Hardware Description
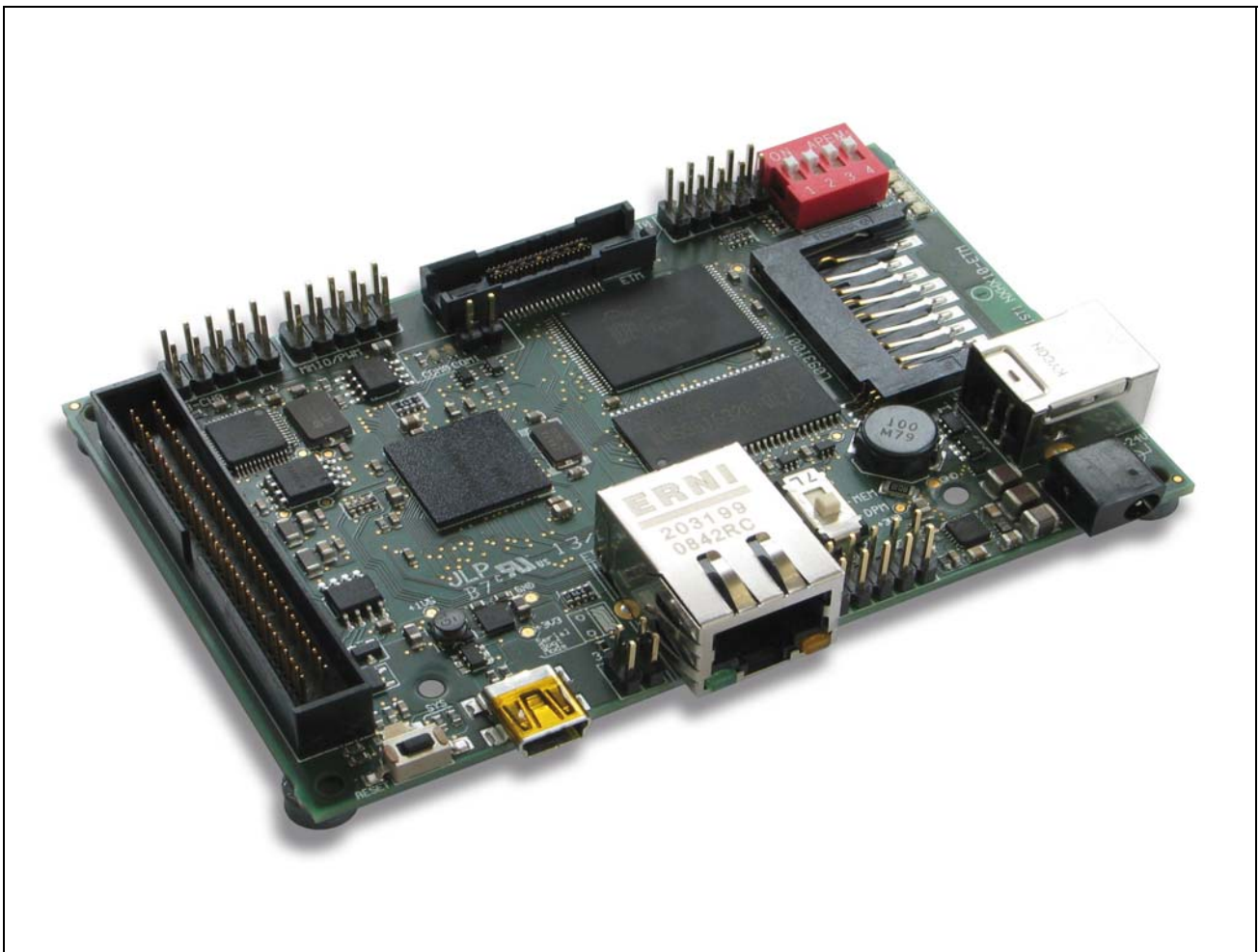
NXHX 10-ETM

Software Development Board

Hilscher Gesellschaft für Systemautomation mbH

www.hilscher.com

Table of Contents

1 Introduction

1.1 About this Manual

This manual describes the NXHX 10-ETM evaluation board.

The NXHX 10-ETM is a development board for software development for netX 10.

1.1.1 List of Revisions

Index	Date	Chapter	Revision
1	2011-12-05	All	Created

Table 1: List of Revisions

1.1.2   Conventions in this Manual

Operation instructions, a result of an operation step or notes are marked as follows:

Operation Instructions:

➢   <instruction>

Or

1.   <instruction>
2.   <instruction>

Results:

✑   <result>

Notes:

Important: <important note>

Note: <note>

<note, were to find further information>

Positions in Figures

The *Positions* ①, ②, ③ **...** or ⓐ, ⓑ, ⓒ **...** or Ⓐ, Ⓑ, Ⓒ **...** refer to the figure used in that section. If the numbers reference to a section outside the current section then a cross reference to that section and figure is indicated.

