

Device Description

**NXEB 500-HMI**  
**netX Evaluation Board**

Edition: 1

Language: English (EN)

**Hilscher Gesellschaft für Systemautomation mbH**

Web: [www.hilscher.com](http://www.hilscher.com)

## List of Revisions

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Although this device has been developed with great care and intensively tested, Hilscher Gesellschaft für Systemautomation mbH cannot guarantee the suitability of this device for any purpose not confirmed by us in writing.

Guarantee claims shall be limited to the right to require rectification. Liability for any damages which may have arisen from the use of this device or its documentation shall be limited to cases of intent.

We reserve the right to modify our products and their specifications at any time in as far as this contribute to technical progress. The version of the manual supplied with the device applies.

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# 1 Description

## 1.1 Introduction

The NXEB 500-HMI is an Evaluation Board allowing the user to test the functionality provided by the netX 500 chip as a Human Machine Interface (HMI).

The board is equipped with a PROFIBUS Fieldbus Interface.

Further, the board provides two 100 Mbit/s Ethernet ports for Realtime Ethernet communication.

As standard communication port the user will find one RS-232 serial port. There is also a USB (1.1. fullspeed) port which operates in hostmode.

The memory setup of the board comes with external SDRAM, external parallel flash, I2C EEPROM and a CompactFlash interface supporting standard CF memory cards.

All elements of the board are powered by an onboard switching power supply, which can be operated by a wide range of simple (unregulated) standard power supplies from 9V to 24V output voltage.

Equipped with an QVGA TFT display with Touchscreen, the graphics capabilities of the netX 500 can easily be evaluated.

For software development, all NXEB 500-HMI come with a JTAG connector, allowing to connect an appropriate debugger device.

Windows CE and Linux board support packages are available from Hilscher, allowing to run any of these operating systems on the NXEB 500-HMI. A VxWorks board support package is in preparation and will be available in the future.

