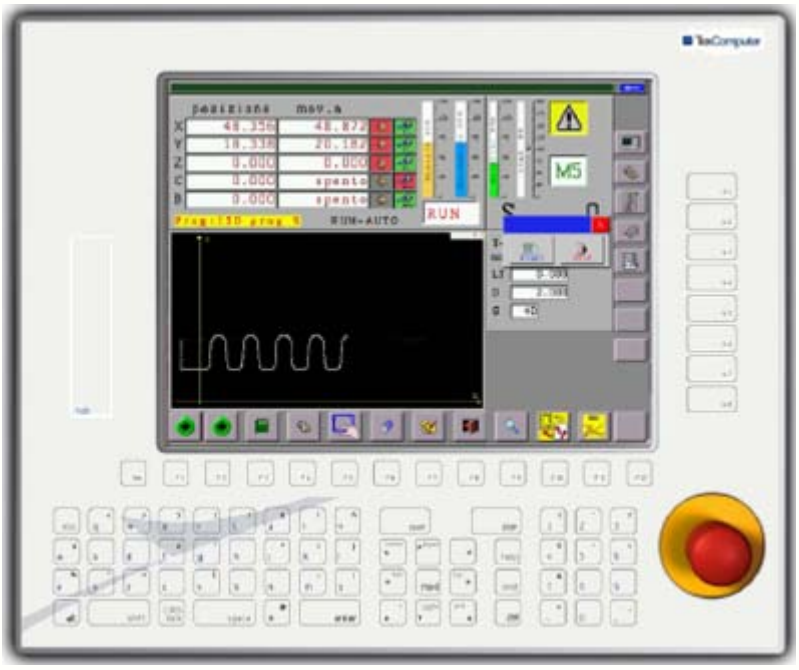
Programmable Automation Controller to manage 16/28 interpolated axes

Power D 10.4” XGA

- TFT XGA display (1024x768) with touch screen
- 80-key thermoformed membrane keypad
- door for access to Ethernet, USB and CF memory
- mushroom-head emergency button
- electronic handwheel with axis selector and movement resolution selector (optional)
- overfeed potentiometers (optional)
- dimensions 434x400x160 (WxHxD in mm)



Power D 15” - 80 keys

- TFT XGA 1024x768 pixel display with or without touch screen
- 80-key thermoformed membrane keypad
- door for access to CF
- mushroom-head emergency button
- dimensions 490x400x160 (WxHxD in mm)

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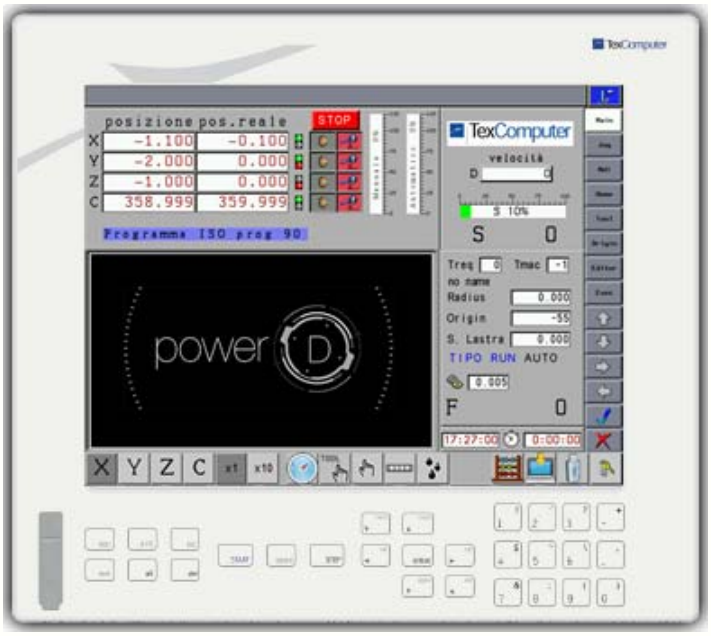
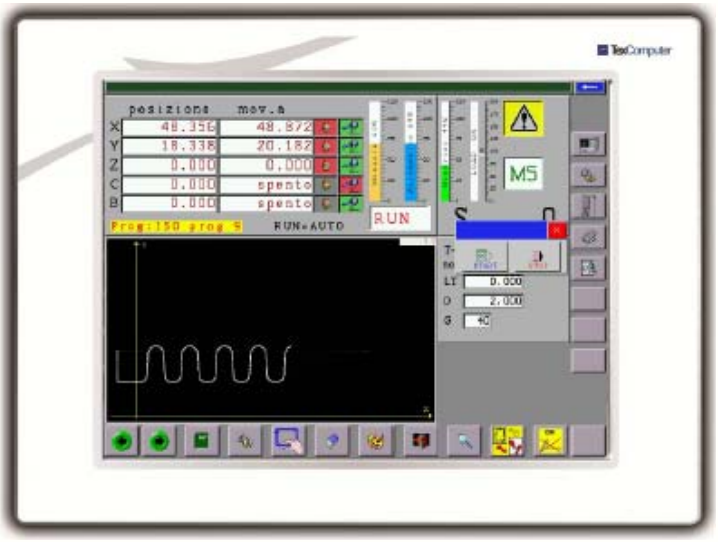


Power D 15” - 28 keys

- TFT XGA 1024x768 pixel display with touch screen
- 28-key thermoformed membrane keypad
- USB socket
- dimensions 400x355x160 (WxHxD in mm)



Power D 15” - Only touch

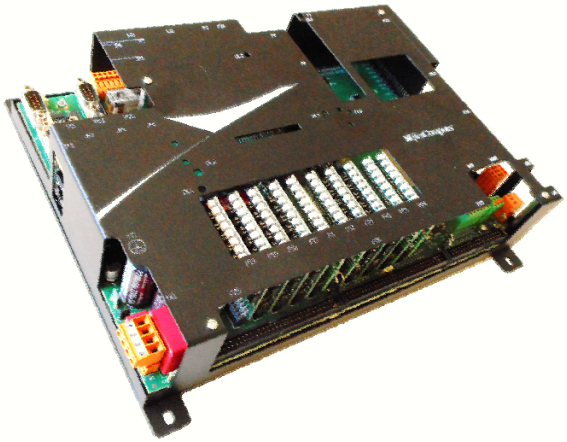
- display TFT XGA (1024x768) with touch screen
- dimensions 398x296x100 WxHxD in mm)

Fixed remotable terminal

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

10.4” Passive mobile terminal

- ergonomic plastic case
- connection to Power D 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 D Box

- fixing from inside panel
- dimensions 296x241x130 (WxHxD in mm)

Technical Data

Description		Notes / Options
CPU	**RISC 32 bit**	Dual core - 264 MHz clock
Flash memory (F volume included)	**12 MB**	
Serial Flash memory	**16 MB**	Optional, can hold icons and character set
RAM memory (ritentive)	**16 MB**	
RAM memory	**512 KB**	
RAM memory (not ritentive)	**4/8 MB**	
Digital inputs 24 Vdc PNP/NPN	**48 ***	
Digital inputs 24 Vdc PNP	**5 ***	1 can be usable as a "dead man" or as generic input
Protected outputs, 1 Amp. 24 Vdc PNP	**32 ***	
Analog inputs 0...10 V - 14 bit	**8**	4 may be 0..5V 4 may be 0..20mA
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, - DAC 16 bit	**8**	Expandable on FDC card
5 V Push Pull encoder interface	**8**	Expandable on FDC card
5V Line Driver encoder interface without index inputs (encoder # 9)	**1**	On on-board terminal board
Digital 24V PNP inputs i28 & i29	**2**	On request, as alternative to encoder # 9
SSI interfaces for absolute encoder	**for 8/16 encoders**	On optional SF80328 card
STEP / DIRECTION outputs	**for 8/16 axes**	On optional T15-GENFR4 card
PWM Outputs	**for 8 axes**	+ 8 optional on FDC card
RS 232 serial port	**2**	
RS 485 serial port	**1**	
CANopen fieldbus port	**3**	CiA standard Profile 401, 402 and 406
Mechatrolink II fieldbus port	**1**	On optional INT-Mechatrolink card
EtherCAT fieldbus port	**1**	Optional with CoE, EoE and FoE protocols
Ethernet port 10-100 T	**1**	TCP/IP, FTP, ModbusTCP and WEB server
USB port 1.1	**1**	
USB port 2.0	**1**	
LVDS interface	**1**	On 36 pin connector
Safety relay outputs	**1**	Optional, without SIL certification
Power supply	**24 Vdc**	

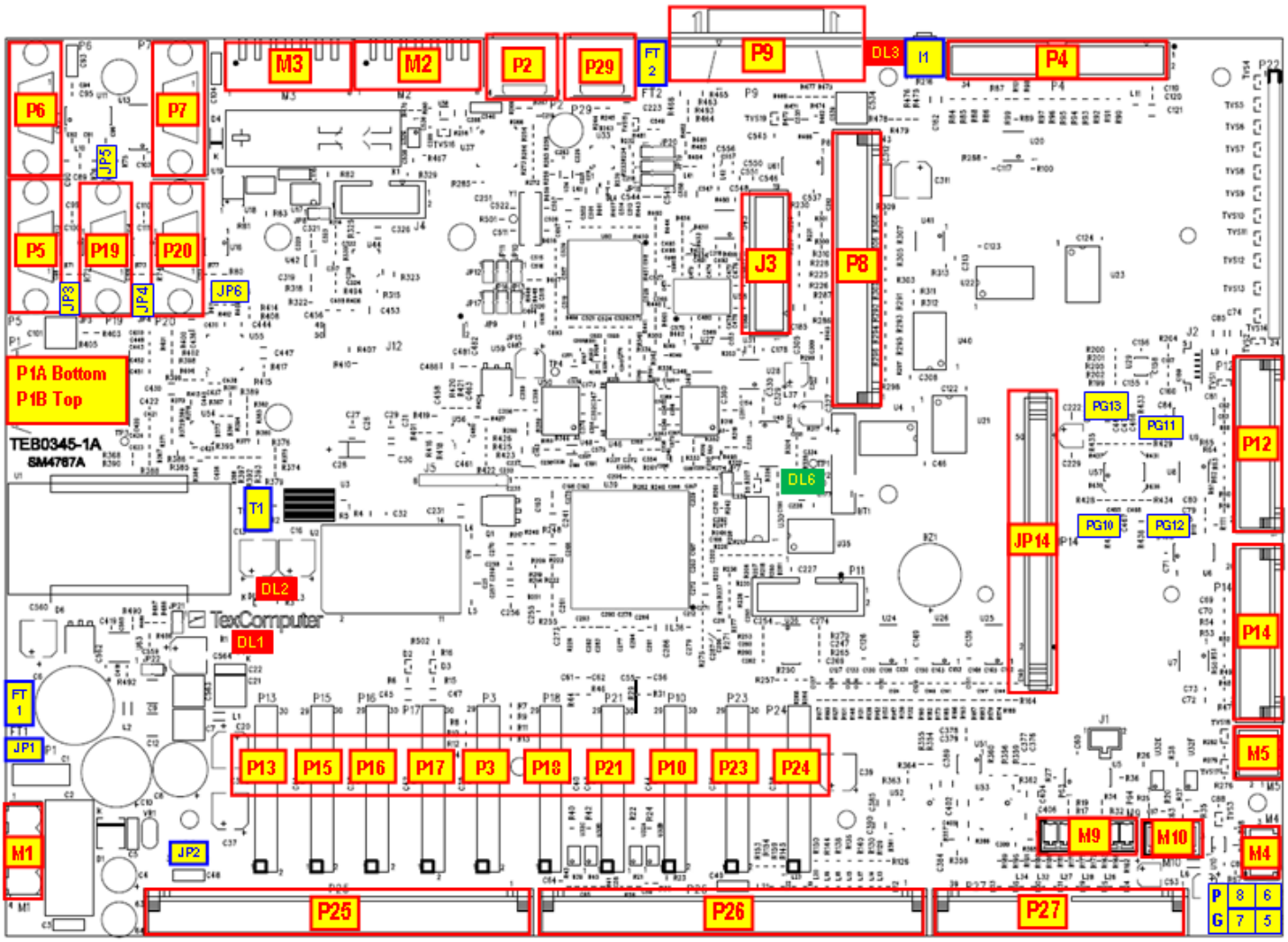
* Can be supplied, on request, also in configuration 45 I + 40 O

