PC20TR

PC data acquisition card (ISA)

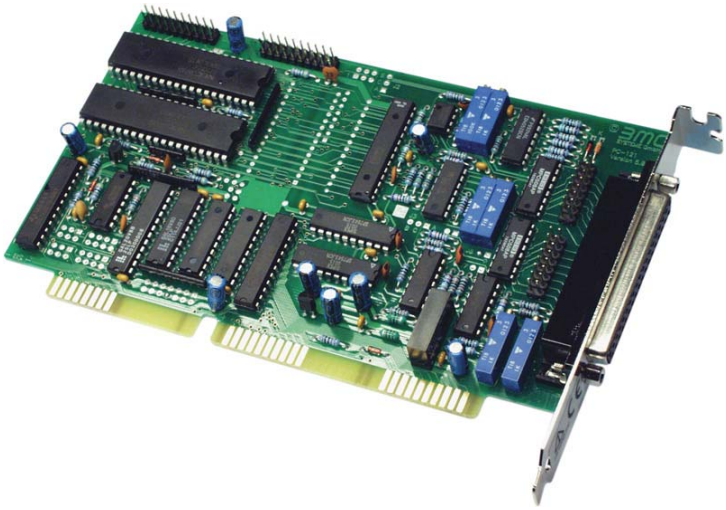
bmc messsysteme gmbh

Features

- 16 analog inputs (12 bit), ±10V, ±5V, ±2V, ±1V
- 2 analog outputs (12 bit), ±10V, ±5V
- 10µs converter rate
- 2 x 16-bit digital channels
- 16-bit ISA bus compatible
- programmable amplification

Applications

- acquisition of analog signals
- analog control
- acquisition of digital events
- digital control



The ISA interface card **PC20TR** is a data acquisition and control card with

... 16 analog input channels ...

with 12 bit accuracy. The programmable amplification allows to choose between the

... input voltages ±10V, ±5V, ±2V and ±1V ...

for each channel at maximum scanning speed.

Additionally provided are

... 2 analog outputs (12 bit) ...

with ±10V or ±5V output range.

The **PC20TR** features

... two digital channels (16 bit) ...

to control and record TTL signals. The direction of the digital lines can be changed in groups of eight.

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

In addition, the **PC20TR** can be used under Windows® 2000/XP/Vista together with our powerful software for acquisition and processing of measuring data

... NextView® 4 ... .

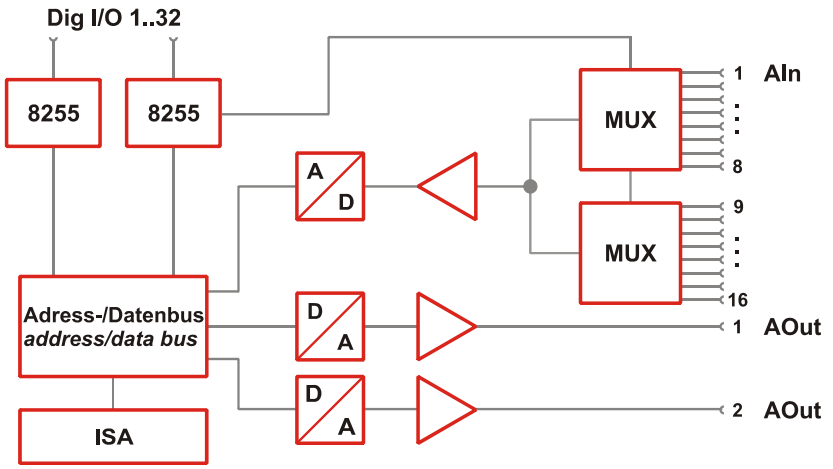
It is available as "Professional", "Lite" or "Client/Server" version. The free version **NextView® 4 Live!** is included with delivery.

With **NextView® 4 Live!**, the entire functional range of the **PC20TR** can be tested.

