

meM-ADfo

USB miniature external Measurement System

Features

- 16 analog, $\pm 5V$ input channels
- connection via USB-interface
- 12 Bit resolution
- 1 analog 12 Bit output channel
- sampling controlled via Microcontroller
- 10kHz overall sampling rate
- 8 electrically isolated relay outputs
- 8 electrically isolated optocoupler inputs

Applications

- measuring analog signals
- analog controls
- measuring digital signals
- digital controls
- perfect for mobile use



With the creation of the modern generation of PCs less and less internal slots are available for additional cards.

The external devices of the meM-series by BMC Messsysteme GmbH (e. g. **meM-ADfo**) are the alternative choice to substitute the measuring cards integrated in the computer.

This USB-solution features

... 16 analog input channels and 1 analog output channel ...

and an accuracy of 12 Bit for the

... measuring range of $\pm 5V$...

The **meM-ADfo** additionally features

... 8 digital in-/outputs each ...

for the control and acquisition of digital signals realized with

.. 8 optocouplers and 8 relays ...

Those are electrically isolated and responsible for the setting and switching of the 8 digital in- and outputs.

The integrated

... RISC-microcontroller ...

allows for sampling rates of up to 10kHz.

Of course, they also show all the typical USB features such as *hot-pluggable* (devices can be plugged in during operation), up to 127

devices can be used, *Plug&Play* and power supply via USB interface.

Included as accessory is a USB driver and the hardware independent ActiveX control **LibadX** for programming under Windows[®] 2000/XP.

In addition the **meM-ADfo** can be used under Windows[®] 2000/XP 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 **meM-ADfo** can be tested.

For further information and software updates please visit our homepage at:

<http://www.bmcm.de>

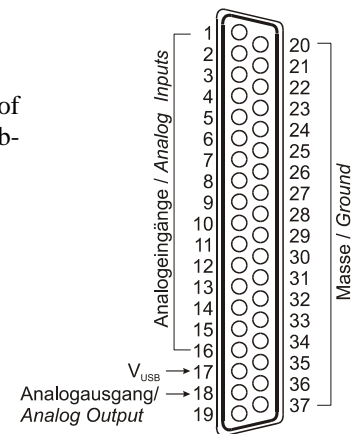
1 Start-up procedure

Plug the red frames onto the short sides of the devices with the feet looking downward, as to be seen in the above diagram. Connect one end of the USB-cable to the device and the other to the USB-interface of the PC. The device is supplied with power via the USB-connection.

2 Analog inputs and outputs

The 37-pole Sub-D socket at the front of the device is designed for the connection of analog in- and outputs. The following table shows the pin assignment of the 37-pole Sub-D socket:

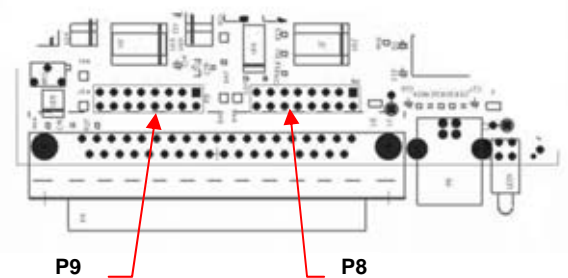
Pin (Sub-D37)	meM-ADfo
1..16	Analog In 1..16
17	V _{USB} (4-5V; max. 20mA)
18	Analog Out 1
19	n. c.
20..37	Analog Ground (AGND)



The max. potentials to ground must not exceed $\pm 7V$. Any channel overload may influence measurements of other channels and may lead to wrong values.

There are two 16-pole pin connectors (P8, P9) on the **meM-ADfo** board. These are the internal connections of the analog inputs, which for example can be used for connecting current shunts. See the table below for the assignment of the pin connectors P8 and P9:

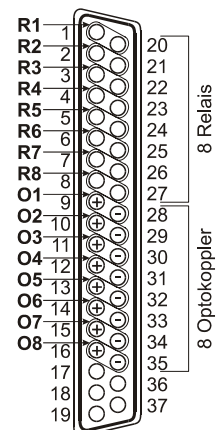
Pin (P8)	meM-ADfo	Pin (P9)	meM-ADfo
1	Analog In 1	1	Analog In 9
3	Analog In 2	3	Analog In 10
5	Analog In 3	5	Analog In 11
...
13	Analog In 7	13	Analog In 15
15	Analog In 8	15	Analog In 16
2,4,...,14, 16	AGND	2,4,...,14, 16	AGND



3 Digital inputs and outputs

The **meM-ADfo** is provided with 8 digital in- and output channels each (*low*: 0V..1V; *high*: 5V..30V), which are controlled via 8 internal optocouplers and relays. The switch contacts can be reached via the 37pole Sub-D socket on the back of the device. See the table below for the assignment of the pin combinations to the respective optocouplers/relays:

Pin combination	meM-ADfo	Pin combination	meM-ADfo
1(+), 20(-)	Relay 1	9(+), 28(-)	Optocoupler 1
2(+), 21(-)	Relay 2	10(+), 29(-)	Optocoupler 2
3(+), 22(-)	Relay 3	11(+), 30(-)	Optocoupler 3
4(+), 23(-)	Relay 4	12(+), 31(-)	Optocoupler 4
5(+), 24(-)	Relay 5	13(+), 32(-)	Optocoupler 5
6(+), 25(-)	Relay 6	14(+), 33(-)	Optocoupler 6
7(+), 26(-)	Relay 7	15(+), 34(-)	Optocoupler 7
8(+), 27(-)	Relay 8	16(+), 35(-)	Optocoupler 8

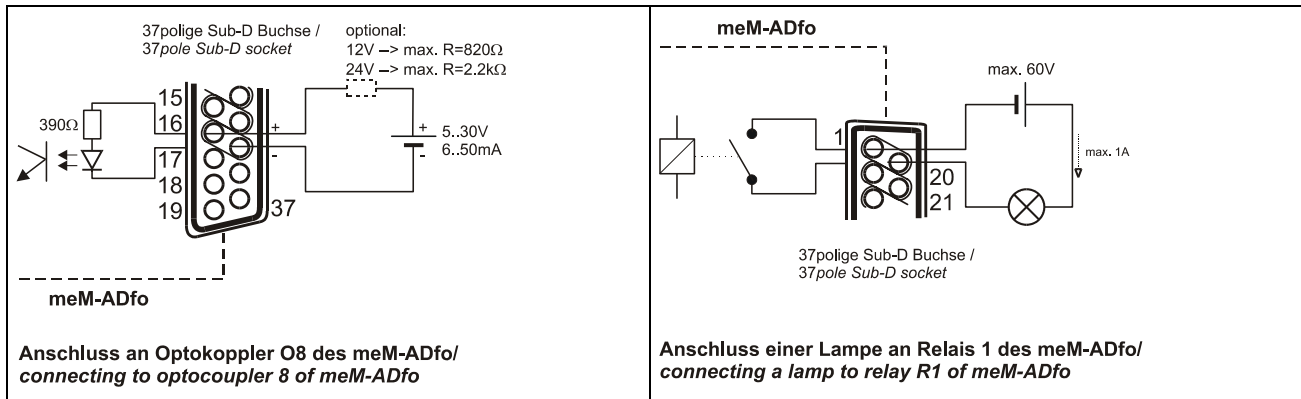


The switch contacts of the relays can be used with 1A maximum. Exceeding the *high* level of 30V at the optocouplers may cause damage to the digital channels.

4 Interfacing examples of the digital channels of meM-ADfo

The pin combinations at the 37pole Sub-D socket for the contacts of the optocouplers or relays are listed in the table above. Please observe to choose the pin with the lower value for the positive connection when using an optocoupler.

The optocoupler inputs are low-ohmic, for high input voltages the input current optionally may be limited by a serial resistor.



5 Softwareinstallation



All the software for Windows® 2000/XP and documentation available for the **meM-ADfo** 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 **meM-ADfo** by selecting the entry "Products" in the CD starter and then the device ("meM-ADfo") listed under the interface "USB".



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	-
	STR-meM	easy-to-use ActiveX controls for programming with Visual Basic®, Delphi®, Visual C++™	STR-meM-IG (installation / programming manual)
	STR-meM-EX	example programs for STR-meM ActiveX controls	-
Operating program	NV4-LIVE	free online version of NextView®4 for testing the functional range of the hardware	NV4-IG (installation Stand-alone version) IG-NV4-CS (inst. Client/Server version)
	NV4	measuring software NextView®4 (requires license number, no freeware!)	NV4-UM (user manual)
	NV4-SERV NV4-WORK	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)

5.1 Driver installation



For **meM-ADfo** 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.

5.1.1. 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 **meM-ADfo** product page of the "Software Collection"-CD.

5.1.2. Plug&Play installation

As soon as the **meM-ADfo** is connected to the PC, 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"

As the driver package has been installed on hard disc before no additional location needs to be entered for the driver search under Windows® 2000.

5.1.3. Check installation

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® 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 **meM-ADfo** to open its properties. For general information, any existing device conflicts and possible sources of error see TAB "General".

5.2 Programming

Programming the **meM-ADfo** with Visual Basic®, Delphi®, Visual C++™ is possible with the hardware independent [LibadX ActiveX control](#). It is available in the section "Programming" 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-meM](#) are located on the **meM-ADfo** product page of the "Software Collection"-CD. Checkmark "meM-ActiveX Control module" to load the device into the programming environment.