## 1.2 Location of Connectors, Indicators and Control Elements

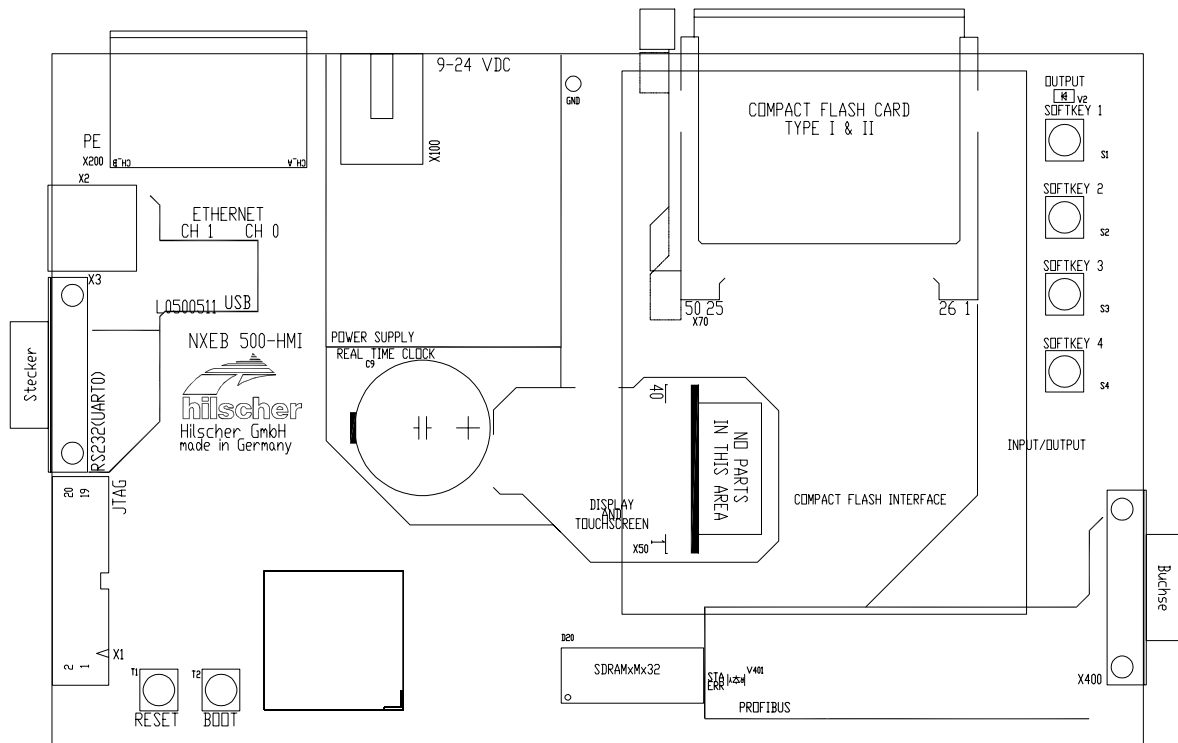


Figure 1: NXEB 500-HMI

## 2 Board Configuration and Operation

### 2.1 Boot Mode

The NXEB 500-HMI will always search for executable boot code at the parallel flash.

Once appropriate boot code is found in this device, it will be executed. If no boot code is found, the bootstart mode comes in.

In bootstart mode, the netX 500 activates the serial port on UART0 and waits for being contacted by an application running on an external host computer. An appropriate Windows Application, providing access to netX registers and memory for downloading program code, etc. is available from Hilscher. In bootstart mode, any connected bootable memory will be ignored.

“BOOT” button T2 (the right one of the two pushbuttons in the lower left area of NXEB 500-HMI board) can be used to enter the bootstart mode.

If this button is held active (pressed) while a reset is applied to the board, the board will come up in bootstart mode.

### 2.2 Reset

The NXEB 500-HMI is equipped with an onboard reset generator, providing a proper Power On Reset signal to the netX 500. This circuit will also issue a reset, in case the voltage from the onboard 3,3V power supply should drop below appr. 2,9V -3V.

Additionally, the netX can be manually reset by a pushbutton:

“RESET” button T1 (the left one of the two pushbuttons in the lower left area of NXEB 500-HMI board) will also activate the Power On Reset signal (signal remains active until button is released). While a “true “Power On Reset also activates the JTAG-Reset signal applied to the netX 500 (Pin U17), the reset controlled by T1, only activates the PORn signal which also resets the onboard flash memories.

### 2.3 Power Supply / Power Fail

The NXEB 500-HMI can be operated by a DC power supply from 9 VDC – 24 VDC which is to be plugged into the power jack X100 located in the upper center of the board.

As the input circuit provides a bridge rectifier, the polarity of the power plug does not matter, however an AC supply shall not be used, as the input capacitors are not sufficient for that mode of operation. The current drawn by the NXEB 500-HMI depends on several factors such as operating mode of the netX 500, CPU load, use of additional hardware and mainly on the level of the input voltage (the higher the voltage, the lower the current). For standard operation of the board, the power supply that comes with your NXEB 500-HMI is sufficient. If additional hardware is used on the NXEB 500-HMI, the use of a stronger supply is recommended. To protect the input rectifier diodes, the board is equipped with a standard fuse (3.15 Amps., Time Lag).

The board provides a secondary voltage control circuit, which is connected to the input voltage of the board. This circuit will generate a Power Fail signal when the input voltage drops below 8.5 V. The Power Fail signal is routed to the RTC\_POK signal of the netX 500, allowing evaluation of the isolated memory feature of the netX 500.

## 2.4 JTAG

Through connector X1, located near the lower right corner of the board, the user has access to the JTAG interface of the integrated ARM CPU inside the netX 500.

The connector pinout follows the common standard for ARM JTAG interfaces and can be found in chapter 5 of this manual.

The JTAG port allows the connection of appropriate debugging devices, such as the “Tantino” from Hitex or the “RealView Multi-ICE” available from ARM.

## 2.5 Fieldbus Interfaces

The NXEB 500-HMI provides a PROFIBUS fieldbus interface which is connected to the netX 500 and will be operated by XMAC/XPEC2.

This interface has a dual led, providing fieldbus status information and is located on the lower right side of the board.

