

PCIe-BASE



bmc messsysteme gmbh

PCIe-Multifunction Measuring Card for MAD/MDA/MDIO/MCAN Modules

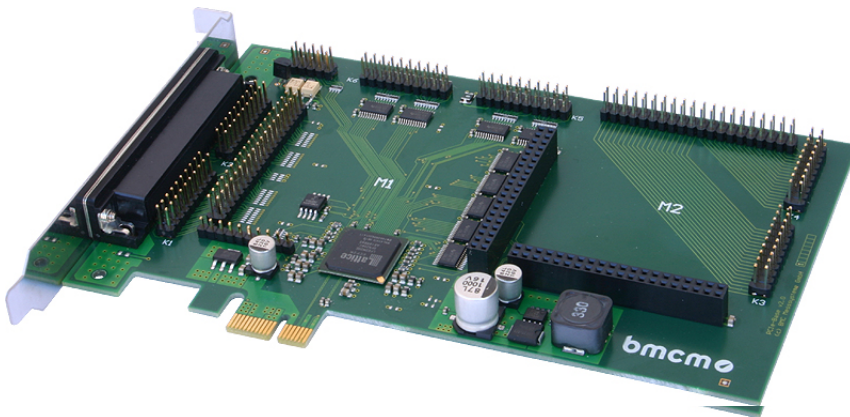
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Features

- 2 slots for plug-on modules (series: MAD, MDA, MDIO, MCAN) => up to 32 analog channels
- FIFO for fast data acquisition
- PCIe bus compatible (PCIe x1)
- 32 digital channels (2x 16 bit)

Applications

- acquisition of analog signals
- analog controls
- acquisition of digital events
- digital controls
- use in the automotive field



PCI-Express (Peripheral Component Interconnect Express) is an extremely powerful PC interface, which will replace the previous "PCI" bus interface in the log run. With the **PCIe-BASE**, BMC Messsysteme GmbH introduces a

... multi-function data acquisition card ...

for the PCIe interface staying abreast of these changes. Designed in

... "PCIe x1" format ...

the **PCIe-BASE** can be installed in any PCIe slot.

Like the previous model *PCI-BASE1000*, the **PCIe-BASE** captivates with a highly integrated and modular concept at an unbeatable price, which allows the user to tackle any measuring task by choosing suitable

... plug-on modules ...

and assembling his individual measuring card.

With the analog input modules of the MAD series, for example, up to

... 32 analog inputs ...

with 12 or 16 bit resolution are available and total sampling rates of

... max. 1 MHz ...

can be reached. Combined with a CAN interface module, analog measurements and via the CAN interface are sampled time synchronously.

The recorded data can be displayed and stored simultaneously to hard disk.

The switch-over from one measuring range to another is defined for each channel separately and does not influence the sampling rate.

... 32 digital channels ...

are available on the **PCIe-BASE** plate so that the base plate without

any analog modules itself represents a digital I/O card.

Additional digital channels with galvanic isolation are provided by the modules of the MDIO series.

Included as accessory is the hardware independent ActiveX control **LibadX** for programming under Windows® 2000/XP/Vista.

In addition, the **PCIe-BASE** can be used under Windows® 2000/XP/Vista together with the powerful software for acquisition and processing of measuring data

... NextView® 4.4 ...

It is available as "Professional", "Lite" or "Client/Server" version. The free version **NextView® 4.4 Live!** is included with delivery.

With **NextView® 4.4 Live!**, the entire functional range of the **PCIe-BASE** can be tested.

In order to access the analog inputs 17..32, a PC card bracket with an additional 37-pole Sub-D female connector plus connecting cable (*ZUKA16*) is available as accessory.

For further information and software updates, please visit our website at:

<http://www.bmcm.de>

1 Module concept

1.1 Overview

The following PCB view shows the module slots M1 and M2, which can be assembled with analog data acquisition modules (MAD series), analog control modules (MDA series), digital I/O modules (MDIO series) or a CAN interface module (MCAN). They can be used in any combination.