If using the **PC20TR** on MS-DOS, the driver **STR-DPC** and installation instructions are provided for basic programming of the card under MS-DOS with the programming languages Pascal and C. It can be downloaded from our website. See the file `liesmich.txt` for additional information.

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

http://www.bmcm.de



1 Mounting the PC20TR

Fix the included bracket to the **PC20TR** by means of the two hexagonal bolts. If using the digital lines, attach the optional connecting cable *ZUKA16* to the pin connectors P1 and P2 (connect channel 1 (colored line) of *ZUKA16* with pin 1 of the pin connector P1 (square pad), attach 2. connector to P2 in parallel) for the digital lines to be accessible from the outside at the 37-pole Sub-D socket of the *ZUKA16* bracket.

After removing a blank bracket (with *ZUKA16*: two), the **PC20TR** is plugged in a free slot of the standard ISA bus and the bracket(s) is fixed to the PC with screws.

- **To avoid damages at the card and the PC, turn off the PC before mounting the PC20TR!**
- **Install the software before mounting the PC20TR (see chapter 7), to be able to change the card settings if necessary.**

2 PCB view

The following PCB view shows the position of the solder bridges, connectors and potentiometers required, to change the hardware configuration of the card, for example, or to connect analog and digital signals.

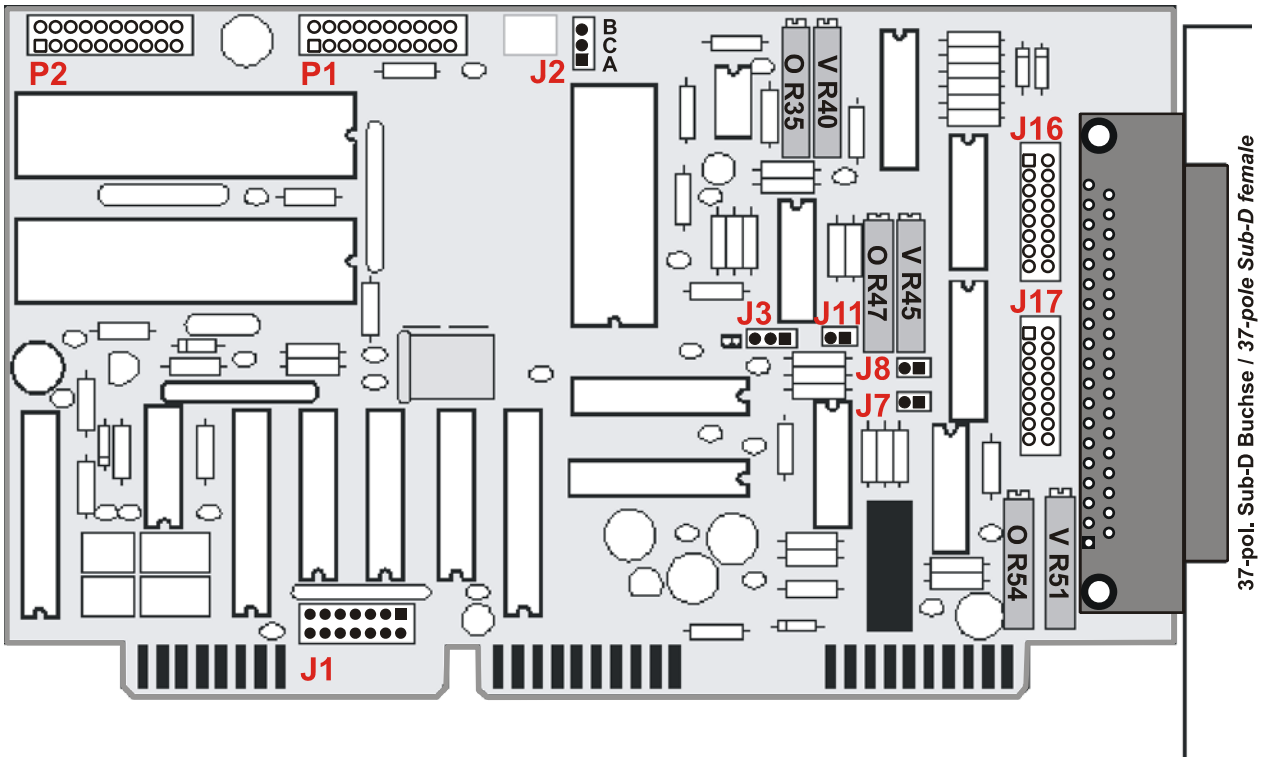


figure 1

Pin connector/solder bridge	Function	Potentiometer	Function
P1, P2	connection of Dig I/O 1..32	R40	gain AIn 1..16
J16, J17	internal connection of AIn 1..16	R35	offset AIn 1..16