1.2   Reference to Hardware

Hardware

Hardware	Revision	Part Number
NXHX 10-ETM	1	7753.200

Table 2: Reference to Hardware

1.3   Documentation for NXHX 10-ETM

The following documentation overview gives information, for which items you can find further information in which manual.

Manual	Contents	Document Name
Technical Reference Guide	netX 10 Chip description	netX10_Technical_Reference_Guide_09.pdf

Table 3: Additional Documentation

1.4 Legal Notes

1.4.1 Copyright

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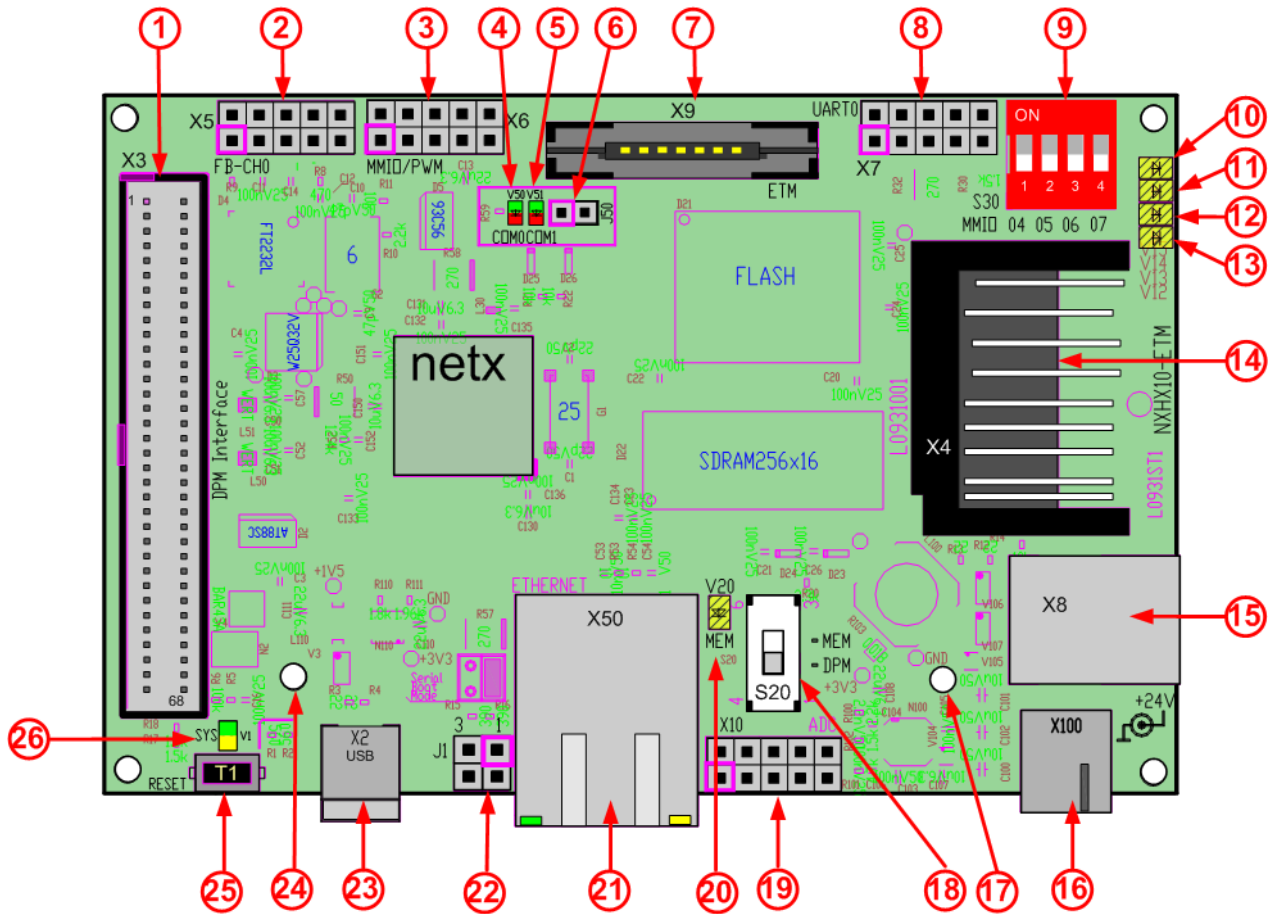# 2 Hardware and Mechanics

2.1 Printed Circuit Board NXHX 10-ETM

Figure 1: NXHX 10-ETM Printed Circuit Board

Number	Name	Description	Details
1	X3	Dual port Memory Interface	Section 3.1 / Page 13
2	X5	Fieldbus physical layer channel 0	Section 3.2 / Page 15
3	X6		Section 3.3 / Page 15
4	V50	COM0	Section 4 / Page 21
5	V51	COM1	Section 4 / Page 21
6	J50		Section 2.2.5 / Page 12
7	X9	ETM Connector	Section 3.4 / Page 16
8	X7	UART0 RS-232 module	Section 3.5 / Page 17
10	V15		Section 4 / Page 21
11	V14		Section 4 / Page 21
12	V13		Section 4 / Page 21
13	V12		Section 4 / Page 21
14	X4	SD Card Slot	Section 3.6 / Page 17
15	X8	USB Port for Development PC	Section 3.7 / Page 18
16	X100	Power Supply Jack, 24 V Power connection.	Section 3.8 / Page 18
17		Mounting hole for RS-232 module.	Section 6.1 / Page 23