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
P1A *	Bottom RJ5 connector	EtherCAT (activation as option)
P1B *	Top RJ45 connector	Ethernet 10/100 T
P2	USB connector	USB port # 2
P5	9 pin D connector	CAN A (0-63 addressable nodes)
P6	9 pin D connector	COM 1 RS232
P7	9 pin D connector	COM 2 RS232 + COM 3 RS485
P8	40 pin flat connector	Connection to FDC expansion card
P9	36 poles Pan Connector	LVDS interface for remote terminal
P10	Connector for I/O module	Set with 8 points digital input or output
P12	26 pin flat connector	PWM & DIR outputs for axes # 5,6, 7 and 8 4 Digital outputs OC, 30V - 30 mA 4 Analog inputs 0-10V / 0-2mA at 14 bit
P14	26 pin flat connector	PWM & DIR outputs for axes X, Y, Z and W 4 Analog inputs 0-10 V / 0-5V at 14 bit set by PG5, 6, 7 and 8 (0-10V as default)
P19	9 pin D connector	CAN B (64-127 addressable nodes) + VA power supply
P20	9 pin D connector	CAN C (128-191 addressable nodes)
P25	64 pin flat connector	31 Digital inputs (also for use as Home limit switch) 6 Configurable digital inputs / outputs 16 Digital outputs 24V 1A PNP

Name	Type	Function
P26	64 pin flat connector	A, B and Z signals, encoders # 1, 2, 3 and 4 Analog outputs +/- 10 V # 1, 2, 3 and 4 Digital outputs, enabling of axes # 1, 2, 3 and 4 1 Emergency input 12 Digital inputs (also for use as Home limit switch) 2 Configurable digital inputs / outputs 9 Digital outputs
P27	40 pin flat connector	A, B and Z signals, encoders # 5, 6, 7 and 8 Analog outputs +/- 10 V # 5, 6, 7 and 8 Digital outputs, enabling of axes # 5, 6, 7 and 8 7 Digital outputs
P29	USB 1.1 connector	USB port # 1
M1	4 pin terminal board	Controller and I/O power supply
M2	8 pin terminal board	Contacts of the push buttons on the mobile terminal + digital input i91, 24V PNP (dead man)
M3	8 pin terminal board	OMRON G78A-2A2B safety relay contacts
M4	3 pin terminal board	1 analog input + / - 10V - 14 bit, buffered 1 analog input 0-20mA - 14 bit, buffered
M5	6 pin terminal board,	3 Analog inputs 0-5 Volt at 14 bit, not buffered
M9 **	6-pin Terminal board clamp. Spring	A, B signals encoder # 9 - 5V Line Driver (5V Push Pull on request)
M10 **	3 pin terminal board	Digital inputs i28 & i29, 24V PNP, alternative to encoder # 9
J3	20 pin flat connector	SPI interface for internal optional card
JP1	Jumper	Short-circuiting of logic GND and analog GND
JP2	Jumper	NPN/PNP selector for digital inputs
JP3	Jumper	CAN A port termination resistor
JP4	Jumper	CAN B port termination resistor
JP5	Jumper	RS485 port termination resistor
JP6	Jumper	CAN C port termination resistor
FT1	Faston	2,5 mm^2 cable earth connection
I1	Micro-pushbutton (i88)	Start of Boot function
DL1	Red Led	Alimentazione 24Vdc ok
DL2	Red Led	Alimentazione interna ok
DL3	Red Led (o42)	Segnalazione funzioni di boot da pulsante I1
DL6	Green Led	RAM Battery low
PG5	Spot welding	Decreases the analog input ADC (3) FS at 5V
PG6	Spot welding	Decreases the analog input ADC (2) FS at 5V
PG7	Spot welding	Decreases the analog input ADC (1) FS at 5V
PG8	Spot welding	Decreases the analog input ADC (0) FS at 5V
PG10	Spot welding	Change the analog input ADC (260) FS to 0-20mA
PG11	Spot welding	Change the analog input ADC (261) FS to 0-20mA
PG12	Spot welding	Change the analog input ADC (259) FS to 0-20mA
PG13	Spot welding	Change the analog input ADC (262) FS to 0-20mA

* The Ethernet connectors are mounted horizontally and stacked, so when the Box versions are installed a gap of about 5 cm should be left on this side of the controller.

** The connectors M9 and M10 are alternatives to each other; M10 connector must be requested when ordering.

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

M1 TERMINAL BOARD (power supply)

Terminal	Function
1	VA +24 Vdc Controller and I/O power supply
2	GNDA 0Vdc power supply
3	GNDA 0Vdc power supply
4	VA +24 Vdc Controller and I/O power supply

M2 TERMINAL BOARD (interfacing with mobile terminal)

Terminal	Function
1	EMG1 emergency button contact 1 (N.C.)
2	EMG1 emergency button contact 1 (N.C.)
3	24 VA +24 Vdc (parallel to Pin 1 terminal board M1)
4	EMG2 emergency button contact 2 (N.C.)
5	EMG2 emergency button contact 2 (N.C.)
6	Digital input i91, 24 Vdc PNP (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

M3 TERMINAL BOARD (safety relay)

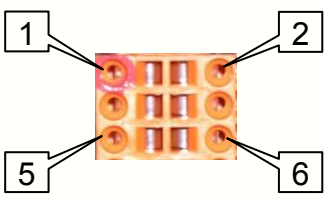
Terminal	Function
1	K1A-NA1 safety relay NO contact (normally open contact of o40)
2	K1A-NA2 safety relay NO contact (normally open contact of o40)
3	K1B-NA1 safety relay NO contact (normally open contact of o40)
4	K1B-NA2 safety relay NO contact (normally open contact of o40)
5	K1A-NC1 safety relay NC contact (normally closed contact of o40)
6	K1A-NC2 safety relay NC contact (normally closed contact of o40)
7	K1B-NC1 safety relay NC contact (normally closed contact of o40)
8	K1B-NC2 safety relay NC contact (normally closed contact of o40)

The internal relay K1, which can be activated by output o40, is an TE CONNECTIVITY SR4D4024 safety relay with two pairs of forced-guide contacts called K1A and K1B. Redundancy is obtained by connecting the 2 NO contacts in series with each other and the 2 NC contacts in parallel. The relay K1 is powered by the voltage VA through an internal electronic circuit.

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

Terminal	Function
1	+/- 10 V Analog input readable with ADC(16) operator, range 1640…14744, res..14 bit
2	GND
3	0-20 mA Analog input readable with ADC(17) c operator, range 0… 16384, resolut.14 bit

M5 TERMINAL BOARD (3 analog inputs at 5V)

Morsetto	Funzione	Layout
1	Analog GND	
2	5 V Analogue input readable with ADC(256) operator	
3	5 V Analogue input readable with ADC(257) operator	
4	5 V Analogue input readable with ADC(258) operator	
5	Analog GND	
6	+ 5V for potentiometer power supply	

M9 TERMINAL BOARD (encoder # 9, as alternative to M10)

Terminal	Function	Note
1	CLK A channel A straight encoder # 9 / input i28 *	5V Line Driver or Push Pull **
2	CLK/ A channel A negated encoder # 9	
3	CLK B channel B straight encoder # 9 / input i29 *	5V Line Driver or Push Pull **
4	CLK/B channel B negated encoder # 9	
5	GND power supply ground encoder # 9	
6	VDC +5Vdc power supply for encoder # 9	

* The hardware configuration parameter "EMIOS30 function" allows you to use pin 1 & 3 as encoder inputs (the default) or as user inputs i28 & i29.

** 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.

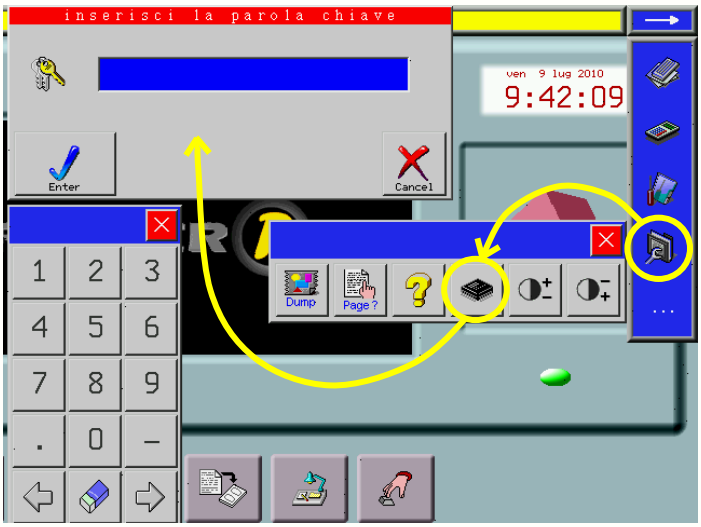
M10 TERMINAL BOARD (24V PNP inputs, as alternative to M9)

Morsetto	Funzione
1	User input i28N - 24V PNP, inverted logic (1 to 0 V, 0 to 24V)
2	24 VA +24 Vdc Controller and I/O power supply
3	User input i29N - 24V PNP, inverted logic (1 to 0 V, 0 to 24V)

These inputs must be enabled through "EMIOS30 function" Hardware configuration parameter.

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.

