



## Get Connected.

The channels of the module on slot 1 are available at the 37-pin D-Sub female of the PCI/ PCIe data acquisition card and can be connected externally at the PC card bracket. Use the add-on cable ZUKA16 to lead through the connections of the module on the second slot.

## Undisturbed and Safe.

The integrated RISC controller generates jitter-free sampling sequences. In addition, the analog channels of the MADDA16 are galvanically isolated from the PC ground. This provides interference-free operation and protects DAQ system and PC against differences of potential.

## Modularity. Individuality. Flexibility.

A great variety of analog input modules, analog output modules or CAN modules is available to equip the PCI/PCIe base board for a measurement application. The combination of the modules in the two card slots creates individual solutions.

## Analog-CAN Combination. Synchronous.

If using both a MADDA and an MCAN module together on the PCI/PCIe card, analog and CAN data are sampled synchronously in time.

# MADDA16/16n

## AD/DA-Wandler Module für PCI-BASEII, PCIe-BASE

### Assemble DAQ Card. Record and Output Signals. Analog.

For optimum customization to a measurement application, the PCI/PCIe cards from BMC Messsysteme GmbH can be supplemented with various modules. The analog modules of the MADDA series are perfectly suitable for the acquisition of measurement data as well as for analog controlling tasks.

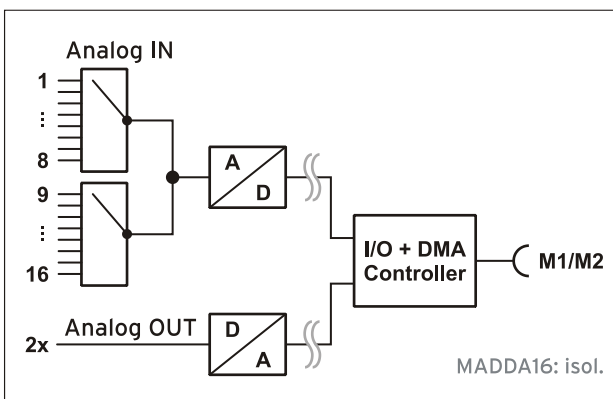
### 16 Analog Inputs. 250kHz.

### 16 Bit. $\pm 10V$ , $\pm 5V$ , $\pm 2V$ , $\pm 1V$ .

16 analog inputs can be sampled with 16 bit resolution and 250kHz total sampling rate so that even slightest peaks of high-frequent signals can be detected. The measuring range is selected via software for each channel separately and does not affect the sampling rate.

### 2 Analog Outputs. 16 Bit. $\pm 10V$ .

The two 10V outputs can be used for analog controls with 16 bit accuracy.



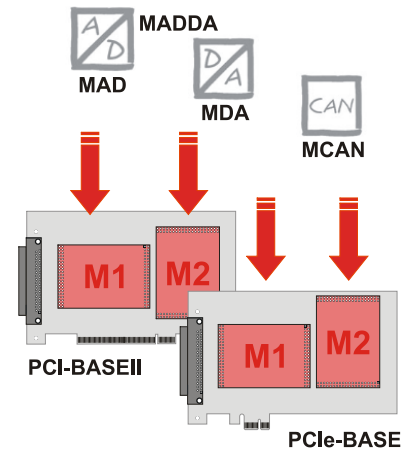
Functional diagram

## 1 Installation on the PCI-BASEII, PCIe-BASE

The MADDA16/16n module must always be installed at slot M1 of the *PCI-BASEII*, *PCIe-BASE*. In this case, all analog inputs and outputs of the MADDA16/16n are available at the D-Sub 37 female connector of the PCI/PCIe card.

If two MADDA modules are used on one card, the module with the lower address must use slot M1 and the other one slot M2 (see chapter 2).

The channels of the module on slot M2 can be accessed at the internal pin connectors K3, K4 of the DAQ card. They can be led out of the PC to a slot bracket with D-Sub 37 female using the optional ZUKA16 connection cable (connect channel 1 - colored line - of ZUKA16 with pin 1 of the pin connector K3 - square pad - and attach 2. connector in parallel).