J7	output range AOut 1	R45	gain AOut 1
J8	output range AOut 2	R47	offset AOut 1
J3, J11	single-ended / differential operation	R51	gain AOut 2
J1	configuration of I/O address	R54	offset AOut 1

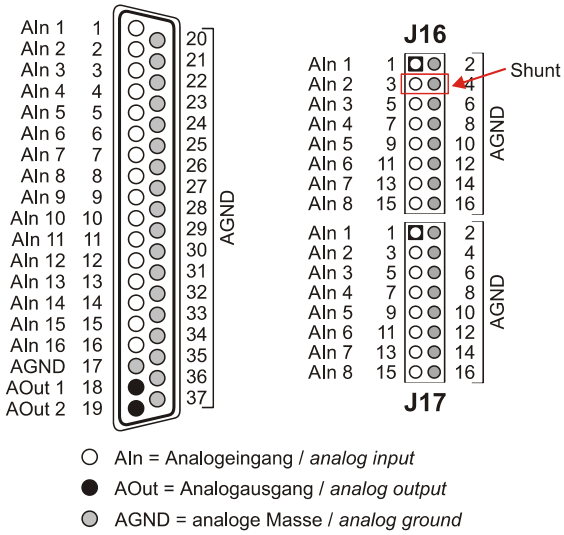
3 Analog channels

3.1 Connections and pin assignment

The 37-pin Sub-D connector at the card bracket is designated for the connection of the analog input and output channels.

In addition, there are two 16-pole pin connectors J16, J17 (see figure 1) on the **PC20TR**. These are the internal connections of the 16 analog inputs, which, for example, can be used to connect current shunts (available as accessory under: *ZU-CS250R*).

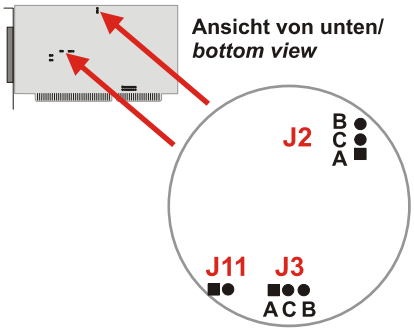
The following table shows the pin assignment of the 37-pole Sub-D female and the pin connectors J16 and J17:



Pin Sub-D37	PC20TR (se)*	16-pole pin conn. / pin	Pin Sub-D37	PC20TR (se)*	16-pole pin conn. / pin	Pin Sub-D37	PC20TR (se)*	16-pole pin connector / pin
1	AIn 1	J16 / 1	9	AIn 9	J17 / 1	18	AOut 1	-
2	AIn 2	J16 / 3	10	AIn 10	J17 / 3	19	AOut 2	-
3	AIn 3	J16 / 5	11	AIn 11	J17 / 5	17, 20..37	AGND	J16 / 2, 4, 6, 8, 10, 12, 14, 16 J17 / 2, 4, 6, 8, 10, 12, 14, 16
4	AIn 4	J16 / 7	12	AIn 12	J17 / 7			
5	AIn 5	J16 / 9	13	AIn 13	J17 / 9			
6	AIn 6	J16 / 11	14	AIn 14	J17 / 11			
7	AIn 7	J16 / 13	15	AIn 15	J17 / 13			
8	AIn 8	J16 / 15	16	AIn 16	J17 / 15			

* **single-ended (see below)**

3.2 Analog inputs: single-ended / differential



In addition to single-ended connection of analog input signals, also the differential operation mode is supported. In reality, this operation mode is used if high noise suppression is required.