Volatile RAM memory

In order to use more than 16 interpolated axes you need more RAM; for this reason you can request the option to add to the controller 4 or 8 Mbytes of volatile static RAM, that resets at every power on.
This memory is dedicated to the following functions:

- As a buffer to hold the compiled PLC code, before the transfer in Flash
- As a buffer to hold the CNC queue of movements (Look-Haed function)
- As a buffer to contain any extra additional V variables

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, to the first 16 axes are assigned the following names: XYZWUABCDVEFGHIJ; these names can also be modified but must consist of only 1 letter. The position adopted by each letter, starting from 0, is the number with which the axis will be identified, if it is installed; therefore, the default is: X is the axis # 0, J is the axis # 15.

Installed axes

In order to install axis and make them operative, the axes must be entered in the specific hardware configuration parameter. It's possible to modify default allocations of the hardware sources working on the 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 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.

Number of axes beyond 16

If the optional volatile RAM is available, this parameter specifies the number of axes that you want to add to the first 16 (min.1, max. 8). In this case the names of added axes must be declared in their "long name" parameter. Additional axes are assigned to the positions 16 to 27; those that are not enabled by this parameter will still be used as an encoder becouse a reduced set of their “special parameters” will be available for them.

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 28).
"encoder number": velocity/position feedback of the axis (valid values from 1 to 28)
“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

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

- **Zero Limit Switch,** allows you to modify axis position at its deactivation or at reception of a pulse generated by the encoder through a “0 Notch” signal. The input must be controllable in interrupt mode.
- **Minimum Limit Switch**, when activated, it stops axis movement and switches to alarm status and prevents any movement towards lower position values. Input must remain active until the axis physical bottom limit is reached.
- **Maximum Limit Switch**, when activated, it stops axis movement and switches to alarm status and prevents any movement towards higher position values. Input must remain active until the axis physical top limit is reached.

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 Switchs use the same input.

+/- 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 # 3 SD unit to process the signal on pin # 2 of the M5 terminal, the command to use will be SDADC 3, 256; the filtered and digitized value will be readable on INFO 2093.

64-bit math libraries

The Power D as 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

P25 CONNECTOR (Digital I/O)

Pin	DESCRIPTION	NOTES
1	GNDA I/O power supply ground	
2	VA +24 I/O power supply	
3	GNDA I/O power supply ground	
4	VA +24 I/O power supply	
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 i39	Axis # 9 (B) home limit switch
9	User output o0	
10	User input i0	
11	User output o1	
12	User input i1	
13	User output o2	
14	User input i2	
15	User output o3	
16	User input i3	
17	User output o4	
18	User input i4	
19	User output o5	
20	User input i5	
21	User output o6	
22	User input i6	
23	User output o7	
24	User input i7	
25	User output o8	
26	User input i8	Non usabile in interrupt
27	User output o9	
28	User input i9	Non usabile in interrupt
29	User output o10	
30	User input i10	Non usabile in interrupt
31	User output o11	
32	User input i11	Non usabile in interrupt
33	User output o12	
34	User input i12	Non usabile in interrupt
35	User output o13	
36	User input i13	Non usabile in interrupt
37	User output o14	
38	User input i14	Non usabile in interrupt
39	User output o15	
40	User input i15	Non usabile in interrupt
41	VA +24 I/O power supply	
42	User input i16	
43	VA +24 I/O power supply	
44	User input i17	
45	GNDA I/O power supply ground	
46	User input i18	
47	GNDA I/O power supply ground	

Pin	DESCRIPTION	NOTES
48	User input i19	
49	GNDA I/O power supply ground	
50	User input i20	
51	User input i33	
52	User input i21	
53	User input i34	
54	User input i23	
55	User input i35	
56	User input i22	
57	User input i50 / User output o50 *	if input, it's Axis # 6 (V) home limit switch
58	User input i51 / User output o51 *	
59	User input i52 / User output 052 *	if input, it's Axis # 7 (A) home limit switch
60	User input i53 / User output o53 *	
61	User input i54 / User output 054 *	if input, it's Axis # 8 (C) home limit switch
62	User input i55 / User output o55 *	
63	GNDA I/O power supply ground	
64	VA +24 I/O power supply	

* Depends on the I/O module inserted in slot P10

P26 CONNECTOR (axes 1- 4 and digital I/O)

Pin	DESCRIPTION	NOTES
1	GNDANAL X X axis analog ground	
2	VREF X reference signal, +/- 10V	axis # 1
3	GNDANAL Y Y axis analog ground	
4	VREF Y reference signal, +/- 10V	axis # 2
5	GNDANAL Z Z axis analog ground	
6	VREF Z reference signal, +/- 10V	axis # 3
7	GNDANAL W W axis analog ground	
8	VREF W reference signal, +/- 10V	axis # 4
9	GND logic ground for connection to screen	
10	GND logic ground for connection to screen	
11	CLKA X encoder # 1 channel	
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	
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	
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	
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 I/O power supply	
33	User output o17	By default ENBY enabling of driver # 2
34	SELPNP/NPN	**Note 1**
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	s23, if EMG is deactivated becomes user 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	DESCRIPTION	NOTES
47	User output o34	Can become DIRO Z axis # 3 direction output if “drive type” parameter = 2 or 4
48	User input i44	By default Axis # 3 (Z) home limit stop
49	User output o35	Can become 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 I/O power supply	
52	GNDA I/O power supply ground	
53	User input i48 / User output o48 *	if input, it’s Axis # 5 (U) home limit stop
54	User input i49 / User output 049 *	
55	User input i32	
56	GNDA I/O power supply ground	
57	User input i25 **	Axis # 10 (D) home limit switch
58	User input i24 **	Not usable in interrupt mode
59	User input i26 **	By default Axis # 11 (E) home limit switch
60	User input i27 **	By default Axis # 12 (F) home limit switch
61	GNDA I/O power supply ground	
62	VA +24 I/O power supply	
63	User output o39	Can become DIRO C axis # 8 direction output if “drive type” parameter = 2 or 4
64		

* Depends on the I/O module inserted in slot P10

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

Note 1 this PIN polarises all inputs called “User input”: if connected to VA it sets them as NPN, or if connected to GNDA it sets them as PNP.

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 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 D 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.

P27 CONNECTOR (axes 5 - 8)

Pin	DESCRIPTION	NOTES
1	U axis GNDANAL	
2	VREF U reference signal, +/- 10V	axis # 5
3	V axis GNDANAL	
4	VREF V reference signal, +/- 10V	axis # 6
5	GND	
6	User output o20	By default ENBU enabling of driver # 5
7	User output o21	By default ENBV enabling of driver # 6
8	GNDA	
9	+VDC +5V for encoder power supply	
10	CLKA U encoder # 5 channel	
11	GND encoder logic ground	
12	CLKb U encoder # 5 channel	
13	GND encoder logic ground	
14	NOTCH 0 U 0 channel encoder # 5	User input i60 only non optoinsulated IPT, 5V
15	+VDC +5Volt ENCODER	
16	CLKA V encoder # 6 channel	
17	GND encoder logic ground	
18	CLKB V encoder # 6 channel	
19	G N D encoder logic ground	
20	NOTCH 0 V 0 channel encoder # 6	User input i61 only non optoinsulated IPT, 5V
21	+VDC +5Volt ENCODER	
22	CLKA encoder # 7 channel	
23	GND encoder logic ground	
24	CLKB encoder # 7 channel	
25	GND encoder logic ground	
26	NOTCH 0 A 0 channel encoder # 7	User input i62 only non optoinsulated IPT, 5V
27	+VDC +5Volt ENCODER	
28	CLKA encoder # 8 channel	
29	CLKB encoder # 8 channel	
30	NOTCH 0 0 channel encoder # 8	User input i63 only non optoinsulated IPT, 5V
31	A axis GNDANAL	
32	A axis VREF	axis # 7
33	C axis GNDANAL	
34	C axis VREF	axis # 8
35	GND logic ground	
36	User output o22	By default ENBA enabling of driver # 7
37	User output o23	By default ENBC enabling of driver # 8
38	User output o36	Can become DIRO U axis # 5 direction output if “drive type” parameter = 2 or 4
39	User output o37	Can become DIRO V axis # 6 direction output if “drive type” parameter = 2 or 4
40	User output o38 XDIROA	Can become DIRO A axis # 7 direction output if “drive type” parameter = 2 or 4

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)	User output o17N (O.C. max. 30V – 30mA)
18	ENABLE # 1 negated (0 = driver enabled)	User output o16N (O.C. max. 30V – 30mA)
19	ENABLE # 4 negated (0 = driver enabled)	User output o19N (O.C. max. 30V – 30mA)
20	ENABLE # 3 negated (0 = driver enabled)	User output o18N (O.C. max. 30V – 30mA))
21	VREF for analog inputs + 5Vdc	
22	AGND analog ground for analog inputs	
23	Analog input 1 – assignment to ADC (1)	Note 1 - 0..10V (0..5V if PG7 is closed)
24	Analog input 0 – assignment to ADC (0)	Note 1 - 0..10V (0..5V if PG8 is closed)
25	Analog input 3 – assignment to ADC (3)	Note 1 - 0..10V (0..5V if PG5 is closed)
26	Analog input 2 – assignment to ADC (2)	Note 1 - 0..10V (0..5V if PG6 is closed)

Note 1:
The buffered analog inputs have a resolution of 14 bits; their input resistance is 200 Kohm (0..10V setting) or 100 Kohm (0..5V setting).

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	+ 12/15 Volt DC 0.05A max	
14	PWM # 8 PWM driver command output	
15	- 12/15 Volt DC 0.05A max	
16	DIR # 8 output direction for PWM driver	User output o31 (5V TTL)
17	ENABLE # 6 negated (0 = driver enabled)	User output o21N (O.C. max. 30V – 30mA)
18	ENABLE # 5 negated (0 = driver enabled)	User output o20N (O.C. max. 30V – 30mA)
19	ENABLE # 8 negated (0 = driver enabled)	User output o23N (O.C. max. 30V – 30mA)
20	ENABLE # 7 negated (0 = driver enabled)	User output o22N (O.C. max. 30V – 30mA)
21	VREF for analog inputs + 5Vdc	
22	AGND analog ground for analog inputs	
23	Analog input assigned to ADC (260)	Note 2 - 0..10V (0..20mA if PG10 is closed)
24	Analog input assigned to ADC (259)	Note 2 - 0..10V (0..20mA if PG12 is closed)
25	Analog input assigned to ADC (262)	Note 2 - 0..10V (0..20mA if PG13 is closed)
26	Analog input assigned to ADC (261)	Note 2 - 0..10V (0..20mA if PG11 is closed)

Note 2:
The analog inputs have a resolution of 14 bits and accept voltages between 0 and 10 volts.
They are buffered to make their input resistance high; if settedin order to accept input signals to 0-20 mA their input resistance is 499 Ω.