- **Make sure the plugs and sockets exactly fit together. If the modules are not plugged correctly, the modules and/or the DAQ card may be damaged!**
- **The modules are electrostatic sensitive devices - please provide for a conductive pad connected to ground during installation.**

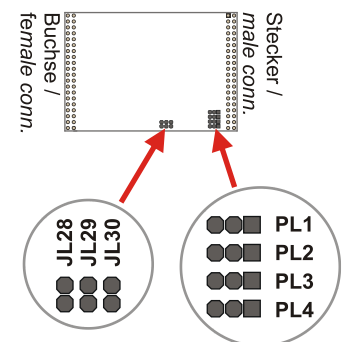
## 2 Addressing the MADDA Modules

The address configuration is done via the 3-pin solder jumpers PL23-25 on the (component-free) bottom side of the module board and, in addition for MADDA16, via the 2-pin solder jumpers JL28-30. The MADDA16/16n module is preset to address 0. The addresses 6 and 7 are reserved.

Address	0	1	2	3	4	5
PL1	●●■	○●■	○●■	○●■	○●■	○●■
PL2	●●■	○●■	○●■	○●■	○●■	○●■
PL3	●●■	○●■	○●■	○●■	○●■	○●■
JL28*	●●	○●	○●	○●	○●	○●
JL29*	●●	○●	○●	○●	○●	○●
JL30*	●●	○●	○●	○●	○●	○●

Address 0 is factory setting, \* only MADDA16

Modulunterseite /  
module bottom



The address determines the assignment of the channels. For example, the MADDA module with the lower address is assigned to the channels 1-16, the MADDA module with the higher address to channel 17-32.

- **Make sure to assign different addresses for modules (also of different type) used on one DAQ card!**
- **If using two MADDA modules on the same DAQ card, the module with the lower address must be in slot M1.**
- **If using two MADDA modules, the channels of the module with the lower address are scanned with the preset sampling rate first, then the channels of the module with the higher address.**

### 3 Pin Assignment of the MADDA Modules with the PCI/PCIe Card

The following table shows which pins are used for the connection of the analog channels. The channels of the module on the first slot are accessible at the 37-pin D-Sub female of the DAQ card. The connections of the module on slot 2 can be led through to an additional 37-pin D-Sub female by means of the add-on cable ZUKA16.

MODULE SLOT M1		MODULE	MODULE SLOT 2	
D-Sub 37 PCI(e)-BASE	Plug/Pin PCI(e)-BASE	MADDA16 MADDA16n	D-Sub 37 ZUKA16	Plug/Pin PCI(e)-BASE
1	K1/1	Aln 1	1	K3/1
2	K1/3	Aln 2	2	K3/3
3	K1/5	Aln 3	3	K3/5
4	K1/7	Aln 4	4	K3/7
5	K1/9	Aln 5	5	K3/9
6	K1/11	Aln 6	6	K3/11
7	K1/13	Aln 7	7	K3/13
8	K1/15	Aln 8	8	K3/15
9	K1/17	Aln 9	9	K3/17
10	K1/19	Aln 10	10	K3/19
11	K2/1	Aln 11	11	K4/1
12	K2/3	Aln 12	12	K4/3
13	K2/5	Aln 13	13	K4/5
14	K2/7	Aln 14	14	K4/7
15	K2/9	Aln 15	15	K4/9
16	K2/11	Aln 16	16	K4/11
17	K2/13	-	17	K4/13
18	K2/15	AOut 1*	18	K4/15
19	K2/17	AOut 2*	19	K4/17
20 .. 29	K1/2, 4, .. 18, 20	AGND	20 .. 29	K3/2, 4, .. 18, 20
30 .. 35	K2/2, 4, .. 10, 12	AGND	30 .. 35	K4/2, 4, .. 10, 12
36*, 37*	K2/14, 16	MADDA16	36*, 37*	K4/14, 16

\* only PCI-BASEII from rev. 3.1 on and PCIe-BASE from rev. 3.3 on

- The maximum potentials against ground must not exceed  $\pm 10V$ ! Any channel overload may influence measurements of other channels and may lead to wrong values.
- Open inputs show any, non-predicative voltages.
- If the MADDA16/16n is used with older versions of the PCI/PCIe data acquisition cards (PCI-BASE300, PCI-BASE1000, PCI-BASEII to rev. 3.0, PCIe-BASE to rev. 3.2), only the 16 analog inputs but not the two analog outputs are available.

