

FXT330 Datasheet / Manual (v1)

Handheld Terminal



FLEXX Term FXT330

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1 Introduction

The FXT-330 is a handheld terminal with a 160x160 pixels graphic LCD and a membrane keyboard designed to serve as a control unit for machines in industrial environments.

The unit is based on the Tiger II Plus NRB Multitasking Computers, which can be easily programmed in Tiger-Multitasking™. It can store and display several menus, graphics and machine states due to its large RAM and Flash memory.

Inputs and machine states can be transferred from or to your application by many various communication ports.

Interconnection with machines or devices by using different versions of connection styles is possible. You have the choice between version with 25 pin D-Sub connector or customised, directly attached “piggytail”.

Different colours of enclosure lead to a highly customisable appearance.



2 Applications

- Operating Units
- Laboratory Apparatus
- Machine Controls
- Data Bus Bridges
- Measurement Devices
- Datalogger
- ... and many more

3 Features

- Tiny-Tiger® 2 plus NRB inside
- With 25 pin D-Sub Connector or directly attached “piggytail”
- Colour customisable enclosure

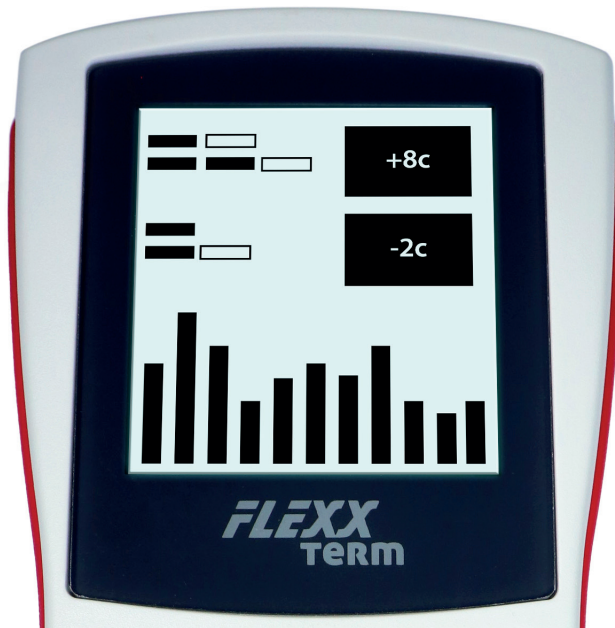
- Parallel or inclined enclosure assembly variants
- Graphic LCD 160x160 pixels
- Switchable LED Backlight
- 8 MByte FLASH for program data (Tiger II Plus NRB)
- 8 MByte FLASH for user data (Tiger II Plus NRB)
- 8 MByte SRAM (Tiger II Plus NRB)
- 16 MByte FLASH (additional „external“ – not on Tiger II Plus NRB)
- 512 Kbit EEPROM e.g. for calibration information
- Galvanic isolated interfaces
- 1x RS232/RS485
- 1x RS232/ USB Slave
- CAN-Bus
- Battery Buffered RTC (Real Time Clock)
- Galvanic isolated power supply
- Power Supply Input 9...36 V DC
- Beeper
- Membrane keyboard 7x4 matrix
- 4x Control LEDs
- 4x Optocoupler inputs

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4 Control Elements

4.1 LCD



4.1.1 Graphic LCD

FlexxTerm has a built-in, black and white graphic LCD with switchable backlight. Its resolution is 160 x 160 pixels in an active area of ca. 54 mm x 54 mm.

The LCD can be run in graphic or text mode. Run in text mode with a font size of 5 x 8 pixels there are 17 columns and 26 lines to be filled with content of your application.

4.1.2 LCD Backlight

The backlight of the display is switchable. The command

```
xout (0FEh, 10000000b)    `turn LCD backlight on
turns the backlight on,
```

```
xout (0FEh, 00000000b)    `turn LCD backlight off
turns it off.
```

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4.1.3 LCD Programming

For use of the LCD the driver "LCD-UC1698.TDP" must be installed.

Since the internal hardware is matched with the driver's concept in terms of line assignment, it can be installed with the default parameters:

```
install_device #LCD, "LCD-UC1698.TDP"
```

You will find detailed information on the use of the LCD driver in the driver's documentation.