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	slot I/O	notes
i0	P25	10	P13	
i1	P25	12		
i2	P25	14		
i3	P25	16		
i4	P25	18		
i5	P25	20		
i6	P25	22		
i7	P25	24		
i8	P25	26	P15	Not usable in interrupt mode
i9	P25	28		Not usable in interrupt mode
i10	P25	30		Not usable in interrupt mode
i11	P25	32		Not usable in interrupt mode
i12	P25	34		Not usable in interrupt mode
i13	P25	36		Not usable in interrupt mode
i14	P25	38		Not usable in interrupt mode
i15	P25	40		Not usable in interrupt mode
i16	P25	42	P16	
i17	P25	44		
i18	P25	46		
i19	P25	48		
i20	P25	50		
i21	P25	52		
i22	P25	56		
i23	P25	54		
i24	**P26**	**58**	motherboard	Not usable in interrupt mode
i25	**P26**	**57**		Not usable in interrupt mode
i26	**P26**	**59**		
i27	**P26**	**60**		
i28N	**M10**	**1**		**Digital inputs 24V PNP with inverted logic, as alternative to encoder # 9 (M9 connector)**
i29N	**M10**	**3**		
i32	**P26**	**55**	P17	
i33	P25	51		
i34	P25	53		
i35	P25	55		
i36	P25	5		RUN CNC (executes the selected CNC program)
i37	P25	7		RUN PLC (activates the PLC program; interrupt MDA)
i38	P25	6		HOLD (blocks axis movement)
i39	P25	8		

input	connector	pin	slot I/O	notes
i40	**P26**	**40**	P21	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**		s23 emergency in. (if EMG is deactivated => i47)
i48 *	**P26**	**53**	P10	Config. as o48* or Axis 5 (U) home limit switch
i49 *	**P26**	**54**		Configurable as o49*
i50 *	P25	57		Config. as o50* or Axis 6 (V) home limit switch
i51 *	P25	58		Configurable as o51*
i52 *	P25	59		Config. as o52* or Axis 7 (A) home limit switch
i53 *	P25	60		Configurable as o53*
i54 *	P25	61		Config. as o54* or Axis 8 (C) home limit switch
i55 *	P25	62		Configurable as o55*
i56	**P26**	**13**	motherboard	X axis 0 notch (5 V TTL, TPU interrupt)
i57	**P26**	**17**		Y axis 0 notch (5 V TTL, TPU interrupt)
i58	**P26**	**21**		Z axis 0 notch (5 V TTL, TPU interrupt)
i59	**P26**	**25**		W axis 0 notch (5 V TTL, TPU interrupt)
i60	**P27**	**14**		U axis 0 notch (5 V TTL, TPU interrupt)
i61	**P27**	**20**		V axis 0 notch (5 V TTL, TPU interrupt)
i62	**P27**	**26**		A axis 0 notch (5 V TTL, TPU interrupt)
i63	**P27**	**30**		C axis 0 notch (5 V TTL, TPU interrupt)
i88	-	-		Microswitch I1
i91	**M2**	**6**		**24V PNP, can be connected to the "dead man" buttonof the mobile terminal**

* Depends on the I/O module inserted in slot P10: if it's a digital input module the hardware configuration parameter ""direction I / O port user" must be set to 0000000.

WARNING: after this parameter is changed the PLC program must be recompiled

** 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	slot I/O	notes	
o0	P25	9	P3		
o1	P25	11			
o2	P25	13			
o3	P25	15			
o4	P25	17			
o5	P25	19			
o6	P25	21			
o7	P25	23			
o8	P25	25	P18		
o9	P25	27			
o10	P25	29			
o11	P25	31			
o12	P25	33			
o13	P25	35			
o14	P25	37			
o15	P25	39			
o16	**P26**	**31**	P23	ENB # 1 (X)	These outputs are available also on P14 connector (5V TTL); they can be used like ENB negated for axes # 1, 2, 3 and 4.
o17	**P26**	**33**		ENB # 2 (Y)	
o18	**P26**	**35**		ENB # 3 (Z)	
o19	**P26**	**37**		ENB # 4 (W)	
o20	**P27**	**6**	P24	ENB # 5 (U)	These outputs are available also on P12 connector (5V TTL); they can be used like ENB negated for axes # 5, 6, 7 and 8.
o21	**P27**	**7**		ENB # 6 (V)	
o22	**P27**	**36**		ENB # 7 (A)	
o23	**P27**	**37**		ENB # 8 (C)	
o24	**P14**	**4**	mother board	PWM DIR # 1 (X) (5V TTL)	
o25	**P14**	**8**		PWM DIR # 2 (Y) (5V TTL)	
o26	**P14**	**12**		PWM DIR # 3 (Z) (5V TTL)	
o27	**P14**	**16**		PWM DIR # 4 (W) (5V TTL)	
o28	**P12**	**4**		PWM DIR # 5 (U) (5V TTL)	
o29	**P12**	**8**		PWM DIR # 6 (V) (5V TTL)	
o30	**P12**	**12**		PWM DIR # 7 (A) (5V TTL)	
o31	**P12**	**16**		PWM DIR # 8 (C) (5V TTL)	
o32	**P26**	**43**	P23	DIRO X if drive # 1 type = 2 or 4	
o33	**P26**	**45**		DIRO Y if drive # 2 type = 2 or 4	
o34	**P26**	**47**		DIRO Z if drive # 3 type = 2 or 4	
o35	**P26**	**49**		DIRO W if drive # 4 type = 2 or 4	

output	connector	pin	slot I/O	notes
o36	P27	38	P24	DIRO U if drive # 5 type = 2 or 4
o37	P27	39		DIRO V if drive # 6 type = 2 or 4
o38	P27	40		DIRO A if drive # 7 type = 2 or 4
o39	P26	63		DIRO C if drive # 8 type = 2 or 4
o40	M3	1&2 3&4 5&6 7&8	mother board	Control of safety relay OMRON G7SA-2A2B
o41	-	-		Reserved for buzzer control
o42	-	-		DL3 led management
o43	-	-		Satety circuit power supply
o48 *	P26	53	P10	Configurable as i48* or Axis 5 (U) home switch
o49 *	P26	54		Configurable as i49 *
o50 *	P25	57		Configurable as i50 *
o51 *	P25	58		Configurable as i51 *
o52 *	P25	59		Configurable as i52 *
o53 *	P25	60		Configurable as i53 *
o54 *	P25	61		Configurable as i54 *
o55 *	P25	62		Configurable as i55 *

* Depends on the I/O module inserted in slot P10 : if it's a digital output module the hardware configuration parameter ""direction I / O port user" must be set to 0000001**1**0.

WARNING: after this parameter is changed the PLC program must be recompiled

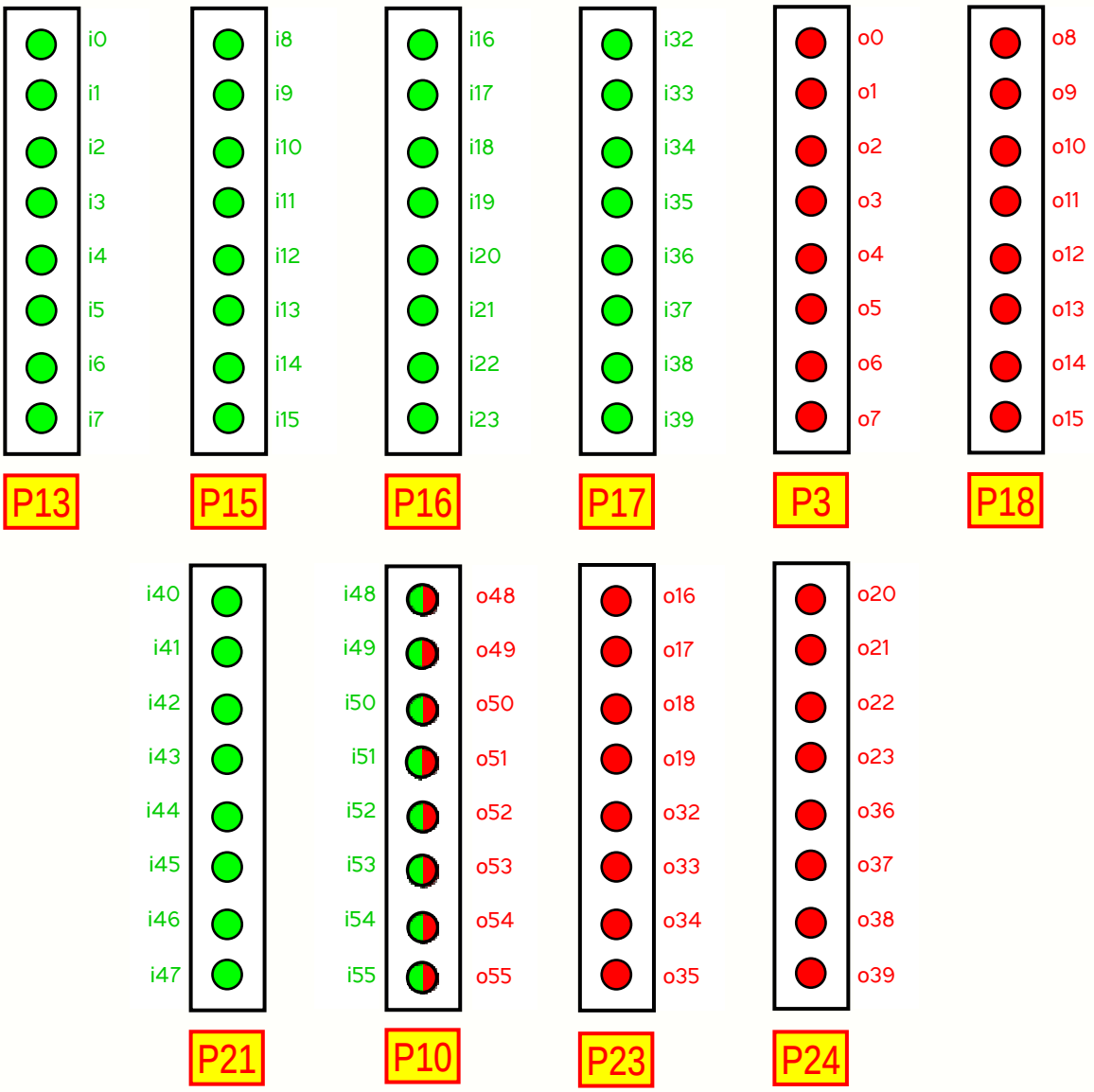
Power supply for outputs separate from VA

On slots P3, P10, P18, P23 and P24 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.

Diagnostic LED layout



ANALOG INPUTS (consecutive numbering)

input	connector	pin	full scale	notes
0	P14	24	0-10V	0-5V witn Pg8 closed
1		23		0-5V witn Pg7 closed
2		26		0-5V witn Pg6 closed
3		25		0-5V witn Pg5 closed
16	M4	1	+/- 10V	
17		3	0-20 mA	
256	M5	2	0-5V	
257		3		
258		4		
259	P12	24	0-10V	0-20 mA witn Pg12 closed
260		23		0-20 mA witn Pg10 closed
261		26		0-20 mA witn Pg11 closed
262		25		0-20 mA witn Pg13 closed

ANALOG OUTPUTS (consecutive numbering)

output	connector	pin	full scale	notes
1	P26	2	+/- 10V	from DAC with 16 bits resolution
2		4		
3		6		
4		8		
5	P27	2		
6		4		
7		32		
8		34		

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.

