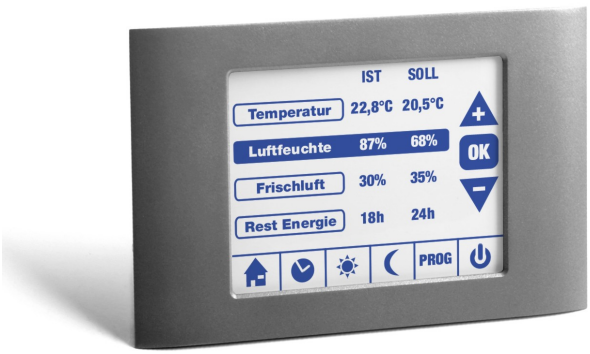
TP1000 1/4VGA Touchpanel Computer

Hardware-Version of Product: 1.6

Technical Documentation

1 Introduction

The TP1000 is a Touchpanel Computer with a ¼ VGA graphic LC-Display designed to be integrated in a door of a control cabinet, in a control desk or in the housing surface of your device.
The unit is based on the TINY-Tiger™ or the TINY-Tiger™ 2 Multitasking Computers, which can be easily programmed in Tiger-BASIC™. It can store and display several menus, graphics and machine states due to it's large RAM and Flash memory. The user can interact with the displayed graphics touching directly on it. For this job you can use our powerful Tiger Graphic Library, which include many subroutines for creating control elements, graphs, printing in graphic fonts or showing dynamically created graphics.
The inputs and machine states can be transferred from or to your application by many various communication ports.



2 Applications

- Touchpanel Terminals
- Operating Units
- Laboratory Apparatus
- Machine Controls
- Data Bus Bridges
- Vending Machines
- Measurement Devices
- Dataloggers
- Info-Points
- ... and many more

3 Features

- Analog touch panel 120mm x 90mm
- With or without front panel for your customized product
- ¼ VGA LCD 5.7“
  320 x 240 pixels
- Switchable LED back light
- Exchangeable Multitasking Computer Modules
- 512kB...4 MByte FLASH
  for program or user data
- 512kB...2 MByte SRAM with battery backup input
- 1x RS485/422
- 1x Ethernet 10 base T
- 1x RS232/USB Slave
- CAN-Bus, V2.0B, active, 11/29 Bit Identifier
- Battery Buffered Real Time Clock
- Power Supply Input 8...30V DC
- Analog Inputs 2 x 0...10 V
- Analog Inputs 2 x 0...20mA
- MF2 keyboard connector
- Buzzer
- Sound Output
- 4 Internal / External Control LEDs
- Group-Wise Plug-able Terminals / Connectors
- Tiger X-Bus I/O Extension Bus
  up to 64k/16M Ports

Technical Documentation

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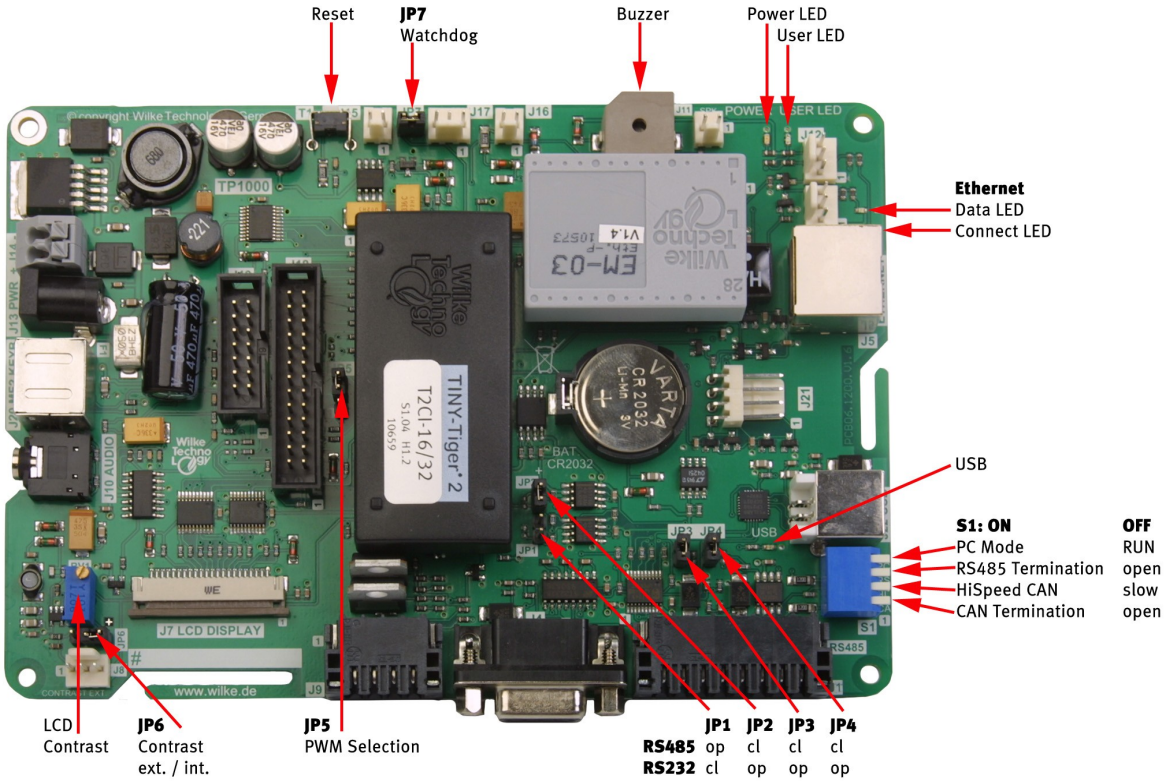


5 Control Elements

5.1 RESET button

If the PC/RUN-Mode switch S1 is turned to PC-Mode, the TINY-Tiger™ will enter the PC Mode after pressing the RESET button.

If the PC/RUN-Mode switch S1 is turned to RUN-Mode, the TINY-Tiger™ will restart the user program after the button is released again.

Additionally you can connect an external RESET button to J15 as well. Please refer chapter 6 “Connectors” for more details.

5.2 Watchdog

The watchdog is working when jumper JP7 is removed.
In this case the watchdog will generate a RESET every ~30-40 seconds. You have to toggle pin L86 at least every 20 seconds to avoid a reset.

If the watchdog jumper JP7 is placed you will disable the watchdog circuit.

Note: Watchdog is always disabled in PC-Mode!

5.3 Internal Buzzer

The TP1000 has an on-board buzzer. It can be used to signal every kind of events. You can use it to signal a touch on the touch-panel.

It is high-active on TINY-Tiger™2 pin L42. A low level turns it off.

Note: If TINY-Tiger™ 1 is used this feature is not available!

5.4 Status LEDs

The TP1000 possesses different kind of status LEDs. It is possible to connect external LEDs to connector J6 and J12. Please refer chapter 6 “Connectors” for more details.

5.4.1 Power LED

The green Power LED will light up if power supply is connected.

5.4.2 User LED

The red user LED is directly connected to the TINY-Tiger™2 pin L40. A high level on this pin turns this LED on. A low signal turns it off. You can use it to signal every kind of error for example.

Note: If TINY-Tiger™ 1 is used this feature is not available!

5.4.3 Ethernet Status LED's

Two LED's show you the state of your Ethernet link. The green connection LED will light up, if ethernet is connected to a network. The yellow data LED will light up, if data is received or transmitted.

5.4.4 USB LED

The yellow LED beside the USB slave port indicates that cable and software driver are successfully installed.