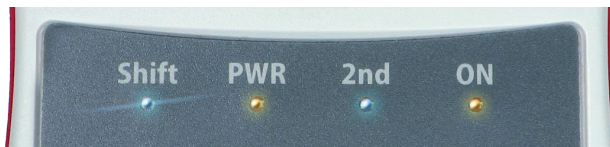
4.2 Internal Beeper

The FlexxTerm has an on-board beeper. It can be used to signal every kind of events. You can use it to signal a touch on the membrane keyboard. It is high-active on TINY-Tiger II Plus pin L42. A low level turns it off.

```
out 4,00000100b, 255
turns the beeper on.
```

```
out 4,00000100b, 0
turns the beeper off.
```

4.3 LEDs on Membrane Keyboard



All LEDs on the membrane keyboard are switchable:

Shift LED:

```
xout (0FEh, 0000 0001b)
```

PWR LED:

```
xout (0FEh, 0000 0010b)
```

2nd LED:

```
xout (0FEh, 0000 0100b)
```

ON LED:

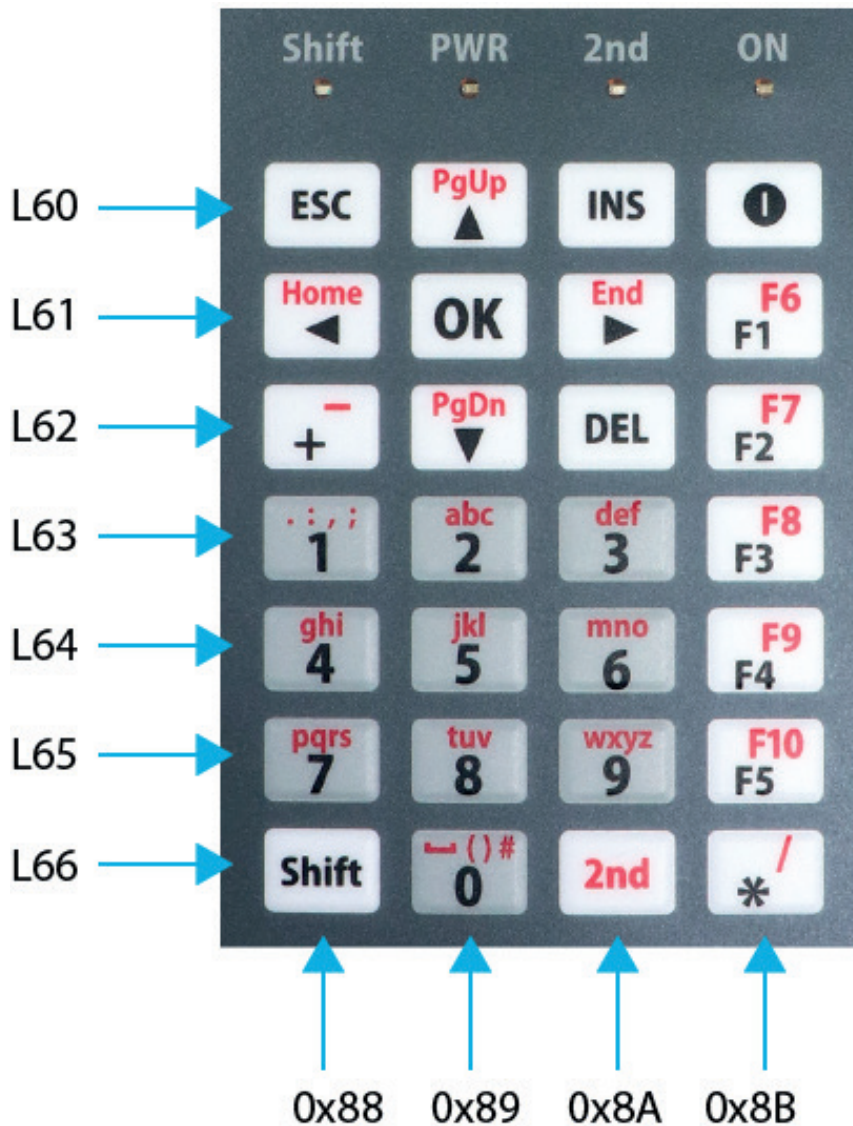
```
xout (0FEh, 0000 1000b)
```

NOTE: None of the LEDs will be turned on by default if the device is powered. All LEDs have to be switched on by the according code in the program.

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4.4 Membrane Keyboard



The columns of the keyboard matrix are accessible on addresses 0x88 to 0x8B.

As a compiler instruction before the beginning of the main task the physical offset must be set:

USER_EPORT PHYSOFFS, 0F0h ' offset to phys. addr. -10h

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To process inputs of the membrane keyboard the LCD1 Driver has to be installed with following parameters.

```
INSTALL_DEVICE #KEYB1, "LCD1.TDP", 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0EEh, 0FFh
```

[illegible]

Key Symbol		Key number	Key number hexadecimal
ESC		0	00
	Home	1	01
+	-	2	02
1	. : , ;	3	03
4	ghi	4	04
7	pqrs	5	05
Shift		6	06
	PgUp	8	08
OK		9	09
	PgDn	10	0A
2	abc	11	0B
5	jkl	12	0C
8	tuv	13	0D
0	 () #	14	0E
INS		16	10
	END	17	11
DEL		18	12
3	def	19	13
6	mno	20	14
9	wxyz	21	15
2nd		22	16
		24	18
F1	F6	25	19
F2	F7	26	1A
F3	F8	27	1B
F4	F9	28	1C
F5	F10	29	1D
*	/	30	1E

