LAN-AD16f

LAN data acquisition system (TCP/IP)

Data acquisition via network. Remote. Ingenious.

The LAN technology of the LAN-AD16f allows for measurement applications across great distances. The number of measuring points, where the devices are installed, is basically not limited. Data transmission to a server PC is fast and reliable.

TCP/IP. Guaranteed reliable.

The LAN-AD16f uses the TCP/IP protocol providing for safe and complete data transmission. Besides that, transmission via internet is possible - data acquisition with absolutely new possibilities.

16 analog inputs. 250kHz. 16 Bit. ±10V, ±5V, ±2V, ±1V.

16 analog inputs can be sampled precisely with 16 bit resolution and 250kHz total sampling rate. The measuring range is selected via software for each channel separately.

2 analog outputs. 16 bit. ±10V.

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

## 4 digital inputs/outputs each. 1 counter.

Digital states are recorded or set at 16 digital inputs and outputs each. Digital inputs are sampled time-synchronously with the analog inputs. One 19-bit counter accessible via the first digital input pins allows the acquisition of counting pulses or the connection of an incremental encoder.

Cascadable. Synchronizable.

The number of DAQ systems and with it the number of available channels is only limited by the bandwidth of the network. Several LAN-AD16f devices can be synchronized with each other. If so, all measured data in distributed operation always keep time even with long-term measurements.

Open for everyone.

Widely supported: The data acquisition system can be used under Windows® 7/XP as well as under MAC OS X, Free BSD and Linux. The complete software for installation and programming of the LAN-AD16f is included for free.
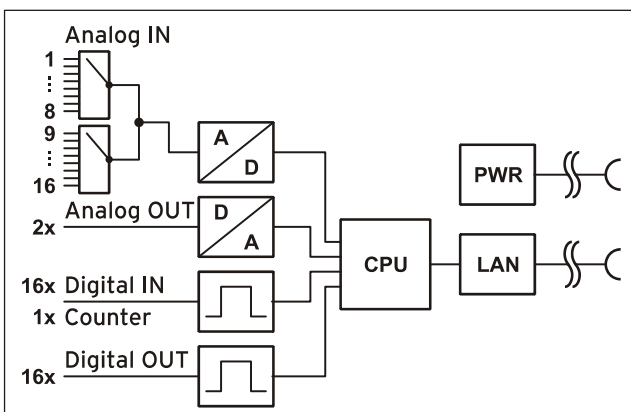
NextView®4. Try for free.

The DAQ system is supported by NextView® 4, the software for data acquisition and analysis. A fully functional 30-day trial is included with delivery to directly test the functionality of the LAN-AD16f.

Functional diagram

1   Start-up procedure

Plug the red frames onto the short sides of the device with the feet looking downward. The LAN-AD16f is suitable for DIN rail mounting. The optional DIN rail set *ZU-SCHI* can be ordered at bmcm.

The device is supplied via a power supply unit (12V, 10W) available under *ZU-PW10W* (see chapter 2.1). Connect the device to a PC or server via network (see chapter 2.2). The LAN-AD16f self-assigns a suitable link-local address when being connected.

If necessary, further software components to be used with the device can be installed now, as described in chapter 4.
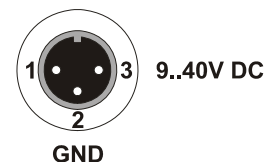
2   Connections and pin assignment

Figure 1

2.1   Power supply

The power supply of the DAQ system with 9-40V DC is connected at the 3-pole DIN plug on the back of the device. The power supply unit *ZU-PW10W* (12V, 12W) is optionally available.

2.2   Network

The PC/data acquisition server and the LAN-AD16f communicate via network, which is realized with by a Twisted Pair connection (100Mbit). If directly connecting the LAN-AD16f to the PC, a crosslink cable must be used. Both cables are available as accessories (*ZUKA10T* or *ZUKA-CL10T*).

If the two LEDs in the LAN connector are flashing, data are transmitted.