5.5 DIP Switch S1

With DIP switch S1 you can configure the following features of the TP1000:

DIP Switch	bus	function
1	CAN	ON: bus termination, 120 Ohm activated
		OFF: no termination
2	CAN	ON: high speed is possible
		OFF: slope control active
3	RS485/ RS422	ON: bus termination, 120 Ohm activated
		OFF: no termination
4	-	ON: PC-Mode
		OFF: RUN-Mode

5.5.1 CAN Bus

The CAN Bus should be terminated at both ends in its characteristic line impedance. You can do this with DIP Switch S1-1.
You have to use S1-2 when the CAN Bus should operate with a slope control. Slope control is used to reduce EMI effects.

Note: Do not use the slope control if the CAN Bus operates at high speeds!

5.5.2 RS485/RS422 Termination

The RS485 Bus should be terminated at both ends (for RS422 bus only receive line) in its characteristic line impedance. You can turn this termination on or off with DIP switch S1-3.

5.5.3 Mode Switch

To enter PC-Mode, turn DIP switch S1-4 on and press RESET. In PC-Mode you can download and debug new program-code using SER1 or USB port.

To enter RUN-Mode, turn DIP switch S1-4 off and press RESET. Use RUN-Mode to start the user program. In this mode SER1 or the USB Port can be used for own applications.

5.6 RS485 / RS422 Selection

The serial port 0 can be used as RS485 or RS422[1]. The serial port 0 can be configured with JP1...4.

	JP1	JP2	JP3	JP4
RS485	open	close	close	close
RS422	close	open	open	open

5.7 PWM Selection Jumper JP5

One PWM output is used for sound output. Use JP5 for selection. If the jumper is set to position 1-2 PWM output 1 is connected to L73. In position 2-3 (default) L72 is connected to the PWM output 0.

JP5	PWM channel	TINY-Tiger™ pin
1-2	1	L73
2-3	0	L72

1 RS422 = 485 in full duplex 4 wires

5.8 LCD contrast and backlight

You can adjust the contrast of the LC display by turning potentiometer RV1. The contrast is largely temperature compensated and set to a factory default value.

The backlight of the display is switchable. A low level on TINY-Tiger™ pin L82 turns the backlight on. A high level on this pin turns it off.

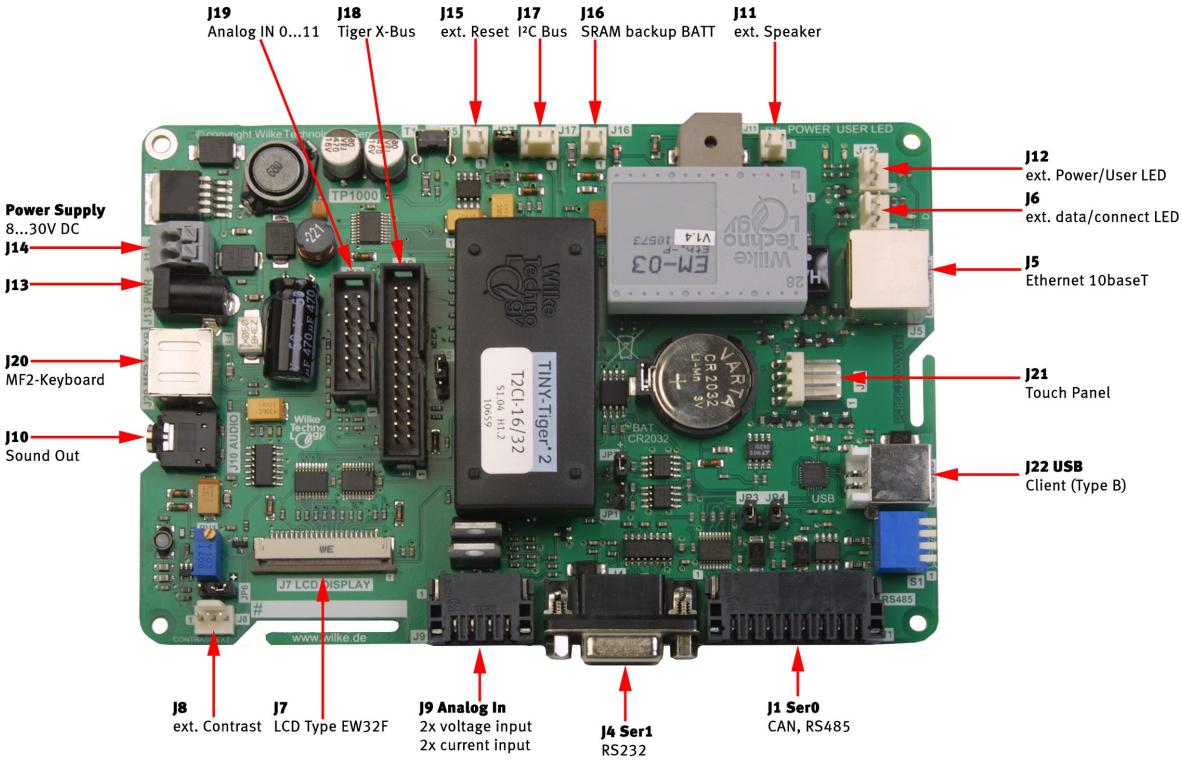
In most situations you have to turn the backlight on for best LCD contrast characteristics.

It is also possible to dim the backlight by toggling L82 like a pulse-width modulation.

5.8.1 int. / ext. Contrast Jumper JP6

An external contrast potentiometer can be connected to connector J8. In this case you have to set jumper JP6 to position 1-2. Otherwise you have to set it to position 2-3.

JP5	Contrast potentiometer
1-2	external
2-3	internal

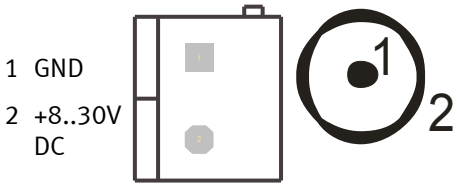


6 Connectors

6.1 Power Supply

You have to connect a power supply 8...30V DC to this board at connector J13 or J14. The green Power-LED will light up if power is applied.

The main power supply input has a poly-switch fuse on board, so no external fuse is necessary at these point.



Connector J13 and J14

The connector J14 is designed for using wires from 0.2 to 1.5 mm².

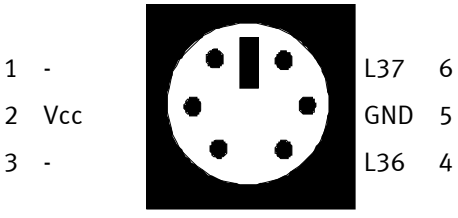
The power jack J13 has a pin with 2.0 mm diameter and is designed for connectors with 4.2 mm outside diameter.

Note: Please connect all devices to the same power supply line and connect the greatest power consumers nearly to the power supply. This helps to maximize the stability of your application and minimizes the risk of damages!

6.2 MF2 keyboard connector J20

The TP1000 has a connector for MF2 keyboards. With this it is possible to connect a common PC keyboard to the TP1000.

For the connection of a MF2 keyboard are two pins of the TINY-Tiger™2 needed. Those are L36 (data) and L37 (clk) of the Tiny-Tiger™2 module. These pins are lead to the MF2 connector J20.



Connector J20

Please use the device driver “MF2_3736.TD2” for using a MF2 keyboard.

```
INSTALL_DEVICE #KEYB, "MF2_3736.TD2"
```

If you don't use the MF2-Keyboard driver, pin L36 and L37 may be used for another application. Each pin has a pull-up resistor of 4k7 Ohm.

Note: The MF2 keyboard device driver is only supported for TINY-Tiger™ 2.

Attention: If you want to use these I/0's for other purpose as intended, consider that these pins are directly connected to the TINY-Tiger™. They are not notably protected. Secure you keep the specifications of the TINY-Tiger™ Series. Risk of EMI-failures including damaging the TINY-Tiger™ is given. For specifications refer **10.1** and the TINY-Tiger™ datasheet. www.wilke-technology.com

6.3 Audio line output J10

You can plug a headphone or active speakers in the 3.5mm phone jack J10 for playing sounds on PWM output.