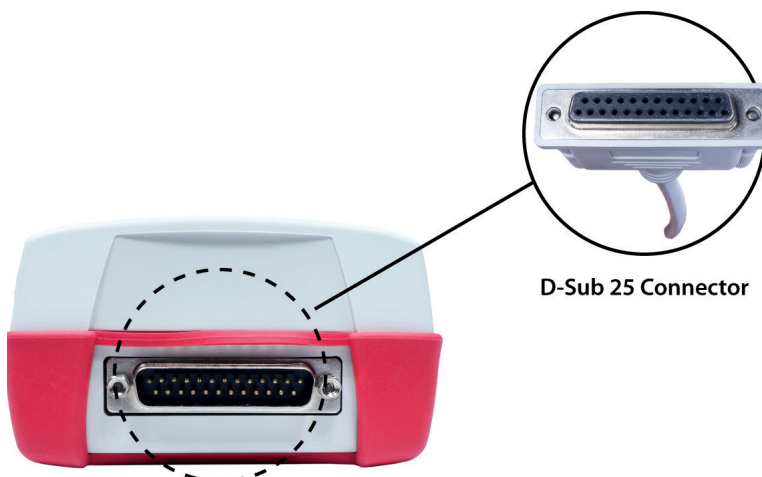
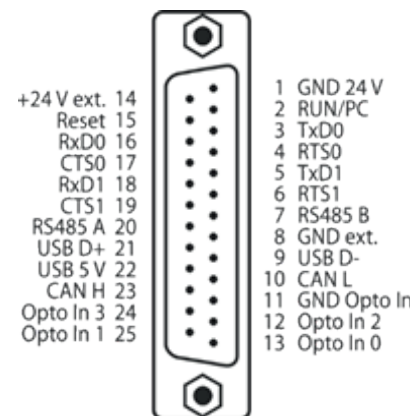
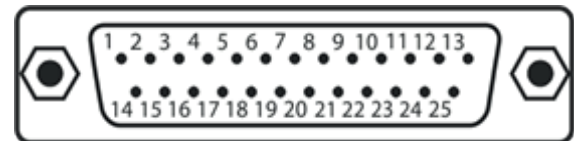


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5 Connectors / Pinout

D-Sub 25 Connector	used for:
Pin 1	GND 24 V
Pin 2	RUN / PC
Pin 3	TxD0
Pin 4	RTS0
Pin 5	TxD1
Pin 6	RTS1
Pin 7	RS485 B
Pin 8	GND ext.
Pin 9	USB D-
Pin 10	CAN L
Pin 11	GND Opto In
Pin 12	Opto In 2
Pin 13	Opto In 0
Pin 14	+24 V ext.
Pin 15	Reset
Pin 16	RxD0
Pin 17	CTS0
Pin 18	RxD1
Pin 19	CTS1
Pin 20	RS485 A
Pin 21	USB D+
Pin 22	USB 5 V
Pin 23	CAN H
Pin 24	Opto In 3
Pin 25	Opto In 1



D-Sub 25 Connector

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5.1 Power Supply

You have to connect a power supply 9...36V DC to this device. Pin 1 is for the GND connection and pin 14 for the positive output of the power supply.

Be careful if you use the internal power fail detection (refer chapter [Power Fail Detection](#)).

NOTE: Please notice this power input is unfused! You have to use a fused power supply.

5.2 Reset Pin

On pin 15 of the 25 pin D-Sub connector is a high active reset pin. Apply a High (5...24 V) signal to reset the device.

5.3 PC/ Run Mode Pin

Depending on the signal you apply on pin 2 of the 25 pin D-Sub connector the internal Tiger II Plus NRB will be in PC Mode or Run Mode.

Input on PC/Run Mode Pin	Operation Mode
No external signal	Run Mode
Low Signal (0V)	Run Mode
High Signal (5 – 24 V)	PC Mode

NOTE: If you switch the operation mode by applying a different signal to the PC/Run Mode Pin, you will have to reset the FXT-330 first to enter the desired operation mode.

5.4 Ser0

The serial port 0 can be used as RS232 or as RS485.

Logic output level on L85	Select Interface on Ser0
High	RS485
Low	RS232

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

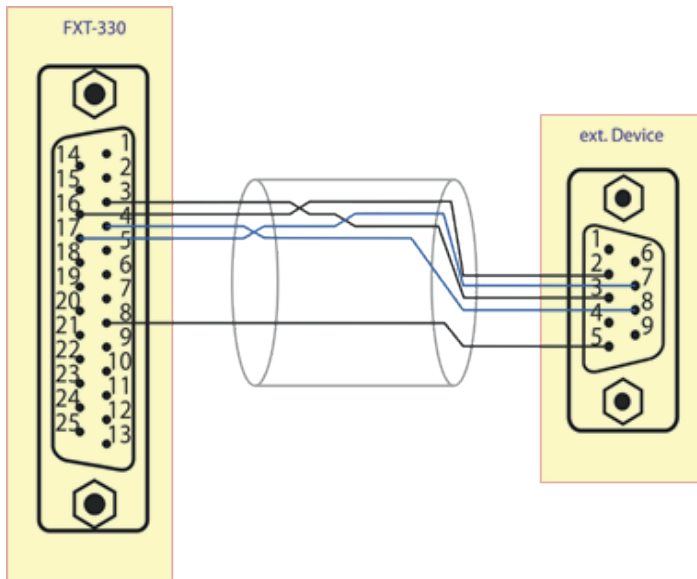
```
INSTALL_DEVICE #SER, "SER1B_K1.TDP", &
BD_9_600, DP_8N, YES, & 'Ser.0
BD_9_600, DP_8N, YES, & 'Ser.1
00010000b, 1, 0 'set L14 to RTS0
```

