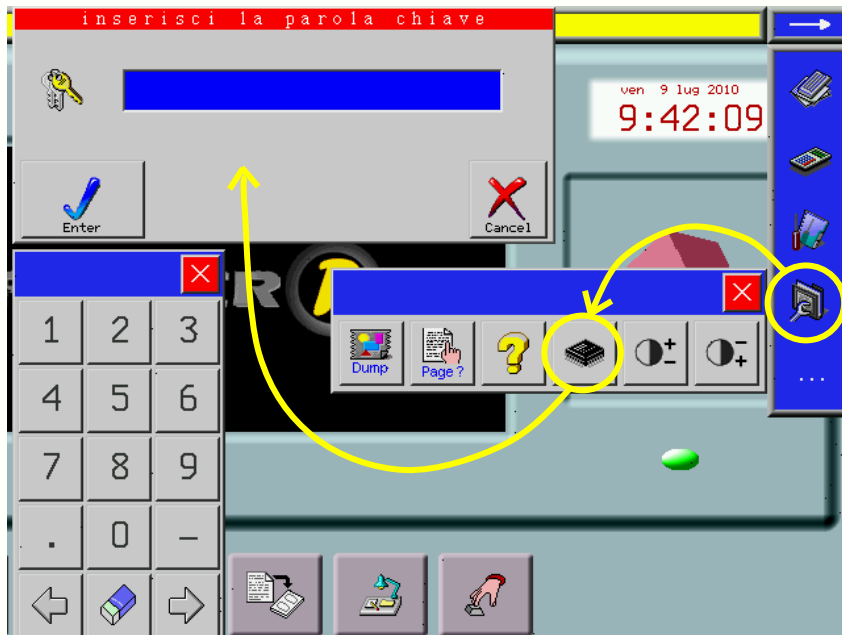
You can find further information on html manual in the paragraph "User's interface". By default connection is already enabled and the controller is accessible at IP 192.168.0.200, subnet mask 255.255.255.0; for a direct connection with a PC (peer to peer mode) use a crossed Ethernet cable with RJ45 8 pins connectors.

Names of axes

This hardware configuration parameter associates the names of 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.). **The names assigned are XYZA** and the position assumed by each letter indicates the number of the hardware resource which will be associated to the relative installed axis.

Installed axes

In order to be installed and be operative the axis have to be declared in specific hardware configuration parameter. It's possible to modify default hardware resources assignation operating on respective special parameters of each axis.

For example: installing axes X and Y and modifying the "encoder number" parameter of the "X axis special parameters" from the default value "1" to value "4" transfers the X axis feedback from encoder # 1 to encoder # 4, while the Y axis feedback will remain the default value "2".

Be careful that only 4 axes can be installed and can operate in interpolation mode.

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 4).
"encoder number": velocity/position feedback of the axis (valid values from 1 to 5)
"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 axis (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

Each installed axis has associated by default inputs which have a predetermined function:

- **Zero Limit switch**, allows you to change axis position when at its deactivation or when an encoder impulse occurs through signal "Notch 0". Input must be manageable in interrupt.
- **Minimum Limit switch** at its activation interrupts axis motion, puts it in alarm and prevents any motion towards lower quotes. The input must remain active till it reaches the lowest physical limit of the axis motion.
- **Maximum Limit switch** at its activation interrupts axis motion, puts it in alarm and prevents any motion towards higher quotes. The input must remain active till it reaches the highest physical limit of the axis motion.

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

Inputs in interrupt

All inputs present on the main board can be managed at interrupt.

+/- 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 operator (16) considering that:

- At each value in input equal to -10V corresponds a value of 1640 um
- At each value in input equal to 0V corresponds a value of 8192 um
- At each value in input equal to +10V corresponds a value of 14744 um

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

Others analog input

All analog inputs readable from ADC operator (xx) have to be lined up to Full Scale value (F.S.) of the input considering that:

- To a value in input equal to 0 % of F.S. corresponds a value of 0 um
- To a value in input equal to 100 % of F.S. corresponds 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.

Alarm signal on protected outputs

If one or more protected 0,6A outputs undergo an overload the automatic thermal protection function of the integrated circuit ISO1H811G releases and restores repeatedly the output generating at the same time an alarm signal detectable from transition from 1 to 0 of input i7. In normal working conditions of the output, input i7 is at 1 but it can change to 0 even if supply tension of the VAX outputs goes below the minimum allowed value of 10,5V.

Expansion I/O on SPI port (J3 connector)

Through the interface INT-SPI, you can expand locally 16 digital inputs + 16 digital outputs.

Special inputs disable

In some controllers are present some special inputs denominated CNC RUN (i36), RUN PLC (I37) and HOLD (I38) which, not being physically wired in Power I, must obligatorily be disabled by setting to 1 the bits 0, 1 and 2 of the parameter "disable special in "(default value = 1111). In Power I therefore, the only bits of this parameter that can be changed is the bit 3 (the last digit in the right) which disables the Emergency special input (i47).

Alarm on 24Vdc inputs of P1 connector

24V PNP inputs on the connector P1 are monitored by a internal circuit reporting, on internal input i20, their operating status. If everything works regularly, its logical state is 1 and switches to 0 if malfunctions are detected on their internal components or if the power supplied to the controller drops below 13 V.

64-bit math libraries

Power I, 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.

P1 CONNECTOR (Analog outputs, encoder and digital I/O)

Pin	DESCRIPTION	NOTES
1	GNDANAL X X axis analog ground	
2	VREF X reference signal, +/- 10V	from DAC # 1, in parallel to M2, pin 1
3	GNDANAL Y Y axis analog ground	
4	VREF Y reference signal, +/- 10V	from DAC # 2, in parallel to M2, pin 3
5	GND logic ground for encoder supply	
6	GND logic ground for encoder supply	
7	CLK A channel A direct encoder # 1	5V Line Driver or Push Pull *
8	CLK /A channel A negative encoder # 1	
9	GND logic ground for encoder supply	
10	CLK B channel B direct encoder # 1	5V Line Driver or Push Pull *
11	CLK /B channel B negative encoder # 1	
12	GND logic ground for encoder supply	
13	NOTCH 0 channel 0 direct encoder # 1	5V Line Driver or Push Pull *, usable in interrupt as i56
14	NOTCH /0 channel 0 negative encoder # 1	
15	VCC supply + 5Vcc for encoder	
16	GND logic ground for encoder supply	
17	CLK A channel A direct encoder # 2	5V Line Driver or Push Pull *
18	CLK /A channel A negative encoder # 2	
19	GND logic ground for encoder supply	
20	CLK B channel B direct encoder # 2	5V Line Driver or Push Pull *
21	CLK /B channel B negative encoder #2	
22	GND logic ground for encoder supply	
23	NOTCH 0 channel 0 direct encoder # 2	5V Line Driver or Push Pull *, usable in interrupt as i57
24	NOTCH /0 channel 0 negative encoder # 2	
25	VCC supply + 5Vcc for encoder	
26	GND logic ground for encoder supply	
27	CLK A channel A direct encoder # 3	5V Line Driver or Push Pull *
28	CLK /A channel A negative encoder # 3	
29	GND logic ground for encoder supply	
30	CLK B channel B direct encoder # 3	5V Line Driver or Push Pull *
31	CLK /B channel B negative encoder #3	
32	GND logic ground for encoder supply	
33	NOTCH 0 channel 0 direct encoder # 3	5V Line Driver or Push Pull *, usable in interrupt as i58
34	NOTCH /0 channel 0 negative encoder # 3	
35	User input i16	
36	User input i17	
37	User input i18	
38	User input i19	
39	User input i46	
40	User input i40	By default = Fc Zero limit stop # 1 (X)
41	FCEMG emergency	s127, if EMG is deactivated becomes user in. i47
42	User input i41	By default = Fc Axis # 1 (X) max limit stop
43	User output o32	DIRO X axis # 1 direction output
44	User input i42	By default = Fc Axis # 2 (Y) home limit stop
45	User output o33	DIRO Y axis # 2 direction output
46	User input i43	By default = Axis # 2 (Y) max limit stop
47	User output o34	