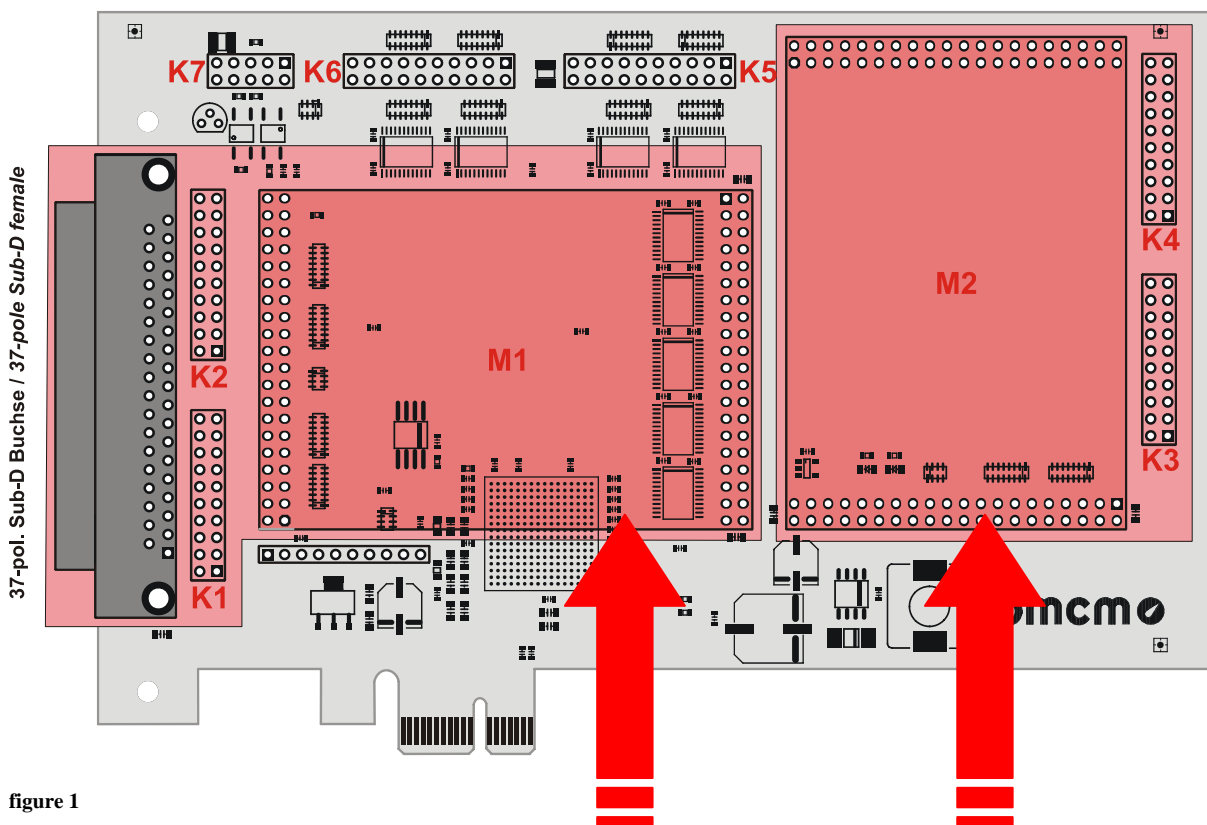


figure 1



- ▶ **MAD16f**
16 AIn, 500kHz, 16 bit
- ▶ **MAD16a**
16 AIn, 100kHz, 16 bit
- ▶ **MAD12a**
16 AIn, 100kHz, 12 bit



- ▶ **MDA16**
2 AOut, 10µs, 16 bit
- ▶ **MDA16-4i**
4 AOut (isol.), 10µs, 16 bit
- ▶ **MDA12**
2 AOut, 10µs, 12 bit
- ▶ **MDA12-4**
4 AOut, 10µs, 12 bit



- ▶ **MDIO**
32 Digital I/O
counter function
- ▶ **MDIOi**
16 DIn (isolated),
16 DOut (isolated),
counter function



- ▶ **MCAN**
2 CAN (isolated),
max. 1Mbit

1.2 Connection cable ZUKA16

Via a flat ribbon cable, the optionally available connection cable *ZUKA16* leads out the channels provided at two 20-pole pin connectors each to a 37-pole Sub-D female connector with bracket, which is mounted at a free PC slot.

With the *ZUKA16*, the channels provided by module slot M2 (see chapter 1.3) and the digital lines of the **PCIe-BASE** (see chapter 2) can be reached externally.

