Device Description

NXEB 100-NET

netX Evaluation Board

Edition: 1
Language: English (EN)

Hilscher Gesellschaft für Systemautomation mbH

Web: www.hilscher.com

List of Revisions

Index	Date	Version	Chapter	Revisions
1	11.01.06		all	created

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.

Table of Contents

1 Description

1.1 Introduction

The NXEB 100-NET board is equipped with all common Fieldbus Interfaces (CAN, Profibus, AS-i, Devicenet, InterBus and CC-Link) whereas one of these Interfaces can be used at a time.

Further, the board provides two 100Mbit Ethernet Ports for Realtime Ethernet communication.

As standard communication ports the user will find one RS-232 serial port, as well as a USB (1.1. fullspeed) port which can either operate as Device.

The memory setup of the board comes with external SDRAM, and a SPI Flash.

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.

For software development, all NXEB100-NET come with a JTAG connector, allowing to connect an appropriate debugger device.

1.2 Location of Connectors, Indicators and Control Elements

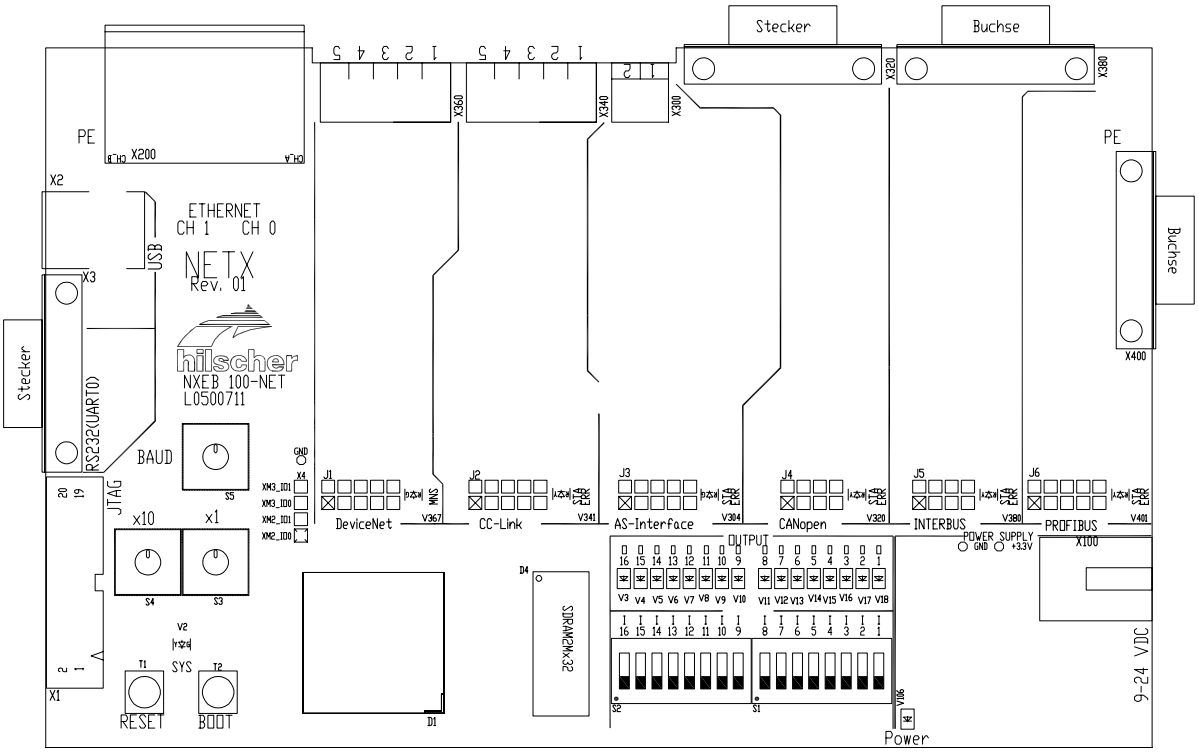


Figure 1: NXEB 100-NET

2 Board Configuration and Operation

2.1 Boot Mode

The versatile boot options of the netX500 require proper setting of the desired boot mode of the board. In order to correctly set the desired boot mode, it is neccessary to understand the netx500 boot sequence:

Except when configured for Bootstart mode, the netx500 will allways search for executable boot code at memory connected to the SPI bus (CS0) and the I2C Bus. Once appropriate boot code is found in any of these devices, it will be executed. If no boot code is found, the configured boot mode comes in.

- Bootastart Boot Mode

In Bootstart Boot Mode, the netX500 activates the serial port on UART0 and the USB port (requires configuring the USB port to “device mode 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.

The Bootstart button “BOOT” 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 NXEB100-NET is equipped with an onboard reset generator, providing a proper Power On Reset signal to the netX500. 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 pushbutton:

Button RESET (labelled “RESET”) 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 netX500 (Pin U17), the reset controlled by RESET, only activates the PORn signal which also resets the onboard Flash memories.