A firewall software installed on the PC might interfere with the operation of the LAN-AD16f. In this case, please contact your network administrator.

2.3 Analog channels

The 37-pole D-Sub female connector at the back of the device is designed for the connection of the analog inputs and outputs. Input range (±10V, ±5V, ±2V, ±1V) and output range (±10V) are set via software (e.g. in **NextView®4**).

The pin assignment of the 37-pole D-Sub female is as follows:

D-Sub 37	LAN-AD16f	D-Sub 37	LAN-AD16f
1	AIn 1	11	AIn 11
2	AIn 2	12	AIn 12
3	AIn 3	13	AIn 13
4	AIn 4	14	AIn 14
5	AIn 5	15	AIn 15
6	AIn 6	16	AIn 16
7	AIn 7	17	n. c.
8	AIn 8	18	AOut 1
9	AIn 9	19	AOut 2
10	AIn 10	20..37	AGND
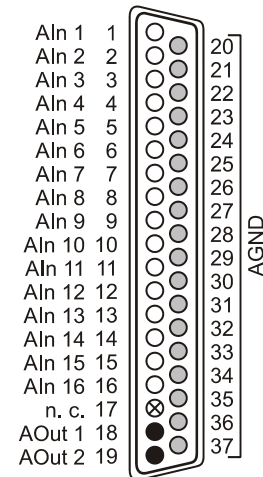
○ AIn = Analogeingang / *analog input*
● AOut = Analogausgang / *analog output*
◐ AGND = analoge Masse / *analog ground*
⊗ n. c. = nicht verbunden / *not connected*

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The max. potentials to ground must not exceed ±12V. Any channel overload may influence measurements of other channels and may lead to wrong values.

The internal connection of the 16 analog inputs is provided via a 40-pole pin connector (see figure on the right) on the LAN-AD16f board, which, for example, can be used to connect current shunts (*ZU-CS250R* available as accessory).

The pin assignment of the 40-pole pin connector is listed in the following table:

Pin	LAN-AD16f	Pin	LAN-AD16f
1	AIn 1	17	AIn 9
3	AIn 2	19	AIn 10
5	AIn 3	21	AIn 11
7	AIn 4	23	AIn 12
9	AIn 5	25	AIn 13
11	AIn 6	27	AIn 14
13	AIn 7	29	AIn 15
15	AIn 8	31	AIn 16
2, 4, .., 30, 32	AGND	33, 34, .., 39, 40	n. c.
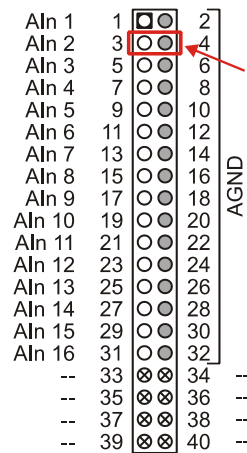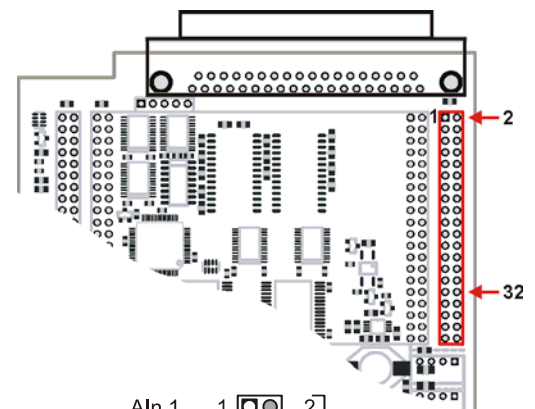
○ AIn = Analogeingang / *analog input*
◐ AGND = analoge Masse / *analog ground*
⊗ -- = interne Verwendung / *internal use*

2.4 Digital channels and counter

The LAN-AD16f features 16 digital inputs and outputs each (*low*: 0V..0.7V; *high*: 3.0V..5V). The digital lines are hard-wired. A 19-bit counter (quadrature decoder) is additionally integrated allowing the connection of an incremental encoder. The counter or incremental encoder and the external counter reset, if required, are attached to the first digital input lines.