The line of the flat ribbon cable leading to pin 1 of the Sub-D37 is colored.



1.3 Module slots M1 and M2

The channels of the module slot M1 are available at the 37-pole Sub-D connector as well as at the pin connectors K1, K2.

The connections of the second module slot M2 are accessible at the pin connectors K3, K4.

With the optional accessory *ZUKA16* (see chapter 1.2), the channels of the module slot M2 are lead out to an additional 37-pole Sub-D female connector (connect line 1 (colored) of *ZUKA16* with pin 1 of the pin connector K3 (square pad), attach 2. connector in parallel to K4).

The figure below shows the pin assignment of the module slots M1 and M2 of the **PCIe-BASE**:

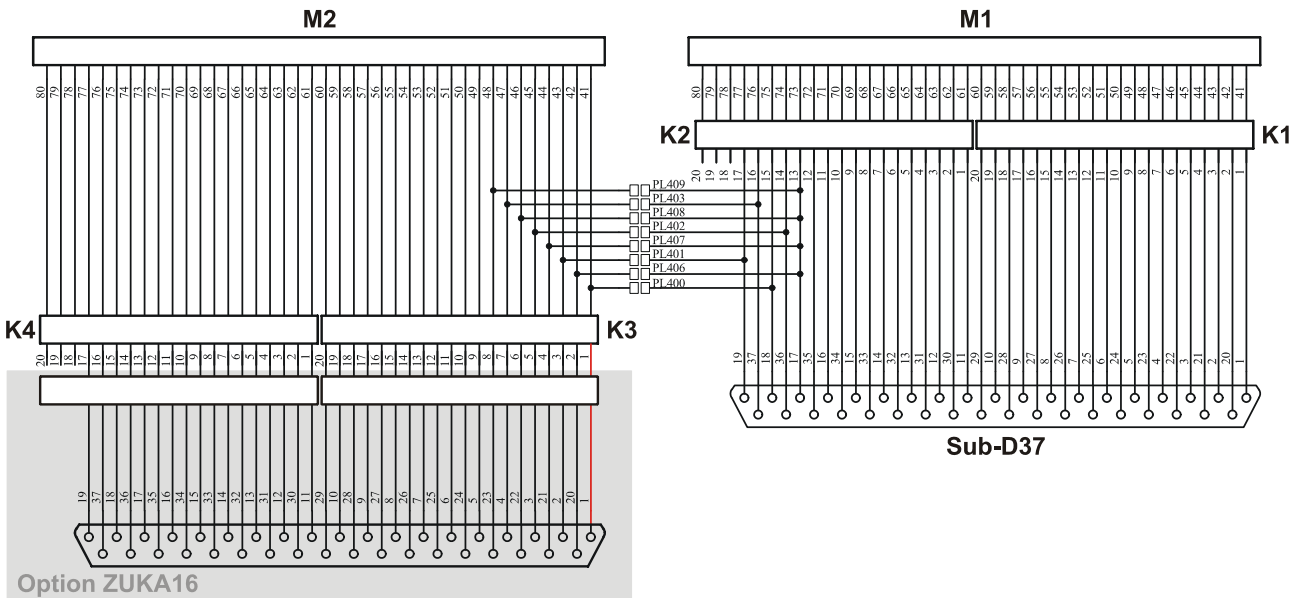
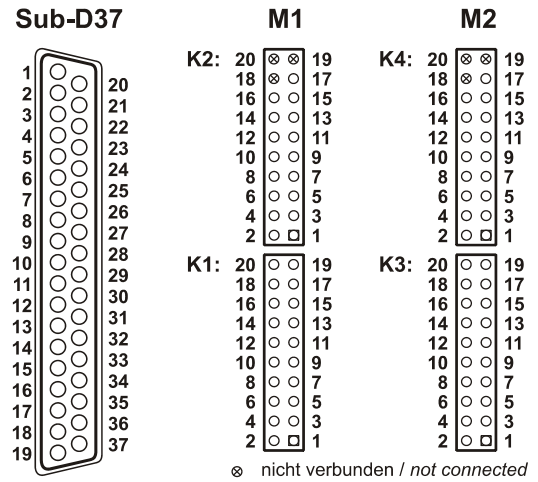
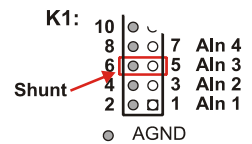