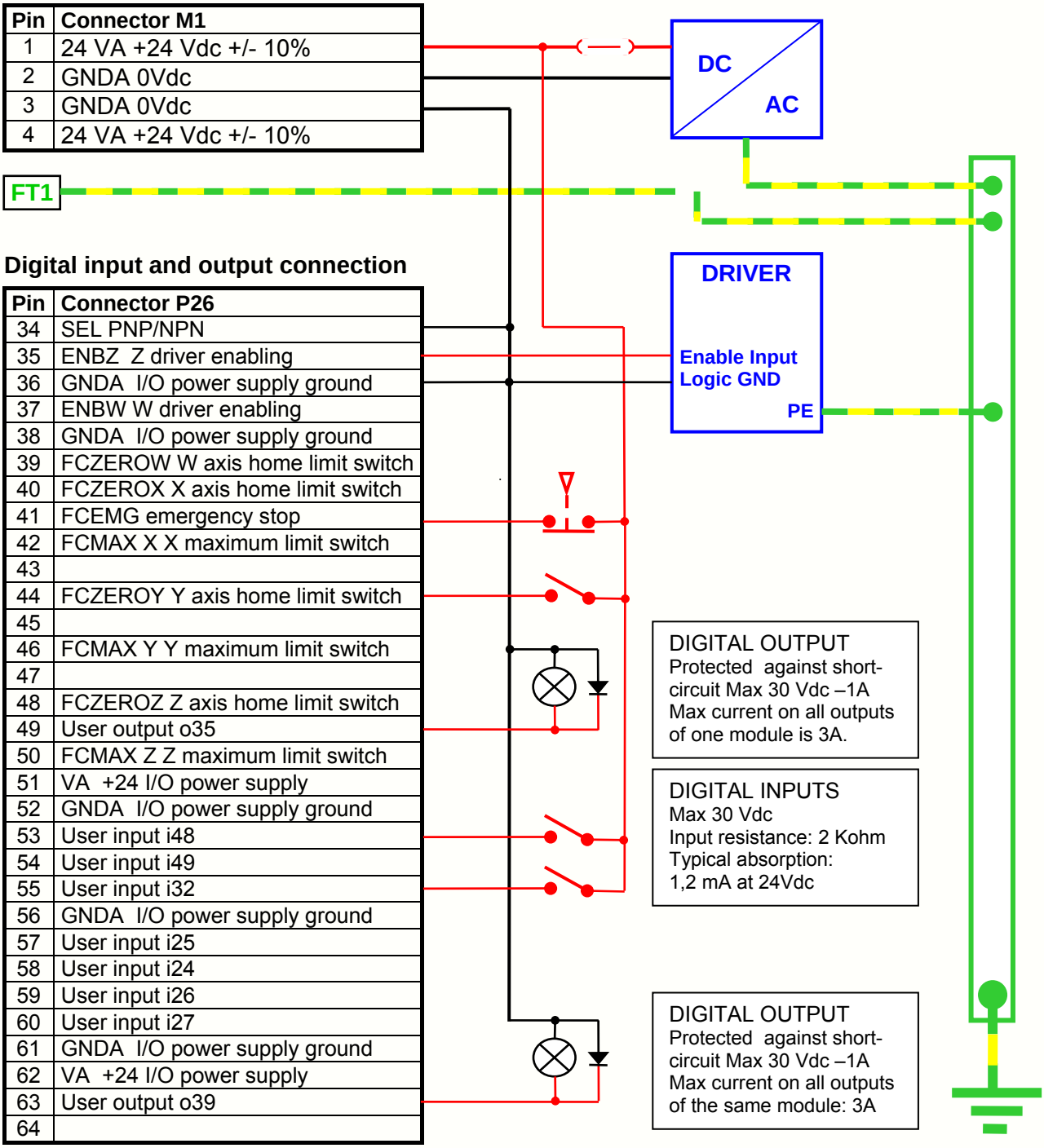
Power supply and ground connection

Pin	Connector M1
1	24 VA +24 Vdc +/- 10%
2	GNDA 0Vdc
3	GNDA 0Vdc
4	24 VA +24 Vdc +/- 10%

FT1

Digital input and output connection

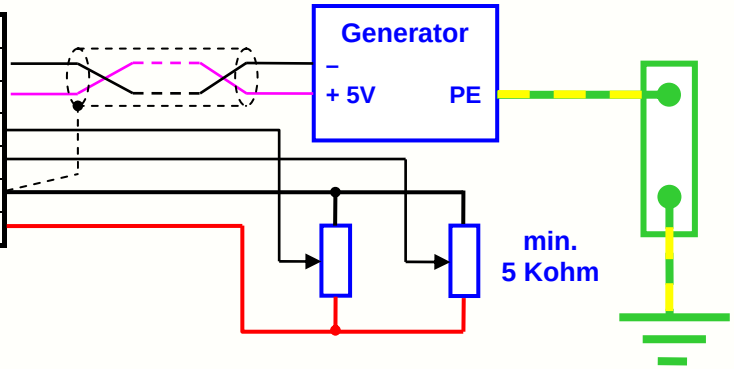
Pin	Connector P26
34	SEL PNP/NPN
35	ENBZ Z driver enabling
36	GNDA I/O power supply ground
37	ENBW W driver enabling
38	GNDA I/O power supply ground
39	FCZEROW W axis home limit switch
40	FCZEROX X axis home limit switch
41	FCEMG emergency stop
42	FCMAX X X maximum limit switch
43	
44	FCZEROY Y axis home limit switch
45	
46	FCMAX Y Y maximum limit switch
47	
48	FCZEROZ Z axis home limit switch
49	User output o35
50	FCMAX Z Z maximum limit switch
51	VA +24 I/O power supply
52	GNDA I/O power supply ground
53	User input i48
54	User input i49
55	User input i32
56	GNDA I/O power supply ground
57	User input i25
58	User input i24
59	User input i26
60	User input i27
61	GNDA I/O power supply ground
62	VA +24 I/O power supply
63	User output o39
64	



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.