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5.4.1 Ser0: RS232 Mode

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

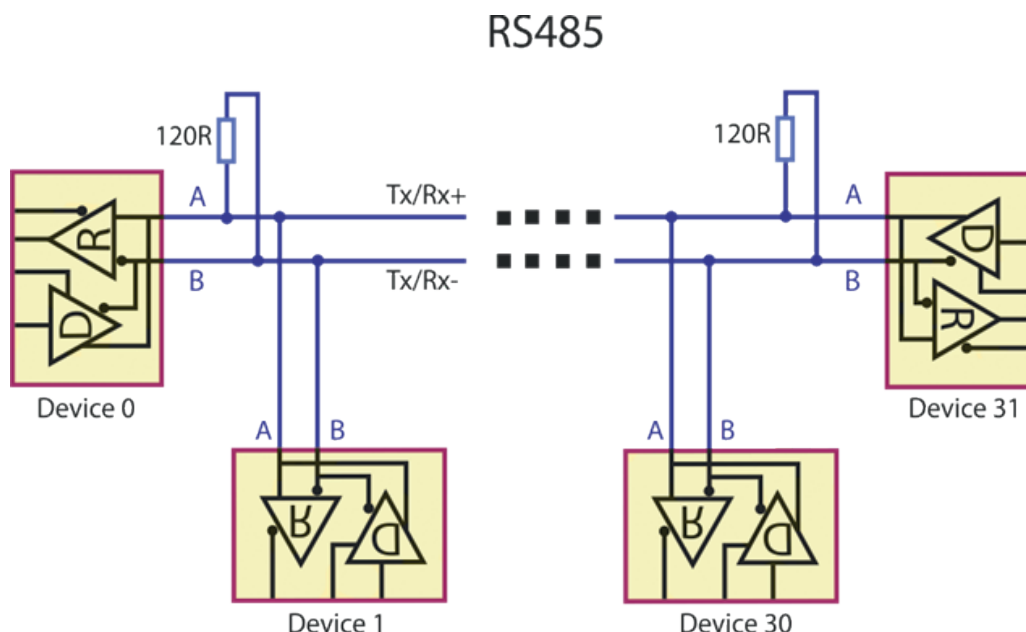


5.4.2 Ser0: RS485 Mode

With print, put or get you can easily send or receive messages from the RS485 bus. For example send 'Hello World' to another device:

```
PRINT #SER, #0, "Hello World"
```

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.



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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 120 Ω bus termination can be switched on by setting L37 to High.

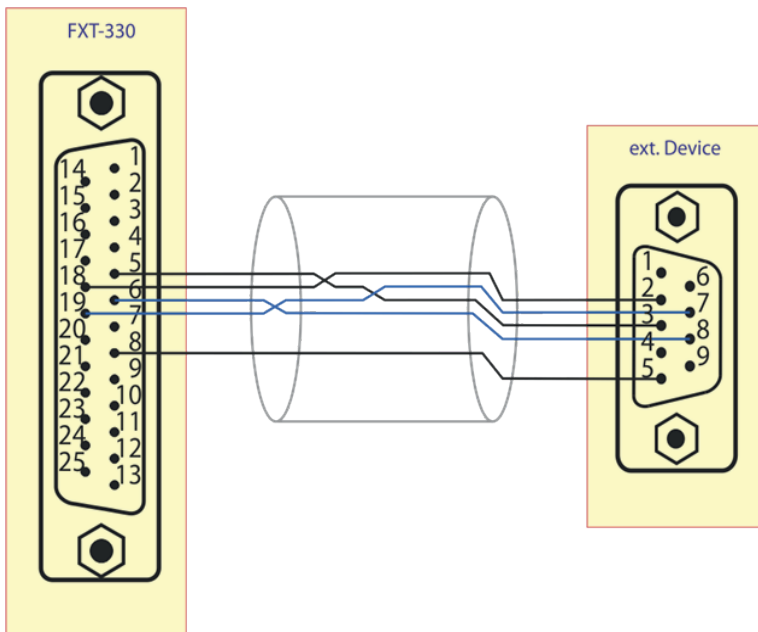
The RS485 port can be used to expand your FXT-330 with relay outputs, digital inputs, PT1000 temperature sensors or any other periphery.