Pin	DESCRIPTION	NOTES
48	User input i44	
49	User output o16	By default = ENBX enabling of driver # 1 (X) - 24 V PNP - 60 mA powered by VA
50	User input i45	
51	User output o17	By default = ENBY enabling of driver # 2 (Y) - 24 V PNP - 60 mA powered by VA
52	User input i0	
53	User output o18	By default = ENBZ enabling of driver # 3 (Z) - 24 V PNP - 60 mA powered by VA
54	User input i1	
55	User output o19	By default = ENBW enabling of driver # 4 (W)
56	User input i2	
57	User output o9	
58	User input i3	
59	User output o11	
60	User output o10	
61	GNDA power supply I/O	
62	GNDA power supply I/O	
63	User output o8	
64	User output o0	24 V PNP - 60 mA powered by VA

* On request, encoder's inputs 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

The GNDANAL signals must be connected to the differential inputs of the DRIVES (where the inputs are available, of course). If the differential input is not provided, this signal must not be connected.
In this case the GND is used as common reference between POWER I and the 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.

P2 CONNECTOR (PWM / STEP and DIR # 1, 2, 3 and 4 + analog inputs)

Pin	DESCRIPTION	NOTES	
1	VCC + 5Vdc power supply for encoder		
2	PWM / STEP # 1 driver control output	Note 1	
3	GND logic ground		
4	DIR # 1 driver direction output	User output o24 (5V TTL)	
5	GND logic ground		
6	PWM / STEP # 2 driver control output	Note 1	
7	GND logic ground		
8	DIR # 2 driver direction output	User output o25 (5V TTL)	
9	GND logic ground		
10	PWM / STEP # 3 driver control output	Note 1	
11	GND logic ground		
12	DIR # 3 driver direction output	User output o26 (5V TTL)	
13	User input i22N	User input i22 negated (5V TTL)	
14	PWM / STEP # 4 driver control output	Note 1	
15	User input i23N	User input i23 negated (5V TTL)	
16	DIR # 4 driver direction output	User output o27 (5V TTL)	
17	ENABLE # 2 negated (0 = driver enabled)	User output o21N (5V TTL)	
18	ENABLE # 1 negated (0 = driver enabled)	User output o20N (5V TTL)	
19	ENABLE # 4 negated (0 = driver enabled)	User output o23N (5V TTL)	
20	ENABLE # 3 negated (0 = driver enabled)	User output o22N (5V TTL)	
21	VREF + 5Vdc reference for analog inputs		
22	AGND analog ground for analog inputs		
23	Analog input # 21	Configurable as 0-20mA welding PG20	
24	Analog input # 20	Configurable as 0-20mA welding PG5	Note 2
25	Analog input # 259	Configurable as 0-20mA welding PG19	
26	Analog input # 22	Configurable as 0-20mA welding PG18	

Note 1: The PWM signal can become a STEP signal if you set the drive type special parameter at value 8; if other motor parameter is set at 0 the axis feedback is an encoder, if it is at 1 the pulses generated by the STEP output are used as feedback. The motor output offset special parameter should also be set at a value different from 0 to avoid that the stabilization time is too long when the target position is reached. Max. frequency of the STEP signal is 263 KHz if INFO 1154=1 and may fall to 37 KHz if INFO 1154 = 7 (further information in "Power Family.chm" manual).

Note 2: Buffered analog inputs with resolution 14 bit: they accept voltages between 0 and 5V. Their input resistance towards AGND is 100 Kohm. They can be conditioned to accept input signals to 0-20 mA shorting its welding point (PG) that inserts an input resistance of 249 ohms to AGND.

Through the INT-185-GP interface, some of these I/O can be electrically conditioned.

WARNING: this document only describes the electrical connections of the connectors most often used. For all further information about the electrical connections and programming of the controller, refer to the manual supplied as a "Compiled HTML Help" file called "**Power Family.chm**"; this manual is on the CD supplied with the controller and can also be downloaded from the "Download Service" area of the site www.texcomputer.com

DIGITAL INPUTS (consecutive numbering)

Input	Connector	pin	led	notes
i0	P1	52	d52	
i1	P1	54	d40	
i2	P1	56	d41	
i3	P1	58	d55	
i7 *	-	-		Internal alarm on protected outputs
i16	P1	35	d47	
i17	P1	36	d46	
i18	P1	37	d45	
i19	P1	38	d44	
i20 **	-	-		Internal alarm on 24V inputs of P1 connector
i21	M6	5		Generic input, can be used as "Dead man input" of mobile terminal
i22N	P2	13		5V TTL negated inputs, can become a 24V PNP via the INT-185 GP interface card
i23N	P2	15		
i40	P1	40	d43	Axis # 1 (X) zero limit stop
i41	P1	42	d42	Axis # 1 (X) max limit stop
i42	P1	44	d48	Axis # 2 (Y) zero limit stop
i43	P1	46	d49	Axis # 2 (Y) max limit stop
i44	P1	48	d50	
i45	P1	50	d51	
i46	P1	39	d53	
i47	P1	41	d54	EMERGENCY s127 (if EMG is deactivated it is i47)
i56	P1	13&14		Enc. # 1 zero notch, 5V Line Driver, usable in interrupt
i57	P1	23&24		Enc. # 2 zero notch, 5V Line Driver, usable in interrupt
i58	P1	33&34		Enc. # 3 zero notch, 5V Line Driver, usable in interrupt
i59	M3	5&6		Enc. # 4 zero notch, 5V Line Driver, usable in interrupt
i88	-	-		I1 push button

* Normally 1, switches to 0 if one or more outputs are in safety alarm or if VAX voltage drops below 10.5 Vdc.

** Normally 1, switches to 0 if malfunctions are detected on the internal components or if the power supply drops below 13 Vdc.

DIGITAL OUTPUTS (consecutive numbering)

| Output	Connector	pin	led	powered from	notes	
o0	P1	64		VA	24 V PNP - 60 mA	
o8	P1	63	d56	VAX		
o9	P1	57	d57	VAX	0,6A * protected output	
o10	P1	60	d58	VAX		
o11	P1	59	d59	VAX		
o16	P1	49		VA	ENB # 1 X, 24 V PNP - 60 mA	
o17	P1	51		VA	ENB # 2 Y, 24 V PNP - 60 mA	
o18	P1	53		VA	ENB # 3 Z, 24 V PNP - 60 mA	
o19	P1	55	d63	VAX	ENB # 4 W, 0,6A * protected output	
o20N	P2	18		internal	negated ENB # 1 X	5V TTL, they cannot be used with INT-185-GP interface card
o21N	P2	17		internal	negated ENB # 2 Y	
o22N	P2	20		internal	negated ENB # 3 Z	
o23N	P2	19		internal	negated ENB # 4 W	
o24	P2	4		internal	DIR # 1	5V TTL; they cannot be used as a user output if the "drive type" parameter of the respective axis is equal to 8
o25	P2	8		internal	DIR # 2	
o26	P2	12		internal	DIR # 3	
o27	P2	16		internal	DIR # 4	
o32	P1	43	d60	VAX	DIRO # 1 X	0,6A * protected output; they can not be used as a user output if the "drive type" parameter of the respective axis is 0, 2, 4 or 5.
o33	P1	45	d61	VAX	DIRO # 2 Y	
o34	P1	47	d62	VAX	DIRO # 3 Z	
o43	-	-	DL3	-	internal output	

* Maximum current supplied at the same time from all outputs cannot exceed 3A.