Pin Signal

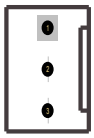
1 PWM_out
2 PWM_out
3 GND

6.4 External Contrast potentiometer J8

An external potentiometer for LCD contrast can be installed to connector[1] J8. Please use a 10...25kΩ potentiometer.

Pin Signal

1 end
2 wiper
3 begin

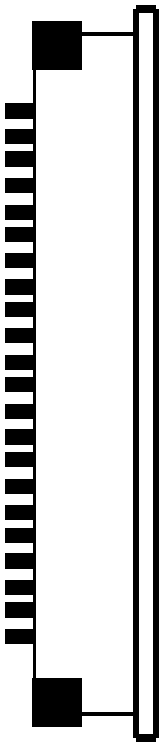


Connector J8

6.5 LCD Connector J7

The LC-Display of the TP1000 is connected to J7. Please use only LCDs of type EW32F or compatible types.

Pin	Signal	Description
1	Vss	Power supply (GND)
2	Vdd	Power supply (+)
3	-22V	Contrast
4	A0	A0
5	/WR	Data write
6	/RD	Data read
7	D0	Data bus line
8	D1	Data bus line
9	D2	Data bus line
10	D3	Data bus line
11	D4	Data bus line
12	D5	Data bus line
13	D6	Data bus line
14	D7	Data bus line
15	/CS	Chip select
16	/RST	RESET
17	Vee	Vee (-24V)
18	68/80	H:6800 L:8080
19	NC	Not used
20	NC	Not used
21	VLED +	Back light anode
22	VLED -	Back light cathode

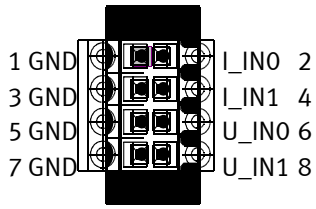


Connector J7

1 Crimpconnector RM2.54mm

6.6 Analog inputs J9

The TP1000 presents 4 analog inputs on header J9. Two 0...10V inputs and two 0...20mA inputs. It's designed for connecting directly to analog voltage / current sensors.



	Analog Input of TINY-Tiger™2
I_IN0	2
I_IN1	4
U_IN0	3
U_IN1	5

Connector J9

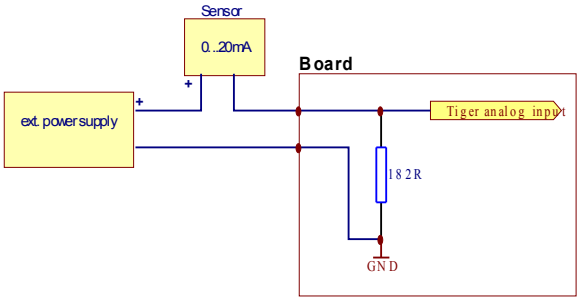
Note: Only with TINY-Tiger™2 available.

This header is designed for using the Weidmueller connectors[1] or compatible. You can use wires with cross section from 0.08 to 1.5 mm².

6.6.1 Analog Input 0...20mA

You can directly connect up to 2 sensors with current outputs of 0...20mA to this board. The current is measured over a 182Ω resistor. As the board presents a 3.75V reference voltage, you will get values between 0 and 994 by using the device driver „ANALOG1.TDD“.

(0.02A * 182Ω *1024 / 3.75V)

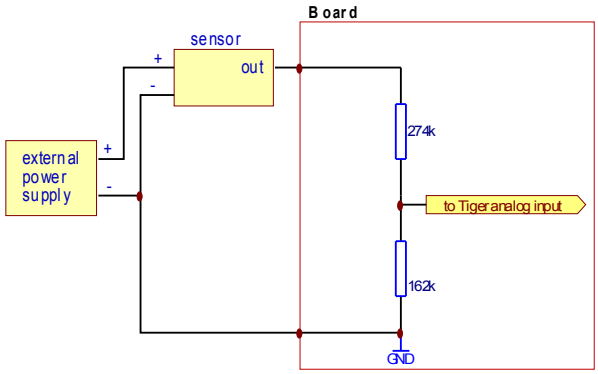


The analog current inputs I_IN0 and I_IN1 are connected to the TINY-Tiger™2 analog inputs 2 and 4.

input	type	Analog input of TINY-Tiger™ 2
I_IN0	0...20mA	2
I_IN1	0...20mA	4

6.6.2 Analog Input 0...10V

At the analog voltage inputs 0V...10V you can connect up to 2 sensors with a voltage output.



The input voltage is divided by a voltage divider and the resulting signal is connected through an amplifier to the analog inputs of the TINY-Tiger™2.
As the board presents a 3.75V reference voltage, you will get values between 0 and 1015 using the device driver „ANALOG1.TDD“.

10V * 162kΩ / (162kΩ+274kΩ) * (1024 / 3.75V)

The analog voltage inputs U_IN0 and U_IN1 are connected to the TINY-Tiger™2 analog inputs 3 and 5.

input	type	Analog input of TINY-Tiger™2
U_IN0	0...10V	3
U_IN1	0...10V	5

1 Item-No. 1748180000 (www.weidmueller.com)

6.7 Serial Port 0

The serial port 0 can be used as RS485 or as RS422[1]. Please refer chapter *RS485 / RS422 selection* for configuration.

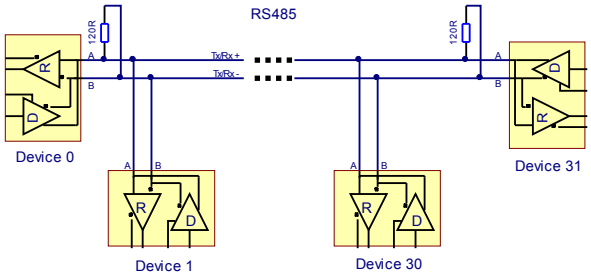
Use the device driver „SER1B_K1.TDD“ to communicate via serial port 0. Install the device driver in your source code for full support of RS232 (Ser1) and RS485 (Ser0) interfaces:

```
#ifdef TIGER_2
  INSTALL_DEVICE #SER, "SER1B_K1.TDD", &
    BD_9_600, DP_8N, YES, &   'Ser.0
    BD_9_600, DP_8N, YES, &   'Ser.1
    00010000b, 1, 0     'RS485 set L14 to RTS0
#endif


#ifdef TIGER_1
  INSTALL_DEVICE #SER, "SER1B_K1.TDD", &
    BD_9_600, DP_8N, YES, &   'Ser.0
    BD_9_600, DP_8N, YES, &   'Ser.1
    00100000b, 9, 0     'RS485 set L95 to RTS0
#endif
```

6.7.1 Ser 0: RS485 Mode

Use the RS485 port for a bus connection of multiple boards up to 32 devices. You should implement a software protocol to prevent that more than one circuit is writing to the bus at the same time. All circuits must use the same baud rate.



Note: The line should be terminated at both ends in its characteristic impedance. Stub lengths off the main line should be kept as short as possible. You have to connect GND to each module if different power supplies are used!

The RS485 port can be used to expand your TP1000 with relay outputs, digital inputs , PT1000 temperature sensors or any other periphery.

In case of RS485 configuration the following signals are available on connector J1:

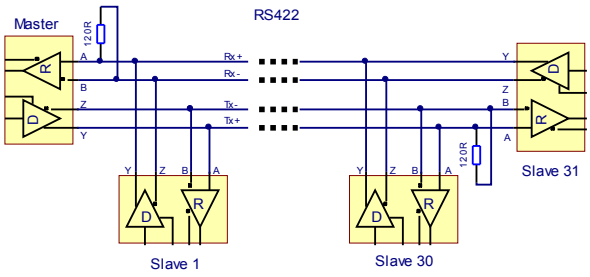
1	RS485_A		RS485_A	2
3	RS485_B		RS485_B	4
5	GND		GND	6
7	RS485_Shield		RS485_Shield	8
9	CAN_L		CAN_L	10
11	CAN_H		CAN_H	12
13	GND		GND	14
15	CAN_Shield		CAN_Shield	16

Connector J1

This header is designed for using the Weidmueller connector[2] or compatible. You can use wire with cross section from 0.08 to 1.5 mm².