The operation mode is set with solder bridges placed on the bottom of the card. The position of the solder bridges is shown in figure 1.

The following table explains the difference between the operation modes:

Operation mode	Description	Number of channels	Jumper configuration
single-ended	The voltage difference between the grounding and the corresponding analog input is measured.	16 AIn	J2: A-C (B, C, A) J11: closed J3: B-C (A C B)
differential	The voltage difference between two points A and B is measured. For each analog input channel, two connectors, A and B, are available.	8 AIn	J2: B-C (B, C, A) J11: open J3: A-C (A C B)

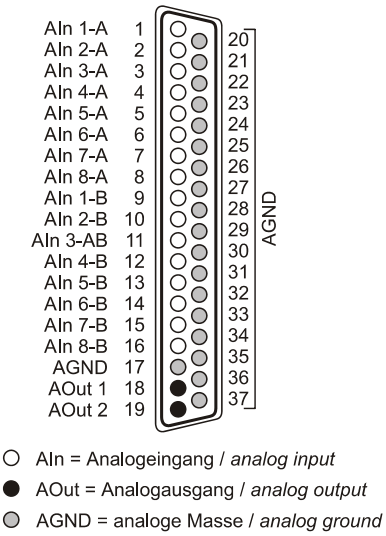
The single-ended operation-mode is factory setting.

- **After each change of the operation mode, the input section of the data acquisition card must be recalibrated (see chapter 6.1)!**
- **The max. potentials to ground must not exceed ±10V. The same also holds true for the differential measurement (i.e. the difference between A and B, between A and GND, between B and GND, as well as between the individual analog input channels)!**
- **Any channel overload may influence measurements of other channels and may lead to wrong values.**

The following table and figure show the pin assignment of the 37-pole Sub-D female for differential connection of analog signals:

Pin Sub-D37	PC20TR (diff.)*	Pin Sub-D37	PC20TR (diff.)*	Pin Sub-D37	PC20TR (diff.)*
1	AIn 1-A	9	AIn 1-B	18	AOut 1
2	AIn 2-A	10	AIn 2-B	19	AOut 2
3	AIn 3-A	11	AIn 3-B	17, 20..37	AGND
4	AIn 4-A	12	AIn 4-B		
5	AIn 5-A	13	AIn 5-B		
6	AIn 6-A	14	AIn 6-B		
7	AIn 7-A	15	AIn 7-B		
8	AIn 8-A	16	AIn 8-B		

*** differential**



3.3 Analog outputs: output range

With the solder bridges J7 and J8 (see figure 1) on the bottom side of the board both analog output channels can be configured independently for either ±10V or ±5V (keeping the resolution of 12 bit).

The following settings are necessary:

Channel	Output range	Jumper configuration
AOut 1	±10V	J7: closed
	±5V	J7: open
AOut 2	±10V	J8: closed
	±5V	J8: open

The ±10V output range is factory setting.

After each change of the output voltage range recalibrate the corresponding output channel (see chapter 6.2)!

4 Digital channels

The **PC20TR** features two digital ports with 16 digital lines each. The direction of the digital interface can be changed in groups of eight via software.

The connections for the digital lines are designed as two 20-pole pin connectors (P1, P2, see figure 1). With the optional accessory *ZUKA16*, the digital channels are lead out to an additional 37-pole Sub-D female connector (see chapter 1).