Figure 2

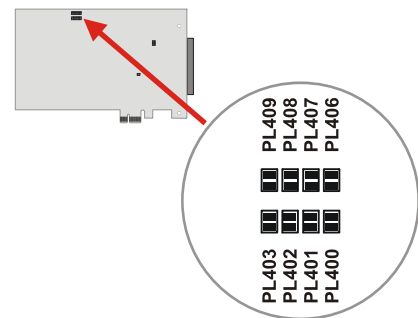
1.3.1. Current measurement

Analog input modules (MAD) installed on module slot M1 can be also used for current measurement. To install current shunts (e.g. *ZU-CS250R*) at the 20-pole pin connectors K1 and K2, connect the pin of the relating analog input with the opposite ground pin by a resistor (current shunt).



1.3.2. Lead connections from M2 to Sub-D37

By closing the solder bridges PL400-403 and PL406-409 on the bottom side of the **PCIe-BASE** board, the first four channels of an analog module (MAD or MDA series) mounted on slot M2 are led out to the free pins of the 37-pole Sub-D female to be available from the outside.



Line M2	Close solder bridge	MAD (se)	MDA 12/16	MDA 12-4/16-4i	Pin K2	Sub-D37 connector
41	400	AIn 1	AOut1	AOut1	15	18
43	401	AIn 2	AOut2	AOut2	17	19
45	402	AIn 3	-	AOut3	14	36
47	403	AIn 4	-	AOut4	16	37
42, 44, 46, 48	406, 407, 408, 409	AGND	AGND		13	17



- Channels of MCAN and MDIO modules cannot be reached in that way at the Sub-D37 female connector!
- If the PCIe-BASE is used together with an MDIO module, all solder bridges must be open to guarantee proper functioning and avoid damage of the module.
- Only analog inputs connected in single-ended mode can be led out.
- The ground pin for the analog channels of the M2 module slot is only available at pin 17 of the Sub-D37.

1.4 Pin assignments of the module slots

Analog inputs of a MAD module can be operated both in single-ended (se) and differential (diff.) mode.