6.7.2 Ser 0: RS422 Mode

With the RS422[3] port, a multi-slave with single-master bus connection, up to 32 devices is possible. You should implement a software protocol to prevent that more than one slave is writing to the master at the same time. All circuits must use the same baud rate.



Note: The transmit line should be terminated in its characteristic impedance. Stub lengths off the main line should be kept as short as possible. You have to connect GND to each module if different power supplies are used!

1 RS422 = 485 in full duplex 4 wires

2 Item-No. 1748220000 (www.weidmueller.com)

3 RS422 = 485 in full duplex 4 wires

In case of RS422 configuration the following signals are available on connector J1:

1	RS422_A		RS422_Y	2
3	RS422_B		RS422_Z	4
5	GND		GND	6
7	RS485_Shield		RS485_Shield	8
9	CAN_L		CAN_L	10
11	CAN_H		CAN_H	12
13	GND		GND	14
15	CAN_Shield		CAN_Shield	16

Connector J1

This header is designed for using the Weidmueller connector[1] or compatible. You can use wires with cross section from 0.08 to 1.5 mm².

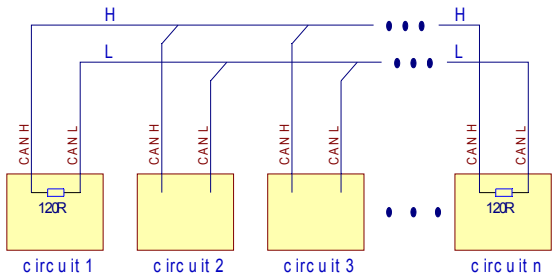
6.8 CAN bus

The CAN bus is available at the same connector like RS485/422.

Use the device driver „CAN1_K8.td2“ to communicate via CAN-Bus. Install this driver in your source code for full support of CAN bus:

```
install_device #CAN, "CAN1_K8.TD2", &
  "6D 55 D9 98 &                    ' access
code
  FF FF FF FF &                     ' access
mask
  10 45 &                       ' bustim1,
bustim2
  08 1A"%          ' single filter mode,
outctrl
```

With the CAN bus port a bus connection of multiple boards is possible. The hardware of the TINY-Tiger™2 supports the CAN 2.0A and 2.0B protocols. If TINY-Tiger™ 1 is used, the CAN bus is not available.



Note: The line should be terminated at both ends in its characteristic impedance. Stub lengths off the main line should be kept as short as possible. You have to connect GND to each module if different power supplies are used!

6.9 Serial Port 1

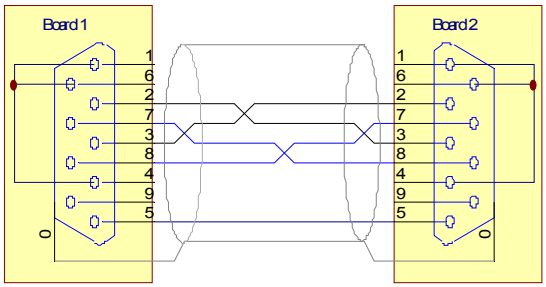
The serial port 1 of the TINY-Tiger™ is used as RS232 or USB slave port. If a USB slave device is plugged in the RS232 is disabled automatically.
For device driver installation please refer chapter *Serial Port 0* and device driver documentation of Ser1b.

6.9.1 Ser 1: RS232 J4

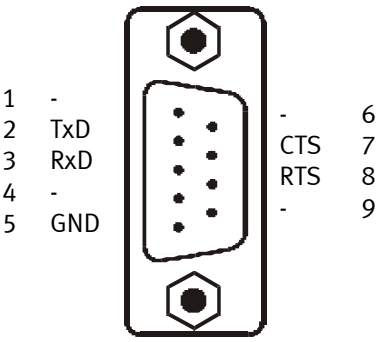
In case of using RS232 port you can have a full duplex point to point connection to another device.

If this board is started in PC Mode, the RS232 port 1 is used as download and debug port.

To connect two boards on serial port 1 you have to use a cross linked cable with male connectors.



1 Item-No. 1748220000 (www.weidmueller.com)



Connector J4 Ser1: RS232 (FEMALE)

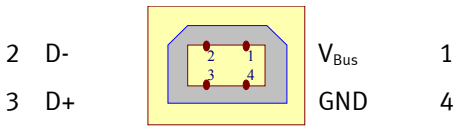
Note: If TINY-Tiger™1 is plugged in, CTS and RTS is not supported.

6.9.2 Ser1: USB J22

In case of using the USB slave port, the RS232 port is automatically disabled.

Please install the virtual COM Port driver (**TP1000_USB_driver**) for connecting the TP1000 to your PC via USB cable.

The yellow LED beside the USB slave port will light up if cable and driver are successfully installed.



Connector J22 Ser1: USB

6.10 Touch Panel Connector J21

The touch panel is connected to a separate connector J21 with following signals.

Pin	Signal	Description
1	XR	Position X right
2	YB	Position Y button
3	XL	Position X left
4	YT	Position Y top

The touch panel is controlled by X-Port address 0xFA_{hex}.

Use this address for controlling this touch panel. The following table shows the defined bit positions and the sense of signal:

Bit	Signal	Description	Status	
0	TP_XR	Position X right	0	Vref on
			1	Vref off
1	TP_YB	Position Y button	0	GND off
			1	GND on
2	TP_YT	Position Y top	0	Vref on
			1	Vref off
3	TP_XL	Position X left	0	GND off
			1	GND on
4	TP_Sync	Signal to discharge analog signal Y	0	Normal mode
			1	Discharge mode

Please install the device driver „touchpanel.tdd“ with device type 0 for using the touch panel of the TP1000:

```
INSTALL_DEVICE #TP, "TOUCHPANEL.TDD",
TP_TYP_0
```

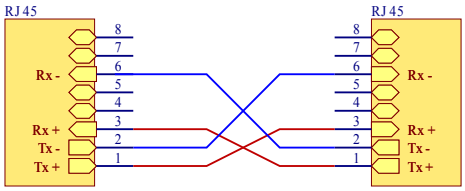
6.11 Ethernet J5

The EM03-ETH-P Ethernet module supports protocols like ARP, IP, TCP, DHCP, DNS, UDP, SNTP. Some more protocols are ready designed in BASIC language. Please take a look at the latest version of the EM03-ETH-P documentation.

The board presents a 10 BASE-T Ethernet connection. You can connect it to another board with a cross linked cable or connect it via a patch cable to an existing network using a hub or switch.

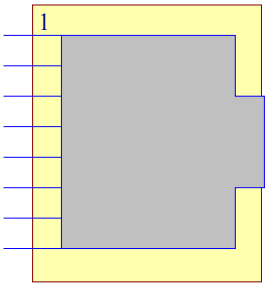
As the board supports TCP/IP you can easily connect your application to an intranet or to the Internet via a gateway.

Possible applications are for example web browser controlled devices or devices which send e-mails if a defined event occurs. With this CPU board you can design measurement devices which will send results to the hard disk drive of an Internet service provider via FTP to get world wide access to the measured values.



Cross linked cable for Ethernet

1	Tx+
2	Tx-
3	Rx+
4	-
5	-
6	Rx-
7	-
8	-



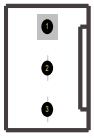
Connector J5

6.12 External LED-Connectors

External LEDs for the Ethernet port can be directly connected to connector[1] J6.