Basically, the netX500 can be manually reset by any of the two signals mentioned before, however the appropriate netX register which reflects the type of reset that occurred last, will be different (see appropriate netX documentation for details).

2.3 Power Supply

The NXEB100-NET can be operated by a DC power supply from 9V – 24V which is to be plugged into the power jack X100 located in the lower right corner 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 NXEB100-NET depends on several factors such as operating mode of the netX500, 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 NXEB100-NET is sufficient.

2.4 JTAG

Through connector X1, located near the lower left corner of the board, the user has access to the JTAG interface of the integrated ARM CPU inside the netX500.

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 NXEB100-NET provides a total of 6 different fieldbus interfaces (CAN, ProfiBus, AS-Interface, DeviceNet, InterBus and CC-Link) which can be connected to the netX500 and will then be operated by XMAX/XPEC**2**.

Every interface has a dual led, providing fieldbus status information.

Only one of these interfaces can be used at a time and the board must be configured appropriately in order to use a certain interface!

The interfaces are located on upper side of the board. There is one jumper group for each of the interface which are all horizontally alligned.

Note ***In order to use a certain interface, ALL of the jumpers in the appropriate jumper group must be set (plugged), while ALL jumpers of the other groups must be removed! Setting jumpers in more than one group, will cause malfunction and may even damage the board, so configuration should be done very carefully and should be checked before powering up the board!***

The NXEB100-NET also serves as a reference design for the netX500. Hence the idea of selecting the fieldbus interfaces through multiplexers, making the configuration more convenient and eliminating the possibility of misconfigurations, was dropped, in order to make the connection between netX and the “physical” part of the fieldbus interface as transparent as possible.

2.5.1 DeviceNet

The DeviceNet -Interface is the first interface of the upper left side of the board. In order to use this interface, all 5 jumpers of jumper group J1 must be set as shown in the following picture.

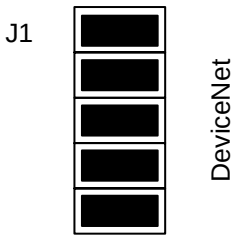


Figure 2: J1 - DeviceNet

DeviceNet units are connected to the NXEB100-NET through connector X360, a 5 pin Combicon connector.

2.5.2 CC-Link

The CC-Link -Interface is the second interface in the upper left corner of the board. In order to use this interface, all 4 jumpers of jumper group J2 must be set as shown in the following picture.

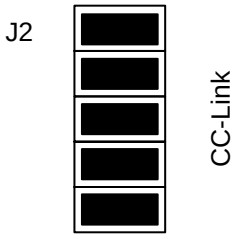


Figure 3: J2 - CC-Link

CC-Link units are connected to the NXEB100-NET through connector X340, a 5 pin Combicon connector

2.5.3 AS-Interface

The AS-Interface is the third interface starting from the middle of the upper side of the board. In order to use this interface, all 5 jumpers of jumper group J3 must be set as shown in the following picture.

Figure 4: J3 - AS-Interface

AS-i devices are connected to the NXEB100-NET through connector X300, a 2 pin Combicon connector.

2.5.4 CANopen

The CANopen interface is the fourth interface starting from the middle of the upper side of the board.

In order to use this interface, all 4 jumpers of jumper group J4 must be set as shown in the following picture.

Figure 5: J4 - CAN

CANopen devices are connected to the NXEB100-NET through connector X320, a standard 9 pin SUB-D male connector.

2.5.5 InterBus

The InterBus Interface is the fifth interface starting from the middle of the right upper side of the board. In order to use this interface, all 4 jumpers of jumper group J5 must be set as shown in the following picture.

Figure 6: J5 - InterBus

InterBUS units are connected to the NXEB100-NET through connector X380, a a standard 9 pin SUB-D female connector.

.

2.5.6 PROFIBUS

The Profibus interface is the sixth interface starting from the middle of the right side of the board. In order to use this interface, all 5 jumpers of jumper group J6 must be set as shown in the following picture.

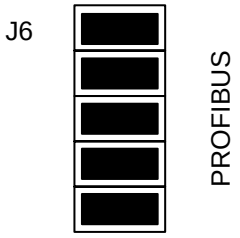


Figure 7: J6 - PROFIBUS

PROFIBUS devices are connected to the NXEB100-NET through connector X400, a standard 9 pin SUB-D female connector.

2.6 Ethernet Ports

The NXEB100-NET provides two standard 100Mbit Ethernet ports combined in a double RJ-45 jack which are driven directly by the two internal PHYs of the netX500.

The jack is located in the upper left corner of the board and also contains Link- and Activity LEDs for both channels.

2.7 UART

The UART of the netX500 is connected through common RS-232 level shifters to one standard serial port (RX,TX,RTS,CTS) located on the left side of the board.