All lines are led to the 37-pole D-Sub female connector at the device front. The pin assignment is as follows:

Pin	LAN-AD16f		Pin	LAN-AD16f	Counter
1	DOut 1		11	DIn 1	Signal A
20	DOut 2		30	DIn 2	Signal B
2	DOut 3		12	DIn 3	Reset
21	DOut 4		31	DIn 4	
3	DOut 5		13	DIn 5	
22	DOut 6		32	DIn 6	
4	DOut 7		14	DIn 7	
23	DOut 8		33	DIn 8	
5	DOut 9		15	DIn 9	
24	DOut 10		34	DIn 10	
6	DOut 11		16	DIn 11	
25	DOut 12		35	DIn 12	
7	DOut 13		17	DIn 13	
26	DOut 14		36	DIn 14	
8	DOut 15		18	DIn 15	
27	DOut 16		37	DIn 16	
9, 28	5V		10, 19, 29	DGND	

● 5V Hilfsspannung / *5V auxiliary voltage*
○ digitale Masse / *digital ground*

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The digital inputs and outputs are protected by serial resistors. Input voltages beyond the permitted voltage range of 0V..5V can damage the device.

The counter of the LAN-AD16f counts the number of incoming pulses (max. 8MHz) sampled at the connection of signal A. If the maximum counting range of 19 bit is reached, the counter will be reset to 0.

If the external counter reset is connected, the counter can be reset at any time.

Compared to a counter, incremental encoders consider the counting direction by decoding a second phase-shifted signal.

The operation mode of the counter (counter, incremental encoder) is set via software.
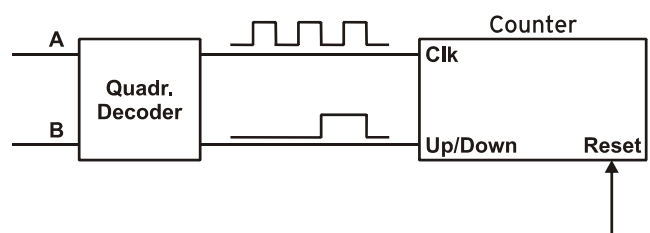
Function	Description	Max. pulse frequency	Connection	Digital pins used
Counter	count ↑	8MHz	Signal A	1
Incremental encoder	count ↑↓	2MHz	Signal A, Signal B	2
Counter reset	set counter to 0	-	Reset	1

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Please see the manufacturer's documentation for details about connecting your incremental encoder.

3 Interfacing examples for digital channels

The following basic connection examples demonstrate the use of the digital inputs and outputs and the connection of a counter to the LAN-AD16f. The pin assignment of the 37-pole D-Sub female connector is described in chapter 2.4.

3.1 Connecting an optocoupler

Optocouplers provide optimum protection at each input line. With them, it is possible to connect higher voltages and to protect the hardware from being destroyed.

The 3.9kΩ pull-down resistor sets the input to *low* if no voltage is applied there.

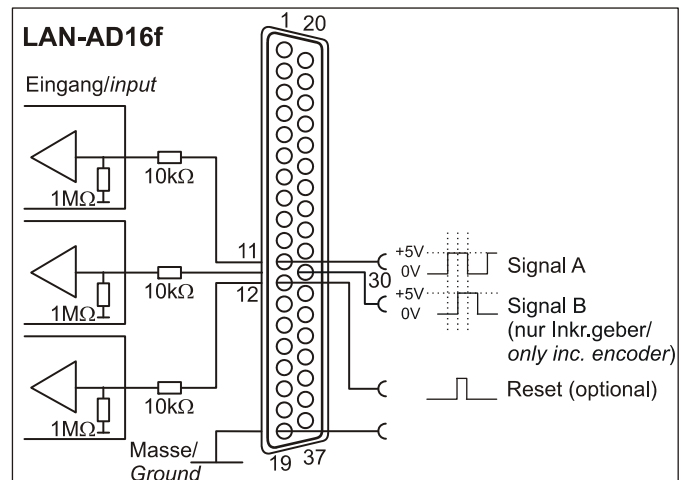In this regard, please also see application examples of the optocoupler you use.