Separate supply of outputs connected to VAX

By removing the jumper JP1 the 0.6A protected outputs can be connected to a power supply different from the one that powers the controller (VA). The max. voltage applicable is 30 Vdc, with the positive connected on VAX and the negative in common with the power supply of the controller (GNDA).

DIGITAL I/O DIAGNOSTICS

Near P1 connector there are leds for digital I/O diagnostics; they are red for the outputs and green for the inputs:
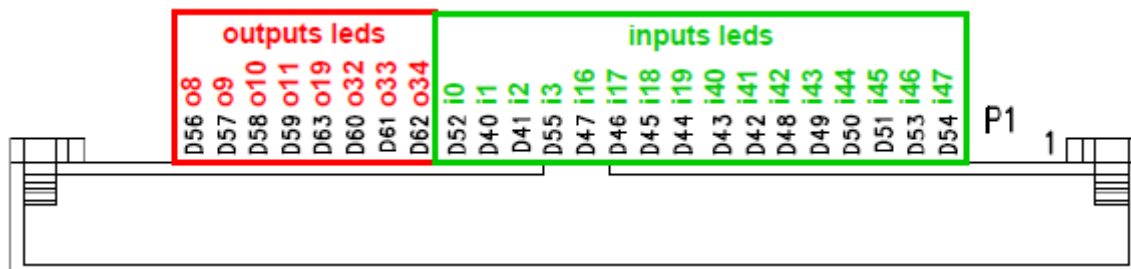
ANALOG INPUTS (consecutive numbering)

input #	connector	pin	full scale	notes
16	M4	1	+/- 10V	14 bit, buffered
17	M4	3	0-20 mA	14 bit, buffered
20	P2	24	0-5V or 0-20mA	14 bit, buffered; they have a 100 KΩ resistance to GND *
21	P2	23	0-5V or 0-20mA	14 bit, buffered; they have a 100 KΩ resistance to GND *
22	P2	26	0-5V or 0-20mA	14 bit, buffered; they have a 100 KΩ resistance to GND *
256	M5	2	0-5V	14 bit, not buffered
257	M5	3	0-5V	14 bit, not buffered
258	M5	4	0-5V	14 bit, not buffered
259	P2	25	0-5V	14 bit, buffered; it has a 100 KΩ resistance to GND *

* Welding the drop pads PG5, PG20, PG19 and PG 18, a 249 Ω precision resistor to GND is inserted in order to configure the relative input as 0-20 mA current input.

ANALOG OUTPUTS (consecutive numbering)

output #	connector	pin	full scale	notes
1	P1	2	+/- 10V	from DAC with 16 bits resolution
1	M2	1	+/- 10V	from DAC with 16 bits resolution
2	P1	4	+/- 10V	from DAC with 16 bits resolution
2	M2	3	+/- 10V	from DAC with 16 bits resolution
3	M2	5	+/- 10V	from DAC with 16 bits resolution
4	M2	7	+/- 10V	from DAC with 16 bits resolution

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 (jumper JP1 closed)

FT1

Digital input and output connection

Pin	Connector P1
37	GNDA I/O power supply ground
49	ENBX X driver enable (60 mA)
50	User in i45
51	User output o17 (opto 60 mA)
40	FCZEROX X axis zero limit
41	FCEMG emergency
52	User in i0
53	User output o18
54	User in i1
60	User output o10
61	GNDA I/O power supply ground
62	GNDA I/O power supply ground
63	
64	

DC / AC

DRIVER
PE
Logic GND
Enable Input

PNP DIGITAL OUTPUT
Max 30 Vdc – 60 mA

PNP DIGITAL INPUTS
Max 30 Vdc
Input resistance: 2 Kohm
Typical absorption:
1,2 mA at 24Vdc

PNP DIGITAL OUTPUTS
Short circuit protected
Max 30 Vdc – 0,6A

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.
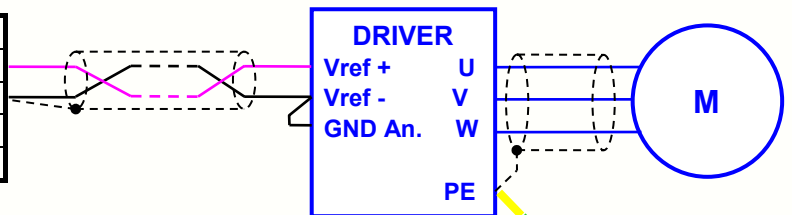
Analog input connection

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

Generator
−
+ 5V   PE
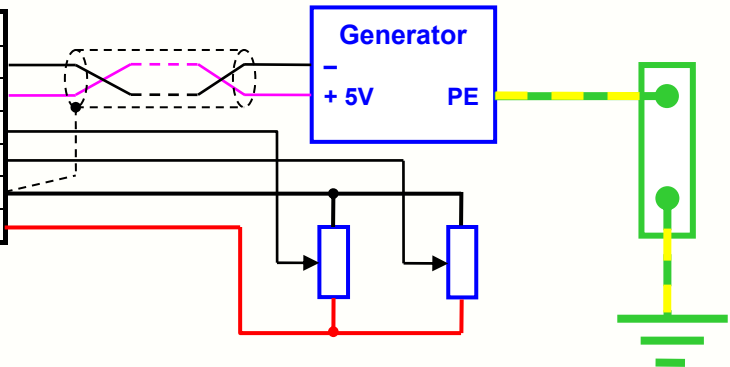
Drive reference connection

Pin	Connector M2
1	VREF #1 reference signal +/- 10V
2	GNDANAL analog ground

DRIVER
Vref +   U
Vref -   V
GND An.   W
PE

M

5V Line Driver Encoder connection

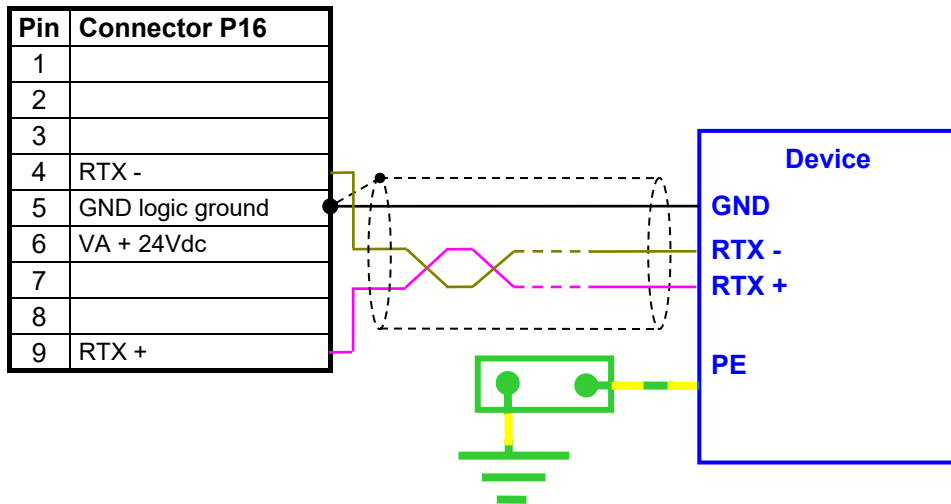| Pin	Connector P1
7	CLK A channel A straight enc. # 1
8	CLK/A channel A negated enc. # 1
10	CLK B channel B straight enc. # 1
11	CLK/B channel B negated enc. # 1
13	NOTCH 0 ch. 0 straight enc. # 1
14	NOTCH /0 ch. 0 negated enc. # 1
12	GND logic ground
15	VDC +5Vdc power supply