2.8 SPI Flash

The NXEB100-NET is equipped with a serial (SPI) Flash memory (D2), that can either be connected to the SPI chip select 0 (SPI_CS0n).

2.9 I2C EEPROM

The NXEB100-NET is equipped with a serial (I2C) EEPROM (D3).

2.10 USB

On the upper left corner of the NXEB100-NET, is one USB connectors (Type B) there is connected to the USB port of the netX500.

2.11 Rotary switch

On the lower left corner of the NXEB100-NET, are three rotary switchs (S3,S4,S5)

The NXEB100-NET board have two rotary switch to set up the device address (S3 and S4).

With the third rotary switch S5, can set the user the baud rate of fieldbus Interface CC-Link.

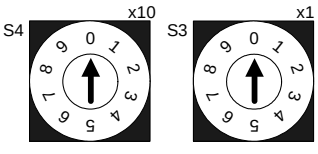


Figure 8: S3,S4 ID-switch

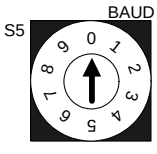


Figure 9: S5 baud switch

2.12 Host Interface-PIO LEDs and Switchs

The NXEB100-NET provides 16 LEDs (V3 – V18) and two 8 Bit DIP-Switch (S1 and S2) which are connected to I/O lines of the netx500 Hostinterface .

The assignment between the LEDs and Switches and the HIF-GPIO pins are as follows:

LED	HIF-GPIO	netX500 pin
V3	47	E14
V4	46	D14
V5	45	C14
V6	44	B14
V7	43	A14
V8	42	C15
V9	41	B15
V10	40	E16
V11	39	C16
V12	38	B16
V13	37	A16
V14	36	D17
V15	35	C17
V16	34	B17
V17	33	A17
V18	32	A18

Table 1: Assignment LEDs - HIF-GPIO pins

Switch	HIF-GPIO	netX500 pin
S1-1	71	D8
S1-2	70	C8
S1-3	69	B8
S1-4	68	E9
S1-5	67	D9
S1-6	66	C9
S1-7	65	B9
S1-8	64	A9
S2-1	79	E6
S2-2	78	C6
S2-3	77	B6
S2-4	76	A6
S2-5	75	C7
S2-6	74	B7
S2-7	73	A7
S2-8	72	E8

Table 2: Assignment Switches - HIF-GPIO pins

3 LED Status Indicators

3.1 Power LEDs

The NXEB100-NET has one green LEDs, located at the lower left of the power supply section of the board, which are labelled with “POWER”.

These LEDs provide a simple status information on the power supply, as they are lit, whenever the corresponding voltage is present. Please note, that these LEDs are simply driven by the corresponding power net and do not provide any information on the exact level or quality of the voltage.

3.2 RDY/RUN LEDs

Located near the lower left corner of the NXEB100-NET, directly above the “BOOT” and “RESET” Pushbuttons, there is a dual LED (yellow/green), providing status information on the netX500, as this LED is connected between the RDY and RUN pins of the chip.

Depending on the corresponding status register of the netX500, 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.

When the board is configured to start in “Bootstart” mode, the LED will flash in yellow colour.

4 Optional Extensions

4.1 Signal Headers

The NXEB100-NET provides direct access to almost any signal of the netX500, X4 headers either for measurement purposes or for adding user specific hardware to the board.

The following table show the pinout of the signal headers, which are also labelled on the board:

X4

XM2_IO0	1
XM2_IO1	2
XM3_IO0	3
XM3_IO1	4

Table 3: Pinout Signal Headers

5 Interface Connector Pinout

5.1 Communication Interfaces

5.1.1 DeviceNet Connector

Isolated ISO 11898 interface.

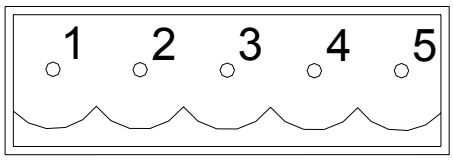


Figure 10: DeviceNet Interface (Combicon male connector, 5 pin, RM 3,5)

Connection with Combicon male connector	Signal	Meaning
1	V-	Reference potential DeviceNet power supply
2	CAN_L	CAN Low-Signal
3	Drain	Shield
4	CAN_H	CAN High-Signal
5	V+	+24 V DeviceNet power supply

Table 4: DeviceNet Interface.

5.1.2 CC-Link Interface

Isolated ISO 11898 interface.

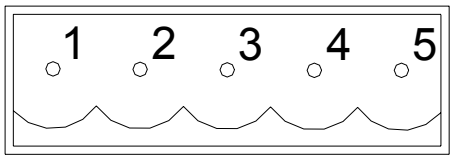


Figure 11: CC-Link Interface (Combicon Interface, 5 pin, RM 3,5)

Combicon Interface 5 pin	Signal	Meaning
1	DA	Data A
2	DB	Data B
3	DG	Data Ground
4	SLD	Shield
5	FG	Field Ground

Table 5: CC-Link Interface

5.1.3 Interface of the AS-Interface

AS-Interface interface according IEC 364-4-41.