Pin Signal

1	Vcc (Anode)
2	Con. LED(Cathode)
3	Data LED(Cathode)

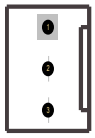


Connector J6

An external User and Power LED can be directly connected to connector[1] J12

Pin Signal

1	GND (Cathode)
2	User LED(Anode)
3	Data LED(Anode)



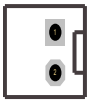
Connector J12

6.13 External Buzzer

An external AC Buzzer can be plugged in to connector[1] J11. This Buzzer is also controlled by TINY-Tiger™2 pin L42. The TP1000 is able to drive a buzzer up to 50mA@5V.

Pin Signal

1	buzzer A1 +5VDC
2	buzzer A2



Connector J11

Note: If TINY-Tiger™ 1 is used, this feature is not available!

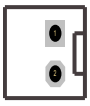
6.14 SRAM backup battery

Connector J16 can be used to connect a backup battery. In case of using a TINY-Tiger™1 the Real Time Clock (RTC) and the static RAM (SRAM) will be buffered. This means data in RAM and RTC will not be lost if power supply shuts down.
In case of using TINY-Tiger™2 only SRAM is buffered by this external battery. The RTC is buffered by the on board battery.

Please use only 3...5V batteries on connector[1] J16.

Pin Signal

1	BATT -
2	BATT +



Connector J16

Note: Please refer to the datasheet of the used TINY-Tiger™ module for electrical specification.

1 Crimp connector RM2.54mm

6.15 I²C Bus

The TINY-Tiger™ is able to communicate with I²C devices by using the following pins for data and clock:

Signal	IO state at the TINY-Tiger™	Description
L70	IO, pull up open collector	Clock line
L71	IO, pull up open collector	Data line

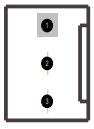
L70 is used as serial clock line (SCL) and L71 as serial data line (SDA). Each line is pulled up to 5V with a 2k2 resistor.

Attention: Please be careful when using 3.3V I²C devices with this CPU module. Special care must be taken using device drivers which may use L70 or L71 as output.

The I²C bus is available on connector[1] J17. It can be used for your own I²C device. Please do not install devices outside of the case of the TP1000. The I²C I/O pins are directly connected to the TINY-Tiger™. They are not notably protected. Secure you keep the specifications of the TINY-Tiger™ Series. Risk of EMI-failures including damaging the TINY-Tiger™ is given. For specifications refer **10.1** and the TINY-Tiger™ datasheet. www.wilke-technology.com

Pin Signal

1 SDA
2 SCL
3 GND



Connector J17

6.15.1 EEPROM

A 64 kByte EEPROM of type M24512 is connected to the I²C bus. To communicate with the EEPROM you have to use the device selection Byte $0xA9_{hex}$ for read access and $0xA8_{hex}$ for write access.

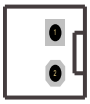
Data such as calibration information can be stored here. The data will be available even after any program updates.

6.16 External Reset J15

Use connector[2] J15 to connect an external RESET button. The internal button is always active.

Pin Signal

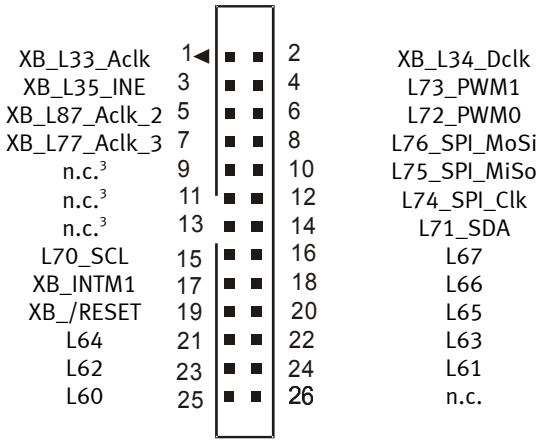
1 Reset In
2 GND



Connector J15

6.17 Tiger X-Bus J18

The Tiger X-Bus is used to connect expansion modules of the **TDR series** or the **SD-Card Adapter 2** to the TP1000. The expansion module is clipped to the DIN rail and is connected with a short ribbon 1:1 cable with a female header connector at one side and a female 25 pole sub D connector at the other side. The cable length must not exceed 0.5m.



Connector J18

During installation of the TP1000 or expansion modules the power of all devices should be turned off.

1 Crimp connector RM2.54mm

2 Crimp connector RM2.54mm

3 Can be optionally connected to GND

The signals of the Tiger X Bus are connected to or controlled by the TINY-Tiger™2 I/O ports. The functions of the signals are listed below. To avoid conflicts between expansion modules the signals of the Tiger X-Bus should only be used as described.

Please take a look to **application_note** for connecting Wilke EP expansion modules to the TP1000 by using the Tiger X-Bus.

Attention: We strictly recommend to take a look at **schematics_of_TP1000** in case of using the Tiger X Bus pins for other purposes in your application. Using the Tiger X Bus pins for other purposes is at your own risk!

If you anyway want to use these I/0's for other purpose as intended, consider that these pins are directly connected to the TINY-Tiger™. They are not notably protected. Secure you keep the specifications of the TINY-Tiger™ Series. Risk of EMI-failures including damaging the TINY-Tiger™ is given. For specifications refer **10.1** and the TINY-Tiger™ datasheet. www.wilke-technology.com

Tiger X-Bus signals in detail:

Tiger X-Bus Signal	Used IO Port of TINY-Tiger	Input / Output	Description
XB_L33_Aclk	L33	Output	address clock low byte high active If this signal is high then the address at L60...L67 is valid. IO Modules should latch the address
XB_L34_Dclk	L34	Output	Data clock (high active). If this signal is high then the data at L60...L67 is valid
XB_L35_/INE	L35	Output	Input Enable (low active). If this signal is low then the input module which address is selected should put it's data to L60..L67
L60	L60	IO	Used as multiplexed address and data bus line.
L61	L61	IO	Used as multiplexed address and data bus line.
L62	L62	IO	Used as multiplexed address and data bus line.
L63	L63	IO	Used as multiplexed address and data bus line.
L64	L64	IO	Used as multiplexed address and data bus line.
L65	L65	IO	Used as multiplexed address and data bus line.
L66	L66	IO	Used as multiplexed address and data bus line.
L67	L67	IO	Used as multiplexed address and data bus line.
L70-SCL	L70	IO, pull-up open collector	I^2C clock line. To use this line an external pull-up resistor is necessary.
L71-SDA	L71	IO, pull-up open collector	I^2C data line. To use this line an external pull-up resistor is necessary.
L72-PWM0	L72	Output	PWM output 0
L73-PWM1	L73	Output	PWM output 1
L74-SPI-CLK	L74	Output	SPI clock line. SPI devices should be enabled using a bit of an extended port.
L75-SPI-MiSo	L75	Input	SPI data input line. SPI devices should be enabled using a bit of an extended port
L76-SPI-MoSi	L76	Output	Serial Peripheral Interface (SPI) data output line. SPI devices should be enabled using a bit of an extended port.
XB_L77_Aclk_3	L77	Output	Address clock high byte high active. If the signal is '1', then L60...L67 is latched as mid byte of an 24 bit address for Xport functions
XB_L87_Aclk_2	L87	Output	Address clock mid byte high active. If the signal is '1', then L60...L67 is latched as high byte of an 24 bit address for Xport functions
XB_INTM1	INTM1	Input pull-up	Expansion modules can pull up this signal to initiate a BASIC interrupt 1.
XB_/RESET	INTM3	IO open collector pull-up 470Ω	If the Reset button is pressed or at power up this TDR module pulls this signal low. If any IO module pulls this signal low, the user program can recognize this using BASIC interrupt 3.
Optional GND	-	-	Can be optional connected to GND with 0R resistor.