5.5 Ser1

The serial port 1 of the Tiny-Tiger® 2 plus NRB 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.

5.5.1 Ser1: RS232 Mode

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.



5.5.2 Ser1: USB Mode

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

5.6 CAN

The CAN Bus should be terminated at both ends in its characteristic line impedance. The 120 Ω bus termination between the CAN High and the CAN Low lines can be switched on by setting L36 to High.

For entering High Speed CAN Modus set L86 to High.

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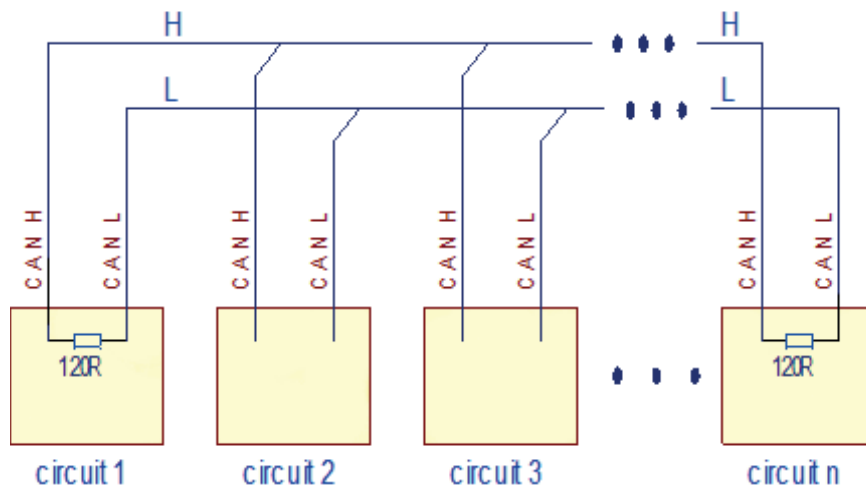
When the CAN-Bus should operate with a slope control L86 must be set to Low. Slope control is used to reduce EMI effects.

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

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.TDP", &
"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 plus NRB supports the CAN 2.0A and 2.0B protocols.



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!

5.7 Opto Inputs

The FlexxTerm has four optocoupler inputs suited for an input voltage range of 5...24 VDC. On address 0xFD you enable reading from the four inputs.

Opto Input	Tiger Pin	D-Sub 25 Connector
Opto In 0	L60	13
Opto In 1	L61	25
Opto In 2	L62	12
Opto In 3	L63	24
GND Opto In	-	11

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6 "Piggytail"

Ordering a FlexxTerm device you have the option to choose a variant with a directly attached cable. The cable assembly is fully up to your wishes and requirements.

In case you want to order a cable without any connectors attached, carrying out all functions, we suggest ordering a cable with a colour code according to old DIN Standard DIN 47100.



Number	Color	Short form	Used for
1	white	WH	GND 25 V
2	brown	BN	RUN / PC
3	green	GN	TxD0
4	yellow	YE	RTS0
5	grey	GY	TxD1
6	pink	PK	RTS1
7	blue	BU	RS485 B
8	red	RD	GND ext.
9	black	BK	USB D-
10	violet	VT	CAN L
11	gray-pink	GYPK	GND Opto In
12	red-blue	RDBU	Opto In 2
13	white-green	WHGN	Opto In 0
14	brown-green	BNGN	+24 V ext.
15	white-yellow	WHYE	Reset
16	yellow-brown	YEBN	RxD0
17	white-gray	WHGY	CTS0
18	gray-brown	GYBN	RxD1
19	white-pink	WHPK	CTS1
20	pink-brown	PKBN	RS485 A
21	white-blue	WHBU	USB D+
22	brown-blue	BNBU	USB 5 V
23	white-red	WHRD	CAN H
24	brown-red	BNRD	Opto In 3
25	white-black	WHBK	Opto In 1

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7 Used Tiger Pins

I/O of Tiger II Plus NRB	Pin No	used for:
L14	28a	Digital I/O port 1 bit 4 Request To Send of serial channel 0
L15	32b	Digital I/O port 1 bit 5 Request To Send line of serial port 1
L33	29a	Digital I/O port 3 bit 3 Address Clock of ePort system
L34	30a	Digital I/O port 3 bit 4 Data Clock of ePort system
L35	31a	Digital I/O port 3 bit 5 In-enable of ePort system
L36	32a	Digital I/O port 3 bit 6 Switch for CAN bus termination (High → On / Low → Off)
L37	33a	Digital I/O port 3 bit 7 Switch of RS485 bus termination (High → On / Low → Off)
L41	36a	Digital I/O port 4 bit 1 Mode input pin (RUN/PC)
L42	38b	Digital I/O port 4 bit 2 Beeper (High → On / Low → Off)
L60 to L67	1a to 8a	Digital I/O port 8 bit 0 to bit 7 multiplexed data and address lines used by Tiger X Bus, LCD, membrane keyboard and extended ports
L70	9a	Digital I/O port 7 bit 0 SCL signal connected to I ² C EEPROM
L71	10a	Digital I/O port 7 bit 1 SDA signal connected to I ² C EEPROM
L74	10b	Digital I/O port 7 bit 4 SPI-Clk of 16MB additional Flash Memory
L75	11b	Digital I/O port 7 bit 5 SPI-MiSo of 16MB additional Flash Memory
L76	12b	Digital I/O port 7 bit 6 SPI-MoSi of 16MB additional Flash Memory
L77	13b	Digital I/O port 7 bit 7 SPI-CS of 16MB additional Flash Memory
L80	13a	Digital I/O port 8 bit 0 RD[E] of LCD
L81	14a	Digital I/O port 8 bit 1 WR[R/W] of LCD
L82	15a	Digital I/O port 8 bit 2 RST of LCD
L83	16a	Digital I/O port 8 bit 3 A0 of LCD