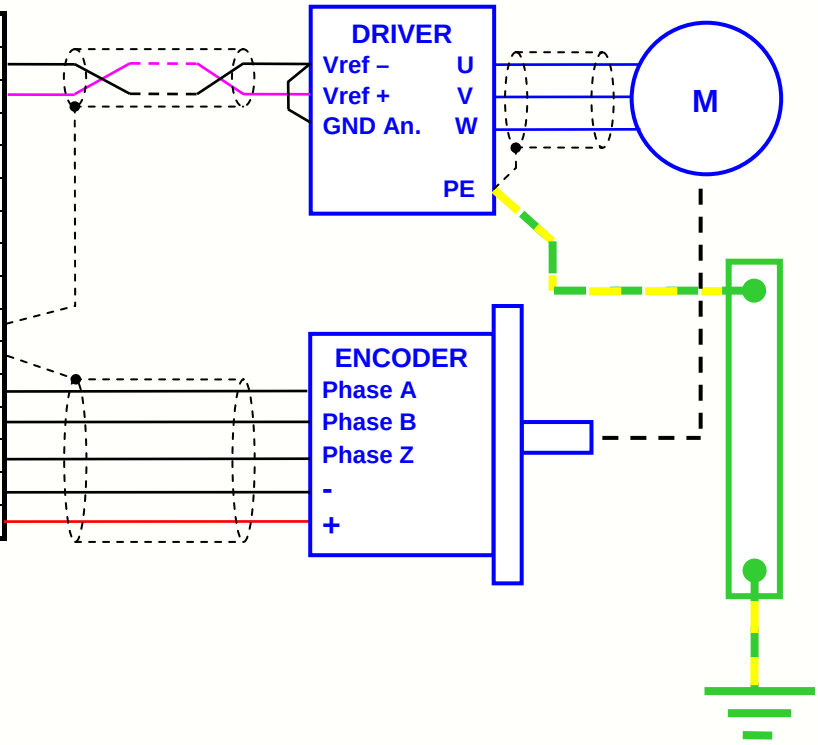
Analog input connection

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



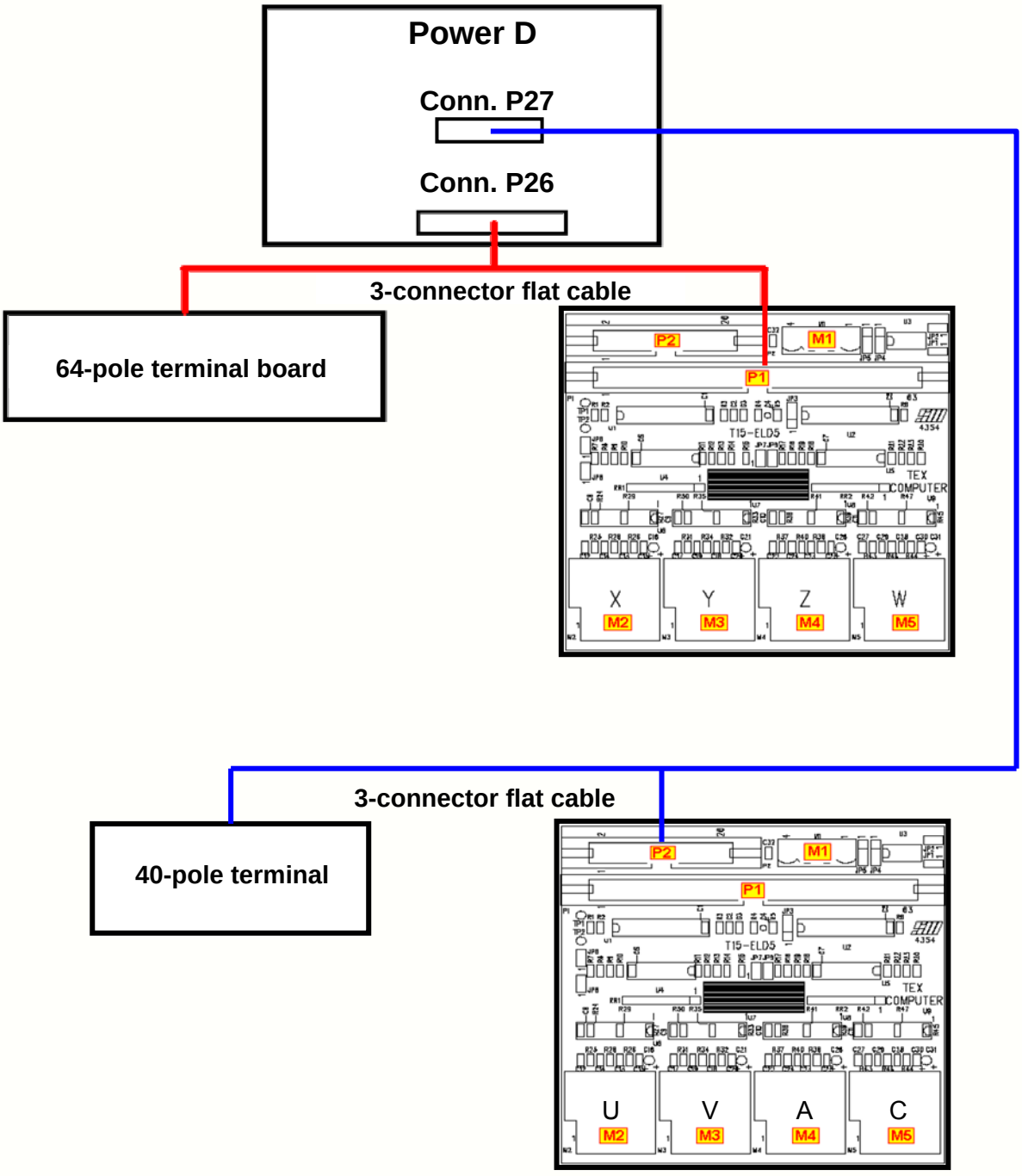
Connection to 5 V Push Pull encoder

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



Connection to 5V Line Driver encoder

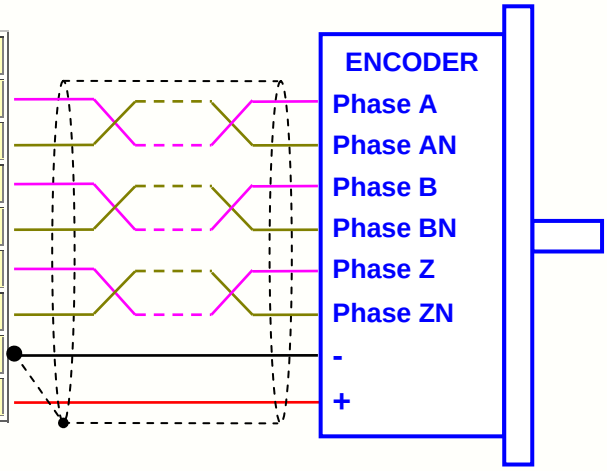
An interface card called **T15ELD** must be added to connect encoders with Line Driver type output to the controller. This interface must be connected with a 3-connector flat cable which makes all the necessary electrical connections available on 4 different terminal boards, called **M2**, **M3**, **M4** and **M5**. If T15ELD is connect to the Driver's "simulated encoder" you don't have to connect + 5Vdc terminal.



T15ELD interface connections

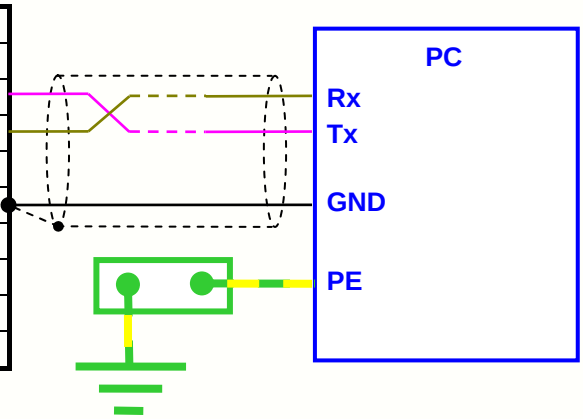
The connections must be made by means of twisted screened cable. If the “simulated encoder” outputs generated by the driver are connected to the T15ELD interface instead of the encoder, the + 5Vdc terminal is not connected.

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)

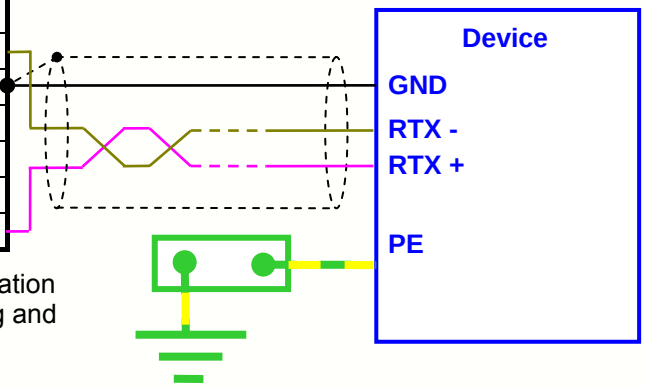
Pin	P6 / P7 Connector
1	
2	RX
3	TX
4	
5	GND logic ground
6	VA + 24Vdc for terminals
7	RTS
8	CTS
9	VDC +5Vdc for terminals



Connection of RS485 serial interface (Com 3)

Pin	P7 Connector
1	
2	
3	
4	RTX -
5	GND logic ground
6	VA + 24Vdc
7	
8	
9	RTX +

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



CANopen interface connection

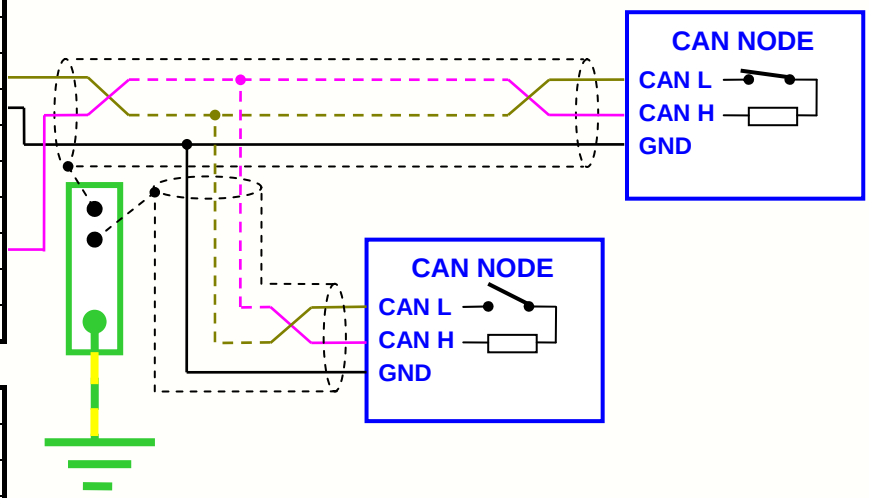
The Power D is able to control up to 3 CAN ports using both the CiA 301 general communication protocol and the specific profiles CiA 401 (I/O devices), CiA 402 (drives) and CiA 406 (encoder).

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 D, the termination resistances are already connected by default and can be disconnected by removing jumpers JP3 (P5), JP4 (P19) and JP6 (P20), but you have to install the termination resistance at the other end of the network.

Pin	Connector P5, P20
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

Power D BOX is equipped with LVDS (Low Voltage Differential Signaling) interface, with which you can connect to the controller, up to a maximum distance of 10 m, 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 mm2.

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

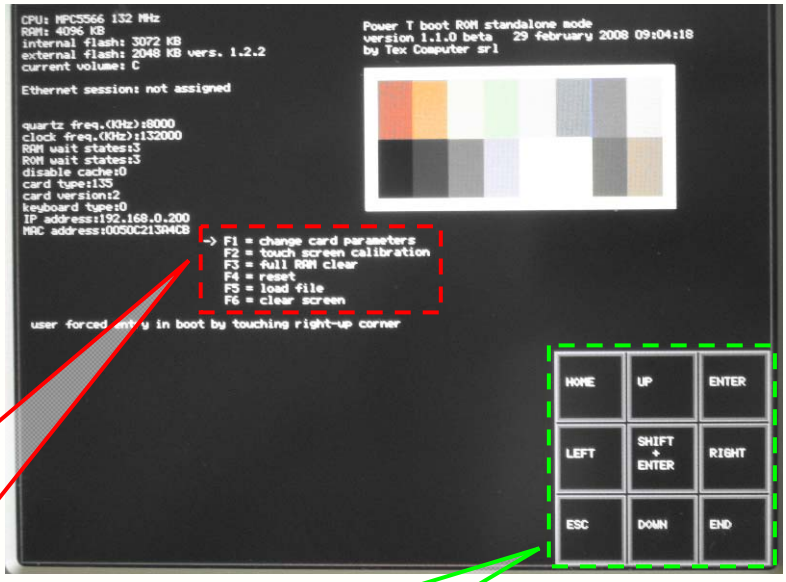
The logic states of the **key-switch** and **buzzer** installed on the mobile terminal are visible from the application program through system’s parameters:
s331: key-switch
s332: buzzer

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 pressure in 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

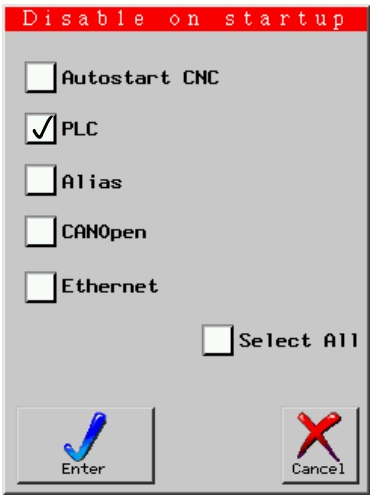
WARNING: the Boot menu only manages the USB memories and not any other peripherals, such as the keypad and the mouse, which may be connected to the same USB port by means of a hub.

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.

Power D 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.