MODULE SLOT M1		DATA ACQUISITION and CONTROL MODULES							MODULE SLOT M2	
Sub-D37 (PCI-BASE)	Plug / Pin	MAD (se)	MAD (diff.)	MDA 12/16	MDA 12-4/16-4i	MDIO (Port/Line)	MDIOi	MCAN	Sub-D37 (ZUKA16)	Plug / Pin
1	K1 / 1	AIn 1	+ AIn 1	AOut 1	AOut 1	B/1	DOut 1	-	1	K3 / 1
2	K1 / 3	AIn 2	+ AIn 2	AOut 2	AOut 2	B/3	DOut 3	CAN1 L	2	K3 / 3
3	K1 / 5	AIn 3	+ AIn 3	-	AOut 3	B/5	DOut 5	CAN1 GND	3	K3 / 5
4	K1 / 7	AIn 4	+ AIn 4	-	AOut 4	B/7	DOut 7	-	4	K3 / 7
5	K1 / 9	AIn 5	+ AIn 5	-	-	B/9	DOut 9	-	5	K3 / 9
6	K1 / 11	AIn 6	+ AIn 6	-	-	B/11	DOut 11	-	6	K3 / 11
7	K1 / 13	AIn 7	+ AIn 7	-	-	B/13	DOut 13	CAN2 H	7	K3 / 13
8	K1 / 15	AIn 8	+ AIn 8	-	-	B/15	DOut 15	-	8	K3 / 15
9	K1 / 17	AIn 9	- AIn 1	-	-	5V	-	CAN2 5V	9	K3 / 17
10	K1 / 19	AIn 10	- AIn 2	-	-	DGND	DGND	-	10	K3 / 19
11	K2 / 1	AIn 11	- AIn 3	-	-	A/1	DIn 1	-	11	K4 / 1
12	K2 / 3	AIn 12	- AIn 4	-	-	A/3	DIn 3	-	12	K4 / 3
13	K2 / 5	AIn 13	- AIn 5	-	-	A/5	DIn 5	-	13	K4 / 5
14	K2 / 7	AIn 14	- AIn 6	-	-	A/7	DIn 7	-	14	K4 / 7
15	K2 / 9	AIn 15	- AIn 7	-	-	A/9	DIn 9	-	15	K4 / 9
16	K2 / 11	AIn 16	- AIn 8	-	-	A/11	DIn 11	-	16	K4 / 11
17*	K2 / 13	-	-	-	-	A/13	DIn 13	-	17	K4 / 13
18*	K2 / 15	-	-	-	-	A/15	DIn 15	-	18	K4 / 15
19*	K2 / 17	-	-	-	-	DGND	DGND	-	19	K4 / 17
20	K1 / 2	AGND	-	AGND	AGND	B/2	DOut 2	-	20	K3 / 2
21	K1 / 4	AGND	-	AGND	AGND	B/4	DOut 4	CAN1 H	21	K3 / 4
22	K1 / 6	AGND	-	-	AGND	B/6	DOut 6	-	22	K3 / 6
23	K1 / 8	AGND	-	-	AGND	B/8	DOut 8	CAN1 5V	23	K3 / 8
24	K1 / 10	AGND	-	-	-	B/10	DOut 10	-	24	K3 / 10
25	K1 / 12	AGND	-	-	-	B/12	DOut 12	CAN2 L	25	K3 / 12
26	K1 / 14	AGND	-	-	-	B/14	DOut 14	CAN2 GND	26	K3 / 14
27	K1 / 16	AGND	-	-	-	B/16	DOut 16	-	27	K3 / 16
28	K1 / 18	AGND	-	-	-	5V	-	-	28	K3 / 18
29	K1 / 20	AGND	-	-	-	DGND	DGND	-	29	K3 / 20
30	K2 / 2	AGND	-	-	-	A/2	DIn 2	-	30	K4 / 2
31	K2 / 4	AGND	-	-	-	A/4	DIn 4	-	31	K4 / 4
32	K2 / 6	AGND	-	-	-	A/6	DIn 6	-	32	K4 / 6
33	K2 / 8	AGND	-	-	-	A/8	DIn 8	-	33	K4 / 8
34	K2 / 10	AGND	-	-	-	A/10	DIn 10	-	34	K4 / 10
35	K2 / 12	AGND	-	-	-	A/12	DIn 12	-	35	K4 / 12
36*	K2 / 14	-	-	-	-	A/14	DIn 14	-	36	K4 / 14
37*	K2 / 16	-	-	-	-	A/16	DIn 16	-	37	K4 / 16

* different assignment if analog channels of the 2nd module slot are lead through (see chapter 1.3.2)

2 Digital channels

The **PCIe-BASE** features two 16-bit digital ports with 16 input or output lines each. The direction of the digital interface can be changed. The connections for the digital inputs and outputs are designed as two 20-pole connectors (male) on the board (see figure 1).

- Pin connector K6 => digital port A, line 1..16
- Pin connector K5 => digital port B, line 1..16

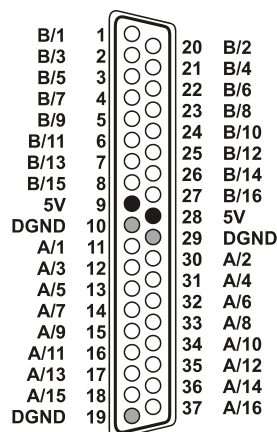


- **The digital inputs and outputs are protected by serial resistors!**
- **At PC start, port A is set to input, port B to output.**

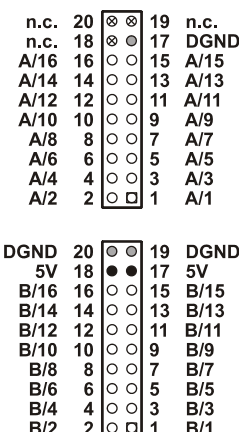
With the optional accessory *ZUKA16* (see chapter 1.2), the digital channels are lead out to an additional 37-pole Sub-D female connector (connect line 1 (colored) of *ZUKA16* with pin 1 of the pin connector K5 (square pad), attach 2. connector in parallel to K6).

The figure on the right shows the connection of the pin connectors K5, K6 with the 37-pole Sub-D connector using a *ZUKA16*.