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L84	17a	Digital I/O port 8 bit 4 CS0 of LCD
L85	18a	Digital I/O port 8 bit 5 Switch between RS232/RS485 (Ser0) (High → RS485 / Low → RS232)
L86	19a	Digital I/O port 8 bit 6 Switch for high speed CAN (High → On / Low → Off)
L90/TxD0	23a	Digital I/O port 9 bit 0 Transmit line of serial channel 0
L91/RxD0	24a	Digital I/O port 9 bit 1 Receive line of serial channel 0
L92/CTS0	25a	Digital I/O port 9 bit 2 Clear To Send line of serial channel 0
L93/TxD1	26a	Digital I/O port 9 bit 3 Transmit line of serial channel 1
L94/RxD1	27a	Digital I/O port 9 bit 4 Receive line of serial channel 1
L95/CTS1	33b	Digital I/O port 9 bit 5 Clear To Send line of serial port 1
L96/CAN-TX	34b	Digital I/O port 9 bit 6 Transmit line of CAN Bus interface
L97/CAN-RX	35b	Digital I/O port 9 bit 7 Receive line of CAN Bus interface
INTM1	8b	Maskable INT-Input 1: rising edge Power Fail Detection

8 "Internal Features/ Functions"

8.1 Power Fail Detection

FlexxTerm offers you the option to use the internal power fail detection. If the supply voltage drops below a voltage level of 14 V there will be an interrupt signal on INTM1 of the Tiger II Plus NRB. If required, the Tiger II Plus NRB can be brought into a safe power down routine before a possible brown out.

8.2 RTC Backup Battery

The RTC is buffered by an on-board CR2032 button cell battery.

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8.3 16 MB additional Flash Memory

A 16 MB Flash Memory offers more additional storage capacity on top of the 8 MB Flash Memory of the Tiger II Plus NRB.

The Tiger-“external” Flash will retain your data up to more than 20 years and is capable of a minimum of 100 000 prog-erase cycles per sector. Its sector size is 64 kB. It is accessible via SPI.

Because the Flash is write protected by default you must use following command to enable write or erase accesses:

```
xout (0FDh, 1000 0000b)
```

8.4 EEPROM

A 512 Kbit EEPROM of type M24512 organized as 64 Kbit × 8 bits is connected to the I²C bus. It will retain your data up to more than 40 years and is capable of more than 1 000 000 write cycles.

To communicate with the EEPROM you have to use the device selection Byte 0xA9hex for read access and 0xA8hex for write access.

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

Once you stored information inside which must not be changed, you can protect your data with the hard-wired write protection. In this case just open the enclosure and set the dedicated switch in the according position.

NOTE: The write protection is turned off by the switch on delivery.

9 Technical Specifications

9.1 Absolute maximum ratings

Maximum supply voltage U _{in} (in respect of GND 24 V)	36 V DC
Input voltage at Opto Inputs (in respect of GND Opto In)	30 V
Operating temperature	-20...+70 °C
Storage temperature	-30...+80 °C
Recommended operating temperature	0...50°C
Protection class	IP40

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9.2 Electrical Specifications