6.18 Analog Inputs J19

All analog inputs are available on connector J19. The pins of this connector are directly connected to the TINY-Tiger™ pins.

The analog inputs 0 and 1 are used for the internal touch panel. The inputs 2 and 4 are used for the 0...20mA current inputs and the analog inputs 3 and 5 of the TINY-Tiger™2 are connected to the 0...10V voltage inputs.

There are two different assembly-versions available:
In case of FULL-assembly version with TINY-Tiger™2 the analog inputs 6 to 11 are usable for other applications.
In case of BASIC-assembly version with TINY-Tiger™1 the analog inputs 2 and 3 are usable for other applications.

The TP1000 has got a 3.75V reference voltage installed as well.

Analog 0	1	2	Analog 1
Analog 2	3	4	Analog 3
Analog 4	5	6	Analog 5
Analog 6	7	8	Analog 7
Analog 8	9	10	Analog 9
Analog 10	11	12	Analog 11
+5V	13	14	GND

Connector J19

Note: Please note, the TINY-Tiger™1 supports only analog input 0...3.

Attention: If you want to use these further analog inputs, consider that these pins are directly connected to the TINY-Tiger™. They are not notably protected. Secure you keep the specifications of the TINY-Tiger™ Series. Risk of EMI-failures including damaging the TINY-Tiger™ is given. For specifications refer **10.1** and the TINY-Tiger™ datasheet. www.wilke-technology.com

7 Used Tiger Pins

I/O of TINY-Tiger$^{T}_{M}$ 2	I/O of TINY-Tiger$^{T}_{M}$ 1	Pin No	used for:
L14	L95	28a	RTS0 (RS485)
L15	-	32b	RTS1 (RS232)
L33	L33	29a	Low byte of address clock
L34	L34	30a	on Tiger X Bus as XB_L34_Dclk and intern as data clock signal for the extended ports. high active output
L35	L35	31a	on Tiger X Bus as XB_L35_/INE and intern as input enable signal for the extended ports. low active output
L36	L36	32a	Keyboard data line
L37	L37	33a	Keyboard clock line
L40	-	37b	User LED, available with TINY-Tiger™ 1 and 2
L41	L41	36a	Run / PC Mode
L42	-	38b	Buzzer
L60 to L67	L60 to L67	1a to 8a	multiplexed data and adress lines used by Tiger X Bus, LCD, Ethernet module and extended ports
L70	L70	9a	SCL signal connected to I²C-EEPROM and J17 low active-pull up 2k2
L71	L71	10a	SDA signal connected to I²C-EEPROM and J17 low active-pull up 2k2
L72	L72	11a	Tiger X Bus L72-PWM0
L73	L73	12a	Tiger X Bus L73-PWM1
L74	-	10b	Tiger X Bus reserved for L74-SPI-CLK, available with TINY-Tiger™ 2
L75	-	11b	Tiger X Bus reserved for L75-SPI-MiSo, available with TINY-Tiger™ 2
L76	-	12b	Tiger X Bus reserved for L76-SPI-MoSi, available with TINY-Tiger™ 2
L77	-	13b	reserved for high byte of address clock, available with TINY-Tiger™ 2
L80	L80	13a	GLCD_/RD Graphic LCDs read
L81	L81	14a	GLCD_/WR Graphic LCDs write signal
L82	L82	15a	LCD_Light Turn back light on or off
L83	L83	16a	GLCD_C/D Graphic LCD command/data select signal output
L84	L84	17a	GLCD_/CE Graphic LCD enable signal low active output
L85	L85	18a	GLCD_/RES Graphic LCD reset signal low active output
L86	L86	19a	Trigger watchdog
L87	L87	20a	reserved for mid byte of address clock
L90	L90	23a	Data out line for RS485/RS422
L91	L91	24a	Data in line for RS485/RS422
L92	L92	25a	CTS0 not used but pulled down by a resistor
L93	L93	26a	TxD1 (RS232)
L94	L94	27a	RxD1 (RS232)
L95	-	33b	CTS1 (RS232)
L96	-	34b	L96_CAN_TX CAN Bus transmit line
L97	-	35b	L97_CAN_RX CAN Bus receive line
INTM1	-	8b	Connected to Tiger X-Bus signal XB_INTM1
INTM3	-	7b	Connected to Tiger X-Bus signal XB_/RESET

8 Used X-Port Addresses

Phy. Address	bit	used for:
0xFA$_{hex}$ (output)	0	connecting right edge of touch panel to VCC low active
	1	connecting bottom edge of touch panel to GND high active
	2	connecting top edge of touch panel to VCC low active
	3	connecting left edge of touch panel to GND high active
	4	Discharge analog signal Y
	5..7	not used
0xF0...0xF4$_{hex}$ (output)	0... 7	Ethernet module EM03-ETH-P

9 Used Analog Inputs

analog inputs of TINY-Tiger™ 2	used for:
A/D Ref Low	GND
A/D Ref High	3.75V
Analog in 0	Touchpanel Y
Analog in 1	Touchpanel X
Analog in 2	0 ... 20mA
Analog in 3	0 ... 10V
Analog in 4	0 ... 20mA
Analog in 5	0 ... 10V
Analog in 6	not used[1]
Analog in 7	not used[1]
Analog in 8	not used[1]
Analog in 9	not used[1]
Analog in 10	not used[1]
Analog in 11	not used[1]

analog inputs of TINY-Tiger™ 1	used for:
A-GND	GND
A/D Ref	3.75V
Analog in 0	Touchpanel Y
Analog in 1	Touchpanel X
Analog in 2	not used[1]
Analog in 3	not used[1]

1 For user application available on connector J19.

10 Technical Specification

10.1 Absolute Maximum and Minimum Ratings

(beyond, permanent damage may occur)

maximum supply voltage U_in (in respect of GND)	30V DC
maximum voltage at GND (in respect of GND at power supply)	5V DC
maximum input voltage at SRAM backup BAT at analog inputs 0...10V at analog TINY-Tiger™ inputs (on connector J19)	 10V DC 30V DC 5.5V DC
Input voltage at any TINY-Tiger™ pins	-0.5...5.5V DC
operating temperature[1)]	-20[1)]...70°C
storage temperature	-30...80°C
recommend operating temperature	0...50°C

Do not connect any signal connector of the TP-1000 directly to wires which are outside a building!
Replace fuses only with fuses which have the same technical characteristics.
[1)] On low temperature the display gets more and more inert. Screen change at -20°C needs a few seconds.