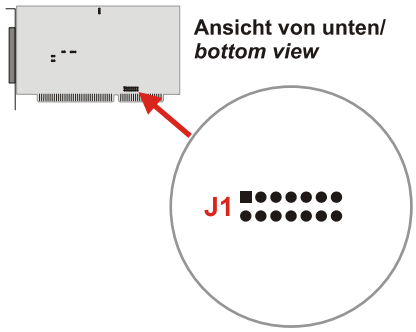
The pin assignment of the 20-pole pin connectors P1, P2 is as follows.

Pin P1	Assignment (channel / bit)	Pin P2	Assignment (channel / bit)
1..16	Dig I/O 1 / 1..16	1..16	Dig I/O 2 / 1..16
17, 18	-	17, 18	-
19, 20	DGND	19, 20	DGND

The digital channels are not protected! Check for correct poling to avoid damages at the card.

5 Setting the I/O address

To be able to communicate with the card, the PC needs to know the address of the card. The I/O address is set with solder bridges J1 (see figure 1) placed on the bottom of the card.



I/O address	Jumper configuration J1	I/O address	Jumper configuration J1
$0200		$0250	
$0210		$0260	
$0220		$0270	
$0230		$0280	
$0240			

The address $230 is factory setting.

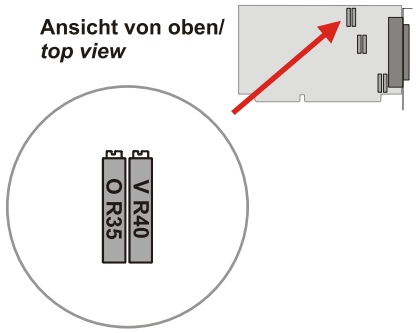
If another extension card in the PC uses the address $0230, either this address or the configuration on the data acquisition card PC20TR has to be changed!

6 Calibration of analog channels

It is usually not necessary to calibrate the analog in- and output channels. The extension cards have an accurate factory setting. In case adjustments or corrections have to be applied, please note the following:

- Always balance the offset first, then the amplification.
- Input and output channels have to be recalibrated for each measuring range. Only the NextView® analysis software automatically balances the offset differences between the individual measuring ranges.

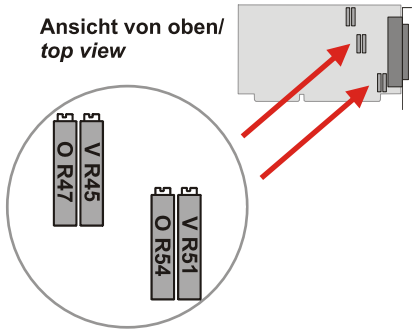
6.1 Analog inputs



In order to recalibrate the analog input channels, an accurate reference voltage between 5V and 9V in conjunction with a program that shows the applied voltage (e.g. NextView®4 Live!) are needed. Repeat the following procedures until both displays show the same voltage:

- Short circuit the input channel and set the offset potentiometer R35 until the display shows 0V.
- Undo the short circuit and apply the known reference voltage. Set the amplification potentiometer R40 until the display shows exactly the reference voltage.

6.2 Analog outputs



In order to recalibrate the analog output channels, a precision multimeter (resolution >12 bit) and a program which can apply a defined voltage to an analog channel (e.g. NextView®4 Live!) are needed. Repeat the above procedures until both displays show the same voltage:

- Set the analog output channel to 0V in the program and connect the multimeter with the corresponding output channel: adjust the offset potentiometer (AOut 1: R47; AOut 2: R54) until the multimeter displays 0V.
- Set 9.9V (or 4.9V for a ±5V output range) for the analog channel in the program: set the amplification potentiometer (AOut 1: R45; AOut 2: R51 2) in such a way that the multimeter displays 9.9V (or 4.9V).

7 Software installation

All the software for Windows® 2000/XP/Vista and documentation available for the **PC20TR** is integrated on the "Software Collection"-CD included with delivery. When inserting the CD, a CD starter opens automatically (otherwise: start **`setup.exe`**).