Num- ber	Name	Description	Details
18	S20		Section 2.2.2 / Page 11
19	X10		Section 3.9 / Page 17
20	V20	Memory Switch	Section 4 / Page 21
21	X50	netX Ethernet Port	Section 3.10 / Page 19
22	J1	Boot mode configuration	Section 2.2.4 / Page 12
23	X2	USB	Section 3.11 / Page 19
24		Mounting hole for fieldbus module.	Section 6.1 / Page 23
25	T1	Reset	Section 2.2.1 / Page 10
26	V1	SYS-LED	Section 4.1 / Page 21

Table 4: Designation in Device Drawing of NXHX 10-ETM

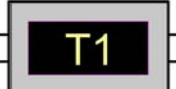## 2.2   Operating Elements

2.2.1   T1 - Reset Button

T1	Function
	A reset is done, when pushing the button.

Table 5: Reset Button T1

Number ㉕ in Figure 1 on page 9.

2.2.2 S20 – Memory-Switch

	Device Destruction!
NOTICE	▪ Hardware demage on the board or on the accessing hardware is possible with the concurrent use of Flash/SDRAM access of the board and dual-port memory access via X3.

USA:

	NOTICE
	Device Destruction!
	▪ Hardware demage on the board or on the accessing hardware is possible with the concurrent use of Flash/SDRAM access of the board and dual-port memory access via X3.

S20	**Function**
W 8 MEM DPM	MEM -> Flash/SDRAM is used , V20 is yellow on. → DPM access via X3 must not be used!
	DPM -> Dual-port memory access via X3 is possible.

Table 6: S20 - Memory-Switch

Number **18** Figure 1 on page 9.

2.2.3 S30 – DIL-Switch

S30	**Switch**	**netX 10 Signal**	**// to**	**Pin**
ON 1 2 3 4	1	MMIO04	X6	1
	2	MMIO05	X6	2
	3	MMIO06	X6	3
	4	MMIO07	X6	4

Table 7: S30 – DIL-Switch

Number **9** in Figure 1 on page 9.

2.2.4 J1 – Boot Jumper

J1	Boot Mode
	Serial, USB or UART
	Dual-port memory
	Extension Bus

Table 8: J1 – Boot Jumper

Number ㉒ in Figure 1 on page 9.

2.2.5 J50 – LEDs V50 and V51

| J50	Function
	Jumper shall not be set if fieldbus modules on X5 are used. Otherwise the signaling is misleading.
	Connects the diodes V50 and V51 to +3V3. Allows the signaling of Real-time Ethernet protocols at V50 and V51.

Table 9: J50 - LEDs V50 and V51

Number ⑥ in Figure 1 on page 9.

3   Interfaces

3.1   X3 Host Interface Connector:

Number ① in Figure 1: NXHX 10-ETM Printed Circuit Board

X3	Pin	DPM	PAD Typ
	1	+3,3V	
	2	GND	
	3		
	4		
	5	GND	
	6		
	7	RSTINn	
	8		
	9		
	10		
	11	DPM_DIRQ	IOU6
	12	DPM_RDY	IOU6
	13	GND	
	14	DPM_RDn	IOU6
	15		
	16	DPM_WRn	IOU6
	17		
	18		
	19	DPM_BHEn / DPM_BE1n	IOU6
	20	GND	
	21		
	22		
	23		
	24	DPM_CSn	IOU6
	25	GND	
	26	DPM_A23	IOD6
	27	DPM_A22	IOD6
	28	DPM_A21	IOD6
	29	DPM_A20	IOD6
	30	DPM_A19	IOD6
	31	DPM_A18	IOD6
	32	DPM_A17	IOD6
	33	GND	
	34	DPM_A15	IOD6
	35	DPM_A14	IOD6
	36	DPM_A13	IOD6
	37	DPM_A12	IOD6
	38	DPM_A11	IOD6
	39	DPM_A10	IOD6
	40	DPM_A9	IOD6
	41	DPM_A8	IOD6
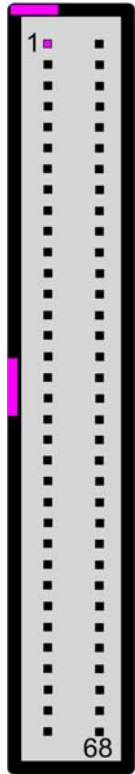
X3	Pin	DPM	PAD Typ
	42	DPM_A7	IOD6
	43	DPM_A6	IOD6
	44	DPM_A5	IOD6
	45	DPM_A4	IOD6
	46	DPM_A3	IOD6
	47	DPM_A2	IOD6
	48	DPM_A1	IOD6
	49	DPM_A0	IOD6
	50	GND	
	51	DPM_D15	IOD6
	52	DPM_D14	IOD6
	53	DPM_D13	IOD6
	54	DPM_D12	IOD6
	55	DPM_D11	IOD6
	56	DPM_D10	IOD6
	57	DPM_D9	IOD6
	58	DPM_D8	IOD6
	59	DPM_D7	IOD6
	60	DPM_D6	IOD6
	61	DPM_D5	IOD6
	62	DPM_D4	IOD6
	63	DPM_D3	IOD6
	64	DPM_D2	IOD6
	65	DPM_D1	IOD6
	66	DPM_D0	IOD6
	67	+3,3V	
	68	DPM_ A16	