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Optocoupler boards with 8 or 16 inputs are available at bmcm.
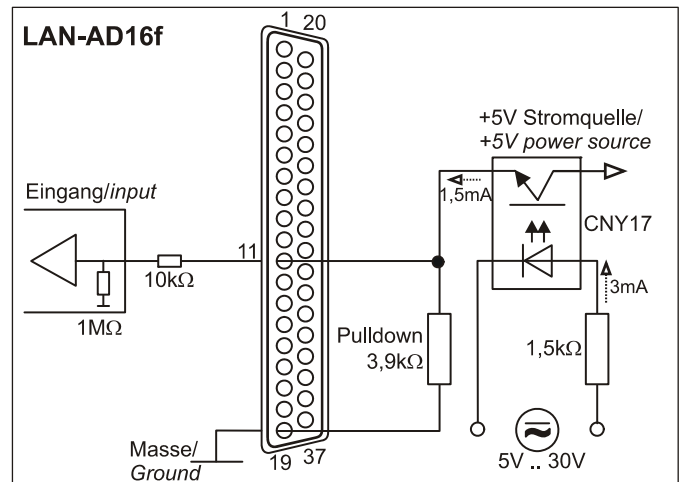
3.2 Connecting a counter or incremental encoder

The connection of "Signal A", "Signal B" and "Reset" is possible at any digital line.

At maximum performance (2^{19}-1), the counter is reset and starts from zero again.

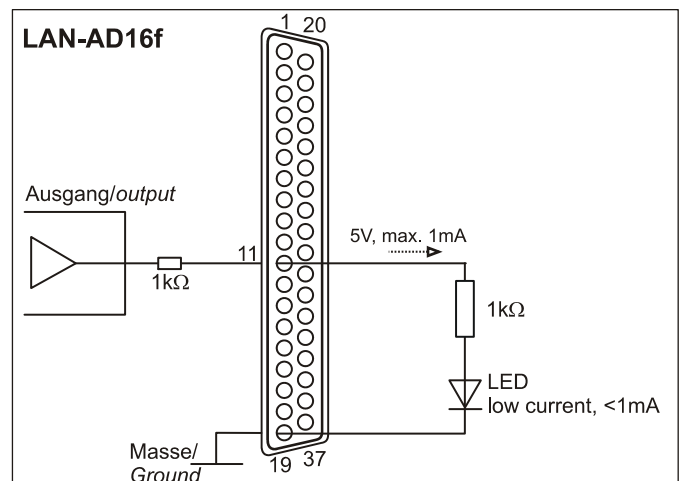## 3.3 Connecting an LED

Only so-called low-current LEDs can be used, because they already work with 1mA current.

Serial resistors in the output lines limit the current and protect the hardware from being destroyed.

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Please also observe the total current listed in the technical data (see chapter 8).

4 Software installation and configuration

All software and documentation available for the LAN-AD16f are integrated on the "Software Collection" CD included with delivery. When inserting the CD, a CD starter opens automatically (otherwise: start **openhtml.exe**).

Change to the product page of the LAN-AD16f by selecting the entry "Products" in the CD starter and then the hardware ("LAN-AD16f") listed under the interface "LAN".