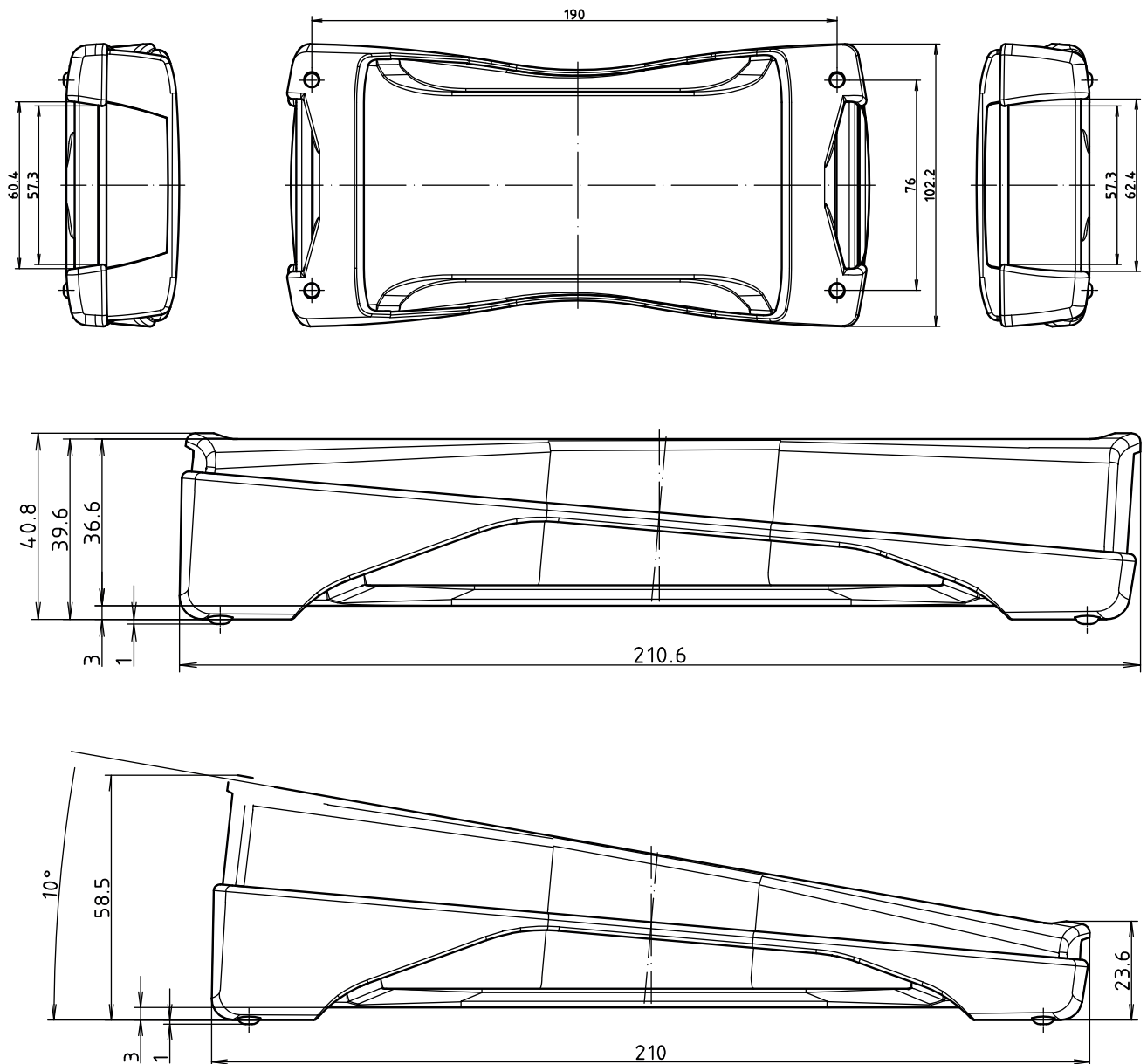
Supply voltage U _{in}	9...36 V DC
Supply current	
at 9 V	285 mA– 470 mA
at 12 V	205 mA– 330 mA
at 24 V	110 mA– 175 mA
at 36 V	80 mA– 140 mA
Power consumption at 9..36 V (LCD backlight + control LEDs always on)	
	min. 2,562 W
	max. 5,017 W
Power consumption at 24 V (LCD backlight + control LEDs always on)	
	min. 2,575 W
	max. 4,242 W
Voltage Levels Reset Pin / PC Mode Pin	
HIGH-Level input voltage	
	min. 5 V
	max. 30 V
LOW-Level input voltage	
	min. -
	max. 1 V
CPU Frequency (adjustable by compiler instructions)	
USER_FREQUENCY SPEED_25 (default)	50 MHz
USER_FREQUENCY SPEED_50	100 MHz
USER_FREQUENCY SPEED_100	200 MHz

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9.3 Mechanical Specifications