Table 10: Pin Assignment X3

The NXPCA-PCI Adapter can be connected at X3.
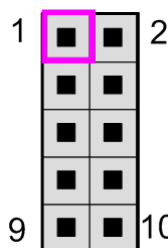
3.2   X5 - Fieldbus Channel 0

X5	Pin	Signal-Name	// to	PAD Typ
	1	XM_TX / MMIO01	V50 red	
	2	XM_AX / MMIO00	V50 green	
	3	XM_IO0 / MMIO03	V51 red	
	4	XM_ECLK/IO / MMIO02	V51 green	
	5	GND		
	6	+3V3		
	7	MMIO18		IOUS6
	8	MMIO19		IOUS6
	9	AIF_RESn		
	10	-		

Table 11: Pin Assignment X5

Number ② in Figure 1 on page 9.

3.3   X6 - MMIO/PWM
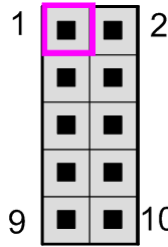
X6	Pin	Signal-Name	// to	PAD Typ
	1	MMIO04	S30,1	IODS6
	2	MMIO05	S30,2	IODS6
	3	MMIO06	S30,3	IODS6
	4	MMIO07	S30,4	IODS6
	5	+ 3V3		
	6	GND		
	7	MMIO08	V12 LED	IODS6
	8	MMIO09	V13 LED	IODS6
	9	MMIO10	V14 LED	IOUS6
	10	MMIO11	V15 LED	IOUS6

Table 12: Pin Assignment X6

Number ③ in Figure 1 on page 9.

3.4   X9 - ETM Connector

→ **Note:** Read and follow the note in section *Using external Debuggers* on page 22 when using connector X9.

Number ⑦ in Figure 1 on page 9.

X9	Pin	Signal Name	ETM9
	1	-	
	2	-	
	3	-	
	4	-	
	5	GND	
	6	MEM_A14	TRACECLK
	7	MEM_A13	DBGRQ
	8	MEM_A16	
	9	PORn	SRSTN
	10	-	
	11	JT_TDO	TDO
	12	+3V3	
	13	-	
	14	+3V3	
	15	JT_TCK	TCK
	16	MEM_D7	TRACEPKT7
	17	JT_TMS	TMS
	18	MEM_D6	TRACEPKT6
	19	JT_TDI	TDI
	20	MEM_D5	TRACEPKT5
	21	JT_TRSTN	TRSTN
	22	MEM_D4	TRACEPKT4
	23	MEM_D15	TRACEPKT15
	24	MEM_A12	TRACEPKT3
	25	MEM_D14	TRACEPKT14
	26	MEM_A12	TRACEPKT2
	27	MEM_D13	TRACEPKT13
	28	MEM_A10	TRACEPKT1
	29	MEM_D12	TRACEPKT12
	30	MEM_A9	TRACEPKT0
	31	MEM_D3	TRACEPKT11
	32	MEM_A15	TRACESYNC
	33	MEM_D2	TRACEPKT10
	34	MEM_A8	PIPESTAT2
	35	MEM_D1	TRACEPKT9
	36	MEM_A7	PIPESTAT1
	37	MEM_D0	TRACEPKT8
	38	MEM_A6	PIPESTAT0
	39	GND	
	40	GND	
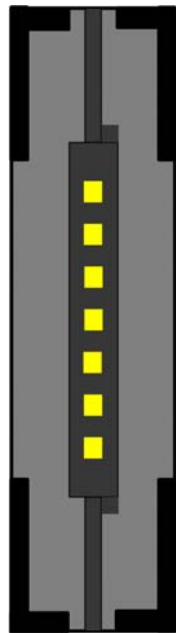
X9	Pin	Signal Name	ETM9
	41	GND	
	42	GND	
	43	GND	

Table 13: X9 - ETM, MICTOR Vertical Connector

3.5 X7 - UART0
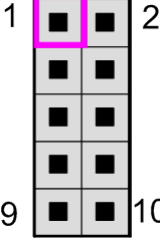
X7	Pin	Signal-Name	PAD Typ
	1	MMIO21 (TXD0)	IOUS6 (5k pu)
	2	MMIO20 (RXD0)	IOUS6 (5k pu)
	3	MMIO13 (RTS0)	IOUS6
	4	MMIO12 (CTS0)	IOUS6
	5	GND	
	6	+3V3	
	7	-	
	8	-	
	9	-	
	10	MMIO14	IOUS6

Table 14: Pin Assignment X6

Number **8** in Figure 1 on page 9.