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

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

Software	Software product	Notes	Documentation
Configura-tion	LAN-ADMIN	free software for the configuration of bmcm LAN data acquisition systems	UM-LAN-ADMIN (user manual)
Program-ming	STR-LIBADX	ActiveX control for hardware independent pro-gramming	IG-LIBADX (installation / programming manual)
	STR-LIBADX-EX	example programs for LIBADX ActiveX control	-
	SDK-LIBAD	SDK with example programs for C/C++ on Windows®, MAC OS X, FreeBSD, Linux	UM-LIBAD4 (installation / programming manual)
Operating program	NV4.5	measuring software NextView®4 available in the Standalone versions: • Lite: "slim" version with basic functions • Pro: full version with complete functional range • Analysis: version for the analysis of stored measuring data NextView®4 can be used for free as a fully func-tional 30-day trial version. After purchasing the software, all projects, measurement files, and settings can still be used.	DS-NV4 (data sheet) UM-NV4 (user manual) "First steps" in the NextView®4 demo project (displayed when first starting the software)

4.1 Configuration with LAN-AD16f Administration Utility

Network settings, firmware version and connection quality of the LAN-AD16f can be tested or chan-ged with the configuration software "LAN-AD16f Administration Utility".

The LAN-AD16f is displayed by software as "LAN-Base".

4.1.1 Installation

The installation program for the configuration software LAN-AD16f Administration Utility is included on the LAN-AD16f product page of the "Software Collection" CD. During installation, you will be prompted to choose the desired program group, to open the LAN-AD16f Administration Utility via the Windows® Start menu, and the directory path, in which the software is to be installed.

If using default settings, the entry "LAN-AD16f Administration Utility" will be available under "Programs" in the Windows® Start menu after installation.

4.1.2 Operation

In the left window of the program screen, all DAQ systems with a working network connection to the PC are listed displaying their IP addresses. The LAN-AD16f is displayed as "LAN-Base".

When being connected to a network, the device automatically self-assigns (DHCP) a link-local address.

Select a network DAQ system to show the parameters of this device in the TABs on the right.

Settings can be modified by clicking the "Options" button.
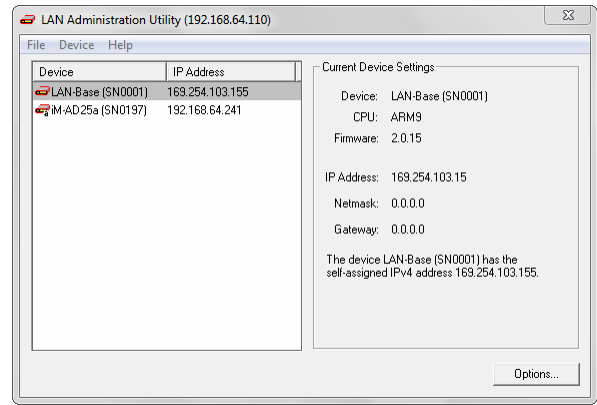
We strongly recommend to use the automatically assigned configuration. Manual changes should only be done by a network administrator.

4.1.3 Notes about TCP/IP

Each participant of the network has his own IP address consisting of four groups of numbers. To guarantee that a data package arrives at the correct address, this IP address must have been given out only once.

Each IP address contains the network number identifying the net your PC belongs to. Please make sure the PC and the LAN-AD16f are in the same net, i.e. they have the same network number, to be able to communicate with each other.

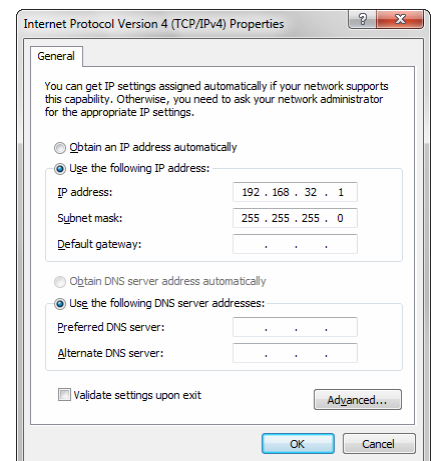### 4.1.4 Example configuration for the manual input of the network settings

If there is only the PC and the DAQ system in your network (network number `192.168.32.0`), you can use the following configuration. The IP address currently set in the PC is shown in the title bar of the LAN-AD16f Administration Utility:

Configuration	Value
IP address PC (see chapter 4.1.5)	`192.168.32.1`
IP address LAN-AD16f	`192.168.32.2`
network mask	`255.255.255.0`