ENCODER
Phase A
Phase AN
Phase B
Phase BN
Phase Z
Phase ZN
-
+
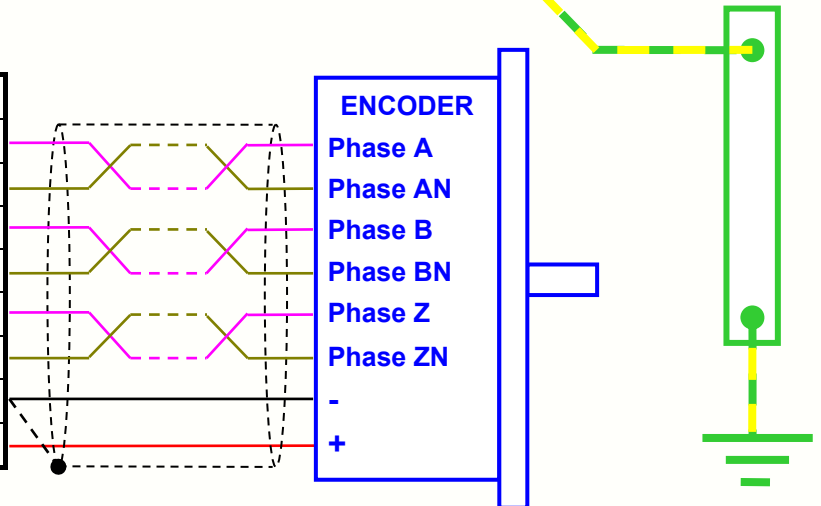
Connection of RS232 serial interface Com 1

Pin	Connector P16
1	GDN logic ground
2	Com. 1 RX
3	Com. 1 TX
4	VA +24V DC
5	GDN logic ground
6	
7	Com. 2 TX
8	Com. 2 RX
9	

view from the insertion side

DB9 male
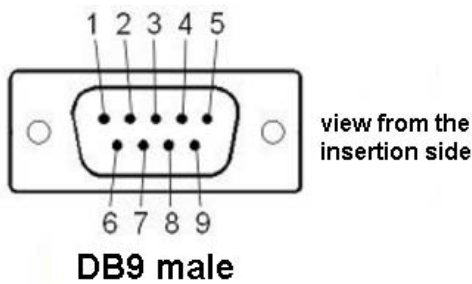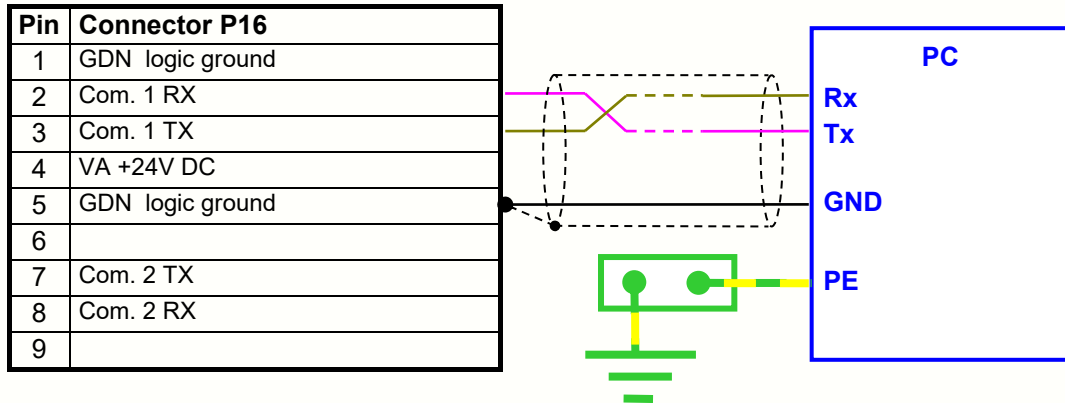
Connection of RS485 serial interface (Com 3)

Pin	Connector P16
1	
2	
3	
4	RTX -
5	GND logic ground
6	VA + 24Vdc
7	
8	
9	RTX +

JP22 inserts the start or end termination resistance of the RS485 line (not connected by default).
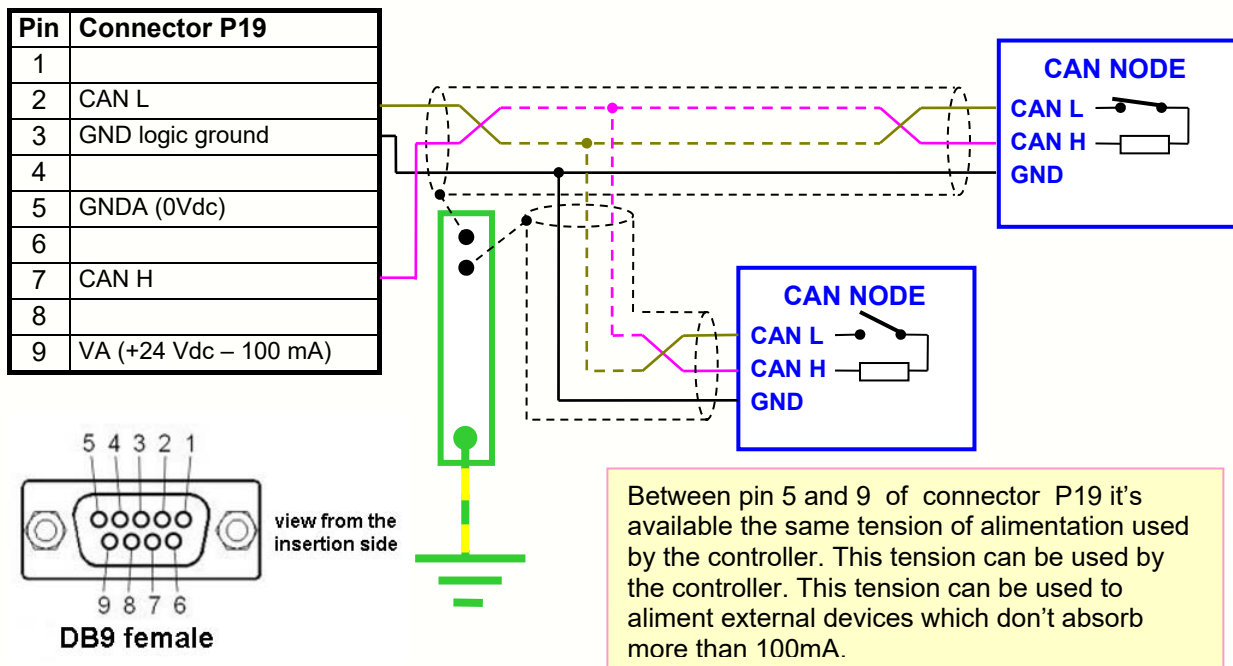
CANopen interface connection

The Power I is able to control one CAN port 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 I, the termination resistance is already connected by default and can be disconnected by removing jumper JP3 and JP4, but you have to install the termination resistance at the other end of the network.

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

5 4 3 2 1

view from the insertion side

9 8 7 6

DB9 female

CAN NODE
CAN L
CAN H
GND

CAN NODE
CAN L
CAN H
GND

Between pin 5 and 9 of connector P19 it's available the same tension of alimentation used by the controller. This tension can be used by the controller. This tension can be used to aliment external devices which don't absorb more than 100mA.