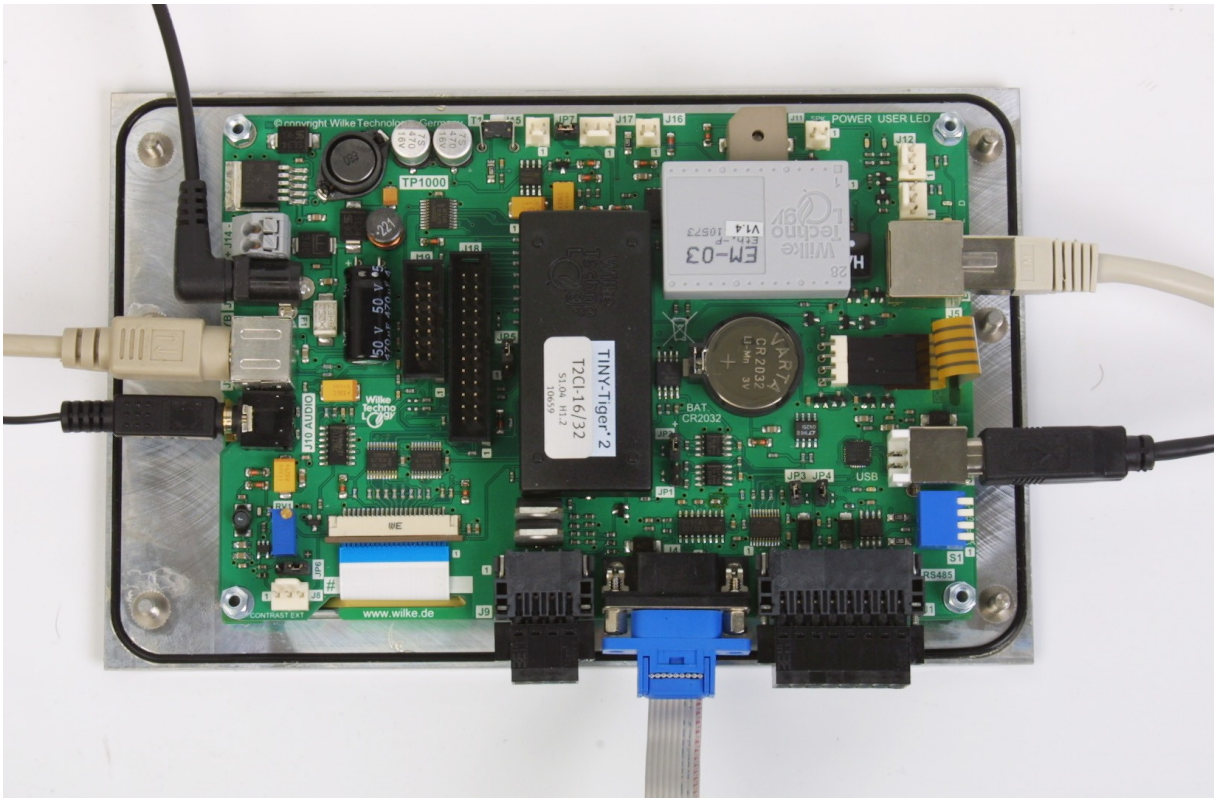
10.2 Electrical Specifications

supply voltage U_in	8...30V DC	
	Minimum value	Maximum value
power consumption at 8...30V:		
TP1000 with TINY-Tiger™ 1 and LCD	1.082W	1.097W
incl. Back light LCD	1.926W	2.034W
TP1000 with TINY-Tiger™ 2 and LCD	1.512W	1.564W
incl. Back light LCD	2.325W	2.578W
incl. Ethernet EM-03 module	2.223W	2.480W
incl. Back light LCD and Ethernet EM-03 module	2.925W	3.317W
power consumption at 12...24V:		
TP1000 with TINY-Tiger™ 1 and LCD	1.067W	1.075W
incl. Back light LCD	1.898W	1.930W
TP1000 with TINY-Tiger™ 2 and LCD	1.478W	1.492W
incl. Back light LCD	2.304W	2.376W
incl. Ethernet EM-03 module	2.203W	2.263W
incl. Back light LCD and Ethernet EM-03 module	2.904W	3.060W
FUSES: Polyswitch	0,5A	

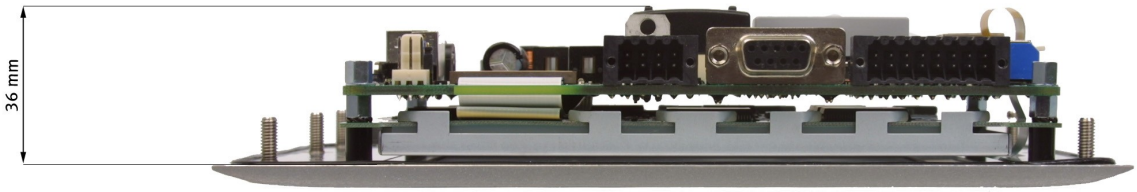
The on board voltage regulator has the best efficiency at 12-24V.