9.3.1 Dimensions

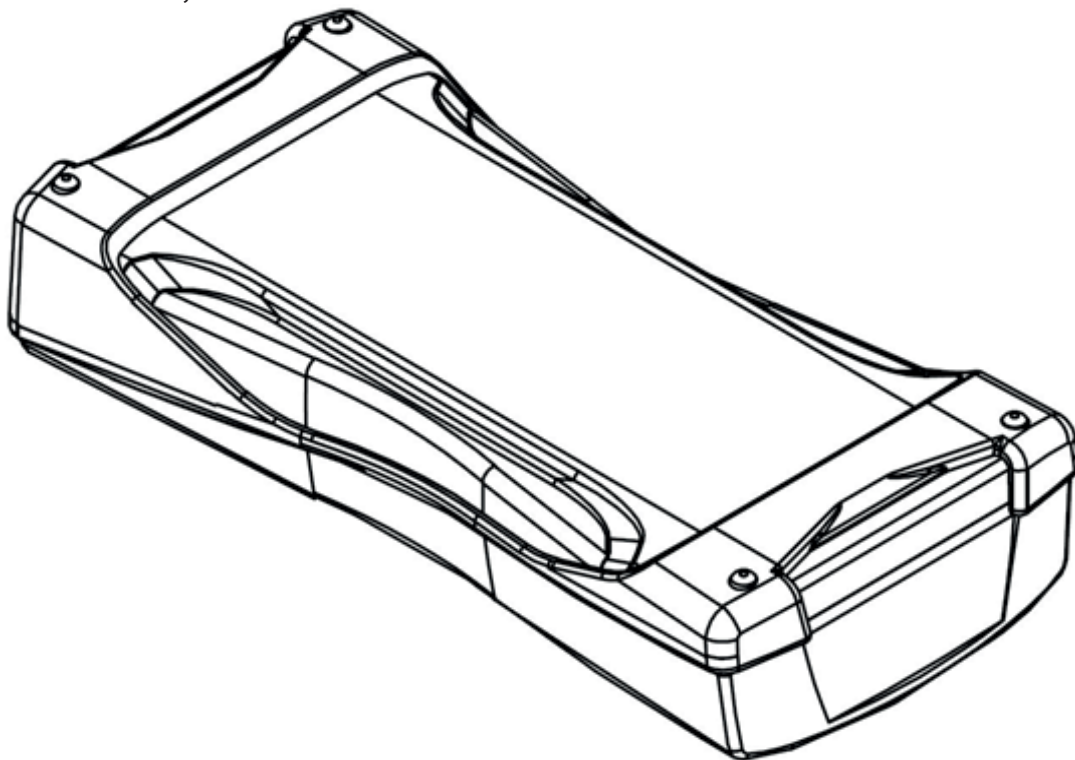


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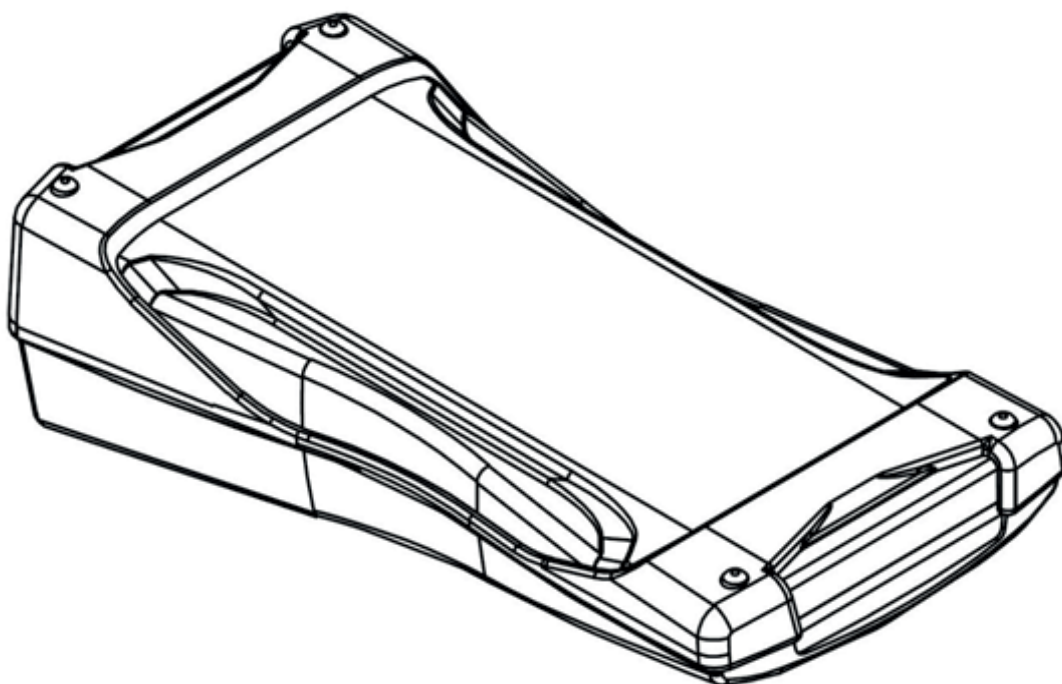
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9.3.2 Assembly variants

Parallel assembly:



Inclined assembly:



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10 Ordering Information

10.1 Part Number Scheme

Example:

FXT-330- F - LG / YE - X

Device Type

FlexxTerm with function module 330

Shape

F = flat

K = wedge

Colour of enclosure

LG = light grey

GG = graphit grey

Colour of seal

OR = orange

BK = black

BL = blue

WH = white

RD = red

GN = green

GR = grey

YE = yellow

Connection Type

X = 25 pin D-Sub Connector (no cable)

001 = 0,1 m cable length (piggytail)

010 = 1 m cable length (piggytail)

100 = 10 m cable length (piggytail)

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11 Documentation

11.1 Document History

Version of Documentation	Board Version	Description / Changes
V001	V1.1	Initial release.

11.2 Product History

Board Version	Description / Changes
V1.1	Starting product history.