3.6 X4 - SD Card Slot
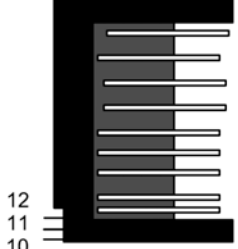
X4	Pin	Signal-Name	PAD Typ
	1	SPI_CSTn	IOUS6
	2	SPII_MOSI	IOD6
	3	GND	
	4	+3V3	
	5	SPI_CLK	IOD6
	6	GND	
	7	SPI_MISO	IOD6
	8	-	
	9	-	
	10	-	
	11	+3V3	
	12	MMC_INS	IOUS6

Table 15: X4 SD Card Slot

Number **14** in Figure 1 on page 9.

Note: The maximum size of the SD or MMC card is 4 GB. The card has to be FAT 16 formatted. The card has to support the SPI legacy mode.

3.7 X8 - USB Port for Development PC
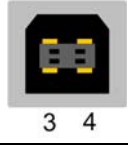
X8	Pin	Signal-Name
2 1	1	VUSB
	2	USBDM
	3	USBDP
3 4	4	GND

Table 16: Pin Assignment X6

Number ⑮ in Figure 1 on page 9.

Note: Read and follow the note in section *Using external Debuggers* on page 22 when using connector X8.

3.8 X100 - Power Supply Jack

The NXHX 10-ETM development board has to be supplied by DC. VIN is from 18 V to 30 V. The typical supply voltage is 24 V. Power consumption is approx. 2.6 W.
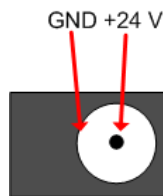
Pin	Description
1	GND Ground
2	VIN 18 - 30 V DC

Number ⑯ in Figure 1 on page 9.

The connection for the power supply is suitable for the power supply **NXAC-Power**.

3.9 X10 - AD-Converter Inputs
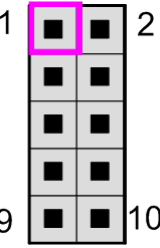
X10	Pin	Signal-Name	Description
	1	AD0_IN0	AD-Converter 0 Input 0
	2	AD0_IN1	AD-Converter 0 Input 1
	3	AD0_IN2	AD-Converter 0 Input 2
	4	AD0_IN3	AD-Converter 0 Input 3
	5	GND	Ground
	6	AD_VREFP	+3V3, reference voltage
	7	AD1_IN0	AD-Converter 1 Input 0
	8	AD1_IN1	AD-Converter 1 Input 1
	9	AD1_IN2	AD-Converter 1 Input 2
	10	AD1_IN3	AD-Converter 1 Input 3

Table 17: Pin Assignment X6

Number ⑲ in Figure 1 on page 9.

3.10 X50 - Ethernet Port

Ethernet on RJ45 Pin Assignment
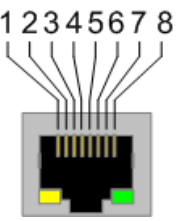
Ethernet	Pin	Signal	Description
1 2 3 4 5 6 7 8 RJ45 socket, female	1	TX+	Transmit data positive
	2	TX–	Transmit data negative
	3	RX+	Receive data positive
	4	Term 1	Connected and terminated to PE via RC combination*
	5	Term 1	
	6	RX–	Receive data negative
	7	Term 2	Connected and terminated to PE via RC combination*
	8	Term 2	
			* Bob Smith Termination

Table 18: Ethernet RJ45 Pin Assignment

Number ㉑ in Figure 1 on page 9.

3.11 X2 - netX USB Device Port
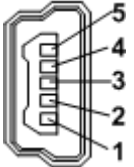
USB Socket	Pin	Signal	Description
5 4 3 2 1	1		
	2	D-	Data -
	3	D+	Data +
	4	ID	
	5	GND	Ground

Table 19: Pin Assignment Mini-B USB Connector (5-pin)

Number ㉓ in Figure 1 on page 9.

3.12 PAD Type Explanation for netX10

Symbol	Description
I	Input
O	Output
Z	Output is tristateable or open drain
S	Input provides Schmitt trigger
U	Internal pull-up 50 k (MMIO20-23: pull-up 5k)
D	Internal pull-down 50 k
6	Output buffer can source / sink 6 mA
9	Output buffer can source / sink 9 mA
XTAL	Crystal input or output
USB	USB pad
PHY	PHY pad
ANA	Analog pin
PWR	1.5 V (Core) or 3.3 V (I/O)
GND	Digital Ground (0 V)
APWR	Analog power (1.5V or 3.3V)
AGND	Analog ground (0 V)