ZUKA16 (Sub-D37)

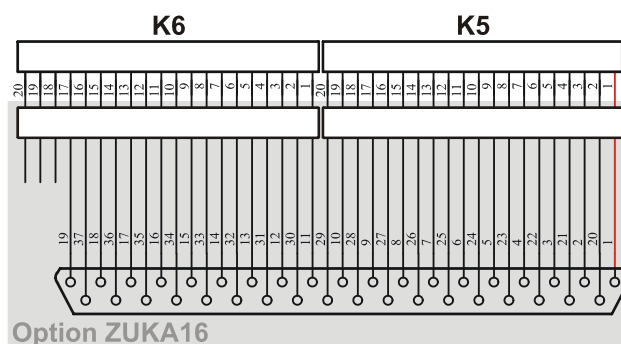


K6



- 5V Hilfsspannung / 5V auxiliary voltage
- digitale Masse / digital ground
- ⊗ nicht verbunden / not connected

K5



2.1 5V Auxiliary voltage

The **PCIe-BASE** provides an auxiliary voltage (e.g. for sensor supply) at pin 17, 18 of the pin connector K5. The 5V DC output (100mA) is protected by a fuse (multifuse). In case of overload, it is sufficient to interrupt the power supply (turn off PC or disconnect the consumer load). After app. 1 min. the multifuse is regenerated.

2.2 Pin assignment

The following table shows the pin assignment of the pin connectors K5, K6 and of the 37-pole Sub-D female connector of the *ZUKA16*, which the digital lines are accessible at:

Port / Line	Sub-D 37 (ZUKA16)	Connector / Pin	Port / Line	Sub-D 37 (ZUKA16)	Connector / Pin	Other connections	Sub-D 37 (ZUKA16)	Connector / Pin
B/1	1	K5 / 1	A/1	11	K6 / 1	5V	9	K5 / 17
B/2	20	K5 / 2	A/2	30	K6 / 2	5V	28	K5 / 18
B/3	2	K5 / 3	A/3	12	K6 / 3	DGND	10	K5 / 19
B/4	21	K5 / 4	A/4	31	K6 / 4	DGND	29	K5 / 20
B/5	3	K5 / 5	A/5	13	K6 / 5	DGND	19	K6 / 17
B/6	22	K5 / 6	A/6	32	K6 / 6	n. c.	-	K6 / 18
B/7	4	K5 / 7	A/7	14	K6 / 7	n. c.	-	K6 / 19
B/8	23	K5 / 8	A/8	33	K6 / 8	n. c.	-	K6 / 20
B/9	5	K5 / 9	A/9	15	K6 / 9			
B/10	24	K5 / 10	A/10	34	K6 / 10			
B/11	6	K5 / 11	A/11	16	K6 / 11			
B/12	25	K5 / 12	A/12	35	K6 / 12			
B/13	7	K5 / 13	A/13	17	K6 / 13			
B/14	26	K5 / 14	A/14	36	K6 / 14			
B/15	8	K5 / 15	A/15	18	K6 / 15			
B/16	27	K5 / 16	A/16	37	K6 / 16			

3 Software installation



All the software for Windows® 2000/XP/Vista and documentation available for the **PCIe-BASE** is integrated on the "Software Collection"-CD included with delivery. When inserting the CD, a CD starter opens automatically (otherwise: start **setup.exe**).



Change to the product page of the **PCIe-BASE** by selecting the entry "Products" in the CD starter and then the hardware ("PCIe-BASE") listed under the interface "PCIe".



For detailed information about installing or operating the software please see the corresponding manuals. To open the documentation in PDF format the Adobe Acrobat Reader is required.



You can run any installation directly from CD. If your browser prevents this first save the setup program to hard disc before running it separately afterwards.