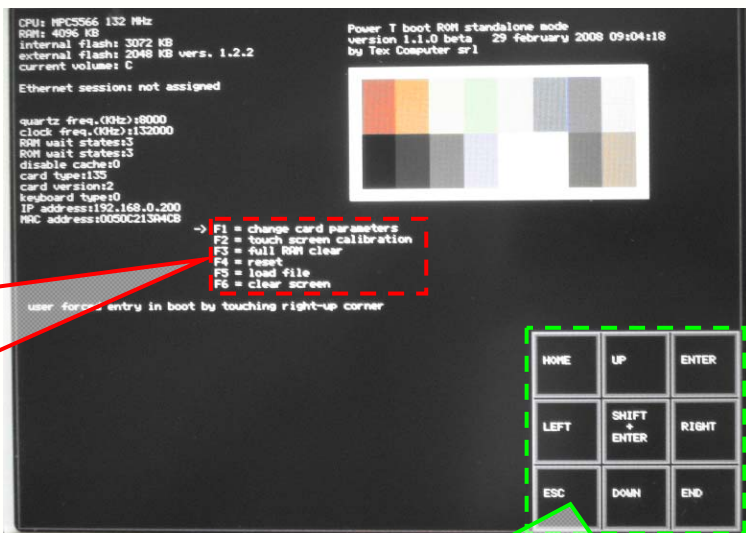**Be careful that can be installed a maximum of 4 axes.**

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 the **Boot menu**:

FUNZIONI DI BOOT

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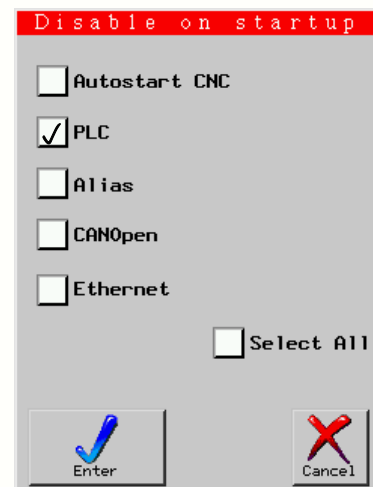
Once you are in Boot menu, we suggest you to calibrate the touch screen so that the touch function is still active when the system is switched on again, even after running functions F3 and F4 which partially or totally clear the RAM memory.

We recommend not to alter the card's basic configurations without contacting first the Tex Computer's technical staff.
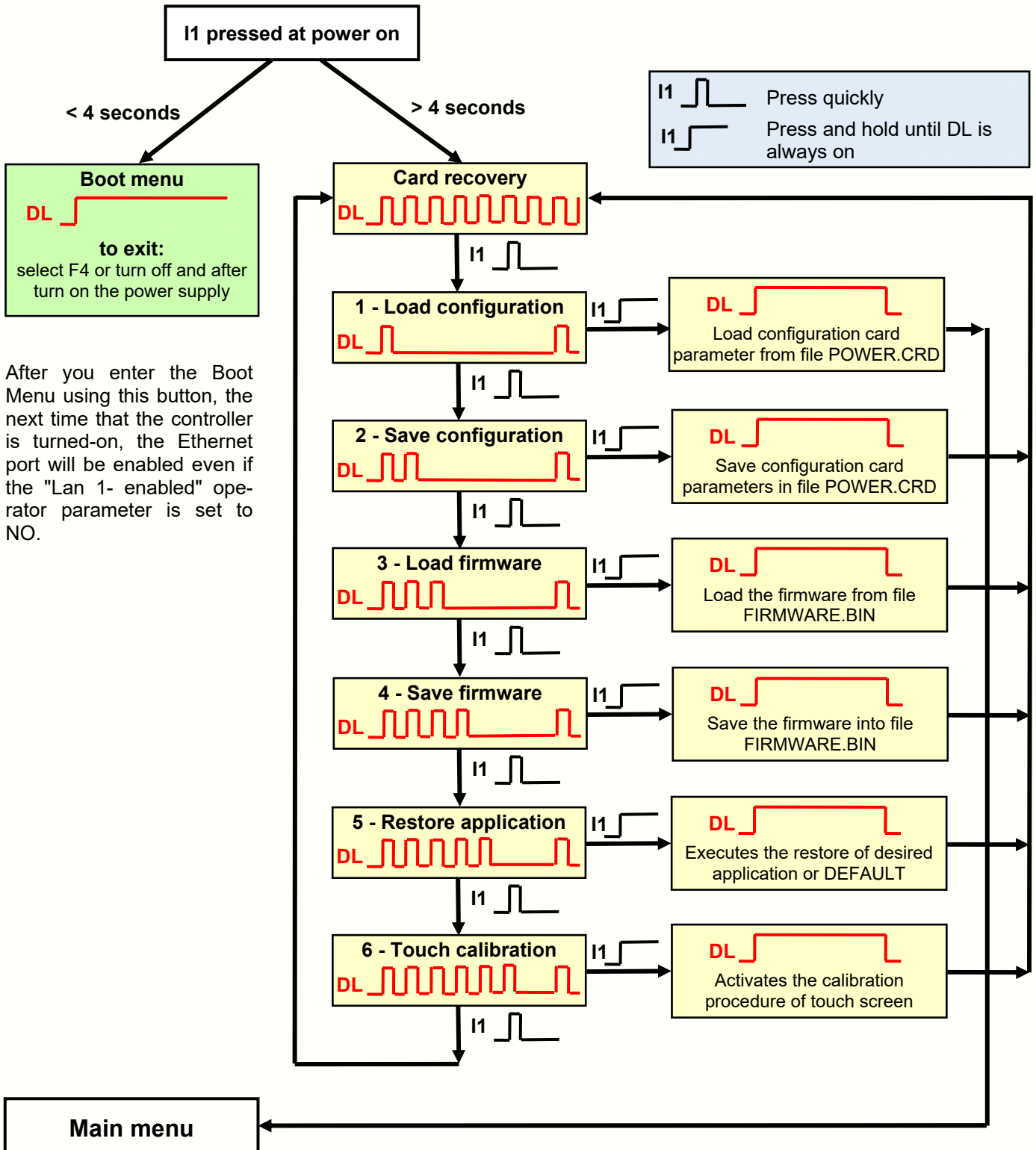
2. If at start up the system detects a pressure at the top left-hand corner of the screen you enter the menu which allows the operator to disable some functions during the current start-up phase. The following check list will be displayed:

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.

Sede Legale e Amministrativa:
47841 Cattolica (RN) - Via Mercadante, 35 - Italy
Tel. +39 0541 832511 - Fax +39 0541 832519

Ufficio Area Nord:
20025 Legnano (MI) - Via Asti, 25 - Italy
Tel. +39 0331 456053 - Fax / Tel. +39 0331 458153

Ufficio Tecnico:
48018 Faenza (RA) - Corso Mazzini, 116 - Italy

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www.texcomputer.com - commerciale@texcomputer.com

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Recalling Boot and Card recovery Functions from I1

I1 pressed at power on

< 4 seconds

> 4 seconds

I1 ⎍ Press quickly
I1 ⎍ Press and hold until DL is always on

Boot menu

DL ⎍

to exit:
select F4 or turn off and after turn on the power supply

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.