PC20TR

Change to the product page of the **PC20TR** by selecting the entry "Products" in the CD starter and then the hardware ("PC20") listed under the interface "ISA".

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. Installation of the driver package to hard disc 2. Installation by Windows® hardware wizard 3. Check installation and I/O address 4. Mount the card into the off-state PC	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	-
	STR-PC	easy-to-use ActiveX controls for programming with Visual Basic®, Delphi®, Visual C++™	STR-PC-IG (installation / programming manual)
	STR-PC-EX	example programs for STR-PC ActiveX controls	-
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) UM-NV4 (user manual) "First steps" in the NextView®4 demo project (displayed at first start of the software)
	NV4	measuring software NextView®4 (requires license number, no freeware!)	
	NV4-SERV NV4-WORK	Client/Server version of NV4 consisting of NextView®4 Server and NextView®4 Workstation	

7.1 Driver installation

For the **PC20TR**, 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 and mount the card after successful installation into the off-state PC.

7.1.1 Install driver package

The prior installation of the bmcm 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 **PC20TR** product page of the "Software Collection"-CD.

7.1.2 Manual installation with the Windows® hardware wizard

Open the control panel to manually install new hardware with the Windows® hardware wizard:

- **Windows® Vista**: Start / Control Panel / Add New Hardware
- **Windows® XP**: Start / Control Panel / Add New Hardware
- **Windows® 2000**: Start / Settings / Control Panel / Add New Hardware

If you are not familiar with the manual installation under Windows®, please follow the detailed instructions of the driver installation manual on CD.

7.1.3 Check installation and I/O address

In the Windows® Device Manager, the entry "Data Acquisition (BMC Messsysteme GmbH)" is included after successful installation displaying the installed bmcm 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 **PC20TR** to open its properties. For general information, any existing device conflicts and possible sources of error, see TAB "General". Switch to TAB "Resources" to change the I/O address.

The I/O address assigned to the ISA card by the system and set on the board enables Windows® to communicate with the card. Therefore, the address settings on the hardware and in the system must correspond and must not be used in the PC by any other hardware component. If necessary, the I/O address has to be adjusted by changing the settings on the card (see chapter 5) or in the Device Manager. For detailed help about how to change the I/O address, please see the driver installation manual on CD.

7.2 Programming

Programming the **PC20TR** under Windows® 2000/XP/Vista with Visual Basic®, Delphi®, Visual C++™ is possible with the hardware independent STR-LIBADX. It is available on the **PC20TR** 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"

The easy-to-use, product specific ActiveX controls STR-PC are located on the **PC20TR** product page of the "Software Collection"-CD. Checkmark "PC16/PC20/P1000 ActiveX Control module" to load the card into the programming environment.

If you select the entry STR-LIBADX-EX or STR-PC-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.

The data sheet STR-DPC contains instructions for DOS programming and can be downloaded as PDF from our website.

7.3 Using the PC20TR 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 **PC20TR** directly. The setup program NV4-LIVE is available in the section "NextView® 4.x". Select your measuring system (**PC20TR**) 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 Live!, signals cannot be stored. The full version NextView®4 is no freeware and requires a license number!**
- **Please note that the configuration of the card must correspond to the settings made during installation of the software (single-ended / differential, output range).**

8 Important notes for using the PC20TR

- The **PC20TR** is only suitable for extra-low voltages - please observe the relevant regulations! For power supply, an electrically isolated power unit (with CE) must be used.
- All accessible pins are electrostatic devices. Workplace must be conductive during installation.
- The **PC20TR** must only be used in closed housings (for reasons relating to EMC). ESD voltages on open lines may cause malfunction.
- The **PC20TR** ground is connected with the ground of the PC. Very often the chassis of the PC is grounded, too. **Attention: Ground loops will lead to measuring errors!**
- For cleaning use water and mild detergent only. The modules are designed to be maintenance-free.
- The signals are connected at the 37-pole Sub-D female connector. Therefore use screened cables. For a good elimination of interferences connect screen only to one cable end. Close open inputs.
- The device must not be used for safety-relevant jobs. By using or processing this product the customer becomes manufacturer by law and therefore is responsible for the proper installation, use and handling of the product. In the case of improper use or unauthorized interference, our warranty ceases and any warranty claims are excluded.