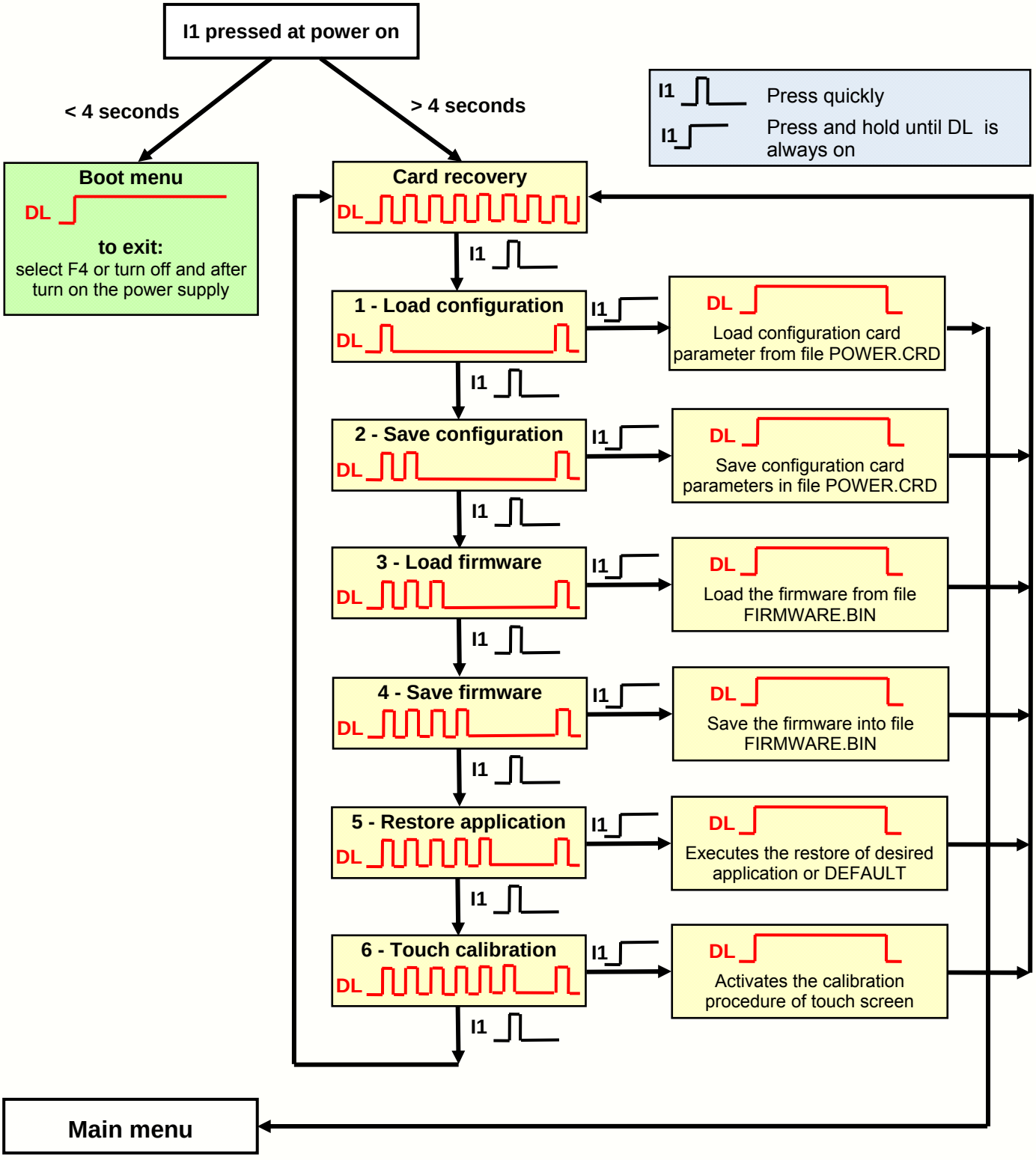
The following resources are electrically connected to the INT-CFC-USB1 card and terminal board M5:

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 # 9
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	ADC(256) *
Spindle Overfeed	Regulates the spindle rotation speed	ADC(257) *

* Analog inputs 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 I1



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.

With the function *3-Load firmware* you can load indifferently both the Main and the Boot of the controller if in the storage medium they are called FIRMWARE.BIN.

With the function *5-Restore application* you can activate the procedure that allows you 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 at reset*.. If this parameter is empty it will be automatically searched for an application program called DEFAULT.

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

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

The main differences are:

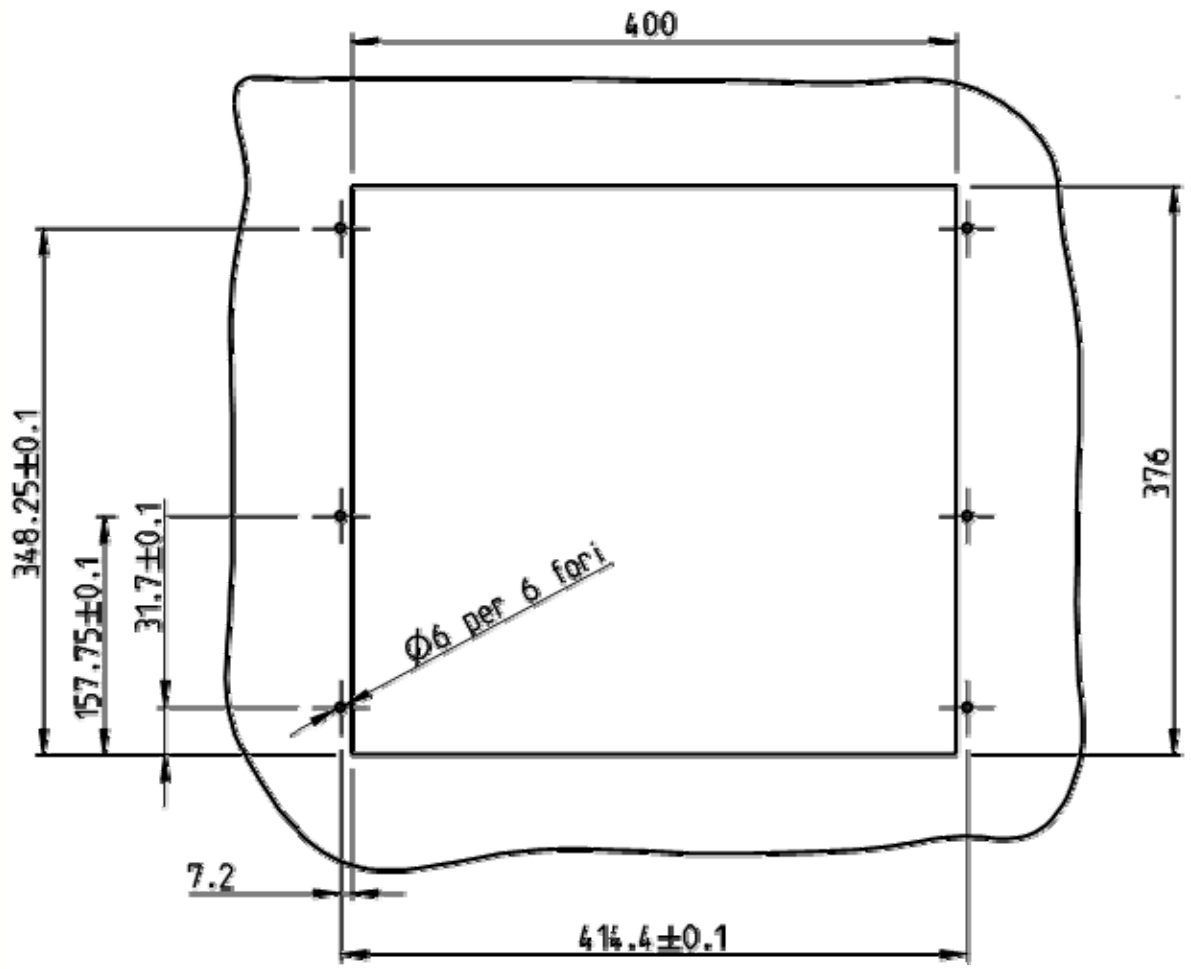
- In Power N the RS485 is alternative to RS232 Com 1, instead in Power D it is the Com 3
- In Power D, the power supply for safety circuit is activated by turning on the o43 internal output, while in Power N became active at power-up
- in Power D the LVDS connector and the other connections to the mobile terminal are on the motherboard, while in Power N are on the internal board GRF3
- Power D Box is smaller than Power N Box, so the mounting holes are not interchangeable

The table shows the changes needed to achieve interchangeability:

Description	Power N	Power D	Interchangeability
safety power supply	at power-up	turning on o43	with software modification
“dead man” input	i22	i91	with software modification
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 23 - 0-10V input	ADC(5)	ADC(260)	with software modification
P12 - Pin 24 - 0-10V input	ADC(4)	ADC(259)	
P12 - Pin 25 - 0-10V input	ADC(36)	ADC(262)	
P12 - Pin 26 - 0-10V input	ADC(35)	ADC(261)	
M4 - Pin 1 - +/- 10V input	ADC(32)	ADC(16)	with software modification
M4 - Pin 3 - 0-20 mA input	ADC(27)	ADC(17)	

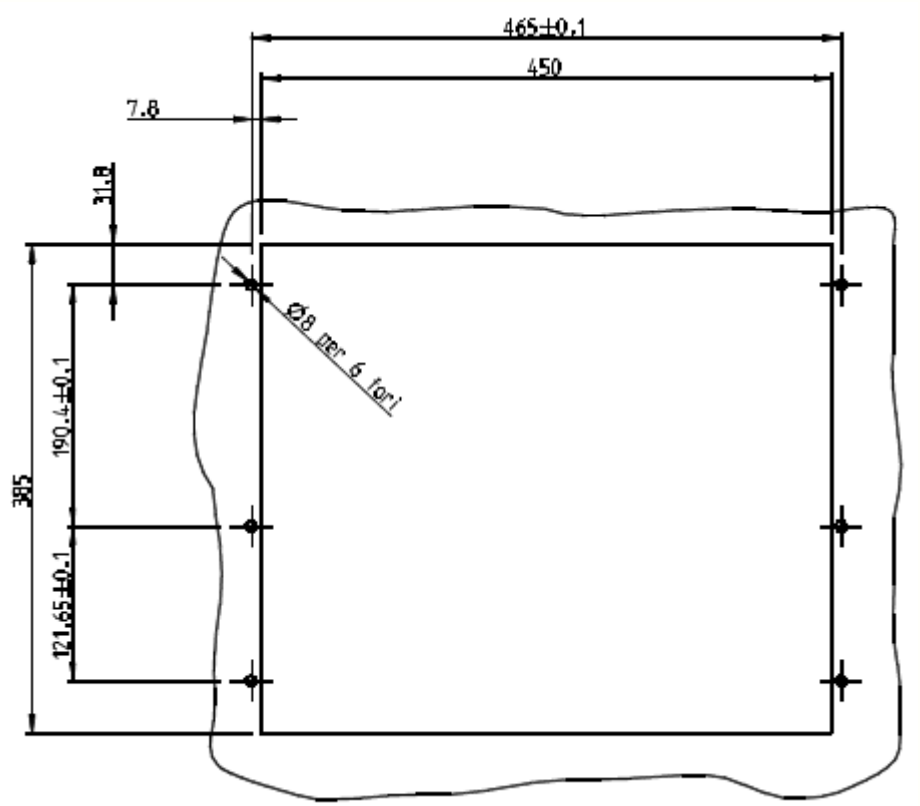
Power D 10,4” XGA, 80 keys drilling template

(Dimensions in mm)