Software	Software product	Notes	Documentation
Device driver	BMCM-DR (driver package)	1. install driver package to hard disc 2. Windows® Plug&Play installation	BMCM-DR-IG (driver installation manual)
Programming	STR-LIBADX	ActiveX control for hardware independent programming	STR-LIBADX-IG (installation / programming manual)
	STR-LIBADX-EX	example programs for LIBADX ActiveX control	-
Operating program	NV4-LIVE	free online version of NextView®4 for testing the functional range of the hardware	IG-NV4 (installation Stand-alone version) IG-NV4-CS (inst. Client/Server version)
	NV4	measuring software NextView®4 (requires license number, no freeware!)	UM-NV4 (user manual)
	NV4-SERV	Client/Server version of NV4 consisting of NextView®4 Server and NextView®4 Workstation	"First steps" in the NextView®4 demo project (displayed at first start of the software)
	NV4-WORK		

3.1 Driver installation



For the **PCIe-BASE** a driver installation is always required. Only then additional software can be installed. To make sure that the installation is done correctly, please follow the instructions in the order as described below.

3.1.1. Install driver package

The prior installation of the bmc driver package [BMCM-DR](#) to the hard disc of your PC makes the driver search for Windows® much easier. Especially in case of driver updates only the new driver package has to be installed, the hardware automatically uses the new version. The link to install the driver package is located on the **PCIe-BASE** product page of the "Software Collection"-CD.

3.1.2. Plug&Play installation

Mount the **PCIe-BASE** into a free PCIe card slot of the off-state PC. At the next start of the PCs the system announces the new hardware. Start the automatic hardware detection by selecting the following option:

- **Windows® XP:** "Install the software automatically" (SP2: do not connect with Windows® Update!)
- **Windows® 2000:** "Search for a suitable driver for my device"

Under Windows® Vista no selections have to be made. The driver is found and installed automatically upon connection of the hardware, because the driver package has been installed on hard disc before. For the same reason no additional location needs to be entered for the driver search under Windows® 2000.

3.1.3. Check installation

In the Windows® Device Manager the entry "Data Acquisition (BMC Messsysteme GmbH)" is included after successful installation displaying the installed bmc hardware. To open the Device Manager proceed as follows:

- **Windows® Vista:** Start / Control Panel / System / "Device Manager"
- **Windows® XP:** Start / Control Panel / System / TAB "Hardware" / button "Device Manager"
- **Windows® 2000:** Start / Settings / Control Panel / System / TAB "Hardware" / button "Device Manager"

Double click the **PCIe-BASE** to open its properties. For general information, any existing device conflicts and possible sources of error see TAB "General".

3.2 Programming

Programming the **PCIe-BASE** under Windows® 2000/XP/Vista with Visual Basic®, Delphi®, Visual C++™ is possible with the hardware independent [STR-LIBADX](#) ActiveX control or with the Libad4 SDK ([SDK-LIBAD](#)). They are available on the **PCIe-BASE** product page of the "Software Collection"-CD. After installation, the ActiveX control must be loaded into the respective programming environment.



- **Visual Basic®**: menu "Project / Components", entry "LIBADX Object Library 4.0"
- **Delphi®**: menu "Components / Import ActiveX", entry "LIBADX Object Library 4.0"

If you select the entry [STR-LIBADX-EX](#) listed directly under the installation program of the corresponding ActiveX control, you can install example programs (incl. source code) demonstrating how to apply the ActiveX control.

- **Using the 4 SDK requires advanced programming experience!**
- **An MCAN module on the data acquisition card can only be programmed with the Libad 4 SDK.**
- **All other modules on the PCIe-BASE can be addressed with the LibadX ActiveX control. However, both the counter function of the MDIO modules and the generator function of the MDA16-4i are only available with the Libad 4 SDK.**



3.3 Using the PCIe-BASE with NextView®4

Install the "Live!" version of the professional software NextView®4 for measurement data acquisition and processing to test the features and functions of the **PCIe-BASE** directly.



The setup program [NV4-LIVE](#) is available in the section "NextView® 4.4". Select your measuring system (**PCIe-BASE**) by pressing the button "Add" in the dialog "Device Setup" of the installation program.

When you open the software you get first instructions about how to operate the program. For detailed information an online help is provided.



With NextView®4.4 Live! signals cannot be stored. The full version NextView®4 is no freeware and requires a license number!