4.1.5 Assign IP address of the PC

The IP address of the PC and the netmask is entered via the Control Panel of the PC in the dialog "Internet Protocol (TCP/IP) Properties". Step by step click the following entries:

Windows® 7	Windows® XP
✓ Start	✓ Start
✓ Control Panel	✓ Control Panel
✓ Network and Internet	✓ dialog "Network Connections"
✓ Network and Sharing Center	✓ Local Area Connection
✓ Connections: Local Area Connection	✓ button "Properties" (in TAB "General")
✓ button "Properties"	✓ item "Internet Protocol (TCP/IP)" (in TAB "General)
✓ item "Internet Protocol Version 4 (TCP/IPv4)"	✓ button "Properties"
✓ button "Properties"	✓ TAB "General"
✓ TAB "General	

4.2 Programming

Programming the LAN-AD16f with Visual Basic®, Delphi®, Visual C++™ under Windows® 7/XP is possible with the hardware independent STR-LIBADX. It is available on the LAN-AD16f 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 (with source code) demonstrating how to apply the ActiveX control.

Programming the LAN-AD16f under Max OS X and Unix (FreeBSD, Linux) with C/C++ is done by means of the LIBAD4 programming interface.

The SDK-LIBAD for the respective operating system (also Windows®) is included on the product page of the LAN-AD16f. For further information about how to integrate the SDK in the programming environment, please see the corresponding programming manual UM-LIBAD4.

Using the LIBAD4 requires advanced programming experience!

4.3 Using LAN-AD16f with NextView®4

Install the fully functional trial of the professional software NextView®4 for measurement data acquisition and processing to directly test the features and functions of the LAN-AD16f.

The setup program NV4.5 is available on the product page of the card. When first starting the software, request a license number with the option "Request 30 days free trial version" being checked and select your DAQ system (LAN-Base) in the following dialog "Device Setup".

The data sheet and the start project of NextView®4 contain first instructions about how to install and operate the program. For detailed information, an online help is provided.
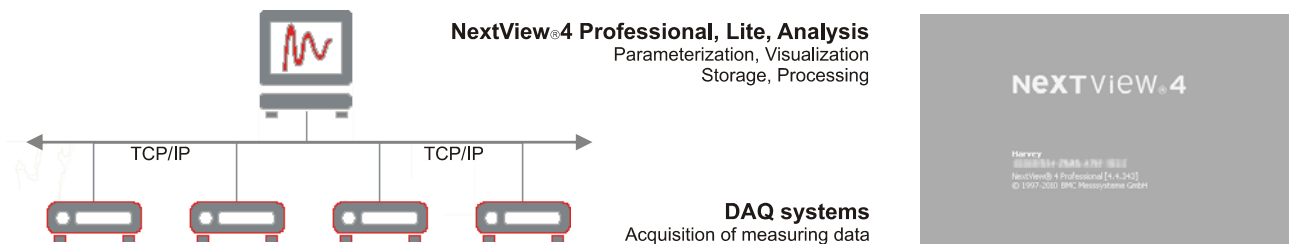
The trial is valid for 30 days after requesting the license number. If a license is not purchased within this period, the functional range of NextView®4 will be considerably cut down!

5 Synchronization

Several LAN-AD16f devices are synchronized via software.

6 LAN-AD16f and NextView®4

NextView®4 Professional, Lite, Analysis
Parameterization, Visualization
Storage, Processing

TCP/IP   TCP/IP

DAQ systems
Acquisition of measuring data

The device perfectly goes together with the modern data acquisition and analysis program NextView®4:

➢ different versions (Trial, Lite, Professional, Analysis) available (German or English)
➢ unlimited number of devices (even of different type) can be installed (except for: NextView®4 Lite)
➢ configure, scan, visualize, record, analyze, document in one software
➢ no programming skills required
➢ for further information visit : www.nextview.de
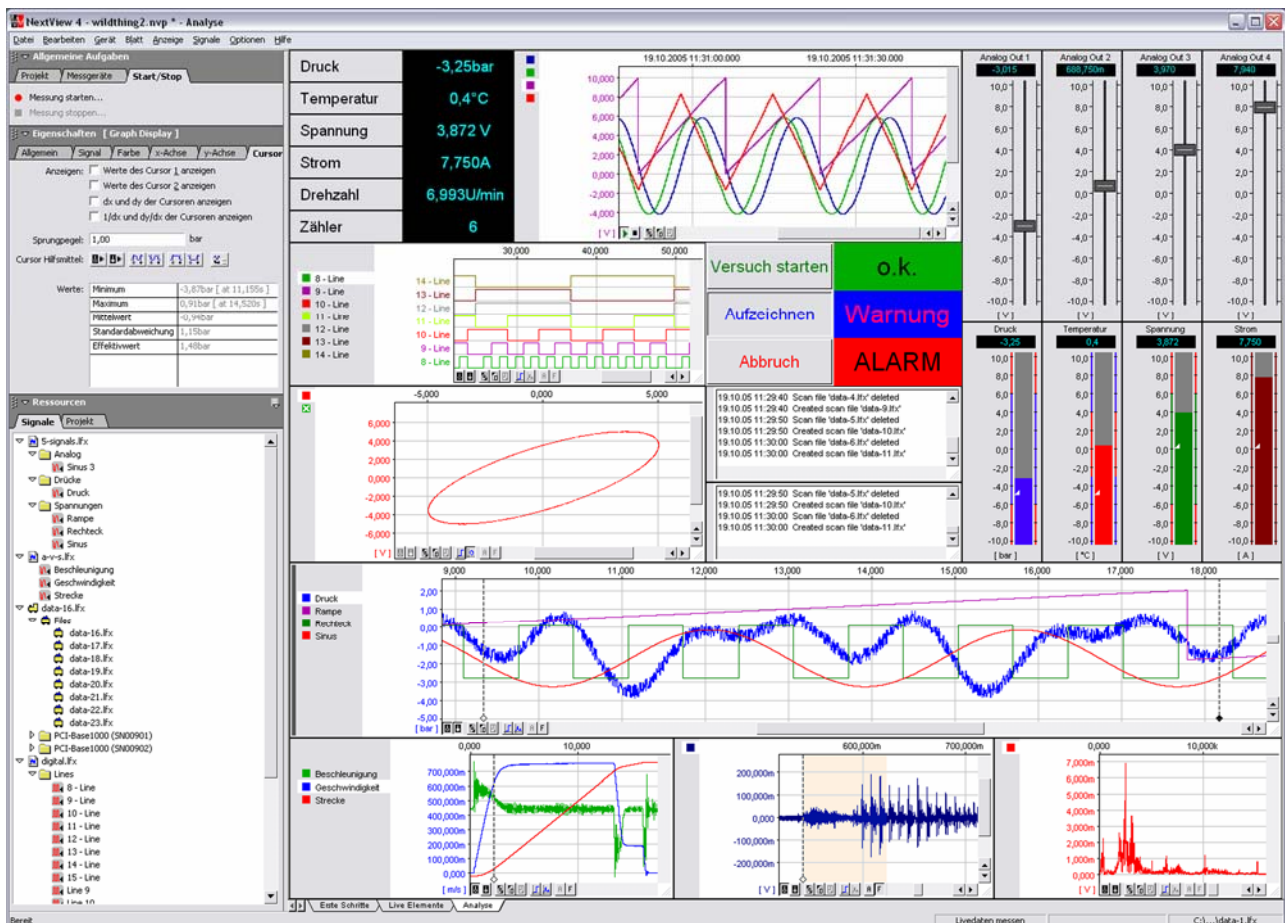
7 Important notes for using the LAN-AD16f