Card recovery
DL

I1 ⎍

1 - Load configuration
DL

I1 ⎍ → DL Load configuration card parameter from file POWER.CRD

I1 ⎍

2 - Save configuration
DL

I1 ⎍ → DL Save configuration card parameters in file POWER.CRD

I1 ⎍

3 - Load firmware
DL

I1 ⎍ → DL Load the firmware from file FIRMWARE.BIN

I1 ⎍

4 - Save firmware
DL

I1 ⎍ → DL Save the firmware into file FIRMWARE.BIN

I1 ⎍

5 - Restore application
DL

I1 ⎍ → DL Executes the restore of desired application or DEFAULT

I1 ⎍

6 - Touch calibration
DL

I1 ⎍ → DL Activates the calibration procedure of touch screen

I1 ⎍

Main menu

The controller is equipped with a microswitch, called I1, located on one side of the motherboard next to it there is also a red LED DL3. Pressing the microswitch I1 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.
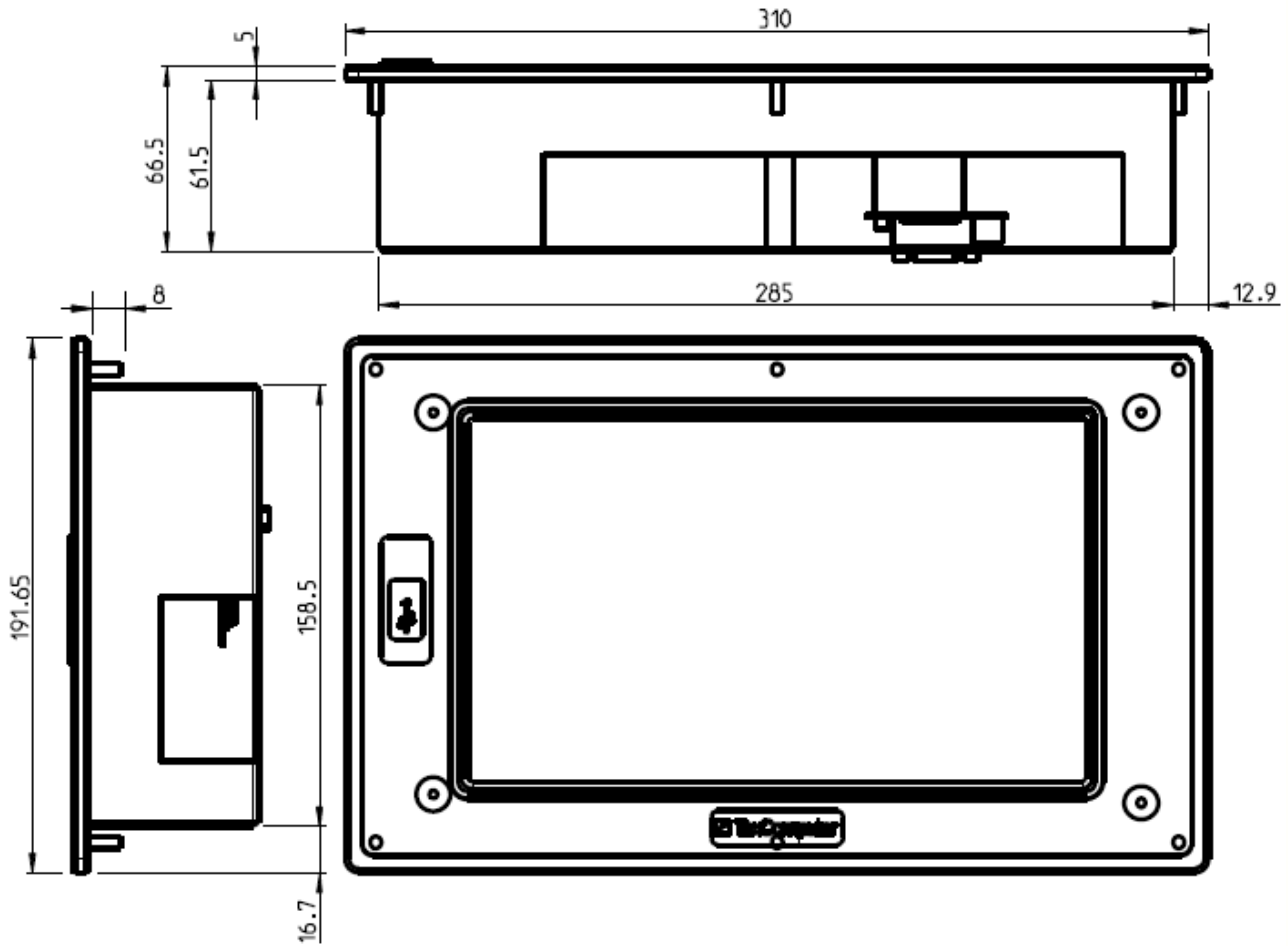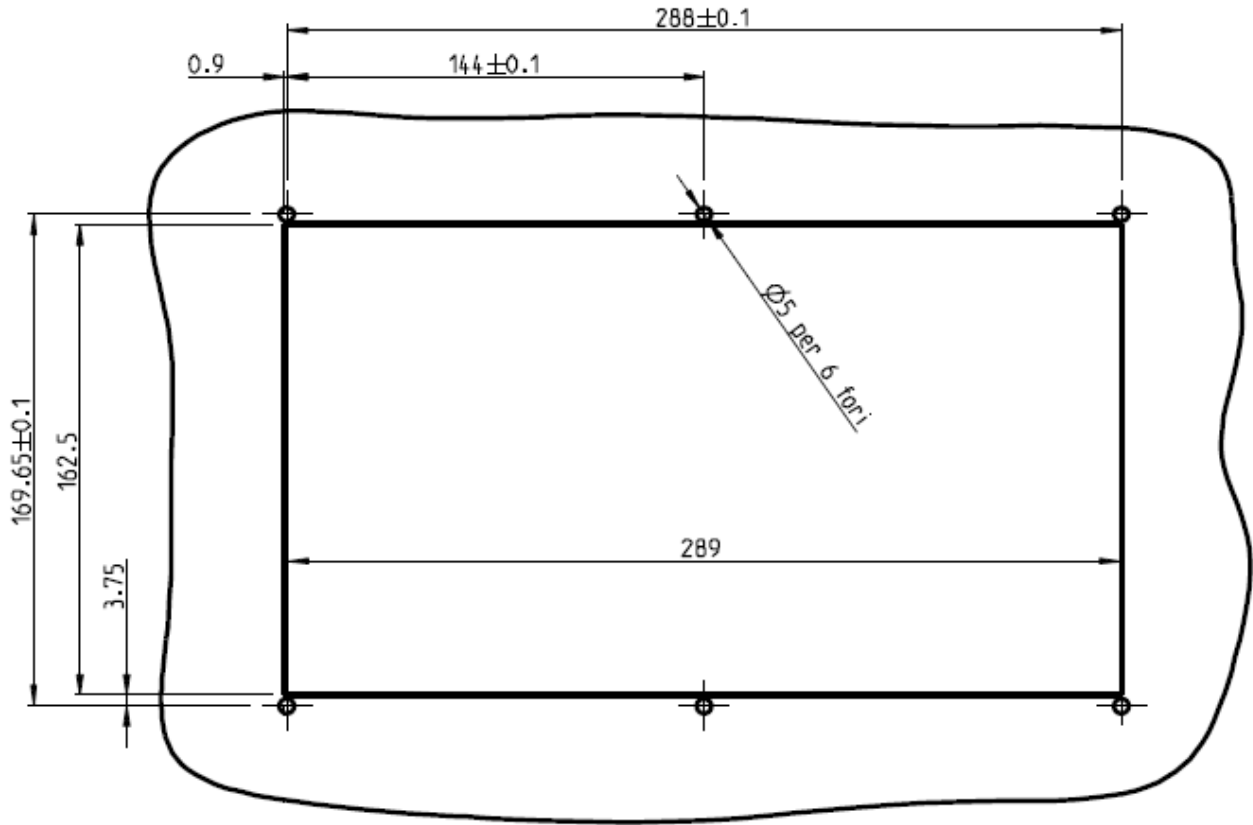
Power I 7" only touch dimensions
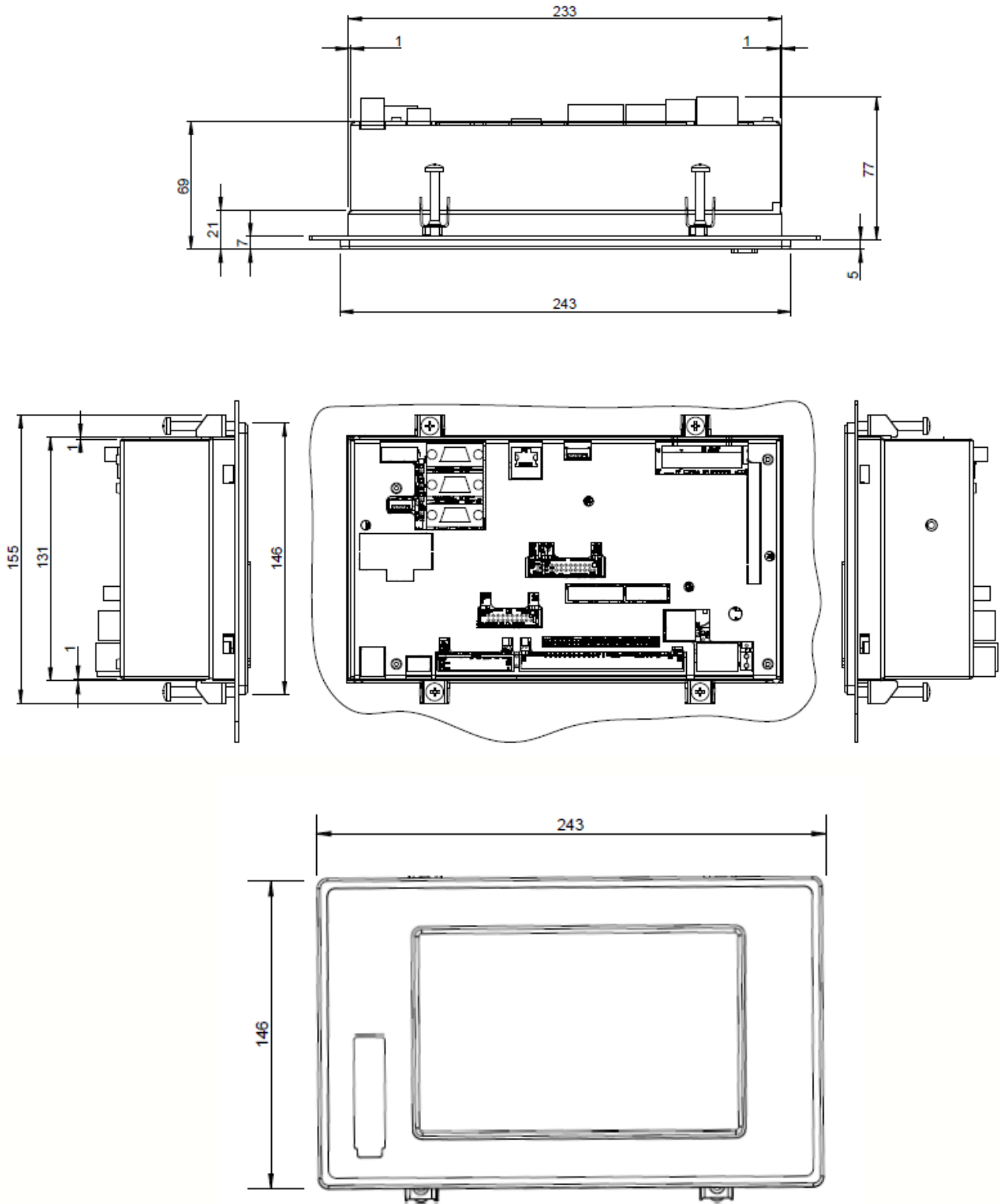
(Dimensions in mm)
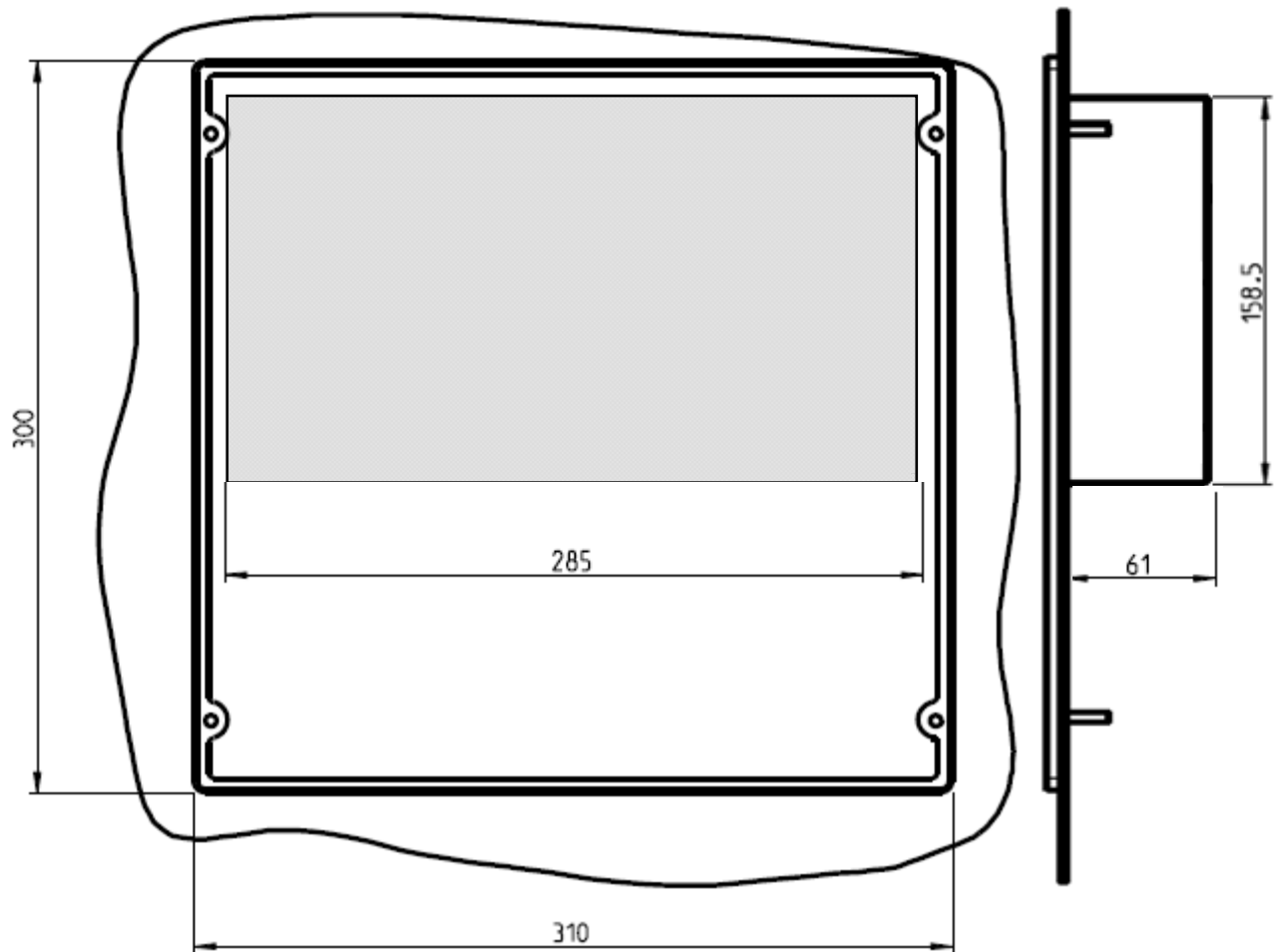
Power I 10" only touch dimensions