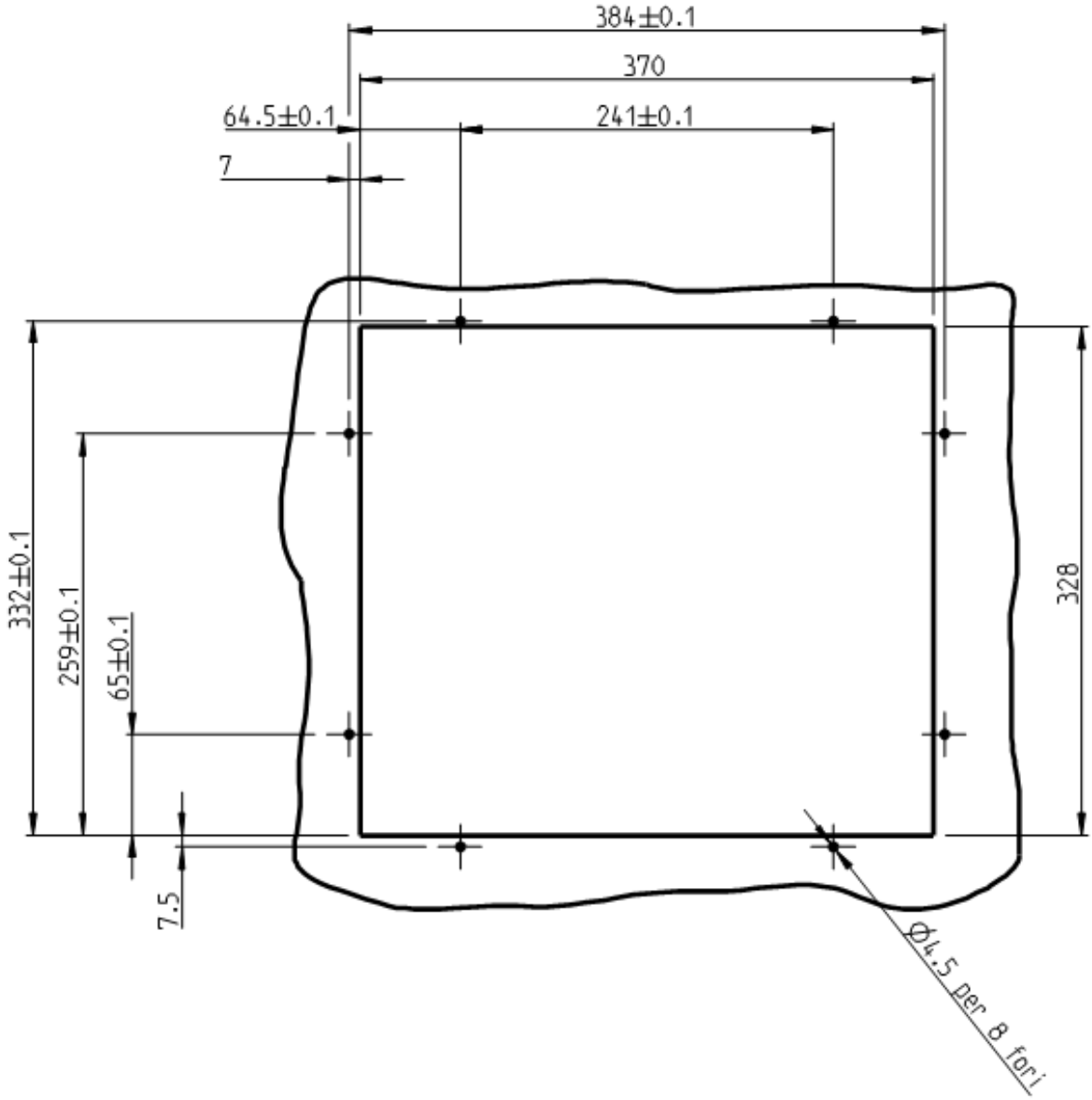
Power D 15”, 80 keys drilling template

(Dimensions in mm)



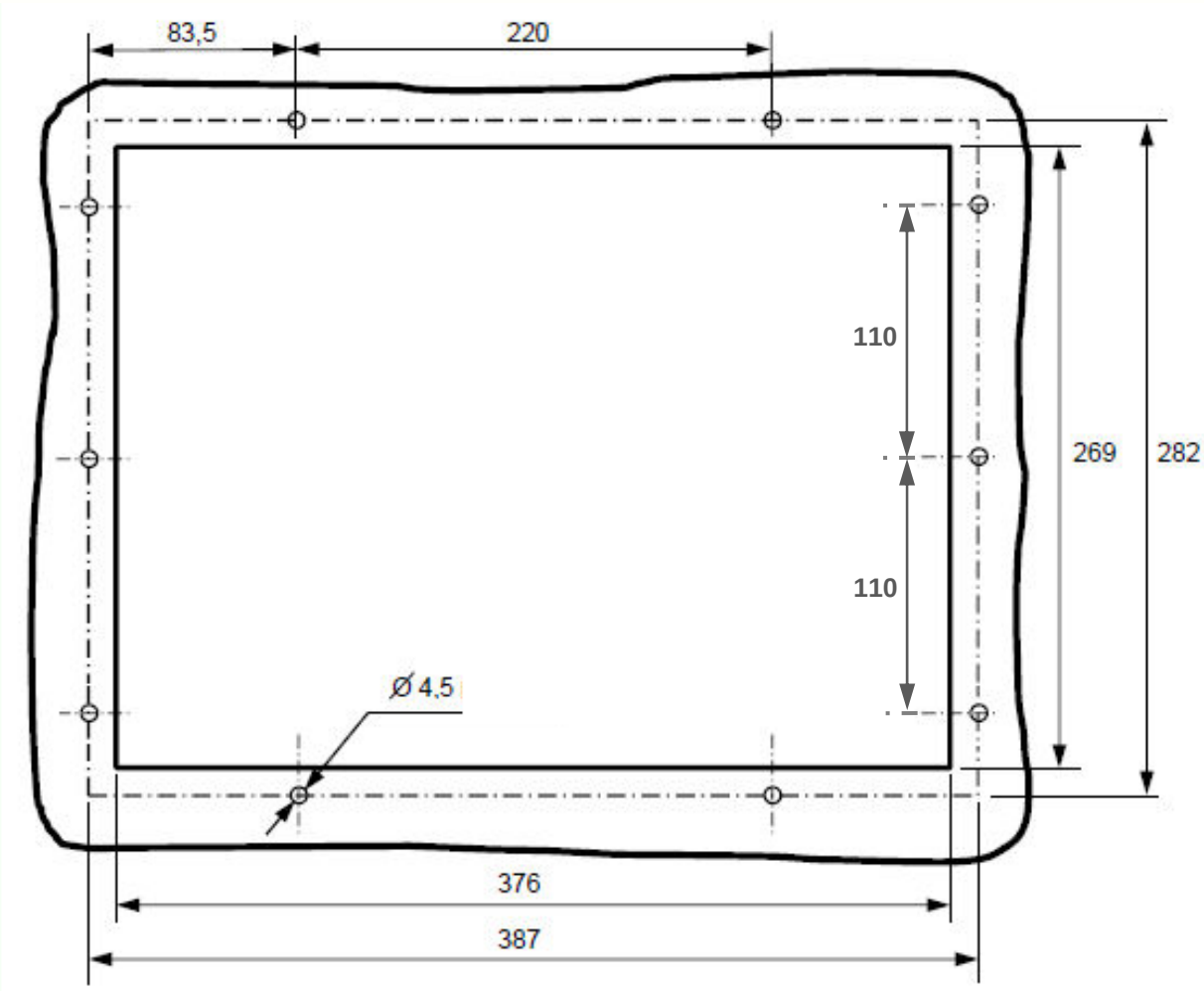
Power D 15” - 28 keys drilling template

(Dimensions in mm)



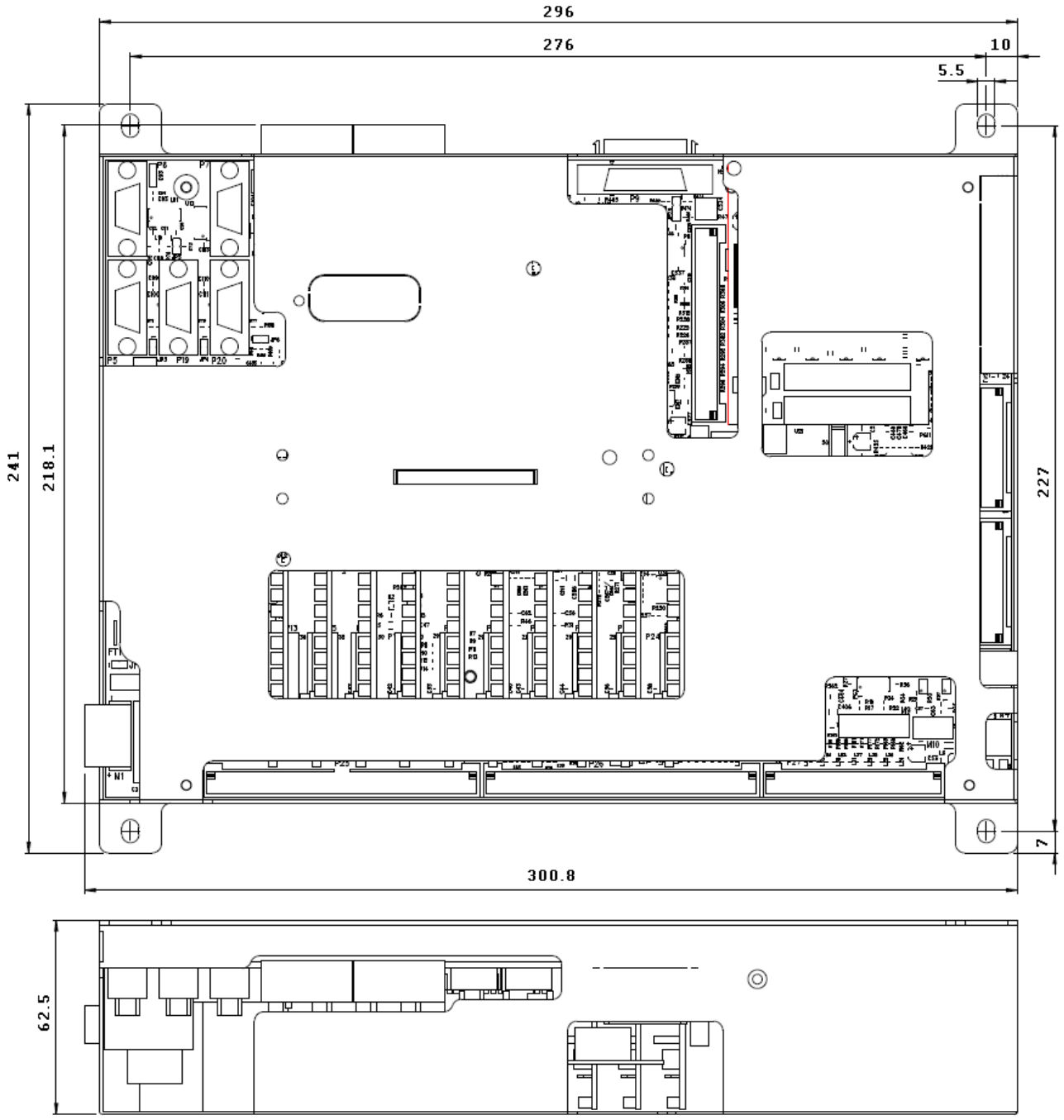
Power D 15” only touch drilling template

(Dimensions in mm)



Power D Box, without FDC expansion board, dimensions

(Dimensions in mm)



With FDC expansion board the overall height is 130 mm.

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

Data subject to modification without notice