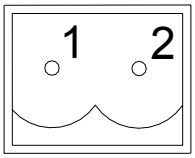


Figure 12: Interface of the AS-Interface (Combicon male connector, 2 pin, RM 3,5)

Connection with 2 pin Combicon male connector	**Signal**	**Meaning**
1	AS-i +	AS Interface positive voltage
2	AS-i -	AS Interface negative voltage

Table 6: Interface of the AS-Interface

5.1.4 CANopen Interface

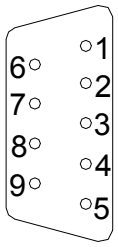
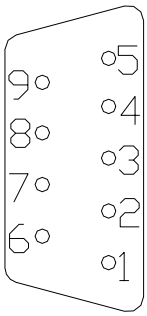


Figure 13: CANopen-Interface

Connection with DSub connector male	Signal	Meaning
2	CAN_L	CAN_L Bus line
3	ISOGND	CAN Ground
7	CAN_H	CAN_H Bus line

Table 7:CANopen-Interface

5.1.5 InterBus Interface



RS-422 interface according DIN EN 50254.

Figure 14: InterBus Interface

Connection with DSub connector male	Signal	Meaning
1	DO2	Send Data Line +
2	DI2	Receive Data Line +
3	GND2	Ground
5	Udd	Logic Voltage 5 Volt
6	/DO2	Send Data Line -
7	/DI2	Receive Data Line -

Table 8: InterBus Interface - Remote out

5.1.6 PROFIBUS Connector

Isolated RS-485 interface:

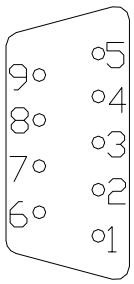


Figure 15: PROFIBUS Interface (DSub female connector)

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

Table 9: PROFIBUS Interface

5.1.7 Ethernet RJ45 Plug

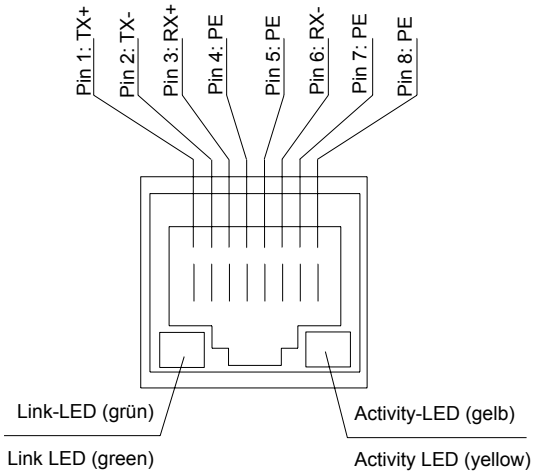


Figure 16: Ethernet Interface- Ethernet pinning at the RJ45 female connector

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 10: Ethernet Pinning at the RJ45 Female Connector

5.1.8 RS232 Connector

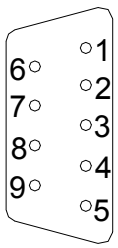


Figure 17: Communication Interface RS232

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 11: Communication Interface RS232

5.1.9 USB Connector Device

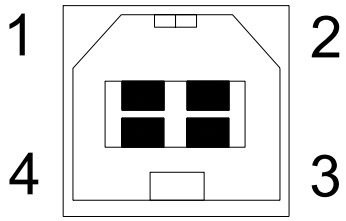


Figure 18: USB Interface female connector Type B

Pin	Name	Description
1	USB_EXT	USB Extern (+5V)
2	D-	Data -
3	D+	Data +
4	GND	Ground

Table 12: Pinouts

5.2 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	DBGRQ	Not used
18	GND	VSS
19	DBGACK	Not used
20	GND	VSS

Table 13: JTAG Connector

5.3 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 14: Power Supply

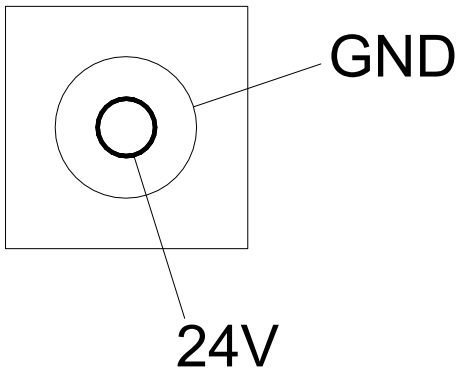


Figure 19: Power Supply

6 Lists

6.1 List of Figures

6.2 List of Tables