Table 20: PAD Type Explanation

4 LEDs

	LED Naming in the Device Drawing	LED Name	Color	Signal Name
26	**V1** 🟡🟢 (yellow / green)	**SYS** System Status	🟢 (green)	RDY
			🟡 (yellow)	RUN
4	**V50** (🔴🟢 (red / green)	**COM0** Communication status	🟢 (green)	MMIO00
			🔴 (red)	MMIO01
5	**V51** 🔴🟢 (red / green)	**COM1**	🟢 (green)	MMIO02
			🔴 (red)	MMIO03
13	**V12** 🟡 (yellow)		🟡 (yellow)	MMIO08
12	**V13** 🟡 (yellow)		🟡 (yellow)	MMIO09
11	**V14** 🟡 (yellow)		🟡 (yellow)	MMIO10
10	**V15** 🟡 (yellow)		🟡 (yellow)	MMIO11
20	**V20** 🟡 (yellow)	**Signals position MEM of S20**	**Do not use X3 at the same time!**	

4.1 LED V1 SYS

The following table describes the meaning of the system LED.

LED	Color	State	Meaning
SYS	**Duo LED yellow/green**		
	🟢 (green)	On	Operating System running
	🟢🟡 (green/yellow)	Blinking green/yellow	Bootloader is waiting for firmware
	🟡 (yellow)	Blinking	Heavy system error: PLC in stop.
	🟡 (yellow)	static	Bootloader is waiting for software
	-	Off	Power supply for the device is missing or hardware defect.

Table 21: System LED

Number 26 in Figure 1 on page 9.

5   Using external Debuggers

Instead of using the onboard debugger of the NXHX 10-ETM along with the HiTOP software, an external debugger with either ETM or JTAG interface can be connected to the NXHX 10-ETM. If an ETM debugger is used, simply connect the debugger to the ETM connector (X9) of the NXHX 10-ETM. If a JTAG debugger is used, connect the ETM-to-JTAG adapter (NXAC-JTAG-ETM) that came with your NXHX 10-ETM board to the ETM connector and then connect your JTAG debugger to the 20 pin shrouded header as shown below.

NOTICE

Hardware Damage!

Only one debugger, **either** the onboard unit **or** an external debugger may be active at a time, otherwise the debugger signals may drive against each other, which may result in damage of the onboard debugger and / or the external debugger!

When using an external debugger, the USB port for the Development PC (X8) must not be connected! Further, any adapter board (e.g. RS-232) must be removed from X7.

When using the onboard debugger, an external debugger must not be connected to the ETM connector (X9)!
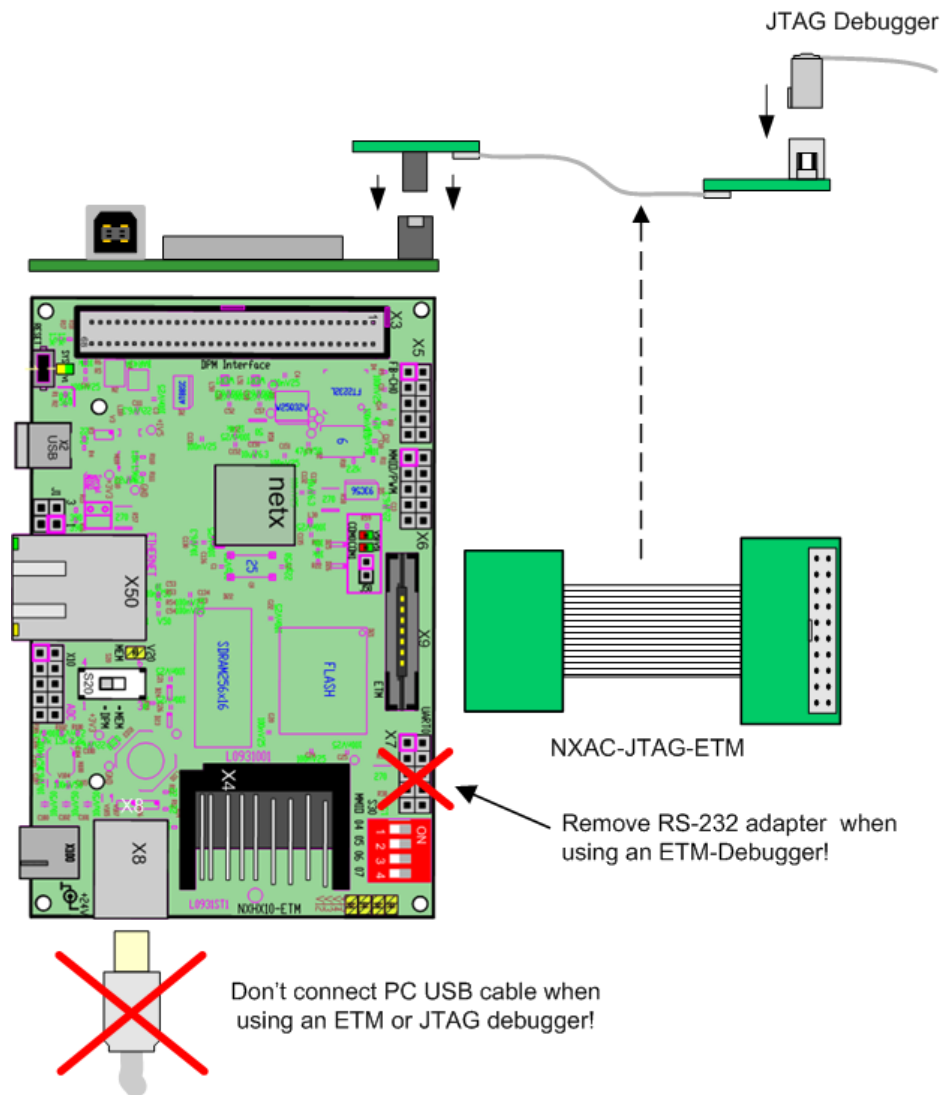