PROFIBUS devices are connected to the NXEB 500-HMI through connector X400, a standard 9 pin SUB-D female connector

## 2.6 Ethernet Ports

The NXEB 500-HMI provides two standard 100 Mbit/s Ethernet ports combined in a double RJ45 jack which are driven directly by the two internal PHYs of the netX 500.

The jack is located on the upper left corner of the board and also contains Link- and Activity LEDs for both channels. The ethernet ports itself are hardwired on the board.

## 2.7 UART

UART0 of the netX 500 is connected through common RS-232 level shifters to a standard serial port (RX,TX,RTS,CTS) located on the left side of the board.

## 2.8 USB

On the upper left side of the NXEB 500-HMI, there is an USB connector (Type A) that is connected to the USB port of the netX 500. The USB port is configured to operate as USB host port. The current which may be drawn from this USB host port is limited to 500 mA by a Power-Distribution Switch D2. Over current is monitored to the netX 500 on GPIO13 (pin Y13).

## 2.9 ADCs

Two of the ADC channels (ADC1, channel 2 and 3) are reserved for the touch panel of the integrated TFT Display on the NXEB 500-HMI (see also chapter 2.13).

## 2.10 TFT and Touchpanel

The NXEB 500-HMI comes with an onboard QVGA (240\*320) TFT Display with a 4-wire resistive touch panel which is supported by the available Windows CE board support package. A Linux board support package is in preparation.

## 2.11 Softkeys and Output LED

The NXEB 500-HMI provides 4 pushbutton softkeys (S1 – S4) located at the right side of the TFT Display. These softkeys are directly connected to GPIO pins (GPIO4 – GPIO7). High level on this input pins means pushbutton is pressed.

For evaluating the direct output function of the netX 500 an output LED (V2) is located at the top of the pushbuttons. This LED is controlled by pin GPIO9.

Function	Reference	GPIO	netX 500 pin
Softkey 1	S1	4	AA17
Softkey 2	S2	5	Y17
Softkey 3	S3	6	AA16
Softkey 4	S4	7	Y16
Output LED	V2	9	Y15

Table 1: Assignment Softkeys / Output LED- GPIO pins

## 2.12 CompactFlash Interface

Connector X70 below the TFT Display provides a CompactFlash Type I and Type II slot for CompactFlash and CF+ cards.

The provided card voltage is limited to 3.3 VDC. 5 VDC card supply voltage is not supported on on this interface.

Inserted cards will work in PC Card Memory Mode and PC Card I/O Mode. True IDE Mode is not supported by the hardware of NXEB 500-HMI.

## 2.13 RTC

To evaluate the integrated Real Time Clock functionality of the netX 500 a 1 Farad gold cap (C9) is fitted on the NXEB 500-HMI. If a power fail of the external power supply voltage is detected by the supervisor circuit N102, the gold cap will provide energy to the netX 500 for nearly 3 days to keep the actual date and time. A longer time will be reached by using a bigger gold cap.

## 3 LED Status Indicators

### 3.1 Power LED

The NXEB 500-HMI has one green LED (V108), located at the lower end of the power supply section of the board.

This LED provide a simple status information on the power supply, as it is lit, whenever the +3.3 VDC voltage is present.

Please note, that these LED is simply driven by the +3.3 VDC power net and do not provide any information on the exact level or quality of the voltage.

### 3.2 RDY/RUN LED

Located in the lower left area of the NXEB 500-HMI there is a dual LED (yellow/green), providing status information on the netX 500, as this LED is connected between the RDY and RUN pins of the chip.

Depending on the corresponding status register of the netX 500, this LED can either show yellow (RDY= 0, RUN=1) or green (RDY=1, RUN=0) colour. If both pins are low or high, the LED will be off.

In bootstart mode (see chapter 2.1), the LED will flash in yellow colour.