10.3 Mechanical Specifications

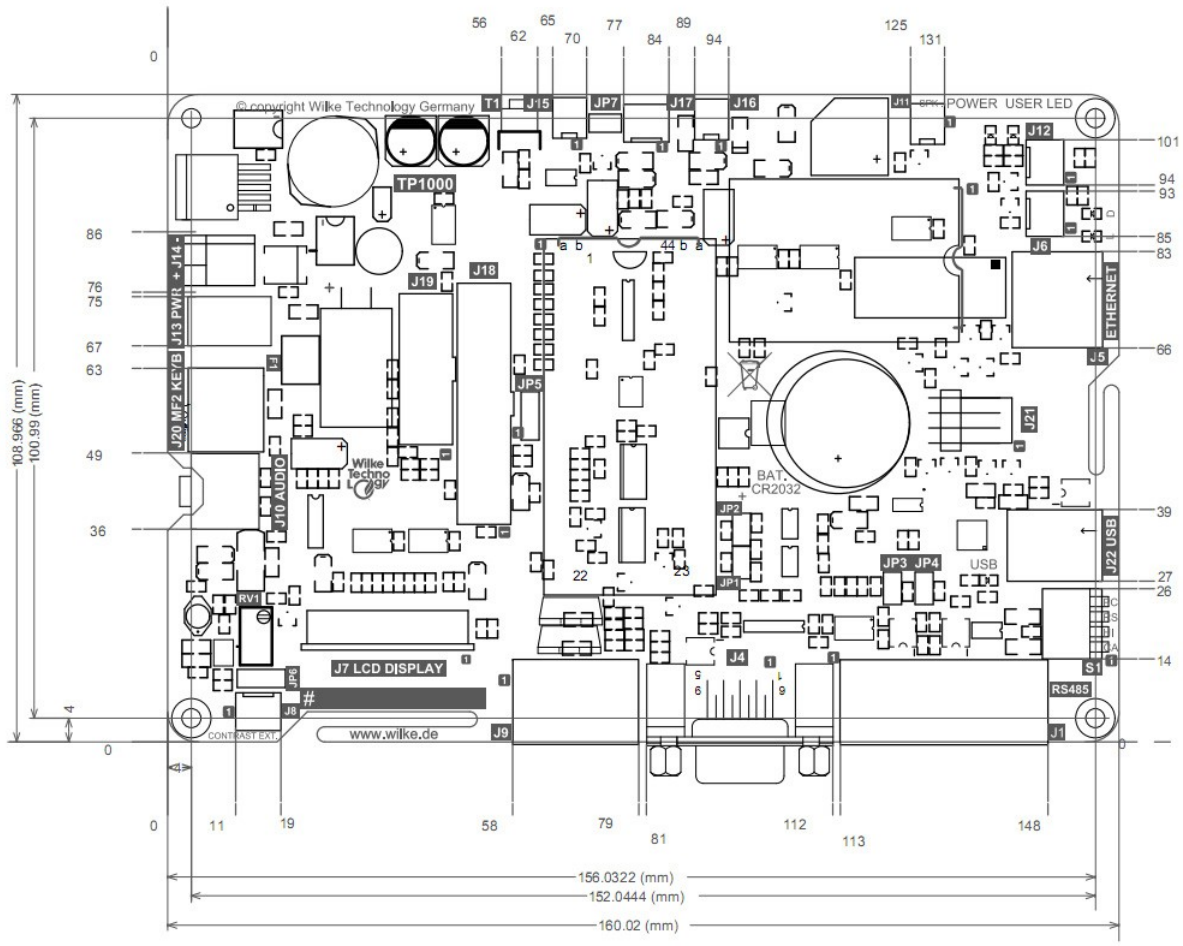
10.3.1 TP1000 Board dimensions



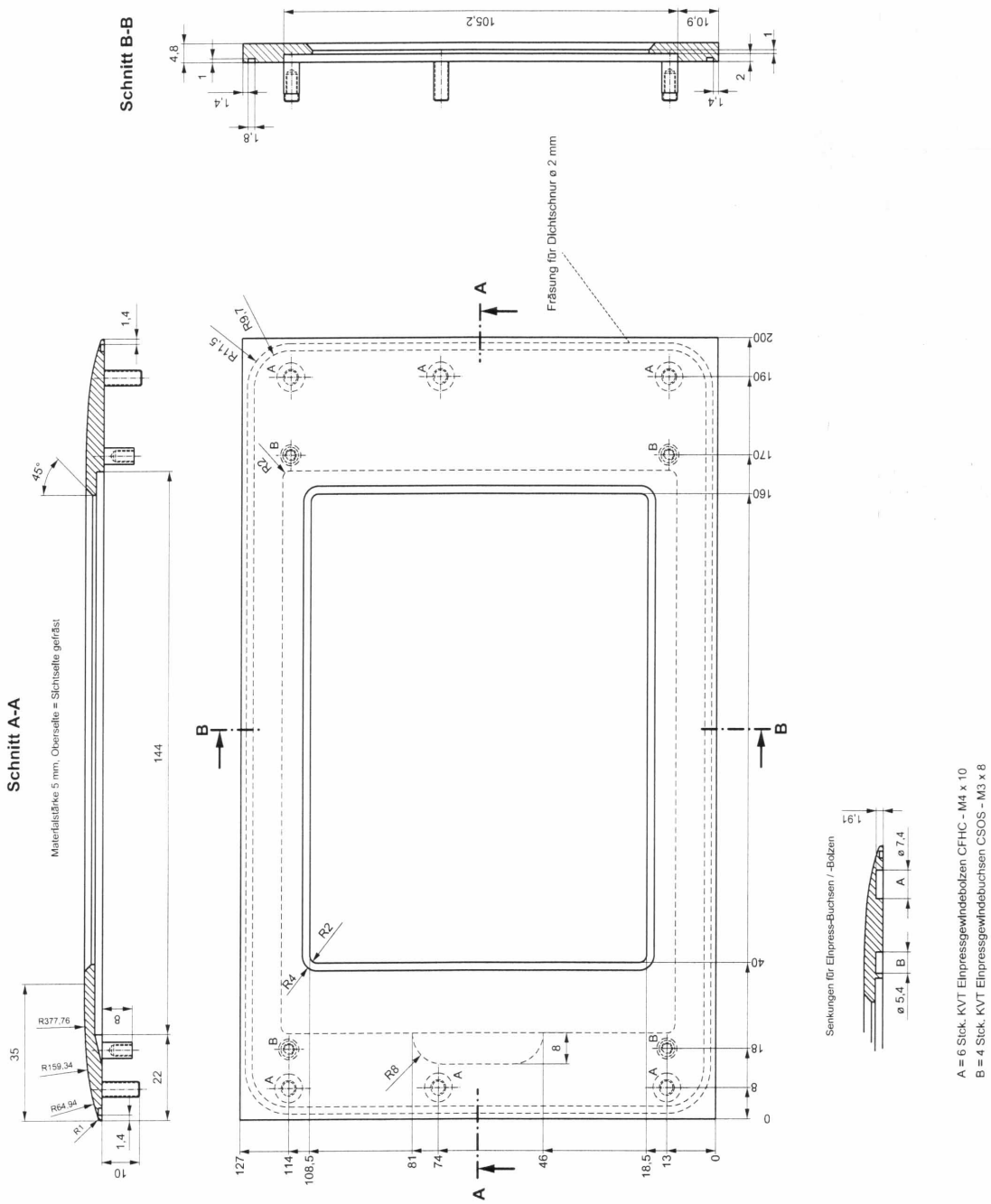
Note: Please note that you have to take a look at plugged-in connectors when attaching the TP1000 to your case.



10.3.2 TP1000 Connector dimensions



10.3.3 Domed front panel (types TP1000-R...)



10.3.4 Drilling template

Note: Please note that you have to take a look at plugged-in connectors when attaching the TP1000 to your case.

11 Order Information

11.1 Part Number Scheme

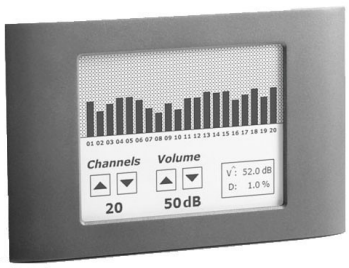
TP1000	- [front panel]	- [Computer module and additional features]	- [LCD]
product name always **TP1000**	**X:** no front-panel, only mainboard with touchpanel for customized integration **R:** domed frontpanel aluminum varnished	**T1:** BASIC-assembly version with TINY-Tiger™1 Multitasking Computer TTI-TCN-4/4-R, with 512kB SRAM, 512kB FLASH **T2B:** FULL-assembly version with TINY-Tiger™2 Multitasking Computer TTI-T2CI-16/32-R, with 2MByte SRAM, 4MByte FLASH	**B:** ¼ VGA display black / white

Note: See Matrix of Features **11.3** for preferred product. Other variations are available on request.

11.2 Example

TP1000-R-T2B-B

- ¼ VGA display black / white
- FULL-assembly version with TINY-Tiger™2 Multitasking Computer TTI-T2CI-16/32-R, with 2MByte SRAM, 4MByte FLASH
- domed frontpanel,
- Touch Panel Computer TP1000,



R-Version
domed frontpanel

X-Version
no frontpanel

11.3 Matrix of Features

Product / Feature	BASIC Assembly Version	FULL Assembly Version
Analog Touchpanel, 120mm x 90mm active area	●	●
5.7" ¼ VGA LCD, 320x240 Pixel, black/white	●	●
TINY-Tiger™ 1, TTI-TCN 4/4, 512kB SRAM, 512kB FLASH	●	-
TINY-Tiger™ 2, TTI-T2CI 16/32, 2MB SRAM, 4MB FLASH	-	●
Fast Boot < 1s	●	●
In Field Programmable	●	●
Battery Buffered Real Time Clock	-	●
Backup Battery Input for SRAM	●	●
Ethernet Module EM03-ETH-P-R	-	●
RS232 / USB-Slave	●/-	●/●
RS485 / RS422	●/●	●/●
CAN-Bus, Version 2.0B, active, 11bit / 29bit Identifier	-	●
2x Analog IN, 0...20mA	-	●
2x Analog IN, 0...10V	-	●
MF2 Keyboard Connector	-	●
serial EEPROM, 64 K byte	●	●
Internal Buzzer	-	●
Sound Output	-	●
1x Internal / External Control LEDs	-	●
Group Wise Pluggable Terminals / Connectors	-	●
Watchdog Circuit	●	●
Tiger X-Bus Modules	○*1	○

●: implemented ○: can be plugged in -: not implemented

Note *1: not all signals available

Other configurations like "TP1000-BASIC with TINY-Tiger™2" or "TP1000-FULL without Ethernet Module" are possible. Please don't hesitate to contact our sales department or our support for further information.

12 Document History

Version of Documentation	Product Version	Description / Changes
V000	V1.0 beta	preliminary version
V001	V1.0 beta	preliminary version, several specifications added
V002	V1.0	preliminary version, Data sheet updated due to a circuit revision
V022	V1.1	preliminary version, Tiger X-Bus change connection
V023	V1.1	preliminary version, Tiger X-Bus 24 bit connection
V024	V1.2	preliminary version, RS485 and RS 422 change pin names
V025	V1.2	preliminary version change L77, L87 high-, mid-byte
V026	V1.3	Add specification of analog inputs and correct specification of RS485
V027	V1.3	Change Font, graphics, add electrical specifications, add drill template
V028	V1.3	Correction of some graphics and tables
V029	V1.3	Correction of some tables
V030	V1.3	Correction of some descriptions
V031	V1.3	Correction of some pin descriptions
V032	V1.3	Correction for serial driver
V033	V1.3	Correction for Tiger X Bus specifications, add specification of power supply
V034	V1.3	New documentation template
V035	V1.3	Correction of temperature ranges, some tables and descriptions
V036	V1.6	New hardware version V1.6