Figure 2: NXHX 10-ETM with JTAG-ETM Adapter
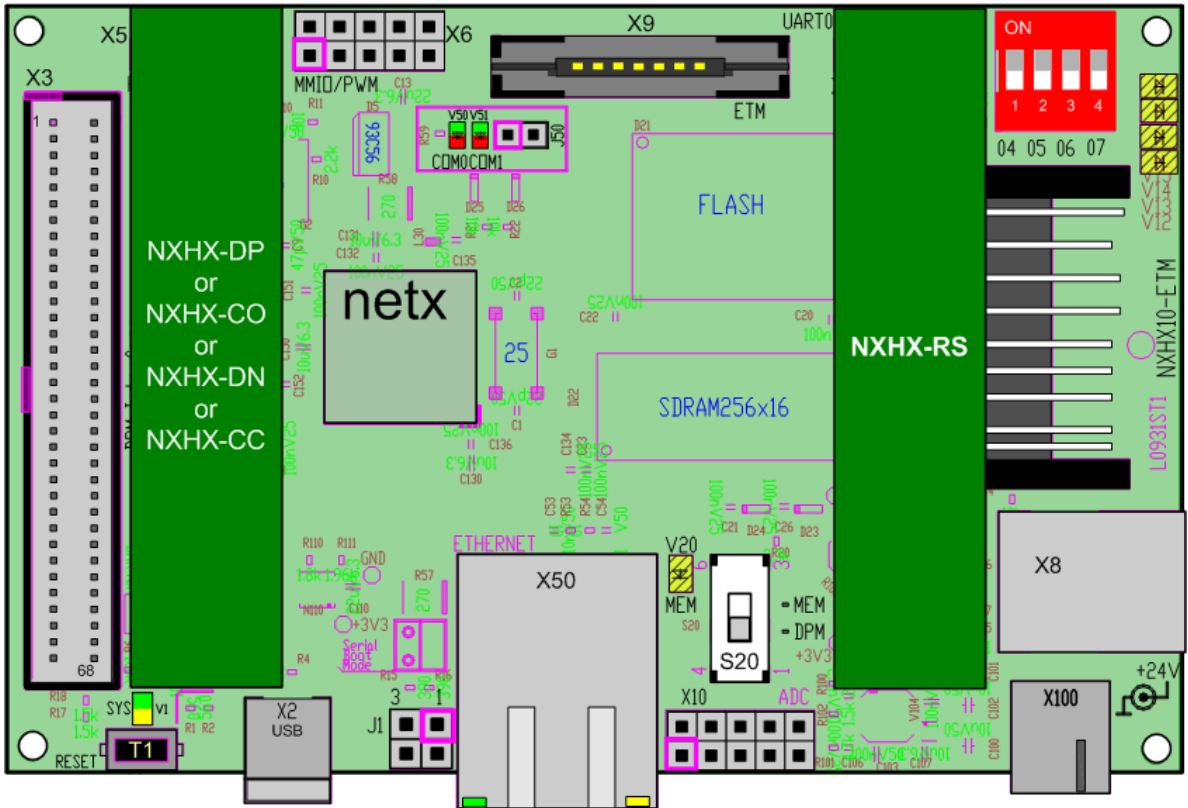
6   Accessories

6.1   Fieldbus Adapters

Figure 3: NXHX 10-ETM with possible Field-Bus-Modules

Fieldbus Interface with Duo Status LED
(Ready / Error) for NXHX Boards.