If you select the entry [STR-LIBADX-EX](#) or [STR-meM-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.

5.3 Using the meM-ADfo 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 **meM-ADfo** directly. The setup program [NV4-LIVE](#) is available in the section "NextView® 4.2". Select your measuring system (**meM-ADfo**) 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!

6 Important notes for using the meM-ADfo

- The device is only suitable for extra-low voltages – please observe the relevant regulations! For reasons relating to EMC, the device must only be operated with housing closed. ESD voltages at open lines may cause malfunction during operation.
- For cleaning use water and mild detergent only. The device is designed to be maintenance-free.
- At the 37-pole Sub-D socket signal cables are connected – use shielded cables only. For best possible interference suppression connect shield at one end only. Close open inputs if necessary.
- The device ground and the chassis are 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!
- PCs (notebooks), which are not grounded often produce high potentials to earth at the USB socket, so that safe operation cannot be guaranteed. In this case connect the measuring system to earth.
- The Gain is adjusted to even values. Therefore only 4000 (with 12 Bit) values of the full range of the converter are used. As a result, the measuring ranges are slightly larger ($\pm 5.12V$) than the indicated measuring ranges, providing the advantage that overranges can be recognized.
- The AD converter of the **meM-ADfo** has a code noise of up to ± 1 LSB.
- 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.



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.

7 Technical data meM-ADfo (typical at 20°C, 5V and after 5min.)

• Analog inputs

Channels:	16 single-ended			
Surge protection:	max. $\pm 35V$ (when turned on), $\pm 7V$ (when turned off), max. $\pm 20mA$ in total of all input channels!			
Input resistance // input capacity:	1M Ω (with PC turned off: 1k Ω) // 5pF			
Sampl. rate // freq. acc. // freq. drift:	10kHz overall sampling rate* // max. $\pm 100ppm$ // max. $\pm 50ppm/^\circ C$			
Zero shift // gain drop:	$\pm 50ppm/^\circ C$ // $\pm 50ppm/^\circ C$			
meM-ADfo:				
measuring range	resolution	overall sampling rate*	abs. accuracy	noise
$\pm 5V$	12 Bit (2.5V)	10kHz	$\pm 5mV$	± 1 LSB

* The overall sampling rate is the sum of the sampling rates of the individual used channels (e.g. from 5 channels scanned with 1kHz results an overall sampling rate of 5kHz).

The values for accuracy always relate to the respective measuring range. Errors might add at worst.

• Analog output

Voltage range // output current:	1 voltage output with $\pm 5V$ // 1mA max.
Resolution // accuracy:	12 Bit // typ. ± 4 LSB, max. ± 8 LSB
Zero shift // gain drop:	$\pm 50ppm/^\circ C$ // $\pm 50ppm/^\circ C$

• Digital in-/ outputs

Channels:	8 optocoupler inputs, 8 relays outputs
Input voltage range // input resistance:	low: 0V..1V; high: 5V..15V (with external series resistor max. $R=2.2k\Omega$: 5V..30V) // $R_{in}=390\Omega$
Contact operation speed of optocouplers:	<1ms
Max. current of the relay contacts:	1A
Relays:	response or fall time: 10ms, live period: 100000 cycles

• General data

Power supply // USB interface:	+4.5V..+5.5V from USB connection to the PC, max. 100mA // USB 1.1 compatible (full speed)
Analog // digital connections:	all channels at a 37-pole Sub-D socket at the front // back of the device
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 // protection:	60V DC acc. to VDE , max. 1kV ESD on open lines // IP50
Temperature range // relative humidity:	-25 $^\circ C$..+70 $^\circ C$ // 0-90% (not condensing)
Housing // delivery:	aluminum housing, size: 167 x 113 x 30 mm ³ // device with aluminum housing, 1m USB-connecting cable, "Software Collection"-CD, description
Accessories (optional):	DIN rail set ZU-SCHL, USB extension cable ZUKA-USB, connecting cables ZUKA37SB, ZUKA37SS, connector boards ZU37BB/-CB/-CO, 37-pole Sub-D plugs ZU37ST
Guarantee:	2 years with effect from sales date, damages at product resulting from improper use excluded

• Software support

Software on CD (included):	ActiveX Controls LibadX (hardware independent) and STR-meM for programming under Windows [®] 2000/XP; measuring program NextView [®] 4 Live! for testing and operating the hardware
NextView [®] 4 (optional):	professional software (versions: Professional, Lite, Client/Server) for the acquisition and analysis of measurement data under Windows [®] 2000/XP

Manufacturer: BMC Messsysteme GmbH. Subject to change due to technical improvements. Errors and printing errors excepted. Rev. 3.3 11/04/2006