## 4 Interface Connector Pinout

### 4.1 Communication Interfaces

#### 4.1.1 PROFIBUS Connector

Isolated RS-485 interface:

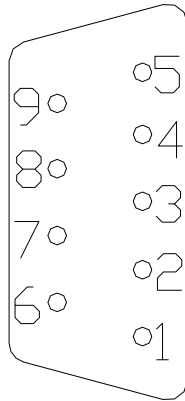


Figure 2: PROFIBUS Interface (DSub female connector)

Connection with DSub female connector	Signal	Meaning
3	RxD/TxD-P	Receive / Send Data-P respectively connection B plug
4	CNTR-P	Control Signal for external repeaters
5	DGND	Reference potential
6	VP	Positive power supply
8	RxD/TxD-N	Receive / Send Data-N respectively connection A plug

Table 2: PROFIBUS Interface

## 4.1.2 Ethernet RJ45 Plug

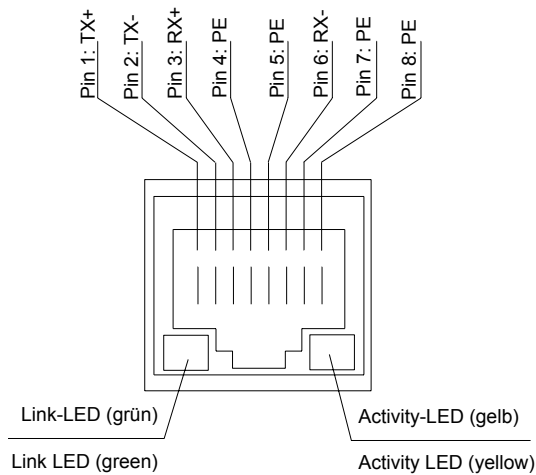


Figure 3: Ethernet Interface- Ethernet pinning at the RJ45 female connector

Pin	Signal	Meaning
1	TX+	Transmitt Data +
2	TX-	Transmitt Data -
3	RX+	Receive Data +
4	PE	connected with PE by RC circuit
5	PE	connected with PE by RC circuit
6	RX-	Receive Data -
7	PE	connected with PE by RC circuit
8	PE	connected with PE by RC circuit

Table 3: Ethernet Pinning at the RJ45 Female Connector

### 4.1.3 RS232 Connector

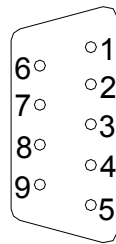


Figure 4: Communication Interface RS232

Pin	Signal	Meaning
2	RXD	Receive Data
3	TXD	Send Data
7	RTS	Ready to Send
8	CTS	Clear to Send
4	DTR	Data Terminal Ready
5	GND	Signal Ground

Table 4: Communication Interface RS232

## 4.1.4 USB Connector Host

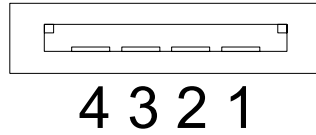


Figure 5: USB Interface female connector Type A

Pin	Name	Description
1	+5V	+5V
2	D-	Data -
3	D+	Data +
4	GND	Ground

Table 5: Pinouts USB Type A

## 4.2 JTAG Connector

Pin	ARM Signals	netX Signals
1	VTref	+3.3V
2	Vsupply	+3.3V
3	nTRST	JT_TRSTn
4	GND	VSS
5	TDO	JT_TDO
6	GND	VSS
7	TMS	JT_TMS
8	GND	VSS
9	TCK	JT_TCK
10	GND	VSS
11	RTCK	Not used
12	GND	VSS
13	TDI	JT_TDI
14	GND	VSS
15	nSRST	PORn
16	GND	VSS
17	DBGQR	Not used
18	GND	VSS
19	DBGACK	Not used
20	GND	VSS

Table 6: JTAG Connector

## 4.3 Power Supply

For connection to the 24 V power supply. The possible range for the power supply is 9 - 24 V.

Pin	Description
1	Ground
2	24 V

Table 7: Power Supply

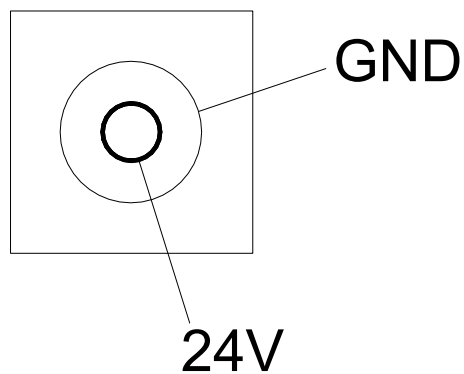


Figure 6: Power Supply

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