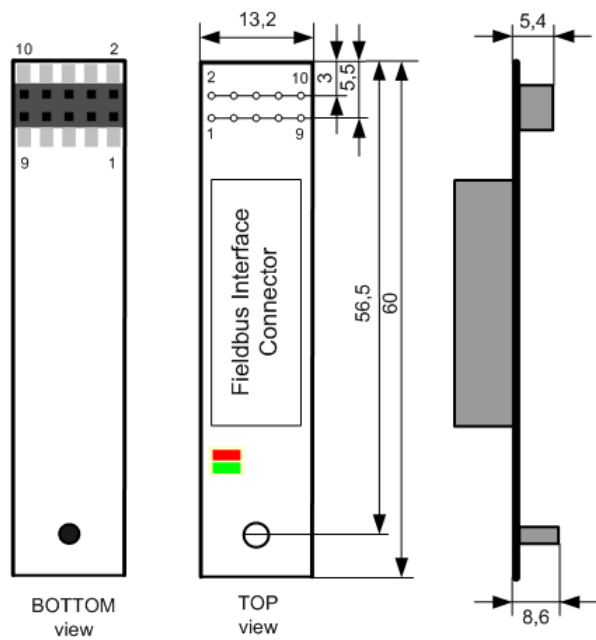| Pin	Signal	Pin	Signal
1	XMAC TX	6	+3,3V
2	XMAC RX	7	PIO 4
3	XMAC IO 0	8	PIO 5
4	XMAC IO 1	9	RSTOUT
5	GND	10	n.c.

Connector to NXHX Board.

Figure 4: Fieldbus Connector (Dimensions in mm)

6.1.1   NXHX-DP

Fieldbus Interface PROFIBUS (RS-485)

Connector: D-Sub DE-9 female

Interface not isolated

Order Number: 7923.410

Pin	Signal	Pin	Signal
1	n.c.	6	n.c.
2	n.c.	7	n.c.
3	TXD/RXD-P	8	TXD/RXD-N
4	n.c.	9	n.c.
5	GND		

6.1.2   NXHX-CO

Fieldbus Interface CAN

Connector: D-Sub DE-9 male

Interface not isolated

Order Number: 7923.500

Pin	Signal	Pin	Signal
1	n.c.	6	n.c.
2	CAN-L	7	CAN-H
3	DGND	8	nc.
4	n.c.	9	n.c.
5	n.c.		

6.1.3   NXHX-DN

Fieldbus Interface DeviceNet

Connector: Combicon MSTBA 2,5

Interface not isolated

Order Number: 7923.510

Pin	Signal
1	DGND
2	CAN-L
3	n.c.
4	CAN-H
5	DN V+

6.1.4   NXHX-RS

Interface RS232

Connector: D-Sub DE-9 male

Interface not isolated

Order Number: 7923.010

Pin	Signal	Pin	Signal
1	n.c.	6	n.c.
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	n.c.
5	GND		

6.1.5   NXHX-CC

Fieldbus Interface CC-Link:

Connector: Combicon MSTBA 2,5

Interface not isolated

Order Number: 7923.740

Pin	Signal
1	DA
2	DB
3	DG
4	SLD
5	FG

6.2 NXAC-Power

Power Supply for NXHX Boards
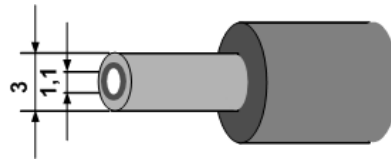
Technical Data:

Input: 100-240V ~0,4A (47-63Hz)

Output: 24V / 0,625mA

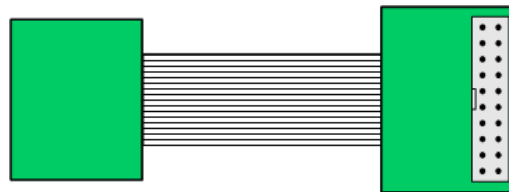Cable: 1,8 m

Order Number: 7930.000

with barrel connector

sizes in mm

6.3 NXAC-JTAG-ETM

ETM-to-JTAG adapter

Order Number: 2400.200

7 Technical Data

7.1 NXHX 10-ETM

Item	NXHX 10-ETM
Supply Voltage	24V DC
Processor	netX 10
Memory	Working memory: 256 KByte SDRAM
	16 MByte serial Flash
LED	SYS, V1; COM0, V50; COM1, V51; V20; V12;V13;V14;V15
Operating Elements	Reset push-button, Memory-Switch
Memory Card	SD/MMC max. 4GB, FAT16 formatted
USB Mini-B	configuration / diagnostic
USB Typ B	Development PC connection
RJ45	Ethernet
Dimensions (L x W x D)	100 x 69 x 20 mm
Operating Temperature	0 … 55 °C

Table 22: Technical Data NXHX 10-ETM

Input / Output	Min.	Typ.	Max.	Unit
Analog Inut AI		0…AD_VREFP		V
ADC_VREFP	3,0	3,3	3,6	V
ADC_I_{VDDIO}	0,3	0,6	1,2	mA
Binary Input DI				
V_{IH}	2,0	3,3	3,6	V
V_{IL}	0		0,8	V
Ili			10	µA
Binary Output DO	Notice! Outputs are not overload protected.			
V_{OH}	2,4		3,3-0,1	V
I_{OH}			18	mA

Table 23: Technical Data NXHX 10-ETM, Local I/O Signals at Connector X1

Technical data of the input and output are described in detail in the „netX10 Technical Data Reference Guide".

8 Appendix

8.1 List of Figures

8.2 List of Tables

8.3   Glossary

DP

Decentral periphery

DPM

Dual-port memory

netX

networX on chip, next generation of communication controllers

8.4   Contacts

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