(Dimensions in mm)

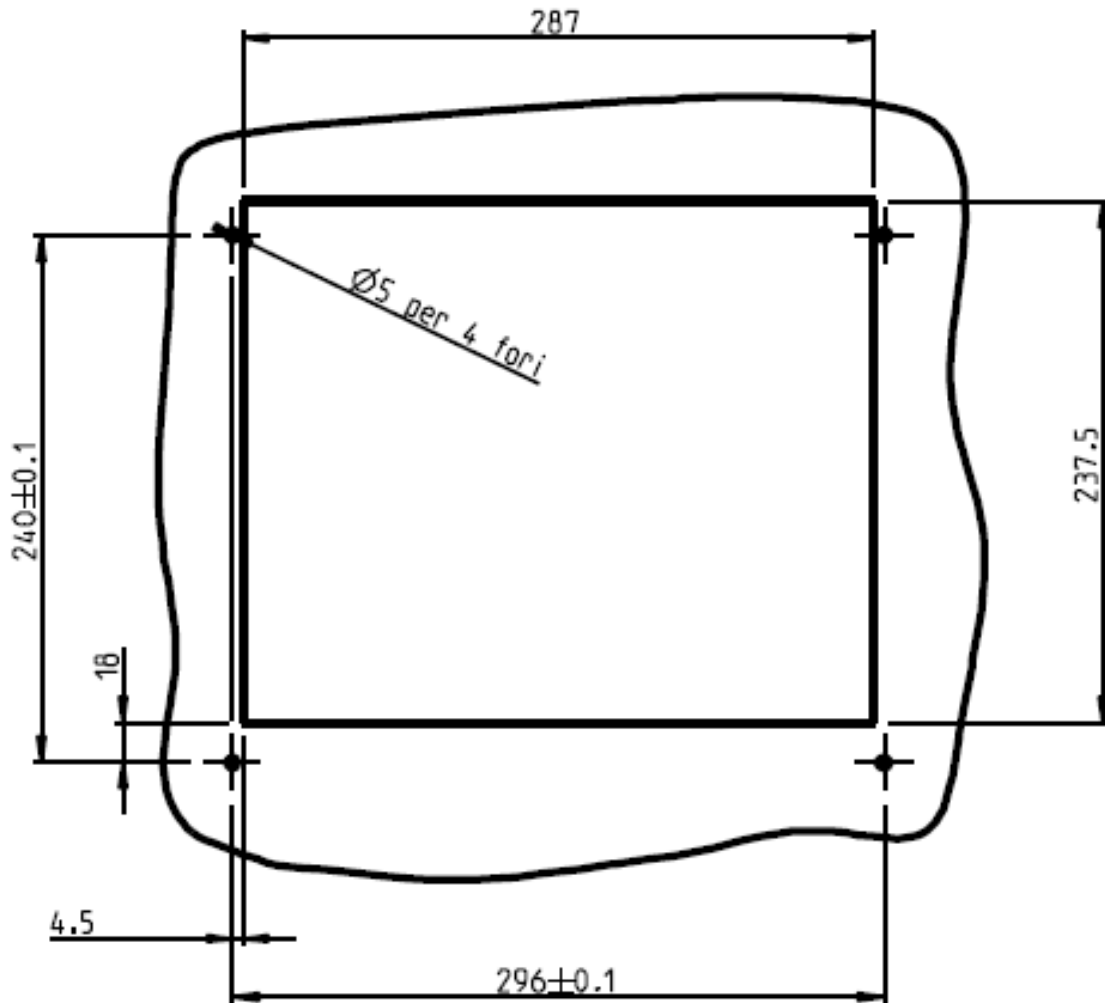**Power I 10" only touch drilling template**   (Dimensions in mm)

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Power I 10" - 56 keys dimensions   (Dimensions in mm)

300

285

310

158.5

61

Power I 10" - 56 keys drilling template   Dim. in mm

287

240±0.1

Ø5 per 4 fori

237.5

18

4.5

296±0.1

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Power I 15" - 28 keys drilling template   (Dimensions in mm)

Sede Legale e Amministrativa:
47841 Cattolica (RN) - Via Mercadante, 35 - Italy
Tel. +39 0541 832511 - Fax +39 0541 832519

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20025 Legnano (MI) - Via Asti, 25 - Italy
Tel. +39 0331 456053 - Fax / Tel. +39 0331 458153

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48018 Faenza (RA) - Corso Mazzini, 116 - Italy

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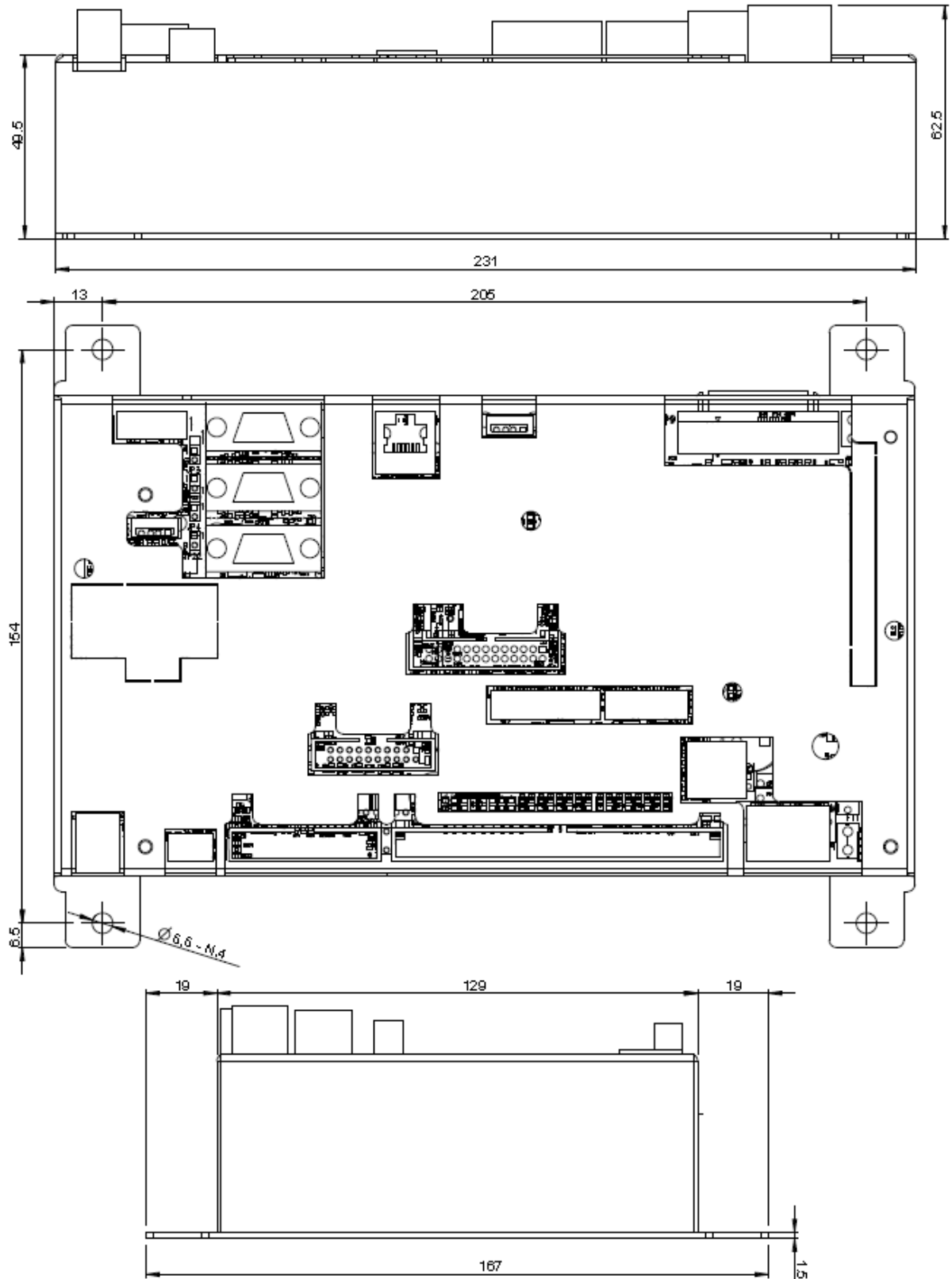**Power I 15" only touch drilling template**   (Dimensions in mm)

Power I Box dimensions

(Dimensions in mm)

Data subject to modification without notice