Do not dispose of the device 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.

9 Technical data PC20TR (typ. at 20°C, 5V, after 5min.)

(with data acquisition and processing software NextView®4)

- **Analog inputs**

Channels:	16 single-ended or 8 differential channels, set with solder bridges
Resolution // Measuring ranges:	12 bit // ±10V, ±5V, ±2V, ±1V programmable for each channel separately
Overvoltage protection:	max. ±35V (when turned on), max. ±20V (when turned off); max. ±20mA in total of all input channels!
Sampling rate:	under Windows® up to 500 values/second can be sampled (depending on software and PC)
Frequency accuracy // Frequency drift:	max. ±100ppm/°C // max. ±50ppm/°C
Input resistance // Input capacity:	1MΩ (with PC turned off: 1kΩ) // 5pF
Zero drift // Amplification drift:	±25ppm/°C // ±25ppm/°C
Error between measuring ranges:	typ. ±0.1%
Converter error // Relative accuracy:	max. ±4 LSB // 0.025%

The cards are factory set in the range of ±5V.
The values for accuracy always relate to the respective value measuring value. Errors might add at worst.

- **Analog outputs**

Channels:	2 output channels
Resolution // Accuracy:	12 bit (0.025% of the defined voltage range) // ±2 LSB
Voltage range:	±10V, ±5V set for each channel with solder bridges junctions
Output current:	max. 1mA
Zero drift // Amplification drift:	±25ppm/°C // ±25ppm/°C

While booting up the PC, the outputs are 10V or 5V (dep. on the output range set by J7, J8) and are initialized as soon as the driver or software is started.

- **Digital channels**

Channels:	2x 16 channels (programmable in groups of 8 as input or output)
Current drain (at each pin):	1mA (with app. 4V level), max. 2.5mA (with app. 3V level)
Input voltage: // Input resistance	TTL level (0 = 0.0V..0.5V; 1 > 2.6V..5.0V) // min. 1MΩ (with PC turned off: 1kΩ)

- **General data**

Power supply:	+4.5V..+5.5V from PC/AT-Bus, max. 300mA, with own DC/DC-converter for ±12V
Bus connector:	16 bit slot, selectable I/O addresses; card uses 16 I/O addresses
Analog connectors:	all channels can be reached at a 37-pole Sub-D female connector at the card bracket.
Digital connectors:	two 20-pole connectors on the board, dig. channels can be lead out via ZUKA16 cable to PC card bracket
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. perm. potentials:	**60V DC acc. to VDE**, max. 1kV ESD on open lines
Temperature ranges:	operating temp. –25°C..+50°C, storage temp. –25°C..+70°C
Dimensions // Relative humidity:	178 x 103 x 13,5 mm^3 // 0-90% (not condensing)
Delivery:	product, PC-bracket, "Software Collection"-CD with drivers and documentation, description
Available accessories:	connecting cables ZUKA 16 (with PC bracket for internal conn.), ZUKA37SB, ZUKA37SS, Sub-D plug ZUST37, optocoupler board OI16-PC, connector boards ZU37BB/-CB/-CO, current shunt ZU-CS250R
Guarantee:	2 years with effect from sales date, damages at product resulting from improper use excluded

- **Software support**

Software on CD (incl.):	ActiveX Controls LibadX (hardware independent) and STR-PC for programming under Windows® 2000/XP/Vista; measuring program NextView®4 Live! to test and operate the card
NextView®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. 5.0 02/05/2001