4 Important notes for using the PCIe-BASE

- The **PCIe-BASE** is only suitable for extra-low voltages - please observe the relevant regulations!
- The **PCIe-BASE** must only be used in closed PC housings (for reasons relating to EMC).
- All accessible pins are electrostatic sensitive devices. Provide for a conductive work place connected to ground.
- For CE reasons use well shielded cables, connect shield at one end only. Close open inputs, if possible. Close open inputs if necessary. ESD voltages at open lines may cause malfunction.
- The **PCIe-BASE** ground is electrically connected to the chassis of the PC, which is usually also connected to ground. Be sure to avoid ground loops since they will cause measuring errors!
- For cleaning use water and mild detergent only. The modules are designed to be maintenance-free.
- The device must not be used for safety-relevant tasks. With the use of the product the customer becomes manufacturer by law and is therefore fully responsible for the proper installation and use of the product. In the case of improper use and/or unauthorized interference our warranty ceases and any warranty claim is excluded.
- Improper installation of the modules on the **PCIe-BASE** may damage the modules and/or the **PCIe-BASE**. When removing the modules, use only blunt tools! Exposing the card to strong vibrations requires additional protection of the modules.
- If connecting internal ribbon cables to the **PCIe-BASE**, please observe that the modules are well ventilated to prevent excess heating. Also observe the temperature ranges of the PC.
- In case of overload, interrupt the power supply (turn off PC), so that the multifuse on the board is regenerated. After app. 1 min. the fuse is ready for use.



Do not dispose of the product in the domestic waste or at any waste collection places. It has to be either duly disposed according to the WEEE directive or can be returned to bmcm at your own expense.

5 Technical data PCIe-BASE (typical at 20°C and 5V supply)

• Sampling parameters (in connection with measuring and analysis software NextView®4)

Max. total sampling rate*:	dep. on the modules used, max. 1 MHz with 2x MAD16f
FIFO:	8kByte
Memory depth:	depending on the RAM or HD space available

* The total sampling rate is the sum of the sampling rates of the individual used channels (e.g. from 5 channels scanned with 10kHz results an total sampling rate of 50kHz).

• Digital input/outputs

Digital input channels:	16x TTL
Digital output channels:	16x TTL
Level:	CMOS/TTL-level (0 = 0.0V..0.5V; 1 > 2.6V..5.0V)
Digital IN R _i :	1MΩ
Digital IN surge resistant to:	20V DC, max. ±20mA in total of all input channels!
Digital OUT R _i // Output current:	1kΩ // 1mA

• Signal connection

Channels of the plug-on modules:	all channels are accessible at a 37-pole Sub-D female connector at the PC-card bracket, via pin connectors or with option ZUKA16 at an additional PC-bracket (Sub-D37)
Digital channels (of PCIe-BASE):	2x20-pole pin connectors on the board; with ZUKA16 (optional) accessible at a PC-bracket (Sub-D37)

• General data

Power supply:	+3,3V from PCIe bus, max. 500mA + power of the modules
Bus connection:	PCIe bus
CE standards:	EN61000-6-1, EN61000-6-3, EN61010-1; for decl. of conformity (PDF) visit www.bmcm.de
ElektroG // ear registration:	RoHS and WEEE compliant // WEEE Reg.-No. DE75472248
Max. permissible potentials:	60V DC acc. to VDE , max. 2kV ESD on the lines
Temperature ranges:	operating temp. -25°C..+50°C, storage temp. -25°C..+70°C
Relative humidity:	0-90% (not condensing)
Size:	with PC-card bracket: 174 x 111 x 16 mm ³
Delivery:	product, PC-bracket, "Software Collection" CD with drivers and documentation, description
Available accessories:	cable with PC-bracket for internal connection ZUKA16, 37-pole Sub-D plug ZUST37, connecting cables ZUKA37SB, ZUKA37SS, optocoupler board OI16-PC, connector panels ZU37BB/-CB/-CO, current shunt ZU-CS250R, modules of the series MAD/MDA/MDIO/MCAN
Guarantee:	2 years with effect from sales date, damages at product resulting from improper use excluded

• Software

Software on CD (included):	ActiveX Controls LibadX (hardware independent) for programming under Windows® 2000/XP/Vista; measuring program NextView®4.4 Live! to test and operate the hardware
NextView®4.4 (optional):	professional software (versions: Professional, Lite, Client/Server) for the acquisition and analysis of measurement data under Windows® 2000/XP/Vista

Manufacturer: BMC Messsysteme GmbH. Subject to change due to technical improvements. Errors and printing errors excepted. Rev. 2.0 05/19/2009