## 4 Important Notes for Using the MADDA16/16n

- The modules are only suitable for extra-low voltages - please observe the relevant regulations! The modules must only be used in closed PC housings (for reasons relating to EMC).
- All accessible pins are electrostatic sensitive devices. Provide for a grounded conductive work place.
- Only use non-solvent detergents for cleaning. The product is designed to be maintenance-free.
- The product 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 PCI/PCIe card may damage the modules and/or the DAQ card.
- Exposing the card to strong vibrations requires additional protection of the module.
- To remove the module, first loosen it on one plugged side by levering the module with the utmost caution using a blunt object (e.g. plastic ballpoint pen). Then carefully lift up the other side with your hand moving it back and forth.
- The MADDA16n ground of the 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!
- The modules are equipped with EEPROMS, in which the parameters of the modules are stored. The included software drivers read them out and correct the offset if necessary. Gain errors are documented in the test report and may be adjusted in the measuring software. The measuring range is shifted by the offset values resulting in the fact that measurements in the upper ranges may exceed or underlie the true values.
- The gain is adjusted to "even" values. Therefore, only 64000 values (for 16 bit) of the full converter range are used. As a result, the measuring ranges are slightly larger (e.g.  $\pm 10.24V$ ) than the indicated measuring ranges, providing the advantage that overranges can be recognized.
- The AD converter of the MADDA16/16n module has a code noise of up to  $\pm 5$  LSB. For 16-bit accuracy, you must average at least 10 times in order to suppress the noise.
- If connecting internal ribbon cables to the PCI/PCIe base board, please make sure the modules are well ventilated to prevent excess heating. Also observe the temperature ranges of the PC.



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 (typical at 20°C, after 5min.)

### • Analog Inputs

Channels // Meas. ranges // Resolution:  
Total sampl rate-:  
Min. sampling rate per channel:  
Typ. noise... // Relative accuracy...:  
Converter error // Error between ranges:  
Basic adjustment in the meas. range:  
Surge protection:  
Skew (jitter) with 32-channel operation:  
Input resistance // Input capacity:  
Zero shift // Gain drop:  
Frequency accuracy // Frequency drift:

16 inputs, add. MADDA16: electrically isolated from PC // $\pm 10V$ , $\pm 5V$ , $\pm 2V$ , $\pm 1V$ // 16 bit
250kHz
4 $\mu$ s
$\pm 5$ LSB, $\pm 7$ LSB, $\pm 8$ LSB, $\pm 8$ LSB // 0.0015%
max. $\pm 4$ LSB // typ. $\pm 0.1\%$
with static calibration signal in the $\pm 5V$ measuring range with $\pm 1$ LSB
$\pm 35V$ (when turned on), $\pm 20V$ (when turned off), max. $\pm 20mA$ in total of all input channels!
max. 1 $\mu$ s between 1. + 2. module
1M $\Omega$ (with PC turned off: 1k $\Omega$ ) // 5pF
typ. $\pm 50ppm/^\circ C$ , max. $\pm 100ppm/^\circ C$
max. $\pm 100ppm$ (with regard to real time) // max. $\pm 50ppm/^\circ C$

\* The MAD modules are factory set in the range of  $\pm 5V$ . The measuring range can be set for each channel separately.

\*\* The total sampling rate is the sum of the sampling rates of the individual used channels  
(e.g. if 5 channels are scanned with 10kHz, the total sampling rate adds up to 50kHz).

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

### • Analog Outputs

Channels // Output range // Resolution:  
Temperature drift:  
Output current // Output resistance:  
Error... // Noise...:

2 outputs, add. MADDA16: electrically isolated from PC // $\pm 10V$ // 16 bit
max. $\pm 50ppm/^\circ C$
max. 1mA // 1k $\Omega$
typ. $\pm 4$ LSB // max. $\pm 8$ LSB

### • General Data

Power supply:  
CE standards:  
ElektroG // ear registration:  
Max. perm. potentials:  
Temperature ranges // Relative humidity:  
Dimensions // Delivery:  
Warranty:

+4.5V, +5.5V from PCI-BASEII or PCIe-BASE, max. 300mA
EN61000-6-1, EN61000-6-3, EN61010-1; for decl. of conformity (PDF) visit <a href="http://www.bmcm.de">www.bmcm.de</a>
RoHS and WEEE compliant // WEEE Reg.-No. DE75472248
60V DC acc. to VDE, max. 1kV ESD on open lines
operating temp.: $-25^\circ C$ .. $+50^\circ C$ , storage temp.: $-25^\circ C$ .. $+70^\circ C$ // 0-90% (not condensing)
~ 74 x 52 x 13 mm; // product, description
2 years from date of purchase at bmcm, claims for damages resulting from improper use excluded

Manufacturer: BMC Messsysteme GmbH. Subject to change due to technical improvements. Errors and printing errors excepted. Rev. 6.1 10.02.2020