- The device is only suitable for extra-low voltages - please observe the relevant regulations! For reasons relating to EMC, it must only be used in closed PC housings. ESD voltages at open lines may cause malfunction. Only use an electrical isolated power supply unit (with CE).
- Only use non-solvent detergents for cleaning. The product is designed to be maintenance-free.
- Signal cables are connected at the two 37-pole D-Sub female connectors – preferably use shielded cables. For best possible interference suppression, connect shield at one end only. Close open inputs if necessary.
- The gain is adjusted to even values. Therefore, only 64000 values (for 16 bit) of the full range of the converter are used. As a result, the measuring ranges are slightly larger (e.g. ±10.24V) than the indicated measuring ranges so that overranges can be recognized.
- The AD converter of the LAN-AD16f has a code noise of up to ±4 LSB. For 16-bit accuracy, you must average app. 10 times in order to suppress the noise.
- 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.

8 Technical data

(typical at 20°C, after 5min., +12V supply)

- **Analog inputs**

Channels // Resolution // Sampling rate:	16 analog inputs (single-ended) // 16 Bit // max. 250kHz total sampling rate*			
Measuring ranges:	±10V	±5V	±2V	±1V
Noise in the relevant meas. range:	±5 LSB	±7 LSB	±8 LSB	±8 LSB
Surge protection:	±35V (when turned on), ±20V (when turned off), max. ±20mA in total of all input channels!			
Memory depth:	only depending on the size of the hard disk of the server PC			
Input resistance // Input capacity:	1MΩ (with PC turned off: 1kΩ) // 5pF			
Zero shift // Gain drop:	±50ppm/°C // ±50ppm/°C			
Frequency accuracy // Frequency drift:	max. ±100ppm // max. ±50ppm/°C			

* The total sampling rate is the sum of the sampling rates of the individual used channels (e.g. if 5 channels are scanned with 50kHz, the total sampling rate adds up to 250kHz).
The values for accuracy always relate to the respective measuring range. Errors might add at worst.

- **Analog outputs**

Output range // Output current:	2 voltage outputs with ±10V // 1mA max.
Resolution // Accuracy:	16 bit // typ. 1mV
Zero shift // Gain drop:	±50ppm/°C // ±50ppm/°C

- **Digital channels**

Channels // Level:	16 digital inputs, 16 digital outputs // CMOS/TTL compatible (low: 0V..0.7V; high: 3V..5V)
Resistance R_i // Output current:	Digital IN: 10kΩ, Digital OUT: 1kΩ // 0.5mA

- **General data**

Power supply:	+9..40V DC, typ. 3W, max. 5W (electr. isolated by DC/DC converter in the device) at 3-pole DIN plug
Connections analog // digital:	all channels at a 37-pole D-Sub female at the device back // front
LAN connection:	Twisted Pair RJ45 socket, 100Mbit
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. 1kV ESD on open lines
Temperature ranges // Relative humidity:	operating temp. -25..50°C, storage temp. -25..70°C // 0-90% (not condensing)
Dimensions // Protection type:	167 x 113 x 30 mm³ // IP30
Delivery:	device in aluminum housing, 3-pole DIN connector, "Software Collection" CD, description
Available accessories (optional):	power supply unit ZU-PW10W, current shunt ZU-CS250R, gender changer ZU37SS, connecting cables ZUKA37SB, ZUKA37SS, ZUKA10T (Twisted Pair), ZUKA-CL10T (Crosslink), D-Sub plug ZUST37, 3-pole DIN socket ZU3DIN, optocoupler board OI16, connector boards ZU37BB/-CB/-CO, DIN rail set ZU-SCHI, waterproof housing ZU-PBOX-LAN
Warranty:	2 years from date of purchase at bmcm, claims for damages resulting from improper use excluded

- **Software**

Software on CD (included):	ActiveX Controls LIBADX (hardware independent) for programming on Windows® 7/XP; LIBAD4 SDK for C/C++ programming on Windows® 7/XP, Mac OS X, Unix (FreeBSD, Linux); trial version of the measuring software NextView®4 to test and operate the hardware; configuration software LAN-Admin
NextView®4 (optional):	professional software (versions: Professional, Lite) for the acquisition and analysis of measurement data on Windows® 7/XP